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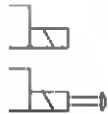



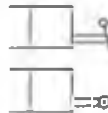

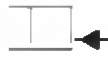



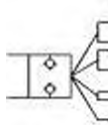

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Information	Information	Information	 1.0
Magnete Magnet Zubehör	Electro-aimant Aimants accessoires	Solenoid Solenoid accessory	 1.1
Magnetschieberventile direktgesteuert	Distributeurs électro-magnétiques à commande directe	Solenoid operated spool valves direct operated	 1.2
Magnetschieberventile direkt- gesteuert explosionsgeschützt	Distributeurs électro-magné- tiques à commande directe anti-déflagrants	Solenoid operated spool valves direct operated explosion proof	 1.3 Ex
Magnetschieberventile direkt- gesteuert weicheschalend	Distributeurs électro-magné- tiques à commande directe avec commutation amortie	Solenoid operated spool valves direct operated soft switching	 1.4 D
Schieberventile direktgesteuert handbetätigt/mechanisch betätigt	Distributeurs à tiroir à commande directe à commande manuelle / à commande hydraulique	Spool valves direct operated hand operation / mechanical operation	 1.5
Schieberventile direktgesteuert pneumatisch betätigt	Distributeurs à tiroir à commande directe à commande pneumatique	Spool valves direct operated pneumatic operation	 1.6
Schieberventile direktgesteuert hydraulisch betätigt	Distributeurs à tiroir à commande directe à commande hydraulique	Spool valves direct operated hydraulic operation	 1.7
Schieberventile eigendruckgesteuert	Distributeurs à tiroir pour renversement automatique de marche	Spool valves integral pressure reversal	 1.8
Schieberventile vorgesteuert	Distributeurs à tiroir pilotés	Spool valves pilot operated	 1.9
Proportional-Schieberventile	Distributeurs proportionnels	Proportional spool valves	 1.10
Sitzventile Sitzventilpatronen Sitzventile	Valves à clapet Cartouche valve à clapet Valves à clapet	Poppet valves Poppet valve cartridge Poppet valves	 1.11 Ex
2/2-Wege-Einbauventile	Cartouches 2/2-voies	2-way cartridge valves	 1.12



<b>Elektronik</b> Industrie Elektronik Mobilelektronik Elektronik Zubehör	<b>Electronique</b> Electronique industrielle Electronique mobile Electronique accessoires	<b>Electronics</b> Industrial electronics Mobile electronics Electro-accessories	 <b>1.13</b>
<b>Information Schraubpatronen</b>	<b>Information cartouches à visser</b>	<b>Information screw-in cartridges</b>	 <b>2.0</b>
<b>Druckbegrenzungsventile</b> Druckbegrenzungsventilen vorgesteuert Druckfolgeventile Speicherladeventile Druckbegrenzungsventile Gegenhaltventile	<b>Limiteurs de pression</b> Limiteurs de pression en cartouche piloté Valve de séquence Valve de charge d'accumulateur Limiteur de pression Valve de maintien	<b>Pressure relief valve</b> Pressure relief cartridge pilot operated Pressure sequence valves Accumulator unloading valves Pressure relief valve Back-pressure valve	 <b>2.1</b>
<b>Druckregelventile</b>	<b>Réducteurs de pression</b>	<b>Pressure control valves</b>	 <b>2.2</b>
<b>Proportional-Druckbegrenzungsventile,</b> <b>Proportional-Druckregelventile</b> Proportional-Druckregelventile Proportional-Druckbegrenzungsventile	<b>Limiteurs de pression proportionnels,</b> <b>Réducteurs de pression proportionnels</b> Réducteurs de pression proportionnels Limiteurs de pression proportionnels	<b>Proportional pressure relief valves,</b> <b>Proportional pressure reducing valves</b> Proportional pressure control valves Proportional pressure relief valves	 <b>2.3</b>
<b>Drosselventile, Drosselrückschlagventile</b> Drosselventile Drosselrückschlagventile	<b>Etrangleur, Etrangleur avec clapet anti-retour</b> Etrangleur Etrangleur avec clapet anti-retour	<b>Throttle valves, Restrictor valves</b> Throttle valves Restrictor valves	 <b>2.4</b>
<b>Stromregelventile, Druckausgleichventile,</b> <b>Vorschubeinheiten</b> Stromregelventile Druckausgleichventile Vorschubeinheiten	<b>Régulateurs de débit, Balances de pression,</b> <b>Unités d'avance</b> Régulateurs de débit Balances de pression Unités d'avance	<b>Flow control valves, Pressure compensating</b> <b>valves, Fast approaches / fine feed valves</b> Flow control valves Pressure compensating valves Fast approaches / fine feed valves	 <b>2.5</b>
<b>Proportional-Drosselventile,</b> <b>Proportional-Stromregelventile</b> Proportional-Drosselventile Proportional-Stromregelventile	<b>Etrangleurs proportionnels, Régulateurs de</b> <b>débit proportionnels</b> Etrangleurs proportionnels Régulateurs de débit proportionnels	<b>Proportional throttle valves, Proportional</b> <b>flow control valves</b> Proportional throttle valves Proportional flow control valves	 <b>2.6</b>
<b>Rückschlagventile</b> Rückschlagventile, Sperventile, Wechselventile, Rohrbruchschonungen, Ablassshhn, Dreiwegewelche	<b>Clapets anti-retours</b> Clapets anti-retours, Sélecteurs de circuit, Valves parachute, Robinet de décharge, Arrière à trois voies	<b>Non-return valves</b> Non-return valves, Check valves, Shuttle valves, Pipe failure valves, Drain valves, 3-way shifting valves	 <b>2.7</b>
<b>Anschlusskomponenten</b> Anschlussplatten Reihenflanschplatten Längsverkettungssysteme Gewindelkörper für Druckbegrenzungsventile	<b>Composants de raccordement</b> Plaque embasée Plaque embasée multiple Emplage longitudinal per bocca modulaire Corps avec raccordements filetés	<b>Connection components</b> Threaded subplates Multi-section subplates Module type manifold system Line mount body for pressure relief valves	 <b>2.9</b>
<b>Zubehör</b>	<b>Accessoires</b>	<b>Accessories</b>	 <b>2.10</b>
<b>Senkungen</b>	<b>Logements</b>	<b>Cavities</b>	 <b>2.13</b>

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Mounting interfaces

- standards for hydraulic valve interfaces

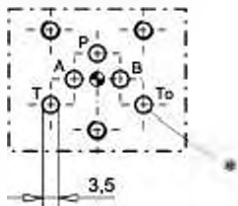


**INFORMATION**

There is considerable confusion over standards as applicable to the valve interfaces depicted below.

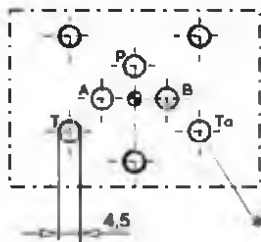
**NG3-Mini**

Wandfluh standard



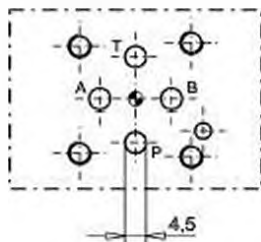
**NG4-Mini**

Wandfluh standard



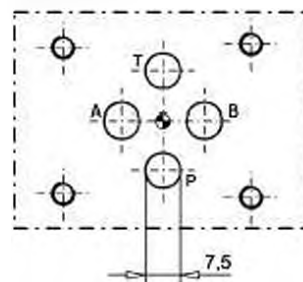
**NG4**

ISO 4401-02



**NG6**

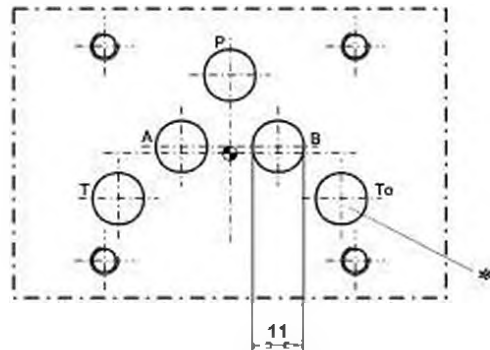
ISO 4401-03



**Note:**  
Wandfluh delivers his products without center bore and center pin.

**NG10**

ISO 4401-05



**\* Important:**

T<sub>2</sub> is not drilled in subplates NG3, NG4 and NG10, but T<sub>2</sub> is included in most of sandwich- and flange valves.



**CONTAMINATION IN HYDRAULIC UNITS**

One differentiates between the following kinds of contamination:

**Initial contamination:**

This contamination takes place during the erection and commissioning of the hydraulic units.  
 (Dust, swarf, rust, hammer scale, packaging residues, etc.)

**Contamination by new oil:**

The oil supplied by the oil supplier is often contaminated, therefore the oil definitely must be filtered before filling it into the unit.

**Contamination during operation:**

Entry of dirt into the hydraulic tank due to insufficient ventilation, piston rod seals, etc.

**FILTER / DEGREE OF CONTAMINATION**

In the Wandfluh product documentation, degrees of contamination and recommended filters are indicated as follows:

Example:

Maximum admissible degree of contamination      ISO 4406:1999, class 18/16/13  
 Recommended filter with retention rate             $\beta_{10} \geq 75$

**CONTAMINATION CLASSES**

The contamination classes indicate how many particles of a certain size are contained in 100 ml of hydraulic fluid. Usually control- and proportional valves are the components most sensitive to contamination in the hydraulic unit. Therefore they determine the overall degree of contamination of the hydraulic oil. At the moment, 5 classification systems are available (ISO 4406:1999, resp. NAS 1638, SAE Mil std. 1246A). In the Wandfluh product documentation the maximum admissible degrees of contamination are indicated in classes in accordance with ISO 4406:1999.

**RETENTION RATE/BETA - VALUE**

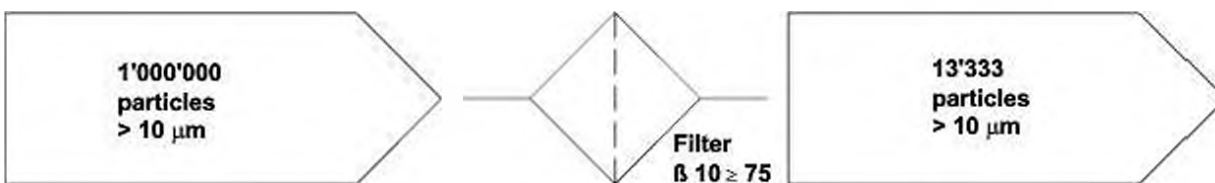
The retention rate of a filter element is the measure for the separation capacity of the filter for defined particle sizes. It is defined by the beta-value ( $\beta_x$ ) The  $\beta_x$  value is the ratio of all particles  $> x \mu\text{m}$  before the filter, to the particles  $> x \mu\text{m}$  after the filter.

Example: Filter element with retention rate  $\beta_{10} \geq 75$

Contamination level  
before the filter

Filter with retention rate

Contamination level after  
the filter



In the Wandfluh product documentation, the retention rate is indicated as  $\beta_x \geq 75$ .

Further customary retention rates are:  $\beta_x \geq 2, 20$  und  $200$

**SELECTION OF FILTER/RECOMMENDATION**

In the following table, the degrees of contamination (extract) in accordance with ISO 4406:1999 with number of particles/100 ml, as well as hydraulic valve groups with the filter fineness recommended for them are indicated.

Contamination class	Number of particles per 100 ml		Recommended filter fineness $\beta_x \geq 75$ ( $x = \mu\text{m}$ )	Control valves	Prop. valves in control systems	Prop. valves in general	Valves with control cylinder	Spool shift valves	Poppet valves	Valves in general $> 160 \text{ bar}$	Valves in general $< 160 \text{ bar}$
	over $8 \mu\text{m}$	over $16 \mu\text{m}$									
18/14/11	> 8000...16000	> 1000...2000	$\beta_{3...5}$								
18/16/13	> 32000...64000	> 4000...8000	$\beta_{6...10}$								
20/18/14	> 130000...260000	> 8000...16000	$\beta_{10...16}$								
21/18/16	> 260000...500000	> 16000...32000	$\beta_{16...25}$								
				Pressure filter required			Pressure filter recommended			return line filter	

## Operating and storage temperatures of valves

Wandfluh valves can be used within the temperature ranges listed below.



### Limitations

#### Temperature range:

Limitations, in particular for the maximum permissible temperatures, can have other reasons, independent of the sealing material (e.g., in the Ex-protection area). Releasing of other values only after consultation.

#### Performance data:

During operation outside the temperature ranges indicated on the data sheets, the performance data may be limited.

Sealing material	Additional designation	Valve	Operating temperature	Storage temperature
NBR / Acrylnitrile	None	Standard	-25°C ... +70°C	-40°C ... +70°C
FKM / Viton	D1	Standard	-20°C ... +70°C	-40°C ... +70°C
NBR 872 / Acrylnitrile	Z604	Standard with increased play	-40°C ... +70°C	-40°C ... +70°C
PU / Polyurethane	Z591	Valves made of special materials and increased play	-60°C ... +70°C	-60°C ... +70°C

### Terms

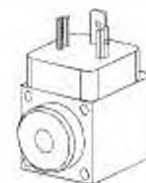
#### Operating temperature:

The operating temperature is the ambient temperature and the temperature of the pressure medium and designates the temperature range, within which the valve may be operated and put into operation.

#### Storage temperature:

Average temperature of the ambient of the valve.

**Important:** This temperature indication also includes the temperature range of the installation in a non-operating condition.

**Solenoid SIN29V  
 to VDE 0580  
 Plug plate to ISO 4400/DIN 43650  
 Protection class IP65**

**DESCRIPTION**

The SIN29V is a switching solenoid. Its design corresponds to VDE standard 0580. The steel housing is zinc coated as a standard. Static pressure-tightness is 160 bars. All o-rings are Viton. The solenoids are fixed to the valve with four screws. Depending on the intended use, the solenoid can be supplied with a plug screw, or with integrated manual override. The connector plate corresponds to ISO 4400 and DIN 43650.

**FUNCTION**

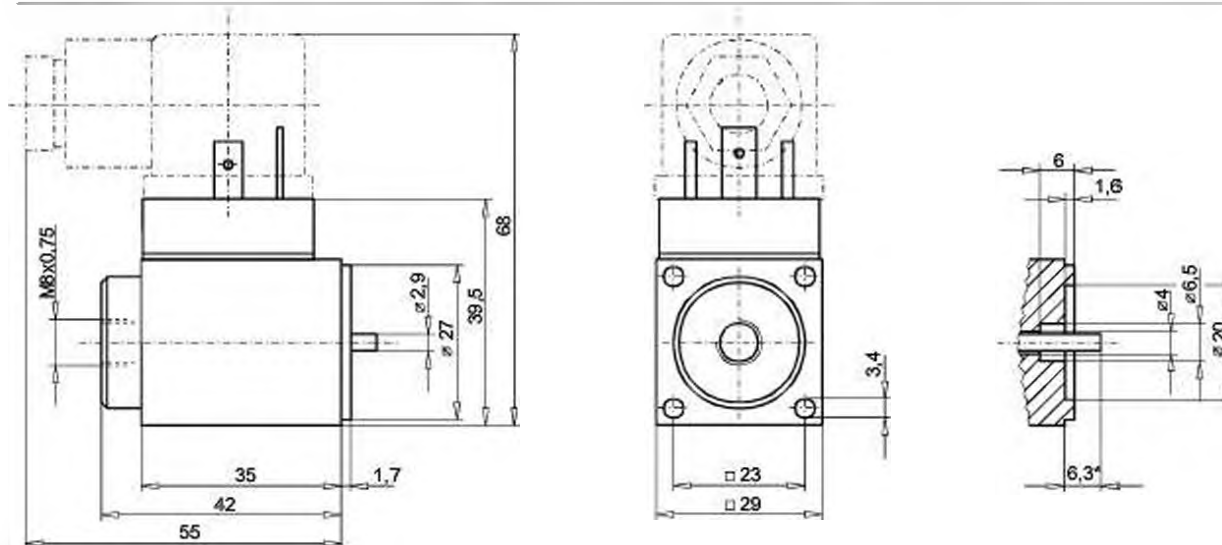
When the solenoid is energised with the specified nominal voltage, the armature moves from the starting position of its stroke ( $s=2,5$  mm) to the end position ( $s=0$  mm). The switching time is essentially dependent on the application. The power-stroke characteristics are designed to suit the requirements of hydraulic valves. AC versions include an electronic rectifier integrated into the connector plate. In this way maximum performance is assured.

**APPLICATION**

Essential for hydraulic directional and poppet valves. Because of the risk of overheating, the solenoid must never be used separately. The length of the fixing screws depends on the base material of the body. An o-ring is used for the valve seal. Information on screws and o-rings will be found in the data sheets relating to the valves concerned. Before changing the plug screw or the screw with integrated manual override, care must be taken to ensure that the solenoid is not under pressure. Risk of injury! The maximum operating pressure is determined by the valve actually used.

**TYPE CODE**

		SI	N	29	V	-	-	#	
Solenoid									
Industrial execution									
Normal									
Square 29 mm housing									
Solenoid completely potted									
Nominal voltage $U_n$	12 VDC	G12							
	24 VDC	G24							
	115 VAC	R115	*						
	230 VAC	R230	*						
AC= 50 to 60 Hz									
* Rectifier integrated in the plug plate									
Other nominal voltages and nominal power on request									
with mounted screw plug (data sheet 1.1-300)								HB0	
with mounted manual override (data sheet 1.1-300)								HB4,5	
with mounted special manual override (data sheet 1.1-310)								H...	
Design-Index (Subject to change)									

**DIMENSIONS**


\* Solenoid energised ( $s=0$  mm)

**CHARACTERISTICS**

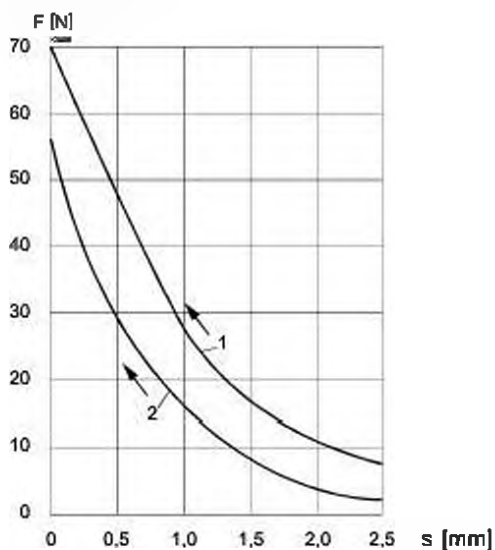
Static pressure tightness	160 bar (seal diameter of valve max. 20 mm) With seal diameter of valve = 27 mm: static pressure tightness = 100 bar
Coil winding insulation class	H
Connection/Power supply	Over device plug connection to ISO 4400/DIN 43650, (2P+E), other connections on request
Protection class to EN 60528	IP65
Relative duty factor	100 %
Reference temperature	50 °C
Seal	Viton, other on request
Fluid	Mineral oil, other fluid on request
Switching cycles	15 000/h
Mounting screws	4 x M3 (Quality 8.8)
Housing	Zinc coated steel housing, other surface treatments on request.

		DC	AC
Total stroke	{mm}	2,5	2,5
Working stroke	{mm}	1	1
Nominal power	{W}	15	
	{VA}		17
Armature weight	{kg}	0,020	0,020
Solenoid weight	{kg}	0,21	0,21
Voltage range	{VDC}	10-250	
	{VAC}		24-250

	12VDC	24VDC	115VAC	230VAC
Nominal resistance (Ω)	10	42	650	2 850
Number of windings (-)	740	1 490	5 800	11 000
Inductivity (mH)	8	35	-	-

**PERFORMANCE**

F = f (s) Force-stroke characteristics



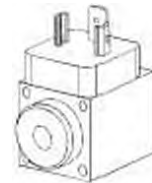
- 1: U = 100 % U<sub>N</sub>      Reference temperature = 20 °C (15W)  
 2: U = 90 % U<sub>N</sub>      Reference temperature = 50 °C  
                                  Solenoid in operating temperature (9W)

The values refer to U<sub>N</sub> = 24VDC.  
 With other nominal voltages deviations can occur.  
 For curve 2 the solenoid has been mounted on a body □ 30 x 38.

**ACCESSOIRES**

Plug HB0	• Article No. 239.2033
Plug with integrated manual override HB4,5	
• Article No. 253.8000	• acc. data sheet 1.1-300
Special manual override	see data sheet 1.1-310
Plug grey	Article No. 219.2001
Plug black	Article No. 219.2002

Technical explanation see data sheet 1.1-400

**Solenoid SIS29V  
 to VDE 0580  
 Plug plate to ISO 4400/DIN 43650  
 Protection class IP65**

**DESCRIPTION**

The SIS29V is a switching solenoid. Its design corresponds to VDE standard 0580. The steel housing is zinc coated as a standard. Static pressure tightness is 350 bars. All o-rings are Viton. The solenoids are fixed to the valve with four screws. Depending on the intended use, the solenoid can be supplied with a plug screw, or with integrated manual override. The connector plate corresponds to ISO 4400 and DIN 43650.

**FUNCTION**

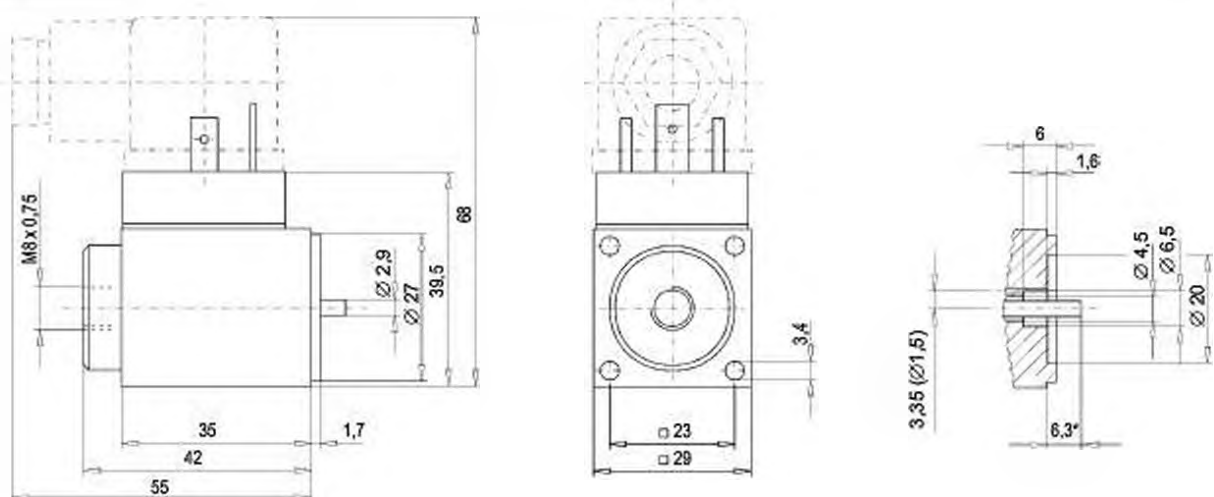
When the solenoid is energised with the specified nominal voltage, the armature moves from the starting position of its stroke ( $s = 2,5$  mm) to the end position ( $s = 0$  mm). The switching time is essentially dependent on the application. The power-stroke characteristics are designed to suit the requirements of hydraulic valves. AC versions include an electronic rectifier integrated into the connector plate. In this way maximum performance is assured.

**APPLICATION**

Essential for hydraulic directional and poppet valves. Because of the risk of overheating, the solenoid must never be used separately. The length of the fixing screws depends on the base material of the body. An o-ring is used for the valve seal. Information on screws and o-rings will be found in the data sheets relating to the valves concerned. Before changing the plug screw or the screw with integrated manual override, care must be taken to ensure that the solenoid is not under pressure. Risk of injury! The maximum operating pressure is determined by the valve actually used.

**TYPE CODE**

		SI	S	29	V	-	-	#	□
Solenoid									
Industrial execution									
Super									
Square 29 mm housing									
Solenoid completely potted									
Nominal voltage $U_n$	12 VDC	G12							
	24 VDC	G24							
	115 VAC	R115 *							
	230 VAC	R230 *							
AC= 50 to 60 Hz									
* Rectifier integrated in the plug plate									
Other nominal voltages and nominal power on request									
with mounted screw plug (data sheet 1.1-300)		HB0							
with mounted manual override (data sheet 1.1-300)		HB4,5							
with mounted special manual override (data sheet 1.1-310)		H...							
Design-Index (Subject to change)									

**DIMENSIONS**


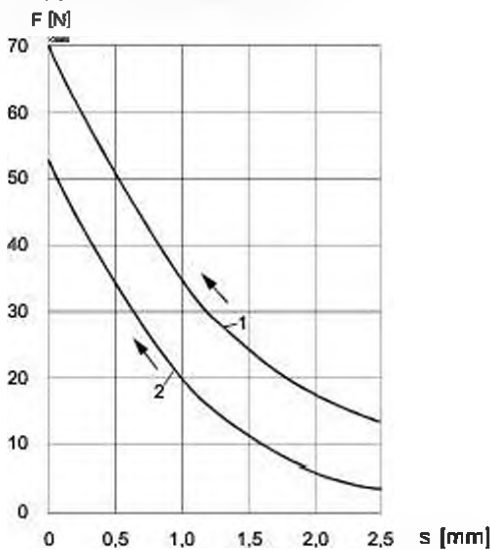
\* Solenoid energised ( $s = 0$  mm)

**CHARACTERISTICS**

Static pressure tightness	350 bar (seal diameter of valve max. 15 mm) With seal diameter of valve = 27 mm: Static pressure tightness = 100 bar
Coil winding insulation class	H
Connection/Power supply	Over device plug connection to ISO 4400/DIN 43650.(2P+E), other connections on request
Protection class to EN 60528	IP65
Relative duty factor	100%
Reference temperature	50 °C
Seal	Viton, other on request
Fluid	Mineral oil, other fluid on request
Switching cycles	15 000/h
Mounting screws	4 x M3 (Quality 8.8)
Housing	Zinc coated steel housing, other surface treatments on request.

		<b>DC</b>	<b>AC</b>
Total stroke	(mm)	2,5	2,5
Working stroke	(mm)	1	1
Nominal power	(W)	15	
	(VA)		17
Armature weight	(kg)	0,014	0,014
Solenoid weight	(kg)	0,21	0,21
Voltage range	(VDC)	10-250	
	(VAC)		24-250

	<b>12VDC</b>	<b>24VDC</b>	<b>115VAC</b>	<b>230VAC</b>
Nominal resistance (Ω)	10	42	650	2 650
Number of windings (-)	740	1'490	5 800	11'000
Inductivity (mH)	17	70	-	-

**PERFORMANCE**
**F = f (s) Force-stroke characteristics**


1: U = 100% U<sub>n</sub>      Reference temperature = 20 °C (15W)  
 2: U = 90% U<sub>n</sub>      Reference temperature = 50 °C  
                                  Solenoid in operating temperature (9W)

The values refer to U<sub>n</sub> = 24VDC.  
 With other nominal voltages deviations can occur.  
 For curve 2 the solenoid has been mounted on a body □ 30 x 38.

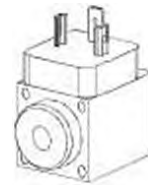
**ACCESSOIRES**

Plug HB0	• Article No. 239.2033
Plug with integrated manual override HB4.5	• Article No. 253.8000
	• acc. data sheet 1.1-300
Special manual override	see data sheet 1.1-310
Plug grey	Article No. 219.2001
Plug black	Article No. 219.2002

Technical explanation see data sheet 1.1-400



**Proportional solenoid PI29V  
to VDE 0580  
Plug plate to ISO 4400/DIN 43650  
Protection class IP65**


**DESCRIPTION**

The PI29V is a proportional solenoid. Its design corresponds to VDE standard 0580. The steel housing is zinc coated as a standard. Static pressure tightness is 350 bars. All o-rings are Viton. The solenoids are fixed to the valve with four screws. Depending on the intended use, the solenoid can be supplied with a plug screw, or with integrated manual override. The connector plate corresponds to ISO 4400 and DIN 43650.

**FUNCTION**

The horizontal force-stroke characteristics in the working stroke range means that:

- a more or less linear force absorption can be achieved with constant stroke and increasing current absorption;
- a more or less linear stroke variation can be achieved when working against a spring and with increasing current absorption.

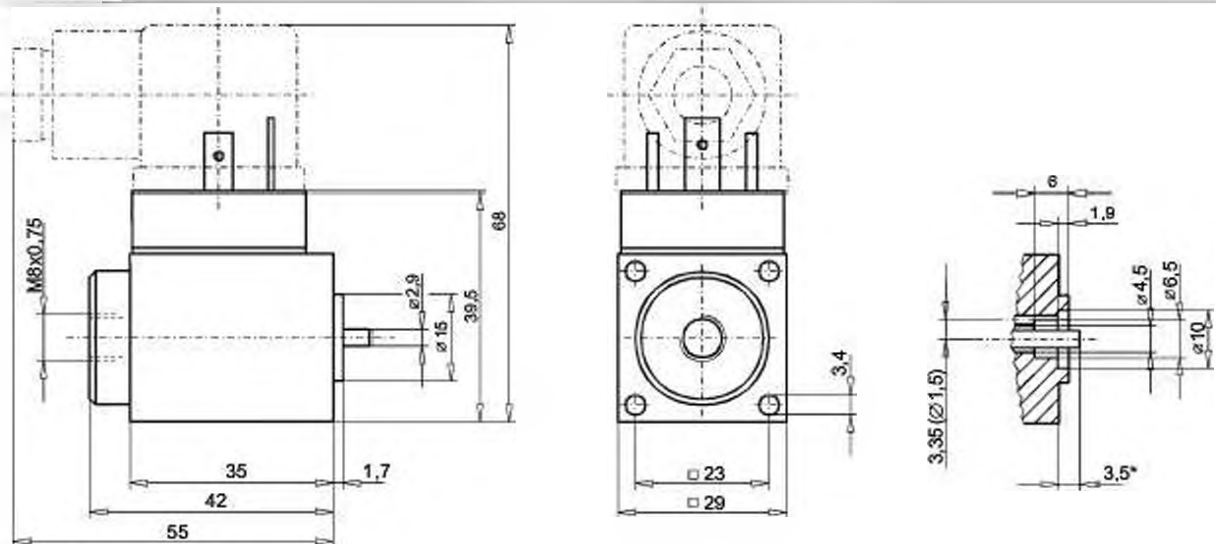
This ensures that the reference voltage is adequate at the specified reference temperature to reach the limit current in every case.

**APPLICATION**

Essential for hydraulic proportional-way-, pressure- and current valves. Because of the risk of overheating, the solenoid must never be used separately. The length of the fixing screws depends on the base material of the body. An o-ring is used for the valve seal. Information on screws and o-rings will be found in the data sheets relating to the valves concerned. Before changing the plug screw or the screw with integrated manual override, care must be taken to ensure that the solenoid is not under pressure. Risk of injury! The maximum operating pressure is determined by the valve actually used.

**TYPE CODE**

			PI 29 V - <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>
Proportional solenoid			
Industrial execution			
Square 29 mm housing			
Solenoid completely potted			
Nominal voltage $U_n$	12 VDC	G12	
	24 VDC	G24	
with mounted screw plug (data sheet 1.1-300)			HB0
with mounted manual override (data sheet 1.1-300)			HB4,5
Design-Index (Subject to change)			

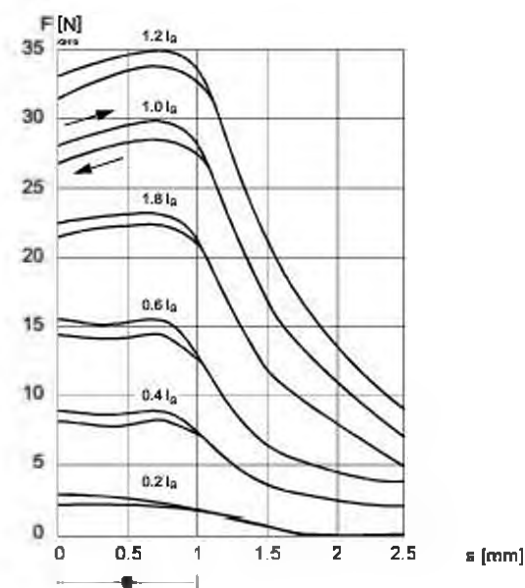
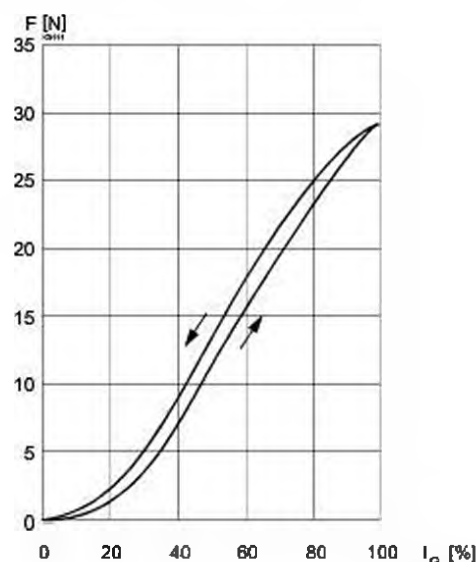
**DIMENSIONS**


\* Solenoid energised (a= 0 mm)

**CHARACTERISTICS**

Static pressure tightness	350 bar (seal diameter of valve max. 15 mm)
Coil winding insulation class	H
Connection/Power supply	Over device plug connection to ISO 4400/DIN 43650. (2P+E), other connections on request
Protection class EN 60529	IP65
Relative duty factor	100%
Reference temperature	50 °C
Seal	Viton, other on request
Fluid	Mineral oil, other fluid on request
Mounting screws	4 x M3 (Quality 8.8)
Housing	Zinc coated steel housing, other surface treatments on request

		12VDC	24VDC
Total stroke	(mm)	2,5	2,5
Working stroke	(mm)	1	1
Rated force	(N)	29	29
Hysteresis of rated force	(%)	5,5	5,5
Hysteresis of rated current	(%)	5,5	5,5
Nom. linearity deviation	(%)	4,5	4,5
Rated resistance	(Ω)	7,2	31
Rated current	(A)	1,08	0,54
Limiting current	(A)	1,08	0,54
Linearity current	(A)	0,2	0,1
Actuation current	(A)	0,02	0,01
Nominal wattage	(W)	8,1	8,8
Performance limit	(W)	13	13
Number of windings	(-)	645	1'310
Inductivity	(mH)	12	45
Armature weight	(kg)	0,014	0,014
Solenoid weight	(kg)	0,21	0,21

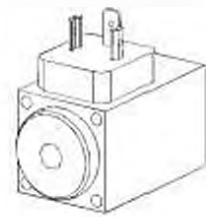
**PERFORMANCE**
**F = f (s) Force-stroke characteristics**

**F = f (I) Force-current characteristics**


◆ = Working stroke

**ACCESSOIRES**

Plug HB0	Article No. 239.2033 data sheet 1.1-300
Plug with integrated manual override HB4.5	Article No. 253.8000 data sheet 1.1-300
Plug grey	Article No. 219.2001
Plug black	Article No. 219.2002

Technical explanation see data sheet 1.1-410

**Solenoid SIN35V  
 to VDE 0580  
 Plug plate to ISO 4400/DIN 43650  
 Protection class IP65**

**DESCRIPTION**

The SIN35V is a switching solenoid. Its design corresponds to VDE standard 0580. The steel housing is zinc coated as a standard. Static pressure tightness is 160 bars. All o-rings are Viton. The solenoids are fixed to the valve with four screws. Depending on the intended use, the solenoid can be supplied with a plug screw, or with integrated manual override. The connector plate corresponds to ISO 4400 and DIN 43650.

**FUNCTION**

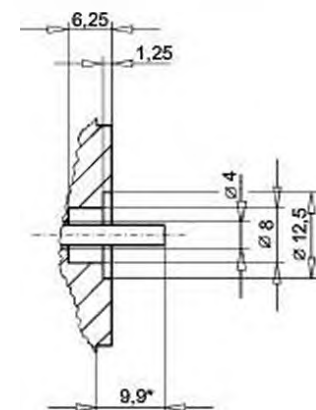
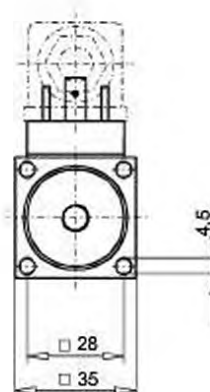
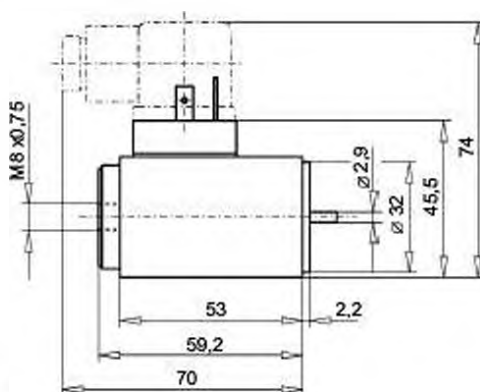
When the solenoid is energised with the specified nominal voltage, the armature moves from the starting position of its stroke ( $s = 3,2 \text{ mm}$ ) to the end position ( $s = 0 \text{ mm}$ ). The switching time is essentially dependent on the application. The power stroke characteristics are designed to suit the requirements of hydraulic valves. AC versions include an electronic rectifier integrated into the connector plate. In this way maximum performance is assured.

**APPLICATION**

Essential for hydraulic directional and poppet valves. Because of the risk of overheating, the solenoid must never be used separately. The length of the fixing screws depends on the base material of the body. An o-ring is used for the valve seal. Information on screws and o-rings will be found in the data sheets relating to the valves concerned. Before changing the plug screw or the screw with integrated manual override, care must be taken to ensure that the solenoid is not under pressure. Risk of injury! The maximum operating pressure is determined by the valve actually used.

**TYPE CODE**

		SI N 35 V - <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>	
Solenoid			
Industrial execution			
Normal			
Square 35 mm housing			
Solenoid completely potted			
Nominal voltage $U_n$	12 VDC	G12	
	24 VDC	G24	
	115 VAC	R115 *	
	230 VAC	R230 *	
AC= 50 to 60 Hz			
* Rectifier integrated in the plug plate			
Other nominal voltages and nominal power on request			
with mounted screw plug (data sheet 1.1-300)		HB0	
with mounted manual override (data sheet 1.1-300)		HB4,5	
with mounted special manual override (data sheet 1.1-310)		H...	
Design-Index (Subject to change)			

**DIMENSIONS**


\* Solenoid energised ( $s = 0 \text{ mm}$ )

**CHARACTERISTICS**

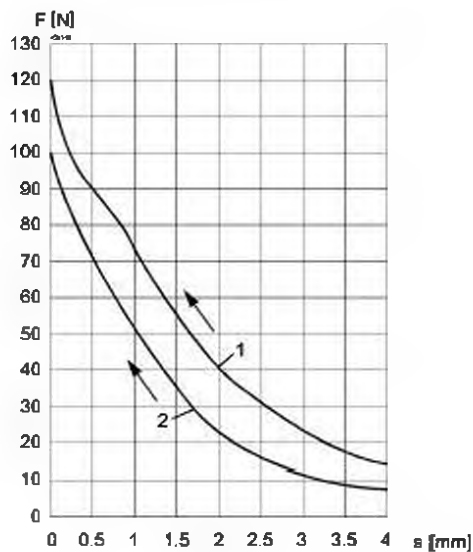
Static pressure tightness	160 bar (seal diameter of valve max. 27 mm) With seal diameter of valve = 32mm Static pressure tightness = 120 bar
Coil winding insulation class	H
Connection/Power supply	Over device plug connection to ISO 4400/DIN 43650, (2P+E), other connections on request
Protection class EN 60529	IP65
Relative duty factor	100 %
Reference temperature	50 °C
Seal	Viton, other on request
Fluid	Mineral oil, other fluid on request
Switching cycles	15 000/h
Mounting screws	4 x M4 (Quality 8.8)
Housing	Zinc coated steel housing, other surface treatments on request

		<b>DC</b>	<b>AC</b>
Totale stroke (mm)	4	4	
Working stroke (mm)	1,7	1,7	
Nominal power (W)	22		
	(VA)		25
Armature weight (kg)	0,038	0,038	
Solenoid weight (kg)	0,45	0,45	
Voltage range (VDC)	10-250		
	(VAC)		24-250

	<b>12VDC</b>	<b>24VDC</b>	<b>115VAC</b>	<b>230VAC</b>
Nominal resistance (Ω)	7,2	25	420	1 500
Number of windings (-)	800	1 550	5 930	11 400
Inductivity (mH)	6	22	-	-

**PERFORMANCE**

F = f (s) Force-stroke characteristics



- 1: U = 100 % U<sub>n</sub>     Reference temperature = 20 °C (20W)  
 2: U = 90 % U<sub>n</sub>     Reference temperature = 50 °C  
                              Solenoid in operating temperature (12W)

The values refer to U<sub>n</sub> = 24 VDC.

With other nominal voltages deviations can occur.

For curve 2 the solenoid has been mounted on a body □ 38 x 54.

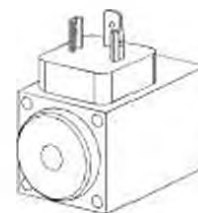
**ACCESSOIRES**

Plug HB0     » Article No. 239.2033  
 Plug with integrated manual override HB4,5     » Article No. 253.8000  
    » acc. data sheet 1.1-300

Special manual override     see data sheet 1.1-310

Plug grey     Article No. 219.2001  
 Plug black     Article No. 219.2002

Technical explanation see data sheet 1.1-400

**Solenoid SIS35V**  
**to VDE 0580**  
**Plug plate to ISO 4400/DIN 43650**  
**Protection class IP65**

**DESCRIPTION**

The SIS35V is a switching solenoid. Its design corresponds to VDE standard 0580. The steel housing is zinc coated as a standard. Static pressure tightness is 350 bars. All o-rings are Viton. The solenoids are fixed to the valve with four screws. Depending on the intended use, the solenoid can be supplied with a plug screw, or with integrated manual override. The connector plate corresponds to ISO 4400 and DIN 43650.

**FUNCTION**

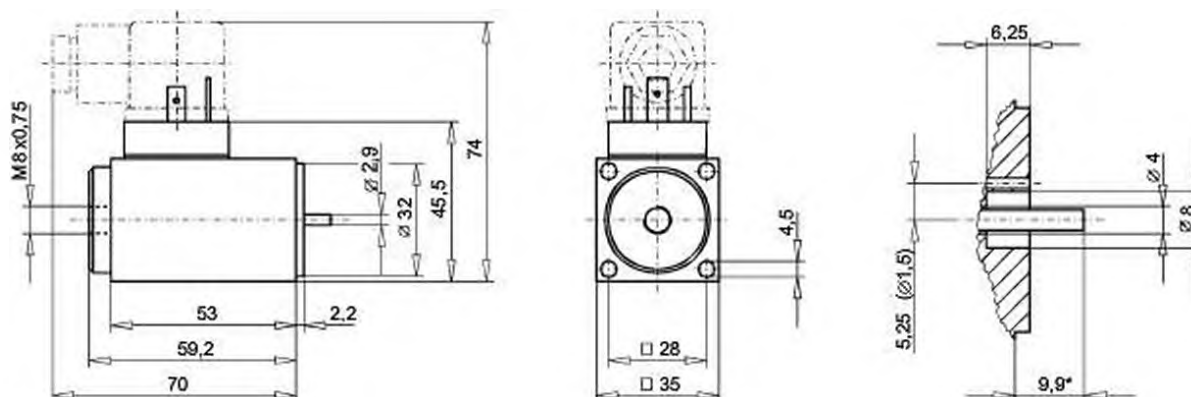
When the solenoid is energised with the specified nominal voltage, the armature moves from the starting position of its stroke ( $s=4$  mm) to the end position ( $s=0$  mm). The switching time is essentially dependent on the application. The power stroke characteristics are designed to suit the requirements of hydraulic valves. AC versions include an electronic rectifier integrated into the connector plate. In this way maximum performance is assured.

**APPLICATION**

Essential for hydraulic directional and poppet valves. Because of the risk of overheating, the solenoid must never be used separately. The length of the fixing screws depends on the base material of the body. An o-ring is used for the valve seal. Information on screws and o-rings will be found in the data sheets relating to the valves concerned. Before changing the plug screw or the screw with integrated manual override, care must be taken to ensure that the solenoid is not under pressure. Risk of injury! The maximum operating pressure is determined by the valve actually used.

**TYPE CODE**

		SI	S	35	V	-	-	#
Solenoid								
Industrial execution								
Super								
Square 35 mm housing								
Solenoid completely potted								
Nominal voltage $U_n$	12 VDC							<b>G12</b>
	24 VDC							<b>G24</b>
	115 VAC							<b>R115</b> *
	230 VAC							<b>R230</b> *
AC= 50 to 60 Hz								
* Rectifier integrated in the plug plate								
Other nominal voltages and nominal performances on request								
with mounted screw plug (data sheet 1.1-300)								<b>H80</b>
with mounted manual override (data sheet 1.1-300)								<b>HB4,5</b>
with mounted special manual override (data sheet 1.1-310)								<b>H...</b>
Design-Index (Subject to change)								

**DIMENSIONS**


\* Solenoid energised ( $s=0$  mm)

**CHARACTERISTICS**

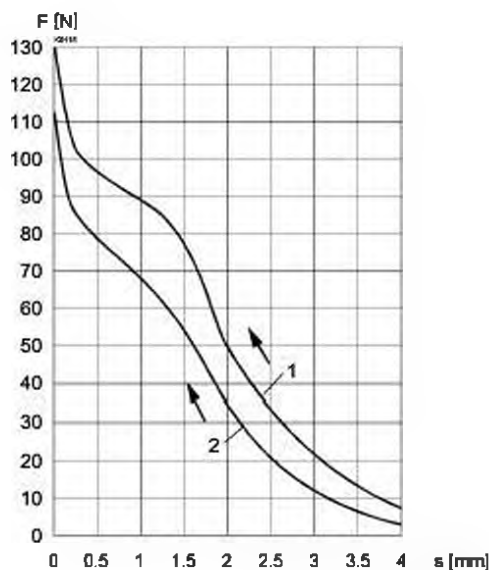
Static pressure tightness	350 bar (seal diameter of valve max. 19 mm) With seal diameter of valve = 32 mm: Static pressure tightness = 120 bar
Coil winding insulation class	H (180 °C)
Connection/Power supply	Over device plug connection to ISO 4400/DIN 43850. (2P+E). other connections on request.
Protection class to EN 60528	IP65
Relative duty factor	100 %
Reference temperature	50 °C
Seal	Viton, other on request
Fluid	Mineral oil, other fluid on request
Switching cycles	15000/h
Mounting screws	4 x M4 (Quality 8.8)
Housing	Zinc coated steel housing, other surface treatments on request.

		<b>DC</b>	<b>AC</b>
Total stroke	(mm)	4	4
Working stroke	(mm)	1,7	1,7
Nominal power	(W)	22	
	(VA)		25
Armature weight	(kg)	0,024	0,024
Solenoid weight	(kg)	0,45	0,45
Voltage range	(VDC)	10-250	
	(VAC)		24-250

	<b>12VDC</b>	<b>24VDC</b>	<b>115VAC</b>	<b>230VAC</b>
Nominal resistance (Ω)	7,2	25	420	1500
Number of windings (-)	800	1550	5930	11400
Inductivity (mH)	14	60	-	-

**PERFORMANCE**

F = f (s) Force-stroke characteristics



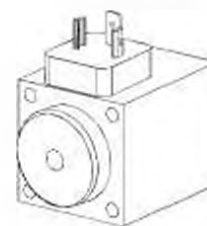
1:  $U = 100\% U_N$  Reference temperature = 20 °C (22W)  
 2:  $U = 80\% U_N$  Reference temperature = 50 °C  
 Solenoid in operating temperature (15W)  
 The values refer to  $U_N = 24VDC$ .  
 With other nominal voltages deviations can occur.  
 For curve 2 the solenoid has been mounted on a body □ 38 x 54.

**ACCESSOIRES**

Plug HB0	• Article No. 239.2033
Plug with integrated manual override HB4,5	• Article No. 253.8000
	• acc. data sheet 1.1-300
Special manual override	see data sheet 1.1-310
Plug grey	Article No. 219.2001
Plug black	Article No. 219.2002

Technical explanation see data sheet 1.1-400



**Solenoid SIN45V  
 to VDE 0580  
 Plug plate to ISO 4400/DIN 43650  
 Protection class IP65**

**DESCRIPTION**

The SIN45V is a switching solenoid. Its design corresponds to VDE standard 0580. The steel housing has a zinc coated finish as standard. Static pressure tightness is 160 bars. All o-rings are Viton. The solenoids are fixed to the valve with four screws. Depending on the intended use, the solenoid can be supplied with a plug screw, or with integrated manual override. The connector plate corresponds to ISO 4400 and DIN 43650.

**FUNCTION**

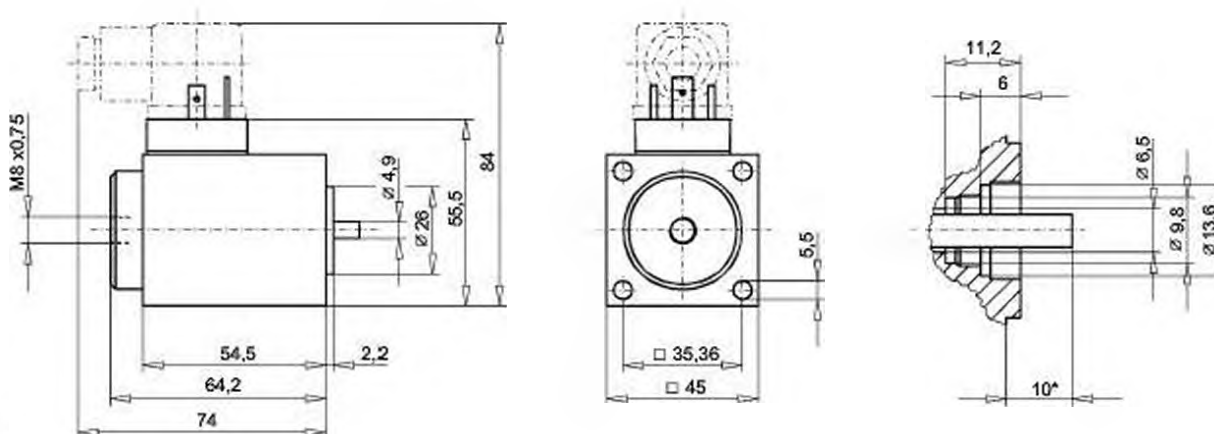
When the solenoid is energised with the specified nominal voltage, the armature moves from the starting position of its stroke ( $s = 5,5$  mm) to the end position ( $s = 0$  mm). The switching time is essentially dependent on the application. The power-stroke characteristics are designed to suit the requirements of hydraulic valves. AC versions include an electronic rectifier integrated into the connector plate. In this way maximum performance is assured.

**APPLICATION**

Essential for hydraulic directional and poppet valves. Because of the risk of overheating, the solenoid must never be used separately. The length of the fixing screws depends on the base material of the body. An o-ring is used for the valve seal. Information on screws and o-rings will be found in the data sheets relating to the valves concerned. Before changing the plug screw or the screw with integrated manual override, care must be taken to ensure that the solenoid is not under pressure. Risk of injury! The maximum operating pressure is determined by the valve actually used.

**TYPE CODE**

		S I N 45 V - <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>	
Solenoid			
Industrial execution			
Normal			
Square 45 mm housing			
Solenoid completely potted			
Nominal voltage $U_N$	12 VDC	G12	
	24 VDC	G24	
	115 VAC	R115	*
	230 VAC	R230	*
AC= 50 to 60 Hz			
* Rectifier integrated in the plug plate			
Other nominal voltages and nominal power on request			
with mounted screw plug (data sheet 1.1-300)			HB0
with mounted manual override (data sheet 1.1-300)			HB6
with mounted special manual override (data sheet 1.1-310)			H...
Design-index (Subject to change)			

**DIMENSIONS**


\* Solenoid energised ( $s = 0$  mm)

**CHARACTERISTICS**

Static pressure tightness	160 bar (seal diameter of valve max. 28 mm)
Coil winding insulation class	H
Connection/Power supply	Over device plug connection to ISO 4400/DIN 43650, (2P+E), other connections on request.
Protection class EN 60529	IP65
Relative duty factor	100 %
Reference temperature	50 °C
Seal	Viton, other on request
Fluid	Mineral oil, other fluid on request
Switching cycles	15000/h
Mounting screws	4 x M5 (Quality 8.8)
Housing	Zinc coated steel housing, other surface treatments on request.

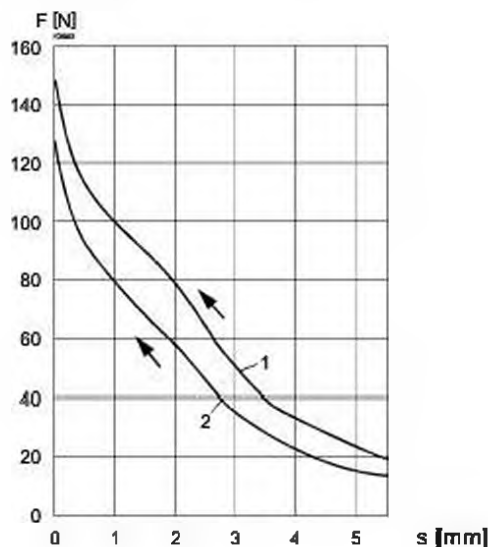
		DC	AC
Total stroke	(mm)	5,5	5,5
Working stroke	(mm)	2,5	2,5
Nominal power	(W)	30	
	(VA)		35
Armature weight	(kg)	0,055	0,055
Solenoid weight	(kg)	0,76	0,76
Voltage range	(VDC)	10-250	
	(VAC)		40-250+

- For AC voltages below 40 VAC DC solenoids plus rectifier plugs are available.  
 21 VDC to 24 VAC  
 32 VDC to 36 VAC

	12VDC	24VDC	115VAC	230VAC
Nominal resistance (Ω)	5	21,8	445	1'400
Number of windings (-)	770	1'560	7'000	13'000
Inductivity (mH)	16	72	-	-

**PERFORMANCE**

$F = f(s)$  Force-stroke characteristics



- 1:  $U = 100\% U_n$  Reference temperature = 20 °C (30W)  
 2:  $U = 90\% U_n$  Reference temperature = 50 °C  
 Solenoid in operating temperature (19W)

The values refer to  $U_n = 24$  VDC.

With other nominal voltages deviations can occur.

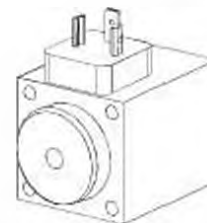
For curve 2 the solenoids has been mounted on a body □ 46 x 64.

**ACCESSOIRES**

Plug HB0	• Article No. 239.2033
Plug with integrated manual override HB6	• Article No. 253.8001
	• acc. data sheet 1.1-300
Special manual override	see data sheet 1.1-310
Plug grey	Article No. 219.2001
Plug black	Article No. 219.2002
Rectifier plug grey	Article No. 219.2105
Rectifier plug black	Article No. 219.2106

Technical explanation see data sheet 1.1-400

**Solenoid SIS45V**  
**to VDE 0580**  
**Plug plate to ISO 4400/DIN 43650**  
**Protection class IP65**


**DESCRIPTION**

The SIS45V is a switching solenoid. Its design corresponds to VDE standard 0580. The steel housing has a zinc coated finish as standard. Static pressure tightness is 350 bara. All o-rings are Viton. The solenoids are fixed to the valve with four screws. Depending on the intended use, the solenoid can be supplied with a plug screw, or with integrated manual override. The connector plate corresponds to ISO 4400 and DIN 43650.

**FUNCTION**

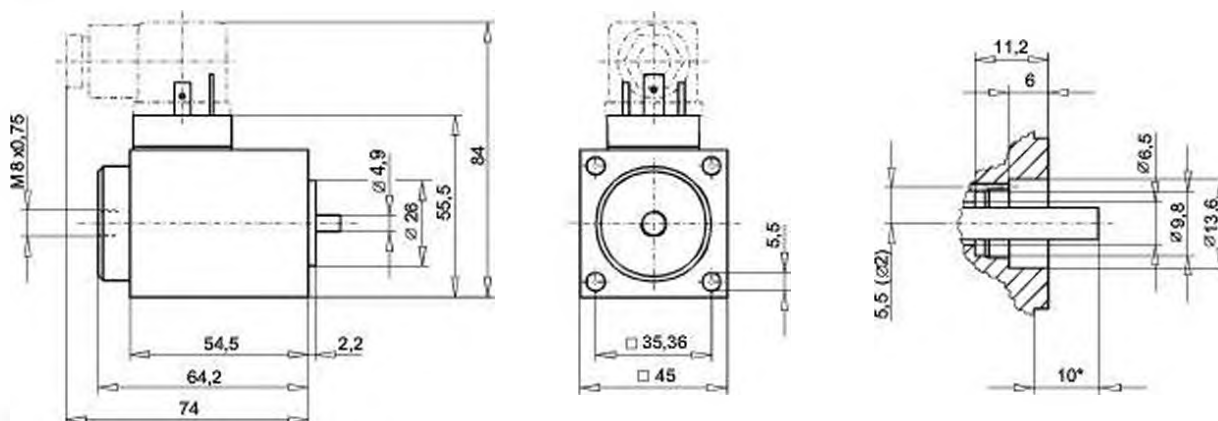
When the solenoid is energised with the specified nominal voltage, the armature moves from the starting position of its stroke ( $s = 5,5 \text{ mm}$ ) to the end position ( $s = 0 \text{ mm}$ ). The switching time is essentially dependent on the application. The power stroke characteristics are designed to suit the requirements of hydraulic valves. AC versions include an electronic rectifier integrated into the connector plate. In this way maximum performance is assured.

**APPLICATION**

Essential for hydraulic directional and poppet valves. Because of the risk of overheating, the solenoid must never be used separately. The length of the fixing screws depends on the base material of the body. An o-ring is used for the valve seal. Information on screws and o-rings will be found in the data sheets relating to the valves concerned. Before changing the plug screw or the screw with integrated manual override, care must be taken to ensure that the solenoid is not under pressure. Risk of injury! The maximum operating pressure is determined by the valve actually used.

**TYPE CODE**

		SI S 45 V - <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>	
Solenoid			
Industrial execution			
Super			
Square 45 mm housing			
Solenoid completely potted			
Nominal voltage $U_n$	12 VDC	G12	
	24 VDC	G24	
	115 VAC	R115	=
	230 VAC	R230	=
AC= 50 to 60 Hz			
• Rectifier integrated in the plug plate			
Other nominal voltages and nominal power on request			
with mounted screw plug (data sheet 1.1-300)		HB0	
with mounted manual override (data sheet 1.1-300)		HB6	
with mounted special manual override (data sheet 1.1-310)		H...	
Design-Index (Subject to change)			

**DIMENSIONS**


\* Solenoid energised ( $s = 0 \text{ mm}$ )

**CHARACTERISTICS**

Static pressure tightness	350 bar (seal diameter of valve max. 25 mm) With seal diameter of valve = 26 mm: Static pressure tightness = 315 bar
Coil winding insulation class	H
Connection/Power supply	Over device plug connection to ISO 4400/DIN 43850, (2P+E), other connections on request
Protection class to EN 60528	IP65
Relative duty factor	100 %
Reference temperature	50 °C
Seal	Viton, other on request
Fluid	Mineral oil, other fluid on request
Switching cycles	15 000/h
Mounting screws	4 x M5 (Quality 8.8)
Housing	Zinc coated steel housing, other surface treatments on request.

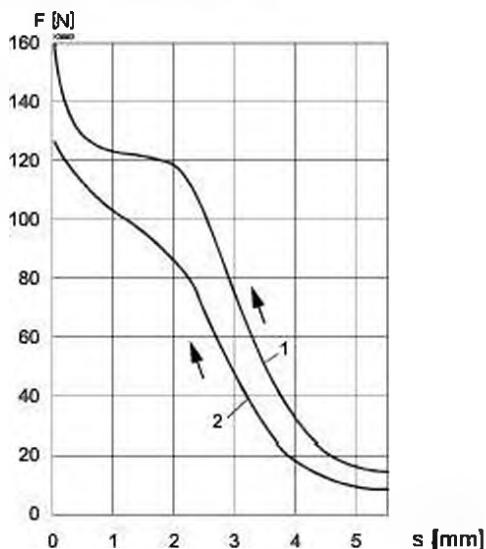
		DC	AC
Totale stroke	(mm)	5,5	5,5
Working stroke	(mm)	2,5	2,5
Nominal power	(W)	30	
	(VA)		35
Armature weight	(kg)	0,044	0,044
Solenoid weight	(kg)	0,76	0,76
Voltage range	(VDC)	10-250	
	(VAC)		40-250*

- \* For AC voltages below 40 VAC DC solenoids plus rectifier plugs are available.  
21 VDC to 24 VAC  
32 VDC to 36 VAC

	12VDC	24VDC	115VAC	230VAC
Nominal resistance (Ω)	5	21,8	445	1'400
Number of windings (-)	770	1'560	7 000	13'000
Inductivity (mH)	19	82		

**PERFORMANCE**

F = f (s) Force-stroke characteristics



- 1: U = 100 % U<sub>n</sub> Reference temperature = 20 °C (30W)  
 2: U = 90 % U<sub>n</sub> Reference temperature = 50 °C  
 Solenoid in operating temperature (19W)

The values refer to U<sub>n</sub> = 24 VDC.

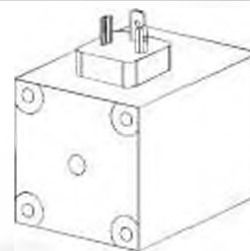
With other nominal voltages deviations can occur.

For curve 2 the solenoid has been mounted on a body □ 46 x 64.

**ACCESSOIRES**

Plug HB0	♦ Article No. 239.2033
Plug with integrated manual override HB6	♦ Article No. 253.8001
	♦ acc. data sheet 1.1-300
Special manual override	see data sheet 1.1-310
Plug gray	Article No. 219.2001
Plug black	Article No. 219.2002
Rectifier plug gray	Article No. 219.2105
Rectifier plug black	Article No. 219.2108

Technical explanation see data sheet 1.1-400

**Solenoid SIN60V  
 to VDE 0580  
 Plug plate to ISO 4400/DIN 43650  
 Protection class IP65**

**DESCRIPTION**

The SIN60V is a switching solenoid. Its design corresponds to VDE standard 0580. The steel housing is zinc coated as a standard. Static pressure tightness is 160 bars. All o-rings are Viton. The solenoids are fixed to the valve with four screws. Depending on the intended use, the solenoid can be supplied with a plug screw, or with integrated manual override. The connector plate corresponds to ISO 4400 and DIN 43650.

**FUNCTION**

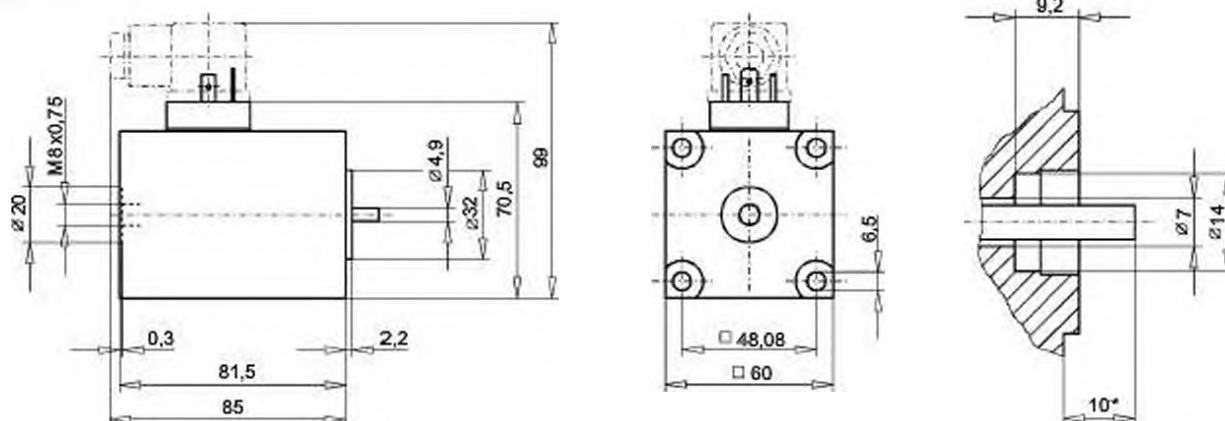
When the solenoid is energised with the specified nominal voltage, the armature moves from the starting position of its stroke ( $s = 8,5$  mm) to the end position ( $s = 0$  mm). The switching time is essentially dependent on the application. The power-stroke characteristics are designed to suit the requirements of hydraulic valves. AC versions include an electronic rectifier integrated into the connector plate. In this way maximum performance is assured.

**APPLICATION**

Essential for hydraulic directional and poppet valves. Because of the risk of overheating, the solenoid must never be used separately. The length of the fixing screws depends on the base material of the body. An o-ring is used for the valve seal. Information on screws and o-rings will be found in the data sheets relating to the valves concerned. Before changing the plug screw or the screw with integrated manual override, care must be taken to ensure that the solenoid is not under pressure. Risk of injury! The maximum operating pressure is determined by the valve actually used.

**TYPE CODE**

		SI	N	60	V	-	-	#
Solenoid								
Industrial execution								
Normal								
Square 60 mm housing								
Solenoid completely potted								
Nominal voltage $U_N$	12 VDC							G12
	24 VDC							G24
	115 VAC							R115 =
	230 VAC							R230 =
AC= 50 to 60 Hz								
• Rectifier integrated in the plug								
Other nominal voltages and nominal power on request								
with mounted screw plug (data sheet 1.1-300)								HB0
with mounted manual override (data sheet 1.1-300)								HB8,5
with mounted special manual override (data sheet 1.1-310)								H...
Design-Index (Subject to change)								

**DIMENSIONS**


\* Solenoid energised ( $s = 0$  mm)

**CHARACTERISTICS**

Static pressure tightness	160 bar (seal diameter of valve max. 32 mm)
Coil winding insulation class	H
Connection/Power supply	Over device plug connection to ISO 4400/DIN 43650, (2P+E), other connections on request
Protection class EN 60 529	IP65
Relative duty factor	100 %
Reference temperature	50 °C
Seal	Viton, other on request
Fluid	Mineral oil, other fluid on request
Switching cycles	15 000/h
Mounting screws	4 x M8 (Quality 8.8)
Housing	Zinc coated steel housing, other surface treatments on request.

		DC	AC
Totale stroke	(mm)	8,5	8,5
Working stroke	(mm)	4	4
Nominal power	(W) (VA)	40	48
Armature weight	(kg)	0,124	0,124
Solenoid weight	(kg)	1,90	1,90
Voltage range	(VDC) (VAC)	10-250	50-250*

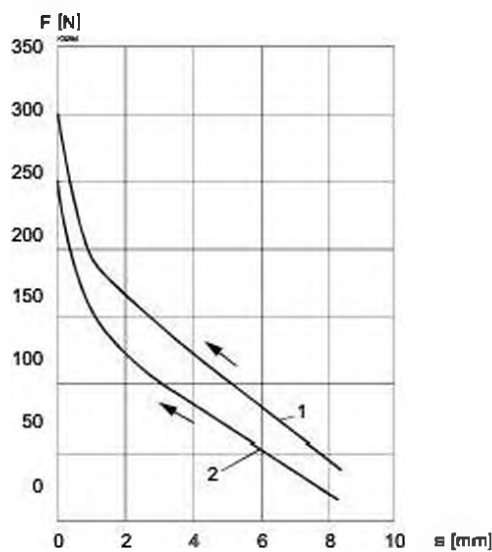
\* For AC voltages below 50 VAC DC solenoids plus rectifier plugs are available.

21 VDC to 24 VAC
32 VDC to 36 VAC
36 VDC to 42 VAC
42 VDC to 48 VAC

	12VDC	24VDC	115VAC	230VAC
Nominal resistance (Ω)	4	16,5	260	920
Number of windings (-)	780	1 580	5710	11 200
Inductivity (mH)	19	75	-	-

**PERFORMANCE**

F = f (s) Force-stroke characteristics



1: U = 100 % U<sub>n</sub> Reference temperature = 20 °C (40W)  
 2: U = 90 % U<sub>n</sub> Reference temperature = 50 °C  
 Solenoid in operating temperature (25W)

The values refer to U<sub>n</sub> = 24 VDC.

With other nominal voltages deviations can occur.

For curve 2 the solenoid has been mounted on a body □ 62 x 93.

**ACCESSOIRES**

Plug HB0 \* Article No. 239.2033  
 Plug with integrated manual override HB8,5 \* Article No. 253.8002  
 \* acc. data sheet 1.1-300

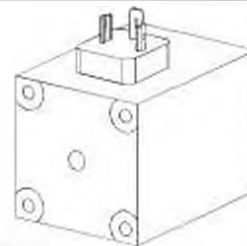
Special manual override see data sheet 1.1-310

Plug grey Article No. 219.2001  
 Plug black Article No. 219.2002

Rectifier plug grey Article No. 219.2105  
 Rectifier plug black Article No. 219.2106

Technical explanation see data sheet 1.1-400

**Solenoid SIS60V**  
 to VDE 0580  
 Plug plate to ISO 4400/DIN 43650  
 Protection class IP65



**DESCRIPTION**

The SIS60V is a switching solenoid. Its design corresponds to VDE standard 0580. Static pressure-tightness is 350 bars. All o-rings are Viton. The solenoids are fixed to the valve with four screws. Depending on the intended use, the solenoid can be supplied with a plug screw, or with integrated manual override. The connector plate corresponds to ISO 4400 and DIN 43650.

**FUNCTION**

When the solenoid is energised with the specified nominal voltage, the armature moves from the starting position of its stroke ( $s = 8,5 \text{ mm}$ ) to the end position ( $s = 0 \text{ mm}$ ). The switching time is essentially dependent on the application. The power-stroke characteristics are designed to suit the requirements of hydraulic valves. AC versions include an electronic rectifier integrated into the connector plate. In this way maximum performance is assured.

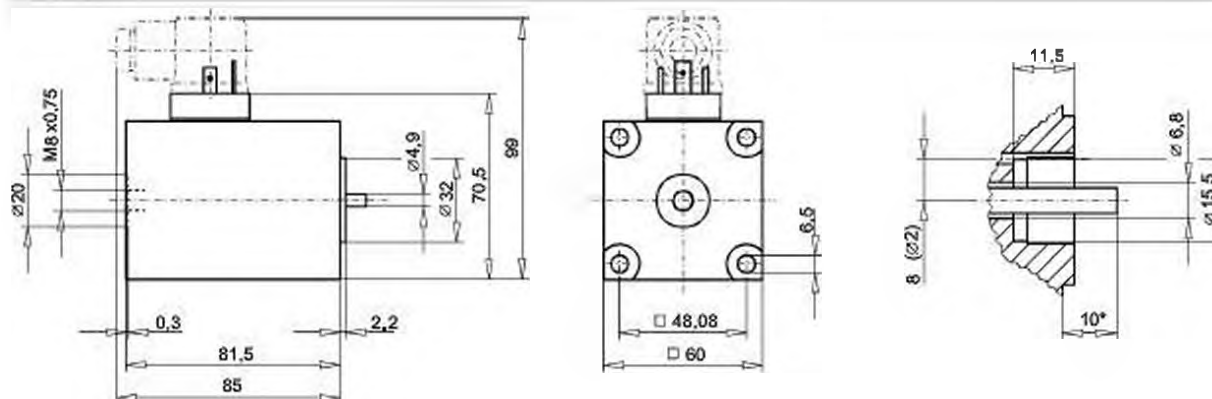
**APPLICATION**

Essential for hydraulic directional and poppet valves. Because of the risk of overheating, the solenoid must never be used separately. The length of the fixing screws depends on the base material of the body. An o-ring is used for the valve seal. Information on screws and o-rings will be found in the data sheets relating to the valves concerned. Before changing the plug screw or the screw with integrated manual override, care must be taken to ensure that the solenoid is not under pressure. Risk of injury! The maximum operating pressure is determined by the valve actually used.

**TYPE CODE**

		SI S 60 V - <input type="checkbox"/> # <input type="checkbox"/>	
Solenoid			
Industrial execution			
Super			
Square 60 mm housing			
Solenoid completely potted			
Nominal voltage $U_n$	12 VDC	G12	
	24 VDC	G24	
	115 VAC	R115	*
	230 VAC	R230	*
AC= 50 to 60 Hz			
* Rectifier integrated in the plug plate			
Other nominal voltages and nominal power on request			
Design-Index (Subject to change)			

**DIMENSIONS**



\* Solenoid energised ( $s = 0 \text{ mm}$ )



**CHARACTERISTICS**

Static pressure tightness	350 bar (seal diameter of valve max. 29 mm) With seal diameter of valve = 32 mm: Static pressure tightness = 315 bar
Coil winding insulation class	H
Connection/Power supply	Over device plug connection to ISO 4400/DIN 43850, (2P+E), other connections on request
Protection class to EN 60528	IP65
Relative duty factor	100%
Reference temperature	50 °C
Seal	Viton, other on request
Fluid	Mineral oil, other fluid on request
Switching cycles	15000/h
Mounting screws	4 x M8 (Quality 8.8)
Housing	Zinc Nickel coated steel housing

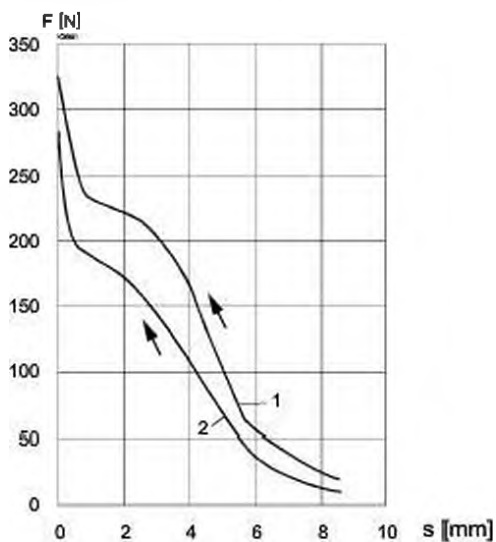
		DC	AC
Totale stroke	(mm)	8,5	8,5
Working stroke	(mm)	4	4
Nominal power	(W)	40	
	(VA)		48
Armature weight	(kg)	0,102	0,102
Solenoid weight	(kg)	1,90	1,90
Voltage range	(VDC)	10-250	
	(VAC)		50-250*

- \* For AC voltages below 50 VAC DC solenoids plus rectifier plugs are available.  
 21 VDC to 24 VAC  
 32 VDC to 36 VAC  
 36 VDC to 42 VAC  
 42 VDC to 48 VAC

STANDARD	12VDC	24VDC	125VDC	115VAC	230VAC
Nominal resistance (Ω)	4	16,5	400	260	920
Number of windings (-)	780	1'580	7760	5710	11'200
Inductivity (mH)	17	65	1625	-	-

**PERFORMANCE**

F = f (s) Force-stroke characteristics



- 1:  $U = 100\% U_N$  Reference temperature = 20 °C (40W)  
 2:  $U = 90\% U_N$  Reference temperature = 50 °C  
 Solenoid in operating temperature (25W)

 The values refer to  $U_N = 24$  VDC.

With other nominal voltages deviations can occur.

 For curve 2 the solenoid has been mounted on a body  $\square 62 \times 93$ .

**ACCESSOIRES**

- Plug HB0 ♦ Article No. 239.2033
- Plug with integrated manual override HB8.5 ♦ Article No. 253.8002
- ♦ acc. data sheet 1.1-300
- Special manual override see data sheet 1.1-310
- Plug gray Article No. 219.2001
- Plug black Article No. 219.2002
- Rectifier plug gray Article No. 219.2105
- Rectifier plug black Article No. 219.2108

Technical explanation see data sheet 1.1-400

**Solenoid coil K.E33 / 13x39**  
**according to DIN VDE 0580**  
**Protection class IP65/67/69K**


**DESCRIPTION**

The slip-on solenoid coil K.E33/13x39 is available in three different connection versions. The construction corresponds to the DIN VDE 0580-Norm. The housing and the connector socket is made of plastic material.

**FUNCTION**

With the combination of an armature tube the function of a switching solenoid results. The solenoid coils are available only as DC versions.

**TYPE CODE**

Plastic housing		K	<input type="checkbox"/> E33 / 13 x 39 -	<input type="checkbox"/> # <input type="checkbox"/>
Connection execution				
Connector socket EN 175301-803/ISO 4400		<b>D</b>		
Connector Deutsch DT04-2P		<b>G</b>		
Coil execution				
Internal coil diameter 13 mm				
Coil length 39 mm				
Nominal voltage U <sub>n</sub>	12 VDC	<b>G12</b>		
	24 VDC	<b>G24</b>		
Design-Index (Subject to change)				

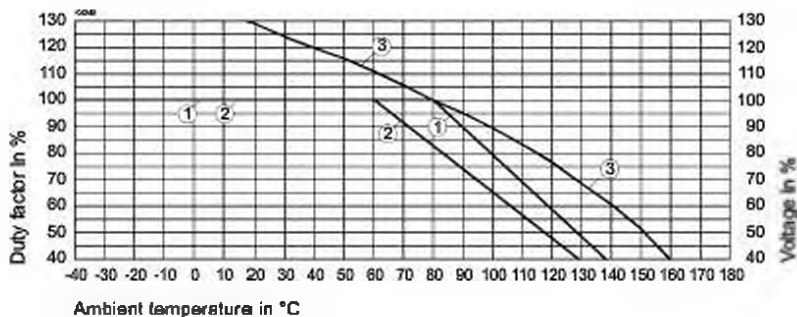
**SPECIFICATIONS**

Coil winding	
insulation class	H (180 °C)
Relative duty factor	100% DF/ED combined with armature tube and valve
Ambient temperature	See temperature curve
Corrosion protection	Plastic coated Black

	12VDC	24VDC
Nominal power (W) (Switching function)	20	20
Nominal resistance (Ω)	7	28
Weight of solenoid coil (kg)	0.19	0.19

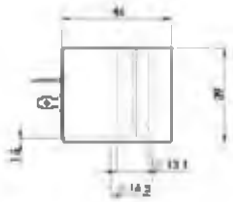
**SAFE OPERATION**

**Caution:** Because of the danger of over-heating the solenoid coil must only be commissioned together with an armature tube as well as with a valve.

**DUTY FACTOR / TEMPERATURE**
**TEMPERATURE / VOLTAGE**


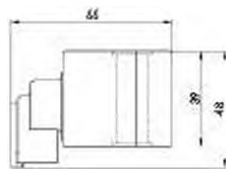
- 1 Duty factor at nominal voltage
- 2 Duty factor at 110% nominal voltage
- 3 Max. voltage in % for 100% duty factor

**TYPE LISTE / DIMENSIONS / GENERAL SPECIFICATIONS**



**Execution: K D E33/13x39-...**

- 3-poles 2 P+E
  - Protection class IP 65
- With corresponding mating connector  
(not included in delivery)  
and professional assembly.

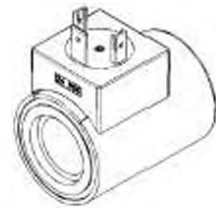


**Execution: K G E33/13x39-...**

- 2-poles 2P
  - only for  $U_n \leq 75$  VDC
  - Protection class IP 67 and 69 K
- With corresponding mating connector  
(not included in delivery)  
and professional assembly.

Technical explanation see data sheet 1.1-400 and 1.1-410

**Solenoid coil V.E37/19**  
 according to VDE 0580  
 Protection class IP65/67/69K


**DESCRIPTION**

The slip-on solenoid coil V.E37/19 is available in two sizes and with three different connection versions (see type code). The construction corresponds to the VDE 0580 standard. The housing is made of steel (nickel-chromium coated), the connector socket is made of plastic material.

**FUNCTION**

With the combination of an armature tube the function of a switching solenoid or of a proportional solenoid results.

**APPLICATION**

The solenoid coils are mainly utilised in hydraulic applications.

**TYPE CODE**

Metal housing round with one-sided collar		V		<input type="checkbox"/>	E37 / 19	x	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Connection execution											
Connector socket EN 175301-803/ISO 4400											
Connector socket AMP Junior-Timer											
Connector Deutsch DT04-2P											
Coil execution											
Internal coil diameter 19 mm											
Coil clamping length		40 mm		40		50 mm		50			
Nominal voltage U <sub>n</sub>		12 VDC		G12		24 VDC		G24			
Design-Index (Subject to change)											

**SPECIFICATIONS**

Coil winding insulation class H (180 °C)  
 Relative duty factor 100% DF/ED  
 combined with armature tube and valve  
 Ambient temperature -20... +50 °C  
 Corrosion protection Salt spray test according to EN ISO 9227: ≥ 200 h

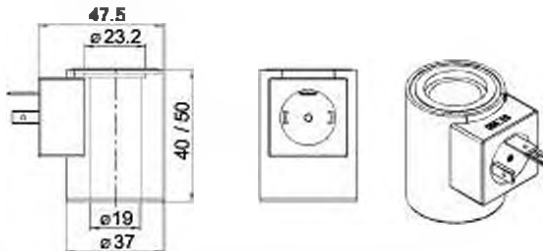
**SAFE OPERATION**

**Caution:** Because of the danger of over-heating the solenoid coil must only be commissioned together with an armature tube as well as with a valve.

		12 VDC	24 VDC
<b>V.E37/19x40</b>	Nominal power (Switching function) (W)	18	18
	Limiting power (Proportional function) (W)	12,5	12,5
	Limiting current (50 °C) (Proportional function) (A)	1,00	0,52
	Nominal resistance (Ω)	8	32
	Number of windings (-)	750	1500
	Weight of solenoid coil (kg)	0,17	0,17

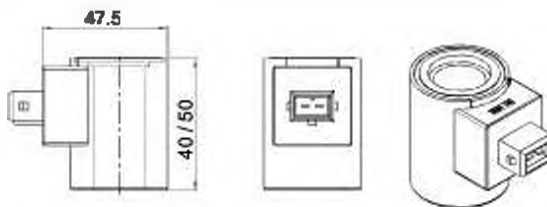
		12 VDC	24 VDC
<b>V.E37/19x50</b>	Nominal power (Switching function) (W)	22	22
	Limiting power (Proportional function) (W)	18	15
	Limiting current (50 °C) (Proportional function) (A)	1,20	0,83
	Nominal resistance (Ω)	6,4	27,2
	Number of windings (-)	780	1560
	Weight of solenoid coil (kg)	0,2	0,2

TYPE LIST / DIMENSIONS / GENERAL SPECIFICATIONS



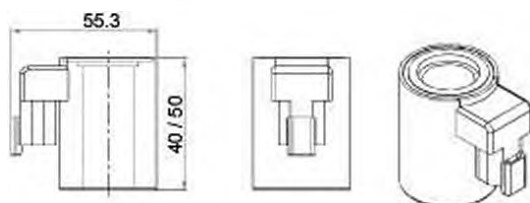
Execution: V D E37/19x...

- 3-poles 2 P+E
- Protection class IP 65
- With corresponding mating connector (not included in delivery) and professional assembly



Execution: V J E37/19x...

- 2-poles 2P
- only for  $U_n \leq 75$  VDC
- Protection class IP 66
- With corresponding mating connector (not included in delivery) and professional assembly.

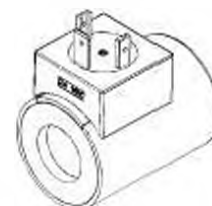


Execution: V G E37/19x...

- 2-poles 2P
- only for  $U_n \leq 75$  VDC
- Protection class IP 67 and 69 K
- With corresponding mating connector (not included in delivery) and professional assembly.

Technical explanation see data sheet 1.1-400 and 1.1-410

**Solenoid coil W.E37/16 x 40**  
 according to DIN VDE 0580  
 Protection class IP65/67/69K


**DESCRIPTION**

The slip-on solenoid coil W.E37/16 x 40 is available in three different connection versions (see type code). The construction corresponds to the DIN VDE 0580-Norm. The housing is made of steel (nickel-chromium coated), the connector socket is made of plastic material.

**FUNCTION**

With the combination of an armature tube the function of a switching solenoid or of a proportional solenoid results.

**APPLICATION**

The solenoid coils are mainly utilised in hydraulic applications.

**TYPE CODE**

Metal housing, round		W		<input type="checkbox"/>	E37 / 16 x 40 -	<input type="checkbox"/>	#	<input type="checkbox"/>
Connection execution								
Connector socket EN 175301-803/ISO 4400								D
Connector socket AMP Junior-Timer								J
Connector Deutsch DT04-2P								G
Coil execution								
Internal coil diameter 16 mm								
Coil length 40 mm								
Nominal voltage U <sub>n</sub>		12 VDC	<input type="checkbox"/>	G12				
		24 VDC	<input type="checkbox"/>	G24				
Design-Index (Subject to change)								

**SPECIFICATIONS**

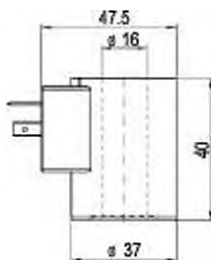
Coil winding  
 insulation class H (180 °C)  
 Relative duty factor 100% DF/ED  
 combined with armature tube and valve  
 Ambient temperature -20...+50 °C  
 Corrosion protection Self spray test according to  
 EN ISO 9227: ≥ 200h

		12VDC	24VDC
Nominal power (Switching function) (W)		20,5	20,5
Limiting power (Proportional function) (W)		14	14
Limiting current (50 °C) (A) (Proportional function)		1,16	0,58
Nominal resistance (Ω)		7	28
Number of windings (-)		710	1420
Weight of solenoid coil (kg)		0,22	0,22

**SAFE OPERATION**

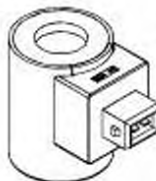
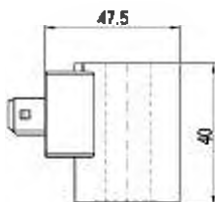
**Caution:** Because of the danger of over-heating the solenoid coil must only be commissioned together with an armature tube as well as with a valve.

TYPE LISTE / DIMENSIONS / GENERAL SPECIFICATIONS



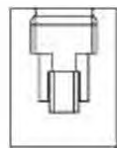
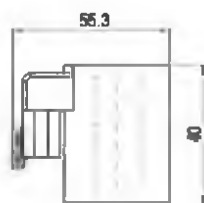
**Execution: W D E37/16x40-...**

- 3-poles 2 P+E
  - Protection class IP 65
- With corresponding mating connector  
(not included in delivery)  
and professional assembly.



**Execution: W J E37/16x40-...**

- 2-poles 2P
  - only for  $U_N \leq 75$  VDC
  - Protection class IP 66
- With corresponding mating connector  
(not included in delivery)  
and professional assembly.

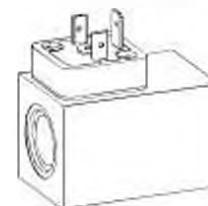


**Execution: W G E37/16x40-...**

- 2-poles 2P
  - only for  $U_N \leq 75$  VDC
  - Protection class IP 67 and 69 K
- With corresponding mating connector  
(not included in delivery)  
and professional assembly.

Technical explanation see data sheet 1.1-400 and 1.1-410



**Solenoid coil M.S35/16x53  
 to VDE 0580  
 Protection class IP65/IP67**

**DESCRIPTION**

The slip-on solenoid coil M.S35/16x53 is available with different types of electric connections. The AC voltage type incorporates a rectifier. The available AC voltages are listed in the type code section. The construction corresponds to standard VDE 0580. The steel housing is zinc-nickel-coated as standard.

**FUNCTION**

In combination with the corresponding armature tube the function of an on-off solenoid or proportional solenoid will be obtained.

**TYPE CODE**


Metal housing, square		M <input type="checkbox"/> S35/16x53 - <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>	
Connection execution			
Connector socket EN175301-803//ISO4400	<input type="checkbox"/> D	Flying leads	<input type="checkbox"/> L (only DC)
Connector socket AMP Junior-Timer	<input type="checkbox"/> J (only DC)	Cable	<input type="checkbox"/> K
Connector Deutsch DT04-2P	<input type="checkbox"/> G	Bayonet connector VG 95234	<input type="checkbox"/> B
		Screw clamp	<input type="checkbox"/> X (only DC)
Coil execution			
Internal coil diameter 16 mm			
Coil length 53 mm			
Voltage	Direct current	<input type="checkbox"/> G	Alternating current
Nominal voltage	12 VDC	<input type="checkbox"/> 12	115 VAC
	24 VDC	<input type="checkbox"/> 24	230 VAC
Standard		<input type="checkbox"/>	
Special cable execution			<input type="checkbox"/> M28
With pressure compensation			<input type="checkbox"/> M35 (only DC)
Special screw clamp			<input type="checkbox"/> M209 (only DC)
Screw clamp and electric wiring			<input type="checkbox"/> M222 (only DC)
Design-Index (Subject to change)			

**SPECIFICATIONS**

Coil winding	min. H (180 °C)
insulation class	
Protection class	depending on the connector version IP65 or IP67 according to EN 60 529 (if correctly mounted)
Relative duty factor	100 % DF / 5 min when mounted on armature tube and valve
Ambient temperature	See temperature curve on page 4
Nominal voltage range	10–250 VDC 24–250 VAC
Corrosion protection	Salt spray test in accordance with EN ISO 9227 > = 1000 hours

		12VDC	24VDC	115VAC	230VAC
Nominal power (W)	(Switching function)	23	22	25,5	28
Limiting power (W)	(Proportional function)	15,5	15	–	–
Limiting current (50 °C) (A)	(Proportional function)	1,285	0,625	–	–
Nominal resistance (Ω)		6,3	26,1	413	1500
Number of windings (–)		815	1856	5930	12000
Weight of solenoid coil (kg)		0,37	0,37	0,37	0,37

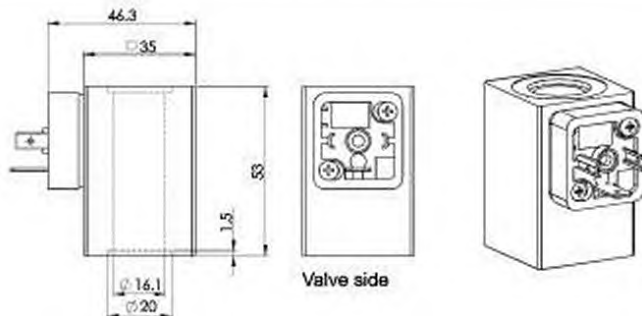
**SAFE OPERATION**

 **Caution:** To avoid overheating the coil may only be energised when mounted on an armature tube and valve.


**NOTE!**

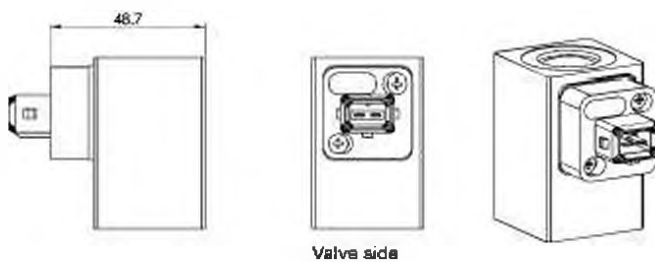
The effective heat emissions depends on the installation conditions (heat emission surface, air circulation, etc.), these influence the described area of application.

**TYPE LISTE / DIMENSIONS / GENERAL SPECIFICATIONS**



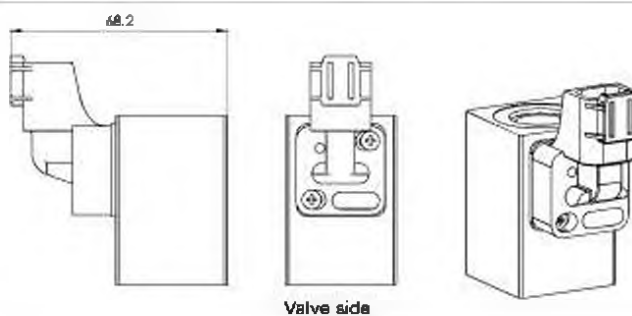
**Execution: M D S35/16x53-...**

- 3 pole 2 P+E
- DC- and AC-execution available
- Connector socket plastic
- Protection class IP65
- With corresponding mating connector (not included in delivery) and professional assembly



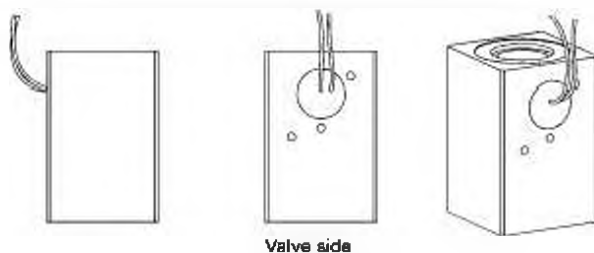
**Execution: M J S35/18x53-...**

- 2 pole 2P
- DC-execution available
- only for  $U_n \leq 75$  VDC
- Connector socket plastic
- Protection class IP65
- With corresponding mating connector (not included in delivery) and professional assembly



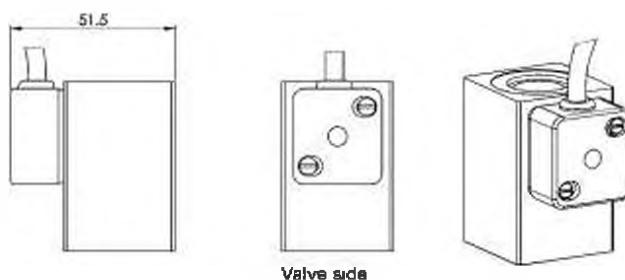
**Execution: M G S35/16x53**

- 2 pole 2P
- DC-execution available
- only for  $U_n \leq 75$  VDC
- Protection class IP 67 and 69 K
- With corresponding mating connector (not included in delivery) and professional assembly



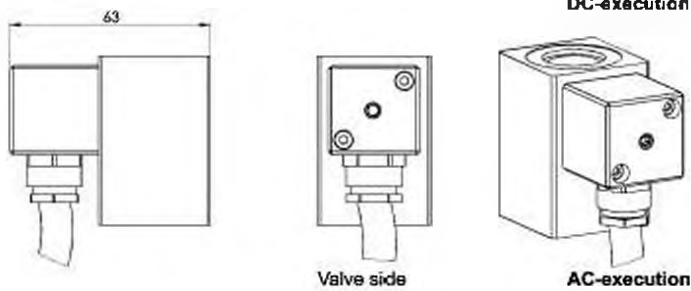
**Execution: M L S35/16x53-...**

- 2 pole 2P (2x 0,25 mm<sup>2</sup>) Radox 155
- Cable length 500 mm
- DC-execution available
- nur für  $U_n \leq 75$  VDC
- Protection class IP65
- With professional assembly



**Execution: M K S35/16x53-...**

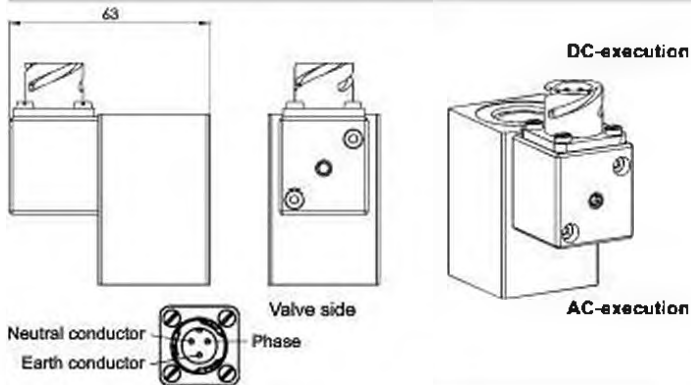
- 3 pole 2P+E 3x 0,75 mm<sup>2</sup> Thermoplast
- Cable length 1500 mm
- Cable diameter 6 mm
- DC- and AC-execution available
- Cable housing plastic
- Protection class IP67
- With professional assembly



Execution: M **K** S35/16x53-... **M28**

- 3 pole 2P+E 2x 1 mm<sup>2</sup> [E]  
(acc. to IEC 332)
- Cable length 1500 mm
- DC- and AC-execution available
- Connector housing steel
- Protection class IP67
- With professional assembly

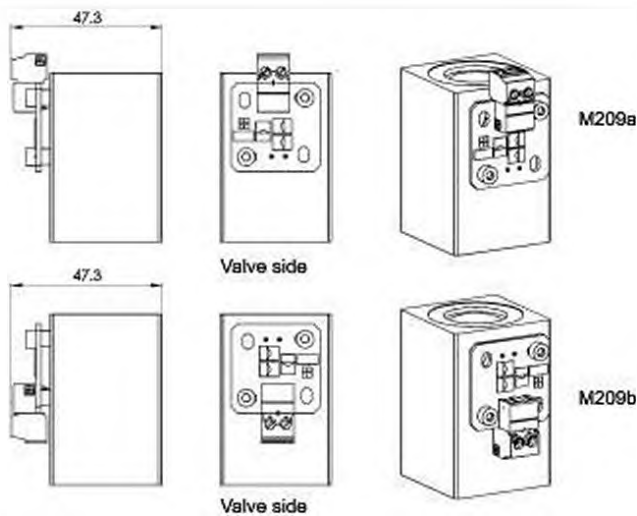
- Plastic rectifier housing, h+10,5 mm



Execution: M **B** S35/16x53-...

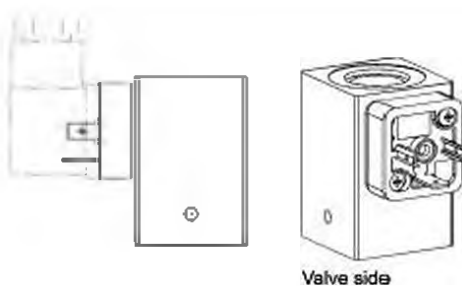
- 3 pole 2P+E
- M/L VG 85234
- DC- and AC-execution available
- Connector housing steel
- Protection class IP67
- With corresponding mating connector  
(not included in delivery)  
and professional assembly

- Plastic rectifier housing, h+10,5 mm



Execution: M **X** S35/16 x 53-... | **M209**

- 2 pole
- DC-version available up to 28 VDC
- Screw clamp plastic
- Printed circuit board protected with  
conformal coating

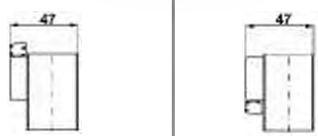

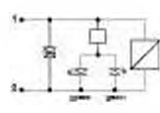
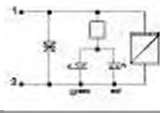
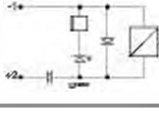


Execution: M **.** S35/16x53-... **M35**  
M **.** S35/16x53-... **M J35**

- With pressure equalising bore for underwater  
applications in oil bath
- Oil tank separated from water by a membrane
- With connection type «D», «L», «X»
- DC-execution available

**Attention:**

In case of the connection execution «D» only  
plugs with the additional designation «Z23»  
must be utilised (not included in the scope of  
supply of the solenoid)

Plug alignment		Electric wiring
		
M222a	M222b	
M222c	M222d	
M222e	M222f	

Execution: M X S35/16x53-... **M222**

- 2 pole
- DC-version available up to 28 VDC
- Screw clamp plastic
- Plug housing plastic, transparent, removable
- Printed circuit board protected with conformal coating
- Protection type IP40 with plastic hood installed

$I_{max} = 1,0 \text{ A at } 130 \text{ }^\circ\text{C}$   
 $I_{max} = 1,5 \text{ A at } 120 \text{ }^\circ\text{C}$   
 $I_{max} = 2,0 \text{ A at } 110 \text{ }^\circ\text{C}$

**PARTS LIST**

Position	Article	Description
10	219.2802	Mating connector (M208 und M222)
20	088.1116	Plastic hood (only M222)


**NOTE!**

Technical explanation see data sheet 1.1-400/410/430

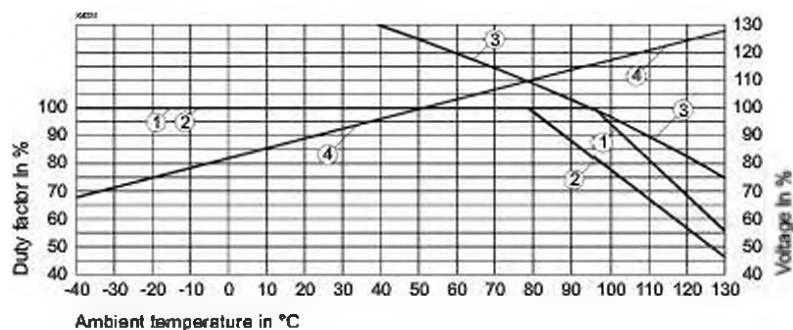
M222b/d/f



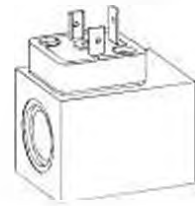
M222a/c/e



Valve side

**DUTY FACTOR / TEMPERATURE**
**TEMPERATURE / VOLTAGE**


- 1 Duty factor at nominal voltage
- 2 Duty factor at 110 % nominal voltage
- 3 Max. voltage in % for 100 % duty factor
- 4 Min. voltage in % for proportional limiting current at 100 % duty factor

**Solenoid coil M.E35/16x40  
 to VDE 0580  
 Protection class IP65/IP67**

**DESCRIPTION**

The slip-on solenoid coil M.S35/16x40 is available with different types of electric connections. The AC voltage type incorporates a rectifier. The available AC voltages are listed in the type code section. The construction corresponds to standard VDE 0580. The steel housing is zinc-nickel-coated as standard.

**FUNCTION**

In combination with the corresponding armature tube the function of an on-off solenoid or proportional solenoid will be obtained.

**TYPE CODE**

M  E35/16x40 -  -  #

Metal housing, square

Connection execution

Connector socket EN175301-803/ISO4400  D Flying leads execution  L (only DC)

Connector socket AMP Junior-Timer  J (only DC)

Connector Deutsch DT04-2P  G Screw clamp  X (only DC)

Coil execution

Internal coil diameter 16 mm

Coil length 40 mm

Voltage

	Direct current	<input type="checkbox"/> G	Alternating current	<input type="checkbox"/> R
Nominal voltage	12 VDC	<input type="checkbox"/> 12	115 VAC	<input type="checkbox"/> 115
	24 VDC	<input type="checkbox"/> 24	230 VAC	<input type="checkbox"/> 230

Standard

With pressure compensation  M35 (only DC)

Special screw clamp  M209 (only DC)

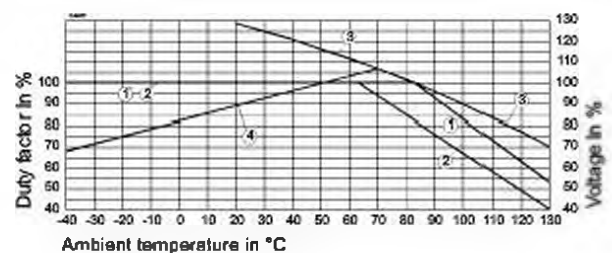
Screw clamp and electric wiring  M222 (only DC)

Design-Index (Subject to change)

**SPECIFICATIONS**

Coil winding	min. H (180°C)
Insulation class	
Protection class	depending on the connector version IP65 or IP67 according to EN 60529 (if correctly mounted)
Relative duty factor	100% ED / 5 min when mounted on armature tube and valve
Ambient temperature	See temperature curve
Nominal voltage range	10-250 VDC 24-250 VAC
Corrosion protection	Salt spray test in accordance with EN ISO 9227 > = 1000 hours

	12 VDC	24 VDC	115 VAC	230 VAC
Nominal power (W) (Switching function)	18,5	20,5	20	16,8
Nominal resistance (Ω)	7,4	28	525	2525
Weight of solenoid coil (kg)	0,28	0,28	0,28	0,28

**DUTY FACTOR**
**VOLTAGE**


- 1 Duty factor at nominal voltage
- 2 Duty factor at 110% nominal voltage
- 3 Max. voltage in % for 100% duty factor
- 4 Min. voltage in % for proportional limiting current at 100% duty factor

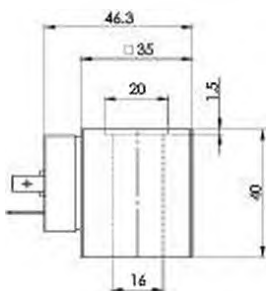
**SAFE OPERATION**


**Caution:** To avoid overheating the coil may only be energised when mounted on an armature tube and valve.

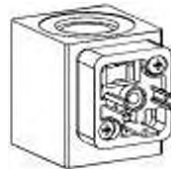

**NOTE!**

The effective heat emissions depends on the installation conditions (heat emission surface, air circulation, etc.), these influence the described area of application.

**TYPE LISTE/DIMENSIONS/GENERAL SPECIFICATIONS**

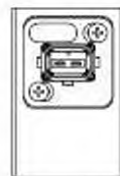
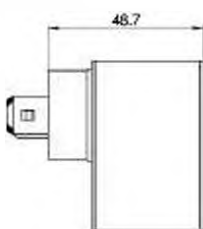


Valve side



**Execution: M D S35/16x40-...**

- 3-pole 2 P+E
  - DC- and AC-execution available
  - Connector socket plastic
  - Protection class IP65
- With corresponding mating connector (not included in delivery) and professional assembly

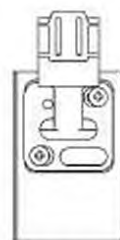
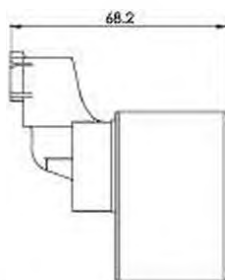


Valve side



**Execution: M J S35/16x40-...**

- 2-pole 2P
  - DC-execution available
  - only for  $U_n \leq 75$  VDC
  - Connector socket plastic
  - Protection class IP65
- With corresponding mating connector (not included in delivery) and professional assembly

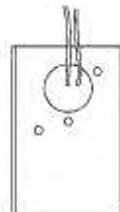
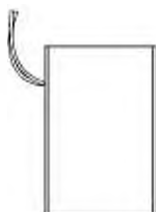


Valve side



**Execution: M G S35/16x40**

- 2-pole 2P
  - DC-execution available
  - only for  $U_n \leq 75$  VDC
  - Protection class IP 67 and 69 K
- With corresponding mating connector (not included in delivery) and professional assembly

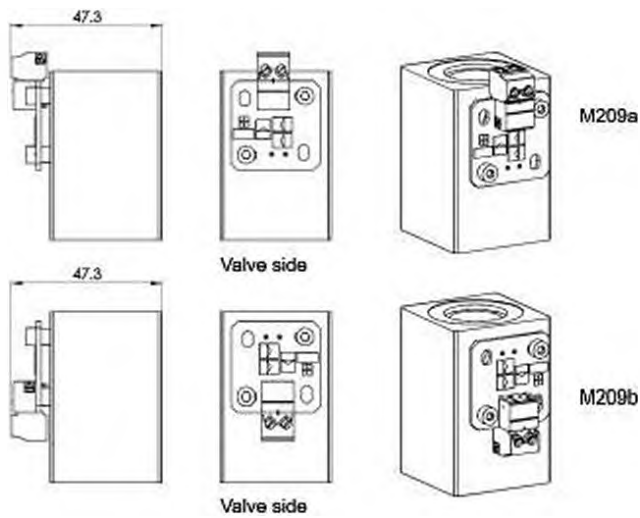


Valve side



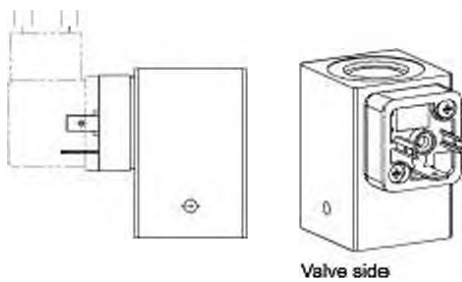
**Execution: M L S35/16x40-...**

- 2-pole 2P (2x 0,25 mm<sup>2</sup>) Radox 155
  - Cable length 500 mm
  - DC-execution available
  - only for  $U_n \leq 75$  VDC
  - Protection class IP65
- With professional assembly



Execution: M X S35/16 x 40-... | **M209**

- 2-pole
- DC-version available up to 28 VDC
- Screw clamp plastic
- Printed circuit board protected with conformal coating



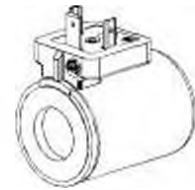
Execution: M . S35/16 x 40-... | **M35**  
M . S35/16 x 40-... | **M...35**

- With pressure equalising bore for underwater applications in oil bath
- Oil tank separated from water by a membrane
- With connection type «D», «L», «X»
- DC-execution available

**Attention:**

In case of the connection execution «D» only plugs with the additional designation «Z23» must be utilised (not included in the scope of supply of the solenoid)

**Solenoid coil W.S37/19 x 50**  
**according to VDE 0580**  
**Protection class IP65/67/69K**


**DESCRIPTION**

The slip-on solenoid coil W.S37/19x50 is available in three different connection versions (see type code). The construction corresponds to the VDE 0580 standard. The housing is made of steel (zinc-/nickel-coated), the connector socket is made of plastic material.

**FUNCTION**

With the combination of an armature tube the function of a switching solenoid or of a proportional solenoid results. The solenoid coils are available with the standard nominal voltages 12 VDC and 24 VDC.

**APPLICATION**

The solenoid coils are mainly utilised in hydraulic applications.

**TYPE CODE**

Metal housing round		W	<input type="checkbox"/>	S37 / 19 x 50 -	<input type="checkbox"/>	#	<input type="checkbox"/>
Connection execution							
Connector socket EN 175301-803/ISO 4400							
Connector socket AMP Junior-Timer							
Connector Deutsch DT04-2P							
Coil execution							
Internal coil diameter 19 mm							
Coil length 50 mm							
Nominal voltage U <sub>n</sub>		12 VDC					
		24 VDC					
Design-Index (Subject to change)							

**SPECIFICATIONS**

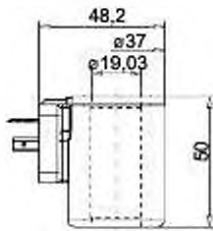
		12 VDC	24 VDC
Coil winding			
insulation class	H (180 °C)		
Relative duty factor	100% DF/ED combined with armature tube and valve		
Ambient temperature	-20...+70 °C		
Corrosion protection	Salt spray test according to EN ISO 9227: ≥ 1000 h		
Nominal power (Switching function)	(W)	26	26
Limiting power (Proportional function)	(W)	16	16
Limiting current (50 °C) (Proportional function)	(A)	1,36	0,68
Nominal resistance	(Ω)	5,5	22,7
Number of windings	(-)	705	1 410
Weight of solenoid coil	(kg)	0,23	0,23

**SAFE OPERATION**

**Caution:** Because of the danger of over-heating the solenoid coil must only be commissioned together with an armature tube as well as with a valve.

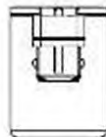
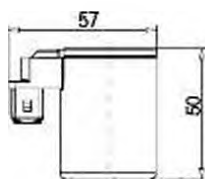


**TYPE LISTE / DIMENSIONS / GENERAL SPECIFICATIONS**



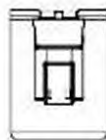
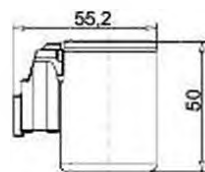
**Execution: W D | S37/19x50-...**

- 3-poles 2 P+E
  - Protection class IP 65
- With corresponding mating connector  
(not included in delivery)  
and professional assembly



**Execution: W J | S37/19x50-...**

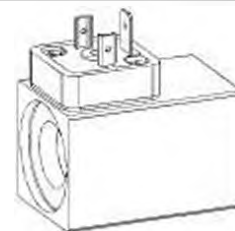
- 2-poles 2P
  - only for  $U_n \leq 75$  VDC
  - Protection class IP 66
- With corresponding mating connector  
(not included in delivery)  
and professional assembly.



**Execution: W G | S37/19x50-...**

- 2-poles 2P
  - only for  $U_n \leq 75$  VDC
  - Protection class IP 67 and 69 K
- With corresponding mating connector  
(not included in delivery)  
and professional assembly.

Technical explanation see data sheet 1.1-400 and 1.1-410

**Solenoid coil M.S35/19x50  
 to VDE 0580  
 Protection class IP65/IP67**

**DESCRIPTION**

The slip-on solenoid coil M.S35/19x53 is available with different types of electric connections. The AC voltage type incorporates a rectifier. The available AC voltages are listed in the type code section. The construction corresponds to standard VDE 0580. The steel housing is zinc-nickel-coated as standard.

**FUNCTION**

In combination with the corresponding armature tube the function of an on-off solenoid or proportional solenoid will be obtained.

**TYPE CODE**

Metal housing, square		M		S35/19x50		-	-	z
Connection execution		D		Flying leads		L (only DC)		
Connector socket EN175301-803//ISO4400		J (only DC)		Cable		K		
Connector socket AMP Junior-Timer		G		Bayonet connector VG 95234		B		
Connector Deutsch DT04-2P				Screw clamp		X (only DC)		
Coil execution								
Internal coil diameter 19 mm								
Coil length 50 mm								
Voltage		Direct current		Alternating current				
Nominal voltage		12 VDC		115 VAC		115		
		24 VDC		230 VAC		230		
Standard								
Special cable execution				M28				
With pressure compensation				M35 (only DC)				
Special screw clamp				M209 (only DC)				
Screw clamp and electric wiring				M222 (only DC)				
Design-Index (Subject to change)								

**SPECIFICATIONS**

Coil winding	min. H (180 °C)
insulation class	
Protection class	IP65 or IP67 according to EN 60 529 (if correctly mounted)
Relative duty factor	100 % DF / 5 min when mounted on armature tube and valve
Ambient temperature	See temperature curve on page 4
Nominal voltage range	10 – 250 VDC 24 – 250 VAC
Corrosion protection	Salt spray test in accordance with EN ISO 9227 > = 1000 hours

		12 VDC	24 VDC	115 VAC	230 VAC
Nominal power (W)	(Switching function)	26	26	26	26
Limiting power (W)	(Proportional function)	16	16	–	–
Limiting current (50 °C) (A)	(Proportional function)	1,36	0,68	–	–
Nominal resistance (Ω)		5,8	22	410	1650
Number of windings (-)		718	1400	6100	11850
Weight of solenoid coil (kg)		0,32	0,32	0,32	0,32

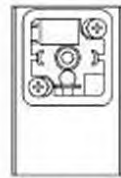
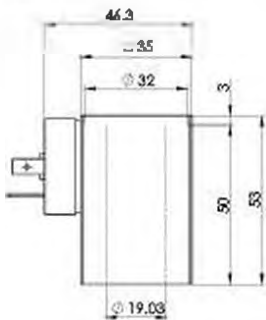
**SAFE OPERATION**


**Caution:** To avoid overheating the coil may only be energised when mounted on an armature tube and valve.

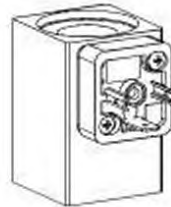

**NOTE!**

The effective heat emissions depends on the installation conditions (heat emission surface, air circulation, etc.), these influence the described area of application.

**TYPE LISTE / DIMENSIONS / GENERAL SPECIFICATIONS**

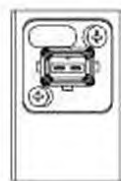
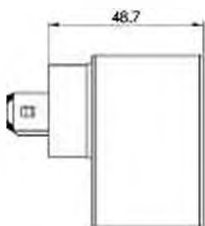


Valve side



*Execution: M D S35/19x50-...*

- 3 pole 2 P+E
- DC- and AC-execution available
- Connector socket plastic
- Protection class IP65
- With corresponding mating connector (not included in delivery) and professional assembly

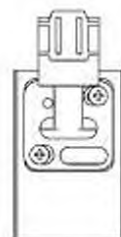
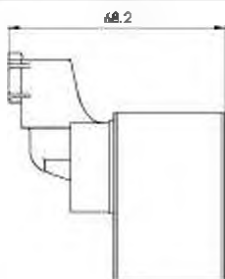


Valve side



*Execution: M J S35/19x50-...*

- 2 pole 2P
- DC-execution available
- only for  $U_N \leq 75$  VDC
- Connector socket plastic
- Protection class IP65
- With corresponding mating connector (not included in delivery) and professional assembly

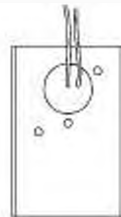
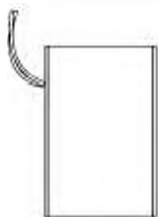


Valve side



*Execution: M G S35/19x50*

- 2 pole 2P
- DC-execution available
- only for  $U_N \leq 75$  VDC
- Protection class IP 67 and 69 K
- With corresponding mating connector (not included in delivery) and professional assembly

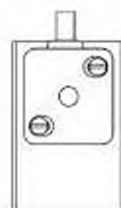
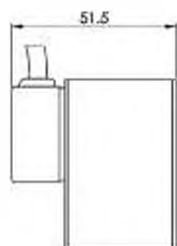


Valve side



*Execution: M L S35/19x50-...*

- 2 pole 2P (2x 0,25 mm<sup>2</sup>) Radox 155
- Cable length 500 mm
- DC-execution available
- nur für  $U_N \leq 75$  VDC
- Protection class IP65
- With professional assembly

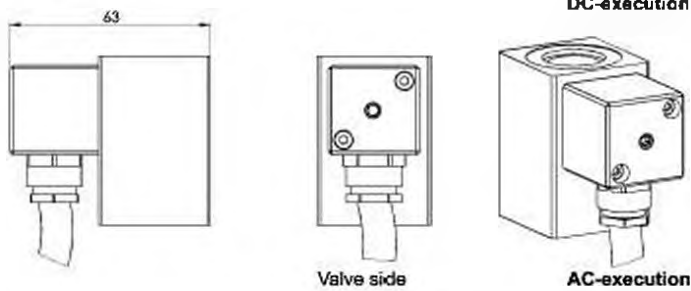


Valve side



*Execution: M K S35/19x50-...*

- 3 pole 2P+E 3x 0,75 mm<sup>2</sup> Thermoplast
- Cable length 1500 mm
- Cable diameter 6 mm
- DC- and AC-execution available
- Cable housing plastic
- Protection class IP67
- With professional assembly

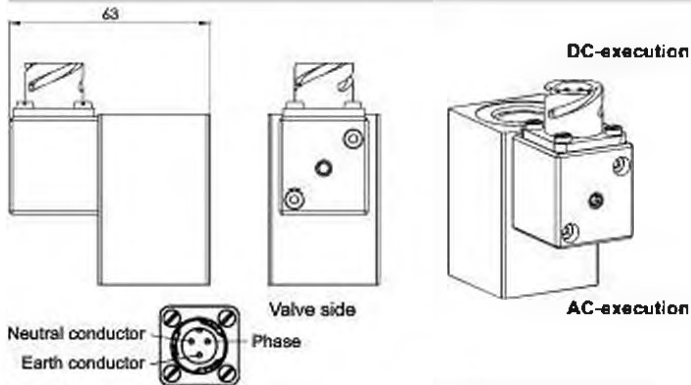


DC-execution

Execution: M **K** S35/19x50-... **M28**

- 3 pole 2P+E 2x 1 mm<sup>2</sup> [E] (acc. to IEC 332)
- Cable length 1500 mm
- DC- and AC-execution available
- Connector housing steel
- Protection class IP67
- With professional assembly

- Plastic rectifier housing, h+10,5 mm

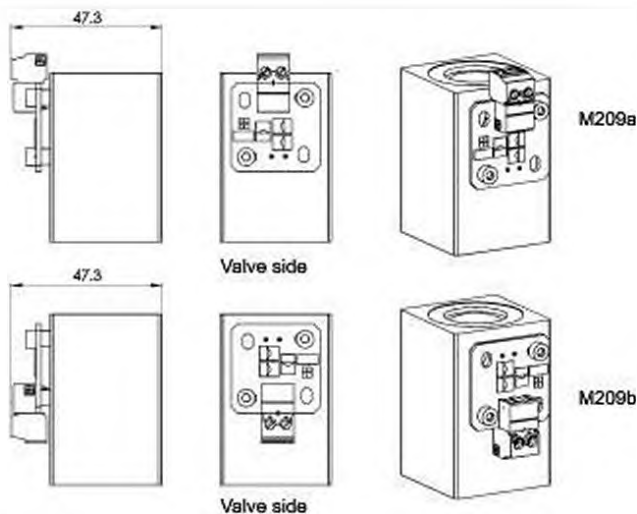


DC-execution

Execution: M **B** S35/19x50-...

- 3 pole 2P+E
- M/L VG 85234
- DC- and AC-execution available
- Connector housing steel
- Protection class IP67
- With corresponding mating connector (not included in delivery) and professional assembly

- Plastic rectifier housing, h+10,5 mm

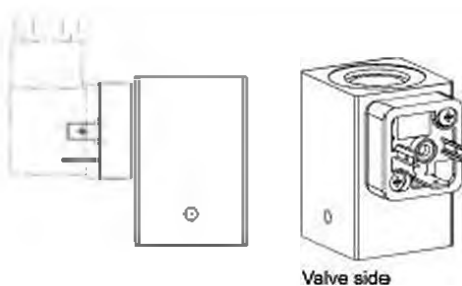


M209a

Execution: M **X** S35/19x50-... | **M209**

- 2 pole
- DC-version available up to 28 VDC
- Screw clamp plastic
- Printed circuit board protected with conformal coating

M209b







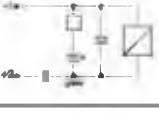
Valve side

Execution: M **.** S35/19x50-... **M35**  
M **.** S35/19x50-... **M J35**

- With pressure equalising bore for underwater applications in oil bath
- Oil tank separated from water by a membrane
- With connection type «D», «L», «X»
- DC-execution available

**Attention:**

In case of the connection execution «D» only plugs with the additional designation «Z23» must be utilised (not included in the scope of supply of the solenoid)

Plug alignment		Electric wiring
		
M222a	M222b	
M222c	M222d	
M222e	M222f	

Execution: M X S35/19x50-... **M222**

- 2 pole
- DC-version available up to 28 VDC
- Screw clamp plastic
- Plug housing plastic, transparent, removable
- Printed circuit board protected with conformal coating
- Protection type IP40 with plastic hood installed

$I_{max} = 1,0 \text{ A at } 130 \text{ }^\circ\text{C}$   
 $I_{max} = 1,5 \text{ A at } 120 \text{ }^\circ\text{C}$   
 $I_{max} = 2,0 \text{ A at } 110 \text{ }^\circ\text{C}$

**PARTS LIST**

Position	Article	Description
10	219.2802	Mating connector (M209 und M222)
20	088.1118	Plastic hood (only M222)

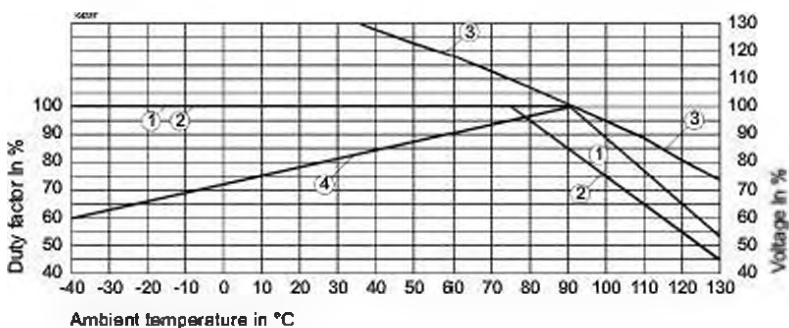

**NOTE!**

Technical explanation see data sheet 1.1-400/410/430

**M222b/d/f**

**M222a/c/e**

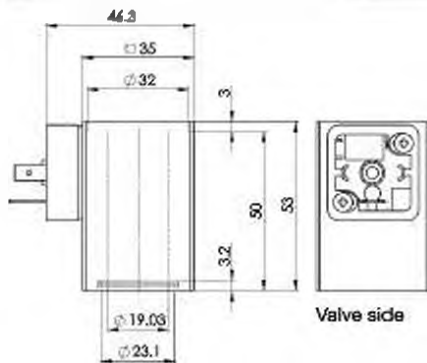

Valve side

**DUTY FACTOR / TEMPERATURE**
**TEMPERATURE / VOLTAGE**


- 1 Duty factor at nominal voltage
- 2 Duty factor at 110 % nominal voltage
- 3 Max. voltage in % for 100 % duty factor
- 4 Min. voltage in % for proportional limiting current at 100 % duty factor

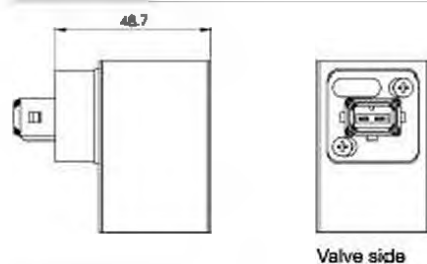


**TYPE LISTE/DIMENSIONS/GENERAL SPECIFICATIONS**



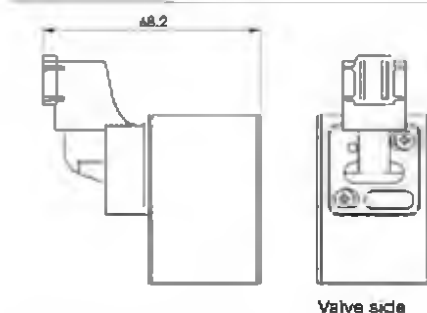
Execution: N | **D** S35/19x50-...

- 3 pole 2 P+E
- DC- and AC-execution available
- Connector socket plastic
- Protection class IP65
- With corresponding mating connector (not included in delivery) and professional assembly



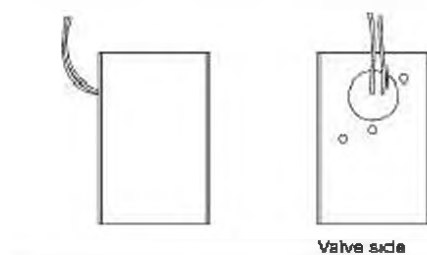
Execution: N | **J** S35/19x50-...

- 2 pole 2P
- DC-execution available
- only for  $U_N \leq 75$  VDC
- Connector socket plastic
- Protection class IP65
- With corresponding mating connector (not included in delivery) and professional assembly



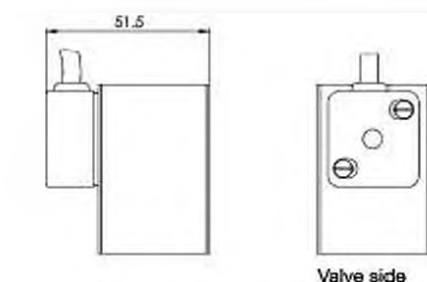
Execution: N | **G** S35/19x50

- 2 pole 2P
- DC-execution available
- only for  $U_N \leq 75$  VDC
- Protection class IP 67 and 69 K
- With corresponding mating connector (not included in delivery) and professional assembly



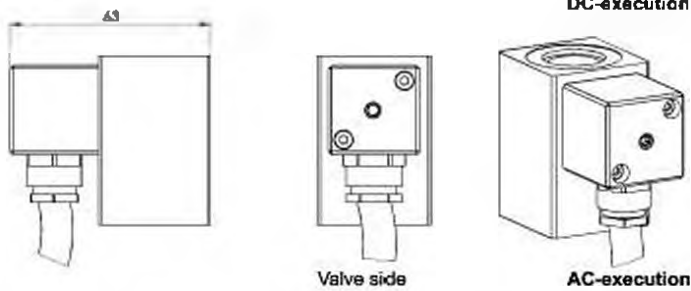
Execution: N | **L** S35/19x50-...

- 2 pole 2P (2x 0,25 mm) Radax 155
- Cable length 500 mm
- DC-execution available
- nur für  $U_N \leq 75$  VDC
- Protection class IP65
- With professional assembly



Execution: N | **K** S35/19x50-...

- 3 pole 2P+E 3x 0,75 mm<sup>2</sup> Thermoplast
- Cable length 1500 mm
- Cable diameter 8 mm
- DC- and AC-execution available
- Cable housing plastic
- Protection class IP67
- With professional assembly

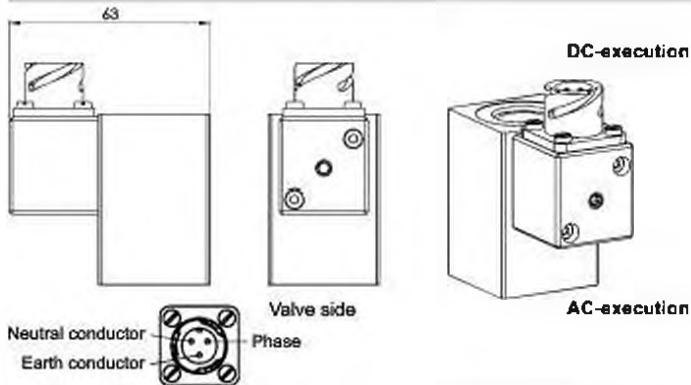


DC-execution

Execution: N K S35/19x50-... M28

- 3 pole 2P+E 2x 1 mm<sup>2</sup> [E] (acc. to IEC 332)
- Cable length 1500 mm
- DC- and AC-execution available
- Connector housing steel
- Protection class IP67
- With professional assembly

- Plastic rectifier housing, h+10,5 mm

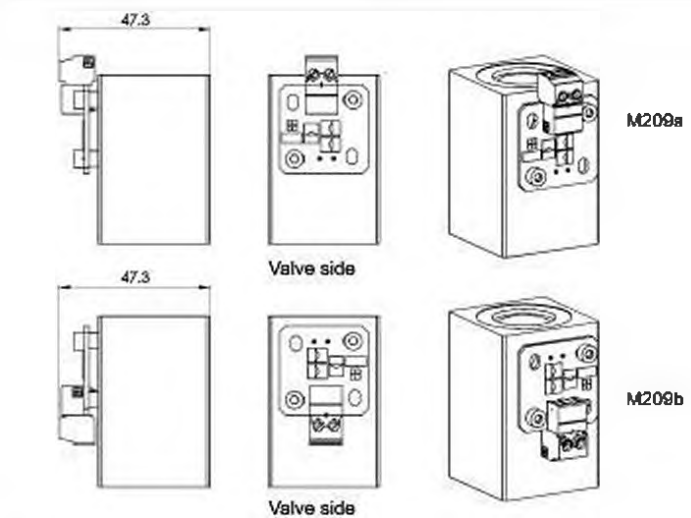


DC-execution

Execution: N B S35/19x50-...

- 3 pole 2P+E
- MIL VG 85234
- DC- and AC-execution available
- Connector housing steel
- Protection class IP67
- With corresponding mating connector (not included in delivery) and professional assembly

- Plastic rectifier housing, h+10,5 mm

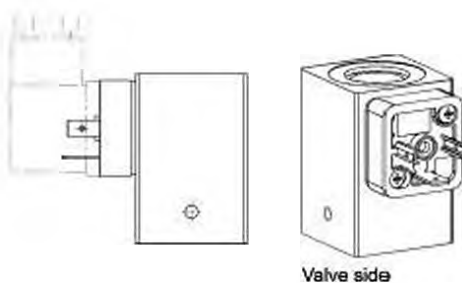


M209a

Execution: N X S35/19x50-... M209

- 2 pole
- DC-version available up to 28 VDC
- Screw clamp plastic
- Printed circuit board protected with conformal coating

M209b



Valve side





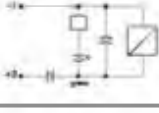
Execution: N S35/19x50-... M35  
N S35/19x50-... M35

- With pressure equalising bore for underwater applications in oil bath
- Oil tank separated from water by a membrane
- With connection type «D», «L», «X»
- DC-execution available

**Attention:**

In case of the connection execution «D» only plugs with the additional designation «Z23» must be utilised (not included in the scope of supply of the solenoid)



Plug alignment		Electric wiring
		
M222a	M222b	
M222c	M222d	
M222e	M222f	

Execution: N X S35/19x50-... **M222**

- 2 pole
- DC-version available up to 28 VDC
- Screw clamp plastic
- Plug housing plastic, transparent, removable
- Printed circuit board protected with conformal coating
- Protection type IP40 with plastic hood ins

$I_{\text{max}} = 1,0 \text{ A at } 130 \text{ }^\circ\text{C}$   
 $I_{\text{max}} = 1,5 \text{ A at } 120 \text{ }^\circ\text{C}$   
 $I_{\text{max}} = 2,0 \text{ A at } 110 \text{ }^\circ\text{C}$

**PARTS LIST**

Position	Article	Description
10	219.2802	Mating connector (M209 und M222)
20	088.1116	Plastic hood (only M222)

M222b/d/f

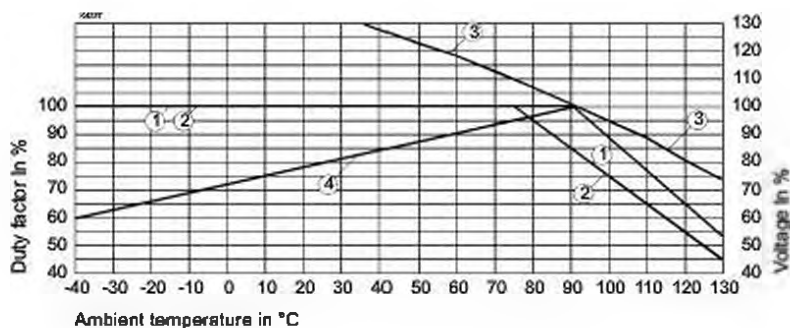
M222a/c/e



Valve side

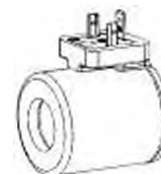

**NOTE!**

Technical explanation see data sheet 1.1-400/410/430

**DUTY FACTOR / TEMPERATURE**
**TEMPERATURE / VOLTAGE**


- 1 Duty factor at nominal voltage
- 2 Duty factor at 110 % nominal voltage
- 3 Max. voltage in % for 100% duty factor
- 4 Min. voltage in % for proportional limit current at 100% duty factor

**Solenoid coil W.S45/23 x 50  
to VDE 0580  
Protection class IP65/67/69K**


**DESCRIPTION**

The slip-on solenoid coil W.S45/23x50 is available in three different connection versions (see type code). The construction corresponds to the VDE 0580 standard. The housing is made of steel (zinc-/nickel-coated), the connector socket is made of plastic material.

**FUNCTION**

With the combination of an armature tube the function of a switching solenoid or of a proportional solenoid results. The solenoid coils are available with the standard nominal voltages 12 VDC and 24 VDC.

**APPLICATION**

The solenoid coils are mainly utilised in hydraulic applications.

**TYPE CODE**

Metal housing round		W	S45 / 23 x 50 -	#
Connection execution				
Connector socket EN 175301-803 / ISO 4400	D			
Connector socket AMP Junior-Timer	J			
Connector Deutsch DT04-2P	G			
Coil execution				
Internal coil diameter 23 mm				
Coil length 50 mm				
Nominal voltage U <sub>N</sub>	12 VDC	G12		
	24 VDC	G24		
Design-Index (Subject to change)				

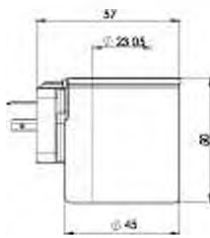
**SPECIFICATIONS**

		12 VDC	24 VDC
Coil winding			
insulation class	H (180 °C)		
Relative duty factor	100 % DF / ED combined with armature tube and valve		
Ambient temperature	-20...+70 °C		
Corrosion protection	Salt spray test according to EN ISO 9227 ≥ 1000 h		
Nominal power (Switching function)	(W)	28	28
Limiting power (Proportional function)	(W)	18	18
Limiting current (50 °C) (Proportional function)	(A)	1,56	0,78
Nominal resistance	(Ω)	5,3	20,6
Number of windings	(-)	700	1330
Weight of solenoid coil	(kg)	0,36	0,36

**SAFE OPERATION**

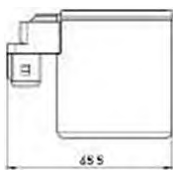
**Caution:** Because of the danger of over-heating the solenoid coil must only be commissioned together with an armature tube as well as with a valve.

**TYPE LISTE / DIMENSIONS / GENERAL SPECIFICATIONS**



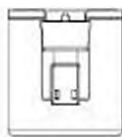
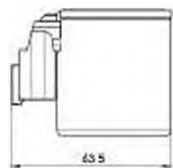
**Execution: W D S45/23x50-...**

- 3-poles 2 P+E
  - Protection class IP 65
- With corresponding mating connector  
(not included in delivery)  
and professional assembly



**Execution: W J S45/23x50-...**

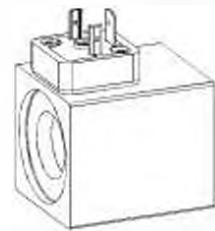
- 2-poles 2P
  - only for  $U_n \leq 75$  VDC
  - Protection class IP 68
- With corresponding mating connector  
(not included in delivery)  
and professional assembly.



**Execution: W G S45/23x50-...**

- 2-poles 2P
  - only for  $U_n \leq 75$  VDC
  - Protection class IP 67 and 69 K
- With corresponding mating connector  
(not included in delivery)  
and professional assembly.

Technical explanation see data sheet 1.1-400 and 1.1-410

**Solenoid coil M.S45/23 x 50  
 to VDE 0580  
 Protection class IP65/IP67**

**DESCRIPTION**

The slip-on solenoid coil M.S45/23 x 50 is available with different types of electric connections. The AC voltage type incorporates a rectifier. The available AC voltages are listed in the type code section. The construction corresponds to standard VDE 0580. The steel housing is zinc-nickel-coated as standard.

**FUNCTION**

In combination with the corresponding armature tube the function of an on-off solenoid or proportional solenoid will be obtained.

**TYPE CODE**

Metal housing, square		M <input type="checkbox"/> S45/23x50 - <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>	
Connection execution		Flying leads execution L (only DC)	
Connector socket EN175301-803/ISO4400 D	J (only DC)	Cable execution K	
Connector socket AMP Junior-Timer	G	Bayonet connector VG 95234 B	
Connector Deutsch DT04-2P		Screw clamp X (only DC)	
Coil execution			
Internal coil diameter 23 mm			
Coil length 50 mm			
Voltage	Direct current G	Alternating current R	
Nominal voltage	12 VDC 12	115 VAC 115	
	24 VDC 24	230 VAC 230	
Standard			
Special cable execution	M28		
With pressure compensation	M35 (only DC)		
Special screw clamp	M209 (only DC)		
Screw clamp and electric wiring	M222 (only DC)		
Design-Index (Subject to change)			

**SPECIFICATIONS**

Coil winding	min. H (180 °C)
insulation class	
Protection class	depending on the connector version IP65 or IP67 according to EN 60529 (if correctly mounted)
Relative duty factor	100 % ED / 5 min when mounted on armature tube and valve
Ambient temperature	See temperature curve on page 4
Nominal voltage range	10–250 VDC 24–250 VAC
Corrosion protection	Salt spray test in accordance with EN ISO 9227 > = 1000 hours

	12 VDC	24 VDC	115 VAC	230 VAC
Nominal power (W) (Switching function)	25,3	26,5	27,3	25
Limiting power (W) (Proportional function)	17,7	18,5	–	–
Limiting current (50 °C) (A) (Proportional function)	1,475	0,77	–	–
Nominal resistance (Ω)	5,75	21,6	420	1700
Number of windings (–)	680	1 313	–	–
Weight of solenoid coil (kg)	0,49	0,49	0,49	0,49

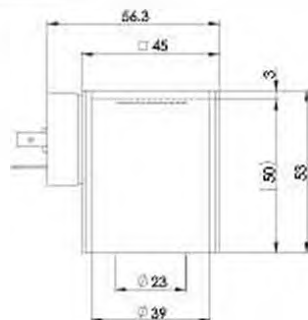
**SAFE OPERATION**


**Caution:** To avoid overheating the coil may only be energised when mounted on an armature tube and valve.


**NOTE!**

The effective heat emissions depends on the installation conditions (heat emission surface, air circulation, etc.), these influence the described area of application.

**TYPE LISTE / DIMENSIONS / GENERAL SPECIFICATIONS**

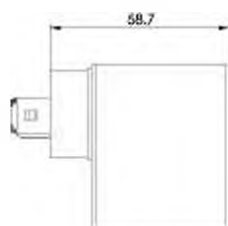


Valve side



**Execution: M D S45/23x50-...**

- 3 pole 2 P+E
  - DC- and AC-execution available
  - Connector socket plastic
  - Protection class IP65
- With corresponding mating connector (not included in delivery) and professional assembly

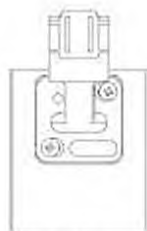
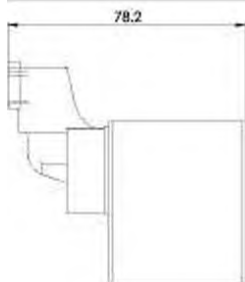


Valve side

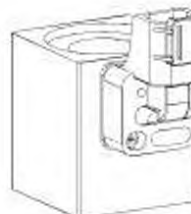


**Execution: M JI S45/23x50-...**

- 2 pole 2P
  - DC-execution available
  - only for  $U_N \leq 75$  VDC
  - Connector socket plastic
  - Protection class IP65
- With corresponding mating connector (not included in delivery) and professional assembly

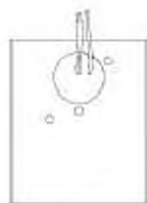


Valve side



**Execution: M G S45/23x50**

- 2 pole 2P
  - DC-execution available
  - only for  $U_N \leq 75$  VDC
  - Protection class IP 67 and 69 K
- With corresponding mating connector (not included in delivery) and professional assembly

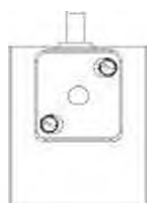


Valve side

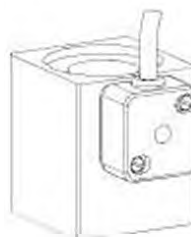


**Execution: M LI S45/23x50-...**

- 2 pole 2P (2x 0,25 mm<sup>2</sup>) Radax 155
  - Cable length 500 mm
  - DC-execution available
  - only for  $U_N \leq 75$  VDC
  - Protection class IP65
- With professional assembly

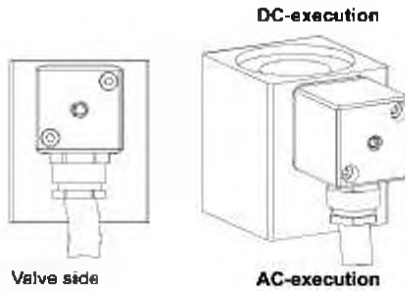
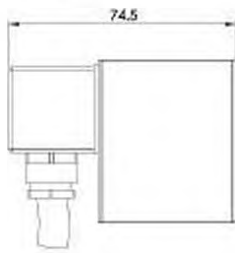


Valve side



**Execution: M K S45/23x50-...**

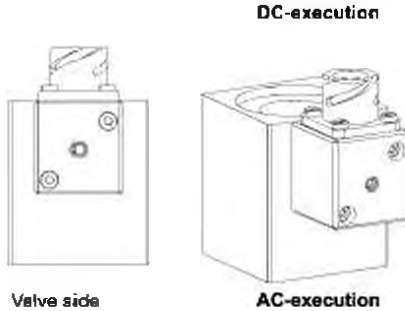
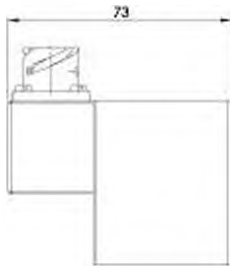
- 3 pole 2P+E 3x 0,75 mm<sup>2</sup> Thermoplast
  - Cable length 1500 mm
  - Cable diameter 6 mm
  - DC- and AC-execution available
  - Cable housing plastic
  - Protection class IP67
- With professional assembly



Execution: M **K** S45/23x50-... **M28**

- 3 pole 2P+E 2x 1 mm<sup>2</sup> [E] (acc. to IEC 332)
- Cable length 1500 mm
- DC- and AC-execution available
- Connector housing steel
- Protection class IP67
- With professional assembly

- Plastic rectifier housing, h+10,5 mm



Execution: M **B** S45/23x50-...

- 3 pole 2P+E
- MIL VG 85234
- DC- and AC-execution available
- Connector housing steel
- Protection class IP67
- With corresponding mating connector (not included in delivery) and professional assembly

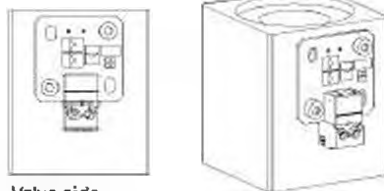
- Plastic rectifier housing, h+10,5 mm



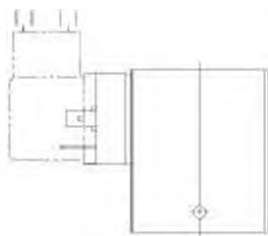
M209a

Execution: M **X** S45/23x50-... **M209**

- 2 pole
- DC-version available up to 28 VDC
- Screw clamp plastic
- Printed circuit board protected with conformal coating



M209b





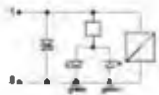
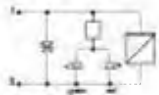
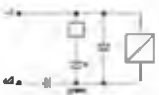
Valve side

Execution: M **.** S45/23x50-... **M35**  
M **.** S45/23x50-... **M /35**

- With pressure equalising bore for underwater applications in oil bath
- Oil tank separated from water by a membrane
- With connection type «D», «L», «X»
- DC-execution available

**Attention:**

In case of the connection execution «D» only plugs with the additional designation «Z23» must be utilised (not included in the scope of supply of the solenoid)

Plug alignment		Electric wiring
		
M222a	M222b	
M222c	M222d	
M222e	M222f	

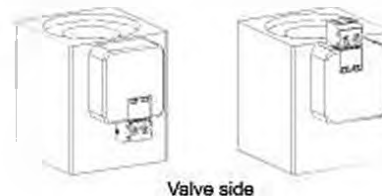
**Execution: M X S45/23 x50-... M222**

- 2 pole
- DC-version available up to 28 VDC
- Screw clamp plastic
- Plug housing plastic, transparent, removable
- Printed circuit board protected with conformal coating
- Protection type IP40 with plastic hood installed

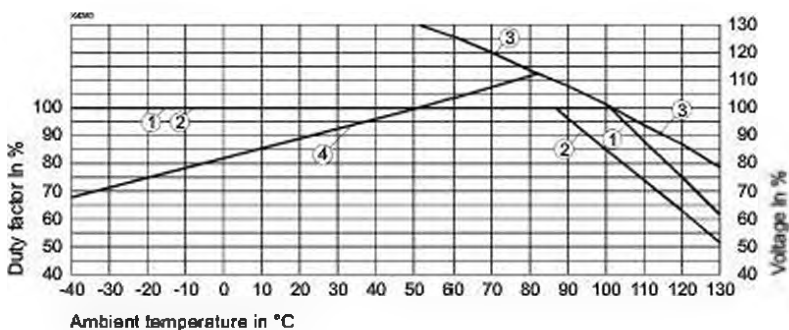
$I_{max} = 1,0 \text{ A at } 130 \text{ }^\circ\text{C}$   
 $I_{max} = 1,5 \text{ A at } 120 \text{ }^\circ\text{C}$   
 $I_{max} = 2,0 \text{ A at } 110 \text{ }^\circ\text{C}$

**PARTS LIST**

Position	Article	Description
10	219.2802	Mating connector (M209 and M222)
20	088.1118	Plastic hood (only M222)

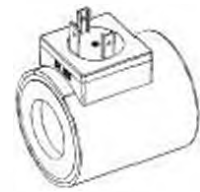
**M222b/d/f**
**M222a/c/e**

**NOTE!**

Technical explanation see data sheet 1.1-400/410/430

**DUTY FACTOR / TEMPERATURE**
**TEMPERATURE / VOLTAGE**


- 1 Duty factor at nominal voltage
- 2 Duty factor at 110 % nominal voltage
- 3 Max. voltage in % for 100 % duty factor
- 4 Min. voltage in % for proportional limiting current at 100 % duty factor

**Solenoid coil W.E45/23 x 50**  
**In accordance with DIN VDE 0580**  
**Protection class IP65/67/69K**


**DESCRIPTION**

The slip-on solenoid coil W.E45/23x50 is available in three different connection versions. The design corresponds to the DIN VDE standard 0580. The housing is made of steel (zinc-nickel coated), the connector socket is made of plastic material.

**FUNCTION**

With the combination of an armature tube the function of a switching solenoid or of a proportional solenoid results.

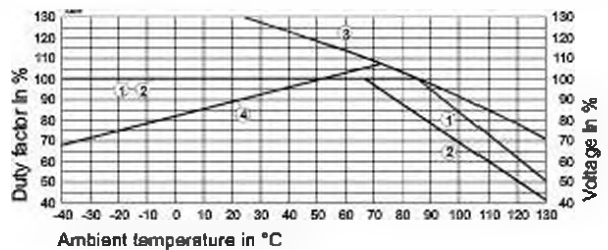
**TYPE CODE**

Metal housing, round		W		E45 / 23 x 50 -		#	
Connection execution							
Connector socket EN 175301-803/ISO 4400	<input type="checkbox"/> D	with protecting diode*		<input type="checkbox"/> D1			
Connector socket AMP Junior-Timer	<input type="checkbox"/> J	(only DC)					
Connector Deutsch DT04-2P	<input type="checkbox"/> G	(only DC)		<input type="checkbox"/> G1			
Connection execution							
Internal coil diameter 23mm							
Coil length 50mm							
Nominal voltage U <sub>N</sub>		12 VDC	<input type="checkbox"/> G12	115 VAC	<input type="checkbox"/> R115		
		24 VDC	<input type="checkbox"/> G24	230 VAC	<input type="checkbox"/> R230		
		28 VDC	<input type="checkbox"/> G28				
Design-Index (Subject to change)							

\*only in execution U<sub>N</sub> = 28 VDC

**SPECIFICATIONS**

Coil winding	
insulation class	H (180 °C), N (200 °C) only G28
Relative duty factor	100 % ED combined with armature tube and valve
Ambient temperature	See temperature curve
Corrosion protection	Salt spray test according to EN ISO 9227: > 1000 h

**DUTY FACTOR**
**VOLTAGE**


- 1 Duty factor at nominal voltage
- 2 Duty factor at 110% nominal voltage
- 3 Max. voltage in % for 100% duty factor
- 4 Min. voltage in % for proportional limiting current at 100% duty factor

	12 VDC	24 VDC	28 VDC	115 VAC	230 VAC
Nominal power (20 °C) (W) (Switching function)	30,9	31,8	36,3	27,2	29,8
Limiting current (50 °C) (A) (Proportional function)	1,715	0,88	0,84	—	—
Limiting power (50 °C) (W) (Proportional function)	20,6	21,2	23,7	—	—
Nominal resistance (20 °C) (Ω)	4,68	18,1	21,6	385	1425
Number of windings (-)	820	1250	1370	5350	10700
Weight of solenoid coil (kg)	0,33	0,33	0,33	0,33	0,33
Breakdown voltage (VDC) (Protecting diode)	—	—	62	—	—

**SAFE OPERATION**

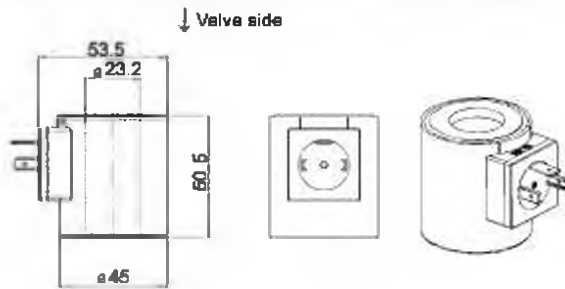

**Caution:** To avoid overheating the coil may only be energised when mounted on an armature tube and valve.


**NOTE!**

The effective heat emissions depends on the installation conditions (heat emission surface, air circulation, etc.), these influence the described area of application.



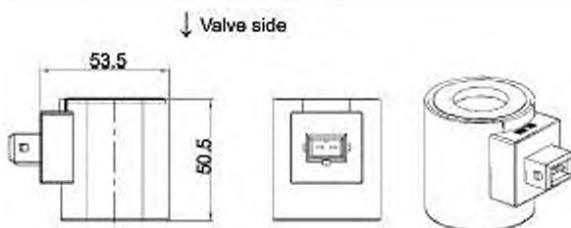
TYPE LISTE / DIMENSIONS / GENERAL SPECIFICATIONS



**Execution: W D1 E45/23x50**

- 3-poles 2 P+E
- Protection class IP 65

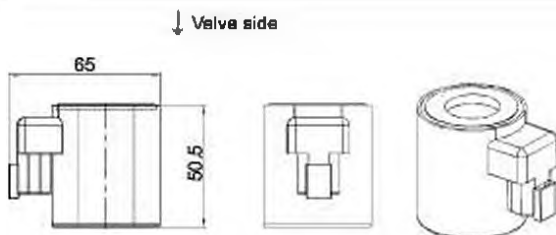
With corresponding mating connector (not included in delivery) and professional assembly.



**Execution: W J E45/23x50**

- 2-poles 2P
- only for  $U_N \leq 75$  VDC
- Protection class IP 66

With corresponding mating connector (not included in delivery) and professional assembly.

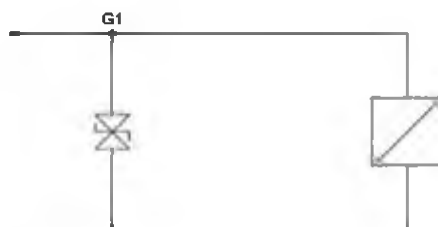


**Execution: W G E45/23x50**

- 2-poles 2P
- only for  $U_N \leq 75$  VDC
- Protection class IP 67 and 69 K

With corresponding mating connector (not included in delivery) and professional assembly.




Technical explanation see data sheet 1.1-400 und 1.1-410



**Execution: W D1 E45/23x50-G28** with protecting diode  
**W G1 E45/23x50-G28** with protecting diode

**Solenoid coil MKY45/18x60**  
**For explosion-hazard zones**  
**Protection class IP65/66/67**  
**Optional with integrated amplifier electronics**

**Ex db IIC T6, T4 Gb**  
**Ex tb IIIC T80°C, T130°C Db**  
**Ex db I Mb**

 **II 2 G Ex db IIC T6, T4**  
 **II 2 D Ex tb IIIC T80°C, T130°C**  
 **I M2 Ex db I Mb**


**DESCRIPTION**

**For explosion-hazard zones**  
 Solenoid coil in acc. with directive 2014/34/EU (ATEX) for explosion-hazard zones. The flameproof enclosure (acc. to EN/IEC 60079-1/31) prevents an explosion in the interior from getting outside. The design prevents a surface temperature capable of igniting. The steel housing is zinc/nickel-coated. Optional with integrated amplifier electronics.

**FUNCTION**

In combination with an armature tube, the function of a switching solenoid or of a proportional solenoid results. Solenoid coils in AC – construction have an integrated rectifier. All cable threaded joints certified for this explosion protection class with a protection class of at least IP65 can be used. The optional amplifier electronics have an analogue interface and can be adjusted by means of push-buttons and 7 segment display or by means of the parameterisation software PASO.

**APPLICATION**

The solenoid coil is suitable for use in all explosion-hazard zones, open cast and also in mines. This signifies, that the coils are certified for applications in zones with explosion-hazard gas, steam, vapour, air and dust mixtures of the zones 1/21 and 2/22. Valves for explosion-hazard zones are utilised in:

- the shipping- and offshore industries
- the oil- and gas industries
- the chemical industry
- wood processing
- grain mills
- the mining application

**CERTIFICATES**

	Surface	Mining	Standard -25°C to...	M224 -40°C to...	M238 -60°C to...	M248 Electronic
ATEX	x	x	x	x	x	x
IECEX	x	x	x	x	x	x
CCC	x	x	x	x	x	x
EAC	x	x	x	x	x	x
Australia	x	x	x	x		
MA		x	x			x

**TYPE CODE**

M K Y 45 / 18 x 60 -  /  /  /  -  #

Mobile execution, metal housing

Terminal box without cable

Explosion proof version Ex d

Housing width 45 mm

Internal coil diameter 18 mm

Coil length 60 mm

Nominal voltage  $U_n$       12 VDC  G 12      115 VAC  R 115  
    24 VDC  G 24      230 VAC  R 230

Nominal power  $P_n$       6 W  L 6      9 W  L 9      15 W  L 15      21 W  L 21

Certification      ATEX, IECEx, CCC, EAC  
                                  Australia  AU8  
                                  MA  MA (only for G24/L15 and G24/L15-M248)

Cable gland       M187      Thread NPT 1/8"

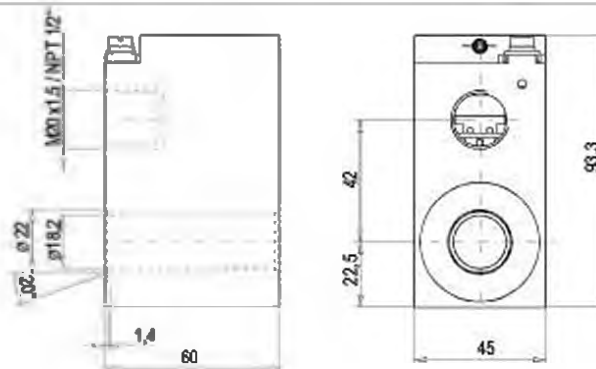
Temperature range      -25 °C to ...  
                                  -40 °C to ...  
                                  -60 °C to ...

Function      Amplifier  M248      only G12 or G24 / up to max. L15 / not for M238  
                                  Freewheel diode  M256      only G12 or G24 / do not use for proportional functions  
                                  Bipolar protecting diode  M264      only G24  
                                  Power reduction  M272      only L6

Design-Index (Subject to change)

**DIMENSIONS**

without amplifier electronics


**CHARACTERISTICS**

Coil winding isolation class H

Protection class

acc. to EN 60529

IP65/66/67, with corresponding cable gland with front side O-ring sealing to the housing and correct installation

Relative duty factor

100 % D.F. combined with armature tube and valve

Reference temperature

**Execution L6 / L9:**

-25...+40 °C (operation as T1...T6/T130 °C)

-25...+90 °C (operation as T1...T4/T130 °C)

**Execution L15 / L12:**

Temperature range „-25° to ...“

-25...+70 °C (operation as T1...T4/T130 °C)

Temperature range „-40° to ...“

-40...+70 °C (operation as T1...T4/T130 °C)

Temperature range „-60° to ...“

-60...+70 °C (operation as T1...T4/T130 °C)

**Execution L 21:**

-25...+60 °C (operation as T1...T4/T130 °C)

Housing

Relative humidity factor

Corrosion protection

Steel housing, zinc/nickel-coated

max. 95 % (not dew-forming)

Salt spray test in accordance with

EN ISO 9227 &gt; = 1000 hours

Maximum operating voltage

Nominal voltage +10 %

Nominal frequency

in acc. with name plate ±2 %

Standard

 $U_n = 12 \text{ VDC}$ 

nominal voltages

 $U_n = 24 \text{ VDC}$ 
 $U_n = 115 \text{ VAC}$ 
 $U_n = 230 \text{ VAC}$ 

Other nominal voltages in the ranges of

12–230 VDC and 24–230 VAC on request

Standard nominal powers

 $P_n = 6 \text{ W}$ 

 with M272  $P_n = 3,8 \text{ W}$ 
 $P_n = 9 \text{ W}$ 
 $P_n = 15 \text{ W}$ 
 $P_n = 21 \text{ W}$ 

	12 VDC				
Nominal power (W)	6	9	12	15	21
Nominal resistance (Ω)	24,75	16,5	13,5	9,9	7,1
Recommended rated current for fuse inserts (mA)	1000	1600	2000	2500	4000
Limiting current (mA) (Proportional function)	400	610	720	960	1230

	24 VDC				
Nominal power (W)	6	9	12	15	21
Nominal resistance (Ω)	98,5	64	49,2	38,5	27,5
Recommended rated current for fuse inserts (mA)	400	600	800	1250	2000
Limiting current (mA) (Proportional function)	200	300	370	450	600

	115 VAC				
Nominal power (W)	6	9	12	15	21
Nominal resistance (Ω)	1840	1180	869	700	500
Recommended rated current for fuse inserts (mA)	100	200	200	315	400

	230 VAC				
Nominal power (W)	6	9	12	15	21
Nominal resistance (Ω)	7280	4750	3370	2850	2050
Recommended rated current for fuse inserts (mA)	100	100	100	180	200

 M272 reduces the nominal power ( $P_n$ ) after 500ms to a reduced power ( $P_r$ )

**OPERATION SECURITY**


The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent.

In case of non-observance, no liability can be assumed.

A corresponding fuse in accordance with its design current has to be connected in series as short-circuit protection for every solenoid coil.

**INSTALLATION**

For stack assembly please observe the remarks in the operating instructions.

**ACCESSORIES**

– The operating instructions incl. the EC declaration of conformity for solenoid coils of the type MKY45/18 x 60 is supplied in German, English and French

– Type test certifications

– EC-declaration of conformity

– Recognition of production quality assurance

QAN: SEV ATEX 4130. QAR: CH/SEV/QAR16.0001

**With amplifier electronics and with analogue interface**
**Digital amplifier electronics to MKY...M248**

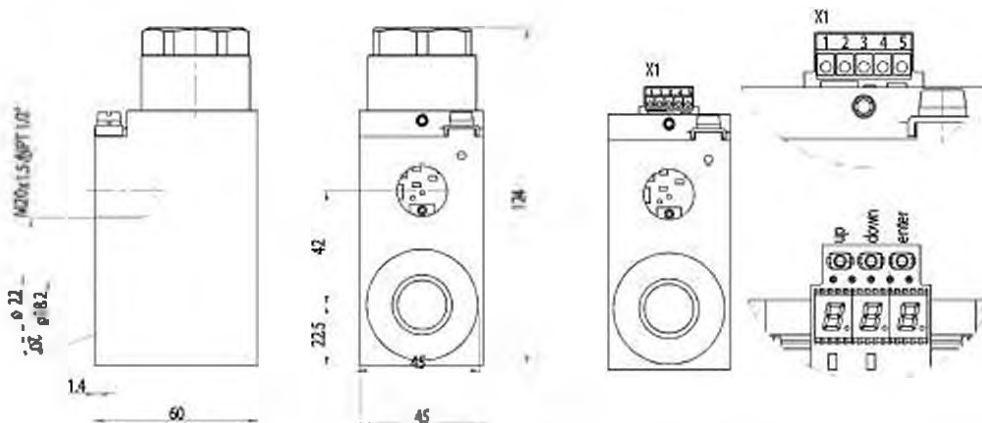
- Electronics integrated in solenoid housing
- For proportional or switching valves
- Screw terminals for simple assembly
- 1 analogue input
- 1 digital input
- Adjustable with push-buttons and display directly on the device or via PC

**ELECTRICAL SPECIFICATIONS**

Supply voltage	G12: 12 V +10%, G24: 24 V +10%	G24/L9	Adjustable $I_{max}$ ... 510 mA
Residual ripple	< +/-5%		Factory setting 600 mA
Fuse	low	G12/L9	Adjustable $I_{max}$ ... 685 mA
No-load current	approx. 20 mA		Factory setting 610 mA
Max. current consumption	No-load current + limiting current of the solenoid	Dither	Frequency adjustable 4 ... 500 Hz
Analogue input	1 input non-differential Voltage / current (adjustable by means of parameter) 0 ... +/- 10V or 0/4 ... 20mA		Factory setting 80 Hz
Resolution	10-Bit	Temperature drift	Level adjustable 0 ... 400 mA
Input resistance	Voltage input >100 kΩ (input current < 8 mA) Load for current input = 124 Ω	Digital inputs	Factory setting 150 mA
Stabilised output voltage	5 VDC max. load 20 mA		<1% at ΔT = 40 °C
Solenoid current:		USB interface	1 input high-active, no pull-up/down
• Minimal current $I_{min}$	Adjustable 0 ... $I_{max}$ mA Factory setting 30 mA		Switching threshold high 6 ... 32 VDC
• Maximal current $I_{max}$	G24/L15 Adjustable $I_{max}$ ... 510 mA Factory setting 450 mA	EMC	Switching threshold low 0 ... 1 VDC
	G12/L15 Adjustable $I_{max}$ ... 1020 mA Factory setting 960 mA	Immunity	Usable as frequency input (frequency 5 ... 5000 Hz) and as PWM input (automatic frequency recognition)
		Emission	Via digital input
			Requires the Wandfluh USB adapter PD2

**DIMENSIONS**

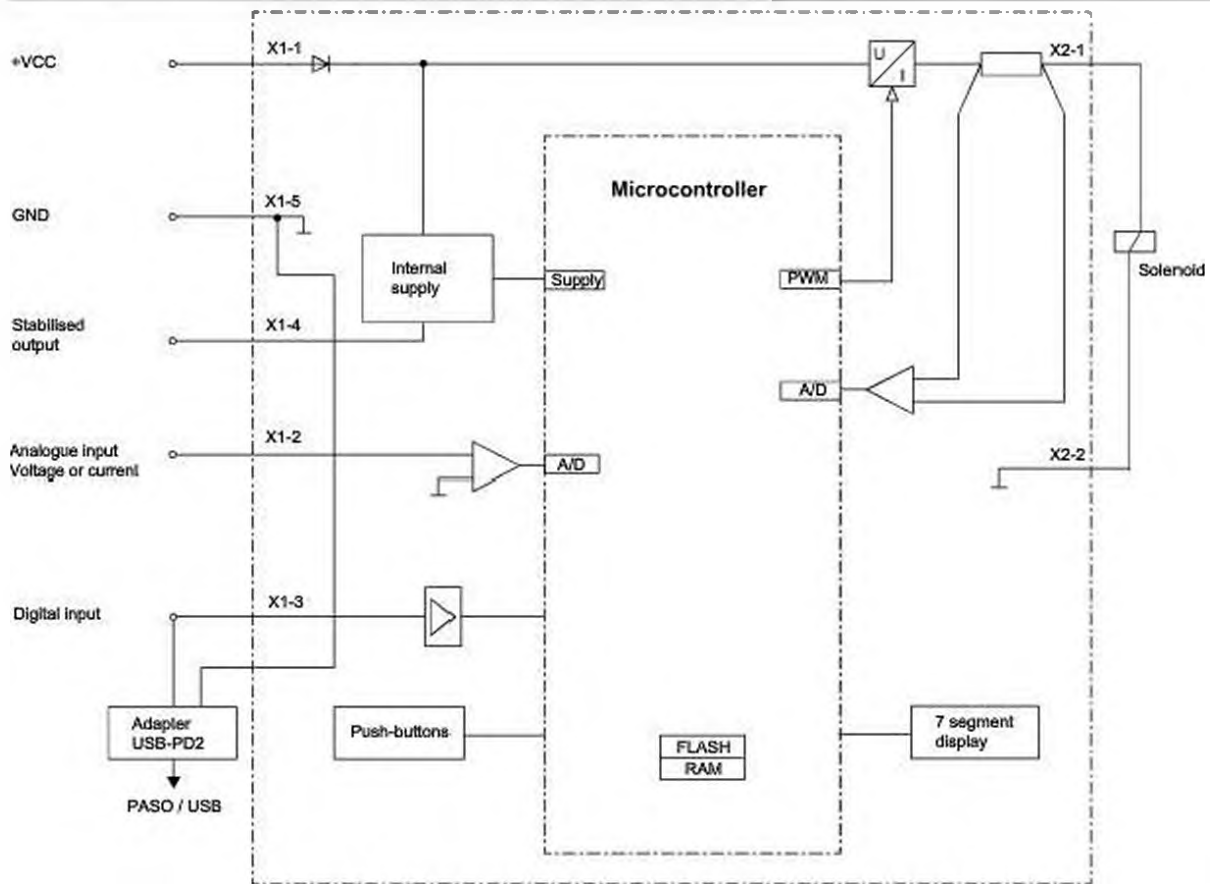
with amplifier electronics


**CONNECTOR ASSIGNMENT (X1)**

- 1 = + VCC
- 2 = Command value
- 3 = Dig Inp
- 4 = Stab out
- 5 = GND

**GENERAL SPECIFICATIONS**

Execution	Electronics board built-in directly in solenoid housing
Connections	
Screw terminal	5-pole, max 1,0 mm <sup>2</sup>
USB interface	via connection «Digital Inputs requires an additional Wandfluh adapter PD2

**BLOCK DIAGRAM**

**START-UP**

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier electronics and in the operating instructions.

Additional information can be found on our website:

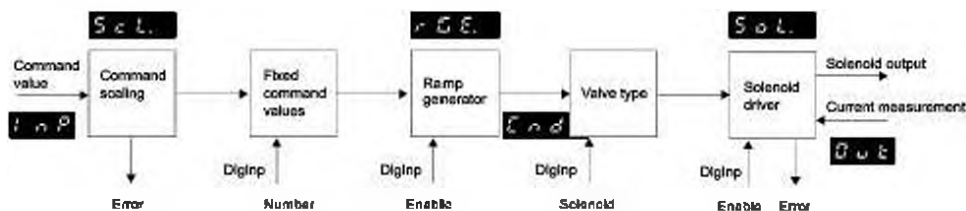
Free-of-charge download:

- «PASO-PD2» Parameterisation software
- Operating instruction (\*.pdf)

**PARAMETER SETTINGS**

The MKY electronics have push-buttons and a display which enable setting the most important parameters. In addition, the digital input can be used as a communication interface, through which, by means of the parameterisation software "PASO-PD2", the complete parameterisation and diagnostics can be carried out. For this, the Wandfluh USB-PD2 adapter is required. (not included in the delivery)

Attention: During the communication, the digital input cannot be used.

**FUNCTION DESCRIPTION**

**ADDITIONAL INFORMATION**

Proportional spool valve  
 Proportional pressure valves  
 Proportional flow control valves

Wandfluh documentation  
 register 1.10  
 register 2.3  
 register 2.6

**ACCESSORIES**

USB adapter PD2  
 incl. USB cable type A-B, 1,8 m  
 (for parameterisation via PASO)

Article no. 726.9900

**AMPLIFIER WITH ANALOGUE INTERFACE**
**Command value scaling**

The command value can be applied as a voltage, current, digital, frequency or PWM signal. The scaling takes place via the parameter "Interface". Furthermore, the command value can be monitored for a cable break. A dead band can also be set.

**Fixed command value**

There is 1 fixed command value available, which can be selected via the digital input. This function has to be configured before in PASO.

**Ramp generator**

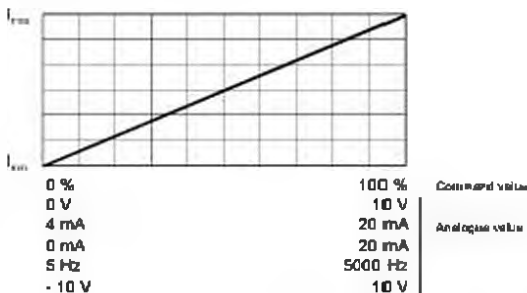
Two linear ramps for up and down are available which can be adjusted separately.

**Valve type**

Adjustment possibilities: switching solenoid or proportional solenoid.

**Mode of operation „Command value unipolar/bipolar (1-Sol)**

Dependent on a command value signal (voltage, current, digital, frequency or PWM), the solenoid is driven (e.g. 0...10V correspond to 0...100 % command value, 0...+100 % command value correspond to I<sub>min</sub>...I<sub>max</sub> solenoid driver)


**Signal recording**

Furthermore, the „PD2“ amplifier electronics have a signal recording function. This, by means of PASO, enables the recording of various system signals, such as command value, solenoid current, etc., which can be represented on a common time axis.

**Solenoid driver**

A Pulse-Width-Modulated current output is available. A dither signal is superimposed, whereby the dither frequency and the dither level are separately adjustable. The minimum (I<sub>min</sub>) and maximum (I<sub>max</sub>) current can be adjusted. The solenoid output can also be configured as switching solenoid output. In this case, a power reduction can be adjusted.

**Optimisation of characteristic curve**

An adjustable characteristic curve „Command value input – solenoid current output“ enables an optimised (e.g. linearised) characteristic of the hydraulic system.

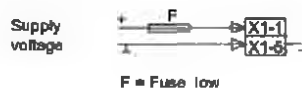
**Channel enabling**

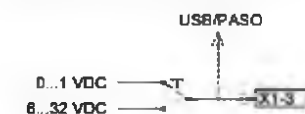
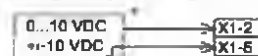
The device is enabled as per factory setting. Via PASO or menu item, the digital input can be enabled. The enabling can be set „on“, „out“ or „external“ (digital input).

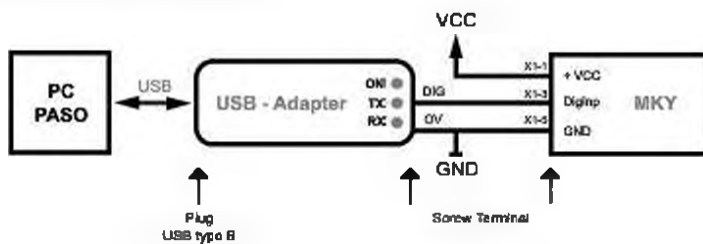
**Hints:**

Digital input: if not wired, the state of the digital input is not defined

Analogue input: if not wired, the voltage input will read 1.11 V constantly.




**CONNECTION EXAMPLES**
**Supply voltage**

**Analogue input with potentiometer**

**Digital input as function input**

**Analogue input voltage with external voltage source**

**Analogue input current with external current source**

**Digital input as USB interface**


**Solenoid coil MKY45/18x60**  
**For explosion-hazard zones**  
**Protection class IP65/66/67**  
**Surface AISI 316L**  
**Optional with integrated amplifier electronics**

**Ex db IIC T6, T4 Gb**  
**Ex tb IIIC T80°C, T130°C Db**  
**Ex db I Mb**

 II 2 G Ex db IIC T6, T4  
 II 2 D Ex tb IIIC T80°C, T130°C  
 I M2 Ex db I Mb


**DESCRIPTION**

**For explosion-hazard zones**  
 Solenoid coil in acc. with directive 2014/34/EU (ATEX) for explosion-hazard zones. The flameproof enclosure (acc. to EN/IEC 60079-1/31) prevents an explosion in the interior from getting outside. The design prevents a surface temperature capable of igniting. The steel housing is AISI 316L. Optional with integrated amplifier electronics.

**FUNCTION**

In combination with an armature tube, the function of a switching solenoid or of a proportional solenoid results. Solenoid coils in AC - construction have an integrated rectifier. All cable threaded joints certified for this explosion protection class with a protection class of at least IP65 can be used. The optional amplifier electronics have an analogue interface and can be adjusted by means of push-buttons and 7 segment display or by means of the parameterisation software PASO.

**APPLICATION**

The solenoid coil is suitable for use in all explosion-hazard zones, open cast and also in mines. This signifies, that the coils are certified for applications in zones with explosion-hazard gas, steam, vapour, air and dust mixtures of the zones 1/21 and 2/22. Valves for explosion-hazard zones are utilised in:

- the shipping- and offshore industries
- the oil- and gas industries
- the chemical industry
- wood processing
- grain mills
- the mining application

**CERTIFICATES**

in accordance with	Surface gas and dust				Mining
	Standard -25 °C to...	M224 -40 °C to...	M238 -60 °C to...	Amplifier M248	
ATEX	x	x	x	x	x
IECEX	x	x	x	x	x
EAC (GOST Ex)	x	x	x	x	x
CCC	x	x	x	x	x

**TYPE CODE**

M K Y 45 / 18 x 60 -  /  - K9 -  #

Mobile execution, metal housing

Terminal box without cable

Explosion proof version Ex d

Housing width 45 mm

Internal coil diameter 18 mm

Coil length 60 mm

Nominal voltage  $U_n$       12 VDC  G 12      115 VAC  R 115  
                                  24 VDC  G 24      230 VAC  R 230

Nominal power  $P_n$     6 W  L 6    9 W  L 9    15 W  L 15    21 W  L 21

Surface

Temperature range    -25°C to ...

-40°C to ...

-60°C to ...

M224

M238

Function

Amplifier

M248

only G12 or G24 / up to max. L15  
 not for M224 and M238

Freewheel diode

M256

do not use for proportional functions

Bipolar protecting diode

M264

only G24

Power reduction

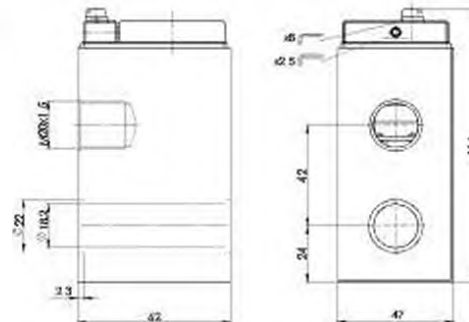
M272

only L6

Design-Index (Subject to change)

**DIMENSIONS**

without amplifier electronics


**CHARACTERISTICS**

Coil winding isolation class H

Protection class

acc. to EN 60529

IP65/66/67, with corresponding cable gland and correct installation

Relative duty factor

100% DF, combined with armature tube and valve

Reference temperature

**Execution L6 / L9:**

-25...+40 °C (operation as T1...T3/T30 °C)

-25...+90 °C (operation as T1...T4/T130 °C)

**Execution L15:**

Temperature range „-25° to ...“

-25...+70 °C (operation as T1...T4/T130 °C)

Temperature range „-40° to ...“

-40...+70 °C (operation as T1...T4/T130 °C)

Temperature range „-60° to ...“

-60...+70 °C (operation as T1...T4/T130 °C)

**Execution L 21:**

-25...+60 °C (operation as T1...T4/T130 °C)

Housing

Steel housing AISI 316L

Relative humidity factor

max. 95 % (not dew-forming)

Corrosion protection

Salt spray test in accordance with EN ISO 9227 &gt; = 2000 hours

Maximum operating voltage

Nominal voltage +10 %

Nominal frequency

in acc. with name plate ±2 %

Standard nominal voltages

 $U_N = 12 \text{ VDC}$ 
 $U_N = 24 \text{ VDC}$ 
 $U_N = 115 \text{ VAC}$ 
 $U_N = 230 \text{ VAC}$ 

Other nominal voltages in the ranges of 12–230 VDC and 24–230 VAC on request

Standard nominal powers

 $P_N = 8 \text{ W}$ 

 with M272  $P_N = 3,8 \text{ W}$ 
 $P_N = 9 \text{ W}$ 
 $P_N = 15 \text{ W}$ 
 $P_N = 21 \text{ W}$ 

	12 VDC			
Nominal power (W)	6	9	15	21
Nominal resistance (Ω)	24,75	16,5	9,9	7,1
Recommended rated current for fuse inserts (mA)	1000	1800	2500	4000
Limiting current (mA) (Proportional function)	400	610	980	1230
	24 VDC			
Nominal power (W)	6	9	15	21
Nominal resistance (Ω)	98,5	64	38,5	27,5
Recommended rated current for fuse inserts (mA)	400	800	1250	2000
Limiting current (mA) (Proportional function)	200	300	450	600
	115 VAC			
Nominal power (W)	6	9	15	21
Nominal resistance (Ω)	1840	1180	700	500
Recommended rated current for fuse inserts (mA)	100	200	315	400
	230 VAC			
Nominal power (W)	6	9	15	21
Nominal resistance (Ω)	7280	4750	2850	2050
Recommended rated current for fuse inserts (mA)	100	100	180	200

 M272 reduces the nominal power ( $P_N$ ) after 500ms to a reduced power ( $P_R$ )

**OPERATION SECURITY**


The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent.

In case of non-observance, no liability can be assumed.

A corresponding fuse in accordance with its design current has to be connected in series as short-circuit protection for every solenoid coil.

**INSTALLATION**

For stack assembly please observe the remarks in the operating instructions.

**ACCESSORIES**

– The operating instructions incl. the EC declaration of conformity for solenoid coils of the type MKY45/18x60 is supplied in German.



**With amplifier electronics and with analogue interface**
**Digital amplifier electronics to MKY...M248**

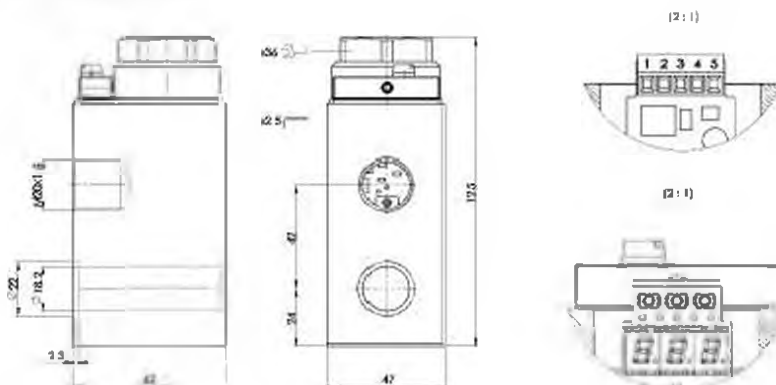
- Electronics integrated in solenoid housing
- For proportional or switching valves
- Screw terminals for simple assembly
- 1 analogue input
- 1 digital input
- Adjustable with push-buttons and display directly on the device or via PC

**ELECTRICAL SPECIFICATIONS**

Supply voltage	G12: 12 V +10%, G24: 24 V +10%	G24/L9 Adjustable	$I_{max}$ ...510 mA
Residual ripple	< +/−5 %	Factory setting	300 mA
Fuse	low	G12/L9 Adjustable	$I_{max}$ ...685 mA
No-load current	approx. 20 mA	Factory setting	610 mA
Max. current consumption	No-load current + limiting current of the solenoid	Frequency adjustable	4...500 Hz
Analogue input	1 input non-differential Voltage / current (switchable by means of parameter) 0...+/- 10V or 0/4...20mA	Dither	Factory setting 80 Hz Level adjustable 0...400 mA Factory setting 150 mA
Resolution	10-Bit	Temperature drift	<1 % at $\Delta T = 40^\circ C$
Input resistance	Voltage input >100 k $\Omega$ (input current < 8 mA) Load for current input = 124 $\Omega$	Digital inputs	1 input high-active, no pull-up/down Switching threshold high 8...32 VDC Switching threshold low 0...1 VDC Usable as frequency input (frequency 5...5000 Hz) and as PWM input (automatic frequency recognition)
Stabilised output voltage	5 VDC max. load 20 mA	USB interface	Via digital input Requires the Wandfluh USB adapter PD2
Solenoid current:		EMC	
• Minimal current $I_{min}$	Adjustable 0... $I_{max}$ mA Factory setting 30 mA	Immunity	EN 61 000-6-2
• Maximal current $I_{max}$	G24/L15 Adjustable $I_{max}$ ...510 mA Factory setting 450 mA G12/L15 Adjustable $I_{max}$ ...1020 mA Factory setting 960 mA	Emission	EN 61 000-6-4

**DIMENSIONS**

with amplifier electronics

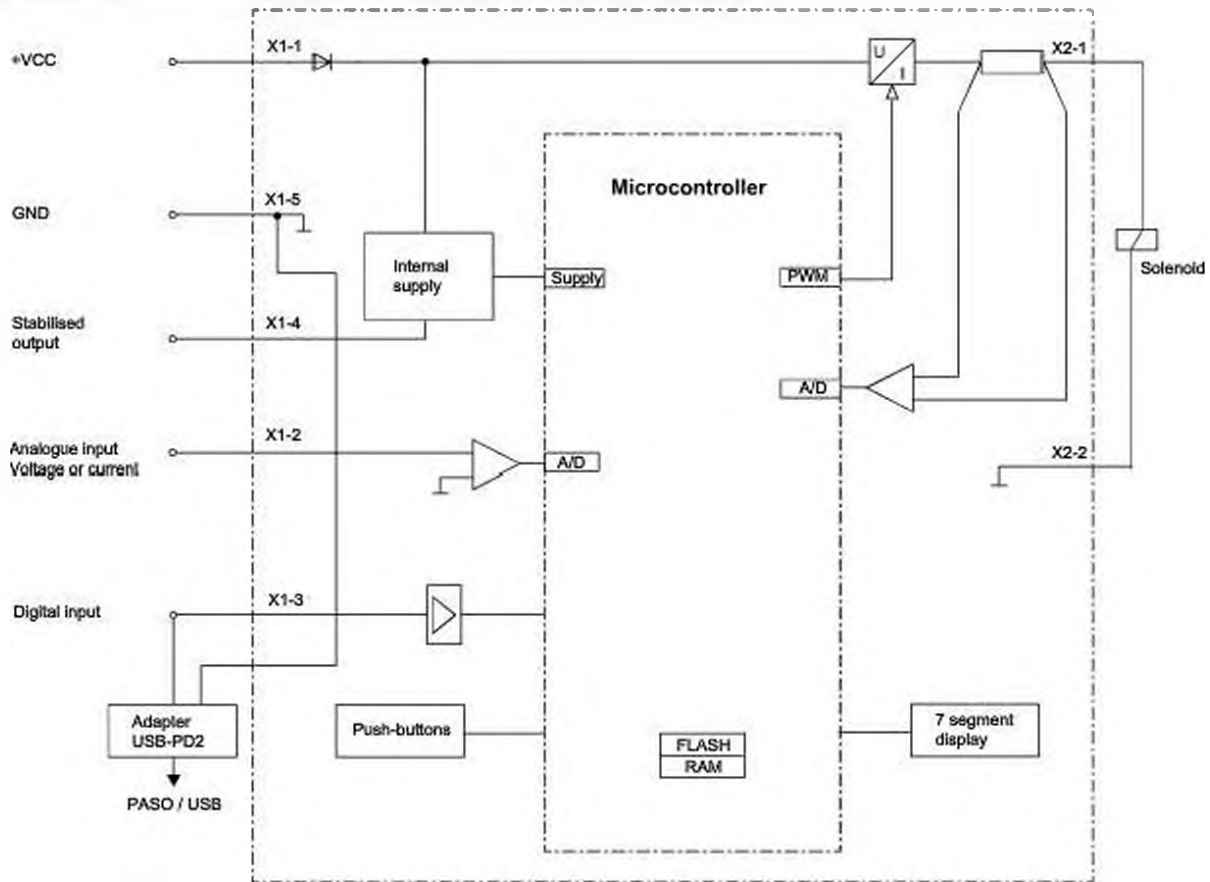

**CONNECTOR ASSIGNMENT (X1)**

- 1 = + VDC
- 2 = Command value
- 3 = Dig Inp
- 4 = Stab out
- 5 = GND

**GENERAL SPECIFICATIONS**

Execution	Electronics board built-in directly in solenoid housing
Connections	5-pole, max. 1.0 mm <sup>2</sup> via connection «Digital Inputs», requires an additional Wandfluh adapter PD2
Screw terminals	
USB interface	

**BLOCK DIAGRAM**



**START-UP**

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier electronics and in the operating instructions.

Additional information can be found on our website:

Free-of-charge download:

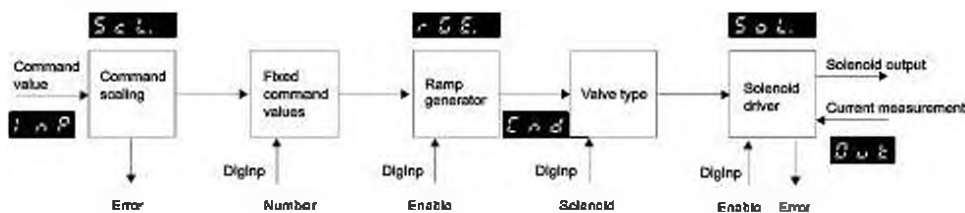
- «PASO-PD2» Parameterisation software
- Operating instruction (\*.pdf)

**PARAMETER SETTINGS**

The MKY electronics have push-buttons and a display which enable setting the most important parameters. In addition, the digital input can be used as a communication interface, through which, by means of the parameterisation software 'PASO-PD2', the complete parameterisation and diagnostics can be carried out. For this, the Wandfluh USB-PD2 adapter is required.

Attention: During the communication, the digital input cannot be used.

**FUNCTION DESCRIPTION**



**ADDITIONAL INFORMATION**

Proportional spool valve	Wandfluh documentation register	1.10
Proportional pressure valves	register	2.3
Proportional flow control valves	register	2.6

**ACCESSORIES**

USB adapter PD2	Article no. 726.9900
incl. USB cable, 1,8 m	
(for parameterisation via PASO)	

**AMPLIFIER WITH ANALOGUE INTERFACE**
**Command value scaling**

The command value can be applied as a voltage, current, digital, frequency or PWM signal. The scaling takes place via the parameter "Interface". Furthermore, the command value can be monitored for a cable break. A dead band can also be set.

**Fixed command value**

There is 1 fixed command value available, which can be selected via the digital input. This function has to be configured before in PASO.

**Ramp generator**

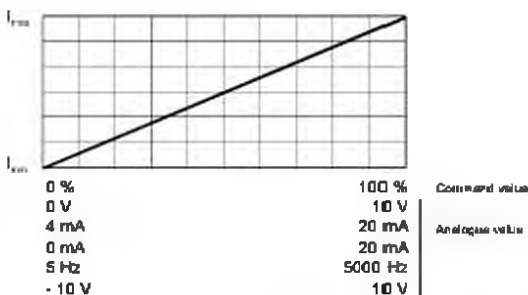
Two linear ramps for up and down are available which can be adjusted separately.

**Valve type**

Adjustment possibilities: switching solenoid or proportional solenoid.

**Mode of operation „Command value unipolar/bipolar (1-SoI)**

Dependent on a command value signal (voltage, current, digital, frequency or PWM), the solenoid is driven (e.g. 0...10V correspond to 0...100 % command value, 0...+100 % command value correspond to I<sub>min</sub>...I<sub>max</sub> solenoid driver)


**Signal recording**

Furthermore, the „PD2“ amplifier electronics have a signal recording function. This, by means of PASO, enables the recording of various system signals, such as command value, solenoid current, etc., which can be represented on a common time axis.

**Solenoid driver**

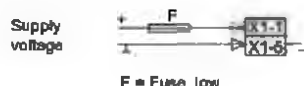
A Pulse-Width-Modulated current output is available. A dither signal is superimposed, whereby the dither frequency and the dither level are separately adjustable. The minimum (I<sub>min</sub>) and maximum (I<sub>max</sub>) current can be adjusted. The solenoid output can also be configured as switching solenoid output. In this case, a power reduction can be adjusted.

**Optimisation of characteristic curve**

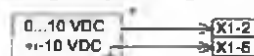
An adjustable characteristic curve „Command value input – solenoid current output“ enables an optimised (e.g. linearised) characteristic of the hydraulic system.

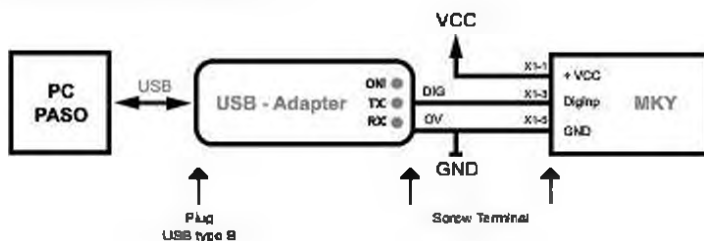
**Channel enabling**

The device is enabled as per factory setting. Via PASO or menu item, the digital input can be configured for enabling.

**CONNECTION EXAMPLES**
**Supply voltage**

**Analogue input with potentiometer**

**Digital input as function input**

**Analogue input voltage with external voltage source**

**Analogue input current with external current source**

**Digital input as USB interface**


**Solenoid coil MKU45/18x60**  
**For explosion-hazard zones**  
**Protection class IP65/67**

**Protection class acc. to UL / CSA**


**DESCRIPTION**

**For explosion-hazard zones**  
 Solenoid coil in acc. with UL and CSA for explosion-hazard zones.  
 The flameproof enclosure prevents an explosion in the interior from getting outside.  
 The design prevents a surface temperature capable of igniting.  
 The steel housing is zinc/nickel-coated

**FUNCTION**

In combination with an armature tube, the function of a switching solenoid or of a proportional solenoid results. Solenoid coils in AC - construction have an integrated rectifier. All cable threaded joints certified for this explosion protection class with a protection class of at least IP65 can be used.

**APPLICATION**

The solenoid coil is suitable for use in all explosion-hazard zones.  
 This signifies, that the coils are certified for applications in zones with explosion-hazard gas-, steam-, vapour-, air- mixtures.  
 Valves for explosion-hazard zones are utilised in:  
 - the shipping- and offshore industries  
 - the oil- and gas industries  
 - the chemical industry

**CERTIFICATES**

In accordance with	Surface Gas	Dust
NEC 500	Class I, Division I, Group A, B, C, D T4	Class II & III, Division I, Group E, F, G T4
NEC 505	Class I, Zone 1, AEx db IIC Gb T4	Class II, Zone 21, AEx tb IIIC T135C Db
Canada	Ex db IIC T4 Gb (Zone 1)	Ex tb IIIC T135C Db (Zone 21)

**TYPE CODE**

M K U 45 / 18 x 60 -  / L17 #

Mobile execution, metal housing

Terminal box without cable

Explosion proof version, Ex d / UL

Housing width 45 mm

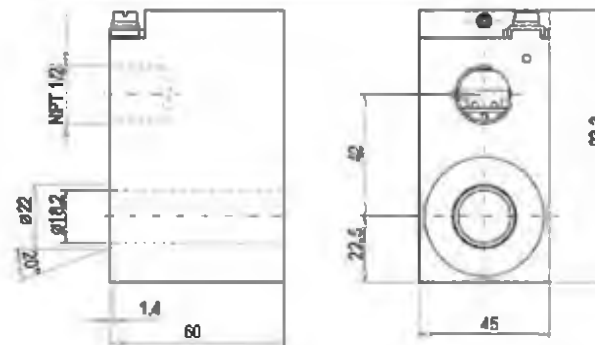
Internal coil diameter 18 mm

Coil length 60 mm

Nominal voltage  $U_n$       12 VDC G 12      115 VAC R 115  
                                  24 VDC G 24      230 VAC R 230

Nominal power  $P_n$                       17 W

Design-index (Subject to change)

**DIMENSIONS**

**CHARACTERISTICS**

Coil winding isolation class	H
Protection class in acc. EN 60520	IP65/67, with corresponding cable gland and correct installation
Relative duty factor	100% DF, combined with armature tube and valve
Reference temperature	<b>Execution L17:</b> -40...+70 °C (Operation as T1...T4)
Housing	Steel housing, Zinc-/Nickel-coated NEMA 4X
Relative humidity factor	max. 95% (not dew-forming)
Corrosion protection	Salt spray test in accordance with EN ISO 9227 > = 1000 hours
Maximum operating voltage	Nominal voltage +10%
Nominal frequency	in acc. with name plate ±2%
Standard nominal voltages	U <sub>N</sub> = 12 VDC U <sub>N</sub> = 24 VDC U <sub>N</sub> = 115 VAC U <sub>N</sub> = 230 VAC
Standard-nominal powers	P <sub>N</sub> = 17 W
Electrical connection	Screw terminal
Wire diameter	0.75...2.5mm <sup>2</sup> / 20...14 AWG

	<b>12 VDC</b>
Nominal power (W)	17
Nominal resistance (Ω)	8,5
Recommended rated current for fuse inserts (mA)	3'150
Limiting current (mA) (Proportional function)	1'000
	<b>24 VDC</b>
Nominal power (W)	17
Nominal resistance (Ω)	34
Recommended rated current for fuse inserts (mA)	1'600
Limiting current (mA) (Proportionalfunktion)	510
	<b>115 VAC</b>
Nominal power (W)	17
Nominal resistance (Ω)	607
Recommended rated current for fuse inserts (mA)	400
	<b>230 VAC</b>
Nominal power (W)	17
Nominal resistance (Ω)	2'477
Recommended rated current for fuse inserts (mA)	200

**OPERATION SECURITY**


The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent.

In case of non-observance, no liability can be assumed.

A corresponding fuse in accordance with its design current has to be connected in series as short-circuit protection for every solenoid coil.

**INSTALLATION**

For stack assembly please observe the remarks in the operating instructions.

**ACCESSORIES**

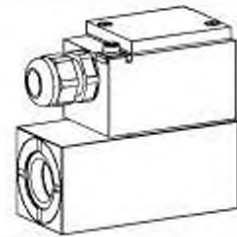
- The operating instructions MKU45/18x60 is supplied in German.

**Solenoid coil M.Z45**  
**for explosion hazard zones**  
**ATEX und IECEx certified**  
**Protection class IP65**

**Ex ia I Ma**  
**Ex ia II C T5/T6 Ga**

 II 1 G Ex ia IIC Ga T6, T5

 I M1 Ex ia I Ma


**DESCRIPTION**

The solenoid coil for explosion hazard areas in the ignition protection type «intrinsic safety» is utilised on solenoid spool valves.

**FUNCTION**

The winding resistance can be adapted to the intrinsically safe electric power supply utilised, in the range of 20...1000 Ω. With 100 Ω or 152 Ω coil resistance it is adapted to the recommended electric power supplies. Three diodes connected in parallel with the winding serve to render the inductivity ineffective, and a diode connected in series serves as a protection against reverse polarity. The electrical minimum values for a secure operation can be taken from the corresponding data sheet of the valve.

**APPLICATION**

The solenoid coil is certified as a device of the device groups I+II, category 1. This signifies that the devices are suitable for utilisation in areas with explosive gas-, vapour-, mist- and air mixtures of the zones 0, 1 and 2 as well as in mining applications.

Intrinsically safe valves are used in:

- the shipping- and offshore industries
- the oil- and gas industries
- the chemical industry
- the mining application

**CERTIFICATES**

in accordance with	Surface	Mining
ATEX	x	x
IECEX	x	x
CCC	x	x

The certificates can be found on [www.wandfluh.com](http://www.wandfluh.com) / DOWNLOADS / Accompanying Ex-proof / M.Z45

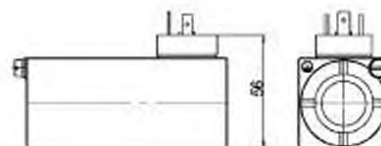
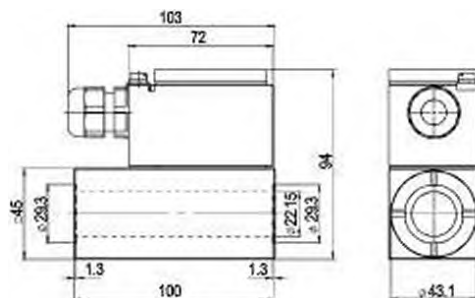
**TYPE CODE**

			M	<input type="text"/>	Z	45	-	<input type="text"/>	-	<input type="text"/>	#	<input type="text"/>
Mobile type, metal housing												
Terminal box with cable screw connection M20x1,5 DIN				<input type="checkbox"/>								
Other connectors on request				<input type="checkbox"/>								
Explosion proof execution, Ex ia												
45 mm square housing												
Coil resistance	100 Ω					<input type="text" value="100"/>						
	152 Ω					<input type="text" value="152"/>						
Temperature range	-25° C to...											
	-40° C to ...					<input type="text" value="M224"/>						
	-60° C to ...					on request						
Design-Index (Subject to change)												

**DIMENSIONS**

Type MKZ45

Type MDZ45



**SPECIFICATIONS**

Insulation material class of the excitation winding	H
Protection class acc. to EN 60529	IP65/67, with corresponding cable gland and correct installation
Relative duty factor	100% DF
Admissible ambient temp.	T1...T6: -20...+45 °C T1...T5: -20...+60 °C
Housing	Steel housing, zinc-nickel
Relative humidity	max. 95% (non-condensing)
Connection / power supply	MKZ45: Standard • Cable entry for cable $\varnothing$ 6...12 mm • + external protective terminal
Only available for device group II	MDZ45: DIN connector in accordance with ISO 4400/DIN 43650 • + external protective terminal

Technical safety limit values	Equipment group	
	I	II
U <sub>i</sub>	30 V	30 V
I <sub>i</sub>	3,25 A	0,8 A
P <sub>i</sub>	7 W	3 W
L <sub>i</sub>	0mH	0mH
C <sub>i</sub>	0nF	0nF

The inductance and capacitance of the solenoid coils are made ineffective.

**RECOMMENDED ELECTRIC POWER SUPPLY**

Electric power supply					Solenoid
Type	Manufacturer	Number of outputs	i <sub>max</sub>	Equipment group	Required coil resistance
BXNE3412	Georgin	1	95mA	II	100Ω
BXNE3422	Georgin	2	95mA	II	100Ω
KFD2-SLD-Ex1.13100	Pepperl+Fuchs	2	105mA	II	100Ω (152Ω)
BXNE3712	Georgin	1	125mA	II	100Ω
BXNE3722	Georgin	2	125mA	II	100Ω
LB6115/FB6215***	Pepperl+Fuchs	4	80mA	II	152Ω
9143/10-156-160-10S	Stahl	1	140mA	II	100Ω

Further characteristic values refer to data sheet of the power supply manufacturer

\*\*\* Maximum line resistance 3Ω (corresponds to 80m line length in case of a 1mm<sup>2</sup> cross section).

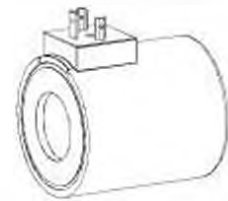
**SAFE OPERATION**

Intrinsically valves must only driven by a suitable electric power supply (see operating instructions). The selection of the power supply and wiring work must be executed by trained specialists.

**ACCESSORIES**

– The operating instructions incl. the EC declaration of conformity for

**Solenoid coil W.E64/31 x 72**  
**In accordance with DIN VDE 0580**  
**Protection class IP65/67/69K**


**DESCRIPTION**

The slip-on solenoid coil W.E64/31x72 is available in three different connection versions (see type code). The design corresponds to the DIN VDE standard 0580. The housing is made of steel (zinc-/nickel-coated), the connector socket is made of plastic material.

**FUNCTION**

With the combination of an armature tube the function of a switching solenoid or of a proportional solenoid results. The solenoid coils are available with the standard nominal voltages 12 VDC and 24 VDC.

**APPLICATION**

The solenoid coils are mainly utilised in hydraulic applications.

**TYPE CODE**

Metal housing, round		W <input type="checkbox"/> E64 / 31 x 72 - <input type="checkbox"/> # <input type="checkbox"/>	
Connection execution		D, J G	
Connector socket EN 175301-803/ISO 4400			
Connector socket AMP Junior-Timer			
Connector Deutsch DT04-2P			
Coil execution			
Internal coil diameter 31 mm			
Coil length 72 mm			
Nominal voltage U <sub>n</sub>	12 VDC	G12	
	24 VDC	G24	
Design-Index (Subject to change)			

**SPECIFICATIONS**

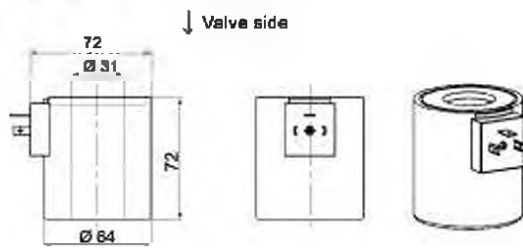
Coil winding	
insulation class	H (180°C)
Relative duty factor	100% DF/ED combined with armature tube and valve
Ambient temperature	-20...+70 °C
Corrosion protection	Salt spray test according to EN ISO 9227:≥ 480h

		12 VDC	24 VDC
Nominal power (20° C)	(W)	39	38
<small>(Switching function)</small>			
Limiting current (50° C)	(A)	2,225	1,105
<small>(Proportional function)</small>			
Limiting power (50° C)	(W)	27,1	26,5
<small>(Proportional function)</small>			
Nominal resistance (20° C)	(Ω)	3,7	15,2
Weight of solenoid coil	(kg)	1,0	1,0

**SAFE OPERATION**

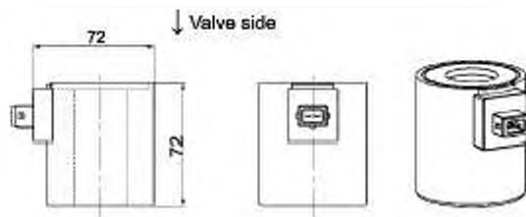
**Caution:** Because of the danger of over-heating the solenoid coil must only be commissioned together with an armature tube as well as with a valve.





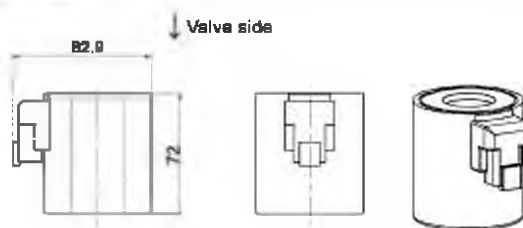
**Execution: W D E64/31 x 72**

- 3-poles 2 P+E
  - Protection class IP 65
- With corresponding mating connector  
(not included in delivery)  
and professional assembly.



**Execution: W J E64/31 x 72**

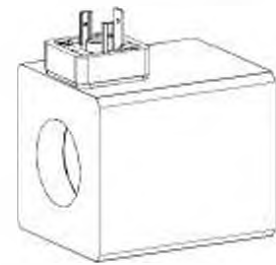
- 2-poles 2P
  - only for  $U_n \leq 75$  VDC
  - Protection class IP 66
- With corresponding mating connector  
(not included in delivery)  
and professional assembly.



**Execution: W G E64/31 x 72**

- 2-poles 2P
  - only for  $U_n \leq 75$  VDC
  - Protection class IP 67 and 69 K
- With corresponding mating connector  
(not included in delivery)  
and professional assembly.

Technical explanation see data sheet 1.1-400 and 1.1-410

**Solenoid coil M..60/31 x72**  
 according to VDE 0580  
 Protection class IP65/IP67

**DESCRIPTION**

The slip-on solenoid coil M..60/31 x72 is available with different types of electric connections. The AC voltage type incorporates a rectifier. The available AC voltages are listed in the type code section. The construction corresponds to standard VDE 0580. The steel housing is zinc-nickel-coated as standard.

**FUNCTION**

In combination with the corresponding armature tube the function of an on-off solenoid or proportional solenoid will be obtained.

**TYPE CODE**

Metal housing square		M		<input type="checkbox"/>	60/31 x72	-	<input type="checkbox"/>	-	<input type="checkbox"/>	*	<input type="checkbox"/>
Connection execution		Flying leads execution		L (only DC)							
Connector socket EN175301-803/ISO4400		J (only DC)		Cable execution		K					
Connector socket AMP Junior-Timer		G		Bayonet connector VG 95234		B					
Connector Deutsch DT04-2P		S		Screw clamp		X (only DC)					
Coil execution		Standard		Proportional		A					
Coil size		Internal coil diameter 31 mm		Coil length 72 mm							
Voltage		Direct current		G		Alternating current		R			
Nominal voltage		12 VDC		12		115 VAC		115			
		24 VDC		24		230 VAC		230			
Standard		M28									
Special cable execution		M35 (only DC)									
With pressure compensation		M208 (only DC)									
Special screw clamp		M222 (only DC)									
Screw clamp and electric wiring											
Design-Index (Subject to change)											

**SPECIFICATIONS**

		12 VDC	24 VDC	115 VAC	230 VAC
Coil winding	min. H (180 °C)				
Insulation class					
Relative duty factor	depending on the connector version IP65 or IP67 according to EN 60 529 (if correctly mounted)	Nominal power (W) (Switching function)	37,4	37,4	34,1
		Limiting power (W) (Proportional function)	27,5	27,5	—
Relative duty factor	100 % ED / 5 min when mounted on armature tube and valve	Limiting current (50 °C) (A) (Proportional function)	2,29	1,14	—
Ambient temperature	See temperature curve on page 4	Nominal resistance (Ω)	3,9	15,4	309
Nominal voltage range	10–250 VDC 50–250 VAC	Number of windings (-)	725	1451	6463
Corrosion protection	Salt spray test in accordance with EN ISO 9227 > = 1000 hours	Weight of solenoid coil (kg)	1,30	1,30	1,30

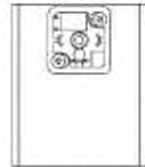
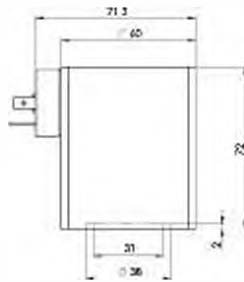
**SAFE OPERATION**


**Caution:** To avoid overheating the coil may only be energised when mounted on an armature tube and valve.


**NOTE!**

The effective heat emissions depends on the installation conditions (heat emission surface, air circulation, etc.), these influence the described area of application.

**TYPE LISTE / DIMENSIONS / GENERAL SPECIFICATIONS**

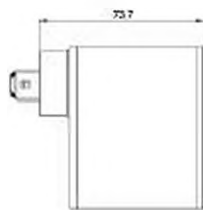


Valve side

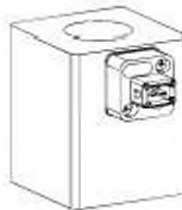


Execution: M **D** . 60/31 x 72-...

- 3 pole 2 P+E
  - DC- and AC-execution available
  - Connector socket plastic
  - Protection class IP65
- With corresponding mating connector (not included in delivery) and professional assembly

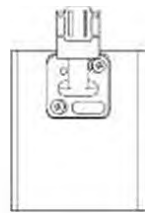
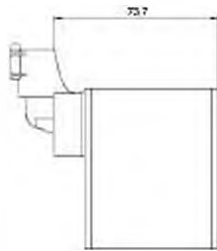


Valve side



Execution: M **J** . 60/31 x 72-...

- 2 pole 2P
  - DC-execution available
  - only for  $U_n \leq 75$  VDC
  - Connector socket plastic
  - Protection class IP65
- With corresponding mating connector (not included in delivery) and professional assembly

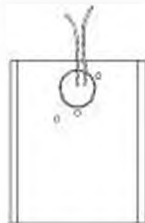
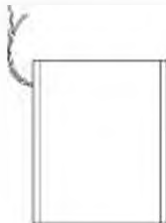


Valve side



Execution: M **G** . 60/31 x 72

- 2 pole 2P
  - DC-execution available
  - only for  $U_n \leq 75$  VDC
  - Protection class IP 67 and 69 K
- With corresponding mating connector (not included in delivery) and professional assembly

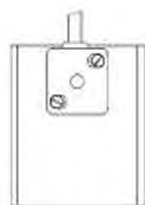
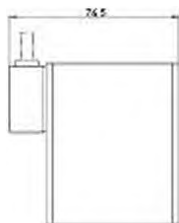


Valve side



Execution: M **L** . 60/31 x 72-...

- 2 pole 2P (2x 0,25 mm<sup>2</sup>)
  - Cable length 500 mm
  - DC-execution available
  - only for  $U_n \leq 75$  VDC
  - Protection class IP65
- With professional assembly

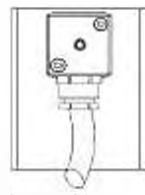
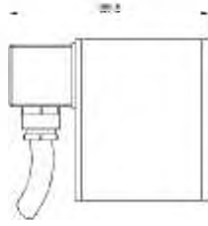


Valve side



Execution: M **K** . 60/31 x 72-...

- 3 pole 2P+E 3x 0,75 mm<sup>2</sup> Thermoplast
  - Cable length 1500 mm
  - Cable diameter 8 mm
  - DC- and AC-execution available
  - Cable housing plastic
  - Protection class IP67
- With professional assembly



Valve side

**DC-execution**

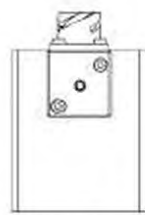
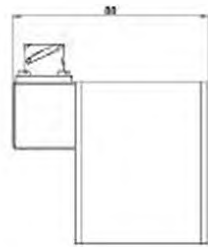


**AC-execution**

Execution: M **K** . 60/31 x 72-... **M28**

- 3 pole 2P+E 2x 1 mm<sup>2</sup> [E] (acc. to IEC 332)
- Cable length 1500 mm
- DC- and AC-execution available
- Connector housing steel
- Protection class IP67
- With professional assembly

- Plastic rectifier housing, h+10,5 mm



Valve side

**DC-execution**

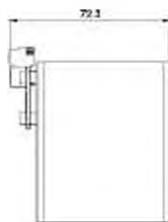
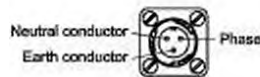


**AC-execution**

Execution: M **B** . 60/31 x 72-...

- 3 pole 2P+E
- DC- and AC-execution available
- Connector housing steel
- Protection class IP67
- With corresponding mating connector (not included in delivery) and professional assembly

- Plastic rectifier housing, h+10,5 mm



Valve side



M209a

Execution: M **X** . 60/31 x 72-... **M209**

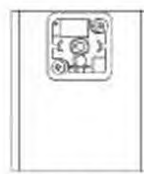
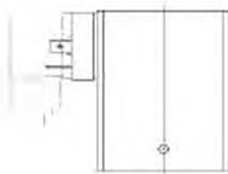
- 2 pole
- DC-version available up to 28 VDC
- Screw clamp plastic
- Printed circuit board protected with conformal coating



Valve side



M209b



Valve side



Execution: M . S60/31 x 72-... **M35**  
M . S60/31 x 72-... **M J35**

- With pressure equalising bore for underwater applications in oil bath
- Oil tank separated from water by a membrane
- With connection type «D», «L», «X»
- DC-execution available

**Attention:**

In case of the connection execution «D» only plugs with the additional designation «223» must be utilised (not included in the scope of supply of the solenoid)

Plug alignment		Electric wiring
M222a	M222b	
M222c	M222d	
M222e	M222f	

Execution: M1X . 60/31x72... M222

- 2 pole
- DC-version available up to 28 VDC
- Screw clamp plastic
- Plug housing plastic, transparent, removable
- Printed circuit board protected with conformal coating
- Protection type IP40 with plastic hood installed

$I_{max} = 1,0 \text{ A at } 130 \text{ }^\circ\text{C}$   
 $I_{max} = 1,5 \text{ A at } 120 \text{ }^\circ\text{C}$   
 $I_{max} = 2,0 \text{ A at } 110 \text{ }^\circ\text{C}$

**PARTS LIST**

Position	Article	Description
10	219.2802	Mating connector (M209 and M222)
20	088.1116	Plastic hood (only M222)



**NOTE!**

Technical explanation see data sheet 1.1-400/410/430

M222b/d/f

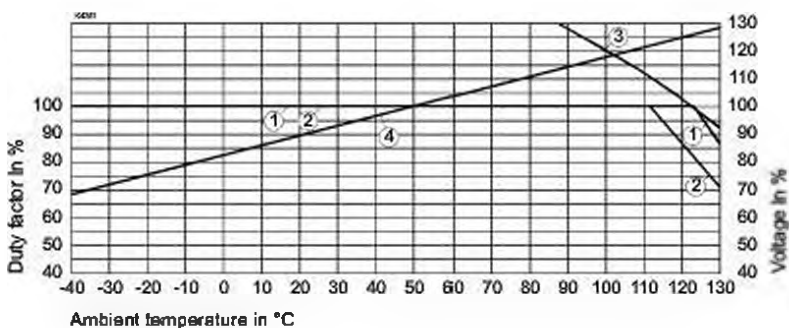


M222a/c/e

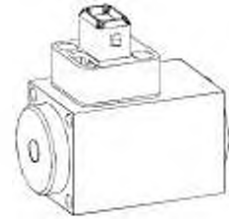


Valve side

**DUTY FACTOR / TEMPERATURE      TEMPERATURE / VOLTAGE**



- 1 Duty factor at nominal voltage
- 2 Duty factor at 110 % nominal voltage
- 3 Max. voltage in % for 100 % duty factor
- 4 Min. voltage in % for proportional limiting current at 100 % duty factor

**Solenoids with special connection executions**

**LIST OF CONNECTION EXECUTIONS**

Standard solenoid Data sheet no.		Connection executions / Dimensions H in mm (Incl. standard solenoid)											
		Standard DIN connector	M92 AMP J unit or Timer	M240 Deutsch	M47 Flying leads with socket	M58 Cable with socket	M55 Flying leads without socket	M28 Cable with connector VDC	M28 Cable with connector VAC	M34 Bayonet connector VDC	M34 Bayonet connector VAC	M206 Screw clamp	M222 Screw clamp and elec- tric wiring
SIN29V	1.1-80	39,5	42,2	59,7	40,3	45	28	57	87,5	57	87,5	41,3	41,5
SIS29V	1.1-85												
PI29V	1.1-90												
BEIIV	1.1-100	45,5	48,2	85,7	46,3	51	35	63	73,5	63	73,5	47,3	47,5
SIN35V	1.1-105												
SIS35V	1.1-110												
PI35V	1.1-115												
SIN45V	1.1-120	55,5	58,2	75,7	56,3	61	45	73	83,5	73	83,5	57,3	57,5
SIS45V	1.1-125												
PI45V	1.1-130												
SIN60V	1.1-145	70,5	73,2	90,7	71,3	78	60	88	98,5	88	98,5	72,3	72,5
SIS60V	1.1-150												
PI60V	1.1-155												

**ORDERING EXAMPLE FOR SOLENOID**

SI S 35 V -  -  #

Switching solenoid  
Industrial execution

Super

Square 35 mm housing

Solenoid completely potted

Standard nominal voltage U<sub>x</sub>

12 VDC	G12
24 VDC	G24
115 VAC	R115 *
230 VAC	R230 *

AC= 50 to 60 Hz  
\* Rectifier integrated in the connector socket  
Other nominal voltages and nominal powers on request

Additional designation for special connection execution

Design-Index (Subject to change)

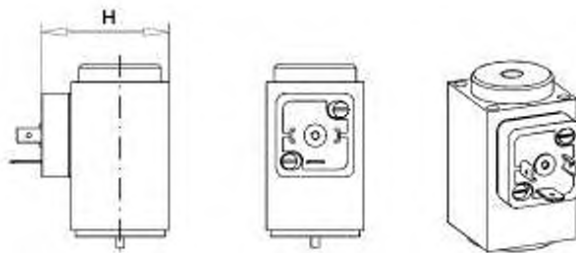
**ORDERING EXAMPLE FOR VALVE**

 AS32061a - G24 - 

**NOTE!**

Manual override, resp. screw plug are not included in the scope of delivery.  
They have to be ordered separately (see data sheet 1.1-300 and 1.1-310).

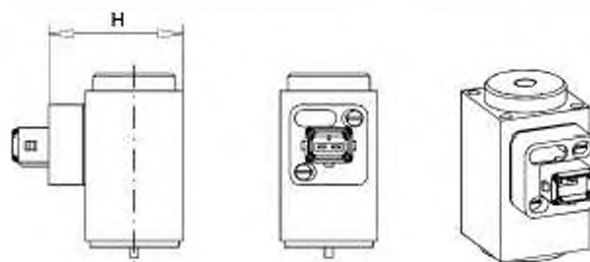
**TYPE LIST / DIMENSIONS / GENERAL SPECIFICATIONS**



*Standard execution with DIN connector*

*Example:* SIS35V-G24

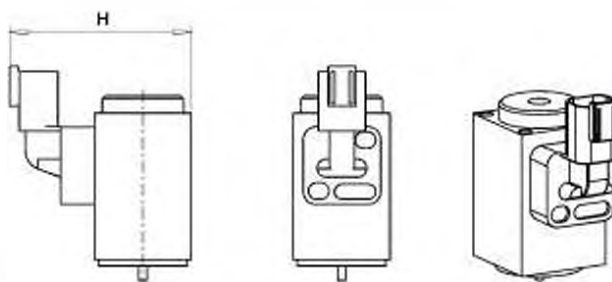
- 3-pole 2 P+E
- DC and AC execution available
- Connector socket plastic
- Protection class IP65 with corresponding mating connector (not included in the scope of delivery) and professional assembly



*Execution:* **M92**  
with AMP Junior-Timer connector

*Example:* SIS35V-G24-M92

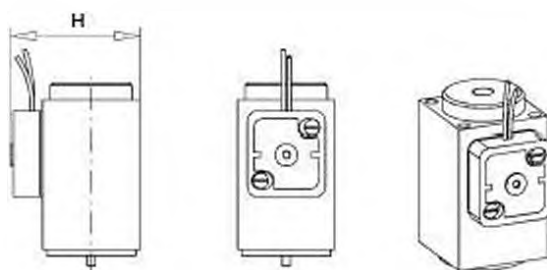
- 2-pole
- DC execution available
- < 120 V external ground recommended
- > 120 V external ground necessary
- Connector socket plastic
- Protection class IP65 with corresponding mating connector (not included in the scope of delivery) and professional assembly



*Execution:* **M240**  
with Deutsch connector

*Example:* SIS35V-G24-M240

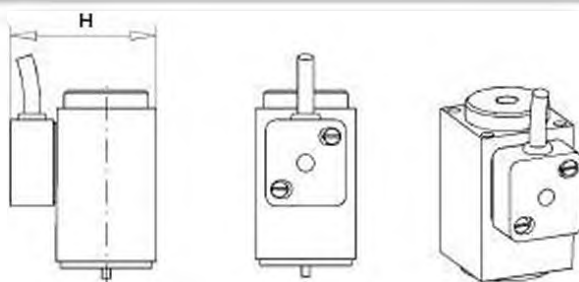
- 2-pole
- DC execution available
- < 120 V external ground recommended
- > 120 V external ground necessary
- Connector socket plastic
- Protection class IP67 and IP69K with corresponding mating connector (not included in the scope of delivery) and professional assembly



*Execution:* **M47**  
with flying leads

*Example:* SIS35V-G24-M47

- 2-pole (2 x 0.25 mm<sup>2</sup>) Radox 155
- Cable length 200 mm
- DC and AC execution available
- < 120 V external ground recommended
- > 120 V external ground necessary
- Flying leads housing plastic
- Protection class IP65 with professional assembly

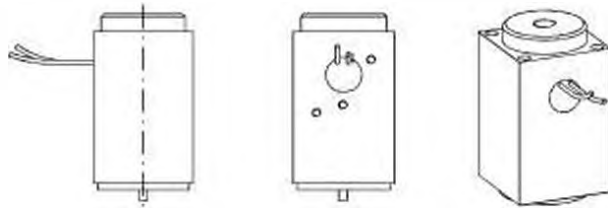


*Execution:* **M56**  
with cable

*Example:* SIS35V-G24-M56

- 3-pole 3 x 0.75 mm<sup>2</sup> thermoplastic
- Cable length 1500 mm
- Cable diameter 6 mm
- DC and AC execution available
- Cable housing plastic
- Protection class IP67 with professional assembly

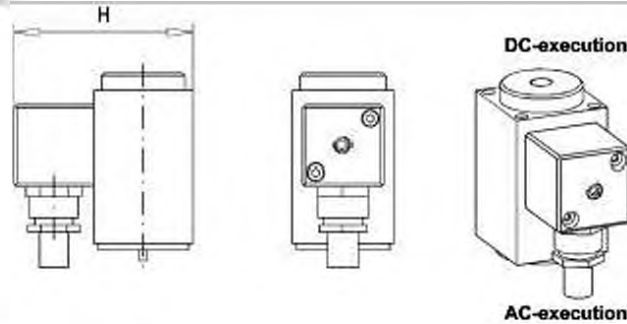
TYPE LIST / DIMENSIONS / GENERAL SPECIFICATIONS



Execution: **M55**  
with flying leads

Example: SIS35V-G24-M55

- 2-pole (2 x 0,25 mm<sup>2</sup>) Radox 155
- Cable length 500 mm
- DC execution available
- < 120 V external ground recommended
- > 120 V external ground necessary
- Protection class IP65 with professional assembly

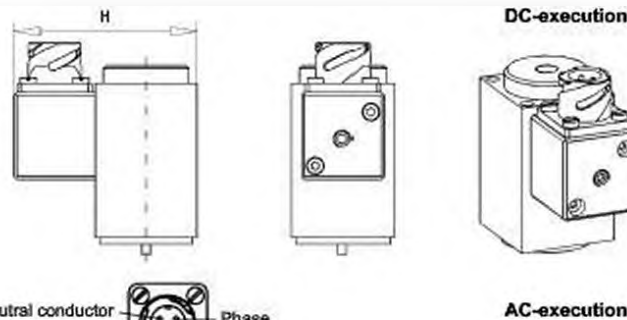


Execution: **M28**  
with cable

Example: SIS35V-G24-M28

- 3-pole 2 x 1 mm<sup>2</sup> [+E] (acc. to IEC 332)
- Cable length 1500 mm
- DC and AC execution available
- Cable housing steel
- Protection class IP67 with professional assembly

- Rectifier housing plastic, h 10,5 mm

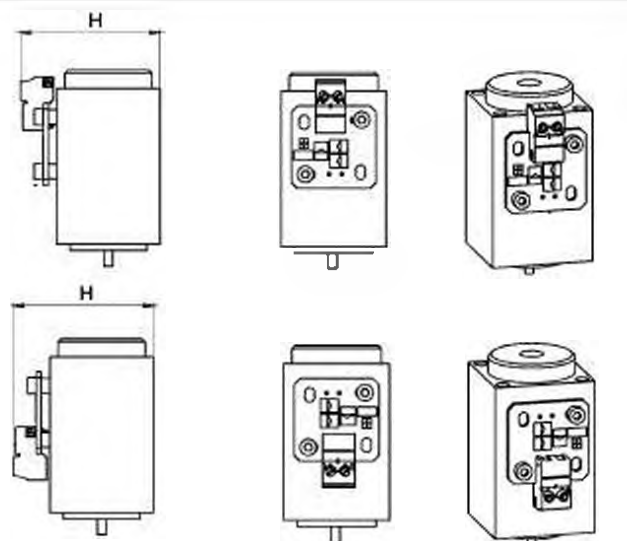
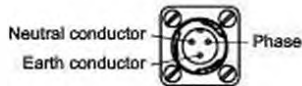


Execution: **M34**  
with bayonet connector

Example: SIS35V-G24-M34

- 3-pole
- DC and AC execution available
- Connector housing steel
- Protection class IP67 with corresponding mating connector (not included in the scope of delivery) and professional assembly

- Rectifier housing plastic, h 10,5 mm



M209a

Execution: **M209** with screw terminal

Example: SIS35V-G24-M209a

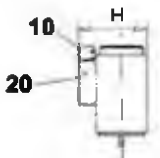

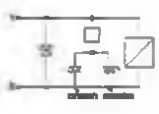

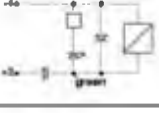
- 2-pole
- DC version available up to 28 VDC
- Screw terminal plastic
- Printed circuit board protected with protective varnish

- Mating connector article no. 219.2802

M209b



**TYPE LIST / DIMENSIONS / GENERAL SPECIFICATIONS**

Connector alignment		Electric wiring
		
M222a	M222b	
M222c	M222d	
M222e	M222f	

**Execution:** M222 with screw terminal

**Example:** SIS35V-G24-M222a

- 2-pole
- DC executions available up to 28 VDC
- Screw terminal plastic
- Connector housing plastic, transparent, removable
- Printed circuit board protected with protective varnish

Protection class IP40 with plastic hood installed

$I_{max} = 1,0 \text{ A at } 130 \text{ }^\circ\text{C}$

$I_{max} = 1,5 \text{ A at } 120 \text{ }^\circ\text{C}$

$I_{max} = 2,0 \text{ A at } 110 \text{ }^\circ\text{C}$

**PARTS LIST**

Position	Article	Description
10	219.2802	Mating connector (M209 and M222)
20	086.1118	Plastic hood (only M222)


**OPERATION SAFETY**

Caution: To avoid overheating, the solenoid may only be energised in combination with a valve.


**NOTE!**

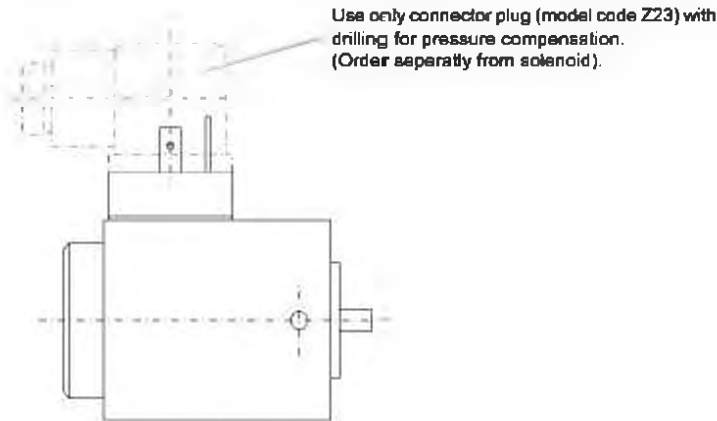
For additional specifications and performance data refer to the corresponding data sheet of the standard solenoid.

Technical explanation see data sheet 1.1-400

**Solenoid with pressure compensation  
(DC voltage only)**

**M35**

**DIMENSIONS**



Dimensions see standard solenoid

**SPECIFICATIONS**

See standard solenoid

**APPLICATION**

For subsea applications where solenoid is placed in oil filled box and separated from sea water.

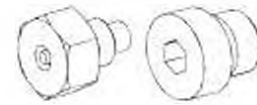
**ORDERING EXEMPLE SOLENOIDS**

Solenoid- Industry version	SI	S	45	-	<input type="checkbox"/>	-	M35	-	HB0	#	<input type="checkbox"/>
Super											
Square 45 mm housing											
Nominal voltage U <sub>n</sub>											
Other nominal voltages and nominal performances on request											
Code for pressure compensation											
with mounted plug (data sheet 1.1-300)											
Design-Index (Subject to change)											

**ORDERING EXEMPLE VALVE**

WDSFA06 - ACB - G24 - M35

Technical explanation see data sheet 1.1-400

**Screw plug with or without  
 Integrated manual override**

**DESCRIPTION**

The screw plugs are screwed into solenoids or armature tubes with a M8 x 0.75 thread. Two different types are available: a normal screw plug made of zinc coated steel and a screw plug with integrated manual override made of stainless steel.

**FUNCTION**

When commissioning a machine or in case of a power supply failure, the function of the solenoid can be replaced by means of the manual override.

**APPLICATION**

The screw plug HB0 allows air bleeding according to data sheets 1.4 and 1.11. To ensure a correct functioning, the screw plugs with integrated manual override HB4,5, HB6 and HB8,5 must be screwed into the solenoids contained on the type list only.

**TYPE LIST**

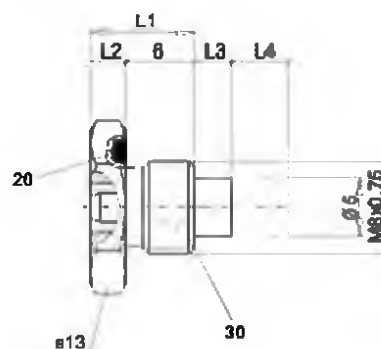
Type/Article no.	Solenoid types
Screw plug HB0 Article no. 239.2033	Can be used for all standard - solenoid types
Screw plugs with integrated manual override HB 4,5 Article no. 253.8000	SIN29V / SIS29V / PI29V / BSIIIV SIN35V / SIS35V / PI35V / BEIIV
HC 4,5 Article no. 253.8017	SMS16/50S (SDSPM18)
HB 6 Article no. 253.8001	SIN45V / SISV45 / PM5V
HB 8,5 Article no. 253.8002	SIN60V / SIS60V / PI60V
HC 8,5 Article no. 253.8022	PMS31/72S (QN/QDPPM42)

**DIMENSIONS**

Screw plug HB0



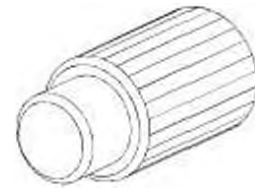
Screw plug with integrated manual override



	L1	L2	L3	L4
HB 4,5	9	3	3,2	5
HB 6	10,5	4,5	3,7	6,5
HB 8,5	13	7	4,2	9
HC 4,5	9	3	9,7	5
HC 8,5	13	7	12,7	9

**PARTS LIST**

Position	Article	Description
20	160.6076	O-ring ID 7,65 x 1,78 (FKM)
30	160.6026	O-ring ID 2,60 x 1,20 (FKM)

**Manual Overrides  
 with spring reset  
 or combined with spring return and detent**

**DESCRIPTION**

The manual overrides are screwed into the solenoid. Two types of overrides are available: one with spring reset and one with spring reset plus locking in the switched position. The housing is made of brass as standard. The pin is made of stainless steel.

**FUNCTION**

When commissioning a machine or if the power supply fails, the solenoid function can be replaced by operating the manual override. In the case of the type with lock, the solenoid can also be held in the end position.

**APPLICATION**

Both types of manual override can be screwed into solenoids with an M8x0,75 thread. With the manual override it is not possible to bleed air from valves. Note: Only restricted use for poppet valve.

**CONTENT**

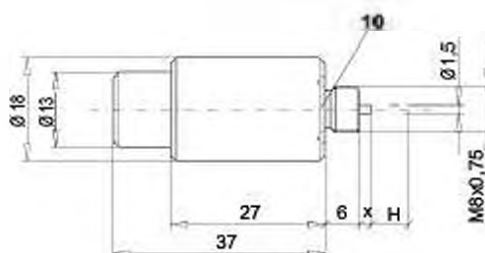
DIMENSIONS ..... 1

**TYPES**

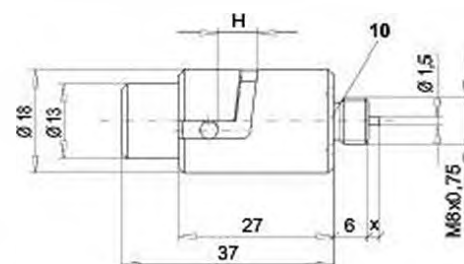
Solenoid type	Manual overrides			
	Spring reset		Detent	
	Des.	Art. no.	Des.	Art. no.
Square 29-solenoids (NG3)	H1	253.9000	H6	253.9502
	SIN29V	253.9000	H22	253.9012
	SIS29V	253.9000	H22	253.9012
	PI29V	253.9000		
Square 35-solenoids (NG4)	H1	253.9000	H3	253.9500
	SIN35V	253.9000	H6	253.9502
	SIS35V	253.9000	H6	253.9502
	PI35V	253.9000		
Square 45-solenoids (NG6)	H1	253.9000	H19	253.9013
	SIN45V	253.9000	H19	253.9013
	PI45V	253.9000		
Square 60-solenoids (NG10)	H21	253.9015	H20	253.9014
	SIN60V	253.9015	H20	253.9014
	PI60V	253.9015		

**DIMENSIONS**

Type with spring reset



Type with spring reset plus locking



Type	x	H	Type	x	H
H1	0	max. 10	H19	0,3	10
H3	-2	10	H20	4	10
H6	-1	10	H21	4	max. 10
			H22	-3	10

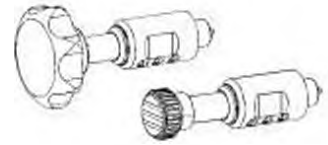
**PARTS LIST**

Position	Article	Description
10	160.6076	O-ring ID 7,65x1,78

**Manual override**

- ◆ with or without detent
- ◆ with or without star button

**M8 x 0,75**



**DESCRIPTION**

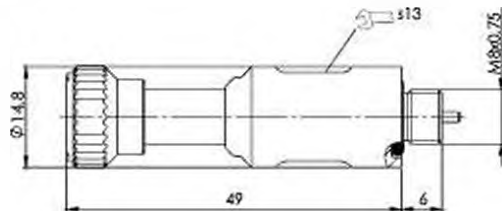
The manual overrides can be screwed into actuators with a M8 x 0,75 thread. The device always has a spring reset, is easy to operate and is also available with a star handle. With the G-execution, the actuator can be held in any position.

**TYPE CODE**

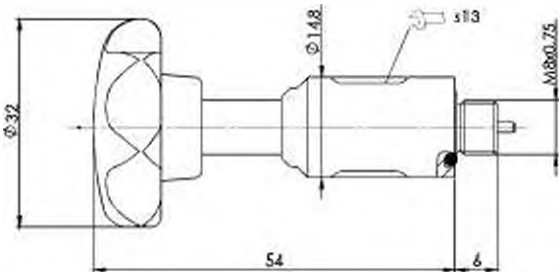
Manual override				H		#
Spring reset						
Thread			N20 G20			
Star button		without with				
Design index (subject to change)						

**DIMENSIONS**

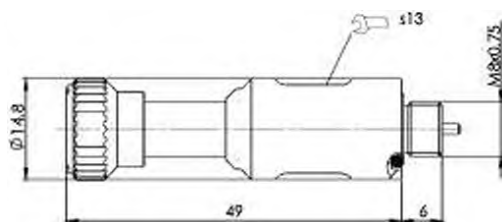
HN20 #2



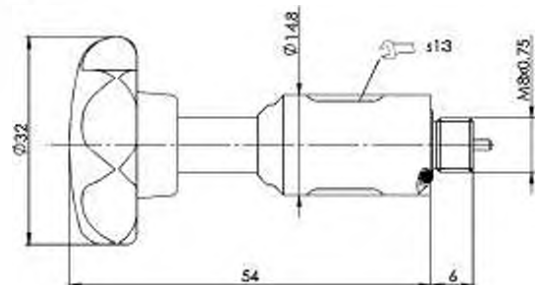
HN20K #2



HG20



HG20K



**Power reducing plug P03**

- After energising solenoid current is reduced by 50%
- Direct mounting on the valve
- Protection class IP 65
- Housing types for solenoids from □ 29

 DIN 43650  
 ISO 4400

**DESCRIPTION**

Power reducing plug direct solenoid mounting. Contact arrangement in accordance with DIN 43650, form A (ISO 4400) for DC switching solenoids from □ 29 or bigger. The protection class of the power reduction plug is IP65 when fitted according to EN 60529. The connecting cable has to be attached to the screw terminals in the plug.

**FUNCTION**

Once the power has been switched on, nominal current passes through the solenoid for approx. 380ms, thereafter the current is limited to half of the nominal value by the cycle controlled output stage. If the power reduction plug version 90...230 VAC/DC is supplied for alternating current, it is nevertheless advantageous to use a DC solenoid.

**APPLICATION**

The housing is splash-protected, and can be used over a wide temperature range. The power reduction plug is suitable both for industrial and mobile use. The plug can be rotated through 180°. It protects continuously energised solenoids (e.g. used as a safety device) from overtemperature and premature ageing. By overenergisation, a valve which is in deenergised normal position (eventually seized piston) can be switched straight through under high-power.

**CONTENTS**

GENERAL SPECIFICATIONS .....	1
ELECTRICAL SPECIFICATIONS .....	1
BLOCK DIAGRAM .....	1
DIMENSIONS .....	2
APPLICATION POSSIBILITIES .....	2
START-UP .....	2

**TYPE CODE**

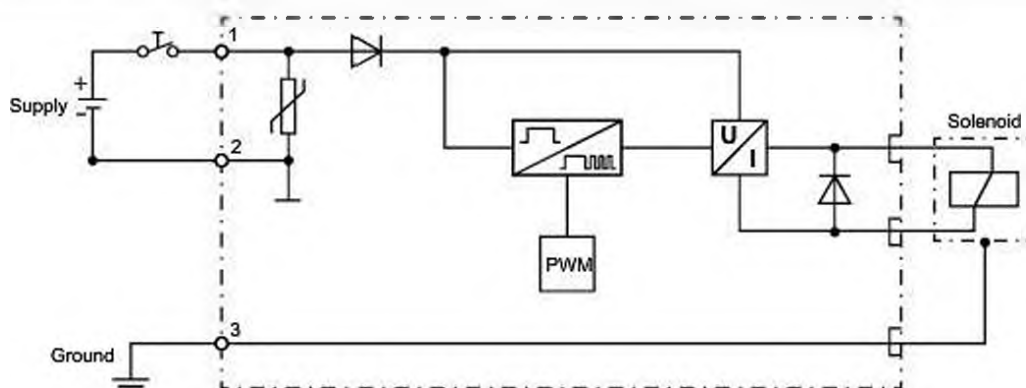
Plug	P 03	A	- 1	□	□
Type number					
Housing type A for solenoids □ 29 or larger					
1-solenoid-version					
Supply voltage			D2		
12...24 VDC			B0		
90...230 VAC or 90...230 VDC					
Design-Index (Subject to change)					

**GENERAL SPECIFICATIONS**

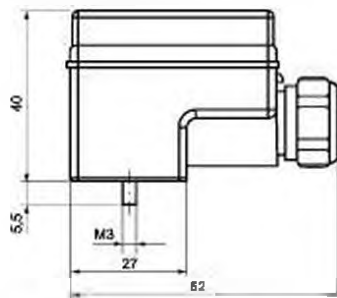
Plug housing	Polyamid
Plug lid	Polycarbonat
Weight	30g
Connections	by cable 0,5...1,5 mm <sup>2</sup>
Ambient temperature	-25...60°C higer temperatures on request

**ELECTRICAL SPECIFICATIONS**

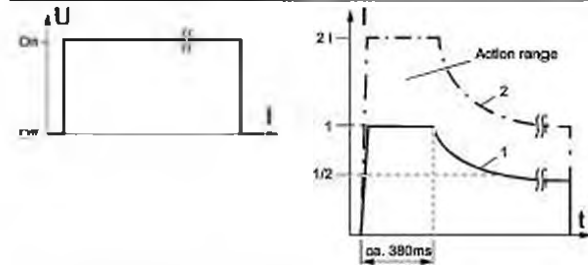
Supply voltage	12...24VDC Range: 11...36VDC 90...230VAC/DC Range: 80...240VAC/DC Caution: Voltages which are outside of the tolerance can destroy the electronics! Frequency fix ca. 700 Hz
Dither	Frequency fix ca. 700 Hz
Solenoid current	Version 12...24VDC (P03A-1D2) $I_{xmax} = 3,8A$ Version 90...230VAC/DC (P03A-1B0) $I_{xmax} = 0,6A$
Switching frequency	600/h (50% ED) Higher switching frequencys on request
EMC	IEC 801-4 Level 3

**BLOCK DIAGRAM**


**DIMENSIONS**



**APPLICATION POSSIBILITIES**



- ① Switching operation at nominal power, with subsequent power reduction.
  - reduced heating of coil
  - extended life of solenoid
  - shorter disconnection time
- ② Switching at elevated nominal power or overvoltage. For optimum design, please contact us.
  - powerful straight-through switching
  - shorter switching time

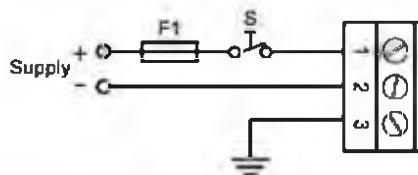
U: Supply voltage of the power reduction plug  
I: Current consumption of the solenoid

**START-UP**

(This data sheet is enclosed with each power reducing plug)

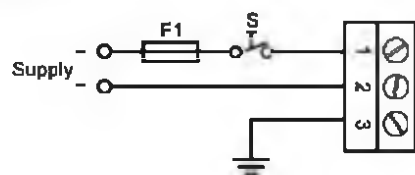
**Examples of connection**

DC- Version:

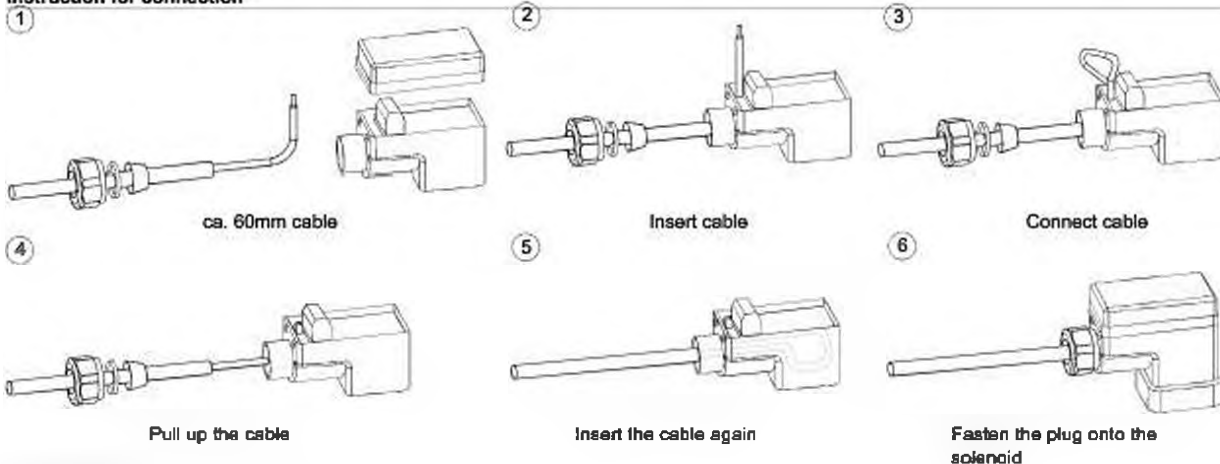


F1: 12...24VDC (P03A-1D2) = 5A quick break  
90...230VAC/DC (P03A-1B0) = 800mA quick break

AC- Version:



**Instruction for connection**



**Supply voltage**

The cable is connected as described above.

**Important warning!**

The power supply to the plug version for 90...230VAC/DC must be disconnected or switched off while the cable is being connected to the plug and/or while the cover is removed.

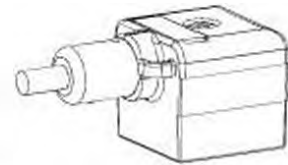
**Installation**

To be able to fit the power reduction plug in the 180° reversed position, it is necessary to remove the bottom of the plug using a screw driver and to refit it rotated through 180°.

**Power reduction plug P04**

- After switching on, current consumption is reduced to 50 %
- Direct mounting on the valve
- Protection class 67
- For switching solenoids with DIN plug construction form A ISO 4400

DIN EN 175301-803


**DESCRIPTION**

Power reduction plug for direct mounting on the valve. Contact arrangement in accordance with DIN EN 175301-803, construction form A (ISO 4400) for DC switching solenoids. The protection class of the power reduction plug is IP 67, mounted according to EN 80529. The connection cable is injection moulded onto the plug.

**FUNCTION**

After switching on the supply, the maximum current of the solenoid passes for approx. 250 ms, thereafter the current is limited to half by the cycle controlled output stage. Thereby the power consumption of the valve is reduced to below 30 %.

**APPLICATION**

By the IP 67 execution and the wide temperature range, the power reduction plug is suitable both for industrial and mobile applications. The plug can be rotated by 180°. It protects continuously energised solenoids (e.g. used as a safety function) from overtemperature and premature ageing. By overenergisation, a valve which is deenergised in normal operation (eventually seized spool), can be switched straight through powerfully.

**CONTENTS**

GENERAL SPECIFICATIONS .....	1
ELECTRICAL SPECIFICATIONS .....	1
BLOCK DIAGRAM / CONNECTION .....	1
DIMENSIONS .....	2
APPLICATION POSSIBILITIES .....	2

**TYPE CODE**

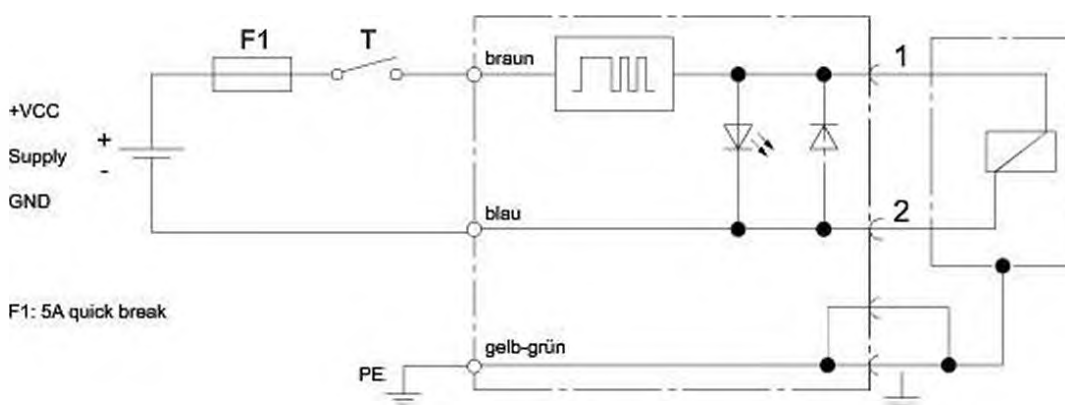
	P 04 A - 1 D2 #
Plug	
Designation	
Housing construction form A, contact clearance 18 mm	
1 solenoid execution	
Supply voltage	
24 VDC	
Design-Index (Subject to change)	

**GENERAL SPECIFICATIONS**

Plug housing	TPU transparent
Connection line	PUR black 3 x 0,5 mm <sup>2</sup>
	Length 5 m
Weight	130 g
Ambient temperature	-25...60 °C

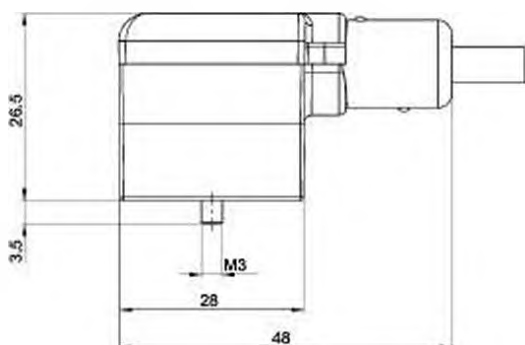
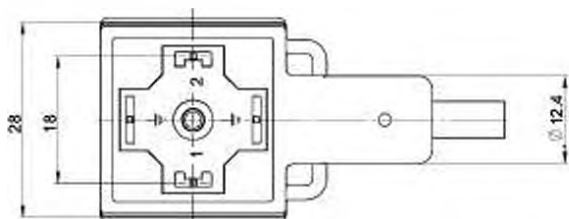
**HYDRAULIC SPECIFICATIONS**

Supply voltage	24 VDC ± 10 %
Suppressor circuit	Freewheel diode
Status display	LED yellow
Dither	Frequency fix 1,1 kHz
Solenoid current	$I_{x_{max}} = 4A$ (max. switching current) $I_{x_{max}} = 2A$ (max. holding current)
Switching frequency	max. 2 Hz
EMC	Immunity EN 61000-6-2 Emission EN 61000-4-2

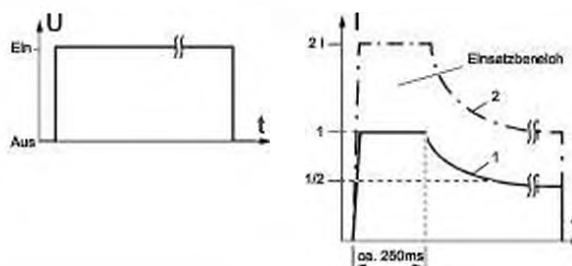
**BLOCK DIAGRAM / CONNECTION**




**DIMENSIONS**



**APPLICATION POSSIBILITIES**



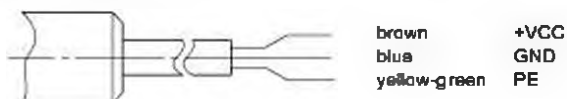
- ① Switching operation at nominal power, with subsequent power reduction.
  - reduced heating of coil
  - extended service life of solenoid
  - shorter disconnection time
- ② Switching at elevated nominal power or overvoltage.
  - For optimum design, please contact us.
  - powerful straight-through switching
  - shorter switching time

U: Supply voltage of the power reduction plug  
I: Current consumption of the solenoid

**START-UP**

(This data sheet is attached to every power reduction plug)  
A back-up fuse (5A, quick break) is recommended.  
The yellow LED status display shows that the plug is energised.  
The plug can also be mounted rotated by 180°.

**CONNECTION ASSIGNMENT**



If the valve is operated to its limit values (pressure, flow), it is possible that the holding current of the plug is not sufficient to hold the valve completely open.  
In this case, power reduction cannot be used.

**Solenoid coil acc. to VDE 0580**

- With integrated amplifier electronics PD2
- Protection class IP 67


**DESCRIPTION**

Solenoid coil with integrated amplifier electronics. Protection class is IP67. The electronics are fix mounted on the solenoid coil. The construction corresponds to standard VDE 0580. The steel housing is zinc nickel coated.

**FUNCTION**

The electronics has a Pulse-Width-Modulated current output. The solenoid output can also be parameterised for switching solenoids. The parameterisation is carried out directly on the device by means of push-buttons and display, or by means of the parameterisation and diagnostics software „PASO“ of Wandfluh.

**APPLICATION**

Due to its water spray resistant execution, the solenoid coil is suitable for most diverse applications.

It can be used on all proportional valves with 19 mm, 23 mm resp. 31 mm armature tube diameters.

Easy connecting enables assembly and commissioning with conventional tools. All settings can be carried out easily and quickly.

**TYPE CODE**

		M		P		-		P		1		-		-		#	
Metal housing square																	
Integrated amplifier electronics																	
Coil execution																	
Square 35 mm		S35/19x50		Square 60 mm		S60/31x72											
Square 45 mm		S45/23x50		Square 60 mm		A60/31x72*											
Connection cable way from the solenoid																	
1-solenoid execution																	
Nominal voltage U <sub>n</sub>		12 VDC		12													
		24 VDC		24													
Analogue input CANopen acc. to DSP-408 with J1939		voltage/current (0...5V factory preset)		A1		C1		J1		(on request)							
Design index (subject to change)																	

\* only for proportional spool valve NG10

**GENERAL SPECIFICATIONS**

Connections	Connection cable	5 x 0,34 mm <sup>2</sup> , Exterior coating PVC length = 1,5 m
	USB interface	via connection «Digital input» requires the Wandfluh USB adapter PD2
Dimensions	See drawing page 3	
Ambient temperature	-20...+85 °C	

**SAFE OPERATION**

**Caution:** To avoid overheating the coil may only be energised when mounted on an armature tube and valve.

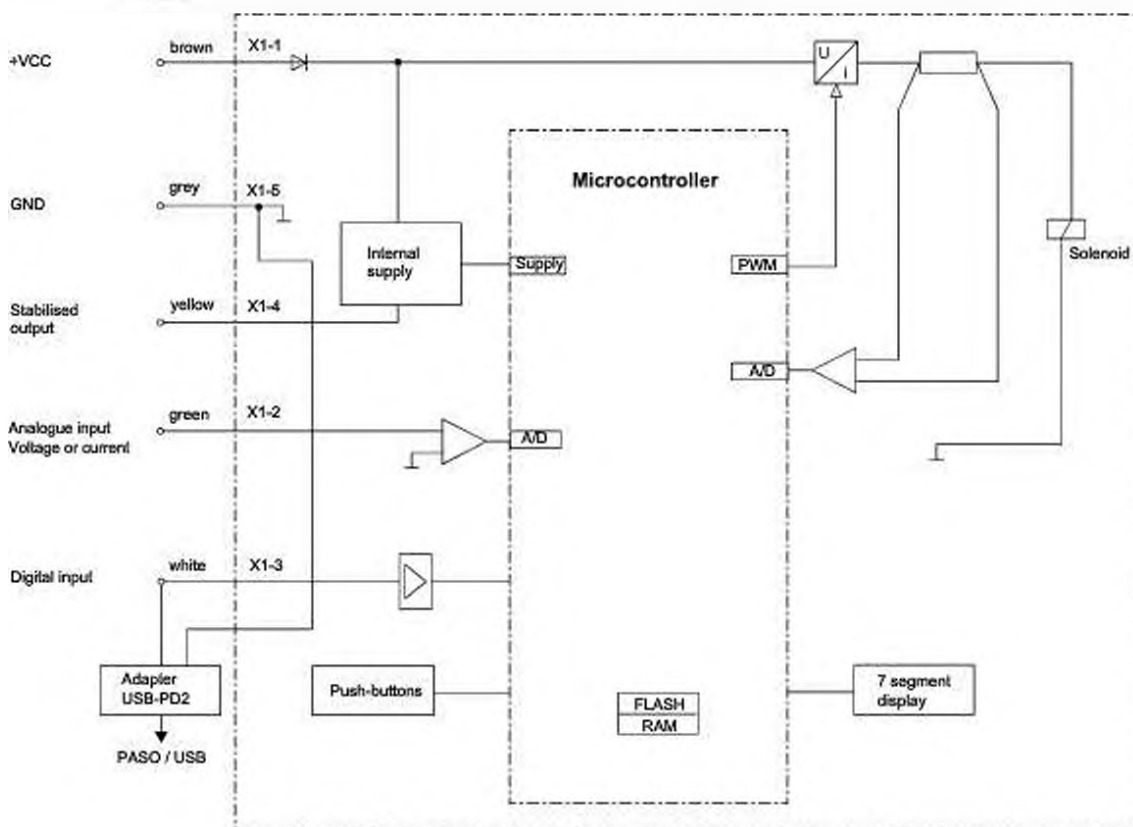
**Note:** For maximum power development the coil has to be installed in its preferred direction. A reversed installation can lead to lower hydraulic values.

## Amplifier with analogue interface

### ELECTRICAL SPECIFICATIONS

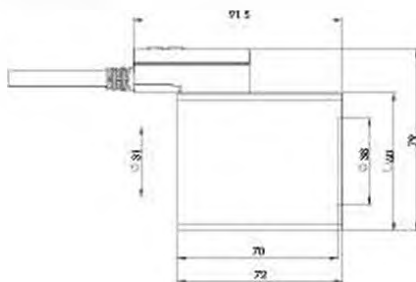
Protection class	IP67 acc. to EN 60 529	Dither	Frequency adjustable 4...500 Hz Factory setting 80 Hz Level adjustable 0...400 mA
Supply voltage	8...32 V	Temperature drift	Factory setting 180 mA <1% at $\Delta T = 40^\circ C$
Residual ripple	< +/-5%	Digital inputs	1 input high-active, no pull-up/down Switching threshold high 6...32 VDC Switching threshold low 0...1 VDC Usable as frequency input (frequency 5...5000 Hz) and as PWM input (automatic frequency recognition)
Fuse	low	Ramps	Adjustable 0...500a
No-load current	approx. 20 mA	USB interface	Via digital input Requires the Wandfluh USB adapter
Max. current consumption	No-load current + 2,5 A per solenoid	EMV	Immunity EN 61 000-6-2 Emission EN 61 000-6-4
Analogue input	1 input non-differential Voltage / current (settable by means of parameter) 0...+/- 10V or 0/4...20mA		
Resolution	10-Bit		
Input resistance	Voltage input >100 k $\Omega$ (input current < 2 mA) Load for current input = 124 $\Omega$		
Stabilised output voltage	5 VDC max. load 20 mA		
<b>Solenoid current:</b>			
• Minimal current $I_{min}$	Adjustable 0... $I_{max}$ mA Factory setting 30 mA		
• Maximal current $I_{max}$	Adjustable $I_{min}$ ...2450 mA MP35/18x50...-12, Factory setting 1360 mA MP35/18x50...-24, Factory setting 680 mA MP45/23x50...-12, Factory setting 1490 mA MP45/23x50...-24, Factory setting 780 mA MPS60/31x72...-12, Factory setting 2290 mA MPA60/31x72...-12, Factory setting 2290 mA MPS60/31x72...-24, Factory setting 1140 mA MPA60/31x72...-24, Factory setting 1140 mA		

### BLOCK DIAGRAM

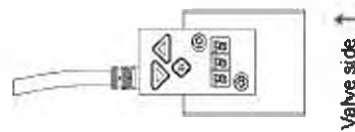
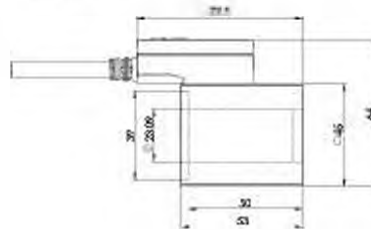


**ABMESSUNGEN**

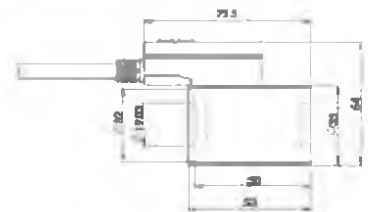
M7541/01/01



M7541/02/01

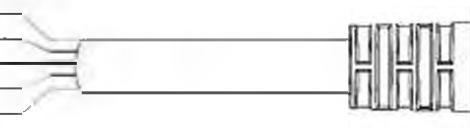


M7551/15/01


**CONNECTOR ASSIGNMENT**

Connection cable

- 1 brown
- 2 green
- 3 white
- 4 yellow
- 5 gray



- 1 = + VCC
- 2 = Command value
- 3 = Dig Inp
- 4 = Stab out
- 5 = GND

**START-UP**

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier electronics and in the operating instructions.

Free-of-charge download:

- «PASO-PD2» Parameterisation software
- Operating instruction (\*.pdf)

**ADDITIONAL INFORMATION**

Wandfluh electronics general	Wandfluh documentation- register	1.13
Proportional spool valve	register	1.10
Proportional pressure valves	register	2.3
Proportional flow control valves	register	2.6

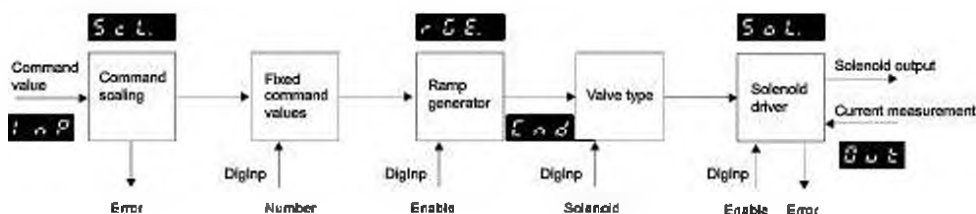
**ACCESSORIES**

USB-adapter PD2 incl. USB-cable type A-B, 1.8 m (for parameterisation via PASO)	Article no. 726 9900
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**PARAMETER SETTINGS**

The PD2 electronics have push-buttons and a 7 segment display which enable setting the most important parameters. In addition, the digital input can be used as a communication interface, through which, by means of the parameterisation software „PASO-PD2“, the complete parameterisation and diagnostics can be carried out. For this, the Wandfluh USB-PD2 adapter is required. (not included in the delivery)

Attention: During the communication, the digital input cannot be used.

**FUNCTION DESCRIPTION**


**PD2-AMPLIFIER WITH ANALOGUE INTERFACE**
**Command value scaling**

The command value can be applied as a voltage, current, digital, frequency or PWM signal. The scaling takes place via the parameter "Interface". Furthermore, the command value can be monitored for a cable break. A dead band can also be set.

**Fixed command value**

There is 1 fixed command value available, which can be selected via the digital input. This function has to be configured before in PASO.

**Ramp generator**

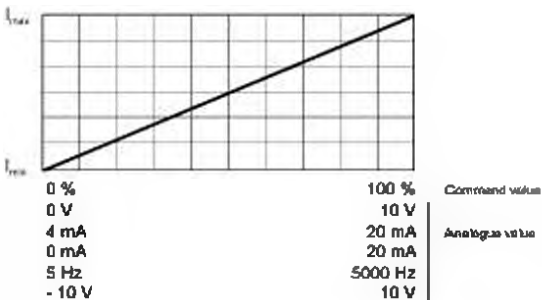
Two linear ramps for up and down are available which can be adjusted separately.

**Valve type**

Adjustment possibilities: switching solenoid or proportional solenoid.

**Mode of operation „Command value unipolar/bipolar (1-SoI)**

Dependent on a command value signal (voltage, current, digital, frequency or PWM), the solenoid is driven (e.g. 0...10V correspond to 0...100 % command value, 0...+100 % command value correspond to I<sub>min</sub>...I<sub>max</sub> solenoid driver)


**Signal recording**

Furthermore, the „PD2“ amplifier electronics have a signal recording function. This, by means of PASO, enables the recording of various system signals, such as command value, solenoid current, etc., which can be represented on a common time axis.

**Solenoid driver**

A Pulse-Width-Modulated current output is available. A dither signal is superimposed, whereby the dither frequency and the dither level are separately adjustable. The minimum (I<sub>min</sub>) and maximum (I<sub>max</sub>) current can be adjusted. The solenoid output can also be configured as switching solenoid output. In this case, a power reduction can be adjusted.

**Optimisation of characteristic curve**

An adjustable characteristic curve „Command value input – solenoid current output“ enables an optimised (e.g. linearsed) characteristic of the hydraulic system.

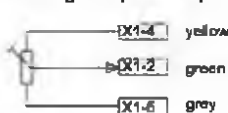
**Channel enabling**

As per factory setting, the device is enabled („on“). This „enable channel“ can be set to „on“, „off“ or „external“ (digital input) via PASO or via menu item.

**Hints:**

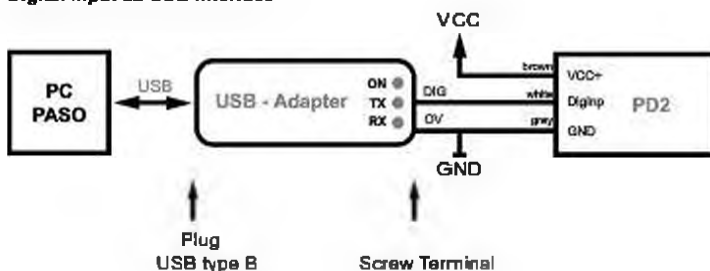
Digital input: if not wired, the state of the digital input is not defined  
 Analogue input: if not wired, the voltage input will read 1.11 V constantly.

**CONNECTION EXAMPLES**
**Supply voltage**

**Analogue input with potentiometer**

**Digital input as function input**

**Analogue input current with external current source**

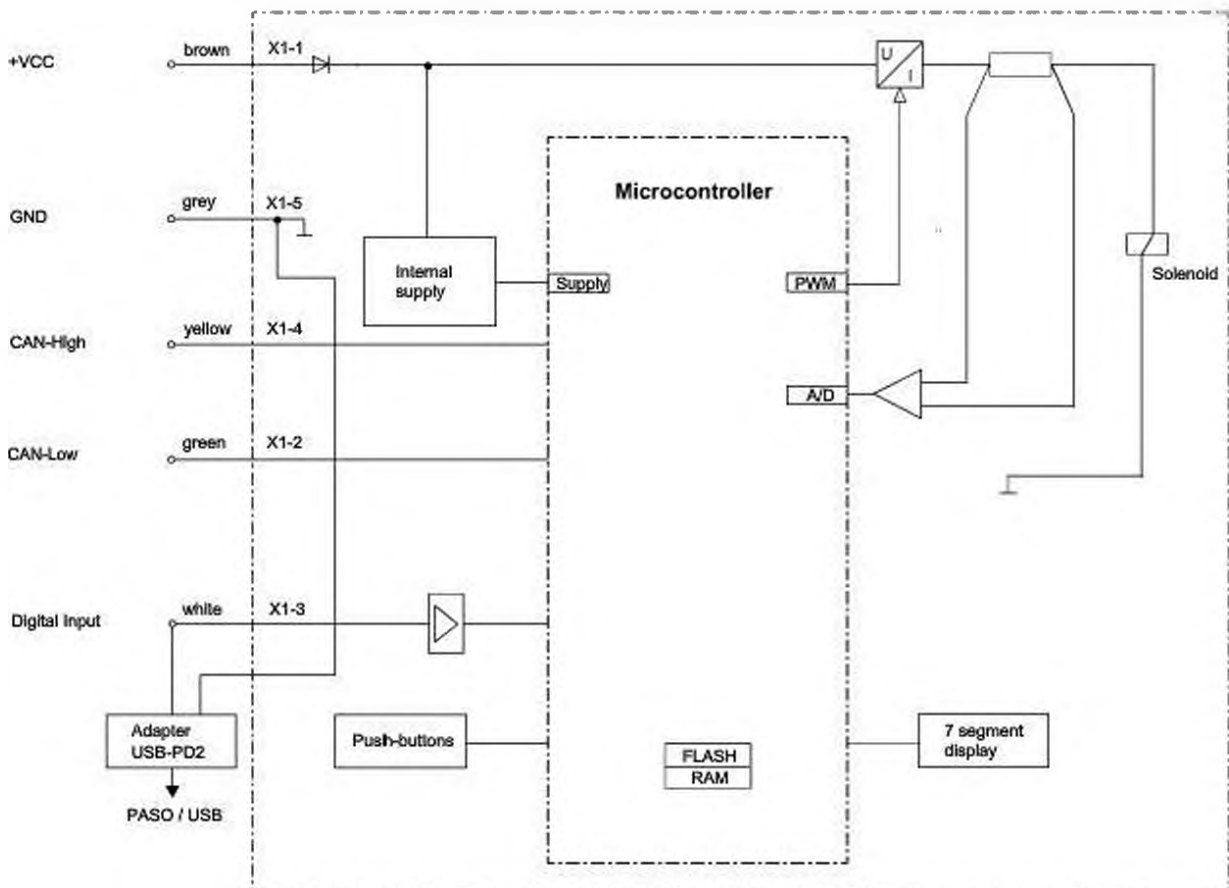
**Analogue input voltage with external voltage source**

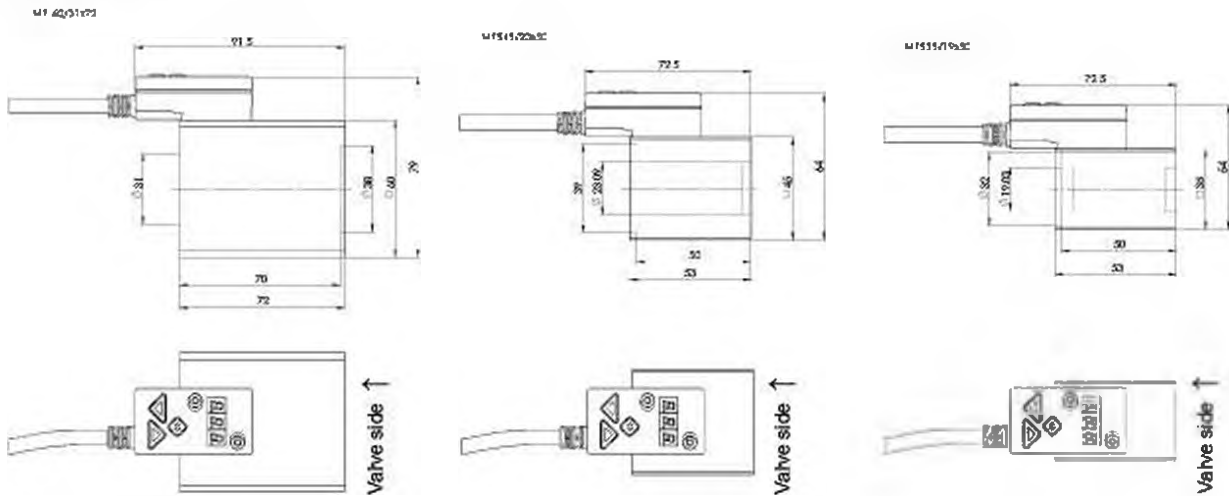
**Digital input as USB interface**


## Amplifier with CANopen interface

**ELECTRICAL SPECIFICATIONS**

Protection class	IP 67 acc. to EN 60 529	Dither	Frequency adjustable 4...500 Hz Factory setting 80 Hz
Supply voltage	8...32 V	Temperature drift	Level adjustable 0...400 mA Factory setting 180 mA
Residual ripple	< +/-5 %	Digital inputs	<1% at $\Delta T = 40^\circ C$ 1 input high-active, no pull-up/down Switching threshold high 6...32 VDC Switching threshold low 0...1 VDC Usable as frequency input (frequency 5...5000 Hz) and as PWM input (automatic frequency recognition)
Fuse	low	USB interface	Via digital input Requires the Wandfluh USB adapter
No-load current	approx. 20 mA	EMV	Immunity EN 61 000-6-2 Emission EN 61 000-6-4
Max. current consumption	No-load current + 2,5 A per solenoid		
<b>Solenoid current:</b>			
• Minimal current $I_{min}$	Adjustable 0... $I_{max}$ mA Factory setting 30 mA		
• Maximal current $I_{max}$	Adjustable $I_{min}$ ...2450 mA MP35/19x50...-12, Factory setting 1360 mA MP35/19x50...-24, Factory setting 680 mA MP45/23x50...-12, Factory setting 1490 mA MP45/23x50...-24, Factory setting 780 mA MPS60/31x72...-12, Factory setting 2280 mA MPA60/31x72...-12, Factory setting 2290 mA MPS60/31x72...-24, Factory setting 1140 mA MPA60/31x72...-24, Factory setting 1140 mA		

**BLOCK DIAGRAM**


**DIMENSIONS**

**ANSCHLUSSBELEGUNG**
**Anschlusskabel**

- 1 brown
- 2 green
- 3 white
- 4 yellow
- 5 grey



- 1 = + VCC
- 2 = CAN-Low
- 3 = Dig Inp
- 4 = CAN-High
- 5 = GND

**START-UP**

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier electronics and in the operating instructions

Additional information can be found on our website:

Free-of-charge download:

- «PASO-PD2» Parameterisation software
- Operating instruction (\*.pdf)

**ADDITIONAL INFORMATION**

Wandfluh electronics general	Wandfluh documentation-register	1.13
Proportional spool valve	register	1.10
Proportional pressure valves	register	2.3
Proportional flow control valves	register	2.6

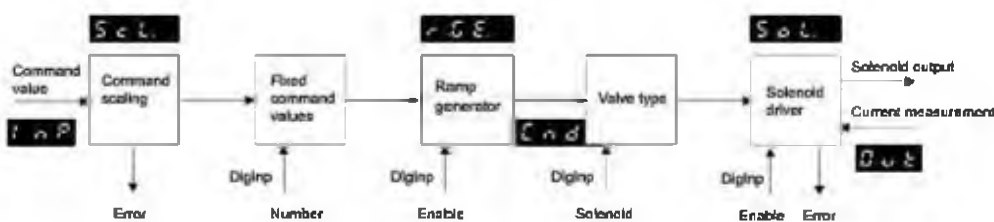
**ACCESSORIES**

USB-adapter PD2 incl. USB-cable type A-B, 1,8 m (for parameterisation via PASO)	Article no. 726-9900
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**PARAMETER SETTINGS**

The PD2 electronics have push-buttons and a 7 segment display which enable setting the most important parameters. In addition, the digital input can be used as a communication interface, through which, by means of the parameterisation software „PASO-PD2“, the complete parameterisation and diagnostics can be carried out. For this, the Wandfluh USB-PD2 adapter is required. (not included in the delivery)

Attention: During the communication, the digital input cannot be used.

**FUNCTION DESCRIPTION**


**PD2-AMPLIFIER WITH CANopen INTERFACE**
**Command value scaling**

The command value can be applied as a CAN-bus, digital, frequency or PWM signal. The scaling takes place via the parameter „Interface“. Furthermore, the command value can be monitored for a cable break. A dead band can also be set.

**Fixed command value**

There is 1 fixed command value available, which can be selected via the digital input. This function has to be configured before in PASO.

**Ramp generator**

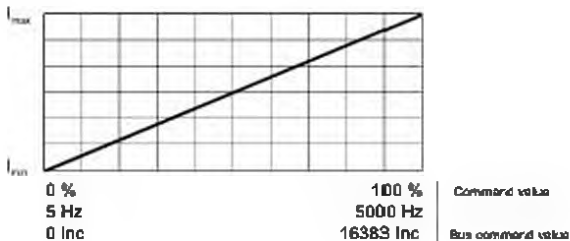
Two linear ramps for up and down are available which can be adjusted separately.

**Valve type**

Adjustment possibilities: switching solenoid or proportional solenoid.

**Mode of operation „Command value unipolar/bipolar (1-Sol)“**

Dependent on a command value signal (CAN-bus, digital, frequency or PWM), the solenoid is driven (e.g. 0...16383 CAN-command correspond to 0...100 % command value, 0...+100 % command value correspond to I<sub>min</sub>...I<sub>max</sub> solenoid driver)


**Signal recording**

Furthermore, the „PD2“ amplifier electronics have a signal recording function. This, by means of PASO, enables the recording of various system signals, such as command value, solenoid current, etc., which can be represented on a common time axis.

**Solenoid driver**

A Pulse-Width-Modulated current output is available. A dither signal is superimposed, whereby the dither frequency and the dither level are separately adjustable. The minimum (I<sub>min</sub>) and maximum (I<sub>max</sub>) current can be adjusted. The solenoid output can also be configured as switching solenoid output. In this case, a power reduction can be adjusted.

**Optimisation of characteristic curve**

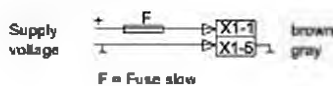
An adjustable characteristic curve „Command value input – solenoid current output“ enables an optimised (e.g. linearsed) characteristic of the hydraulic system.

**Channel enabling**

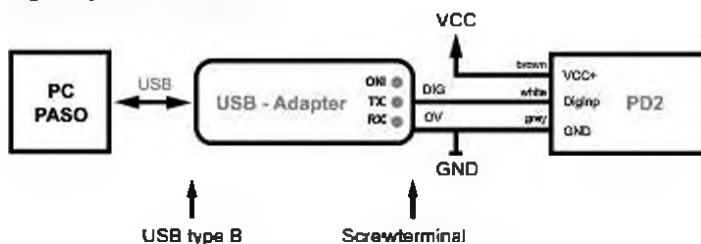
As per factory setting, the device can be enabled via CAN-bus. This „enable channel“ can be set to „bus“, „on“, „off“ or „external“ (digital input) via PASO or via menu item.

**Hint:**

Digital input if not wired, the state of the digital input is not defined

**CONNECTION EXAMPLES**
**Supply voltage**

**CAN connection**

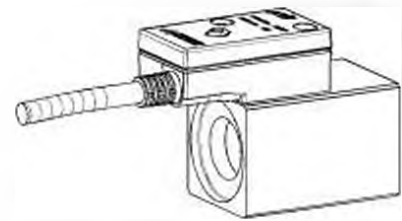
**Digital input as function input**

**Digital input as USB interface**




**Solenoid coil acc. to VDE 0580**

- With integrated amplifier electronics PD3
- Protection class IP 67
- Interface: - IO-Link (with Master Typ B)  
- Analogue
- Adjustable via Bluetooth by means of the Wandfluh App


**DESCRIPTION**

Solenoid coil with integrated amplifier electronics. Protection class is IP67. The electronics are fix mounted on the solenoid coil. The construction corresponds to standard VDE 0580. The steel housing is zinc nickel coated.

**FUNCTION**

The electronics has a Pulse-Width-Modulated current output. The solenoid output can also be parameterised for switching solenoids. The parameterisation is made via Bluetooth by means of the Wandfluh App.

**APPLICATION**

Due to its water spray resistant execution, the solenoid coil is suitable for most diverse applications.

It can be used on all proportional valves with 19 mm, 23 mm resp. 31 mm armature tube diameters.

Easy connecting enables assembly and commissioning with conventional tools. All settings can be carried out easily and quickly.

**TYPE CODE**

		M		T		-		P		1		-		-		#	
Metal housing square																	
Integrated amplifier electronics PD3																	
Coil execution																	
Square 35 mm		S35/19x50		Square 60 mm		S60/31x72											
Square 45 mm		S45/23x50		Square 60 mm		A60/31x72 *											
Connection cable away from the solenoid																	
1-solenoid execution																	
Nominal voltage U <sub>N</sub>		12 VDC		24 VDC		12		24									
IO-Link																	
Analogue input		voltage/current (0...5V factory preset)				I1		A1									
Design index (subject to change)																	

\* only for proportional spool valve NG10

**GENERAL SPECIFICATIONS**

Connections	Connection cable with M12 connector (male) 5 pole length = 1,5 m
Dimensions	See drawing on page 3
Ambient temperature	-20...+85 °C (Derating, see Operating Instructions PD3)

**SAFE OPERATION**

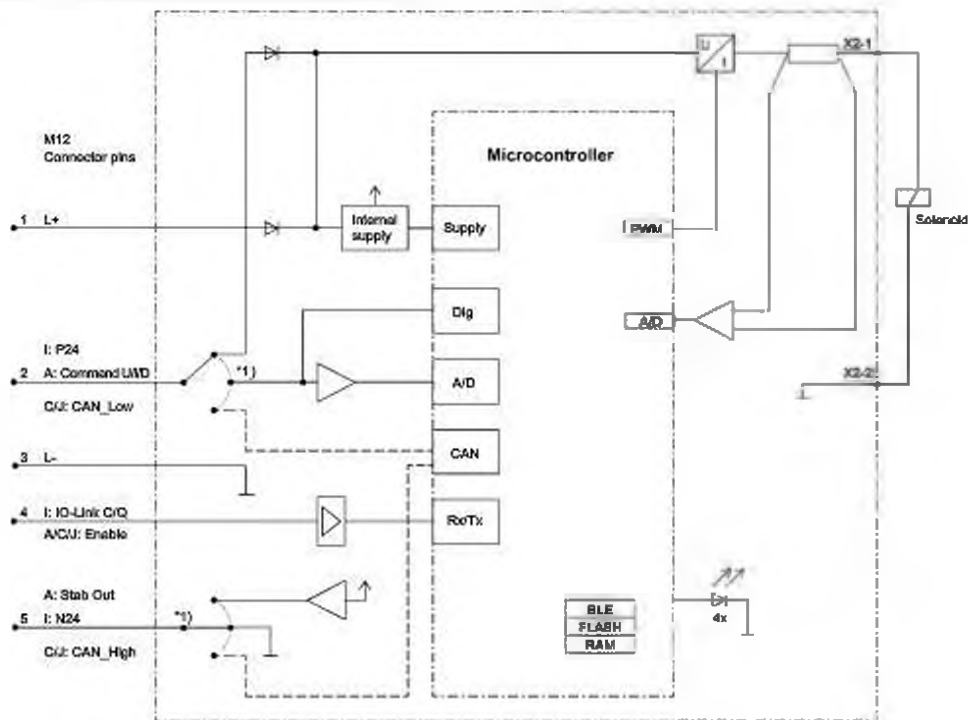
**Caution:** To avoid overheating the coil may only be energised when mounted on an armature tube and valve.

**Note:** For maximum power development the coil has to be installed in its preferred direction. A reversed installation can lead to lower hydraulic values.

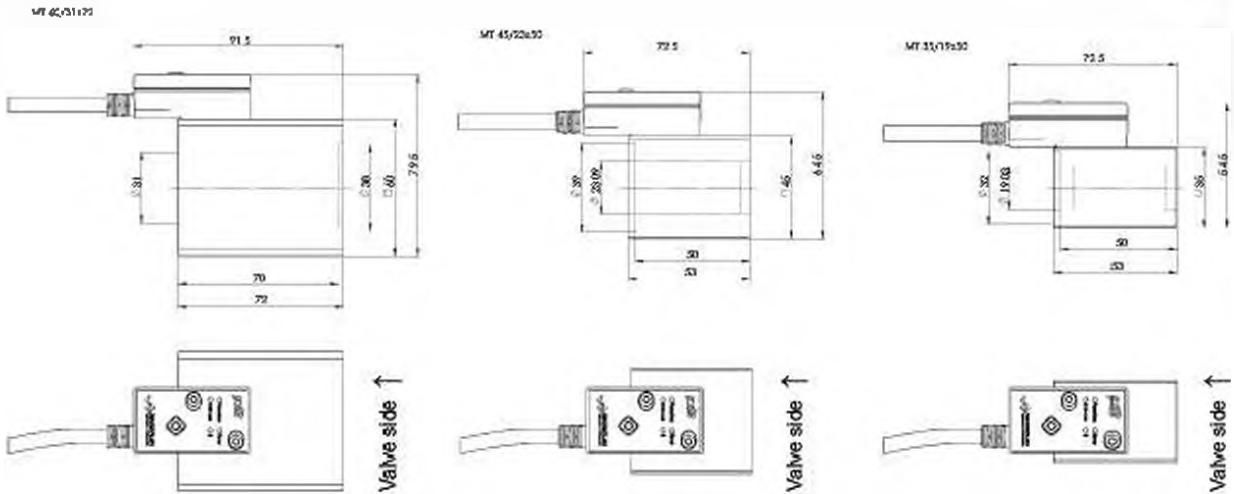
## Amplifier with analogue Interface

**ELECTRICAL SPECIFICATIONS**

Protection class	IP67 acc. to EN 60 528	Dither	Frequency adjustable 4... 500Hz Factory setting 80 Hz Level adjustable 0...400mA Factory setting 180 mA
Supply voltage	IO-Link: 24 V (18...30V), analogue: 8...32V	Temperature drift	<1% bei $\Delta T = 40^\circ C$
Residual ripple	< 1.3 Vpp	Enable input	1 input high-active Switching threshold high 1/2 VCC +2V Switching threshold low 1/2 VCC -2V Adjustable 0...500s
Fuse	Low	Ramps	Adjustable 0...500s
No-load current	Approx. 30 mA	IO-Link interface	Data line C/Q, COM2 = 38,4 kBaud Use master type B Low Energy with access protection Contains FCC ID: QQQ11
Max. current consumption	No-load current + 2,5 A per solenoid	Bluetooth	Low Energy with access protection Contains FCC ID: QQQ11
Command value input	1 input non-differential Voltage / current (switchable by means of parameter) 0...+ 10V or 0/4...20mA Usable as frequency input (frequency 5... 5000 Hz) or as PWM input (automatic frequency detection) or digital dig. switching threshold high >3V dig. switching threshold low <0.8V	Fieldbus (option)	CANopen (on request) J1939 (on request)
Resolution	12-bit	LEDs	Function green Bluetooth blue IO-Link green Error red
Input resistance	Voltage input >100 k $\Omega$ Load for current input = 124 $\Omega$	Supply solenoid	with IO-Link galvanically separated via P24/N24 2014/53/EU (Radio Equipment Directive) ETSI EN 300 328 47 CFR, Part 15 / ICES-003 ETSI EN 301 489-1 / 301 489-17
Stabilised output voltage	5 VDC max. load 20 mA	EMV	EN 61 000-6-2 EN 61 000-6-4
Solenoid current:		Immunity	
• Minimal current $I_{min}$	Adjustable 0... $I_{max}$ mA Factory setting 50 mA	Emission	
• Maximal current $I_{max}$	Adjustable $I_{min}$ ...2500 mA MTS35/19x50...-12, Factory setting 1360 mA MTS35/19x50...-24, Factory setting 680 mA MTS45/23x50...-12, Factory setting 1480 mA MTS45/23x50...-24, Factory setting 780 mA MTS60/31x72...-12, Factory setting 2280 mA MTA60/31x72...-12, Factory setting 2280 mA MTS60/31x72...-24, Factory setting 1140 mA MTA60/31x72...-24, Factory setting 1140 mA		

**BLOCK DIAGRAM**


\*1) for selection according to type code

**DIMENSIONS**

**CONNECTOR ASSIGNMENT**

Valve connection cable (X1)  
 With mounted M12 connector  
 5 pole male A coded



1 (brown)  
 2 (green)  
 3 (grey)  
 4 (white)  
 5 (yellow)

**Typ analogue**

Supply voltage VCC +  
 Command value signal  
 Supply 0 VDC/GND  
 Digital input  
 Stabilised output voltage\*

**Typ IIO-Link**

L+ supply voltage +  
 P24/2L+ additional supply +  
 L-supply 0 VDC/GND  
 C/Q  
 N24/2L-additional supply 0 VDC

\*Caution: Some M12 distributor boxes have the earth connection on pin 5 → Short-circuit hazard!

**START-UP**

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier electronics and in the operating instructions.

Additional information can be found on our website:

Free-of-charge download:

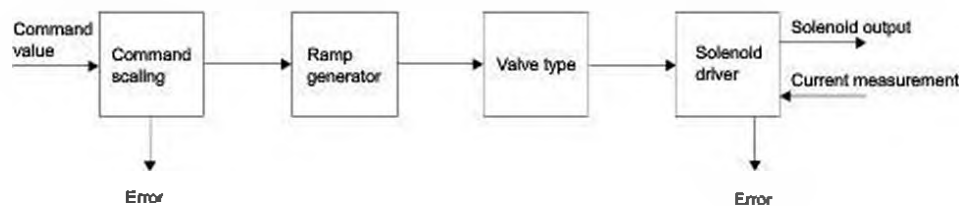
- Operating instruction (\*.pdf)
- Wandfluh App for Android (Google Play) and iOS (App Store)

**ADDITIONAL INFORMATION**

	Wandfluh documentation
Wandfluh electronics general	register 1.13
Digital amplifier electronics PD3	register 1.13-66
Proportional spool valves	register 1.10
Proportional pressure valves	register 2.3
Proportional flow control valves	register 2.6

**ADJUSTMENTS**

The PD3 electronics has a Bluetooth interface. Via the Wandfluh App, the PD3 functions can be analysed and all parameters set.

**FUNCTION DESCRIPTION**


**PD3-AMPLIFIER**
**Command value scaling**

Type IO-Link: The command value can only be specified via IO-Link.

Type analogue: The command value can be specified as a voltage, current, digital, frequency or PWM signal.

**Ramp generator**

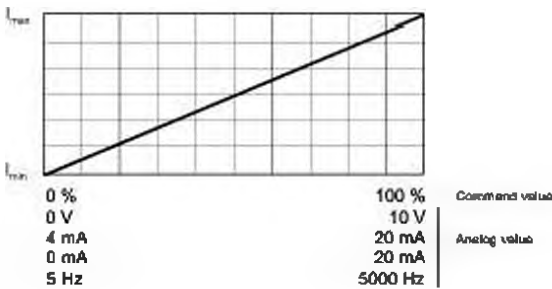
Two linear ramps for up and down are available which can be adjusted separately.

**Valve type**

Adjustment possibilities: switching solenoid or proportional solenoid.

**Mode of operation «Command value unipolar/bipolar (1-Sol)»**

Dependent on a command value signal (IO-Link, voltage, current, digital, frequency or PWM), the solenoid is controlled (e.g. 0...10V correspond to 0...100 % command value, which again corresponds to  $I_{min}$ ... $I_{max}$  solenoid driver).

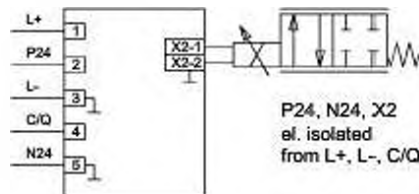
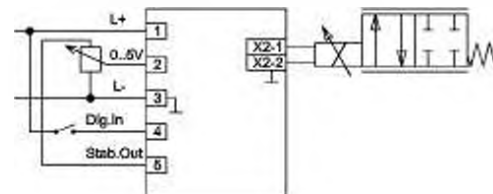

**Solenoid driver**

A Pulse-Width-Modulated current output is available. A dither signal is superimposed, whereby the dither frequency and the dither level are separately adjustable. The minimum ( $I_{min}$ ) and maximum ( $I_{max}$ ) current can be adjusted. The solenoid output can also be configured as switching solenoid output. In this case, a power reduction can be adjusted.

**Channel enabling**

Enable can be configured by means of the App:

- on
- off
- external (enable input with type analogue)
- bus (with type IO-Link)

**CONNECTION EXAMPLES**
**Connection example IO-Link**

**Connection example analogue with stabilised output**


## DUTY FACTOR

All solenoids supplied by Wandfluh in standard version as well as Ex-proof version, are as a standard feature designed for continuous duty (100 % DF) in accordance with definition 1.1. Therefore the steady state temperature of the solenoid can be reached. In under continuous duty conditions, this occurs after approx. 1,5 to 2 hours. With high ambient temperatures, resp., reference temperatures or a high temperature of the fluid and as well with overvoltage, we can offer solenoids with reduced power (M28 see data sheet 1.1-420) or power reducing plug (P03 see data sheet 1.1-320).

### 1.0 TIME DEFINITION

#### 1.1 CONTINUOUS DUTY (CD)

The time of operation during which solenoid is excited is so long, that the steady-state temperature is practically reached. (VDE 0580)

#### 1.2 INTERMITTENT OPERATION (IO)

The type of operation, in which activated time and currentless breaks alternate in a regular or irregular sequence, whereby the breaks are so short, that the solenoid does not cool down to the reference temperature.

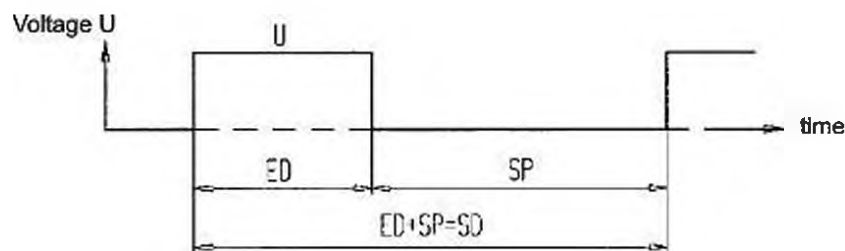
#### 1.2.1 RELATIVE DUTY FACTOR (% DF)

(Determined intermittent operation)

Ratio of duty factor to cycle time expressed in percent.

$$\% DF = \frac{DF}{DF + NCB} \times 100$$

Applicable as preferred values for the relative duty factor (in % of CT) are: 5, 15, 25, 40%. 100 % CT corresponds to continuous operation. Applicable as preferred values for the maximum cycle time are: 2, 5, 10, 30 min. Therefore the additional designation for solenoids with a relative operating time is, e.g.: 40 % CT/5 min.



##### 1.2.1.1 DUTY FACTOR (DF)

The time between the switching on and switching off of the actuating current.

##### 1.2.1.2 NO-CURRENT BREAK (NCB)

The time between the switching off and switching on again of the actuating current.

##### 1.2.1.3 CYCLE TIME (CT)

The sum of activated time and no-current break.

## 2.0 TEMPERATURE DEFINITIONS

### 2.1 AMBIENT TEMPERATURE

Average temperature of the surroundings of the solenoid.

### 2.2 REFERENCE TEMPERATURE


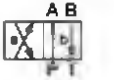





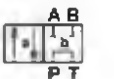

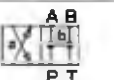
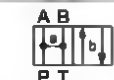
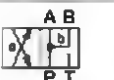



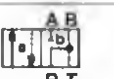

Steady state temperature in a no current condition, when utilized as foreseen. The reference temperature in most cases has a different value than the ambient temperature, since it is additionally affected by the temperature of the fluid (cooling or heating).














### 2.3 STEADY STATE TEMPERATURE

The temperature of the solenoid when heat produced by coil and dissipated heat are in balance.

### 2.4 TEMPERATURE OF THE FLUID

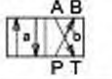
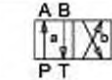
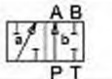
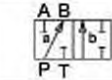
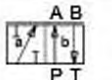
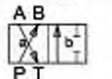
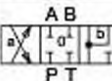
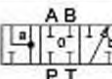
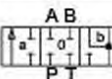
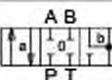
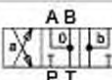
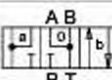
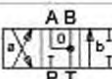
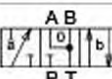
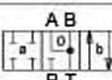
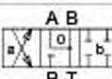
Temperature of the fluid inside the solenoid (valve).

Size Symbol	NG3-Mini	NG4-Mini	NG4 ISO	NG6 ISO	NG10 ISO
	BM4J30 1.2-28	WD.FA04-AB3 1.2-33	WD.FB04-AB3 1.2-53	WDMFA06-AB3 1.2-59	WDMFA10-AB3 1.2-76
	BM4Z30a 1.2-28	WD.FA04-AB1 1.2-33	WD.FB04-AB1 1.2-53	WDMFA06-AB1 1.2-59	WDMFA10-AB1 1.2-76
	BM4Z30b 1.2-28	WD.FA04-AB2 1.2-33	WD.FB04-AB2 1.2-53	WDMFA06-AB2 1.2-59	WDMFA10-AB2 1.2-76
	BM4Z31a 1.2-28	WD.FA04-AC1 1.2-33	WD.FB04-AC1 1.2-53	WDMFA06-AC1 1.2-59	WDMFA10-AC1 1.2-76
	BM4Z31b 1.2-28	WD.FA04-CB2 1.2-33	WD.FB04-CB2 1.2-53	WDMFA06-CB2 1.2-59	WDMFA10-CB2 1.2-76
	BM4Z32a 1.2-28	WD.FA04-AD1 1.2-33	WD.FB04-AD1 1.2-53	WDMFA06-AD1 1.2-59	WDMFA10-AD1 1.2-76
	BM4Z32b 1.2-28	WD.FA04-DB2 1.2-33	WD.FB04-DB2 1.2-53	WDMFA06-DB2 1.2-59	WDMFA10-DB2 1.2-76
	BM4Z33a 1.2-28	WD.FA04-BE1 1.2-33	WD.FB04-BE1 1.2-53	WDMFA06-BE1 1.2-59	WDMFA10-BE1 1.2-76
	BM4Z33b 1.2-28	WD.FA04-EA2 1.2-33	WD.FB04-EA2 1.2-53	WDMFA06-EA2 1.2-59	WDMFA10-EA2 1.2-76
	BM4Z34a 1.2-28	WD.FA04-AF1 1.2-33	WD.FB04-AF1 1.2-53	WDMFA06-AF1 1.2-59	WDMFA10-AF1 1.2-76
	BM4Z34b 1.2-28	WD.FA04-FB2 1.2-33	WD.FB04-FB2 1.2-53	WDMFA06-FB2 1.2-59	WDMFA10-FB2 1.2-76
	BM4Z35a 1.2-28	WD.FA04-AG1 1.2-33	WD.FB04-AG1 1.2-53	WDMFA06-AG1 1.2-59	WDMFA10-AG1 1.2-76
	BM4Z35b 1.2-28	WD.FA04-GB2 1.2-33	WD.FB04-GB2 1.2-53	WDMFA06-GB2 1.2-59	WDMFA10-GB2 1.2-76
		WD.FA04-BH1	WD.FB04-BH1	WDMFA06-BH1	WDMFA10-BH1
		WD.FA04-HA2	WD.FB04-HA2	WDMFA06-HA2	WDMFA10-HA2
		WD.FA04-BI1	WD.FB04-BI1	WDMFA06-BI1	WDMFA10-BI1
		WD.FA04-IA1	WD.FB04-IA1	WDMFA06-IA1	WDMFA10-IA1

Size Symbol	NG3-Mini	NG4-Mini	NG4 ISO	NG6 ISO	NG10 ISO
		WD.FA04-AJ1	WD.FB04-AJ1	WDMFA06-AJ1	WDMFA10-AJ1
		WD.FA04-JB2	WD.FB04-JB2	WDMFA06-JB2	WDMFA10-JB2
		WD.FA04-AK1	WD.FB04-AK1	WDMFA06-AK1	WDMFA10-AK1
		WD.FA04-KB2	WD.FB04-KB2	WDMFA06-KB2	WDMFA10-KB2
	BM4D31 1.2-26	WD.FA04-ACB 1.2-33	WD.FB04-ACB 1.2-53	WDMFA06-ACB 1.2-59	WDMFA10-ACB 1.2-76
	BM4D32 1.2-26	WD.FA04-ADB 1.2-33	WD.FB04-ADB 1.2-53	WDMFA06-ADB 1.2-59	WDMFA10-ADB 1.2-76
	BM4D33 1.2-26	WD.FA04-BEA 1.2-33	WD.FB04-BEA 1.2-53	WDMFA06-BEA 1.2-59	WDMFA10-BEA 1.2-76
	BM4D34 1.2-26	WD.FA04-AFB 1.2-33	WD.FB04-AFB 1.2-53	WDMFA06-AFB 1.2-59	WDMFA10-AFB 1.2-76
	BM4D35 1.2-26	WD.FA04-AGB 1.2-33	WD.FB04-AGB 1.2-53	WDMFA06-AGB 1.2-59	WDMFA10-AGB 1.2-76
		WD.FA04-BHA	WD.FB04-BHA	WDMFA06-BHA	WDMFA10-BHA
		WD.FA04-BIA	WD.FB04-BIA	WDMFA06-BIA	WDMFA10-BIA
		WD.FA04-AJB	WD.FB04-AJB	WDMFA06-AJB	WDMFA10-AJB
		WD.FA04-AKB	WD.FB04-AKB	WDMFA06-AKB	WDMFA10-AKB





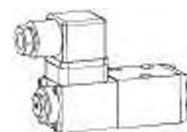
Size Symbol	NG3-Mini	NG4-Mini	NG4 ISO	NG6 ISO	NG10 ISO
		WD.FA04-BA1-Z57	WD.FB04-BA1-Z57	WDMFA06-BA1-Z57	WDMFA10-BA1-Z57
		WD.FA04-BA2-Z57	WD.FB04-BA2-Z57	WDMFA06-BA2-Z57	WDMFA10-BA2-Z57
				WDMFA06-LM1-Z57	WDMFA10-LM1
				WDMFA06-LM2-Z57	WDMFA10-LM2
				WDMFA06-LB1-Z57	
				WDMFA06-AM2-Z57	
		B.4D41-S319		WDMFA06-ACG-Z57	WDMFA10-ACG-Z57
				WDMFA06-DCL-Z57	
				WDMFA06-MCD-Z57	
					WDMFA10-BCD-Z57
		B.4D42-S434		WDMFA06-ADG	WDMFA10-ADG
		B.4D42-S827		WDMFA06-GDB	WDMFA10-GDB
		B.4D42-S714			
		B.4D42-S828			
		B.4D42-S787		WDMFA06-CDB-Z57	
				WDMFA06-ADC-Z57	





**Solenoid operated spool valve**
**Flange construction**

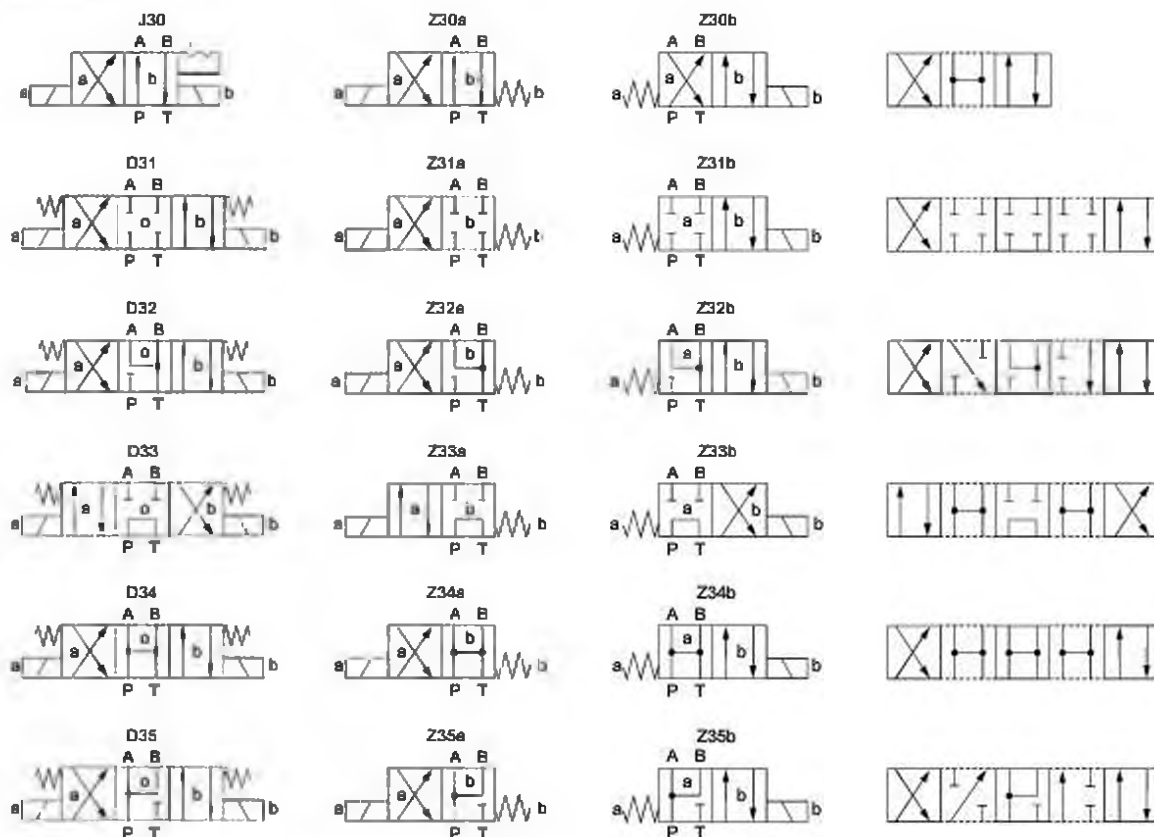
- ◆ 4/2-way impulse execution, detented
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{n,m} = 15 \text{ l/min}$
- ◆  $p_{n,m} = 350 \text{ bar}$

**NG3-Mini**

**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. Spool detented or with spring. With the solenoids de-energised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the impulse spool (4/2), the spool is held in the switching position by the detent. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, body from high quality hydraulic cast steel. Wide range of standard and special voltages.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. Direction of movement depends on the position of spool and its flow symbol. Switching performance limits and leakage of the valves must be taken into account when designing the system. Solenoid operated spool valves are suitable for machine tools and handling systems of any kind. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**


**TYPE CODE**

Mounting interface acc. to Wandfluh standard					B	M	4	-	#	
Solenoid, Medium										
Number of control ports										
Designation of symbols acc. to table										
Nominal voltage $U_N$	12 VDC	<input type="checkbox"/> G12	115 VAC	<input type="checkbox"/> R115						
	24 VDC	<input type="checkbox"/> G24	230 VAC	<input type="checkbox"/> R230						
Design index (subject to change)										

1.2-26

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG3-Mini according to Wandfluh standard
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C if > +50 °C, then no undervoltage is admissible
Weight	0,50 kg (1 solenoid) 0,65 kg (2 solenoids)
MTTFd	150 years

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	SIN29V (data sheet 1.1-80)
Connection	Connector socket EN 175301-803

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10' (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal power	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz, rectifier integrated in the connector socket

Note! Other electrical specifications see data sheet 1.1-80


**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$ ( $P_T < 20 \text{ bar}$ ) $p_{max} = 315 \text{ bar}$ ( $P_T > 20 \text{ bar}$ )
Tank pressure	$p_{Tmax} = 100 \text{ bar}$
Maximum volume flow	$Q_{Tmax} = 15 \text{ l/min}$ , see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

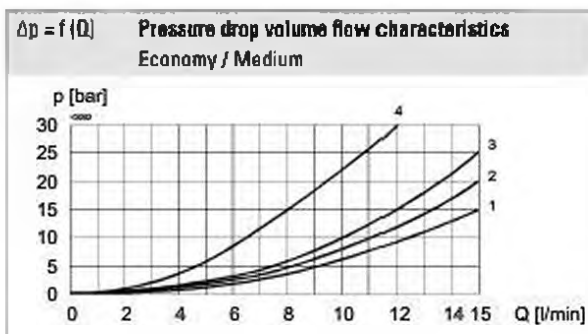
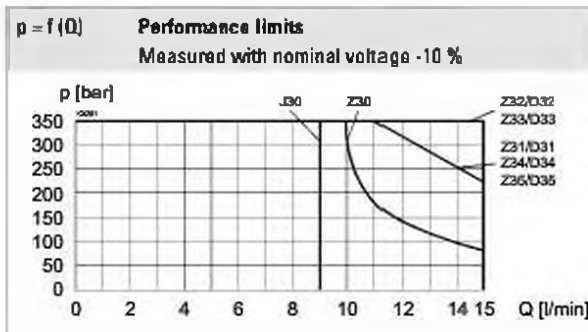
**STANDARDS**

Mounting interface	According to Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 1753301-803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

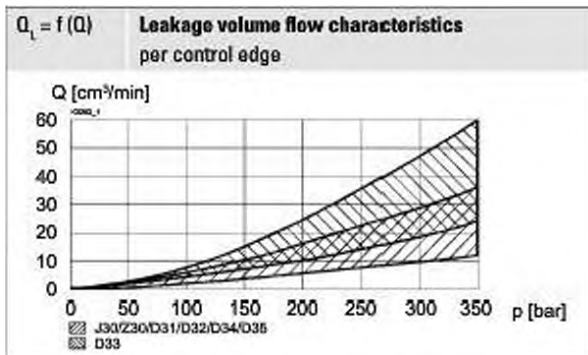
**MANUAL OVERRIDE**

Screw plug with integrated manual override (HB4,5). Actuation by pressing the push button

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
Z30 / J30	3	3	-	2	2
D31 / Z31	3	3	-	2	2
D32 / Z32	3	3	-	1	1
D33 / Z33	4	4	3	4	4
D34 / Z34	2	2	1	1	1
D35 / Z35	2	2	-	2	2


**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

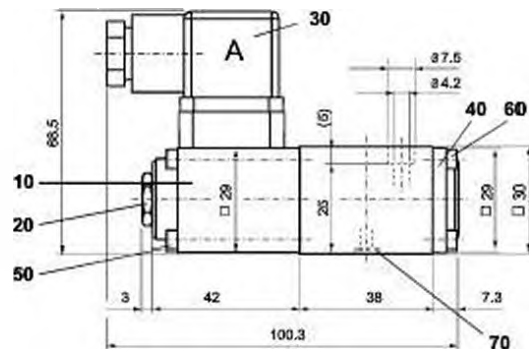
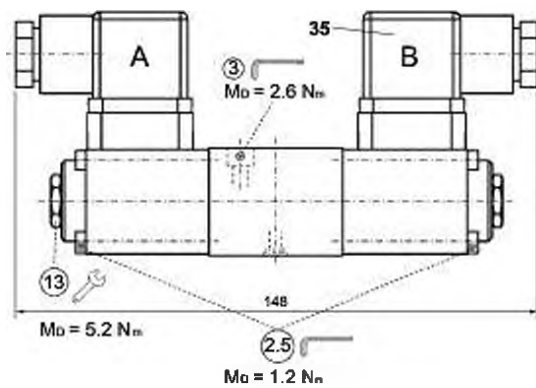
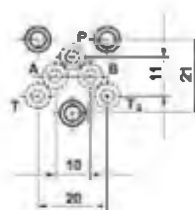
- ◆ The valve body is painted with a two component paint
- ◆ The solenoid and the cover are zinc-nickel coated
- ◆ The socket head screws are zinc coated

**DIMENSIONS**

4/3-way valve (spring centred)

4/2-way valve (impulse)

4/2-way valve (spring reset)


**HYDRAULIC CONNECTION**

**INSTALLATION NOTES**

Mounting type	Flange mounting 3 fixing holes for socket head screws M4 x 30
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 2,6 \text{ Nm}$ (quality 8.8, zinc coated) Fixing screws

**Note!** The length of the fixing screw depends on the base material of the connection element.


**PARTS LIST**

Position	Article	Description
10	260.2...	Solenoid SIN29V
20	253.8000	Screw plug with integrated manual override HB4.5 (Data sheet 1.1-300)
30	219.2001	Electric plug A (grey)
35	219.2002	Electric plug B (black)
40	056.4200	Cover
50	246.0141	Socket head screw M3 x 40 DIN 912
60	246.0109	Socket head screw M3 x 8 DIN 912
70	160.2045	O-ring ID 4,50 x 1,50 (NBR)

**ACCESSORIES**

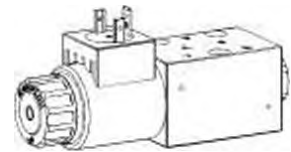
Mounting screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Manual override	Data sheet 1.1-300
Special manual override	Data sheet 1.1-310
Relative duty factor	Data sheet 1.1-430

**Solenoid operated spool valve**
**Flange construction**

- ◆ 4/2-way impulse execution, detented
- ◆ 4/3-way with spring centered mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 30 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**NG4-Mini**

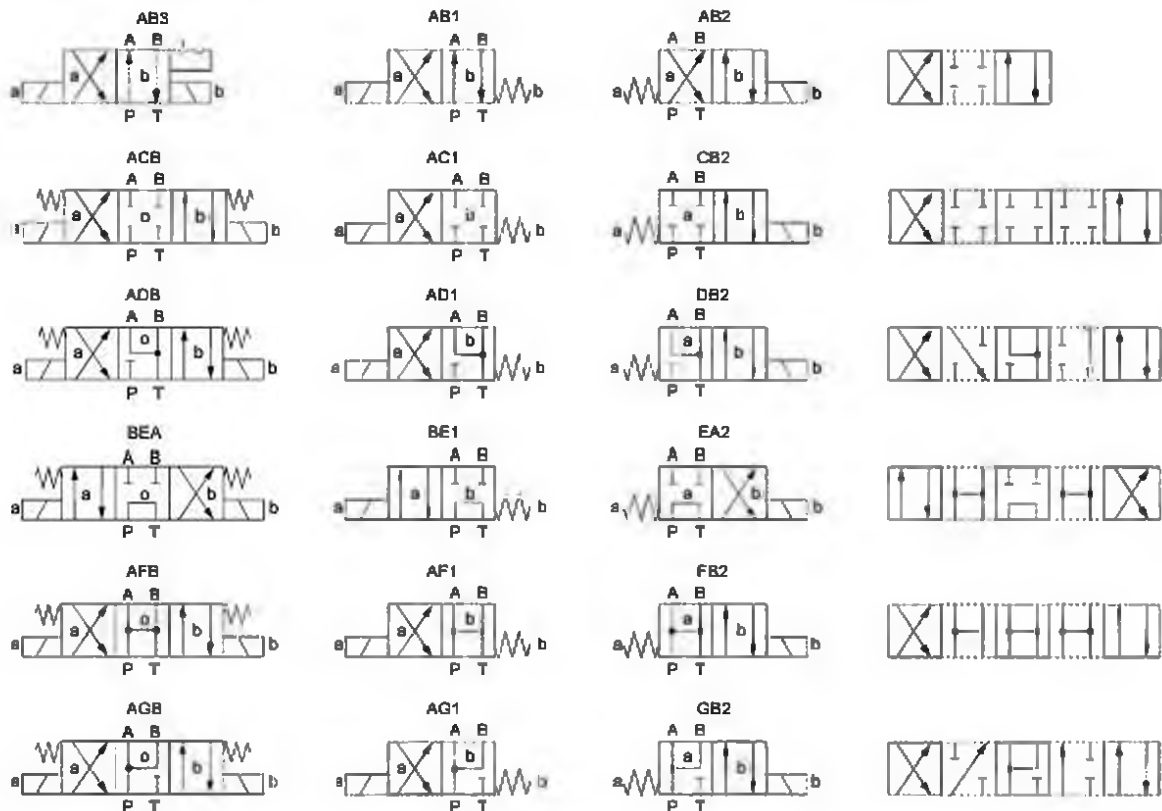
Wandfluh standard


**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. Spool detented or with spring reset. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the impulse spool (4/2), the spool is held in the switching position by the detent. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, valve body from high quality hydraulic cast steel. Wide range of standard and special voltages.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. Switching performance and leakage of the valves must be taken into account when designing the system. Solenoid spool valves are suitable for machine tools and handling systems of any kind. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**




**TYPE CODE**

Spool valve, direct operated		WD <input type="checkbox"/> F A04 - <input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> # <input type="checkbox"/>	
Slip-on coil, Economy	<input type="checkbox"/> E		
Slip-on coil, Medium	<input type="checkbox"/> M		
Flange construction			
Mounting interface acc. to Wandfluh standard, NG4-Mini			
Designation of symbols acc. to table			
Spool specification	Standard <input type="checkbox"/>		
	Low Leakage <input type="checkbox"/> 1/x		
Nominal voltage U <sub>n</sub>	12 VDC <input type="checkbox"/> G12	115 VAC <input type="checkbox"/> R115	
	24 VDC <input type="checkbox"/> G24	230 VAC <input type="checkbox"/> R230	
	without coil <input type="checkbox"/> X5		
Slip-on coil	Metal housing, round with one-sided collar <input type="checkbox"/> V	(only G12 and G24)	
	Metal housing, square with one-sided collar <input type="checkbox"/> N		
Connection execution	Connector socket EN 175301-803 / ISO 4400 <input type="checkbox"/> D		
	Connector socket AMP Junior-Timer <input type="checkbox"/> J	(only G24)	
	Connector Deutsch DT04 - 2P <input type="checkbox"/> G	(only for U <sub>n</sub> ≤ 75 VDC)	
Sealing material	NBR <input type="checkbox"/>		
	FKM (Viton) <input type="checkbox"/> D1		
Manual override	Integrated <input type="checkbox"/>		
	Push-button <input type="checkbox"/> HF1		
	Spline <input type="checkbox"/> HS1		
Surface protection	Standard <input type="checkbox"/>		
	Zinc-nickel <input type="checkbox"/> K8		
Design index (subject to change)			

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C if > +50 °C, then no undervoltage is admissible
Weight	0,83 kg (1 solenoid Economy) 0,90 kg (1 solenoid Medium) 1,12 kg (2 solenoids Economy) 1,24 kg (2 solenoids Medium)
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10' (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!**


Other electrical specifications see data sheet 1.1-168 (slip-on coil V) and 1.1-175 (slip-on coil N)

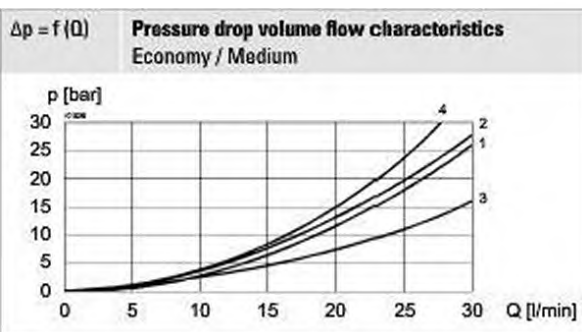
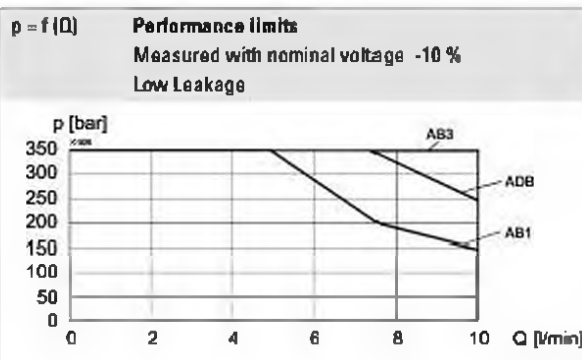
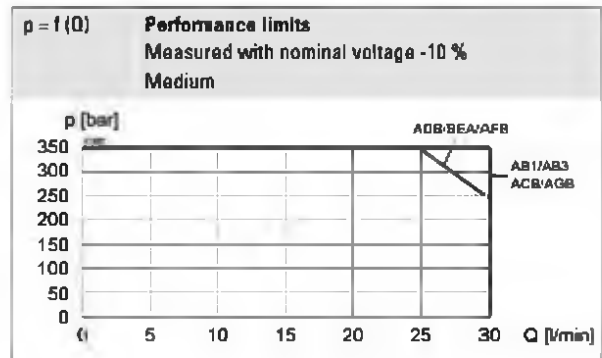
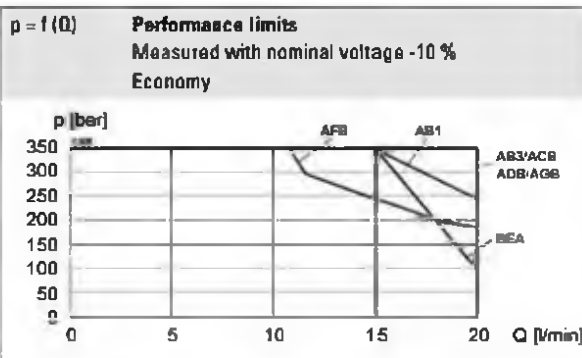
**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	Economy: V.E37 / 19 x 40 (Data sheet 1.1-168) Medium: V.E37 / 19 x 50 (Data sheet 1.1-168) N.S35 / 19 x 50 (Data sheet 1.1-175)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**HYDRAULIC SPECIFICATIONS**

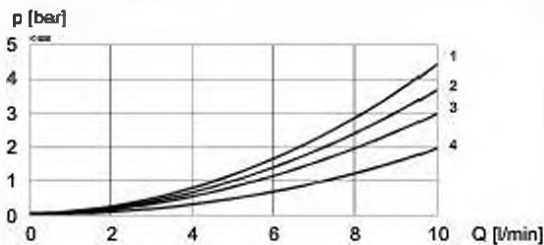
Working pressure	$p_{max} = 350 \text{ bar}$ ( $P_T < 20 \text{ bar}$ ) $p_{max} = 315 \text{ bar}$ ( $P_T > 20 \text{ bar}$ )
Tank pressure	$p_{Tmax} = 100 \text{ bar}$
Maximum volume flow	$Q_{max} = 30 \text{ l/min}$ , see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	$12 \text{ mm}^2/\text{s} \dots 320 \text{ mm}^2/\text{s}$
Temperature range fluid	$-25 \dots +70 \text{ }^\circ\text{C}$ (NBR) $-20 \dots +70 \text{ }^\circ\text{C}$ (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade $\beta_{10} \dots 16 \geq 75$ , see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

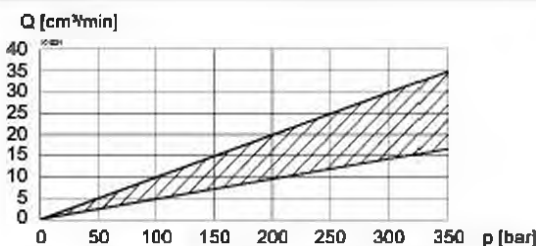
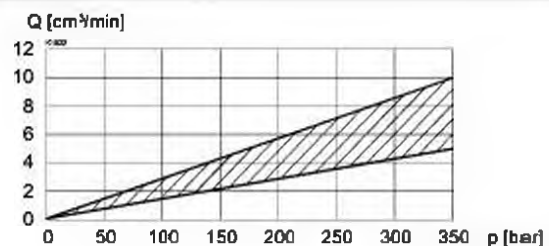
 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1 / AB2 / AB3	2	2	-	1	1
ACB / AC1 / CB2	2	2	-	1	1
ADB / AD1 / DB2	2	2	-	1	1
BEA / BE1 / EA2	1	1	4	1	1
AFB / AF1 / FB2	1	1	3	1	1
AGB / AG1 / GB2	1	1	-	1	1

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 **$\Delta p = f(Q)$  Pressure drop volume flow characteristics**  
 Low Leakage


Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1 / AB2 / AB3	1	1	-	1	2
ADB / AD1 / DB2	1	1	-	4	3

 **$Q_l = f(p)$  Leakage volume flow characteristics**  
 per control edge  
 Economy/Medium

 **$Q_l = f(p)$  Leakage volume flow characteristics**  
 per control edge  
 Low Leakage

**STANDARDS**

Mounting interface	Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**
**Standard:**

- The valve body is painted with a two component paint
- The armature tube, the slip-on coil and the plug screw are zinc-nickel coated

**Optionally (K8):**

- All external parts are zinc-nickel coated
- ISO 9227 (800 h) salt spray test

**INSTALLATION NOTES**

Mounting type	Flange mounting 3 fixing holes for socket head screws M5 x 40
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 5 \text{ Nm}$ knurled nut

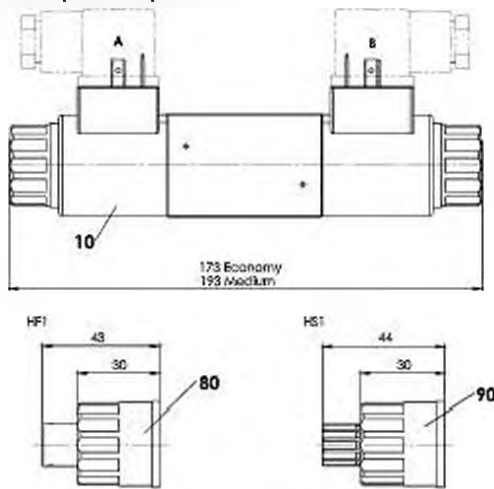
**Note!**


The length of the fixing screw depends on the base material of the connection element.

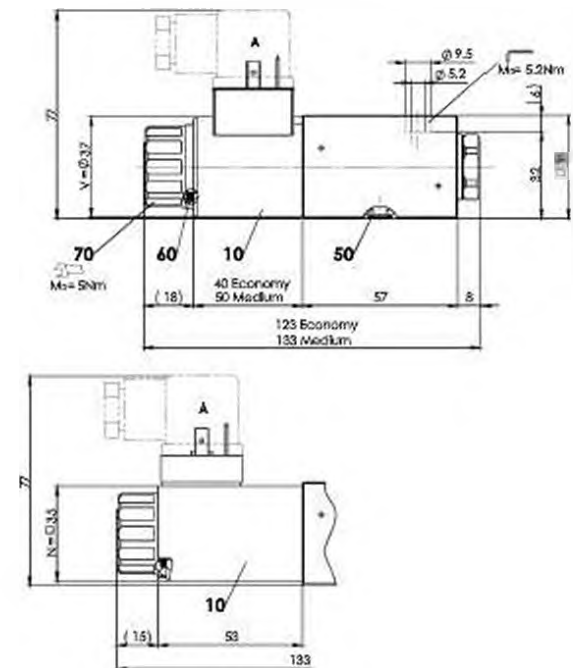
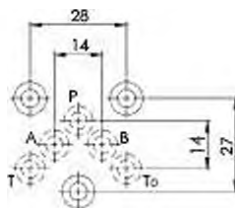
**DIMENSIONS**

4/3-way valve (spring centred)

4/2-way valve (impulse)



4/2-way valve (spring reset)


**HYDRAULIC CONNECTION**

**MANUAL OVERRIDE**

- ◆ Integrated (-) Actuation pin integrated in the armature tube. Actuation by pressing the pin
- ◆ Push-button (HF1) Integrated in the knurled nut. Actuation by pressing the push-button
- ◆ Spindle (HS1) Integrated in the knurled nut. Actuation by turning the spindle (continuously variable valve actuation)

**Attention!** The actuation of the manual override is possible up to a tank pressure of:

- 40 bar Integrated (-)
- 40 bar Push-button (HF1)
- 100 bar Spindle (HS1)


**PARTS LIST**

Position	Article	Description
10	206.2...	V.E37 / 19 x 40
		V.E37 / 19 x 50
	260.5...	N.S35 / 19 x 50
50	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)
60	160.2187	O-ring ID 18,72 x 2,62 (NBR)
	160.6187	O-ring ID 18,72 x 2,62 (FKM)
70	154.2700	Knurled nut
80	253.7001	Push-button
90	253.7000	Spindle

**ACCESSORIES**

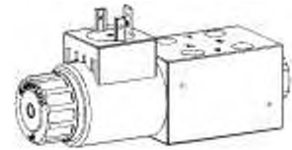
Mating connector gray (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Mounting screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-10
Multi-station subplates	Data sheet 2.9-50
Horizontal mounting blocks	Data sheet 2.9-90
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.1-50
Relative duty factor	Data sheet 1.1-430

**Solenoid operated spool valve**
**Flange construction**

- ◆ 4/2-way impulse execution, detented
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 30 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**NG4**

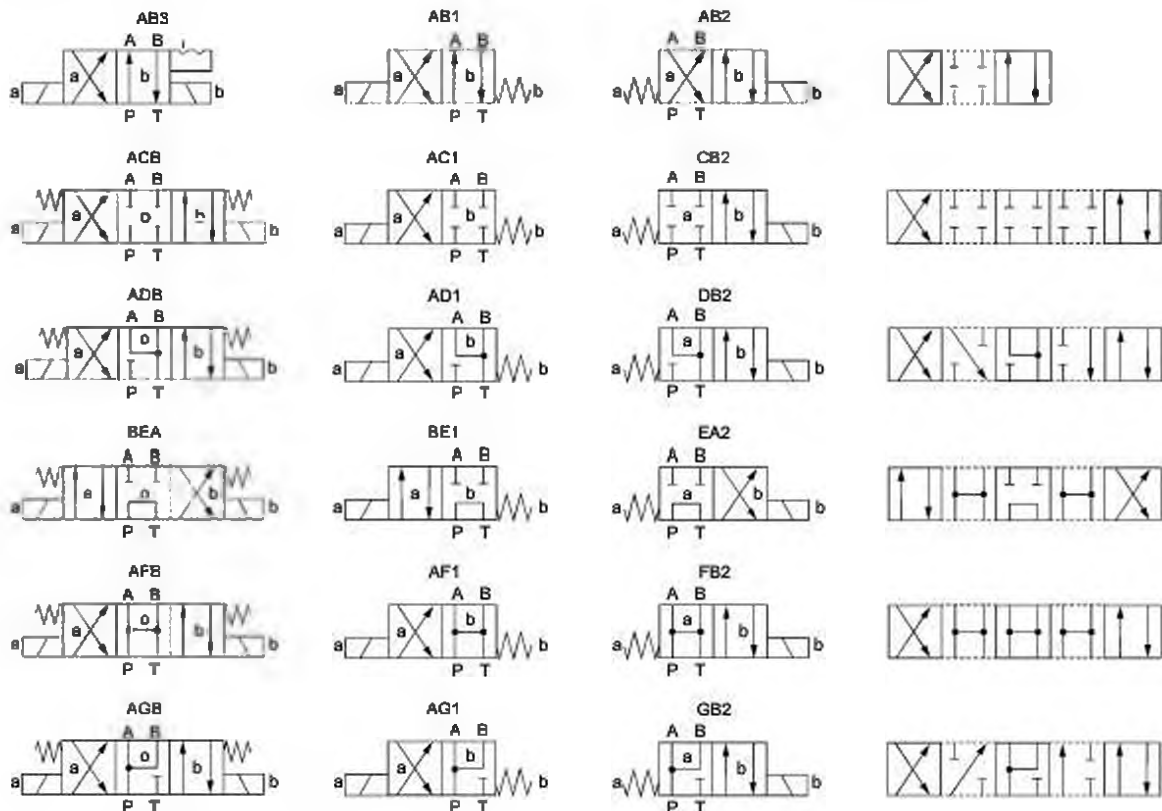
ISO 4401-02


**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. Spool detented or with spring reset. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the impulse spool (4/2), the spool is held in the switching position by the detent. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, valve body from high quality hydraulic cast steel. Wide range of standard and special voltages.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. Switching performance and leakage of the valves must be taken into account when designing the system. Solenoid spool valves are suitable for machine tools and handling systems of any kind. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**


**TYPE CODE**

Spool valve, direct operated		WD	<input type="checkbox"/>	F	B04	-	<input type="checkbox"/>	-	<input type="checkbox"/>	/	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Slip-on coil, Economy		<input type="checkbox"/>													
Slip-on coil, Medium		<input type="checkbox"/>													
Flange construction		<input type="checkbox"/>													
International standard interface ISO, NG4		<input type="checkbox"/>													
Designation of symbols acc. to table		<input type="checkbox"/>													
Spool specification	Standard	<input type="checkbox"/>													
	Low Leakage	<input type="checkbox"/>	1/x												
Nominal voltage $U_n$	12 VDC	<input type="checkbox"/>	G12		115 VAC		R115								
	24 VDC	<input type="checkbox"/>	G24		230 VAC		R230								
	without coil	<input type="checkbox"/>	X5												
Slip-on coil	Metal housing, round with one-sided collar	<input type="checkbox"/>	V												(only G12 and G24)
	Metal housing, square with one-sided collar	<input type="checkbox"/>	N												
Connection execution	Connector socket EN 175301-803 / ISO 4400	<input type="checkbox"/>	D												
	Connector socket AMP Junior-Timer	<input type="checkbox"/>	J												(only G24)
	Connector Deutsch DT04 - 2P	<input type="checkbox"/>	G												(only for $U_n \leq 75$ VDC)
Sealing material	NBR	<input type="checkbox"/>													
	FKM (Viton)	<input type="checkbox"/>	D1												
Manual override	Integrated	<input type="checkbox"/>													
	Push-button	<input type="checkbox"/>	HF1												
	Spline	<input type="checkbox"/>	HS1												
Design index (subject to change)															

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG4 according to ISO 4401-02
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C if > +50 °C, then no undervoltage is admissible
Weight	0,83 kg (1 solenoid Economy) 0,90 kg (1 solenoid Medium) 1,12 kg (2 solenoids Economy) 1,24 kg (2 solenoids Medium)
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	$10^7$ (number of switching cycles, theoretically)
Voltage tolerance	$\pm 10$ % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
	AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-168 (slip-on coil V) and 1.1-175 (slip-on coil N)



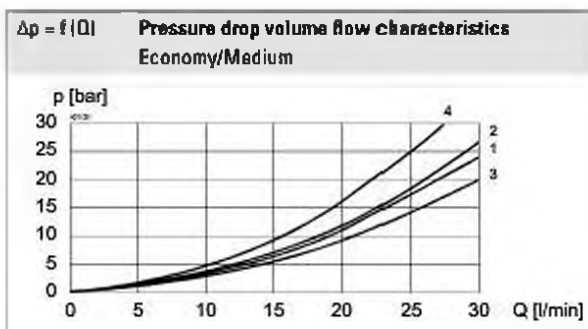
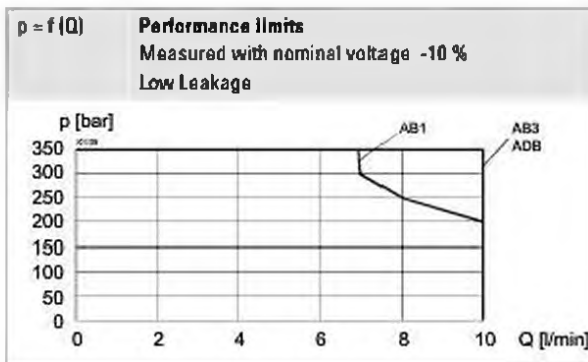
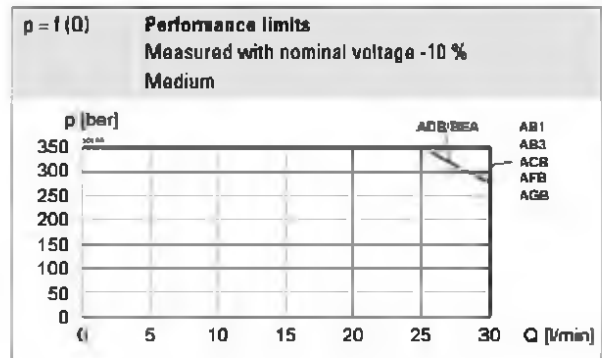
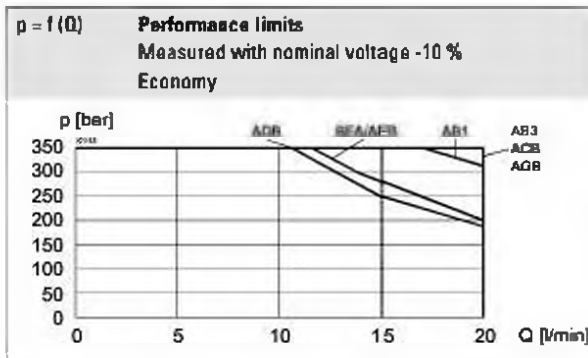
**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	Economy: V.E37 / 19 x 40 (Data sheet 1.1-168)
	Medium: V.E37 / 19 x 50 (Data sheet 1.1-168)
	N.S35 / 19 x 50 (Data sheet 1.1-175)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**HYDRAULIC SPECIFICATIONS**

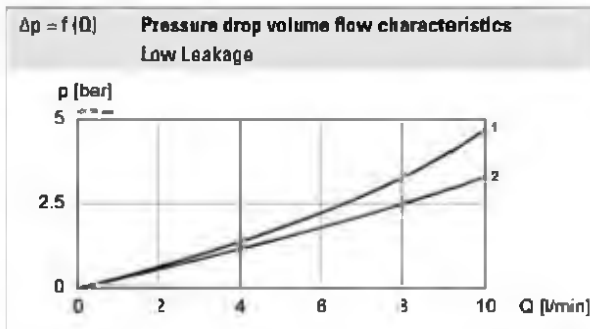
Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{T,max} = 100$ bar
Maximum volume flow	$Q_{max} = 30$ l/min, see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

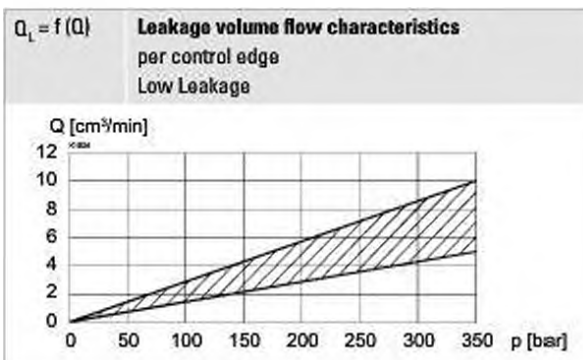
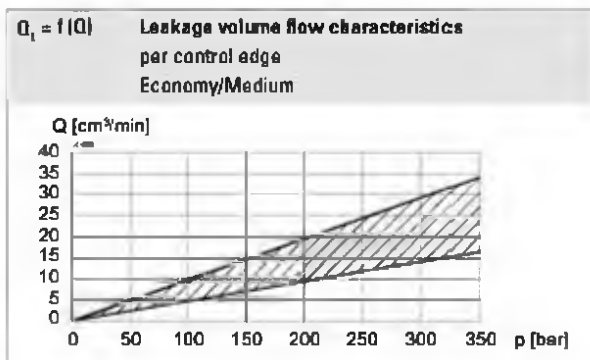
 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s


Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1 / AB2 / AB3	2	2	-	1	1
ACB / AC1 / CB2	2	2	-	1	1
ADB / AD1 / DB2	2	2	-	1	1
BEA / BE1 / EA2	2	2	4	2	2
AFB / AF1 / FB2	1	1	3	3	3
AGB / AG1 / GB2	3	3	-	1	1

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1 / AB2 / AB3	1	1	-	1	1
ADB / AD1 / DB2	1	1	-	2	2


**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The armature tube, the slip-on coil and the plug screw are zinc-nickel coated

**INSTALLATION NOTES**

Mounting type	Flange mounting 3 fixing holes for socket head screws M5 x 40
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 5 \text{ Nm}$ knurled nut

**Note!** The length of the fixing screw depends on the base material of the connection element.


**ACCESSORIES**

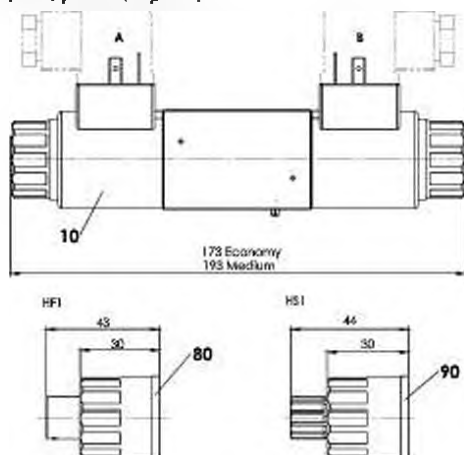
Mating connector grey (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Mounting screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-12
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430



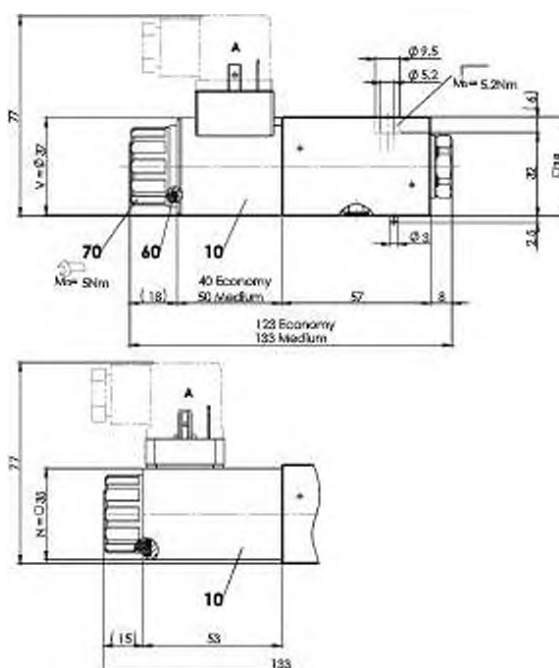
## DIMENSIONS

4/3-way valve (spring centred)

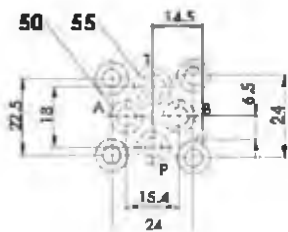
4/2-way valve (impulse)



4/2-way valve (spring reset)



## HYDRAULIC CONNECTION



## MANUAL OVERRIDE

- ◆ Integrated (-) Actuation pin integrated in the armature tube. Actuation by pressing the pin
- ◆ Push-button (HF1) Integrated in the knurled nut. Actuation by pressing the push-button
- ◆ Spindle (HS1) Integrated in the knurled nut. Actuation by turning the spindle (continuously variable valve actuation)

**Attention!** The actuation of the manual override is possible up to a tank pressure of:



40 bar Integrated (-)  
40 bar Push-button (HF1)  
100 bar Spindle (HS1)

## PARTS LIST

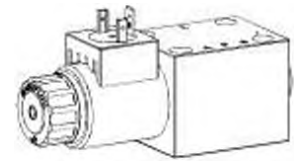
Position	Article	Description
10	206.2...	V.E37 / 19 x 40
		V.E37 / 19 x 50
	260.5...	N.S35 / 19 x 50
50	160.2060	O-ring ID 6,07 x 1,78 (NBR)
	160.6061	O-ring ID 6,07 x 1,78 (FKM)
55	160.2076	O-ring ID 7,65 x 1,78 (NBR)
	160.6076	O-ring ID 7,65 x 1,78 (FKM)
60	160.2187	O-ring ID 18,72 x 2,62 (NBR)
	160.6187	O-ring ID 18,72 x 2,62 (FKM)
70	154.2700	Knurled nut
80	253.7001	Push-button
90	253.7000	Spindle

## STANDARDS

Mounting interface	ISO 4401-02
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**Solenoid operated spool valve**
**Flange construction**

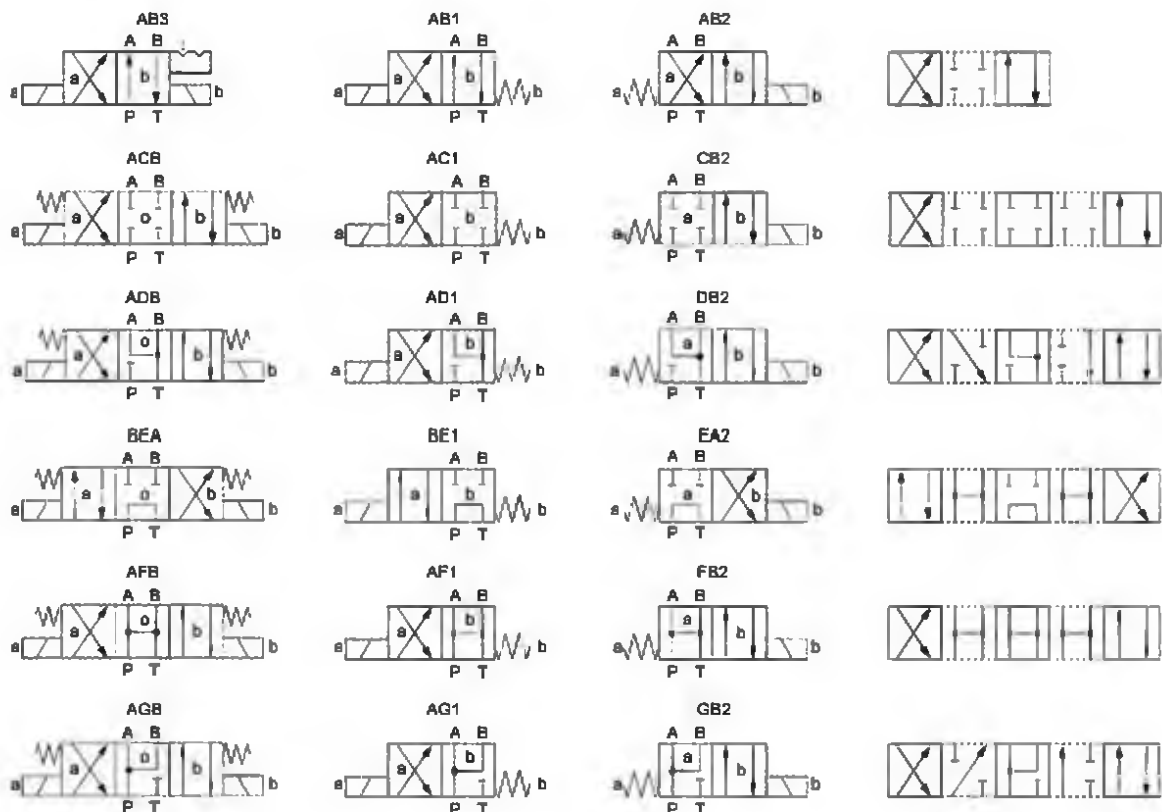
- ◆ 4/2-way impulse execution, detented
- ◆ 4/3-way with spring centered mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 30 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**NG6**
**ISO 4401-03**

**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. Spool detented or with spring reset. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the impulse spool (4/2), the spool is held in the switching position by the detent. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, valve body from high quality hydraulic cast steel. Wide range of standard and special voltages.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol. Switching performance and leakage of the valves must be taken into account when designing the system. Solenoid spool valves are suitable for machine tools and handling systems of any kind.

**SYMBOL**


**TYPE CODE**

		WD	<input type="checkbox"/>	F	A06	-	<input type="checkbox"/>	-	<input type="checkbox"/>	-	<input type="checkbox"/>	/	<input type="checkbox"/>	<input type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>	Z546 #	<input type="checkbox"/>				
Spool valve, direct operated																							
Slip-on coil Economy		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>					
Slip-on coil Medium		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>					
Flange construction																							
International standard interface ISO, NG6																							
Designation of symbols acc. to table																							
Spool specification		Standard <input type="checkbox"/>		Low Leakage <input type="checkbox"/>		1/x <input type="checkbox"/>																	
Nominal voltage U <sub>n</sub>		12 VDC <input type="checkbox"/>		24 VDC <input type="checkbox"/>		without coil <input type="checkbox"/>		G12 <input type="checkbox"/>		G24 <input type="checkbox"/>		X5 <input type="checkbox"/>		115 VAC <input type="checkbox"/>		230 VAC <input type="checkbox"/>		R115 <input type="checkbox"/>		R230 <input type="checkbox"/>			
Slip-on coil		Metal housing round with one-sided collar <input type="checkbox"/>		Metal housing square with one-sided collar <input type="checkbox"/>				V <input type="checkbox"/>		N <input type="checkbox"/>										(only G12 and G24)			
Connection execution		Connector socket EN 175301-803 / ISO 4400 <input type="checkbox"/>		Connector socket AMP Junior-Timer <input type="checkbox"/>		Connector Deutsch DT04 - 2P <input type="checkbox"/>		D <input type="checkbox"/>		J <input type="checkbox"/>		G <input type="checkbox"/>								(only for U <sub>n</sub> ≤ 75 VDC)		(only for U <sub>n</sub> ≤ 75 VDC)	
Sealing material		NBR <input type="checkbox"/>		FKM (Viton) <input type="checkbox"/>				D1 <input type="checkbox"/>															
Manual override		integrated <input type="checkbox"/>		push-button <input type="checkbox"/>		spindle <input type="checkbox"/>		HF1 <input type="checkbox"/>		HS1 <input type="checkbox"/>													
Execution																							
Design index (subject to change)																							

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Switching solenoid
Ambient temperature	-25 ... +70 °C if > +50 °C, then no undervoltage is admissible
Weight	1,10 kg (1 solenoid Economy) 1,16 kg (1 solenoid Medium) 1,35 kg (2 solenoids Economy) 1,47 kg (2 solenoids Medium)
MTTFd	150 years

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	Economy: V.E37 / 19 x 40 (Data sheet 1.1-168) Medium: V.E37 / 19 x 50 (Data sheet 1.1-168) N.S35 / 19 x 50 (Data sheet 1.1-175)
Connection	Connector socket EN 175301 - 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 - 2P

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
Standard nominal voltage	AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-168 (slip-on coil V) and 1.1-175 (slip-on coil N)


**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$ ( $P_7 < 20 \text{ bar}$ ) $p_{max} = 315 \text{ bar}$ ( $P_7 > 20 \text{ bar}$ )
Tank pressure	$p_{Tmax} = 100 \text{ bar}$
Maximum volume flow	$Q_{max} = 30 \text{ l/min}$ , see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**SURFACE TREATMENT**

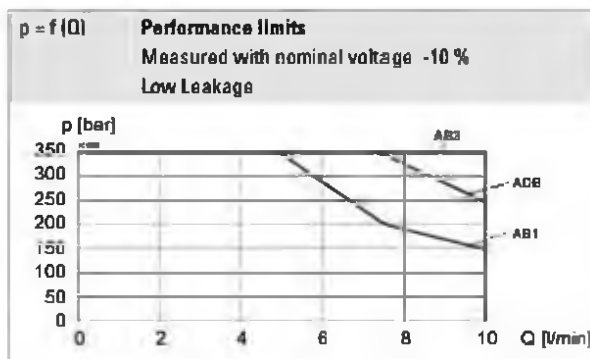
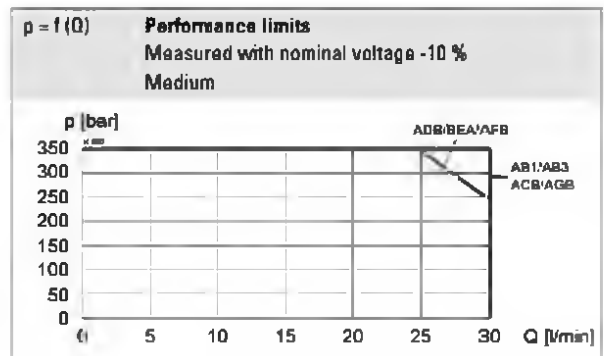
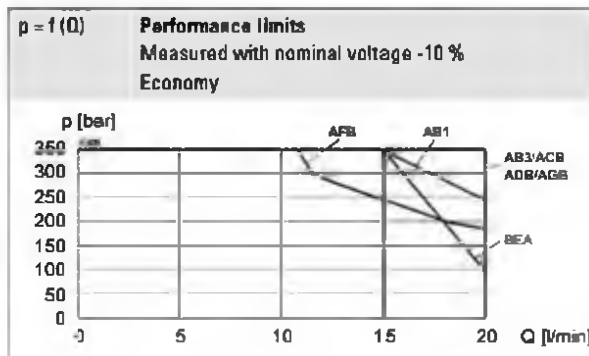
- ◆ The valve body is painted with a two component paint
- ◆ The armature tube, the slip-on coil and the plug screw are zinc-nickel coated

**SEALING MATERIAL**

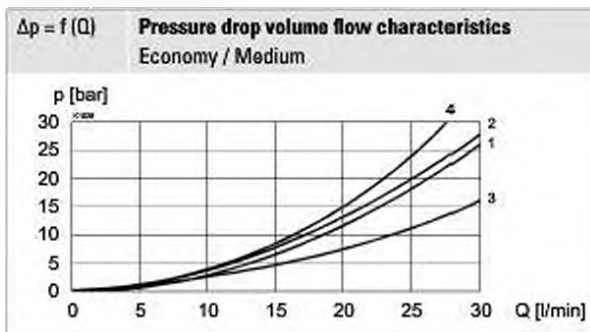
NBR or FKM (Viton) as standard, choice in the type code

**PERFORMANCE SPECIFICATIONS**

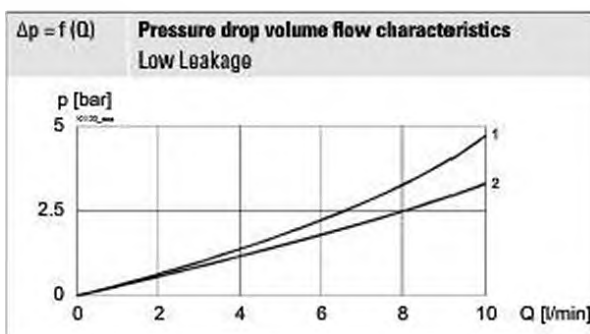
Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



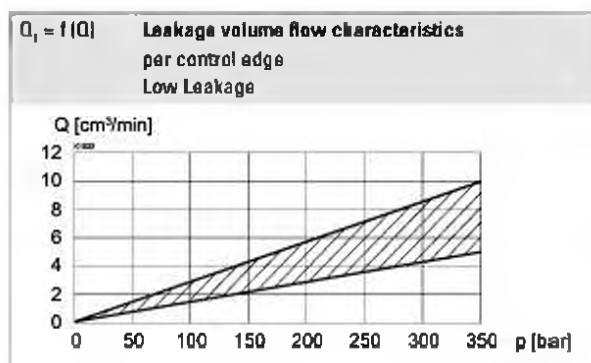
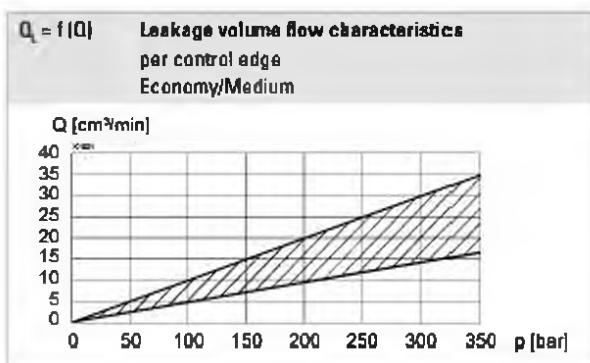
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1	2	2	-	1	1
AB3	2	2	-	1	1
ACB	2	2	-	1	1
ADB	2	2	-	1	1
BEA	1	1	4	1	1
AFB	1	1	3	1	1
AGB	1	1	-	1	1



Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1	1	1	-	1	1
AB3	1	1	-	1	1
ADB	1	1	-	2	2


**STANDARDS**

Mounting interface	ISO 4401-03
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 5 \text{ Nm}$ knurled nut

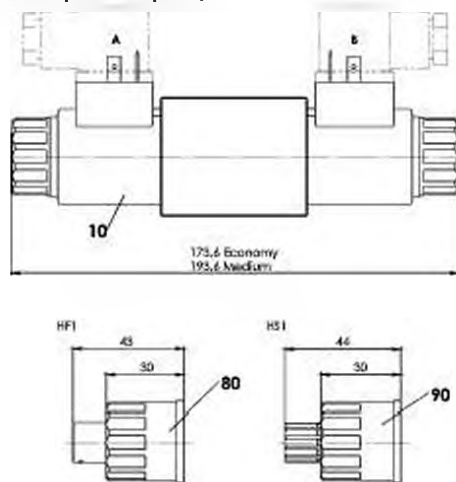
**Note!**


The length of the fixing screw depends on the base material of the connection element.

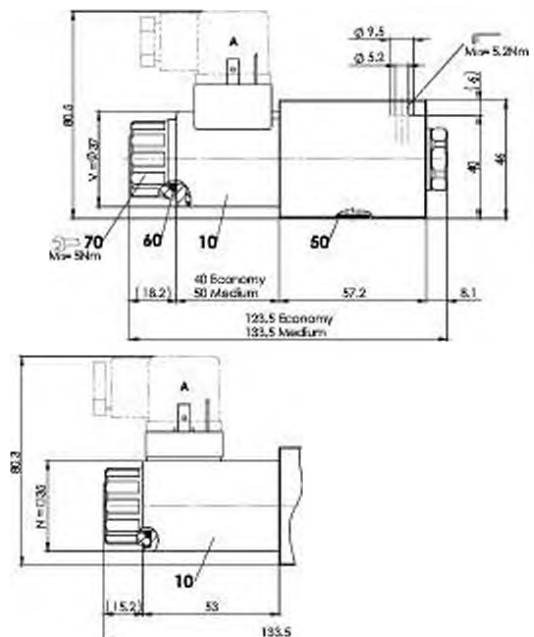
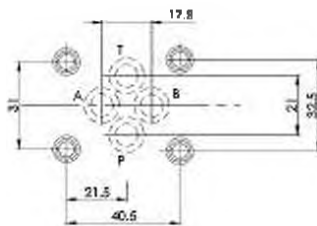
**DIMENSIONS**

4/3-way valve (spring centred)

4/2-way valve (impulse)



4/2-way valve (spring reset)


**HYDRAULIC CONNECTION**

**MANUAL OVERRIDE**

- ◆ Integrated (-) Actuation pin integrated in the armature tube. Actuation by pressing the pin
- ◆ Push-button (HF1) Integrated in the knurled nut. Actuation by pressing the push-button
- ◆ Spindle (HS1) Integrated in the knurled nut. Actuation by turning the spindle (continuously variable valve actuation)

**Attention!** The actuation of the manual override is possible up to a tank pressure of:

- 40 bar Integrated (-)
- 40 bar Push-button (HF1)
- 100 bar Spindle (HS1)


**PARTS LIST**

Position	Article	Description
10	206.2...	V.E37 / 19 x 40 V.E37 / 19 x 50
	260.5...	N.S35 / 19 x 50
50	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
60	160.2187	O-ring ID 18,72 x 2,62 (NBR)
	160.6187	O-ring ID 18,72 x 2,62 (FKM)
70	154.2700	Knurled nut
80	253.7001	Push-button
90	253.7000	Spindle

**ACCESSORIES**

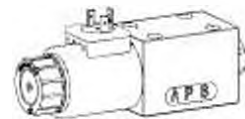
Mating connector gray (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Mounting screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**Solenoid operated spool valve**
**Flange construction**

- ◆ 4/2-way impulse execution, detented
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{n,m} = 80 \text{ l/min}$
- ◆  $p_{n,m} = 350 \text{ bar}$

**NG6**

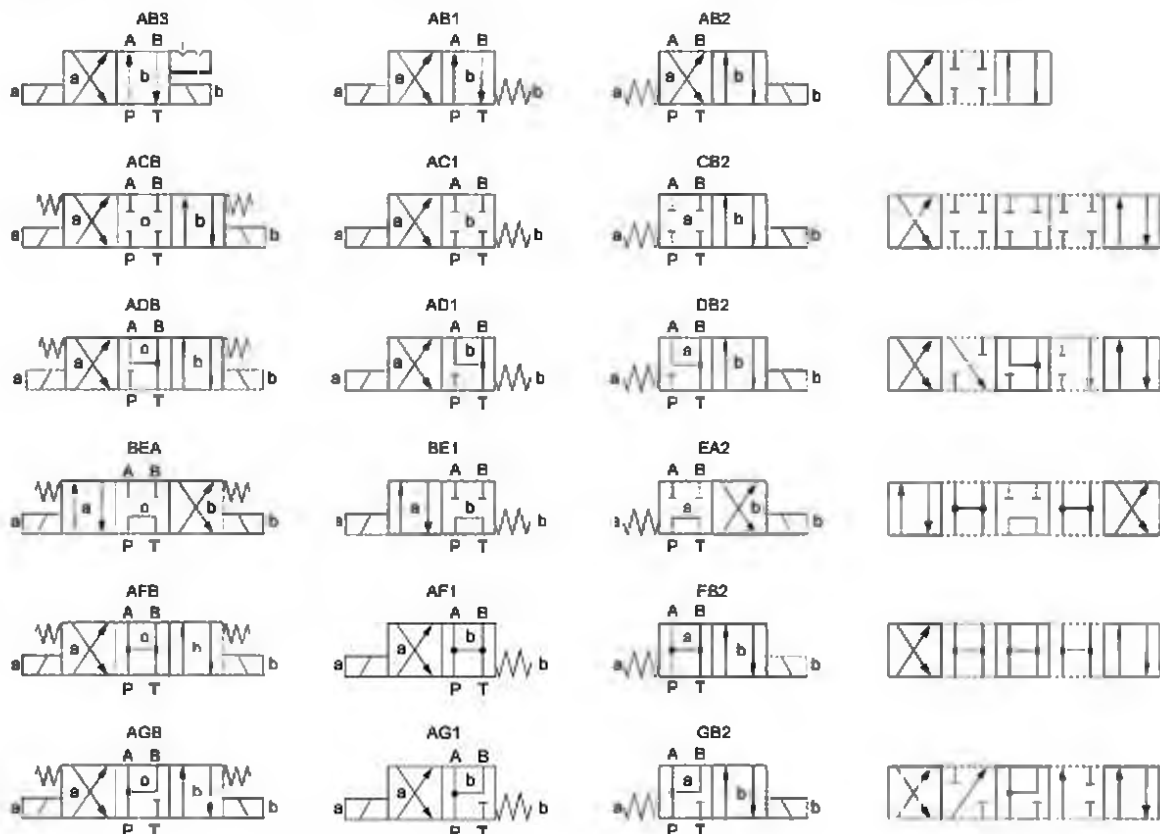
ISO 4401-03


**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. Spool detented or with spring reset. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the impulse spool (4/2), the spool is held in the switching position by the detent. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, valve body from high quality hydraulic cast steel. Wide range of standard and special voltages.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. Switching performance and leakage of the valves must be taken into account when designing the system. Solenoid spool valves are suitable for machine tools and handling systems of any kind.

**SYMBOL**


**TYPE CODE**

Spool valve, direct operated		WD M F A06 - [ ] - [ ] / [ ] [ ] - [ ] [ ] # [ ]	
Slip-on coil, Medium			
Flange construction			
International standard interface ISO, NG6			
Designation of symbols acc. to table			
Nominal voltage $U_n$	12 VDC 24 VDC without coil	G12 G24 X5	115 VAC 230 VAC
			R115 R230
Slip-on coil	Metal housing, round Metal housing, square		W M
Connection execution	Connector socket EN 175301-803 / ISO 4400 Connector socket AMP Junior-Timer Connector Deutsch DT04 - 2P		D J E (only for $U_n \leq 75$ VDC) (only for $U_n \leq 75$ VDC)
Sealing material	NBR FKM (Viton)		[ ] DI
Manual override	Integrated Push-button Spindle		[ ] HF1 HS1
Surface protection	Standard Zinc-nickel		[ ] KB
Design index (subject to change)			

1 2-20

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Switching solenoid
Ambient temperature	-25 ... +70 °C if > +50 °C, then no undervoltage is admissible
Weight	1,53 kg (1 solenoid Economy) 2,07 kg (2 solenoids Economy)
MTTFd	150 years

**ACCESSORIES**

Mating connector gray (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Mounting screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 50
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2$ Nm (screw quality 8.8, zinc coated) $M_0 = 5$ Nm knurled nut

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	W E45 / 23 x 50 (Data sheet 1.1-182) M S45 / 23 x 50 (Data sheet 1.1-181)
Connection	Connector socket EN 175301 - 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 - 2P

**Note!** The length of the fixing screw depends on the base material of the connection element.





**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
Standard nominal voltage	AC = 50 to 60 Hz, rectifier integrated in the connector socket

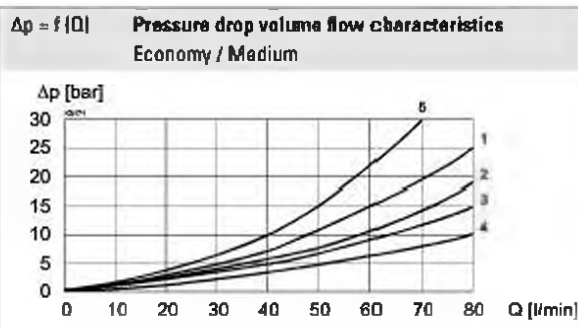
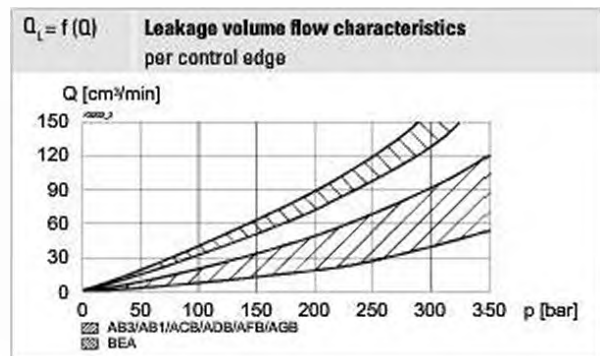
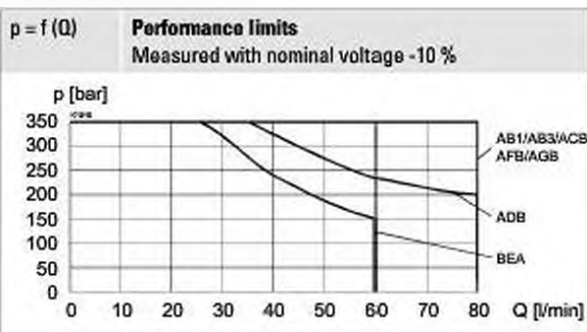
**Note!** Other electrical specifications see data sheet 1.1-182 (slip-on coil W) and 1.1-181 (slip-on coil M)


**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{T,max} = 200$ bar
Maximum volume flow	$Q_{max} = 80$ l/min, see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s



Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1 / AB2 / AB3	2	2	-	1	1
ACB / AC1 / CB2	2	2	-	1	1
ADB / AD1 / DB2	2	2	-	3	3
BEA / BE1 / EA2	2	2	5	2	2
AFB / AF1 / FB2	4	4	-	3	3
AGB / AG1 / GB2	4	4	-	1	1

**STANDARDS**

Mounting interface	ISO 4401-03
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

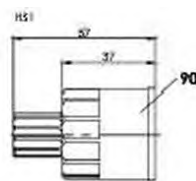
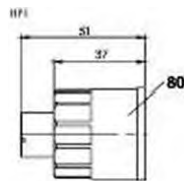
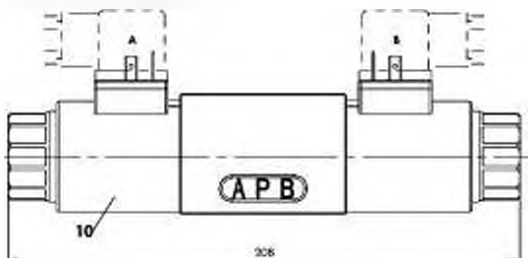
**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

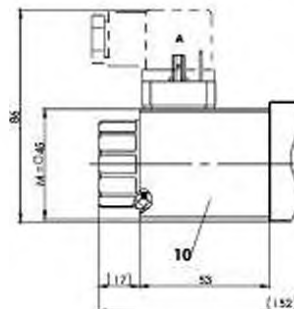
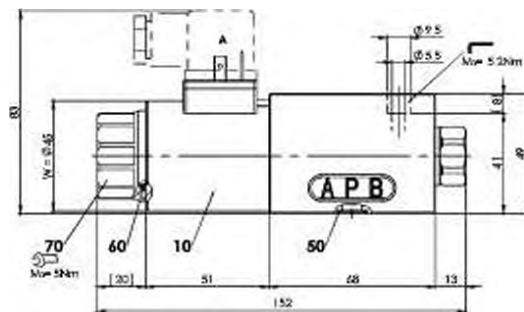
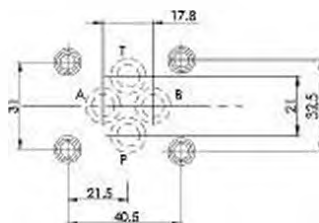
**DIMENSIONS**

4/3-way valve (spring centred)

4/2-way valve (impulse)



4/2-way valve (spring reset)


**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	206.1...	W.E45 / 23 x 50
	206.7...	M.S45 / 23 x 50
50	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
60	160.2222	O-ring ID 22,22 x 2,62 (NBR)
	160.6222	O-ring ID 22,22 x 2,62 (FKM)
70	154.2701	Knurled nut M23 x 1,5 x 19,7
80	253.7004	Push-button
90	253.7002	Spindle

**MANUAL OVERRIDE**

- ◆ Integrated (-) Actuation pin integrated in the armature tube. Actuation by pressing the pin
- ◆ Push-button (HF1) Integrated in the knurled nut. Actuation by pressing the push-button
- ◆ Spindle (HS1) Integrated in the knurled nut. Actuation by turning the spindle (continuously variable valve actuation)

**Attention!** The actuation of the manual override is possible up to a tank pressure of:



- 40 bar Integrated (-)
- 40 bar Push-button (HF1)
- 100 bar Spindle (HS1)

**SURFACE TREATMENT**
**Standard:**

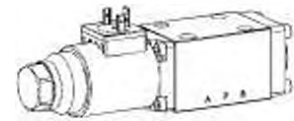
- The valve body is painted with a two component paint
- The armature tube, the slip-on coil and the plug screw are zinc-nickel coated

**Optionally (K8):**

- All external parts are zinc-nickel coated
- ISO 9227 (800 h) salt spray test

**Solenoid operated spool valve stainless**
**Flange construction**

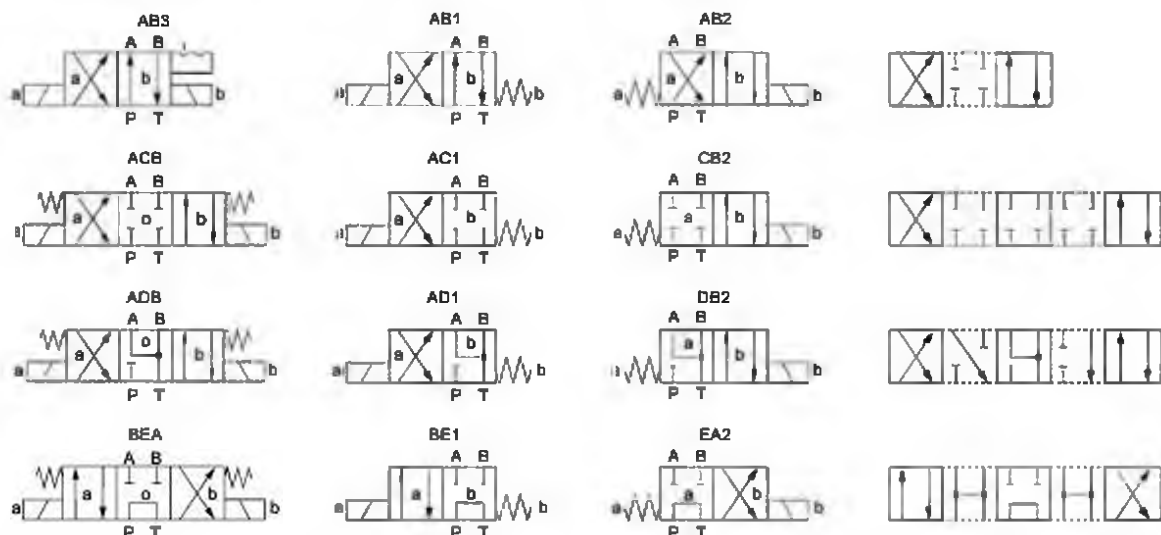
- ◆ 4/2-way impulse execution, detented
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 50 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**NG6**
**ISO 4401-03**

**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the impulse spool (4/2), the spool is held in the switching position by the detent.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol. The stainless execution is especially suitable for the use in wet and salty environment.

**SYMBOL**

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C if > +50 °C, then no undervoltage is admissible
Weight	1,53 kg (1 solenoid Economy) 2,07 kg (2 solenoids Economy)
MTTFd	150 years

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	WE45 / 23 x 50 (Data sheet 1.1-182) M.545 / 23 x 50 (Data sheet 1.1-181)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**TYPE CODE**

		WD M F A06 - [ ] - [ ] / [ ] [ ] - [ ] K9 # [ ]	
Spool valve, direct operated			
Slip-on coil, Medium			
Flange construction			
International standard interface ISO, NG8			
Designation of symbols acc. to table			
Nominal voltage $U_n$	12 VDC 24 VDC without coil	G12 G24 X5	115 VAC 230 VAC
			R115 R230
Slip-on coil	Metal housing, round Metal housing, square		W M
Connection execution	Connector socket EN 175301-803 / ISO 4400 Connector socket AMP Junior-Timer Connector Deutsch DT04 - 2P		D J G (only for $U_n \leq 75$ VDC) (only for $U_n \leq 75$ VDC)
Sealing material	NBR FKM (Viton) NBR 872		[ ] D1 y-2804
Stainless			
Design index (subject to change)			

**ELECTRICAL SPECIFICATIONS**

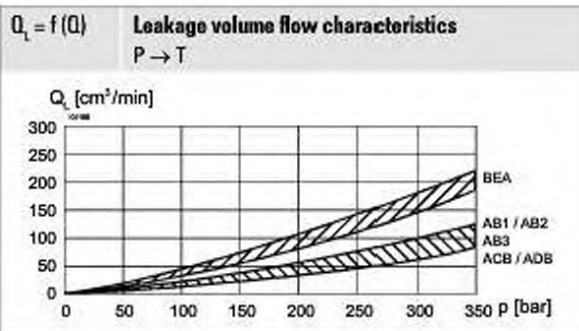
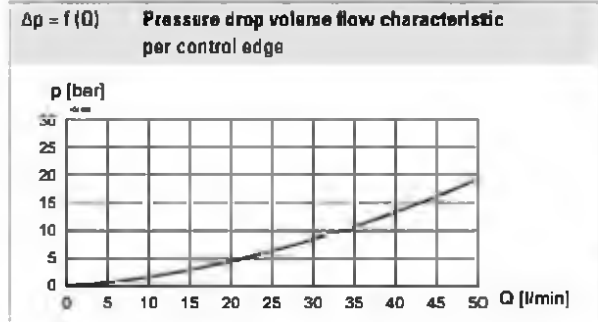
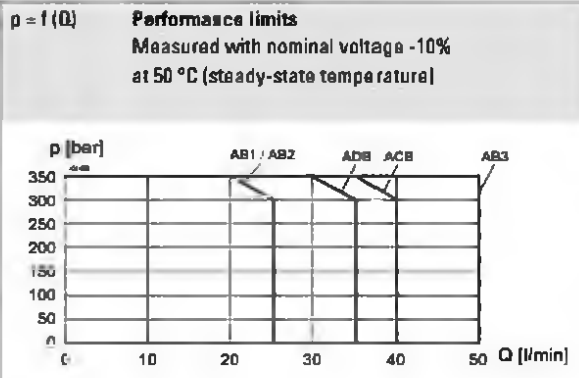
Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	$10^7$ (number of switching cycles, theoretically)
Voltage tolerance	$\pm 10$ % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
	AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-182 (slip-on coil W) and 1.1-181 (slip-on coil M)


**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{stat} = 350$ bar
Tank pressure	$p_{T tank} = 200$ bar
Maximum volume flow	$Q_{stat} = 50$ l/min, see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10 ... 16 $\geq 75$ , see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**Attention!** For valves for the temperature ranges „-40 °C to...“ (Z604) the leakage volume flow can be up to eight times higher.


**ACCESSORIES**

Mating connector gray (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Mounting screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**STANDARDS**

Mounting interface	ISO 4401-03
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_8 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated)

**Note!**

 The length of the fixing screw  $d$  depends on the base material of the connection element.

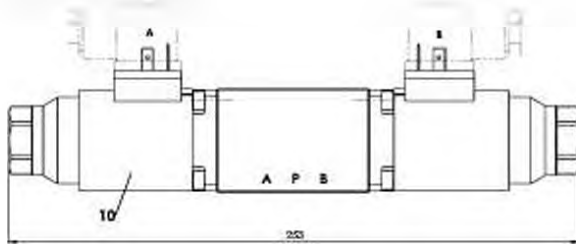
**SURFACE TREATMENT**

- ◆ The valve body, the cover and the socket head screws are made of stainless steel
- ◆ The slip-on coil and the armature tube are zinc nickel coated

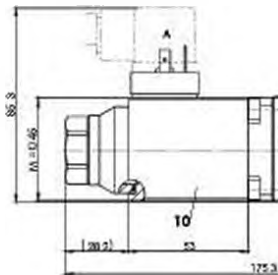
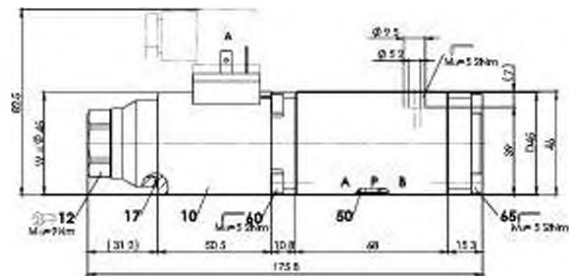
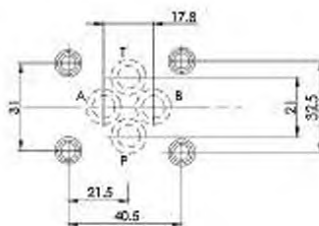
**DIMENSIONS**

4/3-way valve (spring centred)

4/2-way valve (impulse)



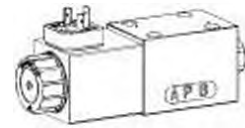
4/2-way valve (spring reset)


**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	206.1...	WE45 / 23 x 50
	206.7...	M.S45 / 23 x 50
12	154.2605	Knurled nut M23 x 1,5 x 31,2
17	160.2330	O-ring ID 33,05 x 1,78 (NBR)
50	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
60	246.2512	Socket head screw M5 x 12 A4 DIN 912
65	246.2516	Socket head screw M5 x 16 A4 DIN 912

**Solenoid operated spool valve**
**Flange construction**

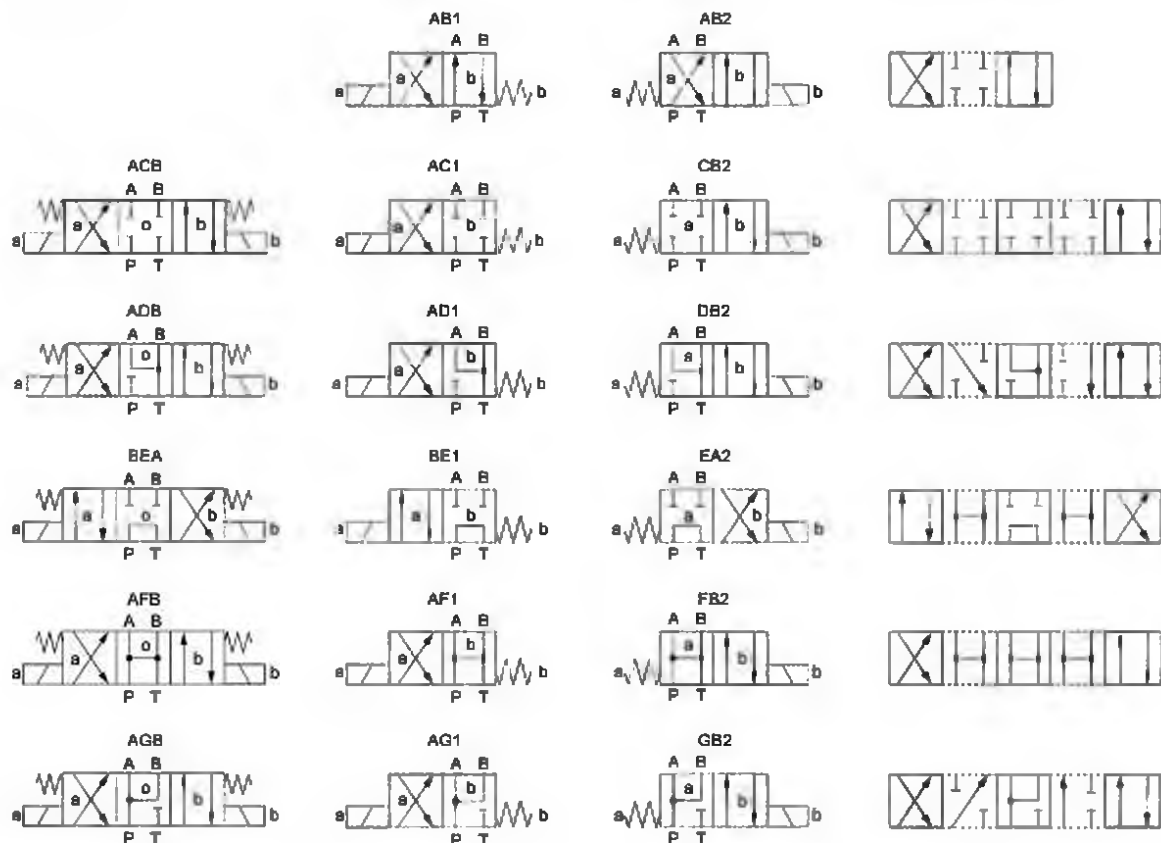
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG6**
**ISO 4401-03**

**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). Precise spool fit, low leakage, long service life time. Spool made from hardened steel, body from high quality hydraulic cast steel. Wide range of standard and special voltages.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol. Switching performance limits and leakage of the valves must be taken into account when designing the system. Solenoid operated spool valves are suitable for machine tools and handling systems of any kind.

**SYMBOL**


**TYPE CODE**

Spool valve, direct operated		W D M F A06 - [ ] - [ ] / LB / M [ ] - [ ] # [ ]	
Slip-on coil, Medium			
Flange construction			
International standard interface ISO, NG6			
Designation of symbols acc. to table			
Nominal voltage $U_n$	12 VDC G12 24 VDC G24	115 VAC R115 230 VAC R230	
Nominal power $P_n$	8 Watt		
Slip-on coil	Metal housing, square		
Connection execution	Connector socket EN 175301-803 / ISO 4400 [D] Connector socket AMP Junior-Timer [J] Connector Deutsch DT04 - 2P [E]	[only for $U_n \leq 75$ VDC] [only for $U_n \leq 75$ VDC]	
Sealing material	NBR FKM (Viton)	[D1]	
Manual override	Integrated Push-button Spindle	[HF1] [HS1]	
Design index (subject to change)			

1.2-40

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Switching solenoid
Ambient temperature	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM) if > +50 °C, then no undervoltage is admissible
Weight	1.70 kg (1 solenoid) 2.50 kg (2 solenoids)
MTTFd	150 years

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 50
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 5,2$ Nm (screw quality 8.8, zinc coated) Fixing screws $M_0 = 7$ Nm knurled nut

**Note!** The length of the fixing screw depends on the base material of the connection element.


**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	M.S45 / 23 x 50 (Data sheet 1.1-181)
Connection	Connector socket EN 175301 - 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 - 2P

**ACCESSORIES**

Mating connector gray (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Mounting screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430



**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal power	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz, rectifier integrated in the connector socket

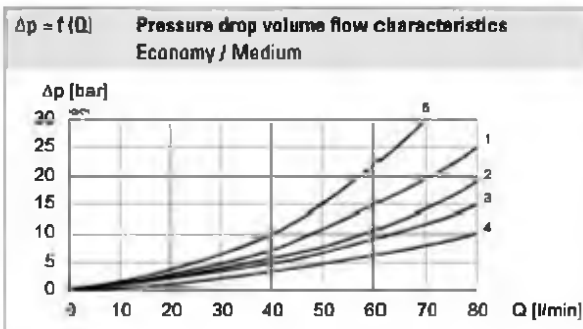
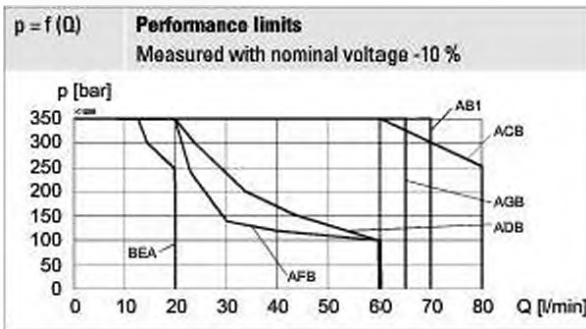
**Note!** Other electrical specifications see data sheet 1.1-181


**HYDRAULIC SPECIFICATIONS**

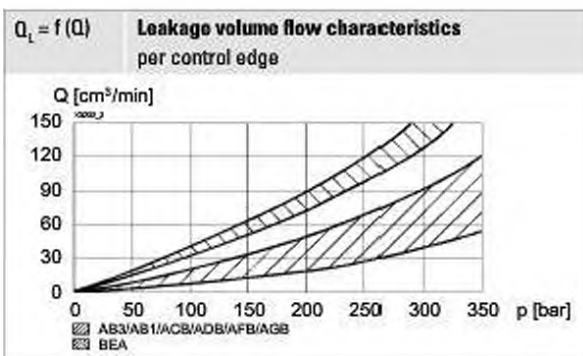
Working pressure	$p_{\text{max}} = 350$ bar
Tank pressure	$p_{\text{Tmax}} = 200$ bar
Maximum volume flow	$Q_{\text{max}} = 80$ l/min, see characteristics
Leakage volume flow	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-20...+70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

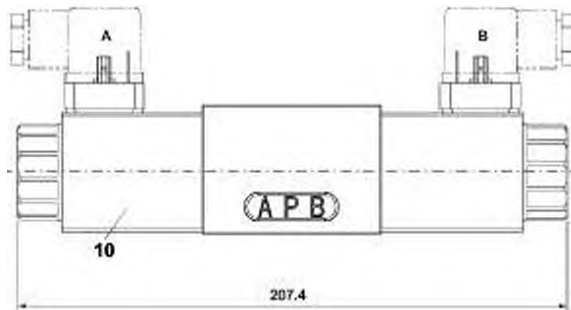


Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1 / AB2	2	2	-	1	1
ACB / AC1 / CB2	2	2	-	1	1
ADB / AD1 / DB2	2	2	-	3	3
BEA / BE1 / EA2	2	2	5	2	2
AFB / AF1 / FB2	4	4	-	3	3
AGB / AG1 / GB2	4	4	-	1	1

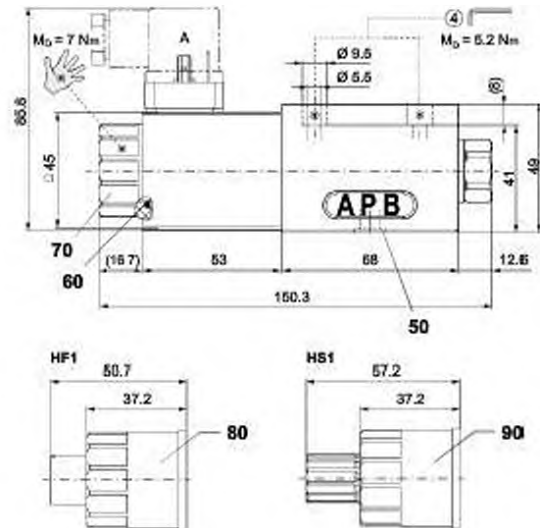
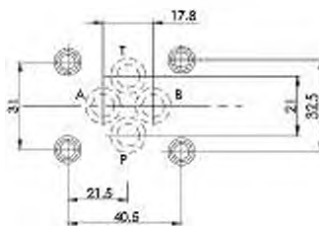


**DIMENSIONS**

4/3-way valve (spring centred)



4/2-way valve (spring reset)


**HYDRAULIC CONNECTION**

**MANUAL OVERRIDE**

- ◆ Integrated (–) Actuation pin integrated in the armature tube. Actuation by pressing the pin
- ◆ Push-button (HF1) Integrated in the knurled nut. Actuation by pressing the push-button
- ◆ Spindle (HS1) Integrated in the knurled nut. Actuation by turning the spindle (continuously variable valve actuation)

**Attention!** The actuation of the manual override is possible up to a

tank pressure of:

40 bar Integrated (–)

40 bar Push-button (HF1)

100 bar Spindle (HS1)


**STANDARDS**

Mounting interface	ISO 4401-03
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803

**PARTS LIST**

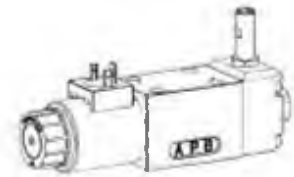
Position	Article	Description
10	206.7...	M.S45 / 23 x 50
50	160.2093	O-ring ID 9.25 x 1.78 (NBR)
	160.6092	O-ring ID 9.25 x 1.78 (FKM)
60	160.2222	O-ring ID 22.22 x 2.62 (NBR)
70	154.2701	Knurled nut
80	253.7004	Push-button
90	253.7002	Spindle

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The screw plug is zinc coated
- ◆ The slip-on coil and the armature tube are zinc-nickel coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**Solenoid operated spool valve with inductive switching position monitoring**
**NG6**  
 ISO 4401-03

**Flange construction**

- ◆ 4/2-way impulse execution, detented
- ◆ 4/3-way with spring centered mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**DESCRIPTION**

Spool valve according to data sheet 1.2-59 with additional inductive switching position monitoring. The contactless sensor transmits the spool position to a step signal.

**TYPE CODE**

<b>Spool valve, direct operated</b>	WD M F A06 - <input style="width: 100px;" type="text"/>
<b>Slip-on coil Medium</b>	
<b>Flange construction</b>	
<b>International standard interface ISO NG6</b>	
<b>Other type designation according to type code data sheet 1.2-59</b>	
<b>Polarity / Signal output / Monitoring</b>	
PNP / NO / Single	<input type="checkbox"/> Z603
PNP / NC / Single	<input type="checkbox"/> Z482
NPN / NO / Single	<input type="checkbox"/> Z680
PNP / NO / Double*	<input type="checkbox"/> Z72 / Z803
PNP / NC / Double*	<input type="checkbox"/> Z72 / Z482
NPN / NO / Double*	<input type="checkbox"/> Z72 / Z680
*not in combination with 4/3-way (spring centred)	
<b>Design index (subject to change)</b>	

**GENERAL SPECIFICATIONS**

Weight	0,5 kg single flange 1,0 kg double flange
--------	--

**Sensor Specifications:**

Nominal voltage	24 VDC
Operating voltage	10...30 VDC
Signal current	max. 200 mA
Switching frequency	2000 Hz
Protection class	IP 68
	According to the connection type, the protection class of the valve can be lower, see data sheet 1.2-59

Dimensions	M12 x 1
Ambient temperature	-25... 50 °C
Fastening torque	15 Nm
Peak pressure	500 bar

**Note!** Other specifications see data sheet 1.2-59


**ACCESSORIES**

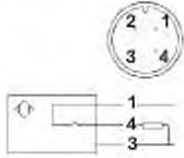
Mating connector (plug female)	
straight, screw terminal	Article no. 219.2978
90°, screw terminal	Article no. 219.3003

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ All the other parts are zinc-nickel coated

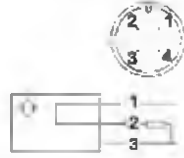
**ELECTRICAL CONNECTION**

Type:	PNP, NO (Normally open)
Designation:	Z603
Article no.:	205.5024
Device receptacle	M12, 4 pole male
Mating connector	M12, 4 pole female
	1 = Supply voltage + 2 = Reserved for extensions 3 = Supply voltage 0 VDC 4 = Signal
	Plus switched




Mating connector not included in delivery

Type:	PNP, NC (Normally closed)
Designation:	Z482
Article no.:	205.5023
Device receptacle	M12, 4 pole male
Mating connector	M12, 4 pole female
	1 = Supply voltage + 2 = Signal 3 = Supply voltage 0 VDC 4 = Reserved for extensions
	Plus switched



Mating connector not included in delivery

Type:	NPN, NO (Normally open)
Designation:	Z680
Article no.:	205.5026
Device receptacle	M12, 4 pole male
Mating connector	M12, 4 pole female
	1 = Supply voltage + 2 = Reserved for extensions 3 = Supply voltage 0 VDC 4 = Signal
	Minus switched



Mating connector not included in delivery

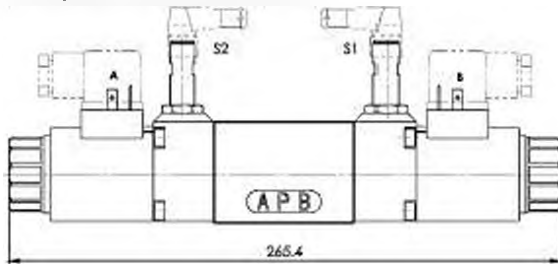
**Signal characteristics**

Signal of the actuator		Signal of the sensor			
		NO Normally open		NC Normally closed	
A	B	S1	S2	S1	S2
0*	0*	0*	0*	1*	1*
0	1	0	1	1	0
1	0	1	0	0	1

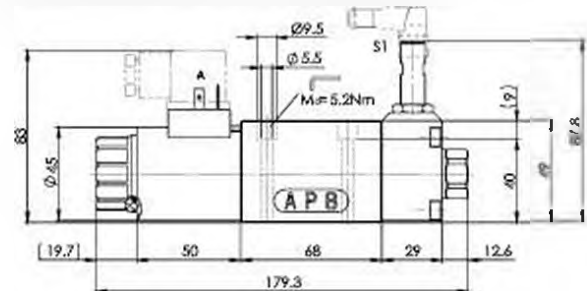
\*Middle position 4/3-way

**DIMENSIONS / SINGLE MONITORING**

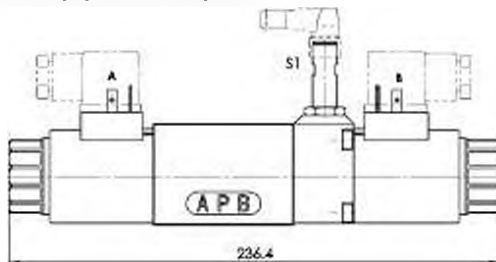
4/3-way spool valve (spring centred)



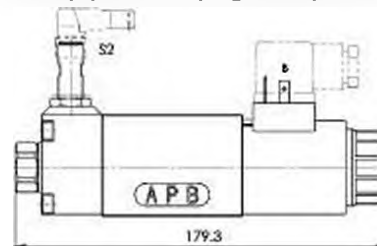
4/2-way spool valve (spring reset) operation A-side



4/2-way spool valve (impulse)

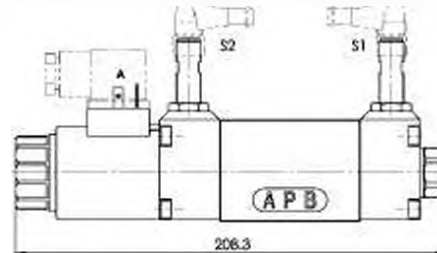


4/2-way spool valve (spring reset) operation B-side

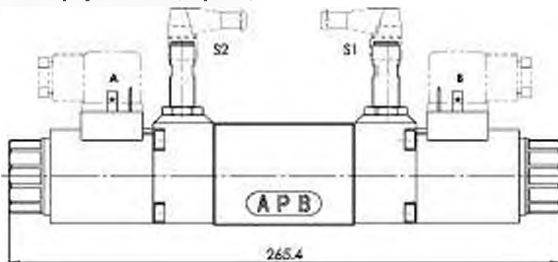


**DIMENSIONS / DOUBLE MONITORING**

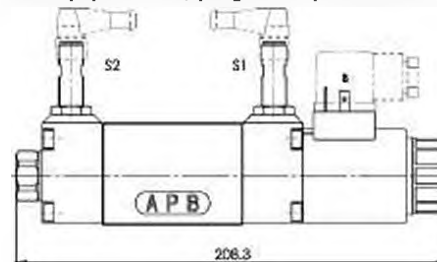
4/2-way spool valve (spring reset) operation A-side



4/2-way spool valve (impulse)



4/2-way spool valve (spring reset) operation B-side

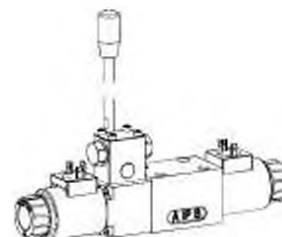


**Solenoid operated spool valve with additional hand lever actuation**

**Flange construction**

- ◆ 4/3-way with spring centered mid position
- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**NG6**  
ISO 4401-03



**DESCRIPTION**

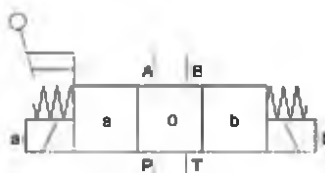
Spool valve according to data sheet 1.2-59 with additional hand lever actuation.

**Note!** The standard valve cannot be retrofitted.



**SYMBOL**

Overview spool types see data sheet 1.2-59

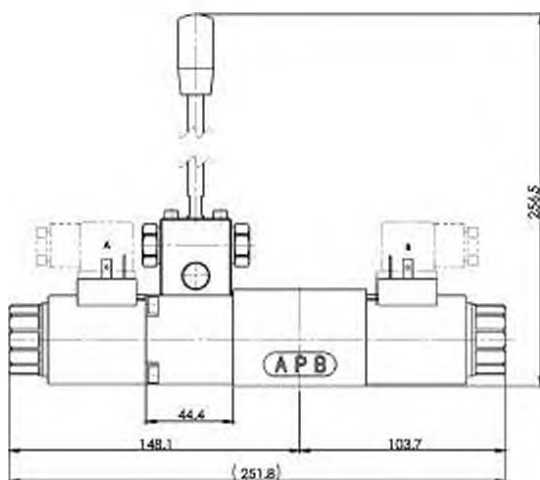


**TYPE CODE**

Spool valve, direct operated	WD M F A06 -	2568 # 2
Slip-on coil Medium		
Flange construction		
International standard interface ISO NG6		
Other type designation according to type code data sheet 1.2-59		
Hand lever		
Design index (subject to change)		

1.2-63

**DIMENSIONS**



**GENERAL SPECIFICATIONS**

Weight WDMFA06 +1,0 kg

**Note!** Other specifications, see data sheet 1.2-59



**SURFACE TREATMENT**

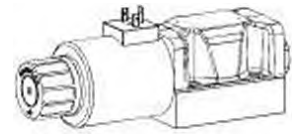
- ◆ The flange, the housing and the lever are zinc-nickel coated

**Solenoid operated spool valve**
**Flange construction**

- ◆ 4/2-way impulse execution, detented
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 160 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**NG10**

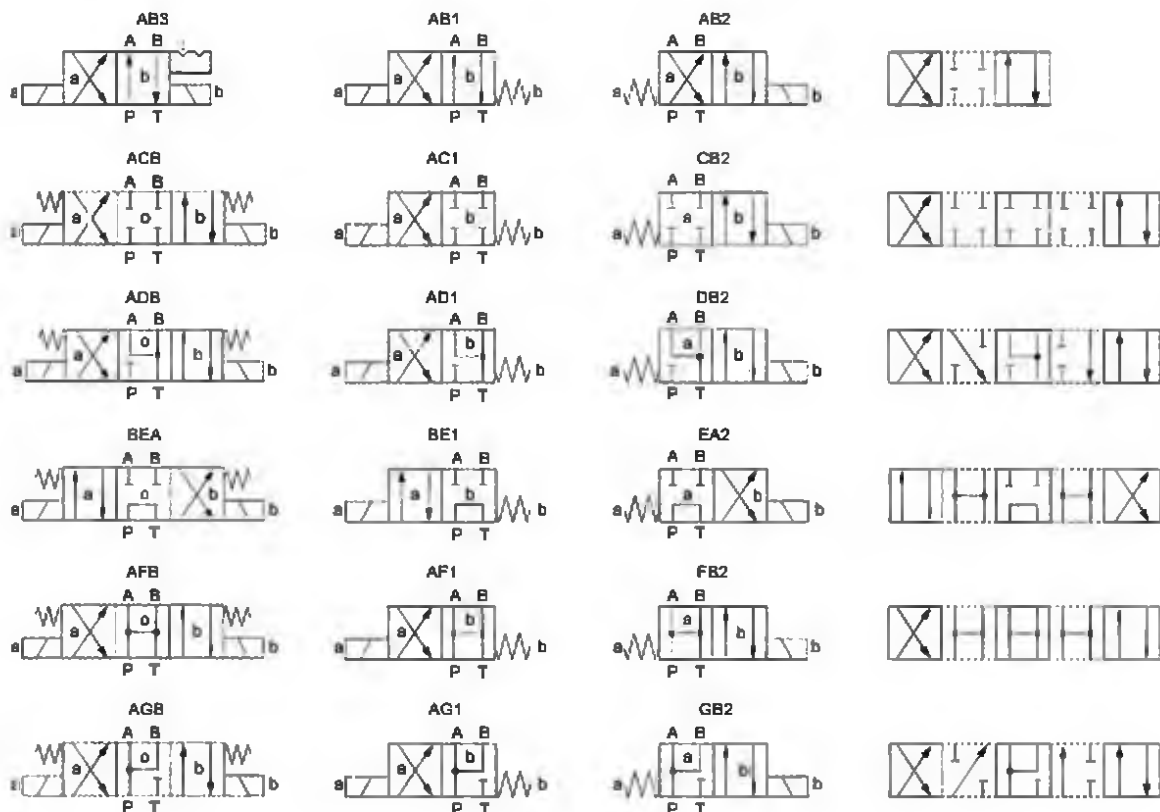
ISO 4401-05


**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. Spool detented or with spring reset. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the impulse spool (4/2), the spool is held in the switching position by the detent. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, valve body from high quality hydraulic cast steel. Wide range of standard and special voltages.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. Switching performance and leakage of the valves must be taken into account when designing the system. Solenoid spool valves are suitable for machine tools and handling systems of any kind.

**SYMBOL**


**TYPE CODE**

		WD M F A10 - [ ] - [ ] / [ ] [ ] - [ ] [ ] # [ ]	
Spool valve, direct operated			
Slip-on coil, medium			
Flange construction			
International standard interface ISO, NG10			
Designation of symbols acc. to table			
Nominal voltage $U_n$	12 VDC <input type="checkbox"/> G12 24 VDC <input type="checkbox"/> G24 without coil <input type="checkbox"/> X5 115 VAC <input type="checkbox"/> R115 230 VAC <input type="checkbox"/> R230		
Slip-on coil	Metal housing, round <input type="checkbox"/> W Metal housing, square <input type="checkbox"/> M (only G12 and G24)		
Connection execution	Connector socket EN 175301-803 / ISO 4400 <input type="checkbox"/> D Connector socket AMP Junior-Timer <input type="checkbox"/> J Connector Deutsch DT04 - 2P <input type="checkbox"/> G (only for $U_n \leq 75$ VDC) (only for $U_n \leq 75$ VDC)		
Sealing material	NBR <input type="checkbox"/> FKM (Viton) <input type="checkbox"/> DI		
Manual override	Integrated <input type="checkbox"/> Push-button <input type="checkbox"/> HF1 Spindle <input type="checkbox"/> HST		
Surface protection	Standard <input type="checkbox"/> Zinc-nickel <input type="checkbox"/> KR		
Design index (subject to change)			

12-28

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C if > +50 °C, then no undervoltage is admissible
Weight	3,90 kg (1 solenoid) 5,40 kg (2 solenoids)
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Switching frequency	6 000 / h
Service life time	$10^7$ (number of switching cycles, theoretically)
Voltage tolerance	$\pm 10$ % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC, 115 VAC, 230 VAC

**Note!**


Other electrical specifications see data sheet 1.1-190 (slip-on coil W) and 1.1-193 (slip-on coil M)



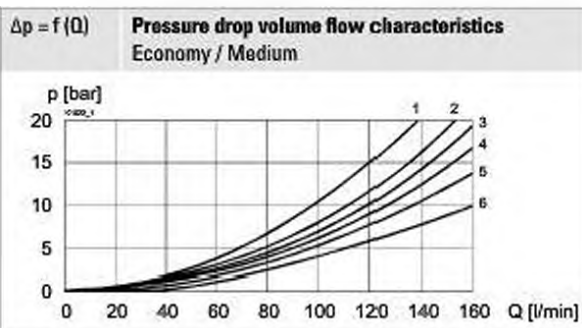
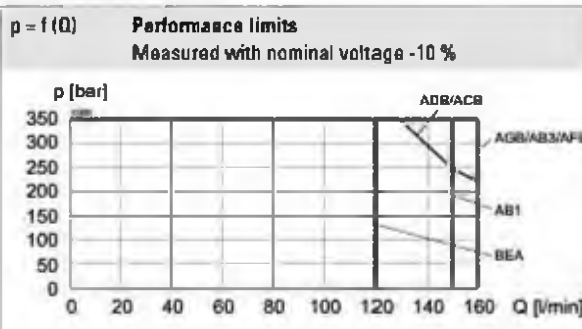
**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	W E64 / 31 x 72 (Data sheet 1.1-190) M A60 / 31 x 72 (Data sheet 1.1-193)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

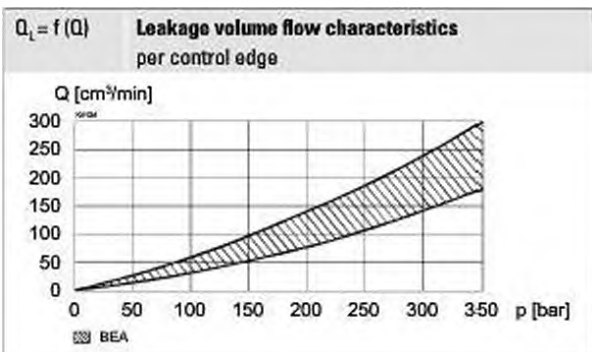
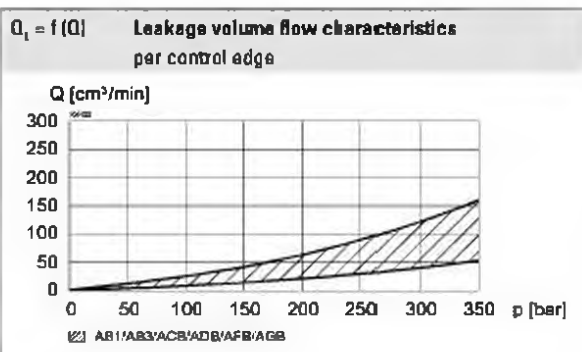
**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{T,max} = 160$ bar
Maximum volume flow	$Q_{max} = 160$ l/min, see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s


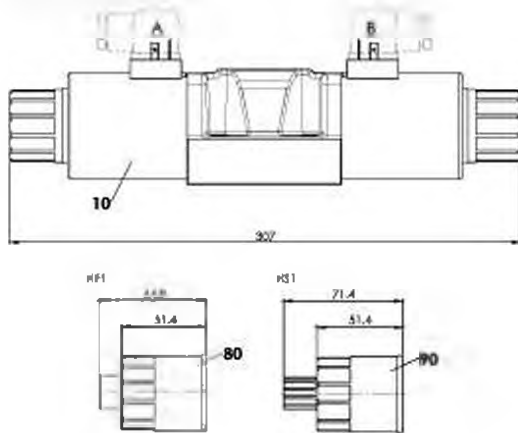
Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1 / AB2 / AB3	5	5	-	3	2
ACB / AC1 / CB2	5	5	-	3	2
ADB / AD1 / DB2	5	5	-	5	4
BEA / BE1 / EA2	3	3	1	3	2
AFB / AF1 / FB2	6	6	6	5	4
AGB / AG1 / GB2	6	6	-	3	2



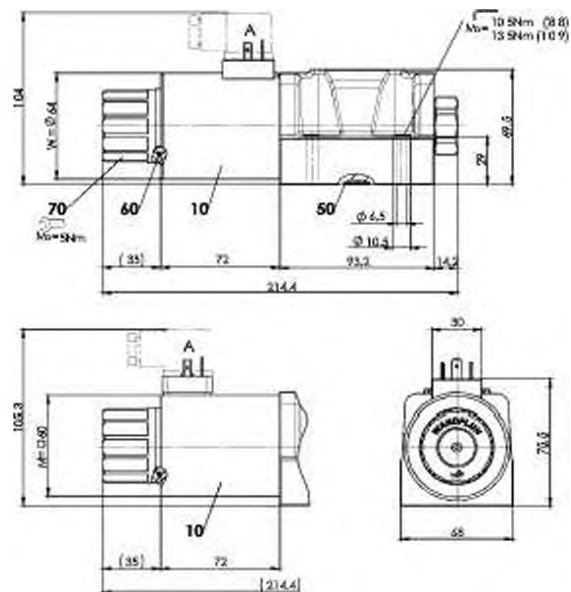
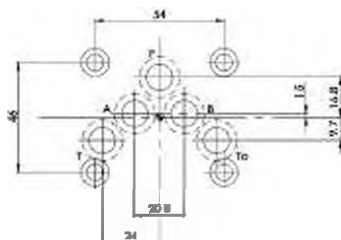
**DIMENSIONS**

4/3-way valve (spring centred)

4/2-way valve (impulse)



4/2-way valve (spring reset)


**HYDRAULIC CONNECTION**

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**PARTS LIST**

Position	Article	Description
10	206.3...	WE64 / 31 x 72
	260.9...	M. 60 / 31 x 72
50	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.8124	O-ring ID 12,42 x 1,78 (FKM)
60	160.2282	O-ring ID 28 24 x 2.62 (NBR)
70	154.2706	Knurled nut
80	253.7006	HF1-M24
90	253.7005	HS1-M24

**SURFACE TREATMENT**
**Standard:**

- The valve body is painted with a two component paint
- The armature tube, the slip-on coil and the plug screw are zinc-nickel coated

**Optionally (K8):**

- All external parts are zinc-nickel coated
- ISO 9227 (800 h) salt spray test

## MANUAL OVERRIDE

- ◆ Integrated (-) Actuation pin integrated in the armature tube. Actuation by pressing the pin
- ◆ Push-button (HF1) Integrated in the knurled nut. Actuation by pressing the push-button
- ◆ Spindle (HS1) Integrated in the knurled nut. Actuation by turning the spindle (continuously variable valve actuation)

**Attention!** The actuation of the manual override is possible up to a



tank pressure of:  
 20 bar Integrated (-)  
 20 bar Push-button (HF1)  
 80 bar Spindle (HS1)

## ACCESSORIES

Mating connector grey (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Horizontal mounting blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

## STANDARDS

Mounting interface	ISO 4401-05
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

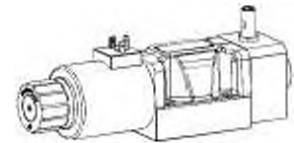
## INSTALLATION NOTES

Mounting type	Flange mounting 4 fixing holes for socket head screws M6 x 40
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screw $M_0 = 10,5 \text{ Nm} \pm 10 \%$ (screw quality 8.8, zinc coated) max. tank pressure 80 bar $M_0 = 13,5 \text{ Nm} \pm 10 \%$ (screw quality 10.9, zinc coated) Knurled nut $M_0 = 5 \text{ Nm}$

**Note!**



The length of the fixing screw depends on the base material of the connection element.

**Solenoid operated spool valve with inductive switching position monitoring**
**NG10**  
 ISO 4401-05

**Flange construction**

- ◆ 4/2-way impulse execution, dented
- ◆ 4/3-way with spring centered mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 160 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**DESCRIPTION**

Spool valve according to data sheet 1.2-76 with additional inductive switching position monitoring. The contactless sensor transmits the spool position to a step signal.

**TYPE CODE**

Spool valve, direct operated	WD	M	F	A10	-	<input type="text"/>	<input type="text"/>	<input type="checkbox"/>
Slip-on coil Medium								
Flange construction								
International standard interface ISO NG10								
Other type designation according to type code data sheet 1.2-76								
Polarity / Signal output / Monitoring								
PNP / NO / Single						Z803		
PNP / NC / Single						Z482		
NPN / NO / Single						Z680		
PNP / NO / Double*						Z72 / Z803		
PNP / NC / Double*						Z72 / Z482		
NPN / NO / Double*						Z72 / Z680		
*not in combination with 4/3-way (spring centred)								
Design index (subject to change)								

**GENERAL SPECIFICATIONS**

Weight	1,30 kg single flange 2,60 kg double flange
--------	--

**Sensor Specifications:**

Nominal voltage	24 VDC
Operating voltage	10...30 VDC
Signal current	max. 200 mA
Switching frequency	2000 Hz
Protection class	IP 68
	According to the connection type, the protection class of the valve can be lower, see data sheet 1.2-76
Dimensions	M12 x 1
Ambient temperature	-25... 50 °C
Fastening torque	15 Nm
Peak pressure	500 bar

**Note!** Other specifications see data sheet 1.2-76

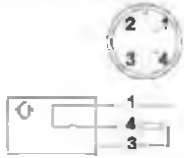

**ACCESSORIES**

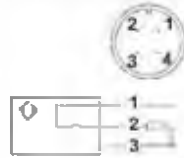
Mating connector (plug female)	
straight, screw terminal	Article no. 219.2978
90°, screw terminal	Article no. 219.3003

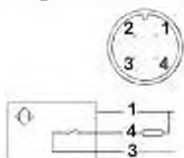
**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ All the other parts are zinc-nickel coated

**ELECTRICAL CONNECTION**

Type:	PNP, NO (Normally open)
Designation:	Z603
Article no.:	205.5024
Device receptacle	M12, 4 pole male
Mating connector	M12, 4 pole female
	1 = Supply voltage + 2 = Reserved for extantions 3 = Supply voltage 0 VDC 4 = Signal Plus switched
	
Mating connector not included in delivery	

Type:	PNP, NC (Normally closed)
Designation:	Z482
Article no.:	205.5023
Device receptacle	M12, 4 pole male
Mating connector	M12, 4 pole female
	1 = Supply voltage + 2 = Signal 3 = Supply voltage 0 VDC 4 = Reserved for extantions Plus switched
	
Mating connector not included in delivery	

Type:	NPN, NO (Normally open)
Designation:	Z680
Article no.:	205.5026
Device receptacle	M12, 4 pole male
Mating connector	M12, 4 pole female
	1 = Supply voltage + 2 = Reserved for extantions 3 = Supply voltage 0 VDC 4 = Signal Minus switched
	
Mating connector not included in delivery	

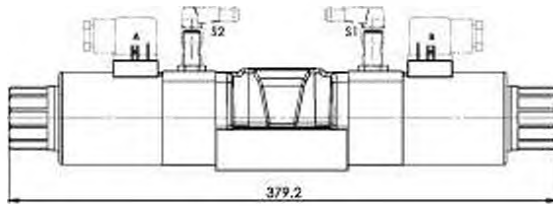
**Signal characteristics**

Signal of the actuator		Signal of the sensor			
		NO Normally open		NC Normally closed	
A	B	S1	S2	S1	S2
0*	0*	0*	0*	1*	1*
0	1	0	1	1	0
1	0	1	0	0	1

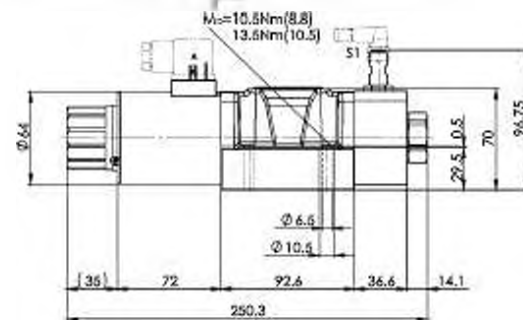
\*Middle position 4/3-way

**DIMENSIONS / SINGLE MONITORING**

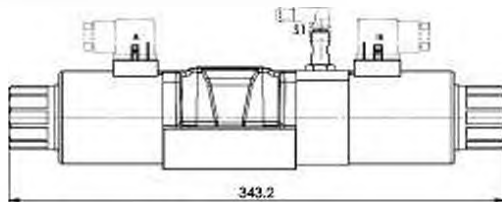
4/3-way spool valve (spring centred)



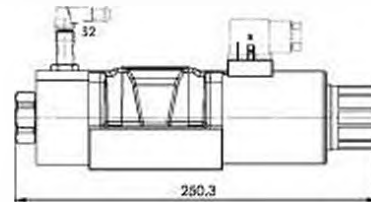
4/2-way spool valve (spring reset) operation A-side



4/2-way spool valve (impulse)

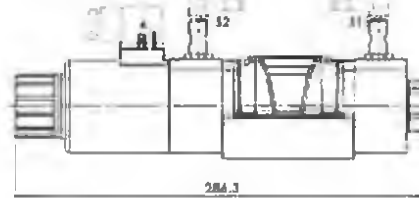


4/2-way spool valve (spring reset) operation B-side

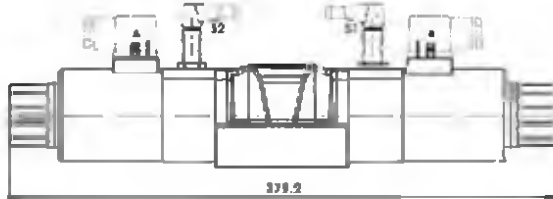


**DIMENSIONS / DOUBLE MONITORING**

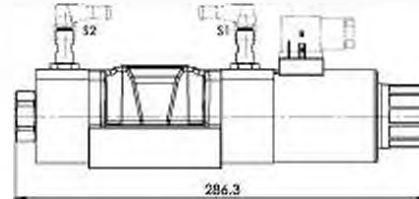
4/2-way spool valve (spring reset) operation A-side



4/2-way spool valve (impulse)

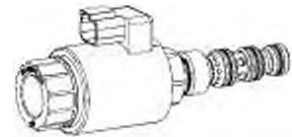
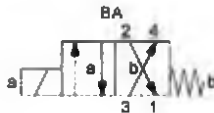


4/2-way spool valve (spring reset) operation B-side



**Solenoid operated spool valve cartridge**
**Screw-in cartridge construction**

- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 38 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**3/8" -14 UNF**
**Wandfluh standard**

**SYMBOL**

**TYPE CODE**

Spool valve, direct operated		W D E PUI0 - BA -			/				#
Slip-on coil Economy									
Screw-in cartridge 7/8" -14 UNF									
Designation of symbol									
Nominal voltage $U_n$	12 VDC	G12	115 VAC	R115					
	24 VDC	G24	230 VAC	R230					
	without coil	X5							
Slip-on coil	Metal housing round			W					
	Metal housing square			M					
Connection execution	Connector socket EN 175301-803 / ISO 4400			D					
	Connector socket AMP Junior-Timer			J	(only for $U_n \leq 75 \text{ VDC}$ )				
	Connector Deutsch DT04 - 2P			G	(only for $U_n \leq 75 \text{ VDC}$ )				
Sealing material	NBR								
	FKM (Viton)			O1					
Design index (subject to change)									

1.2-218

**GENERAL SPECIFICATIONS**

Designation	4/2-spool valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	3/8" -14 UNF according to Wandfluh standard
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C
Weight	0,68 kg
MTTFd	150 years

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	WE45 / 23 x 50 (Data sheet 1.1-182) MS45 / 23 x 50 (Data sheet 1.1-181)
Connection	Connector socket EN 175301 - 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 - 2P

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
Standard nominal voltage	AC = 50 to 60 Hz, rectifier integrated in the connector socket

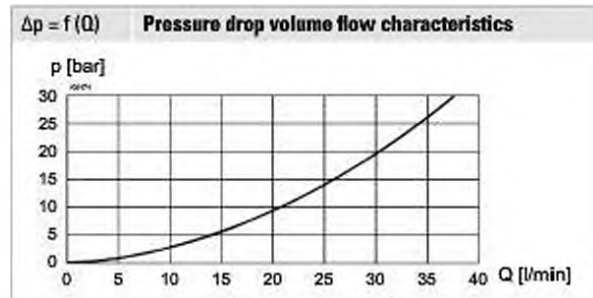
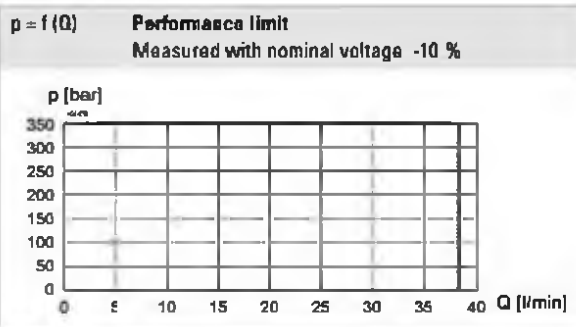
**Note!** Other electrical specifications see data sheet 1.1-182 (slip-on coil W) and 1.1-181 (slip-on coil M)


**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 38$ l/min
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10 ... 16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s


**ACCESSORIES**

Electric plug B (black)	Article no. 219.2002
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge 1/4"-14 UNF
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60$ Nm Screw-in cartridge $M_0 = 5$ Nm knurled nut

**SURFACE TREATMENT**

- ◆ All parts are zinc-nickel coated

**MANUAL OVERRIDE**

None

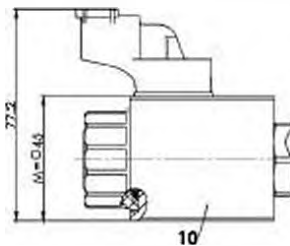
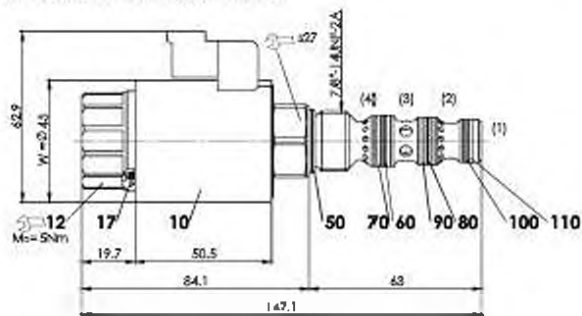
**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

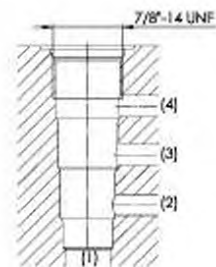


**DIMENSIONS**

4/2-way spool valve (spring reset)


**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard


**Attention!** For detailed cavity drawing and cavity tools see data sheet 2.13-1057

**PARTS LIST**

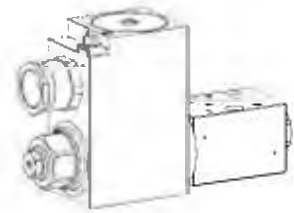
Position	Article	Description
10	206.1...	WE45 / 23 x 50
	206.7 ..	M.S45 / 23 x 50
12	154.2701	Knurled nut M23 x 1,5 x 19,7
17	160.2222	O-ring ID 22,22 x 2,62 (NBR)
50	160.2187	O-ring ID 18,72 x 2,62 (NBR)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
70	049.8196	Backup ring PTSM rd 14,5 x 17,4 x 1,4
80	160.2140	O-ring ID 14,00 x 1,78 (NBR)
90	049.8177	Back-up ring PTSM rd 12,4 x 15,3 x 1,4
100	160.2120	O-ring ID 12,42 x 1,78 (NBR)
110	049.8166	Backup ring PTSM rd 10,8 x 13,7 x 1,4

**Solenoid operated spool valve**
**Flange construction**

- ◆ 4/2-way impulse valve execution detented
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{n,m} = 30$  l/min
- ◆  $p_{n,m} = 350$  bar

**NG4-Mini**
**Wandfluh standard**

- ⊕ II 2 G Ex db IIC T6, T4
- ⊕ II 2 D Ex db III C T60 °C, T130 °C
- ⊕ I M2 Ex db I Mb
- Class I Division 1
- Class I Zone 1


**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the impulse spool (4/2), the spool is held in the switching position by the detent. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol. Miniature valves are used where both, reduced dimensions and weight are important.

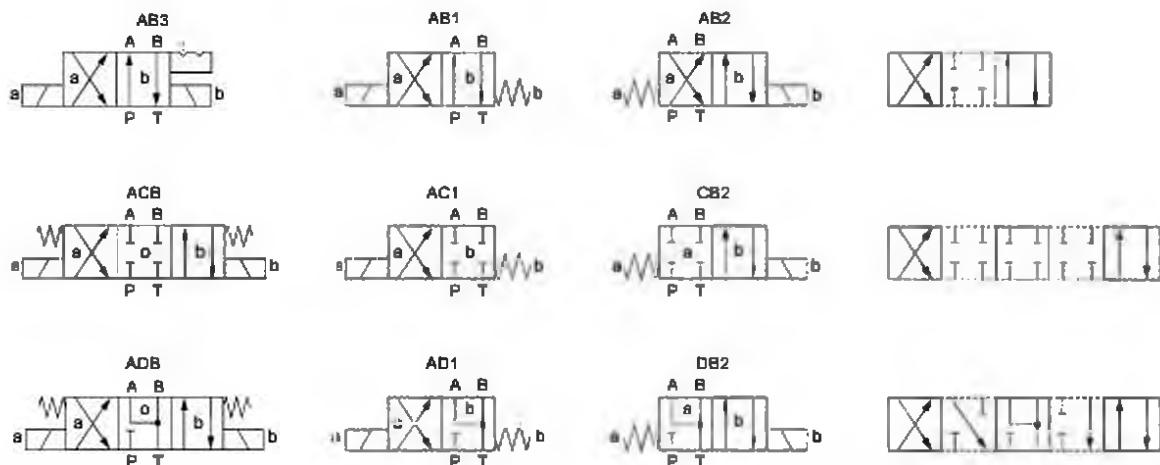
**CERTIFICATES**

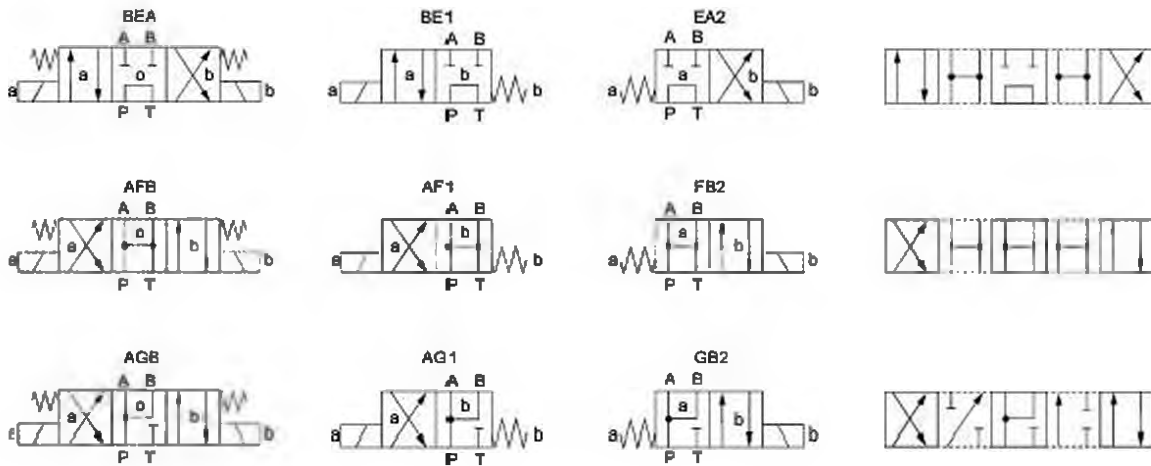
	Surface	Mining	Standard -25 °C to...	Z604 -40 °C to...
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	x
MA		x	x	
UL / CSA	x		x	x

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

**Attention!** The UL execution is always supplied without cable gland


**SYMBOL**


**SYMBOL**

**TYPE CODE**

		WD Y F A04 - [ ] - [ ] - [ ] / [ ] / [ ] - [ ] # [ ]			
Spool valve direct operated		[ ]			
Explosion proof execution Ex d		[ ]			
Flange construction		[ ]			
NG4-Mini to Wandfluh standard		[ ]			
Designation of symbols acc. to table		[ ]			
Spool specification	Standard	[ ]			
	Low Leakage	1/x			
Nominal voltage $U_N$	12 VDC	G12	115 VAC	R115	
	24 VDC	G24	230 VAC	R230	
Nominal power $P_N$	9 W	L9	Ambient temperature up to:		
	15 W	L15	40 °C or 90 °C		
	17 W	L17	70 °C		
		70 °C (only UL / CSA)			
Certification	ATEX, IECEx, CCC, EAC	[ ]			
	Australia	AU	UL / CSA	UL	
	MA	MA			
Sealing material	NBR	[ ]			
	FKM (Viton)	D1			
	NBR -40 °C	y-Z604	(only with 15 W)		
Design index (subject to change)					

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Ex-protection switching solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17) -40...+70 °C (L15 / L17)
Weight	2,6 kg (1 solenoid) 4,4 kg (2 solenoids)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$ ( $p_r < 20 \text{ bar}$ ) $p_{max} = 315 \text{ bar}$ ( $p_r > 20 \text{ bar}$ )
Tank pressure	$p_{Tmax} = 160 \text{ bar}$
Maximum volume flow	$Q_{max} = 30 \text{ l/min}$ , see characteristic
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L9 or L15 / L17) NBR 872 -40...+70 °C (L15 / L17)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade $\beta_{10} \dots 16 \geq 75$ , see data sheet 1.0-50

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Switching frequency	12'000 / h
Voltage tolerance	$\pm 10 \%$ with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz $\pm 2 \%$ , with built-in two-way rectifier
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

**Note!** Other electrical specifications see data sheet 1.1-183 and 1.1-184


**MANUAL OVERRIDE**

HB6 as standard  
 Optionally: HN (K)  
 → see data sheet 1.1-311

**SURFACE TREATMENT**

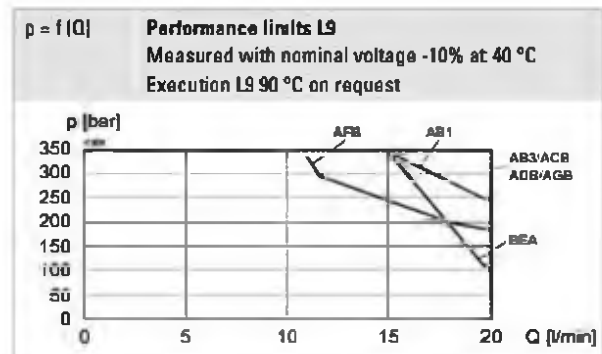
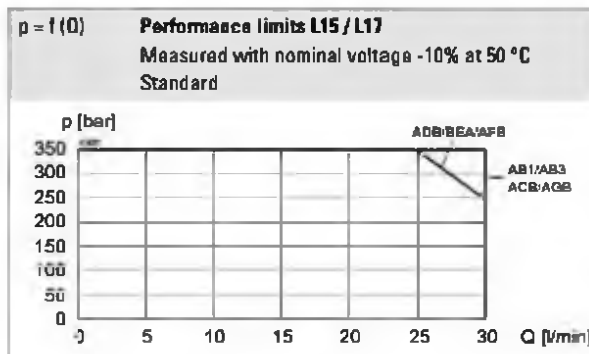
- ◆ The valve body is painted with a two component paint
- ◆ The armature tube, the slip-on coil and the plug screw are zinc-nickel coated

**COMMISSIONING**

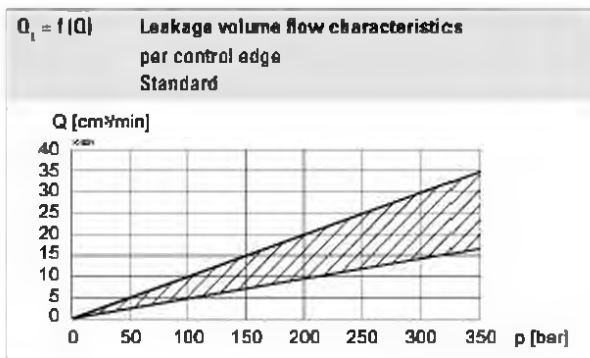
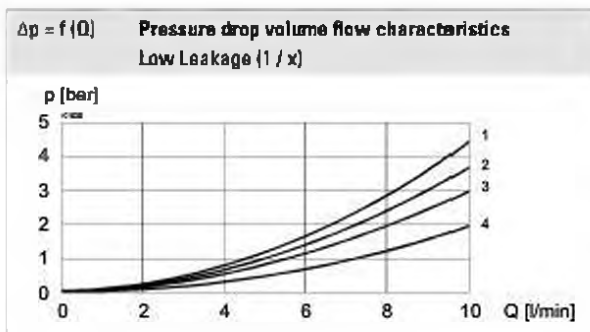
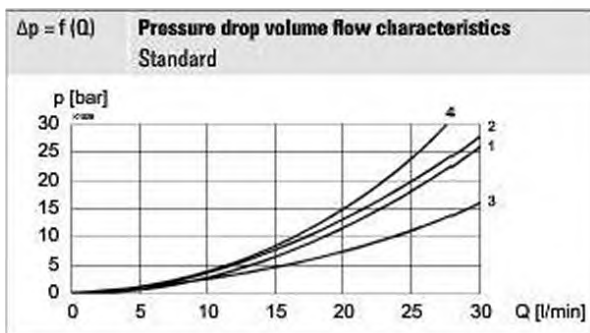
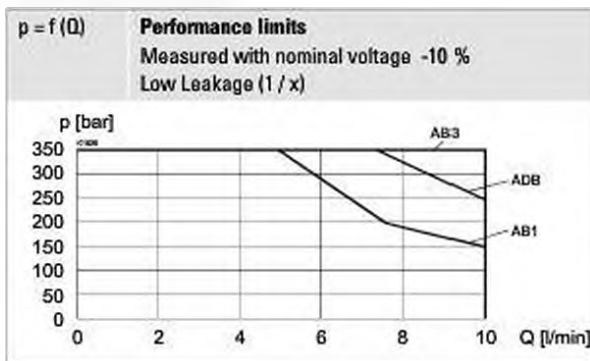
**Attention!** The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability can be assumed.


**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



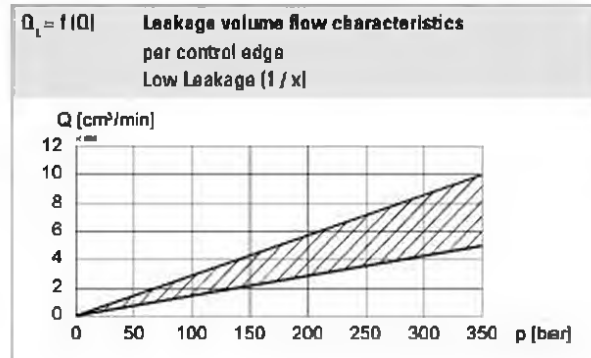
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**Note!**  With the L15 / L17 execution for ambient temperatures up to 70 °C, the performance specifications have been evaluated with an ambient temperature of 50 °C

Symbol	Flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1	2	2	-	1	1
AB3	2	2	-	1	1
ACB	2	2	-	1	1
ADB	2	2	-	1	1
BEA	1	1	4	1	1
AFB	1	1	3	1	1
AGB	1	1	-	1	1

Symbol	Flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1	1	1	-	1	2
AB3	1	1	-	1	2
ADB	1	1	-	4	3



**Attention!**  For valves for the temperature ranges „-40 °C to ...“ (Z604) the leakage volume flow can be up to eight times higher.

**INSTALLATION NOTES**

Mounting type	Flange mounting 3 fixing holes for socket head screws M5 x 40 or M5 x 50 (with distance plate BDP4/12)
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 9 \text{ Nm}$ knurled nut

**Note!** The length of the fixing screw depends on the base material of the connection element.



**Attention!** For stack assembly please observe the remarks in the operating instructions

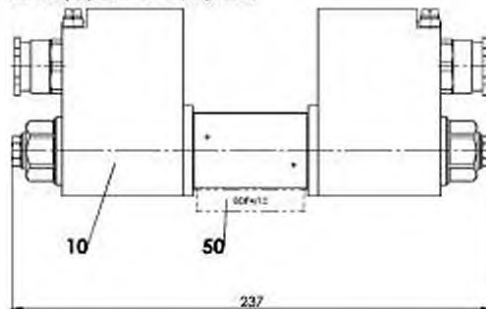

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**DIMENSIONS**

4/3-way spool valve (spring centring)

4/2-way spool valve (impulse)



Dimensions of the solenoid coil see data sheet 1.1-183 and 1.1-184  
The distance plate BDP4/12 has to be ordered separately

**PARTS LIST**

Position	Article	Description
10	263 6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	253.8001	HB6 Manual override „-25 °C to...“
	253.8025	HB6-Z604 Manual override „-40 °C to...“
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
40	239.2206	Socket head screw M20 x 1
50	173.1450	Distance plate BDP4 / 12
70	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)
110	111.1080	Cable gland M20 x 1,5

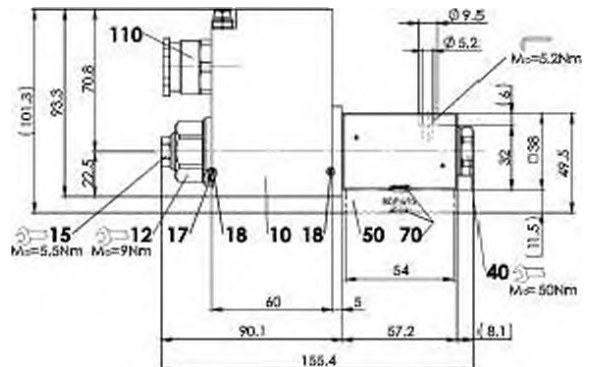
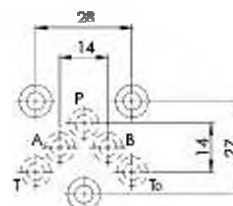
**STANDARDS**

Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Mounting interface	Wandfluh standard
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-10
Multi-station subplates	Data sheet 2.9-50
Module type manifold blocks	Data sheet 2.9-80
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

4/2-way spool valve (spring reset)

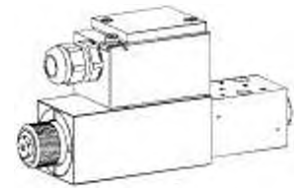

**HYDRAULIC CONNECTION**


**Solenoid operated spool valve, intrinsically safe**
**Flange construction**

- ◆ 4/2-way impulse valve
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**NG4-Mini**
**Wandfluh standard**

- Ex ia I Ma
- Ex ia II C T5 / T6 Ga
- Ⓜ II I G Ex ia II C T6, T5
- Ⓜ I M1 Ex ia I Ma


**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the impulse spool (4/2), the spool is held in the switching position by the detant. Intrinsic safety is achieved by limiting the electric energy in the solenoid circuit by means of a separate intrinsically safe power supply. Therewith sparking is prevented from forming.

**APPLICATION**

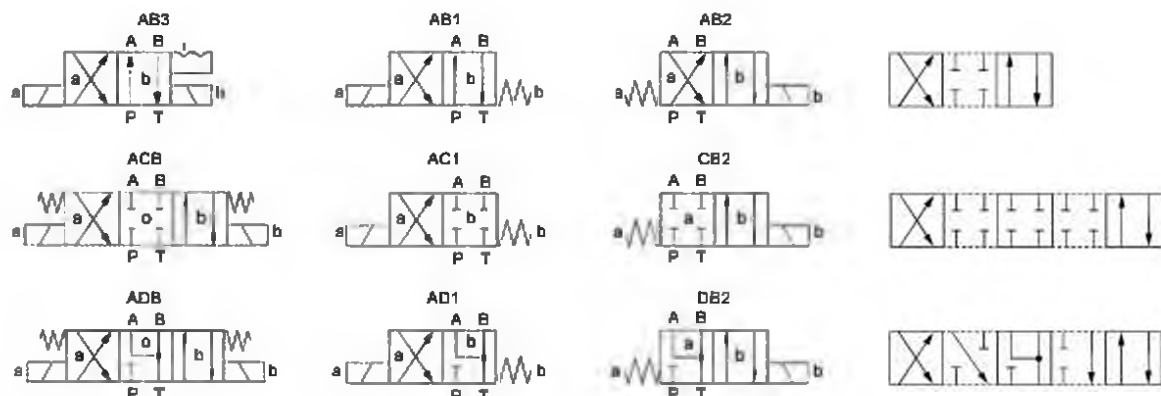
These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol. Miniature valves are used where both, reduced dimensions and weight are important.

**CERTIFICATES**

	Surface gas and dust	Mining
ATEX	x	x
IECEX	x	x

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	M 245 (Data sheet 1.1-185) rotatable in steps of 90° and easy exchangeable
Connection	<ul style="list-style-type: none"> <li>◆ Cable gland for cable <math>\varnothing 6,5 \dots 12 \text{ mm}</math>, two phase conductors +/- as well as one ground conductor</li> <li>◆ Connector socket EN 175301 – 803</li> </ul>

**SYMBOL**


**TYPE CODE**

		WD Z F A04 - <input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>	
Spool valve direct operated			
Explosion proof execution Ex ia			
Flange construction			
Mounting interface according to Wandfluh standard, NG4-Mini			
Designation of symbols acc. to table			
Spool specification	Standard <input type="checkbox"/> Low Leakage <input checked="" type="checkbox"/>		
Coil resistance	100 Ω <input checked="" type="checkbox"/> 152 Ω <input type="checkbox"/>		
Equipment group	I (Mining) <input checked="" type="checkbox"/> II (Surface) <input type="checkbox"/>	only in combination with coil resistance 100 Ω	
Connection execution	D <input type="checkbox"/> K <input type="checkbox"/>		
Sealing material	NBR <input type="checkbox"/> FKM (Viton) <input checked="" type="checkbox"/>		
Design index (subject to change)			
1.3-28			

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Ex-protection switching solenoid
Ambient temperature	-25...+45 °C (operation as T6) -25...+60 °C (operation as T1...T5)
Weight	2,45 kg (1 solenoid) 4,65 kg (2 solenoids)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Tank pressure	$p_{Tmax} = 200 \text{ bar}$
Maximum volume flow	$Q_{max} = 20 \text{ l/min}$ , see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+45 °C (operation as T6, NBR) -20...+45 °C (operation as T6, FKM) -25...+60 °C (operation as T1...T5, NBR) -20...+60 °C (operation as T1...T5, FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**ELECTRICAL SPECIFICATIONS**

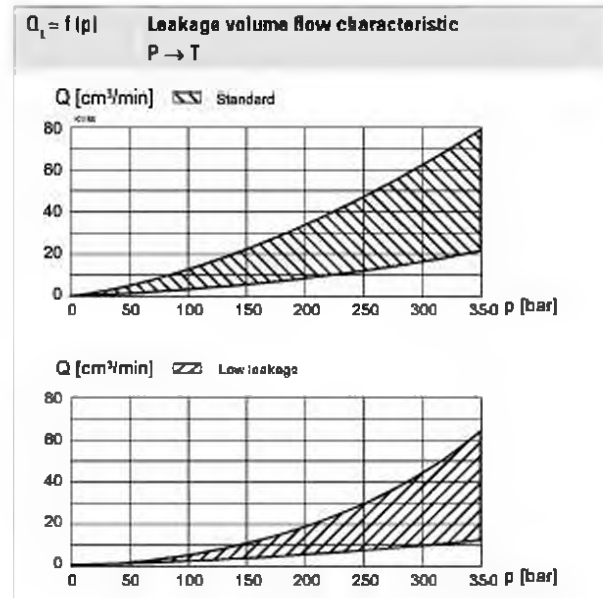
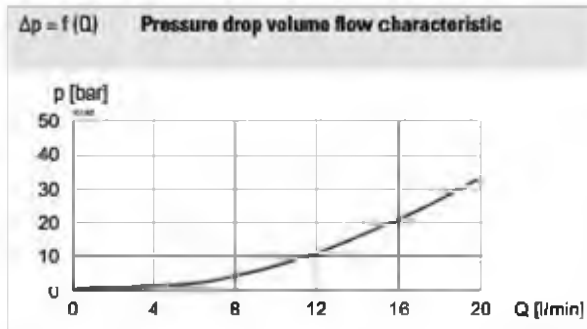
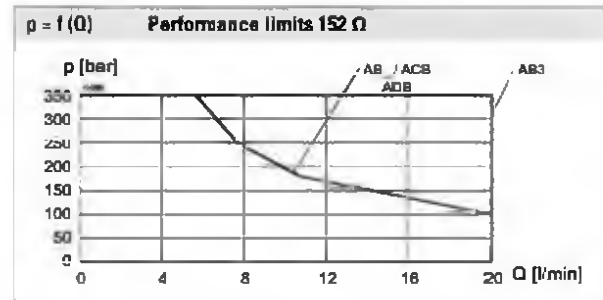
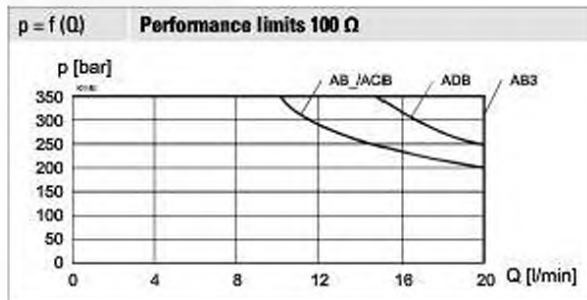
Protection class	IP65
Relative duty factor	Continuous operation
Switching frequency	1'800 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Limiting current at 50 °C	$I_{lim} = 90 \text{ mA}$ (100 Ω execution) $I_{lim} = 64 \text{ mA}$ (152 Ω execution)
Temperature class	T1...T6
Coil resistance	100 Ω, 152 Ω
Minimum power consumption	$P_{min} = 0,81 \text{ W}$ (100 Ω execution) $P_{min} = 0,62 \text{ W}$ (152 Ω execution)

**Note!**


Other electrical specifications, recommended power supply and safety-related limits see data sheet 1.1-185



**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**Attention!** If, because of the given operating conditions, during the switching process volume flows occur which exceed the power limit of the valve, these have to be limited by a throttle or an orifice in connection P.

In case of a continuous flow through, the throttle or orifice, depending on the system behaviour, an additional heating-up of the valve is possible. This has to be appropriately taken into account by the user.

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**STANDARDS**

Explosion protection	Directive 2014 / 34 / EU (ATEX)
Mounting interface	Wandfluh standard
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**MANUAL OVERRIDE**

HB4,5 as standard

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

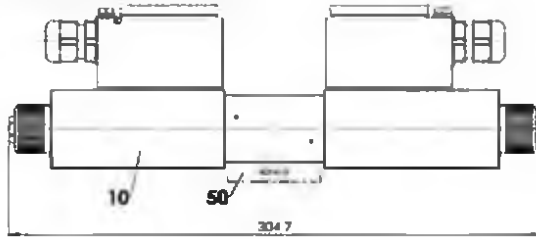
**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The armature tube, the slip-on coil and the plug screw are zinc-nickel coated

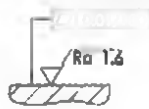
## DIMENSIONS

4/3-way spool valve (spring centring)

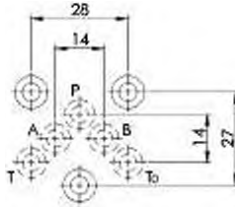
4/2-way spool valve (impulse)



Requirement of the flange surface of the counter piece



## HYDRAULIC CONNECTION



## INSTALLATION NOTES

Mounting type	Flange mounting 3 fixing holes for socket head screws M5 x 40 or M5 x 50 (with distance plate BDP4/12)
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 9 \text{ Nm}$ knurled nut

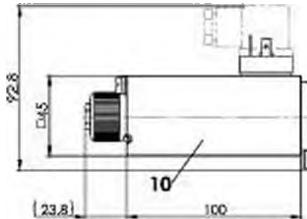
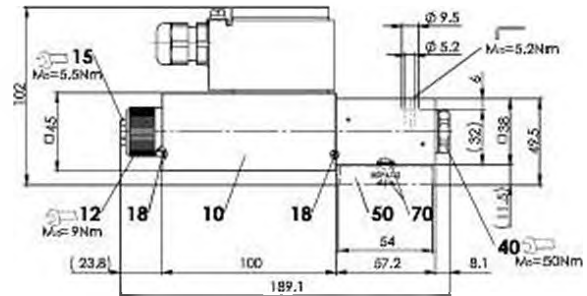
**Note!** The length of the fixing screw depends on the base material of the connection element.



**Attention!** For stack assembly please observe the remarks in the operating instructions



4/2-way spool valve (spring reset)



## PARTS LIST

Position	Article	Description
10	263.66.	Solenoid coil M.Z45-...
12	032.9614	Knurled nut M22 x 1 x 22
15	253.8000	Manual override HB4,5
18	160.2204	O-ring ID 20,35 x 1,78 (NBR)
40	239.2206	Socket head screw M20 x 1
50	173.1450	Distance plate BDP4 / 12
70	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)

## COMMISSIONING

**Attention!** Intrinsicly safe valves must be controlled only by a suitable, certified power supply from out of the hazardous area (see Operating Instructions). The selection of the power supply and the wiring must be carried out by qualified personnel. Recommended power supplies and safety-related limit values according to data sheet 1.1-185

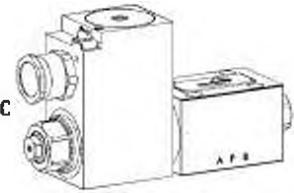


**Solenoid operated spool valve for the temperature range -60 °C**
**Flange construction**

- ◆ 4/2-way impulse valve
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 50 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**NG6**
**ISO 4401-03**

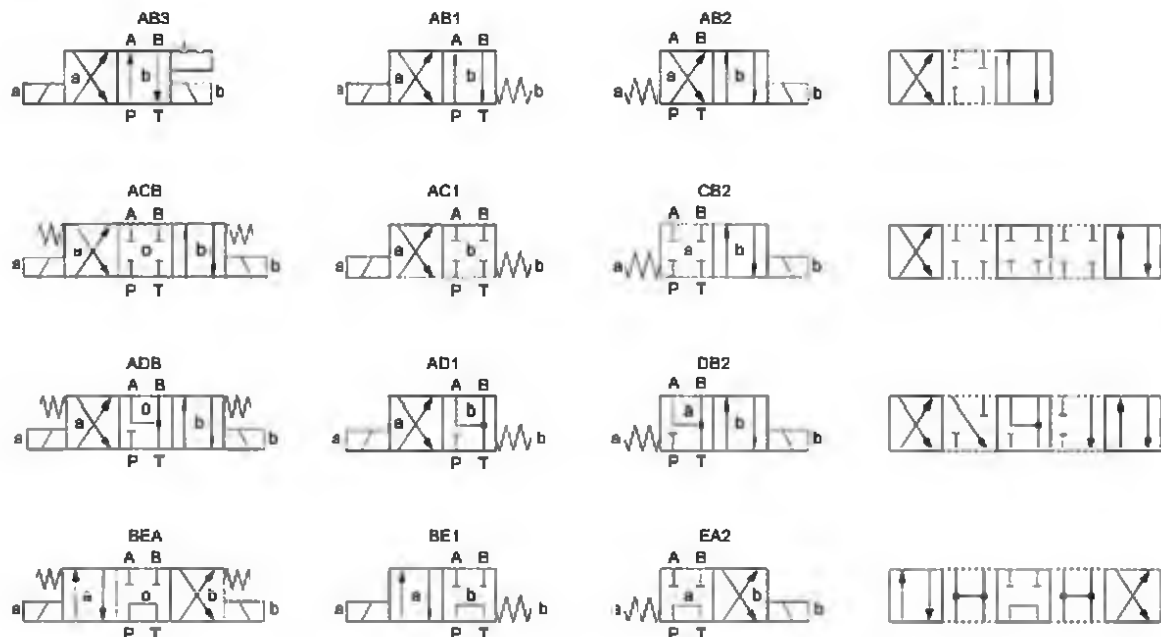
- ⊕ II 2 G Ex db IIC T6, T4
- ⊕ II 2 D Ex db III C T80 °C, T130 °C
- ⊕ I M2 Ex db I Mb


**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the impulse spool (4/2), the spool is held in the switching position by the detent. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors.

**SYMBOL**


**TYPE CODE**

WD Y F A08 -  - y -  /  /  - Z591 #

Spool valve direct operated	<input type="checkbox"/>		
Explosion proof execution Ex d	<input type="checkbox"/>		
Flange construction	<input type="checkbox"/>		
International standard interface ISO, NG6	<input type="checkbox"/>		
Designation of symbols acc. to table	<input type="checkbox"/>		
Spool clearance	<input type="checkbox"/>		
Nominal voltage $U_N$	12 VDC <input type="checkbox"/>	G12 <input type="checkbox"/>	115 VAC <input type="checkbox"/>
	24 VDC <input type="checkbox"/>	G24 <input type="checkbox"/>	230 VAC <input type="checkbox"/>
Nominal power $P_N$	15 W <input type="checkbox"/>	L15 <input type="checkbox"/>	
Certification	ATEX, IECEx, CCC, EAC <input type="checkbox"/>		
Sealing material / Temperature range	-60...+70 °C <input type="checkbox"/>		
Design index (subject to change)	<input type="checkbox"/>		

**CERTIFICATES**

	Surface	Mining	Z591 -60 °C to ...
ATEX	x	x	x
IECEx	x	x	x
CCC	x	x	x
EAC	x	x	x

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (Data sheet 1.1-183)
Connection	Cable gland for cable Ø 6,5...14 mm

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Ex-protection switching solenoid
Ambient temperature	Operation as T4 -60...+70 °C (L15)
Weight	2,8 kg (1 solenoid) 4,6 kg (2 solenoids)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{Tmax} = 100$ bar
Maximum volume flow	$Q_{max} = 50$ l/min, see characteristics
Leakage oil	On request
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	Operation as T4 -60...+70 °C (L15)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**ELECTRICAL SPECIFICATIONS**

Protection class	IP67
Relative duty factor	100 % DF
Switching frequency	12'000 / h
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz ± 2 %, with built-in two-way rectifier
Standard nominal power	15 W
Temperature class	Nominal power 15 W: T1...T4

**Note!** Other electrical specifications see data sheet 1.1-183


**MANUAL OVERRIDE**

HB6-Z591 for „-60...+70 °C“

**SURFACE TREATMENT**

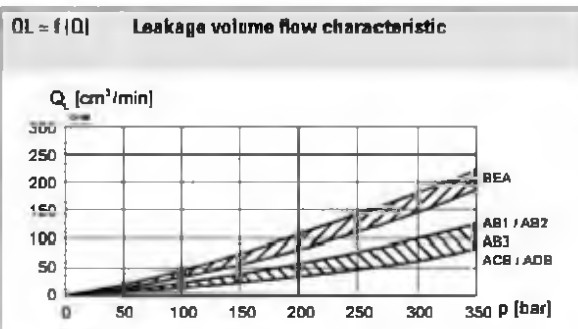
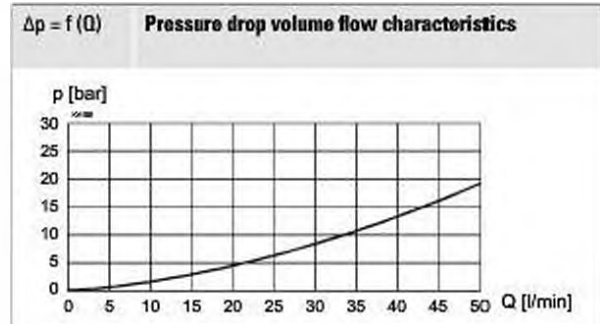
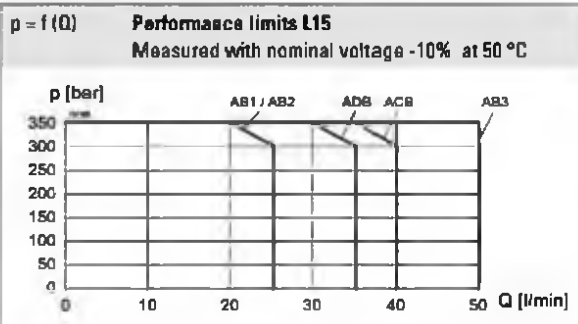
- ◆ The valve body is made of stainless steel
- ◆ The armature tube and the plug screw are zinc-nickel coated

**COMMISSIONING**

**Attention!** The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability can be assumed.


**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



**Note!** With the L15 execution for ambient temperatures up to 70 °C, the performance specifications have been evaluated with an ambient temperature of 50 °C.


**STANDARDS**

Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Mounting interface	ISO 4401-03
Protection class	EN 60 529
Contamination efficiency	ISO 4406

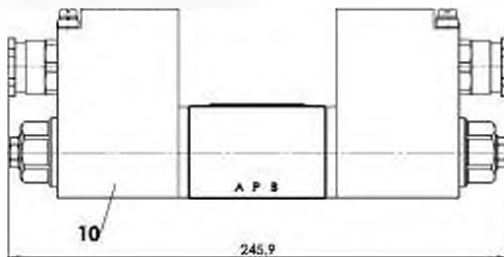
**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Modula type manifold blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

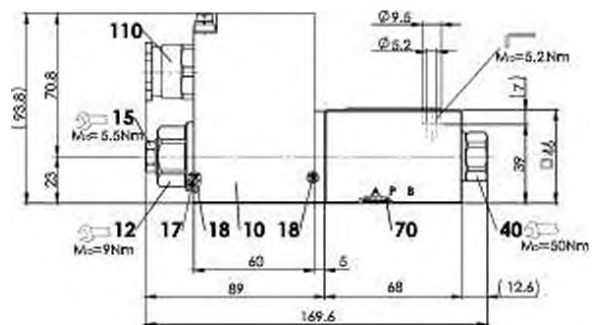
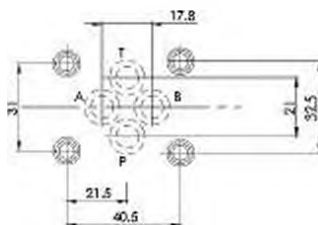
**DIMENSIONS**

4/3-way spool valve (spring centring)

4/2-way spool valve (impulse)



4/2-way spool valve (spring reset)


**HYDRAULIC CONNECTION**

**SEALING MATERIAL**

NBR as standard

**PARTS LIST**

Position	Article	Description
10	263 64.. 263 68..	Solenoid coil MK 45 / 18 x 60-... / L15-M238
12	154 2603	Knurled nut Ex M18 x 1,5 x 18
15	253 8028	HB6-Z591
17	160 2251	O-ring ID 25,07 x 2,62 (NBR)
18	160 0171	O-ring ID 17,17 x 1,78 (polyurethan)
40	239 2210	Socket head screw M20 x 1
70	160 0091	O-ring ID 9,25 x 1,78 (polyurethan)
110	111 1080	Cable gland M20 x 1,5

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,1 \text{ Nm}$ (screw quality A4) $M_0 = 9 \text{ Nm}$ knurled nut

**Note!**


The length of the fixing screw depends on the base material of the connection element.

**Attention!**

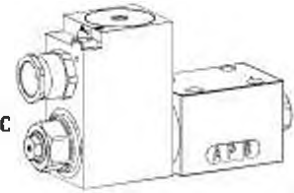

For stack assembly please observe the remarks in the operating instructions

**Solenoid operated spool valve**
**Flange construction**

- ◆ 4/2-way impulse valve
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{n,m} = 80 \text{ l/min}$
- ◆  $p_{n,m} = 350 \text{ bar}$

**NG6**
**ISO 4401-03**

- ⊕ II 2 G Ex db IIC T6, T4
  - ⊕ II 2 D Ex db III C T80 °C, T130 °C
  - ⊕ I M2 Ex db I Mb
- Class 1 Division 1  
 Class 1 Zone 1


**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the impulse spool (4/2), the spool is held in the switching position by the datent. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol.

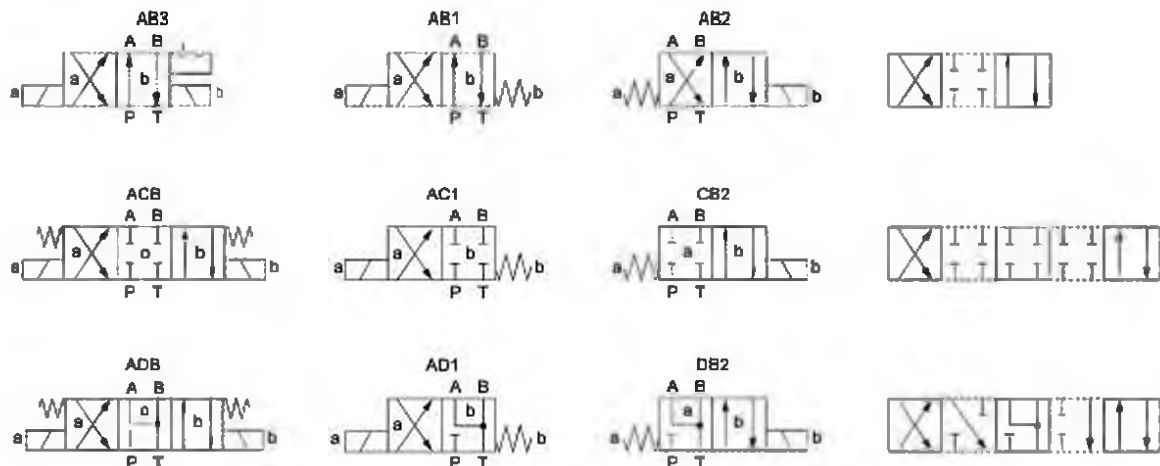
**CERTIFICATES**

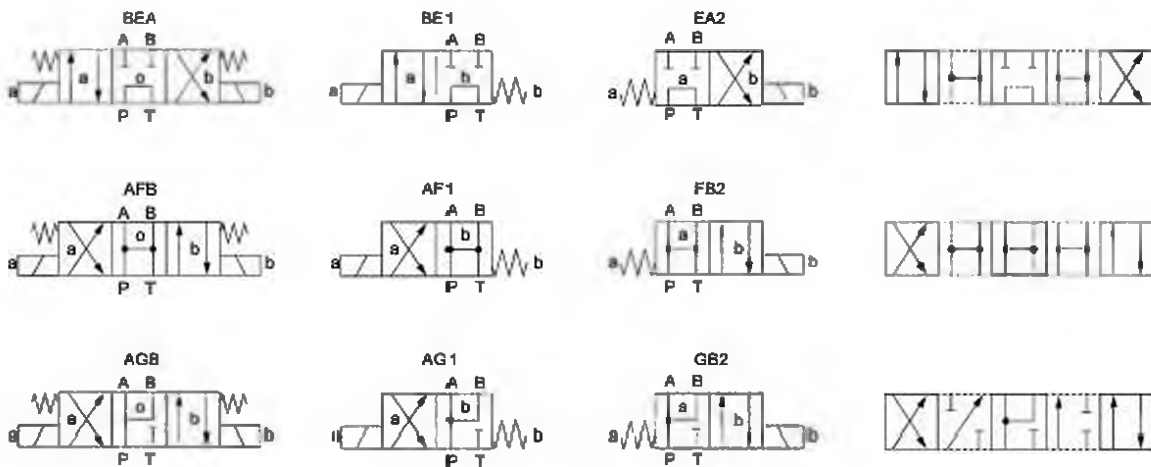
	Surface	Mining	Standard -25 °C to ...	Z604 -40 °C to ...
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	x
MA		x	x	
UL / CSA	x		x	x

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

**Attention!** The UL execution is always supplied without cable gland


**SYMBOL**


**SYMBOL**

**TYPE CODE**

 WVD Y F A06 -  -  /  /  -  # 

Spool valve direct operated

Explosion proof execution Ex d

Flange construction

International standard interface ISO, NG6

Designation of symbols acc. to table

Nominal voltage $U_v$	12 VDC	<input type="checkbox"/> G12	115 VAC	<input type="checkbox"/> R115
	24 VDC	<input type="checkbox"/> G24	230 VAC	<input type="checkbox"/> R230

Nominal power $P_v$	9 W	<input type="checkbox"/> L9	Ambient temperature up to:	
	15 W	<input type="checkbox"/> L15		40 °C or 90 °C
	17 W	<input type="checkbox"/> L17		70 °C
			70 °C (only UL / CSA)	

Certification	ATEX, IECEx, CCC, EAC	<input type="checkbox"/>	UL / CSA	<input type="checkbox"/> UL
	Australia	<input type="checkbox"/> AU		
	MA	<input type="checkbox"/> MA		

Sealing material	NBR	<input type="checkbox"/>	(only with 15 W)
	FKM (Viton)	<input type="checkbox"/> D1	
	NBR -40 °C	<input type="checkbox"/> y-ZR04	

Design index (subject to change)



**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Ex-protection switching solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17) -40...+70 °C (L15 / L17)
Weight	2,8 kg (1 solenoid) 4,6 kg (2 solenoids)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{T,tank} = 200$ bar
Maximum volume flow	$Q_{max} = 80$ l/min, see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L9 or L15 / L17) NBR 872 -40...+70 °C (L15 / L17)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade $\beta_{10...16} \geq 75$ , see data sheet 1.0-50

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Switching frequency	12'000 / h
Voltage tolerance	$\pm 10$ % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz $\pm 2$ %, with built-in two-way rectifier
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

**Note!** Other electrical specifications see data sheet 1.1-183 and 1.1-184


**MANUAL OVERRIDE**

HB6 as standard  
 Optionally: HN (K)  
 → see data sheet 1.1-311

**SURFACE TREATMENT**

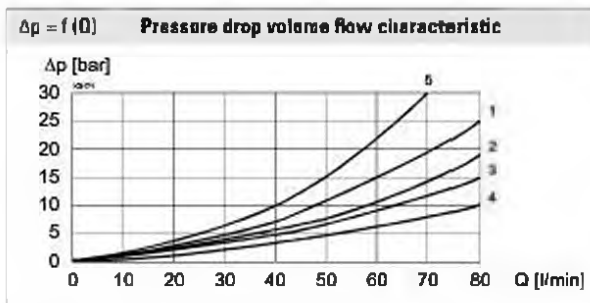
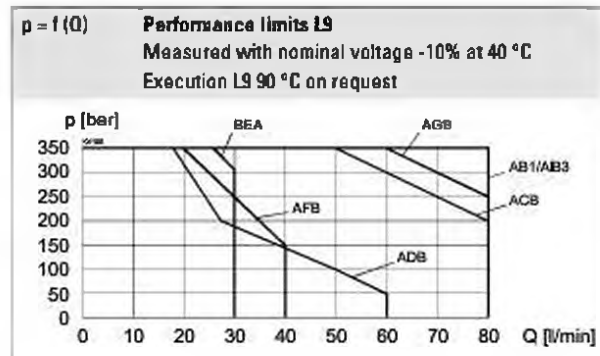
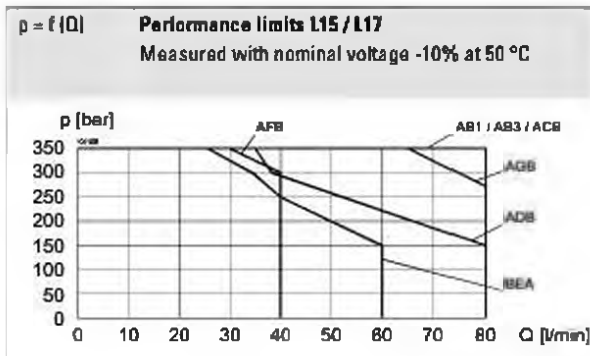
- ◆ The valve body is painted with a two component paint
- ◆ The armature tube, the slip-on coil and the plug screw are zinc-nickel coated

**COMMISSIONING**

**Attention!** The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability can be assumed.

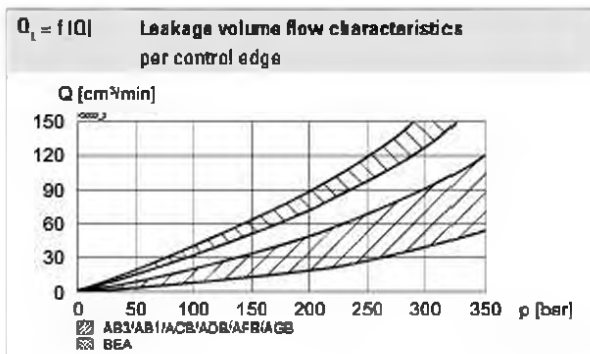



**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**Flow direction**

Symbol	P - A	P - B	P - T	A - T	B - T
AB1	2	2	-	1	1
AB3	2	2	-	1	1
ACB	2	2	-	1	1
ADB	2	2	-	3	3
BEA	2	2	5	2	2
AFB	4	4	-	3	3
AGB	4	4	-	1	1



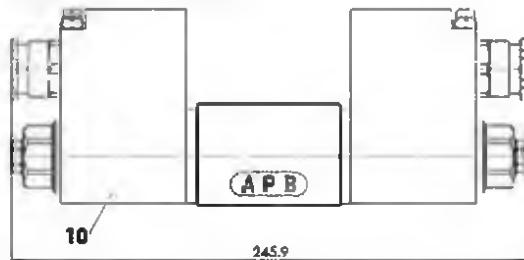
**Note!**  With the L15 / L17 execution for ambient temperatures up to 70 °C, the performance specifications have been evaluated with an ambient temperature of 50 °C.

**Attention!**  For valves for the temperature ranges  $-40 \text{ °C}$  to ... (Z604) the leakage volume flow can be up to eight times higher.

**DIMENSIONS**

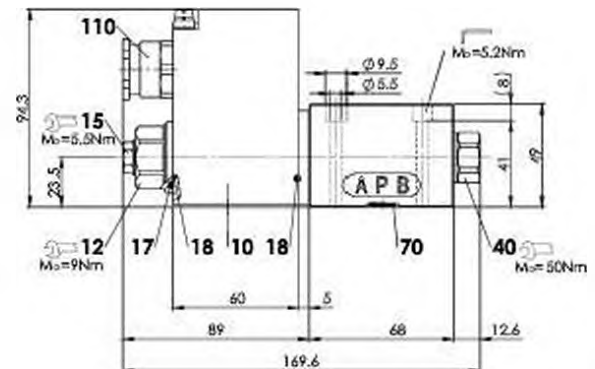
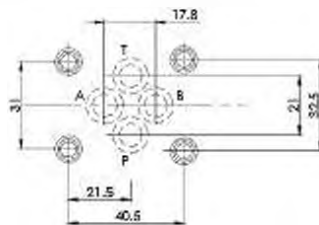
4/3-way spool valve (spring centring)

4/2-way spool valve (impulse)



Dimensions of the solenoid coil, refer to data sheet 1.1-183 and 1.1-184

4/2-way spool valve (spring reset)


**HYDRAULIC CONNECTION**

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Module type manifold blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**STANDARDS**

Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Mounting interface	ISO 4401-03
Protection class	EN 60 529
Contamination	ISO 4406

**PARTS LIST**

Position	Article	Description
10	263 6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	253.8001	HB6 Manual override „-25 °C to ...“
	253.8025	HB6-2604 Manual override „-40 °C to ...“
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
40	239.2205	Socket head screw M20 x 1
70	160.2093	O-ring ID 9,25 x 1,78 (NBR) „-25 °C to ...“
	160.7092	O-ring ID 9,25 x 1,78 (NBR) „-40 °C to ...“
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
110	111.1080	Cable gland M20 x 1,5

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 50
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 9 \text{ Nm}$ knurled nut

**Note!** The length of the fixing screw depends on the base material of the connection element.



**Attention!** For stack assembly please observe the remarks in the operating instructions

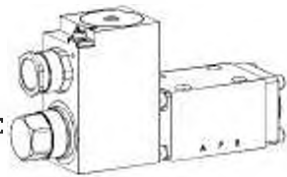


**Solenoid operated spool valve stainless**
**Flange construction**

- ◆ 4/2-way impulse valve
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 50 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**NG6**
**ISO 4401-03**

- ⊕ II 2 G Ex db IIC T6, T4
  - ⊕ II 2 D Ex db III C T80 °C, T130 °C
  - ⊕ I M2 Ex db I Mb
- Class 1 Division 1  
 Class 1 Zone 1


**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the impulse spool (4/2), the spool is held in the switching position by the detent. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. The stainless execution is especially suitable for the use in wet and salty environment. Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors.

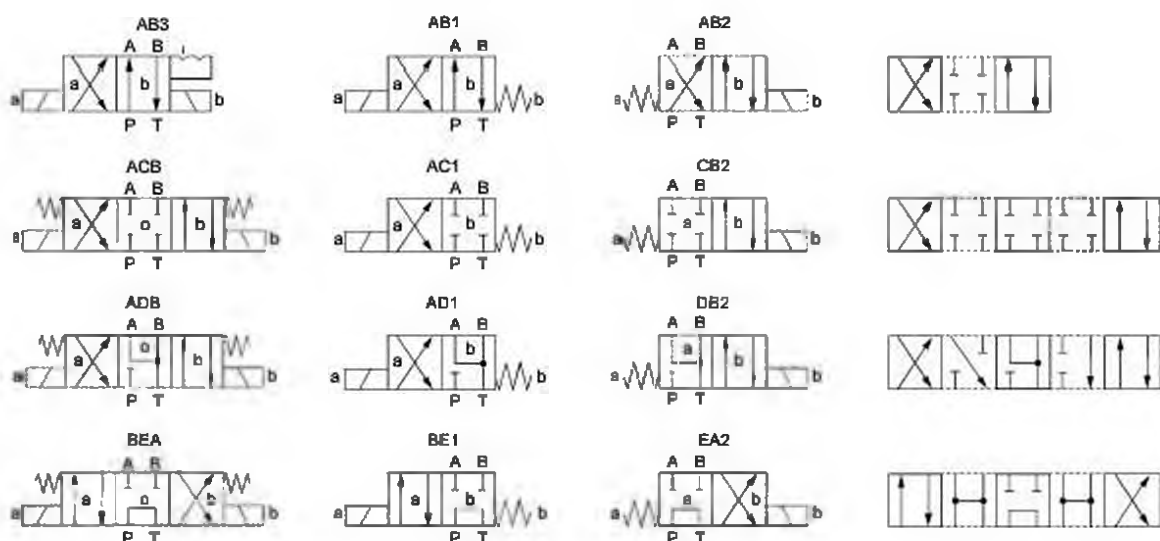
**CERTIFICATES**

	Surface	Mining	Standard -25 °C to ...	Z604 -40 °C to ...
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	x
MA		x	x	
UL / CSA	x		x	x

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKY45 / 18x60 K9 (data sheet 1.1-183S) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5... 14 mm

**Attention!** The UL execution is always supplied without cable gland


**SYMBOL**


**TYPE CODE**

		WD Y F A06 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/> # <input type="checkbox"/>	
Spool valve direct operated			
Explosion proof execution Ex d			
Flange construction			
International standard interface ISO, NG6			
Designation of symbols see. to table			
Nominal voltage $U_N$	12 VDC <input type="checkbox"/> 24 VDC <input type="checkbox"/>	G12 <input type="checkbox"/> G24 <input type="checkbox"/>	115 VAC <input type="checkbox"/> 230 VAC <input type="checkbox"/>
			R115 <input type="checkbox"/> R230 <input type="checkbox"/>
Nominal power $P_N$	9 W <input type="checkbox"/> 15 W <input type="checkbox"/> 17 W <input type="checkbox"/>	L9 <input type="checkbox"/> L15 <input type="checkbox"/> L17 <input type="checkbox"/>	Ambient temperature up to: 40 °C or 90 °C 70 °C 70 °C (only UL / CSA)
Certification	ATEX, IECEx, CCC, EAC Australia MA	<input type="checkbox"/> AU <input type="checkbox"/> MA	UL / CSA <input type="checkbox"/> UL <input type="checkbox"/>
Sealing material	NBR <input type="checkbox"/> FKM (Viton) <input type="checkbox"/> NBR 872 <input type="checkbox"/>	<input type="checkbox"/> D1 <input type="checkbox"/> y-Z804 <input type="checkbox"/>	(only with 15 W)
Stainless	with K9 coil <input type="checkbox"/> with K9 coil <input type="checkbox"/>	K9 <input type="checkbox"/> K10 <input type="checkbox"/>	(not for UL execution)
Design index (subject to change)			

1.3-348

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Ex-protection switching solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17) -40...+70 °C (L15 / L17)
Weight	2,8 kg (1 solenoid) 4,6 kg (2 solenoids)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{T,max} = 200$ bar
Maximum volume flow	$Q_{max} = 50$ l/min, see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L9 or L15 / L17) NBR 872 -40...+70 °C (L15 / L17)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Switching frequency	12'000 / h
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz ± 2 %, with built-in two-way rectifier
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

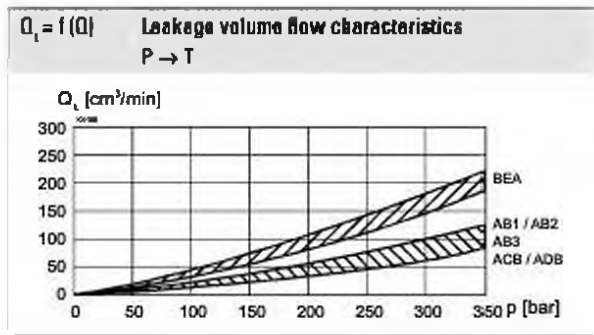
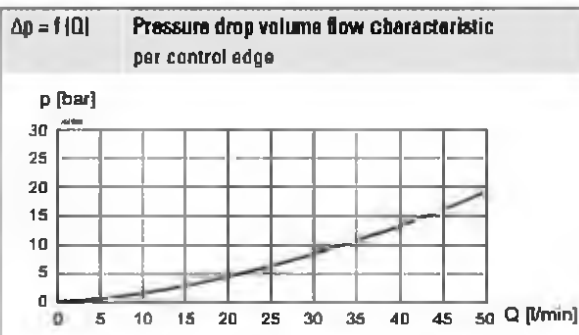
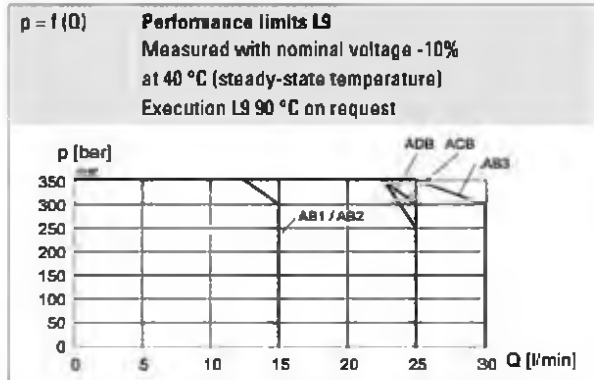
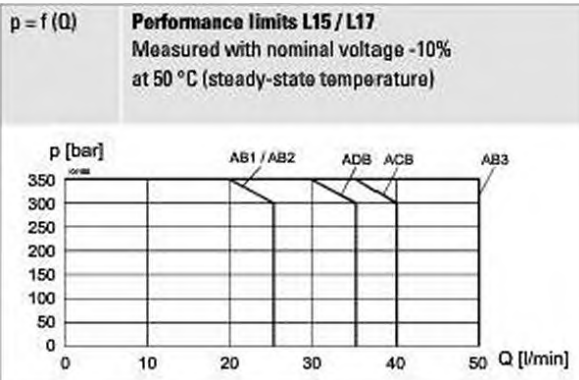
**Note!** Other electrical specifications see data sheet 1.1-183, 1.1-183S and 1.1-184


**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



**Note!** With the L15 / L17 execution for ambient temperatures up to 70 °C, the performance specifications have been evaluated with an ambient temperature of 50 °C



**Attention!** For valves for the temperature ranges „-40 °C to...“ (Z604) the leakage volume flow can be up to eight times higher.


**SURFACE TREATMENT**

-The valve body, the cover and the socket head screws are made of stainless steel

-The slip-on coil and the armature tube are zinc nickel coated

**Optionally K10:**

-The coil is made of stainless steel

**COMMISSIONING**

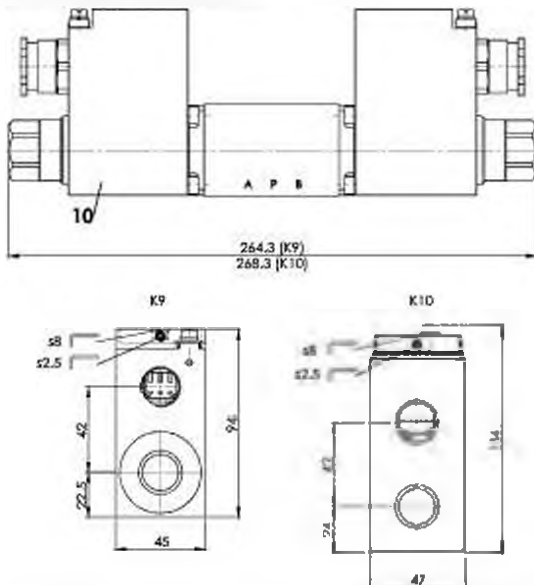
**Attention!** The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability can be assumed.



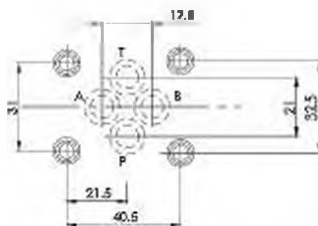
**DIMENSIONS**

4/3-way spool valve (spring centring)

4/2-way spool valve (impulse)



Dimensions of the solenoid coil, refer to data sheet 1.1-183, 1.1-183S and 1.1-184

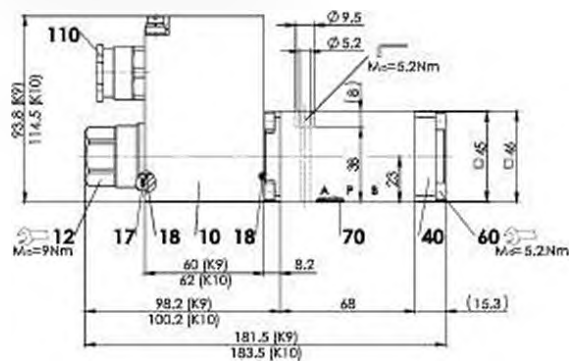
**HYDRAULIC CONNECTION**

**STANDARDS**

Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Mounting interface	ISO 4401-03
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**ACCESSORIES**

Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

4/2-way spool valve (spring reset)



**Note!** The K9 coil (K10 valve) is 1 mm larger than the valve body. Usually, a distance plate is necessary.


**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2201	Knurled nut Ex M18 x 1,5 x 30
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
40	058.4232	Cover 45 /45 x 17,5 K9
60	246.2516	Socket head screw M5 x 16 A4 DIN 912
70	160.2093	O-ring ID 9,25 x 1,78 (NBR) „-25 °C to...“
	160.7092	O-ring ID 9,25 x 1,78 (NBR) „-40 °C to...“
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
110	111.1080	Cable gland M20 x 1,5

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,1$ Nm (screw quality A4) $M_0 = 9$ Nm knurled nut

**Note!** The length of the fixing screw depends on the base material of the connection element.



**Attention!** For stack assembly please observe the remarks in the operating instructions



**Solenoid operated spool valve**
**Flange construction**

- ◆ 4/2-way impulse execution, detented
- ◆ 4/3-way with spring centered mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{n,m} = 80$  l/min
- ◆  $p_{n,m} = 350$  bar

**NG6**
**ISO 4401-03**
 II 2 G Ex db IIC T6, T4

**DESCRIPTION**

Spool valve according to data sheet 1.3-34 with additional inductive switching position monitoring. The contactless sensor transmits the spool position to a step signal.

**TYPE CODE**

Spool valve, direct operated		W0		Y		F		A06		-		-		#		□	
Explosion proof execution, Ex d																	
Flange construction																	
International standard interface ISO NG6																	
Other type designation according to type code data sheet 1.3-34																	
Namur / Monitoring		single		[Z104]													
		double		Z72 / 104		(only 4/2-way spool valves)											
Design index (subject to change)																	

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Switching solenoid
Ambient temperature	L9: -25...+40 °C L15: -25...+70 °C
Weight	0,5 kg single flange 1,0 kg double flange
MTTFd	150 years

**Namur-Sensor Specifications:**

Nominal voltage	8,2 VDC
Operating voltage	7,7...9 VDC
Current consumption damped max.	1 mA
Current consumption undamped min.	4 mA
Admissible series resistor $R_s$	550...1100 Ohm
Switching frequency	1000 Hz
Protection class	IP 68
Dimensions	M12 x 1
Ambient temperature	-25...70 °C
Fastening torque	15 Nm
Peak pressure	500 bar

According to the connection type, the protection class of the valve can be lower, see data sheet 1.2-59

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ All the other parts are zinc-nickel coated

**ACCESSORIES**

Mating connector (plug female, confectionable)

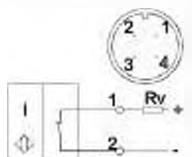
 straight, screw terminal Article no. 219.2978

 angled, screw terminal Article no. 219.3003



**ELECTRICAL CONNECTION**

Namur	Article no. 205 5011
Device receptacle	M12, 4 pole male
Mating connector	M12, 4 pole female
	1 = Supply voltage +
	2 = Signal



**Attention:**  
Do not apply a voltage >9V

Mating connector not incl. in delivery

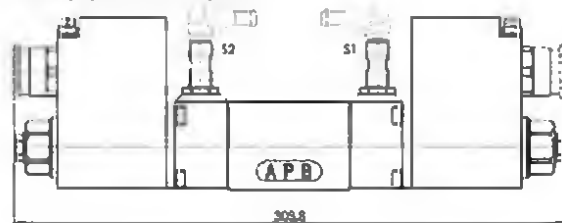
**Signal characteristics**

Signal of the actuator	Signal of the sensor
A / B	Namur
0	≥ 4 mA
1	≤ 1 mA

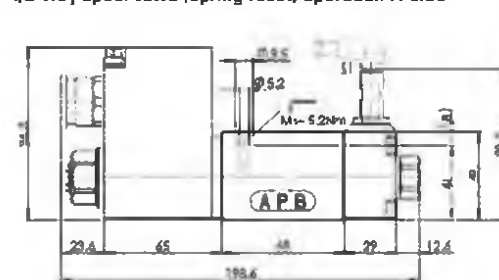
**DIMENSIONS**

4/3-way spool valve (spring centring)

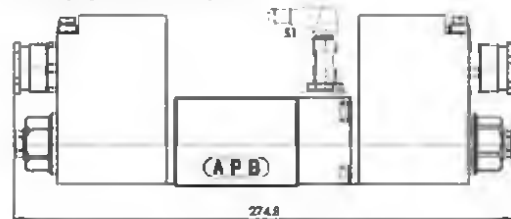
4/2-way spool valve (impulse)



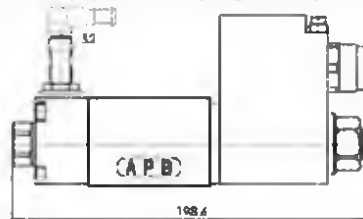
4/2-way spool valve (spring reset) operation A-side



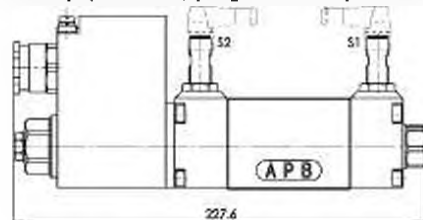
4/2-way spool valve (impulse)



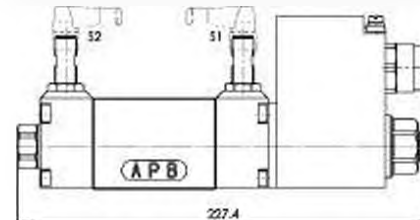
4/2-way spool valve (spring reset) operation B-side



4/2-way spool valve (spring reset) Z72 operation A-side



4/2-way spool valve (spring reset) Z72 operation B-side


**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 50
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 5 \text{ Nm}$ knurled nut

**Note!** The length of the fixing screw depends on the base

### Magnetschieberventil mit zusätzlicher Handhebel-Betätigung

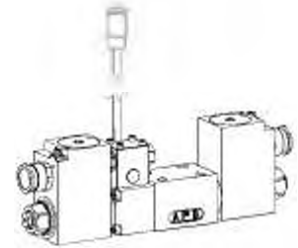
#### Flanschbauart

- ◆ 4/3-Wege mit federzentrierter Mittelstellung
- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $p_{nenn} = 350 \text{ bar}$

#### NG6

ISO 4401-03

- ◆ II 2 G Ex db IIC
  - ◆ II 2 D Ex d A21 IP65
  - ◆ I M2 Ex db I Mb
- Class I Division 1  
Class I Zone 1



### BESCHREIBUNG

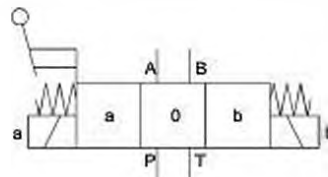
Schieberventil gemäss Datenblatt 1.3-34 mit zusätzlicher Handhebel-Betätigung.

**Hinweis!** Das Standardventil kann nicht nachgerüstet werden.



### SINNBILD

Übersicht Kolbentypen siehe Datenblatt 1.3-34



### TYPENSCHLÜSSEL

Schieberventil, direktgesteuert

Ex-Schutz-Ausführung Ex d

Flanschbauart

Internationale Anschlussnorm ISO NG6

Rechtliche Typenbezeichnung gemäss Typenschlüssel Datenblatt 1.3-34

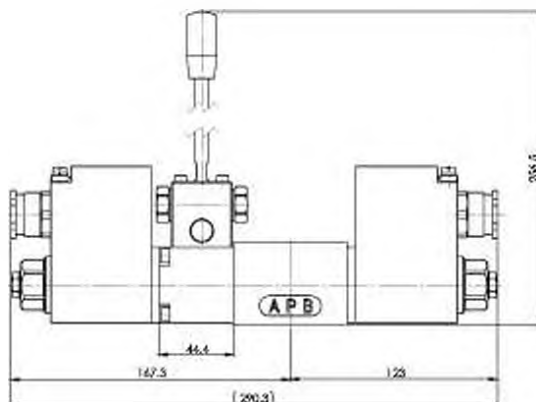
Handhebel

Anderungs-Index (wird vom Werk eingesetzt)

1.5.30

WD Y F A06 -  2568 # 2

### ABMESSUNGEN



### ALLGEMEINE KENNGRÖSSEN

Gewicht WDYFA06 +1,0 kg

**Hinweis!** Weitere Kenngrössen, siehe Datenblatt 1.3-34



### OBERFLÄCHENBEHANDLUNGEN

- ◆ Der Flansch, das Gehäuse und der Hebel sind Zink-Nickel beschichtet

**Solenoid operated spool valve, intrinsically safe**
**Flange construction**

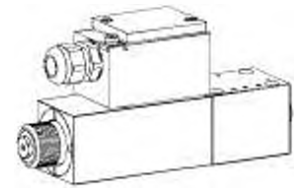
- ◆ 4/2-way impulse valve
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**NG6**
**ISO 4401-03**

Ex ia I Ma

Ex ia II C T5 / T6 Ga

 Ex ia II C T6, T5

 Ex ia I Ma

**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the impulse spool (4/2), the spool is held in the switching position by the detent. Intrinsic safety is achieved by limiting the electric energy in the solenoid circuit by means of a separate intrinsically safe power supply. Therewith sparking is prevented from forming.

**APPLICATION**

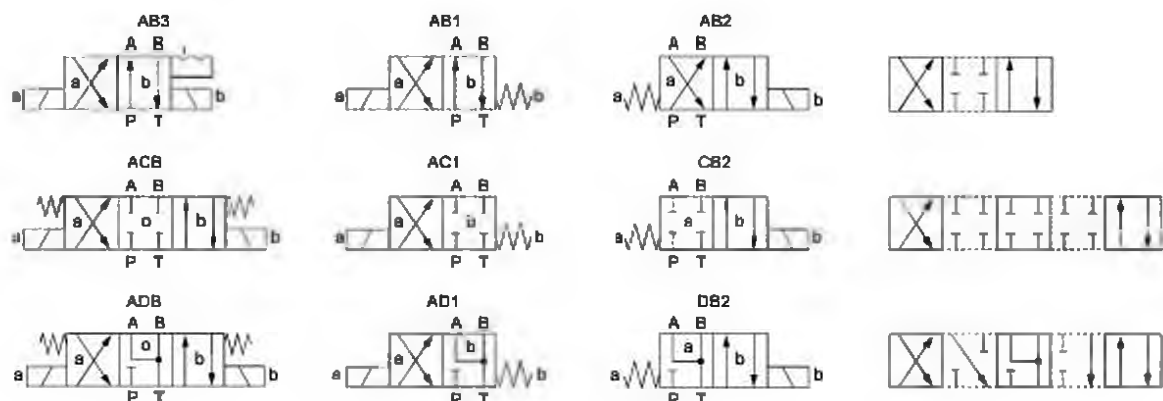
These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol.

**CERTIFICATES**

	Surface gas and dust	Mining
ATEX	x	x
IECEX	x	x

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	M 245 (Data sheet 1.1-185) rotatable in steps of 90° and easy exchangeable
Connection	<ul style="list-style-type: none"> <li>◆ Cable gland for cable <math>\varnothing 6,5 \dots 12 \text{ mm}</math>, two phase conductors +/− as well as one ground conductor</li> <li>◆ Connector socket EN 175301 – 803</li> </ul>

**SYMBOL**


**TYPE CODE**

		WD Z F A06 - <input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> Z546 # <input type="checkbox"/>	
Spool valve direct operated			
Explosion proof execution Ex ia			
Flange construction			
International standard interface ISO, NG6			
Designation of symbols acc. to table			
Spool specification	Standard <input type="checkbox"/>		
	Low Leakage <input checked="" type="checkbox"/>		
Coil resistance	100 Ω <input type="checkbox"/>	100	
	152 Ω <input type="checkbox"/>	152	
Equipment group	I (Mining) <input type="checkbox"/>	Z319	only in combination with coil resistance 100 Ω
	II (Surface) <input type="checkbox"/>	T6	
Connection execution	<input type="checkbox"/>	D	
	<input type="checkbox"/>	K	
Sealing material	NBR <input type="checkbox"/>		
	FKM (Viton) <input type="checkbox"/>	D1	
Execution			
Design index (subject to change)			

1.3-02

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Ex-protection switching solenoid
Ambient temperature	-25...+45 °C (operation as T6) -25...+60 °C (operation as T1...T5)
Weight	3,2 kg (1 solenoid) 5,3 kg (2 solenoids)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{r,max} = 200$ bar
Maximum volume flow	$Q_{max} = 20$ l/min, see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+45 °C (operation as T6, NBR) -20...+45 °C (operation as T6, FKM) -25...+60 °C (operation as T1...T5, NBR) -20...+60 °C (operation as T1...T5, FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade β 10...16 ≥ 75, see data sheet 1.0-50

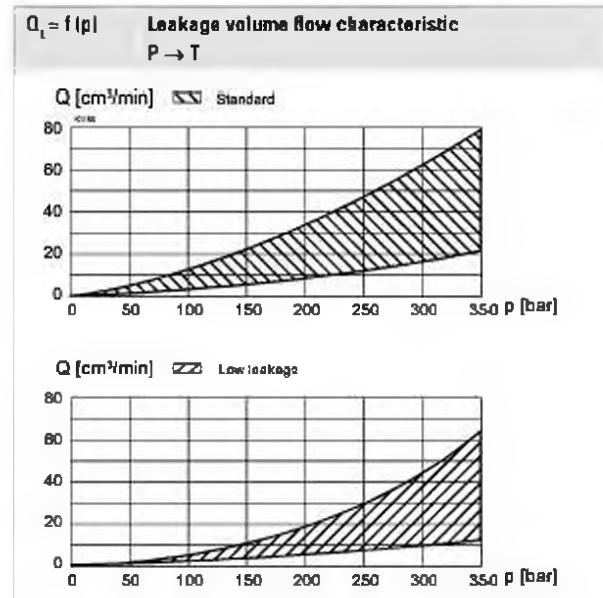
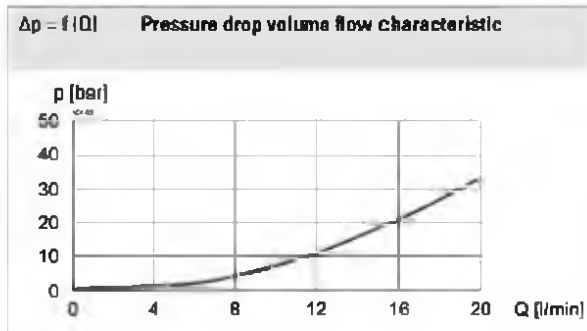
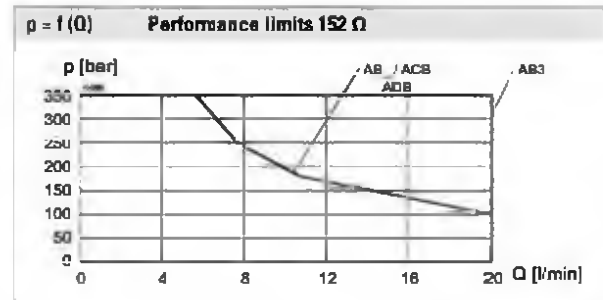
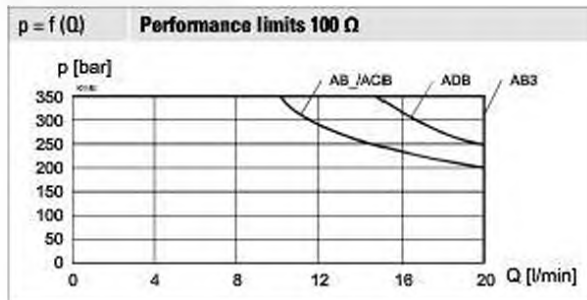
**ELECTRICAL SPECIFICATIONS**


Protection class	IP65
Relative duty factor	Continuous operation
Switching frequency	1'800 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Limiting current at 50 °C	$I_{max} = 90$ mA (100 Ω execution) $I_{max} = 64$ mA (152 Ω execution)
Temperature class	T1...T6
Coil resistance	100 Ω, 152 Ω
Minimum power consumption	$P_{min} = 0,81$ W (100 Ω execution) $P_{min} = 0,62$ W (152 Ω execution)

**Note!**


Other electrical specifications, recommended power supply and safety-related limits see data sheet 1.1-185

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**Attention!**  If, because of the given operating conditions, during the switching process volume flows occur which exceed the power limit of the valve, these have to be limited by a throttle or an orifice in connection P.  
In case of a continuous flow through, the throttle or orifice, depending on the system behaviour, an additional heating-up of the valve is possible. This has to be appropriately taken into account by the user.

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-10
Multi-station subplates	Data sheet 2.9-50
Module type manifold blocks	Data sheet 2.9-90
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**STANDARDS**

Explosion protection	Directive 2014 / 34 / EU (ATEX)
Mounting interface	ISO 4401-03
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**MANUAL OVERRIDE**

HB4,5 as standard

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The armature tube, the slip-on coil and the plug screw are zinc-nickel coated

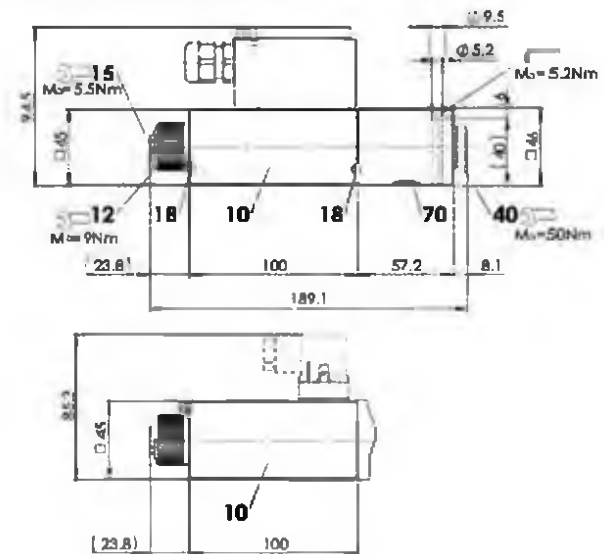
**DIMENSIONS**

4/3-way spool valve (spring centring)

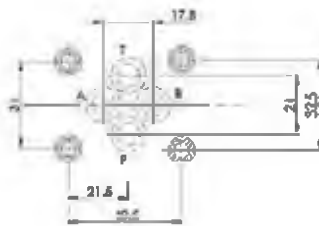
4/2-way spool valve (impulse)



4/2-way spool valve (spring reset)



Requirement of the flange surface of the counter piece


**HYDRAULIC CONNECTION**

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 9 \text{ Nm}$ knurled nut

**Note!** The length of the fixing screw depends on the base material of the connection element.



**Attention!** For stack assembly please observe the remarks in the operating instructions


**PARTS LIST**

Position	Article	Description
10	263.66..	Solenoid coil M.Z45-...
12	032.9614	Knurled nut M22 x 1 x 22
15	253.8000	Manual override HB4,5
18	160.2204	O-ring ID 20,35 x 1,78 (NBR)
40	239.2206	Socket head screw M20 x 1
70	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)

**COMMISSIONING**

**Attention!** Intrinsically safe valves must be controlled only by a suitable, certified power supply from out of the hazardous area (see Operating Instructions). The selection of the power supply and the wiring must be carried out by qualified personnel. Recommended power supplies and safety-related limit values according to data sheet 1.1-185

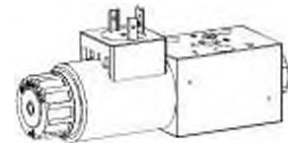


**Solenoid operated spool valve with soft switching**
**Flange construction**

- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG4-Mini**

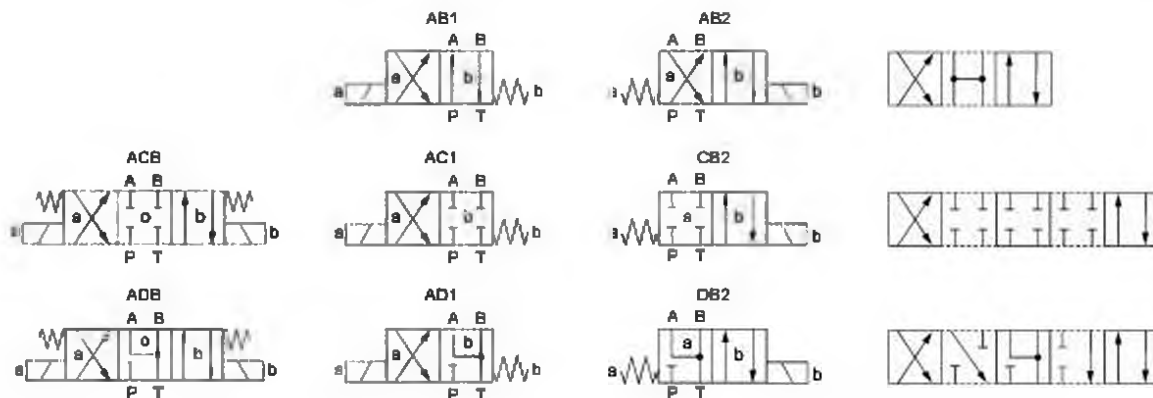
Wandfluh standard


**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). The soft switching of the valve is achieved by means of an optimum combination of the orifice and spool design. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, valve body from high quality hydraulic cast steel. Wide range of standard and special voltages.

**APPLICATION**

Normal solenoid spool valves switch very quickly. This can lead to shocks in the hydraulic system which can cause mechanical wear and have a negative effect on operation. The soft switching valves slow down and dampen the switching movements which benefits the system. Optimum results can be achieved if all 4 connections are connected and the valve is properly vented. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C if > +50 °C, then no undervoltage is admissible
Weight	0,90 kg (1 solenoid) 1,25 kg (2 solenoids)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$ ( $p_T < 20 \text{ bar}$ ) $p_{max} = 315 \text{ bar}$ ( $p_T > 20 \text{ bar}$ )
Tank pressure	$p_{T,max} = 100 \text{ bar}$
Maximum volume flow	$Q_{max} = 20 \text{ l/min}$ , see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade $\beta_{10} \dots \beta_{6} \geq 75$ , see data sheet 1.0-50

**TYPE CODE**

		W W M F A04 - [ ] - [ ] / [ ] [ ] - [ ] [ ] # [ ]	
Spool valve, soft switching			
Slip-on coil, Medium			
Flange construction			
Mounting interface acc. to Wandfluh standard, NG4-Mini			
Designation of symbols acc. to table			
Nominal voltage $U_n$	12 VDC <input type="checkbox"/> G12 24 VDC <input type="checkbox"/> G24 without coil <input type="checkbox"/> X5 115 VAC <input type="checkbox"/> R115 230 VAC <input type="checkbox"/> R230		
Slip-on coil	Metal housing, round with one-sided collar <input type="checkbox"/> V (only G12 and G24) Metal housing, square with one-sided collar <input type="checkbox"/> N		
Connection execution	Connector socket EN 175301-803 / ISO 4400 <input type="checkbox"/> D Connector socket AMP Junior-Timer <input type="checkbox"/> J (only for $U_n \leq 75$ VDC) Connector Deutsch DT04 - 2P <input type="checkbox"/> G (only for $U_n \leq 75$ VDC)		
Sealing material	NBR <input type="checkbox"/> FKM (Viton) <input type="checkbox"/> D1		
Manual override	Integrated <input type="checkbox"/> Push-button <input type="checkbox"/> HF1 Spindle <input type="checkbox"/> HS1		
Orifice diameter	<input type="checkbox"/> Ø 0.3 mm (Standard)		
Design index (subject to change)			

14-13

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Switching frequency	Since switching is damped and slow, switching frequency is of secondary importance.
Service life time	$10^7$ (number of switching cycles, theoretically)
Voltage tolerance	$\pm 10$ % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-168 (slip-on coil V) and 1.1-175 (slip-on coil N)


**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The screw plug, the slip-on coil and the armature tube are zinc-nickel coated

**COMMISSIONING**

**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).


**STANDARDS**

Mounting interface	Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code



**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	V.E37 / 19 x 50 (Data sheet 1.1-168) N.S35 / 19 x 50 (Data sheet 1.1-175)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**MANUAL OVERRIDE**

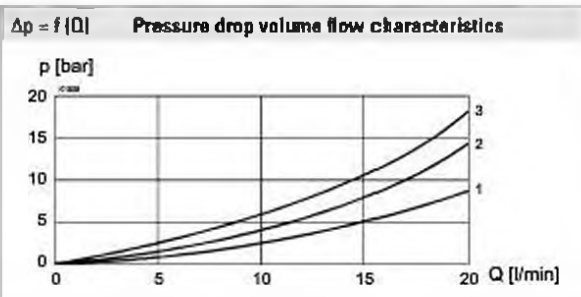
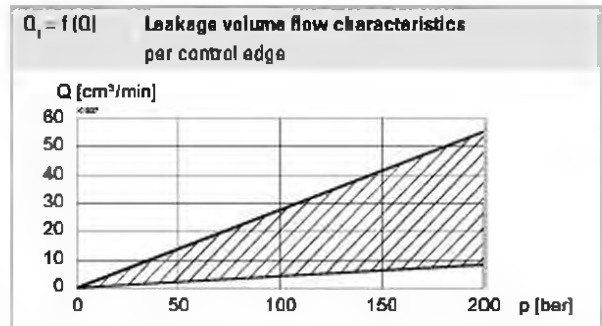
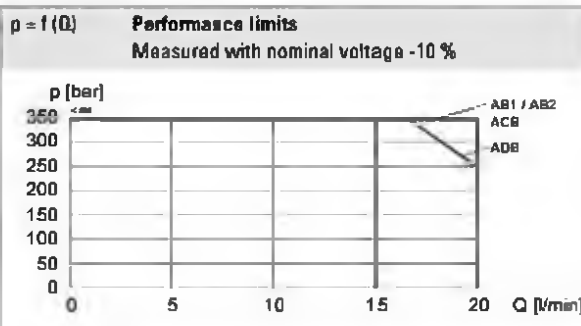
- ◆ Integrated (–) Actuation pin integrated in the armature tube. Actuation by pressing the pin
- ◆ Push-button (HF1) Integrated in the knurled nut. Actuation by pressing the push-button
- ◆ Spindle (HS1) Integrated in the knurled nut. Actuation by turning the spindle (continuously variable valve actuation)

**Attention!** The actuation of the manual override is possible up to a tank pressure of:



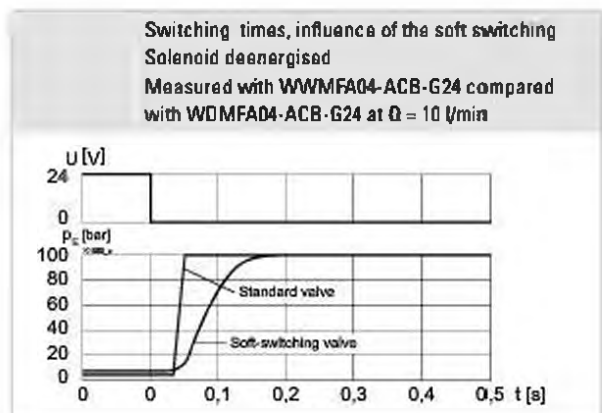
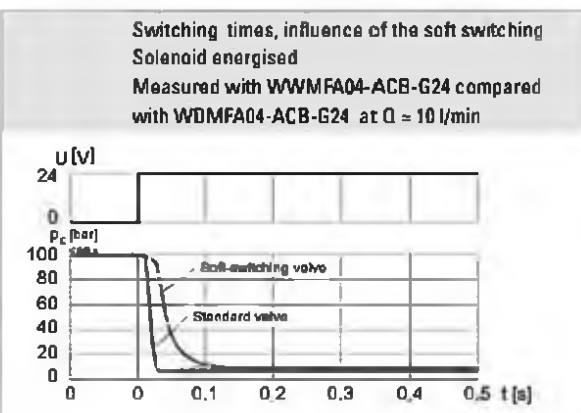
- 40 bar Integrated (–)
- 40 bar Push-button (HF1)
- 100 bar Spindle (HS1)

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


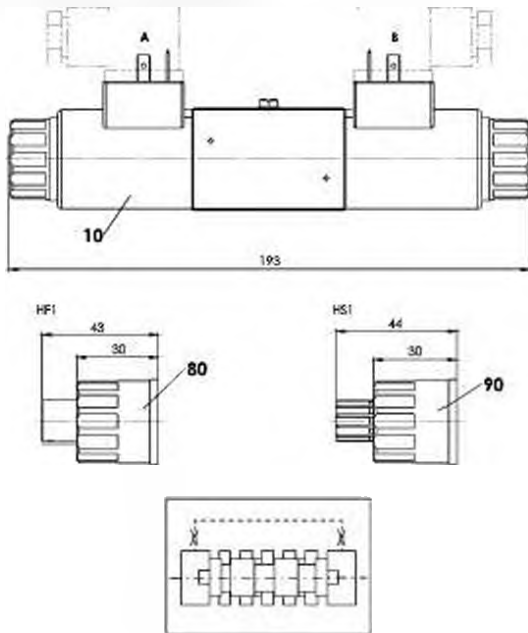
Volume flow direction

Symbol	P - A	P - B	P - T	A - T	B - T
AB1 / AB2	3	3	-	3	3
ACB / AC1 / CB2	2	2	-	2	2
ADB / AD1 / DB2	3	3	-	1	1

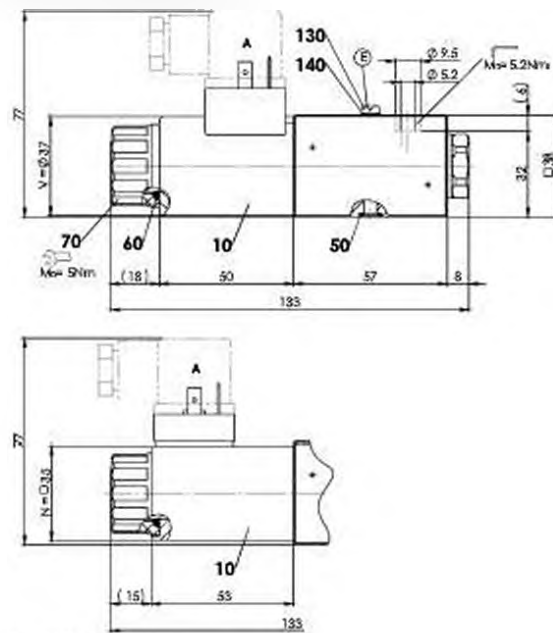


**DIMENSIONS**

4/3-way valve (spring centred)

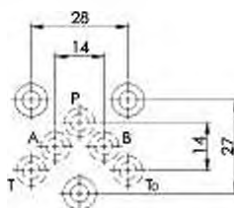


4/2-way valve (spring reset)



E = Air bleed screw

Orifices in valve body influence the switching times

**HYDRAULIC CONNECTION**

**ACCESSORIES**

Mating connector gray (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Mounting screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-10
Multi-station subplates	Data sheet 2.9-50
Horizontal mounting blocks	Data sheet 2.9-90
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.1-50
Relative duty factor	Data sheet 1.1-430

**PARTS LIST**

Position	Article	Description
10	206.2...	V.E37 / 19 x 50
	260.5...	N.S35 / 19 x 50
50	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)
60	160.2187	O-ring ID 18,72 x 2,62 (NBR)
70	154.2700	Knurled nut
80	253.7001	Push-button
90	253.7000	Spindle
130	246.1007	Socket head screw zinc-coated blue M4 x 6 DIN84 A
140	049.2040	Bonded seal ID 4,1 x 7,2 x 1

**INSTALLATION NOTES**

Mounting type	Flange mounting 3 fixing holes for socket head screws M5 x 40
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 5 \text{ Nm}$ knurled nut

**Note!**

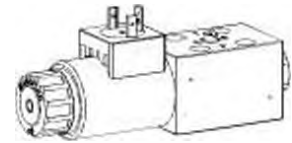

The length of the fixing screw depends on the base material of the connection element.

**Solenoid operated spool valve with soft switching**
**Flange construction**

- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG4**

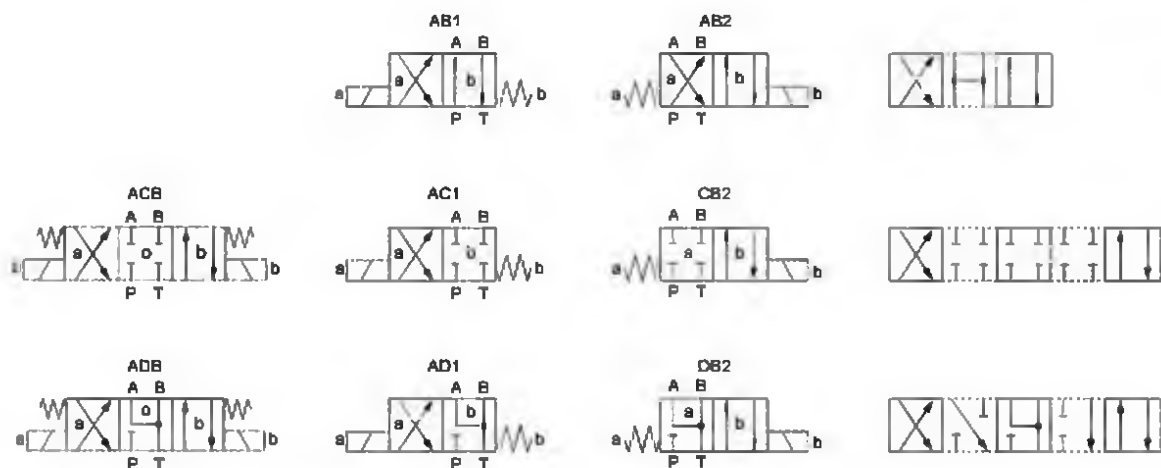
ISO 4401-02


**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). The soft switching of the valve is achieved by means of an optimum combination of the orifice and spool design. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, valve body from high quality hydraulic cast steel. Wide range of standard and special voltages.

**APPLICATION**

Normal solenoid spool valves switch very quickly. This can lead to shocks in the hydraulic system which can cause mechanical wear and have a negative effect on operation. The soft switching valves slow down and dampen the switching movements which benefits the system. Optimum results can be achieved if all 4 connections are connected and the valve is properly vented. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG4 according to ISO 4401-02
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C if > +50 °C, then no undervoltage is admissible
Weight	0,90 kg (1 solenoid) 1,25 kg (2 solenoids)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Tank pressure	$p_{T,max} = 100 \text{ bar}$
Maximum volume flow	$Q_{max} = 20 \text{ l/min}$ , see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 10... 16 ≥ 75, see data sheet 1.0-50

**TYPE CODE**

		W W M F 804 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> # <input type="checkbox"/>										
Spool valve, soft switching												
Slip-on coil, Medium												
Flange construction												
International standard interface ISO, NG 4												
Designation of symbols acc. to table												
Nominal voltage U <sub>n</sub>	12 VDC <input type="checkbox"/> 612 24 VDC <input type="checkbox"/> 624 without coil <input type="checkbox"/> X5	115 VAC <input type="checkbox"/> R115 230 VAC <input type="checkbox"/> R230										
Slip-on coil	Metal housing, round with one-sided collar <input type="checkbox"/> V (only 612 and 624) Metal housing, square with one-sided collar <input type="checkbox"/> N											
Connection execution	Connector socket EN 175301-803 / ISO 4400 <input type="checkbox"/> D Connector socket AMP Junior-Timer <input type="checkbox"/> J (only for U <sub>n</sub> ≤ 75 VDC) Connector Deutsch DT-04 - 2P <input type="checkbox"/> B (only for U <sub>n</sub> ≤ 75 VDC)											
Sealing material	NBR <input type="checkbox"/> FKM (Viton) <input type="checkbox"/> D1											
Manual override	Integrated <input type="checkbox"/> Push-button <input type="checkbox"/> HF1 Spindle <input type="checkbox"/> RS1											
Orifice diameter	Ø 0.3 mm (Standard) <input type="checkbox"/>											
Design index (subject to change)												

1-4-23

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Switching frequency	Since switching is damped and slow, switching frequency is of secondary importance.
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-168 (slip-on coil V) and 1.1-175 (slip-on coil N)


**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**COMMISSIONING**

**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).


**STANDARDS**

Mounting interface	ISO 4401-02
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SURFACE TREATMENT**

- The valve body is painted with a two component paint
- The screw plug, the slip-on coil and the armature tube are zinc-nickel coated

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	V.E37 / 19 x 50 (Data sheet 1.1-168) N.S35 / 19 x 50 (Data sheet 1.1-175)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**MANUAL OVERRIDE**

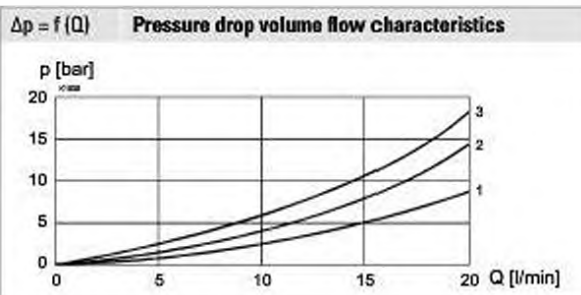
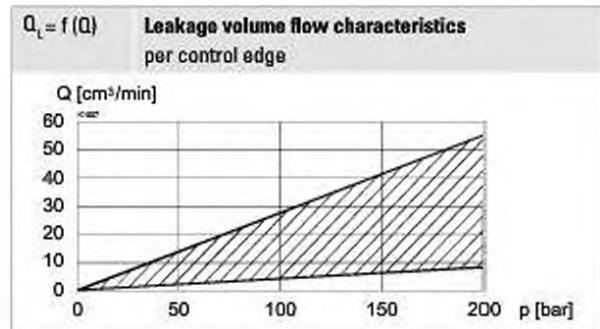
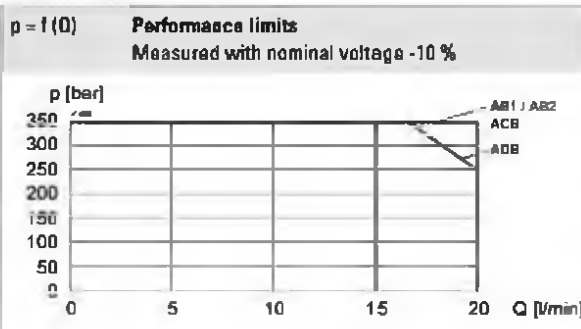
- ◆ Integrated (-) Actuation pin integrated in the armature tube. Actuation by pressing the pin
- ◆ Push-button (HF1) Integrated in the knurled nut. Actuation by pressing the push-button
- ◆ Spindle (HS1) Integrated in the knurled nut. Actuation by turning the spindle (continuously variable valve actuation)

**Attention!** The actuation of the manual override is possible up to a tank pressure of:

- 40 bar Integrated (-)
- 40 bar Push-button (HF1)
- 100 bar Spindle (HS1)

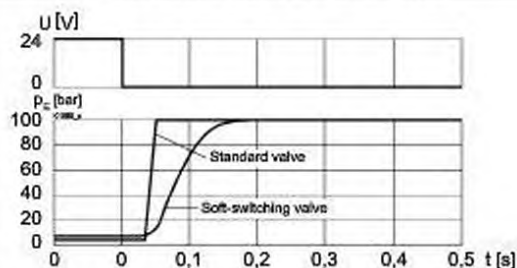

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$

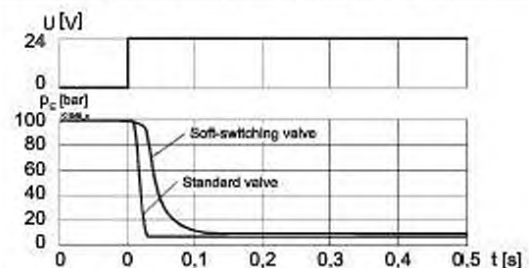


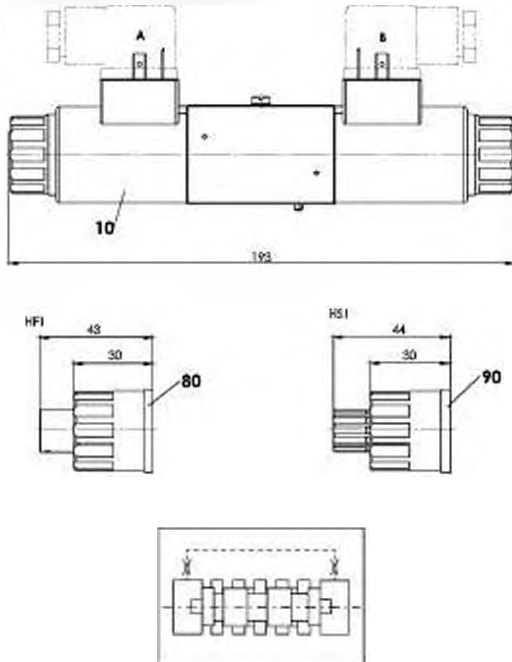
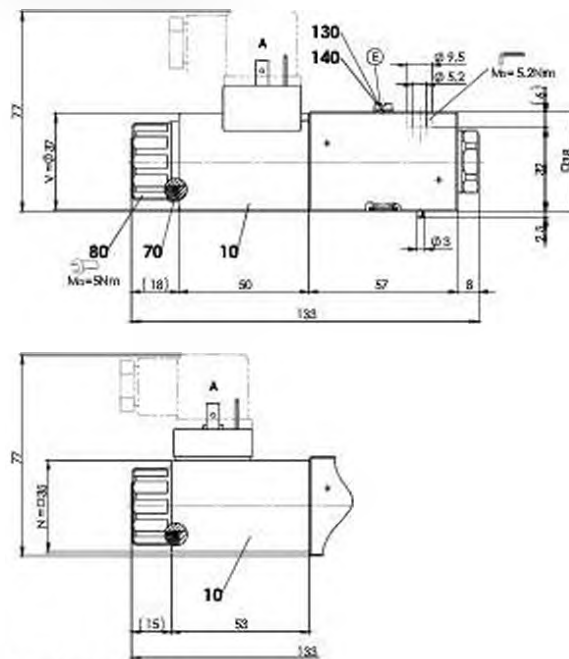
Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1 / AB2	3	3	-	3	3
ACB / AC1 / CB2	3	3	-	3	3
ADB / AD1 / DB2	2	2	-	1	1

Switching times, influence of the soft switching.  
Solenoid energised.  
Measured with WWMFB04-ACB-G24 in comparison  
with WDMFB04-ACB-G24 at  $Q = 10 \text{ l/min}$



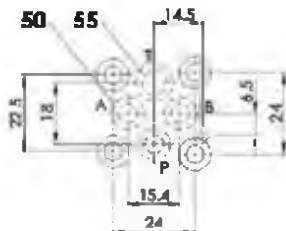
Switching times, influence of the soft switching.  
Solenoid energised.  
Measured with WWMFB04-ACB-G24 in comparison  
with WDMFB04-ACB-G24 at  $Q = 10 \text{ l/min}$



**DIMENSIONS**
**4/3-way valve (spring centred)**

**4/2-way valve (spring reset)**


E = Air bleed screw

Orifices in valve body influence the switching times

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	206.2...	VE37 / 19 x 50
	260.5...	N.S35 / 19 x 50
50	160.2060	O-ring ID 6,07 x 1,78 (NBR)
	160.6061	O-ring ID 6,07 x 1,78 (FKM)
55	160.2076	O-ring ID 7,65 x 1,78 (NBR)
	160.6076	O-ring ID 7,65 x 1,78 (FKM)
60	160.2187	O-ring ID 18,72 x 2,62 (NBR)
70	154.2700	Knurled nut
80	253.7001	Push-button
90	253.7000	Spindle
130	246.1007	Socket head screw zinc-coated blue M4 x 6 DIN84 A
140	049.2040	Banded seal ID 4,1 x 7,2 x 1

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 40
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 5 \text{ Nm}$ knurled nut

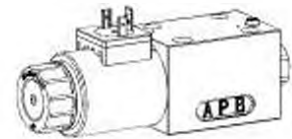
**Note!** The length of the fixing screw depends on the base material of the connection element.

**ACCESSORIES**

Mating connector gray (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Threaded subplates	Data sheet 2.9-12
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**Solenoid operated spool valve with soft switching**
**Flange construction**

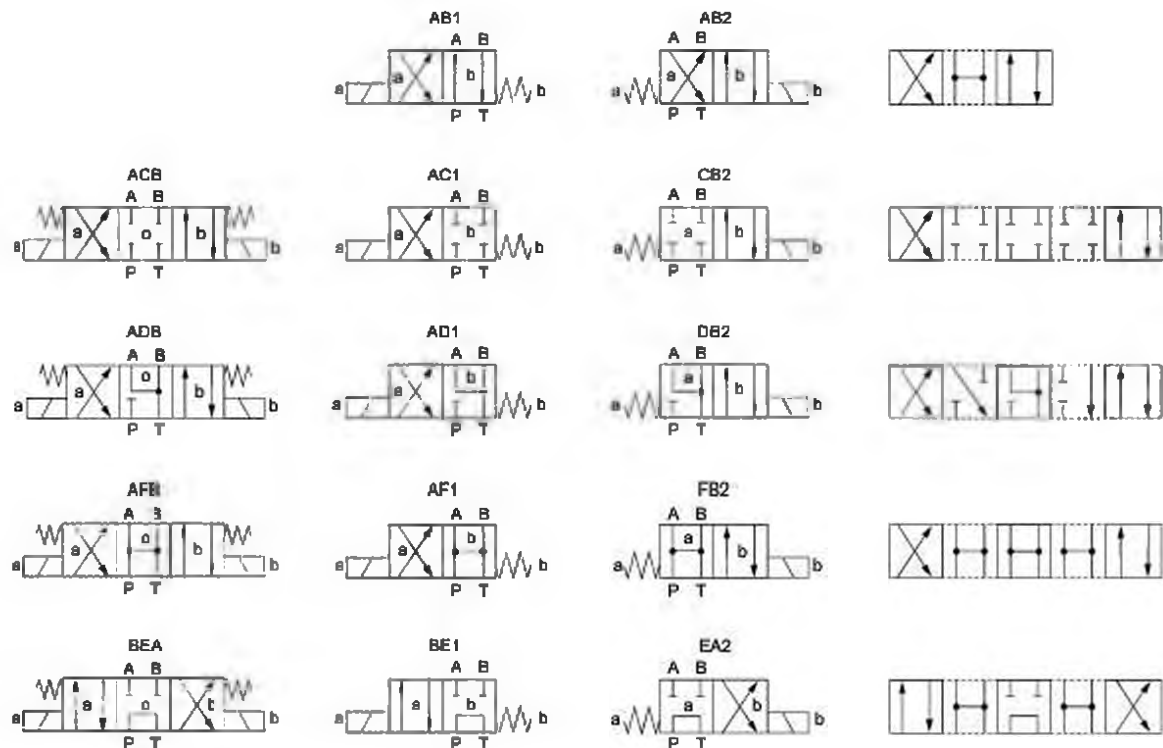
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 60 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG6**  
**ISO 4401-03**

**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). The soft switching of the valve is achieved by means of an optimum combination of the orifice and spool design. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, valve body from high quality hydraulic cast steel. Wide range of standard and special voltages.

**APPLICATION**

Normal solenoid spool valves switch very quickly. This can lead to shocks in the hydraulic system which can cause mechanical wear and have a negative effect on operation. The soft switching valves slow down and dampen the switching movements which benefits the system. Optimum results can be achieved if all 4 connections are connected and the valve is properly vented.

**SYMBOL**


**TYPE CODE**

		W W M F A06 - [ ] - [ ] / [ ] [ ] - [ ] [ ] [ ] # [ ]	
Spool valve, soft switching			
Slip-on coil, medium			
Flange construction			
International standard interface ISO, NG6			
Designation of symbols acc. to table			
Nominal voltage $U_n$	12 VDC [G12] 24 VDC [G24] 115 VAC [R115] 230 VAC [R230] without coil [X5]		
Slip-on coil	Metal housing, round [W] Metal housing, square [M]		
Connection execution	Connector socket EN 175301-803 / ISO 4400 [D] Connector socket AMP Junior-Timer [J] (only for $U_n \leq 75$ VDC) Connector Deutsch DT04 - 2P [E] (only for $U_n \leq 75$ VDC)		
Sealing material	NBR [ ] FKM (Viton) [01]		
Manual override	integrated [ ] Push-button [HF1] Spindle [HST]		
Orifice diameter	Ø 0.3 mm (Standard) [ ] Ø 0.5 mm [00.5]		
Design index (subject to change)			

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C if > +50 °C, then no undervoltage is admissible
Weight	1.50 kg (1 solenoid) 2.00 kg (2 solenoids)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{min} = 200$ bar
Maximum volume flow	$Q_{max} = 60$ l/min, see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	WE45 / 23 x 50 (Data sheet 1.1-182) MS45 / 23 x 50 (Data sheet 1.1-181)
Connection	Connector socket EN 175301-803 Connector socket AMP Junior-Timer Connector Deutsch DT04 - 2P



## ELECTRICAL SPECIFICATIONS

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Switching frequency	Since switching is damped and slow, switching frequency is of secondary importance.
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-182 (slip-on coil W) and 1.1-181 (slip-on coil M)



## STANDARDS

Mounting interface	ISO 4401-03
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## COMMISSIONING

**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).



## ACCESSORIES

Mating connector gray (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

## MANUAL OVERRIDE

- ◆ Integrated (-) Actuation pin integrated in the armature tube. Actuation by pressing the pin
- ◆ Push-button (HF1) Integrated in the knurled nut. Actuation by pressing the push-button
- ◆ Spindle (HS1) Integrated in the knurled nut. Actuation by turning the spindle (continuously variable valve actuation)

**Attention!** The actuation of the manual override is possible up to a tank pressure of:



- 40 bar Integrated (-)
- 40 bar Push-button (HF1)
- 100 bar Spindle (HS1)

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## SURFACE TREATMENT

- ◆ The valve body is painted with a two component paint
- ◆ The screw plug is zinc-nickel coated
- ◆ The slip-on coil and the armature tube are zinc-nickel coated

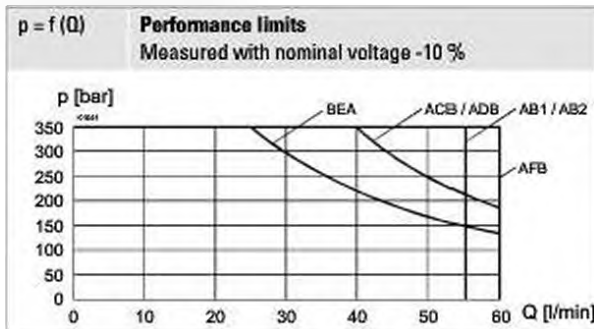
## INSTALLATION NOTES

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 50
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 5 \text{ Nm}$ knurled nut

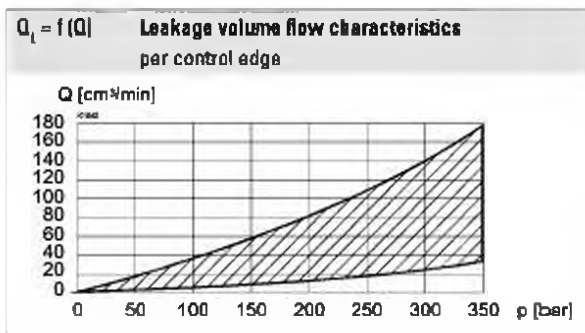
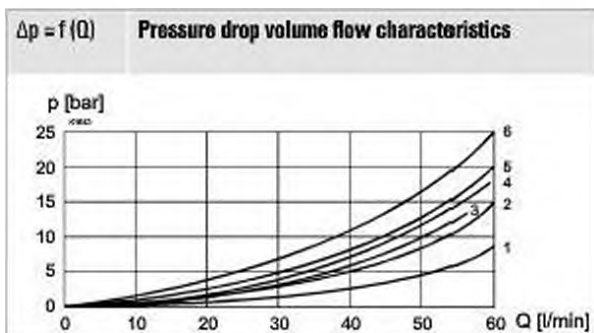
**Note!** The length of the fixing screw depends on the base material of the connection element.



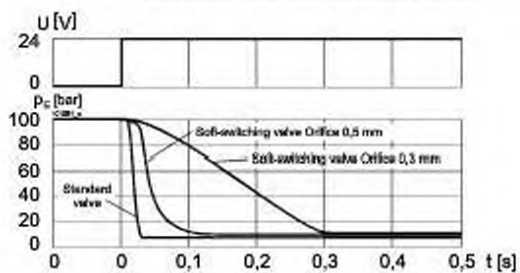
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


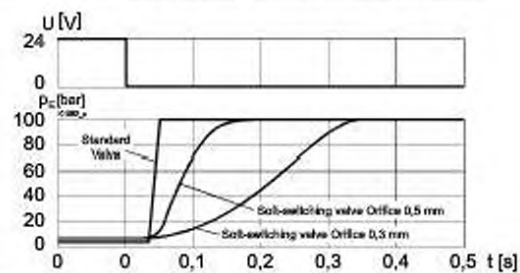
Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1 / AB2	3	3	-	3	3
ACB / AC1 / CB2	5	5	-	5	5
ADB / AD1 / DB2	4	4	-	4	4
AFB / AF1 / FB2	2	2	2	1	1
BEA / BE1 / EA2	2	2	6	2	2

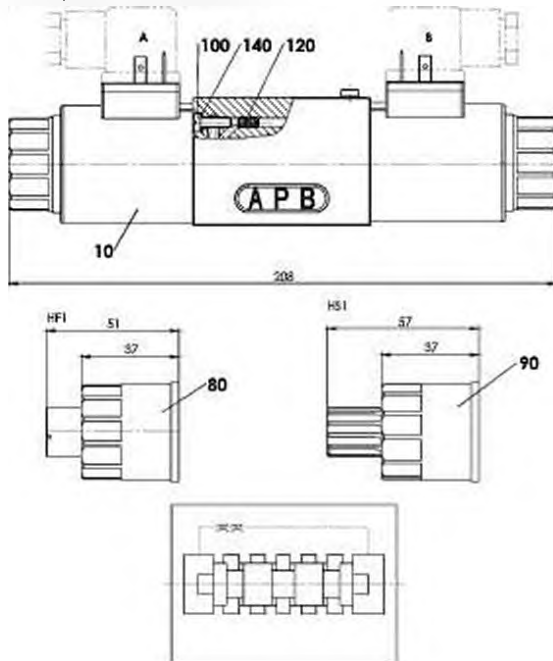
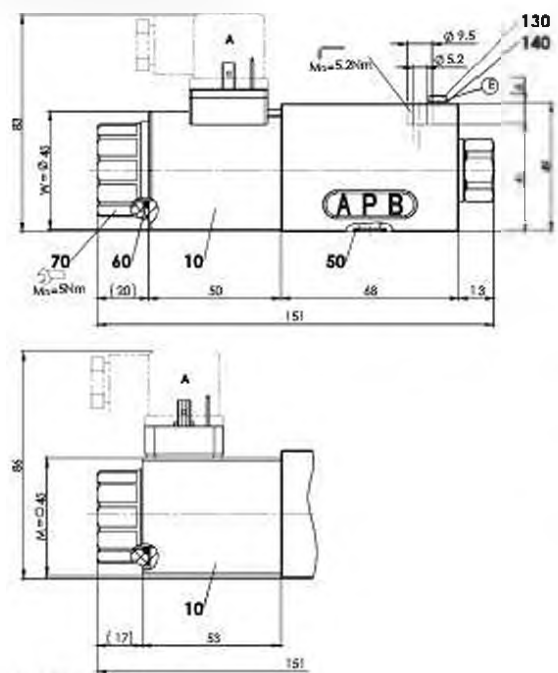


Switching times, influence of the soft switching  
 Solenoid energised  
 Measured with WWMFA06-ACB-G24 in comparison  
 with WDMFA06-ACB-G24 at  $Q = 30 \text{ l/min}$



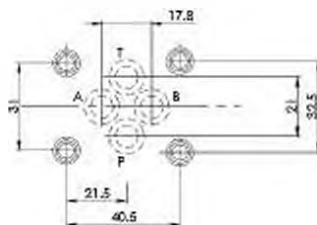
Switching times, influence of the soft switching  
 Solenoid deenergised  
 Measured with WWMFA06-ACB-G24 compared  
 with WDMFA06-ACB-G24 at  $Q = 30 \text{ l/min}$



**DIMENSIONS**
**4/3-way valve (spring centred)**

**4/2-way valve (spring reset)**


E = Air bleed screw

Orifices in valve body influence the switching times

**HYDRAULIC CONNECTION**

**PARTS LIST**

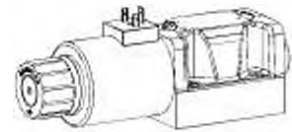
Position	Article	Description
10	206.1...	WE45 / 23 x 50
	206.7...	M.S45 / 23 x 50
50	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
60	160.2222	O-ring ID 22,22 x 2,62 (NBR)
70	154.2701	Knurled nut M23 x 1,5 x 19,7
80	253.7004	Push-button
90	253.7002	Spindle
100	246.1012	Socket head screws zinc-coated blue DIN84A M4 x 12
120	118.1023	Orifica M4 / 0,5 x 4St
	118.1029	Orifica M4 / 0,3 x 4St
130	246.1007	Socket head screw zinc-coated blue M4 x 6 DIN84 A
140	049.2040	Bonded seal ID 4,1 x 7,2 x 1

**Solenoid operated spool valve with soft switching**
**Flange construction**

- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 120 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG10**

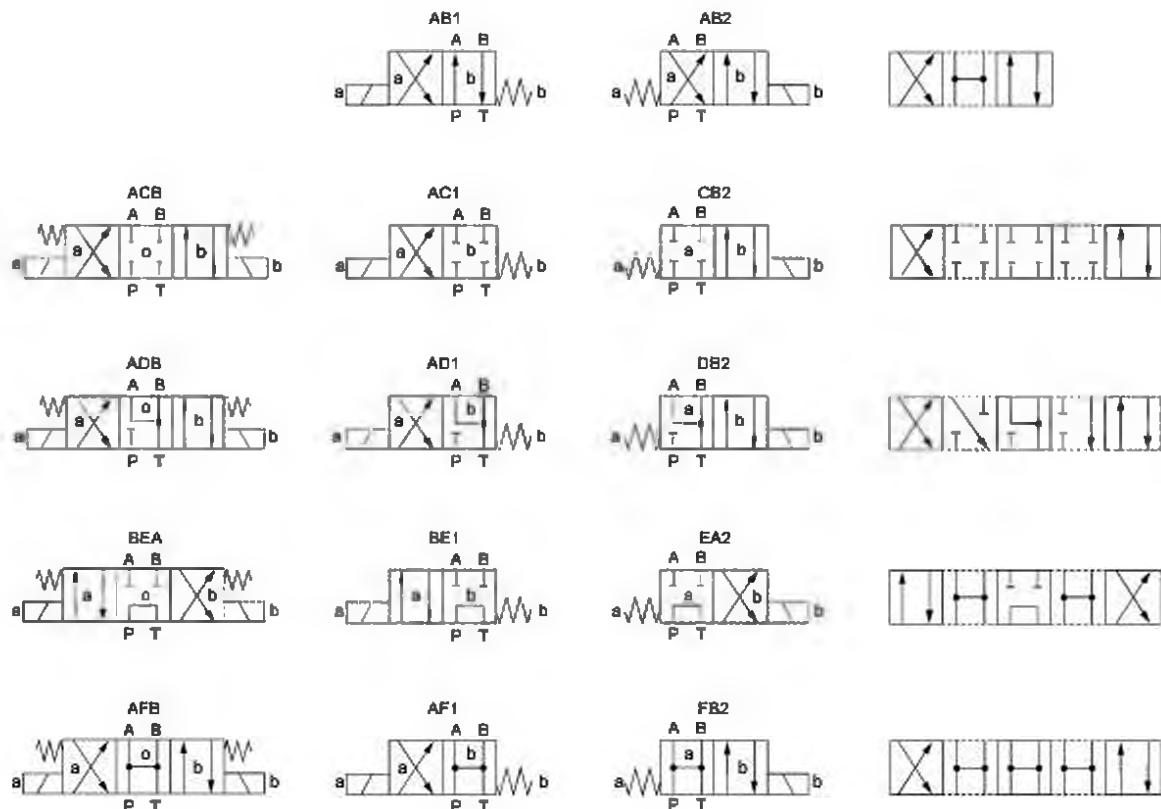
ISO 4401-05


**DESCRIPTION**

Direct operated solenoid spool valve with 4 connections in 5 chamber design. With the solenoids deenergised, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). The soft switching of the valve is achieved by means of an optimum combination of the orifice and spool design. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, valve body from high quality hydraulic cast steel. Wide range of standard and special voltages.

**APPLICATION**

Normal solenoid spool valves switch very quickly. This can lead to shocks in the hydraulic system which can cause mechanical wear and have a negative effect on operation. The soft switching valves slow down and dampen the switching movements which benefits the system. Optimum results can be achieved if all 4 connections are connected and the valve is properly vented.

**SYMBOL**


**TYPE CODE**

		W W M F A10 - [ ] - [ ] / [ ] [ ] - [ ] [ ] [ ] # [ ]	
Spool valve, soft switching			
Slip-on coil Medium			
Flange construction			
International standard interface ISO, NG10			
Designation of symbols acc. to table			
Nominal voltage $U_n$	12 VDC [G12] 24 VDC [G24] 115 VAC [R115] 230 VAC [R230] without coil [X5]		
Slip-on coil	Metal housing round [W] (only G12 and G24) Metal housing square [M]		
Connection execution	Connector socket EN 175301-803 / ISO 4400 [D] Connector socket AMP Junior-Timer [J] (only for $U_n \leq 75$ VDC) Connector Deutsch DT04 - 2P [E] (only for $U_n \leq 75$ VDC)		
Sealing material	NBR [ ] FKM (Viton) [D1]		
Manual override	integrated [ ] Push-button [HF1] Spindle [HS1]		
Orifice diameter	Ø 0,3 mm [Ø0,3] Ø 0,5 mm (Standard) [ ] Ø 0,8 mm [Ø0,8] Spindle (adjustable soft switching) [S]		
Design index (subject to change)			
1.4-2			

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C if > +50 °C, then no undervoltage is admissible
Weight	3,9 kg (1 solenoid) 5,4 kg (2 solenoids)
MTTFd	150 years

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	W.E64/31x72 (Data sheet 1.1-190) W.S60/31x72 (Data sheet 1.1-193)
Connection	Connector socket EN 175301-803 Connector socket AMP Junior-Timer Connector Deutsch DT04 - 2P

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{min} = 160$ bar
Maximum volume flow	$Q_{max} = 120$ l/min, see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

## ELECTRICAL SPECIFICATIONS

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Switching frequency	Since switching is damped and slow, switching frequency is of secondary importance.
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-190 (slip-on coil W) and 1.1-193 (slip-on coil M)



## COMMISSIONING

**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).



## STANDARDS

Mounting interface	ISO 4401-05
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## ACCESSORIES

Mating connector grey (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

## MANUAL OVERRIDE

- ◆ Integrated (-) Actuation pin integrated in the armature tube. Actuation by pressing the pin
- ◆ Push-button (HF1) Integrated in the knurled nut. Actuation by pressing the push-button
- ◆ Spindle (HS1) Integrated in the knurled nut. Actuation by turning the spindle (continuously variable valve actuation)

**Attention!** The actuation of the manual override is possible up to a tank pressure of:



- 20 bar Integrated (-)
- 20 bar Push-button (HF1)
- 80 bar Spindle (HS1)

## SURFACE TREATMENT

- ◆ The valve body is painted with a two component paint
- ◆ The screw plug is zinc-nickel coated
- ◆ The slip-on coil and the armature tube are zinc-nickel coated

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

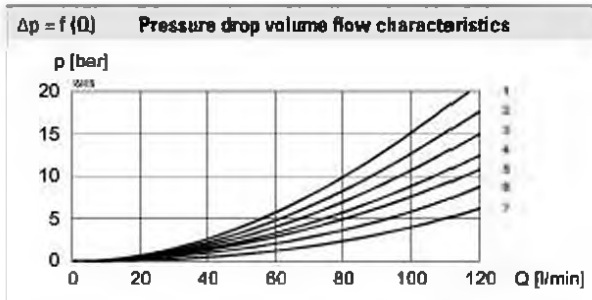
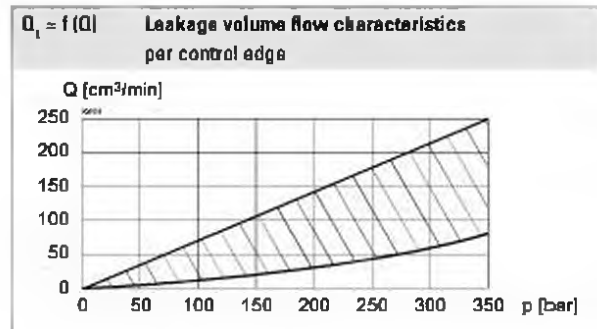
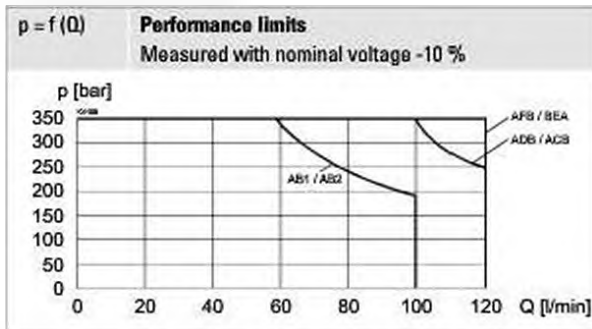
## INSTALLATION NOTES

Mounting type	Flange mounting 4 fixing holes for socket head screws M6 x 40
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screw $M_0 = 10,5 \text{ Nm} \pm 10 \%$ (screw quality 8.8, zinc coated) max. tank pressure 80 bar $M_0 = 13,5 \text{ Nm} \pm 10 \%$ (screw quality 10.9, zinc coated) Knurled nut $M_0 = 5 \text{ Nm}$

**Note!** The length of the fixing screw depends on the base material of the connection element.

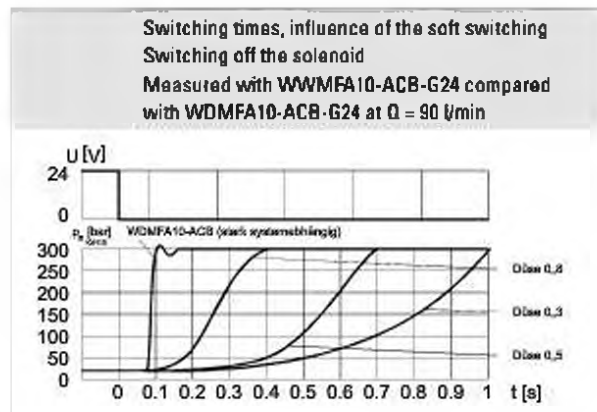
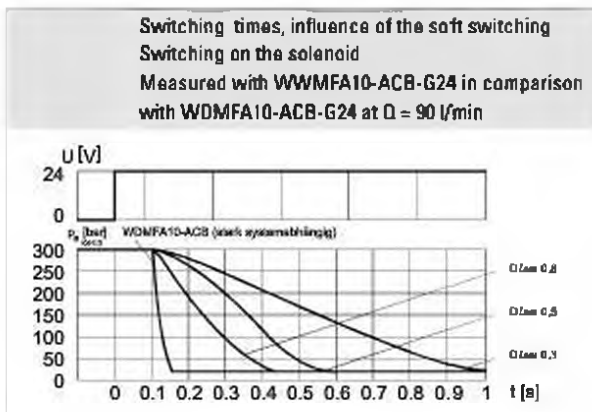


**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


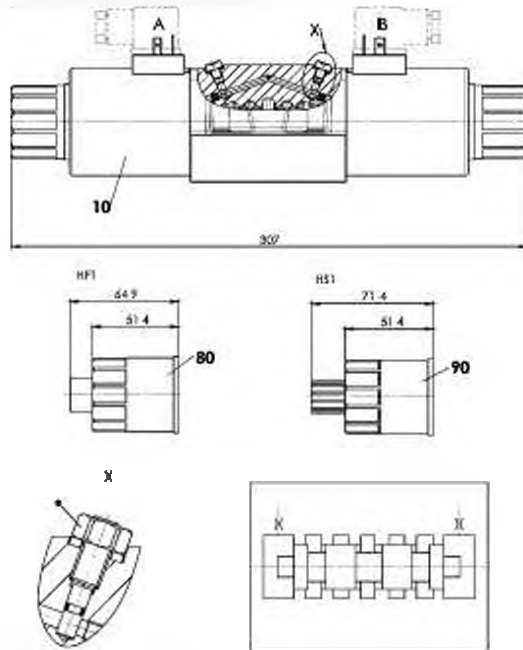
Volume flow direction

Symbol	P - A	P - B	P - T	A - T	B - T
AB1 / AB2	4	4	-	2	1
ACB	5	5	-	4	3
ADB	5	5	-	4	3
BEA	5	5	3	5	4
AFB	6	6	7	7	7

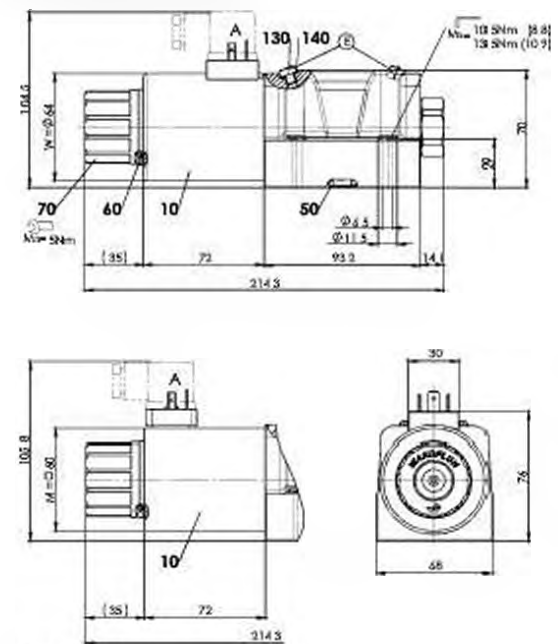


**Note!** With the option spindle «S», the switching time can be adjusted individually.



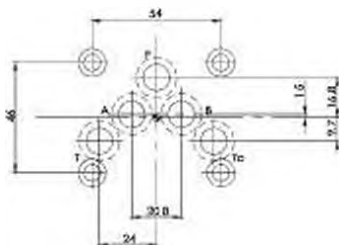
**DIMENSIONS**
**4/3-way valve (spring centred)**


\*optionally spindle

**4/2-way valve (spring reset)**


E = Air bleed screw

Orifices in valve body influence the switching times

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	206.3...	W.E64 / 31 x 72
	260.9...	M..60 / 31 x 72
50	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.8124	O-ring ID 12,42 x 1,78 (FKM)
60	160.2282	O-ring ID 28,24 x 2,62 (NBR)
70	154.2706	Knurled nut
80	253.7006	HF1-M24
90	253.7005	HS1-M24
130	246.3006	Socket head screw M6 x 20 DIN 912
140	049.2062	Bonded seal ID 4,1 x 7,2 x 1



## Spool valve

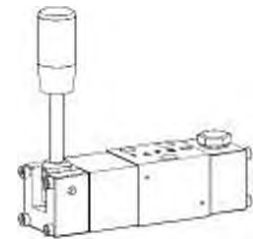
### Flange construction

- ◆ hand operated
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆ 4/2- and 4/3-way detented
- ◆  $Q_{max} = 8 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

## DESCRIPTION

Direct operated spool valve, hand operated with 4 connections in 5 chamber design. Spool detented or with spring. Without actuation, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the detent, the spool is held in the last switching position selected. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, body from high quality hydraulic cast steel.

## NG3-Mini



## APPLICATION

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol. Manually or mechanically operated valves are particularly suitable for use in installations where no electric current is available or for applications in explosion hazard areas. Miniature valves are used where both, reduced dimensions and weight are important.

## TYPE CODE

Spool valve, direct operated		WD	F	A03	-	-	↕
Hand lever with spring reset or spring centred		H					
Hand lever detented		G					
Flange construction							
Mounting interface acc. to Wandfluh standard, NG3-Mini							
Designation of symbols acc. to table	Operation a-side	1					
	Operation b-side	2					
Sealing material	NBR						
	FKM (Viton)	D1					
Design index (subject to change)							

1.0-10

## GENERAL SPECIFICATIONS

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG3-Mini according to Wandfluh standard
Actuation	Hand operated
Ambient temperature	-25...+70 °C
Weight	0,62 kg
MTTFd	150 years

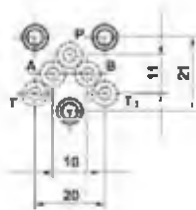
## HYDRAULIC SPECIFICATIONS

Working pressure	$p_{max} = 350 \text{ bar}$ ( $p_T < 20 \text{ bar}$ ) $p_{max} = 315 \text{ bar}$ ( $p_T > 20 \text{ bar}$ )
Tank pressure	$p_{T,max} = 100 \text{ bar}$
Maximum volume flow	$Q_{max} = 8 \text{ l/min}$ , see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50





## HYDRAULIC CONNECTION



## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## INSTALLATION NOTES

Mounting type	Flange mounting 3 fixing holes for socket head screws M4 x 30
Mounting position	Any, preferably horizontal
Tightening torque	$M_t = 2,6 \text{ Nm}$ (quality 8.8, zinc coated) Fixing screws

**Note!** The length of the fixing screw depends on the base material of the connection element.



## ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

## STANDARDS

Mounting interface	Wandfluh standard
Contamination efficiency	ISO 4406

## SURFACE TREATMENT

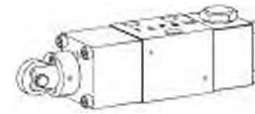
- ◆ The valve body is painted with a two component paint
- ◆ The hand lever housing and the cover are zinc-nickel coated

## Spool valve

### Flange construction

- ◆ roller operated
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 8 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

## NG3-Mini



## DESCRIPTION

Direct operated valve, roller operated with 4 connections in 5 chamber design. Without actuation, the spool is switched back to the offset position. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, body from high quality hydraulic cast steel.

## APPLICATION

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol. Manually or mechanically operated valves are particularly suitable for use in installations where no electric current is available or for applications in explosion hazard areas. Miniature valves are used where both, reduced dimensions and weight are important.

## TYPE CODE

Spool valve, direct operated		WD	T	F	A03	-	-	◆
Roller with spring reset								
Flange construction								
Mounting interface acc. to Wandfluh standard, NG3-Mini								
Designation of symbols acc. to table	Operation a-side							
	Operation b-side							
Sealing material	NBR							
	FKM (Viton)							
Design index (subject to change)								

## GENERAL SPECIFICATIONS

Designation	4/2-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG3-Mini according to Wandfluh standard
Actuation	Roller actuated
Ambient temperature	-25...+70 °C
Weight	0,62 kg
MTTFd	150 years

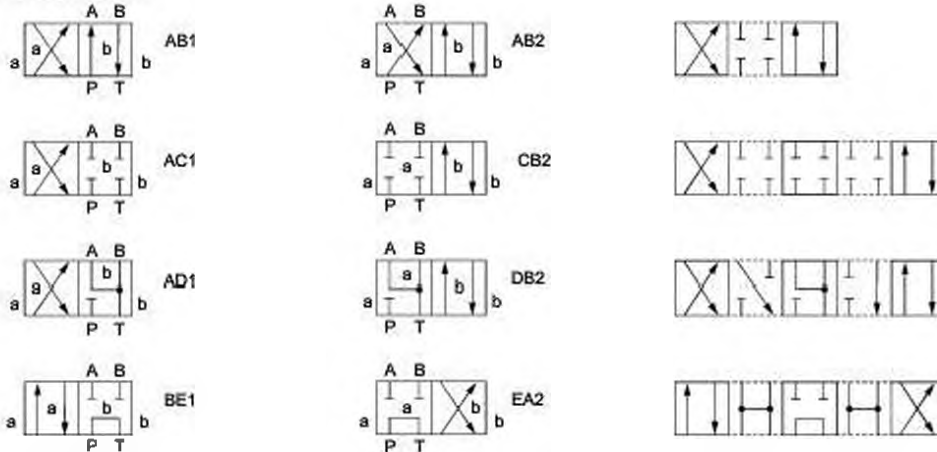
## HYDRAULIC SPECIFICATIONS

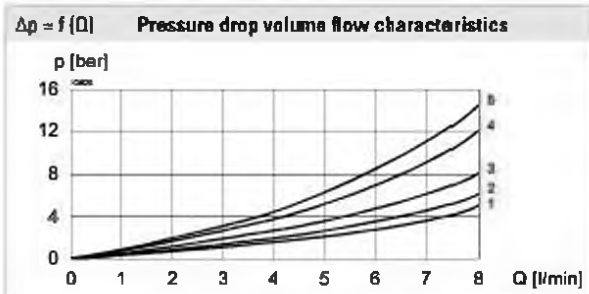
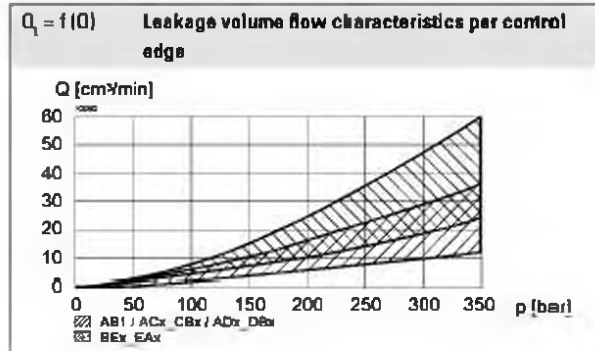
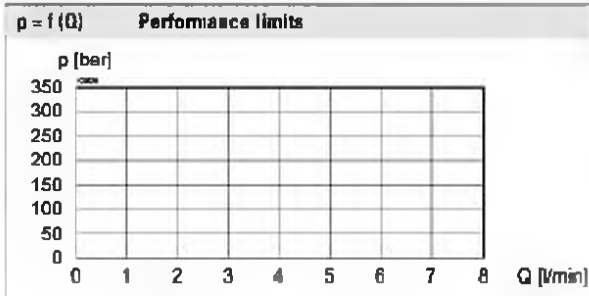
Working pressure	$p_{max} = 350 \text{ bar}$ ( $p_T < 20 \text{ bar}$ )
	$p_{max} = 315 \text{ bar}$ ( $p_T > 20 \text{ bar}$ )
Tank pressure	$p_{T,max} = 100 \text{ bar}$
Maximum volume flow	$Q_{max} = 8 \text{ l/min}$ , see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR)
	-20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

## ACTUATION

Actuation	Roller
Actuation stroke	s = 1,7 mm
Actuation force	$F_A = 90 - 120 \text{ N}$

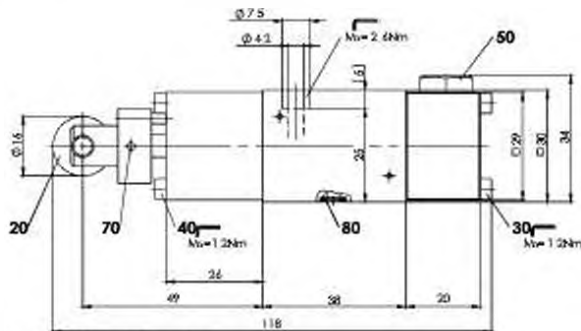
**SYMBOL**
**Overview valves**

**Overview spool types**

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


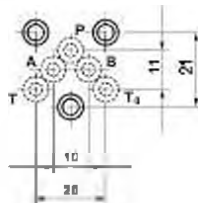
Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1 / AB2	3	3	-	2	2
AC1 / CB2	3	3	-	1	1
AD1 / DB2	2	2	-	1	1
BE1 / EA2	5	5	3	4	4

## DIMENSIONS



Width of the roller = 4.8 mm

## HYDRAULIC CONNECTION



## STANDARDS

Mounting interface	Wandfluh standard
Contamination efficiency	ISO 4406

## SURFACE TREATMENT

- ◆ The valve body is painted with a two component paint
- ◆ The roller housing and the cover are zinc-nickel coated

## PARTS LIST

Position	Article	Description
20	253.1100	Mechanical control head BT III
30	246.0126	Socket head screw M3 x 25 DIN 912
40	246.0131	Socket head screw M3 x 30 DIN 912
50	238.1100	Screw plug M10 x 1 DIN 7604A
70	221.1166	Spring tension split pin ø 2 x 16 DIN 6325
80	160.2045	O-ring ID 4,50 x 1,50 (NBR)

## ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## INSTALLATION NOTES

Mounting type	Flange mounting 3 fixing holes for socket head screws M4 x 30
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 2,6 \text{ Nm}$ (quality 8.8, zinc coated) Fixing screws

### Note!



The length of the fixing screw depends on the base material of the connection element.

## Spool valve

### Flange construction

- ◆ hand operated
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆ 4/2- and 4/3-way detented
- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

## NG4-Mini



## DESCRIPTION

Direct operated spool valve, hand operated with 4 connections in 5 chamber design. Spool detented or with spring. Without actuation, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the detent, the spool is held in the last switching position selected. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, body from high quality hydraulic cast steel.

## APPLICATION

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol. Manually or mechanically operated valves are particularly suitable for use in installations where no electric current is available or for applications in explosion hazard areas. Miniature valves are used where both, reduced dimensions and weight are important.

## TYPE CODE

Mounting interface acc. to Wandfluh standard:	B H 4		<input type="checkbox"/>	/	<input type="checkbox"/>	-	<input type="checkbox"/>	◆	<input type="checkbox"/>
Hand lever									
Number of control ports									
Designation of symbols acc. to table	Operation a-side	<input type="checkbox"/> ...a							
	Operation b-side	<input type="checkbox"/> ...b							
Hand lever with spring reset or spring centred			<input type="checkbox"/> f						
Hand lever detented			<input type="checkbox"/> r						
Sealing material	NBR	<input type="checkbox"/>							
	FKM (Viton)	<input type="checkbox"/> D1							
Design index (subject to change)									

1.5-20

## GENERAL SPECIFICATIONS

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Hand operated
Ambient temperature	-25...+70 °C (NBR) -20...+70 °C (FKM)
Weight	0,87 kg
MTTFd	150 years

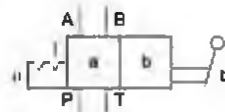
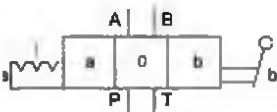
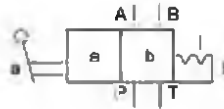
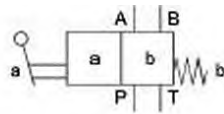
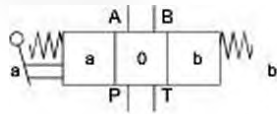
## HYDRAULIC SPECIFICATIONS

Working pressure	$p_{max} = 350 \text{ bar}$
Tank pressure	$p_{T,max} = 100 \text{ bar}$
Maximum volume flow	$Q_{max} = 20 \text{ l/min}$ , see characteristics
Leakage volume flow	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range	-25...+70 °C
fluid	
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10... 16 ≥ 75, see data sheet 1.0-50

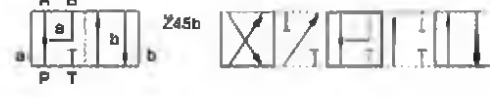
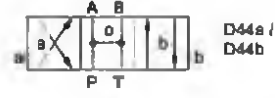
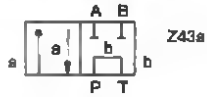
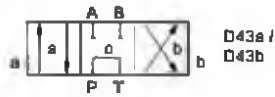
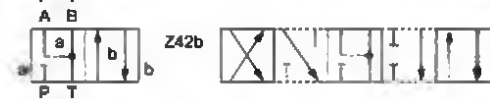
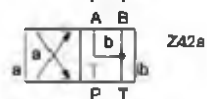
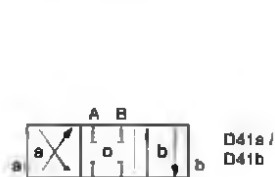


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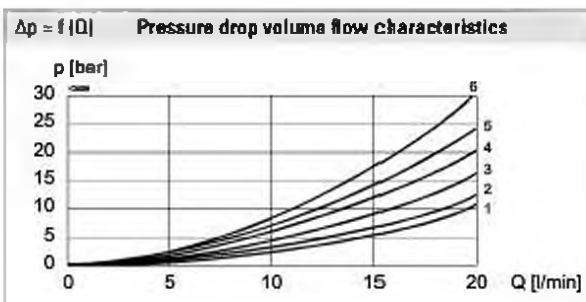
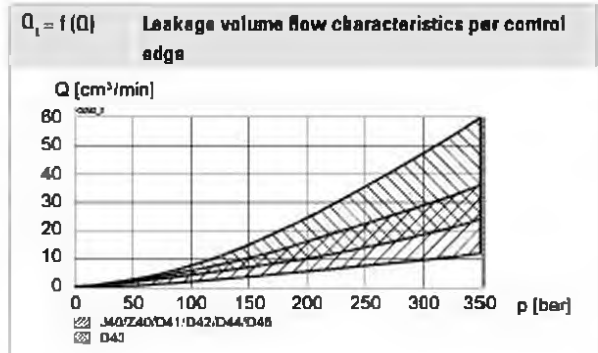
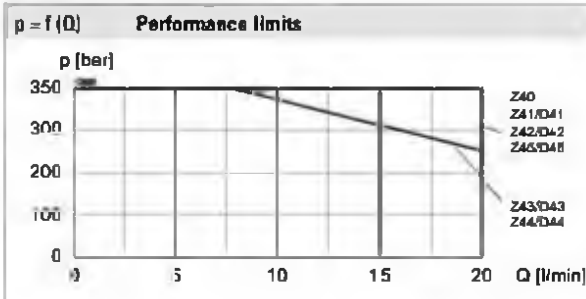
Overview valves



Overview spool types

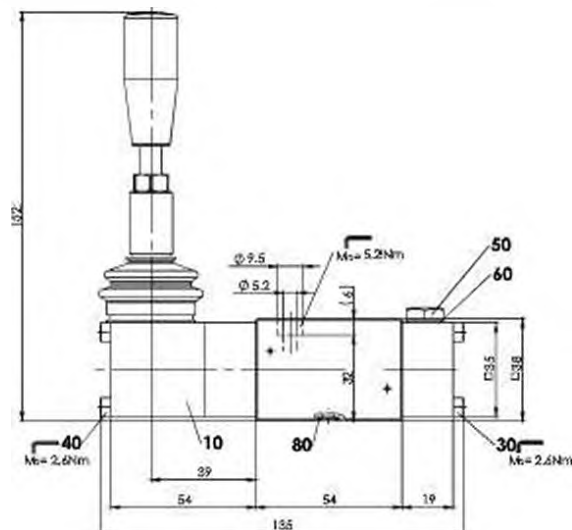


**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Volume flow direction

Symbol	P - A	P - B	P - T	A - T	B - T
Z40	5	5	-	2	2
D41 / Z41	5	5	-	2	2
D42 / Z42	5	5	-	2	2
D43 / Z43	4	4	6	1	1
D44 / Z44	4	4	3	1	1
D45 / Z45	4	4	-	2	2

**DIMENSIONS**

**PARTS LIST**

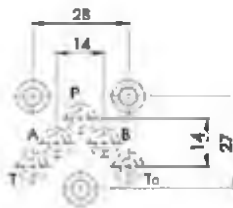
Position	Article	Description
10	253.2000	Hand control head BH11
30	246.1126	Socket head screw M4 x 25 DIN 912
40	246.1161	Socket head screw M4 x 60 DIN 912
50	238.1100	Screw plug M10 x 1 DIN 7604A
	239.1102	Screw plug
60	049.1100	Copper seal ring NG10 x 13.5 x 1.4 DIN7603
80	160.2052	O-ring ID 5,28 x 1,78 (NBR)

**Note!** Screw plug 238 0201 for spring centred execution  
 Screw plug 239 2000 for detented execution  
 Pos. 60 only for screw plug 239.2000


**ACTUATION**

Actuation	Hand lever
Actuation angle	$\alpha_s = 5,7^\circ / \text{side}$
Actuation force	$F_s = 15 - 20 \text{ N}$

## HYDRAULIC CONNECTION



## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## INSTALLATION NOTES

Mounting type	Flange mounting 3 fixing holes for socket head screws M5 x 40
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) Fixing screws

**Note!** The length of the fixing screw depends on the base material of the connection element.



## ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-10
Multi-station subplates	Data sheet 2.9-50
Horizontal mounting blocks	Data sheet 2.9-90
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

## STANDARDS

Mounting interface	Wandfluh standard
Contamination efficiency	ISO 4406

## SURFACE TREATMENT

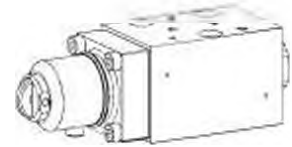
- ◆ The valve body is painted with a two component paint
- ◆ The hand lever housing, the screws and the cover are zinc coated

**Spool valve**
**Flange construction**

- ◆ roller operated
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 30 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG4-Mini**

Wandfluh standard


**DESCRIPTION**

Direct operated valve, roller operated with 4 connections in 5 chamber design. Without actuation, the spool is switched back to the offset position.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. Manually or mechanically operated valves are particularly suitable for use in installations where no electric current is available or for applications in explosion hazard areas.

**TYPE CODE**

		WD T F A04 - <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>
Spool valve, direct operated		
Roller with spring reset		
Flange construction		
Mounting interface according to Wandfluh standard, NG4-Mini		
Designation of symbols acc. to table	Operation a-side <input type="checkbox"/> 1 Operation b-side <input type="checkbox"/> 2	
Sealing material	NBR <input type="checkbox"/> FKM (Viton) <input type="checkbox"/> D1 NBR 872 <input type="checkbox"/> y-2804	
Design index (subject to change)		

**GENERAL SPECIFICATIONS**

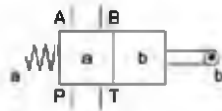
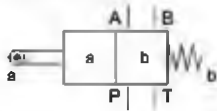
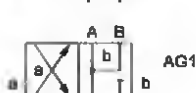
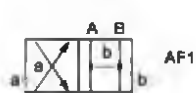
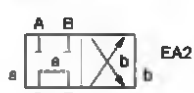
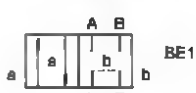
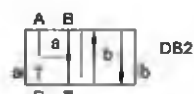
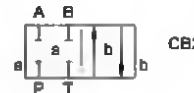
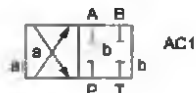
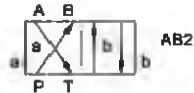
Designation	4/2-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Roller actuated
Ambient temperature	-25...+70 °C
Weight	0,76 kg
MTTFd	150 years

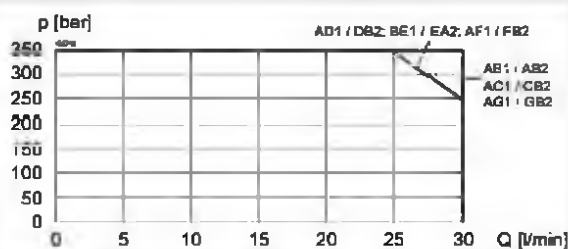
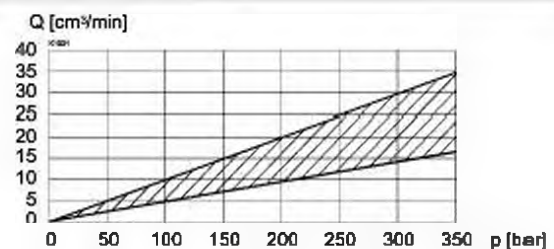
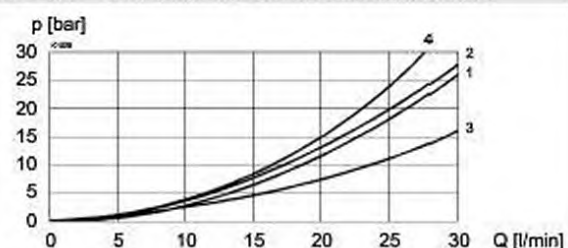
**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Tank pressure	$p_{T,max} = 100 \text{ bar}$
Maximum volume flow	$Q_{max} = 30 \text{ l/min}$ , see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

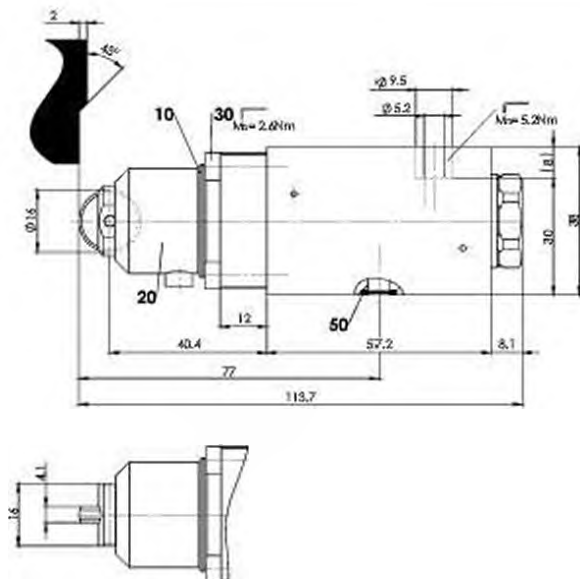
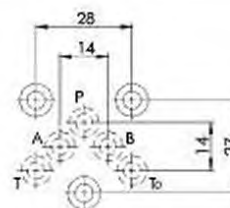
**ACTUATION**

Actuation	Roller
Actuation stroke	$s = 2 \text{ mm}$
Actuation force	$F_s = 110 - 135 \text{ N}$ at $p_{T,max}$

**SYMBOL**
**Overview valves**

**Overview spool types**

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 **$p = f(Q)$  Performance limits**

 **$Q_l = f(Q)$  Leakage volume flow characteristics per control edge**

 **$\Delta p = f(Q)$  Pressure drop volume flow characteristics**

**Volume flow direction**

Symbol	P - A	P - B	P - T	A - T	B - T
AB1 / AB2	2	2	-	1	1
AC1 / CB2	2	2	-	1	1
AD1 / DB2	2	2	-	1	1
BE1 / EA2	1	1	4	1	1
AF1 / FB2	1	1	3	1	1
AG1 / GB2	1	1	-	1	1

**DIMENSIONS**

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	160.8252	O-ring ID 25,12 x 1,78 (FKM)
20	253.6002	Mechanical control head BTII NG4
30	246.2119	Socket head screw M5 x 18 DIN 912
50	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-10
Multi-station subplates	Data sheet 2.9-50
Horizontal mounting blocks	Data sheet 2.9-90
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**STANDARDS**

Mounting interface	Wandfluh standard
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Flange mounting 3 fixing holes for socket head screws M5 x 40
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5.2$ Nm (screw quality 8.8, zinc coated)

**Note!** The length of the fixing screw depends on the base material of the connection element.


**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The roller housing and the cover are zinc-nickel coated

## Spool valve

### Flange construction

- ◆ hand operated
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆ 4/2- and 4/3-way detented
- ◆  $Q_{max} = 60$  l/min
- ◆  $p_{max} = 350$  bar

## NG6

ISO 4401-03



## DESCRIPTION

Direct operated spool valve, hand operated with 4 connections in 5 chamber design. Spool detented or with spring. Without actuation, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the detent, the spool is held in the last switching position selected. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, body from high quality hydraulic cast steel.

## APPLICATION

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol. Manually or mechanically operated valves are particularly suitable for use in installations where no electric current is available or for applications in explosion hazard areas.

## TYPE CODE

International standard interface ISO	A	H	4		/		-		≠	
Hand lever										
Number of control ports										
Designation of symbols acc. to table	Operation a-side	...a								
	Operation b-side	...b								
Hand lever with spring reset or spring centred			f							
Hand lever detented			r							
Sealing material	NBR									
	FKM (Viton)	D1								
Design index (subject to change)										

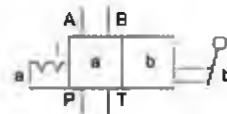
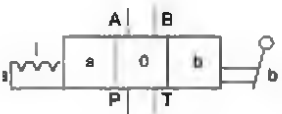
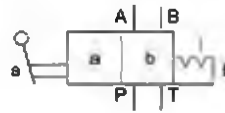
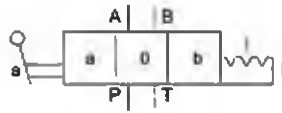
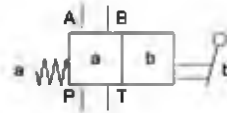
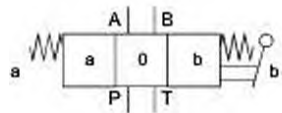
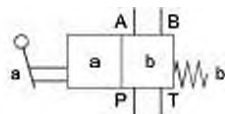
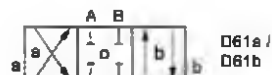
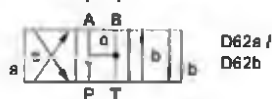
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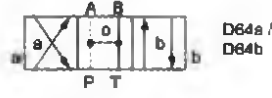
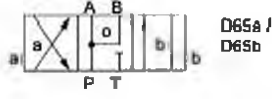
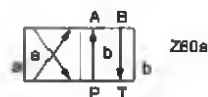
## GENERAL SPECIFICATIONS

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Hand operated
Ambient temperature	-25...+70 °C (NBR) -20...+70 °C (FKM)
Weight	1,55 kg

## HYDRAULIC SPECIFICATIONS

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{T,max} = 100$ bar
Maximum volume flow	$Q_{max} = 60$ l/min, see characteristics
Leakage volume flow	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range	-25...+70 °C
fluid	
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade $\beta_{10} \dots 16 \geq 75$ , see data sheet 1.0-50

**SYMBOL**
**Overview valves**

**Overview spool types**

 D61a /  
D61b

 D62a /  
D62b

 D63a /  
D63b

 D64a /  
D64b

 D65a /  
D65b


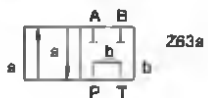
Z60a



Z61a



Z62a



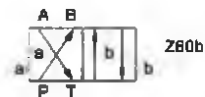
Z63a



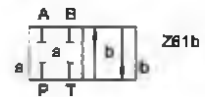
Z64a



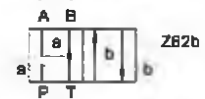
Z65a



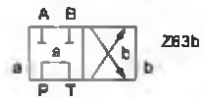
Z60b



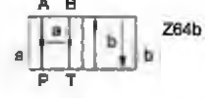
Z61b



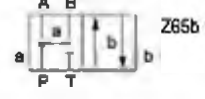
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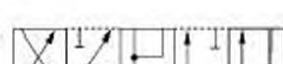
Z63b



Z64b

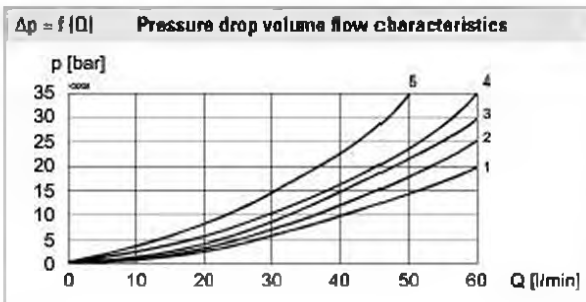
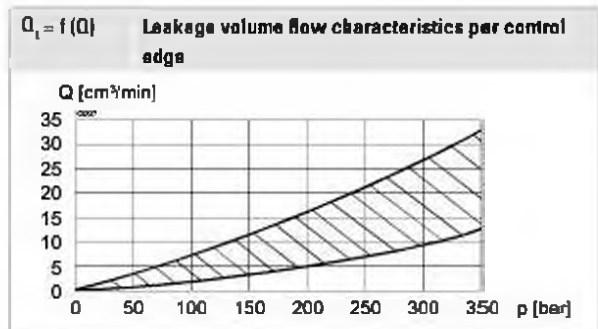
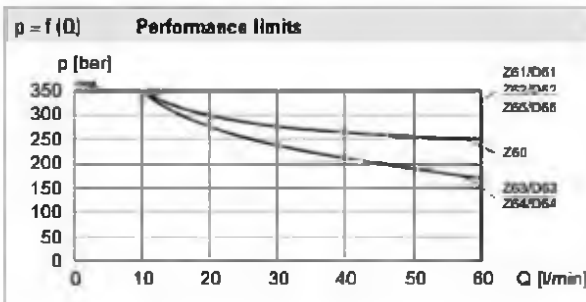


Z65b



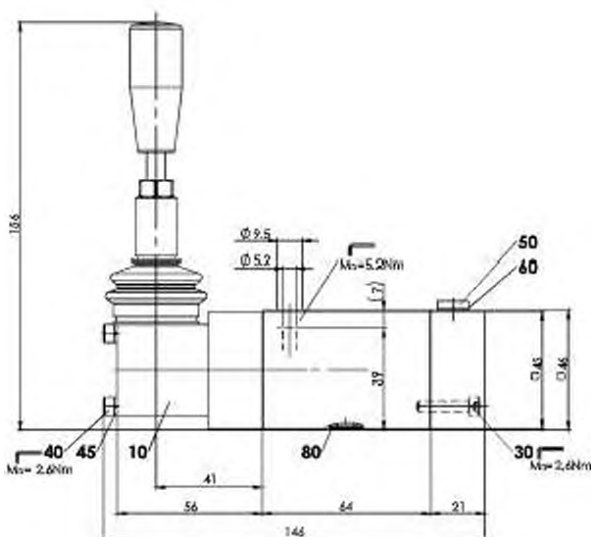


**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Volume flow direction

Symbol	P - A	P - B	P - T	A - T	B - T
Z60	3	3	-	4	4
D61 / Z61	2	2	-	4	4
D62 / Z62	3	3	-	4	4
D63 / Z63	2	2	5	3	3
D64 / Z64	1	1	-	3	3
D65 / Z65	1	1	-	4	4

**DIMENSIONS**

**PARTS LIST**

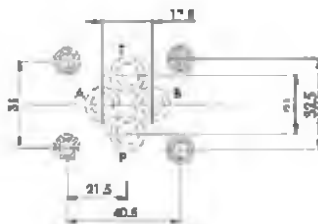
Position	Article	Description
10	253.2000	Hand control head BH II
30	246.1121	Socket head screw M4 x 20 DIN 912
40	249.1007	Socket head screw M4 x 63 DIN 912
45	234.5040	Spring washer M4
50	238.0201	Screw plug MP x 1 DIN 908
	239.2000	Screw plug
60	049.1080	Copper seal ring NG8 x 11.5 x 1 DIN 7603
80	160.2093	O-ring ID 9,25 x 1,78 (NBR)

**Note!** Screw plug 238.0201 for spring centred execution  
 Screw plug 239.2000 for detented execution  
 Pos. 60 only for screw plug 239.2000


**ACTUATION**

Actuation	Hand lever
Actuation angle	$\alpha_s = 7,7^\circ / \text{side}$
Actuation force	$F_s = 15 - 20 \text{ N}$

## HYDRAULIC CONNECTION



## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## INSTALLATION NOTES

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) Fixing screws

**Note!** The length of the fixing screw depends on the base material of the connection element.



## ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

## STANDARDS

Mounting interface	ISO 4401-03
Contamination efficiency	ISO 4406

## SURFACE TREATMENT

- ◆ The valve body is painted with a two component paint
- ◆ The hand lever housing, the screws and the cover are zinc coated

**Spool valve**
**Flange construction**

- ◆ roller operated
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG6**
**ISO 4401-03**

**DESCRIPTION**

Direct operated valve, roller operated with 4 connections in 5 chamber design. Without actuation, the spool is switched back to the offset position.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol. Manually or mechanically operated valves are particularly suitable for use in installations where no electric current is available or for applications in explosion hazard areas.

**TYPE CODE**

Spool valve, direct operated		WD	T	F	AD6	-	-	-	4
Roller with spring reset									
Flange construction									
International standard interface ISO, NG6									
Designation of symbols acc. to table	Operation a-side Operation b-side							1 2	
Sealing material	NBR FKM (Viton)								D1
Design index (subject to change)									

**GENERAL SPECIFICATIONS**

Designation	4/2-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Roller operated
Ambient temperature	-25...+70 °C (NBR) -20...+70 °C (FKM)
Weight	1,27 kg

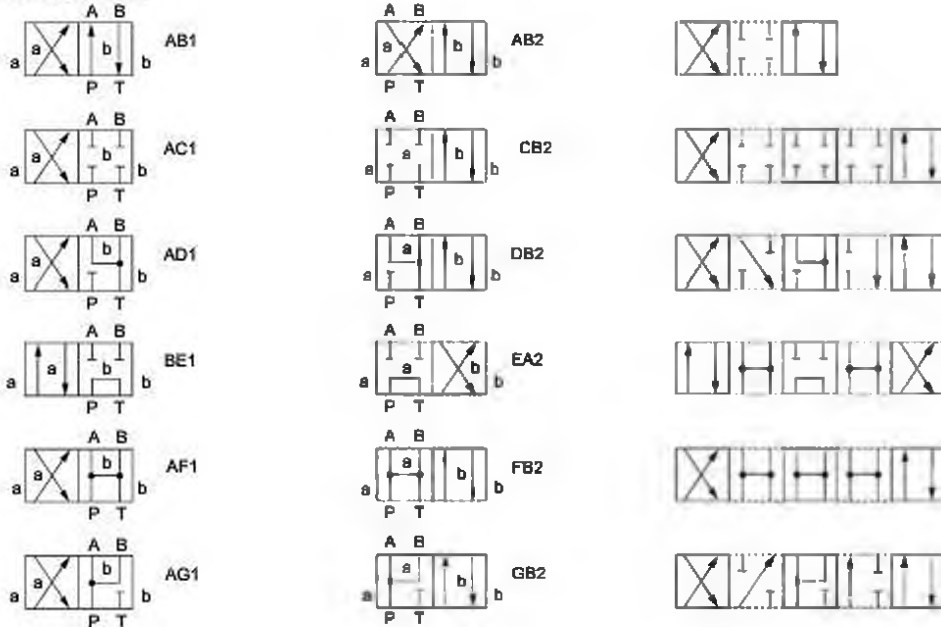
**HYDRAULIC SPECIFICATIONS**

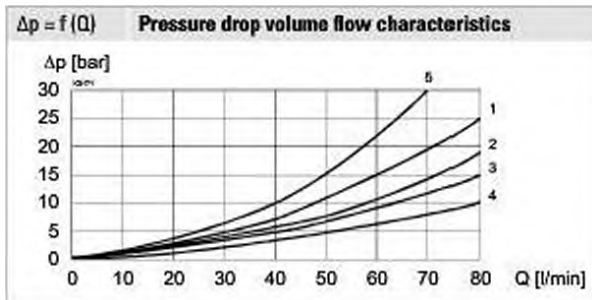
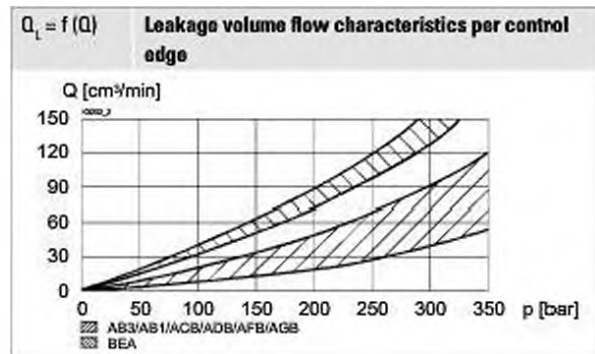
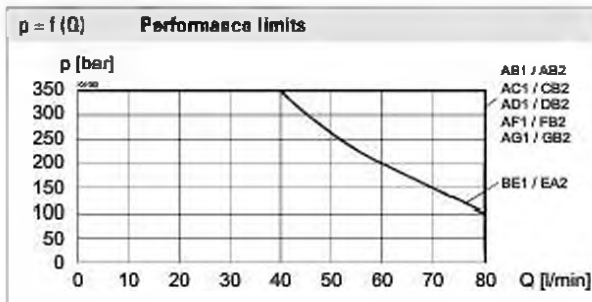
Working pressure	$p_{max} = 350 \text{ bar}$
Tank pressure	$p_{T,max} = 100 \text{ bar}$
Maximum volume flow	$Q_{max} = 80 \text{ l/min}$ , see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**ACTUATION**

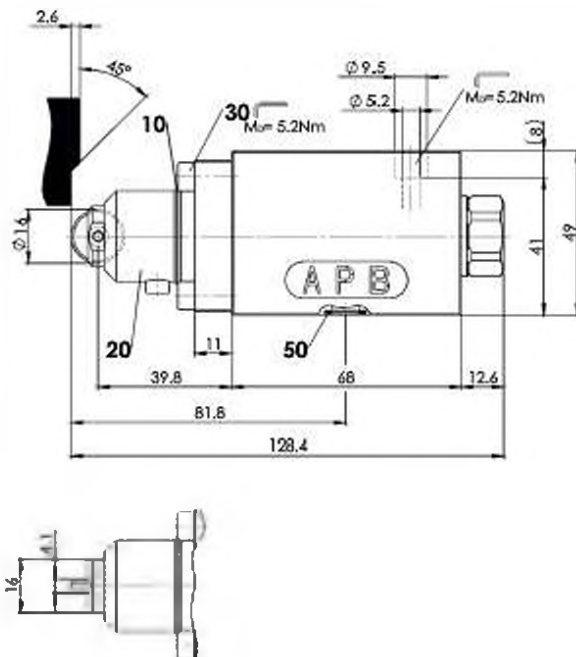
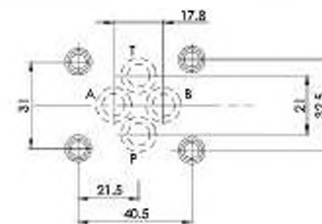
Actuation	Roller
Actuation stroke	$s = 2,6 \text{ mm}$
Actuation force	$F_A = 110 - 135 \text{ N}$ at $p_{T,max}$

**SYMBOL**
**Overview valves**

**Overview spool types**

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Symbole	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1 / AB2	2	2	-	1	1
AC1 / CB2	2	2	-	1	1
AD1 / DB2	2	2	-	3	3
BE1 / EA2	2	2	5	2	2
AF1 / FB2	4	4	-	3	3
AG1 / GB2	4	4	-	1	1

**DIMENSIONS**

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	160.2236	O-ring ID 23,52 x 1,78 (NBR)
20	253.6000	Mechanical control head ATII
30	246.2119	Socket head screw M5 x 18 DIN 912
50	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**STANDARDS**

Mounting interface	ISO 4401-03
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 50
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2$ Nm (screw quality 8.8, zinc coated)

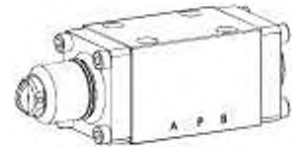
**Note!** The length of the fixing screw depends on the base material of the connection element.


**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The roller housing and the cover are zinc-nickel coated

**Spool valve stainless**
**Flange construction**

- ◆ roller operated
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 60 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG6**
**ISO 4401-03**

**DESCRIPTION**

Direct operated valve, roller operated with 4 connections in 5 chamber design. Without actuation, the spool is switched back to the offset position.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The stainless execution is especially suitable for the use in wet and salty environment. Manually or mechanically operated valves are particularly suitable for use in installations where no electric current is available or for applications in explosion hazard areas.

**TYPE CODE**

Spool valve, direct operated		WD T F A06 - <input type="checkbox"/> - <input type="checkbox"/> KS <input type="checkbox"/>	
Roller with spring reset			
Flange construction			
International standard interface ISO, NG6			
Designation of symbols acc. to table	Operation a-side Operation b-side	<input type="checkbox"/> 1 <input type="checkbox"/> 2	
Sealing material	NBR FKM (Viton) NBR 972	<input type="checkbox"/> D1 <input type="checkbox"/> y-280	
Stainless			
Design index (subject to change)			
1-5-08			

**GENERAL SPECIFICATIONS**

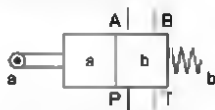
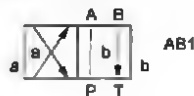
Designation	4/2-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Roller actuated
Ambient temperature	-25...+70 °C
Weight	1,48 kg
MTTFd	150 years

**ACTUATION**

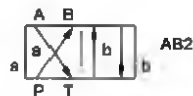
Actuation	Roller
Actuation stroke	s = 2,6 mm
Actuation force	$F_1 = 110 - 135 \text{ N}$ at $p_{max}$

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Tank pressure	$p_{min} = 100 \text{ bar}$
Maximum volume flow	$Q_{max} = 60 \text{ l/min}$ , see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade $\beta_{10} \dots 16 \geq 75$ , see data sheet 1.0-50

**SYMBOL**
**Overview valves**

**Overview spool types**


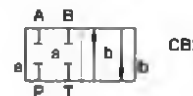
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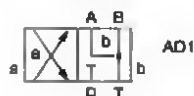
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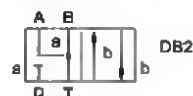
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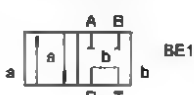
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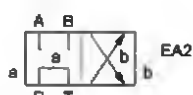
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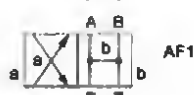
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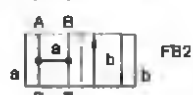
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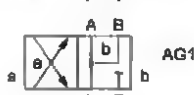
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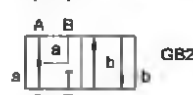
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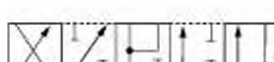
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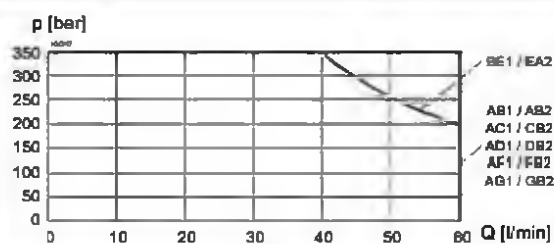
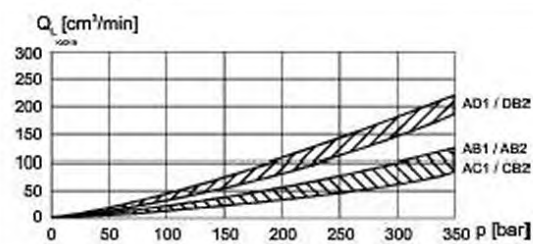
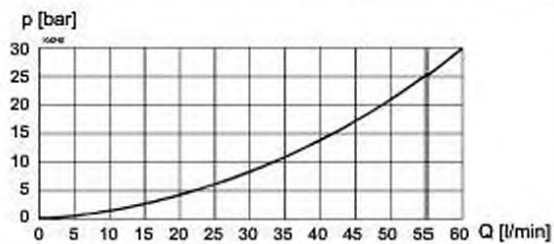


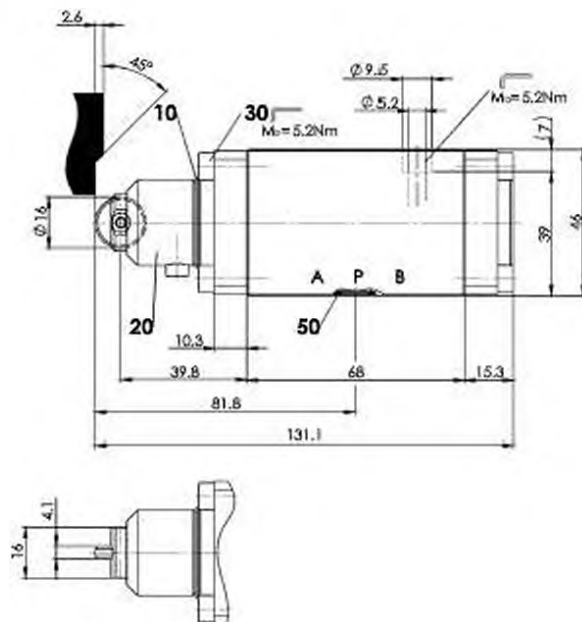
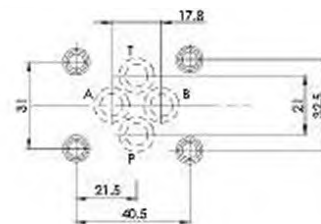
AG1



GB2


**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 **$p = f(Q)$  Performance limits**

 **$Q_L = f(Q)$  Leakage volume flow characteristics  $P \rightarrow T$** 

 **$\Delta p = f(Q)$  Pressure drop volume flow characteristics**


**DIMENSIONS**

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	160.8252	O-ring ID 25,12 x 1,78 (FKM)
20	253.6003	Mechanical control head AT11-K9
30	246.2516	Socket head screw M5 x 16 A4 DIN 912
50	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**STANDARDS**

Mounting interface	ISO 4401-03
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2$ Nm (screw quality 8.8, zinc coated)

**Note!** The length of the fixing screw depends on the base material of the connection element.


**SURFACE TREATMENT**

- ◆ The valve body, the cover, the roller housing and the socket head screws are made of stainless steel



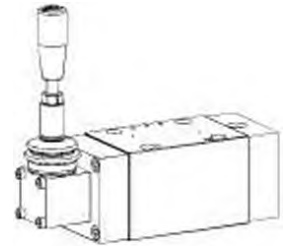
## Spool valve

### Flange construction

- ◆ hand operated
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆ 4/2- and 4/3-way detented
- ◆  $Q_{max} = 100 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

### NG10

ISO 4401-05



## DESCRIPTION

Direct operated spool valve, hand operated with 4 connections in 5 chamber design. Spool detented or with spring. Without actuation, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the detent, the spool is held in the last switching position selected. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, body from high quality hydraulic cast steel.

## APPLICATION

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol. Manually or mechanically operated valves are particularly suitable for use in installations where no electric current is available or for applications in explosion hazard areas.

## TYPE CODE

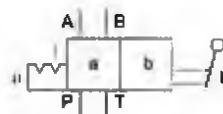
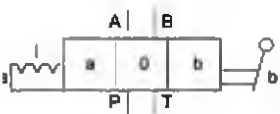
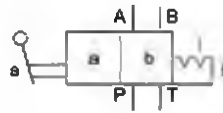
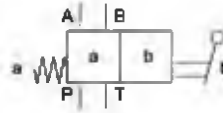
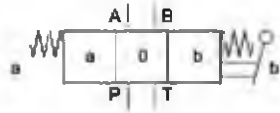
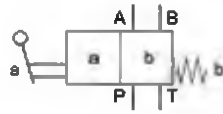
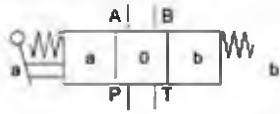
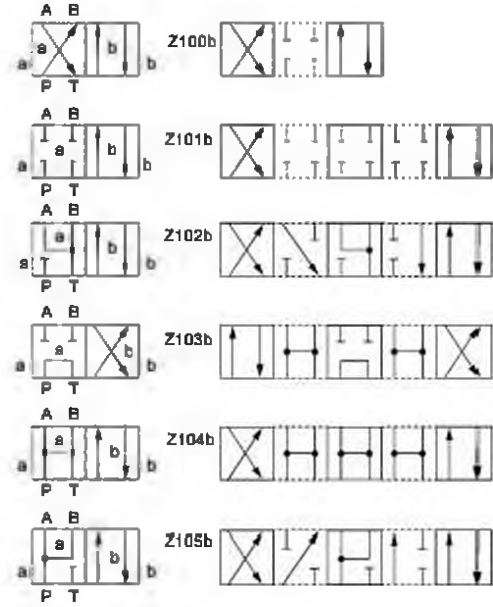
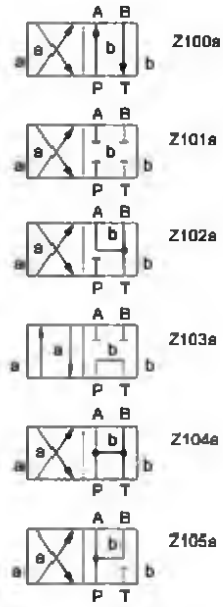
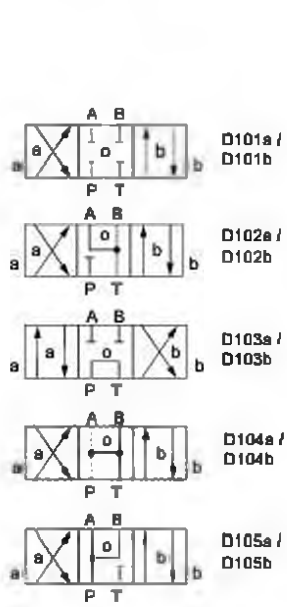
International standard interface ISO	A H 4 <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/>	
Hand lever		
Number of control ports		
Designation of symbols acc. to table	Operation a-side Operation b-side	<input type="checkbox"/> a <input type="checkbox"/> b
Hand lever with spring reset or spring centred Hand lever detented	<input type="checkbox"/> f <input type="checkbox"/> d	
Sealing material	NBR FKM (Viton)	<input type="checkbox"/> 01
Design index (subject to change)		

## GENERAL SPECIFICATIONS

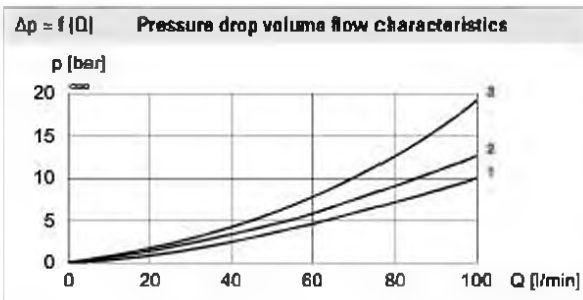
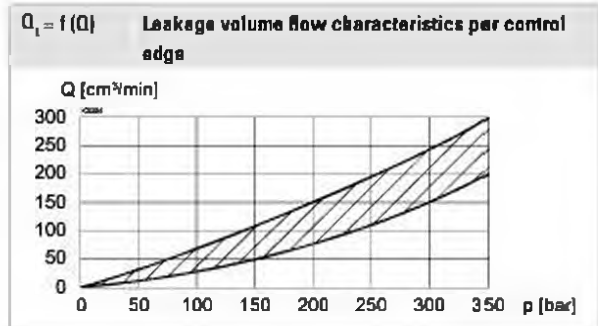
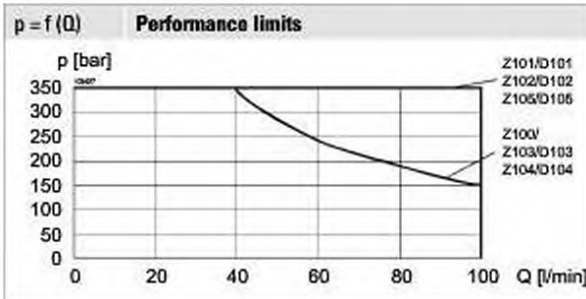
Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Hand operated
Ambient temperature	-25...+70 °C (NBR) -20...+70 °C (FKM)
Weight	3,7 kg

## HYDRAULIC SPECIFICATIONS

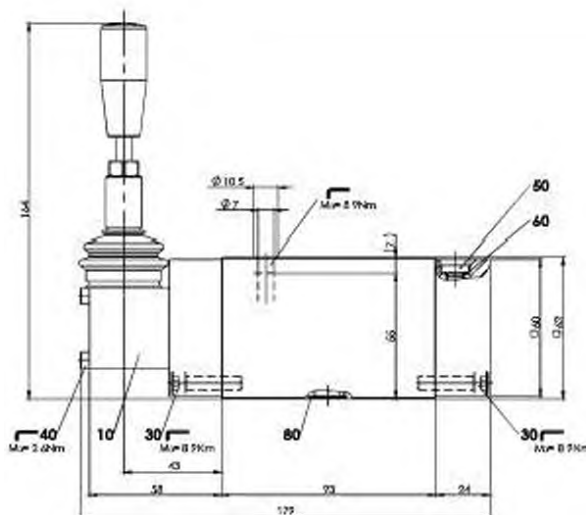
Working pressure	$p_{max} = 350 \text{ bar}$
Tank pressure	$p_{T,max} = 100 \text{ bar}$
Maximum volume flow	$Q_{max} = 100 \text{ l/min}$ , see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**SYMBOL**
**Overview valves**

**Overview spool types**


**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
Z100 / J100	2	2	-	2	2
D101 / Z101	2	2	-	2	2
D102 / Z102	2	2	-	1	1
D103 / Z103	2	2	3	2	2
D104 / Z104	1	1	-	1	1
D105 / Z105	1	1	-	2	2

**DIMENSIONS**

**PARTS LIST**

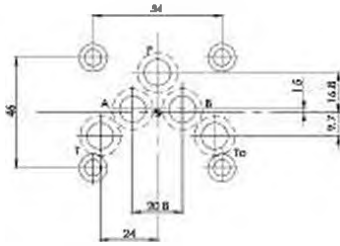
Position	Article	Description
10	253.2000	Hand control head BH11
30	246.3126	Socket head screw M6 x 25 DIN 912
40	246.1141	Socket head screw M4 x 40 DIN 912
50	238.0201	Screw plug MP x 1 DIN908
	239.2000	Screw plug
60	049.1080	Copper seal ring NG8 x 11.5 x 1 DIN 7603
80	160.2140	O-ring ID 14,00 x 1,78 (NBR)

**Note!** Screw plug 238.0201 for spring centred execution  
 Screw plug 239.2000 for detented execution  
 Pos. 60 only for screw plug 239.2000

**ACTUATION**

Actuation	Hand lever
Actuation angle	$\alpha_b \approx 10,8^\circ / \text{side}$
Actuation force	$F_b = 16 - 30 \text{ N}$

## HYDRAULIC CONNECTION



## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## INSTALLATION NOTES

Mounting type	Flange mounting 4 fixing holes for socket head screws M6 x 65
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 8,9 \text{ Nm}$ (screw quality 8.8, zinc coated) Fixing screws

**Note!** The length of the fixing screw depends on the base material of the connection element.



## ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Horizontal mounting blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

## STANDARDS

Mounting interface	ISO 4401-05
Contamination efficiency	ISO 4406

## SURFACE TREATMENT

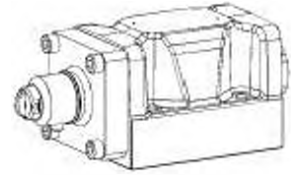
- ◆ The valve body is painted with a two component paint
- ◆ The hand lever housing, the screws and the cover are zinc coated

**Spool valve**
**Flange construction**

- ◆ roller operated
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 160$  l/min
- ◆  $p_{max} = 350$  bar

**NG10**

ISO 4401-05


**DESCRIPTION**

Direct operated valve, roller operated with 4 connections in 5 chamber design. Without actuation, the spool is switched back to the offset position.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. Manually or mechanically operated valves are particularly suitable for use in installations where no electric current is available or for applications in explosion hazard areas.

**TYPE CODE**

Spool valve, direct operated		WD T F A10 -	-	-	#
Roller with spring reset					
Flange construction					
International standard interface ISO, NG10					
Designation of symbols acc. to table	Operation a-side	...	1		
	Operation b-side	...	2		
Sealing material	NBR				
	FKM (Viton)		D1		
	NBR 872		γ-2604		
Design index (subject to change)					

**GENERAL SPECIFICATIONS**

Designation	4/2-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Roller actuated
Ambient temperature	-25...+70 °C
Weight	2,85 kg
MTTFd	150 years

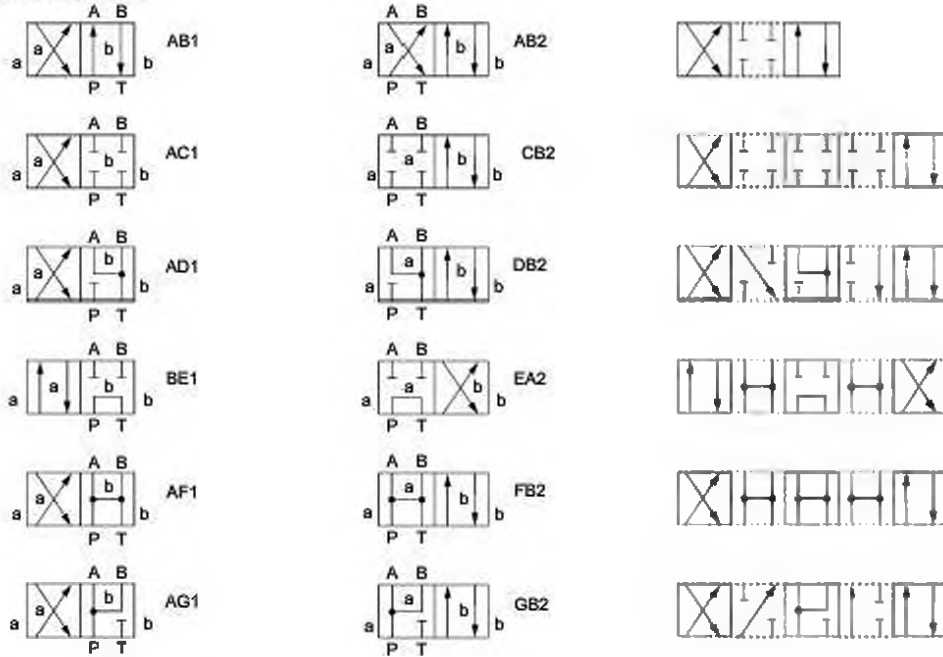
**ACTUATION**

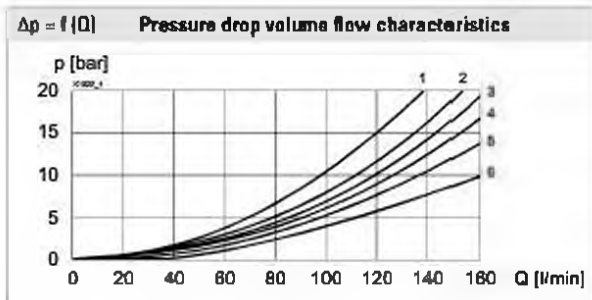
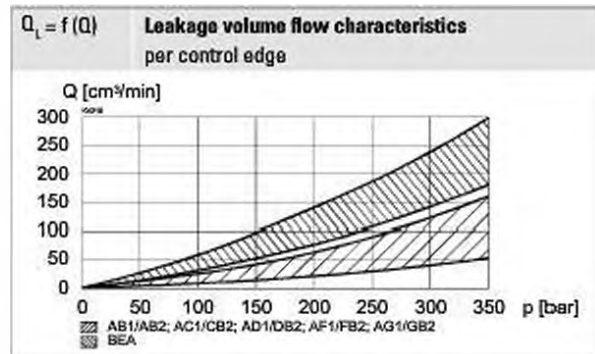
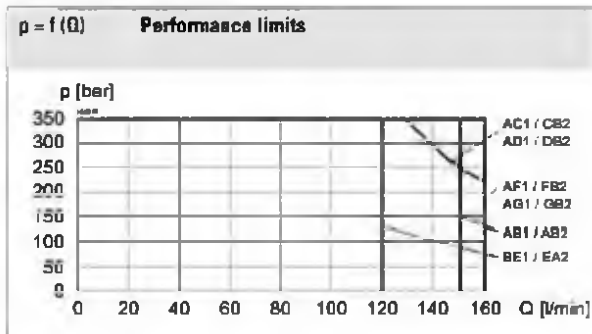
Actuation	Roller
Actuation stroke	s = 4 mm
Actuation force	$F_s = 110 - 135$ N at $p_{T,max}$

**HYDRAULIC SPECIFICATIONS**

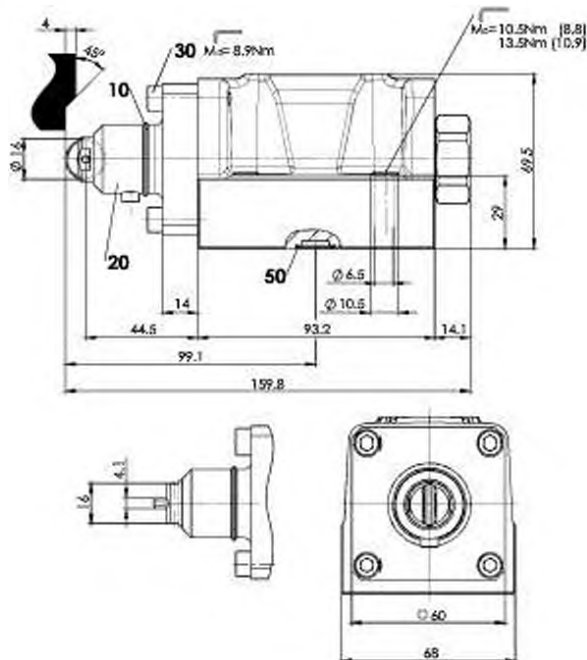
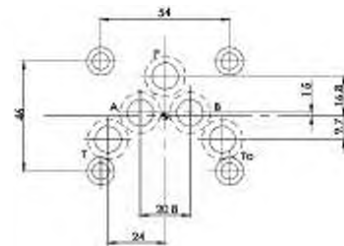
Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{T,max} = 100$ bar
Maximum volume flow	$Q_{max} = 160$ l/min, see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**SYMBOL**
**Overview valves**

**Overview spool types**

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**Volume flow direction**

Symbol	P - A	P - B	P - T	A - T	B - T
AB1 / AB2	5	5	-	3	2
AC1 / CB2	5	5	-	3	2
AD1 / DB2	5	5	-	5	4
BE1 / EA2	3	3	1	3	2
AF1 / FB2	6	6	6	5	4
AG1 / GB2	6	6	-	3	2

**DIMENSIONS**

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	160.8252	O-ring ID 25,12 x 1,78 (FKM)
20	253.6001	Mechanical control head ATI NG10
30	246.3122	Socket head screw M6 x 22 DIN 912
50	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.6124	O-ring ID 12,42 x 1,78 (FKM)

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M6 x 40
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screw $M_0 = 10,5 \text{ Nm} \pm 10 \%$ (screw quality 8.8, zinc coated) max. tank pressure 80 bar $M_0 = 13,5 \text{ Nm} \pm 10 \%$ (screw quality 10.9, zinc coated)

**Note!** The length of the fixing screw depends on the base material of the connection element.


**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Horizontal mounting blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**STANDARDS**

Mounting interface	ISO 4401-05
Contamination efficiency	ISO 4406

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The roller housing and the cover are zinc-nickel coated

## Spool valve

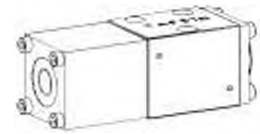
### Flange construction

- ◆ pneumatically operated
- ◆ 4/2-way impulse valve
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 8 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

## DESCRIPTION

Direct operated spool valve, pneumatically operated, with 4 connections in a 5 chamber system. Spool detented or with spring reset. Without actuation, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the detent, the spool is held in the last switching position selected. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, valve body from high quality hydraulic cast steel.

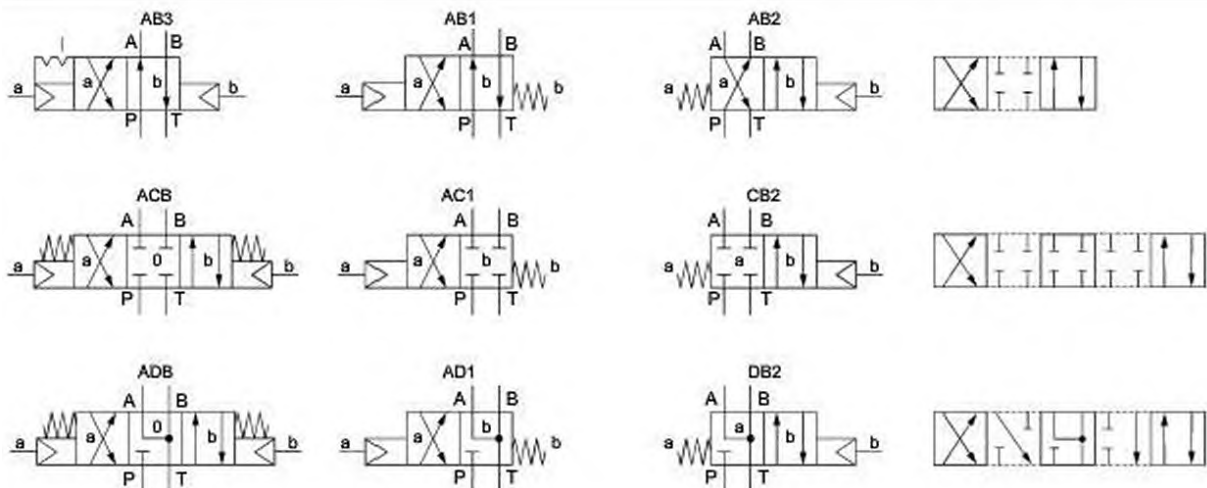
## NG3-Mini



## APPLICATION

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. Miniature valves are used where both, reduced dimensions and weight are important.

## SYMBOL



## GENERAL SPECIFICATIONS

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG3-Mini according to Wandfluh standard
Actuation	Pneumatically operated
Ambient temperature	-25...+70 °C
Weight	0.42 kg (1 actuation) 0.57 kg (2 actuations)
MTTFd	150 years

## ACTUATION

Actuation	Pneumatically operated
Execution	Actuation CKIII
Pilot pressure	$p_{V_{4/3}} = 2 \text{ bar}$ at $p_T = 20 \text{ bar}$ $p_{V_{4/2}} = 5 \text{ bar}$ at $p_T = 100 \text{ bar}$
Control volume	$V = 2 \text{ cm}^3$



**TYPE CODE**

Spool valve, direct operated	WD	L	F	A03	-	-	#	
Pneumatically operated								
Flange construction								
Mounting interface acc. to Wandfluh standard, NG3-Mini								
Designation of symbols acc. to table								
Sealing material	NBR							
	FKM (Viton)							01
Design index (subject to change)								

1.0-15

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$ ( $p_s < 20 \text{ bar}$ ) $p_{max} = 315 \text{ bar}$ ( $p_s > 20 \text{ bar}$ )
Tank pressure	$p_{Tmax} = 100 \text{ bar}$
Maximum volume flow	$Q_{max} = 8 \text{ l/min}$ , see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range	-25...+70 °C (NBR)
fluid	-20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The cover is zinc-nickel coated
- ◆ The pneumatic actuation is zinc coated

**MANUAL OVERRIDE**

None

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**STANDARDS**

Mounting interface	Wandfluh standard
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

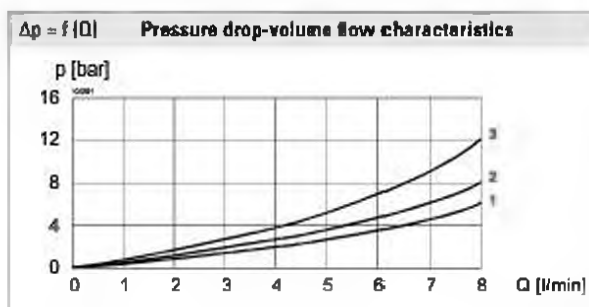
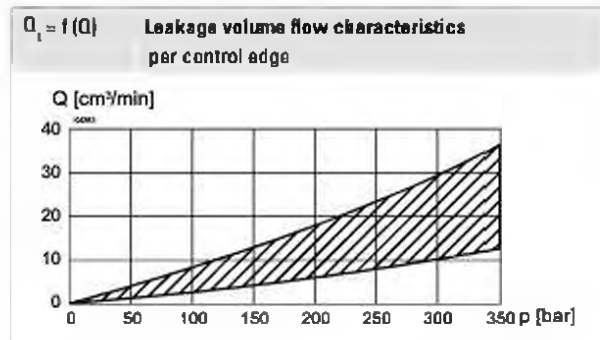
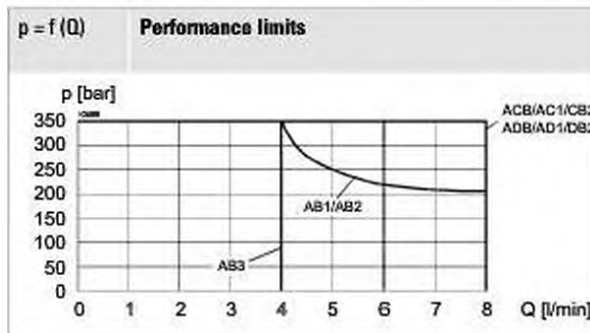
Mounting type	Flange mounting 3 fixing holes for socket head screws M4 x 30
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 2,6 \text{ Nm}$ (screw quality 8.8, zinc-coated) Fixing screws

**Note!** The length of the fixing screw depends on the base material of the connection element.


**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

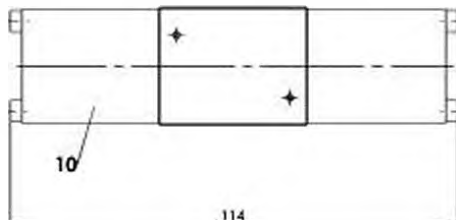
 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1 / AB2 / AB3	3	3	-	2	2
ACB / AC1 / CB2	3	3	-	1	1
ADB / AD1 / DB2	2	2	-	1	1

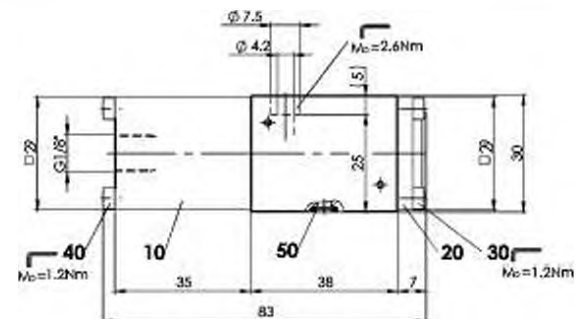
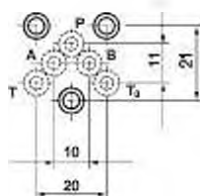
**DIMENSIONS**

4/3-way valve (spring centred)

4/2-way valve (impulse)



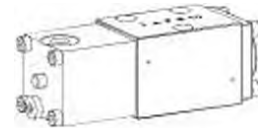
4/2-way valve (spring reset)


**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	254.1000	Pneumatic actuation CKIII
20	056.4200	Cover
30	246.0109	Socket head screw M3 x 8 DIN 912
40	246.0141	Socket head screw M3 x 40 DIN 912
50	160.2045	O-ring ID 4,50 x 1,50 (NBR)

**Spool valve**
**Flange construction**

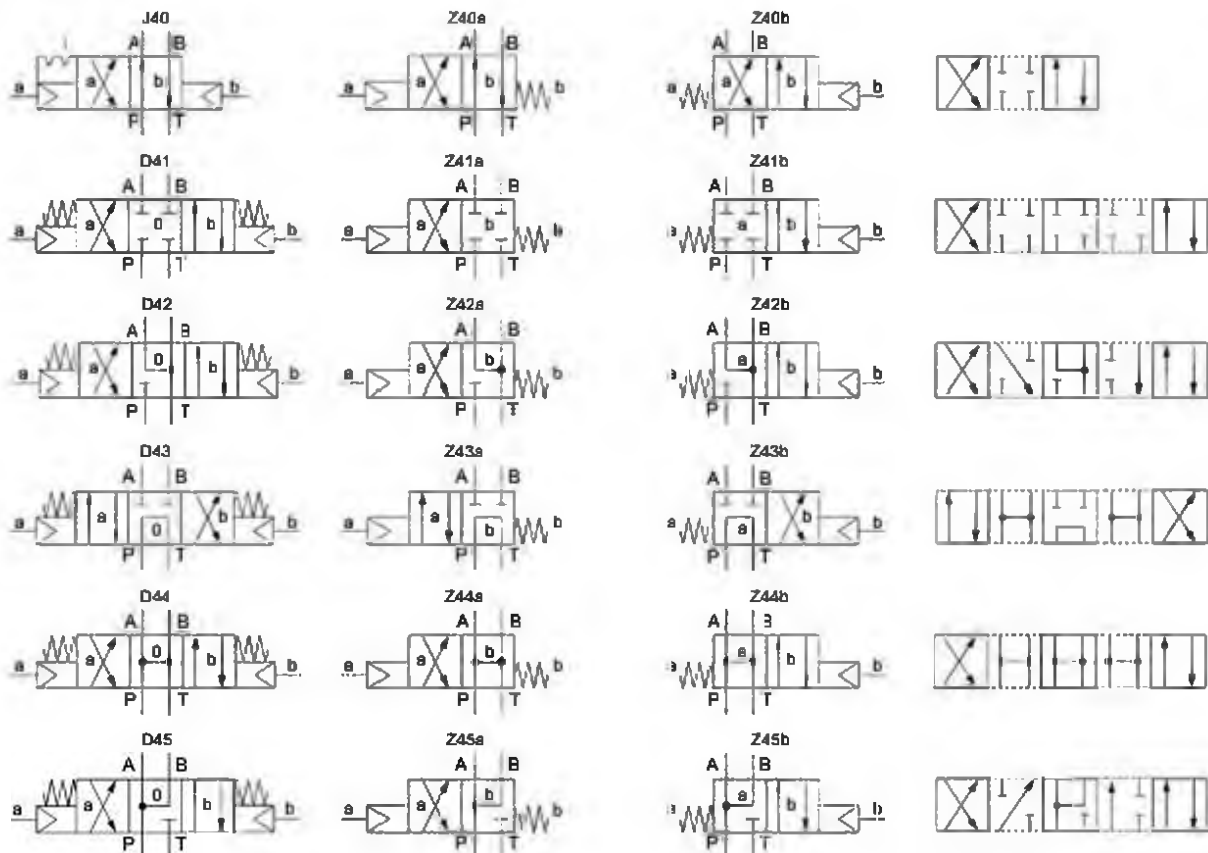
- ◆ pneumatically operated
- ◆ 4/2-way impulse valve
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG4-Mini**

**DESCRIPTION**

Direct operated spool valve, pneumatically operated, with 4 connections in a 5 chamber system. Spool detented or with spring. Without actuation, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the detent, the spool is held in the last switching position selected. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, body from high quality hydraulic cast steel.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**


**TYPE CODE**

Mounting interface acc. to Wandfluh standard	B	K	4	-	#	
Pneumatically operated						
Number of control ports						
Designation of symbols acc. to table						
Sealing material	NBR					01
	FKM (Viton)					
Design index (subject to change)						

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Pneumatically operated
Ambient temperature	-25...+70 °C (NBR) -20...+70 °C (FKM)
Weight	0,82 kg (actuation) 1,04 kg (actuators)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{t,max} = 100$ bar
Maximum volume flow	$Q_{max} = 20$ l/min, see characteristics
Leakage volume flow	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-20...+70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade $\beta_{10} \dots 16 \geq 75$ , see data sheet 1.0-50

**INSTALLATION NOTES**

Mounting type	Flange mounting 3 fixing holes for socket head screws M5 x 40
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 5,2$ Nm (screw quality 8.8, zinc-coated) Fixing screws

**Note!** The length of the fixing screw depends on the base material of the connection element.


**ACTUATION**

Actuation	Pneumatically operated
Execution	Actuation BKII
Pilot pressure	$p_{v,max} = 2,5$ bar at $p_T = 20$ bar $p_{v,max} = 5$ bar at $p_T = 100$ bar
Control volume	$V = 2,5$ cm <sup>3</sup>

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**MANUAL OVERRIDE**

In mechanical control head integrated. Actuation by pressing the pin

**STANDARDS**

Mounting interface	Wandfluh standard
Contamination efficiency	ISO 4406

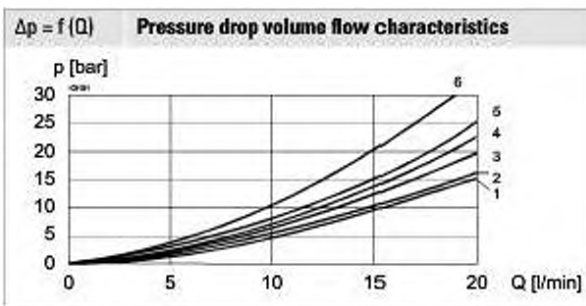
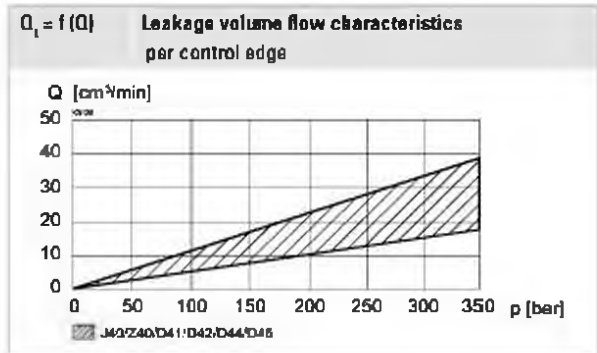
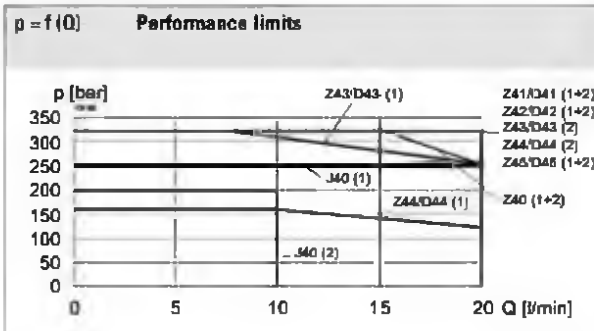
**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The pneumatic actuation, the cover and the socket head screws are zinc coated

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-10
Multi-station subplates	Data sheet 2.9-50
Horizontal mounting blocks	Data sheet 2.9-90
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

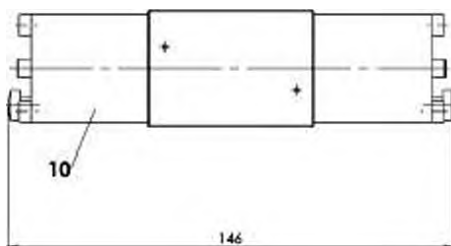
 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
Z40 / J40	5	5	-	2	2
D41 / Z41	5	5	-	2	2
D42 / Z42	5	5	-	1	1
D43 / Z43	4	4	6	2	2
D44 / Z44	4	4	3	2	2
D45 / Z45	4	4	-	2	2

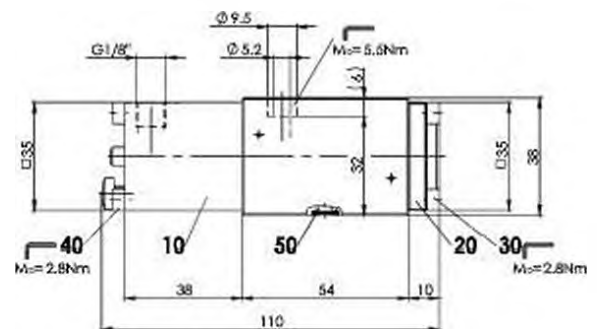
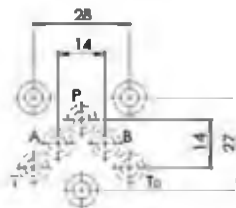
**DIMENSIONS**

4/3-way valve (spring centred)

4/2-way valve (impulse)



4/2-way valve (spring reset)


**HYDRAULIC CONNECTION**

**PARTS LIST**

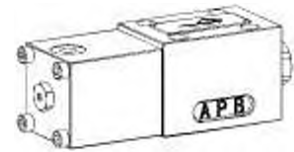
Position	Article	Description
10	254.2000	Pneumatic actuation BK II
20	057.4202	Cover
30	246.1113	Socket head screw M4 x 12 DIN 912
40	246.1146	Socket head screw M4 x 45 DIN 912
50	160.2052	O-ring ID 5,28 x 1,78 (NBR)

**Spool valve**
**Flange construction**

- ◆ pneumatically operated
- ◆ 4/2-way impulse valve
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG6**

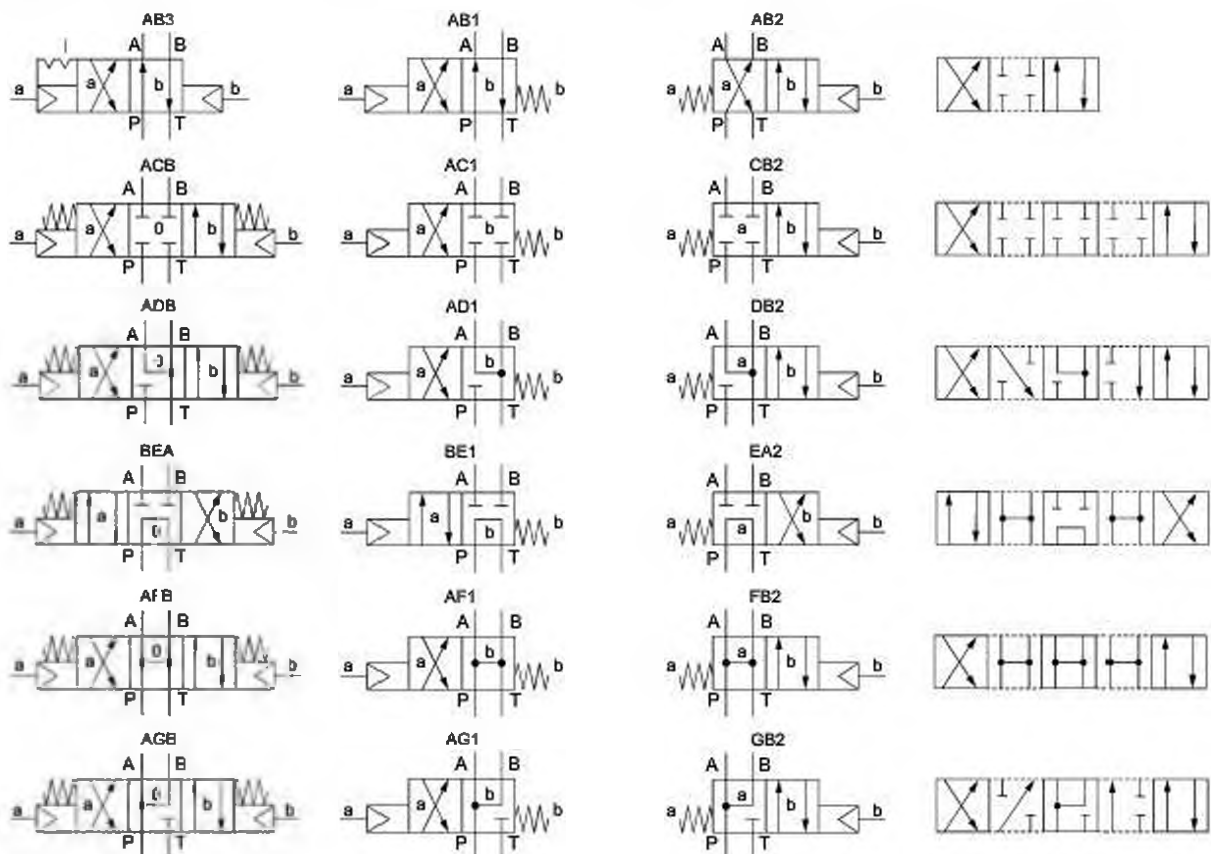
ISO 4401-03


**DESCRIPTION**

Direct operated spool valve, pneumatically operated, with 4 connections in a 5 chamber system. Spool detented or with spring reset. Without actuation, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the detent, the spool is held in the last switching position selected. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, valve body from high quality hydraulic cast steel.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors.

**SYMBOL**


**TYPE CODE**

		WD L F A06 - <input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>			
Spool valve, direct operated					
Pneumatically actuated					
Flange construction					
International standard interface ISO, NG6					
Designation of symbols acc. to table					
Sealing material	NBR FKM (Viton) NBR 872	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Surface protection	Standard Zinc-nickel	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Design index (subject to change)					

1.0-32

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Pneumatically operated
Ambient temperature	-25...+70 °C
Weight	1,75 kg (1 actuation) 2,25 kg (2 actuations)
MTTFd	150 years

**ACTUATION**

Actuation	Pneumatically operated
Execution	Actuation CKIIM
Pilot pressure	$p_{V, \text{min}} = 2 \text{ bar}$ at $p_r = 20 \text{ bar}$ $p_{V, \text{min}} = 5,5 \text{ bar}$ at $p_r = 200 \text{ bar}$
Control volume	$V = 6,9 \text{ cm}^3$

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{\text{max}} = 350 \text{ bar}$
Tank pressure	$p_{r, \text{max}} = 200 \text{ bar}$
Maximum volume flow	$Q_{\text{max}} = 80 \text{ l/min}$ , see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**SURFACE TREATMENT**
**Standard:**

- The valve body is painted with a two component paint
- The pneumatic actuation and the screw plug are zinc-nickel coated
- The socket head screws are zinc coated

**Optionally (K8):**

- All external parts are zinc-nickel coated
- ISO 9227 (800 h) salt spray test

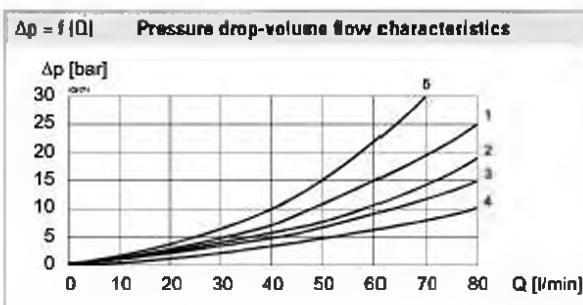
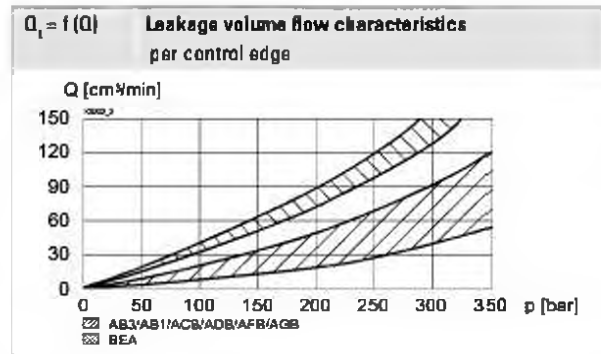
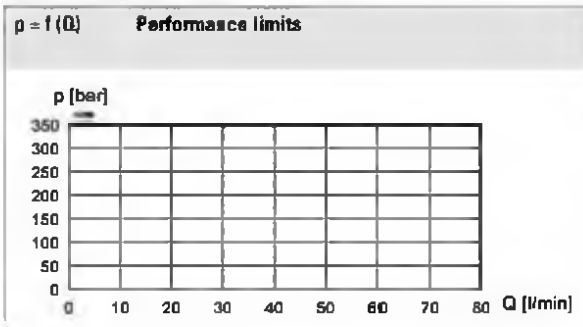
**MANUAL OVERRIDE**

None

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**PERFORMANCE SPECIFICATIONS**

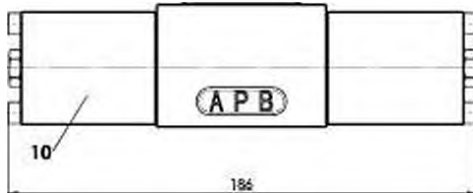
 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1 / AB2 / AB3	2	2	-	1	1
ACB / AC1 / CB2	2	2	-	1	1
ADB / AD1 / DB2	2	2	-	3	3
BEA / BE1 / EA2	2	2	5	2	2
AFB / AF1 / FB2	4	4	-	3	3
AGB / AG1 / GB2	4	4	-	1	1

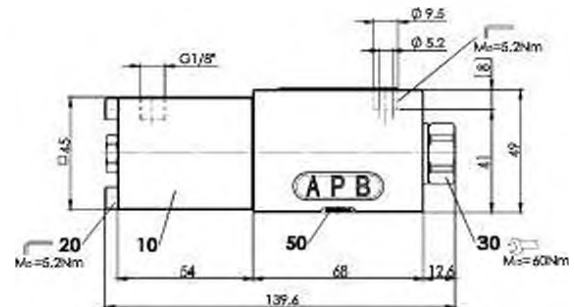
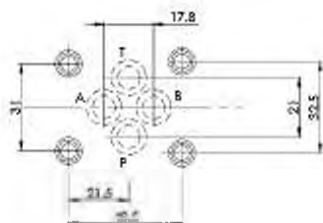
**DIMENSIONS**

4/3-way valve (spring centred)

4/2-way valve (impulse)



4/2-way valve (spring reset)


**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	254.4059	Pneumatic actuation CKIIM
20	246.2160	Socket head screw M5 x 60 DIN 912
30	239.2210	Socket head screw M20 x 1
50	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)



**STANDARDS**

Mounting interface	ISO 4401-03
Contamination efficiency	ISO 4406

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 50
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated)

**Note!**

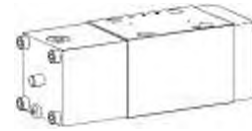

The length of the fixing screw depends on the base material of the connection element.

**Spool valve**
**Flange construction**

- ◆ pneumatically operated
- ◆ 4/2-way impulse valve
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG10**

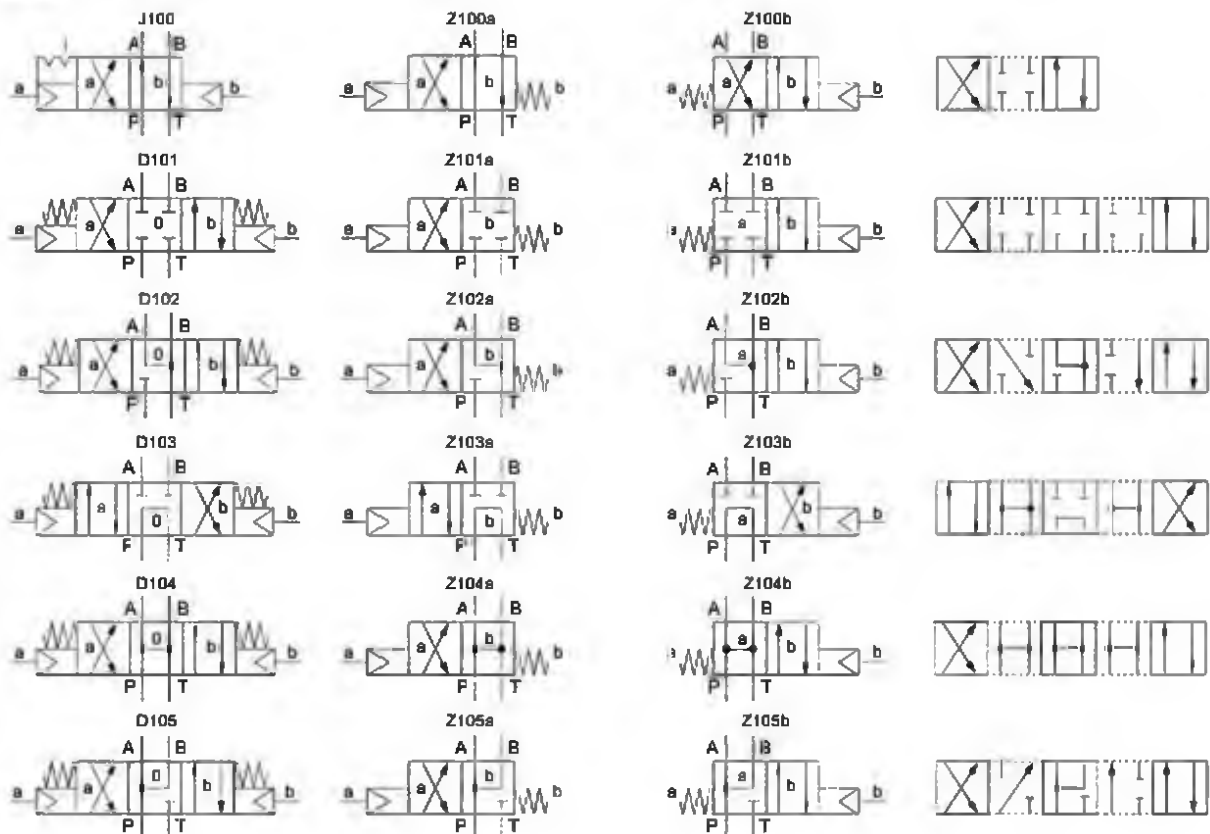
ISO 4401-05


**DESCRIPTION**

Direct operated spool valve, pneumatically operated, with 4 connections in a 5 chamber system. Spool detented or with spring. Without actuation, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the detent, the spool is held in the last switching position selected. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, body from high quality hydraulic cast steel.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol.

**SYMBOL**


**TYPE CODE**

International standard interface ISO	A	K	4	-	#
Pneumatically operated					
Number of control ports					
Designation of symbols acc. to table					
Sealing material	NBR		FKM (Viton)		
Design index (subject to change)	1 0		01		

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Pneumatically operated
Ambient temperature	-25...+70 °C (NBR) -20...+70 °C (FKM)
Weight	3,8 kg (1 actuation) 4,8 kg (2 actuations)
MTTFd	150 years

**ACTUATION**

Actuation	Pneumatically operated
Execution	Actuation AKI
Pilot pressure	$p_{v,act} = 2.5 \text{ bar}$ at $p_r = 20 \text{ bar}$ $p_{v,act} = 5 \text{ bar}$ at $p_r = 200 \text{ bar}$
Control volume	$V = 10,7 \text{ cm}^3$

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Tank pressure	$p_{r,max} = 200 \text{ bar}$
Maximum volume flow	$Q_{max} = 80 \text{ l/min}$ , see characteristics
Leakage volume flow	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-20...+70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**MANUAL OVERRIDE**

In mechanical control head integrated. Actuation by pressing the pin

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The pneumatic actuation, the cover and the socket head screws are zinc coated

**STANDARDS**

Mounting interface	ISO 4401-05
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

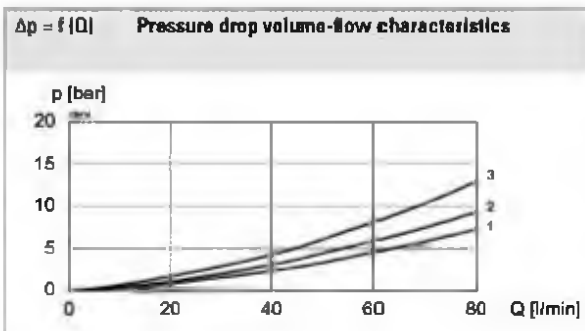
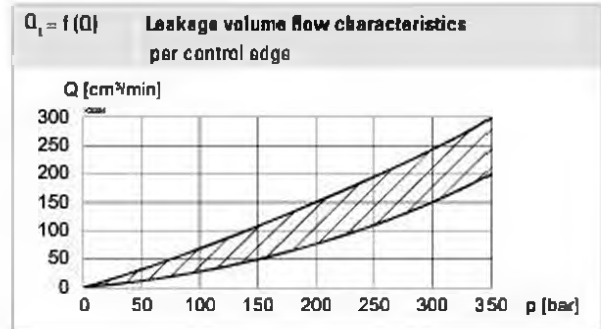
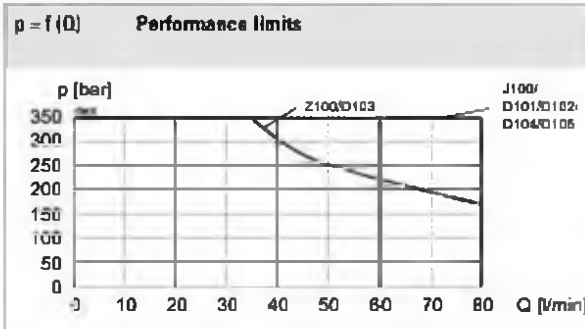
Mounting type	Flange mounting 4 fixing holes for socket head screws M6 x65
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 8,9 \text{ Nm}$ (screw quality 8.8, zinc-coated) Fixing screws

**Note!** The length of the fixing screw depends on the base material of the connection element.


**ACCESSORIES**

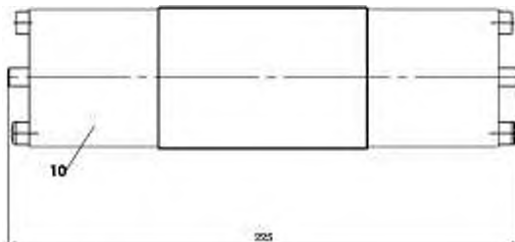
Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Horizontal mounting blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

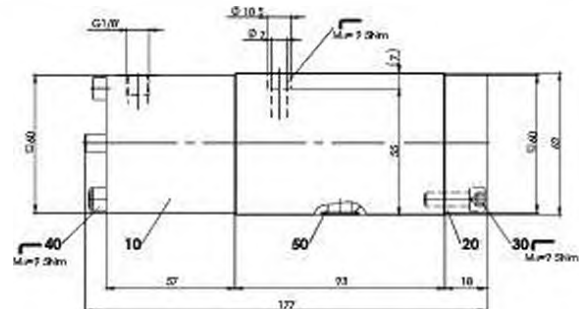
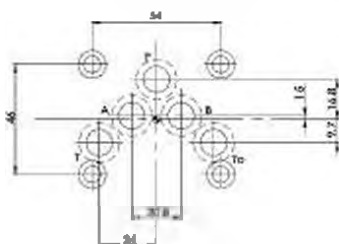
 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
Z100 / J100	2	2	-	2	2
D101 / Z101	2	2	-	2	2
D102 / Z102	2	2	-	1	1
D103 / Z103	2	2	3	2	2
D104 / Z104	1	1	-	1	1
D105 / Z105	1	1	-	2	2

**DIMENSIONS**

 4/3-way valve (spring centred)  
 4/2-way valve (impulse)


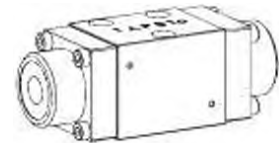
4/2-way valve (spring reset)


**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	254.5000	Pneumatic actuation AK I
20	059.2201	Cover
30	246.3121	Socket head screw M6 x 20 DIN 912
40	246.3166	Socket head screw M6 x 65 DIN 912
50	160.2140	O-ring ID 14,00 x 1,78 (NBR)

**Spool valve**
**Flange construction**

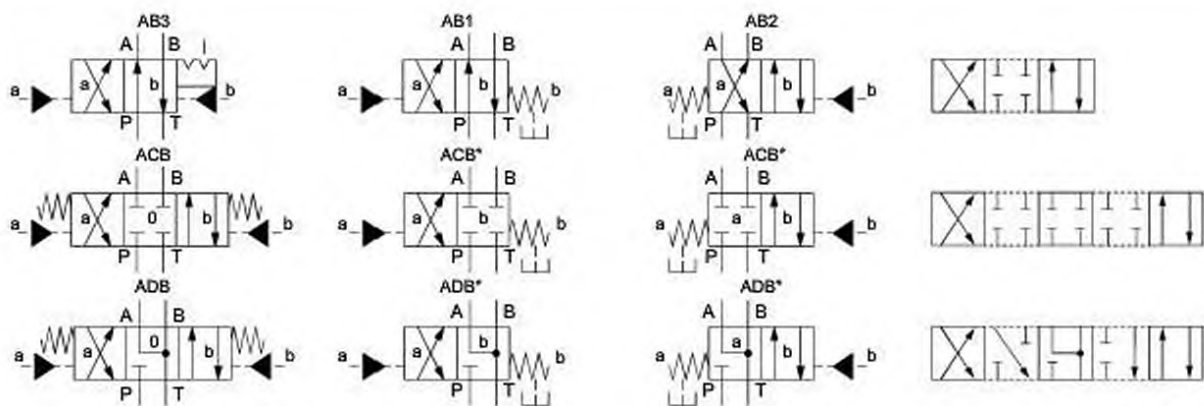
- ◆ hydraulically operated
- ◆ 4/2-way impulse execution, detented
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 8 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**NG3-Mini**

**DESCRIPTION**

Direct operated spool valve hydraulically operated via pilot port with 4 connections in a 5 chamber system. Spool detented or with spring. Without actuation, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the detent, the spool is held in the last switching position selected. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, body from high quality hydraulic cast steel.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**


\* These 4/2-way valves with spring reset are being delivered as 4/3-way valves.

**Nota!**


When the pilot ports are not actuated (without pressure), or not needed, the leakage oil must be discharged.

**TYPE CODE**

Spool valve, directly operated	WD	F	F	A03	-	-	#
Hydraulically operated							
Flange construction							
Mounting interface acc. to Wandfluh standard, NG3-Mini							
Designation of symbols acc. to table							
Sealing material	NBR						
	FKM (Viton)						
							01
Design index (subject to change)							

17-15

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG3-Mini according to Wandfluh standard
Actuation	Hydraulically operated
Ambient temperature	-25...+70 °C
Weight	0,38 kg
MTTFd	150 years

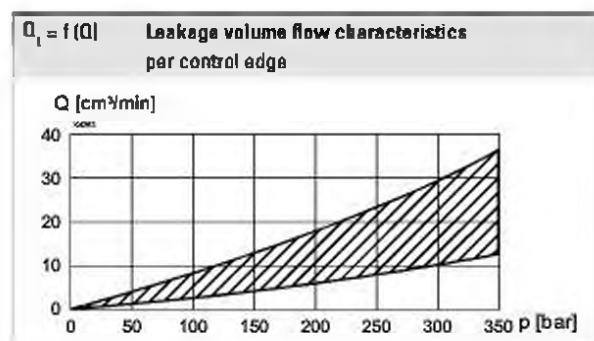
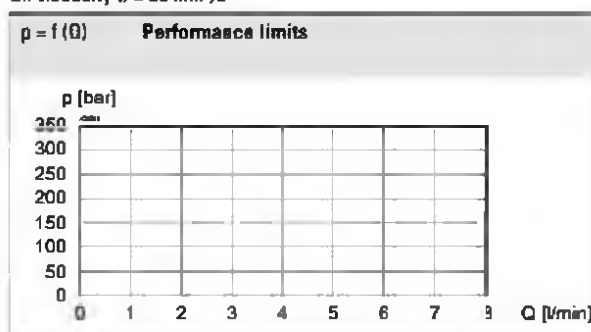
**ACTUATION**

Actuation	Hydraulically operated
Pilot pressure	$p_{min} = 10 \text{ bar}$ $p_{max} = 100 \text{ bar}$
Control volume	$V = 0,08 \text{ cm}^3$

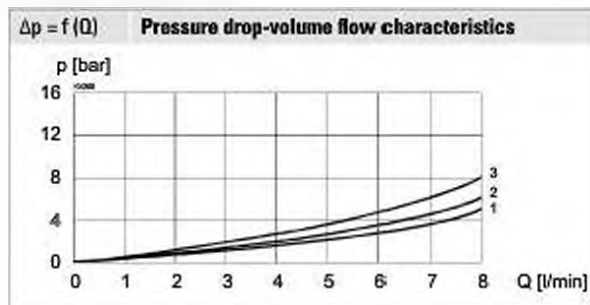
**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$ ( $p_c < 20 \text{ bar}$ ) $p_{max} = 315 \text{ bar}$ ( $p_c > 20 \text{ bar}$ )
Tank pressure	$p_{T,max} = 90 \text{ bar}$ Resp. 10 bar lower than the control pressure
Maximum volume flow	$Q_{max} = 8 \text{ l/min}$ , see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

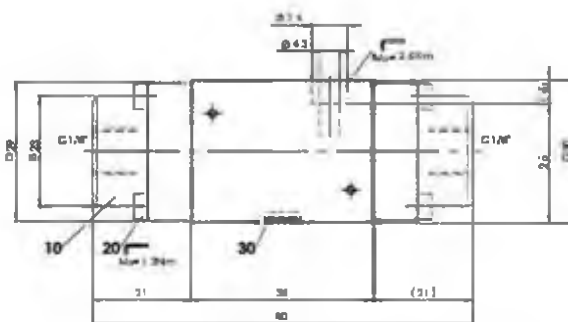
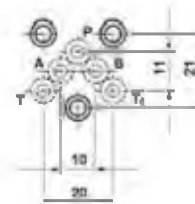
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1 / AB2 / AB3	3	3	-	2	2
ACB	3	3	-	1	1
ADB	2	2	-	1	1

**DIMENSIONS**

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	056.4701	Cover
20	246.0114	Socket head screw M3 x 14 DIN 912
80	160.2045	O-ring ID 4,50 x 1,50 (NBR)

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**STANDARDS**

Mounting interface	Wandfluh standard
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Flange mounting 3 fixing holes for socket head screws M4 x 30
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 2,6 \text{ Nm}$ (quality 8.8, zinc coated)

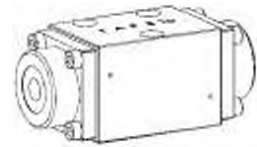
**Note!** The length of the fixing screw depends on the base material of the connection element.


**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The covers are zinc-nickel coated

**Spool valve**
**Flange construction**

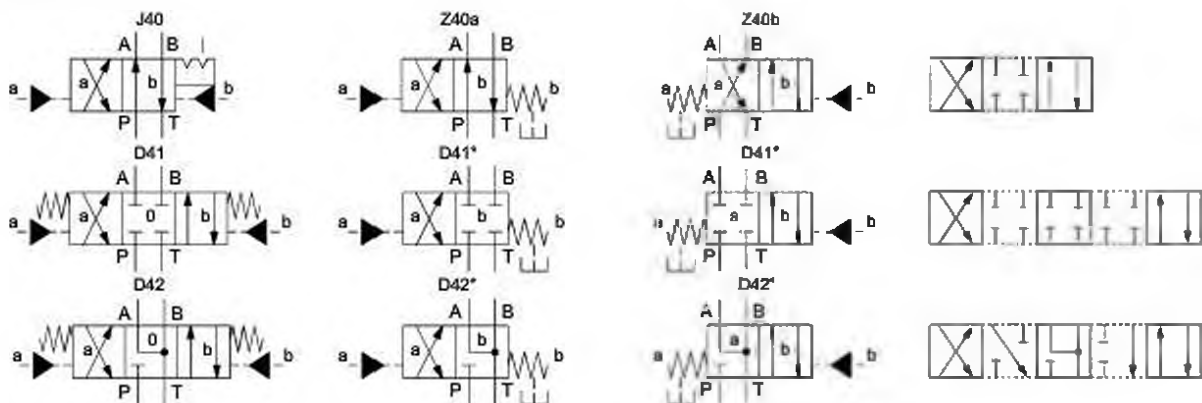
- ◆ hydraulically operated
- ◆ 4/2-way impulse execution detented
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG4-Mini**

**DESCRIPTION**

Direct operated spool valve hydraulically operated via pilot port with 4 connections in a 5 chamber system. Spool detented or with spring. Without actuation, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the detent, the spool is held in the last switching position selected. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, body from high quality hydraulic cast steel.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**


\* These 4/2-way valves with spring reset are being delivered as 4/3-way valves.

**Note!**


When the pilot ports are not actuated (without pressure), or not needed, the leakage oil must be discharged.



**TYPE CODE**

Mounting interface acc. to Wandfluh standard	B P 4	-	#
Hydraulically operated			
Number of control ports			
Designation of symbols acc. to table			
Sealing material	NBR FKM (Viton)		01
Design index (subject to change)			

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Hydraulically operated
Ambient temperature	-25 ... +70 °C
Weight	0.69 kg
MTTFd	150 years

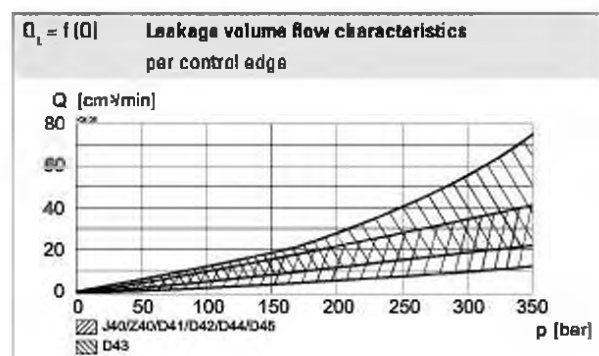
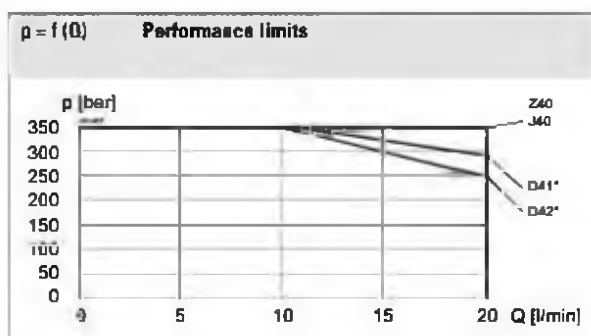
**ACTUATION**

Actuation	Hydraulically operated
Pilot pressure	$p_{min} = 10$ bar $p_{max} = 100$ bar
Control volume	$V = 0,16$ cm <sup>3</sup>

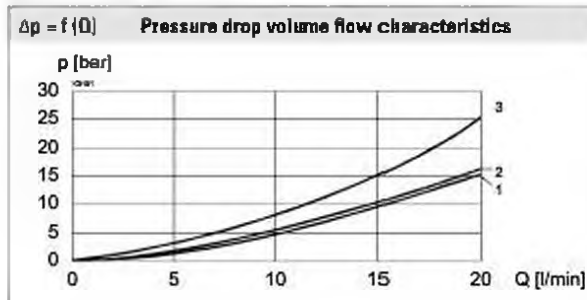
**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{min} = 90$ bar Resp. 10 bar lower than the control pressure
Maximum volume flow	$Q_{max} = 20$ l/min, see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10 ... 16 ≥ 75, see data sheet 1.0-50

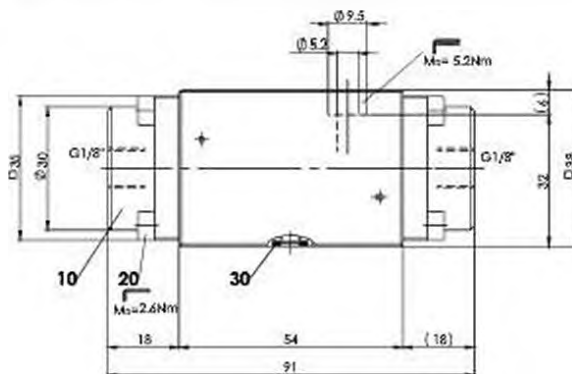
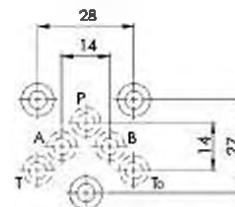
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s


**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
J40 / Z40	3	3	-	2	2
D41	3	3	-	2	2
D42	3	3	-	1	1

**DIMENSIONS**

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	057 4600	Cover
30	246 1113	Socket head screw M4 x 12 DIN 912
50	160 2052	O-ring ID 5,28 x 1,78 (NBR)

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-10
Multi-station subplates	Data sheet 2.9-50
Horizontal mounting blocks	Data sheet 2.9-90
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**STANDARDS**

Mounting interface	Wandfluh standard
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Flange mounting 3 fixing holes for socket head screws M5 x 40
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated)

**Note!** The length of the fixing screw depends on the base material of the connection element.

**SURFACE TREATMENT**

- ◆ The valve body is coated with a two component paint
- ◆ The covers and the screws are zinc coated

## Spool valve

### Flange construction

- ◆ hydraulically operated
- ◆ 4/2-way impulse execution detented
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{n\max} = 80 \text{ l/min}$
- ◆  $p_{n\max} = 350 \text{ bar}$

### NG6

ISO 4401-03-03



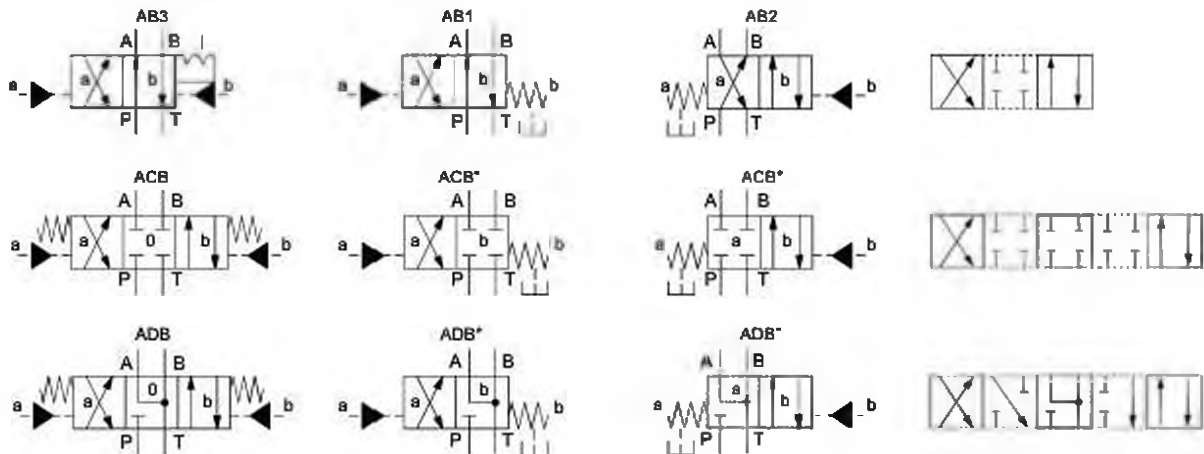
## DESCRIPTION

Direct operated spool valve hydraulically operated via pilot port with 4 connections in a 5 chamber system. Spool detented or with spring reset. Without actuation, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the detent, the spool is held in the last switching position selected.

## APPLICATION

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors.

## SYMBOL



\* These 4/2-way valves with spring reset are being delivered as 4/3-way valves.

**Note!** When the pilot ports are not actuated (without pressure), or not needed, the leakage oil must be discharged.



## GENERAL SPECIFICATIONS

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 to ISO 4401-03-03
Actuation	Hydraulically operated
Ambient temperature	-25...+70 °C
Weight	1,1 kg
MTTFd	150 years

## ACTUATION

Actuation	Hydraulically operated
Pilot pressure	$p_{pilot} = 15 \text{ bar}$ $p_{pilot} = 280 \text{ bar}$
Control volume	$V = 0,34 \text{ cm}^3$

**TYPE CODE**

Spool valve, direct operated		WF F F A06 -	-	-	-	#
Hydraulically actuated						
Flange construction						
International standard interface ISO, NG8						
Designation of symbols acc. to table						
Pilot oil	sideways via mounting interface	BB				
Sealing material	NBR					
	FKM (Viton)	D1				
	NBR 872	y-Z8DM				
Surface protection	Standard					
	Zinc-nickel	KB				
Design index (subject to change)						

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{T,max} = 200$ bar Resp. 15 bar lower than the control pressure
Maximum volume flow	$Q_{max} = 80$ l/min, see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade $\beta_{10...16} \geq 75$ , see data sheet 1.0-50

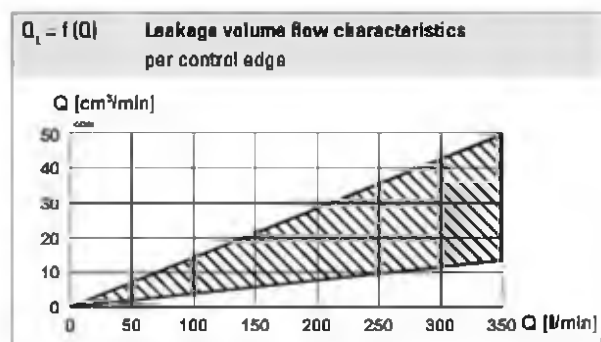
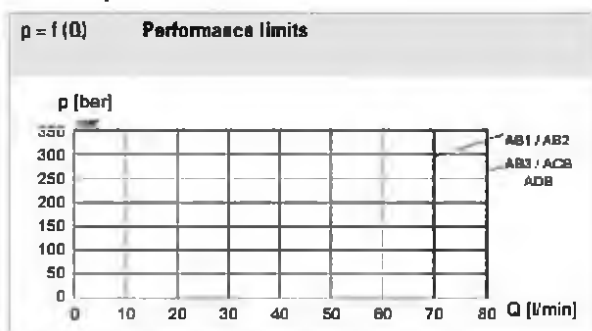
**STANDARDS**

Mounting interface	ISO 4401-03-03
Contamination efficiency	ISO 4406

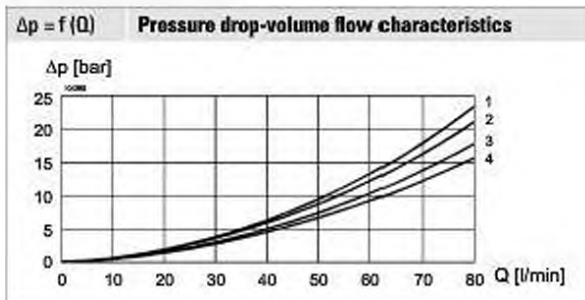
**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

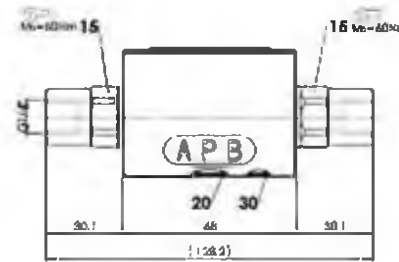
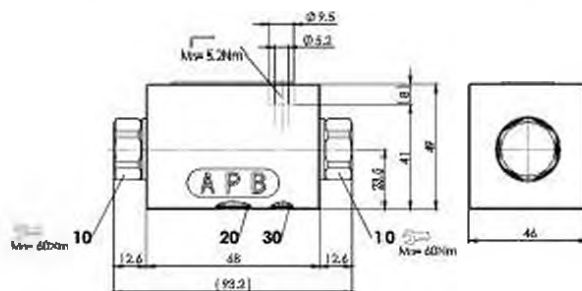
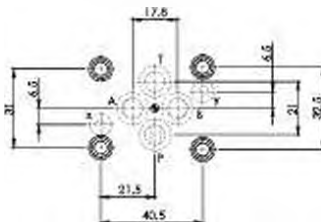
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s


**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB1 / AB2	2	2	-	3	3
AB3	1	1	-	2	2
ACB	2	2	-	3	3
ADB	2	2	-	4	4

**DIMENSIONS**

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	239.2210	Socket head screw M20 x 1
15	032.4818	Bush rd 24 / M3 x 38,5
20	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
30	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 50
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated)

**Note!** The length of the fixing screw depends on the base material of the connection element.


**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**
**Standard:**

- The valve body is painted with a two component paint
- The screw plug and the bush are zinc-nickel coated

**Optionally (K8):**

- All external parts are zinc-nickel coated
- ISO 9227 (800 h) salt spray test

**Spool valve**
**Flange construction**

- ◆ hydraulically operated
- ◆ 4/2-way impulse execution detented
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 160 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG10**

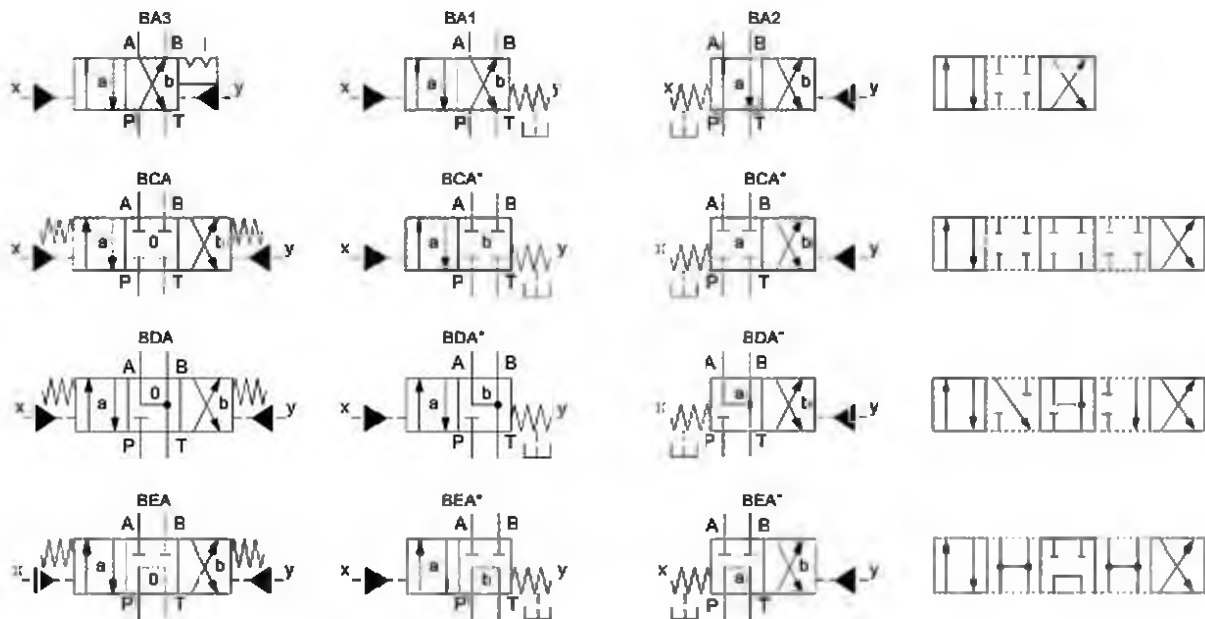
ISO 4401-05


**DESCRIPTION**

Direct operated spool valve hydraulically operated via pilot port with 4 connections in a 5 chamber system. Spool detented or with spring reset. Without actuation, the spool is held in the center position by the spring (4/3), or switched back to the offset position (4/2). With the detent, the spool is held in the last switching position selected.

**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors.

**SYMBOL**


\* These 4/2-way valves with spring reset are being delivered as 4/3-way valves.

**Note!**


When the pilot ports are not actuated (without pressure), or not needed, the leakage oil must be discharged.

**TYPE CODE**

		WF F F A10 - <input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>	
Spool valve, direct operated			
Hydraulically actuated			
Flange construction			
International standard interface ISO, NG10			
Designation of symbols acc. to table			
Pilot oil	via control plate	<input type="checkbox"/> ta	
	via mounting interface	<input type="checkbox"/> aa	
Sealing material	NBR	<input type="checkbox"/> D1	
	FKM (Viton)	<input type="checkbox"/> y-ZRDM	
	NBR 872		
Orifice diameter		<input type="checkbox"/> D0,9	up to 70 bar pilot pressure
		<input type="checkbox"/> D0,7	up to 160 bar pilot pressure
		<input type="checkbox"/> D0,6	up to 350 bar pilot pressure
Surface protection	Standard	<input type="checkbox"/>	
	Zinc-nickel	<input type="checkbox"/> KB	
Design index (subject to change)			

17402

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Hydraulically operated
Ambient temperature	-25...+70 °C
Weight	3,0 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{T,max} = 12$ bar lower as back pressure $p_{T,max}$ for ta = 160 bar $p_{T,max}$ for aa = 70 bar, at max. 10 bar tank pressure in x or y. With higher tank pressure in the control line, the pressure in T-T <sub>d</sub> must be reduced.
Maximum volume flow	$Q_{max} = 160$ l/min, see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM) -40...+70 °C (NBR 872)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**STANDARDS**

Mounting interface	ISO 4401-05
Contamination efficiency	ISO 4406

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**ACTUATION**

Actuation	Hydraulically operated
Pilot pressure	$p_{max} = 20$ bar $\Delta p (x-y) < 3$ bar for a stable position $\Delta p (x-y) > 12$ bar for secure switching

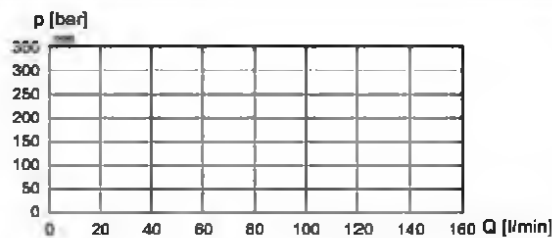
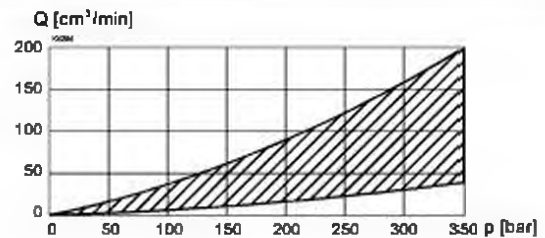
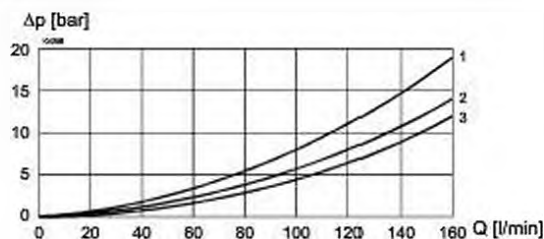
**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M6 x 40
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 10.5$ Nm $\pm$ 10 %, quality 8.8

**Note!** The length of the fixing screw depends on the base material of the connection element.


**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

 **$p = f(Q)$  Performance limits**

 **$Q_L = f(Q)$  Leakage volume flow characteristics per control edge**

 **$\Delta p = f(Q)$  Pressure drop-volume flow characteristics**


Volume flow direction

Symbol	P - A	P - B	P - T	A - T	B - T
BA1 / BA2 / BA3	3	3	-	2	1
BCA	3	3	-	2	1
BDA	3	3	-	2	1

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Horizontal mounting blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SURFACE TREATMENT**
**Standard:**

- The valve body is painted with a two component paint
- The screw plug and the control plate are zinc-nickel coated

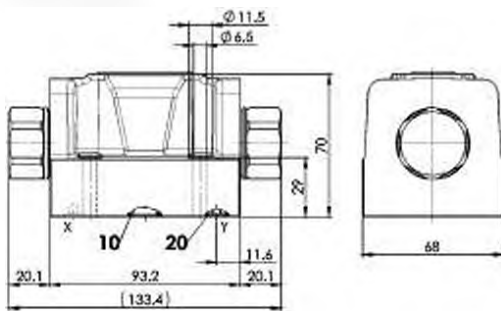
**Optionally (K8):**

- All external parts are zinc-nickel coated
- ISO 9227 (800 h) salt spray test

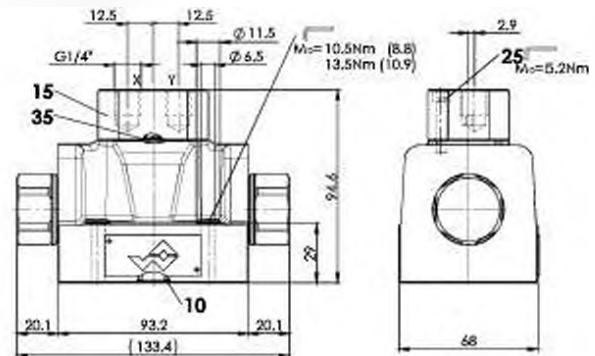
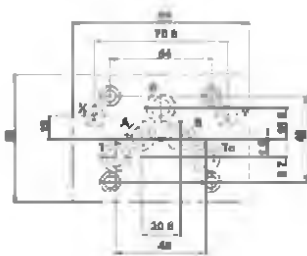


**DIMENSIONS**

Pilot control ae



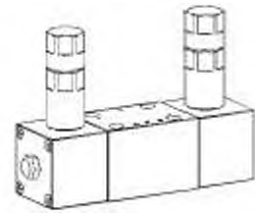
Pilot control te


**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.6124	O-ring ID 12,42 x 1,78 (FKM)
15	173.1516	Pilot plate NG4-Mini
20	160.2076	O-ring ID 7,65 x 1,78 (NBR)
	160.6076	O-ring ID 7,65 x 1,78 (FKM)
25	246.2126	Socket head screw M5 x 25 DIN 912
35	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)

**Spool valve**
**Flange construction**

- ◆ with integral pressure reversal
- ◆ 4/2-way
- ◆  $Q_{max} = 30 \text{ l/min}$
- ◆  $p_{max} = 315 \text{ bar}$

**NG6**
**ISO 4401-03**

**DESCRIPTION**

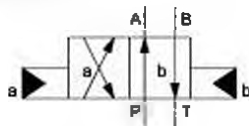
Spool valve with 4 connections in a 5 chamber system with integral pressure reversal. Switch into the opposite switching position when the adjusted reversal pressure is reached. The reversal takes place e.g. in the end position of the stroke or when the load pressure is exceeding the adjusted reversal pressure. Cover with pressure reliefs for adjusting the reversal pressure. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, body from high quality hydraulic cast steel.

**APPLICATION**

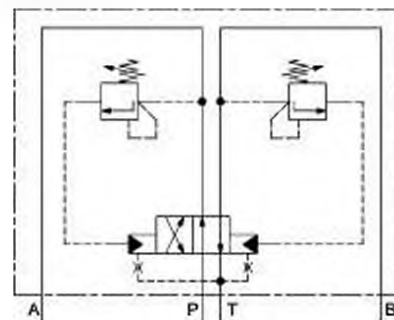
Valves with integral pressure reversal are suitable for controlling oscillating movements of a cylinder. Fields of application are press controls, assembly robots, feeding systems for wood heating or other systems with pressure dependent repositioning.

**SYMBOL**

Simplified



Detailed


**TYPE CODE**

International standard interface ISO	A	0	4	Z	6	0	-	4
Integral pressure reversal								
Number of control ports								
2 switching positions								
Nominal size 6								
Spool number								
Standard								
Soft switching								
Sealing material								
Design index (subject to change)								

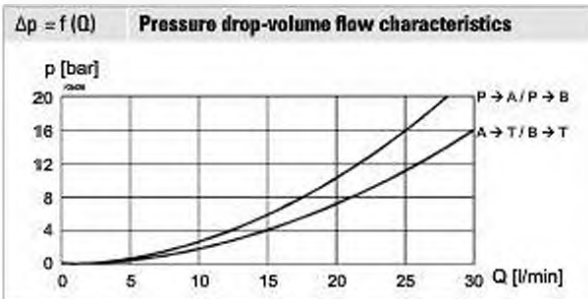
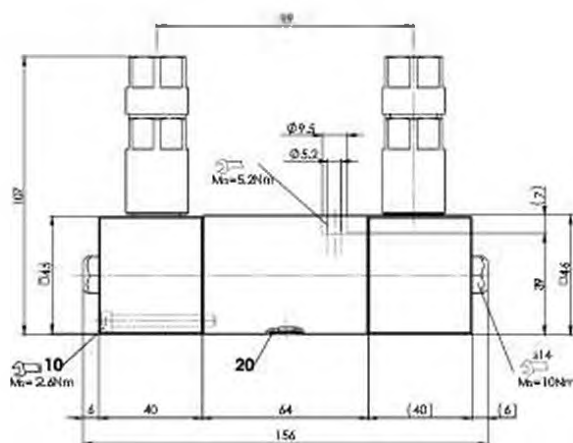
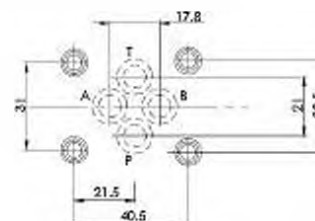
**GENERAL SPECIFICATIONS**

Designation	4/2-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Integral pressure reversal
Ambient temperature	-25...+70 °C
Weight	2,5 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 315$ bar
Tank pressure	$p_{r,max} = 160$ bar
System pressure	25...315 bar
Reversal pressure	Maximum 90 % of the system pressure
Maximum volume flow	$Q_{max} = 30$ l/min, see characteristics
Minimum volume flow	$Q_{min} = 2$ l/min
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range	-25...+70 °C (NBR)
fluid	-20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**DIMENSIONS**

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	246.1141	Socket head screw M4 x 40 DIN 912
20	160.2093	O-ring ID 9,25 x 1,78 (NBR)

**STANDARDS**

Mounting interface	ISO 4401-03
Contamination efficiency	ISO 4406

### MANUAL OVERRIDE

Integrated in the cover. Actuation by pressing the pin.

### SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

### INSTALLATION NOTES

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_{10} = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated)

**Note!** The length of the fixing screw depends on the base material of the connection element.



### ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

### SURFACE TREATMENT

- ◆ The valve body is coated with a two component paint
- ◆ The covers and the screws are zinc coated

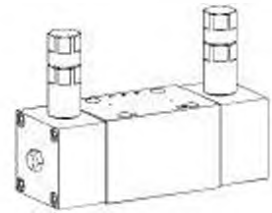
### COMMISSIONING

**Attention!** The reversal pressure adjusted on the pressure reliefs must not exceed a maximum of 90% of the system pressure.



**Spool valve**
**Flange construction**

- ◆ with integral pressure reversal
- ◆ 4/2-way
- ◆  $Q_{max} = 60 \text{ l/min}$
- ◆  $p_{max} = 315 \text{ bar}$

**NG10**
**ISO 4401-05**

**DESCRIPTION**

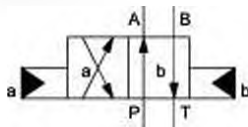
Spool valve with 4 connections in a 5 chamber system with integral pressure reversal. Switches into the opposite switching position when the adjusted reversal pressure is reached. The reversal takes place e.g. in the end position of the stroke or when the load pressure is exceeding the adjusted reversal pressure. Cover with pressure reliefs for adjusting the reversal pressure. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, valve body from high quality hydraulic cast steel.

**APPLICATION**

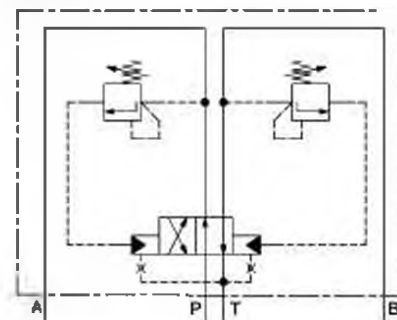
Valves with integral pressure reversal are suitable for controlling oscillating movements of a cylinder. Fields of application are press controls, assembly robots, feeding systems for wood heating or other systems with pressure dependent repositioning.

**SYMBOL**

Simplified



Detailed


**TYPE CODE**

International standard interface ISO	A Q 4 2 10 0		-	4
Integral pressure reversal				
Number of control ports				
2 switching positions				
Nominal size 10				
Spool number				
Standard				
Soft switching	W			
Sealing material	NBR FKM (Viton)			01
Design index (subject to change)				

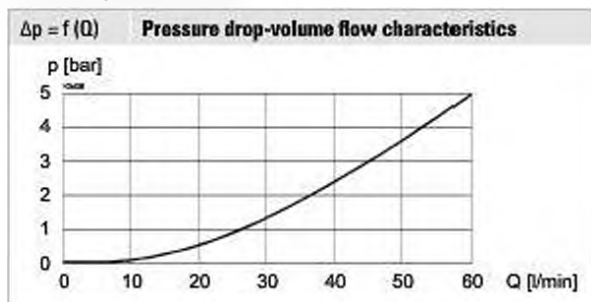
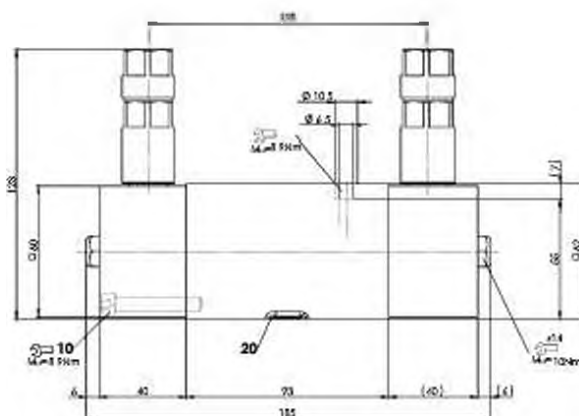
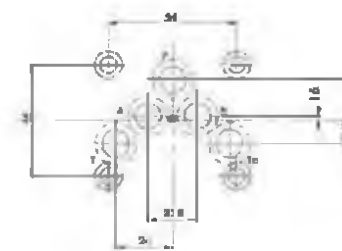
**GENERAL SPECIFICATIONS**

Designation	4/2-spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Integral pressure reversal
Ambient temperature	-25...+70 °C
Weight	4,8 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 315$ bar
Tank pressure	$p_{Tmax} = 160$ bar
System pressure	25...315 bar
Reversal pressure	Maximum 90% of the system pressure
Maximum volume flow	$Q_{max} = 60$ l/min, see characteristics
Minimum volume flow	$Q_{min} = 4$ l/min
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range	-25...+70 °C (NBR)
fluid	-20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10... 16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**DIMENSIONS**

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	246.3141	Socket head screw M6 x 40 DIN 912
20	160.2140	O-ring ID 14,00 x 1,78 (NBR)

**STANDARDS**

Mounting interface	ISO 4401-05
Contamination efficiency	ISO 4406

## MANUAL OVERRIDE

Integrated in the cover. Actuation by pressing the pin.

## ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Horizontal mounting blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## COMMISSIONING

**Attention!** The reversal pressure adjusted on the pressure reliefs must not exceed a maximum of 90% of the system pressure.



## INSTALLATION NOTES

Mounting type	Flange mounting 4 fixing holes for socket head screws M6 x 65
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 8,9 \text{ Nm}$ (quality 8.8, zinc coated)

**Note!** The length of the fixing screw depends on the base material of the connection element.



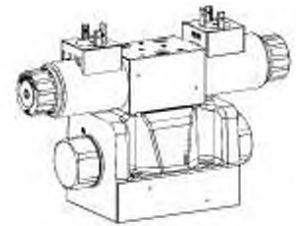
## SURFACE TREATMENT

- ◆ The valve body is coated with a two component paint
- ◆ The covers and the screws are zinc coated



**Spool valve**
**Flange construction**

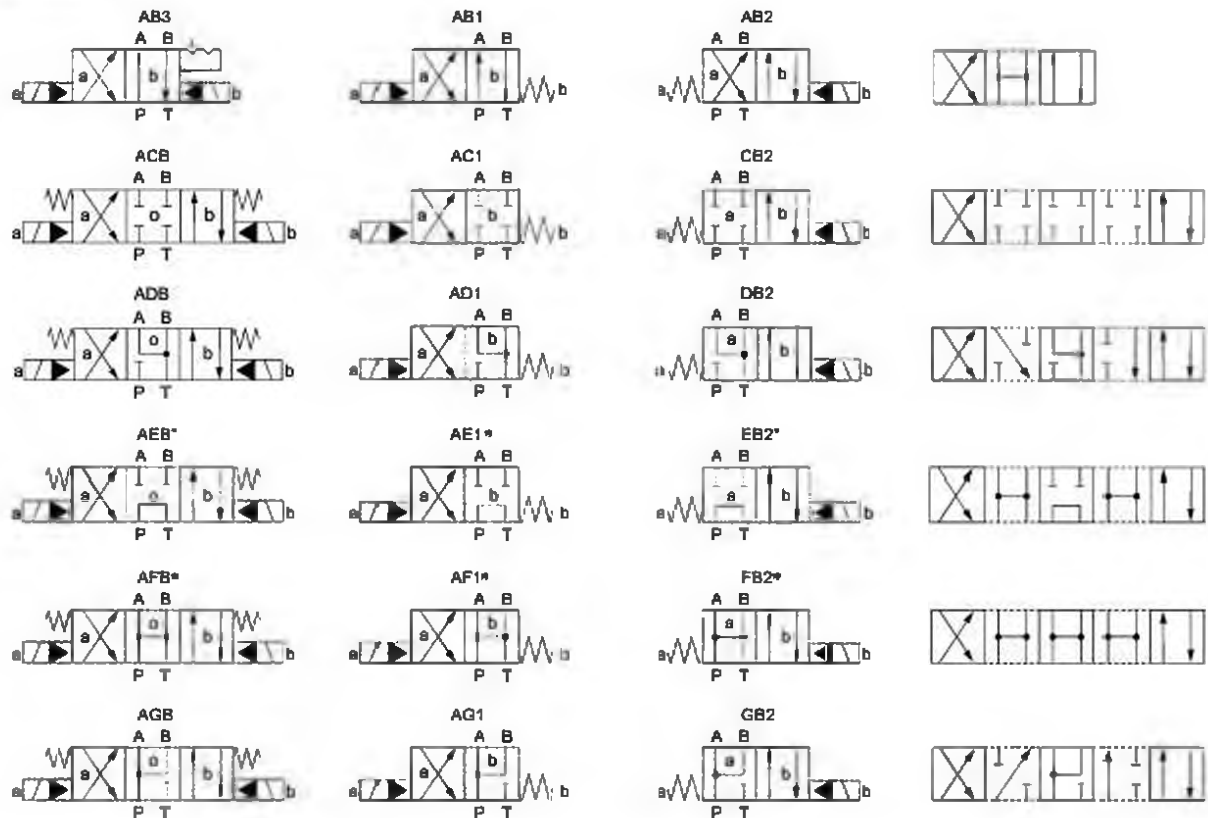
- ◆ pilot operated
- ◆ 4/2-way impulse execution detented
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 160 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG10**  
**ISO 4401-05**

**DESCRIPTION**

Pilot operated 4-way valve in a 5 chamber system. The control of the pilot valve takes place electrically. Very compact construction with corresponding low weight and high flow values. The hydraulic control of the pilot valve can be internal or external via an additional connection plate or the mounting interface depending on the type of pilot operation. Spool detented or with spring reset. Precise spool fit, low leakage, long service life time. Spool made from hardened steel, valve body from high quality hydraulic cast steel.

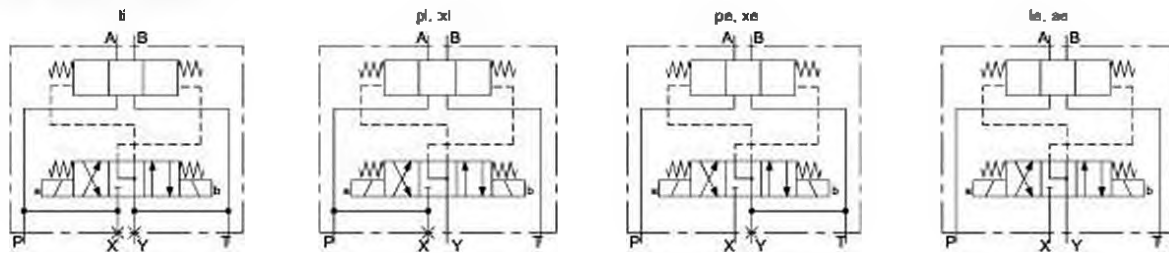
**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. Pilot operated valves are used where large volume flows have to be controlled. Switching performance and leakage of the valves must be taken into account when designing the system. Solenoid spool valves are suitable for machine tools and handling systems of any kind.

**SYMBOL**


\* When the connections P and T are connected in the middle position, a back pressure cartridge is built in as standard in the case of internal pilot oil supply (ti/pi). If this back pressure valve is not used (0, according to the type code), it must be ensured that a pilot pressure of minimum 4 bar is present. The pressure difference of this cartridge has to be added to the pressure difference of the main valve (see characteristics) which results in an overall value. Pilot control type xi is not available with a back pressure cartridge.



**Types of pilot operation**

**TYPE CODE**

WVM F A10 -  -  -  -  /   -    #

Spool valve pilot operated, solenoid operated

Flange construction

International standard interface ISO NG10

Designation of symbols acc. to table

Back pressure cartridge  Standard  
 only symbols AEB and AFB  
 without back pressure cartridge  see notes  
 Section symbols

Type of pilot operation:  
 Pilot oil supply (x) and drain (y)  **ii**  
 (x) and (y) internally via control plate:  
 (x) and (y) externally  **te**  
 (x) internally (y) externally  **pi**  
 (x) externally (y) internally  **pe**  
 via mounting interface:  
 (x) and (y) externally  **le**  
 (x) internally (y) externally  **xe**  
 (x) externally (y) internally  **se**

Nominal voltage  $U_v$   12 VDC  G12  115 VDC  R115  
 24 VDC  G24  230 VAC  R230  
 without coil  X5

Slip-on coil  Metal housing square with one-sided collar  N  
 Metal housing round with one-sided collar  V (only G12 and G24)

Connection execution  Connector socket EN 175301-803/ISO 4400  D  
 Connector socket AMP Junior-Timer  J (only for  $U_v \leq 75$  VDC)  
 Connector Deutsch DT04-2P  G (only for  $U_v \leq 75$  VDC)

Sealing material  NBR  D1  FKM (Viton)

Manual override pilot valve  Integrated   
 Push-button  HFI Actuation pressures see pilot valve  
 Spindle  HSI Actuation pressures see pilot valve

Dampening orifices in control connections A and B  without orifice   
 orifice  $\varnothing$  0,5 mm  D 0.5 Provide for control pressure above 100 bar

Design index (subject to change)

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Electrical
Ambient temperature	-25...+70 °C if > +50 °C, then no undervoltage is admissible
Weight	3,5 kg (1 solenoid) 3,8 kg (2 solenoids) 0,3 kg control plate
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{r,max} = 160$ bar (type of pilot operation te, pi, ae and xi) $p_{r,max} = 100$ bar (type of pilot operation ti, pe and xe)
Pilot pressure	$p_{s,max}$ : 8...14 bar, see performance limits $p_{s,max} = 350$ bar for connection X (control plate) $p_{s,max} = 200$ bar for connection X (mounting interface)
Pressure pilot oil drain	minimum lower by $p_{s,max}$
Maximum volume flow	$Q_{max} = 160$ l/min
Leakage oil	See characteristic and pilot valves
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10... 16 ≥ 75, see data sheet 1.0-50

**SURFACE TREATMENT**

- ◆ The main valve body, the distance plate, the screw plugs, the slip-on coil and the armature tube are zinc-nickel coated
- ◆ The pilot valve body is coated with a two component paint

**ACTUATION**

Solenoid spool valve direct operated  
 Data sheet 1.2-33 (slip-on coil)  
 WDMFA04-AB1 / AB2 for 4/2-way AB1 / AB2  
 WDMFA04-AD1 / DB2 for other 4/2-way  
 WDMFA04-ADB for 4/3-way with spring centred mid position  
 WDMFA04-ADB for 4/2-way impulse execution detented

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M6 x 40
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 13.5$ Nm ± 10 %, quality min. 10.9  $M_0 = 10.5$ Nm ± 10 %, quality 8.8:

- ◆ maximum tank pressure without external connections: 80 bar
- ◆ maximum tank pressure and maximum pressure external connections: 35 bar

**Note!**


The length of the fixing screw depends on the base material of the connection element.

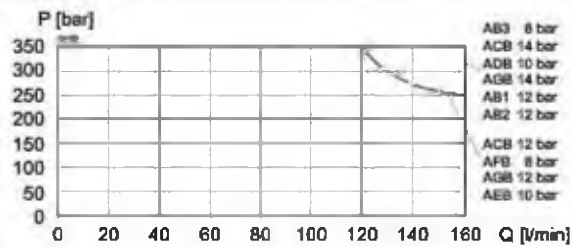
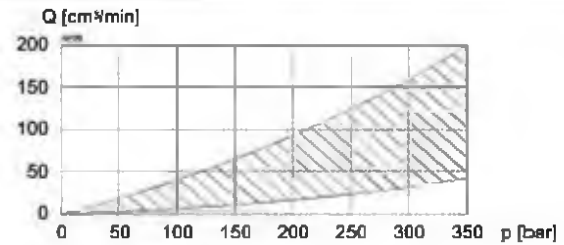
**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

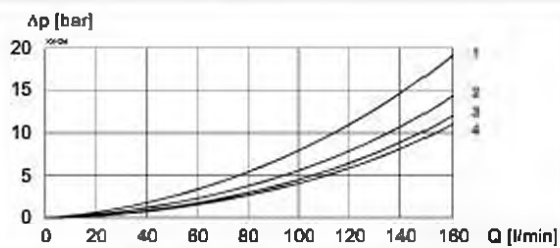
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $Q = f(p)$ 
**Performance limits**

Minimum pilot pressures measured with back pressure free pilot oil drain


 $Q = f(p)$ 
**Leakage volume flow characteristic per control edge**

 $\Delta p = f(Q)$ 
**Pressure drop volume flow characteristics**

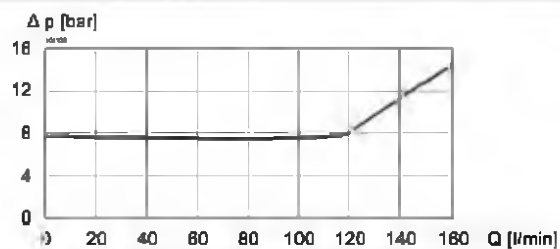
Spool type / flow direction


**Volume flow direction**

Symbol	Volume flow direction				
	P - A	P - B	P - T	A - T	B - T
AB	3	3	-	2	1
ACB	3	3	-	2	1
ADB	3	3	-	2	1
AEB	3	3	1	2	1
AFB	2	2	4	4	2
AGB	2	2	-	2	1

 $\Delta p = f(Q)$ 
**Pressure drop volume flow characteristic**

Back pressure cartridge (in addition to P-A or P-B of the main valve)

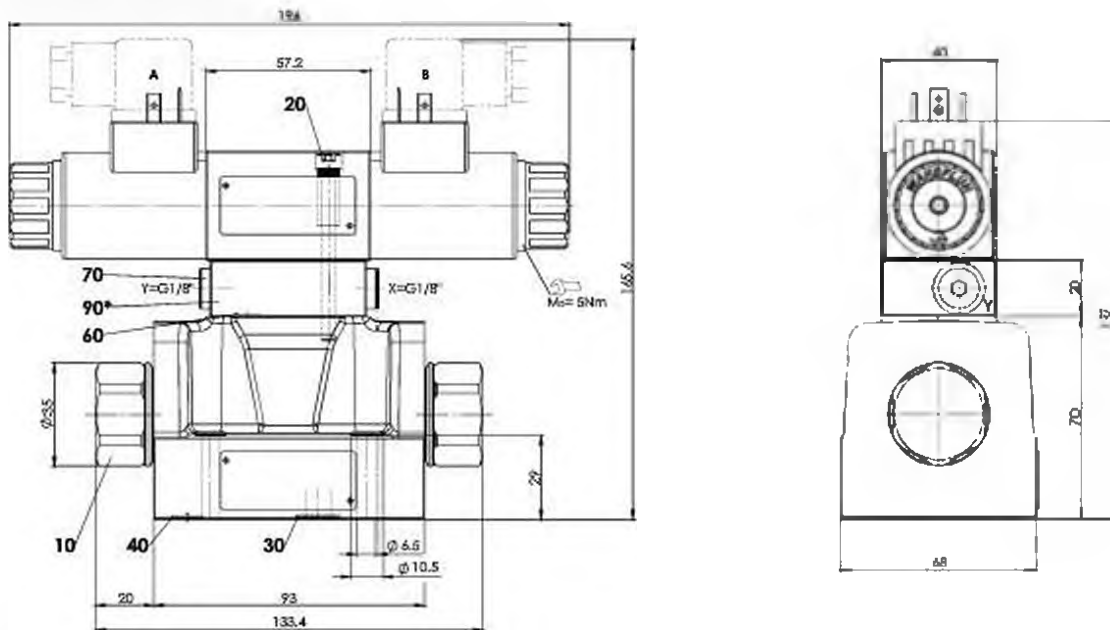

**Note!**


\*Please ensure the minimum pilot pressure. Attention internal pilot connections: valves only switch when the pressure difference in the valve is high enough. Further details on request.

**DIMENSIONS**

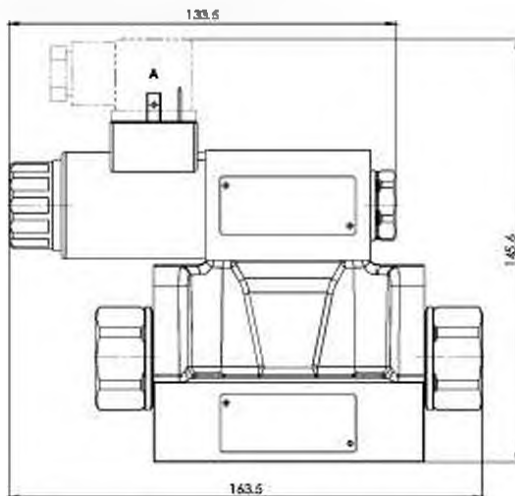
4/3-way spool valve (spring centring)

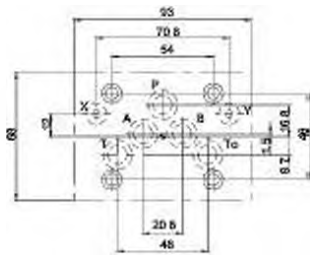
4/2-way spool valve (impulse)



Pos. 90° \* Control plate with type of pilot operation to, pi, pe only

4/2-way spool valve (spring reset)



**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	239.7203	Screw plug
20	246.2141	Socket head screw M5 x 40 DIN 912
	246.2160	Socket head screw M5 x 60 DIN 912
30	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.8124	O-ring ID 12,42 x 1,78 (FKM)
40	160.2076	O-ring ID 7,65 x 1,78 (NBR)
	160.8076	O-ring ID 7,65 x 1,78 (FKM)
60	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)
70	238.1405	Screw plug VSTI G 1/8"-ED
90	173.1500	Control plate NG4 Mini

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Horizontal mounting blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**STANDARDS**

Mounting interface	ISO 4401-05
Solenoids	DIN VDE 0580
Connection execution O	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**Spool valve**
**Flange construction**

- ◆ pilot operated
- ◆ 4/2-way impulse execution detented
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 160 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

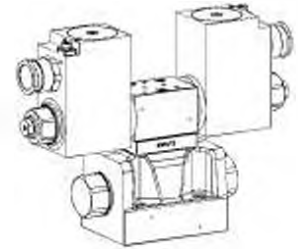
**DESCRIPTION**

Pilot operated 4-way valve in a 5 chamber system. The control of the pilot valve takes place electrically. Very compact construction with corresponding low weight. The hydraulic control of the pilot valve can be internal or external via an additional connection plate or the mounting interface depending on the type of pilot operation. Spool detented or with spring reset.

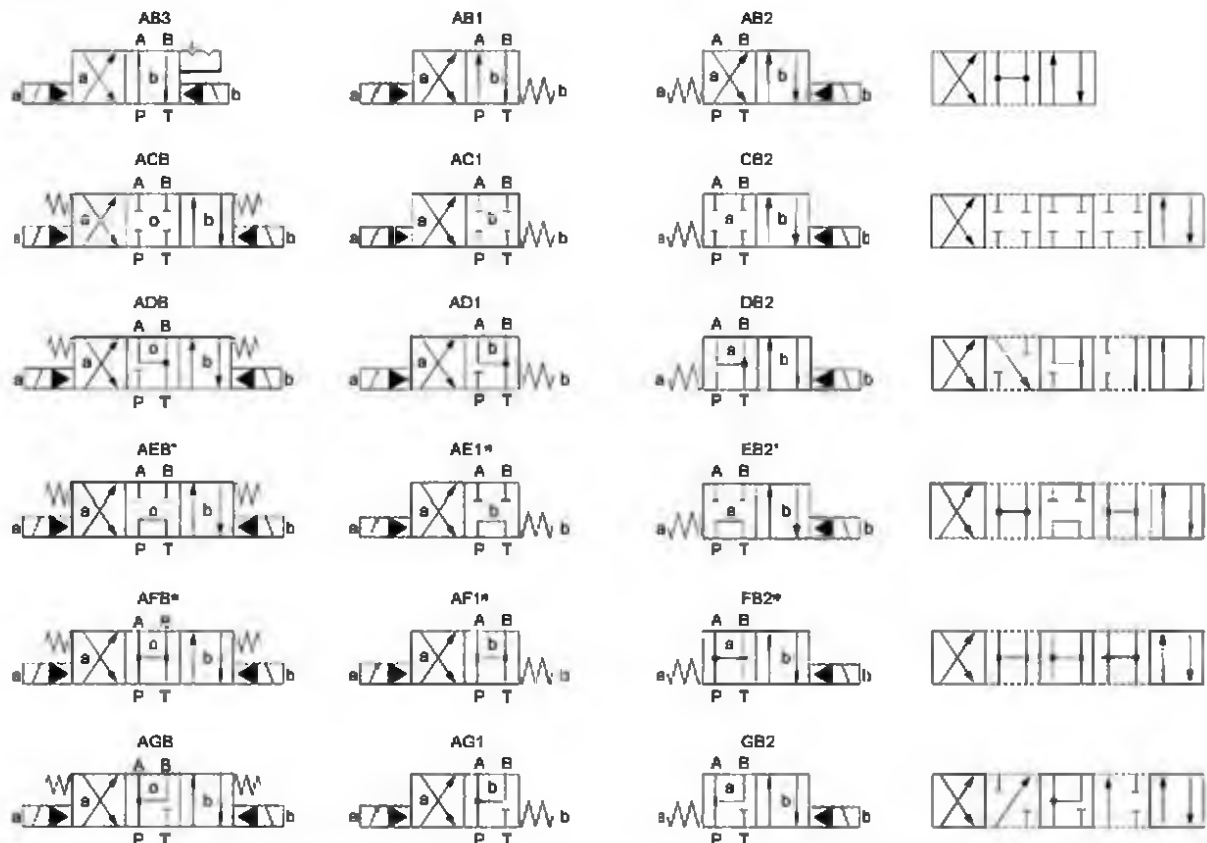
The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**NG10**
**ISO 4401-05**

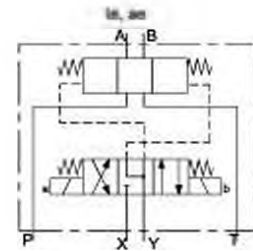
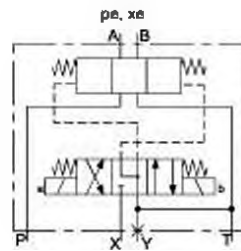
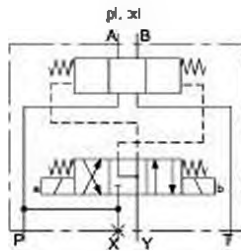
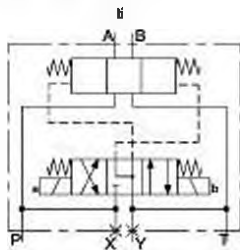
- ⊕ II 2 G Ex db IIC T6, T4
- ⊕ II 2 D Ex db III C T60 °C, T130 °C
- ⊕ I M2 Ex db I Mb
- Class I Division 1
- Class I Zone 1


**APPLICATION**

Spool valves are mainly used for controlling direction of movement and stopping of hydraulic cylinders and motors. The direction of movement is determined by the position of the spool and its symbol. Pilot operated valves are used where large volume flows have to be controlled. Switching performance and leakage of the valves must be taken into account when designing the system. Solenoid spool valves are suitable for machine tools and handling systems of any kind.

**SYMBOL**


\* When the connections P and T are connected in the middle position, a back pressure cartridge is built in as standard in the case of internal pilot oil supply (ti/pi). If this back pressure valve is not used (0, according to the type code), it must be ensured that a pilot pressure of minimum 4 bar is present. The pressure difference of this cartridge has to be added to the pressure difference of the main valve (see characteristics) which results in an overall value. Pilot control type xi is not available with a back pressure cartridge.

**Types of pilot operation**

**TYPE CODE**

 WVY F A10 -  -  -  /    -  

Spool valve, pilot operated, explosion proof

Flange construction

International standard interface ISO NG10

Designation of symbols acc. to table

 Back pressure cartridge  Standard  
 only symbols AEB and AFB  
 without back pressure cartridge  0 see notes  
 Section symbols

Type of pilot operation:

 Control oil Supply (x)  
 and drain (y)  ii  
 (x) and (y) internally  
 via control plate:  
 (x) and (y) externally  lb  
 (x) internally (y) externally  pi  
 (x) externally (y) internally  pe  
 via mounting interface:  
 (x) and (y) externally  ee  
 (x) internally (y) externally  xe  
 (x) externally (y) internally  se

 Nominal voltage  $U_n$   12 VDC  G12  115 VAC  R115  
 24 VDC  G24  230 VAC  R230

 Nominal power  $P_n$   9 W  L9  Ambient temperature up to:  
 15 W  L15 40 °C or 90 °C  
 17 W  L17 70 °C  
 70 °C (only UL; CSA)

 Certification  ATEX, IECEx, CCC, EAC    
 Australia  AU  UL / CSA  UL  
 MA  MA

 Sealing material  NBR   
 FKM [Viton]  D1

 Dampening orifices   
 in control connections A and B without orifice   
 orifice Ø 0,5 mm  0,5 Provides for control pressure above 100 bar

Design index (subject to change)

**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Electrical
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17) -40...+70 °C (L15 / L17)
Weight	5,1 kg (1 solenoid) 6,8 kg (2 solenoids) 0,3 kg control plate 0,17 kg spacer plate
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{r,max} = 160$ bar (type of pilot operation te, pi, ae and xi) $p_{r,max} = 100$ bar (type of pilot operation ti, pe and xe)
Pilot pressure	$p_{r,max}$ : 8...14 bar, see performance limits $p_{r,max} = 350$ bar for connection X (control plate) $p_{r,max} = 200$ bar for connection X (mounting interface)
Pressure pilot oil drain	minimum lower by $p_{r,max}$
Maximum volume flow	$Q_{max} = 160$ l/min
Leakage oil	See characteristic and pilot valves
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L9 or L15 / L17) NBR 872 -40...+70 °C (L15 / L17)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade $\beta_{10...16} \geq 75$ , see data sheet 1.0-50

**ACTUATION**

Solenoid spool valve direct operated  
 Data sheet 1.3-24  
 WDYFA04-AB1 / AB2 for 4/2-way AB1 / AB2  
 WDYFA04-AD1 / DB2 for other 4/2-way  
 WDYFA04-ADB for 4/3-way with spring centred mid position  
 WDYFA04-ADB for 4/2-way impulse execution detented

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to...	Z604 -40 °C to...
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	x
MA		x	x	
UL / CSA	x		x	x

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M6 x 40
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 13.5$ Nm $\pm$ 10 %, quality min. 10.9  $M_0 = 10.5$ Nm $\pm$ 10 %, quality 8.8:  ◆ maximum tank pressure without external connections: 80 bar ◆ maximum tank pressure and maximum pressure external connections: 35 bar

**Note!**


The length of the fixing screw depends on the base material of the connection element.

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

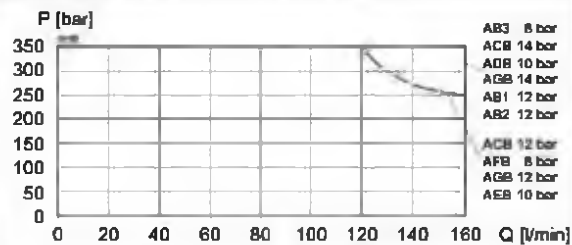
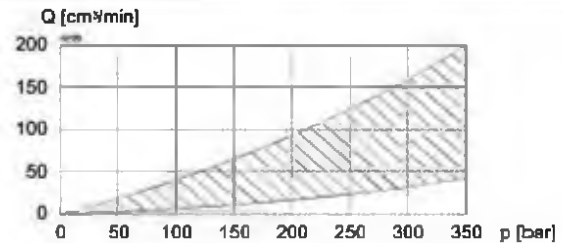
- ◆ The main valve body, the distance plate, the screw plugs, the slip-on coil and the armature tube are zinc-nickel coated
- ◆ The pilot valve body is coated with a two component paint



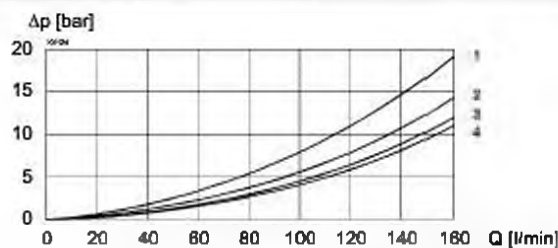
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $Q = f(p)$ 
**Performance limits**

\*Minimum pilot pressures measured with back pressure free pilot oil drain


 $Q = f(p)$ 
**Leakage volume flow characteristic per control edge**

 $\Delta p = f(Q)$ 
**Pressure drop volume flow characteristics**

Spool type / flow direction


**Volume flow direction**

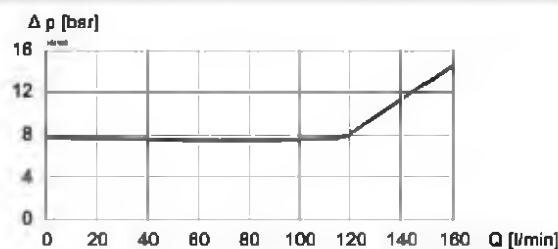
Symbol	P - A	P - B	P - T	A - T	B - T
AB1 / AB2 / AB3	3	3	-	2	1
ACB / AC1 / CB2	3	3	-	2	1
ADB / AD1 / DB2	3	3	-	2	1
AEB / AE1 / EB2	3	3	1	2	1
AFB / AF1 / FB2	2	2	4	4	2
AGB / AG1 / GB2	2	2	-	2	1

**Note!**


\*Please ensure the minimum pilot pressure. Attention internal pilot connections: valves only switch when the pressure difference in the valve is high enough. Further details on request.

 $\Delta p = f(Q)$ 
**Pressure drop volume flow characteristic**

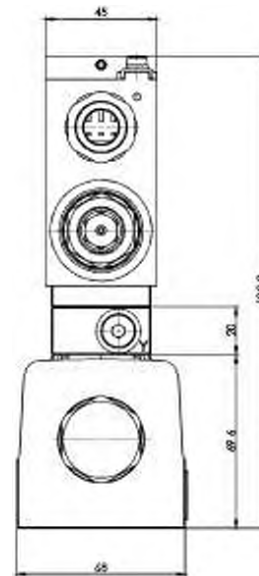
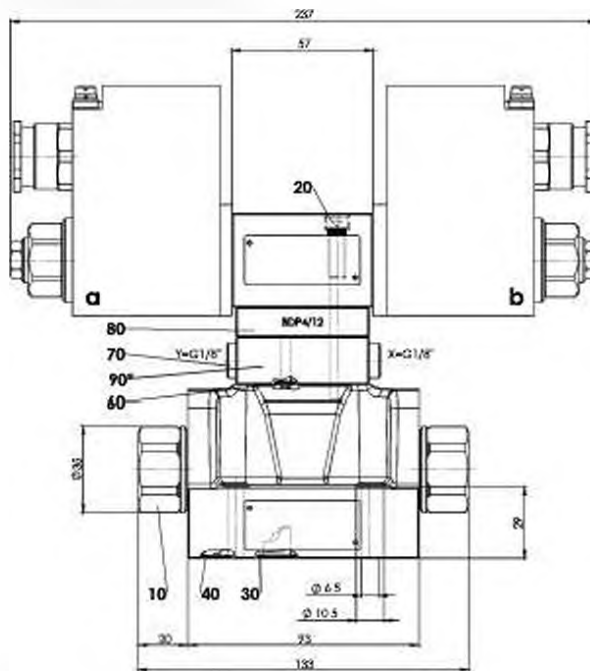
Back pressure cartridge (in addition to P-A or P-B of the main valve)



**DIMENSIONS**

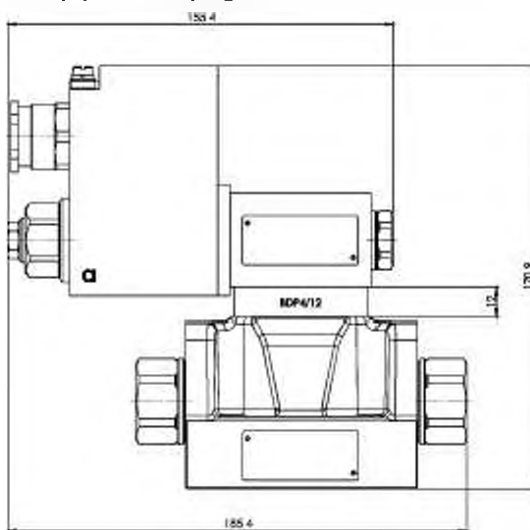
4/3-way spool valve (spring centring)

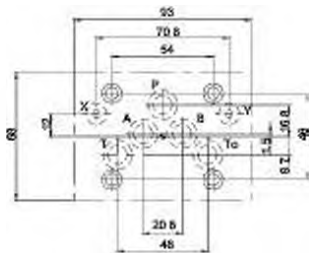
4/2-way spool valve (impulse)



\* Pos.90 Control plate with type of pilot operation te, pi, pa only

4/2-way spool valve (spring reset)



**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	239.7203	Screw plug
20	246.2151	Socket head screw M5 x 50 DIN 912
	246.2171	Socket head screw M5 x 70 DIN 912
30	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.8124	O-ring ID 12,42 x 1,78 (FKM)
40	160.2076	O-ring ID 7,65 x 1,78 (NBR)
	160.8076	O-ring ID 7,65 x 1,78 (FKM)
60	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)
70	238.1405	Screw plug VSTI G 1/8"-ED
80	173.1400	Spacer plate NG4 Mini
90	173.1500	Control plate NG4 Mini

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Horizontal mounting blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**STANDARDS**

Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Mounting interface	ISO 4401-05
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**Spool valve intrinsically safe**
**Flange construction**

- ◆ pilot operated
- ◆ 4/2-way impulse execution detented
- ◆ 4/3-way with spring centred mid position
- ◆ 4/2-way with spring reset
- ◆  $Q_{max} = 160 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**DESCRIPTION**

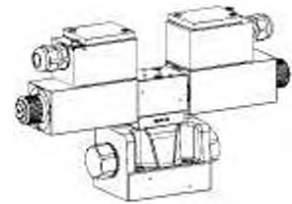
Pilot operated 4-way valve in a 5 chamber system. The control of the pilot valve takes place electrically. Very compact construction with corresponding low weight. The hydraulic control of the pilot valve can be internal or external via an additional connection plate or the mounting interface depending on the type of pilot operation. Spool detented or with spring reset. Intrinsic safety is achieved by limiting the electric energy in the solenoid circuit by means of a separate intrinsically safe power supply. Therewith sparking is prevented from forming.

**NG10**
**ISO 4401-05**

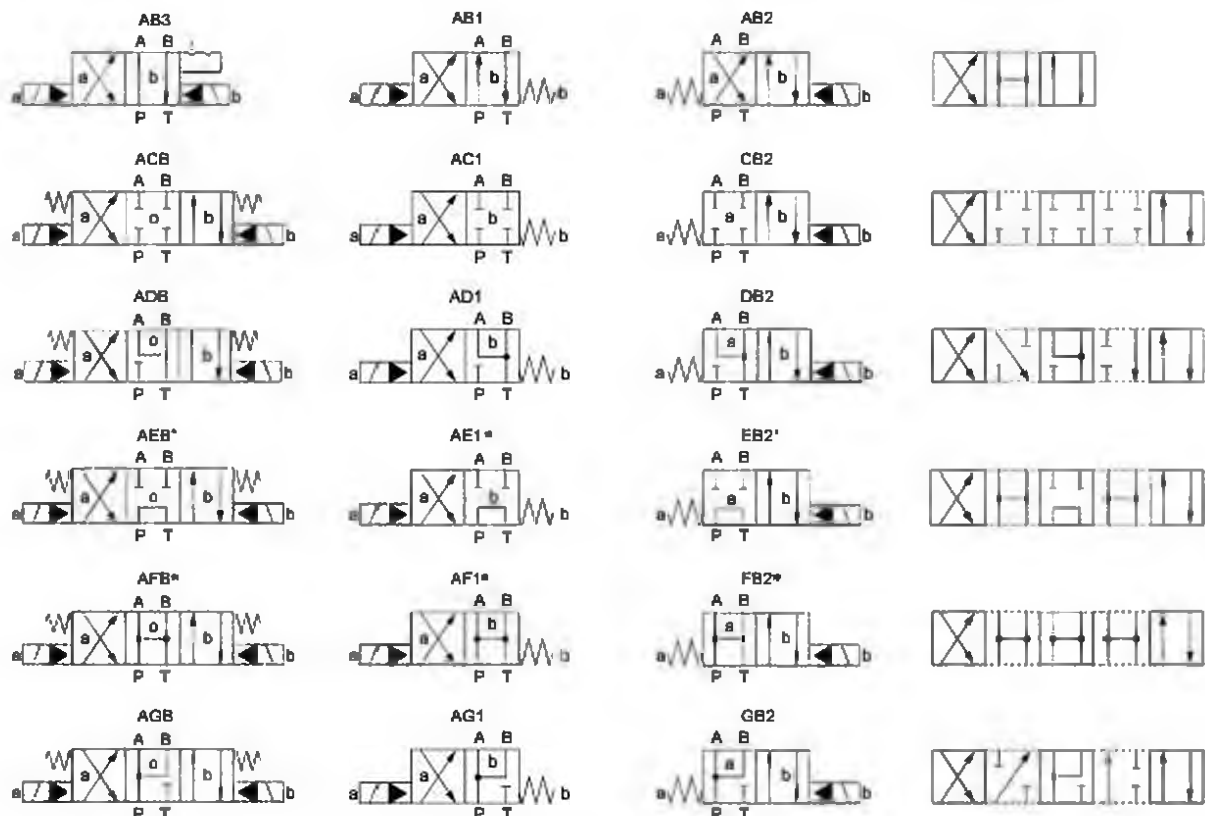
Ex ia I Ma

Ex ia II C T5 / T6 Ga

 II G Ex ia II C T6, T5

 I M1 Ex ia I Ma

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. The direction of movement is determined by the position of the spool and its symbol. Pilot operated valves are used where large volume flows have to be controlled. Switching performance and leakage of the valves must be taken into account when designing the system.

**SYMBOL**


\* When the connections P and T are connected in the middle position, a back pressure cartridge is built in as standard in the case of internal pilot oil supply (ti/pi). If this back pressure valve is not used (0, according to the type code), it must be ensured that a pilot pressure of minimum 4 bar is present. The pressure difference of this cartridge has to be added to the pressure difference of the main valve (see characteristics) which results in an overall value. Pilot control type xi is not available with a back pressure cartridge.



**GENERAL SPECIFICATIONS**

Designation	4/2-, 4/3-spool valve
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Ambient temperature	-25...+45 °C (operation as T6) -25...+60 °C (operation as T1... T5)
Weight	5,4 kg (1 K-solenoid) 7,6 kg (2 K-solenoids)
MTTFd	150 years

**ACTUATION**

Solenoid spool valve direct operated  
 Data sheet 1.3-28  
 WDZFA04-AB1 / AB2 for 4/2-way AB1 / AB2  
 WDZFA04-AD1 / DB2 for other 4/2-way  
 WDZFA04-ADB for 4/3-way with spring centred mid position  
 WDZFA04-ANR for 4/2-way impulse execution detented

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{T,max} = 160$ bar (type of pilot operation te, pi, ae and xi) $p_{T,max} = 100$ bar (type of pilot operation ti, pe and xe)
Pilot pressure	$p_{p,max} = 8...14$ bar, see performance limits $p_{p,max} = 350$ bar for connection X (control plate) $p_{p,max} = 200$ bar for connection X (mounting interface)
Pressure pilot oil drain	minimum lower by $p_{p,max}$
Maximum volume flow	$Q_{max} = 160$ l/min
Leakage oil	See characteristic and pilot valves
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+45 °C (operation as T6, NBR) -20...+45 °C (operation as T6, FKM) -25...+60 °C (operation as T1... T5, NBR) -20...+60 °C (operation as T1... T5, FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade $\beta_{10...16} \geq 75$ , see data sheet 1.0-50

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	Continuous operation
Switching frequency	1'800 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	$\pm 10\%$ with regard to nominal voltage
Limiting current at 50 °C	$I_{lim} = 90$ mA (100 $\Omega$ execution) $I_{lim} = 64$ mA (152 $\Omega$ execution)
Temperature class	T1...T6
Coil resistance	100 $\Omega$ , 152 $\Omega$
Minimum power consumption	$P_{min} = 0,81$ W (100 $\Omega$ execution) $P_{min} = 0,62$ W (152 $\Omega$ execution)

**Note!**


Other electrical specifications, recommended power supply and safety-related limits see data sheet 1.1-185

**MANUAL OVERRIDE**

HB4,5 as standard

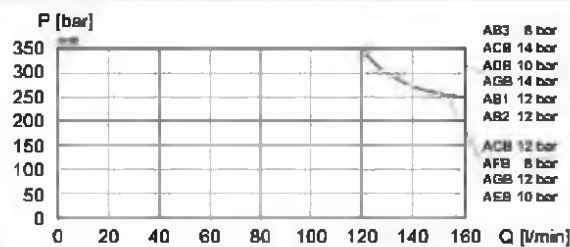
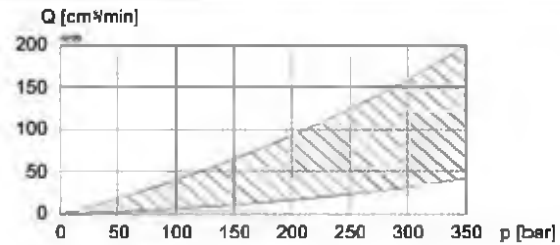
**CERTIFICATES**

	Surface gas and dust	Mining
ATEX	x	x
IECEx	x	x

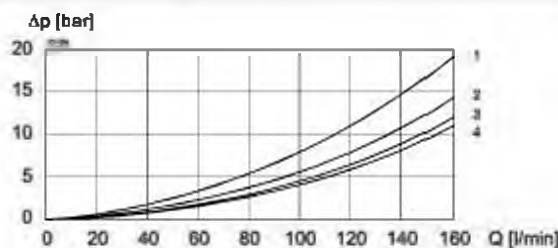
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $Q = f(p)$ 
**Performance limits**

\*Minimum pilot pressures measured with back pressure free pilot oil drain


 $Q = f(p)$ 
**Leakage volume flow characteristic per control edge**

 $\Delta p = f(Q)$ 
**Pressure drop volume flow characteristics**

Spool type / flow direction

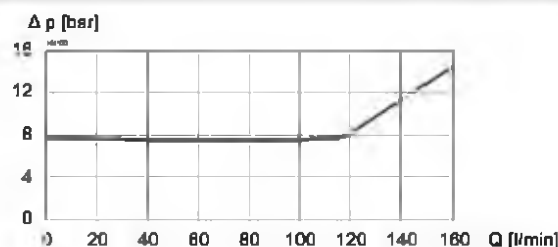


Volume flow direction

Symbol	P - A	P - B	P - T	A - T	B - T
AB1 / AB2 / AB3	3	3	-	2	1
ACB / AC1 / CB2	3	3	-	2	1
ADB / AD1 / DB2	3	3	-	2	1
AEB / AE1 / EB2	3	3	1	2	1
AFB / AF1 / FB2	2	2	4	4	2
AGB / AG1 / GB2	2	2	-	2	1

 $\Delta p = f(Q)$ 
**Pressure drop volume flow characteristic**

Back pressure cartridge (in addition to P-A or P-B of the main valve)


**Note!**


\*Please ensure the minimum pilot pressure. Attention internal pilot connections: valves only switch when the pressure difference in the valve is high enough. Further details on request.

**SURFACE TREATMENT**

- ◆ The main valve body, the distance plate, the screw plugs, the slip-on coil and the armature tube are zinc-nickel coated
- ◆ The pilot valve body is coated with a two component paint

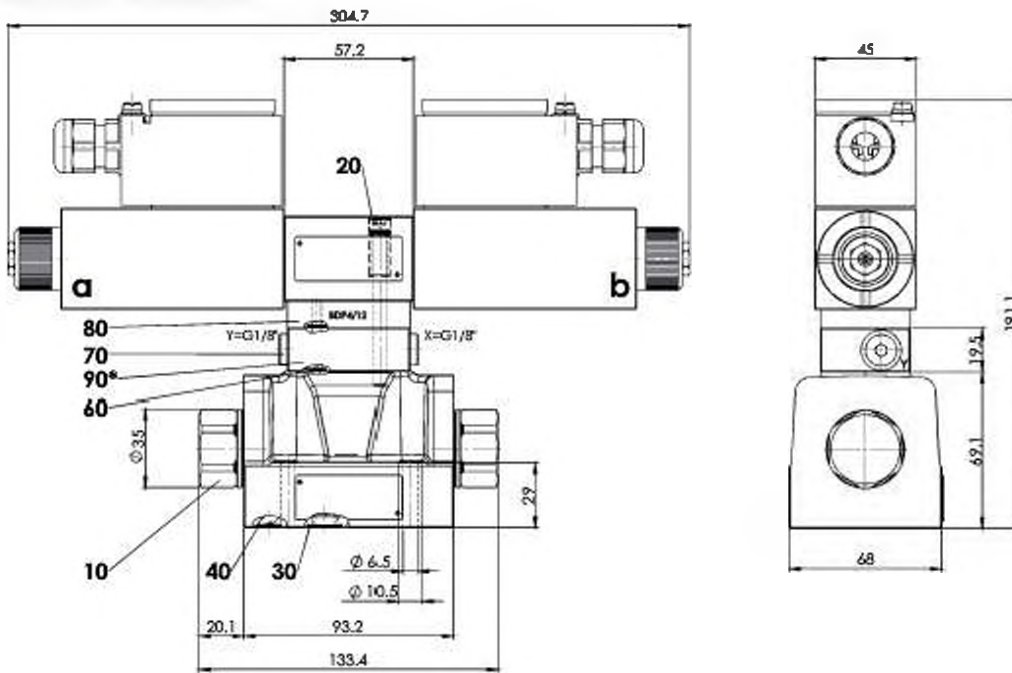
**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

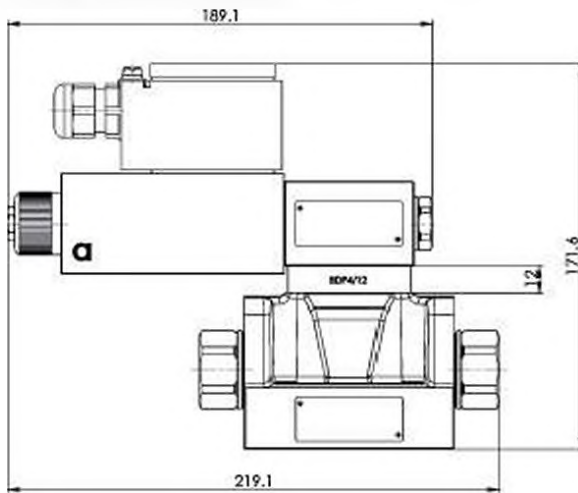
**DIMENSIONS**

4/3-way spool valve (spring centring)

4/2-way spool valve (impulse)

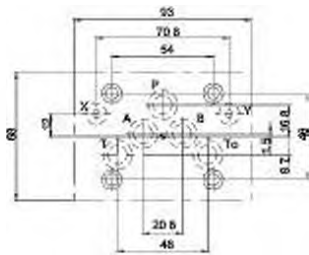


\* Pos 90 Control plate with type of pilot operation ta, pi, pe only  
4/2-way spool valve (spring reset)





## HYDRAULIC CONNECTION



## ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Horizontal mounting blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

## COMMISSIONING

**Attention!** Inherently safe valves must be controlled only by a suitable, certified power supply from out of the hazardous area (see Operating Instructions). The selection of the power supply and the wiring must be carried out by qualified personnel. Recommended power supplies and safety-related limit values according to data sheet 1.1-185



## PARTS LIST

Position	Article	Description
10	239.7203	Screw plug
20	246.2151	Socket head screw M5 x 50 DIN 912
	246.2171	Socket head screw M5 x 70 DIN 912
30	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.8124	O-ring ID 12,42 x 1,78 (FKM)
40	160.2076	O-ring ID 7,65 x 1,78 (NBR)
	160.8076	O-ring ID 7,65 x 1,78 (FKM)
60	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)
70	238.1405	Screw plug VSTI G 1/8"-ED
80	173.1400	Spacer plate NG4 Mini
90	173.1500	Control plate NG4 Mini

## STANDARDS

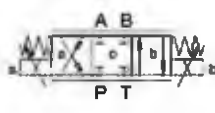
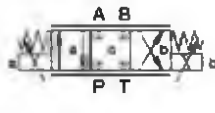
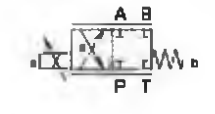
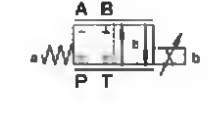
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Mounting interface	ISO 4401-05
Protection class	EN 60 529
Contamination efficiency	ISO 4406


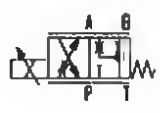
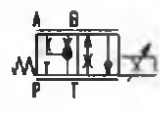
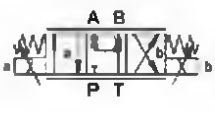

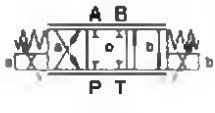
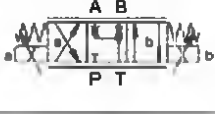
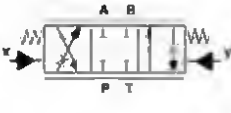

## INSTALLATION NOTES

Mounting type	Flange mounting 4 fixing holes for socket head screws M6 x 40
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 13.5 \text{ Nm} \pm 10 \%$ , quality min. 10.9  $M_0 = 10.5 \text{ Nm} \pm 10 \%$ , quality 8.8  ◆ maximum tank pressure without external connections: 80 bar ◆ maximum tank pressure and maximum pressure external connections: 35 bar

**Note!** The length of the fixing screw depends on the base material of the connection element.



	NG3-Mini	NG4-Mini	NG6 ISO	NG10 ISO
	Type designation			
	<b>WDPFA03-ACB</b> 1.10-66	<b>WDPFA04-ACB</b> 1.10-73  <b>WDPFA04-ACB-. /NE</b> 1.10-3240 (integrated electronics)	<b>WDPFA06-ACB</b> 1.10-77  <b>WDBFA06-ACB</b> 1.10-88 (Ex d)  <b>WDPFA06-ACB-. /ME</b> 1.10-3340 (integrated electronics)  <b>WDRFA06-ACB</b> 1.10-82 (integr. electr. and LVDT)	<b>WDPFA10-ACB</b> 1.10-3400
		<b>BRW.4D41</b> 1.10-70 (integr. electr. and LVDT)  <b>VWS4D41</b> 1.10-06	<b>VWS4D61</b> 1.10-11	<b>VWS4D101</b> 1.10-20
	<b>WDPFA03-AC1</b> 1.10-66	<b>WDPFA04-AC1</b> 1.10-73  <b>WDPFA04-AC1-. /NE</b> 1.10-3240 (integrated electronics)	<b>WDPFA06-AC1</b> 1.10-77	<b>WDPFA10-AC1</b> 1.10-3400
	<b>WDPFA03-CB2</b> 1.10-66	<b>WDPFA04-CB2</b> 1.10-73  <b>WDPFA04-CB2-. /NE</b> 1.10-3240 (integrated electronics)	<b>WDPFA06-CB2</b> 1.10-77	<b>WDPFA10-CB2</b> 1.10-3400

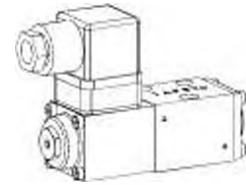
	NG3-Mini	NG4-Mini	NG6 ISO	NG10 ISO
	Type designation			
	<b>WDPFA03-ADB</b> 1.10-66	<b>WDPFA04-ADB</b> 1.10-73  <b>WDPFA04-ADB-..NE</b> 1.10-3240 (integrated electronics)	<b>WDPFA06-ADB</b> 1.10-77  <b>WDBFA06-ADB</b> 1.10-88 (Ex d)  <b>WDPFA06-ADB-..ME</b> 1.10-3340 (integrated electronics)  <b>WDRFA06-ADB</b> 1.10-82 (Integr. electr. and LVDT)	<b>WDPFA10-ADB</b> 1.10-3400
		<b>WDPFA04-AD1</b> 1.10-73  <b>WDPFA04-AD1-..NE</b> 1.10-3240 (integrated electronics)		
		<b>WDPFA04-DB2</b> 1.10-73  <b>WDPFA04-DB2-..NE</b> 1.10-3240 (integrated electronics)		
		<b>VWS4D42</b> 1.10-08	<b>VWS4D62</b> 1.10-11	<b>VWS4D102</b> 1.10-20
		<b>BRW.4D42</b> 1.10-72 (integr. electr. and LVDT)		
	<b>3/4"-16 UNF</b>	<b>7/8"-14 UNF</b>	<b>M33 x 2</b>	<b>M42 x 2</b>
	<b>WDPPU08-ACB</b> 1.10-2710	<b>WDPPU10-ACB</b> 1.10-2720		
	<b>WDPPU08-ADB</b> 1.10-2710	<b>WDPPU10-ADB</b> 1.10-2720		
			<b>WVPPM33-ACB</b> 1.10-2310	<b>WVPPM42-ACB</b> 1.10-2410
			<b>WVPPM33-ADB</b> 1.10-2310	<b>WVPPM42-ADB</b> 1.10-2410

**Proportional spool valve**
**Flange construction**

- ◆  $Q_{max} = 10 \text{ l/min}$
- ◆ 3 volume flow levels
- ◆  $Q_{nom} = 5 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG3-Mini**

Wandfluh standard


**DESCRIPTION**

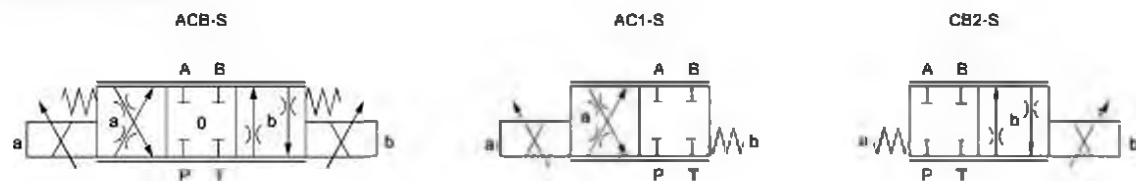
Direct operated proportional spool valve with 4 connections in 5-chamber system. Precise spool fit, low leakage, long service life time. The volume flow adjustment takes place by a Wandfluh proportional solenoid. Proportional to the solenoid current, the spool stroke, the spool opening and the valve volume flow increase. For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

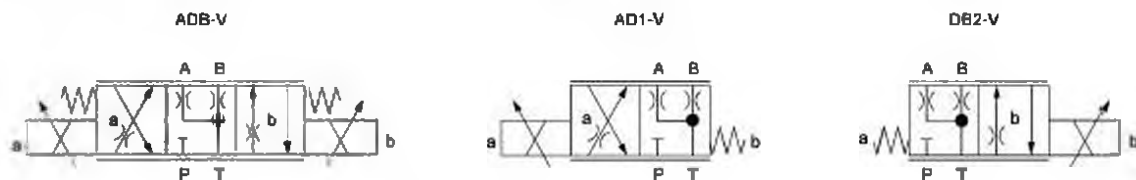
Proportional spool valves are perfectly suitable for demanding tasks due to the high resolution, large volume flow and low hysteresis. The applications are in the industry as well as in the mobile hydraulics for the smooth control of hydraulic actuators. Some examples: rotor blades control of wind generators, forestry and earth moving machines, machine tools and paper production machines with simple position control, robotics and fan control. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**

Symmetrical control



Meter-in control


**TYPE CODE**

Spool valve, directly operated, proportional		WDP F A03 -		-	-	-	-	# 2
Flange construction								
Mounting interface acc. to Wandfluh standard, NG3-Mini								
Designation of symbols acc. to table								
Nominal volume flow rate $Q_n$	1 l/min	1						
	2 l/min	2						
	5 l/min	5						
Nominal voltage $U_n$	12 VDC	G12						
	24 VDC	G24						
Sealing material	NBR							
	FKM (Viton)	D1						
Design index (subject to change)								

**GENERAL SPECIFICATIONS**

Designation	Proportional spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG3-Mini according to Wandfluh standard
Actuation	Proportional solenoid
Ambient temperature	-25 ... +70 °C if >50 °C, $I_a$ is only conditionally achievable
Weight	0,5 kg (1 solenoid) 0,65 kg (2 solenoids)
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	100 % DF
Standard nominal power	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 540 \text{ mA}$ ( $U_N = 24\text{VDC}$ ) $I_a = 1\,080 \text{ mA}$ ( $U_N = 12\text{VDC}$ )

**STANDARDS**

Mounting interface	Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The solenoid and the cover are re zinc-nickel coated
- ◆ The socket head screws are zinc coated

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	P29V (Data sheet 1.1-90)
Connection	Connector socket EN 175301 – 803

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$ ( $p_T < 20 \text{ bar}$ ) $p_{max} = 315 \text{ bar}$ ( $p_T > 20 \text{ bar}$ )
Tank pressure	$p_{Tmax} = 100 \text{ bar}$
Maximum volume flow	$Q_{max} = 10 \text{ l/min}$ , see characteristics
Nominal volume flow	$Q_N = 1 \text{ l/min}$ , 2 l/min, 5 l/min
Leakage oil	See characteristics
Hysteresis	≤ 5 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 ≥ 75, see data sheet 1.0-50

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

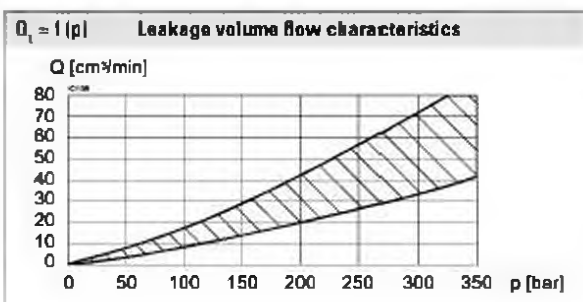
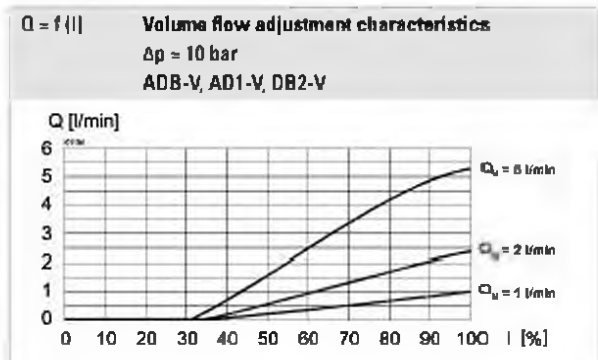
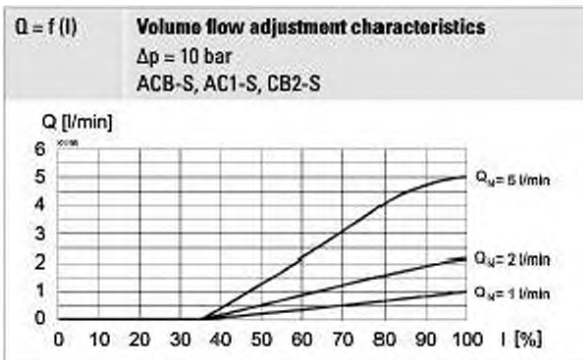
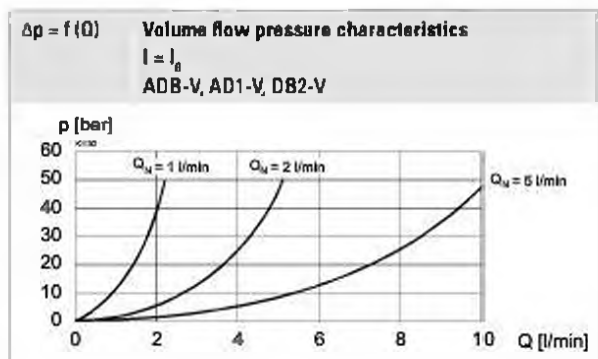
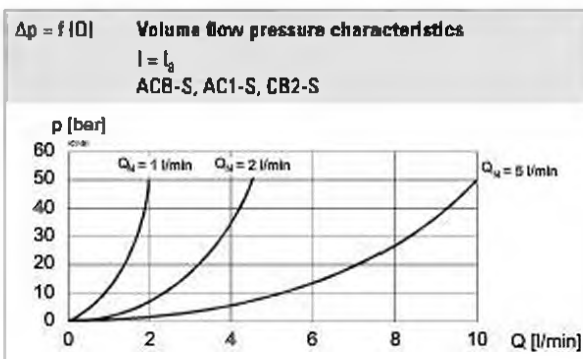
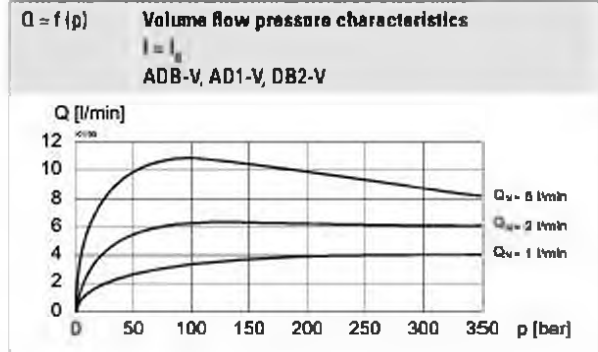
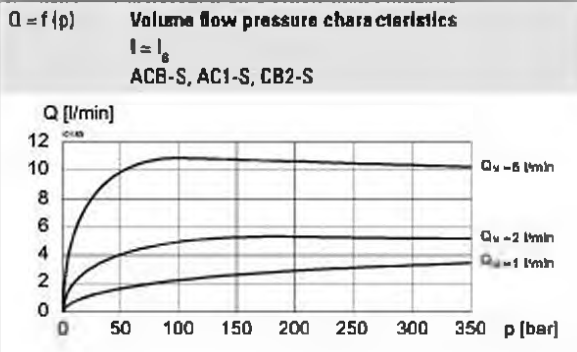
**INSTALLATION NOTES**

Mounting type	Flange mounting 3 fixing holes for socket head screws M4 x 30
Mounting position	Any, preferably horizontal
Tightening torque	$M_a = 2,6 \text{ Nm}$ (quality 8.8) Fixing screws

**Note!**

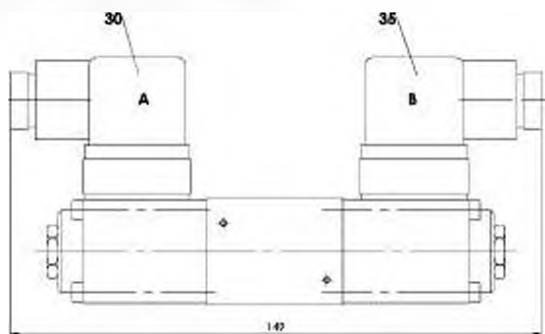

The length of the fixing screw depends on the base material of the connection element.

**PERFORMANCE SPECIFICATIONS**

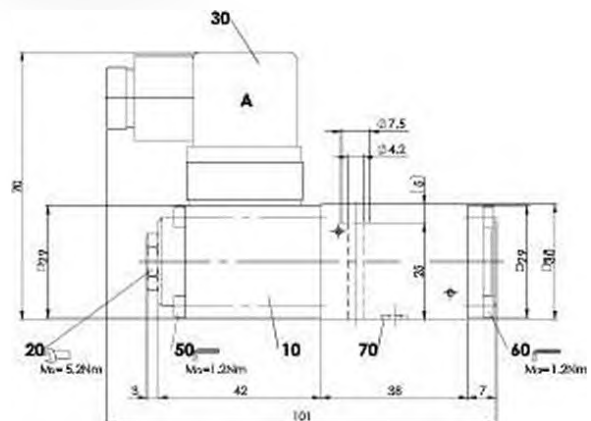
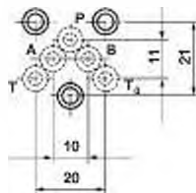
 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**DIMENSIONS**

4/3-way spool valve (spring centred)



4/2-way spool valve


**HYDRAULIC CONNECTION**

**MANUAL OVERRIDE**

Screw plug with integrated manual override (HB4,5). Actuation by pressing the push button

**PARTS LIST**

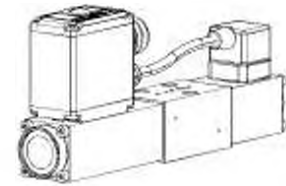
Position	Article	Description
10	256.2453	Proportional solenoid P129V-G24
	256.2418	Proportional solenoid P129V-G12
20	253.8000	Screw plug with integrated manual override HB4.5 (Data sheet 1.1-300)
30	219.2001	Electric plug A (grey)
35	219.2002	Electric plug B (black)
50	246.0141	Socket head screw M3 x 40 DIN 912
60	246.0109	Socket head screw M3 x 8 DIN 912
70	160.2045	O-ring ID 4,50 x 1,50 (NBR)

**ACCESSORIES**

Proportional amplifier	Register 1.13
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Modula type manifold blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**Proportional directional control valve**

- Integrated amplifier
- Integrated spool position control with LVDT
- Direct operated, not pressure compensated
- $Q_{max} = 20$  l/min
- $Q_N = 8$  l/min
- $p_{max} = 315$  bar

**NG4-Mini®**

**DESCRIPTION**

Direct operated proportional spool valve with integrated electronics in flange design NG4-Mini acc. to Wandfluh standard with 4 ports. The valve possesses an integrated positional control of the valve spool. This assures a minimal hysteresis and improved dynamic characteristics. Housing for electronics with protection class IP67 for harsh environment. The spool valve is designed acc. to the 5 chamber principle. The volume flow is adjusted by Wandfluh proportional solenoids (VDE standard 0580). Low pressure drop due to the body design and spool profiling. The spool is made of hardened steel. The body made of high grade hydraulic casting is painted. The solenoids are zinc coated and the housing for the electronics is made of aluminium.

**FUNCTION**

With the integrated spool position sensor (LVDT) the actual position of the spool is continuously recorded and made to follow the set-point value transmitted in an analogue manner. By means of this internal positional control, a minimal hysteresis and excellent dynamic characteristics are assured. With an increasing set-point value signal, the valve opening and therefore the volume flow increases and vice versa. Parameter setting and diagnosis with the free-of-charge software «PASO». Data are stored in a non volatile memory. Even after an electric power failure settings can easily be reproduced and transmitted.

**APPLICATION**

Proportional directional control valves with integrated electronics are highly suitable for demanding applications thanks to a high resolution, large volume flow, minimal hysteresis and very good dynamic characteristics. They are implemented in systems calling for good valve-to-valve reproducibility, easy installation, comfortable operation and high precision in industrial hydraulics as well as in mobile hydraulics for the smooth control of actuators. Application examples: pitch control of wind generators, forest and earth moving machines, machine tools and paper production machines with position controls, robotics and fan control.

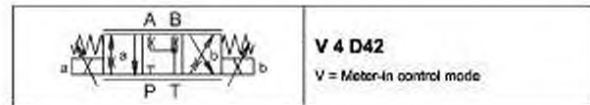
**TYPE CODE**

		B	R	W	<input type="checkbox"/>	-	<input type="checkbox"/>	-	24	<input type="checkbox"/>	#	<input type="checkbox"/>
Interface acc. to Wandfluh standard												
Integrated electronics, position control												
Spool valve, direct operated												
Description of symbols acc. to table												
Nominal volume flow $Q_x$	4 l/min											<input type="checkbox"/>
	8 l/min											<input type="checkbox"/>
Nominal voltage $U_n$												24 VDC
Hardware configuration												<input type="checkbox"/>
With analog signal (-10...+10 V factory set)												<input type="checkbox"/>
With CANopen acc. to DSP-408												<input type="checkbox"/>
With Profibus DP acc. to Fluid Power Technology												<input type="checkbox"/>
Design-Index (Subject to change)												

**GENERAL SPECIFICATIONS**

Designation	4/3-way proportional valve with integrated electronics	Ambient temperature	-20...+65 °C (typical) <small>(The upper temperature limit is a guideline value for typical applications. In individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions «DSVs».)</small>
Nominal size	NG4-Mini acc. to Wandfluh standard	Mounting position	any, preferably horizontal
Construction	Direct operated spool valve	Fastening torque	$M_0 = 5,5$ Nm (quality 8.8)
Operations	Proportional solenoid, wet pin push type, pressure tight	Weight	$m = 1,95$ kg
Mounting	Flange, 3 fixing holes for socket head cap screws M5x40		
Connections	Threaded connection plates, multi-flange subplates, longitudinal stacking system		



**TYPE CHARTS / DESIGNATIONS OF SYMBOLS**

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{6...10} \geq 75$ ) refer to data sheet 1.0-50/2 12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Working pressure	$p_{max} = 315$ bar (connections P, A, B)
Tank pressure	$p_{max} = 160$ bar (connections T)
Nominal volume flow	$Q_n = 4$ l/min, 8 l/min
Max. volume flow	see characteristic
Leakage volume flow	on request
Hysteresis	< 0,4 %
Repeatability	< 0,4 %
Jump response	typically 25 ms from 10 to 90 %
Frequency response	see characteristics

**ELECTRICAL SPECIFICATIONS**

Protection class	IP 67 acc. to EN 60 529 with suitable connector and closed electronic housing
Supply voltage	24 VDC
Range	separate adjustment for up and down for each solenoid
Parameterisation	via fieldbus or USB
Interface	USB (Mini B) for parameterisation with «PASO» (under the closing screw of the housing cover, factory set parameters)

**Analog interface:**

Device receptacle (male)	M23, 12-poles
Mating connector	Plug (female), M23, 12-poles (not incl. in delivery)
Preset value signal:	Voltage / current selected with software

**Fieldbus interface:**

Device receptacle supply (male)	M12, 4-poles
Mating connector	Plug (female), M12, 4-poles (not incl. in delivery)
Device receptacle CANopen (male)	M12, 5-poles (acc. to DRP 303-1)
Mating connector	Plug (female), M12, 5-poles (not incl. in delivery)
Device receptacle Profibus (female)	M12, 5-poles, B-codiert (acc. to IEC 947-6-2)
Mating connector	Plug (male), M12, 5-poles, B-codiert (not incl. in delivery)
Preset value signal:	Fieldbus


**NOTE!**

Detailed electrical characteristics and description of «DSV» electronics are shown on data sheet 1.13-75.

**START-UP**

Normally there is no need to adjust settings by the customer. The connectors have to be wired according to the chapter «Connector wiring diagram».

Additional information can be found on our website:

Free-of-charge download of the «PASO»-software and the instruction manual for the «DSV» hydraulic valves as well as the operation instruction CANopen protocol with device profile DSP-408 for «DSV».

**CONNECTOR WIRING DIAGRAM**
**Analog interface:**
**Device receptacle (male) X1**

- 1 = Supply voltage +
- 2 = Supply voltage 0 VDC
- 3 = Stabilised output voltage
- 4 = Preset value voltage +
- 5 = Preset value voltage -
- 6 = Preset value current +
- 7 = Preset value current -
- 8 = Reserved for extensions
- 9 = Reserved for extensions
- 10 = Enable control (Digital input)
- 11 = Error signal (Digital output)
- 12 = Chassis



Preset value voltage (PIN 4/5) resp. current (PIN 6/7) are selected with set-up and diagnosis software.

Factory setting: Voltage (-10...+10 V), (PIN 4/5)

**Fieldbus interface:**
**Device receptacle supply (male) X1**
**MAIN**

- 1 = Supply voltage +
- 2 = Reserved for extensions
- 3 = Supply voltage 0 VDC
- 4 = Chassis


**Device receptacle CANopen (male) X3**
**CAN**

- 1 = not connected
- 2 = not connected
- 3 = CAN Gnd
- 4 = CAN High
- 5 = CAN Low


**Device receptacle Profibus (female) X3**
**PROFIBUS**

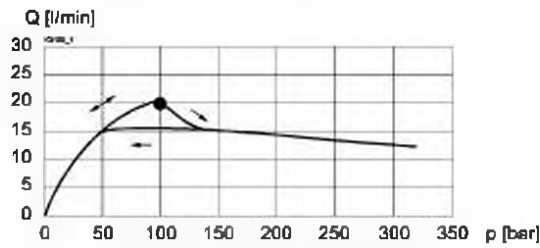
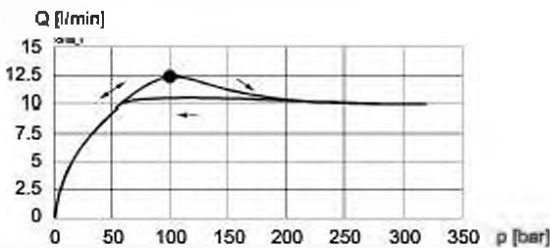
- 1 = VP
- 2 = Rx/D / Tx/D - N
- 3 = DGND
- 4 = Rx/D / Tx/D - P
- 5 = Shield


**Parameterisation Interface (USB, Mini B) X2**

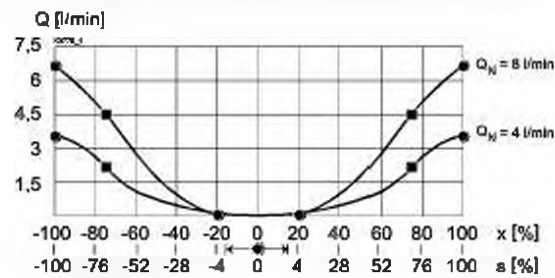
Under the closing screw of the housing cover


**NOTE!**

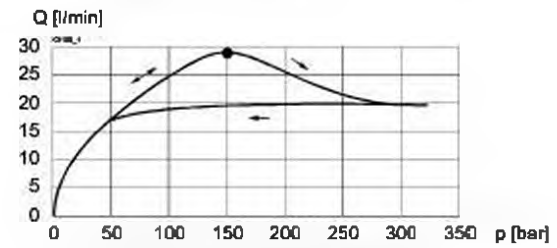
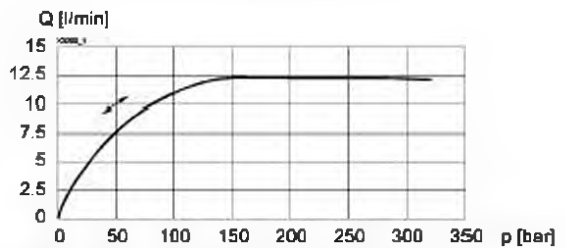
The mating connector and the cable to adjust the settings are not part of the delivery. To order the cable, look up the article no. in the chapter «Accessories».

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
**Q = f(p)** Volume flow pressure characteristics  
 [Type: S4D41-08] S = 100%

**Q = f(p)** Volume flow pressure characteristics  
 [Type: S4D41-04] S = 100%

**Q = f(s, x)** Volume flow-signal-characteristics ( $\Delta p = 10 \text{ bar}$ )  
 [Type: S4D41]

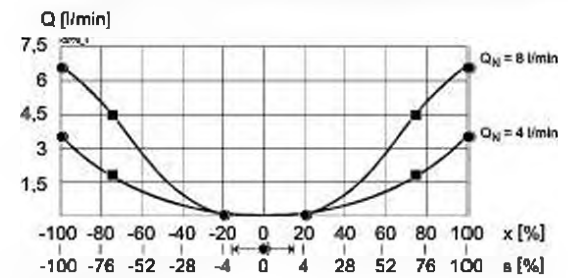
(s corresponds to preset value signal and x corresponds to spool stroke)


**Factory settings:**

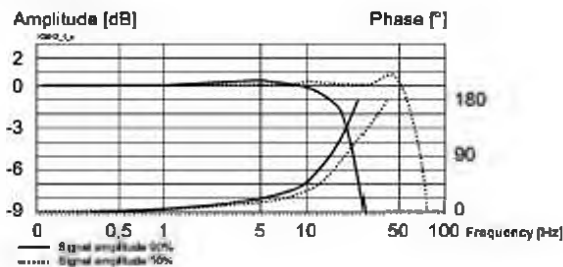
- = Deadband: Both solenoids switched off with command signal  $-2\% \dots +2\%$
- = Opening point: at command signal  $\pm 4\%$
- = Flow at  $\Delta p = 10 \text{ bar}$  over 2 metering edges at command signal  $\pm 70\%$   
 4,5 l/min for  $Q_N = 8 \text{ l/min}$   
 2,1 l/min for  $Q_N = 4 \text{ l/min}$

**Q = f(p)** Volume flow pressure characteristics  
 [Type: V4D42-08] S = 100%

**Q = f(p)** Volume flow pressure characteristics  
 [Type: V4D42-04] S = 100%

**Q = f(s, x)** Volume flow-signal-characteristics ( $\Delta p = 10 \text{ bar}$ )  
 [Type: V4D42]

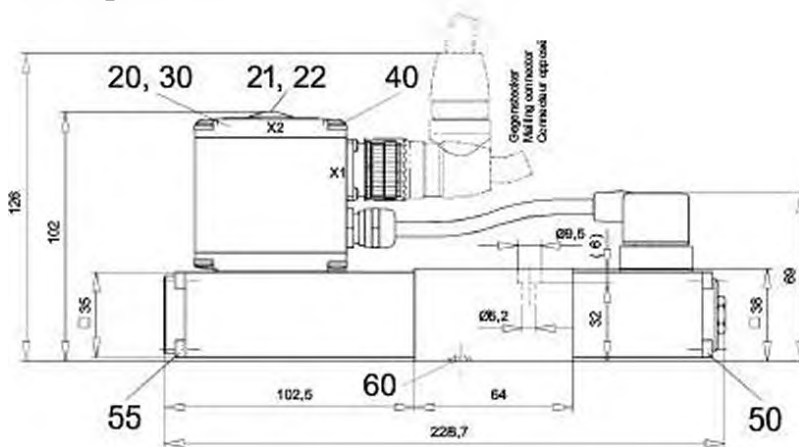
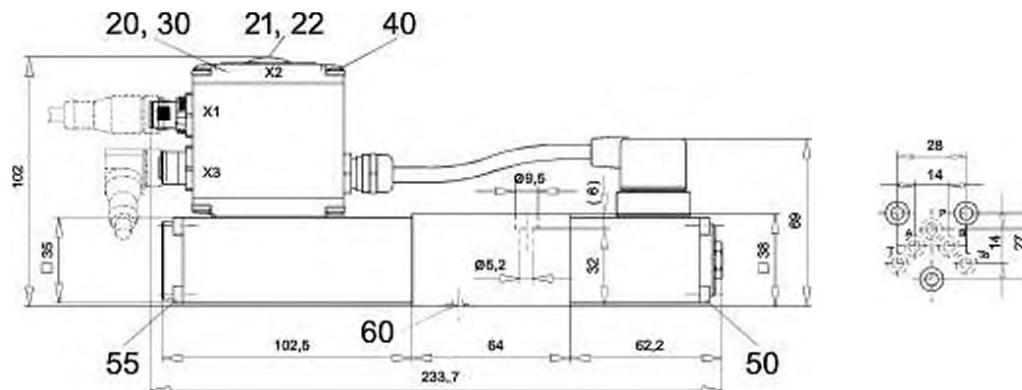
(s corresponds to preset value signal and x corresponds to spool stroke)


**Factory settings:**

- = Deadband: Both solenoids switched off with command signal  $-2\% \dots +2\%$
- = Opening point: at command signal  $\pm 4\%$
- = Flow at  $\Delta p = 10 \text{ bar}$  over 2 metering edges at command signal  $\pm 70\%$   
 4,5 l/min for  $Q_N = 8 \text{ l/min}$   
 1,8 l/min for  $Q_N = 4 \text{ l/min}$

**Frequency response**
 $\Delta p = 10 \text{ bar}$   
 $p_1 < 1 \text{ bar}$ 

**NOTE!**

All values measured over 2 metering edges, A and B ports linked.

**DIMENSIONS**
**With analog interface**

**With fieldbus interface**

**NOTE!**

The cable connector is not part of the delivery. The dimensions refer to those of the cable connector in the chapter «Accessories».

**PARTS LIST**

Position	Article	Description
20	062.0102	Cover
21	223.1317	Dummy plug M16x1,5
22	180.6131	O-ring ID 13,00x1,5
30	072.0021	Gasket 33x2x59,9x2
40	208.0100	Socket head cap screw M4x10
50	246.1161	Socket head cap screw M4x60 DIN 912
55	246.1191	Socket head cap screw M4x100 DIN 912
60	180.2052	O-ring ID 5.28x1,78

**ACCESSORIES**

- Set-up software see start-up
- Cable to adjust the settings through interface USB  
(from plug type A to Mini B, 3m) article no. 219.2896
- Cable connector for analog interface:
  - straight, soldering contact article no. 219.2330
  - 90°, soldering contact article no. 219.2331
- Recommended cable size:
  - Outer diameter 9...10,5 mm
  - Single wire max. 1 mm<sup>2</sup>
  - Recommended wire size:
    - 0...25 m = 0,75 mm<sup>2</sup> (AWG16)
    - 25...50 m = 1 mm<sup>2</sup> (AWG17)

Technical explanation see data sheet 1.0-100

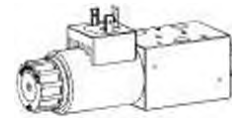
## Proportional spool valve

### Flange construction

- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆ 3 volume flow levels
- ◆  $Q_{min} = 12 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

### NG4-Mini

Wandfluh standard



## DESCRIPTION

Direct operated proportional spool valve with 4 connections in 5-chamber system. Precise spool fit, low leakage, long service life time. The volume flow adjustment takes place by a Wandfluh proportional solenoid. Proportional to the solenoid current, the spool stroke, the spool opening and the valve volume flow increase. For the control, Wandfluh proportional amplifiers are available (see register 1.13).

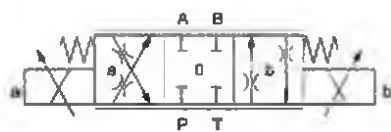
## APPLICATION

Proportional spool valves are perfectly suitable for demanding tasks due to the high resolution, large volume flow and low hysteresis. The applications are in the industry as well as in the mobile hydraulics for the smooth control of hydraulic actuators. Some examples: rotor blades control of wind generators, forestry and earth moving machines, machine tools and paper production machines with simple position control, robotics and fan control. Miniature valves are used where both, reduced dimensions and weight are important.

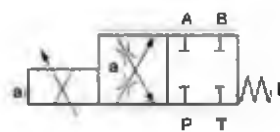
## SYMBOL

### Symmetrical control

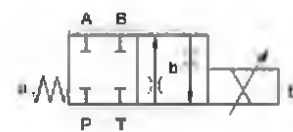
ACB-S



AC1-S

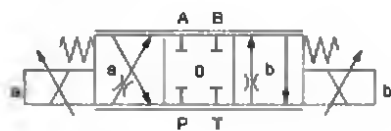


CB2-S

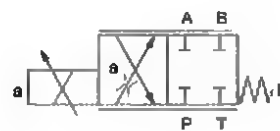


### Mater-in control

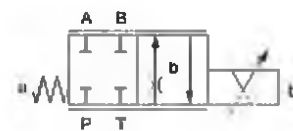
ACB-V



AC1-V

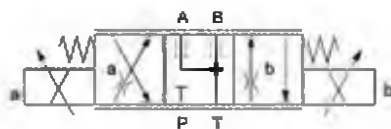


CB2-V

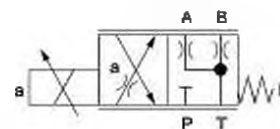


### Mater-in control

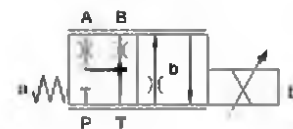
ADB-V



AD1-V

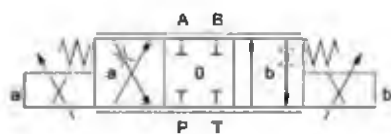


DB2-V

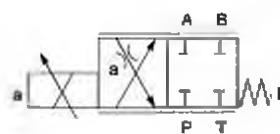


### Mater-out control

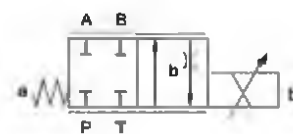
ACB-R



AC1-R



CB2-R



**TYPE CODE**

Spool valve, directly operated, proportional		W D P F A04 - <input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/> # <input type="checkbox"/>
Flange construction		
Mounting interface acc. to Wandfluh standard, NG4-Mini		
Designation of symbols acc. to table		
Nominal volume flow rate $Q_n$	4 l/min <input type="checkbox"/> 8 l/min <input type="checkbox"/> 12 l/min <input type="checkbox"/>	
Nominal voltage $U_n$	12 VDC <input type="checkbox"/> 24 VDC <input type="checkbox"/> without coil <input type="checkbox"/>	B12 <input type="checkbox"/> G24 <input type="checkbox"/> X5 <input type="checkbox"/>
Slip-on coil	Metal housing, round with one-sided collar <input type="checkbox"/> Metal housing, square with one-sided collar <input type="checkbox"/>	V <input type="checkbox"/> N <input type="checkbox"/>
Connection execution	Connector socket EN 175301-803 / ISO 4400 <input type="checkbox"/> Connector socket AMP Junior-Timer <input type="checkbox"/> Connector Deutsch DT04-2P <input type="checkbox"/>	D <input type="checkbox"/> J <input type="checkbox"/> G <input type="checkbox"/>
Sealing material	NBR <input type="checkbox"/> FKM (Viton) <input type="checkbox"/>	D1 <input type="checkbox"/>
Manual override	Integrated <input type="checkbox"/> Push-button <input type="checkbox"/> Spindle <input type="checkbox"/>	HF1 <input type="checkbox"/> HS1 <input type="checkbox"/>

Design index (subject to change)  
 1 10-37

**GENERAL SPECIFICATIONS**

Designation	Proportional spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Proportional solenoid
Ambient temperature	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM) if >50 °C, $I_a$ is only conditionally achievable
Weight	0,90 kg (1 solenoid) 1,25 kg (2 solenoids)

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal power	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 620 \text{ mA}$ ( $U_n = 24 \text{ VDC}$ ) $I_n = 1'200 \text{ mA}$ ( $U_n = 12 \text{ VDC}$ )

**Note!** Other electrical specifications see data sheet 1.1-168 (slip-on coil V) and 1.1-175 (slip-on coil N)

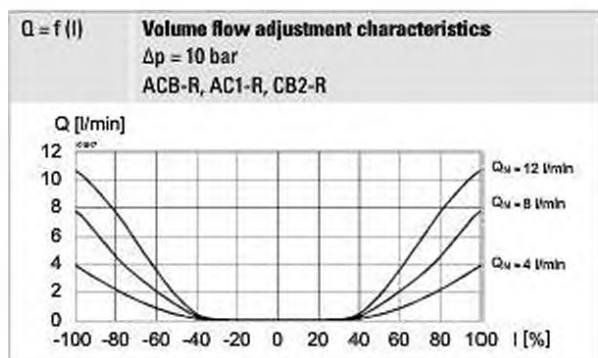
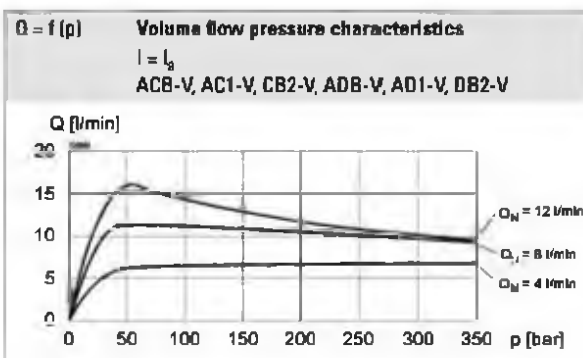
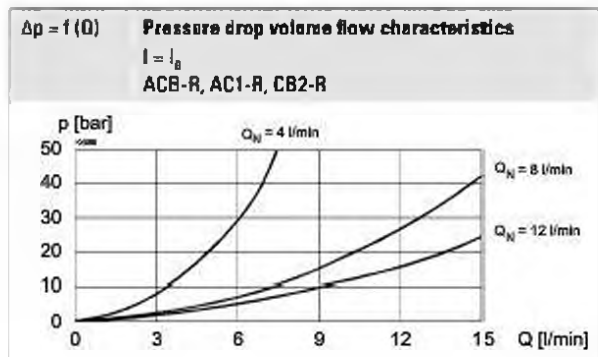
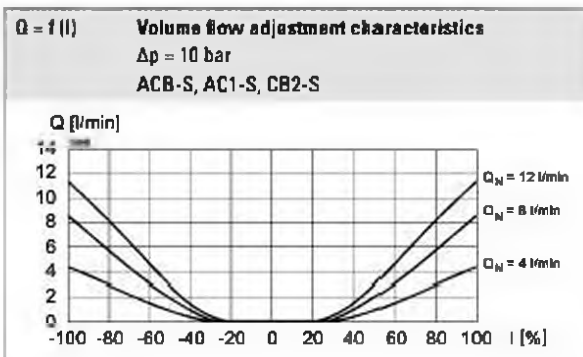
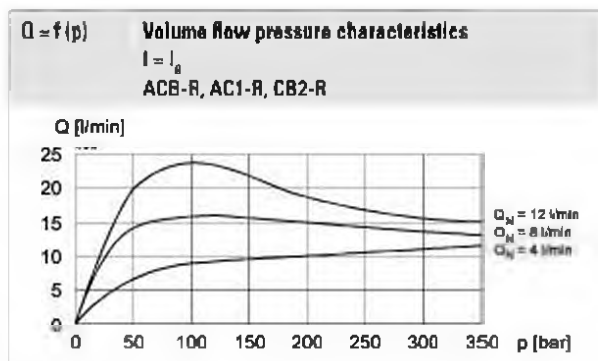
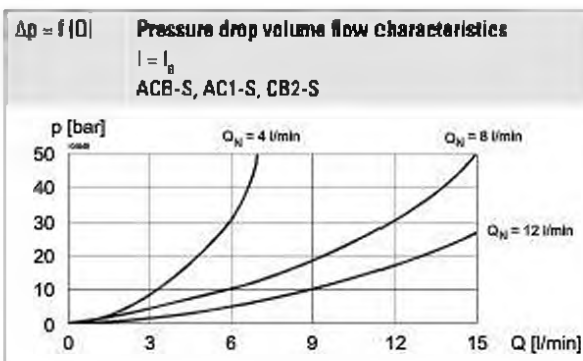
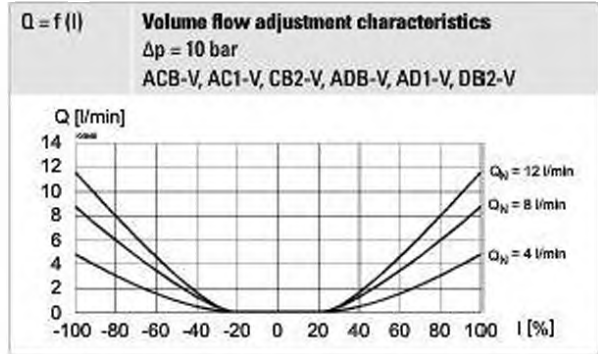
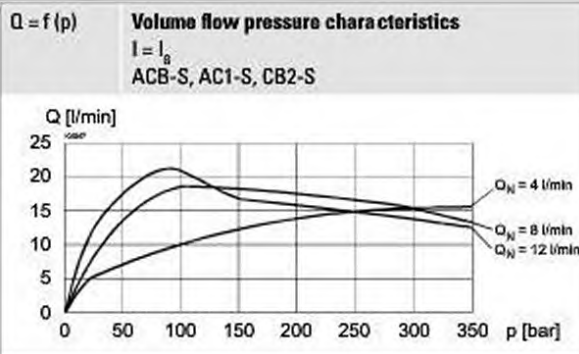

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	V.E37 / 19 x 50 (Data sheet 1.1-168) N.S35 / 19 x 50 (Data sheet 1.1-175)
Connection	Connector socket EN 175301-803 Connector socket AMP Junior-Timer Connector Deutsch DT04-2P

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$ ( $p_r < 20 \text{ bar}$ ) $p_{max} = 315 \text{ bar}$ ( $p_r > 20 \text{ bar}$ )
Tank pressure	$p_{Tmax} = 160 \text{ bar}$
Maximum volume flow	$Q_{max} = 20 \text{ l/min}$ , see characteristics
Nominal volume flow	$Q_n = 4 \text{ l/min}, 8 \text{ l/min}, 12 \text{ l/min}$
Leakage volume flow	On demand
Hysteresis	$\leq 5 \%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-20 ... +70 °C
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 $\geq 75$ , see data sheet 1.0-50

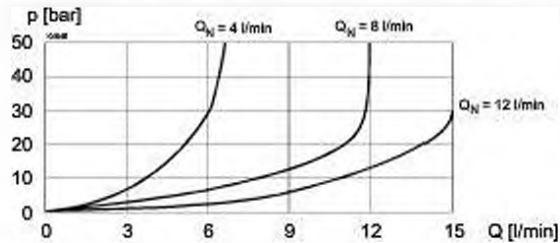
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

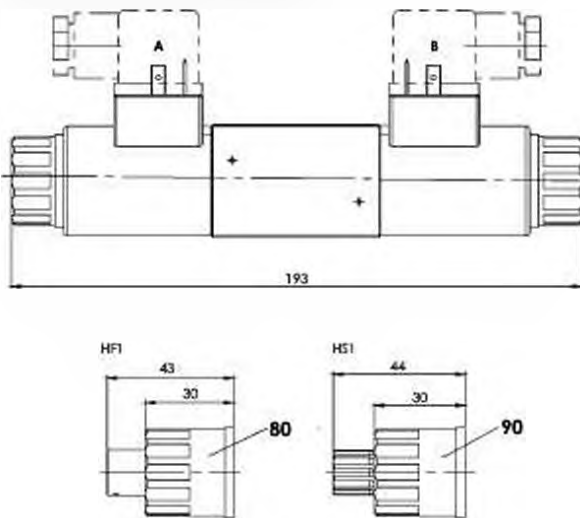
$\Delta p = f(Q)$  **Pressure drop volume flow characteristics**  
 $l = l_g$   
 ACB-V, AC1-V, CB2-V, ADB-V, AD1-V, DB2-V


**Nota!**

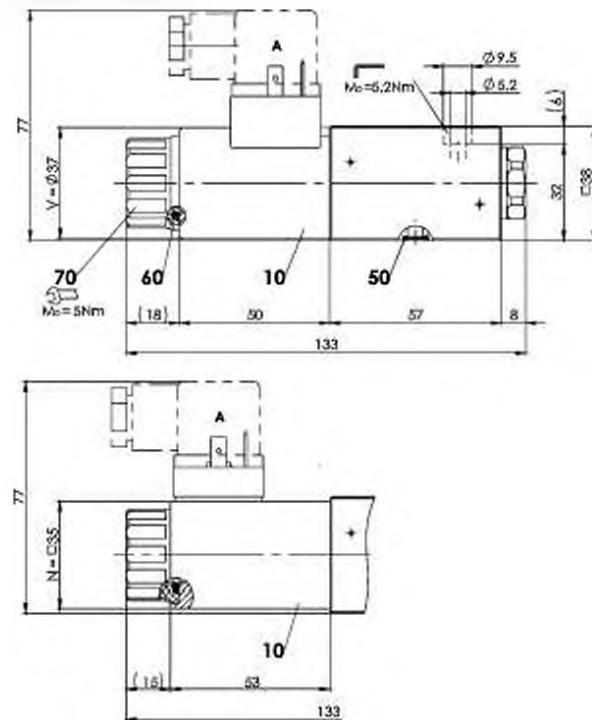

All values were measured over two control edges. The connections A and B were short-circuited.

**DIMENSIONS**

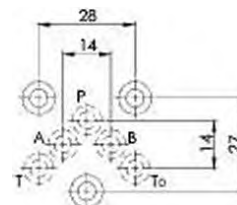
4/3-way spool valve (spring centred)



4/2-way spool valve


**PARTS LIST**

Position	Article	Description
10	206.2...	V.E37 / 19 x 50
	260.5...	N.S35 / 19 x 50
50	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)
60	160.2187	O-ring ID 18,72 x 2,62 (NBR)
70	154.2700	Knurled nut
80	253.7001	Push-button
90	253.7000	Spindle

**HYDRAULISCHER ANSCHLUSS**


## INSTALLATION NOTES

Mounting type	Flange mounting 3 fixing holes for socket head screws M5 x 40
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) Fixing screws $M_0 = 5 \text{ Nm}$ knurled nut

**Note!** The length of the fixing screw depends on the base material of the connection element.



## STANDARDS

Mounting interface	Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## SURFACE TREATMENT

- ◆ The valve body is painted with a two component paint
- ◆ The armature tube and the plug screw are zinc coated
- ◆ The slip-on coil is zinc-nickel coated

## MANUAL OVERRIDE

- ◆ Integrated (-) Actuation pin integrated in the armature tube. Actuation by pressing the pin
- ◆ Push-button (HF1) Integrated in the knurled nut. Actuation by pressing the push-button
- ◆ Spindle (HS1) Integrated in the knurled nut. Actuation by turning the spindle (continuously variable valve actuation)

**Attention!** The actuation of the manual override is possible up to a tank pressure of:



- 160 bar Integrated (-)
- 160 bar Push-button (HF1)
- 160 bar Spindle (HS1)

## ACCESSORIES

Mating connector gray (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Threaded subplates	Data sheet 2.9-10
Multi-station subplates	Data sheet 2.9-50
Horizontal mounting blocks	Data sheet 2.9-90
Explications techniques	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430
Proportional amplifier	Register 1.13

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code



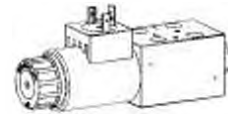


**Proportional spool valve**
**Flange construction**

- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆ 3 volume flow levels
- ◆  $Q_{min,max} = 12 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG4**

ISO 4401-02


**DESCRIPTION**

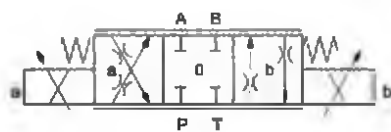
Direct operated proportional spool valve with 4 connections in 5-chamber system. Precise spool fit, low leakage, long service life time. The volume flow adjustment takes place by a Wandfluh proportional solenoid. Proportional to the solenoid current, the spool stroke, the spool opening and the valve volume flow increase. For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

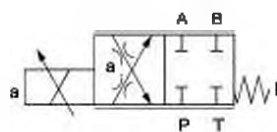
Proportional spool valves are perfectly suitable for demanding tasks due to the high resolution, large volume flow and low hysteresis. The applications are in the industry as well as in the mobile hydraulics for the smooth control of hydraulic actuators. Some examples: rotor blades control of wind generators, forestry and earth moving machines, machine tools and paper production machines with simple position control, robotics and fan control. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**
**Symmetrical control**

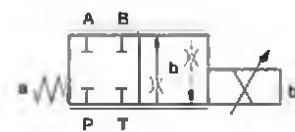
ACB-S



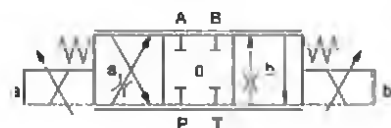
AC1-S



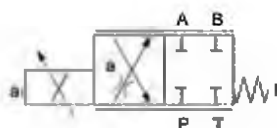
CB2-S


**Meter-in control**

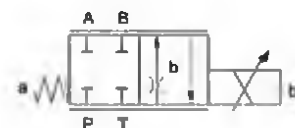
ACB-V



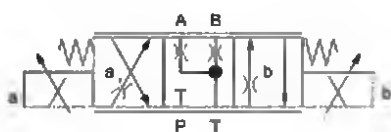
AC1-V



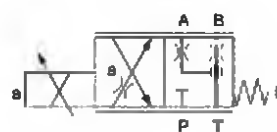
CB2-V


**Meter-in control**

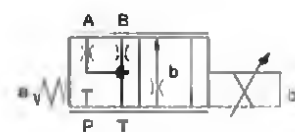
ADB-V



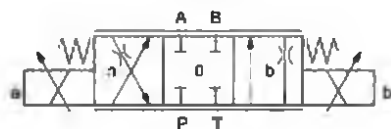
AD1-V



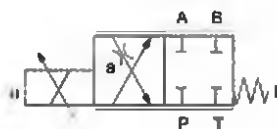
DB2-V


**Meter-out control**

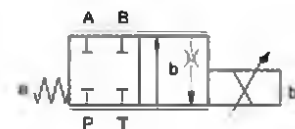
ACB-R



AC1-R

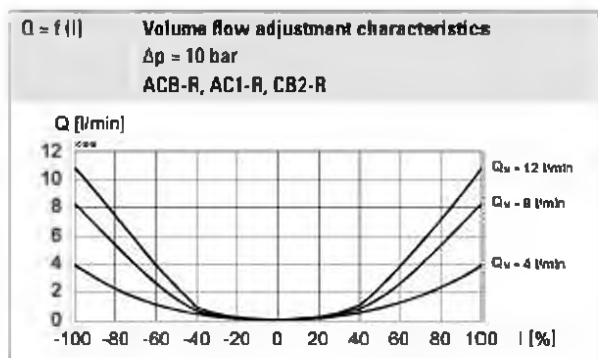
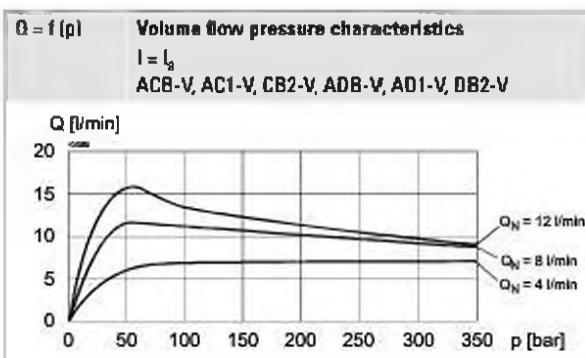
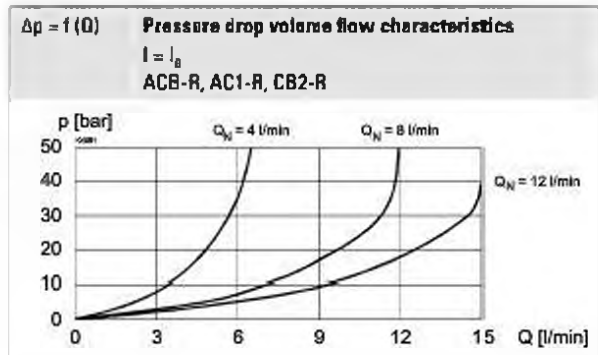
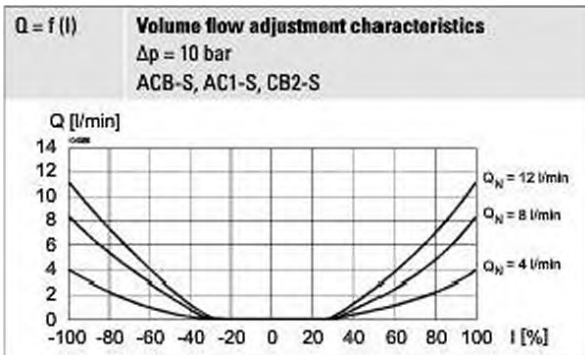
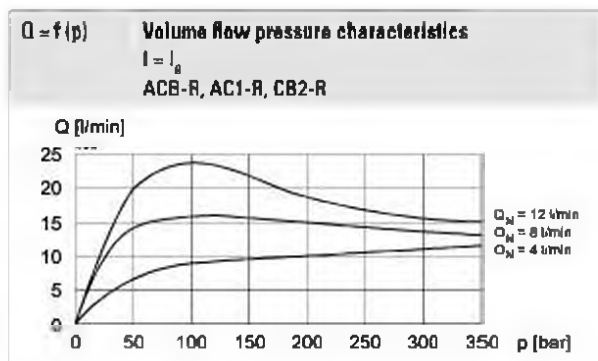
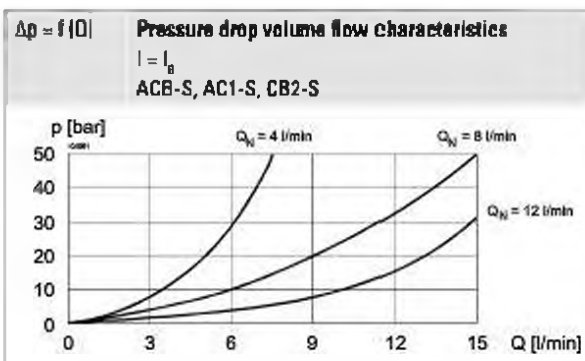
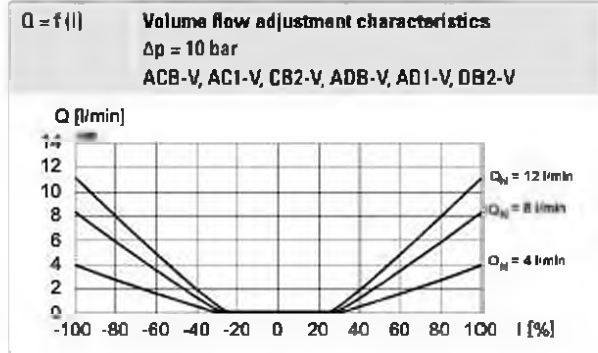
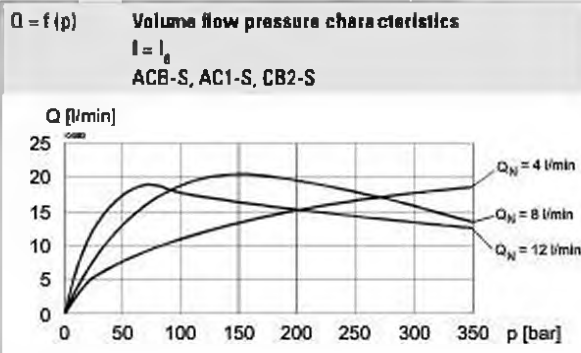


CB2-R





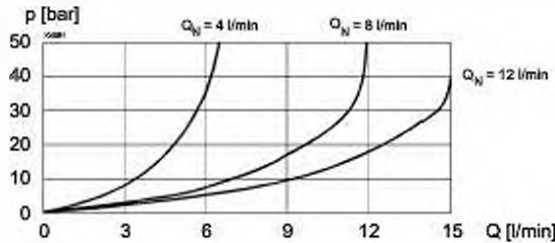
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

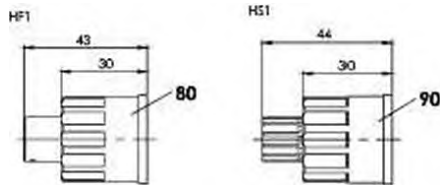
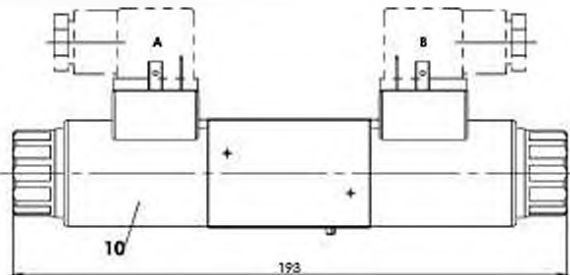
$\Delta p = f(Q)$  **Pressure drop volume flow characteristics**  
 $l = l_0$   
 ACB-V, AC1-V, CB2-V, ADB-V, AD1-V, DB2-V


**Note!**

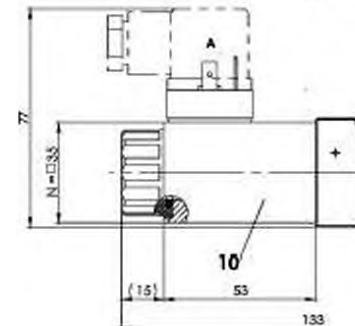
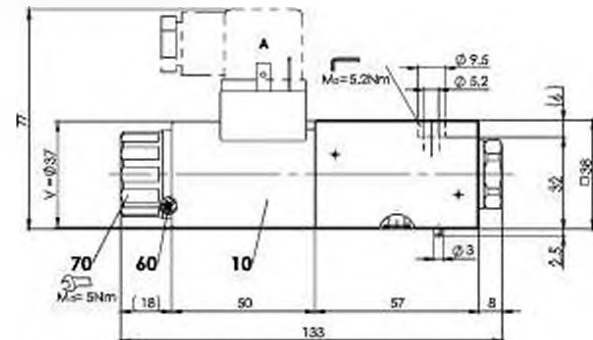

All values were measured over two control edges. The connections A and B were short-circuited.

**DIMENSIONS**

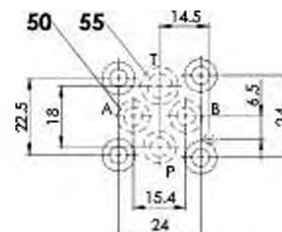
4/3-way spool valve (spring centred)



4/2-way spool valve


**PARTS LIST**

Position	Article	Description
10	206.22..	Solenoid coil VE37 / 19 x 50
50	160.2060	O-ring ID 6,07 x 1,78 (NBR)
	160.6061	O-ring ID 6,07 x 1,78 (FKM)
55	160.2076	O-Ring ID 7,65 x 1,78 (NBR)
	160.6076	O-Ring ID 7,65 x 1,78 (FKM)
60	160.2187	O-ring ID 18,72 x 2,62 (NBR)
70	154.2700	Knurled nut
80	253.7001	Push-button
90	253.7000	Spindle

**HYDRAULISCHER ANSCHLUSS**


## INSTALLATION NOTES

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 40
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) Fixing screws $M_0 = 5 \text{ Nm}$ knurled nut

**Note!** The length of the fixing screw depends on the base material of the connection element.



## MANUAL OVERRIDE

- ◆ Integrated (-) Actuation pin integrated in the armature tube. Actuation by pressing the pin
- ◆ Push-button (HF1) Integrated in the knurled nut. Actuation by pressing the push-button
- ◆ Spindle (HS1) Integrated in the knurled nut. Actuation by turning the spindle (continuously variable valve actuation)

**Attention!** The actuation of the manual override is possible up to a tank pressure of:  
 160 bar Integrated (-)  
 160 bar Push-button (HF1)  
 160 bar Spindle (HS1)



## STANDARDS

Mounting interface	ISO 4401-02
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## ACCESSORIES

Mating connector gray (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Threaded subplates	Data sheet 2.9-12
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430
Proportional amplifier	Register 1.13

## SURFACE TREATMENT

- ◆ The valve body is painted with a two component paint
- ◆ The armature tube and the plug screw are zinc coated
- ◆ The slip-on coil is zinc-nickel coated

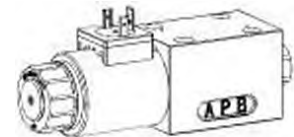
## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code



**Proportional spool valve**
**Flange construction**

- ◆  $Q_{n,max} = 42 \text{ l/min}$
- ◆ 4 volume flow levels
- ◆  $Q_{H,max} = 32 \text{ l/min}$
- ◆  $p_{n,max} = 350 \text{ bar}$

**NG6**
**ISO 4401-03**

**DESCRIPTION**

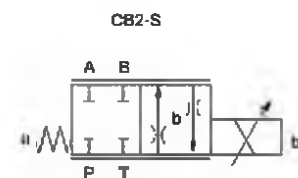
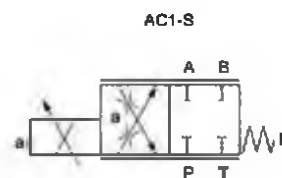
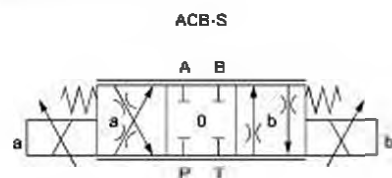
Direct operated proportional spool valve with 4 connections in 5-chamber system. Precise spool fit, low leakage, long service life time. The volume flow adjustment takes place by a Wandfluh proportional solenoid. Proportional to the solenoid current, the spool stroke, the spool opening and the valve volume flow increase. For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

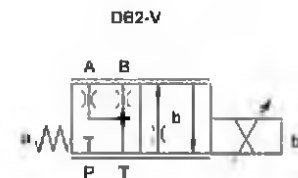
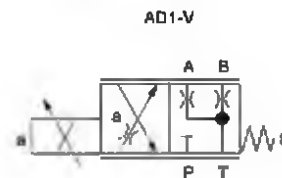
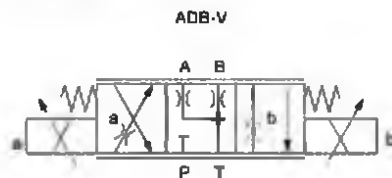
Proportional spool valves are perfectly suitable for demanding tasks due to the high resolution, large volume flow and low hysteresis. The applications are in the industry as well as in the mobile hydraulics for the smooth control of hydraulic actuators. Some examples: control of the rotor blades of wind generators, forestry and earth moving machines, machine tools and paper production machines, simple position controls, robotics and fan control.

**SYMBOL**

Symmetrical control



Meter-in control


**GENERAL SPECIFICATIONS**

Designation	Proportional spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C if >50 °C, $I_a$ is only conditionally achievable
Weight	1,5 kg (1 solenoid) 2,0 kg (2 solenoids)

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	WE45 / 23 x 50 (Data sheet 1.1-182) MS45 / 23 x 50 (Data sheet 1.1-181)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**TYPE CODE**

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Spool valve, direct operated					
Proportional					
Flange construction					
International standard interface ISO, NG8					
Designation of symbols acc. to table					
Nominal volume flow rate $Q_n$	5 l/min <input type="checkbox"/> 10 l/min <input type="checkbox"/>	18 l/min <input type="checkbox"/> 32 l/min <input type="checkbox"/>	5 <input type="checkbox"/> 10 <input type="checkbox"/>	16 <input type="checkbox"/> 32 <input type="checkbox"/>	
Nennspannung $U_n$	12 VDC <input type="checkbox"/> 24 VDC <input type="checkbox"/> ohne Spule <input type="checkbox"/>	612 <input type="checkbox"/> 624 <input type="checkbox"/> X5 <input type="checkbox"/>			
Slip-on coil	Metal housing, round <input type="checkbox"/> Metal housing, square <input type="checkbox"/>		W <input type="checkbox"/> M <input type="checkbox"/>		
Connection execution	Connector socket EN 175301-803 / ISO 4400 <input type="checkbox"/> Connector socket AMP Junior-Timer <input type="checkbox"/> Connector Deutsch DT04 - 2P <input type="checkbox"/>		D <input type="checkbox"/> J <input type="checkbox"/> G <input type="checkbox"/>		
Sealing material	NBR <input type="checkbox"/> FKM (Viton) <input type="checkbox"/>		<input type="checkbox"/> D1 <input type="checkbox"/>		
Manual override	Integrated <input type="checkbox"/> Push-button <input type="checkbox"/> Spindle <input type="checkbox"/>		<input type="checkbox"/> HF1 <input type="checkbox"/> HS1 <input type="checkbox"/>		
Surface protection	Standard <input type="checkbox"/> Zinc-nickel <input type="checkbox"/>		<input type="checkbox"/> KB <input type="checkbox"/>		

Design index (subject to change)

1.10-02

**ELECTRICAL SPECIFICATIONS**

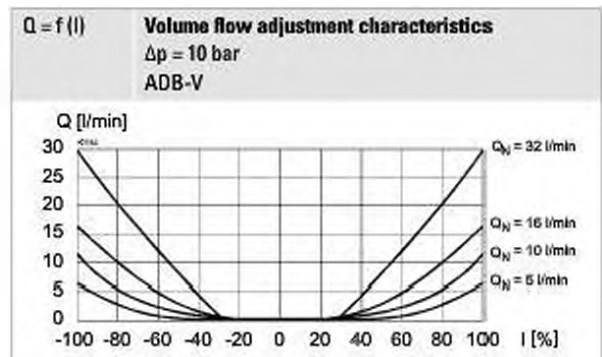
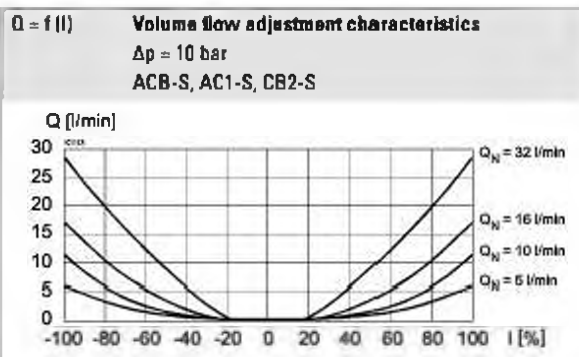
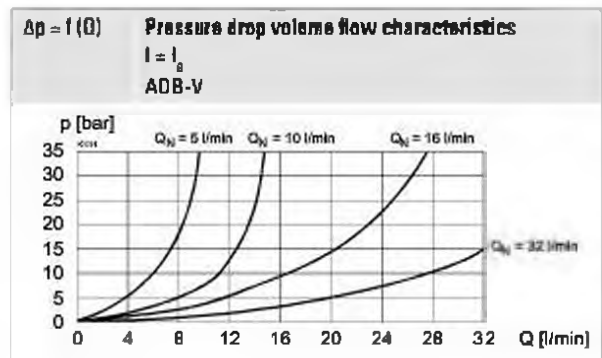
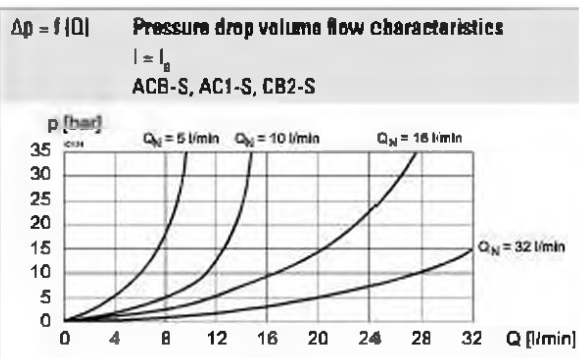
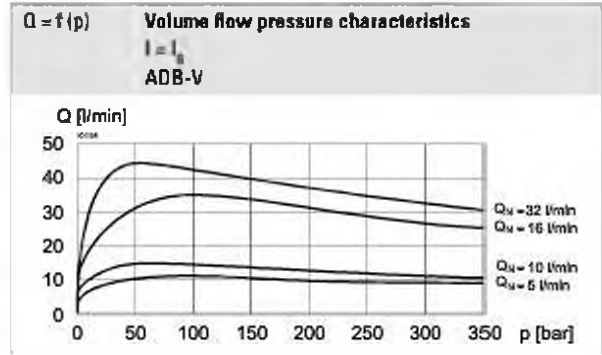
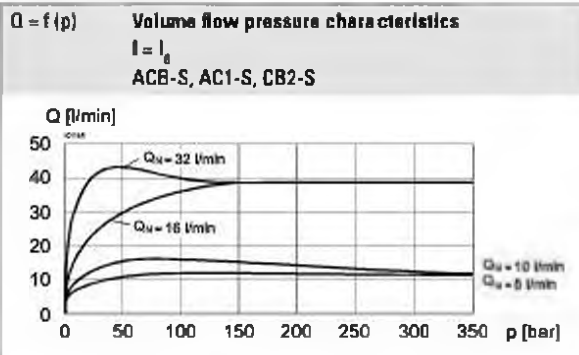
Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 930 \text{ mA}$ ( $U_n = 24 \text{ VDC}$ ) $I_a = 1690 \text{ mA}$ ( $U_n = 12 \text{ VDC}$ )

**Note!** Other electrical specifications see data sheet 1.1-182 (slip-on coil W) and 1.1-181 (slip-on coil M)


**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Tank pressure	$p_{T,max} = 250 \text{ bar}$
Maximum volume flow	$Q_{max} = 42 \text{ l/min}$ , see characteristics
Nominal volume flow	$Q_n = 5 \text{ l/min}, 10 \text{ l/min}, 16 \text{ l/min}, 32 \text{ l/min}$
Leakage oil	On request
Hysteresis	$\leq 5 \%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 $\geq 75$ , see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


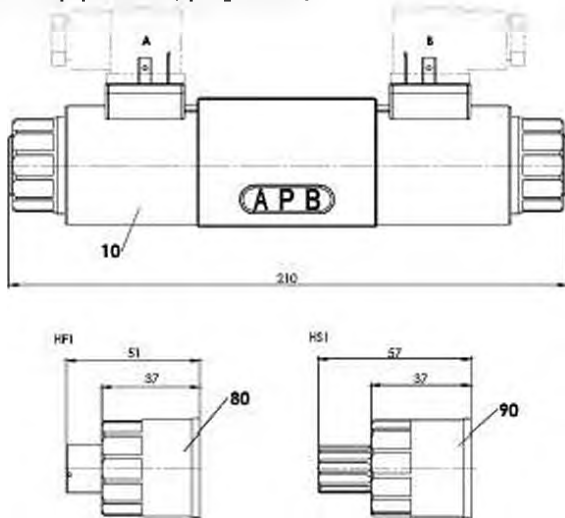
**Note!** All values were measured over two control edges. The connections A and B were short-circuited.



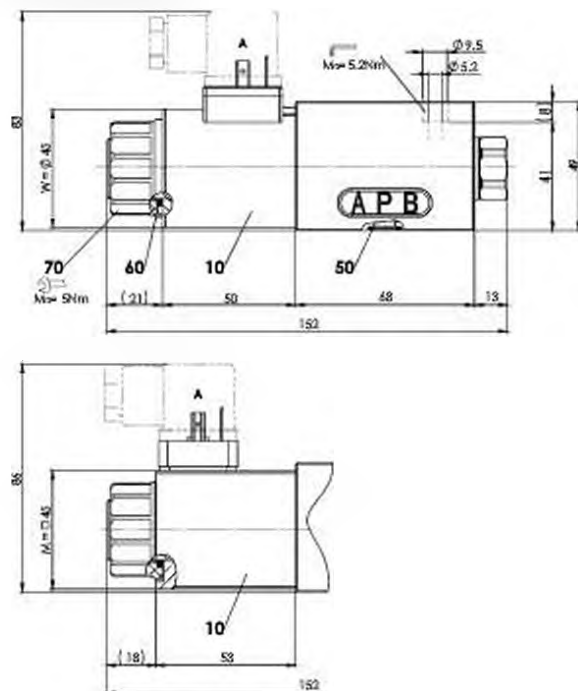
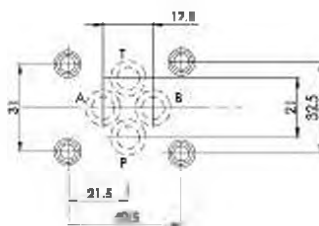


**DIMENSIONS**

4/3-way spool valve (spring centred)



4/2-way spool valve


**HYDRAULIC CONNECTION**

**MANUAL OVERRIDE**

- ◆ Integrated (-) Actuation pin integrated in the armature tube. Actuation by pressing the pin
- ◆ Push-button (HF1) Integrated in the knurled nut. Actuation by pressing the push-button
- ◆ Spindle (HS1) Integrated in the knurled nut. Actuation by turning the spindle (continuously variable valve actuation)

**Attention!** The actuation of the manual override is possible up to a tank pressure of:

- 160 bar Integrated (-)
- 160 bar Push-button (HF1)
- 250 bar Spindle (HS1)


**PARTS LIST**

Position	Article	Description
10	206.1...	WE45 / 23 x 50
	206.7...	M.S45 / 23 x 50
50	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
60	160.2222	O-ring ID 22,22 x 2,62 (NBR)
70	154.2701	Knurled nut M23 x 1,5 x 19,7
80	253.7004	Push-button
90	253.7002	Spindle

**ACCESSORIES**

Mating connector gray (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430
Proportional amplifier	Register 1.13

## SURFACE TREATMENT

### Standard:

- The valve body is painted with a two component paint
- The armature tube, the slip-on coil and the plug screw are zinc-nickel coated

### Optionally (K8):

- All external parts are zinc-nickel coated
- ISO 9227 (800 h) salt spray test

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## INSTALLATION NOTES

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 50
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2$ Nm (screw quality 8.8, zinc coated) $M_0 = 5$ Nm knurled nut

**Note!** The length of the fixing screw depends on the base material of the connection element.



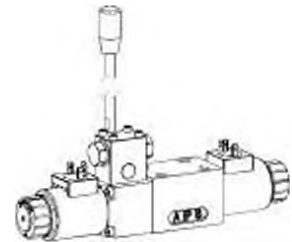
## STANDARDS

Mounting interface	ISO 4401-03
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406



**Proportional spool valve with additional hand lever actuation**
**Flange construction**

- ◆  $Q_{Vmax} = 42 \text{ l/min}$
- ◆ 4 volume flow levels
- ◆  $Q_{Tmax} = 32 \text{ l/min}$
- ◆  $p_{Rmax} = 350 \text{ bar}$

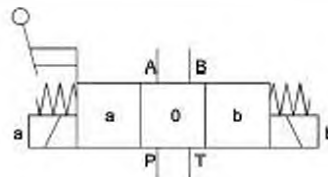
**NG6**  
 ISO 4401-03

**DESCRIPTION**

Proportional spool valve according to data sheet 1.10-77 with additional hand lever actuation.

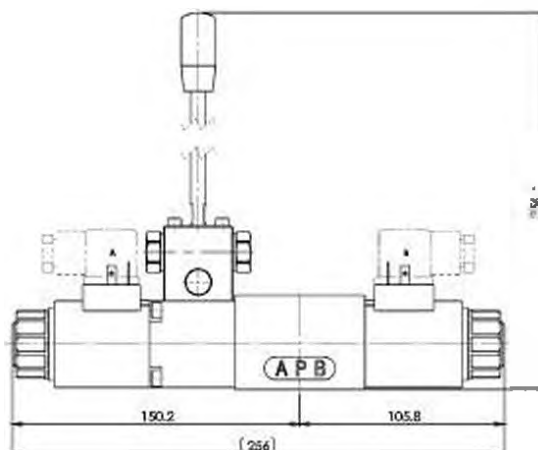
**Note!** The standard valve cannot be retrofitted.

**SYMBOL**

Overview spool types see data sheet 1.10-77


**TYPE CODE**

Spool valve, direct operated	WD P F A06 -	Z568 # 2
Proportional		
Flange construction		
International standard interface ISO NG6		
Other type designation according to type code data sheet 1.10-77		
Hand lever		
Design index (subject to change)		

**DIMENSIONS**

**GENERAL SPECIFICATIONS**
**Weight** WDPFA06 ±1,0 kg

**Note!** Further specifications, see data sheet 1.10-77

**SURFACE TREATMENT**

- ◆ The flange, the housing and the lever are zinc-nickel coated

## Proportional spool valve with integrated electronics and spool position control with LVDT

### Flange construction

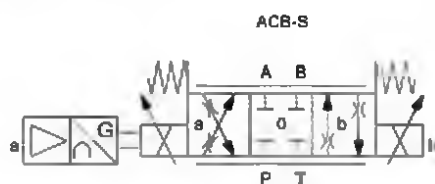
- ◆ direct operated
- ◆  $Q_{max} = 50 \text{ l/min}$
- ◆  $Q_{lmax} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

### DESCRIPTION

Direct operated proportional spool valve with 4 connections in 5-chamber system. With the integrated spool position sensor (LVDT), the actual position of the spool is continuously recorded and made to follow the transmitted command value. By means of this internal position control, a minimum hysteresis and excellent dynamic characteristics are assured. The Plug & Play valves are factory set and adjusted and have therefore a high valve-to-valve reproducibility. With protection class IP67 for the electronics, these valves are suitable for harsh environmental conditions. Proportional to the electronically transmitted command value, the spool stroke, the spool opening and the valve volume flow increase. The control takes place via an analogue interface or a fieldbus interface (CANopen, J1939 or Profibus DP). The parameterisation takes place by means of the free of cost parameterisation and diagnostics software «PASO» or via fieldbus interface. The USB parameterisation interface is accessible through a screw plug. «PASO» is a Windows program in the flow diagram style which enables the intuitive setting and storing of all variable parameters. The data remain saved in case of a power failure and can also be reproduced and transferred to other DSVs. As an option, these valves are available with integrated controller. As feedback value generators sensors with voltage or current output can be connected directly. The available controller structures are optimised for applications with hydraulic actuators.

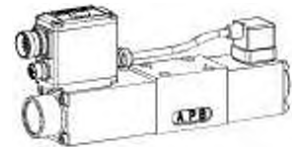
### SYMBOL

Symmetrical control



NG6

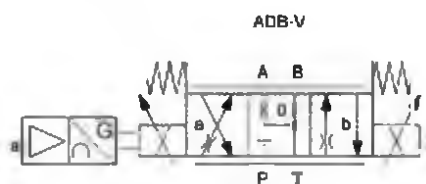
ISO 4401-03

### APPLICATION

Proportional spool valves are perfectly suitable for demanding tasks due to the high resolution, large volume flow and low hysteresis. They are used where good valve-to-valve reproducibility, easy installation, comfortable operation and high precision are very important. The integrated controller relieves the machine control and operates the axis (position, angle, pressure, etc.) in a closed control loop. The applications are in the industry as well as in the mobile hydraulics for the smooth control of hydraulic actuators. Some examples: control of the rotor blades of wind generators, forestry and earth moving machines, machine tools and paper production machines, simple position controls, robotics and fan control.

Meter-in control



### ELECTRICAL SPECIFICATIONS

Protection class	IP67 with suitable mating connector and closed housing cover
Ramps	Adjustable
Parameterisation	Via fieldbus or USB
Supply voltage	24 VDC

**Note!** Exact electrical specifications and detailed description of «DSV» electronics can be found on data sheet 1.13-76.



### ACTUATION

Actuation	Proportional solenoid, wet pin push type, pressure tight
Connection	Via device receptacle

**TYPE CODE**

		W D R F A06 -		<input type="text"/>	-	<input type="text"/>	-	24	<input type="text"/>	<input type="text"/>	-	<input type="text"/>	#	<input type="text"/>
Signal valve														
Direct operated														
Proportional, spool position control														
Flange construction														
International standard interface ISO, NG6														
Designation of symbols acc. to table														
Nominal volume flow rate $Q_n$	5 l/min	<input type="text" value="5"/>	32 l/min	<input type="text" value="32"/>	(only ADB-V)									
	10 l/min	<input type="text" value="10"/>	40 l/min	<input type="text" value="40"/>										
	16 l/min	<input type="text" value="16"/>												
Nominal voltage $U_n$	24 VDC													
Hardware configuration														
Analog command value signal	12 pole	<input type="text" value="A2"/>	7 pole	<input type="text" value="D2"/>	{-10 ... 10 V preset}									
Analog command value signal	12 pole	<input type="text" value="A4"/>	7 pole	<input type="text" value="D4"/>	{4 ... 20 mA preset}									
CANopen according to DSP-408														
Profibus DP according to Fluid Power Technology														
CAN J1939 (on request)														
Function														
Amplifier														
Controller with current feedback value signal (0 ... 20 mA / 4 ... 20 mA)														
Controller with voltage feedback value signal (0 ... 10 V)														
Sealing material														
NBR														
FKM (Viton)														
Design index (subject to change)														

1 3040


**GENERAL SPECIFICATIONS**


Designation	Proportional spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Proportional solenoid
Ambient temperature	-20 ... +65 °C The upper temperature limit is a guideline for typical applications, in individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions „DSV“.
Weight	3,3 kg

**HYDRAULIC SPECIFICATIONS**


Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{T,max} = 160$ bar
Maximum volume flow	$Q_{max} = 50$ l/min, see characteristics
Nominal volume flow	$Q_n = 5, 10, 16, 32, 40$ (ADB-V) l/min
Leakage oil	On request
Hysteresis	< 0,4 %
Repeatability	< 0,4 %
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-20 ... +70 °C
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 10 ... 16 ≥ 75, see data sheet 1.0-50
Step response	Typical 25 ms from 10 to 90 %
Frequency response	See characteristics


**ELECTRICAL CONNECTION**


X1	Analog interface (Main)
Device receptacle	M23, 12 pole male
	1 = Supply voltage + 2 = Supply voltage 0 VDC 3 = Stabilised output voltage 4 = Command value signal voltage + 5 = Command value signal voltage - 6 = Command value signal current + 7 = Command value signal current - 8 = Reserved for extensions 9 = Reserved for extensions 10 = Enable signal (Digital input) 11 = Error signal (Digital output) 12 = Chassis
Command value signal voltage (PIN 4/5) resp. current (PIN 6/7) are selected with parameterisation and diagnostics software PASO. Factory setting: voltage (-10... +10 V), (PIN 4/5)	


X1	Fieldbus interface (Main)
Device receptacle	M12, 4 pole male
	1 = Supply voltage + 2 = Reserved for extensions 3 = Supply voltage 0 VDC 4 = Chassis

X2	Parameterisation interface
USB, Mini B	Under the screw plug of the housing cover Factory set

X1	Analog interface (Main)
Device receptacle	Connector DIN EN 175201 - 804
	7 pole male A = Supply voltage + B = Supply voltage 0 VDC C = Analog output - D = Command value signal + E = Command value signal - F = Analog output + G = Chassis
Command value signal: current (D4) or voltage (D2) to specify when placing the order	

X3	Profibus interface according to IEC 947-5-2
Device receptacle	M12, 5 pole male B-coded
	1 = VP 2 = RxD / TxD - N 3 = DGND 4 = RxD / TxD - P 5 = Shield

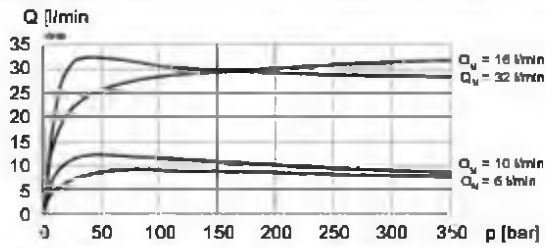
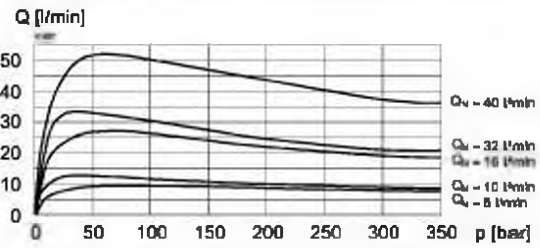
X3	CANopen interface according to DRP 303-1
Device receptacle	M12, 5 pole male
	1 = Not connected 2 = Not connected 3 = CAN Gnd 4 = CAN High 5 = CAN Low

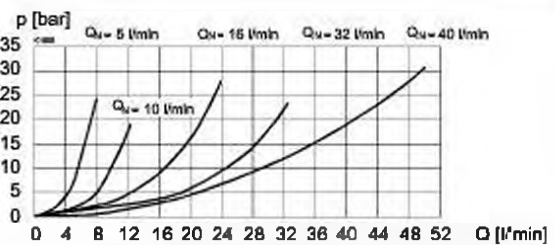
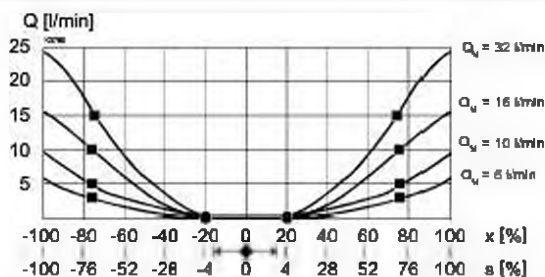
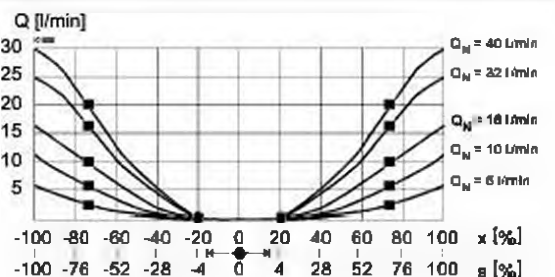
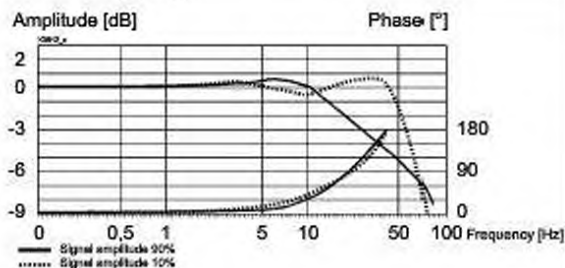
X4 (controller only)	Feedback value interface (sensor)
Device receptacle	M12, 5 pole female
	1 = Supply voltage (output) + 2 = Feedback value signal + 3 = Supply voltage 0 VDC 4 = Not connected 5 = Stabilised output voltage
Feedback value signal: current (R1) or voltage (R2) to specify when placing the order	

**Note!** The mating connector is not included in the delivery



**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 **$Q = f(p)$  Volume flow pressure characteristics**  
 $s = 100\%$   
 ACB-S

 **$Q = f(p)$  Volume flow pressure characteristics**  
 $s = 100\%$   
 ADB-V

 **$\Delta p = f(Q)$  Pressure drop volume flow characteristics**  
 $s = 100\%$   
 ACB-S

 **$\Delta p = f(Q)$  Pressure drop volume flow characteristics**  
 $s = 100\%$   
 ADB-V

 **$Q = f(s, x)$  Volume flow adjustment characteristics**  
 $\Delta p = 10 \text{ bar}$ ,  $s = \text{Command value signal}$ ,  $x = \text{spool stroke}$   
 ACB-S

 **$Q = f(s, x)$  Volume flow adjustment characteristics**  
 $\Delta p = 10 \text{ bar}$ ,  $s = \text{Command value signal}$ ,  $x = \text{spool stroke}$   
 ADB-V

**Frequency response**
 $\Delta p = 10 \text{ bar}$   
 $p_t < 1 \text{ bar}$ 

**Note!**


All values were measured over two control edges. The connections A and B were short-circuited.

**FACTORY SETTINGS**

Dither set for optimum hysteresis

- ◆ = Deadband: Both solenoids switched off at command value signal -2%... 2%
- = Opening pressure at command value signal +/ - 4%
- = Flow at  $\Delta p = 10$  bar over two control edges +/ - 70% command value signal

**Type: ACB-S**

15,0 l/min	at nominal volume flow rate $Q_x$	32 l/min
9,4 l/min	at nominal volume flow rate $Q_x$	16 l/min
4,4 l/min	at nominal volume flow rate $Q_x$	10 l/min
2,7 l/min	at nominal volume flow rate $Q_x$	5 l/min

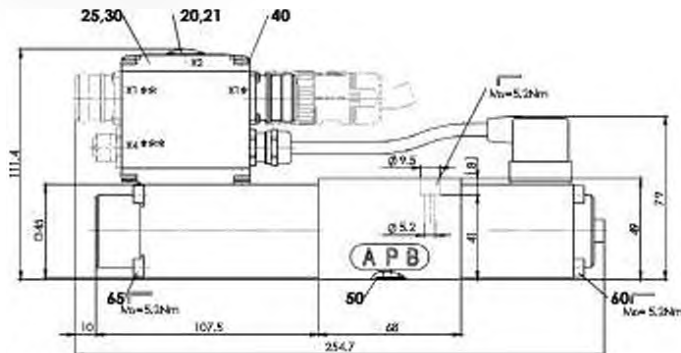
Dither set for optimum hysteresis

- ◆ = Deadband: Both solenoids switched off at command value signal -2%... 2%
- = Opening pressure at command value signal +/ - 4%
- = Flow at  $\Delta p = 10$  bar over two control edges +/ - 70% command value signal

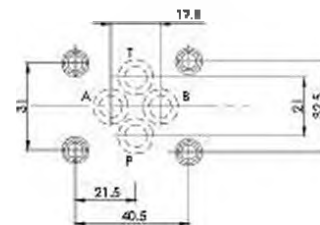
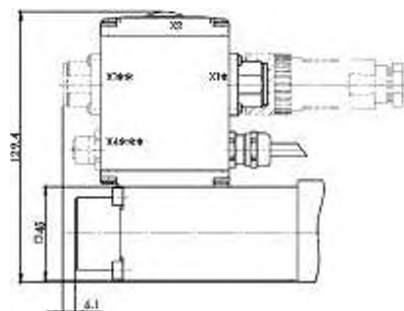
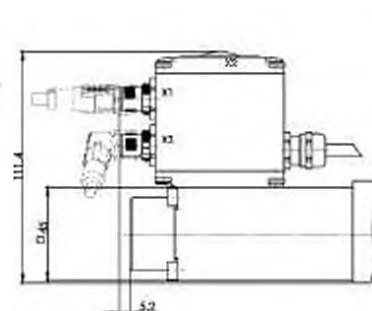
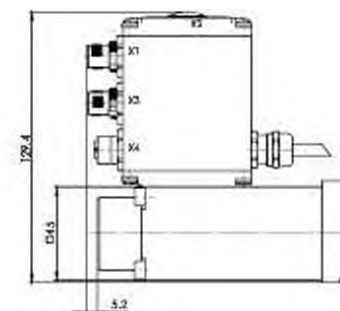
**Type: ADB-V**

20,5 l/min	at nominal volume flow rate $Q_x$	40 l/min
16,5 l/min	at nominal volume flow rate $Q_x$	32 l/min
10,5 l/min	at nominal volume flow rate $Q_x$	16 l/min
5,5 l/min	at nominal volume flow rate $Q_x$	10 l/min
3,0 l/min	at nominal volume flow rate $Q_x$	5 l/min

**DIMENSIONS**

 With analog interface, 12 pole connector  
 Amplifier and controller


- \* For amplifier
- \*\* For controller
- \*\*\* Only controller

**HYDRAULIC CONNECTION**

 With analog interface, 7 pole connector  
 Amplifier and controller

 With fieldbus interface  
 Amplifier

 With fieldbus interface  
 Controller




## PARTS LIST

Position	Article	Description
20	223.1317	Dummy plug M16 x 1,5
21	160.6131	O-ring ID 13,00 x 1,5 (FKM)
25	062.0102	Cover
30	072.0021	Gasket 33,2 x 59,9 x 2
40	208.0100	Socket head screw M4 x 10
50	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
60	246.2160	Socket head screw M5 x 60 DIN 912
65	246.2190	Socket head screw M5 x 90 DIN 912

## INSTALLATION NOTES

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 50
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2$ Nm (screw quality 8.8, zinc coated)

**Note!** The length of the fixing screw depends on the base material of the connection element.



## SURFACE TREATMENT

- ◆ The valve body is painted with a two component paint
- ◆ The solenoids are zinc nickel coated
- ◆ The electronics housing / chassis is made of aluminium

## COMMISSIONING

For DSV amplifiers as a rule no parameter adjustments by the customer are required. The plugs have to be connected in accordance with the chapter «Electrical connection».

Controllers are supplied configured as amplifiers. The adjustment of the mode of control and of the controller are carried out by the customer by means of the software adjustment (USB interface, Mini B). Further information can be found

Free- of charge download of the «PASO» software and the operation instructions for «DSV» hydraulic valves as well as the operation instructions CANopen Protocol resp. Profibus DP Protocol, with Device Profile DSP-408 for «DSV».

**Note!** The mating connectors and the parameterisation cable are not part of the delivery. Refer to chapter «Accessories».



## ACCESSORIES

Parameterisation software	See start-up
Parameterisation cable for interface USB	Article no. 219.2696 (from plug type A on Mini B, 3 m)

### Mating connector (plug female) for analog interface

straight, soldering contact M23, 12 pole	Article no. 219.2330
angled, soldering contact M23, 12 pole	Article no. 219.2331
straight, soldering contact, 7 pole	Article no. 219.2335

Threaded subplates	Data sheet 2.9-30
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Multi-station subplates	Data sheet 2.9-60
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Horizontal mounting blocks	Data sheet 2.9-100
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Technical explanations	Data sheet 1.0-100
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Hydraulic fluids	Data sheet 1.0-50
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Filtration	Data sheet 1.0-50
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Relative duty factor	Data sheet 1.1-430
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### Note!



Auxiliary conditions for the cable:

- External diameter 12 pol: 3,5...14,7 mm
- External diameter 7 pol: 8...10 mm
- Wire cross section max. 1 mm<sup>2</sup>
- Recommended wire cross section:  
0...25 m = 0,75 mm<sup>2</sup> (AWG18)  
25...50 m = 1 mm<sup>2</sup> (AWG17)

## MANUAL OVERRIDE

None

## SEALING MATERIAL

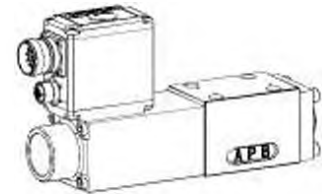
NBR or FKM (Viton) as standard, choice in the type code

## STANDARDS

CANopen	DRP 303-1
Profibus DP	IEC 947-5-2
Mounting interface	ISO 4401-03
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**Proportional directional control valve**

- Integrated amplifier or controller electronics
- Integrated spool position control with LVDT
- Direct operated, not pressure compensated
- $Q_{max} = 27 \text{ l/min}$
- $Q_{Nmax} = 20 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$


**DESCRIPTION**

Direct operated proportional spool valve with integrated electronics in flange design NG6 acc. to ISO 4401-03/7790 with 4 ports. The valve possesses an integrated positional control of the valve spool. This assures a minimal hysteresis and improved dynamic characteristics. Housing for electronics with protection class IP67 for harsh environment. The spool valve is designed acc. to the 5 chamber principle. The volume flow is adjusted by Wandfluh proportional solenoids (VDE standard 0580). Low pressure drop due to the body design and spool profiling. The spool is made of hardened steel. The body made of high grade hydraulic casting is painted. The solenoids are zinc coated and the housing for the electronics is made of aluminium.

**FUNCTION**

With the integrated spool position sensor (LVDT) the actual position of the spool is continuously recorded and made to follow the set-point value transmitted in an analogue manner. By means of this internal positional control, a minimal hysteresis and excellent dynamic characteristics are assured. With an increasing command value signal, the valve opening and therefore the volume flow changes. With 50 % of the solenoid current, the centre of the spool position (PTAB closed) is reached. In the case of an electric power failure, the spool by means of the spring force shifts into the basic position. Parameter setting and diagnosis with the free-of-charge software «PASO». Data are stored in a non volatile memory. Even after an electric power failure settings can easily be reproduced and transmitted. These valves are available with an integrated controller as an option. As feedback signal source sensors with voltage or current output signal can be directly connected. The available controller structure has been optimised for applications with hydraulic actuators.

**APPLICATION**

Proportional directional control valves with integrated electronics are highly suitable for demanding applications thanks to a high resolution, large volume flow, minimal hysteresis and very good dynamic characteristics. They are implemented in systems calling for good valve-to-valve reproducibility, easy installation, comfortable operation and high precision in industrial hydraulics as well as in mobile hydraulics for the smooth control of actuators. The integrated controller relieves the machine control system and operates the axis (position, angle, pressure, etc.) in a closed control loop. Application examples: pitch control of wind generators, forest and earth moving machines, machine tools and paper production machines with position controls, robotics and fan control.

**TYPE CODE**

 WD R F A06 -  -  -  - 24 -   # 

Directional control valve, direct operated

Proportional valve with integrated electronics

Flange version

International standard interface ISO, nominal size 6

Designation of symbols acc. to table 1.10-83/2

 Nominal volume flow ranges  $Q_N$ : 10 l/min  ACB1-S only 20 l/min  ACB1-R only

 Standard nominal voltage  $U_N$ : 24 VDC

**Hardware configuration:**

With analog signal (-10...+10 V voreingestellt)

With CANopen acc. to DSP-408

With Profibus DP in accordance with Fluid Power Technology

 A2

 C1

 P1

**Functions:**

Amplifier

 no remark

Controller with current feedback signal (0...20 mA / 4...20 mA)

 R1

Controller with voltage feedback signal (0...10 V)

 R2



Design-Index (Subject to change)

**GENERAL SPECIFICATIONS**

Designation	4/3-way proportional valve with integrated electronics
Nominal size	NG6-Mini acc. to ISO 4401-03/7790
Construction	Direct operated spool valve
Operations	Proportional solenoid, wet pin push type, pressure tight
Mounting	Flange, 4 fixing holes for socket head cap screws M5x50
Connections	Threaded connection plates, multi-flange subplates, longitudinal stacking system

Ambient temperature	-20...+65 °C (typical) <small>(The upper temperature limit is a guideline value for typical applications, in individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions «DSV».)</small>
Mounting position	any, preferably horizontal
Tightening torque	$M_t = 5,5 \text{ Nm}$ (quality 8.8)
Weight	$m = 2,65 \text{ kg}$

**TYPE CHARTS/DESIGNATIONS OF SYMBOLS**

	<b>ACB1 - S</b> S = Symmetrical control mode
	<b>ACB1 - R</b> R = Meter-out control mode

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1998, class 18/16/13 (Required filtration grade $\beta_{6...10} \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Fluid temperature	-20 ... +70 °C
Working pressure	$p_{max} = 350$ bar (connections P, A, B)
Tank pressure	$p_{max} = 160$ bar (connections T)
Nominal volume flow	$Q_N = 10$ l/min, 20 l/min,
Max. volume flow	see characteristic
Leakage volume flow	on request
Hysteresis	< 0,4 %
Repeatability	< 0,4 %
Jump response	typically 25 ms from 10 to 90 %

**ELECTRICAL SPECIFICATIONS**

Protection class	IP 67 acc. to EN 60 529 with suitable connector and closed electronic housing
Supply voltage	24 VDC
Ramps (amplifier only)	separate adjustment for up and down for each solenoid
Preset value generator (controller only)	preset value speed adjustable
Parametrisation	via fieldbus or USB
Interface	USB (Mini B) for parametrisation with «PASO» (under the closing screw of the housing cover, factory set parametris.)
<b>Analog interface</b>	
Device receptacle (male)	M23, 12-poles
Mating connector	Plug (female), M23, 12-poles (not incl. in delivery)
Preset value signal:	Voltage / current selected with software
<b>Fieldbus interface:</b>	
Device receptacle supply (male)	M12, 4-poles
Mating connector	Plug (female), M12, 4-poles (not incl. in delivery)
Device receptacle CANopen (male)	M12, 5-poles (acc. to DRP 303-1)
Mating connector	Plug (female), M12, 5-poles (not incl. in delivery)
Device receptacle Profibus (female)	M12, 5-poles, B-codiert (acc. to IEC 617-2)
Mating connector	Plug (male), M12, 5-poles, B-codiert (not incl. in delivery)
Preset value signal:	Fieldbus


**NOTE!**

Detailed electrical characteristics and description of «DSV» electronics are shown on data sheet 1.13-75.

**START-UP**

Normally there is no need to adjust settings by the customer. The connectors have to be wired according to the chapter «Connector wiring diagram».

Controllers will be supplied configured as amplifiers. Switching into controller mode and setting of the adjustments of the controller must be done by the customer using the set-up software (USB interface, Mini B).

Additional information can be found on our website:

Free-of-charge download of the «PASO»-software and the instruction manual for the «DSV» hydraulic valves as well as the operation instruction CANopen protocol with device profile DSP-408 for «DSV».

**CONNECTOR WIRING DIAGRAM**
**Analog interface:**
**Device receptacle (male) X1**


- 1 = Supply voltage +
- 2 = Supply voltage 0 VDC
- 3 = Stabilised output voltage
- 4 = Preset value voltage +
- 5 = Preset value voltage -
- 6 = Preset value current +
- 7 = Preset value current -
- 8 = Reserved for extensions
- 9 = Reserved for extensions
- 10 = Enable control (Digital input)
- 11 = Error signal (Digital output)
- 12 = Chassis

Preset value voltage (PIN 4/5) resp. current (PIN 6/7) are selected with set-up and diagnosis software.

Factory setting: Voltage (-10...+10 V), (PIN 4/5)

**Fieldbus interface:**
**Device receptacle supply (male) X1**

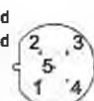
**MAIN**

- 1 = Supply voltage +
- 2 = Reserved for extensions
- 3 = Supply voltage 0 VDC
- 4 = Chassis

**Device receptacle CANopen (male) X3**

**CAN**

- 1 = not connected
- 2 = not connected
- 3 = CAN Gnd
- 4 = CAN High
- 5 = CAN Low

**Device receptacle Profibus (female) X3**

**PROFIBUS**

- 1 = VP
- 2 = Rx/D / Tx/D - N
- 3 = DGND
- 4 = Rx/D / Tx/D - P
- 5 = Shield

**Parameterisation interface (USB, Mini B) X2**

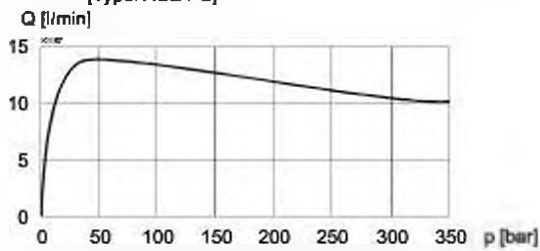
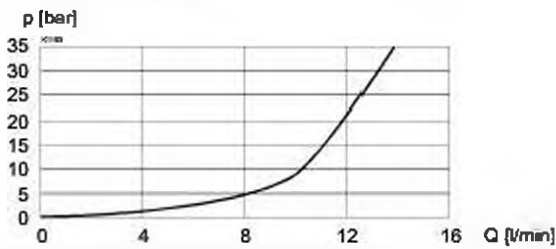
Under the closing screw of the housing cover

**Feedback signal interface**
**Device receptacle Sensor (female) X4 (controller only)**

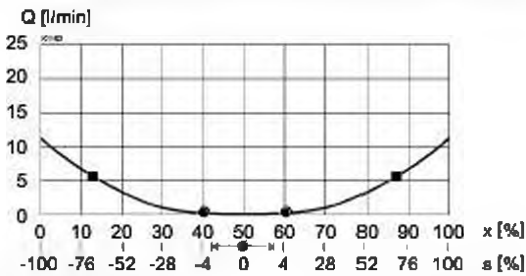

- 1 = Supply voltage (output) +
- 2 = Feedback signal +
- 3 = Supply voltage 0 VDC
- 4 = not connected
- 5 = stab. output voltage


**NOTE!**

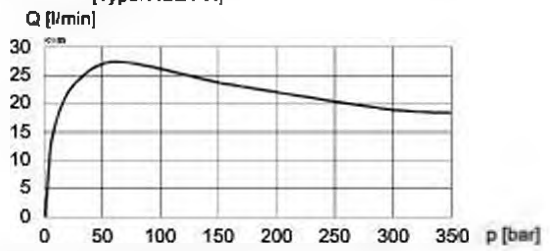
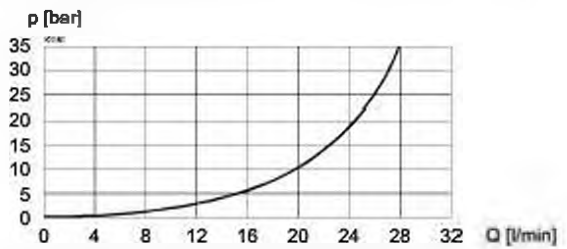
The mating connector and the cable to adjust the settings are not part of the delivery. To order the cable, look up the article no. in the chapter «Accessories».

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
**Q = f(p)** Volume flow pressure characteristics ( $s = 100 \%$ )  
 [Type: ACB1-S]

 **$\Delta p = f(Q)$**  Pressure loss/flow characteristics ( $s = 100 \%$ )  
 [Type: ACB1-S]

**Q = f(s, x)** Volume flow-signal-characteristics ( $\Delta p = 10 \text{ bar}$ )  
 [Type: ACB1-S]

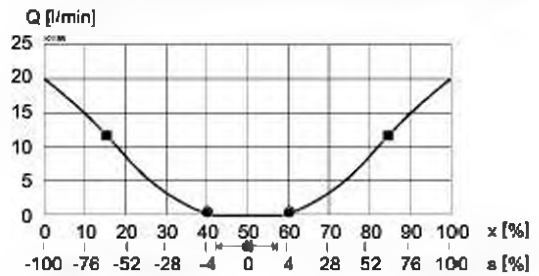
(s corresponds to preset value signal and x corresponds to spool stroke)


**Factory settings:**

- = Deadband: 50% of the solenoid current with command signal  $-2\% \dots +2\%$
- = Opening point: at command signal  $\pm 4\%$
- = Flow at  $\Delta p = 10 \text{ bar}$  over 2 metering edges at command signal  $\pm 70\%$

**Q = f(p)** Volume flow pressure characteristics ( $s = 100 \%$ )  
 [Type: ACB1-R]

 **$\Delta p = f(Q)$**  Pressure loss/flow characteristics ( $s = 100 \%$ )  
 [Type: ACB1-R]

**Q = f(s, x)** Volume flow-signal-characteristics ( $\Delta p = 10 \text{ bar}$ )  
 [Type: ACB1-R]

(s corresponds to preset value signal and x corresponds to spool stroke)


**Factory settings:**

- = Deadband: 50% of the solenoid current with command signal  $-2\% \dots +2\%$
- = Opening point: at command signal  $\pm 4\%$
- = Flow at  $\Delta p = 10 \text{ bar}$  over 2 metering edges at command signal  $\pm 70\%$

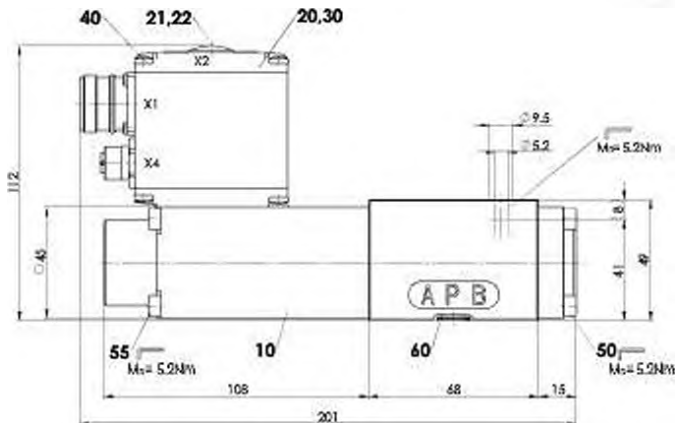
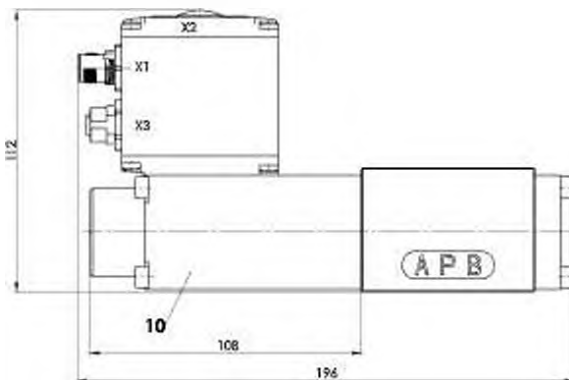
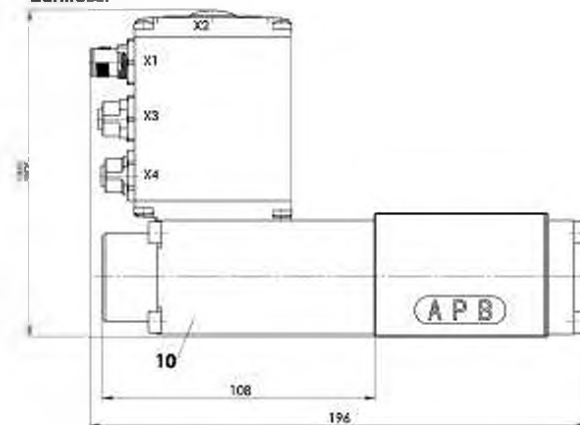

**NOTE!**

All values measured over 2 metering edges, A and B ports linked.

**DIMENSIONS**
**With analog interface**  
 Amplifier and controller

**NOTE!**

The cable connector is not part of the delivery. The dimensions refer to those of the cable connector in the chapter «Accessories».


**With fieldbus interface**  
 Amplifier

**With fieldbus interface**  
 Controller

**PARTS LIST**

Position	Article	Description
20	062.0102	Cover
21	223.1317	Dummy plug M16x1,5
22	180.6131	O-ring ID 13,00x1,5
30	072.0021	Gasket 33x2x59,9x2
40	208.0100	Socket head cap screw M4x10
50	246.2117	Socket head cap screw M5x16 DIN 912
55	246.2190	Socket head cap screw M5x90 DIN 912
60	180.2093	O-ring ID 9,25x1,78

**ACCESSORIES**

- Set-up software see start-up
  - Cable to adjust the settings through interface USB  
(from plug type A to Mini B, 3 m) article no. 219.2896
  - Cable connector for analog interface:
    - straight soldering contact article no. 219.2330
    - 90° soldering contact article no. 219.2331
- Recommended cable size:
- Outer diameter 9...10,5 mm
  - Single wire max. 1 mm<sup>2</sup>
  - Recommended wire size:
    - 0...25 m = 0,75 mm<sup>2</sup> (AWG18)
    - 25...50 m = 1 mm<sup>2</sup> (AWG17)

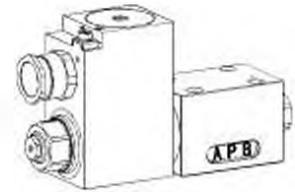
Technical explanation see data sheet 1.0-100

**Proportional spool valve**
**Flange construction**

- ◆  $Q_{n,max}$  = 35 l/min
- ◆ 4 volume flow levels
- ◆  $Q_{nl,max}$  = 25 l/min
- ◆  $p_{n,max}$  = 350 bar

**NG6**
**ISO 4401-03**

- ⊕ II 2 G Ex db IIC T6, T4
  - ⊕ II 2 D Ex db III C T60 °C, T130 °C
  - ⊕ I M2 Ex db I Mb
- Class I Division 1  
 Class I Zone 1


**DESCRIPTION**

Direct operated proportional spool valve with 4 connections in 5-chamber system. Precise spool fit, low leakage, long service life time. Proportional to the solenoid current, the spool stroke, the spool opening and the valve volume flow increase. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. Proportional spool valves are perfectly suitable for demanding tasks due to the high resolution, large volume flow and low hysteresis. The applications are in the industrial as well as in the mobile hydraulics for the smooth control of hydraulic actuations.

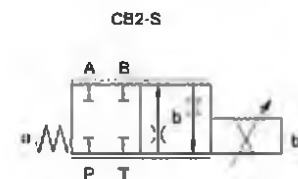
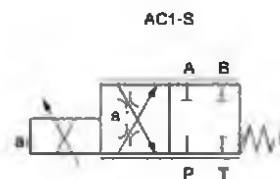
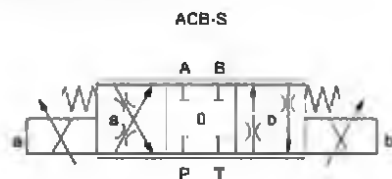
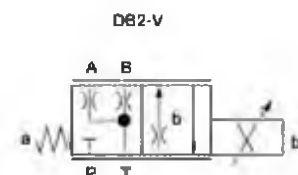
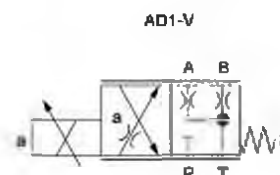
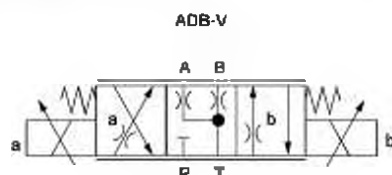
**CERTIFICATES**

	Surface	Mining	Standard -25 °C to...	M248 Electronic
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	
MA		x	x	x
UL / CSA	x		x	

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

**Attention!** The UL execution is always supplied without cable gland


**SYMBOL**
**Symmetrical control**

**Meter-in control**


**TYPE CODE**

WD B F A06 -  -  -  /  /  -   # 1

Spool valve, direct operated		<input type="checkbox"/>	
Proportional, explosion proof execution Ex d		<input type="checkbox"/>	
Flange construction		<input type="checkbox"/>	
International standard interface ISO, NG6		<input type="checkbox"/>	
Designation of symbols acc. to table		<input type="checkbox"/>	
Nominal volume flow $Q_n$	5 l/min <input type="checkbox"/> 5 10 l/min <input type="checkbox"/> 10 16 l/min <input type="checkbox"/> 16 25 l/min <input type="checkbox"/> 25		
Nominal voltage $U_n$	12 VDC <input type="checkbox"/> G12 24 VDC <input type="checkbox"/> G24		
Nominal power $P_n$	9 W <input type="checkbox"/> L9 15 W <input type="checkbox"/> L15 17 W <input type="checkbox"/> L17	Ambient temperature up to: 40 °C or 90 °C 70 °C 70 °C (only UL / CSA)	
Certification	ATEX, IECEX, CCC, EAC <input type="checkbox"/> Australia <input type="checkbox"/> AU MA <input type="checkbox"/> MA	UL / CSA <input type="checkbox"/> UL	
Sealing material	NBR <input type="checkbox"/> FKM (Viton) <input type="checkbox"/> D1		
Amplifier	<input type="checkbox"/> M248		

Design index (subject to change)

1 70 88

**GENERAL SPECIFICATIONS**

Designation	Proportional spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Ex-protection proportional solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17)
Weight	2,8 kg (1 solenoid) 4,8 kg (2 solenoids)
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at... °C	<b>L15 / L17 / 70 °C:</b> $I_a = 445 \text{ mA}$ ( $U_n = 24\text{VDC}$ ) $I_a = 890 \text{ mA}$ ( $U_n = 12\text{VDC}$ ) <b>L9 / 40 °C:</b> $I_a = 305 \text{ mA}$ ( $U_n = 24\text{VDC}$ ) $I_a = 610 \text{ mA}$ ( $U_n = 12\text{VDC}$ ) <b>L9 / 90 °C:</b> $I_a = 265 \text{ mA}$ ( $U_n = 24\text{VDC}$ ) $I_a = 530 \text{ mA}$ ( $U_n = 12\text{VDC}$ )
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

**Note!**


Other electrical specifications see data sheet 1.1-183 and 1.1-184

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Tank pressure	$p_{res} = 160 \text{ bar}$
Maximum volume flow	$Q_{max} = 35 \text{ l/min}$ , see characteristics
Nominal volume flow	$Q_n = 5 \text{ l/min}, 10 \text{ l/min}, 16 \text{ l/min}, 25 \text{ l/min}$
Leakage oil	On request
Hysteresis	L15 / 70°C: $\leq 10 \%$ at optimal dither signal L9 / 40°C: $\leq 12 \%$ at optimal dither signal L9 / 90°C: $\leq 14 \%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L9 or L15 / L17)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 $\geq 75$ , see data sheet 1.0-50

**Attention!** With the execution L9 for ambient temperatures up to 90 °C (L9/90 °C),  $Q_n$  is not reached


**MANUAL OVERRIDE**

HB4,5 as standard  
 Optionally: HN (K)  
 → see data sheet 1.1-311

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The armature tube, the slip-on coil and the plug screw are zinc-nickel coated

**STANDARDS**

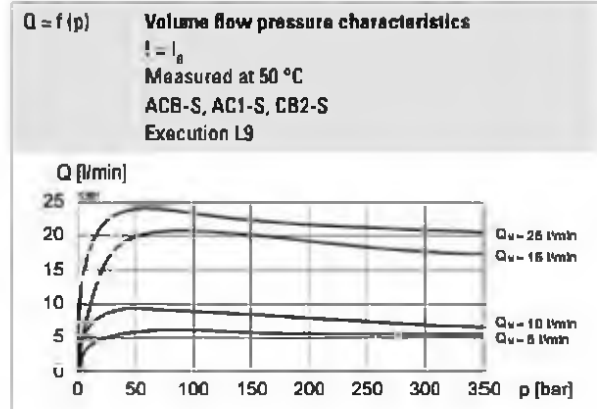
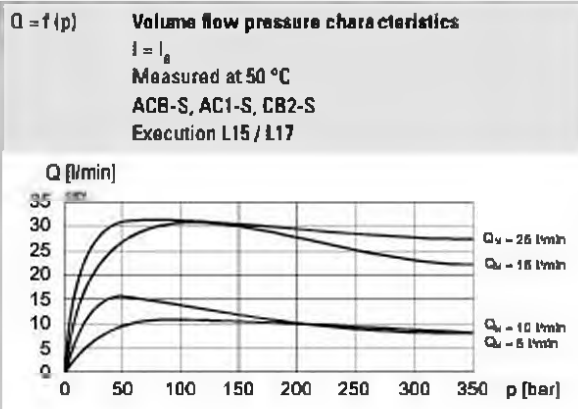
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Mounting interface	ISO 4401-03
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

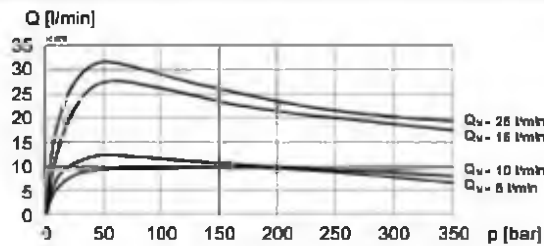
**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$

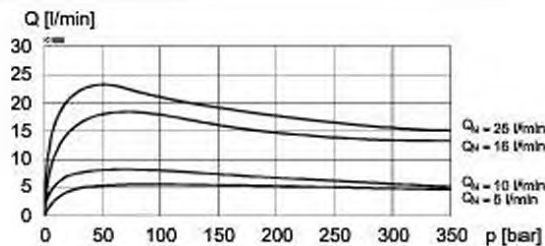




$Q = f(p)$  **Volume flow pressure characteristics**  
 $l = l_B$   
 Measured at 50 °C  
 ADB-V, AD1-V, DB2-V  
 Execution L15 / L17



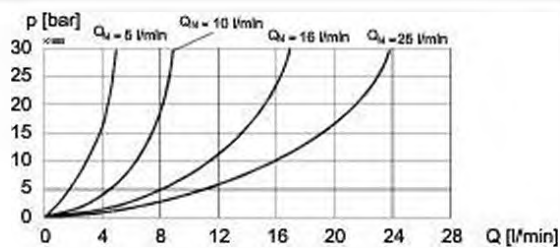
$Q = f(p)$  **Volume flow pressure characteristics**  
 $l = l_B$   
 Measured at 50 °C  
 ADB-V, AD1-V, DB2-V  
 Execution L9



$\Delta p = f(Q)$  **Pressure drop volume flow characteristics**  
 $l = l_B$   
 Measured at 50 °C  
 ACB-S, AC1-S, CB2-S  
 Execution L15 / L17



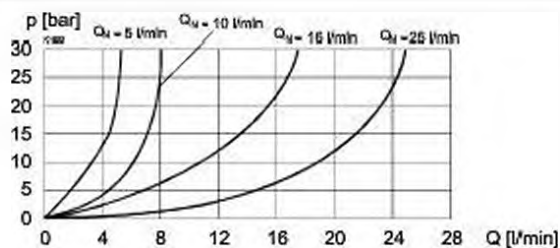
$\Delta p = f(Q)$  **Pressure drop volume flow characteristics**  
 $l = l_B$   
 Measured at 50 °C  
 ACB-S, AC1-S, CB2-S  
 Execution L9

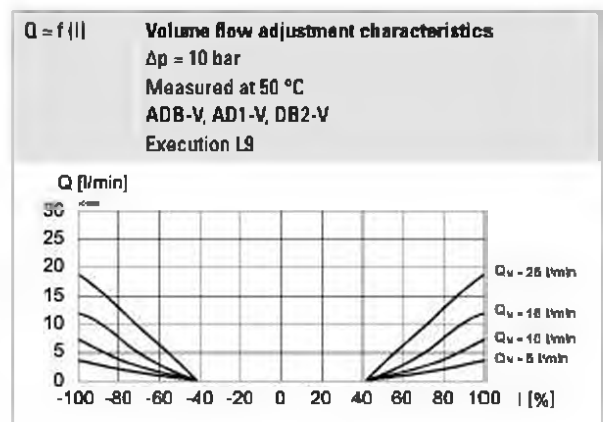
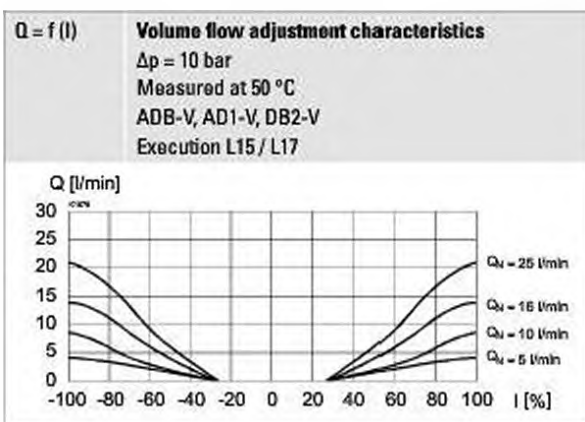
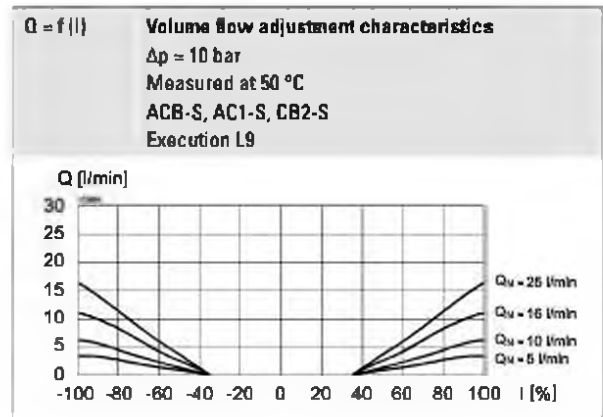
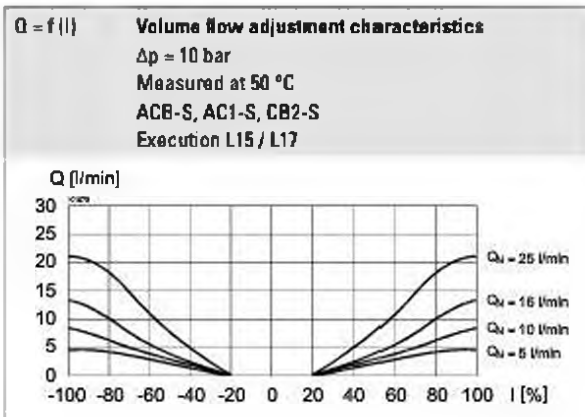


$\Delta p = f(Q)$  **Pressure drop volume flow characteristics**  
 $l = l_B$   
 Measured at 50 °C  
 ADB-V, AD1-V, DB2-V  
 Execution L15 / L17



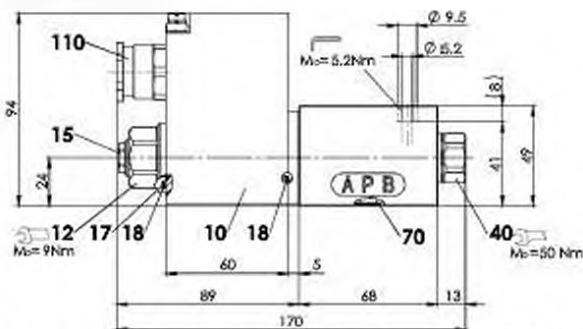
$\Delta p = f(Q)$  **Pressure drop volume flow characteristics**  
 $l = l_B$   
 Measured at 50 °C  
 ADB-V, AD1-V, DB2-V  
 Execution L9



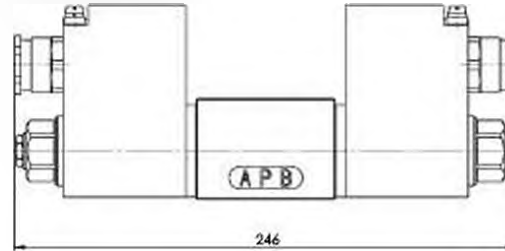


**Note!** All values were measured over two control edges. The connections A and B were short-circuited.



**DIMENSIONS**
**4/2-way spool valve**


Dimensions of the solenoid coil, refer to data sheet 1.1-183 and 1.1-184

**4/3-way spool valve**

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	263 6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	253.8000	Manual override HB4,5
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
40	239.2209	Socket head screw M20 x 1
70	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
110	111.1080	Cable gland M20 x 1,5

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 50
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 9 \text{ Nm}$ knurled nut

**Note!** The length of the fixing screw depends on the base material of the connection element.



**Attention!** For stack assembly please observe the remarks in the operating instructions


**ACCESSORIES**

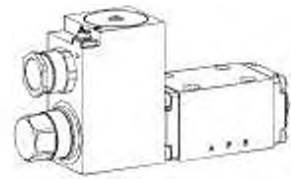
Proportional amplifier	Register 1.13
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Modula type manifold blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**Proportional spool valve stainless**
**Flange construction**

- ◆  $Q_{Nmax} = 30 \text{ l/min}$
- ◆ 3 volume flow levels
- ◆  $Q_{Nmax} = 20 \text{ l/min}$
- ◆  $p_{Nmax} = 350 \text{ bar}$

**NG6**
**ISO 4401-03**

- ⊕ II 2 G Ex db IIC T6, T4
- ⊕ II 2 D Ex db III C T60 °C, T130 °C
- ⊕ I M2 Ex db I Mb
- Class I Division 1
- Class I Zone 1


**DESCRIPTION**

Direct operated proportional spool valve with 4 connections in 5-chamber system. Precise spool fit, low leakage, long service life time. Proportional to the solenoid current, the spool stroke, the spool opening and the valve volume flow increase. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. The stainless execution is especially suitable for the use in wet and salty environment. Proportional spool valves are perfectly suitable for demanding tasks due to the high resolution, large volume flow and low hysteresis. The applications are in the industrial as well as in the mobile hydraulics for the smooth control of hydraulic actuations.

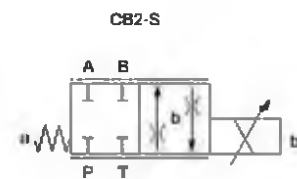
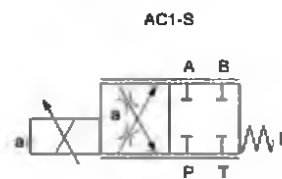
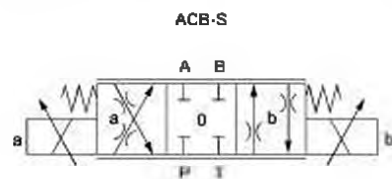
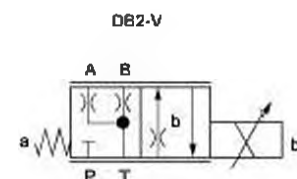
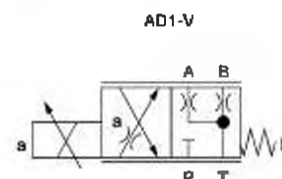
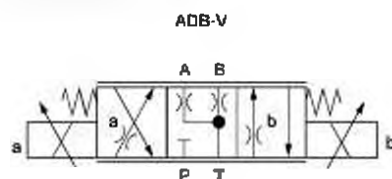
**CERTIFICATES**

	Surface	Mining	Standard -25 °C to...	M248 Electronic
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	
MA		x	x	x
UL / CSA	x		x	

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

**Attention!** The UL execution is always supplied without cable gland


**SYMBOL**
**Symmetrical control**

**Meter-in control**


**TYPE CODE**

Spool valve, direct operated		WD B F A06 - <input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/> K9 # 1												
Proportional, explosion proof execution Ex d														
Flange construction														
International standard interface ISO, NG6														
Designation of symbols acc. to table														
Nominal volume flow $Q_n$	<table border="1"> <tr> <td>L15 / L17</td> <td>L9 ACB-S</td> <td>L9 ADB-V</td> </tr> <tr> <td>6 l/min <input type="checkbox"/> 8</td> <td>3 l/min <input type="checkbox"/> 3</td> <td>5 l/min <input type="checkbox"/> 5</td> </tr> <tr> <td>12 l/min <input type="checkbox"/> 12</td> <td>7 l/min <input type="checkbox"/> 7</td> <td>10 l/min <input type="checkbox"/> 10</td> </tr> <tr> <td>20 l/min <input type="checkbox"/> 20</td> <td>14 l/min <input type="checkbox"/> 14</td> <td>16 l/min <input type="checkbox"/> 16</td> </tr> </table>	L15 / L17	L9 ACB-S	L9 ADB-V	6 l/min <input type="checkbox"/> 8	3 l/min <input type="checkbox"/> 3	5 l/min <input type="checkbox"/> 5	12 l/min <input type="checkbox"/> 12	7 l/min <input type="checkbox"/> 7	10 l/min <input type="checkbox"/> 10	20 l/min <input type="checkbox"/> 20	14 l/min <input type="checkbox"/> 14	16 l/min <input type="checkbox"/> 16	
L15 / L17	L9 ACB-S	L9 ADB-V												
6 l/min <input type="checkbox"/> 8	3 l/min <input type="checkbox"/> 3	5 l/min <input type="checkbox"/> 5												
12 l/min <input type="checkbox"/> 12	7 l/min <input type="checkbox"/> 7	10 l/min <input type="checkbox"/> 10												
20 l/min <input type="checkbox"/> 20	14 l/min <input type="checkbox"/> 14	16 l/min <input type="checkbox"/> 16												
Nominal voltage $U_n$	<table border="1"> <tr> <td>12 VDC <input type="checkbox"/> 612</td> </tr> <tr> <td>24 VDC <input type="checkbox"/> 624</td> </tr> </table>	12 VDC <input type="checkbox"/> 612	24 VDC <input type="checkbox"/> 624											
12 VDC <input type="checkbox"/> 612														
24 VDC <input type="checkbox"/> 624														
Nominal power $P_n$	<table border="1"> <tr> <td>9 W <input type="checkbox"/> L9</td> <td rowspan="3">Ambient temperature up to: 40 °C or 90 °C 70 °C 70 °C (only ILL / CSA)</td> </tr> <tr> <td>15 W <input type="checkbox"/> L15</td> </tr> <tr> <td>17 W <input type="checkbox"/> L17</td> </tr> </table>	9 W <input type="checkbox"/> L9	Ambient temperature up to: 40 °C or 90 °C 70 °C 70 °C (only ILL / CSA)	15 W <input type="checkbox"/> L15	17 W <input type="checkbox"/> L17									
9 W <input type="checkbox"/> L9	Ambient temperature up to: 40 °C or 90 °C 70 °C 70 °C (only ILL / CSA)													
15 W <input type="checkbox"/> L15														
17 W <input type="checkbox"/> L17														
Certification	<table border="1"> <tr> <td>ATEX, IECEX, CCC, EAC <input type="checkbox"/></td> <td rowspan="3">UL / CSA <input type="checkbox"/> UC</td> </tr> <tr> <td>Australia <input type="checkbox"/> AU</td> </tr> <tr> <td>MA <input type="checkbox"/> MA</td> </tr> </table>	ATEX, IECEX, CCC, EAC <input type="checkbox"/>	UL / CSA <input type="checkbox"/> UC	Australia <input type="checkbox"/> AU	MA <input type="checkbox"/> MA									
ATEX, IECEX, CCC, EAC <input type="checkbox"/>	UL / CSA <input type="checkbox"/> UC													
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MA <input type="checkbox"/> MA														
Sealing material	<table border="1"> <tr> <td>NBR <input type="checkbox"/></td> </tr> <tr> <td>FKM (Viton) <input type="checkbox"/> D1</td> </tr> </table>	NBR <input type="checkbox"/>	FKM (Viton) <input type="checkbox"/> D1											
NBR <input type="checkbox"/>														
FKM (Viton) <input type="checkbox"/> D1														
Amplifier	<input type="checkbox"/> M245													
Stainless														
Design index (subject to change)														

1 10 888

**GENERAL SPECIFICATIONS**

Designation	Proportional spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Ex-protection proportional solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17)
Weight	3,1 kg (1 solenoid) 4,9 kg (2 solenoids)
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at... °C	<b>L15 / L17 / 70 °C:</b> $I_n = 445 \text{ mA } (U_n = 24\text{VDC})$ $I_n = 890 \text{ mA } (U_n = 12\text{VDC})$ <b>L9 / 40 °C:</b> $I_n = 305 \text{ mA } (U_n = 24\text{VDC})$ $I_n = 610 \text{ mA } (U_n = 12\text{VDC})$ <b>L9 / 90 °C:</b> $I_n = 265 \text{ mA } (U_n = 24\text{VDC})$ $I_n = 530 \text{ mA } (U_n = 12\text{VDC})$
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1... T6 Nominal power 15 W / 17 W: T1... T4

**Nota!** Other electrical specifications see data sheet 1.1-183 and 1.1-184



**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Tank pressure	$p_{Tmax} = 160 \text{ bar}$
Maximum volume flow	$Q_{max} = 30 \text{ l/min}$ , see characteristics
Nominal volume flow	$Q_N = 6 \text{ l/min}$ , $12 \text{ l/min}$ , $20 \text{ l/min}$ (L15 / L17) $Q_M = 3 \text{ l/min}$ , $7 \text{ l/min}$ , $14 \text{ l/min}$ (L9 ACB-S) $Q_M = 5 \text{ l/min}$ , $10 \text{ l/min}$ , $16 \text{ l/min}$ (L9 ADB-V)
Leakage oil	On request
Hysteresis	L15 / 70°C: $\leq 10 \%$ at optimal dither signal L9 / 40°C: $\leq 12 \%$ at optimal dither signal L9 / 90°C: $\leq 14 \%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	$12 \text{ mm}^2/\text{s} \dots 320 \text{ mm}^2/\text{s}$
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L9 or L15 / L17)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade $\beta_{6 \dots 10} \geq 75$ , see data sheet 1.0-50

**Attention!** With the execution L9 for ambient temperatures up to 90 °C (L9/90 °C),  $Q_M$  is not reached


**STANDARDS**

Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Mounting interface	ISO 4401-03
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SURFACE TREATMENT**

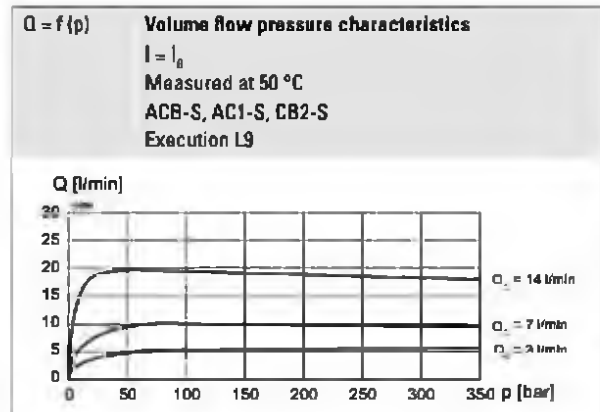
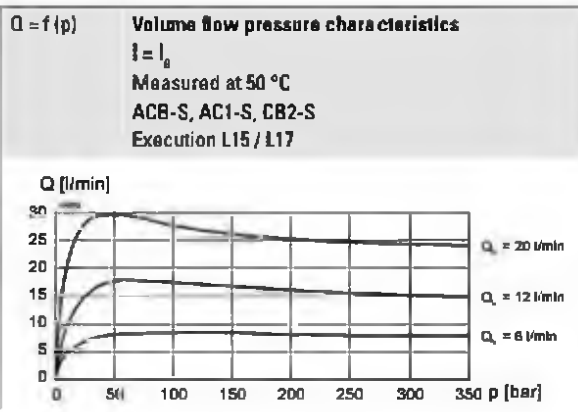
- ◆ The valve body, the cover and the socket head screws are made of stainless steel
- ◆ The slip-on coil and the armature tube are zinc nickel coated

**SEALING MATERIAL**

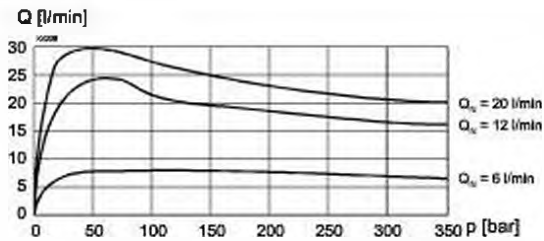
NBR or FKM (Viton) as standard, choice in the type code

**PERFORMANCE SPECIFICATIONS**

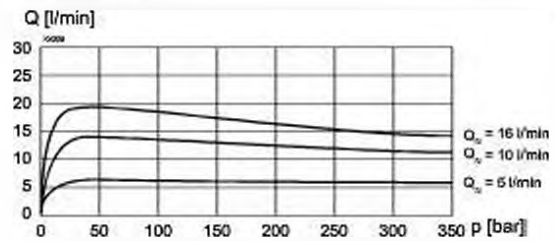
Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



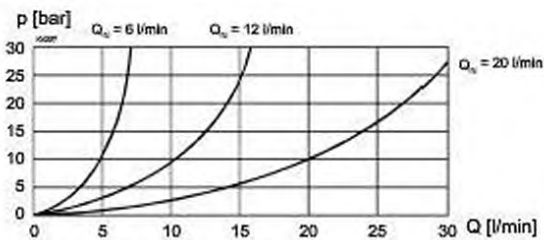
$Q = f(p)$  **Volume flow pressure characteristics**  
 $l = l_B$   
 Measured at 50 °C  
 ADB-V, AD1-V, DB2-V  
 Execution L15 / L17



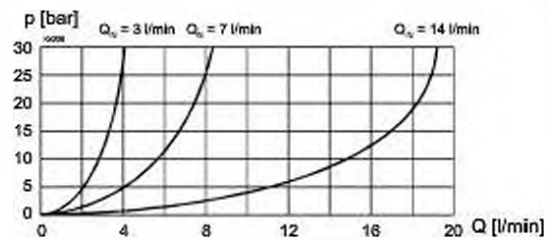
$Q = f(p)$  **Volume flow pressure characteristics**  
 $l = l_B$   
 Measured at 50 °C  
 ADB-V, AD1-V, DB2-V  
 Execution L9



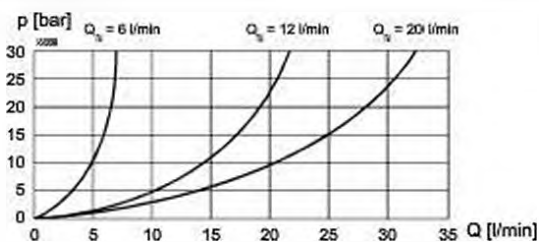
$\Delta p = f(Q)$  **Pressure drop volume flow characteristics**  
 $l = l_B$   
 Measured at 50 °C  
 ACB-S, AC1-S, CB2-S  
 Execution L15 / L17



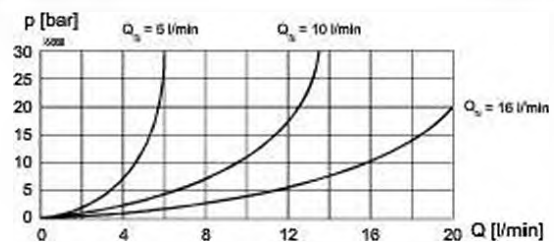
$\Delta p = f(Q)$  **Pressure drop volume flow characteristics**  
 $l = l_B$   
 Measured at 50 °C  
 ACB-S, AC1-S, CB2-S  
 Execution L9

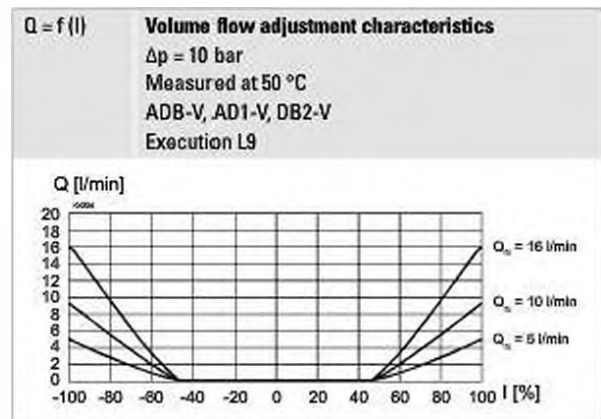
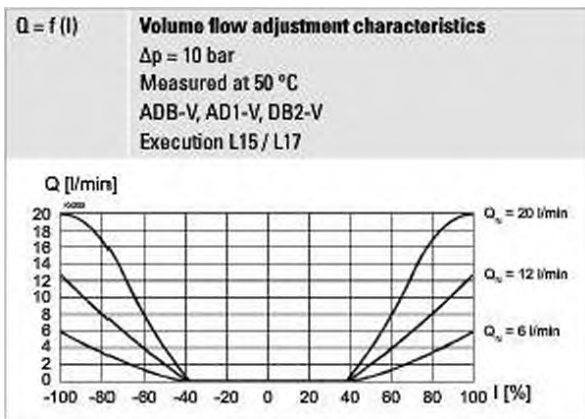
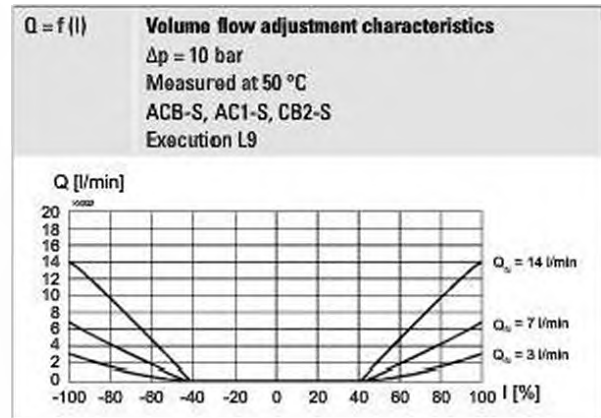
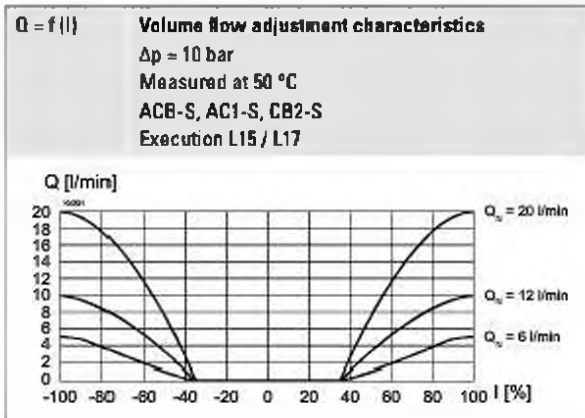


$\Delta p = f(Q)$  **Pressure drop volume flow characteristics**  
 $l = l_B$   
 Measured at 50 °C  
 ADB-V, AD1-V, DB2-V  
 Execution L15 / L17



$\Delta p = f(Q)$  **Pressure drop volume flow characteristics**  
 $l = l_B$   
 Measured at 50 °C  
 ADB-V, AD1-V, DB2-V  
 Execution L9

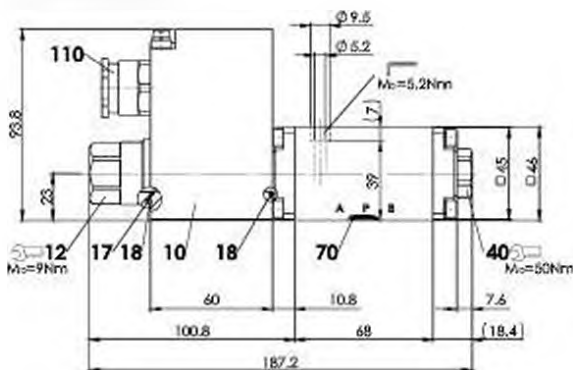




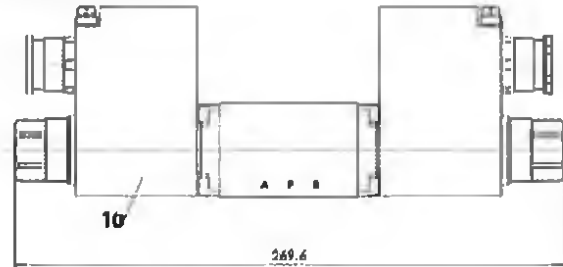
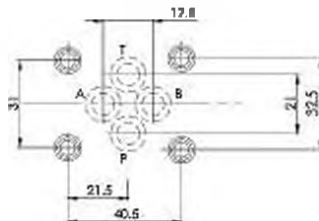
**Note!** All values were measured over two control edges. The connections A and B were short-circuited.





**DIMENSIONS**
**4/2-way spool valve**


Dimensions of the solenoid coil, refer to data sheet 1.1-183 and 1.1-184

**4/3-way spool valve**

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK 45 / 18 x 60
12	154.2201	Knurled nut Ex M18 x 1,5 x 30
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
40	239.2214	Socket head screw M20 x 1
70	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.8092	O-ring ID 9,25 x 1,78 (FKM)
110	111.1080	Cable gland M20 x 1,5

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality A4) $M_0 = 9 \text{ Nm}$ knurled nut

**Note!** The length of the fixing screw depends on the base material of the connection element.



**Attention!** For stack assembly please observe the remarks in the operating instructions


**ACCESSORIES**

Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**Proportional spool valve with additional hand lever actuation**

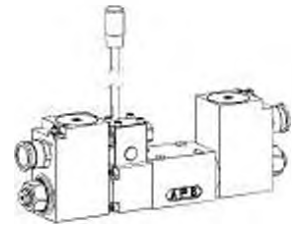
**Flange construction**

- ◆  $Q_{Tmax} = 35 \text{ l/min}$
- ◆ 4 volume flow levels
- ◆  $Q_{Nmax} = 25 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG6**

ISO 4401-03

- ⊕ II 2 G Ex db IIC
- ⊕ II 2 D Ex td A21 IP65
- ⊕ I M2 Ex db I Mb
- Class I Division 1
- Class I Zone 1



**DESCRIPTION**

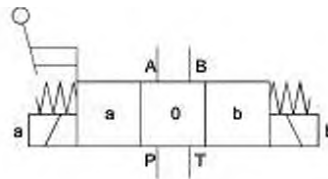
Proportional spool valve according to data sheet 1.10-88 with additional hand lever actuation.

**Note!** The standard valve cannot be retrofitted.



**SYMBOL**

Overview spool types see data sheet 1.10-88



**TYPE CODE**

Spool valve, direct operated

Proportional, explosion proof execution Ex d

Flange construction

International standard interface ISO NG6

Other type designation according to type code data sheet 1.10-88

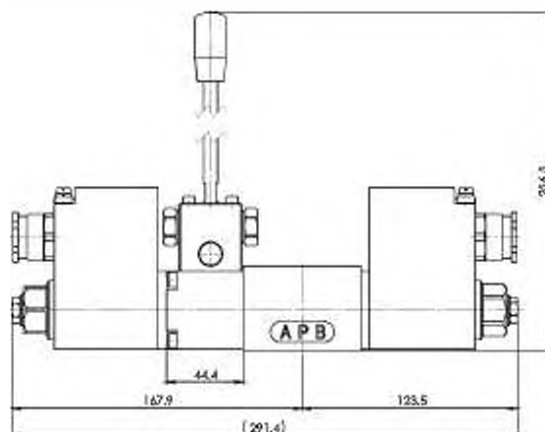
Hand lever

Design index (subject to change)

1.10.88

WD B F A06 -  Z568 # 2

**DIMENSIONS**



**GENERAL SPECIFICATIONS**

Weight WDBFA06 +1,0 kg

**Note!** Further specifications, see data sheet 1.10-88



**SURFACE TREATMENT**

- ◆ The flange, the housing and the lever are zinc-nickel coated

**Proportional spool valve**
**Screw-in cartridge type**

- ◆ pilot operated
- ◆  $Q_{max} = 150 \text{ l/min}$
- ◆ 1 volume flow level
- ◆  $Q_{Nmax} = 90 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**M33 x 2**  
 Wandfluh standard

**DESCRIPTION**

Pilot operated proportional spool valve in screw-in cartridge construction. Precise spool fit, low leakage, long service life time. Spool made of hardened steel. The valve is controlled externally through a pilot pressure via the x and y connections. Without control, the piston is held in the central position by a spring. Proportional to the pilot pressure, the spool opening and the valve volume flow increase. Thanks to the optimum spool form, sensitive movement processes are possible. For the control, Wandfluh proportional pressure valves (see register 2.3) and Wandfluh proportional amplifiers (see register 1.13) are available.

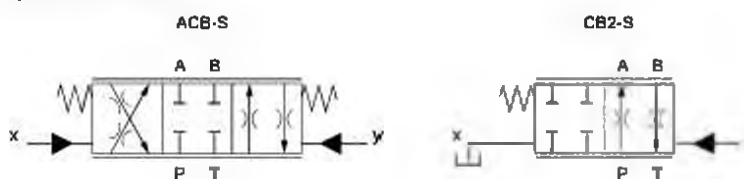
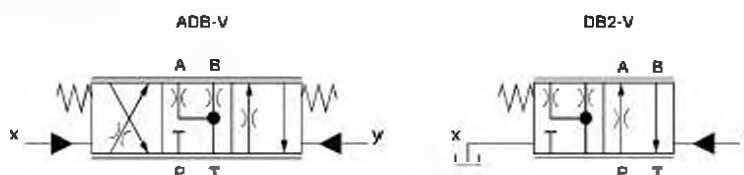
**APPLICATION**

Proportional spool valves are perfectly suitable for demanding tasks due to the high resolution, large volume flow and low hysteresis. The applications are in the industry as well as in the mobile hydraulics for the smooth control of hydraulic actuators. Some examples: rotor blades control of wind generators, forestry and earth moving machines, machine tools and paper production machines with simple position control, robotics and fan control.

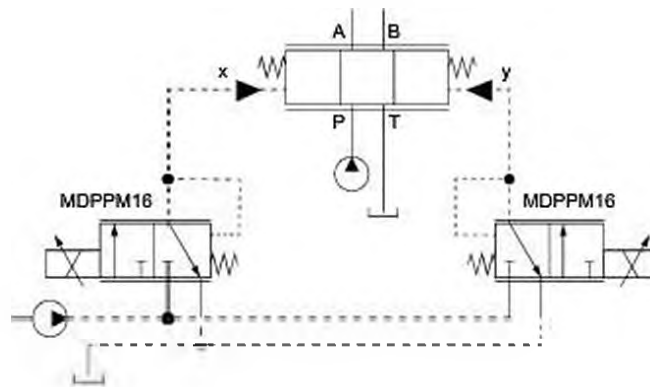
**TYPE CODE**

Spool valve	W	V	P	PM33	-	-	90	#
Directly operated								
Proportional								
Screw-in cartridge M33 x 2								
Designation of symbols acc. to table								
Nominal volume flow rate $Q_N$							90	l/min
Design index (subject to change)								

1 33-2010

**SYMBOL**
**Symmetrical control**

**Master-in control**


## Connection example

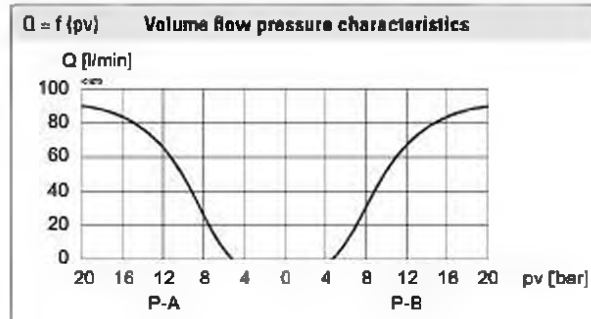
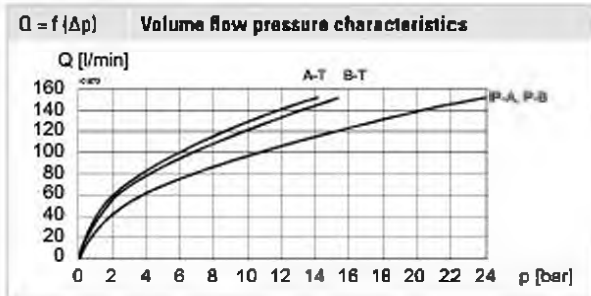

**GENERAL SPECIFICATIONS**

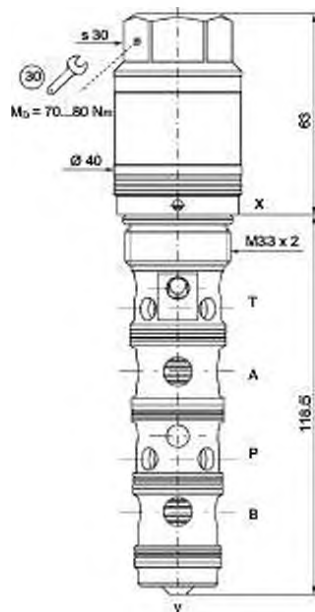
Designation	Proportional spool valve
Construction	Pilot operated
Mounting	Screw-in cartridge type
Nominal size	M33 x 2 according to Wandfluh standard
Actuation	Pilot valve
Ambient temperature	-30 ... +90 °C
Weight	0,79 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Maximum volume flow	$Q_{max} = 150 \text{ l/min}$ , see characteristics
Nominal volume flow	$Q_N = 90 \text{ l/min}$
Leakage volume flow	P → T (at 200 bar): < 0,4 l/min
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range	-20 ... +70 °C
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard


**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1053

**ACCESSORIES**

Proportional pressure valves	Register 2.3
Proportional amplifier	Register 1.13
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M33 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 70 \dots 80$ Nm Screw-in cartridge

**STANDARDS**

Mounting interface	Wandfluh standard
Contamination efficiency	ISO 4406

**ACTUATION**

Actuation	Pilot control
Minimum pilot pressure	4,5 bar
Maximum pilot pressure	30 bar

**SURFACE TREATMENT**

The external parts of the cartridge body are zinc / nickel coated

**SEALING MATERIAL**

NBR as standard

**Proportional spool valve**
**Screw-in cartridge type**

- ◆ pilot operated
- ◆  $Q_{max} = 250 \text{ l/min}$
- ◆ 1 volume flow level
- ◆  $Q_{N100} = 150 \text{ l/min}$
- ◆  $p_{max} = 315 \text{ bar}$

**M42 x 2**  
 Wandfluh standard

**DESCRIPTION**

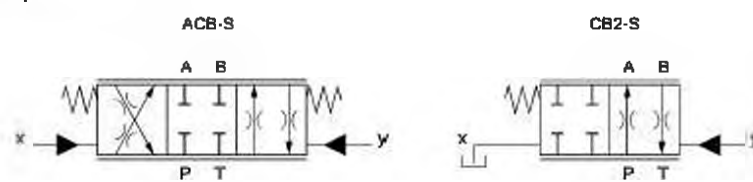
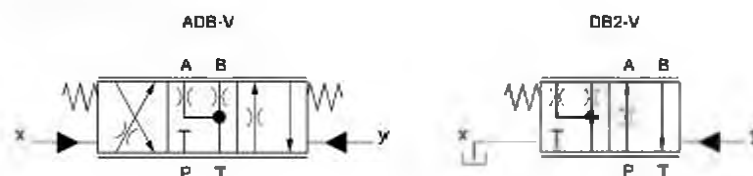
Pilot operated proportional spool valve in screw-in cartridge construction. Precise spool fit, low leakage, long service life time. Spool made of hardened steel. The valve is controlled externally through a pilot pressure via the x and y connections. Without control, the piston is held in the central position by a spring. Proportional to the pilot pressure, the spool opening and the valve volume flow increase. Thanks to the optimum spool form, sensitive movement processes are possible. For the control, Wandfluh proportional pressure valves (see register 2.3) and Wandfluh proportional amplifiers (see register 1.13) are available.

**APPLICATION**

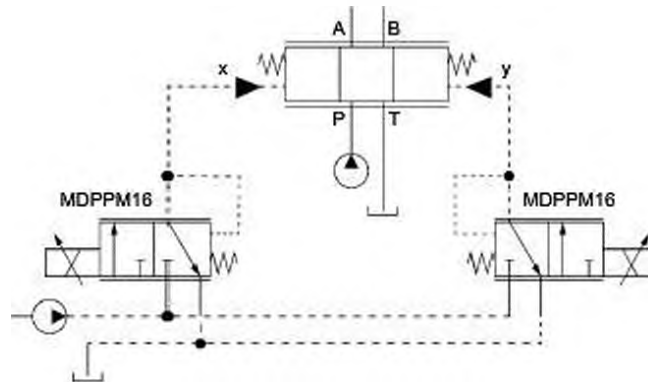
Proportional spool valves are perfectly suitable for demanding tasks due to the high resolution, large volume flow and low hysteresis. The applications are in the industry as well as in the mobile hydraulics for the smooth control of hydraulic actuators. Some examples: rotor blades control of wind generators, forestry and earth moving machines, machine tools and paper production machines with simple position control, robotics and fan control.

**TYPE CODE**

Spool valve	W	V	P	PM42	-	-	-	150	#	
Pilot operated										
Proportional										
Screw-in cartridge M42 x 2										
Designation of symbols acc. to table										
Nominal volume flow rate $Q_N$								150	l/min	
Design index (subject to change)										

**SYMBOL**
**Symmetrical control**

**Master-in control**


## Connection example

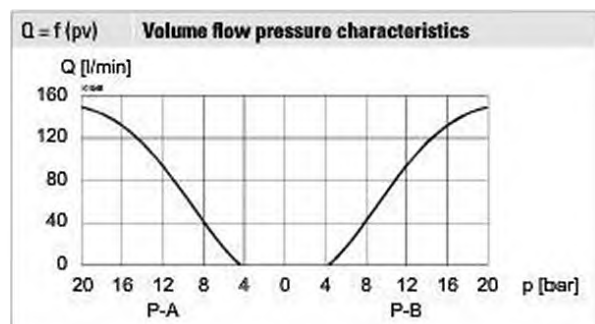
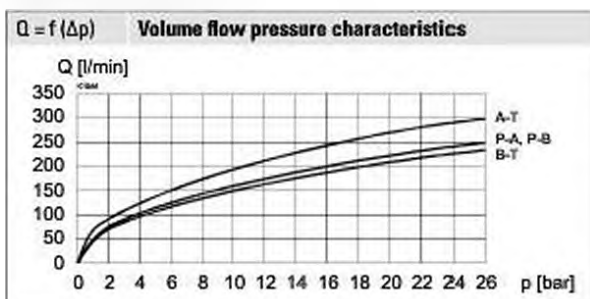

**GENERAL SPECIFICATIONS**

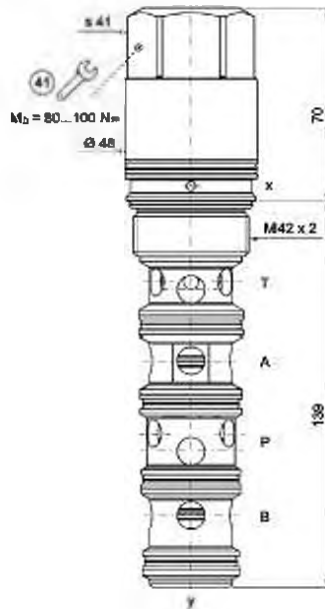
Designation	Proportional spool valve
Construction	Pilot operated
Mounting	Screw-in cartridge type
Nominal size	M42 x 2 according to Wandfluh standard
Actuation	Pilot valve
Ambient temperature	-30 ... +90 °C
Weight	1,4 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

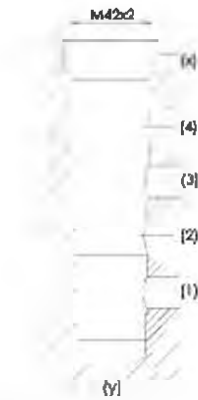
Working pressure	$p_{max} = 315 \text{ bar}$
Maximum volume flow	$Q_{max} = 250 \text{ l/min}$ , see characteristics
Nominal volume flow	$Q_N = 150 \text{ l/min}$
Leakage volume flow	P → T (at 200 bar): < 0,5 l/min
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range	-20 ... +70 °C
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard


**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1052

**ACCESSORIES**

Proportional pressure valves	Register 2.3
Proportional amplifier	Register 1.13
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**ACTUATION**

Actuation	Pilot control
Minimum pilot pressure	4,5 bar
Maximum pilot pressure	30 bar

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M42 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_2 = 80 \dots 100 \text{ Nm}$ Screw-in cartridge

**SURFACE TREATMENT**

The external parts of the cartridge body are zinc / nickel coated

**STANDARDS**

Mounting interface	Wandfluh standard
Contamination efficiency	ISO 4406

**SEALING MATERIAL**

NBR as standard





## GENERAL SPECIFICATIONS

Designation	Proportional spool valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	3/4"-16 UNF according to Wandfluh standard
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C if >50 °C, $I_a$ is only conditionally achievable
Weight	0,65 kg (W) 0,75 kg (M)
MTTFd	150 years

## ELECTRICAL SPECIFICATIONS

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 550$ mA (W), $560$ mA (M), $U_x = 24$ VDC $I_a = 1100$ mA (W), $1080$ mA (M), $U_x = 12$ VDC

**Note!** Other electrical specifications see data sheet 1.1-169 (slip-on coil W) and 1.1-171 (slip-on coil M)



## ACTUATION

Actuation	Proportional solenoid, wet pin pull and push type, pressure tight
Execution	W.E37 / 16 x 40 (Data sheet 1.1-169) M.E35 / 16 x 40 (Data sheet 1.1-171)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

## HYDRAULIC SPECIFICATIONS

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{T,max} = 250$ bar
Maximum volume flow	$Q_{max} = 23$ l/min, see characteristics
Leakage oil	See characteristics
Hysteresis	≤ 5 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade β <sub>6</sub> ...10 ≥ 75, see data sheet 1.0-50

## MANUAL OVERRIDE

Optionally: HP

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## SURFACE TREATMENT

- ◆ The cartridge body is gas-nitro-carburised
- ◆ The armature tube is zinc coated
- ◆ The slip-on coil is zinc- / nickel-coated

## ACCESSORIES

Mating connector grey (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

## STANDARDS

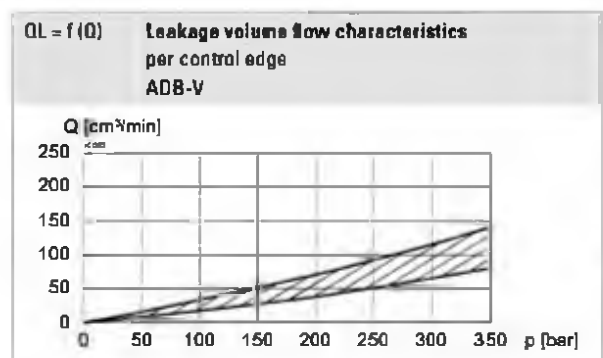
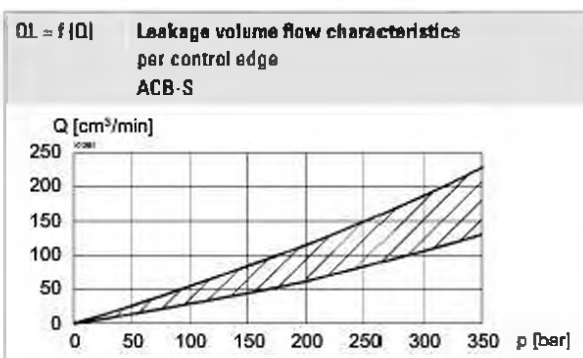
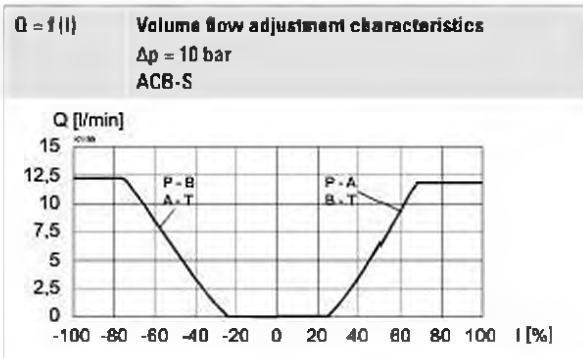
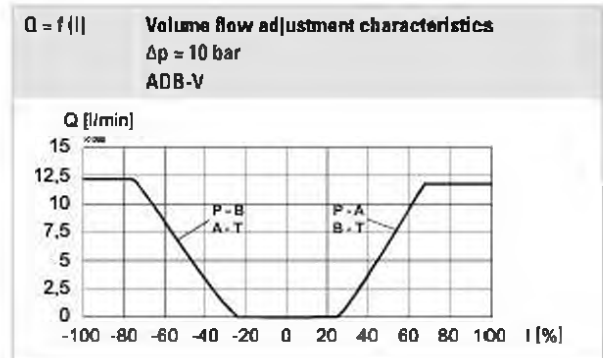
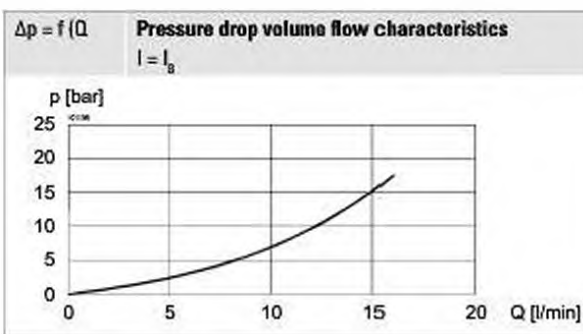
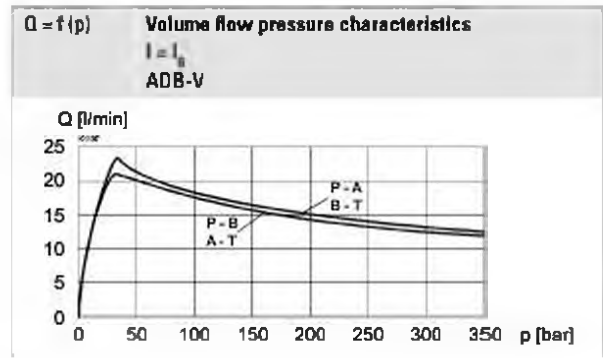
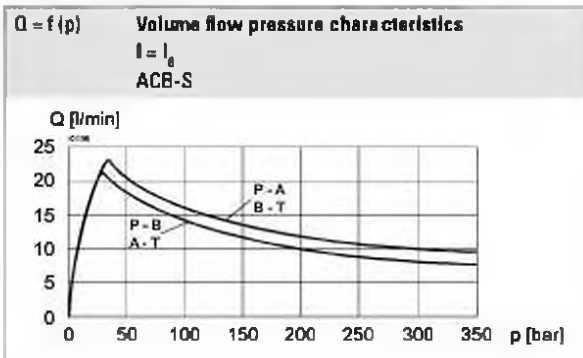
Cartridge cavity	Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## INSTALLATION NOTES

Mounting type	Screw-in cartridge type 3/4"-16 UNF
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 30$ Nm Screw-in cartridge $M_0 = 5$ Nm knurled nut

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$

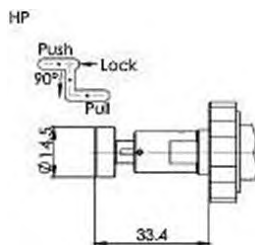
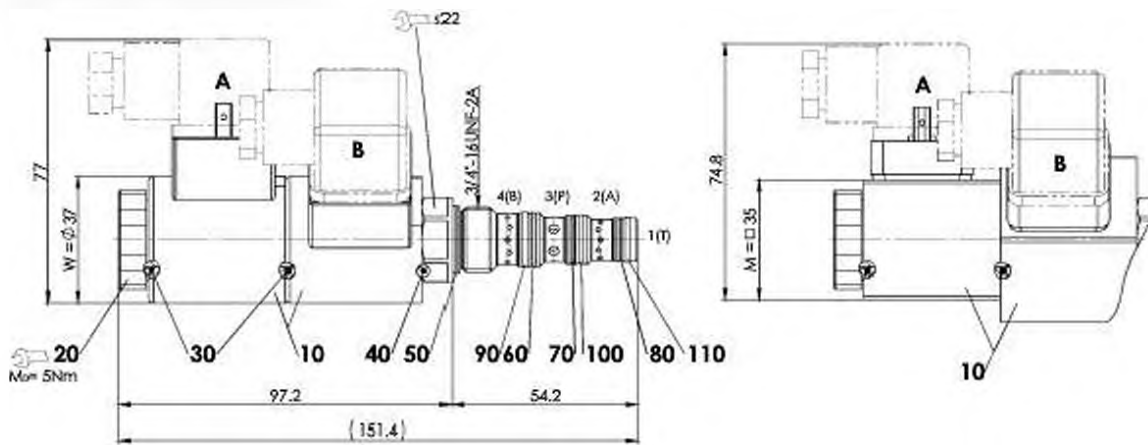


**Note!** All values were measured over two control edges. The connections A and B were short-circuited.



**DIMENSIONS**

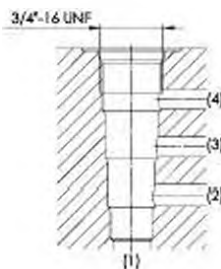
4/3-way spool valve (spring centred)



**Attention!** The actuation of the manual override is possible up to a tank pressure of approx. 100 bar. The manual override cannot be retrofitted.

**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard



**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1055 and 2.13-1056


**PARTS LIST**

Position	Article	Description
10	206.2... 260.4...	WE37 / 16 x 40 M.E35 / 16 x 40
20	154.2600	Knurled nut M16 x 1 x 9
30	160.2170	O-ring ID 17,17 x 1,78 (NBR)
40	160.1162	O-ring ID 16,00 x 1,25 (NBR)
50	160.2156 160.6156	O-ring ID 15,60 x 1,78 (NBR) O-ring ID 15,60 x 1,78 (FKM)
60	160.2120 160.6124	O-ring ID 12,42 x 1,78 (NBR) O-ring ID 12,42 x 1,78 (FKM)
70	160.2111 160.6111	O-ring ID 11,11 x 1,78 (NBR) O-ring ID 11,11 x 1,78 (FKM)
80	160.2093 160.6092	O-ring ID 9,25 x 1,78 (NBR) O-ring ID 9,25 x 1,78 (FKM)
90	049.3166	Backup ring rd 13,1 x 16 x 1,4
100	049.3146	Backup ring rd 11,1 x 14 x 1,4
110	049.3136	Backup ring rd 10 x 13 x 1,4



**GENERAL SPECIFICATIONS**

Designation	Proportional spool valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	1/4"-14 UNF according to Wandfluh standard
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C if >50 °C, I <sub>a</sub> is only conditionally achievable
Weight	0,69 kg (W) 0,79 kg (M)
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	I <sub>a</sub> = 560 mA (W), 560 mA (M), U <sub>x</sub> = 24VDC I <sub>a</sub> = 1100 mA (W), 1080 mA (M), U <sub>x</sub> = 12VDC

**Note!** Other electrical specifications see data sheet 1.1-169 (slip-on coil W) and 1.1-171 (slip-on coil M)


**ACTUATION**

Actuation	Proportional solenoid, wet pin pull and push type, pressure tight
Execution	W.E37 / 16 x 40 (Data sheet 1.1-169) M.E35 / 16 x 40 (Data sheet 1.1-171)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**HYDRAULIC SPECIFICATIONS**

Working pressure	p <sub>max</sub> = 350 bar
Tank pressure	p <sub>T,max</sub> = 250 bar
Maximum volume flow	Q <sub>max</sub> = 28 l/min, see characteristics
Leakage oil	See characteristics
Hysteresis	≤ 5 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade β <sub>6</sub> ...10 ≥ 75, see data sheet 1.0-50

**MANUAL OVERRIDE**

Optionally: HP

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The cartridge body is gas-nitro-carburised
- ◆ The armature tube is zinc coated
- ◆ The slip-on coil is zinc- / nickel-coated

**ACCESSORIES**

Mating connector grey (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

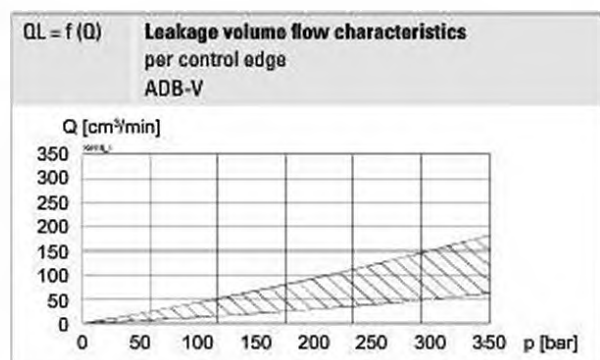
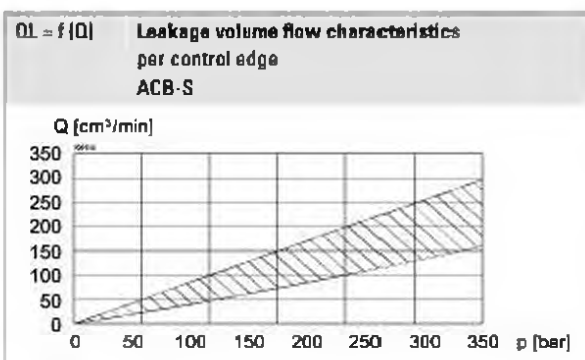
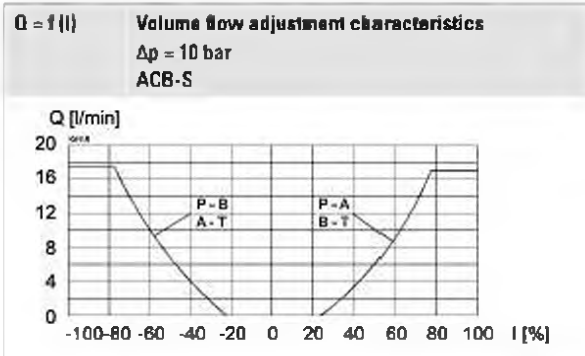
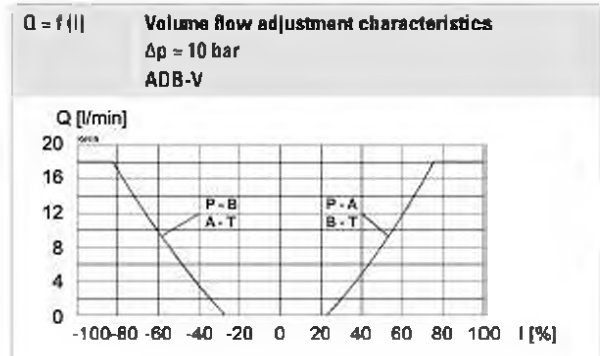
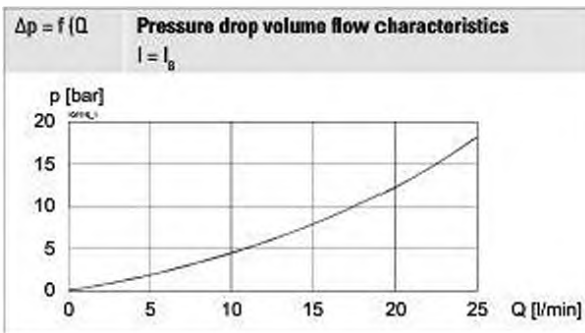
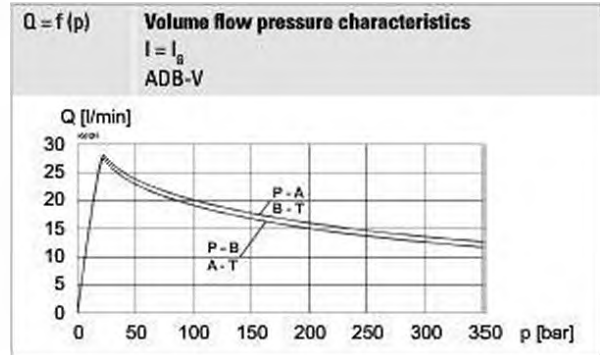
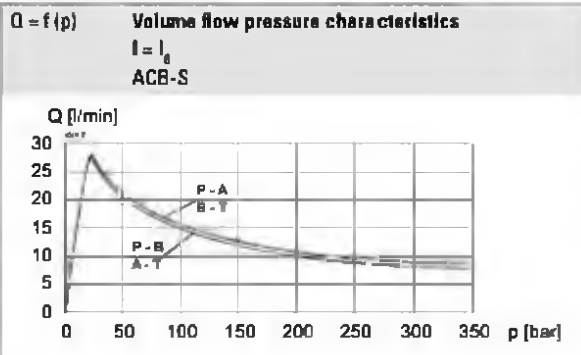
**STANDARDS**

Cartridge cavity	Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge type 1/4"-14 UNF
Mounting position	Any, preferably horizontal
Tightening torque	M <sub>0</sub> = 50 Nm Screw-in cartridge M <sub>0</sub> = 5 Nm knurled nut

**PERFORMANCE SPECIFICATIONS**

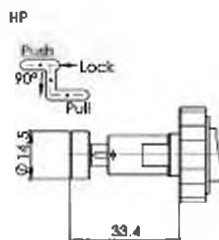
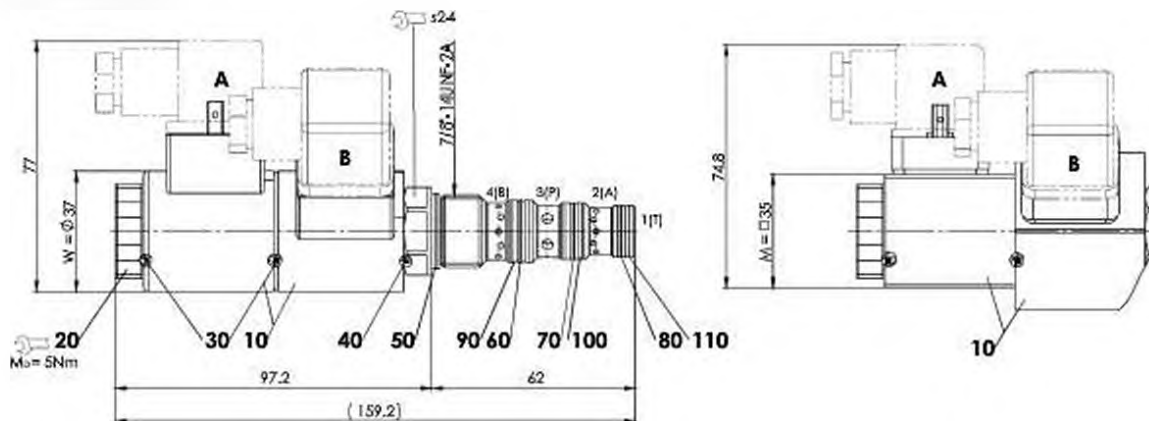
 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**Note!** All values were measured over two control edges. The connections A and B were short-circuited.



**DIMENSIONS**

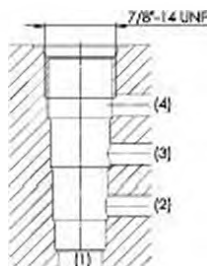
4/3-way spool valve



**Attention!** The actuation of the manual override is possible up to a tank pressure of approx. 100 bar. The manual override cannot be retrofitted.


**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard



**Attention!** For detailed cavity drawing and cavity tools see data sheet 2.13-1057


**PARTS LIST**

Position	Article	Description
10	206.2...	W.E37 / 16 x 40
	260.4...	M.E35 / 16 x 40
20	157.2600	Knurled nut M 16 x 1 x 9
30	160.2156	O-ring ID 15,60 x 1,78 (NBR)
40	160.1162	O-ring ID 16,00 x 1,25 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
80	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.6124	O-ring ID 12,42 x 1,78 (FKM)
90	049.3196	Backup ring rd 16,1 x 19 x 1,4
100	049.3177	Back-up ring sd 14,6 x 17,5 x 1,4
110	049.3166	Backup ring rd 13,1 x 16 x 1,4



## Proportional spool valve with integrated electronics

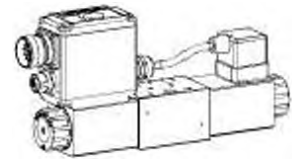
### Flange construction

- ◆ direct operated
- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆  $Q_{Nmax} = 12 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

### DESCRIPTION

Direct operated proportional spool valve with 4 connections in 5-chamber system with integrated electronics. The Plug & Play valves are factory set and adjusted and have therefore a high valve-to-valve reproducibility. With protection class IP67 for the electronics, these valves are suitable for harsh environmental conditions. Proportional to the electronically transmitted command value, the spool stroke, the spool opening and the valve volume flow increase. The control takes place via an analogue interface or a fieldbus interface (CANopen, J1939 or Profibus DP). The parameterisation takes place by means of the free of cost parameterisation and diagnostics software «PASO» or via fieldbus interface. The USB parameterisation interface is accessible through a screw plug. As an option, these valves are available with integrated controller. As feedback value generators sensors with voltage or current output can be connected directly. The available controller structures are optimised for applications with hydraulic actuations.

### NG4-Mini Wandfluh standard



### APPLICATION

Proportional spool valves are perfectly suitable for demanding tasks due to the high resolution, large volume flow and low hysteresis. The applications are in the industry as well as in the mobile hydraulics for the smooth control of hydraulic actuators. Some examples: control of the rotor blades of wind generators, forestry and earth moving machines, machine tools and paper production machines, simple position controls, robotics and fan control. Miniature valves are used where both, reduced dimensions and weight are important.

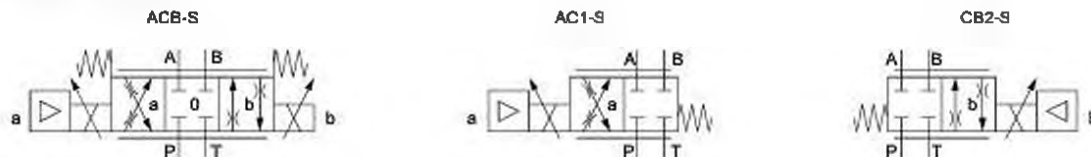
#### Note!



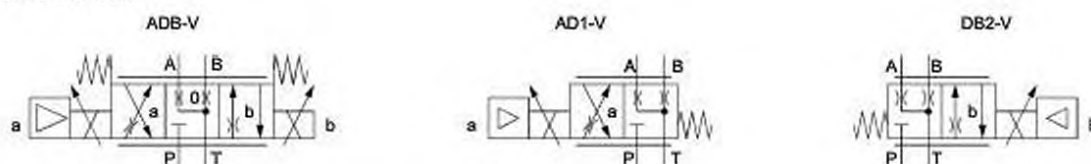
„PASO“ is a Windows program in the flow diagram style, which enables the intuitive adjustment and storing of all variable parameters. The data remain saved in case of a power failure and can also be reproduced and transferred to other DSV.

### SYMBOL

#### Symmetrical control



#### Meter-in control



### ELECTRICAL SPECIFICATIONS

Protection class	IP67 with suitable mating connector and closed housing cover
Ramps	Adjustable
Parameterisation	Via fieldbus or USB
Supply voltage	12 VDC, 24 VDC

**Note!** Exact electrical specifications and detailed description of «DSV» electronics can be found on data sheet 1.13-76.



### ACTUATION

Actuation	Proportional solenoid, wet pin push type, pressure tight
Connection	Via device receptacle

**TYPE CODE**

		W D P F A04 - [ ] - [ ] - [ ] / N E [ ] [ ] - [ ] [ ] # [ ]									
Signal valve											
Direct operated											
Proportional											
Flange construction											
Mounting interface according to Wandfluh standard, NG4-Mini											
Designation of symbols acc. to table											
Nominal volume flow rate $Q_n$	4 l/min 8 l/min	[4] [8]	12 l/min	[12]							
Nominal voltage $U_n$	12 VDC 24 VDC	[G12] [G24]									
Slip-on coil	Metal housing square with one-sided collar										
Connection execution	Integrated electronics										
Hardware configuration											
Analog command value signal	12 pole	[A2]	7 pole	[D2]	(-10 ... 10 V preset)						
Analog command value signal	12 pole	[A4]	7 pole	[D4]	(4 ... 20 mA preset)						
CANopen according to DSP-408		[C1]									
Profibus DP according to Fluid Power Technology		[P1]									
CAN J1939 (on request)		[J1]									
Function											
Amplifier											
Controller with current feedback value signal (0 ... 20 mA / 4 ... 20 mA)	[R1]										
Controller with voltage feedback value signal (0 ... 10 V)	[R2]										
Sealing material	NBR FKM (Viton)									[D1]	
Manual override	integrated Push-button Spindle									[HFI] [RST]	
Design index (subject to change)											

1 10-2040


**GENERAL SPECIFICATIONS**


Designation	Proportional spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Proportional solenoid
Ambient temperature	-20 ... +65 °C The upper temperature limit is a guideline for typical applications, in individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions „DSV“.
Weight	1,8 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**


Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{Tmax} = 160$ bar
Maximum volume flow	$Q_{max} = 20$ l/min, see characteristics
Nominal volume flow	$Q_n = 4, 8, 12$ l/min
Leakage oil	On request
Hysteresis	≤ 6 %
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 10 ... 16 ≥ 75, see data sheet 1.0-50


**ELECTRICAL CONNECTION**


X1	Analog interface (Main)
Device receptacle	M23, 12 pole male
	1 = Supply voltage + 2 = Supply voltage 0 VDC 3 = Stabilised output voltage 4 = Command value signal voltage + 5 = Command value signal voltage - 6 = Command value signal current + 7 = Command value signal current - 8 = Reserved for extensions 9 = Reserved for extensions 10 = Enable signal (Digital input) 11 = Error signal (Digital output) 12 = Chassis
Command value signal voltage (PIN 4/5) resp. current (PIN 6/7) are selected with parameterisation and diagnostics software PASO.	


X1	Fieldbus interface (Main)
Device receptacle	M12, 4 pole male
	1 = Supply voltage + 2 = Reserved for extensions 3 = Supply voltage 0 VDC 4 = Chassis

X2	Parameterisation interface
USB, Mini B	Under the screw plug of the housing cover Factory set

X1	Analog interface (Main)
Device receptacle	Connector DIN EN 175201 - 804
	7 pole male A = Supply voltage + B = Supply voltage 0 VDC C = Not connected D = Command value signal + E = Command value signal - F = Not connected G = Chassis
Command value signal: current (D4) or voltage (D2) to specify when placing the order	

X3	Profibus interface according to IEC 947-5-2
Device receptacle	M12, 5 pole female B-coded
	1 = VP 2 = RxD / TxD - N 3 = DGND 4 = RxD / TxD - P 5 = Shield

X3	CANopen interface according to DRP 303-1
Device receptacle	M12, 5 pole male
	1 = Not connected 2 = Not connected 3 = CAN Gnd 4 = CAN High 5 = CAN Low

X4 (controller only)	Feedback value interface (sensor)
Device receptacle	M12, 5 pole female
	1 = Supply voltage (output) + 2 = Feedback value signal + 3 = Supply voltage 0 VDC 4 = Not connected 5 = Stabilised output voltage
Feedback value signal: current (R1) or voltage (R2) to specify when placing the order	

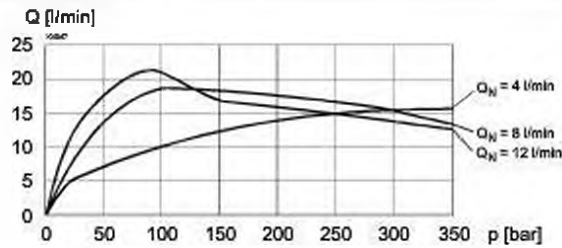
**Note!** The mating connector is not included in the delivery



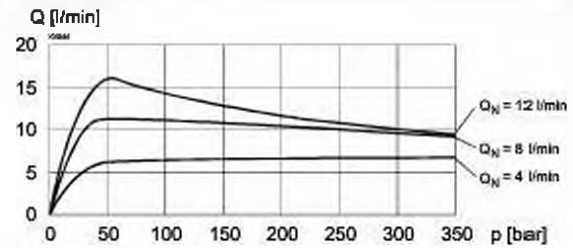
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

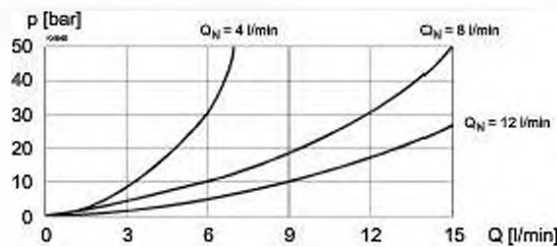
$Q = f(p)$  **Volume flow pressure characteristics**  
 S = 100 %  
 ACB-S, AC1-S, CB2-S



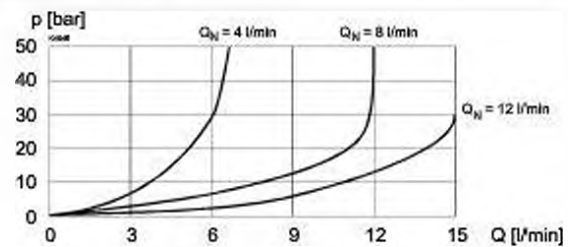
$Q = f(p)$  **Volume flow pressure characteristics**  
 S = 100 %  
 ADB-V, AD1-V, DB2-V



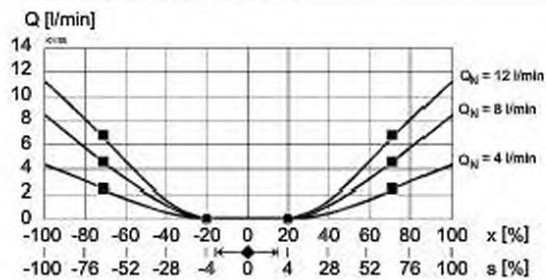
$\Delta p = f(Q)$  **Pressure drop volume flow characteristics**  
 S = 100 %  
 ACB-S, AC1-S, CB2-S



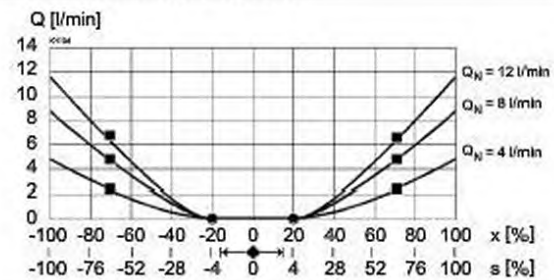
$\Delta p = f(Q)$  **Pressure drop volume flow characteristics**  
 S = 100 %  
 ADB-V, AD1-V, DB2-V



$Q = f(s, x)$  **Volume flow adjustment characteristics**  
 $\Delta p = 10 \text{ bar}$ , s = Command value signal, x = spool stroke  
 ACB-S, AC1-S, CB2-S



$Q = f(s, x)$  **Volume flow adjustment characteristics**  
 $\Delta p = 10 \text{ bar}$ , s = Command value signal, x = spool stroke  
 ADB-V, AD1-V, DB2-V

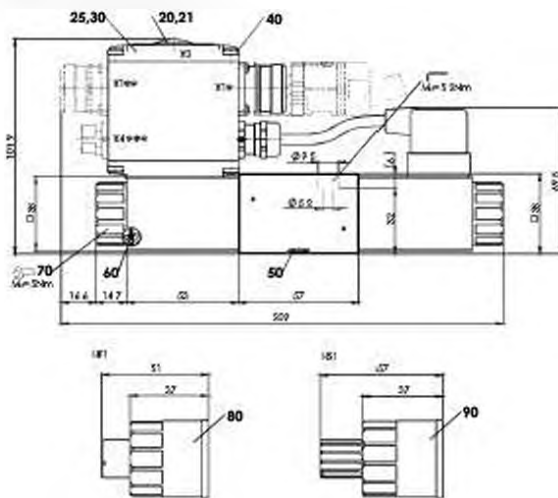
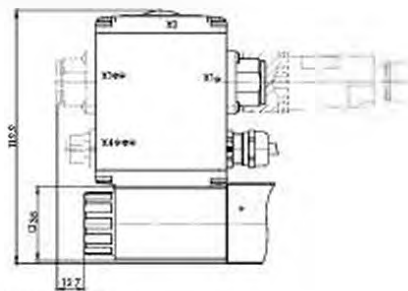


**Note!** All values were measured over two control edges. The connections A and B were short-circuited.

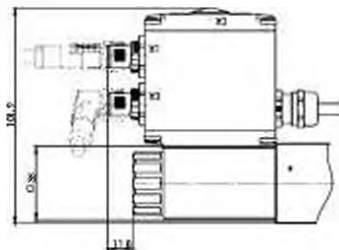
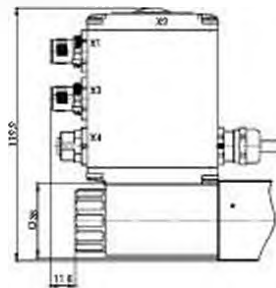

**FACTORY SETTINGS**

Dither set for optimum hysteresis

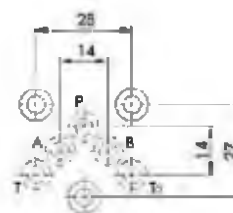
- ◆ = Deadband: Both solenoids switched off at command value signal -2%... 2%
- = Opening pressure at command value signal + / - 4%
- = Flow at  $\Delta p = 10 \text{ bar}$  over two control edges + / - 70% command value signal

**DIMENSIONS**
**With analog interface, 12 pole connector**
**Amplifier and controller**

**With analog interface, 7 pole connector**
**Amplifier and controller**


\* For amplifier  
 \*\* For controller  
 \*\*\* Only controller

**With fieldbus interface**
**Amplifier**

**With fieldbus interface**
**Controller**

**PARTS LIST**

Position	Article	Description
20	223.1317	Dummy plug M16 x 1,5
21	160.6131	O-ring ID 13,00 x 1,5 (FKM)
25	062.0102	Cover
30	072.0021	Gasket 33,2 x 59,9 x 2
40	208.0100	Socket head screw M4 x 10
50	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)
60	160.2187	O-ring ID 18,72 x 2,62 (NBR)
70	154.2700	Knurled nut
80	253.7004	Push-button
90	253.7002	Spindle

**HYDRAULIC CONNECTION**


## COMMISSIONING

For DSV amplifiers as a rule no parameter adjustments by the customer are required. The plugs have to be connected in accordance with the chapter «Electrical connection».

Controllers are supplied configured as amplifiers. The adjustment of the mode of control and of the controller are carried out by the customer by means of the software adjustment (USB interface, Mini B). Further information can be found

Free-of-charge download of the «PASQ» software and the operation instructions for «DSV» hydraulic valves as well as the operation instructions CANopen Protocol resp. Profibus DP Protocol, with Device Profile DSP-408 for «DSV».

**Note!** The mating connectors and the parameterisation cable are not part of the delivery. Refer to chapter «Accessories».



## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## SURFACE TREATMENT

- ◆ The valve body is painted with a two component paint
- ◆ The slip-on coil and the armature tube are zinc nickel coated
- ◆ The electronics housing / chassis is made of aluminium

## INSTALLATION NOTES

Mounting type	Flange mounting 3 fixing holes for socket head screws M5 x 40
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_1 = 5 \text{ Nm}$ knurled nut

**Note!** The length of the fixing screw depends on the base material of the connection element.



## ACCESSORIES

Parameterisation software	See start-up
Parameterisation cable for interface USB (from plug type A on Mini B, 3 m)	Article no. 219.2896
<b>Mating connector (plug female) for analog interface</b>	
straight, soldering contact M23, 12 pole	Article no. 219.2330
angled, soldering contact M23, 12 pole	Article no. 219.2331
straight, soldering contact, 7 pole	Article no. 219.2335
Threaded subplates	Data sheet 2.9-10
Multi-station subplates	Data sheet 2.9-50
Module type manifold blocks	Data sheet 2.9-90
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**Note!** Auxiliary conditions for the cable:

- External diameter 12 pol: 3,5 ... 14,7 mm
- External diameter 7 pol: 8 ... 10 mm
- Wire cross section max. 1 mm<sup>2</sup>
- Recommended wire cross section:  
0 ... 25 m = 0,75 mm<sup>2</sup> (AWG18)  
25 ... 50 m = 1 mm<sup>2</sup> (AWG17)



## STANDARDS

CANopen	DRP 303-1
Profibus DP	IEC 947-5-2
Mounting interface	Wandfluh standard
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## MANUAL OVERRIDE

- ◆ Integrated (–) Actuation pin integrated in the armature tube. Actuation by pressing the pin
- ◆ Push-button (HF1) Integrated in the knurled nut. Actuation by pressing the push-button
- ◆ Spindle (HS1) Integrated in the knurled nut. Actuation by turning the spindle (continuously variable valve actuation)

**Attention!** The actuation of the manual override is possible up to a tank pressure of:

- 160 bar Integrated (–)
- 160 bar Push-button (HF1)
- 160 bar Spindle (HS1)



## Proportional spool valve with integrated electronics

### Flange construction

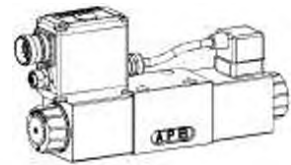
- ◆ direct operated
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $Q_{Kmax} = 32 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

### DESCRIPTION

Direct operated proportional spool valve with 4 connections in 5-chamber system with integrated electronics. The Plug & Play valves are factory set and adjusted and have therefore a high valve-to-valve reproducibility. With protection class IP67 for the electronics, these valves are suitable for harsh environmental conditions. Proportional to the electronically transmitted command value, the spool stroke, the spool opening and the valve volume flow increase. The control takes place via an analogue interface or a fieldbus interface (CANopen, J1939 or Profibus DP). The parameterisation takes place by means of the free of cost parameterisation and diagnostics software «PASO» or via fieldbus interface. The USB parameterisation interface is accessible through a screw plug. As an option, these valves are available with integrated controller. As feedback value generators sensors with voltage or current output can be connected directly. The available controller structures are optimised for applications with hydraulic actuations.

### NG6

ISO 4401-03



### APPLICATION

Proportional spool valves are perfectly suitable for demanding tasks due to the high resolution, large volume flow and low hysteresis. The applications are in the industry as well as in the mobile hydraulics for the smooth control of hydraulic actuators. Some examples: control of the rotor blades of wind generators, forestry and earth moving machines, machine tools and paper production machines, simple position controls, robotics and fan control.

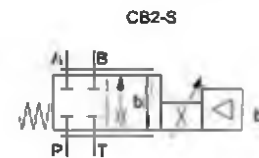
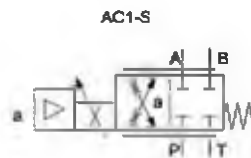
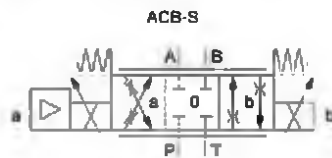
#### Note!



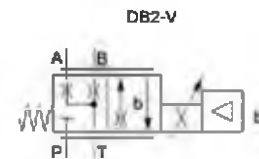
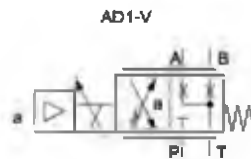
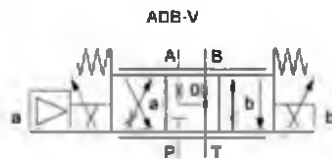
„PASO“ is a Windows program in the flow diagram style, which enables the intuitive adjustment and storing of all variable parameters. The data remain saved in case of a power failure and can also be reproduced and transferred to other DSV.

### SYMBOL

#### Symmetrical control



#### Meter-in control



### ELECTRICAL SPECIFICATIONS

Protection class	IP67 with suitable mating connector and closed housing cover
Ramps	Adjustable
Parameterisation	Via fieldbus or USB
Supply voltage	12 VDC, 24 VDC

**Note!** Exact electrical specifications and detailed description of «DSV» electronics can be found on data sheet 1.13-76.



### ACTUATION

Actuation	Proportional solenoid, wet pin push type, pressure tight
Connection	Via device receptacle

**TYPE CODE**

		W D P F A06 - <input type="text"/> - <input type="text"/> - <input type="text"/> / M E <input type="text"/> <input type="text"/> - <input type="text"/> <input type="text"/> # <input type="text"/>			
Spool valve					
Direct operated					
Proportional					
Flange construction					
International standard interface ISO, NG6					
Designation of symbols acc. to table					
Nominal volume flow rate $Q_n$	5 l/min 10 l/min	<input type="text" value="5"/> <input type="text" value="10"/>	16 l/min 32 l/min	<input type="text" value="16"/> <input type="text" value="32"/>	
Nominal voltage $U_n$	12 VDC 24 VDC	<input type="text" value="G12"/> <input type="text" value="G24"/>			
Slip-on coil	Metal housing square				
Connection execution	Integrated electronics				
Hardware configuration					
Analog command value signal	12 pole	<input type="text" value="A2"/>	7 pole	<input type="text" value="D2"/>	(-10 ... 10 V preset)
Analog command value signal	12 pole	<input type="text" value="A4"/>	7 pole	<input type="text" value="D4"/>	(4 ... 20 mA preset)
CANopen according to DSP-408	<input type="text" value="C1"/>				
Profibus DP according to Fluid Power Technology	<input type="text" value="P1"/>				
CAN J1939 (on request)	<input type="text" value="J1"/>				
Function					
Amplifier	<input type="text"/>				
Controller with current feedback value signal (0 ... 20 mA / 4 ... 20 mA)	<input type="text" value="R1"/>				
Controller with voltage feedback value signal (0 ... 10 V)	<input type="text" value="R2"/>				
Sealing material	NBR FKM (Viton)				<input type="text" value="D1"/>
Manual override	integrated Push-button Spindle				<input type="text" value="HF1"/> <input type="text" value="RST"/>
Design index (subject to change)					

1 10-2040

**GENERAL SPECIFICATIONS**


Designation	Proportional spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Proportional solenoid
Ambient temperature	-20 ... +65 °C The upper temperature limit is a guideline for typical applications, in individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions „DSV“.
Weight	2,8 kg
MTTFd	150 years


**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{min} = 160$ bar
Maximum volume flow	$Q_{max} = 40$ l/min, see characteristics
Nominal volume flow	$Q_n = 5, 10, 16, 32$ l/min
Leakage oil	On request
Hysteresis	≤ 6 %
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 10 ... 16 ≥ 75, see data sheet 1.0-50





**ELECTRICAL CONNECTION**


X1	Analog interface (Main)
Device receptacle	M23, 12 pole male
	1 = Supply voltage + 2 = Supply voltage 0 VDC 3 = Stabilised output voltage 4 = Command value signal voltage + 5 = Command value signal voltage - 6 = Command value signal current + 7 = Command value signal current - 8 = Reserved for extensions 9 = Reserved for extensions 10 = Enable signal (Digital input) 11 = Error signal (Digital output) 12 = Chassis
Command value signal voltage (PIN 4/5) resp. current (PIN 6/7) are selected with parameterisation and diagnostics software PASO.	


X1	Fieldbus interface (Main)
Device receptacle	M12, 4 pole male
	1 = Supply voltage + 2 = Reserved for extensions 3 = Supply voltage 0 VDC 4 = Chassis

X2	Parameterisation interface
USB, Mini B	Under the screw plug of the housing cover
	Factory set

X1	Analog interface (Main)
Device receptacle	Connector DIN EN 175201 - 804
	7 pole male A = Supply voltage + B = Supply voltage 0 VDC C = Not connected D = Command value signal + E = Command value signal - F = Not connected G = Chassis
Command value signal: current (D4) or voltage (D2) to specify when placing the order	

X3	Profibus interface according to IEC 947-5-2
Device receptacle	M12, 5 pole female B-coded
	1 = VP 2 = RxD / TxD - N 3 = DGND 4 = RxD / TxD - P 5 = Shield

X3	CANopen interface according to DRP 303-1
Device receptacle	M12, 5 pole male
	1 = Not connected 2 = Not connected 3 = CAN Gnd 4 = CAN High 5 = CAN Low

X4 (controller only)	Feedback value interface (sensor)
Device receptacle	M12, 5 pole female
	1 = Supply voltage (output) + 2 = Feedback value signal + 3 = Supply voltage 0 VDC 4 = Not connected 5 = Stabilised output voltage
Feedback value signal: current (R1) or voltage (R2) to specify when placing the order	

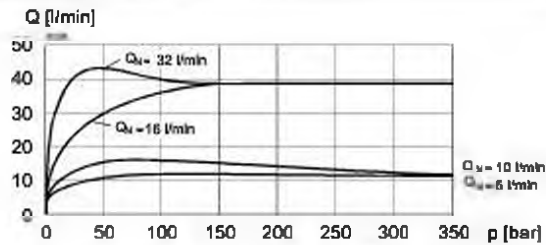
**Note!** The mating connector is not included in the delivery



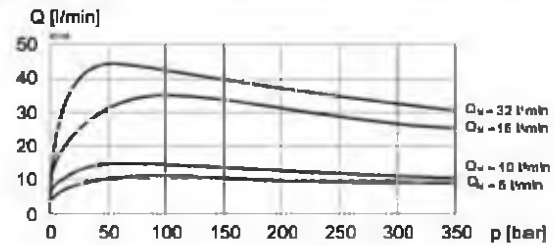
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

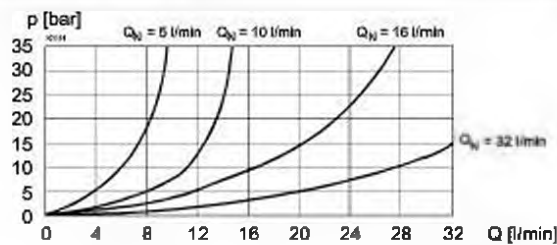
$Q = f(p)$  **Volume flow pressure characteristics**  
 S = 100%  
 ACB-S, AC1-S, CB2-S



$Q = f(p)$  **Volume flow pressure characteristics**  
 S = 100%  
 ADB-V, AD1-V, DB2-V



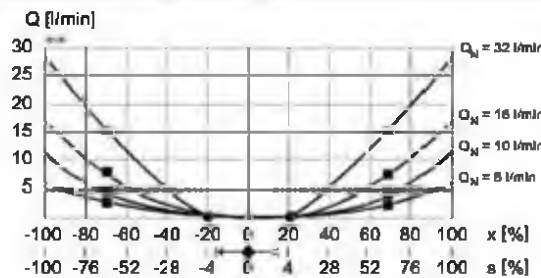
$\Delta p = f(Q)$  **Pressure drop volume flow characteristics**  
 S = 100%  
 ACB-S, AC1-S, CB2-S



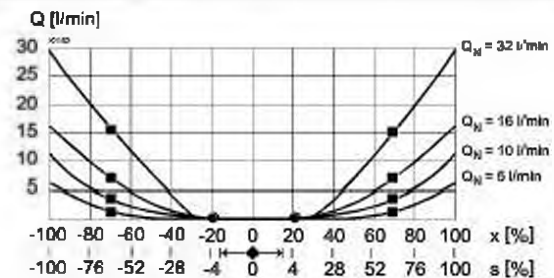
$\Delta p = f(Q)$  **Pressure drop volume flow characteristics**  
 S = 100%  
 ADB-V, AD1-V, DB2-V



$Q = f(s, x)$  **Volume flow adjustment characteristics**  
 $\Delta p = 10 \text{ bar}$ , s = Command value signal, x = spool stroke  
 ACB-S, AC1-S, CB2-S



$Q = f(s, x)$  **Volume flow adjustment characteristics**  
 $\Delta p = 10 \text{ bar}$ , s = Command value signal, x = spool stroke  
 ADB-V, AD1-V, DB2-V



**Note!** All values were measured over two control edges. The connections A and B were short-circuited.

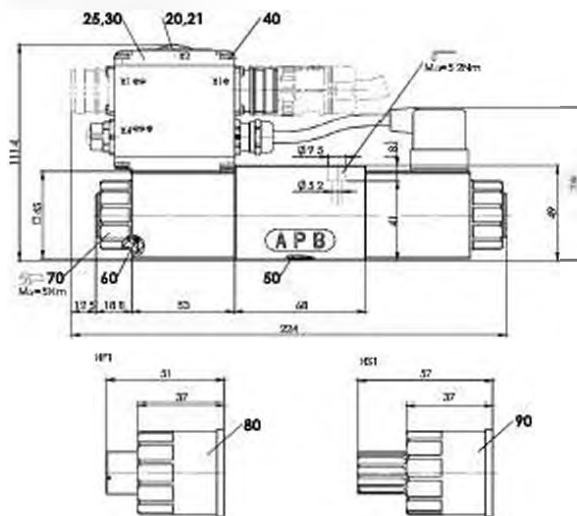

**FACTORY SETTINGS**

Either set for optimum hysteresis

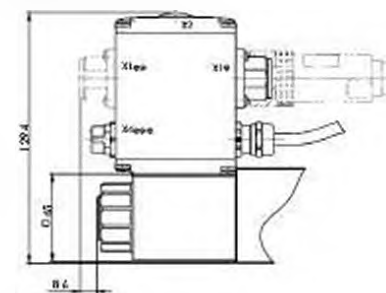
- ◆ = Deadband: Both solenoids switched off at command value signal -2% ... 2%
- = Opening pressure at command value signal +/- 4%
- = Flow at  $\Delta p = 10 \text{ bar}$  over two control edges +/- 70% command value signal

**DIMENSIONS**
**With analog interface, 12 pole connector**

Amplifier and controller

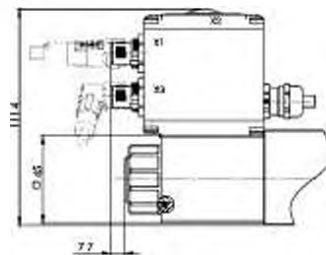

**With analog interface, 7 pole connector**

Amplifier and controller

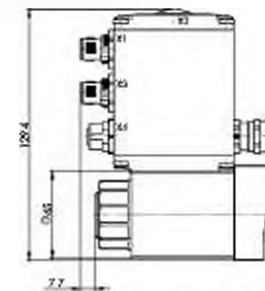

 \* For amplifier  
 \*\* For controller  
 \*\*\* Only controller

**With fieldbus interface**

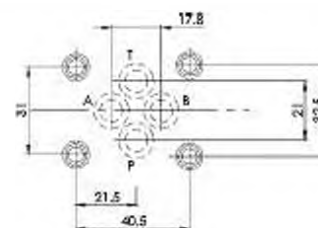
Amplifier


**With fieldbus interface**

Controller


**PARTS LIST**

Position	Article	Description
20	223.1317	Dummy plug M16 x 1,5
21	160.6131	O-ring ID 13,00 x 1,5 (FKM)
25	062.0102	Cover
30	072.0021	Gasket 33,2 x 59,9 x 2
40	208.0100	Socket head screw M4 x 10
50	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
60	160.2222	O-ring ID 22,22 x 2,62 (NBR)
70	154.2701	Knurled nut M23 x 1,5 x 19,7
80	253.7004	Push-button
90	253.7002	Spindle


**HYDRAULIC CONNECTION**


## COMMISSIONING

For DSV amplifiers as a rule no parameter adjustments by the customer are required. The plugs have to be connected in accordance with the chapter «Electrical connection».

Controllers are supplied configured as amplifiers. The adjustment of the mode of control and of the controller are carried out by the customer by means of the software adjustment (USB interface, Mini B). Further information can be found

Free of charge download of the «PASQ» software and the operation instructions for «DSV» hydraulic valves as well as the operation instructions CANopen Protocol resp. Profibus DP Protocol, with Device Profile DSP-408 for «DSV».

**Note!**  The mating connectors and the parameterisation cable are not part of the delivery. Refer to chapter «Accessories».

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## SURFACE TREATMENT

- ◆ The valve body is painted with a two component paint
- ◆ The slip-on coil and the armature tube are zinc nickel coated
- ◆ The electronics housing / chassis is made of aluminium


## INSTALLATION NOTES

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 50
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 5 \text{ Nm}$ knurled nut

**Note!**  The length of the fixing screw depends on the base material of the connection element.

## ACCESSORIES

Parameterisation software	See start-up
Parameterisation cable for interface USB (from plug type A on Mini B, 3 m)	Article no. 219.2896
<b>Mating connector (plug female) for analog interface</b>	
straight, soldering contact M23, 12 pole	Article no. 219.2330
angled, soldering contact M23, 12 pole	Article no. 219.2331
straight, soldering contact, 7 pole	Article no. 219.2335
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**Note!**  Auxiliary conditions for the cable:


- External diameter 9...10,5 mm
- Wire cross section max. 1 mm<sup>2</sup>
- Recommended wire cross section:  
0...25 m = 0,75 mm<sup>2</sup> (AWG18)  
25...50 m = 1 mm<sup>2</sup> (AWG17)

## STANDARDS

CANopen	DRP 303-1
Profibus DP	IEC 947-5-2
Mounting interface	ISO 4401-03
Protection class	EN 60 529
Contamination efficiency	ISO 4406

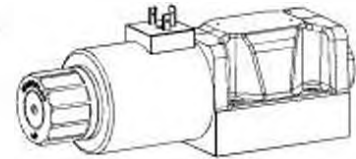
## MANUAL OVERRIDE

- ◆ Integrated (-) Actuation pin integrated in the armature tube. Actuation by pressing the pin
- ◆ Push-button (HF1) Integrated in the knurled nut. Actuation by pressing the push-button
- ◆ Spindle (HS1) Integrated in the knurled nut. Actuation by turning the spindle (continuously variable valve actuation)

**Attention!**  The actuation of the manual override is possible up to a tank pressure of:  
160 bar Integrated (-)  
160 bar Push-button (HF1)  
250 bar Spindle (HS1)

**Proportional spool valve**
**Flange construction**

- ◆  $Q_{max} = 100 \text{ l/min}$
- ◆  $Q_{N=100} = 65 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG10**  
**ISO 4401-05**

**DESCRIPTION**

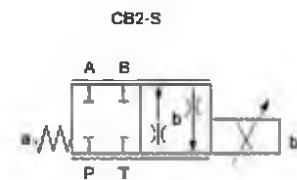
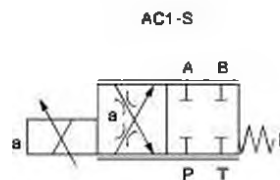
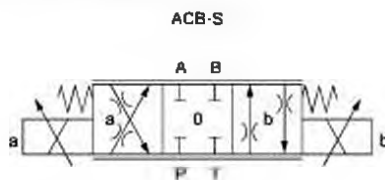
Direct operated proportional spool valve with 4 connections in 5-chamber system. Precise spool fit, low leakage, long service life time. The volume flow adjustment takes place by a Wandfluh proportional solenoid. Proportional to the solenoid current, the spool stroke, the spool opening and the valve volume flow increase. For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

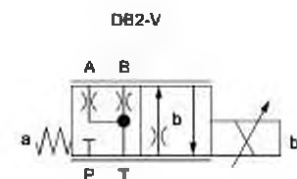
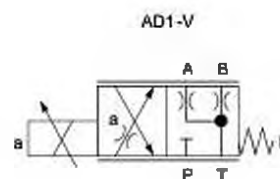
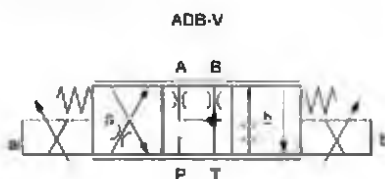
Proportional spool valves are perfectly suitable for demanding tasks due to the high resolution, large volume flow and low hysteresis. The applications are in the industry as well as in the mobile hydraulics for the smooth control of hydraulic actuators. Some examples: control of the rotor blades of wind generators, forestry and earth moving machines, machine tools and paper production machines, simple position controls, robotics and fan control.

**SYMBOL**

Symmetrical control



Meter-in control


**GENERAL SPECIFICATIONS**

Designation	Proportional spool valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C if >50 °C, $I_g$ is only conditionally achievable
Weight	3,9 kg (1 solenoid) 5,4 kg (2 solenoids)

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Tank pressure	$p_{T,max} = 160 \text{ bar}$
Maximum volume flow	$Q_{max} = 100 \text{ l/min}$ , see characteristics
Nominal volume flow	$Q_{N=100} = 65 \text{ l/min}$
Leakage oil	see characteristics
Hysteresis	$\leq 7\%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 $\geq 75$ , see data sheet 1.0-50

**TYPE CODE**

		W	D	P	F	A10	-	-	-	65	-	/					#		
Spool valve																			
Directly operated																			
Proportional																			
Flange construction																			
International standard interface ISO, NG10																			
Designation of symbols acc. to table																			
Nominal volume flow rate $Q_n$	65 l/min																		
Nominal voltage $U_n$	12 VDC																		
	24 VDC	G12																	
	without coil	G24																	
Slip-on coil	Metal housing, round																		
	Metal housing, square	W																	
Connection execution	Connector socket EN 175301-803 / ISO 4400																		
	Connector socket AMP Junior-Timer	J																	
	Connector Deutsch DT04-2P	G																	
Sealing material	NBR																		
	FKM (Viton)	DT																	
Manual override	Integrated																		
	Push-button	HFI																	
	Spindle	HSI																	

Design index (subject to change)

1.10-348

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 2255 \text{ mA}$ ( $U_n = 12\text{VDC}$ ) $I_a = 1105 \text{ mA}$ ( $U_n = 24\text{VDC}$ )

**Note!** Other electrical specifications see data sheet 1.1-190 (slip-on coil W) and 1.1-193 (slip-on coil M)


**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M6 x 40
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screw $M_0 = 10,5 \text{ Nm} \pm 10 \%$ (screw quality 8.8, zinc coated) max. tank pressure 80 bar $M_0 = 13,5 \text{ Nm} \pm 10 \%$ (screw quality 10.9, zinc coated) Knurled nut $M_0 = 5 \text{ Nm}$

**Note!** The length of the fixing screw depends on the base material of the connection element.


**STANDARDS**

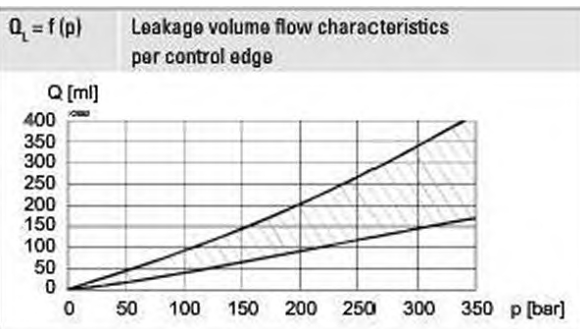
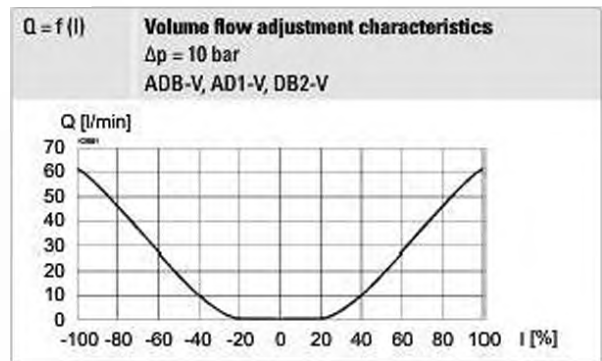
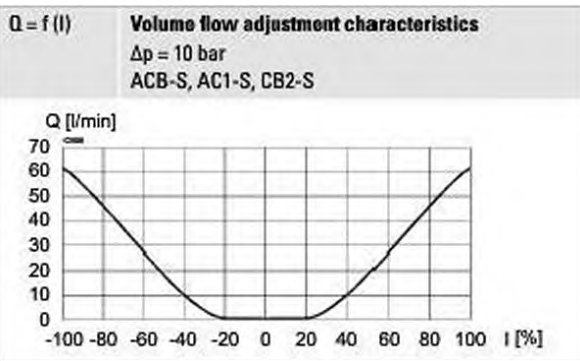
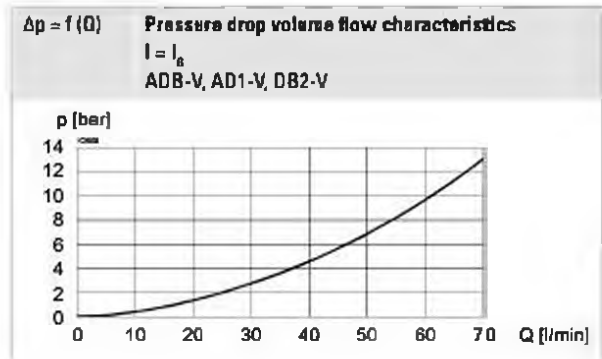
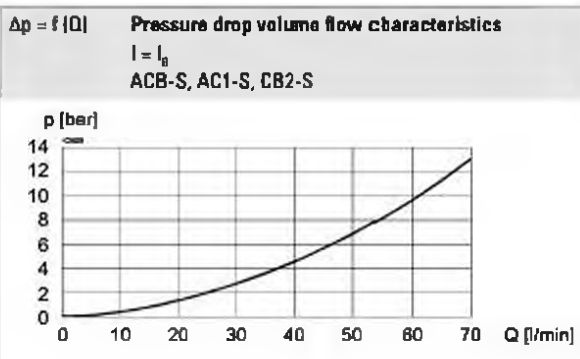
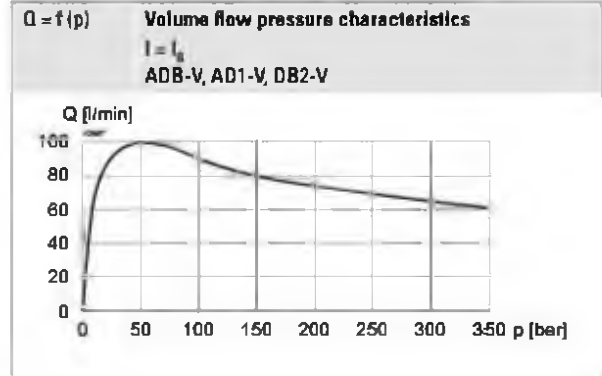
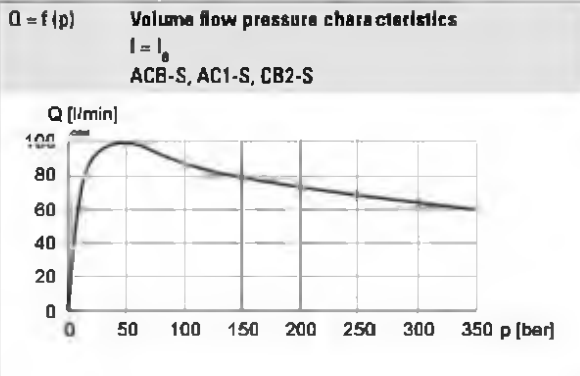
Mounting interface	ISO 4401-05
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	W.E64 / 31 x 72 (Data sheet 1.1-190) M.A60 / 31 x 72 (Data sheet 1.1-193)
Connection	Connector socket EN 175301 - 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 - 2P

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$

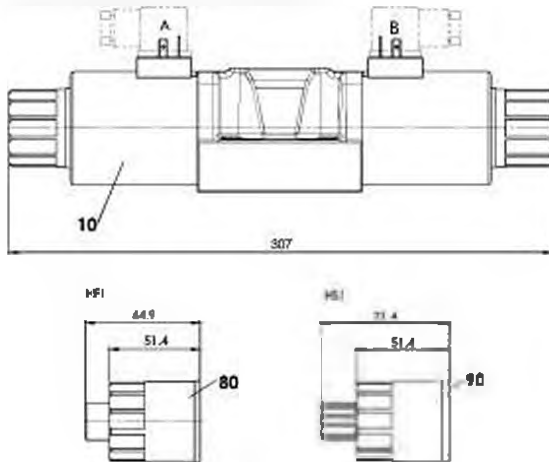


**Note!** All values were measured over two control edges. The connections A and B were short-circuited.

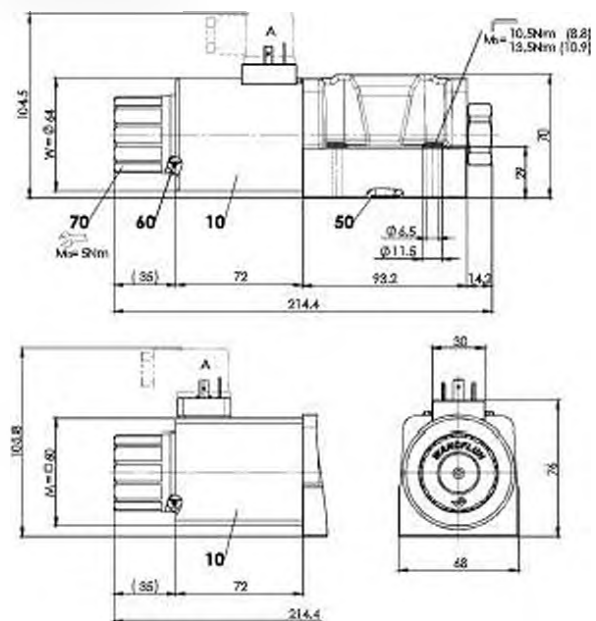
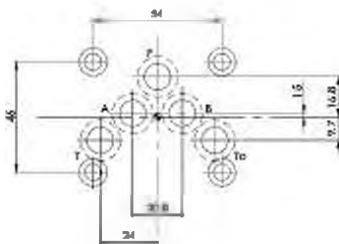


**DIMENSIONS**

4/3-way spool valve (spring centred)



4/2-way spool valve


**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	206.3...	W.E64 / 31 x 72
	260.9...	M.A60 / 31 x 72
50	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.8124	O-ring ID 12,42 x 1,78 (FKM)
60	160.2282	O-ring ID 28,24 x 2,62 (NBR)
70	154.2706	Knurled nut
80	253.7006	HF1-M24
90	253.7005	HS1-M24

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The armature tube, the slip-on coil and the plug screw are zinc-nickel coated

**MANUAL OVERRIDE**

- ◆ Integrated (-) Actuation pin integrated in the armature tube. Actuation by pressing the pin
- ◆ Push-button (HF1) Integrated in the knurled nut. Actuation by pressing the push-button
- ◆ Spindle (HS1) Integrated in the knurled nut. Actuation by turning the spindle (continuously variable valve actuation)

**Attention!** The actuation of the manual override is possible up to a tank pressure of:



- 20 bar Integrated (-)
- 20 bar Push-button (HF1)
- 80 bar Spindle (HS1)

**ACCESSORIES**

Proportional amplifier	Register 1.13
Mating connector gray (A)	Article no. 219.2001
Mating connector black (B)	Article no. 219.2002
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Horizontal mounting blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

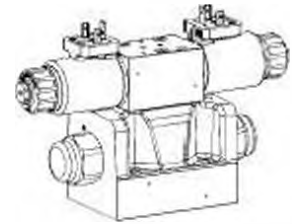


**Proportional spool valve**
**Flange construction**

- ◆ pilot operated
- ◆  $Q_{max} = 200 \text{ l/min}$
- ◆  $Q_{N(11 bar)} = 90 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG10**

ISO 4401-05


**DESCRIPTION**

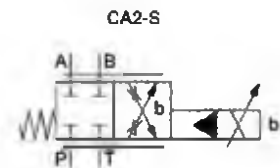
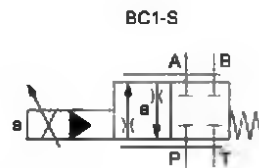
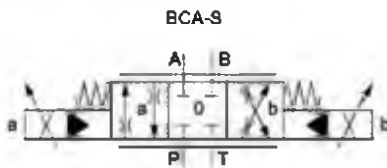
Pilot operated proportional spool valve with 4 connections in 5-chamber system. Precise spool fit, low leakage, long service life time. Very compact construction with corresponding low weight. The pilot valve is a proportional solenoid operated pressure reducing valve. The function of the pilot and main valve as well as the interaction of both valves can be found in the hydraulic diagram. Proportional to the solenoid current, the spool stroke, the spool opening and the valve volume flow increase. The proportional spool valve is not pressure compensated. For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

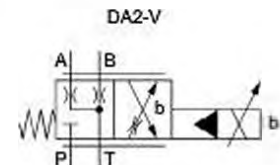
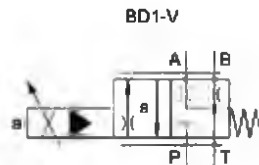
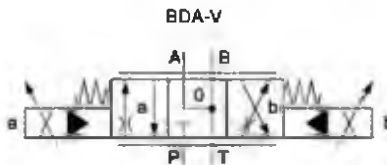
Proportional spool valves are perfectly suitable for demanding tasks due to the high resolution, large volume flow and low hysteresis. Pilot operated valves are used where large volume flows have to be controlled. Due to the large flow range and the high stiffness of the actuation as a result of the pilot control, these valves are suitable for applications where fast acceleration and deceleration processes, high speeds and sensitive motion sequences are required. The applications are in the industrial as well as in the mobile hydraulics for the smooth control of hydraulic actuations.

**SYMBOL**

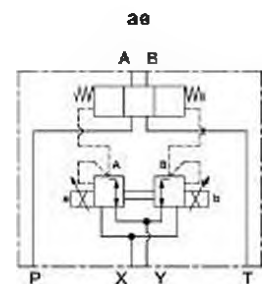
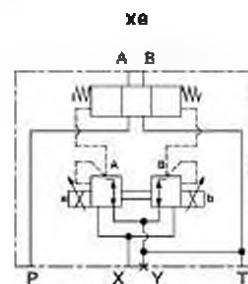
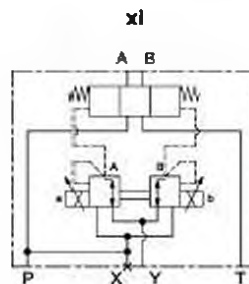
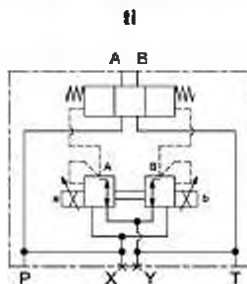
Symmetrical control



Meter-in control



Types of pilot operation



**TYPE CODE**

WVP F A10 -  - 90 -  -  /    #

Spool valve, pilot operated, proportional									
Flange construction									
International standard interface ISO NG10									
Designation of symbols acc. to table									
Nominal volume flow									
Type of pilot operation: Control oil supply (x) and drain (y)	<table border="1"> <tr> <td>(x) and (y) internally</td> <td>ti</td> </tr> <tr> <td>(x) and (y) externally</td> <td>ae</td> </tr> <tr> <td>(x) internally (y) externally</td> <td>xi</td> </tr> <tr> <td>(x) externally (y) internally</td> <td>xe</td> </tr> </table>	(x) and (y) internally	ti	(x) and (y) externally	ae	(x) internally (y) externally	xi	(x) externally (y) internally	xe
(x) and (y) internally	ti								
(x) and (y) externally	ae								
(x) internally (y) externally	xi								
(x) externally (y) internally	xe								
Nominal voltage U <sub>n</sub>	<table border="1"> <tr> <td>12 VDC</td> <td>G12</td> </tr> <tr> <td>24 VDC</td> <td>G24</td> </tr> </table>	12 VDC	G12	24 VDC	G24				
12 VDC	G12								
24 VDC	G24								
Slip-on coil	<table border="1"> <tr> <td>Metal housing round</td> <td>W</td> </tr> <tr> <td>Metal housing square</td> <td>M</td> </tr> </table>	Metal housing round	W	Metal housing square	M				
Metal housing round	W								
Metal housing square	M								
Connection execution	<table border="1"> <tr> <td>Connector socket EN 175301-803/ISO 4400</td> <td>D</td> </tr> <tr> <td>Connector socket AMP Junior-Timer</td> <td>J</td> </tr> <tr> <td>Connector Deutsch DT04-2P</td> <td>S</td> </tr> </table>	Connector socket EN 175301-803/ISO 4400	D	Connector socket AMP Junior-Timer	J	Connector Deutsch DT04-2P	S		
Connector socket EN 175301-803/ISO 4400	D								
Connector socket AMP Junior-Timer	J								
Connector Deutsch DT04-2P	S								
Sealing material	<table border="1"> <tr> <td>NBR</td> <td><input type="text"/></td> </tr> <tr> <td>FKM (Viton)</td> <td>01</td> </tr> </table>	NBR	<input type="text"/>	FKM (Viton)	01				
NBR	<input type="text"/>								
FKM (Viton)	01								
Design index (subject to change)									

1 10-000

**GENERAL SPECIFICATIONS**

Designation	Proportional spool valve
Construction	Pilot operated
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Electrical
Ambient temperature	-25...+70 °C (NBR) -20...+70 °C (FKM) if >50 °C, I <sub>g</sub> is only conditionally achievable
Weight	3,5 kg (1 solenoid) 3,9 kg (2 solenoids)
MTTFd	150 years

**ACTUATION**

Pressure reducing valve  
 MDPFA04-P / AB-25 for BCA-S / BDA-V  
 MDPFA04-P / B-25 for BC1-S / BD1-V  
 MDPFA04-P / A-25 for CA2-S / DA2-V  
 Connector socket EN 175301 – 803

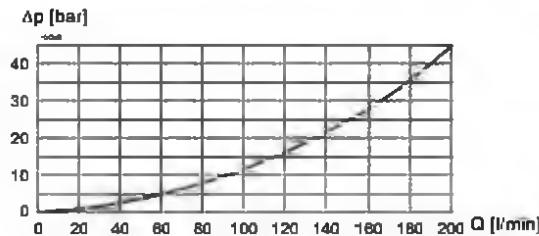
**HYDRAULIC SPECIFICATIONS**

Working pressure	p <sub>max</sub> = 350 bar
Tank pressure	p <sub>Tmax</sub> = 160 bar (type of pilot operation ae and xi) p <sub>Tmax</sub> = 100 bar (type of pilot operation ti and xe)
Pilot pressure	p <sub>p</sub> = 25...350 bar Connection X: p <sub>p</sub> = 25...200 bar
Pressure pilot oil drain	Minimum 25 bar lower than p <sub>p</sub>
Maximum volume flow	Q <sub>max</sub> = 200 l/min, see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-20...+70 °C
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade β <sub>6...10</sub> ≥ 75, see data sheet 1.0-50

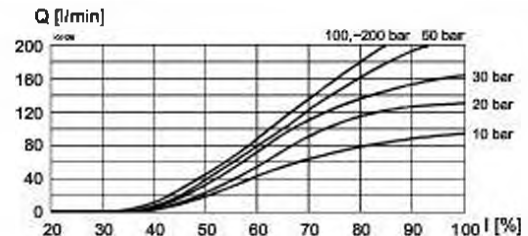
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

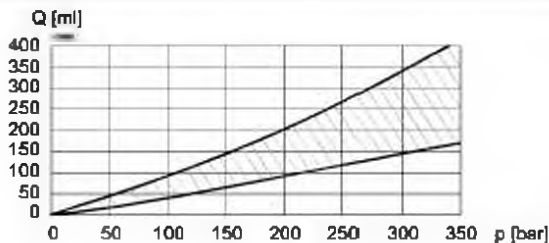
$\Delta p = f(Q)$  Pressure drop / flow characteristic over 2 control edges  
 [Types: BCA-S, BC1-S, CA2-S, BDA-V, BD1-V, DA2-V]



$Q = f(I)$  Volume flow signal characteristics over 2 control edges  
 [Types: BCA-S, BC1-S, CA2-S, BDA-V, BD1-V, DA2-V]



$Q_l = f(p)$  Leakage volume flow characteristics main stage per control edge



$Q_l = f(p)$  Leakage volume flow pilot control stage

@ 350 bar,  $p_{\text{pilot}} 0 \text{ bar}$ : 100 ml/min  
 @ 350 bar,  $p_{\text{pilot}} 25 \text{ bar}$ : 320 ml/min

**Note!**


All values were measured over two control edges. The connections A and B were short-circuited.

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Horizontal mounting blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**STANDARDS**

Mounting interface	ISO 4401-05
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SURFACE TREATMENT**

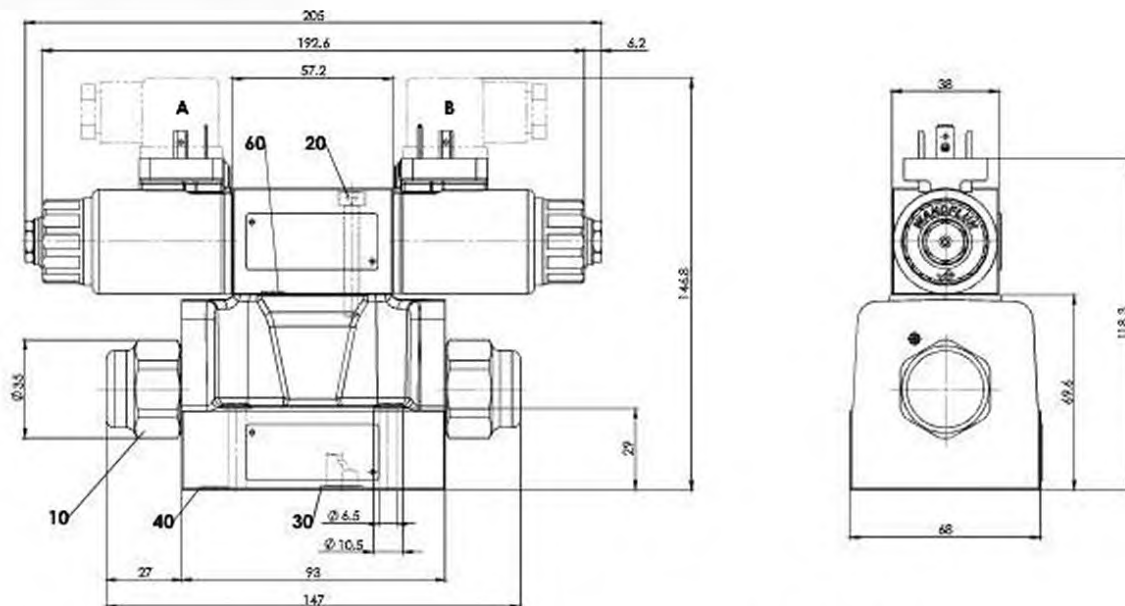
- ◆ The main valve body, the screw plugs, the slip-on coil and the armature tube are zinc-nickel coated
- ◆ The pilot valve body is coated with a two-component paint

**SEALING MATERIAL**

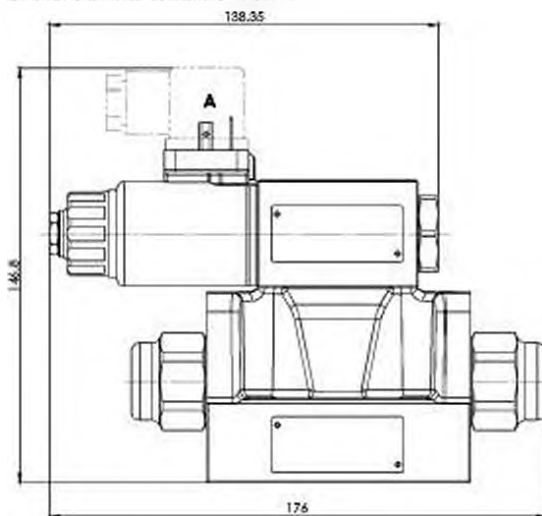
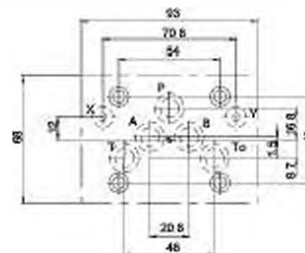
NBR or FKM (Viton) as standard, choice in the type code

**DIMENSIONS**

4/3-way spool valve (spring centring)



4/2-way spool valve (spring reset)


**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	239.7203	Screw plug
20	246.2146	Socket head screw M5 x 45 DIN 912
30	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.8124	O-ring ID 12,42 x 1,78 (FKM)
40	160.2076	O-ring ID 7,65 x 1,78 (NBR)
	160.8076	O-ring ID 7,65 x 1,78 (FKM)
60	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M6 x 40
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 13.5 \text{ Nm} \pm 10 \%$ , quality min. 10.9  $M_0 = 10.5 \text{ Nm} \pm 10 \%$ , quality 8.8:

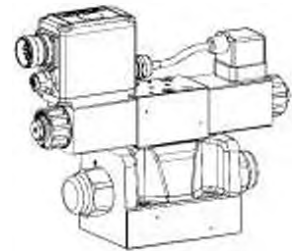
- ◆ maximum tank pressure without external connections: 80 bar
- ◆ maximum tank pressure and maximum pressure external connections: 35 bar

**Nota!**


The length of the fixing screw depends on the base material of the connection element.

**Proportional spool valve with integrated electronics**
**Flange construction**

- ◆ pilot operated
- ◆  $Q_{max} = 200 \text{ l/min}$
- ◆  $Q_{Nmax} = 90 \text{ l/min}$
- ◆  $p_{Nmax} = 350 \text{ bar}$

**NG10**  
 ISO 4401-05

**DESCRIPTION**

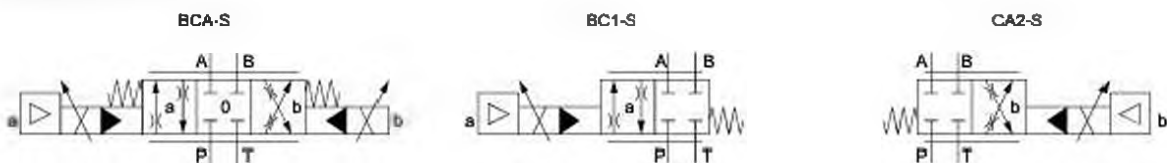
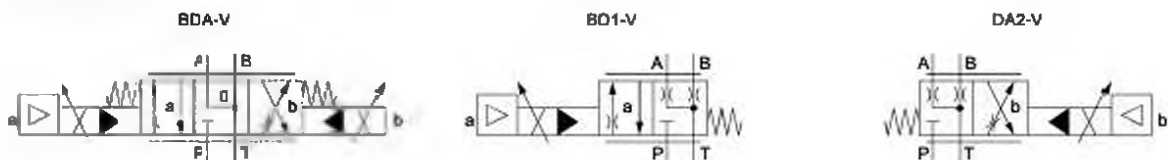
Pilot operated proportional spool valve with 4 connections in 5-chamber system and integrated electronics. Precise spool fit, low leakage, long service life time. Very compact construction with corresponding low weight. The pilot valve is a proportional solenoid operated pressure reducing valve. The function of the pilot and main valve as well as the interaction of both valves can be found in the hydraulic diagram. Proportional to the solenoid current, the spool stroke, the spool opening and the valve volume flow increase. The control takes place via an analogue interface or a fieldbus interface (CANopen, J1939 or Profibus DP). The parameterisation takes place by means of the free of cost parameterisation and diagnostics software »PASO« or via fieldbus interface. As an option, these valves are available with integrated controller. As feedback value generators sensors with voltage or current output can be connected directly. The available controller structures are optimised for applications with hydraulic actuators.

**APPLICATION**

Proportional spool valves are perfectly suitable for demanding tasks due to the high resolution, large volume flow and low hysteresis. Pilot operated valves are used where large volume flows have to be controlled. Due to the large flow range and the high stiffness of the actuation as a result of the pilot control, these valves are suitable for applications where fast acceleration and deceleration processes, high speeds and sensitive motion sequences are required. The applications are in the industrial as well as in the mobile hydraulics for the smooth control of hydraulic actuators.

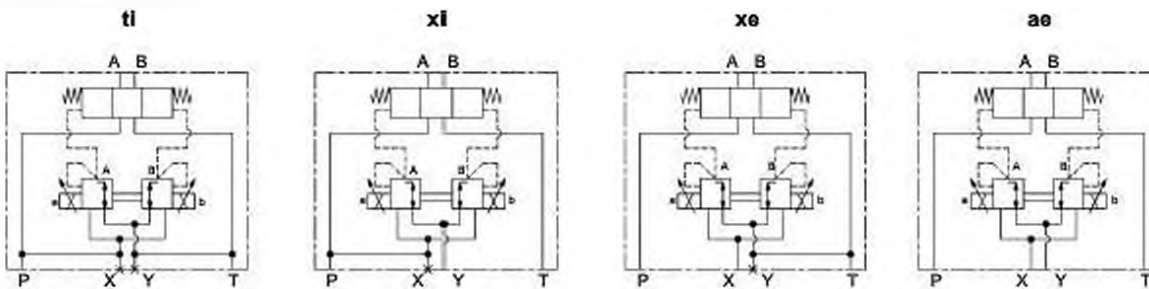
**Note!**


„PASO“ is a Windows programm in the flow diagram style, which enables the intuitive adjustment and storing of all variable parameters. The data remain saved in case of a power failure and can also be reproduced and transferred to other DSVs

**SYMBOL**
**Symmetrical control**

**Meter-in control**


**SYMBOL**

Types of pilot operation


**TYPE CODE**

		WVP F A10 - <input type="text"/> - 90 - <input type="text"/> - <input type="text"/> / M E <input type="text"/> - <input type="text"/> # <input type="text"/>			
Spool valve, pilot operated, proportional					
Flange construction					
International standard interface ISO NG10					
Designation of symbols acc. to table					
Nominal volume flow					
Type of pilot operation:					
Control oil supply (x) and drain (y)	(x) and (y) internally	<input type="checkbox"/>			
	(x) and (y) externally	<input type="checkbox"/>			
	(x) internally (y) externally	<input type="checkbox"/>			
	(x) externally (y) internally	<input type="checkbox"/>			
Nominal voltage $U_n$	12 VDC	<input type="checkbox"/>			
	24 VDC	<input type="checkbox"/>			
Slip-on coil	Metal housing square				
Connection execution	Integrated electronics				
Hardware configuration					
Analog command value signal	12 pole	<input type="checkbox"/>	7 pole	<input type="checkbox"/>	{-10 ... 10 V preset}
Analog command value signal	12 pole	<input type="checkbox"/>	7 pole	<input type="checkbox"/>	{4 ... 20 mA preset}
CANopen according to DSP-408		<input type="checkbox"/>			
Profibus DP according to Fluid Power Technology		<input type="checkbox"/>			
CAN J1939 (on request)		<input type="checkbox"/>			
Function					
Amplifier					
Controller with current feedback value signal (0 ... 20 mA / 4 ... 20 mA)		<input type="checkbox"/>			
Controller with voltage feedback value signal (0 ... 10 V)		<input type="checkbox"/>			
Sealing material	NBR	<input type="checkbox"/>			
	FKM (Viton)	<input type="checkbox"/>			
Design index (subject to change)					

**GENERAL SPECIFICATIONS**

Designation	Proportional spool valve
Construction	Pilot operated
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Proportional solenoid
Ambient temperature	-20...+65 °C The upper temperature limit is a guideline for typical applications, in individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions „DSV“.
Weight	3,5 kg (1 solenoid) 3,9 kg (2 solenoids)
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP67 with suitable mating connector and closed housing cover
Ramps	Adjustable
Parameterisation	Via fieldbus or USB
Supply voltage	12 VDC, 24 VDC

**Note!** Exact electrical specifications and detailed description of «DSV» electronics can be found on data sheet 1.13-76.


**ACCESSORIES**

Parameterisation software	See start-up
Parameterisation cable for interface USB (from plug type A on Mini B, 3 m)	Article no. 219.2896
<b>Mating connector (plug female) for analog interface</b>	
straight, soldering contact M23, 12 pole	Article no. 219.2330
straight, soldering contact, 7 pole	Article no. 219.2335
angled, soldering contact M23, 12 pole	Article no. 219.2331
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**Note!** Auxiliary conditions for the cable:  
 – External diameter 12 pol: 3,5...14,7 mm  
 – External diameter 7 pol: 8...10 mm  
 – Wire cross section max. 1 mm<sup>2</sup>  
 – Recommended wire cross section:  
 0...25 m = 0,75 mm<sup>2</sup> (AWG18)  
 25...50 m = 1 mm<sup>2</sup> (AWG17)


**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{T,max} = 160$ bar (type of pilot operation ae and xi) $p_{T,max} = 100$ bar (type of pilot operation ti and xe)
Pilot pressure	$p_p = 25...350$ bar Connection X: $p_p = 25...200$ bar
Pressure pilot oil drain	Minimum 25 bar lower than $p_p$
Maximum volume flow	$Q_{max} = 200$ l/min, see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**ACTUATION**

Pressure reducing valve  
 MDPFA04-P / AB-25 for BCA-S / BDA-V  
 MDPFA04-P / A-25 for BC1-S / BD1-V  
 MDPFA04-P / B-25 for CA2-S / DA2-V  
 via device receptacle

**COMMISSIONING**

For DSV amplifiers as a rule no parameter adjustments by the customer are required. The plugs have to be connected in accordance with the chapter «Electrical connection».


Controllers are supplied configured as amplifiers. The adjustment of the mode of control and of the controller are carried out by the customer by means of the software adjustment (USB interface, Mini B). Further information can be found


Free- of charge download of the «PASO» software and the operation instructions for «DSV» hydraulic valves as well as the operation instructions CANopen Protocol resp. Profibus DP Protocol, with Device Profile DSP-408 for «DSV».

**Note!** The mating connectors and the parameterisation cable are not part of the delivery. Refer to chapter «Accessories».





**ELECTRICAL CONNECTION**


X1	Analog interface (Main)
Device receptacle	M23, 12 pole male
	1 = Supply voltage + 2 = Supply voltage 0 VDC 3 = Stabilised output voltage 4 = Command value signal voltage + 5 = Command value signal voltage - 6 = Command value signal current + 7 = Command value signal current - 8 = Reserved for extarctions 9 = Reserved for extarctions 10 = Enable signal (Digital input) 11 = Error signal (Digital output) 12 = Chassis
Command value signal voltage (PIN 4/5) resp. current (PIN 6/7) are selected with parametarisation and diagnostics software PASO.	


X1	Fieldbus interface (Main)
Device receptacle	M12, 4 pole male
	1 = Supply voltage + 2 = Reserved for extarctions 3 = Supply voltage 0 VDC 4 = Chassis

X2	Parameterisation interface
USB, Mini B	Under the screw plug of the housing cover Factory set

X1	Analog interface (Main)
	Connector DIN EN 175201 - 804
Device receptacle	7 pole male
	A = Supply voltage + B = Supply voltage 0 VDC C = Not connected D = Command value signal + E = Command value signal - F = Not connected G = Chassis
Command value signal: current (D4) or voltage (D2) to specify when placing the order	

X3	Profibus interface according to IEC 947-5-2
Device receptacle	M12, 5 pole female B-coded
	1 = VP 2 = RxD / TxD - N 3 = DGND 4 = RxD / TxD - P 5 = Shield

X3	CANopen interface according to DRP 303-1
Device receptacle	M12, 5 pole male
	1 = Not connected 2 = Not connected 3 = CAN Gnd 4 = CAN High 5 = CAN Low

X4 (controller only)	Feedback value interface (sensor)
Device receptacle	M12, 5 pole female
	1 = Supply voltage (output) + 2 = Feedback value signal + 3 = Supply voltage 0 VDC 4 = Not connected 5 = Stabilised output voltage
Feedback value signal: current (R1) or voltage (R2) to specify when placing the order	

**Nota!** The mating connector is not included in the delivery

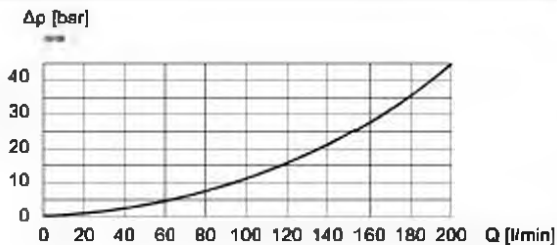
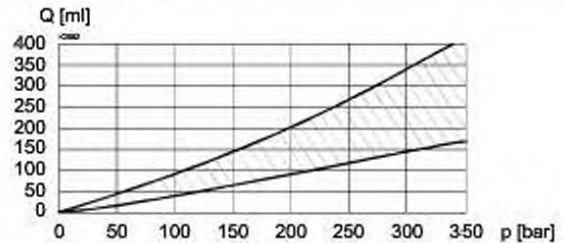




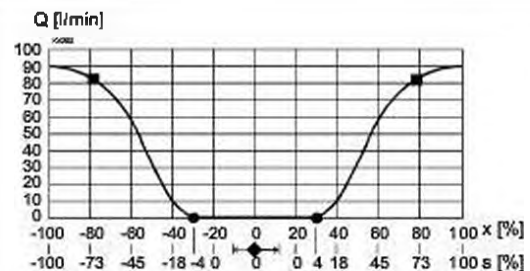
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 **$\Delta p = f(Q)$  Pressure drop / flow characteristic over 2 control edges**

|Types: BCA-S, BC1-S, CA2-S, BDA-V, BD1-V, DA2-V|


 **$Q_L = f(p)$  Leakage volume flow characteristics main stage per control edge**

 **$Q_L = f(p)$  Leakage volume flow pilot control stage**

- @ 350 bar,  $p_{\text{ref}} = 0$  bar: 100 ml/min
- @ 350 bar,  $p_{\text{ref}} = 25$  bar: 320 ml/min

 **$Q = f(s, x)$  Volume flow adjustment characteristics**  
 $\Delta p = 10$  bar,  $s$  = command value signal,  $x$  = spool stroke

**Note!** All values were measured over two control edges. The connections A and B were short-circuited.

**FACTORY SETTINGS**

Dither set for optimum hysteresis

- ◆ = Deadband: Both solenoids switched off at command value signal  $-2\% \dots 2\%$
- = Opening pressure at command value signal  $\pm 4\%$
- = Flow at  $\Delta p = 10$  bar over two control edges  $\pm 70\%$  command value signal

**STANDARDS**

CANopen	DRP 303-1
Profibus DP	IEC 947-5-2
Mounting interface	ISO 4401-05
Protection class	EN 60 529
Contamination efficiency	ISO 4406

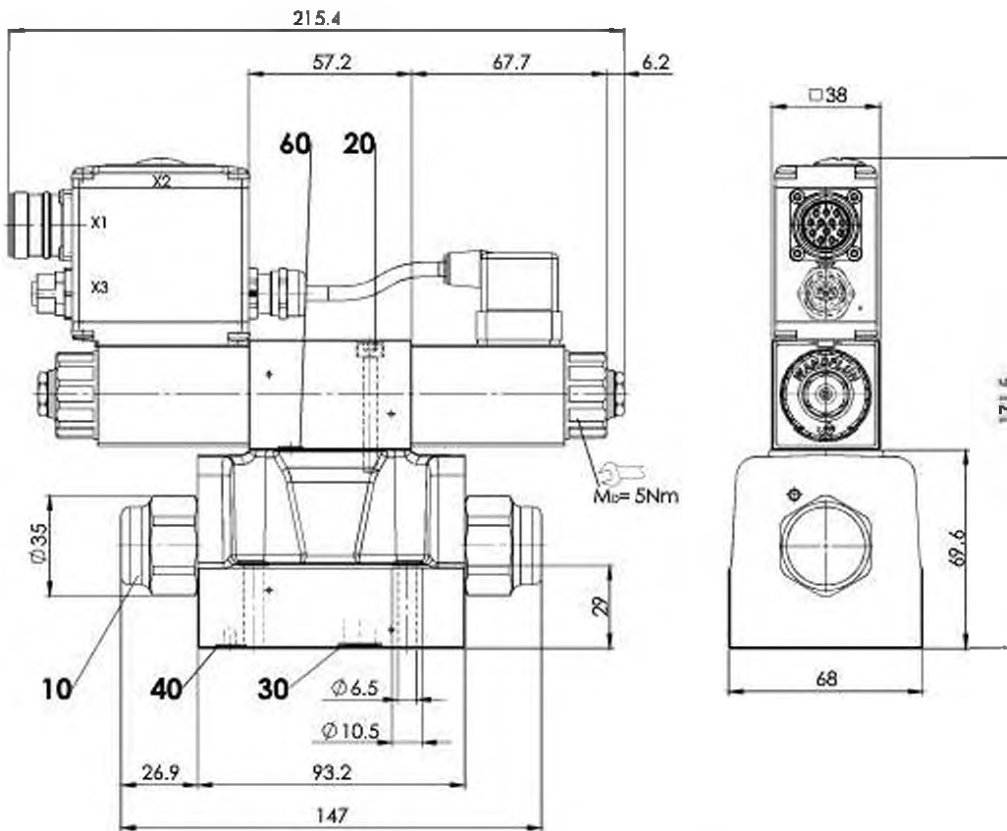
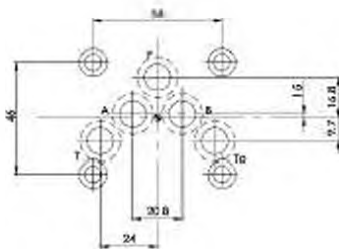
**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M6 x 40
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 13.5 \text{ Nm} \pm 10\%$ , quality min. 10.9

 $M_0 = 10.5 \text{ Nm} \pm 10\%$ , quality 8.8:

- ◆ maximum tank pressure without external connections: 80 bar
- ◆ maximum tank pressure and maximum pressure external connections: 35 bar

**Note!** The length of the fixing screw depends on the base material of the connection element.


**DIMENSIONS**

**HYDRAULIC CONNECTION**

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**PARTS LIST**

Position	Article	Description
10	239.7203	Screw plug
20	246.2146	Socket head screw M5 x 45 DIN 912
30	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.8124	O-ring ID 12,42 x 1,78 (FKM)
40	160.2076	O-ring ID 7,65 x 1,78 (NBR)
	160.8076	O-ring ID 7,65 x 1,78 (FKM)
60	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)

**SURFACE TREATMENT**

-The electronics housing / chassis is made of aluminium

**Main stage:**

-The valve body is zinc coated

-The screw plug is zinc-nickel coated

**Pilot control stage:**

-The valve body is painted with a two component paint

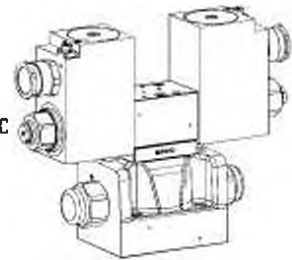
-The coils are zinc-nickel coated

**Proportional spool valve**
**Flange construction**

- ◆ pilot operated
- ◆  $Q_{max} = 200 \text{ l/min}$
- ◆  $Q_{Hmax} = 90 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**NG10**
**ISO 4401-05**

- ⊕ II 2 G Ex db IIC T6, T4
  - ⊕ II 2 D Ex db III C T80 °C, T130 °C
  - ⊕ I M2 Ex db I Mb
- Class I Division 1  
 Class I Zone 1


**DESCRIPTION**

Pilot operated proportional spool valve with 4 connections in 5-chamber system. Very compact construction with corresponding low weight and high flow values. The function of the pilot and main valve as well as the interaction of both valves can be found in the hydraulic diagram. Proportional to the solenoid current, the spool stroke, the spool opening and the valve volume flow increase. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature. For the control, Wandfluh proportional pressure valves (see register 2.3) and Wandfluh proportional amplifiers (see register 1.13) are available.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. Pilot operated valves are used where large volume flows have to be controlled. Due to the large flow range and the high stiffness of the actuation as a result of the pilot control, these valves are suitable for applications where fast acceleration and deceleration processes, high speeds and sensitive motion sequences are required. The applications are in the industrial as well as in the mobile hydraulics for the smooth control of hydraulic actuations.

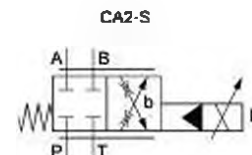
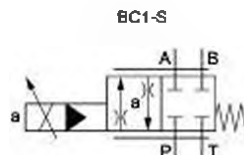
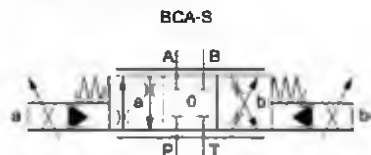
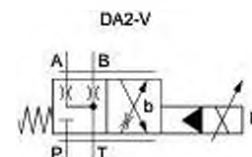
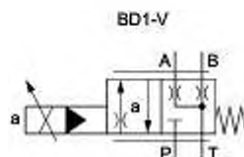
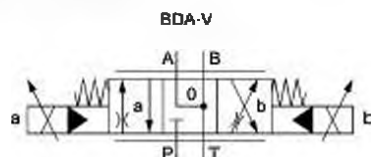
**CERTIFICATES**

	Surface	Mining	Standard -25 °C to ...	M248 Electronic
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	
MA		x	x	x
UL / CSA	x		x	

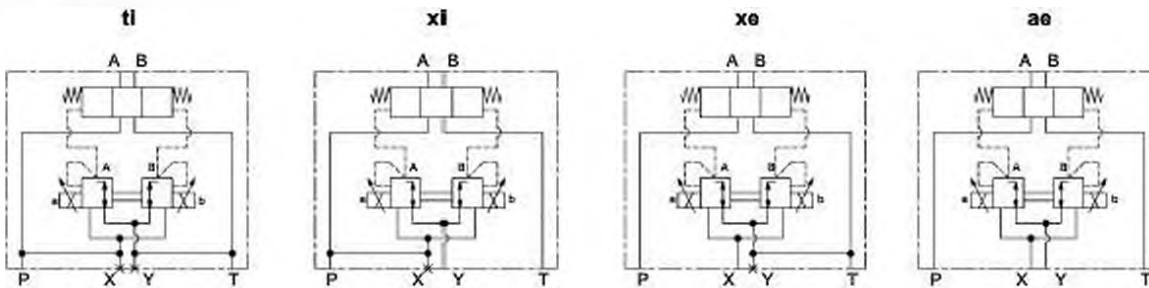
**ACTUATION**

Pressure reducing valve  
 MDBFA04-P / AB-25 for BCA-S / BDA-V  
 MDBFA04-P / B-25 for BC1-S / BD1-V  
 MDBFA04-P / A-25 for CA2-S / DA2-V

**Attention!** The UL execution is always supplied without cable gland


**SYMBOL**
**Symmetrical control**

**Meter-in control**


## Types of pilot operation


**TYPE CODE**

WVB F A10 -  -  -  -  /     #

Spool valve, pilot operated, proportional, ex-protection execution Ex d

Flange construction

International standard interface ISO NG10

Designation of symbols acc. to table

Nominal volume flow      60 l/min (L9)        
    90 l/min (L15 / 17)     

Type of pilot operation:  
 Control oil supply (x)  
 and drain (y)

(x) and (y) internally	<input type="text" value="ti"/>
(x) and (y) externally	<input type="text" value="ae"/>
(x) internally (y) externally	<input type="text" value="xi"/>
(x) externally (y) internally	<input type="text" value="xe"/>

Nominal voltage  $U_n$       12 VDC        
    24 VDC     

Nominal power  $P_n$       9 W        
    15 W        
    17 W     

Ambient temperature up to:

40 °C or 90 °C  
 70 °C  
 70 °C (only UL / CSA)

Certification      ATEX, IECEx, CCC, EAC        
    Australia            UL / CSA            MA     

Sealing material      NBR        
    FKM (Viton)     

Amplifier     

Design index (subject to change)

1 10-2820

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Horizontal mounting blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**STANDARDS**

Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Mounting interface	ISO 4401-05
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**GENERAL SPECIFICATIONS**

Designation	Proportional spool valve
Construction	Pilot operated
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Ex-protection proportional solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17)
Weight	5,2 kg (1 solenoid) 7,0 kg (2 solenoids)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{v,max} = 160$ bar (type of pilot operation ae and xi) $p_{v,max} = 100$ bar (type of pilot operation ti and xe)
Pilot pressure	$p_p = 25...350$ bar Connection X: $p_p = 25...200$ bar
Pressure pilot oil drain	Minimum 25 bar lower than $p_p$
Maximum volume flow	$Q_{max} = 200$ l/min, see characteristics
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L9 or L15 / L17)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**Attention!** With the execution L9 for ambient temperatures up to 90 °C (L9/90 °C),  $Q_x$  is not reached


**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at... °C	<b>L9, 40 °C</b> $I_a = 625$ mA (12 VDC) $I_a = 305$ mA (24 VDC) <b>L15 / 17, 50 °C</b> $I_a = 950$ mA (12 VDC) $I_a = 450$ mA (24 VDC) <b>L15 / 17, 70 °C</b> $I_a = 910$ mA (12 VDC) $I_a = 420$ mA (24 VDC)
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

**Note!** Other electrical specifications see data sheet 1.1-183 and 1.1-184


**MANUAL OVERRIDE**

HB4,5 as standard  
Optionally: HN (K)  
→ see data sheet 1.1-311

**SURFACE TREATMENT**

- ◆ The main valve body, the distance plate, the screw plugs, the slip-on coil and the armature tube are zinc-nickel coated
- ◆ The pilot valve body is coated with a two component paint

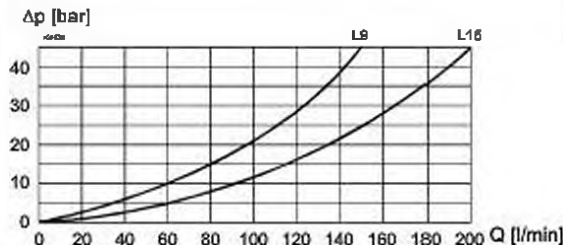
**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

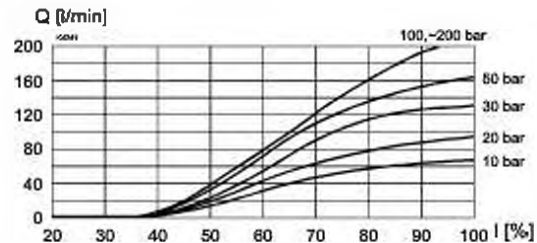
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

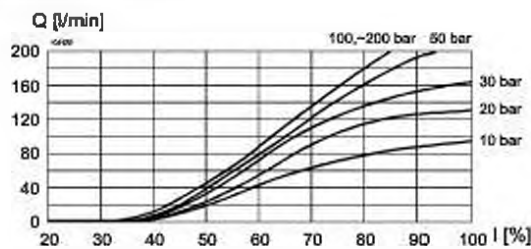
$\Delta p = f(Q)$  **Pressure drop / flow characteristic over 2 control edges**  
 [Types: BCA-S, BC1-S, CA2-S, BDA-V, BD1-V, DA2-V]



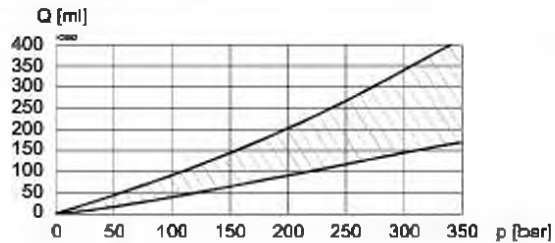
$Q = f(i)$  **Volume flow signal characteristics over 2 control edges L9**  
 [Types: BCA-S, BC1-S, CA2-S, BDA-V, BD1-V, DA2-V]



$Q = f(i)$  **Volume flow signal characteristics over 2 control edges L15 / L17**  
 [Types: BCA-S, BC1-S, CA2-S, BDA-V, BD1-V, DA2-V]



$Q_l = f(p)$  **Leakage volume flow characteristics main stage per control edge**



$Q_l = f(p)$  **Leakage volume flow pilot control stage**

- @ 350 bar,  $p_{\text{out}} = 0$  bar: 100 ml/min
- @ 350 bar,  $p_{\text{out}} = 25$  bar: 320 ml/min

**Note!**


All values were measured over two control edges. The connections A and B were short-circuited.

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M6 x 40
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 13.5 \text{ Nm} \pm 10 \%$ , quality min. 10.9  $M_0 = 10.5 \text{ Nm} \pm 10 \%$ , quality 8.8:  <ul style="list-style-type: none"> <li>◆ maximum tank pressure without external connections: 80 bar</li> <li>◆ maximum tank pressure and maximum pressure external connections: 35 bar</li> </ul>

**Note!**

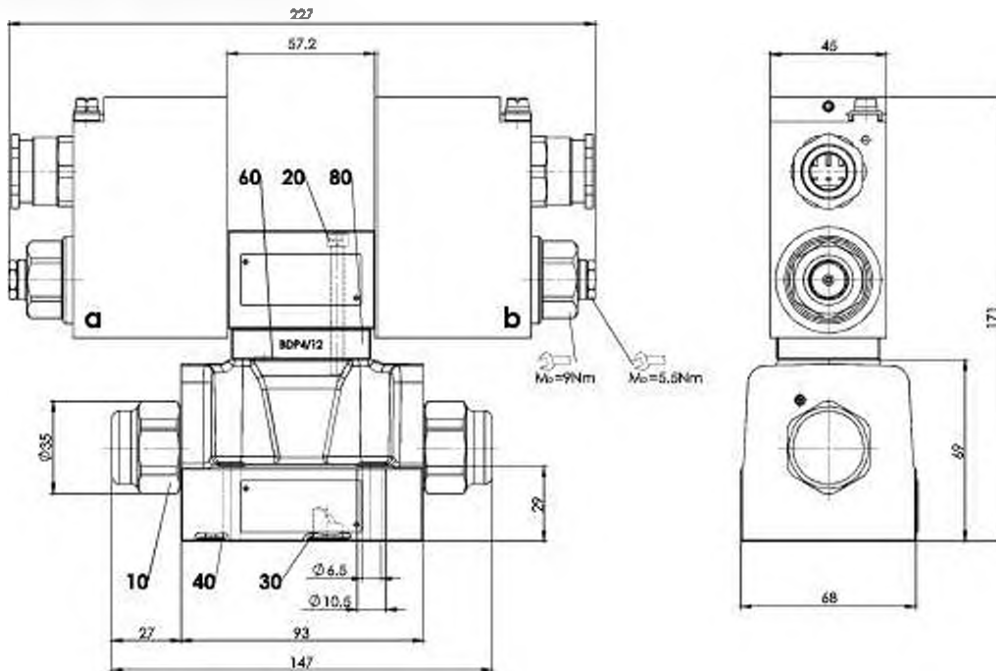

The length of the fixing screw depends on the base material of the connection element.

**PARTS LIST**

Position	Article	Description
10	239.7203	Screw plug
20	246.2146	Socket head screw M5 x 45 DIN 912
30	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.8124	O-ring ID 12,42 x 1,78 (FKM)
40	160.2076	O-ring ID 7,65 x 1,78 (NBR)
	160.8076	O-ring ID 7,65 x 1,78 (FKM)
60	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)
80	173.1450	Distance plate BDP4 / 12

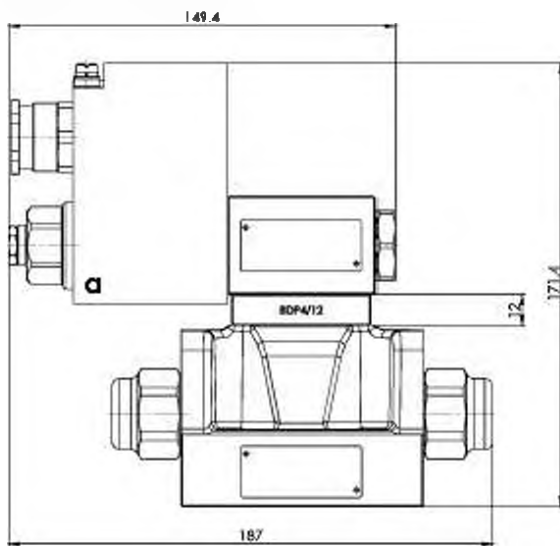
**DIMENSIONS**

4/3-way spool valve (spring centring)



Dimensions of the solenoid coil, refer to data sheet 1.1-183 and 1.1-184

4/2-way with spring reset



**HYDRAULIC CONNECTION**




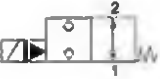


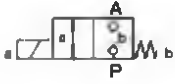
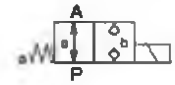

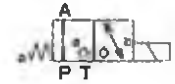



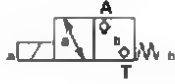
## OVERVIEW SCREW-IN CARTRIDGES

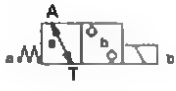
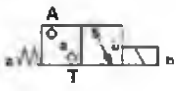
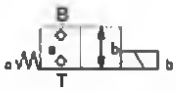
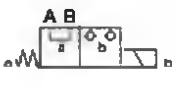




Function		Size					
		M18x1.5	M20x1.5	1/4"-18 UNF	M22x1.5	M33x2	M42x2
direct operated 	Type	<b>SDSPM18-BA</b>	<b>SDEPM20-BA</b>	<b>SDEPU08-BA</b>	<b>SDSPM22-BA</b>		
	Data sheet	1.11-2051	1.11-205A	1.11-205B	1.11-2061		
	Type Exd	<b>SDYPM18-BA</b>			<b>SDYPM22-BA</b>		
	Data sheet	1.11-2052			1.11-2064		
	Type Exi	<b>SDZPM18-BA</b>					
	Data sheet	1.11-2054					
	Cavity	2.13-1002				2.13-1008	
direct operated 	Type	<b>SDSPM18-AB</b>		<b>SDEPU08-AB</b>	<b>SDSPM22-AB</b>		
	Data sheet	1.11-2051		1.11-205B	1.11-2061		
	Type Exd	<b>SDYPM18-AB</b>			<b>SDYPM22-AB</b>		
	Data sheet	1.11-2052			1.11-2064		
	Type Exi	<b>SDZPM18-AB</b>					
	Data sheet	1.11-2054					
	Cavity	2.13-1002				2.13-1008	
direct operated 	Type	<b>SDSPM18-FG</b>			<b>SDSPM22-FG</b>		
	Data sheet	1.11-2051			1.11-2061		
	Type Exd	<b>SDYPM18-FG</b>			<b>SDYPM22-FG</b>		
	Data sheet	1.11-2052			1.11-2064		
	Type Exi	<b>SDZPM18-FG</b>					
	Data sheet	1.11-2054					
	Cavity	2.13-1020				2.13-1004	

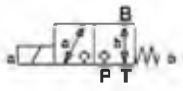
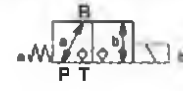


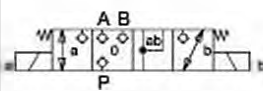
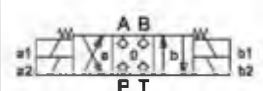
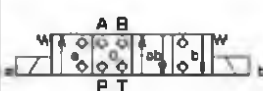


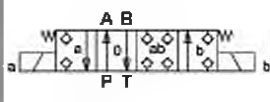



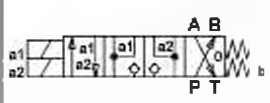
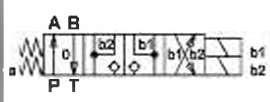
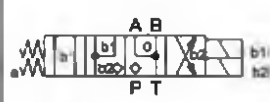

## OVERVIEW SCREW-IN CARTRIDGES



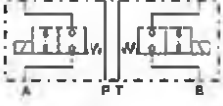
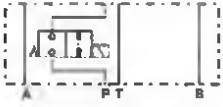
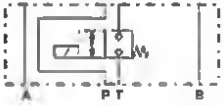

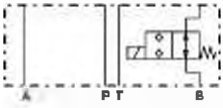
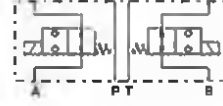

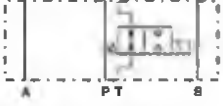
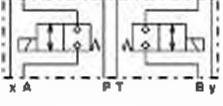
Function		Size					
		M18x1.5	M20x1.5	1/4"-16 UNF	M22x1.5	M33x2	M42x2
pilot operated 	Type	<b>SVSPM18-BC</b>	<b>SVEPM20-BC</b>	<b>SVEPU08-BC</b>	<b>SVSPM22-BC</b>	<b>SVSPM33-BC</b>	<b>SVSPM42-BC</b>
	Data sheet	1.11-2080	1.11-208A	1.11-208B	1.11-2082	1.11-2076	1.11-2091
	Type Exd				<b>SVYPM22-BC</b>	<b>SVYPM33-BC</b>	
	Data sheet				1.11-2084	1.11-2085	
	Cavity	2.13-1002	2.13-1042	2.13-1043	2.13-1008	2.13-1005	2.13-1050
pilot operated 	Type	<b>SVSPM18-CB</b>		<b>SVEPU08-CB</b>	<b>SVSPM22-CB</b>	<b>SVSPM33-CB</b>	<b>SVSPM42-CB</b>
	Data sheet	1.11-2080		1.11-208B	1.11-2082	1.11-2076	1.11-2091
	Type				<b>SVYPM22-CB</b>	<b>SVYPM33-CB</b>	
	Data sheet				1.11-2084	1.11-2085	
	Cavity	2.13-1002		2.13-1043	2.13-1008	2.13-1005	2.13-1050
pilot operated 	Type			<b>SVEPU08-BA</b>		<b>SVSPM33-BA</b>	<b>SVSPM42-BA</b>
	Data sheet			1.11-208B		1.11-2076	1.11-2091
	Type Exd					<b>SVYPM33-BA</b>	
	Data sheet					1.11-2085	
	Cavity			2.13-1043		2.13-1005	2.13-1050
pilot operated 	Type					<b>SVSPM33-AB</b>	<b>SVSPM42-AB</b>
	Data sheet					1.11-2076	1.11-2091
	Type Exd					<b>SVYPM33-AB</b>	
	Data sheet					1.11-2085	
	Cavity					2.13-1005	2.13-1050

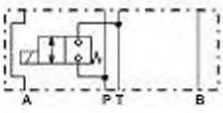
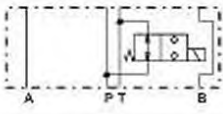
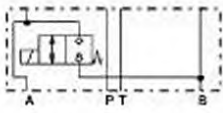
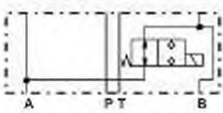
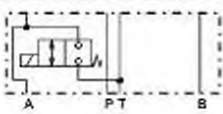
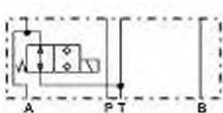
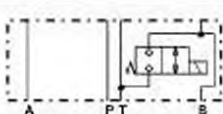
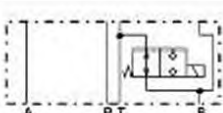
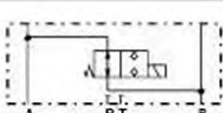
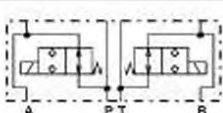
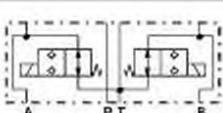
	NG3-Mini	NG4-Mini	NG6 ISO	NG10 ISO
<b>Types</b>				
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	<b>B.22030b</b> 1.11-2100	<b>B.22040b</b> 1.11-2120	<b>A.22060b</b> 1.11-2140	<b>A.22100b</b> 1.11-2160
	<b>B.32031a</b> 1.11-2100	<b>B.32041a</b> 1.11-2120	<b>A.32061a</b> 1.11-2140	<b>A.32101a</b> 1.11-2160
	<b>B.32030b</b> 1.11-2100	<b>B.32040b</b> 1.11-2120	<b>A.32060b</b> 1.11-2140	<b>A.32100b</b> 1.11-2160
	<b>B.3403</b> 1.11-2100	<b>B.3404</b> 1.11-2120	<b>A.3406</b> 1.11-2140	<b>A.3410</b> 1.11-2160
		<b>B.22040a-S792</b>	<b>A.22060a-S792</b>	
			<b>A.22061b-S792</b>	
			<b>A.22061a-S395</b>	


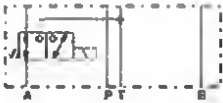

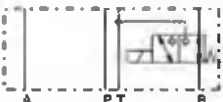
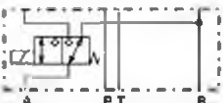
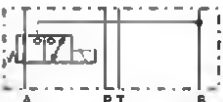
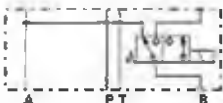

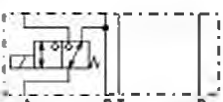

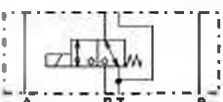
	NG3-Mini	NG4-Mini	NG6 ISO	NG10 ISO
Types				
			A.22060b-S395	
			A.22061b-S395	
			A.22061b-S1201	
	B.22030b-S1640			
			A.22061a-S977	
			A.22060b-S977	
		B.32041b-S792	A.32061b-S792	A.32101b-S792
		B.32040a-S792	A.32060a-S792	A.32100a-S792

	NG3-Mini	NG4-Mini	NG6 ISO	NG10 ISO
	Types			
		B.32041a-S1555	A.32061a-S1555	
		B.32040b-S1555	A.32060b-S1555	
		B.32041a-S558	A.32061a-S558	A.32101a-S558
		B.32040b-S558	A.32060b-S558	A.32100b-S558
			A.3406-S952	
		B.4904	A.4906	A.4910
			A.4406-S690	

	NG3-Mini	NG4-Mini	NG6 ISO	NG10 ISO
	Types			
			SDSFA06-ZS03	
			A.4206a-S1021	
			A.440602-S1065	A.441002-S1065
			A.440805-S1065	A.441005-S1065
			A.440612-S1065	A.441012-S1065
			A.440613-S1065	A.441013-S1065
			A.440602-S1320	A.441002-S1320
			SDSFA06-ZS37	

	NG3-Mini	NG4-Mini	NG6 ISO	NG10 ISO
	<b>Types</b>			
	Z.22031A 1.11-2500	Z.22041A 1.11-2520	Z.22061A 1.11-2540	Z.22101A 1.11-2560
	Z.22031B 1.11-2500	Z.22041B 1.11-2520	Z.22061B 1.11-2540	Z.22101B 1.11-2560
	Z.22031AB 1.11-2500	Z.22041AB 1.11-2520	Z.22061AB 1.11-2540	Z.22101AB 1.11-2560
	Z.22031P 1.11-2500	Z.22041P 1.11-2520	Z.22061P 1.11-2540	Z.22101P 1.11-2560
	Z.22031T 1.11-2500	Z.22041T 1.11-2520	Z.22061T 1.11-2540	
	Z.22030A 1.11-2500	Z.22040A 1.11-2520	Z.22060A 1.11-2540	Z.22100A 1.11-2560
		Z.22040B 1.11-2520	Z.22060B 1.11-2540	Z.22100B 1.11-2560
			Z.22060AB 1.11-2540	
			Z.22060P 1.11-2540	
			Z.22060T 1.11-2540	
				Z.22101AB-S1714

	NG3-Mini	NG4-Mini	NG6 ISO	NG10 ISO
	Types			
		Z.22041a-S590	Z.22061a-S590	
		Z.22040b-S589	Z.22060b-S589	
			Z.22061a-S754	Z.22101a-S754
			Z.22060b-S988	Z.22100b-S988
			Z.22061a-S1307	
		Z.22040b-S1339	Z.22060b-S1339	
			Z.22061b-S1712	
		Z.22040b-S1430	Z.22060b-S1430	
			Z.22060b-S691	
			SDSSA06-P/A0-B/T0	
			SDSSA06-A/T0-B/T0	

	NG3-Mini	NG4-Mini	NG6 ISO	NG10 ISO
	<b>Types</b>			
		Z.32041A-S1008	Z.32061A-S1008	Z.32101A-S1008
		Z.32040A-S1008	Z.32060A-S1008	Z.32100A-S1008
		Z.32041B-S1008	Z.32061B-S1008	Z.32101B-S1008
		Z.32040B-S1008	Z.32060B-S1008	Z.32100B-S1008
			Z.32061A-S1009	Z.32101A-S1009
			Z.32060A-S1009	Z.32100A-S1009
	Z.32031B-S1009		Z.32061B-S1009	Z.32101B-S1009
	Z.32030B-S1009		Z.32060B-S1009	Z.32100B-S1009
			Z.32061A-S1381	Z.32101A-S1381
			Z.32060A-S1381	Z.32100A-S1381
			Z.32061a-S1827	Z.32101a-S1827





**Solenoid poppet valve cartridge**

- normally closed
- $Q_{max} = 6 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**NG3**

**DESCRIPTION**

The 2/2-way seating valve in slip-in cartridge form is the central control element of virtually all directly-controlled seating valves in nominal size 3-Mini. The seating valve cartridge, the spring, one O-ring and a washer are supplied separately. A solenoid (VDE standard 0580) is an optional addition.

**Important:** at the time the valve is taken into service, the valve must be vented under pressure (max. 2 revolutions of screw E).

**FUNCTION**

The seating valve piston is held against the spring by the pressure-tight control solenoid. Because the seat-piston design has equal surface areas on both sides and since the seat/piston construction is balanced in terms of pressure, no undesirable closing and opening forces are generated. As a result, oil can flow in both directions through the seating valve. The seat/piston guide is sealed with an O-ring. The seat with a metallic seal closes off the valve so that there is no leakage oil.

**APPLICATION**

Wandfluh poppet valves can be used anywhere absolutely leak tight closing functions are important. Completely sealed loading, gripping and clamping operations are all important functions which Wandfluh poppet valves can perform. Cartridge type poppet valves can be neatly accommodated in valve blocks. Cavity tools are available for hire or sale for machining aluminium or steel.

See data sheet register no. 2.13.

**TYPE CODE**

Poppet valve cartridge				2	2	03	#	<input type="checkbox"/>
Poppet valve cartridge with solenoid				2	2	03	-	# <input type="checkbox"/>
Medium-solenoid	M							
Super-solenoid	S							
2-way (Connections)								
2 Position								
Nominal size 3								
Nominal voltage $U_n$	12 VDC	[G12]	110 VAC	[R110]				
	24 VDC	[G24]	115 VAC	[R115]				
			230 VAC	[R230]				
Design-Index (Subject to change)								

**GENERAL SPECIFICATIONS**

Description	2/2-way poppet valve
Nominal size	NG3
Construction	Direct operated poppet valve
Operations	Solenoid cartridge form
Mounting	4 solenoid fixing screws M3
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_0 = 1,2 \text{ Nm}$ (quality 8.8)
Weight: 2203	$m = 0,015 \text{ kg}$
2203-...	$m = 0,225 \text{ kg}$
Volume flow direction	any

**HYDRAULIC SPECIFICATIONS**

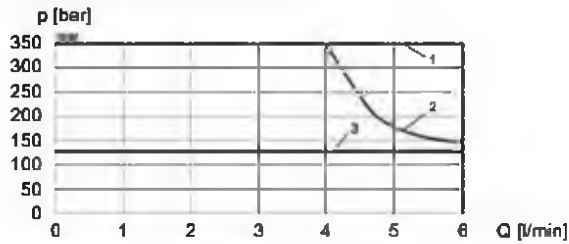
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 20/18/14 (Required filtration grade $\geq 10...16 \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Working pressure	Medium: $p_{max} = 125 \text{ bar}$ Super: $p_{max} = 350 \text{ bar}$
Max. volume flow	$Q_{max} = 6 \text{ l/min}$ , see characteristics

**ELECTRICAL CONTROL**

Construction	Solenoid, wet pin push type, pressure tight
Standard-nominal flow	$U_n = 12 \text{ VDC}$ $U_n = 24 \text{ VDC}$ $U_n = 110 \text{ VAC}$ $U_n = 115 \text{ VAC}$ $U_n = 230 \text{ VAC}$ AC = 50 to 60 Hz • Rectifier integrated in the plug
Voltage tolerance	Other nominal voltages and nominal performances on request
Protection class	±10% of nominal voltage
Relative duty factor	IP 65 to EN 60529
Switching cycles	100% DF (see data sheet 1.1-430)
Operating life	15000/h
Connections/	10 <sup>7</sup> (number of switching cycles, theoretical)
Solenoid:	Over device plug connection to ISO4400/Power supply DIN 43850, (2P+E), other connections on request. - Medium SIN29V (data sheet 1.1-80) - Super SIS29V (data sheet 1.1-85)

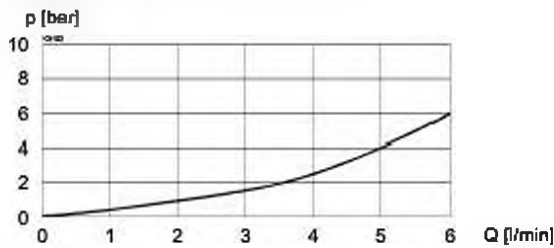
**SYMBOLS**


**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$   
 $p = f(Q)$  Performance limit at -10%



Type	Flow direction	
	1 → 2	2 → 1
M2203	3	3
S2203	1	2

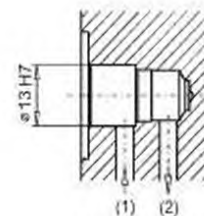
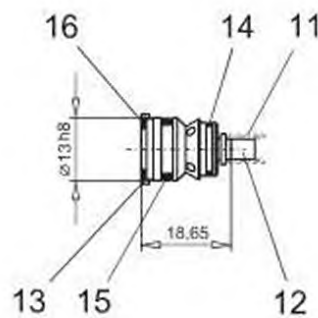
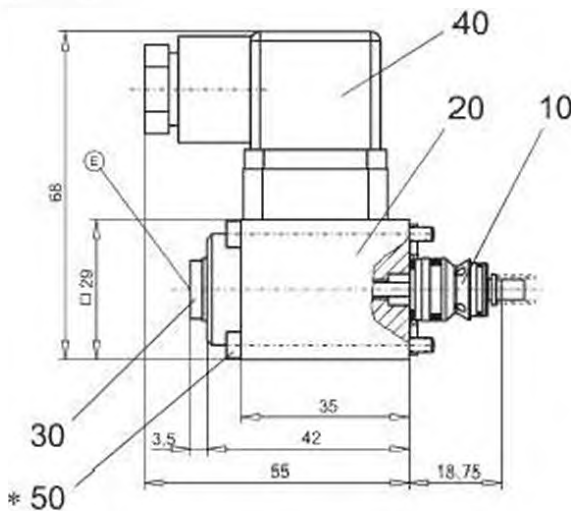
$\Delta p = f(Q)$  Pressure loss / flow characteristics



### DIMENSIONS

2203- ...

2203



For detailed cavity drawing and cavity tools see data sheet 2.13-1012

### PARTS LIST

Position	Article	Description
10	500 0002	Poppet valve cartridge 2203
11	052.1607	Spring 0,8 x 6 x 8
12	222 0097	Pin
13	212.1580	Washer
14	160.2090	O-ring ID 9,00 x 1,00
15	160.2093	O-ring ID 9,25 x 1,78
16	160.1095	O-ring ID 9,50 x 1,6
20	260.2...	Medium-solenoid SIN29V
20	260.3...	Super-solenoid SIS29V
30	239.2033	Plug (incl. seal) H80
40	219.2002	Plug
50	246 0141	Socket head cap screw M3 x 40 DIN 912

- Cartridge supplied with fastening screw M3x40 for steel bodies/blocs. For aluminium bodies/blocs longer screws are recommended (min. 2 screw diameter).

E = air bleed screw

### ACCESSORIES

Cartridge built-in flange- or sandwich body:

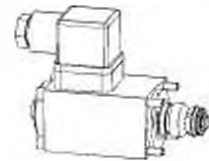
Flange Register 1.11  
 Sandwich Register 1.11

Special tool 983.2005 to poppet valve cartridge 2203

Explications techniques voir feuille 1.0-100

**Solenoid poppet valve cartridge**

- normally closed
- $Q_{max} = 15 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**NG4**

**DESCRIPTION**

The 2/2-way seating valve in slip-in cartridge form is the central control element of virtually all directly-controlled seating valves in nominal size 4-Mini. The poppet valve cartridge, the stroke limiting piston and the spring are supplied separately. A solenoid (VDE standard 0580) is an optional addition.

**Important:** at the time the valve is taken into service, the valve must be vented under pressure (max. 2 revolutions of screw E).

**FUNCTION**

The poppet valve piston is held against the spring by the pressure-tight control solenoid. Because the seat-piston design has equal surface areas on both sides and since the seat/piston construction is balanced in terms of pressure, no undesirable closing and opening forces are generated. As a result, oil can flow in both directions through the seating valve. The seat/piston guide is sealed with an O-ring. The seat with a metallic seal closes off the valve so that there is no leakage oil.

**APPLICATION**

Wandfluh poppet valves can be used anywhere absolutely leak tight closing functions are important. Completely sealed loading, gripping and clamping operations are all important functions which Wandfluh poppet valves can perform. Cartridge type poppet valves can be neatly accommodated in valve blocks. Cavity tools are available for hire or sale for machining aluminium or steel. See data sheet register no. 2.13.

**TYPE CODE**

Poppet valve cartridge				2 2 04K	#	<input type="checkbox"/>
Poppet valve cartridge with solenoid				2 2 04	*	<input type="checkbox"/>
Medium-solenoid	M					
Super-solenoid	S					
2-way (Connections)						
2 Position						
Nominal size 4						
Nominal voltage $U_n$	12 VDC	G12	110 VAC	R110		
	24 VDC	G24	115 VAC	R115		
			230 VAC	R230		
Design-Index (Subject to change)						

**GENERAL SPECIFICATIONS**

Description	2/2-way poppet valve
Nominal size	NG4
Construction	Direct operated poppet valve
Operations	Solenoid
Mounting	cartridge form
	4 solenoid fixing screws M4
Ambient temperature	-20...+50°C
Mounting positions	any
Fastening torque	$M_c = 2,6 \text{ Nm}$ (quality 8.8)
Weight: 2204K	$m = 0,035 \text{ kg}$
. 2204-...	$m = 0,5 \text{ kg}$
Volume flow direction	any

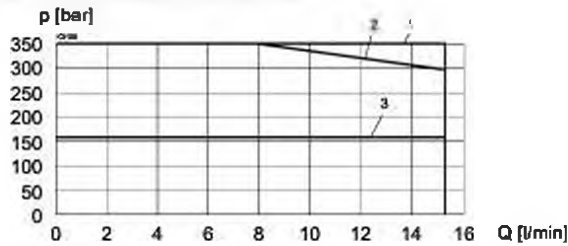
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, classe 20/18/14 (Required filtration grade B10...16±75) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70°C
Working pressure	Medium: $p_{max} = 160 \text{ bar}$ Super: $p_{max} = 350 \text{ bar}$
Max. volume flow	$Q_{max} = 15 \text{ l/min}$ . see characteristics

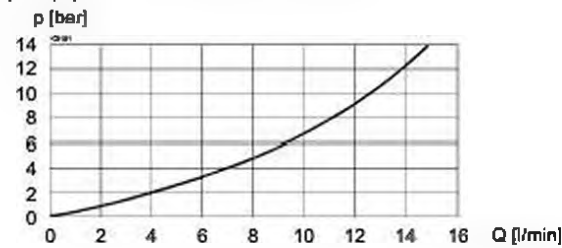
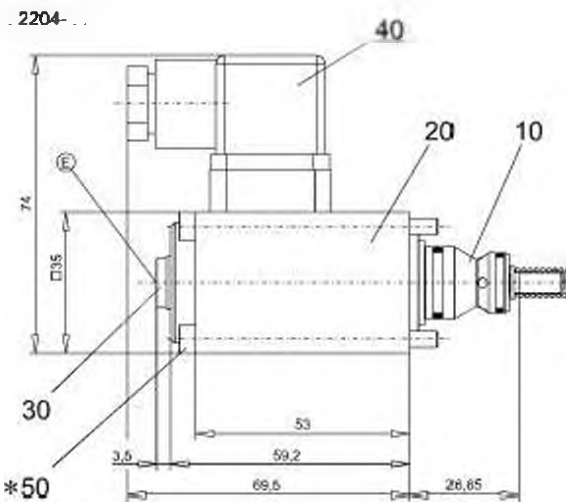
**ELECTRICAL CONTROL**

Construction	Solenoid, wet pin push type, pressure tight
Standard-nominal flow	$U_n = 12 \text{ VDC}$ $U_n = 24 \text{ VDC}$ $U_n = 110 \text{ VAC}$ $U_n = 115 \text{ VAC}$ $U_n = 230 \text{ VAC}$ AC = 50 to 60 Hz • Rectifier integrated in the plug Other nominal voltages and nominal performances on request
Voltage tolerance	±10% of nominal voltage
Protection class	IP 65 to EN 60 529
Relative duty factor	100% DF (see data sheet 1.1-430)
Switching cycles	15'000/h
Operating life	10 <sup>7</sup> (number of switching cycles, non-reversely)
Connections/Power supply	Over device plug connection to ISO 4400/DIN 43 650, (2P+E), other connections on request
Solenoid:	- Medium SIN35V (data sheet 1.1-105) - Super SIS35V (data sheet 1.1-110)

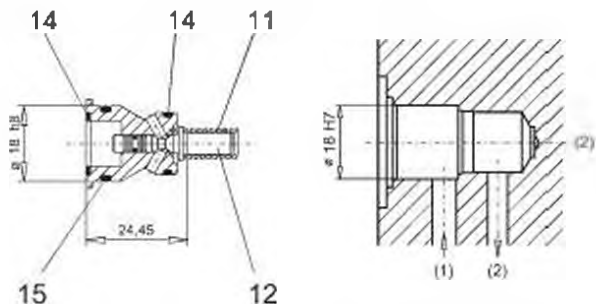
**SYMBOLS**


**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $p = f(Q)$  Performance limit at -10%


Type	Flow direction	
	1 → 2	2 → 1
M2204	3	3
S2204	1	2

 $\Delta p = f(Q)$  Pressure loss / flow characteristics

**DIMENSIONS**


E = air bleed screw

**2204K**


For detailed cavity drawing and cavity tools see data sheet 2.13-1013

**PARTS LIST**

Position	Article	Description
10	500.9111	Poppet valve cartridge 2204K
11	053.2101	Spring 1x7,4x18,5
12	222.0056	Pin
14	160.2121	O-ring ID 12,00x1,5
15	160.2140	O-ring ID 14,00x1,78
20	260.4...	Medium-solenoid SIN35V
	260.5...	Super-solenoid SIS35V
30	239.2033	Plug (incl. seal) HB0
40	219.2002	Plug
50	246.1161	Socket head cap screw M4x60 DIN 912

- Cartridge supplied with fastening screw M4x60 for steel bodies/blocs. For aluminium bodies/blocs longer screws are recommended (min. 2 screw diameter).

**ACCESSORIES**

Cartridge built-in flange- or sandwich body:

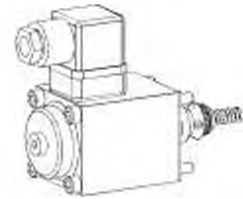
 Flange Register 1.11  
 Sandwich Register 1.11

Special tool 983.2000 to poppet valve cartridge 2204K

Technical explanation see data sheet 1.0-100

**Solenoid poppet valve cartridge**

- normally closed
- $Q_{max} = 40 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**NG6**

**DESCRIPTION**

The 2/2-way seating valve in slip-in cartridge form is the central control element of virtually all directly-controlled seating valves in nominal size 6. The seating valve cartridge, the stroke limiting piston, the spring, one O-ring and a washer are supplied separately. A solenoid (VDE standard Q580) is an optional addition. **Important:** at the time the valve is taken into service, the valve must be vented under pressure (max. 2 revolutions of screw E).

**FUNCTION**

The seating valve piston is held against the spring by the pressure-tight control solenoid. Because the seat-piston design has equal surface areas on both sides and since the seat/piston construction is balanced in terms of pressure, no undesirable closing and opening forces are generated. As a result, oil can flow in both directions through the seating valve. The seat/piston guide is sealed with an O-ring. The seat with a metallic seal closes off the valve so that there is no leakage oil.

**APPLICATION**

Wandfluh poppet valves can be used anywhere absolutely leak tight closing functions are important. Completely sealed loading, gripping and clamping operations are all important functions which Wandfluh poppet valves can perform. Cartridge type poppet valves can be neatly accommodated in valve blocks. Cavity tools are available for hire or sale for machining aluminium or steel. See data sheet register no. 2.13.

**TYPE CODE**

Poppet valve cartridge			2	2	06		#	<input type="checkbox"/>
Poppet valve cartridge with solenoid			2	2	06	-	#	<input type="checkbox"/>
Medium-solenoid	<b>M</b>							
Super-solenoid	<b>S</b>							
<b>2-way (Connections)</b>								
<b>2 Positions</b>								
<b>Nominal size 6</b>								
Nominal voltage $U_n$	12 VDC	<b>G12</b>	110 VAC	<b>R110</b>				
	24 VDC	<b>G24</b>	115 VAC	<b>R115</b>				
			230 VAC	<b>R230</b>				
Design-Index (Subject to change)								

**GENERAL SPECIFICATIONS**

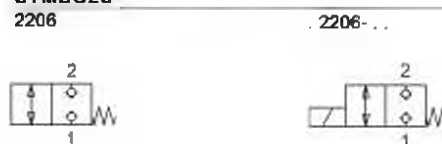
Description	2/2-way poppet valve cartridge
Nominal size	NG6
Construction	Direct operated poppet valve
Operations	Solenoid
Mounting	cartridge form 4 solenoid fixing screws M5
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_0 = 5,2 \text{ Nm}$ (quality 8.8)
Weight: 2206	$m = 0,04 \text{ kg}$
2206-..	$m = 0,8 \text{ kg}$
Volume flow direction	any

**HYDRAULIC SPECIFICATIONS**

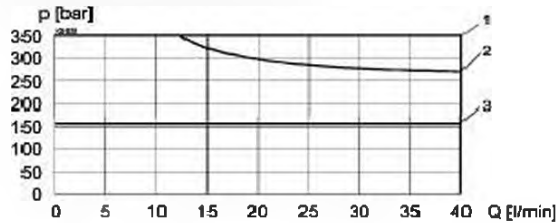
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 20/18/14 (Required filtration grade B10...16≥75) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Working pressure	Medium: $p_{max} = 160 \text{ bar}$ Super: $p_{max} = 350 \text{ bar}$
Max. volume flow	$Q_{max} = 40 \text{ l/min}$ , see characteristics

**ELECTRICAL CONTROL**

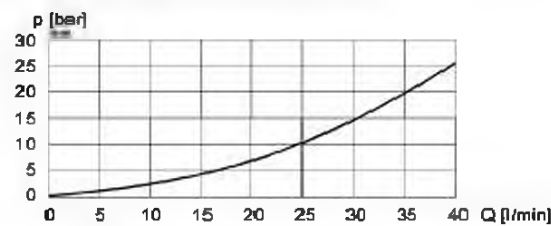
Construction	Solenoid, wet pin push, pressure tight
Standard-nominal flow	$U_n = 12 \text{ VDC}$ , 24 VDC $U_n = 110 \text{ VAC}$ *, 115 VAC*, 230 VAC* AC = 50 to 60 Hz * Rectifier integrated in the plug Other nominal voltages and nominal performances on request
Voltage tolerance	±10% of nominal voltage
Protection class	IP 65 to EN 60529
Relative duty factor	100% DF (see data sheet 1.1-430)
Switching cycles	15 000/h
Operating life	$10^7$ (number of switching cycles, theoretically)
Connections/Power supply	Over device plug connection to ISO 4400/DIN 43850, (2P+E), other connections on request
Solenoid:	- Medium SIM45V (1.1-120) - Super SIS45V (1.1-125)

**SYMBOLS**


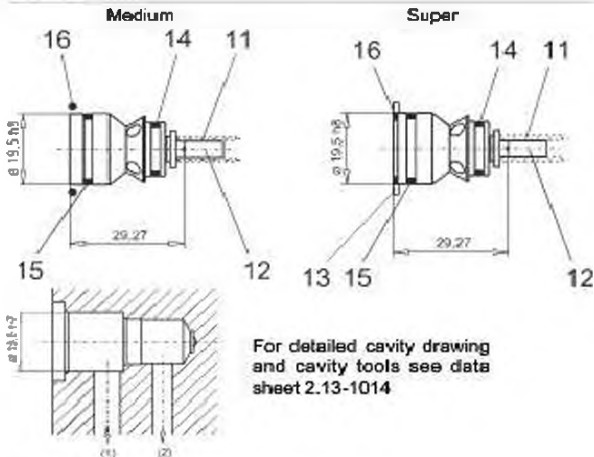
**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$   
 $p = f(Q)$  Performance limit at -10%



$\Delta p = f(Q)$  Pressure loss / flow characteristics



**DIMENSIONS**

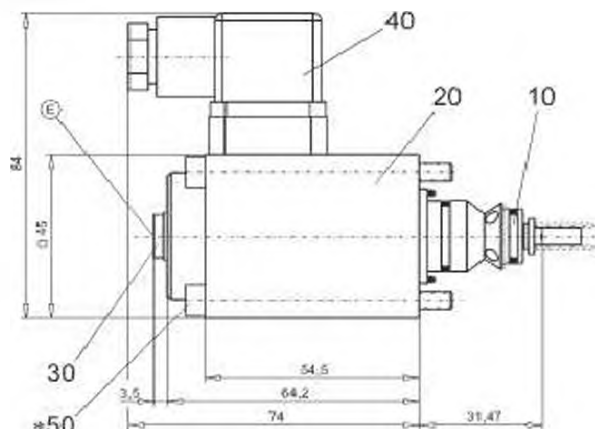


**PARTS LIST**

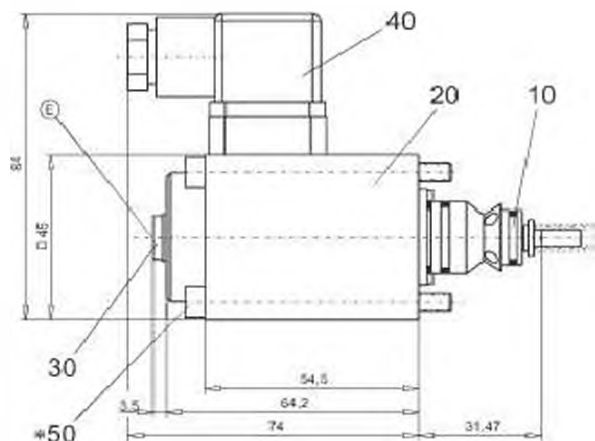
Position	Article	Description
10	500.3000 500.3013	Poppet valve cartridge 2206 Medium Poppet valve cartridge 2206 Super
11	053.2600 053.2616	Spring 1,2 x 7,2 x 15 Medium Spring 1,2 x 7,2 x 16 Super
12	222.0041	Pin
13	212.0502	Washer (only for Super)
14	160.2108	O-ring ID 10,82 x 1,78
15	160.2156	O-ring ID 15,60 x 1,78
16	160.2236 160.2161	O-ring ID 23,52 x 1,78 Medium O-ring ID 16,00 x 1,5 Super
20	260.6 ... 260.7 ...	Medium-solenoid SIN45V Super-solenoid SIS45V
30	239.2033	Plug HB0
40	219.2002	Plug
50	249.2001	Socket head cap screw M5 x 63

Type	Flow directions	
	1 → 2	2 → 1
M2206	3	3
S2206	1	2

Medium



Super



E = air bleed screw

- Cartridge supplied with fastening screw M5 x 63 for steel bodies/blocs. For aluminium bodies/blocs longer screws are recommended (min. 2 screw diameter).

**ACCESSORIES**

Cartridge built in flange- or sandwich body:

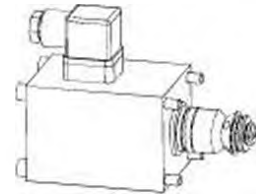
- Flange Register 1.11
- Sandwich Register 1.11

Special tool 983.2001 to poppet valve cartridge 2206.

Technical explanation see data sheet 1.0-100

**Solenoid poppet valve cartridge**

- normally closed
- $Q_{max} = 80 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**NG10**

**DESCRIPTION**

The 2/2-way seating valve in slip-in cartridge form is the central control element of virtually all directly-controlled seating valves in nominal size 10. The seating valve cartridge, the stroke limiting piston, the spring, one O-ring and a washer are supplied separately. A solenoid (VDE standard 0580) is an optional addition. **Important:** at the time the valve is taken into service, the valve must be vented under pressure (max. 2 revolutions of screw E).

**FUNCTION**

The seating valve piston is held against the spring by the pressure-tight control solenoid. Because the seat-piston design has equal surface areas on both sides and since the seat/piston construction is balanced in terms of pressure, no undesirable closing and opening forces are generated. As a result, oil can flow in both directions through the seating valve. The seat/piston guide is sealed with an O-ring. The seat with a metallic seal closes off the valve so that there is no leakage oil.

**APPLICATION**

Wandfluh poppet valves can be used anywhere absolutely leak tight closing functions are important. Completely sealed loading, gripping and clamping operations are all important functions which Wandfluh poppet valves can perform. Cartridge type poppet valves can be neatly accommodated in valve blocks. Cavity tools are available for hire or sale for machining aluminium or steel. See data sheet register no. 2.13.

**TYPE CODE**

Poppet valve cartridge				2 2 10	#
Poppet valve cartridge with solenoid				2 2 10 -	#
Medium-solenoid	M				
Super-solenoid	S				
2-way (Connections)					
2 Position					
Nominal size 10					
Nominal voltage $U_N$	12 VDC	G12	110 VAC	R110	
	24 VDC	G24	115 VAC	R115	
			230 VAC	R230	
Design-Index (Subject to change)					

**GENERAL SPECIFICATIONS**

Description	2/2-way poppet valve cartridge
Nominal size	NG10
Construction	Direct operated poppet valve
Operations	Solenoid
Mounting	cartridge form
	4 solenoid fixing screws M6
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_c = 8,9 \text{ Nm}$ (quality 8.8)
Weight: 2210	$m = 0,12 \text{ kg}$
2210-...	$m = 1,98 \text{ kg}$
Volume flow direction	any (see characteristics)

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 20/18/14 (Required filtration grade B10...16≥75) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Working pressure	Medium: $p_{max} = 160 \text{ bar}$ Super: $p_{max} = 350 \text{ bar}$
Max. volume flow	$Q_{max} = 80 \text{ l/min}$ . see characteristics

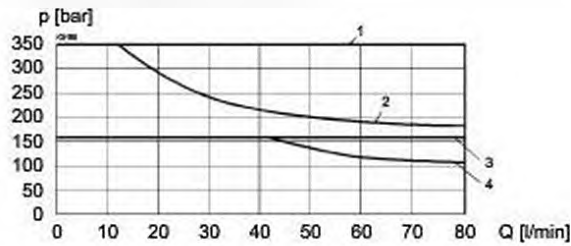
**ELECTRICAL CONTROL**

Construction	Solenoid, wet pin push type, pressure tight
Standard-nominal flow	$U_N = 12 \text{ VDC}$ , $U_N = 24 \text{ VDC}$ $U_N = 110 \text{ VAC}$ , $U_N = 115 \text{ VAC}$ * $U_N = 230 \text{ VAC}$ * AC = 50 to 60 Hz * Rectifier integrated in the plug Other nominal voltages and nominal performances on request ±10% of nominal voltage
Voltage tolerance	±10% of nominal voltage
Protection class	IP 65 to EN 60529
Relative duty factor	100% DF (see data sheet 1.1-430)
Switching cycles	15 000/h
Operating life	10 <sup>7</sup> (number of switching cycles, theoretical)
Connections/Power supply	Overdevice plug connection to ISO4400/DIN 43650, (2P+E), other connections on request
Solenoid:	- Medium SIN60V (data sheet 1.1-145) - Super SIS60V (data sheet 1.1-150)

**SYMBOLS**

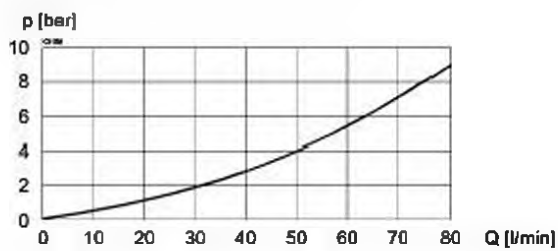



**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$   
 $p = f(Q)$  Performance limit at -10%

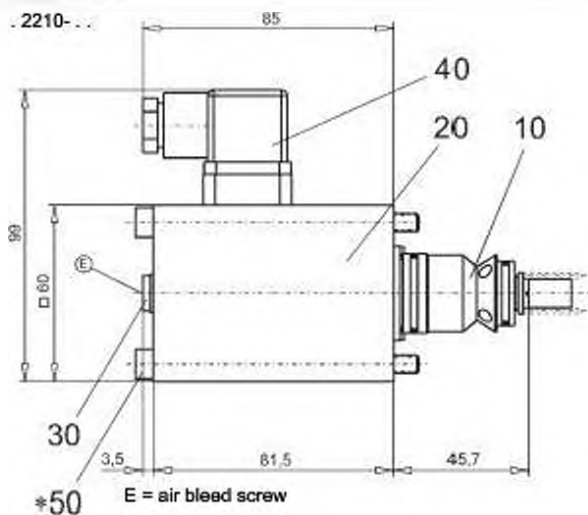


Type	Flow direction	
	1 → 2	2 → 1
M2210	3	4
S2210	1	2

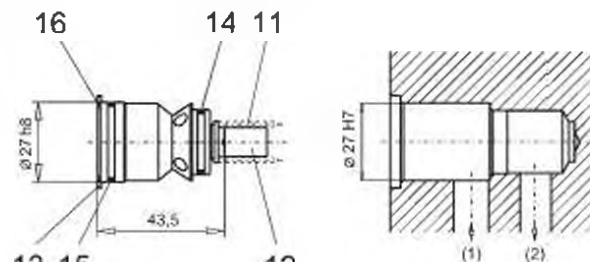
$\Delta p = f(Q)$  Pressure loss / flow characteristics



### DIMENSIONS



2210



For detailed cavity drawing and cavity tools see data sheet 2.13-1015

### PARTS LIST

Position	Article	Description
10	500.4010	Poppet valve cartridge 2210
11	052.4202	Spring 1,8 x 13,6 x 26
12	222.0042	Pin
13	212.0504	Washer
14	180.2188	O-ring ID 18,77 x 1,78
15	180.2236	O-ring ID 23,52 x 1,78
16	180.2230	O-ring ID 23,00 x 1,5
20	260.8...	Medium-solenoid SIN60V
	280.9...	Super-solenoid SIS60V
30	239.2033	Plug (incl. seal) HB0
40	219.2002	Plug
50	246.3190	Socket head cap screw M6 x 90 DIN 912

- Cartridge supplied with fastening screw M6 x 90 for steel bodies / blocs. For aluminium bodies / blocs longer screws are recommended (min. 2 screw diameter).

### ACCESSORIES

Cartridge built-in flange- or sandwich body:

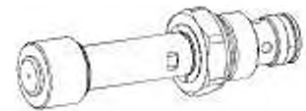
Flange Register 1.11  
 Sandwich Register 1.11

Special tool 983.2002 to poppet valve cartridge 2210.

Technical explanation see data sheet 1.0-100

**Solenoid operated poppet valve cartridge**

- ◆ solenoid operated
- ◆ direct operated
- ◆ normally closed
- ◆ 2/2-way
- ◆  $Q_{max} = 15 \text{ l/min}$
- ◆  $p_{max} = 250 \text{ bar}$

**M20 x 1,5**

**DESCRIPTION**

Direct operated 2/2-way solenoid poppet valve in screw-in cartridge construction for cavity according to Wandfluh standard. In case of the BA execution, the valve is closed in the de-energised position.

**APPLICATION**

Poppet valves are used where tight closing functions of the valve are essential like leakfree load holding, clamping or gripping. The poppet valve cartridge is mainly used in the mobile and stationary block construction.

**SYMBOL**

„Normally closed“ BA


**TYPE CODE**

Poppet valve	S	D	E	PM20	-	-	X5	‡
Direct operated								
Solenoid								
Screw-in cartridge M20 x 1,5								
2/2 way, „normally closed“						BA		
Without coil								(The coil has to be ordered separately)
Design index (subject to change)								

\* 11-200A

**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Direct operated
Mounting	Screw-in cartridge type
Nominal size	M20 x 1,5
Actuation	Switching solenoid
Ambient temperature	-30...+110 °C
Weight	0,12 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 250 \text{ bar}$
Maximum volume flow	$Q_{max} = 15 \text{ l/min}$ , see characteristics
Leakage volume flow	Seat tight, max. 5 drops / min at $p_{max}$
Fluid	Mineral oil, other fluid on request
Viscosity range	8 mm <sup>2</sup> /s... 420 mm <sup>2</sup> /s
Temperature range	-20...+70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10... 16 ≥ 75, see data sheet 1.0-50

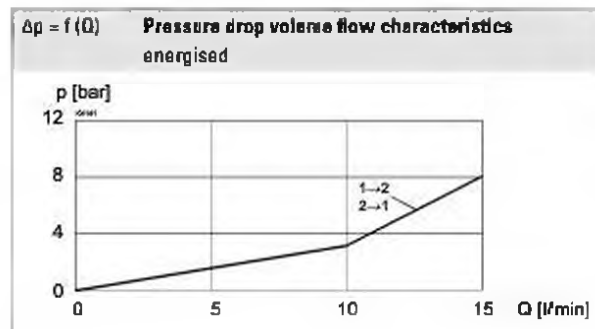
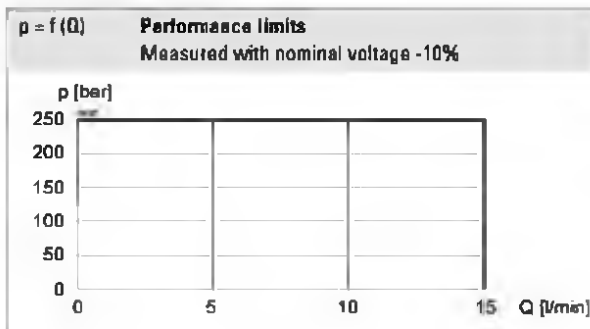
**SURFACE TREATMENT**

- ◆ The armature tube and the external parts of the cartridge body are zinc coated

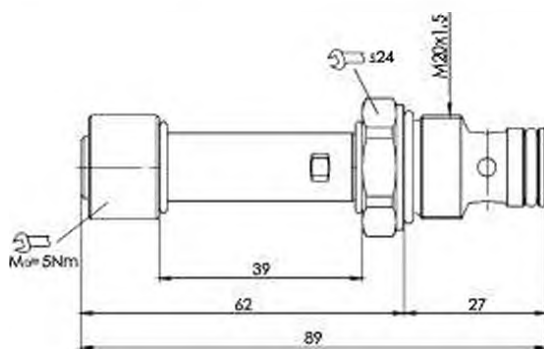
**MANUAL OVERRIDE**

None

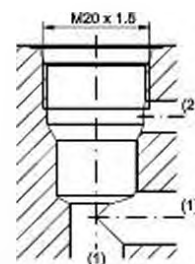
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**Switching times**

SDEPM20	Type	Switch on	Switch off
	BA	approx. 20 ms	approx. 40 ms

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard


**Nota!**

For detailed cavity drawing and cavity tools see data sheet 2.13-1042


**ACCESSORIES**

Technical explanations	data sheet 1.0-100
Hydraulic fluids	data sheet 1.0-50
Filtration	data sheet 1.0-50
Relative duty factor	data sheet 1.1-430

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	K E33 / 13 x 39 (data sheet 1.1-160)
Connection	Connector socket EN 175301 - 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 - 2P

**Nota!**

The solenoid coil is not included in the delivery!


**INSTALLATION NOTES**

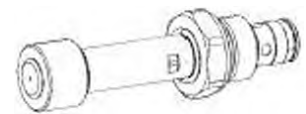
Mounting type	Screw-in cartridge M20 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 40-45 \text{ Nm}$ for screw-in cartridge

**STANDARDS**

Protection class	EN 60 529
Contamination efficiency	ISO 4406

**Solenoid operated poppet valve cartridge**

- ◆ solenoid operated
- ◆ direct operated
- ◆ normally open and normally closed
- ◆ 2/2-way
- ◆  $Q_{max} = 15 \text{ l/min}$
- ◆  $p_{max} = 250 \text{ bar}$

 **$\frac{3}{4}$ "-16 UNF**

**DESCRIPTION**

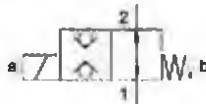
Direct operated 2/2-way solenoid poppet valve in screw-in cartridge design for cavity according to Wandfluh standard. In case of the AB execution, the valve is closed in the energised position, in case of the BA execution in the de-energised position.

**APPLICATION**

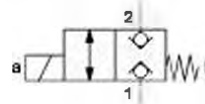
Poppet valves are used where tight closing functions of the valve are essential like leakfree load holding, clamping or gripping. The poppet valve cartridge is mainly used in the mobile and stationary block construction.

**SYMBOL**

„Normally open“ AB



„Normally closed“ BA


**TYPE CODE**

Poppet valve	S	D	E	PU08	-		-	X5	#	
Direct operated										
Solenoid										
Screw-in cartridge $\frac{3}{4}$ "-16 UNF										
2/2 way, «normally open»										AB
2/2 way, «normally closed»										BA
Without coil										[The coil has to be ordered separately]
Design index (subject to change)										

1 11-2008

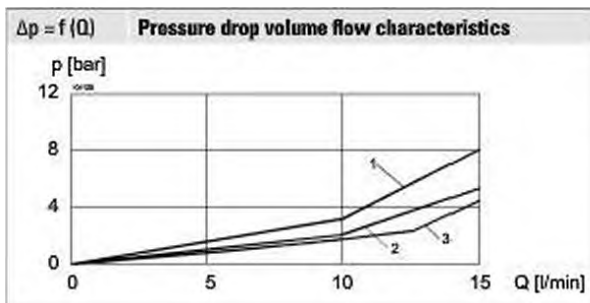
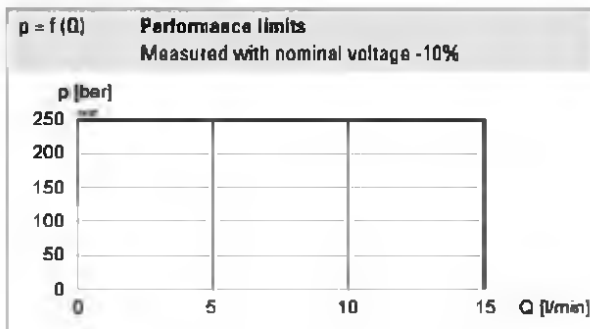
**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Direct operated
Mounting	Screw-in cartridge type
Nominal size	$\frac{3}{4}$ "-16 UNF
Actuation	Switching solenoid
Ambient temperature	-30...+110 °C
Weight	0,12 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 250 \text{ bar}$
Maximum volume flow	$Q_{max} = 15 \text{ l/min}$ , see characteristics
Leakage volume flow	Seat tight, max. 5 drops / min at $p_{max}$
Fluid	Mineral oil, other fluid on request
Viscosity range	8 mm <sup>2</sup> /s ... 420 mm <sup>2</sup> /s
Temperature range	-20...+70 °C
fluid	
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 $\geq 75$ , see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

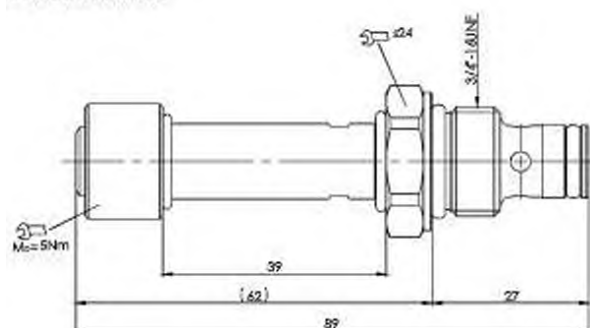
 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**Switching times**

SDEPU08	Type	Switching on	Switching off
	AB	approx. 35 ms	approx. 80 ms
BA	approx. 20 ms	approx. 40 ms	

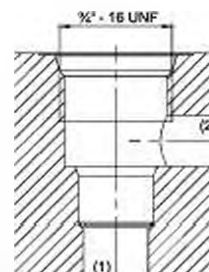
	AB	BA
de-energised 1 → 2	2	-
de-energised 2 → 1	3	-
energised 1 → 2	-	1
energised 2 → 1	-	1

**DIMENSIONS**

SDEPU08-AB / BA


**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1043

**ACCESSORIES**

Technical explanations	data sheet 1.0-100
Hydraulic fluids	data sheet 1.0-50
Filtration	data sheet 1.0-50
Relative duty factor	data sheet 1.1-430

**ACTUATION**

Actuation	Switching solenoid, wet pin push + pull type, pressure tight
Execution	K.E33 / 13 x 39 (data sheet 1.1-160)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**Note!** The solenoid coil is not included in the delivery!


**SURFACE TREATMENT**

- ◆ The armature tube and the external parts of the cartridge body are zinc coated

**MANUAL OVERRIDE**

None

**STANDARDS**

Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

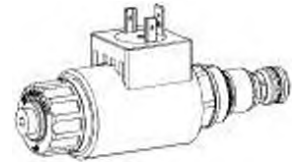
Mounting type	Screw-in cartridge ¼"-16 UNF
Mounting position	Any, preferably horizontal
Tightening torque	M <sub>0</sub> = 40-45 Nm for screw-in cartridge



**Solenoid operated poppet valve cartridge**

- ◆ direct operated
- ◆ 2/2- and 3/2-way
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**M18 x 1,5**  
**ISO 7789 /**  
**Wandfluh standard**


**DESCRIPTION**

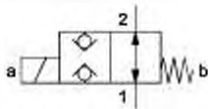
Direct operated 2/2- and 3/2-way solenoid poppet valve in screw-in cartridge construction for cavity according to ISO 7789 / Wandfluh standard. By means of the pressure tight switching solenoid, the pressure compensated, metallically sealing poppet spool is either opened or closed. The seat spool guide is sealed by means of an O-ring.

**APPLICATION**

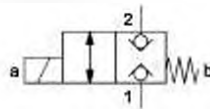
Wandfluh solenoid operated poppet valve cartridges are used where tight closing functions are essential like leakage-free load holding, clamping or gripping. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

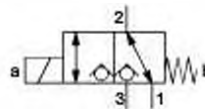
„Normally open“ AB



„Normally closed“ BA



FG


**TYPE CODE**

		S D S PM18 -				/				#
Poppet valve										
Direct operated										
Solenoid										
Screw-in cartridge M18 x 1,5										
Designation of symbols acc. to table										
Nominal voltage $U_n$	12 VDC	G12	115 VAC	R115						
	24 VDC	G24	230 VAC	R230						
	without coil	X5								
Slip-on coil	Metal housing round with one-sided collar	V	(only G12 and G24)							
	Metal housing square with one-sided collar	N								
Connection execution	Connector socket EN 175301-803 / ISO 4400	D								
	Connector socket AMP Junior-Timer	J	(only for $U_n \leq 75 \text{ VDC}$ )							
	Connector Deutsch DT04 - 2P	G	(only for $U_n \leq 75 \text{ VDC}$ )							
Sealing material	NBR									
	FKM (Viton)	D1								
	NBR 872	ZDM								
Armature tube	closed	0								
	with screw plug HB0									
	with manual override	HB4,5								
Design index (subject to change)										

**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2-way poppet valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M18 x 1,5 according to ISO 7789 / Wandfluh standard
Actuation	Switching solenoid
Ambient temperature	-25 ... +70 °C
Weight	0,46 - 0,48 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 40$ l/min, see characteristics
Leakage oil	Seat tight, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	NBR -25 ... +70 °C FKM (D1) -20 ... +70 °C NBR 872 (Z604) -40 ... +70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10 ... 16 ≥ 75, see data sheet 1.0-50

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Switching frequency	5 000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-168 (slip-on coil V) and 1.1-175 (slip-on coil N)


**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	V.E37 / 19 x 50 (Data sheet 1.1-168) N.S35 / 19 x 50 (Data sheet 1.1-175)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**SURFACE TREATMENT**

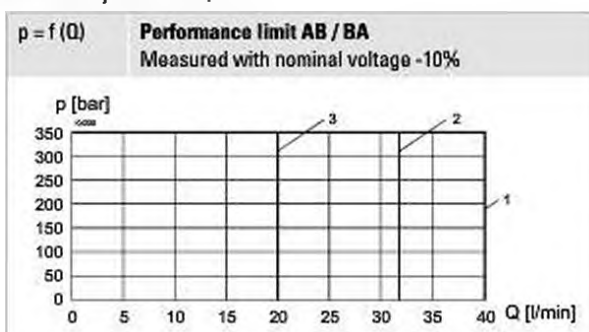
- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**PERFORMANCE SPECIFICATIONS**

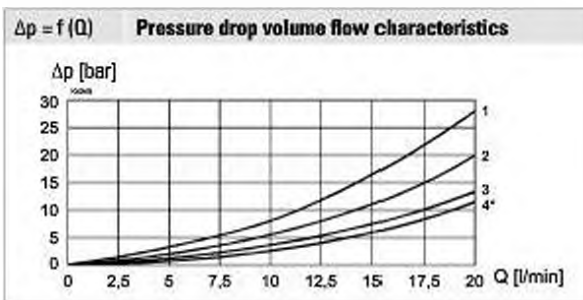
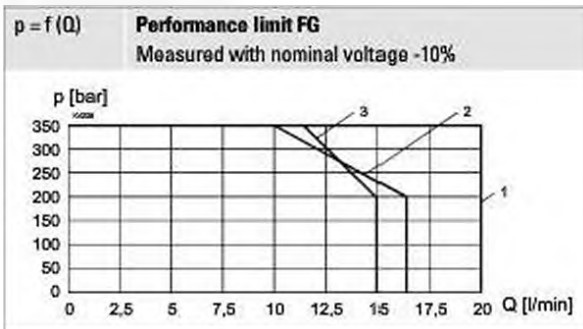
Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s



Execution	Flow direction	
	1 → 2	2 → 1
SDSPM18-AB	3	1
SDSPM18-BA	2	1



**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Execution	Flow direction			
	1 → 2	2 → 1	2 → 3	3 → 2
SDSPM18-FG	3	1	1	2

Execution	Flow direction			
	1 → 2	2 → 1	2 → 3	3 → 2
SDSPM18-AB	4	4	-	-
SDSPM18-BA	3	3	-	-
SDSPM18-FG	2	2	1	1

<sup>a</sup>Δp 80 bar at 40 l/min

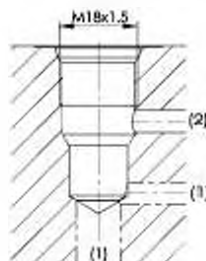
Typ	Flow direction	Switching times		
		Switching on	Switching off	
SDSPM18	AB	1 → 2	approx. 40 ms	approx. 20 ms
		2 → 1	approx. 40 ms	approx. 10 ms
	BA	1 → 2	approx. 40 ms	approx. 30 ms
		2 → 1	approx. 30 ms	approx. 30 ms
FG	1 → 2	approx. 40 ms	approx. 10 ms	
	2 → 1	approx. 40 ms	approx. 10 ms	
	2 → 3	approx. 40 ms	approx. 40 ms	
	3 → 2	approx. 40 ms	approx. 20 ms	

**Note!**


The switching times depend on the volume flow, pressure and viscosity. In case of very large volume flows, the switching time for closing can get considerably longer.

**HYDRAULIC CONNECTION**

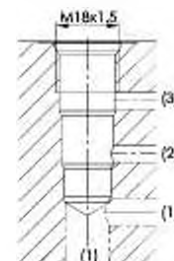
Cavity drawing according to ISO 7789-18-01-D-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1002

**HYDRAULIC CONNECTION**

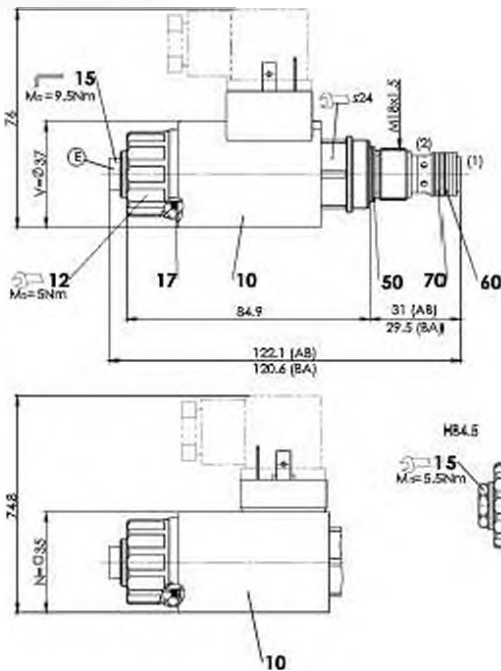
Cavity drawing according to Wandfluh standard


**Note!**

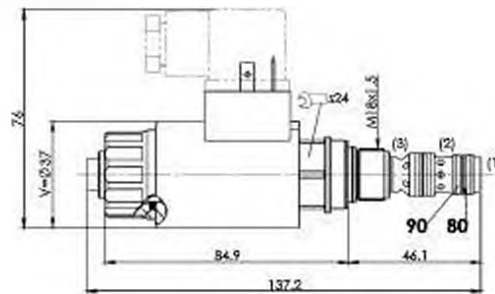

For detailed cavity drawing and cavity tools see data sheet 2.13-1020

**DIMENSIONS**

SDSPM18-AB / BA



SDSPM18-FG


**PARTS LIST**

Position	Article	Description
10	206.2...	V.E37 / 19 x 50
	260.5...	N.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000	HB4,5 manual override
	239.2033	HB0 Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
50	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
60	160.2111	O-ring ID 11,11 x 1,78 (NBR)
	160.6111	O-ring ID 11,11 x 1,78 (FKM)
70	049.8137	Back-up ring PTSM rd 8,7 x 11,6 x 1,4
80	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
90	049.8156	Back-up ring PTSM rd 10,1 x 13 x 1,4

**STANDARDS**

Cartridge cavity	ISO 7789 / Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**ACCESSORIES**

Threaded body	Data sheet 2.9-2xx
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible

Optionally: HB4,5, HN(K) or HG(K)

→ See data sheet 1.1-311

**INSTALLATION NOTES**

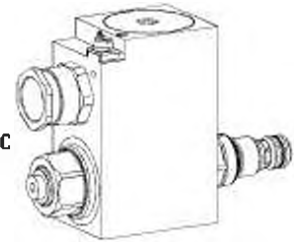
Mounting type	Screw-in cartridge M18 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 40 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5

**Solenoid operated poppet valve cartridge**

- ◆ solenoid actuated
- ◆ direct operated
- ◆ 2/2- or 3/2-way
- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**M18 x 1,5**
**ISO 7789 / Wandfluh standard**

- ⊕ II 2 G Ex db IIC T6, T4
  - ⊕ II 2 D Ex db III C T80 °C, T130 °C
  - ⊕ I M2 Ex db I Mb
- Class I Division 1  
Class I Zone 1


**DESCRIPTION**

Direct operated 2/2- and 3/2-way solenoid poppet valve in screw-in cartridge construction for cavity according to ISO 7789 / Wandfluh standard. By means of the pressure tight switching solenoid, the pressure compensated, metallically sealing poppet spool is either opened or closed. The seat spool guide is sealed by means of an O-ring. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to ...	Z604 -40 °C to ...
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	x
MA		x	x	
UL / CSA	x		x	x

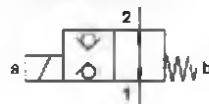
**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

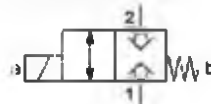
**Attention!** The UL execution is always supplied without cable gland


**SYMBOL**

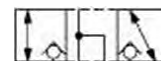
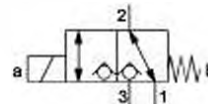
„Normally open“ AB



„Normally closed“ BA



FG



**TYPE CODE**

		S D Y PM18 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>	
Poppet valve			
Direct operated			
Ex-protection execution, Exd			
Screw-in cartridge M18 x 1,5			
Designation of symbols acc. to table			
Nominal voltage $U_N$	12 VDC 24 VDC	<input type="checkbox"/> G12 <input type="checkbox"/> G24	115 VAC 230 VAC
			<input type="checkbox"/> R115 <input type="checkbox"/> R230
Nominal power $P_N$	9 W 15 W 17 W	<input type="checkbox"/> L9 <input type="checkbox"/> L15 <input type="checkbox"/> L17	Ambient temperature up to: 40 °C or 90 °C 70 °C 70 °C (only UL / CSA)
Certification	ATEX, IECEx, EAC, CCC Australia	<input type="checkbox"/> AU	<input type="checkbox"/> UL / CSA <input type="checkbox"/> UL <input type="checkbox"/> MA <input type="checkbox"/> MA
Sealing material	NBR FKM (Viton) NBR -40° C	<input type="checkbox"/> <input type="checkbox"/> D1 <input type="checkbox"/> Z604	(only with 15 W)
Design index (subject to change)			

**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2-way poppet valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M18 x 1,5 according to ISO 7789 / Wandfluh standard
Actuation	Ex-protection switching solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17) -40...+70 °C (L15 / L17)
Weight	1,85 kg (2/2-way) 1,90 kg (3/2-way)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{nom} = 350$ bar
Maximum volume flow	$Q_{max} = 20$ l/min, see characteristics
Nominal volume flow	$Q_N = 15$ l/min
Leakage oil	Poppet type, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L9 or L15 / L17) NBR 872 -40...+70 °C (L15 / L17)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**ACCESSORIES**

Threaded body	Data sheet 2.9-2xx
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible  
 Optionally: HB4,5, HN(K) or HG(K)  
 → See data sheet 1.1-311

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Switching frequency	5 000 / h
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz ± 2 %, with built-in two-way rectifier
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

**Note!** Other electrical specifications see data sheet 1.1-183 and 1.1-184


**STANDARDS**

Cartridge cavity	ISO 7789 / Wandfluh standard
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 2, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M18 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 40$ Nm Screw-in cartridge $M_0 = 5$ Nm knurled nut $M_0 = 9,5$ Nm HBD $M_0 = 5,5$ Nm HB4,5

**COMMISSIONING**

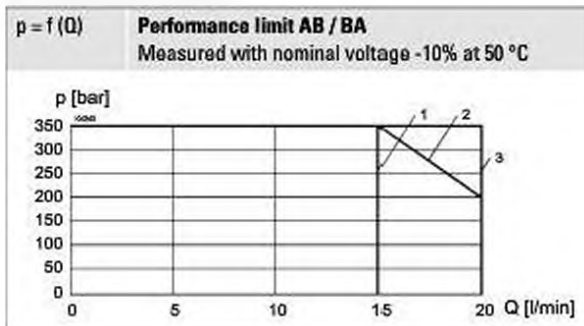
**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).



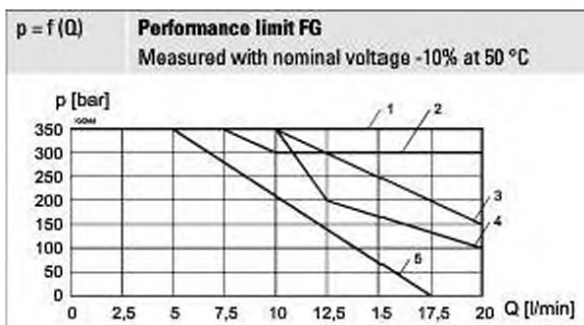
The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability is assumed.

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

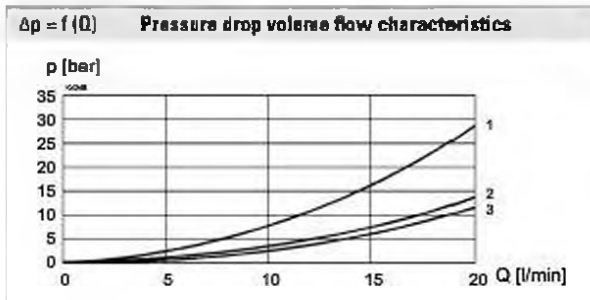


Execution	Flow direction	
	1 → 2	2 → 1
SDYPM18-AB	1	3
SDYPM18-BA	2	2



Execution	Flow direction			
	1 → 2	2 → 1	2 → 3	3 → 2
SDYPM18-FG-L9	4	1	2	5
SDYPM18-FG-L15 / L17	4	1	1	3

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Execution	Flow direction			
	1 → 2	2 → 1	2 → 3	3 → 2
SDYPM18-AB	2	2	-	-
SDYPM18-BA	2	2	-	-
SDYPM18-FG	3	3	1	1



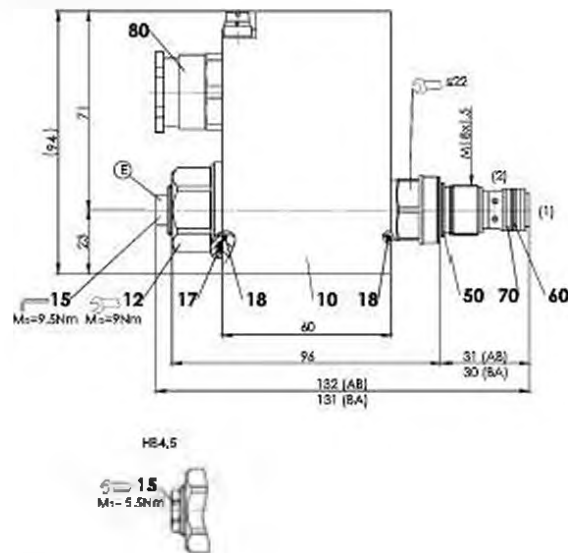
**Note!** With the L15 / L17 execution for ambient temperatures up to 70 °C, the performance specifications have been evaluated with an ambient temperature of 50 °C



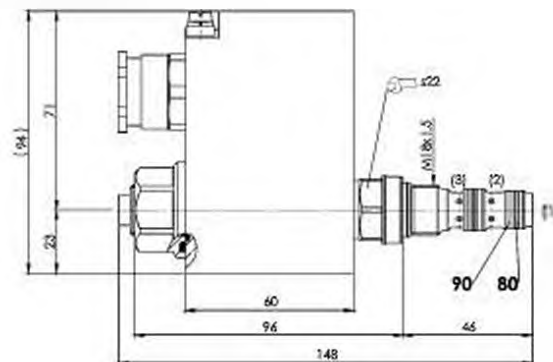
**Attention!** Long periods of non-actuation can reduce the switching performance

**DIMENSIONS**

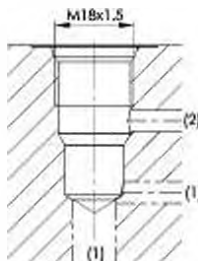
SDYPM18-AB / BA



SDYPM18-FG


**HYDRAULIC CONNECTION**

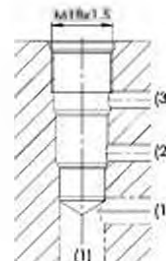
Cavity drawing according to ISO 7789-18-01-0-98



**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1002

**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard



**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1020

**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	239.2033	Screw plug HB0 (incl. seal)
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
60	160.2111	O-ring ID 11,11 x 1,78 (NBR)
	160.6111	O-ring ID 11,11 x 1,78 (FKM)
70	049.8156	Back-up ring PTSM rd 10,1 x 13 x 1,4
80	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
90	049.8137	Back-up ring PTSM rd 8,7 x 11,6 x 1,4
110	111.1080	Cable gland M20 x 1,5

**SURFACE TREATMENT**

- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

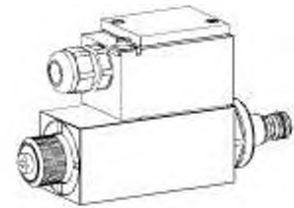


**Solenoid operated poppet valve cartridge**

- ◆ direct operated
- ◆ intrinsically safe
- ◆ 2/2- and 3/2-way
- ◆  $Q_{max} = 8 \text{ l/min}$
- ◆  $p_{max} = 250 \text{ bar}$

**M18 x 1,5**  
**ISO 7789**

- Ex ia I Ma
- Ex ia II T5 / T6 Ga
- II 1 G Ex ia II C T6, T5
- I M1 Ex ia I Ma



**DESCRIPTION**

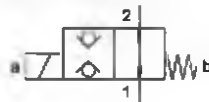
Direct operated 2/2- and 3/2-way solenoid poppet valve in screw-in cartridge construction for cavity according to ISO 7789. By means of the pressure tight switching solenoid, the pressure compensated, metallically sealing poppet spool is either opened or closed. The seat spool guide is sealed by means of an O-ring. The rotatable, easy exchangeable slip-on coil can be supplied in two different executions.

**APPLICATION**

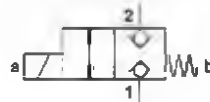
Wandfluh solenoid operated poppet valve cartridges are used where tight closing functions are essential like leakage-free load holding, clamping or gripping. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

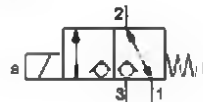
„Normally open“ AB



„Normally closed“ BA



FG



**TYPE CODE**

		S D Z PM18 - <input type="text"/> - <input type="text"/> / <input type="text"/> / <input type="text"/> - <input type="text"/> # <input type="text"/>	
Poppet valve			
Direct operated			
Explosion proof, Ex ia			
Screw-in cartridge M18 x 1,5			
Designation of symbols acc. to table			
Coil resistance	100 Ohm	<input type="text" value="100"/>	
	152 Ohm	<input type="text" value="152"/>	
Equipment group	I (Mining)	<input type="text" value="Z319"/>	only in combination with coil resistance 100 Ω
	II (Surface)	<input type="text" value="T6"/>	
Connection execution		<input type="text" value="D"/>	
		<input type="text" value="K"/>	
Sealing material	NBR	<input type="text"/>	
	FKM (Viton)	<input type="text" value="D1"/>	
Design index (subject to change)			



**CERTIFICATE**

according to	Surface gas + dust	Mining
ATEX	x	x
IECEX	x	x

Note!


**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	M.Z45 (Data sheet 1.1-185) rotatable in steps of 90 ° and easy exchangeable
Connection	Through cable gland for cable Ø 6...12 mm two phase conductors +/- as well as one ground conductor

**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2-poppet valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M18 x 1,5 according to ISO 7789
Actuation	Ex-protection switching solenoid
Ambient temperature	-20...+45 °C (operation as T6) -20...+60 °C (operation as T1...T5)
Weight	2,32 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 250$ bar
Maximum volume flow	$Q_{max} = 8$ l/min, see characteristics
Leakage oil	Seat tight
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-20...+45 °C (operation as T6) -20...+60 °C (operation as T1...T5)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**ELECTRICAL SPECIFICATIONS**

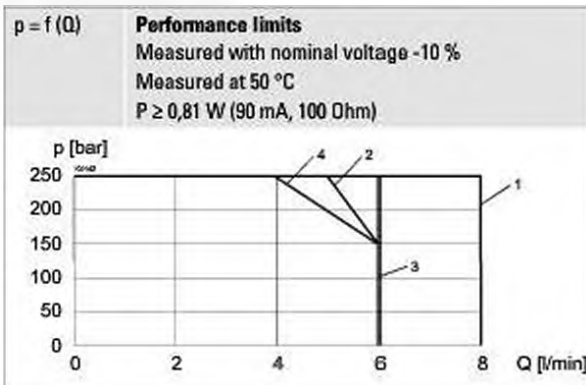
Protection class	IP65
Relative duty factor	Continuous operation
Switching frequency	1'800 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Limiting current at 50 °C	$I_{lim} = 90$ mA (100 Ω execution) $I_{lim} = 64$ mA (152 Ω execution)
Temperature class	T1...T6
Coil resistance	100 Ω, 152 Ω
Minimum power consumption	$P_{min} = 0,81$ W (100 Ω execution) $P_{min} = 0,62$ W (152 Ω execution)

Note! Other electrical specifications see data sheet 1.1-185

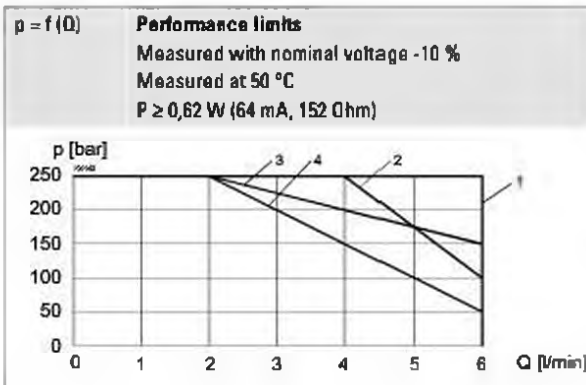

**ACCESSORIES**

Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

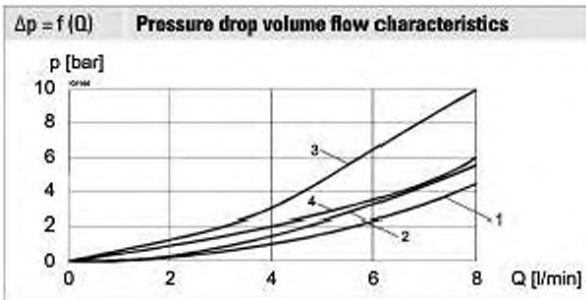
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Execution	Flow direction			
	1 → 2	2 → 1	2 → 3	3 → 2
SDZPM18-AB	1	1	-	-
SDZPM18-BA	1	1	-	-
SDZPM18-FG	2	3	3	4



Execution	Flow direction			
	1 → 2	2 → 1	2 → 3	3 → 2
SDZPM18-AB	1	1	-	-
SDZPM18-BA	1	1	-	-
SDZPM18-FG	2	1	3	4



Execution	Flow direction		
	1 → 2	2 → 1	3 → 2
SDZPM18-AB	2	1	-
SDZPM18-BA	1	1	-
SDZPM18-FG	-	4	3

**STANDARDS**

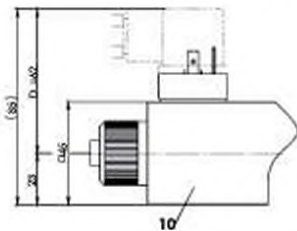
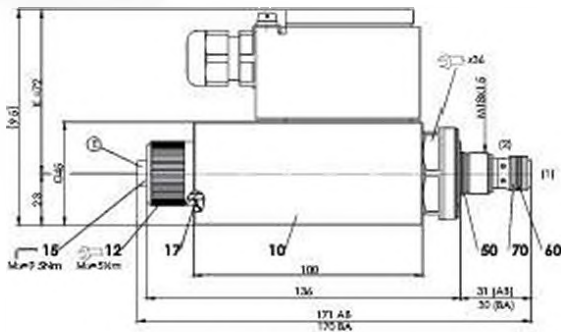
Cartridge cavity	ISO 7789
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC 60079-1 / 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

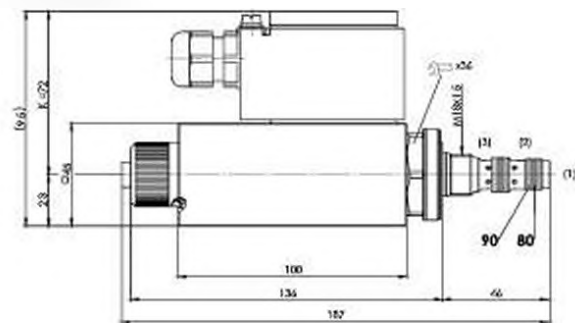
Mounting type	Screw-in cartridge M18 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 40 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut

**DIMENSIONS**

SDZPM18-AB / BA



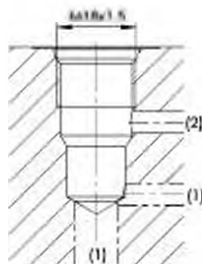
SDZPM18-FG


**SEALING MATERIAL**

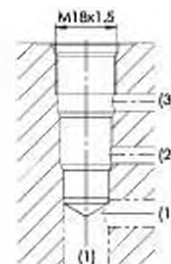
NBR or FKM (Viton) as standard, choice in the type code

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-18-01-0-98


**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1002


Cavity drawing according to Wandfluh standard


**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1020

**PARTS LIST**

Position	Article	Description
10	263.66..	Solenoid coil M.245-...
12	032.9614	Knurled nut M22 x 1 x 22
15	239.2033	Screw plug HB0 (incl. seal)
17	160.2204	O-ring ID 20,35 x 1,78 (NBR)
50	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
60	160.2111	O-ring ID 11,11 x 1,78 (NBR)
	160.6111	O-ring ID 11,11 x 1,78 (FKM)
70	049.8156	Back-up ring PTSM rd 10,1 x 13 x 1,4
80	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)

**SURFACE TREATMENT**

- ◆ The cartridge body is zinc coated
- ◆ The slip-on coil and the armature tube are zinc-nickel coated

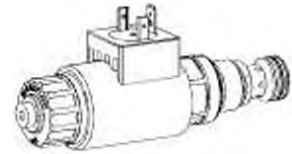
**COMMISSIONING**

**Attention!** Intrinsically safe valves must be controlled only by a suitable, certified power supply from out of the hazardous area (see Operating Instructions). The selection of the power supply and the wiring must be carried out by qualified personnel. Recommended power supplies and safety-related limit values according to data sheet 1.1-185



**Solenoid operated poppet valve cartridge**

- ◆ direct operated
- ◆ 2/2- and 3/2-way
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

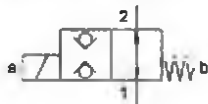
Direct operated 2/2- and 3/2-way solenoid poppet valve in screw-in cartridge construction for cavity according to ISO 7789. By means of the pressure tight switching solenoid, the pressure compensated, metallically sealing poppet spool is either opened or closed. The seat spool guide is sealed by means of an O-ring.

**APPLICATION**

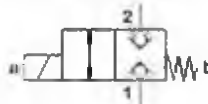
Wandfluh solenoid operated poppet valve cartridges are used where tight closing functions are essential like leakage-free load holding, clamping or gripping. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

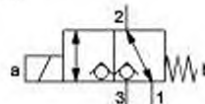
„Normally open“ AB



„Normally closed“ BA



FG


**TYPE CODE**

		S D S PM22 - [ ] - [ ] / [ ] - [ ] [ ] # [ ]			
Poppet valve					
Direct operated					
Solenoid					
Screw-in cartridge M22 x 1,5					
Designation of symbols acc. to table					
Nominal voltage $U_n$	12 VDC 24 VDC without coil	G12 G24 X5	115 VAC 230 VAC	R115 R230	
Slip-on coil	Metal housing round with one-sided collar Metal housing square with one-sided collar	V R	(only G12 and G24)		
Connection execution	Connector socket EN 175301-803 / ISO 4400 Connector socket AMP Junior-Timer Connector Deutsch DT04 - 2P	T J G	(only for $U_n \leq 75 \text{ VDC}$ ) (only for $U_n \leq 75 \text{ VDC}$ )		
Sealing material	NBR FKM (Viton) NBR 872	[ ] 01 Z804			
Armature tube	closed with screw plug HB0 with manual override	0 [ ] HB4,5			
Design index (subject to change)					

**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2-way poppet valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C
Weight	0,56 - 0,60 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 40$ l/min, see characteristics
Leakage oil	Seat tight, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Switching frequency	5'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-168 (slip-on coil V) and 1.1-175 (slip-on coil N)


**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	V.E37 / 19 x 50 (Data sheet 1.1-168) N.S35 / 19 x 50 (Data sheet 1.1-175)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**SURFACE TREATMENT**

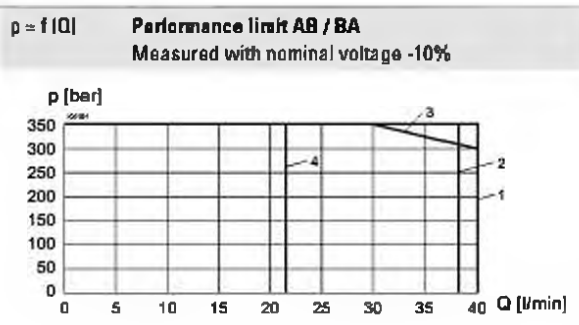
- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

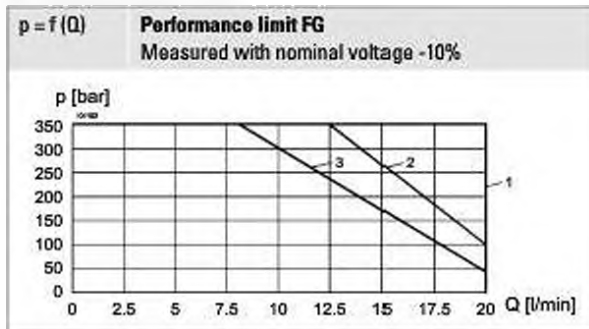
**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

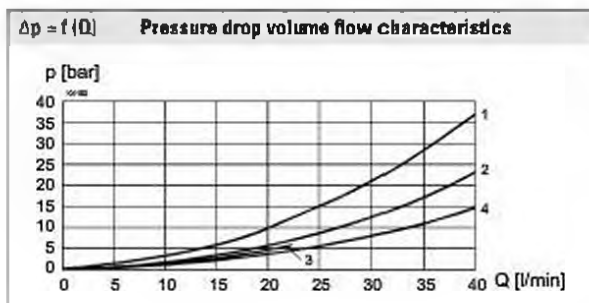


Execution	Flow direction	
	1 → 2	2 → 1
SDSPM22-AB	4	2
SDSPM22-BA	3	1

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Execution	Flow direction			
	1 → 2	2 → 1	2 → 3	3 → 2
SDSPM22-FG	2	1	1	3



Execution	Flow direction			
	1 → 2	2 → 1	2 → 3	3 → 2
SDSPM22-AB	3	4	-	-
SDSPM22-BA	2	2	-	-
SDSPM22-FG	3	4	1	1

**Switching times**

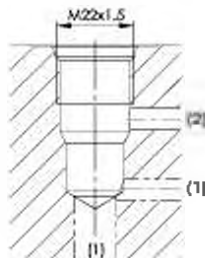
Type	Flow direction	Switching times	
		Switching on	Switching off
AB	1 → 2	approx. 40 ms	approx. 20 ms
	2 → 1	approx. 40 ms	approx. 10 ms
BA	1 → 2	approx. 30 ms	approx. 30 ms
	2 → 1	approx. 40 ms	approx. 30 ms
FG	1 → 2	approx. 40 ms	approx. 10 ms
	2 → 1	approx. 40 ms	approx. 10 ms
	2 → 3	approx. 40 ms	approx. 40 ms
	3 → 2	approx. 40 ms	approx. 20 ms

**Note!**


The switching times depend on the volume flow, pressure and viscosity. In case of very large volume flows, the switching time for closing can get considerably longer.

**HYDRAULIC CONNECTION**

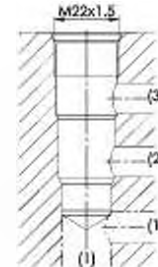
Cavity drawing according to ISO 7789-22-01-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1008

**HYDRAULIC CONNECTION**

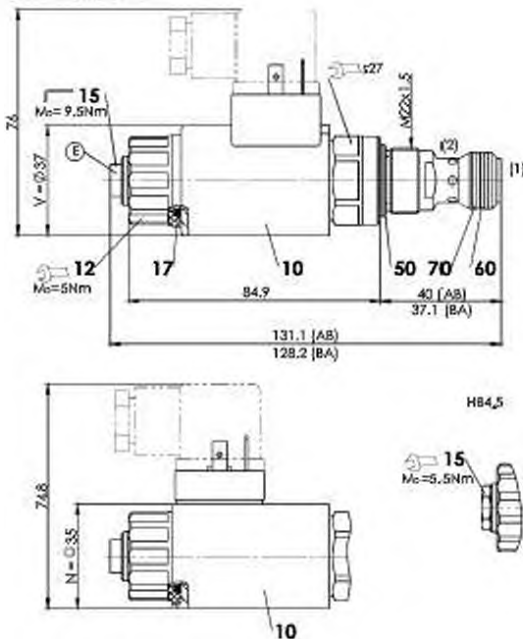
Cavity drawing according to ISO 7789-22-04-0-98


**Note!**

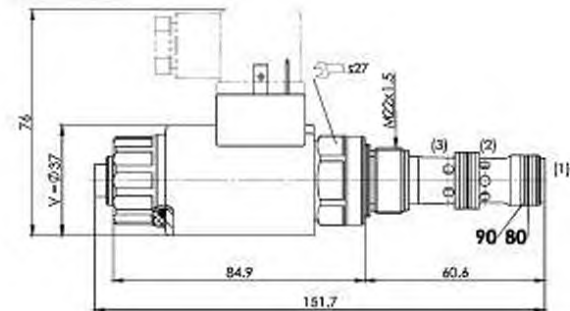

For detailed cavity drawing and cavity tools see data sheet 2.13-1004

**DIMENSIONS**

SDSPM22-AB / BA



SDSPM22-FG


**PARTS LIST**

Position	Article	Description
10	206.2...	V.E37 / 19 x 50
	260.5...	N.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000	HB4,5 manual override
	239.2033	HB0 Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.8196	Backup ring PTSM rd 14,5 x 17,4 x 1,4
80	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
90	049.8176	Back-up ring PTSM rd 12,7 x 15,6 x 1,4

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**ACCESSORIES**

Threaded body	Data sheet 2.9-2xx
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible

Optionally: HB4,5, HN(K) or HR(K)

→ See data sheet 1.1-311

**INSTALLATION NOTES**

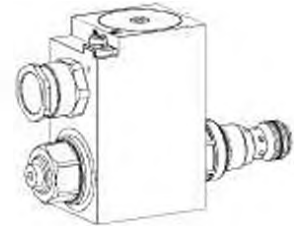
Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge
	$M_0 = 5 \text{ Nm}$ knurled nut
	$M_0 = 9,5 \text{ Nm}$ HB0
	$M_0 = 5,5 \text{ Nm}$ HB4,5

**Solenoid operated poppet valve cartridge**

- ◆ solenoid actuated
- ◆ direct operated
- ◆ 2/2- or 3/2-way
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**

- ⊕ II 2 G Ex db IIC T6, T4
- ⊕ II 2 D Ex db III C T60 °C, T130 °C
- ⊕ I M2 Ex db I Mb
- Class I Division 1
- Class I Zone 1


**DESCRIPTION**

Direct operated 2/2- and 3/2-way solenoid poppet valve in screw-in cartridge construction for cavity according to ISO 7789. By means of the pressure tight switching solenoid, the pressure compensated, metallically sealing poppet spool is either opened or closed. The seat spool guide is sealed by means of an O-ring. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to...	Z604 -40 °C to...
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	x
MA		x	x	
UL / CSA	x		x	x

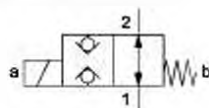
**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

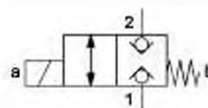
**Attention!** The UL execution is always supplied without cable gland


**SYMBOL**

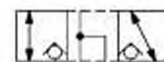
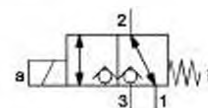
„Normally open“ AB



„Normally closed“ BA



FG





**TYPE CODE**

S □ Y PM22 - □ - □ / □ □ - □ # □

Poppet valve					
Direct operated					
Ex-protection execution, Exd					
Screw-in cartridge M22 x 1,5					
Designation of symbols acc. to table					
Nominal voltage $U_N$	12 VDC 24 VDC	<input type="checkbox"/> G12 <input type="checkbox"/> G24	115 VAC 230 VAC	<input type="checkbox"/> R115 <input type="checkbox"/> R230	
Nominal power $P_N$	15 W 17 W 21 W	<input type="checkbox"/> L15 <input type="checkbox"/> L17 <input type="checkbox"/> L21	Ambient temperature up to: 70 °C 70 °C (only UL / CSA) 50 °C		
Certification	ATEX, IECEx, EAC, CCC Australia	<input type="checkbox"/> AU	UL / CSA	<input type="checkbox"/> UL	MA <input type="checkbox"/> MA
Sealing material	NBR FKM (Viton) NBR -40° C	<input type="checkbox"/> <input type="checkbox"/> D1 <input type="checkbox"/> Z904	(only with 15 W)		
Design index (subject to change)					

**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2-way poppet valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Ex-protection switching solenoid
Ambient temperature	<b>Operation as T4</b> -25 ... +70 °C (L15 / L17) -25 ... +50 °C (L21)
Weight	1,90 kg (2/2-way) 1,95 kg (3/2-way)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 40$ l/min, see characteristics
Nominal volume flow	$Q_N = 20$ l/min
Leakage oil	Poppet type, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	NBR -25 ... +70 °C FKM (D1) -20 ... +70 °C NBR 872 (Z604) -40 ... +70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 6 ... 10 ≥ 75, see data sheet 1.0-50

**ACCESSORIES**

Threaded body	Data sheet 2.9-2xx
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible.  
 Optionally HN (K) or HG (K)  
 → See data sheet 1.1-311

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Switching frequency	5'000 / h
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz ± 2 %, with built-in two-way rectifier
Standard nominal power	15 W, 17 W, 21 W
Temperature class	Nominal power 15 W / 17 W / 21 W: T1... T4

**Note!** Other electrical specifications see data sheet 1.1-183 and 1.1-184


**COMMISSIONING**

**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).



The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability is assumed.

**STANDARDS**

Cartridge cavity	ISO 7789
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 2, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

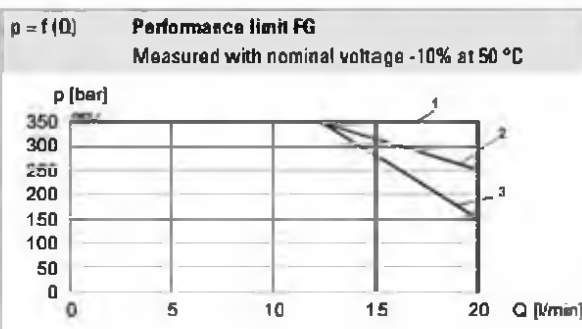
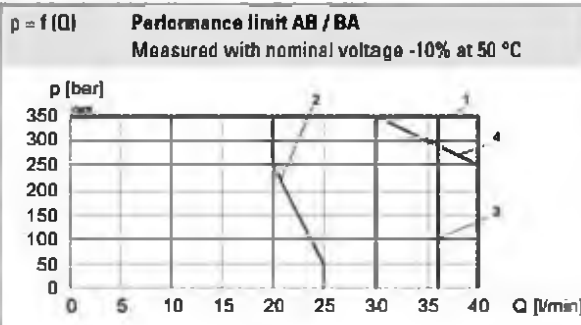
**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60$ Nm Screw-in cartridge $M_0 = 9$ Nm knurled nut

**Attention!** For stack assembly please observe the remarks in the operating instructions


**PERFORMANCE SPECIFICATIONS**

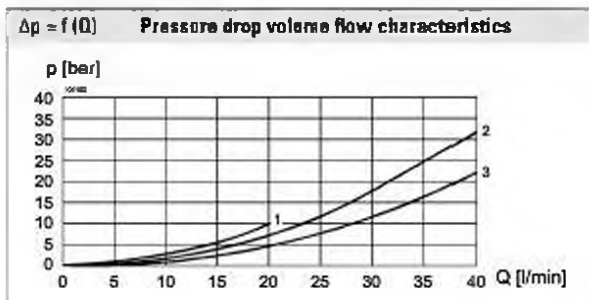
Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s



	1 → 2	2 → 1
SDYPM22-AB-L21	2	1
SDYPM22-BA-L21	1	1
SDYPM22-AB-L15 / L17	2	4
SDYPM22-BA-L15 / L17	3	1

	1 → 2	2 → 1	2 → 3	3 → 2
SDYPM22-FG-L21	3	1	1	1
SDYPM22-FG-L15 / L17	3	1	1	2

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


	1 → 2	2 → 1	2 → 3	3 → 2
SDYPM22-AB-...	3	2	-	-
SDYPM22-BA-...	3	2	-	-
SDYPM22-FG-...	3	3	1	1

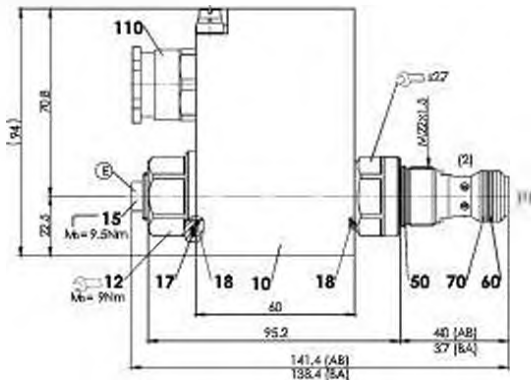
**Note!** With the L15 / L17 execution for ambient temperatures up to 70 °C, the performance specifications have been evaluated with an ambient temperature of 50 °C



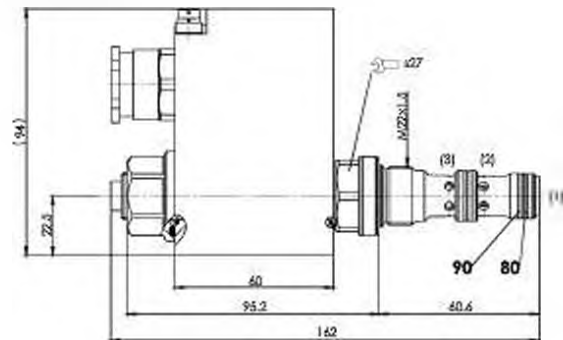
**Attention!** Long periods of non-actuation can reduce the switching performance


**ABMESSUNGEN**

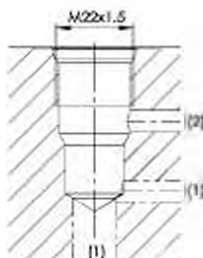
SDYPM22-AB / BA



SDYPM22-FG


**HYDRAULISCHER ANSCHLUSS**

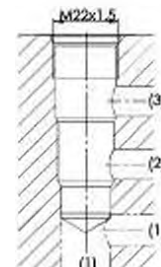
Senkungszeichnung nach ISO 7789-22 01-0-98



**Hinweis!** Detaillierte Senkungszeichnung und Senkungswerkzeug siehe Datenblatt 2.13-1008


**HYDRAULISCHER ANSCHLUSS**

Senkungszeichnung nach ISO 7789-22 04-0-98



**Hinweis!** Detaillierte Senkungszeichnung und Senkungswerkzeug siehe Datenblatt 2.13-1004



**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	239.2033	Screw plug HB0 (incl. seal)
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.8196	Backup ring PTSM rd 14,5 x 17,4 x 1,4
80	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
90	049.8176	Back-up ring PTSM rd 12,7 x 15,6 x 1,4
110	111.1080	Cable gland M20 x 1,5

**SURFACE TREATMENT**

- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

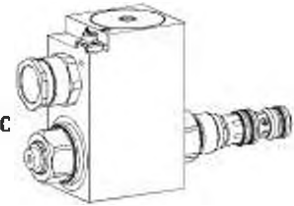


**Solenoid operated poppet valve cartridge**

- ◆ solenoid actuated
- ◆ direct operated
- ◆ 3/2-way
- ◆  $Q_{max} = 10 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$
- ◆ low power

**M22 x 1,5**  
**ISO 7789**

- ⊕ II 2 G Ex db IIC T6, T4
  - ⊕ II 2 D Ex tb III C T80 °C, T130 °C
  - ⊕ I M2 Ex db I Mb
- Class I Division 1
- 
- Class I Zone 1


**DESCRIPTION**

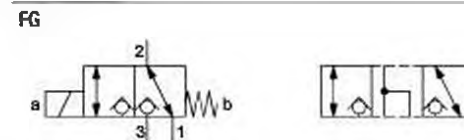
Direct operated 3/2-way solenoid poppet valve in screw-in cartridge construction for cavity according to ISO 7789. By means of the pressure tight switching solenoid, the pressure compensated, metallically sealing poppet spool is either opened or closed. The seat spool guide is sealed by means of an O-ring. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**CERTIFICATES**

	Surface	Mining	Standard -25°C to ...
ATEX	x	x	x
IECEX	x	x	x
CCC	x	x	x
EAC	x	x	x
Australia	x	x	x

**SYMBOL**

**TYPE CODE**

Poppet valve	S L Y PM22 - FG - <input type="text"/> / <input type="text"/> <input type="text"/> - <input type="text"/> # <input type="text"/>		
Direct operated, Low wattage			
Ex-protection execution, Exd			
Screw-in cartridge M22 x 1,5			
Designation of symbols			
Nominal voltage $U_N$	24 VDC	<input type="text"/> G24	
Nominal power $P_N$	6 W 6 W	<input type="text"/> L6R4 <input type="text"/> L6	Holding power 4 W
Certification	ATEX, IECEX, EAC, CCC Australia	<input type="text"/> <input type="text"/> AU	
Sealing material	NBR FKM (Viton)	<input type="text"/> <input type="text"/> D1	
Design index (subject to change)			

**GENERAL SPECIFICATIONS**

Designation	3/2-way poppet valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Ex-protection switching solenoid
Ambient temperature	Operation as T4 -25...+70 °C (L6, L6R4T4)
Weight	2,30 kg (3/2-way)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{v,max} = 10$ l/min, see characteristics
Nominal volume flow	$Q_n = 10$ l/min
Leakage oil	Seat tight, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	NBR -25...+70 °C FKM (D1) -20...+70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Switching frequency	5'000 / h
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	24 VDC
Standard nominal power	6 W 6 W with 4 W holding power (electronic power reduction)
Temperature class	Nominal power 6 W: T1...T4

**Note!** Other electrical specifications see data sheet 1.1-183


**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (Data sheet 1.1-183)
Connection	Cable gland for cable Ø 6,5...14 mm

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

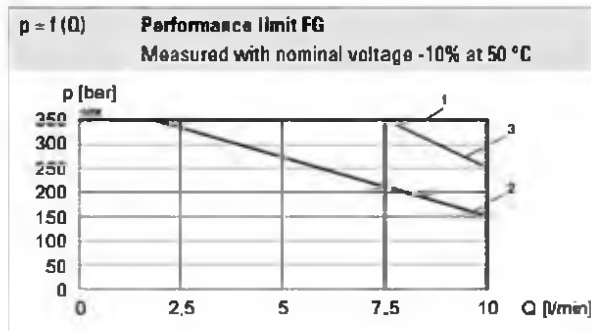
**SURFACE TREATMENT**

- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

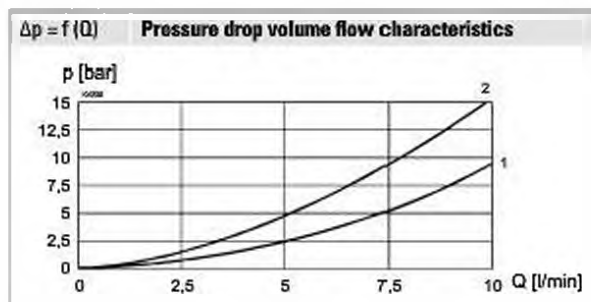
**STANDARDS**

Cartridge cavity	ISO 7789
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


	1 → 2	2 → 1	2 → 3	3 → 2
SLYPM22-FG	3	1	1	2



	1 → 2	2 → 1	2 → 3	3 → 2
SLYPM22-FG	1	1	2	2

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible.

Optionally HN (K) or HR (K)

→ See data sheet 1.1-311

**ACCESSORIES**

Threaded body	Data sheet 2.9-2xx
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**COMMISSIONING**

**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).



The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability is assumed.

**INSTALLATION NOTES**

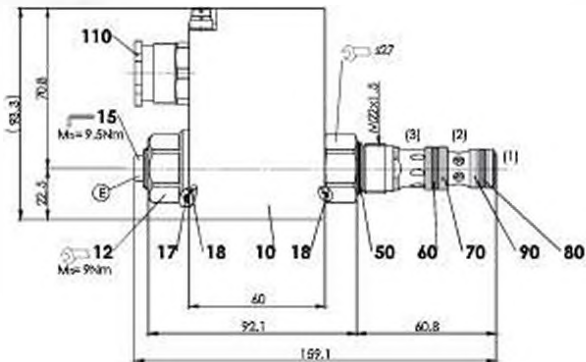
Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge $M_0 = 9 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5

**Attention!** For stack assembly please observe the remarks in the operating instructions

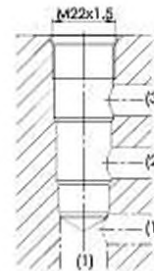


**DIMENSIONS**

SLYPM22-FG


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-04-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1004

**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	239.2033	Screw plug HB0 (incl. seal)
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.8196	Backup ring PTSM rd 14,5 x 17,4 x 1,4
80	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
90	049.8176	Back-up ring PTSM rd 12,7 x 15,6 x 1,4
110	111.1080	Cable gland M20 x 1,5

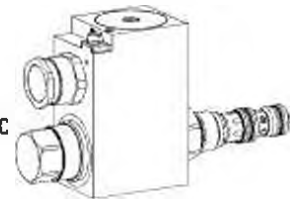


**Solenoid operated poppet valve cartridge stainless**

- ◆ solenoid actuated
- ◆ direct operated
- ◆ 3/2-way
- ◆  $Q_{max} = 10 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$
- ◆ low power

**M22 x 1,5**  
**ISO 7789**

- ⊕ II 2 G Ex db IIC T6, T4
  - ⊕ II 2 D Ex db III C T80 °C, T130 °C
  - ⊕ I M2 Ex db I Mb
- Class I Division 1
- 
- Class I Zone 1


**DESCRIPTION**

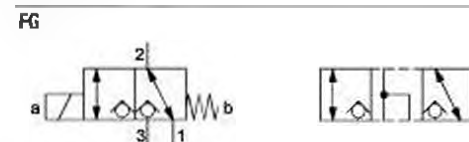
Direct operated 3/2-way solenoid poppet valve in screw-in cartridge construction for cavity according to ISO 7789. By means of the pressure tight switching solenoid, the pressure compensated, metallically sealing poppet spool is either opened or closed. The seat spool guide is sealed by means of an O-ring. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. The stainless execution is especially suitable for the use in wet and salty environment. Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**CERTIFICATES**

	Surface	Mining	Standard -25°C to...
ATEX	x	x	x
IECEX	x	x	x
CCC	x	x	x
EAC	x	x	x
Australia	x	x	x

**SYMBOL**

**TYPE CODE**

Poppet valve	S L Y PM22 - FG - <input type="text"/> / <input type="text"/> - <input type="text"/> <input type="text"/> #		
Direct operated, Low wattage			
Ex-protection execution, Exd			
Screw-in cartridge M22 x 1,5			
Designation of symbols			
Nominal voltage $U_N$	24 VDC	<input type="text"/> G24	
Nominal power $P_N$	6 W 8 W	<input type="text"/> L8R <input type="text"/> L8	Holding power 4 W
Certification	ATEX, IECEX, EAC, CCC Australia	<input type="text"/> <input type="text"/> AU	
Sealing material	NBR FKM (Viton)	<input type="text"/> <input type="text"/> D1	
Stainless	with K8 coil with K8 coil	<input type="text"/> <input type="text"/> K9 <input type="text"/> K10	
Design index (subject to change)			

**GENERAL SPECIFICATIONS**

Designation	3/2-way poppet valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Ex-protection switching solenoid
Ambient temperature	Operation as T4 -25...+70 °C (L6, L6R4T4)
Weight	2,4 kg (3/2-way)
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Switching frequency	5'000 / h
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	24 VDC
Standard nominal power	6 W 6 W with 4 W holding power (electronic power reduction)
Temperature class	Nominal power 6 W: T1...T4

**Note!** Other electrical specifications see data sheet 1.1-183


**SURFACE TREATMENT**

- ◆ The cartridge body is made of stainless steel
- ◆ The slip-on coil and the armature tube are zinc-nickel coated

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 10$ l/min, see characteristics
Nominal volume flow	$Q_n = 10$ l/min
Leakage oil	Seat tight, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	NBR -25...+70 °C FKM (D1) -20...+70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (Data sheet 1.1-183)
Connection	Cable gland for cable Ø 6,5...14 mm

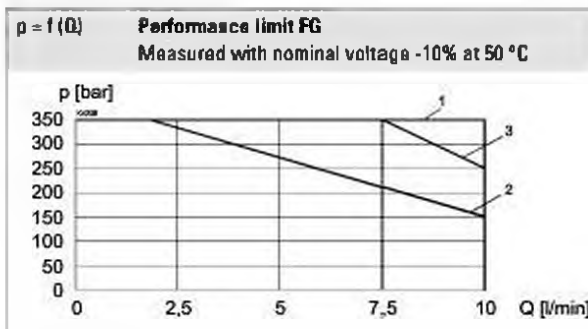
**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

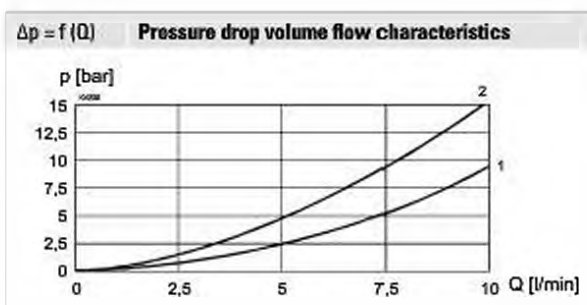
**STANDARDS**

Cartridge cavity	ISO 7789
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Execution	Flow direction			
	1 → 2	2 → 1	2 → 3	3 → 2
SLYPM22-FG-K9	3	1	1	2



Execution	Flow direction			
	1 → 2	2 → 1	2 → 3	3 → 2
SLYPM22-FG-K9	1	1	2	2

**COMMISSIONING**

**Attention!** The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability can be assumed.


**ACCESSORIES**

Threaded body	Data sheet 2.9-2xx
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**INSTALLATION NOTES**

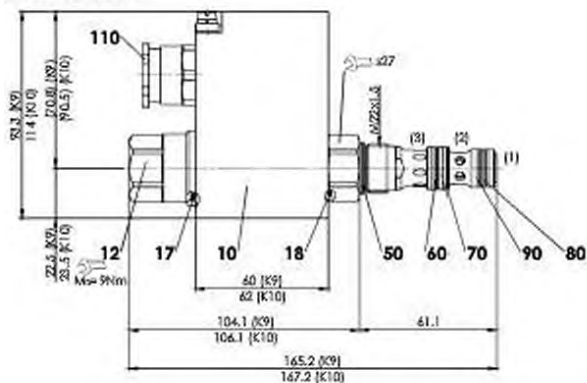
Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge $M_0 = 9 \text{ Nm}$ knurled nut

**Attention!** For stack assembly please observe the remarks in the operating instructions

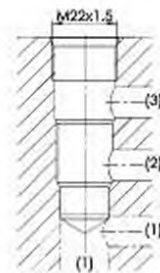


**DIMENSIONS**

SLYPM22-FG-K..


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-04-0-98


**Note!**

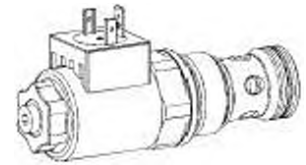

For detailed cavity drawing and cavity tools see data sheet 2.13-1004

**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2203	Knurled nut Ex M18 x 1,5 x 30 K9
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.8196	Backup ring PTSM rd 14,5 x 17,4 x 1,4
80	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
90	049.8176	Back-up ring PTSM rd 12,7 x 15,6 x 1,4
110	111.1080	Cable gland M20 x 1,5

**Solenoid operated poppet valve cartridge**

- ◆ solenoid operated
- ◆ pilot operated
- ◆ normally open and normally closed
- ◆ 2/2-way
- ◆  $Q_{max} = 150 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**M33 x 2**  
**ISO 7789**

**DESCRIPTION**

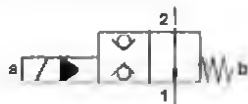
Pilot operated 2/2-way solenoid poppet valve in screw-in cartridge construction for cavity according to ISO 7789. The AB and CB execution is closed in the energised position, the BA and BC execution is closed in the de-energised position. In this, the main spool closes practically leakage-free by means of the applied pressure.

**APPLICATION**

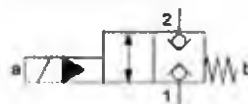
Wandfluh solenoid operated poppet valve cartridges are used where tight closing functions are essential like leakage-free load holding, clamping or gripping. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

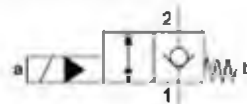
„Normally open“ AB



„Normally closed“ BA



„Normally closed“ BC



„Normally open“ CB


**TYPE CODE**

		S V S PM33 -		<input type="checkbox"/>	-	<input type="checkbox"/>	/	<input type="checkbox"/>	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Poppet valve													
Pilot operated													
Solenoid, Super													
Screw-in cartridge M33 x 2													
Designation of symbols acc. to table													
Nominal voltage $U_N$	12 VDC	<input type="checkbox"/>	G12	115 VAC	<input type="checkbox"/>	R115							
	24 VDC	<input type="checkbox"/>	G24	230 VAC	<input type="checkbox"/>	R230							
	without coil	<input type="checkbox"/>	X5										
Slip-on coil	Metal housing, round	<input type="checkbox"/>	W	(only G12 and G24)									
	Metal housing, square	<input type="checkbox"/>	M										
Connection execution													
Connector socket EN 175301-803 / ISO 4400	<input type="checkbox"/>	D											
Connector socket AMP Junior-Timer	<input type="checkbox"/>	J											
Connector Deutsch DT04-2P	<input type="checkbox"/>	G											
Sealing material	NBR	<input type="checkbox"/>											
	FKM (Viton)	<input type="checkbox"/>	D1										
Design index (subject to change)													

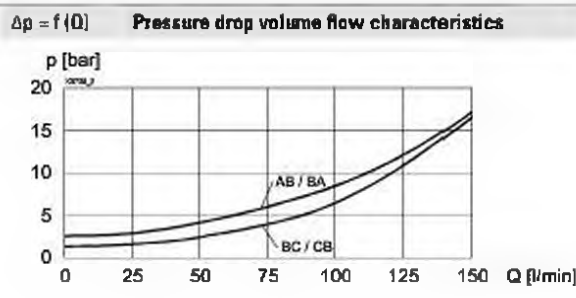
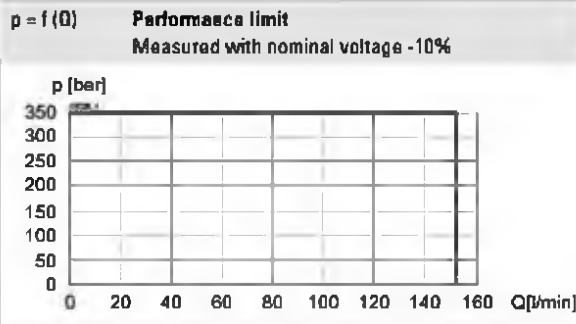
**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M33 x 2 according to ISO 7789
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C
Weight	0,7 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Opening pressure	1,5 bar 1 → 2 version CB / BC 2,5 bar 1 → 2 version AB / BA 2,5 bar 2 → 1 version AB / BA
Maximum volume flow	$Q_{max} = 150$ l/min, see characteristics
Leakage oil	Poppet type, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**ACTUATION**

Actuation	Switching solenoid, wet pin push + pull type, pressure tight
Execution	WE37 / 16 x 40 (Data sheet 1.1-169) ME35 / 16 x 40 (Data sheet 1.1-171)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DE, WE37 only up to 50 °C
Switching frequency	5 000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz, rectifier integrated in the connector socket

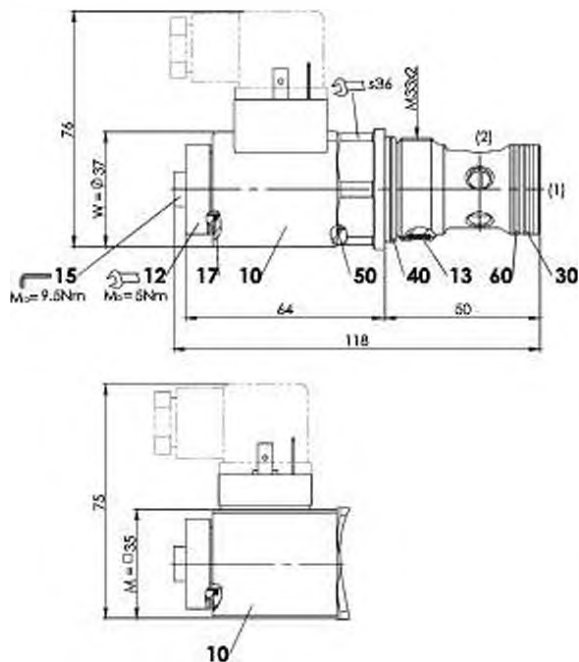
**Note!** Other electrical specifications see data sheet 1.1-169 (slip-on coil W) and 1.1-171 (slip-on coil M)



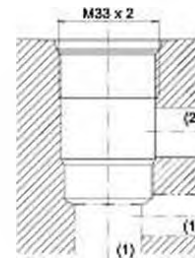
Type	Flow direction	Switching times	
		Energised	De-energised
SVSPM33	AB 1→2	approx. 100 ms	approx. 60 ms
	2→1	approx. 100 ms	approx. 80 ms
BA	1→2	approx. 30 ms	approx. 100 ms
	2→1	approx. 30 ms	approx. 100 ms
BC	2→1	approx. 30 ms	approx. 70 ms
CB	2→1	approx. 60 ms	approx. 70 ms

**Note!** The switching times depend on the volume flow, pressure and viscosity. In case of very large volume flows, the switching time for closing can get considerably longer.



**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-33-01-0-98


**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1005

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**ACCESSORIES**

Threaded body	Data sheet 2.9-2xx
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M33 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 130 \text{ Nm}$ for screw-in cartridge $M_0 = 5 \text{ Nm}$ for Knurled nut

Position	Article	Description
10	206.2...	WE37 / 16 x 40
	260.4...	M.E35 / 16 x 40
12	154.2600	Knurled nut M16 x 1 x 9
13	212.0013	Plastic disc rd 7 x 1,5
15	239.2033	Screw plug HB0 (incl. seal)
17	160.2156	O-ring ID 15,60 x 1,78 (NBR)
30	160.2238	O-ring ID 23,81 x 2,62 (NBR)
	160.6238	O-ring ID 23,81 x 2,62 (FMK)
40	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FMK)
50	160.1260	O-ring ID 26,00 x 1,00 (NBR)
60	049.8297	Backup ring PTSM rd 22,1 x 26,6 x 1,4

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible.

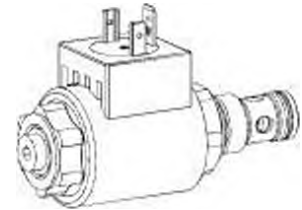
Optionally HN (K) or HG (K) (pushing) resp. HZ (K) (pulling)

→ See data sheet 1.1-311

**Attention!** The manual override HZ (H91) cannot be retrofitted.


**Solenoid operated poppet valve cartridge**

- ◆ solenoid operated
- ◆ pilot operated
- ◆ normally open and normally closed
- ◆ 2/2-way
- ◆  $Q_{max} = 50 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**M18 x 1,5**  
**ISO 7789**

**DESCRIPTION**

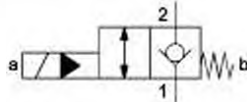
Pilot operated 2/2-way solenoid poppet valve in screw-in cartridge construction for cavity according to ISO 7789. The CB execution is closed in the energised position, the BC execution in the de-energised position. In this, the main spool closes practically leakage-free by means of the applied pressure. In the opposite flow direction, the valve opens after reaching the opening pressure.

**APPLICATION**

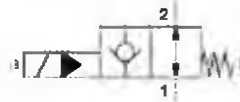
Wandfluh solenoid operated poppet valve cartridges are used where tight closing functions are essential like leakage-free load holding, clamping or gripping. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

„Normally closed“ BC



„Normally open“ CB


**TYPE CODE**

Poppet valve		S		V		S		PM18		-	-	/	-	-	#
Pilot operated															
Solenoid, Super															
Screw-in cartridge M18 x 1,5															
2/2 way, «normally closed»		BC													
2/2 way, «normally open»		CB													
Nominal voltage $U_n$		12 VDC		G12		115 VAC		R115							
		24 VDC		G24		230 VAC		R230							
		without coil		X5											
Slip-on coil		Metal housing, round		W		(only G12 and G24)									
		Metal housing, square		M											
Connection execution															
Connector socket EN 175301-803 / ISO 4400				D											
Connector socket AMP Junior-Timer				J											
Stecker Deutsch DT04-2P				G											
Sealing material		NBR													
		FKM (Viton)		D1											
Design index (subject to change)															



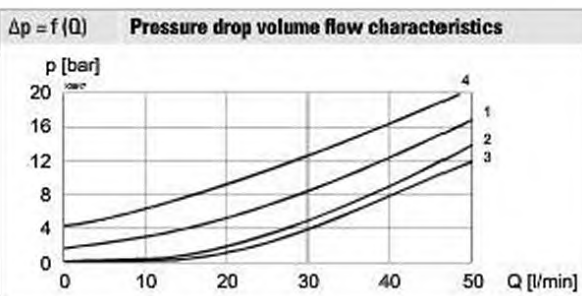
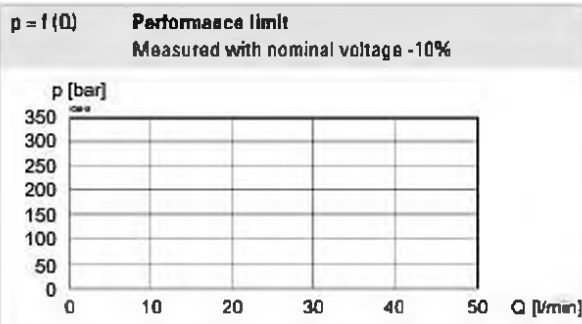
**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M18 x 1,5 according to ISO 7789
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C
Weight	0,42 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 50$ l/min, see characteristics
Leakage oil	Poppet type, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**ACTUATION**

Actuation	Switching solenoid, wet pin push + pull type, pressure tight
Execution	W.E37 / 16 x 40 (Data sheet 1.1-169) M.E35 / 16 x 40 (Data sheet 1.1-171)
Connection	Connector socket EN 175301 - 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 - 2P

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF, W.E37 only up to 50 °C
Switching frequency	5 000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-169 (slip-on coil W) and 1.1-171 (slip-on coil M)

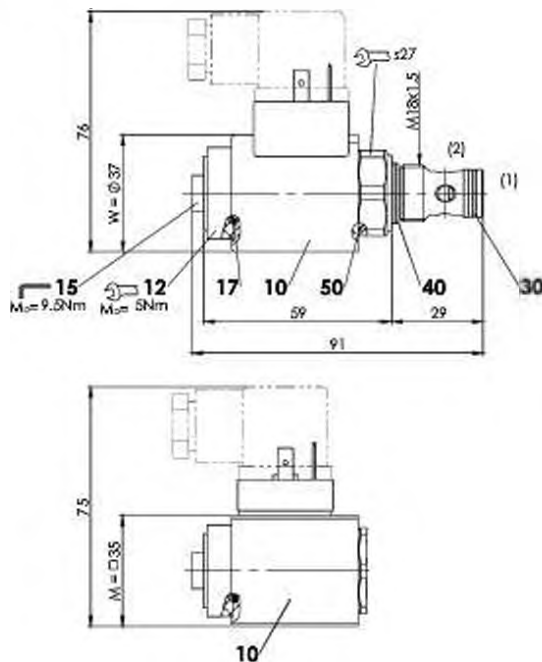


Type	Flow direction	Switch on	Switch off
SVSPM18	BC 2 → 1	approx. 30 ms	approx. 150 ms
	CB 2 → 1	approx. 45 ms	approx. 80 ms

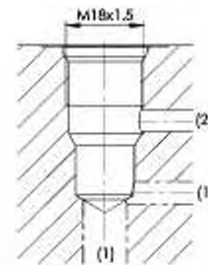
**Note!** The switching times depend on the volume flow, pressure and viscosity. In case of very large volume flows, the switching time for closing can get considerably longer.



	BC	CB
de-energised 1 → 2	1	2
de-energised 2 → 1	-	3
energised 1 → 2	2	4
energised 2 → 1	3	-

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-18-01-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1002

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**MANUAL OVERRIDE**

 Optionally HN (K) or HG (K) (pushing) resp. HZ (K) (pulling)  
 → See data sheet 1.1-311

**PARTS LIST**

Position	Article	Description
10	206.2... 260.4...	WE37 / 16 x 40 M.E35 / 16 x 40
12	154.2600	Knurled nut M16 x 1 x 9
15	239.2033	Screw plug HB0 (incl. seal)
17	160.2156	O-ring ID 15,60 x 1,78 (NBR)
30	160.0108	O-ring ID 10,82 x 1,78 (polyurethan)
40	160.2156 160.8156	O-ring ID 15,60 x 1,78 (NBR) O-ring ID 15,60 x 1,78 (FKM)
50	160.1220	O-Ring ID 22,00 x 1,00 (NBR)

**SURFACE TREATMENT**

- ◆ All parts are zinc-nickel coated

**ACCESSORIES**

Threaded body	Data sheet 2.9-2xx
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**INSTALLATION NOTES**

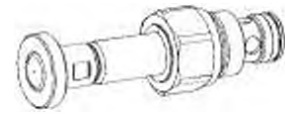
Mounting type	Screw-in cartridge M18 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 40 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**Solenoid operated poppet valve cartridge**

- ◆ solenoid operated
- ◆ pilot operated
- ◆ normally closed
- ◆ 2/2-way
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**M20 x 1,5**

**DESCRIPTION**

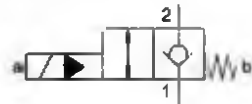
Pilot operated 2/2-way solenoid poppet valve in screw-in cartridge design for cavity according to Wandfluh standard. In case of the BC execution, the valve is closed in the de-energised position.

**APPLICATION**

Poppet valves are used where tight closing functions of the valve are essential like leakfree load holding, clamping or gripping. The poppet valve cartridge is mainly used in the mobile and stationary block construction.

**SYMBOL**

„Normally closed“ BC


**TYPE CODE**

Poppet valve	S	V	E	PM20	-	-	X5	#
Pilot operated								
Solenoid								
Screw-in cartridge M20 x 1,5								
2/2 way, «normally closed»						BC		
Without coil								{The coil has to be ordered separately}
Design index (subject to change)								

1 11-328A

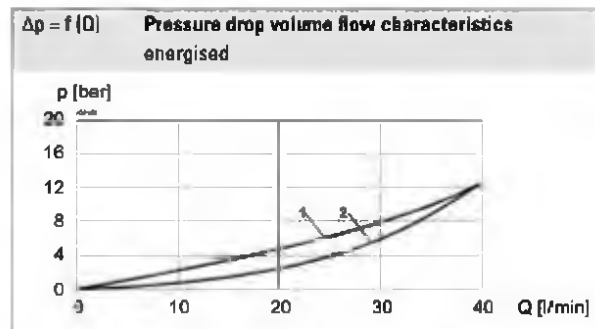
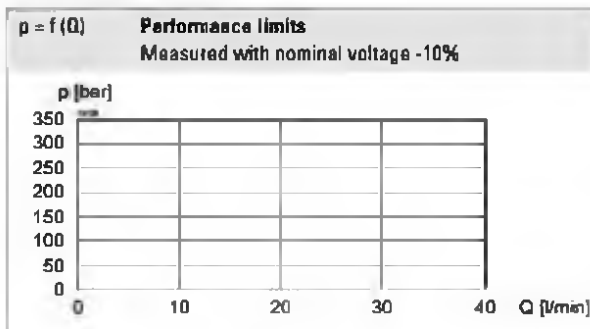
**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Pilot operated
Mounting	Screw-in cartridge type
Nominal size	M20 x 1,5
Actuation	Switching solenoid
Ambient temperature	-30...+110 °C
Weight	0,12 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

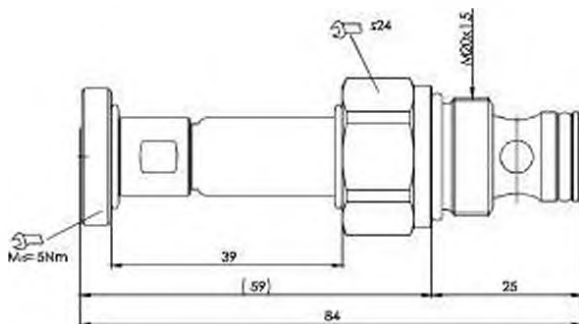
Working pressure	$p_{max} = 350 \text{ bar}$
Maximum volume flow	$Q_{max} = 40 \text{ l/min}$ , see characteristics
Leakage volume flow	Seat tight, max. 5 drops / min at $p_{max}$
Fluid	Mineral oil, other fluid on request
Viscosity range	8 mm <sup>2</sup> /s... 420 mm <sup>2</sup> /s
Temperature range	-20...+70 °C
fluid	
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

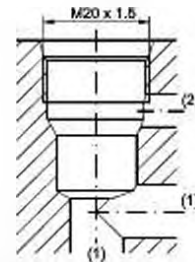
 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Switching times			
SVEPM20	Type	Switching on	Switching off
	BC		approx. 30 ms

		BC
de-energised 1 → 2		2
de-energised 2 → 1		-
energised 1 → 2		2
energised 2 → 1		1

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard



**Nota!** For detailed cavity drawing and cavity tools see data sheet 2.13-1042


**ACCESSORIES**

Technical explanations	data sheet 1.0-100
Hydraulic fluids	data sheet 1.0-50
Filtration	data sheet 1.0-50
Relative duty factor	data sheet 1.1-430

**ACTUATION**

Actuation	Switching solenoid, wet pin pull type, pressure tight
Execution	K E33 / 13 x 39 (data sheet 1.1-160)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**Nota!** The solenoid coil is not included in the delivery!


**INSTALLATION NOTES**

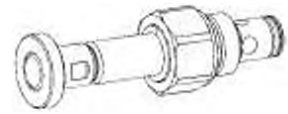
Mounting type	Screw-in cartridge M20 x 1
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 40-45 \text{ Nm}$ for screw-in cartridge

**STANDARDS**

Protection class	EN 60 529
Contamination efficiency	ISO 4406

**Solenoid operated poppet valve cartridge**

- ◆ solenoid operated
- ◆ pilot operated
- ◆ normally open and normally closed
- ◆ 2/2-way
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

 **$\frac{3}{4}$ "-16 UNF**

**DESCRIPTION**

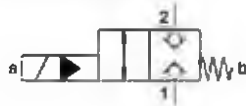
Pilot operated 2/2-way solenoid poppet valve in screw-in cartridge design for cavity according to Wandfluh standard. In case of the CB execution, the valve is closed in the energised position, in case of the BA and BC execution in the de-energised position.

**APPLICATION**

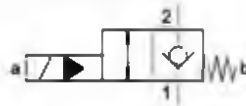
Poppet valves are used where tight closing functions of the valve are essential like leakfree load holding, clamping or gripping. The poppet valve cartridge is mainly used in the mobile and stationary block construction.

**SYMBOL**

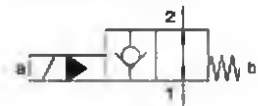
„Normally closed“ BA



„Normally closed“ BC



„Normally open“ CB


**TYPE CODE**

Poppet valve	<input type="checkbox"/>	S	V	E	P1108	-	<input type="checkbox"/>	-	X5	#	<input type="checkbox"/>
Pilot operated	<input type="checkbox"/>										
Solenoid	<input type="checkbox"/>										
Screw-in cartridge $\frac{3}{4}$ "-16 UNF	<input type="checkbox"/>										
2/2 way, „normally closed“	<input type="checkbox"/>										
2/2 way, „normally closed“	<input type="checkbox"/>										
2/2 way, „normally open“	<input type="checkbox"/>										
Without coil	<input type="checkbox"/>										
Design index (subject to change)											

(The coil has to be ordered separately)

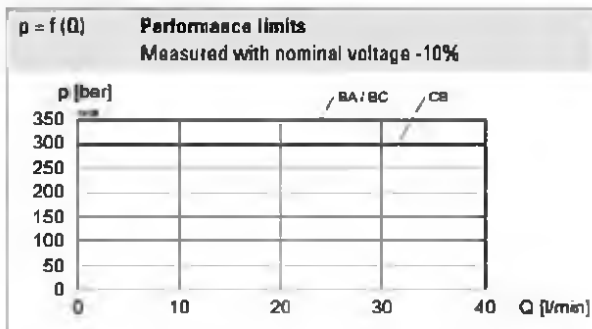
**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Pilot operated
Mounting	Screw-in cartridge type
Nominal size	$\frac{3}{4}$ "-16 UNF
Actuation	Switching solenoid
Ambient temperature	-30...+110 °C
Weight	0,12 kg
MTTFd	150 years

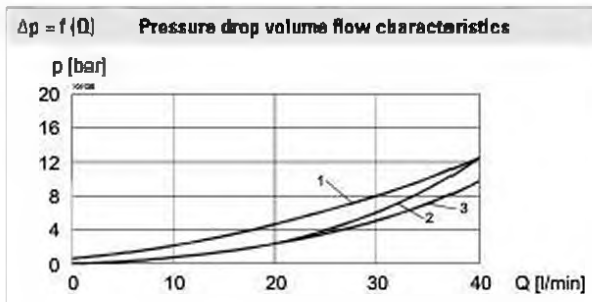
**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$ $p_{max} = 300 \text{ bar (CB)}$
Maximum volume flow	$Q_{max} = 40 \text{ l/min}$ , see characteristics
Leakage volume flow	Seat tight, max. 5 drops / min at $p_{max}$
Fluid	Mineral oil, other fluid on request
Viscosity range	8 mm <sup>2</sup> /s ... 420 mm <sup>2</sup> /s
Temperature range	-20...+70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 $\geq 75$ , see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**Switching times**

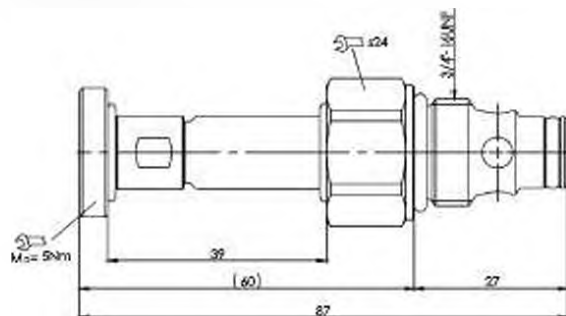
	Type	Switching on	Switching off
SVEPU08	BC	approx. 30 ms	approx. 50 ms
	CB	approx. 20 ms	approx. 30 ms
	BA	approx. 30 ms	approx. 60 ms



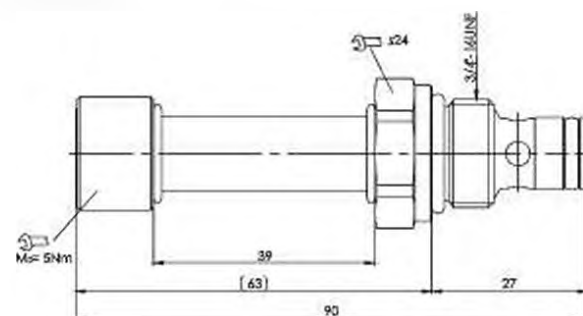
	BC	CB	BA
de-energised 1 → 2	2	3	-
de-energised 2 → 1	-	3	-
energised 1 → 2	2	3	2
energised 2 → 1	1	-	3

**DIMENSIONS**

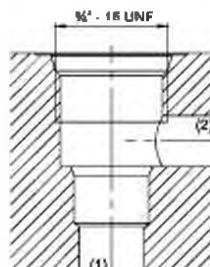
SVEPU08-BA / BC



SVEPU08-CB


**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard


**Note!**

For detailed cavity drawing and cavity tools see data sheet 2.13-1043



**ACCESSORIES**

Technical explanations	data sheet 1.0-100
Hydraulic fluids	data sheet 1.0-50
Filtration	data sheet 1.0-50
Relative duty factor	data sheet 1.1-430

**SURFACE TREATMENT**

- ◆ The armature tube and the external parts of the cartridge body are zinc coated

**STANDARDS**

Protection class	EN 60 529
Contamination efficiency	ISO 4406

**ACTUATION**

Actuation	Switching solenoid, wet pin push + pull type, pressure tight
Execution	K.E33 / 13 x 39 (data sheet 1.1-160)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**Note!** The solenoid coil is not included in the delivery!


**MANUAL OVERRIDE**

None

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge 3/4"-16 UNF
Mounting position	Any, preferably horizontal
Tightening torque	$M_t = 40-45$ Nm for screw-in cartridge







**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C
Weight	0,45 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 80$ l/min, see characteristics
Leakage oil	Poppet type, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**ACTUATION**

Actuation	Switching solenoid, wet pin push + pull type, pressure tight
Execution	W.E37 / 16 x 40 (Data sheet 1.1-169) M.E35 / 16 x 40 (Data sheet 1.1-171)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

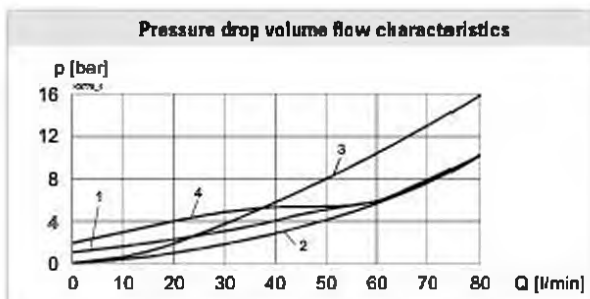
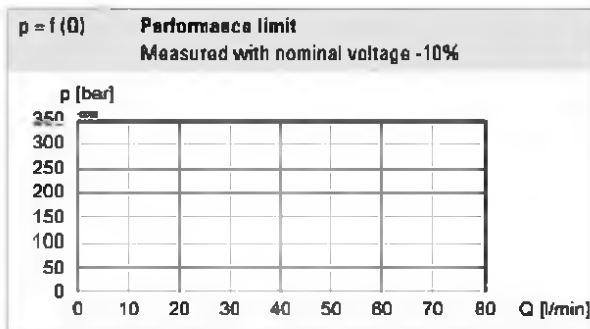
**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF, W.E37 only up to 50 °C
Switching frequency	5 000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-169 (slip-on coil W) and 1.1-171 (slip-on coil M)


**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

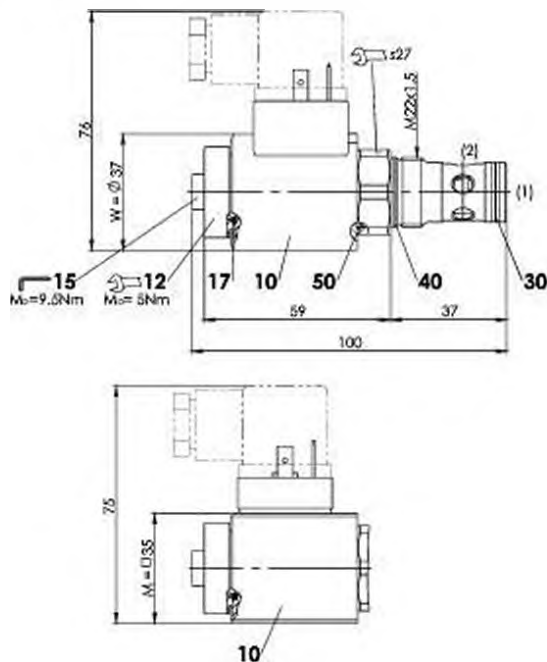

**Switching times**

Type	Flow direction	Switch on	Switch off
SVSPM22	BC	2 → 1 approx. 30 ms	approx. 150 ms
	CB	2 → 1 approx. 45 ms	approx. 85 ms

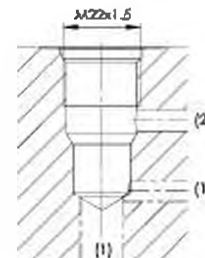
**Note!** The switching times depend on the volume flow, pressure and viscosity. In case of very large volume flows, the switching time for closing can get considerably longer.



	BC	CB
de-energised 1 → 2	1	2
de-energised 2 → 1	-	3
energised 1 → 2	2	4
energised 2 → 1	3	-

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-01-0-88


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1008

**MANUAL OVERRIDE**

Optionally HN (K) or HG (K) (pushing) resp. HZ (K) (pulling)

→ See data sheet 1.1-311

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**PARTS LIST**

Position	Article	Description
10	206.2... 260.4...	WE37 / 16 x 40 M.E35 / 16 x 40
12	154.2600	Knurled nut M16 x 1 x 9
15	239.2033	Screw plug HB0 (incl. seal)
17	160.2156	O-ring ID 15,60 x 1,78 (NBR)
30	160.0157	O-ring ID 15,60 x 1,78 (polyurethan)
40	160.2188 160.8188	O-ring ID 18,77 x 1,78 (NBR) O-ring ID 18,77 x 1,78 (FKM)
50	160.1220	O-Ring ID 22,00 x 1,00 (NBR)

**ACCESSORIES**

Threaded body	Data sheet 2.9-2xx
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut

**SURFACE TREATMENT**

- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**STANDARDS**

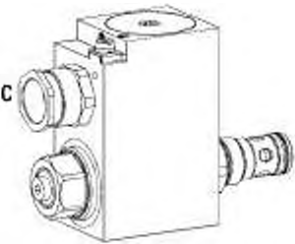
Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301-803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**Solenoid operated poppet valve cartridge**

- ◆ solenoid actuated
- ◆ pilot operated
- ◆ normally open and normally closed
- ◆ 2/2-way
- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**

- ⊕ II 2 G Ex db IIC T6, T4
  - ⊕ II 2 D Ex db III C T80 °C, T130 °C
  - ⊕ I M2 Ex db I Mb
- Class I Division 1
- 
- Class I Zone 1


**DESCRIPTION**

Pilot operated 2/2-way solenoid poppet valve in screw-in cartridge construction for cavity according to ISO 7789. The CB execution is closed in the energised position, the BC execution in the de-energised position. In this, the main spool closes practically leakage-free by means of the applied pressure. In the opposite flow direction, the valve opens after reaching the opening pressure. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to ...	Z604 -40 °C to ...
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	x
MA		x	x	
UL / CSA	x		x	x

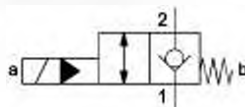
**ACTUATION**

Actuation	Switching solenoid, wet pin push + pull type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

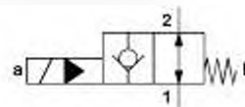
**Attention!** The UL execution is always supplied without cable gland


**SYMBOL**

„Normally closed“ BC



„Normally open“ CB



**TYPE CODE**

		S V Y PM22 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>			
Poppet valve					
Pilot operated					
Ex-protection execution, Exd					
Screw-in cartridge M22 x 1,5					
2/2 way, «normally closed»		<input type="checkbox"/> BC			
2/2 way, «normally open»		<input type="checkbox"/> CB			
Nominal voltage U <sub>N</sub>	12 VDC	<input type="checkbox"/> G12	115 VAC	<input type="checkbox"/> R115	
	24 VDC	<input type="checkbox"/> G24	230 VAC	<input type="checkbox"/> R230	
Nominal power P <sub>N</sub>	9 W	<input type="checkbox"/> L9	Ambient temperature up to:		
	15 W	<input type="checkbox"/> L15	40 °C or 90 °C		
	17 W	<input type="checkbox"/> L17	70 °C		
		70 °C (only UL / CSA)			
Certification	ATEX, IECEx, EAC, CCC	<input type="checkbox"/>			
	Australia	<input type="checkbox"/> AU	UL / CSA	<input type="checkbox"/> UL	MA <input type="checkbox"/> MA
Sealing material	NBR	<input type="checkbox"/>			
	FKM (Viton)	<input type="checkbox"/> D1			
	NBR -40° C	<input type="checkbox"/> Z604	(only with 15 W)		
Design index (subject to change)					
1.11-2294					

**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Ex-protection switching solenoid
Ambient temperature	<b>Operation as T6</b>
	-25 ... +40 °C (L9)
	<b>Operation as T4</b>
	-25 ... +90 °C (L9)
	-25 ... +70 °C (L15 / L17)
	-40 ... +70 °C (L15 / L17)
Weight	2,25 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	p <sub>max</sub> = 350 bar
Opening pressure	1 bar version BC
	2 bar version CB
Maximum volume flow	Q <sub>max</sub> = 80 l/min, see characteristics
Leakage oil	Poppet type, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b>
	NBR -25 ... +40 °C (L9)
	FKM -20 ... +40 °C (L9)
	<b>Operation as T4</b>
	NBR -25 ... +70 °C (L9 or L15 / L17)
	FKM -20 ... +70 °C (L9 or L15 / L17)
	NBR 872 -40 ... +70 °C (L15 / L17)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10 ... 16 ≥ 75, see data sheet 1.0-50

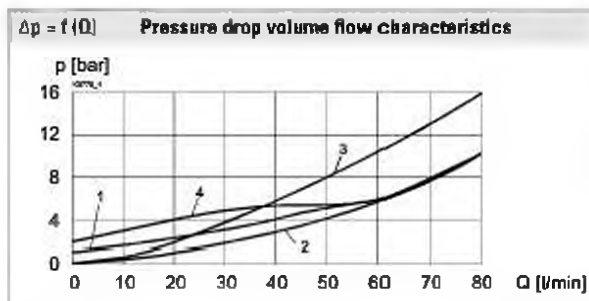
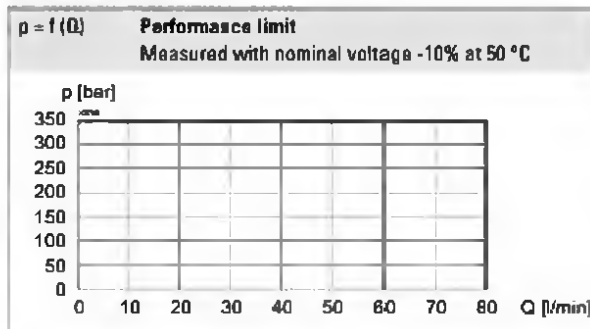
**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Switching frequency	5 000 / h
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz ± 2 %, with built-in two-way rectifier
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

**Note!** Other electrical specifications see data sheet 1.1-183 and 1.1-184


**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



**Note!** With the L15 / L17 execution for ambient temperatures up to 70 °C, the characteristics have been evaluated with an ambient temperature of 50 °C.



The switching times depend on the volume flow, pressure and viscosity. In case of small volume flows, the switching time can get considerably longer.

**SURFACE TREATMENT**

- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**STANDARDS**

Cartridge cavity	ISO 7789
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 2, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**Switching times**

Type	Flow direction	Energised	De-energised
SVYPM22	BC 2 → 1	approx. 30 ms	approx. 120 ms
	CB 2 → 1	approx. 50 ms	approx. 80 ms

	BC	CB
de-energised 1 → 2	1	2
de-energised 2 → 1	-	3
energised 1 → 2	2	4
energised 2 → 1	3	-

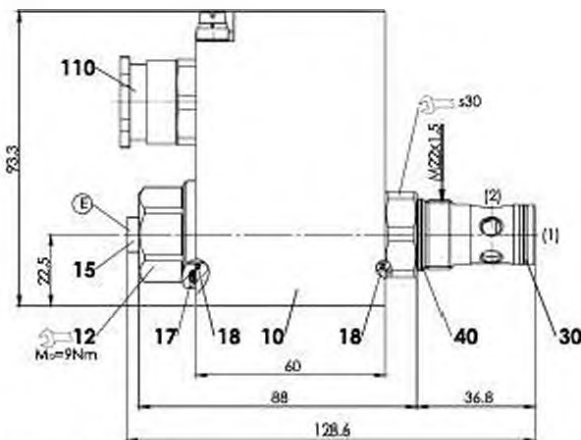
**Attention!** Long periods of non-actuation can reduce the switching performance


**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible.  
 Optionally HN (K) or HG (K) (pushing) resp. HZ (K) (pulling)  
 → See data sheet 1.1-311

**Attention!** The manual override HZ (H91) cannot be retrofitted.



**DIMENSIONS**


E = Air bleed screw

Dimensions of the solenoid coil see data sheet 1.1-183 and 1.1-184

**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	239.2033	Screw plug HB0 (incl. seal)
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
	160.6172	O-ring ID 17,17 x 1,78 (FKM)
30	160.0157	O-ring ID 15,60 x 1,78 (polyurethan)
40	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.8188	O-ring ID 18,77 x 1,78 (FKM)
110	111.1080	Cable gland M20 x 1,5

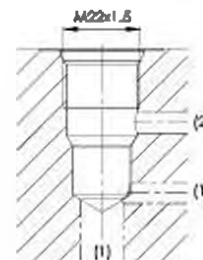
**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge $M_0 = 9 \text{ Nm}$ knurled nut

**Attention!** For stack assembly please observe the remarks in the operating instructions


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-01-0-98


**Note!**

For detailed cavity drawing and cavity tools see data sheet 2.13-1008


**ACCESSORIES**

Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**COMMISSIONING**

**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).




The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability is assumed.

**Solenoid operated poppet valve cartridge**

- ◆ solenoid actuated
- ◆ pilot operated
- ◆ normally open and normally closed
- ◆ 2/2-way
- ◆  $Q_{max} = 150 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

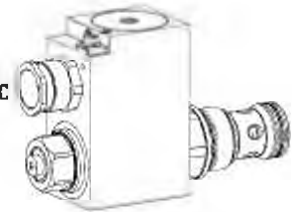
**M33 x 2**
**ISO 7789**
 II 2 G Ex db IIC T6, T4

 II 2 D Ex db III C T80 °C, T130 °C

 I M2 Ex db I Mb

Class I Division 1

Class I Zone 1


**DESCRIPTION**

Pilot operated 2/2-way solenoid poppet valve in screw-in cartridge construction for cavity according to ISO 7789. The AB and CB execution is closed in the energised position, the BA and BC execution in the de-energised position. In this, the main spool closes practically leakage-free by means of the applied pressure. In the opposite flow direction, the valve opens after reaching the opening pressure. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to ...	Z604 -40 °C to ...
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	x
MA		x	x	
UL / CSA	x		x	x

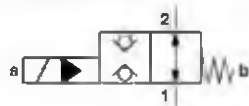
**ACTUATION**

Actuation	Switching solenoid, wet pin push + pull type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

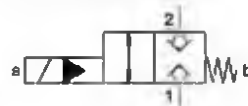
**Attention!** The UL execution is always supplied without cable gland


**SYMBOL**

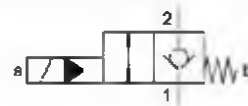
„Normally open“ AB



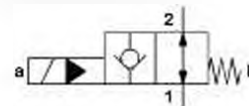
„Normally closed“ BA



„Normally closed“ BC



„Normally open“ CB



**TYPE CODE**

Poppet valve		S		V		Y		PM33		-	-	/	-	#
Pilot operated														
Ex-protection execution, Exd														
Screw-in cartridge M33 x 2														
Designation of symbols acc. to table														
Nominal voltage $U_N$	12 VDC	<input type="checkbox"/>	115 VAC	<input type="checkbox"/>	24 VDC	<input type="checkbox"/>	230 VAC	<input type="checkbox"/>	R115	<input type="checkbox"/>	R230	<input type="checkbox"/>		
		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>				
Nominal power $P_N$	9 W	<input type="checkbox"/>	Ambient temperature up to:		L9	<input type="checkbox"/>	40 °C or 90 °C							
	15 W	<input type="checkbox"/>		70 °C	L15	<input type="checkbox"/>								
	17 W	<input type="checkbox"/>		70 °C (only UL / CSA)	L17	<input type="checkbox"/>								
Certification	ATEX, IECEx, EAC, CCC	<input type="checkbox"/>	UL / CSA	<input type="checkbox"/>	Australia	<input type="checkbox"/>	UL	<input type="checkbox"/>	MA	<input type="checkbox"/>	MA	<input type="checkbox"/>		
		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		
Sealing material	NBR	<input type="checkbox"/>												
	FKM (Viton)	<input type="checkbox"/>			D1	<input type="checkbox"/>								
	NBR 40° C	<input type="checkbox"/>			Z6M	<input type="checkbox"/>							(only with 15 W)	
Design index (subject to change)														

1 71 2005

**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M33 x 2 according to ISO 7789
Actuation	Ex-protection switching solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17) -40...+70 °C (L15 / L17)
Weight	2,45 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Opening pressure	1,5 bar 1 → 2 version BC / CB 2,0 bar 2 → 1 version BC / CB 3,0 bar 1 → 2 version AB / BA 3,0 bar 2 → 1 version AB / BA
Maximum volume flow	$Q_{max} = 150 \text{ l/min}$ , see characteristics
Leakage oil	Poppet type, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L9 or L15 / L17) NBR 872 -40...+70 °C (L15 / L17)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50



**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Switching frequency	5 000 / h
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz ± 2 %, with built-in two-way rectifier
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

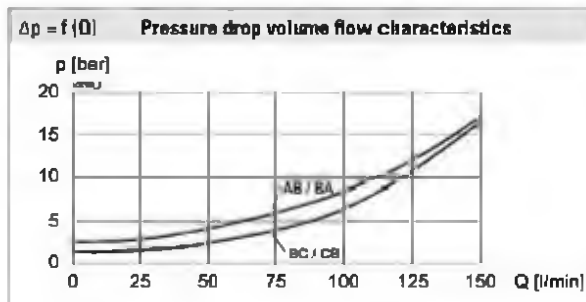
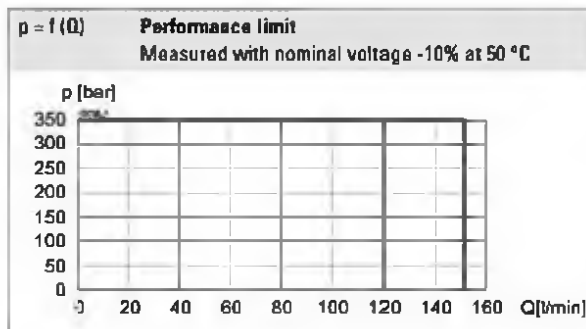
**Note!** Other electrical specifications see data sheet 1.1-183 and 1.1-184


**STANDARDS**

Cartridge cavity	ISO 7789
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 2, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$


**SURFACE TREATMENT**

- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

Type	Flow direction	Switching times	
		Energised	De-energised
AB	1 → 2	approx. 100 ms	approx. 60 ms
	2 → 1	approx. 100 ms	approx. 80 ms
BA	1 → 2	approx. 30 ms	approx. 100 ms
	2 → 1	approx. 30 ms	approx. 100 ms
BC	2 → 1	approx. 30 ms	approx. 70 ms
CB	2 → 1	approx. 60 ms	approx. 70 ms

**Note!** With the L15 / L17 execution for ambient temperatures up to 70 °C, the characteristics have been evaluated with an ambient temperature of 50 °C.

The switching times depend on the volume flow, pressure and viscosity. In case of small volume flows, the switching time can get considerably longer.

**Attention!** Long periods of non-actuation can reduce the switching performance

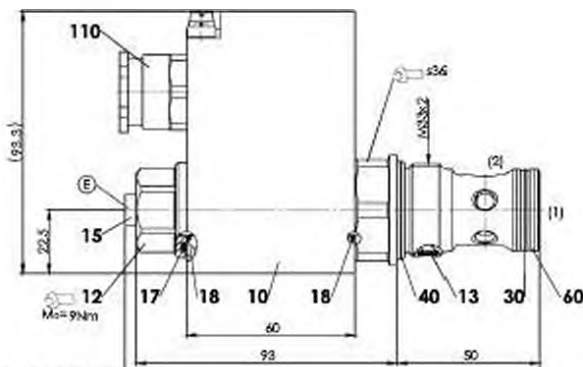

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible.

Optionally HN (K) or HG (K) (pushing) resp. HZ (K) (pulling)  
→ See data sheet 1.1-311

**Attention!** The manual override HZ (H91) cannot be retrofitted.



**DIMENSIONS**


E = Air bleed screw

Dimensions of the solenoid coil see data sheet 1.1-183 and 1.1-184

**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
13	212.0013	Plastic disc rd 7 x 1,5
15	239.2033	Screw plug HB0 (incl. seal)
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
30	160.2238	O-ring ID 23,81 x 2,62 (NBR)
	160.6238	O-ring ID 23,81 x 2,62 (FMK)
40	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FMK)
60	049.8297	Backup ring PTSM rd 22,1 x 26,6 x 1,4
110	111.1080	Cable gland M20 x 1,5

**COMMISSIONING**

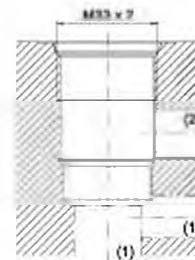
**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).



The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability is assumed.

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-33-01-0-98


**Note!**

For detailed cavity drawing and cavity tools see data sheet 2.13-1005


**ACCESSORIES**

Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M33 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 130 \text{ Nm}$ Screw-in cartridge $M_0 = 9 \text{ Nm}$ knurled nut

**Attention!**

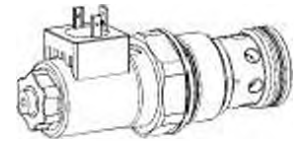
For stack assembly please observe the remarks in the operating instructions



**Solenoid operated poppet valve cartridge**

- ◆ solenoid operated
- ◆ pilot operated
- ◆ normally open and normally closed
- ◆ 2/2-way
- ◆  $Q_{max} = 300 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**M42 x 2**  
**ISO 7789**



**DESCRIPTION**

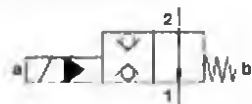
Pilot operated 2/2-way solenoid poppet valve in screw-in cartridge construction for cavity according to ISO 7789. The AB and CB execution is closed in the energised position, the BA and BC execution in the de-energised position. In this, the main spool closes practically leakage-free by means of the applied pressure.

**APPLICATION**

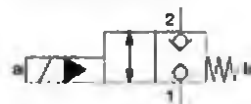
Wandfluh solenoid operated poppet valve cartridges are used where tight closing functions are essential like leakage-free load holding, clamping or gripping. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

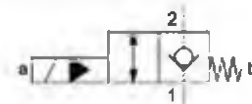
„Normally open“ AB



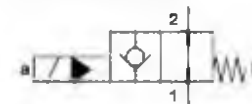
„Normally closed“ BA



„Normally closed“ BC



„Normally open“ CB



**TYPE CODE**

				S V S PM42 - [ ] - [ ] / [ ] [ ] - [ ] # [ ]	
Poppet valve					
Pilot operated					
Solenoid, Super					
Screw-in cartridge M42 x 2					
Designation of symbols acc. to table					
Nominal voltage $U_v$	12 VDC 24 VDC without coil	G12 G24 XS		115 VAC 230 VAC	R115 R230
Slip-on coil	Metal housing, round Metal housing, square	W M	!only G12 and G24!		
Connection execution					
Connector socket EN 175301-803 / ISO 4400		D			
Connector socket AMP Junior-Timer		J			
Connector Deutsch DT04-2P		G			
Sealing material	NBR FKM (Viton)	[ ] D1			
Design index (subject to change)					

**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M42 x 2 according to ISO 7789
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C
Weight	0,95 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Opening pressure	2 bar 1 → 2 version AB / BA 2 bar 2 → 1 version AB / BA 1,5 bar 1 → 2 version BC / CB 1,5 bar 2 → 1 version BC / CB
Maximum volume flow	$Q_{max} = 300$ l/min, see characteristics
Leakage oil	Poppet type, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**ACTUATION**

Actuation	Proportional solenoid, wet pin pull and push type, pressure tight
Execution	W.E37 / 16 x 40 (Data sheet 1.1-169) M.E35 / 16 x 40 (Data sheet 1.1-171)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**ELECTRICAL SPECIFICATIONS**

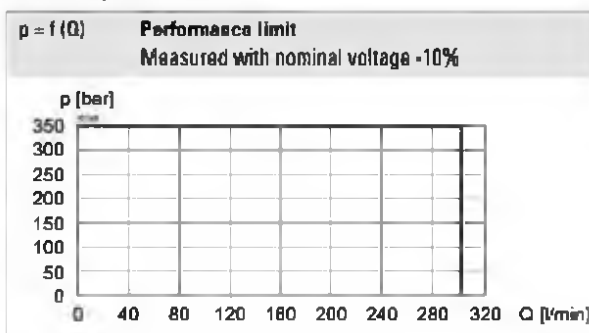
Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF, W.E37 only up to 50 °C
Switching frequency	5 000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!**


Other electrical specifications see data sheet 1.1-169 (slip-on coil W) and 1.1-171 (slip-on coil M)

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

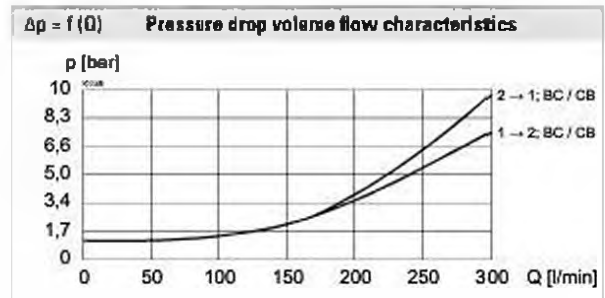
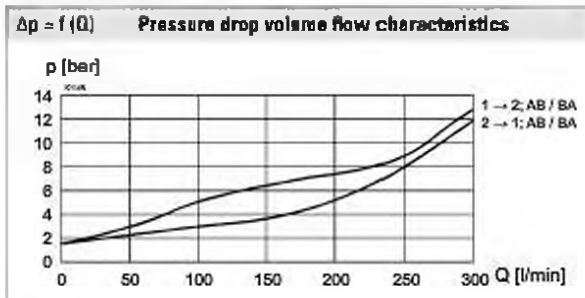

**Switching times**

Type	Flow direction	Switching times	
		Energised	De-energised
SVSPM42	AB	1 → 2: approx. 200 ms 2 → 1: approx. 250 ms	approx. 35 ms
	BA	1 → 2: approx. 35 ms 2 → 1: approx. 35 ms	approx. 200 ms approx. 250 ms
CB	BC	2 → 1: approx. 35 ms	approx. 300 ms
	CB	2 → 1: approx. 300 ms	approx. 40 ms

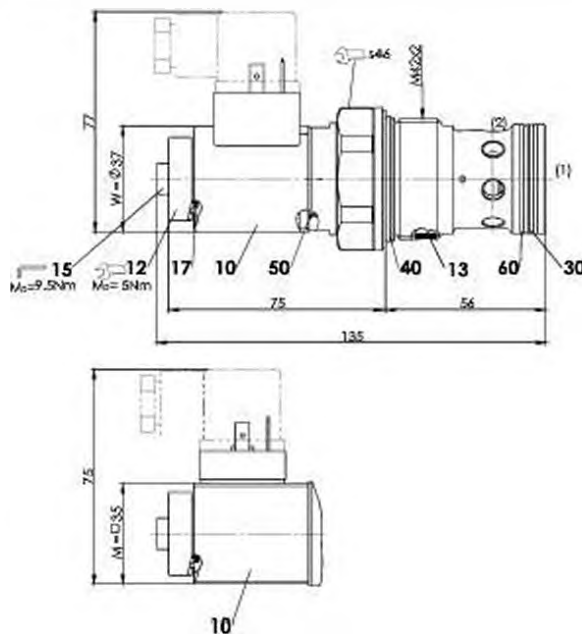
**Note!**


The switching times depend on the volume flow, pressure and viscosity. In case of very large volume flows, the switching time for closing can get considerably longer.

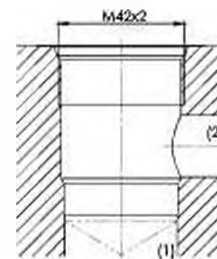
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**Attention!** Measured with cavity according to data sheet 2.13-1059 (annular groove)


**DIMENSIONS**

**HYDRAULIC CONNECTION**

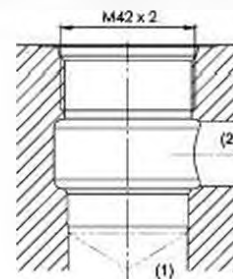
Cavity drawing according to ISO 7789-42-01-0-07



**Note!** Detailed cavity drawing refer to data sheet 2.13-1050


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-42-01-0-07 (with annular groove) recommended for minimum delta p values



**Note!** Detailed cavity drawing refer to data sheet 2.13-1059


**PARTS LIST**

Position	Article	Description
10	206.2...	W.E37 / 16 x 40
	260.4...	M.E35 / 16 x 40
12	154.2600	Knurled nut M16 x 1 x 9
13	212.0013	Plastic disc rd 7 x 1,5
15	239.2033	Screw plug HB0 (incl. seal)
17	160.2156	O-ring ID 15,60 x 1,78 (NBR)
30	160.2329	O-ring ID 32,99 x 2,62 (NBR)
	160.6325	O-ring ID 32,99 x 2,62 (FKM)
40	160.2377	O-ring ID 37,77 x 2,62 (NBR)
	160.6379	O-ring ID 37,77 x 2,62 (FKM)
50	160.1260	O-ring ID 26,00 x 1,00 (NBR)
60	049.8384	Backup ring PTSM rd 31 x 35,5 x 1,4

### ACCESSORIES

Threaded body	Data sheet 2.9-2xx
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

### SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

### STANDARDS

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

### MANUAL OVERRIDE

Screw plug (HB0), no actuation possible.

Optionally HN (K) or HG (K) (pushing) resp. HZ (K) (pulling)  
 → See data sheet 1.1-311

**Attention!** The manual override HZ (H91) cannot be retrofitted.



### SURFACE TREATMENT

◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

### INSTALLATION NOTES

Mounting type	Screw-in cartridge M42 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 420$ Nm Screw-in cartridge $M_0 = 5$ Nm knurled nut

**Note!** Without varying pressure load in connection 2, a tightening torque reduced by 15% is sufficient

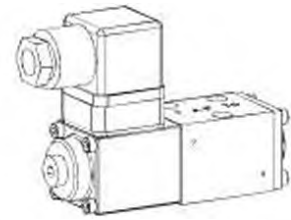


**Solenoid operated poppet valve**
**Flange construction**

- ◆ 2/2-, 3/2- and 3/4-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 6 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG3-Mini**

Wandfluh standard


**DESCRIPTION**

Direct operated 2/2-, 3/2 and 3/4-way solenoid poppet valve in flange construction. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

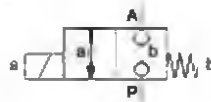
Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**

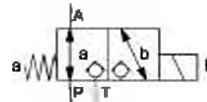
B 22030b



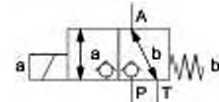
B 22031a



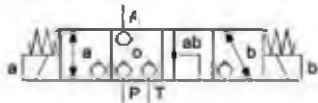
B 32030b



B 32031a



B 3403


**TYPE CODE**

 2/2 or 3/2 way execution  
 3/4 way execution

B	<input type="checkbox"/>	2	03	<input type="checkbox"/>	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
B	<input type="checkbox"/>	3	03	<input type="checkbox"/>	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>

Mounting interface acc. to Wandfluh standard

 Solenoid, Medium  
 Solenoid, Super

<input type="checkbox"/>	M
<input type="checkbox"/>	S

 2 way (connections)  
 3 way (connections)

<input type="checkbox"/>	2
<input type="checkbox"/>	3

 2 switching positions  
 4 switching positions

Nominal size 3-Mini

 Normally closed  
 Normally open

 Solenoid on A-side  
 Solenoid on B-side

<input type="checkbox"/>	1a
<input type="checkbox"/>	0b

 Nominal voltage  $U_n$ 

12 VDC	<input type="checkbox"/>	R12	115 VAC	<input type="checkbox"/>	R115
24 VDC	<input type="checkbox"/>	R24	230 VAC	<input type="checkbox"/>	R230

Sealing material

NBR	<input type="checkbox"/>	
FKM (Viton)	<input type="checkbox"/>	D1

Design index (subject to change)

111-2000

**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2- and 3/4-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG3-Mini according to Wandfluh standard
Actuation	Switching solenoid
Ambient temperature	-25 ... +70 °C
Weight	0,46 kg (2/2- and 3/2-way) 0,72 kg (3/4-way)
MTTFd	150 years

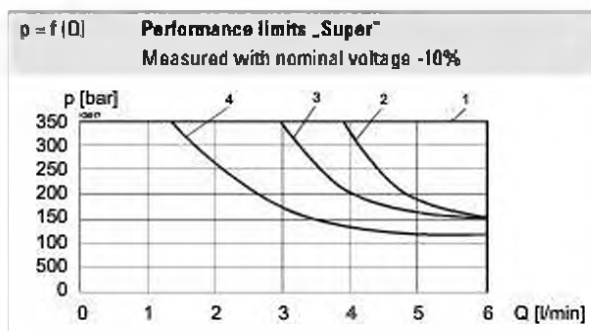
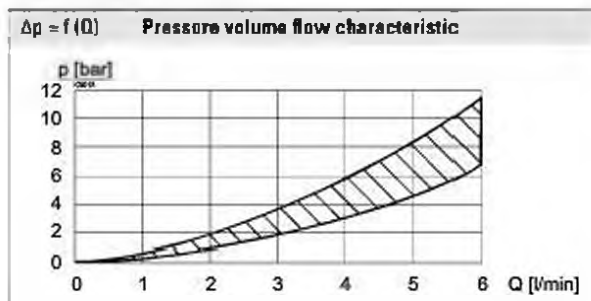
**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
voltage	AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-80 (Medium) and 1.1-85 (Super)


**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$


**ACTUATION**

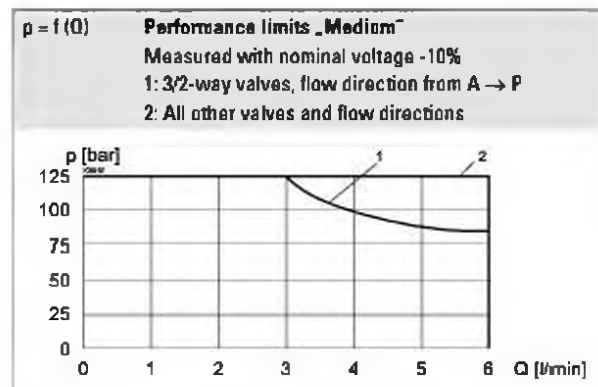
Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	Medium: SIN29V (Data sheet 1.1-80) Super: SIS29V (Data sheet 1.1-85)
Connection	Connector socket EN 175301 – 803

**COMMISSIONING**

**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).


**HYDRAULIC SPECIFICATIONS**

Working pressure	Medium: $p_{max} = 125 \text{ bar}$ Super: $p_{max} = 350 \text{ bar}$
Maximum volume flow	$Q_{max} = 6 \text{ l/min}$ , see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Poppet type, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50



Type	Flow direction			
	P - A	A - T	A - P	T - A
BS22031a	1	-	2	-
BS22030b	1	-	3	-
BS32031a	1	2	4	1
BS32030b	1	2	4	1
BS3403	1	1	2	4

**Attention!** Long periods of non-actuation can reduce the switching performance





**STANDARDS**

Mounting interface	Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**INSTALLATION NOTES**

Mounting type	Flange mounting 3 fixing holes for socket head screws M4 x 30
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 2,6 \text{ Nm}$ (quality 8.8, zinc coated)

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible  
 Optionally: HB4.5, HN(K) or HG(K)  
 → See data sheet 1.1-311

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**Note!** The length of the fixing screw depends on the base material of the connection element.

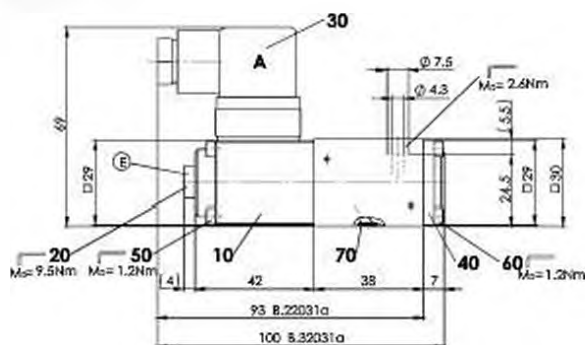

**VALVES INSTALLED**

The central functioning element is the poppet valve cartridge listed below

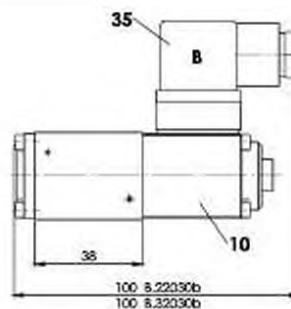
Article	Description	Data sheet no.
2203	Solenoid poppet valve cartridge normally closed NG3	1.11-2010

**DIMENSIONS**

3/2-; 2/2-way

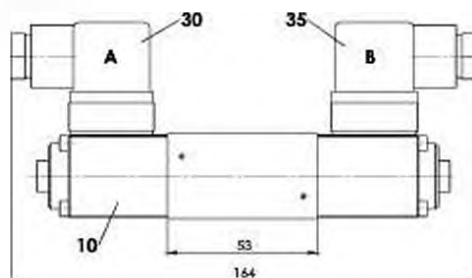


3/2-; 2/2-way

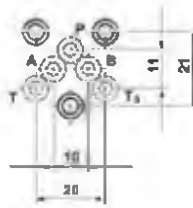


E = Air bleed screw

3/4-way



## HYDRAULIC CONNECTION



## SURFACE TREATMENT

- ◆ The valve body is painted with a two component paint
- ◆ The solenoid and the cover are re zinc-nickel coated
- ◆ The socket head screws are zinc coated

## PARTS LIST

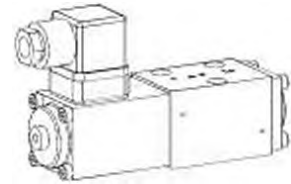
Position	Article	Description
10	260.2...	Solenoid SIN29V
	260.3...	Solenoid SIS29V
20	239.2033	Screw plug HB0 (incl. seal)
30	219.2001	Electric plug A (grey)
35	219.2002	Electric plug B (black)
40	056.4203	Cover
50	246.0141	Socket head screw M3 x 40 DIN 912
60	246.0109	Socket head screw M3 x 8 DIN 912
70	160.2045	O-ring ID 4,50 x 1,50 (NBR)
	160.6045	O-ring ID 4,50 x 1,50 (FKM)

**Solenoid operated poppet valve**
**Flange construction**

- ◆ 2/2-, 3/2- and 3/4-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 15 \text{ l/min}$
- ◆  $p_{max} = 350$

**NG4-Mini**

Wandfluh standard


**DESCRIPTION**

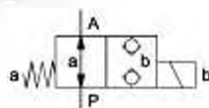
Direct operated 2/2-, 3/2 and 3/4-way solenoid poppet valve in flange construction. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

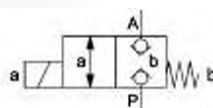
Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**

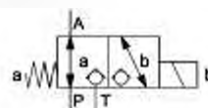
B 22040b



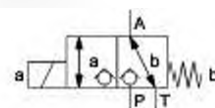
B 22041a



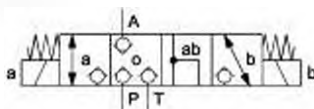
B 32040b



B 32041a



B 3404


**TYPE CODE**

 2/2 or 3/2 way execution  
 3/4 way execution

B			2	04		-		-		#	
B			3	4	04		-		-	#	

Mounting interface acc. to Wandfluh standard

 Solenoid, Medium  
 Solenoid, Super

M
S

 2 way (connections)  
 3 way (connections)

2
3

 2 switching positions  
 4 switching positions

Nominal size 4-Mini

 Normally closed  
 Normally open

 Solenoid on A-side  
 Solenoid on B-side

0a
0b

 Nominal voltage  $U_N$ 

12 VDC	G12	115 VAC	R115
24 VDC	G24	230 VAC	R230

Sealing material

NBR	
FKM (Viton)	D1

Design index (subject to change)

1 11-2720

**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2- and 3/4-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Switching solenoid
Ambient temperature	-25 ... +70 °C
Weight	0,95 kg (2/2- and 3/2-way) 1,45 kg (3/4-way)
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
voltage	AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-105 (Medium) and 1.1-110 (Super)


**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	Medium: SIN35V (Data sheet 1.1-105) Super: SIS35V (Data sheet 1.1-110)
Connection	Connector socket EN 175301 – 803

**COMMISSIONING**

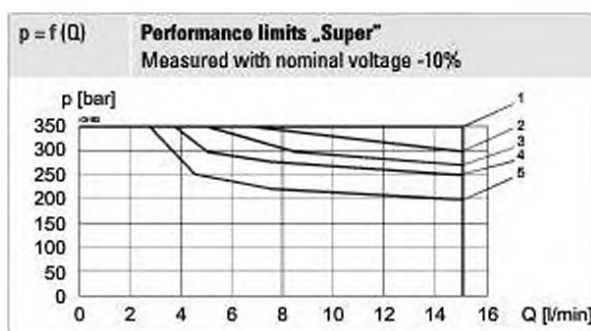
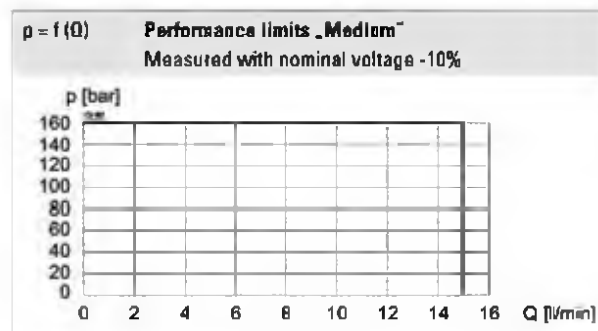
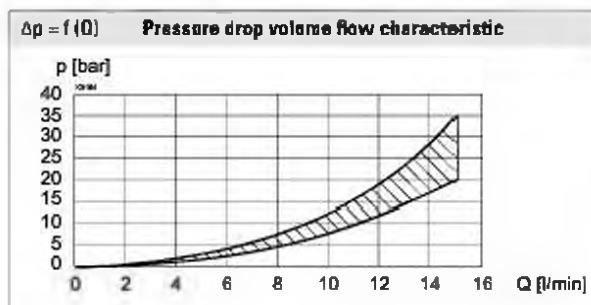
**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).


**HYDRAULIC SPECIFICATIONS**

Working pressure	Medium: p <sub>max</sub> = 160 bar Super: p <sub>max</sub> = 350 bar
Maximum volume flow	Q <sub>max</sub> = 15 l/min, see characteristics
Volume flow direction	Any (see characteristic)
Leakage oil	Poppet type, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10 ... 16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



Type	Flow direction			
	P - A	A - T	A - P	T - A
BS22041a	1	-	2	-
BS22040b	1	-	4	-
BS32041a	1	3	5	1
BS32040b	1	4	5	1
BS3404	1	1	2	2

**Attention!** Long periods of non-actuation can reduce the switching performance



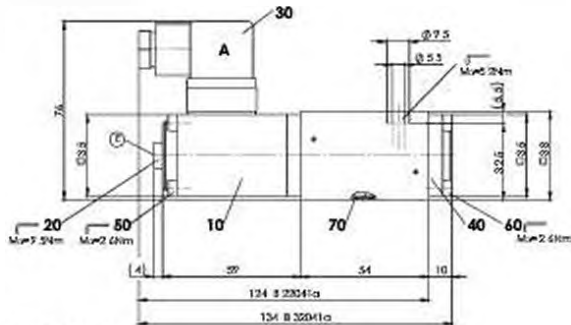
## VALVES INSTALLED

The central functioning element is the poppet valve cartridge listed below

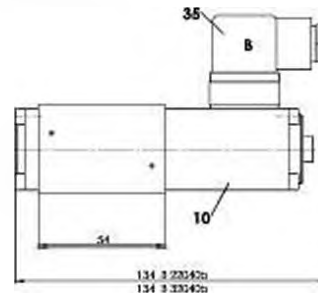
Article	Description	Data sheet no.
2204	Solenoid poppet valve cartridge normally closed NG4	1.11-2020

## DIMENSIONS

3/2-; 2/2-way

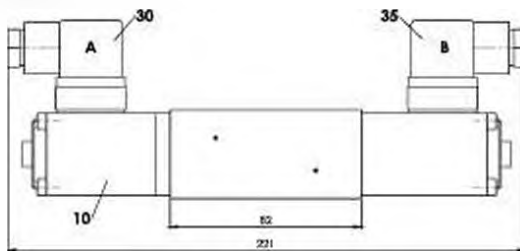


3/2-; 2/2-way

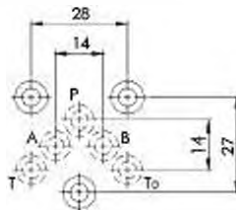


E = Air bleed screw

3/4-way



## HYDRAULIC CONNECTION



## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## PARTS LIST

Position	Article	Description
10	260.4...	Solenoid SIN35V
	260.5...	Solenoid SIS35V
20	239.2033	Screw plug HB0 (incl. seal)
30	219.2001	Electric plug A (grey)
35	219.2002	Electric plug B (black)
40	057.4201	Cover
50	246.1161	Socket head screw M4 x 60 DIN 912
60	246.1113	Socket head screw M4 x 12 DIN 912
70	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)

## STANDARDS

Mounting interface	Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 ~ 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-10
Multi-station subplates	Data sheet 2.9-50
Module type manifold blocks	Data sheet 2.9-90
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

## MANUAL OVERRIDE

Screw plug (HB0), no actuation possible  
 Optionally: HB4,5, HN(K) or HG(K)  
 → See data sheet 1.1-311

## INSTALLATION NOTES

Mounting type	Flange mounting 3 fixing holes for socket head screws M5 x 40
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated)

**Note!** The length of the fixing screw depends on the base material of the connection element.



## SURFACE TREATMENT

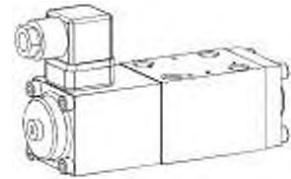
- ◆ The valve body is painted with a two component paint
- ◆ The solenoid and the cover are re zinc-nickel coated
- ◆ The socket head screws are zinc coated

**Solenoid operated poppet valve**
**Flange construction**

- ◆ 2/2-, 3/2- and 3/4-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG6**

ISO 4401-03


**DESCRIPTION**

Direct operated 2/2-, 3/2 and 3/4-way solenoid poppet valve in flange construction. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

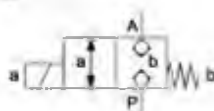
Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

**SYMBOL**

A 22060b



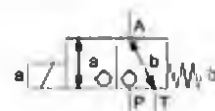
A 22061a



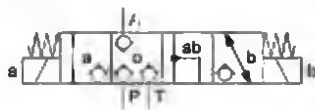
A 32060b



A 32061a



A 3406


**TYPE CODE**

 2/2 or 3/2 way execution  
 3/4 way execution

A	<input type="checkbox"/>	2	06	<input type="checkbox"/>	-	-	-	#	<input type="checkbox"/>
A	<input type="checkbox"/>	3	4	06	<input type="checkbox"/>	-	-	-	#

International standard interface ISO

Solenoid, Medium	<input type="checkbox"/>	M
Solenoid, Super	<input type="checkbox"/>	S

2 way (connections)	<input type="checkbox"/>	2
3 way (connections)	<input type="checkbox"/>	3

2 switching positions	<input type="checkbox"/>	2
4 switching positions	<input type="checkbox"/>	4

Nominal size 6

Normally closed	Solenoid on A-side	<input type="checkbox"/>	1a
Normally open	Solenoid on B-side	<input type="checkbox"/>	0b

Nominal voltage $U_n$	12 VDC	<input type="checkbox"/>	G12	115 VAC	<input type="checkbox"/>	R115
	24 VDC	<input type="checkbox"/>	G24	230 VAC	<input type="checkbox"/>	R230

Sealing material	NBR	<input type="checkbox"/>
	FKM (Viton)	<input type="checkbox"/>

Design index (subject to change)

11-2580

**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2- and 3/4-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C
Weight	1,8 kg (2/2- and 3/2-way) 2,8 kg (3/4-way)
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
Standard nominal voltage	AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-120 (Medium) and 1.1-125 (Super)


**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	Medium: SIN45V (Data sheet 1.1-120) Super: SIS45V (Data sheet 1.1-125)
Connection	Connector socket EN 175301 – 803

**COMMISSIONING**

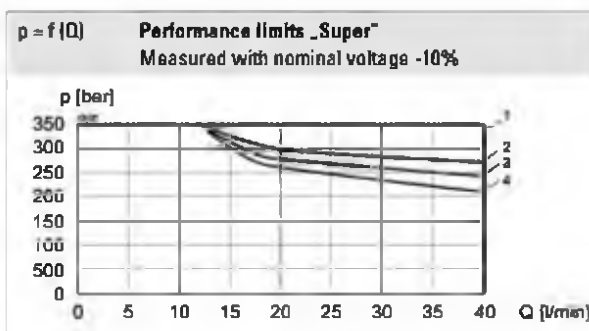
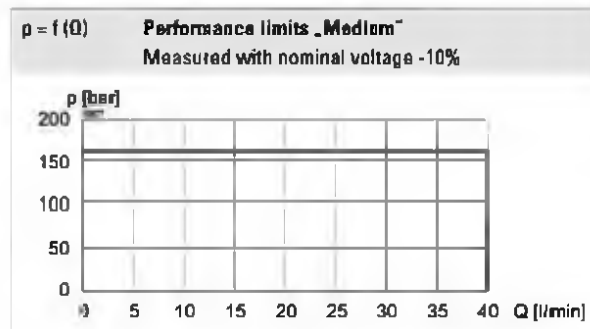
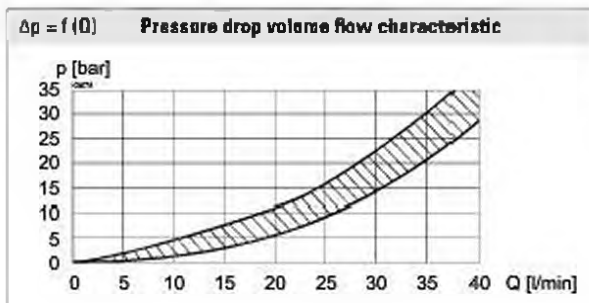
**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).


**HYDRAULIC SPECIFICATIONS**

Working pressure	Medium: p <sub>max</sub> = 160 bar Super: p <sub>max</sub> = 350 bar
Maximum volume flow	Q <sub>max</sub> = 40 l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Poppet type, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



Type	Flow direction			
	P - A	A - T	A - P	T - A
AS22061a	1	-	2	-
AS22060b	1	-	4	-
AS32061a	1	2	3	1
AS32060b	1	2	3	1
AS3406	1	1	2	2

**Attention!** Long periods of non-actuation can reduce the switching performance







## ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

## MANUAL OVERRIDE

Screw plug (HB0), no actuation possible  
 Optionally: HB6, HN(K) or HG(K)  
 → See data sheet 1.1-311

## INSTALLATION NOTES

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated)

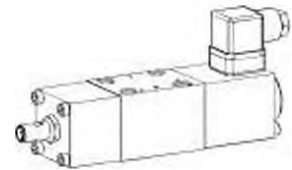
### Note!



The length of the fixing screw depends on the base material of the connection element.

## SURFACE TREATMENT

- ◆ The valve body is painted with a two component paint
- ◆ The solenoid and the cover are zinc-nickel coated
- ◆ The socket head screws are zinc coated

**Solenoid operated poppet valve with additional inductive switching position monitoring**
**NG6**  
 ISO 4401-03

**Flange construction**

- ◆ 2/2- and 3/2-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**DESCRIPTION**

Solenoid operated poppet valve according to data sheet 1.11-2140 with additional inductive switching position monitoring. The contactless sensor transmits the poppet position to a step signal.

**TYPE CODE**

2/2 or 3/2 way execution		A	<input type="checkbox"/>	<input type="checkbox"/>	2	<input type="checkbox"/>	06	<input type="checkbox"/>	-	<input type="checkbox"/>	-	<input type="checkbox"/>	≠	<input type="checkbox"/>
International standard interface ISO														
Solenoid, Medium														
Solenoid, Super														
2 way (connections)														
3 way (connections)														
2 switching positions														
Nominal size 6														
Normally closed														
Normally open														
	Solenoid on A-side													
	Solenoid on B-side													
Other type designation according to type code data sheet 1.11-2140														
Polarity / Signal output / Monitoring														
PNP / NO / Single														Z603
PNP / NC / Single														Z682
NPN / NO / Single														Z680
Design index (subject to change)														
														1.11-2140

**GENERAL SPECIFICATIONS**

Weight 2,25 kg

**Sensor Specifications:**

Nominal voltage	24 VDC
Operating voltage	10...30 VDC
Signal current	max. 200 mA
Switching frequency	2000 Hz
Protection class	IP 68

According to the connection type, the protection class of the valve can be lower, see data sheet 1.11-2140

Dimensions	M12 x 1
Ambient temperature	-25...50 °C
Fastening torque	15 Nm
Peak pressure	500 bar

**ACCESSORIES**

Mating connector (plug female)

straight, screw terminal Article no. 219.2978

90°, screw terminal Article no. 219.3003

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The solenoid, the flange and the cover are zinc coated
- ◆ The socket head screws are zinc coated


**Note!**

Other specifications see data sheet 1.11-2140



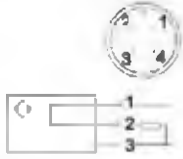
**ELECTRICAL CONNECTION**

Type:	PNP, NO (Normally open)
Designation:	Z603
Article no.:	205.5024
Device receptacle	M12, 4 pole male
Mating connector	M12, 4 pole female
	1 = Supply voltage +
	2 = Reserved for extensions
	3 = Supply voltage 0 VDC
	4 = Signal
	Plus switched



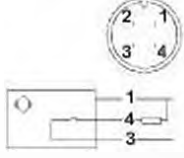
Mating connector not included in delivery

Type:	PNP, NC (Normally closed)
Designation:	Z482
Article no.:	205.5023
Device receptacle	M12, 4 pole male
Mating connector	M12, 4 pole female
	1 = Supply voltage +
	2 = Signal
	3 = Supply voltage 0 VDC
	4 = Reserved for extensions
	Plus switched



Mating connector not included in delivery

Type:	NPN, NO (Normally open)
Designation:	Z680
Article no.:	205.5026
Device receptacle	M12, 4 pole male
Mating connector	M12, 4 pole female
	1 = Supply voltage +
	2 = Reserved for extensions
	3 = Supply voltage 0 VDC
	4 = Signal
	Minus switched



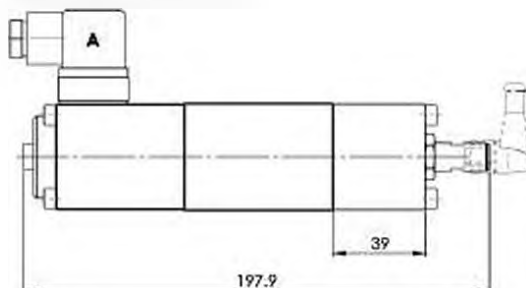
Mating connector not included in delivery

**Signal characteristics**

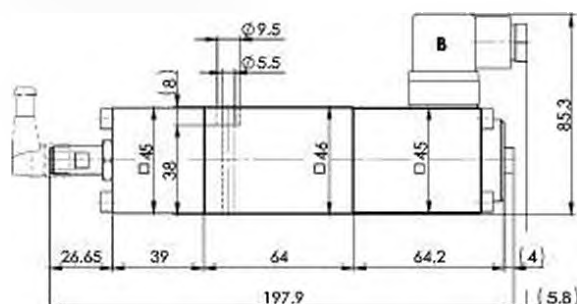
Signal of the actuator	Signal of the sensor	
	NO Normally open	NC Normally closed
A / B	S1	S1
0	0	1
1	1	0

**DIMENSIONS**

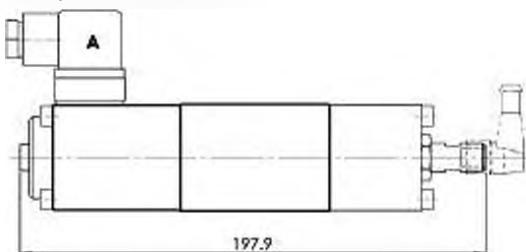
22061 (solenoid on A side)



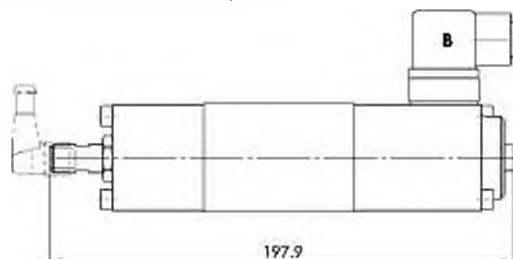
22060 (solenoid on B side)



32061 (solenoid on A side)



32060 (solenoid on B side)



**Solenoid operated poppet valve detented**
**Flange construction**

- ◆ 3/2-way
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG6**
**ISO 4401-03**

**DESCRIPTION**

Direct operated 3/2-way solenoid poppet valve in flange construction. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring and is held in the switching position by the form-closed detent. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

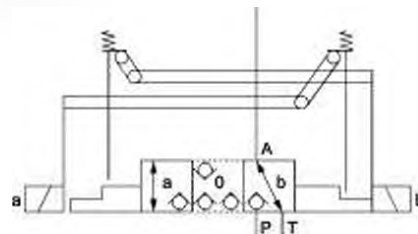
Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

**SYMBOL**

Simplified



Detailed


**TYPE CODE**

International standard interface ISO					A	3	2	06	rr	-	-	#	
Solenoid, Medium													
Solenoid, Super													
3 way (connections)													
2 switching positions													
Nominal size 6													
Detent	on both sides												
Nominal voltage $U_n$	12 VDC	<input type="checkbox"/>	G12	115 VAC	<input type="checkbox"/>	R115							
	24 VDC	<input type="checkbox"/>	G24	230 VAC	<input type="checkbox"/>	R230							
Sealing material / Temperature range	NBR	<input type="checkbox"/>											
	FKM (Viton)	<input type="checkbox"/>		D1									
	NBR -40 °C	<input type="checkbox"/>		Z604									
Design index (subject to change)													

**GENERAL SPECIFICATIONS**

Designation	3/2-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C (NBR) -20...+70 °C (FKM)
Weight	3,5 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	Medium: $p_{max} = 160$ bar Super: $p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 40$ l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Seat tight, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	100 % DF
Switching frequency	7'500 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
voltage	AC = 50 to 60 Hz, rectifier integrated in the connector socket

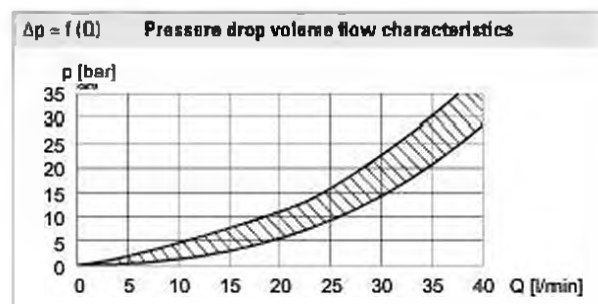
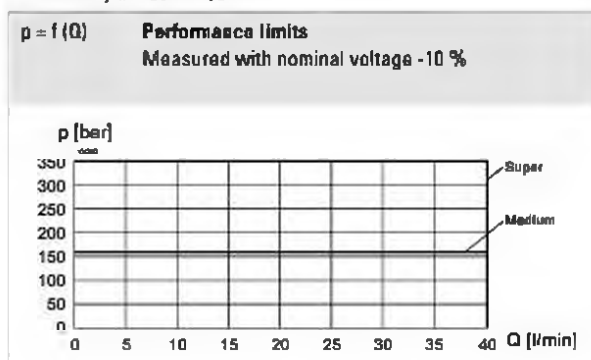
**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	Medium: SIN45V (Data sheet 1.1-120) Super: SIS45V (Data sheet 1.1-125)
Connection	Connector socket EN 175301 – 803

**Note!** Other electrical specifications see data sheet 1.1-120 (Medium) and 1.1-125 (Super)

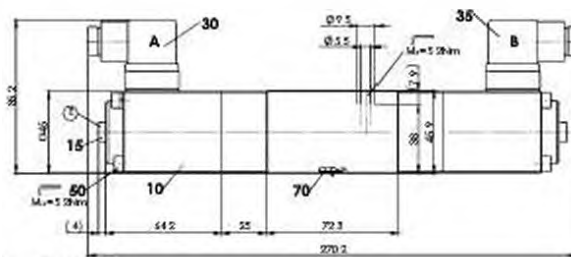

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s



**Attention!** Long periods of non-actuation can reduce the switching performance



**DIMENSIONS**


E = Air bleed screw

**PARTS LIST**

Position	Article	Description
10	260 6...	Solenoid SIN45V
	260 7...	Solenoid SIS45V
15	239 2033	Screw plug HB0 (incl. seal)
30	219 2001	Electric plug A (grey)
35	219 2002	Electric plug B (black)
50	246 2190	Socket head screw M5 x 90 DIN 912
70	160 2093	O-ring ID 9,25 x 1,78 (NBR)
	160 6092	O-ring ID 9,25 x 1,78 (FKM)

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible

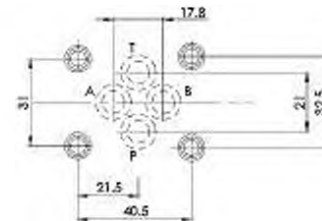
Optionally: HB6 or HN(K)

→ See data sheet 1.1-311

**STANDARDS**

Mounting interface	ISO 4401-03
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**COMMISSIONING**
**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).

**HYDRAULIC CONNECTION**

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Module type manifold blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The solenoid and the flange are zinc-nickel coated
- ◆ The socket head screws are zinc coated

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated)

**Note!**


The length of the fixing screw depends on the base material of the connection element.

### Solenoid operated poppet valve

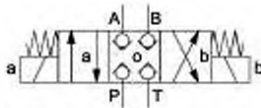
#### Flange construction

- ◆ 4/3 way
- ◆  $Q_{max} \approx 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

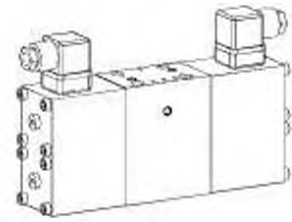
#### DESCRIPTION

Direct operated 4/3-way solenoid poppet valve in flange construction. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

#### SYMBOL



**NG6**  
**ISO 4401-03**



#### APPLICATION

Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

#### COMMISSIONING

**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).



#### TYPE CODE

4/3 way execution

International standard interface ISO

Solenoid, Medium  
 Solenoid, Super

M  
 S

4-way (connections)

3 switching positions

Nominal size 6

Nominal voltage  $U_n$

12 VDC  
 24 VDC

G12  
 G24

115 VAC  
 230 VAC

R115  
 R230

Sealing material

NBR  
 FKM (Viton)

D1

Design index (subject to change)

1.1-2010

A  4 3 06 -  -  #

#### GENERAL SPECIFICATIONS

Designation	4/3-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C (NBR) -20...+70 °C (FKM)
Weight	5,4 kg
MTTFd	150 years

#### ACTUATION

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	Medium: SIN45DV (Data sheet 1.1-122) Super: SIS45DV (Data sheet 1.1-127)
Connection	Connector socket EN 175301 - 803



**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
	AC = 50 to 60 Hz, rectifier integrated in the connector socket

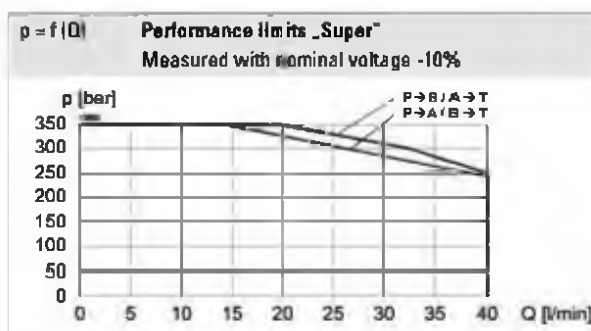
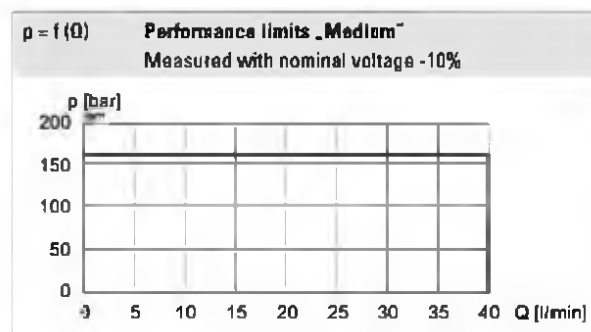
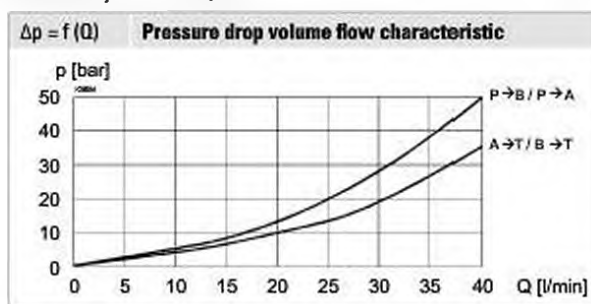
**Note!** Other electrical specifications see data sheet 1.1-122 (Medium) and 1.1-127 (Super)


**HYDRAULIC SPECIFICATIONS**

Working pressure	Medium: p <sub>max</sub> = 160 bar Super: p <sub>max</sub> = 350 bar
Maximum volume flow	Q <sub>max</sub> = 40 l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Seat tight, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-20...+70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



**Attention!** Long periods of non-actuation can reduce the switching performance


**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x90
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 9,7 \text{ Nm}$ (quality 12.9, zinc coated)

**Note!** The length of the fixing screw depends on the base material of the connection element.


**STANDARDS**

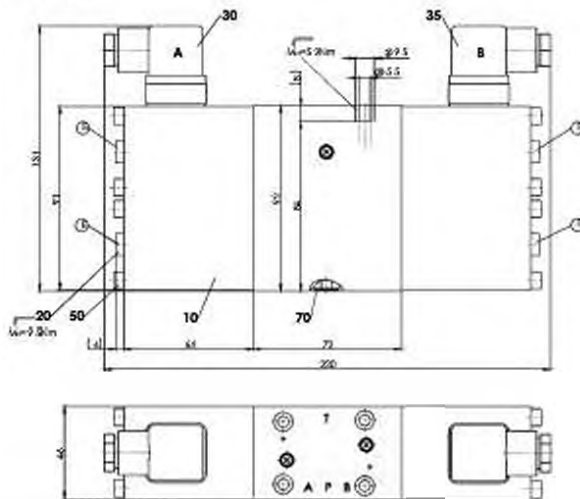
Mounting interface	ISO 4401-03
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## VALVES INSTALLED

The central functioning element is the poppet valve cartridge NG6, data sheet 1.11-2030.

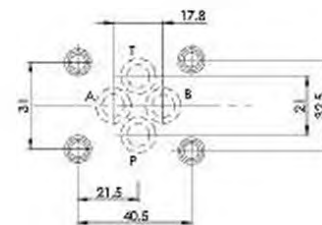
## DIMENSIONS

4/3-way



E = Air bleed screw

## HYDRAULIC CONNECTION



## PARTS LIST

Position	Article	Description
10	260.64..	Solenoid SIN45DV-...-M40-HB0
	260.74..	Solenoid SIS45DV-...-M40-HB0
30	219.2001	Electric plug A (grey)
35	219.2002	Electric plug B (black)
50	246.2171	Socket head screw M5 x 70 DIN 912
70	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)

## ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

## SURFACE TREATMENT

- ◆ The valve body is painted with a two component paint
- ◆ The solenoid is zinc coated
- ◆ The screws are zinc coated

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

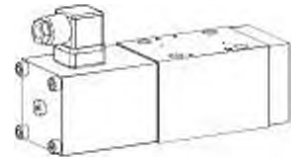


**Solenoid operated poppet valve**
**Flange construction**

- ◆ 2/2-, 3/2- und 3/4-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG10**

ISO 4401-05


**DESCRIPTION**

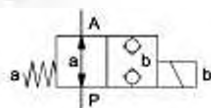
Direct operated 2/2-, 3/2 and 3/4-way solenoid poppet valve in flange construction. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

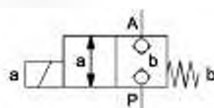
Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

**SYMBOL**

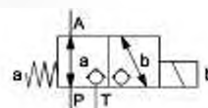
A.22100b



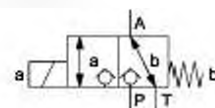
A.22101a



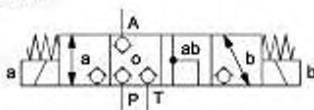
A.32100b



A.32101a



A.3410


**TYPE CODE**

 2/2 or 3/2 way execution  
 3/4 way execution

A	<input type="checkbox"/>	<input type="checkbox"/>	2	10	<input type="checkbox"/>	-	-	-	#
A	<input type="checkbox"/>	<input type="checkbox"/>	3	4	10	<input type="checkbox"/>	-	-	#

International standard interface ISO

 Solenoid, Medium  
 Solenoid, Super

M
S

 2 way (connections)  
 3 way (connections)

2
3

 2 switching positions  
 4 switching positions

Nominal size 10

 Normally closed  
 Normally open

 Solenoid on A-side  
 Solenoid on B-side

1a
0b

 Nominal voltage  $U_n$ 

12 VDC	G12	115 VAC	R115
24 VDC	G24	230 VAC	R230

Sealing material

NBR	<input type="checkbox"/>
FKM (Viton)	D1

Design index (subject to change)

111-2100

**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2- and 3/4-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C
Weight	4,6 kg (2/2- and 3/2-way) 6,4 kg (3/4-way)
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-145 (Medium) and 1.1-150 (Super)


**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	Medium: SIN60V (Data sheet 1.1-145) Super: SIS60V (Data sheet 1.1-150)
Connection	Connector socket EN 175301 – 803

**COMMISSIONING**

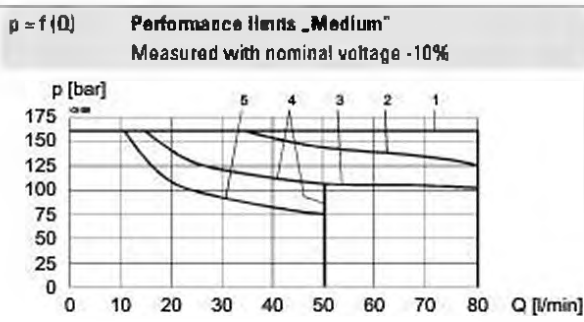
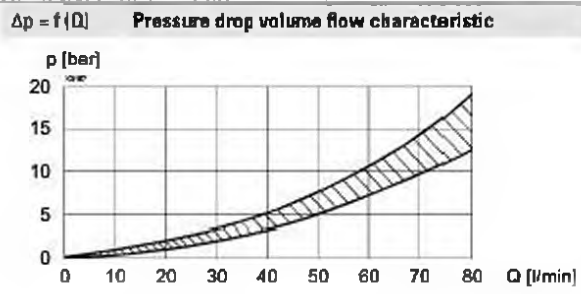
**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).


**HYDRAULIC SPECIFICATIONS**

Working pressure	Medium: $p_{max} = 160$ bar Super: $p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 80$ l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Poppet type, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

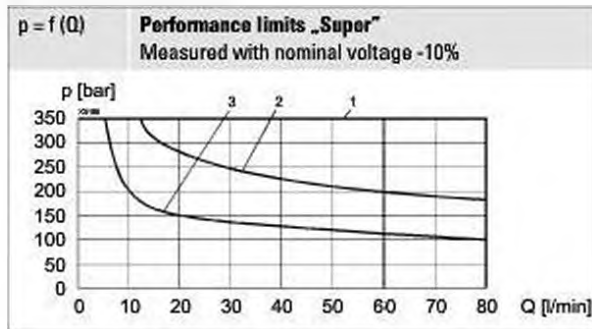
**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s



Type	Flow direction			
	P - A	A - T	A - P	T - A
AM22101a	1	-	4	-
AM22100b	1	-	2	-
AM32101a	1	3	5	1
AM32100b	1	3	3	1
AM3410	1	1	4	4

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Type	Flow direction			
	P - A	A - T	A - P	T - A
AS22101a	1	-	2	-
AS22100b	1	-	2	-
AS32101a	1	2	3	1
AS32100b	1	2	3	1
AS3410	1	1	2	2

**Attention!** Long periods of non-actuation can reduce the switching performance

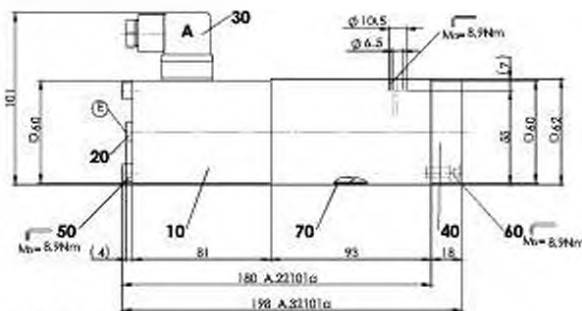

**VALVES INSTALLED**

The central functioning element is the poppet valve cartridge listed below

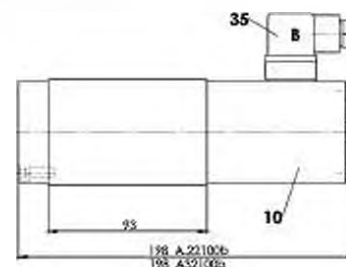
Article	Description	Data sheet no.
2210	Solenoid poppet valve cartridge normally closed NG10	1.11-2040

**DIMENSIONS**

3/2-; 2/2-way

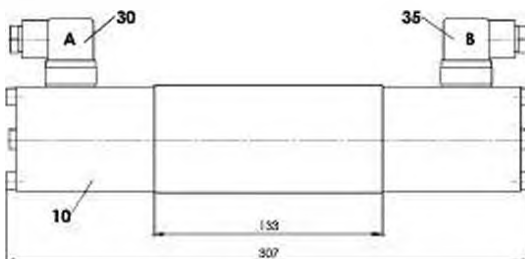
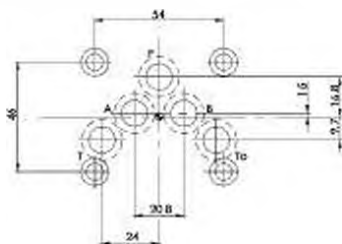


3/2-; 2/2-way



E = Air bleed screw

3/4-way


**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	260.8...	Solenoid SIN60V
	260.9...	Solenoid SIS60V
20	239.2033	Screw plug HB0 (incl. seal)
30	219.2001	Electric plug A (grey)
35	219.2002	Electric plug B (black)
40	059.2200	Cover
50	246.3190	Socket head screw M6 x 90 DIN 912
60	246.3121	Socket head screw M6 x 20 DIN 912
70	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

## INSTALLATION NOTES

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 65
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 8,9 \text{ Nm}$ (quality 8.8, zinc coated)

### Note!

The length of the fixing screw depends on the base material of the connection element.



## STANDARDS

Mounting interface	ISO 4401-05
Solenoids	DIN VDE 0580
Connection execution O	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## MANUAL OVERRIDE

Screw plug (HB0), no actuation possible

Optionally: HB8,5, HN(K) or HG(K)

→ See data sheet 1.1-311

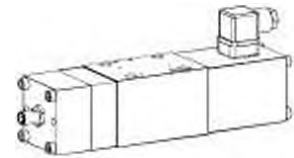
## SURFACE TREATMENT

- ◆ The valve body is painted with a two component paint
- ◆ The solenoid and the cover are re zinc-nickel coated
- ◆ The socket head screws are zinc coated

**Solenoid operated poppet valve with additional inductive switching position monitoring**
**NG10**  
 ISO 4401-05

**Flange construction**

- ◆ 2/2- and 3/2-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$


**DESCRIPTION**

Solenoid operated poppet valve according to data sheet 1.11-2160 with additional inductive switching position monitoring. The contactless sensor transmits the poppet position to a step signal.

**TYPE CODE**

2/2 or 3/2 way execution

International standard interface ISO

 Solenoid, Medium  
 Solenoid, Super

M
S

 2 way (connections)  
 3 way (connections)

2
3

2 switching positions

Nominal size 10

 Normally closed  
 Normally open

 Solenoid on A-side  
 Solenoid on B-side

1a
0b

Other type designation according to type code data sheet 1.11-2160

 Polarity /Signal output /Monitoring  
 PNP / NO / Single  
 PNP / NC / Single  
 NPN / NO / Single

Z603
Z482
Z680

 Design index (subject to change)  
 1.11-2162

A			2	10		-		-		#
---	--	--	---	----	--	---	--	---	--	---

**GENERAL SPECIFICATIONS**

Weight	5,30 kg (22101)
	5,95kg (22100; 3210.)

**Sensor Specifications:**

Nominal voltage	24 VDC
Operating voltage	10...30 VDC
Signal current	max. 200 mA
Switching frequency	2000 Hz
Protection class	IP 68
	According to the connection type, the protection class of the valve can be lower, see data sheet 1.11-2160
Dimensions	M12 x 1
Ambient temperature	-25...50 °C
Fastening torque	15 Nm
Peak pressure	500 bar

**ACCESSORIES**

Mating connector (plug female)	
straight, screw terminal	Article no. 219.2978
90°, screw terminal	Article no. 219.3003

**SURFACE TREATMENT**

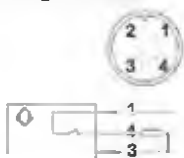
- ◆ The valve body is painted with a two component paint
- ◆ The solenoid, the flange and the cover are zinc coated
- ◆ The socket head screws are zinc coated

**Note!**


Other specifications see data sheet 1.11-2160

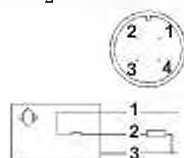
**ELECTRICAL CONNECTION**

Type:	PNP, NO (Normally open)
Designation:	Z603
Article no.:	205.5024
Device receptacle	M12, 4 pole male
Mating connector	M12, 4 pole female
	1 = Supply voltage +
	2 = Reserved for extantions
	3 = Supply voltage 0 VDC
	4 = Signal
	Plus switched




Mating connector not included in delivery

Type:	PNP, NC (Normally closed)
Designation:	Z482
Article no.:	205.5023
Device receptacle	M12, 4 pole male
Mating connector	M12, 4 pole female
	1 = Supply voltage +
	2 = Signal
	3 = Supply voltage 0 VDC
	4 = Reserved for extantions
	Plus switched



Mating connector not included in delivery

Type:	NPN, NO (Normally open)
Designation:	Z680
Article no.:	205.5026
Device receptacle	M12, 4 pole male
Mating connector	M12, 4 pole female
	1 = Supply voltage +
	2 = Reserved for extantions
	3 = Supply voltage 0 VDC
	4 = Signal
	Minus switched



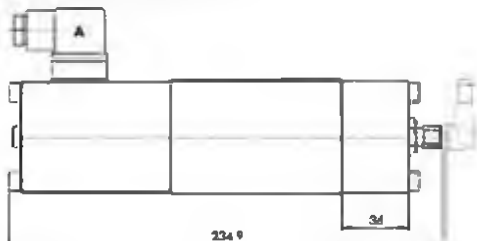
Mating connector not included in delivery

**Signal characteristics**

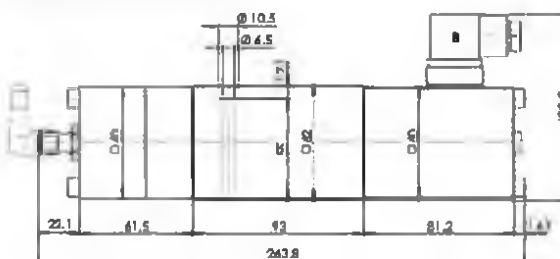
Signal of the actuator	Signal of the sensor	
	NO Normally open	NC Normally closed
A / B	S1	S1
0	0	1
1	1	0

**DIMENSIONS**

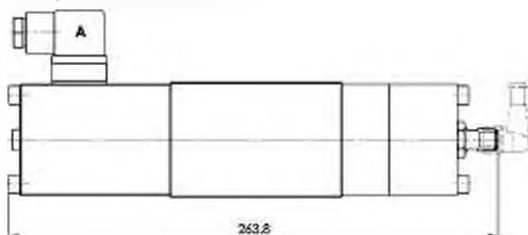
22101 (solenoid on A side)



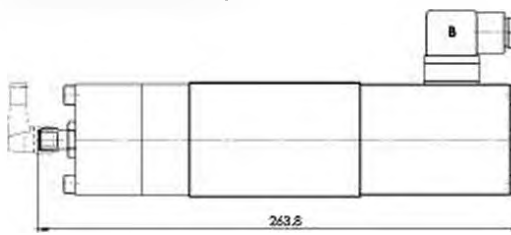
22100 (solenoid on B side)



32101 (solenoid on A side)



32100 (solenoid on B side)



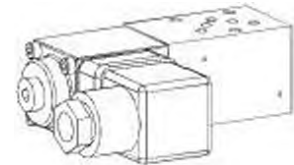


**Solenoid operated poppet valve**
**Sandwich construction**

- ◆ 2/2-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 6 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG3-Mini**

Wandfluh standard


**DESCRIPTION**

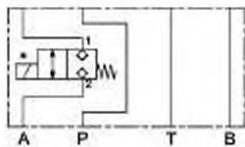
Direct operated 2/2-way solenoid poppet valve in sandwich construction. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

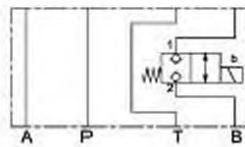
Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**

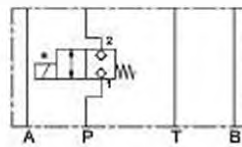
Z.22031A



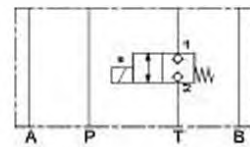
Z.22031B



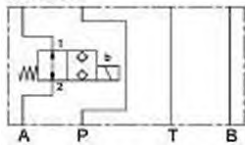
Z.22031P



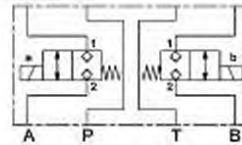
Z.22031T



Z.22030A



Z.22031AB


**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Direct operated
Mounting	Sandwich construction
Nominal size	NG3-Mini according to Wandfluh standard
Actuation	Switching solenoid
Ambient temperature	-25 ... +70 °C
Weight	0,40 - 0,45 kg (1 solenoid) 0,65 kg (2 solenoids)
MTTFd	150 years

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	Medium: SIN29V (Data sheet 1.1-80) Super: SIS29V (Data sheet 1.1-85)
Connection	Connector socket EN 175301 - 803

**TYPE CODE**

Poppet valve, sandwich construction		Z	<input type="checkbox"/>	2	<input type="checkbox"/>	2	<input type="checkbox"/>	03	<input type="checkbox"/>	<input type="checkbox"/>	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Solenoid, Medium		M														
Solenoid, Super		S														
2 way (connections)																
2 switching positions																
Nominal size 3-Mini																
Normally closed		1														
Normally open		0														
Type list / Function																
Poppet valve	in P in A and B	P AB	in T in A	T A		in B	B									
Nominal voltage $U_n$	12 VDC 24 VDC	G12 G24	115 VAC 230 VAC	R115 R230												
Sealing material	NBR FKM (Viton)	<input type="checkbox"/> D1														
Design index (subject to change)																

1.11-2320

**ELECTRICAL SPECIFICATIONS**

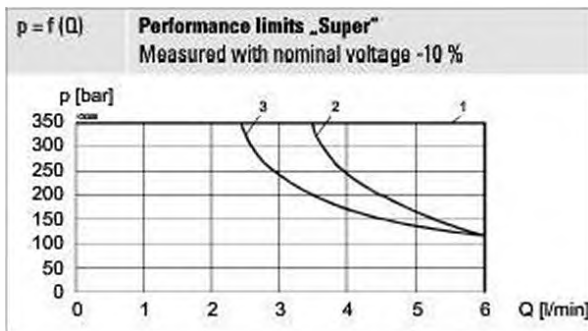
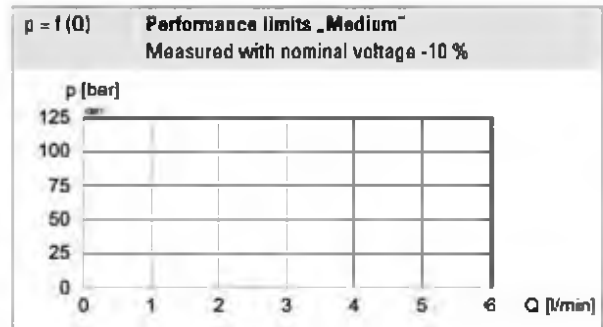
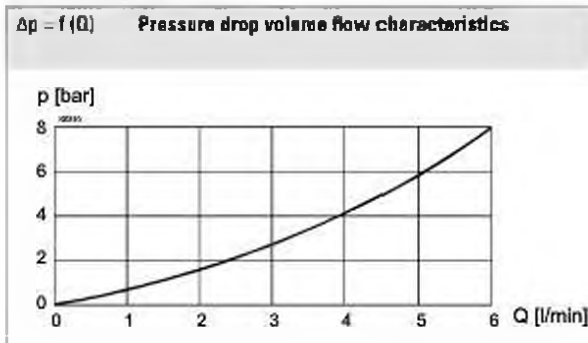
Protection class	IP65
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	$10^7$ (number of switching cycles, theoretically)
Voltage tolerance	$\pm 10$ % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
voltage	AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-80 (Medium) and 1.1-85 (Super)


**HYDRAULIC SPECIFICATIONS**

Working pressure	Medium: $p_{max} = 125$ bar Super: $p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 6$ l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Poppet type, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10 ... 16 $\geq 75$ , see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Symbol	Flow direction	
	1 → 2	2 → 1
ZS22031	1	2
ZS22030A	1	3

**Attention!** Long periods of non-actuation can reduce the switching performance


**STANDARDS**

Mounting interface	Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible

Optionally: HB4,5, HN(K) or HR(K)

→ See data sheet 1.1-311

**COMMISSIONING**

**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).


**SURFACE TREATMENT**

- ◆ The sandwich bodies are zinc-phosphated or zinc-nickel coated
- ◆ The solenoid and the cover are zinc-nickel coated
- ◆ The socket head screws are zinc coated

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**SEALING MATERIAL**

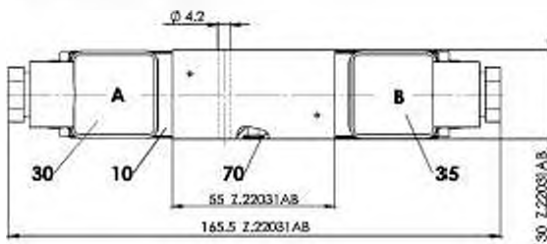
NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

Mounting type	Sandwich mounting 3 fixing holes for socket head screws or studs M4
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 2,6 \text{ Nm}$ (quality 8.8, zinc coated)

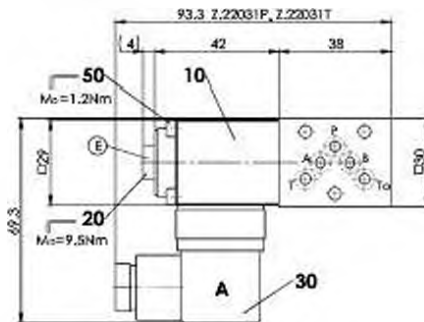
**DIMENSIONS**

Poppet valves in A and B

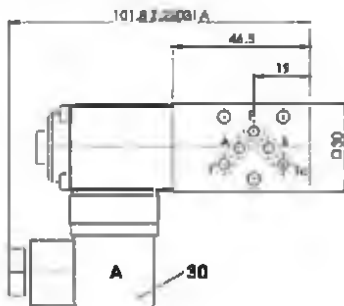


Poppet valve in P or T

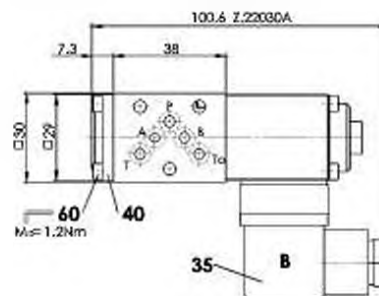
E = Air bleed screw



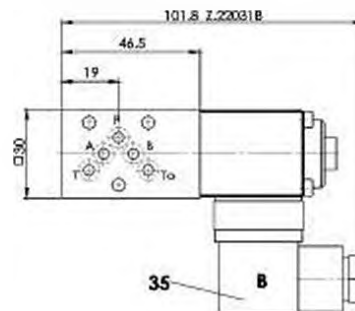
Poppet valve in A



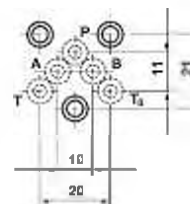
Poppet valve in A



Poppet valve in B


**PARTS LIST**

Position	Article	Description
10	260.2...	Solenoid SIN29V
	260.3...	Solenoid SIS29V
20	239.2033	Screw plug HB0 (incl. seal)
30	219.2001	Electric plug A (grey)
35	219.2002	Electric plug B (black)
40	056.4203	Cover
50	246.0141	Socket head screw M3 x 40 DIN 912
60	246.0109	Socket head screw M3 x 8 DIN 912
70	160.2045	O-ring ID 4,50 x 1,50 (NBR)
	160.6045	O-ring ID 4,50 x 1,50 (FKM)

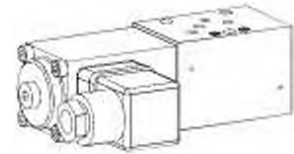
**HYDRAULIC CONNECTION**


**Solenoid operated poppet valve**
**Sandwich construction**

- ◆ 2/2-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 15 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG4-Mini**

Wandfluh standard


**DESCRIPTION**

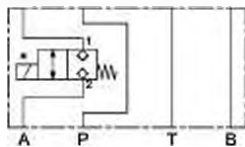
Direct operated 2/2-way solenoid poppet valve in sandwich construction. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

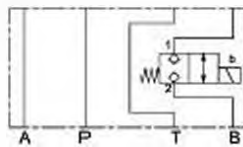
Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**

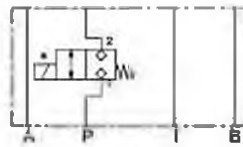
Z.22041A



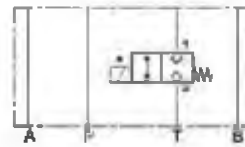
Z.22041B



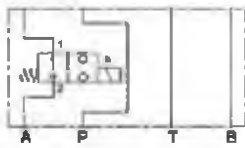
Z.22041P



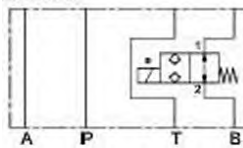
Z.22041T



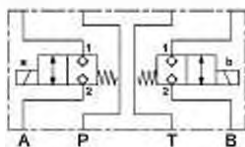
Z.22040A



Z.22040B



Z.22041AB


**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Direct operated
Mounting	Sandwich construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C (NBR) -20...+70 °C (FKM)
Weight	1,00 - 1,15 kg (1 solenoid) 1,75 kg (2 solenoids)
MTTFd	150 years

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	Medium: SIN35V (Data sheet 1.1-105) Super: SIS35V (Data sheet 1.1-110)
Connection	Connector socket EN 175301 – 803

**TYPE CODE**

Poppet valve, sandwich construction		Z	<input type="checkbox"/>	2	<input type="checkbox"/>	2	<input type="checkbox"/>	04	<input type="checkbox"/>	<input type="checkbox"/>	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Solenoid, Medium	<input type="checkbox"/>	M														
Solenoid, Super	<input type="checkbox"/>	S														
2 way (connections)																
2 switching positions																
Nominal size 4-Mini																
Normally closed	<input type="checkbox"/>	1														
Normally open	<input type="checkbox"/>	0														
Type list / Function																
Poppet valve	in P	<input type="checkbox"/>	P	in T	<input type="checkbox"/>	T										
	in A and B	<input type="checkbox"/>	AB	in A	<input type="checkbox"/>	A	in B	<input type="checkbox"/>	B							
Nominal voltage $U_n$	12 VDC	<input type="checkbox"/>	G12	115 VAC	<input type="checkbox"/>	R115										
	24 VDC	<input type="checkbox"/>	G24	230 VAC	<input type="checkbox"/>	R230										
Sealing material	NBR	<input type="checkbox"/>														
	FKM (Viton)	<input type="checkbox"/>	D1													
Design index (subject to change)																

1.11-2020

**ELECTRICAL SPECIFICATIONS**

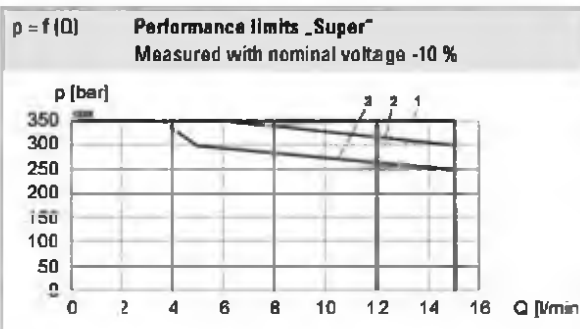
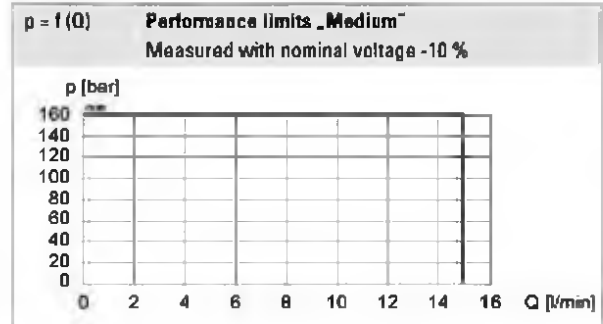
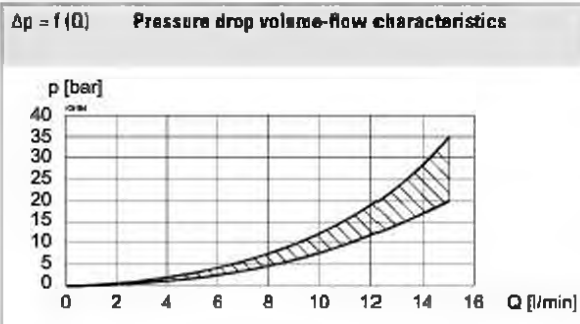
Protection class	IP65
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
	AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-105 (Medium) and 1.1-110 (Super)


**HYDRAULIC SPECIFICATIONS**

Working pressure	Medium: $p_{max} = 160$ bar Super: $p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 15$ l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Seat tight, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-20... +70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10... 16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Type	Flow direction	
	1 → 2	2 → 1
ZS22041	1	3
ZS22040	1	3

**Attention!** Long periods of non-actuation can reduce the switching performance


**STANDARDS**

Mounting interface	Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 -- 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible

Optionally: HB4,5, HN(K) or HR(K)

→ See data sheet 1.1-311

**COMMISSIONING**

**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).


**SURFACE TREATMENT**

- ◆ The sandwich bodies made of steel are zinc-phosphated
- ◆ The solenoid and the cover are zinc coated
- ◆ The socket head screws are zinc coated

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**SEALING MATERIAL**

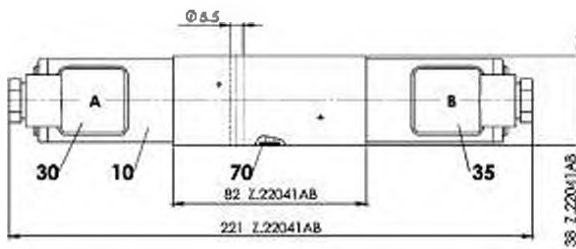
NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

Mounting type	Sandwich mounting 3 fixing holes for socket head screws or studs M5
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated)

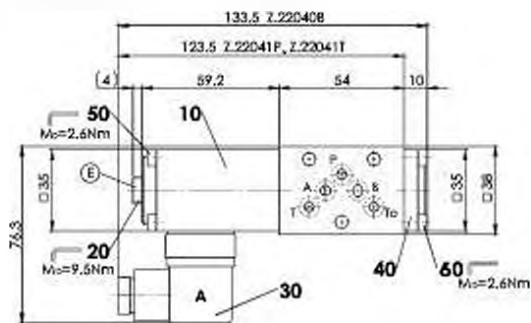
**DIMENSIONS**

Poppet valves in A and B

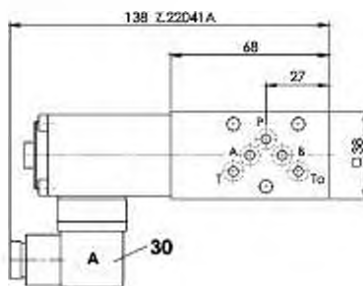


Poppet valve in B, P or T

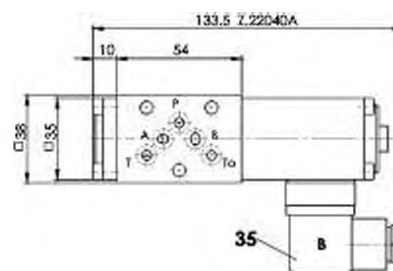
E = Air bleed screw



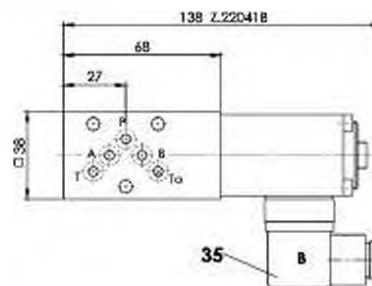
Poppet valve in A



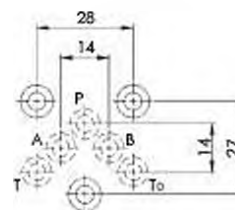
Poppet valve in A



Poppet valve in B


**PARTS LIST**

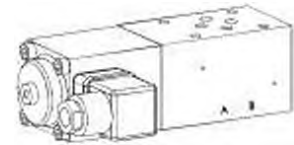
Position	Article	Description
10	260.4...	Solenoid SIN35V
	260.5...	Solenoid SIS35V
20	239.2033	Screw plug HB0 (incl. seal)
30	219.2001	Electric plug A (grey)
35	219.2002	Electric plug B (black)
40	057.4201	Cover
50	246.1161	Socket head screw M4 x 60 DIN 912
60	246.1113	Socket head screw M4 x 12 DIN 912
70	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)

**HYDRAULIC CONNECTION**




**Solenoid operated poppet valve**
**Sandwich construction**

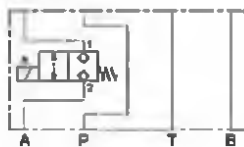
- ◆ 2/2-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

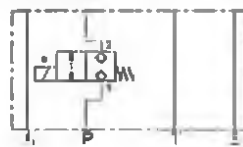
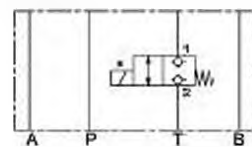
**NG6**
**ISO 4401-03**

**DESCRIPTION**

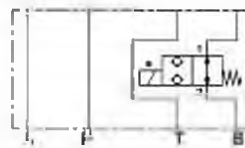
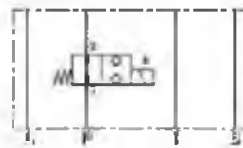
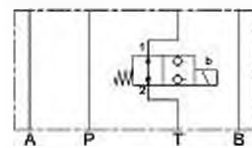
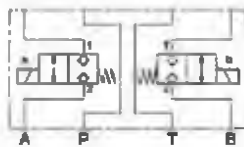
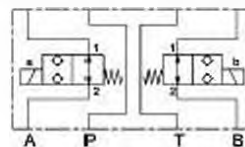
Direct operated 2/2-way solenoid poppet valve in sandwich construction. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

**SYMBOL**
**Z.22061A**

**Z.22061B**

**Z.22061P**

**Z.22061T**

**Z.22060A**

**Z.22060B**

**Z.22060P**

**Z.22060T**

**Z.22061AB**

**Z.22060AB**

**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Direct operated
Mounting	Sandwich construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C
Weight	1,8 kg (1 solenoid) 2,8 - 3,3 kg (2 solenoids)
MTTFd	150 years

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	Medium: SIN45V (Data sheet 1.1-120) Super: SIS45V (Data sheet 1.1-125)
Connection	Connector socket EN 175301 - 803

**TYPE CODE**

Poppet valve, sandwich construction		Z	<input type="checkbox"/>	2	<input type="checkbox"/>	2	<input type="checkbox"/>	06	<input type="checkbox"/>	<input type="checkbox"/>	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Solenoid, Medium		M														
Solenoid, Super		S														
2 way (connections)																
2 switching positions																
Nominal size 6																
Normally closed		1														
Normally open		0														
Type list / Function																
Poppet valve	in P	<input type="checkbox"/>	in T	<input type="checkbox"/>												
	in A and B	AB	in A	A												
					in B	B										
Nominal voltage $U_n$	12 VDC	G12	115 VAC	R115												
	24 VDC	G24	230 VAC	R230												
Sealing material	NBR	<input type="checkbox"/>														
	FKM (Viton)	D1														
Design index (subject to change)																

1.11-20-00

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
voltage	AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-120 (Medium) and 1.1-125 (Super)


**HYDRAULIC SPECIFICATIONS**

Working pressure	Medium: $p_{max} = 160$ bar Super: $p_{max} = 350$ bar ZS22060AB $p_{max} = 315$ bar
Maximum volume flow	$Q_{max} = 40$ l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Poppet type, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10... 16 ≥ 75, see data sheet 1.0-50

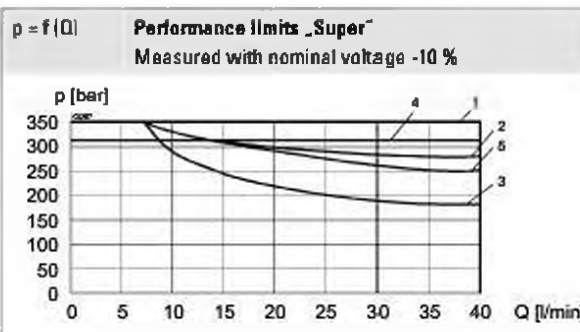
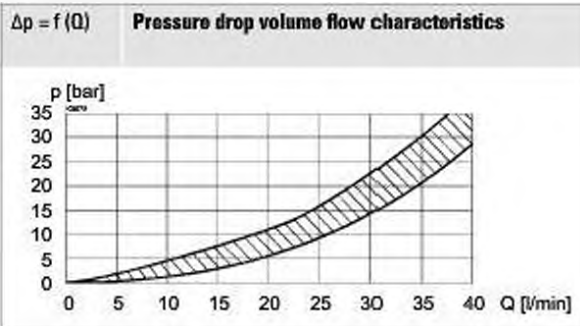
**SURFACE TREATMENT**

- ◆ The sandwich bodies are zinc-nickel coated
- ◆ The solenoid and the cover are re zinc-nickel coated
- ◆ The socket head screws are zinc coated

**INSTALLATION NOTES**

Mounting type	Sandwich mounting 4 fixing holes for socket head screws or studs M5
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2$ Nm (screw quality 8.8, zinc coated)

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Type	Flow direction	
	1 → 2	2 → 1
ZS22061	1	2
ZS22060	1	3
ZS22060AB	4	5

**Attention!** Long periods of non-actuation can reduce the switching performance


**STANDARDS**

Mounting interface	ISO 4401-03
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible  
 Optionally: HB6, HN(K) or HR(K)  
 → See data sheet 1.1-311

**VALVES INSTALLED**

The central functioning element is the poppet valve cartridge NG6, data sheet 1.11-2030.

**ACCESSORIES**

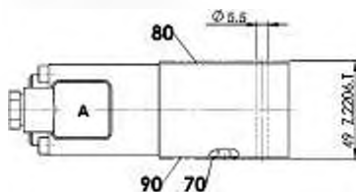
Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Module type manifold blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**COMMISSIONING**

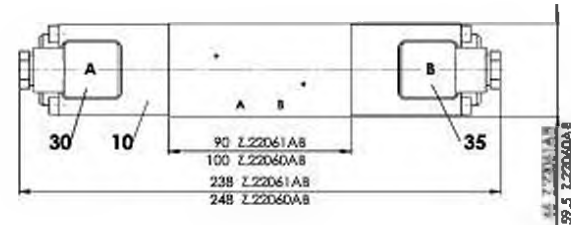
**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).



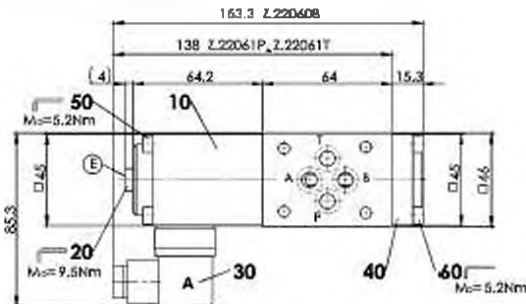
**DIMENSIONS**

 Poppet valve in T  
 E = Air bleed screw


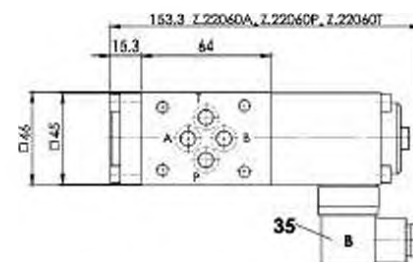
Poppet valves in A and B



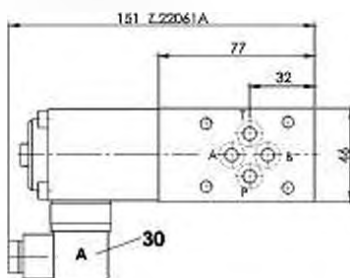
Poppet valve in B, P or T



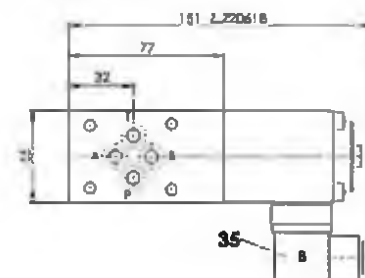
Poppet valve in A, P or T



Poppet valve in A

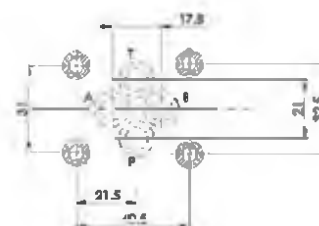


Poppet valve in B


**PARTS LIST**

Position	Article	Description
10	260.6...	Solenoid SIN45V
	260.7...	Solenoid SIS45V
20	239.2033	Screw plug HB0 (incl. seal)
30	219.2001	Electric plug A (grey)
35	219.2002	Electric plug B (black)
40	058.4215	Cover
50	246.2160	Socket head screw M5 x 60 DIN 912
60	246.2117	Socket head screw M5 x 16 DIN 912
70	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
80	173.3700	Intermediale plate AZB6
90	173.3650	Sealing plate ADB6

**Note!** Pos. 80 and 90 only for Z.2206.T

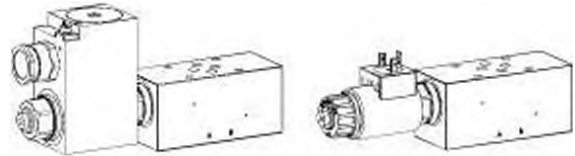
**HYDRAULIC CONNECTION**


**Solenoid operated poppet valve**

**Sandwich construction**

- ◆ direct operated
- ◆ normally open and normally closed
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG6**  
ISO 4401-03



**DESCRIPTION**

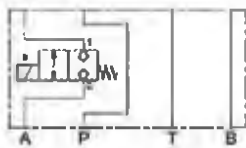
Direct operated 2/2-way solenoid poppet valve in sandwich construction. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

**SYMBOL**

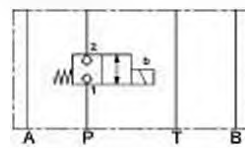
SD.SA06-AC



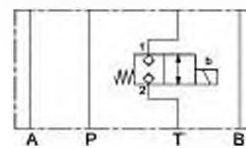
SD.SA06-BC



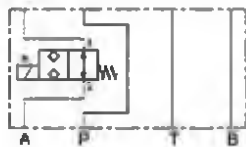
SD.SA06-PC



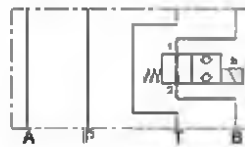
SD.SA06-TC



SD.SA06-A0



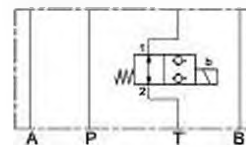
SD.SA06-B0



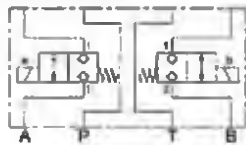
SD.SA06-P0



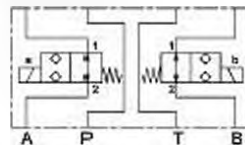
SD.SA06-T0



SD.SA06-ABC



SD.SA06-AB0



**TYPE CODE**

Poppet valve direct operated		SD <input type="checkbox"/> SA06 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>	
Coil execution	Standard <input type="checkbox"/> S Ex-protection <input type="checkbox"/> Y		
Sandwich construction nominal size 6			
Type list / Function	Poppet valve		
	in P <input type="checkbox"/> P in A and B <input type="checkbox"/> AB	in T <input type="checkbox"/> T in A <input type="checkbox"/> A	in B <input type="checkbox"/> B
Normally closed	<input type="checkbox"/> C		
Normally open	<input type="checkbox"/> D		
Nominal voltage U <sub>N</sub>	12 VDC <input type="checkbox"/> G12 24 VDC <input type="checkbox"/> G24	115 VAC <input type="checkbox"/> R115 230 VAC <input type="checkbox"/> R230	
Slip-on coil Standard (S)	<input type="checkbox"/> Y <input type="checkbox"/> N		
Ex-protection (Y)	<input type="checkbox"/> L15	<input type="checkbox"/> L17	<input type="checkbox"/> L21
Connection execution (S)	<input type="checkbox"/> D <input type="checkbox"/> J <input type="checkbox"/> G		
Certification (Y)	ATEX, IECEx, EAC <input type="checkbox"/> Australia <input type="checkbox"/> AU	UL / CSA <input type="checkbox"/> UL MA <input type="checkbox"/> MA	
Sealing material	NBR <input type="checkbox"/> FKM (Viton) <input type="checkbox"/> D1 NBR 872 <input type="checkbox"/> Z604		
Design index (subject to change)			
1.11-2545			

**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Direct operated
Mounting	Sandwich construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C
Weight	1,5 kg (only body)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	p <sub>max</sub> = 350 bar
Maximum volume flow	Q <sub>max</sub> = 40 l/min, see characteristics
Leakage oil	Poppet type, max. 0,15 ml / min (app.rox. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	V.E37 / 19 x 50 (Data sheet 1.1-168) N.S35 / 19 x 50 (Data sheet 1.1-175) MKY45 / 18 x 60 (data sheet 1.1-183) MKU45 / 18 x 60 (data sheet 1.1-184)

**Note!** Other specifications, see data sheet of the screw-in cartridges


**INSTALLATION NOTES**

Mounting type	Sandwich mounting 4 fixing holes for socket head screws or studs M5
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws M <sub>0</sub> = 5,2 Nm (screw quality 8.8, zinc coated)

## PERFORMANCE SPECIFICATIONS

**Attention!** The performance data especially the „pressure-flowcharacteristic,“ on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the sandwich body must be taken into consideration.



**Note!**



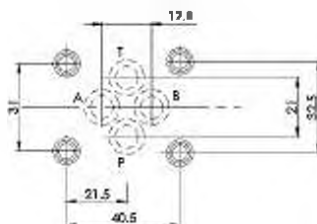
Detailed characteristics as well as further hydraulic specifications can be found on the data sheet of the cartridge installed.

## VALVES INSTALLED

The following screw-in cartridges are used in the sandwich body.

Article	Description	Data sheet no.
SDSPM22-BA	Poppet valve, normally closed	1.11-2061
SDSPM22-AB	Poppet valve, normally open	1.11-2061
SOYPM22-BA	Poppet valve ex-protection, normally closed	1.11-2064
SOYPM22-AB	Poppet valve ex-protection, normally open	1.11-2064

## HYDRAULIC CONNECTION



## ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Module type manifold blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

## PARTS LIST

Position	Article	Description
20	238 5404	Screw plug VST1 M22 x 1,5

## MANUAL OVERRIDE

Screw plug (HB0), no actuation possible  
 Optionally: HB4,5, HN(K) or HR(K)  
 → See data sheet 1.1-311

## STANDARDS

Mounting interface	ISO 4401-03
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## SURFACE TREATMENT

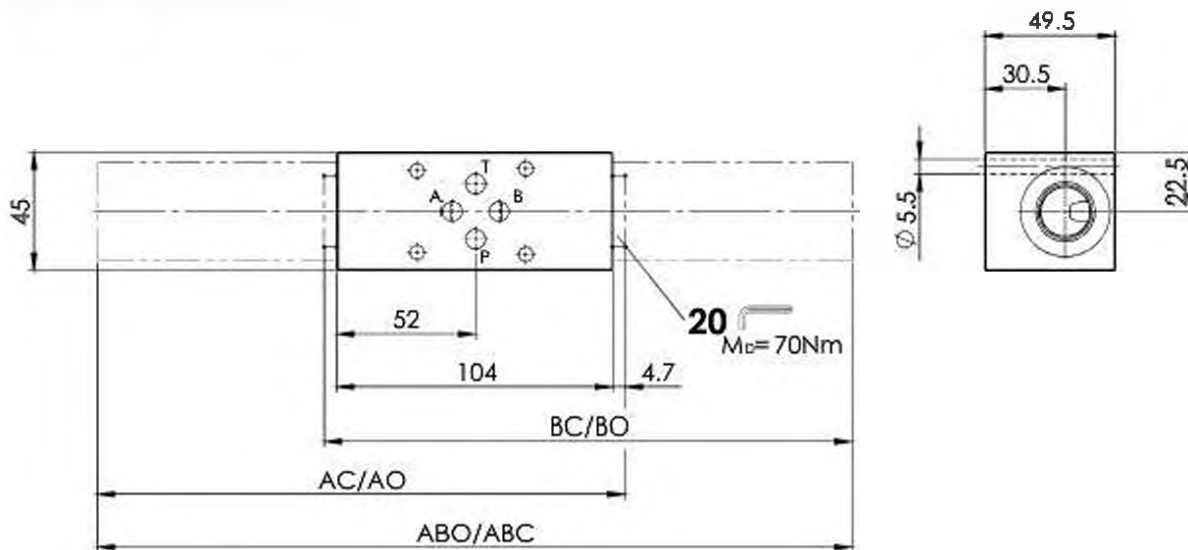
- ◆ The sandwich bodies are zinc-nickel coated

## SEALING MATERIAL

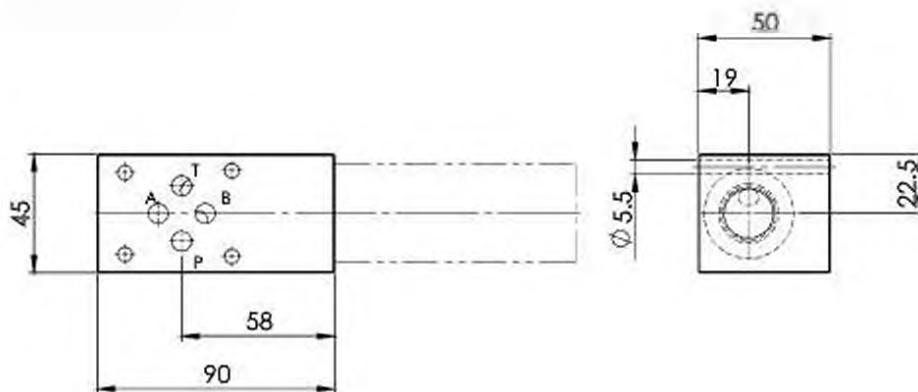
NBR or FKM (Viton) as standard, choice in the type code

**DIMENSIONS**

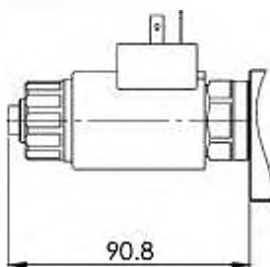
SD.SA06-AC / AO / BC / BO / ABC / ABO



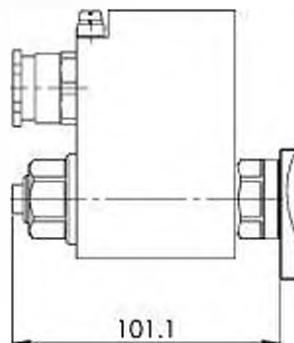
SD.SA06-PC / PO / TC / TO



SDSSA06



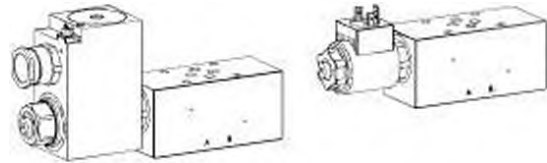
SDYSA06





**Solenoid operated poppet valve**
**Sandwich construction**

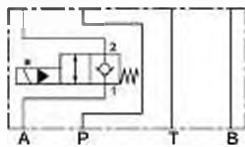
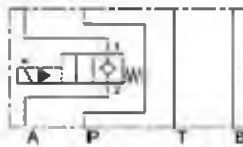
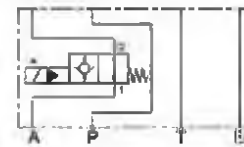
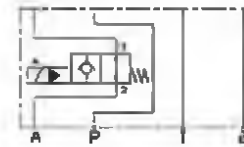
- ◆ pilot operated
- ◆ normally open and normally closed
- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

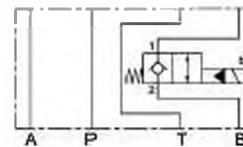
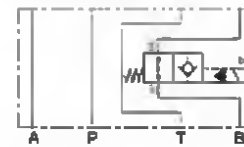
**NG6**
**ISO 4401-03**

**DESCRIPTION**

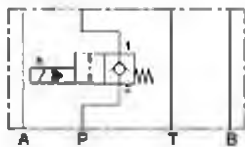
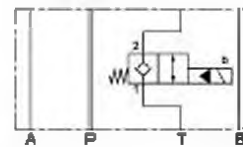
Pilot operated 2/2-way solenoid poppet valve in sandwich construction. The main spool of the built-in cartridge closes practically leakage-free by means of the applied pressure. The poppet valve is available in forward flow (V) or return flow (R), normally open (o) or normally closed (c).

**APPLICATION**

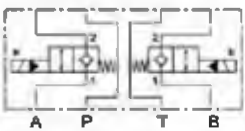
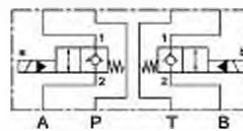
Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

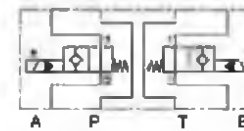
**SYMBOL**
**SV.SA06-AC-V**

**SV.SA06-AC-R**

**SV.SA06-AD-V**

**SV.SA06-AD-R**

**SV.SA06-BC-V**

**SV.SA06-BC-R**

**SV.SA06-BD-V**

**SV.SA06-BD-R**

**SV.SA06-PC-V**

**SV.SA06-TC-R**

**SV.SA06-PO-V**

**SV.SA06-TO-R**

**SV.SA06-ABC-V**

**SV.SA06-ABC-R**

**SV.SA06-ABO-V**

**SV.SA06-ABO-R**


**TYPE CODE**

Poppet valve pilot operated		SV		<input type="checkbox"/>	SA06	-	<input type="checkbox"/>	-	<input type="checkbox"/>	-	<input type="checkbox"/>	/	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Coil execution	Standard	<input type="checkbox"/>	Ex-protection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sandwich construction nominal size 6																	
Type list / Function																	
Poppet valve	in P	<input type="checkbox"/>	in T	<input type="checkbox"/>	in A and B	<input type="checkbox"/>	in A	<input type="checkbox"/>	in B	<input type="checkbox"/>							
Normally closed	<input type="checkbox"/>																
Normally open	<input type="checkbox"/>																
Forward flow	<input type="checkbox"/> (not available for poppet valve in T)																
Return flow	<input type="checkbox"/> (not available for poppet valve in P)																
Nominal voltage U <sub>N</sub>	12 VDC	<input type="checkbox"/>	115 VAC	<input type="checkbox"/>	24 VDC	<input type="checkbox"/>	230 VAC	<input type="checkbox"/>									
Slip-on coil Standard (S)	<input type="checkbox"/>																
Ex-protection (Y)	<input type="checkbox"/>																
Connection execution (S)	<input type="checkbox"/>																
Certification (Y)	ATEX, IECEx,	<input type="checkbox"/>															
	EAC, CCC	<input type="checkbox"/>															
	Australia	<input type="checkbox"/>															
Sealing material	NBR	<input type="checkbox"/>															
	FKM (Viton)	<input type="checkbox"/>															
	NBR 872	<input type="checkbox"/>															

Design index (subject to change)

1.11-2017

**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Pilot operated
Mounting	Sandwich construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C
Weight	1,5 kg (only body)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	p <sub>max</sub> = 350 bar
Maximum volume flow	Q <sub>max</sub> = 80 l/min, see characteristics
Leakage oil	Poppet type, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade β <sub>10</sub> ...16 ≥ 75, see data sheet 1.0-50

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	WE37 / 19 x 40 (Data sheet 1.1-169) ME35 / 19 x 40 (Data sheet 1.1-171) MKY45 / 18 x 60 (data sheet 1.1-183) MKU45 / 18 x 60 (data sheet 1.1-184)

**Note!** Other specifications, see data sheet of the screw-in cartridges


**INSTALLATION NOTES**

Mounting type	Sandwich mounting 4 fixing holes for socket head screws or studs M5
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws M <sub>5</sub> = 5,2 Nm (screw quality 8.8, zinc coated)

## PERFORMANCE SPECIFICATIONS

**Attention!** The performance data especially the „pressure-flow characteristic,“ on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the sandwich body must be taken into consideration.



**Note!**



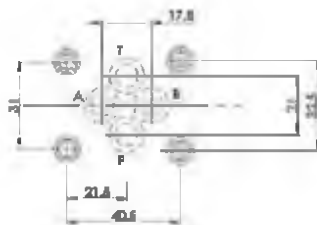
Detailed characteristics as well as further hydraulic specifications can be found on the data sheet of the cartridge installed.

## VALVES INSTALLED

The following screw-in cartridges are used in the sandwich body.

Article	Description	Data sheet no.
SVSPM22-BA	Poppet valve, normally closed	1.11-2061
SVSPM22-AB	Poppet valve, normally open	1.11-2082
SVYPM22-BA	Poppet valve ex-protection, normally closed	1.11-2084
SVYPM22-AB	Poppet valve ex-protection, normally open	1.11-2084

## HYDRAULIC CONNECTION



## ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Module type manifold blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

## PARTS LIST

Position	Article	Description
10	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
20	238.5404	Screw plug VSTI M22 x 1,5

## STANDARDS

Mounting interface	ISO 4401-03
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## MANUAL OVERRIDE

Screw plug (HB0), no actuation possible  
 Optionally: HB4,5, HN(K) or HR(K)  
 → See data sheet 1.1-311

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

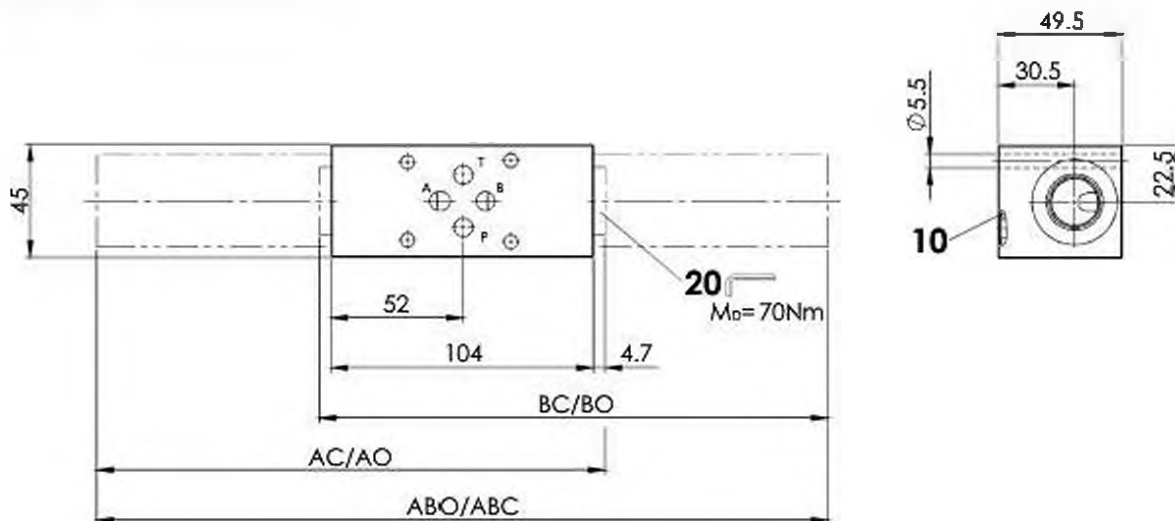
## SURFACE TREATMENT

◆ The sandwich bodies are zinc-nickel coated

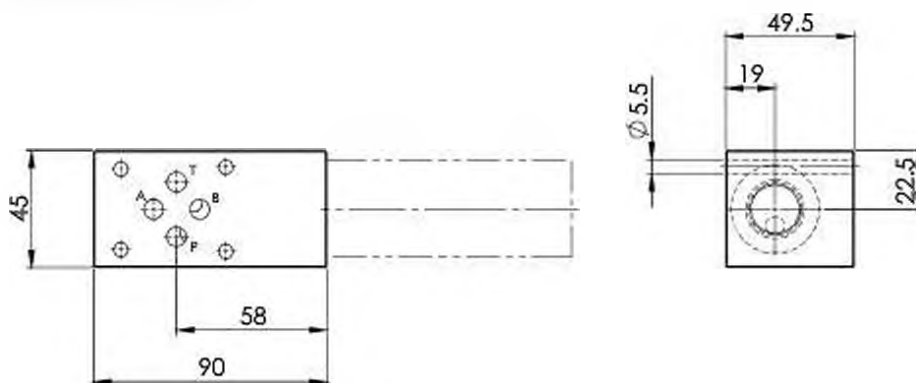


**DIMENSIONS**

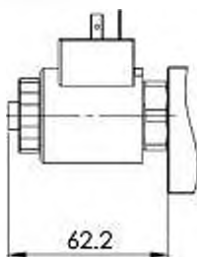
SV.SA06-AC / AO / BC / BO / ABC / ABO



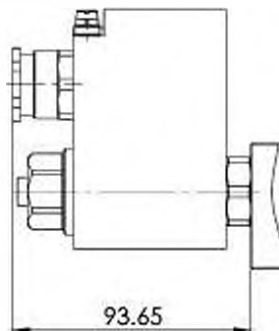
SV.SA06-PC / PO / TC / TO



SVSSA06

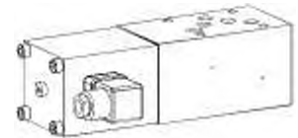


SVYSA06



**Solenoid operated poppet valve**
**Sandwich construction**

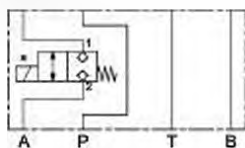
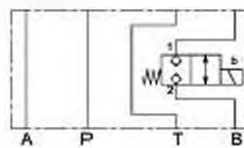
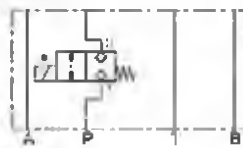
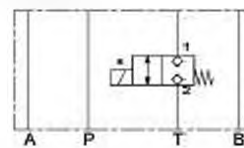
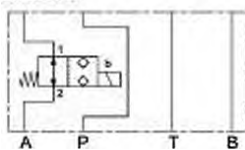
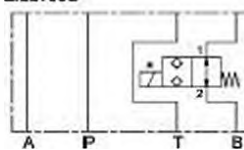
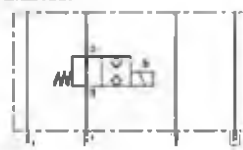
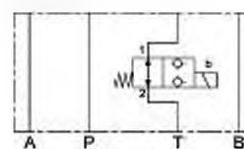
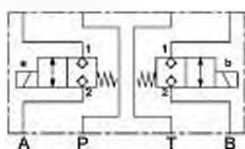
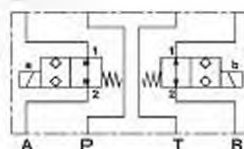
- ◆ 2/2-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG10**
**ISO 4401-05**

**DESCRIPTION**

Direct operated 2/2-way solenoid poppet valve in sandwich construction. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

**SYMBOL**
**Z.22101A**

**Z.22101B**

**Z.22101P**

**Z.22101T**

**Z.22100A**

**Z.22100B**

**Z.22100P**

**Z.22100T**

**Z.22101AB**

**Z.22100AB**

**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Direct operated
Mounting	Sandwich construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Switching solenoid
Ambient temperature	-25...+70 °C (NBR) -20...+70 °C (FKM)
Weight	4,7 kg (1 solenoid) 7,0 - 11,0 kg (2 solenoids)
MTTFd	150 years

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	Medium: SIN60V (Data sheet 1.1-145) Super: SIS60V (Data sheet 1.1-150)
Connection	Connector socket EN 175301 – 803

**TYPE CODE**

Poppet valve, sandwich construction		Z	<input type="checkbox"/>	2	<input type="checkbox"/>	2	<input type="checkbox"/>	10	<input type="checkbox"/>	<input type="checkbox"/>	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Solenoid, Medium	<input type="checkbox"/>	M														
Solenoid, Super	<input type="checkbox"/>	S														
2 way (connections)																
2 switching positions																
Nominal size 10																
Normally closed	<input type="checkbox"/>	1														
Normally open	<input type="checkbox"/>	0														
Type list / Function																
Poppet valve	in P	<input type="checkbox"/>	P	in T	<input type="checkbox"/>	T										
	in A and B	<input type="checkbox"/>	AB	in A	<input type="checkbox"/>	A	in B	<input type="checkbox"/>	B							
Nominal voltage $U_n$	12 VDC	<input type="checkbox"/>	G12	115 VAC	<input type="checkbox"/>	R115										
	24 VDC	<input type="checkbox"/>	G24	230 VAC	<input type="checkbox"/>	R230										
Sealing material	NBR	<input type="checkbox"/>														
	FKM (Viton)	<input type="checkbox"/>	D1													
Design index (subject to change)																

1.11-228B

**ELECTRICAL SPECIFICATIONS**

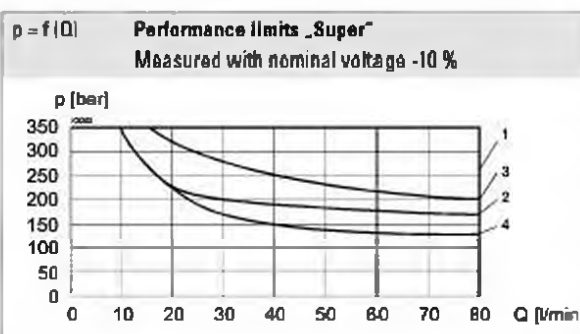
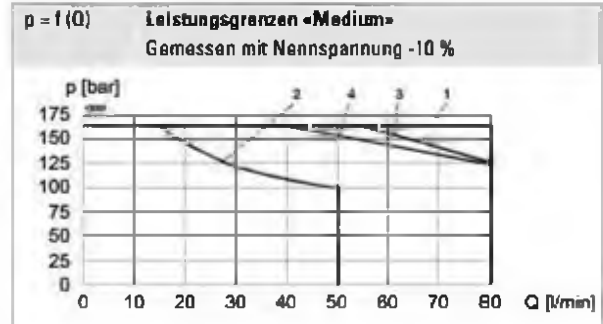
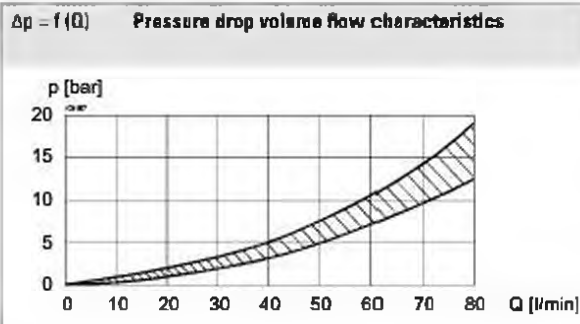
Protection class	IP65
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
voltage	AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-145 (Medium) and 1.1-150 (Super)


**HYDRAULIC SPECIFICATIONS**

Working pressure	Medium: $p_{max} = 160$ bar Super: $p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 80$ l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Seat tight, max. 0.05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-20... +70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade $\beta_{10} \dots 16 \geq 75$ , see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Type	Flow direction	
	1 → 2	2 → 1
Z.22101.	1	2
Z.22100.	1	3
Z.22100AB	1	4

**Attention!** Long periods of non-actuation can reduce the switching performance


**STANDARDS**

Mounting interface	ISO 4401-05
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - B03
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible

Optionally: HB8,5, HN(K) or HR(K)

→ See data sheet 1.1-311

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The sandwich bodies made of steel are zinc-phosphated
- ◆ The solenoid and the cover are zinc coated
- ◆ The socket head screws are zinc coated

**VALVES INSTALLED**

The central functioning element is the poppet valve cartridge NG10, data sheet 1.11-2040.

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**COMMISSIONING**

**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).


**INSTALLATION NOTES**

Mounting type	Sandwich mounting 4 fixing holes for socket head screws or studs M6
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 8,9 \text{ Nm}$ (quality 8.8, zinc-coated)

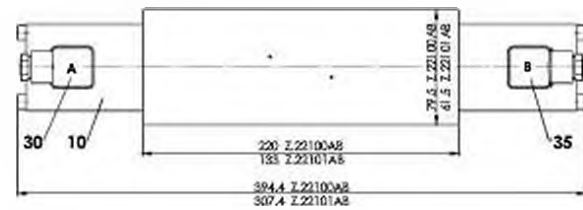
**DIMENSIONS**

Poppet valve in B

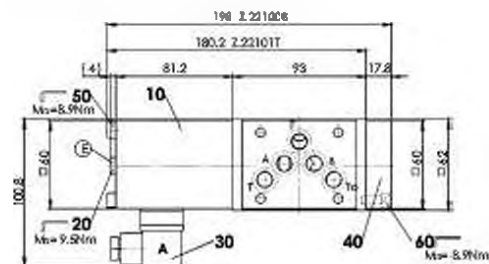
E = Air bleed screw



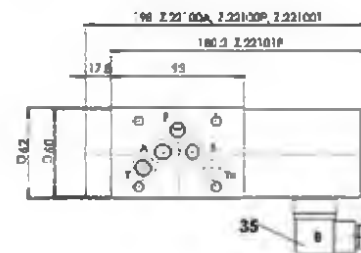
Poppet valves in A and B



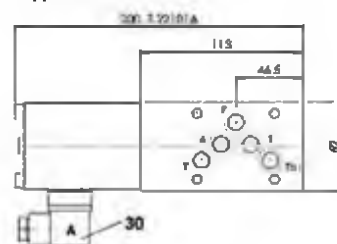
Poppet valve in B or T



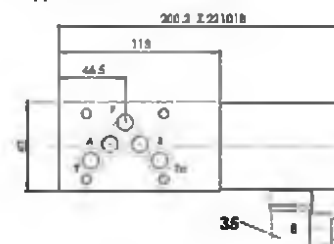
Poppet valve in A, P or T



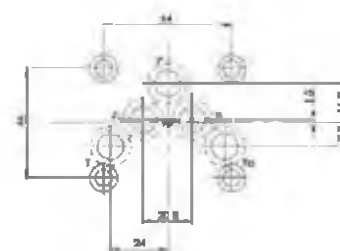
Poppet valve in A



Poppet valve in B


**PARTS LIST**

Position	Article	Description
10	260.8...	Solenoid SIN60V
	260.9...	Solenoid SIS60V
20	239.2033	Screw plug HB0 (incl. seal)
30	219.2001	Electric plug A (grey)
35	219.2002	Electric plug B (black)
40	059.2200	Cover
50	246.3190	Socket head screw M6 x 90 DIN 912
60	246.3121	Socket head screw M6 x 20 DIN 912
70	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
80	173.4700	Intermediate plate AZB10 (only for Z.22100B)
90	173.4650	Sealing plate ADB10 (only for Z.22100B)

**HYDRAULIC CONNECTION**




### Solenoid operated poppet valve

#### Installation in pipes

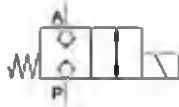
- ◆ 2/2-way
- ◆ normally open and normally closed
- ◆ threaded connection 1/4"
- ◆  $Q_{max} = 15 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

#### DESCRIPTION

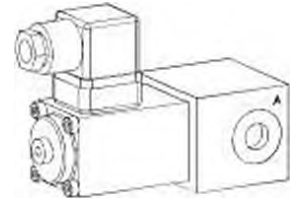
Direct operated 2/2-way solenoid poppet valve for installation in pipes. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

#### SYMBOL

G 22041



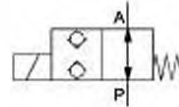
NG4



#### APPLICATION

Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

G 22040



#### TYPE CODE

Threaded connection	G 2 2 04				
Solenoid, Medium	M				
Solenoid, Super	S				
2 way (connections)					
2 switching positions					
Nominal size 4					
Normally closed	1				
Normally open	0				
Nominal voltage $U_n$	12 VDC	G12	115 VAC	R115	
	24 VDC	G24	230 VAC	R230	
Sealing material	NBR				
	FKM (Viton)	D1			
Design index (subject to change)					

1.1-0820

#### COMMISSIONING

**Attention!** When commissioning, the valve must be vented under pressure (max. 2 rotations of screw E).



#### ACTUATION

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	Medium: SIN35V (Data sheet 1.1-105) Super: SIS35V (Data sheet 1.1-110)
Connection	Connector socket EN 175301 – 803

**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Direct operated
Mounting	Installation in pipes
Nominal size	NG4
Connection	Threaded connection G1/4"
Actuation	Switching solenoid
Ambient temperature	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Weight	≤ 1,2 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
voltage	AC = 50 to 60 Hz, rectifier integrated in the connector socket

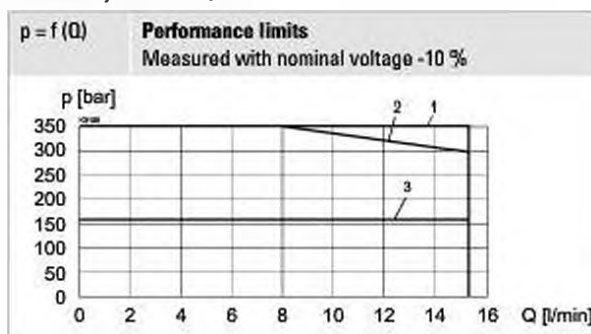
**Note!** Other electrical specifications see data sheet 1.1-105 (Medium) and 1.1-110 (Super)


**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$


**Flow direction**

Type	P → A	A → P
GM2204	3	3
GS2204	1	2

**HYDRAULIC SPECIFICATIONS**

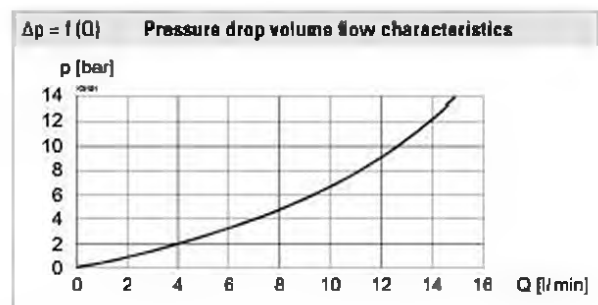
Working pressure	Medium: $p_{max} = 160 \text{ bar}$ Super: $p_{max} = 350 \text{ bar}$
Maximum volume flow	$Q_{max} = 15 \text{ l/min}$ , see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Seat tight, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-20 ... +70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10 ... 16 ≥ 75, see data sheet 1.0-50

**STANDARDS**

Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – B03
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SURFACE TREATMENT**

- ◆ The valve body, the solenoid, the cover and the socket head screws are zinc coated

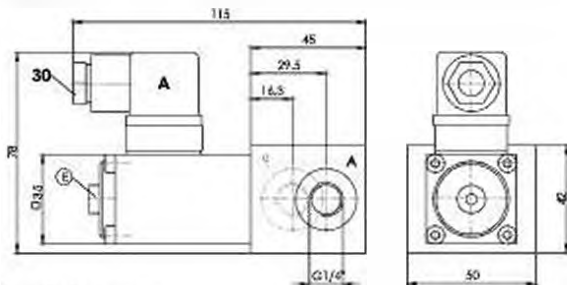


**VALVES INSTALLED**

Zentrales Funktionselement ist die Sitzventilpatrone NG4, Datenblatt 1.11-2020.

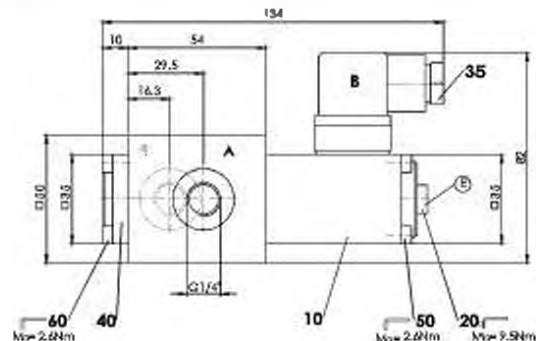
**DIMENSIONS**

G.22041



E = Air bleed screw

G.22040


**PARTS LIST**

Position	Article	Description
10	260.4...	Solenoid SIN35V
	260.5...	Solenoid SIS35V
20	239.2033	Screw plug HB0 (incl. seal)
30	219.2001	Electric plug A (grey)
35	219.2002	Electric plug B (black)
40	056.4201	Cover
50	246.1161	Socket head screw M4 x 60 DIN 912
60	246.1113	Socket head screw M4 x 12 DIN 912

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible

Optionally: HB4,5; HN(K) or HR(K)

→ See data sheet 1.1-311

**INSTALLATION NOTES**

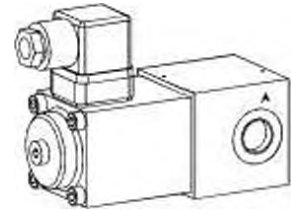
Mounting position      Any, preferably horizontal

**ACCESSORIES**

Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**Solenoid operated poppet valve**
**Installation in pipes**

- ◆ 2/2-way
- ◆ normally open and normally closed
- ◆ threaded connection 3/8"
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG6**

**DESCRIPTION**

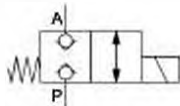
Direct operated 2/2-way solenoid poppet valve for installation in pipes. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

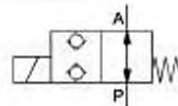
Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

**SYMBOL**

G.22061



G.22060


**TYPE CODE**

Threaded connection					G	2	2	06	-	-	≠
Solenoid, Medium					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Solenoid, Super					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 way (connections)					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 switching positions					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nominal size 6					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Normally closed					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Normally open					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nominal voltage $U_N$	12 VDC	<input type="checkbox"/>	G12	115 VAC	<input type="checkbox"/>	R115					
	24 VDC	<input type="checkbox"/>	G24	230 VAC	<input type="checkbox"/>	R230					
Sealing material	NBR	<input type="checkbox"/>									
	FKM (Viton)	<input type="checkbox"/>	D1								
Design index (subject to change)											

**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Direct operated
Mounting	Installation in pipes
Nominal size	NG6
Connection	Threaded connection G3/8"
Actuation	Switching solenoid
Ambient temperature	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Weight	≤ 1,7 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
voltage	AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-120 (Medium) and 1.1-125 (Super)


**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**HYDRAULIC SPECIFICATIONS**

Working pressure	Medium: $p_{max} = 160$ bar Super: $p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 40$ l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Seat tight, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-20 ... +70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10 ... 16 ≥ 75, see data sheet 1.0-50

**STANDARDS**

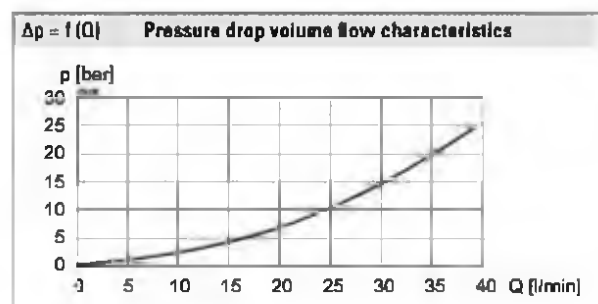
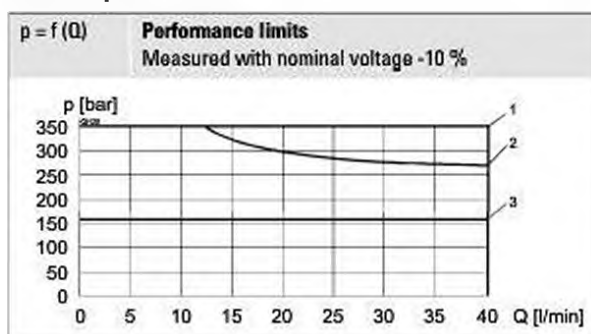
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SURFACE TREATMENT**

- ◆ The valve body, the solenoid, the cover and the socket head screws are zinc coated

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s


**Flow direction**

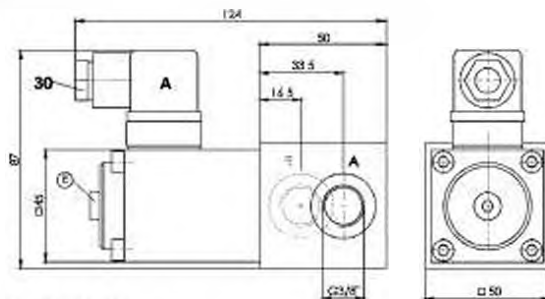
Type	P → A	A → P
GM2206	3	3
GS2206	1	2

**VALVES INSTALLED**

The central functioning element is the poppet valve cartridge NG6, data sheet 1.11-2030.

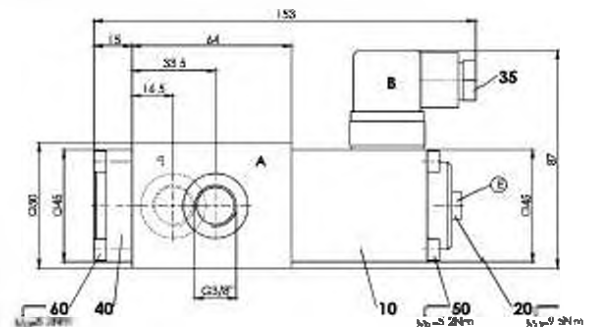
**DIMENSIONS**

G.22061



E = Air bleed screw

G.22060


**PARTS LIST**

Position	Article	Description
10	260.6...	Solenoid SIN45V
	260.7...	Solenoid SIS45V
20	239.2033	Screw plug HB0 (incl. seal)
30	219.2001	Electric plug A (grey)
35	219.2002	Electric plug B (black)
40	058.4215	Cover
50	246.2160	Socket head screw M5 x 60 DIN 912
80	246.2117	Socket head screw M5 x 16 DIN 912

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible

Optionally: HB6; HN(K) or HR(K)

→ See data sheet 1.1-311

**INSTALLATION NOTES**

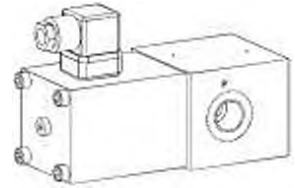
Mounting position      Any, preferably horizontal

**ACCESSORIES**

Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**Solenoid operated poppet valve**
**Installation in pipes**

- ◆ 2/2-way
- ◆ normally open and normally closed
- ◆ threaded connection 1/2"
- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG10**

**DESCRIPTION**

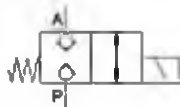
Direct operated 2/2-way solenoid poppet valve for installation in pipes. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

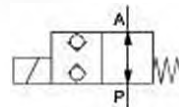
Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

**SYMBOL**

G 22101



G 22100


**TYPE CODE**

		G		2		2		10		-		-		#			
Threaded connection																	
Solenoid, Medium		M															
Solenoid, Super		S															
2 way (connections)																	
2 switching positions																	
Nominal size 10																	
Normally closed		1															
Normally open		0															
Nominal voltage $U_n$		12 VDC		G12		115 VAC		RTS		24 VDC		G24		230 VAC		R230	
Sealing material		NBR		D1		FKM (Viton)		D1									
Design index (subject to change)																	

**GENERAL SPECIFICATIONS**

Designation	2/2-way poppet valve
Construction	Direct operated
Mounting	Installation in pipes
Nominal size	NG10
Connection	Threaded connection G1/2"
Actuation	Switching solenoid
Ambient temperature	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Weight	≤ 4,0 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
voltage	AC = 50 to 60 Hz, rectifier integrated in the connector socket

**Note!** Other electrical specifications see data sheet 1.1-145 (Medium) and 1.1-150 (Super)


**HYDRAULIC SPECIFICATIONS**

Working pressure	Medium: $p_{max} = 160$ bar Super: $p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 80$ l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Seat tight, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-20 ... +70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10 ... 16 ≥ 75, see data sheet 1.0-50

**STANDARDS**

Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SEALING MATERIAL**

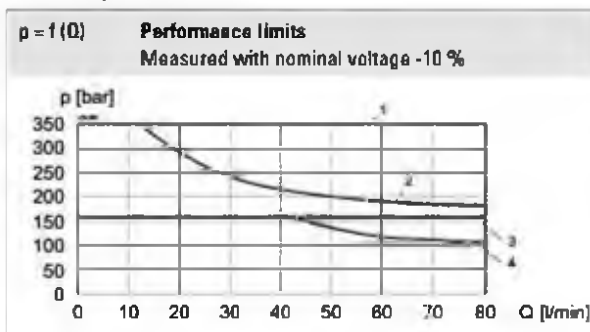
NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The valve body, the solenoid, the cover and the socket head screws are zinc coated

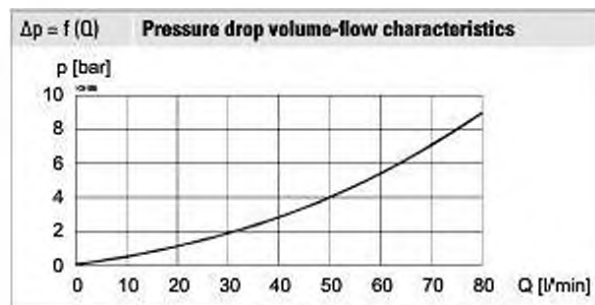
**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s



Flow direction

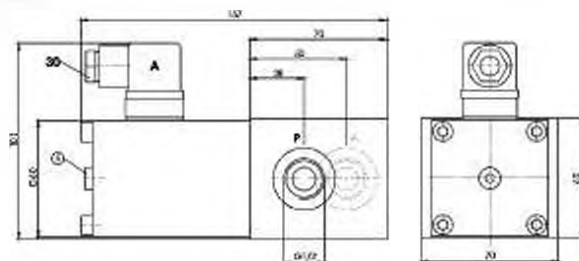
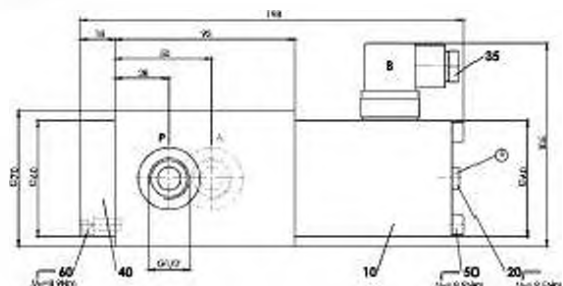
Type	P → A	A → P
GM2210.	3	4
GS2210.	1	2





**VALVES INSTALLED**

The central functioning element is the poppet valve cartridge NG10, data sheet 1.11-2040.

**DIMENSIONS**
**G.22101**

**G.22100**

**PARTS LIST**

Position	Article	Description
10	260.8...	Solenoid SIN60V
	260.9...	Solenoid SIS60V
20	239.2033	Screw plug HB0 (incl. seal)
30	219.2001	Electric plug A (grey)
35	219.2002	Electric plug B (black)
40	059.2200	Cover
50	246.3190	Socket head screw M6 x 90 DIN 912
60	246.3121	Socket head screw M6 x 20 DIN 912

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible

Optionally: HB0,5; HN(K) or HR(K)

→ See data sheet 1.1-311

**INSTALLATION NOTES**

Mounting position      Any, preferably horizontal

**ACCESSORIES**

Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**Solenoid operated poppet valve**
**Flange construction**

- ◆ 2/2-, 3/2- und 3/4-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 15 \text{ l/min}$
- ◆  $P_{max} = 350 \text{ bar}$

**DESCRIPTION**

Direct operated 2/2-, 3/2 and 3/4-way solenoid poppet valve in sandwich construction. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The metallic sealing seat closes the valve virtually leak free. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**CERTIFICATES**

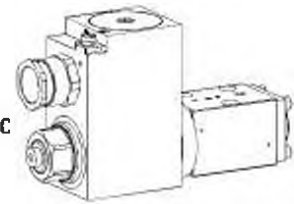
	Surface	Mining	Standard -25 °C to...	Z604 -40 °C to...
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	x
MA		x	x	
UL / CSA	x		x	x

**NG4-Mini**
**Wandfluh standard**

- ⊕ II 2 G Ex db IIC T6, T4
- ⊕ II 2 D Ex db III C T80 °C, T130 °C
- ⊕ I M2 Ex db I Mb

Class I Division 1

Class I Zone 1


**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping. Miniature valves are used where both, reduced dimensions and weight are important.

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5... 14 mm

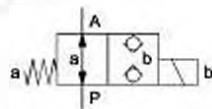
**Attention!** The UL execution is always supplied without cable gland


**STANDARDS**

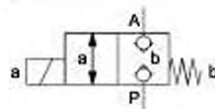
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Mounting interface	Wandfluh standard
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SYMBOL**

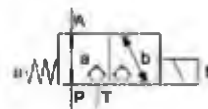
B.22040b



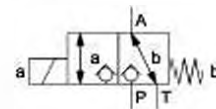
B.22041a



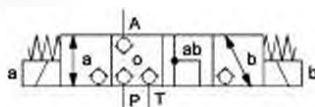
B.32040b



B.32041a



B.3404



**TYPE CODE**

2/2 or 3/2 way execution	B Exd <input type="checkbox"/> 2 04 <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>	
3/4 way execution	B Exd <input type="checkbox"/> 3 4 04 <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>	
Mounting interface according to Wandfluh standard		
Explosion-proof execution, Ex d		
2 way (connections)	<input type="checkbox"/> 2	
3 way (connections)	<input type="checkbox"/> 3	
2 switching positions		
4 switching positions		
Nominal size 4-Mini		
Normally closed	Solenoid on A-side	<input type="checkbox"/> 1a
Normally open	Solenoid on B-side	<input type="checkbox"/> 0b
Nominal voltage $U_v$	12 VDC <input type="checkbox"/> G12	115 VAC <input type="checkbox"/> R115
	24 VDC <input type="checkbox"/> G24	230 VAC <input type="checkbox"/> R230
Nominal power $P_v$	9 W <input type="checkbox"/> L9	Ambient temperature up to:
	15 W <input type="checkbox"/> L15	40 °C or 90 °C
	17 W <input type="checkbox"/> L17	70 °C
		70 °C (only UL / CSA)
Certification	ATEX, IECEx, EAC, CCC <input type="checkbox"/>	
	Australia <input type="checkbox"/> AU	UL / CSA <input type="checkbox"/> UL MA <input type="checkbox"/> MA
Sealing material	NBR <input type="checkbox"/>	
	FKM (Viton) <input type="checkbox"/> 01	
	NBR -40° C <input type="checkbox"/> Z80d	(only with 15 W)

Design index (subject to change)

111-002

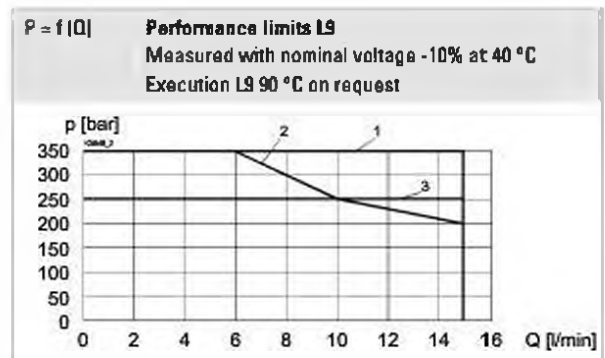
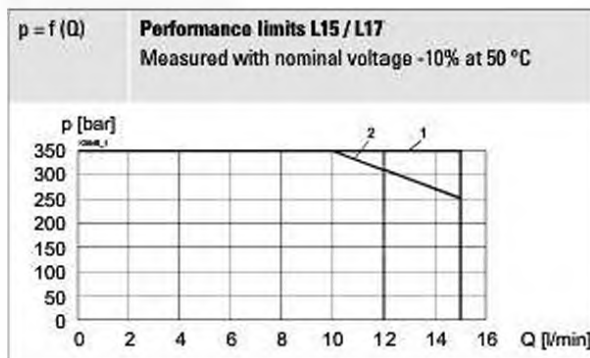
**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2- and 3/4-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Ex-protection switching solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17) -40...+70 °C (L15 / L17)
Weight	3,2 kg (2/2- and 3/2-way) 5,0 kg (3/4-way)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

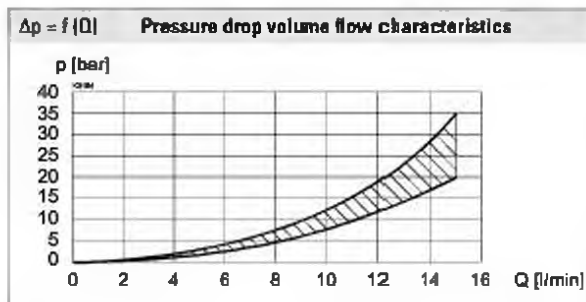
Working pressure	$p_{max} = 350 \text{ bar}$
Maximum volume flow	$Q_{max} = 15 \text{ l/min}$ , see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Poppet type, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L9 or L15 / L17) NBR 872 -40...+70 °C (L15 / L17)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 > 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Type	Flow direction			
	P - A	A - T	A - P	T - A
BEXd22041a	1	-	1	-
BEXd22040b	1	-	1	-
BEXd32041a	1	1	2	1
BEXd32040b	1	1	1	1
BEXd3404	1	1	1	1

Type	Flow direction			
	P - A	A - T	A - P	T - A
BEXd22041a	1	-	1	-
BEXd22040b	1	-	2	-
BEXd32041a	1	2	1	1
BEXd32040b	1	1	3	1
BEXd3404	1	1	1	1



**Nota!**  With the L15 / L17 execution for ambient temperatures up to 70 °C, the performance specifications have been evaluated with an ambient temperature of 50 °C

**Attention!**  Long periods of non-actuation can reduce the switching performance

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The cover, the slip-on coil and the armature tube are zinc-nickel coated

**ELECTRICAL SPECIFICATIONS**

Protection class	IP67
Relative duty factor	100 % DF
Switching frequency	12'000 / h
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz ± 2 %, with built-in two-way rectifier
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

**Nota!**  Other electrical specifications see data sheet 1.1-183 and 1.1-184

**SEALING MATERIAL**

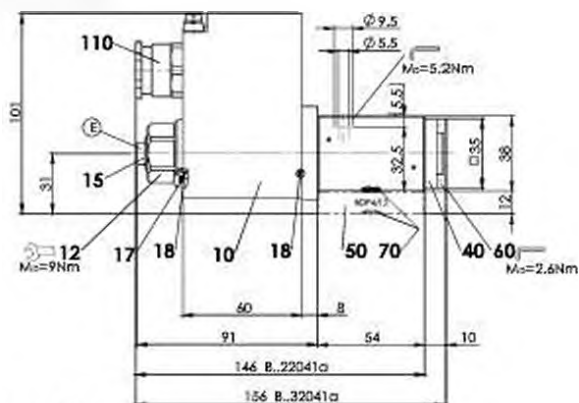
NBR or FKM (Viton) as standard, choice in the type code

**VALVES INSTALLED**

The central functioning element is the poppet valve cartridge NG4, data sheet 1.11-2020.

**DIMENSIONS**

3/2-; 2/2-way

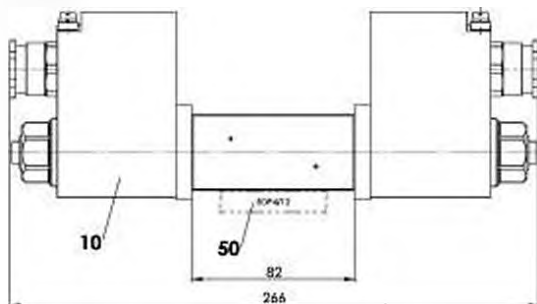


E = Air bleed screw

Dimensions of the solenoid coil see data sheet 1.1-183 and 1.1-184

The distance plate BDP4/12 has to be ordered separately

3/4-way


**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MKY45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	239.2033	Screw plug HB0 (incl. seal)
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
40	057.4201	Cover
50	173.1450	Distance plate BDP4 / 12
60	246.1113	Socket head screw M4 x 12 DIN 912
70	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)
110	111.1080	Cable gland M20 x 1,5

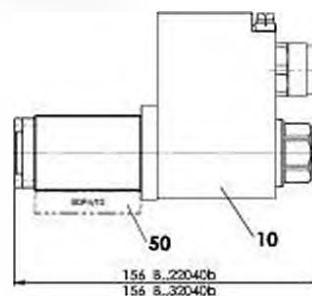
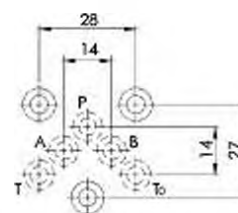
**COMMISSIONING**

**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).



The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability is assumed.

3/2-; 2/2-way


**HYDRAULIC CONNECTION**

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible

Optionally: HB4,5, HN(K) or HG(K)

→ See data sheet 1.1-311

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**INSTALLATION NOTES**

Mounting type	Flange mounting 3 fixing holes for socket head screws M5 x 40 or M5 x 50 (with distance plate BDP4/12)
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 5 \text{ Nm}$ knurled nut

**Note!**


The length of the fixing screw depends on the base material of the connection element.

**Attention!**


For stack assembly please observe the remarks in the operating instructions

**Solenoid operated poppet valve**
**Flange construction**

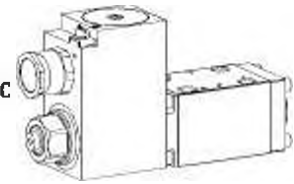
- ◆ 2/2-, 3/2- and 3/4-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG6**
**ISO 4401-03**

- ⊕ II 2 G Ex db IIC T6, T4
- ⊕ II 2 D Ex db III C T80 °C, T130 °C
- ⊕ I M2 Ex db I Mb

Class I Division 1

Class I Zone 1


**DESCRIPTION**

Direct operated 2/2-, 3/2 and 3/4-way solenoid poppet valve in flange construction. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The metallic sealing seat closes the valve virtually leak free. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to ...	Z604 -40 °C to ...	Z591 -60 °C to ...
ATEX	x	x	x	x	x
IECEX	x	x	x	x	x
CCC	x	x	x	x	x
EAC	x	x	x	x	x
Australia	x	x	x	x	
MA		x	x		
UL / CSA	x		x	x	

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

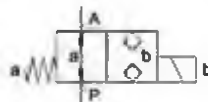
**Attention!** The UL execution is always supplied without cable gland


**STANDARDS**

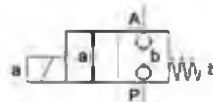
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC 60079-1 / 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Mounting interface	ISO 4401-03
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SYMBOL**

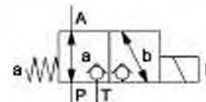
A 22060b



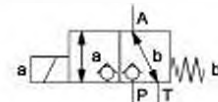
A 22061a



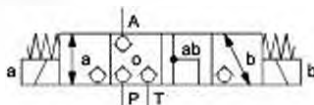
A 32060b



A.32061a



A 3406



**TYPE CODE**

2/2 or 3/2 way execution	A Exd <input type="checkbox"/> 2 06 <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>	
3/4 way execution	A Exd <input type="checkbox"/> 3 4 06 <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>	
International standard interface ISO		
Explosion-proof execution, Ex d		
2 way (connections)	<input type="checkbox"/> 2	
3 way (connections)	<input type="checkbox"/> 3	
2 switching positions		
4 switching positions		
Nominal size 6		
Normally closed	Solenoid on A-side	<input type="checkbox"/> 1a
Normally open	Solenoid on B-side	<input type="checkbox"/> 1b
Nominal voltage $U_v$	12 VDC <input type="checkbox"/> G12	115 VAC <input type="checkbox"/> R115
	24 VDC <input type="checkbox"/> G24	230 VAC <input type="checkbox"/> R230
Nominal power $P_v$	9 W <input type="checkbox"/> L9	Ambient temperature up to:
	15 W <input type="checkbox"/> L15	40 °C or 90 °C
	17 W <input type="checkbox"/> L17	70 °C
		70 °C (only UL / CSA)
Certification	ATEX, IECEx, EAC, CCC <input type="checkbox"/>	
	Australia <input type="checkbox"/> AU	UL / CSA <input type="checkbox"/> UL MA <input type="checkbox"/> MA
Sealing material / Temperature range	NBR <input type="checkbox"/>	
	FKM (Viton) <input type="checkbox"/> D1	
	NBR -40 °C <input type="checkbox"/> Z604	(only with 15 W)
	-60 °C to ... <input type="checkbox"/> Z581	(only with 15 W / ATEX and IECEx / Surface)

Design index (subject to change)

111-350

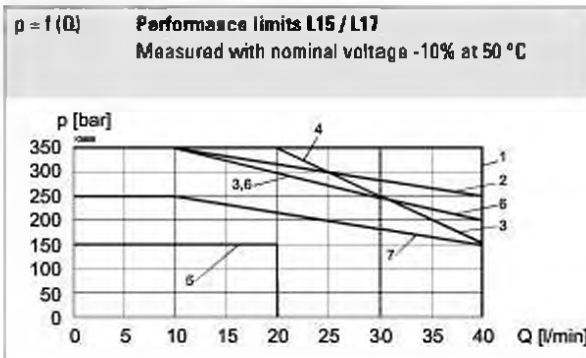
**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2- and 3/4-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Ex-protection switching solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17) -40...+70 °C (L15 / L17)
Weight	3,3 kg (2/2- and 3/2-way) 5,4 kg (3/4-way)
MTTFd	150 years

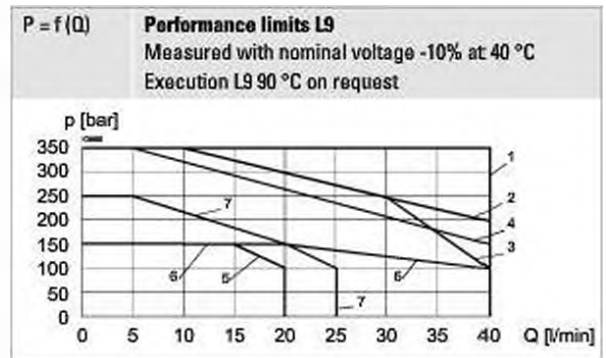
**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 40$ l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Poppet type, max. 0,05 ml / min (approx. 1 drop / min) at 90 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L9 or L15 / L17) NBR 872 -40...+70 °C (L15 / L17)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

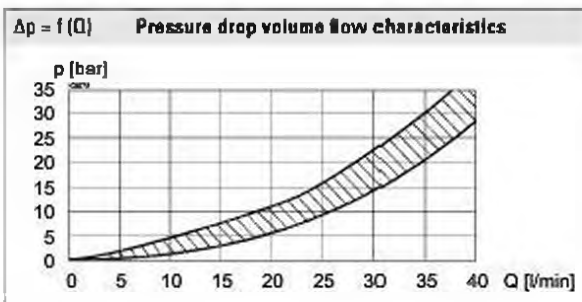
**PERFORMANCE SPECIFICATIONS**


 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Type	Flow direction			
	P - A	A - T	A - P	T - A
AEXd22061a	1	-	6	-
AEXd22060b	1	-	3	-
AEXd32061a	1	2	5	1
AEXd32060b	1	4	7	1
AEXd3406	1	1	6	6



Type	Flow direction			
	P - A	A - T	A - P	T - A
AEXd22061a	1	-	6	-
AEXd22060b	1	-	3	-
AEXd32061a	1	2	5	1
AEXd32060b	1	4	7	1
AEXd3406	1	1	6	6



**Note!**  With the L15 / L17 execution for ambient temperatures up to 70 °C, the performance specifications have been evaluated with an ambient temperature of 50 °C

**Attention!**  Long periods of non-actuation can reduce the switching performance

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The cover, the slip-on coil and the armature tube are zinc-nickel coated

**VALVES INSTALLED**

The central functioning element is the poppet valve cartridge NG6, data sheet 1.11-2030.

**ELECTRICAL SPECIFICATIONS**

Protection class	IP67
Relative duty factor	100 % DF
Switching frequency	12'000 / h
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz ± 2 %, with built-in two-way rectifier
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

**Note!**  Other electrical specifications see data sheet 1.1-183 and 1.1-184

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

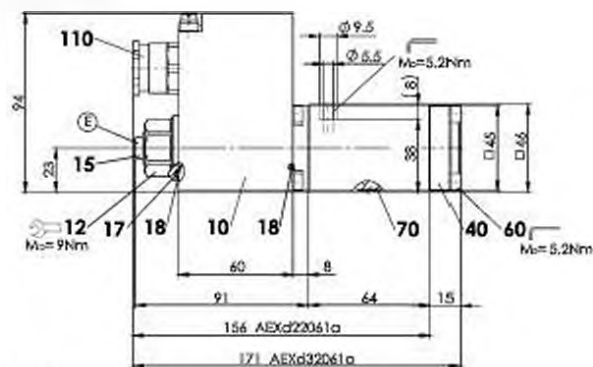
**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible  
 Optionally: HB6, HN(K) or HG(K)  
 → See data sheet 1.1-311



**DIMENSIONS**

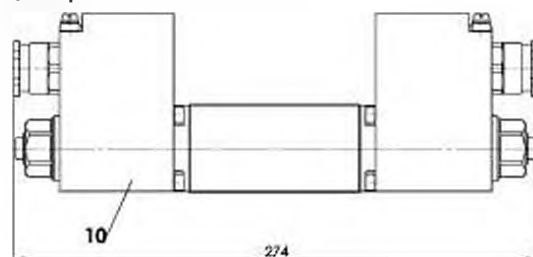
3/2-; 2/2-way



E = Air bleed screw

Dimensions of the solenoid coil see data sheet 1.1-183 and 1.1-184

3/4-way


**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	239.2033	Screw plug HB0 (incl. seal)
	239.2043	Screw plug HB0-H40-Z591 (incl. seal)
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
40	058.4215	Cover
60	246.2117	Socket head screw M5 x 16 DIN 912
70	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.7092	O-ring ID 9,25 x 1,78 (NBR -40 °C)
	160.0091	O-ring ID 9,25 x 1,78 (Polyurethan -60 °C)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
110	111.1080	Cable gland M20 x 1,5

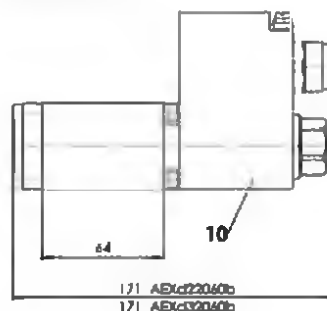
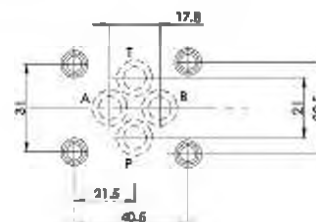
**COMMISSIONING**

**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).



The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability is assumed.

3/2-; 2/2-way


**HYDRAULIC CONNECTION**

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 5 \text{ Nm}$ knurled nut

**Note!** The length of the fixing screw depends on the base material of the connection element. For valves for the temperature range „-60 °C to...“ (Z591), screws of the quality A4 have to be used



**Attention!** For stack assembly please observe the remarks in the operating instructions

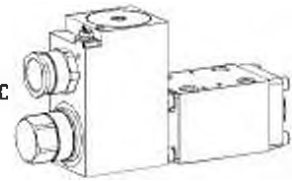


**Solenoid operated poppet valve stainless**
**Flange construction**

- ◆ 2/2- or 3/2-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG6**
**ISO 4401-03**

- Ⓜ II 2 G Ex db IIC T6, T4
  - Ⓜ II 2 D Ex db III C T80 °C, T130 °C
  - Ⓜ I M2 Ex db I Mb
- Class I Division 1  
Class I Zone 1


**DESCRIPTION**

Direct operated 2/2- and 3/2-way poppet valve in flange construction. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The metallic sealing seat closes the valve virtually leak free. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. The stainless execution is especially suitable for the use in wet and salty environment. Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to ...	Z604 -40 °C to ...
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	x
MA		x	x	
UL / CSA	x		x	x

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

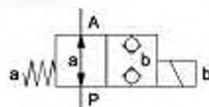
**Attention!** The UL execution is always supplied without cable gland


**STANDARDS**

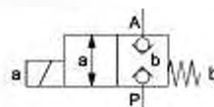
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Mounting interface	ISO 4401-03
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SYMBOL**

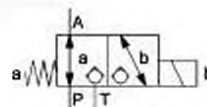
A 22060b



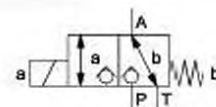
A 22061a



A 32060b



A 32061a



**TYPE CODE**

International standard interface ISO		A Exd		<input type="checkbox"/>	2	06	<input type="checkbox"/>	-	<input type="checkbox"/>	/	<input type="checkbox"/>	/	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Explosion-proof execution, Ex d																	
2 way (connections)		<input type="checkbox"/>		2													
3 way (connections)		<input type="checkbox"/>		3													
2 switching positions																	
Nominal size 6																	
Normally closed		Solenoid on A-side		<input type="checkbox"/>		1a											
Normally open		Solenoid on B-side		<input type="checkbox"/>		0b											
Nominal voltage U <sub>N</sub>		12 VDC		<input type="checkbox"/>		G12		115 VAC		<input type="checkbox"/>		R115					
		24 VDC		<input type="checkbox"/>		G24		230 VAC		<input type="checkbox"/>		R230					
Nominal power P <sub>N</sub>		9 W		<input type="checkbox"/>		L9		Ambient temperature up to:									
		15 W		<input type="checkbox"/>		L15		40 °C or 90 °C									
		17 W		<input type="checkbox"/>		L17		70 °C									
								70 °C (only UL / CSA)									
Certification		ATEX, IECEx, EAC, CCC		<input type="checkbox"/>				UL / CSA		<input type="checkbox"/>		MA		<input type="checkbox"/>			
		Australia		<input type="checkbox"/>		AU											
Sealing material / Temperature range		NBR		<input type="checkbox"/>													
		FKM (Viton)		<input type="checkbox"/>		D1											
		NBR -40 °C		<input type="checkbox"/>		Z604		(only with 15 W)									
Stainless		with K8 coil		<input type="checkbox"/>		K9											
		with K9 coil		<input type="checkbox"/>		K10		(not for UL execution)									

Design index (subject to change)

1 11-2018

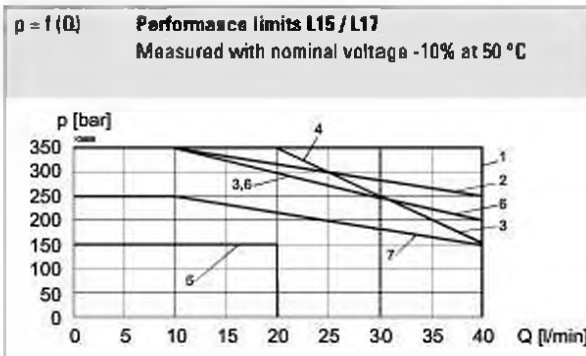
**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Ex-protection switching solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17) -40...+70 °C (L15 / L17)
Weight	3,3 kg
MTTFd	150 years

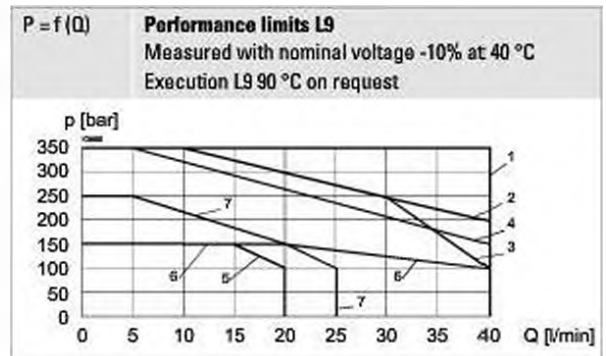
**HYDRAULIC SPECIFICATIONS**

Working pressure	p <sub>max</sub> = 350 bar
Maximum volume flow	Q <sub>max</sub> = 40 l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Poppet type, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L9 or L15 / L17) NBR 872 -40...+70 °C (L15 / L17)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

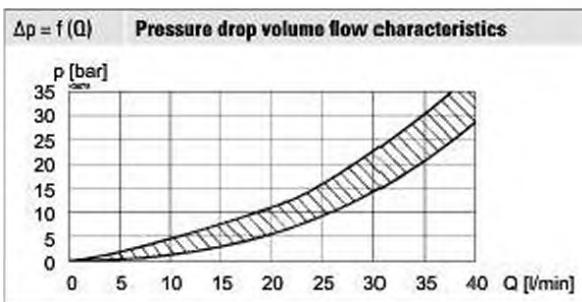
**PERFORMANCE SPECIFICATIONS**


 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


Type	Flow direction			
	P - A	A - T	A - P	T - A
AEXd22061a	1	-	6	-
AEXd22060b	1	-	3	-
AEXd32061a	1	2	5	1
AEXd32060b	1	4	7	1



Type	Flow direction			
	P - A	A - T	A - P	T - A
AEXd22061a	1	-	6	-
AEXd22060b	1	-	3	-
AEXd32061a	1	2	5	1
AEXd32060b	1	4	7	1



**Note!**  With the L15 / L17 execution for ambient temperatures up to 70 °C, the performance specifications have been evaluated with an ambient temperature of 50 °C

**Attention!**  Long periods of non-actuation can reduce the switching performance

**SURFACE TREATMENT**

-The valve body, the cover and the socket head screws are made of stainless steel

-The slip-on coil and the armature tube are zinc nickel coated

**Optionally K10:**

-The coil is made of stainless steel

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Switching frequency	12'000 / h
Voltage tolerance	$\pm 10 \%$ with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz $\pm 2 \%$ , with built-in two-way rectifier
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

**Note!**  Other electrical specifications see data sheet 1.1-183 and 1.1-184

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**MANUAL OVERRIDE**

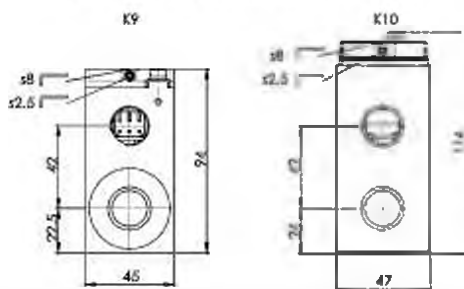
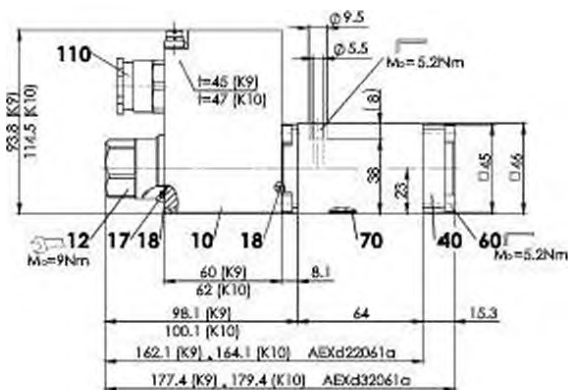
Screw plug (HB0), no actuation possible

Optionally: HB6, HN(K) or HG(K)

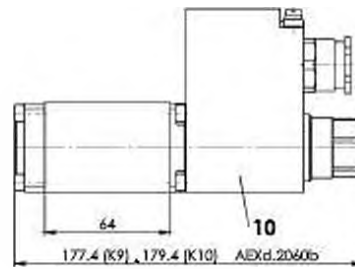
→ See data sheet 1.1-311

**VALVES INSTALLED**

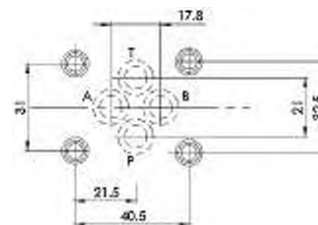
The central functioning element is the poppet valve cartridge NG6, data sheet 1.11-2030.

**DIMENSIONS**


Dimensions of the solenoid coil see data sheet 1.1-183, 1.1-183S and 1.1-184


**Note!**

The K9 coil (K10 valve) is 1 mm larger than the valve body. Usually, a distance plate is necessary.


**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK 45 / 18 x 60
12	154.2201	Knurled nut Ex M18 x 1,5 x 30
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
40	058.4221	Cover 45 /45 x 17,5 K9
60	246.2516	Socket head screw M5 x 16 A4 DIN 912
70	160.2093	O-ring ID 9,25 x 1,78 (NBR) -25 °C to...
	160.7092	O-ring ID 9,25 x 1,78 (NBR) -40 °C to...
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
110	111.1080	Cable gland M20 x 1,5

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,1 \text{ Nm}$ (screw quality A4) $M_0 = 9 \text{ Nm}$ knurled nut

**Note!**

The length of the fixing screw depends on the base material of the connection element.


**Attention!**

For stack assembly please observe the remarks in the operating instructions


**COMMISSIONING**

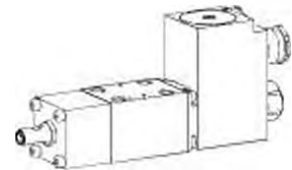
**Attention!** The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability can be assumed.


**ACCESSORIES**

Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**Solenoid operated poppet valve with inductive switching position monitoring**

- ◆ 2/2- or 3/2-way execution
- ◆  $Q_{nval} = 40 \text{ l/min}$
- ◆  $p_{nval} = 350 \text{ bar}$

**NG6**  
**ISO 4401-03**
 II 2 G Ex db IIC T6, T4

**DESCRIPTION**

Solenoid operated poppet valve according to data sheet 1.11-3143 with additional inductive switching position monitoring. The contactless sensor transmits the poppet position to a step signal.

**TYPE CODE**

International standard interface ISO	A EXd <input type="checkbox"/> 2 06 / <input type="checkbox"/> - <input type="checkbox"/> Z104 # <input type="checkbox"/>
Explosion proof execution	
2-Wege (Anschlüsse) <span style="float: right;">[2]</span>	
3-Wege (Anschlüsse) <span style="float: right;">[3]</span>	
2 switching positions	
Nominal size 6	
Normally closed <span style="margin-left: 100px;">Solenoid on A-side</span> <input type="checkbox"/> 1a	
Normally open <span style="margin-left: 100px;">Solenoid on B-side</span> <input type="checkbox"/> 06	
Other type designation according to type code data sheet 1.11-3143	
Namur / monitoring	
Design index (subject to change)	

111-3143

**GENERAL SPECIFICATIONS**

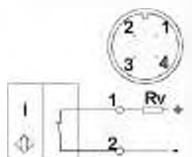
Designation	2/2-, 3/2-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Switching solenoid
Ambient temperature	L9: -25...+40 °C L15: -25...+70 °C
Weight	3,30 kg
MTTFd	150 years

**Namur-Sensor Specifications:**

Nominal voltage	8,2 VDC
Operating voltage	7,7...9 VDC
Current consumption damped max.	1 mA
Current consumption undamped min.	4 mA
Admissible series resistor $R_s$	550...1100 Ohm
Switching frequency	1000 Hz
Protection class	IP 68
	According to the connection type, the protection class of the valve can be lower, see data sheet 1.11-3143
Dimensions	M12 x 1
Ambient temperature	-25...70 °C
Fastening torque	15 Nm
Peak pressure	500 bar

**ELECTRICAL CONNECTION**

Namur	Article no. 205 5011
Device receptacle	M12, 4 pole male
Mating connector	M12, 4 pole female
	1 = Supply voltage +
	2 = Signal



**Attention:**  
Do not apply a voltage > 9V

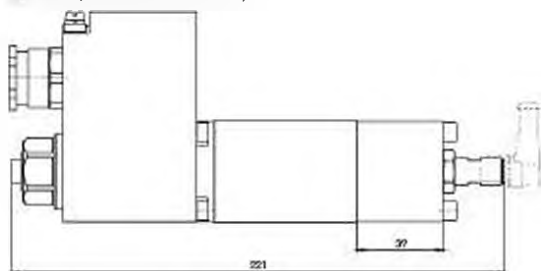
Mating connector not incl. in delivery

**Signal characteristics**

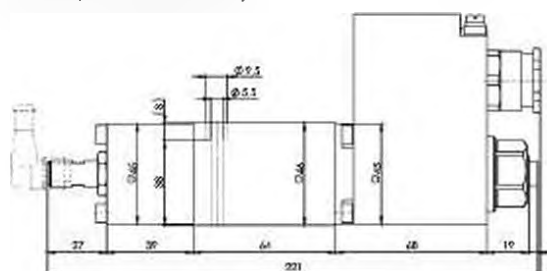
Signal of the actuator	Signal of the sensor
A / B	Namur
0	≥ 4 mA
1	≤ 1 mA

**DIMENSIONS**

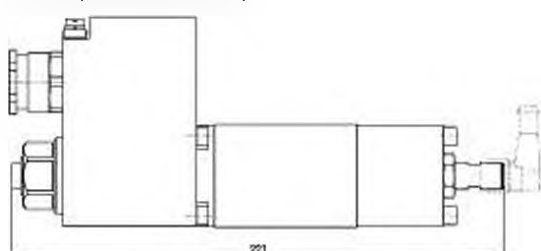
... 22061 (solenoid on A side)



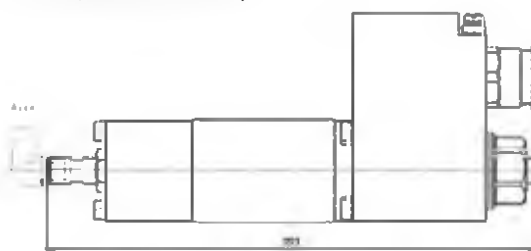
... 22060 (solenoid on B side)



... 32061 (solenoid on A side)



... 32060 (solenoid on B side)


**ACCESSORIES**

Mating connector (plug female, confectionable)

straight, screw terminal      Article no. 219.2978

angled, screw terminal      Article no. 219.3003

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The solenoid coil is zinc-nickel coated
- ◆ All the other parts are zinc coated

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 5 \text{ Nm}$ knurled nut

**Note!**


The length of the fixing screw depends on the base material of the connection element.

**Solenoid operated poppet valve detented**
**Flange construction**

- ◆ 3/2-way
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{adm} = 350 \text{ bar}$

**DESCRIPTION**

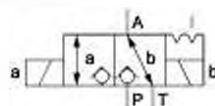
Direct operated 3/2-way solenoid poppet valve in flange construction. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring and is held in the switching position by the form-closed detent. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The metallic sealing seat closes the valve virtually leak free. The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to...	Z604 -40 °C to...
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	x
MA		x	x	
UL / CSA	x		x	x

**SYMBOL**

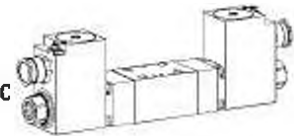
Simplified


**NG6**
**ISO 4401-03**

- ⊕ II 2 G Ex db IIC T6, T4
- ⊕ II 2 D Ex db III C T80 °C, T130 °C
- ⊕ I M2 Ex db I Mb

Class I Division 1

Class I Zone 1


**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

**ACTUATION**

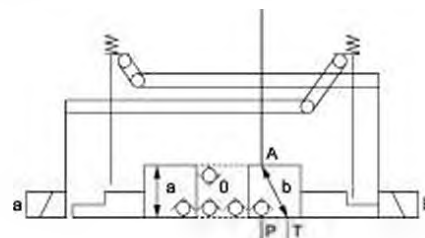
Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

**Attention!** The UL execution is always supplied without cable gland


**STANDARDS**

Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Mounting interface	ISO 4401-03
Protection class	EN 60 529
Contamination efficiency	ISO 4406

Detailed





**TYPE CODE**

International standard interface ISO	A Exd 3 2 06 rr - <input type="checkbox"/> / <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>				
Explosion-proof execution, Ex d					
3 way (connections)					
2 switching positions					
Nominal size 6					
Detent	on both sides				
Nominal voltage $U_n$	12 VDC 24 VDC	<input type="checkbox"/> B12 <input type="checkbox"/> G24	115 VAC 230 VAC	<input type="checkbox"/> R115 <input type="checkbox"/> R230	
Nominal power $P_n$	9 W 15 W 17 W	<input type="checkbox"/> L9 <input type="checkbox"/> L15 <input type="checkbox"/> L17	Ambient temperature up to: 40 °C or 90 °C 70 °C 70 °C (only UL / CSA)		
Certification	ATEX, IECEx, EAC, CCC Australia	<input type="checkbox"/> AU	UL / CSA	<input type="checkbox"/> UL	MA <input type="checkbox"/> MA
Sealing material / Temperature range	NBR FKM (Viton) NBR -40 °C	<input type="checkbox"/> <input type="checkbox"/> DT <input type="checkbox"/> Z604	{only with 15 W}		
Design index (subject to change)					

1 31-3546

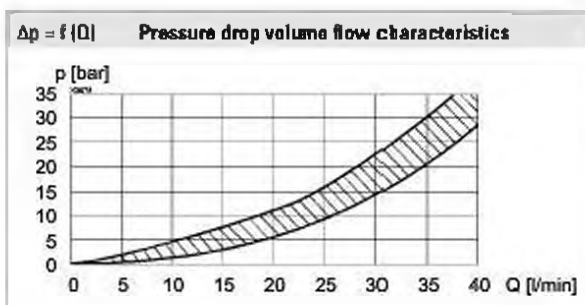
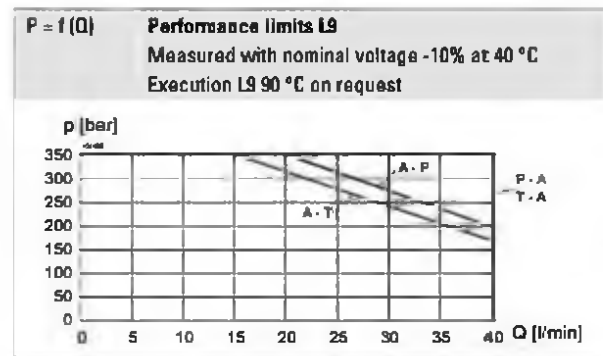
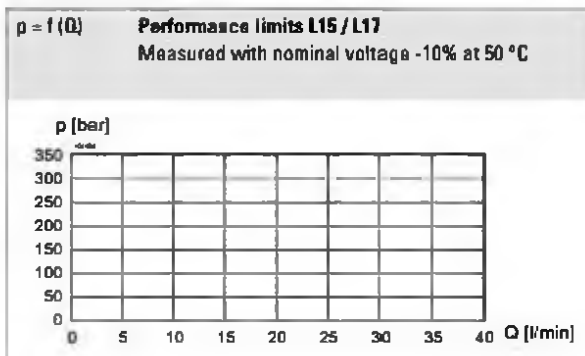
**GENERAL SPECIFICATIONS**

Designation	3/2-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Ex-protection switching solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17) -40...+70 °C (L15 / L17)
Weight	5,4 kg
MTTFd	150 years


**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 40$ l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Poppet type, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L9 or L15 / L17) NBR 872 -40...+70 °C (L15 / L17)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Switching frequency	12'000 / h
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC AC = 50 to 60 Hz ± 2 %, with built-in two-way rectifier
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

**Note!**  With the L15 / L17 execution for ambient temperatures up to 70 °C, the performance specifications have been evaluated with an ambient temperature of 50 °C

**Attention!**  Long periods of non-actuation can reduce the switching performance

**Note!**  Other electrical specifications see data sheet 1.1-183 and 1.1-184

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**MANUAL OVERRIDE**

Screw plug (HB0), no actuation possible

Optionally: HB6 or HN(K)

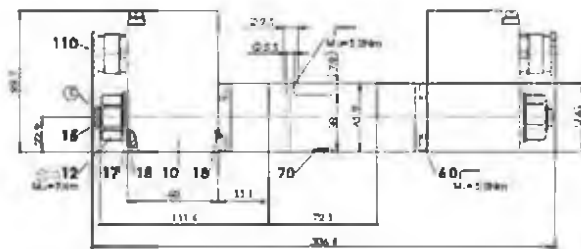
→ See data sheet 1.1-311

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The cover, the slip-on coil and the armature tube are zinc-nickel coated

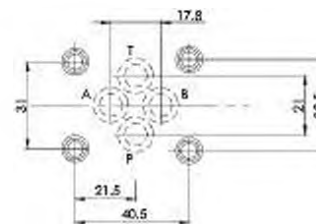
**VALVES INSTALLED**

The central functioning element is the poppet valve cartridge NG6, data sheet 1.11-2030.

**DIMENSIONS**


E = Air bleed screw

Dimensions of the solenoid coil see data sheet 1.1-183 and 1.1-184

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	239.2033	Screw plug HB0 (incl. seal)
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
60	246.2136	Socket head screw M5 x 35 DIN 912
70	160.2093	O-ring ID 9,25 x 1,78 (NBR) „-25 °C to...“
	160.7092	O-ring ID 9,25 x 1,78 (NBR) „-40 °C to...“
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
110	111.1080	Cable gland M20 x 1,5

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Module type manifold blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**COMMISSIONING**

**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).



The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability is assumed.

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated) $M_0 = 9 \text{ Nm}$ knurled nut

**Note!** The length of the fixing screw depends on the base material of the connection element.



**Attention!** For stack assembly please observe the remarks in the operating instructions



**Poppet valve**
**Flange construction**

- ◆ hand operated
- ◆ 2/2-, 3/2- und 3/4-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 15 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG4-Mini**

Wandfluh standard


**DESCRIPTION**

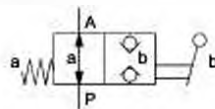
Direct operated 2/2-, 3/2 and 3/4-way poppet valve in flange construction. By means of the hand lever, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

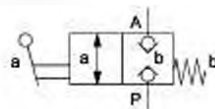
Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**

BH22040b



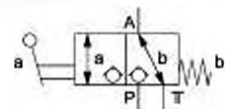
BH22041a



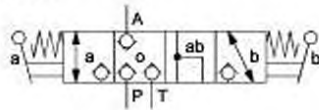
BH32040b



BH32041a



BH3404


**TYPE CODE**

2/2 or 3/2 way execution

3/4 way execution

B	H	2	04	-	#
B	H	3	04	-	#

Mounting interface according to Wandfluh standard

Hand lever

2 way (connections)

2
---

3 way (connections)

3
---

2 switching positions

4 switching positions

Nominal size 4-Mini

Normally closed

Hand lever on A-side

1a
----

Normally open

Hand lever on B-side

0b
----

Sealing material

NBR

FKM (Viton)

01
----

Design index (subject to change)

1 11-0120

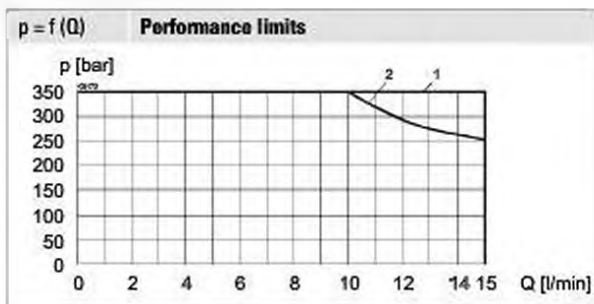
**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2- and 3/4-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Hand operated
Ambient temperature	-25...+70 °C (NBR) -20...+70 °C (FKM)
Weight	0,95 kg (2/2- and 3/2-way) 1,45 kg (3/4-way)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 15$ l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Seat tight, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-20...+70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**ACTUATION**

Actuation	Hand lever
Actuation angle	$\alpha = 5^\circ$
Actuation force	$F_A = 20 - 120$ N (depending on flow direction and pressure)

**STANDARDS**

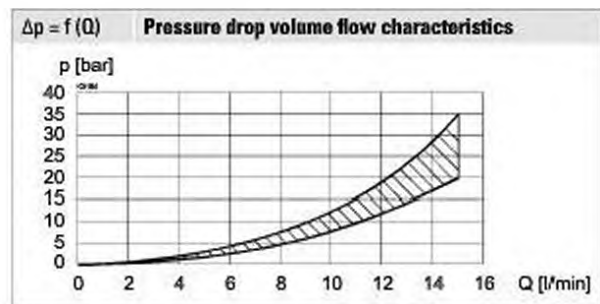
Mounting interface	Wandfluh standard
Contamination efficiency	ISO 4406

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-10
Multi-station subplates	Data sheet 2.9-50
Modula type manifold blocks	Data sheet 2.9-90
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SURFACE TREATMENT**

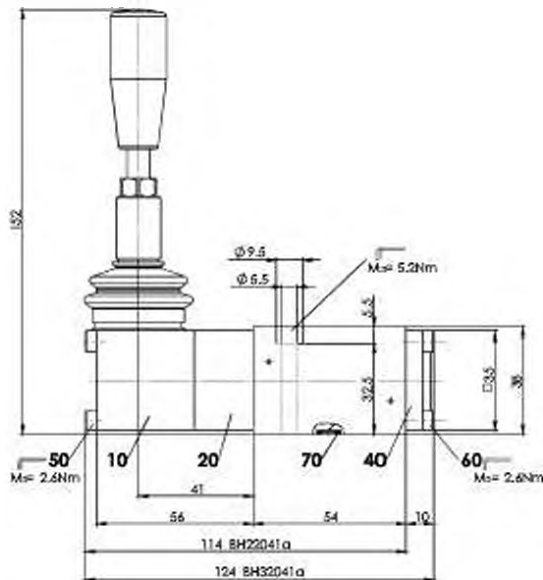
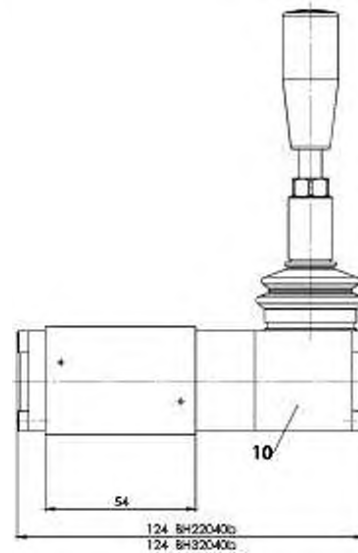
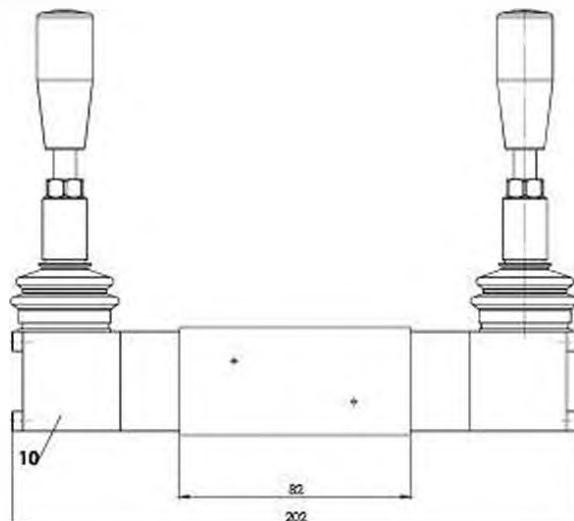
- ◆ The valve body is painted with a two component paint
- ◆ The hand lever housing, the screws and the cover are zinc coated


**Flow direction**

Type	P - A	A - T	A - P	T - A
BH22041a	1	-	1	-
BH22040b	1	-	2	-
BH32041a	1	2	1	1
BH32040b	1	1	2	1
BH3404	1	1	1	1

**VALVES INSTALLED**

The central functioning element is the poppet valve cartridge NG4, data sheet 1.11-2020.

**DIMENSIONS**
**3/2-; 2/2-way**

**3/2-; 2/2-way**

**3/4-way**

**PARTS LIST**

Position	Article	Description
10	253.2000	Hand control head BH11
20	074.2703	Flange square
40	057.4201	Cover
50	249.1007	Socket head screw M4 x 63 DIN 912
60	246.1113	Socket head screw M4 x 12 DIN 912
70	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)

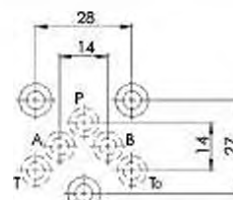
**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

Mounting type	Flange mounting 3 fixing holes for socket head screws M5 x 40
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated)

**Note!** The length of the fixing screw depends on the base

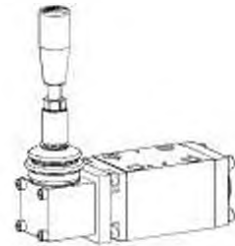
**HYDRAULIC CONNECTION**


**Poppet valve**

**Flange construction**

- ◆ hand operated
- ◆ 2/2-, 3/2- und 3/4-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG6**  
**ISO 4401-03**



**DESCRIPTION**

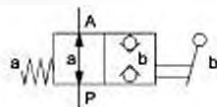
Direct operated 2/2-, 3/2 and 3/4-way poppet valve in flange construction. By means of the hand lever, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

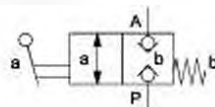
Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

**SYMBOL**

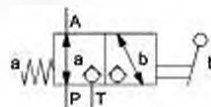
AH22060b



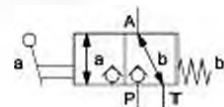
AH22061a



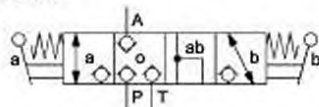
AH32060b



AH32061a



AH3406



**TYPE CODE**

2/2 or 3/2 way execution  
3/4 way execution

A H  2 06  -     
A H 3 4 06  -

International standard interface ISO

Hand lever

2 way (connections)  
3 way (connections)

2  
 3

2 switching positions  
4 switching positions

Nominal size 6

Normally closed  
Normally open

Hand lever on A-side  
Hand lever on B-side

1a  
 0b

Sealing material

NBR   
FKM (Viton)  01

Design index (subject to change)

1 11-0540

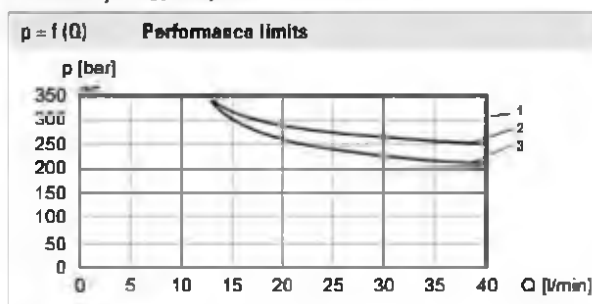
**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2- and 3/4-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Hand operated
Ambient temperature	-25...+70 °C
Weight	1,70 kg (2/2- and 3/2-way) 2,50 kg (3/4-way)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 40$ l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Seat tight, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade $\beta_{10} \dots 16 \geq 75$ , see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**ACTUATION**

Actuation	Hand lever
Actuation angle	$\alpha = 6^\circ$
Actuation force	$F_A = 20 - 120$ N (depending on flow direction and pressure)

**STANDARDS**

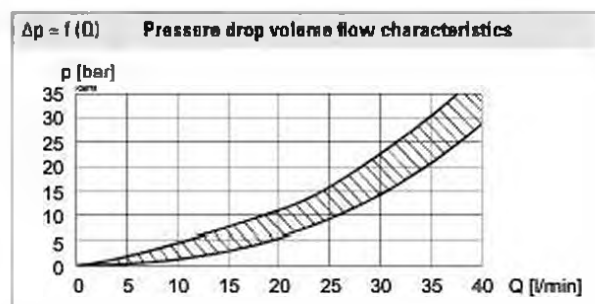
Mounting interface	ISO 4401-03
Contamination efficiency	ISO 4406

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The hand lever housing, the screws and the cover are zinc coated

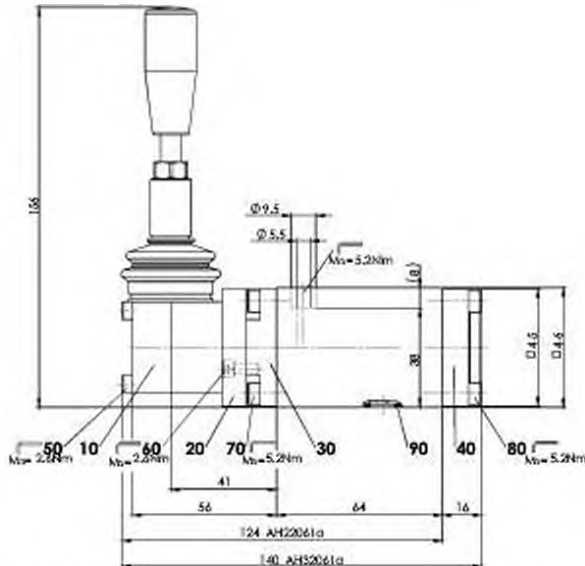
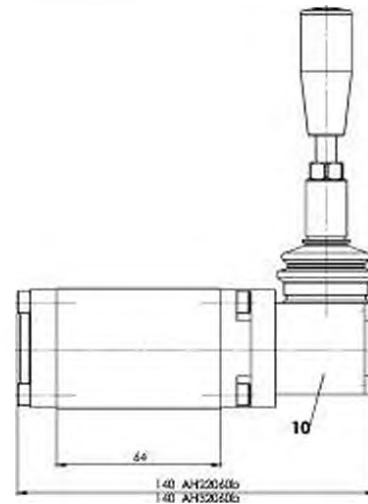
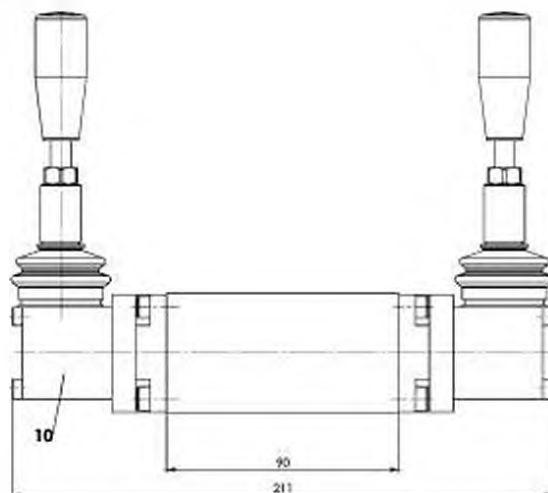

**Flow direction**

Type	P - A	A - T	A - P	T - A
AH22061a	1	-	1	-
AH22060b	1	-	3	-
AH32061a	1	2	1	1
AH32060b	1	1	2	1
AH3406	1	1	1	1



**VALVES INSTALLED**

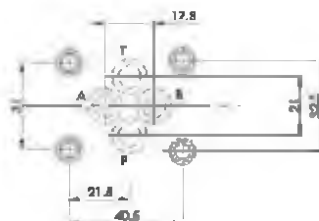
The central functioning element is the poppet valve cartridge NG6, data sheet 1.11-2030.

**DIMENSIONS**
**3/2-; 2/2-way**

**3/2-; 2/2-way**

**3/4-way**

**PARTS LIST**

Position	Article	Description
10	253.2000	Hand control head BHII
20	074.1802	Flange square
30	074.2702	Flange square
40	058.4215	Cover
50	246.1140	Socket head screw M4 x 40 DIN 912
60	246.1111	Socket head screw M4 x 10 DIN 912
70	246.2112	Socket head screw M5 x 12 DIN 912
80	246.2117	Socket head screw M5 x 16 DIN 912
90	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**HYDRAULIC CONNECTION**

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated)

**Nota!**


The length of the fixing screw depends on the base material of the connection element.

**Poppet valve**
**Flange construction**

- ◆ hand operated
- ◆ 2/2-, 3/2 and 3/4-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG6**
**ISO 4401-03**

**DESCRIPTION**

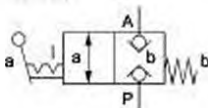
Direct operated 2/2-, 3/2 and 3/4-way poppet valve in flange construction. By means of the hand lever, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

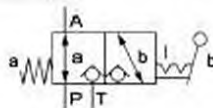
Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

**SYMBOL**

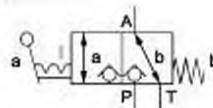
AG22061a



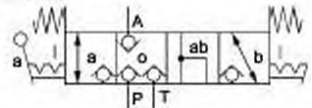
AG32060b



AG32061a



AG3406


**TYPE CODE**

 2/2 or 3/2 way execution  
 3/4 way execution

A	G	2	06				
A	G	3	06				

International standard interface ISO

Hand lever

2 way (connections)

 2

3 way (connections)

 3

2 switching positions

4 switching positions

Nominal size 6

Normally closed

Hand lever on A-side

 In

Normally open

Hand lever on B-side

 Ob

Sealing material

NBR

FKM (Viton)

 01

Design index (subject to change)

111-016

**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2- and 3/4-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Hand operated
Ambient temperature	-25...+70 °C
Weight	1,45 kg (2/2- and 3/2-way) 2,00 kg (3/4-way)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 40$ l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Seat tight, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade $\beta_{10} \dots 16 \geq 75$ , see data sheet 1.0-50

**ACTUATION**

Actuation	Hand lever
Actuation angle	$\alpha_A = 90^\circ$
Actuation force	$F_A = 10 - 50$ N (depending on flow direction and pressure)

**STANDARDS**

Mounting interface	ISO 4401-03
Contamination efficiency	ISO 4406

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SEALING MATERIAL**

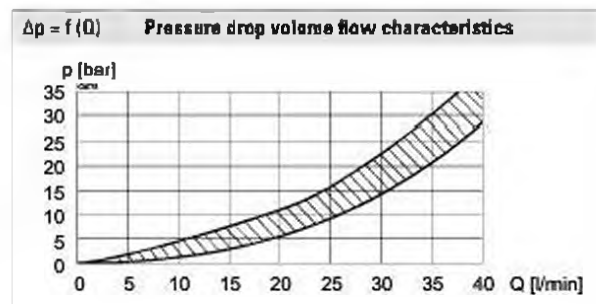
NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The hand lever housing and the cover are zinc-nickel coated

**PERFORMANCE SPECIFICATIONS**

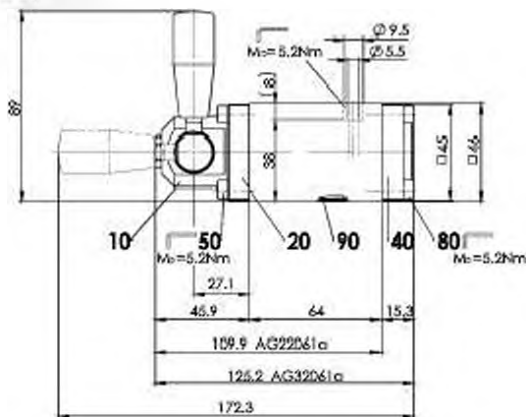
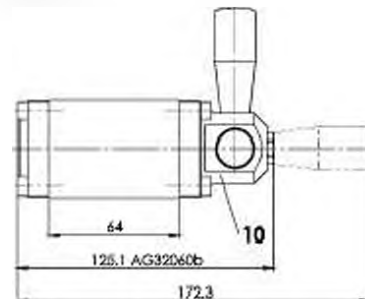
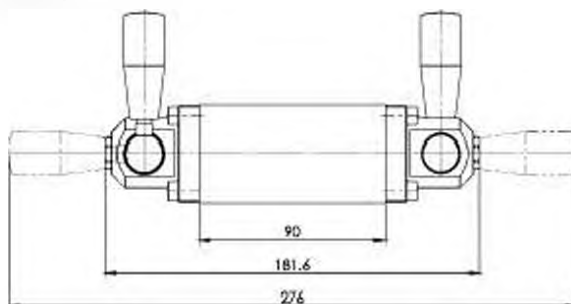
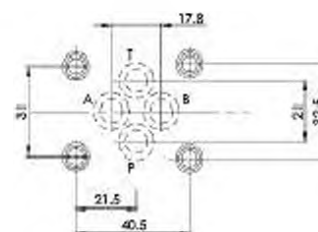
Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s



Type	Flow direction			
	P - A	A - T	A - P	T - A
AG22061a	1	-	2	-
AG32061a	1	2	3	1
AG32060b	1	2	3	1
AG3406	1	1	2	2

**VALVES INSTALLED**

The central functioning element is the poppet valve cartridge NG6, data sheet 1.11-2030.

**DIMENSIONS**
**3/2-; 2/2-way**

**3/2-way**

**3/4-way**

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	253.4501	Manual actuation AG..06
20	074.4805	Flange squarre
10	058.4215	Cover
50, 80	246.2117	Socket head screw M5 x 16 DIN 912
90	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$   screw quality 8.8, zinc coated

**Note!** The length of the fixing screw depends on the base material of the connection element.



**Poppet valve**

**Flange construction**

- ◆ hand operated
- ◆ 2/2-, 3/2- und 3/4-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG10**  
ISO 4401-05



**DESCRIPTION**

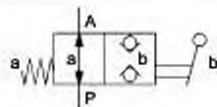
Direct operated 2/2-, 3/2 and 3/4-way poppet valve in flange construction. By means of the hand lever, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

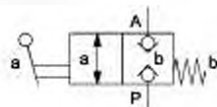
Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

**SYMBOL**

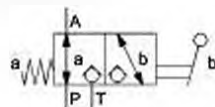
AH22100b



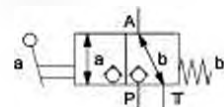
AH22101a



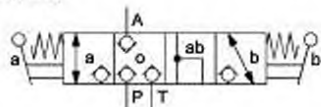
AH32100b



AH32101a



AH3410



**TYPE CODE**

2/2 or 3/2 way execution  
3/4 way execution

A H  2 10  -  #   
A H 3 4 10 -  #

International standard interface ISO

Hand lever

2 way (connections)  
3 way (connections)

2  
 3

2 switching positions  
4 switching positions

Nominal size 10

Normally closed  
Normally open

Hand lever on A-side  
Hand lever on B-side

1a  
 0b

Sealing material

NBR  
FKM (Viton)  D1

Design index (subject to change)

**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2- and 3/4-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Hand operated
Ambient temperature	-25...+70 °C (NBR) -20...+70 °C (FKM)
Weight	3,60 kg (2/2- and 3/2-way) 4,60 kg (3/4-way)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 80$ l/min, see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Seat tight, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-20...+70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade $\beta_{10} \dots 16 \geq 75$ , see data sheet 1.0-50

**ACTUATION**

Actuation	Hand lever
Actuation angle	$\alpha_h = 11^\circ$
Actuation force	$F_h = 20 - 120$ N (depending on flow direction and pressure)

**STANDARDS**

Mounting interface	ISO 4401-05
Contamination efficiency	ISO 4406

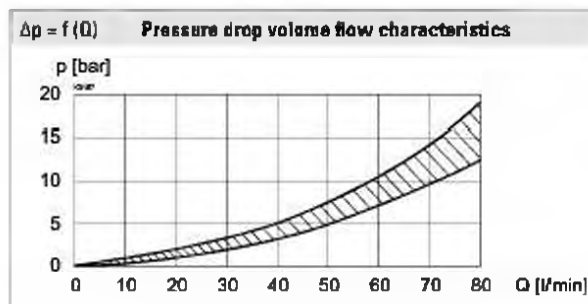
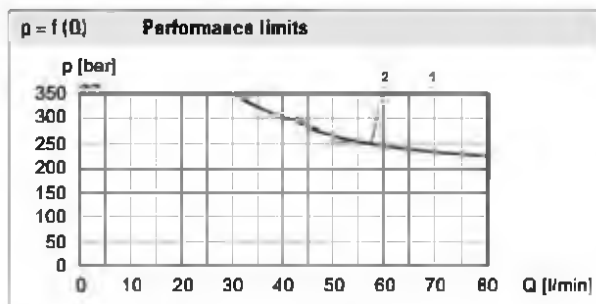
**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Modula type manifold blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The hand lever housing, the screws and the cover are zinc coated

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**Flow direction**

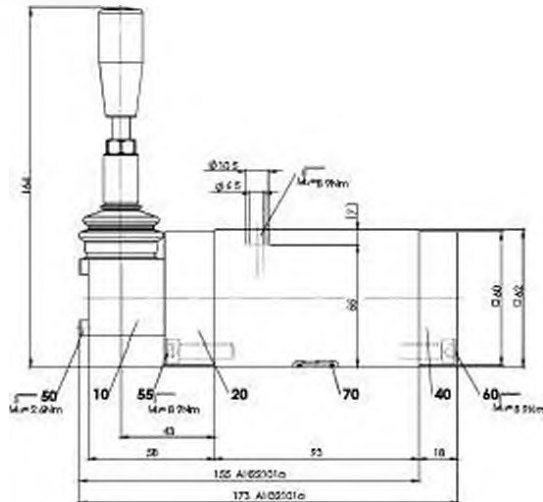
Type	P - A	A - T	A - P	T - A
AH22101a	1	-	1	-
AH22100b	1	-	2	-
AH32101a	1	2	1	1
AH32100b	1	1	2	1
AH3410	1	1	1	1

**VALVES INSTALLED**

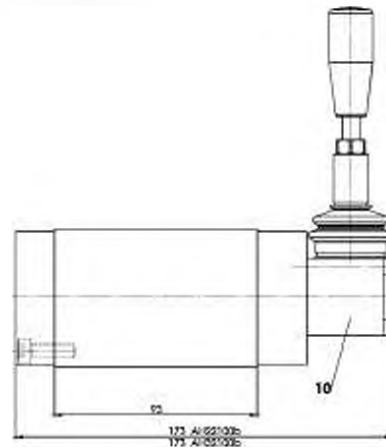
The central functioning element is the poppet valve cartridge NG10, data sheet 1.11-2040.

**DIMENSIONS**

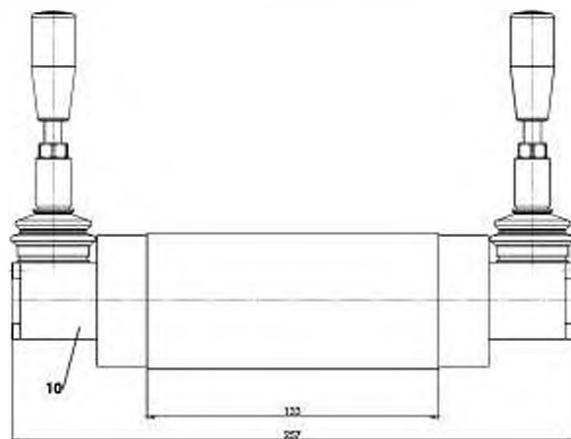
3/2-; 2/2-way



3/2-; 2/2-way



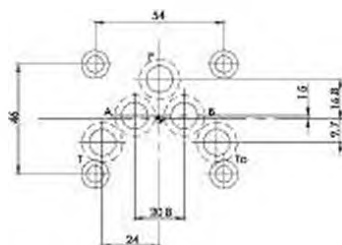
3/4-way


**PARTS LIST**

Position	Article	Description
10	253.2000	Hand control head BHII
20	074.2813	Flange squarre
40	059.2200	Cover
50	246.1140	Socket head screw M4 x 40 DIN 912
55	246.3125	Socket head screw M6 x 25 DIN912
60	246.3121	Socket head screw M6 x 20 DIN 912
70	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**HYDRAULIC CONNECTION**

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 65
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 8,9 \text{ Nm}$ (quality 8.8, zinc-coated)

**Note!**


The length of the fixing screw depends on the base material of the connection element.

**Poppet valve**
**Flange construction**

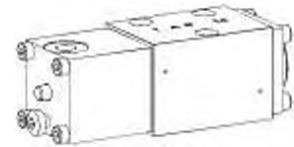
- ◆ pneumatically operated
- ◆ 2/2-, 3/2- and 3/4-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 15 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**DESCRIPTION**

Direct operated 2/2-, 3/2 and 3/4-way poppet valve in flange construction. By means of the pneumatic actuation control head, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**NG4-Mini**

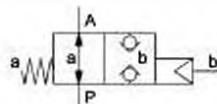
Wandfluh standard


**APPLICATION**

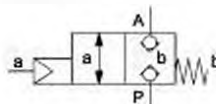
Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**

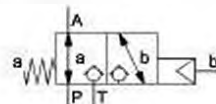
BK22040b



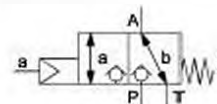
BK22041a



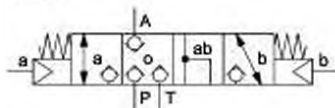
BK32040b



BK32041a



BK3404


**TYPE CODE**

 2/2 or 3/2 way execution  
 3/4 way execution

 B K  2 04  -  #   
 B K  3 4 04  -  # 

Mounting interface acc. to Wandfluh standard

Pneumatically operated

 2 way (connections)  
 3 way (connections)

 2  
 3

 2 switching positions  
 4 switching positions

Nominal size 4-Mini

 Normally closed  
 Normally open

 Pilot head on A-side  
 Pilot head on B-side

 1a  
 0b

Sealing material

 NBR   
 FKM (Viton)  D1

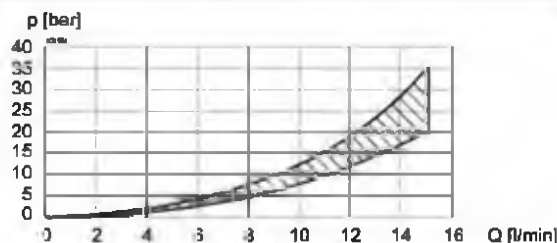
Design index (subject to change)

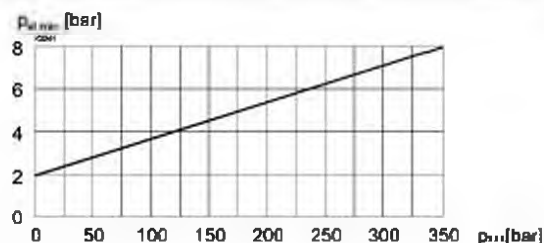


**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2- and 3/4-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Pneumatically operated
Ambient temperature	-25...+70 °C (NBR) -20...+70 °C (FKM)
Weight	0,9 kg (2/2- at 3/2-way) 1,2 kg (3/4-way)
MTTFd	150 years

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 **$\Delta p = f(Q)$  Pressure drop volume flow characteristics**

 **$p = f(Q)$  Performance limits**

 **$P_{\text{act}} = f(p)$  Min. pilot pressure-pressure characteristic at  $Q_{\text{max}}$** 

**ACTUATION**

Actuation	Pneumatically
Execution	Actuation BKII
Pilot pressure	$p_{\text{act}} =$ see characteristic $p_{\text{act}} = 8 \text{ bar}$
Control volume	$V = 2,5 \text{ cm}^3$

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{\text{max}} = 350 \text{ bar}$
Maximum volume flow	$Q_{\text{max}} = 15 \text{ l/min}$ , see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Seat tight, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 $\text{mm}^2/\text{s}$ ... 320 $\text{mm}^2/\text{s}$
Temperature range fluid	-20...+70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10... 16 $\geq 75$ , see data sheet 1.0-50

**Flow direction**

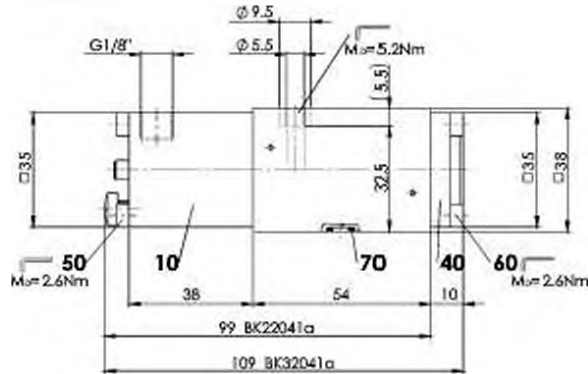
Type	P - A	A - T	A - P	T - A
BK22041a	1	-	2	-
BK22040b	1	-	4	-
BK32041a	1	3	5	1
BK32040b	1	4	5	1
BK3404	1	1	2	2

## VALVES INSTALLED

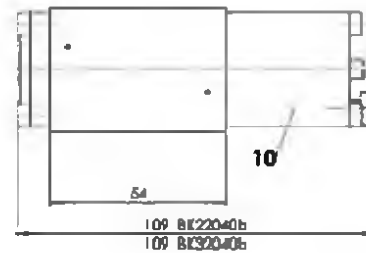
The central functioning element is the poppet valve cartridge NG4, data sheet 1.11-2020.

## DIMENSIONS

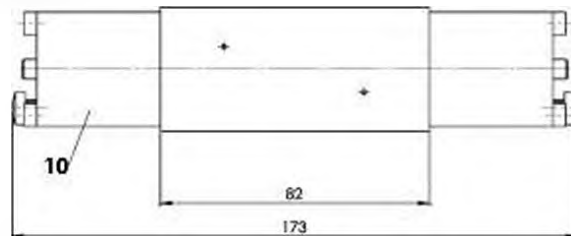
3/2-; 2/2-way



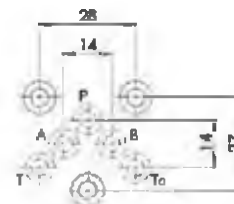
3/2-; 2/2-way



3/4-way



## HYDRAULIC CONNECTION



## PARTS LIST

Position	Article	Description
10	254.2000	Pneumatic actuation BK II
40	057.4201	Cover
50	246.1146	Socket head screw M4 x 45 DIN 912
60	246.1113	Socket head screw M4 x 12 DIN 912
70	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)

## ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-10
Multi-station subplates	Data sheet 2.9-50
Module type manifold blocks	Data sheet 2.9-90
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

## SURFACE TREATMENT

- ◆ The valve body is painted with a two component paint
- ◆ The pneumatic actuation, the cover and the socket head screws are zinc coated

## INSTALLATION NOTES

Mounting type	Flange mounting 3 fixing holes for socket head screws M5 x 40
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_t = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated)

**Nota!** The length of the fixing screw depends on the base material of the connection element.

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## MANUAL OVERRIDE

In mechanical control head integrated. Actuation by pressing the pin

## STANDARDS

Mounting interface	Wandfluh standard
Contamination efficiency	ISO 4406

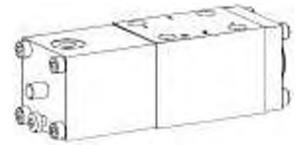
**Poppet valve**

**Flange construction**

- ◆ pneumatically operated
- ◆ 2/2-, 3/2- und 3/4-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG6**

ISO 4401-03



**DESCRIPTION**

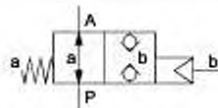
Direct operated 2/2-, 3/2 and 3/4-way poppet valve in flange construction. By means of the pneumatic actuation control head, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

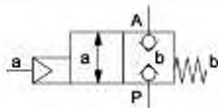
Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

**SYMBOL**

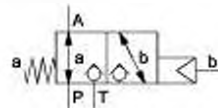
AK22060b



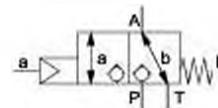
AK22061a



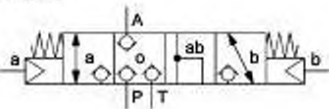
AK32060b



AK32061a



AK3406



**TYPE CODE**

2/2 or 3/2 way execution  
3/4 way execution

A K  2 06  -  #   
A K 3 4 06  -  #

International standard interface ISO

Pneumatically operated

2 way (connections)

2

3 way (connections)

3

2 switching positions

4 switching positions

Nominal size 6

Normally closed

Pilot head on A-side

1a

Normally open

Pilot head on B-side

0b

Sealing material

NBR

FKM (Viton)

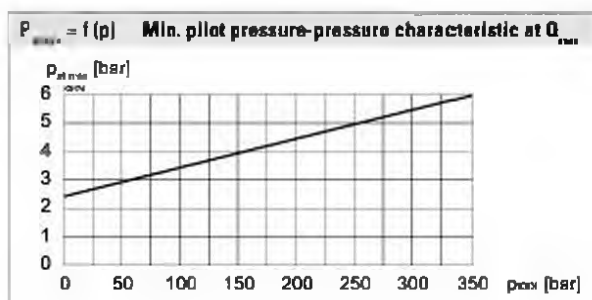
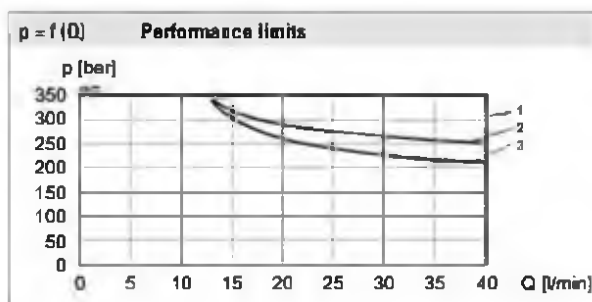
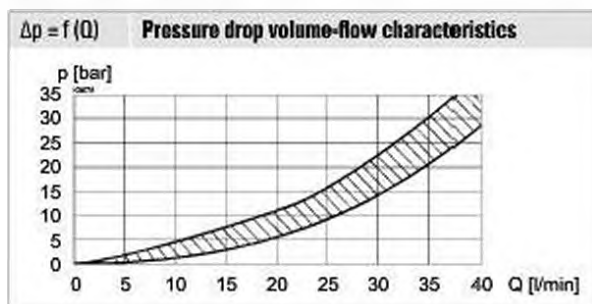
01

Design index (subject to change)

**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2- and 3/4-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Pneumatically operated
Ambient temperature	-25...+70 °C (NBR) -20...+70 °C (FKM)
Weight	1,7 kg (2/2- and 3/2-way) 2,5 kg (3/4-way)
MTTFd	150 years

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACTUATION**

Actuation	Pneumatically
Execution	Actuation CKII
Pilot pressure	$p_{\text{act min}} = \text{see characteristic}$ $p_{\text{act max}} = 8 \text{ bar}$
Control volume	$V = 7,0 \text{ cm}^3$

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{\text{max}} = 350 \text{ bar}$
Maximum volume flow	$Q_{\text{max}} = 40 \text{ l/min}$ , see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Seat tight, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-20...+70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 $\geq 75$ , see data sheet 1.0-50

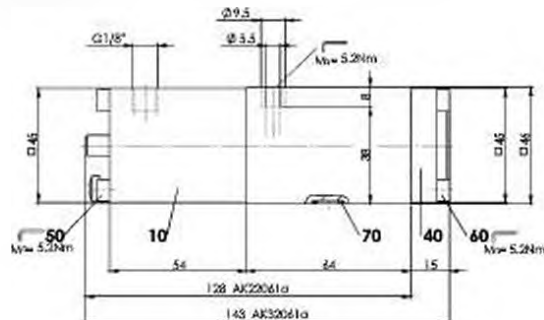
Type	Flow direction			
	P - A	A - T	A - P	T - A
AK22061a	1	-	1	-
AK22060b	1	-	3	-
AK32061a	1	2	1	1
AK32060b	1	1	2	1
AK3406	1	1	1	1

**VALVES INSTALLED**

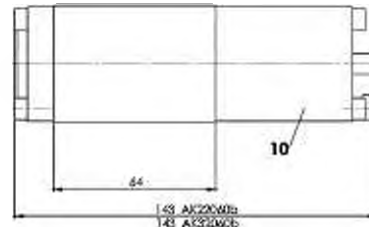
The central functioning element is the poppet valve cartridge NG6, data sheet 1.11-2030.

**DIMENSIONS**

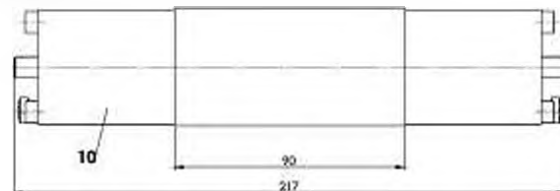
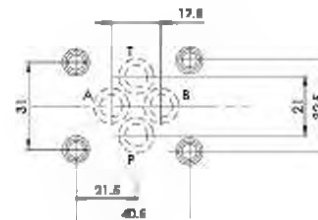
3/2-; 2/2-way



3/2-; 2/2-way



3/4-way


**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	254.4054	Pneumatic actuation CK II
40	058.4215	Cover
50	246.2160	Socket head screw M5 x 60 DIN 912
60	246.2117	Socket head screw M5 x 16 DIN 912
70	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Horizontal mounting blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SURFACE TREATMENT**

- ◆ The valve body is painted with a two component paint
- ◆ The pneumatic actuation, the cover and the socket head screws are zinc coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated)

**Note!** The length of the fixing screw depends on the base material of the connection element.


**MANUAL OVERRIDE**

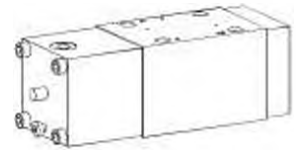
In mechanical control head integrated. Actuation by prassing the pin

**STANDARDS**

Mounting interface	ISO 4401-03
Contamination efficiency	ISO 4406

**Poppet valve**
**Flange construction**

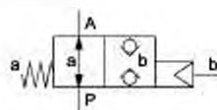
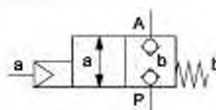
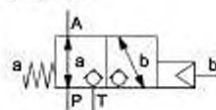
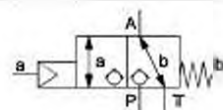
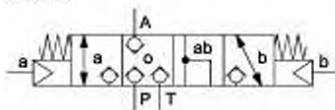
- ◆ pneumatically operated
- ◆ 2/2-, 3/2- and 3/4-way
- ◆ normally open and normally closed
- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG10**
**ISO 4401-05**

**DESCRIPTION**

Direct operated 2/2-, 3/2 and 3/4-way poppet valve in flange construction. By means of the pneumatic actuation control head, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free.

**APPLICATION**

Poppet valves are used where tight closing functions of the valve are essential like leakage-free load holding, clamping or gripping.

**SYMBOL**
**AK22100b**

**AK22101a**

**AK32100b**

**AK32101a**

**AK3410**

**TYPE CODE**

 2/2 or 3/2 way execution  
 3/4 way execution

A	K	2	10	-	#
A	K	3	4	10	#

International standard interface ISO

Pneumatically operated

 2 way (connections)  
 3 way (connections)

2
3

 2 switching positions  
 4 switching positions

Nominal size 10

 Normally closed  
 Normally open

 Pilot head on A-side  
 Pilot head on B-side

1a
0b

Sealing material

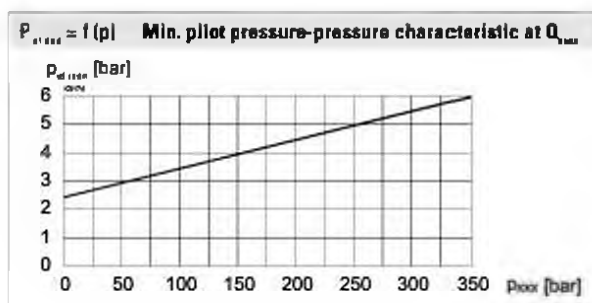
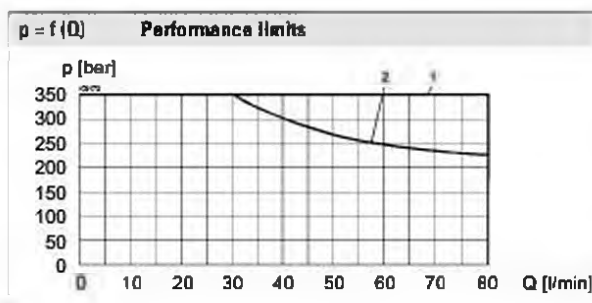
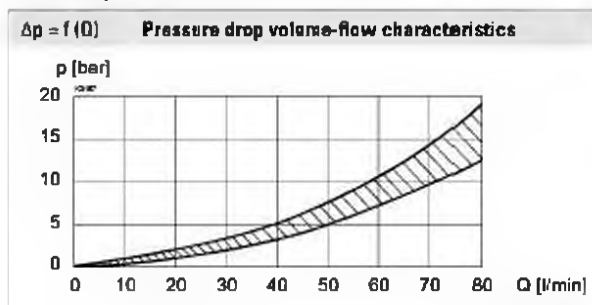
NBR	
FKM (Viton)	01

Design index (subject to change)

**GENERAL SPECIFICATIONS**

Designation	2/2-, 3/2- and 3/4-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Pneumatically operated
Ambient temperature	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Weight	4,1 kg (2/2- and 3/2-way) 5,4 kg (3/4-way)
MTTFd	150 years

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACTUATION**

Actuation	Pneumatically
Execution	Actuation AKI
Pilot pressure	$p_{\text{act}} = \text{see characteristic}$ $p_{\text{act}} = 8 \text{ bar}$
Control volume	$V = 10 \text{ cm}^3$

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{\text{nom}} = 350 \text{ bar}$
Maximum volume flow	$Q_{\text{max}} = 80 \text{ l/min}$ , see characteristic
Volume flow direction	Any (see characteristic)
Leakage oil	Seat tight, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-20 ... +70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10 ... 16 $\geq 75$ , see data sheet 1.0-50

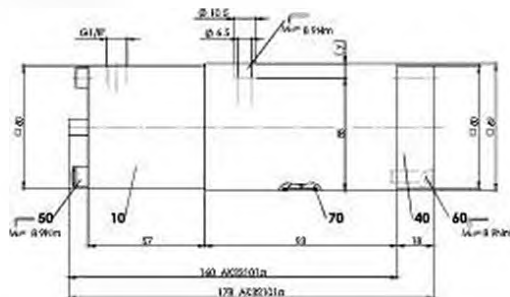
Type	Flow direction			
	P - A	A - T	A - P	T - A
AK22101a	1	-	1	-
AK22100b	1	-	2	-
AK32101a	1	2	1	1
AK32100b	1	1	2	1
AK3410	1	1	1	1

## VALVES INSTALLED

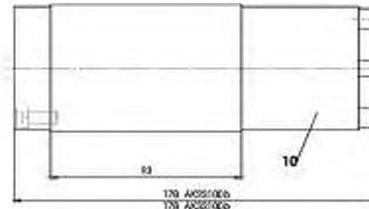
The central functioning element is the poppet valve cartridge NG10, data sheet 1.11-2040.

## DIMENSIONS

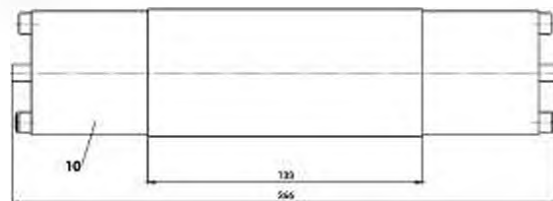
3/2-; 2/2-way



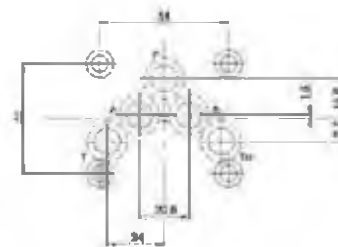
3/2-; 2/2-way



3/4-way



## HYDRAULIC CONNECTION



## PARTS LIST

Position	Article	Description
10	254.5000	Pneumatic actuation AKI
40	059.2200	Cover
50	246.3166	Socket head screw M6 x 65 DIN 912
60	246.3121	Socket head screw M6 x 20 DIN 912
70	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)

## ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Modula type manifold blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

## SURFACE TREATMENT

- ◆ The valve body is painted with a two component paint
- ◆ The pneumatic actuation, the cover and the socket head screws are zinc coated

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## INSTALLATION NOTES

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 65
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 8,9$ Nm (quality 8.8, zinc-coated)

## MANUAL OVERRIDE

In mechanical control head integrated. Actuation by pressing the pin

## STANDARDS

Mounting interface	ISO 4401-05
Contamination	ISO 4406

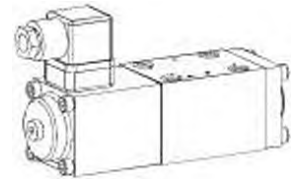


**Solenoid operated poppet valve**
**Flange construction**

- ◆ 3/2-way
- ◆ normally open and normally closed
- ◆ positive switching overlap
- ◆  $Q_{n,m} = 15 \text{ l/min}$
- ◆  $p_{n,m} = 300 \text{ bar}$

**NG6**

ISO 4401-03


**DESCRIPTION**

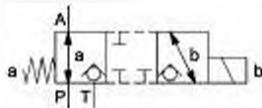
Direct operated 3/2-way solenoid poppet valve in sandwich construction. By means of the pressure tight switching solenoid, the poppet valve spool is opened or closed acting against the spring. Due to the poppet spool construction with pressure compensation on both sides, the flow through the valve is possible in both directions. The seat spool guide is sealed by means of an O-ring. The metallic sealing seat closes the valve virtually leak free. The spool has been designed to create a positive switching overlap.

**APPLICATION**

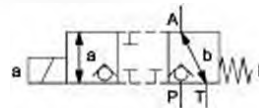
Poppet valves with positive switching overlap are used where oil losses are not allowed to occur neither in the static state nor in the dynamic state of the valve. In the use in accumulator loading systems, a rapid draining of the accumulator is avoided. Used as a pilot valve, no uncontrolled switching connections occur.

**SYMBOL**

A 32060b-S1779



A.32061a-S1779


**TYPE CODE**

International standard interface ISO

A 3 2 06 - - - S1779

 Solenoid, Medium  
 Solenoid, Super

 M  
 S

3 way (connections)

2 switching positions

Nominal size 6

 Normally closed  
 Normally open

 Solenoid on A-side  
 Solenoid on B-side

 1a  
 0b

 Nominal voltage  $U_v$ 

12 VDC	G12	115 VAC	R115
24 VDC	G24	230 VAC	R230

Sealing material

NBR	
FKM (Viton)	D1

Positive switching overlap

Design index (subject to change)

1 11-1200

**GENERAL SPECIFICATIONS**

Designation	3/2-way poppet valve
Construction	Direct operated
Mounting	Flange construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Switching solenoid
Ambient temperature	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Weight	1,8 kg
MTTFd	150 years

**ACTUATION**

Actuation	Switching solenoid, wet pin push type, pressure tight
Execution	Medium: SIN45V (Data sheet 1.1-120) Super: SIS45V (Data sheet 1.1-125)
Connection	Connector socket EN 175301 – 803

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	100 % DF
Switching frequency	15'000 / h
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24VDC, 115 VAC, 230 VAC
voltage	AC = 50 to 60 Hz, rectifier integrated in the connector socket

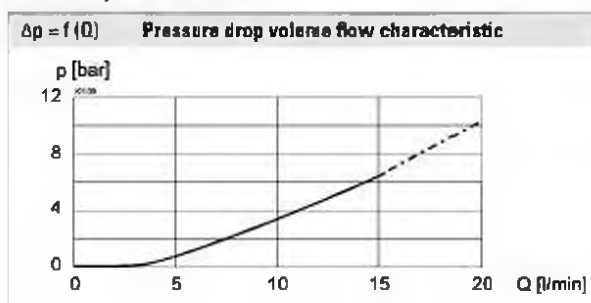
**Note!** Other electrical specifications see data sheet 1.1-120 (Medium) and 1.1-125 (Super)


**HYDRAULIC SPECIFICATIONS**

Working pressure	Medium: p <sub>max</sub> = 160 bar Super: p <sub>max</sub> = 300 bar
Maximum volume flow	Q <sub>max</sub> = 15 l/min, see characteristic
Volume flow direction	Any
Leakage oil	Seat tight, max. 0,05 ml / min (approx. 1 drop / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-20 ... +70 °C
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10 ... 16 ≥ 75, see data sheet 1.0-50

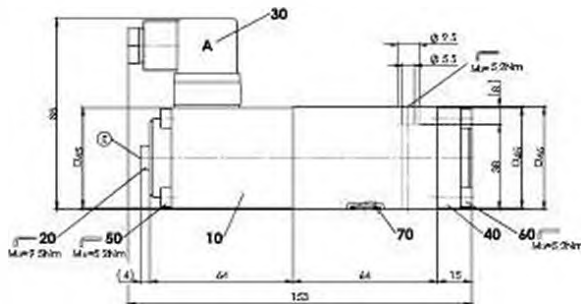
**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$


**VALVES INSTALLED**

The central functioning element is the poppet valve cartridge NG6, data sheet 1.11-2030.

## DIMENSIONS



E = Air bleed screw

## PARTS LIST

Position	Article	Description
10	260.6... 260.7...	Solenoid SIN45V Solenoid SIS45V
20	239.2033	Screw plug HB0 (incl. seal)
30	219.2001	Electric plug A (grey)
35	219.2002	Electric plug B (black)
40	058.4215	Cover
50	246.2160	Socket head screw M5 x 60 DIN 912
60	246.2117	Socket head screw M5 x 16 DIN 912
70	160.2093 160.6092	O-ring ID 9,25 x 1,78 (NBR) O-ring ID 9,25 x 1,78 (FKM)

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## SURFACE TREATMENT

- ◆ The valve body is painted with a two component paint
- ◆ The solenoid and the cover are zinc coated
- ◆ The socket head screws are zinc coated

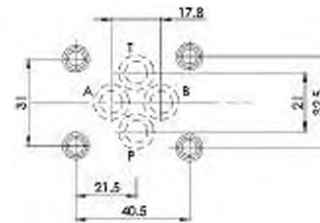
## INSTALLATION NOTES

Mounting type	Flange mounting 4 fixing holes for socket head screws M5 x 45
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (screw quality 8.8, zinc coated)

**Notes!** The length of the fixing screw depends on the base material of the connection element.



## HYDRAULIC CONNECTION



## MANUAL OVERRIDE

Screw plug (HB0), no actuation possible  
Optionally: HB6, HN(K) or HR(K)  
→ See data sheet 1.1-311

## STANDARDS

Mounting interface	ISO 4401-03
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## ACCESSORIES

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

## COMMISSIONING

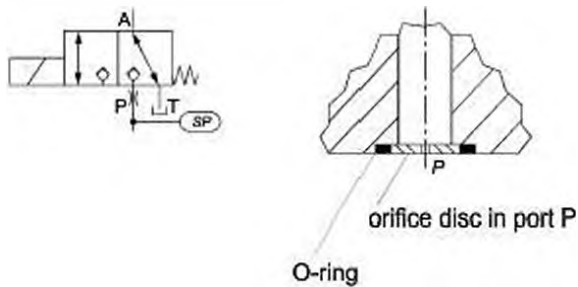
**Attention!** When commissioning, the valve must be vented under pressure (max. two rotations of screw E).



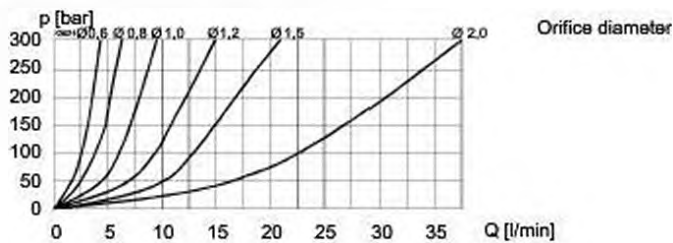
**ORIFICE DISC FOR POPPET VALVES**

A orifice is required if the volume flow during shifting might pass the performance limit ( $Q_{max}$ ) of the valve. The corresponding orifice can be mounted by the customer and enlarged if necessary according to  $\Delta p/Q$  characteristic of orifice disc below.

Example: accumulator in P line



**CHARACTERISTICS** oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$   
 $\Delta p = f(Q)$  Pressure loss/flow characteristics



**Available orifice discs**

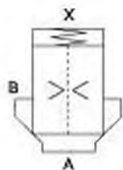
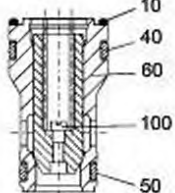
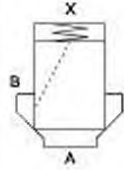
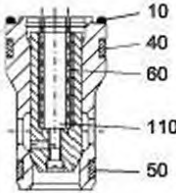

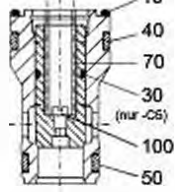
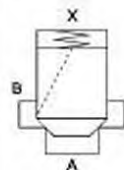
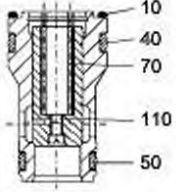
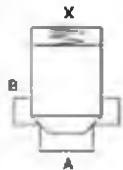
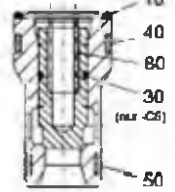
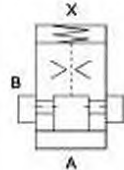
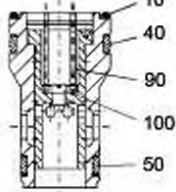
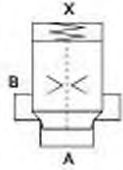
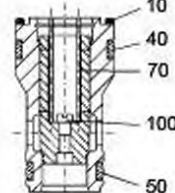
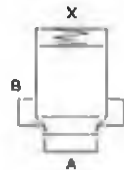
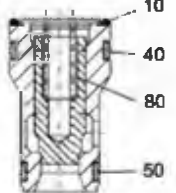
**Part no.**

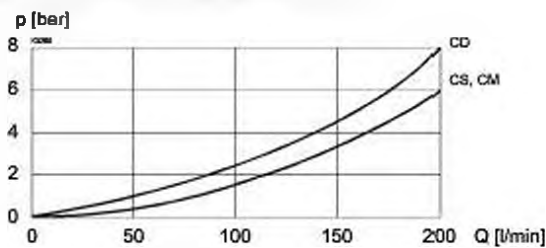
Orifice $\varnothing$	NG3	NG4-Mini	NG6	NG10
$\varnothing 0.6$	212.0481	212.0406	212.0448	
$\varnothing 0.8$		212.0440	212.0416	212.1466
$\varnothing 1.0$		212.0402	212.0407	212.1406
$\varnothing 1.2$		212.0469	212.0425	
$\varnothing 1.5$			212.0445	212.1477
$\varnothing 2.0$				212.1480

**2 position, 2 way cartridge valve**

- $Q_{max} = 200 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**NG 16**  
 ISO 7368


<p><b>Type:</b> CS16-10/..</p> <p><b>General application:</b> Pressure relief valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1</p>	 <p>Opening pressures A → B 0.5; 2.0; 5.0 bar</p>	<p><b>Type:</b> CS16-10/..-C7</p> <p><b>General application:</b> Non return valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>
<p><b>Type:</b> CS16-12/..</p> <p><b>General application:</b> Spool valve</p> <p><b>Type:</b> CS16-12/..-C5</p> <p><b>General application:</b> Poppet valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1,2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>	<p><b>Type:</b> CS16-12/..-C7</p> <p><b>General application:</b> Non return valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1,2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>
<p><b>Type:</b> CS16-20/..</p> <p><b>General application:</b> Spool valve</p> <p><b>Type:</b> CS16-20/..-C5</p> <p><b>General application:</b> Poppet valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>	<p><b>Type:</b> CM16-10/..</p> <p><b>General application:</b> Pressure reducing valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1</p>	 <p>Closing pressure: B → A 3.0 bar</p>
<p><b>Type:</b> CD16-12/..</p> <p><b>General application:</b> Flow valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1,2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>	<p><b>Type:</b> CD16-20/..</p> <p><b>General application:</b> Flow valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure loss / flow characteristics


Opening pressures B→A = f (Area ratio opening pressure A→B)

Area ratio	Opening pressure [bar]	
	A → B	B → A
1:1,2	0,5	2,5
1:1,2	2,0	10,0
1:1,2	5,0	25,0
1:2	0,5	0,5
1:2	2,0	2,0
1:2	5,0	5,0

**GENERAL SPECIFICATIONS**

Design	2 way cartridge valve
Installation	any
Installation dimension	to ISO 7368 / DIN 24342 refer to data sheet: 12.13-1021
Ambient temp.	-20...+50 °C
Weight spool	m = 0,050 kg
Weight total	m = 0,180 kg

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination	ISO 4406:1999, class 18/16/13
Efficiency	Required filtration grade (88...10≥75) (refer to data sheet Nr. 1.0-50/2)
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Working pressure	p <sub>max</sub> = 350 bar (connections A, B, X)
Max. volume flow	Q <sub>max</sub> = 200 l/min
Pilot oil volume	Q <sub>pr</sub> = 1.0 cm <sup>3</sup>

**TYPE CODE**

Slip-in cartridge			C	<input type="checkbox"/>	16	-	<input type="checkbox"/>	/	<input type="checkbox"/>	/	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>	
Poppet spool			S													
Poppet spool with damping			D													
Spool			M													
Size	16															
Area ratio	1:1	<input type="checkbox"/>	10													
	1:1,2	<input type="checkbox"/>	12													
	1:2	<input type="checkbox"/>	20	+												
Opening pressure A → B	0 bar (no spring)	<input type="checkbox"/>	0													
	0.5 bar	<input type="checkbox"/>	05													
	2.0 bar	<input type="checkbox"/>	20													
	3.0 bar	<input type="checkbox"/>	30													
	5.0 bar	<input type="checkbox"/>	50													
Orifice in poppet spool	plugged	<input type="checkbox"/>	0													
	0.4 mm	<input type="checkbox"/>	0.4													
	0.6 mm	<input type="checkbox"/>	0.6													
	usw.															
Omit if ordered without orifice or plug																
+ Omitted as no provision for orifice made																
Special features			C7													
Check function X connected to B port			C5													
additional seal on poppet spool																
Design-Index (subject to change)																

**PARTS LIST**

Position	Article	Description
10	160.2266	O-Ring ID 26,64x2,62
30	160.2120	O-Ring ID 12,42x1,78
40	049.0320	Cover-Seal PU 83 rd 32/27,5x5,1
50	049.0251	Cover-Seal PU 83 rd 25/20,5x5,2
60	53.2604	Spring 1,25x9,8x38,6
	53.4100	Spring 1,6x9,8x40,8
	53.5101	Spring 2x10x39,8
70	53.2603	Spring 1,1x9,7x37,5
	53.3602	Spring 1,5x9,8x39,2
	53.4601	Spring 1,8x9,8x39,3

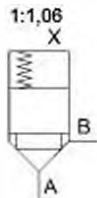
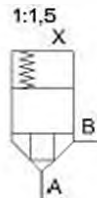
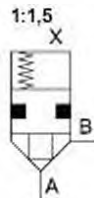
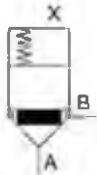
Position	Article	Description
80	53.2104	Spring 1x10x28,6
	53.2602	Spring 1,1x9,7x33,7
	53.3601	Spring 1,5x9,8x32
90	53.5201	Spring 1,9x10,8x29
100	246.1003	Cyl. screw M4x4 VSM 213302
	117.1001	Orifice bing M4 / 0,4
	117.1003	Orifice bing M4 / 0,6
	117.1005	Orifice bing M4 / 0,8
	117.1007	Orifice bing M4 / 1,0
110	246.1003	Cyl. screw M4x4 VSM 213302

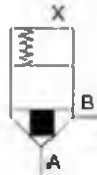
**2/2-way slip-in cartridge valves**

- $Q_{max} = 360$  l/min
- $p_{max} = 630$  bar

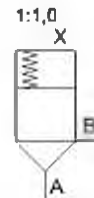
**NG 16**  
 DIN ISO 7368

**2/2-WAY FUNCTION**

 Area ratio  
 A:X

 CSEN16-11  
 Standard

 CSEN16-15  
 Standard

 CLEN16-15  
 with seal  
 B → X

 Type  
 Execution

 CDEN16-11  
 with damping

 CDEN16-15  
 with damping

**PRESSURE RELIEF**

 Area ratio  
 A:X

 Type  
 Execution

 CPEN16-10  
 Standard

**TYPE CODE**
**2/2-way slip-in cartridge valve**

Seal construction	S	
Seal construction with seal	L	
Seal construction with damping	D	
Pressure function	P	
Nominal size 16, Enhanced		
Area ratio	1:1	10 For pressure function only
	1:1,06	11
	1:1,5	15
Opening pressure A to B	0 bar (without spring)	0 Not for type CLEN
Nominal	0,5 bar	05 Not for type CLEN
	1,0 bar	10
	2,0 bar	20
	4,0 bar	40
Orifice in poppet spool	closed	
Sealing material	NBR	
	FKM	D1 (Viton)

 C  EN16 -  /  /  /  -  # 

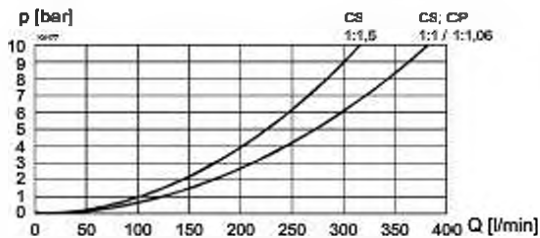
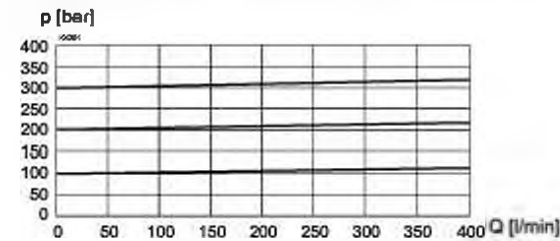
Design-Index (subject to change)

**GENERAL SPECIFICATIONS**

Construction	2/2-way slip-in cartridge valves
Mounting position	any
Mounting dimensions	according to DIN ISO 7368
Ambient temperature	-30...+80 °C
Weight spool	m = 0,035 kg (1:1,5)
Weight total	m = 0,180 kg (1:1,5; without spring)
MTTFd	150 years

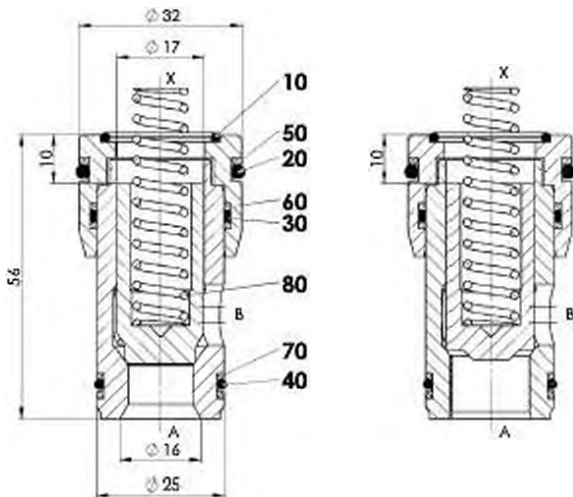
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade B6...10≥75) refer to data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+80 °C (FKM) -30...+80 °C (NBR)
Operating pressure	$p_{max} = 630$ bar (connections A, B, X) CLEN $p_{max} = 420$ bar CPEN connection X, X-A < 420 bar max. cover pressure to be observed
Max. volume flow	$Q_{max} = 360$ l/min at v = 30 m/s
Pilot oil volume	$Q_{oil} = 2,2$ cm <sup>3</sup>

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure drop / volume flow characteristics

 $p = f(Q)$  Pressure volume flow characteristics

**DIMENSIONS**

CSEN16-15

CPEN16-10


**INSTALLATION NOTES**

Mounting type	Slip-in cartridge
Mounting position	Any, preferably horizontal
Dismounting	Dismounting tool DW-C.E.16 Article no. 983.3015

**Note!** The length of the cover fixing screws to be used depends on the base material of the valve body and on the maximum system pressure.

**CHARACTERISTICS**

Nominal	Opening pressure [bar]			
	0,5	1,0	2,0	4,0

Area ratio	Flow direction A to B			
	1:1	0,4	0,8	1,6
1:1,06	0,4	0,9	1,7	3,4
1:1,5	0,6	1,2	2,5	4,9

Area ratio	Flow direction B to A			
	1:1	-	-	-
1:1,06	6,3	12,5	25,1	50,1
1:1,5	1,1	2,2	4,4	8,8

Pressure spring	Article no.			
		053.2201	053.2702	053.3203

**PARTS LIST**

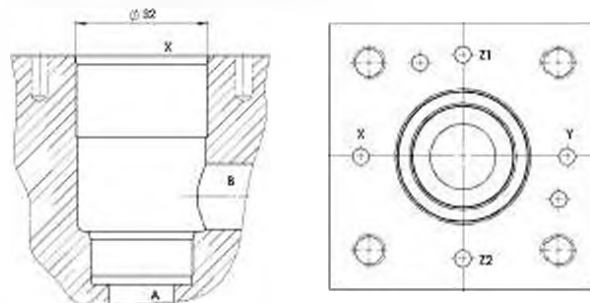
Position	Description	Seal kit
10	O-ring ID 20,35 x 1,78	-
20	O-ring ID 26,64 x 2,62	-
30	O-ring ID 25,12 x 1,78	-
40	O-ring ID 21,95 x 1,78	-
50	Backup ring rd 25,7 x 29,8 x 1,4	-
60	Backup ring rd 25,0 x 27,7 x 1,4	-
70	Backup ring rd 20,1 x 22,8 x 1,4	-
80	Pressure spring 10,9	-

**SEAL KIT**

251.6810	Seal kit C.E.16	NBR
251.6811	Seal kit C.E.16	VITON

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7368



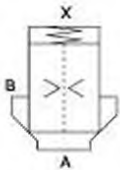
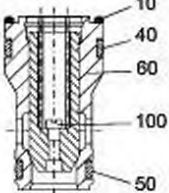

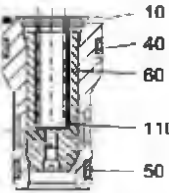
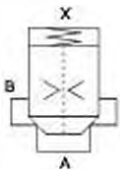
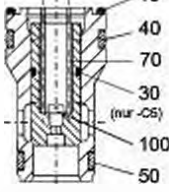
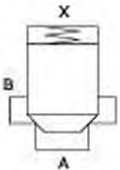
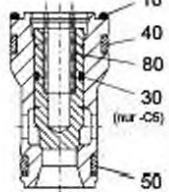
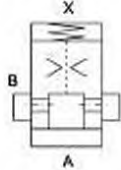
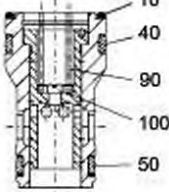
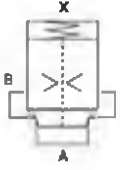
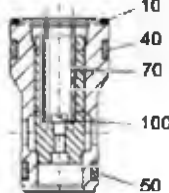

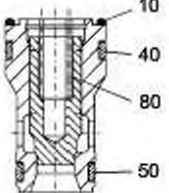
**Important!** For detailed cavity drawing and cavity tools see data sheet 2.13-1021

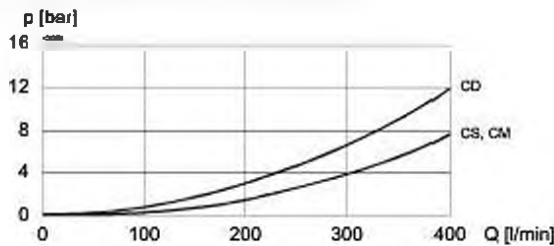


**2 position, 2 way cartridge valve**

- $Q_{max} = 400 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**NG 25**  
 ISO 7368


<p><b>Type:</b> CS25-10/..</p> <p><b>General application:</b> Pressure relief valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>	<p><b>Type:</b> CS25-10/..-C7</p> <p><b>General application:</b> Non-return valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>
<p><b>Type:</b> CS25-12/..</p> <p><b>General application:</b> Spool valve</p> <p><b>Type:</b> CS25-12/..-C5</p> <p><b>General application:</b> Poppet valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1,2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>			
<p><b>Type:</b> CS25-20/..</p> <p><b>General application:</b> Spool valve</p> <p><b>Type:</b> CS25-20/..-C5</p> <p><b>General application:</b> Poppet valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>	<p><b>Type:</b> CM25-10/..</p> <p><b>General application:</b> Pressure reducing valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1</p>	 <p>Closing pressure: B → A 3.0 bar</p>
<p><b>Type:</b> CD25-12/..</p> <p><b>General application:</b> Flow valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1,2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>	<p><b>Type:</b> CD25-20/..-</p> <p><b>General application:</b> Flow valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure loss / flow characteristics


Opening pressure B→A = f (Area ratio Opening pressure A→B)

Area ratio	Opening pressure [bar]	
	A → B	B → A
1:1,2	0.5	2.5
1:1,2	2.0	10.0
1:1,2	5.0	25.0
1:2	0.5	0.5
1:2	2.0	2.0
1:2	5.0	5.0

**GENERAL SPECIFICATIONS**

Design	2 way cartridge valve
Installation	any
Installation dimension	to ISO 7368 / DIN 24 342 refer to data sheet 1 2.13-1022
Ambient temp.	-20... +50 °C
Weight spool	m = 0,140 kg
Weight total	m = 0,420 kg

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination	ISO 4408:1999, class 18/16/13
Efficiency	Required filtration grade (88...10>75) (refer to data sheet Nr. 1.0-50/2)
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20... +70 °C
Working pressure	$p_{max} = 350 \text{ bar}$ (connections A, B, X)
Max. volume flow	$Q_{max} = 400 \text{ l/min}$
Pilot oil volume	$Q_{pilot} = 3,7 \text{ cm}^3$

**TYPE CODE**

Slip-in cartridge

Poppet spool	S
Poppet spool with damping	D
Spool	M

Size 25

Area ratio	1:1	10
	1:1,2	12
	1:2	20

Opening pressure A → B	0 bar (no spring)	0
	0.5 bar	05
	2.0 bar	20
	3.0 bar (only CM)	30
	5.0 bar	50

Orifice in poppet spool	plugged	0
	0.4 mm	0.4
	0.6 mm	0.6
	usw.	

 Omit if ordered without orifice or plug  
 \* Omitted as no provision for orifice made

**Special features**

Check function X connected to B part	C7
additional seal on poppet spool	C5
Design-Index (subject to change)	

 C  25 -  /  /  -  # 
**PARTS LIST**

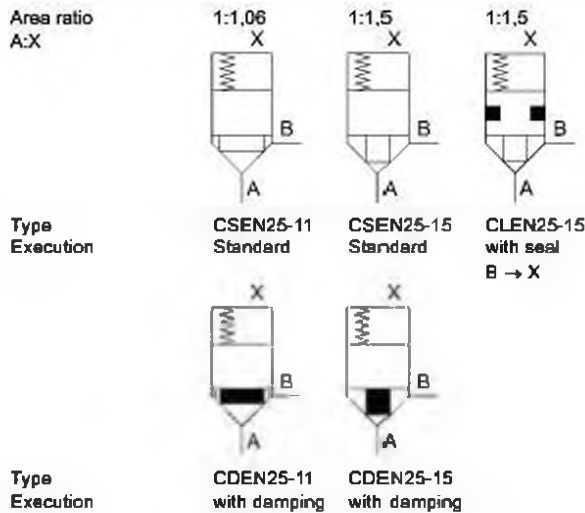
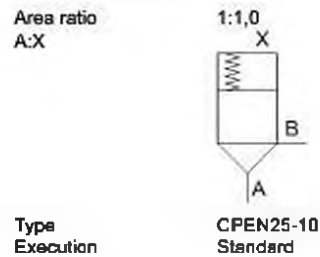
Position	Article	Description
10	160.2372	O-Ring ID 37,70x3,53
30	160.2203	O-Ring ID 20,29x2,62
40	049.0450	Cover-Seal PU 83 rd 45/38,8x8,1
50	049.0340	Cover-Seal PU 83 rd 34/28,5x5,1
60	053.4801	Spring 1,8x15,7x80,2
	053.6302	Spring 2,4x15,7x82,2
	052.6701	Spring 2,8x15x64
70	053.4300	Spring 1,8x15,7x57,3
	053.5800	Spring 2,25x15,7x59,5
	053.6800	Spring 2,6x15,7x62,3

Position	Article	Description
80	053.2800	Spring 1,1x15,2x57,6
	053.4301	Spring 1,7x15,7x56,2
	053.5900	Spring 2,1x15,7x60,5
90	053.6301	Spring 2,3x15,3x34
100	246.1003	Cyl. screw M4x4 VSM 213302
	118.1041	Orifice M4 / 0,4
	117.1003	Orifice bing M4 / 0,6
	117.1005	Orifice bing M4 / 0,8
	117.1007	Orifice bing M4 / 1,0
110	246.1003	Cyl. screw M4x4 VSM 213302

**2/2-way slip-in cartridge valves**

- $Q_{max} = 880 \text{ l/min}$
- $p_{max} = 630 \text{ bar}$

**NG 25**  
 DIN ISO 7368

**2/2-WAY FUNCTION**

**PRESSURE RELIEF**

**TYPE CODE**

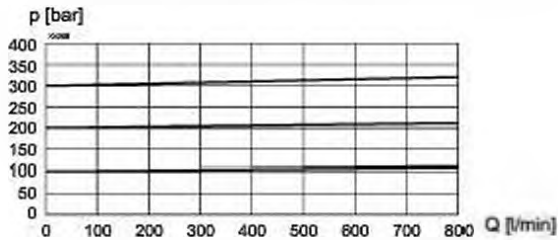
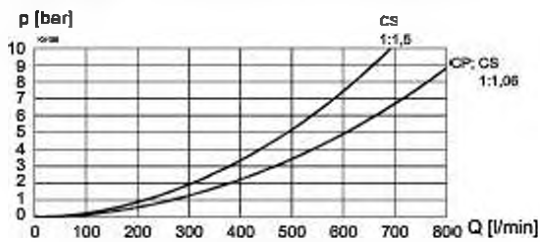
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<b>2/2-way slip-in cartridge valve</b>															
Seal construction		S													
Seal construction with seal		L													
Seal construction with damping		D													
Pressure function		P													
Nominal size 25, Enhanced															
Area ratio	1:1	10	For pressure function only												
	1:1,06	11													
	1:1,5	15													
Opening pressure A to B	0 bar (without spring)	0	Not for type CLEN												
Nominal	0,5 bar	05	Not for type CLEN												
	1,0 bar	10													
	2,0 bar	20													
	4,0 bar	40													
Orifice in poppet spool	closed														
Sealing material	NBR														
	FKM	D1 (Viton)													
Design-Index (subject to change)															

**GENERAL SPECIFICATIONS**

Construction	2/2-way slip-in cartridge valves
Mounting position	any
Mounting dimensions	according to DIN ISO 7368
Ambient temperature	-30...+80 °C
Weight spool	m = 0,12 kg (1:1,5)
Weight total	m = 0,44 kg (1:1,5; without spring)
MTTFd	150 years

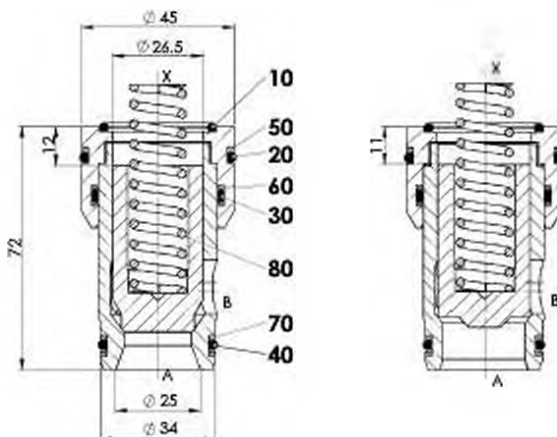
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade β6...10 > 75) refer to data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+80 °C (FKM) -30...+80 °C (NBR)
Operating pressure	$p_{max} = 630 \text{ bar}$ (connections A, B, X) CLEN $p_{max} = 420 \text{ bar}$ CPEN connection X, X-A = < 420 bar max. cover pressure to be observed
Max. volume flow	$Q_{max} = 880 \text{ l/min}$ at v = 30 m/s
Pilot oil volume	$Q_p = 6,5 \text{ cm}^3$

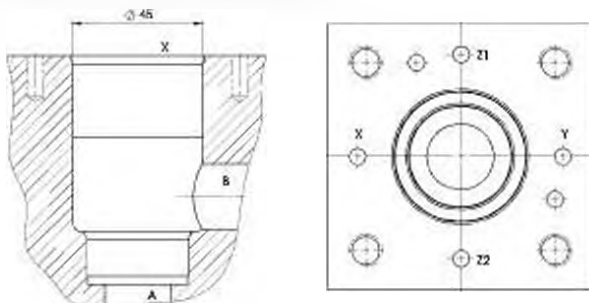
**CHARACTERISTICS** Oil viscosity  $\nu_1 = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure drop / volume flow characteristics

**DIMENSIONS**

CSEN25-15

CPEN25-10


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7368


**CHARACTERISTICS**

Nominal	Opening pressure [bar]			
	0,5	1,0	2,0	4,0

Area ratio	Flow direction A to B			
	1:1	0,4	0,8	1,6
1:1,06	0,4	0,9	1,7	3,4
1:1,5	0,6	1,2	2,5	4,9

Area ratio	Flow direction B to A			
	1:1	-	-	-
1:1,06	6,1	12,3	24,5	49,1
1:1,5	1,1	2,2	4,4	8,7

Pressure spring	Article no.			
		053.3804	053.4804	053.5806

**PARTS LIST**

Position	Description	Seal kit
10	O-ring ID 29,82 x 2,62	-
20	O-ring ID 39,34 x 2,62	-
30	O-ring ID 34,59 x 2,62	-
40	O-ring ID 28,24 x 2,62	-
50	Backup ring rd 38,5 x 42,6 x 1,4	
60	Backup ring rd 35,0 x 39,1 x 1,4	
70	Backup ring rd 27,6 x 31,7 x 1,4	
80	Pressure spring 16,8	

**SEAL KIT**

251.7410	Seal kit C.E.25	NBR
251.7411	Seal kit C.E.25	VITON

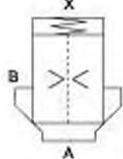
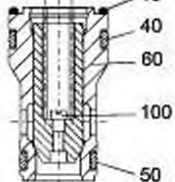
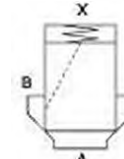
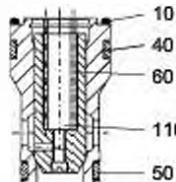
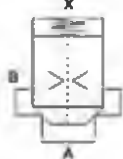
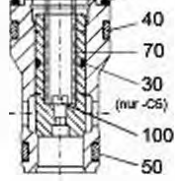
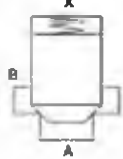
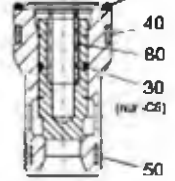
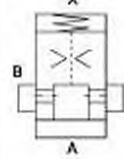
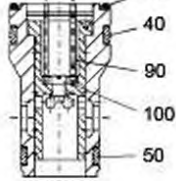
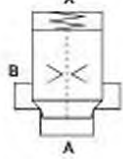
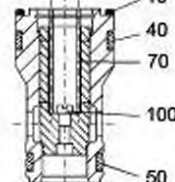
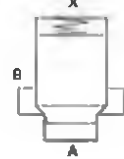
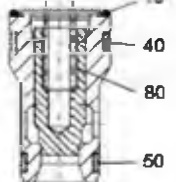
**INSTALLATION NOTES**

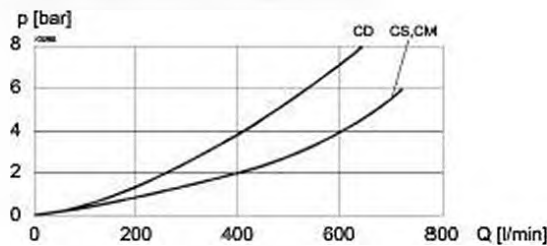
Mounting type	Slip-in cartridge
Mounting position	Any, preferably horizontal
Dismounting	Dismounting tool DW-C.E.25 Article no. 983.3014

**2 position, 2 way cartridge valve**

- $Q_{max} = 700 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**NG 32**  
 ISO 7368


<p><b>Type:</b> CS32-10/..</p> <p><b>General application:</b> Pressure relief valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>	<p><b>Type:</b> CS32-10/..-C7</p> <p><b>General application:</b> Non-return valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>
<p><b>Type:</b> CS32-12/..</p> <p><b>General application:</b> Spool valve</p> <p><b>Type:</b> CS32-12/..-C5</p> <p><b>General application:</b> Poppet valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1,2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>			
<p><b>Type:</b> CS32-20/..</p> <p><b>General application:</b> Spool valve</p> <p><b>Type:</b> CS32-20/..-C5</p> <p><b>General application:</b> Poppet valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>	<p><b>Type:</b> CM32-10/..</p> <p><b>General application:</b> Pressure reducing valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1</p>	 <p>Closing pressure: B → A 3.0 bar</p>
<p><b>Type:</b> CD32-12/..</p> <p><b>General application:</b> Flow valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1,2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>	<p><b>Type:</b> CD32-20/..</p> <p><b>General application:</b> Flow valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure loss / flow characteristics


Opening pressure B→A = f (Area ratio opening pressure A→B)

Area ratio	Opening pressure [bar]	
	A → B	B → A
1:1,2	0.5	2.5
1:1,2	2.0	10.0
1:1,2	5.0	25.0
1:2	0.5	0.5
1:2	2.0	2.0
1:2	5.0	5.0

**GENERAL SPECIFICATIONS**

Design	2 way cartridge valve
Installation	any
Installation dimension	to ISO 7368 / DIN 24 342 refer to data sheet 2.13-1023
Ambient temp.	-20...+50 °C
Weight spool	m = 0,267 kg
Weight total	m = 0,895 kg

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination	ISO 4406:1999, class 18/16/13
Efficiency	Required filtration grade (β <sub>0.6...10</sub> :75) (refer to data sheet Nr. 1.0-50/2)
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Working pressure	p <sub>max</sub> = 350 bar (Connections A, B, X)
Max. volume flow	Q <sub>max</sub> = 700 l/min
Pilot oil volume	Q <sub>pr</sub> = 7,8 cm <sup>3</sup>

**TYPE CODE**

Slip-in cartridge		C	<input type="checkbox"/>	32	-	<input type="checkbox"/>	/	<input type="checkbox"/>	/	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Poppet spool		S												
Poppet spool with damping		D												
Spool		M												
Size	32													
Area ratio	1:1	10												
	1:1,2	12												
	1:2	20	*											
Opening pressure A → B	0 bar (no spring)	0												
	0.5 bar	05												
	2.0 bar	20												
	3.0 bar	30												
	5.0 bar	50												
Orifice in poppet spool	plugged	0												
	0.4 mm	0.4												
	0.6 mm	0.6												
	USW.													
Omit if ordered without orifice or plug														
* Omitted as no provision for orifice made														
Special features														
Check function X connected to B part		C7												
additional seal on poppet spool		C5												
Design-Index (subject to change)														

**PARTS LIST**

Position	Article	Description
10	180.2522	O-Ring ID 52,39x3,53
30	180.2266	O-Ring ID 26,64x2,62
40	49.0800	Cover-Seal PU 83 rd 60/53,8x6,1
50	49.0451	Cover-Seal PU 83 rd 45/40,5x5,1
80	53.5401	Spring 2x20,5x82,1
	53.6901	Spring 2,8x20,5x83,7
	53.7900	Spring 3,8x20,5x78,4
70	53.4900	Spring 1,8x20,5x79,4
	53.6902	Spring 2,8x20,5x78,3
	53.7403	Spring 3,4x20,5x77,5

Position	Article	Description
80	53.3900	Spring 1,5x20,5x70,2
	53.5901	Spring 2,2x20,5x87,3
	53.7404	Spring 3x20,5x83,5
90	52.6405	Spring 2,5x22,5x54
100	246.1003	Cyl. screw M4x4 VSM 213302
	117.1001	Orifice bing M4 / 0,4
	117.1003	Orifice bing M4 / 0,6
	117.1005	Orifice bing M4 / 0,8
	117.1007	Orifice bing M4 / 1,0
110	246.1003	Cyl. screw M4x4 VSM 213302

**2/2-way slip-in cartridge valves**

- $Q_{max} = 1450 \text{ l/min}$
- $p_{max} = 630 \text{ bar}$

**NG 32**  
 DIN ISO 7368

**2/2-WAY FUNCTION**

Area ratio A:X	1:1,06 X	1:1,5 X	1:1,5 X
Type Execution	CSEN32-11 Standard	CSEN32-15 Standard	CLEN32-15 with seal B → X
Type Execution	CDEN32-11 with damping	CDEN32-15 with damping	

**PRESSURE RELIEF**

Area ratio A:X	1:1,0 X
Type Execution	CPEN32-10 Standard

**TYPE CODE**
**2/2-way slip-in cartridge valve**

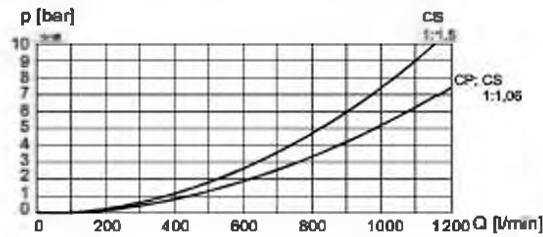
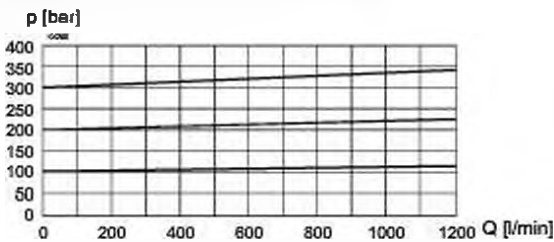
			C	EN32	-	/	/	/	-	#
Seal construction		S								
Seal construction with seal		L								
Seal construction with damping		D								
Pressure function		P								
Nominal size 32, Enhanced										
Area ratio	1:1	10								
	1:1,06	11								
	1:1,5	15								
Opening pressure A to B	0 bar (without spring)	0								
Nominal	0.5 bar	05								
	1.0 bar	10								
	2.0 bar	20								
	4.0 bar	40								
Orifice in poppet spool	closed									
Sealing material	NBR									
	FKM	D1 (Viton)								
Design-Index (subject to change)										

**GENERAL SPECIFICATIONS**

Construction	2/2-way slip-in cartridge valves
Mounting position	any
Mounting dimensions	according to DIN ISO 7368
Ambient temperature	-30...+80 °C
Weight spool	m = 0,25 kg (1:1,5)
Weight total	m = 0,93kg (1:1,5; without spring)
MTTFd	150 years

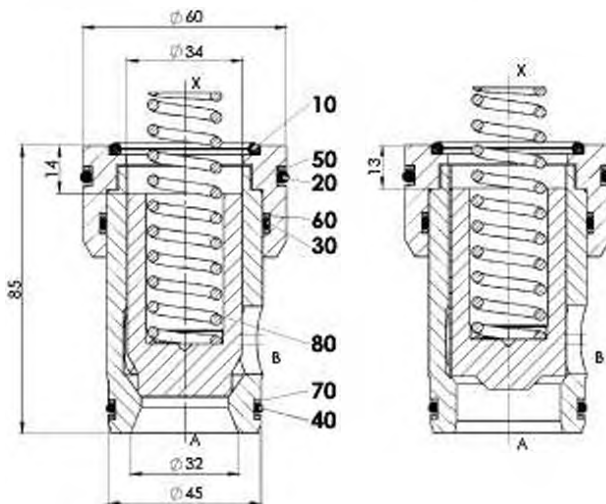
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/18/13 (Required filtration grade $\beta_{6...10} > 75$ ) refer to data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Fluid temperature	-20...+80 °C (FKM) -30...+80 °C (NBR)
Operating pressure	$p_{max} = 630 \text{ bar}$ (connections A, B, X) CLEN $p_{max} = 420 \text{ bar}$ CPEN connection X, X-A = < 420 bar max. cover pressure to be observed
Max. volume flow	$Q_{max} = 1450 \text{ l/min}$ at v = 30 m/s
Pilot oil volume	$Q_p = 12,7 \text{ cm}^3$

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure drop / volume flow characteristics

 $p = f(Q)$  Pressure volume flow characteristics

**DIMENSIONS**

CSEN32-15

CPEN32-10


**INSTALLATION NOTES**

Mounting type	Slip-in cartridge
Mounting position	Any, preferably horizontal
Dismounting	Dismounting tool DW-C.E.32 Article no. 983 3013



**Note!** The length of the cover fixing screws to be used depends on the base material of the valve body and on the maximum system pressure.

**CHARACTERISTICS**

Nominal	Opening pressure [bar]			
	0,5	1,0	2,0	4,0

Area ratio	Flow direction A to B			
	1:1	0,4	0,8	1,6
1:1,06	0,4	0,9	1,7	3,4
1:1,5	0,6	1,2	2,5	4,9

Area ratio	Flow direction B to A			
	1:1	-	-	-
1:1,06	8,3	12,5	25,1	50,1
1:1,5	1,1	2,2	4,4	8,8

Pressure spring	Article no.			
	053.5405	053.5902	053.6903	053.7410

**PARTS LIST**

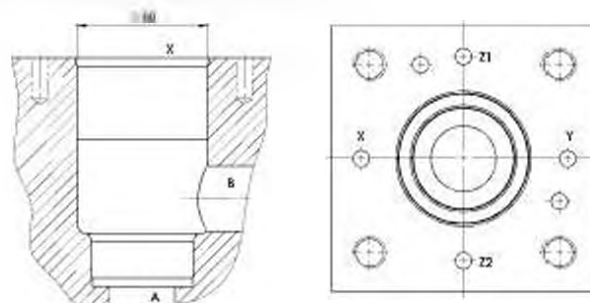
Position	Description	Seal kit
10	O-ring ID 37,70 x 3,53	-
20	O-ring ID 52,39 x 3,53	-
30	O-ring ID 45,69 x 2,62	-
40	O-ring ID 38,34 x 2,62	-
50	Backup ring rd 51,7 x 57,3 x 1,4	-
60	Backup ring rd 46,0 x 50,1 x 1,4	-
70	Backup ring rd 38,5 x 42,6 x 1,4	-
80	Pressure spring 21,8	-

**SEAL KIT**

251.6810	Seal kit C.E.32	NBR
251.6811	Seal kit C.E.32	VIITON

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7368



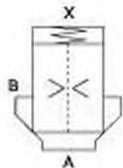
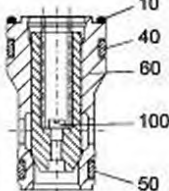
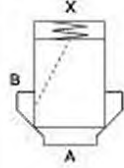
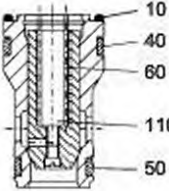
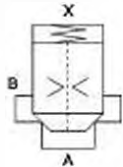
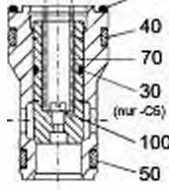

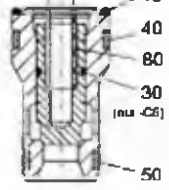
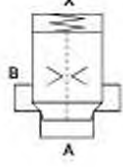
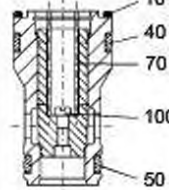

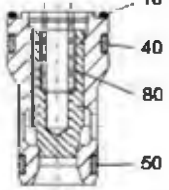
**Important!** For detailed cavity drawing and cavity tools see data sheet 2.13-1023

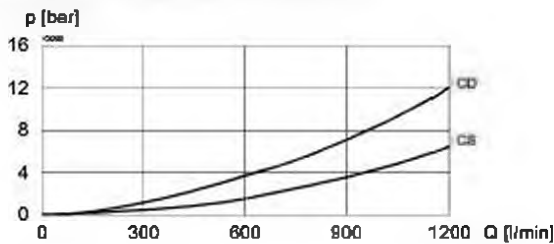


**2 position, 2 way cartridge valve**

- $Q_{max} = 1'200 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**NG 40**  
 ISO 7368


<p><b>Type:</b> CS40-10/..</p> <p><b>General application:</b> Pressur relief valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>	<p><b>Type:</b> CS40-10/..-C7</p> <p><b>General application:</b> Non-return valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>
<p><b>Type:</b> CS40-12/..</p> <p><b>General application:</b> Spool valve</p> <p><b>Type:</b> CS40-12/..-C5</p> <p><b>General application:</b> Poppet valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1,2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>			
<p><b>Type:</b> CS40-20/..</p> <p><b>General application:</b> Spool valve</p> <p><b>Type:</b> CS40-20/..-C5</p> <p><b>General application:</b> Poppet valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>			
<p><b>Type:</b> CD40-12/..</p> <p><b>General application:</b> Flow valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:1,2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>	<p><b>Type:</b> CD40-20/..</p> <p><b>General application:</b> Flow valve</p>	<p><b>Symbol:</b></p>  <p>Opening ratio: 1:2</p>	 <p>Opening pressure: A → B 0.5; 2.0; 5.0 bar</p>

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure loss / flow characteristics


Opening pressures B→A = f (Area ratio opening pressure A→B)

Area ratio	Opening pressure [bar]	
	A → B	B → A
1:1,2	0.5	2.5
1:1,2	2.0	10.0
1:1,2	5.0	25.0
1:2	0.5	0.5
1:2	2.0	2.0
1:2	5.0	5.0

**GENERAL SPECIFICATIONS**

Design	2 way cartridge valve
Installation	any
Installation dimension	to ISO 7368 / DIN 24342
	refer to data sheet 2.13-1024
Ambient temp.	-20... +50 °C
Weight spool	m = 0,485 kg
Weight total	m = 1,650 kg

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination	ISO 4406:1999, class 18/16/13
Efficiency	Required filtration grade (B8...10≥75) (refer to data sheet Nr. 1.0-50/2)
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20... +70 °C
Working pressure	$p_{\text{max}} = 350 \text{ bar}$ (Connections A, B, X)
Max. volume flow	$Q_{\text{max}} = 1'200 \text{ l/min}$
Pilot oil volume	$Q_{\text{p}} = 15.1 \text{ cm}^3$

**TYPE CODE**

Slip-in cartridge		C	<input type="checkbox"/>	40	-	<input type="checkbox"/>	/	<input type="checkbox"/>	/	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Poppet spool		CS												
Poppet spool with damping		CS												
Size 40														
Area ratio	1:1			10										
	1:1,2			12										
	1:2			20										
Opening pressure A → B: 0 bar (no spring)				0										
	0.5 bar			05										
	2.0 bar			20										
	5.0 bar			50										
Orifice in poppet spool	plugged			0										
	0.4 mm			0.4										
	0.8 mm			0.8										
	usw.													
Omit if ordered without orifice or plug														
+ Omitted as no provision for orifice made														
Special features														
Check function X connected to B port				C7										
additional seal on poppet spool				CS										
Design-Index (subject to change)														

**PARTS LIST**

Position	Article	Description
10	160.2628	O-Ring ID 62,87x5,33
30	160.2328	O-Ring ID 32,92x3,53
40	49.0750	Cover-Seal PU 83 rd 75/65,8x8,8
50	49.0550	Cover-Seal PU 83 rd 55/48,8x6,1
60	53.6403	Spring 2.5x26x105
	53.7902	Spring 3,6x26x104,2
	53.8903	Spring 4.5x26x102,3
70	53.6404	Spring 2.5x26x96,5
	53.7901	Spring 3,6x26x94,7
	53.8400	Spring 4.25x26x98,1

Position	Article	Description
80	53.5400	Spring 2x26x83,6
	53.7402	Spring 3x26x82,7
	53.7903	Spring 3,6x26x83
100	246.1003	Cyl. screw M4x4 VSM 213302
	117.1001	Orifice bing M4 / 0.4
	117.1003	Orifice bing M4 / 0.6
	117.1005	Orifice bing M4 / 0.8
	117.1007	Orifice bing M4 / 1.0
110	246.1003	Cyl. screw M4x4 VSM 213302

**2/2-way slip-in cartridge valves**

- $Q_{max} = 2260$  l/min
- $p_{max} = 630$  bar

**NG 40**  
 DIN ISO 7368

**2/2-WAY FUNCTION**

Area ratio A:X	1:1,06	1:1,5	1:1,5
Type	CSEN40-11	CSEN40-15	CLEN40-15
Execution	Standard	Standard	with seal B → X
Type	CDEN40-11	CDEN40-15	
Execution	with damping	with damping	

**PRESSURE RELIEF**

Area ratio A:X	1:1,0
Type	CPEN40-10
Execution	Standard

**TYPE CODE**

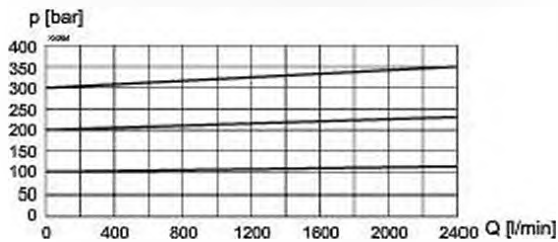
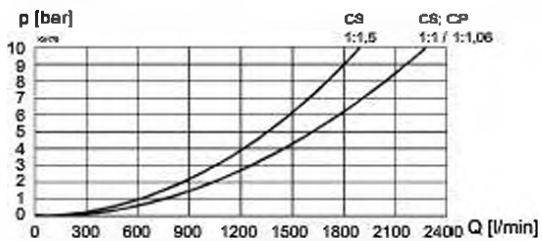
2/2-way slip-in cartridge valve		C		EN40 -		/ / / - / #	
Seal construction	S						
Seal construction with seal	L						
Seal construction with damping	D						
Pressure function	F						
Nominal size 40, Enhanced							
Area ratio	1:1	10	For pressure function only				
	1:1,06	11					
	1:1,5	15					
Opening pressure A to B	0 bar (without spring)	0	Not for type CLEN				
Nominal	0.5 bar	05	Not for type CLEN				
	1.0 bar	10					
	2.0 bar	20					
	4.0 bar	40					
Orifice in poppet spool	closed						
Sealing material	NBR						
	FKM	D1 (Viton)					
Design-index (subject to change)							

**GENERAL SPECIFICATIONS**

Construction	2/2-way slip-in cartridge valves
Mounting position	any
Mounting dimensions	according to DIN ISO 7368
Ambient temperature	-30...+80 °C
Weight spool	m = 0,500 kg (1:1,5)
Weight total	m = 1,742 kg (1:1,5; without spring)
MTTFd	150 years

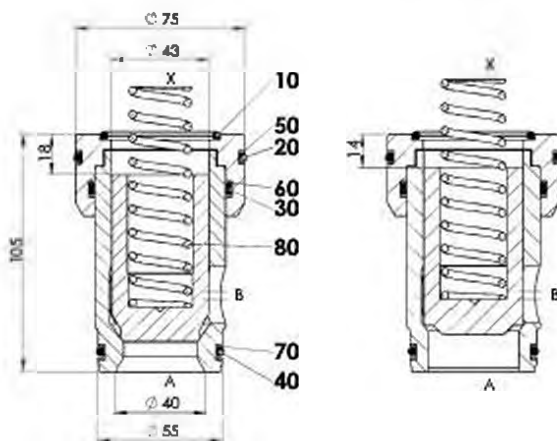
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade B6...10≥75) refer to data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+80 °C (FKM) -30...+80 °C (NBR)
Operating pressure	$p_{max} = 630$ bar (connections A, B, X) CLEN $p_{max} = 420$ bar CPEN connection X, X-A = < 420 bar max. cover pressure to be observed
Max. volume flow	$Q_{max} = 2260$ l/min at v = 30 m/s
Pilot oil volume	$Q_{pilot} = 25,7$ cm <sup>3</sup> $Q_{pilot} = 21,1$ cm <sup>3</sup> (Pressure function)

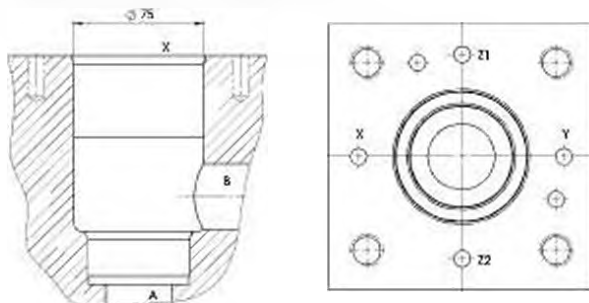
**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure drop / volume flow characteristics

**DIMENSIONS**

CSEN40-15

CPEN40-10


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7368


**CHARACTERISTICS**

Nominal	Opening pressure [bar]			
	0,5	1,0	2,0	4,0

Area ratio	Flow direction A to B			
	1:1	0,4	0,8	1,6
1:1,06	0,4	0,9	1,7	3,4
1:1,5	0,6	1,2	2,5	4,9

Area ratio	Flow direction B to A			
	1:1	-	-	-
1:1,06	6,6	13,2	26,4	52,9
1:1,5	1,1	2,2	4,4	8,7

Pressure spring	Article no.			
		053.8412	053.7418	053.7415

**PARTS LIST**

Position	Description	Seal kit
10	O-ring ID 47,22 x 3,53	-
20	O-ring ID 68,27 x 3,53	-
30	O-ring ID 58,74 x 3,53	-
40	O-ring ID 47,22 x 3,53	-
50	Backup ring rd 68,0 x 71,6 x 1,4	-
60	Backup ring rd 58,0 x 83,6 x 1,4	-
70	Backup ring rd 46,5 x 52,1 x 1,4	-
80	Pressure spring 27,8	-

**SEAL KIT**

251.8810	Seal kit C.E.40	NBR
251.8811	Seal kit C.E.40	VITON

**INSTALLATION NOTES**

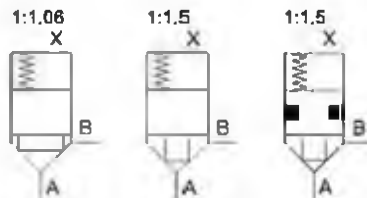
Mounting type	Slip-in cartridge
Mounting position	Any, preferably horizontal
Dismounting	Dismounting tool DW-C.E.40 Article no. 983.3012

**2/2-way slip-in cartridge valves**

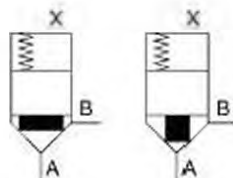
- $Q_{max} = 3530$  l/min
- $p_{max} = 630$  bar

**NG 50**  
 DIN ISO 7368

**2/2-WAY FUNCTION**

 Area ratio  
 A:X

 Type  
 Execution

CSEN50-11	CSEN50-15	CLEN50-15
Standard	Standard	with seal B → X


 Type  
 Execution

CDEN50-11	CDEN50-15
with damping	with damping

**PRESSURE RELIEF**

 Area ratio  
 A:X

 Type  
 Execution

CPEN50-10
Standard

**TYPE CODE**
**2/2-way slip-in cartridge valve**

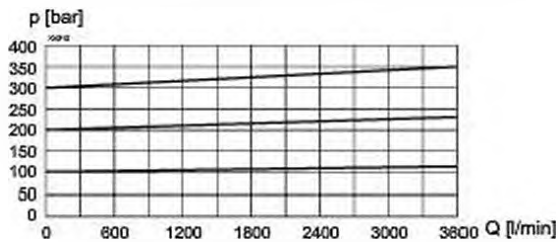
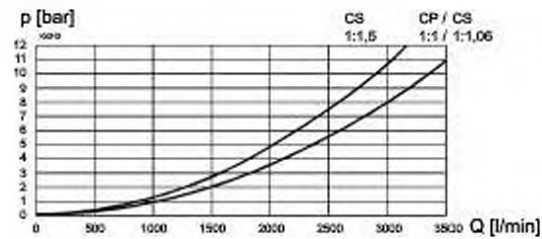
Seal construction	S	
Seal construction with seal	L	
Seal construction with damping	D	
Pressure function	P	
Nominal size 50, Enhanced		
Area ratio	1:1	10 For pressure function only
	1:1.06	11
	1:1.5	15
Opening pressure A to B	0 bar (without spring)	0 Not for type CLEN
Nominal	0.5 bar	05 Not for type CLEN
	1.0 bar	10
	2.0 bar	20
	4.0 bar	40
Orifices in poppet spool	closed	
Sealing material	NBR	
	FKM	:DT (Viton)

 C  EN50 -  /  /  -  # 
**GENERAL SPECIFICATIONS**

Construction	2/2-way slip-in cartridge valves
Mounting position	any
Mounting dimensions	according to DIN ISO 7368
Ambient temperature	-30...+80 °C
Weight spool	m = 0,88 kg (1:1,5)
Weight total	m = 2,88 kg (1:1,5; without spring)
MTTFd	150 years

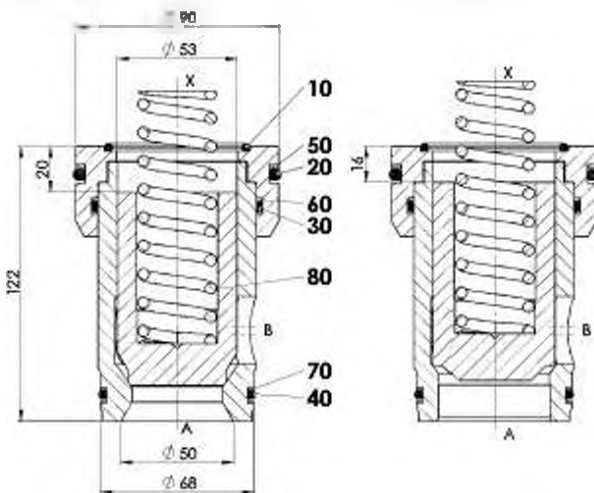
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade B6...10≥75) refer to data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+80 °C (FKM) -30...+80 °C (NBR)
Operating pressure	$p_{max} = 630$ bar (connections A, B, X) CLEN $p_{max} = 420$ bar CPEN connection X, X-A = < 420 bar max. cover pressure to be observed
Max. volume flow	$Q_{max} = 3530$ l/min at v = 30 m/s
Pilot oil volume	$Q_{pilot} = 45,0$ cm <sup>3</sup> $Q_{pilot} = 35,3$ cm <sup>3</sup> (Pressure function)

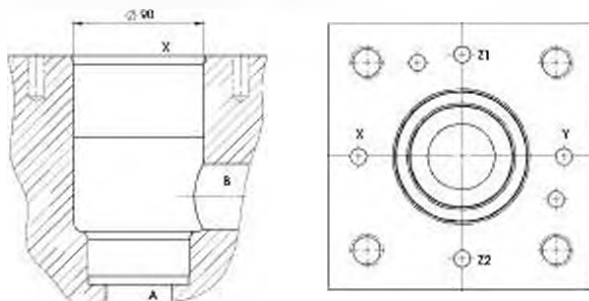
**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure drop / volume flow characteristics

**DIMENSIONS**

CSEN50-15

CPEN50-10


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7368


**CHARACTERISTICS**

Nominal	Opening pressure [bar]			
	0,5	1,0	2,0	4,0

Area ratio	Flow direction A $\rightarrow$ B			
	1:1	0,4	0,8	1,6
1:1,06	0,4	0,9	1,7	3,4
1:1,5	0,6	1,2	2,5	4,9

Area ratio	Flow direction B $\rightarrow$ A			
	1:1	-	-	-
1:1,06	6,5	13,1	26,1	52,3
1:1,5	1,1	2,2	4,4	8,8

Pressure spring	Article no.			
		053.7414	053.7908	053.8405

**PARTS LIST**

Position	Description	Seal kit
10	O-ring ID 58,74 x 3,53	-
20	O-ring ID 78,74 x 5,33	-
30	O-ring ID 69,44 x 3,53	-
40	O-ring ID 59,92 x 3,53	-
50	Backup ring rd 78,4 x 87,1 x 1,7	-
60	Backup ring rd 70,0 x 75,6 x 1,4	-
70	Backup ring rd 59,3 x 64,9 x 1,4	-
80	Pressure spring 34,8	-

**SEAL KIT**

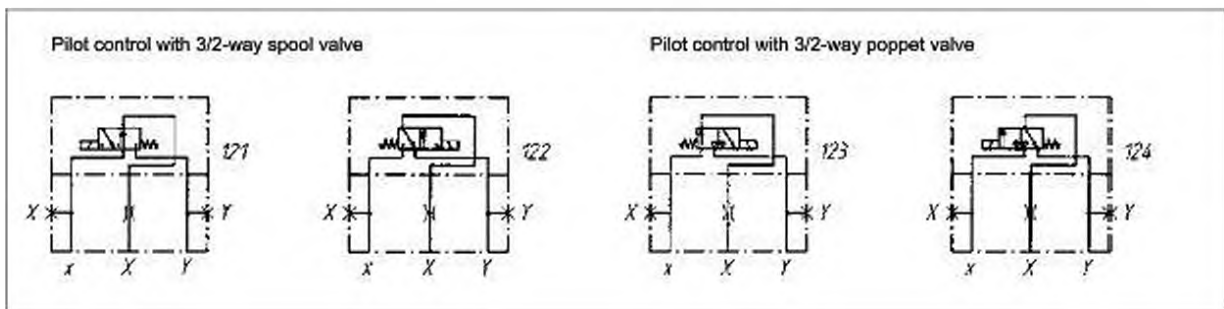
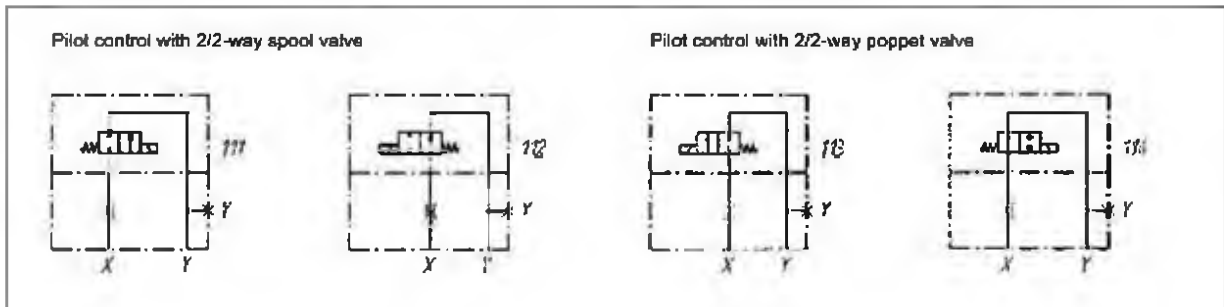
251.8710	Seal kit C.E.50	NBR
251.8711	Seal kit C.E.50	VITON

**INSTALLATION NOTES**

Mounting type	Slip-in cartridge
Mounting position	Any, preferably horizontal
Dismounting	Dismounting tool DW-C.E.50 Article no. 983.3011

Control cover  
 for directional function  
 •  $p_{max} = 350 \text{ bar}$

**NG 16**  
 ISO 7368


**TYPE CODE**

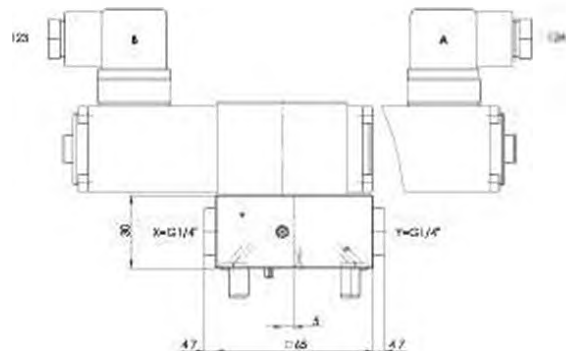
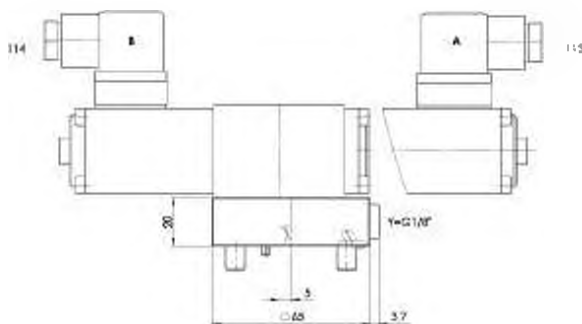
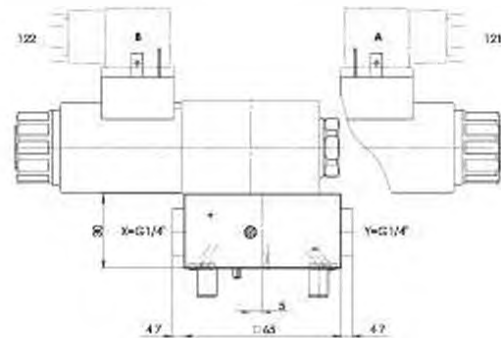
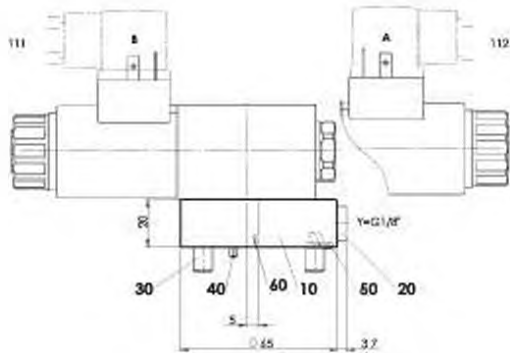
Control cover					D	16		-		/	#
Size 16											
Pilot no. 111...124											
Solenoid type for pilot valve					M	.. / VD (only G12 and G24)					
Standard	111, 112, 121, 122			M	.. / ND						
	113, 114, 123, 124			S							
Nominal voltage $U_n$	12 VDC	G12	115 VAC	R115							
	24 VDC	G24	230 VAC	R230							
Orifice in cover	0.6 mm	0.6									
	1.0 mm	1.0	etc.								
Omit if without orifice											
Design-Index (Subject to change)											

**GENERAL SPECIFICATIONS**

Construction	Control cover for directional function
Mounting position	any
Installation dimension	see dimension to ISO 7368 see data sheet 2.13-1021
Ambient temperature	-25...+70 °C
Fastening torque	$M_0 = 25 \text{ Nm}$ (Qual. 8.8) for fixing screw

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade B6...10>75) see data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s to 320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Operation pressure	$p_{\text{max}} = 350 \text{ bar}$

**DIMENSIONS**

**PILOT VALVES**

Pilot operated valves:	111, 122	WDMFA04-AB2	Data sheet 1.2-33
	112, 121	WDMFA04-AB1	Data sheet 1.2-33
	113	BS22041a	Data sheet 1.11-2120
	114	BS22040b	Data sheet 1.11-2120
	123	BS32040b	Data sheet 1.11-2120
	124	BS32041a	Data sheet 1.11-2120

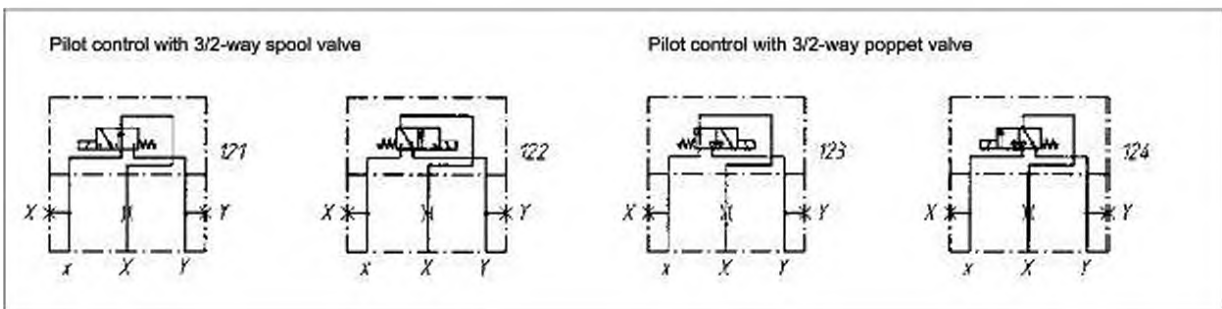
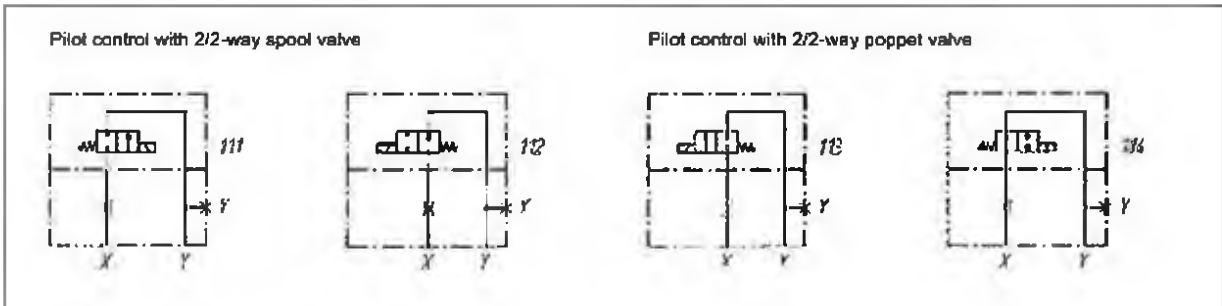
**PARTS LIST**

Position	Article	Description
10	063.0009	Plate to 111, 112, 113, 114
	063.0026	Plate to other types
20	238.1405	Locking screw VSTI G1/8"
	238.2406	Locking screw VSTI G1/4"
30	246.4121	Cylinder screw M8x20 DIN912
	246.4131	Cylinder screw M8x30 DIN912
40	221.2255	Pin Ø3x10 DIN1481
50	160.2061	O-Ring ID 6,02x2,62
60	118.2051	Orifice M5 / 0,6 x 5
	118.2030	Orifice M5 / 0,7 x 5
	118.2032	Orifice M5 / 0,8 x 5
	118.2052	Orifice M5 / 0,8 x 5
	118.2031	Orifice M5 / 1,0 x 5



Control cover  
for directional function  
•  $p_{max} = 350 \text{ bar}$

**NG 25**  
ISO 7368



**TYPE CODE**

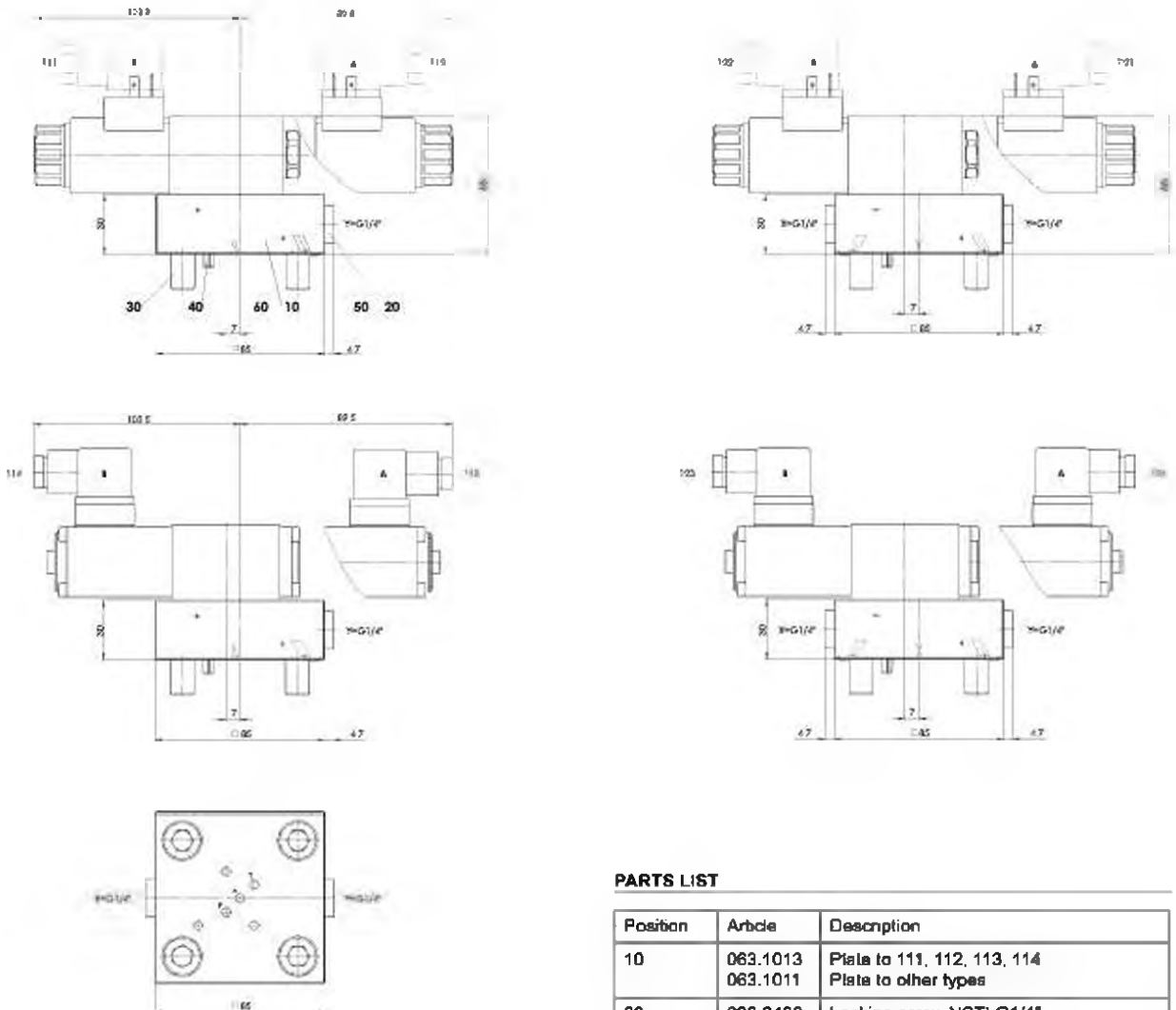
Control cover			D	25	-	/	#
Size	25						
Pilot no.	111...124						
Solenoid type for pilot valve	Standard 111, 112, 121, 122 M ... / VD (only G12 and G24) 113, 114, 123, 124 M ... / ND S						
Nominal voltage $U_n$	12 VDC 24 VDC	G12 G24	115 VAC 230 VAC	R115 R230			
Orifice in cover	0.6 mm 1.0 mm	0.6 1.0	etc.				
Omit if without orifice							
Design-Index (Subject to change)							

**GENERAL SPECIFICATIONS**

Construction	Control cover for directional function
Mounting position	any
Installation dimension	see dimension to ISO 7368 see data sheet 2.13-1022
Ambient temperature	-25...+70 °C
Fastening torque	$M_0 = 80 \text{ Nm}$ (Qual. 8.8) for fixing screw

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade B6...10>75) see data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s to 320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Operation pressure	$p_{\text{max}} = 350 \text{ bar}$

**DIMENSIONS**

**PILOT OPERATED VALVES**

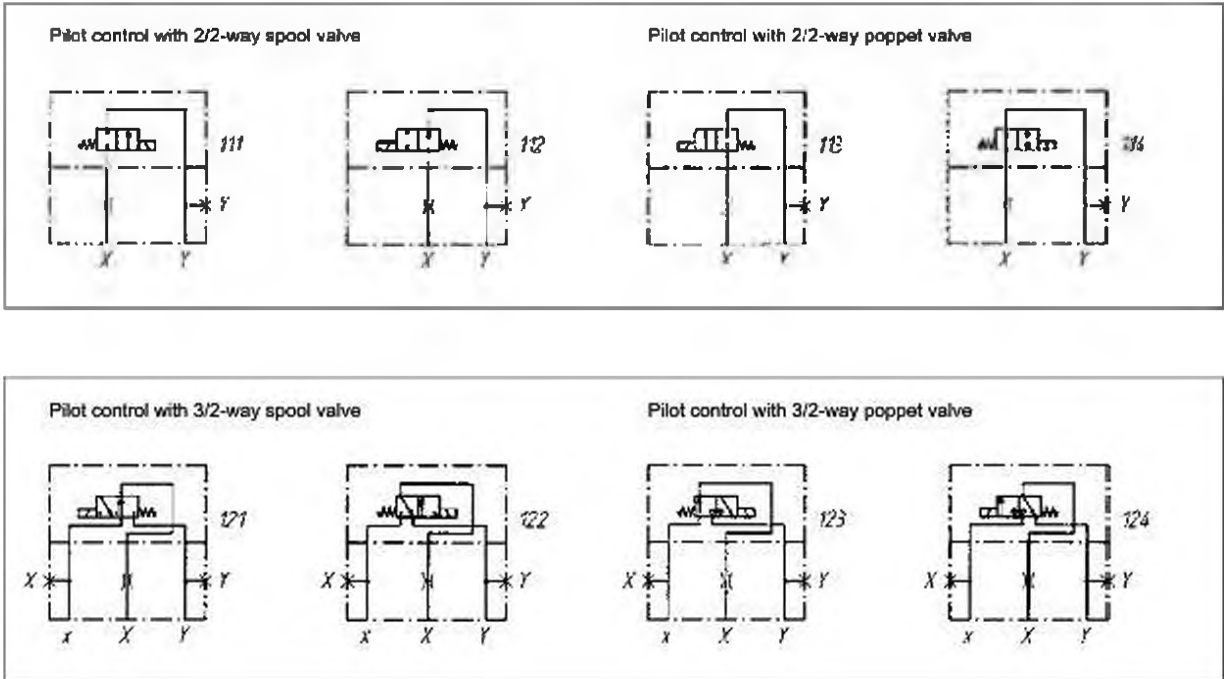
Pilot operated valves:	111, 122	WDMFA04-AB2	Data sheet 1.2-33
	112, 121	WDMFA04-AB1	Data sheet 1.2-33
	113	BS22041a	Data sheet 1.11-2120
	114	BS22040b	Data sheet 1.11-2120
	123	BS32040b	Data sheet 1.11-2120
	124	BS32041a	Data sheet 1.11-2120

**PARTS LIST**

Position	Article	Description
10	063.1013	Plate to 111, 112, 113, 114
	063.1011	Plate to other types
20	238.2406	Locking screw VST1 G1/4"
30	246.8136	Cylinder screw M12x35 DIN912
40	221.2470	Pin $\varnothing 5 \times 16$ DIN 1481
50	160.2092	O-Ring ID 9,19x2,62
60	118.2051	Orifice M5 / 0,6 x 5
	118.2030	Orifice M5 / 0,7 x 5
	118.2032	Orifice M5 / 0,8 x 5
	118.2052	Orifice M5 / 0,9 x 5
	118.2031	Orifice M5 / 1,0 x 5

Control cover  
for directional function  
•  $p_{max} = 350$  bar

**NG 32**  
ISO 7368



**TYPE CODE**

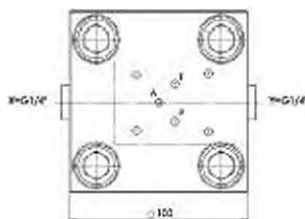
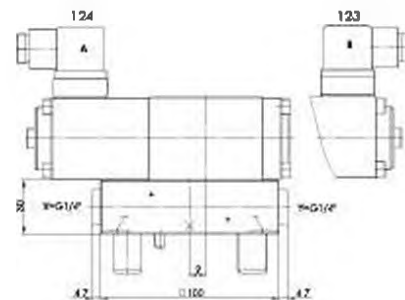
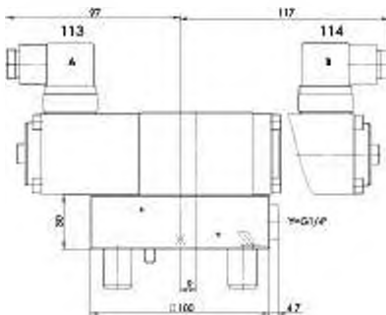
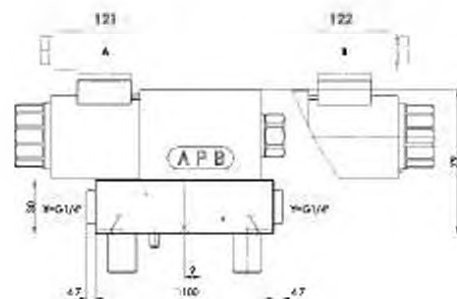
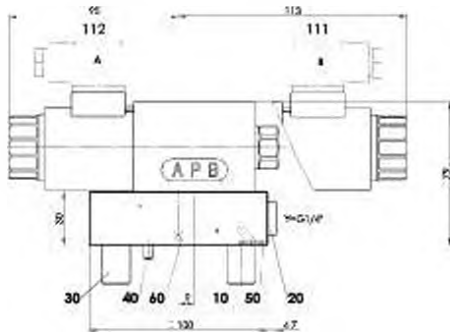
Control cover	D	32		-		/	#
Size 32							
Pilot no. 111...124							
Solenoid type for pilot valve							
Standard	111, 112, 121, 122	M .. / WD					
	113, 114, 123, 124	S					
Nominal voltage $U_n$	12 VDC	G12	115 VAC	R115			
	24 VDC	G24	230 VAC	R230			
Orifice in cover	0.8 mm	0.8					
	1.0 mm	1.0 etc.					
Omit if without orifice							
Design-Index (Subject to change)							

**GENERAL SPECIFICATIONS**

Construction	Control cover for directional function
Mounting position	any
Installation dimension	see dimension to ISO 7368
	see data sheet 2.13-1023
Ambient temperature	-25...+70 °C
Fastening torque	$M_D = 190 \text{ Nm}$ (Qual. 8.8) for fixing screw

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/18/13 (Required filtration grade $\beta_{0.6} \dots 10 > 75$ ) see data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s to 320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Operation pressure	$p_{max} = 350 \text{ bar}$

**DIMENSIONS**

**PILOT OPERATED VALVES**

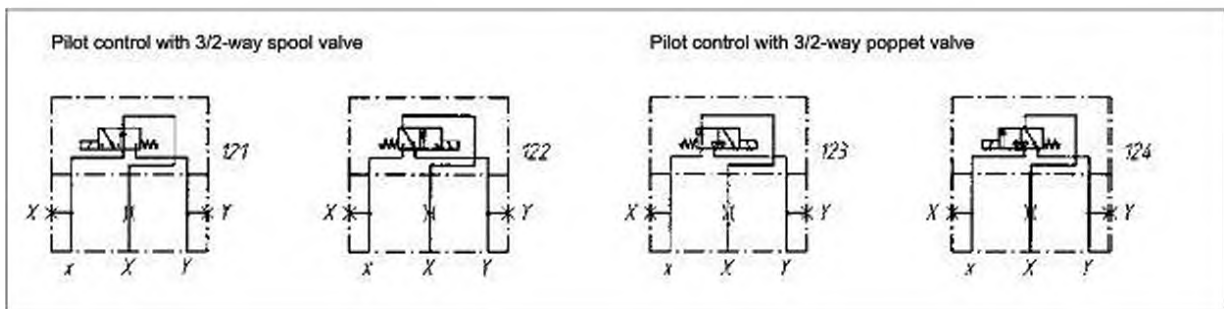
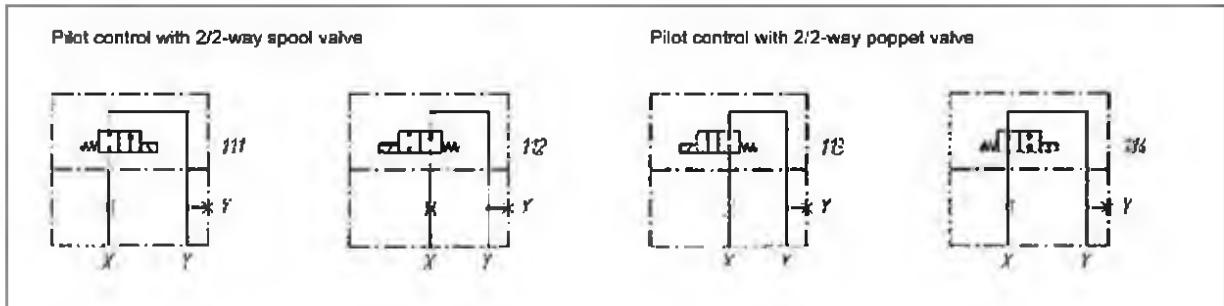
Pilot operated valves:	111, 122	WDMFA06-AB2	Data sheet 1.2-59
	112, 121	WDMFA06-AB1	Data sheet 1.2-59
	113	AS22061a	Data sheet 1.11-2140
	114	AS22060b	Data sheet 1.11-2140
	123	AS32060b	Data sheet 1.11-2140
	124	AS32061a	Data sheet 1.11-2140

**PARTS LIST**

Position	Article	Description
10	063.2030	Plate to 111, 112, 113, 114
	063.2017	Plate to other types
20	238.2406	Locking screw VST1 G1/4"
30	246.7135	Cylinder screw M16x35 DIN912
40	221.2470	Pin $\varnothing 5 \times 16$ DIN 1481
50	160.2092	O-Ring ID 9,19x2,62
60	118.2032	Orifice M5 / 0,8 x 5
	118.2052	Orifice M5 / 0,9 x 5
	118.2031	Orifice M5 / 1,0 x 5
	118.2058	Orifice M5 / 1,2 x 5
	118.2072	Orifice M5 / 1,5 x 5

Control cover  
 for directional function  
 •  $p_{max} = 350 \text{ bar}$

**NG 40**  
 ISO 7368


**TYPE CODE**

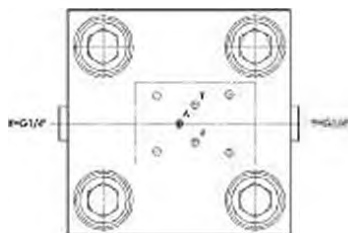
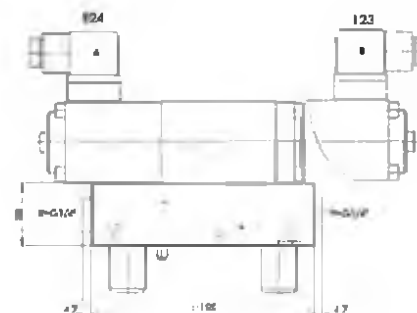
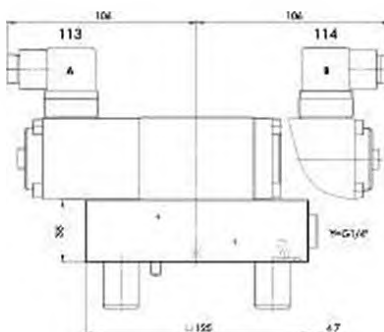
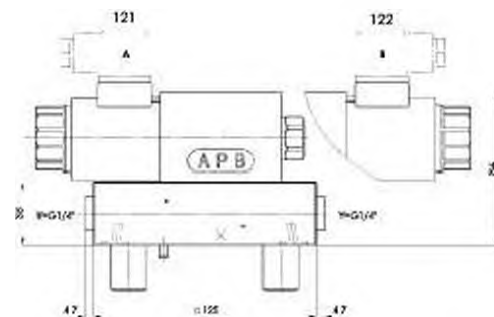
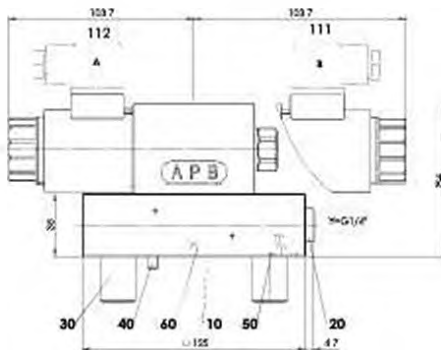
Control cover	D 40				-	/	#
Size 40							
Pilot no. 111...124							
Solenoid type for pilot valve	M .. / WD						
Standard	111, 112, 121, 122	M .. / WD					
	113, 114, 123, 124	S					
Nominal voltage $U_k$	12 VDC	G12	115 VAC	R115			
	24 VDC	G24	230 VAC	R230			
Orifice in cover	0.8 mm	0.8					
	1.0 mm	1.0	etc.				
Omit if without orifice							
Design-Index (Subject to change)							

**GENERAL SPECIFICATIONS**

Construction	Control cover for directional function
Mounting position	any
Installation dimension	see dimension to ISO 7368 see data sheet 2.13-1024
Ambient temperature	-25...+70 °C
Fastening torque	$M_c = 370 \text{ Nm}$ (Qual. 8.8) for fixing screw

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{6...10} > 75$ ) see data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s to 320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Operation pressure	$p_{max.} = 350 \text{ bar}$

**DIMENSIONS**

**PILOT OPERATED VALVES**

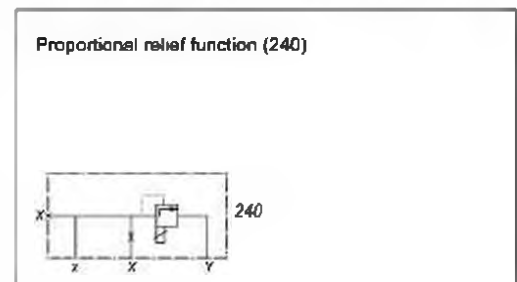
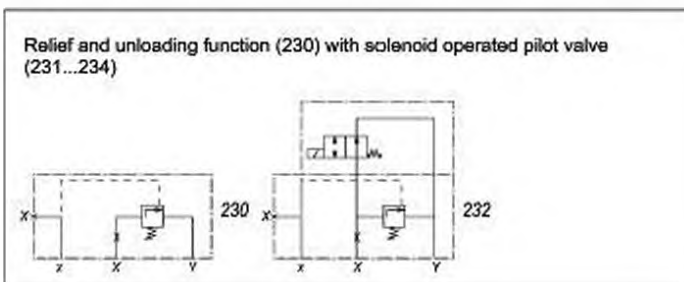
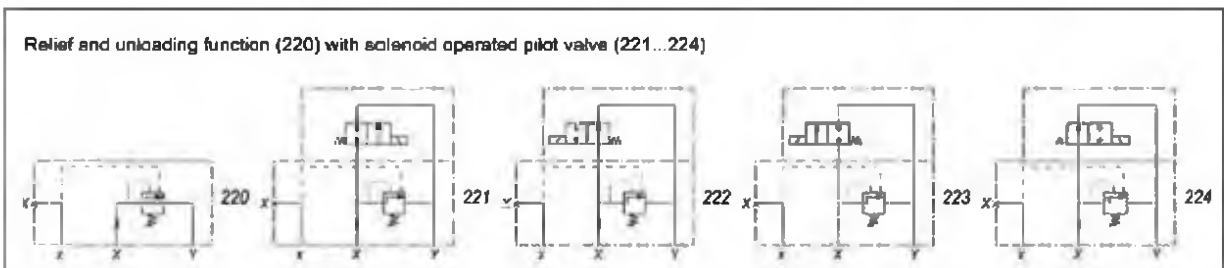
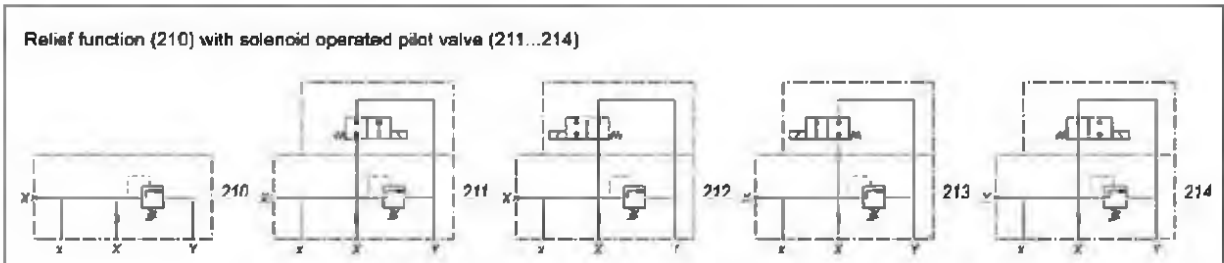
Pilot operated valves:	111, 122	WDMFA06-AB2	Data sheet 1.2-59
	112, 121	WDMFA06-AB1	Data sheet 1.2-59
	113	AS22061a	Data sheet 1.11-2140
	114	AS22060b	Data sheet 1.11-2140
	123	AS32060b	Data sheet 1.11-2140
	124	AS32061a	Data sheet 1.11-2140

**PARTS LIST**

Position	Article	Description
10	063.3018	Plate to 111, 112, 113, 114
	063.3015	Plate to other types
20	238.2406	Locking screw VST1 G1/4"
30	246.8140	Cylinder screw M20x40 DIN912
40	221.2470	Pin 25x16 DIN1481
50	160.2107	O-Ring ID 10,77x2,62
60	118.2032	Orifice M5 / 0,8 x 5
	118.2052	Orifice M5 / 0,8 x 5
	118.2031	Orifice M5 / 1,0 x 5
	118.2058	Orifice M5 / 1,2 x 5
	118.2072	Orifice M5 / 1,5 x 5

Control cover  
 for pressure function  
 •  $p_{max} = 350 \text{ bar}$

**NG 16**  
 ISO 7368



#### TYPE CODE

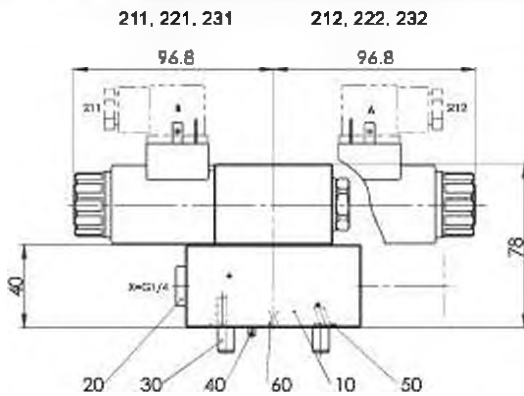
Control cover	D 18				-		/		-		#	
Size 16												
Pilot no. 210...240												
Solenoid type for pilot valve												
Standard	211, 212, 221, 222, 231, 232	M	/	VD								
	213, 214, 223, 224, 233, 234	S										
	240		/	WD								
Nominal voltage $U_n$	12 VDC	G12		115 VAC	R115							
	24 VDC	G24		230 VAC	R230							
Orifice in cover	0.6 mm	0.6										
	1.0 mm	1.0	etc.									
Omit if without orifice												
Setting versions S, D, K, A (not applicable at cover 240) and press. range from press. valve												e.g. D250
Design-Index (Subject to change)												

**GENERAL SPECIFICATIONS**

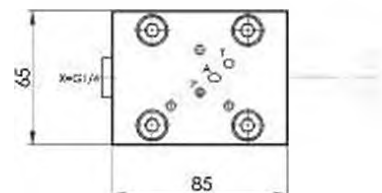
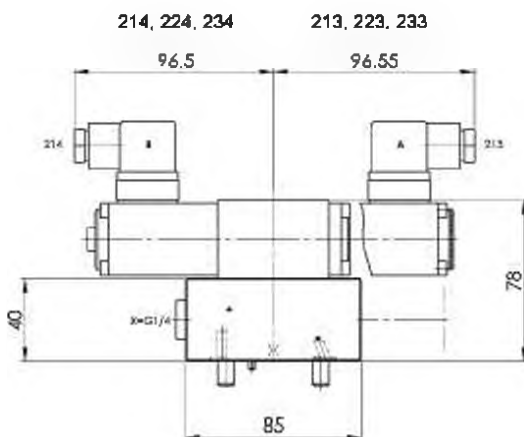
Construction	Control cover for directional function
Mounting position	any
Installation dimension	see dimension to ISO 7368 see data sheet 2.13-1021
Ambient temperature	-20...+70°C
Fastening torque	$M_0 = 25 \text{ Nm}$ (Qual. 8.8) for fixing screws

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4408:1989, class 18/16/13 (Required filtration grade B6...10 $\geq$ 75) see data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s to 320 mm <sup>2</sup> /s
Fluid temperature	-20...+70°C
Operation pressure	$p_{max} = 350 \text{ bar}$

**DIMENSIONS**


210, 220, 230, 240


**VALVES**

Pilot operated valves:	211, 221, 231	WDMFA04-AB2	Data sheet 1.2-33
	212, 222, 232	WDMFA04-AB1	Data sheet 1.2-33
	213, 223, 233	BS22041a	Data sheet 1.11-2120
	214, 224, 234	BS22040b	Data sheet 1.11-2120
Pressure valves:	210...214	BA.PM22	Data sheet 2.1-540
	220...224	BY.PM22	Data sheet 2.1-544
	230...234	BX.PM22	Data sheet 2.1-544
	240	BDPPM22	Data sheet 2.3-540
Pressure ranges from press. valves:	210...214	63, 160, 315, 350 [bar]	
	220...224	100, 315 [bar]	
	230...234	100, 315 [bar]	
	240	40, 100, 200, 315 [bar]	

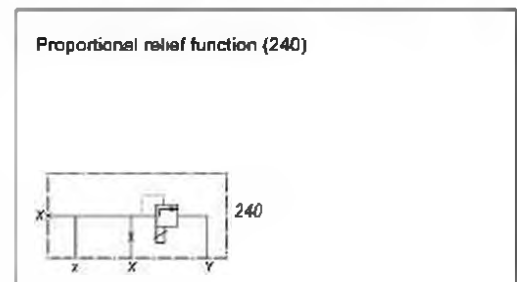
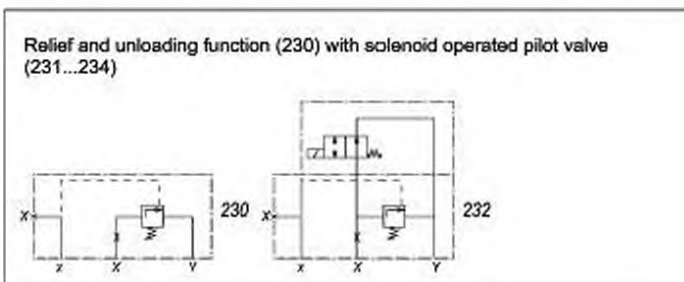
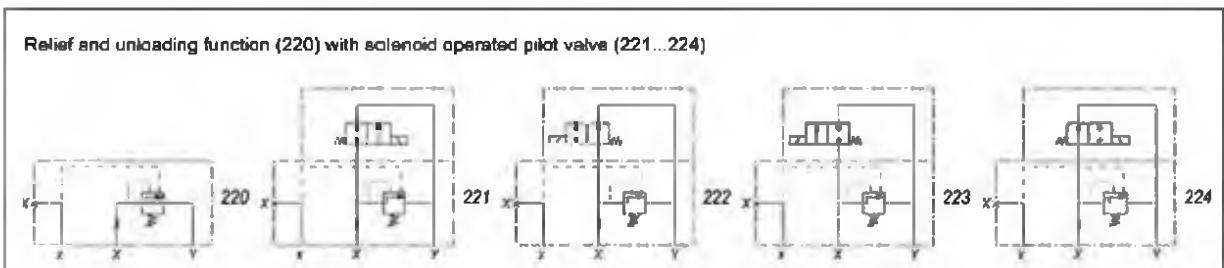
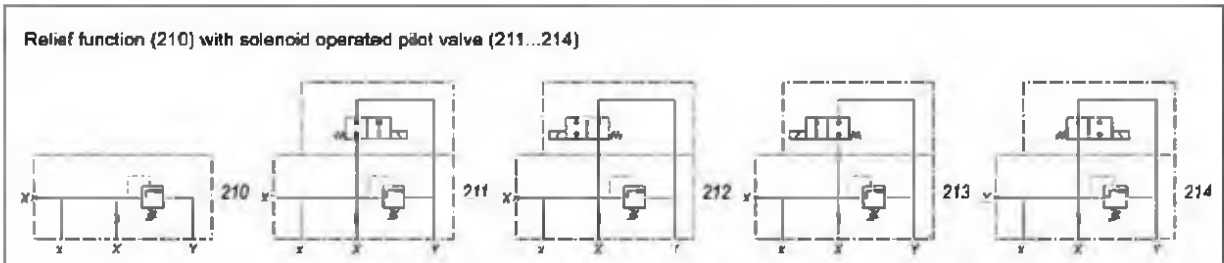
**PARTS LIST**

Position	Article	Description
10	063.0069	Plate to 210, 220, 230, 240
	063.0064	Plate to other types
20	238.2406	Locking screw VSTI G1/4"
30	246.4141	Cyl. screw M8x40 DIN912
40	221.2255	Pin $\varnothing 3 \times 10$ DIN1481
50	160.2061	O-ring ID 6.02x2.62
60	118.2051	Orifice M5 / 0,6 x 5
	118.2030	Orifice M5 / 0,7 x 5
	118.2032	Orifice M5 / 0,8 x 5
	118.2052	Orifice M5 / 0,8 x 5
	118.2031	Orifice M5 / 1,0 x 5



Control cover  
 for pressure function  
 •  $p_{max} = 350 \text{ bar}$

**NG 25**  
 ISO 7368



#### TYPE CODE

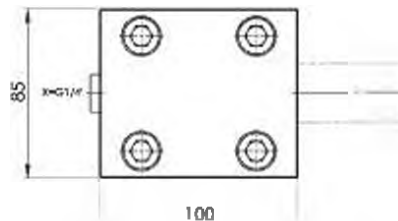
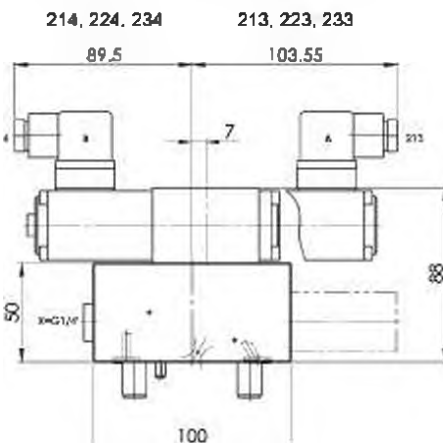
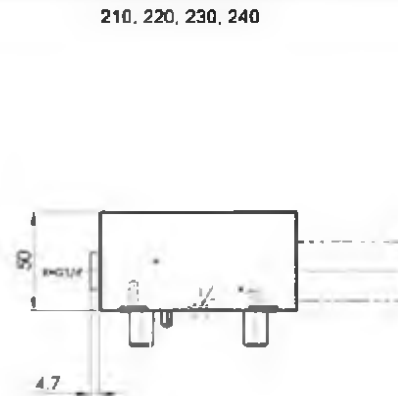
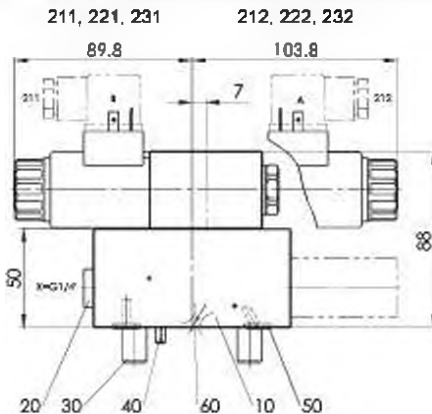
Control cover	D 25				
Size 25					
Pilot no. 210...240					
Solenoid type for pilot valve					
Standard	211, 212, 221, 222, 231, 232	M	/	VD	
	213, 214, 223, 224, 233, 234	S			
	240		/	WD	
Nominal voltage $U_n$	12 VDC	G12	115 VAC	R115	
	24 VDC	G24	230 VAC	R230	
Orifice in cover	0.6 mm	0.6			
	1.0 mm	1.0	etc.		
Omit if without orifice					
Setting versions S, D, K, A (not applicable at cover 240) and press. range from press. valve	e.g. D250				
Design-Index (Subject to change)					

**GENERAL SPECIFICATIONS**

Construction	Control cover for directional function
Mounting position	any
Installation dimension	see dimension to ISO 7368
Ambient temperature	see data sheet 2.13-1022
Fastening torque	-20...+50 °C M <sub>0</sub> = 80 Nm (Qual. 8.8) for fixing screws

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4408:1989, class 18/16/13 (Required filtration grade B6...10≥75) see data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s to 320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Operation pressure	p <sub>max</sub> = 350 bar

**DIMENSIONS**

**VALVES**

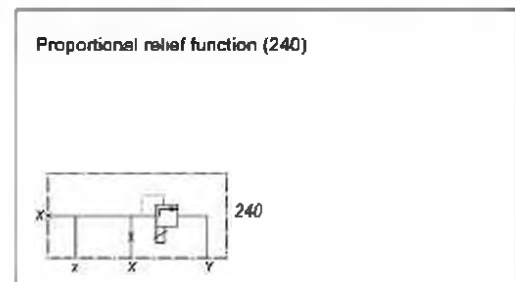
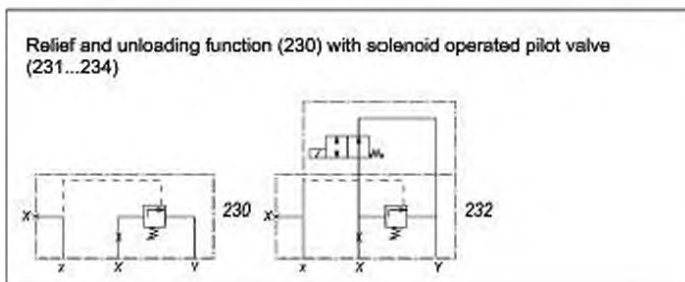
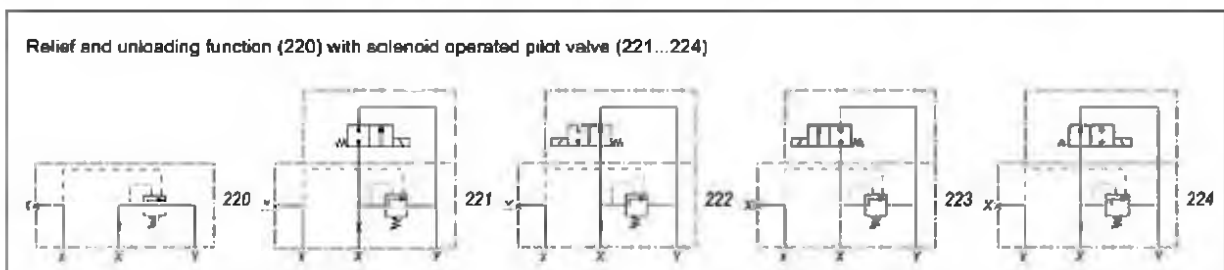
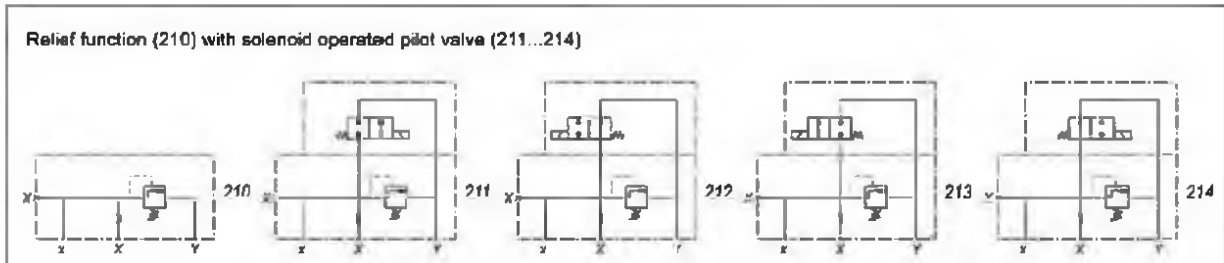
Pilot operated valves:	211, 221, 231	WDMFA04-AB2	Data sheet 1.2-33
	212, 222, 232	WDMFA04-AB1	Data sheet 1.2-33
	213, 223, 233	BS22041a	Data sheet 1.11-2120
	214, 224, 234	BS22040b	Data sheet 1.11-2120
Pressure valves:	210...214	BA.PM22	Data sheet 2.1-540
	220...224	BY.PM22	Data sheet 2.1-544
	230...234	BX.PM22	Data sheet 2.1-544
	240	BDPPM22	Data sheet 2.3-540
Pressure ranges from press. valves:	210...214	63, 160, 315, 350 [bar]	
	220...224	100, 315 [bar]	
	230...234	100, 315 [bar]	
	240	40, 100, 200, 315 [bar]	

**PARTS LIST**

Position	Article	Description
10	063.1061	Plate to 210, 220, 230, 240
	063.1062	Plate to other types
20	238.2406	Locking screw VSTI G1/4"
30	246.8156	Cyl. screw M12x55 DIN912
40	221.2470	Pin Ø5x16 DIN1481
50	160.2092	O-ring ID 9,19x2,62
60	118.2051	Orifice M5 / 0,6 x 5
	118.2030	Orifice M5 / 0,7 x 5
	118.2032	Orifice M5 / 0,8 x 5
	118.2052	Orifice M5 / 0,8 x 5
	118.2031	Orifice M5 / 1,0 x 5

Control cover  
 for pressure function  
 •  $p_{max} = 350 \text{ bar}$

**NG 32**  
 ISO 7368



**TYPE CODE**

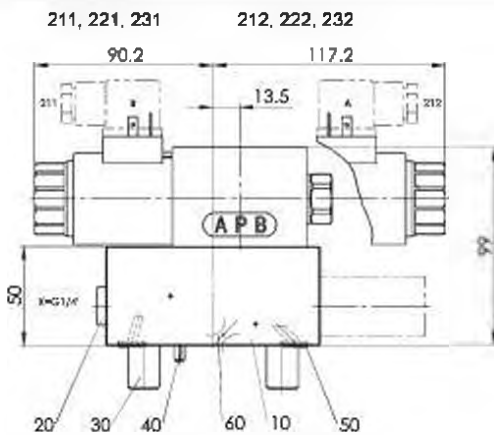
Control cover	D 32					-		/		-		#	
Size 32													
Pilot no. 210...240													
Solenoid type for pilot valve													
Standard	211, 212, 221, 222, 231, 232	M	/	WD									
	213, 214, 223, 224, 233, 234	S	/	WD									
	240		/	WD									
Nominal voltage $U_n$	12 VDC	G12		115 VAC	R115								
	24 VDC	G24		230 VAC	R230								
Orifice in cover	0.6 mm	0.6											
	1.0 mm	1.0	etc.										
Omit if without orifice													
Setting versions S, D, K, A (not applicable at cover 240) and press. range from press. valve												e.g. D250	
Design-Index (Subject to change)													

**GENERAL SPECIFICATIONS**

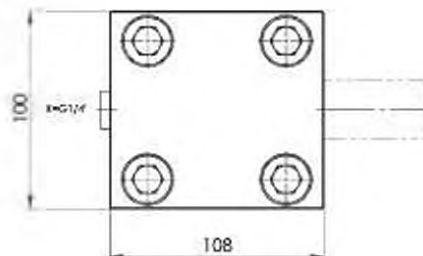
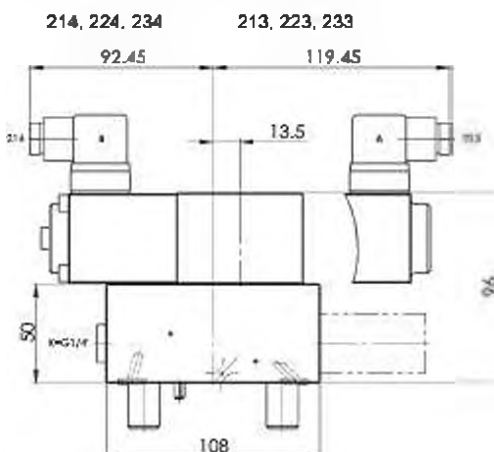
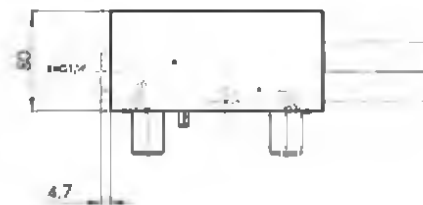
Construction	Control cover for directional function
Mounting position	any
Installation dimension	see dimension to ISO 7368
	see data sheet 2.13-1023
Ambient temperature	-25...+70°C
Fastening torque	$M_0 = 180 \text{ Nm}$ (Qual. 8.8) for fixing screws

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4408:1989, class 18/16/13 (Required filtration grade B6...10 $\geq$ 75) see data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s to 320 mm <sup>2</sup> /s
Fluid temperature	-20...+70°C
Operation pressure	$p_{max} = 350 \text{ bar}$

**DIMENSIONS**


210, 220, 230, 240


**VALVES**

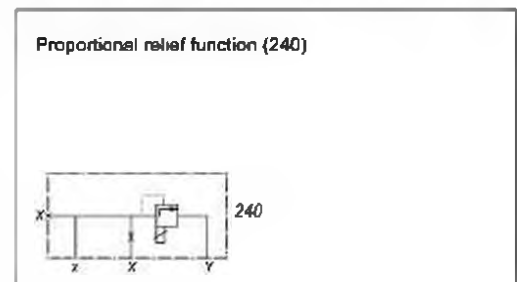
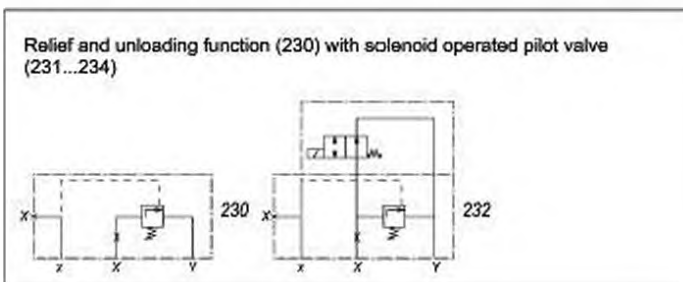
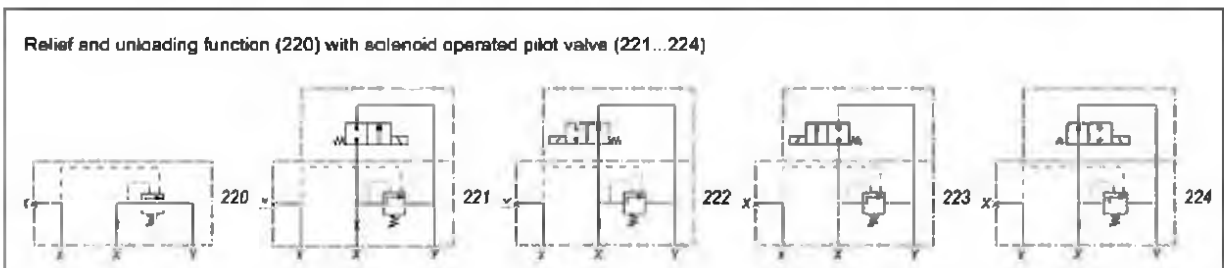
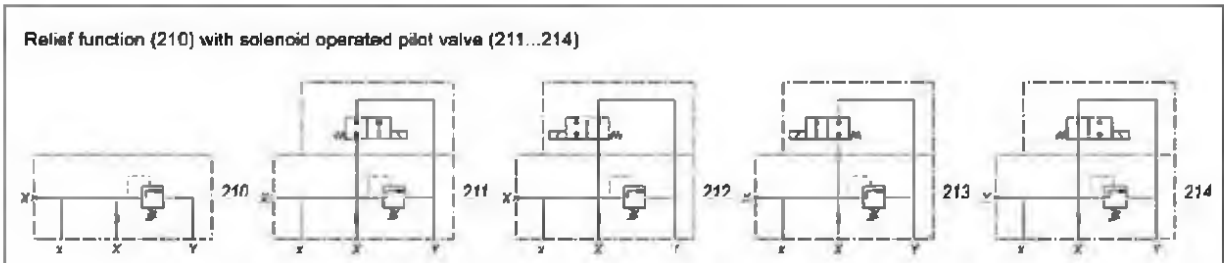
Pilot operated valves:	211, 221, 231	WDMFA06-AB2	Data sheet 1.2-59
	212, 222, 232	WDMFA06-AB1	Data sheet 1.2-59
	213, 223, 233	AS22061a	Data sheet 1.11-2140
	214, 224, 234	AS22060b	Data sheet 1.11-2140
Pressure valves:	210...214	BA.PM22	Data sheet 2.1-540
	220...224	BY.PM22	Data sheet 2.1-544
	230...234	BX.PM22	Data sheet 2.1-544
	240	BDPPM22	Data sheet 2.3-540
Pressure ranges from press. valves:	210...214	63, 160, 315, 350 [bar]	
	220...224	100, 315 [bar]	
	230...234	100, 315 [bar]	
	240	40, 100, 200, 315 [bar]	

**PARTS LIST**

Position	Article	Description
10	063.2036	Plate to 210, 220, 230, 240
	063.2037	Plate to other types
20	238.2406	Locking screw VSTI G1/4"
30	246.7156	Cyl. screw M16x55 DIN912
40	221.2470	Pin Ø5x16 DIN1481
50	160.2092	O-ring ID 9,19x2,62
60	118.2032	Orifice M5 / 0,8 x 5
	118.2052	Orifice M5 / 0,8 x 5
	118.2031	Orifice M5 / 1,0 x 5
	118.2058	Orifice M5 / 1,2 x 5
	118.2072	Orifice M5 / 1,5 x 5

Control cover  
 for pressure function  
 •  $p_{max} = 350 \text{ bar}$

**NG 40**  
 ISO 7368



**TYPE CODE**

Control cover	D 40				
Size 40					
Pilot no. 210...240					
Solenoid type for pilot valve					
Standard	211, 212, 221, 222, 231, 232	M	/	WD	
	213, 214, 223, 224, 233, 234	S	/	WD	
	240		/	WD	
Nominal voltage $U_n$	12 VDC	G12	115 VAC	R115	
	24 VDC	G24	230 VAC	R230	
Orifice in cover	0.6 mm	0.6			
	1.0 mm	1.0	etc.		
Omit if without orifice					
Setting versions S, D, K, A (not applicable at cover 240) and press. range from press. valve	e.g. D250				
Design-Index (Subject to change)					

**GENERAL SPECIFICATIONS**

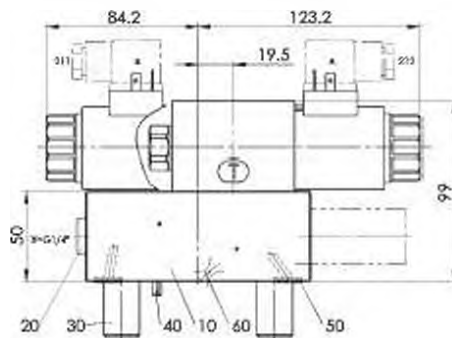
Construction	Control cover for directional function
Mounting position	any
Installation dimension	see dimension to ISO 7368
	see data sheet 2.13-1024
Ambient temperature	-25...+70°C
Fastening torque	$M_0 = 370 \text{ Nm}$ (Qual. 8.8) for fixing screws

**HYDRAULIC SPECIFICATIONS**

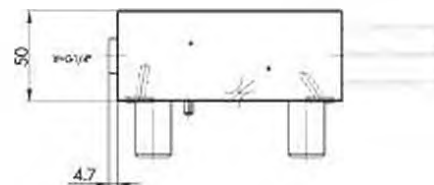
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4408:1989, class 18/16/13 (Required filtration grade B6...10 $\geq$ 75) see data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s to 320 mm <sup>2</sup> /s
Fluid temperature	-20...+70°C
Operation pressure	$p_{max} = 350 \text{ bar}$

**DIMENSIONS**

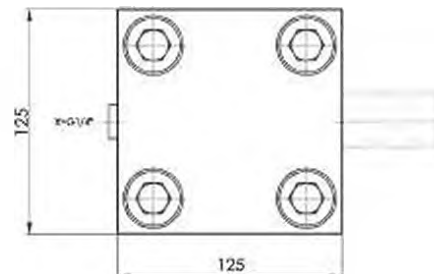
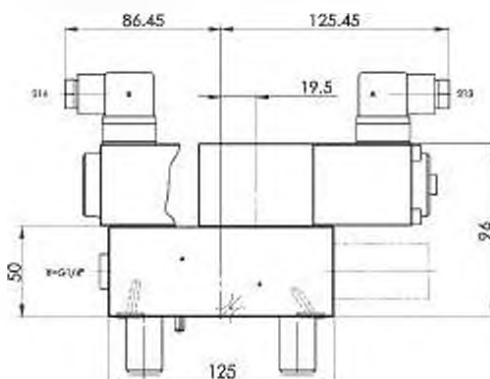
211, 221, 231      212, 222, 232



210, 220, 230, 240



214, 224, 234      213, 223, 233


**VALVES**

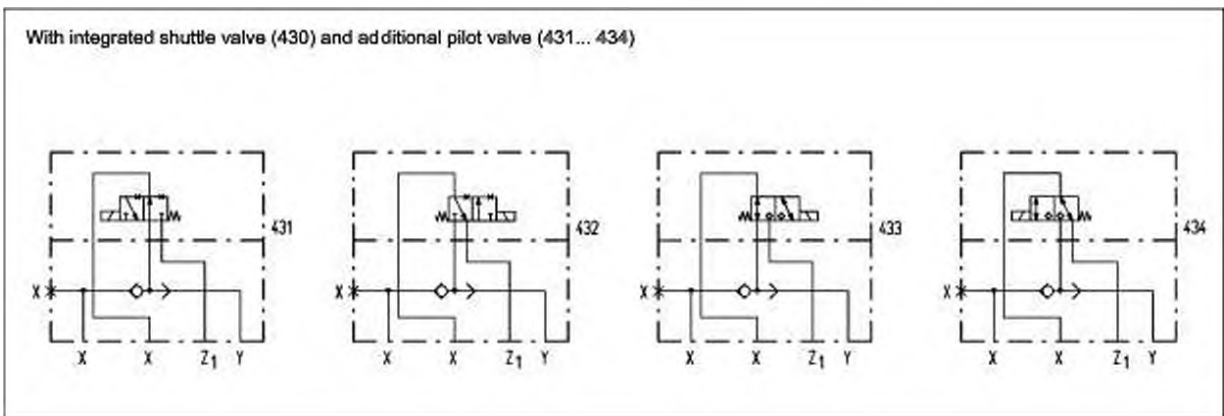
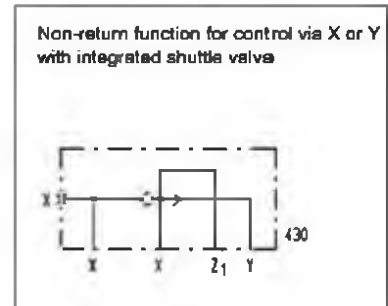
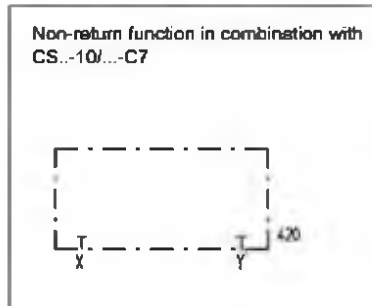
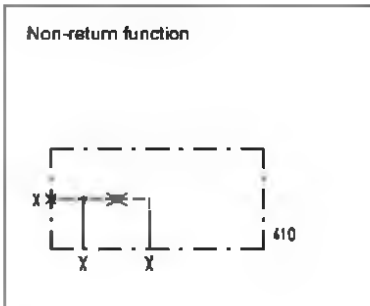
Pilot operated valves:	211, 221, 231	WDMFA06-AB2	Data sheet 1.2-59
	212, 222, 232	WDMFA06-AB1	Data sheet 1.2-59
	213, 223, 233	AS22061a	Data sheet 1.11-2140
	214, 224, 234	AS22060b	Data sheet 1.11-2140
Pressure valves:	210...214	BA.PM22	Data sheet 2.1-540
	220...224	BY.PM22	Data sheet 2.1-544
	230...234	BX.PM22	Data sheet 2.1-544
	240	BDPPM22	Data sheet 2.3-540
Pressure ranges from press. valves:	210...214	63, 160, 315, 350 [bar]	
	220...224	100, 315 [bar]	
	230...234	100, 315 [bar]	
	240	40, 100, 200, 315 [bar]	

**PARTS LIST**

Position	Article	Description
10	063.3021	Plate to 210, 220, 230, 240
	063.3022	Plate to other types
20	238.2406	Locking screw VSTI G1/4"
30	246.8160	Cyl. screw M20x60 DIN912
40	221.2470	Pin Ø5x16 DIN1481
50	160.2107	O-ring ID 10,77x2,62
60	118.2032	Orifice M5 / 0,8 x 5
	118.2052	Orifice M5 / 0,8 x 5
	118.2031	Orifice M5 / 1,0 x 5
	118.2058	Orifice M5 / 1,2 x 5
	118.2072	Orifice M5 / 1,5 x 5

Control cover  
 for check function  
 •  $p_{max} = 350 \text{ bar}$

**NG 16**  
 ISO 7368



#### TYPE CODE

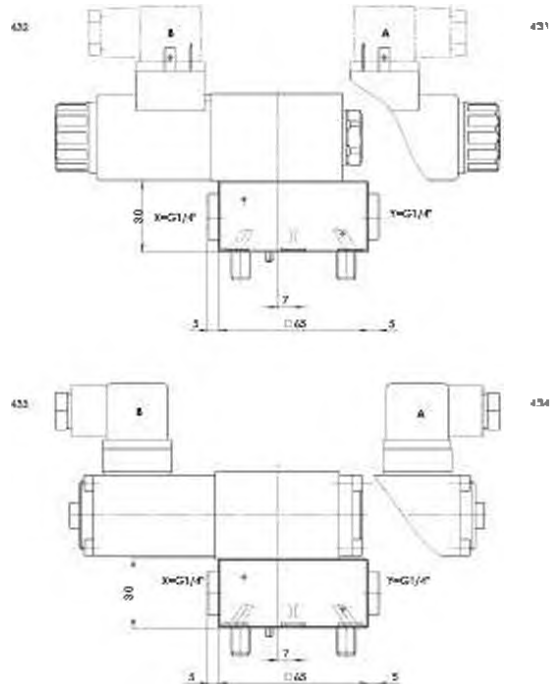
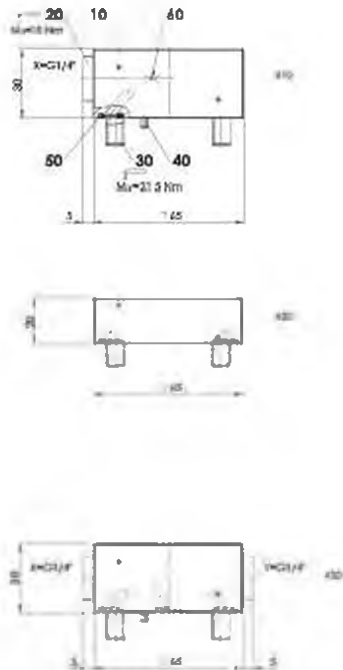
				D	16		-		/		#	
Control cover												
Nominal size 16												
Pilot no. 410...434												
Solenoid type for pilot valve												
Standard	431, 432	M .. / VD (only G12 and G24)										
		M .. / ND										
	433, 434	S										
Nominal voltage $U_n$	12 VDC	G12	115 VAC	R115								
	24 VDC	G24	230 VAC	R230								
Orifices in cover	0.6 mm	0.6										
	1.0 mm	1.0	etc.									
Omit if without orifice												
Design-Index (Subject to change)												

**GENERAL SPECIFICATIONS**

Construction	Control cover for check function
Mounting position	any
Installation dimension	see dimension to ISO 7368, see data sheet 2.13-1021
Ambient temperature	-25...+70 °C
Fastening torque	$M_0 = 25 \text{ Nm}$ (qual. 8.8) for fixing screws

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{6...10} > 75$ ) see data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s bis 320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Operation pressure	$p_{\text{max}} = 350 \text{ bar}$

**DIMENSIONS**

**PARTS LIST**

Position	Article	Description
10	063.0016	Plate to 410
	063.0005	Plate to 420
	063.0024	Plate to 430
	063.0030	Plate to 431, 432, 433, 434
	238.2406	Locking screw VSTI G1/4"
30	248.4121	Cyl. screw M8x20 DIN912
	248.4131	Cyl. screw M8x30 DIN912
40	221.2255	Pin $\varnothing 3 \times 10$ DIN1481
50	160.2081	O-ring ID 6,02x2,62
80	118.2051	Orifice M5 / 0,6 x 5
	118.2030	Orifice M5 / 0,7 x 5
	118.2032	Orifice M5 / 0,8 x 5
	118.2052	Orifice M5 / 0,9 x 5
	118.2031	Orifice M5 / 1,0 x 5

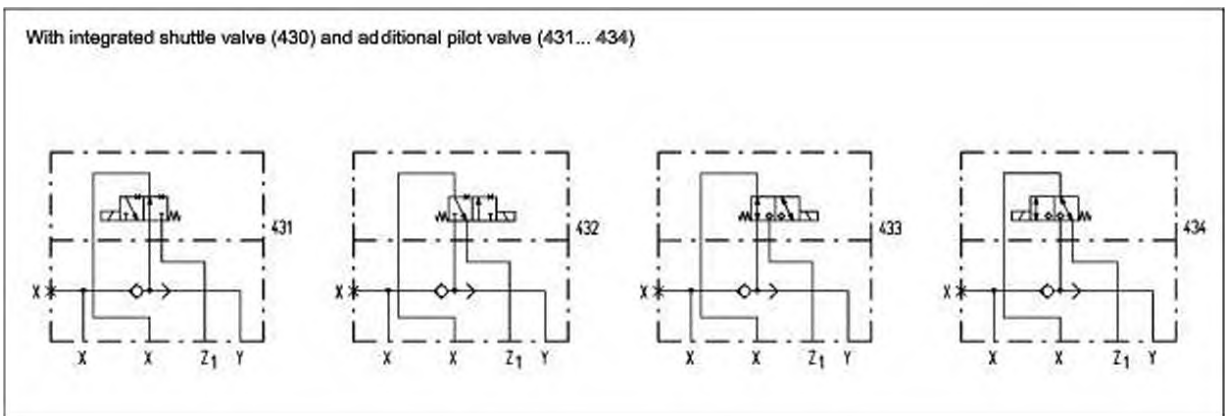
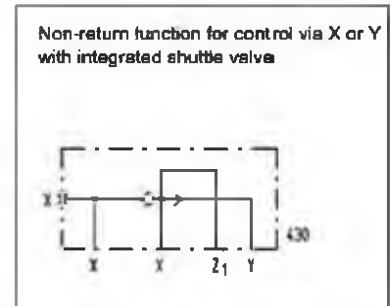
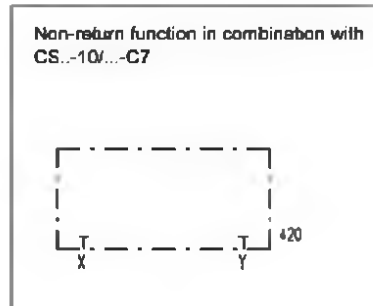
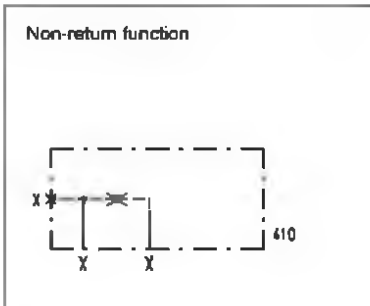
**PILOT OPERATED VALVES**

Pilot operated valves:	431	WDMFA04-AB1	Data sh. 1.2-33
	432	WDMFA04-AB2	Data sh. 1.2-33
	433	BS32040b	Data sh. 1.11-2120
	434	BS32041a	Data sh. 1.11-2120



Control cover  
 for check function  
 •  $p_{max} = 350 \text{ bar}$

**NG 25**  
 ISO 7368



**TYPE CODE**

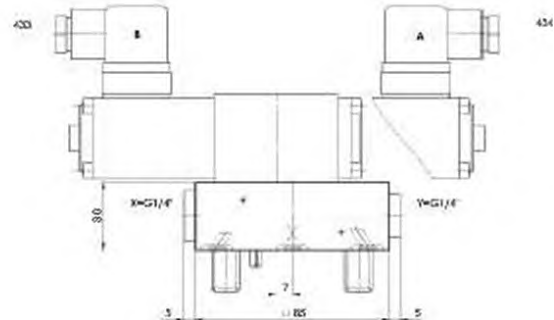
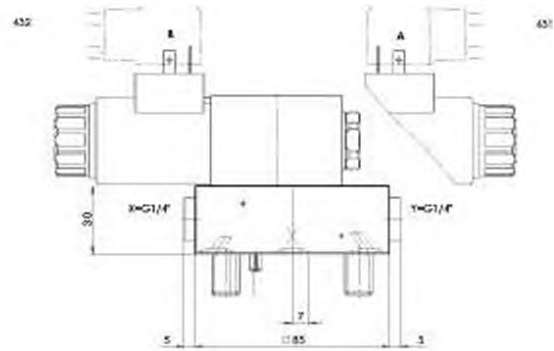
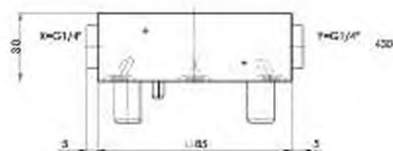
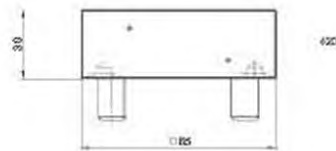
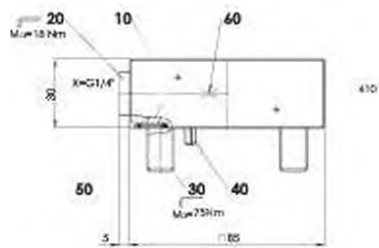
Control cover		D 25		<input type="checkbox"/>	-	<input type="checkbox"/>	/	<input type="checkbox"/>	#	<input type="checkbox"/>
Nominal size 25										
Pilot no. 410...434										
Solenoid type for pilot valve		M .. / VD (only G12 and G24)								
Standard 431, 432		M .. / ND								
433, 434		S								
Nominal voltage $U_n$	12 VDC	G12	115 VAC	R115						
	24 VDC	G24	230 VAC	R230						
Orifice in cover	0.6 mm	0.6								
	1.0 mm	1.0 etc.								
Omit if without orifice										
Design-Index (Subject to change)										

**GENERAL SPECIFICATIONS**

Construction	Control cover for check function
Mounting position	any
Installation dimension	see dimension to ISO 7368 see data sheet 2.13-1022
Ambient temperature	-25...+70 °C
Fastening torque	$M_0 = 80 \text{ Nm}$ (Qual. 8.8) for fixing screws

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{6...10} \geq 75$ ) see data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s bis 320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Operation pressure	$p_{\text{max}} = 350 \text{ bar}$

**DIMENSIONS**

**PARTS LIST**

Position	Article	Description
10	063.1016	Plate to 410
	063.1006	Plate to 420
	063.1038	Plate to 430
	063.1010	Plate to 431, 432, 433, 434
20	238.2406	Locking screw VST1 G1/4"
30	248.6136	Cyl. screw M12x35 DIN912
40	221.2470	Pin 2/5x16 DIN1481
50	160.2092	O-Ring ID 9,19x2,62
80	118.2051	Orifice M5 / 0.6 x 5
	118.2030	Orifice M5 / 0.7 x 5
	118.2032	Orifice M5 / 0.8 x 5
	118.2052	Orifice M5 / 0.9 x 5
	118.2031	Orifice M5 / 1.0 x 5

**PILOT OPERATED VALVES**

Pilot operated valves:	431	WDMFA04-AB1	Data sh. 1.2-33
	432	WDMFA04-AB2	Data sh. 1.2-33
	433	BS32040b	Data sh. 1.11-2120
	434	BS32041a	Data sh. 1.11-2120

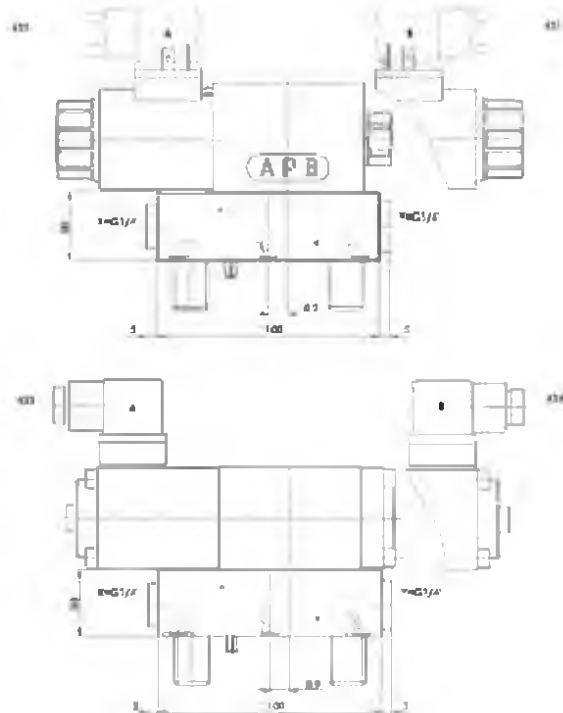
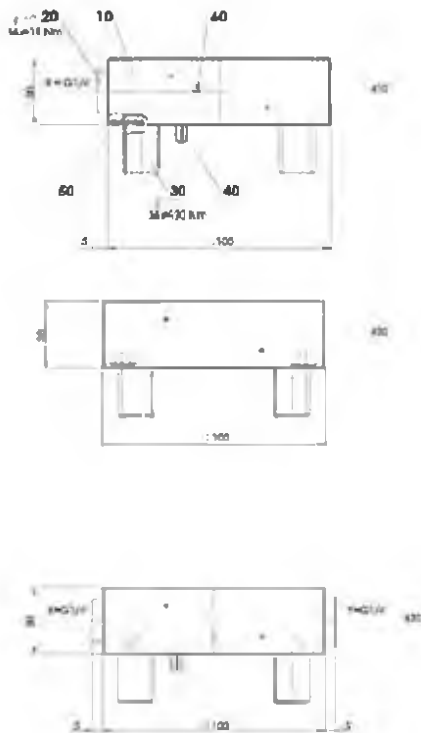


**GENERAL SPECIFICATIONS**

Construction	Control cover for check function
Mounting position	any
Installation dimension	see dimension to ISO 7368 see data sheet 2.13-1023
Ambient temperature	-25...+70 °C
Fastening torque	$M_o = 190 \text{ Nm}$ (qual. 8.8) for fixing screws

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4408:1999, class 18/16/13 (Required filtration grade B6...10≥75) see data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s to 320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Operation pressure	$p_{\text{max}} = 350 \text{ bar}$

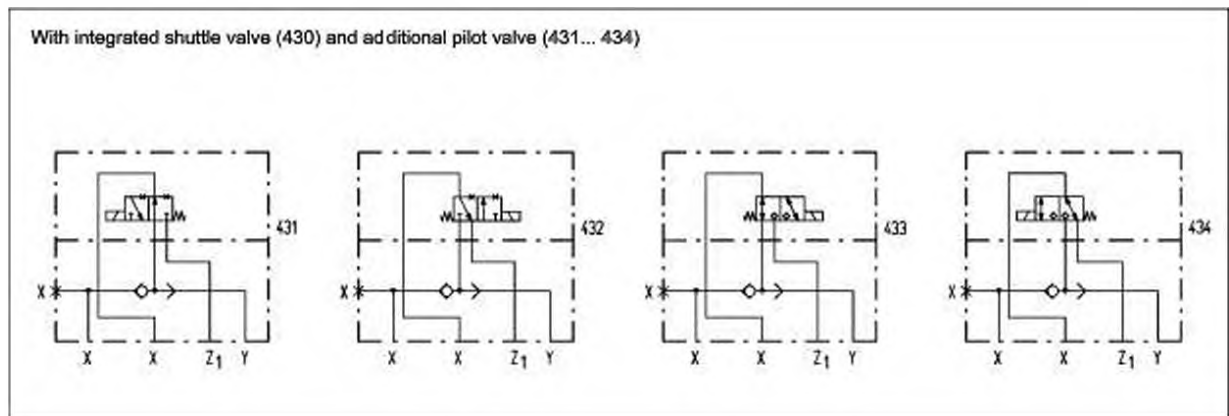
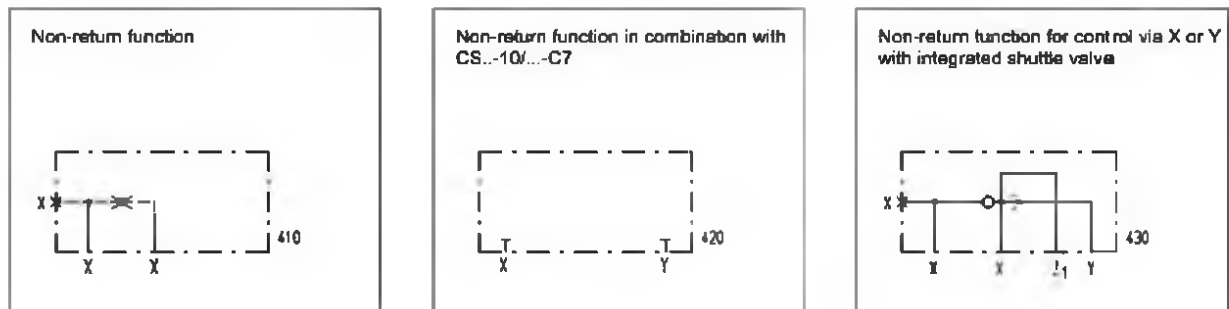
**DIMENSIONS**

**PARTS LIST**

Position	Article	Description
10	063.2008	Plate to 410
	063.2000	Plate to 420
	063.2029	Plate to 430
	063.2032	Plate to 431, 432, 433, 434
20	238.2406	Locking screw VSTI G1/4"
	238.3402	Locking screw VSTI G3/8"
30	246.7135	Cyl. screw M18x35 DIN912
40	221.2470	Pin $\varnothing 5 \times 16$ DIN1481
50	160.2092	O-Ring ID 9,19x2,62
80	118.2032	Orifice M5 / 0,8 x 5
	118.2052	Orifice M5 / 0,9 x 5
	118.2031	Orifice M5 / 1,0 x 5
	118.2058	Orifice M5 / 1,2 x 5
	118.2072	Orifice M5 / 1,5 x 5

**PILOT OPERATED VALVES**

Pilot operated valves:	431	WDMFA06-AB1	Data sh. 1.2-59
	432	WDMFA06-AB2	Data sh. 1.2-59
	433	AS32080b	Data sh. 1.11-2140
	434	AS32081a	Data sh. 1.11-2140

**Control cover  
for check function**

 •  $p_{max} = 350 \text{ bar}$ 
**NG 40**  
 ISO 7368

**TYPE CODE**

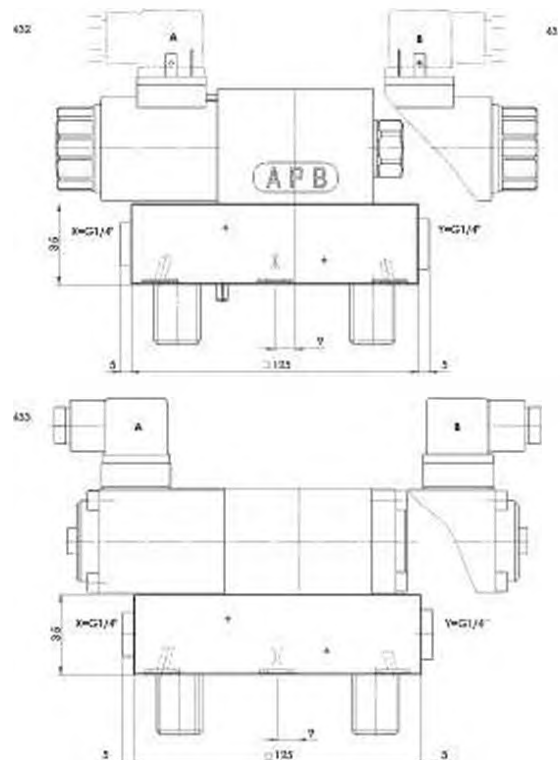
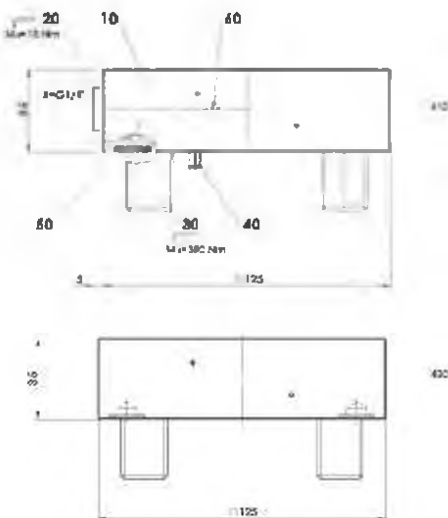
				D	40	-		/	#
Control cover									
Nominal size 40									
Pilot no. 410...434									
Solenoid type for pilot valve									
Standard	431, 432	M	/	WD					
	433, 434	S							
Nominal voltage $U_v$	12 VDC	G12	115 VAC	R115					
	24 VDC	G24	230 VAC	R230					
Orifice in cover	0.8 mm	0.8							
	1.0 mm	[1.0]	etc.						
Omit if without orifice									
Design-Index (Subject to change)									

**GENERAL SPECIFICATIONS**

Construction	Control cover for check function
Mounting position	any
Installation dimension	see dimension to ISO 7368 see data sheet 2.13-1024
Ambient temperature	-25...+70 °C
Fastening torque	$M_0 = 370 \text{ Nm}$ (qual. 8.8) for fixing screws

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{6...10} > 75$ ) see data sheet no. 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s to 320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Operation pressure	$p_{\text{max}} = 350 \text{ bar}$

**DIMENSIONS**

**PARTS LIST**

Position	Article	Description
10	063.3001	Plate to 410
	063.3005	Plate to 420
	063.3010	Plate to 430
	063.3017	Plate to 431, 432, 433, 434
20	238.2406	Locking screw VSTI G1/4"
	238.3402	Locking screw VSTI G3/8"
30	246.8140	Cyl. screw M20x40 DIN912
40	221.2470	Pin 25x16 DIN1481
50	160.2107	O-Ring ID 10,77x2,62
60	118.2032	Orifice M5 / 0,8 x 5
	118.2052	Orifice M5 / 0,9 x 5
	118.2031	Orifice M5 / 1,0 x 5
	118.2058	Orifice M5 / 1,2 x 5
	118.2072	Orifice M5 / 1,5 x 5

**PILOT OPERATED VALVES**

Pilot operated valves:	431	WDMFA06-AB1	Data sh. 1.2-59
	432	WDMFA06-AB2	Data sh. 1.2-59
	433	AS32060b	Data sh. 1.11-2140
	434	AS32061a	Data sh. 1.11-2140

**Cartridge valve body**

 •  $p_{max} = 350 \text{ bar}$ 
**NG16**
**NG25**
**ISO 7368**
**NG32**
**NG40**
**DESCRIPTION**

Valve body with cavity for cartridge (logic element) size NG16, NG25, NG32 and NG40 to ISO 7368 / DIN 24342 (see data sheets 1.12-210, 1.12-220, 1.12-230, 1.12-240). Body surface is phosphated.

**TYPE CODE**

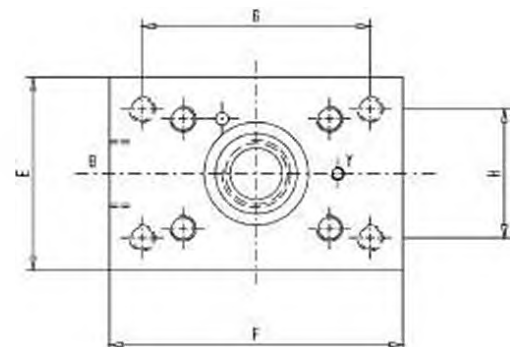
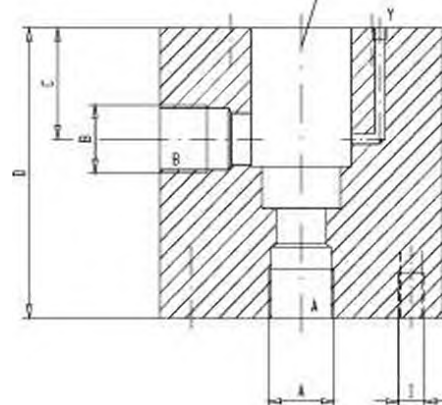
		K	<input type="checkbox"/>	#	<input type="checkbox"/>
Cartridge valve body					
Nominal size	NG16	18			
	NG25	25			
	NG32	32			
	NG40	40			
Port size for NG16	G3/8"	38			
	G1/2"	12			
	G3/4"	34			
for NG25	G1"	100			
	G1 1/4"	114			
	G1 1/2"	112			
for NG32 and NG40	G1 1/2"	112			
Design-Index (Subject to change)					

**GENERAL SPECIFICATIONS**

Description	Cartridge valve body
Nominal size	NG16, NG25, NG32, NG40 to ISO 7368 / DIN 24342
Mounting	4 tapped holes for fixation
Weight: NG16	m = 2,6 kg
NG25	m = 8,7 kg
NG32	m = 11,4 kg
NG40	m = 19,1 kg

**DIMENSIONS**

For detailed cavity drawing see data sheets:

 NG16 = 2.13-1021  
 NG25 = 2.13-1022  
 NG32 = 2.13-1023  
 NG40 = 2.13-1024

**HYDRAULIC SPECIFICATIONS**

 Working pressure  $p_{max} = 350 \text{ bar}$ 

Dimensions (in mm)				
	NG16	NG25	NG32	NG40
Port sizes A and B	G3/8" G1/2" G3/4"	G1" G1 1/4" G1 1/2"	G1 1/2"	G1 1/2"
C	30	44	52	84
D	90	125	130	160
E	70	90	105	130
F	70	125	145	160
G	54	105	121	130
H	54	70	81	100
I	M8	M8	M10	M12

Execution / Designation	Function	Data sheet number	Functions					Analog Input signals		Digital Input signals		Digital inputs / outputs	Solenoid outputs	Analog outputs	Fieldbus					Graphic signal recording
			Ramps	Fixed command value	Pressure/Flow controller	Position controller	P/O Controller	Voltage	Current	SSI/SSD	Start/Stop				Profibus DP	CANopen	HART	FFS39	IO-Link	
<b>Snap-on modules</b>																				
SD7.0	Digital amplifier module «Basic»	1.13-101	X	X				1	1			2/2	1 or 2		X	X	X	X		X
SD735	Digital amplifier module «Enhanced»	1.13-101	X	X				2	2			8/4	1 or 2	1	X	X	X	X		X
SD733	Digital controller module «Basic»	1.13-106	X	X	X	X		1	1(2)			2/2	2		X	X	X	X		X
SD736	Digital controller module «Enhanced»	1.13-106	X	X	X	X	X	2(1)	2(3)	X	X	8/4	2	1	X	X	X	X		X
<b>Plug</b>																				
P02	Analog amplifier	1.13-62	X					1				1/0	1							
PD2	Digital amplifier	1.13-64	X	X				1	1			1/0	1			X		X		X
<b>Mobile electronics</b>																				
MD230	Digital amplifier «Basic»	1.13-240	X	X				1	1			2/2	4			X		X		X
MD235	Digital amplifier «Enhanced»	1.13-240	X	X				2	2			4/2	8			X		X		X
MD236	Digital controller «Basic»	1.13-240	X	X	X	X		1	1			2/2	4			X		X		X
MD238	Digital controller «Enhanced»	1.13-240	X	X	X	X		2	2			4/2	8			X		X		X
<b>Integrated «DSV»</b>																				
Digital Smart Valve	- Integrated amplifier electronics	1.13-76	X	X				1	1			1/1	1 or 2		X	X		X		
	- Integrated controller electronics for proportional hydraulic valves	1.13-76	X	X	X	X		1	1			1/1	1 or 2		X	X		X		X
PD3	Digital amplifier	1.13-66	X	X				1	1			1/0	1						X	



### PME (Programmable Mobile Electronics)

PME products can be easily networked to each other. This results in a control system that can be adapted exactly to the needs of the application. An overview of the PME programme can be found in the brochure «PME – the smart hydraulic solutions».

Type	Data sheet number	Inputs				Outputs				Sensor supply	Interfaces
		Total	Analog	Digital	Freq.	Total	PWM	Solenoid current measurement	Digital		
CL-307	1.13-270	3/5	3	0/2	0/2	8	8	4	8		CAN
CL-446	1.13-275	16	16	16	2	8	8	0	8	5V	2x CAN/USB
CL-449	1.13-280	8/6	4/2	8/6	4/2	4	4	0	4	-5V	CAN
CL-450	1.13-285	69	14	65	4	33	33	4	33	5V	3x CAN
CL-451	1.13-290	17	5	17	1	16	16	0	16		CAN

The number of usable inputs and outputs depends on the variant. Details can be found in the data sheet.

Type	Data sheet number	Inputs				Outputs				Display	Interfaces
		Total	Analog	Digital	Freq.	Total	PWM	Solenoid current measurement	Digital		
CL-609	1.13-300	2	1	2	0	4	4	0	4	20	CAN

Type	Display Size	Data sheet number	Resolution	Inputs					Outputs			Sensor supply	Interfaces
				Total	Analog	Digital	Freq.	Video	Total	PWM	Digital		
CL-709	4.3" 109 mm	1.13-310	480x242	10	4	10	4	0	4	4	4	5V	CAN/USB
CL-711	7" 178 mm	1.13-320	800x480	10	6	10	4	4	4	4	4	5V	2x CAN/USB

**Programming tools**

<b>Orchestra™</b>	Project management software article no. 740.1000 contains:
<b>Composer™</b>	For developing software by means of intuitive «Ladder-Logic» programming. Simple definition of a complete system from inputs and outputs to CAN messaging with minimal programming knowledge.
<b>Presto™</b>	Orchestra™ project definition tool for C/C++ application programming, with the 3 <sup>rd</sup> party tool CodeWarrior™ for the C-code compilation. The respectively required NXP (Freescale) Suite «CW-SUITE-STANDARD: CodeWarrior® Development Suite-Standard» (contains «HCS12 (X) Edition» version 5.1 and «Microcontrollers Edition» version 10.6) is not contained in Orchestra™. It must be ordered directly from NXP.
<b>Arranger™</b>	The graphic display can be programmed with pre-prepared graphical elements simply with Drag & Drop. The program variables can be assigned to these elements in order to make the desired inputs and outputs via the display.
<b>Conductor™</b>	Diagnostic and set-up tool. Real-time view of system inputs, outputs and variables. Conductor is part of Orchestra™, but it is also available as an autonomous software with separate license dongle Article no. 740.1001
<b>Additional tools</b>	
<b>USB-to-CAN-adapter</b>	The adapter is needed for downloading software on PME modules, which do not have a USB interface. Not contained in Orchestra™. PCAN-USB from Peak-Systems or from Gridconnect.
<b>C-Code Debugging</b>	Development tool for C-code debugging using JTAG interface. Not contained in Orchestra™. Must be ordered via P & E Microcomputer systems.

**Proportional-amplifier**

- Plug amplifier for direct assembly on the valve
- Protection class IP65
- 24 and 12 VDC supply voltage
- Housing-types for solenoids from □ 29

**P02**  
 DIN 43 650  
 ISO 4400

**DESCRIPTION**

Proportional amplifier for direct assembly on the valve. Pin layout according to DIN 43650, Type A (ISO 4400) for solenoids from □ 29 or larger. Protection class of the plug amplifier is IP65, mounted according to DIN 40050. The connector cable is already mounted in the plug.

**FUNCTION**

The proportional amplifier has a clock-pulsed final stage. The clock frequency acts as dither and can be steplessly adjusted. Minimum and maximum solenoid current can be adjusted separately. Furthermore, a linear ramp is integrated. By means of the input release/block, the function can be blocked. A stabilized output voltage is available for supplying external pre-set value transmitters.

**APPLICATIONS**

The amplifier is suitable for different applications because of its splash water proof design. The easyness of connection allows to put it into operation without help of special tools. All settings are easily adjustable. The plug can be rotated by 180°.

**CONTENTS**

GENERAL SPECIFICATIONS .....	1
ELECTRICAL SPECIFICATIONS .....	1
BLOCK DIAGRAM .....	2
DIMENSIONS .....	2
MAX. AMBIENT TEMPERATURE .....	2
ADDITIONAL INFORMATIONS .....	2
START-UP .....	3

**TYPE CODE**

		P	02	A	0	1	□	□	#	□
Plug										
Type number										
Housing A for solenoids □ 29 or larger										
with cable connection										
1-solenoid version										
Supply voltage										
24 VDC	24 V proportional solenoid			D2						
12 VDC	12 V proportional solenoid			D3						
Preset value input 0...+ 8 VDC (only for 12 VDC)										
Preset value input 0...+ 10 VDC (only for 24 VDC)										
3										
4										
Design-Index (Subject to change)										

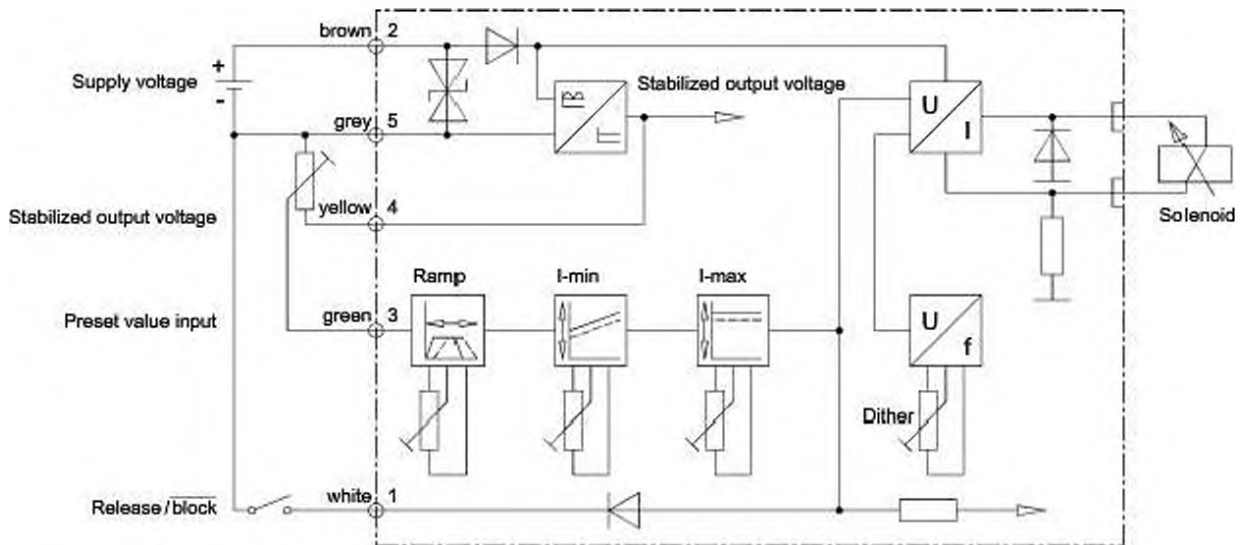
**GENERAL SPECIFICATIONS**

Plug housing	polyamide
Plug	polycarbonate
Weight	160 g
Connections	mounted cable, length 1,5 m (on request, cable length 5 m/10 m)
Ambient temperature	see curve max. ambient temp.

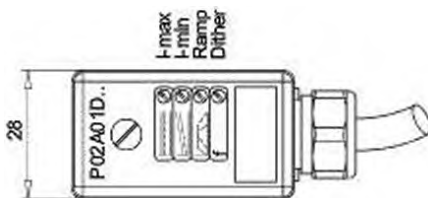
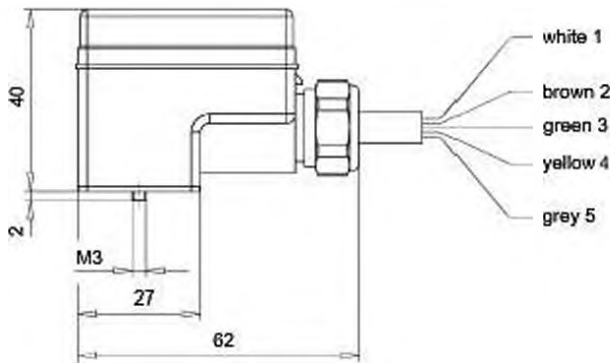
**ELECTRICAL SPECIFICATIONS**

Supply voltage	24 VDC	tolerance: 22...36 VDC
	12 VDC	tolerance: 11...18 VDC
Preset value input	0...+10 VDC	(0...+ 8 VDC)
Input resistance	≥ 100 kΩ	
Stabilized output voltage		
24 V-version:	10 VDC, max. load 2 mA	
12 V-version:	8 VDC, max. load 2 mA	
Dither	frequency adjustable 60...250 Hz	
Works setting	200 Hz	
No load-power	24 VDC: 0,3 W 12 VDC: 0,2 W	
Solenoid current	<b>for 24 Volt solenoid</b>	
	min. current $I_{min}$ adjustable	30...400 mA
	works setting	150 mA
	max. current $I_{max}$ adjustable	$I_{max}$ 1200 mA
	works setting	700 mA
	<b>for 12 Volt solenoid</b>	
	min. current $I_{min}$ adjustable	60...800 mA
	works setting	300 mA
	max. current $I_{max}$ adjustable	$I_{max}$ 1800 mA
	works setting	1200 mA
Ramp	1 ramp up/down adjustable with same potentiometer.	
Ramp time	0,25...6 s.	
EMC		
Immunity	EN 61 000-6-2	
Emission	EN 61 000-6-4	

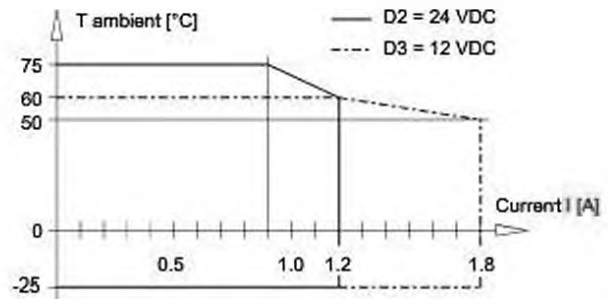
**BLOCK DIAGRAM**



**DIMENSIONS**



**MAX. AMBIENT TEMPERATURE CURVE**



If mounted on the solenoid □ 60/12V the current has to be limited to 1.8 A, otherwise the proportional-amplifier could be overloaded.

**ADDITIONAL INFORMATIONS**

Proportional directional control valves  
Proportional pressure control valves  
Proportional flow control valves

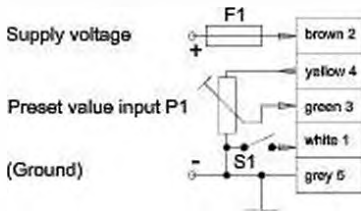
Wandfluh-Dokumentation  
register 1.10  
register 2.3  
register 2.6

**START-UP**

This data sheet is enclosed with each proportional-amplifier.

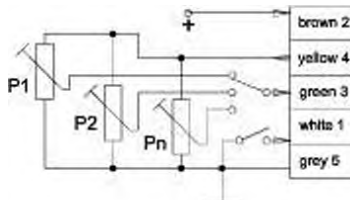
**Connection examples**

Connection with external preset value potentiometer



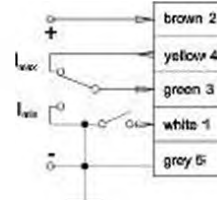
F1: 24 V = 1,6 A quick-break P1 = 10 kΩ  
12 V = 2,5 A quick-break S1 = release / block

Connection with n preset value potentiometers

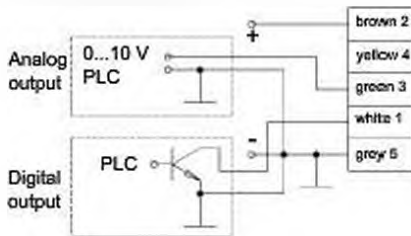


P1 – Pn = 50 kΩ

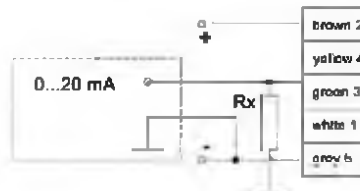
Connection with preset value switch



Connection with external power source release / block with PLC, PC or NC



Connection with external current source



Rx = 470 Ω / 0,5 W for 24 VDC  
Rx = 390 Ω / 0,5 W for 12 VDC

**Connection instructions**

**Supply voltage (brown, grey)**

The connection has to be done as shown above:

- + pole = brown
- pole = grey (Ground)

**Stabilized output voltage (yellow)**

The output can be used for supplying an external preset input. The maximum load is 2 mA. (R preset input > 5 kΩ)

**Preset value Input (green)**

The analog preset value signal 0...+10 VDC (0...+8 VDC / 12 V-version) has to be connected here.

**Release/block (white)**

If the line is not connected, the proportional amplifier is released. If the line is connected to ground, the amplifier is blocked.

**Mounting**

With a screw driver the bottom of the amplifier can be lifted-off and turned by 180°.

**Setting instructions**

**Minimum current I<sub>min</sub>**

Adjust the external preset value to 0%. Adjust the solenoid current with the potentiometer I<sub>set</sub> to a value which results in the desired minimum output of the consumer.

**Maximum current I<sub>max</sub>**

Adjust the external preset value to 100%. Adjust the solenoid current with the potentiometer I<sub>set</sub> to a value which results in the desired maximum output of the consumer.

**Dither**

With the potentiometer Dither, adjust the frequency of the modulated solenoid current to the value which results in the desired sensitivity of the consumers.

- Turning the potentiometer to the right: Higher frequency.
- Turning the potentiometer to the left: Lower frequency.

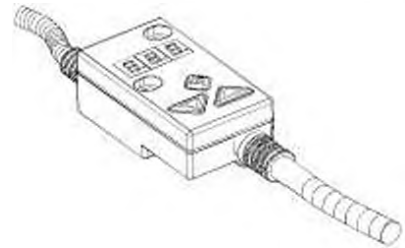
**Ramp**

There is a common potentiometer mounted for the «ramping up / ramping down» functions.

- Turning the potentiometer to the right: Long ramping time.
- Turning the potentiometer to the left: Short ramping time.

**Digital amplifier electronics PD2**

- For 1 proportional or switching solenoid
- With cable outlet for free choice of the valve connection plug
- Protection class IP 67
- Interface:   - analog  
              - CANopen/J1939
- 1 analog input
- 1 digital input
- Adjustable with push-buttons and display directly on the device or via PC


**DESCRIPTION**

Amplifier with cable outlet for free choice of the connection plug such as DIN EN 175301-803/ISO 4400, AMP Junior Timer or Deutsch DT04-2P. Protection class IP67. The connection and solenoid cable are mounted fixed in the device. The voltage range enables the control of 12 VDC and 24VDC devices. The amplifier is also available mounted directly on the solenoid.

**FUNCTION**

The electronics has a Pulse-Width-Modulated current output. The solenoid output can also be parameterised for switching solenoids. The parameterisation is carried out directly on the device by means of push-buttons and display, or by means of the parameterisation and diagnostics software "PASO" of Wandfluh.

**APPLICATION**

Due to its water spray resistant execution, the amplifier is suitable for most diverse applications. Easy connection enables assembly and commissioning with conventional tools. All settings can be carried out easily and quickly.

**TYPE CODE**

 P D2 3 0 1 D8 0 - A   # 

Connector	
Digital	
Adjustable with Push-buttons / display and PASO	
Basic amplifier	
1-solenoid execution	
Supply voltage	8...32 VDC
Analog input	Voltage / current (not for fieldbus)
10-bit resolution	
Option fieldbus: • without fieldbus • with CANopen • with J1939	<input type="checkbox"/> A <input type="checkbox"/> C <input type="checkbox"/> J   (On request)
Connection cable length • 1,5 m • 7,5 m	<input type="checkbox"/> <input checked="" type="checkbox"/> 7,5   (Not for fieldbus)
Design index (subject to change)	

**GENERAL SPECIFICATIONS**

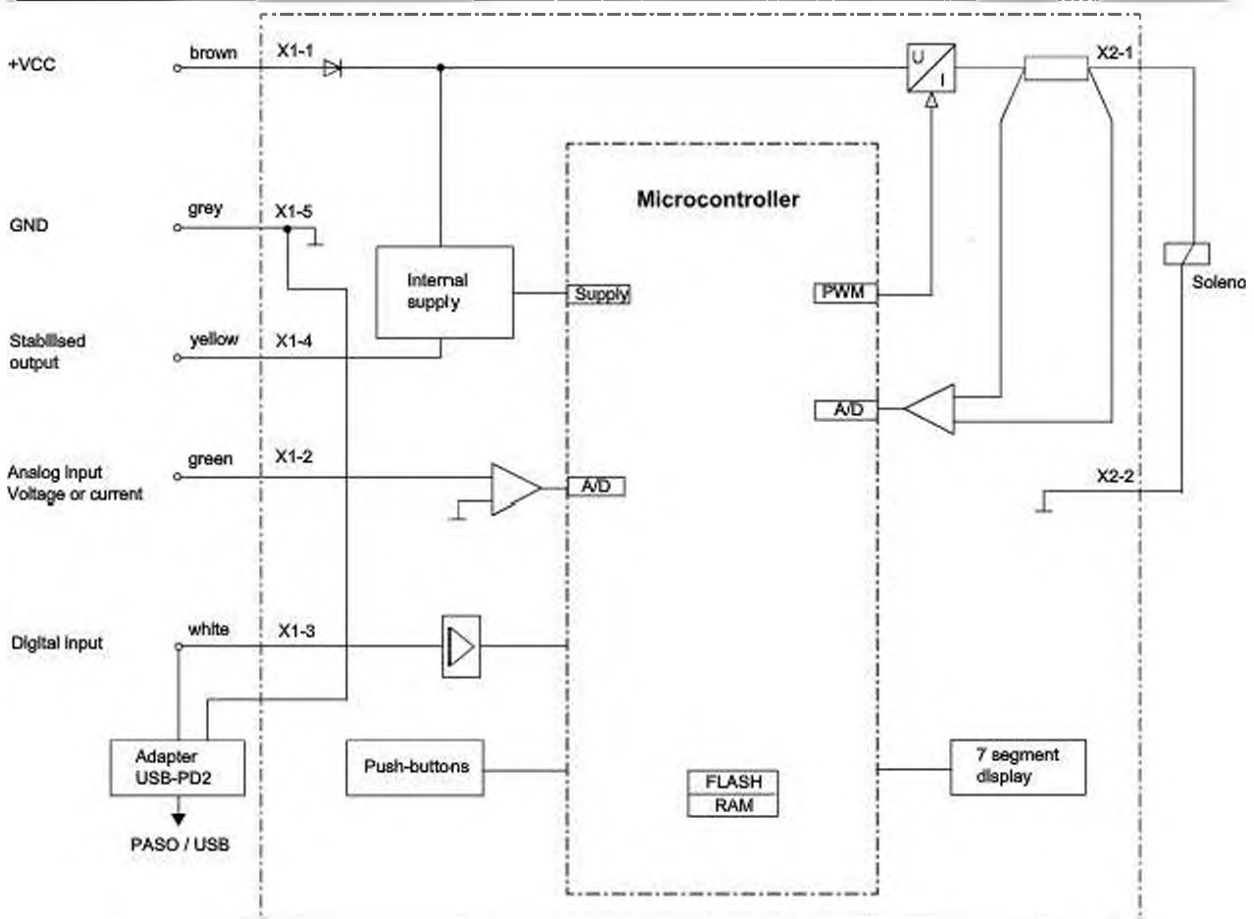
Execution	With cable outlet for free choice of the valve connection plug
Connections	Connection cable   5 x 0,34 mm <sup>2</sup> , Exterior coating PVC length = 1,5 m or 7,5 m Solenoid cable       2 x 0,34 mm <sup>2</sup> , Exterior coating PVC length = 0,5 m USB interface        Via connection «Digital inputs» requires the Wandfluh USB adapter PD2
Dimensions	See drawing page 2
Ambient temperature	-40...+85 °C
Installation	2 screws M3x20, tightening torque 0.1 Nm

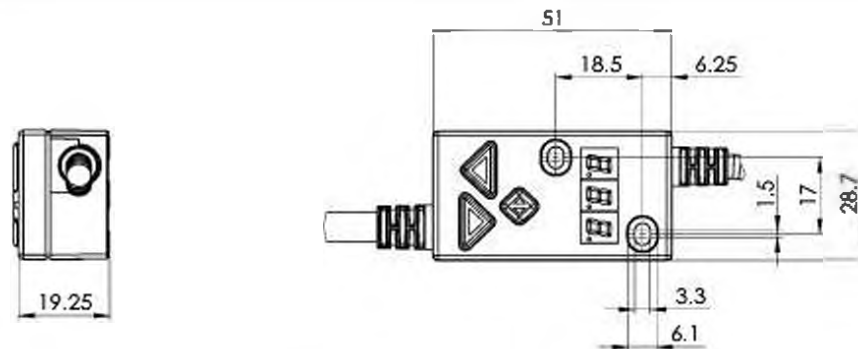
## Amplifier with analog interface

### ELECTRICAL SPECIFICATIONS

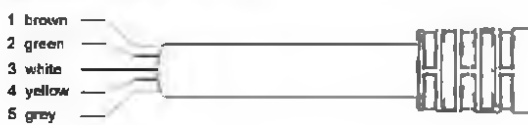
Protection class	IP67 acc. to EN 60 529	Dither	Frequency adjustable 4...500 Hz Factory setting 80 Hz
Supply voltage	8...32 V	Temperature drift	Level adjustable 0...400 mA Factory setting 180 mA
Residual ripple	< +/-5%	Digital inputs	<1% at $\Delta T = 40^\circ C$ 1 input high-active, no pull-up/down Switching threshold high 6...32 VDC Switching threshold low 0...1 VDC
Fuse	Low	Ramps	Usable as frequency input (frequency 5...5000 Hz) and as PWM input (automatic frequency recognition)
No-load current	Approx. 20 mA	USB interface	Adjustable 0...500 a Via digital input Requires the Wandfluh USB adapter
Max. current consumption	No-load current + 2,5 A per solenoid	EMV	Immunity
Analog input	1 input non-differential Voltage / current (switchable by means of parameter) 0...+/- 10V or 0/4...20mA	Emission	EN 61 000-6-2 EN 61 000-6-4
Resolution	10-bit		
Input resistance	Voltage input >100 k $\Omega$ (Input current < 8 mA) Load for current input = 124 $\Omega$		
Stabilised output voltage	5 VDC Max. load 20 mA		
Solenoid current:			
• Minimal current $I_{min}$	Adjustable 0... $I_{max}$ mA Factory setting 150 mA		
• Maximal current $I_{max}$	Adjustable $I_{min}$ ...2450 mA Factory setting 700 mA		

### BLOCK DIAGRAM



**DIMENSIONS**

**CONNECTOR ASSIGNMENT**

Connection cable (X1)



- 1 = + VCC
- 2 = Command value
- 3 = Dig Inp
- 4 = Stab out
- 5 = GND

Solenoid cable (X2)



- 1 = Solenoid +
- 2 = Solenoid -

**START-UP**

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier electronics and in the operating instructions.

**ADDITIONAL INFORMATION**

Wandfluh electronics general	Wandfluh documentation-register	1.13
Proportional spool valves	register	1.10
Proportional pressure valves	register	2.3
Proportional flow control valves	register	2.6

Free-of-charge download:

- «PASO-PD2» Parameterisation software
- Operating instruction (\*.pdf)

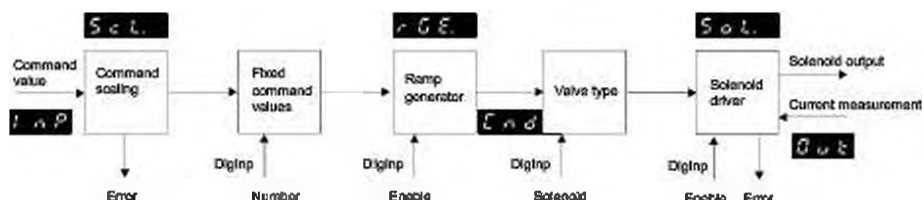
**ACCESSORIES**

USB-adapter PD2	Article no. 728.9900
incl. USB-cable, type A-B 1,8 m (for parameterisation via PASO)	

**ADJUSTMENTS**

The PD2 electronics have push-buttons and a 7 segment display which enable setting the most important parameters. In addition, the digital input can be used as a communication interface, through which, by means of the parameterisation software «PASO-PD2», the complete parameterisation and diagnostics can be carried out. For this, the Wandfluh USB-PD2 adapter is required. (not included in the delivery)

 **Important:** During the communication, the digital input cannot be used.

**FUNCTION DESCRIPTION**




**PD2 AMPLIFIER WITH ANALOG INTERFACE**
**Command value scaling**

The command value can be applied as a voltage, current, digital, frequency or PWM signal. The scaling takes place via the parameter „Interface“. Furthermore, the command value can be monitored for a cable break. A dead band can also be set.

**Fixed command value**

There is 1 fixed command value available, which can be selected via the digital input. This function has to be configured before in PASO.

**Ramp generator**

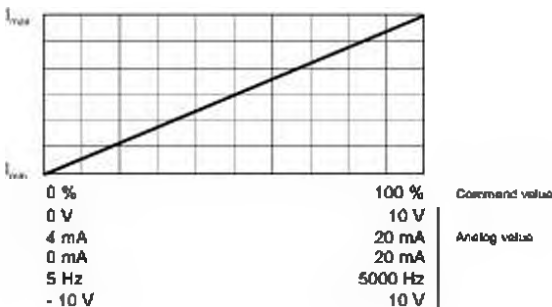
Two linear ramps for up and down are available which can be adjusted separately.

**Valve type**

Adjustment possibilities: switching solenoid or proportional solenoid.

**Mode of operation „Command value unipolar/bipolar (1-So)“**

Dependent on a command value signal (voltage, current, digital, frequency or PWM), the solenoid is driven (e.g. 0...10V correspond to 0...100 % command value, 0...+100 % command value correspond to I<sub>min</sub>...I<sub>max</sub> solenoid driver)


**Signal recording**

Furthermore, the „PD2“ amplifier electronics have a signal recording function. This, by means of PASO, enables the recording of various system signals, such as command value, solenoid current, etc., which can be represented on a common time axis.

**Solenoid driver**

A Pulse-Width-Modulated current output is available. A dither signal is superimposed, whereby the dither frequency and the dither level are separately adjustable. The minimum (I<sub>min</sub>) and maximum (I<sub>max</sub>) current can be adjusted. The solenoid output can also be configured as switching solenoid output. In this case, a power reduction can be adjusted.

**Optimisation of characteristic curve**

An adjustable characteristic curve „Command value input – solenoid current output“ enables an optimised (e.g. linearsed) characteristic of the hydraulic system.

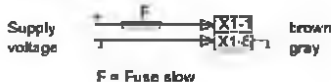
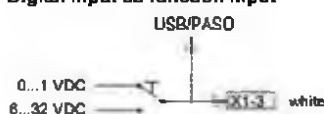
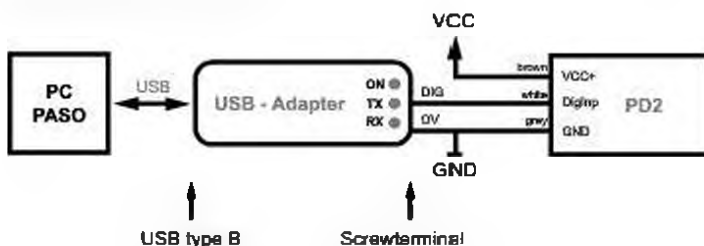
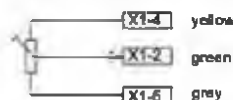
**Channel enabling**

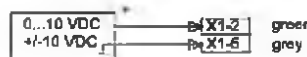
As per factory setting, the device is enabled („on“). This „enable channel“ can be set to „on“, „off“ or „external“ (digital input) via PASO or via menu item.


**Important!**

Digital input: If deenergised, not wired, the state is not defined

Analog input: If deenergised, the voltage input will read 1.11 V constantly

**CONNECTION EXAMPLES**
**Supply voltage**

**Digital input as function input**

**Digital input as USB interface**

**Analog Input with potentiometer**

**Analog input current with external current source**

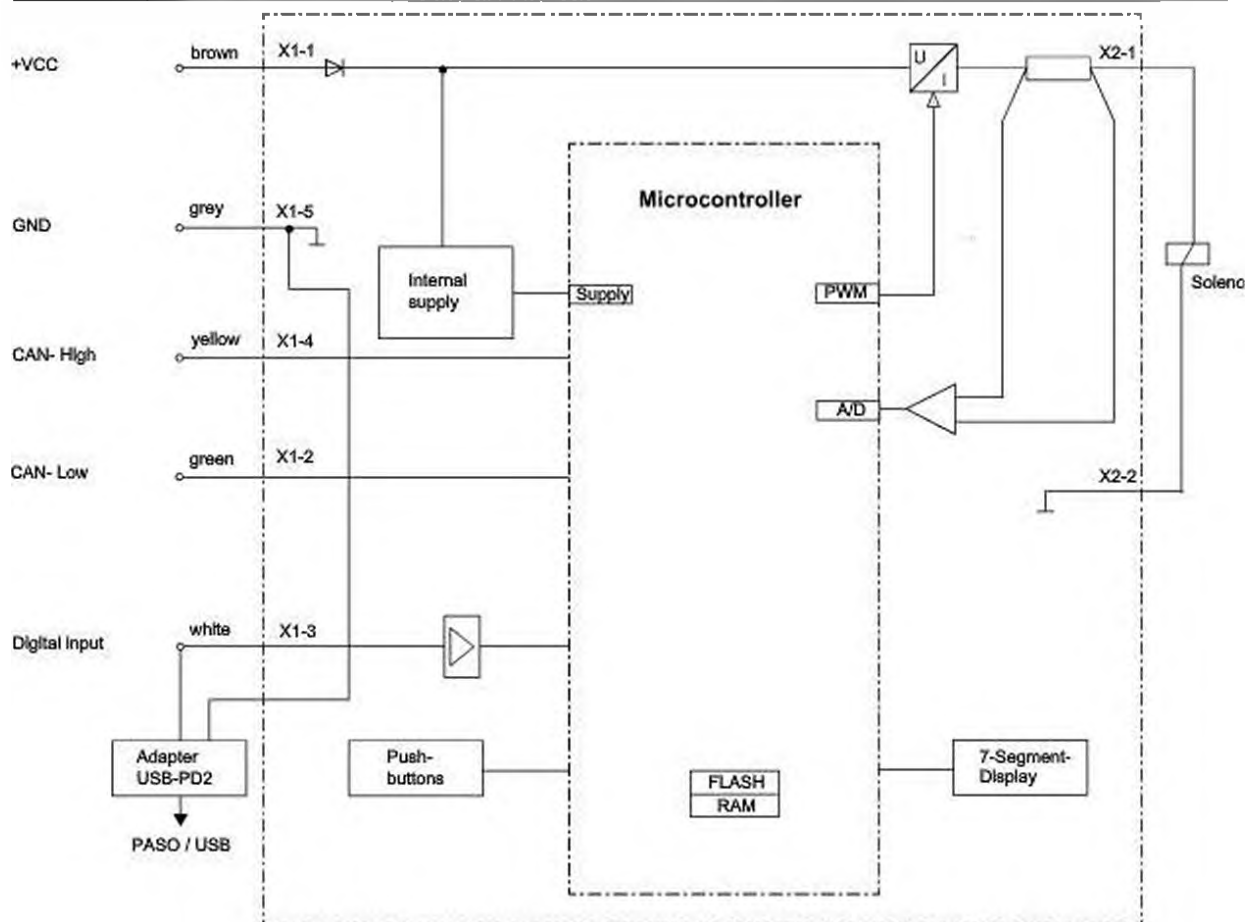
**Analog input voltage with external voltage source**


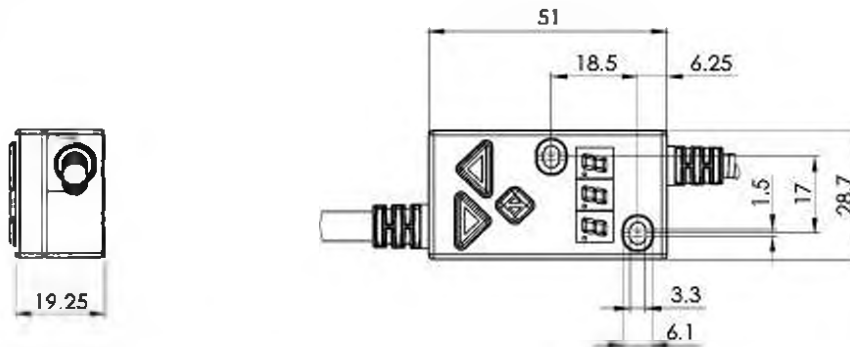
## Amplifier with CANopen interface

### ELECTRICAL SPECIFICATIONS

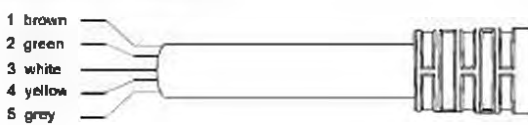
Protection class	IP67 acc. to EN 60 529	Temperature drift	<1% at $\Delta T = 40^\circ C$
Supply voltage	8...32 V	Digital inputs	1 input high-active, no pull-up/down
Residual ripple	< +/-5%		Switching threshold high 6...32 VDC
Fuse	Low		Switching threshold low 0...1 VDC
No-load current	Approx. 20 mA		Usable as frequency input
Max. current consumption	No-load current + 2,5 A per solenoid	USB interface	(frequency 5...5000 Hz) and as PWM input (automatic frequency recognition)
			Via digital input
<i>Solenoid current:</i>			Requires the Wandfluh USB adapter
• Minimal current $I_{min}$	Adjustable 0... $I_{max}$ mA	EMC	
	Factory setting 150 mA	Immunity	EN 61 000-6-2
• Maximal current $I_{max}$	Adjustable $I_{min}$ ...2450 mA	Emission	EN 61 000-6-4
	Factory setting 700 mA		
Dither	Frequency adjustable 4...500Hz		
	Factory setting 80Hz		
	Level adjustable 0...400 mA		
	Factory setting 180 mA		

### BLOCK DIAGRAM



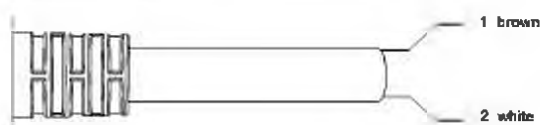
**DIMENSIONS**

**CONNECTOR ASSIGNMENT**

Connection cable (X1)



- 1 = + VCC
- 2 = CAN-Low
- 3 = Dig Inp
- 4 = CAN-High
- 5 = GND

Solenoid cable (X2)



- 1 = Solenoid +
- 2 = Solenoid -

**START-UP**

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier electronics and in the operating instructions.

Additional information can be found on our website:

Free-of-charge download:

- «PASO-PD2» Parameterisation software
- Operating instruction (\*.pdf)

**ADDITIONAL INFORMATION**

Wandfluh electronics general	Wandfluh documentation-register	1.13
Proportional spool valve	register	1.10
Proportional pressure valves	register	2.3
Proportional flow control valves	register	2.8

**ACCESSORIES**

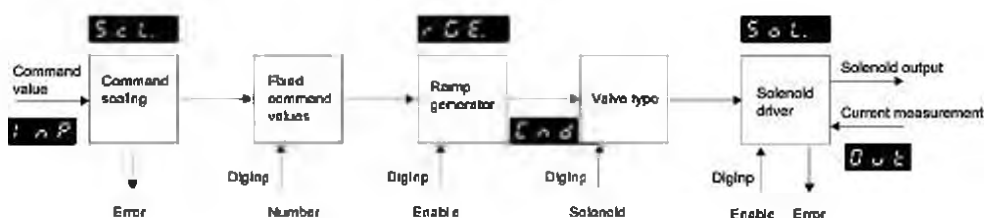
USB-adaptor PD2	Article no. 728.9900
incl. USB-cable, type A-B, 1.8 m (for parameterisation via PASO)	

**ADJUSTMENTS**

The PD2 electronics have push-buttons and a 7 segment display which enable setting the most important parameters. In addition, the digital input can be used as a communication interface, through which, by means of the parameterisation software „PASO-PD2“, the complete parameterisation and diagnostics can be carried out. For this, the Wandfluh USB-PD2 adapter is required. (not included in the delivery)



**Important:** During the communication, the digital input cannot be used.

**FUNCTION DESCRIPTION**


**PD2 AMPLIFIER WITH CANopen INTERFACE**
**Command value scaling**

The command value can be applied as a CAN-bus-, digital, frequency or PWM signal. The scaling takes place via the parameter „Interface“. Furthermore, the command value can be monitored for a cable break. A dead band can also be set.

**Fixed command value**

There is 1 fixed command value available, which can be selected by the digital input. This function has to be configured before in PASO.

**Ramp generator**

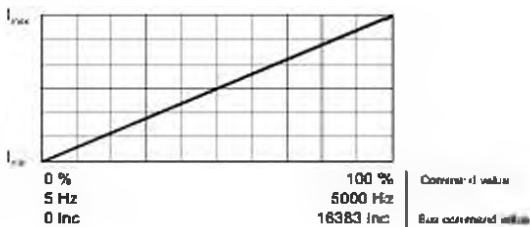
Two linear ramps for up and down are available which can be adjusted separately.

**Valve type**

Adjustment possibilities: switching solenoid or proportional solenoid.

**Mode of operation „Command value unipolar/bipolar (1-Sol)“**

Dependent on a command value signal (CAN-bus, digital, frequency or PWM), the solenoid is driven (e.g. 0...16383 CAN-command correspond to 0...100 % command value, 0...+100 % command value correspond to I<sub>min</sub>...I<sub>max</sub> solenoid driver)


**Signal recording**

Furthermore, the „PD2“ amplifier electronics have a signal recording function. This, by means of PASO, enables the recording of various system signals, such as command value, solenoid current, etc., which can be represented on a common time axis.

**Solenoid driver**


A Pulse-Width-Modulated current output is available. A dither signal is superimposed, whereby the dither frequency and the dither level are separately adjustable. The minimum (I<sub>min</sub>) and maximum (I<sub>max</sub>) current can be adjusted. The solenoid output can also be configured as switching solenoid output. In this case, a power reduction can be adjusted.

**Optimisation of characteristic curve**

An adjustable characteristic curve „Command value input – solenoid current output“ enables an optimised (e.g. linearsed) characteristic of the hydraulic system.

**Channel enabling**

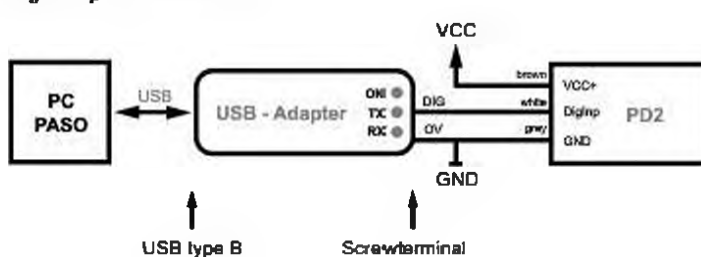
As per factory setting, the device can be enabled via CAN-bus. This „enable channel“ can be set to „bus“, „on“, „off“ or „external“ (digital input) via PASO or via menu item.

 **Important!** Digital input: If deenergised, the state of the digital input is not defined

**CONNECTION EXAMPLES**
**Supply voltage**

**CAN connection**

**Digital input as function input**

**Digital input as USB interface**


**Digital amplifier electronics PD3**

- For 1 proportional or switching solenoid
- With cable outlet for free choice of the valve connection plug
- Protection class IP 67
- Interface:
  - IO-Link (with Master Typ B)
  - Analogue
  - CANopen/J1939
- Adjustable via Bluetooth by means of the Wandfluh App


**DESCRIPTION**

Amplifier with cable outlet for free choice of the connection plug such as DIN EN 175301-803/ISO 4400, AMP Junior Timer or Deutsch DT04-2P. Protection class IP67. The connection and solenoid cable are mounted fixed in the device. With the IO-Link interface, the PD3 electronics can both be controlled and diagnosed. The amplifier is also available mounted directly on the solenoid.

**FUNCTION**

The electronics has a Pulse-Width-Modulated current output. This output is adjustable for a proportional or switching solenoid. The parameterisation is made via Bluetooth by means of the Wandfluh App.

**APPLICATION**

Due to its water spray resistant execution, the amplifier is suitable for most diverse applications. The M12 connector allows easy connection to standardized M12 sensor/actuator boxes. With the IO-Link interface, the PD3 electronics is prepared for IIoT and Industry 4.0.

**TYPE CODE**

 P D3 4 0 1 D8 0 - A   # 

Connector

Digital

 Adjustable via Bluetooth  
 by means of the App

Basic amplifier

1-solenoid execution

Supply voltage 8...32V (IO-Link: only 24V)

Command value input Voltage / current / digital / frequency / PWM only [A] analogue

12-bit resolution For analogue input

Type selection:

- IO-Link  Standard
- Only analogue  [A]
- CANopen  on request
- J1939  on request

 Connection cable  1.5 m, with M12 plug

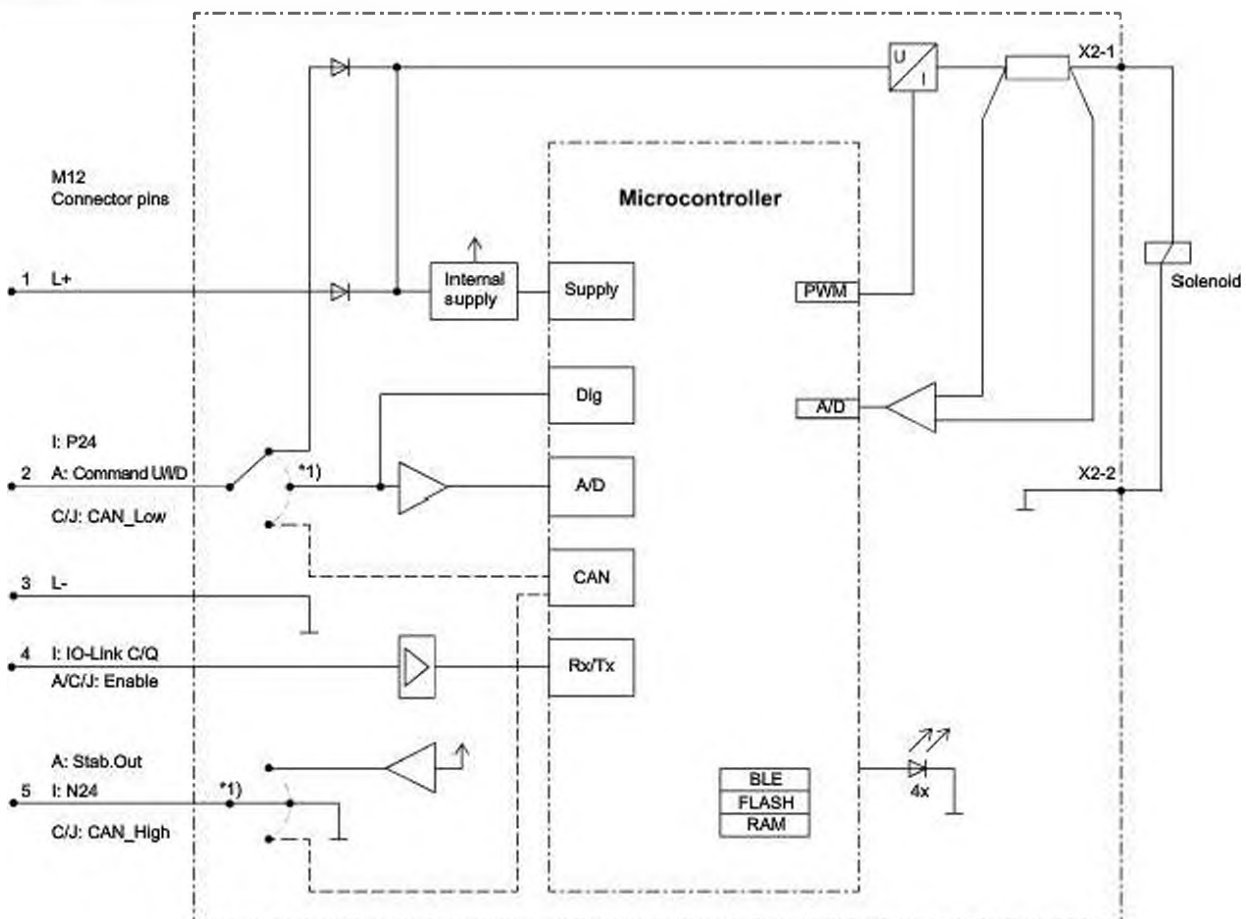
Design index (subject to change)

**GENERAL SPECIFICATIONS**

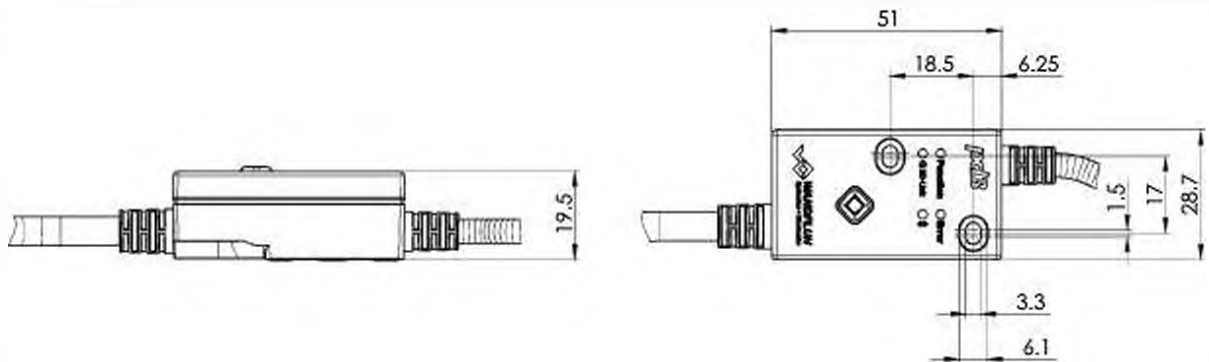
Execution	With cable outlet for free choice of the valve connection plug	
Connections	Connection cable	PVC with M12 plug (male) 5-pole length = 1.5 m
	Solenoid cable	PVC, 2 x 0,34 mm length = 0,5 m
Dimensions	See drawing page 3	
Ambient temperature	-40...+85 °C (Derating see operating manual)	
Installation	2 screws M3x20, tightening torque 0.1 Nm	

**ELECTRICAL SPECIFICATIONS**

Protection class	IP67 acc. to EN 60 529	Drifter	Frequency adjustable 4...500Hz
Supply voltage	IO-Link: 24 V (18...30V), analogue: 8...32V	Temperature drift	Factory setting 80Hz
Residual ripple	< 1.3 Vpp	Enable input	Level adjustable 0...400 mA
Fuse	Low		Factory setting 180 mA
No-load current	Approx. 30 mA		<1 % bei $\Delta T = 40^\circ C$
Max. current consumption	No-load current + 2,5 A per solenoid	Ramps	1 input high-active
Command value input	1 input non-differential	IO-Link interface	Switching threshold high 1/2 VCC +2V
	Voltage / current (switchable by means of parameter)	Bluetooth	Switching threshold low 1/2 VCC -2V
	0...+ 10V or 0/4...20mA	Fieldbus (option)	Adjustable 0...500s
	Usable as frequency input	LEDs	Data line C/Q, COM2 = 38,4 kBaud
	(frequency 5...5000 Hz) or as PWM input		Use master type B
	(automatic frequency detection) or digital	Supply solenoid	Low Energy with access protection
	dig. switching threshold high >3V	EMV	Contains FCC ID: Q0011
	dig. switching threshold low <0.8V	Immunity	CANopen (on request)
Resolution	12-bit	Emission	J1939 (on request)
Input resistance	Voltage input >100 k $\Omega$		Function green
	Load for current input = 124 $\Omega$		Bluetooth blue
Stabilised output voltage	5 VDC		IO-Link green
	max. load 20 mA		Error red
Solenoid current:			with IO-Link
• Minimal current $I_{min}$	Adjustable 0... $I_{max}$ mA		galvanically separated via P24/N24
	Factory setting 50 mA		2014/53/EU (Radio Equipment Directive)
• Maximal current $I_{max}$	Adjustable $I_{min}$ ...2500 mA		ETSI EN 300 328
	Factory setting 700 mA		47 CFR, Part 15 / ICES-003
			ETSI EN 301 489-1 / 301 489-17
			EN 61 000-6-2
			EN 61 000-6-4

**BLOCK DIAGRAM**


\*1) fix selection according to type code

**DIMENSIONS**

**CONNECTOR ASSIGNMENT**

Valve connection cable (X1)  
 With mounted M12 connector  
 5-pole male A coded

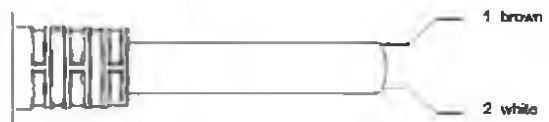

**Typ analogue**

- 1 (brown) Supply voltage VCC +
- 2 (green) Command value signal
- 3 (grey) Supply 0 VDC/GND
- 4 (white) Digital input
- 5 (yellow) Stabilised output voltage\*

**Typ I/O-Link**

- L+ supply voltage +
- P24/2L+ additional supply +
- L-supply 0 VDC/GND
- C/Q
- N24/2L-additional supply 0 VDC

Solenoid cable (X2)  
 Open end for free choice of the valve connection plug



- 1 = Solenoid +
- 2 = Solenoid -

\*Caution: Some M12 distributor boxes have the earth connection on pin 5 → Short-circuit hazard!

**START-UP**

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier electronics and in the operating instructions.

Additional information can be found on our website:

Free-of-charge download:

- Operating instruction (\*.pdf)
- Wandfluh App for Android (Google Play) and iOS (App Store)
- I/O-Link Interface Description

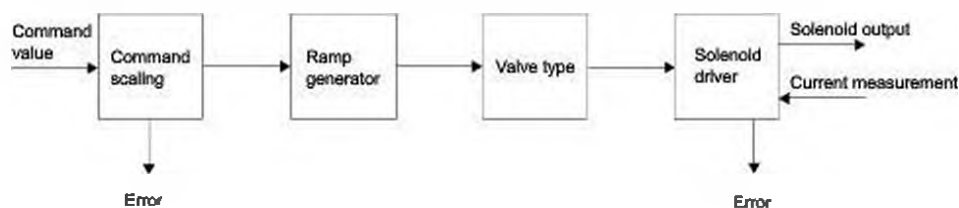
**ADDITIONAL INFORMATION**

Wandfluh electronics general  
 Proportional spool valves  
 Proportional pressure valves  
 Proportional flow control valves  
 Solenoid coil with PD3

Wandfluh documentation  
 register 1.13  
 register 1.10  
 register 2.3  
 register 2.6  
 register 1.1-331

**ADJUSTMENTS**

The PD3 electronics has a Bluetooth interface. Via the Wandfluh App, the PD3 functions can be analysed and all parameters set.

**FUNCTION DESCRIPTION**


**PD3-AMPLIFIER**
**Command value scaling**

Type IO-Link: The command value can only be specified via IO-Link.

Type analogue: The command value can be specified as a voltage, current, digital, frequency or PWM signal.

**Ramp generator**

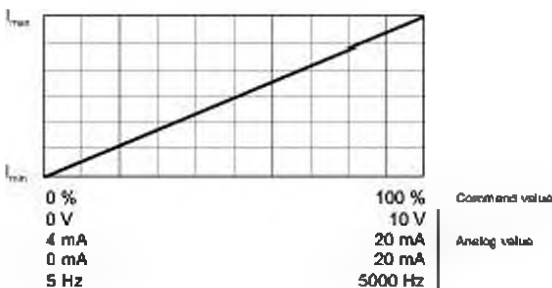
Two linear ramps for up and down are available which can be adjusted separately.

**Valve type**

Adjustment possibilities: switching solenoid or proportional solenoid.

**Mode of operation «Command value unipolar/bipolar (1-Sol)»**

Dependent on a command value signal (IO-Link, voltage, current, digital, frequency or PWM), the solenoid is controlled (e.g. 0...10V correspond to 0...100 % command value, which again corresponds to  $I_{min}$ ... $I_{max}$  solenoid driver).

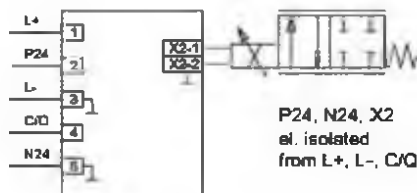
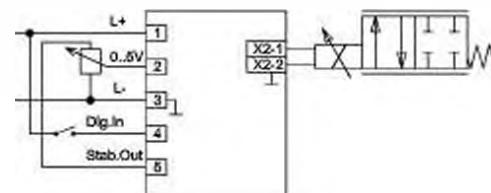

**Solenoid driver**

A Pulse-Width-Modulated current output is available. A dither signal is superimposed, whereby the dither frequency and the dither level are separately adjustable. The minimum ( $I_{min}$ ) and maximum ( $I_{max}$ ) current can be adjusted. The solenoid output can also be configured as switching solenoid output. In this case, a power reduction can be adjusted.

**Channel enabling**

Enable can be configured by means of the App:

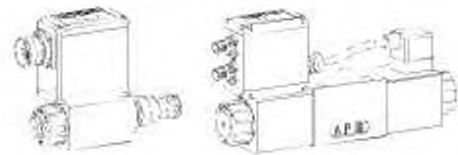
- on
- off
- external (enable input with type analogue)
- bus (with type IO-Link)

**CONNECTION EXAMPLES**
**Connection example IO-Link**

**Connection example analogue with stabilised output**




**Integrated amplifier and controller electronics**
**for proportional hydraulic valves**

- **Interface:** - analogue
- CANopen or J1939
- Profibus DP
- **24 VDC or 12 VDC**
- **Electronic card setting via PC (USB)**
- **Optimisation of characteristic curve**


**Description**

Wandfluh offers proportional valves with integrated, intelligent electronics. With protection class IP67 these valves are suitable for rough ambient conditions. The term "Digital Smart Valve" stands for digital amplifier or controller electronics requiring the smallest space. As a result of the compact construction, Wandfluh is in the position to also offer miniature valves of the nominal size 4 in an optimum, slender design. In addition to this, Wandfluh as the only manufacturer offers proportional screw-in cartridges M22 and M33 with integrated electronics. The electronics are mounted onto a slip-on coil.

**Function**

The actuation takes place via an analogue interface or a fieldbus interface (CANopen/J1939 or Profibus DP). The parameterisation takes place by means of the free-of-charge parameterisation and diagnosis software "PASO" or via the fieldbus interface.

"PASO" is a Windows program in the flow diagram style, which enables the intuitive adjustment and storing of all variable parameters. The data remain saved in case of a power failure and can also be reproduced and transferred to other DSVs.

As an option, these valves are available with an integrated controller. As feedback value generators sensors with voltage or current outputs can be directly connected. The available controller structures have been optimised for applications with hydraulic actuators.

**Application**

The „DSV“ electronics are used by Wandfluh exclusively for proportional hydraulic valves. They are factory set and adjusted in order to guarantee the highest valve-to-valve reproducibility. The hydraulic valves have their application where a good valve-to-valve reproducibility, a simple installation, convenient operation and the highest precision are of great importance. The integrated controller relieves the machine control and operates the axis (position, angle, pressure, etc.) in a closed control loop. The applications are in the industrial as well as in the mobile hydraulics for the smooth control of hydraulic actuators.

**TYPE CODE**

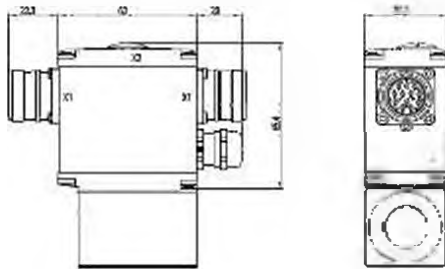
	-	M	E		-		#	
Type designation according to type list. (derived from valve designation basic execution)								
<b>Example:</b> BVPPM33 - 200								
Standard nominal voltage U <sub>n</sub> :	12 VDC	G12						
	24 VDC	G24						
Slip-on coil	Metal housing, square							
Connection execution	Integrated electronics							
<b>Hardware configuration:</b>								
Analog command value signal	12-pole	A1	7-pole	D1	(0...+10V factory preset)			
Analog command value signal	12-pole	A2	7-pole	D2	(-10...+10V factory preset)			
Analog command value signal	12-pole	A3	7-pole	D3	(0...+20mA factory preset)			
Analog command value signal	12-pole	A4	7-pole	D4	(4...+20mA factory preset)			
CANopen according to DSP-408	C1							
Profibus DP acc. to Fluid Power Technology	P1							
CAN J1939 (on request)	J1							
<b>Functions:</b>								
Amplifier	no remark							
Controller with current feedback value signal (0...20 mA / 4...20 mA)	R1							
Controller with voltage feedback value signal (0...10 V)	R2							
Sealing material / manual override								
Design-Index (Subject to change)								

**Electrical SPECIFICATIONS**

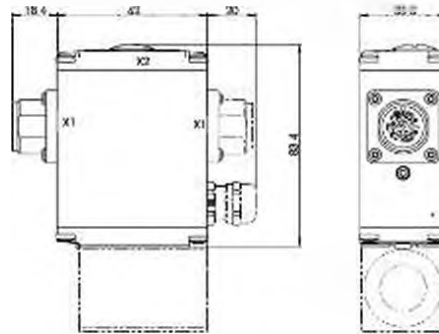
Protection class	IP 67 acc. to EN 60 529 With suitable mating connector and closed electronics housing cover	Input resistance	Voltage input >18 kΩ Load for current input = 250 Ω
Device receptacle (male) Analog interface	M23, 12-pole or Connector DIN EN175201 - 804, 7-pole	Command value signal CANopen/J1939 interface	via CANopen / J1939 Two wire lead acc. to ISO 11898 Differential signal transmission
Device receptacle (male) Supply Fieldbus interface	M12, 4-pole	Command value signal Profibus	via Profibus Shielded, twisted wire Differential signal transmission
Mating connector (female)	Plug M23, 12-pole or Plug DIN EN175201 - 804, 7-pole or Plug M12, 4-pole (not incl. in delivery)	Feedback value signal: (controller only)	Differential input not galvanically separated, for earth potential difference up to 1.5 V • Type R1 4...+20 mA / 0...+20 mA • Type R2 0...+10 V / -10...+10 V Resolution ±12 bit
Device receptacle (female) Sensor (controller only)	M12, 5-pole	Bustopologie Fieldbus interface	Line
Mating connector (male) Sensor (controller only)	M12, 5-pole (not incl. in delivery)	Separation of potential Fieldbus interface	CANopen / Profibus to DSV 500 VDC
Device receptacle (male) CANopen / J1939	M12, 5-pole (according to DRP 303-1)	Digital inputs (analog interface only with M23 connector, 12-pole)	Switching level high 6...30 VDC Switching level low 0...1 VDC Utilisable as frequency input (frequencies 0...5 kHz) and as PWM-input (automatic frequency recognition)
Mating connector (female) CANopen / J1939	Plug M12, 5-pole (not incl. in delivery)	Digital output (analog interface only with M23 connector, 12-pole)	Low-Side-Switch: $U_{max} = 40 \text{ VDC}$ $I_{max} = -700 \text{ mA}$
Device receptacle (female) Profibus	M12, 5-pole, B coded (according to IEC 947-5-2)	Reamps adjustable	0...500 s
Mating connector (male) Profibus	Plug M12, 5-pole, B coded (not incl. in delivery)	Temperature drift	<1 % at ΔT = 40 °C
Voltage range: • 24 VDC • 12 VDC	21...30 VDC 10,5...15 VDC	Parameterisation only)	via USB or CANopen / J1939 (CANopen / J1939 or Profibus (Profibus only)
Ripple on supply voltage	<10 %	Interface	USB (Mini B) for parameterisation with «PASO» under the closing screw of the housing cover factory preset
Fuse	Low	EMC Immunity Emission	EN 61 000-6-2 EN 61 000-6-4
Stabilised output voltage	10 VDC (with version 24 VDC) 8 VDC (with version 12 VDC) max. load 10 mA	Command value signal: Analog interface	Input voltage/current and signal range are adjustable by software. Diff. inputs not galvanically separated, for ground potential differences up to 1.5 V 4...+20 mA / 0...+20 mA 0...+10 V (1- or 2-solenoid valve) -10...+10 V (only 2-solenoid valve) Resolution +/-12 bit
Current consumption: • No load current • 35 mm square size solenoid • 45 mm square size solenoid • Maximum current	approx. 40 mA $I_{max} = 1000 \text{ mA}$ (with version 24 VDC) $I_{max} = 2000 \text{ mA}$ (with version 12 VDC) $I_{max} = 1200 \text{ mA}$ (with version 24 VDC) $I_{max} = 2400 \text{ mA}$ (with version 12 VDC) $I_{max} = 1534 \text{ mA}$ (with version 24 VDC) $I_{max} = 2557 \text{ mA}$ (with version 12 VDC)		

**DIMENSIONS**

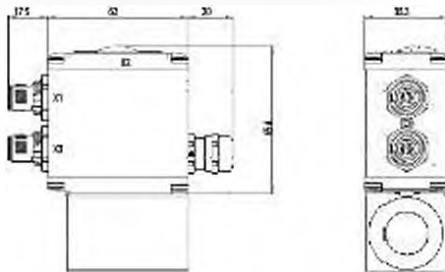
Amplifier with analog interface, plug 12-pole



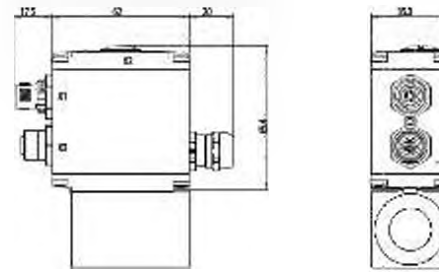
Amplifier with analog interface, plug 7-pole



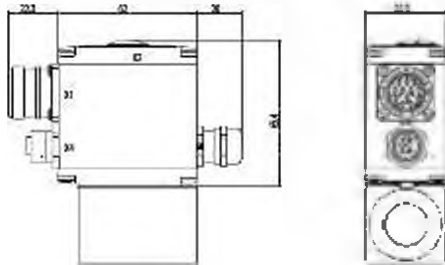
Amplifier with CANopen / J1939 interface



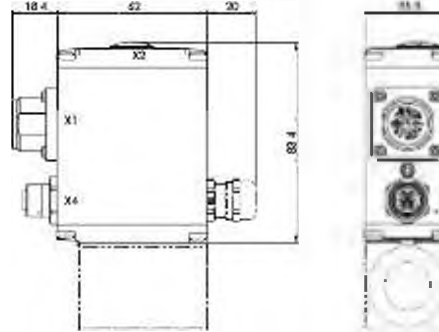
Amplifier with Profibus interface



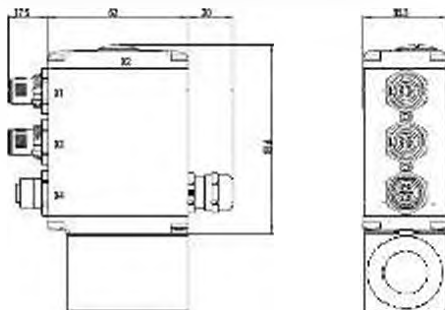
Controller with analog interface, plug 12-pole



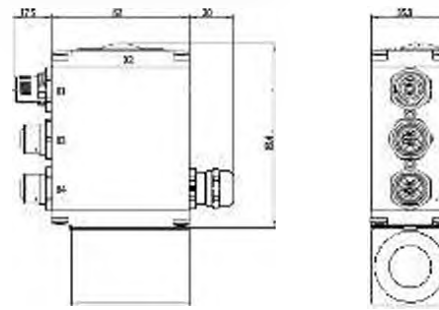
Controller with analog interface, plug 7-pole




Controller with CANopen / J1939 interface




Controller with Profibus interface





**CONNECTOR WIRING DIAGRAM**


X1	Analog interface (Main)
Device receptacle	M23, 12 pole male
	1 = Supply voltage + 2 = Supply voltage 0 VDC 3 = Stabilised output voltage 4 = Command value signal voltage + 5 = Command value signal voltage - 6 = Command value signal current + 7 = Command value signal current - 8 = Reserved for extensions 9 = Reserved for extensions 10 = Enable signal (Digital input) 11 = Error signal (Digital output) 12 = Chassis
Command value signal voltage (PIN 4/5) resp. current (PIN 6/7) are selected with parameterisation and diagnostics software PASO.	


X1	Fieldbus interface (Main)
Device receptacle	M12, 4 pole male
	1 = Supply voltage + 2 = Reserved for extensions 3 = Supply voltage 0 VDC 4 = Chassis

X2	Parameterisation interface
USB, Mini B	Under the screw plug of the housing cover
	Factory set

X1	Analog interface (Main) Connector DIN EN 175201 - 804
Device receptacle	7 pole male
	A = Supply voltage + B = Supply voltage 0 VDC C = Not connected D = Command value signal + E = Command value signal - F = Not connected G = Chassis
Command value signal: current (D3/D4) or voltage (D1/D2) to specify when placing the order	

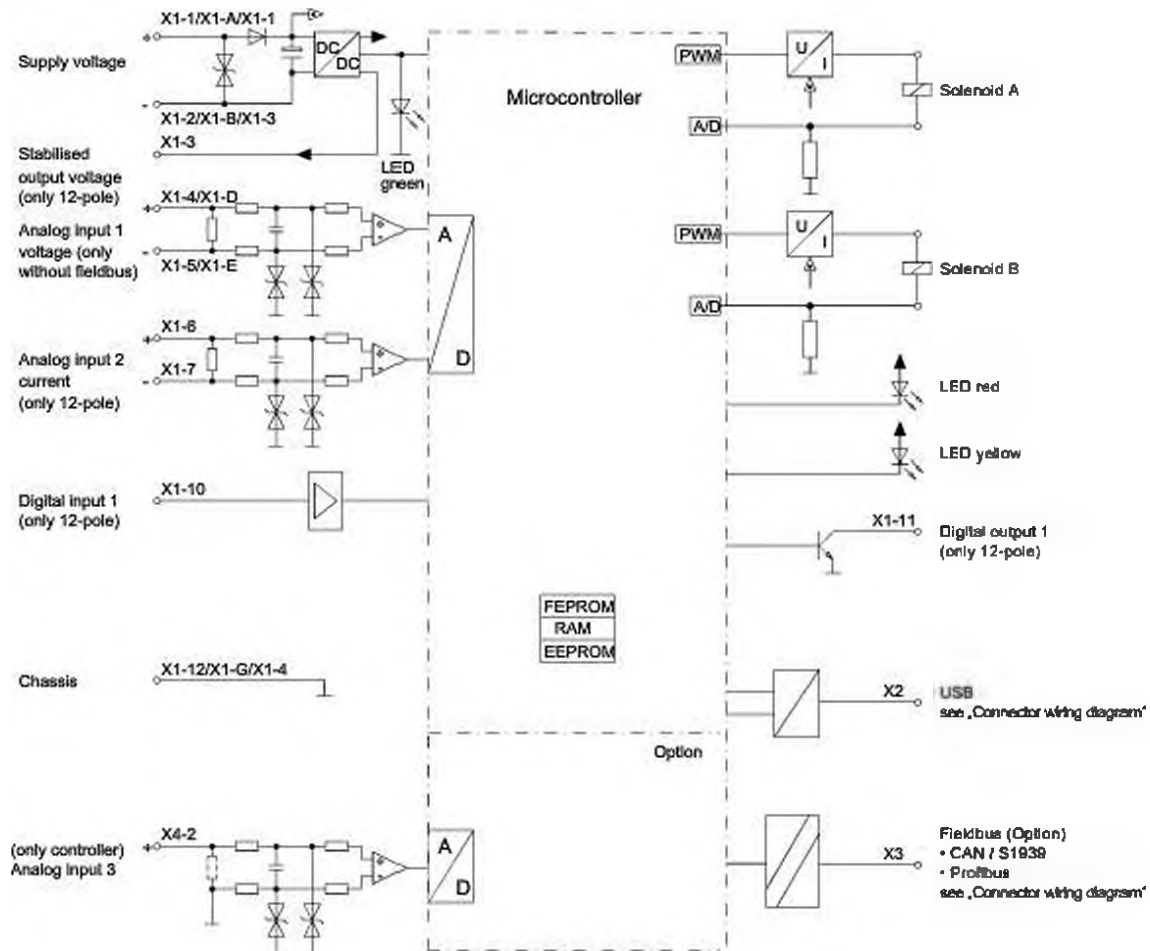
X3	Profibus interface according to IEC 947-5-2
Device receptacle	M12, 5 pole female B-coded
	1 = VP 2 = RxD / TxD - N 3 = DGND 4 = RxD / TxD - P 5 = Shield

X3	CANopen interface according to DRP 303-1
Device receptacle	M12, 5 pole male
	1 = Not connected 2 = Not connected 3 = CAN Gnd 4 = CAN High 5 = CAN Low

X4 (controller only)	Feedback value interface (sensor)
Device receptacle	M12, 5 pole female
	1 = Supply voltage (output) + 2 = Feedback value signal + 3 = Supply voltage 0 VDC 4 = Not connected 5 = Stabilised output voltage
Feedback value signal: current (R1) or voltage (R2) to specify when placing the order	

**Nota!** The mating connector is not included in the delivery

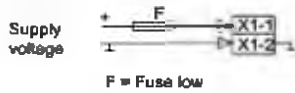


**BLOCK DIAGRAM**

**Configuration analog inputs**

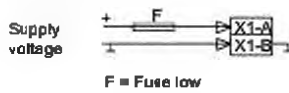
Type designation	Analog input 1	Analog input 2	Analog input 3
..A1..	Voltage	Current	
..A2..	Voltage	Current	
..A3..	Voltage	Current	
..A4..	Voltage	Current	
..D1..	Voltage	–	
..D2..	Voltage	–	
..D3..	Current	–	
..D4..	Current	–	
..C1..	–	–	
..P1..	–	–	
..J1..	–	–	
..R1..			Current
..R2..			Voltage

**EXAMPLE OF CONNECTION**
**Connection of the supply voltage**

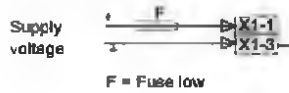
with 12-pole connector



with 7-pole connector



with fieldbus interface


**Connection of the digital inputs / outputs (only with 12-pole connector)**

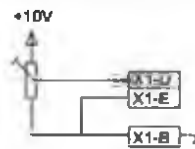

R = Consumer resistance for max. current 0.7 A

**Connection command value with potentiometer (not differential)**

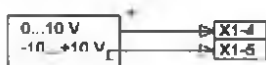
with 12-pole connector



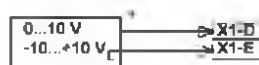
with 7-pole connector


**Connection with external command value generator (voltage differential)\***

with 12-pole connector



with 7-pole connector


**Connection with external command value generator (voltage differential)\***

with 12-pole connector



with 7-pole connector



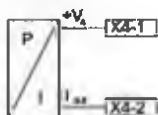
\* Ground potential difference between 0V-GND of the external command value generator and 0V-GND of the DSV electronics max. 1.5V. If required, connect the negative input X1-5 or X1-7 with 0V X1-2.

**Connection CANopen J1939**

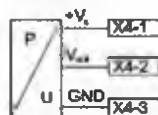
**Connection Profibus**

**Connection voltage or current feedback value of a pressure sensor**

2 conductor



3 conductor



## Amplifier electronics

### CONSTRUCTION

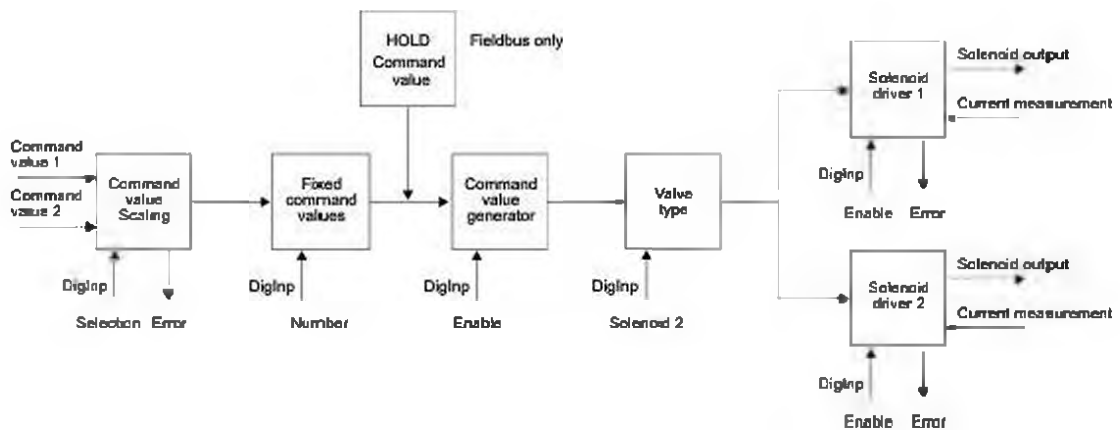
#### General

- The „DSV“ electronics is an integral part of the valve.
- All inputs and outputs are to be contacted via the device receptacle.
- Under the closing screw of the housing cover there is a USB - interface, through which with the menu-controlled Windows program „PASO“ the parameterisation and diagnostics can be carried out.
- At the factory the “DSV” electronics are adapted to the valve, so that, as a rule, no intervention of the user is necessary.

#### Fieldbus

- The „DSV“ electronics is an integral part of the valve.
- The fieldbus is to be contacted through the corresponding device receptacle
- CAN open resp. Profibus DP is used as transmission protocol.
- The characteristics and functions of the „DSV“ electronics are described through the device profile DSP-408 „Device Profile Fluid Power Technology“. A detailed description can be found on our website (see Set-up instructions).
- With the fieldbus the „DSV“ electronics can be controlled and parameterised
- The utilisation of J1939 has to be jointly specified by the customer and Wandfluh.

### DESCRIPTION OF THE FUNCTION



**Command value scaling**

The command value can be applied as a voltage, current or digital signal, or via fieldbus. For every command value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore every command value can be monitored for a cable break (except for digital signal). For every command value a dead band can also be set. Optionally one can operate with two command values. The characteristic of these command values can be adjusted.

**Fixed command values**

- One fixed command value is available, which can be selected via a digital input (only DSV electronics with analog interface and 12-pole connector).

**Command value generator**

For each solenoid output two linear ramps for up and down are available which can be adjusted separately.

**HOLD command value (fieldbus option only)**

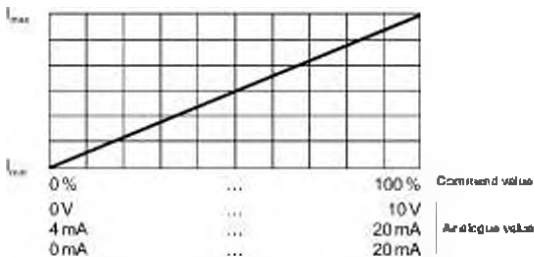
If via Profibus DP the device is put into the "HOLD" condition, the respective command value is activated.

**Valve type**

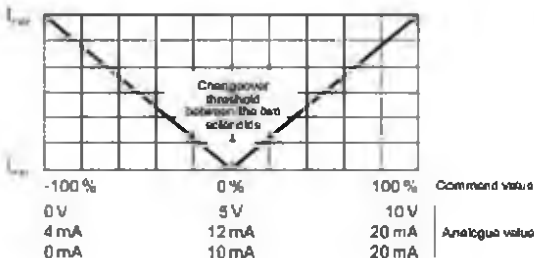
Here the mode of operation mode is set.

**Mode of operation „Command value unipolar (1-sol)“**

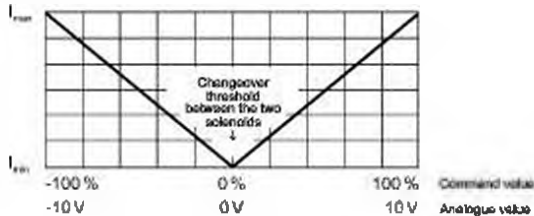
Dependent on a unipolar command value (voltage, current), the solenoid is driven (e.g. 0...10V correspond to 0...100 % command value, 0...100 % command value correspond to Imin...Imax solenoid driver 1).


**Mode of operation „Command value unipolar (2-sol)“**

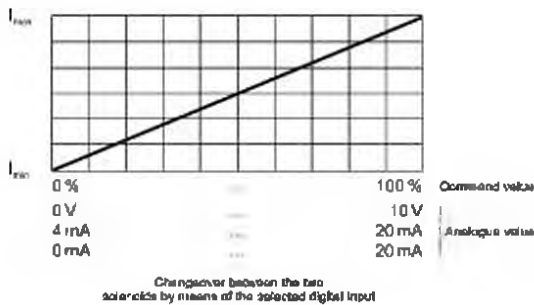
Dependent on a unipolar command value signal (voltage, current), according to the signal level one of the two solenoids is driven. The switching threshold between the two solenoids as standard is in the middle of the values range of the command value signal (e.g. 0...10V correspond to -100...+100 % command value, -100...0 % command value correspond to Imin...Imax solenoid driver 2, 0...+100 % command value correspond to Imin...Imax solenoid driver 1).


**Mode of operation „Command value bipolar (2-sol)“**

Dependent on a bipolar command value signal (voltage), according to the signal level one of the two solenoids is driven. The switching threshold between the two solenoids as standard is at 0V (e.g. -10...+10V correspond to -100...+100 % command value, -100...0 % command value correspond to Imin...Imax solenoid driver 2, 0...+100 % command value correspond to Imin...Imax solenoid driver 1).


**Mode of operation „Command value unipolar (2-sol with DigInp)“**

Dependent on a unipolar command value signal (voltage, current), the solenoid is driven by solenoid driver 1, when the selected digital input is „not activated“, resp. the solenoid by the solenoid driver 2, when the selected digital input is „activated“ (e.g. 0...10V correspond to 0...100 % command value, 0...100 % command value correspond to Imin...Imax solenoid driver 1 or 2).


**Signal recording**

The DSV electronics has a signal recording function. This, by means of PASO, enables the recording of various system signals, such as command value, solenoid currents, etc., which can be represented on a common time axis.

**Solenoid driver**

Two Pulse-Width-Modulated current outputs are available. To each output, a dither signal is superimposed, whereas dither frequency and dither level can be adjusted separately. For each output, the minimum (Imin) and maximum (Imax) current can be adjusted separately. The solenoid outputs can also be configured as switching outputs. Therewith for each output a power reduction can be adjusted separately.

**Optimization of characteristic curve**

A characteristic curve adjustable per solenoid „Command value input – solenoid current output“ enables an optimised (e.g., linearised) characteristic of the hydraulic system.



## Controller electronics

### CONSTRUCTION

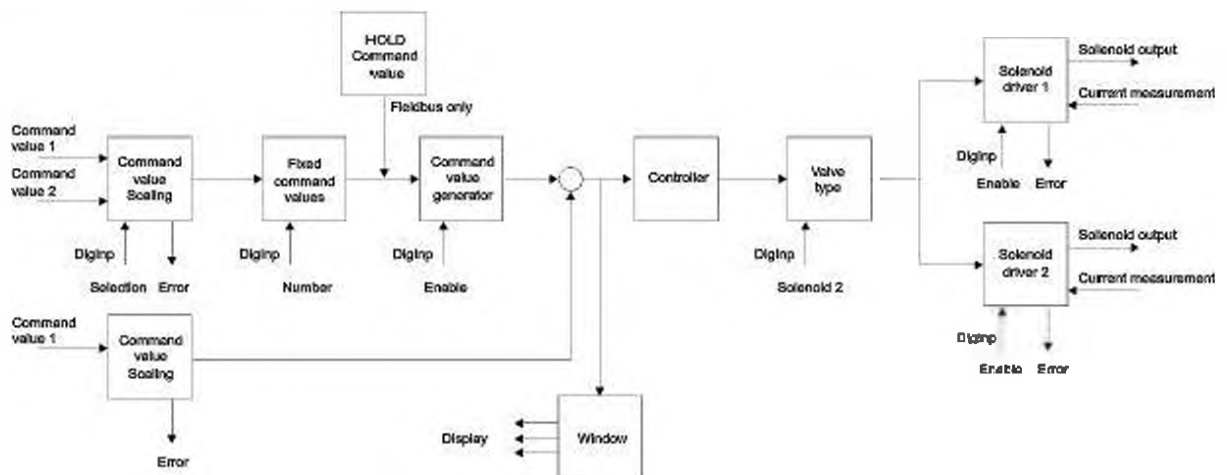
#### General

- The „DSV“ electronics is an integral part of the valve.
- All inputs and outputs are to be contacted via the device receptacle.
- Under the closing screw of the housing cover there is a USB - interface, through which with the menu-controlled Windows program „PASO“ the parameterisation and diagnostics can be carried out.
- At the factory the „DSV“ electronics are adapted to the valve, so that as a rule, no intervention of the user is necessary.

#### Fieldbus

- The fieldbus is to be contacted through the corresponding device receptacle.
- CANopen resp. Profibus DP is used as transmission protocol.
- The characteristics and functions of the „DSV“ electronics are described through the device profile DSP-408 „Device Profile Fluid Power Technology“. A detailed description can be found on our website (see set-up instructions).
- Via the fieldbus, the DSV electronics can be controlled and parameterised.
- The utilisation of J1939 has to be jointly specified by the customer and Wandfluh.

### DESCRIPTION OF THE FUNCTION



#### Command value scaling

The command value can be applied via the fieldbus or as a voltage, current, digital, frequency or PWM signal. For every command value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore every command value can be monitored for a cable break (except for digital signal). For every command value a dead band can also be set. Optionally one can operate with two command values. The characteristic of these command values can be adjusted.

#### Fixed command values

One fixed command value is available, which can be selected via a digital input (only DSV electronics with analog interface and 12-pole connector).

#### Command value generator

With the Open-Loop-Controller modes, for each solenoid output two linear ramps for up and down are available which can be adjusted separately. With the Closed-Loop-Controller modes, a positive and a negative traversing speed is available.

#### HOLD command value (fieldbus option only)

If via Profibus DP the device is put into the "HOLD" condition, the respective command value is activated.

#### Feedback value scaling

The feedback value can be applied as voltage, current, frequency or PWM signal. For the feedback value, the input utilised can be selected. The scaling takes place via the parameters „Interface“ and „Reference“. Furthermore the feedback value can be monitored for a cable break.

#### Windows

A target, tracking error and magnetic stop window are available. The threshold and delay time can be set for each window.

#### Controller

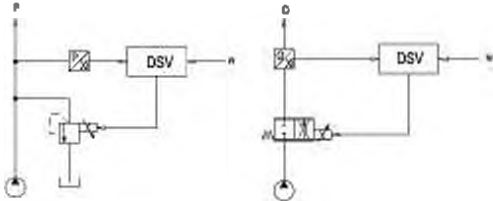
The DSV controller module has a controller circuit. This is built up as PID controller. The following controller modes can be selected:

#### Controller mode Pressure/flow valve control

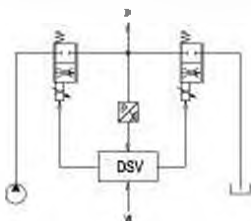
Control of a pressure relief, pressure reducing, throttle or flow control valve in open control circuit (without feedback value signal). The number of solenoids that can be controlled depends on the selected operating mode.

**Controller mode Pressure/flow valve control (1-Sol)**

Actuation of one solenoid pressure relief, pressure reducing, throttle, or flow control valve in closed-loop control circuit (with feedback value signal). Only one solenoid can be controlled with it (corresponds to the magnet driver 1).


**Controller mode „Pressure control (2-Sol)“**

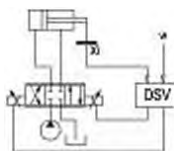
Control of two 1 solenoid throttle valves in closed position Control loop (with feedback value signal) as pressure reducing control. The one throttle valve serves as a loading valve and the other as a unloading valve. The loading valve corresponds to the solenoid driver 1, the unloading valve corresponds to the solenoid driver 2.


**Controller mode „Axis position controlled“**

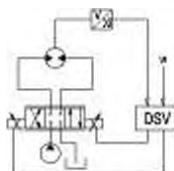
Control of a spool valve in the open control circuit (without feedback value signal). The number of solenoids to be controlled depends on the selected operating mode.

**Control mode „Axis position controlled (2-Sol)“**

Control of a two solenoid spool valve in closed position control loop (with feedback value signal). Two solenoids can be used with it.


**Controller mode „Speed control (2-Sol)“**

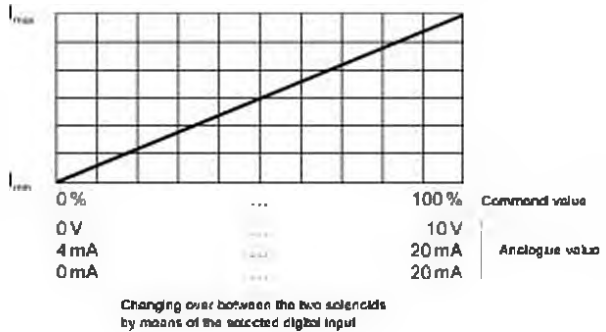
Control of a two solenoid spool, throttle, or flow control valve in closed control loop (with feedback value signal). Two solenoid can be used with it.


**Valve type**

The operating mode is set here for the open loop controller modes. It is also possible to select whether proportional or switching solenoids are to be controlled.

**Solenoid driver**

Two Pulse-Width-Modulated current outputs are available. To each output, a dither signal is superimposed, whereas dither frequency and dither level can be adjusted separately. For each output, the minimum ( $I_{min}$ ) and maximum ( $I_{max}$ ) current can be adjusted separately. The solenoid outputs can also be configured as switching outputs. There-with for each output a power reduction can be adjusted separately.


**Signal recording**

The DSV controller module has a signal recording function. This, by means of PASO, enables the recording of various system signals, such as command value, solenoid currents, etc., which can be represented on a common time axis.

**Optimization of characteristic curve**

A characteristic curve adjustable per solenoid „Command value input – solenoid current output“ enables an optimized (e.g. linearised) characteristic of the hydraulic system.

**Digital amplifier module SD7**

- For 1 or 2 proportional solenoids
- Interface: - analog
  - CANopen / J1939
  - Profibus DP
  - HART
- Max. 4 analog differential inputs
- Max. 8 digital inputs
- Fixed command values
- Adjustable via PC
- (optionally with manual operation on front panel)
- For snapping on to dome rail
- Also available as controller module (see data sheet 1.13-106)


**DESCRIPTION**

Digital amplifier module for installation on dome rail for controlling proportional or switching valves with one or two solenoids. The parameterisation takes place by means of menu-controlled parameterisation and diagnostics software «PASO» from Wandfluh (USB interface) or optionally with a manual operation on the front panel. Separate ramps for up and down as well as fixed adjustable command values are integrated in the amplifier module as standard. The electronics are optionally available with different fieldbus interfaces.

**FUNCTION**

The amplifier module has one, resp. two Pulse-Width-Modulated current outputs with superimposed dither signal. The solenoid outputs can also be parameterised for switching solenoids. The analog and digital inputs as well as the digital outputs can be programmed individually. With this device control tasks can be solved in a very simple manner. The fieldbus connection enables reading the command value signal as well as the parameterisation directly via the fieldbus.

**APPLICATION**

As snap-on module, the amplifier module is mainly utilised in the industrial field. The module can be mounted on dome-rails. The connection with terminal screws enables commissioning without special tools in a short time. The amplifier module is particularly suitable for applications with additional functions such as ramps, fixed command values, etc. Customer specific requirements can be implemented in a simple manner.

**GENERAL SPECIFICATIONS**

Execution	Module for control cubicle, housing made of plastic
Installation	on 35 mm dome rail according to EN 60715
Weight	
• Basic amplifier analog	130 g
• Basic amplifier fieldbus	220 g
• Enhanced amplifier analog	220 g
• Enhanced amplifier fieldbus	240 g
Connections	Screw terminals, max. cable cross-section 2.5 mm <sup>2</sup>
Working temperature	-20...+70 °C

Further information can be found in the Operating instructions.

**COMMISSIONING**

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier module and in the Operating instructions. Further information can be found on our website:

- Free-of-charge download:
- «PASO» Parameterisation software
  - Operating instructions (.pdf)
  - Device description data: (EDS file «WAGSD7C1.edx»)  
(GSD file «SD7-0B8E.gsd»)

**ADDITIONAL INFORMATION**

Wandfluh electronics general	Wandfluh documentation
Proportional spool valves	Register 1.13
Proportional pressure valves	Register 1.10
Proportional flow valves	Register 2.3
	Register 2.6

**TYPE CODE**

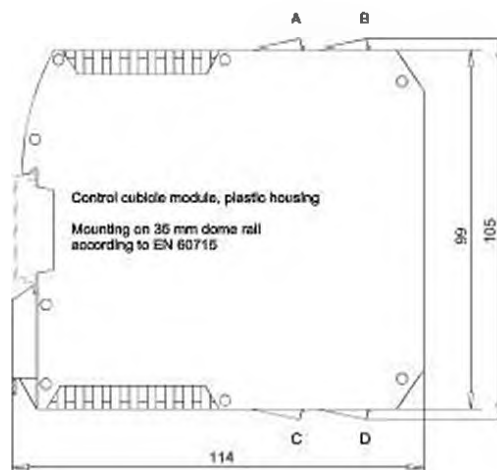
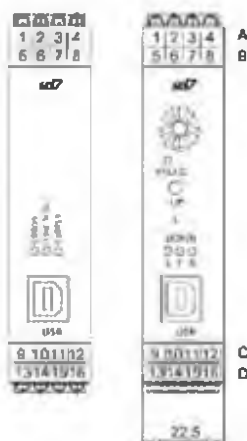
		S	D7						-		#	
Control cubicle												
Digital												
Adjustable with												
• PASO and manual operation (Basic amplifier only, without fieldbus)												
• PASO without manual operation												
Software configuration (function of card):												
• Basic amplifier												
• Enhanced amplifier												
1-solenoid version												
2-solenoid version												
Supply voltage:												
24 VDC												
12 VDC												
Basic amplifier:												
• Analog input 1: voltage												
2: current												
• Analog input 1 and 2: both voltage												
• Analog input 1 and 2: both current												
Analog input 3: always current (with HART only)												
Enhanced amplifier:												
• Analog input 1 and 3: both voltage												
Analog input 2 and 4: both current												
• Analog input 1 to 4: all voltage												
• Analog input 1 to 4: all current												
• Analog input 1 and 2: both voltage												
Analog input 3 and 4: both current												
• Analog input 1 and 2: both current												
Analog input 3 and 4: both voltage												
Analog input 3 and 4: always current (with HART only)												
Basic amplifier without HART												
• Analog input 1 and 2: 10-bit resolution												
Basic amplifier with HART												
• Analog input 1 and 2: 10-bit resolution												
• Analog input 3: 16-bit resolution												
Enhanced amplifier												
• Analog input 1 and 2: 10-bit resolution												
• Analog input 3 and 4: 16-bit resolution												
Option fieldbus:												
• without fieldbus												
• with CANopen												
• with Profibus DP												
• with J1939												
• with HART												
Design-index (Subject to change)												

**ELECTRICAL SPECIFICATIONS**

<p><b>Protection class</b> IP 30 according to EN 60 529</p> <p><b>Supply voltage</b> 24 VDC or 12 VDC</p> <p><b>Voltage range:</b>                  • 24 VDC 21...30 V                  • 12 VDC 10.5...15 V</p> <p><b>Residual ripple</b> &lt;10 %</p> <p><b>Fuse</b> Low</p> <p><b>Current consumption:</b>                  • No-load current approx. 40 mA                  • Maximum current consumption                  No-load current + 1,8 A per solenoid (with 24 VDC)                  No-load current + 2,3 A per solenoid (with 12 VDC)</p> <p><b>Command value signal:</b> Selectable by means of software                  Input 1 and 2                  Differential input not galvanically separated, for ground potential difference up to 1,5 V                  4...+20 mA / 0...+20 mA                  0...+10 V (1- or 2-solenoid version)                  -10...+10 V (2-solenoid version only)                  Input 3 (option):                  Galvanically separated for HART signal                  10-bit (analog inputs 1 and 2)                  16-bit (analog inputs 3 and 4)</p> <p><b>Resolution</b> Voltage input &gt;18 kΩ                  Load for current input = 250 Ω</p> <p><b>Input resistance</b> Enhanced amplifier:                  Voltage output ± 10 VDC                  Max. output current ± 3 mA                  Enhanced amplifier with HART:                  Current output 0...20 mA                  Max. output voltage 12 VDC</p> <p><b>Analog output</b> Stabilised output voltage                  10 VDC (with 24 VDC)                  8 VDC (with 12 VDC)                  Max. load 30 mA</p>	<p><b>Fieldbus (option)</b>                  • Device receptacle DSUB, 9-pole, CANopen, J1939, Profibus                  • Screw terminals HART                  • Bus topology Line, differential signal transmission                  • Potential separation 500 VDC</p> <p><b>Solenoid current:</b>                  • Minimal current <math>I_{min}</math> Adjustable 0...850 mA                  Factory setting 150 mA                  • Maximal current <math>I_{max}</math> Adjustable <math>I_{max} \dots 1,8 \text{ A}</math> (with 24 VDC)  <math>I_{max} \dots 2,3 \text{ A}</math> (with 12 VDC)                  Factory setting 700 mA</p> <p>• Accumulated current limitation                  The accumulated current of the simultaneously controlled solenoids depends on the ambient temperature. Further information can be found in the Operating instructions.</p> <p><b>Dither</b> Frequency adjustable 20...500 Hz                  Factory setting 100 Hz                  Level adjustable 0...400 mA                  Factory setting 100 mA</p> <p><b>Temperature drift</b> &lt;1 % at <math>\Delta T = 40 \text{ }^\circ\text{C}</math></p> <p><b>Digital inputs</b> Switching threshold high 6...30 VDC                  Switching threshold low 0...1 VDC                  Digital input 5 – 7 can be used as frequency input (frequencies 0...5 kHz) and as PWM input (automatic frequency recognition)</p> <p><b>Digital outputs</b> Low-Side-Switch:  <math>U_{max} = 40 \text{ VDC}</math>  <math>I_{max} = -700 \text{ mA}</math></p> <p><b>Ramps adjustable</b> 0...500 s</p> <p><b>Serial interface</b> USB (plug type B)                  for parameterising with «PASO»</p> <p><b>EMV</b>                  Immunity EN 61 000-6-2                  Emission EN 61 000-6-4</p>
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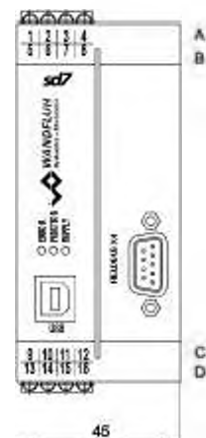
**DIMENSIONS**

Type: SD730    Type: SD720



Type: Fieldbus

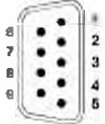
Type: SD735



**CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT**
**USB-interface, USB Type B X2**


- 1 = VBUS
- 2 = D-
- 3 = D+
- 4 = GND

The parameterisation cable is not included in the delivery (commercially available USB cable, plug type A to plug type B)

**Device receptacle CANopen, J1939 (male) X4 (option)**


- |               |              |
|---------------|--------------|
| 1 = Reserved  | 8 = Reserved |
| 2 = CANLow    | 7 = CAN High |
| 3 = CANGnd    | 8 = Reserved |
| 4 = Reserved  | 9 = Reserved |
| 5 = CANShield |              |

The mating connector (plug female, DSUB, 9-pole) is not included in the delivery.

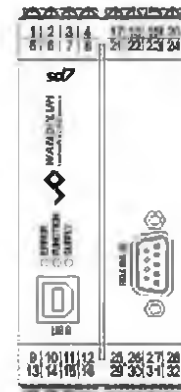
**Device receptacle Profibus (female) X4 (option)**


- |               |               |
|---------------|---------------|
| 1 = Reserved  | 6 = VP        |
| 2 = Reserved  | 7 = Reserved  |
| 3 = RxD/TxD-P | 8 = RxD/TxD-N |
| 4 = Reserved  | 9 = Reserved  |
| 5 = DGND      |               |

The mating connector (plug male, DSUB, 9-pole) is not included in the delivery.

**Basic amplifier**

- 1 = Digital input 1
- 2 = Digital input 2
- 3 = Digital output 1
- 4 = Digital output 2
- 5 = Supply voltage +
- 6 = Supply voltage 0 VDC
- 7 = Stabilised output voltage
- 8 = Analog ground
- 9 = Analog input 1+
- 10 = Analog input 1-
- 11 = Analog input 2+
- 12 = Analog input 2-
- 13 = Output solenoid driver 2 +
- 14 = Output solenoid driver 2 -
- 15 = Output solenoid driver 1 +
- 16 = Output solenoid driver 1 -
- 21 = HART (option) Analog input 3 +
- 22 = HART (option) Analog input 3 -

**PIN-assignment X1**

**Additional Enhanced amplifier**

- 17 = Digital input 3
- 18 = Digital input 4
- 19 = Digital input 5
- 20 = Digital input 6
- 21 = Digital input 7
- 22 = Digital input 8
- 23 = Digital output 3
- 24 = Digital output 4
- 25 = Analog input 3 +
- 26 = Analog input 3 -
- 27 = Analog input 4 +
- 28 = Analog input 4 -
- 29 = Digital ground
- 30 = Analog ground
- 31 = Stabilised output voltage
- 32 = Analog output

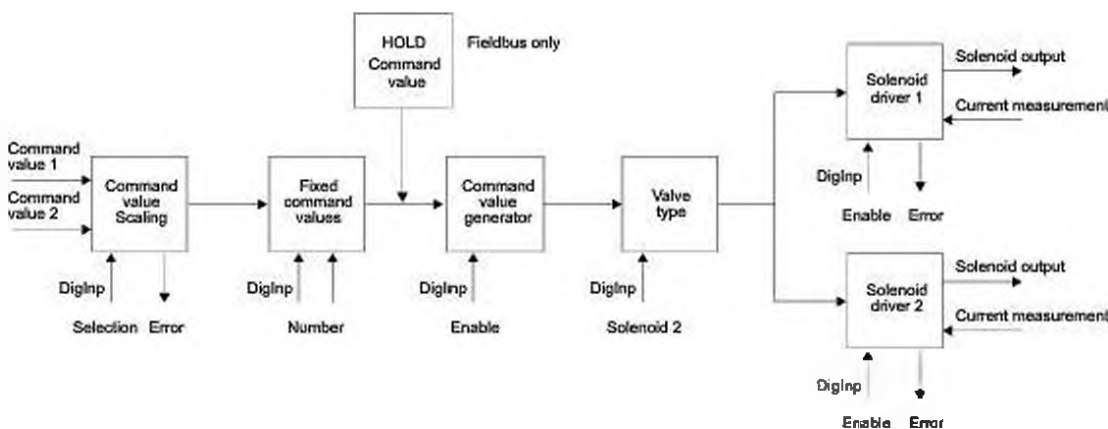
**Enhanced amplifier with HART**

- 17 = Analog output +
- 18 = Analog output -
- 19 = Digital input 3
- 20 = Digital input 4
- 21 = Analog input 3 +
- 22 = Analog input 3 -
- 23 = Analog input 4 +
- 24 = Analog input 4 -

**FUNCTION DESCRIPTION**

The amplifier module can be parameterised by means of the parameterisation software «PASO» through the USB-interface. In addition, the parameterisation software makes a data analysis possible. Optionally the amplifier module is equipped with a manual operation, which

enables the setting of the most important parameters by means of rotary selector switch and push-buttons and therefore makes a commissioning of the amplifier module possible without a PC.



**Command value scaling**

The command value can be applied as a voltage, current or digital signal, or via fieldbus. For every command value, the input utilised can be selected. The scaling takes place via the parameters «Interface» and «Reference». Furthermore every command value can be monitored for a cable break (except for voltage and digital signal). For every command value a dead band can also be set. Optionally one can operate with two command values. The characteristic of these command values can be adjusted.

**Fixed command values**

- For the Basic amplifier, 3 fixed command values are available, which can be selected via 2 digital inputs.
- For the Enhanced amplifier, 7 fixed command values are available, which can be selected via 3 digital inputs.

**Command value generator**

For each solenoid output two linear ramps for up and down are available which can be adjusted separately.

**HOLD command value (fieldbus only)**

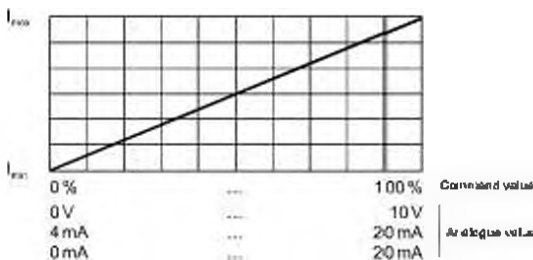
If via Profibus DP the device is put into the «HOLD» state, the respective command value is activated.

**Valve type**

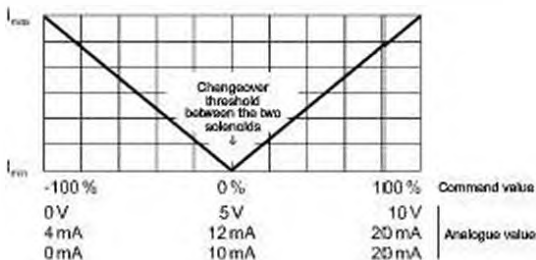
Here the mode of operation is set. It is also possible to select whether proportional or switching solenoids are to be controlled.

**Mode of operation «Command value unipolar (1-sol)»**

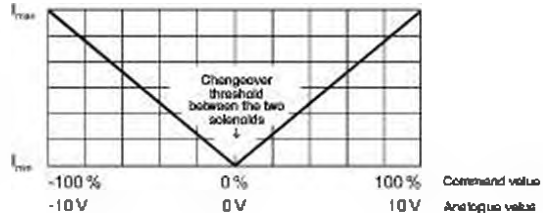
Dependent on a unipolar command value signal (voltage, current), the solenoid is driven (e.g. 0...10V correspond to 0...100 % command value, 0...100 % command value correspond to  $I_{min}$ ... $I_{max}$  solenoid driver 1).


**Mode of operation «Command value unipolar (2-sol)»**

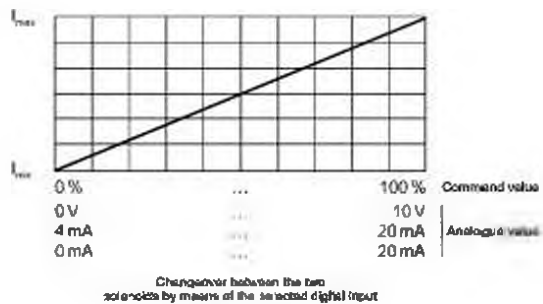
Dependent on a unipolar command value signal (voltage, current), according to the signal level one of the two solenoids is driven. The switching threshold between the two solenoids as standard is in the middle of the values range of the command value signal (e.g. 0...10V correspond to -100...+100 % command value, -100...0 % command value correspond to  $I_{min}$ ... $I_{max}$  solenoid driver 2, 0...+100 % command value correspond to  $I_{min}$ ... $I_{max}$  solenoid driver 1).


**Mode of operation «Command value bipolar (2-sol)»**

Dependent on a bipolar command value signal (voltage), according to the signal level one of the two solenoids is driven. The switching threshold between the two solenoids as standard is at 0V (e.g. -10...+10V correspond to -100...+100 % command value, -100...0 % command value correspond to  $I_{min}$ ... $I_{max}$  solenoid driver 2, 0...+100 % command value correspond to  $I_{min}$ ... $I_{max}$  solenoid driver 1).


**Mode of operation «Command value unipolar (2-sol with DigInp)»**

Dependent on a unipolar command value signal (voltage, current), the solenoid is driven by solenoid driver 1, when the selected digital input is «not activated», resp. the solenoid by the solenoid driver 2, when the selected digital input is «activated» (e.g. 0...10V correspond to 0...100 % command value, 0...100 % command value correspond to  $I_{min}$ ... $I_{max}$  solenoid driver 1 or 2).


**Signal recording**

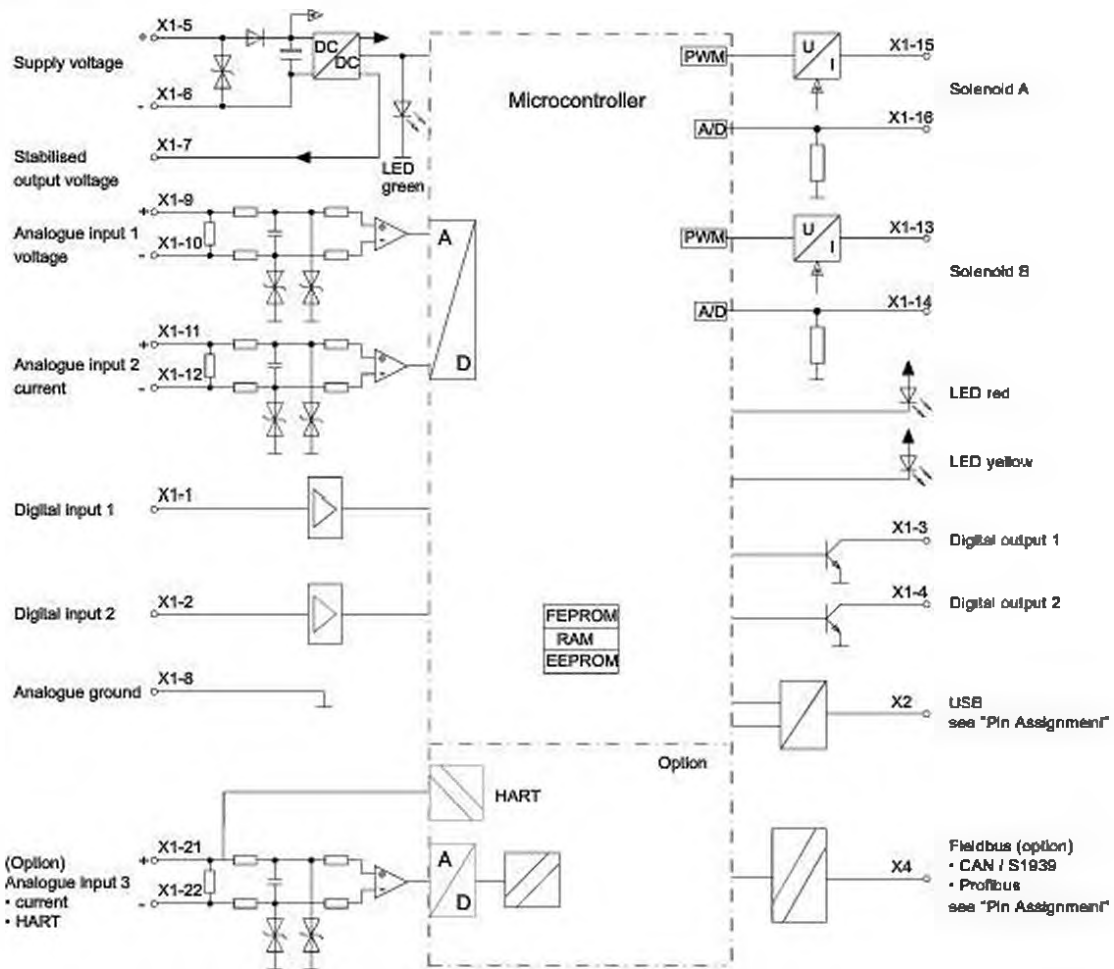
The SD7 amplifier module has a signal recording function. This, by means of PASO, enables the recording of various system signals, such as command value, solenoid currents, etc., which can be represented on a common time axis.

**Solenoid driver**

Two Pulse-Width-Modulated current outputs are available. To each output, a dither signal is superimposed, whereas dither frequency and dither level can be adjusted separately. For each output, the minimum ( $I_{min}$ ) and maximum ( $I_{max}$ ) current can be adjusted separately. The solenoid outputs can also be configured as switching outputs. Therewith for each output a power reduction can be adjusted separately.

**Optimisation of characteristic curve**

A characteristic curve adjustable per solenoid «Command value input - solenoid current outputs» enables an optimised (e.g., linearised) characteristic of the hydraulic system.

**BLOCK DIAGRAM BASIC AMPLIFIER**

**Configuration Analog inputs Basic amplifier**

Type designation	Analog input 1	Analog input 2
SD7x0xDx0-Ax	Voltage	Current
SD7x0xDx1-Ax	Voltage	Voltage*
SD7x0xDx2-Ax	Current	Current

\* x = P only 0...10VDC possible

**Configuration Analog inputs Enhanced amplifier**

Type designation	Analog inputs			
	Nr. 1	Nr. 2	Nr. 3	Nr. 4
SD735xDx4-Bx	Voltage	Current	Voltage	Current
SD735xDx5-Bx	Voltage	Voltage*	Voltage	Voltage
SD735xDx6-Bx	Current	Current	Current	Current
SD735xDx7-Bx	Voltage	Voltage*	Current	Current
SD735xDx8-Bx	Current	Current	Voltage	Voltage

**Configuration Analog inputs Basic amplifier HART**

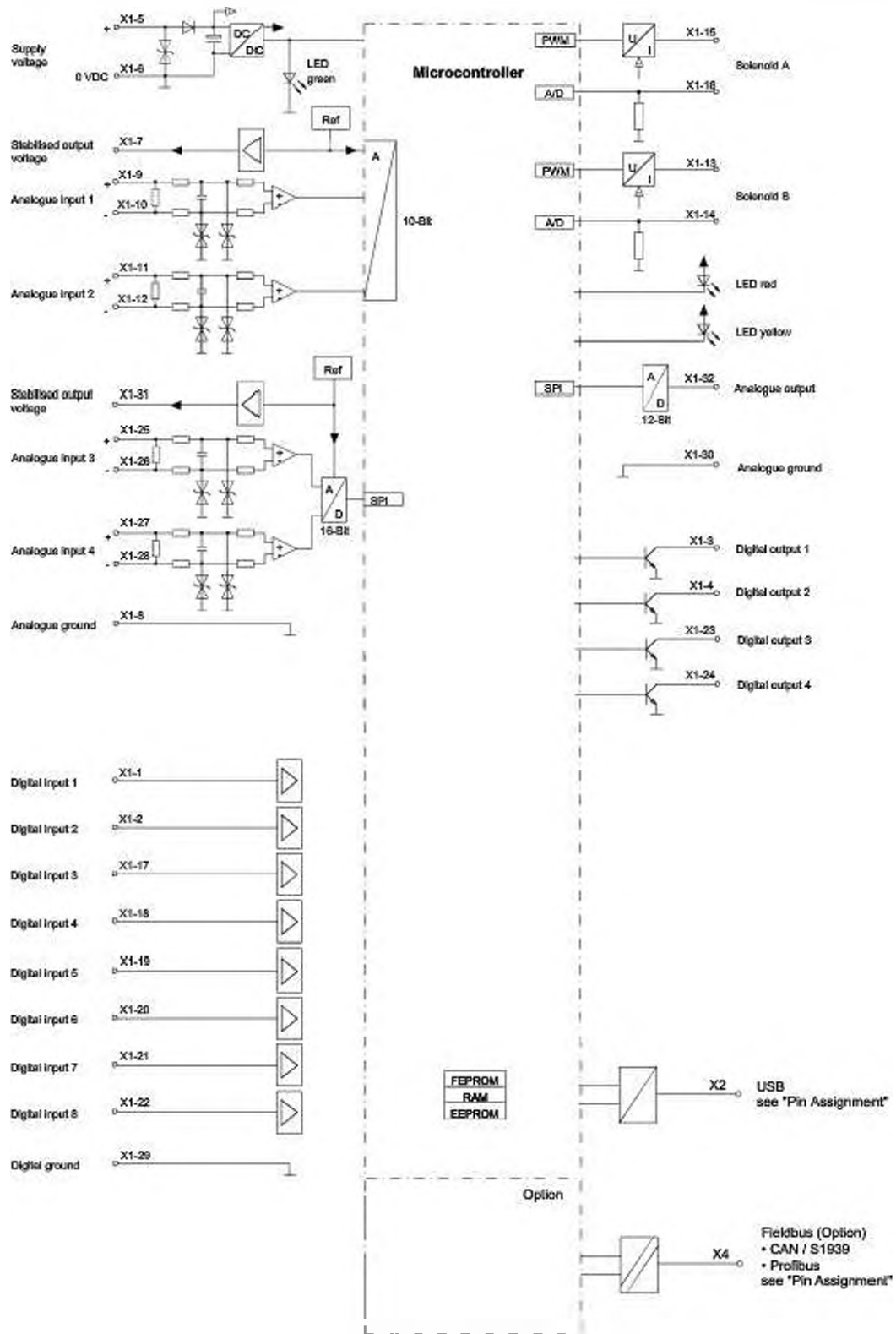
Type designation	Analog inputs		
	Nr. 1	Nr. 2	Nr. 3
SD7x0xDx0-BH	Voltage	Current	Current
SD7x0xDx1-BH	Voltage	Voltage	Current
SD7x0xDx2-BH	Current	Current	Current

**Configuration Analog inputs Enhanced amplifier HART**

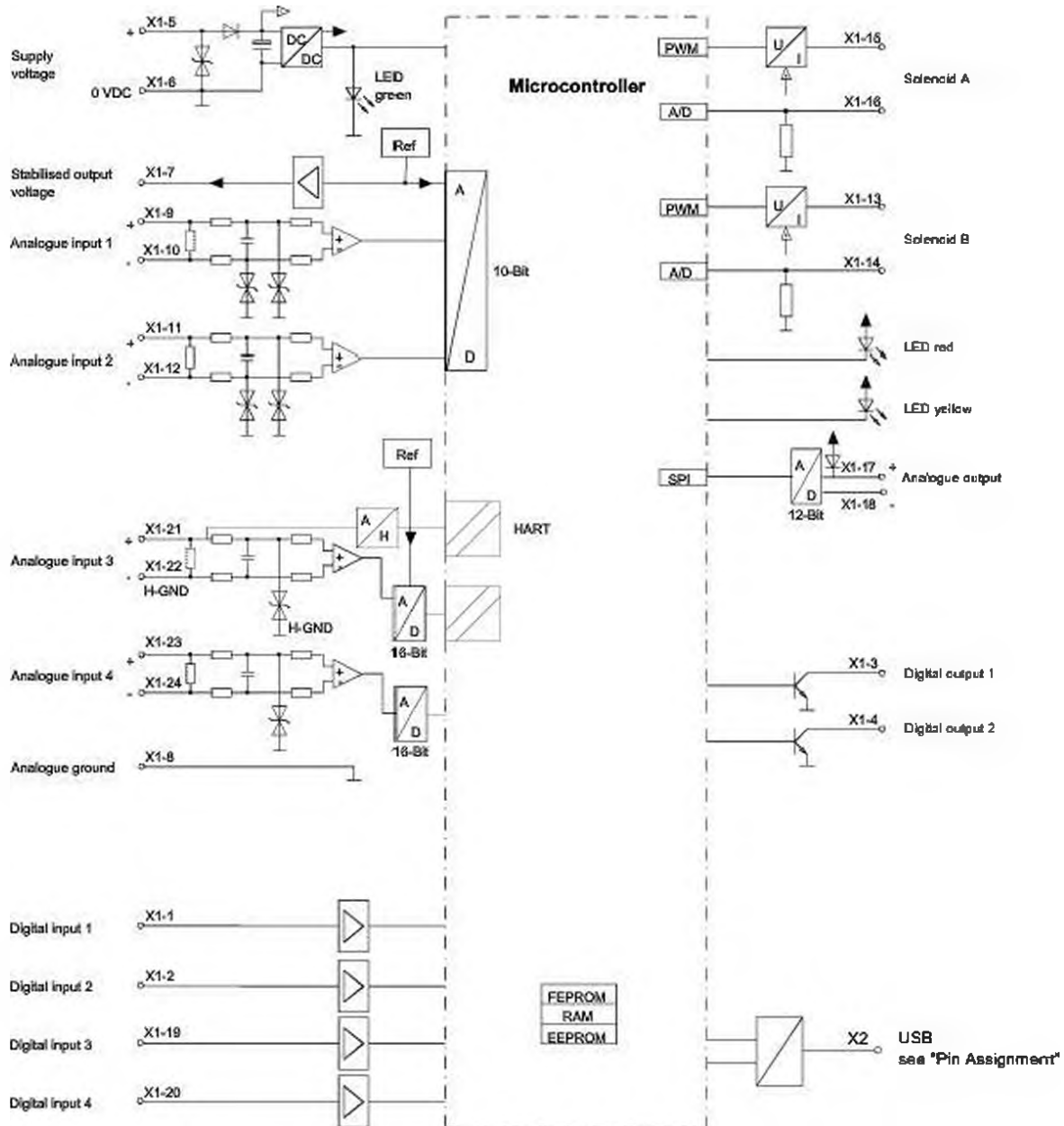
Type designation	Analog inputs			
	Nr. 1	Nr. 2	Nr. 3	Nr. 4
SD735xDx4-BH	Voltage	Current	Current	Current
SD735xDx6-BH	Current	Current	Current	Current
SD735xDx7-BH	Voltage	Voltage	Current	Current



**BLOCK DIAGRAM ENHANCED AMPLIFIER**

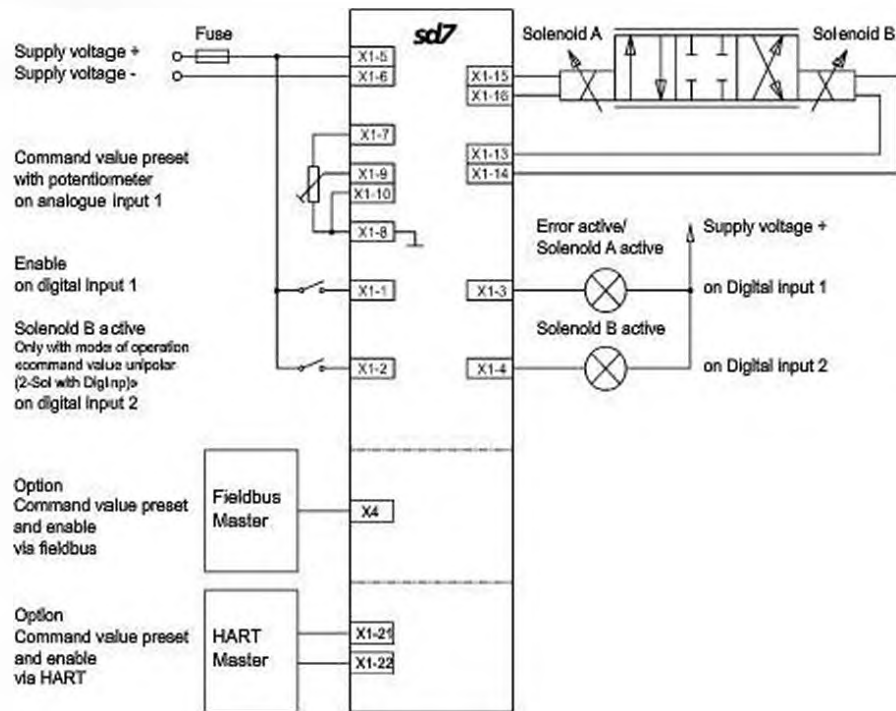


**BLOCK DIAGRAM ENHANCED AMPLIFIER WITH HART**

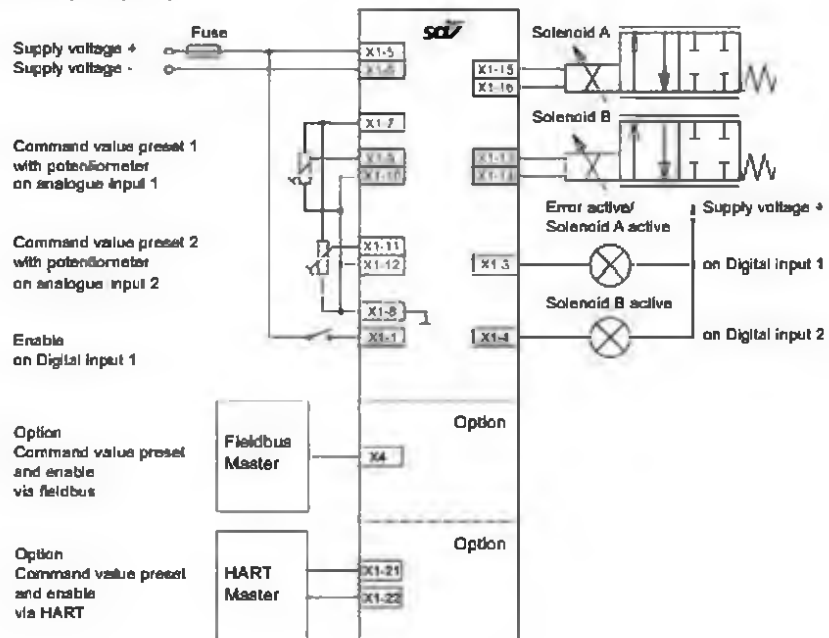


**CONNECTION EXAMPLE BASIC AMPLIFIER**

Mode of operation „Command value unipolar (2-sol)“ or  
„Command value unipolar (2-sol with DigInp)“

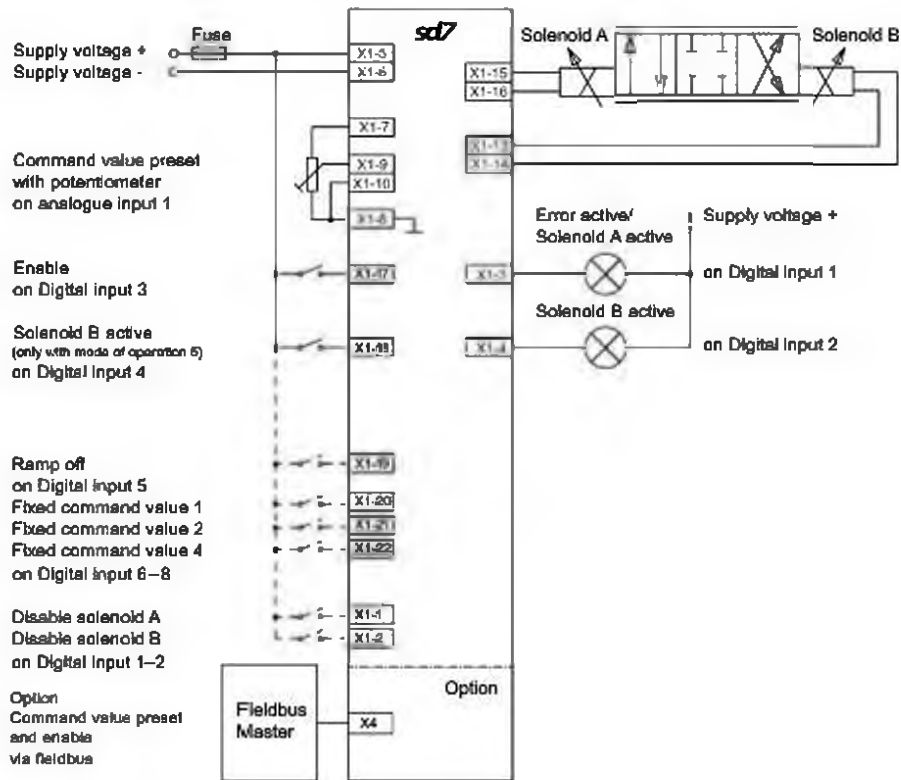


Mode of operation „Command value unipolar (1-sol)“

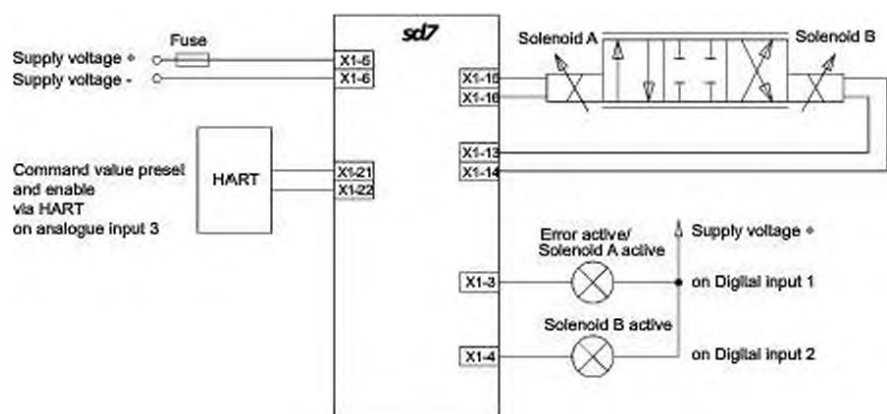


**CONNECTION EXAMPLE ENHANCED AMPLIFIER**

Mode of operation „Command value unipolar (2-sol)“ or „Command value unipolar (2-sol with DigInp)“


**CONNECTION EXAMPLE ENHANCED AMPLIFIER WITH HART**

Mode of operation „Command value unipolar (2-sol)“ or „Command value unipolar (2-sol with DigInp)“



**Digital Controller Module SD7**

- For position, pressure and volume flow controls
- Interface:
  - analogue
  - CANopen/J1939
  - Profibus DP
  - HART
- Analogue or SSI sensors for the feedback signal
- Integrated final power stage
- Adjustment via PC
- For snapping on to dome rail
- Also available as amplifier module (see data sheet 1.13-101)


**DESCRIPTION**

Digital controller module for installation on dome rail for driving proportional or switching valves with one or two solenoids. Regulation of pressure, volume flow or position can be realized. The parameterisation takes place by means of menu-controlled parameterisation- and diagnostics software «PASO» from Wandfluh (USB-interface). The electronics are optionally available with different field bus interfaces.

**FUNCTION**

The controller module has two Pulse-Width-Modulated current outputs with superimposed dither signal. The analog and digital inputs as well as the digital outputs are individually programmable. With the Enhanced controller, the command value (position, pressure, force, etc.) can also be specified by means of freely adjustable travel profiles. The fieldbus connection enables reading the command value signal respectively the feedback value signal as well as the parameterisation directly via the fieldbus.

**APPLICATION**

As snap-on module, the controller module is mainly utilised in the industrial field. The module can be mounted on dome rails. Thanks to numerous digital inputs and outputs, the controller module can be connected to a higher-level machine control. Alternatively, the Enhanced controller can be used to control valves with integrated controllers (e.g. DSV, servo valves, etc.) via the analog output.

**GENERAL SPECIFICATIONS**

Execution	Module for control cubicle, housing made of plastic
Installation	on 35 mm dome rail according to EN 60715
Weight	<ul style="list-style-type: none"> <li>• Basic controller analog 130 g</li> <li>• Basic controller fieldbus 220 g</li> <li>• Enhanced controller analog 220 g</li> <li>• Enhanced controller fieldbus 240 g</li> </ul>
Connections	Screw terminals, max. cable cross-section 2.5 mm <sup>2</sup>
Working temperature	-20...+70 °C

Further information can be found in the Operating instructions.

**COMMISSIONING**

Information regarding installation and commissioning are contained in the information leaflet supplied with the controller module and in the operating instructions. Further information can be found on our website:

- Free-of-charge download:
- «PASO» Parameterisation software
  - Operating instructions (.pdf)
  - Device description data:
    - {EDS file «WAGSD7C1.ede»}
    - {GSD file «SD7-0B8E.gsd»}

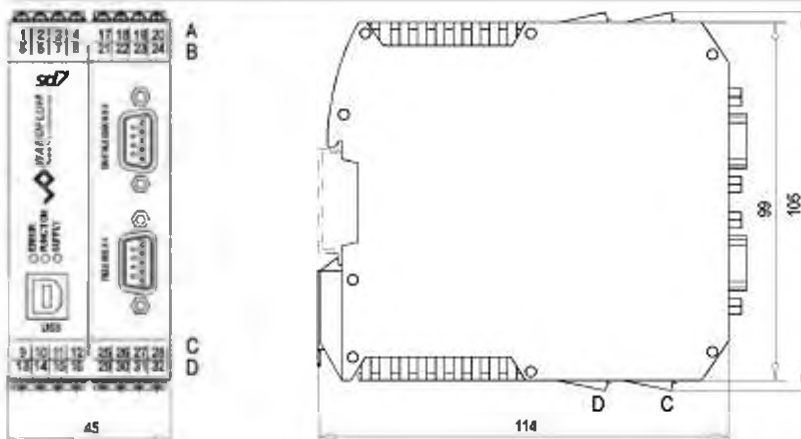
**ADDITIONAL INFORMATION**

Wandfluh electronics general	Register	1.13
Proportional spool valves	Register	1.10
Proportional pressure valves	Register	2.3
Proportional flow valves	Register	2.6



**ELECTRICAL SPECIFICATIONS**

<p>Protection class IP 30 according to EN 60 529</p> <p>Supply voltage 24 VDC or 12 VDC</p> <p>Voltage range:</p> <ul style="list-style-type: none"> <li>• 24 VDC 21...30 V</li> <li>• 12 VDC 10,5...15 V</li> </ul> <p>Residual ripple &lt;10 %</p> <p>Fuse Low</p> <p>Current consumption:</p> <ul style="list-style-type: none"> <li>• No-load current approx. 40 mA</li> <li>• Maximum current consumption</li> </ul> <p>Command value signal: Selectable by means of software</p> <p>Input 1 and 2 and 4 (option): Differential input not galvanically separated, for ground potential difference up to 1,5 V</p> <p>4...+20 mA / 0...+20 mA</p> <p>0...+10 V (1- or 2-solenoid version)</p> <p>-10...+10 V (2-solenoid version only)</p> <p>Input 3 (option): Galvanically separated for HART signal</p> <p>Resolution 10-bit (for analog inputs 1 and 2) 16-bit (for analog inputs 3 and 4)</p> <p>Input resistance Voltage input &gt;18 k<math>\Omega</math> Load for current input = 250 <math>\Omega</math></p> <p>Measuring system input DSUB plug coupling 9-pole (female) to front panel according to RS422 standard selectable by software</p> <ul style="list-style-type: none"> <li>- Absolutely via Start/Stop</li> <li>- Absolutely via SSI (1... 32 bit, gray or binary)</li> </ul> <p>Analog output Enhanced controller: Voltage output <math>\pm</math> 10 VDC Max. output current <math>\pm</math> 3 mA</p> <p>Enhanced controller with HART: Current output 0...20 mA Max. output voltage 12 VDC</p> <p>Stabilised output voltage 10 VDC (with 24 VDC) 8 VDC (with 12 VDC) Max. load 30 mA</p>	<p>Fieldbus (option)</p> <ul style="list-style-type: none"> <li>• Device receptacle DSUB, 9-pole, CANopen, J1939, Profibus</li> <li>• Screw terminals HART</li> <li>• Bus topology Line, differential signal transmission</li> <li>• Potential separation 500 VDC</li> </ul> <p>Solenoid current</p> <ul style="list-style-type: none"> <li>• Minimal current <math>I_{min}</math> Adjustable 0...850 mA Factory setting 150 mA</li> <li>• Maximal current <math>I_{max}</math> Adjustable <math>I_{max}</math>...1,8 A (with 24 VDC) <math>I_{max}</math>...2,3 A (with 12 VDC) Factory setting 700 mA</li> </ul> <p>• Accumulated current limitation The accumulated current of the simultaneously controlled solenoids depends on the ambient temperature. Further information can be found in the Operating instructions.</p> <p>Dither Frequency adjustable 2...500 Hz Factory setting 100 Hz Level adjustable 0...400 mA Factory setting 100 mA</p> <p>Temperature drift &lt;1 % at <math>\Delta T = 40</math> °C</p> <p>Digital inputs Switching threshold high 6...30 VDC Switching threshold low 0...1 VDC Digital input 5 - 7 can be used as frequency input (frequencies 0...5 kHz) and as PWM input (automatic frequency recognition)</p> <p>Digital outputs Low-Side-Switch: <math>U_{max} = 40</math> VDC <math>I_{max} = -700</math> mA 0...500 s</p> <p>Ramps adjustable</p> <p>Serial interface USB (plug type B) for parameterising with «PASO»</p> <p>EMV Immunity EN 61 000-6-2 Emission EN 61 000-6-4</p>
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**DIMENSIONS**


**CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT**
**USB-interface, USB Type B X2**


- 1 = VBUS
- 2 = D-
- 3 = D+
- 4 = GND

The parameterisation cable is not included in the delivery (commercially available USB cable, plug type A to plug type B)

**Device receptacle CANopen, J1939 (male) X4 (option)**


- 1 = Reserved
- 2 = CANLow
- 3 = CANGnd
- 4 = Reserved
- 5 = CANShield
- 6 = Reserved
- 7 = CANHigh
- 8 = Reserved
- 9 = Reserved

The mating connector (plug female, DSUB, 9-pole) is not included in the delivery

**Device receptacle Profibus (female) X4 (option)**


- 1 = Reserved
- 2 = Reserved
- 3 = RxD/TxD - P
- 4 = Reserved
- 5 = DGND
- 6 = VP
- 7 = Reserved
- 8 = RxD/TxD - N
- 9 = Reserved

The mating connector (plug male, DSUB, 9-pole) is not included in the delivery.

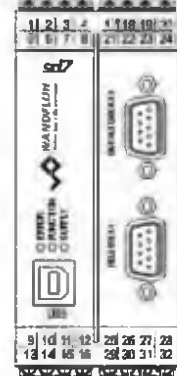
**Device receptacle Sensor (female) X3**


- 1 = Digital input +
- 2 = Digital input -
- 3 = Reserved
- 4 = Reserved
- 5 = Clock output +
- 6 = Clock output -
- 7 = Output +5VDC
- 8 = Sensor ground
- 9 = Output +24VDC

The mating connector (plug male, DSUB, 9-pole) is not included in the delivery.

**Basic controller**

- 1 = Digital input 1
- 2 = Digital input 2
- 3 = Digital output 1
- 4 = Digital output 2
- 5 = Supply voltage+
- 6 = Supply voltage 0 VDC
- 7 = Stabilised output voltage
- 8 = Analog ground
- 9 = Analog input 1+
- 10 = Analog input 1 -
- 11 = Analog input 2+
- 12 = Analog input 2 -
- 13 = Output solenoid driver 2 +
- 14 = Output solenoid driver 2 -
- 15 = Output solenoid driver 1 +
- 16 = Output solenoid driver 1 -
- 21 = HART (option) Analog input 3 +
- 22 = HART (option) Analog input 3 -

**PIN assignment X1**

**Additional**
**Enhanced controller**

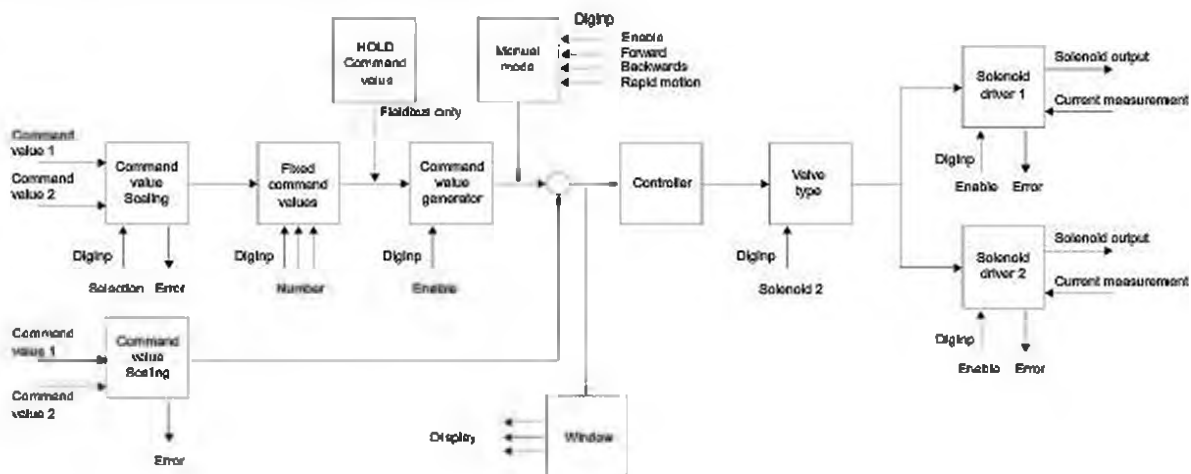
- 17 = Digital input 3
- 18 = Digital input 4
- 19 = Digital input 5
- 20 = Digital input 6
- 21 = Digital input 7
- 22 = Digital input 8
- 23 = Digital output 3
- 24 = Digital output 4
- 25 = Analog input 3 +
- 26 = Analog input 3 -
- 27 = Analog input 4 +
- 28 = Analog input 4 -
- 29 = Digital ground
- 30 = Analog ground
- 31 = Stabilised output voltage
- 32 = Analog output

**Enhanced controller with HART**

- 17 = Analog output +
- 18 = Analog output -
- 19 = Digital input 3
- 20 = Digital input 4
- 21 = Analog input 3 + H
- 22 = Analog input 3 - H
- 23 = Analog input 4 +
- 24 = Analog input 4 -

**FUNCTION DESCRIPTION**

The controller module can be parameterised by means of the parameterisation software «PASO» through the USB-interface. In addition, the parameterisation software makes a data analysis possible.





**CONTROLLER MODULE SD7**
**Command value scaling**

The command value can be applied via the fieldbus or as a voltage, current, digital, frequency or PWM signal. The input used can be selected for each command value. The scaling is carried out via the «Interface» and «Reference» parameters. Furthermore, each command value can be monitored for cable break (except HART, voltage and digital signal). For every command value, a dead band can also be set. Optionally one can operate with two command values. The characteristic of these command values can be adjusted.

**Profiles/Fixed command values (Enhanced controller only)**

There are 7 fixed command values available, which can be selected via 3 digital inputs. Optionally, travel profiles can also be used. The SD7 controller module is able to store and to travel whole travel profiles, which have been previously generated by the user in the profile generator. A travel profile consists of the following data:

- Target position (target or end position of the sequence)
- Speed (of the travel)
- Acceleration (to reach the speed)
- Deceleration (starting from the speed)
- Stop time (after reaching the end position of the sequence)
- Setting of a digital output when reaching the end position of the sequence
- Adjust whether the command value or the feedback value for the end of the sequence is to be queried

**Command value generator**

In the open-loop controller modes, there are two linear ramps for up and down per solenoid output available, which can be adjusted separately. In the closed-loop controller modes, there is a positive and a negative travel speed available.

**HOLD command value (option Fieldbus only)**

If via fieldbus the device is put into the «HOLD» state, the respective command value is activated.

**Feedback value scaling**

The feedback value can be applied via HART or as voltage, current, frequency or PWM signal. For the feedback value, the input used can be selected. The scaling is carried out via the «Interface» and «Reference» parameters. In addition, the feedback value can be monitored for cable break (except HART and voltage signal).

**Manual operation (Enhanced controller only)**

The commands Enable, Forward, Reverse and Fast speed are available. This makes it possible to move the cylinders through a superimposed control without specifying a command value.

**Window**

A target, tracking error and solenoid stop window is available. The threshold and delay time can be set for each window.

**Controller**

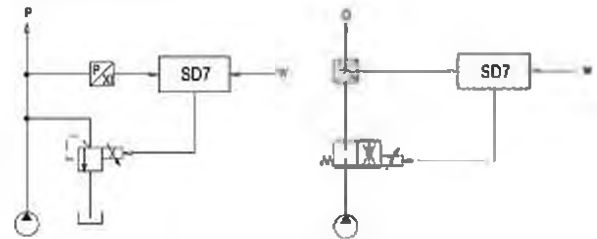
The SD7 controller module has a controller circuit. This is built up as PID controller. The following controller modes can be selected:

**Controller mode «Pressure/flow valve control»**

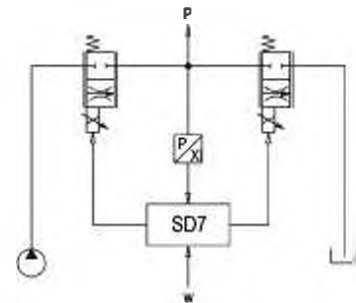
Control of a pressure relief, pressure reducing, throttle or flow control valve in open control circuit (without feedback value signal). The number of solenoids controlled depends on the selected operating mode of operation.

**Controller mode «Pressure/flow valve control (1-sol)»**

Control of a 1-solenoid pressure relief, pressure reducing, throttle or flow control valve in closed control circuit (with feedback value signal). Only one solenoid can be controlled with it (corresponds to the solenoid driver 1).


**Controller mode «Pressure control (2-sol)»**

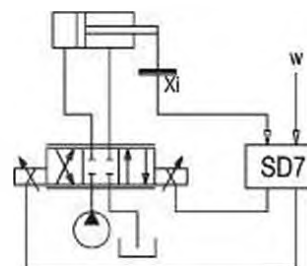
Control of two 1 solenoid throttle valves in closed control circuit (with feedback value signal) as pressure control. The one throttle valve serves as a loading valve and the other as an unloading valve. The loading valve corresponds to the solenoid driver 1, the unloading valve corresponds to the solenoid driver 2.


**Controller mode «Axis position controlled»**

Control of a spool valve in open control circuit (without feedback value signal). The number of solenoids controlled depends on the selected mode of operation.

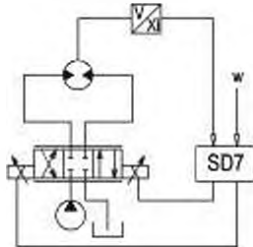
**Controller mode «Axis position controlled (2-sol)»**

Control of a 2-solenoid spool valve in closed control circuit (with feedback value signal). Two solenoids can be controlled with it.



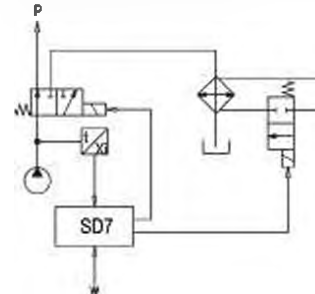
**Controller mode «Speed control (2-sol)»**

Control of a 2-solenoid spool, throttle or flow control valve in closed control circuit (with feedback value signal). Two solenoids can be controlled with it.



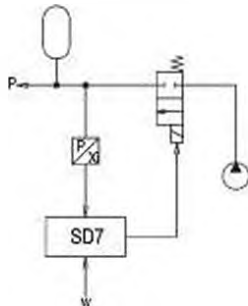
**Controller mode «2-point controller (2-sol)»**

Control of a 2-solenoid valve with switching solenoid or of two 1-solenoid valves with switching solenoid in closed control circuit (with feedback value signal). Two solenoids can be controlled with it.



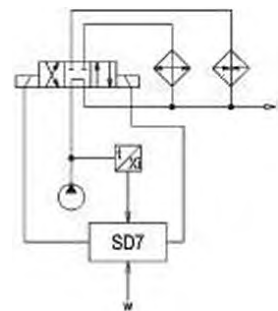
**Controller mode «2-point controller (1-sol)»**

Control of a 1-solenoid valve with switching solenoid in closed control circuit (with feedback value signal). Only one solenoid can be controlled with it (corresponds to the solenoid driver 1).



**Controller mode «3-point controller (2-sol)»**

Control of a 2-solenoid valve with switching solenoid or of two 1-solenoid valves with switching solenoid in closed control circuit (with feedback value signal). Two solenoids can be controlled with it.

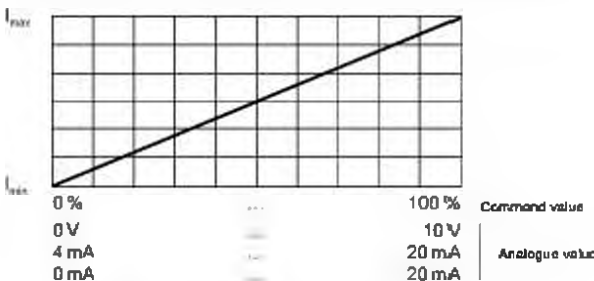


**Valve type**

The operating mode is set here for the open loop controller modes. It is also possible to select whether proportional or switching solenoids are to be controlled.

**Solenoid driver**

Two Pulse-Width-Modulated current outputs are available. To each output, a dither signal is superimposed, whereas dither frequency and dither level can be adjusted separately. For each output, the minimum ( $I_{min}$ ) and maximum ( $I_{max}$ ) current can be adjusted separately. The solenoid outputs can also be configured as switching outputs. There-with for each output a power reduction can be adjusted separately.



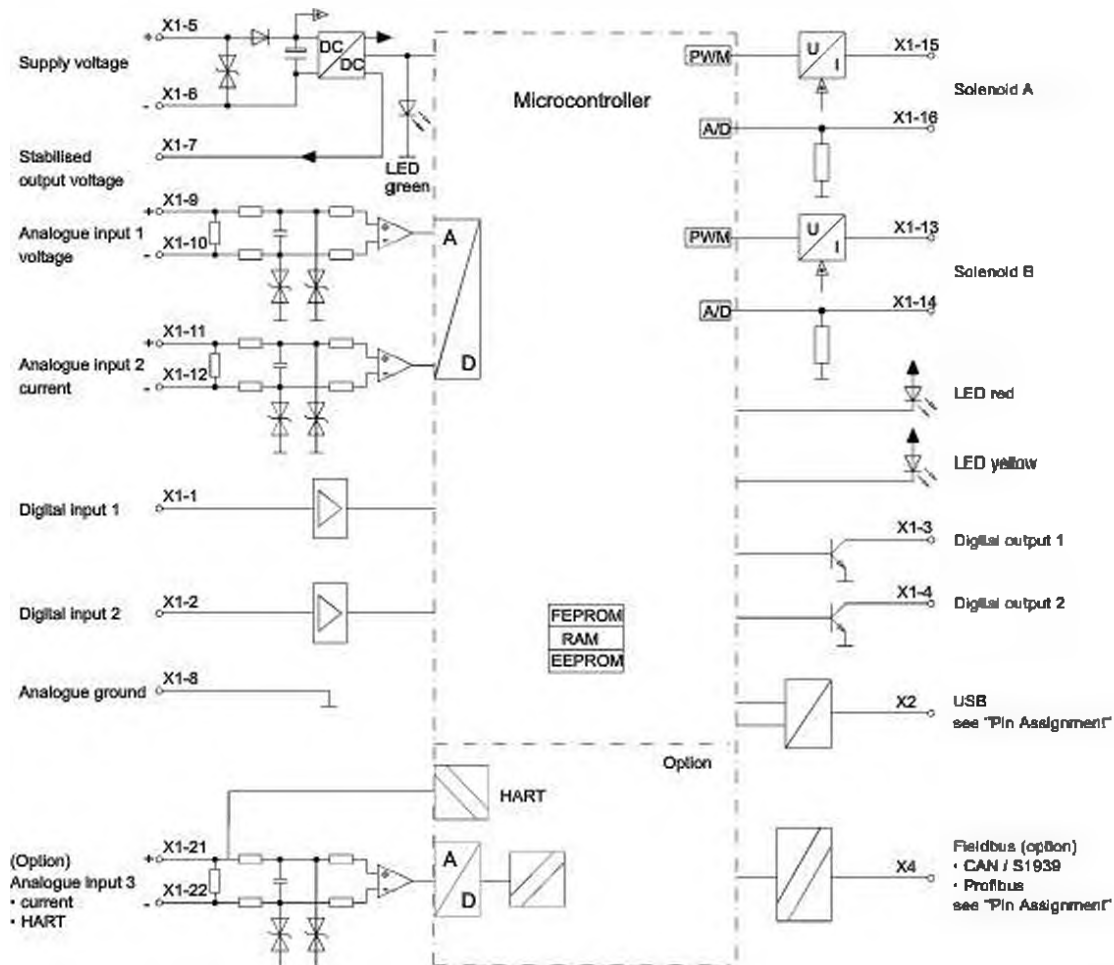
Changing over between the two solenoids by means of the selected digital input

**Signal recording**

The SD7 controller module has a signal recording function. This, by means of PASO, enables the recording of various system signals, such as command value, solenoid currents, etc., which can be represented on a common time axis.

**Optimisation of characteristic curve**

A characteristic curve adjustable per solenoid «Command value input – solenoid current output» enables an optimised (e.g. linearised) characteristic of the hydraulic system.

**BLOCK DIAGRAM BASIC CONTROLLER CONTROLLER**

**Configuration Analogue Inputs Basic controller**

Type designation	Analog input 1	Analog input 2
SD7332Dx0-Ax	Voltage	Current
SD7332Dx1-Ax	Voltage	Voltage*
SD7332Dx2-Ax	Current	Current

\* x = P only 0...10VDC possible

**Configuration Analogue inputs Enhanced controller**

Type designation	Analog inputs			
	Nr. 1	Nr. 2	Nr. 3	Nr. 4
SD7362Dx4-8x	Voltage	Current	Voltage	Current
SD7362Dx5-8x	Voltage	Voltage*	Voltage	Voltage
SD7362Dx6-8x	Current	Current	Current	Current
SD7362Dx7-8x	Voltage	Voltage*	Current	Current
SD7362Dx8-8x	Current	Current	Voltage	Voltage

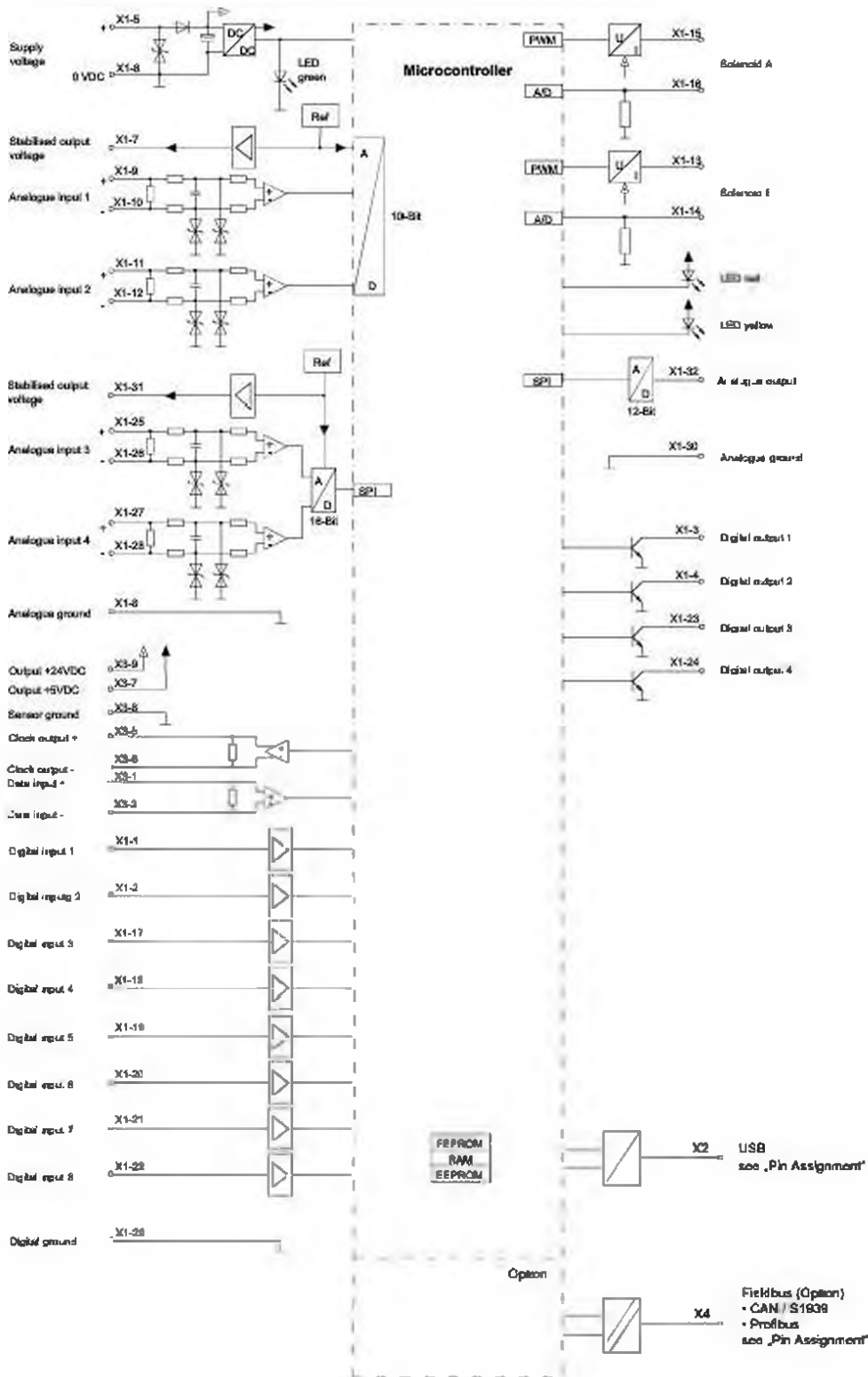
**Configuration Analogue Inputs Basic controller HART**

Type designation	Analog inputs		
	Nr. 1	Nr. 2	Nr. 3
SD7332Dx0-BH	Voltage	Current	Current
SD7332Dx1-BH	Voltage	Voltage	Current
SD7332Dx2-BH	Current	Current	Current

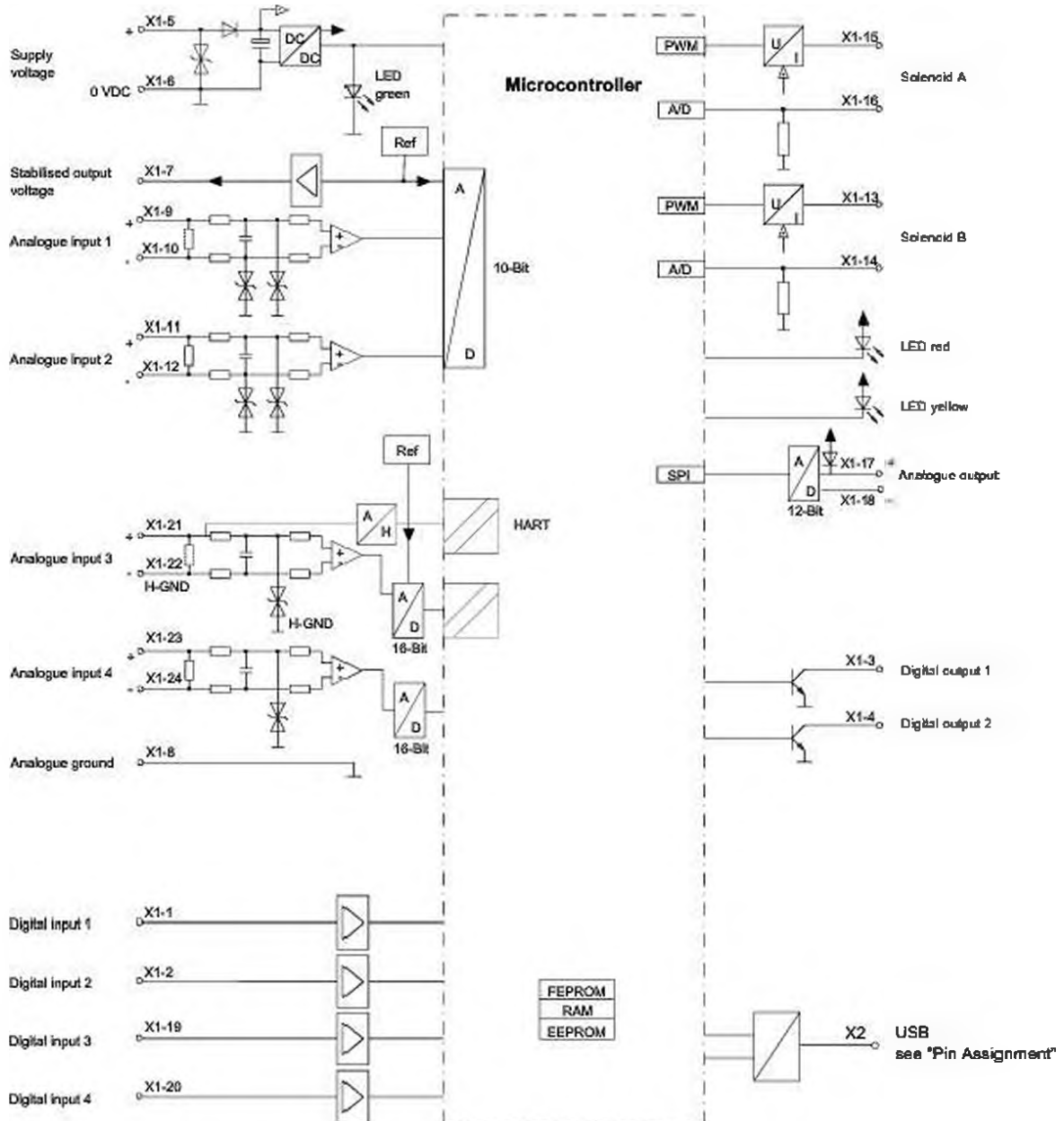
**Configuration Analogue inputs Enhanced controller HART**

Type designation	Analog inputs			
	Nr. 1	Nr. 2	Nr. 3	Nr. 4
SD7362Dx4-BH	Voltage	Current	Current	Current
SD7362Dx6-BH	Current	Current	Current	Current
SD7362Dx7-BH	Voltage	Voltage	Current	Current

**BLOCK DIAGRAM ENHANCED CONTROLLER**

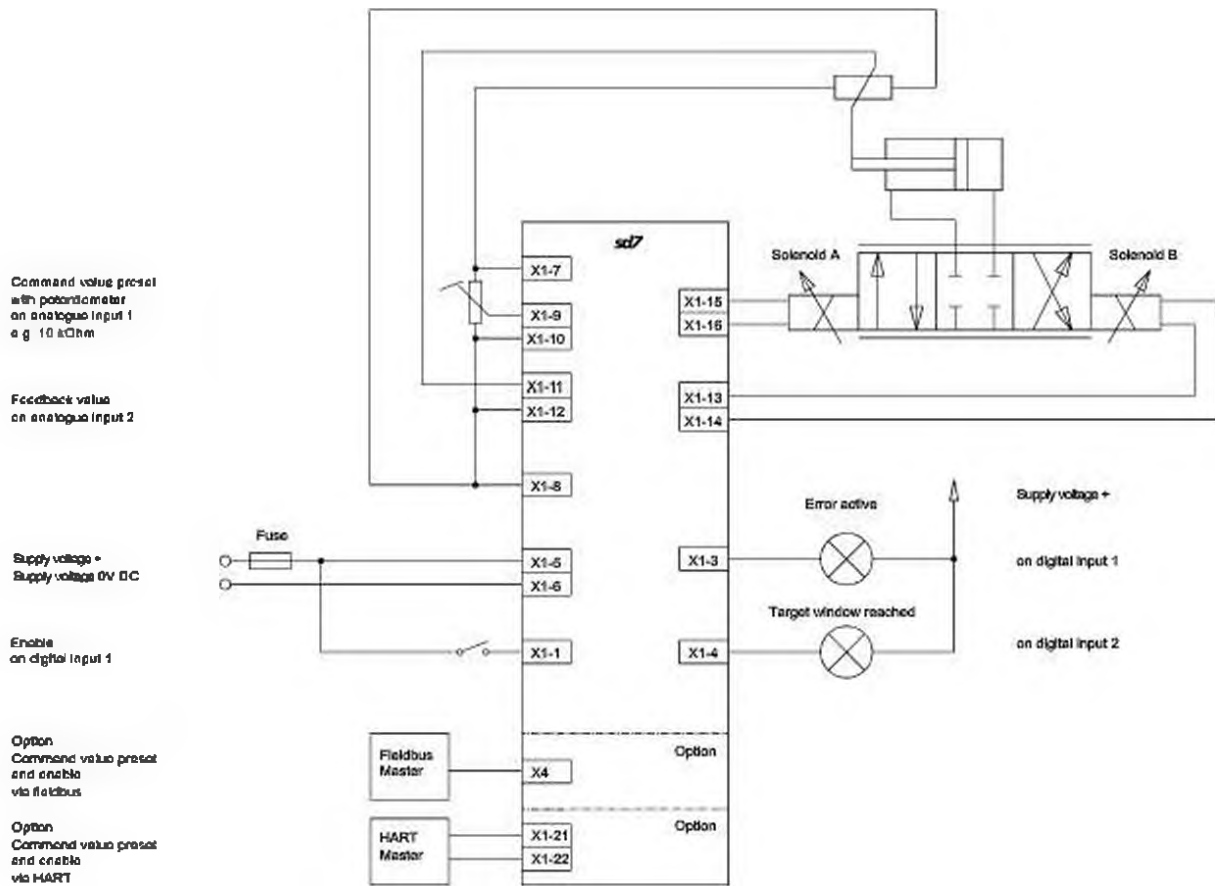


BLOCK DIAGRAM ENHANCED CONTROLLER WITH HART



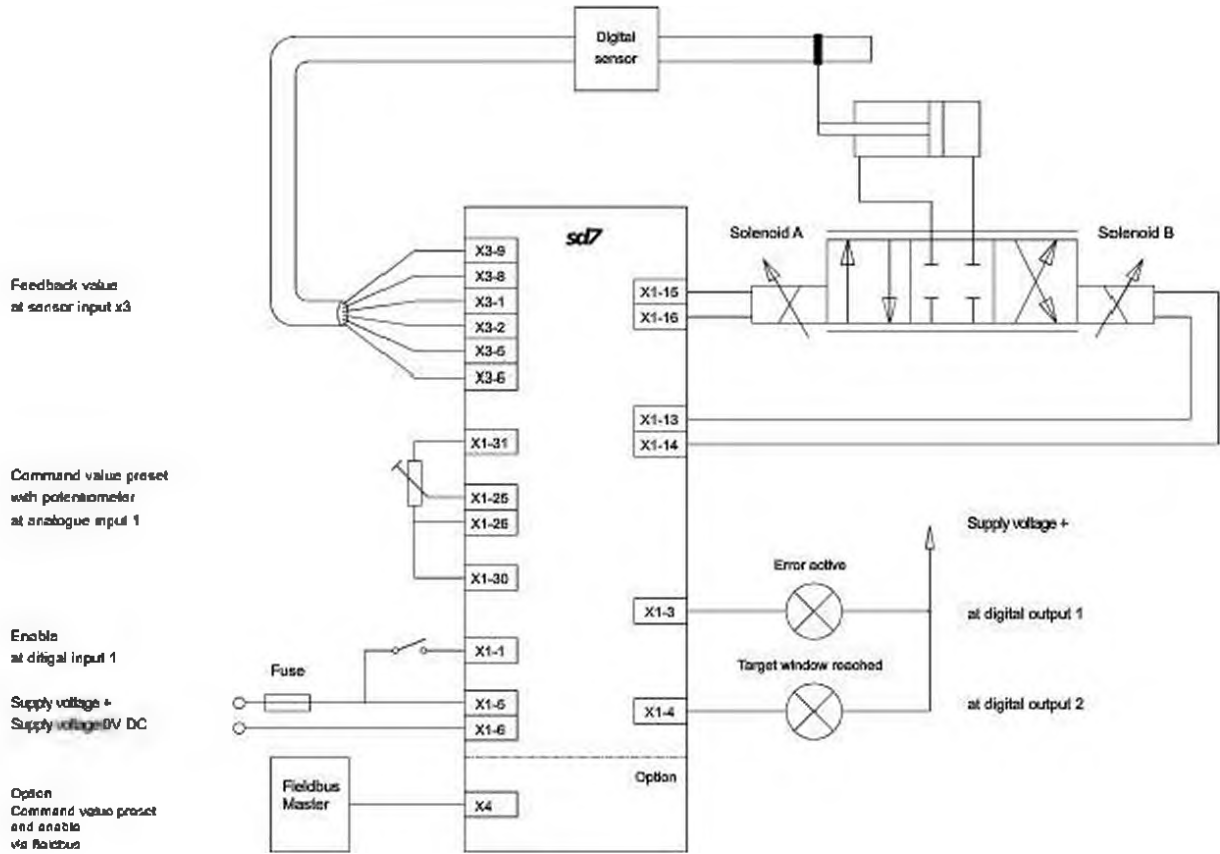
**CONNECTION EXAMPLE**

Position control (command value and feedback value as voltage signal)



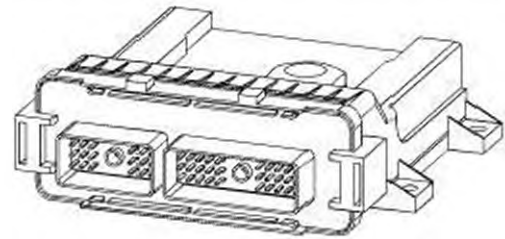
**CONNECTION EXAMPLE**

Position control (command value - voltage signal, feedback value via digital sensor)



**Digital amplifier- and controller electronics MD2**

- Robust construction for mobile applications
- For 4 or 8 proportional- or switching solenoids
- Plug-In connection suitable for mobile applications
- Protection class IP67
- Adjustable via PC
- CANopen<sup>®</sup>-Connection
- Available as amplifier or controller


**DESCRIPTION**

Digital amplifier electronics, with four or eight solenoid outputs. They are characterised by a robust and compact construction. The extensive supply voltage range enables the driving of 12VDC- and 24VDC- devices. The parameterisation takes place through the menu-controlled parameterisation- and diagnostics software «PASO» of Wandfluh (USB-interface). The electronics are available as an amplifier- and as a controller function with optional CAN-interface (according to CANopen<sup>®</sup> DSP-40B).

**FUNCTION**

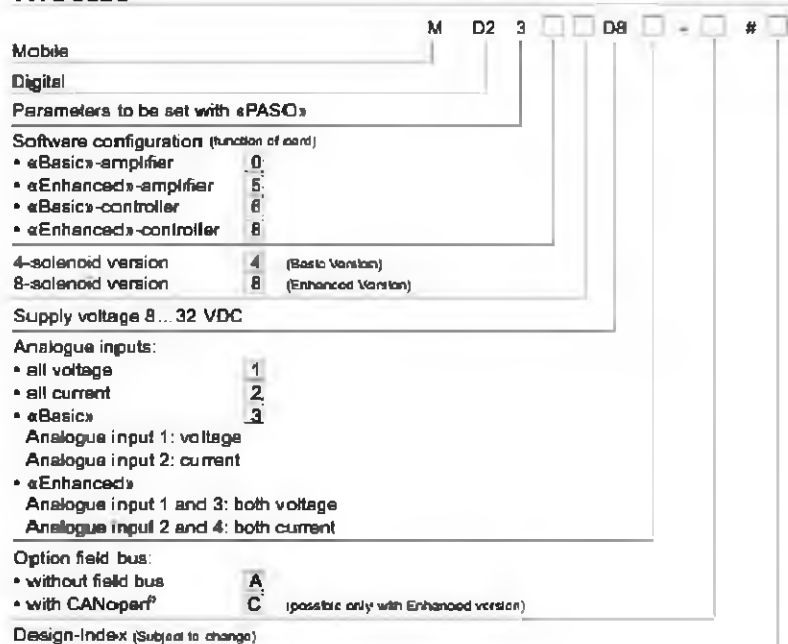
The electronics have four, resp., eight pulse width modulated current outputs with super-imposed dither signal. The solenoid outputs can also be parameterised for black/white solenoids. The two, resp. four analogue- and digital inputs as well as the two digital outputs are individually programmable. With the device, control- and closed-circuit control tasks can very easily be solved. The CAN-connection enables the reading-in of command value- and feedback value signals as well as the parameterisation directly through the fieldbus.

**APPLICATION**

Screwed on to a metallic surface, the amplifier electronics are used primarily in the mobile field because of their compact construction, protection class IP67, extensive operating temperature range and the selected plug-in connection. Customer-specific requirements can easily be implemented.

**CONTENT**

GENERAL SPECIFICATIONS .....	1
ELECTRICAL SPECIFICATIONS .....	2
BLOCK DIAGRAM .....	3
DIMENSIONS/ASSEMBLY/ ACCESSORIES .....	4
CONNECTOR WIRING DIAGRAM .....	5
START-UP .....	5
ADDITIONAL INFORMATION .....	5
DESCRIPTION AMPLIFIER .....	8-8
DESCRIPTION CONTROLLER .....	9-10

**TYPE CODE**

**GENERAL SPECIFICATIONS**

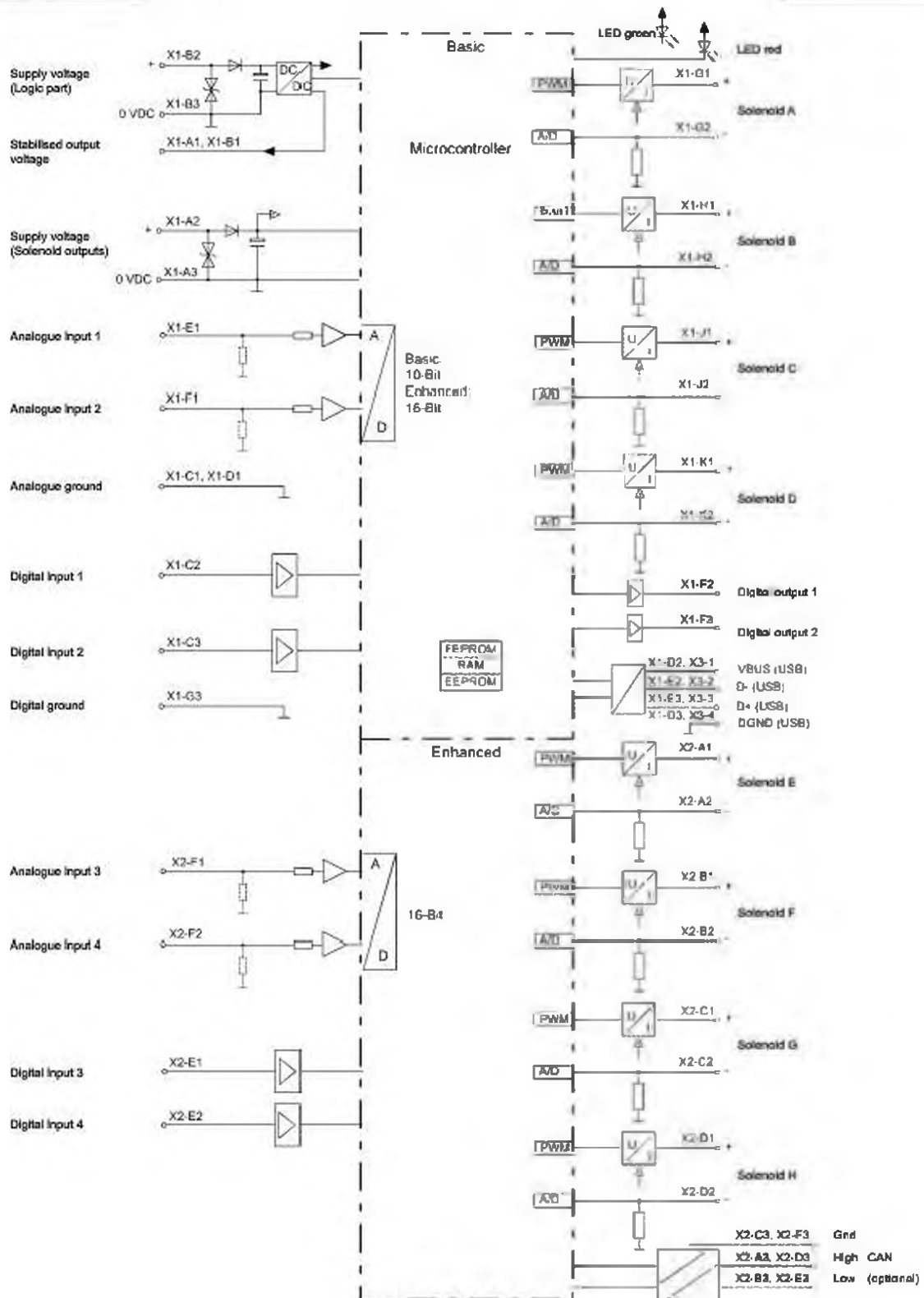
Execution	Housing made of plastic
Dimensions	153 x 57 x 14,7 (see dimensions)
Installations	On metallic surface, screwed on
Weight	0,50 kg
Device receptacle (male)	Type SHS, 30/48-poles (Manufacturer: CINCH, www.cinch.com)
Mating connector	Plug (female) type SHS, 30-poles (not incl. in delivery)
Mating connector	Plug (female) type SHS, 18-poles (for MD2 «Enhanced» only, not incl. in delivery)
Working temperature	-40...+85 °C
Environmental compatibility	The material limit values from the RoHS-directive (2002/95/EC) and the ELV «end-of-life vehicles directive» (2000/53/EC) are complied with.

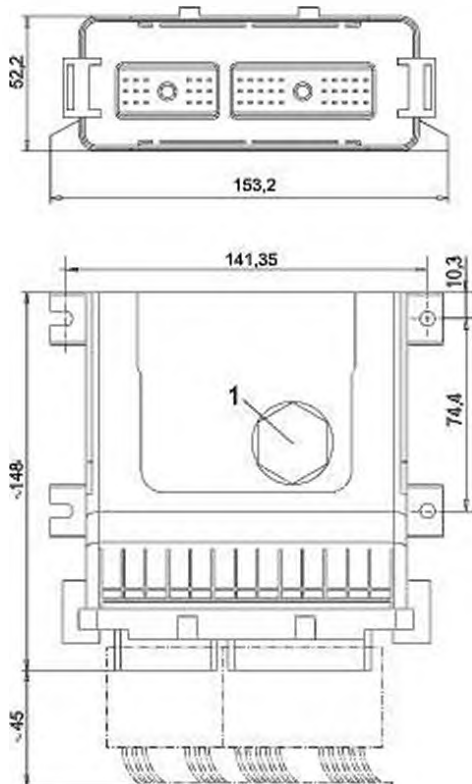


**ELECTRICAL SPECIFICATIONS**

Protection class	IP67 acc. to DIN/EN 60 529	Dither	Frequency adjustable 20...500 Hz Factory-preset 100 Hz
Supply voltage	8...32 VDC (for logic part) 8...32 VDC (for solenoid outputs)		Amplitude adjustable 0...400 mA Factory-preset 100 mA
Ripple on supply vol.	<10 %	Temperature drift	<1% at $\Delta T = 40^\circ C$
Fuse	slow-blow	Digital inputs	Switching threshold high 8...32 VDC Switching threshold low 0...1 VDC Utilisable as frequency input (frequencies 0...5 kHz) and as PWM-input (automatic frequency identification)
Current consumption:		Digital outputs	High-Side-Switch Maximum load 500 mA per output
• No-load current	approx. 55 mA	Ramps adjustable	0...500 s
• Maximum current consumption	no-load current + 2 A per solenoid	Serial interface	USB (receptacle type B) to set parameters with «PASO»
Analogue inputs:		LED	
• Voltage	0...+5 V/0...+10 V/-10...+10 V	Green:	- is lit, when the MD2 - electronics are ready for operation. - blinks twice, if the supply voltage is too low for the solenoid outputs.
• Current	4...20 mA/0...+20 mA	Red:	- is lit, when an error has occurred. The cause for the error can be in- dentified by means of the «PASO»- software.
• Resolution	Basic: Analogue inputs 1 and 2: 10-Bit resolution Enhanced: Analogue inputs 1 to 4: 16 bit resolution	EMV	
• Input resistance	Voltage input > 18 k $\Omega$ Load for current input = 250 $\Omega$	• Immunity	EN 81 000-6-2
Stabilised output voltage	5 VDC max. load 50 mA	• Emission	EN 81 000-6-4
Solenoid current:		• Road vehicles	ISO 7637-2 and RL 2004/104/EC
• Minimal current $I_{gr}$	Adjustable 0...950 mA Factory-preset 150 mA	Vibration / shock	
• Maximal current $I_{max}$	Adjustable: $I_{gr}$ ...2 A Factory-preset 700 mA	• Oscillation	IEC 80 068-2-6
• Accumulated current limitation	10 A The number of solenoids simultane- ously supplied with current and their maximum current are dependent on the ambient temperature. Further information can be found in the ope- rating instructions.	• Single shock	IEC 80 068-2-27
CANopen <sup>®</sup> interface (optional)	Two-wire line acc. to ISO 11898 differential signal transmission	• Continuous shock	IEC 80 068-2-29
Bus topology	Line		
Voltage separation	CANopen <sup>®</sup> to MD2 500 VDC		

**BLOCK DIAGRAM**



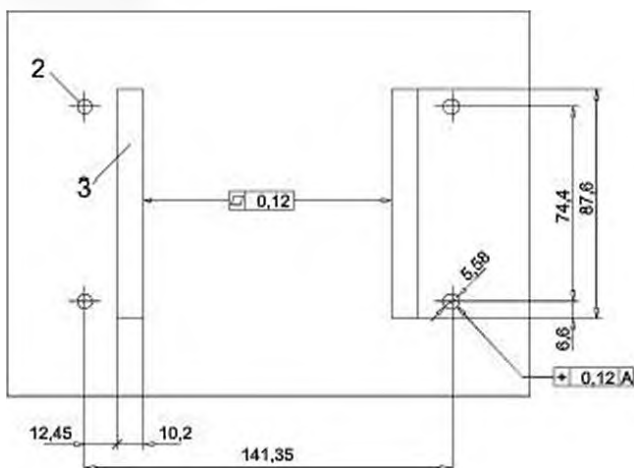
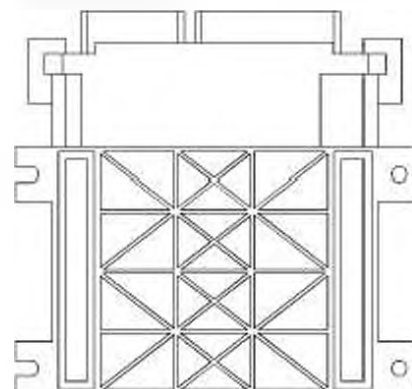
**DIMENSIONS**

**ACCESSORIES**

- |   |  |
|---|--|
| • Parameterisation software                                 | Refer to commissioning   |
| • Connection-Set for MD2 «Basic»<br>Wandfluh No 727.9900    | - 1 pce mating connector 30-poles<br>- 50 pce crimp terminals<br>- 30 pce cavity filler plugs                                      |
| • Connection-Set for MD2 «Enhanced»<br>Wandfluh No 727.9901 | - 1 pce mating connector 30-poles<br>- 1 pce mating connector 18-poles<br>- 80 pce crimp terminals<br>- 50 pce cavity filler plugs |
| • Mating connector  | Plug (female) type SHS 30-poles<br>Cinch No 581 01 30 029  |
| • Mating connector  | Plug (female) type SHS 18-poles<br>Cinch No 581 01 18 023  |
| • Crimp terminal  | 0,8–1,0 mm <sup>2</sup><br>Cinch No 425 00 00 873  |
| • Cavity filler plug  | Cinch No 581 00 00 011   |
| • Tool<br>(to open mating connector)                        | Cinch No 599 11 11 628<br>Wandfluh No 983.0950   |
| • Tool<br>(Hand crimp tool for crimp terminals)             | Cinch No 599 11 11 616   |
| • Tool<br>(Removal tool for crimp terminals)                | Cinch No 581 01 18 920   |

1 Transparent screw-on cap for the access to the USB - interface. The green and the red LEDs are visible without having to remove the screw-on cap.

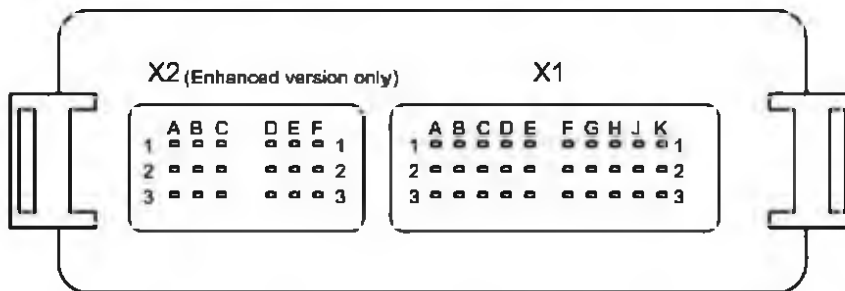
**ASSEMBLY**

For conducting the heat away, the MD2-electronics have to be installed on a metallic surface.

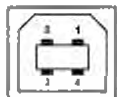
**Mounting surface**

**View from below**


2 Installation bores

3 Contact surface for the cooling body

**CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT**

**DEVICE PLUG (X2: ONLY FOR ENHANCED VERSION)**

A1 = Output solenoid E +  
 A2 = Output solenoid E -  
 A3 = CAN High  
 B1 = Output solenoid F +  
 B2 = Output solenoid F -  
 B3 = CAN Low  
 C1 = Output solenoid G +  
 C2 = Output solenoid G -  
 C3 = CAN Gnd  
 D1 = Output solenoid H +  
 D2 = Output solenoid H -  
 D3 = CAN High  
 E1 = Digital input 3  
 E2 = Digital input 4  
 E3 = CAN Low  
 F1 = Analogue input 3  
 F2 = Analogue input 4  
 F3 = CAN Gnd

**USB-interface (X3, underneath the screw cover)**


1 = VBUS  
 2 = D-  
 3 = D+  
 4 = GND

Socket USB type B


**Remark!**

The parameterisation cable is not part of the scope of supply (commercially available USB-cable, plug type A to plug type B)

**DEVICE PLUG (X1)**

A1 = Stabilised output voltage  
 A2 = Supply voltage + (Solenoid outputs)  
 A3 = Supply voltage 0 VDC (Solenoid outputs)  
 B1 = Stabilised output voltage  
 B2 = Supply voltage + (Logic part)  
 B3 = Supply voltage 0 VDC (Logic part)  
 C1 = Analogue ground  
 C2 = Digital input 1  
 C3 = Digital input 2  
 D1 = Analogue ground  
 D2 = VBUS (USB)  
 D3 = GND (USB)  
 E1 = Analogue input 1  
 E2 = D- (USB)  
 E3 = D+ (USB)  
 F1 = Analogue input 2  
 F2 = Digital output 1  
 F3 = Digital output 2  
 G1 = Output solenoid A +  
 G2 = Output solenoid A -  
 G3 = Digital ground  
 H1 = Output solenoid B +  
 H2 = Output solenoid B -  
 H3 = Reserved  
 J1 = Output solenoid C +  
 J2 = Output solenoid C -  
 J3 = Reserved  
 K1 = Output solenoid D +  
 K2 = Output solenoid D -  
 K3 = Reserved

**START-UP**

Information regarding installation and commissioning are contained in the information leaflet supplied with the amplifier module and in the operating instructions.

Additional information can be found on our website:

Free-of-charge download:  
 • «PASO-MD2» Parameterisation software  
 • Operating instructions (\*.pdf)

**ADDITIONAL INFORMATION**

Wandfluh electronics general  
Accessories

Proportional directional valves  
 Proportional pressure valves  
 Proportional flow control valves

Wandfluh-Dokumentation  
register 1.13  
register 1.13

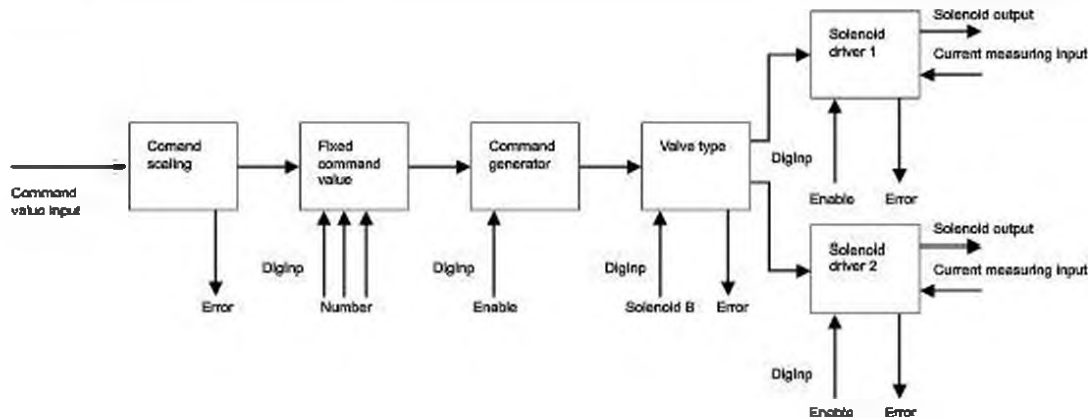
register 1.10  
 register 2.3  
 register 2.6

## Description of the «MD2»-amplifier electronics

### DESIGN

The mobile electronics can be parameterised by means of the parameterisation software «PASO MD2» through the USB-interface. In addition, the parameterisation software makes a data analysis possible. The software «PASO MD2» is supported by Windows 2000, Windows XP, Windows Vista and Windows 7.

### DESCRIPTION OF FUNCTION



### MD2 AMPLIFIER

#### Command value scaling

The command value can be applied as a voltage -, current -, digital -, frequency - or PWM-signal. For each command value the input utilised can be selected. The scaling takes place through the parameters «Interface» and «Reference». Furthermore each command value can be monitored for cable break (excepting the voltage - and digital signal). For each command value a dead band can be set.

#### Fixed command values

There are 7 fixed command values available, which can be selected through 3 digital inputs.

#### Command value generator

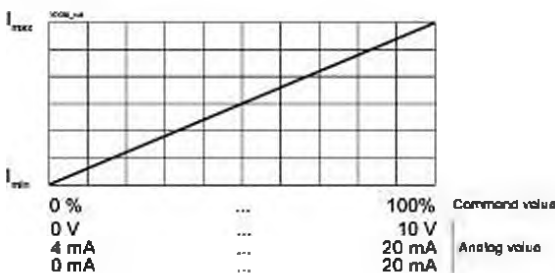
Per solenoid output, two linear ramps separately settable for Up and Down are available.

#### Valve type

Here the operating mode is set, when in open-loop controller mode. In addition it can be selected, whether proportional - or switching solenoids are to be driven.

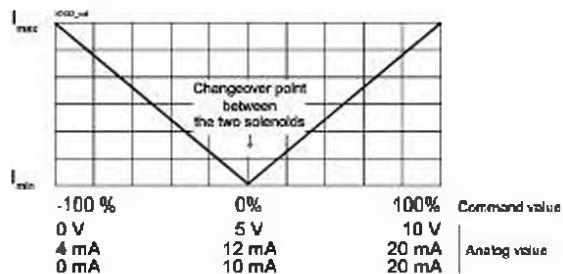
#### Operating mode command value unipolar (1-solenoid)

The solenoid is driven in dependence of a unipolar command value signal (voltage, current, frequency or PWM) (e.g., 0...10V correspond to 0...100 % command value, 0...100 % command value correspond to  $I_{min}$ ... $I_{max}$  solenoid driver 1).



#### Operating mode command value unipolar (2-solenoids)

Depending on the signal level (voltage, current, frequency or PWM), one of the two solenoids is driven in dependence of a unipolar command value signal. The switching point between the two solenoids, as standard, is at the centre of the values range of the command value signal (e.g., 0...10V correspond to -100...+100 % command value, -100...0 % command value correspond to  $I_{min}$ ... $I_{max}$  solenoid driver 2, 0...+100 % command value correspond to  $I_{min}$ ... $I_{max}$  solenoid driver 1).



#### Operating mode command value bipolar (2-solenoids)

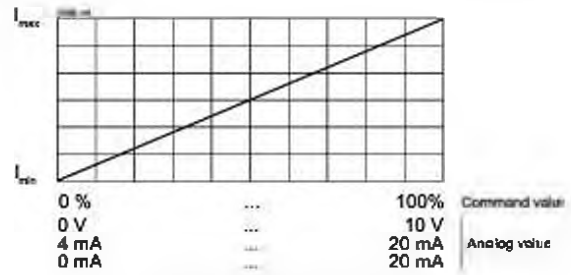
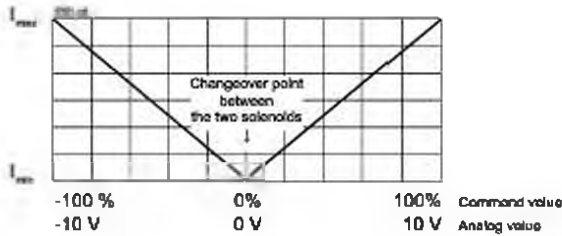
In dependence of a bipolar command value signal (voltage), according to the signal level, one of the two solenoids is driven. The changeover point between the two solenoids as standard is at 0V (e.g., -10...+10V correspond to -100...+100 % command value, -100...0 % command value correspond to  $I_{min}$ ... $I_{max}$  solenoid driver 2, 0...+100 % command value correspond to  $I_{min}$ ... $I_{max}$  solenoid driver 1).

**Operating mode command value unipolar (2-solenoids with Digin)**

In dependence of a unipolar command signal (voltage, current, frequency or PWM) the solenoid is driven by the solenoid driver 1, if the selected digital input is «not activated», resp. the solenoid is driven by the solenoid driver 2, if the selected digital input is «activated» (e.g. 0...10V correspond to 0...100 % command value, 0...100 % command value correspond to  $I_{min}$ ... $I_{max}$  solenoid driver 1 or 2).

**Solenoid drivers**

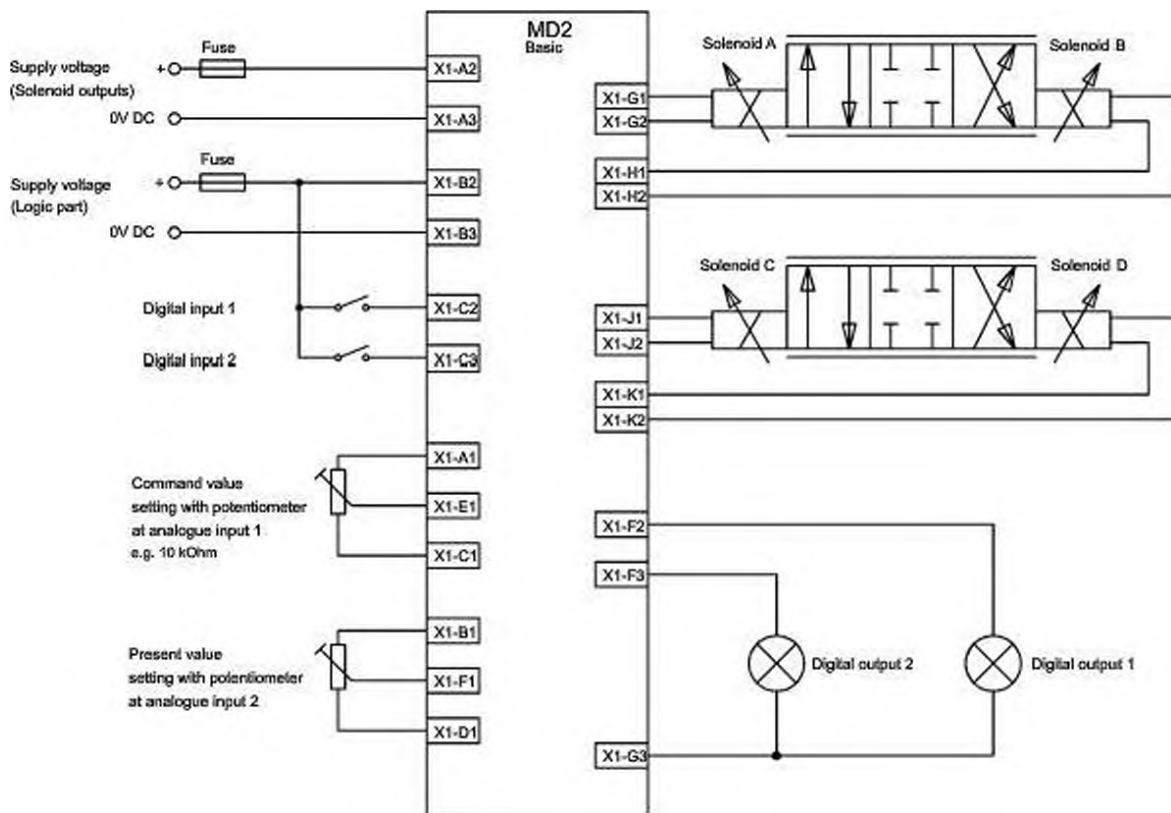
Four (in case of the basic version) or eight (in case of the enhanced version) pulse width modulated current outputs are available. A dither signal is superimposed on the output, whereby the dither frequency and the dither level are separately adjustable. For each output the minimum ( $I_{min}$ ) and the maximum ( $I_{max}$ ) current can be separately set. The solenoid outputs are also configurable as switching outputs. In doing so, a power reduction can be separately set for each output.



Changing over between the two solenoids by means of the selected digital input

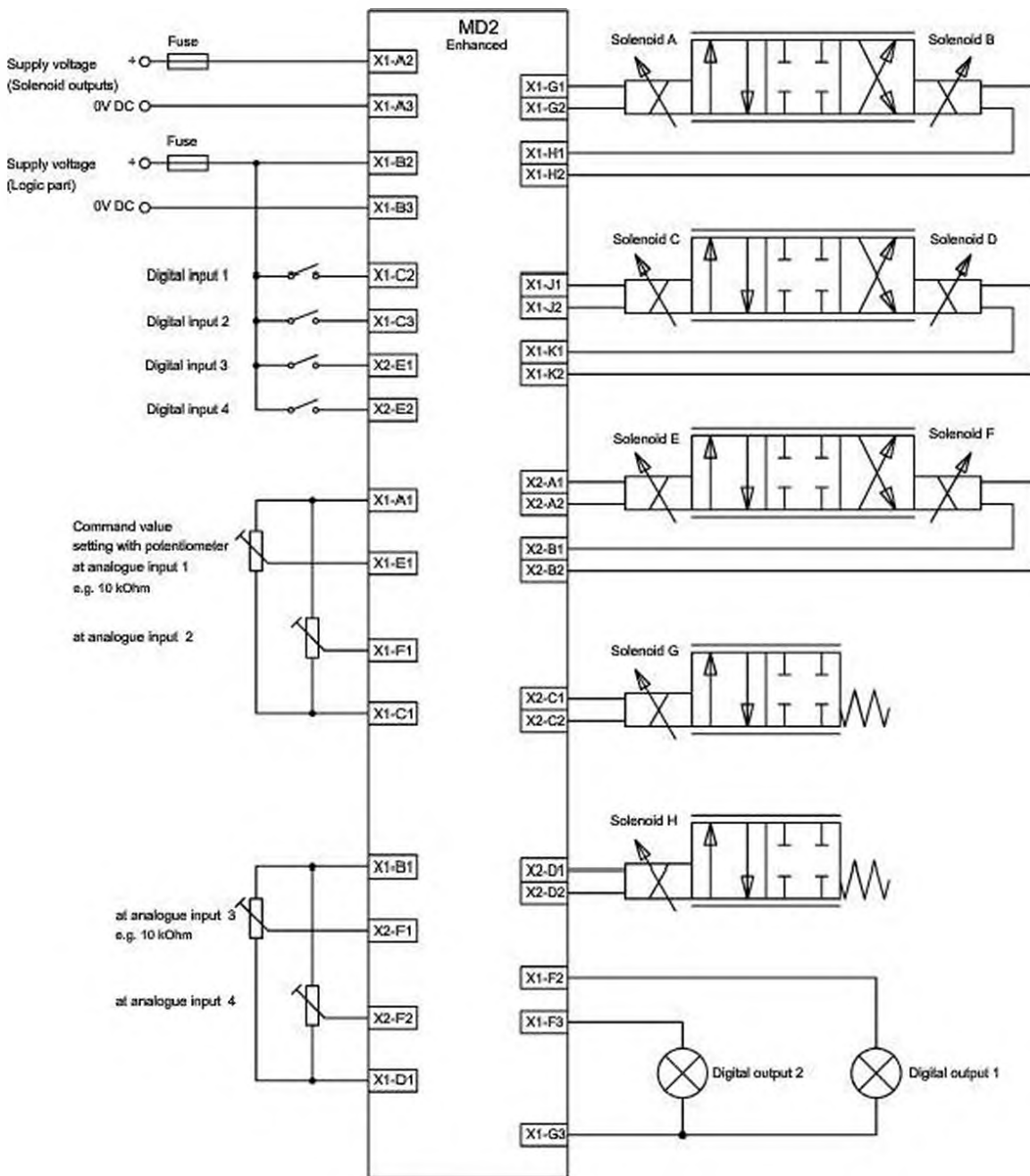
**CONNECTION EXAMPLE:**

Amplifier module: MD2 Basic (all analogue inputs voltage):



**CONNECTION EXAMPLE:**

Amplifier module: MD2 Enhanced (all analogue inputs voltage):

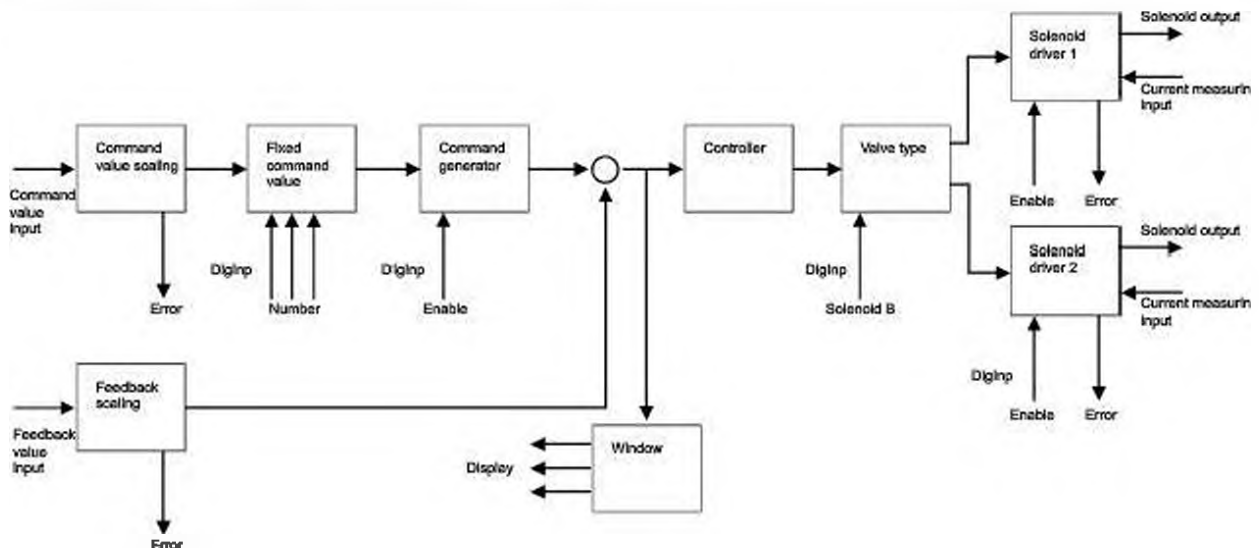


## Description of the amplifier – and controller electronics «MD2»

### DESIGN

The mobile electronics can be parameterised by means of the parameterisation software «PASO MD2» through the USB-interface. In addition, the parameterisation software makes a data analysis possible, with integrated graphic signal recording. The software «PASO MD2» is supported by Windows 2000, Windows XP, Windows Vista and Windows 7.

### DESCRIPTION OF FUNCTION



### MD2 CONTROLLER

#### Command value scaling

The command value can be applied as a voltage -, current -, digital -, frequency - or PWM-signal. For each command value the input utilised can be selected. The scaling takes place through the parameters «Interface» and «Reference». Furthermore each command value can be monitored for cable break (excepting the voltage - and digital signal). In the version with CAN-connection, the command value can also be digitally transmitted.

#### Fixed command values

There are 7 fixed command values available, which can be selected through 3 digital inputs.

#### Command value generator

In the open-loop controller modes, two linear ramps separately settable for Up and Down are available per solenoid output.

In the closed-loop controller modes, a positive and a negative travelling speed are available.

#### Feedback value scaling

The feedback value can be applied as a voltage -, current -, frequency - or PWM-signal. For each feedback signal the input utilised can be selected. The scaling takes place through the parameters «Interface» and «Reference». Furthermore each command value can be monitored for cable break (excepting the voltage signal). In the version with CAN-connection, the feedback value can be read-in by a sensor with CAN interface.

#### Windows

Available are a target -, contouring error - and solenoid-off window. In each window the threshold and the delay time can be adjusted.

#### Controller

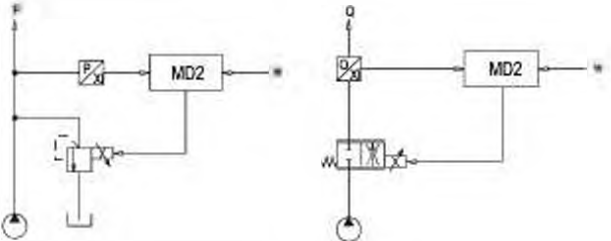
Two (for the Basic version) or four (for the Enhanced version) controller circuits are available. The following controller modes can be selected:

#### Controller mode 3 «Pressure/volume flow valve control»

Driving of a pressure relief -, pressure control -, throttle - or flow control valve in the open control circuit (without feedback value return). The number of solenoids that are driven is dependent on the selected operating mode.

#### Controller mode 4 «Pressure/volume flow valve control (1-solenoid)»

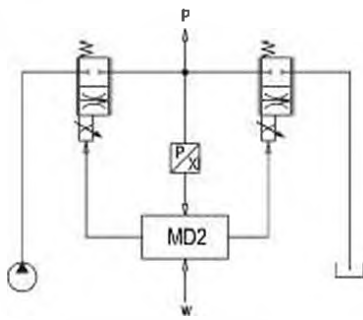
Driving of a 1-solenoid pressure relief -, pressure control -, throttle - or flow control valve in the closed control circuit (with feedback value return). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).



#### Controller mode 5 «Pressure control (2-solenoids)»

Driving of two 1-solenoid throttle valves in the closed control circuit (with feedback value return) as pressure reduction. In doing so, one of the throttle valves serves as the charge - and the other one as the discharge valve. The charge valve corresponds to the solenoid driver 1, the discharge valve to the solenoid driver 2 (graphics on the following page).



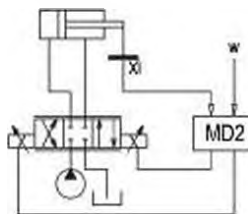


**Controller mode 6 «Axis position controlled»**

Driving of a directional control valve in the open control circuit (without feedback value return). The number of solenoids that are driven is dependent on the selected operating mode.

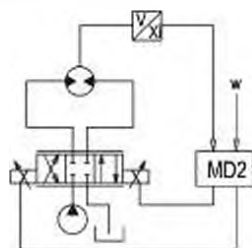
**Controller mode 9 «Axis position controlled»**

Driving of a 2-solenoid directional control valve in the closed control circuit (with feedback value return). With it, two solenoids can be driven.



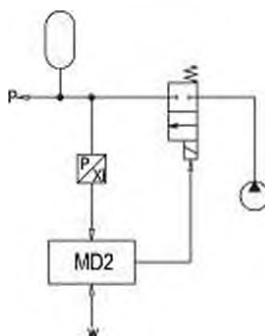
**Controller mode 7 «Speed control (2-solenoids)»**

Controlling of a 2-solenoid directional -, throttle - or flow control valve in the closed control circuit (with feedback value return). With it, two solenoids can be driven.



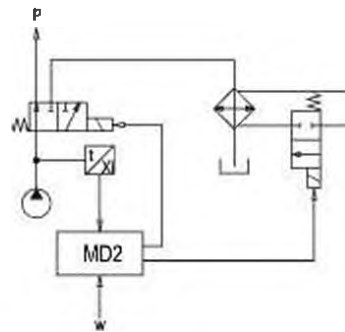
**Controller mode 8 «2-Point controller (1-solenoid)»**

Driving of a 1-solenoid valve with switching solenoid in the closed control circuit (with feedback value return). With it, only one solenoid can be driven (corresponds to the solenoid driver 1).



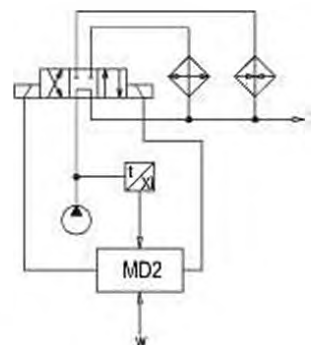
**Controller mode -7 «2-Point controller (2-solenoids)»**

Driving of a 2-solenoid valve with switching solenoid, resp. of two 1-solenoid valves with switching solenoid in the closed control circuit (with feedback value return). With it, two solenoids can be driven.



**Controller mode -8 «3-Point controller (2-solenoids)»**

Driving of a 2-solenoid valve with switching solenoid, resp., of two 1-solenoid valves with switching solenoid in the closed control circuit (with feedback value return). With it, two solenoids can be driven.



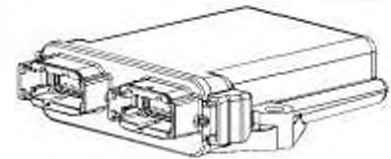
**Valve type**

Here the operating mode is set when in open-loop controller mode. In addition it can be selected, whether proportional - or switching solenoids are to be driven. A detailed description of the operating modes can be found in the section «Description of the MD2-amplifier electronics», page 8.

**Solenoid drivers**

Four (in the basic version) or eight (in the enhanced version) pulse width modulated current outputs are available. A dither signal is superimposed on the output, whereby the dither frequency and the dither level are separately adjustable. For each output the minimum ( $I_{min}$ ) and the maximum ( $I_{max}$ ) current can be separately set. The solenoid outputs are also configurable as switching outputs. In doing so, for each output a power reduction can be separately set.

- Digital mobile electronics CL-307
- Robust construction with plug-in connection for mobile applications
- Protection class IP68
- 5/3 Inputs / 8 outputs, for up to 4 pairs of proportional solenoids, or 8 switching solenoids, or 8 digital outputs
- CAN connection
- Freely programmable


**DESCRIPTION**

Microcontroller based control with multifunctional inputs/outputs of the PME devices family (Programmable Mobile Electronics). Delivered in a robust and compact plastic housing, it is designed for the hard use in working devices and is perfectly suitable for various open loop and closed loop control tasks.

**FUNCTION**

The control can be used and programmed as a stand alone unit, or as part of a distributed, decentralised system architecture. The variably usable inputs and outputs enable reading and controlling sensors and actuators of all kinds.

**APPLICATION**

This mobile electronics is used mainly in the mobile field because of the compact construction, protection class IP67 as well as the extensive operating temperature range and the selected plug connection. Customer-specific requirements can be easily implemented.

**CONTENT**

GENERAL SPECIFICATIONS	1
ELECTRICAL SPECIFICATIONS	1
DIMENSIONS, ASSEMBLY	2
ACCESSORIES	2
CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT	3

**TYPE CODE**

CL-307-101-WAG-00	Master I/O Module
CL-307-103-WAG-00	Client I/O Module

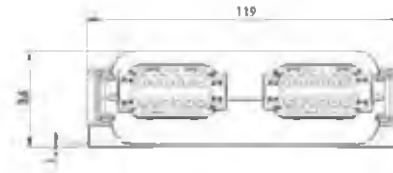
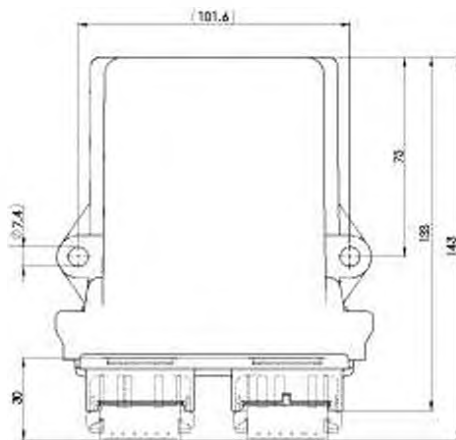
**GENERAL SPECIFICATIONS**

Execution	Plastic molded housing	
Dimensions	119 x 36 x 133 mm (see Dimensions)	
Mounting	Mounting flange, screwed on	
Weight	250 g	
Device receptacle	Deutsch DTM04-12PC/D pin header	
Mating connectors	Deutsch DTM06-12SC / DTM06-12SD	<b>Note:</b> Mating connector not part of the delivery
Working temperature	-40...+70°C	

**ELECTRICAL SPECIFICATIONS**

Protection class	IP68	<b>Digital outputs</b>	
Supply voltage	8...32 VDC	Number of outputs	up to 8 / up to 4 x 2
No-load current	43 mA at 13.8 V, 27 mA at 28 V	Protection	Short to GND Short to Battery Overcurrent
<b>Analogue Inputs</b>		Pull-up resistance	10 kOhm for diagnostics
Number of inputs	3	<b>DOUT Digital Outputs</b>	
Input voltage range	0...5.5 V	maximum current	3.0 A (individual) 2.5 A (grouped)
Input resistance	58.7 kOhm	<b>PWM Pulse Width Modulation Outputs</b>	
Resolution	12 bit	maximum current	3.0 A (individual) 2.0 A (grouped)
<b>Digital Inputs</b>		<b>ECC Estimated Current Feedback, 0.2-3.5 A/12 bit</b>	
Number of inputs	Master: 2, Client: none	Accuracy ECC	+/- 50mA at 2 A
Switching threshold	positive >3.5 V, negative <1.5 V	<b>CC Constant Current (4 pairs)</b>	
<b>STG Switch To Ground input</b>		current sensing	0...3.43 A / 12 bit
Pull-up resistor	389 Ohm to internal 5 V	<b>CAN</b>	40 kbit/s to 250 kbit/s
<b>FREQ Frequency Input</b>		<b>Software</b>	
Pull-up resistor	3.92 kOhm to internal 5 V	Apart from the programming tools, a software for diagnostics and error eliminating for the commissioning of the system is available.	
Resolution	< 5 Hz		
Frequency range	max. 1 kHz (open drain, sinking sensor) max. 10 kHz (active push-pull sensor)		
<b>HID Harness Identification (Client addressing)</b>			

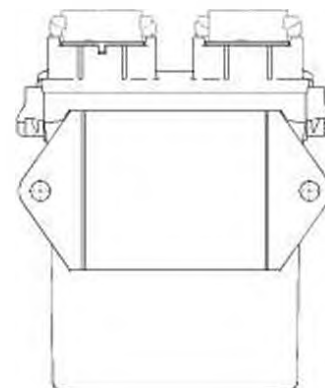
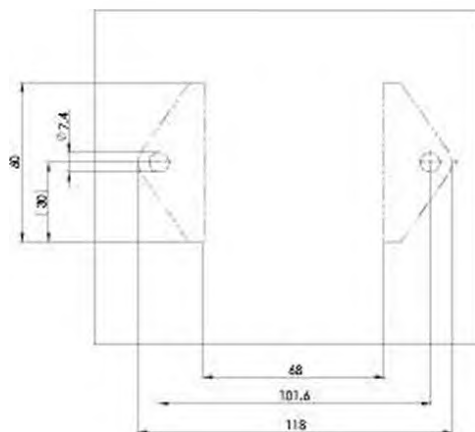
**DIMENSIONS**



**ASSEMBLY**

Mounting surface

View from below



**ACCESSORIES**

Mating connector 1  
Mating connector 2  
Wedge lock  
Crimp socket AWG 20, 0.5 mm<sup>2</sup>  
or Crimp socket AWG 16-18, 0.75-1 mm<sup>2</sup>  
Sealing plugs

Deutsch DTM06-12SC  
Deutsch DTM06-12SD  
Deutsch W12S (2 pcs)  
Deutsch 0462-201-20141 (max. 24 pcs)  
Deutsch 0462-005-20141 (max. 24 pcs)  
Deutsch 0413-204-2005 (max. 24 pcs)

Orchestra Software Suite  
Art. no. 740.1000

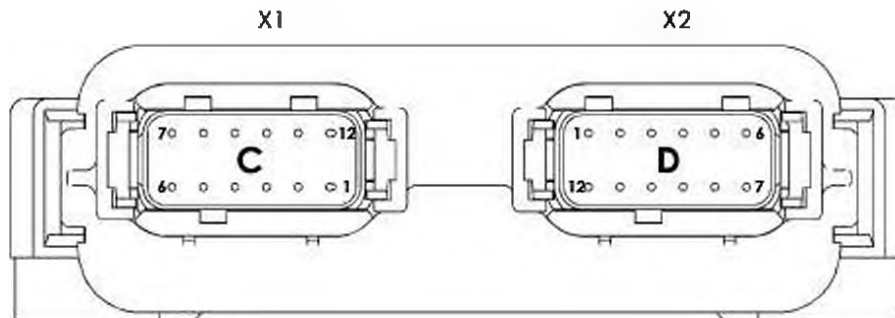
Project management software  
Ladder-Logic and C-Code  
Display GUI Programming incl. Conductor Software

Conductor Software  
Art. no. 740.1001

Standalone diagnostics and set-up tool

NXP (Freescale) CodeWarrior  
3rd party tool

C-Code Programming tool/Compiler

**CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT**

**X1, green, 12-pole, connector C-coded**

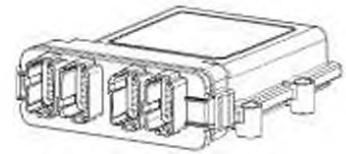
Pin	Function
1	Ground - Analog inputs
2	BAT(-) Module
3	CAN1-H
4	CAN1-L
5	BAT(+) Outputs 1-4
6	BAT(+) Module / Input #6 Battery Voltage
7	Output #1 DOUT(+) / PWM(+) / CC(+) (2A)
8	Output #2 DOUT(+) / PWM(+) / CC(+) (2A)
9	Output #3 DOUT(+) / PWM(+) / CC(+) (2A)
10	Output #4 DOUT(+) / PWM(+) / CC(+) (2A)
11	Return(-) Outputs 1-2
12	Return(-) Outputs 3-4

**X2, brown, 12-pole, connector D-coded**

Pin	Function
1	Return(-) Outputs 5-6
2	Return(-) Outputs 7-8
3	Output #5 DOUT(+) / PWM(+) / CC(+) (2A)
4	Output #6 DOUT(+) / PWM(+) / CC(+) (2A)
5	Output #7 DOUT(+) / PWM(+) / CC(+) (2A)
6	Output #8 DOUT(+) / PWM(+) / CC(+) (2A)
7	BAT(+) Outputs 5-8
8	Input #1 AIN (0-5.5VDC)
9	Input #2 AIN (0-5.5VDC)
10	Input #3 AIN (0-5.5VDC)
11	Master: Input #4 STG / FREQ: Client: HID 1
12	Master: Input #5 STG / FREQ: Client: HID 2

DOUT = Digital output  
 CC = Constant current  
 PWM = Pulse width modulation  
 AIN = Analog input  
 STG = Switch to ground input  
 FREQ = Frequency input  
 HID = Harness identification code digital inputs for addressing client modules

- Digital mobile electronics CL-446
- Robust construction with plug-in connection for mobile applications
- Protection class IP 67
- 16 inputs / 8 outputs, for 8 switching solenoids or 8 digital outputs
- CAN connection
- Freely programmable


**DESCRIPTION**

Microcontroller based control with multifunctional inputs/outputs of the PME devices family (Programmable Mobile Electronics). Delivered in a robust and compact plastic housing, it is designed for the hard use in working devices and is perfectly suitable for various open loop and closed loop control tasks.

**FUNCTION**

The control can be used and programmed as a stand alone unit, or as part of a distributed, decentralised system architecture. The variably usable inputs and outputs enable reading and controlling sensors and actuators of all kinds. The free programmability enables maximum flexibility for the adaptation to any desired machine function

**APPLICATION**

This mobile electronics is used mainly in the mobile field because of the compact construction, protection class IP67 as well as the extensive operating temperature range and the selected plug connection. Customer-specific requirements can be easily implemented.

**CONTENT**

GENERAL SPECIFICATIONS	1
ELECTRICAL SPECIFICATIONS	1
DIMENSIONS, ASSEMBLY	2
ACCESSORIES	2
CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT	3

**TYPE CODE**

CL-446-101-WAG-00	Master I/O Module
CL-446-103-WAG-00	Client I/O Module

**GENERAL SPECIFICATIONS**

Execution	Plastic molded housing
Dimensions	160 x 55 x 204 mm (see Dimensions)
Mounting	Mounting flange, screwed on
Weight	620 g
Device receptacle	Deutsch DT04-12PA/B/C/D pin header
Mating connector	Deutsch DT06-12SA/B/C/D

Working temperature -40...+70°C

**Note** Mating connector not part of the delivery

**ELECTRICAL SPECIFICATIONS**

Protection Class	IP 67
Supply Voltage	8...32 VDC
No-load current	60 mA at 13.8 V, 47mA at 28 V

**Analogue Inputs**

Number of inputs	up to 16
Input voltage range	0...5.5 V / 0...11 V
- Input resistance	57 kOhm / 115 kOhm
- Resolution	12 bit

**Digital Inputs**

Number of inputs	up to 16
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**STB Switch To Battery input**

Switching threshold	positive > 7.0 V, negative < 3.0 V
Input resistance	1.47 kOhm

**STG Switch To Ground input**

Switching threshold	positive > 3.5 V, negative < 1.5 V
Pull-up resistor	580 Ohm to internal 5 V

**FREQ Frequency Input**

(up to 2 inputs)	
Switching threshold	positive >3.5 V, negative <1 V
Pull-up resistor	4.7 kOhm to internal 5 V
Resolution	< 5 Hz
Frequency range	max. 10 kHz

**RTD Resistance to digital**

(up to 4 inputs)	
Pull-up resistor	1 kOhm
Accuracy	+/- 1 % and +/- 7 Ohm

**HID Harness Identification**

(client addressing)

**Digital Outputs**

Number of outputs	up to 8 / up to 4 x 2
Protection	Short to GND Short to Battery Overcurrent
Pull-up/down	560 Ohm / 1.4 kOhm for diagnostics

**DOUT Digital Outputs**

maximum current	2.5 A (individual) 2.5 A (grouped) Output #1 - #4 is one group Output #5 - #8 is one group
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**PWM Pulse Width Modulation Outputs**

maximum current	2.5 A (individual) 2.0 A (grouped)
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**ECC Estimated Current feedback, 0.2-3.2 A / 12 bit**

Accuracy ECC	+/- 50mA at 2 A
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**Sensor output**

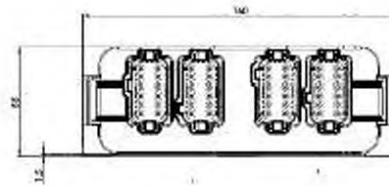
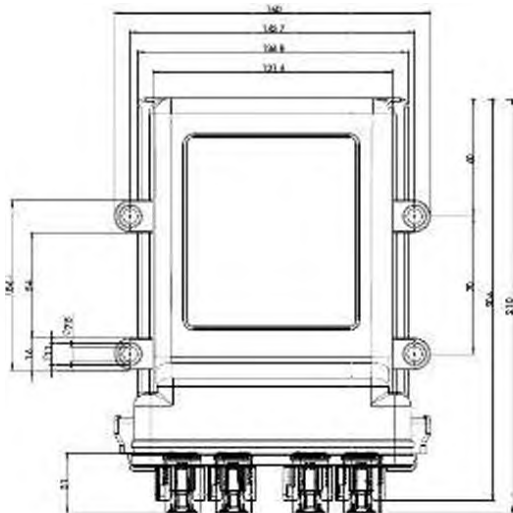
Supply	5 V +/- 5 %, 500 mA
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**CAN**

	40 kbit/s to 500 kbit/s
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**Software**

Apart from the programming tools, a software for diagnostics and error elimination for the commissioning of the system is available

**DIMENSIONS**

**ACCESSORIES**

Mating connector 1	Deutsch DT06-12SA
Mating connector 2	Deutsch DT06-12SB
Mating connector 3	Deutsch DT06-12SC
Mating connector 4	Deutsch DT06-12SD
Wedge lock	Deutsch W12S (4 pcs)
Crimp socket AWG 18-20, 0.5-1.5 mm <sup>2</sup>	Deutsch 0462-201-16141 (max. 48 pcs)
or crimp socket AWG 14, max 2 mm <sup>2</sup>	Deutsch 0462-209-16141 (max. 48 pcs)
Sealing plug	Deutsch 114017 (max. 48 pcs)
or snapping sealing plug	Deutsch 0413-217-1605

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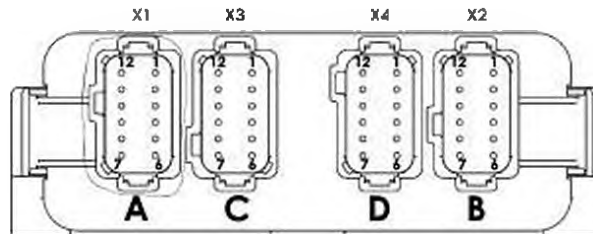
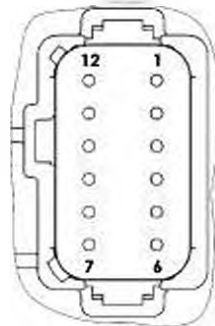
Project management software  
 Ladder-Logic and C-Code  
 Display GUI Programming incl. Conductor Software

Conductor Software  
 Art. no. 740.1001

Standalone diagnostics and set-up tool

NXP (FreeScale) CodeWarrior  
 3rd party tool

C-Code Programming tool/Compiler

**CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT**

**X1, grey, 12-pole, connector A-coded**

Pin	Function
1	Input #1 STB / STG / VTD / RTD
2	Input #2 STB / STG / VTD / RTD
3	Input #3 STB / STG / VTD / RTD
4	Input #4 STB / STG / VTD / RTD
5	BAT(+) Module / Input #21 Battery Voltage
6	BAT(-) Module
7	CAN1-L
8	CAN1-H
9	Input #5 STB / STG / VTD
10	Input #6 STB / STG / VTD
11	Input #7 STB / STG / VTD / FREQ
12	Input #8 STB / STG / VTD / FREQ

**X2, black, 12-pole, connector B-coded**

Pin	Function
1	Input #9 STB / STG / VTD
2	Input #10 STB / STG / VTD
3	Input #11 STB / STG / VTD
4	Input #12 STB / STG / VTD
5	Input #13 STB / STG / VTD(0-11V)
6	Input #14 STB / STG / VTD(0-11V)
7	Input #15 STB / STG / VTD(0-11V)
8	Input #16 STB / STG / VTD(0-11V)
9	HID #1
10	HID #2
11	HID #3
12	HID #4

**X3, green, 12-pole, connector C-coded**

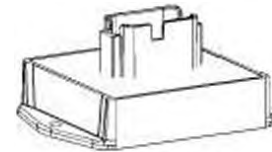
Pin	Function
1	BAT(+) Outputs 1-4 / Input #18 Battery Voltage
2	Output #1 DOUT+(2.5A) / PWM / ECC+(2A)
3	Output #2 DOUT+(2.5A) / PWM / ECC+(2A)
4	Output #3 DOUT+(2.5A) / PWM / ECC+(2A)
5	Output #4 DOUT+(2.5A) / PWM / ECC+(2A)
6	5VDC Sensor Supply (500mA)
7	5VDC Sensor Supply GND
8	Output #5 DOUT+(2.5A) / PWM(+) / ECC+(2A)
9	Output #6 DOUT+(2.5A) / PWM(+) / ECC+(2A)
10	Output #7 DOUT+(2.5A) / PWM(+) / ECC+(2A)
11	Output #8 DOUT+(2.5A) / PWM(+) / ECC+(2A)
12	BAT(+) Outputs 5-8 / Input #19 Battery Voltage

**X4, brown, 12-pole, connector D-coded**

Pin	Function
1	CAN2-L
2	CAN2-H
3	Not connected
4	Not connected
5	USB (Power)
6	USB (GND)
7	USB (DP)
8	USB (DM)
9	Not connected
10	Not connected
11	Not connected
12	Unswitched Battery(+) / Input #20 Battery Voltage

DOUT = digital output  
 ECC = estimated current feedback  
 PWM = pulse with modulation  
 AIN = analog input  
 STG = switch to ground (input)  
 FREQ = frequency input  
 HID = harness identification code digital inputs for addressing client modules

- Digital mobile electronics CL-449
- Robust construction with plug-in connection for mobile applications
- Protection class IP68
- Multi-functional pin assignment, up to 8 I/Os
- CAN connection
- Freely programmable


**DESCRIPTION**

Microcontroller based control with multifunctional inputs/outputs of the PME devices family (Programmable Mobile Electronics). Delivered in a robust and compact plastic housing, it is designed for the hard use in working devices and is perfectly suitable for various open loop and closed loop control tasks.

**FUNCTION**

The control can be used and programmed as a stand alone unit, or as part of a distributed, decentralised system architecture. The variably usable inputs and outputs enable reading and controlling sensors and actuators of all kinds. The free programmability enables maximum flexibility for the adaptation to any desired machine function.

**APPLICATION**

This mobile electronics is used mainly in the mobile field because of the compact construction, protection class IP67 as well as the extensive operating temperature range and the selected plug connection. Customer-specific requirements can easily be implemented.

**CONTENT**

GENERAL SPECIFICATIONS	1
ELECTRICAL SPECIFICATIONS	1
DIMENSIONS, ASSEMBLY	2
ACCESSORIES	2
CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT	3

**TYPE CODE**

CL-449-100-11-WAG-00	Master I/O Module
CL-449-100-21-WAG-00	Client I/O Module
CL-449-101-11-WAG-00	Master I/O Module with 5V sensor supply
CL-449-101-21-WAG-00	Client I/O Module with 5V sensor supply
CL-449-103-11-WAG-00	Master I/O Module with 4 current analog inputs
CL-449-103-21-WAG-00	Client I/O Module with 4 current analog inputs

**GENERAL SPECIFICATIONS**

Execution	Plastic molded housing
Dimensions	103 x 79 x 45 mm (see Dimensions)
Mounting	Mounting flange, screwed on
Weight	210 g
Device receptacle	Deutsch DTF15-12PA pin header
Mating connector	Deutsch DT06-12SA

Working temperature	-40...+70°C
MTBF	139 years (Telcordia SR-332)

**Note:** Mating connector not part of the delivery

**ELECTRICAL SPECIFICATIONS**

Protection Class	IP68
Supply Voltage	8...32 VDC
No-load current	23mA at 13.8 V, 13mA at 28 V

**Analogue Inputs**

Number of inputs	up to 4
Input voltage range	0...5.5 V
Input resistance	57 kOhm
Input range current	0...22.1mA
Input resistance	201.3 Ohm
Resolution	12 bit

**Digital Inputs**

number of inputs	up to 8
------------------	---------

**STB switch to battery input**

Input resistance	1.4 kOhm
Switching threshold	positive >8.5V, negative <3.5V

**STG Switch To Ground input**

Pull-up resistor	580 Ohm to internal 5V
Switching threshold	positive >3.25V, negative <1.75V

**FREQ Frequency Input**

Switching threshold	positive >3.5V, negative <1.0V
Pull-up resistor	4.7kOhm to internal 5V
Resolution	< 5 Hz
Frequency Range	max. 10 kHz (open drain, sinking sensor)

**Digital Outputs**

Number of outputs	up to 4
Protection	Short to GND Short to Battery Overcurrent
Pull-up/down	560 Ohm / 1.4 kOhm for diagnostics

**DOUT Digital Outputs**

maximum current	3.0 A (individual) 2.5 A (grouped)
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**PWM Pulse Width Modulation Outputs**

maximum current	3.0 A (individual) 2.0 A (grouped)
-----------------	---------------------------------------

ECC Estimated Current feedback Accuracy ECC	0.2-4.1 A / 12 bit +/- 50mA at 2 A
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**Sensor output**

Supply	(only with CL-449-101) 5 V +/- 5 %, 250 mA
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**CAN**

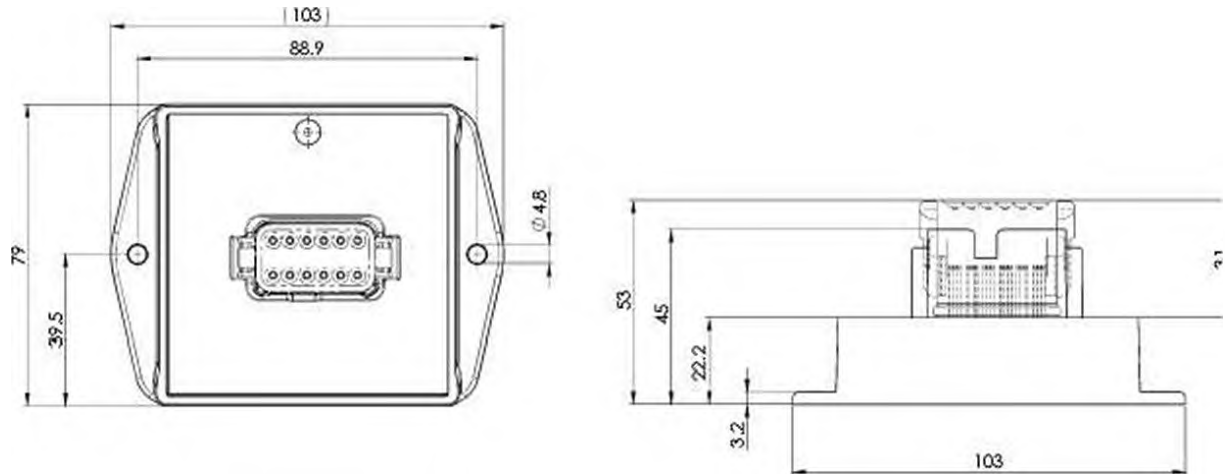
	40 kbit/s to 500 kbit/s
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**Software**

Apart from the programming tools, a software for diagnostics and error eliminating for the commissioning of the system is available.

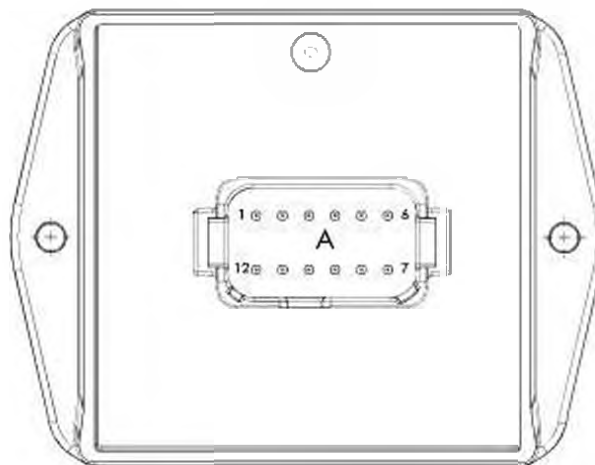


**DIMENSIONS**



**ACCESSORIES**

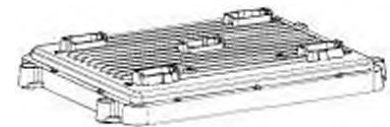
Mating connector	Deutsch DT06-12SA
Wedge lock	Deutsch W12S
Crimp socket AWG 18-20, 0.5-1.5 mm <sup>2</sup>	Deutsch 0462-201-16141 (max. 12 pcs)
or crimp socket AWG 14, max. 2mm <sup>2</sup>	Deutsch 0462-209-16141 (max. 12 pcs)
Sealing plug	Deutsch 114017 (max. 12 pcs)
or snapping sealing plug	Deutsch 0413-217-1605
Orchestra Software Suite	Project management software
Art. no. 740.1000	Ladder-Logic and C-Code
	Display GUI Programming incl. Conductor Software
Conductor Software	Standalone diagnostics and set-up tool
Art. no. 740.1001	
NXP (Freescale) CodeWarrior	C-Code Programming tool/Compiler
3rd party tool	

**CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT**

**X1, gray, 12-Pin, Connector A-coded**

Pin	Function
1	Input #1 STB / STG / VTD (CL-449-103: 20mA) / FREQ / PWM / Encoder(1A)
2	Input #2 STB / STG / VTD (CL-449-103: 20mA) / FREQ / PWM / Encoder(1B)
3	Input #3 STB / STG / VTD (CL-449-103: 20mA) / FREQ / PWM / Encoder(2A) Only CL-449-101: Output 5 VDC Sensor supply
4	Input #4 STB / STG / VTD (CL-449-103: 20mA) / REQ / PWM / Encoder(2B) Only CL-449-101: Sensor supply GND
5	CAN1-L
6	CAN1-H
7	Input #6 STB / Output #1 DOUT(+) / PWM(+) / ECC(+)
8	Input #7 STB / Output #2 DOUT(+) / PWM(+) / ECC(+)
9	Input #8 STB / Output #3 DOUT(+) / PWM(+) / ECC(+)
10	Input #9 STB / Output #4 DOUT(+) / PWM(+) / ECC(+)
11	BAT(-) Module
12	BAT(+) Module and Output 1-4 / Input #5 Battery Voltage VTD (0-32 VDC)

DOUT = digital output  
 ECC = estimated current feedback  
 PWM = pulse with modulation  
 AIN = analog input  
 STB = switch to battery (input)  
 STG = switch to ground (input)  
 FREQ = frequency input  
 VTD = voltage to digital (input)  
 20mA = 0..20mA / 4..20mA current input instead of voltage input

- Digital mobile electronics CL-450
- Robust construction with plug-in connection for mobile applications
- Protection class IP68
- 69 inputs / 33 outputs, for up to 4 pairs of proportional solenoids and 25 switching solenoids / digital outputs
- CAN connection
- Freely programmable


**DESCRIPTION**

Microcontroller based control with multifunctional inputs/outputs of the PME devices family (Programmable Mobile Electronics). Delivered in a robust and compact plastic housing, it is designed for the hard use in working devices and is perfectly suitable for various open loop and closed loop control tasks.

**FUNCTION**

The control can be used and programmed as a stand alone unit, or as part of a distributed, decentralised system architecture. The variably usable inputs and outputs enable reading and controlling sensors and actuators of all kinds. The free programmability enables maximum flexibility for the adaptation to any desired machine function.

**APPLICATION**

This mobile electronics is used mainly in the mobile field because of the compact construction, protection class IP67 as well as the extensive operating temperature range and the selected plug connection. Customer-specific requirements can be easily implemented.

**CONTENT**

GENERAL SPECIFICATIONS	1
ELECTRICAL SPECIFICATIONS	1
DIMENSIONS, ASSEMBLY	2
ACCESSORIES	2
CONNECTOR WIRING DIAGRAM /	3
PIN ASSIGNMENT	

**TYPE CODE**

CL-450-101-10-WAG-00	Master I/O Module
CL-450-101-20-WAG-00	Client I/O Module

**GENERAL SPECIFICATIONS**

Execution	Plastic molded housing
Dimensions	285 x 203 x 39 mm (see Dimensions)
Mounting	Mounting flange screwed on
Weight	620 g
Device receptacle	Deutsch DT18 pin headers
Mating connectors	Deutsch DT16-18SA/B/C/D/E-K004

Working temperature	-40...+70°C
MTBF	27 years (Telcordia SR-332)

**Note** Mating connector not part of the delivery

**ELECTRICAL SPECIFICATIONS**

Protection Class	IP68
Supply Voltage	8...32 VDC
No-load current	180 mA at 8 V, 88mA at 32 V
<b>Analogue Inputs</b>	
Number of inputs	up to 14
Input voltage range	Inputs #55-#58: 0-5.93 V / 0-38.91 V Inputs #63-#72: 0-6 V / 0-24 mA
Input resistance	Inputs #55-#58: 120 k / 22.9 kOhm Inputs #63-#72: 53.9 k / 201.3 Ohm
Resolution	12 bit

See CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT  
 Special requirements

<b>Digital Inputs</b>	
Number of inputs	up to 65
Switching threshold	positive > 3.5 V, negative < 1.0 V
STB Switch To Battery input (up to 65)	
Input resistance	2.6 kOhm
STG Switch To Ground input (up to 43)	
Pull-up resistance	560 Ohm to internal 5 V
FREQ Frequency Input (up to 4)	
Pull-up resistance	4.7 kOhm to internal 5V
Resolution	< 5 Hz
Frequency Range	max 10 kHz
RTD Resistance to digital (up to 6)	
Pull-up resistor	Inputs #63/64/67: 499 Ohm Inputs #68/70/71: 2 kOhm
Accuracy	+/-2 %

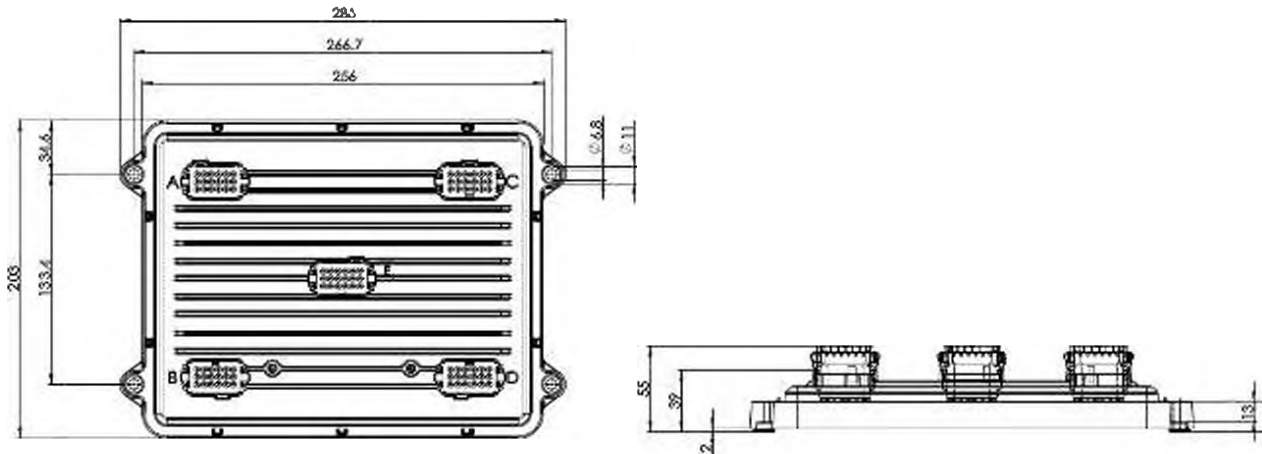
<b>Digital Outputs</b>	
Number of outputs	up to 33
Protection	Short to GND Short to Battery Overcurrent
Pull-up/down	560 Ohm / 2.6 kOhm for diagnostics

<b>DOUT Digital Outputs</b>	
maximum current	3.0 A (individual) 3.0 A (grouped)
<b>PWM Pulse Width Modulation Outputs</b>	
maximum current	3.0 A (individual) 2.0 A (grouped)
2 x 4 CC	Constant Current (4 complementary pairs)
Current sensing	0...3.84 A / 12 bit
ECC Estimated Current feedback, 0.2-4 A / 10 bit	
Accuracy ECC	+/- 50mA at 2A

<b>Sensor output</b>	
Supply	5 V +/- 4 %, 250 mA
CAN	3x 40 kbit/s to 500 kbit/s

**Software**  
 Apart from the programming tools, a software for diagnostics and error eliminating for the commissioning of the system is available.

**DIMENSIONS**



**ACCESSORIES**

Mating connector 1	Deutsch DT16-18SA-K004
Mating connector 2	Deutsch DT16-18SB-K004
Mating connector 3	Deutsch DT16-18SC-K004
Mating connector 4	Deutsch DT16-18SD-K004
Mating connector 5	Deutsch DT16-18SE-K004
Crimp socket AWG 18-20, 0.5-1.5 mm <sup>2</sup>	Deutsch 0462-201-16141 (max. 80 pcs)
or crimp socket AWG 14, max. 2 mm <sup>2</sup>	Deutsch 0462-209-16141 (max. 80 pcs)
Sealing plug	Deutsch 114017 (max. 80 pcs)
or snapping sealing plug	Deutsch 0413-217-1605

Orchestra Software Suite  
Art. no. 740.1000

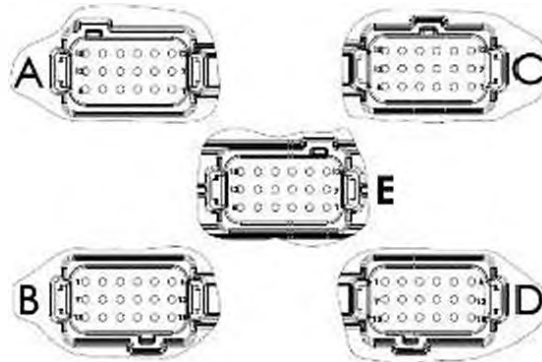
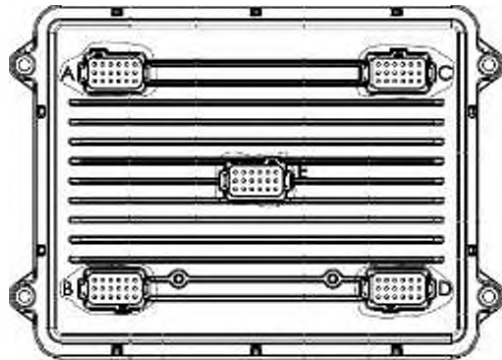
Project management software  
Ladder-Logic and C-Code  
Display GUI Programming incl. Conductor Software

Conductor Software  
Art. no. 740.1001

Standalone diagnostics and set-up tool

NXP (Freescale) CodeWarrior  
3rd party tool

C-Code Programming tool/Compiler

**CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT**

**X1 (A), 18-pole, Connector A-coded**

Pin	Function
1*	Input #1 STB / STG Output #1 DOUT(+) / PWM(+) / ECC
2*	Input #2 STB / STG Output #2 DOUT(+) / PWM(+) / ECC
3*	Input #3 STB / STG Output #3 DOUT(+) / PWM(+) / ECC
4*	Input #4 STB / STG Output #4 DOUT(+) / PWM(+) / ECC
5	BAT(-) Module
6	Steady plus BAT(+) Module and Outputs 1-8
7	CAN1-H
8	CAN1-L
9*	Input #5 STB / STG Output #5 DOUT(+) / PWM(+) / ECC
10*	Input #6 STB / STG Output #6 DOUT(+) / PWM(+) / ECC
11	Switched BAT(+) Input #7 Battery Voltage
12	Return(-) Outputs 7 - 8
13*	Input #8 STB / STG Output #7 DOUT(+) / PWM(+) / CC
14*	Input #9 STB / STG Output #8 DOUT(+) / PWM(+) / CC
15	Input #10 STB
16	Input #11 STB
17	Input #12 STB
18	Input #13 STB

**X2 (B), 18-pole, Connector B-coded**

Pin	Function
1*	Input #14 STB / STG Output #9 DOUT(+) / PWM(+) / ECC
2*	Input #15 STB / STG Output #10 DOUT(+) / PWM(+) / ECC
3*	Input #16 STB / STG Output #11 DOUT(+) / PWM(+) / ECC
4*	Input #17 STB / STG Output #12 DOUT(+) / PWM(+) / ECC
5	BAT(-) Module
6	BAT(+) Outputs 9-16
7	CAN2-H
8	CAN2-L
9*	Input #18 STB / STG Output #13 DOUT(+) / PWM(+) / ECC
10*	Input #19 STB / STG Output #14 DOUT(+) / PWM(+) / ECC
11	Input #20 STB
12	Return(-) Outputs 15 - 16
13*	Input #21 STB / STG Output #15 DOUT(+) / PWM(+) / CC
14*	Input #22 STB / STG Output #16 DOUT(+) / PWM(+) / CC
15	Input #23 STB
16	Input #24 STB
17	Input #25 STB
18	Input #26 STB

**X3 (C), 18-pole, Connector C-coded**

Pin	Function
1*	Input #27 STB / STG Output #17 DOUT(+) / PWM(+) / ECC
2*	Input #28 STB / STG Output #18 DOUT(+) / PWM(+) / ECC
3*	Input #29 STB / STG Output #19 DOUT(+) / PWM(+) / ECC
4*	Input #30 STB / STG Output #20 DOUT(+) / PWM(+) / ECC
5	BAT(-) Module
6	BAT(+) Outputs 17-24
7	CAN3-H
8	CAN3-L
9*	Input #31 STB / STG Output #21 DOUT(+) / PWM(+) / ECC
10*	Input #32 STB / STG Output #22 DOUT(+) / PWM(+) / ECC
11	Input #33 STB
12	Return(-) Outputs 23 - 24
13*	Input #34 STB / STG Output #23 DOUT(+) / PWM(+) / CC
14*	Input #35 STB / STG Output #24 DOUT(+) / PWM(+) / CC
15	Input #36 STB
16	Input #37 STB
17	Input #38 STB
18	Input #39 STB

**X5 (E), 18-pole, Connector E-coded**

Pin	Function
1	Input #55 VTD1(0-5.5V) / VTD2(0-35V)
2	Input #56 VTD1(0-5.5V) / VTD2(0-35V)
3	Input #57 VTD1(0-5.5V) / VTD2(0-35V)
4	Input #58 VTD1(0-5.5V) / VTD2(0-35V)
5	5VDC Sensor Supply (250mA)
6	5VDC Sensor Supply (250mA)
7	Input #61 STB
8	Input #62 STB
9	Input #63 STB / STG / VTD(0-5.5V) / RTD(500Ohm) / 20mA
10	Input #64 STB / STG / VTD(0-5.5V) / RTD(500Ohm) / 20mA
11	Input #65 STB / STG / VTD(0-5.5V) / FREQ / Count / PWM / Encoder(1A)
12	Input #66 STB / STG / VTD(0-5.5V) / FREQ / Count / PWM / Encoder(1B)
13	Input #67 STB / STG / VTD(0-5.5V) / RTD(500Ohm) / 20mA
14	Input #68 STB / STG / VTD(0-5.5V) / RTD(2kOhm) / 20mA
15	Input #69 STB / STG / VTD(0-5.5V) / FREQ / Count / PWM / Encoder(2A)
16	Input #70 STB / STG / VTD(0-5.5V) / RTD(2kOhm) / 20mA
17	Input #71 STB / STG / VTD(0-5.5V) / RTD(2kOhm) / 20mA
18	Input #72 STB / STG / VTD(0-5.5V) / FREQ / Count / PWM / Encoder(2B)

\*) Special requirements:

The input and output pins are linked together in a connector strip (Bank). All pins within one connector strip have to be configured in the same way. Either all pins as outputs, or as STB/STG inputs.

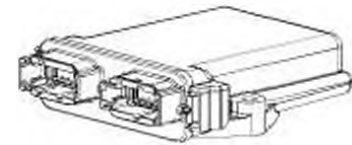
**X4 (D), 18-pole, Connector D-coded**

Pin	Function
1*	Input #40 STB / STG Output #25 DOUT(+) / PWM(+) / ECC
2*	Input #41 STB / STG Output #26 DOUT(+) / PWM(+) / ECC
3*	Input #42 STB / STG Output #27 DOUT(+) / PWM(+) / ECC
4*	Input #43 STB / STG Output #28 DOUT(+) / PWM(+) / ECC
5	BAT(-) Module
6	BAT(+) Outputs 25-33
7*	Input #44 STB / STG Output #29 DOUT(+) / PWM(+) / ECC
8	Input #45 STB
9*	Input #46 STB / STG Output #30 DOUT(+) / PWM(+) / ECC
10*	Input #47 STB / STG Output #31 DOUT(+) / PWM(+) / ECC
11	Input #48 STB
12	Return(-) Outputs 32 - 33
13*	Input #49 STB / STG Output #32 DOUT(+) / PWM(+) / CC
14*	Input #50 STB / STG Output #33 DOUT(+) / PWM(+) / CC
15	Input #51 STB
16	Input #52 STB
17	Input #53 STB
18	Input #54 STB

DOUT	= digital output
CC	= constant current
ECC	= estimated current feedback
PWM	= pulse with modulation
VTD	= analog input
STG	= switch to ground (input)
STB	= switch to battery (input)
FREQ	= frequency input

Bank 1:	X1 (A) pin 1 / pin 2 / pin 13 / pin 14
Bank 2:	X2 (B) pin 1 / pin 2 / pin 13 / pin 14
Bank 3:	X3 (C) pin 1 / pin 2 / pin 13 / pin 14
Bank 4:	X4 (D) pin 1 / pin 2 / pin 13 / pin 14
Bank 5:	X1 (A) pin 3 / pin 4 / pin 9 / pin 10
	X2 (B) pin 3 / pin 4 / pin 9 / pin 10
	X3 (C) pin 3 / pin 4 / pin 9 / pin 10
	X4 (D) pin 3 / pin 4 / pin 7 / pin 9 / pin 10

- Digital mobile electronics CL-451
- Robust construction with plug-in connection for mobile applications
- Protection class IP68
- Multi-functional pin assignment, up to 17 I/Os
- CAN connection
- Freely programmable


**DESCRIPTION**

Microcontroller based control with multifunctional inputs/outputs of the PME devices family (Programmable Mobile Electronics). Delivered in a robust and compact plastic housing, it is designed for the hard use in working devices and is perfectly suitable for various open loop and closed loop control tasks.

**FUNCTION**

The control can be used and programmed as a stand alone unit, or as part of a distributed, decentralised system architecture. The variably usable inputs and outputs enable reading and controlling sensors and actuators of all kinds. The free programmability enables maximum flexibility for the adaptation to any desired machine function.

**APPLICATION**

This mobile electronics is used mainly in the mobile field because of the compact construction, protection class IP67 as well as the extensive operating temperature range and the selected plug connection. Customer-specific requirements can be easily implemented.

**CONTENT**

GENERAL SPECIFICATIONS	1
ELECTRICAL SPECIFICATIONS	1
DIMENSIONS, ASSEMBLY	2
ACCESSORIES	2
CONNECTOR WIRING DIAGRAM /	3
PIN ASSIGNMENT	

**TYPE CODE**

CL-451-100-10-WAG-00	Master I/O Module
CL-451-100-20-WAG-00	Client I/O Module

**GENERAL SPECIFICATIONS**

Execution	Plastic molded housing
Dimensions	119 x 38 x 133 mm (see Dimensions)
Mounting	Mounting flange, screwed on
Weight	250 g
Device receptacle	Deutsch DTM04-12PA/8 pin header
Mating connectors	Deutsch DTM08-12SA / DTM08-12SB

Working temperature	-40...+70°C
MTBF	79 years (Telcordia SR-332)

**Note** Mating connector not part of the delivery

**ELECTRICAL SPECIFICATIONS**

Protection Class	IP68
Supply Voltage	8...32 VDC
No-load current	152 mA at 8 V, 259 mA at 32 V

**Analogue Inputs**

Number of inputs	up to 5
Input voltage range	0...5.5 V
Input resistance	58.7 kOhm typ.
Resolution	12 bit

**Digital Inputs**

number of inputs	up to 17
Switching threshold	positive >3.5 V, negative <1.0 V

**STB Switch to battery input**

Input resistance	2.8 kOhm
------------------	----------

**STG Switch To Ground input**

Pull-up resistor	580 Ohm to internal 5 V
------------------	-------------------------

**FREQ Frequency Input**

Pull-up resistor	4.7 kOhm to internal 5 V
Resolution	< 5 Hz
Frequency Range	max. 10 kHz (open drain, sinking sensor)

**Digital Outputs**

Number of outputs	up to 16
Protection	Short to GND Short to Battery Overcurrent
Pull-up / down	580 Ohm / 2.8 kOhm for diagnostics

**DOUT Digital Outputs**

maximum current	3.0 A (individual) 2.0 A (grouped)
-----------------	---------------------------------------

**PWM Pulse Width Modulation Output**

maximum current	3.0 A (individual) 1.5 A (grouped)
-----------------	---------------------------------------

ECC Estimated Current Feedback, 0.2-3.7 A / 10 Bit  
Accuracy ECC +/- 50mA at 2A

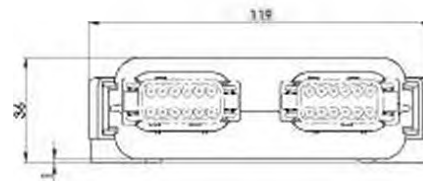
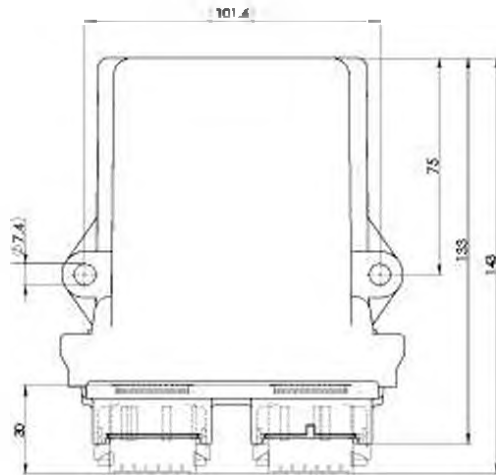
**CAN**

40 kbit/s to 500 kbit/s

**Software**

Apart from the programming tools, a software for diagnostics and error eliminating for the commissioning of the system is available.

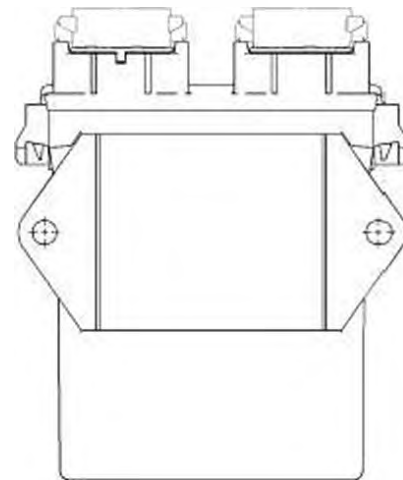
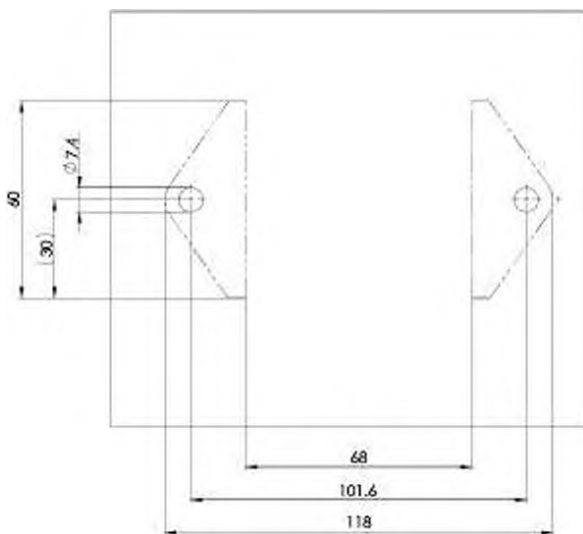
**DIMENSIONS**



**ASSEMBLY**

Mounting surface

View from below

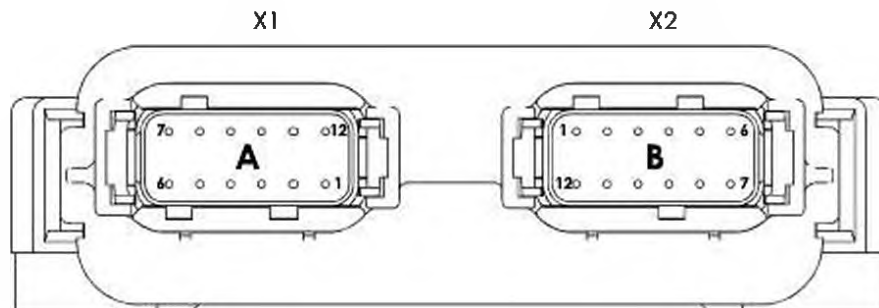


**ACCESSORIES**

- Mating connector 1
- Mating connector 2
- Wedge lock
- Crimp socket AWG 20, 0.5 mm<sup>2</sup>
- or crimp socket AWG 16-18, 0.75-1 mm<sup>2</sup>
- Sealing plug

- Deutsch DTM06-12SA
- Deutsch DTM06-12SB
- Deutsch WM-12S (2 pcs)
- Deutsch 0482-201-20141 (max. 24 pcs)
- Deutsch 0482-005-20141 (max. 24 pcs)
- Deutsch 0413-204-2005 (max. 24 pcs)



**CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT**

**X1, gray, 12-pole, connector A-coded**

Pin	Function
1	Input #1 STB / STG Output #1 DOUT(+) / PWM(+) / ECC
2	Input #2 STB / STG / Output #2 DOUT(+) / PWM(+) / ECC
3	Input #3 STB/STG / VTD / Output #3 DOUT(+) / PWM(+) / ECC
4	Input #4 STB / STG / VTD / Output #4 DOUT(+) / PWM(+) / ECC
5	Input #5 STB / STG / Output #5 DOUT(+) / PWM(+) / ECC
6	Input #6 STB / STG / Output #6 DOUT(+) / PWM(+) / ECC
7	Input #7 STB / STG / Output #7 DOUT(+) / PWM(+) / ECC
8	Input #8 STB / STG / Output #8 DOUT(+) / PWM(+) / ECC
9	CAN1-L
10	CAN1-H
11	BAT(-) Module
12	Unswitched BAT(+) Module and Outputs 1-8

**X2, black, 12-pole, connector B-coded**

Pin	Function
1	Input #9 STB / STG / Output #9 DOUT(+) / PWM(+) / ECC
2	Input #10 STB / STG / Output #10 DOUT(+) / PWM(+) / ECC
3	Input #11 STB / STG / VTD / Output #11 DOUT(+) / PWM(+) / ECC
4	Input #12 STB / STG / VTD / Output #12 DOUT(+) / PWM(+) / ECC
5	Input #13 STB / STG / Output #13 DOUT(+) / PWM(+) / ECC
6	Input #14 STB / STG / Output #14 DOUT(+) / PWM(+) / ECC
7	Input #15 STB / STG / Output #15 DOUT(+) / PWM(+) / ECC
8	Input #16 STB / STG / Output #16 DOUT(+) / PWM(+) / ECC
9	Input #17 STB / VTD
10	BAT(+) Input #18 Battery Voltage
11	BAT(-) Module
12	BAT(+) Outputs 9-16

**NOTE**

All 8 inputs and outputs, I/O 5-8 and 13-16, have to be assigned to the same input/output type. Either all as Output, as STB respectively as STG input. The maximum current is 10A per 8 outputs per connector.

DOUT = digital output  
 ECC = estimated constant current  
 PWM = pulse with modulation  
 AIN = analog input  
 STB = switch to battery (input)  
 STG = switch to ground (input)  
 FREQ = frequency input  
 VTD = voltage to digital (input)

Orchestra Software Suite  
 Art. no. 740.1000

Project management software  
 Ladder-Logic and C-Code  
 Display GUI Programming incl.  
 Conductor Software

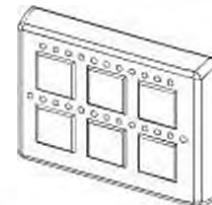
Conductor Software  
 Art. no. 740.1001

Standalone diagnostics and  
 set-up tool

NXP (Freescale) CodeWarrior  
 3rd party tool

C-Code Programming tool /  
 Compiler

- Digital mobile electronics keypad CL-609
- Robust construction with plug-in connection for mobile applications
- Protection class IP 67
- Multi-functional pin assignment, 4 I/Os
- CAN connection
- Freely programmable


**DESCRIPTION**

Microcontroller based keypad with LED displays and multifunctional inputs/outputs of the PME devices family (Programmable Mobile Electronics). Delivered in a robust and compact plastic housing with a practically wear-free keypad, it is designed for the hard use in working devices and is used for the operation and for the display of machine functions.

**FUNCTION**

The control can be used and programmed as a stand alone unit, or as part of a distributed, decentralised system architecture. The variably usable inputs and outputs enable reading and controlling sensors and actuators of all kinds. The free programmability enables maximum flexibility for the adaptation to any desired machine function.

**APPLICATION**

The CL-609 keypad can significantly reduce vehicle dashboard wiring, and can be programmed with a dimming function. Customer-specific requirements can easily be implemented.

**CONTENT**

GENERAL SPECIFICATIONS	1
ELECTRICAL SPECIFICATIONS	1
DIMENSIONS, ASSEMBLY	2
ACCESSORIES	2
CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT	3

**TYPE CODE**

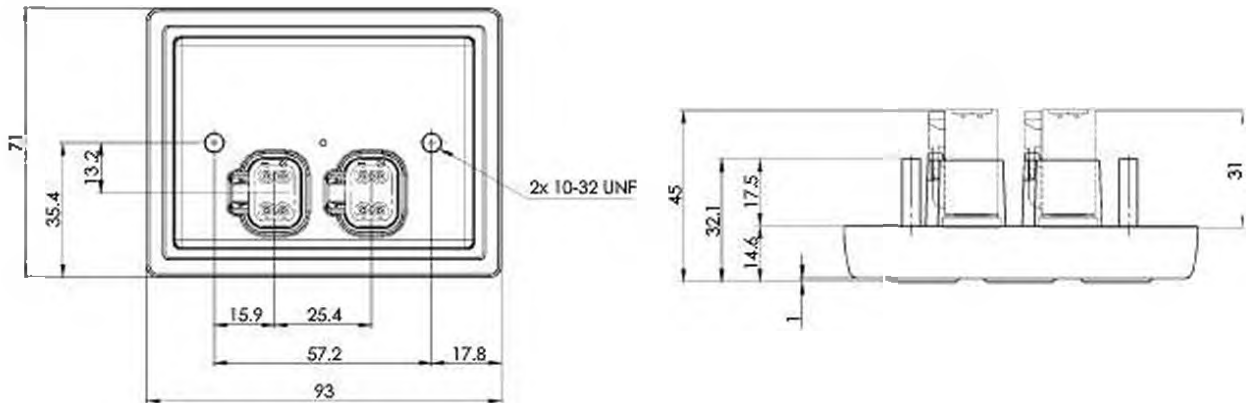
CL-609-102-10-WAG-00	Master Keypad
CL-609-102-20-WAG-00	Client Keypad

**GENERAL SPECIFICATIONS**

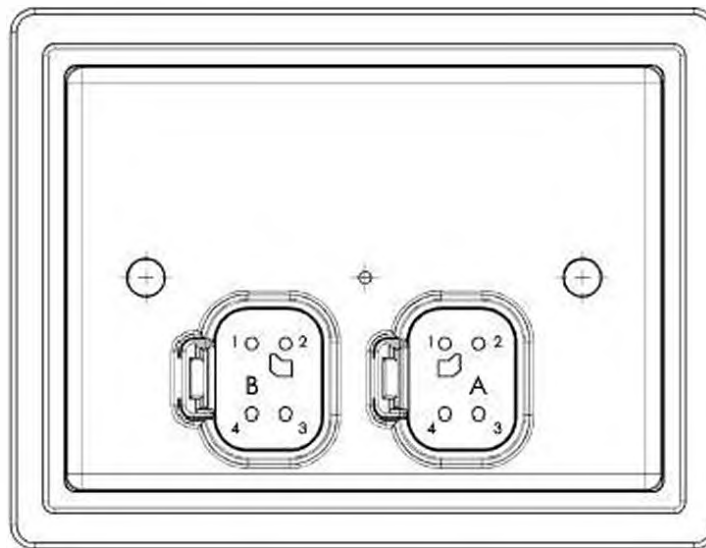
Execution	Sealed construction	
Keypad	Durability: > 1 million key presses Customized key labelling possible	
LED Indicators	Dimmable LED indicators and backlit icons (via CAN or Analog input)	
Dimensions	93 x 71 x 32 mm (see Dimensions)	
Mounting	Front panel mounting (2 x M5 screws)	
Weight	100 g	
Device receptacle	Deutsch DT04-4P pin header	
Mating connector	Deutsch DT06-4SA + DT06-4SB	
Working temperature	-40...+70°C	<b>Note</b> Mating connector not part of the delivery

**ELECTRICAL SPECIFICATIONS**

Protection Class	IP 67	Digital outputs	
Supply Voltage	8...32 VDC	Number of outputs	up to 4
No-load current	22 mA at 13.8 V, 17 mA at 28 V	Protection	Short to GND Short to Battery
Analogue inputs		Maximum current	-0.75 A (individual)
Number of inputs	up to 1	Type	Low-side-switch
Input voltage range	0...35 V	DOUT Digital Outputs	
Input resistance	78.1 kOhm	PWM Pulse Width Modulation Outputs	
Resolution	12 bit	CAN	40 kbit/s to 500 kbit/s
Digital inputs		Software	
Number of inputs	up to 2	Apert from the programming tools, a software for diagnostics and error eliminating for the commissioning of the system is available.	
STB Switch to battery input			
Input resistance	1.4 kOhm		
Switching threshold	positive >6.5V, negative <3.5 V		
STG Switch To Ground input			
Pull-up resistance	580 Ohm to internal 5 V		
Switching threshold	positive >3.25 V, negative <1.75 V		

**DIMENSIONS**

**ACCESSORIES**

Mating connector	DT06-4S (2 pcs)
Wedge lock	Deutsch W4SA and W4SB
Crimp socket AWG 16-20, 0.5-1.5 mm <sup>2</sup>	Deutsch 0462-201-16141 (max. 8 pcs)
or crimp socket AWG 14, max. 2mm <sup>2</sup>	Deutsch 0462-209-16141 (max. 8 pcs)
Sealing plug	Deutsch 114017 (max. 8 pcs)
or snapping sealing plug	Deutsch 0413-217-1605
Orchestra Software Suite	Project management software
Art. no. 740.1000	Ladder-Logic and C-Code
	Display GUI Programming incl. Conductor Software
Conductor Software	Standalone diagnostics and set-up tool
Art. no. 740.1001	
NXP (Freescale) CodeWarrior	C-Code Programming tool/Compiler
3rd party tool	

**CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT**

**X1, 4-pole, connector A-coded**

Pin	Function
1	BAT(+) Module / Input Battery Voltage
2	BAT(-) Module
3	CAN-H
4	CAN-L

**X2, 4-pole, connector B-coded**

Pin	Function
1	Input STB / STG / AIN or Output DOUT/PWM/(-)
2	Input STB / STG or Output DOUT/PWM/(-)
3	Output DOUT/PWM(-)
4	Output DOUT/PWM(-)

DOUT = Digital output  
 PWM = Pulse width modulation  
 AIN = Analog input  
 STB = Switch to battery (input)  
 STG = Switch to ground (input)

- Digital mobile electronics display CL-709
- 4,3" colour display
- Robust construction with plug-in connection for mobile applications
- Protection class IP67
- Multi-functional pin assignment, 10 I/Os
- CAN connection
- Freely programmable


**DESCRIPTION**

Microcontroller based control with display and operating buttons including multifunctional inputs/outputs. Delivered in a robust plastic housing, it is designed for the hard use in working devices and is perfectly suitable for the communication between the machine and the user.

**FUNCTION**

The control can be used and programmed as a stand alone unit, or as part of a distributed, decentralised system architecture. The functions on the display and the buttons are simply and individually generated with a programming tool. The additional inputs and outputs enable reading and controlling sensors and actuators of all kinds.

**APPLICATION**

This mobile electronics is used mainly in the mobile field because of the compact construction, protection class IP67 as well as the extensive operating temperature range and the selected plug connection. Customer-specific requirements can easily be implemented.

**CONTENT**

GENERAL SPECIFICATIONS	1
ELECTRICAL SPECIFICATIONS	1
DIMENSIONS, ASSEMBLY	2
ACCESSORIES	2
CONNECTOR WIRING DIAGRAM/ PIN ASSIGNMENT	3

**TYPE CODE**

CL-709-100-10-WAG-00	Master I/O Display
CL-709-100-20-WAG-00	Client I/O Display

**GENERAL SPECIFICATIONS**

Execution	Plastic molded housing
Dimensions	144 x 121 x 51 mm (see Dimensions)
Mounting	Front panel assembly with separate mounting bracket
Weight	380 g
Device receptacle	Deutsch DT, 18-pole pin header
Mating connector	Deutsch DT16-18SA-K004

**USB connector**

Device receptacle	female, M8, 4-pole
Mating connector	Cable connector (male), M8, 4-pole

Working temperature -40...+70°C

**Display**

Diagonal 4.3"/109 mm  
 Readable also in direct sunlight  
 TFT LCD 480 x 242 pixel  
 Real time clock  
 Low power sleep mode  
 with wake-up function

**Note**

The mating connector and mounting bracket are not part of the delivery

**ELECTRICAL SPECIFICATIONS**

Protection Class	IP 67
Supply Voltage	8...32 VDC
No-load current	155 mA at 13.8 V, 99 mA at 28 V

**Analogue inputs**

Number of inputs	up to 4
Input voltage range	0...5.51 V
Input resistance	57 kOhm
Resolution	10 bit

**Digital inputs**

Number of inputs	up to 10
STB Switch to Battery input	
Input resistance	1.4 kOhm
Switching threshold	positive >6.5 V, negative <3.5 V
STG Switch To Ground input	
Pull-up resistor	560 Ohm to internal 5 V
Switching threshold	positive >3.25 V, negative <1.75 V

**FREQ Frequency input**

Switching threshold	positive >2.6 V, negative <0.5 V
Pull-up resistor	4.7 kOhm to internal 5 V
Resolution	< 5 Hz

**Frequency range**

max. 10 kHz (open drain, sinking sensor)

**RTD Resistance to digital**

Pull-up resistor	499 Ohm (for 0-500 Ohm range)
Accuracy	+/- 1 % and +/- 5 Ohm

**Digital Outputs**

Number of outputs	up to 4
Protection	Short to GND Short to Battery Overcurrent
Pull-up/down	560 Ohm / 1.4 kOhm for diagnostics

**DOOUT Digital Outputs**

Maximum current	3.0 A (individual) 2.5 A (grouped)
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**PWM Pulse Width Modulation Outputs**

Maximum current	3.0 A (individual) 2.0 A (grouped)
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**ECC Estimated Current Feedback, 0.2-4.1 A / 10 bit**

Accuracy ECC +/- 50mA at 2A

**Sensor output**

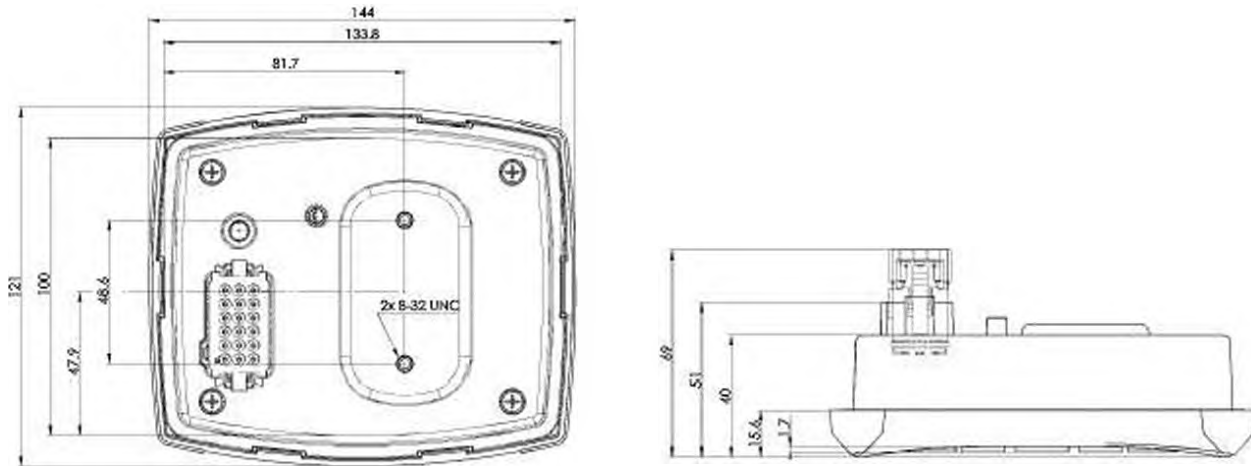
Supply	5 V +/- 5%, 250 mA
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**CAN**

2x 40 kbit/s to 500 kbit/s

**Software**

Apart from the programming tools, a software for diagnostics and error eliminating for the commissioning of the system is available.

**DIMENSIONS**

**Fixing:**
**Threaded socket, max. depth 8.5 mm**
**ACCESSORIES**

Mating connector  
 Crimp socket AWG 18-20, 0.5-1.5 mm<sup>2</sup>  
 or crimp socket AWG 14, max. 2 mm<sup>2</sup>  
 Sealing plug  
 or anapping sealing plug

DT18-18SA-K004  
 Deutsch 0462-201-16141 (max. 18 pcs)  
 Deutsch 0462-209-16141 (max. 18 pcs)  
 Deutsch 114017 (max. 18 pcs)  
 Deutsch 0413-217-1605

USB connector  
 Mating connector

Cable connector (male), M8, 4-pole

Mounting bracket  
 Art. no. 728.990

Orchestra Software Suite  
 Art. no. 740.1000

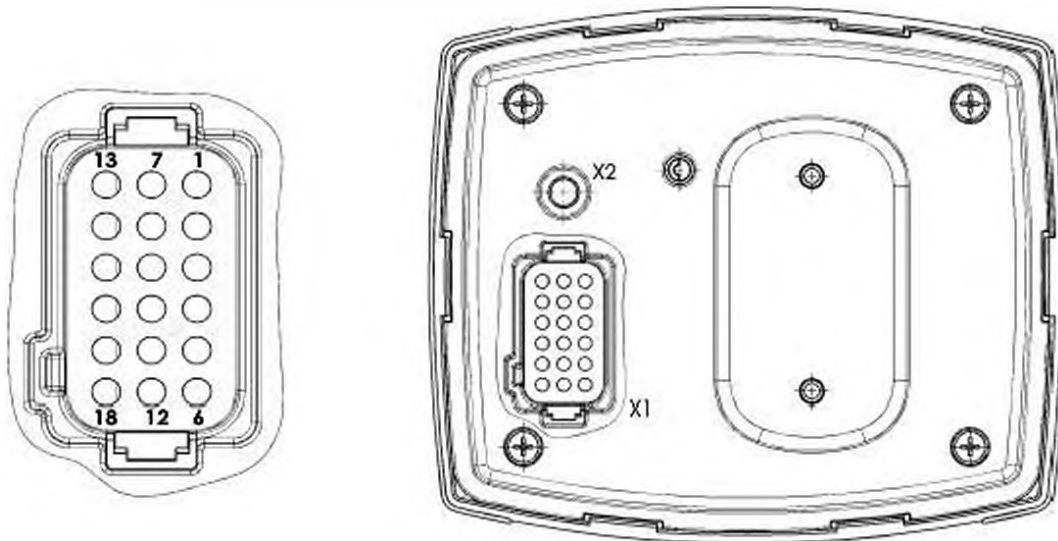
Project management software  
 Ladder-Logic and C-Code  
 Display GUI Programming incl. Conductor Software

Conductor Software  
 Art. no. 740.1001

Standalone diagnostics and set-up tool

NXP (Freescale) CodeWarrior  
 3rd party tool

C-Code Programming tool/Compiler

**CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT**

**X1, 18-pole, connector A-coded**

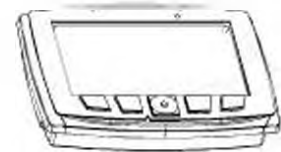
Pin	Function
1	Output #1 DOUT(+) / PWM(+) / ECC/(+) / Input STB / STG
2	Output #2 DOUT(+) / PWM(+) / ECC/(+) / Input STB / STG
3	Output #3 DOUT(+) / PWM(+) / ECC/(+) / Input STB / STG
4	Output #4 DOUT(+) / PWM(+) / ECC/(+) / Input STB / STG
5	BAT(-) Module
6	Steady plus +Battery Module and Outputs input #8 Battery Voltage
7	CAN1-H
8	CAN1-L
9	5VDC Sensor Supply GND
10	5VDC Sensor Supply
11	Wake-Up (STB Input) Input #6 STB / STG
12	Input #5 STB / STG
13	CAN2-L
14	CAN2-H
15	Input #4 STB / STG / VTD / RTD / FREQ / PWM / Encoder(1A)
16	Input #3 STB / STG / VTD / RTD / FREQ / PWM / Encoder(1B)
17	Input #2 STB / STG / VTD / RTD / FREQ / PWM / Encoder(2A)
18	Input #1 STB / STG / VTD / RTD / FREQ / PWM / Encoder (2B)

**X2, 4-pole, connector round M8 for USB**

Pin	Function
1	USB (Power)
2	USB (DP)
3	USB (DM)
4	USB (GND)

DOUT = Digital output  
 ECC = Estimated current feedback  
 PWM = Pulse width modulation  
 STB = Switch to battery input  
 STG = Switch to ground input  
 FREQ = Frequency input  
 VTD = Voltage to digital (analog input)  
 RTD = Resistance to digital (resistor input)

- Digital mobile electronics display CL-711
- 7" colour display
- Robust construction with plug-in connection for mobile applications
- Protection class IP67
- Multi-functional pin assignment, 10 I/Os
- CAN connection
- Freely programmable


**DESCRIPTION**

Microcontroller based control with display and operating buttons including multifunctional inputs/outputs. Delivered in a robust plastic housing, it is designed for the hard use in working devices and is perfectly suitable for the communication between the machine and the user.

**FUNCTION**

The control can be used and programmed as a stand alone unit, or as part of a distributed, decentralised system architecture. The functions on the display and the buttons are simply and individually generated with a programming tool. The additional inputs and outputs enable reading and controlling sensors and actuators of all kinds.

**APPLICATION**

This mobile electronics is used mainly in the mobile field because of the compact construction, protection class IP67 as well as the extensive operating temperature range and the selected plug connection. Customer-specific requirements can easily be implemented.

**CONTENT**

GENERAL SPECIFICATIONS	1
ELECTRICAL SPECIFICATIONS	1
DIMENSIONS, ASSEMBLY	2
ACCESSORIES	2
CONNECTOR WIRING DIAGRAM/ PIN ASSIGNMENT	3

**TYPE CODE**

CL-711-101-10-WAG-00	Master I/O Display
CL-711-101-20-WAG-00	Client I/O Display

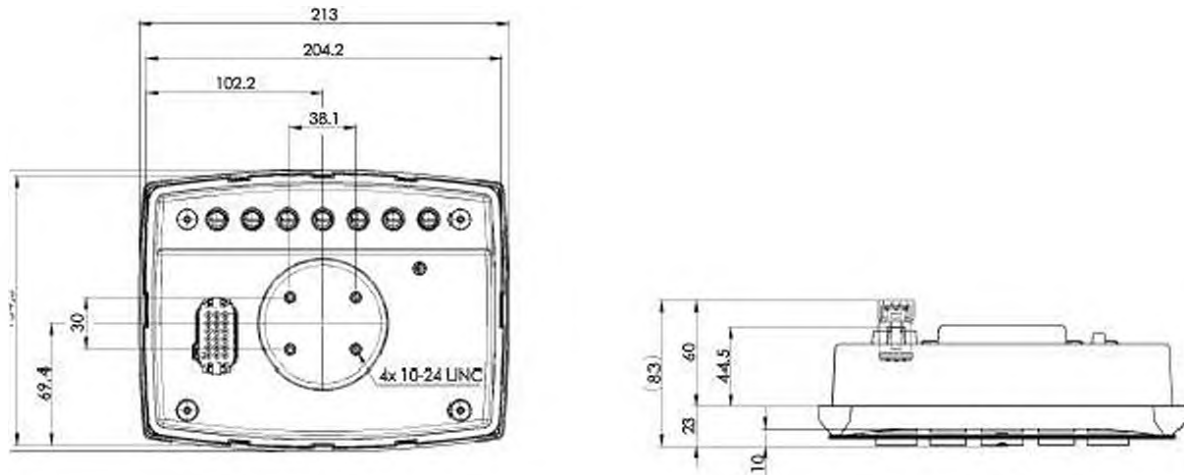
**GENERAL SPECIFICATIONS**

Execution	Plastic molded housing	<b>Display</b>	Diagonal 7" / 178 mm Readable also in direct sunlight
Dimensions	213 x 162 x 87.5 mm (see Dimensions)		TFT LCD 800 x 480 pixel Real time clock
Mounting	Front panel assembly with separate mounting bracket		Low power sleep mode with wake-up function
Weight	1000 g	<b>Video inputs</b>	
Device receptacle	Deutsch DT, 18-pole pin header	Device receptacle	male, M12, 4-pole, B coded
Mating connector	Deutsch DT18-18SA-K004	Mating connector	Cable plug (female), M12, 4-pole, B coded
<b>USB connector</b>		<b>Note</b>	The mating connector and mounting bracket are not part of the delivery
Device receptacle	male, M12, 4-pole		
Mating connector	Cable plug (female), M12, 4-pole		
Working temperature	-40...+70°C		

**ELECTRICAL SPECIFICATIONS**

Protection Class	IP 67	<b>Digital Outputs</b>	
Supply Voltage	8...32 VDC	Number of outputs	up to 4
No-load current	440 mA at 13.8 V, 252 mA at 28 V	Protection	Short to GND Short to Battery Overcurrent
<b>Analogue inputs</b>		Pull-up/down	560 Ohm / 1.4 kOhm for diagnostics
Number of inputs	up to 5	<b>DOUT Digital Outputs</b>	
Input voltage range	0...5.51 V	Maximum current	3.0 A (individual) 8.0 A (grouped for pin 1-4) 2.5 A (grouped)
Input resistance	57 kOhm	<b>PWM Pulse Width Modulation Outputs</b>	
Resolution	12 bit	Maximum current	3.0 A (individual) 8.0 A (grouped for pin 1-4) 2.0 A (grouped)
<b>Digital inputs</b>		<b>ECC Estimated Current Feedback, 0.2-4.1 A / 12 bit</b>	
Number of inputs	up to 10	Accuracy ECC	+/- 50mA at 2A
STB Switch to Battery input		<b>5 V Sensor Supply</b>	
Input resistance	1.4 kOhm	Stabilised output voltage	5 V +/- 5 %
Switching threshold	positive >5.9 V, negative <3.2 V	Max. load	250 mA
STG Switch To Ground input		<b>CAN</b>	
Pull-up resistor	580 Ohm to internal 5 V		2 CAN interfaces 40 kbit/s to 500 kbit/s
Switching threshold	positive >3.25 V, negative <1.75 V	<b>Software</b>	
<b>FREQ Frequency input</b>		Beside the programming tools, a software for diagnostics and troubleshooting for the commissioning of the system is available.	
Switching threshold	positive >3.5 V, negative <1.0 V		
Pull-up resistor	4.7 kOhm to internal 5 V		
Resolution	<5 Hz		
Frequency range	max. 10 kHz (open drain, sinking sensor)		
RTD Resistance to digital			
Pull-up resistor	499 Ohm (Input#1) 2000 Ohm (Input#2)		
Accuracy	+/-1 % and +/- 5 Ohm (Input#1) +/-1 % and +/- 19.5 Ohm (Input#2)		

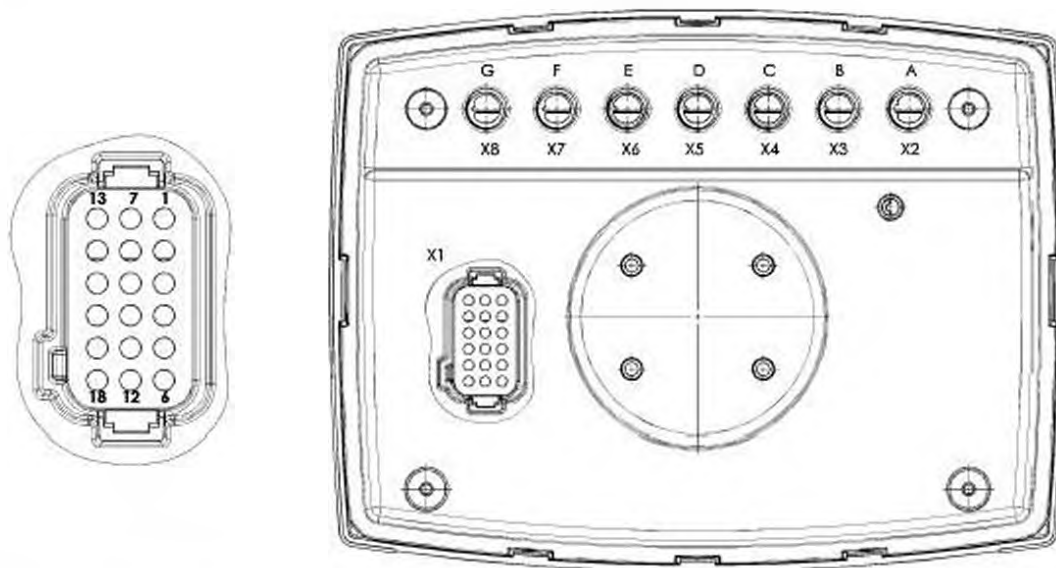


**DIMENSIONS**

**Fixing:**

Threaded socket UNC 10-24, max. depth 11 mm

**ACCESSORIES**

Mating connector	DT18-18SA-K004
Crimp socket AWG 18-20, 0.5-1.5 mm <sup>2</sup>	Deutsch 0462-201-16141 (max. 18 pcs)
or crimp socket AWG 14, max. 2 mm <sup>2</sup>	Deutsch 0462-209-16141 (max. 18 pcs)
Sealing plug	Deutsch 114017 (max. 18 pcs)
or snapping sealing plug	Deutsch 0413-217-1605
USB connector	
Mating connector	Cable plug (female), M12, 4-pole
Video connector	
Mating connector	Cable plug (female), M12, 4-pole, B coded
Orchestra Software Suite	Project management software
Art. no. 740.1000	Ladder-Logic and C-Code
	Display GUI Programming incl. Conductor Software
Conductor Software	Standalone diagnostics and set-up tool
Art. no. 740.1001	
NXP (Freescale) CodeWarrior	C-Code Programming tool/Compiler
3rd party tool	

**CONNECTOR WIRING DIAGRAM / PIN ASSIGNMENT**

**X1, 18-pole, connector A-coded**
**Pin Function**

Pin	Function
1	Output #1 DOUT(+) / PWM(+) / ECC/(+) / Input STB / STG
2	Output #2 DOUT(+) / PWM(+) / ECC/(+) / Input STB / STG
3	Output #3 DOUT(+) / PWM(+) / ECC/(+) / Input STB / STG
4	Output #4 DOUT(+) / PWM(+) / ECC/(+) / Input STB / STG
5	BAT(-) Module
6	Steady plus +Battery Module and Outputs
7	CAN1-H
8	CAN1-L
9	Input #1 STB / STG / VTD(0-5.6V) / FREQ / PWM / Encoder(1A) / RTD(0-500Ohm)
10	Input #2 STB / STG / VTD(0-5.6V) / FREQ / PWM / Encoder(1B) / RTD(0-2kOhm)
11	Input #3 STB / STG / Wake-Up
12	Input #4 STB / STG / VTD(0-5.6V)
13	CAN2-L
14	CAN2-H
15	Input #5 STB / STG / VTD(0-5.6V) / FREQ / PWM / Encoder(2A)
16	Input #6 STB / STG / VTD(0-5.6V) / FREQ / PWM / Encoder(2B)
17	5VDC Sensor Supply Ground
18	5VDC Sensor Supply

DOUT = Digital output  
 ECC = Estimated current feedback  
 PWM = Pulse width modulation  
 STB = Switch to battery input  
 STG = Switch to ground input  
 FREQ = Frequency input  
 VTD = Voltage to digital (Analogeingang)  
 RTD = Resistance to digital (Widerstandeingang)

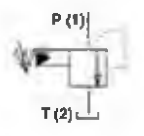
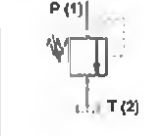

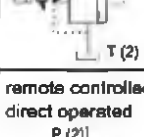
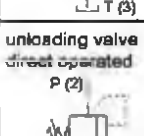

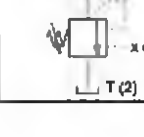

**X4 (C), USB Client, X6 (E) USB Host  
 round 4-pole, M12 connector, A-coded for USB**
**Pin Function**

Pin	Function
1	USB (Power)
2	USB (DP)
3	USB (DM)
4	USB (GND)


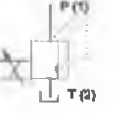
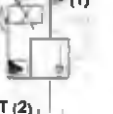

**X7 (F), X8 (G)  
 round 4-pole, M12 connector, B-coded for Video**
**Pin Function**

Pin	Function
1	Ground
2	Ground
3	F: Video #1 / G: Video #3
4	F: Video #2 / G: Video #4

**OVERVIEW PRESSURE RELIEF-, PRESSURE SEQUENCE-, ACCUMULATOR UNLOADING VALVES**

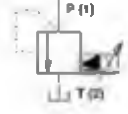
Function		Size					
		M18x1.5	1/4"-16 UNF	M22x1.5	7/8"-14 UNF	M33x2	M42x2
pilot operated 	Type	<b>BV.PM18</b>		<b>BV.PM22</b> <b>BVTPM22</b> <b>BC.PM22</b>		<b>BV.PM33</b>	
	Data sheet	2.1-510		2.1-530 2.1-532 2.1-538		2.1-550	
	Cavity	2.13-1001		2.13-1003		2.13-1041	
direct operated 	Type	<b>BS.PM18</b>	<b>BESPU08</b>	<b>BA.PM22</b> <b>BK.PM22</b> <b>BESPM22</b>	<b>BESPU10</b>		
	Data sheet	2.1-520	2.1-523	2.1-540 2.1-542 2.1-539	2.1-590		
	Cavity	2.13-1001	2.13-1043	2.13-1003	2.13-1054		
pilot operated, hydraulic vented 	Type			<b>BV.PM22-Z9</b>			
	Data sheet			2.1-534			
	Cavity			2.13-1007			
pilot operated, electric vented 	Type			<b>BVEPM22</b>			
	Data sheet			2.1-536			
	Cavity			2.13-1003			
remote controlled direct operated 	Type			<b>BX.PM22</b>			
	Data sheet			2.1-544			
	Cavity			2.13-1037			
unloading valve direct operated 	Type			<b>BY.PM22</b>			
	Data sheet			2.1-544			
	Cavity			2.13-1037			
sequence valve pilot operated 	Type			<b>FV.PM22</b>			
	Data sheet			2.1-546			
	Cavity			2.13-1006			
accumulator unloading pilot operated 	Type			<b>US.PM22</b>			
	Data sheet			2.1-548			
	Cavity			2.13-1006			


**OVERVIEW PROPORTIONAL PRESSURE RELIEF VALVES**

Function		Size					
		M18x1.5	3/4"-16 UNF	M22x1.5	7/8"-14 UNF	M33x2	M42x2
pilot operated 	Type	<b>BVPPM18</b>		<b>BVPPM22</b>		<b>BVPPM33</b>	<b>BVPPM42</b>
	Data sheet	2.3-510		2.3-529		2.3-551	2.3-590
	Type ■			<b>BVPPM22- /ME</b>		<b>BVPPM33- /ME</b>	
	Data sheet			2.3-537		2.3-553	
	Type ●			<b>BVBPM22</b>			
	Data sheet			2.3-536			
	Cavity		2.13-1001		2.13-1003		2.13-1041
direct operated 	Type	<b>BDPPM18</b>		<b>BDPPM22</b>			
	Data sheet	2.3-520		2.3-539			
	Type ■			<b>BDPPM22- /ME</b>			
	Data sheet			2.3-561			
	Type ●			<b>BDBPM22</b>			
	Data sheet			2.3-547			
	Cavity		2.13-1001		2.13-1003		
pilot operated Inverse 	Type			<b>BNIPM22</b>			
	Data sheet			2.3-533			
	Type			<b>BVIPM22</b>			
	Data sheet			2.3-528			
direct operated Inverse 	Type			<b>BDIPM22</b>			
	Data sheet			2.3-548			
	Type ■			<b>BDIPM22- /ME</b>			
	Data sheet			2.3-562			
	Cavity			2.13-1003			


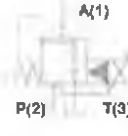

■ Execution with integrated electronics ● Execution Ex d

**OVERVIEW PRESSURE REDUCING VALVES**

Function		Size					
		M18x1.5	1/4"-16 UNF	M22x1.5	7/16"-14 UNF	M33x2	M42x2
pilot operated 	Type	<b>MVPM18</b>		<b>MVPM22</b>			
	Data sheet	2.2-510		2.2-530			
	Cavity	2.13-1020		2.13-1004			



Function		Size					
		M16x1.5	M18x1.5	M22x1.5	7/16"-14 UNF	M33x2	M42x2
direct operated 	Type	<b>MDPM16</b>		<b>MSSPM22</b>	<b>MDPU10</b>		
	Data sheet	2.2-508		2.2-532	2.2-550		
	Cavity	2.13-1051			2.13-1045		

**OVERVIEW PROPORTIONAL PRESSURE REDUCING VALVES**

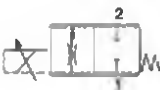

Function		Size					
		M16x1.5	M18x1.5	M22x1.5	7/16"-14 UNF	M33x2	M42x2
pilot operated 	Type		<b>MVPPM18</b>	<b>MVPPM22</b>	<b>MVPPU10</b>	<b>MVPPM33</b>	<b>MVPPM42</b>
	Data sheet		2.3-610	2.3-629	2.3-672	2.3-649	2.3-690
	Type ■			<b>MVPPM22- /ME</b>		<b>MVPPM33- /ME</b>	
	Data sheet			2.3-632		2.3-652	
	Type ●			<b>MVBPM22</b>		<b>MVBPM33</b>	
	Data sheet			2.3-635		2.3-654	
pilot operated 	Type			<b>MQPPM22</b>			
	Data sheet			2.3-641			
	Type ■			<b>MQPPM22- /ME</b>			
	Data sheet			2.3-643			
	Type ●			<b>MQBPM22</b>			
	Data sheet			2.3-644			
direct operated 	Type	<b>MDPPM16</b>		<b>MPPPM22</b>	<b>MPPPU10</b>		
	Data sheet	2.3-605		2.3-625	2.3-673		
	Type	<b>MGPPM16</b>					
	Data sheet	2.3-607					
	Type ●	<b>MDBPM16</b>		<b>MPBPM22</b>			
	Data sheet	2.3-602		2.3-627			
	Type ●	<b>MGBPM16</b>					
	Data sheet	2.3-608					
	Type	<b>MDIPM16</b>					
	Data sheet	2.3-603					
Cavity	2.13-1051		2.13-1004				

■ Execution with integrated electronics ● Execution Ex d

**OVERVIEW THROTTLE- AND RESTRICTOR VALVES**




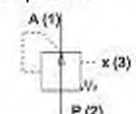
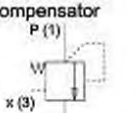
Function		Size					
		M18x1.5	1/4"-16 UNF	M22x1.5	7/16"-14 UNF	M33x2	M42x2
Throttle valve 	Type	<b>DN.PM18</b> <b>DNIPM18</b>		<b>DNIPM22</b>		<b>DNIPM33</b>	
	Data sheet	2.4-510 2.4-512		2.4-532		2.4-552	
	Cavity	2.13-1002		2.13-1008		2.13-1005	
Restrictor valve 	Type	<b>DR.PM18</b>					
	Data sheet	2.4-610					
	Cavity	2.13-1002					

**OVERVIEW PROPORTIONAL THROTTLE VALVES**


Function		Size					
		M18x1.5	1/4"-16 UNF	M22x1.5	7/16"-14 UNF	M33x2	M42x2
Throttle valve normally closed 	Type	<b>DNPPM18</b>		<b>DNPPM22</b>		<b>DNPPM33</b>	
	Data sheet	2.6-510		2.6-531		2.6-551	
	Type ■			<b>DNPPM22-.../ME</b>		<b>DNPPM33-.../ME</b>	
	Data sheet			2.6-541		2.6-561	
	Type ●			<b>DNBPM22</b>			
	Data sheet			2.6-535			
Throttle valve normally open 	Type	<b>DOPPM18</b>		<b>DOPPM22</b>		<b>DOPPM33</b>	
	Data sheet	2.6-510		2.6-531		2.6-551	
	Type ■			<b>DOPPM22-.../ME</b>			
	Data sheet			2.6-541			
	Type ●			<b>DOBPM22</b>			
	Data sheet			2.6-535			
	Cavity	2.13-1002		2.13-1008		2.13-1005	

■ Execution with integrated electronics ● Execution Ex d


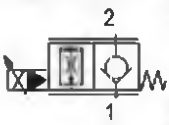
**OVERVIEW FLOW CONTROL-, PRESSURE COMPENSATING VALVES**

Function		Size					
		M18x1.5	1/4"-16 UNF	M22x1.5	7/16"-14 UNF	M33x2	M42x2
2-way 	Type	<b>QA.PM18</b>		<b>QZ.PM22</b>		<b>QZ.PM33</b>	
	Data sheet	2.5-510		2.5-535		2.5-550	
	Cavity	2.13-1002		2.13-1008		2.13-1005	
2-way 	Type			<b>QRSPM22</b>			
	Data sheet			2.5-530			
	Cavity			2.13-1008			
3-way 	Type			<b>QD.PM22</b>		<b>QD.PM33</b>	
	Data sheet			2.5-540		2.5-555	
	Cavity			2.13-1004		2.13-1040	
2-way pressure compensator 	Type			<b>UZFPM22</b>		<b>UZFPM33</b>	
	Data sheet			2.5-630		2.5-650	
	Cavity			2.13-1006		2.13-1011	
3-way pressure compensator 	Type			<b>UDFPM22</b>		<b>UDFPM33</b>	
	Data sheet			2.5-630		2.5-650	
	Cavity			2.13-1006		2.13-1011	

**OVERVIEW NON-RETURN VALVES**

Function		Size					
		M18x1.5	1/4"-16 UNF	M22x1.5	7/16"-14 UNF	M33x2	M42x2
hydraulic pilot 	Type			<b>RNXPM22</b>		<b>RNXPM33</b>	
	Data sheet			2.7-61		2.7-62	
	Cavity			2.13-1006		2.13-1011	

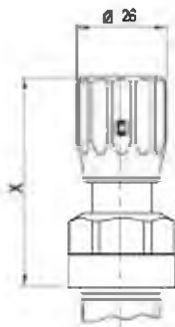
## OVERVIEW PROPORTIONAL FLOW CONTROL VALVES

Function		Size					
		M18x1.5	1/4"-14 UNF	M22x1.5	1 1/8"-12 UN	M33x2	M42x2
2-way 	Type	<b>QZPPM18</b>		<b>QNPPM22</b>	<b>QNPPU16</b>	<b>QNPPM33</b>	<b>QNPPM42</b>
	Data sheet	2.6-610		2.6-631	2.6-675	2.6-651	2.6-690
	Type ■			<b>QNPPM22- /ME</b>		<b>QNPPM33- /ME</b>	
	Data sheet			2.6-633		2.6-659	
	Type ●			<b>QNBPM22</b>		<b>QNBPM33</b>	
	Data sheet			2.6-634		2.6-655	
Cavity		2.13-1038		2.13-1008	2.13-1048	2.13-1005	2.13-1050
2-way seat-tight 	Type		<b>QSPPU10</b>			<b>QSPPM33</b>	
	Data sheet		2.6-638			2.6-661	
	Cavity		2.13-1058			2.13-1005	
3-way 	Type			<b>QDPPM22</b>	<b>QDPPU16</b>	<b>QDPPM33</b>	<b>QDPPM42</b>
	Data sheet			2.6-644	2.6-670	2.6-668	2.6-695
	Type ■			<b>QDPPM22- /ME</b>		<b>QDPPM33- /ME</b>	
	Data sheet			2.6-647		2.6-668	
	Type ●			<b>QDBPM22</b>			
	Data sheet			2.6-648			
Cavity				2.13-1004	2.13-1046	2.13-1040	2.13-1047

■ Execution with integrated electronics ● Execution Ex d



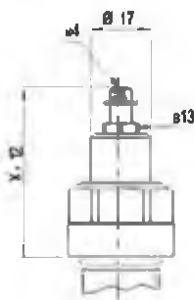
**Types of adjustment  
for manual screw-in cartridges**



**Turning knob "D"**  
Ordering example:  
BVDPM22-350

Standard adjustment

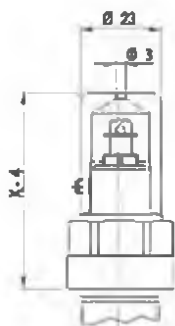
Materials of the adjustment:  
Plastic



**Key "S"**  
Ordering example:  
MVSPM22-63

Standard adjustment

Materials of the adjustment:  
Steel zinc-coated



**Cover "A"**  
Ordering example:  
MVAPM22-63

Addition to adjustment type "S"

On the face there is a small bore which, if required, allows the user to insert a sealing wire.

**Important:** The necessary cross bore in the adjusting spindle has to be drilled by the customer. We recommend a bore diameter of 2 mm.

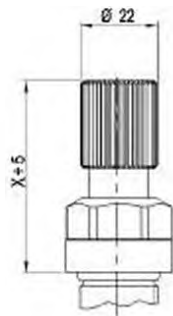
Materials of the adjustment:  
Steel zinc-coated



**Lock "K"**  
Ordering example:  
MVKPM22-63

The lockable adjustment

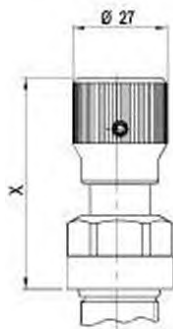
Materials of the adjustment:  
Aluminium



**Turning knob "D-Z545"**  
Ordering example:  
**BVDPM22-350-Z545**

The slightly more robust adjustment

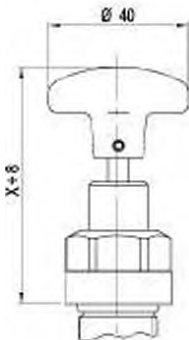
Materials of the adjustment:  
Aluminium anodized



**Turning knob "D-K9Z656"**  
Ordering example:  
**BVDPM22-350-Z656**

The rust-free adjustment


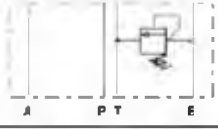
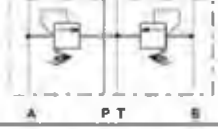

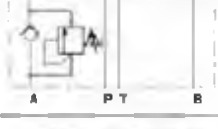
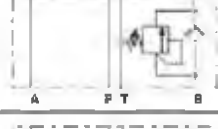

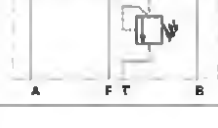
Materials of the adjustment:  
stainless steel (1.4436)


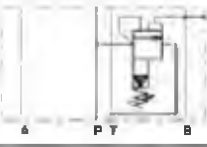



**Turning knob "G"**  
Ordering example:  
**BVGPM22-350**

The comfortable adjustment

Materials of the adjustment:  
stainless steel (1.4301)

	NG3-Mini	NG4-Mini NG4 ISO	NG6 ISO	NG10 ISO
	Types			
	<b>B..SA03-A</b> 2.1-600	<b>B..SA04-A</b> 2.1-620	<b>B..SA06-A</b> 2.1-640	<b>B..SA10-A</b> 2.1-660
	<b>B..SA03-B</b> 2.1-600	<b>B..SA04-B</b> 2.1-620	<b>B..SA06-B</b> 2.1-640	<b>B..SA10-B</b> 2.1-660
	<b>B..SA03-AB</b> 2.1-600	<b>B..SA04-AB</b> 2.1-620	<b>B..SA06-AB</b> 2.1-640	<b>B..SA10-AB</b> 2.1-660
	<b>B..SA03-P</b> 2.1-600	<b>B..SA04-P</b> 2.1-620	<b>B..SA06-P</b> 2.1-640	<b>B..SA10-P</b> 2.1-660
		<b>G..SA04-A</b> 2.1-720	<b>G..SA06-A</b> 2.1-740	<b>G..SA10-A</b> 2.1-760
		<b>G..SA04-B</b> 2.1-720	<b>G..SA06-B</b> 2.1-740	<b>G..SA10-B</b> 2.1-760
		<b>G..SA04-AB</b> 2.1-720	<b>G..SA06-AB</b> 2.1-740	
		<b>G..SA04-T</b> 2.1-720	<b>G..SA06-T</b> 2.1-740	<b>G..SA10-T</b> 2.1-760

	NG3-Mini	NG4-Mini NG4 ISO	NG6 ISO	NG10 ISO
	Types			
			FV.SA06-P 2.1-840	FV.SA10-P 2.1-880
		US.SA04 2.1-920	US.SA06 2.1-940	US.SA10 2.1-980
			ASPLV62 2.1-950	

**Pressure relief cartridge**

- ◆ pilot operated
- ◆  $p_{nom} = 400 \text{ bar}$
- ◆  $p_{N, max} = 350 \text{ bar}$
- ◆  $Q_{max} = 25 \text{ l/min}$

**M18 x 1,5**  
**ISO 7789**

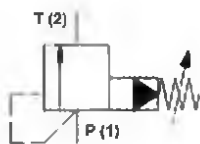
**DESCRIPTION**

Pilot operated pressure relief valve in screw-in cartridge construction for cavity according to ISO 7789. High flow capacity, very sensitively adjustable. If the pressure in P (1) exceeds the adjusted value of the valve, the excessive pressure is drained to T (2). Rapid switching with low hysteresis and excellent stability over the whole flow range. The small clearance of the hardened spool ensures a low leakage volume flow.

**APPLICATION**

These valves are used for limiting the operating pressure in the hydraulic system. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or pure lease). Please refer to the data sheets in register 2.13.

**Attention!** Not to be used in applications with periodically changing flow direction.


**SYMBOL**

**ACTUATION**

Actuation	Adjustment spindle M8 x 1
Execution	S = blockable key adjustment D = blockable knob adjustment Optional: K = lockable adjustment G = star handle adjustment → see Data sheet 2.0-50
Actuation angle	$\alpha_1 = 1800^\circ$ (5 rotations)
Actuation stroke	$S_A = 5 \text{ mm}$

**TYPE CODE**

Pressure relief valve			B	V	PM18	-	-	-	≠	□
Pilot operated										
Type of adjustment	Key Control knob Cover	S D A								
Screw-in cartridge M18 x 1,5										
Nominal pressure range $p_N$	63 bar 160 bar 350 bar	63 160 350								
Sealing material	NBR FKM (Viton) NBR 872	01 y-2804								
Design index (subject to change)										

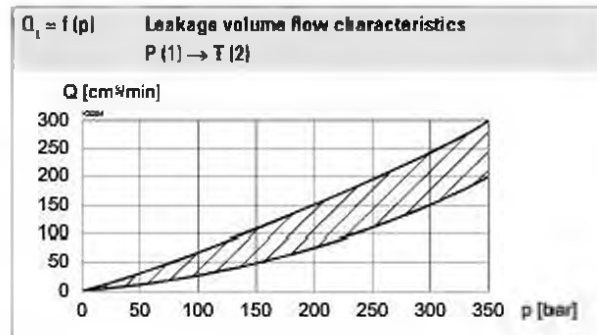
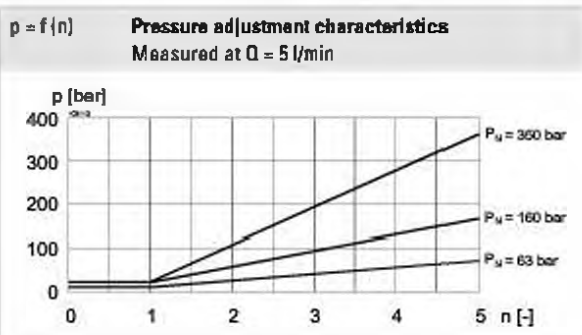
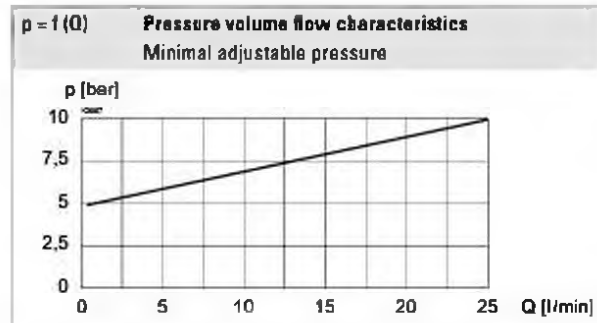
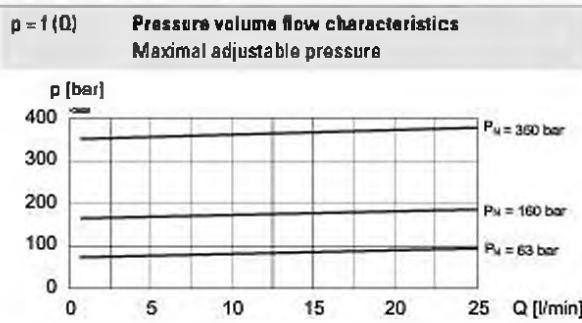
**GENERAL SPECIFICATIONS**

Designation	Pressure relief valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M18 x 1,5 according to ISO 7789
Actuation	Manually
Ambient temperature	-25 ... +90 °C
Weight	0,10 kg key adjustment 0,12 kg control knob adjustment 0,16 kg cover
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{\text{max}} = 400 \text{ bar}$
Tank pressure	$p_{\text{Tmax}} p_p + 80 \text{ bar}$
Nominal pressure range	$p_N = 63 \text{ bar}, 160 \text{ bar}, 350 \text{ bar}$
Minimum pressure	See characteristics
Volume flow range	$Q = 0,1 \dots 25 \text{ l/min}$
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	$12 \text{ mm}^2/\text{s} \dots 320 \text{ mm}^2/\text{s}$
Temperature range fluid	-25 ... +90 °C (NBR) -20 ... +90 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 $\geq 75$ , see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The cartridge body is zinc-nickel coated
- ◆ The control knob is made of plastic

**STANDARDS**

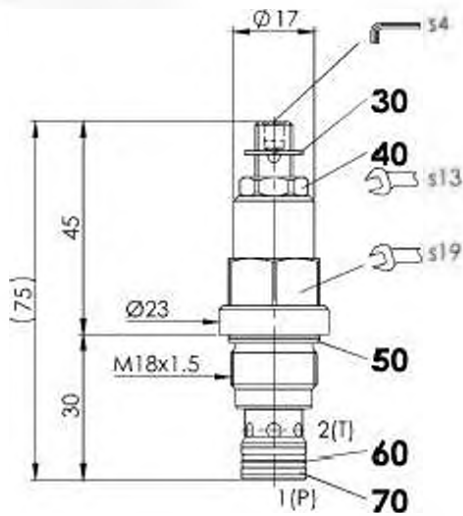
Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

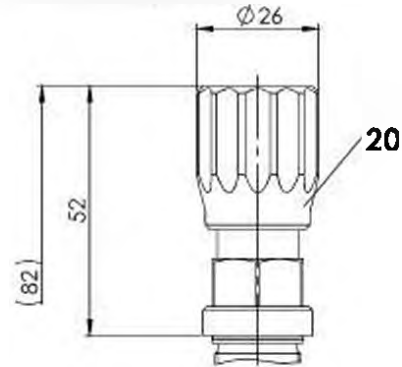
Mounting type	Screw-in cartridge M18 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 \approx 40 \text{ Nm}$ Screw-in cartridge

**DIMENSIONS**

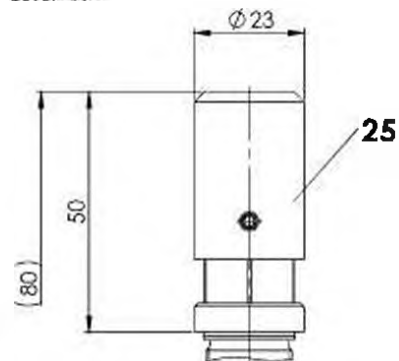
Key adjustment «S»



Control knob adjustment «D»



Cover «A»


**PARTS LIST**

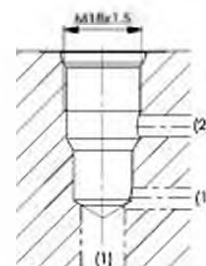
Position	Article	Description
20	114.2224	Control knob
25	032.0611	Cover rd 23 / 3 x 35
30	193.1061	Retainer rd 6 DIN 6799
40	153.1402	Hexagon nut 0,5d M8 x 1
50	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
60	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
70	049.3137	Backup ring rd 10,6 x 13,5 x 1,4

**ACCESSORIES**

Types of adjustment for screw-in cartridges	Data sheet 2.0-50
Flange body / sandwich plate NG3-Mini	Data sheet 2.1-600
Sandwich plate NG3-Mini (back pressure valve)	Data sheet 2.1-700
Threaded body	Data sheet 2.9-200
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-18-02-0-96



**Pressure relief valve**
**Screw-in cartridge**

- Direct operated
- $Q_{max} = 5 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_{Nmax} = 315 \text{ bar}$

**M18x1,5**  
 ISO 7789

**DESCRIPTION**

Direct operated pressure relief valve as screw-in cartridge with a threaded M18x1,5 and cavity according to ISO draft 7789. The valve is available in two different setting versions: Key setting "S" and turning knob setting "D". Key adjustment "S" is also available with cover, see data sheet 2.0-50. Three standard pressure levels are available: 63, 160 and 315 bar. The cartridge body made of steel is galvanized and therefore rust-protected.

**FUNCTION**

When the set operating pressure is reached, the poppet spool opens and connects the protected line with the return line to the tank. By means of the adjusting mechanism the poppet spool is pressed onto a hardened seat which is pressed into the lower cartridge opening by a helical spring. Thanks to the poppet/spool principle and the direct operation, these pressure relief valves are rapid acting and free to leakage oil. Therefore they are suitable wherever no leakage must occur in the system and where short opening times are demanded.

**APPLICATION**

For limiting the operating pressure in hydraulic systems by releasing the oil from the protected oil line P (1) to the outlet/tank return line T (2). The screw-in cartridge is very suitable for mounting in control blocks and is built into the Wandfluh miniature hydraulics NG3 as a functional element in sandwich style plates (vertical combination) and flange-mounted valves (please refer to the separate data sheets in register 2.1). Stepped tools are available for making the receptacle bores in steel and aluminium (Hire or purchase). Please refer to the data sheets in register 2.13.

**Attention:** Should therefore not be utilized anymore in applications with periodically changing direction of flow.

**TYPE CODE**

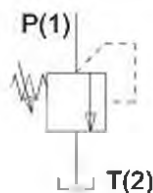
Pressure relief valve	B	S	<input type="checkbox"/>	PM18 -	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Direct operated, poppet spool							
Type of adjustment	Key	S					
	Control knob	D					
	Cover	A	see data sheet 2.0-86)				
Screw-in cartridge M18x1,5							
Pressure range $p_x$	63 bar	63					
	160 bar	160					
	315 bar	315					
Design-Index (Subject to change)							

**GENERAL CHARACTERISTICS**

Description	Direct operated pressure relief valve
Construction	Screw-cartridge for cavity acc. to ISO 7789
Mounting	Screw thread M18x1,5
Ambient temperature	-20...+50°C
Mounting position	any
Fastening	$M_o = 30 \text{ Nm}$
Weight	$m = 0,11 \text{ kg}$ (key) $m = 0,12 \text{ kg}$ (control knob)

**HYDRAULIC CHARACTERISTICS**

Hydraulic fluid	Mineral oils, other fluids on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade B 6...10≥75) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70°C
Peak pressure	$p_{max} = 400 \text{ bar}$ $p_{Nmax} = p_x + 80 \text{ bar}$
Nominal pressure range	$p_x = 63 \text{ bar}$ , $p_x = 160 \text{ bar}$ , $p_x = 315 \text{ bar}$
Minimum pressure	see characteristics
Volume flow	$Q = 0,1...5 \text{ l/min}$
Leakage volume flow	Maximum 4 drops/min

**SYMBOL**

**MECHANICAL ACTUATION**

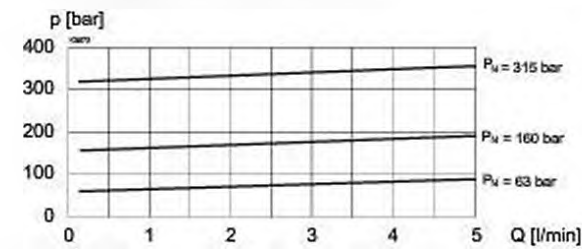
Mechanical types of operation in 2 different versions:

S	= Key adjustment by means of Span key and Allen key
D	= Control knob adjustment, fixed
Actuation stroke $S_a$	= 5 mm
Actuation angle $\alpha_a$	= 1800° (5 revolutions)

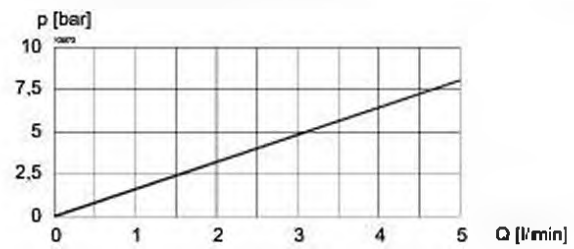


**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

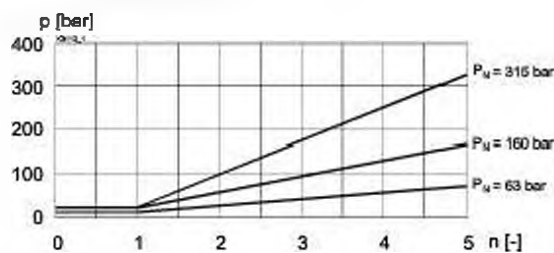
$p = f(Q)$  Pressure volume flow characteristics  
 (Maximal adjustable pressure)



$p = f(Q)$  Pressure volume flow characteristics  
 (Minimal adjustable pressure)

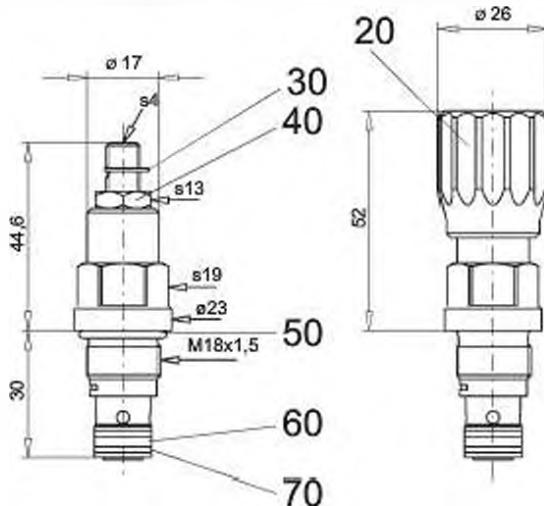
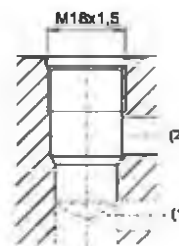


$p = f(n)$  Pressure adjustment characteristics  
 (at Q = 1 l/min)


**DIMENSIONS**

Screw adjustment "S"

Knob adjustment "D"


 Cavity drawing to  
 ISO 7789-18-02-0-98

 Detailed cavity drawing and cavity  
 tools see data sheet 2.13-1001.

**PARTS LIST**

Position	Article	Description
20	114.2224	Knob
30	193.1061	Safety plate RD6 DIN 6799
40	153.1402	Hexagonal nut 0,5D M8x1
50	160.2156	O-ring ID 15,6x1,78
60	160.2063	O-ring ID 9,25x1,78
70	49.3137	Back-up ring RD 10,6x13,5x1,4

**ACCESSORIES**

Pressure relief valve:	
Flange-/sandwich plate NG3-Mini	Data sheet 2.1-600
Back pressure valve:	
Sandwich plate NG3-Mini	Data sheet 2.1-700
Line mount body	Data sheet 2.9-200

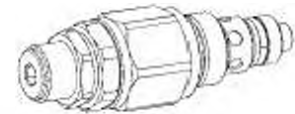
Technical explanation see data sheet 1.0-100

**Pressure relief cartridge**

- ◆ direct operated
- ◆  $p_{max} = 350$  bar
- ◆  $p_{N,max} = 350$  bar
- ◆  $Q_{max} = 30$  l/min

**3/4"-16 UNF**

Wandfluh standard


**DESCRIPTION**

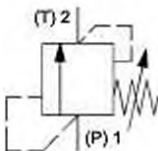
Direct operated poppet type pressure relief valve in screw-in cartridge construction for cavity according to Wandfluh standard. The valve is closed in the neutral position. If the pressure in P (1) exceeds the adjusted value of the valve, the excessive pressure is drained to T (2). The back pressure at T (2) is added to the adjusted value. T (2) can be charged up to the maximum. Hardened precision parts ensure virtually leakage-free closing. Rapid switching with low hysteresis and excellent stability over the whole flow range.

**APPLICATION**

These valves are used for limiting the operating pressure in the hydraulic system. Can be used in double pressure relief switches. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

Pressure relief valve		B E S PU08	#
Direct operated, leakage-free			
Type of adjustment	key		
Screw-in cartridge 3/4"-16 UNF			
Nominal pressure range $p_N$	60 bar	60	
	135 bar	135	
	220 bar	220	
	350 bar	350	
Design index (subject to change)			

**SYMBOL**

**GENERAL SPECIFICATIONS**

Designation	Pressure relief valve
Construction	Direct operated seat tight
Mounting	Screw-in cartridge type
Nominal size	3/4"-16 UNF according to Wandfluh standard
Actuation	Manually
Ambient temperature	-30...+110 °C
Weight	0,145 kg key adjustment
MTTFd	150 years

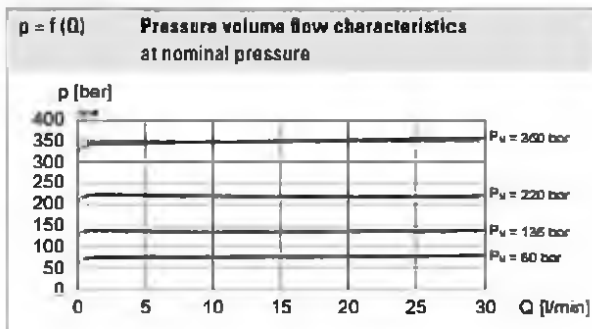
**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Tank pressure	$p_{T,max} = 350$ bar
Nominal pressure range	$p_N = 60$ bar, 135 bar, 220 bar, 350 bar
Minimum pressure	$P_N$ 60 bar = 15 bar $P_N$ 135 bar = 25 bar $P_N$ 220 bar = 50 bar $P_N$ 350 bar = 120 bar
Volume flow range	$Q = 0,1 \dots 30$ l/min
Leakage volume flow	Leakage free 0,25 cc / min
Fluid	Mineral oil, other fluid on request
Viscosity range	7,4 mm <sup>2</sup> /s... 420 mm <sup>2</sup> /s
Temperature range	-20...+70 °C
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

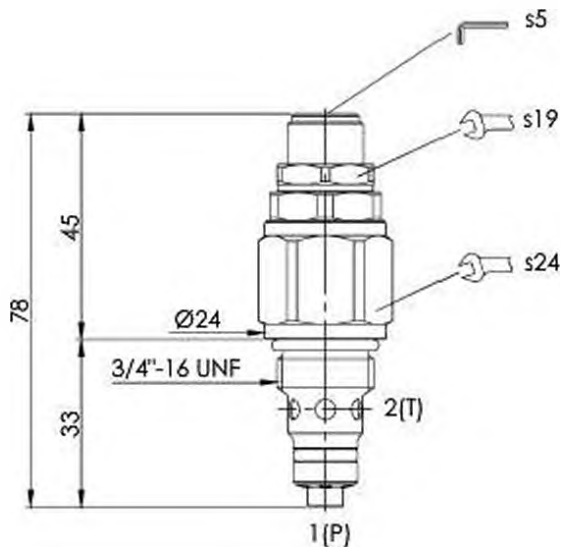
**ACTUATION**

Actuation	S = lockable key adjustment
Actuation angle	2520 ° (7 rotations)
Actuation stroke	7 mm

**PERFORMANCE SPECIFICATIONS**

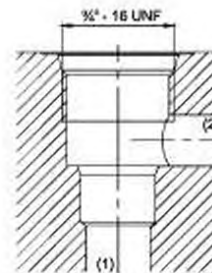
 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**SURFACE TREATMENT**

- ◆ The external parts of the cartridge body are zinc coated

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard

**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1043



**Attention!** The nose of the cartridge protrudes 4 mm


**INSTALLATION NOTES**

Mounting type	Screw-in cartridge 3/4"-16 UNF
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 40 - 45 \text{ Nm}$ Screw-in cartridge

**SEALING MATERIAL**

NBR as standard

**Pressure relief cartridge**

- ◆ pilot operated
- ◆  $p_{max} = 400 \text{ bar}$
- ◆  $p_{N,max} = 350 \text{ bar}$
- ◆  $Q_{max} = 100 \text{ l/min}$

**M22 x 1,5**  
**ISO 7789**

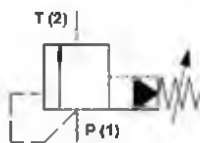
**DESCRIPTION**

Pilot operated pressure relief valve in screw-in cartridge construction for cavity according to ISO 7789. High flow capacity, very sensitively adjustable. If the pressure in P (1) exceeds the adjusted value of the valve, the excessive pressure is drained to T (2). Rapid switching with low hysteresis and excellent stability over the whole flow range. The small clearance of the hardened spool ensures a low leakage volume flow.

**APPLICATION**

These valves are used for limiting the operating pressure in the hydraulic system or for protection against pressure peaks. Can be used in double pressure relief switches. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**Attention!** As of design index #2, applications with periodically changing flow direction are admitted.


**SYMBOL**

**ACTUATION**

Actuation	Adjustment spindle M8 x 1
Execution	S = blockable key adjustment D = blockable knob adjustment Optional: K = lockable adjustment G = star handle adjustment → see Data sheet 2.0-50
Actuation angle	$\alpha_1 = 1800^\circ$ (5 rotations)
Actuation stroke	$S_a \approx 5 \text{ mm}$

**TYPE CODE**

Pressure relief valve					B V	PM22	-		-		# 2
Pilot operated											
Type of adjustment	Key	S									
	Control knob	D									
	Cover	A									
Screw-in cartridge M22 x 1,5											
Nominal pressure range $p_n$	63 bar	63									
	160 bar	160									
	350 bar	350									
Sealing material	NBR										
	FKM (Viton)	D1									
	NBR 872	y-2604									
Design index (subject to change)											

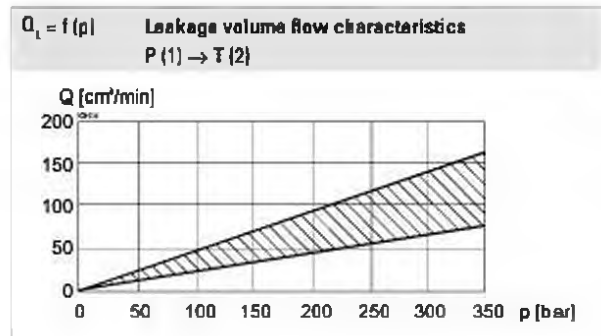
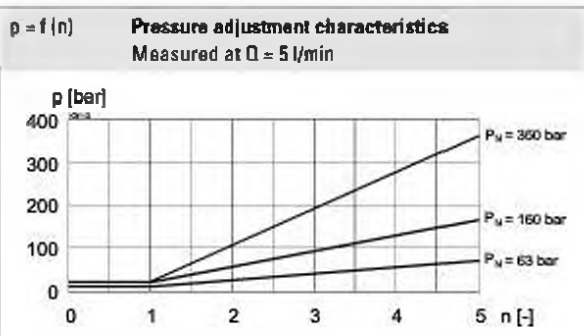
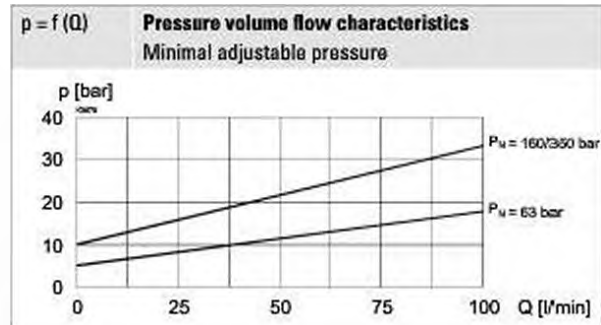
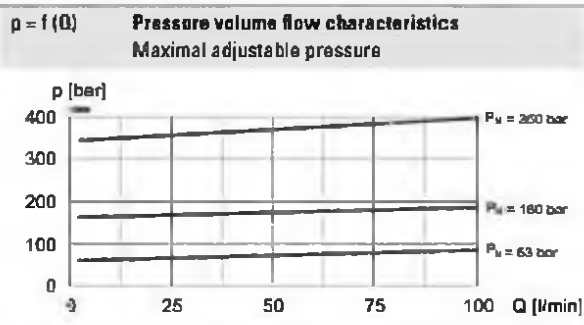
**GENERAL SPECIFICATIONS**

Designation	Pressure relief valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Manually
Ambient temperature	-25 ... +90 °C
Weight	0,15 kg key adjustment 0,16 kg control knob adjustment 0,21 kg cover
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400$ bar
Tank pressure	$p_{T,max} = p_p + 20$ bar
Nominal pressure range	$p_N = 63; 160; 350$ bar
Minimum pressure	See characteristics
Volume flow range	$Q = 0,2 \dots 100$ l/min
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +90 °C (NBR) -20 ... +90 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The cartridge body is zinc-nickel coated
- ◆ The control knob is made of plastic

**STANDARDS**

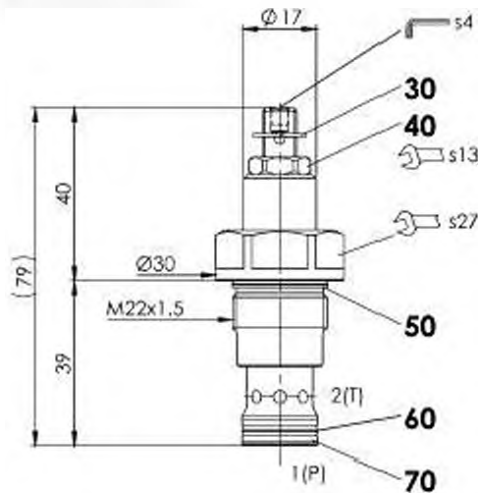
Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

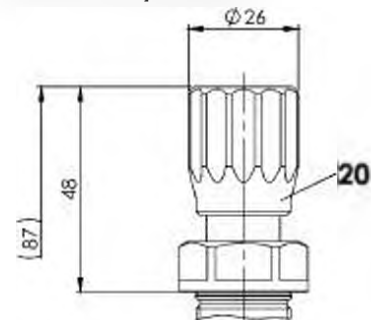
Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60$ Nm Screw-in cartridge

**DIMENSIONS**

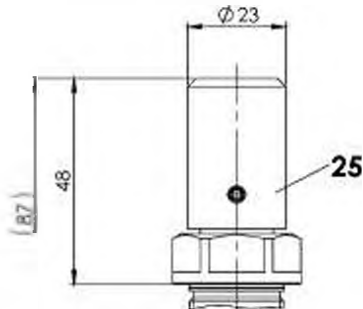
Key adjustment «S»



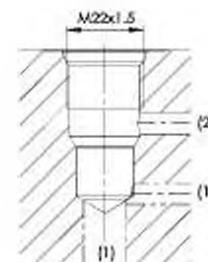
Control knob adjustment «D»



Cover «A»


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-02-0-98


**Nota!**

For detailed cavity drawing and cavity tools see data sheet 2.13-1003


**ACCESSORIES**
**Pressure relief valve**

Flange body / sandwich plate NG4-Mini	Data sheet 2.1-620
Flange body / sandwich plate NG6	Data sheet 2.1-640
Flange body / sandwich plate NG10	Data sheet 2.1-660

**Back pressure valve**

Sandwich plate NG4-Mini	Data sheet 2.1-720
Sandwich plate NG6	Data sheet 2.1-740
Sandwich plate NG10	Data sheet 2.1-760

Types of adjustment for screw-in cartridges	Data sheet 2.0-50
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Threaded body	Data sheet 2.9-200
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Technical explanations	Data sheet 1.0-100
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Hydraulic fluids	Data sheet 1.0-50
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Filtration	Data sheet 1.0-50
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**PARTS LIST**

Position	Article	Description
20	114.2224	Control knob
25	032.0611	Cover rd 23 / 3 x 35
30	193.1061	Retainer rd 6 DIN 6799
40	153.1402	Hexagon nut 0,5d M8 x 1
50	160.2188	O-ring ID 18,77 x 1,78 {NBR}
	160.6188	O-ring ID 18,77 x 1,78 {FKM}
60	160.2140	O-ring ID 14,00 x 1,78 {NBR}
	160.6141	O-ring ID 14,00 x 1,78 {FKM}
70	049.3177	Back-up ring rd 14,6 x 17,5 x 1,4

**Pressure relief cartridge stainless**

- ◆ pilot operated
- ◆  $p_{N \max} = 400 \text{ bar}$
- ◆  $p_{N \max} = 350 \text{ bar}$
- ◆  $Q_{N \max} = 100 \text{ l/min}$

**M22 x 1,5**  
**ISO 7789**

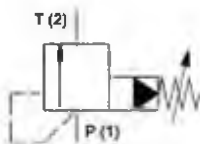
**DESCRIPTION**

Pilot operated pressure relief valve in screw-in cartridge construction for cavity according to ISO 7789. High flow capacity, very sensitively adjustable. If the pressure in P (1) exceeds the adjusted value of the valve, the excessive pressure is drained to T (2). Rapid switching with low hysteresis and excellent stability over the whole flow range. The small clearance of the hardened spool ensures a low leakage volume flow. The stainless execution is especially suitable for the use in wet and salty environment.

**APPLICATION**

These valves are used for limiting the operating pressure in the hydraulic system or for protection against pressure peaks. Can be used in double pressure relief switches. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**Attention!** As of design index #2, applications with periodically changing flow direction are admitted.


**SYMBOL**

**ACTUATION**

Actuation	Adjustment spindle M8 x 1
Execution	S = blockable key adjustment D = blockable knob adjustment Optional: G = star handle adjustment
Actuation angle	$\alpha_s = 1800^\circ$ (5 rotations)
Actuation stroke	$S_s = 5 \text{ mm}$

**TYPE CODE**

Pressure relief valve			B	V	PM22	-	-	K9	# 2
Pilot operated									
Type of adjustment	Key Control knob Cover	S D A							
Screw-in cartridge M22 x 1,5									
Nominal pressure range $p_N$	63 bar 160 bar 350 bar	63 160 350							
Sealing material	NBR FKM (Viton) NBR 872	 D1 y-ZBRM							
Stainless									
Design index (subject to change)									

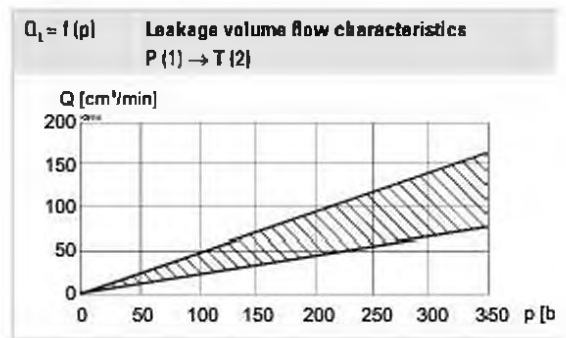
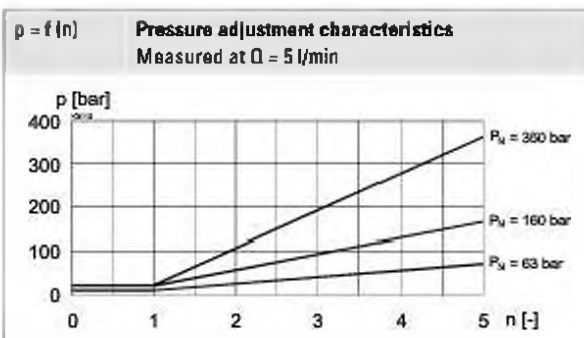
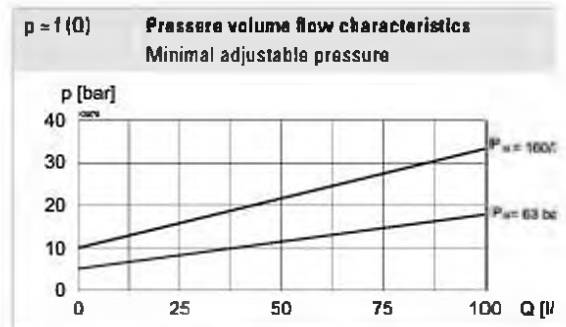
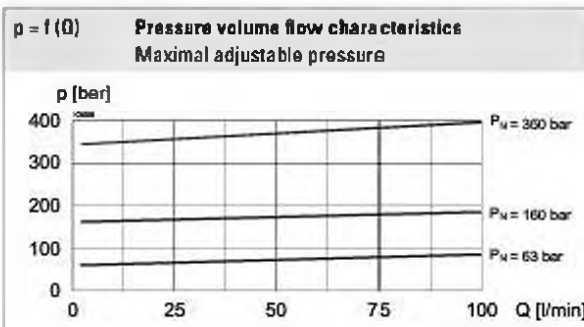
**GENERAL SPECIFICATIONS**

Designation	Pressure relief valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Manually
Ambient temperature	-25 ... +90 °C
Weight	0,17 kg key adjustment 0,26 kg control knob adjustment 0,21 kg cover
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400$ bar
Tank pressure	$p_{T,max} = 210$ bar
Nominal pressure range	$p_N = 63; 160; 350$ bar
Minimum pressure	See characteristics
Volume flow range	$Q = 0,2 \dots 100$ l/min
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +90 °C (NBR) -20 ... +90 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade $\beta_{6...10} \geq 7$ see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The cartridge body and the control knob are made of stainless steel

**STANDARDS**

Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

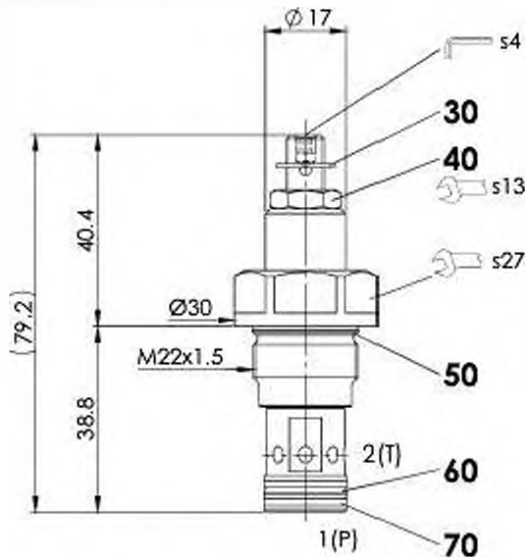
**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_N = 60$ Nm Screw-in cartridge

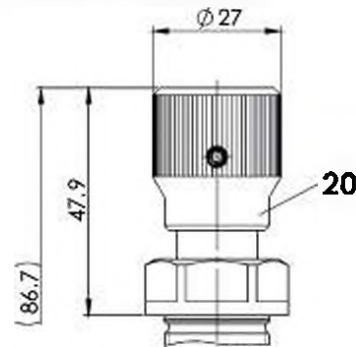


**DIMENSIONS**

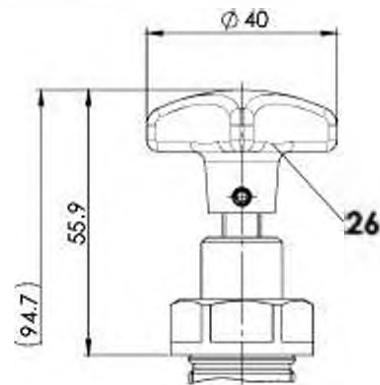
Key adjustment «S»



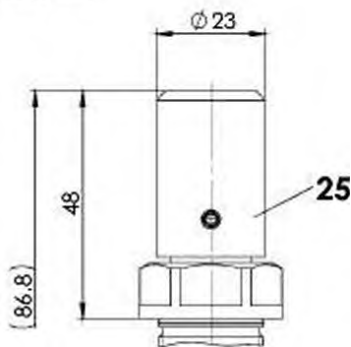
Control knob adjustment «D»



Star handle «G»



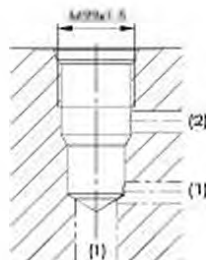
Cover «A»


**ACCESSORIES**

Types of adjustment for screw-in cartridges	Data sheet 2.0-50
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-02-D-98


**Notes!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1003

**PARTS LIST**

Position	Article	Description
20	114.2228	Control knob K9
25	032.0616	Cover rd 23 / 3 x 35 K9
26	082.2004	Star handle rd 40 x 26
30	193.1062	Retainer rd 6 DIN 6799
40	154.7407	Hexagon nut M8 x 1 x 4
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
70	049.8177	Back-up ring PTSM rd 12,4 x 15,3 x 1,4

**Safety valve**
**EU - type tested**
**Pressure Equipment Directive 2014/68/EU**

- Pilot operated
- $Q_{max} = 30 \text{ l/min}$
- $p_{Nmax} = 350 \text{ bar}$

**M22x1,5**  
 ISO 7789

**DESCRIPTION**

Pilot operated pressure relief valve as screw-in cartridge with thread M22x1,5 for cavity according to ISO 7789. The valve is designed according to AD-2000 and EU-type tested in accordance with the Pressure Equipment Directive 2014/68/EU. As standard versions, the following preferential response pressures are available: 100, 140, 250, 330 and 350 bar. Apart from this, within the range of 50 – 350 bar response pressures can be freely selected. The cartridge body and the cover made of steel are zinc coated and therefore protected against rust and the blue locking seal made of plastic provide this quality product with a clean design.

**FUNCTION**

When reaching the set and locked seal response pressure, the main spool opens and connects the protected line with the return line to the tank. These pressure relief valves consist of a main and a pilot operation system integrated into the cartridge. The pilot operation is a direct operated pressure relief valve which acts on the main system. These safety valves are suitable for the protection of hydraulic systems with pressure accumulators, resp. pressure reservoirs. The very limited play of the hardened spool results in a limited oil leakage.

**APPLICATION**

For the protection of the maximum permissible operating pressure in hydraulic systems with pressure accumulators, resp. pressure reservoirs by the flowing out of the oil from the protected oil line P (1) to the tank line T (2). The screw-in cartridge is very suitable for mounting in control blocks and is built into the Wandfluh hydraulics NG6 and NG10 as a functional element in sandwich style plates (vertical combination) and flange-mounted valves (please refer to the separate data sheets in register 2.1). Stepped tools are available for making the receptacle bores in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13. **Attention:** The banking-up pressure in the tank line for  $Q_{max}$  must amount to a maximum of 3 bar.

**CONTENT**

GENERAL SPECIFICATIONS .....	1
HYDRAULIC SPECIFICATIONS .....	1
SYMBOL .....	1
CHARACTERISTICS .....	2
DIMENSIONS .....	2
PARTS LIST .....	2
ACCESSORIES .....	2

**TYPE CODE**

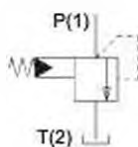
Pressure relief valve	B	V	T	PM22	-	-	#
Pilot operated							
EU - Type tested in accordance with PED 2014/68/EU							
Screw-in cartridge M22x1,5							
Response pressure range							
50... < 160 bar						A	
160... < 260 bar						B	
260... 350 bar						C	
Response pressure $p_A$ in bar							
Design-Index (Subject to change)							

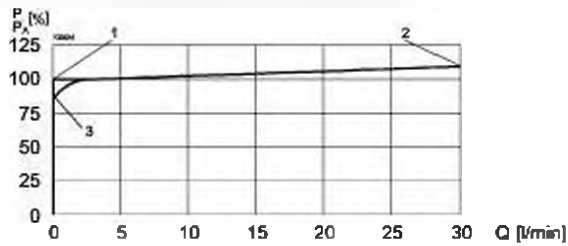
**GENERAL SPECIFICATIONS**

Description	EU - type tested safety valve
Construction	Screw-in cartridge for cavity acc. to ISO 7789
Mounting	Screw thread M22x1,5
Ambient temperature	-20...+50°C
Mounting position	any
Fastening	$M_0 = 50 \text{ Nm}$
Weight	$m = 0,20 \text{ kg}$
Basic material	The material of the hydraulic block must be chosen in accordance to the pressure equipment directive (PED) and general safety considerations. In case of pressure above 160 bar the manufacturer advises steel with a tensile strength of at least 330 N/mm <sup>2</sup> .

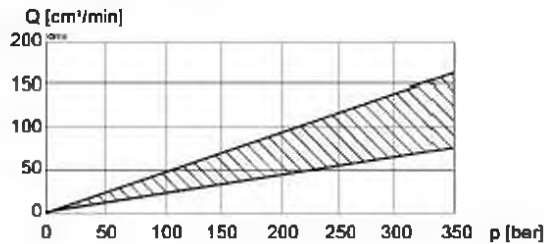
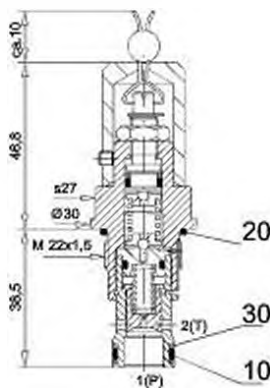
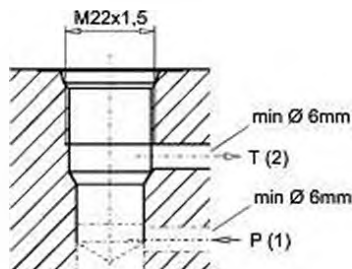
**HYDRAULIC SPECIFICATIONS**

Hydraulic fluid	Mineral oils of fluid group 2, other media on request
Contamination efficiency	ISO 4406:1999, class 16/16/13 (Required filtration grade $\beta_{0.5} \dots 10 \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	Standard: -20...+70°C ATEX IIC, T6: -20°C...+40°C ATEX IIC, T4: -20°C...+70°C
Ad. volume flow	$Q_{max} = 30 \text{ l/min}$
Leakage volume flow	See curve
Preferential response pressure $p_A$	100 bar * 140 bar * 250 bar * 330 bar * 350 bar *
Individual response pressure	on request 50... 350 bar *± 3%

**SYMBOL**


**CHARACTERISTICS** Oil viscosity  $\nu_1 = 30 \text{ mm}^2/\text{s}$   
 $p = f(Q)$  Pressure volume flow characteristics


- 1 Response pressure: Response pressure in accordance with type code.
- 2 Blow-off pressure: The blow-off pressure is situated a maximum of 10 % above the response pressure.
- 3 Closing pressure: The closing pressure is situated a maximum of 15 % below the response pressure.

 $Q_L = f(p)$  Leakage volume flow characteristics  
 [P (1) → T (2)]

**DIMENSIONS**

 Cavity drawing to  
 ISO 7789-22-02-0-98

 Detailed cavity drawing and cavity tools  
 see data sheet 2.13-1003.

**PARTS LIST**

Position	Article	Description
10	160.2140	O-ring ID 14,00x1,78
20	160.2188	O-ring ID 18,77x1,78
30	049.3177	Back-up ring RD 14,8x17,5x1,4

**ACCESSORIES**

Cartridge built into flange- or sandwich body:

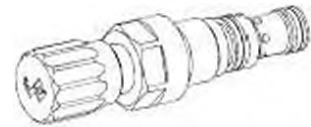
- Flange valve register 2.1
- Sandwich valve register 2.1

– The operating instructions incl. the EU declaration of conformity is included in German, English and French.

Technical explanation see data sheet 1.0-100E

**Vented relief valve**
**Screw-in cartridge**

- Pilot operated
- $Q_{max} = 80 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_{N max} = 350 \text{ bar}$

**M22x1,5**  
 ISO 7789

**DESCRIPTION**

Spool type pilot operated relief valve, vented. Thread M22x1,5 and cavity in accordance with ISO 7789. The valve is available in 2 different setting versions: Key setting «S» and turning knob setting «D». Key adjustment «S» is also available with cover, see data sheet 2.0-50. Three standard pressure levels are available: 63, 160 and 350 bar. The steel cartridge body and adjustment spindle are galvanised to protect them from corrosion. The quality of this product is reflected in the good performance data and the relevant design.

**FUNCTION**

If the operating pressure exceeds a set value, the pilot part opens. A control fluid then starts to flow and relieves the back of the spool in the direction of the tank. The pressure difference generated displaces the spool towards the spring and the valve opens the closed pipe to the tank. When the excess pressure has been reduced, the pilot control interrupts the flow of control fluid and the pressures at the spool are equilibrated. The spring displaces the spool and the valve closes. If the control pipe x is switched to unpressurised by an external valve, the pressure shut off valve switches to an unpressurised circuit.

**APPLICATION**

To limit the operating pressure in hydraulic systems. The valve function can be remote controlled via connection x. When relieving/ opening control pipe x (3), the circuit is more or less unpressurised. The screw in cartridge is very suitable for installing in control blocks. Cavity tools are available for hire or sale for machining aluminium and steel. Please refer to data sheet 2.13. **Attention:** Should therefore not be utilized anymore in applications with periodically changing direction of flow.

**TYPE CODE**

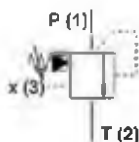
	B	V	<input type="checkbox"/>	PM22	-	<input type="checkbox"/>	-	Z9	#	<input type="checkbox"/>
Pressure relief valve										
Pilot operated										
Type of adjustment Key	S									
Control knob	D									
Cover	A (see data sheet 2.0-50)									
Screw-in cartridge M22x1,5										
Pressure range $p_x$	63 bar	63								
	160 bar	160								
	350 bar	350								
Additional description										
Design-Index (Subject to change)										

**GENERAL SPECIFICATIONS**

Description	Pilot operated relief valve, vented
Construction	Screw-in cartridge to ISO 7789
Mounting	Screw-in thread M22x1,5 to ISO 7789
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_c = 50 \text{ Nm}$
Weight	$m = 0,21 \text{ kg}$ $m = 0,22 \text{ kg (control knob)}$

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{6...10} > 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Peak pressure	$p_{max} = 400 \text{ bar}$ $p_{hydro} = p_p + 20 \text{ bar}$
Fluid temperature	-20...+70 °C
Nominal pressure	$p_N = 63 \text{ bar}$ , $p_N = 160 \text{ bar}$ , $p_N = 350 \text{ bar}$ .
Volume flow	$Q = 0,5 \dots 80 \text{ l/min}$
Minimal pressure	see curve
Leakage volume flow	see data sheet 2.1-530

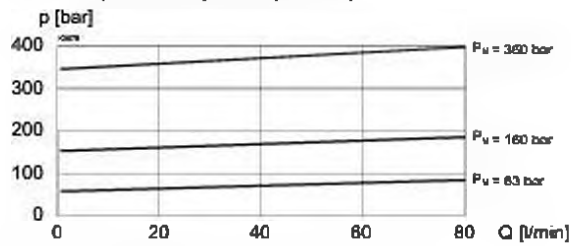
**SYMBOL**

**CONTROL MECHANICAL**

Mechanical types of operation in 2 different versions:

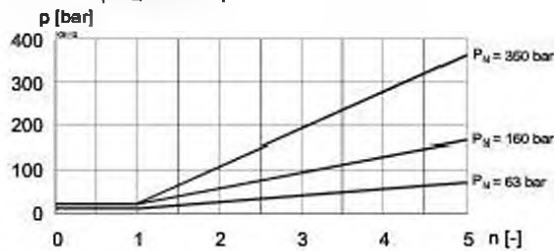
S	= Screw adjustment with fork wrench and Allen key
D	= Control knob adjustment, fixed
Stroke $S_c$	= 5 mm
Angle $\alpha_n$	= 1800° (5 Turns)

**CHARACTERISTICS** Oil viscosity  $\nu_1 = 30 \text{ mm}^2/\text{s}$ 

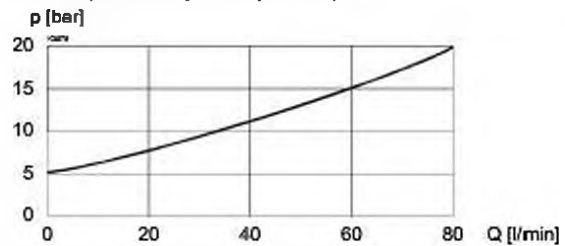
$p = f(Q)$  Pressure volume flow characteristics  
(Maximal adjustable pressure)



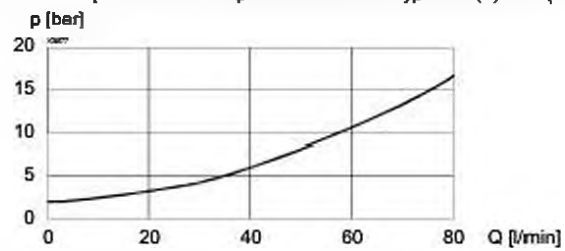
$p = f(n)$  Pressure adjustment characteristics  
(at Q = 5 l/min)



$p = f(Q)$  Pressure volume flow characteristics  
(Minimal adjustable pressure)

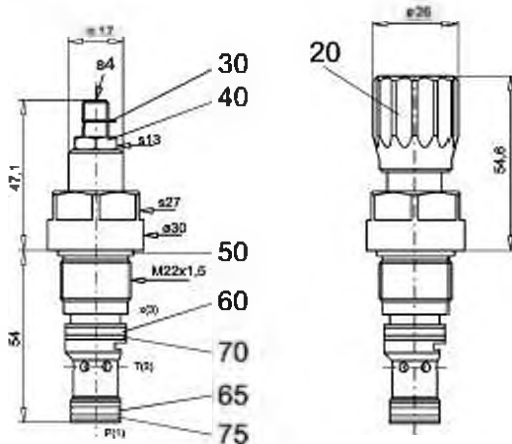
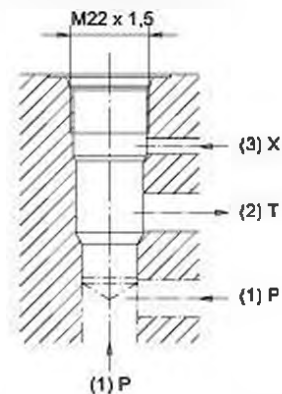


$\Delta p = f(Q)$  Pressure volume flow characteristics  
(control line x unpressurised circ. - bypass P (1) → T (2))


**DIMENSIONS**

Screw adjustment «S»

Knob adjustment «D»


 Cavity drawing to  
 ISO 7789-22-07-0-98

 For detailed cavity drawing and cavity  
 tools see data sheet 2.13-1007.

**PARTS LIST**

Position	Article	Description
20	114.2224	Knob
30	193.1061	Safety plate RD6 DIN 6799
40	153.1402	Hexagon nut 0,5D M8x1
50	160.2188	O-ring ID 18,77x1,78
60	160.2158	O-ring ID 15,80 x 1,78
65	160.2120	O-ring ID 12,42 x 1,78
70	049.3196	Back-up ring RD 18,1 x 19 x 1,4
75	049.3157	Back-up ring RD 12,6 x 15,5 x 1,4

Technical explanation see data sheet 1.0-100

**Pressure relief cartridge**

**Seat tight**

- ◆ pilot operated
- ◆  $p_{max} = 450$  bar
- ◆  $p_{set} = 420$  bar
- ◆  $Q_{max} = 100$  l/min

**M22 x 1,5**  
**ISO 7789**



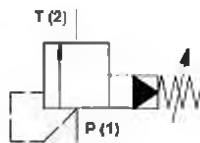
**DESCRIPTION**

Pilot operated pressure relief valve in screw-in cartridge construction for cavity according to ISO 7789. High flow capacity, very sensitively adjustable. If the pressure in P (1) exceeds the adjusted value of the valve, the excessive pressure is drained to T (2). The back pressure at T (2) is added to the adjusted value. T (2) can be charged up to the maximum. Hardened precision parts ensure virtually leakage-free closing. Rapid switching with low hysteresis and excellent stability over the whole flow range.

**APPLICATION**

These valves are used for limiting the operating pressure in the hydraulic system or for protection against pressure peaks. Can be used in double pressure relief switches. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**



**ACTUATION**

Actuation	Adjustment spindle M8 x 1
Execution	S = blockable key adjustment D = blockable knob adjustment Optionally: K = lockable adjustment G = star handle adjustment → see Data sheet 2.0-50
Actuation angle	$\alpha_1 = 1800^\circ$ (5 rotations)
Actuation stroke	$S_1 = 5$ mm

**TYPE CODE**

Pressure relief valve	B C	PM22 -	-	-	#
Pilot operated, seat tight					
Type of adjustment	Key	S			
	Control knob	D			
	Cover	A			
Screw-in cartridge M22 x 1,5					
Nominal pressure range $p_N$	63 bar	63			
	160 bar	160			
	350 bar	350			
	420 bar	420			
Sealing material	NBR				
	FKM (Viton)	D1			
Design index (subject to change)					

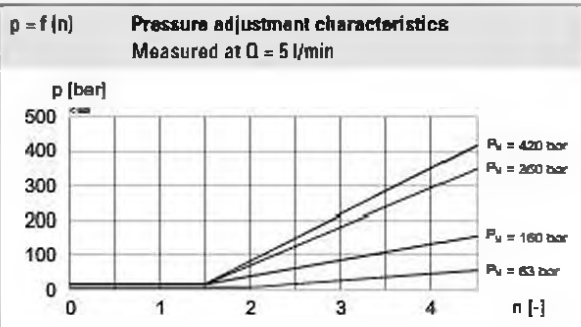
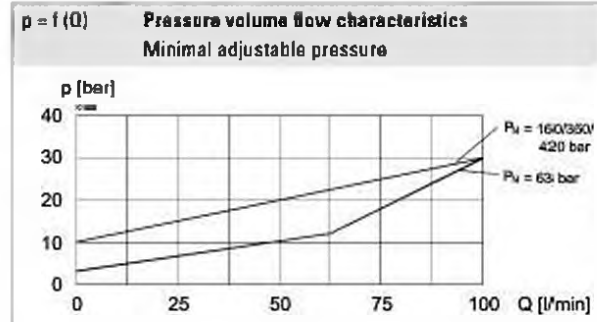
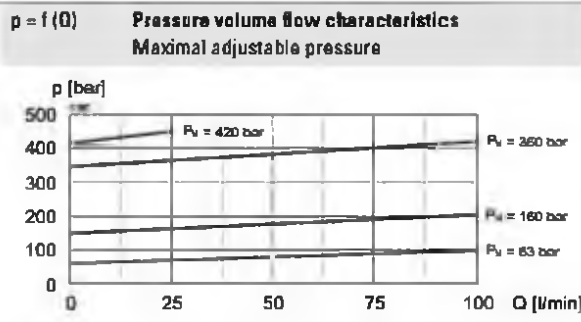
**GENERAL SPECIFICATIONS**

Designation	Pressure relief valve
Construction	Pilot operated, seat tight
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Manually
Ambient temperature	-25...+90 °C
Weight	0,15 kg key adjustment 0,16 kg control knob adjustment 0,21 kg cover
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 450$ bar
Tank pressure	$p_{T,max} = 450$ bar
Nominal pressure range	$p_N = 63; 160; 350; 420$ bar
Minimum pressure	See characteristics
Volume flow range	$Q = 0,2 \dots 100$ l/min
Leakage oil	Seat tight, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+90 °C (NBR) -20...+90 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The cartridge body is zinc-nickel coated
- ◆ The control knob is made of plastic

**STANDARDS**

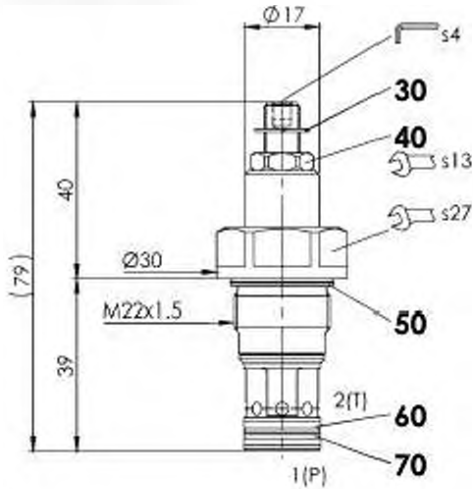
Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

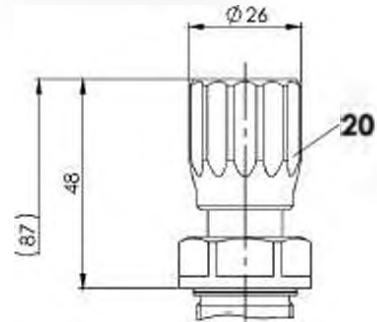
Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60$ Nm Screw-in cartridge

**DIMENSIONS**

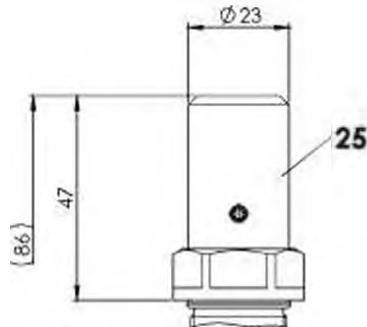
Key adjustment «S»



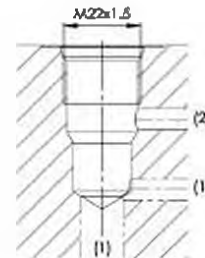
Control knob adjustment «D»



Cover «A»


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-02-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1003

**ACCESSORIES**

Types of adjustment for screw-in cartridges	Data sheet 2.0-50
Flange body / sandwich plate NG4-Mini	Data sheet 2.1-620
Flange body / sandwich plate NG6	Data sheet 2.1-640
Flange body / sandwich plate NG10	Data sheet 2.1-660
Threaded body	Data sheet 2.9-200
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

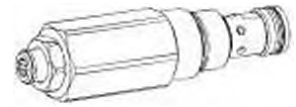
**PARTS LIST**

Position	Article	Description
20	114.2224	Control knob
25	032.0611	Cover rd 23 / 3 x 35
30	193.1061	Retainer rd 6 DIN 6799
40	153.1402	Hexagon nut 0,5d M8 x 1
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
70	049.3177	Back-up ring rd 14,6 x 17,5 x 1,4



**Pressure relief cartridge**
**Leakage-free**

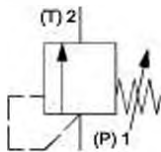
- ◆ direct operated
- ◆  $p_{max} = 450 \text{ bar}$
- ◆  $p_{N, max} = 420 \text{ bar}$
- ◆  $Q_{max} = 50 \text{ l/min}$

**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Direct operated poppet type pressure relief valve in screw-in cartridge construction for cavity according to ISO 7789. The valve is closed in the neutral position. If the pressure in P (1) exceeds the adjusted value of the valve, the excessive pressure is drained to T (2). The back pressure at T (2) is added to the adjusted value. T (2) can be charged up to the maximum. Hardened precision parts ensure virtually leakage-free closing. Rapid switching with low hysteresis and excellent stability over the whole flow range.

**APPLICATION**

These valves are used for limiting the operating pressure in the hydraulic system. Can be used in double pressure relief switches. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Adjustment spindle M12 x 1
Execution	S = blockable key adjustment
Actuation angle	$\alpha_s = 1800^\circ$ (5 rotations)
Actuation stroke	$S_s = 5 \text{ mm}$

**TYPE CODE**

Pressure relief valve					B E S PM22 -			#
Direct operated, leakage-free								
Type of adjustment	Key							
Screw-in cartridge M22 x 1,5								
Nominal pressure range $p_N$	63 bar 420 bar							
Sealing material	NBR FKM (Viton) NBR 872							
Design index (subject to change)								

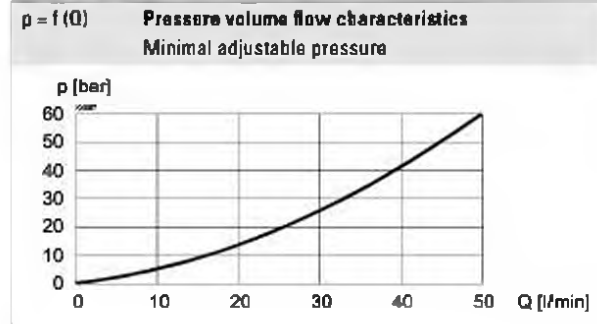
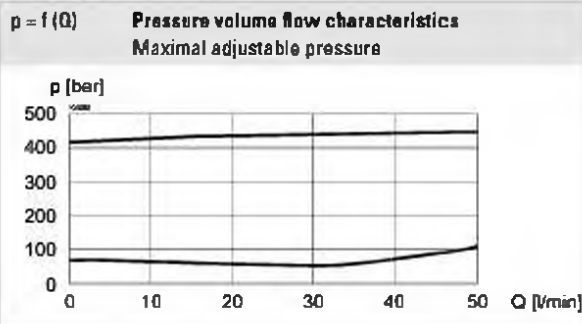
**GENERAL SPECIFICATIONS**

Designation	Pressure relief valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Manually
Ambient temperature	-25 ... +90 °C
Weight	0,30 kg $p_N = 420$ bar 0,24 kg $p_N = 63$ bar
MTTFd	150 years

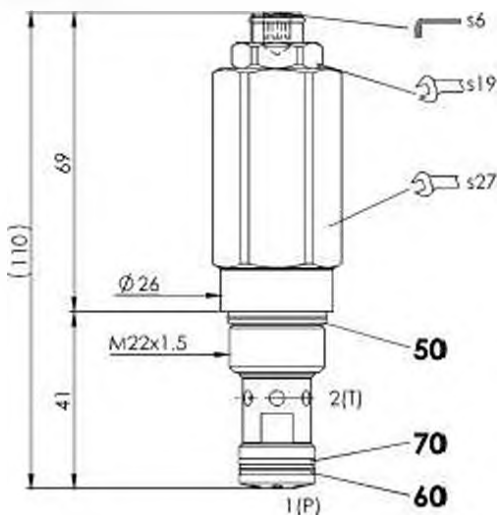
**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 450$ bar
Tank pressure	$p_{Tmax} = 210$ bar
Nominal pressure range	$p_N = 63; 420$ bar
Minimum pressure	See characteristics
Volume flow range	$Q = 0,1 ... 50$ l/min
Leakage oil	Seat tight, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +90 °C (NBR) -20 ... +90 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 $\geq 75$ , see data sheet 1.0-50

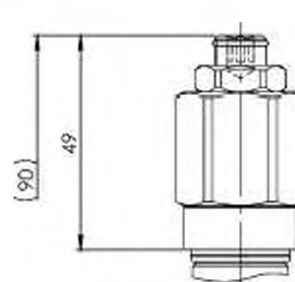
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**DIMENSIONS**

BESPM22-420

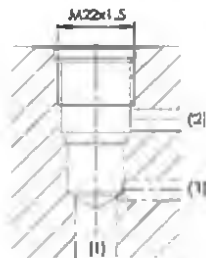


BESPM22-63



## HYDRAULIC CONNECTION

Cavity drawing according to ISO 7789-22-02-0-98



**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1003



## ACCESSORIES

Flange body / sandwich plate NG4-Mini	Data sheet 2.1-620
Flange body / sandwich plate NG6	Data sheet 2.1-640
Flange body / sandwich plate NG10	Data sheet 2.1-660
Threaded body	Data sheet 2.9-200
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

## PARTS LIST

Position	Article	Description
10	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
20	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
30	049.3177	Back-up ring rd 14,6 x 17,5 x 1,4

## SURFACE TREATMENT

- ◆ The cartridge body is zinc-nickel coated

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## INSTALLATION NOTES

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge

## STANDARDS

Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

**Pressure relief cartridge**

- ◆ direct operated
- ◆  $p_{max} = 400$  bar
- ◆  $p_{N,max} = 350$  bar
- ◆  $Q_{max} = 25$  l/min

**M22 x 1,5**  
**ISO 7789**

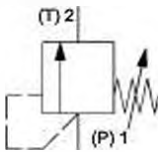
**DESCRIPTION**

Direct operated poppet type pressure relief valve as screw-in cartridge for cavity according to ISO 7789. The valve is closed in the neutral position. If the pressure in P (1) exceeds the adjusted value of the valve, the excessive pressure is drained to T (2). Changing back pressure at T (2) influences the adjusted value. Hardened precision parts ensure virtually leakage-free closing. The hydraulically damped poppet spool provides excellent stability over the entire flow range.

**APPLICATION**

These valves are used for limiting the operating pressure in the hydraulic system. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**Attention!** Not to be used in applications with periodically changing flow direction.


**SYMBOL**

**ACTUATION**

Actuation	S = lockable key adjustment D = Lockable knob adjustment
Execution	Adjustment spindle M8 x 1
Actuation angle	$\alpha_b = 1800^\circ$ (5 rotations) $\alpha_b = 1400^\circ$ $p_N = 210$ bar
Actuation stroke	$S_b = 5$ mm $S_b = 4$ mm $p_N = 210$ bar

**TYPE CODE**

Pressure relief valve	B		A	PM22	-	-	#
Directly operated, poppet spool							
Type of adjustment	Key	[S]					
	Control knob	[D]					
	Cover	[A]					
Screw-in cartridge M22 x 1,5							
Nominal pressure range $p_N$	63 bar	[63]	315 bar	[315]			
	210 bar	[210]	350 bar	[350]			
Sealing material	NBR	[ ]					
	FKM (Viton)	[D1]					
	NBR 872	[Z884]					
Design index (subject to change)							

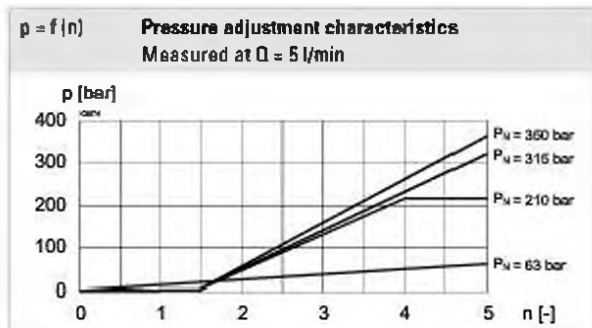
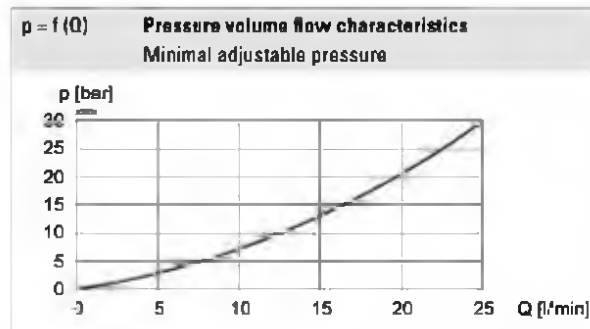
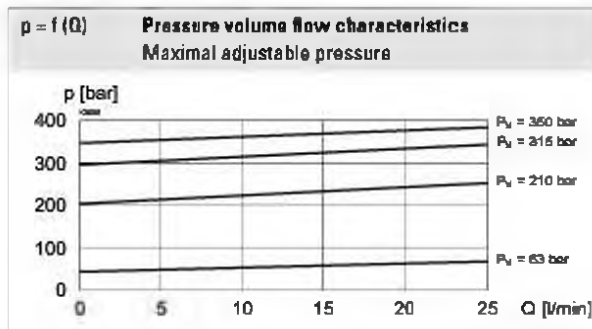
**GENERAL SPECIFICATIONS**

Designation	Pressure relief valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Manually
Ambient temperature	-25...+90 °C
Weight	0,19 kg key adjustment 0,20 kg control knob adjustment 0,25 kg cover
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{\text{max}} = 400 \text{ bar}$
Tank pressure	$p_{\text{T,relief}} = p(1) + 20 \text{ bar (valve closed)}$
Nominal pressure range	$p_N = 63; 210; 315; 350 \text{ bar}$
Minimum pressure	See characteristics
Volume flow range	$Q = 0,1 \dots 25 \text{ l/min}$
Leakage oil	Poppet type, max. 4 drops / min at $p_{\text{max}}$
Fluid	Mineral oil, other fluid on request
Viscosity range	$12 \text{ mm}^2/\text{s} \dots 320 \text{ mm}^2/\text{s}$
Temperature range fluid	-25...+90 °C (NBR) -20...+90 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 $\geq 75$ , see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The cartridge body is zinc-nickel coated
- ◆ The control knob is made of plastic

**STANDARDS**

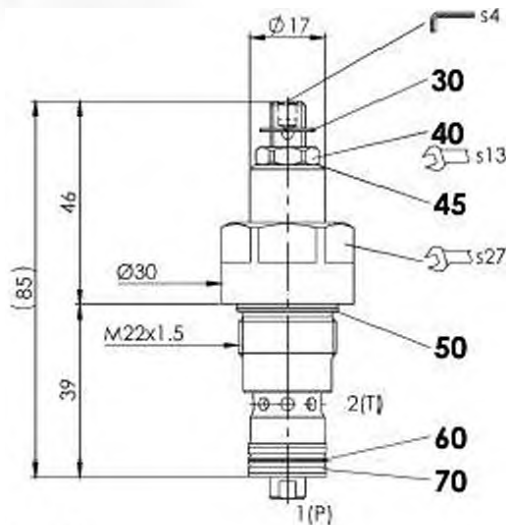
Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

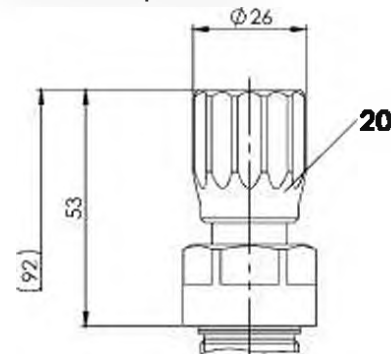
Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge

**DIMENSIONS**

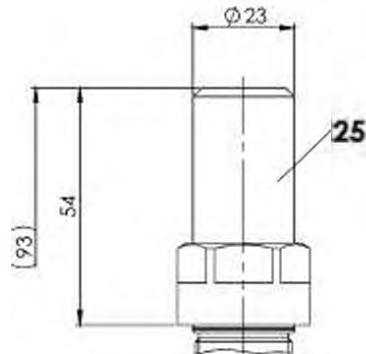
Key adjustment «S»



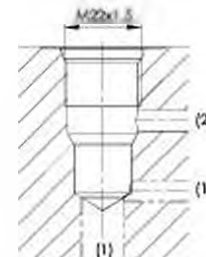
Control knob adjustment «D»



Cover «A»


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-02-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1003

**ACCESSORIES**
**Pressure relief valve**

Flange body / sandwich plate NG4-Mini Data sheet 2.1-620

Flange body / sandwich plate NG6 Data sheet 2.1-640

Flange body / sandwich plate NG10 Data sheet 2.1-660

**Back pressure valve**

Sandwich plate NG4-Mini Data sheet 2.1-720

Sandwich plate NG6 Data sheet 2.1-740

Sandwich plate NG10 Data sheet 2.1-760

Types of adjustment for screw-in cartridges Data sheet 2.0-50

Threaded body Data sheet 2.9-200

Technical explanations Data sheet 1.0-100

Hydraulic fluids Data sheet 1.0-50

Filtration Data sheet 1.0-50

**PARTS LIST**

Position	Article	Description
20	114.2224	Control knob
25	032.0611	Cover rd 23 / 3 x 35
30	193.1061	Retainer rd 6 DIN 6799
40	153.1402	Hexagon nut 0,5d M8 x 1
45	212.1486	Washer (only for $p_n = 210$ bar)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
70	049.3177	Back-up ring rd 14,6 x 17,5 x 1,4

**Pressure relief valve**
**Screw-In cartridge**

- Direct operated
- $Q_{max} = 100 \text{ l/min}$
- $p_{max} = 100 \text{ bar}$
- $p_{Nmax} = 32 \text{ bar}$

**M22x1,5**  
 ISO 7789

**DESCRIPTION**

Directly operated pressure relief valve in screw-in cartridge construction with M22x1,5 thread for cavity acc. to ISO 7789. The valve is available with two different types of adjustment: key adjustment «S» and control knob adjustment «D». Key adjustment «S» is also available with cover, see data sheet 2.0-50. One pressure stage, 32 bar, is available as standard. The cartridge body made of steel is galvanized and therefore rust-protected.

**FUNCTION**

The adjustment mechanism keeps the control spool in its end position by means of a coil spring. When the set operating pressure has been reached, the main spool opens and connects the protected line with the return to the tank. This means that the pressure occurring in P is relieved to T until the spring force returns the valve spool to its end position.

**APPLICATION**

For hydraulic systems with low operating pressures and high volume flows to limit the operating pressure by diverting the flow of the oil from the protected line P (1) to the outlet/tank line T (2). The screw cartridges are very well suited for installation in control blocks and are installed as a functioning part in Wandfluh hydraulics NG4, NG6 and NG10 sandwich plates (vertical stacking) and flange valves (please see separate data sheets in register 2.1). Cavity tools are available (for hire or purchase) for the manufacture of cartridge cavities in steel or aluminium blocks. See data sheets in register 2.13.

**Attention:** Should therefore not be utilized anymore in applications with periodically changing direction of flow.

**TYPE CODE**

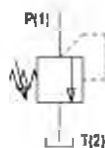
Pressure relief valve	B	K	<input type="checkbox"/>	PM22	-	32	#	<input type="checkbox"/>
Direct operated, control spool								
Type of adjustment	Key	S						
	Control knob	D						
	Cover	A	(see data sheet 2.0-50)					
Screw cartridge M22x1,5								
Pressure range $p_N$	32 bar							
Design-Index (Subject to change)								

**GENERAL CHARACTERISTICS**

Description	Directly operated pressure relief valve
Construction	Screw-in cartridge for cavity acc. to ISO 7789
Type of fixture	M22x1,5 screw thread
Ambient temperature	-20...+50 °C
Installation position	any
Tightening torque	$M_c = 50 \text{ Nm}$
Weight	$m = 0,18 \text{ kg}$ (key) $m = 0,19 \text{ kg}$ (control knob)

**HYDRAULIC CHARACTERISTICS**

Hydraulic fluid	Mineral oils, other fluids on request
Max permissible contamination level	ISO 4406:1999, class 18/18/13 (recommended filter gauge $\beta_{0.5} \dots 10 \geq 75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Hydraulic fluid temp.	-20...+70 °C
Peak pressure	$p_{max} = 100 \text{ bar}$ $p_{Tmax} = p_s + 20 \text{ bar}$
Rated pressure stage	$p_N = 32 \text{ bar}$
Minimum pressure	see curve
Volume flow	$Q = 0,2 \dots 100 \text{ l/min}$
Leak volume flow	see curve

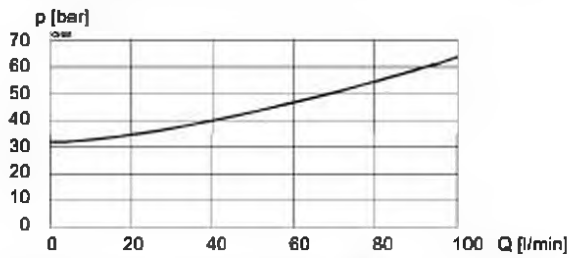
**SYMBOL**

**MECHANICAL ACTUATION**

Mechanical types of operation in 2 different versions:

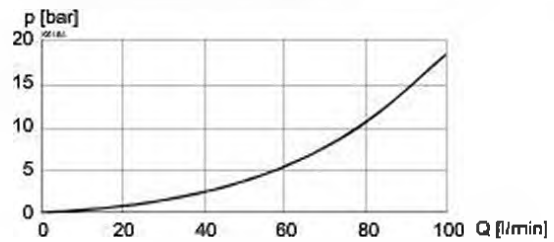
S	= Screw adjustment with fork wrench and Allen key
D	= Control knob adjustment, fixed
Actuation stroke $S_a$	= 7 mm
Actuation angle $\alpha_a$	= 2520° (7 revolutions)

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

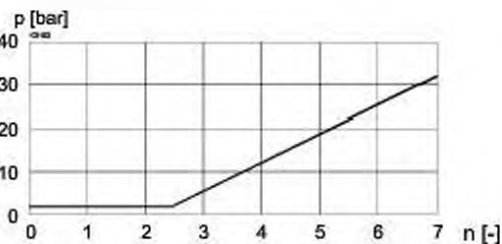
$p = f(Q)$  Pressure volume flow characteristics  
(Maximal adjustable pressure)



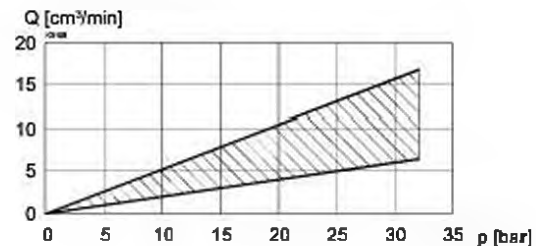
$p = f(Q)$  Pressure volume flow characteristics  
(Minimal adjustable pressure)



$p = f(n)$  Pressure adjustment characteristics  
(at  $Q = 5 \text{ l/min}$ )

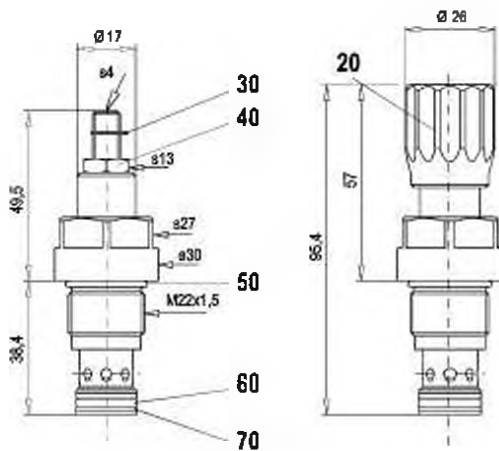
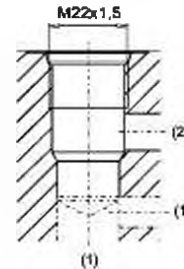


$Q_L = f(p)$  Leakage volume flow characteristics  
[P (1) → T (2)]


**DIMENSIONS**

Screw adjustment «S»

Knob adjustment «D»


 Cavity drawing to  
 ISO 7789-22-02-0-98

 Detailed cavity drawing and cavity  
 tools see data sheet 2.13-1003.

**PARTS LIST**

Position	Article	Description
20	114.2224	Knob
30	193.1061	Safety plate RD6 DIN 6799
40	153.1402	Hexagonal nut 0,5D M8 x 1
50	160.2188	O-ring ID 18,77 x 1,78
60	160.2140	O-ring ID 14,00 x 1,78
70	049.3177	Back-up ring RD 14,8 x 17,5 x 1,4

**ACCESSORIES**

Pressure relief valve:	
Flange-/sandwich plate NG4-Mini	Data sheet 2.1-620
Flange-/sandwich plate NG6	Data sheet 2.1-640
Flange-/sandwich plate NG10	Data sheet 2.1-660
Back pressure valve:	
Sandwich plate NG4-Mini	Data sheet 2.1-720
Sandwich plate NG6	Data sheet 2.1-740
Sandwich plate NG10	Data sheet 2.1-760
Line mount body	Data sheet 2.9-200

Technical explanation see data sheet 1.0-100



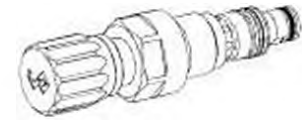
**Pressure relief valve**
**Screw-In cartridge**

- Direct operated
- $Q_{max} = 25 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_{Nmax} = 350 \text{ bar}$

**DESCRIPTION**

Direct operated pressure relief valve as a screw-in cartridge with a thread M22x1,5 and cavity according to Wandfluh-Norm. The valve is available in 2 different setting versions: Key setting „S“ and turning knob setting „D“. Key adjustment „S“ is also available with cover seal adjustment „A“ is also available with cover seal adjustment. The cartridge body made of steel is galvanized and therefore rust-protected.

**M22x1,5**  
 Wandfluh standard


**FUNCTION**

**BX:** If pressure in pilot line x reaches the set pressure poppet spool will be pushed against the spring. Oil passage from P to T line will be opened-up irrespective of pressure in P line, this due to a drain connection separating x and P line. Poppet spool and pilot piston are physically linked.

**BY:** If pressure in pilot line x reaches the set pressure poppet spool will be pushed against the spring. Oil passage from P to T line will be opened-up. Poppet spool and pilot piston are separate items. Due to the area ratio of the pilot the required pilot pressure in x line is lower than pressure in P line by the percentage of the differential pressure.

**APPLICATION**

**BX:** Used to pilot e.g a logic elements which must relief independent of system pressure.

**BY:** Used to pilot e.g a logic element with loading/unloading and relief function in an accumulator or dual pump system.

For machining the cavity in steel or aluminium tools are available for rent or sale. See also data sheet in register 2.13

**TYPE CODE**

Pressure relief valve		B	<input type="checkbox"/>	PM22	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Relief valve remote controlled		X						
Relief and unloading valve		Y						
Type of adjustment	Key	<input checked="" type="checkbox"/>	S					
	Control knob	<input type="checkbox"/>	D					
	Cover	<input type="checkbox"/>	A	(see data sheet 2.0-60)				
Screw cartridge M22x1,5								
Nominal pressure range $p_N$	100 bar	<input type="checkbox"/>	100					
	315 bar	<input checked="" type="checkbox"/>	315					
	350 bar	<input type="checkbox"/>	350					
Design-Index (Subject to change)								

**GENERAL CHARACTERISTICS**

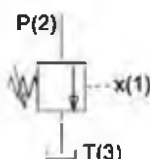
Description	BX: Direct operated relief valve, remote controlled BY: Direct operated relief valve, with additional unloading function
Construction	Screw-in cartridge for cavity acc. to Wandfluh-standard M22x1.5 screw thread
Mounting	
Ambient temperature	-20...+50°C
Installation position	any
Tightening torque	$M_a = 50 \text{ Nm}$
Weight:	$m = 0,20 \text{ kg}$ (key) $m = 0,21 \text{ kg}$ (control knob)

**HYDRAULIC CHARACTERISTICS**

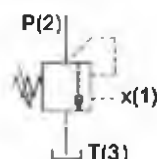
Hydraulic fluid	Mineral oils, other fluids on request
Max permissible contamination level	ISO 4406:1998, class 18/18/13 (recommended filter gauge $\Delta 10...25>75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Hydraulic fluid temp.	-20...+70°C
Peak pressure	$p_{max} = 400 \text{ bar}$ $p_{Tmax} = p_N + 20 \text{ bar}$
Nominal pressure	$p_N = 100 \text{ bar}$ , $p_N = 315 \text{ bar}$ , $p_N = 350 \text{ bar}$
Min. pressure	see characteristic
Differential pressure (only for BY.PM22)	11% for $p_N = 100 \text{ bar}$ 7,5% for $p_N = 315 \text{ bar}$ and $p_N = 350 \text{ bar}$
Volume flow	$Q = 0,1...25 \text{ l/min}$
Leak volume flow	see characteristic (BX.PM22) tight seating (BY.PM22)

**SYMBOLS**

BX.PM22

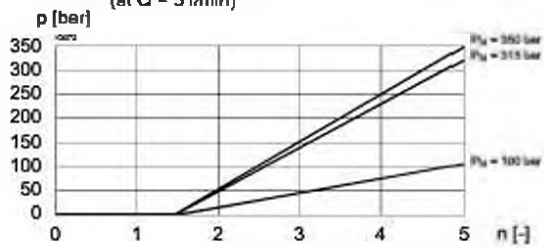
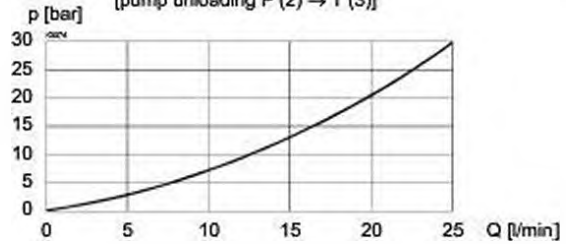
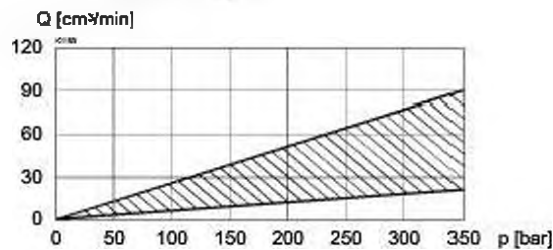


BY.PM22


**MECHANICAL ACTUATION**

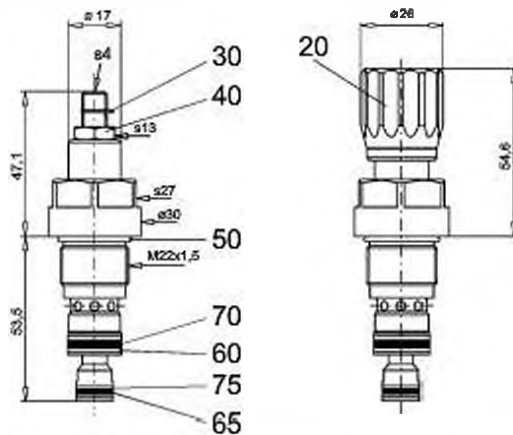
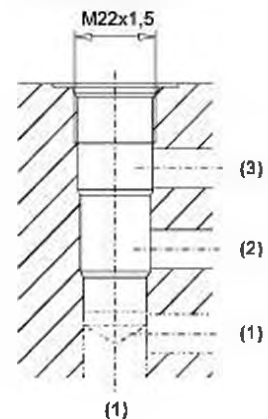
2 types of adjustments:

- S = Screw adjustment  
with fork wrench and Allen key
- D = Control knob adjustment, fixed
- Actuation stroke  $S_a$  = 5 mm
- Actuation angle  $\alpha_a$  = 1800° (5 revolutions)

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $p = f(n)$  Pressure adjustable characteristics  
 (at  $Q = 5 \text{ l/min}$ )

 $p = f(Q)$  Pressure volume flow characteristics  
 [pump unloading P (2)  $\rightarrow$  T (3)]

 $Q_L = f(p)$  Leakage volume flow characteristics  
 BX PM22  
 [P (2) + x(1)  $\rightarrow$  T (3)]

**DIMENSIONS**

Screw adjustment „S“

Knob adjustment „D“


 Cavity drawing acc. to  
 Wandfluh-Norm

 For detailed cavity drawing  
 and cavity tools see data sheet  
 2.13-1037.

**PARTS LIST**

Position	Article	Description
20	114.2224	Knob
30	193.1061	Safety plate RD6 DIN 6799
40	153.1402	Hexagonal nut 0,5D M8x1
50	160.2188	O-ring ID 18,77x1,78
60	160.2140	O-ring ID 14,00x1,78
65	160.2087	O-ring ID 8,73x1,78
70	049.3177	Back up ring RD 14,6x17,5x1,4
75	049.3126	Back up ring RD 9,1x12x1,4

**Pressure sequence valve**
**Screw-In cartridge**

- Pilot operated
- $Q_{max} = 100 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_{N max} = 350 \text{ bar}$

**M22x1,5**  
 ISO 7789

**DESCRIPTION**

Pilot operated pressure sequence valve in screw cartridge construction with M22x1,5 thread for cavity acc. to ISO 7789. The valve is available with 2 different types of adjustment: key adjustment „S“ and control knob adjustment „D“ both of which are fixed, and a lockable version „K“. Key adjustment „S“ is also available with cover see data sheet 2.0-50. Three pressure ranges are available as standard: 63, 160 and 350 bar. The steel cartridge body is zinc coated and thus protected against rust.

**FUNCTION**

The pressure sequence valve connects consumers in hydraulic circuits. Its separate leakage line means that the valve can be used as a pressure relief valve that is not sensitive to ram pressure. When the set pressure has been reached, the pilot operation opens to the tank, thereby opening the main spool to the next consumer. Pilot operated pressure sequence valves can be very finely adjusted and are suitable for high volume flows and pressures. There is very little play in the hardened spool, thus leakage is kept to a minimum.

**APPLICATION**

For sequence control of operating sequences, whereby a consumer is switched on when a specific pressure is reached. Operates as a pressure relief valve for controls where ram pressure in the secondary line may not affect the pressure setting. The screw cartridges are very well suited for use in control blocks and are installed as functional parts in the Wandfluh-Hydraulik NG4, NG6 and NG10 sandwich plates (vertical stacking). Please see separate data sheets in register 2.1). Step tools are available (for hire or purchase) for the manufacture of the cartridge cavities in steel or aluminium blocks. See data sheets in register 2.13

**TYPE CODE**

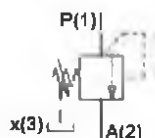
		F	V	<input type="checkbox"/>	PM22	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Pressure sequence valve									
Pilot operated									
Type of adjustment	Key	S							
	Control knob	D							
	Cover	A (see data sheet 2.0-50)							
Screw cartridge M22x1,5									
Pressure range $p_x$	63 bar	<input type="checkbox"/> 63							
	160 bar	<input type="checkbox"/> 160							
	350 bar	<input type="checkbox"/> 350							
Design-Index (Subject to change)									

**GENERAL CHARACTERISTICS**

Description	Pilot operated pressure sequence valve
Construction	Screw cartridge for cavity acc. to ISO 7789
Type of fixture	M22x1,5 screw thread
Ambient temperature	-20...+50°C
Installation position	any
Tightening torque	$M_t = 50 \text{ Nm}$
Weight	$m = 0,17 \text{ kg}$ (key) $m = 0,18 \text{ kg}$ (control knob)

**HYDRAULIC CHARACTERISTICS**

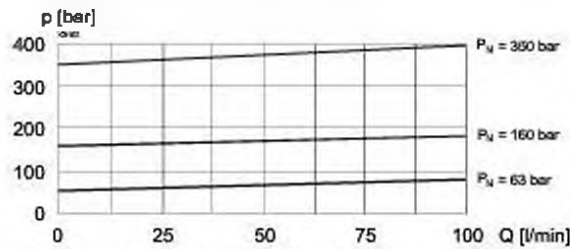
Hydraulic fluid	Mineral oil, other media on request
Max. permissible contamination level	ISO 4406:1999, class 18/16/13 (recommended filter gauge B6...10z75) see also data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Hydraulic fluid temp.	-20...+70°C
Peak pressure	$p_{rel} = 400 \text{ bar}$ $p_{Tmax} = p_p + 20 \text{ bar}$
Rated pressure ranges	$p_x = 63 \text{ bar}$ , $p_x = 160 \text{ bar}$ , $p_x = 350 \text{ bar}$
Minimum pressure	see curve
Volume flow	$Q = 0,2 \dots 100 \text{ l/min}$
Leak volume flow	see curve
Control volume flow	$Q_{ex} = 0,1 \dots 0,4 \text{ l/min}$ (dep. on pressure)

**SYMBOL**

**MECHANICAL ACTUATION**

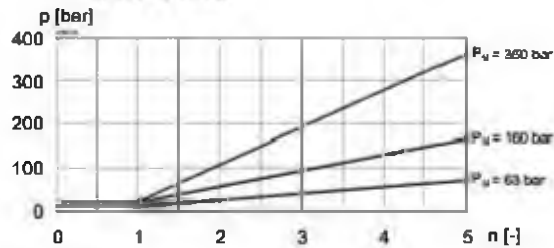
Mechanical types of operation in 2 different versions:	
S	= Screw adjustment with fork wrench and Allen key
D	= Control knob adjustment, fixed
Actuation stroke $S_s$	= 5 mm
Actuation angle $\alpha_s$	= 1800° (5 turns)

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

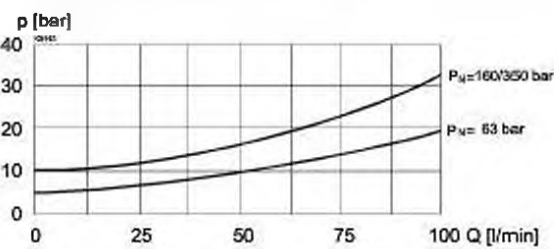
$p = f(Q)$  Pressure volume flow characteristics  
(Maximal adjustable pressure)



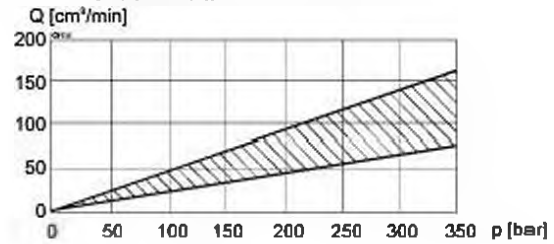
$p = f(n)$  Pressure adjustment characteristics  
(at  $Q = 5 \text{ l/min}$ )



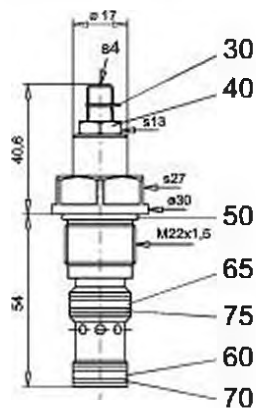
$p = f(Q)$  Pressure volume flow characteristics  
(Minimal adjustable pressure)



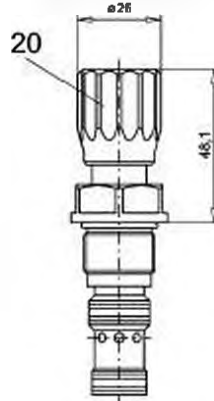
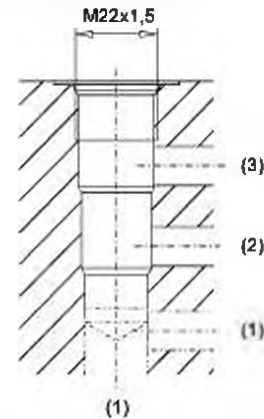
$Q_L = f(p)$  Leakage volume flow characteristics  
[P (1) → T (2)]


**DIMENSIONS**

Screw adjustment „S“



Knob adjustment „D“


 Cavity drawing acc. to  
ISO 7789-22-06-0-98


For detailed cavity drawing and cavity  
tools see data sheet 2.13-1006.

**PARTS LIST**

Position	Article	Description
20	114.2224	Knob
30	193.1061	Safety plate RD6 DIN 6799
40	153.1402	Hexagonal nut 0,5D M8x1
50	160.2188	O-ring ID 18,77x1,78
60	160.2140	O-ring ID 14,00x1,78
65	160.2156	O-ring ID 15,60x1,78
70	049.3176	Back-up ring RD 14,1x17x1,4
75	049.3196	Back-up ring RD 16,1x19x1,4

**ACCESSORIES**

Sandwich plate NG4-Mini	Data sheet 2.1-820
Sandwich plate NG8	Data sheet 2.1-840
Sandwich plate NG10	Data sheet 2.1-860

**Accumulator loading cartridge**

- ◆ pilot operated
- ◆  $p_{max} = 400$  bar
- ◆  $p_{N, max} = 350$  bar
- ◆  $Q_{max} = 30$  l/min

**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

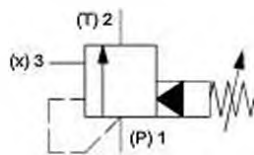
Pilot operated accumulator unloading valve in screw-in cartridge construction for cavity according to ISO 7789. The valve has an adjustable upper switching point and a switching pressure difference which is fixed by the design. If the pressure in P exceeds the upper, adjustable switching pressure, the pilot control is opened by the pilot control spool. A pilot oil flow passes, and the reverse side of the main spool is unloaded. The produced pressure difference shifts the main spool against the spring, and the valve switches to unloading circuit. Due to the surface difference in the pilot control part, the pilot oil flow is interrupted, as soon as the pressure in the accumulator drops by 15 %, resp. 25 % of the upper switching point. Pressures at the main spool balance out, and the spring shifts the main spool into the closed position. The pump can now again build up the system pressure up to the upper switching point, the cycle starts again.

**APPLICATION**

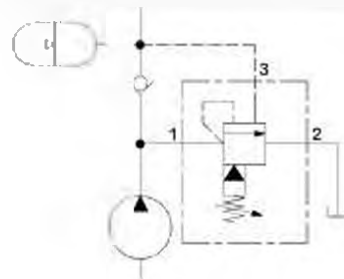
Accumulator unloading valves are used in hydraulic systems with pressure accumulators. They allow an energy and cost-saving system design in the case of strongly varying oil requirement of cylinders, or for maintaining pressures over a period of time, e.g. in the case of clamping procedures. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**Note!**


An additional pressure relief valve must be present for the system protection. Please observe the adjustment and connection example in the „Symbol“ section.

**SYMBOL**

**Adjustment and connection example**

Upper switching point (US) adjusted = 100 bar  
 Switching pressure difference 15 % fixed  
 Lower switching point (US) =  $US - 15\% = 85$  bar  
 Gas preload for accumulator max. 90 % of US = 76 bar


**TYPE CODE**

Pilot operated, accumulator loading valve		US	PM22	.		.		#	
Type of adjustment	Key	S							
	Control knob	D							
	Cover	A	(see Data sheet 2.0-50)						
Screw-in cartridge M22 x 1,5									
Nominal pressure range $p_N$	100 bar	100							
	160 bar	160							
	350 bar	350							
Sealing material	NBR								
	FKM (Viton)	D1							
Design index (subject to change)									

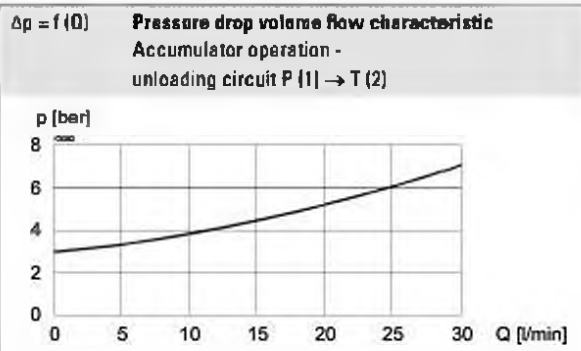
**GENERAL SPECIFICATIONS**

Designation	Accumulator loading valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Manually
Ambient temperature	-25 ... +70 °C
Weight	0,22 kg key adjustment 0,24 kg control knob 0,28 kg cover

**ACTUATION**

Actuation	S = lockable key adjustment D = lockable knob adjustment
Actuation angle	$p_N = 100 / 160 \text{ bar}$ $\alpha_A = 1368^\circ$ (3,8 rotations) $p_N = 350 \text{ bar}$ $\alpha_A = 2700^\circ$ (7,5 rotations)
Actuation stroke	$p_N = 100 / 160 \text{ bar}$ $S_A = 3,8 \text{ mm}$ $p_N = 350 \text{ bar}$ $S_A = 7,5 \text{ mm}$

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400 \text{ bar}$
Nominal pressure range	$p_N = 100 \text{ bar}, 160 \text{ bar}, 350 \text{ bar}$
Minimum pressure	$p_{min} = 50 \text{ bar}$ for $p_N = 160 / 350 \text{ bar}$ $p_{min} = 25 \text{ bar}$ for $p_N = 100 \text{ bar}$
Volume flow range	$Q = 1 \dots 30 \text{ l/min}$
Leakage oil	Maximum 4 drops / min in accumulator unloading operation P - T
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 ≥ 75, see data sheet 1.0-50
Diff. unloading / loading	15 ± 3 % for $p_N = 160 / 350 \text{ bar}$ 25 ± 3 % for $p_N = 100 \text{ bar}$

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

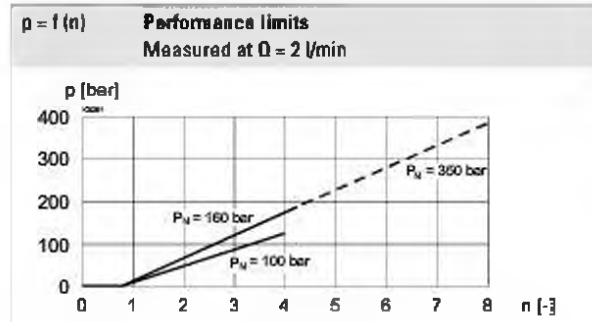
- ◆ The cartridge body is zinc-nickel coated
- ◆ The control knob is made of plastic

**STANDARDS**

Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

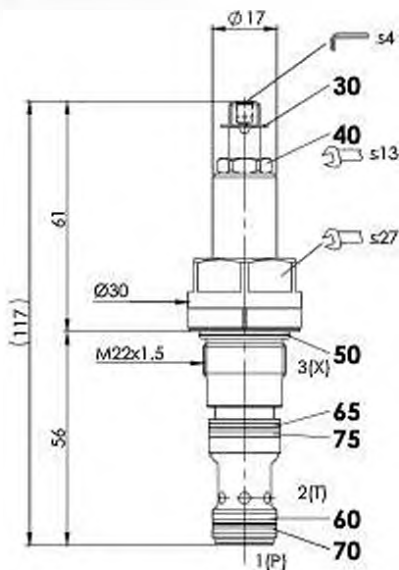
**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge

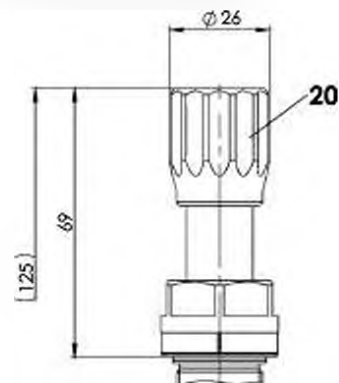


**DIMENSIONS**

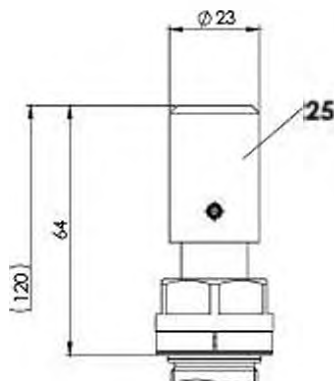
Key adjustment «S»



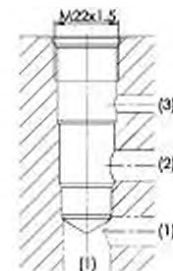
Control knob adjustment «D»



Cover «A»


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-06-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1006

**PARTS LIST**

Position	Article	Description
20	114.2224	Control knob
25	032.0611	Cover rd 23 / 3 x 35
30	193.1061	Retainer rd 6 DIN 6799
40	153.1402	Hexagon nut 0,5d M8 x 1
45	212.1488	Washer (only for $p_n = 100, 160$ bar)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
65	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.3176	Backup ring rd 14,1 x 17 x 1,4
75	049.3196	Backup ring rd 16,1 x 19 x 1,4

**ACCESSORIES**

Types of adjustment for screw-in cartridges	Data sheet 2.0-50
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**Pressure relief valve**
**Screw-In cartridge**

- Pilot operated
- $Q_{max} = 230 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_{N max} = 350 \text{ bar}$

**M33x2**  
 ISO 7789

**DESCRIPTION**

Pilot operated pressure relief valve as screw-in cartridge with a thread M33x2 and cavity according to ISO draft 7789. The valve is available in two different setting versions: Key setting "S" and turning knob setting "D". Key adjustment "S" is also available with cover, see data sheet 2.0-50. 2 standard pressure levels are available: 160 and 350 bar. The cartridge body made of steel is galvanized and therefore rust-protected.

**FUNCTION**

When the set operating pressure is reached, the main spool opens and connects the protected line with the return line to the tank. These pressure relief valves consist of a main and a pilot operation system integrated into the cartridge. The pilot operation is a direct operated pressure relief valve which acts on the main system. The helical spring of the pilot operation can be easily set to the desired operating pressure. Pilot operated pressure relief valves can be very sensitively adjusted and are suitable for large oil flows and high pressure. The very limited play of the hardened spool results in a limited oil leakage.

**APPLICATION**

For limiting the operating pressure in hydraulic systems by releasing the oil from the protected oil line P (1) to the outlet/tank return line T (2). The screw-in cartridge is very suitable for mounting in control blocks. Cavity tools are available for hire or sale for machining aluminium or steel. See register 2.13.

**Attention:** Should therefore not be utilized anymore in applications with periodically changing direction of flow.

**TYPE CODE**

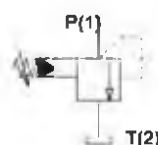
Pressure relief valve				B	V		PM33	-			p		
Pilot operated													
Type of adjustment	Key	S	(see data sheet 2.0-50)										
	Control knob	D											
	Cover	A											
Screw-in cartridge M33x2													
Pressure range $p_x$	160 bar	160											
	350 bar	350											
Design-Index (Subject to change)													

**GENERAL CHARACTERISTICS**

Description	Pilot operated pressure relief valve
Construction	Screw-cartridge for cavity acc. to ISO 7789
Mounting	Screw thread M33x2
Ambient temperature	-25...+50°C
Mounting position	any
Fastening	$M_c = 80 \text{ Nm}$
Weight	$m = 0,32 \text{ kg}$
MTTFd	150 years

**HYDRAULIC CHARACTERISTICS**

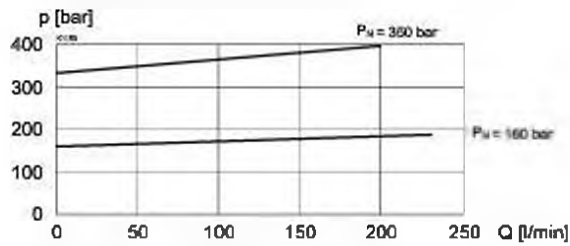
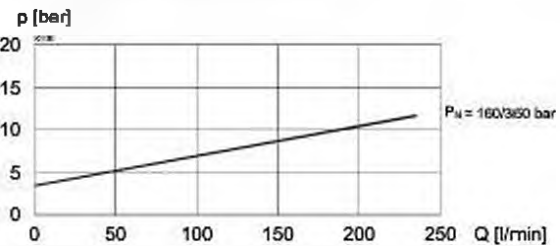
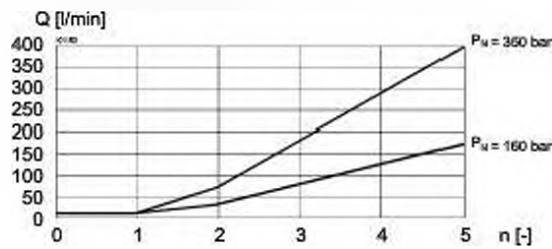
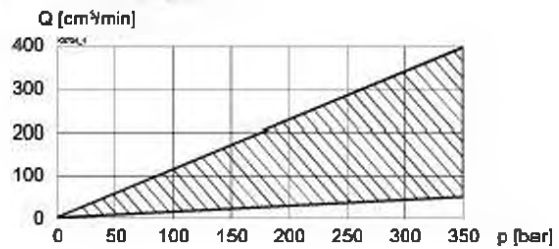
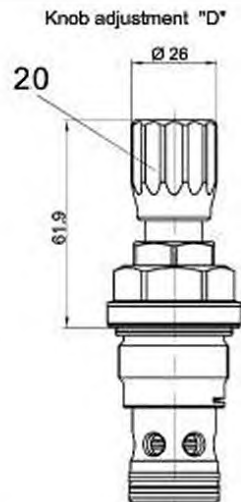
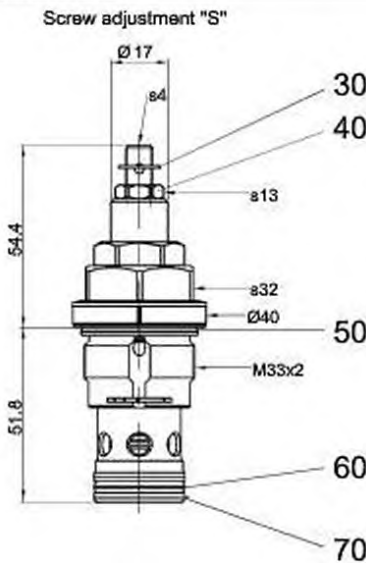
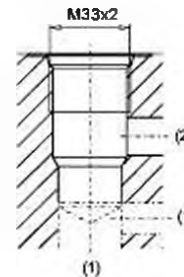
Hydraulic fluid	Mineral oils, other fluids on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade B 6...10@75) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-25...+70°C
Peak pressure	$p_{max} = 400 \text{ bar}$ $p_{Tmax} = p_p + 20 \text{ bar}$
Nominal pressure range	$p_x = 160 \text{ bar}$ , $p_x = 350 \text{ bar}$
Minimum pressure	see characteristics
Volume flow	$Q = 0,2 \dots 230 \text{ l/min}$
Leakage volume flow	see characteristics

**SYMBOL**

**MECHANICAL ACTUATION**

Mechanical types of operation in 2 different versions:

S	= Key adjustment by means of Span key and Allen key
D	= Control knob adjustment, fixed
Actuation stroke $S_a$	= 5 mm
Actuation angle $\alpha_a$	= 1800° (5 revolutions)



**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 **$p = f(Q)$  Pressure volume flow characteristics**  
 (Maximal adjustable pressure)

 **$p = f(Q)$  Pressure volume flow characteristics**  
 (Minimal adjustable pressure)

 **$p = f(n)$  Pressure adjustment characteristics**  
 (at  $Q = 30 \text{ l/min}$ )

 **$Q = f(p)$  Leakage volume flow characteristics**  
 (P (1) → T (2))

**DIMENSIONS**

 Cavity drawing to  
 ISO 7789-33-02-0

 Detailed cavity drawing and cavity  
 tools see data sheet 2.13-1041.

**PARTS LIST**

Position	Article	Description
20	114.2224	Knob
30	193.1061	Safety plate RD6 DIN 6799
40	153.1402	Hexagonal nut 0.50 M8x1
50	180.2298 180.6296	O-ring ID 28.82 x 2.62 (NBR) O-ring ID 28.82 x 2.62 (FKM)
60	180.2219 180.6216	O-ring ID 21.89 x 2.62 (NBR) O-ring ID 21.89 x 2.62 (FKM)
70	049.3277	Back-up ring RD 22.5 x 27 x 1.4

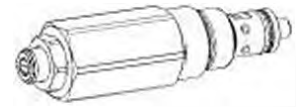
**ACCESSORIES**

Line mount body

Data sheet 2.9-200

**Pressure relief cartridge**
**Leakage-free**

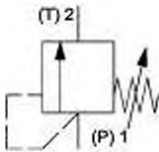
- ◆ direct operated
- ◆  $p_{max} = 450 \text{ bar}$
- ◆  $p_{set max} = 420 \text{ bar}$
- ◆  $Q_{max} = 50 \text{ l/min}$

**7/8" -14 UNF**
**Wandfluh standard**

**DESCRIPTION**

Direct operated poppet type pressure relief valve in screw-in cartridge construction for cavity according to Wandfluh standard. The valve is closed in the neutral position. If the pressure in P (1) exceeds the adjusted value of the valve, the excessive pressure is drained to T (2). The back pressure at T (2) is added to the adjusted value. T (2) can be charged up to the maximum. Hardened precision parts ensure virtually leakage-free closing. Rapid switching with low hysteresis and excellent stability over the whole flow range.

**APPLICATION**

These valves are used for limiting the operating pressure in the hydraulic system. Can be used in double pressure relief switches. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Adjustment spindle M12 x 1
Execution	S = blockable key adjustment
Actuation angle	$\alpha_s = 1800^\circ$ (5 rotations)
Actuation stroke	$S_s = 5 \text{ mm}$

**TYPE CODE**

Pressure relief valve			B E S PU10 - <input type="text"/> - <input type="text"/> ↗ <input type="text"/>
Direct operated, leakage-free			
Type of adjustment	Key		
Screw-in cartridge 7/8" - 14 UNF - 2A			
Nominal pressure range $p_n$	63 bar 420 bar	<input type="text" value="63"/> <input type="text" value="420"/>	
Sealing material	NBR FKM (Viton) NBR 872	<input type="text"/> <input type="text" value="01"/> <input type="text" value="281M"/>	
Design index (subject to change)			

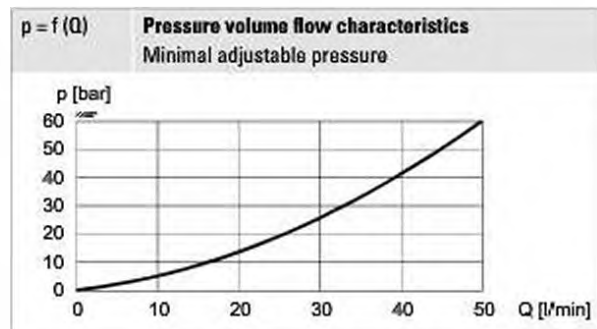
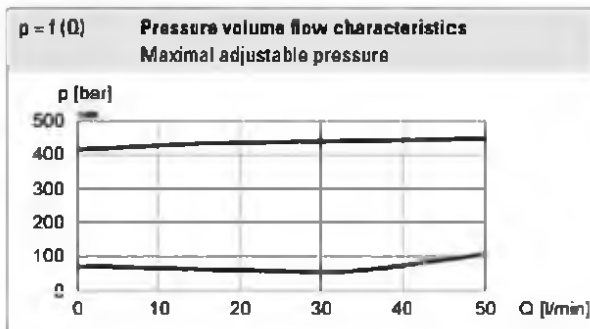
**GENERAL SPECIFICATIONS**

Designation	Pressure relief valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	1/4"-14 UNF according to Wandfluh standard
Actuation	Manually
Ambient temperature	-25...+90 °C
Weight	0,30 kg (420 bar) 0,24 kg (63 bar)
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 450$ bar
Tank pressure	$p_{Tmax} = 210$ bar
Nominal pressure range	$p_N = 63; 420$ bar
Minimum pressure	See characteristics
Volume flow range	$Q = 0,1...50$ l/min
Leakage oil	Seat tight, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+90 °C (NBR) -20...+90 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**SURFACE TREATMENT**

- ◆ The cartridge body is zinc-nickel coated

**ACCESSORIES**

Types of adjustment for screw-in cartridges	Data sheet 2.0-50
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

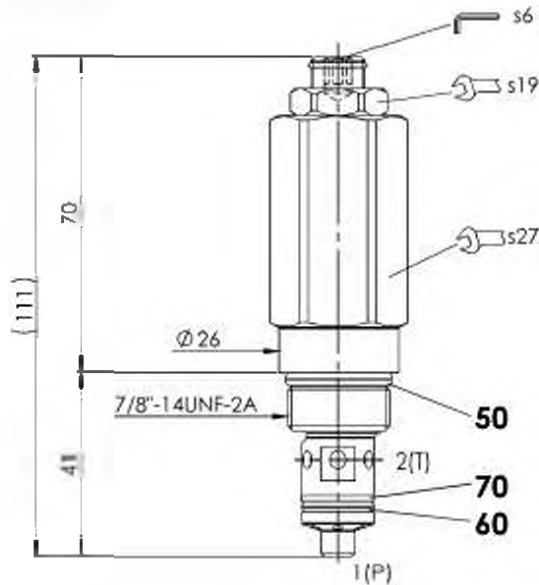
Mounting type	Screw-in cartridge 1/4"-14 UNF
Mounting position	Any
Tightening torque	$M_0 = 60$ Nm Screw-in cartridge

**STANDARDS**

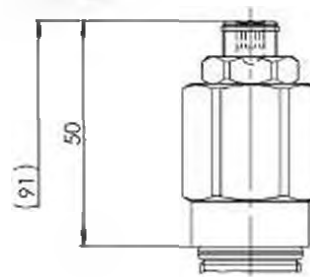
Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

**DIMENSIONS**

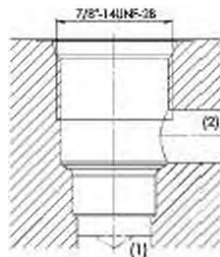
BESPU10-420



BESPU10-63


**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1054

**PARTS LIST**

Position	Article	Description
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.6124	O-ring ID 12,42 x 1,78 (FKM)
	049.3166	Backup ring rd 13,1 x 16 x 1,4

## Pressure relief valve

### Flange- or Sandwich construction

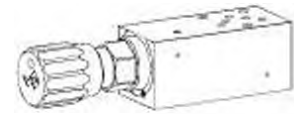
- ◆ pilot or direct operated
- ◆  $p_{max} = 400$  bar
- ◆  $p_{rel, max} = 350$  bar
- ◆  $Q_{max} = 8$  l/min

### DESCRIPTION

Pilot or direct operated pressure relief valve in flange or sandwich construction. When the adjusted operating pressure is reached, the main spool opens and connects the protected line with the drain to the tank. For flange or sandwich executions with pressure relief in port P, there is a manometer connection.

### NG3-Mini

Wandfluh standard



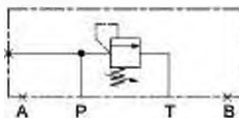
### APPLICATION

For the limitation of the operating pressure in hydraulic systems by relieving the oil from the secured oil line P (1), A (2), B (3) to output / tank line T (4). Miniature valves are used where both, reduced dimensions and weight are important.

### SYMBOL

Flange execution

B..FA03-P



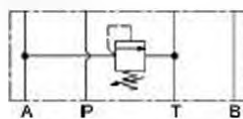
Sandwich execution

B..SA03-P



Sandwich execution

B..SA03-A



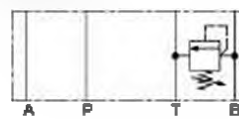
Note!



- ◆ Direct operated execution drawn
- ◆ All variants are also available pilot operated

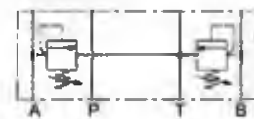
Sandwich execution

B..SA03-B



Sandwich execution

B..SA03-AB



### GENERAL SPECIFICATIONS

Designation	Pressure relief valve
Construction	Direct or pilot operated
Mounting	Flange- or Sandwich construction
Nominal size	NG3-Mini according to Wandfluh standard
Actuation	Manually
Ambient temperature	-25...+70 °C (NBR) -20...+70 °C (FKM)
Weight	0,8 kg (Flange construction) 0,6 kg (Sandwich construction P, A, B) 0,7 kg (Sandwich construction AB)

### ACTUATION

Actuation	S = lockable key adjustment D = lockable knob adjustment
-----------	---

Note!



Other specifications, see data sheet of the screw-in cartridges

### STANDARDS

Mounting interface	Wandfluh standard
Contamination efficiency	ISO 4406

### SURFACE TREATMENT

- ◆ The flange body is painted with a two component paint
- ◆ The sandwich bodies are zinc-nickel coated

**TYPE CODE**

Pressure relief valve		B <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> A03 - <input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>	
Direct operated	<input type="checkbox"/> S		
Pilot operated	<input type="checkbox"/> V		
Type of adjustment	Key <input type="checkbox"/> S		
	Control knob <input type="checkbox"/> D		
	Cover <input type="checkbox"/> A		
Flange construction	<input type="checkbox"/> F		
Sandwich construction	<input type="checkbox"/> S		
Mounting interface acc. to Wandfluh standard, NG3-Mini			
Type list / Function	flange construction	sandwich construction	
	in P <input type="checkbox"/> P	in P <input type="checkbox"/> P	
		in A <input type="checkbox"/> A	
		in B <input type="checkbox"/> B	
		in A and B <input type="checkbox"/> AB	
Nominal pressure range $p_N$	pilot operated	direct operated	
	63 bar <input type="checkbox"/> 63	63 bar <input type="checkbox"/> 63	
	160 bar <input type="checkbox"/> 160	160 bar <input type="checkbox"/> 160	
	350 bar <input type="checkbox"/> 350	315 bar <input type="checkbox"/> 315	
Sealing material	NBR <input type="checkbox"/>		
	FKM (Viton) <input type="checkbox"/> D1		
Design index (subject to change)			
21-002			

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400$ bar
Nominal pressure range	$P_{Nmax} =$ S: 63, 160, 315 bar V: 63, 160, 350 bar
Maximum volume flow	<b>pilot operated</b> $Q_{Vmax} = 8$ l/min <b>direct operated</b> $Q_{Vmax} = 5$ l/min
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**Note!** Other specifications, see data sheet of the screw-in cartridges


**PERFORMANCE SPECIFICATIONS**

**Note!** Detailed performance limits and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.



**Attention!** The performance data especially the „pressure-flow characteristic,“ on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.


**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

## VALVES INSTALLED

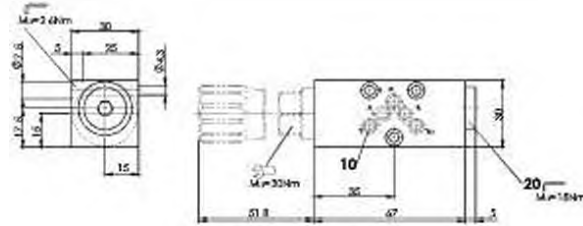
The following screw-in cartridges are used in either the flange body or the sandwich body.

Article	Description	Data sheet no.
BV.PM18	Pressure relief cartridge pilot operated	2.1-510
BS.PM18	Pressure relief cartridge direct operated	2.1-520

## DIMENSIONS

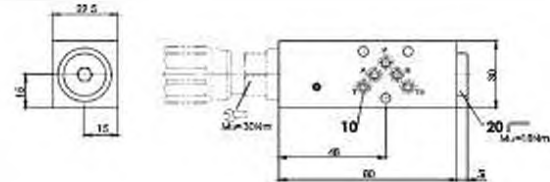
### Flange execution

#### B.DFA03-P



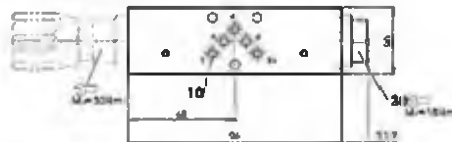
### Sandwich execution

#### B.DSA03-P



### Sandwich execution

#### B.DSA03-A / B / AB



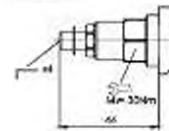
B.DSA03-A: Cartridge on A side

B.DSA03-B: Cartridge on B side

B.DSA03-AB: Cartridge on A and B side

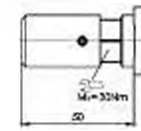
### Type of adjustment

#### B.S.A03

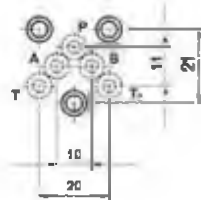


### Type of adjustment

#### B.A.A03



## HYDRAULIC CONNECTION



## PARTS LIST

Position	Article	Description
10	160.2045	O-ring ID 4,50 x 1,50 (NBR)
	160.6045	O-ring ID 4,50 x 1,50 (FKM)
20	238.2406	Screw plug VSTI G1/4"-ED
30	239.3011	Screw plug M18 x 1,5

## INSTALLATION NOTES

Mounting type	Flange or sandwich mounting 3 fixing holes for socket head screws or stud M4
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 2,6$ Nm (quality 8.8, zinc coated) Screw-in cartridge $M_0 = 30$ Nm

## ACCESSORIES

Verstellarten für Schraubpatronen	Data sheet 2.0-50
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Horizontal mounting blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**Pressure relief valve**
**Flange- or Sandwich construction**

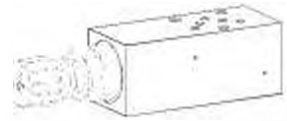
◆ pilot or direct operated

 ◆  $p_{max} = 400 \text{ bar}$ 

 ◆  $p_{Hmax} = 350 \text{ bar}$ 

 ◆  $Q_{max} = 30 \text{ l/min}$ 
**NG4-Mini**

Wandfluh standard


**DESCRIPTION**

Pilot or direct operated pressure relief valve in flange or sandwich construction. When the adjusted operating pressure is reached, the main spool opens and connects the protected line with the drain to the tank. For flange or sandwich executions with pressure relief in port P, there is a manometer connection.

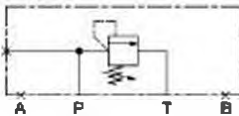
**APPLICATION**

For the limitation of the operating pressure in hydraulic systems by relieving the oil from the secured oil line P (1), A (2), B (3) to output / tank line T (4). Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**

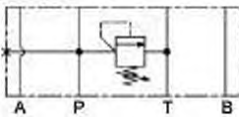
Flange execution

B..FA04-P



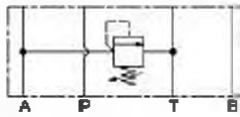
Sandwich execution

B..SA04-P



Sandwich execution

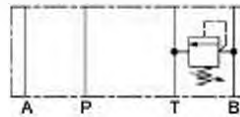
B..SA04-A


**Note!**


- ◆ Direct operated execution drawn
- ◆ All variants are also available pilot operated

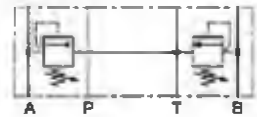
Sandwich execution

B..SA04-B



Sandwich execution

B..SA04-AB


**GENERAL SPECIFICATIONS**

Designation	Pressure relief valve
Construction	Direct or pilot operated
Mounting	Flange- or Sandwich construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Manually
Ambient temperature	-25 ... +70 °C
Weight	1,35 kg (Flange construction) 1,15 kg (Sandwich construction P, A, B) 1,60 kg (Sandwich construction AB)

**ACTUATION**

Actuation

S = lockable key adjustment

D = lockable knob adjustment

**Note!**


Other specifications, see data sheet of the screw-in cartridges



**TYPE CODE**

Pressure relief valve		B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A04	-	<input type="checkbox"/>	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Direct operated		<input type="checkbox"/>	A											
Pilot operated		<input type="checkbox"/>	V											
Type of adjustment	Key	<input type="checkbox"/>	S											
	Control knob	<input type="checkbox"/>	B											
	Cover	<input type="checkbox"/>	A											
Flange construction		<input type="checkbox"/>	F											
Sandwich construction		<input type="checkbox"/>	S											
Mounting interface according to Wandfluh standard, NG4-Mini														
Type list / Function	Flange construction	in P	<input type="checkbox"/>	P										
	Sandwich construction	in P	<input type="checkbox"/>	P										
		in A	<input type="checkbox"/>	A										
		in B	<input type="checkbox"/>	B										
		in A and B	<input type="checkbox"/>	AB										
Nominal pressure range ( $p_n$ ) of the screw-in cartridges														
Sealing material	NBR	<input type="checkbox"/>												
	FKM (Viton)	<input type="checkbox"/>	D1											
Design index (subject to change)														

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400$ bar
Nominal pressure range	$P_{N1000}$
	A: 63, 210, 315 bar
	V: 63, 160, 350 bar
Maximum volume flow	$Q_{max} = 30$ l/min
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR)
	-20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 ≥ 75, see data sheet 1.0-50

**Note!** Other specifications, see data sheet of the screw-in cartridges


**ACCESSORIES**

Verstellarten für Schraubpatrone	Data sheet 2.0-40
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Horizontal mounting blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

**Note!** Detailed performance limits and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.



**Attention!** The performance data especially the „pressure-flow characteristic„ on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.


**SEALING MATERIAL**

NBR or FKM (Viton) as standard. choice in the type code

**SURFACE TREATMENT**

- ◆ The flange body is painted with a two component paint
- ◆ The sandwich bodies are zinc-nickel coated

### VALVES INSTALLED

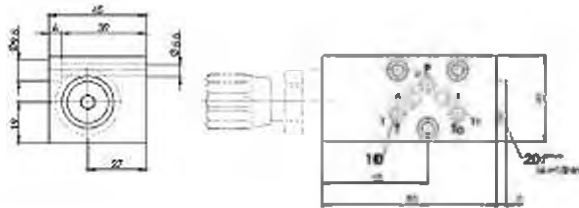
The following screw-in cartridges are used in either the flange body or the sandwich body.

Article	Description	Data sheet no.
BV.PM22	Pressure relief cartridge pilot operated	2.1-530
BA.PM22	Pressure relief cartridge direct operated	2.1-540

### DIMENSIONS

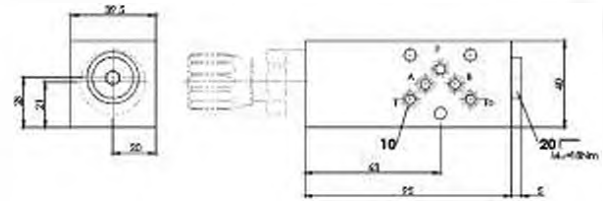
Flange execution

B.DFA04-P



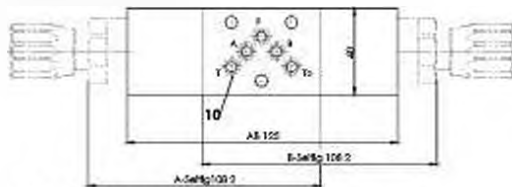
Sandwich execution

B.DSA04-P



Sandwich execution

B.DSA04-A / B / AB



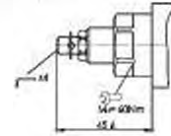
B.DSA04-A: Cartridge on A side

B.DSA04-B: Cartridge on B side

B.DSA04-AB: Cartridge on A and B side

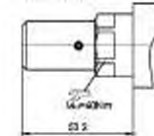
Type of adjustment

B.S.A04

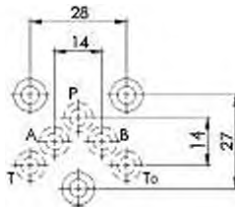


Type of adjustment

B.A.A04



### HYDRAULIC CONNECTION



### PARTS LIST

Position	Article	Description
10	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)
20	238.2406	Screw plug VSTI G1/4"-ED

### STANDARDS

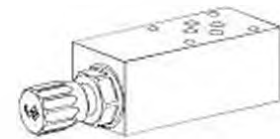
Mounting interface	Wandfluh standard
Contamination efficiency	ISO 4406

### INSTALLATION NOTES

Mounting type	Flange or sandwich mounting 3 fixing holes for socket head screws or studs M5
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (quality 8.8, zinc coated) Screw-in cartridge $M_0 = 60 \text{ Nm}$

**Pressure relief valve**
**Flange and sandwich construction**

- Pilot operated:  $Q_{max} = 80 \text{ l/min}$   
 $p_{N\ max} = 350 \text{ bar}$   $p_{max} = 400 \text{ bar}$
- Direct operated:  $Q_{max} = 80 / 25 \text{ l/min}$   
 $p_{N\ max} = 32 / 315 \text{ bar}$   $p_{max} = 100 / 400 \text{ bar}$

**NG6**  
 ISO 4401-03

**DESCRIPTION**

Pilot operated pressure reducing valves NG6. Flange and sandwich construction according to ISO 4401-03 with 4 ports. Incorporated are proportional pressure reducing cartridges size M22x1,5 according to ISO 7789. The steel bodies for flange constructions and the bodies for sandwich constructions are phosphatized.

**FUNCTION**

When the set operating pressure has been reached, the spool opens and joins the protected line with the return to the tank T. G1/4" connection thread is provided (sealed) as standard for flange and sandwich designs with pressure relief in P. This enables connection to a pressure gauge.

**APPLICATION**

For relieving the operating pressure of a hydraulic system by diverting the flow of oil from the protected oil lines P, A or B to the return/tank line T. Flange and sandwich valves (vertical stacking) are particularly suitable for: machine tools and all types of handling systems. NG6 size valves are also generally used in stacking systems on power units.

**TYPE CODE**

Pressure relief valve				B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A 06 -	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>	
Direct operation, conical spool				A										
Direct operation, control spool				K										
Pilot operated				V										
Type of adjustment	Key			S										
	Control knob			D										
	Cover			A										
Flange design				F										
Sandwich design				S										
International standard interface ISO, NG6														
Type list / function	Flange design		Sandwich design											
	in P	P	in P	P										
			in A	A										
			in B	B										
			in A and B	AB										
Pressure range $p_x$	Pilot operated		conical spool, direct operated		control spool, direct operated									
	63 bar	63	63 bar	63	32 bar	32								
	160 bar	160	210 bar	210										
	350 bar	350	315 bar	315										
Design-Index (Subject to change)														

**GENERAL CHARACTERISTICS**

Denomination	Pilot or direct operated pressure relief valve
Nominal size	NG6 acc. to ISO 4401-03
Construction	Flange or sandwich construction
Type of mounting	4 fixing holes for socket head cap screws M5 or stud M5
Fastening torque	$M_0 = 5,5 \text{ Nm}$ (quality 8.8) for fixing screws $M_0 = 50 \text{ Nm}$ for screw-in cartridge
Type of connections	Thread-connection plates rows of flange plates and horizontal stacking system
Installation position	any
Ambient temperature	-20...+50°C
Weight	• Flange design $m = 1,43 \text{ kg}$ • Sandwich design P, A, B $m = 1,18 \text{ kg}$ • Sandwich design AB $m = 1,58 \text{ kg}$
(without screw-in-cartridges)	

**HYDRAULIC CHARACTERISTICS**

Hydraulic fluid	Mineral oils, other media on request
Max. permissible contamination level	ISO 4406:1989, classe 18/16/13 (Rec. filter gauge B 6...10>75) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s ... 320 m
Peak pressure:	$p_{max} = 400 \text{ bar}$ $p_{max} = 100 \text{ bar}$ (direct operated control spool)
Maximum volume flow	
pilot, direct op. conical spool	$Q_{max} = 80 \text{ l/min}$
direct operated control spool	$Q_{max} = 25 \text{ l/min}$


**REMARK!**

Detailed performance data and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.

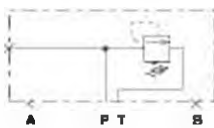
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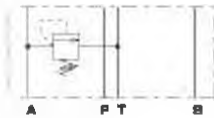
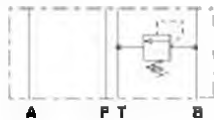
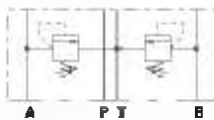
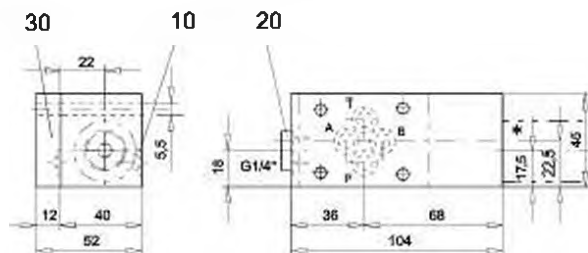

The performance data especially the „pressure-flow-characteristic„ on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

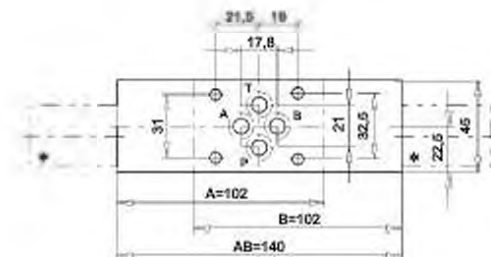
**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.
BV.PM22	Pressure relief valve • pilot operated	2.1-530
BA.PM22	Pressure relief valve • direct operated	2.1-540
BK.PM22	Pressure relief valve • direct operated	2.1-542

**TYPES / DIMENSIONS**
**Flange construction**
**B..FA06-P**

**Sandwich construction**
**B..SA06-P**

**B..SA06-A**

**B..SA06-B**

**B..SA06-AB**

**Flange construction**

**Sandwich construction in P**

**Sandwich construction in A, B or AB**

**PARTS LIST**

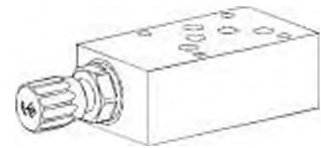
Position	Article	Description
10	160.2093	O-ring ID 9,25x1,78
20	238.2406	Plug VST1 G1/4"-ED (only for flange and sandwich plate P)
30	173.3150	Blindplate ABP6 (only for flansch)

\* The exterior dimensions of the cartridges can be obtained from the corresponding data sheets

Technical explanation see data sheet 1.0-100

**Pressure relief valve**
**Flange and sandwich construction**

- Pilot operated:  $Q_{max} = 100 \text{ l/min}$   
 $p_N \text{ max} = 350 \text{ bar}$   $p_{max} = 400 \text{ bar}$
- Direct operated:  $Q_{max} = 100 / 25 \text{ l/min}$   
 $p_N \text{ max} = 32 / 315 \text{ bar}$   $p_{max} = 100 / 400 \text{ bar}$

**NG10**  
 ISO 4401-05

**DESCRIPTION**

Pilot operated pressure reducing valves NG10. Flange and sandwich construction according to ISO 4401-05 with 4 ports. Incorporated are proportional pressure reducing cartridges size M22x1,5 according to ISO 7789. The steel bodies for flange constructions and the bodies for sandwich constructions are phosphatized.

**FUNCTION**

When the set operating pressure has been reached, the spool opens and joins the protected line with the return to the tank T. G1/4" connection thread is provided (sealed) as standard for flange and sandwich designs with pressure relief in P. This enables connection to a pressure gauge.

**APPLICATION**

For relieving the operating pressure of a hydraulic system by diverting the flow of oil from the protected oil lines P, A or B to the return/tank line T. Flange and sandwich valves (vertical stacking) are particularly suitable for: machine tools and all types of handling systems. NG10 size valves are also generally used in stacking systems on power units.

**TYPE CODE**

Pressure relief valve		B		A 10 -		#	
Direct operation, conical spool		A					
Direct operation, conical spool		K					
Pilot operated		V					
Type of adjustment	Key	S					
	Control knob	D					
	Cover	A					
Flange design		F					
Sandwich design		S					
International standard interface ISO, NG10							
Type list / function	Flange design	Sandwich design					
	in P	P	in P	P			
			in A	A			
			in B	B			
			in A and B	AB			
Pressure range $p_N$	Pilot operated	conical spool, direct operated		control spool, direct operated			
	63 bar	63	63 bar	63	32 bar	32	
	160 bar	160	210 bar	210			
	350 bar	350	315 bar	315			

Design-Index (Subject to change)

**GENERAL CHARACTERISTICS**

Denomination	Pilot or direct operated pressure relief valve	
Nominal size	NG10 acc. to ISO 4401-05	
Construction	Flange or sandwich construction	
Type of mounting	4 fixing holes for socket head cap screws M8 or stud M6	
Fastening torque	$M_0 = 9,5 \text{ Nm}$ (quality 8.8) for fixing screws $M_0 = 50 \text{ Nm}$ for screw-in cartridge	
Type of connections	Thread-connection plates rows of flange plates and horizontal stacking system	
Installation position	any	
Ambient temperature	-20...+50 °C	
Weight (without screw-in-cartridges)	• Flange design	$m = 2,34 \text{ kg}$
	• Sandwich design P, A, B	$m = 1,70 \text{ kg}$
	• Sandwich design AB	$m = 1,94 \text{ kg}$

**HYDRAULIC CHARACTERISTICS**

Hydraulic fluid	Mineral oils, other media on request
Max. permissible contamination level	ISO 4406:1999, class 18/16/13 (Rec. filter gauge $\beta_{0.5} \dots 10 \geq 75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s ... 320 m
Peak pressure:	$p_{max} = 400 \text{ bar}$ $p_{max} = 100 \text{ bar}$ (direct operated control spool)
Maximum volume flow	
pilot, direct op. conical spool	$Q_{max} = 100 \text{ l/min}$
direct op. control spool	$Q_{max} = 25 \text{ l/min}$


**REMARK!**

Detailed performance data and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.

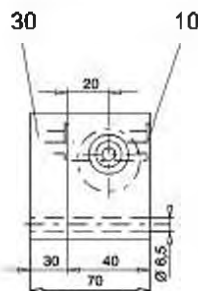
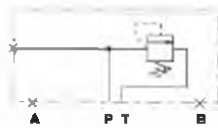
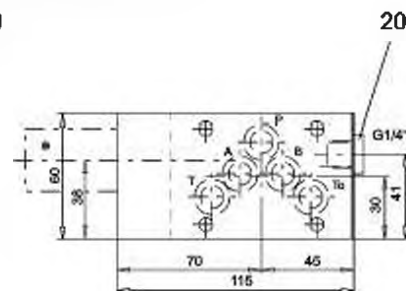

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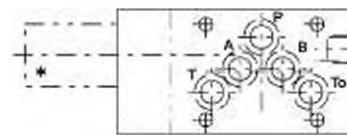
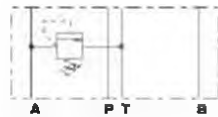
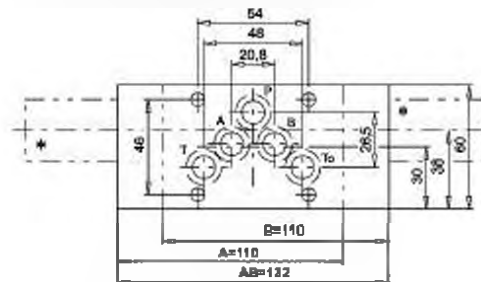
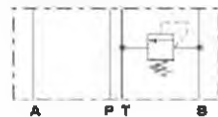
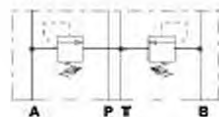
The performance data especially the «pressure-flow-characteristic» on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.
BV.PM22	Pressure relief valve • pilot operated	2.1-530
BA.PM22	Pressure relief valve • direct operated	2.1-540
BK.PM22	Pressure relief valve • direct operated	2.1-542

**TYPES / DIMENSIONS**
**Flange construction**
**B..FA10-P**

**Flange construction**

**Sandwich construction**
**B..SA10-P**

**Sandwich construction in P**

**B..SA10-A**

**Sandwich construction in A, B or AB**

**B..SA10-B**

**B..SA10-AB**

**PARTS LIST**

Position	Article	Description
10	160.2140	O-ring ID 14,0x1,78
20	238.2406	Plug VST1 G1/4"-ED (only for flange and sandwich plate P)
30	173.4150	Blindplate ABP10 (only for flansch)

\* The exterior dimensions of the cartridges can be obtained from the corresponding data sheets

Technical explanation see data sheet 1.0-100

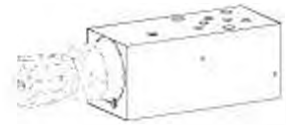
## Back pressure valve

### Sandwich construction

- ◆ pilot operated or direct operated
- ◆  $p_{act} = 400 \text{ bar}$
- ◆  $p_{Nmax} = 350 \text{ bar}$
- ◆  $Q_{max} = 30 \text{ l/min}$

### NG4-Mini

Wandfluh standard



## DESCRIPTION

Pilot or direct operated backpressure valve in sandwich construction. The backpressure valve, also called pre-loading valve, opens the main spool when the adjusted pressure is reached.

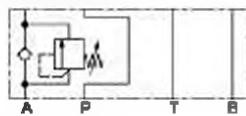
## APPLICATION

Backpressure valves with pressure adjustment in A, B, AB or T, are used for pre-loading of cylinders / motors, resp. for reaching a back pressure. Miniature valves are used where both, reduced dimensions and weight are important.

## SYMBOL

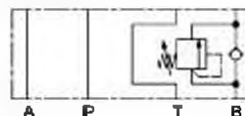
### Sandwich execution

G..SA.-A



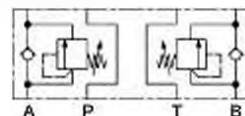
### Sandwich execution

G..SA.-B



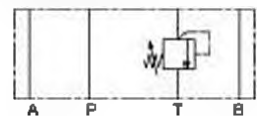
### Sandwich execution

G..SA.-AB



### Sandwich execution

G..SA.-T



### Note!



- ◆ Direct operated execution drawn
- ◆ All variants are also available pilot operated

## TYPE CODE

Back-pressure valve		6		S		A04		-		-		-		#	
Direct operated		A													
Pilot operated		V													
Type of adjustment	Key	S													
	Control knob	B													
	Cover	A													
Sandwich construction															
Mounting interface acc. to Wandfluh standard, NG4-Mini															
Type list / Function	in T	T	in A												
	in A and B	AB	in B												
Nominal pressure range ( $p_N$ ) of the built-in screw-in cartridge															
Sealing material	NBR														
	FKM (Viton)	D1													
Design index (subject to change)															

**GENERAL SPECIFICATIONS**

Designation	Back pressure valve
Construction	Direct or pilot operated
Mounting	Sandwich construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Manually
Ambient temperature	-25 ... +70 °C
Weight	1,14 kg (Sandwich construction T) 1,75 kg (Sandwich construction A, B) 1,80 kg (Sandwich construction AB)

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400$ bar
Nominal pressure range	$P_{NOM}$ A: 63, 210, 315 bar V: 63, 160, 350 bar
Maximum volume flow	$Q_{max} = 30$ l/min
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade $\beta_{6...10} \geq 75$ , see data sheet 1.0-50

**Note!** Other specifications, see data sheet of the screw-in cartridges


**ACTUATION**

Actuation	S = lockable key adjustment D = lockable knob adjustment
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**Note!** Other specifications, see data sheet of the screw-in cartridges


**STANDARDS**

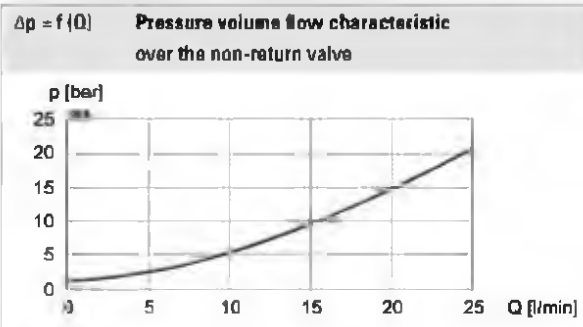
Mounting interface	Wandfluh standard
Contamination efficiency	ISO 4406

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

◆ The sandwich bodies are zinc-nickel coated

**PERFORMANCE SPECIFICATIONS**


**Note!** Detailed performance limits and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.



**Attention!** The performance data especially the „pressure-flow characteristic,“ on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the sandwich body must be taken into consideration.

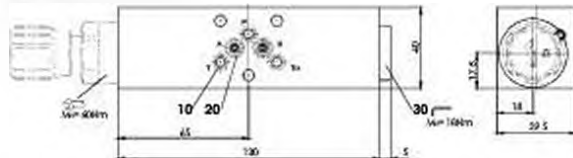

**VALVES INSTALLED**

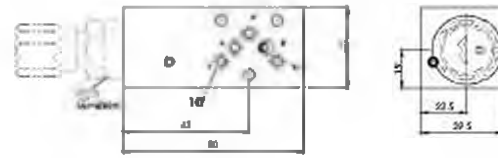
The following screw-in cartridges are used in the sandwich body.

Article	Description	Data sheet no.
BV.PM22	Pressure relief cartridge pilot operated	2.1-530
BA.PM22	Pressure relief cartridge direct operated	2.1-540

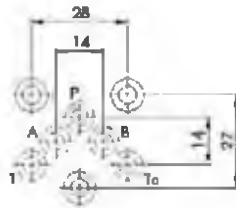


**DIMENSIONS**

 Sandwich execution  
 G.DSA04-A / B / AB

 G.DSA04-A: Cartridge on A side  
 G.DSA04-B: Cartridge on B side  
 G.DSA04-AB: Cartridge on A and B side

 Sandwich execution  
 G.DSA04-T

 Type of adjustment  
 G.SSA04

 Type of adjustment  
 G.ASA04

**HYDRAULIC CONNECTION**

**ACCESSORIES**

Verstellarten für Schraubpatrone	Data sheet 2.0-50
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Horizontal mounting blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**PARTS LIST**

Position	Article	Description
10	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)
20	160.2067	O-ring ID 6,75 x 1,78 (NBR)
	160.6067	O-ring ID 6,75 x 1,78 (FKM)
30	238.5404	Screw plug VSTI M22 x 1,5

**INSTALLATION NOTES**

Mounting type	Flange or sandwich mounting 3 fixing holes for socket head screws or studs M5
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (quality 8.8, zinc coated) Screw-in cartridge $M_0 = 60 \text{ Nm}$

**Back pressure valve**
**Sandwich construction**

- ◆ pilot operated or direct operated
- ◆  $p_{max} = 400 \text{ bar}$
- ◆  $p_{Hmax} = 350 \text{ bar}$
- ◆  $Q_{max} = 80 \text{ l/min}$

**NG6**
**ISO 4401-03**

**DESCRIPTION**

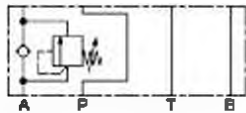
Pilot or direct operated backpressure valve in sandwich construction. The backpressure valve, also called pre-loading valve, opens the main spool when the adjusted pressure is reached.

**APPLICATION**

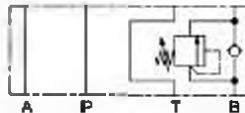
Backpressure valves with pressure adjustment in A, B, AB or T, are used for pre-loading of cylinders / motors, resp. for reaching a back pressure.

**SYMBOL**

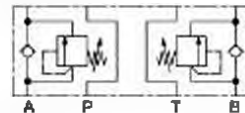
Sandwich execution

**G..SA..A**


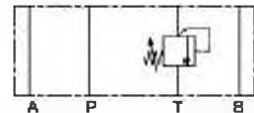
Sandwich execution

**G..SA..B**


Sandwich execution

**G..SA..AB**


Sandwich execution

**G..SA..T**

**Note!**


- ◆ Direct operated execution drawn
- ◆ All variants are also available pilot operated

**TYPE CODE**

Back-pressure valve	6		S A06		-	-	-	#
Direct operated		[A]						
Pilot operated		[V]						
Type of adjustment	Key	[S]						
	Control knob	[D]						
	Cover	[A]						
Sandwich construction								
Mounting interface acc. to ISO, NG6								
Type list / Function	in T	[T]	in A	[A]				
	in A and B	[AB]	in B	[B]				
Nominal pressure range (p <sub>..</sub> ) of the built-in screw-in cartridge								
Sealing material	NBR	[N]						
	FKM (Viton)	[D]						
Design index (subject to change)								

**GENERAL SPECIFICATIONS**

Designation	Back pressure valve
Construction	Direct or pilot operated
Mounting	Sandwich construction
Nominal size	NG6 according to ISO 4401-03
Actuation	Manually
Ambient temperature	-25...+70 °C
Weight	1,3 kg (Sandwich construction T) 2,6 kg (Sandwich construction A, B and AB)

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400$ bar
Nominal pressure range	$p_{x_{nom}} =$ A: 63, 210, 315 bar V: 63, 160, 350 bar
Minimum pressure	See characteristics
Maximum volume flow	$Q_{max} = 80$ l/min
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**Note!** Other specifications, see data sheet of the screw-in cartridges


**ACTUATION**

Actuation	S = lockable key adjustment D = lockable knob adjustment
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**Note!** Other specifications, see data sheet of the screw-in cartridges


**STANDARDS**

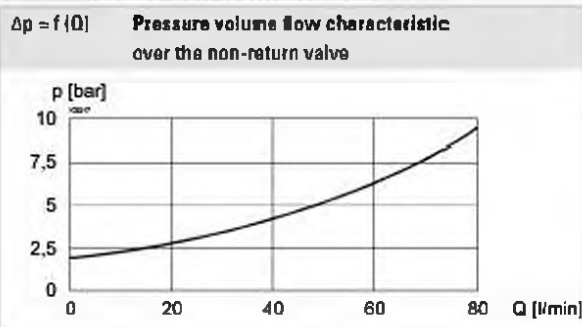
Mounting interface	ISO 4401-03
Contamination efficiency	ISO 4406

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

◆ The sandwich bodies are zinc-nickel coated

**PERFORMANCE SPECIFICATIONS**


**Note!** Detailed performance limits and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.



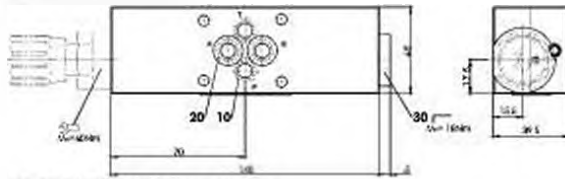
**Attention!** The performance data especially the „pressure-flow characteristic“ on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.


**VALVES INSTALLED**

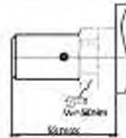
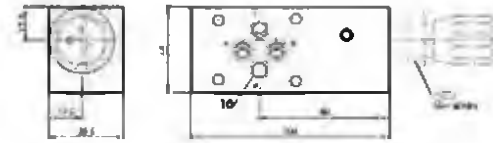
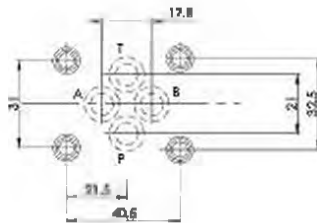
The following screw-in cartridges are used in the sandwich body.

Article	Description	Data sheet no.
BV.PM22	Pressure relief cartridge pilot operated	2.1-530
BA.PM22	Pressure relief cartridge direct operated	2.1-540

**DIMENSIONS**

 Sandwich execution  
 G.DSA06- A / B / AB

 G.DSA06-A: Cartridge on A side  
 G.DSA06-B: Cartridge on B side  
 G.DSA06-AB: Cartridge on A and B side

 Type of adjustment  
 G.SSA06

 Type of adjustment  
 G.ASA06

 Sandwich execution  
 G.DSA06-T

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
20	160.2111	O-ring ID 11,11 x 1,78 (NBR)
	160.6111	O-ring ID 11,11 x 1,78 (FKM)
30	238.5404	Screw plug VSTI M22 x 1,5

**ACCESSORIES**

Types of adjustment for screw-in cartridges	Data sheet 2.0-50
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Module type manifold blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**INSTALLATION NOTES**

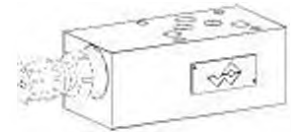
Mounting type	Sandwich mounting 4 fixing holes for socket head screws or studs M5
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (quality 8.8, zinc coated) Screw-in cartridge $M_0 = 60 \text{ Nm}$

**Back pressure valve**
**Sandwich construction**

- ◆ pilot operated or direct operated
- ◆  $p_{act} = 400 \text{ bar}$
- ◆  $p_{Nmax} = 350 \text{ bar}$
- ◆  $Q_{max} = 100 \text{ l/min}$

**NG10**

ISO 4401-05

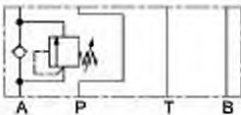
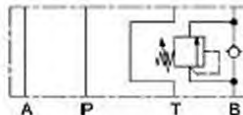
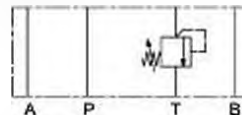

**DESCRIPTION**

Pilot or direct operated backpressure valve in sandwich construction. The backpressure valve, also called pre-loading valve, opens the main spool when the adjusted pressure is reached.

**APPLICATION**

Backpressure valves with pressure adjustment in A, B or T, are used for pre-loading of cylinders / motors, resp. for reaching a back pressure.

**SYMBOL**

 Sandwich execution  
 G..SA.-A

 Sandwich execution  
 G..SA.-B

 Sandwich execution  
 G..SA.-T

**Note!**


- ◆ Direct operated execution drawn
- ◆ All variants are also available pilot operated

**TYPE CODE**

Back-pressure valve		G		S		A10		-		-		-		#	
Direct operated			A												
Pilot operated			V												
Type of adjustment	Key		S												
	Control knob		D												
	Cover		A												
Sandwich construction															
Mounting interface acc. to ISO, NG 10															
Type list / Function	in T		T	in A		A									
	in B		B												
Nominal pressure range ( $p_N$ ) of the built-in screw-in cartridge															
Sealing material	NBR														
	FKM (Viton)		DT												
Design index (subject to change)															

**GENERAL SPECIFICATIONS**

Designation	Back pressure valve
Construction	Direct or pilot operated
Mounting	Sandwich construction
Nominal size	NG10 according to ISO 4401-05
Actuation	Manually
Ambient temperature	-25...+70 °C
Weight	2,3 kg

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400$ bar
Nominal pressure range	$P_{N100}$ A: 63, 210, 315 bar V: 63, 160, 350 bar
Minimum pressure	See characteristics
Maximum volume flow	$Q_{max} = 100$ l/min
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**Note!** Other specifications, see data sheet of the screw-in cartridges


**ACTUATION**

Actuation	S = lockable key adjustment □ = lockable knob adjustment
-----------	---

**Note!** Other specifications, see data sheet of the screw-in cartridges


**STANDARDS**

Mounting interface	ISO 4401-05
Contamination efficiency	ISO 4406

**SEALING MATERIAL**

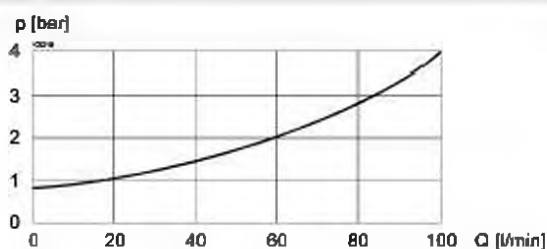
NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The sandwich bodies made of steel are zinc-phosphated

**PERFORMANCE SPECIFICATIONS**

$\Delta p = f(Q)$  Pressure volume flow characteristic over the non-return valve



**Note!** Detailed performance limits and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.



**Attention!** The performance data especially the „pressure-flowcharacteristic,“ on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the sandwich body must be taken into consideration.

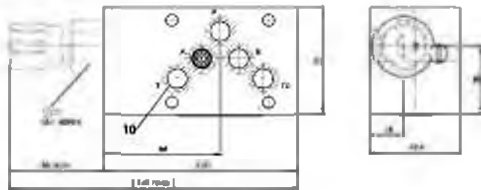

**VALVES INSTALLED**

The following screw-in cartridges are used in the sandwich body.

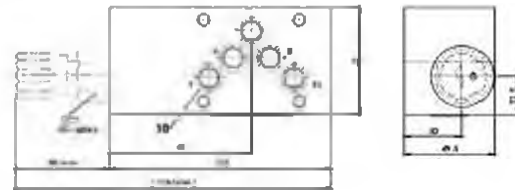
Article	Description	Data sheet no.
BV PM22	Pressure relief cartridge pilot operated	2.1-530
BA PM22	Pressure relief cartridge direct operated	2.1-540

**DIMENSIONS**

Sandwich execution

**G.DSA10-A / B**

**G.DSA10-A: Cartridge on A side**
**G.DSA10-B: Cartridge on B side**

Sandwich execution

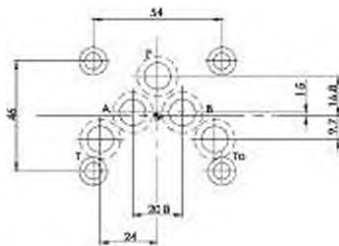
**G.DSA10-T**


Type of adjustment

**G.SSA10**


Type of adjustment

**G.ASA10**

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)

**ACCESSORIES**

Types of adjustment for screw-in cartridges	Data sheet 2.0-50
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Module type manifold blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

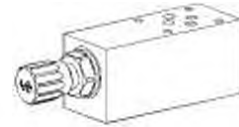
**INSTALLATION NOTES**

Mounting type	Sandwich mounting 4 fixing holes for socket head screws or studs M6
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 8,9 \text{ Nm}$ (quality 8.8, zinc coated) Screw-in cartridge $M_0 = 60 \text{ Nm}$

**Pressure sequence valve**
**Sandwich construction**

- Pilot operated
- $Q_{max} = 60 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_{N max} = 350 \text{ bar}$

**NG6**  
 ISO 4401-03


**DESCRIPTION**

Pressure sequence valve in sandwich construction. Connection diagram in accordance with ISO 4401-03. The valves are available in three types of adjustment, one of them being lockable, the others being fixed. A cover is also available for key adjustment, see data sheet 2.0-50. Three pressure stages are available as standard. The steel bodies of the sandwich are phosphate coated.

**FUNCTION**

The pressure sequence valve connects consumers in hydraulic circuits. When the set pressure has been reached, the pilot operation opens to the tank, thereby opening the main spool to the next consumer. The pilot oil flows via an internal drain line to T port.

**APPLICATION**

For sequence control of operating sequences, whereby a consumer is switched on when a specific pressure is reached. Sandwich vertical stacking valves are suitable for machine tools, also for mobile equipment of all kinds.

**TYPE CODE**

		F	V	<input type="checkbox"/>	S	A06	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Pressure sequence valve											
Pilot operated											
Type of adjustment	Key	S									
	Control knob	D									
	Cover	A									
Sandwich construction											
International standard interface ISO, NG6											
Type list / function	in P	P									
Nominal pressure, $p_N$	63 bar	63									
	160 bar	160									
	350 bar	350									
Design-Index (Subject to change)											

**GENERAL SPECIFICATIONS**

Nominal Size	NG6 according to ISO 4401-03
Designation	Pressure sequence valve pilot operated
Construction	Sandwich construction
Type of fixture	4 mounting holes for M5 socket head screws or M5 locking screws.
Tightening torques	$M_t = 5,5 \text{ Nm}$ (qual. 8.8) for fixing screws $M_t = 60 \text{ Nm}$ for screw cartridges
Type of connections	Thread-connection plates Rows of flange plates and horizontal stacking system.
Installation position	any
Ambient temperature	-20...+50 °C
Weight	m = 1,4 kg

**HYDRAULIC SPECIFICATIONS**

Hydraulic fluid	Mineral oils, other media on request
Max. permissible contamination level	ISO 4406:1999, class 18/16/13 (Recommended filter gauge $\beta_{8...10} \geq 75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Hydraulic fluid temp.	-20...+70 °C
Peak pressure	$p_{max} = 400 \text{ bar}$
Rated pressure ranges	$p_N = 63 \text{ bar}, 160 \text{ bar}, 350 \text{ bar}$
Minimum pressure	see curve
Opening pressure over non-return valve	$p_o = 2,0 \text{ bar}$
Maximum volume flow	$Q_{max} = 60 \text{ l/min}$

Other hydraulic characteristics can be obtained from the data sheets 2.1-548 for cartridge M22x1,5.




**REMARK!**

Detailed performance data and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.

**CAUTION!**


The performance data especially the „pressure-flow-characteristic,“ on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

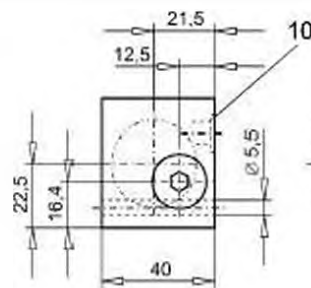
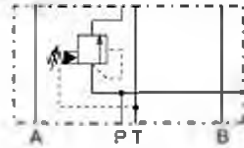
**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in the sandwich body:

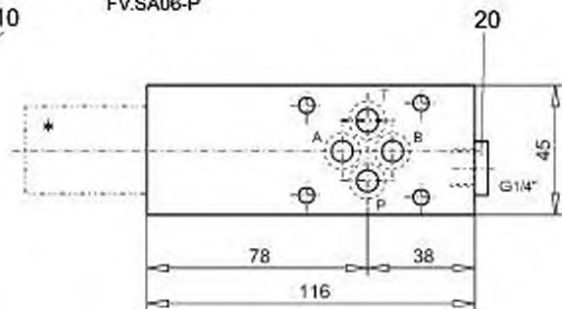
Type	Designation	Data sheet no.
FV.PM22	Pressure sequence valve - pilot operated	2.1-546

**TYPE LIST / DIMENSIONS**

FV.SA06-P



FV.SA06-P


**PARTS LIST**

Position	Article	Description
10	180.2093	O-ring ID 9,25x1,78
20	238.2406	Plug VSTI G1/4"-ED

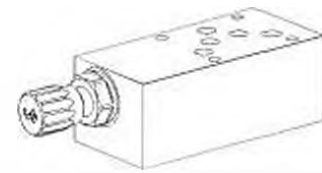
\* The exterior dimensions of the cartridges can be obtained from the data sheet 2.1-546.

Technical explanation see data sheet 1.0-100

**Pressure sequence valve**
**Sandwich construction**

- Pilot operated
- $Q_{max} = 100 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_{Nmax} = 350 \text{ bar}$

**NG10**  
ISO 4401-05


**DESCRIPTION**

Pressure sequence valve in sandwich construction. Connection diagram in accordance with ISO 4401-05. The valves are available in two types of adjustment, the others being fixed. A cover is also available for key adjustment, see data sheet 2.0-50. Three pressure stages are available as standard. The steel bodies of the sandwich are phosphate coated.

**FUNCTION**

The pressure sequence valve connects consumers in hydraulic circuits. When the set pressure has been reached, the pilot operation opens to the tank, thereby opening the main spool to the next consumer. The pilot oil flows via an internal drain line to T port.

**APPLICATION**

For sequence control of operating sequences, whereby a consumer is switched on when a specific pressure is reached. Sandwich vertical stacking valves are suitable for machine tools, also for mobile equipment of all kinds.

**TYPE CODE**

	F V <input type="checkbox"/> S A10 <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>
Pressure sequence valve	
Pilot operated	
Type of adjustment	
Key	S
Control knob	D
Cover	A
Sandwich construction	
International standard interface ISO, NG10	
Type list / function	
in P	P
Nominal pressure, $p_N$	
63 bar	63
160 bar	160
350 bar	350
Design-Index (Subject to change)	

**GENERAL SPECIFICATIONS**

Nominal Size	NG10 acc. to ISO 4401-05
Designation	Pressure sequence valve pilot operated
Construction	Sandwich construction
Type of fixture	4 mounting holes for M6 socket head screws or M6 locking screws
Tightening torques	$M_t = 9,5 \text{ Nm}$ (Qual. 8.8) for fixing screws $M_t = 60 \text{ Nm}$ for screw cartridge
Type of connection	Thread-connection plates Rows of flange plates and horizontal stacking system.
Installation position	any
Ambient temperature	-20...+50 °C
Weight	m = 1,9 kg

**HYDRAULIC SPECIFICATIONS**

Hydraulic fluid	Mineral oils, other media on request
Max. permissible contamination level	ISO 4406:1999, class 18/18/13 (Recommended filter gauge G6...10:75) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Hydraulic fluid temp.	-20...+70 °C
Peak pressure	$p_{max} = 400 \text{ bar}$
Rated pressure ranges	$p_N = 63 \text{ bar}, 160 \text{ bar}, 350 \text{ bar}$
Minimum pressure	see curve
Maximum volume flow	$Q_{max} = 100 \text{ l/min}$

Other hydraulic characteristics can be obtained from the data sheets 2.1-548 for cartridge M22x1,5.


**REMARK!**

Detailed performance data and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.

**CAUTION!**


The performance data especially the „pressure-flow-characteristic,“ on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

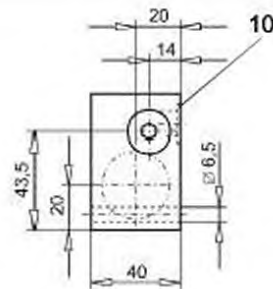
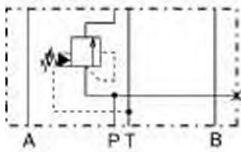
**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in the sandwich body:

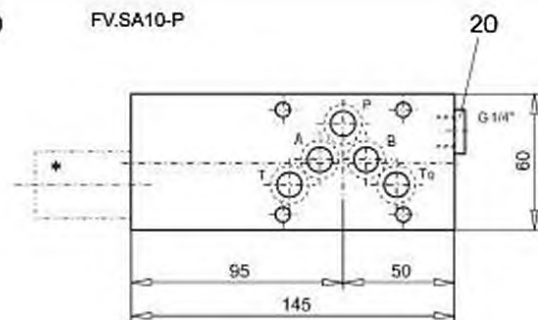
Type	Designation	Data sheet no.
FV.PM22	Pressure sequence valve - pilot operated	2.1-546

**TYPE LIST / DIMENSIONS**

FV.SA10-P



FV.SA10-P


**PARTS LIST**

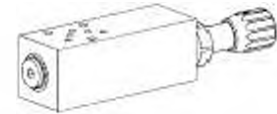
Position	Article	Description
10	160.2140	O-ring ID 14,00x1.78
20	238.2406	Plug VST1 G1/4"-ED

\* The exterior dimensions of the cartridges can be obtained from the data sheet 2.1-546.

Technical explanation see data sheet 1.0-100

**Accumulator unloading valve**
**Sandwich construction**

- 1-point adjustment
- Pilot operated
- $Q_{max} = 8 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_{Nmax} = 350 \text{ bar}$

**NG4-Mini<sup>30</sup>**

**DESCRIPTION**

Sandwich type pilot operated accumulator unloading valve. Mounting interface according to Wandfluh standard. The valve is available with two types of setting, both interlockable. There are three pressure stages to choose from. The valve has an adjustable unloading point and a defined re-switching difference. The steel bodies of the sandwich valve are phosphata coated. Steel cartridge body and adjustment spindle galvanised to protect them against corrosion. The aluminium knob has a natural anodised finish. The quality of this product is reflected in the good performance data and design.

**FUNCTION**

If the P pressure exceeds the adjustable unloading point, the pilot spool is opening the pilot valve. A control flow starts to flow and the back end of the main spool is depressurised. The resultant pressure difference displaces the main spool towards the spring and the valve switches to unloading circulation. Because of the difference in section in the pilot area, the pilot flow is interrupted as soon as the pressure in the accumulator drops by 15% or 25% of the upper switching point. The pressure at the main spool are equilibrated and the spring displaces the main spool to the closed position. The pump can now build up the system pressure again as far as the unloading point and the cycle starts again.

**APPLICATION**

Accumulator loading valves are used in hydraulic systems with accumulators. They allow a low cost, energy saving system design in cases where the cylinder flow demand varies considerably or for retaining pressures over a period of time, e.g. for clamping processes. Mini-4 accumulator unloading valves are used everywhere where lightweight, small hydraulic control systems are required. **Note:** An additional relief valve for system protection must be installed. Please refer to the set-up and connection example on page 2.

**TYPE CODE**

			US	<input type="checkbox"/>	S	A04	-	P	<input type="checkbox"/>	#	<input type="checkbox"/>
Accumulator unloading valve, pilot operated											
Type of adjustment	Key				S						
	Control knob				D						
Sandwich construction											
Mounting interface acc. to Wandfluh standard, NG4-Mini											
Type list / function	in P										
Pressure range $p_N$	100 bar										100
	160 bar										160
	350 bar										350
Design-Index (Subject to change)											

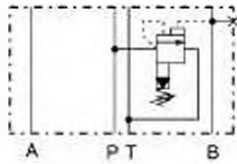
**GENERAL SPECIFICATIONS**

Description	Pilot operated accumulator unloading valve
Nominal size	NG4-Mini acc. to Wandfluh standard
Construction	Sandwich construction
Mounting	3 holes for socket cap screw M5 or studs M5
Connections	Connection plates Multi-station flange subplate Longitudinal stacking system
Mounting position	any
Ambient temperature	-20...+50 °C
Fastening torque	$M_0 = 5,5 \text{ Nm}$ (qual 8.8) for fixing screw $M_0 = 50 \text{ Nm}$ for screw cartridge
Weight	$m = 1,4 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade B6...10275) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 400 \text{ bar}$
Nominal pressure	$p_N = 100 \text{ bar}$ , $p_N = 160 \text{ bar}$ , $p_N = 350 \text{ bar}$
Minimum pressure	$p_{min} = 50 \text{ bar}$ for $p_N 160 / 350 \text{ bar}$ $p_{min} = 25 \text{ bar}$ for $p_N 100 \text{ bar}$
Diff. unloading/loading	15 ± 3% for $p_N = 160 / 350 \text{ bar}$ 25 ± 3% for $p_N = 100 \text{ bar}$
Volume flow	$Q_{max} = 1...8 \text{ l/min}$ (over 8 l/min on request)
Leakage volume flow	Maximum 4 drops/min in accumulator operation P - T

For further hydraulic characteristics refer to data sheet: 2.1-548

**SYMBOL**

**REMARK!**

Detailed performance data and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.

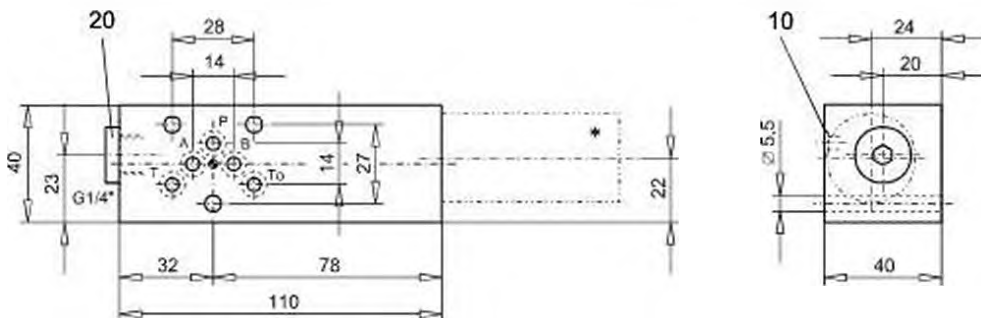
**CAUTION!**


The performance data especially the „pressure-flow-characteristic“, on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in the sandwich body:

Type	Designation	Data sheet no.
US.PM22	Accumulator unloading valve • pilot operated	2.1-548

**DIMENSIONS**


\* The exterior dimensions of the cartridge can be obtained from the corresponding data sheet 2.1-548

**PARTS LIST**

Position	Article	Description
10	180.2052	O-ring ID 5,28x1,78
20	238.2406	Plug VSTI G1/4"-ED

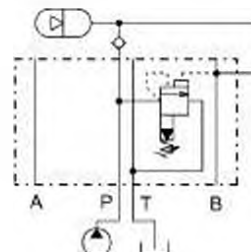
**SET-UP AND CONNECTION EXAMPLES**

Unloading point adjusted at 100 bar (OS)

Differential value 15%

Loading point: (US) = OS minus 15% = 85 bar

Gas side of accumulator loaded upto max. 90% of US = 76 bar

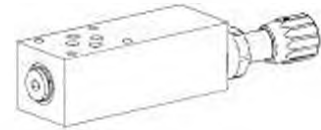


Technical explanation see data sheet 1.0-100

**Accumulator unloading valve**
**Sandwich construction**

- 1-point adjustment
- Pilot operated
- $Q_{max} = 24 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_{Nmax} = 350 \text{ bar}$

**NG6**  
 ISO 4401-03


**DESCRIPTION**

Sandwich type pilot operated accumulator unloading valve. Mounting interface acc. to ISO 4401-03. The valve is available with two types of setting, both interlockable. There are three pressure stages to choose from. The valve has an adjustable unloading point and a defined re-switching difference. The steel bodies of the sandwich valve are phosphate coated. Steel cartridge body and adjustment spindle galvanised to protect them against corrosion. The aluminium knob has a natural anodised finish. The quality of this product is reflected in the good performance data and design.

**FUNCTION**

If the P pressure exceeds the adjustable unloading point, the pilot spool is opening the pilot valve. A control flow starts to flow and the back end of the main spool is depressurised. The resultant pressure difference displaces the main spool towards the spring and the valve switches to unloading circulation. Because of the difference in section in the pilot area, the pilot flow is interrupted as soon as the pressure in the accumulator drops by 15% or 25% of the upper switching point. The pressures at the main spool are equilibrated and the spring displaces the main spool to the closed position. The pump can now build up the system pressure again as far as the unloading point and the cycle starts again.

**APPLICATION**

Accumulator loading valves are used in hydraulic systems with accumulators. They allow a low cost, energy saving system design in cases where the cylinder flow demand varies considerably or for retaining pressures over a period of time, e.g. for clamping processes. **Note:** An additional relief valve for system protection must be installed. Please refer to the set-up and connection example on page 2.

**TYPE CODE**

		US	<input type="checkbox"/>	S	<input type="checkbox"/>	A06	-	P	<input type="checkbox"/>	#	<input type="checkbox"/>
Accumulator unloading valve, pilot operated											
Type of adjustment	screw knob			S							
				D							
Sandwich construction											
International standard interface ISO, NG6											
Type list / function	in P										
Pressure range $p_x$	100 bar	100									
	160 bar	160									
	350 bar	350									
Design-Index (Subject to change)											

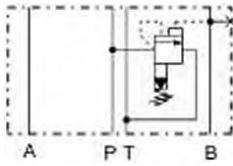
**GENERAL SPECIFICATIONS**

Description	Pilot operated accumulator unloading valve
Nominal size	NG6 according to ISO 4401-03
Construction	Sandwich construction
Mounting	4 holes for socket cap screw M5 or studs M5
Connections	Connection plates Multi-station flange subplate Longitudinal stacking system
Mounting position	any
Ambient temperature	-20...+50 °C
Fastening torque	$M_0 = 5,5 \text{ Nm}$ (Qual 8.8) for fixing screw $M_c = 50 \text{ Nm}$ for screw cartridge
Weight	$m = 1,7 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\geq 6 \dots 10 \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 400 \text{ bar}$
Nominal pressure	$p_x = 100 \text{ bar}$ , $p_x = 160 \text{ bar}$ , $p_x = 350 \text{ bar}$
Minimum pressure	$p_{min} = 50 \text{ bar}$ for $p_x = 160 / 350 \text{ bar}$ $p_{min} = 25 \text{ bar}$ for $p_x = 100 \text{ bar}$
Diff. unloading/loading	$15 \pm 3\%$ for $p_x = 160 / 350 \text{ bar}$ $25 \pm 3\%$ for $p_x = 100 \text{ bar}$
Volume flow	$Q_{max} = 1 \dots 24 \text{ l/min}$ (over 24 l/min on request)
Leakage volume flow	Maximum 4 drops/min in accumulator operation P - T

For further hydraulic characteristics refer to data sheet: 2.1-548

**SYMBOL**

**REMARK!**

Detailed performance data and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.

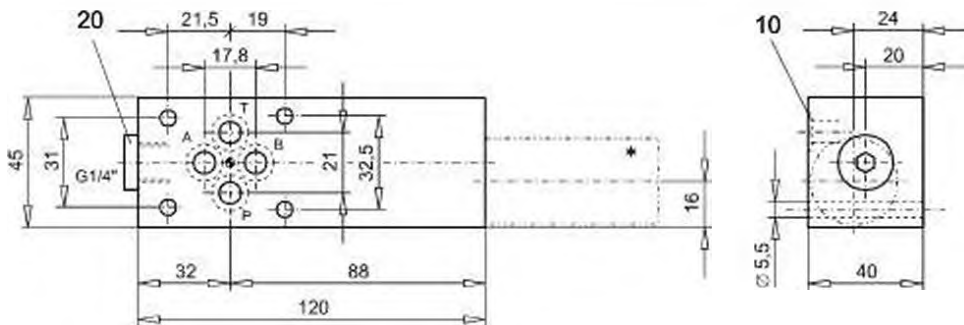
**CAUTION!**


The performance data especially the „pressure-flow-characteristic“, on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in the sandwich body:

Type	Designation	Data sheet no.
US.PM22	Accumulator unloading valve • pilot operated	2.1-548

**DIMENSIONS**


- The exterior dimensions of the cartridge can be obtained from the corresponding data sheet 2.1-548

**PARTS LIST**

Position	Article	Description
10	160.2093	O-ring ID 9.25x1,78
20	238.2406	Plug VST1 G1/4"-ED

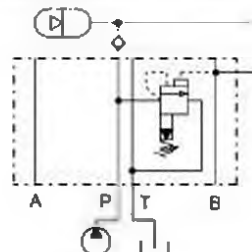
**SET-UP AND CONNECTION EXAMPLES**

Unloading point adjusted at 100 bar (OS)

Differential value 15%

Loading point: (US) = OS minus 15% = 85 bar

Gas side of accumulator loaded upto max. 90% of US = 76 bar



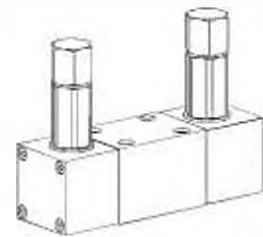
Technical explanation see data sheet 1.0-100

**Accumulator loading valve**
**Flange construction**

- 2-point-adjustment
- $Q_{max} = 30 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_{N max} = 350 \text{ bar}$

**DESCRIPTION**

Flange typ pilot operated accumulator loading valve. Mounting interface acc. to ISO 4401-03. 3 pressure ranges are available. The upper and lower shifting pressure are adjustable in dependency from each other. A minimum pressure difference must be observed. Spools are of hardened steel, body is of high grade hydraulic cast iron for long service life.

**NG6**  
 ISO 4401-03

**FUNCTION**

The accumulator loading valve diverts pump flow back to tank at low  $\Delta p$  after upper working pressure of the accumulator has been reached and to load the accumulator when pressure of the stored fluid drops to the lower working pressure. Hydraulic circuits with short time peak consumption of fluids may be built by combining a pump with relatively low delivery and an accumulator. Energy input will be reduced.

**Important:**

For loading an accumulator a check valve for free flow from P to B line is necessary (Sandwich plate NG8: ARV6/P-B must be ordered separately).

**APPLICATION**

Accumulator loading valves are used in hydraulic systems with accumulator. Systems with low energy consumption and reduced installation costs may be built where oil demand of a cylinder varies or for load holding functions eg. clamping functions.

**Important:**

- An additional relief valve for system protection has to be installed. The relief valve setting must be above the upper shifting pressure of the accumulator loading valve.
- Drain port A needs a separate tank line as back pressure influences the pressure settings.
- Gas charge of the accumulator may not exceed 90 % of lower shifting pressure.

**TYPE CODE**

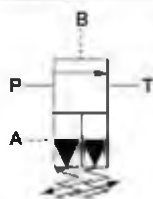
			A	SPLV	6	2	/	<input type="checkbox"/>	#	<input type="checkbox"/>
International mounting interface ISO										
Accumulator loading valve										
Nominal size 6										
2 adjustable shifting pressures										
Pressure range $p_x$	63 bar	<input type="checkbox"/>								
	160 bar	<input type="checkbox"/>								
	350 bar	<input type="checkbox"/>								
Design-index (Subject to change)										

**GENERAL SPECIFICATIONS**

Description	Pilot operated accumulator loading valve
Nominal size	NG6 acc. to ISO 4401-03
Construction	Flange construction
Mounting	Flange 4 fixing holes for head cap screws M5x45 (with in addition ARV6/P-B: socket head cap screws M5x88)
Connections	Connection plates Multi-station flange subplate Longitudinal stacking system
Ambient temperature	-20...+50°C
Mounting position	any
Fastening torque	$M_0 = 5,5 \text{ Nm}$ (quality 8.8)
Weight	$m = 2,7 \text{ kg}$

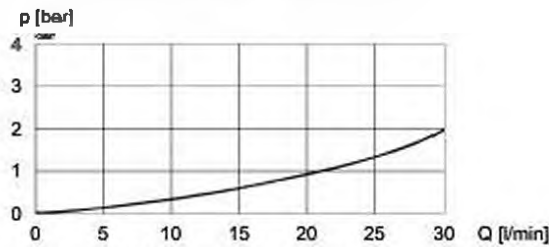
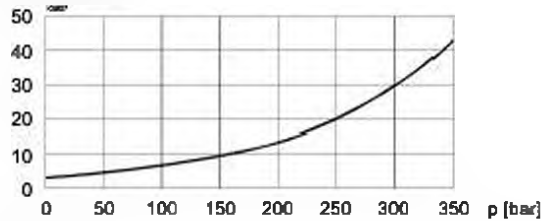
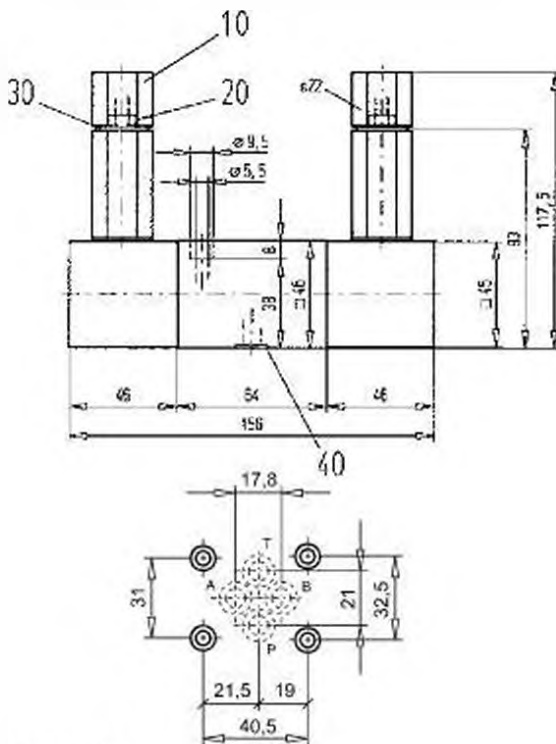
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1989, class 18/16/13...21/19/15 (Required filtration grade 86...25>75) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70°C
Peak pressure	$p_{max} = 400 \text{ bar}$
Nominal pressure $p_x$	$p_1 = 63 \text{ bar}$ , $p_2 = 160 \text{ bar}$ , $p_3 = 350 \text{ bar}$
Minimum pressure $p_{min}$	$p_1: 20 \text{ bar}$ , $p_2/p_3: 25 \text{ bar}$
Min. shifting pressure diff.	$p_1: 15 \text{ bar}$ , $p_2: 25 \text{ bar}$ , $p_3: 30 \text{ bar}$
Pressure adjustment	$p_1: 12 \text{ bar/tum}$ , $p_2: 20 \text{ bar/tum}$ $p_3: 40 \text{ bar/tum}$
Volume flow	$Q = 1...30 \text{ l/min}$
Leakage volume flow	see characteristics

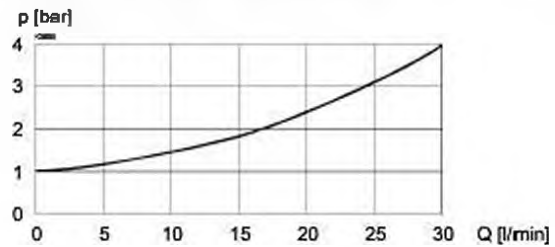
**SYMBOL**


P: Pressure port  
 T: Tank port  
 A: Drain port  
 B: Pilot port



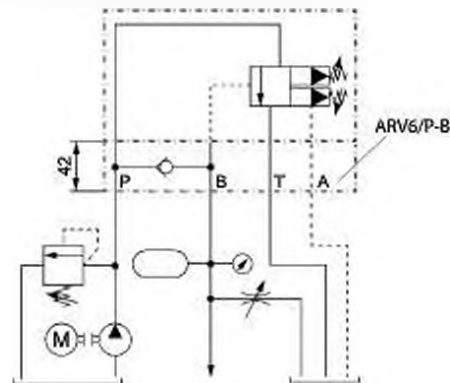
**CHARACTERISTICS** oilviscosity  $\nu = 30 \text{ mm}^2/\text{s}$   
 $\Delta p = f(Q)$  Pressure-flow characteristics curve  
 (Accumulator operation- pump unloading)

 $Q_L = f(p)$  Leakage volume flow-characteristics  
 $Q$  [cm<sup>3</sup>/min]

**DIMENSIONS**

**PARTS LIST**

Position	Article	Designation
10	154.7200	Cap nut M6x23
20	153.1301	Hexagonal nut 0,8 D M6
30	049.1180	Cap. seal ring NG 18x22x1,5 DIN 7803
40	160.2078 160.2108	O-ring ID 7,65 x 1,78 (A and B) O-ring ID 10,82 x 1,78 (P and T)

 $\Delta p = f(Q)$  Pressure-drop flow characteristics curve  
 (over check valve ARV6/P-B)

**Setting procedure**
**Adjusting the shifting pressures**

To adjust the acc. / v. a drain code (B to tank) is required.

The accumulator loading valve has 2 adjusting screws, and lock nuts, to ensure that the set pressures are maintained. The „OS“ adjusting screw is used to set the upper shifting point, and the „US“ adjusting screw to set the lower shifting point.


**Procedure**

1. Open throttle to by-pass flow to tank when pump gets started.
2. Adjustment screw „US“: turn anti clockwise to relief spring completely.
3. Adjustment screw „OS“: turn clockwise to the stop, then 2 turns back.
4. Start pumps. Close throttle. Check relief valve setting (min 10 bar higher than desired upper shifting pressure of accumulator for loading valve).
5. Close throttle partially and let pressure rise to the desired upper working pressure.
6. Turn adjustment „OS“ anti clockwise to the point where the valve shifts into unloading function.
7. Open throttle slowly and let pressure drop until valve shifts into loading function.
8. Turn adjustment „US“ clockwise to the specified lower shifting pressure.
9. Lock adjustments with lock nuts. Check set pressures by simulating varying oil demands with throttle.
10. Mount caps and close throttle.

**ACCESSORIES**

Connection plates, multi-station flange subplate and longitudinal stacking system Register 2.9  
 Check sandwich valve NG6 ARV6/P-B Article no. 662.3010

Technical explanation see data sheet 1.0-100

**Accumulator unloading valve**
**Sandwich construction**

- 1-point adjustment
- Pilot operated
- $Q_{max} = 30 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_{Nmax} = 350 \text{ bar}$

**NG10**  
ISO 4401-05


**DESCRIPTION**

Sandwich type pilot operated accumulator unloading valve. Mounting interface acc. to ISO 4401-05. The valve is available with two types of setting, both interlockable. There are three pressure stages to choose from. The valve has an adjustable unloading point and a defined re-switching difference. The steel bodies of the sandwich valve are phosphate coated. Steel cartridge body and adjustment spindle galvanised to protect them against corrosion. The aluminium knob has a natural anodised finish. The quality of this product is reflected in the good performance data and design.

**FUNCTION**

If the P pressure exceeds the adjustable unloading point, the pilot spool is opening the pilot valve. A control flow starts to flow and the back end of the main spool is depressurised. The resultant pressure difference displaces the main spool towards the spring and the valve switches to unloading circulation. Because of the difference in section in the pilot area, the pilot flow is interrupted as soon as the pressure in the accumulator drops by 15% or 25% of the upper switching point. The pressures at the main spool are equilibrated and the spring displaces the main spool to the closed position. The pump can now build up the system pressure again as far as the unloading point and the cycle starts again.

**APPLICATION**

Accumulator loading valves are used in hydraulic systems with accumulators. They allow a low cost, energy saving system design in cases where the cylinder flow demand varies considerably or for retaining pressures over a period of time, e.g. for clamping processes. **Note:** An additional relief valve for system protection must be installed. Please refer to the set-up and connection example on page 2.

**TYPE CODE**

		US <input type="checkbox"/> S <input type="checkbox"/> A10 - P <input type="checkbox"/> = <input type="checkbox"/>
Accumulator unloading valve pilot operated		
Type of adjustment	screw knob	<b>S</b> <b>D</b>
Sandwich construction		
International standard interface ISO, NG10		
Type list / function	in P	
Pressure range $p_x$	100 bar	<b>100</b>
	160 bar	<b>160</b>
	350 bar	<b>350</b>
Design-Index (Subject to change)		

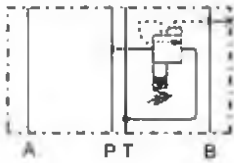
**GENERAL SPECIFICATIONS**

Description	Pilot operated accumulator unloading valve
Nominal size	NG10 according to ISO 4401-05
Construction	Sandwich construction
Mounting	4 holes for socket cap screw M6 or studs M6
Connections	Connection plates Multi-station flange subplate Longitudinal stacking system
Mounting position	any
Ambient temperature	-20...+50 °C
Fastening torque	$M_s = 9,5 \text{ Nm}$ (Qual 8.8) for fixing screw $M_c = 50 \text{ Nm}$ for screw cartridge
Weight	$m = 2,7 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\geq 6 \dots 10 \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 400 \text{ bar}$
Nominal pressure	$p_x = 100 \text{ bar}$ , $p_x = 160 \text{ bar}$ , $p_x = 350 \text{ bar}$
Minimum pressure	$p_{min} = 50 \text{ bar}$ for $p_x = 160 / 350 \text{ bar}$ $p_{min} = 25 \text{ bar}$ for $p_x = 100 \text{ bar}$
Diff. unloading/loading	$15 \pm 3\%$ for $p_x = 160 / 350 \text{ bar}$ $25 \pm 3\%$ for $p_x = 100 \text{ bar}$
Volume flow	$Q_{max} = 1...30 \text{ l/min}$ (over 30 l/min on request)
Leakage volume flow	Maximum 4 drops/min in accumulator operation P - T

For further hydraulic characteristics refer to data sheet: 2.1-548

**SYMBOL**

**REMARK!**

Detailed performance data and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.

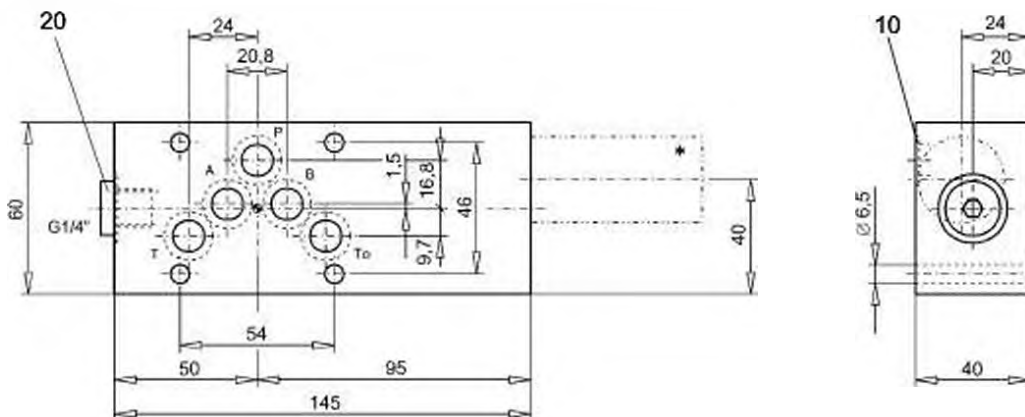
**CAUTION!**


The performance data especially the „pressure-flow-characteristic“, on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in the sandwich body:

Type	Designation	Data sheet no.
US.PM22	Accumulator unloading valve • pilot operated	2.1-548

**DIMENSIONS**


- The exterior dimensions of the cartridge can be obtained from the corresponding data sheet 2.1-548

**PARTS LIST**

Position	Article	Description
10	180.2140	O-ring ID 14.00x1.78
20	238.2406	Plug VST1 G1/4"-ED

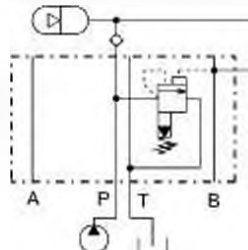
**SET-UP AND CONNECTION EXAMPLES**

Unloading point adjusted at 100 bar (OS)




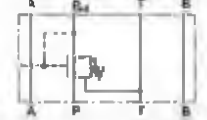
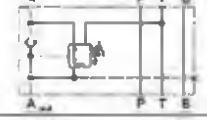
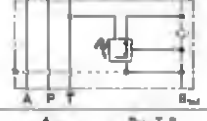


Differential value 15%

Loading point: (US) = OS minus 15% = 85 bar

Gas side of accumulator loaded upto max. 90% of US = 76 bar



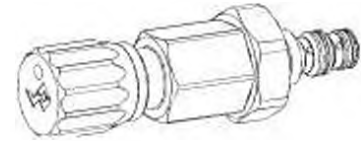
Technical explanation see data sheet 1.0-100

	NG3-Mini	NG4-Mini	NG6 ISO	NG10 ISO
Direct operated execution drawn	<b>Types</b>			
	MD_FA03-P/A 2.2-605 MV_FA03-P/A 2.2-600	MV_FA04-P/A 2.2-620 BDRVdN4 2.2-630	MV_FA06-P/A 2.2-640 ADRVdN6 2.2-650	MV_FA10-P/A 2.2-660 ADRVdN10 2.2-670
			ADRVd6	
		BDRVd4		
	MD_SA03-P 2.2-605 MV_SA03-P 2.2-600	MV_SA04-P 2.2-620 BDRVd4 2.2-630	MV_SA06-P 2.2-640 ADRVd6 2.2-650	MV_SA10-P 2.2-660 ADRVd10 2.2-670
	MD_SA03-A 2.2-605 MV_SA03-A 2.2-600	MV_SA04-A 2.2-620 BDRVdA4 2.2-630	MV_SA06-A 2.2-640 ADRVdA6 2.2-650	MV_SA10-A 2.2-660 ADRVdA10 2.2-670
		MV_SA04-B 2.2-620 BDRVdB4 2.2-630	MV_SA06-B 2.2-640 ADRVdB6 2.2-650	MV_SA10-B 2.2-660 ADRVdB10 2.2-670
		BDRVd4-S486	ADRVd6-S486	
			ADRVdB6-S486	

**Pressure reducing valve**
**Screw-in cartridge**

- Direct operated
- $Q_{max} = 6 \text{ l/min}$
- $p_{max} = 210 \text{ bar (350 bar)}$
- $p_{N \text{ red max}} = 50 \text{ bar}$

**M16x1,5**  
Wandfluh standard


**DESCRIPTION**

Direct operated pressure reducing valve as a screw-in cartridge with a thread M16x1,5. The valve reduces the inlet pressure to an adjustable outlet pressure. The integrated pressure relief function prevents the reduced pressure, a result of external pressures, from being exceeded. The valve is available with 2 types of adjustment. For the key adjustment, in addition a cover is available, see data sheet 2.0-50. The special surface treatment protects the external parts against corrosion and improves the slide properties of the control spool. The housing is made of stainless steel.

**FUNCTION**

The pressure reducing valve controls the pressure in port A (1). By increasing the spring tension, the pressure in port A (1) increases. The valve works practically independent of the pressure in port P (2). A pressure increase in port A (1) above the adjusted pressure, e.g. by an active oil consumer, is prevented by relieving excess oil to tank T (3).

**APPLICATION**

Pressure reducing valves are used to keep the pressure in the consumer constant independent of pressure fluctuations on the supply side. In the case of several consumers, the pressure of the individual consumers can be adjusted individually by the pressure reducing valve. By the integrated pressure relief, an additional pressure relief valve is not necessary in the consumer line. Installation of the screw-in cartridge in control blocks.

**TYPE CODE**

Pressure reducing valve		M	D	PM16	-	-	-	#
Direct operated								
Type of adjustment	Key	S						
	Turning knob	D						
	Cover	A	(see data sheet 2.0-50)					
Screw-in cartridge M16x1,5								
Nominal pressure range $p_{N \text{ red}}$	18 bar	18						
	32 bar	32						
	50 bar	50						
Sealing material	NBR							
	FKM (Viton)	D1						
System pressure max. 210 bar								
System pressure max. 350 bar		Z406						

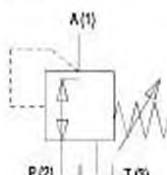
Design-Index (Subject to change)

**GENERAL SPECIFICATIONS**

Description	Direct operated pressure reducing valve
Construction	Screw-in cartridge for cavity according to Wandfluh standard
Mounting	Screw thread M16x1,5
Ambient temperature	-25...+70°C
Mounting position	any
Fastening torque	$M_0 = 30 \text{ Nm}$
Weight:	$m = 0,11 \text{ kg}$ (Key)
	$m = 0,12 \text{ kg}$ (Control knob)

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{0.5} \dots 10 \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-25...+70°C
Peak pressure	$p_{max} = 210 \text{ bar}$
Minimum adjustable pressure	< 0,5 bar
Nominal pressure range	$p_{N \text{ red}} = 18 \text{ bar, } 32 \text{ bar, } 50 \text{ bar}$
Volume flow range	$Q = 0 \dots 6 \text{ l/min}$
Leakage volume flow	18/32 bar version
	$p_{210} = 210 \text{ bar}$
	$p_{210} = 0 \text{ bar: } < 10 \text{ ml/min.}$
	$p_{210} = 25 \text{ bar: } < 50 \text{ ml/min.}$
	50 bar version
	$p_{210} = 0 \text{ bar: } < 10 \text{ ml/min.}$
	$p_{210} = 40 \text{ bar: } < 40 \text{ ml/min.}$

**SYMBOL**

**ACTUATION**

Mechanical types of actuation in 2 different executions:

S = Key adjustment with fork wrench and Allen key

D = Control knob adjustment, lockable

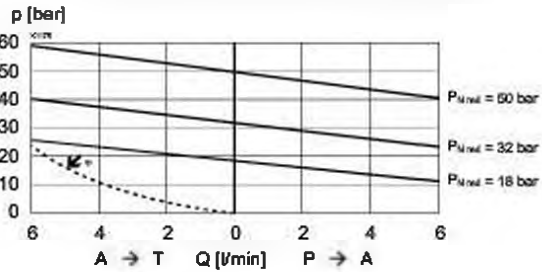
 Actuation stroke  $S_s = 5,25 \text{ mm}$ 

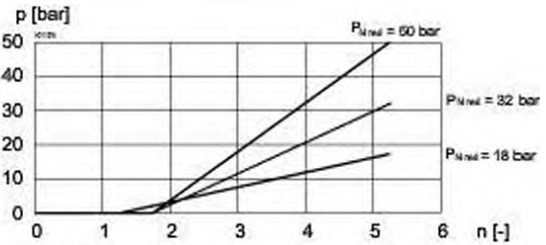
 Actuation angle  $\alpha_s = 1890^\circ$  (5,25 revolutions)

**CHARACTERISTICS** oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $p_{\text{red}} = f(Q)$  Pressure volume flow characteristics

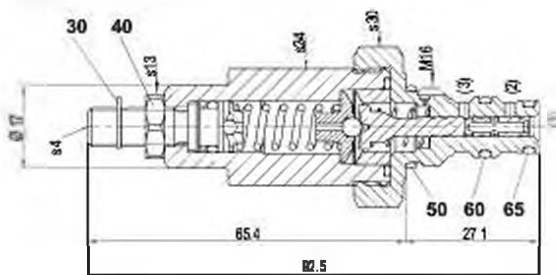
(Maximal adjustable pressure)

- Consumer resistance dependent on system

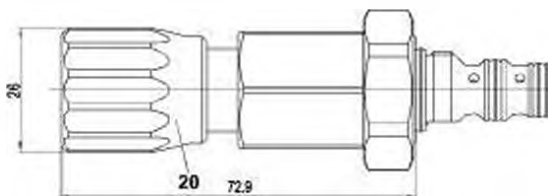

 $p_{\text{red}} = f(n)$  Pressure adjustment characteristics

 [at  $Q = 0 \text{ l/min}$  (static)]

**DIMENSIONS/SECTIONAL DRAWINGS**

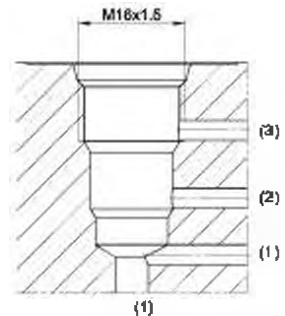
Key adjustment „S“



Turning knob adjustment „D“



Cavity drawing acc. to Wandfluh standard



For detailed cavity drawing see data sheet 2.13-1051

**PARTS LIST**

Position	Article	Description
20	114.2224	Knob
30	193.1061	Safety plate RD6 DIN 6799
40	153.1402	Hexagonal nut 0,5D M8x1
50	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.8140	O-ring ID 14,00 x 1,78 (FKM)
60	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.8092	O-ring ID 9,25 x 1,78 (FKM)
65	160.2076	O-ring ID 7,65 x 1,78 (NBR)
	160.8076	O-ring ID 7,65 x 1,78 (FKM)

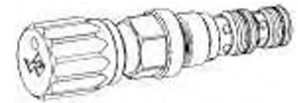
Technical explanation see data sheet 1.0-100E

**Pressure reducing cartridge**

- ◆ pilot operated
- ◆  $p_{nom}$  = 400 bar
- ◆  $p_{N\ red\ max}$  = 350 bar
- ◆  $Q_{max}$  = 25 l/min

**M18 x 1,5**

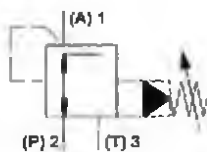
Wandfluh standard


**DESCRIPTION**

Pilot operated pressure reducing valve in screw-in cartridge construction for cavity according to Wandfluh standard. The valve reduces the input pressure to an adjustable output pressure. Through the integrated pressure relief function, exceeding the reduced pressure as a result of external forces is avoided. The pressure reducing valve controls the pressure in port A (1). Through increasing the spring tension, the pressure in port A(1) rises. The valve operates practically independently of the pressure in port P (2). Pressure increase in port A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank (3).

**APPLICATION**

The integrated pressure relief makes an additional pressure relief valve in the consumer line superfluous. In the case of several consumers, the pressure of the specific consumers can be individually adjusted by the pressure reducing valve. Pressure reducing valves are used to maintain the pressure in a consumer constant independent of pressure fluctuations on the supply side. The screw-in cartridge is perfectly suitable for installation in control blocks. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Adjustment spindle M8 x 1
Execution	S = blockable key adjustment D = blockable knob adjustment Optionally: K = lockable adjustment G = star handle adjustment → see Data sheet 2.0-50
Actuation angle	$\alpha_1 = 1800^\circ$ (5 rotations)
Actuation stroke	$S_1 = 5\text{ mm}$

**TYPE CODE**

Pressure reducing valve			M	V	PM18	-		-		#
Pilot operated										
Type of adjustment	Key				S					
	Control knob				D					
	Cover				A					
Screw-in cartridge M18 x 1,5										
Nominal pressure range $p_N$	63 bar				63					
	160 bar				160					
	350 bar				350					
Sealing material	NBR									
	FKM (Viton)				D1					
Design index (subject to change)										

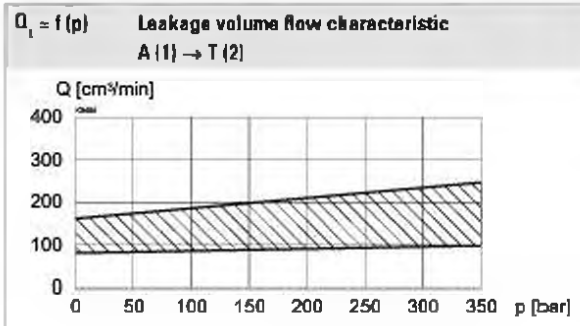
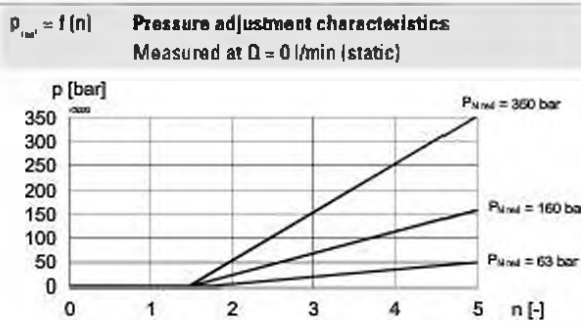
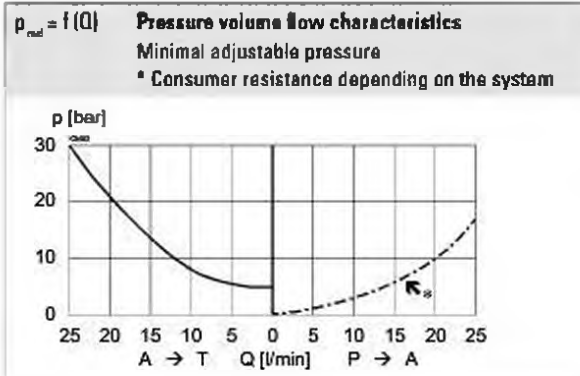
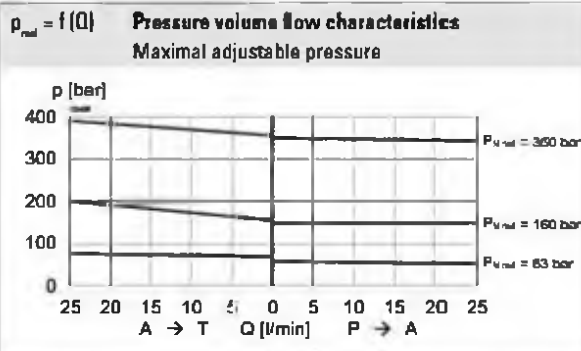
**GENERAL SPECIFICATIONS**

Designation	Pressure reducing valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M18 x 1,5 according to Wandfluh standard
Actuation	Manually
Ambient temperature	-25 ... +90 °C
Weight	0,11 kg key adjustment 0,12 kg control knob adjustment 0,15 kg cover
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400$ bar
Nominal pressure range	$p_{N,red} = 63$ bar, 160 bar, 350 bar
Volume flow range	$Q = 0 \dots 25$ l/min
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +90 °C (NBR) -20 ... +90 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 10 ... 16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The cartridge body made of steel is zinc-nickel coated
- ◆ The control knob is made of plastic

**STANDARDS**

Cartridge cavity	Wandfluh standard
Contamination efficiency	ISO 4406

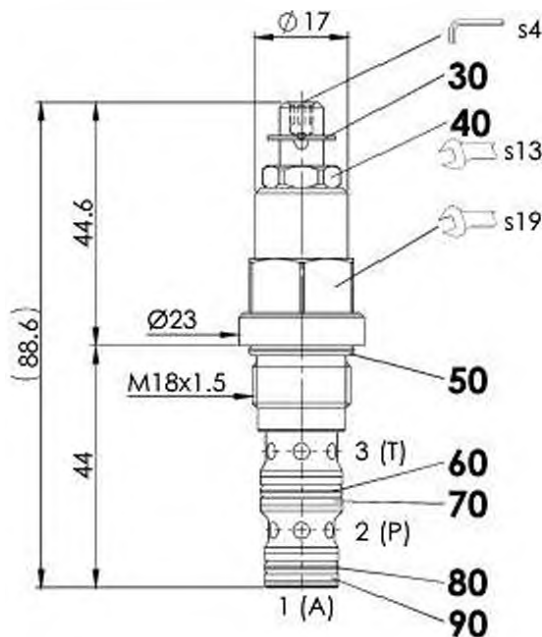
**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M18 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_t = 40$ Nm Screw-in cartridge

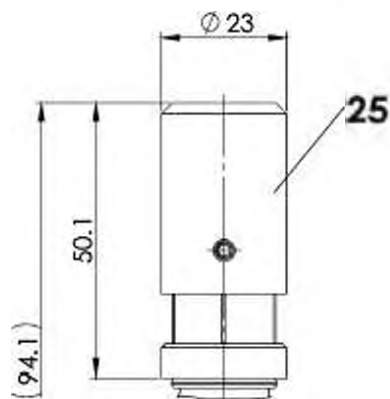


**DIMENSIONS**

Key adjustment „S“

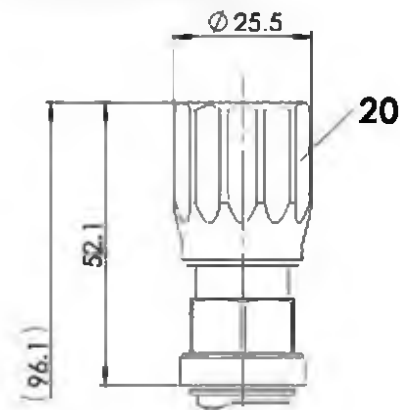


Cover „A“

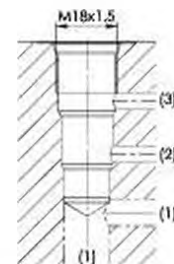

**ACCESSORIES**

Adjustment types for screw-in cartridges	Data sheet 2.0-50
Flange body / sandwich plate NG3-Mini	Data sheet 2.2-600
Threaded body	Data sheet 2.9-210
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

Control knob adjustment „D“


**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard



Note!



For detailed cavity drawing and cavity tools see data sheet 2.13-1020

**PARTS LIST**

Position	Article	Description
20	114.2224	Control knob
25	032.0611	Cover rd 23 / 3 x 35
30	193.1061	Retainer rd 6 DIN 6799
40	153.1402	Hexagon nut 0,5d M8 x 1
50	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
60	160.2111	O-ring ID 11,11 x 1,78 (NBR)
	160.6111	O-ring ID 11,11 x 1,78 (FKM)
70	049.3156	Backup ring rd 12,1 x 15 x 1,4
80	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.6092	O-ring ID 9,25 x 1,78 (FKM)
90	049.3137	Backup ring rd 10,6 x 13,5 x 1,4

**Pressure reducing cartridge**

- ◆ pilot operated
- ◆  $p_{nom}$  = 400 bar
- ◆  $p_{N red max}$  = 350 bar
- ◆  $Q_{max}$  = 80 l/min

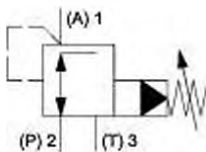
**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Pilot operated pressure reducing valve in screw-in cartridge construction for cavity according to ISO 7789. The valve reduces the input pressure to an adjustable output pressure. Through the integrated pressure relief function, exceeding the reduced pressure as a result of external forces is avoided. The pressure reducing valve controls the pressure in port A (1). Through increasing the spring tension, the pressure in port A (1) rises. The valve operates practically independently of the pressure in port P (2). Pressure increase in port A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank (3).

**APPLICATION**

The integrated pressure relief makes an additional pressure relief valve in the consumer line superfluous. In the case of several consumers, the pressure of the specific consumers can be individually adjusted by the pressure reducing valve. Pressure reducing valves are used to maintain the pressure in a consumer constant independent of pressure fluctuations on the supply side. The screw-in cartridge is perfectly suitable for installation in control blocks. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Adjustment spindle M8 x 1
Execution	S = blockable key adjustment D = blockable knob adjustment Optionally: K = lockable adjustment G = star handle adjustment → see Data sheet 2.0-50
Actuation angle	$\alpha_s = 1800^\circ$ (5 rotations)
Actuation stroke	$S_s = 5$ mm

**TYPE CODE**

Pressure reducing valve	M	V	PM22	-	-	#
Pilot operated						
Type of adjustment	Key	S				
	Control knob	D				
	Cover	A				
Screw-in cartridge M22 x 1,5						
Nominal pressure range $p_n$	63 bar	63				
	160 bar	160				
	350 bar	350				
Sealing material	NBR					
	FKM (Viton)	D1				
Design index (subject to change)						

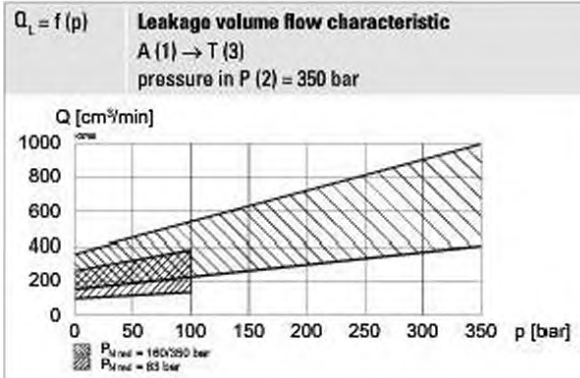
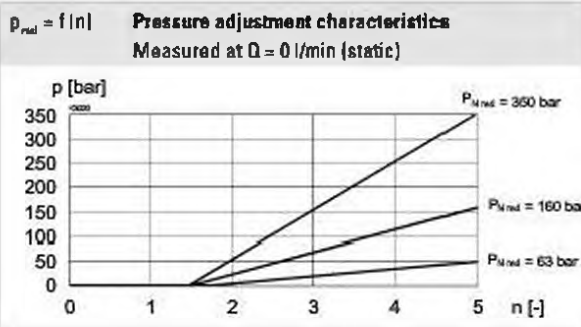
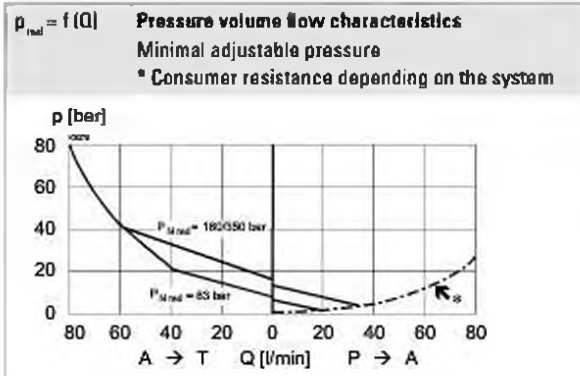
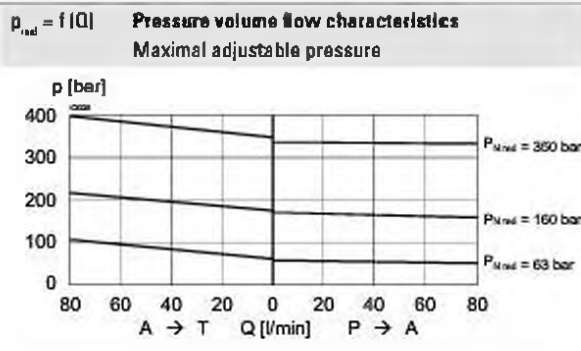
**GENERAL SPECIFICATIONS**

Designation	Pressure reducing valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Manually
Ambient temperature	-25...+90 °C
Weight	0,17 kg key adjustment 0,18 kg control knob adjustment 0,22 kg cover
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400$ bar
Nominal pressure range	$p_{N,red} = 63$ bar, 160 bar, 350 bar
Volume flow range	$Q = 0 \dots 80$ l/min
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+90 °C (NBR) -20...+90 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The cartridge body made of steel is zinc-nickel coated
- ◆ The control knob is made of plastic

**STANDARDS**

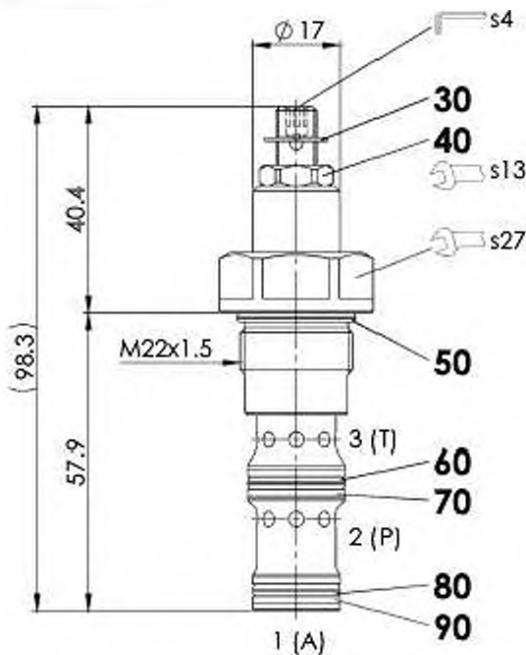
Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

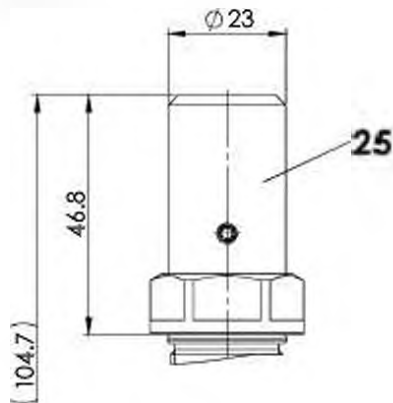
Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_g = 60$ Nm Screw-in cartridge

**DIMENSIONS**

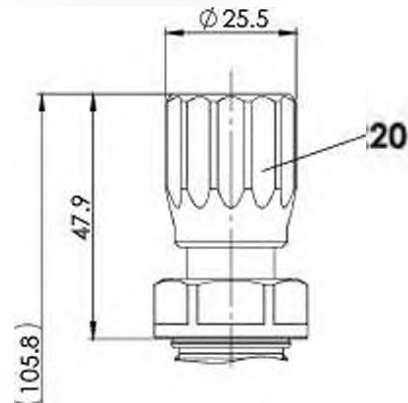
Key adjustment „S“



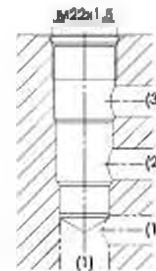
Cover „A“



Control knob adjustment „D“


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-04-0-98



Nota!



For detailed cavity drawing and cavity tools see data sheet 2.13-1004

**ACCESSORIES**

Adjustment types for screw-in cartridges	Data sheet 2.0-50
Flange body / sandwich plate NG4-Mini	Data sheet 2.2-620
Flange body / sandwich plate NG6	Data sheet 2.2-640
Flange body / sandwich plate NG10	Data sheet 2.2-660
Threaded body	Data sheet 2.9-210
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**PARTS LIST**

Position	Article	Description
20	114.2224	Control knob
25	032.0611	Cover rd 23 / 3 x 35
30	193.1061	Retainer rd 6 DIN 6799
40	153.1402	Hexagon nut 0,5d M8 x 1
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.3196	Backup ring rd 16,1 x 19 x 1,4
80	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
90	049.3176	Backup ring rd 14,1 x 17 x 1,4

**Pressure reducing cartridge stainless**

- ◆ pilot operated
- ◆  $p_{nom}$  = 400 bar
- ◆  $p_{N red max}$  = 350 bar
- ◆  $Q_{max}$  = 80 l/min

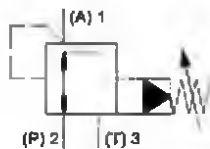
**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Pilot operated pressure reducing valve in screw-in cartridge construction for cavity according to ISO 7789. The valve reduces the input pressure to an adjustable output pressure. Through the integrated pressure relief function, exceeding the reduced pressure as a result of external forces is avoided. The pressure reducing valve controls the pressure in port A (1). Through increasing the spring tension, the pressure in port A(1) rises. The valve operates practically independently of the pressure in port P (2). Pressure increase in port A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank (3). The stainless execution is especially suitable for the use in wet and salty environment.

**APPLICATION**

The integrated pressure relief makes an additional pressure relief valve in the consumer line superfluous. In the case of several consumers, the pressure of the specific consumers can be individually adjusted by the pressure reducing valve. Pressure reducing valves are used to maintain the pressure in a consumer constant independent of pressure fluctuations on the supply side. The screw-in cartridge is perfectly suitable for installation in control blocks. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Adjustment spindle M8 x 1
Execution	S = blockable key adjustment D = blockable knob adjustment Optional: G = star handle adjustment
Actuation angle	$\alpha_s = 1800^\circ$ (5 rotations)
Actuation stroke	$S_s = 5$ mm

**TYPE CODE**

Pressure reducing valve			M	V		PM22	-		-		K9	◆	
Pilot operated													
Type of adjustment	Key												
	Control knob												
	Cover												
Screw-in cartridge M22 x 1,5													
Nominal pressure range $p_n$	63 bar												
	160 bar												
	350 bar												
Sealing material	NBR												
	FKM (Viton)												
	NBR 872												
Stainless													
Design index (subject to change)													

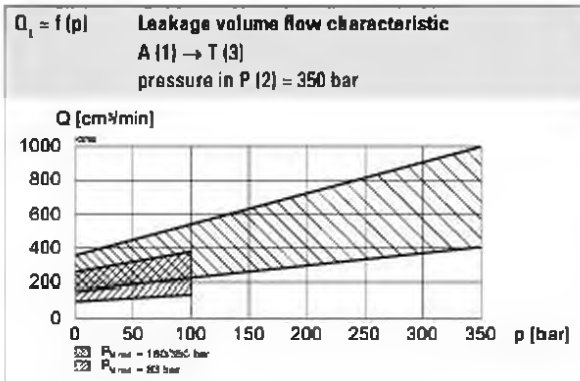
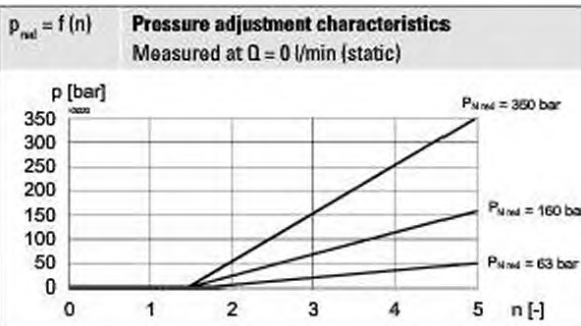
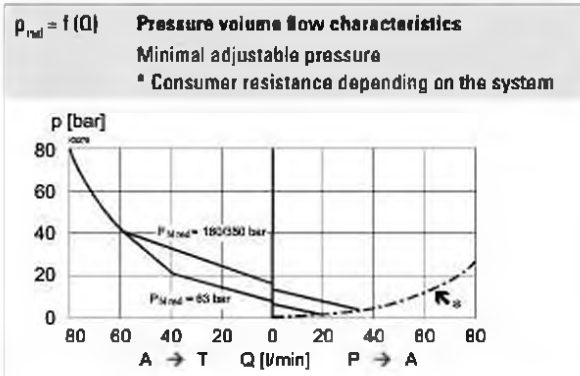
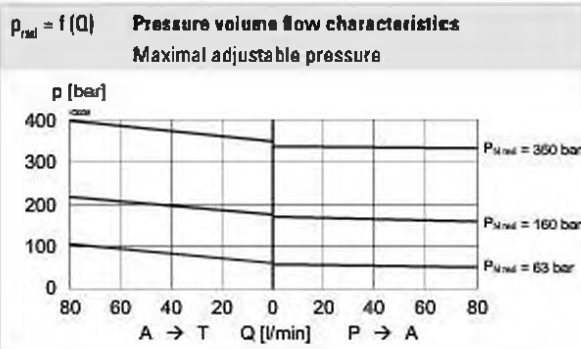
**GENERAL SPECIFICATIONS**

Designation	Pressure reducing valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Manually
Ambient temperature	-25 ... +90 °C
Weight	0,18 kg key adjustment 0,27 kg control knob adjustment 0,22 kg cover
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{\text{max}} = 400 \text{ bar}$
Nominal pressure range	$p_{\text{N,red}} = 63 \text{ bar}, 160 \text{ bar}, 350 \text{ bar}$
Volume flow range	$Q = 0 \dots 80 \text{ l/min}$
Leakage oil	See characteristics
Fluid	Mineral oil, other fluid on request
Viscosity range	$12 \text{ mm}^2/\text{s} \dots 320 \text{ mm}^2/\text{s}$
Temperature range fluid	-25 ... +90 °C (NBR) -20 ... +90 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 10 ... 16 $\geq 75$ , see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The cartridge body and the control knob are made of stainless steel

**STANDARDS**

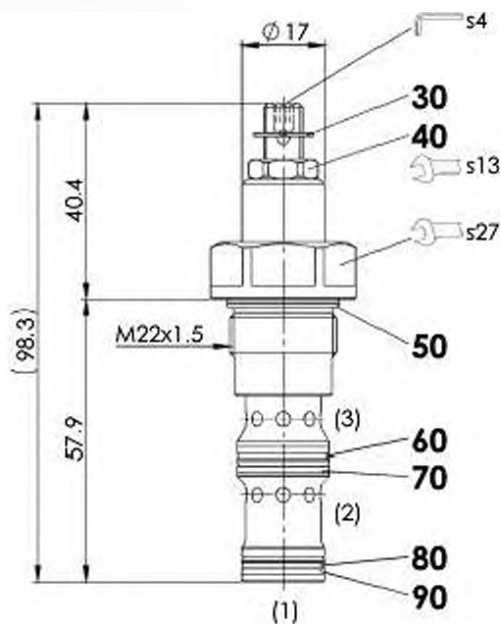
Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

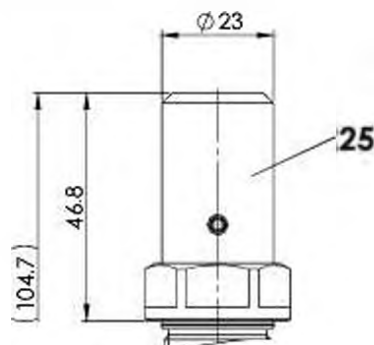
Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge

**DIMENSIONS**

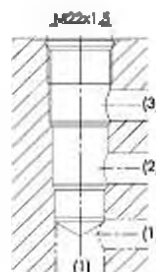
Key adjustment „S“



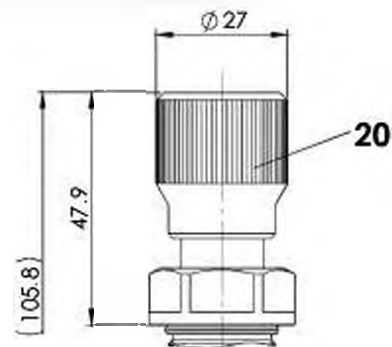
Cover „A“


**HYDRAULIC CONNECTION**

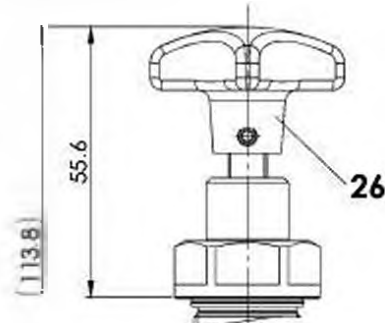
Cavity drawing according to ISO 7789-22-04-0-98



Control knob adjustment „D“



Star handle „G“


**ACCESSORIES**

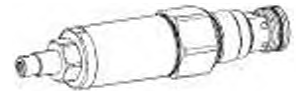
Types of adjustment for screw-in cartridges	Data sheet 2.0-50
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**PARTS LIST**

Position	Article	Description
20	114.2228	Control knob K9
25	032.0616	Cover rd 23 / 3 x 35 K9
26	082.2004	Star handle rd 40 x 26
30	193.1062	Retainer rd 6 DIN 6799
40	154.7407	Hexagon nut M8 x 1 x 4
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.8196	Backup ring PTSM rd 14,5 x 17,4 x 1,4
80	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
90	049.8176	Back-up ring PTSM rd 12,7 x 15,6 x 1,4

**2-way pressure reducing cartridge, seat tight**

- ◆ direct operated
- ◆  $p_{nom} = 350 \text{ bar}$
- ◆  $p_{H \text{ red max}} = 315 \text{ bar}$
- ◆  $Q_{max} = 20 \text{ l/min}$

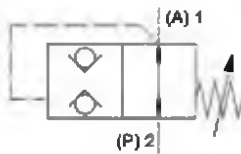
**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Direct operated 2-way pressure reducing valve in screw-in cartridge construction for cavity according to ISO 7789. Oil flows from P (2) to A (1) (and vice versa) as long as the pressure in A (1) is lower than the value set on the adjusting screw. Otherwise the valve is closed seat-tight, even if the pressure drops in P (2). If the pressure in P (2) is sufficiently high, the valve ensures that the pressure in A (1) is regulated to the set value. Turning in the adjusting screw increases the setting pressure.

**Note!** An inadmissibly high pressure in port A (1) when the valve is closed, has eventually to be avoided by a separate pressure relief valve.


**APPLICATION**

Pressure reducing valves are used to maintain the pressure in a consumer constant independent of pressure fluctuations on the supply side. In the case of several consumers, the pressure of the specific consumers can be individually adjusted by the pressure reducing valve. The screw-in cartridge is perfectly suitable for installation in control blocks. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	S = lockable key adjustment D = lockable knob adjustment
Actuation angle	$\alpha_s = 3240^\circ$ (9 rotations)
Actuation stroke	$S_s = 9 \text{ mm}$

**TYPE CODE**

Pressure reducing valve			M	S		PM22	-		-		#	
Direct operated, poppet spool												
Type of adjustment	Key			S								
	Control knob			D								
Screw-in cartridge M22 x 1,5												
Nominal pressure range $p_n$	160 bar				160							
	315 bar				315							
Sealing material	NBR											
	FKM (Viton)				D1							
Design index (subject to change)												



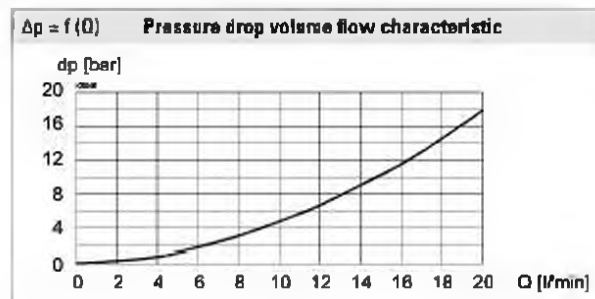
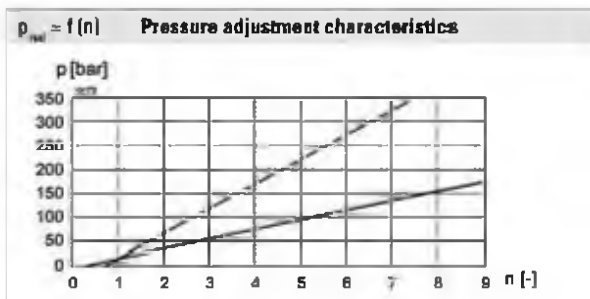
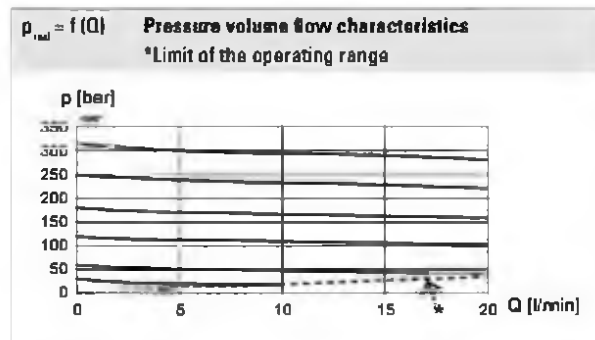
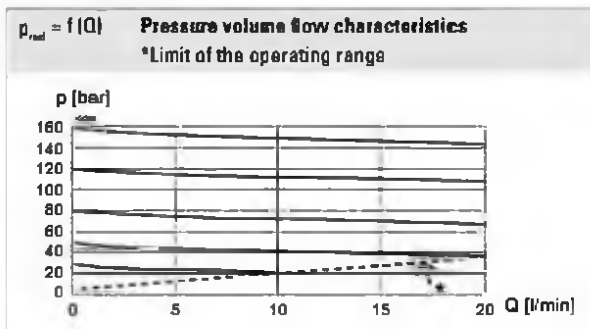
**GENERAL SPECIFICATIONS**

Designation	Pressure reducing valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Manually
Ambient temperature	-25...+90 °C
Weight	0,29 kg key adjustment 0,29 kg control knob adjustment
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Nominal pressure range	$p_{nom} = 160$ bar, 315 bar
Volume flow range	See characteristic
Nominal volume flow	$Q_{nom} = 15$ l/min
Leakage oil	Seat tight, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+90 °C (NBR) -20...+90 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**ACCESSORIES**

Types of adjustment for screw-in cartridges	Data sheet 2.0-50
Threaded body	Data sheet 2.9-205
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SURFACE TREATMENT**

- ◆ The housing and the spindle are made of stainless steel
- ◆ The control knob is made of aluminium

**SEALING MATERIAL**

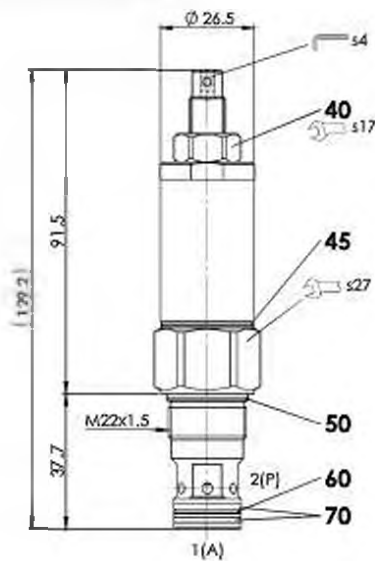
NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

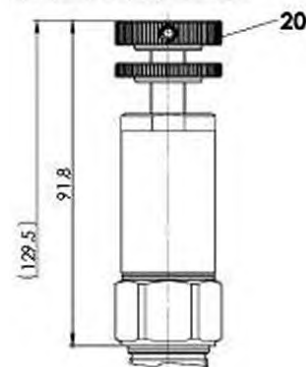
Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 50$ Nm Screw-in cartridge

**DIMENSIONS**

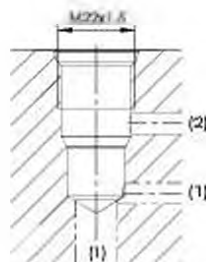
Key adjustment „S“



Control knob adjustment „D“


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-01-D-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1008

**PARTS LIST**

Position	Article	Description
20	113.1049	Standard knob incl. counter nut
40	153.1505	Hexagon nut 0,8d A4 M10 x 1
45	160.6218	O-ring ID 21,95 x 1,75 (FKM)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.8196	Backup ring PTSM rd 14,5 x 17,4 x 1,4

**STANDARDS**

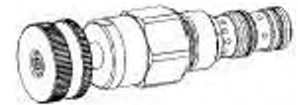
Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

**Pressure reducing cartridge**

- ◆ direct operated
- ◆  $p_{nom} = 350 \text{ bar}$
- ◆  $p_{N \text{ red max}} = 200 \text{ bar}$
- ◆  $Q_{max} = 20 \text{ l/min}$

**7/8" -14 UNF**

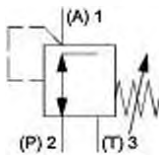
Wandfluh standard


**DESCRIPTION**

Direct operated pressure reducing valve in screw-in cartridge construction for cavity according to Wandfluh standard. The valve reduces the input pressure to an adjustable output pressure. Through the integrated pressure relief function, exceeding the reduced pressure as a result of external forces is avoided. The pressure reducing valve controls the pressure in port A (1). Through increasing the spring tension, the pressure in port A (1) rises. The valve operates practically independently of the pressure in port P (2). Pressure increase in port A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank (3).

**APPLICATION**

The integrated pressure relief makes an additional pressure relief valve in the consumer line superfluous. In the case of several consumers, the pressure of the specific consumers can be individually adjusted by the pressure reducing valve. Pressure reducing valves are used to maintain the pressure in a consumer constant independent of pressure fluctuations on the supply side. The screw-in cartridge is perfectly suitable for installation in control blocks. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

- Actuation
- S = lockable key adjustment
  - = lockable control knob adjustment

**TYPE CODE**

Pressure reducing valve			M	D	□	PU10	-	□	-	□	#	□
Direct operated												
Type of adjustment	Key	Control knob			S							
					□							
Screw-in cartridge 7/8" - 14 UNF												
Nominal pressure range $p_n$	80 bar	200 bar			80							
					200							
Sealing material	NBR	FKM (Viton)										
Design index (subject to change)												

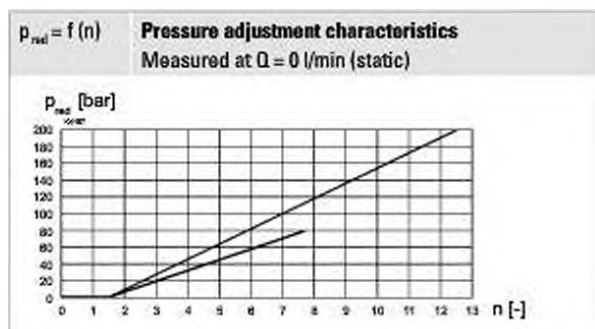
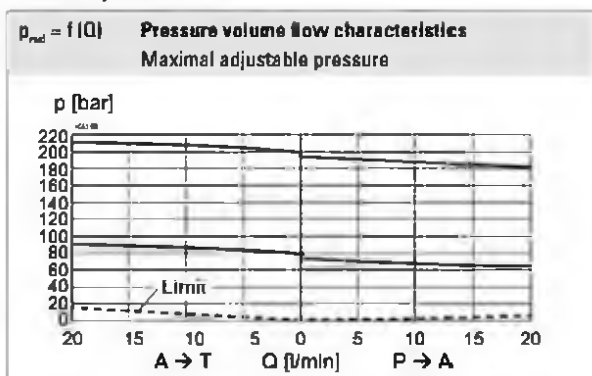
**GENERAL SPECIFICATIONS**

Designation	Pressure reducing valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	7/8"-14 UNF according to Wandfluh standard
Actuation	Manually
Ambient temperature	-25...+90 °C (NBR) -20...+90 °C (FKM)
Weight	0,22 kg (80 bar) 0,32 kg (200 bar)
MTTFd	150 years

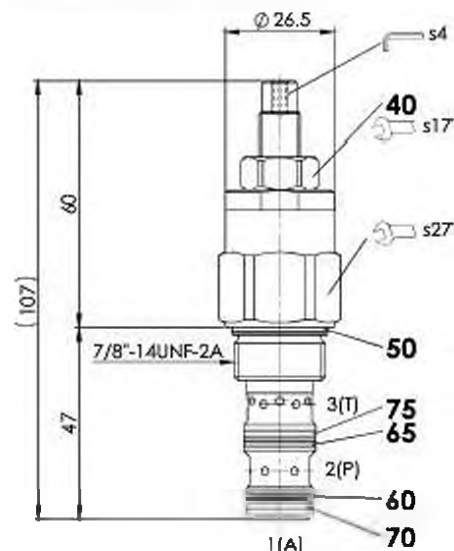
**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Nominal pressure range	$p_{N,red} = 80$ bar, 200 bar
Volume flow range	$Q = 0 \dots 20$ l/min
Leakage oil	< 40 ml/min @ $p_{red} = 200$ bar, $p_{pm} = 315$ bar < 10 ml/min @ $p_{red} = 100$ bar, $p_{pm} = 160$ bar
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

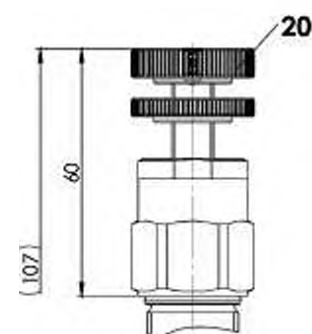
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**DIMENSIONS**

Key adjustment „S“ 80 bar version

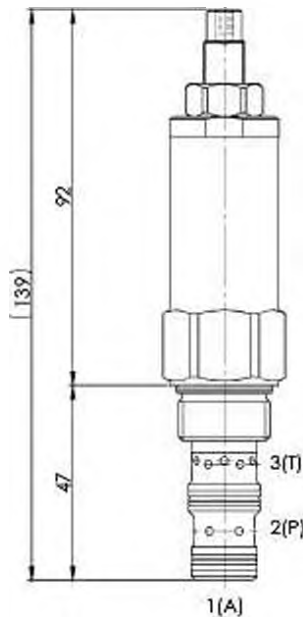


Control knob adjustment „D“ 80 bar version

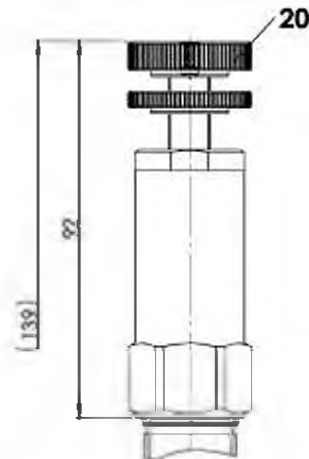


**DIMENSIONS**

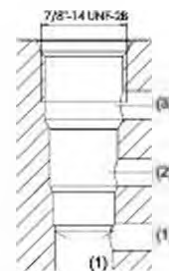
Key adjustment „S“ 200 bar version



Control knob adjustment „D“ 200 bar version


**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard


**Attention!** For detailed cavity drawing and cavity tools see data sheet 2.13-1045

**ACCESSORIES**

Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**PARTS LIST**

Position	Article	Description
20	113.1049	Standard knob incl. counter nut
40	153.1505	Hexagon nut 0,8d A4 M10 x 1
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.6124	O-ring ID 12,42 x 1,78 (FKM)
65	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
70	049.8166	Backup ring PTSM rd 10,8 x 13,7 x 1,4
75	049.8177	Back-up ring PTSM rd 12,4 x 15,3 x 1,4

**SURFACE TREATMENT**

- ◆ The housing and the spindle are made of stainless steel
- ◆ The control knob is made of aluminium

**STANDARDS**

Cartridge cavity	Wandfluh standard
Contamination efficiency	ISO 4406

**SEALING MATERIAL**

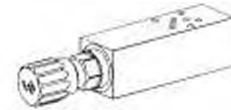
NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge 3/4"-14 UNF
Tightening torque	$M_0 = 50 \text{ Nm}$ Screw-in cartridge

**Pressure reducing valve**
**Flange- and sandwich construction**
**• Pilot operated**

- $Q_{max}$  = 8 l/min
- $p_{max}$  = 315 bar

**NG3-Mini<sup>®</sup>**

**DESCRIPTION**

Flange or sandwich type pilot operated 3-way pressure reducing valve NG3-Mini in accordance with Wandfluh standard. Screw-in cartridge M18x1.5 in according with Wandfluh-Norm. The valve reduces the inlet pressure to a preset output pressure. The integrated pressure relief function prevents the reduced pressure from being exceeded as a result of external forces. Two types of setting and three pressure stages are available. A pressure gauge connection is provided in the reduced connection. With the sandwich execution in A, the bypass non-return valve is installed directly into the plate. The flange body and the sandwich plates made of steel are painted or zinc-nickel coated.

**FUNCTION**

The spool, located in the pilot operated main section of the valve, is held in the reset position by a spring. The connection to the consumer is fully open. With the pilot stage which is designed as relief valve, reduced pressure is adjustable. It opens when the set value is reached. As a result, a pilot volume flows through the nozzle in the spool. The resultant pressure difference displaces the spool towards the spring. The volume flow is throttled in the valve inlet and the reduced pressure is controlled. If forces acting on the actuator allow the reduced pressure to exceed the set value, the spool is displaced until the valve inlet closes and the reduced pressure port is being connected to tank. The pressure increase is then limited.

**APPLICATION**

Pressure reducing valves are used for keeping the pressure constant in a consumer, irrespective of pressure fluctuations on the supply side. If several consumers are used, the reduced pressure can be set individually with the aid of one pressure control valve for each consumer. Generally speaking, pressure control valves are used for reducing a hydraulic pressure to a lower level. The integrated pressure relief function obviates the need for any additional pressure relief valve in the reduced pipe. Directly operated pressure reducing valves also keep the reduced pressure stable, even under very difficult operating conditions. Mini-3 valves are used where both, reduced dimensions and weight are important.

**TYPE CODE**

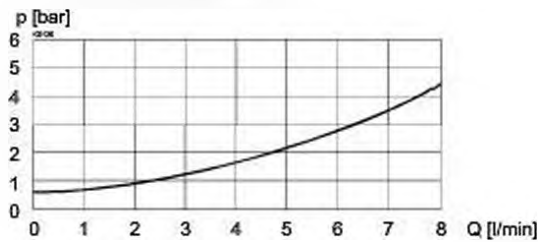
				M	V	<input type="checkbox"/>	<input type="checkbox"/>	A03	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Pressure reducing valve														
Pilot operated														
Type of adjustment	Key	S												
	Control knob	D												
Flange design	F													
Sandwich design	S													
Mounting interface acc. to Wandfluh standard, NG3-Mini														
Type list / function	Flange design		Sandwich design											
	P → A	P/A	in P	P										
			in A	A										
Pressure range $p_{x,red}$	63 bar		63											
	160 bar		160											
	350 bar		350											
Design-Index (Subject to change)														

**GENERAL SPECIFICATIONS**

Description	Pilot operated pressure control valve
Nominal size	NG3-Mini according to Wandfluh standard
Construction	Flange- or sandwich
Mounting	3 mounting holes for cyl. screws M4 or double ended screws M4
Connection	Threaded connection plates Multi-flange subplates Longitudinal stacking system
Ambient temperature	-20...+50°C
Mounting position	any
Fastening torque	$M_0 = 2.8$ Nm (Qual. 8.8) for fastening screws $M_0 = 30$ Nm for screw-in cartridge
Weight	Depending on the type 0,26...0,50 kg

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (required filtration grade B 8...10≥75) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70°C
Peak pressure	$p_{max} = 315$ bar
Nominal pressure ranges	$p_{N,red} = 63$ bar, $p_{N,red} = 160$ bar $p_{N,red} = 350$ bar
Opening pressure to non-return valve	$p_2 = 0.8$ bar
Volume flow	$Q = 0...8$ l/min
For further hydraulic specifications see data sheet 2.2-510	

**CHARACTERISTICS** oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure loss/flow characteristics over non-return valve

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.
MV.PM18	Pressure reducing valve • pilot operated	2.2-510

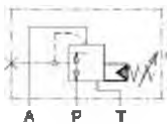
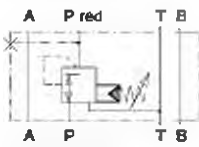

**REMARK!**

Detailed performance data and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed cartridge.

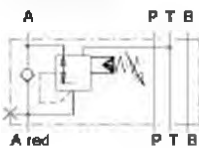

**CAUTION!**

The performance data especially the „pressure-flow-characteristic,“ on the data sheets of the screw-in cartridges refers to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

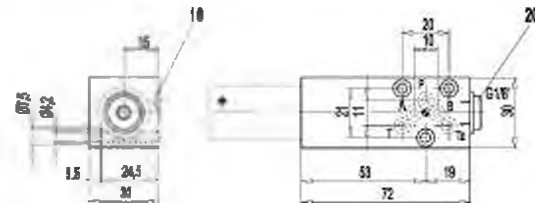
**TYPES/DIMENSIONS**

 Flange construction  
MV.FA03-P/A

 Sandwich construction  
MV.SA03-P


MV.SA03-A



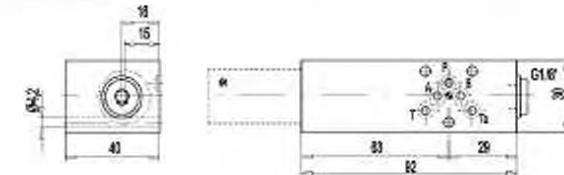
MV.FA03-P/A



MV.SA03-P



MV.SA03-A


**PARTS LIST**

Position	Article	Description
10	160.2045	O-ring ID 4,50x1,5
20	238.1405	Plug VSTI G1/8"-ED

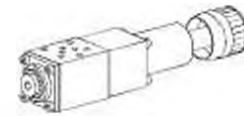
• The external dimensions of the cartridges can be found on the corresponding data sheets.

**ACCESSORIES**

Threaded connection plate and multi-flange subplates Reg. 2.9

**Pressure reducing valve**
**Flange- and sandwich construction**

- $Q_{max}$  = 8 l/min
- $p_{max}$  = 315 bar
- $p_{N,red,max}$  = 200 bar

**NG3-Mini**

**DESCRIPTION**

Flange or sandwich type directly operated 3-way pressure reducing valve NG3-Mini in accordance with Wandfluh standard. The valve reduces the inlet pressure to a preset output pressure. The integrated pressure relief function prevents the reduced pressure from being exceeded as a result of external forces. Two types of setting and four pressure stages are available. A pressure gauge connection is provided in the reduced connection. The flange valve body is painted, the other parts are zinc-nickel coated.

**FUNCTION**

The spool is held in the home position by the spring. The connection to the consumer is fully open. The reduced pressure can be adjusted at the adjustment spindle, irrespective of the inlet pressure. If the reduced pressure increases, it displaces the valve towards the spring. The volume flow at the valve inlet is then throttled, controlling the reduced pressure. If forces acting on the consumer allow the reduced pressure to be increased above the set value, the spool is displaced until the valve inlet closes and the tank port opens. The pressure increase is then limited to a low value, controlled by the spring.

**APPLICATION**

Pressure reducing valves are used for keeping the pressure constant in a consumer, irrespective of pressure fluctuations on the supply side. If several consumers are used, the reduced pressure can be set individually with the aid of one pressure control valve for each consumer. Generally speaking, pressure control valves are used for reducing a hydraulic pressure to a lower level. The integrated pressure relief function obviates the need for any additional pressure relief valve in the reduced pipe. Directly operated pressure reducing valves also keep the reduced pressure stable, even under very difficult operating conditions. Mini-3 valves are used where both, reduced dimensions and weight are important.

**TYPE CODE**

		M	D	<input type="checkbox"/>	<input type="checkbox"/>	A03	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Pressure reducing valve												
Direct operated												
Type of adjustment	Key	S										
	Control knob	T										
Flange construction		F										
Sandwich construction		S										
Mounting interface acc. to Wandfluh standard, NG3-Mini												
Type list / function	Flange design		Sandwich design									
	P → A		P/A		in P		P					
Pressure range $p_{N,red}$	32 bar	<input type="checkbox"/>	32									
	80 bar	<input type="checkbox"/>	80									
	200 bar	<input type="checkbox"/>	200									
Design-Index (Subject to change)												

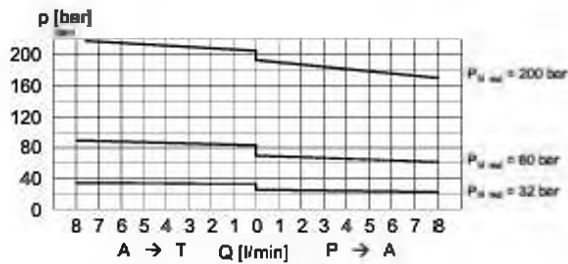
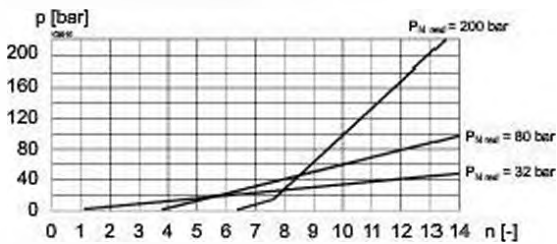
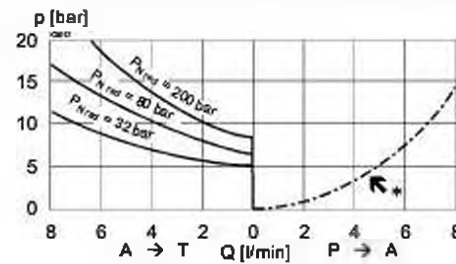
**GENERAL SPECIFICATIONS**

Description	Direct operated pressure reducing valve
Nominal size	NG3-Mini according to Wandfluh standard
Constructions	Flange- or sandwich
Mounting	3 mounting holes for cyl. screws M4 or double ended screws M4
Connections	Threaded connection plates Multi-flange plates Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_0 = 2,8 \text{ Nm}$ (quality 8.8)
Weight	$m = 0,54 \text{ kg}$ (Flange, Sandwich P)

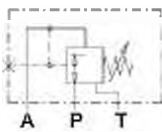
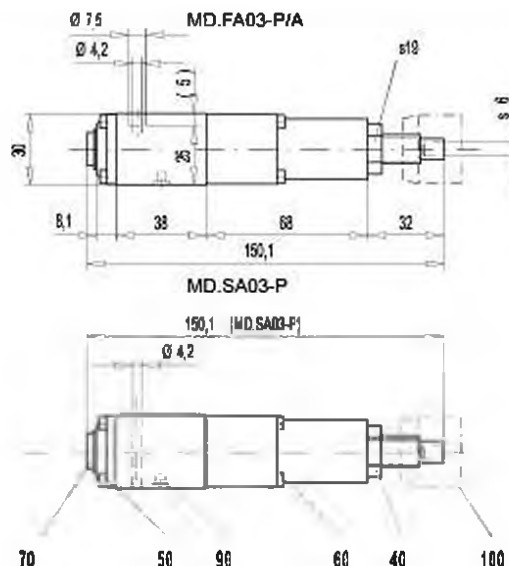
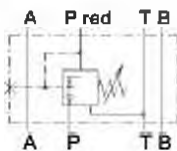
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{6...10} \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 315 \text{ bar}$
Tank load in connection T	$p_T = 50 \text{ bar}$
Nominal pressure	$p_{N,red} = 32 \text{ bar, } 80 \text{ bar and } 200 \text{ bar}$
Volume flow	$Q = 0...8 \text{ l/min}$

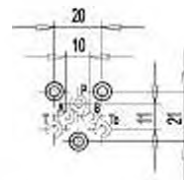


**CHARACTERISTICS** oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $p_{\text{red}} = f(Q)$  Pressure volume flow characteristics  
 (Maximal adjustable pressure)

 $p_{\text{red}} = f(n)$  Pressure adjustment characteristics  
 (at  $Q = 0 \text{ l/min}$  (static))

 $p_{\text{red}} = f(Q)$  Pressure volume flow characteristics  
 (Minimal adjustable pressure)  
 \* Consumption resistance dependent on system

 $\Delta p = f(Q)$  Pressure loss/flow characteristics  
 over non-return valve

**TYPES / DIMENSIONS**

 Flange construction  
 MD.FA03-P/A

 Sandwich construction  
 MD.SA03-P

**PARTS LIST**

Position	Article	Description
40	153.1605	Hexagonal nut 0,6D M12 x 1
50	246.0109	Cylinder screw M3 x 8 DIN912
55	246.0131	Cylinder screw M3 x 30 DIN912
80	246.0136	Cylinder screw M3 x 35 DIN912
70	238.1405	Plug screw VSTI G1/8"-ED
90	160.2045	O-ring ID 4.5 x 1.5
100	114.1226	Turning knob


 Spindle not secured  
 against unscrewing

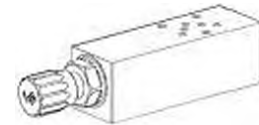
**ACCESSORIES**

Threaded connection plates and multi flange plates Register 2.9

Technical explanation see data sheet 1.0-100

**Pressure reducing valve**
**Flange- and sandwich construction**
**• Pilot operated**

- $Q_{max}$  = 20 l/min
- $p_{max}$  = 400 bar
- $p_{N red max}$  = 350 bar

**NG4-Mini<sup>20</sup>**

**DESCRIPTION**

Flange or sandwich type pilot operated 3-way pressure reducing valve NG4-Mini in accordance with Wandfluh standard. Screw-in cartridge M22x1.5 in according with ISO 7789. The valve reduces the inlet pressure to a preset output pressure. The integrated pressure relief function prevents the reduced pressure from being exceeded as a result of external forces. Two types of setting and three pressure stages are available. A pressure gauge connection is provided in the reduced connection. A bypass non-return valve plate for the flange valve – for free flow from A to P – can be ordered separately. The flange valve body is painted, the other parts are phosphatised.

**FUNCTION**

The spool, located in the pilot operated main section of the valve, is held in the reset position by a spring. The connection to the consumer is fully open. With the pilot stage which is designed as relief valve, reduced pressure is adjustable. It opens when the set value is reached. As a result, a pilot volume flows through the nozzle in the spool. The resultant pressure difference displaces the spool towards the spring. The volume flow is throttled in the valve inlet and the reduced pressure is controlled. If forces acting on the actuator allow the reduced pressure to exceed the set value, the spool is displaced until the valve inlet closes and the reduced pressure part is being connected to tank. The pressure increase is then limited.

**APPLICATION**

Pressure reducing valves are used for keeping the pressure constant in a consumer, irrespective of pressure fluctuations on the supply side. If several consumers are used, the reduced pressure can be set individually with the aid of one pressure control valve for each consumer. Generally speaking, pressure control valves are used for reducing a hydraulic pressure to a lower level. The integrated pressure relief function obviates the need for any additional pressure relief valve in the reduced pipe. Directly operated pressure reducing valves also keep the reduced pressure stable, even under very difficult operating conditions. Mini-4 valves are used where both, reduced dimensions and weight are important.

**TYPE CODE**

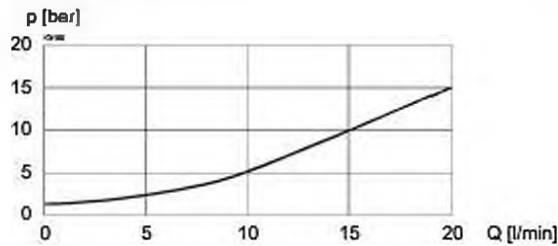
		M	V	<input type="checkbox"/>	<input type="checkbox"/>	A04	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Pressure reducing valve												
Pilot operated												
Type of adjustment	Key	S										
	Control knob	D										
Flange design	F											
Sandwich design	S											
Mounting interface acc. to Wandfluh standard, NG4-Mini												
Type list / function	Flange design		Sandwich design									
	P → A	P/A	in P	P								
			in A	A								
			in B	B								
Pressure range $p_{x red}$	63 bar		63									
	160 bar		160									
	350 bar		350									
Design-Index (Subject to change)												

**GENERAL SPECIFICATIONS**

Description	Pilot operated pressure control valve
Nominal size	NG4-Mini according to Wandfluh standard
Construction	Flange- or sandwich
Mounting	3 mounting holes for zyl. screws M5 or double ended screws M5
Connection	Threaded connection plates Multi-flange subplates Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_c$ = 5,5 Nm (qual. 8.8) for fastening screws $M_L$ = 50 Nm for screw-in cartridge
Weight	Depending on the type 1,4...1,53 kg

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 Required filtration grade & 6...10 (>75) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max}$ = 400 bar
Nominal pressure ranges	$p_{x red}$ = 63 bar, $p_{x red}$ = 160 bar $p_{x red}$ = 350 bar
Opening pressure to non-return valve	$p_b$ = 2.2 bar
Volume flow	$Q$ = 0...20 l/min
For further hydraulic specifications see data sheet 2.2-530	

**CHARACTERISTICS** oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure loss/flow characteristics over non-return valve

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

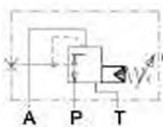
Type	Designation	Data sheet no.
MV.PM22	Pressure reducing valve • pilot operated	2.2-530


**REMARK!**

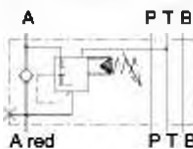
Detailed performance data and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed cartridge.


**CAUTION!**

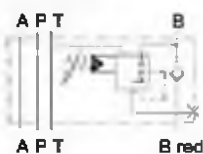
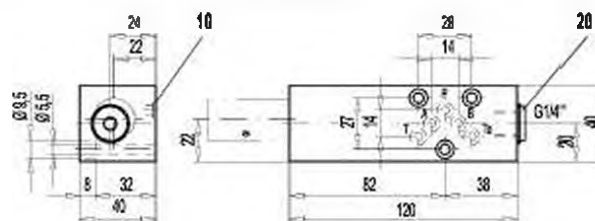
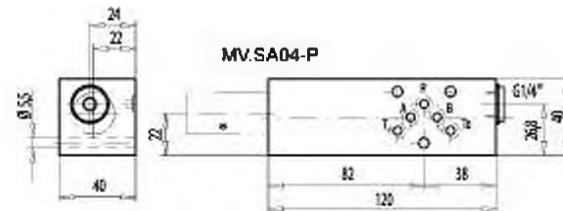
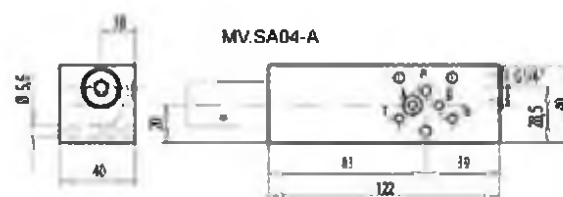
The performance data especially the „pressure-flow-characteristic,“ on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**TYPES / DIMENSIONS**
**Flange**  
 MV.FA04-P/A

**Sandwich**  
 MV.SA04-P


## MV.SA04-A



## MV.SA04-B


**MV.FA04-P/A**

**MV.SA04-P**

**MV.SA04-A**

**PARTS LIST**

Position	Article	Description
10	180.2052	O-ring ID 5,28x1,78
20	238.2406	Plug VSTI G1/4\"-ED

For sandwich red pressure in B cartridge is located on B-side

\* The total length depends on the cartridge type, see data sheet 2.2-530.

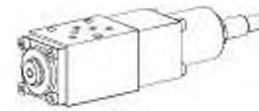
**ACCESSORIES**

 Threaded connection plate and multi-flange subplates  
 Bypass non-return valve BDRVP4

Reg. 2.9

**Pressure reducing valve**  
**Flange- and sandwich construction**

- $Q_{max}$  = 20 l/min
- $p_{max}$  = 315 bar
- $p_{N\text{red max}}$  = 200 bar

**NG4-Mini<sup>20</sup>**

**DESCRIPTION**

Flange or sandwich type directly operated 3-way pressure reducing valve NG4-Mini in accordance with Wandfluh standard. The valve reduces the inlet pressure to a preset output pressure. The integrated pressure relief function prevents the reduced pressure from being exceeded as a result of external forces. Two types of setting and four pressure stages are available. A pressure gauge connection is provided in the reduced connection. A bypass non-return valve plate for the flange valve – for free flow from A to P – can be ordered separately. The flange valve body is painted, the other parts are zinc-nickel coated.

**FUNCTION**

The spool is held in the home position by the spring. The connection to the consumer is fully open. The reduced pressure can be adjusted at the adjustment spindle, irrespective of the inlet pressure. If the reduced pressure increases, it displaces the valve towards the spring. The volume flow at the valve inlet is then throttled, controlling the reduced pressure. If forces acting on the consumer allow the reduced pressure to be increased above the set value, the spool is displaced until the valve inlet closes and the tank port opens. The pressure increase is then limited to a low value, controlled by the spring.

**APPLICATION**

Pressure reducing valves are used for keeping the pressure constant in a consumer, irrespective of pressure fluctuations on the supply side. If several consumers are used, the reduced pressure can be set individually with the aid of one pressure control valve for each consumer. Generally speaking, pressure control valves are used for reducing a hydraulic pressure to a lower level. The integrated pressure relief function obviates the need for any additional pressure relief valve in the reduced pipe. Directly operated pressure reducing valves also keep the reduced pressure stable, even under very difficult operating conditions. Mini-4 valves are used where both, reduced dimensions and weight are important.

**TYPE CODE**

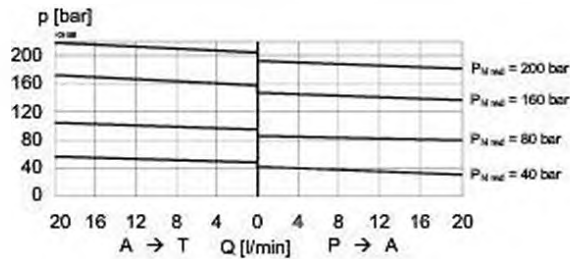
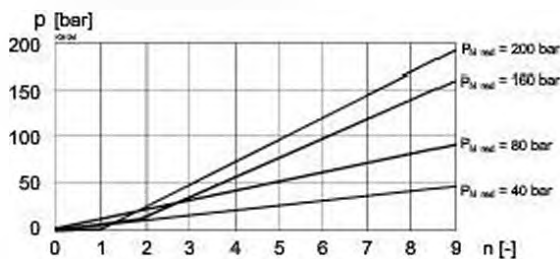
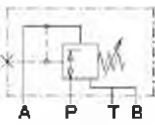
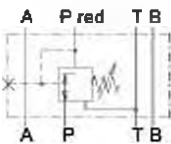
Mounting interface acc. to Wandfluh standard,		B	DRV	d	<input type="checkbox"/>	4	f	<input type="checkbox"/>	#	<input type="checkbox"/>
Pressure reducing valve										
Direct operated										
Type list / function										
Flange design		N								
Sandwich design, $P_{red}$ in P		<input type="checkbox"/>								
Sandwich design, $P_{red}$ in A		A								
Sandwich design, $P_{red}$ in B		B								
Interface NG4-Mini										
Type of adjustment		Key								
		Control knob		D						
		Cover		H						
Pressure range $p_{N\text{red}}$		40 bar		<input type="checkbox"/>						
		80 bar		<input type="checkbox"/>						
		160 bar		<input type="checkbox"/>						
		200 bar		<input type="checkbox"/>						
Design-Index (Subject to change))										

**GENERAL SPECIFICATIONS**

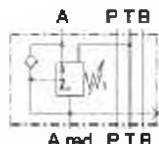
Description	Direct operated pressure control valve
Nominal size	NG4-Mini acc. to Wandfluh standard
Construction	Flange- or sandwich
Mounting	3 mounting holes for zyl. screws M5 or double ended screws M5
Connection	Threaded connection plates Multi-flange subplates Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_d = 5,5 \text{ Nm}$ (quality 8.8)
Weight	$m = 1,0 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

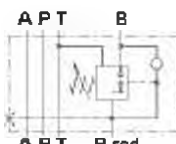
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{0.5} \dots 10 \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 315 \text{ bar}$
Tank load in connection T	$p_{T\text{max}} = 50 \text{ bar}$
Nominal pressure ranges	$p_{N\text{red}} = 40 \text{ bar}$ , $p_{N\text{red}} = 160 \text{ bar}$ $p_{N\text{red}} = 80 \text{ bar}$ , $p_{N\text{red}} = 200 \text{ bar}$
Opening pressure to non-return valve	$p_{N\text{red}} = 2,2 \text{ bar}$
Volume flow	$Q = 0 \dots 20 \text{ l/min}$

**CHARACTERISTICS** oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $p_{\text{red}} = f(Q)$  Pressure volume flow characteristics  
 (Maximal adjustable pressure)

 $p_{\text{red}} = f(n)$  Pressure adjustment characteristics  
 (at  $Q = 0 \text{ l/min}$  (static))

**TYPES / DIMENSIONS**
**Flange**  
 BDRVdN4

**Sandwich**  
 BDRVd4


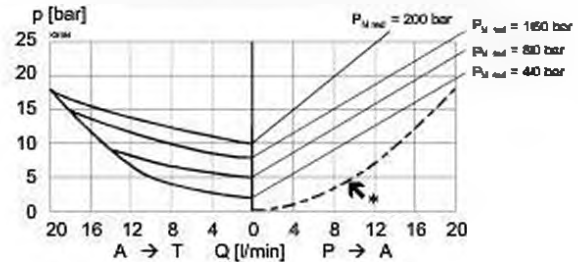
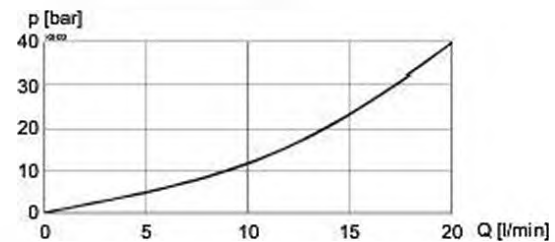
BDRVdA4



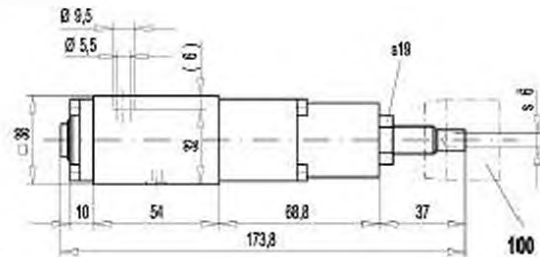
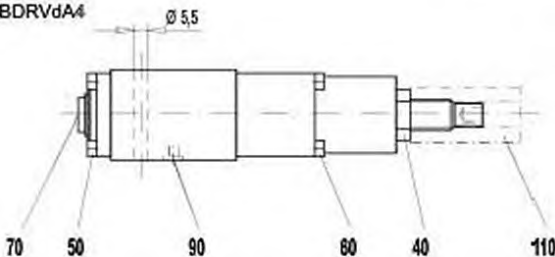
BDRVdB4


 $p_{\text{red}} = f(Q)$  Pressure volume flow characteristics  
 (Minimal adjustable pressure)

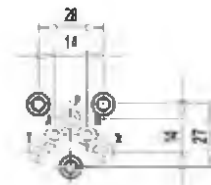
= Consumption resistance dependent on system


 $\Delta p = f(Q)$  Pressure loss/flow characteristics  
 over non-return valve


BDRVdN4


 BDRVd4  
 BDRVdA4

**PARTS LIST**

Position	Article	Description
40	153.1801	Hexagonal nut 0,5D M12
50	246.1113	Zyl. screw M4 x 12 DIN912
60	246.1141	Zyl. screw M4 x 40 DIN912
70	238.1405	Plug VSTI G1/8"-ED
90	160.2052	O-Ring ID 5,28 x 1,78
100	114.1202	Knob
110	154.7100	Cap nut


 Spindle not secured against  
 unscrewing

 For sandwich red. pressure  
 in B the adjusting parts are  
 on A-side

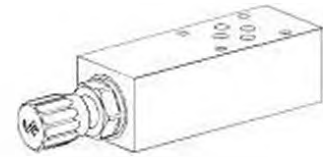
**ACCESSORIES**

 Threaded connection plates and Multi-flange subplates Register 2.9  
 Bypass non-return valve BDRVP4

Technical explanation see data sheet 1.0-100

**Pressure reducing valve**
**Flange- and sandwich construction**
**• Pilot operated**

- $Q_{max}$  = 80 l/min
- $p_{max}$  = 400 bar
- $p_{N red max}$  = 350 bar

**NG6**  
 ISO 4401-03

**DESCRIPTION**

Flange or sandwich type pilot operated 3-way pressure reducing valve. Screw-in cartridge M22x1,5 in according with ISO 7789. The valve reduces the inlet pressure to a preset output pressure. The integrated pressure relief function prevents the reduced pressure from being exceeded as a result of external forces. Two types of setting and three pressure stages are available. A pressure gauge connection is provided in the reduced connection. A bypass non-return valve plate for the flange valve – for free flow from A to P – can be ordered separately. The flange valve body is painted, the sandwich plates are phosphatised.

**FUNCTION**

The spool, located in the pilot operated main section of the valve, is held in the reset position by a spring. The connection to the consumer is fully open. With the pilot stage which is designed as relief valve, reduced pressure is adjustable. It opens when the set value is reached. As a result, a pilot volume flows through the nozzle in the spool. The resultant pressure difference displaces the spool towards the spring. The volume flow is throttled in the valve inlet and the reduced pressure is controlled. If forces acting on the actuator allow the reduced pressure to exceed the set value, the spool is displaced until the valve inlet closes and the reduced pressure port is being connected to tank. The pressure increase is then limited.

**APPLICATION**

Pressure reducing valves are used for keeping the pressure constant in a consumer, irrespective of pressure fluctuations on the supply side. If several consumers are used, the reduced pressure can be set individually with the aid of one pressure control valve for each consumer. Generally speaking, pressure control valves are used for reducing a hydraulic pressure to a lower level. The integrated pressure relief function obviates the need for any additional pressure relief valve in the reduced pipe. Pilot operated pressure reducing valves also keep the reduced pressure stable, even under very difficult operating conditions.

**TYPE CODE**

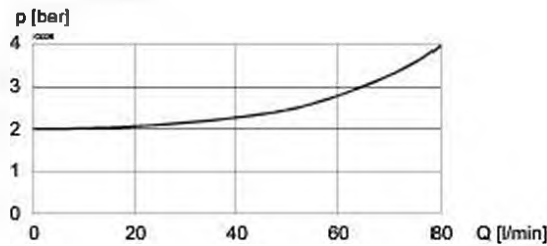
		M	V	<input type="checkbox"/>	<input type="checkbox"/>	A06	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>	
Pressure reducing valve													
Pilot operated													
Type of adjustment	Key	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
	Control knob	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Flange design	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Sandwich design	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
International standard interface ISO, NG6													
Type list / function	Flange design		Sandwich design		Flange design		Sandwich design		Flange design		Sandwich design		
	P → A	P/A	in P	P	in P	P	in A	A	in A	A	in B	B	
Pressure range $p_{N red}$	63 bar		63		160		160		350		350		
	160 bar												
	350 bar												
Design-Index (Subject to change)													

**GENERAL SPECIFICATIONS**

Description	Pilot operated pressure control valve
Nominal size	NG6 according to ISO 4401-03
Construction	Flange or sandwich
Mounting	4 mounting holes for zyl. screws M5 or double ended screws M5
Connection	Threaded connection plates Multi-flange subplates Longitudinal stacking system
Ambient temperature	-20...+50°C
Mounting position	any
Fastening torque	$M_0 = 5,5 \text{ Nm}$ (qual. 8.8) for fastening screws $M_0 = 50 \text{ Nm}$ for screw-in cartridge
Weight	Depending on the type 1,57...1,92 kg

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{6...10} \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70°C
Peak pressure	$p_{max} = 400 \text{ bar}$
Red. nominal pressure	$p_{N red} = 63 \text{ bar}$ , $p_{N red} = 160 \text{ bar}$ $p_{N red} = 350 \text{ bar}$
Opening pressure to non-return valve	$p_b = 2 \text{ bar}$
Volume flow	$Q = 0...80 \text{ l/min}$
For further hydraulic specifications see data sheet 2.2-530.	

**CHARACTERISTICS** oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure loss/flow characteristics over RV

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.
MV.PM22	Pressure reducing valve • pilot operated	2.2-530


**REMARK!**

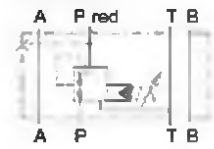
Detailed performance data and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed cartridge.


**CAUTION!**

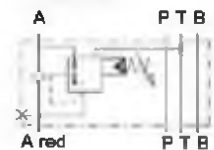
The performance data especially the „pressure-flow-characteristic„ on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**TYPES / DIMENSIONS**

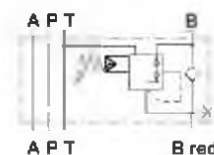
 Flange  
 MV.FA06-P/A

 Sandwich  
 MV.SA06-P


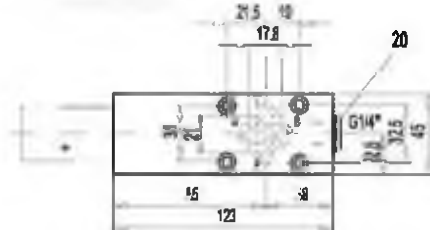
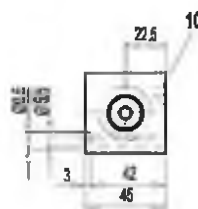
MV.SA06-A



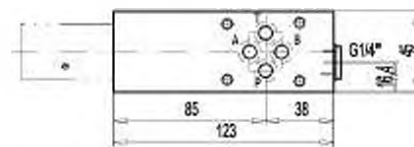
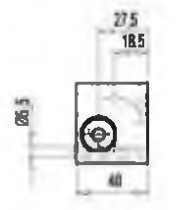
MV.SA06-B



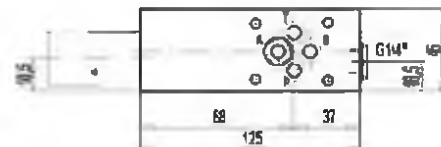
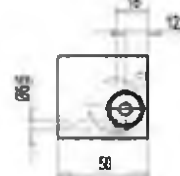
MV.FA06-P/A



MV.SA06-P



MV.SA06-A


**PARTS LIST**

Position	Article	Description
10	160.2093	O-ring ID 9,25x1,78
20	238.2408	Plug VSTI G1/4"-ED

For sandwich red, pressure in B cartridge is located on B-side.

\* The total length depends on the cartridge type, see data sheet 2.2-530.

**ACCESSORIES**

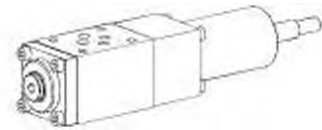
 Threaded connection plate and multi-flange subplates Reg. 2.9  
 Bypass non-return valve ADRVP6

Technical explanation see data sheet 1.0-100

**Pressure reducing valve**
**Flange- and sandwich construction**

- $Q_{max}$  = 30 l/min
- $p_{max}$  = 315 bar
- $p_{N\ red\ max}$  = 200 bar

**NG6**  
 ISO 4401-03


**DESCRIPTION**

Flange or sandwich type directly operated 3-way pressure reducing valve. The valve reduces the inlet pressure to a preset output pressure. The integrated pressure relief function prevents the reduced pressure from being exceeded as a result of external forces. Two types of setting and five pressure stages are available. A pressure gauge connection is provided in the reduced connection. A by-pass non-return valve plate for the flange valve for free flow from A to P (B port not drilled) can be ordered separately. In the sandwiches with control in A or B line by-pass check valves are integrated. The flange valve body is painted, the other parts are zinc-nickel coated.

**FUNCTION**

The spool is held in the home position by the spring. The connection to the consumer is fully open. The reduced pressure can be adjusted at the adjustment spindle, irrespective of the inlet pressure. If the reduced pressure increases, it displaces the valve towards the spring. The volume flow at the valve inlet is then throttled, controlling the reduced pressure. If forces acting on the consumer allow the reduced pressure to be increased above the set value, the spool is displaced until the valve inlet closes and the tank port opens. The pressure increase is then limited to a low value, controlled by the spring.

**APPLICATION**

Pressure reducing valves are used for keeping the pressure constant in a consumer, irrespective of pressure fluctuations on the supply side. If several consumers are used, the reduced pressure can be set individually with the aid of one pressure control valve for each consumer. Generally speaking, pressure control valves are used for reducing a hydraulic pressure to a lower level. The integrated pressure relief function obviates the need for any additional pressure relief valve in the reduced pipe. Directly operated pressure reducing valves also keep the reduced pressure stable, even under very difficult operating conditions.

**TYPE CODE**

		A	DRV	d	<input type="checkbox"/>	6	<input type="checkbox"/>	/	<input type="checkbox"/>	#	<input type="checkbox"/>
International mounting interface ISO											
Pressure reducing valve											
Direct operated											
Type list / function											
Flange design <input type="checkbox"/> N											
Sandwich design, $P_{red}$ in P <input type="checkbox"/>											
Sandwich design, $P_{red}$ in A <input type="checkbox"/> A											
Sandwich design, $P_{red}$ in B <input type="checkbox"/> B											
Interface NG6											
Type of adjustment											
Key <input type="checkbox"/>											
Control knob <input type="checkbox"/> D											
Cover <input type="checkbox"/> H											
Pressure range $p_{N\ red}$											
31,5 bar <input type="checkbox"/> 31,5											
63 bar <input type="checkbox"/> 63											
125 bar <input type="checkbox"/> 125											
160 bar <input type="checkbox"/> 160											
200 bar <input type="checkbox"/> 200											
Design-Index (Subject to change)											

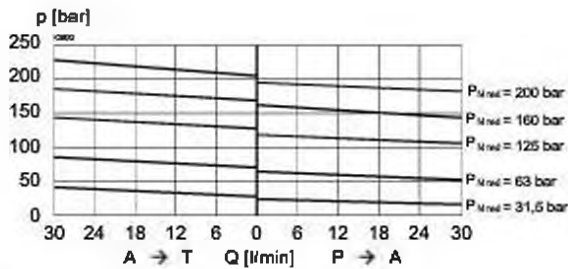
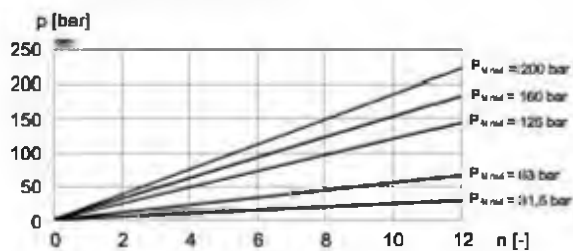
**GENERAL SPECIFICATIONS**

Description	Direct operated pressure control valve
Nominal size	NG6 acc. to ISO 4401-03
Construction	Flange- or sandwich
Mounting	4 mounting holes for zyl. screws M5 or double ended screws M5
Connection	Threaded connection plates Multi-flange subplates Longitudinal stacking system
Ambient temperature	-20 ... +50 °C
Mounting position	any
Fastening torque	$M_0$ = 5,5 Nm (Quality 8.8)
Weight	$m$ = 2.0 kg

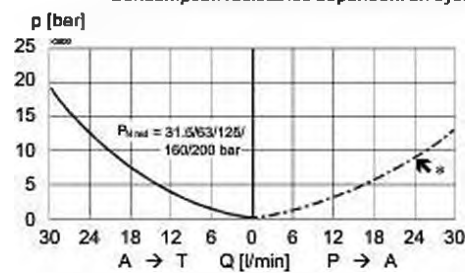
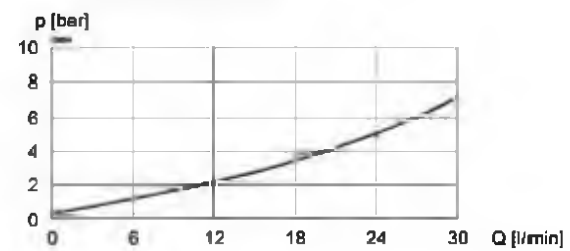
**HYDRAULIC SPECIFICATIONS**

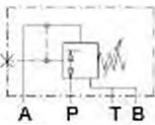
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{0.5} \dots 10 \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Fluid temperature	-20 ... +70 °C
Peak pressure	$p_{max}$ = 315 bar
Tank load in connection T	$p_T$ = 50 bar
Nominal pressure	$p_{N\ red}$ = 31,5 bar, $p_{N\ red}$ = 63 bar $p_{N\ red}$ = 125 bar, $p_{N\ red}$ = 160 bar $p_{N\ red}$ = 200 bar
Opening pressure to non-return valve	$p_0$ = 0,2 bar
Volume flow	$Q$ = 0 ... 30 l/min



**CHARACTERISTICS** oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $p_{\text{red}} = f(Q)$  Pressure volume flow characteristics  
 (Maximal adjustable pressure)

 $p_{\text{red}} = f(n)$  Pressure adjustment characteristics  
 (at  $Q = 0 \text{ l/min}$  (static))

 $p_{\text{red}} = f(Q)$  Pressure volume flow characteristics  
 (Minimal adjustable pressure)

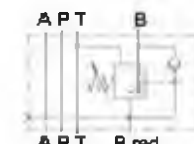
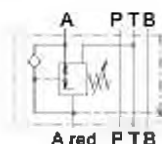
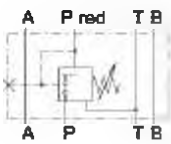
\* Consumption resistance dependent on system


 $\Delta p = f(Q)$  Pressure loss/flow characteristics  
 over non-return valve

**TYPES / DIMENSIONS**

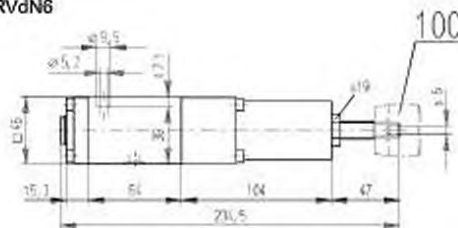
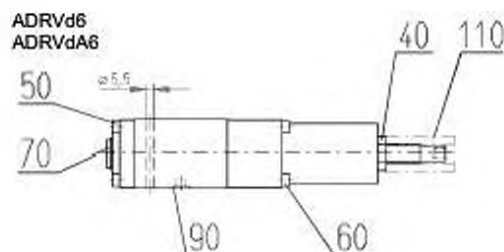
 Flange construction  
 ADRVdN6

 Sandwich construction  
 ADRVd6

ADRVdA6

ADRVd86



ADRVdN6


 ADRVd6  
 ADRVdA6

**PARTS LIST**

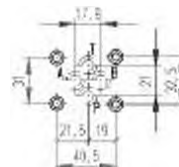
Position	Article	Description
40	153.1601	Hexagonal nut 0.5D M12
50	248.2117	Zyl. screw M5 x 16 DIN912
60	248.2148	Zyl. screw M5 x 45 DIN912
70	238.2406	Plug VST1 G1/4"-ED
90	160.2093	O-Ring ID 9,25 x 1.7B
100	114.1202	Knob
110	154.7100	Cap nut

Technical explanation see data sheet 1.0-100

**ACCESSORIES**

 Threaded connection plate and multi-flange subplates  
 Bypass non-return valve ADRVP6

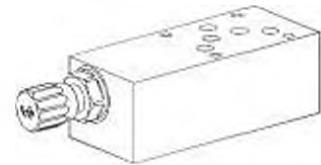
Reg. 2.9


 Spindle not secured against  
 unscrewing

 For sandwich red. pressure  
 in B the adjusting parts are  
 on A-side

**Pressure reducing valve**
**Flange- and sandwich construction**
**• Pilot operated**

- $Q_{max}$  = 80 l/min
- $p_{max}$  = 400 bar
- $p_{N red max}$  = 350 bar

**NG10**  
 ISO 4401-05

**DESCRIPTION**

Flange or sandwich type pilot operated 3-way pressure reducing valve. Screw-in cartridge M22x1,5 in according with ISO 7789. The valve reduces the inlet pressure to a preset output pressure. The integrated pressure relief function prevents the reduced pressure from being exceeded as a result of external forces. Two types of setting and three pressure stages are available. A pressure gauge connection is provided in the reduced connection. A bypass non-return valve plate for the flange valve – for free flow from A to P – can be ordered separately. The flange valve body is painted, the sandwich plates are phosphatized.

**FUNCTION**

The spool, located in the pilot operated main section of the valve, is held in the reset position by a spring. The connection to the consumer is fully open. With the pilot stage which is designed as relief valve, reduced pressure is adjustable. It opens when the set value is reached. As a result, a pilot volume flows through the nozzle in the spool. The resultant pressure difference displaces the spool towards the spring. The volume flow is throttled in the valve inlet and the reduced pressure is controlled. If forces acting on the actuator allow the reduced pressure to exceed the set value, the spool is displaced until the valve inlet closes and the reduced pressure port is being connected to tank. The pressure increase is then limited.

**APPLICATION**

Pressure reducing valves are used for keeping the pressure constant in a consumer, irrespective of pressure fluctuations on the supply side. If several consumers are used, the reduced pressure can be set individually with the aid of one pressure control valve for each consumer. Generally speaking, pressure control valves are used for reducing a hydraulic pressure to a lower level. The integrated pressure relief function obviates the need for any additional pressure relief valve in the reduced pipe. Directly operated pressure reducing valves also keep the reduced pressure stable, even under very difficult operating conditions.

**TYPE CODE**

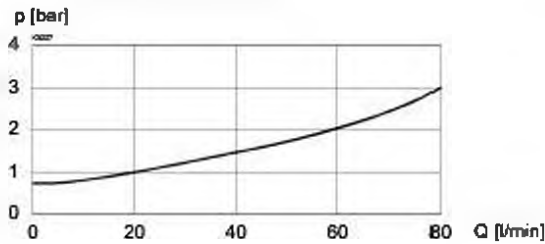
		M	V	<input type="checkbox"/>	<input type="checkbox"/>	A10	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>	
Pressure reducing valve													
Pilot operated													
Type of adjustment	Key	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
	Control knob	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Flange design	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
Sandwich design	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	
International standard interface ISO, NG10													
Type list / function	Flange design		Sandwich design		in P		in A		in B				
	P → A	P/A		P	A	B							
Pressure range $p_{N red}$	63 bar		160 bar		350 bar								
Design-Index (Subject to change)													

**GENERAL SPECIFICATIONS**

Description	Pilot operated pressure control valve
Nominal size	NG10 according to ISO 4401-05
Construction	Flange or Sandwich
Mounting	4 mounting holes for zyl. screws M6 or double ended screws M6
Connection	Threaded connection plates Multi-flange subplates Longitudinal stacking system
Ambient temperature	-20...+50°C
Mounting position	any
Fastening torque	$M_0 = 9,5$ Nm (qual. 8.8) for fastening screws $M_0 = 50$ Nm for screw-in cartridge
Weight	Depending on the type 2,89...3,09 kg

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{6...10} \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70°C
Peak pressure	$p_{max} = 400$ bar
Red. nominal pressure	$p_{N red} = 63$ bar. $p_{N red} = 160$ bar $p_{N red} = 350$ bar
Opening pressure to non-return valve	$p_{0.1} = 0,8$ bar
Volume flow	$Q = 0...80$ l/min
For further hydraulic specifications see data sheet 2.2-530.	

**CHARACTERISTICS** oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure loss/flow characteristics over non-return valve

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.
MV.PM22	Pressure reducing valve • pilot operated	2.2-530


**REMARK!**

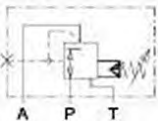
Detailed performance data and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed cartridge.


**CAUTION!**

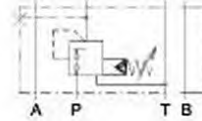
The performance data especially the „pressure-flow-characteristic„ on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**TYPES / DIMENSIONS**
**Flange**

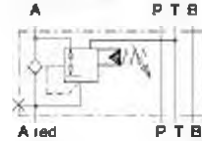
MV.FA10-P/A


**Sandwich**

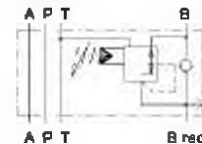
MV.SA10-P



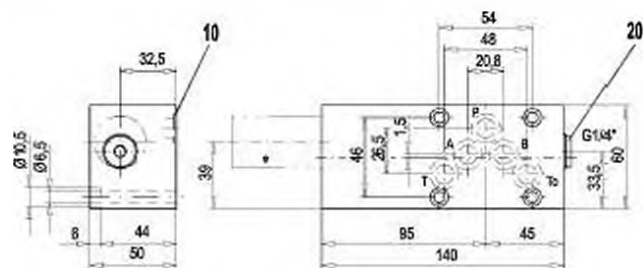
MV.SA10-A



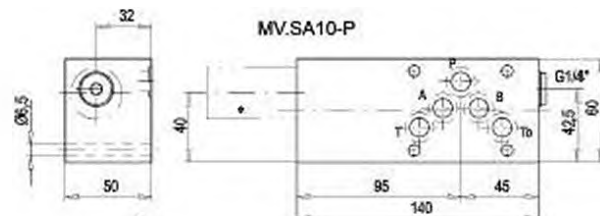
MV.SA10-B



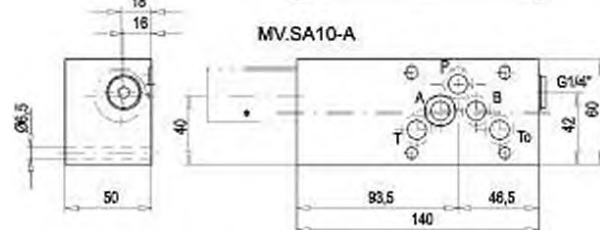
MV.FA10-P/A



MV.SA10-P



MV.SA10-A


**PARTS LIST**

Position	Article	Description
10	180.2140	O-ring ID 14.00x1.78
20	238.2406	Plug VST1 G1/4"-ED

For sandwich red. pressure in B cartridge is located on B-side.

\* The total lengths depends on the cartridge type, see data sheet 2.2-530.

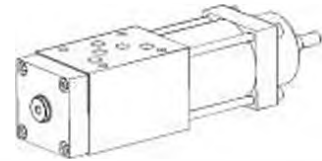
**ACCESSORIES**

 Threaded connection plate and multi-flange subplates  
 Bypass non-return valve BDRVP4

Reg. 2.9

**Pressure reducing valve**
**Flange- and sandwich construction**

- $Q_{max}$  = 80 l/min
- $p_{max}$  = 315 bar
- $p_{H,red,max}$  = 160 bar

**NG10**  
 ISO 4401-05

**DESCRIPTION**

Flange or sandwich type directly operated 3-way pressure reducing valve. The valve reduces the inlet pressure to a preset output pressure. The integrated pressure relief function prevents the reduced pressure from being exceeded as a result of external forces. Two types of setting and four pressure stages are available. A pressure gauge connection is provided in the reduced connection. In the sandwiches with control in A or B line by-pass check valves are integrated. The flange valve body is painted, the other parts are phosphated.

**FUNCTION**

The spool is held in the home position by the spring. The connection to the consumer is fully open. The reduced pressure can be adjusted at the adjustment spindle, irrespective of the inlet pressure. If the reduced pressure increases, it displaces the valve towards the spring. The volume flow at the valve inlet is then throttled, controlling the reduced pressure. If forces acting on the consumer allow the reduced pressure to be increased above the set value, the spool is displaced until the valve inlet closes and the tank port opens. The pressure increase is then limited to a low value, controlled by the spring.

**APPLICATION**

Pressure reducing valves are used for keeping the pressure constant in a consumer, irrespective of pressure fluctuations on the supply side. If several consumers are used, the reduced pressure can be set individually with the aid of one pressure control valve for each consumer. Generally speaking, pressure control valves are used for reducing a hydraulic pressure to a lower level. The integrated pressure relief function obviates the need for any additional pressure relief valve in the reduced pipe. Directly operated pressure reducing valves also keep the reduced pressure stable, even under very difficult operating conditions.

**TYPE CODE**

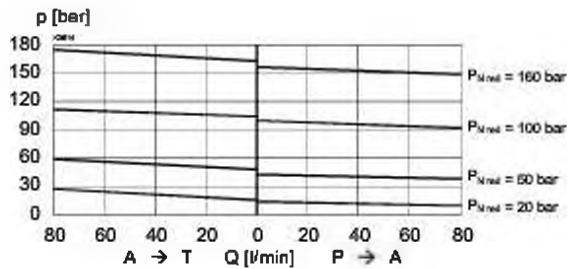
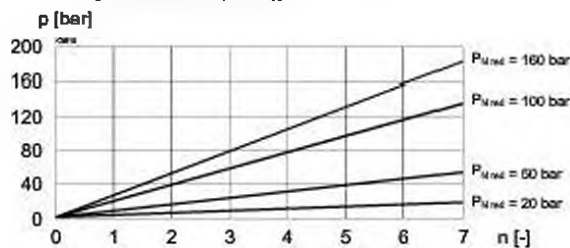
		A	DRV	d	10		J		#
Mounting interface acc. to Wandfluh standard.									
Pressure reducing valve									
Direct operated									
Type list / function									
Flange design		N							
Sandwich design, $p_{red}$ in P									
Sandwich design, $p_{red}$ in A		A							
Sandwich design, $p_{red}$ in B		B							
Interface NG10									
Type of adjustment		Key							
		Control knob							
		Cover							
		D							
		H							
Pressure range $p_{H,red}$		20 bar		50 bar		100 bar		160 bar	
Design-Index (Subject to change)									

**GENERAL SPECIFICATIONS**

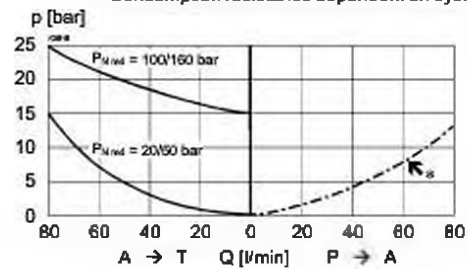
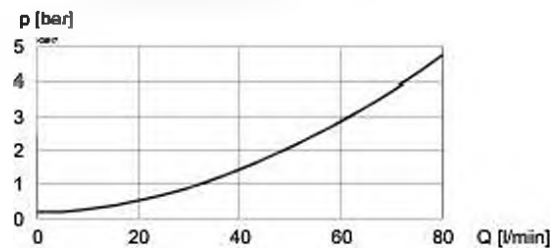
Description	Direct operated pressure control valve
Nominal size	NG10 acc. to ISO 4401-05
Construction	Flange- or sandwich
Mounting	4 mounting holes for zyl. screws M6 or double ended screws M6
Connection	Threaded connection plates Multi-flange subplates Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_0 = 9,5 \text{ Nm}$ (quality 8.8)
Weight	$m = 4,2 \text{ kg}$

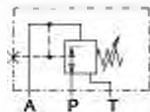
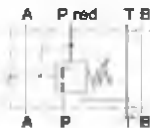
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade & $\beta_{0.5} \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 315 \text{ bar}$
Tank load in connection T	$p_{T,max} = 50 \text{ bar}$
Nominal pressure	$p_{N,max} = 20 \text{ bar}$ , $p_{N,max} = 100 \text{ bar}$ $p_{H,red} = 50 \text{ bar}$ , $p_{H,red} = 160 \text{ bar}$
Opening pressure to non-return valve	$p_0 = 0,2 \text{ bar}$
Volume flow	$Q = 0...80 \text{ l/min}$

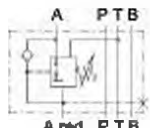
**CHARACTERISTICS** oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $p_{\text{red}} = f(Q)$  Pressure volume flow characteristics  
 (Maximal adjustable pressure)

 $p_{\text{red}} = f(n)$  Pressure adjustment characteristics  
 (at  $Q = 0 \text{ l/min}$  (static))

 $p_{\text{red}} = f(Q)$  Pressure volume flow characteristics  
 (Minimal adjustable pressure)

\* Consumption resistance dependent on system

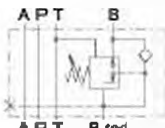

 $\Delta p = f(Q)$  Pressure loss/flow characteristics  
 over non-return valve

**TYPES / DIMENSIONS**

 Flange construction  
 ADRVdN10

 Sandwich construction  
 ADRVd10


ADRVdA10



ADRVdB10

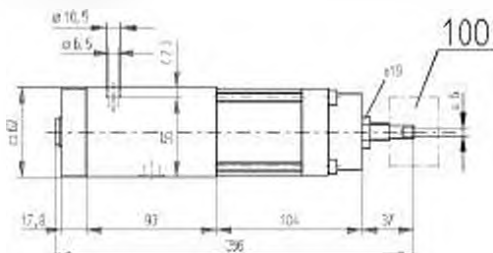
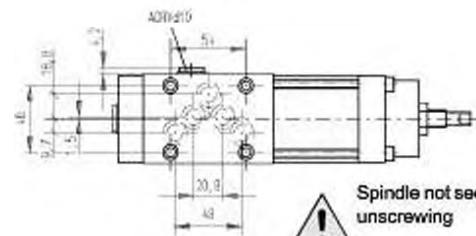
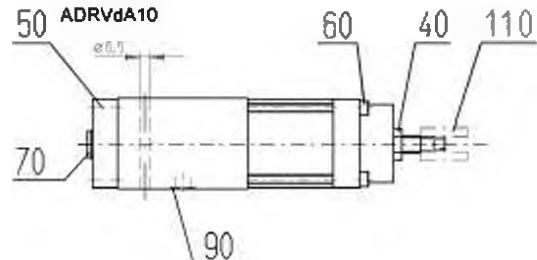


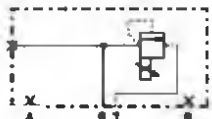
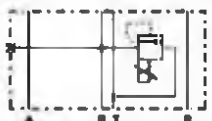


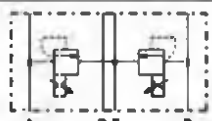
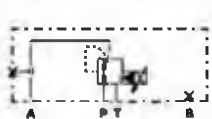
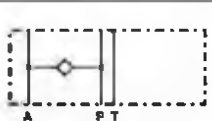
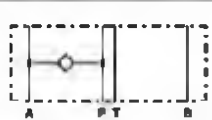
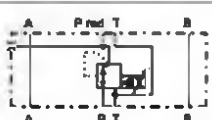
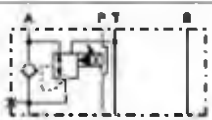
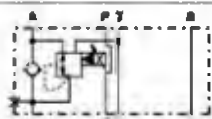
For sandwich red. pressure in B the adjusting parts are on A-side

**PARTS LIST**

Position	Article	Description
40	153.1601	Hexagonal nut 0.5D M12
50	246.3121	Zyl. screw M6 x 20 DIN912
60	246.3190	Zyl. screw M6 x 90 DIN912
70	238.2406	Plug VST1 G1/4"-ED
90	160.2093	O-Ring ID 14.00 x 1,78
100	114.1100	Knob
110	154.7100	Cap nut

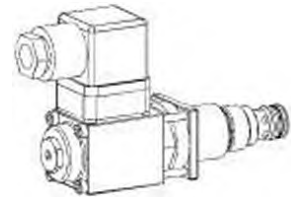
ADRVdN10


 ADRVd10  
 ADRVdA10

 Spindle not secured against  
 unscrewing

	NG3-Mini	NG4-Mini NG4 ISO	NG6 ISO	NG10 ISO
	Types			
	B.PFA03-P 2.3-700	B.PFA04-P 2.3-720	B.PFA06-P 2.3-740	B.PFA10-P 2.3-760
	B.PSA03-P 2.3-700	B.PSA04-P 2.3-720	B.PSA06-P 2.3-740	B.PSA10-P 2.3-760
	B.PSA03-A 2.3-700	B.PSA04-A 2.3-720	B.PSA06-A 2.3-740	B.PSA10-A 2.3-760
	B.PSA03-B 2.3-700	B.PSA04-B 2.3-720	B.PSA06-B 2.3-740	B.PSA10-B 2.3-760
	B.PSA03-AB 2.3-700	B.PSA04-AB 2.3-720	B.PSA06-AB 2.3-740	B.PSA10-AB 2.3-760
	MVPFA03-P/A 2.3-800	MVPFA04-P/A 2.3-820	MVPFA06-P/A 2.3-840	MVPFA10-P/A 2.3-860
			ADRVP6	
		BDRVP4		
	MVPSA03-P 2.3-800	MVPSA04-P 2.3-820	MVPSA06-P 2.3-840	MVPSA10-P 2.3-860
	MVPSA03-A 2.3-800	MVPSA04-A 2.3-820	MVPSA06-A 2.3-840	MVPSA10-A 2.3-860
	MVPSA03-B 2.3-800	MVPSA04-B 2.3-820	MVPSA06-B 2.3-840	MVPSA10-B 2.3-860

**Proportional pressure relief cartridge**

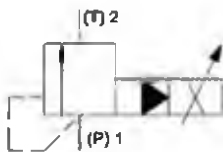
- ◆ pilot operated
- ◆  $Q_{max} = 25 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$
- ◆  $p_{Nmax} = 315 \text{ bar}$

**M18 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Pilot operated proportional pressure relief valve in screw-in cartridge construction for cavity according to ISO 7789. High flow capacity, very sensitively adjustable. When the operating pressure adjusted by means of the proportional solenoid is reached, the valve opens and connects the protected line with the drain to the tank. The back pressure in T (2) affects the pressure in P (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	P129V (Data sheet 1.1-90)
Connection	Connector socket EN 175301 – 803

**TYPE CODE**

Pressure relief valve					B	V	P	PM18	-		-		-		#	
Pilot operated																
Proportional																
Screw-in cartridge M18 x 1,5																
Nominal pressure range $p_N$	20 bar	<input type="text" value="20"/>	200 bar	<input type="text" value="200"/>												
	100 bar	<input type="text" value="100"/>	315 bar	<input type="text" value="315"/>												
Nominal voltage $U_N$	12 VDC	<input type="text" value="G12"/>														
	24 VDC	<input type="text" value="G24"/>														
Sealing material	NBR	<input type="text"/>														
	FKM (Viton)	<input type="text" value="D1"/>														
Design index (subject to change)																

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure relief valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M18 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,38 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	100 % DF
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	I <sub>a</sub> = 1080 mA (12 VDC) I <sub>a</sub> = 540 mA (24 VDC)

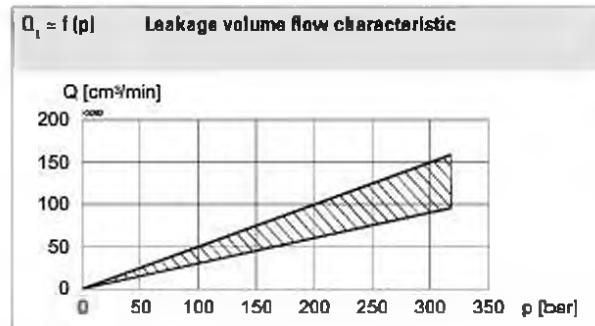
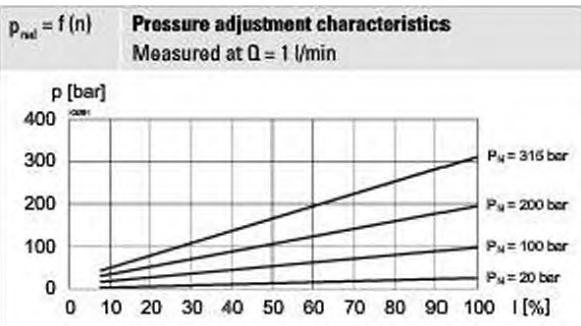
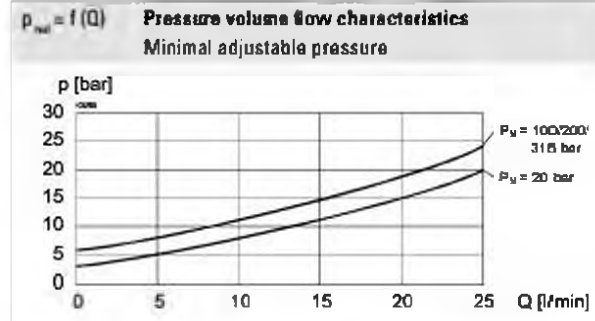
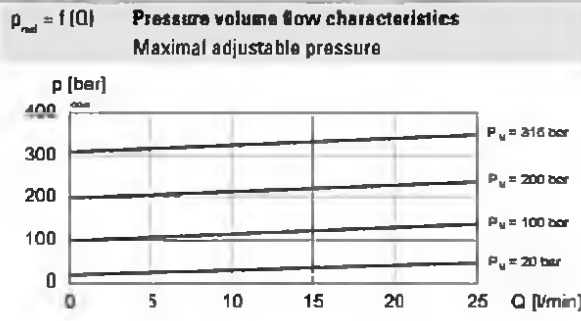
**Note!** Other electrical specifications see data sheet 1.1-90


**HYDRAULIC SPECIFICATIONS**

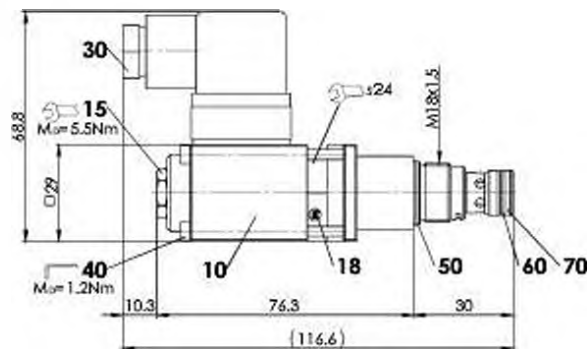
Working pressure	p <sub>max</sub> = 350 bar
Tank pressure	p <sub>T,max</sub> = p <sub>p</sub> + 80 bar
Nominal pressure range	P <sub>N</sub> = 20 bar, 100 bar, 200 bar, 315 bar
Volume flow range	Q = 0,3...25 l/min
Leakage oil	See characteristics
Hysteresis	≤ 2 % at optimal dither signal
Repeatability	≤ 1 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade β <sub>6</sub> ...10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

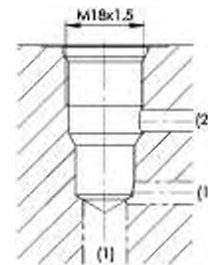
Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$





**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-18-02-0-88


**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1001

**PARTS LIST**

Position	Article	Description
10	256 2418	Proportional solenoid PI29V-G12
	256 2453	Proportional solenoid PI29V-G24
15	253 8000	Manual override HB4,5
18	160 2120	O-ring ID 12,42 x 1,78 (NBR)
30	219 2002	Electric plug B (black)
40	246 0151	Socket head screw M3 x 50 DIN 912
50	160 2156	O-ring ID 15,60 x 1,78 (NBR)
	160 6156	O-ring ID 15,60 x 1,78 (FKM)
60	160 2093	O-ring ID 9,25 x 1,78 (NBR)
	160 6092	O-ring ID 9,25 x 1,78 (FKM)
70	049.3137	Backup ring rd 10,6 x 13,5 x 1,4

**ACCESSORIES**

Proportional amplifier	Register 1.13
Flange body / sandwich plate NG3-Mini	Data sheet 2.3-700
Threaded body	Data sheet 2.9-200
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5 as standard

**SURFACE TREATMENT**

- ◆ All external parts of the cartridge as well the solenoid coil are zinc-nickel coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**STANDARDS**

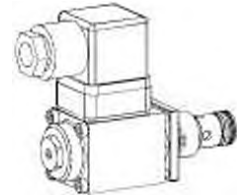
Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M18 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 40$ Nm Screw-in cartridge $M_0 = 1,2$ Nm solenoid screws

**Proportional pressure relief cartridge**

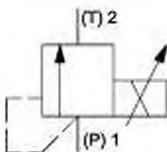
- ◆ direct operated
- ◆  $Q_{max} = 8 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$
- ◆  $p_{Nmax} = 315 \text{ bar}$

**M18 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Direct operated proportional pressure relief valve in screw-in cartridge construction for cavity according to ISO 7789. Good flow capacity due to the differential area principle, very sensitively adjustable. When the operating pressure adjusted by means of the proportional solenoid is reached, the valve opens and connects the protected line with the drain to the tank. The back pressure in T (2) affects the pressure in P (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	PI29V (Data sheet 1.1-90)
Connection	Connector socket EN 175301 - 803

**TYPE CODE**

Pressure relief valve					B	D	P	PM18	-	-	-	#	
Direct operated													
Proportional													
Screw-in cartridge M18 x 1,5													
Nominal pressure range $p_N$	20 bar	100 bar	200 bar	315 bar	20	100	200	315					
Nominal voltage $U_N$	12 VDC	24 VDC			G12	G24							
Sealing material	NBR	FKM (Viton)				D1							
Design index (subject to change)													

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure relief valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M18 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,25 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_b = 1080 \text{ mA (12 VDC)}$ $I_b = 540 \text{ mA (24 VDC)}$

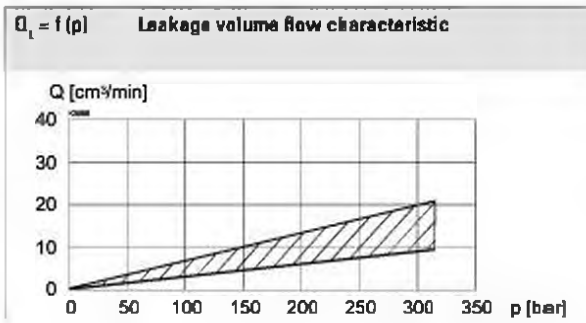
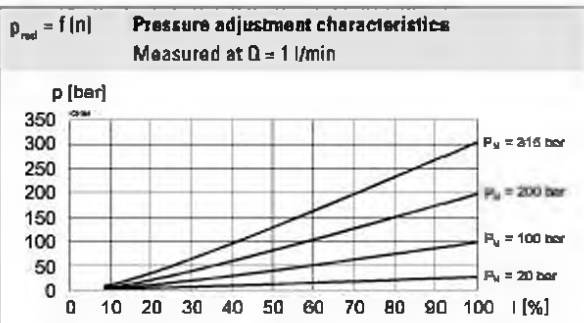
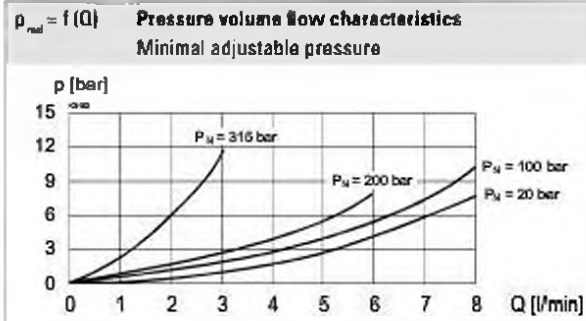
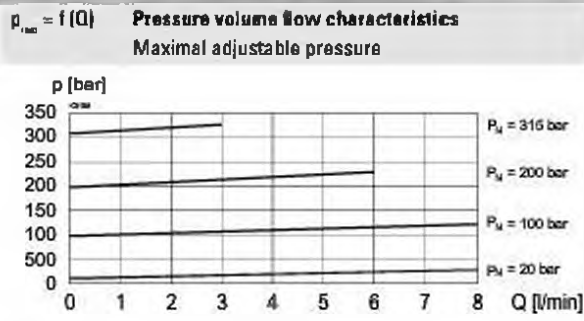
**Note!** Other electrical specifications see data sheet 1.1-90

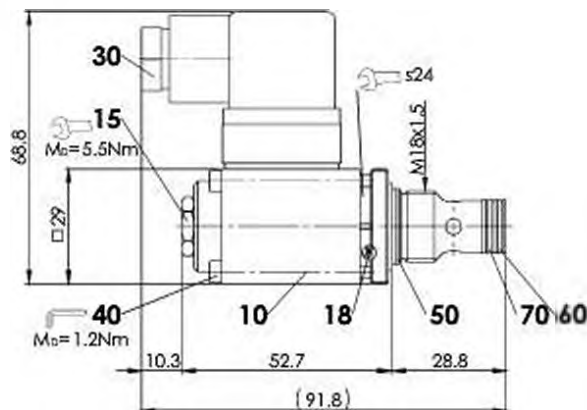

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Nominal pressure range	$P_N = 20 \text{ bar, 100 bar, 200 bar, 315 bar}$
Maximum volume flow	$Q_{max} = 8 \text{ l/min (} p_N = 20 / 100 \text{ bar)}$ $Q_{max} = 6 \text{ l/min (} p_N = 200 \text{ bar)}$ $Q_{max} = 3 \text{ l/min (} p_N = 315 \text{ bar)}$
Minimum volume flow	$Q_{min} = 0,1 \text{ l/min}$
Leakage oil	See characteristics
Hysteresis	$\leq 2 \%$ at optimal dither signal
Repeatability	$\leq 1 \%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 $\geq 75$ , see data sheet 1.0-50

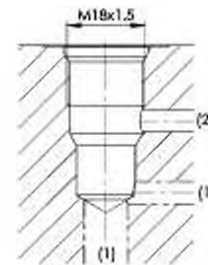
**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-18-02-0-88


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1001

**PARTS LIST**

Position	Article	Description
10	256 2418	Proportional solenoid PI29V-G12
	256 2453	Proportional solenoid PI29V-G24
15	253 8000	Manual override HB4,5
18	160 2120	O-ring ID 12,42 x 1,78 (NBR)
30	219 2002	Electric plug B (black)
40	249 0006	Socket head screw M3 x 42
50	160 2156	O-ring ID 15,60 x 1,78 (NBR)
	160 6156	O-ring ID 15,60 x 1,78 (FKM)
60	160 2093	O-ring ID 9,25 x 1,78 (NBR)
	160 6092	O-ring ID 9,25 x 1,78 (FKM)
70	049.3137	Backup ring rd 10,6 x 13,5 x 1,4

**ACCESSORIES**

Proportional amplifier	Register 1.13
Flange body / sandwich plate NG3-Mini	Data sheet 2.3-700
Threaded body	Data sheet 2.9-200
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5 as standard

**SURFACE TREATMENT**

- ◆ All external parts of the cartridge as well the solenoid coil are zinc-nickel coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**STANDARDS**

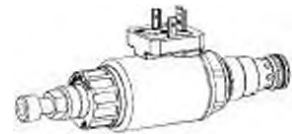
Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M18 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 40$ Nm Screw-in cartridge $M_0 = 1,2$ Nm solenoid screws

**Proportional pressure relief cartridge inverse**

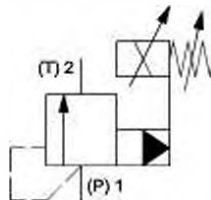
- ◆ pilot operated
- ◆  $Q_{max} = 100 \text{ l/min}$
- ◆  $p_{max} = 400 \text{ bar}$
- ◆  $p_{Nmax} = 350 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Pilot operated proportional pressure relief valve with inverse function in screw-in cartridge construction for cavity according to ISO 7789. High flow capacity, very sensitively adjustable. When the operating pressure adjusted by means of the proportional solenoid is reached, the valve opens and connects the protected line with the drain to the tank. With the solenoid deenergised, maximum working pressure is present. If the solenoid current increases, the pressure in part P (1) drops. The back pressure in T (2) affects the pressure in P (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. By means of the inverse function, the maximum system pressure is maintained if the electrical valve control falls out (safety function). The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W.S37 / 19 x 50 (Data sheet 1.1-173) M.S35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**TYPE CODE**

		B V I PM22 - <input type="text"/> - <input type="text"/> / <input type="text"/> <input type="text"/> - <input type="text"/> # <input type="text"/>			
Pressure relief valve					
Pilot operated					
Proportional, inverse					
Screw-in cartridge M22 x 1,5					
Nominal pressure range $p_n$	20 bar	<input type="text" value="20"/>	200 bar	<input type="text" value="200"/>	
	63 bar	<input type="text" value="63"/>	275 bar	<input type="text" value="275"/>	
	100 bar	<input type="text" value="100"/>	350 bar	<input type="text" value="350"/>	
	160 bar	<input type="text" value="160"/>			
Nominal voltage $U_n$	12 VDC	<input type="text" value="G12"/>			
	24 VDC	<input type="text" value="G24"/>			
	without coil	<input type="text" value="X5"/>			
Slip-on coil	Metal housing round		<input type="text" value="W"/>		
	Metal housing square		<input type="text" value="M"/>		
Connection execution	Connector socket EN 175301-803 / ISO 4400		<input type="text" value="D"/>		
	Connector socket AMP Junior - Timer		<input type="text" value="J"/>		
	Connector Deutsch DT04 - 2P		<input type="text" value="G"/>		
Sealing material	NBR	<input type="text"/>			
	FKM (Viton)	<input type="text" value="D1"/>			
Design index (subject to change)					

1 3-008

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure relief valve with inverse function
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,70 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{nom} = 400$ bar
Tank pressure	$p_{T,nom} = p_p + 20$ bar
Nominal pressure range	$P_n = 20$ bar, 63 bar, 100 bar, 160 bar, 200 bar, 275 bar, 350 bar Adjustable via adjustment screw (-20 % / +30 %)
Volume flow range	$Q = 5...100$ l/min
Leakage oil	See characteristics
Hysteresis	≤ 4 % at optimal dither signal
Repeatability	≤ 3 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

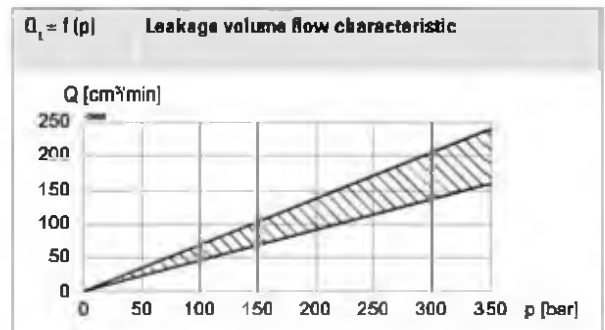
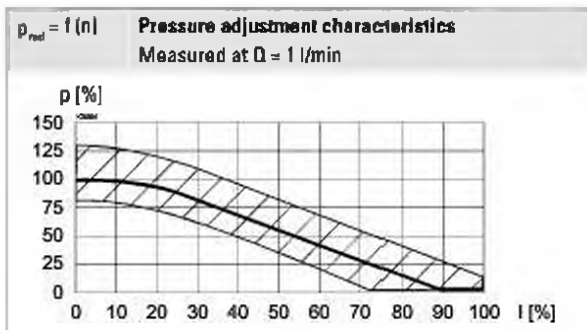
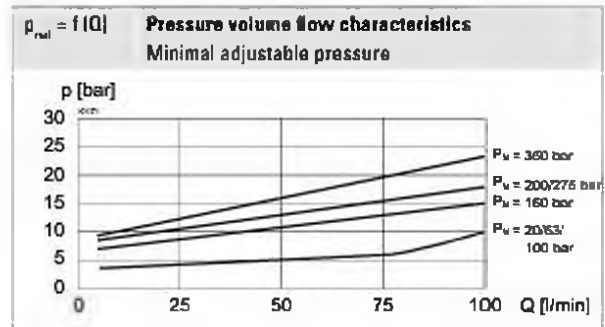
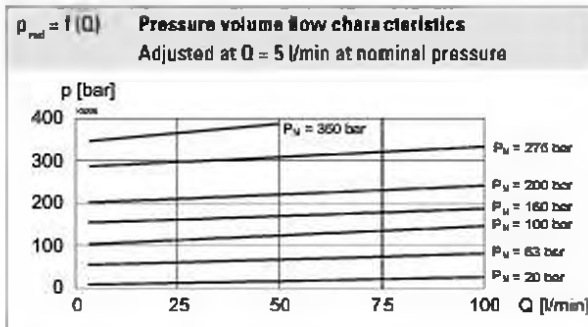
**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1320$ mA ( $U_n = 12$ VDC) $I_a = 660$ mA ( $U_n = 24$ VDC)

**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)



**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**SURFACE TREATMENT**

- ◆ The cartridge body made of steel and the slip-on coil are zinc-nickel coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

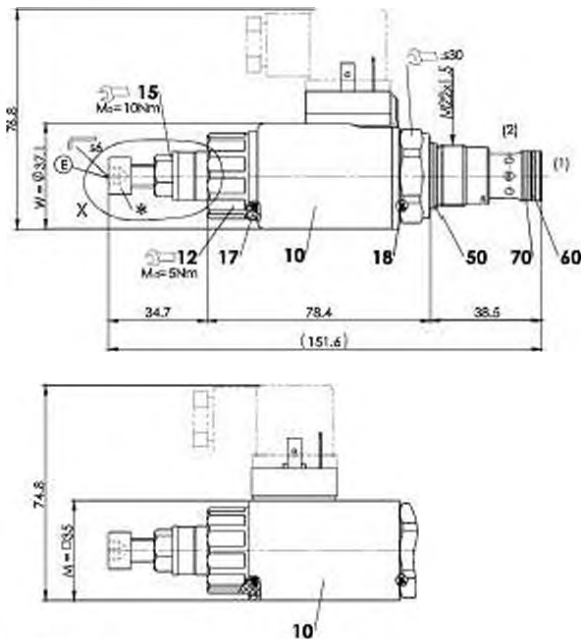
Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut

**ACCESSORIES**

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2002
Flange body / sandwich plate NG4-Mini	Data sheet 2.3-720
Flange body / sandwich plate NG6	Data sheet 2.3-740
Flange body / sandwich plate NG10	Data sheet 2.3-760
Threaded body	Data sheet 2.9-200
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

None

**DIMENSIONS**


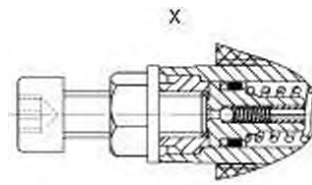
E = Air bleed screw

\*Adjustment screw for adjusting the nominal pressure

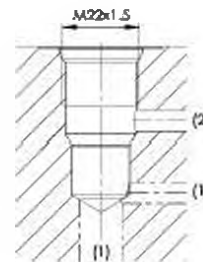
**COMMISSIONING**

When commissioning, the valve must be vented under pressure as follows (see detail X in Dimensions):

- ◆ Loosen lock nut
- ◆ Remove screw (E)
- ◆ Push the non-return valve (with pin or hex key < 1,3 mm)
- ◆ Screw-in the screw (E)
- ◆ Adjust the required pressure and tighten the lock nut

**Attention!** Therewith oil flows out with the corresponding pressure! Cover with a cloth.

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-02-0-98


**Note!**

For detailed cavity drawing and cavity tools see data sheet 2.13-1003

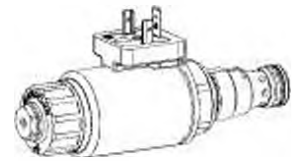

**PARTS LIST**

Position	Article	Description
10	206.2...	W.S37 / 19 x 50
	260.5...	M.S35 / 19 x 50
12	154.2700	Knurled nut
15	153.2401	Dichtmutter Norm „Seal-Lock“ 8 Zi - Ni M8
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
70	049.3177	Back-up ring rd 14,6 x 17,5 x 1,4



**Proportional pressure relief cartridge**

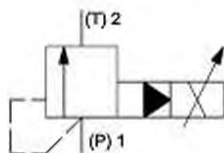
- ◆ pilot operated
- ◆  $Q_{max} = 100 \text{ l/min}$
- ◆  $p_{max} = 400 \text{ bar}$
- ◆  $p_{Nmax} = 350 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Pilot operated proportional pressure relief valve in screw-in cartridge construction for cavity according to ISO 7789. High flow capacity, very sensitively adjustable. When the operating pressure adjusted by means of the proportional solenoid is reached, the valve opens and connects the protected line with the drain to the tank. The back pressure in T (2) affects the pressure in P (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	WS37 / 19 x 50 (Data sheet 1.1-173) MS35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**TYPE CODE**

Pressure relief valve		B	V	P	PM22	-		-		/		-		-		+
Pilot operated																
Proportional																
Screw-in cartridge M22 x 1,5																
Nominal pressure range $p_N$	20 bar	20	200 bar	200												
	63 bar	63	275 bar	275												
	100 bar	100	350 bar	350												
	160 bar	160														
Nominal voltage $U_N$	12 VDC	G12														
	24 VDC	G24														
	without coil	X5														
Slip-on coil	Metal housing round															
	Metal housing square															
Connection execution	Connector socket EN 175301-803 / ISO 4400															
	Connector socket AMP Junior - Timer															
	Connector Deutsch DT04 - 2P															
Sealing material	NBR															
	FKM (Viton)	D1														
Manual override	Manual override															
	Screw plug															

Design index (subject to change)

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure relief valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,50 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1320 \text{ mA}$ ( $U_n = 12\text{VDC}$ ) $I_a = 660 \text{ mA}$ ( $U_n = 24\text{VDC}$ )

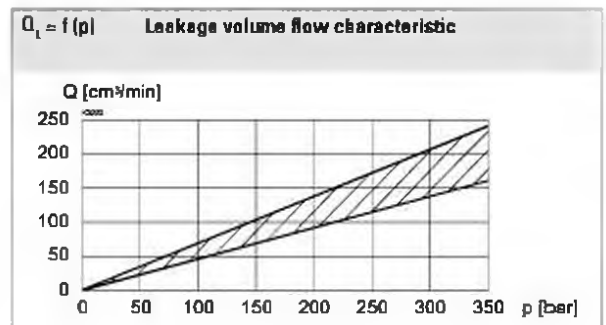
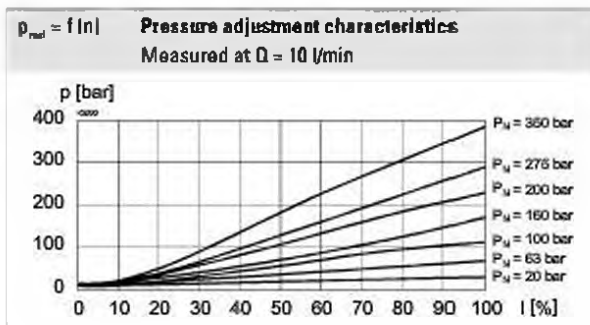
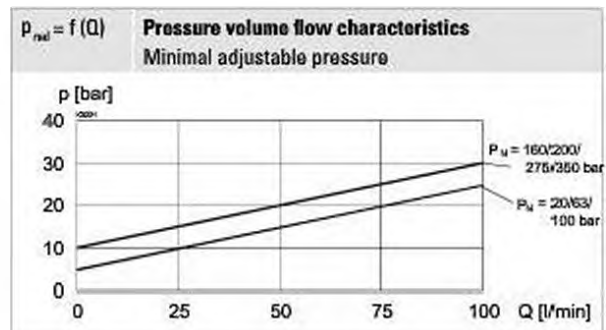
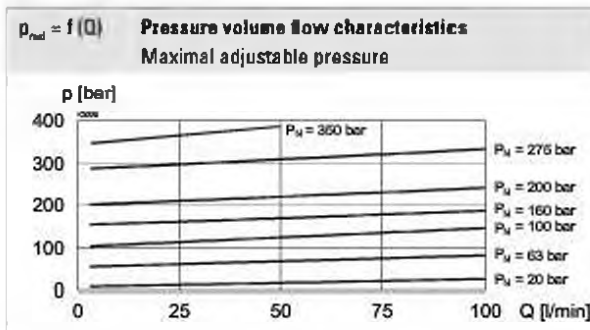
**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)

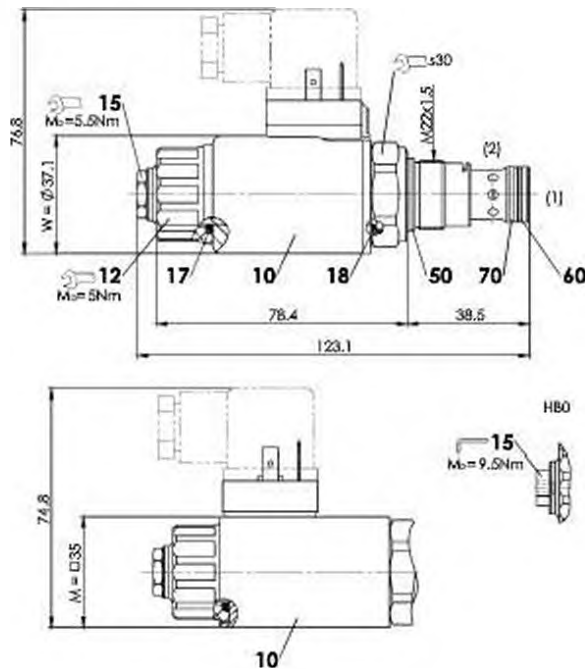

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{\text{max}} = 400 \text{ bar}$
Tank pressure	$p_{\text{Tank}} = p_p + 20 \text{ bar}$
Nominal pressure range	$P_n = 20 \text{ bar}, 63 \text{ bar}, 100 \text{ bar}, 160 \text{ bar}, 200 \text{ bar}, 275 \text{ bar}, 350 \text{ bar}$
Volume flow range	$Q = 0,3...100 \text{ l/min}$
Leakage oil	See characteristics
Hysteresis	$\leq 4 \%$ at optimal dither signal
Repeatability	$\leq 2 \%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	$12 \text{ mm}^2/\text{s} \dots 320 \text{ mm}^2/\text{s}$
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade $\beta_6 \dots 10 \geq 75$ , see data sheet 1.0-50

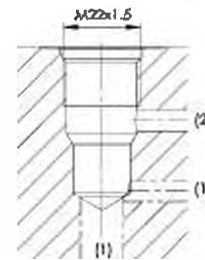
**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-02-0-88


**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1003

**MANUAL OVERRIDE**

HB4,5

Optionally: Screw plug (HBO), no actuation possible

**SURFACE TREATMENT**

♦ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**PARTS LIST**

Position	Article	Description
10	206.2...	WS37 / 19 x 50
	260.5...	M.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000	HB4,5 manual override
	239.2033	HBO Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
70	049.8177	Back-up ring PTSM rd 12,4 x 15,3 x 1,4

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**ACCESSORIES**

Proportional amplifier	Registrar 1.13
Electric plug B (black)	Article no. 219.2002
Flange body / sandwich plate NG4-Mini	Data sheet 2.3-720
Flange body / sandwich plate NG6	Data sheet 2.3-740
Flange body / sandwich plate NG10	Data sheet 2.3-760
Threaded body	Data sheet 2.9-200
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**SEALING MATERIAL**

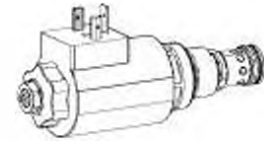
NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HBO $M_0 = 5,5 \text{ Nm}$ HB4,5

**Proportional inverse pressure relief valve**
**Screw-In cartridge**

- Pilot operated
- Nominal pressure adjustable +20% / -30%
- $Q_{max} = 100 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_{Nmax} = 200 \text{ bar}$

**M22x1,5**  
 ISO 7789

**DESCRIPTION**

Pilot operated proportional pressure relief valve with inverse function. Thread M22x1,5 and cavity according to ISO 7789. As standard versions, 4 pressure levels are available. The adjustment takes place by means of a Wandfluh proportional solenoid (VDE-standard 0580). The cartridge body made of steel is zinc coated and therefore rust-protected. The solenoid coil is made of plastic.

**FUNCTION**

When the operating pressure set by the proportional solenoid is reached, the main spool opens and connects the protected line with the return line to the tank. The back pressure in T (2) influences the pressure in P (1). This pilot operated proportional pressure relief valve can be adjusted very sensitively and is suitable for large volume flows and high pressures. To control the valve, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The valve has its application in hydraulic systems, in which the pressure frequently has to be changed. The facility for electric remote controlling of the valve in conjunction with process control systems enables economic problem solutions with repeatable sequences. Installation of the screw-in cartridge in control blocks.

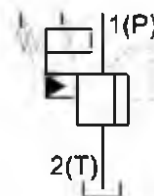
Cavity tools are available for machining the cavities in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

		B N I PM22 - [ ] - [ ] / K [ ] - [ ] # [ ]	
Pressure relief valve			
Pilot operated, inverse			
Proportional			
Screw-in cartridge M22x1,5			
Nominal pressure range $p_n$	83 bar   100 bar   160 bar   200 bar	83   100   160   200	
Nominal voltage $U_n$	12VDC 24VDC without coil	G12 G24 X5	
Slip-on coil	Plastic housing round		
Connection execution	Connector socket EN175301-803/ISO4400 Connector socketAMP Junior-Timer Connector Deutsch DT04-2P	D J G	(only for G24)
Sealing material	NBR FKM (Viton)	D1	
Design-Index (Subject to change)			

**GENERAL SPECIFICATIONS**

Description	Pilot operated proportional pressure relief valve with inverse function
Construction	Screw-in cartridge for cavity to ISO 7789
Actuation	Proportional solenoid
Mounting	Screw-in thread M22x1,5
Ambient temperature	-20...+50 °C
Mounting position	any, preferably horizontal
Fastening torque	$M_o = 50 \text{ Nm}$ for screw-in cartridge $M_o = 3 \pm 1.2 \text{ Nm}$ for knurled nut $M_o = 9.5 \text{ Nm}$ for hexagon nut
Weight	$m = 0.45 \text{ kg}$

**SYMBOLS**


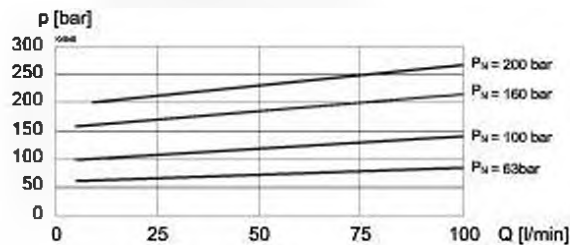
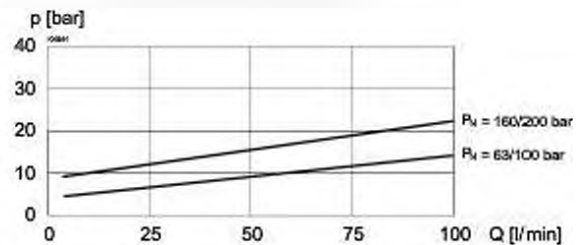
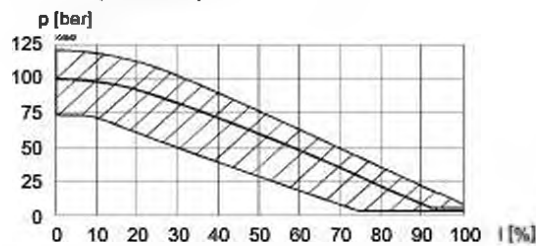
**ELECTRICAL SPECIFICATIONS**

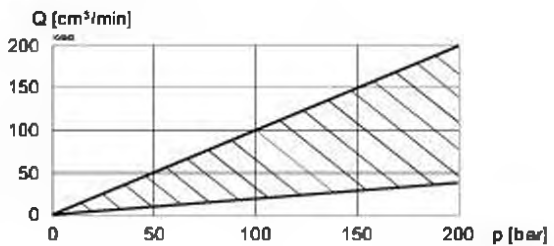
Construction	Proportional solenoid, wet pin push type, pressure tight	
Standard-Nominal voltage	$U_N = 12 \text{ VDC}$	$U_N = 24 \text{ VDC}$
Limiting current	$I_G = 1250 \text{ mA}$	$I_G = 680 \text{ mA}$
Relative duty factor	100% DF (see data sheet 1.1-430)	
Protection class acc. EN 60529	Connection version D: IP 65 J: IP 68 G: IP 67 / IP 69K acc. EN 40050	

For further electrical specifications see data sheet 1.1-172

**HYDRAULIC SPECIFICATIONS**

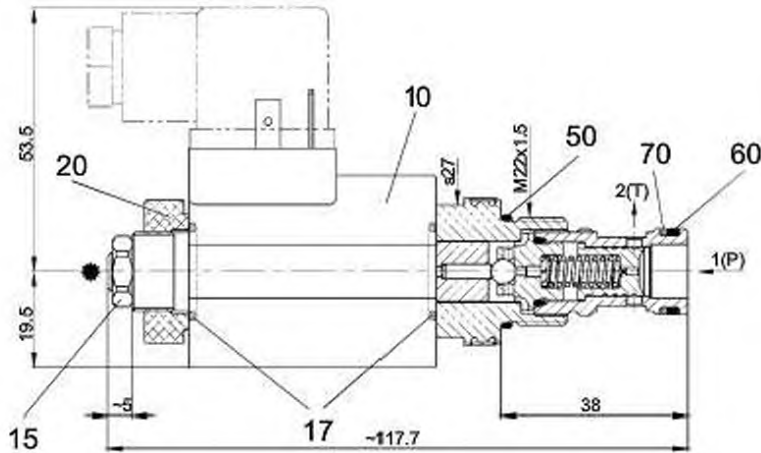
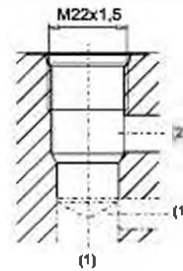
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{6...10} \geq 75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 400 \text{ bar}$ $p_{tr,max} = 50 \text{ bar}$
Nominal pressure ranges	$p_N = 63, 100 \text{ bar}, 160 \text{ bar}, 200 \text{ bar}$
Volume flow	$Q = 5...100 \text{ l/min}$ with $p_N = 63 / 100 / 160 \text{ bar}$ $Q = 10...100 \text{ l/min}$ with $p_N = 200 \text{ bar}$
Leakage volume flow	see characteristics
Hysteresis	$\leq 5\%$ * * at optimal dither signal

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 **$p = f(Q)$  Pressure volume flow characteristics (Maximum adjustable pressure)**

 **$p = f(Q)$  Pressure volume flow characteristics (Minimum adjustable pressure)**

 **$p = f(i)$  Pressure adjustment characteristics (Q = 5 l/min)**

 Adjustable range of nominal pressure, adjusted with set screw..

 **$Q = f(p)$  Leakage volume flow characteristics**


**DIMENSIONS / SECTIONAL DRAWINGS**

- ◆ Adjusting screw for setting the nominal pressure (+20 % / -30 %)


 Cavity drawing according to  
 ISO 7789-22-02-0-98

 For detailed cavity drawing  
 and cavity tools  
 see data sheet 2.13-1003

Dimensions of the other connection versions see data sheet 1.1-172

Position	Article	Description
10	206.2301	EN 175301 solenoid coil KD35/16-G24
	206.2300	solenoid coil KD35/16-G12
		Junior-Timer
	206.2303	solenoid coil KJ35/16-G24
	206.2302	solenoid coil KJ35/16-G12
206.2304		Deutsch solenoid coil KG35/16-G24
15	153.1402	Hexagon nut M8x1
17	160.1158	O-ring ID 15,60 x1,78 (NBR)
20	154.2600	Knurled nut
50	160.2188	O-ring ID 18,77 x1,78 (NBR)
	160.8188	O-ring ID 18,77 x1,78 (FKM)
60	160.2140	O-ring ID 14,00 x1,78 (NBR)
	160.8141	O-ring ID 14,00 x1,78 (FKM)
70	049.3177	Backup ring RD 14,8 x 17,5 x 1,4

**ACCESSORIES**

Flange/sandwich plate NG4-Mini	Data sheet 2.3-720
Flange/sandwich plate NG6	Data sheet 2.3-740
Flange/sandwich plate NG10	Data sheet 2.3-760
Line mount body	Data sheet 2.9-200
Proportional amplifier	Register 1.13
Mating connector EN 175301-803	Article no. 218.2002

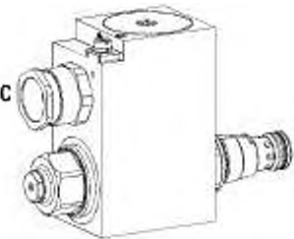
Technical explanation see data sheet 1.0-100

**Proportional pressure relief cartridge**

- ◆ pilot operated
- ◆  $Q_{max} = 100 \text{ l/min}$
- ◆  $p_{nom} = 400 \text{ bar}$
- ◆  $p_{Nmax} = 350 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**

- ⊕ II 2 G Ex db IIC T6, T4
  - ⊕ II 2 D Ex db III C T80 °C, T130 °C
  - ⊕ I M2 Ex db I Mb
- Class I Division 1
- 
- Class I Zone 1


**DESCRIPTION**

Pilot operated proportional pressure relief valve in screw-in cartridge construction for cavity according to ISO 7789. High flow capacity, very sensitively adjustable. When the operating pressure adjusted by means of the proportional solenoid is reached, the valve opens and connects the protected line with the drain to the tank. The back pressure in T (2) affects the pressure in P (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13). The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

		B V B PM22 - [ ] - [ ] / [ ] / [ ] - [ ] # [ ]			
Pressure relief valve					
Pilot operated					
Proportional, explosion proof execution Ex d					
Screw-in cartridge M22 x 1,5					
Execution		L8	L15 / L17		
Nominal pressure range $p_v$ [bar]		20 50 80	180 220 280	20 63 100	200 275 350
Nominal voltage $U_v$		12 VDC 24 VDC	G12 G24		
Nominal power $P_v$		9 W 15 W 17 W	L8 L15 L17	Ambient temperature up to: 40 °C or 90 °C 70 °C 70 °C (only UL / CSA)	
Certification		ATEX, IECEx, EAC, CCC Australia	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	UL / CSA MA	<input type="checkbox"/> <input type="checkbox"/>
Sealing material		NBR FKM (Viton)	<input type="checkbox"/> <input type="checkbox"/>		
Options		without amplifier	<input type="checkbox"/> <input type="checkbox"/>		
<b>Design index (subject to change)</b>					

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to...	M248 Electronic
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	
MA		x	x	x
UL / CSA	x		x	

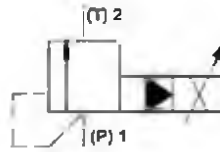
**GENERAL SPECIFICATIONS**

Designation	Proportional pressure relief valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17)
Weight	1,9 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at... °C	<b>L9, 40 °C</b> $I_a = 625 \text{ mA}$ (12 VDC) $I_a = 305 \text{ mA}$ (24 VDC) <b>L15 / 17, 50 °C</b> $I_a = 950 \text{ mA}$ (12 VDC) $I_a = 450 \text{ mA}$ (24 VDC) <b>L15 / 17, 70 °C</b> $I_a = 910 \text{ mA}$ (12 VDC) $I_a = 420 \text{ mA}$ (24 VDC)
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

**Nota!** Other electrical specifications see data sheet 1.1-183 and 1.1-184


**SYMBOL**

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{\text{nom}} = 400 \text{ bar}$
Nominal pressure range	<b>Execution L9</b> $P_N = 20 \text{ bar}, 50 \text{ bar}, 80 \text{ bar}, 160 \text{ bar}, 220 \text{ bar}, 280 \text{ bar}$ <b>Execution L15 / 17</b> $P_N = 20 \text{ bar}, 63 \text{ bar}, 100 \text{ bar}, 200 \text{ bar}, 275 \text{ bar}, 350 \text{ bar}$
Volume flow range	$Q = 0,3 \dots 100 \text{ l/min}$
Leakage oil	See characteristics
Hysteresis	≤ 5 % at optimal dither signal
Repeatability	≤ 2 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L15 / L17) FKM -20...+70 °C (L9)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**ACTUATION**

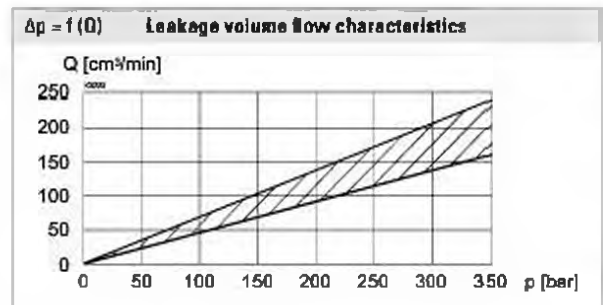
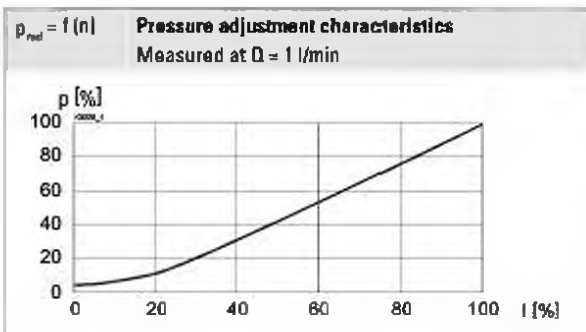
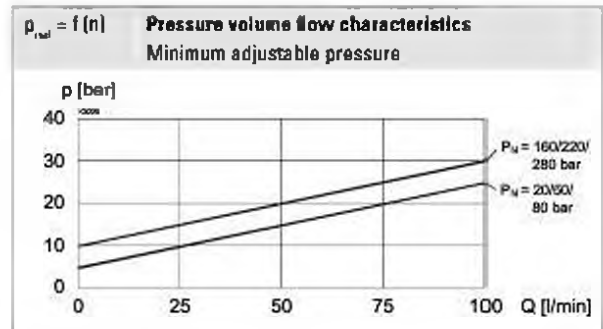
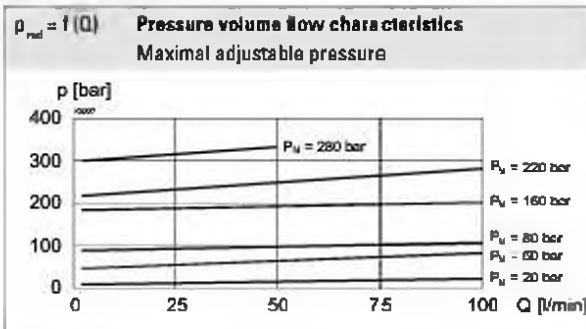
Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

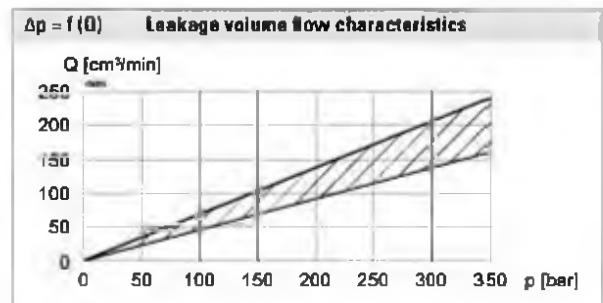
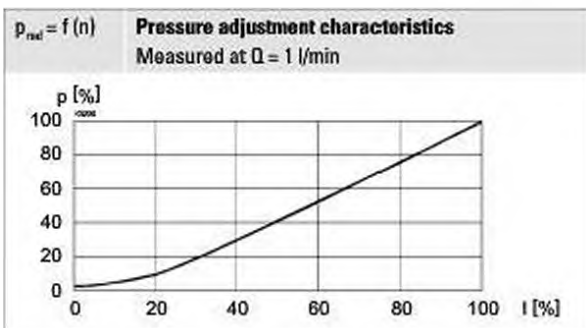
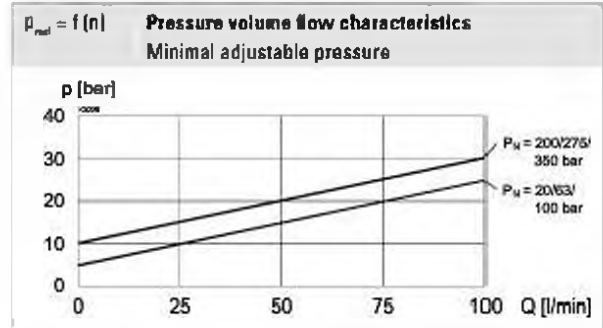
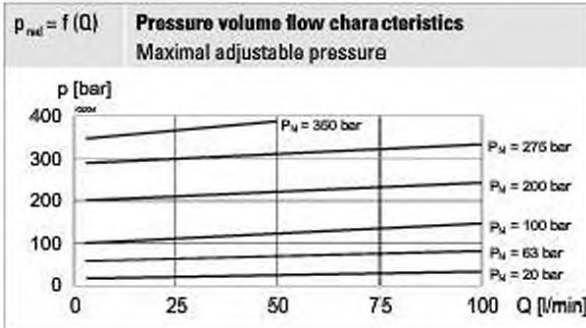
**Attention!** The UL execution is always supplied without cable gland

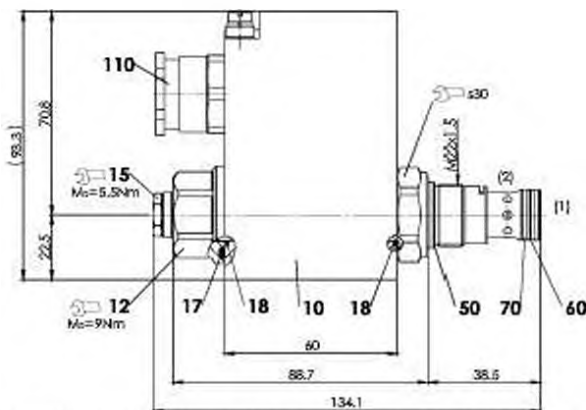




**PERFORMANCE SPECIFICATIONS EXECUTION L9 (MEASURED AT 40 °C)**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**PERFORMANCE SPECIFICATIONS EXECUTION L15 / L17 (MEASURED AT 50 °C)**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**DIMENSIONS**


Dimensions of the solenoid coil see data sheet 1.1-183 and 1.1-184

**PARTS LIST**

Position	Article	Description
10	263.6	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	253.8000	Manual override HB4,5
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.8188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.8140	O-ring ID 14,00 x 1,78 (FKM)
70	049.3177	Back-up ring rd 14,6 x 17,5 x 1,4
110	111.1080	Cable gland M20 x 1,5

**STANDARDS**

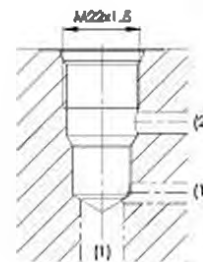
Cartridge cavity	ISO 7789
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60$ Nm Screw-in cartridge $M_0 = 9$ Nm knurled nut $M_0 = 9,5$ Nm HB0 $M_0 = 5,5$ Nm HB4,5

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-02-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1003

**ACCESSORIES**

Proportional amplifier	Register 1.13
Flange body / sandwich plate NG4-Mini	Data sheet 2.3-720
Flange body / sandwich plate NG6	Data sheet 2.3-740
Flange body / sandwich plate NG10	Data sheet 2.3-760
Threaded body	Data sheet 2.9-200
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5 as standard

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**COMMISSIONING**
**Attention!**

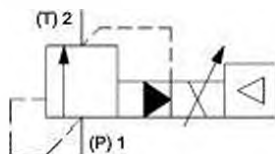

The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability can be assumed.

**Proportional pressure relief cartridge with integrated electronics**

- ◆ pilot operated
- ◆  $Q_{max} = 100 \text{ l/min}$
- ◆  $p_{nom} = 400 \text{ bar}$
- ◆  $p_{Nmax} = 350 \text{ bar}$

**DESCRIPTION**

Pilot operated proportional pressure relief valve with integrated electronics as screw-in cartridge for cavity according to ISO 7789. When the operating pressure adjusted by means of the proportional solenoid is reached, the valve opens and connects the protected line with the drain to the tank. The back pressure in T (2) affects the pressure in P (1). This proportional valve is very sensitively adjustable and suitable for high pressures. The Plug & Play valves are factory set and adjusted and have therefore a high valve-to-valve reproducibility. The control takes place via an analogue interface or a fieldbus interface (CANopen, J1939 or Profibus DP). The parameterisation takes place by means of the free of cost parameterisation and diagnostics software «PASO» or via fieldbus interface. The USB parameterisation interface is accessible through a screw plug. As an option, these valves are available with integrated controller. As feedback value generators sensors with voltage or current output can be connected directly. The available controller structures are optimised for applications with hydraulic actuations.

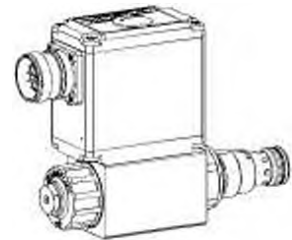
**SYMBOL**

**ELECTRICAL SPECIFICATIONS**

Protection class	IP67 with suitable mating connector and closed housing cover
Ramps	Adjustable
Parameterisation	Via fieldbus or USB
Supply voltage	12 VDC, 24 VDC

**Note!** Exact electrical specifications and detailed description of «DSV» electronics can be found on data sheet 1.13-76.



M22 x 1,5  
ISO 7789



**APPLICATION**

Proportional pressure relief valves with integrated electronics are perfectly suitable for demanding applications in which the pressure frequently has to be changed. They are used in applications where high valve-to-valve reproducibility, easy installation, comfortable operation and high precision are very important. The integrated controller relieves the machine control and operates the pressure control in a closed loop circuit. The applications are in the industrial as well as in the mobile hydraulics for the smooth control of hydraulic actuations. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**Note!**



„PASO“ is a Windows programm in the flow diagram style, which enables the intuitive adjustment and storing of all variable parameters. The data remain saved in case of a power failure and can also be reproduced and transferred to other DSV.

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Connection	Via device receptacle

**MANUAL OVERRIDE**

HB4,5 as standard

**TYPE CODE**

		B V P PM22 - <input type="checkbox"/> - <input type="checkbox"/> / M E <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/> HB4,5 # <input type="checkbox"/>			
Pressure relief valve					
Pilot operated					
Proportional					
Screw-in cartridge M22 x 1,5					
Nominal pressure range $p_n$	20 bar	<input type="checkbox"/> 20	200 bar	<input type="checkbox"/> 200	
	63 bar	<input type="checkbox"/> 63	275 bar	<input type="checkbox"/> 275	
	100 bar	<input type="checkbox"/> 100	350 bar	<input type="checkbox"/> 350	
	160 bar	<input type="checkbox"/> 160			
Nominal voltage $U_n$	12 VDC	<input type="checkbox"/> G12			
	24 VDC	<input type="checkbox"/> G24			
Slip-on coil	Metal housing square				
Connection execution	Integrated electronics				
Hardware configuration					
Analog command value signal	12 pole	<input type="checkbox"/> A1	7 pole	<input type="checkbox"/> D1	{0 ... 10 V preset}
Analog command value signal	12 pole	<input type="checkbox"/> A4	7 pole	<input type="checkbox"/> D4	{4 ... 20 mA preset}
CANopen according to DSP-408		<input type="checkbox"/> C1			
Profibus DP according to Fluid Power Technology		<input type="checkbox"/> P1			
CAN J1939 (on request)		<input type="checkbox"/> J1			
Function					
Amplifier				<input type="checkbox"/> R1	
Controller with current feedback value signal (0...20 mA / 4...20 mA)				<input type="checkbox"/> R2	
Controller with voltage feedback value signal (0...10 V)					
Sealing material	NBR	<input type="checkbox"/> D1			
	FKM (Viton)				
Manual override					
Design index (subject to change)					

1.3-600


**GENERAL SPECIFICATIONS**


Designation	Proportional pressure relief valve with integrated electronic
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-20 ... +65 °C The upper temperature limit is a guideline for typical applications, in individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions „DSV“.
Weight	1,0 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**


Working pressure	$p_{max} = 400$ bar
Tank pressure	$p_{min} = p_p + 20$ bar
Nominal pressure range	$P_n = 20$ bar, 63 bar, 100 bar, 160 bar, 200 bar, 275 bar, 350 bar
Volume flow range	$Q = 0,3...100$ l/min
Leakage oil	See characteristics
Hysteresis	$\leq 4\%$ at optimal dither signal
Repeatability	$\leq 2\%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 $\geq 75$ , see data sheet 1.0-50


**ELECTRICAL CONNECTION**


X1	Analog interface (Main)
Device receptacle	M23, 12 pole male
	1 = Supply voltage + 2 = Supply voltage 0 VDC 3 = Stabilised output voltage 4 = Command value signal voltage + 5 = Command value signal voltage - 6 = Command value signal current + 7 = Command value signal current - 8 = Reserved for extensions 9 = Reserved for extensions 10 = Enable signal (Digital input) 11 = Error signal (Digital output) 12 = Chassis
Command value signal voltage (PIN 4/5) resp. current (PIN 6/7) are selected with parameterisation and diagnostics software PASO.	


X1	Fieldbus interface (Main)
Device receptacle	M12, 4 pole male
	1 = Supply voltage + 2 = Reserved for extensions 3 = Supply voltage 0 VDC 4 = Chassis

X2	Parameterisation interface
USB, Mini B	Under the screw plug of the housing cover Factory set

X1	Analog interface (Main)
Device receptacle	Connector DIN EN 175201 - 804
	7 pole male A = Supply voltage + B = Supply voltage 0 VDC C = Not connected D = Command value signal + E = Command value signal - F = Not connected G = Chassis
Command value signal: current (D4) or voltage (D2) to specify when placing the order	

X3	Profibus interface according to IEC 947-5-2
Device receptacle	M12, 5 pole female B-coded
	1 = VP 2 = Rx/D / Tx/D - N 3 = DGND 4 = Rx/D / Tx/D - P 5 = Shield

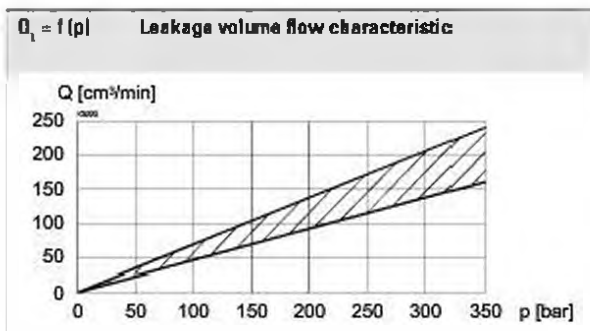
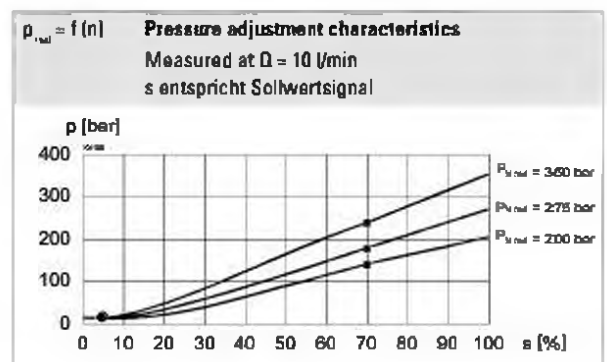
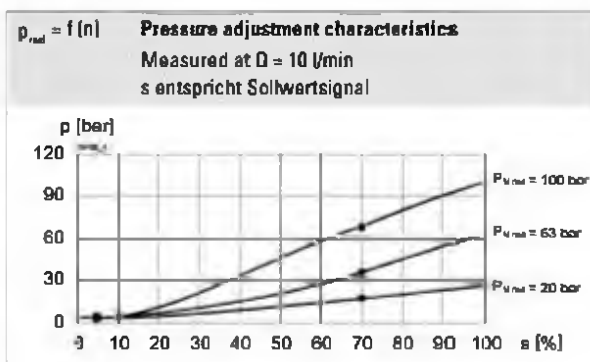
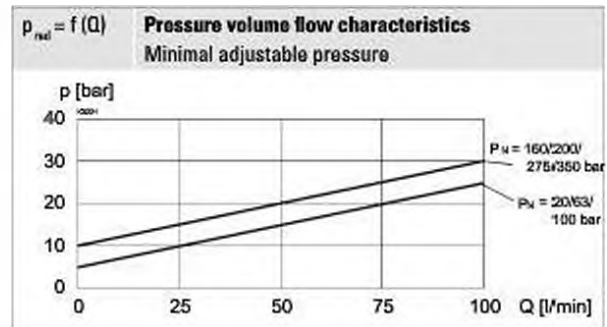
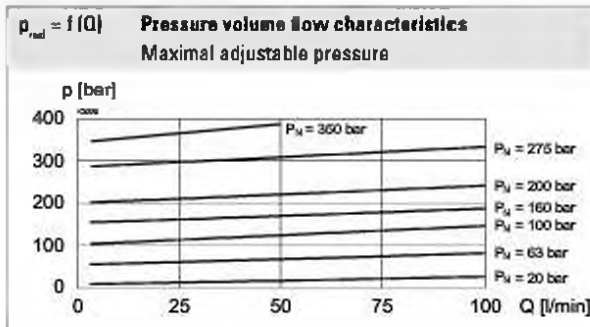
X3	CANopen interface according to DRP 303-1
Device receptacle	M12, 5 pole male
	1 = Not connected 2 = Not connected 3 = CAN Gnd 4 = CAN High 5 = CAN Low

X4 (controller only)	Feedback value interface (sensor)
Device receptacle	M12, 5 pole female
	1 = Supply voltage (output) + 2 = Feedback value signal + 3 = Supply voltage 0 VDC 4 = Not connected 5 = Stabilised output voltage
Feedback value signal: current (R1) or voltage (R2) to specify when placing the order	

**Note!** The mating connector is not included in the delivery



**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**FACTORY SETTINGS**

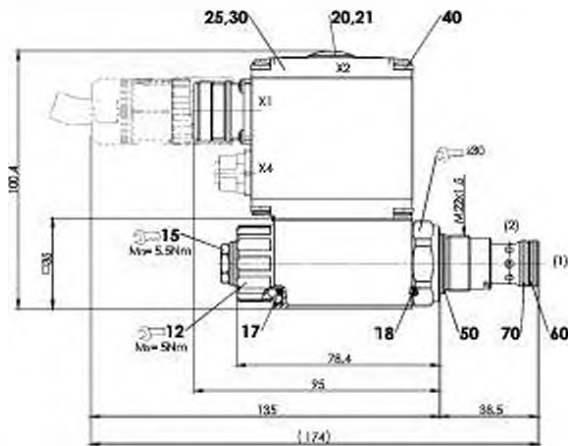
Dither set for optimum hysteresis

- = Deadband: solenoid switched off at command value signal < 5 %
- = Limited pressure in port P (1) at 70 % command value signal

248 bar	at nominal pressure range $p_N$	350 bar
192 bar	at nominal pressure range $p_x$	275 bar
144 bar	at nominal pressure range $p_x$	200 bar
114 bar	at nominal pressure range $p_N$	160 bar
72 bar	at nominal pressure range $p_N$	100 bar
46 bar	at nominal pressure range $p_x$	63 bar
16 bar	at nominal pressure range $p_x$	20 bar

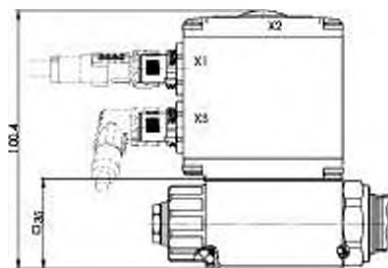
**DIMENSIONS**

With analog interface, 12 pole connector  
 Amplifier and controller

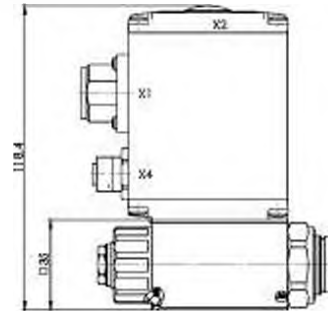


X4 (controller only)

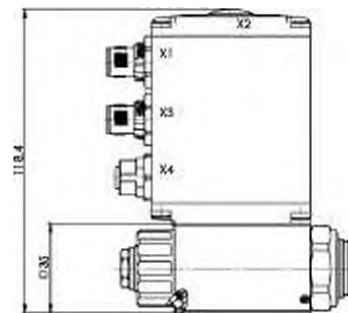
With fieldbus interface  
 Amplifier



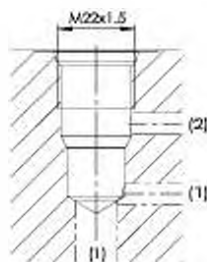
With analog interface, 7 pole connector  
 Amplifier and controller



With fieldbus interface  
 Controller


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-02-0-98



Note!



For detailed cavity drawing and cavity tools see data sheet 2.13-1003

**PARTS LIST**

Position	Article	Description
12	154.2700	Knurled nut
15	253.8000	Manual override HB4,5
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
20	223.1317	Dummy plug M16 x 1,5
21	160.6131	O-ring ID 13,00 x 1,5 (FKM)
25	062.0102	Cover
30	072.0021	Gasket 33,2 x 59,9 x 2
40	208.0100	Socket head screw M4 x 10
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
70	049.3177	Back-up ring rd 14,6 x 17,5 x 1,4

## ACCESSORIES

Parameterisation software	See start-up
Parameterisation cable for interface USB (from plug type A on Mini B, 3 m)	Article no. 219 2869
Mating connector (plug female) for analog interface	
straight, soldering contact M23, 12 pole	Article no. 219 2330
angled, soldering contact M23, 12 pole	Article no. 219 2331
straight, soldering contact, 7 pole	Article no. 219 2335
Flange body / sandwich plate NG4-Mini	Data sheet 2.3-720
Flange body / sandwich plate NG6	Data sheet 2.3-740
Flange body / sandwich plate NG10	Data sheet 2.3-760
Threaded body	Data sheet 2.9-200
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

### Attention!



Auxiliary conditions for the cable:

- External diameter 12 pol: 3,5...14,7 mm
- External diameter 7 pol: 8...10 mm
- Wire cross section max. 1 mm<sup>2</sup>
- Recommended wire cross section:  
 0...25 m = 0,75 mm<sup>2</sup> (AWG18)  
 25...50 m = 1 mm<sup>2</sup> (AWG17)

## SURFACE TREATMENT

- ◆ The cartridge body and the solenoid are zinc-nickel coated
- ◆ The electronics housing is made of aluminium.

## STANDARDS

Cartridge cavity	ISO 7789
CANopen	DRP 303-1
Profibus DP	IEC 947-5-2
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## COMMISSIONING

For DSV amplifiers as a rule no parameter adjustments by the customer are required. The plugs have to be connected in accordance with the chapter «Electrical connection».

Controllers are supplied configured as amplifiers. The adjustment of the mode of control and of the controller are carried out by the customer by means of the software adjustment (USB interface, Mini B). Further information can be found

Free- of charge download of the «PASO» software and the operation instructions for «DSV» hydraulic valves as well as the operation instructions CANopen Protocol resp. Profibus DP Protocol, with Device Profile DSP-408 for «DSV».

### Note!



The mating connectors and the parameterisation cable are not part of the delivery. Refer to chapter «Accessories».

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

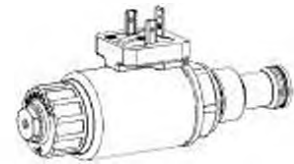
## INSTALLATION NOTES

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	M <sub>0</sub> = 60 Nm Screw-in cartridge M <sub>0</sub> = 5 Nm knurled nut



**Proportional pressure relief cartridge**

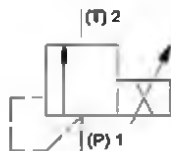
- ◆ direct operated
- ◆  $Q_{max} = 25$  l/min
- ◆  $p_{nom} = 400$  bar
- ◆  $p_{Nmax} = 350$  bar

**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Direct operated proportional pressure relief valve in screw-in cartridge construction for cavity according to ISO 7789. Good flow capacity due to the differential area principle, very sensitively adjustable. When the operating pressure adjusted by means of the proportional solenoid is reached, the valve opens and connects the protected line with the drain to the tank. The back pressure in T (2) affects the pressure in P (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	WS37 / 19 x 50 (Data sheet 1.1-173) MS35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**TYPE CODE**

		B		D		P		PM22		-		-		/		-		-		#	
Pressure relief valve																					
Direct operated																					
Proportional																					
Screw-in cartridge M22 x 1,5																					
Nominal pressure range $p_N$	20 bar		20	315 bar		315															
	100 bar		100	350 bar		350															
	200 bar		200																		
Nominal voltage $U_N$	12 VDC		G12																		
	24 VDC		G24																		
	without coil		X5																		
Slip-on coil	Metal housing round					W															
	Metal housing square					M															
Connection execution	Connector socket EN 175301-803 / ISO 4400					D															
	Connector socket AMP Junior - Timer					J															
	Connector Deutsch DT04 - 2P					G															
Sealing material	NBR																				
	FKM (Viton)		D1																		
Manual override	Manual override					HB4,5															
	Screw plug					HB0															

Design index (subject to change)

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure relief valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,6 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1320 \text{ mA}$ ( $U_N = 12\text{VDC}$ ) $I_a = 660 \text{ mA}$ ( $U_N = 24\text{VDC}$ )

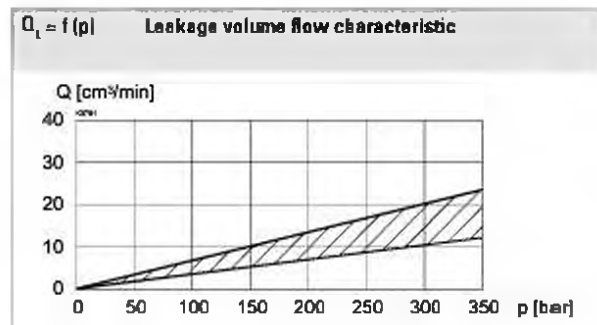
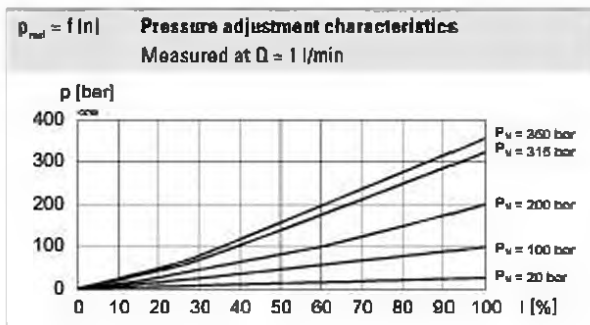
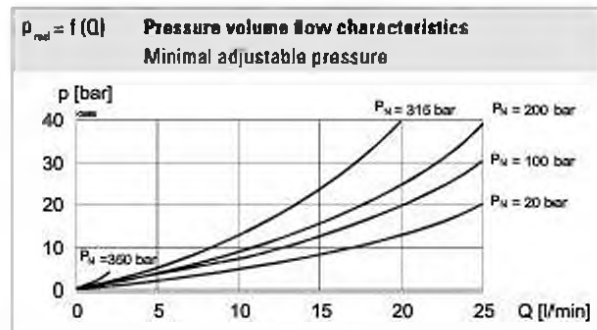
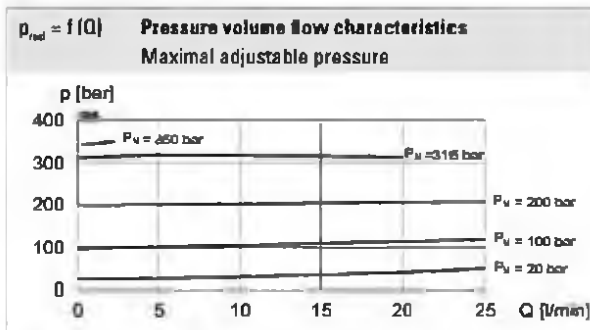
**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)

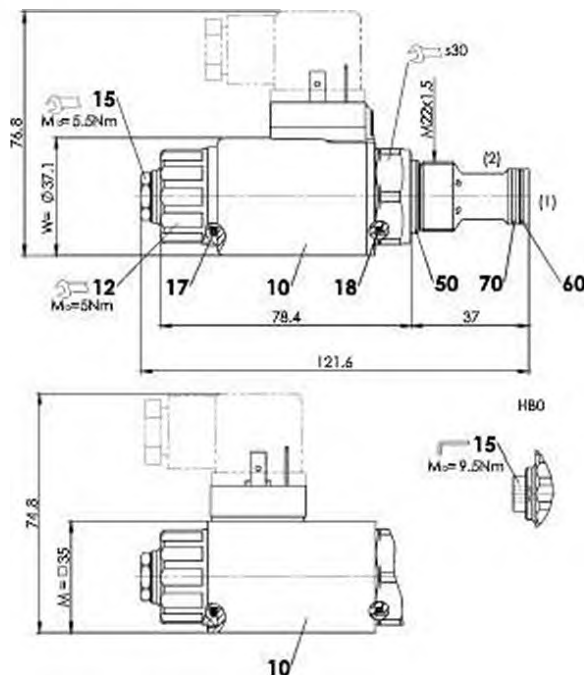

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400 \text{ bar}$
Nominal pressure range	$P_N = 20 \text{ bar}, 100 \text{ bar}, 200 \text{ bar}, 315 \text{ bar}, 350 \text{ bar}$
Maximum volume flow	$Q_{max} = 25 \text{ l/min}$ ( $p_N = 20 / 100 / 200 \text{ bar}$ ) $Q_{max} = 20 \text{ l/min}$ ( $p_N = 315 \text{ bar}$ ) $Q_{max} = 2 \text{ l/min}$ ( $p_N = 350 \text{ bar}$ )
Minimum volume flow	$Q_{min} = 0,1 \text{ l/min}$
Leakage oil	See characteristics
Hysteresis	$\leq 4 \%$ at optimal dither signal
Repeatability	$\leq 1 \%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 $\geq 75$ , see data sheet 1.0-50

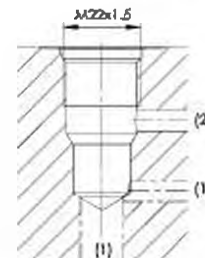
**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-02-0-88


**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1003

**MANUAL OVERRIDE**

HB4,5

Optionally: Screw plug (HB0), no actuation possible

**SURFACE TREATMENT**

- ◆ The cartridge body made of steel and the slip-on coil are zinc-nickel coated

**PARTS LIST**

Position	Article	Description
10	206.2... 260.5...	W.S37 / 19 x 50 M.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000 239.2033	HB4,5 manual override HB0 Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188 160.6188	O-ring ID 18,77 x 1,78 (NBR) O-ring ID 18,77 x 1,78 (FKM)
60	160.2140 160.6141	O-ring ID 14,00 x 1,78 (NBR) O-ring ID 14,00 x 1,78 (FKM)
70	049.8177	Back-up ring PTSM rd 12,4 x 15,3 x 1,4

**ACCESSORIES**

Proportional amplifier	Registrar 1.13
Electric plug B (black)	Article no. 219.2002
Flange body / sandwich plate NG4-Mini	Data sheet 2.3-720
Flange body / sandwich plate NG6	Data sheet 2.3-740
Flange body / sandwich plate NG10	Data sheet 2.3-760
Threaded body	Data sheet 2.9-200
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

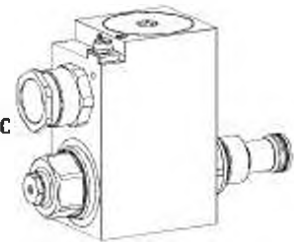
Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5

**Proportional pressure relief cartridge**

- ◆ direct operated
- ◆  $Q_{max} = 25 \text{ l/min}$
- ◆  $p_{nom} = 400 \text{ bar}$
- ◆  $p_{Nmax} = 350 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**

- Ⓢ II 2 G Ex db IIC T6, T4
- Ⓢ II 2 D Ex db III C T80 °C, T130 °C
- Ⓢ I M2 Ex db I Mb
- Class I Division 1
- Class I Zone 1


**DESCRIPTION**

Direct operated proportional pressure relief valve in screw-in cartridge construction for cavity according to ISO 7789. Good flow capacity due to the differential area principle, very sensitively adjustable. When the operating pressure adjusted by means of the proportional solenoid is reached, the valve opens and connects the protected line with the drain to the tank. The back pressure in T (2) affects the pressure in P (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13). The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

		B D B PM22 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/> # <input type="checkbox"/>	
Pressure relief valve			
Direct operated			
Proportional, explosion proof execution Ex d			
Screw-in cartridge M22 x 1,5			
Execution	L9	L15 / L17	
Nominal pressure range $p_N$ [bar]	<input type="checkbox"/> 20 <input type="checkbox"/> 80 <input type="checkbox"/> 160	<input type="checkbox"/> 250 <input type="checkbox"/> 280	<input type="checkbox"/> 20 <input type="checkbox"/> 100 <input type="checkbox"/> 200 <input type="checkbox"/> 275 <input type="checkbox"/> 315 <input type="checkbox"/> 350
Nominal voltage $U_N$	12 VDC 24 VDC	<input type="checkbox"/> G12 <input type="checkbox"/> G24	
Nominal power $P_N$	9 W 15 W 17 W	<input type="checkbox"/> L9 <input type="checkbox"/> L15 <input type="checkbox"/> L17	Ambient temperature up to: 40 °C or 90 °C 70 °C 70 °C (only UL / CSA)
Certification	ATEX, IECEx, EAC, CCC Australia	<input type="checkbox"/> <input type="checkbox"/> AU	UL / CSA MA <input type="checkbox"/> UL <input type="checkbox"/> MA
Sealing material	NBR FKM (Viton)	<input type="checkbox"/> <input type="checkbox"/> D1	
Options	without amplifier	<input type="checkbox"/> M248	
Design index (subject to change)			

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to...	M248 Electronic
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	
MA		x	x	x
UL / CSA	x		x	

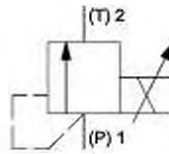
**GENERAL SPECIFICATIONS**

Designation	Proportional pressure relief valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17)
Weight	2,2 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at... °C	<b>19, 40 °C</b> $I_a = 625 \text{ mA (12 VDC)}$ $I_a = 305 \text{ mA (24 VDC)}$ <b>115 / 17, 50 °C</b> $I_a = 950 \text{ mA (12 VDC)}$ $I_a = 450 \text{ mA (24 VDC)}$ <b>115 / 17, 70 °C</b> $I_a = 910 \text{ mA (12 VDC)}$ $I_a = 420 \text{ mA (24 VDC)}$
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

**Note!** Other electrical specifications see data sheet 1.1-183 and 1.1-184


**SYMBOL**

**ACTUATION**

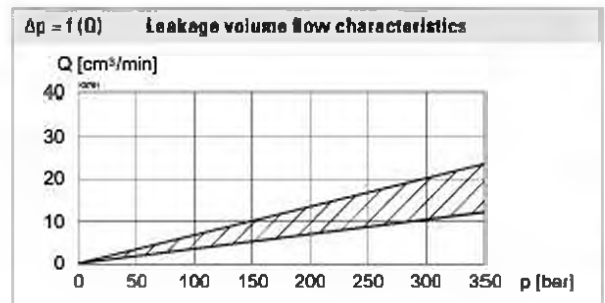
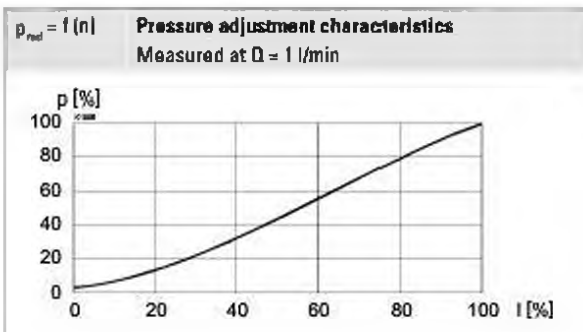
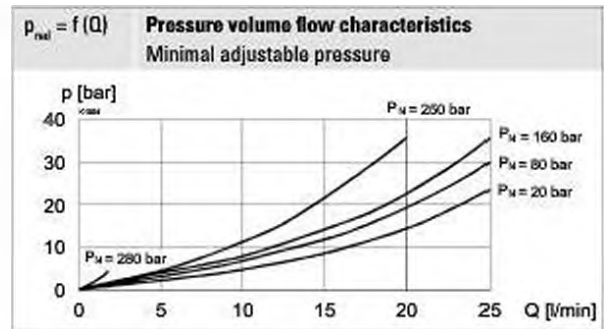
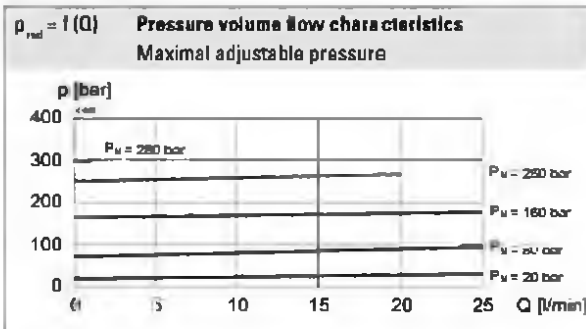
Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

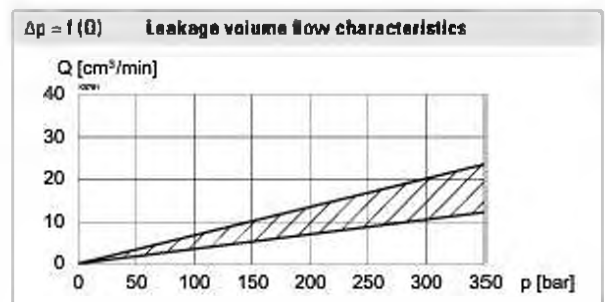
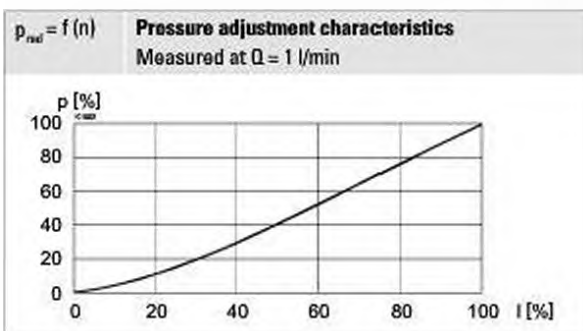
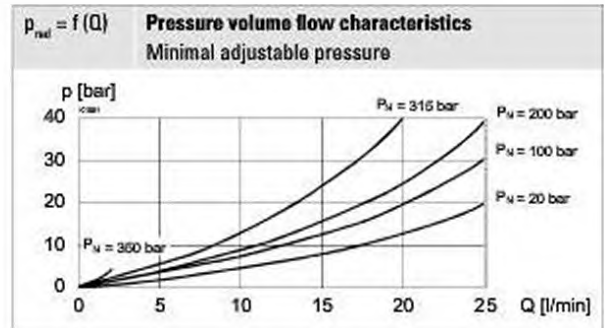
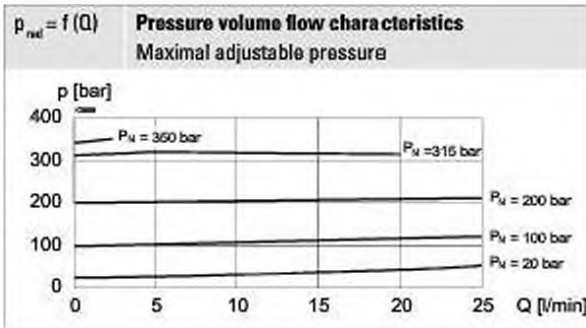
**Attention!** The UL execution is always supplied without cable gland


**HYDRAULIC SPECIFICATIONS**

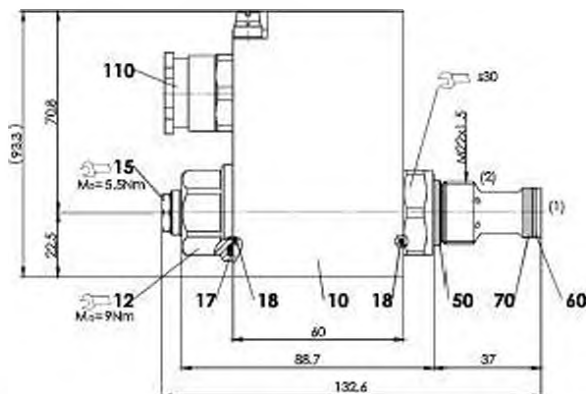
Working pressure	$p_{max} = 400 \text{ bar}$
Nominal pressure range	<b>Execution L9</b> $P_N = 20 \text{ bar, 80 bar, 160 bar, 250 bar, 290 bar}$ <b>Execution L15 / 17</b> $P_N = 20 \text{ bar, 100 bar, 200 bar, 275 bar, 315 bar, 350 bar}$
Maximum volume flow	See characteristics
Minimum volume flow	$Q_{v,0} = 0,1 \text{ l/min}$
Leakage oil	See characteristics
Hysteresis	≤ 5 % at optimal dither signal
Repeatability	≤ 2 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L15 / L17) FKM -20...+70 °C (L9)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade β 6...10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS EXECUTION L9 (MEASURED AT 40 °C)**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**PERFORMANCE SPECIFICATIONS EXECUTION L15 / L17 (MEASURED AT 50 °C)**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


## DIMENSIONS



Dimensions of the solenoid coil see data sheet 1.1-183 and 1.1-184

## PARTS LIST

Position	Article	Description
10	263 6...	Solenoid coil MK 45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	253 8000	Manual override HB4,5
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.8188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.8140	O-ring ID 14,00 x 1,78 (FKM)
70	049.3177	Back-up ring rd 14,6 x 17,5 x 1,4
110	111.1080	Cable gland M20 x 1,5

## SURFACE TREATMENT

- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

## STANDARDS

Cartridge cavity	ISO 7789
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

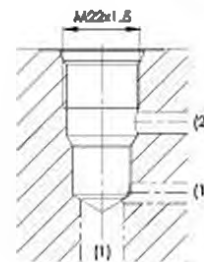
## COMMISSIONING

**Attention!** The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability can be assumed.



## HYDRAULIC CONNECTION

Cavity drawing according to ISO 7789-22-02-0-98



**Note!**



For detailed cavity drawing and cavity tools see data sheet 2.13-1003

## ACCESSORIES

Proportional amplifier	Registrar 1.13
Flange body / sandwich plate NG4-Mini	Data sheet 2.3-720
Flange body / sandwich plate NG6	Data sheet 2.3-740
Flange body / sandwich plate NG10	Data sheet 2.3-760
Threaded body	Data sheet 2.9-200
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

## MANUAL OVERRIDE

HB4,5 as standard

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## INSTALLATION NOTES

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60$ Nm Screw-in cartridge $M_0 = 9$ Nm knurled nut

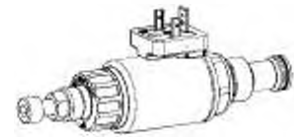
**Attention!**



For stack assembly please observe the remarks in the operating instructions

**Proportional pressure relief cartridge inverse**

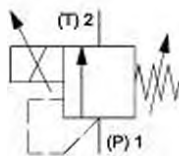
- ◆ direct operated
- ◆  $Q_{max} = 25 \text{ l/min}$
- ◆  $p_{max} = 400 \text{ bar}$
- ◆  $p_{Nmax} = 350 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Direct operated proportional pressure relief valve with inverse function in screw-in cartridge construction for cavity according to ISO 7789. Good flow capacity due to the differential area principle, very sensitively adjustable. When the operating pressure adjusted by means of the proportional solenoid is reached, the valve opens and connects the protected line with the drain to the tank. With the solenoid deenergised, maximum working pressure is present. If the solenoid current increases, the pressure in port P (1) drops. The back pressure in T (2) affects the pressure in P (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. By means of the inverse function, the maximum system pressure is maintained if the electrical valve control falls out (safety function). The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W.S37 / 19 x 50 (Data sheet 1.1-173) M.S35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301-803 Connector socket AMP Junior-Timer Connector Deutsch DT04 - 2P

**TYPE CODE**

Pressure relief valve	B D I PM22 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>			
Direct operated				
Proportional, inverse				
Screw-in cartridge M22 x 1,5				
Nominal pressure range $p_x$	20 bar	<input type="checkbox"/> 20	200 bar	<input type="checkbox"/> 200
	100 bar	<input type="checkbox"/> 100	315 bar	<input type="checkbox"/> 315
	160 bar	<input type="checkbox"/> 160	350 bar	<input type="checkbox"/> 350
Nominal voltage $U_x$	12 VDC	<input type="checkbox"/> G12		
	24 VDC	<input type="checkbox"/> G24		
	without coil	<input type="checkbox"/> X5		
Slip-on coil	Metal housing round		<input type="checkbox"/> W	
	Metal housing square		<input type="checkbox"/> M	
Connection execution	Connector socket EN 175301-803 / ISO 4400		<input type="checkbox"/> D	
	Connector socket AMP Junior - Timer		<input type="checkbox"/> J	
	Connector Deutsch DT04 - 2P		<input type="checkbox"/> G	
Sealing material	NBR			
	FKM (Viton)	<input type="checkbox"/> D1		
Design index (subject to change)				



**GENERAL SPECIFICATIONS**

Designation	Proportional pressure relief valve with inverse function
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25 ... +70 °C
Weight	0,60 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_0 = 1320 \text{ mA (} U_N = 12\text{VDC)}$ $I_0 = 660 \text{ mA (} U_N = 24\text{VDC)}$

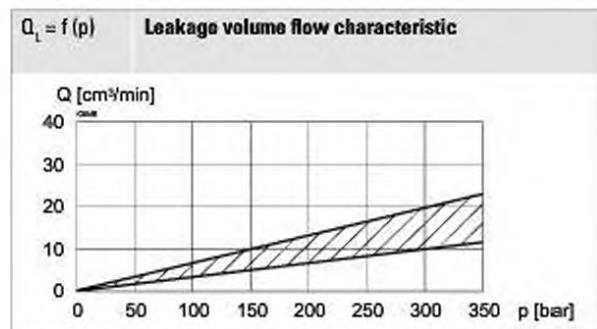
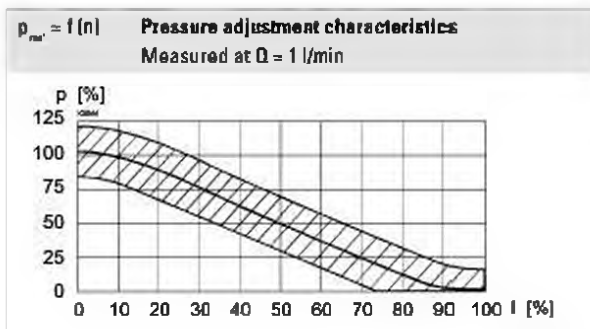
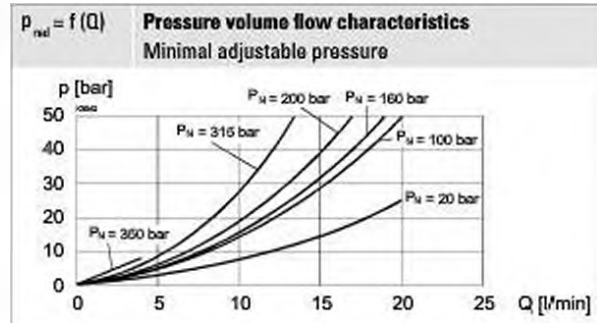
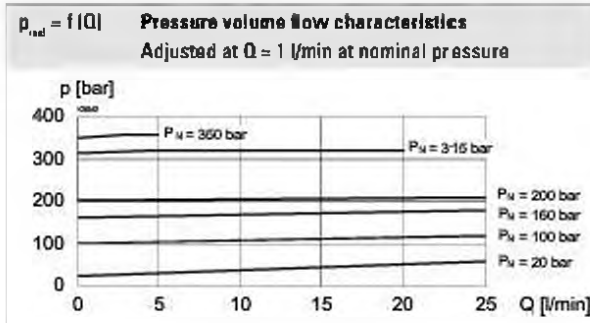
**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil WI and 1.1-174 (slip-on coil M)

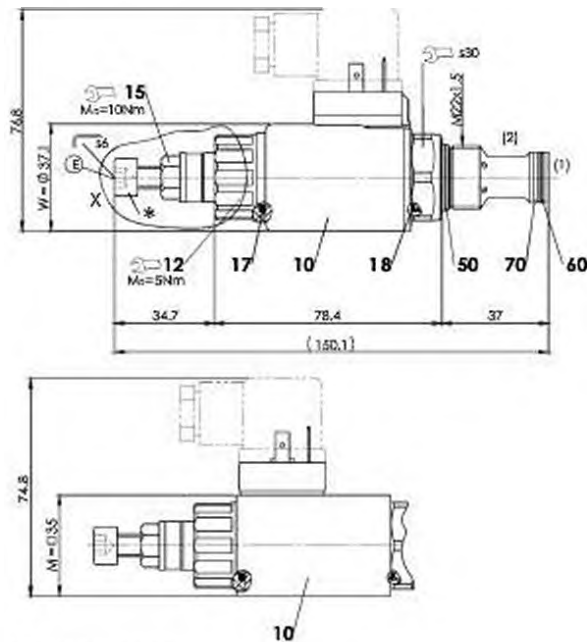

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{\text{max}} = 400 \text{ bar}$
Nominal pressure range	$P_N = 20 \text{ bar, } 100 \text{ bar, } 160 \text{ bar, } 200 \text{ bar, } 315 \text{ bar, } 350 \text{ bar}$ Adjustable via adjustment screw (-20 % / +30 %)
Maximum volume flow	$Q_{\text{max}} = 25 \text{ l/min (} p_N = 20 / 100 / 160 / 200 \text{ bar)}$ $Q_{\text{max}} = 15 \text{ l/min (} p_N = 315 / 350 \text{ bar)}$ $Q_{\text{max}} = 5 \text{ l/min}$
Minimum volume flow	$Q_{\text{min}} = 0,2 \text{ l/min}$
Leakage oil	See characteristics
Hysteresis	$\leq 4 \%$ at optimal dither signal
Repeatability	$\leq 2 \%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 $\geq 75$ , see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

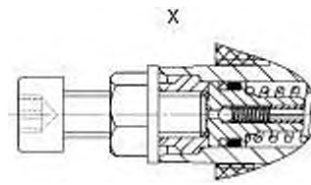
Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



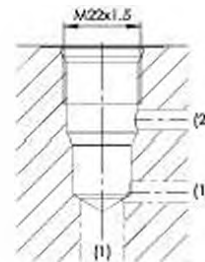
**DIMENSIONS**


E = Air bleed screw

\*Adjustment screw for adjusting the nominal pressure


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-02-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1003

**PARTS LIST**

Position	Article	Description
10	206.2...	W.S37 / 19 x 50
	260.5...	M.S35 / 19 x 50
	154.2700	Knurled nut
	153.2401	Dichtmutter Norm „Seal-Lock“ 8 Zi - Ni M8
	160.2187	O-ring ID 18,72 x 2,62 (NBR)
	160.2170	O-ring ID 17,17 x 1,78 (NBR)
	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
	049.3177	Back-up ring rd 14,6 x 17,5 x 1,4

**COMMISSIONING**

When commissioning, the valve must be vented under pressure as follows (see detail X in Dimensions):

- ◆ Loosen lock nut
- ◆ Remove screw (E)
- ◆ Push the non-return valve (with pin or hex key < 1,3 mm)
- ◆ Screw-in the screw (E)
- ◆ Adjust the required pressure and tighten the lock nut

**Attention!**


Therewith oil flows out with the corresponding pressure! Cover with a cloth.

**MANUAL OVERRIDE**

None

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**ACCESSORIES**

Proportional amplifier	Registrar 1.13
Electric plug B (black)	Article no. 219.2002
Flange body / sandwich plate NG4-Mini	Data sheet 2.3-720
Flange body / sandwich plate NG6	Data sheet 2.3-740
Flange body / sandwich plate NG10	Data sheet 2.3-760
Threaded body	Data sheet 2.9-200
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

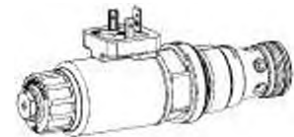
- ◆ The cartridge body made of steel and the slip-on coil are zinc-nickel coated

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut

**Proportional pressure relief cartridge**

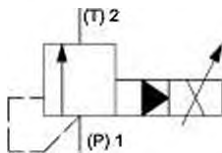
- ◆ pilot operated
- ◆  $Q_{max} = 230$  l/min
- ◆  $p_{nom} = 400$  bar
- ◆  $p_{Nmax} = 350$  bar

**M33 x 2**  
**ISO 7789**

**DESCRIPTION**

Pilot operated proportional pressure relief valve in screw-in cartridge construction for cavity according to ISO 7789. High flow capacity, very sensitively adjustable. When the operating pressure adjusted by means of the proportional solenoid is reached, the valve opens and connects the protected line with the drain to the tank. The back pressure in T (2) affects the pressure in P (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W.S37 / 19 x 50 (Data sheet 1.1-173) M.S35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 - 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 - 2P

**TYPE CODE**

		B V P PM33 - [ ] - [ ] / [ ] [ ] - [ ] [ ] [ ] [ ]			
Pressure relief valve					
Pilot operated					
Proportional					
Screw-in cartridge M33 x 2					
Nominal pressure range $p_n$	100 bar 200 bar	100 200	275 bar 350 bar	275 350	
Nominal voltage $U_n$	12 VDC 24 VDC without coil	G12 G24 X5			
Slip-on coil	Metal housing round Metal housing square			W M	
Connection execution	Connector socket EN 175301-803 / ISO 4400 Connector socket AMP Junior - Timer Connector Deutsch DT04 - 2P			D J B	
Sealing material	NBR FKM (Viton)		D1		
Manual override	Manual override Screw plug			HB4.5 HR0	
Design index (subject to change)					

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure relief valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M33 x 2 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,70 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1320 \text{ mA}$ ( $U_N = 12\text{VDC}$ ) $I_a = 660 \text{ mA}$ ( $U_N = 24\text{VDC}$ )

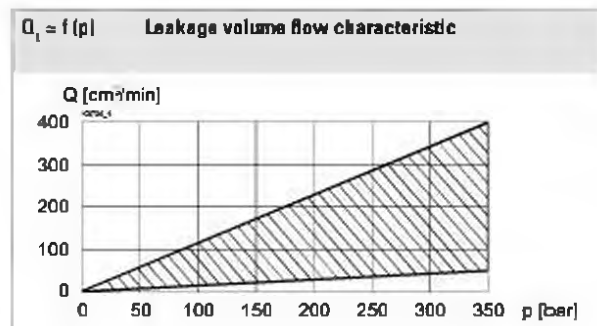
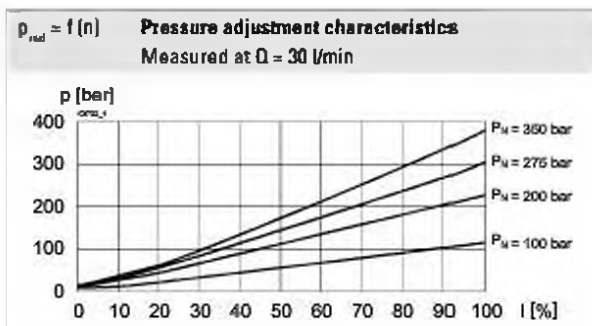
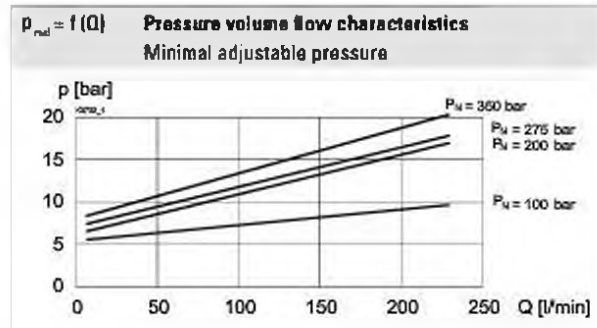
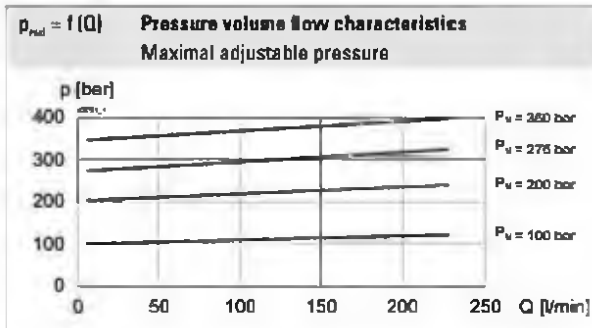
**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)

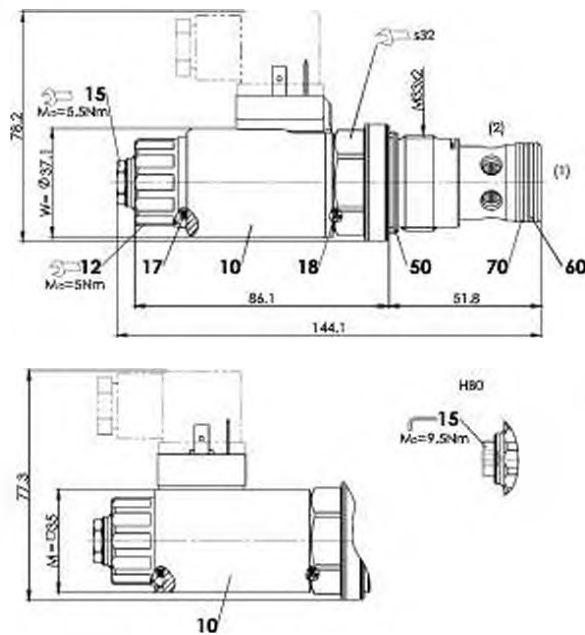

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{\text{max}} = 400 \text{ bar}$
Tank pressure	$p_{\text{T,max}} = p_p + 15 \text{ bar}$
Nominal pressure range	$P_N = 100 \text{ bar}, 200 \text{ bar}, 275 \text{ bar}, 350 \text{ bar}$
Volume flow range	$Q = 5 \dots 230 \text{ l/min}$
Leakage oil	See characteristics
Hysteresis	$\leq 4 \%$ at optimal dither signal
Repeatability	$\leq 2 \%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	$12 \text{ mm}^2/\text{s} \dots 320 \text{ mm}^2/\text{s}$
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade $\beta_{6 \dots 10} \geq 75$ , see data sheet 1.0-50

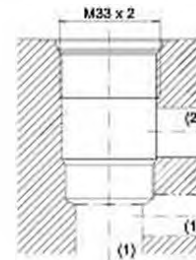
**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-33-02-0-88


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1041

**PARTS LIST**

Position	Article	Description
10	206.2... 260.5...	W.S37 / 19 x 50 M.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000 239.2033	HB4,5 manual override HB0 Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2298 160.6296	O-ring ID 29,82 x 2,62 (NBR) O-ring ID 29,82 x 2,62 (FKM)
60	160.2219 160.6216	O-ring ID 21,89 x 2,62 (NBR) O-ring ID 21,89 x 2,62 (FKM)
70	049.3277	Backup ring rd 22,5 x 27 x 1,4

**ACCESSORIES**

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2002
Threaded body	Data sheet 2.9-200
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5

Optionally: Screw plug (HB0), no actuation possible

**SURFACE TREATMENT**

- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

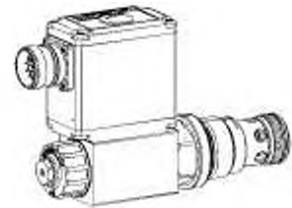
Mounting type	Screw-in cartridge M33 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 80 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5

**Proportional pressure relief cartridge with integrated electronics**

- ◆ pilot operated
- ◆  $Q_{max} = 230 \text{ l/min}$
- ◆  $p_{max} = 400 \text{ bar}$
- ◆  $p_{Nmax} = 315 \text{ bar}$

**DESCRIPTION**

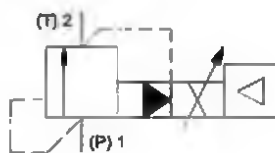
Pilot operated proportional pressure relief valve with integrated electronics as screw-in cartridge for cavity according to ISO 7789. When the operating pressure adjusted by means of the proportional solenoid is reached, the valve opens and connects the protected line with the drain to the tank. The back pressure in T (2) affects the pressure in P (1). This proportional valve is very sensitively adjustable and suitable for high pressures. The Plug & Play valves are factory set and adjusted and have therefore a high valve-to-valve reproducibility. The control takes place via an analogue interface or a fieldbus interface (CANopen, J1939 or Profibus DP). The parameterisation takes place by means of the free of cost parameterisation and diagnostics software «PASO» or via fieldbus interface. The USB parameterisation interface is accessible through a screw plug. As an option, these valves are available with integrated controller. As feedback value generators sensors with voltage or current output can be connected directly. The available controller structures are optimised for applications with hydraulic actuators.

**M33 x 2**  
**ISO 7789**

**APPLICATION**

Proportional pressure relief valves with integrated electronics are perfectly suitable for demanding applications in which the pressure frequently has to be changed. They are used in applications where high valve-to-valve reproducibility, easy installation, comfortable operation and high precision are very important. The integrated controller relieves the machine control and operates the pressure control in a closed loop circuit. The applications are in the industrial as well as in the mobile hydraulics for the smooth control of hydraulic actuators. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**Note!**


„PASO“ is a Windows programm in the flow diagram style, which enables the intuitive adjustment and storing of all variable parameters. The data remain saved in case of a power failure and can also be reproduced and transferred to other DSV.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Connection	Via device receptacle

**ELECTRICAL SPECIFICATIONS**

Protection class	IP67 with suitable mating connector and closed housing cover
Ramps	Adjustable
Parameterisation	Via fieldbus or USB
Supply voltage	12 VDC, 24 VDC

**Note!**


Exact electrical specifications and detailed description of «DSV» electronics can be found on data sheet 1.13-76.

**MANUAL OVERRIDE**

HB4,5 as standard

**TYPE CODE**

Pressure relief valve		B V P PM33 - <input type="checkbox"/> - <input type="checkbox"/> / M E <input type="checkbox"/> - <input type="checkbox"/> HB4,5 # <input type="checkbox"/>	
Pilot operated			
Proportional			
Screw-in cartridge M33 x 2			
Nominal pressure range $p_N$	100 bar <input type="checkbox"/> 200 bar <input type="checkbox"/> 275 bar <input type="checkbox"/> 350 bar <input type="checkbox"/>		
Nominal voltage $U_N$	12 VDC <input type="checkbox"/> 24 VDC <input type="checkbox"/>		
Slip-on coil	Metal housing square <input type="checkbox"/>		
Connection execution	Integrated electronics <input type="checkbox"/>		
Hardware configuration			
Analog command value signal	12 pole <input type="checkbox"/> 7 pole <input type="checkbox"/>	A1 <input type="checkbox"/> D1 <input type="checkbox"/>	{0 ... 10 V preset}
Analog command value signal	12 pole <input type="checkbox"/> 7 pole <input type="checkbox"/>	A4 <input type="checkbox"/> D4 <input type="checkbox"/>	{4 ... 20 mA preset}
CANopen according to DSP-408	C1 <input type="checkbox"/>		
Profibus DP according to Fluid Power Technology	P1 <input type="checkbox"/>		
CAN J1939 (on request)	J1 <input type="checkbox"/>		
Function			
Amplifier	<input type="checkbox"/>		
Controller with current feedback value signal (0 ... 20 mA / 4 ... 20 mA)	R1 <input type="checkbox"/>		
Controller with voltage feedback value signal (0 ... 10 V)	R2 <input type="checkbox"/>		
Sealing material	NBR <input type="checkbox"/> FKM (Viton) <input type="checkbox"/>	D1 <input type="checkbox"/>	
Manual override	<input type="checkbox"/>		
Design index (subject to change)	73-00		

**GENERAL SPECIFICATIONS**


Designation	Proportional pressure relief valve with integrated electronic
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M33 x 2 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-20 ... +65 °C The upper temperature limit is a guideline for typical applications, in individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions „DSV“.
Weight	1,25 kg
MTTFd	150 years


**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400$ bar
Tank pressure	$p_{Tmax} = p_p + 15$ bar
Nominal pressure range	$P_N = 100$ bar, 200 bar, 275 bar, 350 bar
Volume flow range	$Q = 5 \dots 230$ l/min
Leakage oil	See characteristics
Hysteresis	$\leq 5\%$ at optimal dither signal
Repeatability	$\leq 3\%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 $\geq 75$ , see data sheet 1.0-50





**ELECTRICAL CONNECTION**


<b>X1</b>	<b>Analog interface (Main)</b>
<b>Device receptacle</b>	<b>M23, 12 pole male</b>
	1 = Supply voltage + 2 = Supply voltage 0 VDC 3 = Stabilised output voltage 4 = Command value signal voltage + 5 = Command value signal voltage - 6 = Command value signal current + 7 = Command value signal current - 8 = Reserved for extantions 9 = Reserved for extantions 10 = Enable signal (Digital input) 11 = Error signal (Digital output) 12 = Chassis
<b>Command value signal voltage (PIN 4/5) resp. current (PIN 6/7) are selected with parameterisation and diagnostics software PASO.</b>	


<b>X1</b>	<b>Fieldbus interface (Main)</b>
<b>Device receptacle</b>	<b>M12, 4 pole male</b>
	1 = Supply voltage + 2 = Reserved for extantions 3 = Supply voltage 0 VDC 4 = Chassis

<b>X2</b>	<b>Parameterisation interface</b>
<b>USB, Mini B</b>	Under the screw plug of the housing cover Factory set

<b>X1</b>	<b>Analog interface (Main)</b>
	<b>Connector DIN EN 175201 - 804</b>
<b>Device receptacle</b>	<b>7 pole male</b>
	A = Supply voltage + B = Supply voltage 0 VDC C = Not connected D = Command value signal + E = Command value signal - F = Not connected G = Chassis
<b>Command value signal: current (D4) or voltage (D2) to specify when placing the order</b>	

<b>X3</b>	<b>Profibus interface according to IEC 947-5-2</b>
<b>Device receptacle</b>	<b>M12, 5 pole female B-coded</b>
	1 = VP 2 = RxD / TxD - N 3 = DGND 4 = RxD / TxD - P 5 = Shield

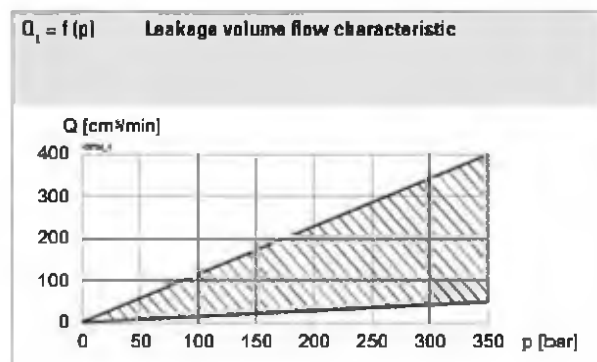
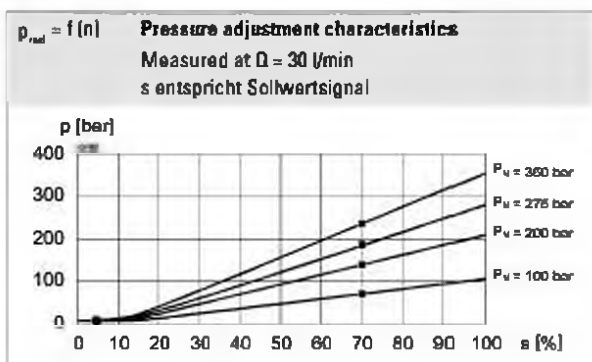
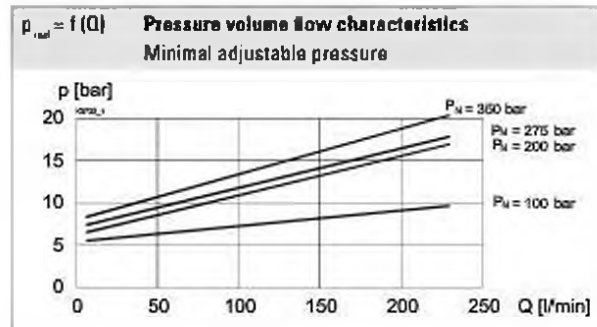
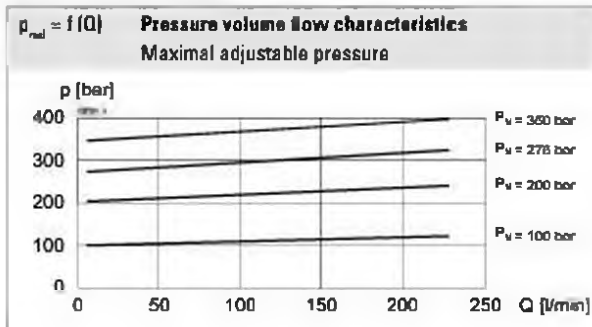
<b>X3</b>	<b>CANopen interface according to DRP 303-1</b>
<b>Device receptacle</b>	<b>M12, 5 pole male</b>
	1 = Not connected 2 = Not connected 3 = CAN Gnd 4 = CAN High 5 = CAN Low

<b>X4 (controller only)</b>	<b>Feedback value interface (sensor)</b>
<b>Device receptacle</b>	<b>M12, 5 pole female</b>
	1 = Supply voltage (output) + 2 = Feedback value signal + 3 = Supply voltage 0 VDC 4 = Not connected 5 = Stabilised output voltage
<b>Feedback value signal: current (R1) or voltage (R2) to specify when placing the order</b>	

**Note!** The mating connector is not included in the delivery



**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**FACTORY SETTINGS**

Dither set for optimum hysteresis

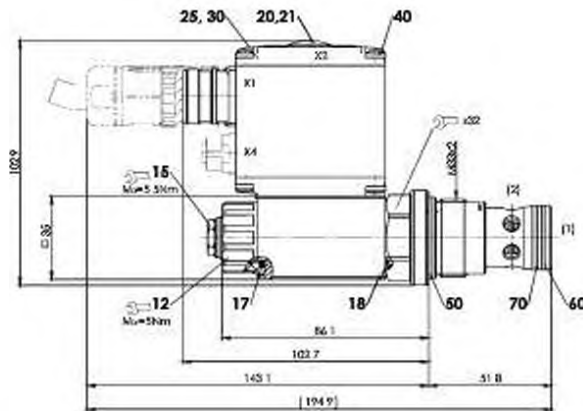
- = Deadband: solenoid switched off at command value signal < 5 %
- = Limited pressure in port P (1) at 70 % command value signal

 233 bar at nominal pressure range  $p_N$  350 bar

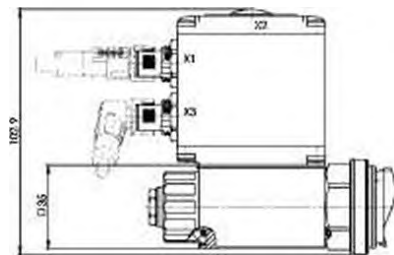
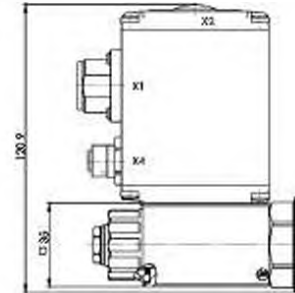
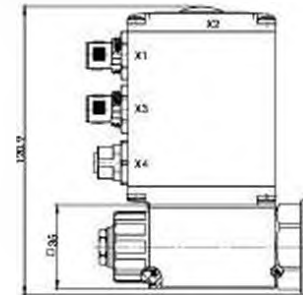
 192 bar at nominal pressure range  $p_N$  275 bar

 143 bar at nominal pressure range  $p_N$  200 bar

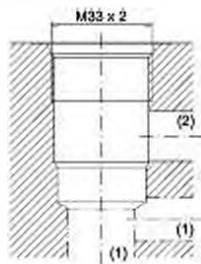
 72 bar at nominal pressure range  $p_N$  100 bar

**DIMENSIONS**
**With analog interface, 12 pole connector**  
 Amplifier and controller


X4 (controller only)

**With fieldbus interface**  
 Amplifier

**With analog interface, 7 pole connector**  
 Amplifier and controller

**With fieldbus interface**  
 Controller

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-33-02-0-98


**Nota!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1041

**PARTS LIST**

Position	Article	Description
12	154.2700	Knurled nut
15	253.8000	Manual override HB4,5
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
20	223.1317	Dummy plug M16 x 1,5
21	160.6131	O-ring ID 13,00 x 1,5 (FKM)
25	062.0102	Cover
30	072.0021	Gasket 33,2 x 59,9 x 2
40	208.0100	Socket head screw M4 x 10
50	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FKM)
60	160.2219	O-ring ID 21,89 x 2,62 (NBR)
	160.6216	O-ring ID 21,89 x 2,62 (FKM)
70	049.3277	Backup ring rd 22,5 x 27 x 1,4

## ACCESSORIES

Parameterisation software	See start-up
Parameterisation cable for interface USB (from plug type A on Mini B, 3 m)	Article no. 219.2896
Mating connector (plug female) for analog interface straight, soldering contact M23, 12 pole	Article no. 219.2330
angled, soldering contact	Article no. 219.2331
straight, soldering contact, 7 pole	Article no. 219.2335
Threaded body	Data sheet 2.9-200
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**Attention!**


Auxiliary conditions for the cable:

- External diameter 12 pol: 3,5...14,7 mm
- External diameter 7 pol: 8...10 mm
- Wire cross section max. 1 mm<sup>2</sup>
- Recommended wire cross section:  
0...25 m = 0,75 mm<sup>2</sup> (AWG18)  
25...50 m = 1 mm<sup>2</sup> (AWG17)

## COMMISSIONING

For DSV amplifiers as a rule no parameter adjustments by the customer are required. The plugs have to be connected in accordance with the chapter «Electrical connection».

Controllers are supplied configured as amplifiers. The adjustment of the mode of control and of the controller are carried out by the customer by means of the software adjustment (USB interface, Mini B). Further information can be found

Free- of charge download of the «PASQ» software and the operation instructions for «DSV» hydraulic valves as well as the operation instructions CANopen Protocol resp. Profibus DP Protocol, with Device Profile DSP-408 for «DSV».

**Note!**


The mating connectors and the parameterisation cable are not part of the delivery. Refer to chapter «Accessories».

## SURFACE TREATMENT

- ◆ The cartridge body and the solenoid are zinc-nickel coated
- ◆ The electronics housing is made of aluminium.

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## STANDARDS

Cartridge cavity	ISO 7789
CANopen	DRP 303-1
Profibus DP	IEC 947-5-2
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## INSTALLATION NOTES

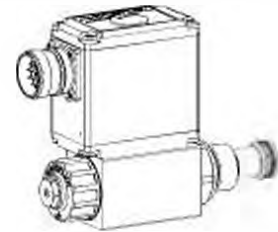
Mounting type	Screw-in cartridge M33 x 2
Mounting position	Any, preferably horizontal
Tightening torque	M <sub>0</sub> = 80 Nm Screw-in cartridge M <sub>0</sub> = 5 Nm knurled nut

**Proportional pressure relief valve**  
**Screw-in cartridge**

- Integrated amplifier or controller electronics
- Pilot operated
- $Q_{max} = 25 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_{Nmax} = 350 \text{ bar}$

**M22x1,5**

ISO 7789


**DESCRIPTION**

Direct operated proportional pressure relief valve with integrated electronics as a screw-in cartridge. Thread M22x1,5 for cavity according to ISO 7789. These plug & play valves are factory set and adjusted. High valve-to-valve reproducibility. Housing for electronics with protection class IP67 for harsh environment. Five standard pressure levels are available: 20, 100, 200, 315 and 350 bar. Adjustment by a Wandfluh proportional solenoid (VDE standard 0580). The cartridge and the solenoid made of steel are zinc coated and therefore rust-protected.

Optionally these valves are available with integrated controller. As feedback value generator sensors with voltage or current output can be directly connected. The available controller structures are optimised for the utilisation with hydraulic drives.

**FUNCTION**

The valve limits the pressure in port P (1) and relieves the volume flow to tank port T (2). The back pressure in T (2) influences the pressure in P (1). When the operating pressure set by is reached, the poppet spool opens and connects the protected line to the tank T (2). The control connection is provided by an analog interface or a fieldbus interface (CANopen, J1939 or Profibus DP). Parameter setting and diagnosis with the free-of-charge software «PASO» or via fieldbus interface. The USB parameterisation interface is accessible through a cover flap. «PASO» is a Windows program in the flow diagram style, which enables the intuitive setting and storing of all variable parameters. The data remain saved in case of a power failure and can also be reproduced and transferred to other DSVs.

**APPLICATION**

Proportional pressure relief valves with integrated electronics are well suited for demanding applications, in which the pressure frequently has to be changed. They are implemented in systems calling for good valve-to-valve reproducibility, easy installation, comfortable operation and high precision in industrial hydraulics as well as in mobile hydraulics. The integrated controller relieves the machine control system and operates the pressure control in a closed control circuit. The proportional pressure relief cartridge is very suitable for mounting in control blocks, flange bodies and sandwich plates size NG4-Mini and NG6. (Please note the separate data sheets in register 2.3). Cavity tools are available for machining the cavities in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

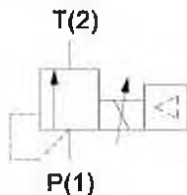
		B	D	P	PM22	-	-	/	M	E	-	HB4,5	#
Pressure relief valve													
Direct operated													
Proportional													
Screw-in cartridge M22x1,5													
Nominal pressure range $p_N$	20 bar	20		200 bar		200							
	100 bar	100		315 bar		315							
				350 bar		350							
Nominal voltage $U_N$	12 VDC											G12	
	24 VDC											G24	
Slip-on coil	Metal housing, square												
Connection execution	Integrated electronics												
Hardware configuration													
With analog signal (0...+10 V factory set)												A1	
With CANopen acc. to DSP-408												C1	
With Profibus DP in accordance with Fluid Power Technology												P1	
With CAN J1939 (on request)												J1	
Function													
Amplifier													
Controller with current feedback signal (0...20 mA / 4...20 mA)												R1	
Controller with voltage feedback signal (0...10 V)												R2	
Sealing material	NBR												
	FKM (Vitron)											D1	
Manual override													
Design-Index (Subject to change)													

**GENERAL SPECIFICATIONS**

Description	Direct operated proportional pressure relief valve with integrated electronics
Construction	Screw-in cartridge for cavity acc. to ISO 7789
Operations	Proportional solenoid wet pin push type, pressure tight
Mounting	Screw-in thread M22x1,5
Ambient temperature	-20...+65°C (typical) <small>(The upper temperature limit is a guideline value for typical applications. In individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions «DSVe».)</small>
Mounting position	any, preferably horizontal
Fastening torque	M <sub>0</sub> = 50 Nm for screw-in cartridge M <sub>0</sub> = 2,6 Nm (Qual. 8.8) for solenoid screws
Weight	m = 0,9 kg

**ELECTRICAL SPECIFICATIONS**

Protection class	IP 67 acc. to EN 60 529 with suitable connector and closed electronic housing
Supply voltage	12 VDC or 24 VDC
Ramps	adjustable
Parameterisation	via Fieldbus or USB
Interface	USB (Mini B) for parameterisation with «PASO» <small>(under the closing screw of the housing cover, Preset ex-works)</small>
<b>Analogue interface:</b>	
Device receptacle (male)	M23, 12-poles
Mating connector	Plug (female), M23, 12-poles <small>(not incl. in delivery)</small>
Preset value signal	Input voltage / current as well as signal range can be set by software
<b>Fieldbus interface:</b>	
Device receptacle supply (male)	M12, 4-poles
Mating connector	Plug (female), M12, 4-poles <small>(not incl. in delivery)</small>
Device receptacle CANopen (male)	M12, 5-poles (acc. to DRP303-1)
Mating connector	Plug (female), M12, 5-poles <small>(not incl. in delivery)</small>
Device receptacle Profibus (female)	M12, 5-poles, B-coded (acc. to IEC 947-6-2)
Mating connector	Plug (male), M12, 5-poles, B-coded <small>(not incl. in delivery)</small>
Preset value signal	Fieldbus
<b>Feedback signal interface (Sensor):</b> <small>(controller only)</small>	
Device receptacle (female)	M12, 5-poles
Mating connector	Plug (male), M12, 5-poles <small>(not incl. in delivery)</small>
Feedback signal::	Voltage / current sense when ordering

**SYMBOL**

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/18/13 <small>(Required filtration grade β<sub>0.5</sub> &gt; 10 &gt; 75)</small>
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70°C
Peak pressure	p <sub>max</sub> = 400 bar
Nominal pressure ranges	p <sub>K</sub> = 20 bar, p <sub>K</sub> = 100 bar, p <sub>K</sub> = 200 bar, p <sub>K</sub> = 315 bar
Min. volume flow	Q <sub>min</sub> = 0,1 l/min
Max. volume flow	Q <sub>max</sub> = 25 l/min for p <sub>K</sub> = 20/100/200 bar Q <sub>max</sub> = 20 l/min for p <sub>K</sub> = 315 bar
Leakage volume flow	see characteristics
Repeatability	≤ 1 %
Hysteresis	≤ 4 %

**CONNECTOR WIRING DIAGRAM**
**Analogue interface:**
**Device receptacle (male) X1**


- 1 = Supply voltage +
- 2 = Supply voltage 0 VDC
- 3 = Stabilised output voltage
- 4 = Preset value voltage +
- 5 = Preset value voltage -
- 6 = Preset value current +
- 7 = Preset value current -
- 8 = Reserved for extensions
- 9 = Reserved for extensions
- 10 = Enable control (Digital input)
- 11 = Error signal (Digital output)
- 12 = Chassis

Preset value voltage (PIN 4/5) resp. current (PIN 6/7) are selected with set-up and diagnosis software PASO.  
Factory setting: Voltage (0...+10V), (PIN 4/5)

**Fieldbus interface:**
**Device receptacle supply (male) X1**
**MAIN**


- 1 = Supply voltage +
- 2 = Reserved for extensions
- 3 = Supply voltage 0 VDC
- 4 = Chassis

**Device receptacle CANopen (male) X3**


- CAN**
- 1 = not connected
- 2 = not connected
- 3 = CAN Gnd
- 4 = CAN High
- 5 = CAN Low

**Device receptacle Profibus (female) X3**


- PROFIBUS**
- 1 = VP
- 2 = Rx/D/TxD - N
- 3 = DGND
- 4 = Rx/D/TxD - P
- 5 = Shield

**Parameterisation interface (USB, Mini B) X2**  
Under the closing screw of the housing cover

**Feedback signal interface (Sensor)**
**Device receptacle (female) X4 (only controller)**


- 1 = Supply voltage (output) +
- 2 = Feedback signal +
- 3 = Supply voltage 0 VDC
- 4 = not connected
- 5 = stab. output voltage



**NOTE!**  
 Detailed electrical characteristics and description of «DSV» electronics are shown on data sheet 1.13-76.

Free-of-charge download of the «PASO»-software and the instruction manual for the «DSV» hydraulic valves as well as the operation instruction CANopen eg Profibus DP protocol with device profile DSP-408 for «DSV».

**START-UP**

Normally there is no need to adjust settings by the customer. The connector has to be wired according to the chapter «Connector wiring diagram».


**NOTE!**

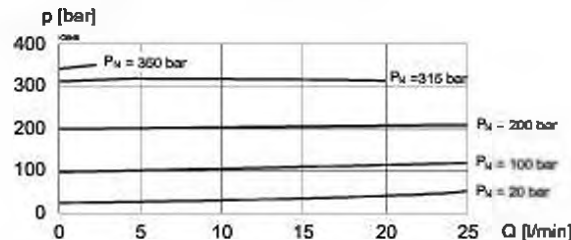
The mating connectors and the cable to adjust the settings are not part of the delivery. Refer to chapter «Accessories».

Controllers are supplied configured as amplifiers. The setting of the mode of control and the setting of the controller are done by the customer by software setting (USB interface, Mini B).

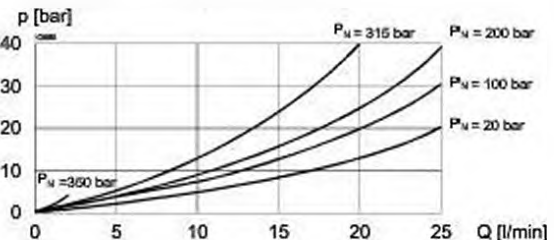
Additional information can be found on our website:

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

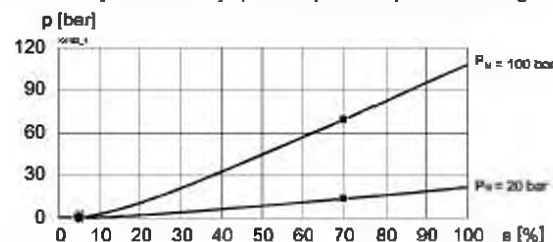
$p = f(Q)$  Pressure volume flow characteristics (Maximum adjustable pressure)



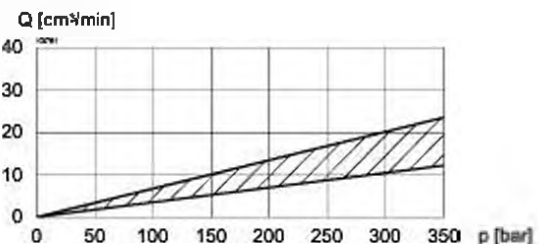
$p = f(Q)$  Pressure volume flow characteristics (Minimum adjustable pressure)



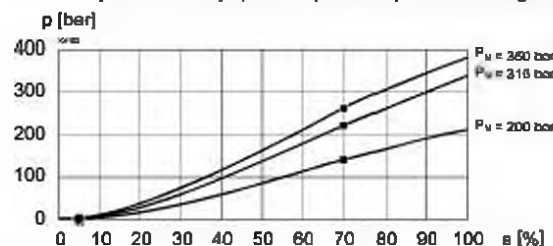
$p = f(i)$  Pressure adjustment characteristics [at  $Q = 5 \text{ l/min}$ ] ( $i$  corresponds to preset value signal)



$Q_L = f(p)$  Leakage volume flow characteristics

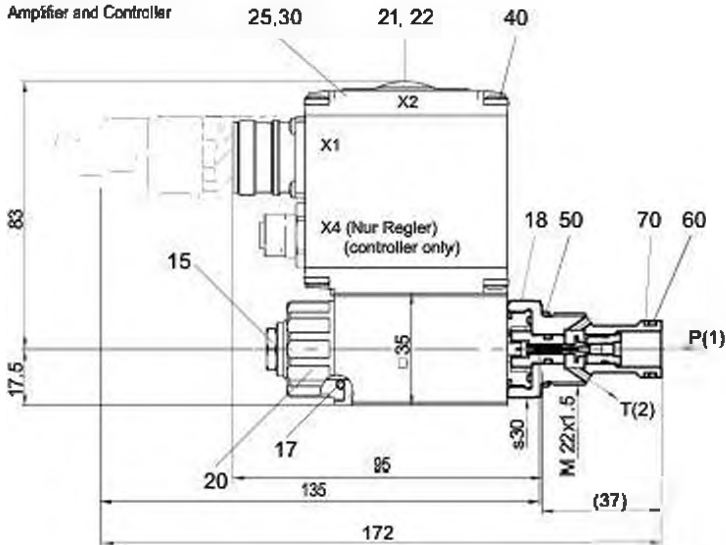
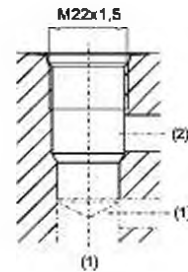


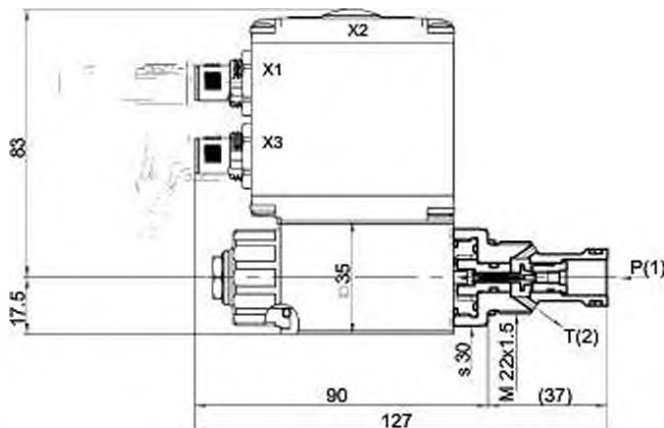
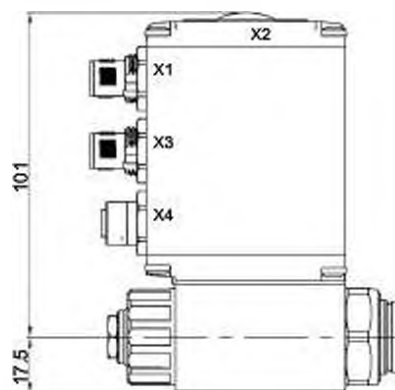
$p = f(i)$  Pressure adjustment characteristics [at  $Q = 5 \text{ l/min}$ ] ( $i$  corresponds to preset value signal)


**Factory settings:**

Dither set for optimal hysteresis

- ◆ = Deadband: Solenoid switched off with command preset value signal < 5 %
- = Limited pressure in port P (1) at 70 % of preset value signal:
  - 250 bar with pressure range 350 bar
  - 225 bar with pressure range 315 bar
  - 143 bar with pressure range 200 bar
  - 72 bar with pressure range 100 bar
  - 14.5 bar with pressure range 20 bar

**DIMENSIONS / SECTIONAL DRAWINGS**
**With analog interface**  
 Amplifier and Controller

 Cavity drawing according to  
 ISO 7789-22-02-0-98

 For detailed cavity drawing  
 and cavity tools  
 see data sheet 2.13-1003

**With fieldbus interface**  
 Amplifier

**With fieldbus interface**  
 Controller

**PARTS LIST**

Position	Article	Description
15	253.8000	HB 4,5 Manual override (data sheet 1.1-300)
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
20	154.2700	Knurled nut
21	223.1317	Dummy plug M16x1,5
22	160.6131	O-Ring ID 13,00x1,5
25	062.0102	Cover square
30	072.0021	Gasket 33,2x59,9 x 2
40	208.0100	Socket head cap screw M4 x 10
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
70	049.3177	Beck-up ring RD 14,6 x 17,5 x 1,4

**ACCESSOIRES**

- Flange-/sandwich plate NG4-Mini Data sheet 2.3-720
- Flange-/sandwich plate NG6 Data sheet 2.3-740
- Flange-/sandwich plate NG10 Data sheet 2.3-760
- Line mount body Data sheet 2.9-200
- Set-up software see start-up
- Cable to adjust the settings through interface USB  
(from plug type A to Mini B, 3 m) article no. 219.2896
- Mating connector (plug female) for the analogue interface:
  - straight, soldering contact article no. 219.2330
  - 90°, soldering contact article no. 219.2331
- Recommended cable size:
  - Outer diameter 8...10,5mm
  - Single wire max. 1 mm<sup>2</sup>
  - Recommended wire size:
    - 0...25 m = 0,75mm<sup>2</sup>(AWG18)
    - 25...50 m = 1 mm<sup>2</sup>(AWG17)



**Proportional pressure relief valve inverse  
Screw-In cartridge**

- Integrated amplifier or controller electronics
- Direct operated
- $Q_{max} = 20$  and  $25$  l/min
- $p_{max} = 400$  bar
- $p_{Nmax} = 350$  bar

**M22x1,5**  
 ISO 7789

**DESCRIPTION**

Direct operated proportional pressure relief valve with integrated electronics and inverse function. Thread M22x1,5 for cavity according to ISO 7789. These plug & play valves are factory set and adjusted. High valve-to-valve reproducibility. Housing for electronics with protection class IP67 for harsh environment. As standard versions, 6 pressure ranges are available: 20, 40, 63, 100, 160, 200, 315 and 350 bar. Good flow performance due to the differential area principle. Small leakage along the poppet guide. Adjustment by a Wandfluh (VDE-Norm 0580) proportional solenoid. The cartridge and the solenoid made of steel are zinc coated and therefore rust-protected

**FUNCTION**

The valve limits the pressure in the port P (1) and reliefs the volume flow to tank port T (2). The back pressure in T (2) influences the pressure in P (1). The relieved pressure drops with rising solenoid current (inverse function), and the with deenergised solenoid, a maximum pressure is present. The control connection is provided by an analog interface or a fieldbus interface (CANopen or Profibus DP). Parameter setting and diagnosis with the free-of-charge software «PASO» or via fieldbus interface. After taking off the cover of the electronic housing, the serial interface to adjust the settings is accessible. The menu controlled Windows program «PASO» allows easy adjustment of all variable settings. Data are stored in a non-volatile memory. Even after an electric power failure settings can easily be reproduced and transmitted.

**APPLICATION**

Proportional pressure relief valves with integrated electronics are well suited for demanding applications, in which the pressure frequently has to be changed. They are implemented in systems calling for good valve-to-valve reproducibility, easy installation, comfortable operation and high precision in industrial hydraulics as well as in mobile hydraulics. The proportional pressure relief cartridge is very suitable for mounting in control blocks, flange bodies and sandwich plates size NG4-Mini and NG6. (Please note the separate data sheets in register 2.3). Cavity tools are available for machining the cavities in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

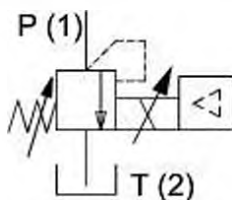
		B		D		I		PM22		-	-	/	M	E	-	#		
Pressure relief valve																		
Direct operated																		
Proportional, inverse																		
Screw-in cartridge M22x1,5																		
Nominal pressure rang $p_x$	20 bar	<input type="text" value="20"/>															200 bar	<input type="text" value="200"/>
	100 bar	<input type="text" value="100"/>															315 bar	<input type="text" value="315"/>
	160 bar	<input type="text" value="160"/>															350 bar	<input type="text" value="350"/>
Nominal voltage $U_n$	12 VDC																<input type="text" value="G12"/>	
	24 VDC																<input type="text" value="G24"/>	
Slip-on coil	<input type="text" value="Metal housing, square"/>																	
Execution connection	<input type="text" value="Integrated electronics"/>																	
Hardware configuration																		
With analog signal (0...+10V factory set)																<input type="text" value="A1"/>		
With CANopen acc. to DSP-408																<input type="text" value="C1"/>		
With Profibus DP in accordance Fluid Power Technology																<input type="text" value="P1"/>		
With CAN J1939 (on request)																<input type="text" value="J1"/>		
Function																		
Amplifier																		
Controller with current feedback signal (0...20 mA / 4...20 mA)																<input type="text" value="R1"/>		
Controller with voltage feedback signal (0...10 V)																<input type="text" value="R2"/>		
Sealing material	<input type="text" value="NBR"/>																	
	<input type="text" value="FKM (Vitron)"/>																	
Design-Index (Subject to change)																		

**GENERAL SPECIFICATIONS**

Description	Direct operated proportional pressure relief valve with integrated electronics inverse function
Construction	Screw-in cartridge for cavity acc. to ISO 7789
Operations	Proportional solenoid wet pin push type, pressure tight
Mounting	Screw-in thread M22x1,5
Ambient temperature	-20...+65°C (typical) (The upper temperature limit is a guideline value for typical applications, in individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions «DSVs».)
Mounting position	any, preferably horizontal
Fastening torque	$M_0 = 50 \text{ Nm}$ for screw-in cartridge $M_0 = 5 \text{ Nm}$ for knurled nut
Weight	$m = 1,0 \text{ kg}$

**ELECTRICAL SPECIFICATIONS**

Protection class	IP 67 acc. to EN 60 529 with suitable connector and closed electronics housing
Supply voltage	12 VDC or 24 VDC
Ramps	adjustable
Parameterisation	via Fieldbus or USB
Interface	USB (Mini B) for parameterisation with «PASO» under the closing screw of the housing cover. Preset ex-works
Analogue interface:	
Device receptacle (male)	M23, 12-poles
Mating connector	Plug (female), M23, 12-poles (not incl. in delivery)
Preset value signal	Input voltage / current as well as signal range can be set by software.
Fieldbus interface:	
Device receptacle supply (male)	M12, 4-poles
Mating connector	Plug (female), M12, 4-poles (not incl. in delivery)
Device receptacle CANopen (male)	M12, 5-poles (acc. to DRP 303-1)
Mating connector	Plug (female), M12, 5-poles (not incl. in delivery)
Device receptacle Profibus (female)	M12, 5-poles, B-coded (acc. to IEC 947-6-2)
Mating connector	Plug (male), M12, 5-poles, B-coded (not incl. in delivery)
Preset value signal	Fieldbus
Feedback signal interface (Sensor):	
(controller only)	
Device receptacle (female)	M12, 5-poles
Mating connector	Plug (male), M12, 5-poles (not incl. in delivery)
Feedback signal::	Voltage / current state when ordering

**SYMBOL**

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluids on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{0.1} > 75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70°C
Peak pressure	$p_{max} = 400 \text{ bar}$
Nominal pres. ranges	$p_n = 20 \text{ bar}, 100 \text{ bar}, 160 \text{ bar}, 200 \text{ bar}, 315 \text{ bar}, 350 \text{ bar}$
Min. volume flow	$Q_{min} = 0,1 \text{ l/min}$
Max. volume flow	$Q_{max} = 25 \text{ l/min}$ for $p_n = 20 \text{ bar}/100 \text{ bar}/160 \text{ bar}/200 \text{ bar}$ $Q_{max} = 20 \text{ l/min}$ for $p_n = 315 \text{ bar}$ $Q_{max} = 5 \text{ l/min}$ for $p_n = 350 \text{ bar}$
Leakage volume flow	see characteristics
Repeatability	$\leq 3\%$
Hysteresis	$\leq 5\%$

**CONNECTOR WIRING DIAGRAM**

Analog interface:

Device receptacle (male) X1



- 1 = Supply voltage +
- 2 = Supply voltage 0 VDC
- 3 = Stabilised output voltage
- 4 = Preset value voltage +
- 5 = Preset value voltage -
- 6 = Preset value current +
- 7 = Preset value current -
- 8 = Reserved for extensions
- 9 = Reserved for extensions
- 10 = Enable control (Digital input)
- 11 = Error signal (Digital output)
- 12 = Chassis

Preset value voltage (PIN 4/5) resp. current (PIN 6/7) are selected with set-up and diagnosis software PASO.

Factory setting: Voltage (0...+10V), (PIN 4/5)

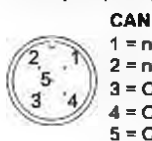
CANopen interface:

Device receptacle supply (male) X1


**MAIN**

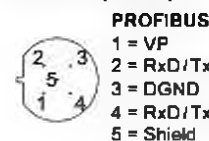
- 1 = Supply voltage +
- 2 = Reserved for extensions
- 3 = Supply voltage 0 VDC
- 4 = Chassis

Device receptacle CANopen (male) X3


**CAN**

- 1 = not connected
- 2 = not connected
- 3 = CAN Gnd
- 4 = CAN High
- 5 = CAN Low

Device receptacle Profibus (female) X3


**PROFIBUS**

- 1 = VP
- 2 = Rx/D / Tx/D - N
- 3 = DGND
- 4 = Rx/D / Tx/D - P
- 5 = Shield

 Parameterisation interface (USB, Mini B) X2  
 Under the closing screw of the housing cover

Feedback signal interface (Sensor)

Device receptacle (female) X4 (only connector)



- 1 = Supply voltage (output) +
- 2 = Feedback signal +
- 3 = Supply voltage 0 VDC
- 4 = not connected
- 5 = stab. output voltage



**NOTE!**  
 Detailed electrical characteristics and description of «DSV» electronics are shown on data sheet 1.13-76.

Free-of-charge download of the «PASO»-software and the instruction manual for the «DSV» hydraulic valves as well as the operation instruction **CANopen** eg **Profibus DP** protocol with device profile DSP-408 for «DSV».

**START-UP**

For DSV amplifiers as a rule no parameter settings by the customer are required. The plugs have to be connected in accordance with the chapter «Pin assignments».

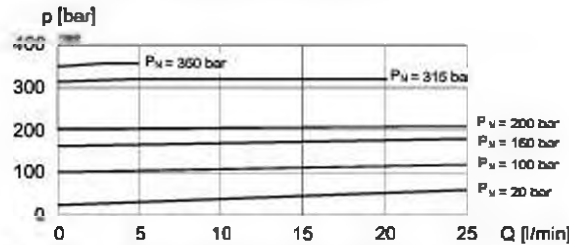

**NOTE!**

The mating connectors and the cable to adjust are settings is not part of the delivery. Refer to chapter «Accessories».

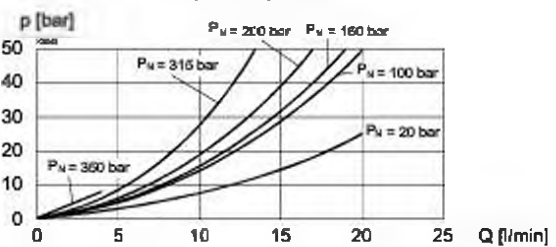
Controllers are supplied configured as amplifiers. The setting of the mode of control and the setting of the controller are done by the customer by software setting (USB interface, Mini B).

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

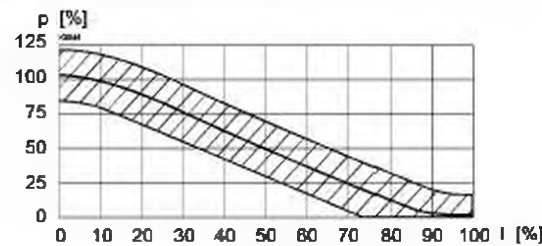
$p = f(Q)$  Pressure volume flow characteristics (Maximum adjustable pressure)



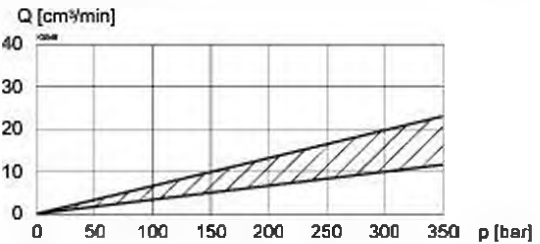
$p = f(Q)$  Pressure volume flow characteristics (Minimum adjustable pressure)



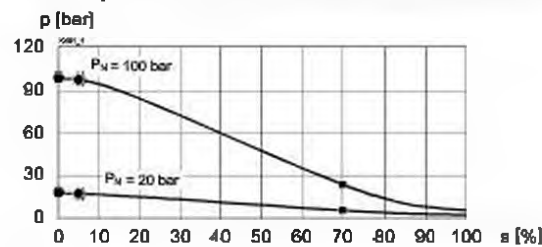
$p_{\text{red}} = f(I)$  Pressure adjustment characteristics [at  $Q = 10 \text{ l/min}$ ] ( $s$  corresponds to preset value signal)



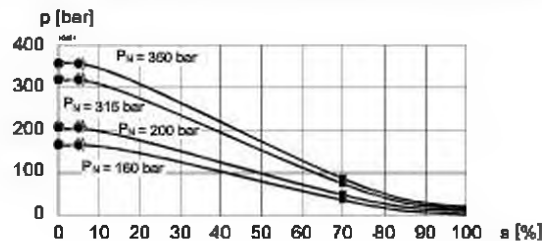
$f(p)$  Leakage volume flow characteristics



$p = f(I)$  Pressure adjustment characteristics [at  $Q = 5 \text{ l/min}$ ] ( $s$  corresponds to preset value signal)



$p = f(I)$  Pressure adjustment characteristics [at  $Q = 5 \text{ l/min}$ ] ( $s$  corresponds to preset value signal)


**Factory settings:**

Dither set for optimal hysteresis

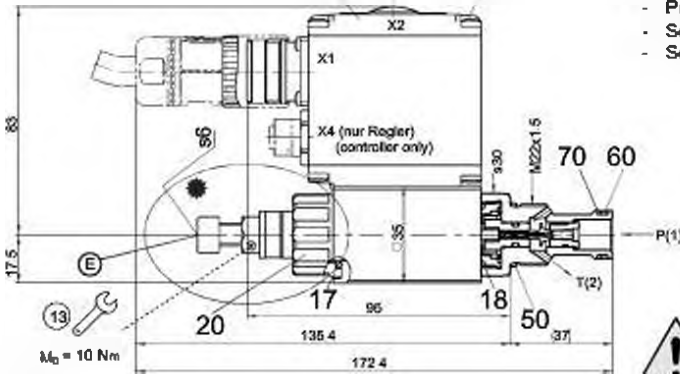
- = Deadband: Solenoid switched off with command preset value signal  $< 5\%$
- =  $p_N$  mechanically pre-set at  $Q = 5 \text{ l/min}$
- = Limited pressure in port P (1) at 70 % of preset value signal:
  - 95 bar with pressure range 350 bar
  - 65 bar with pressure range 315 bar
  - 58 bar with pressure range 200 bar
  - 32 bar with pressure range 160 bar
  - 25 bar with pressure range 100 bar
  - 4 bar with pressure range 20 bar

**DIMENSIONS/SECTIONAL DRAWINGS**

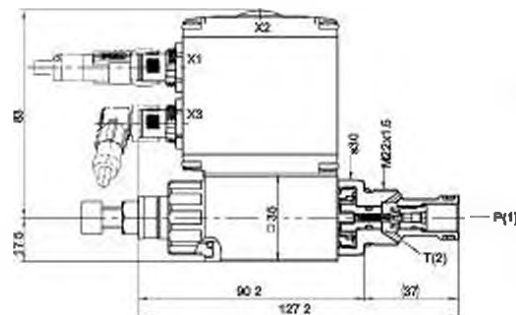
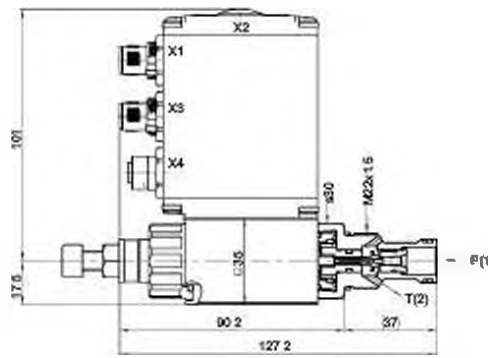
\*Adjusting screw for setting the nominal pressure (-20% / +30%)

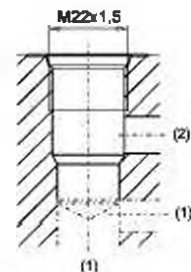
**With analog Interface  
 Amplifier and Controller**

25,30 21, 22 40


**E: Venting**

- Release locknut
- Remove screw
- Press check-valve (with a pin or with allen key < 1.3 mm)
- Screw the screw back in
- Set the required pressure and tighten the lock nut


**Under pressure oil shoot out!  
 Cover with a cloth.**
**With fieldbus Interface  
 Amplifier**

**With fieldbus interface  
 Controller**

 Cavity drawing according to  
 ISO 7789-22-02-0-98

 For detailed cavity drawing  
 and cavity tools  
 see data sheet 2.13-1003

**PARTS LIST**

Position	Article	Description
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
20	154.2700	Knurled nut
21	223.1317	Dummy plug M16x1,5
22	160.6131	O-ring ID 13,00 x 1,5
25	082.0102	Cover square
30	072.0021	Gasket 33,2 x 59,9 x 2
40	208.0100	Socket head cap screw M4 x 10
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
70	049.3177	Back-up ring RD 14,6 x 17,5 x 1,4

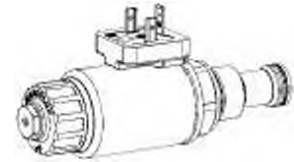
**ACCESSORIES**

- Cartridge built in:  
 flange and sandwich bodies see register 2.3
  - Set-up software see start-up
  - Cable to adjust the settings through interface USB  
 (from plug type A to Mini B, 3 m) article no. 219.2896
  - Cable connector for analog interface:
    - straight, soldering contact article no. 219.2330
    - 90°, soldering contact article no. 219.2331
- Recommended cable size:**
- Outer diameter 9...10,5 mm
  - Single wire max. 1 mm<sup>2</sup>
  - Recommended wire size:  
 0...25 m = 0,75 mm<sup>2</sup> (AWG18)  
 25...50 m = 1 mm<sup>2</sup> (AWG17)

Technical explanation see data sheet 1.0-100

**Proportional pressure relief cartridge**
**Seat tight**

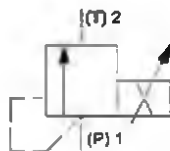
- ◆ direct operated
- ◆  $Q_{max} = 2 \text{ l/min}$
- ◆  $p_{o,act} = 500 \text{ bar}$
- ◆  $p_{H,max} = 450 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Direct operated, practically leakage-free proportional pressure relief valve in screw-in cartridge construction for cavity according to ISO 7789. When the operating pressure adjusted by means of the proportional solenoid is reached, the valve opens and connects the protected line with the drain to the tank. The back pressure in T (2) affects the pressure in P (1). This proportional valve is very sensitively adjustable and suitable for high pressures. For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W.S37 / 19 x 50 (Data sheet 1.1-173) M.S35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**TYPE CODE**

		B S P PM22 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/> # <input type="checkbox"/>					
Pressure relief valve							
Direct operated, leakage-free							
Proportional							
Screw-in cartridge M22 x 1,5							
Nominal pressure range $p_N$	350 bar	<input type="checkbox"/> 350					
	450 bar	<input type="checkbox"/> 450					
Nominal voltage $U_N$	12 VDC	<input type="checkbox"/> G12					
	24 VDC	<input type="checkbox"/> G24					
	without coil	<input type="checkbox"/> X5					
Slip-on coil	Metal housing round	<input type="checkbox"/> W					
	Metal housing square	<input type="checkbox"/> M					
Connection execution	Connector socket EN 175301-803 / ISO 4400	<input type="checkbox"/> D					
	Connector socket AMP Junior - Timer	<input type="checkbox"/> J					
	Connector Deutsch DT04 - 2P	<input type="checkbox"/> G					
Sealing material	NBR	<input type="checkbox"/>					
	FKM (Viton)	<input type="checkbox"/> D1					
Manual override	Manual override	<input type="checkbox"/> HB4,5					
	Screw plug	<input type="checkbox"/> HB0					
<b>Design index (subject to change)</b>							
13-00*							

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure relief valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,6 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

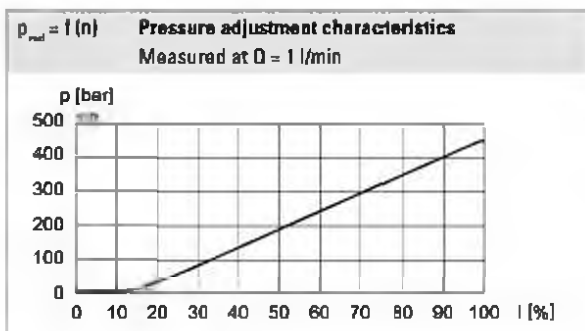
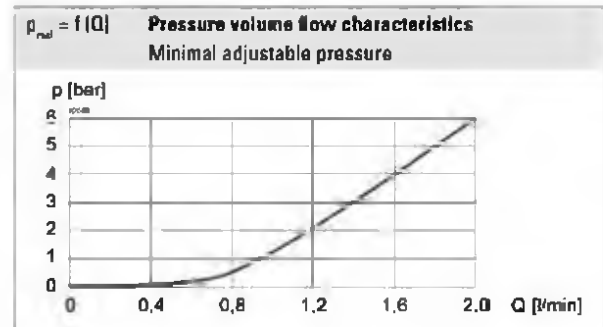
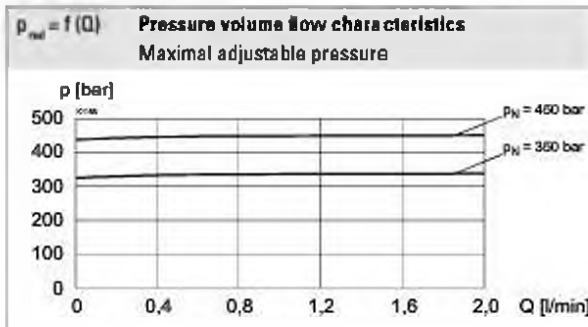
Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1320 \text{ mA}$ ( $U_N = 12\text{VDC}$ ) $I_a = 660 \text{ mA}$ ( $U_N = 24\text{VDC}$ )

**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)


**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 500 \text{ bar}$
Nominal pressure range	$P_N = 450 \text{ bar}$
Maximum volume flow	$Q_{max} = 2 \text{ l/min}$
Minimum volume flow	$Q_{min} = 0,1 \text{ l/min}$
Leakage oil	Seat tight, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Hysteresis	≤ 3 % at optimal dither signal
Repeatability	≤ 1,5 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACCESSORIES**

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2082
Flange body / sandwich plate NG4-Mini	Data sheet 2.3-720
Flange body / sandwich plate NG6	Data sheet 2.3-740
Flange body / sandwich plate NG10	Data sheet 2.3-760
Threaded body	Data sheet 2.9-200
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SEALING MATERIAL**

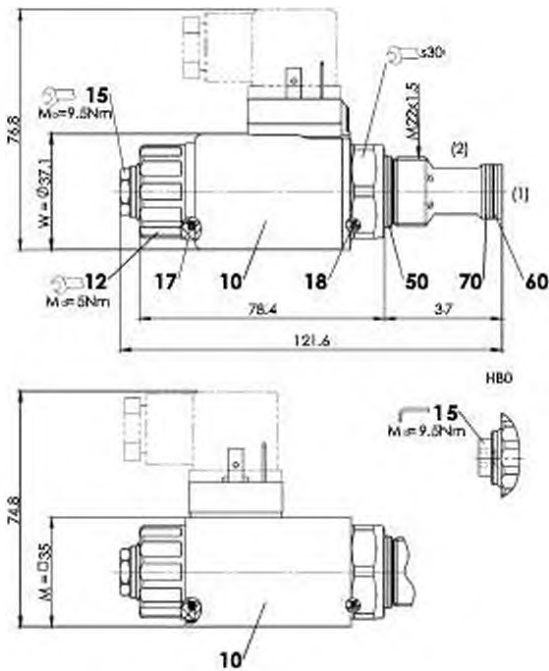
NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

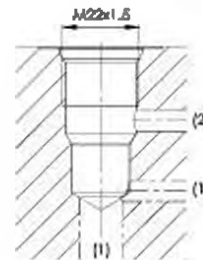
- ◆ The cartridge body made of steel and the slip-on coil are zinc-nickel coated

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-02-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1003

**PARTS LIST**

Position	Article	Description
10	206.2...	W.S37 / 19 x 50
	260.5...	M.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000	HB4,5 manual override
	239.2033	HB0 Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
70	049.3177	Back-up ring rd 14,6 x 17,5 x 1,4

**MANUAL OVERRIDE**

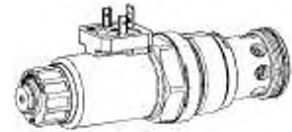
HB4,5

Optionally: Screw plug (HB0), no actuation possible



**Proportional pressure relief cartridge**

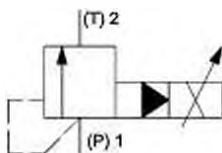
- ◆ pilot operated
- ◆  $Q_{max} = 400$  l/min
- ◆  $p_{nom} = 400$  bar
- ◆  $p_{Nmax} = 350$  bar

**M42 x 2**  
**ISO 7789**

**DESCRIPTION**

Pilot operated proportional pressure relief valve in screw-in cartridge construction for cavity according to ISO 7789. High flow capacity, very sensitively adjustable. When the operating pressure adjusted by means of the proportional solenoid is reached, the valve opens and connects the protected line with the drain to the tank. The back pressure in T (2) affects the pressure in P (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W S37 / 19 x 50 (Data sheet 1.1-173) M S35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**TYPE CODE**

		B V P PM42 - [ ] - [ ] / [ ] [ ] - [ ] [ ] # [ ]			
Pressure relief valve					
Pilot operated					
Proportional					
Screw-in cartridge M22 x 1,5					
Nominal pressure range $p_n$	100 bar 200 bar	[100] [200]	275 bar 350 bar	[275] [350]	
Nominal voltage $U_n$	12 VDC 24 VDC without coil	[G12] [G24] [X5]			
Slip-on coil	Metal housing round Metal housing square			[W] [M]	
Connection execution	Connector socket EN 175301-803 / ISO 4400 Connector socket AMP Junior - Timer Connector Deutsch DT04 - 2P			[D] [J] [G]	
Sealing material	NBR FKM (Viton)	[ ] [D1]			
Manual override	Manual override Screw plug			[HB4,5] [HB0]	

Design index (subject to change)

1 2-04

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure relief valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M42 x 2 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,90 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1320 \text{ mA}$ ( $U_a = 12\text{VDC}$ ) $I_a = 660 \text{ mA}$ ( $U_a = 24\text{VDC}$ )

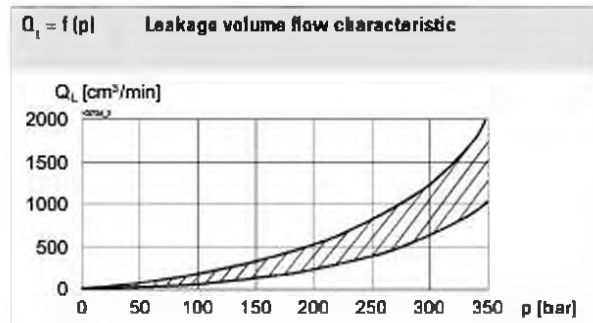
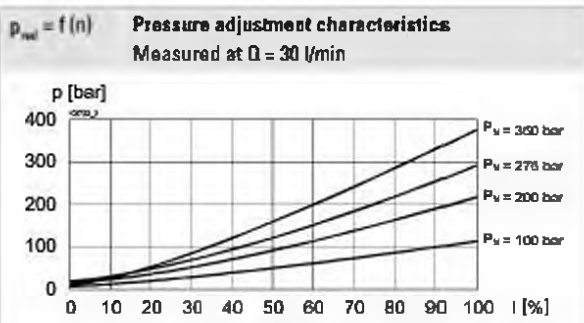
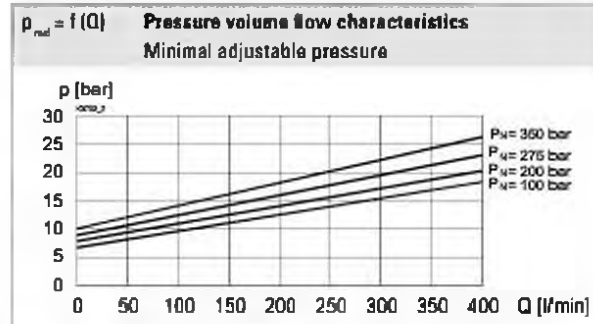
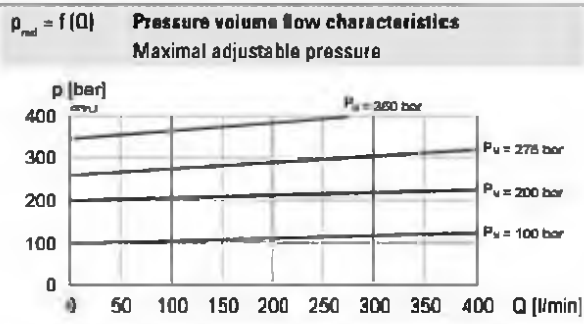
**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)

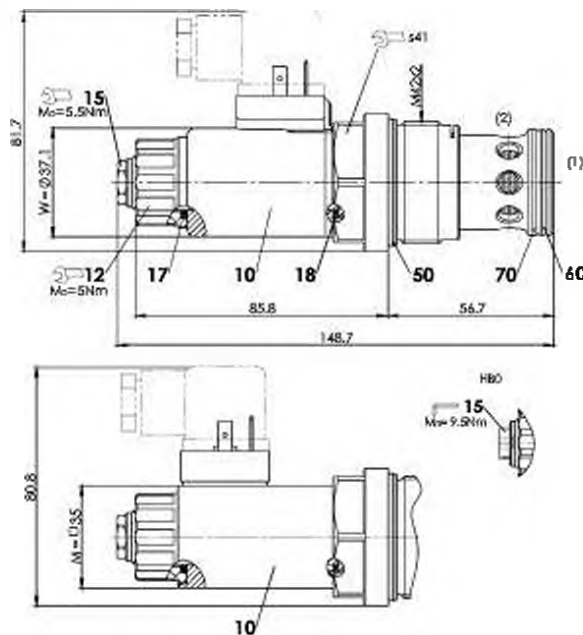

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{\text{max}} = 400 \text{ bar}$
Tank pressure	$p_{\text{T tank}} = p_p + 15 \text{ bar}$
Nominal pressure range	$P_N = 100 \text{ bar}, 200 \text{ bar}, 275 \text{ bar}, 350 \text{ bar}$
Volume flow range	$Q = 5 \dots 400 \text{ l/min}$
Leakage oil	See characteristics
Hysteresis	$\leq 5 \%$ at optimal dither signal
Repeatability	$\leq 2 \%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	$12 \text{ mm}^2/\text{s} \dots 320 \text{ mm}^2/\text{s}$
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade $\beta_{6 \dots 10} \geq 75$ , see data sheet 1.0-50

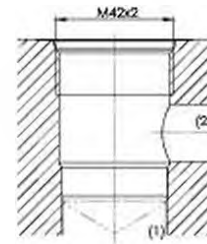
**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-42-02-0-07


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1048

**PARTS LIST**

Position	Article	Description
10	206.2... 260.5...	W.S37 / 19 x 50 M.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000 239.2033	HB4,5 manual override HB0 Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2377 160.6379	O-ring ID 37,77 x 2,62 (NBR) O-ring ID 37,77 x 2,62 (FKM)
60	160.2314 160.6315	O-ring ID 31,42 x 2,62 (NBR) O-ring ID 31,42 x 2,62 (FKM)
70	049.8364	Backup ring PTSM rd 29,1 x 33,6 x 1,4

**ACCESSORIES**

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2002
Threaded body	Data sheet 2.9-200
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5

Optionally: Screw plug (HB0), no actuation possible

**SURFACE TREATMENT**

- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301-803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

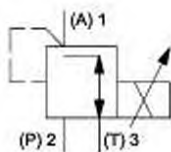
Mounting type	Screw-in cartridge M42 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 100 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5

**Proportional pressure reducing cartridge**

- ◆ direct operated
- ◆  $Q_{max} = 6 \text{ l/min}$
- ◆  $p_{nom} = 210 \text{ bar (350 bar)}$
- ◆  $p_{Nradmax} = 40 \text{ bar}$

**DESCRIPTION**

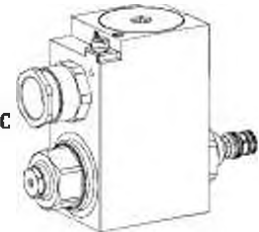
Direct operated proportional pressure reducing valve in screw-in cartridge construction for cavity according to Wandfluh standard. Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). Pressure increase in the consumer part A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from consumer part A (1) to port T (3). For the control, Wandfluh proportional amplifiers are available (see register 1.13). The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**SYMBOL**

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M16 x 1,5 according to Wandfluh standard
Actuation	Proportional solenoid
Ambient temperature	<b>Operation as T4</b> -25 ... +70 °C (L15 / L17) -25 ... +50 °C (L21)
Weight	2,2 kg
MTTFd	150 years

**M16 x 1,5**
**Wandfluh standard**

- ⊕ II 2 G Ex db IIC T6, T4
  - ⊕ II 2 D Ex db III C T80 °C, T130 °C
  - ⊕ I M2 Ex db I Mb
- Class I Division 1  
Class I Zone 1


**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to ...	M248 Electronic
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	
MA		x	x	x
UL / CSA	x		x	

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

**Attention!** The UL execution is always supplied without cable gland



**TYPE CODE**

		M D B PM16 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> # <input type="checkbox"/>									
Pressure reducing valve											
Direct operated											
Proportional, explosion proof execution Ex d											
Screw-in cartridge M16 x 1,5											
Nominal pressure range $p_{H,red}$	25 bar	<input type="checkbox"/> 25									
	40 bar	<input type="checkbox"/> 40									
Nominal voltage $U_N$	12 VDC	<input type="checkbox"/> G12									
	24 VDC	<input type="checkbox"/> G24									
Nominal power $P_N$	15 W	<input type="checkbox"/> L15	Ambient temperature up to:								
	17 W	<input type="checkbox"/> L17	70 °C								
	21 W	<input type="checkbox"/> L21	70 °C (only UL / CSA)								
			50 °C								
Certification	ATEX, IECEx, EAC	<input type="checkbox"/>	UL / CSA		<input type="checkbox"/> UL						
	CCC		MA		<input type="checkbox"/> MA						
	Australia	<input type="checkbox"/> AU									
Sealing material	NBR	<input type="checkbox"/>									
	FKM (Viton)	<input type="checkbox"/> D1									
Options	without amplifier	<input type="checkbox"/>									
		<input type="checkbox"/> M248									
	System pressure max. 210 bar	<input type="checkbox"/>									
	System pressure max. 350 bar	<input type="checkbox"/> Z400									

Design index (subject to change)

13483

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at... °C	<b>L15 / 17, 50 °C</b> $I_a = 950$ mA (12 VDC) $I_a = 450$ mA (24 VDC) <b>L15 / 17, 70 °C</b> $I_a = 910$ mA (12 VDC) $I_a = 420$ mA (24 VDC) <b>L21, 50 °C</b> $I_a = 1230$ mA (12 VDC) $I_a = 600$ mA (24 VDC)
Standard nominal power	15 W, 17 W, 21 W
Temperature class	T1...T4

**Note!** Other electrical specifications see data sheet 1.1-183 and 1.1-184


**HYDRAULIC SPECIFICATIONS**

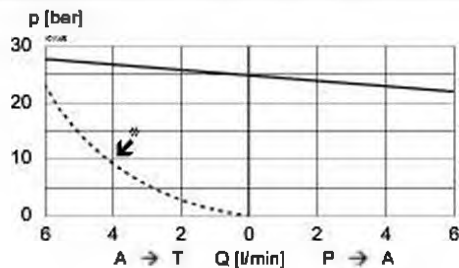
Working pressure	$p_{max} = 210$ bar (350 bar)
Nominal pressure range	$P_{H,red} = 25$ bar, 40 bar
Minimum adjustable pressure	< 0,5 bar
Volume flow range	$Q = 0...6$ l/min
Leakage oil	<b>25 bar execution at <math>p_{H,red} = 210</math> bar</b> $p_{red} = 0$ bar: < 10 ml/min $p_{red} = 25$ bar: < 50 ml/min <b>40 bar execution at <math>p_{H,red} = 210</math> bar</b> $p_{red} = 0$ bar: < 10 ml/min $p_{red} = 45$ bar: < 40 ml/min
Hysteresis	≤ 4 % at optimal dither signal
Repeatability	≤ 1 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR; L15 / 17) -20...+70 °C (FKM; L15 / 17) -25...+50 °C (NBR; L21) -20...+50 °C (FKM; L21)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $p_{\text{red}} = f(Q)$  **Pressure volume flow characteristics**

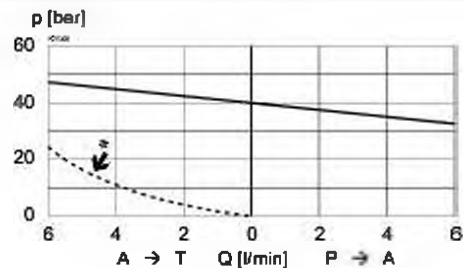
 Maximal adjustable pressure  
 25 bar execution

\*Limit of the operating range


 $p_{\text{red}} = f(Q)$  **Pressure volume flow characteristics**

 Maximal adjustable pressure  
 40 bar execution

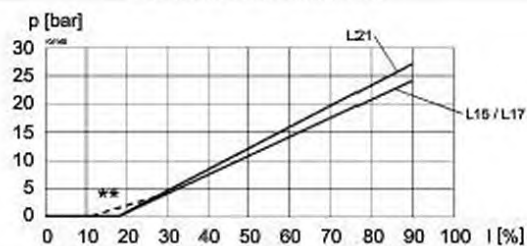
\*Limit of the operating range


 $p_{\text{red}} = f(i)$  **Pressure adjustment characteristics**

 Measured at  $Q = 0 \text{ l/min}$  (static)

25 bar execution

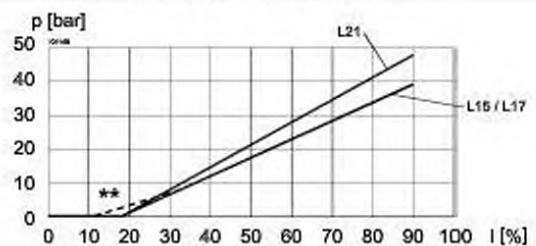
\*\*Slightly increased hysteresis


 $p_{\text{red}} = f(i)$  **Pressure adjustment characteristics**

 Measured at  $Q = 0 \text{ l/min}$  (static)

40 bar execution

\*\*Slightly increased hysteresis


**STANDARDS**

Cartridge cavity	Wandfluh standard
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SURFACE TREATMENT**

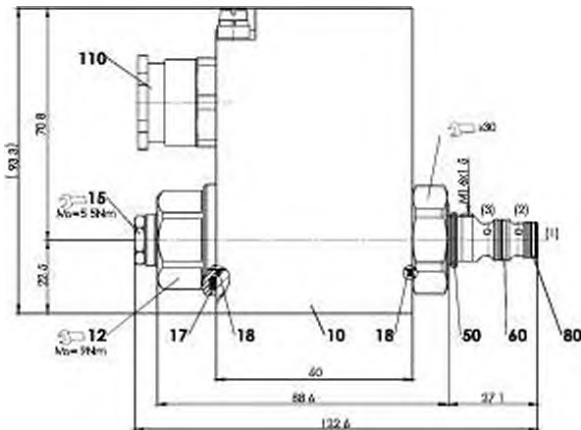
- ◆ The cartridge body is gas-nitro carburised
- ◆ The slip-on coil and the armature tube are zinc-nickel coated

**COMMISSIONING**

**Attention!** The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability can be assumed.


**INSTALLATION NOTES**

Mounting type	Screw-in cartridge type M16 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 30 \text{ Nm}$ screw-in cartridge $M_1 = 9 \text{ Nm}$ Knurled nut

**DIMENSIONS**


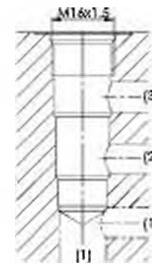
Dimensions of the solenoid coil see data sheet 1.1-183 and 1.1-184

**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	253.8000	Manual override HB4,5
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.8140	O-ring ID 14,00 x 1,78 (FKM)
60	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.8092	O-ring ID 9,25 x 1,78 (FKM)
80	160.2076	O-ring ID 7,65 x 1,78 (NBR)
	160.8076	O-ring ID 7,65 x 1,78 (FKM)
110	111.1080	Cable gland M20 x 1,5

**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard



**Attention!** For detailed cavity drawing and cavity tools see data sheet 2.13-1051


**ACCESSORIES**

Proportional amplifier	Register 1.13
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5 as standard

**SEALING MATERIAL**

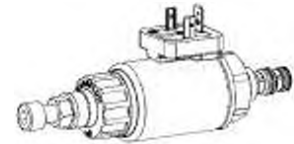
NBR or FKM (Viton) as standard, choice in the type code

**Proportional pressure reducing cartridge inverse**

- ◆ direct operated
- ◆  $Q_{max} = 6 \text{ l/min}$
- ◆  $p_{nom} = 210 \text{ bar (350 bar)}$
- ◆  $p_{H relief max} = 40 \text{ bar}$

**M16 x 1,5**

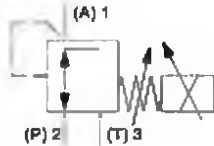
Wandfluh standard


**DESCRIPTION**

Direct operated proportional pressure reducing valve with inverse function in screw-in cartridge construction for cavity according to Wandfluh standard. The proportional pressure reducing valve controls the pressure in port A (1). With the solenoid deenergised, maximum working pressure is present. If the solenoid current increases, the pressure in port A drops (1). The valve operates practically independently of the pressure in port P (2). Pressure increase in port A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank (3). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

These valves are used in hydraulic systems where the pressure has to be changed frequently. The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W.S37 / 19 x 50 (Data sheet 1.1-173) M.S35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**STANDARDS**

Cartridge cavity	Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge type M16 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 30 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut



**TYPE CODE**

Pressure reducing valve		M	D	I	PM16	-		-		/		-		#	
Direct operated															
Proportional, inverse															
Screw-in cartridge M16 x 1,5															
Nominal pressure range $p_{N,red}$	25 bar 40 bar														
Nominal voltage $U_N$	12 VDC 24 VDC without coil														
Slip-on coil	Metal housing round Metal housing square														
Connection execution	Connector socket EN 175301-803 / ISO 4400 Connector socket AMP Junior - Timer Connector Deutsch DT04 - 2P														
Sealing material	NBR FKM (Viton)														
	System pressure max. 210 bar System pressure max. 350 bar														

Design index (subject to change)

1 1400

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M16 x 1,5 according to Wandfluh standard
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,45 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1360 \text{ mA}$ ( $U_N = 12\text{VDC}$ ) $I_a = 680 \text{ mA}$ ( $U_N = 24\text{VDC}$ )

**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W1 and 1.1-174 (slip-on coil M)

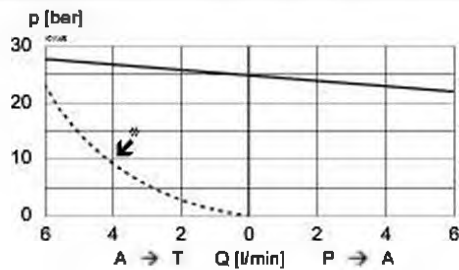

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 210 \text{ bar}$ (350 bar)
Nominal pressure range	$P_{N,red} = 25 \text{ bar}, 40 \text{ bar}$ Adjustable via adjustment screw (+20 % / -30 %)
Minimum adjustable pressure	< 0,5 bar
Volume flow range	$Q = 0...6 \text{ l/min}$
Leakage oil	<b>25 bar execution at <math>p_{op} = 210 \text{ bar}</math></b> $p_{red} = 0 \text{ bar}$ : < 10 ml/min $p_{red} = 25 \text{ bar}$ : < 50 ml/min <b>40 bar execution at <math>p_{op} = 210 \text{ bar}</math></b> $p_{red} = 0 \text{ bar}$ : < 10 ml/min $p_{red} = 45 \text{ bar}$ : < 40 ml/min
Hysteresis	≤ 4 % at optimal dither signal
Repeatability	≤ 1 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

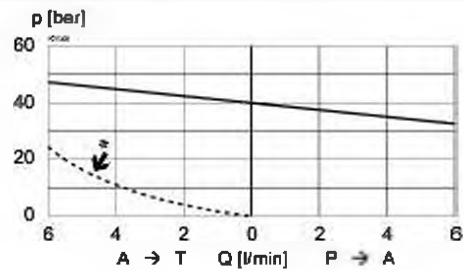
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

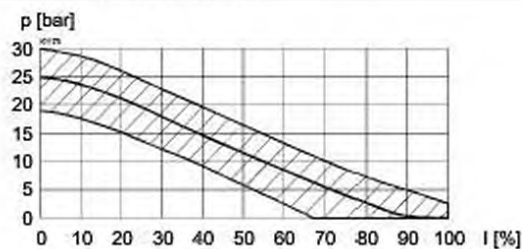
$p_{\text{red}} = f(Q)$  **Pressure volume flow characteristics**  
 Statically adjusted at nominal pressure  
 25 bar execution  
 \*Limit of the operating range



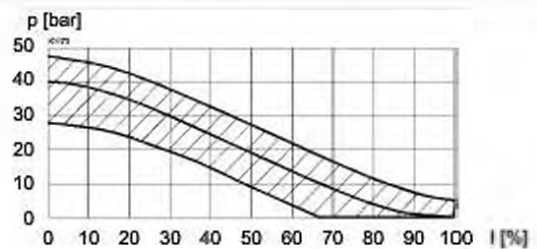
$p_{\text{red}} = f(Q)$  **Pressure volume flow characteristics**  
 Statically adjusted to nominal pressure  
 40 bar execution  
 \*Limit of the operating range



$p_{\text{red}} = f(n)$  **Pressure adjustment characteristics**  
 Measured at  $Q = 0 \text{ l/min}$  (static)  
 25 bar execution



$p_{\text{red}} = f(n)$  **Pressure adjustment characteristics**  
 Measured at  $Q = 0 \text{ l/min}$  (static)  
 40 bar execution


**ACCESSORIES**

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2002
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SURFACE TREATMENT**

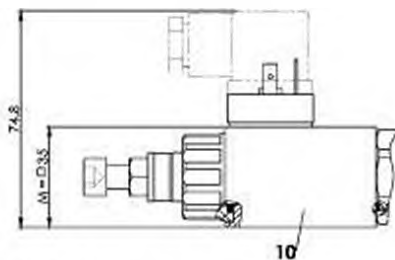
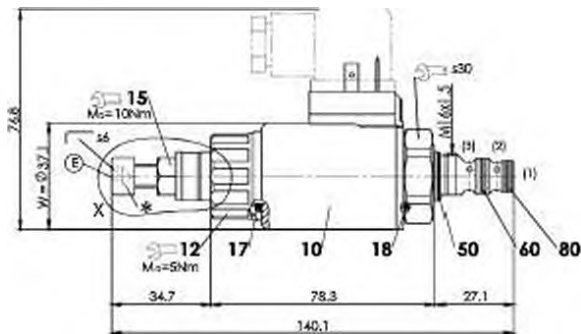
- ◆ The cartridge body is gas-nitro carburised
- ◆ The slip-on coil and the armature tube are zinc nickel coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**MANUAL OVERRIDE**

None

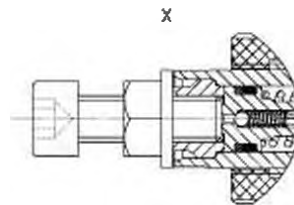
**DIMENSIONS**


E = Air bleed screw

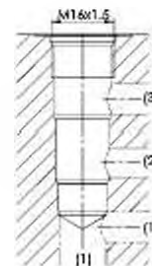
\*Adjustment screw for adjusting the nominal pressure

**PARTS LIST**

Position	Article	Description
10	206.2...	W.S37 / 19 x 50
	260.5...	M.S35 / 19 x 50
12	154.2700	Knurled nut
15	153.2401	Dichtmutter Norm „Seal-Lock“ 8 Zi - Ni M8
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.8140	O-ring ID 14,00 x 1,78 (FKM)
60	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.8092	O-ring ID 9,25 x 1,78 (FKM)
80	160.2076	O-ring ID 7,65 x 1,78 (NBR)
	160.8076	O-ring ID 7,65 x 1,78 (FKM)


**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard


**Attention!** For detailed cavity drawing and cavity tools see data sheet 2.13-1051

**COMMISSIONING**

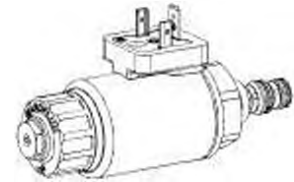
When commissioning, the valve must be vented under pressure as follows (see detail X in Dimensions):

- ◆ Loosen lock nut
- ◆ Remove screw (E)
- ◆ Push the non-return valve (with pin or hex key < 1,3 mm)
- ◆ Screw-in the screw (E)
- ◆ Adjust the required pressure and tighten the lock nut

**Attention!** Therewith oil flows out with the corresponding pressure! Cover with a cloth.


**Proportional pressure reducing cartridge**

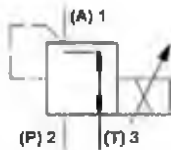
- ◆ direct operated
- ◆  $Q_{max} = 6 \text{ l/min}$
- ◆  $p_{nom} = 210 \text{ bar (350 bar)}$
- ◆  $p_{Nradmax} = 40 \text{ bar}$

**M16 x 1,5**  
 Wandfluh standard

**DESCRIPTION**

Direct operated proportional pressure reducing valve in screw-in cartridge construction for cavity according to Wandfluh standard. Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). Pressure increase in the consumer port A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from consumer port A (1) to port T (3). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

These valves are used in hydraulic systems where the pressure has to be changed frequently. The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W.S37 / 19 x 50 (Data sheet 1.1-173) M.S35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**STANDARDS**

Cartridge cavity	Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge type M16 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 30 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5

**TYPE CODE**

Pressure reducing valve		M	O	P	PM16	-		-		/		-			#	
Direct operated																
Proportional																
Screw-in cartridge M16 x 1,5																
Nominal pressure range $p_{H,red}$	25 bar 40 bar															
Nominal voltage $U_n$	12 VDC 24 VDC without coil															
Slip-on coil	Metal housing round Metal housing square															
Connection execution	Connector socket EN 175301-803 / ISO 4400 Connector socket AMP Junior - Timer Connector Deutsch DT04 - 2P															
Sealing material	NBR FKM (Viton)															
Manual override	Manual override Screw plug															
	System pressure max. 210 bar System pressure max. 350 bar															

Design index (subject to change)

73488

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M16 x 1,5 according to Wandfluh standard
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,45 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1360 \text{ mA}$ ( $U_n = 12\text{VDC}$ ) $I_a = 680 \text{ mA}$ ( $U_n = 24\text{VDC}$ )

**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)

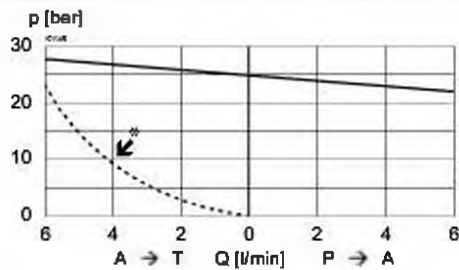

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 210 \text{ bar}$ (350 bar)
Nominal pressure range	$P_{H,red} = 25 \text{ bar}, 40 \text{ bar}$
Minimum adjustable pressure	< 0,5 bar
Volume flow range	$Q = 0...6 \text{ l/min}$
Leakage oil	<b>25 bar execution at <math>p_{app} = 210 \text{ bar}</math></b> $p_{red} = 0 \text{ bar}$ : < 10 ml/min $p_{red} = 25 \text{ bar}$ : < 50 ml/min <b>40 bar execution at <math>p_{app} = 210 \text{ bar}</math></b> $p_{red} = 0 \text{ bar}$ : < 10 ml/min $p_{red} = 45 \text{ bar}$ : < 40 ml/min
Hysteresis	≤ 4 % at optimal dither signal
Repeatability	≤ 1 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

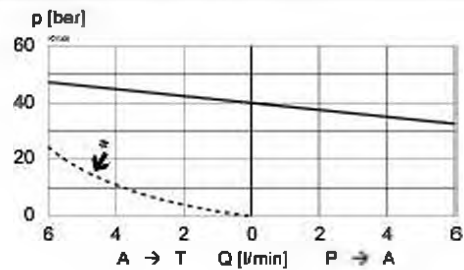
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

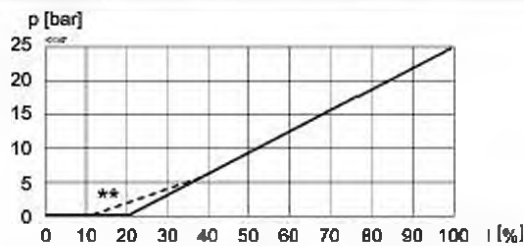
$p_{\text{red}} = f(Q)$  **Pressure volume flow characteristics**  
 Maximal adjustable pressure  
 25 bar execution  
 \*Limit of the operating range



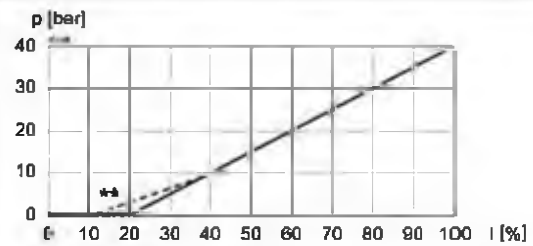
$p_{\text{red}} = f(Q)$  **Pressure volume flow characteristics**  
 Maximal adjustable pressure  
 40 bar execution  
 \*Limit of the operating range



$p_{\text{red}} = f(i)$  **Pressure adjustment characteristics**  
 Measured at  $Q = 0 \text{ l/min}$  (static)  
 25 bar execution  
 \*\*Slightly increased hysteresis



$p_{\text{red}} = f(i)$  **Pressure adjustment characteristics**  
 Measured at  $Q = 0 \text{ l/min}$  (static)  
 40 bar execution  
 \*\*Slightly increased hysteresis


**ACCESSORIES**

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2002
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5

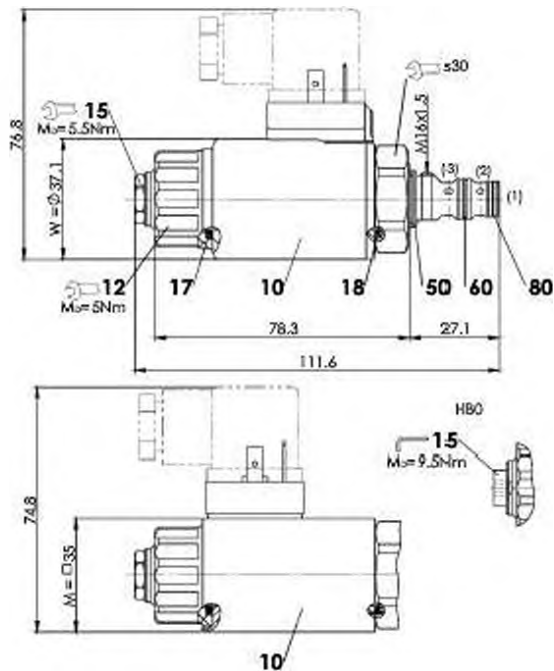
Optionally: Screw plug (HB0), no actuation possible

**SURFACE TREATMENT**

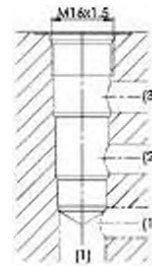
- ◆ The cartridge body is gas-nitro carburised
- ◆ The slip-on coil and the armature tube are zinc nickel coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard


**Attention!** For detailed cavity drawing and cavity tools see data sheet 2.13-1051

**PARTS LIST**

Position	Article	Description
10	206.2...	W.S37 / 19 x 50
	260.5...	M.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000	HB4,5 manual override
	239.2033	HBO Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.8140	O-ring ID 14,00 x 1,78 (FKM)
60	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.8092	O-ring ID 9,25 x 1,78 (FKM)
80	160.2076	O-ring ID 7,65 x 1,78 (NBR)
	160.8076	O-ring ID 7,65 x 1,78 (FKM)

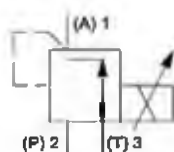
### Proportional pressure reducing cartridge

- ◆ direct operated
- ◆  $Q_{max} = 6 \text{ l/min}$
- ◆  $p_{nom} = 210 \text{ bar (350 bar)}$
- ◆  $p_{Nredmax} = 100 \text{ bar}$

### DESCRIPTION

Direct operated proportional pressure reducing valve in screw-in cartridge construction for cavity according to Wandfluh standard. Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). Pressure increase in the consumer port A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from consumer port A (1) to port T (3). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

### SYMBOL



### ACCESSORIES

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2002
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

### SURFACE TREATMENT

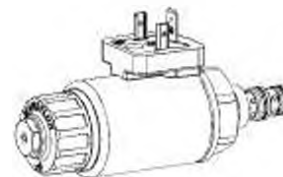
- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

### STANDARDS

Cartridge cavity	Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

### M16 x 1,5

Wandfluh standard



### APPLICATION

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

### ACTUATION

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W.S37 / 19 x 50 (Data sheet 1.1-173) M.S35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

### MANUAL OVERRIDE

HB4,5

Optionally: Screw plug (HB0), no actuation possible

### SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

### INSTALLATION NOTES

Mounting type	Screw-in cartridge type M16 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 30 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5



**TYPE CODE**

		M G P PM16 · 100 - [ ] / [ ] [ ] - [ ] [ ] [ ] # [ ]	
Pressure reducing valve			
Direct operated			
Proportional, inverse			
Screw-in cartridge M16 x 1,5			
Nominal pressure range $p_{N,red}$	100 bar		
Nominal voltage $U_N$	12 VDC 24 VDC without coil	G12 G24 X5	
Slip-on coil	Metal housing round Metal housing square	W M	
Connection execution	Connector socket EN 175301-803 / ISO 4400 Connector socket AMP Junior - Timer Connector Deutsch DT04 - 2P	D J G	
Sealing material	NBR FKM (Viton)	[ ] D1	
Manual override	Manual override Screw plug	HB4,5 HB0	
	System pressure max. 210 bar System pressure max. 350 bar	[ ] Z406	
Design index (subject to change)			

1.1-173

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M16 x 1,5 according to Wandfluh standard
Actuation	Proportional solenoid
Ambient temperature	-25 ... +70 °C
Weight	0,45 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

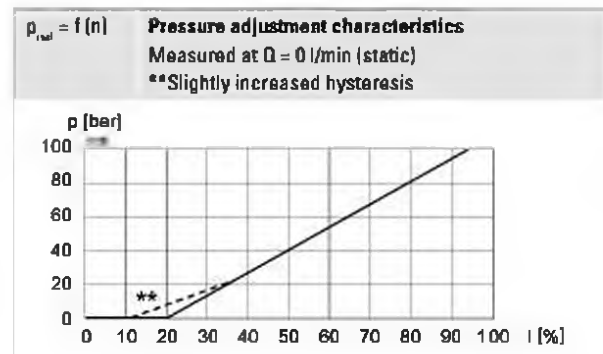
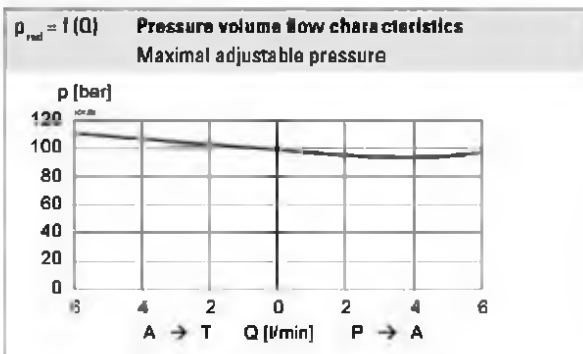
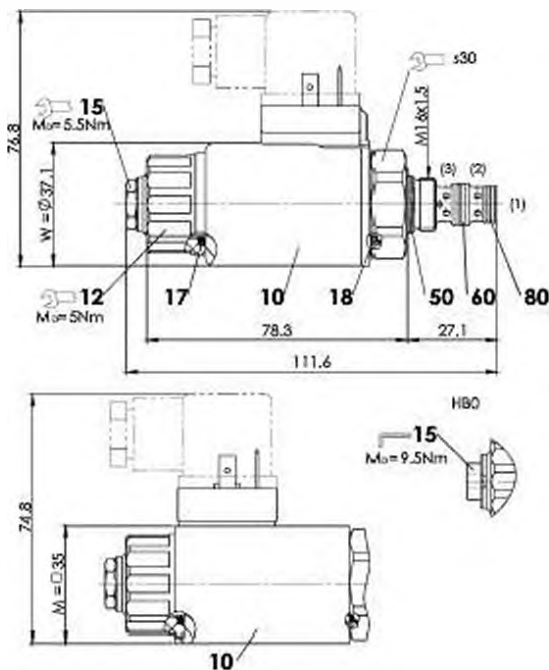
Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_0 = 1360 \text{ mA}$ ( $U_N = 12\text{VDC}$ ) $I_0 = 680 \text{ mA}$ ( $U_N = 24\text{VDC}$ )

**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)

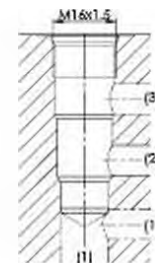

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{stat} = 210 \text{ bar}$ (350 bar)
Nominal pressure range	$p_{N,red} = 100 \text{ bar}$
Minimum adjustable pressure	< 0,5 bar
Volume flow range	$Q = 0 \dots 6 \text{ l/min}$
Leakage oil	$p_{app} = 160 \text{ bar}$ $p_{red} = 0 \text{ bar}$ : < 15 ml/min $p_{red} = 0,5 \times p_{N,red}$ : < 60 ml/min
Hysteresis	≤ 4 % at optimal dither signal
Repeatability	≤ 1 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard


**Attention!** For detailed cavity drawing and cavity tools see data sheet 2.13-1051

**PARTS LIST**

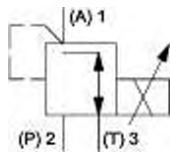
Position	Article	Description
10	206.2... 260.5...	W.S37 / 19 x 50 M.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000 239.2033	HB4,5 manual override HB0 Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2140 160.8140	O-ring ID 14,00 x 1,78 (NBR) O-ring ID 14,00 x 1,78 (FKM)
60	160.2093 160.8092	O-ring ID 9,25 x 1,78 (NBR) O-ring ID 9,25 x 1,78 (FKM)
80	160.2076 160.8076	O-ring ID 7,65 x 1,78 (NBR) O-ring ID 7,65 x 1,78 (FKM)

**Proportional pressure reducing cartridge**

- ◆ direct operated
- ◆  $Q_{max} = 6 \text{ l/min}$
- ◆  $p_{nom} = 210 \text{ bar (350 bar)}$
- ◆  $p_{Nredmax} = 100 \text{ bar}$

**DESCRIPTION**

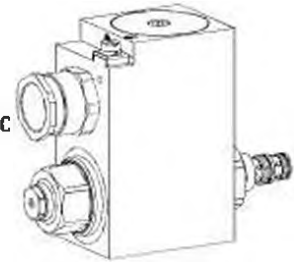
Direct operated proportional pressure reducing valve in screw-in cartridge construction for cavity according to Wandfluh standard. Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). Pressure increase in the consumer part A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from consumer part A (1) to port T (3). For the control, Wandfluh proportional amplifiers are available (see register 1.13). The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**SYMBOL**

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M16 x 1,5 according to Wandfluh standard
Actuation	Proportional solenoid
Ambient temperature	Operation as T4 -25...+70 °C (L15 / L17)
Weight	2,2 kg
MTTFd	150 years

**M16 x 1,5**
**Wandfluh standard**

- ⊕ II 2 G Ex db IIC T6, T4
  - ⊕ II 2 D Ex db III C T80 °C, T130 °C
  - ⊕ I M2 Ex db I Mb
- Class I Division 1  
Class I Zone 1


**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to...	M248 Electronic
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	
MA		x	x	x
UL / CSA	x		x	

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

**Attention!** The UL execution is always supplied without cable gland



**TYPE CODE**

		M G B PM16 - 100 - <input type="checkbox"/> / <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> # <input type="checkbox"/>					
Pressure reducing valve							
Direct operated							
Proportional, explosion proof execution Ex d							
Screw-in cartridge M16 x 1,5							
Nominal pressure range $p_{N,red}$	100 bar						
Nominal voltage $U_N$	12 VDC	<input type="checkbox"/> G12					
	24 VDC	<input type="checkbox"/> G24					
Nominal power $P_N$	15 W	<input type="checkbox"/> L15	Ambient temperature up to: 70 °C 70 °C (only UL / CSA)				
	17 W	<input type="checkbox"/> L17					
Certification	ATEX, IECEx, EAC	<input type="checkbox"/>					
	CCC	<input type="checkbox"/>	UL / CSA	<input type="checkbox"/> UL			
	Australia	<input type="checkbox"/> AU	MA	<input type="checkbox"/> MA			
Sealing material	NBR	<input type="checkbox"/>					
	FKM (Viton)	<input type="checkbox"/> F1					
Options	without amplifier	<input type="checkbox"/>					
		<input type="checkbox"/> M248					
	System pressure max. 210 bar	<input type="checkbox"/>					
	System pressure max. 350 bar	<input type="checkbox"/> Z400					
Design index (subject to change)							

1.1-183

**ELECTRICAL SPECIFICATIONS**

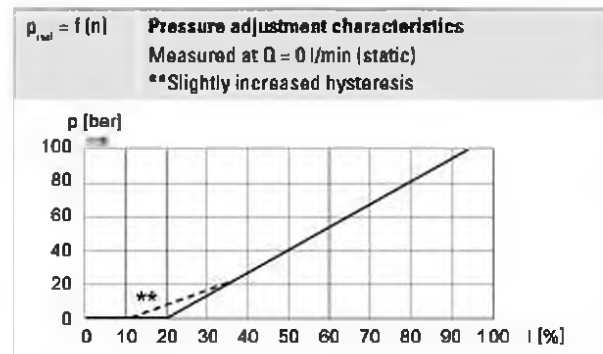
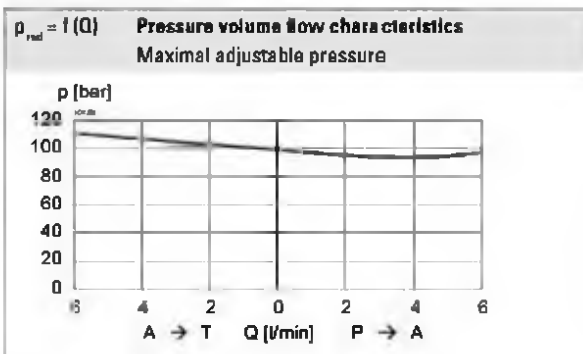
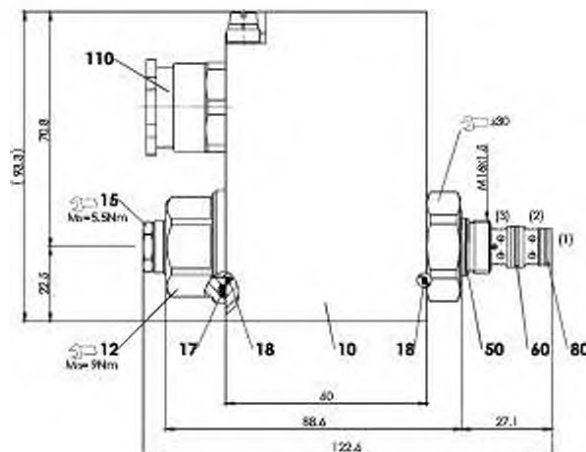
Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	<b>L15 / 17, 50 °C</b>
	$I_a = 950 \text{ mA (12 VDC)}$
	$I_a = 450 \text{ mA (24 VDC)}$
	<b>L15 / 17, 70 °C</b>
	$I_a = 910 \text{ mA (12 VDC)}$
	$I_a = 420 \text{ mA (24 VDC)}$
Standard nominal power	15 W, 17 W
Temperature class	Nominal power 15 W / 17 W: T1...T4

**Note!** Other electrical specifications see data sheet 1.1-183 and 1.1-184

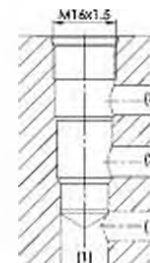

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 210 \text{ bar (350 bar)}$
Nominal pressure range	$p_{N,red} = 100 \text{ bar}$
Minimum adjustable pressure	< 0,5 bar
Volume flow range	$Q = 0 \dots 6 \text{ l/min}$
Leakage oil	$p_{rel} = 160 \text{ bar}$
	$p_{rel} = 0 \text{ bar: } < 15 \text{ ml/min}$
	$p_{rel} = 0,5 \times p_{N,red} : < 60 \text{ ml/min}$
Hysteresis	≤ 4 % at optimal dither signal
Repeatability	≤ 1 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T4</b>
	NBR -25...+70 °C (L15 / L17) FKM -20...+70 °C (L15 / L17)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard


**Attention!** For detailed cavity drawing and cavity tools see data sheet 2.13-1051

**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	253.8000	Manual override HB4,5
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.8140	O-ring ID 14,00 x 1,78 (FKM)
60	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.8092	O-ring ID 9,25 x 1,78 (FKM)
80	160.2076	O-ring ID 7,65 x 1,78 (NBR)
	160.8076	O-ring ID 7,65 x 1,78 (FKM)
110	111.1080	Cable gland M20 x 1,5

**ACCESSORIES**

Proportional amplifier	Register 1.13
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5 as standard

### **SURFACE TREATMENT**

- ◆ The cartridge body is gas-nitro carburised
- ◆ The slip-on coil and the armature tube are zinc-nickel coated

### **STANDARDS**

Cartridge cavity	Wandfluh standard
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

### **COMMISSIONING**

**Attention!** The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability can be assumed.



### **SEALING MATERIAL**

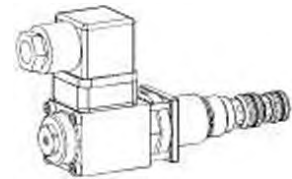
NBR or FKM (Viton) as standard, choice in the type code

### **INSTALLATION NOTES**

Mounting type	Screw-in cartridge type M16 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 30$ Nm screw-in cartridge $M_0 = 9$ Nm Knurled nut

**Proportional pressure reducing cartridge**

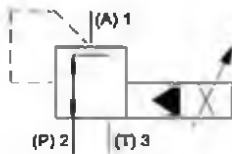
- ◆ pilot operated
- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$
- ◆  $p_{h \text{ red max}} = 315 \text{ bar}$

**M18 x 1,5**  
 Wandfluh standard

**DESCRIPTION**

Pilot operated proportional pressure reducing valve in screw-in cartridge construction for cavity according to Wandfluh standard. Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). Pressure increase in the consumer part A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from port P (2) to consumer part A (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	PI29V (Data sheet 1.1-90)
Connection	Connector socket EN 175301 - 803

**TYPE CODE**

					M	V	P	PM18	-	-	-	+	
Pressure reducing valve													
Pilot operated													
Proportional													
Screw-in cartridge M18 x 1,5													
Nominal pressure range $p_{nom}$	20 bar	<input type="checkbox"/>	100 bar	<input type="checkbox"/>	200 bar	<input type="checkbox"/>	315 bar	<input type="checkbox"/>					
Nominal voltage $U_n$	12 VDC	<input type="checkbox"/>	G12	<input type="checkbox"/>	24 VDC	<input type="checkbox"/>	G24	<input type="checkbox"/>					
Sealing material	NBR	<input type="checkbox"/>	FKM (Viton)	<input type="checkbox"/>									
Design index (subject to change)													

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M18 x 1,5 according to Wandfluh standard
Actuation	Proportional solenoid
Ambient temperature	-25 ... +70 °C
Weight	0,40 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65
Relative duty factor	100 % DF
Service life time	10 <sup>7</sup> (number of switching cycles, theoretically)
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1080 \text{ mA (12 VDC)}$ $I_a = 540 \text{ mA (24 VDC)}$

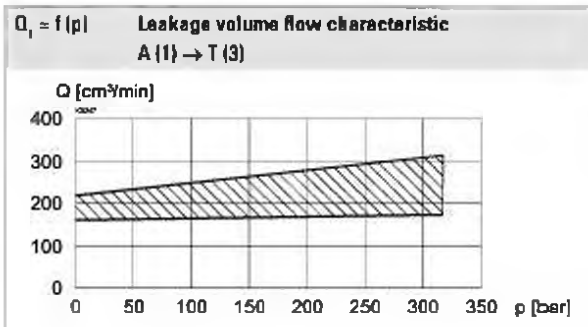
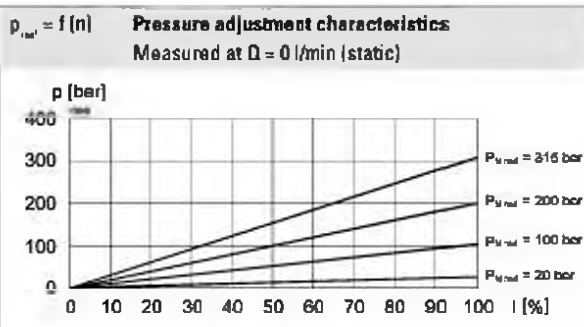
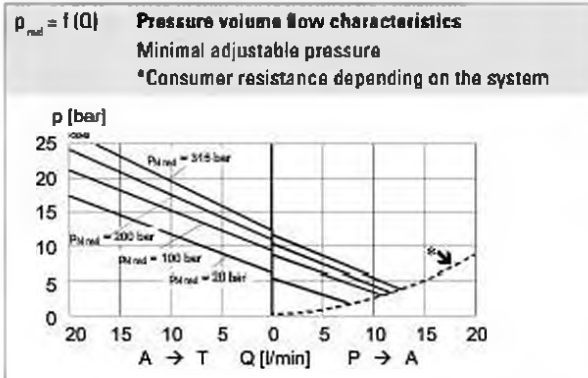
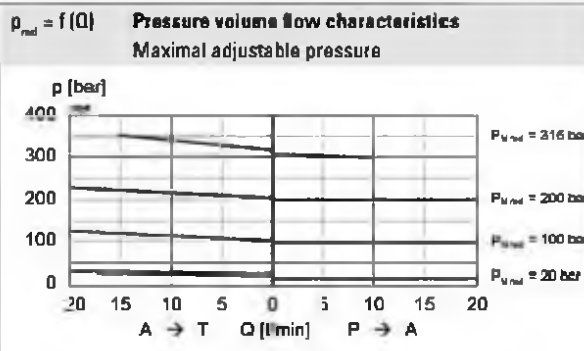
Note! Other electrical specifications see data sheet 1.1-90


**HYDRAULIC SPECIFICATIONS**

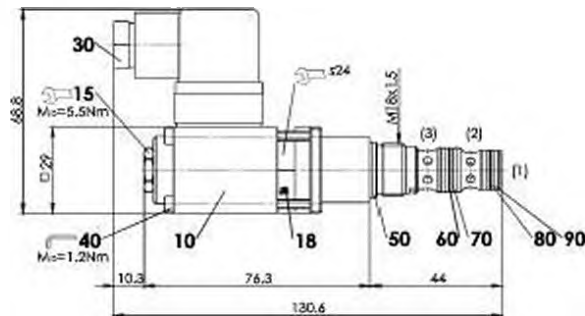
Working pressure	$p_{\text{max}} = 350 \text{ bar}$
Nominal pressure range	$P_{\text{N,red}} = 20 \text{ bar, 100 bar, 200 bar, 315 bar}$
Volume flow range	$Q = 0 \dots 20 \text{ l/min}$
Leakage oil	See characteristics
Hysteresis	≤ 4 % at optimal dither signal
Repeatability	≤ 1 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

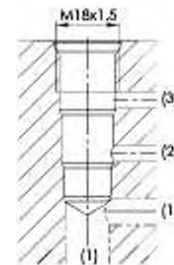
Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$





**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard


**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1020

**PARTS LIST**

Position	Article	Description
10	256 2418	Proportional solenoid PI29V-G12
	256 2453	Proportional solenoid PI29V-G24
15	253 8000	Manual override HB4,5
18	160 2120	O-ring ID 12,42 x 1,78 (NBR)
30	219 2002	Electric plug B (black)
40	246 0151	Socket head screw M3 x 50 DIN 912
50	160 2156	O-ring ID 15,60 x 1,78 (NBR)
	160 6156	O-ring ID 15,60 x 1,78 (FKM)
60	160 2111	O-ring ID 11,11 x 1,78 (NBR)
	160 6111	O-ring ID 11,11 x 1,78 (FKM)
70	049 3156	Backup ring rd 12,1 x 15 x 1,4
80	160 2093	O-ring ID 9,25 x 1,78 (NBR)
	160 6092	O-ring ID 9,25 x 1,78 (FKM)
90	049 3137	Backup ring rd 10,6 x 13,5 x 1,4

**ACCESSORIES**

Proportional amplifier	Register 1.13
Flange body / sandwich plate NG3-Mini	Data sheet 2.3-800
Threaded body	Data sheet 2.9-210
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5 as standard

**SURFACE TREATMENT**

- ◆ All external parts of the cartridge as well the solenoid coil are zinc-nickel coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**STANDARDS**

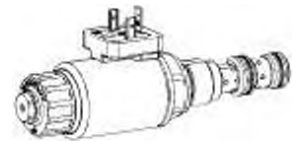
Cartridge cavity	Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M18 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 40$ Nm Screw-in cartridge $M_0 = 1,2$ Nm solenoid screws

**Proportional pressure reducing cartridge**

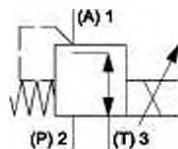
- ◆ direct operated by means of pilot spool
- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$
- ◆  $p_{h \text{ red max}} = 200 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Direct operated proportional pressure reducing valve with pilot spool actuation in screw-in cartridge construction for cavity according to ISO 7789. Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). Pressure increase in the consumer port A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from consumer port A (1) to port T (3). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

These valves are used in hydraulic systems where the pressure has to be changed frequently. The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). Direct operated pressure reducing valves are used where a low minimal adjustable pressure is required. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	WS37 / 19 x 50 (Data sheet 1.1-173) MS35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5

**TYPE CODE**

Pressure reducing valve			M	P	P	PM22	-		-		/			-			#		
Direct operated by means of pilot spool																			
Proportional																			
Screw-in cartridge M22 x 1,5																			
Nominal pressure range $p_{Nred}$	20 bar	<input type="text" value="20"/>	115 bar	<input type="text" value="115"/>															
	80 bar	<input type="text" value="80"/>	200 bar	<input type="text" value="200"/>															
Nominal voltage $U_N$	12 VDC	<input type="text" value="G12"/>	24 VDC	<input type="text" value="G24"/>															
	without coil	<input type="text" value="X5"/>																	
Slip-on coil	Metal housing round		<input type="text" value="W"/>																
	Metal housing square		<input type="text" value="M"/>																
Connection execution	Connector socket EN 175301 - B03 / ISO 4400			<input type="text" value="D"/>															
	Connector socket AMP Junior - Tamer			<input type="text" value="J"/>															
	Connector Deutsch DT04 - 2P			<input type="text" value="E"/>															
Sealing material	NBR	<input type="text" value=""/>																	
	FKM (Viton)	<input type="text" value="D1"/>																	
Manual override	Manual override		<input type="text" value="HR4,5"/>																
	Screw plug		<input type="text" value="HR0"/>																
Design index (subject to change)																			

1.1-173

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Direct operated by means of pilot spool
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,55 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

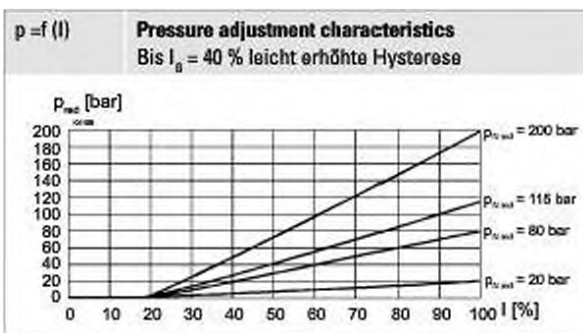
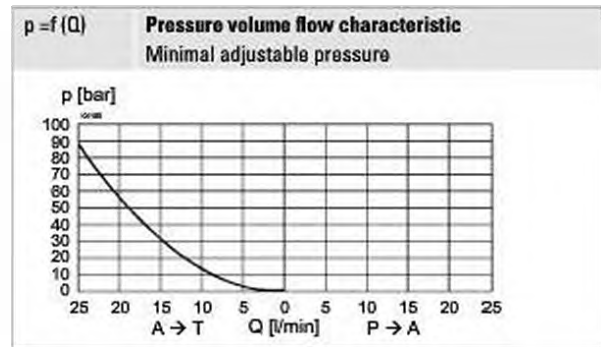
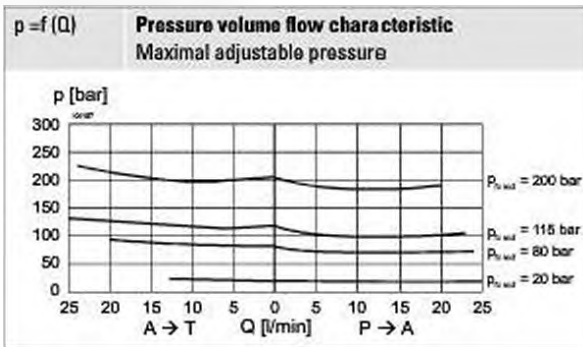
Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1360 \text{ mA}$ ( $U_N = 12\text{VDC}$ ) $I_a = 680 \text{ mA}$ ( $U_N = 24\text{VDC}$ )

**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)


**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Nominal pressure range	$P_{Nred} = 20, 80, 115, 200 \text{ bar}$
Minimum adjustable pressure	< 1 bar
Volume flow range	See characteristic
Leakage oil	at $p_{sm} = 350 \text{ bar}$ < 30 ml/min for $p_{Nred} = 20, 80, 115 \text{ bar}$ < 50 ml/min for $p_{Nred} = 200 \text{ bar}$
Hysteresis	≤ 4 % at optimal dither signal
Repeatability	≤ 1 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACCESSORIES**

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2002
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5

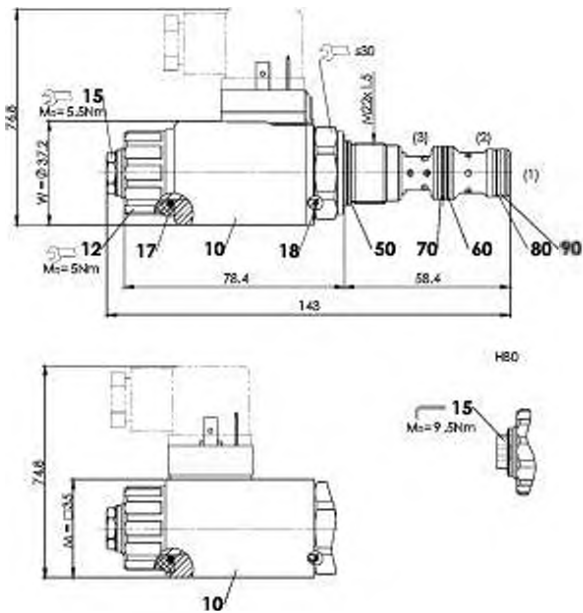
Optionally: Screw plug (HB0), no actuation possible

**SURFACE TREATMENT**

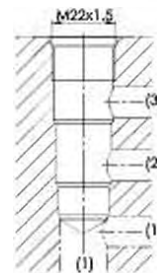
- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-04-0-98


**Nota!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1004

**PARTS LIST**

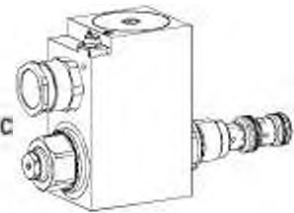
Position	Article	Description
10	206.2...	W.S37 / 19 x 50
	260.5...	M.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000	HB4,5 manual override
	239.2033	HB0 Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.8196	Backup ring PTSM rd 14,5 x 17,4 x 1,4
80	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
90	049.8176	Back-up ring PTSM rd 12,7 x 15,6 x 1,4

**Proportional pressure reducing cartridge**

- ◆ direct operated by means of pilot spool
- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$
- ◆  $p_{h \text{ red max}} = 200 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**

- ⊕ II 2 G Ex db IIC T6, T4
  - ⊕ II 2 D Ex db III C T80 °C, T130 °C
  - ⊕ I M2 Ex db I Mb
- Class I Division 1
- 
- Class I Zone 1


**DESCRIPTION**

Direct operated proportional pressure reducing valve with pilot spool actuation in screw-in cartridge construction for cavity according to ISO 7789. Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). Pressure increase in the consumer part A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from consumer part A (1) to port T (3). For the control, Wandfluh proportional amplifiers are available (see register 1.13). The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

		M P B PM22 -		-		/		/		-		#	
Pressure reducing valve													
Direct operated by means of pilot spool													
Proportional, explosion proof execution Ex d													
Screw-in cartridge M22 x 1,5													
Execution		L9		L15 / L17									
Nominal pressure range $p_v$ [bar]		20	115	20	135								
		80	200	85	235								
Nominal voltage $U_v$		12 VDC		G12									
		24 VDC		G24									
Nominal power $P_v$		9 W		L9		Ambient temperature up to:							
		15 W		L15		40 °C or 90 °C							
		17 W		L17		70 °C							
						70 °C (only UL / CSA)							
Certification		ATEX, IECEx, EAC, CCC		AU		UL / CSA		UL					
		Australia				MA (nur L15)		MA					
Sealing material		NBR		D1									
		FKM (Viton)											
Options		without amplifier		M248									
Design index (subject to change)													

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to...	M248 Electronic
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	
MA		x	x	x
UL / CSA	x		x	

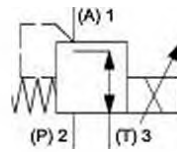
**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Direct operated by means of pilot spool
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+70 °C (L9) -25...+70 °C (L15 / L17)
Weight	1,95 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at... °C	<b>19, 40 °C</b> $I_a = 625 \text{ mA}$ (12 VDC) $I_a = 305 \text{ mA}$ (24 VDC) <b>115 / 17, 50 °C</b> $I_a = 950 \text{ mA}$ (12 VDC) $I_a = 450 \text{ mA}$ (24 VDC) <b>115 / 17, 70 °C</b> $I_a = 910 \text{ mA}$ (12 VDC) $I_a = 420 \text{ mA}$ (24 VDC)
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

**Note!** Other electrical specifications see data sheet 1.1-183 and 1.1-184


**SYMBOL**

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Nominal pressure range	<b>Ausführung L9</b> $p_n = 20 \text{ bar}, 80 \text{ bar}, 115 \text{ bar}, 200 \text{ bar}$ <b>Ausführung L15 / 17</b> $p_n = 20 \text{ bar}, 95 \text{ bar}, 135 \text{ bar}, 235 \text{ bar}$
Minimum adjustable pressure	< 1 bar
Volume flow range	See characteristic
Leakage oil	at $p_{set} = 350 \text{ bar}$ < 30 ml/min for $p_{nom} = 20, 80 (95), 115 (135) \text{ bar}$ < 50 ml/min for $p_{nom} = 200 (235) \text{ bar}$
Hysteresis	≤ 5 % at optimal dither signal
Repeatability	≤ 2 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L15 / L17) FKM -20...+70 °C (L9)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**ACTUATION**

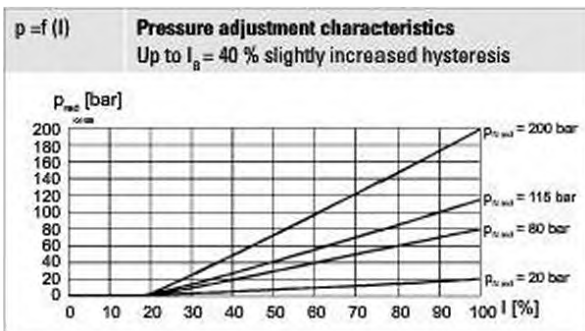
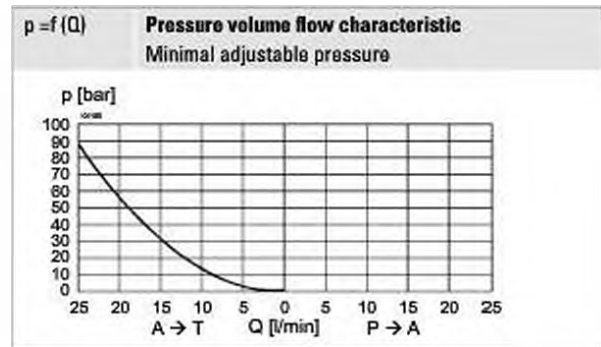
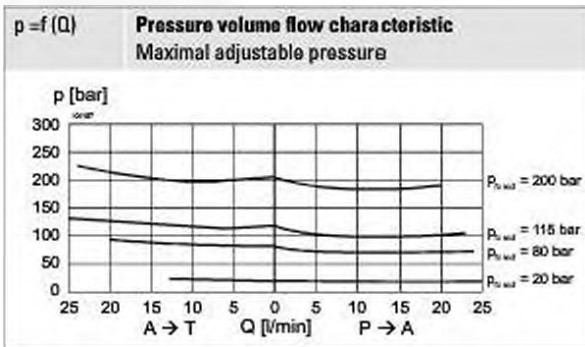
Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

**Attention!** The UL execution is always supplied without cable gland



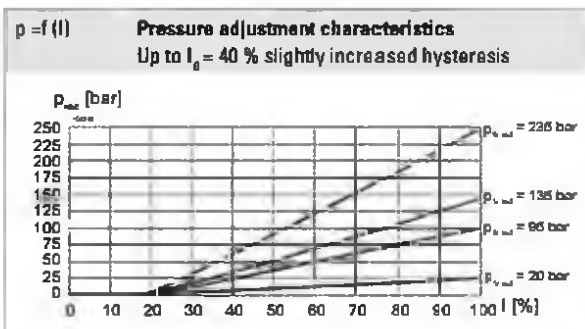
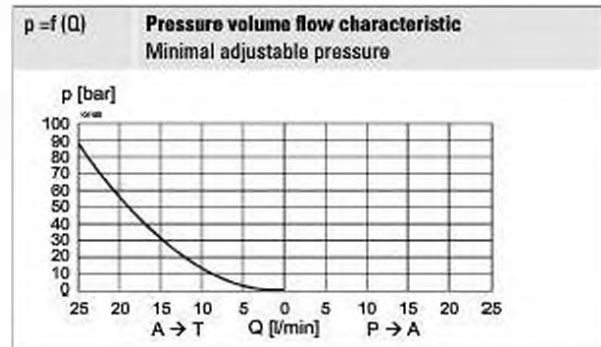
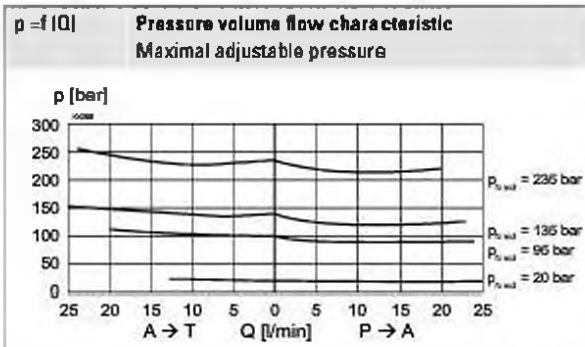
**PERFORMANCE SPECIFICATIONS EXECUTION L9 (MEASURED AT 40 °C)**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$

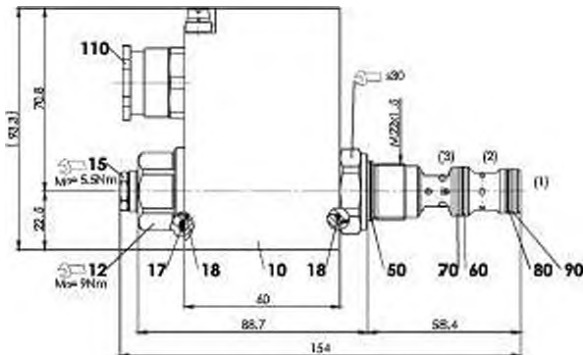


**PERFORMANCE SPECIFICATIONS EXECUTION L15 / L17 (MEASURED AT 50 °C)**

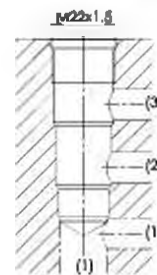
Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$





**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-04-0-98


**Nota!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1004

**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	253.8000	Manual override HB4,5
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.8196	Backup ring PTSM rd 14,5 x 17,4 x 1,4
80	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
90	049.8176	Back-up ring PTSM rd 12,7 x 15,6 x 1,4
110	111.1080	Cable gland M20 x 1,5

**ACCESSORIES**

Proportional amplifier	Registar 1.13
Flange body / sandwich plate NG4-Mini	Data sheet 2.3-820
Flange body / sandwich plate NG6	Data sheet 2.3-840
Flange body / sandwich plate NG10	Data sheet 2.3-860
Threaded body	Data sheet 2.9-210
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SURFACE TREATMENT**

- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**STANDARDS**

Cartridge cavity	ISO 7789
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

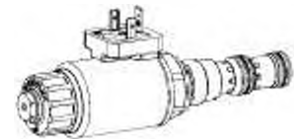
**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60$ Nm Screw-in cartridge $M_0 = 9$ Nm knurled nut

**Attention!** For stack assembly please observe the remarks in the operating instructions


**Proportional pressure reducing cartridge**

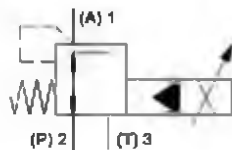
- ◆ pilot operated
- ◆  $Q_{max} = 60$  l/min
- ◆  $p_{nom} = 400$  bar
- ◆  $p_{h\ red\ max} = 350$  bar

**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Pilot operated proportional pressure reducing valve in screw-in cartridge construction for cavity according to ISO 7789. Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). Pressure increase in the consumer part A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from port P (2) to consumer part A (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	WS37 / 19 x 50 (Data sheet 1.1-173) MS35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60$ Nm Screw-in cartridge $M_0 = 5$ Nm knurled nut $M_0 = 9,5$ Nm HB0 $M_0 = 5,5$ Nm HB4,5

**TYPE CODE**

		M V P PM22 - <input type="text"/> - <input type="text"/> / <input type="text"/> <input type="text"/> - <input type="text"/> <input type="text"/> # <input type="text"/>			
Pressure reducing valve					
Pilot operated					
Proportional					
Screw-in cartridge M22 x 1,5					
Nominal pressure range $p_{max}$	20 bar	<input type="text" value="20"/>	200 bar	<input type="text" value="200"/>	
	63 bar	<input type="text" value="63"/>	275 bar	<input type="text" value="275"/>	
	100 bar	<input type="text" value="100"/>	350 bar	<input type="text" value="350"/>	
	160 bar	<input type="text" value="160"/>			
Nominal voltage $U_n$	12 VDC	<input type="text" value="G12"/>			
	24 VDC	<input type="text" value="G24"/>			
	without coil	<input type="text" value="X5"/>			
Slip-on coil	Metal housing round		<input type="text" value="W"/>		
	Metal housing square		<input type="text" value="M"/>		
Connection execution	Connector socket EN 175301-803 / ISO 4400		<input type="text" value="D"/>		
	Connector socket AMP Junior - Tamer		<input type="text" value="J"/>		
	Connector Deutsch DT04 - 2P		<input type="text" value="IS"/>		
Sealing material	NBR	<input type="text"/>			
	FKM (Viton)	<input type="text" value="D1"/>			
Manual override	Manual override		<input type="text" value="HB4,5"/>		
	Screw plug		<input type="text" value="HB0"/>		
Design index (subject to change)					

23402

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25 ... +70 °C
Weight	0,53 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400$ bar
Nominal pressure range	$P_{nom} = 20$ bar, 63 bar, 100 bar, 160 bar, 200 bar, 275 bar, 350 bar
Volume flow range	$Q = 0 \dots 60$ l/min
Leakage oil	See characteristics
Hysteresis	≤ 4 % at optimal dither signal
Repeatability	≤ 2 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 ≥ 75, see data sheet 1.0-50

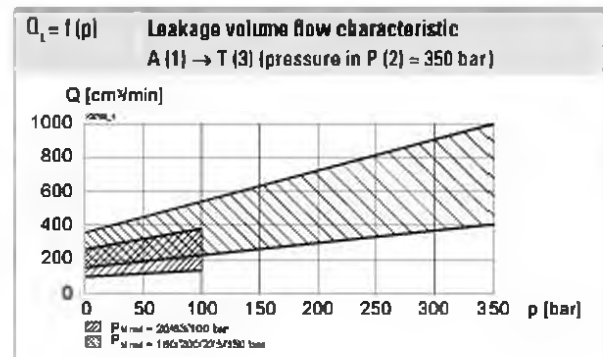
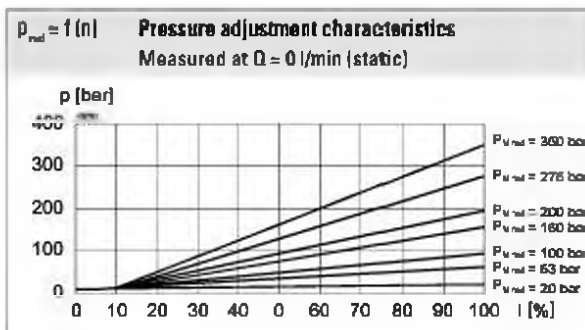
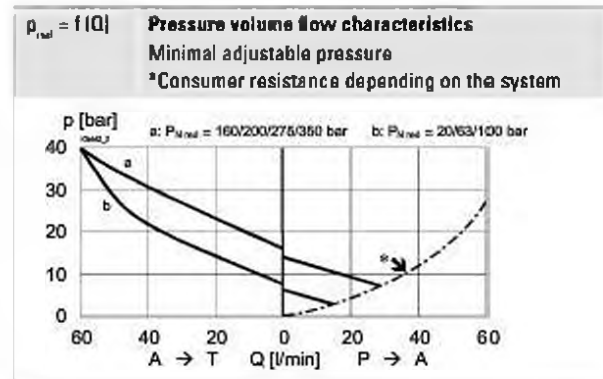
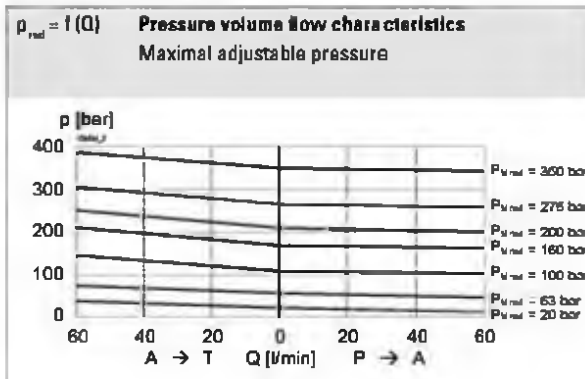
**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1320$ mA ( $U_n = 12$ VDC) $I_a = 660$ mA ( $U_n = 24$ VDC)

**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)



**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACCESSORIES**

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2002
Flange body / sandwich plate NG4-Mini	Data sheet 2.3-820
Flange body / sandwich plate NG6	Data sheet 2.3-840
Flange body / sandwich plate NG10	Data sheet 2.3-860
Threaded body	Data sheet 2.9-210
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**SURFACE TREATMENT**

- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

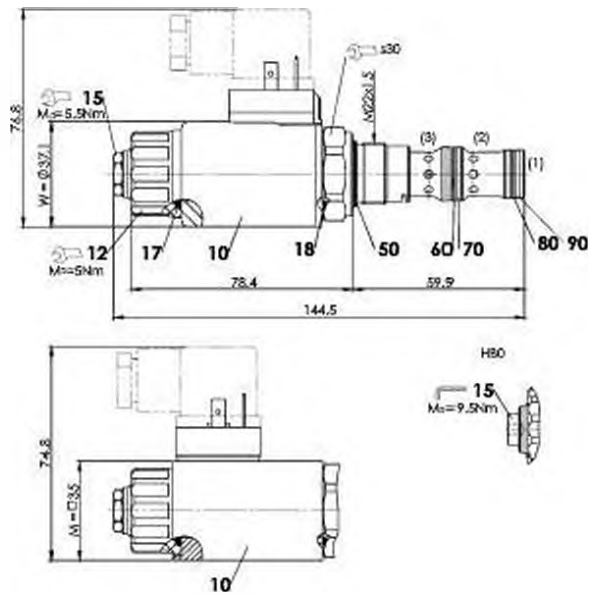
**MANUAL OVERRIDE**

HB4,5

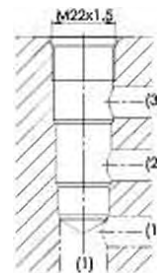
Optionally: Screw plug (HB0), no actuation possible

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-04-0-98


**Nota!**

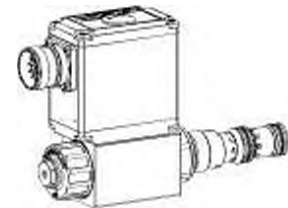

For detailed cavity drawing and cavity tools see data sheet 2.13-1004

**PARTS LIST**

Position	Article	Description
10	206.2...	W.S37 / 19 x 50
	260.5...	M.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000	HB4,5 manual override
	239.2033	HBO Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.3196	Backup ring rd 16,1 x 19 x 1,4
80	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
90	049.3176	Backup ring rd 14,1 x 17 x 1,4

**Proportional pressure reducing valve  
Screw-in cartridge**

- Integrated amplifier or controller electronics
- Pilot operated
- $Q_{max} = 60 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_{N \text{ red max}} = 350 \text{ bar}$

**M22x1,5**  
 ISO 7789

**DESCRIPTION**

Pilot operated proportional pressure reducing valve with integrated electronics as a screw-in cartridge. Thread M22x1,5 for cavity according to ISO 7789. These plug & play valves are factory set and adjusted. High valve-to-valve reproducibility. Housing for electronics with protection class IP67 for harsh environment. Seven standard pressure levels are available. Adjustment by a Wandfluh proportional solenoid (VDE standard 0580). The cartridge and the solenoid made of steel are zinc coated and therefore rustprotected. The housing for the electronics is made of aluminium.

Optionally these valves are available with integrated controller. As feedback value generator sensors with voltage or current output can be directly connected. The available controller structures are optimised for the utilisation with hydraulic drives.

**FUNCTION**

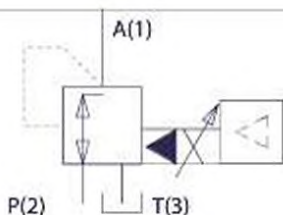
The proportional pressure reducing valve controls the pressure in port A (1). Proportionally to the solenoid current solenoid force and pressure in port A rise. The valve functions practically independently of the pressure in port P (2). The control connection is provided by an analog interface or a fieldbus interface (CANopen, J1939 or Profibus DP). Parameter setting and diagnosis with the free-of-charge software «PASO» or via fieldbus interface. The USB parameterisation interface is accessible through a cover flap. «PASO» is a Windows program in the flow diagram style, which enables the intuitive setting and storing of all variable parameters. The data remain saved in case of a power failure and can also be reproduced and transferred to other DSVs.

**APPLICATION**

Proportional pressure reducing valves with integrated electronics are well suited for demanding applications, in which the pressure frequently has to be changed. They are implemented in systems calling for good valve-to-valve reproducibility, easy installation, comfortable operation and high precision in industrial hydraulics as well as in mobile hydraulics. The integrated controller relieves the machine control system and operates the pressure regulation in a closed control loop. The proportional pressure reducing cartridge is very suitable for mounting in control blocks, flange bodies and sandwich plates of the size NG4-Mini, NG6 and NG10. (Please note the separate data sheets in register 2.3). Cavity tools are available for machining the cavities in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

		M	V	P	PM22	-	-	/	M	E	-	-	HB4,5	#
Pressure reducing valve														
Pilot operated														
Proportional														
Screw-in thread M22x1,5														
Nominal pressure range $p_{x \text{ max}}$	20 bar <input type="checkbox"/> 20 63 bar <input type="checkbox"/> 63 100 bar <input type="checkbox"/> 100 160 bar <input type="checkbox"/> 160				200 bar <input type="checkbox"/> 200 275 bar <input type="checkbox"/> 275 350 bar <input type="checkbox"/> 350									
Nominal voltage $U_N$	12 VDC <input type="checkbox"/> 24 VDC <input type="checkbox"/>				G12 <input type="checkbox"/> G24 <input type="checkbox"/>									
Slip-on coil	Metal housing, square													
Execution connection	Integrated electronics													
Hardware configuration														
With analog signal (0...+10V factory set)														
With CANopen acc. to DSP-408														
With Profibus DP in accordance with Fluid Power Technology														
With CAN J1939 (on request)														
Function														
Amplifier														
Controller with current feedback signal (0...20 mA / 4...20 mA)														
Controller with voltage feedback signal (0...10 V)														
Sealing material	NBR <input type="checkbox"/> FKM (Viton) <input type="checkbox"/>													
Manual override														
Änderungs-Index (wird vom Werk eingesetzt)														

**SYMBOL**

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluids on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{0.5} \dots 10 \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 400$ bar
Nominal pressure ranges	$p_{rated} = 20$ bar, 63 bar, 100 bar, 160 bar, 200 bar, 275 bar, 350 bar
Volume flow range	$Q = 0 \dots 60$ l/min
Pilot- and leakage volume flow	see characteristics
Repeatability	$\leq 2\%$
Hysteresis	$\leq 4\%$ • at optimal dither signal

**ELECTRICAL SPECIFICATIONS**

Protection class	IP 67 acc. to EN 60 529 with suitable connector and closed electronic housing
Supply voltage	12 VDC or 24 VDC
Ramps (amplifier only)	separate adjustment for up and down for each solenoid
Preset value generator (controller only)	preset value speed adjustable
Parameterisation Interface	via fieldbus or USB USB (Mini B) for parameterisation with «PASO» (under the closing screw of the housing cover, Preset on-works)
<b>Analog interface (MAIN):</b>	
Device receptacle (male)	M23, 12-poles
Mating connector	Plug (female), M23, 12-poles (not incl. in delivery)
Preset value signal:	Input voltage / current as well as signal range can be set by software.
<b>Fieldbus interface:</b>	
Device receptacle supply (male)	M12, 4-poles
Mating connector	Plug (female), M12, 4-poles (not incl. in delivery)
Device receptacle CANopen (male)	M12, 5-poles (acc. to DRP 303-1)
Mating connector	Plug (female), M12, 5-poles (not incl. in delivery)
Device receptacle Profibus (female)	M12, 5-poles, B-coded (acc. to IEC 947-3-2)
Mating connector	Plug (male), M12, 5-poles, B-coded (not incl. in delivery)
Preset value signal:	Fieldbus
<b>Feedback signal interface (Sensor):</b> (controller only)	
Device receptacle (female)	M12, 5-poles
Mating connector	Plug (male), M12, 5-poles (not incl. in delivery)
Feedback signal:	Voltage / current <b>state when ordering</b>

**CONNECTOR WIRING DIAGRAM**
**Analog interface:**
**Device receptacle (male) X1**


- 1 = Supply voltage +
- 2 = Supply voltage 0 VDC
- 3 = Stabilisierte Ausgangsspannung
- 4 = Stabilised output voltage
- 4 = Preset value voltage +
- 5 = Preset value voltage -
- 6 = Preset value current +
- 7 = Preset value current -
- 8 = Reserved for extensions
- 9 = Reserved for extensions
- 10 = Enable control (Digital input)
- 11 = Error signal (Digital output)
- 12 = Chassis

Preset value voltage (PIN 4/5) resp. current (PIN 6/7) are selected with set-up and diagnosis software PASO.

Factory setting: Voltage (0...+10 V), (PIN 4/5)

**Fieldbus Interface:**
**Device receptacle supply (male) X1**

**MAIN**

- 1 = Supply voltage +
- 2 = Reserved for extensions
- 3 = Supply voltage 0 VDC
- 4 = Chassis

**Device receptacle CANopen (male) X3**

**CAN**

- 1 = not connected
- 2 = not connected
- 3 = CAN Gnd
- 4 = CAN High
- 5 = CAN Low

**Device receptacle Profibus (female) X3**

**PROFIBUS**

- 1 = VP
- 2 = RxD/TxD - N
- 3 = DGND
- 4 = RxD/TxD - P
- 5 = Shield

**Parameterisation interface (USB, Mini B) X2**

Under the closing screw of the housing cover

**Feedback signal interface (Sensor)**
**Device receptacle (female) X4 (only controller)**


- 1 = Supply voltage (output) +
- 2 = Feedback signal +
- 3 = Supply voltage 0 VDC
- 4 = not connected
- 5 = stab. output voltage


**NOTE!**

The mating connectors and the cable to adjust the settings are not part of the delivery. Refer chapter «Accessories».

**INBETRIEBNAHME**

For DSV amplifiers as a rule no parameter settings by the customer are required. The plugs have to be connected in accordance with the chapter «Pin assignments».

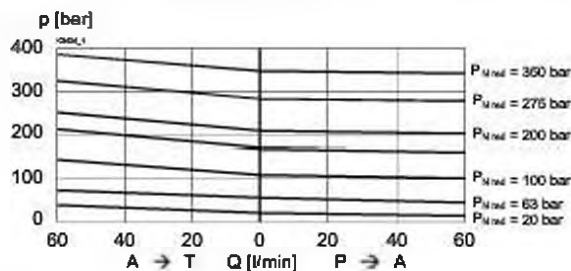
Controllers will be supplied configured as amplifiers. Switching into controller mode and setting of the adjustments of the controller must be done by the customer using the set-up software (USB interface, Mini B).

Additional information can be found on our website:

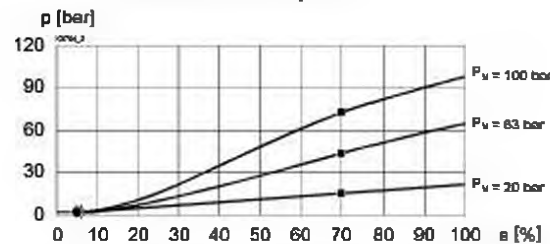
Free-of-charge download of the «PASO»-software and the instruction manual for the «DSV» hydraulic valves as well as the operation instruction CANopen protocol eg. Profibus DP protocol with device profile DSP-408 for «DSV».

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

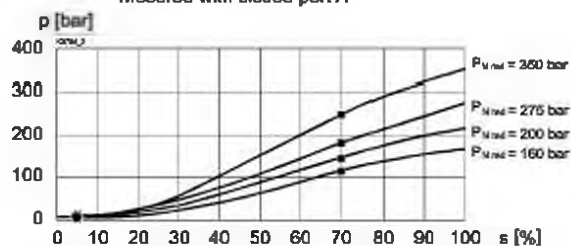
$p_{\text{red}} = f(Q)$  Pressure volume flow characteristics (Maximal adjustable pressure)



$p_{\text{red}} = f(i)$  Pressure adjustment characteristics (at  $Q = 0 \text{ l/min}$ )/(s corresponds to preset value signal) Inlet pressure:  $p_x + 10\%$  Measured with closed port A



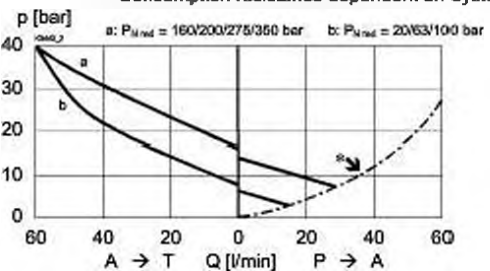
$p_{\text{red}} = f(i)$  Pressure adjustment characteristics (at  $Q = 0 \text{ l/min}$ )/(s corresponds to preset value signal) Inlet pressure:  $p_x + 10\%$  Measured with closed port A


**Factory settings:**

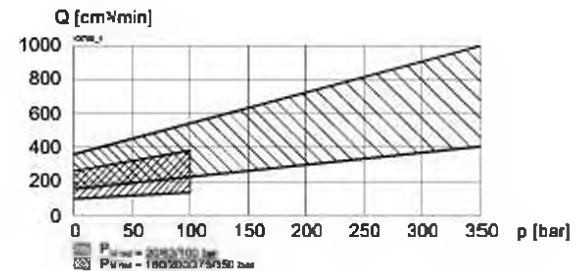
Dither set for optimal hysteresis

- ◆ = Deadband: Solenoid switched off with command preset value signal < 5%
- = Regulated pressure in port A (1) at 70% of preset value signal:
  - 250 bar with pressure range 350 bar
  - 192 bar with pressure range 275 bar
  - 143 bar with pressure range 200 bar
  - 112 bar with pressure range 160 bar
  - 72 bar with pressure range 100 bar
  - 45 bar with pressure range 63 bar
  - 14,5 bar with pressure range 20 bar

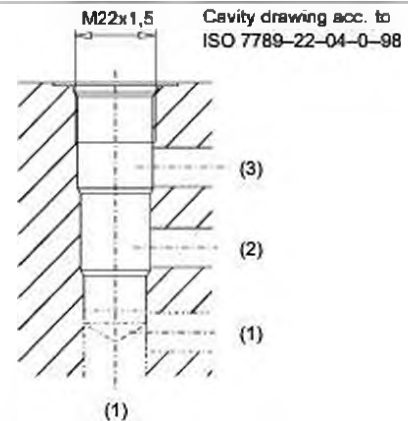
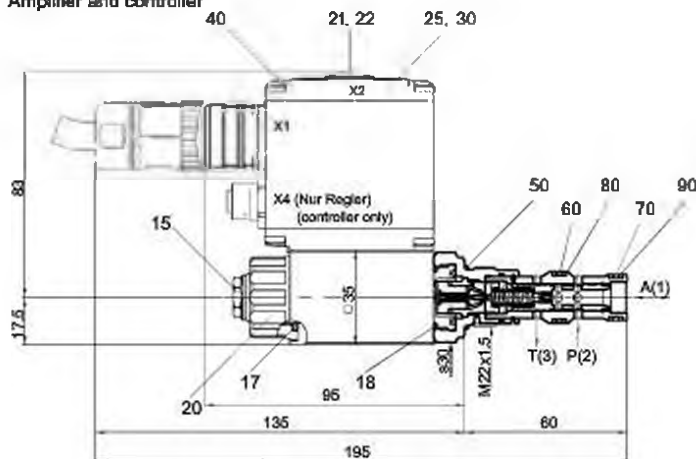
$p_{\text{red}} = f(Q)$  Pressure volume flow characteristics (Minimal adjustable pressure) \* Consumption resistance dependent on system

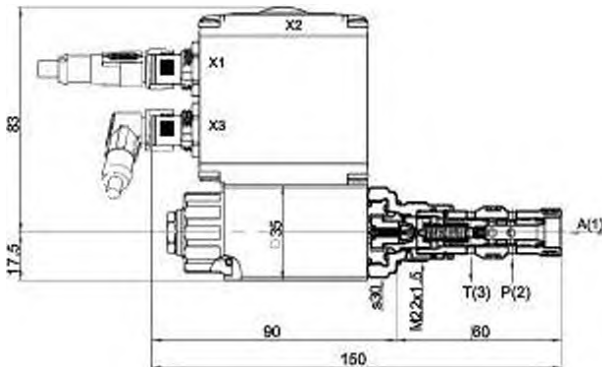
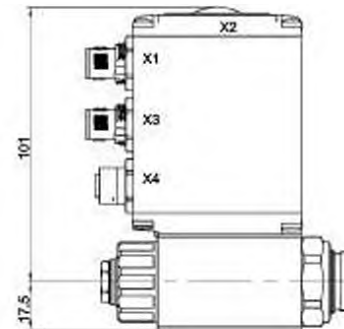


$Q_{\text{pilot}} = f(p)$  Pilot- and leakage volume flow characteristic [A (1) → T (3)] (Pressure in P (2) = 350 bar)





**DIMENSIONS**
**With analog interface  
 Amplifier and controller**

 For detailed cavity drawing  
 and cavity tools see data sheet 2.13-1004

**With fieldbus interface  
 Amplifier**

**With fieldbus interface  
 Controller**

**PARTS LIST**

Position	Article	Description
15	253.8000	HB 4,5 Manual override (data sheet 1.1-300)
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
20	154.2700	Knurled nut
21	223.1317	Dummy plug M16 x 1,5
22	160.6131	O-ring ID 13,00 x 1,5
25	062.0102	Cover square
30	072.0021	Gasket 33,2 x 59,9 x 2
40	208.0100	Socket head cap screw M4 x 10
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
80	049.3196	Backup ring RD16,1 x 19 x 1,4
90	049.3176	Backup ring RD14,1 x 17 x 1,4

**ACCESSORIES**

 Flange-/sandwich plate NG4-Mini Data sheet 2.3-820  
 Flange-/sandwich plate NG6 Data sheet 2.3-840  
 Flange-/sandwich plate NG10 Data sheet 2.3-860  
 Line mount body Data sheet 2.9-210

- Set-up software see start-up
- Cable to adjust the settings through interface USB (from plug type A to Mini B, 3 m) article no. 219.2896
- Cable connector for analog interface:
  - straight, soldering contact article no. 219.2330
  - 90°, soldering contact article no. 219.2331
- Recommended cable size:
  - Outer diameter 9...10,5 mm
  - Single wire max. 1 mm<sup>2</sup>
  - Recommended wire size:
    - 0...25 m = 0,75 mm<sup>2</sup> (AWG18)
    - 25...50 m = 1 mm<sup>2</sup> (AWG17)

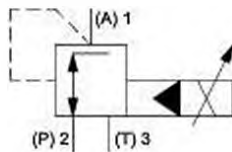
Technical explanation see data sheet 1.0-100

**Proportional pressure reducing cartridge**

- ◆ pilot operated
- ◆  $Q_{max} = 60$  l/min
- ◆  $p_{nom} = 400$  bar
- ◆  $p_{h\ rad\ max} = 350$  bar

**DESCRIPTION**

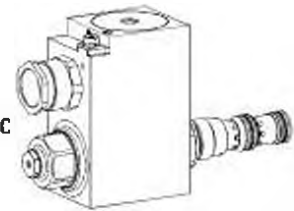
Pilot operated proportional pressure reducing valve in screw-in cartridge construction for cavity according to ISO 7789. Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). Pressure increase in the consumer port A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from port P (2) to consumer port A (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13). The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**SYMBOL**

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17)
Weight	2,2 kg
MTTFd	150 years

**M22 x 1,5**  
**ISO 7789**

- ⊕ II 2 G Ex db IIC T6, T4
  - ⊕ II 2 D Ex db III C T80 °C, T130 °C
  - ⊕ I M2 Ex db I Mb
- Class I Division 1  
Class I Zone 1


**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to...	M248 Electronic
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	
MA		x	x	x
UL / CSA	x		x	

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

**Attention!** The UL execution is always supplied without cable gland



**TYPE CODE**

M V B PM22 -  -  /  /  -   #

Pressure reducing valve				
Pilot operated				
Proportional, explosion proof execution Ex d				
Screw-in cartridge M22 x 1,5				
Execution	L9		L15 / L17	
Nominal pressure range $p_{N,red}$ [bar]	20 50 80	160 220 280	20 63 100	200 275 350
Nominal voltage $U_N$	12 VDC 24 VDC	G12 G24		
Nominal power $P_N$	9 W 15 W 17 W	L9 L15 L17	Ambient temperature up to: 40 °C or 90 °C 70 °C 70 °C (only UL / CSA)	
Certification	ATEX, IECEx, EAC, CCC Australia	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	UL / CSA MA	<input type="checkbox"/> <input type="checkbox"/>
Sealing material	NBR FKM (Viton)	<input type="checkbox"/> <input type="checkbox"/>		
Options	without amplifier	<input type="checkbox"/> M248		

Design index (subject to change)  
1348

**ELECTRICAL SPECIFICATIONS**

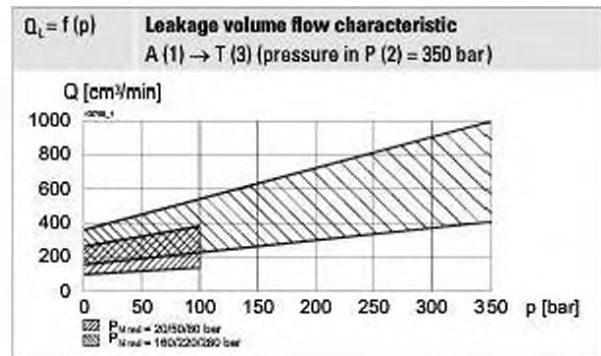
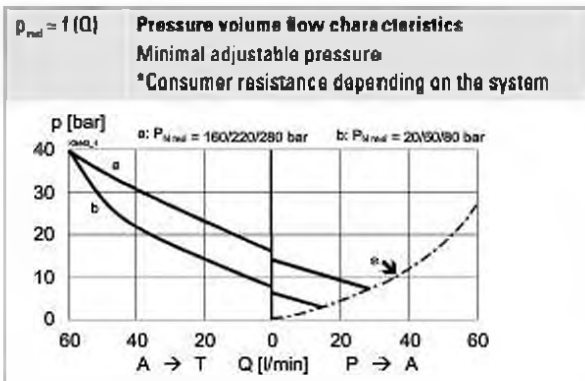
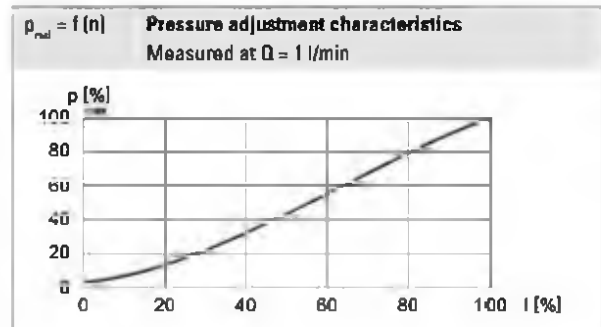
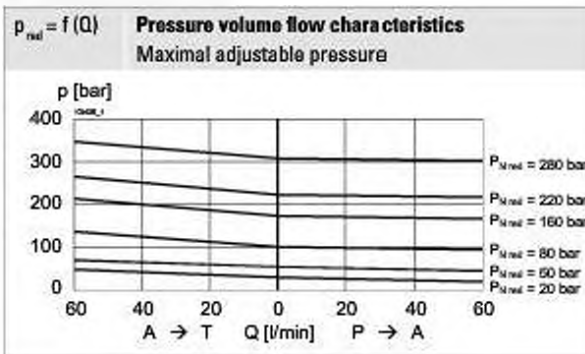
Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at... °C	<b>L9, 40 °C</b> $I_a = 625 \text{ mA (12 VDC)}$ $I_a = 305 \text{ mA (24 VDC)}$ <b>L15 / 17, 50 °C</b> $I_a = 950 \text{ mA (12 VDC)}$ $I_a = 450 \text{ mA (24 VDC)}$ <b>L15 / 17, 70 °C</b> $I_a = 910 \text{ mA (12 VDC)}$ $I_a = 420 \text{ mA (24 VDC)}$
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

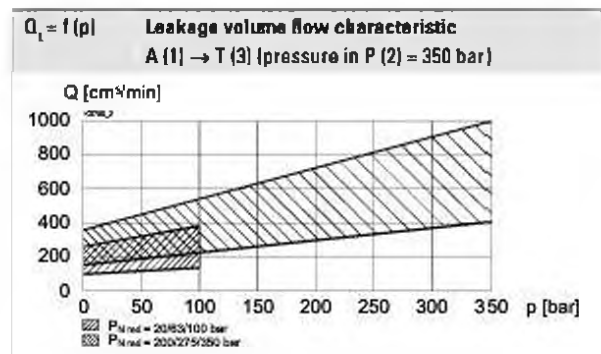
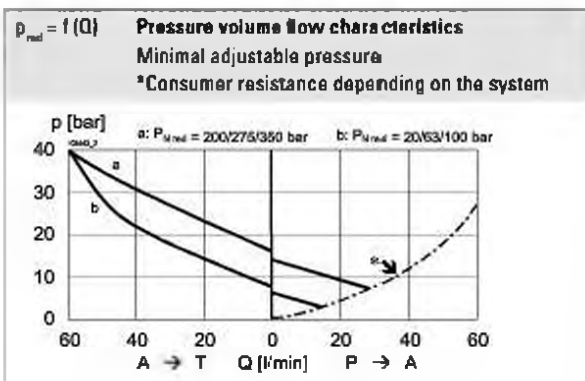
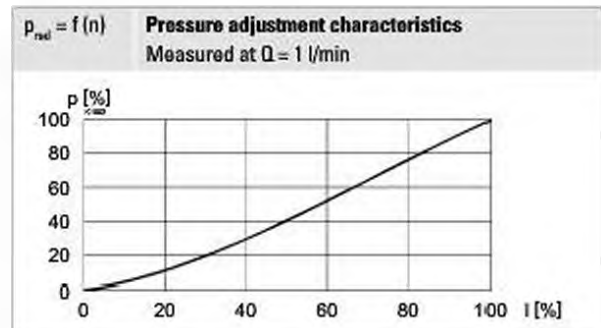
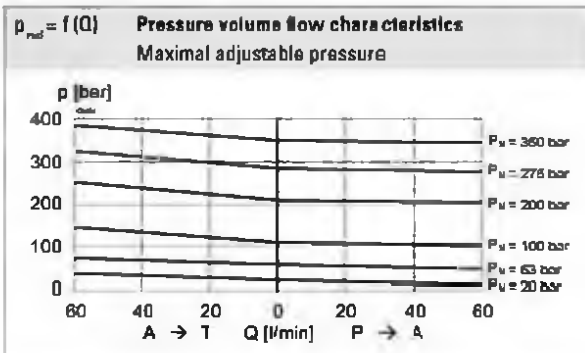
**Note!** Other electrical specifications see data sheet 1.1-183 and 1.1-184

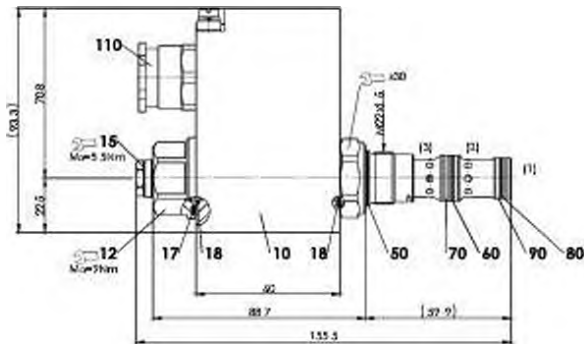

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400 \text{ bar}$
Nominal pressure range	<b>Execution L9</b> $p_{N,red} = 20; 50; 80; 160; 220; 280 \text{ bar}$ <b>Execution L15 / L17</b> $p_{N,red} = 20; 63; 100; 200; 275; 350 \text{ bar}$
Volume flow range	$Q = 0 \dots 60 \text{ l/min}$
Leakage oil	See characteristics
Hysteresis	≤ 5 % at optimal dither signal
Repeatability	≤ 2 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L15 / L17) FKM -20...+70 °C (L9)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS EXECUTION L9 (MEASURED AT 40 °C)**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**PERFORMANCE SPECIFICATIONS EXECUTION L15 / L17 (MEASURED AT 50 °C)**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**DIMENSIONS**

**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	253.8000	Manual override HB4,5
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188 160.8188	O-ring ID 18,77 x 1,78 (NBR) O-ring ID 18,77 x 1,78 (FKM)
60	160.2156 160.8156	O-ring ID 15,60 x 1,78 (NBR) O-ring ID 15,60 x 1,78 (FKM)
70	049.3196	Backup ring rd 16,1 x 19 x 1,4
80	160.2140 160.8140	O-ring ID 14,00 x 1,78 (NBR) O-ring ID 14,00 x 1,78 (FKM)
90	049.3176	Backup ring rd 14,1 x 17 x 1,4
110	111.1080	Cable gland M20 x 1,5

**STANDARDS**

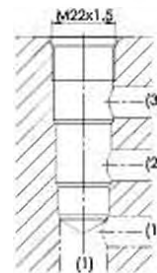
Cartridge cavity	ISO 7789
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60$ Nm Screw-in cartridge $M_0 = 9$ Nm knurled nut $M_0 = 9,5$ Nm HB0 $M_0 = 5,5$ Nm HB4,5

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-04-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1004

**ACCESSORIES**

Proportional amplifier	Registrar 1.13
Flange body / sandwich plate NG4-Mini	Data sheet 2.3-820
Flange body / sandwich plate NG6	Data sheet 2.3-840
Flange body / sandwich plate NG10	Data sheet 2.3-860
Threaded body	Data sheet 2.9-210
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5 as standard

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

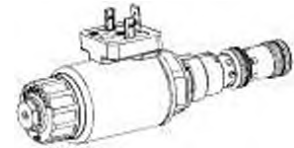
- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**COMMISSIONING**
**Attention!**


The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability can be assumed.

**Proportional pressure reducing cartridge**

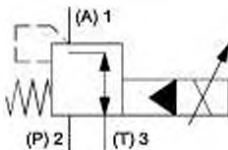
- ◆ pilot operated
- ◆ static < 1 bar adjustable
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{max} = 400 \text{ bar}$
- ◆  $p_{h, red max} = 350 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Pilot operated proportional pressure reducing valve in screw-in cartridge construction for cavity according to ISO 7789. Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). Pressure increase in the consumer port A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from consumer port A (1) to port T (3). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W.S37 / 19 x 50 (Data sheet 1.1-173) M.S35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut

**TYPE CODE**

		M D P PM22 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/> # <input type="checkbox"/>	
Pressure reducing valve			
Pilot operated			
Proportional			
Screw-in cartridge M22 x 1,5			
Nominal pressure range $p_{N,red}$	40 bar <input type="checkbox"/> 63 bar <input type="checkbox"/> 100 bar <input type="checkbox"/> 160 bar <input type="checkbox"/>	40 <input type="checkbox"/> 63 <input type="checkbox"/> 100 <input type="checkbox"/> 160 <input type="checkbox"/>	200 bar <input type="checkbox"/> 275 bar <input type="checkbox"/> 350 bar <input type="checkbox"/>
Nominal voltage $U_N$	12 VDC <input type="checkbox"/> 24 VDC <input type="checkbox"/> without coil <input type="checkbox"/>	G12 <input type="checkbox"/> G24 <input type="checkbox"/> X5 <input type="checkbox"/>	
Slip-on coil	Metal housing round <input type="checkbox"/> Metal housing square <input type="checkbox"/>	W <input type="checkbox"/> M <input type="checkbox"/>	
Connection execution	Connector socket EN 175301-803 / ISO 4400 <input type="checkbox"/> Connector socket AMP Junior - Tamer <input type="checkbox"/> Connector Deutsch DT04 - 2P <input type="checkbox"/>	D <input type="checkbox"/> J <input type="checkbox"/> G <input type="checkbox"/>	
Sealing material	NBR <input type="checkbox"/> FKM (Viton) <input type="checkbox"/>	D1 <input type="checkbox"/>	
Manual override	Manual override <input type="checkbox"/> Screw plug <input type="checkbox"/>	HB4,5 <input type="checkbox"/> HB0 <input type="checkbox"/>	
Design index (subject to change)			

13461

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25 ... +70 °C
Weight	0,53 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

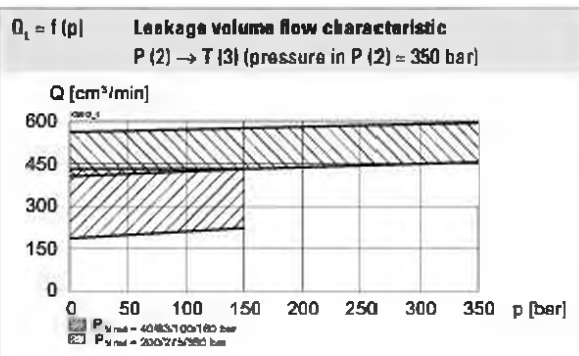
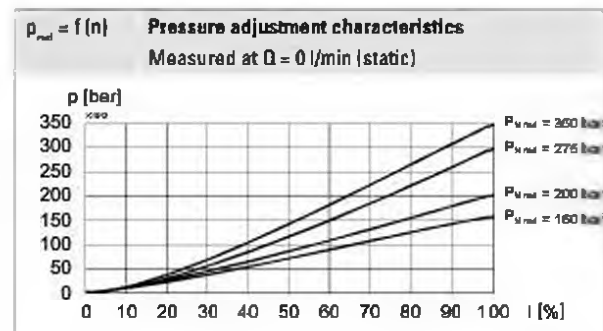
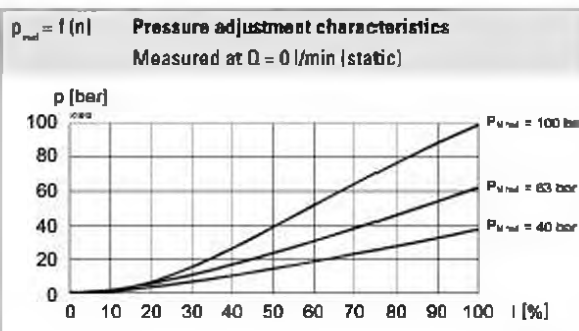
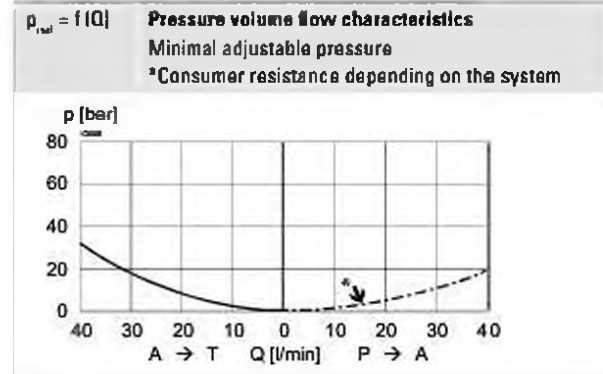
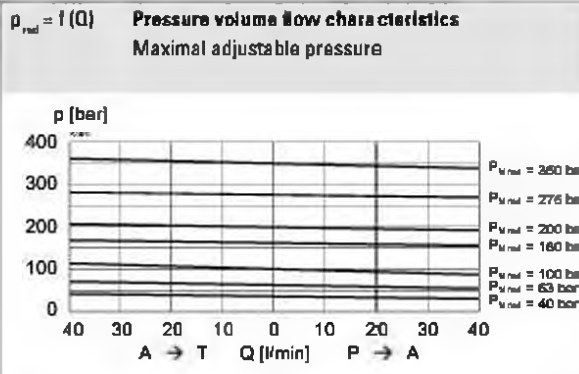
Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1360 \text{ mA}$ ( $U_N = 12\text{VDC}$ ) $I_a = 680 \text{ mA}$ ( $U_N = 24\text{VDC}$ )

**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)


**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{T,max} = 400 \text{ bar}$ (connection P) $p_{T,max} = 100 \text{ bar}$ (connection T)
Tank pressure	$p_{T,max} = p_p + 20 \text{ bar}$
Supply pressure	$p_p \geq p_{red} + 10 \text{ bar}$ (static) $p_p \geq p_{red} + 80 \text{ bar}$ (at 40 l/min)
Nominal pressure range	$p_{N,red} = 40; 63; 100; 160; 200; 275; 350 \text{ bar}$
Minimum adjustable pressure	Static < 1 bar adjustable
Volume flow range	$Q = 0 \dots 40 \text{ l/min}$
Leakage oil	See characteristics
Hysteresis	$\leq 4 \%$ at optimal dither signal
Repeatability	$\leq 1 \%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 $\geq 75$ , see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACCESSORIES**

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2002
Flange body / sandwich plate NG4-Mini	Data sheet 2.3-820
Flange body / sandwich plate NG6	Data sheet 2.3-840
Flange body / sandwich plate NG10	Data sheet 2.3-860
Threaded body	Data sheet 2.9-210
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5  
 Optionally: Screw plug (HB01, no actuation possible)

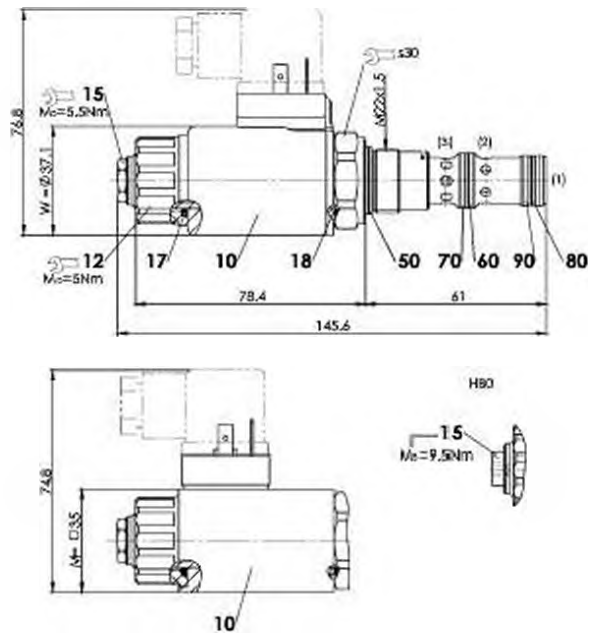
**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

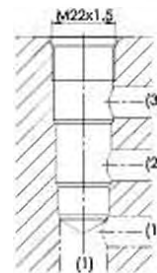
**SURFACE TREATMENT**

- The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated



**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-04-0-98


**Nota!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1004

**PARTS LIST**

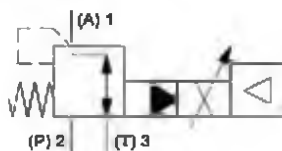
Position	Article	Description
10	206.2...	W.S37 / 19 x 50
	260.5...	M.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000	HB4,5 manual override
	239.2033	H90 Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.3196	Backup ring rd 16,1 x 19 x 1,4
80	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
90	049.3176	Backup ring rd 14,1 x 17 x 1,4

**Proportional pressure reducing cartridge with integrated electronics**

- ◆ pilot operated
- ◆  $Q_{max} = 40 \text{ l/min}$
- ◆  $p_{nom} = 400 \text{ bar}$
- ◆  $p_{h, red max} = 350 \text{ bar}$

**DESCRIPTION**

Pilot operated proportional pressure reducing valve with integrated electronics in screw-in cartridge construction for cavity according to ISO 7789. Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). Pressure increase in the consumer port A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from consumer port A (1) to port T (3). The Plug & Play valves are factory set and adjusted and have therefore a high valve-to-valve reproducibility. The control takes place via an analogue interface or a fieldbus interface (CANopen, J1939 or Profibus DP). The parameterisation takes place by means of the free of cost parameterisation and diagnostics software «PASO» or via fieldbus interface. The USB parameterisation interface is accessible through a screw plug. As an option, these valves are available with integrated controller. As feedback value generators sensors with voltage or current output can be connected directly. The available controller structures are optimised for applications with hydraulic actuations.

**SYMBOL**

**ELECTRICAL SPECIFICATIONS**

Protection class	IP67 with suitable mating connector and closed housing cover
Ramps	Adjustable
Parameterisation	Via fieldbus or USB
Supply voltage	12 VDC, 24 VDC

**Note!** Exact electrical specifications and detailed description of «DSV» electronics can be found on data sheet 1.13-76.



M22 x 1,5  
ISO 7789


**APPLICATION**

Proportional pressure reducing valves with integrated electronics are perfectly suitable for demanding applications in which the pressure frequently has to be changed. They are used in applications where high valve-to-valve reproducibility, easy installation, comfortable operation and high precision are very important. The integrated controller relieves the machine control and operates the pressure control in a closed loop circuit. The applications are in the industrial as well as in the mobile hydraulics for the smooth control of hydraulic actuations. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**Note!**



„PASO“ is a Windows programm in the flow diagram style, which enables the intuitive adjustment and storing of all variable parameters. The data remain saved in case of a power failure and can also be reproduced and transferred to other DSV.

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Connection	Via device receptacle

**TYPE CODE**

M Q P PM22 -  -  / M E   -  HB4,5 #

Pressure reducing valve

Pilot operated

Proportional

Screw-in cartridge M22 x 1,5

Nominal pressure range $p_{max}$	40 bar	<input type="checkbox"/> 40	200 bar	<input type="checkbox"/> 200
	63 bar	<input type="checkbox"/> 63	275 bar	<input type="checkbox"/> 275
	100 bar	<input type="checkbox"/> 100	350 bar	<input type="checkbox"/> 350
	160 bar	<input type="checkbox"/> 160		

Nominal voltage $U_n$	12 VDC	<input type="checkbox"/> G12
	24 VDC	<input type="checkbox"/> G24

Slip-on coil      Metal housing square

Connection execution      Integrated electronics

Hardware configuration

Analog command value signal	12 pole	<input type="checkbox"/> A1	7 pole	<input type="checkbox"/> D1	{0 ... 10 V preset}
Analog command value signal	12 pole	<input type="checkbox"/> A4	7 pole	<input type="checkbox"/> D4	{4 ... 20 mA preset}
CANopen according to DSP-408		<input type="checkbox"/> C1			
Profibus DP according to Fluid Power Technology		<input type="checkbox"/> P1			
CAN J1939 (on request)		<input type="checkbox"/> J1			

Function

Amplifier

Controller with current feedback value signal (0...20 mA / 4...20 mA)	<input type="checkbox"/> R1
Controller with voltage feedback value signal (0...10 V)	<input type="checkbox"/> R2

Sealing material      NBR       D1

FKM (Viton)

Manual override

Design index (subject to change)


**GENERAL SPECIFICATIONS**


Designation	Proportional pressure reducing valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-20 ... +65 °C The upper temperature limit is a guideline for typical applications, in individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions „DSV“.
Weight	1,05 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**


Working pressure	$p_{max} = 400$ bar (port P) $p_{max} = 100$ bar (port T)
Tank pressure	$p_{Tmax} = p_p + 20$ bar
Supply pressure	$p_p \geq p_{red} + 10$ bar (static) $p_p \geq p_{red} + 80$ bar (at 40 l/min)
Nominal pressure range	$p_{Nmax} = 40$ bar, 63 bar, 100 bar, 160 bar, 200 bar, 275 bar, 350 bar
Minimum adjustable pressure	< 1 bar
Volume flow range	See characteristics
Leakage oil	See characteristics
Hysteresis	≤ 5 % at optimal dither signal
Repeatability	≤ 3 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 ≥ 75, see data sheet 1.0-50


**ELECTRICAL CONNECTION**


X1	Analog interface (Main)
Device receptacle	M23, 12 pole male
	1 = Supply voltage + 2 = Supply voltage 0 VDC 3 = Stabilised output voltage 4 = Command value signal voltage + 5 = Command value signal voltage - 6 = Command value signal current + 7 = Command value signal current - 8 = Reserved for extensions 9 = Reserved for extensions 10 = Enable signal (Digital input) 11 = Error signal (Digital output) 12 = Chassis
Command value signal voltage (PIN 4/5) resp. current (PIN 6/7) are selected with parameterisation and diagnostics software PASO.	


X1	Fieldbus interface (Main)
Device receptacle	M12, 4 pole male
	1 = Supply voltage + 2 = Reserved for extensions 3 = Supply voltage 0 VDC 4 = Chassis

X2	Parameterisation interface
USB, Mini B	Under the screw plug of the housing cover Factory set

X1	Analog interface (Main)
Device receptacle	Connector DIN EN 175201 - 804
	7 pole male A = Supply voltage + B = Supply voltage 0 VDC C = Not connected D = Command value signal + E = Command value signal - F = Not connected G = Chassis
Command value signal: current (D4) or voltage (D2) to specify when placing the order	

X3	Profibus interface according to IEC 947-5-2
Device receptacle	M12, 5 pole female B-coded
	1 = VP 2 = Rx/D / Tx/D - N 3 = DGND 4 = Rx/D / Tx/D - P 5 = Shield

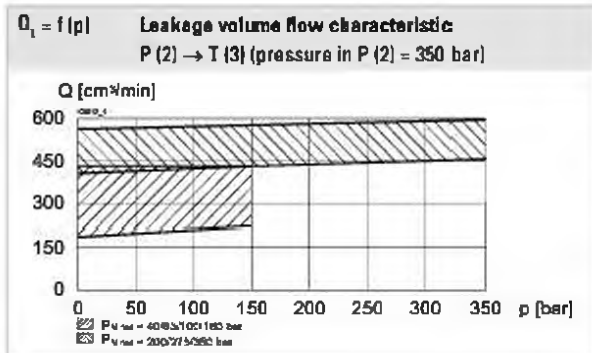
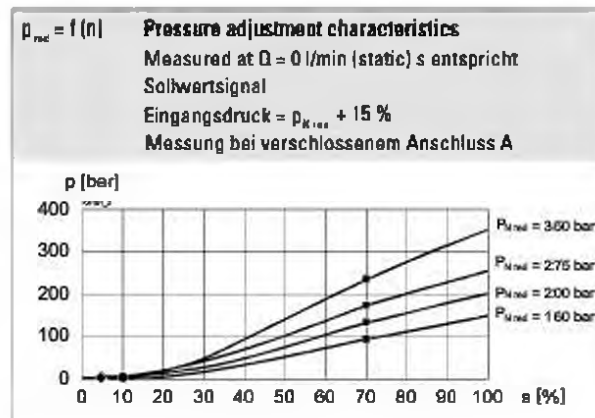
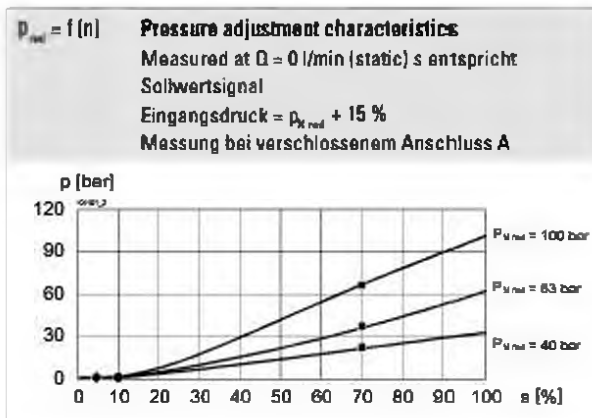
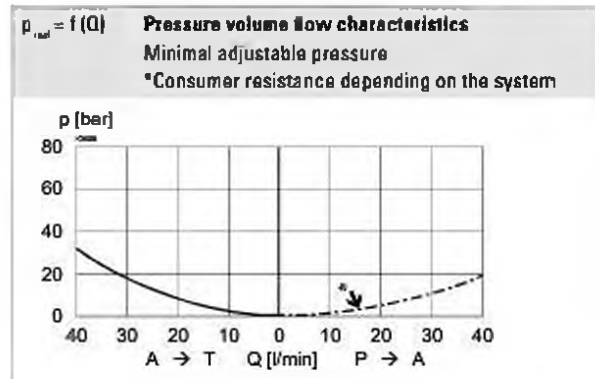
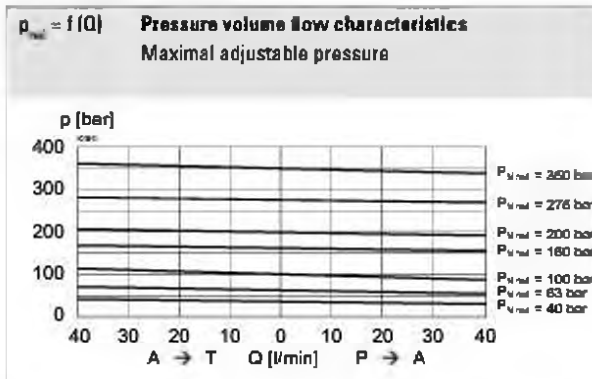
X3	CANopen interface according to DRP 303-1
Device receptacle	M12, 5 pole male
	1 = Not connected 2 = Not connected 3 = CAN Gnd 4 = CAN High 5 = CAN Low

X4 (controller only)	Feedback value interface (sensor)
Device receptacle	M12, 5 pole female
	1 = Supply voltage (output) + 2 = Feedback value signal + 3 = Supply voltage 0 VDC 4 = Not connected 5 = Stabilised output voltage
Feedback value signal: current (R1) or voltage (R2) to specify when placing the order	

**Note!** The mating connector is not included in the delivery



**PERFORMANCE SPECIFICATIONS**

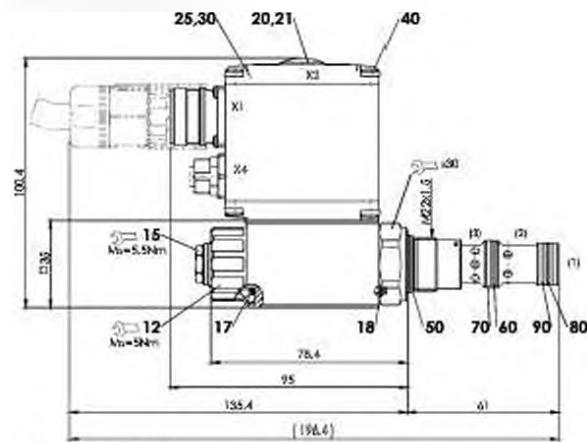
 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**FACTORY SETTINGS**

Dither set for optimum hysteresis

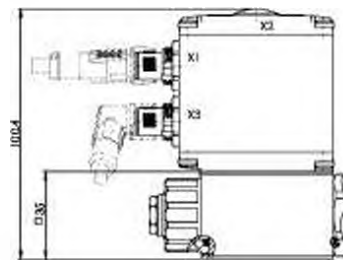
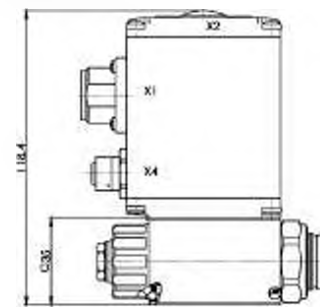
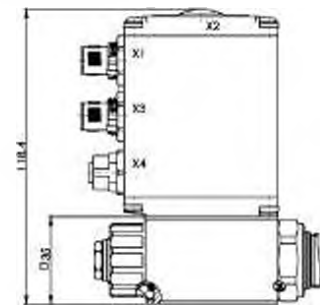
◆ = Daadband: Solenoid switched off at command value signal 5-10 %

● = Opening pressure at command value signal + 10 %

value	pressure in port A (1) at 70 % command value	at nominal pressure range $p_N$	value
230 bar	at nominal pressure range $p_N$	350 bar	
180 bar	at nominal pressure range $p_N$	275 bar	
130 bar	at nominal pressure range $p_N$	200 bar	
102 bar	at nominal pressure range $p_N$	160 bar	
68 bar	at nominal pressure range $p_N$	100 bar	
38 bar	at nominal pressure range $p_N$	63 bar	
21 bar	at nominal pressure range $p_N$	40 bar	

**DIMENSIONS**
**With analog interface, 12 pole connector**  
 Amplifier and controller


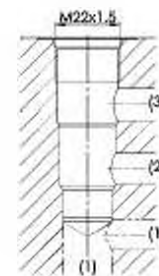
X4 (controller only)

**With fieldbus interface**  
 Amplifier

**With analog interface, 7 pole connector**  
 Amplifier and controller

**With fieldbus interface**  
 Controller

**PARTS LIST**

Position	Article	Description
12	154.2700	Knurled nut
15	253.8000	Manual override HB4,5
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
20	223.1317	Dummy plug M16 x 1,5
21	160.6131	O-ring ID 13,00 x 1,5 (FKM)
25	062.0102	Cover
30	072.0021	Gasket 33,2 x 59,9 x 2
40	208.0100	Socket head screw M4 x 10
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.3196	Backup ring rd 16,1 x 19 x 1,4
80	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
90	049.3176	Backup ring rd 14,1 x 17 x 1,4

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-04-0-98


**Note!**



For detailed cavity drawing and cavity tools see data sheet 2.13-1004

## COMMISSIONING

For DSV amplifiers as a rule no parameter adjustments by the customer are required. The plugs have to be connected in accordance with the chapter «Electrical connection».

Controllers are supplied configured as amplifiers. The adjustment of the mode of control and of the controller are carried out by the customer by means of the software adjustment (USB interface, Mini B). Further information can be found

Free of charge download of the «PASQ» software and the operation instructions for «DSV» hydraulic valves as well as the operation instructions CANopen Protocol resp. Profibus DP Protocol, with Device Profile DSP-408 for «DSV».

**Note!**  The mating connectors and the parameterisation cable are not part of the delivery. Refer to chapter «Accessories».

## INSTALLATION NOTES

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut

## SEALING MATERIAL


NBR or FKM (Viton) as standard, choice in the type code

## SURFACE TREATMENT

- ◆ The cartridge body and the solenoid are zinc-nickel coated
- ◆ The electronics housing is made of aluminium.

## ACCESSORIES

Parameterisation software	See start-up
Parameterisation cable for interface USB (from plug type A on Mini B, 3 m)	Article no. 219.2896
<b>Mating connector (plug female) for analog interface</b>	
straight, soldering contact M23, 12 pole	Article no. 219.2330
angled, soldering contact M23, 12 pole	Article no. 219.2331
straight, soldering contact, 7 pole	Article no. 219.2335
<b>Flange body / sandwich plate</b>	
NG4-Mini	Data sheet 2.3-820
Flange body / sandwich plate NG6	Data sheet 2.3-840
Flange body / sandwich plate NG10	Data sheet 2.3-860
Threaded body	Data sheet 2.9-210
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**Note!**  Auxiliary conditions for the cable:

- External diameter 12 pol: 3,5 ... 14,7 mm
- External diameter 7 pol: 8 ... 10 mm
- Wire cross section max. 1 mm<sup>2</sup>
- Recommended wire cross section:  
0 ... 25 m = 0,75 mm<sup>2</sup> (AWG18)  
25 ... 50 m = 1 mm<sup>2</sup> (AWG17)

## STANDARDS

Cartridge cavity	ISO 7789
CANopen	DRP 303-1
Profibus DP	IEC 947-5-2
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## MANUAL OVERRIDE

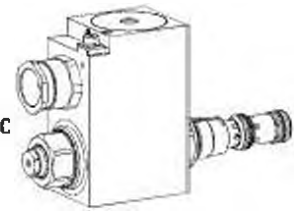
HB4,5 as standard

**Proportional pressure reducing cartridge**

- ◆ pilot operated
- ◆  $Q_{max} = 40$  l/min
- ◆  $p_{nom} = 400$  bar
- ◆  $p_{h\ red\ max} = 350$  bar

**M22 x 1,5**  
**ISO 7789**

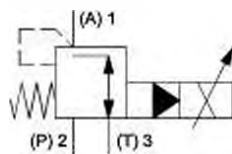
- Ⓢ II 2 G Ex db IIC T6, T4
  - Ⓢ II 2 D Ex db III C T80 °C, T130 °C
  - Ⓢ I M2 Ex db I Mb
- Class I Division 1
- 
- Class I Zone 1


**DESCRIPTION**

Pilot operated proportional pressure reducing valve in screw-in cartridge construction for cavity according to ISO 7789. Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). Pressure increase in the consumer port A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from consumer port A (1) to port T (3). For the control, Wandfluh proportional amplifiers are available (see register 1.13). The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to...	M248 Electronic
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	
MA		x	x	x
UL / CSA	x		x	

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	<b>Operation as T4</b> -25...+70 °C (L15 / L17)
Weight	2,2 kg
MTTFd	150 years

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

**Attention!** The UL execution is always supplied without cable gland





**TYPE CODE**

M 0 B PM22 -  -  /  /  -   #

Pressure reducing valve			
Pilot operated			
Proportional			
Screw-in cartridge M22 x 1,5			
Nominal pressure range $p_{rated}$	40 bar <input type="checkbox"/>	200 bar <input type="checkbox"/>	
	63 bar <input type="checkbox"/>	275 bar <input type="checkbox"/>	
	100 bar <input type="checkbox"/>	350 bar <input type="checkbox"/>	
	160 bar <input type="checkbox"/>		
Nominal voltage $U_n$	12 VDC <input type="checkbox"/>	24 VDC <input type="checkbox"/>	
Nominal power $P_n$	15 W <input type="checkbox"/>	17 W <input type="checkbox"/>	Ambient temperature up to: 70 °C 70 °C (only UL / CSA)
Certification	ATEX, IECEx, EAC, CCC <input type="checkbox"/>	Australia <input type="checkbox"/>	UL / CSA <input type="checkbox"/>
			MA <input type="checkbox"/>
Sealing material	NBR <input type="checkbox"/>	FKM (Viton) <input type="checkbox"/>	
Options	without amplifier <input type="checkbox"/>		M248 <input type="checkbox"/>

Design index (subject to change)  
23008

**ELECTRICAL SPECIFICATIONS**

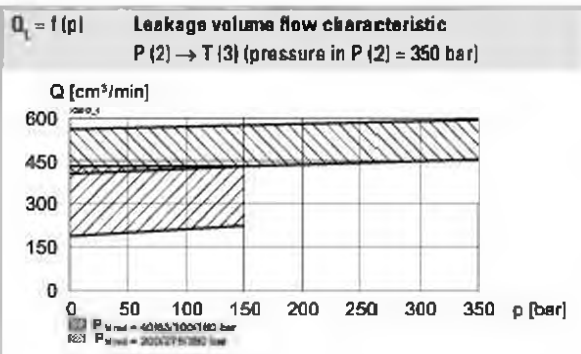
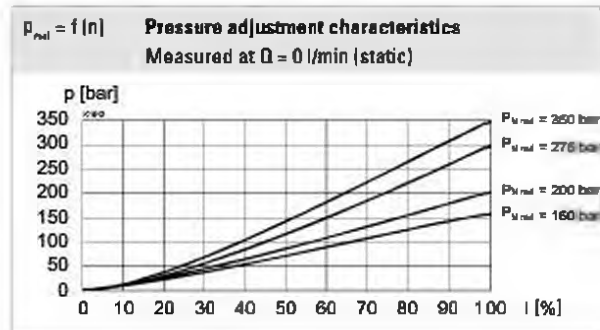
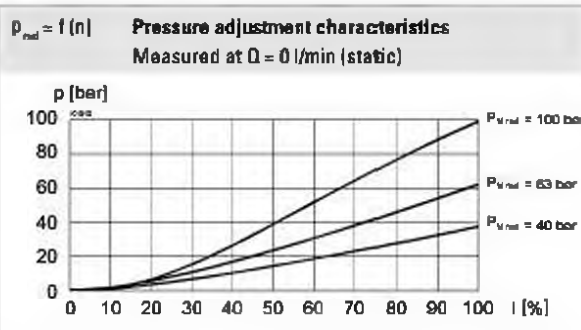
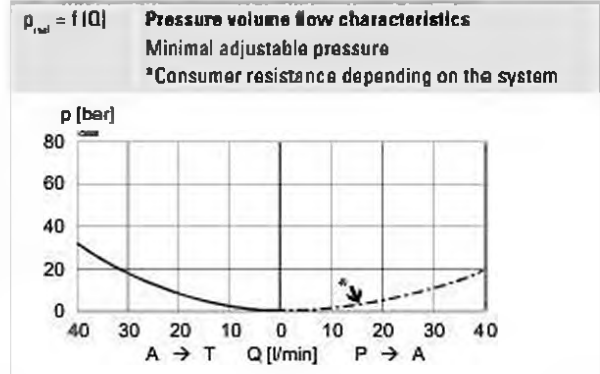
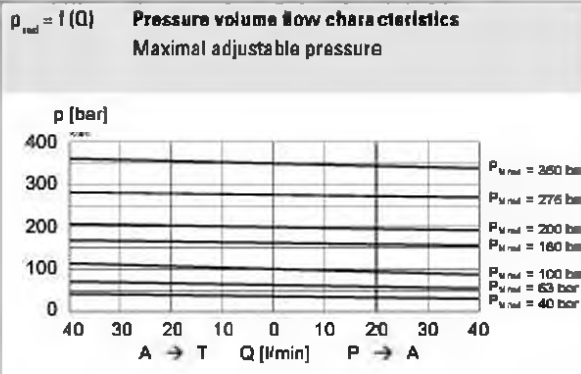
Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	<b>115 / 17, 50 °C</b> $I_a = 950 \text{ mA}$ (12 VDC) $I_a = 450 \text{ mA}$ (24 VDC) <b>115 / 17, 70 °C</b> $I_a = 910 \text{ mA}$ (12 VDC) $I_a = 420 \text{ mA}$ (24 VDC)
Standard nominal power	15 W, 17 W
Temperature class	Nominal power 15 W / 17 W: T1...T4

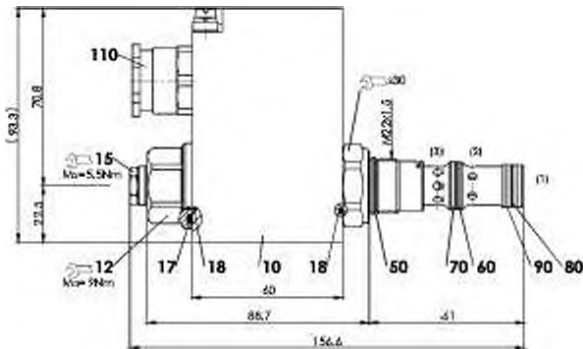
**Note!** Other electrical specifications see data sheet 1.1-183 and 1.1-184


**HYDRAULIC SPECIFICATIONS**

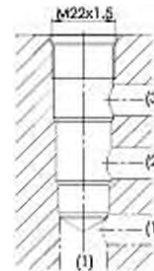
Working pressure	$p_{max} = 400 \text{ bar}$
Tank pressure	$p_{T,max} = p_p + 20 \text{ bar}$
Supply pressure	$p_p \geq p_{rated} + 10 \text{ bar}$ (static) $p_p \geq p_{rated} + 80 \text{ bar}$ (at 40 l/min)
Nominal pressure range	$p_{N,rated} = 40; 63; 100; 160; 200; 275; 350 \text{ bar}$
Minimum adjustable pressure	Static < 1 bar adjustable
Volume flow range	$Q = 0 \dots 40 \text{ l/min}$
Leakage oil	See characteristics
Hysteresis	≤ 5 % at optimal dither signal
Repeatability	≤ 3 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T4</b> NBR -25...+70 °C (L15 / L17) FKM -20...+70 °C (L15 / L17)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-04-0-98


**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1004

**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	253.8000	Manual override HB4,5
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.3196	Backup ring rd 16,1 x 19 x 1,4
80	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
90	049.3176	Backup ring rd 14,1 x 17 x 1,4
110	111.1080	Cable gland M20 x 1,5

**STANDARDS**

Cartridge cavity	ISO 7789
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60$ Nm Screw-in cartridge $M_0 = 9$ Nm knurled nut $M_0 = 9,5$ Nm HB0 $M_0 = 5,5$ Nm HB4,5

**ACCESSORIES**

Proportional amplifier	Register 1.13
Flange body / sandwich plate NG4-Mini	Data sheet 2.3-820
Flange body / sandwich plate NG6	Data sheet 2.3-840
Flange body / sandwich plate NG10	Data sheet 2.3-860
Threaded body	Data sheet 2.9-210
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5 as standard

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

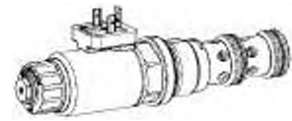
**COMMISSIONING**

**Attention!** The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability can be assumed.



**Proportional pressure reducing cartridge**

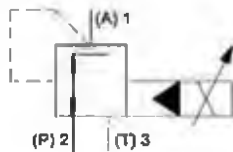
- ◆ pilot operated
- ◆  $Q_{max} = 160 \text{ l/min}$
- ◆  $p_{nom} = 400 \text{ bar}$
- ◆  $p_{h \text{ red max}} = 350 \text{ bar}$

**M33 x 2**  
**ISO 7789**

**DESCRIPTION**

Pilot operated proportional pressure reducing valve in screw-in cartridge construction for cavity according to ISO 7789. Proportionally to the solenoid current, the solenoid force and the pressure in part A (1) rise. The valve functions practically independently of the pressure in part P (2). Pressure increase in the consumer part A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from part P (2) to consumer part A (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W.S37 / 19 x 50 (Data sheet 1.1-173) M.S35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M33 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 80 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut

**TYPE CODE**

		M V P PM33 - <input type="text"/> - <input type="text"/> / <input type="text"/> <input type="text"/> - <input type="text"/> <input type="text"/> # <input type="text"/>			
Pressure reducing valve					
Pilot operated					
Proportional					
Screw-in cartridge M33 x 2					
Nominal pressure range $p_{Nred}$	100 bar	<input type="text" value="100"/>	200 bar	<input type="text" value="200"/>	
	275 bar	<input type="text" value="275"/>	350 bar	<input type="text" value="350"/>	
Nominal voltage $U_N$	12 VDC	<input type="text" value="G12"/>			
	24 VDC	<input type="text" value="G24"/>			
	without coil	<input type="text" value="X5"/>			
Slip-on coil	Metal housing round		<input type="text" value="W"/>		
	Metal housing square		<input type="text" value="M"/>		
Connection execution	Connector socket EN 175301-803 / ISO 4400		<input type="text" value="D"/>		
	Connector socket AMP Junior - Timer		<input type="text" value="J"/>		
	Connector Deutsch DT04 - 2P		<input type="text" value="B"/>		
Sealing material	NBR				
	FKM (Viton)	<input type="text" value="D1"/>			
Manual override	Manual override		<input type="text" value="HBA5"/>		
	Screw plug		<input type="text" value="HBB"/>		
Design index (subject to change)					

1.304

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M33 x 2 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,75 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{stat} = 400$ bar
Nominal pressure range	$P_{Nred} = 100$ bar, 200 bar, 275 bar, 350 bar
Volume flow range	$Q = 0...160$ l/min
Leakage oil	See characteristics
Hysteresis	$\leq 4\%$ at optimal dither signal
Repeatability	$\leq 2\%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 $\geq 75$ , see data sheet 1.0-50

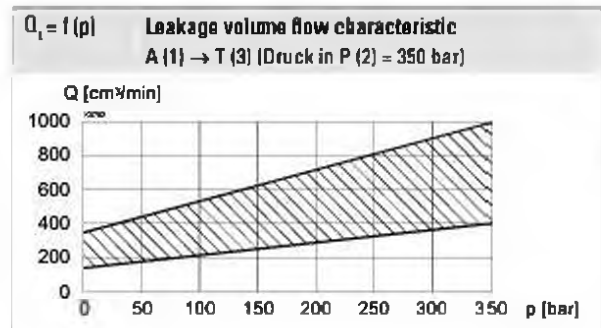
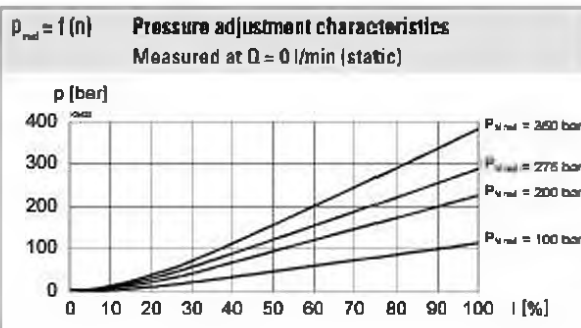
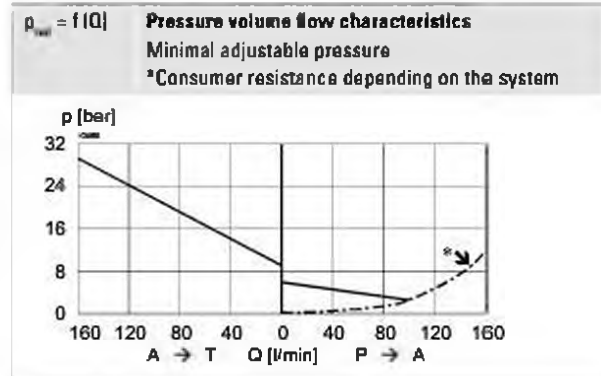
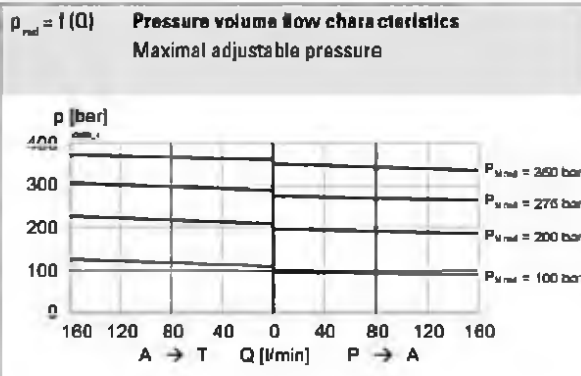
**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1320$ mA ( $U_N = 12$ VDC) $I_a = 660$ mA ( $U_N = 24$ VDC)

**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)



**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACCESSORIES**

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2002
Threaded body	Data sheet 2.9-210
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5

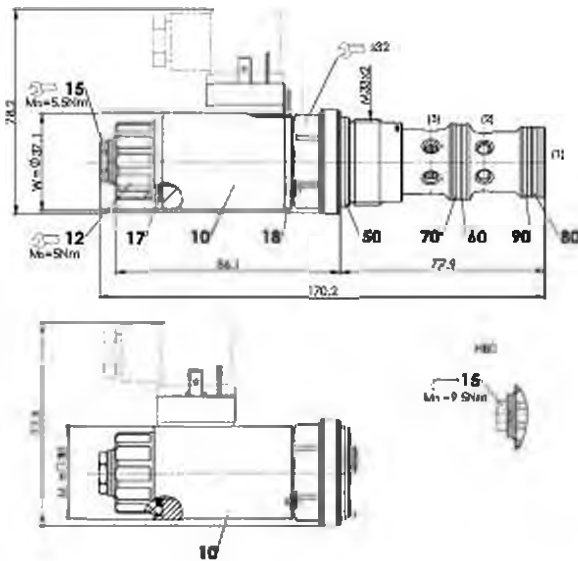
Optionally: Screw plug (HB0), no actuation possible

**SURFACE TREATMENT**

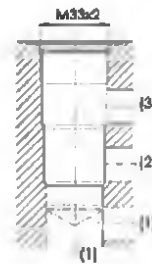
- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-33-04-0-98


**Note!**

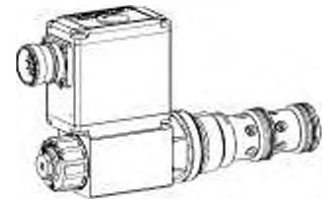

For detailed cavity drawing and cavity tools see data sheet 2.13-1040

**PARTS LIST**

Position	Article	Description
10	206.2...	W.S37 / 19 x 50
	260.5...	M.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000	HB4,5 manual override
	239.2033	HB0 Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FKM)
60	160.2235	O-ring ID 23,47 x 2,62 (NBR)
	160.6235	O-ring ID 23,47 x 2,62 (FKM)
70	049.3297	Backup ring rd 24,5 x 29 x 1,4
80	160.2219	O-ring ID 21,89 x 2,62 (NBR)
	160.6216	O-ring ID 21,89 x 2,62 (FKM)
90	049.3277	Backup ring rd 22,5 x 27 x 1,4

**Proportional pressure reducing valve  
 Screw-in cartridge construction**

- Integrated amplifier or controller electronics
- Pilot operated
- $Q_{max} = 160 \text{ l/min}$
- $p_{max} = 400 \text{ bar}$
- $p_{N \text{ red max}} = 350 \text{ bar}$

**M33x2**  
 ISO 7789

**DESCRIPTION**

Pilot operated proportional pressure reducing valve with integrated electronics as screw-in cartridge. Thread M22x1,5 for cavity according to ISO 7789. The Plug & Play valves are factory set and adjusted and have a high valve-to-valve reproducibility. With protection IP67 for the electronics, these valves are suitable for harsh environmental conditions. As standard, 4 pressure ranges are available. The adjustment takes place by a Wandfluh proportional solenoid (VDE standard 0580). The cartridge body as well as the solenoid made of steel are zinc coated and therefore rust protected. The electronics housing is made of aluminium. Optionally these valves are available with integrated controller. As feedback value generator, sensors with voltage or current output can be directly connected. The available controller structures are optimised for the utilisation with hydraulic drives.

**FUNCTION**

The proportional pressure reducing valve controls the pressure in port A (1). Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). The control takes place via an analog interface or a fieldbus interface (CANopen, J1939 or Profibus DP). The parameterisation takes place by means of the free of cost parameterisation and diagnostics software «PASO» or via Feldbus interface. The USB parameterisation interface is accessible through a cover flap. «PASO» is a Windows program in the flow diagram style, which enables the intuitive adjustment and storing of all variable parameters. The data remain saved in case of a power failure and can also be reproduced and transferred to other DSVs.

**APPLICATION**

Proportional pressure reducing valves with integrated electronics are perfectly suitable for demanding applications in which the pressure frequently has to be changed. They are used in applications where high valve-to-valve reproducibility, ration and high precision are very important. The applications are in the industrial as well as in the mobile hydraulics. The proportional pressure reducing cartridge is perfectly suitable for installation in control blocks as well as in flange and sandwich valves of the size NG10 (please refer to separate data sheets in register 2.3). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

		M V P PM33 - <input type="checkbox"/> - <input type="checkbox"/> / M E <input type="checkbox"/> - <input type="checkbox"/> HB4.5 # <input type="checkbox"/>	
Pressure reducing valve			
Pilot operated			
Proportional			
Screw-in thread M33x2			
Nominal pressure range $p_{N \text{ red}}$	100 bar	<input type="checkbox"/> 100	
	200 bar	<input type="checkbox"/> 200	
	275 bar	<input type="checkbox"/> 275	
	350 bar	<input type="checkbox"/> 350	
Nominal voltage $U_M$	12 VDC	<input type="checkbox"/> G12	
	24 VDC	<input type="checkbox"/> G24	
Slip-on coil	Metal housing, square		
Connection execution	Integrated electronics		
Hardware configuration			
With analog command value signal (0...+10 V preset)		<input type="checkbox"/> A1	
With CANopen according to DSP-408		<input type="checkbox"/> C1	
With Profibus DP in accordance with Fluid Power Technology		<input type="checkbox"/> P1	
With CAN J1939 (on request)		<input type="checkbox"/> J1	
Function			
Amplifier		<input type="checkbox"/>	
Controller with current feedback value signal (0...20 mA / 4...20 mA)		<input type="checkbox"/> R1	
Controller with voltage feedback value signal (0...10 V)		<input type="checkbox"/> R2	
Dichtwerkstoff	NBR		
	FKM (Vitron)	<input type="checkbox"/> O1	
Manual override			
Design-Index (Subject to change)			



**GENERAL SPECIFICATIONS**

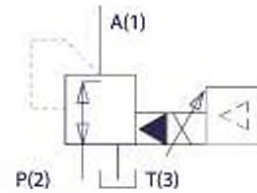
Description	Pilot operated proportional pressure reducing valve with integrated electronics
Construction	Screw-in cartridge for cavity acc. to ISO 7789
Operations	Proportional solenoid, wet pin push type, pressure tight
Mounting	Screw-in thread M33x2
Ambient temperature	-20...+65°C (typical) <small>(The upper temperature limit is a guideline value for typical applications. In individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions «DSVs».)</small>
Mounting position	any, preferably horizontal
Fastening torque	$M_a = 80 \text{ Nm}$ for screw-in cartridge $M_c = 5 \text{ Nm}$ for knurled nut
Weight	$m = 1,35 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluids on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 <small>(Required filtration grade &amp; 6...10≥75) refer to data sheet 1.0-50/2</small>
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70°C
Peak pressure	$p_{max} = 400 \text{ bar}$
Nominal pressure ranges	$p_{N,red} = 100 \text{ bar}$ , $p_{N,red} = 200 \text{ bar}$ , $p_{N,red} = 350 \text{ bar}$
Volume flow range	$Q = 0...160 \text{ l/min}$
Pilot- and leakage volume flow	see characteristics
Repeatability	≤ 2% *
Hysteresis	≤ 4% * * at optimal dither signal

**ELECTRICAL SPECIFICATIONS**

Protection class	IP 67 acc. to EN 60 529 with suitable mating connector and closed housing cover
Supply voltage	12 VDC or 24 VDC
Ramps (amplifier only)	adjustable separately up and down per each solenoid
Command value generator (controller only)	Command value speed adjustable
Parameterisation Interface	via fieldbus or USB USB (Mini B) for parameterisation with «PASO» under the closing screw of the housing cover, Preset ax-works
<b>Analog interface:</b>	
Device receptacle (male)	M23, 12-poles
Mating connector	Plug (female), M23, 12-pole (not incl. in delivery)
Preset value signal	Input voltage / current as well as signal range can be set by software
<b>Fieldbus interface:</b>	
Device receptacle supply (male)	M12, 4-pole
Mating connector	Plug (female), M12, 4-pole (not incl. in delivery)
Device receptacle CANopen (male)	M12, 5-pole (acc. to DRP 303-1)
Mating connector	Plug (female), M12, 5-pole (not incl. in delivery)
Device receptacle Profibus (female)	M12, 5-pole, B-coded (acc. to IEC 947-5-2)
Mating connector	Cable plug (male), M12, 5-pole, B-coded (not incl. in delivery)
Command value signal	Fieldbus
<b>Feedback value interface (sensor) (controller only)</b>	
Device receptacle (female)	M12, 5-pole
Mating connector	Cable plug (male), M12, 5-pole (not included in the delivery)
Feedback value	Voltage / current to indicate when ordering

**SYMBOL**

**CONNECTOR WIRING DIAGRAM**
**Analog interface:**
**Device receptacle (male) X1**


- 1 = Supply voltage +
- 2 = Supply voltage 0 VDC
- 3 = Stabilised output voltage
- 4 = Preset value voltage +
- 5 = Preset value voltage -
- 6 = Preset value current +
- 7 = Preset value current -
- 8 = Reserved for extensions
- 9 = Reserved for extensions
- 10 = Enable control (Digital input)
- 11 = Error signal (Digital output)
- 12 = Chassis

Preset value voltage (PIN 4/5) resp. current (PIN 6/7) are selected with set-up and diagnosis software PASO.

Factory setting: Voltage (0...+10 V), (PIN 4/5)

**Fieldbus interface:**
**Device receptacle supply (male) X1**

**MAIN**

- 1 = Supply voltage +
- 2 = Reserved for extensions
- 3 = Supply voltage 0 VDC
- 4 = Chassis

**Device receptacle CANopen (male) X3**


- CAN**
- 1 = not connected
- 2 = not connected
- 3 = CAN Gnd
- 4 = CAN High
- 5 = CAN Low

**Device receptacle Profibus (female) X3**


- PROFIBUS**
- 1 = VP
- 2 = Rx/D/TxD - N
- 3 = DGND
- 4 = Rx/D/TxD - P
- 5 = Shield

**Parameterisation interface (USB, Mini B) X2**  
 Under the closing screw of the housing cover

**Feedback value interface (sensor)**
**Device receptacle (female) X4 (controller only)**


- 1 = Supply voltage (output) +
- 2 = Feedback value signal +
- 3 = Supply voltage 0 VDC
- 4 = Not connected
- 5 = Stabilised output voltage


**NOTE!**

The mating connector and the parameterisation cable are not included in the delivery. See chapter "Accessories".


**NOTE!**

Detailed electrical characteristics and description of «DSV» electronics are shown on data sheet 1.13-76.

**START-UP**

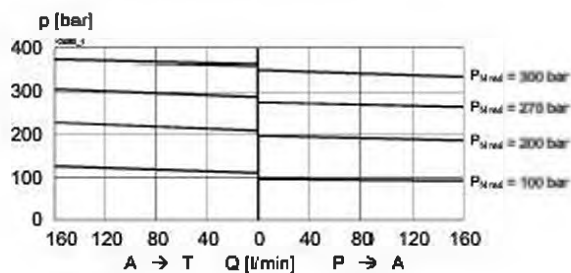
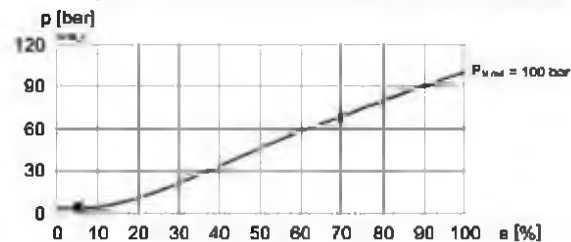
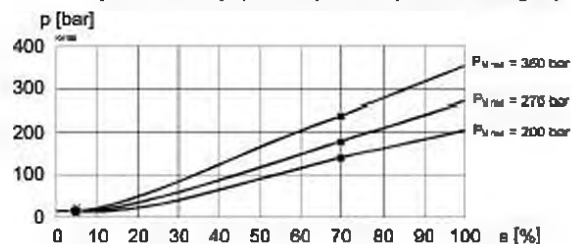
For DSV amplifiers as a rule no parameter settings by the customer are required. The plugs have to be connected in accordance with the chapter «Pin assignments».

Controllers are delivered configured as amplifiers. Setting the controller mode and adjustment of the controller are carried out by the customer by means of the software adjustment (USB interface, Mini B).

Free-of-charge download of the «PASO»-software and the instruction manual for the «DSV» hydraulic valves as well as the operation instruction CANopen eg Profibus DP protocol with device profile DSP-408 for «DSV».


**NOTE!**

The mating connectors and the cable to adjust the settings are not part of the delivery. Refer to chapter «Accessories».

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $p_{red} = f(Q)$  Pressure volume flow characteristics (Maximal adjustable pressure)

 $p_{red} = f(s)$  Pressure adjustment characteristics [at  $Q = 0 \text{ l/min}$ ] ( $s$  corresponds to preset value signal)

 $p_{red} = f(s)$  Pressure adjustment characteristics [at  $Q = 0 \text{ l/min}$ ] ( $s$  corresponds to preset value signal)

 Inlet pressure:  $p_x + 10\%$ 

Measured with closed port A (static conditions).

**Factory settings:**

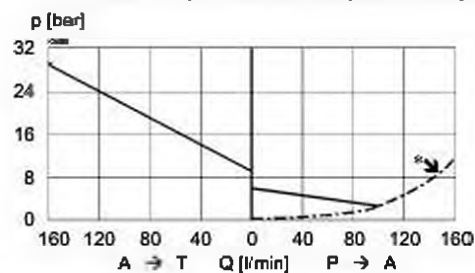
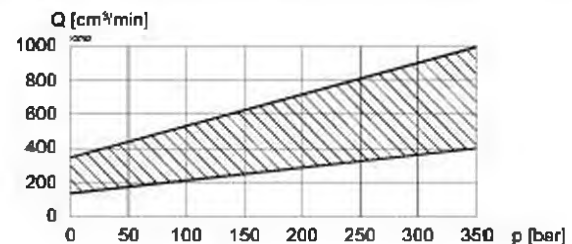
Dither set for optimal hysteresis

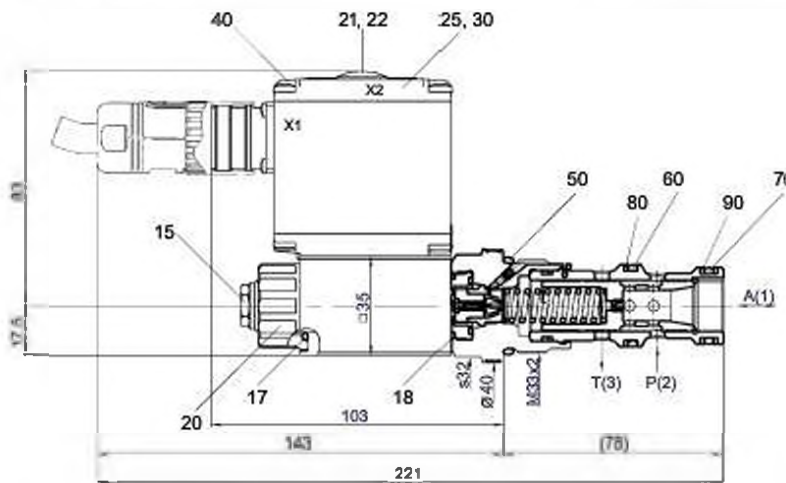
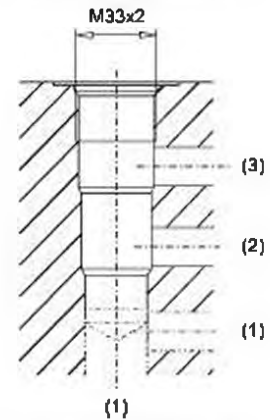
- = Deadband: Solenoid switched off with command preset value signal  $< 5\%$
- = Regulated pressure in port A (1) at 70% of preset value signal:
  - 250 bar with pressure range 350 bar
  - 192 bar with pressure range 275 bar
  - 143 bar with pressure range 200 bar
  - 72 bar with pressure range 100 bar

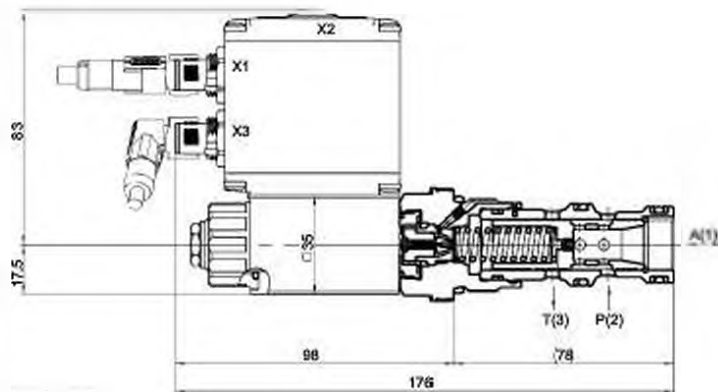
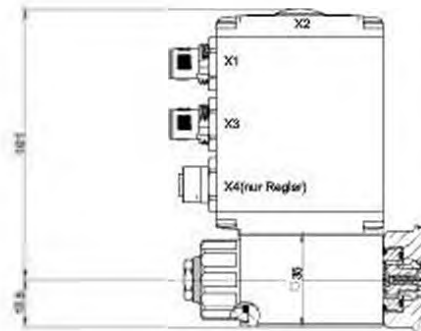
 $p_{red} = f(Q)$  Pressure volume flow characteristics

(Minimal adjustable pressure)

\* Consumption resistance dependent on system


 $Q_{pilot} = f(p_{red})$  Pilot- and leakage volume flow characteristic [A (1) → T (3)]


**DIMENSIONS/SECTIONAL DRAWINGS**
**With analog interface**

 Cavity drawing acc. to  
 ISO 7789-33-04-0-98

 For detailed cavity drawing  
 see data sheet 2.13-1040

**With fieldbus interface**

**With fieldbus interface  
 Controller**

**PARTS LIST**

Position	Article	Description
15	253.8000	HB 4,5 Manual override (data sheet 1.1-300)
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
20	154.2700	Knurled nut
21	223.1317	Dummy plug M16x1,5
22	160.6131	O-ring ID 13,00 x 1,5
25	062.0102	Cover square
30	072.0021	Gasket 33,2 x 59,9 x 2
40	208.0100	Socket head cap screw M4 x 10
50	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FKM)
60	160.2235	O-ring ID 23,47 x 2,62 (NBR)
	160.6235	O-ring ID 23,47 x 2,62 (FKM)
70	160.2219	O-ring ID 21,89 x 2,62 (NBR)
	160.6216	O-ring ID 21,89 x 2,62 (FKM)
80	049.3297	Backup ring RD 24,5 x 29 x 1,4
90	049.3277	Backup ring RD 22,5 x 27 x 1,4

**ACCESSORIES**

Line mount body

Data sheet 2.9-210

• Set-up software

see start-up

 • Cable to adjust the settings through  
 interface USB  
 (from plug type A to Mini B, 3 m)

article no. 219.2896

• Mating connector (plug female) for the analogue interface:

– straight, soldering contact

article no. 219.2330

– soldering contact

article no. 219.2331

**Recommended cable size:**

– Outer diameter 9...10,5 mm

 – Single wire max. 1 mm<sup>2</sup>

– Recommended wire size:

 0...25 m = 0,75 mm<sup>2</sup> (AWG18)

 25...50 m = 1 mm<sup>2</sup> (AWG17)

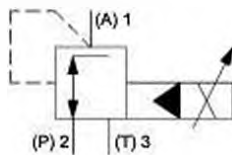
Technical explanation see data sheet 1.0-100

**Proportional pressure reducing cartridge**

- ◆ pilot operated
- ◆  $Q_{max} = 160 \text{ l/min}$
- ◆  $p_{nom} = 400 \text{ bar}$
- ◆  $p_{h \text{ red max}} = 350 \text{ bar}$

**DESCRIPTION**

Pilot operated proportional pressure reducing valve in screw-in cartridge construction for cavity according to ISO 7789. Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). Pressure increase in the consumer part A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from port P (2) to consumer part A (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13). The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

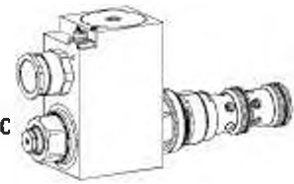
**SYMBOL**

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M33 x 2 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17)
Weight	2,4 kg
MTTFd	150 years

**M33 x 2  
ISO 7789**

- ⊕ II 2 G Ex db IIC T6, T4
- ⊕ II 2 D Ex db III C T80 °C, T130 °C
- ⊕ I M2 Ex db I Mb

Class I Division 1  
Class I Zone 1


**APPLICATION**

These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to...	M248 Electronic
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	
MA		x	x	x
UL / CSA	x		x	

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

**Attention!** The UL execution is always supplied without cable gland



**TYPE CODE**

		M V B PM33 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/> # <input type="checkbox"/>			
Pressure reducing valve					
Pilot operated					
Proportional, explosion proof execution Ex d					
Screw-in cartridge M33 x 2					
Execution	L9		L15 / L17		
Nominal pressure range $p_{N,red}$ [bar]	80 160	220 280	100 200	275 350	
Nominal voltage $U_N$	12 VDC 24 VDC	G12 G24			
Nominal power $P_N$	9 W 15 W 17 W	L9 L15 L17	Ambient temperature up to: 40 °C or 90 °C 70 °C 70 °C (only UL / CSA)		
Certification	ATEX, IECEx, EAC, CCC Australia	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	UL / CSA MA	<input type="checkbox"/> <input type="checkbox"/>	
Sealing material	NBR FKM (Viton)	<input type="checkbox"/> <input type="checkbox"/>			
Options	without amplifier	<input type="checkbox"/> M 248			
Design index (subject to change)					

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400$ bar
Nominal pressure range	Execution L9 $P_{N,red} = 80$ bar, 160 bar, 220 bar, 280 bar Execution L15 / L17 $P_{N,red} = 100$ bar, 200 bar, 275 bar, 350 bar
Volume flow range	$Q = 0 \dots 160$ l/min
Leakage oil	See characteristics
Hysteresis	$\leq 5\%$ at optimal dither signal
Repeatability	$\leq 2\%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	Operation as T6 NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) Operation as T4 NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L15 / L17) FKM -20...+70 °C (L9)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade $\beta_{6...10} \geq 75$ , see data sheet 1.0-50

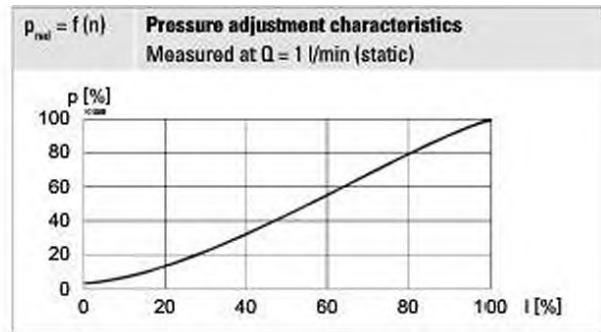
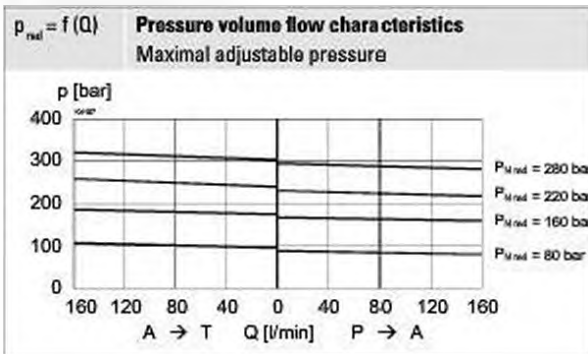
**ELECTRICAL SPECIFICATIONS**

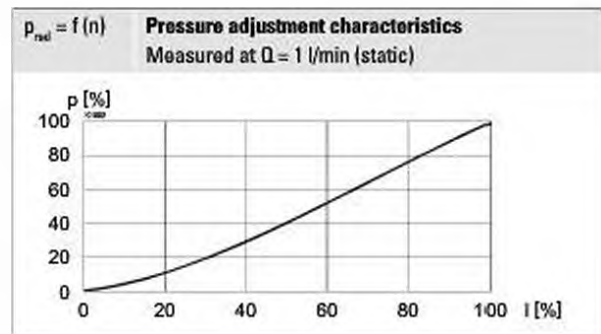
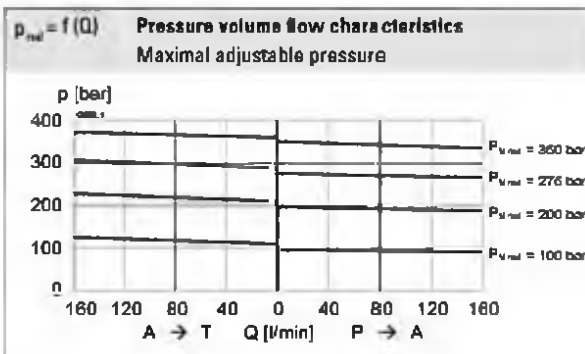
Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Voltage tolerance	$\pm 10\%$ with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at... °C	L9, 40 °C $I_a = 625$ mA (12 VDC) $I_a = 305$ mA (24 VDC) L15 / 17, 50 °C $I_a = 950$ mA (12 VDC) $I_a = 450$ mA (24 VDC) L15 / 17, 70 °C $I_a = 910$ mA (12 VDC) $I_a = 420$ mA (24 VDC)
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

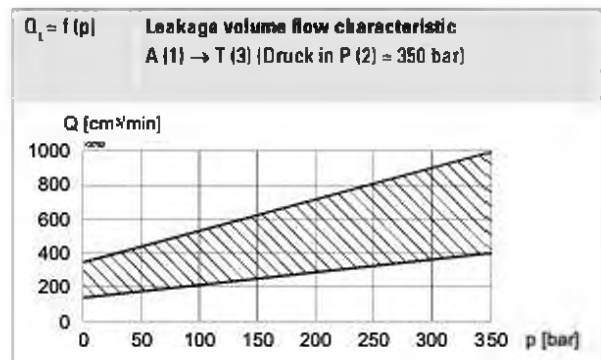
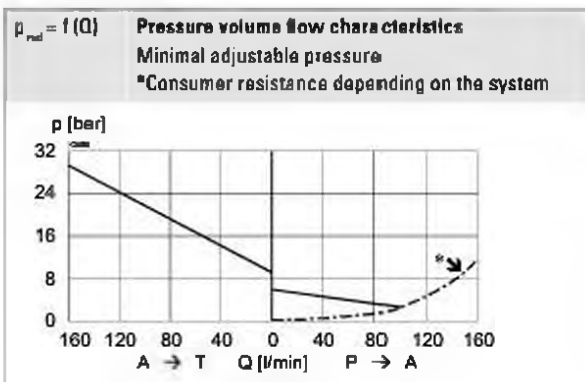
**Note!**

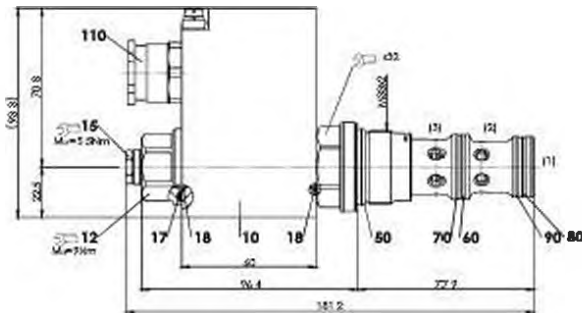

Other electrical specifications see data sheet 1.1-183 and 1.1-184

**PERFORMANCE SPECIFICATIONS EXECUTION L9 (MEASURED AT 40 °C)**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**PERFORMANCE SPECIFICATIONS EXECUTION L15 / L17 (MEASURED AT 50 °C)**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**DIMENSIONS**

**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	253.8000	Manual override HB4,5
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FKM)
60	160.2235	O-ring ID 23,47 x 2,62 (NBR)
	160.6235	O-ring ID 23,47 x 2,62 (FKM)
70	049.3297	Backup ring rd 24,5 x 29 x 1,4
80	160.2219	O-ring ID 21,89 x 2,62 (NBR)
	160.6216	O-ring ID 21,89 x 2,62 (FKM)
90	049.3277	Backup ring rd 22,5 x 27 x 1,4
110	111.1080	Cable gland M20 x 1,5

**STANDARDS**

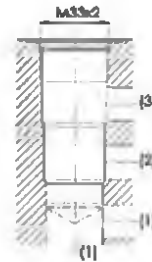
Cartridge cavity	ISO 7789
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M33 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 80 \text{ Nm}$ Screw-in cartridge $M_0 = 9 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-33-04-0-98


**Nota!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1040

**ACCESSORIES**

Proportional amplifier	Register 1.13
Threaded body	Data sheet 2.9-210
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5 as standard

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**COMMISSIONING**
**Attention!**


The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability can be assumed.



**Proportional pressure control valve  
 Slip-in cartridge construction**

- Direct-operated
- $Q_{max} = 3 \text{ l/min}$
- $p_{max} = 450 \text{ bar}$
- $p_{Tmax} = 20 \text{ bar}$ ,  $p_{N \text{ red} max} = 48 \text{ bar}$

**DESCRIPTION**

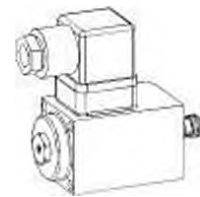
Direct-operated proportional pressure control cartridge for cavity MDPPR11 PI35. Due to the very compact installation dimensions, new application possibilities are offered. As standard versions, two pressure ranges are available. The adjustment is done by means of a Wandfluh proportional solenoid (VDE-Standard 0580). The solenoid as well as the housing bottom made of steel are zinc coated and therefore rust-protected.

**FUNCTION**

The proportional pressure control valve controls the pressure in the connection A (1). Solenoid power and the pressure in the connection A (1) increase proportionally to the solenoid current. The valve operates to a great extent independent of the pressure in the connection P (2). The increase of the pressure in the connection A (1) to over the set value, e.g. by an active consumer, is prevented by diverting excess oil to the tank T (3). The back pressure in T influences the pressure in A (1). With a current-free solenoid, the oil freely flows from the consumer connection A to the connection T. For driving the valve, Wandfluh proportional amplifiers are available (see Register 1.13).

**APPLICATION**

The compact valve has its application in hydraulic systems, in which the pressure frequently has to be varied. The facility of electric remote control of the valve, in conjunction with process control systems, makes economical solutions with repetitive sequences possible. Application fields are the pilot-operation of proportional spool valves, the driving of control pumps and motors as well as the controlling of the contact pressure of disc brake coatings. With the compact valve a minimum control oil volume is achieved.


**TYPE CODE**

	M	D	P	PR11	-	-	#
Pressure reducing valve							
Direct operated							
Proportional							
Slip-in cartridge, diameter 11 mm							
Nominal pressure range $p_{N \text{ red}}$				25 bar			
				48 bar			
Nominal voltage $U_N$				12 VDC		G12	
				24 VDC		G24	
Design-Index (Subject to change)							

**GENERAL SPECIFICATIONS**

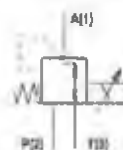
Denomination	Direct operated proportional pressure reducing valve
Construction	Slip-in cartridge for cavity acc. to Wandfluh-standard
Actuation	Proportional solenoid
Mounting	min. 2 head screws crosswise M4 x60
Ambient temperature	-25...50°C
Mounting position	any
Fastening torque	$M_t = 2,8 \text{ Nm}$ (quality 8.8)
Weight	$m = 0,45 \text{ kg}$

**ELECTRICAL SPECIFICATIONS**

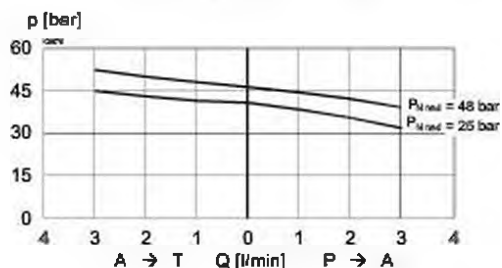
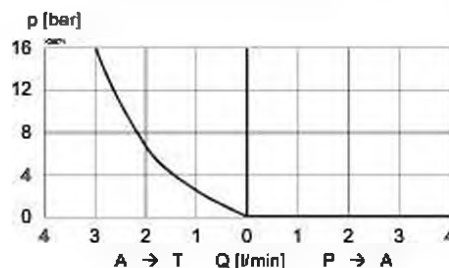
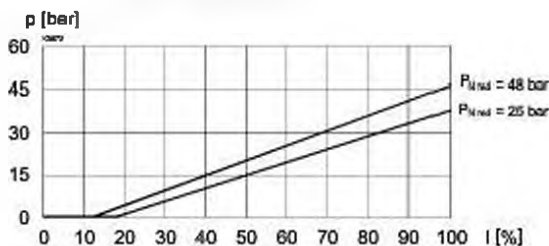
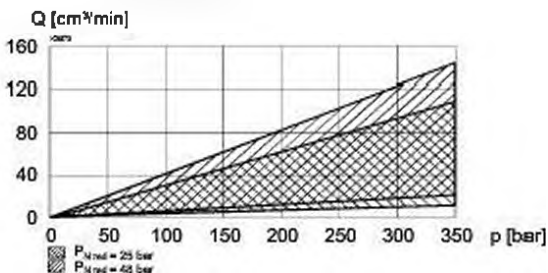
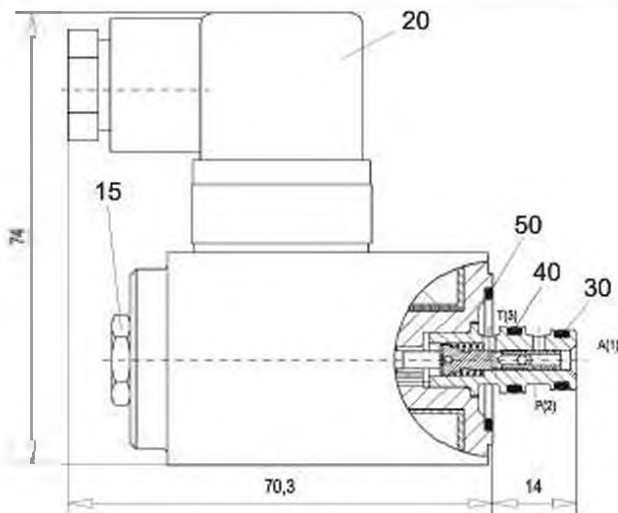
Construction	Proportional solenoid, wet pin push type, pressure tight	
Standard nominal voltage	$U = 12 \text{ VDC}$	$U = 24 \text{ VDC}$
Limiting current	$I_c = 1250 \text{ mA}$	$I_c = 680 \text{ mA}$
Relative duty factor	100% ED/DF	
Protection class	IP 65 acc. to EN 60529	
Connection/Power supply	Over device plug connection to EN 175301-803 (DIN 43650) ISO 4400	

**HYDRAULIC SPECIFICATIONS**

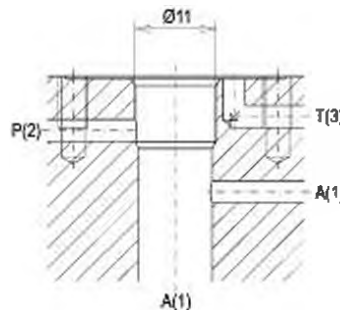
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 Required filtration grade (B6...10 ≥ 75) (refer to data sheet 1.0-50/2)
Oil temperature	Acrylnitril -25...+70°C
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Maximum pressure	$p_{max} = 450 \text{ bar}$ (trial testing at VdAG up to 360 bar)
Nominal pressure range	$p_{N \text{ red}} = 25 \text{ bar}$ , $p_{N \text{ red}} = 48 \text{ bar}$
Volume flow range	25 bar $Q = 0-1 \text{ l/min}$ $p \rightarrow A$ $A \rightarrow T$ 48 bar $Q = 0-3 \text{ l/min}$
Pressure decrease 1 → 3	$\Delta p_{red \text{ min}} < \text{lower than nominal pressure at nominal volume flow}$ see characteristics
Leakage volume flow	see characteristics
Hysteresis	≤ 4% (at optimal dither signal)

**SYMBOL**




**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $p_{\text{red}} = f(Q)$  Pressure volume flow characteristics  
 (Maximal adjustable pressure)

 $p_{\text{red}} = f(Q)$  Pressure volume flow characteristics  
 (Minimal adjustable pressure)

 $p_{\text{red}} = f(I)$  Pressure adjustment characteristics  
 (at  $Q = 0 \text{ l/min}$ ) / (static)

 $Q_{\text{pil.}} = f(p_{\text{red}})$  Pilot- and leakage volume flow characteristics  
 [P (2) → T (3)]

**DIMENSIONS/SECTIONAL DRAWINGS**

**PARTS LIST**

Position	Article	Description
15	253.8000	Mounted screw with integrated manual override HB 4,5
20	219.2002	Plug (black)
30	160.0080	O-ring ID 6,07 x 1,78
40	160.0071	O-ring ID 7,65 x 1,78
50	160.2204	O-ring ID 20,35 x 1,78

 Cavity drawing acc. to  
 Wandfluh standard

**ACCESSORIES**

Proportional amplifier

register 1.13

Technical explanation see data sheet 1.0-100

 For detailed cavity drawing  
 see data sheet 2.13-1044

**Proportional pressure reducing cartridge**

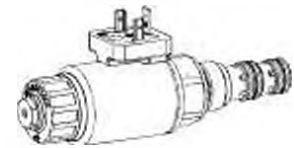
- ◆ pilot operated
- ◆  $Q_{max} = 60 \text{ l/min}$
- ◆  $p_{max} = 400 \text{ bar}$
- ◆  $p_{h \text{ red max}} = 350 \text{ bar}$

**DESCRIPTION**

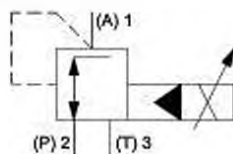
Pilot operated proportional pressure reducing valve in screw-in cartridge construction for cavity according to Wandfluh standard. Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). Pressure increase in the consumer port A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from port P (2) to consumer port A (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

 $\frac{3}{8}''$ -14 UNF

Wandfluh standard


**APPLICATION**

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W.S37 / 19 x 50 (Data sheet 1.1-173) M.S35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**STANDARDS**

Cartridge cavity	Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge $\frac{3}{8}''$ -14 UNF
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5

**TYPE CODE**

		M V P PU10 - [ ] - [ ] / [ ] [ ] - [ ] [ ] # [ ]			
Pressure reducing valve					
Pilot operated					
Proportional					
Screw-in cartridge 7/8" - 14 UNF					
Nominal pressure range $p_{n,red}$	20 bar	[ 20 ]	200 bar	[ 200 ]	
	63 bar	[ 63 ]	275 bar	[ 275 ]	
	100 bar	[ 100 ]	350 bar	[ 350 ]	
	160 bar	[ 160 ]			
Nominal voltage $U_n$	12 VDC	[ G12 ]			
	24 VDC	[ G24 ]			
	without coil	[ X5 ]			
Slip-on coil	Metal housing round		[ W ]		
	Metal housing square		[ M ]		
Connection execution	Connector socket EN 175301 - 803 / ISO 4400		[ D ]		
	Connector socket AMP Junior - Tamer		[ J ]		
	Connector Deutsch DT04 - 2P		[ B ]		
Sealing material	NBR				
	FKM (Viton)	[ D1 ]			
Manual override	Manual override		[ HB4,5 ]		
	Screw plug		[ HB0 ]		
Design index (subject to change)					

23402

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	7/8"-14 UNF according to Wandfluh standard
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,53 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400$ bar
Nominal pressure range	$P_{n,red} = 20; 63; 100; 160; 200; 275; 350$ bar
Volume flow range	$Q = 0...60$ l/min
Leakage oil	See characteristics
Hysteresis	≤ 4 % at optimal dither signal
Repeatability	≤ 2 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

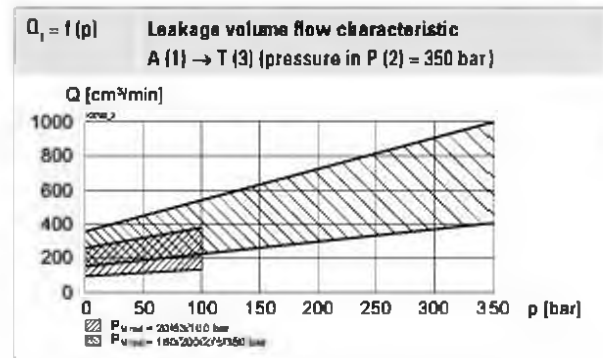
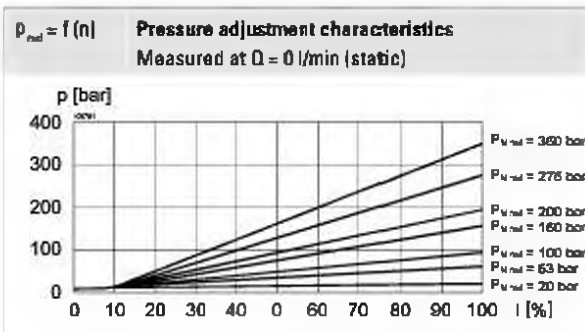
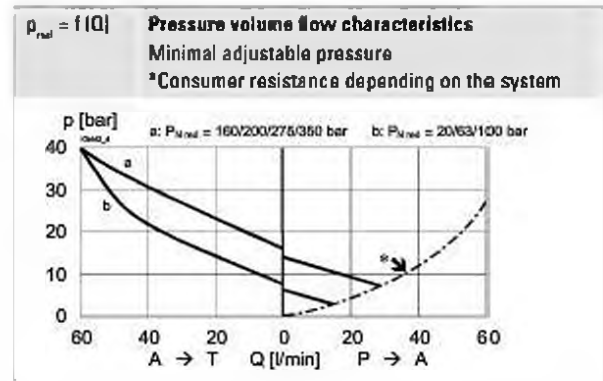
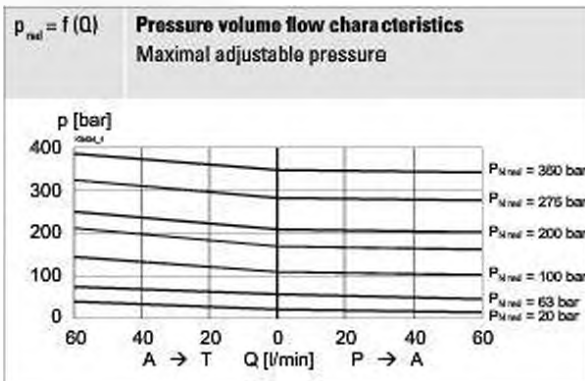
**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1320$ mA ( $U_n = 12$ VDC) $I_a = 660$ mA ( $U_n = 24$ VDC)

**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W1 and 1.1-174 (slip-on coil M)



**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACCESSORIES**

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2002
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5

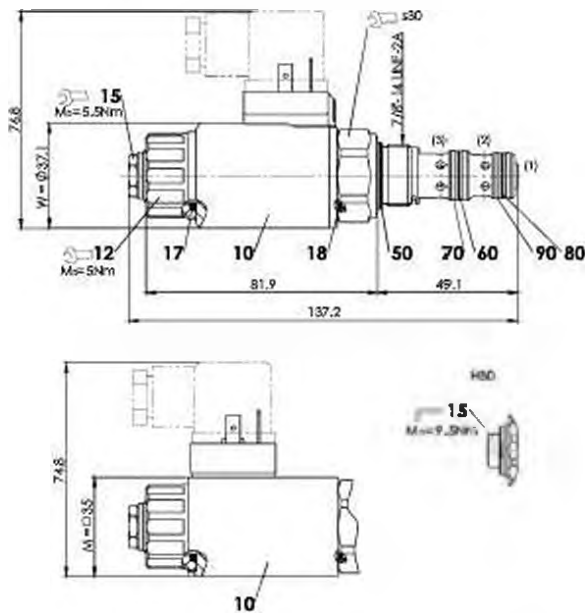
Optionally: Screw plug (HB0), no actuation possible

**SURFACE TREATMENT**

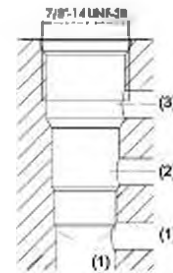
- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard


**Attention!** For detailed cavity drawing and cavity tools see data sheet 2.13-1045

**PARTS LIST**

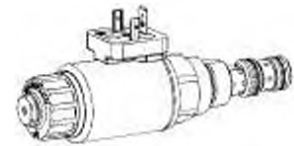
Position	Article	Description
10	206.2...	W.S37 / 19 x 50
	260.5...	M.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000	HB4,5 manual override
	239.2033	HB0 Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
70	049.3177	Back-up ring rd 14,6 x 17,5 x 1,4
80	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.6124	O-ring ID 12,42 x 1,78 (FKM)
90	049.3166	Backup ring rd 13,1 x 16 x 1,4

**Proportional pressure reducing cartridge**

- ◆ direct operated by means of pilot spool
- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$
- ◆  $p_{h \text{ red max}} = 200 \text{ bar}$

 $\frac{3}{8}$ " -14 UNF

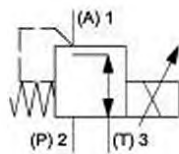
Wandfluh standard


**DESCRIPTION**

Direct operated proportional pressure reducing valve with pilot spool actuation in screw-in cartridge construction for cavity according Wandfluh standard. The proportional pressure reducing valve controls the pressure in port A (1). Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). Pressure increase in the consumer port A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from consumer port A (1) to port T (3). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

These valves are used in hydraulic systems where the pressure has to be changed frequently. The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. Direct operated pressure reducing valves are used where a low minimal adjustable pressure is required. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W.S37 / 19 x 50 [Data sheet 1.1-173] M.S35 / 19 x 50 [Data sheet 1.1-174]
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**STANDARDS**

Cartridge cavity	Wandfluh standard
Solenoids	DIN VDE 0590
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge $\frac{3}{8}$ " -14 UNF
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5

**TYPE CODE**

		M P P PU10 - [ ] - [ ] / [ ] [ ] - [ ] [ ] # [ ]			
Pressure reducing valve					
Direct operated by means of pilot spool					
Proportional					
Screw-in cartridge 7/8" - 14 UNF					
Nominal pressure range $p_{N,red}$	20 bar	[ 20 ]	115 bar	[ 115 ]	
	80 bar	[ 80 ]	200 bar	[ 200 ]	
Nominal voltage $U_N$	12 VDC	[ G12 ]			
	24 VDC	[ G24 ]			
	without coil	[ X5 ]			
Slip-on coil	Metal housing round		[ W ]		
	Metal housing square		[ M ]		
Connection execution	Connector socket EN 175301 - 803 / ISO 4400		[ D ]		
	Connector socket AMP Junior - Timer		[ J ]		
	Connector Deutsch DT04 - 2P		[ G ]		
Sealing material	NBR				
	FKM (Viton)	[ D1 ]			
Manual override	Manual override		[ HB4,5 ]		
	Screw plug		[ H80 ]		
<b>Design index (subject to change)</b>					

1 34871

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Direct operated by means of pilot spool
Mounting	Screw-in cartridge construction
Nominal size	7/8" - 14 UNF according to Wandfluh standard
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,55 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

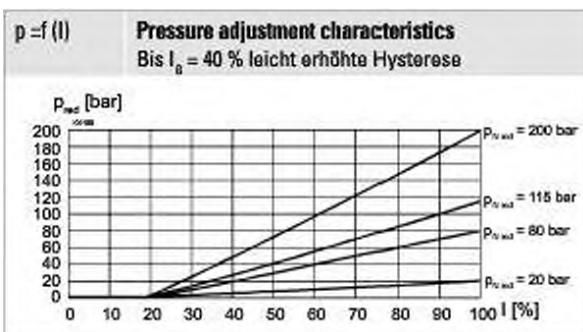
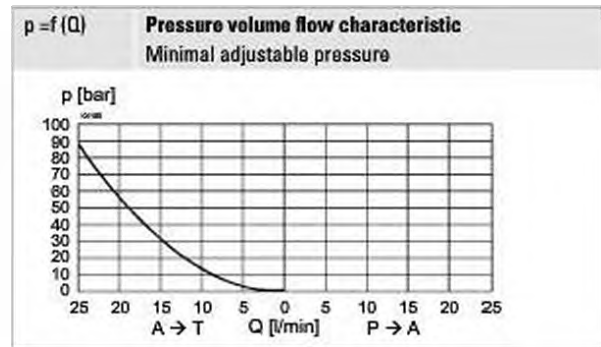
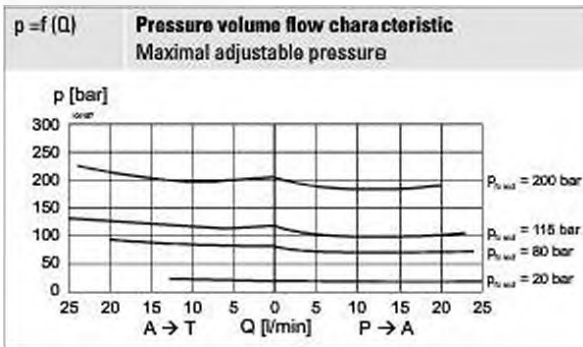
Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1360 \text{ mA}$ ( $U_N = 12\text{VDC}$ ) $I_a = 680 \text{ mA}$ ( $U_N = 24\text{VDC}$ )

**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)


**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Nominal pressure range	$P_{N,red} = 20, 80, 115, 200 \text{ bar}$
Minimum adjustable pressure	< 1 bar
Volume flow range	See characteristic
Leakage oil	at $p_{p,pu} = 350 \text{ bar}$ < 30 ml/min for $p_{N,red} = 20, 80, 115 \text{ bar}$ < 50 ml/min for $p_{N,red} = 200 \text{ bar}$
Hysteresis	≤ 4 % at optimal dither signal
Repeatability	≤ 1 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACCESSORIES**

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2002
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**SURFACE TREATMENT**

- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**MANUAL OVERRIDE**

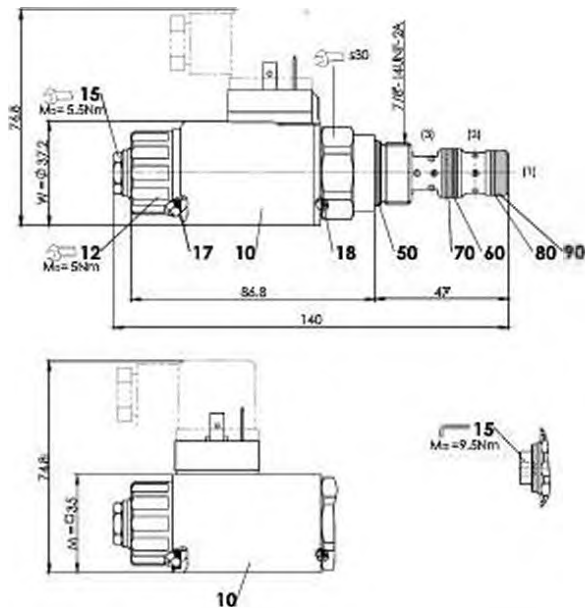
HB4.5

Optionally: Screw plug (HB0), no actuation possible

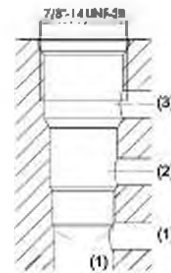
**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code



**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard

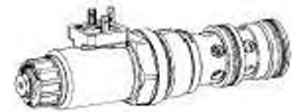

**Attention!** For detailed cavity drawing and cavity tools see data sheet 2.13-1045

**PARTS LIST**

Position	Article	Description
10	206.2...	W.S37 / 19 x 50
	260.5...	M.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000	HB4,5 manual override
	239.2033	HB0 Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
	160.6187	O-ring ID 18,72 x 2,62 (FKM)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
	160.6172	O-ring ID 17,17 x 1,78 (FKM)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
70	049.8177	Back-up ring PTSM rd 12,4 x 15,3 x 1,4
80	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.6124	O-ring ID 12,42 x 1,78 (FKM)
90	049.8166	Backup ring PTSM rd 10,8 x 13,7 x 1,4

**Proportional pressure reducing cartridge**

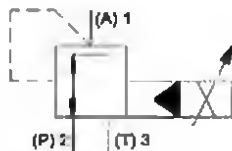
- ◆ pilot operated
- ◆  $Q_{max} = 250$  l/min
- ◆  $p_{nom} = 400$  bar
- ◆  $p_{h\ red\ max} = 350$  bar

**M42 x 2**  
**ISO 7789**

**DESCRIPTION**

Pilot operated proportional pressure reducing valve in screw-in cartridge construction for cavity according to ISO 7789. Proportionally to the solenoid current, the solenoid force and the pressure in port A (1) rise. The valve functions practically independently of the pressure in port P (2). Pressure increase in the consumer part A (1) to above the adjusted value, e.g. through an active consumer, is avoided by discharging excess oil to the tank T (3). With the solenoid deenergised, the oil flows freely from port P (2) to consumer part A (1). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. The screw-in cartridge is perfectly suitable for installation in control blocks. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W.S37 / 19 x 50 (Data sheet 1.1-173) M.S35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M42 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 100$ Nm Screw-in cartridge $M_0 = 5$ Nm knurled nut $M_0 = 9,5$ Nm HB0 $M_0 = 5,5$ Nm HB4,5

**TYPE CODE**

		M V P PM42 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>			
Pressure reducing valve					
Pilot operated					
Proportional					
Screw-in cartridge M42 x 2					
Nominal pressure range $p_{H,red}$	100 bar	<input type="checkbox"/> 100	275 bar	<input type="checkbox"/> 275	
	200 bar	<input type="checkbox"/> 200	350 bar	<input type="checkbox"/> 350	
Nominal voltage $U_N$	12 VDC	<input type="checkbox"/> G12			
	24 VDC	<input type="checkbox"/> G24			
	without coil	<input type="checkbox"/> X5			
Slip-on coil	Metal housing round		<input type="checkbox"/> W		
	Metal housing square		<input type="checkbox"/> M		
Connection execution	Connector socket EN 175301-803 / ISO 4400		<input type="checkbox"/> D		
	Connector socket AMP Junior - Timer		<input type="checkbox"/> J		
	Connector Deutsch DT04 - 2P		<input type="checkbox"/> G		
Sealing material	NBR	<input type="checkbox"/>			
	FKM (Viton)	<input type="checkbox"/> D1			
Manual override	Manual override		<input type="checkbox"/> HB4,5		
	Screw plug		<input type="checkbox"/> HBO		
Design index (subject to change)					

23-026

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure reducing valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M42 x 2 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25 ... +70 °C
Weight	1,05 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

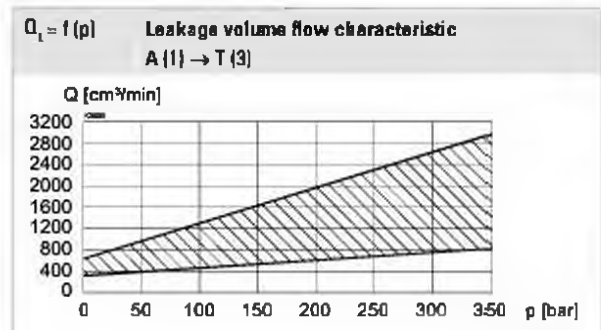
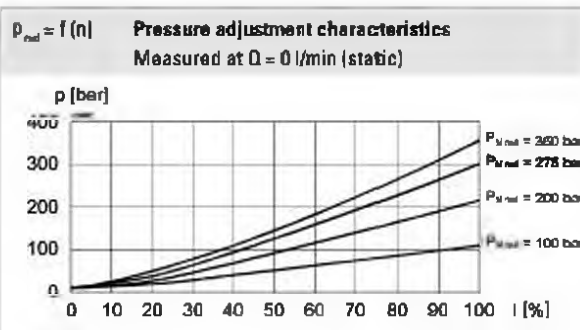
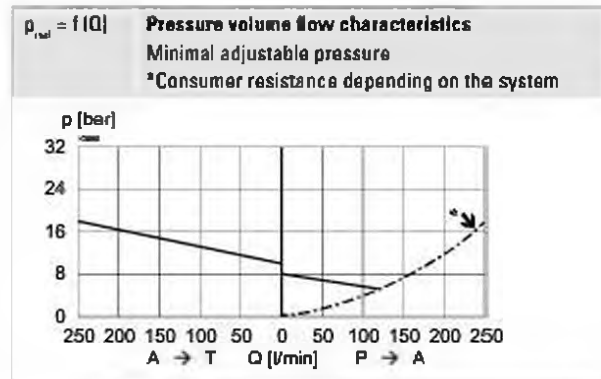
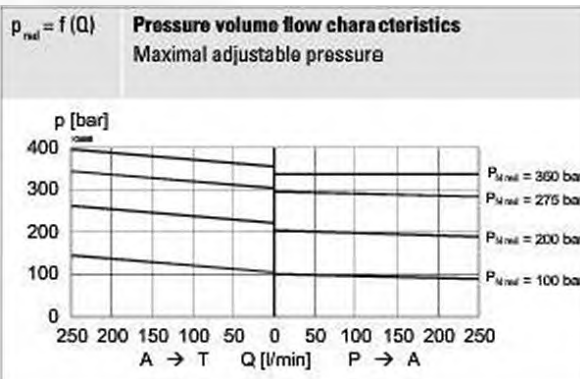
Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1320 \text{ mA}$ ( $U_N = 12\text{VDC}$ ) $I_a = 660 \text{ mA}$ ( $U_N = 24\text{VDC}$ )

**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)


**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400 \text{ bar}$
Nominal pressure range	$P_{N,max} = 100; 200; 275; 350 \text{ bar}$
Volume flow range	$Q = 0 \dots 250 \text{ l/min}$
Leakage oil	See characteristics
Hysteresis	$\leq 5 \%$ at optimal dither signal
Repeatability	$\leq 2 \%$ at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	$12 \text{ mm}^2/\text{s} \dots 320 \text{ mm}^2/\text{s}$
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 $\geq 75$ , see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACCESSORIES**

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2002
Threaded body	Data sheet 2.9-210
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**SURFACE TREATMENT**

- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

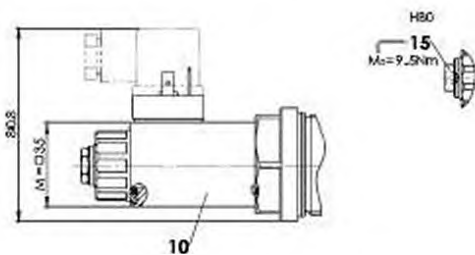
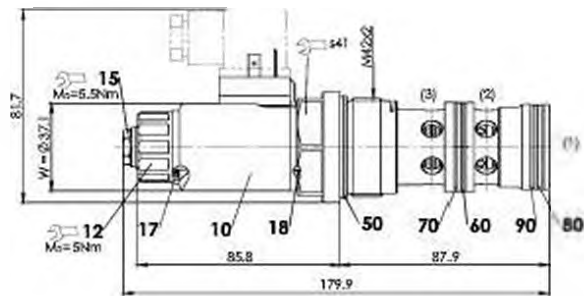
**MANUAL OVERRIDE**

HB4,5

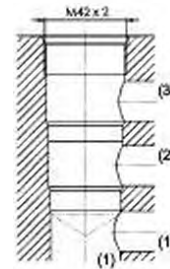
Optionally: Screw plug (HB0), no actuation possible

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-42-04-0-07


**Nota!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1047

**PARTS LIST**

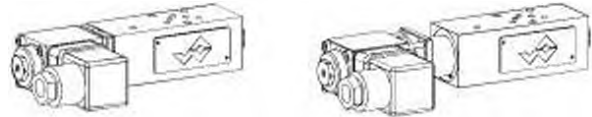
Position	Article	Description
10	206.2...	W.S37 / 19 x 50
	260.5...	M.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000	HB4,5 manual override
	239.2033	H80 Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2377	O-ring ID 37,77 x 2,62 (NBR)
	160.8378	O-ring ID 37,77 x 2,62 (FKM)
60	160.2329	O-ring ID 32,99 x 2,62 (NBR)
	160.6325	O-ring ID 32,99 x 2,62 (FKM)
70	049.3384	Backup ring rd 33,5 x 38 x 1,4
80	160.2314	O-ring ID 31,42 x 2,62 (NBR)
	160.6315	O-ring ID 31,42 x 2,62 (FKM)
90	049.3364	Back-up ring rd 31,5 x 36 x 1,4

**Proportional pressure relief valve**
**Flange- or Sandwich construction**

- ◆ pilot or direct operated
- ◆  $Q_{max} = 8 \text{ l/min}$
- ◆  $p_{o,ad} = 350 \text{ bar}$
- ◆  $p_{N,red,max} = 315 \text{ bar}$

**NG3-Mini**

Wandfluh standard


**DESCRIPTION**

Pilot or direct operated proportional pressure relief valve in flange or sandwich construction. When the operating pressure adjusted by means of the proportional solenoid is reached, the valve opens and connects the protected line with the drain to the tank. These proportional valves are very sensitively adjustable. For flange or sandwich executions with pressure relief in port P, there is a manometer connection. For the control, Wandfluh proportional amplifiers are available (see register 1.13).

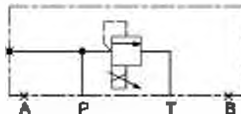
**APPLICATION**

The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**

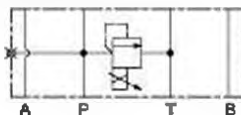
Flange execution

B..FA03-P



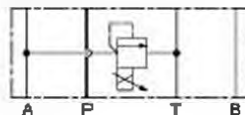
Sandwich execution

B..SA03-P



Sandwich execution

B..SA03-A


**Note!**


- ◆ Direct operated execution drawn
- ◆ All variants are also available pilot operated

Sandwich execution

B..SA03-E



Sandwich execution

B..SA03-AB


**GENERAL SPECIFICATIONS**

Designation	Proportional pressure relief valve
Construction	Pilot or direct operated
Mounting	Flange- or Sandwich construction
Nominal size	NG3-Mini according to Wandfluh standard
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	Without screw-in cartridge 0,65 kg (Flange construction) 0,45 kg (Sandwich construction P) 0,52 kg (Sandwich construction A, B, AB)
MTTFd	150 years

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	PI29V (Data sheet 1.1-90)
Connection	Connector socket EN 175301 – 803

**Note!**


Other specifications, see data sheet of the screw-in cartridges



**TYPE CODE**

Pressure relief valve		B	P	A03	-	-	-	-	#									
Pilot operated	<input type="checkbox"/>	<input checked="" type="checkbox"/>																
Direct operated	<input checked="" type="checkbox"/>	<input type="checkbox"/>																
Proportional																		
Flange construction	<input checked="" type="checkbox"/>	<input type="checkbox"/>																
Sandwich construction	<input type="checkbox"/>	<input checked="" type="checkbox"/>																
Mounting interface according to Wandfluh standard, NBS-Mini																		
Type list / Function	flange construction in P	<input checked="" type="checkbox"/>	sandwich construction in P	<input checked="" type="checkbox"/>	in A	<input type="checkbox"/>	in B	<input type="checkbox"/>	in A and B	<input checked="" type="checkbox"/>								
Nominal pressure range $p_N$	pilot operated	20 bar	<input checked="" type="checkbox"/>	100 bar	<input type="checkbox"/>	200 bar	<input type="checkbox"/>	315 bar	<input type="checkbox"/>	direct operated	20 bar	<input type="checkbox"/>	100 bar	<input type="checkbox"/>	200 bar	<input type="checkbox"/>	315 bar	<input type="checkbox"/>
Nominal voltage $U_N$	12 VDC	<input checked="" type="checkbox"/>	24 VDC	<input type="checkbox"/>														
Sealing material	NBR	<input type="checkbox"/>	FKM (Viton)	<input checked="" type="checkbox"/>														
Design index (subject to change)																		

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Nominal pressure range	<b>Pilot or direct operated</b> $P_N = 20$ bar, 100 bar, 200 bar, 315 bar
Volume flow range	$Q = 0 \dots 8$ l/min
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 $\geq$ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

- Note!**  Detailed performance specifications as well as further hydraulic specifications can be found on the data sheet of the pressure reducing cartridge installed.
- Attention!**  The performance data especially the „pressure-flowcharacteristic,“ on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**VALVES INSTALLED**

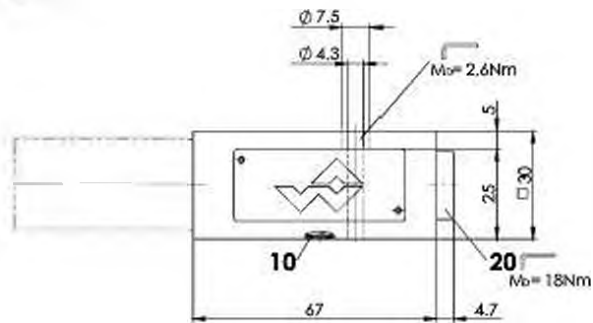
The following screw-in cartridges are used in either the flange body or the sandwich body.

Article	Description	Data sheet no.
BVPPM18	Proportional pressure relief cartridge pilot operated	2.3-510
BDPPM18	Proportional pressure relief cartridge direct operated	2.3-520

**DIMENSIONS**

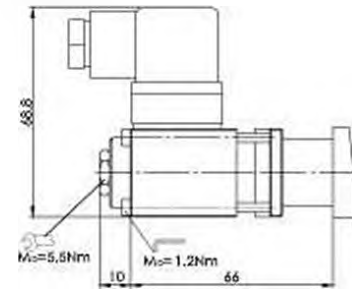
Flange execution

B.PFA03-P



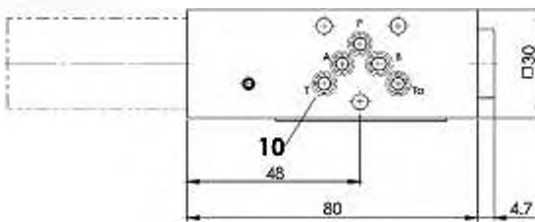
Sandwich execution

BDPSA03-...



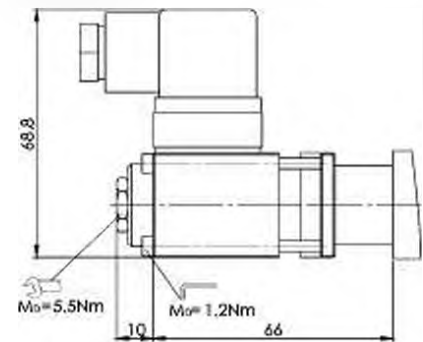
Sandwich execution

B.PSA03-P



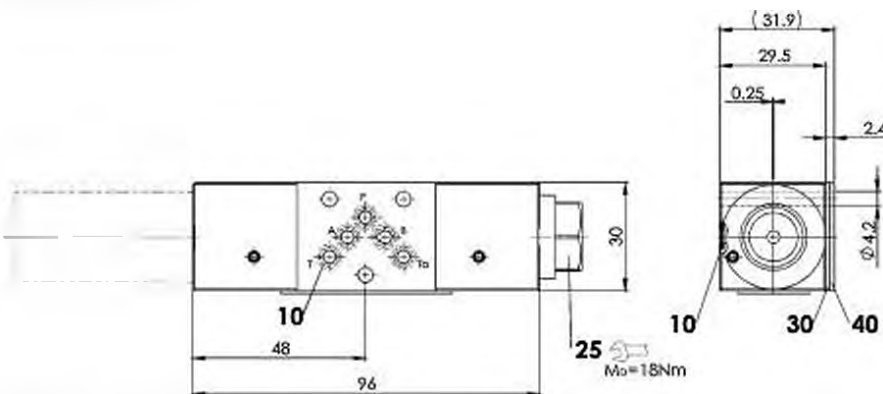
Sandwich execution

BVPSA03-...



Sandwich execution

B.PSA03-A / B / AB

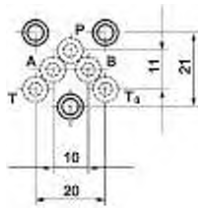


B.PSA03-A: Cartridge on A side

B.PSA03-B: Cartridge on B side

B.PSA03-AB: Cartridge on A and B side



**HYDRAULIC CONNECTION**

**ACCESSORIES**

Proportional amplifier	Register 1.13
Threaded subplates	Data sheet 2.9-05
Multi-station subplates	Data sheet 2.9-45
Module type manifold blocks	Data sheet 2.9-85
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**STANDARDS**

Mounting interface	Wandfluh standard
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**PARTS LIST**

Position	Article	Description
10	160.2045	O-ring ID 4,50 x 1,50 (NBR)
	160.6045	O-ring ID 4,50 x 1,50 (FKM)
20	238.2406	Screw plug VSTI G 1/4"-ED
30	173.0650	Sealing plate PDSA03
40	173.0700	Intermediate plate PZSA03

**SURFACE TREATMENT**

- ◆ The flange body is painted with a two component paint
- ◆ The sandwich bodies are zinc-nickel coated

**SEALING MATERIAL**

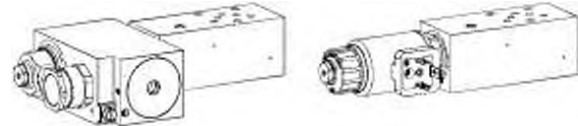
NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

Mounting type	Flange or sandwich mounting 3 fixing holes for socket head screws or studs M4
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 2,6 \text{ Nm}$ (quality 8.8, zinc coated)

**Proportional pressure relief valve**
**Flange- or Sandwich construction**

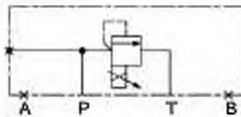
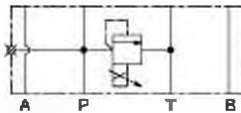
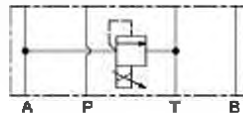
- ◆ pilot or direct operated
- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆  $p_{max} = 400 \text{ bar}$


**NG4-Mini**
**Wandfluh standard**

**DESCRIPTION**

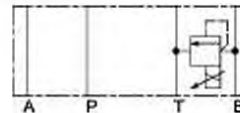
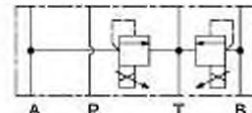
Pilot or direct operated proportional pressure relief valve in flange or sandwich construction. When the operating pressure adjusted by means of the proportional solenoid is reached, the valve opens and connects the protected line with the drain to the tank. The back pressure in T influences the pressure in the secured oil line. These proportional valves are very sensitively adjustable. For flange or sandwich executions with pressure relief in port P, there is a manometer connection. For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

These valves are used in hydraulic systems where the pressure has to be changed frequently. The electrical remote control in conjunction with process controls allows economical solutions with repeatable processes. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**
**Flange execution**
**B..FA04-P**

**Sandwich execution**
**B..SA04-P**

**Sandwich execution**
**B..SA04-A**

**Nota!**


- ◆ Direct operated execution drawn
- ◆ All variants are also available pilot operated

**Sandwich execution**
**B..SA04-B**

**Sandwich execution**
**B..SA04-AB**

**GENERAL SPECIFICATIONS**

Designation	Proportional pressure relief valve
Construction	Pilot or direct operated
Mounting	Flange- or Sandwich construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	Without screw-in cartridge 1,15 kg (Flange construction) 0,96 kg (Sandwich construction P, A, B) 1,24 kg (Sandwich construction AB)
MTTFd	150 years

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
-----------	--

**Nota!**


Other specifications, see data sheet of the screw-in cartridges

**TYPE CODE**



Pressure relief valve		B			AD4	-		-		#
Direct operated	<input type="checkbox"/>	<input type="checkbox"/>								
Pilot operated	<input type="checkbox"/>	<input type="checkbox"/>								
Proportional	<input type="checkbox"/>	<input type="checkbox"/>								
Proportional Ex-protection	<input type="checkbox"/>	<input type="checkbox"/>								
Flange construction	<input type="checkbox"/>	<input type="checkbox"/>								
Sandwich construction	<input type="checkbox"/>	<input type="checkbox"/>								
Mounting interface according to Wandfluh standard, NG4-Mini										
Type list / Function	flange construction in P	<input type="checkbox"/>	sandwich construction in P	<input type="checkbox"/>	in A	<input type="checkbox"/>	in B	<input type="checkbox"/>	in A and B	<input type="checkbox"/>
Nominal pressure range $p_N$ , Nominal voltage $U_N$ , etc. of the built-in screw-in cartridge										
Design index (subject to change)										

1.3-173

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 400$ bar
Nominal pressure range	$P_N =$ see data sheet of the screw-in cartridges
Volume flow range	$Q = 0 \dots 20$ l/min
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

- Note!**  Detailed performance specifications as well as further hydraulic specifications can be found on the data sheet of the pressure reducing cartridge installed.
- Attention!**  The performance data especially the „pressure-flowcharacteristic.. on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**VALVES INSTALLED**

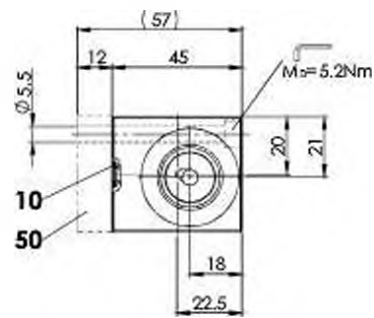
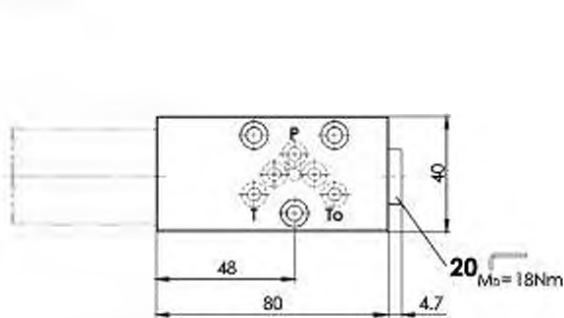
The following screw-in cartridges are used in either the flange body or the sandwich body.

Article	Description	Data sheet no.
BVIPM22	Proportional pressure relief cartridge pilot operated, inverse	2.3-528
BVPPM22	Proportional pressure relief cartridge pilot operated	2.3-529
BVBPM22	Proportional pressure relief cartridge pilot operated, Ex-protection Ex d	2.3-536
BVPPM22-./ME	Proportional pressure relief cartridge pilot operated, with integrated electronics	2.3-537
BDPPM22	Proportional pressure relief cartridge direct operated	2.3-539
BDBPM22	Proportional pressure relief cartridge direct operated, Ex-protection Ex d	2.3-547
BDIPM22	Proportional pressure relief cartridge direct operated, inverse	2.3-548
BDPPM22-./ME	Proportional pressure relief cartridge direct operated, with integrated electronics	2.3-561
BDIPM22-./ME	Proportional pressure relief cartridge direct operated, inverse, with integr. electronics	2.3-562

**DIMENSIONS**

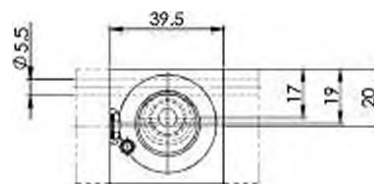
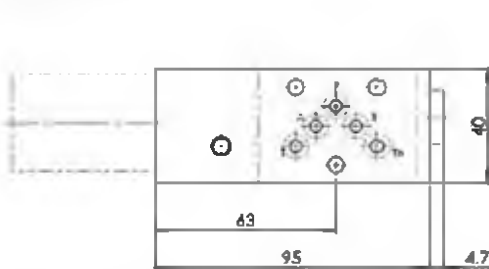
Flange execution

B..FA04-P



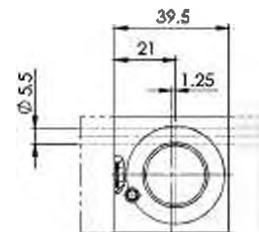
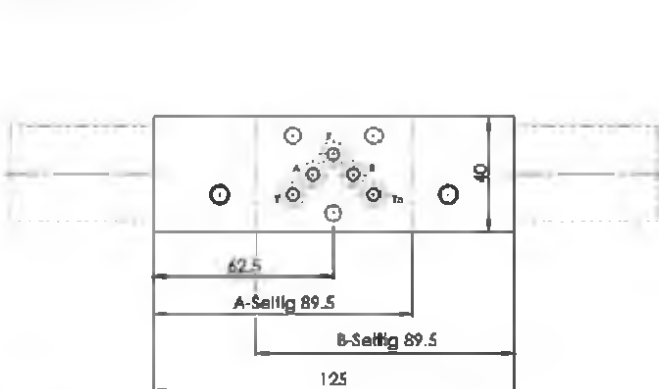
Sandwich execution

B..SA04-P

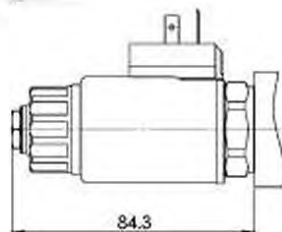


Sandwich execution

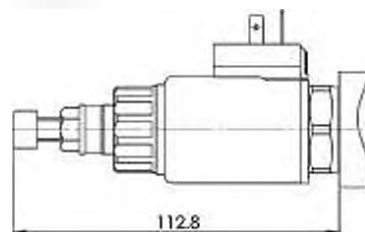
B..SA04-A / B / AB



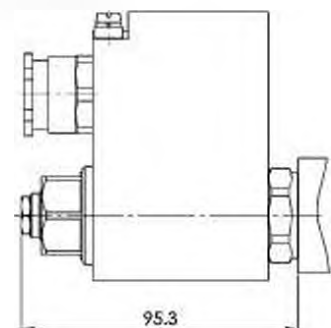
B.PSA04



B.ISA04



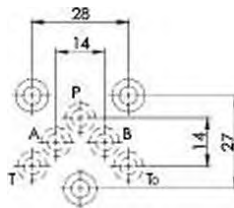
B.BSA04



**Note!**



The distance plate BDP4 / ... (pos. 50) has to be ordered separately for the ex-protection solenoid

**HYDRAULIC CONNECTION**

**ACCESSORIES**

Proportional amplifier	Register 1.13
Threaded subplates	Data sheet 2.9-10
Multi-station subplates	Data sheet 2.9-50
Module type manifold blocks	Data sheet 2.9-90
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**STANDARDS**

Mounting interface	Wandfluh standard
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**PARTS LIST**

Position	Article	Description
10	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)
20	238.2406	Screw plug VSTI G 1/4"-ED
50	173.1450	Distance plate BDP4 / 12 (h = 12 mm)
	173.1451	Distance plate BDP4 / 20 (h = 20 mm)

**SURFACE TREATMENT**

- ◆ The flange body is painted with a two component paint
- ◆ The sandwich bodies are zinc-nickel coated

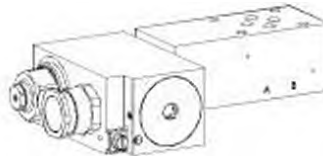
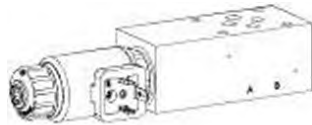
**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

Mounting type	Flange or sandwich mounting 3 fixing holes for socket head screws or studs M5
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (quality 8.8, zinc coated) Screw-in cartridge $M_0 = 60 \text{ Nm}$

**Proportional pressure relief valve  
 Flange and sandwich construction**

 •  $p_{max} = 400 \text{ bar}$ 
**NG6**  
 ISO 4401-03

**DESCRIPTION**

Pilot and direct operated proportional pressure relief valves NG6. Flange and sandwich construction according to ISO 4401-03 with 4 ports. Incorporated are proportional pressure relief cartridges size M22x1.5 according to ISO 7789. The flange and sandwich bodies made of steel are phosphalized.

**FUNCTION**

By adjusting the electric current to the proportional solenoid the operating pressure in hydraulic systems is limited by relieving the fluid from the protected lines P, A, B or A and B to the return / tank line T. Back pressure in T influences the pressure in the relieved pressure lines. This proportional pressure relief valves are adjustable very sensitively. To control the valve proportional amplifiers are available from Wandfluh (see register 1.13).

**APPLICATION**

The valves have their applications in hydraulic systems in which the pressure frequently has to be changed. The facility for remote control and signal processing from process control systems enable economical solutions to problems with repeatable sequences.

**TYPE CODE**

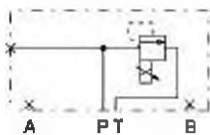
		B	<input type="checkbox"/>	A06	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Pressure relief valve										
2nd and 3rd digit position of the designation of the built-in cartridge										
Flange construction <input type="checkbox"/> F										
Sandwich construction <input type="checkbox"/> S										
International standard interface ISO, NG6										
Type list / Function	flange construction		sandwich construction							
	in P <input type="checkbox"/> P		in P <input type="checkbox"/> P		in A <input type="checkbox"/> A		in B <input type="checkbox"/> B		in A and B <input type="checkbox"/> AB	
Nominal pressure range, nominal voltage, etc., of the built-in cartridge										
Design-Index (Subject to change)										

Examples: B V P F A06 - P - 20 - G24 / WD - HB4,5  
 B D B S A06 - A - 100 - G12 / L15  
 B N I S A06 - B - 200 - G24 / KD - D1  
 B V P S A06 - AB - 350 - G12 / ME A1 R1

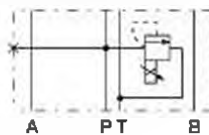
**TYPE LIST / FUNCTION**

Flange construction:

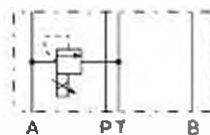
Sandwich construction:



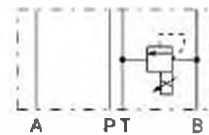
B..FA06-P



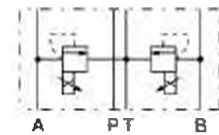
B..SA06-P



B..SA06-A



B..SA06-B



B..SA06-AB

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.	$Q_{max}^*$
BVPPM22	pilot operated	2.3-529	60 l/min
BNIPM22	pilot operated, inverse	2.3-533	60 l/min
BVBPM22	pilot operated, explosion proof Ex d	2.3-536	60 l/min
BVPPM22-.../ME	pilot operated, with integrated electronics	2.3-537	60 l/min
BDPPM22	direct operated	2.3-538	25 l/min
BDIPM22	direct operated, inverse	2.3-548	20 l/min
BDBPM22	direct operated, explosion proof Ex d	2.3-547	25 l/min
BDPPM22-.../ME	direct operated, with integrated electronics	2.3-581	25 l/min
BDIPM22-.../ME	direct operated, inverse, with integrated electronics	2.3-582	20 l/min

\* Can deviate from the values on the data sheets of the screw-in cartridges.

**GENERAL SPECIFICATIONS**

Description	Pilot and direct operated proportional pressure relief valve	
Nominal size	NG6 according to ISO 4401-03	
Constructions	Flange or sandwich	
Operations	Proportional solenoid	
Mounting	4 fixing holes for socket head cap screws M5 or studs M5	
Connections	Threaded connection plates Multi-flange subplates Longitudinal stacking system	
Weight:	• Flange type	m = 1,43 kg
(without screw-in cartridge)	• Sandwich type P, A, B	m = 1,18 kg
	• Sandwich type AB	m = 1,58 kg


**REMARK!**

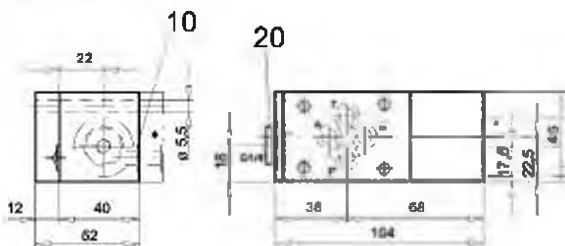
Detailed performance data and additional hydraulic and electric specifications may be drawn from the data sheets of the corresponding installed screw-in cartridge.


**CAUTION!**

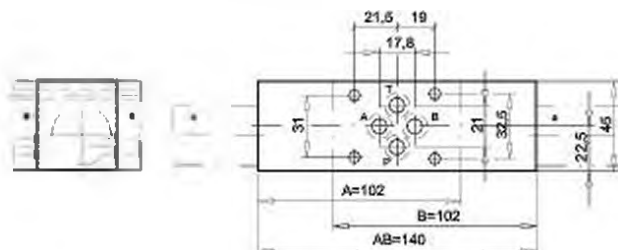
The performance data especially the „pressure-flow-characteristic., on the data sheets of the screw-in cartridges refers to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**DIMENSIONS**

Flange construction



Sandwich construction in A, B or AB



Sandwich construction in P



• The envelop dimensions of the screw-in cartridge are shown on their corresponding data sheets.

• Distance plate ADP6/... must be ordered separately.

**PARTS LIST**

Position	Article	Description
10	160.2093	O-ring ID 9,25 x 1,78 (NBR)
20	238.2406	Plug VSTI G1/4"-ED

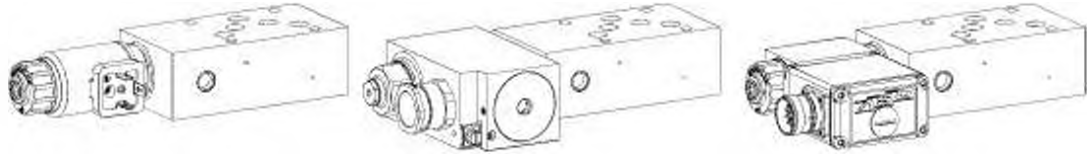
**ACCESSORIES**

Proportional amplifier	register 1.13
Distance plate ADP6/12 (12 mm)	art. no. 173.3451
Distance plate ADP6/30 (30 mm)	art. no. 173.3453
Distance plate ADP6/46 (46 mm)	art. no. 173.3454
Distance plate ADP6/87 (87 mm)	art. no. 173.3461

Technical explanation see data sheet 1.0-100

**Proportional pressure relief valve  
 Flange and sandwich construction**

 •  $p_{max}$  = 400 bar

**NG10**  
 ISO 4401-05

**DESCRIPTION**

Pilot operated proportional pressure relief valves NG10. Flange and sandwich construction according to ISO 4401-05 with 4 ports. Incorporated are proportional pressure relief cartridges size M22x1.5 according to ISO 7789. The flange and sandwich bodies made of steel are phosphalized.

**FUNCTION**

By adjusting the electric current to the proportional solenoid the operating pressure in hydraulic systems is limited by relieving the fluid from the protected lines P, A, B or A and B to the return / tank line T. Back pressure in T influences the pressure in the relieved pressure lines. This proportional pressure relief valves are adjustable very sensitively. To control the valve proportional amplifiers are available from Wandfluh (see register 1.13).

**APPLICATION**

The valves have their applications in hydraulic systems in which the pressure frequently has to be changed. The facility for remote control and signal processing from process control systems enable economical solutions to problems with repeatable sequences.

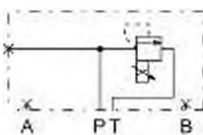
**TYPE CODE**

		B	<input type="checkbox"/>	A10	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Pressure relief valve										
2nd and 3rd digit position of the designation of the built-in cartridge										
Flange construction <b>F</b>										
Sandwich construction <b>S</b>										
International standard interface ISO, NG10										
Type list / Function	flange construction		sandwich construction							
	in P		in P		in A		in B		in A and B	
	<b>JP</b>		<b>P</b>		<b>A</b>		<b>B</b>		<b>AB</b>	
Nominal pressure range, nominal voltage, etc., of the built-in cartridge										
Design-Index (Subject to change)										

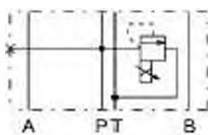
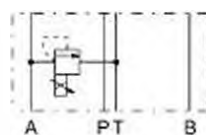
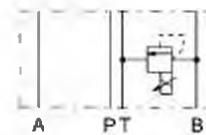
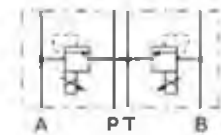
Examples: B V P F A10 - P - 20 - G24 / WD - HB4,5  
 B D B S A10 - A - 100 - G12 / L15  
 B N I S A10 - B - 200 - G24 / KD - D1  
 B V P S A10 - AB - 350 - G12 / ME A1 R1

**TYPE LIST / FUNCTION**

Flange construction:


**BV.FA10-P**

Sandwich construction:


**BV.SA10 - P**

**BV.SA10 - A**

**BV.SA10 - B**

**BV.SA10 - AB**



**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.	Q <sub>max</sub> *
BVPPM22	pilot operated	2.3-529	100 l/min
BNIPM22	pilot operated, inverse	2.3-533	100 l/min
BVBPM22	pilot operated, explosion proof Ex d	2.3-536	100 l/min
BVPPM22-..ME	pilot operated, with integrated electronics	2.3-537	100 l/min
BDPPM22	direct operated	2.3-539	25 l/min
BDBPM22	direct operated, explosion proof Ex d	2.3-547	25 l/min
BDPPM22-..ME	direct operated, with integrated electronics	2.3-581	25 l/min

\* Can deviate from the values on the data sheets of the screw-in cartridges.

**GENERAL SPECIFICATIONS**

Description	Pilot operated proportional pressure relief valve NG10 according to ISO 4401-05	
Nominal size	Flange or sandwich	
Constructions	Proportional solenoid	
Operations	4 fixing holes for socket head cap screws M6 or studs M6	
Mounting	Threaded connection plates Multi-flange subplates Longitudinal stacking system	
Connections	<ul style="list-style-type: none"> <li>• Flange type m = 2,34 kg</li> <li>• Sandwich type P, A, B m = 1,70 kg</li> <li>• Sandwich type AB m = 1,94 kg</li> </ul>	
Weight: (without screw-in cartridge)		


**REMARK!**

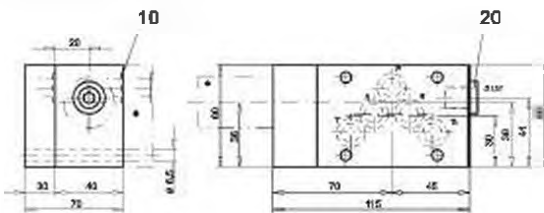
Detailed performance data and additional hydraulic and electric specifications may be drawn from the data sheets of the corresponding installed screw-in cartridge.


**CAUTION!**

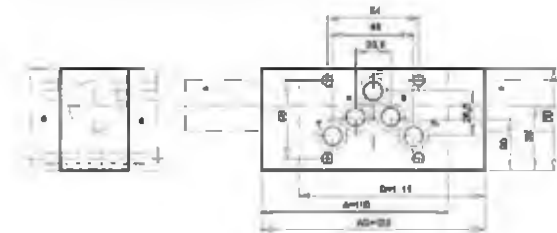
The performance data especially the „pressure-flow-characteristic“, on the data sheets of the screw-in cartridges refers to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**DIMENSIONS**

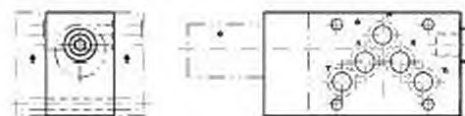
Flange construction



Sandwich construction in A, B or AB



Sandwich construction in P



• The envelop dimensions of the screw-in cartridge are shown on their corresponding data sheets.

♦ Distance plate ADP10/... must be ordered separately.

**PARTS LIST**

Position	Article	Description
10	160.2140	O-ring ID 14,00 x 1,78 (NBR)
20	238.2408	Plug VSTI G1/4"-ED

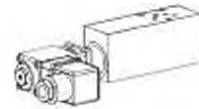
**ACCESSORIES**

Proportional amplifier	register 1.13
Distance plate ADP10/29,5 (29,5 mm)	art. no. 173.4456

Technical explanation see data sheet 1.0-100

**Proportional pressure reducing valve**
**Flange and sandwich construction**

- Pilot operated
- $Q_{max} = 8 \text{ l/min}$
- $p_{max} = 315 \text{ bar}$

**NG3-Mini<sup>20</sup>**

**DESCRIPTION**

Pilot operated proportional pressure reducing valves NG3-Mini. Flange and sandwich construction according to Wandfluh standard with 4 ports. Incorporated are proportional pressure reducing cartridges size M18x1,5 according to Wandfluh standard. Adjustment by Wandfluh proportional solenoids (Standard VDE 0580). The flange body and the sandwich plates made of steel are painted or zinc-nickel coated.

**FUNCTION**

By adjusting the electric current to the proportional solenoid the pressure in the controlled port will be changed proportionally to the solenoid current. A pressure rise in the controlled port above the adjusted value, caused e.g. by an active oil consumer, will be prevented by relieving excessive flow to the tank line T. This proportional pressure reducing valves are adjustable very sensitively. To control the valve proportional amplifiers are available from Wandfluh (see register 1.13).

**APPLICATION**

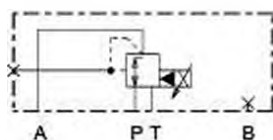
The valves have their applications in hydraulic systems in which the pressure in a consumer has to remain constant at the adjusted value independently of pressure fluctuations on the supply side. The facility for remote control and signal processing from process control systems enable economical solutions to problems with repeatable sequences. NG3-Mini valves are used where both, reduced dimensions and weight are important.

**TYPE CODE**

				M	V	P	<input type="checkbox"/>	A03	-	<input type="checkbox"/>	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Pressure reducing valve																
Pilot operated																
Proportional																
Flange construction			F													
Sandwich construction			S													
Mounting interface acc. to Wandfluh standard, NG3-Mini																
Type list / Function	flange construction from P → A		P/A													
Nominal pressure range $p_{x,red}$	20 bar		20													
	100 bar		100													
	200 bar		200													
	315 bar		315													
Nominal voltage $U_n$	12 VDC		G12													
	24 VDC		G24													
Design-Index (Subject to change)																

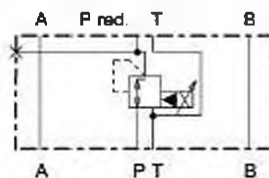
**TYPE LIST / FUNCTION**

Flange construction:

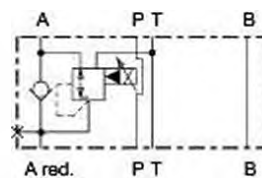


MVPFA03-P/A

Sandwich construction:



MVPSA03 - P



MVPSA03 - A

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.
MVPPM18	Pressure reducing valve • pilot operated, proportional	2.3-610

**GENERAL SPECIFICATIONS**

Description	Pilot operated proportional pressure reducing valve	
Nominal size	NG3-Mini according to Wandfluh standard	
Constructions	Flange or sandwich	
Operations	Proportional solenoid	
Mounting	3 fixing holes for socket head cap screws M4 or studs M4	
Connections	Threaded connection plates Multi-flange subplates Longitudinal stacking system	
Ambient temperature	-20...50 °C	
Mounting position	any	
Weight:	• Flange type	m = 0,14 kg
(without screw-in cartridge)	• Sandwich type P	m = 0,19 kg
	• Sandwich type A	m = 0,26 kg

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade B 6...10≥75) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	p <sub>max</sub> = 315 bar
Volume flow range	Q = 0...8 l/min


**REMARK!**

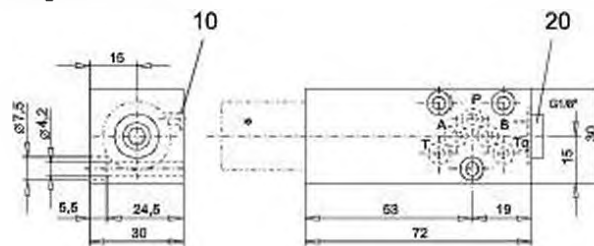
Detailed performance data and additional hydraulic and electric specifications may be drawn from the data sheets of the corresponding installed pressure reducing cartridge.


**CAUTION!**

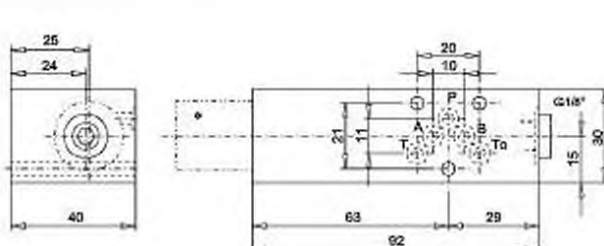
The performance data especially the „pressure-flow-characteristic“, on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**DIMENSIONS**

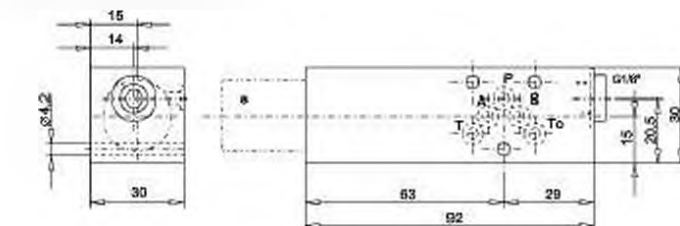
Flange construction



Sandwich construction in A



Sandwich construction in P



• The envelop dimensions of the screw-in cartridge are shown on their corresponding data sheets.

**PARTS LIST**

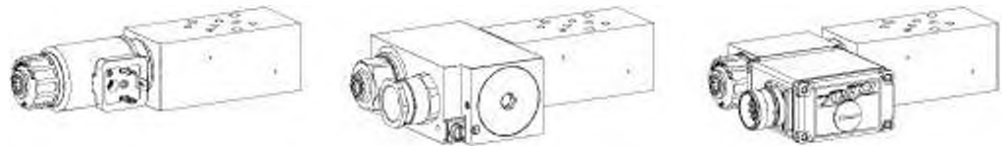
Position	Article	Description
10	160.2045	O-ring ID 4,5 x 1,5 (NBR)
20	238.1405	Plug VSTI G1/8"-ED

**ACCESSORIES**

Proportional amplifier	register 1.13
------------------------	---------------

Technical explanation see data sheet 1.0-100

**Proportional pressure reducing valve  
 Flange and sandwich construction**

 •  $p_{max} = 400 \text{ bar}$ 
**NG4-Mini<sup>®</sup>**

**DESCRIPTION**

Pilot operated proportional pressure reducing valves NG4-Mini. Flange and sandwich construction according to Wandfluh standard with 4 ports. Incorporated are proportional pressure relief cartridges size M22x1,5 according to ISO 7789. The steel bodies for flange constructions are painted with a two component painting and the bodies for sandwich constructions are phosphatized.

**FUNCTION**

By adjusting the electric current to the proportional solenoid the pressure in the controlled port will be changed proportionally to the solenoid current. A pressure rise in the controlled port above the adjusted value, caused e.g. by an active oil consumer, will be prevented by relieving excessive flow to the tank line T. This proportional pressure reducing valves are adjustable very sensitively. To control the valve proportional amplifiers are available from Wandfluh (see register 1.13).

**APPLICATION**

The valves have their applications in hydraulic systems in which the pressure in a consumer has to remain constant at the adjusted value independently of pressure fluctuations on the supply side. The facility for remote control and signal processing from process control systems enable economical solutions to problems with repeatable sequences. NG4-Mini valves are used where both, reduced dimensions and weight are important.

**TYPE CODE**

M		<input type="checkbox"/>	A04	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Pressure reducing valve									
2nd and 3rd digit position of the designation of the built-in cartridge									
Flange construction	F								
Sandwich construction	S								
Mounting interface acc. to Wandfluh standard, NG4-Mini									
Type list / Function	flange construction	sandwich construction							
	P → A	P/A	in P	P					
			in A	A					
			in B	B					
Nominal pressure range, nominal voltage, etc., of the built-in cartridge									
Design-Index (Subject to change)									

Examples: M VP FA04 - P/A - 100 - G24 / WD - D1  
 M VB SA04 - A - 200 - G12 / L15 / IN  
 M QP SA04 - B - 350 - G24 / MEA1 - HB0

**GENERAL SPECIFICATIONS**

Description	Pilot operated proportional pressure reducing valve	
Nominal size	NG4-Mini according to Wandfluh standard	
Constructions	Flange or sandwich	
Operations	Proportional solenoid	
Mounting	3 fixing holes for socket head cap screws M5 or studs M5	
Connections	Threaded connection plates Multi-flange subplates Longitudinal stacking system	
Weight:	• Flange type	m = 1,23 kg
(without screw-in cartridge)	• Sandwich type	m = 1,24 kg

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.	$Q_{max}^*$
MVPPM22	pilot operated	2.3-629	20 l/min
MQPPM22	pilot operated from connection P	2.3-641	20 l/min
MVBPM22	pilot operated, explosion proof Ex d	2.3-635	20 l/min
MVPPM22-.../ME	pilot operated, with integrated electronics	2.3-632	20 l/min
MQPPM22-.../ME	pilot operated from connection P, with integrated electronics	2.3-643	20 l/min


**REMARK!**

Detailed performance data and additional hydraulic and electric specifications may be drawn from the data sheets of the corresponding installed screw-in cartridge.


**CAUTION!**

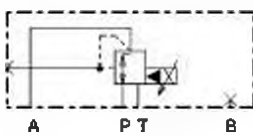
The performance data especially the „pressure-flow-characteristic.. on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

\* Can deviate from the value on the data sheets of the screw-in cartridges.  
 \*\* Do not use anymore for new applications.

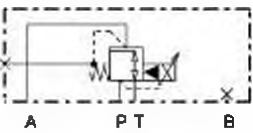
**TYPE LIST / FUNCTION**

Flange construction:

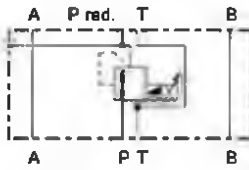
Sandwich construction:



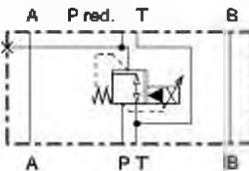
MV.FA04-P/A



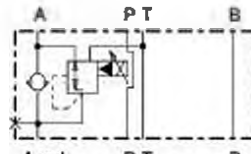
MQ.FA04-P/A



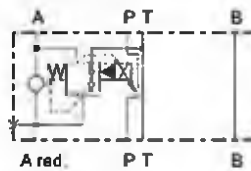
MV.SA04-P



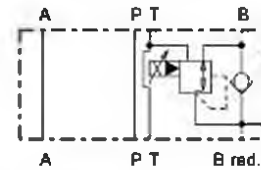
MQ.SA04-P



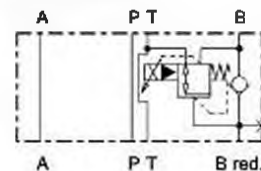
MV.SA04-A



MQ.SA04-A



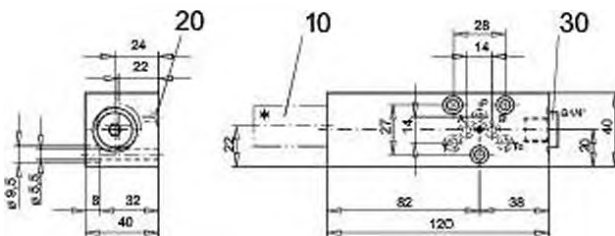
MV.SA04-B



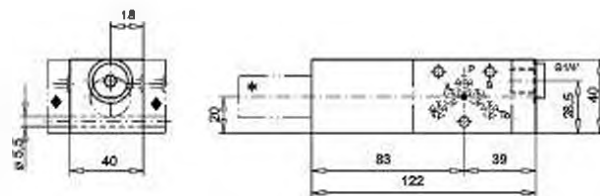
MQ.SA04-B

**DIMENSIONS**

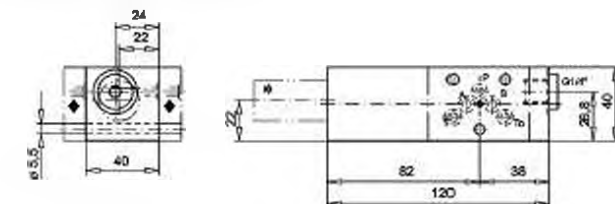
Flange construction



Sandwich construction in A or B



Sandwich construction in P



For sandwich red. pressure in B cartridge is located on B-side.

• The envelop dimensions of the screw-in cartridge are shown on their corresponding data sheets.

• Distance plate BDP4/... must be ordered separately.

**PARTS LIST**

Position	Article	Description
10	617.3 ...	Screw-in cartridge
20	180.2052	O-ring ID 5,28x1,78
30	238.2406	Plug VSTI G1/4"-ED (only flange and sandwich type in P)

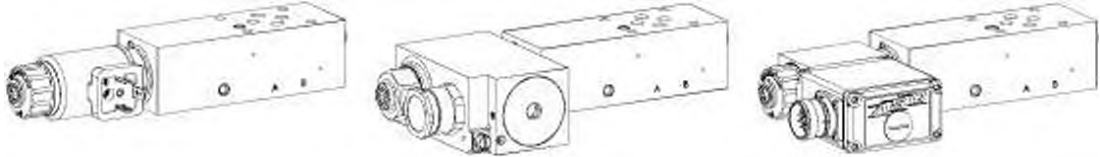
**ACCESSORIES**

Proportional amplifier register 1.13

Distance plate BDP4/12 (12 mm) art. no. 173.1450  
 Distance plate BDP4/20 (20 mm) art. no. 173.1451  
 Distance plate BDP4/30 (30 mm) art. no. 173.1452

Technical explanation see data sheet 1.0-100

**Proportional pressure reducing valve  
 Flange and sandwich construction**

 •  $p_{max} = 400 \text{ bar}$ 
**NG6**  
 ISO 4401-03

**DESCRIPTION**

Pilot operated proportional pressure reducing valves NG6. Flange and sandwich construction according to ISO 4401-03 with 4 ports. Incorporated are proportional pressure reducing cartridges size M22x1,5 according to ISO 7789. The steel bodies for flange constructions are painted with a two component painting and the bodies for sandwich constructions are phosphatized.

**FUNCTION**

By adjusting the electric current to the proportional solenoid the pressure in the controlled port will be changed proportionally to the solenoid current. A pressure rise in the controlled port above the adjusted value, caused e.g. by an active oil consumer, will be prevented by relieving excessive flow to the tank line T. This proportional pressure reducing valves are adjustable very sensitively. To control the valve proportional amplifiers are available from Wandfluh (see register 1.13).

**APPLICATION**

The valves have their applications in hydraulic systems in which the pressure in a consumer has to remain constant at the adjusted value independently of pressure fluctuations on the supply side. The facility for remote control and signal processing from process control systems enable economical solutions to problems with repeatable sequences.

**TYPE CODE**

M		<input type="checkbox"/>	A06	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Pressure reducing valve									
2nd and 3rd digit position of the designation of the built-in cartridge									
Flange construction		E							
Sandwich construction		S							
International standard interface ISO, NG6									
Type list / Function		flange construction			sandwich construction				
P → A		P/A			in P		P		
					in A		A		
					in B		B		
Nominal pressure range, nominal voltage, etc., of the built-in cartridge									
Design-Index (Subject to change)									

Examples: M V P F A06 - P/A - 100 - G24 / WD - D1  
 M V B S A06 - A - 200 - G12 / L15 / IN  
 M Q P S A06 - B - 350 - G24 / MEA1 - HB0

**GENERAL SPECIFICATIONS**

Description	Pilot operated proportional pressure reducing valve
Nominal size	NG6 according to ISO 4401-03
Constructions	Flange or sandwich
Operations	Proportional solenoid
Mounting	4 fixing holes for socket head cap screws M5 or studs M5
Connections	Threaded connection plates Multi-flange subplates Longitudinal stacking system
Weight:	• Flange type m = 1,64 kg
(without screw-in cartridge)	• Sandwich type P m = 1,41 kg
	• Sandwich type A, B m = 1,78 kg

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.	$Q_{max}^*$
MVPPM22	pilot operated	2.3-629	60 l/min
MQPPM22	pilot operated from connection P	2.3-641	40 l/min
MVBPM22	pilot operated, explosion proof Ex d	2.3-635	60 l/min
MVPPM22-.../ME	pilot operated, with integr. electronics	2.3-632	60 l/min
MQPPM22-.../ME	pilot operated from connection P, with integrated electronics	2.3-643	40 l/min


**REMARK!**

Detailed performance data and additional hydraulic and electric specifications may be drawn from the data sheets of the corresponding installed screw-in cartridge.


**CAUTION!**

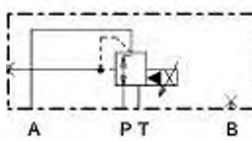
The performance data especially the «pressure-flow-characteristic» on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

\* Can deviate from the values on the data sheets of the screw-in cartridges.  
 \*\* Do not use anymore for new applications

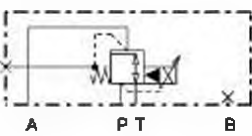
**TYPE LIST / FUNCTION**

Flange construction:

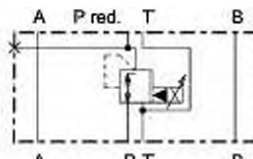
Sandwich construction:



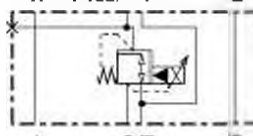
MV.FA06-P/A



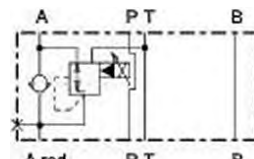
MQ.FA06-P/A



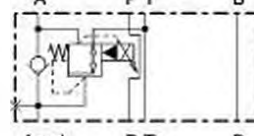
MV.SA06-P



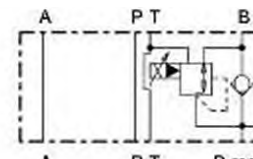
MQ.SA06-P



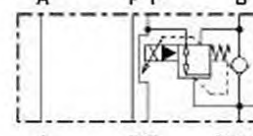
MV.SA06-A



MQ.SA06-A



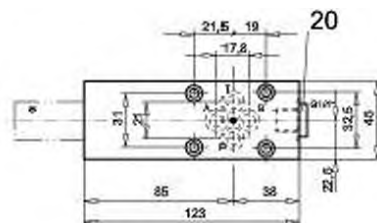
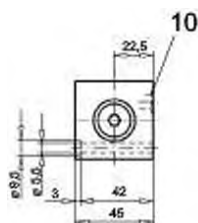
MV.SA06-B



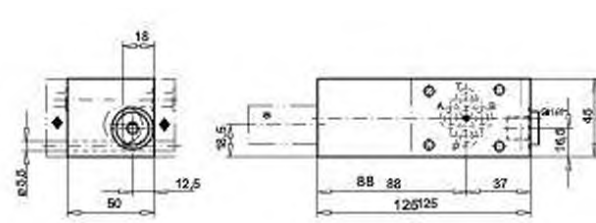
MQ.SA06-B

**DIMENSIONS**

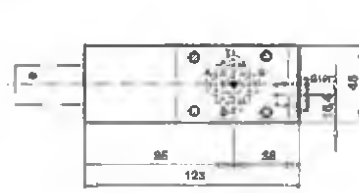
Flange construction



Sandwich construction in A or B



Sandwich construction in P



For sandwich red. pressure in B cartridge is located on B-side.

- The envelop dimensions of the screw-in cartridge are shown on their corresponding data sheets.
- Distance plate ADP6/... must be ordered separately.

**PARTS LIST**

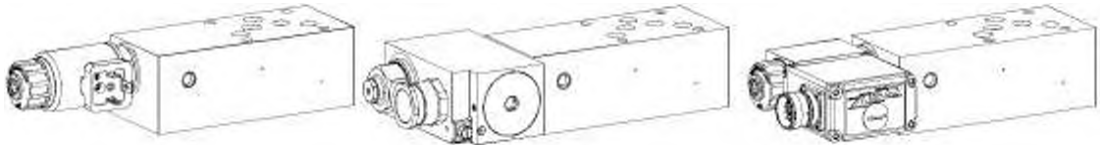
Position	Article	Description
10	160.2093	O-ring ID 9,25 x 1,78 (NBR)
20	238.2406	Plug VSTI G1/4"-ED

**ACCESSORIES**

Proportional amplifier	register 1.13
Distance plate ADP6/12 (12 mm)	art. no. 173.3451
Distance plate ADP6/30 (30 mm)	art. no. 173.3453
Distance plate ADP6/46 (46 mm)	art. no. 173.3454
Distance plate ADP6/87 (87 mm)	art. no. 173.3461

Technical explanation see data sheet 1.0-100

**Proportional pressure reducing valve  
 Flange and sandwich construction**

 •  $p_{max} = 400 \text{ bar}$ 
**NG10**  
 ISO 4401-05

**DESCRIPTION**

Pilot operated proportional pressure reducing valves NG10. Flange and sandwich construction according to ISO 4401-05 with 4 ports. Incorporated are proportional pressure reducing cartridges size M22x1,5 according to ISO 7789. The steel bodies for flange constructions are painted with a two component painting and the bodies for sandwich constructions are phosphatized.

**FUNCTION**

By adjusting the electric current to the proportional solenoid the pressure in the controlled port will be changed proportionally to the solenoid current. A pressure rise in the controlled port above the adjusted value, caused e.g. by an active oil consumer, will be prevented by relieving excessive flow to the tank line T. This proportional pressure reducing valves are adjustable very sensitively. To control the valve proportional amplifiers are available from Wandfluh (see register 1.13).

**APPLICATION**

The valves have their applications in hydraulic systems in which the pressure in a consumer has to remain constant at the adjusted value independently of pressure fluctuations on the supply side. The facility for remote control and signal processing from process control systems enable economical solutions to problems with repeatable sequences.

**TYPE CODE**

M		<input type="checkbox"/>	A10	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Pressure reducing valve									
2nd and 3rd digit position of the designation of the built-in cartridge									
Flange construction		E							
Sandwich construction		S							
International standard interface ISO, NG10									
Type list / Function									
flange construction		P/A			sandwich construction				
P → A					in P		P		
					in A		A		
					in B		B		
Nominal pressure range, nominal voltage, etc., of the built-in cartridge									
Design-Index (Subject to change)									

Examples: MVP FA10-P/A-100-G24 / WD-D1  
 MVB SA10-A-200-G12 / L15 / IN  
 MQP SA10-B-350-G24 / MEA1-HB0

**GENERAL SPECIFICATIONS**

Description	Pilot operated proportional pressure reducing valve	
Nominal size	NG10 according to ISO 4401-05	
Constructions	Flange or sandwich	
Operations	Proportional solenoid	
Mounting	4 fixing holes for socket head cap screws M6 or studs M6	
Connections	Threaded connection plates Multi-flange subplates Longitudinal stacking system	
Weight:	• Flange type	m = 1,80 kg
(without screw-in cartridge)	• Sandwich type	m = 2,72 kg



**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.	$Q_{max}^*$
MVPPM22	pilot operated	2.3-629	60 l/min
MQPPM22	pilot operated from connection P	2.3-641	40 l/min
MVBP22	pilot operated, explosion proof Ex d	2.3-635	60 l/min
MVVPM22	pilot operated, with integrated electronics	2.3-632	60 l/min
MQVPM22	pilot operated from connection P, with integrated electronics	2.3-643	40 l/min


**REMARK!**

Detailed performance data and additional hydraulic and electric specifications may be drawn from the data sheets of the corresponding installed screw-in cartridge.


**CAUTION!**

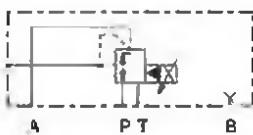
The performance data especially the „pressure-flow-characteristic„ on the data sheets of the screw-in cartridges refers to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

\* Can deviate from the values on the data sheets of the screw-in cartridges. \*\* Do not use anymore for new applications.

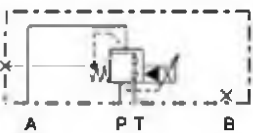
**TYPE LIST / FUNCTION**

Flange construction:

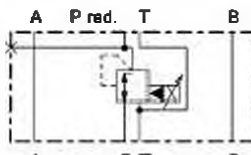
Sandwich construction:



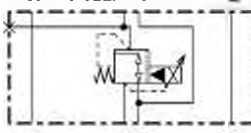
MV.FA10-P/A



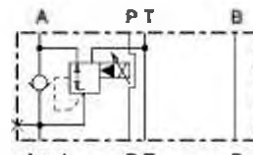
MQ.FA10-P/A



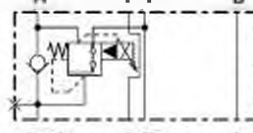
MV.SA10-P



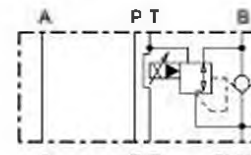
MQ.SA10-P



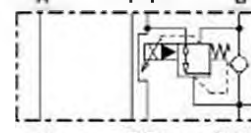
MV.SA10-A



MQ.SA10-A



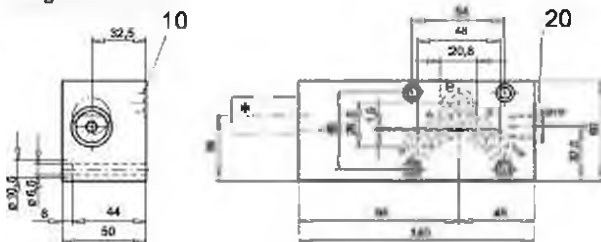
MV.SA10-B



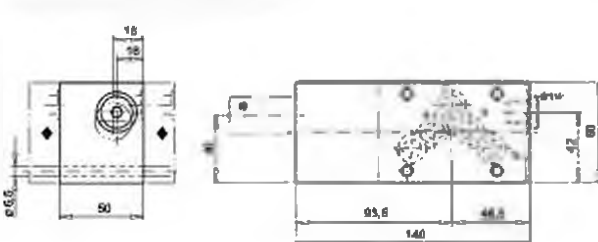
MQ.SA10-B

**DIMENSIONS**

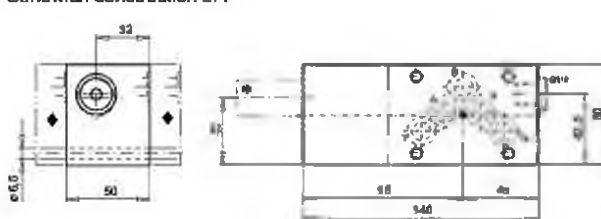
Flange construction



Sandwich construction in A or B



Sandwich construction in P



For sandwich red. pressure in B cartridge is located on B-side.

- The envelop dimensions of the screw-in cartridge are shown on their corresponding data sheets.
- Distance plate ADP10/... must be ordered separately.

**PARTS LIST**

Position	Article	Description
10	180.2140	O-ring ID 14,00 x 1,78 (NBR)
20	238.2406	Plug VSTI G1/4"-ED

**ACCESSORIES**

Proportional amplifier	register 1.13
Distance plate ADP10/29.5 (29,5 mm)	art. no. 173.4456

Technical explanation see data sheet 1.0-100





**Throttle cartridge**

- ◆  $Q_{max} = 25 \text{ l/min}$
- ◆  $Q_{Nmax} = 25 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**M18 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Mechanically adjustable throttle valve in screw-in cartridge construction for cavity according to ISO 7789. The throttle spindle which can be adjusted via a fine thread releases a ring gap or a triangular notch for the volume flow entering the port 1 or 2. The adjusted throttle cross section generates a pressure drop which determines the volume flow. When screwed in, the throttle closes practically leakage-free. The oil flow is possible in both directions.

**APPLICATION**

Throttle valves are used where volume flows have to be controlled continuously in both flow directions without taking into account pressure fluctuations. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich plates (vertical stacked systems, corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation  
 S = lockable key adjustment  
 D = lockable knob adjustment  
 Optionally  
 K = lockable adjustment  
 G = star handle adjustment  
 → see data sheet 2.0-50

Actuation angle  $\alpha_a = 1620^\circ$  (4,5 rotations)

Actuation stroke  $S_a = 4,5 \text{ mm}$

**TYPE CODE**

Throttle valve		DN	PM18	-	-	-	#
Type of adjustment	Key Control knob Cover	S D A					
Screw-in cartridge M18 x 1,5							
Nominal volume flow rate $Q_N$	0,32 l/min 3,2 l/min 25 l/min	0,32 3,2 25					
Sealing material	NBR FKM (Viton) NBR 872	 D1 Z604					
Design index (subject to change)							

24-518

**INSTALLATION NOTES**

Mounting type Screw-in cartridge M18 x 1,5  
 Mounting position Any, preferably horizontal  
 Tightening torque  $M_0 = 40 \text{ Nm}$  Screw-in cartridge

**STANDARDS**

Cartridge cavity ISO 7789  
 Contamination ISO 4406  
 efficiency

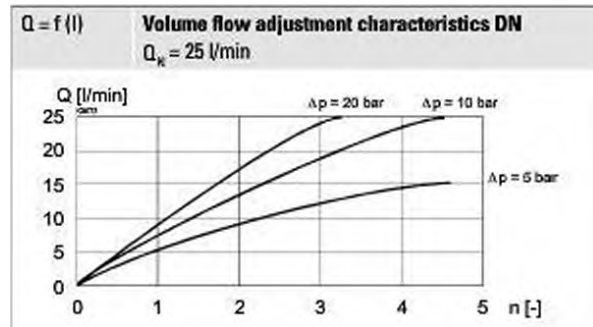
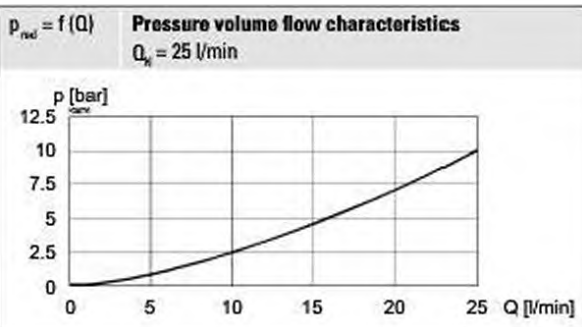
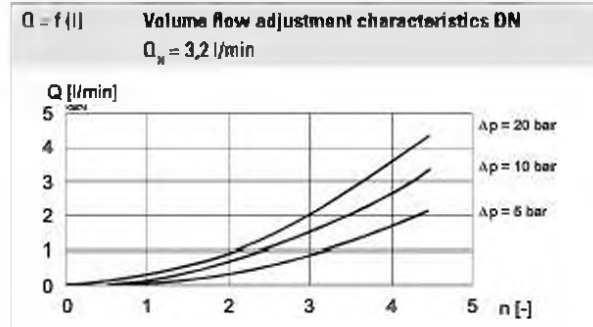
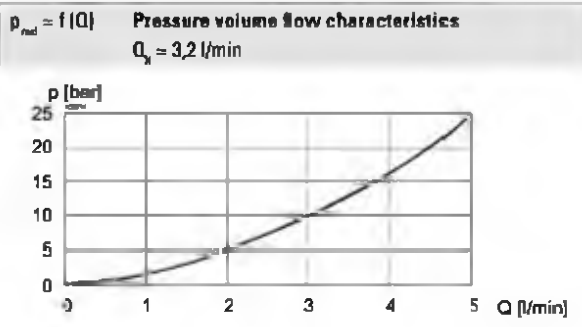
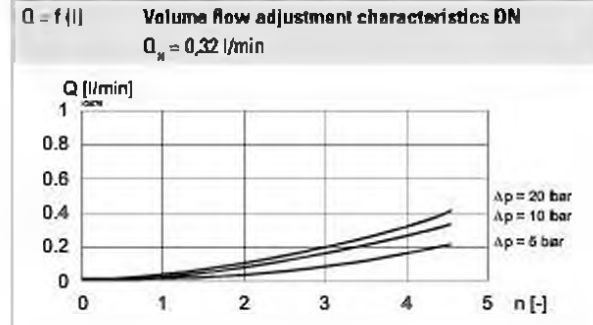
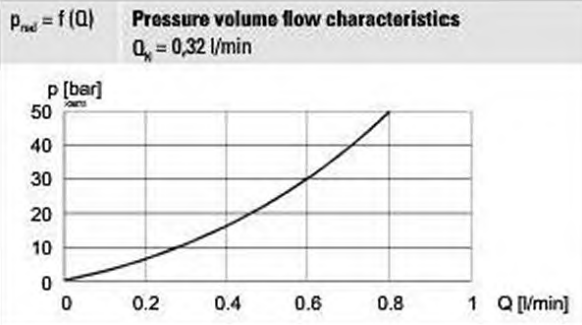
**GENERAL SPECIFICATIONS**

Designation	Throttle valve
Mounting	Screw-in cartridge construction
Nominal size	M18 x 1,5 according to ISO 7789
Ambient temperature	-25 ... +90 °C
Weight	0,09 kg key adjustment 0,10 kg control knob adjustment 0,16 kg cover
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

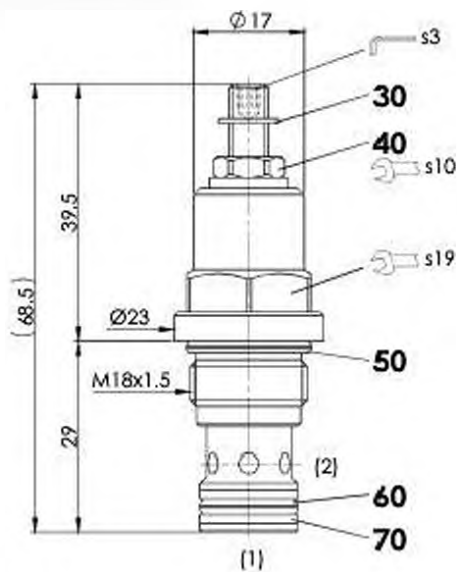
Working pressure	$p_{\text{max}} = 350 \text{ bar}$
Maximum volume flow	$Q_{\text{max}} = 25 \text{ l/min}$
Nominal volume flow	$Q_N = 0,32; 3,2; 25 \text{ l/min}$ at 10 bar valve pressure drop
Leakage oil	With closed throttle practically leakage-free
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +90 °C (NBR) -20 ... +90 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14 ... 21 / 19 / 15
Filtration	Required filtration grade B 10 ... 25 ≥ 75, see data sheet 1.0-50 / 2

**PERFORMANCE SPECIFICATIONS**

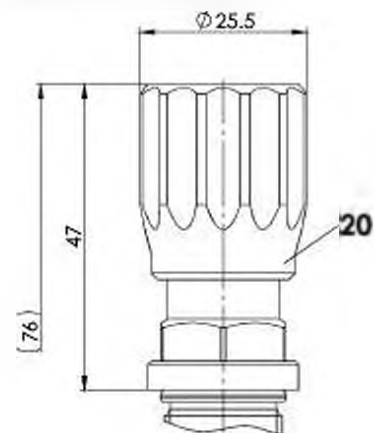
 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


**DIMENSIONS**

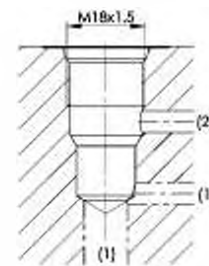
Key adjustment „S“



Control knob adjustment „D“


**HYDRAULIC CONNECTION**

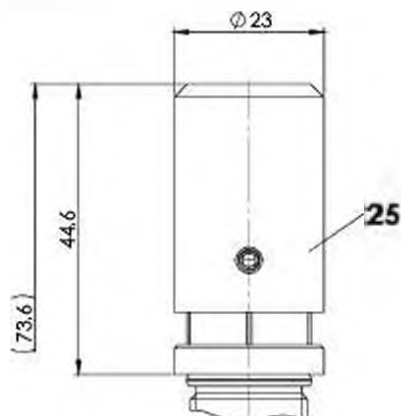
Cavity drawing according to ISO 7789-18-01-0-96


**Nota!**

For detailed cavity drawing and cavity tools see data sheet 2.13-1002



Cover „A“


**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The cartridge body made of steel is zinc-nickel coated
- ◆ The control knob is made of plastic

**PARTS LIST**

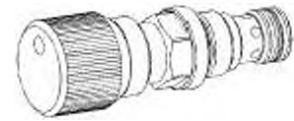
Position	Article	Description
20	114.2299	Control knob
25	032.0611	Cover rd 23 / 3 x 35
30	193.1040	Retainer rd 4 DIN 6799
40	153.1302	Hexagon nut 0,5d M6 x 3,2
45	234.1060	Washer DIN 125A M6
50	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
60	160.2111	O-ring ID 11,11 x 1,78 (NBR)
	160.6111	O-ring ID 11,11 x 1,78 (FKM)
70	049.3156	Backup ring rd 12,1 x 15 x 1,4

**ACCESSORIES**

Types of adjustment for screw-in cartridges	Data sheet 2.0-50
Flange body / sandwich plate NG3-Mini	Data sheet 2.4-700
Threaded body	Data sheet 2.9-205
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**Throttle cartridge stainless**

- ◆  $Q_{max} = 25 \text{ l/min}$
- ◆  $Q_{Nmax} = 25 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**M18 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Mechanically adjustable throttle valve in screw-in cartridge construction for cavity according to ISO 7789. The throttle spindle which can be adjusted via a fine thread releases a ring gap or a triangular notch for the volume flow entering the port 1 or 2. The adjusted throttle cross section generates a pressure drop which determines the volume flow. When screwed in, the throttle closes practically leakage-free. The oil flow is possible in both directions. The stainless execution is especially suitable for the use in wet and salty environment.

**APPLICATION**

Throttle valves are used where volume flows have to be controlled continuously in both flow directions without taking into account pressure fluctuations. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich plates (vertical stacked systems, corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Adjustment spindle M10 x 1
Execution	S = blockable key adjustment D = blockable knob adjustment Optionally: G = star handle adjustment
Actuation angle	$\alpha_s \approx 1620^\circ$ (4,5 rotations)
Actuation stroke	$S_s \approx 4,5 \text{ mm}$

**TYPE CODE**

Throttle valve		DN	<input type="checkbox"/>	PM18	-	<input type="checkbox"/>	-	<input type="checkbox"/>	K9	#	<input type="checkbox"/>
Type of adjustment	Key Control knob Cover										
				S D A							
Screw-in cartridge M18 x 1,5											
Nominal volume flow rate $Q_n$	0,32 l/min 3,2 l/min 25 l/min			0,32 3,2 25							
Sealing material	NBR FKM (Viton) NBR 872			<input type="checkbox"/> D1 Z604							
Stainless											
Design index (subject to change)											

24518

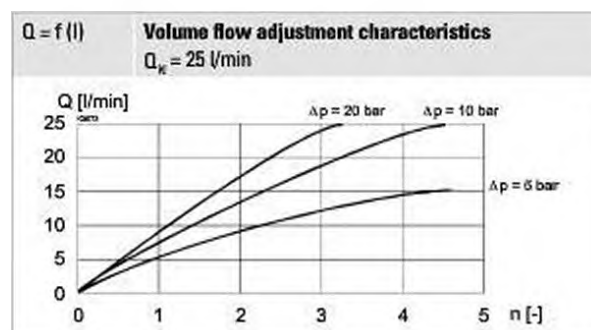
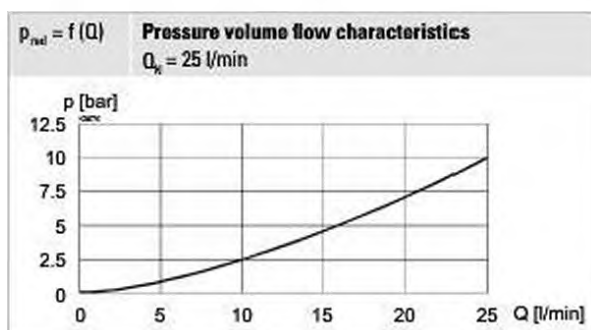
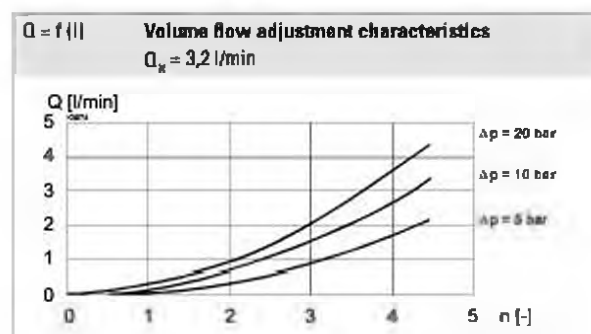
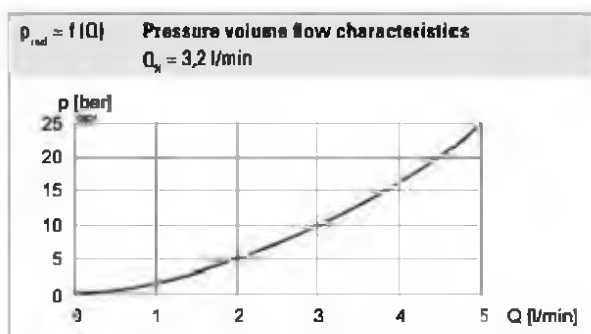
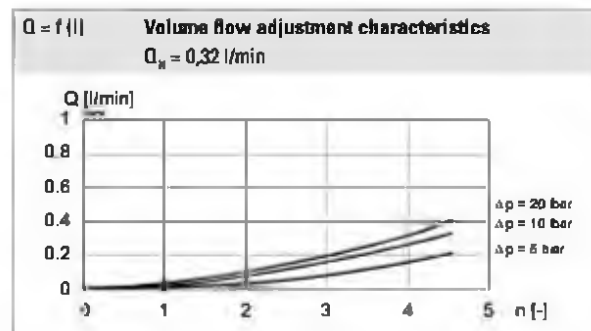
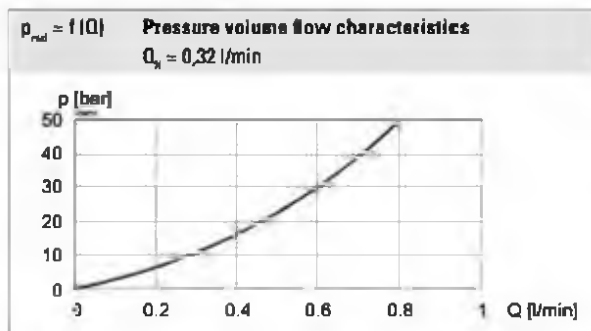
**GENERAL SPECIFICATIONS**

Designation	Throttle valve
Mounting	Screw-in cartridge construction
Nominal size	M18 x 1,5 according to ISO 7789
Ambient temperature	-25 ... +90 °C
Weight	0,09 kg key adjustment 0,18 kg control knob adjustment 0,16 kg cover
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 25$ l/min
Nominal volume flow	$Q_N = 0,32; 3,2; 25$ l/min at 10 bar valve pressure drop
Leakage oil	With closed throttle practically leakage-free
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +90 °C (NBR) -20 ... +90 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14 ... 21 / 19 / 15
Filtration	Required filtration grade B 10 ... 25 ≥ 75, see data sheet 1.0-50 / 2

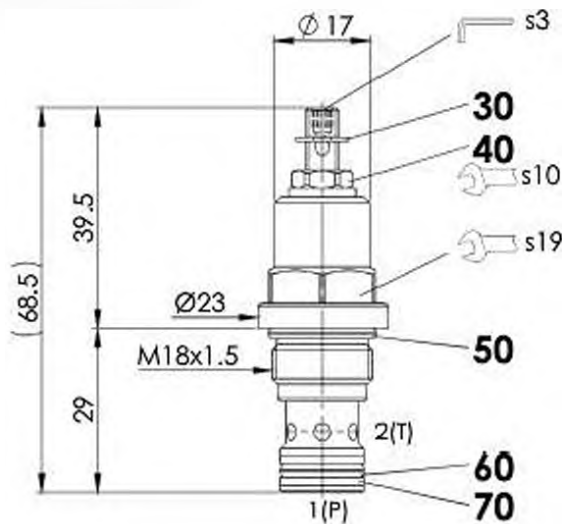
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s


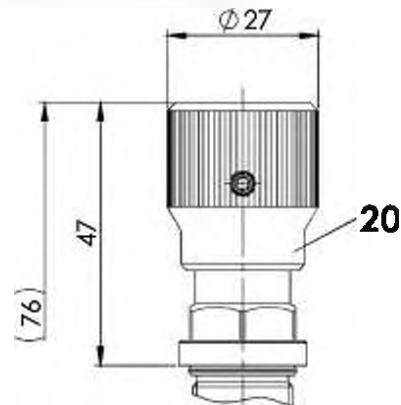


**DIMENSIONS**

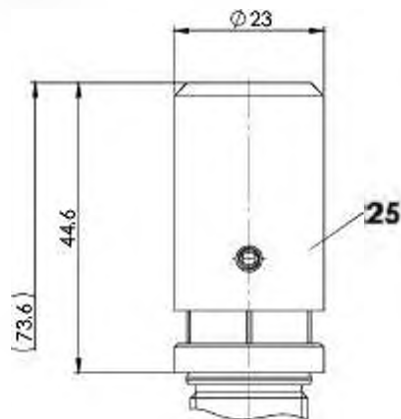
Key adjustment „S“



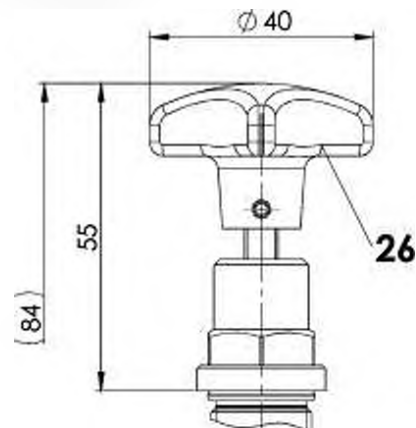
Control knob adjustment „D“



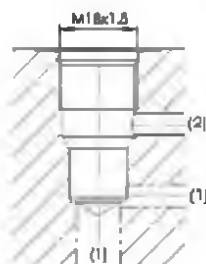
Cover „A“



Star handle „G“


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-18-01-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1002

**PARTS LIST**

Position	Article	Description
20	114.2228	Control knob K9
25	032.0616	Cover rd 23 / 3 x 35 K9
26	082.2004	Star handle rd 40 x 26
30	193.1040	Retainer rd 4 DIN 6799
40	153.1302	Hexagon nut 0,5d M6 x 3,2
45	234.1060	Washer DIN 125A M6
50	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
60	160.2111	O-ring ID 11,11 x 1,78 (NBR)
	160.6111	O-ring ID 11,11 x 1,78 (FKM)
70	049.3156	Backup ring rd 12,1 x 15 x 1,4

## ACCESSORIES

Types of adjustment for screw-in cartridges	Data sheet 2.0-50
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## INSTALLATION NOTES

Mounting type	Screw-in cartridge M18 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 40 \text{ Nm}$ Screw-in cartridge

## SURFACE TREATMENT

- ◆ The cartridge body and the control knob are made of stainless steel

## STANDARDS

Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

**Throttle valve**  
**Screw-in cartridge**

- $Q_{N\max} = 30$  l/min
- $Q_{\max} = 40$  l/min
- $p_{\max} = 350$  bar

**M18x1,5**  
 ISO 7789

**DESCRIPTION**

Manually adjustable, M18x1,5 screw-in cartridge throttle valve in accordance with cavity ISO 7789. The cartridge body made of steel is galvanized and therefore rust-protected.

**FUNCTION**

A fine tread on the adjustable throttle reveals an annular gap. The adjusted throttle cross-section produces a pressure drop which determines the volume flow. The volume flow is zero when the throttle is screwed in (the metal sealing edge seals completely). The valve flow is bidirectional.

**APPLICATION**

Throttle valves can be used anywhere where volume flows can be infinitely controlled in both directions without taking pressure fluctuations into account. Stepped tools are available for making the receptacle bores in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

	DN	PM18	-	30	#	<input type="checkbox"/>
Throttle valve						
Type of adjustment						
Screw-in cartridge M18x1,5						
Nominal volume flow rate $Q_N$				30 l/min		
Design-Index (Subject to change)						

**GENERAL SPECIFICATIONS**

Description	Throttle valve
Construction	Screw-in cartridge for cavity acc. to ISO 7789
Mounting	Screw-in thread M18x1,5
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_c = 30$ Nm
Weight	$m = 0,11$ kg
Volume flow direction	1 ↔ 2

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1989, class 20/18/14...21/19/15
	Required filtration grade (β 10...25 ≥ 75) (refer to data sheet 1.0-50/2)
Viscosity range	12mm <sup>2</sup> /s...320mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{\max} = 350$ bar
Nominal volume flow rates	$Q_N = 30$ l/min
	$Q_N$ at 10 bar valve pressure loss
Max. volume flow	$Q_{\max} = 40$ l/min
Leakage volume flow	Almost leak free with closed restrictor

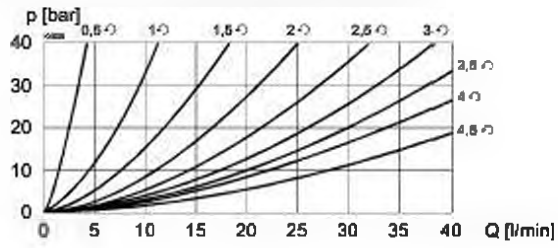
**SYMBOL**

**MECHANICAL ACTUATION**

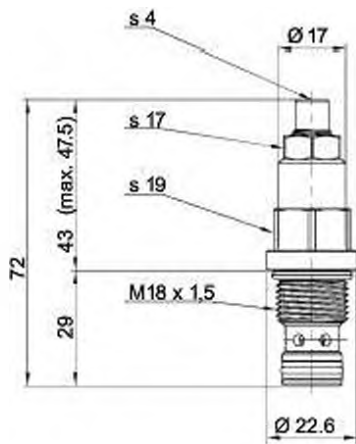
Screw adjustment with fork wrench and Allen key	
Control stroke $S_c$	= 4,5 mm
Control angle $\alpha_c$	= 1620° / 4,5 turns

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$

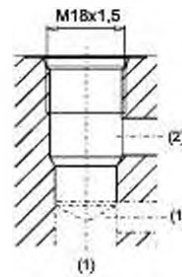
$\Delta p = f(Q)$  Pressure drop/flow characteristics



**DIMENSIONS**



Cavity drawing according to ISO 7789-18-01-0-98



For detailed cavity drawing and cavity tools see data sheet 2.13-1002.

**ACCESSORIES**

Line mount body

Data sheet 2.9-205

**Throttle valve**  
**Screw-in cartridge**

- $Q_{N\max} = 60$  l/min
- $Q_{\max} = 80$  l/min
- $p_{\max} = 350$  bar

**M22x1,5**  
 ISO 7789

**DESCRIPTION**

Manually adjustable, M22x1,5 screw-in cartridge throttle valve in accordance with cavity ISO 7789. The cartridge body made of steel is galvanized and therefore rust-protected.

**FUNCTION**

A fine thread on the adjustable throttle reveals an annular gap. The adjusted throttle cross-section produces a pressure drop which determines the volume flow. The volume flow is zero when the throttle is screwed in (the metal sealing edge seals completely). The valve flow is bidirectional.

**APPLICATION**

Throttle valves can be used anywhere where volume flows can be infinitely controlled in both directions without taking pressure fluctuations into account. Stepped tools are available for making the receptacle bores in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

	DN	I	PM22	-	80	#	<input type="checkbox"/>
Throttle valve							
Type of adjustment							
Screw-in cartridge M22x1,5							
Nominal volume flow rate $Q_N$				60 l/min			
Design-Index (Subject to change)							

**GENERAL SPECIFICATIONS**

Description	Throttle valve
Construction	Screw-in cartridge for cavity acc. to ISO 7789
Mounting	Screw-in thread M22x1,5
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_c = 50$ Nm
Weight	$m = 0,16$ kg
Volume flow direction	1 ↔ 2

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1989, class 20/18/14...21/19/15
	Required filtration grade (β 10...25 ≥ 75) (refer to data sheet 1.0-50/2)
Viscosity range	12mm <sup>2</sup> /s...320mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{\max} = 350$ bar
Nominal volume flow rates	$Q_N = 60$ l/min $Q_N$ at 10 bar valve pressure loss
Max. volume flow	$Q_{\max} = 80$ l/min
Leakage volume flow	Almost leak free with closed restrictor

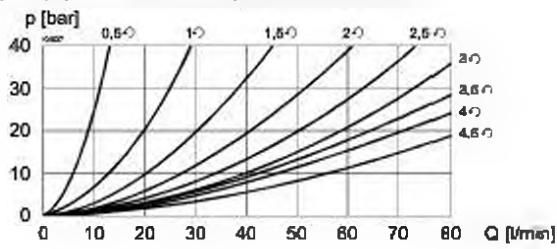
**SYMBOL**

**MECHANICAL ACTUATION**

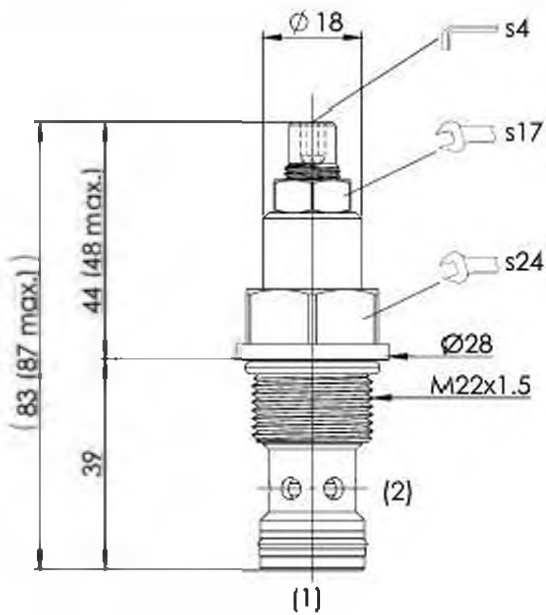
Screw adjustment with fork wrench and Allen key	
Control stroke $S_c$	= 4,5 mm
Control angle $\alpha_c$	= 1620° / 4,5 turns

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$

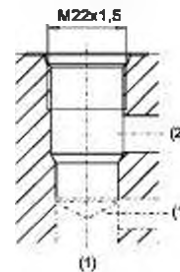
$\Delta p = f(Q)$  Pressure drop/flow characteristics



**DIMENSIONS**



Cavity drawing according to ISO 7789-22-01-0-88



For detailed cavity drawing and cavity tools see data sheet 2.13-1008.

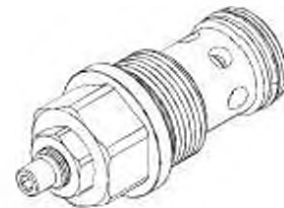
**ACCESSORIES**

Line mount body

Data sheet 2.9-205

**Throttle valve**
**Screw-in cartridge**

- $Q_{N\ max}$  = 140 l/min
- $Q_{\ max}$  = 140 l/min
- $p_{\ max}$  = 350 bar

**M33x2**  
 ISO 7789

**DESCRIPTION**

Manually adjustable, M33x2 screw-in cartridge throttle valve in accordance with cavity ISO 7789. The cartridge body made of steel is galvanized and therefore rust-protected.

**FUNCTION**

A fine tread on the adjustable throttle reveals an annular gap. The adjusted throttle cross-section produces a pressure drop which determines the volume flow. The volume flow is zero when the throttle is screwed in (the metal sealing edge seals completely). The valve flow is bidirectional.

**APPLICATION**

Throttle valves can be used anywhere where volume flows can be infinitely controlled in both directions without taking pressure fluctuations into account. Stepped tools are available for making the receptacle bores in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

	DN	PM33	-	140	#	<input type="checkbox"/>
Throttle valve						
Type of adjustment						
Screw-in cartridge M33x2						
Nominal volume flow rate $Q_N$				140 l/min		
Design-Index (Subject to change)						

**GENERAL SPECIFICATIONS**

Description	Throttle valve
Construction	Screw-in cartridge for cavity acc. to ISO 7789
Mounting	Screw-in thread M33x2
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_c = 80$ Nm
Weight	$m = 0,37$ kg
Volume flow direction	1 ↔ 2

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1989, class 20/18/14...21/19/15
	Required filtration grade (B 10...25 ≥ 75) (refer to data sheet 1.0-50/2)
Viscosity range	12mm <sup>2</sup> /s...320mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{\ max} = 350$ bar
Nominal volume flow rates	$Q_N = 140$ l/min
	$Q_N$ at 10 bar valve pressure loss
Max. volume flow	$Q_{\ max} = 140$ l/min
Leakage volume flow	Almost leak free with closed restrictor

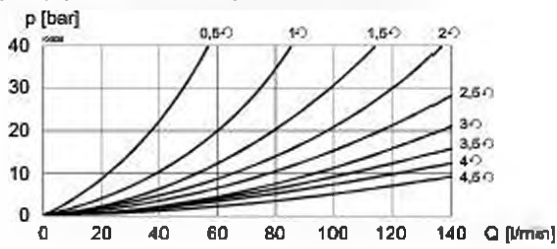
**SYMBOL**

**MECHANICAL ACTUATION**

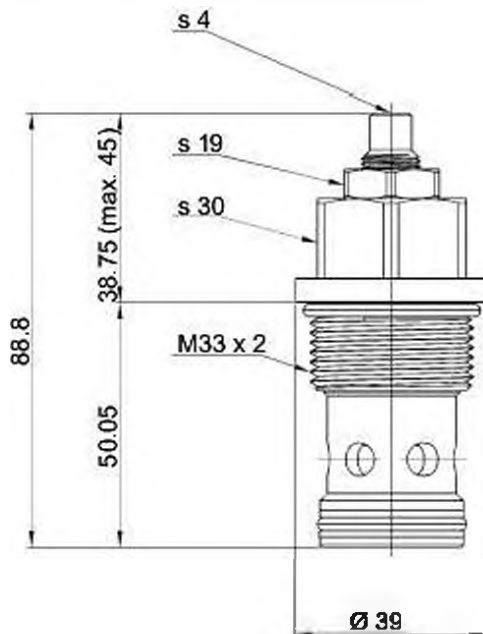
Screw adjustment with fork wrench and Allen key	
Control stroke $S_c$	= 4,5 mm
Control angle $\alpha_c$	= 1620° / 4,5 turns

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$

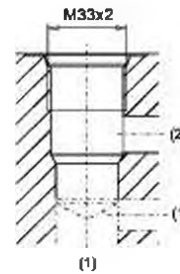
$\Delta p = f(Q)$  Pressure drop/flow characteristics



**DIMENSIONS**



Cavity drawing according to ISO 7789-33-01-0-98



For detailed cavity drawing and cavity tools see data sheet 2.13-1005.

**ACCESSORIES**

Line mount body

Data sheet 2.9-205



**Throttle non-return cartridge**

- ◆  $Q_{max} = 25 \text{ l/min}$
- ◆  $Q_{Nmax} = 25 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**M18 x 1,5**  
**ISO 7789**

**DESCRIPTION**

Mechanically adjustable throttle valve in screw-in cartridge construction for cavity according to ISO 7789. The one-piece throttle non-return spool shifts into the completely open position with the volume flow direction 2 to 1. The opening pressure of the valve is 1 bar. With the volume flow direction from 1 to 2, the spool is pressed against the adjustment spindle and reduces the volume flow to the required extent via the throttle area, resp., throttle notch, milled laterally on the cone. When the adjustment spindle is screwed out, the throttle closes practically leakage-free from 1 to 2, because the hydraulic pressure and the spring press the throttle non-return spool into the closed position.

**APPLICATION**

Throttle non-return valves are used where the volume flow in the one direction via the spring loaded non-return valve has to be nearly free. In the opposite direction, the oil flows via the continuously adjustable, load depending throttle. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich plates (vertical stacked systems, corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

**ACTUATION**

Actuation	Adjustment spindle M8 x 1
Execution	S = blockable key adjustment D = blockable knob adjustment Optional: K = lockable adjustment G = star handle adjustment → see Data sheet 2.0-50
Actuation angle	$\alpha_1 = 1800^\circ$ (5 rotations)
Actuation stroke	$S_1 = 5 \text{ mm}$

**TYPE CODE**

Throttle non-return valve			DR	<input type="checkbox"/>	PM18	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Type of adjustment	Key	<input type="checkbox"/>	S								
	Control knob	<input type="checkbox"/>	D								
	Cover	<input type="checkbox"/>	A								
Screw-in cartridge M18 x 1,5											
Nominal volume flow rate $Q_N$	3,2 l/min	<input type="checkbox"/>	3,2								
	25 l/min	<input type="checkbox"/>	25								
Sealing material	NBR	<input type="checkbox"/>									
	FKM (Viton)	<input type="checkbox"/>	D1								
	NBR 872	<input type="checkbox"/>	Z604								
Design index (subject to change)											
14-011											

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M18 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 40 \text{ Nm}$ Screw-in cartridge

**STANDARDS**

Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

**GENERAL SPECIFICATIONS**

Designation	Throttle non-return valve
Mounting	Screw-in cartridge construction
Nominal size	M18 x 1,5 according to ISO 7789
Ambient temperature	-25...+90 °C
Weight	0,09 kg key adjustment 0,10 kg control knob adjustment 0,16 kg cover
MTTFd	150 years

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

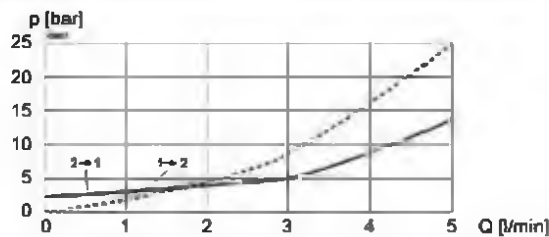
**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Maximum volume flow	$Q_{max} = 25 \text{ l/min}$
Volume flow direction	1 → 2 adjustable flow 2 → 1 free flow
Nominal volume flow	$Q_N = 3,2; 25 \text{ l/min}$ at 10 bar valve pressure drop
Leakage oil	With closed throttle practically leakage-free
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	NBR -25...+90 °C FKM (D1) -20...+90 °C NBR 872 (Z604) -40...+90 °C
Contamination efficiency	Classe 20 / 18 / 14...21 / 19 / 15
Filtration	Required filtration grade B 10...25 ≥ 75, see data sheet 1.0-50 / 2

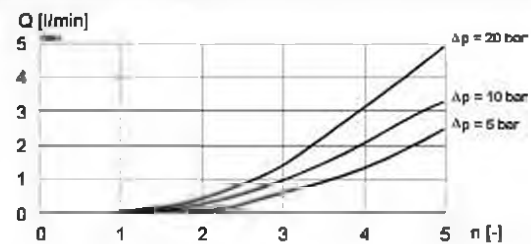
**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$

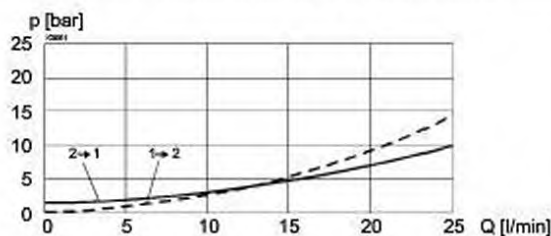
$\Delta p = f(Q)$  **Pressure drop volume flow characteristic**  
 $Q_N = 3,2 \text{ l/min}$   
 1 → 2 via completely opened throttle  
 2 → 1 via non-return valve with closed throttle



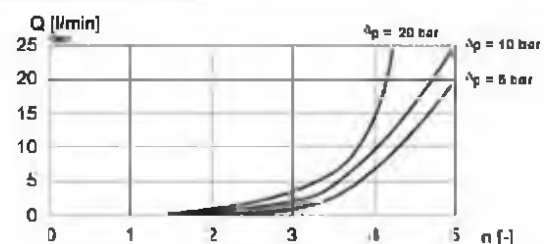
$Q = f(\eta)$  **Volume flow adjustment characteristics DN**  
 $Q_N = 3,2 \text{ l/min}$



$\Delta p = f(Q)$  **Pressure drop volume flow characteristic**  
 $Q_N = 25 \text{ l/min}$   
 1 → 2 via completely opened throttle  
 2 → 1 via non-return valve with closed throttle

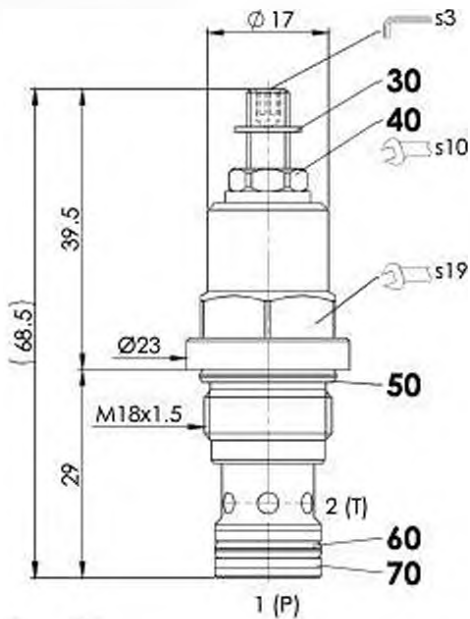


$Q = f(\eta)$  **Volume flow adjustment characteristics DN**  
 $Q_N = 25 \text{ l/min}$

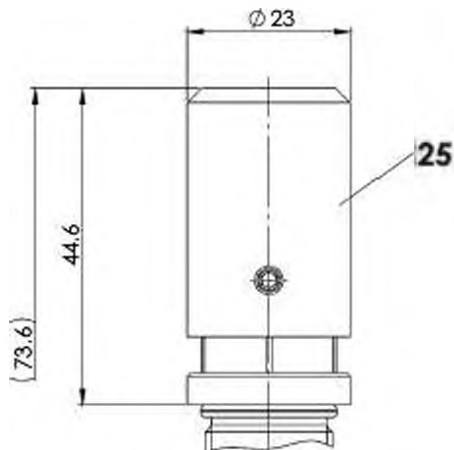


**DIMENSIONS**

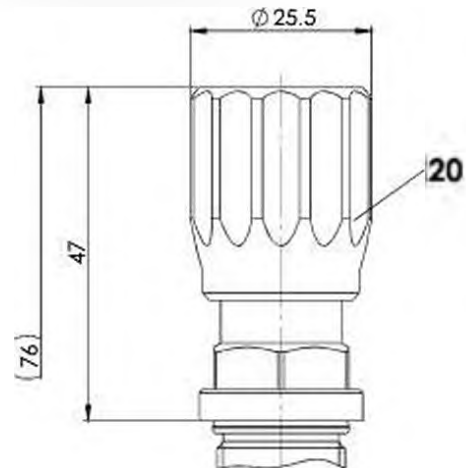
Key adjustment „S“



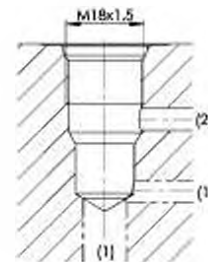
Cover „A“



Control knob adjustment „D“


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-18-01-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1002

**PARTS LIST**

Position	Article	Description
20	114.2299	Control knob
25	032.0611	Cover rd 23 / 3 x 35
30	193.1040	Retainer rd 4 DIN 6799
40	153.1302	Hexagon nut 0,5d M6 x 3,2
45	234.1060	Washer DIN 125A M6
50	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
60	160.2111	O-ring ID 11,11 x 1,78 (NBR)
	160.6111	O-ring ID 11,11 x 1,78 (FKM)
70	049.3156	Backup ring rd 12,1 x 15 x 1,4

**SURFACE TREATMENT**

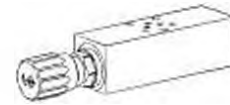
- ◆ The cartridge body made of steel is zinc-nickel coated
- ◆ The control knob is made of plastic

**ACCESSORIES**

Types of adjustment for screw-in cartridges	Data sheet 2.0-50
Flange body / sandwich plate NG3-Mini	Data sheet 2.4-800
Threaded body	Data sheet 2.9-205
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**Throttle valve**
**Sandwich construction**

- $Q_{max} = 15 \text{ l/min}$
- $Q_{Nmax} = 8 \text{ l/min}$
- $p_{max} = 315 \text{ bar}$

**NG3-Mini<sup>®</sup>**

**DESCRIPTION**

Sandwich type throttle valves based on an M18x1.5 screw type throttle cartridge in accordance with ISO 7789 (see data sheet no. 2.4-510).

**FUNCTION**

A fine thread on the adjustable throttle reveals an annular gap or triangular notch. The volume flow is zero when the throttle is screwed in (the metal sealing edge seals completely). The valve flow is bidirectional.

**APPLICATION**

Sandwich type throttle valves can be used anywhere where volume flows have to be infinitely controlled in both directions without taking pressure fluctuations into account. These sandwich valves are ideal for machine tools and also all types of handling operation. Mini-3 throttle valves are used wherever light, extremely compact hydraulic control units are needed.

**TYPE CODE**

		DN	<input type="checkbox"/>	S	A03	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Throttle valve											
Type of adjustment	Screw	<input type="checkbox"/>	S	Knob	<input type="checkbox"/>	D					
Sandwich construction											
Mounting interface acc. to Wandfluh standard, NG3-Mini											
Type list / function	in A		A	in B		B					
	in A and B		AB								
	in P		P								
Nominal volume flow rate $Q_N$	0,32 l/min	<input type="checkbox"/>	0,32	3,2 l/min	<input type="checkbox"/>	3,2	8 l/min	<input type="checkbox"/>	8		
Design-Index (Subject to change)											

**GENERAL SPECIFICATIONS**

Denomination	Throttle valve
Nominal size	NG3-Mini according to Wandfluh standard
Construction	Sandwich construction
Mounting	3 holes for socket head cap screw M4 or studs M4
Connections	Threaded connection plates, Multi-flange plates, Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_0 = 2,8 \text{ Nm}$ (Qual. 8.8) for fastening screws $M_0 = 30 \text{ Nm}$ for screw-in cartridge
Weight	Depending on the type 0,22...0,40 kg

**HYDRAULIC SPECIFICATIONS**

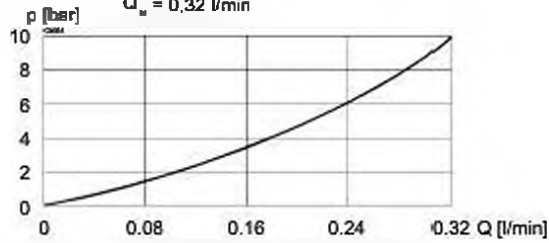
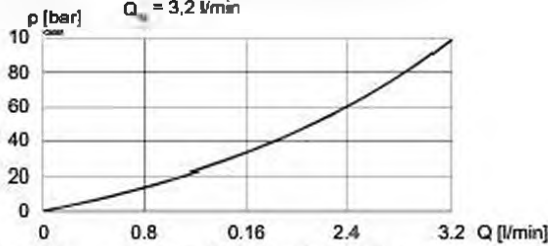
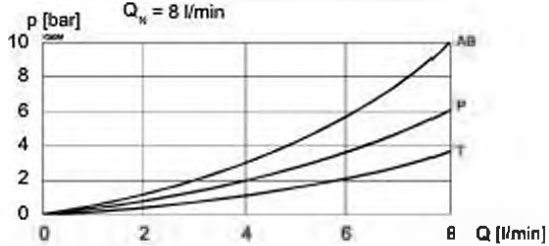
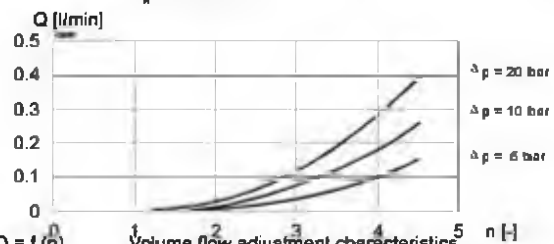
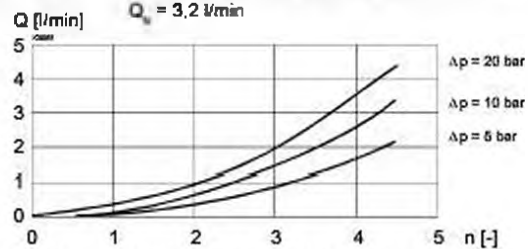
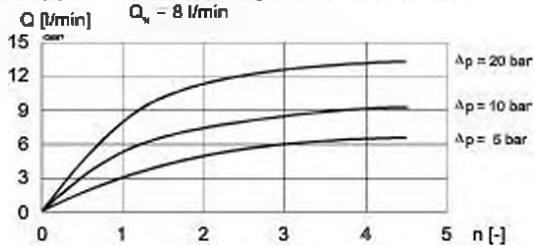
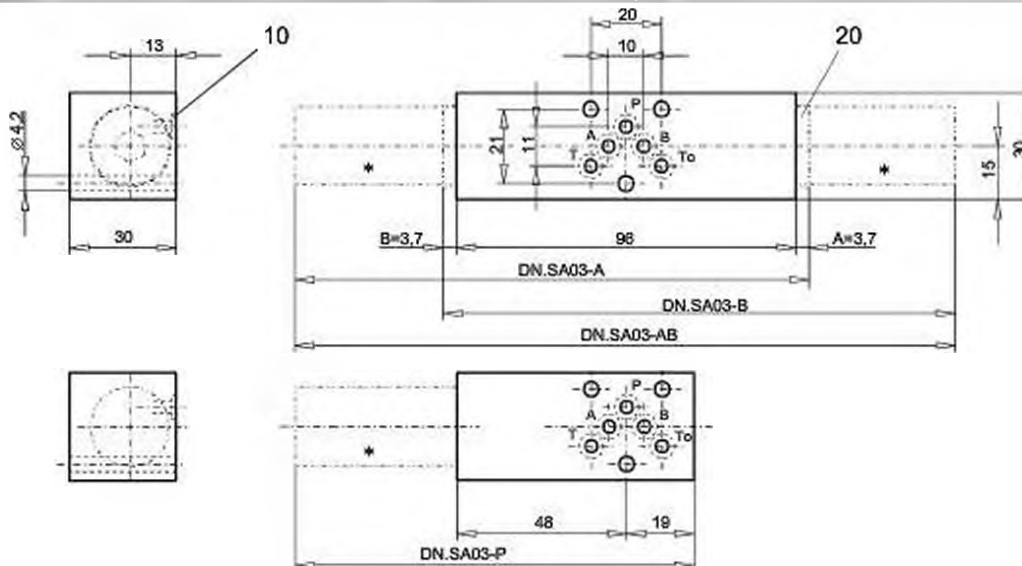
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 20/18/14...21/19/15 (Required filtration grade B 10...25 $\geq$ 75) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 315 \text{ bar}$
Nominal volume flow rates	$Q_N = 0,32 \text{ l/min}$ , $Q_N = 3,2 \text{ l/min}$ $Q_N = 8 \text{ l/min}$ $Q_N$ at 10 bar valve pressure loss $Q_{Nmax} = 15 \text{ l/min}$
Max. volume flow	$Q_{Nmax} = 15 \text{ l/min}$
Leakage volume flow	Almost leak free with closed restrictor
For additional informations refer to data sheet no 2.4-510. (For $Q_N = 8 \text{ l/min}$ please take the screw-in cartridge DN.PM18-25)	

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.
DN.PM18	Throttle valve	2.4-510

**TYPE LIST / FUNCTION**

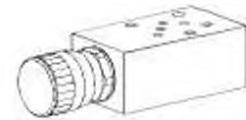

**CHARACTERISTICS** oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure drop/flow characteristics  
 $Q_N = 0,32 \text{ l/min}$ 

 $\Delta p = f(Q)$  Pressure drop/flow characteristics  
 $Q_N = 3,2 \text{ l/min}$ 

 $\Delta p = f(Q)$  Pressure drop/flow characteristics  
 $Q_N = 8 \text{ l/min}$ 

 $Q = f(n)$  Volume flow adjustment characteristics  
 $Q_N = 0,32 \text{ l/min}$ 

 $Q = f(n)$  Volume flow adjustment characteristics  
 $Q_N = 3,2 \text{ l/min}$ 

 $Q = f(n)$  Volume flow adjustment characteristics  
 $Q_N = 8 \text{ l/min}$ 

**DIMENSIONS**

**PARTS LIST**

Position	Article	Description
10	160.2045	O-ring ID 4,5 x 1,50 (NBR)
20	238.4401	Plug VSTI M18 x 1,5-OR

\* The exterior dimensions of the screw-in cartridge can be obtained from the corresponding data sheet no. 2.4-510

**Throttle valve**
**Sandwich construction**

- $Q_{max}$  = 20 l/min
- $Q_{N max}$  = 15 l/min
- $p_{max}$  = 315 bar

**NG4-Mini<sup>®</sup>**

**DESCRIPTION**

Throttle valve sandwich design NG4-Mini with mounting interface acc. to Wandfluh standard. The throttle valve is available in two different variants, namely the standard and the precision throttle (FD). The rotary control is made from aluminium, all other parts, have been phosphated.

**FUNCTION**

Using the precision thread adjusting spindle, the restriction of the volume flow can be continuously adjusted. With the spindle fully screwed home, the volume flow is zero, and a metallic edge makes a leak-tight closure. The throttle effect is produced by an annular gap which can be varied in size, or by means of a triangular edge. Because of the nature of the design, there is only a small amount of leakage.

**APPLICATION**

Sandwich type throttle valves can be used anywhere where volume flows have to be infinitely controlled in both directions without taking pressure fluctuations into account. These sandwich valves are ideal for machine tools and also all types of handling operation. Mini-4 throttle valves are used wherever light, extremely compact hydraulic control units are needed.

**TYPE CODE**

Mounting interface acc. to Wandfluh standard	B	DR	<input type="checkbox"/>	4	<input type="checkbox"/>	#	<input type="checkbox"/>
Throttle valve							
Type list / function							
in A	A	in B	[B]				
in A and B	AB						
in P	P	in T	[T]				
in P and T	[PT]						
Nominal size 4-Mini							
Standard							
Precision throttle	- FD						
Design-Index (Subject to change)							

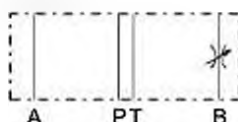
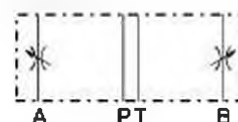
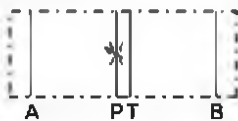
**GENERAL SPECIFICATIONS**

Description	Throttle valve
Nominal size	NG4-Mini acc. to Wandfluh standard
Construction	Sandwich
Mounting screws	3 mounting holes for socket head cap screws
Connections	M5 or studs M5
Ambient temperature	Threaded connection plates, Multi-flange subplates, Longitudinal stacking system
Mounting position	-20...+50 °C
Fastening torque	any
Weight	$M_c = 5,5 \text{ Nm}$ (Quality: 8.8)
	Depending on the type 0,8...0,9 kg

**HYDRAULIC SPECIFICATIONS**

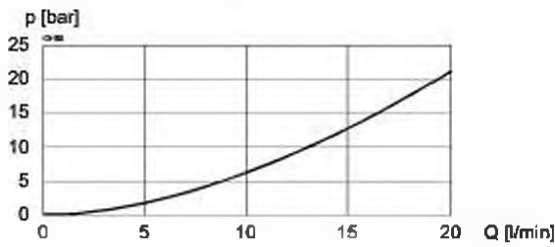
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4408:1989, class 20/18/14...21/19/15 (Required filtration grade $\beta_{10...25} \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 315 \text{ bar}$
Nominal volume flow rate	$Q_N = 15 \text{ l/min}$
Max. Volume flow	$Q_{max} = 20 \text{ l/min}$
Leakage volume flow	$Q_{10}$ at 10 bar valve pressure loss
	Almost leak free with closed restrictor

**TYPE LIST / FUNCTION**
**BDRA4**

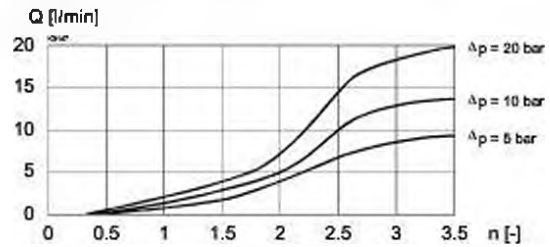
**BDRB4**

**BDRAB4**

**BDRP4**

**BDRT4**

**BDRPT4**

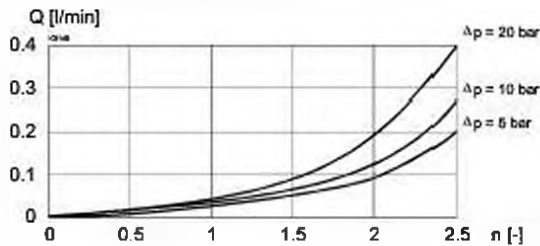

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$   
 $\Delta p = f(Q)$  Pressure loss/flow characteristics



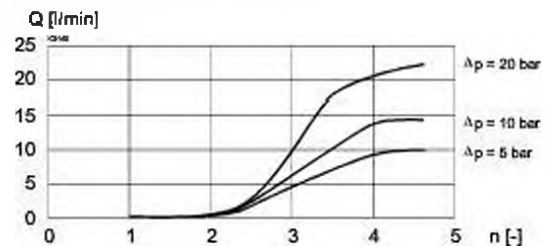
$Q = f(n)$  Volume flow adjustment characteristics (Standard)



$Q = f(n)$  Volume flow adjustment characteristics (Precision throttle)

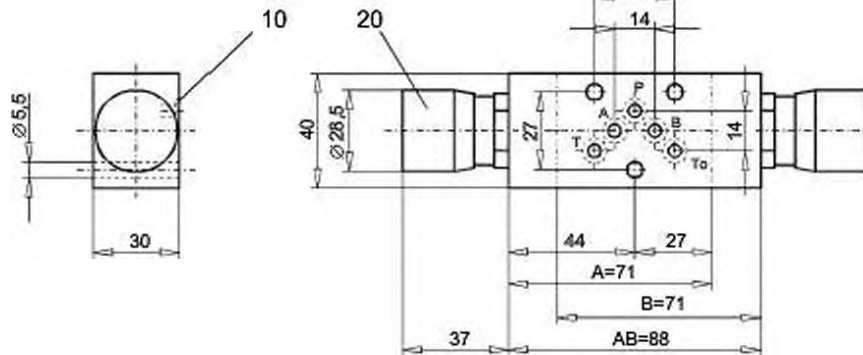


$Q = f(n)$  Volume flow adjustment characteristics (Precision throttle)

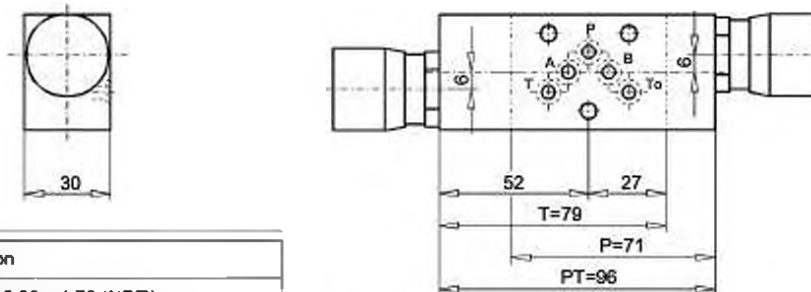


**DIMENSIONS**

BDR4A, BDRB4 et BDRAB4



BDRP4, BDRPT4 et BDRPT4



**PARTS LIST**

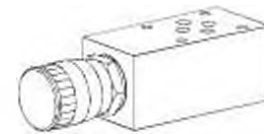
Position	Article	Description
10	160.2052	O-ring ID 5,28 x 1,78 (NBR)
20	114.1204	Turning knob

Technical explanation see data sheet 1.0-100

**Throttle valve**
**Sandwich construction**

- $Q_{max} = 80 \text{ l/min}$
- $Q_N = 50 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**NG6**  
ISO 4401-03


**DESCRIPTION**

Throttle valve in sandwich construction NG6 with interface according to ISO 4401-03. The throttle valve is available in two different variants, the standard and the precision throttle (FD). The FD execution is available for restriction in A, B or AB only. The tuning knob is made from aluminium, the sandwich plate made of steel is zinc-nickel coated.

**FUNCTION**

By means of the adjusting spindle (fine thread), the restriction of the volume flow can be continuously adjusted. With the spindle fully screwed in, the volume flow is zero, and a metallic edge seals leakfree. The throttle effect is produced by an annular gap which can be varied in size, or by means of a triangular edge. The flow through of throttle valves is possible in both directions. The precision throttle (FD) has an even finer resolution in the lowest volume flow range. Due to the type of construction, there is a very low leakage.

**APPLICATION**

Sandwich construction throttle valves are used where volume flows can be continuously adjusted in both flow directions without consideration of the pressure fluctuations. These sandwich valves are perfectly suitable for machine tools as well as all types of handling operation.

**TYPE CODE**

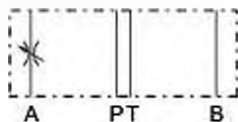
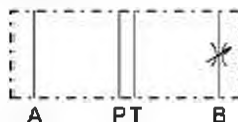
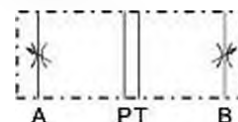
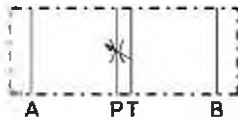
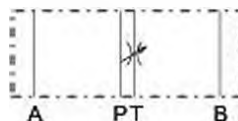
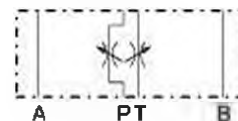
International standard interface ISO	A	DR		6	#
Throttle valve					
Type list / function					
in A	A	in B	B		
in A and B	AB				
in P	P	in T	T		
in P and T	PT				
Nominal size 6					
Standard					
Precision throttle					
Design-Index (Subject to change)					

**GENERAL SPECIFICATIONS**

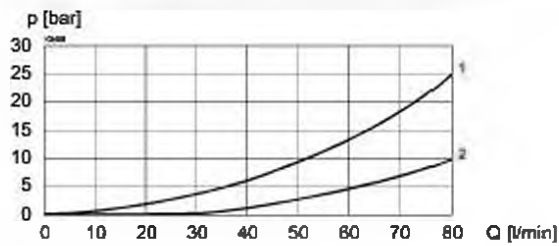
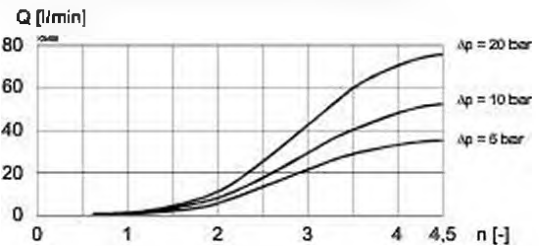
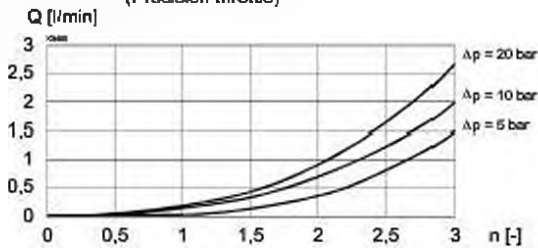
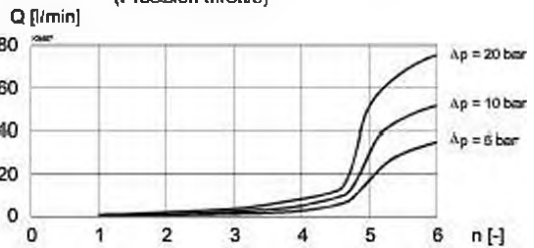
Description	Throttle valve
Nominal size	NG6 acc. to ISO 4401-03
Construction	Sandwich construction
Mounting	4 fixing holes for socket cap screws M5 or studs screws M5
Connections	Threaded connection plates, Multi-flange subplates, Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_0 = 5,5 \text{ Nm}$ (Quality 8.8)
Weight	$m = 1,9 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

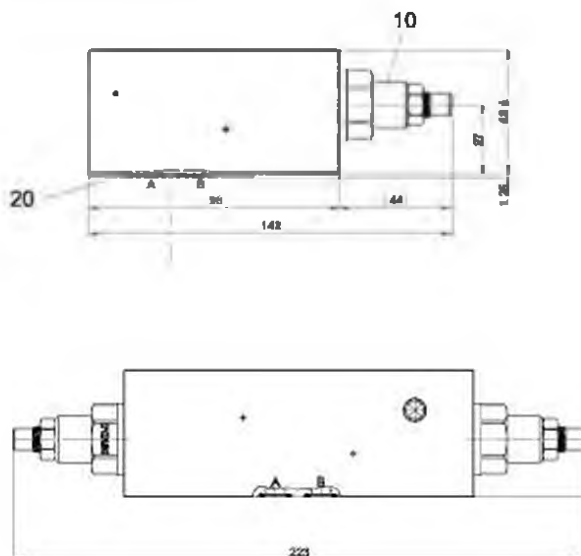
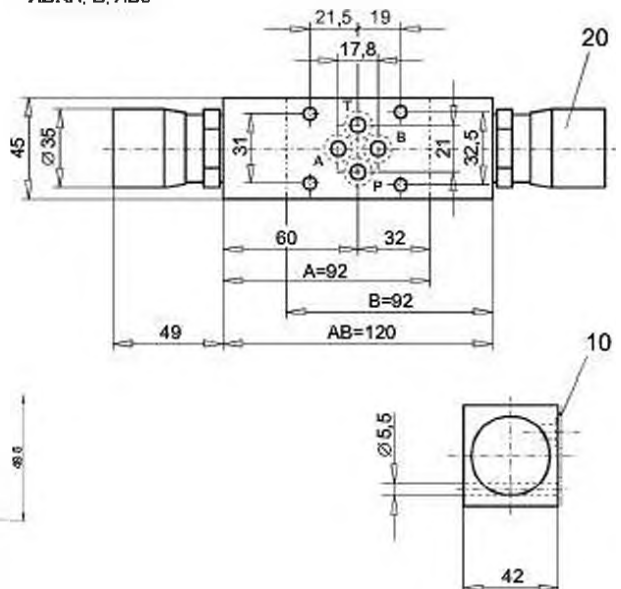
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 20/18/14...21/19/15 (Required filtration grade $\beta_{10...25} \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 350 \text{ bar}$
Nominal volume flow rate	$Q_N = 50 \text{ l/min}$ (throttle at A or B) $Q_N$ at 10 bar valve pressure loss
Max. Volume flow	$Q_{max} = 80 \text{ l/min}$
Leakage volume flow	Almost leak free with closed restrictor

**TYPE LIST / FUNCTION**
**ADRA6**

**ADRB6**

**ADRAB6**

**ADRP6 #1**

**ADRT6 #1**

**ADRPT6 #1**




**CHARACTERISTICS ADRA, B, AB6** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$   
 $\Delta p = f(Q)$  Pressure drop/volume flow characteristics

 $Q = f(n)$  Volume flow adjustment characteristics

 $Q = f(n)$  Volume flow adjustment characteristics (Precision throttle)

 $Q = f(n)$  Volume flow adjustment characteristics (Precision throttle)


Characteristics ADRP, T and PT can be found on data sheet 2.4-532 (throttle cartridge DNIPM22).

**DIMENSIONS**
**00ADRP6, ADRT6, ADRPT6**

**ADRA, B, AB6**

**PARTS LIST**

Position	Article	Description
10	623.3002	DNIPM22-60
20	173.3650	ADB6 Sealing plate

**PARTS LIST**

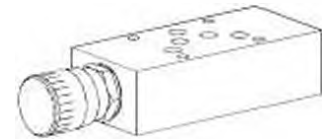
Position	Article	Description
20	114.1201	Turning knob
30	160.2093	O-ring ID 9,25 x 1,78

Technical explanation see data sheet 1.0-100

**Throttle valve**
**Sandwich construction**

- $Q_{max} = 100 \text{ l/min}$
- $Q_N = 60 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**NG10**  
ISO 4401-05


**DESCRIPTION**

Throttle valve sandwich type NG10 with interface acc. to ISO 4401-05. The tuning knob is made from aluminium, the sandwich plate made of steel is zinc-nickel coated.

**FUNCTION**

Using the precision thread adjusting spindle, the restriction of the volume flow can be continuously adjusted. With the spindle fully screwed home, the volume flow is zero, and a metallic edge makes a leak-tight closure. The throttle effect is produced by an annular gap which can be varied in size. The valve flow is bidirectional. Because of the nature of the design, there is only a small amount of leakage.

**APPLICATION**

Sandwich type throttle valves can be used anywhere where volume flows have to be infinitely controlled in both directions without taking pressure fluctuations into account. These sandwich valves are ideal for machine tools and also all types of handling operation.

**TYPE CODE**

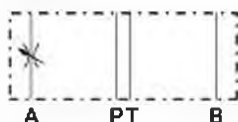
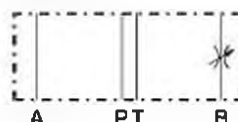
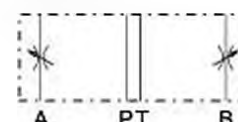
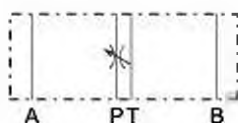
International standard interface ISO	A	DR		10	#
Throttle valve					
Type list / function					
in A	A	in B	[B]		
in A and B	[AB]				
in P	[P]				
Nominal size 10					
Standard					
Design-Index (Subject to change)					

**GENERAL SPECIFICATIONS**

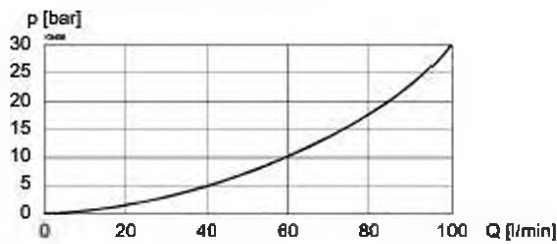
Description	Throttle valve
Nominal size	NG10 acc. to ISO 4401-05
Construction	Sandwich construction
Mounting	4 mounting holes for socket head cap screws M6 or studs screws M6
Connections	Threaded connection plates, Multi-flange subplates, Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_0 = 9,5 \text{ Nm}$ (Quality: 8.8)
Weight	$m = 2,1 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

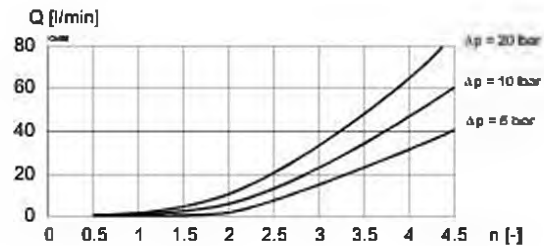
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 20/18/14...21/19/15 (Required filtration grade $\beta_{10} \dots 25 \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 350 \text{ bar}$
Nominal volume flow rate	$Q_N = 60 \text{ l/min}$ $Q_N$ at 10 bar valve pressure loss
Max. Volume flow	$Q_{max} = 100 \text{ l/min}$
Leakage volume flow	Almost leak free with closed restrictor

**TYPE LIST / FUNCTION**
**ADRA10**

**ADRB10**

**ADRAB10**

**ADRP10 #1**


**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$   
 $\Delta p = f(Q)$  Pressure loss/flow characteristics  
 Restriction in A, B



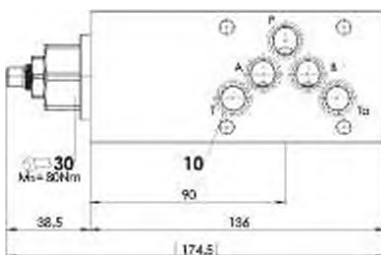
$Q = f(n)$  Volume flow adjustment characteristics  
 (Standard ADRA, B, AB)



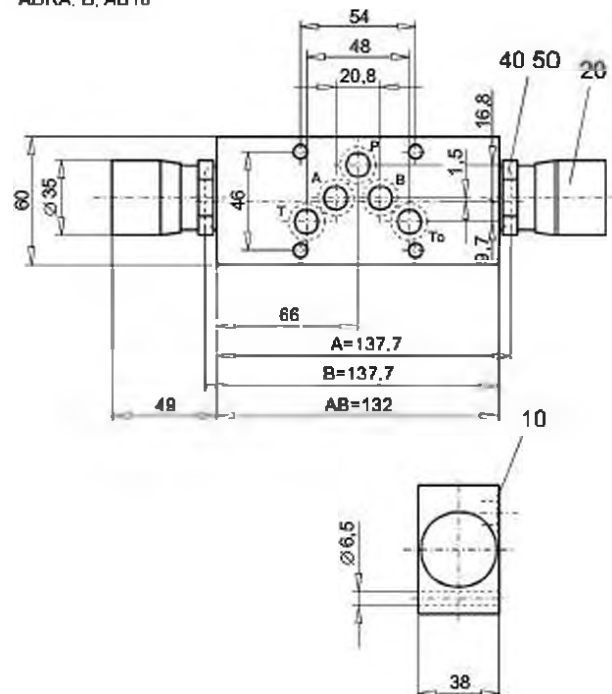
Characteristics ADRPT10 can be found on data sheet 2.4-552 (throttle cartridge DNIPM33)

**DIMENSIONS**

ADRP10



ADRA, B, AB10


**PARTS LIST**

Position	Article	Description
30	823.8009	DNIPM33
10	160.2140	O-ring ID 14,00 x 1,78 (NBR)

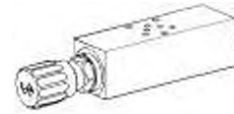
**PARTS LIST**

Position	Article	Description
10	160.2140	O-ring ID 14,00 x 1,78 (NBR)
20	114.1201	Turning knob
40	049.2222	Bounded seal ID 22.7 x 30 x 2
50	238.5201	Plug DIN 908 M 22 x 1,5

Technical explanation see data sheet 1.0-100

**Restrictor valve with reverse free flow check**
**Sandwich construction**

- $Q_{max} = 10 \text{ l/min}$
- $Q_{Nmax} = 8 \text{ l/min}$
- $p_{max} = 315 \text{ bar}$

**NG3-Mini<sup>3D</sup>**

**DESCRIPTION**

Sandwich type one-way restrictor. Fitted with one way restrictor cartridge with incorporated free flow check. Screw-in cartridge M18x1.5 in accordance with ISO 7789 (see data sheet no. 2.4-610). The sandwich plate made of steel is zinc-nickel coated.

**FUNCTION**

Free flow in one direction via the spring-loaded check valve integrated in the screw-in cartridge. The opening pressure of the check valve  $p_0 = 1 \text{ bar}$ . In the other direction, with the check valve shut, the volume flow can be infinitely adjusted via the restrictor section as a function of the pressure.

**APPLICATION**

Sandwich type, one-way restrictors are used where volume flows have to be controlled in one flow direction according to the load. Depending on the application, a distinction is made between restricting the forward flow or the return flow. These sandwich valves are particularly suitable for machine tools and also all kinds of handling operations. Mini-3 oneway restrictors are used where hydraulic systems have to be both light and compact.

**TYPE CODE**

		DR	<input type="checkbox"/>	S	A03	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Throttle check valve											
Type of adjustment	Screw Knob	S	<input type="checkbox"/>	D	<input type="checkbox"/>						
Sandwich construction											
Mounting interface acc. to Wandfluh standard, NG3-Mini											
Type list / function											
Meter-out	in A	<input type="checkbox"/>	A	in B	<input type="checkbox"/>						
	in A and B	<input type="checkbox"/>	AB								
Meter-in	in A	<input type="checkbox"/>	AV	in B	<input type="checkbox"/>						
	in A and B	<input type="checkbox"/>	ABV								
Nominal volume flow rates $Q_N$	3,2 l/min	<input type="checkbox"/>	3,2	8 l/min	<input type="checkbox"/>						
		<input type="checkbox"/>	8								
Design-Index (Subject to change)											

**GENERAL SPECIFICATIONS**

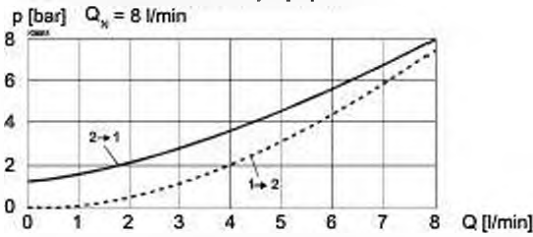
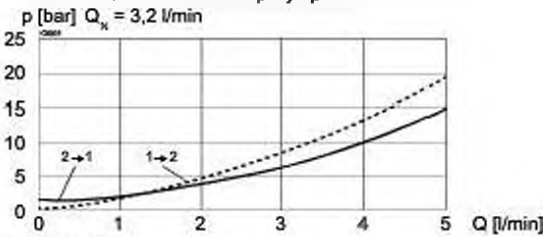
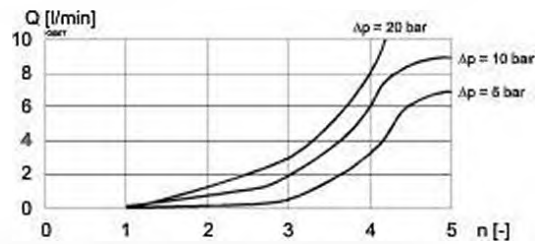
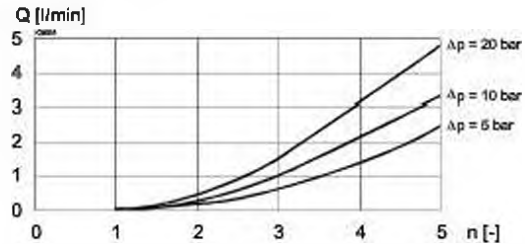
Denomination	Restrictor valve with reverse free flow check
Nominal size	NG3-Mini acc. to Wandfluh standard
Construction	Sandwich
Mounting	3 mounting holes for socket head cap screws M4 or stud screws M4
Connections	Threaded connection plates, Multi-flange subplates, Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_0 = 2,8 \text{ Nm}$ (Qual. 8.8) for fastening screws $M_0 = 30 \text{ Nm}$ for screw-in cartridge
Weight	Depending on the type 0,4...0,5 kg

**HYDRAULIC SPECIFICATIONS**

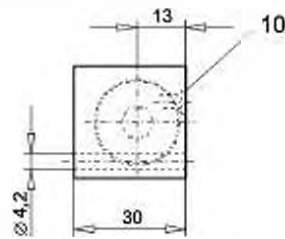
Fluid	Mineraloil, other fluid on request
Contamination efficiency	ISO 4406:1998, class 201/8/14...21/19/15 (Required filtration grade $\beta_{10...25} \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 315 \text{ bar}$
Pressure required to open the check valve	$p_0 = 1 \text{ bar}$
Nominal volume flow rates	$Q_N = 8 \text{ l/min}$ , $Q_N = 3,2 \text{ l/min}$ $Q_N$ at 10 bar valve pressure loss
Max. volume flow	$Q_{max} = 10 \text{ l/min}$
Leakage volume flow	Almost leak free with closed restrictor
For further hydraulic specifications refer to data sheet 2.4-610.	

**TYPE LIST / FUNCTION**

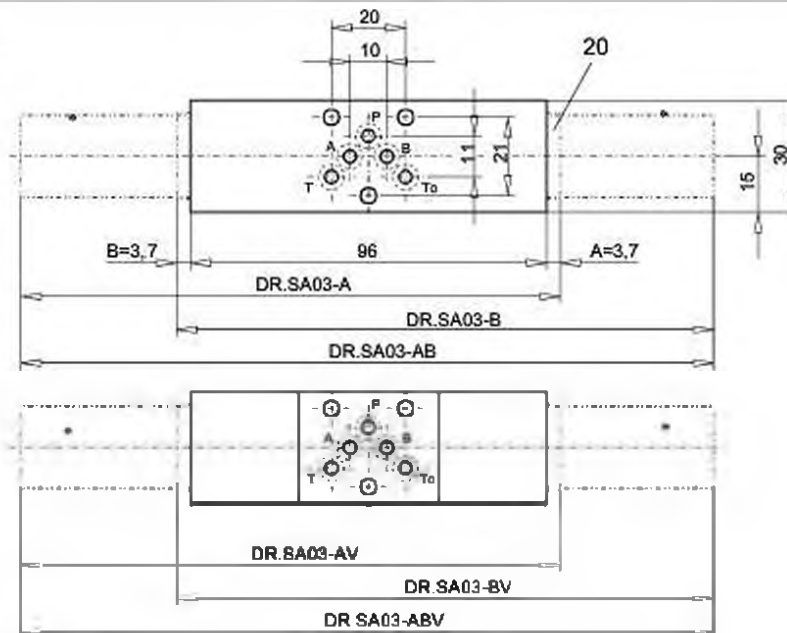
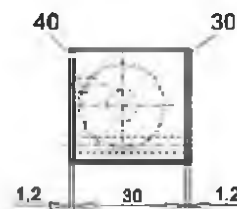
Meter-out:		Meter-in:		
	DR.SA03-A		DR.SA03-AV	Valves for restricting the meter-in flow are achieved by turning the one-way restrictors (horizontal axis): A get BV B get AV AB get ABV Valves for restricting the meter-in flow are supplied with a sealing plate and an intermediate plate
	DR.SA03-B		DR.SA03-BV	
	DR.SA03-AB		DR.SA03-ABV	

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure loss / volume flow diagram  
 — 2 → 1 over check valve by closed restrictor  
 - - - 1 → 2 restrictor completely open

 $\Delta p = f(Q)$  Pressure loss / volume flow diagram  
 — 2 → 1 over check valve by closed restrictor  
 - - - 1 → 2 restrictor completely open

 $Q = f(n)$  Volume flow - adjustment characteristics  
 $Q_n = 8 \text{ l/min}$ 

 $Q = f(n)$  Volume flow - adjustment characteristics  
 $Q_n = 3,2 \text{ l/min}$ 

**DIMENSIONS**

Meter-out:



Meter-in:



\* The total lengths depends on the cartridge type.  
 see data sheet no. 2.4-610.

**PARTS LISTS**

Position	Article	Description
10	160.2045	O-ring ID 4,5x1,5
20	236.4401	Plug VSTI M18x1,5-OR
30	173.0650	Sealing plate PZSA03
40	173.0700	Intermediate plate PZSA03

**SCREW-IN CARTRIDGES INSTALLED**

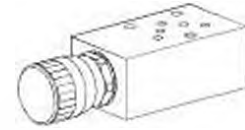
The following screw-in cartridges are used in the sandwich body:

Type	Designation	Data sheet no.
DR.PM18	Restrictor valve with reverse free flow check	2.4-610

Technical explanation see data sheet 1.0-100

**Restrictor valve with reverse free flow check**
**Sandwich construction**

- $Q_{max} = 20 \text{ l/min}$
- $Q_N = 12 \text{ l/min}$
- $p_{max} = 315 \text{ bar}$

**NG4-Mini<sup>®</sup>**

**DESCRIPTION**

Restrictor valve sandwich design NG4-Mini with connecting diagram pursuant acc. to Wandfluh standard. The non-return throttle valve is available in two different variants, namely the standard and the precision throttle (FD). The rotary control is made from aluminium, all other parts, have been phosphated.

**FUNCTION**

Using the precision thread adjusting spindle, the restriction of the volume flow can be continuously adjusted. With the spindle fully screwed home, the volume flow is zero, and a metallic edge makes a leak-tight closure. In the opposite direction, the spring-loaded tapered piston opens and volume flow with a load pressure drop is enabled. The throttle effect is produced by an annular gap which can be varied in size, or by means of a triangular edge. Because of the nature of the design, there is only a small amount of leakage.

**APPLICATION**

Sandwich type, one-way restrictors are used where volume flows have to be controlled in one flow direction according to the load. Depending on the application, a distinction is made between restricting the forward flow or the return flow. These sandwich valves are particularly suitable for machine tools and also all kinds of handling operations. Mini-4 one-way restrictors are used where hydraulic systems have to be both light and compact.

**TYPE CODE**

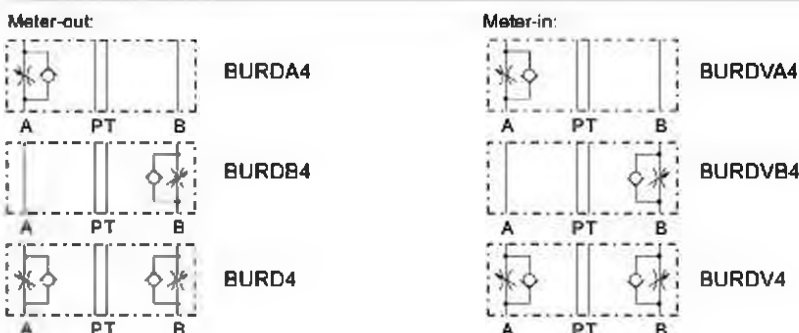
Mounting interface acc. to Wandfluh standard	B	URD	<input type="checkbox"/>	4	<input type="checkbox"/>	#	<input type="checkbox"/>
Throttle check valve							
Type list / function							
Meter-out	in A	<input type="checkbox"/> A	in B	<input type="checkbox"/> B			
Meter-in	in A and B	<input type="checkbox"/> VA	in B	<input type="checkbox"/> VB			
	in A	<input type="checkbox"/> V	in B	<input type="checkbox"/> VB			
	in A and B	<input type="checkbox"/> V					
Nominal size 4-Mini							
Standard							
Precision throttle	<input type="checkbox"/> - FD						
Design-Index (Subject to change)							

**GENERAL SPECIFICATIONS**

Denomination	Restrictor valve with reverse free flow check
Nominal size	NG4-Mini acc. to Wandfluh standard
Construction	Sandwich
Mounting	3 mounting holes for socket head cap screws M5 or stud screws M5
Connections	Threaded connection plates, Multi-flange subplates, Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Tightening torque	$M_0 = 5,5 \text{ Nm}$ (Qual. 8.8) for fastening screws
Weight	Depending on the type 0,8...0,9 kg

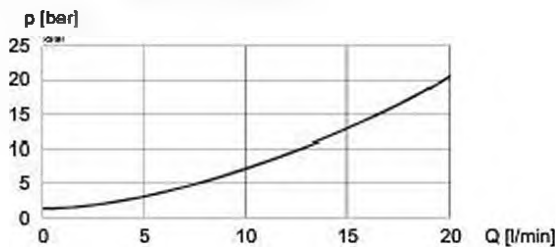
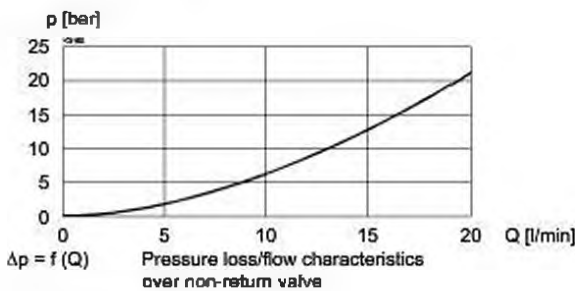
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineraloil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 20/18/14 ... 21/19/16 (Required filtration grade $\beta_{10} \dots 25 \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 315 \text{ bar}$
Pressure required to open the check valve	$p_{\Delta} = 2,2 \text{ bar}$
Nominal volume flow rates	$Q_N = 12 \text{ l/min}$ $Q_N$ at 10 bar valve pressure loss
Max. volume flow	$Q_{max} = 20 \text{ l/min}$
Leakage volume flow	Almost leak free with closed restrictor

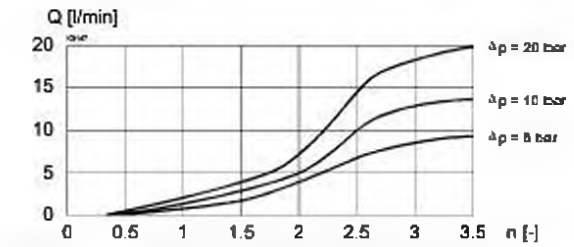
**TYPE LIST / FUNCTION**


Valves for restricting the meter-in flow are achieved by turning the one-way restrictors (horizontal axis):  
 BURDA4 get BURDVB4  
 BURDB4 get BURDVA4  
 BURD4 get BURDV4  
 Valves for restricting the meter-in flow are supplied with a sealing plate and an intermediate plate.

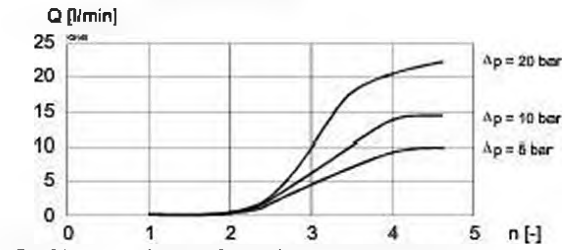
**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$   
 $\Delta p = f(Q)$  Pressure loss/flow characteristics



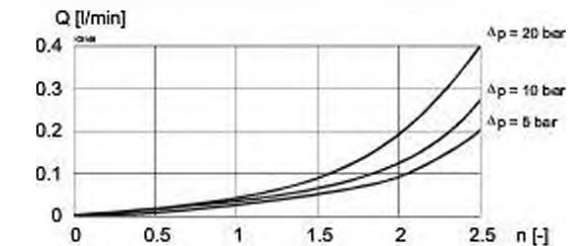
$Q = f(n)$  Volume flow adjustment characteristics (Standard)



$Q = f(n)$  Volume flow adjustment characteristics (Precision throttle)



$Q = f(n)$  Volume flow adjustment characteristics (Precision throttle)



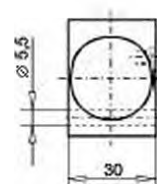
**PARTS LISTS**

Position	Article	Description
10	160.2052	O-ring ID 5,28x1,78
15	160.2067	O-ring ID 6,75x1,78 in line with check valve
20	114.1204	Turning knob
30	173.1650	Sealing plate BDB4
40	173.1700	Intermediate plate BZB4

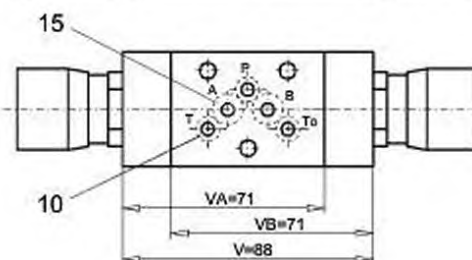
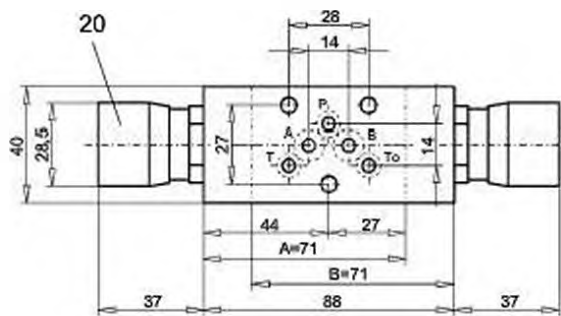
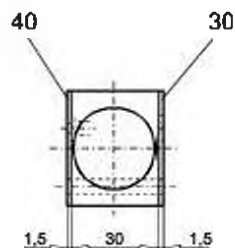
Technical explanation see data sheet 1.0-100

**DIMENSIONS**

Meter-out



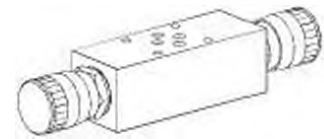
Meter-in:



**Restrictor valve with reverse free flow check**
**Sandwich construction**

- $Q_{max} = 70$  l/min
- $Q_N = 40$  l/min
- $p_{max} = 350$  bar

**NG6**  
ISO 4401-03


**DESCRIPTION**

Restrictor valve sandwich type NG6 with interface to ISO 4401-03. The non-return throttle valve is available in two different variants, namely the standard and the precision throttle (FD). The turning knob is made from aluminium, the sandwich plate made of steel is zinc-nickel coated.

**FUNCTION**

Using the precision thread adjusting spindle, the restriction of the volume flow can be continuously adjusted. With the spindle fully screwed home, the volume flow is zero, and a metallic edge makes a leak-tight closure. In the opposite direction, the spring-loaded tapered piston opens and volume flow with a load pressure drop is enabled. The throttle effect is produced by an annular gap which can be varied in size, or by means of a triangular edge. Because of the nature of the design, there is only a small amount of leakage.

**APPLICATION**

Sandwich type, one-way restrictors are used where volume flows have to be controlled in one flow direction according to the load. Depending on the application, a distinction is made between restricting the forward flow or the return flow. These sandwich valves are particularly suitable for machine tools and also all kinds of handling operations.

**TYPE CODE**

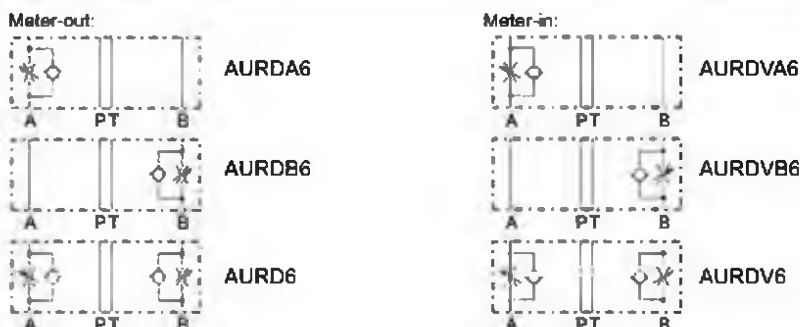
	A	URD	<input type="checkbox"/>	6	<input type="checkbox"/>	# <input type="checkbox"/>
International standard interface ISO						
Throttle check valve						
Type list / function						
Meter-out	in A	<input type="checkbox"/>	in B	<input type="checkbox"/>		
	in A and B	<input type="checkbox"/>	in B	<input type="checkbox"/>		
Meter-in	in A	<input type="checkbox"/>	in B	<input type="checkbox"/>		
	in A and B	<input type="checkbox"/>	in B	<input type="checkbox"/>		
Nominal size 6						
Standard						
Precision throttle	<input type="checkbox"/> - FD					
Design-Index (Subject to change)						

**GENERAL SPECIFICATIONS**

Denomination	Restrictor valve with reverse free flow check
Nominal size	NG6 acc. to ISO 4401-03
Construction	Sandwich
Mounting	4 mounting holes for socket head cap screws M5 or stud screws M5
Connections	Threaded connection plates, Multi-flange subplates, Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_0 = 5,5$ Nm (Qual. 8.8) for fastening screws
Weight	Depending on the type 1,8...1,9 kg

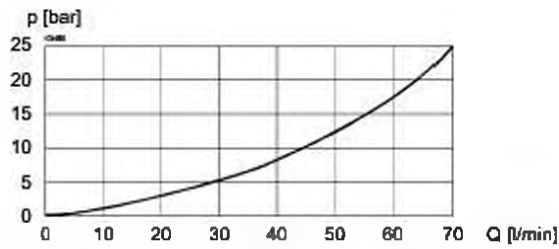
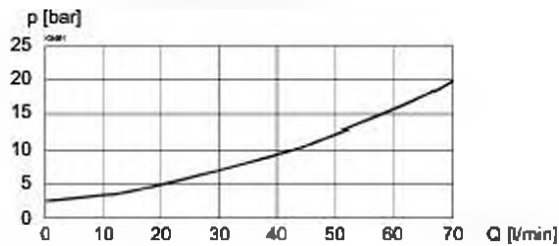
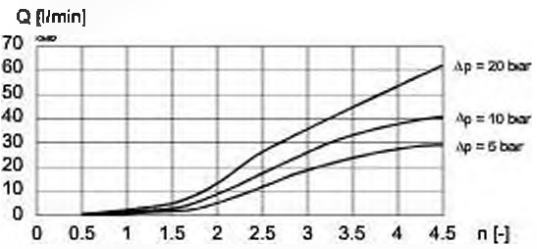
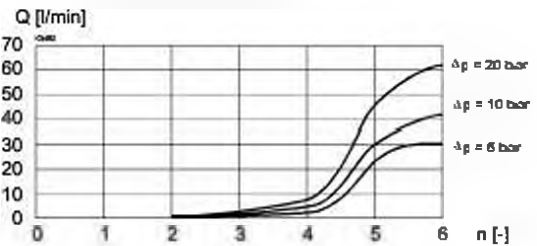
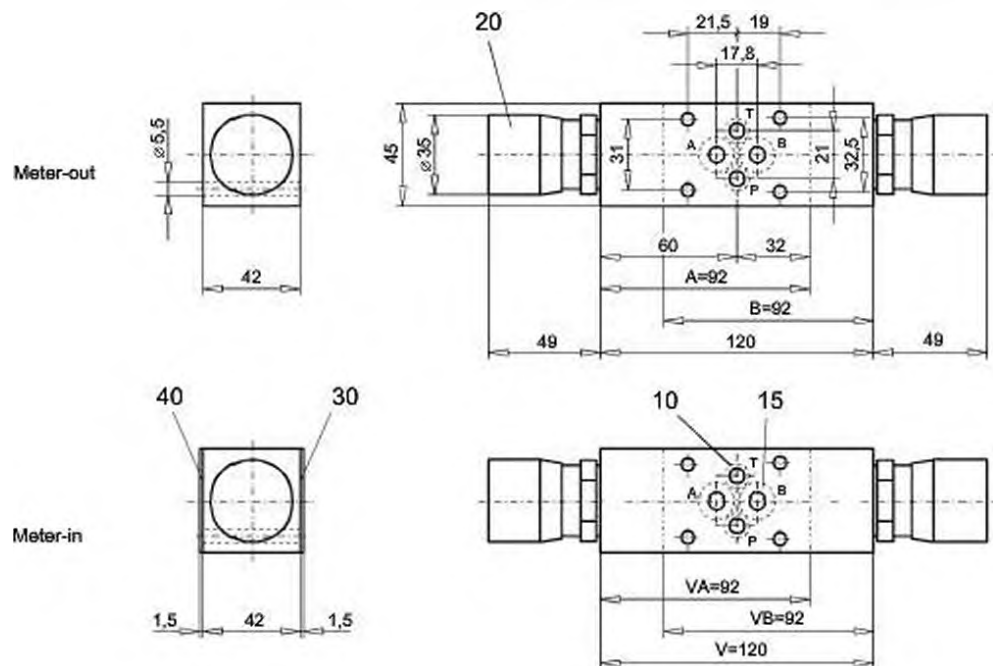
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineraloil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 20/18/14 ... 21/19/16 (Required filtration grade $\beta_{10...25} \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 350$ bar
Pressure required to open the check valve	$p_a = 2$ bar
Nominal volume flow rates	$Q_N = 40$ l/min $Q_N$ at 10 bar valve pressure loss
Max. volume flow	$Q_{max} = 70$ l/min
Leakage volume flow	Almost leak free with closed restrictor

**TYPE LIST / FUNCTION**


Valves for restricting the meter-in flow are achieved by turning the meter-out valves restrictors (longitudinal axis):  
 AURDA6 get AURDVA6  
 AURDB6 get AURDVB6  
 AURD6 get AURDV6  
 Valves for restricting the meter-in flow are supplied with a sealing plate and an intermediate plate.



**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$   
 $\Delta p = f(Q)$  Pressure loss/flow characteristics

 $\Delta p = f(Q)$  Pressure loss/flow characteristics over non-return valve

 $Q = f(n)$  Volume flow adjustment characteristics (Standard)

 $Q = f(n)$  Volume flow adjustment characteristics (Precision throttle)

**DIMENSIONS**

**PARTS LISTS**

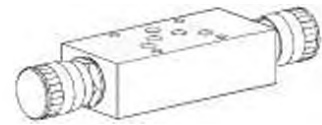
Position	Article	Description
10	160.2076	O-ring ID 7,65x1,78
15	160.2120	O-ring ID 12,42x1,78 in line with check valve
20	114.1201	Turning knob
30	173.3650	Sealing plate ADB6
40	173.3700	Intermediate plate AZB6

Technical explanation see data sheet 1.0-100

**Restrictor valve with reverse free flow check**
**Sandwich construction**

- $Q_{max} = 100 \text{ l/min}$
- $Q_N = 60 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**NG10**  
ISO 4401-05


**DESCRIPTION**

Restrictor valve sandwich type NG10 with interface to ISO 4401-05. The non-return throttle valve is available in two different variants, namely the standard and the precision throttle (FD). The turning knob is made from aluminium, all other parts made of steel, have been phosphated.

**FUNCTION**

Using the precision thread adjusting spindle, the restriction of the volume flow can be continuously adjusted. With the spindle fully screwed home, the volume flow is zero, and a metallic edge makes a leak-tight closure. In the opposite direction, the spring-loaded tapered piston opens and volume flow with a load pressure drop is enabled. The throttle effect is produced by an annular gap which can be varied in size, or by means of a triangular edge. Because of the nature of the design, there is only a small amount of leakage.

**APPLICATION**

Sandwich type, one-way restrictors are used where volume flows have to be controlled in one flow direction according to the load. Depending on the application, a distinction is made between restricting the forward flow or the return flow. These sandwich valves are particularly suitable for machine tools and also all kinds of handling operations.

**TYPE CODE**

	A	URD	10	#
International standard interface ISO				
Throttle check valve				
Type list / function				
Meter-out	in A	A	in B	B
	in A and B	VA	in B	VB
Meter-in	in A	V	in B	VB
	in A and B	V	in B	VB
Nominal size 10				
Standard				
Precision throttle		- FD		
Design-Index (Subject to change)				

**GENERAL SPECIFICATIONS**

Denomination	Restrictor valve with reverse free flow check
Nominal size	NG10 acc. to ISO 4401-05
Construction	Sandwich
Mounting	4 mounting holes for socket head cap screws M6 or stud screws M6
Connections	Threaded connection plates, Multi-flange subplates, Longitudinal stacking system
Ambient temperature	-20...+50° C
Mounting position	any
Fastening torque	$M_0 = 9,5 \text{ Nm}$ (Qual. 8.8) for fastening screws
Weight	Depending on the type 1.8...2.3 kg

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineraloil, other fluid on request
Contamination efficiency	ISO 4408:1989, class 20/18/14...21/18/16 (Required filtration grade $\beta_{10...25} \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70°C
Peak pressure	$p_{max} = 350 \text{ bar}$
Pressure required to open the check valve	$p_0 = 0,8 \text{ bar}$
Nominal volume flow rates	$Q_N = 60 \text{ l/min}$ $Q_N$ at 10 bar valve pressure loss
Max. volume flow	$Q_{max} = 100 \text{ l/min}$
Leakage volume flow	Almost leak free with closed restrictor

**TYPE LIST / FUNCTION**

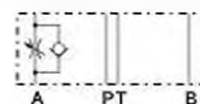
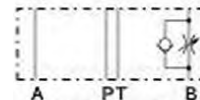
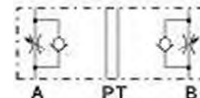
Meter-out:


**AURDA10**

**AURDB10**

**AURD10**

Meter-in:


**AURDVA10**

**AURDVB10**

**AURDV10**

Valves for restricting the meter-in flow are achieved by turning the meter-out valves restrictors (lateral axis):

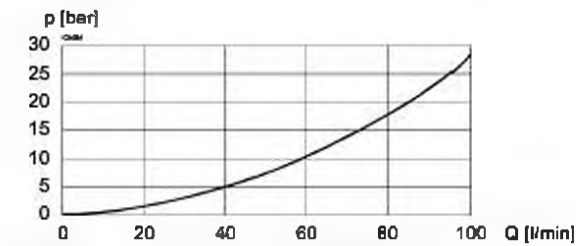
AURDA10 get AURDVB10

AURDB10 get AURDVA10

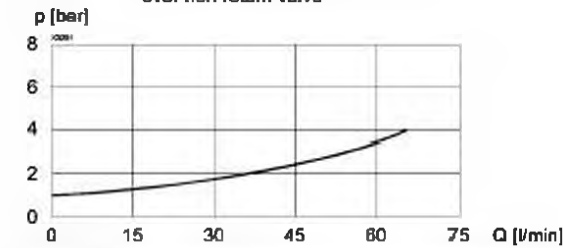
AURD10 get AURDV10

Valves for restricting the meter-in flow are supplied with a sealing plate and an in-intermediate plate.

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$   
 $\Delta p = f(Q)$  Pressure loss/flow characteristics

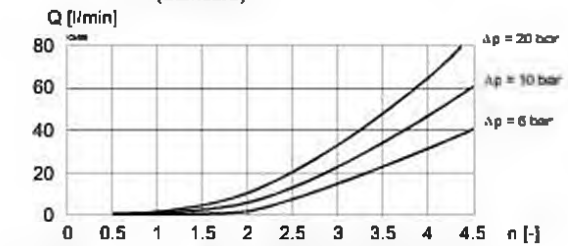


$\Delta p = f(Q)$  Pressure loss/flow characteristics over non-return valve

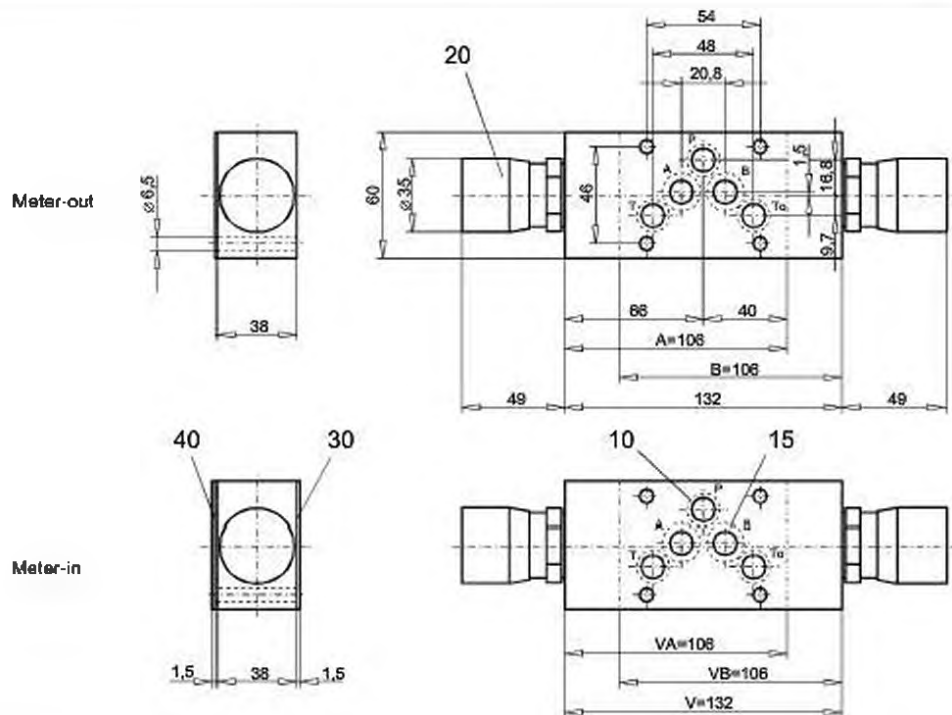
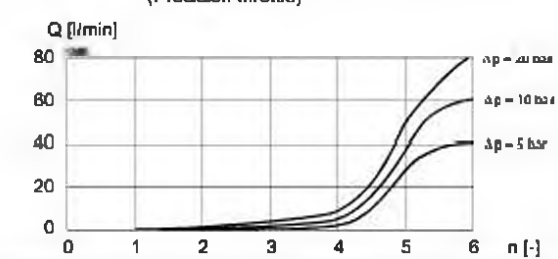


**DIMENSIONS**

$Q = f(n)$  Volume flow adjustment characteristics (Standard)




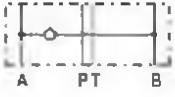



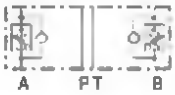





$Q = f(n)$  Volume flow adjustment characteristics (Precision throttle)




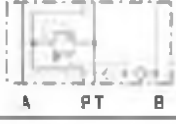



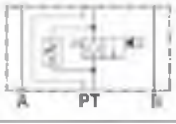

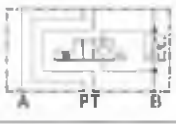


**PARTS LISTS**

Position	Article	Description
10	160.2120	O-ring ID 12.42x1.78
15	160.2132	O-ring ID 13,10x2.62 in line with check valve
20	114.1201	Turning knob
30	173.4650	Sealing plate ADB10
40	173.4700	Intermediate plate AZB10

Technical explanation see data sheet 1.0-100

	NG3-Mini	NG4-Mini	NG6 ISO	NG10 ISO
	Types			
		QZ.FA04-A/B 2.5-720	QZ.FA06-A/B 2.5-740	QZ.FA10-A/B 2.5-760
			AMRP62	
			AMRG62	AMRG102
	QA.SA03-A 2.5-700	QZ.SA04-A 2.5-720	QZ.SA06-A 2.5-740	QZ.SA10-A 2.5-760
	QA.SA03-B 2.5-700	QZ.SA04-B 2.5-720	QZ.SA06-B 2.5-740	QZ.SA10-B 2.5-760
	QA.SA03-AB 2.5-700	QZ.SA04-AB 2.5-720	QZ.SA06-AB 2.5-740	QZ.SA10-AB 2.5-760
	QA.SA03-P 2.5-700	QZ.SA04-P 2.5-720	QZ.SA06-P 2.5-740	QZ.SA10-P 2.5-760
	QA.SA03-T 2.5-700	QZ.SA04-T 2.5-720	QZ.SA06-T 2.5-740	
	QA.SA03-AV 2.5-700	QZ.SA04-AV 2.5-720	QZ.SA06-AV 2.5-740	QZ.SA10-AV 2.5-760
	QA.SA03-BV 2.5-700	QZ.SA04-BV 2.5-720	QZ.SA06-BV 2.5-740	QZ.SA10-BV 2.5-760
	QA.SA03-ABV 2.5-700	QZ.SA04-ABV 2.5-720	QZ.SA06-ABV 2.5-740	QZ.SA10-ABV 2.5-760

	NG3-Mini	NG4-Mini	NG6 ISO	NG10 ISO
	Types			
				QD.FA10-A/B 2.5-762
			QD.SA06-P 2.5-742	QD.SA10-P 2.5-762
		UZFSA04 2.5-820	UZFSA06 2.5-840	
			UDFSA06 2.5-840	
		VQSA04-A. 2.5-920	VQSA06-A. 2.5-940	VQSA10-A. 2.5-960
		VQSA04-B. 2.5-920	VQSA06-B. 2.5-940	VQSA10-B. 2.5-960
		VQSA04-P. 2.5-920	VQSA06-P. 2.5-940	VQSA10-P. 2.5-960
			VQSA06-T. 2.5-940	VQSA10-T. 2.5-960
		VQSA04-AV. 2.5-920	VQSA06-AV. 2.5-940	VQSA10-AV. 2.5-960
		VQSA04-BV. 2.5-920	VQSA06-BV. 2.5-940	VQSA10-BV. 2.5-960

**2-way flow control valve**
**Screw-in cartridge**
**Fixed orifice, adjustable pressure compensator**
**M18x1,5**

ISO 7789



- $Q_{max}$  = 17 l/min
- $Q_{N max}$  = 12,5 l/min
- $p_{max}$  = 315 bar

**DESCRIPTION**

2-way screw-in cartridge-type flow control valve with M18x1,5 thread, for pressure cavity acc. to ISO 7789. The valve is available in two different setting versions: Spanner setting „S“ and turning knob „D“. In its standard form, this control valve can be supplied with five nominal volume flow ranges. The two part cartridge body is made of steel. The surface of the valve is zinc-coated plated for rust protection.

**FUNCTION**

The 2-way flow control valve is designed to keep the speed of a consumer constant irrespective of the load. The fixed measuring orifice which is integrated into the pressure compensating piston determines the volume flow. If there is a pressure change, the pressure compensating spool is displaced and changes the outlet diameter in order to keep the pressure difference on the measuring orifice constant. By varying the spring bias acting on the compensator spool the flow rate can be changed. Minimum adjustable flow within 40...70% of  $Q_{N max}$ . Flow regulation is effective above  $\Delta p$  10 bar approx. Backward flow depends on load.

**APPLICATION**

For use in all hydraulic systems where the supply volume flow needs to be kept constant even when the load fluctuates. Installation of the screw-in cartridge in control blocks as well as in the Wandfluh sandwich plates (vertical stacked systems) and flange valves of the NG3-Mini size. (Please note the separate data sheets in register 2.5). Cavity tools are available for machining the cavities in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

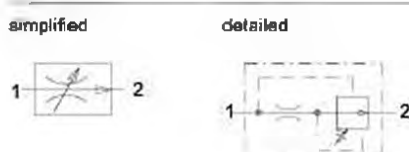
			QA	<input type="checkbox"/>	PM18	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Flow control valve, 2-way									
Type of adjustment	Screw	S							
	Turning knob	D							
	Cover	A (see data sheet 2.0-50)							
Screw-in cartridge M18x1,5									
Nominal volume flow rate $Q_N$	0,4...0,8 l/min	0,63							
	0,8...1,25 l/min	1,25							
	1,3...2,1 l/min	2							
	2,5...5,0 l/min	5							
	5,0...12,5 l/min	12,5							
Design-Index (Subject to change)									

**GENERAL SPECIFICATIONS**

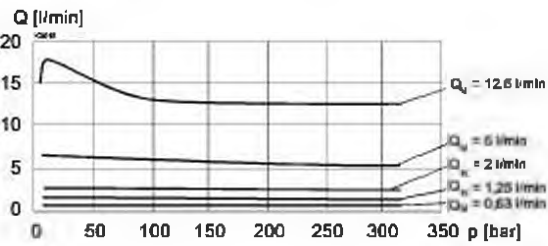
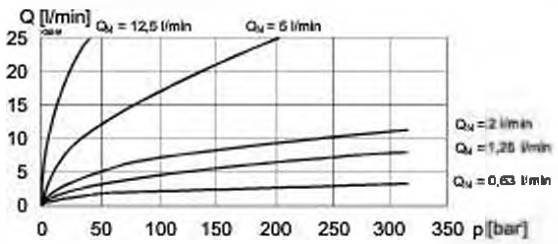
Denomination	Flow control valve 2-way
Construction	Screw-in cartridge for cavity acc. to ISO 7789
Mounting	Screw-in thread M18x1,5
Ambient temperature	-20...50 °C
Mounting position	any
Fastening torque	$M_0 = 30$ Nm
Weight:	$m = 0,09$ kg (screw) $m = 0,1$ kg (knob)
Volume flow direction:	1 → 2 adjustable flow 2 → 1 free flow

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{8...10} \geq 75$ )
Contamination efficiency	refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 315$ bar
Minimum pressure for controlled flow	$\Delta p_{min} = 10$ bar
Nominal volume flow rates:	$Q_N = 0,63$ l/min, $Q_N = 1,25$ l/min, $Q_N = 2$ l/min, $Q_N = 5$ l/min, $Q_N = 12,5$ l/min
Min. volume flow	$Q_{min} = 0,4$ l/min
Max. volume flow	$Q_{max} = 17$ l/min
Hysteresis	depending on nom. volume flow 3...8 %

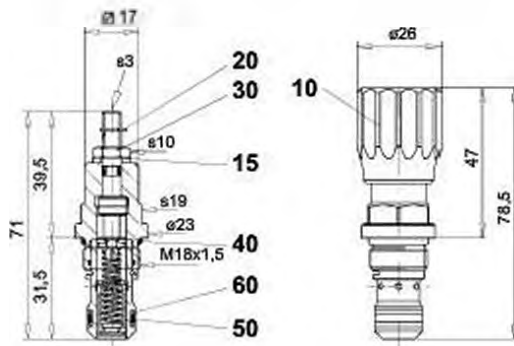
**SYMBOLS**

**MECHANICAL ACTUATION**

Mechanical types of operation in 2 different versions:	
S	= Screw adjustment with fork wrench and Allen key
D	= Control knob adjustment, fixed = 5 mm
Control angle $\alpha_s$	= 1800° / 5 turns

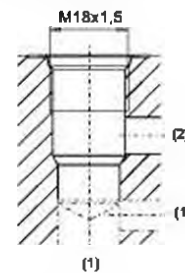
**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $Q = f(p)$  Pressure drop-flow characteristics

 $\Delta p = f(Q)$  Pressure drop characteristics for return flow (from 2 → 1)

**DIMENSIONS / SECTIONAL DRAWING**

Screw adjustment „S“

Knob adjustment „D“



Cavity drawing according to ISO 7789-18-01-0-98



For detailed cavity drawing and cavity tools see data sheet 2.13-1002.

**PARTS LIST**

Position	Article	Description
10	114.2299	Knob
15	234.1080	Disc
20	193.1040	Safety plate RD4 DIN 6799
30	153.1302	Hexagonal nut 0.5D M6x3.2
40	160.2156	O-ring ID 15,60x1,78
50	160.2111	O-ring ID 11,11x1,78
60	049.3156	Back-up ring RD 12,1x15x1,4

**ACCESSORIES**

Sandwich plate NG3-Mini Data sheet 2.5-700

Line mount body Data sheet 2.9-205

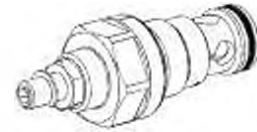
Technical explanation see data sheet 1.0-100

**2-way flow control valve**
**Screw-in cartridge**

- Integrated non-return valve function
- Fixed orifice, adjustable pressure compensator
- $Q_{max} = 50 \text{ l/min}$
- $Q_{Nmax} = 40 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**M22x1,5**

ISO 7789


**DESCRIPTION**

2-way flow control valve with non-return function as a screw-in cartridge with a thread M22x1,5 for cavity according to ISO 7789. In its standard form, this flow control valve can be supplied with nine nominal volume flow ranges. For a flow at low pressure drop in the opposite direction, a check function has been integrated. The two part cartridge body is made of steel. The surface of the valve is zinc-coated for rust protection.

**FUNCTION**

The 2-way flow control valve is designed to keep the speed of a consumer constant, irrespective of the load. The fixed measuring orifice which is integrated into the pressure compensating spool, determines the volume flow. If there is a pressure change, the compensating spool is displaced and changes the outlet diameter in order to keep the pressure difference over the measuring orifice constant. The volume flow is adjustable with the adjustment spindle within a range of 60...100% of  $Q_N$  by changing the spring force acting on the compensating spool.

**APPLICATION**

For use in all hydraulic systems where the supply volume flow has to be kept constant even when the load fluctuates. Installation of the screw-in cartridge in control blocks as well as in the Wandfluh sandwich plates (vertical stacked systems) and flange valves of the NG4-Mini and NG6 size. (Please note the separate data sheets in register 2.5). Cavity tools are available for machining the cavities in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

		QR	S	PM22	-		#	
Flow control valve, 2-way, with non-return function								
Type of adjustment		Screw						
Screw-in cartridge M22x1,5								
Nominal volume flow range $Q_N$ :	0,6...1,0 l/min	1						
	1,0...1,6 l/min	1,6						
	1,6...2,5 l/min	2,5						
	2,5...4,0 l/min	4						
	4,0...6,3 l/min	6,3						
	6,3...10 l/min	10						
	10...16 l/min	16						
	16...25 l/min	25						
	25...40 l/min	40						
Design-Index (Subject to change)								

**GENERAL SPECIFICATIONS**

Description	2-way flow control valve
Construction	Screw-in cartridge for cavity acc. to ISO 7789
Mounting	Screw-in thread M22x1,5
Ambient temperature	-20...50 °C
Mounting position	any
Tightening torque	$M_0 = 50 \text{ Nm}$
Weight	$m = 0,1 \text{ kg}$
Volume flow direction:	1 → 2 adjusted volume flow 2 → 1 free flow through by-pass check

**HYDRAULIC SPECIFICATIONS**

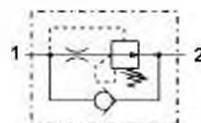
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{6...10} \geq 75$ ) refer to data sheet 1.0-50x2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 350 \text{ bar}$
Beginning of regulation	approx. 9 bar for 60% of $Q_N$ approx. 25 bar for 100% $Q_N$
Influence of load pressure	< 10% of adjusted volume flow
Nominal volume flow rates	see type code
Max. volume flow	$Q_{max} = 50 \text{ l/min}$
Hysteresis	< 5% of $Q_N$ , minimum 0,2 l/min

**SYMBOLS**

simplified



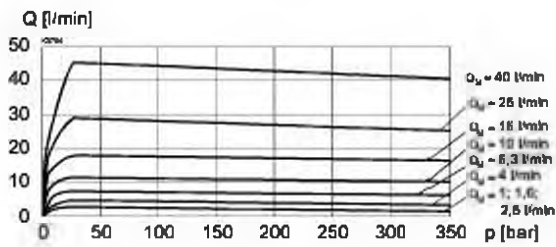
detailed


**CONTROL**

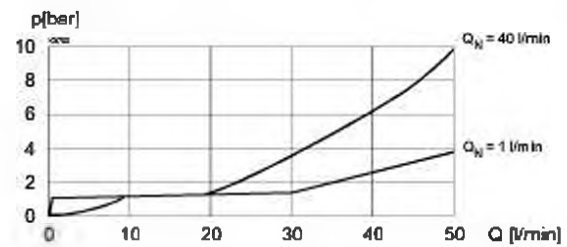
Screw setting	Hexagonal socket wrench s4
Control angle $\alpha_s$	1440° (4 turns)



**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$   
 $Q = f(p)$  Volume flow pressure characteristics

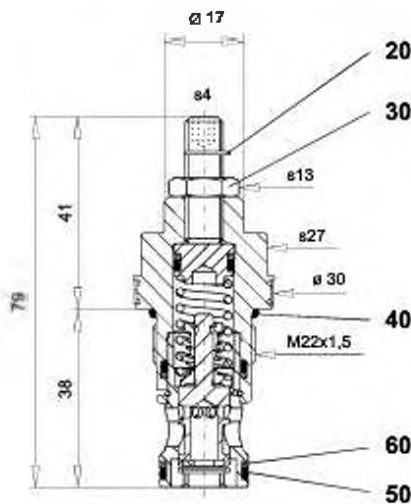


$\Delta p = f(Q)$  Pressure drop characteristics for return flow (from 2 → 1)

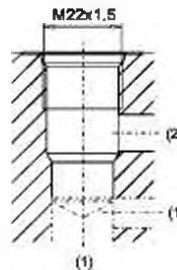


**DIMENSIONS / SECTIONAL DRAWINGS**

Screw setting versions „S“



Cavity drawing according to ISO 7789-22-01-0-98



For detailed cavity drawing and cavity tools see data sheet 2.13-1008.

**PARTS LIST**

Position	Article	Description
20	193.1050	Retainer for shaft RD5 DIN 6799
30	153.1403	Hexagonal nut 0,5D M8
40	160.2188	O-ring ID 18,77x1,78
50	160.2156	O-ring ID 15,60x1,78
60	049.3196	Back-up ring RD 16,1x19x1,4

**ACCESSORIES**

Line mount body

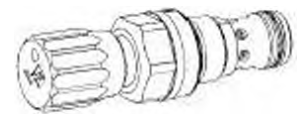
Data sheet 2.9-205

Technical explanation see data sheet 1.0-100

**2-way flow control cartridge**

- ◆  $Q_{max} = 48 \text{ l/min}$
- ◆  $Q_{Nmax} = 40 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**



**DESCRIPTION**

Pressure compensated 2-way flow control valve in screw-in cartridge construction for cavity according to ISO 7789. From the input (1), the fluid flows over the control and throttling spool to the controlled output (2). The control spool keeps the pressure difference via the throttle point constant so that the same set volume flow always exits at connection 2. The volume flow is changed via an adjustment spindle.

**APPLICATION**

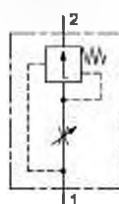
Flow control valves are used for speed control, where the load current has to be maintained constant independent of the input and output pressure. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

Simplified



Detailed



**ACTUATION**

Actuation	Adjustment spindle M10 x 1
Execution	S = lockable key adjustment D = lockable knob adjustment
Actuation angle	$\alpha_s \approx 900^\circ$ (2,5 rotations)
Actuation stroke	$S_s \approx 2,5 \text{ mm}$

**TYPE CODE**

2-way flow control valve

Type of adjustment

Key  
Control knob  
Cover

S  
D  
A

(see data sheet 2.0 20)

Screw-in cartridge M22 x 1,5

Nominal volume flow range  $Q_N$

2,5 l/min  
6,3 l/min  
18 l/min

2,5  
6,3  
18

25 l/min  
40 l/min

25  
40

Sealing material

NBR  
FKM (Viton)  
NBR 872

01  
y-ZR04

Design index (subject to change)

2.3-202

Q2 PM22 - - #

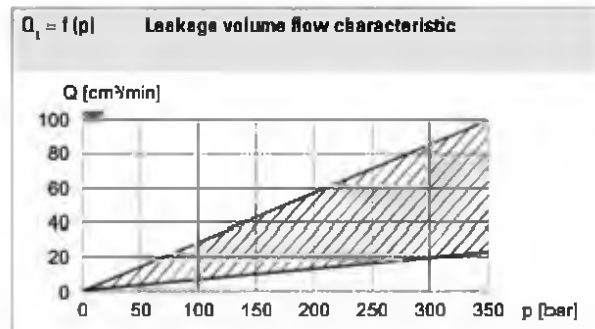
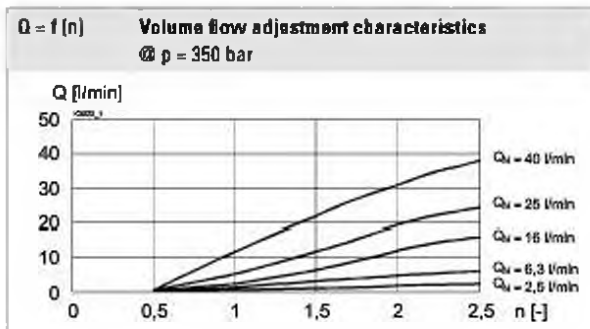
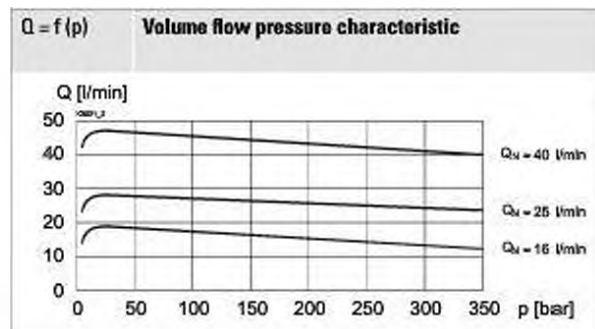
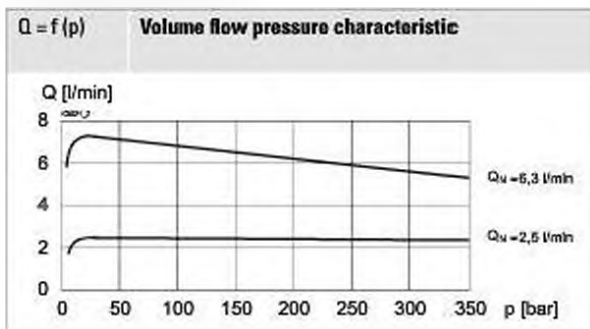
**GENERAL SPECIFICATIONS**

Designation	2-way flow control cartridge
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Ambient temperature	-25 ... +90 °C
Weight	0,18 kg key adjustment 0,19 kg control knob adjustment 0,24 kg cover
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{\text{max}} = 350$ bar
Regelgenauigkeit	$\leq 1\%$
Maximum volume flow	$Q_{\text{max}} = 48$ l/min
Minimum volume flow	$Q_{\text{min}} = 0,1$ l/min
Volume flow direction	1 → 2 adjustable flow
Nominal volume flow	$Q_N = 2,5; 6,3; 16; 25; 40$ l/min
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range	-25 ... +90 °C (NBR) -20 ... +90 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 $\geq 75$ , see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The cartridge body is zinc-nickel coated
- ◆ The control knob is made of plastic

**INSTALLATION NOTES**

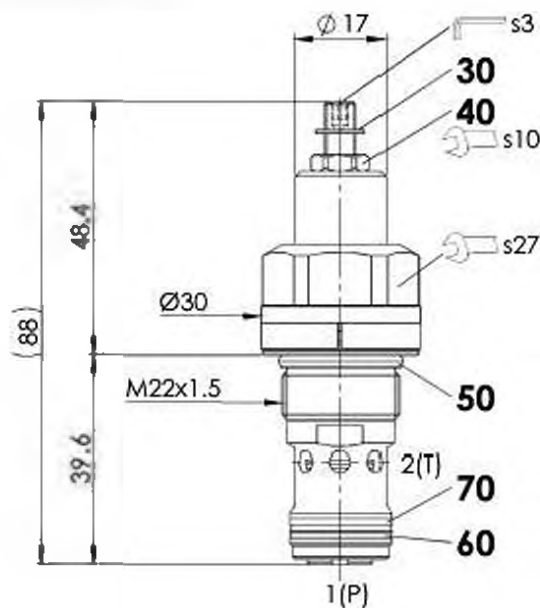
Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60$ Nm Screw-in cartridge

**STANDARDS**

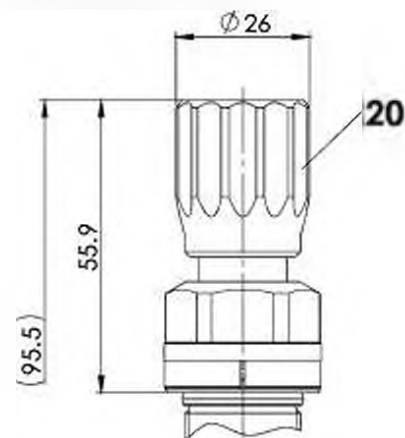
Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

**DIMENSIONS**

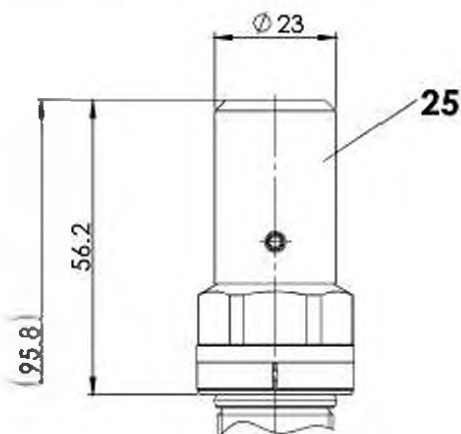
Key adjustment „S“



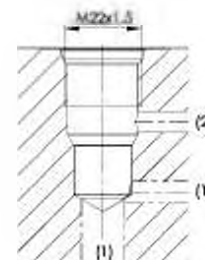
Control knob adjustment „D“



Cover „A“


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-01-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1008

**PARTS LIST**

Position	Article	Description
20	114.2299	Control knob
25	032.0611	Cover rd 23 / 3 x 35
30	193.1040	Retainer rd 4 DIN 6799
40	153.1302	Hexagon nut 0,5d M6 x 3,2
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.3196	Backup ring rd 16,1 x 19 x 1,4

**ACCESSORIES**

Types of adjustment for screw-in cartridges	Data sheet 2.0-50
Flange body / sandwich plate NG4-Mini	Data sheet 2.5-720
Flange body / sandwich plate NG6	Data sheet 2.5-740
Threaded body	Data sheet 2.9-205
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**3-way flow control valve**  
**With a fixed pressure compensator**  
**and adjustable orifice**  
**Screw-in cartridge construction**

- $Q_{max} = 42 \text{ l/min}$
- $Q_{Nmax} = 40 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**DESCRIPTION**

3-way flow control valve as screw-in cartridge with thread M22x1.5 for cavity in accordance with ISO 7789. The valve can be supplied in 2 different setting versions: Spanner setting «S» and rotary knob setting «D». Available as standard are 3 nominal flow steps. The two-part cartridge body is made of steel. External parts are zinc coated and as a result rust protected.

**M22x1,5**  
 ISO 7789

**FUNCTION**

The 3-way flow control valve is designed to keep the oil flow to any actuator constant irrespective of the load. Surplus volume flow will be diverted to the tank line thus saving energy and preventing an overheating of the hydraulic system. By turning the knob of the variable restrictor, the volume flow can be adjusted. In case of pressure fluctuations, the through flow cross-section in the pressure balance spool changes in such a manner, that the pressure difference in the measuring orifice is kept constant.

**APPLICATION**

For use in all hydraulic systems where the supply volume flow needs to be kept constant even when the load fluctuates. Installation of the screw-in cartridge in control blocks as well as in the Wandfluh sandwich plates (vertical slaked systems) and flange valves. (Please note the separate data sheets in register 2.5) Cavity tools are available for machining cavities (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

		QD	<input type="checkbox"/>	PM22	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Flow control valve, 3-way								
Type of adjustment	Screw	<input checked="" type="checkbox"/>	S					
	Turning knob	<input type="checkbox"/>	D					
	Cover	<input type="checkbox"/>	A	(see data sheet 2.0-80)				
Screw-in cartridge M22x1,5								
Nominal flow rate $Q_N$	12 l/min	<input checked="" type="checkbox"/>	12					
	25 l/min	<input type="checkbox"/>	25					
	40 l/min	<input type="checkbox"/>	40					
Design-Index (Subject to change)								

**GENERAL SPECIFICATIONS**

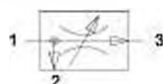
Denomination	3-way flow control valve
Construction	Screw-in cartridge for cavity acc. to ISO 7789
Type of fastening	Screw-in thread M22x1,5
Ambient temperature	-20...50 °C
Installation position	any
Tightening torque	$M_0 = 50 \text{ Nm}$
Weight	$m = 0,22 \text{ kg}$ (screw) $m = 0,23 \text{ kg}$ (knob)
Volume flow direction	1 → 3 adjustable flow

**HYDRAULIC SPECIFICATIONS**

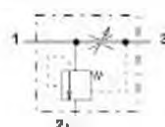
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 Required filtration grade ( $\beta_{8...10} \geq 75$ ) (refer to data sheet 1.0-50/2)
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 350 \text{ bar}$
Nominal volume flow rates	$Q_N = 12 \text{ l/min}, 25 \text{ l/min}, 40 \text{ l/min}$
Min. volume flow	$Q_{min} = 0,1 \text{ l/min}$ (at $v = 30 \text{ mm}^2/\text{s}$ )
Max. volume flow	$Q_{max} = 42 \text{ l/min}$
Max. feed flow	50 l/min
Control accuracy	≤ 1 %

**SYMBOLS**

simplified

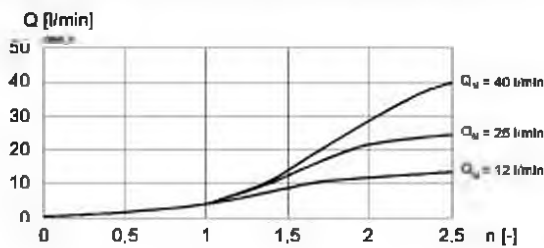
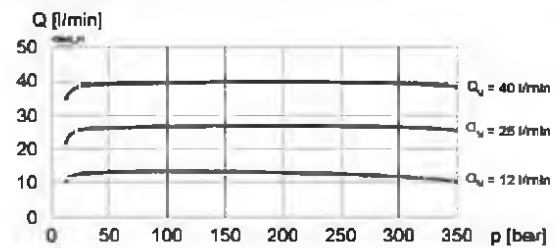
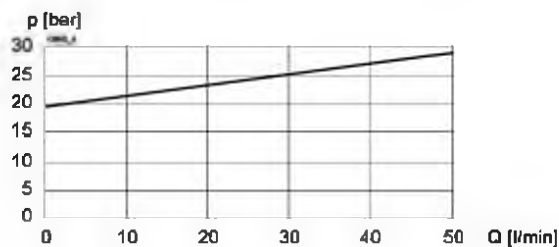
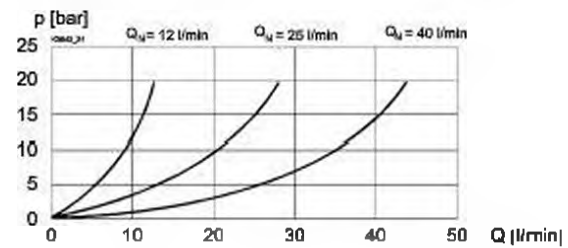


detailed


**MECHANICAL ACTUATION**

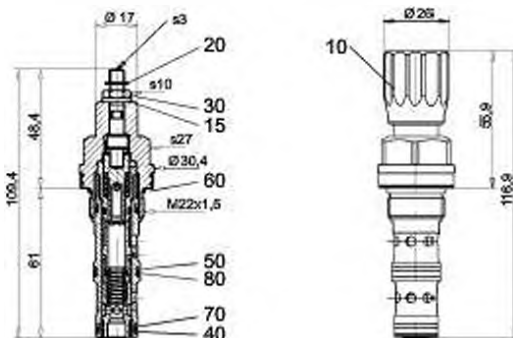
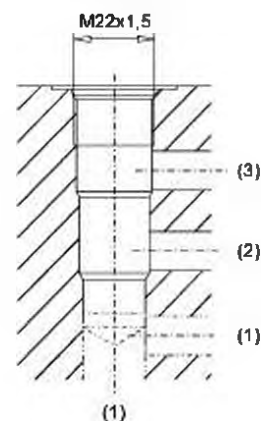
Mechanical types of operation in 2 different versions:

- S = Screw adjustment  
 with fork wrench and Allen key
- D = Control knob adjustment, fixed  
 Control stroke  $S_b = 2,5 \text{ mm}$   
 Control angle  $\alpha_b = 900^\circ$  (2,5 turns)

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $Q = f(n)$  Volume flow adjustment characteristic (at  $p = 350 \text{ bar}$ )

 $Q = f(p)$  Volume flow pressure characteristic

 $\Delta p = f(Q)$  Pressure drop volume flow characteristic 1 → 2

 $\Delta p = f(Q)$  Pressure drop-volume flow characteristic 1 → 3

**DIMENSIONS/SECTIONAL DRAWINGS**

Screw adjustment «S»

Knob adjustment «D»


 Cavity drawing  
 ISO 7789-22-04-0-98

 For cavity details and  
 cavity tools,  
 see data sheet 2.13-1004

**PARTS LIST**

Position	Article	Description
10	114.2299	Knob
15	234.1060	Plate
20	193.1040	Safety plate RD4 DIN 6799
30	153.1302	Hexagonal nut 0.5D M6x3.2
40	180.2140	O-ring ID 14,00x1,78
50	180.2156	O-ring ID 15,60x1,78
60	180.2188	O-ring ID 18,77x1,78
70	049.3176	Back-up RD 14,1x17x1,4
80	049.3196	Back-up RD 16,1x19x1,4

**ACCESSORIES**

Flange/sandwich plate NG6	Data sheet 2.5-742
Line mount body	Data sheet 2.9-210

Technical explanation see data sheet 1.0-100

**2-way flow control cartridge**

- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $Q_{Nmax} = 70 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**M33 x 2**  
**ISO 7789**



**DESCRIPTION**

2-way flow control valve in screw-in cartridge construction for cavity according to ISO 7789. The valve serves to maintain the speed of a consumer constant independent of the load. The adjustable throttle spool determines the volume flow. When the pressure changes, the pressure compensating piston shifts and changes the flow cross-section so that the pressure difference at the throttle spool is kept constant.

**APPLICATION**

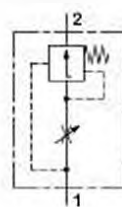
In all hydraulic systems in which the volume flow must be kept constant in one flow direction when the load fluctuates. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

Simplified



Detailed



**ACTUATION**

Actuation	Adjustment spindle M10 x 1
Execution	S = blockable key adjustment D = blockable knob adjustment Optionally: K = lockable adjustment G = star handle adjustment → see Data sheet 2.0-50
Actuation angle	$\alpha_s = 1440^\circ$ (4 rotations)
Actuation stroke	$S_s = 4 \text{ mm}$

**TYPE CODE**

2-way flow control valve		QZ	<input type="checkbox"/>	PM33	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Type of adjustment	Key Control knob Cover	<input type="checkbox"/> S <input type="checkbox"/> D <input type="checkbox"/> A	[see data sheet 2.0 60]							
Screw-in cartridge M33 x 2										
Nominal volume flow range $Q_n$	32 l/min 70 l/min	<input type="checkbox"/> 32 <input type="checkbox"/> 70								
Sealing material	NBR FKM (Viton) NBR 872	<input type="checkbox"/> <input type="checkbox"/> D1 <input type="checkbox"/> y-2804								
Design index (subject to change)										

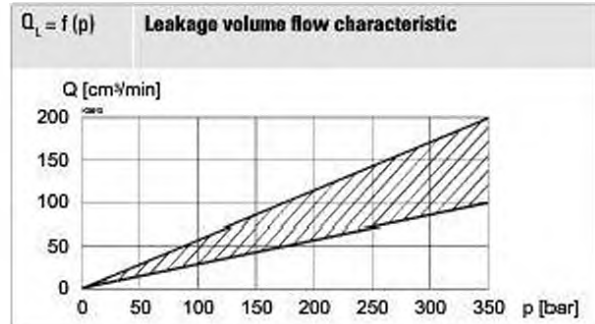
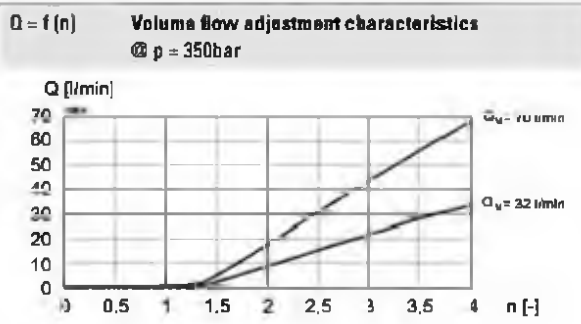
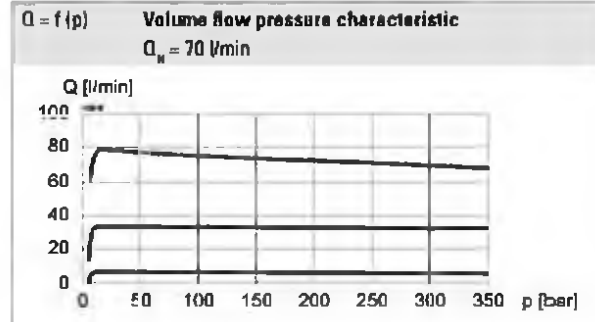
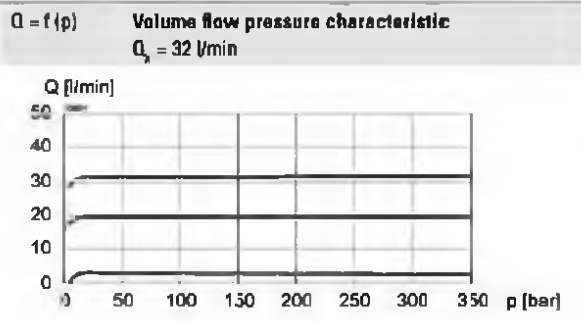
**GENERAL SPECIFICATIONS**

Designation	2-way flow control cartridge
Mounting	Screw-in cartridge construction
Nominal size	M33 x 2 according to ISO 7789
Ambient temperature	-25 ... +90 °C
Weight	0,39 kg key adjustment 0,40 kg control knob adjustment 0,45 kg cover
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{\text{max}} = 350 \text{ bar}$
Regelgenauigkeit	$\leq 1 \%$
Maximum volume flow	$Q_{\text{max}} = 80 \text{ l/min}$
Minimum volume flow	$Q_{\text{min}} = 0,2 \text{ l/min}$
Volume flow direction	1 → 2 adjustable flow
Nominal volume flow	$Q_N = 32; 70 \text{ l/min}$
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range	-25 ... +90 °C (NBR) -20 ... +90 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 $\geq 75$ , see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The cartridge body is zinc-nickel coated
- ◆ The control knob is made of plastic

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M33 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 80 \text{ Nm}$ screw-in cartridge

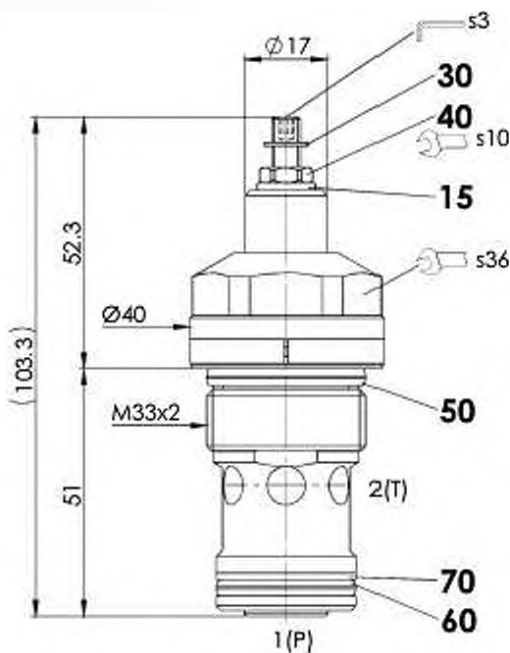
**STANDARDS**

Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

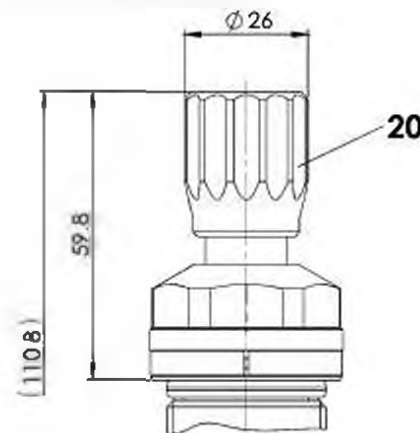


**DIMENSIONS**

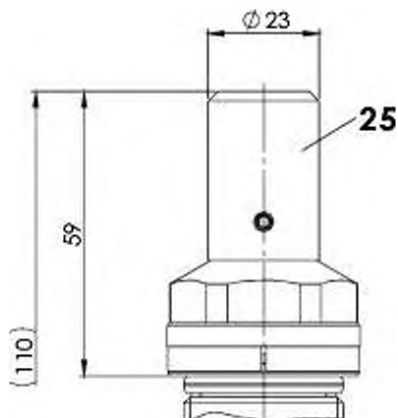
Key adjustment „S“



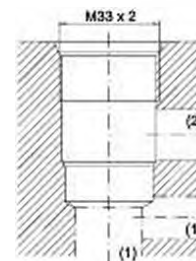
Control knob adjustment „D“



Cover „A“


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-33-01-0-98


**Nota!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1005

**ACCESSORIES**

Types of adjustment for screw-in cartridges	Data sheet 2.0-50
Flange body / sandwich plate NG10	Data sheet 2.5-760
Threaded body	Data sheet 2.9-205
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**PARTS LIST**

Position	Article	Description
15	234.1060	Washer DIN 125A M6
20	114.2299	Control knob
25	032.0611	Cover rd 23 / 3 x 35
30	193.1040	Retainer rd 4 DIN 6799
40	153.1302	Hexagon nut 0,5d M6 x 3,2
50	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FMK)
60	160.2238	O-ring ID 23,81 x 2,62 (NBR)
	160.6238	O-ring ID 23,81 x 2,62 (FMK)
70	049.3297	Backup ring rd 24,5 x 29 x 1,4

**3-way flow control valve**  
**With fixed pressure compensator and**  
**adjustable orifice,**  
**Screw-in cartridge construction**

- $Q_{max} = 120 \text{ l/min}$
- $Q_{Nmax} = 100 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**DESCRIPTION**

3-way flow control valve as screw-in cartridge with thread M33x2 for cavity in accordance with ISO 7789. The valve can be supplied in 2 different setting versions: Key setting «S» and turning knob setting «D». Key adjustment «S» is also available with cover, see data sheet 2.0.50. Available as standard are 2 nominal flow steps.

The two-part cartridge body is made of steel. External parts are zinc coated and as a result rust protected. The colourlessly anodised aluminium rotary knob gives this quality product a clean design.

**M33x2**  
 ISO 7789

**FUNCTION**

The 3-way flow control valve is designed to keep the oil flow to any actuator constant irrespective of the load. Surplus volume flow will be diverted to the tank line thus saving energy and preventing an overheating of the hydraulic system. By turning the knob of the variable restrictor the volume flow can be adjusted. In case of pressure fluctuations, the through flow cross-section in the pressure balance spool changes in such a manner, that the pressure difference in the measuring orifice is kept constant.

**APPLICATION**

For use in all hydraulic systems where the supply volume flow needs to be kept constant even when the load fluctuates. Installation of the screw-in cartridge in control blocks as well as in the Wandfluh sandwich plates (vertical slaked systems) and flange valves. (Please note the separate data sheets in register 2.5). Cavity tools are available for machining cavities (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

		QD <input type="checkbox"/> PM33 - <input type="checkbox"/> # <input type="checkbox"/>	
Flow control valve, 3-way			
Type of adjustment	Screw	<input type="checkbox"/> S	(see data sheet 2.0.80)
	Turning knob	<input type="checkbox"/> D	
	Cover	<input type="checkbox"/> A	
Screw-in cartridge M33x2			
Nominal flow rates $Q_N$	50 l/min	<input type="checkbox"/> 50	
	100 l/min	<input type="checkbox"/> 100	
Design-Index (Subject to change)			

**GENERAL SPECIFICATIONS**

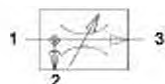
Denomination	3-way flow control valve
Construction	Screw-in cartridge for cavity acc. to ISO 7789
Mounting	Screw-in thread M33x2
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_c = 80 \text{ Nm}$
Weight	$m = 0,48 \text{ kg}$ (screw) $m = 0,49 \text{ kg}$ (knob)
Volume flow direction	1 → 3 adjustable flow

**HYDRAULIC SPECIFICATIONS**

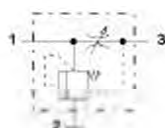
Fluid	Mineral oil, other fluid on request ISO 4406:1999, class 18/16/13
Contamination efficiency	Required filtration grade (β <sub>8...10</sub> ≥ 75) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 350 \text{ bar}$
Nominal volume flow rates:	$Q_N = 50 \text{ l/min}, 100 \text{ l/min}$
Min. volume flow	$Q_{min} = 0,2 \text{ l/min}$ (at $v = 30 \text{ mm}^2/\text{s}$ )
Max. volume flow	$Q_{max} = 120 \text{ l/min}$
Max. feed flow	140 l/min
Control accuracy	≤ 1 %

**SYMBOLS**

simplified

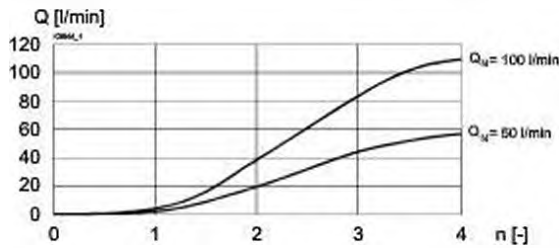
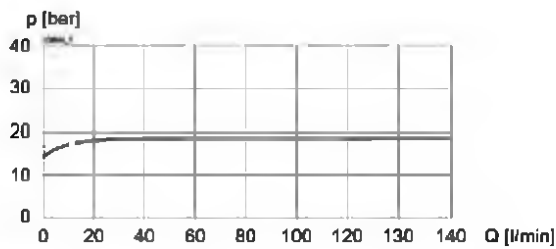
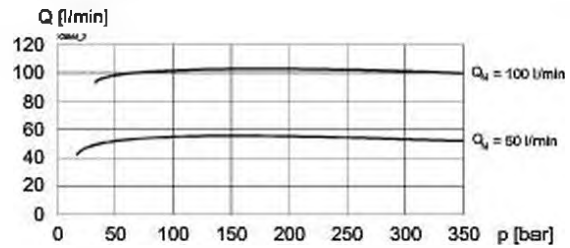
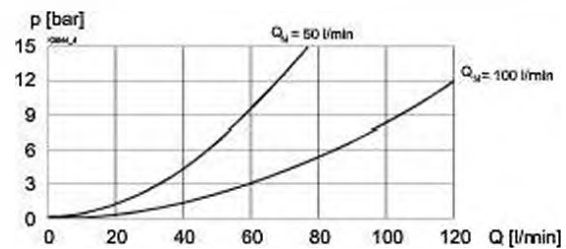


detailed


**MECHANICAL ACTUATION**

Mechanical types of operation in 2 different versions:

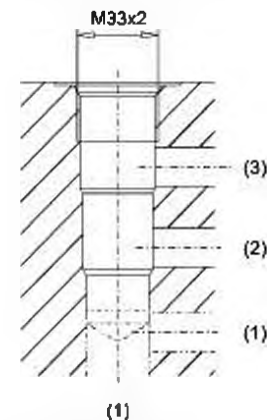
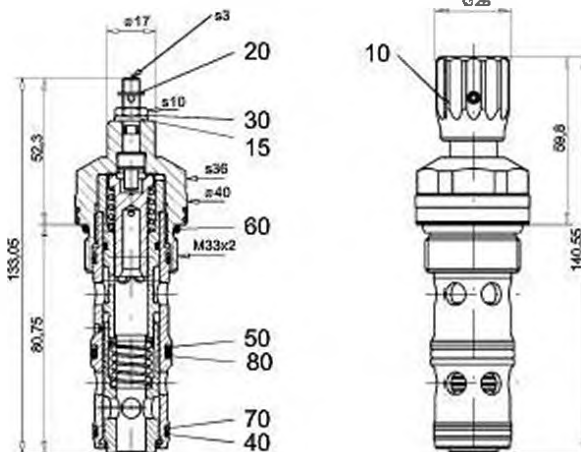
- S = Screw adjustment  
 with fork wrench and Allen key
- D = Control knob adjustment, fixed
- Control stroke  $S_b$  = 4 mm
- Control angle  $\alpha_b$  = 1440° (4 turns)

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $Q = f(n)$  Volume flow adjustment characteristics (at  $p = 350 \text{ bar}$ )

 $\Delta p = f(Q)$  Pressure drop volume flow characteristic 1 → 2

 $Q = f(p)$  Volume flow pressure characteristic

 $\Delta p = f(Q)$  Pressure drop volume flow characteristic 1 → 3

**DIMENSIONS / SECTIONAL DRAWING**

Screw adjustment «S»

Knob adjustment «D»

Cavity drawing acc. to ISO 7789-33-04-0-98



For cavity details and cavity tools, see data sheet 2.13-1040

**PARTS LIST**

Position	Article	Description
10	114.2289	Knob
15	234.1060	Plate
20	193.1040	Safety plate RD4 DIN 6799
30	153.1302	Hexagonal nut 0.50 M6x3.2
40	180.2236	O-ring ID 23,52x1,78
50	180.2238	O-ring ID 23,81x2,62
60	180.2298	O-ring ID 29,82x2,62
70	049.3276	Back-up ring RD 24,1x27x1,4
80	049.3297	Back-up ring RD 24,5x28x1,4

**ACCESSORIES**

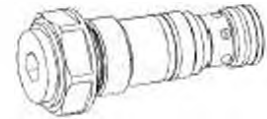
 Flange-sandwich plate NG10 Data sheet 2.5-762

 Line mount body Data sheet 2.9-210

Technical explanation see data sheet 1.0-100

**Pressure compensating valve**
**Screw-in cartridge**

- 2- and 3-way operation
- $Q_{max} = 25 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**M22x1,5**  
 ISO 7789

**DESCRIPTION**

Pressure compensator valve with fixed settings, in screw cartridge construction with M22x1,5 thread for cavity acc. to ISO 7789. The valve is available in a 2 or 3 way design. The one-piece cartridge is made of steel. The external parts are zinc coated and therefore protected against rust.

**FUNCTION**

The pressure compensator valve keeps the pressure difference between inlet pressure at port P and the pressure in output port A or B on the directional valve nearly constant. It ensures that, for a given actuating spool position, a precise amount of oil, which is not dependent on load pressure, flows through the directional valve. Pressure compensating valves are mostly used in conjunction with proportional valves.

**APPLICATION**

**2-way pressure compensating valve:** Volume flow changes resulting from pressure or load changes in the consumer are corrected. Cylinder or motor speeds remain constant. If several consumers are operating in parallel, the full system pressure is available to each one.

**3-way pressure compensating valve:** Surplus output flow is cost-effectively led to the return system. This prevents the hydraulic system from overheating, especially in mobile systems which lack the necessary cooling surfaces. Parallel operation is not possible. If there are several consumers the pump pressure is set at the maximum working pressure. **Important:** Pressure compensators are only suitable for open loop control.

**TYPE CODE**

			<input type="checkbox"/> U	<input type="checkbox"/> F	<input type="checkbox"/> PM22	<input type="checkbox"/> #
Pressure compensator, 2-way	Z					
Pressure compensator, 3-way	D					
Type of adjustment	fixed setting					
Screw-in cartridge M22x1.5						
Design-Index (Subject to change)						

**GENERAL CHARACTERISTICS**

Designation	2- and 3-way pressure compensating valve
Construction	Screw cartridge for cavity acc. to ISO 7789
Type of fastening	M22x1,5 screw thread
Ambient temperature	-20...+50 °C
Installation position	any
Tightening torque	$M_c = 50 \text{ Nm}$
Weight:	$m = 0,4 \text{ kg}$ (2-way operation) $m = 0,4 \text{ kg}$ (3-way operation)

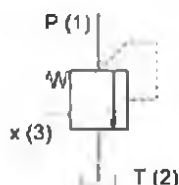
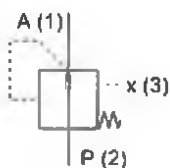
**HYDRAULIC CHARACTERISTICS**

Hydraulic fluid	mineral oils, other media on request
Max. permissible contamination level	ISO 4406:1999, class 18/16x13 (Recommended filter gauge G 6...10x75) see also data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Hydraulic fluid temp.	-20...+70 °C
Peak pressure	$p_{max} = 350 \text{ bar}$
Differential pressure	$p_{DR} = 10 \text{ bar}$ other differential pressures on request
max. volume flow	$Q_{max} = 25 \text{ l/min}$
Leakage volume flow	see curve

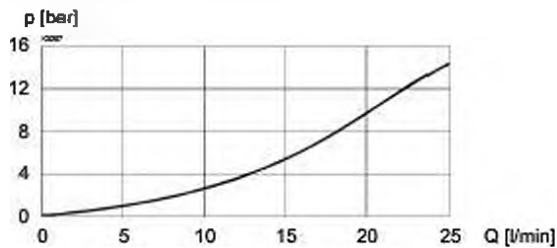
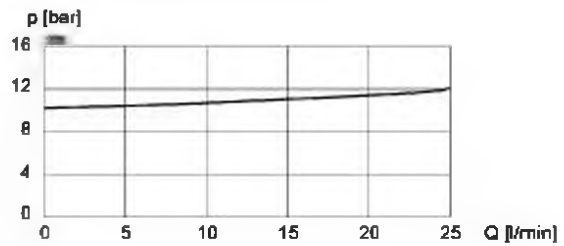
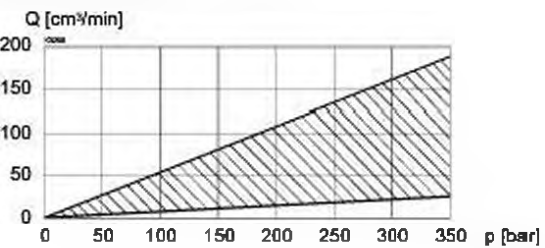
**SYMBOLS**

2-way operation

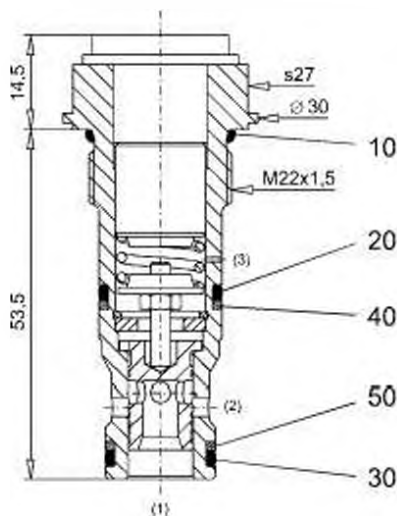
3-way operation


**MECHANICAL ACTUATION**

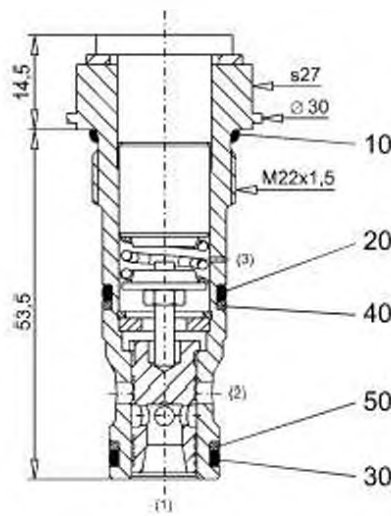
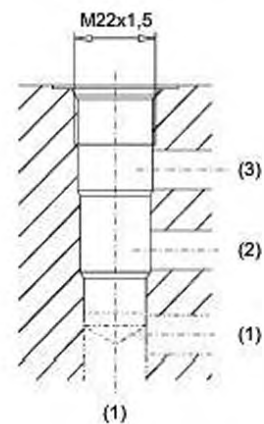
Fixed setting design. Other differential pressure available on request.

**PERFORMANCE CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure drop-volume flow curve  
 2-way operation

 $\Delta p = f(Q)$  Pressure drop-volume flow curve  
 3-way operation

 $Q_l = f(p)$  Leakage volume flow curve

**DIMENSIONS / SECTIONAL DRAWINGS**

2-way operation



3-way operation


 Cavity drawing acc. to  
 ISO 7789-22-06-0-98

 For detailed cavity drawings  
 and cavity tools see data  
 sheet 2.13-1006.

**PARTS LIST**

Position	Article	Description
10	160.2188	O-ring ID 18,77x1,78
20	160.2156	O-ring ID 15,60x1,78
30	160.2120	O-ring ID 12,42x1,78
40	049.3198	Back-up ring RD 16,1x19x1,4
50	049.3176	Back-up ring RD 14,1x17x1,4

**ACCESSORIES**

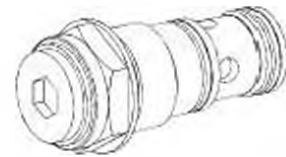
 Cartridge installed in sandwich plates:  
 Sandwich valve

register 2.5

Technical explanation see data sheet 1.0-100

**Pressure compensating valve**
**Screw-in cartridge**

- 2- and 3-way operation
- $Q_{max} = 100 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**M33x2**  
 ISO 7789

**DESCRIPTION**

Pressure compensator valve with fixed settings, in screw cartridge construction with M33x2 thread for cavity acc. to ISO 7789. The valve is available in a 2 or 3 way design. The one-piece cartridge is made of steel. The external parts are zinc coated and therefore protected against rust.

**FUNCTION**

The pressure compensator valve keeps the pressure difference between inlet pressure at port P and the pressure in output port A or B on the directional valve nearly constant. It ensures that, for a given actuating spool position, a precise amount of oil, which is not dependent on load pressure, flows through the directional valve. Pressure compensating valves are mostly used in conjunction with proportional valves.

**APPLICATION**

**2-way pressure compensating valve:** Volume flow changes resulting from pressure or load changes in the consumer are corrected. Cylinder or motor speeds remain constant. If several consumers are operating in parallel, the full system pressure is available to each one.

**3-way pressure compensating valve:** Surplus output flow is cost-effectively led to the return system. This prevents the hydraulic system from overheating, especially in mobile systems which lack the necessary cooling surfaces. Parallel operation is not possible. If there are several consumers the pump pressure is set at the maximum working pressure.

**Important:** Pressure compensators are only suitable for open loop control.

**TYPE CODE**

			<input type="checkbox"/>	U	<input type="checkbox"/>	F	PM33	#	<input type="checkbox"/>
Pressure compensator, 2-way		Z							
Pressure compensator, 3-way		D							
Type of adjustment	fixed setting								
Screw-in cartridge M33x2									
Design-Index (Subject to change)									

**GENERAL CHARACTERISTICS**

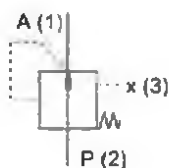
Designation	2- and 3-way pressure compensating valve
Construction	Screw cartridge for cavity acc. to ISO 7789
Type of fastening	M33x2 screw thread
Ambient temperature	-20...+50°C
Installation position	any
Tightening torque	$M_s = 80 \text{ Nm}$
Weight:	$m = 0,52 \text{ kg}$ (2-way operation) $m = 0,42 \text{ kg}$ (3-way operation)

**HYDRAULIC CHARACTERISTICS**

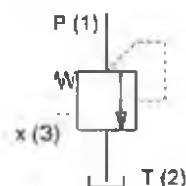
Hydraulic fluid	mineral oils, other media on request
Max. permissible contamination level	ISO 4406:1999, class 18/16/13 (Recommended filter gauge $\beta_{0.5} \dots 10 \geq 75$ ) see also data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Hydraulic fluid temp.	-20...+70°C
Peak pressure	$p_{max} = 350 \text{ bar}$
Differential pressure	$p_{diff} = 10 \text{ bar}$ other differential pressures on request
Max. volume flow	$Q_{max} = 100 \text{ l/min}$
Leakage volume flow	see curve

**SYMBOLS**

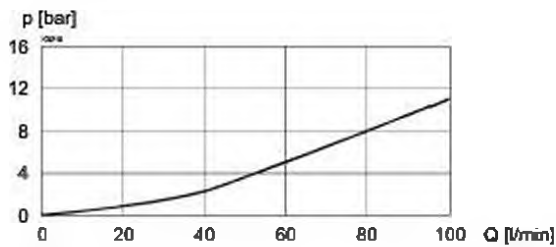
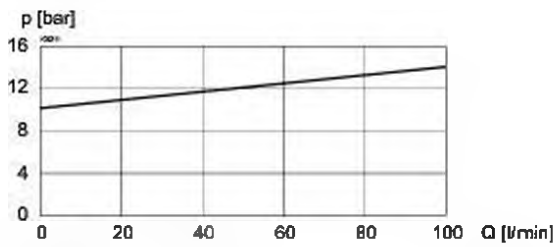
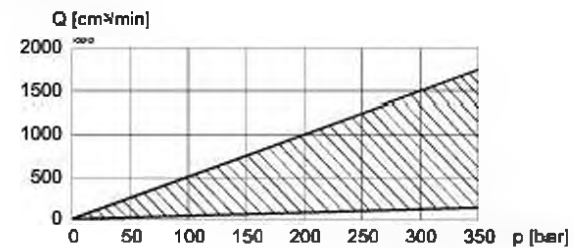
2-way operation



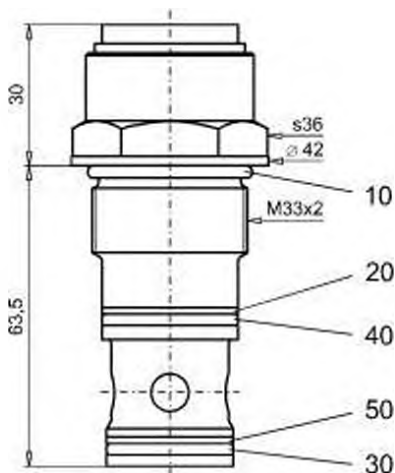
3-way operation


**MECHANICAL ACTUATION**

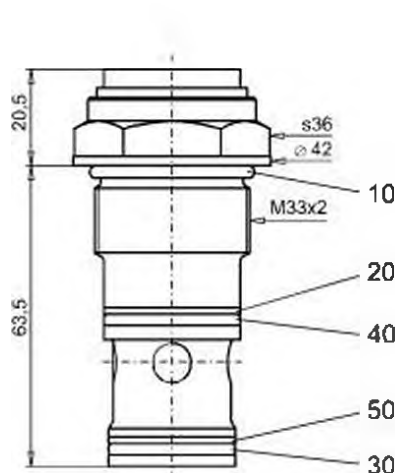
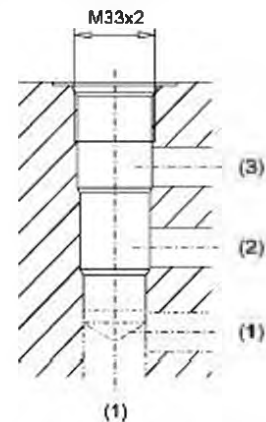
Fixed setting design. Other differential pressure available on request.

**PERFORMANCE CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure drop-volume flow curve  
 2-way operation

 $\Delta p = f(Q)$  Pressure drop-volume flow curve  
 3-way operation

 $Q_L = f(p)$  Leakage volume flow curve

**DIMENSIONS**

2-way operation



3-way operation


 Cavity drawing according to  
 ISO 7789-33-06-0-98

 For detailed cavity drawings  
 and cavity tools see data  
 sheet 2.13-1011.

**PARTS LIST**

Position	Article	Description
10	160.2298	O-ring ID 29,82x2,62
20	160.2252	O-ring ID 25,12x1,78
30	160.2236	O-ring ID 23,52x1,78
40	49.3296	Back-up ring RD 26,1x29x1,4
50	49.3276	Back-up ring RD 24,1x27x1,4

**ACCESSORIES**

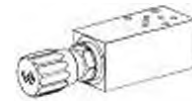
 Cartridge installed in sandwich plates:  
 Sandwich valve

register 2.5

Technical explanation see data sheet 1.0-100

**2-way flow control valve**
**Fixed orifice, adjustable pressure compensator**
**Sandwich construction**

- $Q_{max}$  = 10 l/min
- $Q_N$  = 8 l/min
- $p_{max}$  = 315 bar

**NG3-Mini<sup>®</sup>**

**DESCRIPTION**

Sandwich type 2-way flow control valve. Fitted with 2-way flow control cartridge M18x1,5 in accordance with ISO 7789. Type of adjustment available: „S“ = screw adjustment, „D“ = knob adjustment, (see data sheet no. 2.5-510). For the sandwich plates in A, B and AB, a bypass non-return valve for reversed free flow is installed.

**FUNCTION**

The 2-way flow control valve is designed to keep the speed of a consumer constant irrespective of the load. The fixed measuring orifice which is integrated into the pressure compensating piston determines the volume flow. If there is a pressure change, the pressure compensating spool is displaced and changes the outlet diameter in order to keep the pressure difference across the measuring orifice constant. By varying the spring bias acting on the compensator spool, the flow rate can be changed. Minimum adjustable flow within 40...70% of  $Q_N$ . Flow regulation is effective above  $\Delta p$  10 bar approx.

**APPLICATION**

Sandwich type flow control valves are used where the supply volume flow has to be kept constant even when the load fluctuates. Depending on the application, a distinction is made between restricting the forward flow or the return flow. These sandwich valves are particularly suitable for machine tools and also all types of handling operations. The Mini-3 flow control valves are used where hydraulic systems have to be both light and compact.

**TYPE CODE**

Flow control valve, 2-way	QA	<input type="checkbox"/>	S	A03	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Type of adjustment	Screw	S	Turning knob	D						
Sandwich construction										
Mounting interface acc. to Wandfluh standard, NG3-Mini										
Type list/Function										
	in P	<input type="checkbox"/>	P	in T	<input type="checkbox"/>					
Meter-out flow control	in A	<input type="checkbox"/>	A	in B	<input type="checkbox"/>					
	in A and B	<input type="checkbox"/>	AB							
Meter-in flow control	in A	<input type="checkbox"/>	AV	in B	<input type="checkbox"/>					
	in A and B	<input type="checkbox"/>	ABV							
Nominal volume flow rate $Q_N$	0,4...0,6 l/min	<input type="checkbox"/>	0,63							
	0,8...1,25 l/min	<input type="checkbox"/>	1,25							
	1,3...2,1 l/min	<input type="checkbox"/>	2							
	2,5...5 l/min	<input type="checkbox"/>	5							
	5...8 l/min	<input type="checkbox"/>	8							

Design index (subject to change)

**GENERAL SPECIFICATIONS**

Description	2-way flow control valve
Nominal size	NG3-Mini acc. to Wandfluh standard
Construction	Sandwich
Mounting	3 mounting holes for socket head screws M4 or double ended screws M4
Connections	Threaded connection plates, Multi-flange subplates, Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_c$ = 2,8 Nm (quality 8.8) for fastening screws $M_a$ = 30 Nm for screw-in cartridge
Weight	depending on the type 0,32...0,42 kg

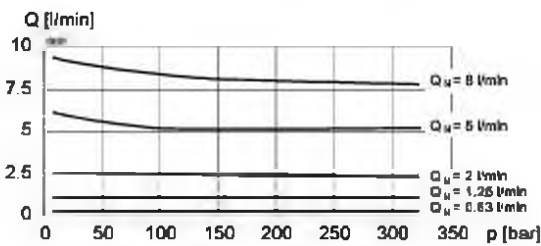
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1899, class 18/16/13 (Required filtration grade $\beta_{0.5} \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max}$ = 315 bar
Opening pressure to non-return valve	$p_b$ = 0,2 bar
Minimum pressure for controlled flow	$\Delta p$ = 10 bar
Nominal volume flow	$Q_N$ = 0,63 l/min, $Q_N$ = 1,25 l/min, $Q_N$ = 2 l/min, $Q_N$ = 5 l/min, $Q_N$ = 8 l/min
Min. volume flow	$Q_{min}$ = 0,4 l/min
Max. volume flow	$Q_{max}$ = 10 l/min
Hysteresis	depending on nominal volume flow 3...8%

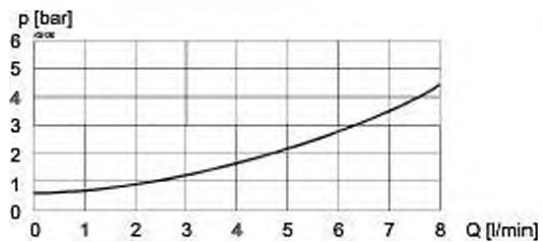
For further hydraulic specifications refer to data sheet 2.5-510.



CHARACTERISTICS Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$   
 $Q = f(p)$  Pressure drop/flow characteristics

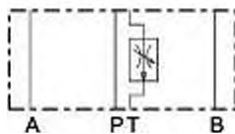
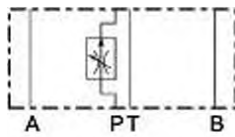


$\Delta p = f(Q)$  Pressure loss/flow characteristics over non-return valve

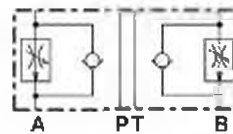
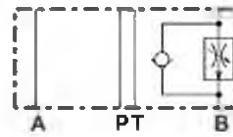
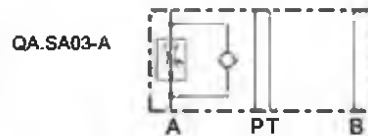
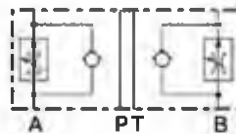
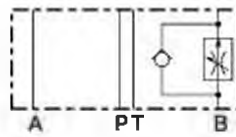
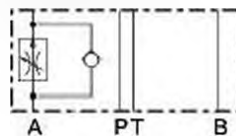


### SYMBOLS / DIMENSIONS

Meter-out flow control



Meter-in flow control

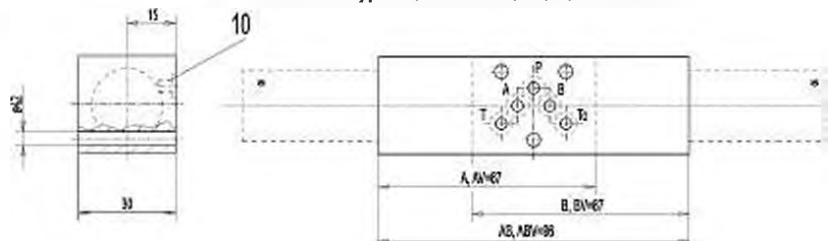


By turning around valves with meter-out function, meter-in function can be achieved

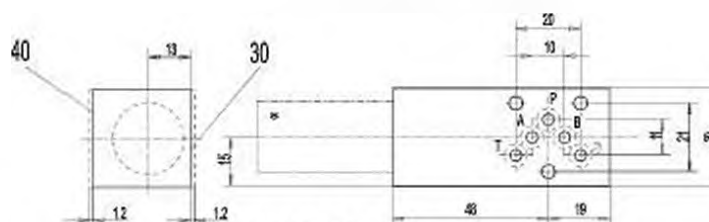
- A turns into BV
- B turns into AV
- AB turns into ABV

Valves for meter-in functions are supplied with a sealing plate and a intermediate plate

Sandwich types QA . SA03-A, AV, B, BV AB, ABV



Sandwich types QA . SA03-P, T



\* The total lengths depends on the cartridge type, see data sheet 2.5-510

Technical explanation see data sheet 1.0-100

### SCREW-IN CARTRIDGES INSTALLED

The following screw-in cartridges are used in the sandwich body:

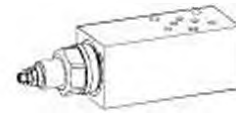
Type	Designation	Data sheet no.
QA.PM18	2-way flow control valve	2.5-510

### PARTS LIST

Position	Article	Description
10	180.2045	O-ring ID 4,5x1,5 (NBR)
30	173.0700	Intermediate plate PZSA03
40	173.0850	Sealing plate PDSA03

**2-way flow control valve**
**Flange- and sandwich construction**

- $Q_{max} = 48 \text{ l/min}$ ,  $p_{max} = 350 \text{ bar}$
- $Q_{N max} = 40 \text{ l/min}$

**NG4-Mini<sup>®</sup>**

**DESCRIPTION**

Direct operated, pressure compensated flow control valve in flange- and sandwich construction. Flow control screw-in cartridges M22x21,5 acc. to ISO 7789 are installed. In the sandwich plates for A, B and AB line, a bypass check valve for reversed free flow is installed. A bypass non-return valve plate for the flange valve, for free flow from B to A, can be ordered separately. Two flow ranges are available. The flange body is painted and the sandwich plates are phosphated.

**FUNCTION**

The 2-way flow control valve is designed to keep the oil flow to any actuator constant irrespective of the load.

**APPLICATION**

2-way flow control valves are used where the supply volume flow has to be kept constant even when the load fluctuates. Depending on the application, a distinction is made between restricting the forward flow or the return flow. Mini-4 flow control valves are used where hydraulic systems have to be both light and compact.

**TYPE CODE**

		Q	Z		A04	-	#
Flow control valve							
2-way							
Type of adjustment	Key Control knob Cover	S D A					
Flange construction		F					
Sandwich construction		S					
Mounting interface acc. to Wandfluh standard, NG4-Mini							
Type list/Function	Flange construction	Sandwich construction	Sandwich construction	Sandwich construction	Sandwich construction		
	A → B	Meter-out flow control in P in T	Meter-in flow control in A in B in A and B				
	A/B	P T	A B AB			AV BV ABV	
Nominal volume flow rate $Q_N$	2,5 l/min 6,3 l/min 16 l/min 25 l/min 40 l/min	2,5 6,3 16 25 40					
Design index (subject to change)							

**GENERAL SPECIFICATIONS**

Description	2-way flow control valve
Nominal size	NG4-Mini acc. to Wandfluh standard
Construction	Flange- and sandwich construction
Mounting	3 holes for socket cap screws M5 or studs screws M5
Connection	Threaded connection plates Multi-flange subplate Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_0 = 5,5 \text{ Nm}$ (Qual. 8.8), for fastening screws $M_1 = 50 \text{ Nm}$ for screw-in cartridge
Weight	• Flange type $m = 0,46 \text{ kg}$
(without screw-in cartridge)	• Sandwich type P,T,A,B $m = 0,95 \text{ kg}$
	• Sandwich type AB $m = 1,22 \text{ kg}$

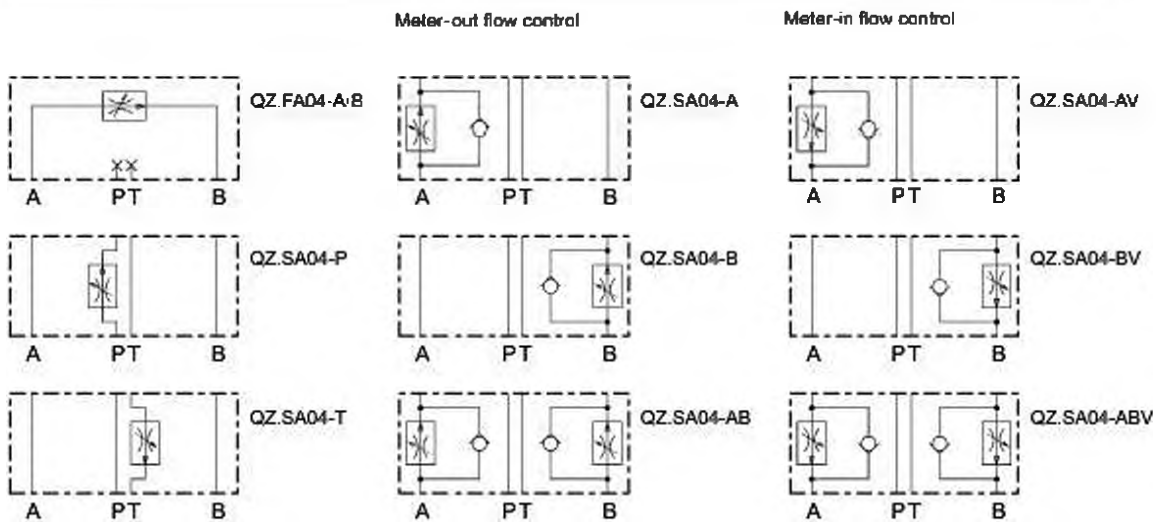
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4408:1999, class 18/16/13 (Required filtration grade B 6...10≥75) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 350 \text{ bar}$
Min. volume flow	$Q_{min} = 0,1 \text{ l/min}$
Max. volume flow	$Q_{max} = 48 \text{ l/min}$

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.
QZ.PM22	flow control valve •2-way	2.5-535

**TYPE CHARTS**


By turning around valves with meter-out function, meter-in function can be achieved:

- A turns into BV
- B turns into AV
- AB turns into ABV

Valves for flow control are supplied respectively with a sealing plate and an intermediate plate.


**REMARK!**

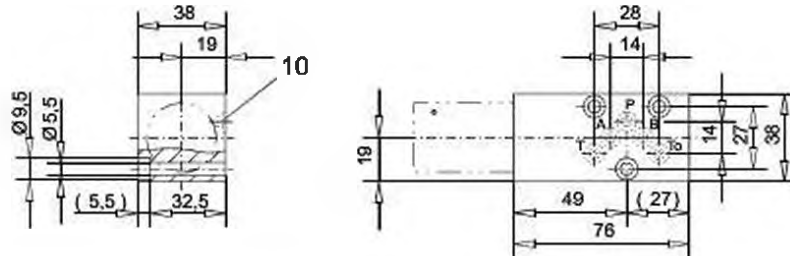
Detailed performance data and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.


**CAUTION!**

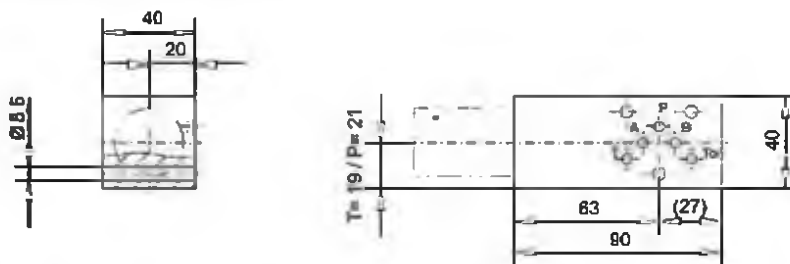
The performance data especially the „pressure-flow-characteristic„ on the data sheets of the screw-in cartridges refers to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**DIMENSIONS**

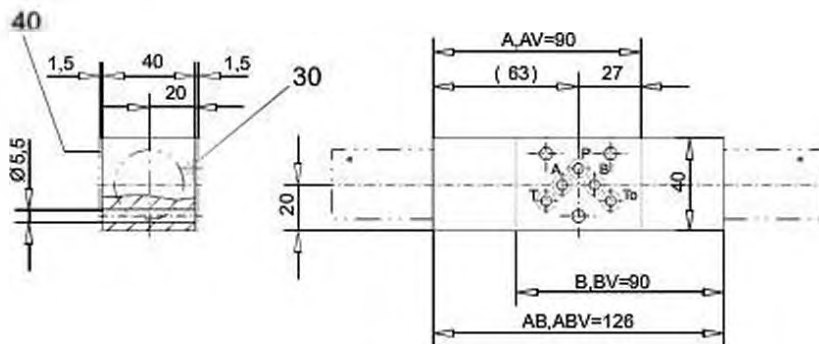
Flange construction QZ.FA04 - A/B



Sandwich construction QZ.SA04 - P, T



Sandwich construction QZ.SA04 - A, B, AB, AV, BV, ABV



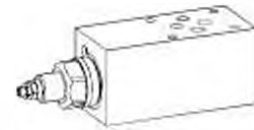
\* The total lengths depends on the cartridge type, see data sheet 2.5-535

**PARTS LIST**

Position	Article	Description
10	160.2052	O-ring ID 5,28x1,78 (NBR)
30	173.1700	Intermediate plate BZB4
40	173.1650	Sealing plate BDB4

**2-way flow control valve**
**Flange- and sandwich construction**

- $Q_{max} = 48 \text{ l/min}$ ,  $p_{max} = 350 \text{ bar}$
- $Q_{N max} = 40 \text{ l/min}$

**NG6**  
 ISO 4401-03

**DESCRIPTION**

Direct operated, pressure compensated flow control valve in flange- and sandwich construction. Flow control screw-in cartridges M22x1,5 acc. to ISO 7789 are installed. In the sandwich plates for A, B and AB line, a bypass check valve for reversed free flow is installed. A bypass non-return valve plate for the flange valve, for free flow from B to A, can be ordered separately. Two flow ranges are available. The flange body is painted and the sandwich plates are phosphated.

**FUNCTION**

The 2-way flow control valve is designed to keep the oil flow to any actuator constant irrespective of the load.

**APPLICATION**

2-way flow control valves are used where the supply volume flow has to be kept constant even when the load fluctuates. Depending on the application, a distinction is made between restricting the forward flow or the return flow.

**TYPE CODE**

Flow control valve		Q		Z	<input type="checkbox"/>	<input type="checkbox"/>	A08 -	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
2-way												
Type of adjustment	Key	S										
	Control knob	D										
	Cover	Ai										
Flange construction		F										
Sandwich construction		S										
International standard interface ISO, NG6												
Type list/Function	Flange construction	Sandwich construction	Sandwich construction	Sandwich construction	Sandwich construction							
	A → B	AV	Meter-out flow control	Meter-in flow control								
			in P	in A	A	in A	AV					
			in T	in B	B	in B	BV					
				in A and B	AB	in A and B	ABV					
Nominal volume flow rate $Q_N$	2,5 l/min	2,5										
	6,3 l/min	6,3										
	16 l/min	16										
	25 l/min	25										
	40 l/min	40										
Design index (subject to change)												

**GENERAL SPECIFICATIONS**

Description	2-way flow control valve	
Nominal size	NG6 acc. to ISO 4401-03	
Construction	Flange- and sandwich construction	
Mounting	4 holes for socket cap screws M5 or studs screws M5	
Connection	Threaded connection plates Multi-flange subplate Longitudinal stacking system	
Ambient temperature	-20...+50 °C	
Mounting position	any	
Fastening torque	$M_0 = 5,5 \text{ Nm}$ (Qual. 8.8), for fastening screws $M_1 = 50 \text{ Nm}$ for screw-in cartridge	
Weight	<ul style="list-style-type: none"> <li>• Flange type <math>m = 0,81 \text{ kg}</math></li> <li>• Sandwich type A, B <math>m = 1,15 \text{ kg}</math></li> <li>• Sandwich type P, T, AB <math>m = 1,45 \text{ kg}</math></li> </ul>	
(without screw-in cartridge)		

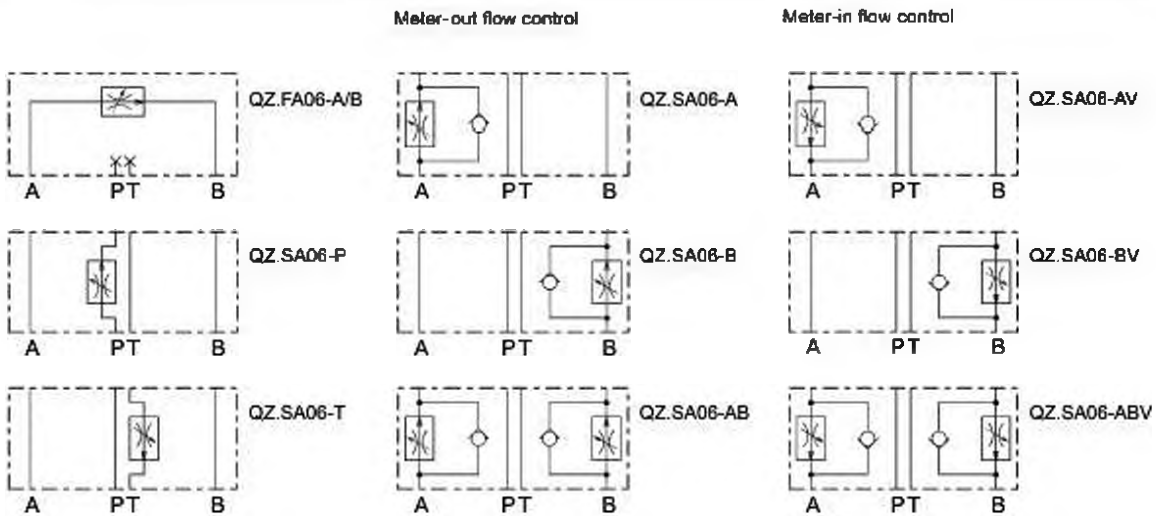
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade B 6...10≥75)
Viscosity range	see data sheet 1.0-50/2
Fluid temperature	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Peak pressure	-20...+70 °C
Min. volume flow	$p_{max} = 350 \text{ bar}$
Max. volume flow	$Q_{opt} = 0,1 \text{ l/min}$
	$Q_{max} = 48 \text{ l/min}$

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.
QZ.FM22	flow control valve •2-way	2.5-535

**TYPE CHARTS**


By turning around (longitudinal axis) valves with meter-out function, meter-in function can be achieved:

- A turns into AV
- B turns into BV
- AB turns into ABV


**REMARK!**

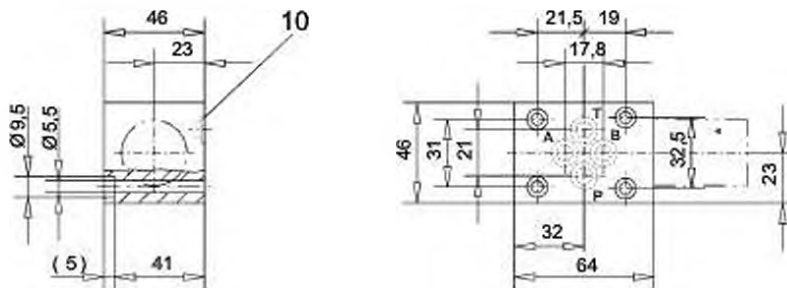
Detailed performance data and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.


**CAUTION!**

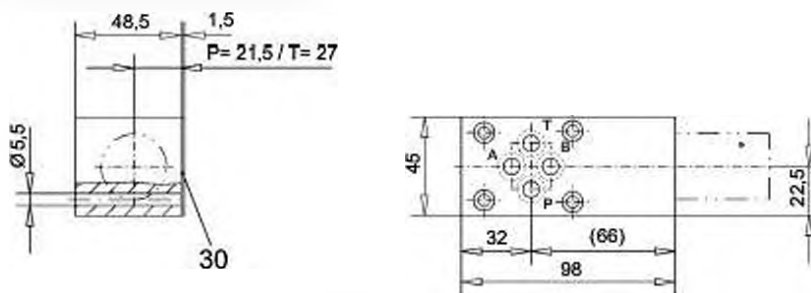
The performance data especially the „pressure-flow-characteristic„ on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**DIMENSIONS**

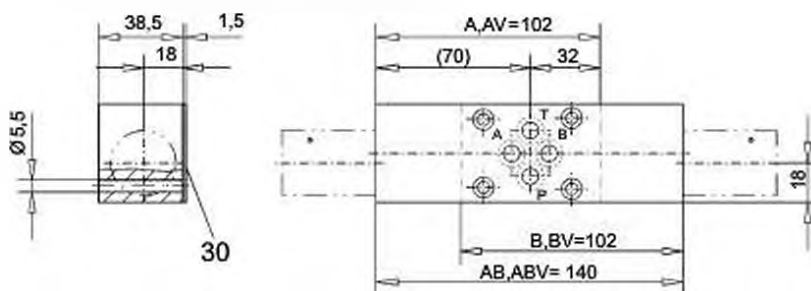
## Flange construction QZ.FA06-A/B



## Sandwich construction QZ.SA06-P, T



## Sandwich construction QZ.SA06-A, B, AB, AV, BV, ABV



\* The total length depends on the cartridge type, see data sheet 2.5-535

**PARTS LIST**

Position	Article	Description
10	160.2093	O-ring ID 9,25x1,78 (NBR)
30	173.3650	Sealing plate ADB6

Technical explanation see data sheet 1.0-100

**3-way flow control valve**
**Flange- and sandwich construction**

- $Q_{max}$  = 42 l/min
- $Q_{Hmax}$  = 40 l/min
- $p_{max}$  = 350 bar

**NG6**  
 ISO 4401-03

**DESCRIPTION**

Direct operated, pressure compensated flow control valve in flange- and sandwich construction. Flow control screw-in cartridges M22x1,5 acc. to ISO 7789 are installed. The flange body is painted, the sandwich plates and the outside parts are phosphalised. The solenoid is zinc coated.

**FUNCTION**

The 3-way flow control valve is designed to keep the oil flow to any actuator constant irrespective of the load.

**APPLICATION**

3-way flow control valves are used where the supply volume flow has to be kept constant even when the load fluctuates. Depending on the application, a distinction is made between restricting the forward flow or the return flow.

**TYPE CODE**

		Q		D		A06		-		#	
Flow control valve											
3-way											
Type of adjustment	Key	S									
	Control knob	D									
	Cover	A									
Flange construction		F									
Sandwich construction		S									
International standard interface ISO, NG6											
Type list/Function	Flange construction A → B	A/B	Sandwich construction in P	P							
Nominal volume flow rate $Q_n$		12 l/min	12								
		25 l/min	25								
		40 l/min	40								
Design index (subject to change)											

**GENERAL SPECIFICATIONS**

Description	3-way flow control valve
Nominal size	NG6 acc. to ISO 4401-03
Construction	Flange- and sandwich construction
Mounting	4 holes for socket cap screws M5 or studs screws M5
Connection	Threaded connection plates Multi-flange subplate Longitudinal stacking system
Ambient temperature	-20...50 °C
Mounting position	any
Fastening torque	$M_0 = 5,5 \text{ Nm}$ (Qual. 8.8) for fastening screws $M_c = 50 \text{ Nm}$ for screw-in cartridge
Weight:	• Flange type $m = 1,10 \text{ kg}$
(without screw-in cartridge)	• Sandwich type $m = 1,30 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination	ISO 4406:1999, class 18/18/13
efficiency	(Required filtration grade $\beta \{6...10>75\}$ see data sheet 1.0-50/2)
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 350 \text{ bar}$
Min. volume flow	$Q_{min} = 0,1 \text{ l/min}$ (at $v = 30 \text{ mm}^2/\text{s}$ )
Max. volume flow	$Q_{max} = 42 \text{ l/min}$
Control accuracy	± 1%



**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body.

Type	Designation	Data sheet no.
QD.PM22	flow control valve •3-way	2.5-540


**REMARK!**

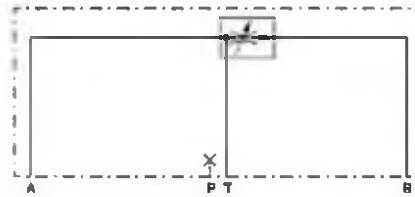
Detailed performance data and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.


**CAUTION!**

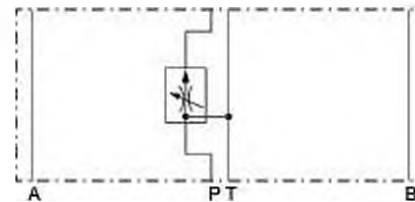
The performance data especially the «pressure-flow-characteristic» on the data sheets of the screw-in cartridges refers to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**TYPE CHARTS**

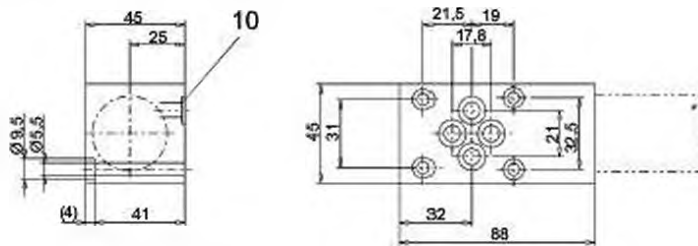
QD.FA06-A/B



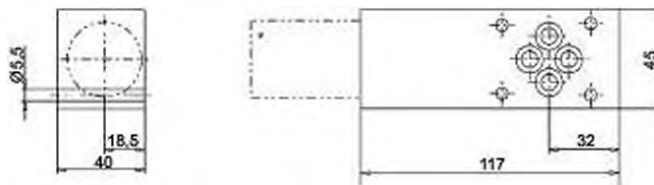
QD.SA06-P


**DIMENSIONS**

Flange construction QD.FA06-A/B



Sandwich construction QD.SA06-P



\* The total lengths depends on the cartridge type, see data sheet 2.5-540

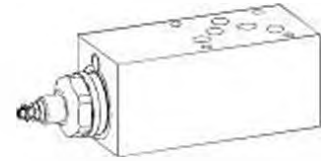
**PARTS LIST**

Position	Article	Description
10	160.2093	O-ring ID 9,25 x 1,78 (NBR)

Technical explanation see data sheet 1.0-100

**2-way flow control valve**
**Flange- and sandwich construction**

- $Q_{max} = 85 \text{ l/min}$ ,  $p_{max} = 350 \text{ bar}$
- $Q_{N max} = 70 \text{ l/min}$

**NG10**  
 ISO 4401-05

**DESCRIPTION**

Direct operated, pressure compensated flow control valve in flange- and sandwich construction. Flow control screw-in cartridges M33x2 acc. to ISO 7789 are installed. In the sandwich plates for A, B and AB line, a bypass check valve for reversed free flow is installed. A bypass non-return valve plate for the flange valve, for free flow from B to A, can be ordered separately. Two flow ranges are available. The flange body is painted and the sandwich plates are phosphated.

**FUNCTION**

The 2-way flow control valve is designed to keep the oil flow to any actuator constant irrespective of the load.

**APPLICATION**

2-way flow control valves are used where the supply volume flow has to be kept constant even when the load fluctuates. Depending on the application, a distinction is made between restricting the forward flow or the return flow.

**TYPE CODE**

Flow control valve		Q		Z	<input type="checkbox"/>	<input type="checkbox"/>	A10-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
2-way												
Type of adjustment	Key	S										
	Control knob	D										
	Cover	Ai										
Flange construction		F										
Sandwich construction		S										
International standard interface ISO, NG10												
Type list/Function	Flange construction	Sandwich construction	Sandwich construction	Sandwich construction	Sandwich construction							
	A → B	A/B	Meter-out flow control	Meter-in flow control								
			in P	in A	A							
			in T	in B	B							
				in A and B	AB							
Nominal volume flow rate $Q_N$	32 l/min	32										
	70 l/min	70										
Design index (subject to change)												

**GENERAL SPECIFICATIONS**

Description	2-way flow control valve	
Nominal size	NG10 acc. to ISO 4401-05	
Construction	Flange- and sandwich construction	
Mounting	4 holes for socket cap screws M6 or studs screws M6	
Connection	Threaded connection plates Multi-flange subplate Longitudinal stacking system	
Ambient temperature	-20...50°C	
Mounting position	any	
Fastening torque	$M_0 = 9,5 \text{ Nm}$ (Qual. 8.8), for fastening screws $M_1 = 80 \text{ Nm}$ for screw-in cartridge	
Weight	• Flange type	m = 2,20 kg
(without screw-in cartridge)	• Sandwich type P,T,A,B	m = 3,10 kg
	• Sandwich type AB	m = 3,75 kg

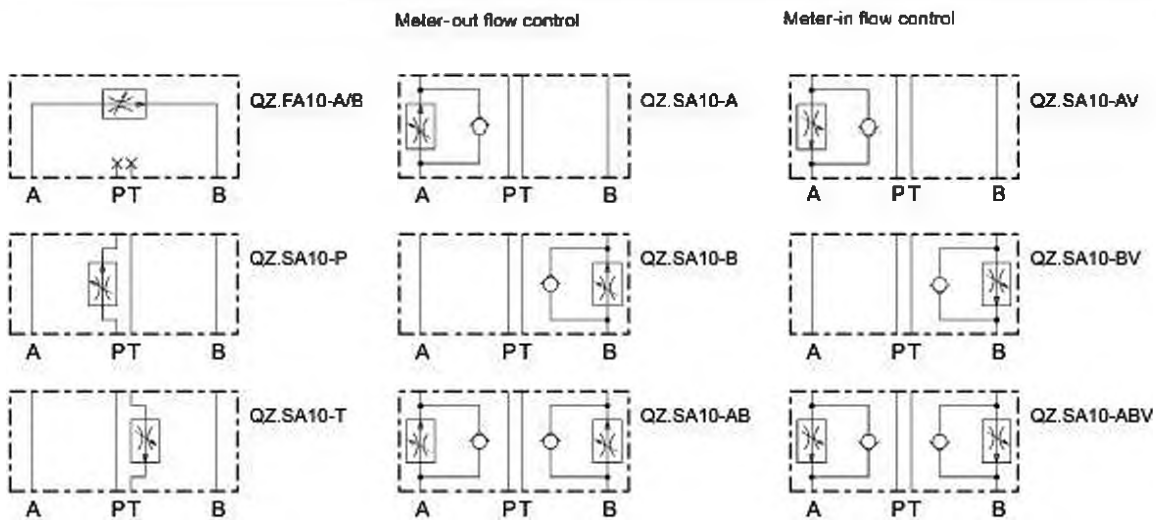
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade B 6...10≥75) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 350 \text{ bar}$
Min. volume flow	$Q_{min} = 0,2 \text{ l/min}$
Max. volume flow	$Q_{max} = 85 \text{ l/min}$

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.
QZ.FM33	flow control valve •2-way	2.5-550

**TYPE CHARTS**


By turning around valves with meter-out function, meter-in function can be achieved:

- A turns into BV
- B turns into AV
- AB turns into ABV

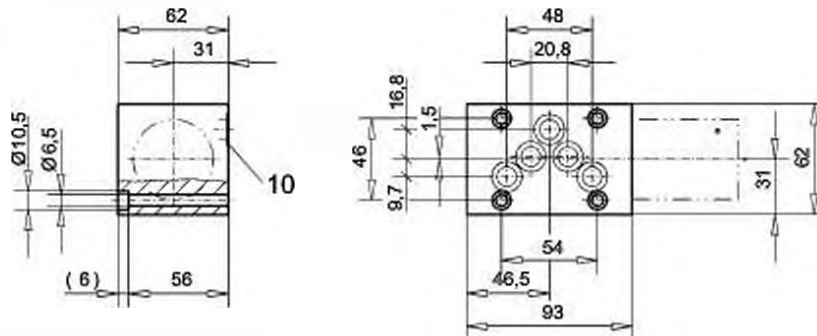
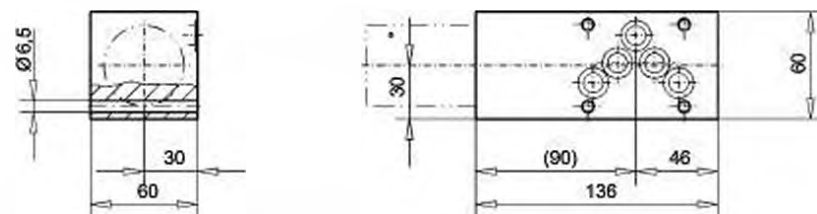
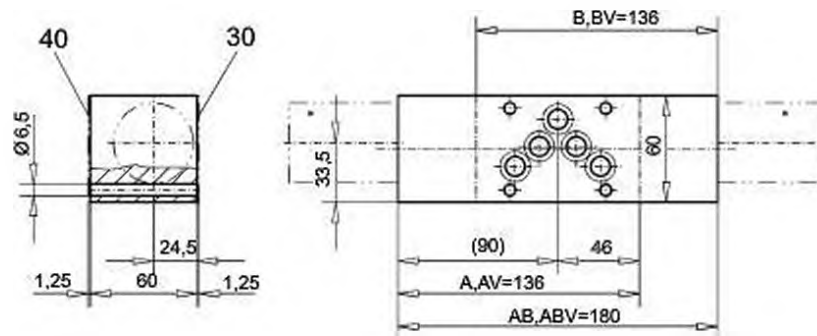
Valves for flow control are supplied respectively with a sealing plate and an intermediate plate.


**REMARK!**

Detailed performance data and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.


**CAUTION!**

The performance data especially the „pressure-flow-characteristic“, on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**DIMENSIONS**
**Flange construction QZ.FA10-A/B**

**Sandwich construction QZ.SA10-P, T**

**Sandwich construction QZ.SA10-A, B, AB, AV, BV, ABV**


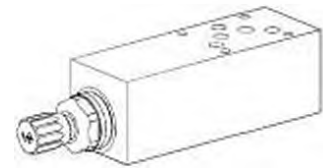
\* The total lengths depends on the cartridge type, see data sheet 2.5-550

**PARTS LIST**

Position	Article	Description
10	160.2140	O-ring ID 14,00 x 1,78 (NBR) for flange and sandwich P, T
	160.2120	O-ring ID 12,42 x 1,78 (NBR) for sandwich A, B, AB, VA, VB, VAB
	160.2132	O-ring ID 13,10 x 2,62 (NBR) in line with RV
30	173.4700	Intermediate plate AZB10
40	173.4650	Sealing plate ADB10

**3-way flow control valve**
**Flange- and sandwich construction**

- $Q_{max}$  = 120 l/min
- $Q_{H max}$  = 100 l/min
- $p_{max}$  = 350 bar

**NG10**  
 ISO 4401-05

**DESCRIPTION**

Direct operated, pressure compensated flow control valve in flange- and sandwich construction. Flow control screw-in cartridges M33x2 acc. to ISO 7789 are installed. The flange body is painted, the sandwich plates and the outside parts are phosphatised. The solenoid is zinc coated.

**FUNCTION**

The 3-way flow control valve is designed to keep the oil flow to any actuator constant irrespective of the load.

**APPLICATION**

3-way flow control valves are used where the supply volume flow has to be kept constant even when the load fluctuates. Depending on the application, a distinction is made between restricting the forward flow or the return flow.

**TYPE CODE**

		Q	D		A10	-	#
Flow control valve							
3-way							
Type of adjustment	Key Control knob Cover	S D A					
Flange construction		F					
Sandwich construction		SI					
International standard interface ISO, NG10							
Type list/Function	Flange construction A → B	A/B	Sandwich construction in P	P			
Nominal volume flow rate $Q_n$	50 l/min 100 l/min	50 100					
Design index (subject to change)							

**GENERAL SPECIFICATIONS**

Description	3-way flow control valve
Nominal size	NG10 acc. to ISO 4401-05
Construction	Flange- and sandwich construction
Mounting	4 holes for socket cap screws M6 or studs screws M6
Connection	Threaded connection plates Multi-flange subplate Longitudinal stacking system
Ambient temperature	-20...50 °C
Mounting position	any
Fastening torque	$M_0$ = 9,5 Nm (Qual. 8.8) for fastening screws $M_1$ = 80 Nm for screw-in cartridge
Weight	• Flange type $m$ = 2,40 kg • Sandwich type $m$ = 3,75 kg
<small>(without screw-in cartridge)</small>	

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination	ISO 4406:1999, class 18/18/13
efficiency	(Required filtration grade $\beta$ (6...10>75) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max}$ = 350 bar
Min. volume flow	$Q_{min}$ = 0,2 l/min (at $v$ = 30 mm <sup>2</sup> /s)
Max. volume flow	$Q_{max}$ = 120 l/min
Control accuracy	± 1%

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.
QD.PM33	flow control valve • 3-way	2.5-555


**REMARK!**

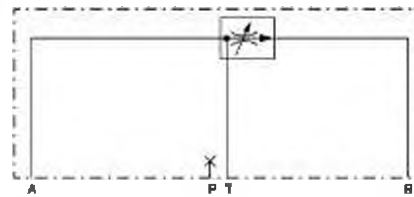
Detailed performance data and additional hydraulic specifications may be drawn from the data sheets of the corresponding installed pressure relief cartridge.


**CAUTION!**

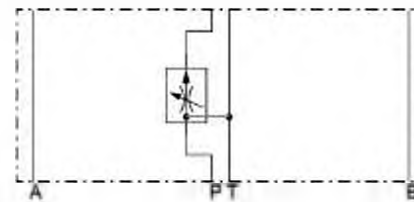
The performance data especially the «pressure-flow-characteristic» on the data sheets of the screw-in cartridges refer to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**TYPE CHARTS**

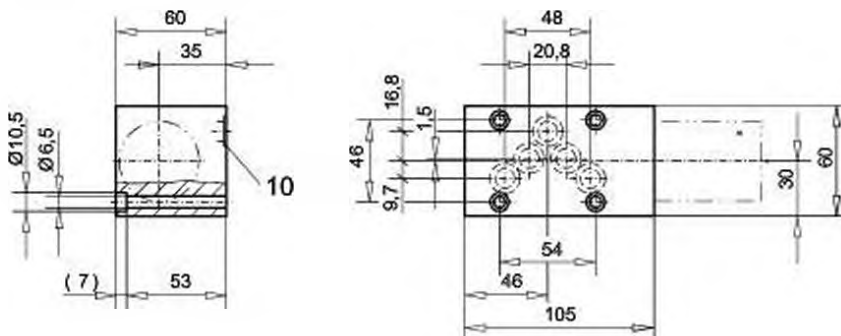
QD.FA10-A/B



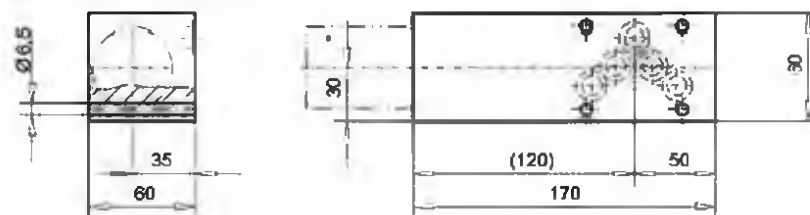
QD.SA10-P


**DIMENSIONS**

Flange construction QD.FA10-A/B



Sandwich construction QD.SA10-P



\* The total length depends on the cartridge type, see data sheet 2.5-555

**PARTS LIST**

Position	Article	Description
10	160.2140	O-ring ID 14,00 x 1,78 (NBR)

**Pressure compensating valve**
**Sandwich construction**

- 2-way operation
- $Q_{max} = 10 \text{ l/min}$
- $p_{max} = 315 \text{ bar}$

**NG4-Mini<sup>®</sup>**

**DESCRIPTION**

Pressure compensator valve with fixed setting in sandwich design with interface NG4-Mini acc. to Wandfluh standard with 4 ports. The steel body of the sandwich valve is phosphatized and the cartridge body is zinc coated for corrosion protection. The load is sensed in line A or B with an incorporated shuttle valve.

**FUNCTION**

The pressure compensator valve maintains a constant differential pressure through an orifice (e.g. metering edge of a directional valve). The 2-way pressure compensator restricts the volume flow in the meter-in mode.

**APPLICATION**

Pressure compensator sandwich valves are usually stacked underneath proportional directional valves. They are used in open loop circuits. 2-way pressure compensators may be installed in parallel pressure lines with a common power source to operate actuators individually. For each actuator the full pump pressure is available.

**TYPE CODE**

	U	Z	F	S	A04	#
Pressure compensator, 2-way						
Type of adjustment			fixed setting			
Sandwich construction						
Mounting interface acc. to Wandfluh standard, NG4-Mini						
Design-Index (Subject to change)						

**GENERAL SPECIFICATIONS**

Designation	2-way pressure compensating valve
Size	NG4-Mini acc. to Wandfluh standard
Construction	Sandwich construction
Mounting	3 mounting holes for M5 socket head screws or M5 locking screws
Type of connection	Thread connection plates Rows of flange plates and horizontal stacking system
Ambient temperature	-20...+50 °C
Installation position	any
Fastening torque	$M_o = 5.5 \text{ Nm}$ (Qual. 8.8) for fixing screws $M_o = 50 \text{ Nm}$ for screw cartridge
Weight	$m = 1,5 \text{ kg}$

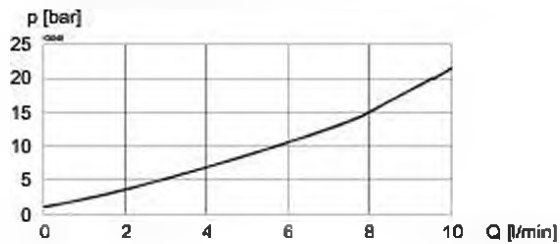
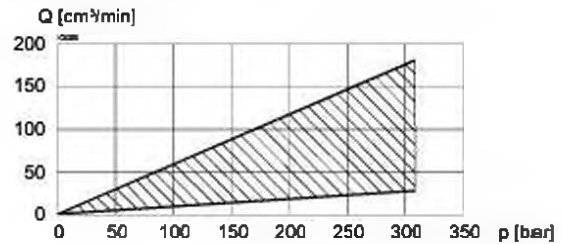
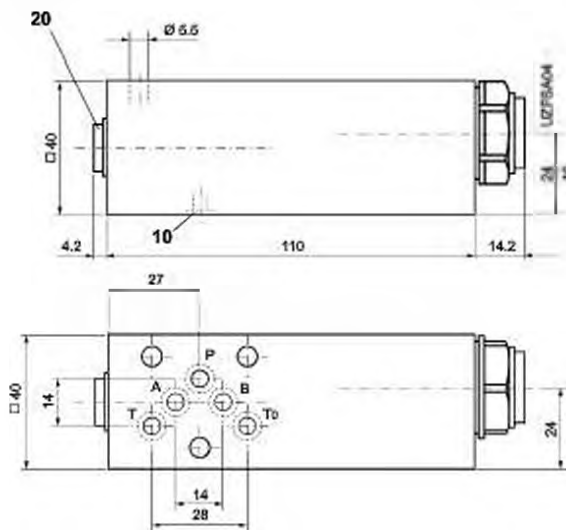
**HYDRAULIC SPECIFICATIONS**

Hydraulic fluid	Mineral oils, other media on request
Max. permissible contamination level	ISO 4406:1999, class 18/16/13 (Recommended filter gauge B6...10@75) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Hydraulic fluid temperature	-20 ... +70 °C
Peak pressure	$p_{max} = 315 \text{ bar}$
Differential pressure	$p_{dH} = 10 \text{ bar}$ other differential pressures on request
Maximum volume flow	$Q_{max} = 10 \text{ l/min}$
Leakage volume flow	see characteristics

**SWITCHING DIAGRAMS**
**2-way operation**

**MECHANICAL ACTUATION**

Fixed setting design. Other differential pressures available on request.

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure drop-volume flow curve  
 2-way operation

 $Q_L = f(p)$  Leakage volume flow curve

**DIMENSIONS**

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in the sandwich body:

Type	Designation	Data sheet no.
UZFPM22	2-way operation	2.5-630

**PARTS LIST**

Position	Article	Description
10	160.2052	O-Ring ID 5,28 x 1,78
20	238.1405	Locking screw DIN 908 G1/8"

**ACCESSORIES**

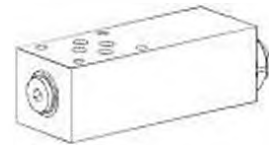
Thread connection plates and rows of flange plates register 2.9

Technical explanation see data sheet 1.0-100



**Pressure compensating valve**
**Sandwich construction**

- 2- and 3-way operation
- $Q_{max} = 25 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**NG6**  
 ISO 4401-03

**DESCRIPTION**

Pressure compensator valve with fixed setting in sandwich design with interface NG6 acc. to ISO 4401-03 with 4 ports. Available with 2-way and 3-way operation. The steel body of the sandwich valve is phosphatized and the cartridge body is zinc coated for corrosion protection. The load is sensed in line A or B with an incorporated shuttle valve.

**FUNCTION**

The pressure compensator valve maintains a constant differential pressure across an orifice (e.g. metering edge of a directional valve). The 2-way pressure compensator restricts the volume flow in the meter-in mode. The 3-way pressure compensator diverts the surplus volume flow to the tank line. As a result, with both compensator types the amount of flow through an orifice (directional valve) remains constant even if the load pressure changes.

**APPLICATION**

Pressure compensator sandwich valves are usually stacked underneath proportional directional valves. They are used in open loop circuits. 2-way pressure compensators may be installed in parallel pressure lines with a common power source to operate actuators individually. For each actuator the full pump pressure is available. Only one 3-way pressure compensator can be installed in a system.

**TYPE CODE**

	U	F	S	A06 #
Pressure compensator, 2-way	Z			
Pressure compensator, 3-way	D			
Type of adjustment	fixed setting			
Sandwich construction				
International standard interface ISO, NG6				
Design-Index (Subject to change)				

**GENERAL SPECIFICATION**

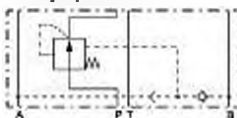
Designation	2- and 3-way pressure compensating valve
Size	NG6 acc. to ISO 4401-03
Construction	Sandwich construction
Mounting	3 mounting holes for M5 socket head screws or M5 locking screws
Type of connection	Thread connection plates Rows of flange plates and horizontal stacking system
Ambient temperature	-20 ... +50 °C
Installation position	any
Fastening torque	$M_f = 5.5 \text{ Nm}$ (Qual. 8.8) for fixing screws $M_c = 50 \text{ Nm}$ for screw cartridge
Weight	$m = 1.8 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

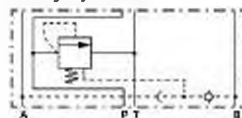
Hydraulic fluid	Mineral oils, other media on request
Max. permissible contamination level	ISO 4406:1999, class 18/16/13 (Recommended filter gauge G8...10z75)
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Hydraulic fluid temperature	-20 ... +70 °C
Peak pressure	$p_{max} = 350 \text{ bar}$
Differential pressure	$p_{diff} = 10 \text{ bar}$ other differential pressures on request
Maximum volume flow	$Q_{max} = 25 \text{ l/min}$
Leaking volume flow	see characteristics

**SWITCHING DIAGRAMS**

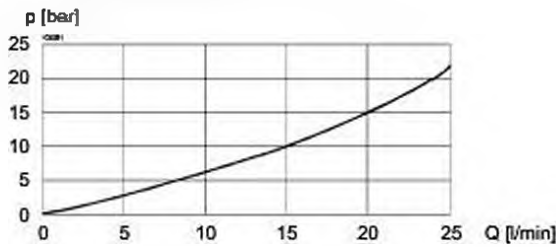
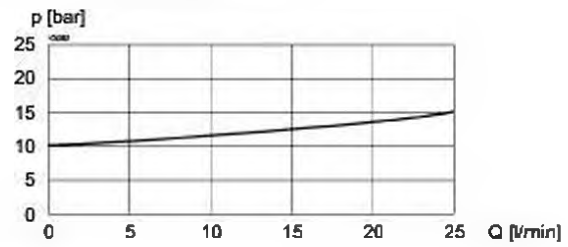
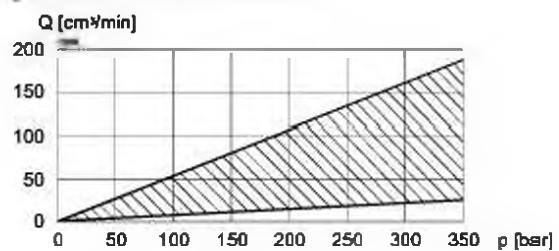
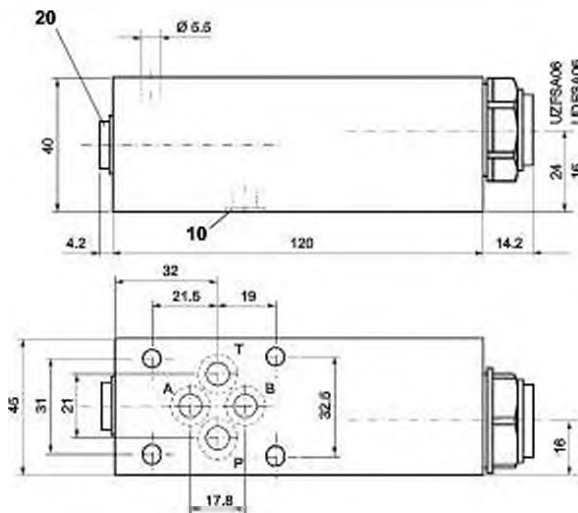
2-way operation



3-way operation


**MECHANICAL ACTUATION**

Fixed setting design. Other differential pressures available on request.

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure drop-volume flow curve  
 2-way operation

 $\Delta p = f(Q)$  Pressure drop-volume flow curve  
 3-way operation

 $Q_L = f(p)$  Leakage volume flow curve

**DIMENSIONS**

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in the sandwich body:

Type	Designation	Data sheet no.
UZFPM22	2-way operation	2.5-630
UDFPM22	3-way operation	2.5-630

**PARTS LIST**

Position	Article	Description
10	160.2093	O-ring ID 9,25 x 1,78
20	238.2406	Locking screw VSTI G1/4"-ED

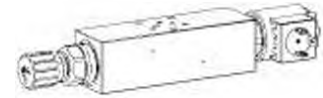
**ACCESSORIES**

Thread connection plates and rows of flange plates register 2.9

Technical explanation see data sheet 1.0-100

**Fine feed-/fast approach valve**
**Sandwich construction**

- $Q_{max}$  = 20 l/min (Fine feed)
- $Q_{max}$  = 30 l/min (Fast approach)
- $Q_N$  = 20 l/min
- $p_{max}$  = 350 bar

**NG4-Mini®**

**DESCRIPTION**

Fine feed-/fast approach valve in sandwich construction. 2-way flow control cartridges (see data sheet 2.5-535) and 2/2-way solenoid poppet valve cartridges (1.11-2082) are installed. 4 standard nominal volume flow ranges are available. The sandwich body made of steel is phosphatized.

**FUNCTION**

The fine feed-/fast approach valve serves for the electrically controlled two-stage speed control. Fine feed and fast approach. In the fine feed, the volume flow is controlled by the flow control valve, to the manually adjusted value independent on the load. In doing so, the poppet valve is closed. In the fast approach, the volume flow, dependent of the load and of the system pressure, flows through the poppet valve.

**APPLICATION**

The fine feed-/fast approach valves are utilised in hydraulic systems, which require an electrically controlled fine feed-/fast approach changeover, such as positioning controls on machine tools or elevation controls of elevating platforms, etc. Due to the sandwich construction, these fine feed-/fast approach valves can be integrated into stacked systems as an intermediate flange.

**TYPE CODE**

Fine feed- / fast approach valve		V		Q	<input type="checkbox"/>	S	A04	-	<input type="checkbox"/>	-	<input type="checkbox"/>	-	<input type="checkbox"/>	/	W	<input type="checkbox"/>	#	<input type="checkbox"/>	
Flow control function																			
Type of adjustment	Key	S																	
	Control knob	D																	
Sandwich construction																			
Mounting interface acc. to Wandfluh standard, NG4-Mini																			
Type list / Function																			
	in P	<b>P</b>	Meter-out flow control	in A	<b>A</b>	Meter-in flow control in	in A	<b>AV</b>											
	in T	<b>T</b>		in B	<b>B</b>		in B	<b>BV</b>											
Poppet valve	Normally closed	<b>C</b>																	
	Normally open	<b>O</b>																	
Nominal volume flow rate $Q_N$	2,5 l/min	<b>2.5</b>																	
Flow control valve	6,3 l/min	<b>6.3</b>																	
	16 l/min	<b>16</b>																	
	20 l/min	<b>20</b>																	
Nominal voltage $U_N$	12VDC	<b>G12</b>	115VAC	<b>R115</b>															
	24VDC	<b>G24</b>	230VAC	<b>R230</b>															
Slip-on coil	Metal housing round																		
Connection execution	Connector socket	EN175301-803/ISO 4400		<b>D</b>															
	Connector socket	AMP Junior-Timer		<b>J</b>	(only for $U_N \leq 75$ VDC)														
Design index (subject to change)																			

**GENERAL SPECIFICATIONS**

Description	Fine feed-/fast approach valve
Nominal size	NG4-Mini®
Construction	Sandwich construction
Mounting	3 holes for socket cap screws M5 or studs M5
Connection	Threaded connection plates, multi-flange subplate, stacking system
Ambient temperature	-20 ... +50 °C
Mounting	any
Fastening torque	$M_o = 5,5$ Nm (Quel. 8.8) for fixing screws cartridges: see valve data sheets
Weight	$m = 1,65$ kg

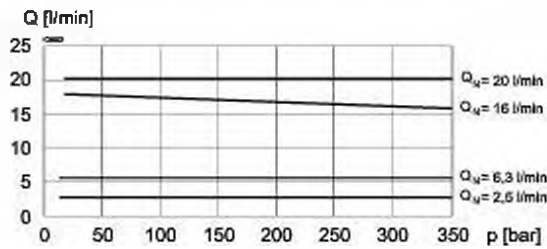
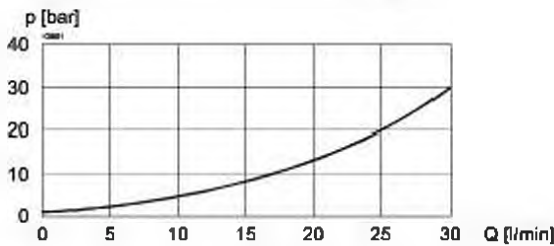
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Recommended filtration grade B 6...10 $\geq$ 75) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 350$ bar
Nominal volume flow rates	$Q_N = 2,5$ l/min, 6,3 l/min, 16 l/min, 20 l/min
Min. volume flow	$Q_{min} = 0,1$ l/min
Max. volume flow	$Q_{max} = 30$ l/min

For further hydraulic specifications, refer to flow control valve data sheet 2.5-535.

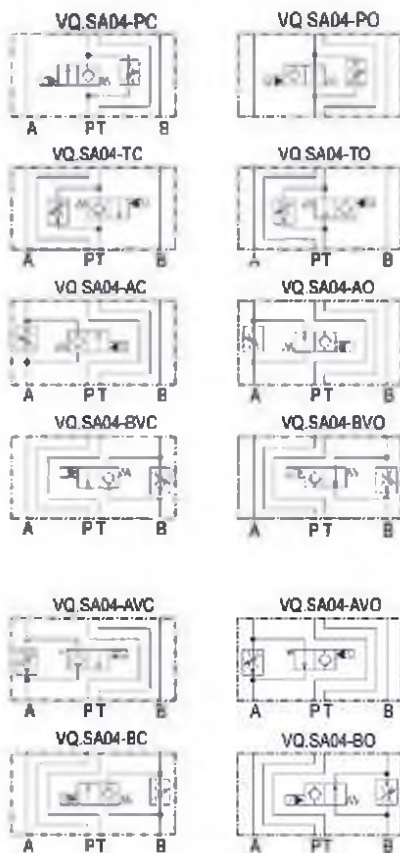
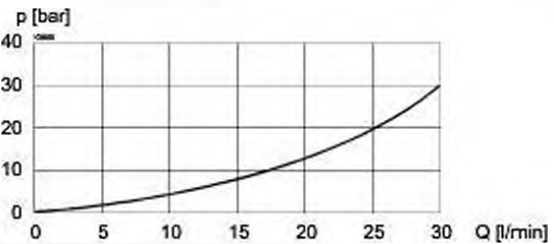
**ELECTRICAL ACTUATION**

Solenoid construction: see data sheet poppet valve (1.11-2082)

**CHARACTERISTICS** Oil viscosity  $\nu_1 = 30 \text{ mm}^2/\text{s}$ 
 $Q = f(p)$  Volume flow pressure characteristics (Fine feed)

 $\Delta p = f(Q)$  Pressure drop volume flow characteristic over non-return valve function of poppet valve

**ACCESSORIES**

 Threaded connection plates and multi-flange subplates Register 2.9  
 Mating connector EN 175301-803 article no. 219.2002

Technical explanation see data sheet 1.0-100

**TYPES / DIMENSIONS**

 $\Delta p = f(Q)$  Pressure drops volume flow characteristic (Fast approach)

**SCREW-IN CARTRIDGES INSTALLED**

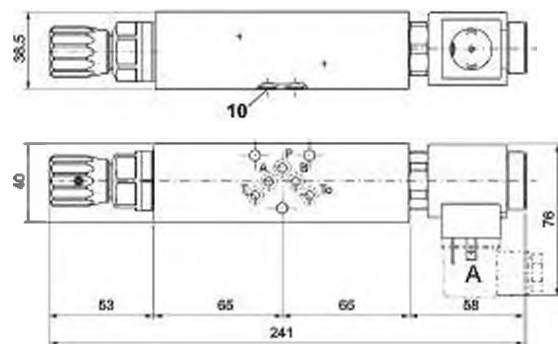
The following screw-in cartridges are used in the sandwich body:

Type	Designation	Data sheet no.
QZ.PM22	Flow control valve	2.5-535
SVSPM22	Solenoid poppet valve	1.11-2082

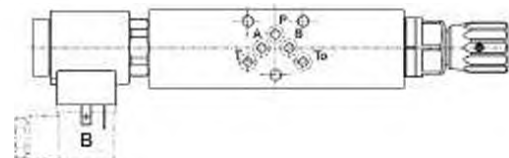
**PARTS LIST**

Position	Article	Description
10	180.2060	O-ring ID 6,07 x 1,78 (NBR)

Control P, T, A, BV



Control AV, B



Dimensions of the other setting versions see data sheet 2.5-535

**Fine feed / fast approach unit**
**Sandwich construction**

- ◆  $Q_{\text{fine}} = 40 \text{ l/min}$  (Fine feed)
- ◆  $Q_{\text{fast}} = 80 \text{ l/min}$  (Fast speed)
- ◆  $Q_{\text{H max}} = 40 \text{ l/min}$
- ◆  $p_{\text{max}} = 350 \text{ bar}$

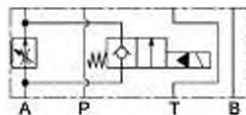
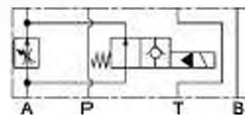
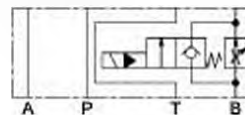
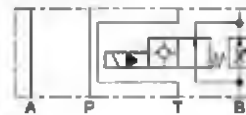
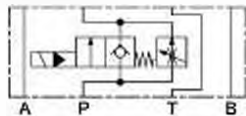
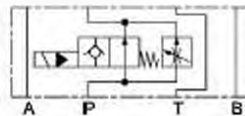
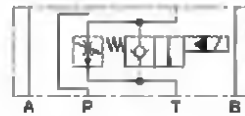
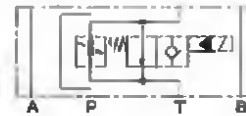
**NG6**
**ISO 4401-03**

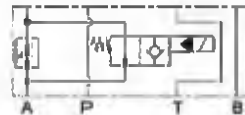
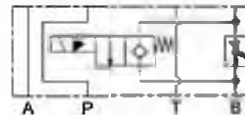
**DESCRIPTION**

Feed unit in sandwich construction. In fine feed, the volume flow is controlled independently of the load via the 2-way flow control cartridge to the manually set value. In doing so, the 2/2-way seat valve cartridge is closed. At the fast approach the volume flow, dependent of the load and of the system pressure, flows through the poppet valve.

**APPLICATION**

The fine feed-/fast approach valves are utilised in hydraulic systems, which require an electrically controlled fine feed-/fast approach changeover, such as positioning controls on machine tools or elevation controls of elevating platforms, etc. Due to the sandwich construction, these fine feed-/fast approach valves can be integrated into stacked systems as an intermediate flange.

**SYMBOL**
**VQ.SA06-AC**

**VQ.SA06-AO**

**VQ.SA06-BC**

**VQ.SA06-BO**

**VQ.SA06-PC**

**VQ.SA06-PO**

**VQ.SA06-TC**

**VQ.SA06-TO**

**VQ.SA06-AVC**

**VQ.SA06-AVO**

**VQ.SA06-BVC**

**VQ.SA06-BVO**

**INSTALLATION NOTES**

Mounting type	Sandwich mounting 4 fixing holes for socket head screws or studs M5
Mounting position	Any, preferably horizontal
Tightening torque	Fixing screws $M_0 = 5,2 \text{ Nm}$ (quality 8.8, zinc coated) Screw-in cartridge $M_0 = 60 \text{ Nm}$

**STANDARDS**

Mounting interface	ISO 4401-03
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**TYPE CODE**

Fine feed / fast approach unit		V	Q	S	A06	-	-	-	-	/	W	-	-	-	-
Flow control function															
Type of adjustment	Key	<input type="checkbox"/>													
	Control knob	<input type="checkbox"/>													
Sandwich construction															
International standard interface ISO, NG6															
Type list / Function	in P	<input type="checkbox"/>	P	in T	<input type="checkbox"/>	T									
Return flow control	in A	<input type="checkbox"/>	A	in B	<input type="checkbox"/>	B									
Forward flow control	in A	<input type="checkbox"/>	AV	in B	<input type="checkbox"/>	BV									
Poppet valve	normally closed	<input type="checkbox"/>													
	normally open	<input type="checkbox"/>													
Nominal volume flow rate $Q_n$	2,5 l/min	<input type="checkbox"/>	2,5	25 l/min	<input type="checkbox"/>	25									
Flow control valve	6,3 l/min	<input type="checkbox"/>	6,3	40 l/min	<input type="checkbox"/>	40									
	16 l/min	<input type="checkbox"/>	16												
Nominal voltage $U_n$	12 VDC	<input type="checkbox"/>	G12	115 VAC	<input type="checkbox"/>	R115									
	24 VDC	<input type="checkbox"/>	G24	230 VAC	<input type="checkbox"/>	R230									
Slip-on coil	Metal housing round														
Connection execution	Connector socket EN 175301-803 / ISO 4400	<input type="checkbox"/>													
	Connector socket AMP Junior-Timer	<input type="checkbox"/>													
	Stecker Deutsch DT04-2P	<input type="checkbox"/>													
Sealing material	NBR	<input type="checkbox"/>													
	FKM (Viton)	<input type="checkbox"/>													

Design index (subject to change)

11-2014

**GENERAL SPECIFICATIONS**

Designation	Fine feed / fast approach unit
Mounting	Sandwich construction
Nominal size	NG6 according to ISO 4401-03
Ambient temperature	-25...+70 °C
Weight	2,2 kg
MTTFd	150 years

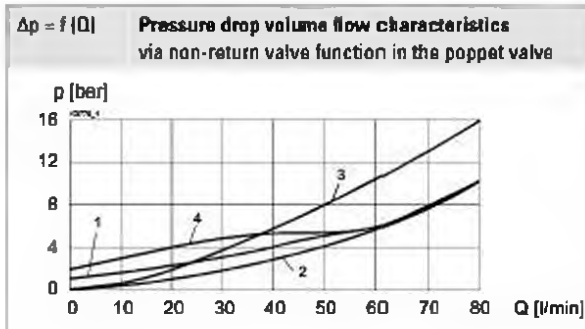
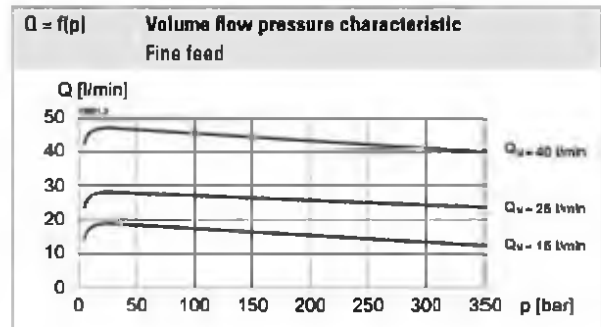
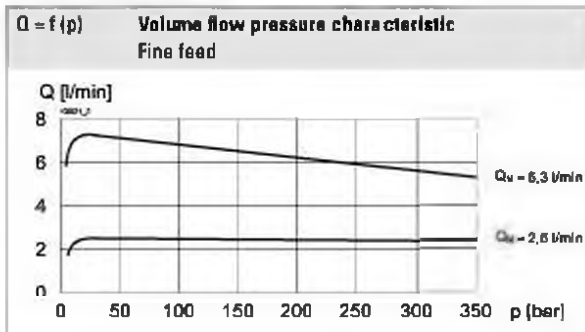
**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 80$ l/min
Minimum volume flow	$Q_{min} = 0,1$ l/min
Nominal volume flow range	$Q_n = 2,5; 6,3; 16; 25; 40$ l/min
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**Note!**


Other specifications, see data sheet of the screw-in cartridges

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 


	Normally closed	Normally open
de-energised 1 → 2	1	2
de-energised 2 → 1	-	3
energised 1 → 2	2	4
energised 2 → 1	3	-

**ACTUATION**

Note! See data sheet of the solenoid operated poppet valve


**SURFACE TREATMENT**

- ◆ The sandwich bodies are zinc coated or zinc-nickel coated

**ACCESSORIES**

Types of adjustment for screw-in cartridges	Data sheet 2.0-50
Threaded subplates	Data sheet 2.9-30
Multi-station subplates	Data sheet 2.9-60
Module type manifold blocks	Data sheet 2.9-100
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

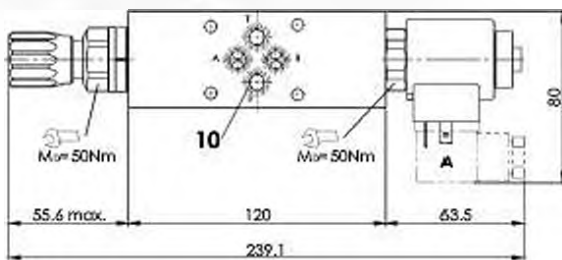
**VALVES INSTALLED**

The following screw-in cartridges are used in the sandwich body.

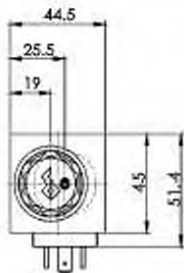
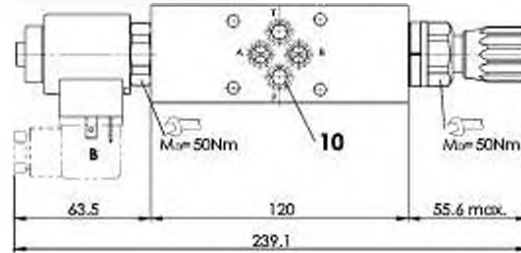
Article	Description	Data sheet no.
QZ.PM22	2-way flow control cartridge	2.5-535
SVSPM22	Solenoid operated poppet valve cartridge	1.11-2082

## DIMENSIONS

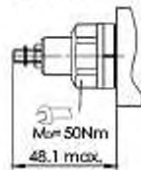
VQDSA06-A, VQDSA06-BV, VQDSA06-P, VQDSA06-T.



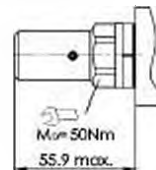
VQDSA06-AV, VQDSA06-B.



VQSSA06



VQASA06



## HYDRAULIC CONNECTION



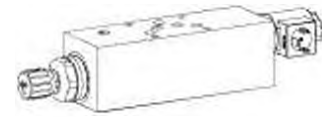
## PARTS LIST

Position	Article	Description
10	160.2093	O-ring ID 9,25 x 1,78 (NBR)
	160.8092	O-ring ID 9,25 x 1,78 (FKM)



**Fine feed-/fast approach valve**
**Sandwich construction**

- $Q_{max}$  = 80 l/min (Fine feed)
- $Q_{max}$  = 120 l/min (Fast approach)
- $Q_{N max}$  = 70 l/min
- $p_{max}$  = 350 bar

**NG10**  
 ISO 4401-05

**DESCRIPTION**

Fine feed-/fast approach valve in sandwich construction. 2-way flow control cartridges (see data sheet 2.5-550) and 2/2-way solenoid poppet valve cartridges 1.11-2076 are installed. 2 standard nominal volume flow ranges are available. The sandwich body made of steel is phosphatized.

**FUNCTION**

The fine feed-/fast approach valve serves for the electrically controlled two-stage speed control. Fine feed and fast approach. At the fine feed the volume flow is controlled by the flow control valve, to the manually adjusted value independent on the load. In doing so, the poppet valve is closed. At the fast approach the volume flow, dependent of the load and of the system pressure, flows through the poppet valve.

**APPLICATION**

The fine feed-/fast approach valves are utilised in hydraulic systems, which require an electrically controlled fine feed-/fast approach flow changeover, such as positioning controls on machine tools or elevation controls of elevating platforms, etc. Due to the sandwich construction, these fine feed-/fast approach valves can be integrated into stacked systems as an intermediate flange.

**TYPE CODE**

Fine feed-/fast approach valve		V		Q	<input type="checkbox"/>	S	A10	-	<input type="checkbox"/>	<input type="checkbox"/>	-	<input type="checkbox"/>	-	<input type="checkbox"/>	/	W	<input type="checkbox"/>	#	<input type="checkbox"/>
Flow control function		Key		S		Control knob		D											
Sandwich construction																			
International standard interface ISO, NG10																			
Type list / Function																			
		in P		<input type="checkbox"/> P		Meter-out flow control		in A		<input type="checkbox"/> A		Meter-in flow control in		in A		<input type="checkbox"/> AV			
		in T		<input type="checkbox"/> T		in B		<input type="checkbox"/> B		in B		<input type="checkbox"/> BV							
Poppet valve		Normally closed		<input type="checkbox"/> C		Normally open		<input type="checkbox"/> O											
Nominal volume flow rate $Q_N$		32 l/min		<input type="checkbox"/> 32		70 l/min		<input type="checkbox"/> 70											
Flow control valve		12VDC		<input type="checkbox"/> G12		115VAC		<input type="checkbox"/> R115											
Nominal voltage $U_N$		24VDC		<input type="checkbox"/> G24		230VAC		<input type="checkbox"/> R230											
Slip-on coil		Metal housing round																	
Connection execution		Connector socket EN175301-803/ISO 4400		<input type="checkbox"/> D		Connector socket AMP Junior-Timer		<input type="checkbox"/> J (only for $U_N \leq 75$ VDC)											
Design index (subject to change)																			

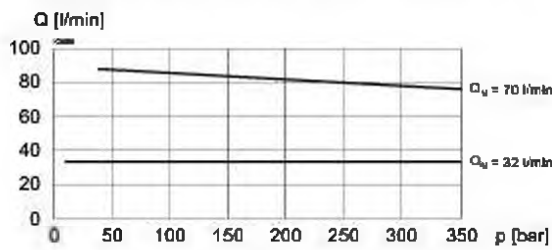
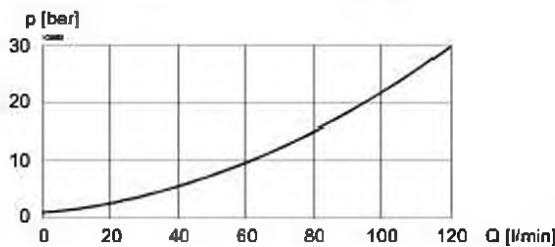
**GENERAL SPECIFICATIONS**

Description	Fine feed-/fast approach valve
Nominal size	NG10 acc. to ISO 4401-05
Construction	Sandwich construction
Mounting	4 holes for socket cap screws M6 or studs M6
Connection	Threaded connection plates, multi-flange subplate, stacking system
Ambient temperature	-20 ... +50 °C
Mounting	any
Fastening torque	$M_0 = 9,5$ Nm (Quel. 8.8) for fixing screws cartridges: see valve data sheets
Weight	$m = 4,5$ kg

**HYDRAULIC SPECIFICATIONS**

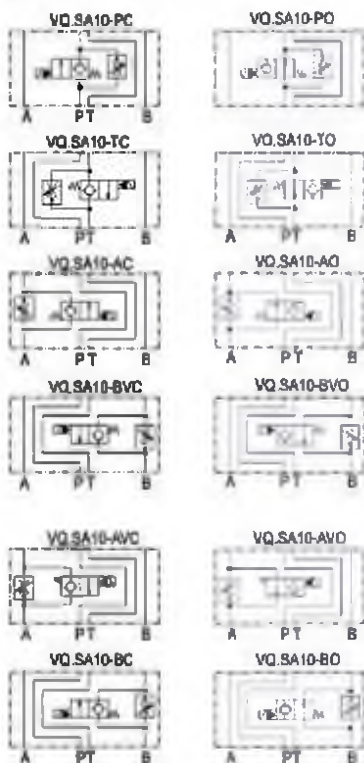
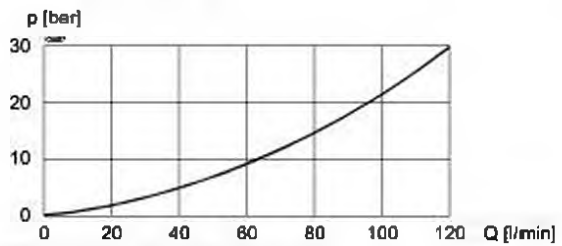
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Recommended filtration grade $\beta_{6...10} \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 350$ bar
Nominal volume flow rates	$Q_N = 32$ l/min, 70 l/min
Min. volume flow	$Q_{min} = 0,2$ l/min
Max. volume flow	$Q_{max} = 120$ l/min

For further hydraulic specifications, refer to flow control valve data sheet 2.5-550.

**CHARACTERISTICS** Oil viscosity  $\nu_1 = 30 \text{ mm}^2/\text{s}$ 
 $Q = f(p)$  Volume flow pressure characteristics (Fine feed)

 $\Delta p = f(Q)$  Pressure drop volume flow characteristic over non-return valve function of poppet valve

**ACCESSORIES**

 Threaded connection plates and multi-flange subplates Register 2.9  
 Mating connector EN 175301-803 Article no. 219.2002

Technical explanation see data sheet 1.0-100

**TYPES / DIMENSIONS**

 $\Delta p = f(Q)$  Pressure drops volume flow characteristic (Fast approach)

**SCREW-IN CARTRIDGES INSTALLED**

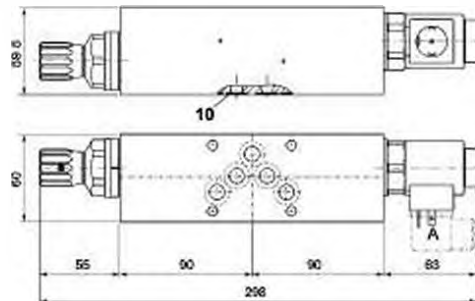
The following screw-in cartridges are used in the sandwich body:

Type	Designation	Data sheet no.
OZ.PM33	Flow control valve	2.5-550
SVSPM33	Solenoid poppet valve	1.11-2076

**PARTS LIST**

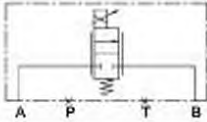
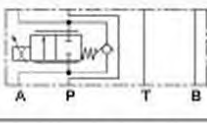
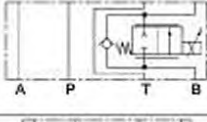
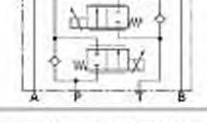
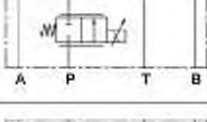
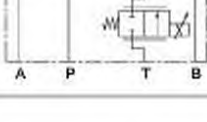
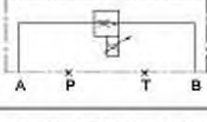
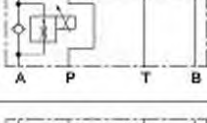
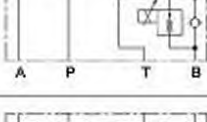
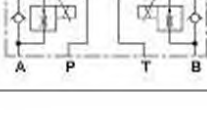
Position	Article	Description
10	160.2140	O-ring ID 14,00 x 1.78 (NBR)

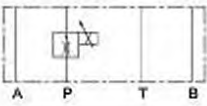
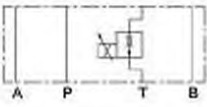
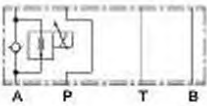
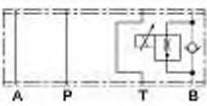
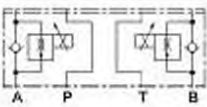
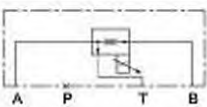
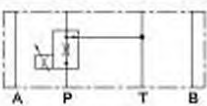
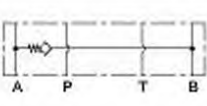
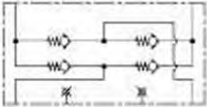
Control P, T, A, BV



Control AV, B

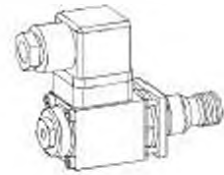


	NG3-Mini	NG4-Mini	NG6 ISO	NG10 ISO
	<b>Types</b>			
	D_PFA03-A/B 2.6-700	D_PFA04-A/B 2.6-720	D_PFA06-A/B 2.6-740	DNPFA10-A/B 2.6-760
	D_PSA03-A 2.6-700	D_PSA04-A 2.6-720	D_PSA06-A 2.6-740	DNPSA10-A 2.6-760
	D_PSA03-B 2.6-700	D_PSA04-B 2.6-720	D_PSA06-B 2.6-740	DNPSA10-B 2.6-760
	D_PSA03-AB 2.6-700	D_PSA04-AB 2.6-720	D_PSA06-AB 2.6-740	DNPSA10-AB 2.6-760
	D_PSA03-P 2.6-700	D_PSA04-P 2.6-720	D_PSA06-P 2.6-740	DNPSA10-P 2.6-760
	D_PSA03-T 2.6-700	D_PSA04-T 2.6-720	D_PSA06-T 2.6-740	DNPSA10-T 2.6-760
		QNPFA04-A/B 2.6-820	QNPFA06-A/B 2.6-840	QNPFA10-A/B 2.6-860
		QNPSA04-A 2.6-820	QNPSA06-A 2.6-840	QNPSA10-A 2.6-860
		QNPSA04-B 2.6-820	QNPSA06-B 2.6-840	QNPSA10-B 2.6-860
		QNPSA04-AB 2.6-820	QNPSA06-AB 2.6-840	QNPSA10-AB 2.6-860

	NG3-Mini	NG4-Mini	NG6 ISO	NG10 ISO
	<b>Types</b>			
		QNPSA04-P 2.6-820	QNPSA06-P 2.6-840	QNPSA10-P 2.6-860
		QNPSA04-T 2.6-820	QNPSA06-T 2.6-840	QNPSA10-T 2.6-860
		QNPSA04-AV 2.6-820	QNPSA06-AV 2.6-840	QNPSA10-AV 2.6-860
		QNPSA04-BV 2.6-820	QNPSA06-BV 2.6-840	QNPSA10-BV 2.6-860
		QNPSA04-ABV 2.6-820	QNPSA06-ABV 2.6-840	QNPSA10-ABV 2.6-860
			QDPFA06-A/B 2.6-842	QDPFA10-A/B 2.6-862
			QDPSA06-P 2.6-842	QDPSA10-P 2.6-862
			AMRP62	
			AMRG62	AMRG102

**Proportional throttle valve**
**Screw-in cartridge**

- Direct operated, not pressure compensated
- Throttle in one flow direction
- $Q_{max} = 12 \text{ l/min}$ ,  $p_{max} = 250 \text{ bar}$
- $Q_{N1max} = 6,3 \text{ l/min}$

**M18x1,5**  
 ISO 7789

**DESCRIPTION**

Direct operated proportional throttle valve. Thread M18x1,5 and cavity in accordance with ISO 7789. Spool options „normally closed“ and „normally open“. Two flow ranges are available. The volume flow is adjusted by a Wandfluh-proportional solenoid (VDE standard 0580). Progressive increase and decrease of volume flow and reduced hysteresis are characteristics of this valve. The cartridge body is made of steel. Its special surface coating protects the outside against corrosion and reduces friction of the control spool. The solenoid is zinc coated.

**FUNCTION**

The force controlled wet pin proportional solenoid acts directly on the control spool which opens or closes the throttle segments of the radial holes in the valve body. The throttle opening and therefore the flow volume changes proportionally to the current input to the proportional solenoid. With deenergised solenoid the control spool is held in closed respectively open position by a spring. To control the valve proportional amplifiers are available from Wandfluh (see register 1.13).

**APPLICATION**

Proportional throttle valves are suitable for precise feed control systems. Very sensitive opening and closing characteristics allow smooth control of movements in stationary or mobile installations, e.g. machine tools, public vehicles. Installation of the screw-in cartridge in control blocks as well as in the Wandfluh sandwich plates (vertical stacked systems) and flange valves of the NG3-Mini types. (Please note the separate data sheets in register 2.6). Cavity tools are available for machining the cavities in steel and aluminium (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

		D	<input type="checkbox"/>	P	<input type="checkbox"/>	PM18	-		-		#	<input type="checkbox"/>
Throttle valve												
Normally closed	<input type="checkbox"/>	N										
Normally open	<input type="checkbox"/>	O										
Proportional												
Screw-in cartridge M18x1,5												
Nominal volume flow rate $Q_N$		4 l/min	<input type="checkbox"/>	6,3 l/min	<input type="checkbox"/>							
Nominal voltage $U_N$		12 VDC	<input type="checkbox"/>	24 VDC	<input type="checkbox"/>	G12						
						G24						
Design-Index (Subject to change)												

**GENERAL SPECIFICATIONS**

Description	Direct operated proportional throttle valve
Construction	Screw-in cavity acc. to ISO 7789
Operations	Proportional solenoid
Befestigungsart	Screw-in thread M18x1,5
Ambient temperature	-20...+50 °C
Mounting position	any
Tightening torque	$M_t = 30 \text{ Nm}$ for screw-in cartridge $M_t = 1,2 \text{ Nm}$ (Qual. 8.8) for solenoid screws
Weight	$m = 0,25 \text{ kg}$
Volume flow direction	1 → 2

**HYDRAULIC SPECIFICATIONS**

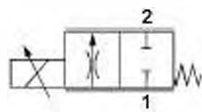
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4408:1999, class 18/16/13 (Required filtration grade $\beta_{0.6...10} \geq 75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 250 \text{ bar}$
Nominal volume flow rates	$Q_N = 4 \text{ l/min}$ , $Q_N = 6,3 \text{ l/min}$ at 10 bar pressure drop
Max. Volume flow	$Q_{max} = 12 \text{ l/min}$
Leakage volume flow	see characteristics
Resolution	1 mA
Repeatability	≤ 1% •
Hysteresis	≤ 2% • • at optimal dithersignal

**ELECTRICAL SPECIFICATIONS**

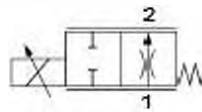
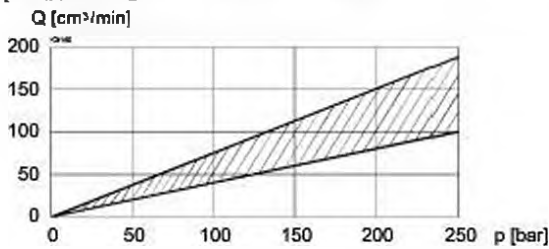
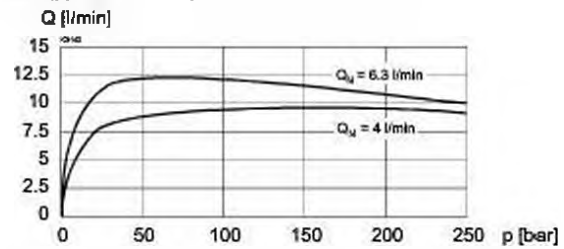
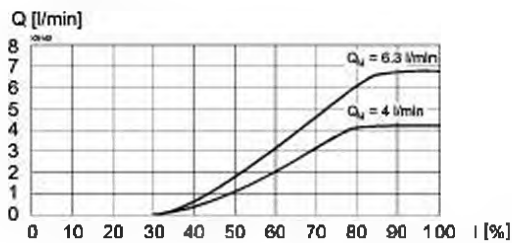
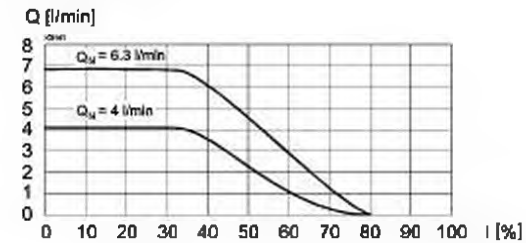
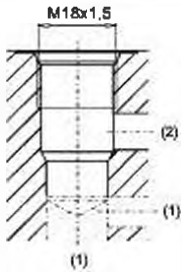
Construction	Proportional solenoid, wet pin push type, pressure tight.	
Standard-Nominal voltage	$U_N = 12 \text{ VDC}$	$U_N = 24 \text{ VDC}$
Limiting current	$I_a = 1080 \text{ mA}$	$I_a = 540 \text{ mA}$
Relative duty factor	100% DF (see data sheet 1.1-430)	
Protection class	IP 65 to EN 60 529	
Connection/Power supply	Over device plug connection to ISO 4400 / DIN 43 650 (2P+E)	
Other electrical specifications	see data sheet 1.1-90 (PI29V)	

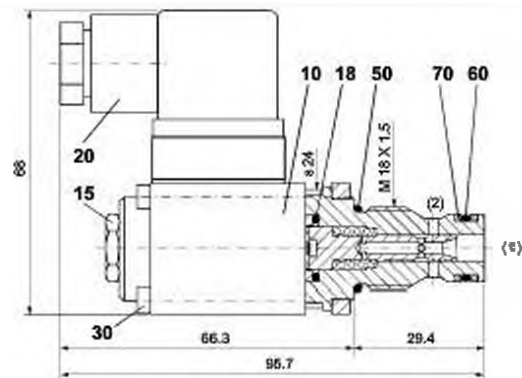
**SYMBOLS**

Normally closed



Normally open


**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $Q_L = f(p)$  Leakage volume flow characteristics

 $Q = f(p)$  Volume flow pressure characteristics

 $Q = f(i)$  Volume flow adjustment characteristics  
 DNPPM18

 $Q = f(i)$  Volume flow adjustment characteristics  
 DOPPM18

**DIMENSIONS / SECTIONAL DRAWINGS**

 Cavity drawing according to  
 ISO 7789-18-01-0-98

 For detailed cavity drawing  
 and cavity tools see data  
 sheet 2.13-1002.

**PARTS LIST**

Position	Article	Description
10	256.2453 256.2418	Proportional solenoid PI29V-G24 Proportional solenoid PI29V-G12
15	253.8000	Mounted screw with integrated manual override HB4,5
18	180.2120	O-ring ID 12,42x1,78
20	219.2002	Plug (black)
30	246.0148	Socket head cap screw M3x45 DIN912
50	180.2158	O-ring ID 15,80x1,78
60	180.2111	O-ring ID 11,11x1,78
70	049.3158	Back up ring RD 12,1x15x1,4

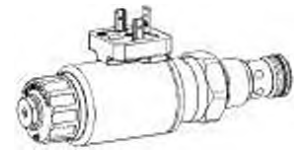
**ACCESSORIES**

Flange-sandwich plate NG3-Mini	Data sheet 2.6-700
Line mount body	Data sheet 2.9-205
Proportional amplifier	Register 1.13
Mating connector EN 175301-803	Article Nr. 219.2002

Technical explanation see data sheet 1.0-100

**Proportional throttle cartridge**

- ◆ direct operated
- ◆  $Q_{max} = 32 \text{ l/min}$
- ◆  $Q_{Nmax} = 25 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

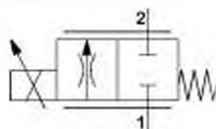
Direct operated proportional throttle valve in screw-in cartridge construction for cavity according to ISO 7789. With the solenoid deenergised, the control spool is held in the closed position (DN) or open position (DO) by a spring. The change of the electric current is followed by a proportional volume flow change. Very sensitive opening and closing characteristics and low hysteresis are characteristics of these valves. For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

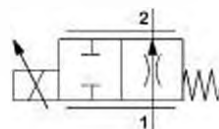
Proportional throttle valves are suitable for smooth control of movements in stationary or mobile systems. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

„normally closed“ DN



„normally open“ DO


**TYPE CODE**

		D <input type="checkbox"/> P PM22 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> HB4,5 <input type="checkbox"/>	
Throttle valve			
Normally closed	N		
Normally open	O		
Proportional			
Screw-in cartridge M22 x 1,5			
Nominal volume flow rate $Q_N$	6,3 l/min <input type="checkbox"/> 10 l/min <input type="checkbox"/> 25 l/min <input type="checkbox"/>	6,3 10 25	
Nominal voltage $U_N$	12 VDC <input type="checkbox"/> 24 VDC <input type="checkbox"/> without coil <input type="checkbox"/>	12 24 X5	
Slip-on coil	Metal housing round <input type="checkbox"/> Metal housing square <input type="checkbox"/>	W M	
Connection execution	Connector socket EN 175301-803/ISO 4400 <input type="checkbox"/> Connector socket AMP Junior - Timer <input type="checkbox"/> Connector Deutsch DTDM-2P <input type="checkbox"/>	D J G	
Sealing material	NBR <input type="checkbox"/> FKM (Viton) <input type="checkbox"/>	<input type="checkbox"/> D1	
Manual override			
Design index (subject to change)			

**GENERAL SPECIFICATIONS**

Designation	Proportional throttle valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,57 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1320 \text{ mA}$ ( $U_N = 12\text{VDC}$ ) $I_a = 660 \text{ mA}$ ( $U_N = 24\text{VDC}$ )

**Note!** Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)


**ACTUATION**

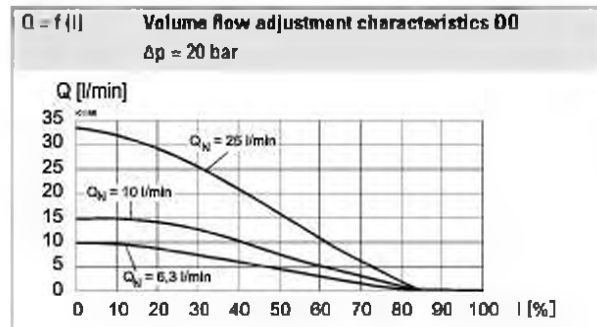
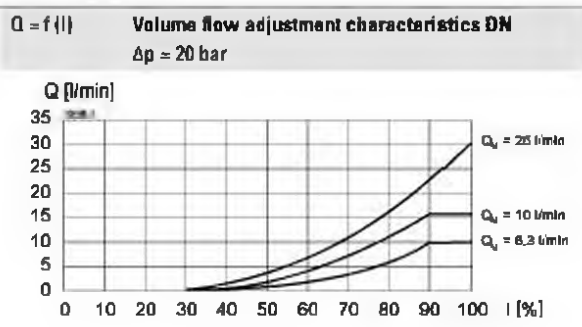
Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W.S37 / 19 x 50 (Data sheet 1.1-173) M.S35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Maximum volume flow	$Q_{max} = 32 \text{ l/min}$
Volume flow direction	1 → 2
Leakage oil	On request
Nominal volume flow range	$Q_N = 6,3; 10; 25 \text{ l/min}$ at 10 bar valve pressure drop
Hysteresis	≤ 8 % (DN); 10-12 % (DD) at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

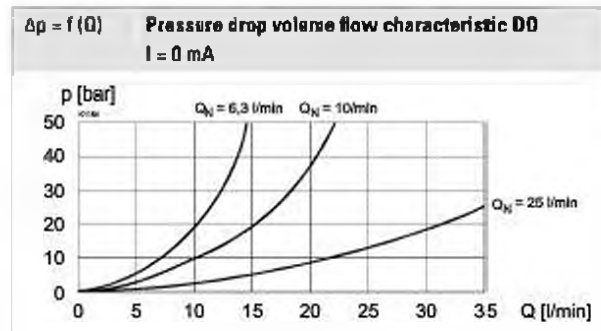
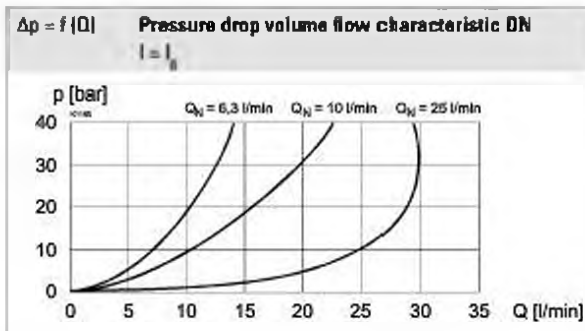
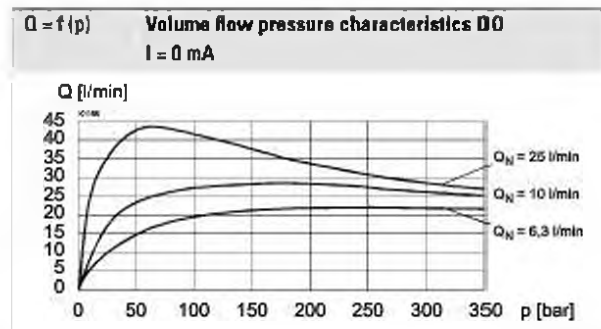
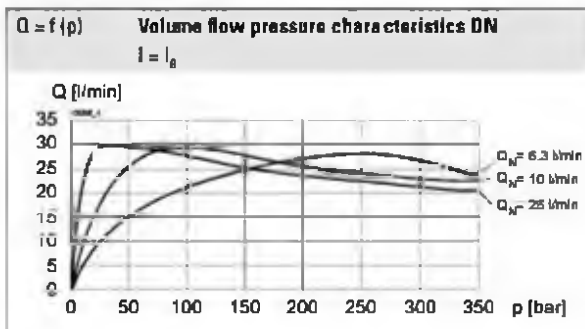
**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$





**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**SURFACE TREATMENT**

- ◆ The cartridge body is gas-nitro-carburised
- ◆ The armature tube and the slip-on coil are zinc- / nickel-coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

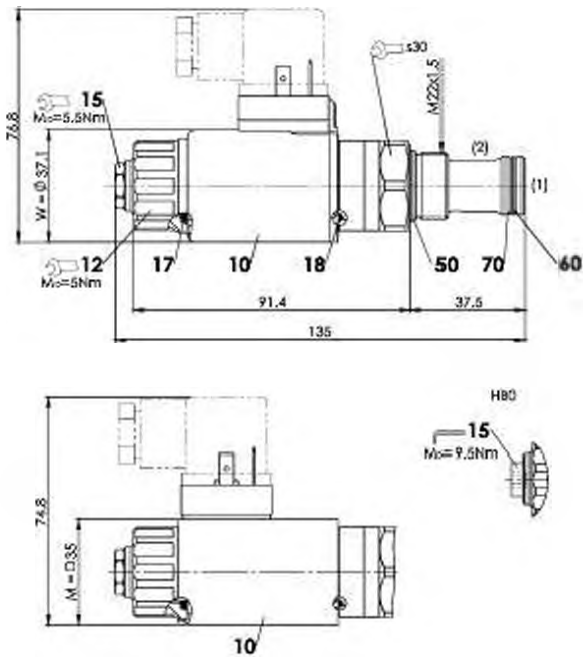
**ACCESSORIES**

Proportional amplifier	Register 1.13
Mating connector black (B)	Article no. 219.2002
Flange body / sandwich plate NG4-Mini	Data sheet 2.6-720
Flange body / sandwich plate NG6	Data sheet 2.6-740
Threaded body	Data sheet 2.9-205
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

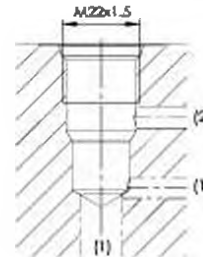
**MANUAL OVERRIDE**

HB4,5

Optionally: Screw plug (HB0), no actuation possible

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-01-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1008

**PARTS LIST**

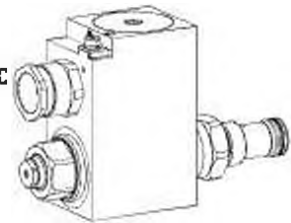
Position	Article	Description
10	206.2...	W.S37 / 19 x 50
	260.5...	M.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000	HB4,5 manual override
	239.2033	HB0 Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.3196	Backup ring rd 16,1 x 19 x 1,4

**Proportional throttle cartridge**

- ◆ direct operated
- ◆  $Q_{max} = 45 \text{ l/min}$
- ◆  $Q_{Nmax} = 25 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**

- ⊕ II 2 G Ex db IIC T6, T4
  - ⊕ II 2 D Ex db III C T80 °C, T130 °C
  - ⊕ I M2 Ex db I Mb
- Class I Division 1
- 
- Class I Zone 1


**DESCRIPTION**

Direct operated proportional throttle valve in screw-in cartridge construction for cavity according to ISO 7789. With the solenoid deenergised, the control spool is held in the closed position (DN) or open position (DO) by a spring. The change of the electric current is followed by a proportional volume flow change. Very sensitive opening and closing characteristics and low hysteresis are characteristics of these valves. For the control, Wandfluh proportional amplifiers are available (see register 1.13). The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

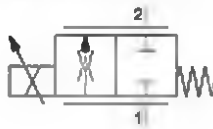
Proportional throttle valves are suitable for smooth control of movements in stationary or mobile systems. These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. The screw-in cartridge is perfectly suitable for installation in control blocks. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

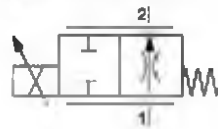
Throttle valve		<input type="checkbox"/> B PM22 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>	
Normally closed		N	
Normally open		O	
Proportional, ex-protection execution Ex d			
Screw-in cartridge M22 x 1,5			
Nominal volume flow rate $Q_N$	6,3 l/min	<input type="checkbox"/> 6,3	
	10 l/min	<input type="checkbox"/> 10	
	25 l/min	<input type="checkbox"/> 25	
Nominal voltage $U_N$	12 VDC	<input type="checkbox"/> G12	
	24 VDC	<input type="checkbox"/> G24	
Nominal power $P_N$	9 W	<input type="checkbox"/> L9	Ambient temperature up to: 40 °C or 80 °C 70 °C 70 °C (only UL / CSA)
	15 W	<input type="checkbox"/> L15	
	17 W	<input type="checkbox"/> L17	
Certification	ATEX, IECEx, EAC, CCC	<input type="checkbox"/>	UL / CSA <input type="checkbox"/> UL
	Australia	<input type="checkbox"/> AU	MA <input type="checkbox"/> MA
Sealing material	NBR	<input type="checkbox"/>	
	FKM (Viton)	<input type="checkbox"/> D1	
Design index (subject to change)			

**SYMBOL**

„normally closed“ DN



„normally open“ DO


**GENERAL SPECIFICATIONS**

Designation	Proportional throttle valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Ex-protection proportional solenoid
Ambient temperature	<b>Operation as T6</b> -25...+40 °C (L9) <b>Operation as T4</b> -25...+90 °C (L9) -25...+70 °C (L15 / L17)
Weight	1,95 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Maximum volume flow	$Q_{max} = 45 \text{ l/min}$
Volume flow direction	1 → 2
Leakage oil	On request
Nominal volume flow range	$Q_N = 6,3; 10; 25 \text{ l/min}$ at 10 bar valve pressure drop
Hysteresis	≤ 8 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T6</b> NBR -25...+40 °C (L9) FKM -20...+40 °C (L9) <b>Operation as T4</b> NBR -25...+70 °C (L9 or L15 / L17) FKM -20...+70 °C (L15 / L17) FKM -20...+70 °C (L9)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade β <sub>6</sub> ...10 ≥ 75, see data sheet 1.0-50

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to...	M248 Electronic
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	
MA		x	x	x
UL / CSA	x		x	

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable Ø 6,5...14 mm

**Attention!** The UL execution is always supplied without cable gland

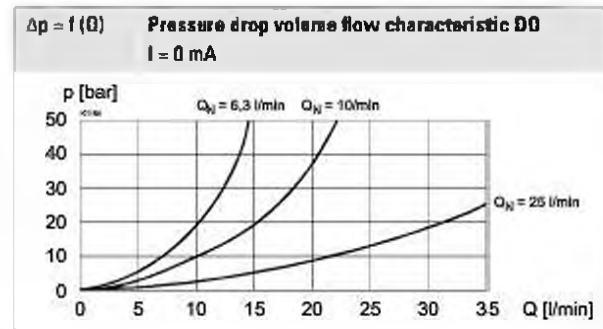
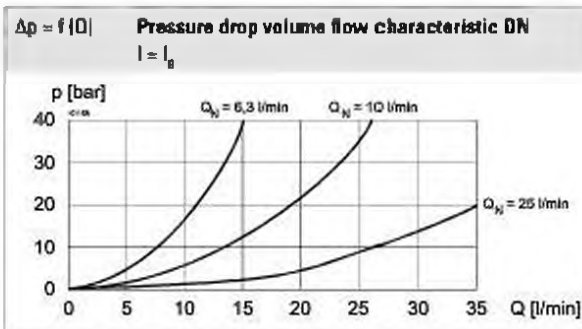
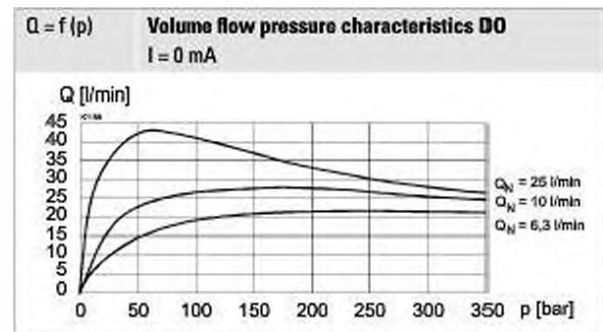
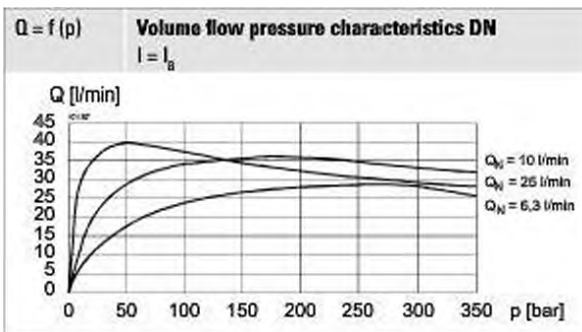
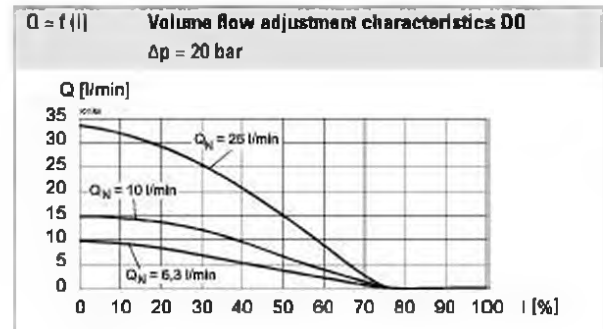
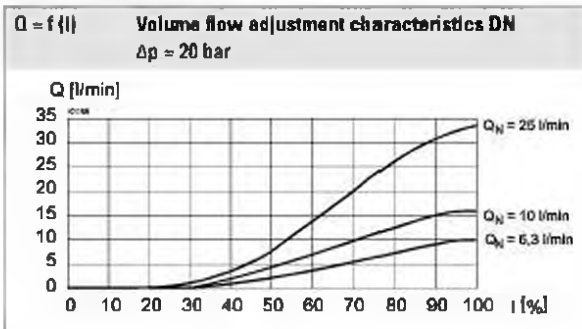

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at... °C	<b>L9, 40 °C</b> $I_a = 625 \text{ mA}$ (12 VDC) $I_a = 305 \text{ mA}$ (24 VDC) <b>L15 / 17, 50 °C</b> $I_a = 950 \text{ mA}$ (12 VDC) $I_a = 450 \text{ mA}$ (24 VDC) <b>L15 / 17, 70 °C</b> $I_a = 910 \text{ mA}$ (12 VDC) $I_a = 420 \text{ mA}$ (24 VDC)
Standard nominal power	9 W, 15 W, 17 W
Temperature class	Nominal power 9 W: T1...T6 Nominal power 15 W / 17 W: T1...T4

**Note!** Other electrical specifications see data sheet 1.1-183 and 1.1-184



**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACCESSORIES**

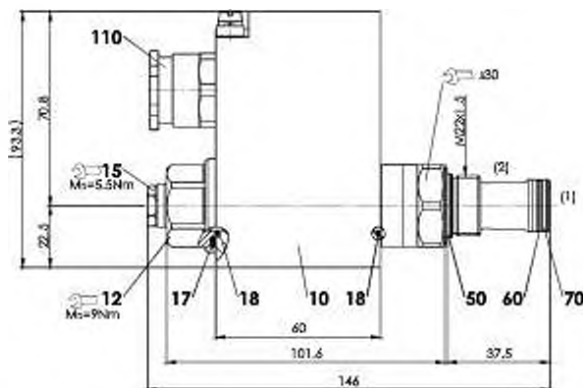
Proportional amplifier	Register 1.13
Flange body / sandwich plate NG4-Mini	Data sheet 2.6-720
Flange body / sandwich plate NG6	Data sheet 2.6-740
Threaded body	Data sheet 2.9-205
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5 as standard

**SEALING MATERIAL**

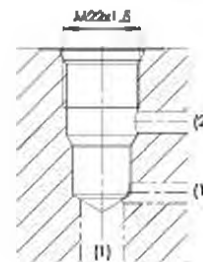
NBR or FKM (Viton) as standard, choice in the type code

**DIMENSIONS**


Dimensions of the solenoid coil see data sheet 1.1-183 and 1.1-184

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-01-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1008

**PARTS LIST**

Position	Article	Description
10	263.6 ..	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	253.8000	Manual override HB4,5
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.3196	Backup ring rd 16,1 x 19 x 1,4
110	111.1080	Cable gland M20 x 1,5

**STANDARDS**

Cartridge cavity	ISO 7789
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flamproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**SURFACE TREATMENT**

- ◆ The cartridge body is gas-nitro-carburised
- ◆ The armature tube and the slip-on coil are zinc- / nickel-coated

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 50 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut

**COMMISSIONING**
**Attention!**


The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent. In case of non-observance, no liability can be assumed.

**Proportional throttle cartridge with integrated electronics**

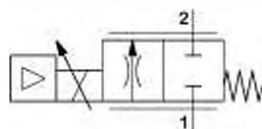
- ◆ direct operated
- ◆  $Q_{N\max} = 32 \text{ l/min}$
- ◆  $Q_{N\min} = 25 \text{ l/min}$
- ◆  $p_{\text{act}} = 350 \text{ bar}$

**DESCRIPTION**

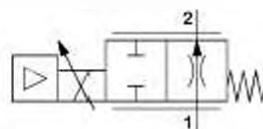
Direct operated proportional throttle valve with integrated electronics as screw-in cartridge for cavity according to ISO 7789. With the solenoid deenergised, the control spool is held in the closed position (DN) or open position (DO) by a spring. The change of the electric current is followed by a proportional volume flow change. Progressive increase and decrease of volume flow and reduced hysteresis are characteristics of this valve. The Plug & Play valves are factory set and adjusted and have therefore a high valve-to-valve reproducibility. The control takes place via an analogue interface or a fieldbus interface (CANopen, J1939 or Profibus DP). The parameterisation takes place by means of the free of cost parameterisation and diagnostics software «PASO» or via fieldbus interface. The USB parameterisation interface is accessible through a screw plug. As an option, these valves are available with integrated controller. As feedback value generators sensors with voltage or current output can be connected directly. The available controller structures are optimised for applications with hydraulic actuations.

**SYMBOL**

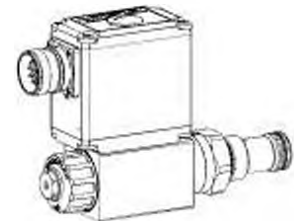
„normally closed“ DN



„normally open“ DO


**MANUAL OVERRIDE**

HB4,5 as standard

**M22 x 1,5**  
**ISO 7789**

**APPLICATION**

Proportional throttle valves with integrated electronics are perfectly suitable for demanding applications in which the volume flow frequently has to be changed. They are used in applications where high valve-to-valve reproducibility, easy installation, comfortable operation and high precision are very important. The integrated controller relieves the machine control and operates the volume flow control in a closed loop circuit. The applications are in the industrial as well as in the mobile hydraulics for the smooth control of hydraulic actuations. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**Nota!**


„PASO“ is a Windows programm in the flow diagram style, which enables the intuitive adjustment and storing of all variable parameters. The data remain saved in case of a power failure and can also be reproduced and transferred to other DSV.

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Connection	Via device receptacle

**ELECTRICAL SPECIFICATIONS**

Protection class	IP67 with suitable mating connector and closed housing cover
Ramps	Adjustable
Parameterisation	Via fieldbus or USB
Supply voltage	12 VDC, 24 VDC

**Nota!**


Exact electrical specifications and detailed description of «DSV» electronics can be found on data sheet 1.13-76.

**TYPE CODE**

Throttle valve		D <input type="checkbox"/> P PM22 - <input type="checkbox"/> - <input type="checkbox"/> / M E <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/> HB4,5 # <input type="checkbox"/>	
Normally closed	<input type="checkbox"/> N		
Normally open	<input type="checkbox"/> O		
Proportional			
Screw-in cartridge M22 x 1,5			
Nominal volume flow rate $Q_n$	6,3 l/min <input type="checkbox"/> 6,3		
	10 l/min <input type="checkbox"/> 10		
	25 l/min <input type="checkbox"/> 25		
Nominal voltage $U_n$	12 VDC <input type="checkbox"/> 12		
	24 VDC <input type="checkbox"/> 24		
Slip-on coil	Metal housing square <input type="checkbox"/>		
Connection execution	Integrated electronics <input type="checkbox"/>		
Hardware configuration			
Analog command value signal	12 pole <input type="checkbox"/> A2	7 pole <input type="checkbox"/> 02	(0 ... 10 V preset)
Analog command value signal	12 pole <input type="checkbox"/> A4	7 pole <input type="checkbox"/> 04	(4 ... 20 mA preset)
CANopen according to DSP-408	<input type="checkbox"/> C7		
Profibus DP according to Fluid Power Technology	<input type="checkbox"/> P1		
CAN J1939 (on request)	<input type="checkbox"/> J1		
Function			
Amplifier	<input type="checkbox"/>		
Controller with current feedback value signal (0 ... 20 mA / 4 ... 20 mA)	<input type="checkbox"/> R1		
Controller with voltage feedback value signal (0 ... 10 V)	<input type="checkbox"/> R2		
Sealing material	NBR <input type="checkbox"/>		
	FKM (Viton) <input type="checkbox"/> 01		
Manual override <input type="checkbox"/>			
Design index (subject to change)			

28-341

**GENERAL SPECIFICATIONS**


Designation	Proportional throttle valve with integrated electronics
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-20 ... +65 °C The upper temperature limit is a guideline for typical applications, in individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions „DSV“.
Weight	1,0 kg
MTTFd	150 years


**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 32$ l/min
Volume flow direction	1 → 2
Leakage oil	max. 50 cm <sup>3</sup> /min at 350 bar
Nominal volume flow range	$Q_n = 6,3; 10; 25$ l/min at 10 bar valve pressure drop
Hysteresis	≤ 6 %
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 ≥ 75, see data sheet 1.0-50





**ELECTRICAL CONNECTION**


X1	Analog interface (Main)
Device receptacle	M23, 12 pole male
	1 = Supply voltage + 2 = Supply voltage 0 VDC 3 = Stabilised output voltage 4 = Command value signal voltage + 5 = Command value signal voltage - 6 = Command value signal current + 7 = Command value signal current - 8 = Reserved for extensions 9 = Reserved for extensions 10 = Enable signal (Digital input) 11 = Error signal (Digital output) 12 = Chassis
Command value signal voltage (PIN 4/5) resp. current (PIN 6/7) are selected with parameterisation and diagnostics software PASO.	


X1	Fieldbus interface (Main)
Device receptacle	M12, 4 pole male
	1 = Supply voltage + 2 = Reserved for extensions 3 = Supply voltage 0 VDC 4 = Chassis

X2	Parameterisation interface
USB, Mini B	Under the screw plug of the housing cover Factory set

X1	Analog interface (Main)
Device receptacle	Connector DIN EN 175201 - 804
	7 pole male A = Supply voltage + B = Supply voltage 0 VDC C = Not connected D = Command value signal + E = Command value signal - F = Not connected G = Chassis
Command value signal: current (D4) or voltage (D2) to specify when placing the order	

X3	Profibus interface according to IEC 947-5-2
Device receptacle	M12, 5 pole female B-coded
	1 = VP 2 = Rx/D / Tx/D - N 3 = DGND 4 = Rx/D / Tx/D - P 5 = Shield

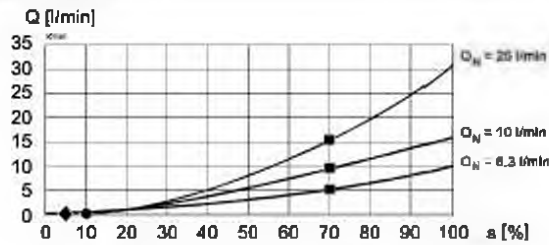
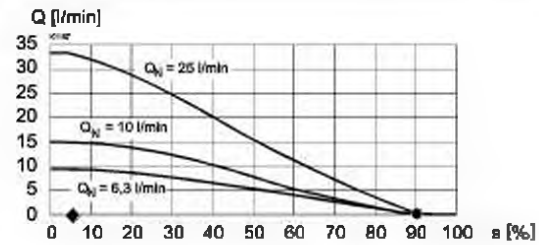
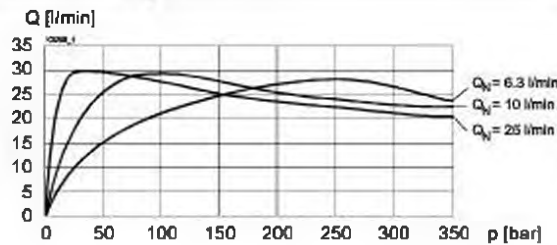
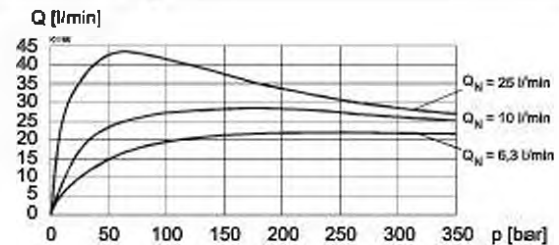
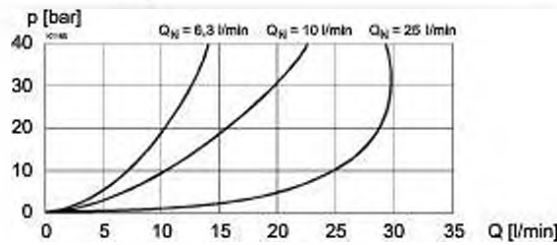
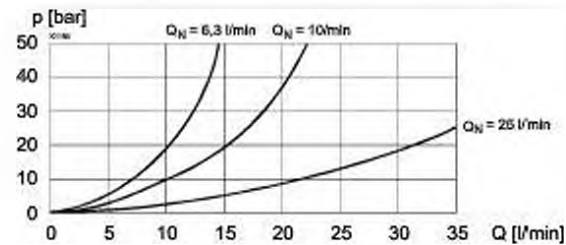
X3	CANopen interface according to DRP 303-1
Device receptacle	M12, 5 pole male
	1 = Not connected 2 = Not connected 3 = CAN Gnd 4 = CAN High 5 = CAN Low

X4 (controller only)	Feedback value interface (sensor)
Device receptacle	M12, 5 pole female
	1 = Supply voltage (output) + 2 = Feedback value signal + 3 = Supply voltage 0 VDC 4 = Not connected 5 = Stabilised output voltage
Feedback value signal: current (R1) or voltage (R2) to specify when placing the order	

**Note!** The mating connector is not included in the delivery



**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
**Q = f (s)** Volume flow adjustment characteristics DN  
 $p_1 - p_2 = 20 \text{ bar}$  / s corresponds to command value signal

**Q = f (s)** Volume flow adjustment characteristics DO  
 $p_1 - p_2 = 20 \text{ bar}$  / s corresponds to command value signal

**Q = f (p)** Volume flow pressure characteristics DN  
 $l = l_B$ 

**Q = f (p)** Volume flow pressure characteristics DO  
 $l = l_B$ 

 **$\Delta p = f (Q)$**  Pressure drop volume flow characteristic DN  
 $l = l_B$ 

 **$\Delta p = f (Q)$**  Pressure drop volume flow characteristic DO  
 $l = l_B$ 

**FACTORY SETTINGS**

Dither set for optimum hysteresis DN

- ◆ = Deadband: solenoid switched off at command value signal < 5 %
- = Opening pressure at command value signal + 10 %
- = Flow at  $\Delta p = 30 \text{ bar}$  at 70% command value signal

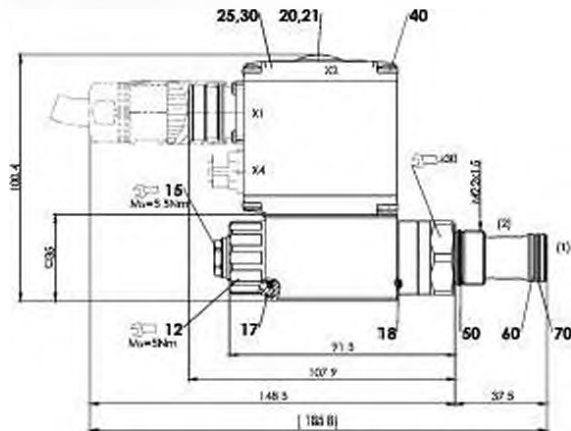
15,0 l/min	at nominal volume flow rate $Q_N$	25 l/min
10,0 l/min	at nominal volume flow rate $Q_N$	10 l/min
5,2 l/min	at nominal volume flow rate $Q_N$	6,3 l/min

Dither set for optimum hysteresis DO

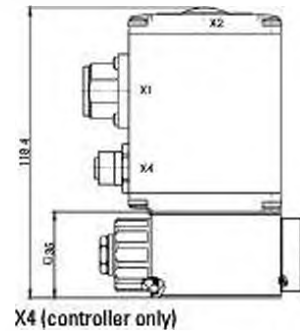
- ◆ = Deadband: solenoid switched off at command value signal < 5 %
- = Closing point at 90 %

**DIMENSIONS**

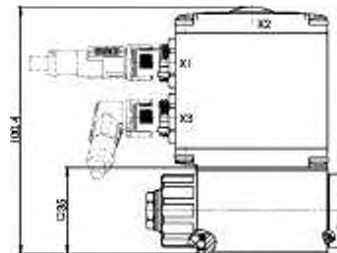
With analog interface, 12 pole connector  
 Amplifier and controller



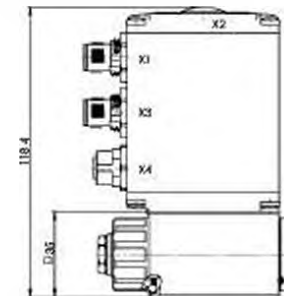
With analog interface, 7 pole connector  
 Amplifier and controller



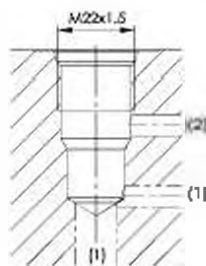
With fieldbus interface  
 Amplifier



With fieldbus interface  
 Controller


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-01-0-98



Note!



For detailed cavity drawing and cavity tools see data sheet 2.13-1008

**PARTS LIST**

Position	Article	Description
12	154.2700	Knurled nut
15	253.8000	Manual override HB4,5
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
20	223.1317	Dummy plug M16 x 1,5
21	160.6131	O-ring ID 13,00 x 1,5 (FKM)
25	062.0102	Cover
30	072.0021	Gasket 33,2 x 59,9 x 2
40	208.0100	Socket head screw M4 x 10
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.3196	Backup ring rd 16,1 x 19 x 1,4

### SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

### SURFACE TREATMENT

- ◆ The cartridge body is gas-nitro-carburised
- ◆ The slip-on coil is zinc- / nickel-coated
- ◆ The electronics housing / chassis is made of aluminium

### COMMISSIONING

For DSV amplifiers as a rule no parameter adjustments by the customer are required. The plugs have to be connected in accordance with the chapter «Electrical connection».

Controllers are supplied configured as amplifiers. The adjustment of the mode of control and of the controller are carried out by the customer by means of the software adjustment (USB interface, Mini B).

Further information can be found on:

Free- of charge download of the «PASO» software and the operation instructions for «DSV» hydraulic valves as well as the operation instructions CANopen Protocol resp. Profibus DP Protocol, with Device Profile DSP-408 for «DSV».

#### Note!



The mating connectors and the parameterisation cable are not part of the delivery. Refer to chapter «Accessories».

### STANDARDS

Cartridge cavity	ISO 7789
CANopen	DRP 303-1
Profibus DP	IEC 947-5-2
Protection class	EN 60 529
Contamination efficiency	ISO 4406

### INSTALLATION NOTES

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut

### ACCESSORIES

Parameterisation software	See start-up
Parameterisation cable for interface USB (from plug type A on Mini B, 3 m)	Article no. 219.289
<b>Mating connector (plug female) for analog interface</b>	
straight, soldering contact M23, 12 pole	Article no. 219.233
straight, soldering contact, 7 pole	Article no. 219.233
angled, soldering contact M23, 12 pole	Article no. 219.233
Flange body / sandwich plate NG4-Mini	Data sheet 2.6-720
Flange body / sandwich plate NG6	Data sheet 2.6-740
Threaded body	Data sheet 2.9-205
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

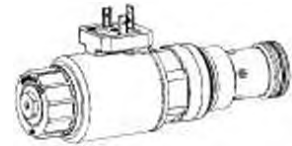
#### Attention! Auxiliary conditions for the cable:



- External diameter 12 pol: 3,5...14,7 mm
- External diameter 7 pol: 8...10 mm
- Wire cross section max. 1 mm<sup>2</sup>
- Recommended wire cross section:  
0...25 m = 0,75 mm<sup>2</sup> (AWG18)  
25...50 m = 1 mm<sup>2</sup> (AWG17)

**Proportional throttle cartridge**

- ◆ direct operated
- ◆  $Q_{max} = 65 \text{ l/min}$
- ◆  $Q_{Nmax} = 63 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**M33 x 2**  
**ISO 7789**

**DESCRIPTION**

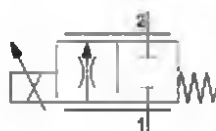
Direct operated proportional throttle valve in screw-in cartridge construction for cavity according to ISO 7789. With the solenoid deenergised, the control spool is held in the closed position (DN) or open position (DO) by a spring. The change of the electric current is followed by a proportional volume flow change. Very sensitive opening and closing characteristics and low hysteresis are characteristics of these valves. For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

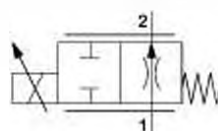
Proportional throttle valves are suitable for smooth control of movements in stationary or mobile systems. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

„normally closed“ DN



„normally open“ DO


**TYPE CODE**

		D <input type="checkbox"/> P PM33 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> HB4,5 # <input type="checkbox"/>	
Throttle valve			
Normally closed	<input type="checkbox"/> N		
Normally open	<input type="checkbox"/> D		
Proportional			
Screw-in cartridge M33 x 2			
Nominal volume flow rate $Q_N$	normally closed		normally open
	32 l/min <input type="checkbox"/> 32		40 l/min <input type="checkbox"/> 40
	63 l/min <input type="checkbox"/> 63		
Nominal voltage $U_N$	12 VDC	<input type="checkbox"/> G12	
	24 VDC	<input type="checkbox"/> G24	
	without coil	<input type="checkbox"/> X5	
Slip-on coil	Metal housing round	<input type="checkbox"/> W	
	Metal housing square	<input type="checkbox"/> M	
Connection execution	Connector socket EN 175301-803 / ISO 4400	<input type="checkbox"/> D	
	Connector socket AMP Junior-Timer	<input type="checkbox"/> J	
	Connector Deutsch DT04-2P	<input type="checkbox"/> G	
Sealing material	NBR	<input type="checkbox"/>	
	FKM (Viton)	<input type="checkbox"/> D1	
Manual override			
Design index (subject to change)			

**GENERAL SPECIFICATIONS**

Designation	Proportional throttle valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M33 x 2 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25 ... +70 °C
Weight	0,95 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1560 \text{ mA}$ ( $U_N \approx 12\text{VDC}$ ) $I_a = 780 \text{ mA}$ ( $U_N = 24\text{VDC}$ )

**Note!** Other electrical specifications see data sheet 1.1-180 (slip-on coil W) and 1.1-181 (slip-on coil M)


**ACTUATION**

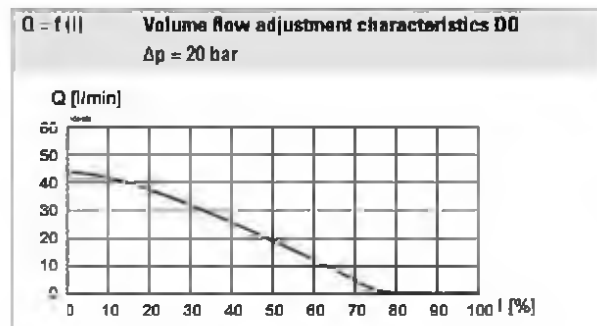
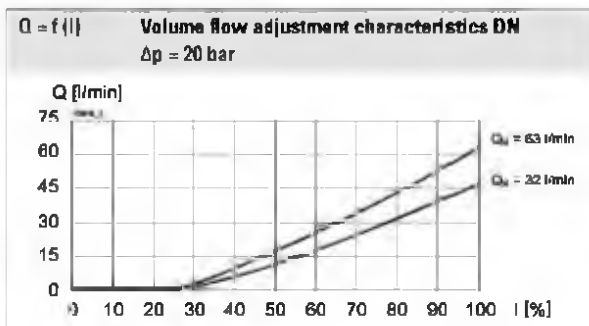
Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W S45 / 23 x 50 (Data sheet 1.1-180) M S45 / 23 x 50 (Data sheet 1.1-181)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**HYDRAULIC SPECIFICATIONS**

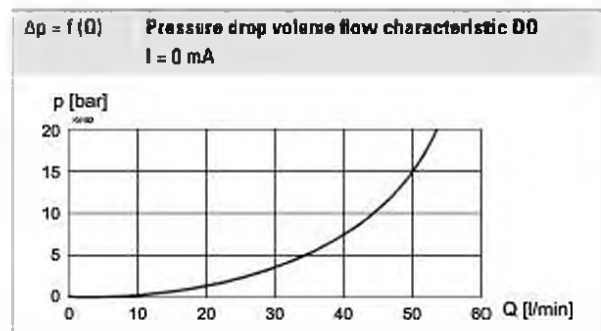
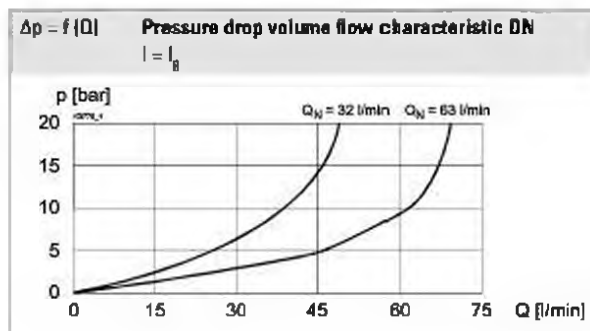
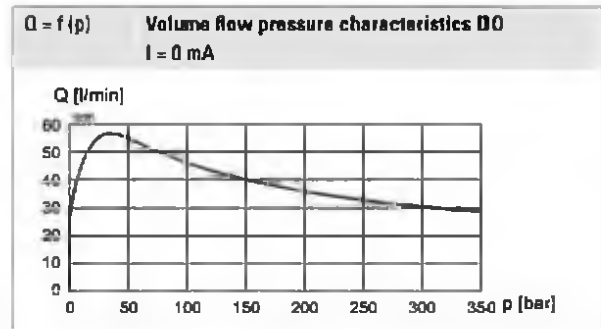
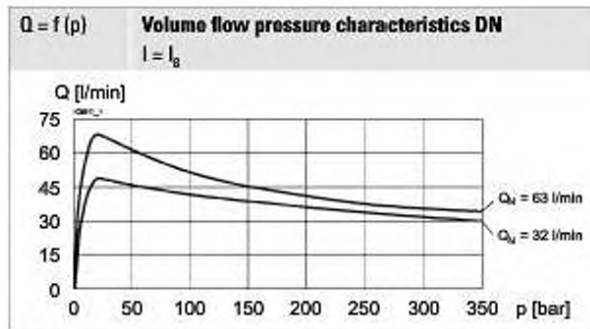
Working pressure	$p_{max} = 350 \text{ bar}$
Maximum volume flow	$Q_{max} = 65 \text{ l/min}$
Volume flow direction	1 → 2
Leakage oil	On request
Nominal volume flow range	$Q_N = 32 \text{ l/min}$ , 63 l/min (DN) $Q_N = 40 \text{ l/min}$ (DO)
Hysteresis	≤ 8 % (DN); 10-12 % (DO) at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACCESSORIES**

Flange body / sandwich plate	Data sheet 2.6-760
Threaded body	Data sheet 2.9-205
Proportional amplifier	Register 1.13
Mating connector black (B)	Article no. 219.2002
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**MANUAL OVERRIDE**

HB4,5

Optionally: Screw plug (HB0), no actuation possible

**INSTALLATION NOTES**

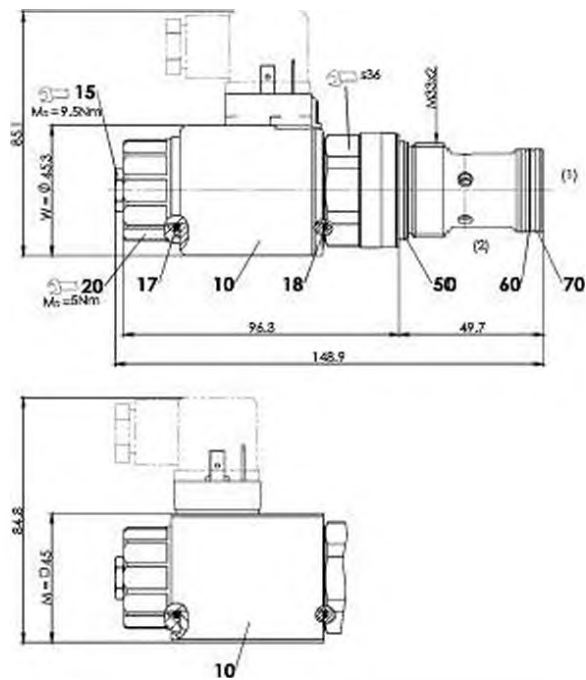
Mounting type	Screw-in cartridge M33 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 80 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut

**SURFACE TREATMENT**

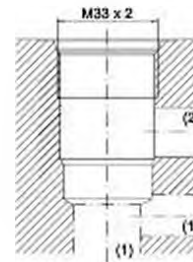
- ◆ The cartridge body is gas-nitro-carburised
- ◆ The armature tube and the slip-on coil are zinc- / nickel-coated

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-33-01-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1005

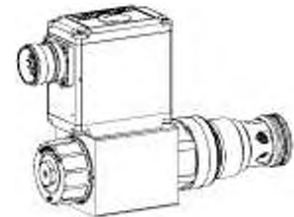
**PARTS LIST**

Position	Article	Description
10	206.12..	W.S45 / 23 x 50
	206.7...	M.S45 / 23 x 50
15	253.8000	HB4,5 manual override
	239.2033	HB0 Screw plug
17	160.2222	O-ring ID 22,22 x 2,62 (NBR)
18	160.2220	O-ring ID 21,95 x 1,78 (NBR)
20	154.2701	Knurled nut M23 x 1,5 x 19,7
50	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FMK)
60	160.2238	O-ring ID 23,81 x 2,62 (NBR)
	160.6238	O-ring ID 23,81 x 2,62 (FMK)
70	049.8297	Backup ring PTSM rd 22,1 x 26,6 x 1,4



**Proportional throttle cartridge with integrated electronics**

- ◆ direct operated
- ◆  $Q_{n,act} = 65 \text{ l/min}$
- ◆  $Q_{T,max} = 63 \text{ l/min}$
- ◆  $p_{act} = 350 \text{ bar}$

**M33 x 2**  
**ISO 7789**

**DESCRIPTION**

Direct operated proportional throttle valve with integrated electronics as screw-in cartridge for cavity according to ISO 7789. With the solenoid deenergised, the control spool is held in the closed position by a spring. The change of the electric current is followed by a proportional volume flow change. Progressive increase and decrease of volume flow and reduced hysteresis are characteristics of this valve. The Plug & Play valves are factory set and adjusted and have therefore a high valve-to-valve reproducibility. The control takes place via an analogue interface or a fieldbus interface (CANopen, J1939 or Profibus DP). The parameterisation takes place by means of the free of cost parameterisation and diagnostics software «PASO» or via fieldbus interface. The USB parameterisation interface is accessible through a screw plug. As an option, these valves are available with integrated controller. As feedback value generators sensors with voltage or current output can be connected directly. The available controller structures are optimised for applications with hydraulic actuations.

**APPLICATION**

Proportional throttle valves with integrated electronics are perfectly suitable for demanding applications in which the volume flow frequently has to be changed. They are used in applications where high valve-to-valve reproducibility, easy installation, comfortable operation and high precision are very important. The integrated controller reliefs the machine control and operates the volume flow control in a closed loop circuit. The applications are in the industrial as well as in the mobile hydraulics for the smooth control of hydraulic actuations. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**Note!**


„PASO“ is a Windows programm in the flow diagram style, which enables the intuitive adjustment and storing of all variable parameters. The data remain saved in case of a power failure and can also be reproduced and transferred to other DSV.

**SYMBOL**

„normally closed“ DN


**MANUAL OVERRIDE**

HB4,5 as standard

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Connection	Via device receptacle

**ELECTRICAL SPECIFICATIONS**

Protection class	IP67 with suitable mating connector and closed housing cover
Ramps	Adjustable
Parameterisation	Via fieldbus or USB
Supply voltage	12 VDC, 24 VDC

**Note!**


Exact electrical specifications and detailed description of «DSV» electronics can be found on data sheet 1.13-76.

**TYPE CODE**

Throttle valve		D N P PM33 - <input type="checkbox"/> - <input type="checkbox"/> / M E <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/> HB4,5 # <input type="checkbox"/>	
Normally closed			
Proportional			
Schraubpatrone M33 x 2			
Screw-in cartridge $Q_n$	32 l/min <input type="checkbox"/> 32 63 l/min <input type="checkbox"/> 63		
Nominal voltage $U_n$	12 VDC <input type="checkbox"/> 12 24 VDC <input type="checkbox"/> 24		
Slip-on coil	Metal housing square		
Connection execution	Integrated electronics		
<b>Hardware configuration</b>			
Analog command value signal	12 pole <input type="checkbox"/> A2	7 pole <input type="checkbox"/> D2	(0 ... 10 V preset)
Analog command value signal	12 pole <input type="checkbox"/> A4	7 pole <input type="checkbox"/> D4	(4 ... 20 mA preset)
CANopen according to DSP-408	<input type="checkbox"/> C1		
Profibus DP according to Fluid Power Technology	<input type="checkbox"/> P1		
CAN J1939 (on request)	<input type="checkbox"/> J1		
<b>Function</b>			
Amplifier	<input type="checkbox"/>		
Controller with current feedback value signal (0 ... 20 mA / 4 ... 20 mA)	<input type="checkbox"/> R1		
Controller with voltage feedback value signal (0 ... 10 V)	<input type="checkbox"/> R2		
Sealing material	NBR <input type="checkbox"/> FKM (Viton) <input type="checkbox"/> DT		
<b>Manual override</b>			
Design index (subject to change)			

11-001


**GENERAL SPECIFICATIONS**


Designation	Proportional throttle valve with integrated electronics
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M33 x 2 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-20 ... +65 °C The upper temperature limit is a guideline for typical applications, in individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions „DSV“
Weight	1,5 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**


Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 65$ l/min
Volume flow direction	1 → 2
Leakage oil	On request
Nominal volume flow range	$Q_n = 32; 63$ l/min
Hysteresis	≤ 8 %
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6 ... 10 ≥ 75, see data sheet 1.0-50


**ELECTRICAL CONNECTION**


X1	Analog interface (Main)
Device receptacle	M23, 12 pole male
	1 = Supply voltage + 2 = Supply voltage 0 VDC 3 = Stabilised output voltage 4 = Command value signal voltage + 5 = Command value signal voltage - 6 = Command value signal current + 7 = Command value signal current - 8 = Reserved for extensions 9 = Reserved for extensions 10 = Enable signal (Digital input) 11 = Error signal (Digital output) 12 = Chassis
Command value signal voltage (PIN 4/5) resp. current (PIN 6/7) are selected with parameterisation and diagnostics software PASO.	


X1	Fieldbus interface (Main)
Device receptacle	M12, 4 pole male
	1 = Supply voltage + 2 = Reserved for extensions 3 = Supply voltage 0 VDC 4 = Chassis

X2	Parameterisation interface
USB, Mini B	Under the screw plug of the housing cover Factory set

X1	Analog interface (Main)
Device receptacle	Connector DIN EN 175201 - 804
	7 pole male A = Supply voltage + B = Supply voltage 0 VDC C = Not connected D = Command value signal + E = Command value signal - F = Not connected G = Chassis
Command value signal: current (D4) or voltage (D2) to specify when placing the order	

X3	Profibus interface according to IEC 947-5-2
Device receptacle	M12, 5 pole female B-coded
	1 = VP 2 = RxD / TxD - N 3 = DGND 4 = RxD / TxD - P 5 = Shield

X3	CANopen interface according to DRP 303-1
Device receptacle	M12, 5 pole male
	1 = Not connected 2 = Not connected 3 = CAN Gnd 4 = CAN High 5 = CAN Low

X4 (controller only)	Feedback value interface (sensor)
Device receptacle	M12, 5 pole female
	1 = Supply voltage (output) + 2 = Feedback value signal + 3 = Supply voltage 0 VDC 4 = Not connected 5 = Stabilised output voltage
Feedback value signal: current (R1) or voltage (R2) to specify when placing the order	

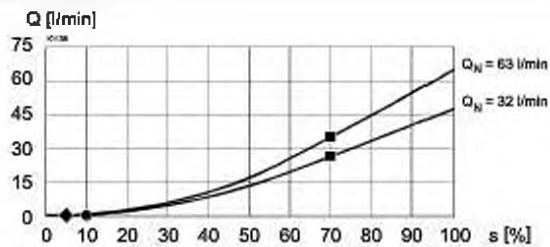
**Note!** The mating connector is not included in the delivery



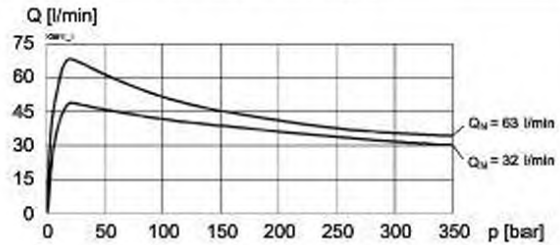
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

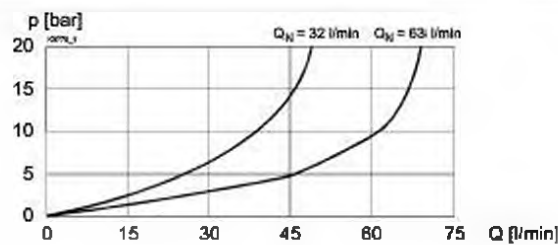
$Q = f(s)$  **Volume flow adjustment characteristics**  
 $\Delta p = 20 \text{ bar}$  /  $s$  corresponds to command value signal



$Q = f(p)$  **Volume flow pressure characteristics**  
 Command value signal = 100 %



$\Delta p = f(Q)$  **Pressure drop volume flow characteristic**  
 Command value signal = 100 %


**FACTORY SETTINGS**

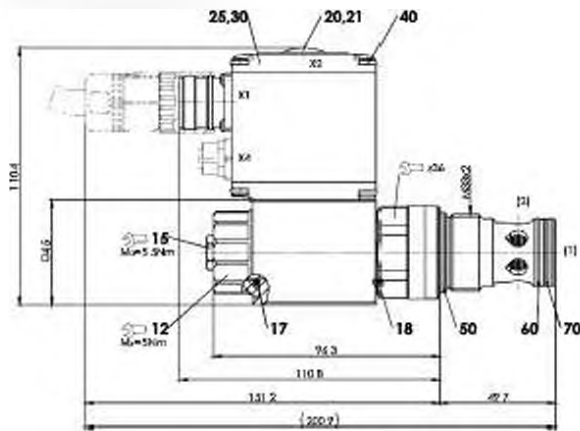
Dither set for optimum hysteresis

- ◆ = Deadband: solenoid switched off at command value signal < 5 %
- = Opening pressure at command value signal + 10 %
- = Flow at  $\Delta p = 20 \text{ bar}$  at 70% command value signal

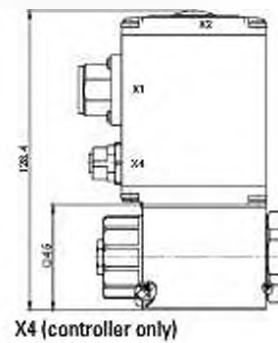
24 l/min	at nominal volume flow rate $Q_N$	32 l/min
34 l/min	at nominal volume flow rate $Q_N$	63 l/min

**DIMENSIONS**

With analog interface, 12 pole connector  
 Amplifier and controller

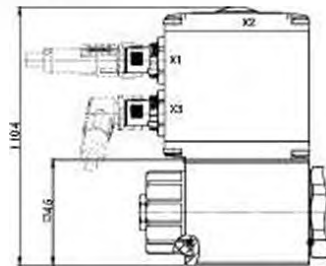


With analog interface, 7 pole connector  
 Amplifier and controller

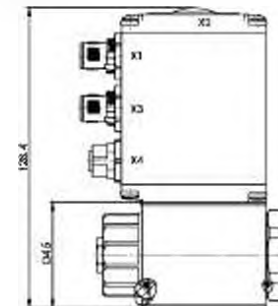


X4 (controller only)

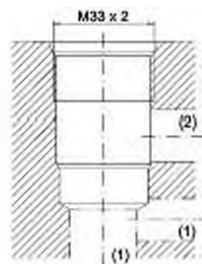
With fieldbus interface  
 Amplifier



With fieldbus interface  
 Controller


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789 -33-01-0-98



**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1005

**PARTS LIST**

Position	Article	Description
12	154.2700	Knurled nut
15	253.8000	Manual override HB4,5
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2220	O-ring ID 21,95 x 1,78 (NBR)
20	223.1317	Dummy plug M16 x 1,5
21	160.6131	O-ring ID 13,00 x 1,5 (FKM)
25	062.0102	Cover
30	072.0021	Gasket 33,2 x 59,9 x 2
40	208.0100	Socket head screw M4 x 10
50	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FKM)
60	160.2238	O-ring ID 23,81 x 2,62 (NBR)
	160.6238	O-ring ID 23,81 x 2,62 (FKM)
70	049.3297	Backup ring rd 24,5 x 29 x 1,4

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## COMMISSIONING

For DSV amplifiers as a rule no parameter adjustments by the customer are required. The plugs have to be connected in accordance with the chapter «Electrical connection».

Controllers are supplied configured as amplifiers. The adjustment of the mode of control and of the controller are carried out by the customer by means of the software adjustment (USB interface, Mini B). Further information can be found

Further information can be found

Free- of charge download of the «PASQ» software and the operation instructions for «DSV» hydraulic valves as well as the operation instructions CANopen Protocol resp. Profibus DP Protocol, with Device Profile DSP-408 for «DSV».

**Note!** The mating connectors and the parameterisation cable are not part of the delivery. Refer to chapter «Accessories».



## STANDARDS

Cartridge cavity	ISO 7789
CANopen	DRP 303-1
Profibus DP	IEC 947-5-2
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## ACCESSORIES

Parameterisation software	See start-up
Parameterisation cable for interface USB (from plug type A on Mini B, 3 m)	Article no. 219 2896

### Mating connector (plug female) for analog interface

straight, soldering contact M23, 12 pole	Article no. 219 2330
straight, soldering contact, 7 pole	Article no. 219 2335
straight, soldering contact, 7 pole	Article no. 219 2331

Flange body / sandwich plate NG10	Data sheet 2.6-760
Threaded body	Data sheet 2.9-205
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**Attention!** Auxiliary conditions for the cable:

- External diameter 12 pol: 3,5 ... 14,7 mm
- External diameter 7 pol: 8 ... 10 mm
- Wire cross section max. 1 mm<sup>2</sup>
- Recommended wire cross section:  
 0 ... 25 m = 0,75 mm<sup>2</sup> (AWG18)  
 25 ... 50 m = 1 mm<sup>2</sup> (AWG17)



## SURFACE TREATMENT

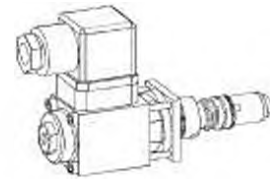
- ◆ The cartridge body is gas-nitro-carburised
- ◆ The slip-on coil is zinc- / nickel-coated
- ◆ The electronics housing / chassis is made of aluminium

## INSTALLATION NOTES

Mounting type	ScREW-IN cartridge M33 x 2
Mounting position	Any, preferably horizontal
Tightening torque	M <sub>0</sub> = 80 Nm SCREW-IN cartridge M <sub>0</sub> = 5 Nm knurled nut

**Proportional 2-way flow control valve  
Screw-in cartridge**

- Direct operated, pressure compensated
- $Q_{N \max} = 2 \text{ l/min}$ ,  $p_{\max} = 350 \text{ bar}$

**M18x1,5**  
 Wandfluh standard

**DESCRIPTION**

Direct operated, pressure compensated proportional flow regulating valve, as a screw-in cartridge with a thread M18x1,5 for cavity acc. to Wandfluh standard. The volume flow is adjusted by a proportional solenoid (VDE standard 0580). A progressive increase in volume flow and reduced hysteresis are characteristic of this valve. The cartridge body is made of steel, is zinc coated and therefore rust-protected. The solenoid is zinc nickel coated.

**FUNCTION**

The force controlled proportional solenoid running in the fluid acts directly on the control spool which opens the triangular shaped throttling notches in the cartridge body. The throttle opening, and therefore the flow volume changes proportionally to the current absorption of the proportional solenoid. If pressure in the system changes the pressure compensator will change the area of the oil passage to an extent as to keep the pressure drop over the restrictor constant. When the solenoid is without current, the control spool is held in the closed position by a spring. To control the valve Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

The 2-way flow control valve is designed to keep the oil flow to any actuator constant irrespective of the load. Proportional flow control valves are suitable for precise feed control system where the supply volume flow needs to be kept constant even when the load fluctuates. The screw-in cartridge is very suitable for mounting in control blocks.

**TYPE CODE**

			Q	Z	P	PM18 -	-	-	#	□
Flow control valve										
2-way										
Proportional										
Screw-in cartridge M18x1,5										
Nominal volume flow rate $Q_N$	2 l/min									
Nominal voltage $U_N$	12 VDC									
	24 VDC									
Design-Index (Subject to change)										

**GENERAL SPECIFICATIONS**

Description	2-way proportional flow control valve
Construction	Screw-in cartridge for cavity acc. to Wandfluh standard
Operations	Proportional solenoid
Mounting	Screw-in thread M18x1,5
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_a = 30 \text{ Nm}$ for screw-in cartridge $M_s = 1,2 \text{ Nm}$ (Qual. 8.8) for solenoid screws
Weight	$m = 0,7 \text{ kg}$

**ELECTRICAL SPECIFICATIONS**

Construction	Proportional solenoid, wet pin push type, pressure tight.	
--------------	---	--

Standard-Nominal voltage	$U_N = 12 \text{ VDC}$	$U_N = 24 \text{ VDC}$
Limiting current	$I_a = 1080 \text{ mA}$	$I_a = 540 \text{ mA}$

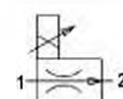
Relative duty factor	100% DF (see data sheet 1.1-430)
Protection class	IP 65 to EN 60 529
Connection/Power supply	Over device plug connection to ISO 4400 / DIN 43 650 (2P+E)
Other electrical specifications	see data sheet 1.1-90 (PI29V)

**HYDRAULIC SPECIFICATIONS**

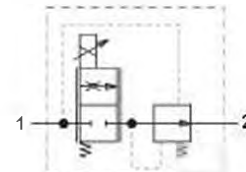
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/18/13 (Required filtration grade $\beta_{8...10} \geq 75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{\max} = 350 \text{ bar}$
Nominal volume flow	$Q_N = 2 \text{ l/min}$
Max. Volume flow	$Q_{\max} = 2 \text{ l/min}$
Min. Volume flow	$Q_{\min} = 0,02 \text{ l/min}$
Leakage volume flow	see characteristics
Resolution	1 mA
Repeatability	≤ 1% ♦
Hysteresis	≤ 3% ♦
	♦ at optimal dither signal

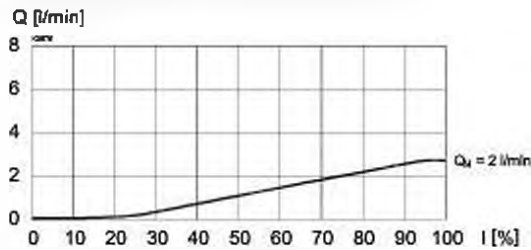
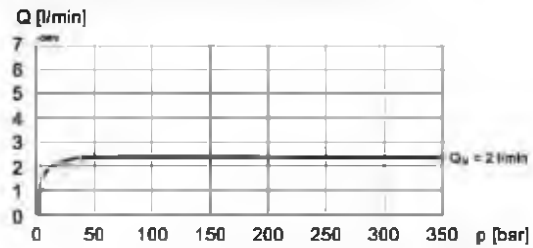
**SYMBOLS**

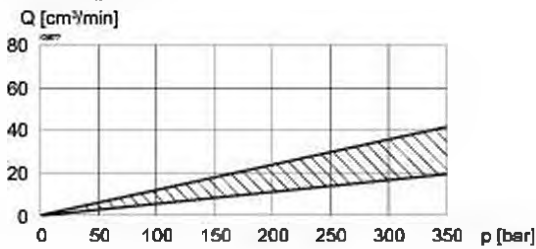
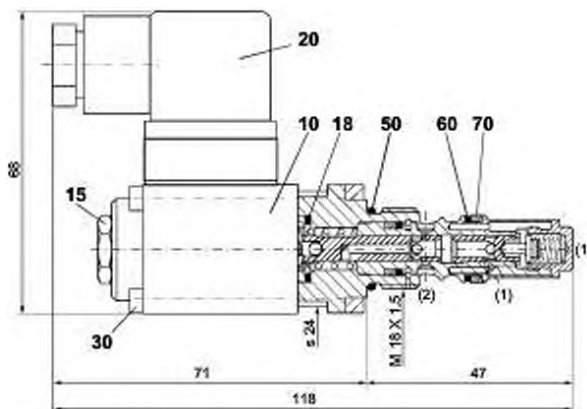
simplified



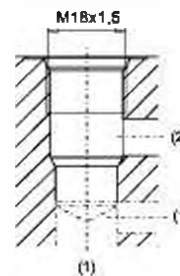
detailed



**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
**Q = f (l)** Volume flow adjustment characteristics

**Q = f (p)** Volume flow pressure characteristics

**Q<sub>L</sub> = f (p)** Leakage volume flow characteristics

 $Q_{x0} = 2 \text{ l/min}$ 

**DIMENSIONS / SELECTIONAL DRAWING**


Cavity drawing acc. to Wandfluh standard



For detailed cavity drawing see data sheet no. 2.13-1038

**PARTS LIST**

Position	Article	Description
10	256.2453 256.2418	Proportional solenoid PI29V-G24 Proportional solenoid PI29V-G12
15	253.8000	Mounted screw with integrated manual override HB4,5
18	160.2120	O-ring ID 12,42 x 1,78
20	218.2002	Plug (black)
30	246.0151	Socket head screw M3 x 50 DIN912
50	160.2156	O-ring ID 15,60 x 1,78
60	160.2111	O-ring ID 11,11 x 1,78
70	049.3156	Back up ring RD 12,1 x 15 x 1,4

**ACCESSORIES**

 Line mount body Data sheet  
 Proportional amplifier  
 Mating connector EN 175301-803

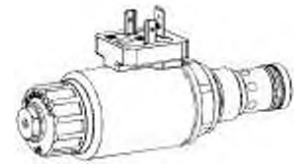
 2.9-205  
 Register 1.13  
 Article Nr. 218.2002

Technical explanation see data sheet 1.0-100



**Proportional 2-way flow control cartridge**

- ◆ direct operated
- ◆  $Q_{max} = 25 \text{ l/min}$
- ◆  $Q_{Nmax} = 25 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

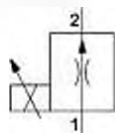
Direct operated, pressure compensated proportional flow control valve in screw-in cartridge construction for cavity according to ISO 7789. With the solenoid deenergised, the control spool is held in the closed position (QN) or open position (QO) by a spring. The change of the electric current is followed by a proportional volume flow change. From the input (1), the fluid flows over a throttle and a control spool to the controlled output (2). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

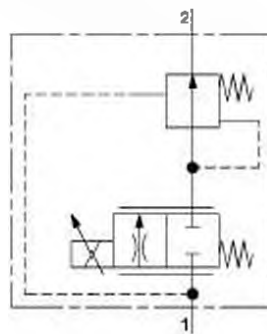
Proportional flow control valves are suitable for precise speed control, where the load current has to be maintained constant independent of the input and output pressure. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

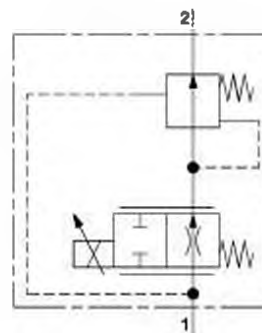
Simplified



Detailed QN...



Detailed QO...


**GENERAL SPECIFICATIONS**

Designation	Proportional 2-way flow control valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,64 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1360 \text{ mA}$ ( $U_n = 12\text{VDC}$ ) $I_a = 680 \text{ mA}$ ( $U_n = 24\text{VDC}$ )

**Note!**


Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)

**TYPE CODE**

Flow control valve	Q <input type="checkbox"/> P PM22 - <input type="checkbox"/> - <input type="checkbox"/> / <input type="checkbox"/> - <input type="checkbox"/> - <input type="checkbox"/> # <input type="checkbox"/>	
Normally closed	<input type="checkbox"/> N	
Normally open	<input type="checkbox"/> O	
Proportional		
Screw-in cartridge M22 x 1,5		
Nominal volume flow rate $Q_N$	normally closed	normally open
	3,2 l/min <input type="checkbox"/> 3,2	3,2 l/min <input type="checkbox"/> 3,2
	8 l/min <input type="checkbox"/> 8	
	16 l/min <input type="checkbox"/> 16	
	25 l/min <input type="checkbox"/> 25	
Nominal voltage $U_N$	12 VDC <input type="checkbox"/> G12	
	24 VDC <input type="checkbox"/> G24	
	without coil <input type="checkbox"/> X5	
Slip-on coil	Metal housing round <input type="checkbox"/> W	
	Metal housing square <input type="checkbox"/> M	
Connection execution	Connector socket EN 175301-803 / ISO 4400 <input type="checkbox"/> D	
	Connector socket AMP Junior-Timer <input type="checkbox"/> J	
	Connector Deutsch DT04-2P <input type="checkbox"/> G	
Sealing material	NBR <input type="checkbox"/>	
	FKM (Viton) <input type="checkbox"/> D1	
Manual override	<input type="checkbox"/> HB45	
	<input type="checkbox"/> HB0	
Design index (subject to change)	2 4-021	

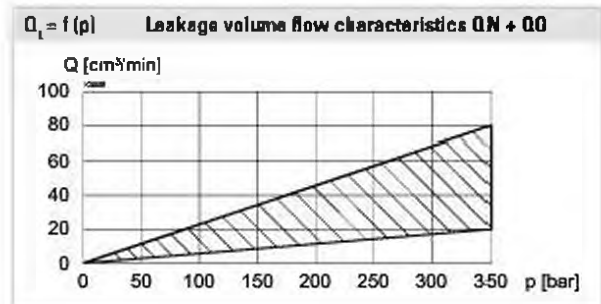
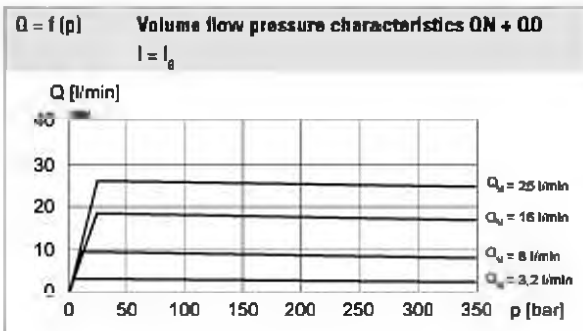
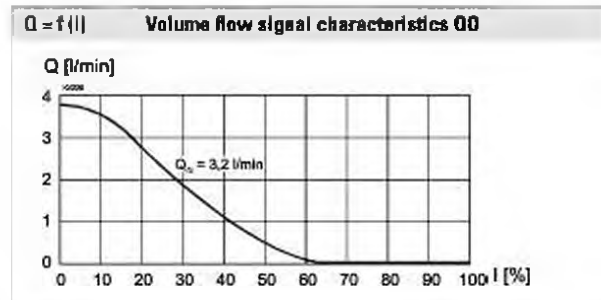
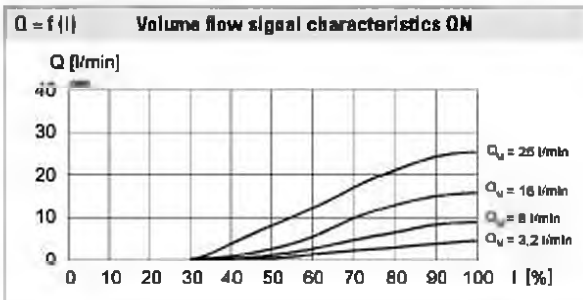
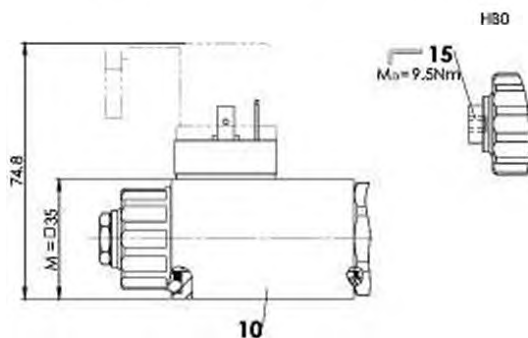
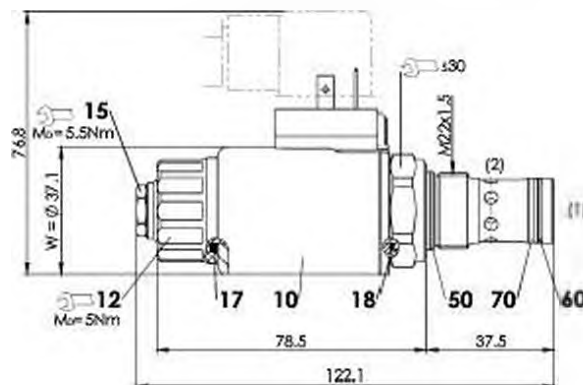
**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W S37 / 19 x 50 (Data sheet 1.1-173) M S35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

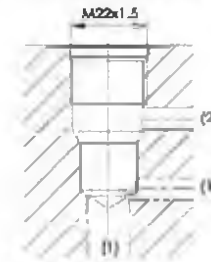
**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Maximum volume flow	$Q_{max} = 25 \text{ l/min}$
Minimum volume flow	$Q_{min} = 0,1 \text{ l/min}$
Volume flow direction	1 → 2
Leakage oil	See characteristics
Nominal volume flow range	$Q_N = 3,2; 8; 16; 25 \text{ l/min (QN)}$ $Q_N = 3,2 \text{ l/min (QO)}$
Hysteresis	≤ 6 % (QN); 10 % (QO) at optimal dither signal
Repeatability	≤ 2 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-01-0-98



Note! For detailed cavity drawing and cavity tools see data sheet 2.13-1008


**PARTS LIST**

Position	Article	Description
10	206.2...	W.S37 / 19 x 50
	260.5...	M.S35 / 19 x 50
12	154.2700	Knurled nut
15	253.8000	HB4,5 manual override
	239.2033	HB0 Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.3196	Backup ring rd 16,1 x 19 x 1,4

## ACCESSORIES

Proportional amplifier	Register 1.13
Mating connector black (B)	Article no. 219.2002
Flange body / sandwich plate NG4-Mini	Data sheet 2.6-820
Flange body / sandwich plate NG6	Data sheet 2.6-840
Threaded body	Data sheet 2.9-205
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

## SURFACE TREATMENT

- ◆ The cartridge body is gas-nitro-carburised
- ◆ The armature tube and the slip-on coil are zinc- / nickel-coated

## INSTALLATION NOTES

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 50 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5

## MANUAL OVERRIDE

HB4,5

Optionally: Screw plug (HB0), no actuation possible

## SEALING MATERIAL

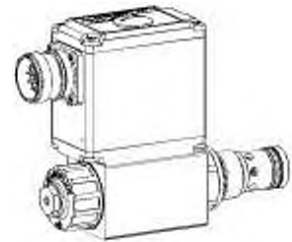
NBR or FKM (Viton) as standard, choice in the type code

## STANDARDS

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**Proportional 2-way flow control cartridge with integrated electronics**

- ◆ direct operated
- ◆  $Q_{max} = 25 \text{ l/min}$
- ◆  $Q_{Nmax} = 25 \text{ l/min}$
- ◆  $p_{act} = 350 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**

**DESCRIPTION**

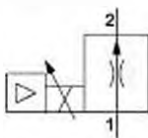
Direct operated, pressure compensated proportional flow control valve as screw-in cartridge for cavity according to ISO 7789. With the solenoid deenergised, the control spool is held in the closed position by a spring. The change of the electric current is followed by a proportional volume flow change. From the input (1), the fluid flows over the control and throttling spool to the controlled output (2). The control takes place via an analogue interface or a fieldbus interface (CANopen, J1939 or Profibus DP). The parameterisation takes place by means of the free of cost parameterisation and diagnostics software «PASO» or via fieldbus interface. For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

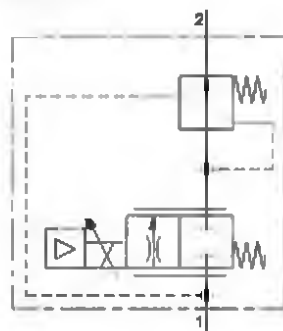
Proportional flow control valves with integrated electronics are perfectly suitable for demanding applications in which the volume flow frequently has to be changed. They are used in applications where high valve-to-valve reproducibility, easy installation, comfortable operation and high precision are very important. The integrated controller relieves the machine control and operates the volume flow control in a closed loop circuit. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

Simplified



Detailed


**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Connection	Via device receptacle

**MANUAL OVERRIDE**

HB4,5 as standard

**ELECTRICAL SPECIFICATIONS**

Protection class	IP67 with suitable mating connector and closed housing cover
Ramps	Adjustable
Parameterisation	Via fieldbus or USB
Supply voltage	12 VDC, 24 VDC

**Nota!** Exact electrical specifications and detailed description of «DSV» electronics can be found on data sheet 1.13-76.



**TYPE CODE**

Flow control valve	O N P PM22 - <input type="checkbox"/> - <input type="checkbox"/> / M E <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/> HB4,5 # <input type="checkbox"/>									
Normally closed										
Proportional										
Screw-in cartridge M22 x 1,5										
Nominal volume flow rate $Q_n$	3,2 l/min	<input type="checkbox"/> 3,2	16 l/min	<input type="checkbox"/> 16						
	8 l/min	<input type="checkbox"/> 8	25 l/min	<input type="checkbox"/> 25						
Nominal voltage $U_n$	12 VDC	<input type="checkbox"/> 12	24 VDC	<input type="checkbox"/> 24						
Slip-on coil	Metal housing square									
Connection execution	Integrated electronics									
Hardware configuration										
Analog command value signal	12 pole	<input type="checkbox"/> A2	7 pole	<input type="checkbox"/> D2	(0 ... 10 V preset)					
Analog command value signal	12 pole	<input type="checkbox"/> A4	7 pole	<input type="checkbox"/> D4	(4 ... 20 mA preset)					
CANopen according to DSP-408	<input type="checkbox"/> C1									
Profibus DP according to Fluid Power Technology	<input type="checkbox"/> F1									
CAN J1939 (on request)	<input type="checkbox"/> J1									
Function										
Amplifier										
Controller with current feedback value signal (0 ... 20 mA / 4 ... 20 mA)				<input type="checkbox"/> R1						
Controller with voltage feedback value signal (0 ... 10 V)				<input type="checkbox"/> R2						
Sealing material	NBR	<input type="checkbox"/>	FKM (Viton)	<input type="checkbox"/> DT						
Manual override										
Design index (subject to change)										

74-403


**GENERAL SPECIFICATIONS**


Designation	Proportional 2-way flow control valve with integrated electronics
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-20 ... +65 °C The upper temperature limit is a guideline for typical applications, in individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions „DSV“
Weight	0,95 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**


Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 25$ l/min
Minimum volume flow	$Q_{min} = 0,1$ l/min
Volume flow direction	1 → 2
Leakage oil	See characteristics
Nominal volume flow range	$Q_n = 3,2; 8; 16; 25$ l/min
Hysteresis	≤ 5 % at optimal dither signal
Repeatability	≤ 2 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade β <sub>6</sub> ... 10 ≥ 75, see data sheet 1.0-50


**ELECTRICAL CONNECTION**


X1	Analog interface (Main)
Device receptacle	M23, 12 pole male
	1 = Supply voltage + 2 = Supply voltage 0 VDC 3 = Stabilised output voltage 4 = Command value signal voltage + 5 = Command value signal voltage - 6 = Command value signal current + 7 = Command value signal current - 8 = Reserved for extensions 9 = Reserved for extensions 10 = Enable signal (Digital input) 11 = Error signal (Digital output) 12 = Chassis
Command value signal voltage (PIN 4/5) resp. current (PIN 6/7) are selected with parameterisation and diagnostics software PASO.	


X1	Fieldbus interface (Main)
Device receptacle	M12, 4 pole male
	1 = Supply voltage + 2 = Reserved for extensions 3 = Supply voltage 0 VDC 4 = Chassis

X2	Parameterisation interface
USB, Mini B	Under the screw plug of the housing cover Factory set

X1	Analog interface (Main)
Device receptacle	Connector DIN EN 175201 - 804
	7 pole male A = Supply voltage + B = Supply voltage 0 VDC C = Not connected D = Command value signal + E = Command value signal - F = Not connected G = Chassis
Command value signal: current (D4) or voltage (D2) to specify when placing the order	

X3	Profibus interface according to IEC 947-5-2
Device receptacle	M12, 5 pole female B-coded
	1 = VP 2 = Rx/D / Tx/D - N 3 = DGND 4 = Rx/D / Tx/D - P 5 = Shield

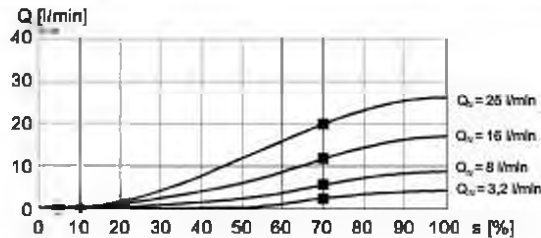
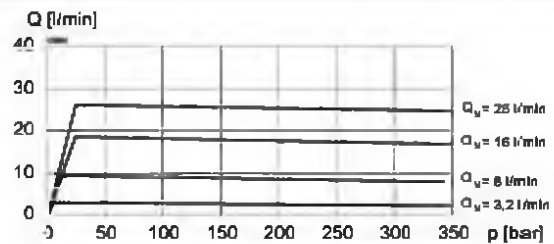
X3	CANopen interface according to DRP 303-1
Device receptacle	M12, 5 pole male
	1 = Not connected 2 = Not connected 3 = CAN Gnd 4 = CAN High 5 = CAN Low

X4 (controller only)	Feedback value interface (sensor)
Device receptacle	M12, 5 pole female
	1 = Supply voltage (output) + 2 = Feedback value signal + 3 = Supply voltage 0 VDC 4 = Not connected 5 = Stabilised output voltage
Feedback value signal: current (R1) or voltage (R2) to specify when placing the order	

**Note!** The mating connector is not included in the delivery



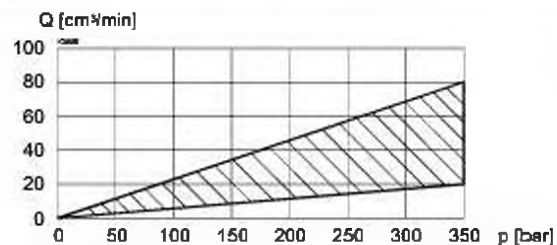
**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 **$Q = f(i)$**  Volume flow signal characteristics  
 at 50 bar pressure difference /  
 s corresponds to command value signal

 **$Q = f(p)$**  Volume flow pressure characteristics

**FACTORY SETTINGS**

Dither set for optimum hysteresis DN

- ◆ = Deadband: solenoid switched off at command value signal < 5 %
- = Opening pressure at command value signal 10 %
- = Volume flow at 70% command value signal

18,0 l/min	at nominal volume flow rate $Q_n$	25 l/min
11,9 l/min	at nominal volume flow rate $Q_n$	16 l/min
6,0 l/min	at nominal volume flow rate $Q_n$	8 l/min
2,6 l/min	at nominal volume flow rate $Q_n$	3,2 l/min

 **$Q_l = f(p)$**  Leakage volume flow characteristics

**COMMISSIONING**

For DSV amplifiers as a rule no parameter adjustments by the customer are required. The plugs have to be connected in accordance with the chapter «Electrical connection».

Controllers are supplied configured as amplifiers. The adjustment of the mode of control and of the controller are carried out by the customer by means of the software adjustment (USB interface, Mini B). Further information can be found on:

Free-of-charge download of the «PASO» software and the operation instructions for «DSV» hydraulic valves as well as the operation instructions CANopen Protocol resp. Profibus DP Protocol, with Device Profile DSP-408 for «DSV».

**Note!** The mating connectors and the parameterisation cable are not part of the delivery. Refer to chapter «Accessories».


**ACCESSORIES**

Parameterisation software	See start-up
Parameterisation cable for interface USB (from plug type A on Mini B, 3 m)	Article no. 219.2896
<b>Mating connector (plug female) for analog interface</b>	
straight, soldering contact M23, 12 pole	Article no. 219.2330
straight, soldering contact, 7 pole	Article no. 219.2335
angled, soldering contact M23, 12 pole	Article no. 219.2331
Flange body / sandwich plate NG4-Mini	Data sheet 2.6-820
Flange body / sandwich plate NG6	Data sheet 2.6-840
Threaded body	Data sheet 2.9-205
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

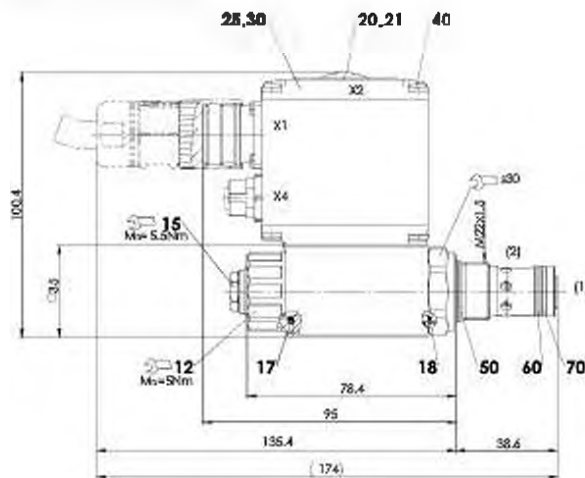
- Attention!** Auxiliary conditions for the cable:
- External diameter 12 pol: 3,5...14,7 mm
  - External diameter 7 pol: 8...10 mm
  - Wire cross section max. 1 mm<sup>2</sup>
  - Recommended wire cross section:  
 0...25 m = 0,75 mm<sup>2</sup> (AWG18)  
 25...50 m = 1 mm<sup>2</sup> (AWG17)



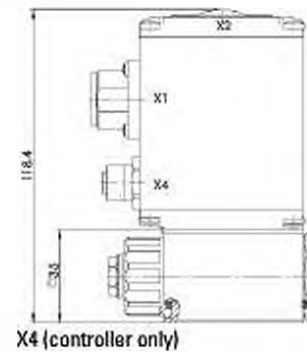


**DIMENSIONS**

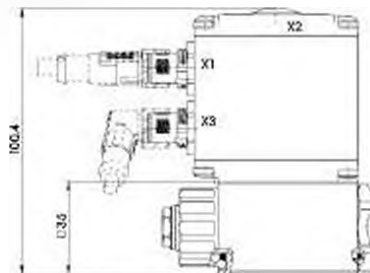
With analog interface, 12 pole connector  
 Amplifier and controller



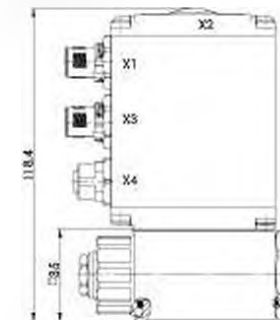
With analog interface, 7 pole connector  
 Amplifier and controller



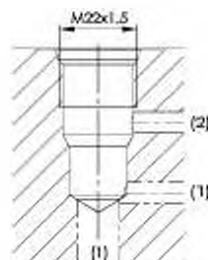
With fieldbus interface  
 Amplifier



With fieldbus interface  
 Controller


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-01-D-98



**Note!**



For detailed cavity drawing and cavity tools see data sheet 2.13-1008

**PARTS LIST**

Position	Article	Description
12	154.2700	Knurled nut
15	253.8000	Manual override HB4,5
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
20	223.1317	Dummy plug M16 x 1,5
21	160.6131	O-ring ID 13,00 x 1,5 (FKM)
25	062.0102	Cover
30	072.0021	Gasket 33,2 x 59,9 x 2
40	208.0100	Socket head screw M4 x 10
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.3196	Backup ring rd 16,1 x 19 x 1,4

## STANDARDS

Cartridge cavity	ISO 7789
CANopen	DRP 303-1
Profibus DP	IEC 947-5-2
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## SURFACE TREATMENT

- ◆ The cartridge body is gas-nitro-carburised
- ◆ The slip-on coil is zinc- / nickel-coated
- ◆ The electronics housing / chassis is made of aluminium

## INSTALLATION NOTES

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 \approx 50$ Nm Screw-in cartridge $M_0 \approx 5$ Nm knurled nut

## SEALING MATERIAL

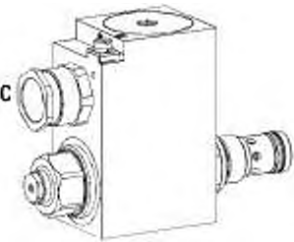
NBR or FKM (Viton) as standard, choice in the type code

**Proportional 2-way flow control cartridge**

- ◆ direct operated
- ◆  $Q_{max} = 28$  l/min
- ◆  $Q_{Nmax} = 25$  l/min
- ◆  $p_{nom} = 350$  bar

**M22 x 1,5**
**ISO 7789**

- ⊕ II 2 G Ex db IIC T6, T4
- ⊕ II 2 D Ex db III C T80 °C, T130 °C
- ⊕ I M2 Ex db I Mb
- Class I Division 1
- Class I Zone 1


**DESCRIPTION**

Direct operated, pressure compensated proportional flow control valve in screw-in cartridge construction for cavity according to ISO 7789. With the solenoid deenergised, the control spool is held in the closed position by a spring. The change of the electric current is followed by a proportional volume flow change. From the input (1), the fluid flows over a throttle and a control spool to the controlled output (2). The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

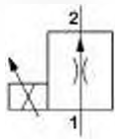
Proportional flow control valves are suitable for precise speed control, where the load current has to be maintained constant independent of the input and output pressure. These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. The screw-in cartridge is perfectly suitable for installation in control blocks. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

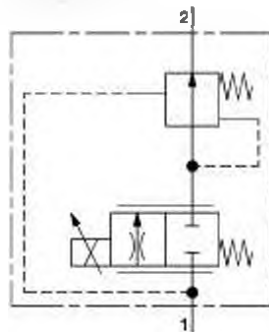
		Q N B PM22 -		-		/		/		-		#	
Flow control valve													
Normally closed													
Proportional, Ex-protection execution Ex d													
Screw-in cartridge M22 x 1,5													
Nominal volume flow rate $Q_N$	3,2 l/min 8 l/min	<input type="text" value="3,2"/> <input type="text" value="8"/>	18 l/min 25 l/min	<input type="text" value="18"/> <input type="text" value="25"/>									
Nominal voltage $U_N$	12 VDC 24 VDC	<input type="text" value="G12"/> <input type="text" value="G24"/>											
Nominal power $P_N$	15 W 17 W	<input type="text" value="L15"/> <input type="text" value="L17"/>	Ambient temperature up to: 70 °C 70 °C (only UL / CSA)										
Certification	ATEX, IECEx, EAC, CCC Australia	<input type="text" value="AU"/> <input type="text" value="AU"/>	UL / CSA	<input type="text" value="UL"/>	MA	<input type="text" value="MA"/>							
Sealing material	NBR FKM (Viton)	<input type="text" value="D1"/> <input type="text" value="D1"/>											
Options	without amplifier	<input type="text" value="M248"/>											
Design index (subject to change)													

**SYMBOL**

Simplified



Detailed QN...


**GENERAL SPECIFICATIONS**

Designation	Proportional 2-way flow control valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	Ex-protection proportional solenoid
Ambient temperature	<b>Operation as T4</b> -25...+70 °C (L15 / L17)
Weight	1,85 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Maximum volume flow	$Q_{max} = 28 \text{ l/min}$
Minimum volume flow	$Q_{min} = 0,1 \text{ l/min}$
Volume flow direction	1 → 2
Leakage oil	See characteristics
Nominal volume flow range	$Q_N = 3,2; 8; 16; 25 \text{ l/min}$
Hysteresis	≤ 7 % at optimal dither signal
Repeatability	≤ 3 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T4</b> NBR -25...+70 °C (L15 / L17) FKM -20...+70 °C (L15 / L17)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade $\beta_{6...10} \geq 75$ , see data sheet 1.0-50

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to...	M248 Electronic
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	
MA		x	x	x
UL / CSA	x		x	

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable $\varnothing 6,5...14 \text{ mm}$

**Attention!** The UL execution is always supplied without cable gland

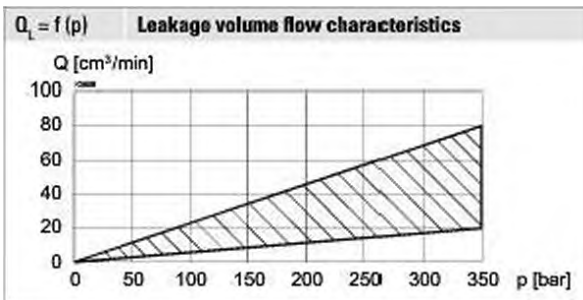
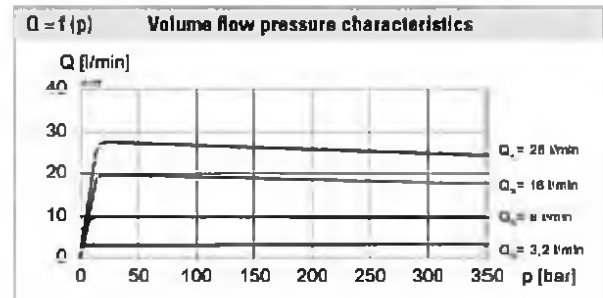
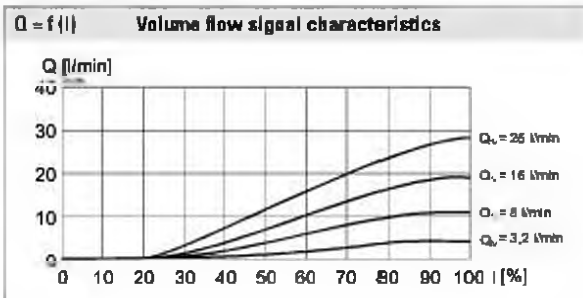

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67
Relative duty factor	100 % DF
Voltage tolerance	± 10 % with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	<b>L15 / 17, 50 °C</b> $I_a = 950 \text{ mA}$ (12 VDC) $I_a = 450 \text{ mA}$ (24 VDC) <b>L15 / 17, 70 °C</b> $I_a = 910 \text{ mA}$ (12 VDC) $I_a = 420 \text{ mA}$ (24 VDC)
Standard nominal power	15 W, 17 W
Temperature class	Nominal power 15 W / 17 W: T1...T4

**Note!** Other electrical specifications see data sheet 1.1-183 and 1.1-184



**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACCESSORIES**

Proportional amplifier	Register 1.13
Flange body / sandwich plate NG4-Mini	Data sheet 2.6-820
Flange body / sandwich plate NG6	Data sheet 2.6-840
Threaded body	Data sheet 2.9-205
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SURFACE TREATMENT**

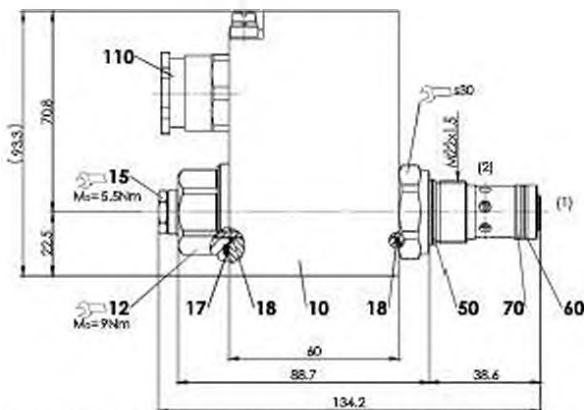
- ◆ The cartridge body is gas-nitro-carburised
- ◆ The armature tube and the slip-on coil are zinc- / nickel-coated

**MANUAL OVERRIDE**

HB4,5 as standard

**SEALING MATERIAL**

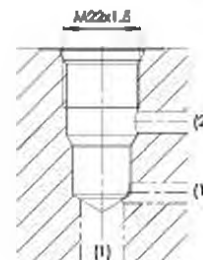
NBR or FKM (Viton) as standard, choice in the type code

**DIMENSIONS**


Dimensions of the solenoid coil see data sheet 1.1-183 and 1.1-184

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-01-0-98



Note!



For detailed cavity drawing and cavity tools see data sheet 2.13-1008

**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	253.8000	Manual override HB4,5
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	049.3196	Backup ring rd 16,1 x 19 x 1,4
110	111.1080	Cable gland M20 x 1,5

**STANDARDS**

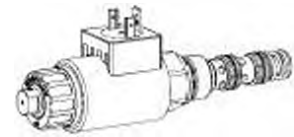
Cartridge cavity	ISO 7789
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60$ Nm Screw-in cartridge $M_0 = 5$ Nm knurled nut

**Proportional 2-way flow control poppet cartridge**

- ◆ pilot operated
- ◆  $Q_{max} = 35 \text{ l/min}$
- ◆  $Q_{Nmax} = 25 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

 $\frac{3}{8}''$ -14 UNF

**DESCRIPTION**

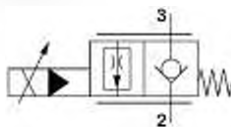
Pilot operated, load-compensated proportional flow control poppet valve as screw-in cartridge for UNF cavity. When the solenoid is deenergised, the control spool closes practically leakage-free. With increasing solenoid current the flow from inlet port (3) to the regulated outlet port (2) increases independently of the load pressure. For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

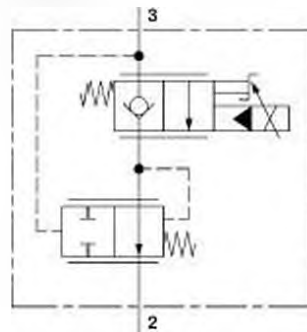
These valves are used in hydraulic systems, in which the positioning of loads and the simultaneous controlling of the lowering of these loads are demanded. The insensitivity to load changes and the very small leakage are a great advantage for this purpose. They are ideally used in the bypass to the pump. The screw-in cartridge is perfectly suitable for installation in control blocks. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

Simplified



Detailed


**ACTUATION**

Actuation	Proportional solenoid, wet pin pull type, pressure tight.
Execution	V.E37 / 19 x 50 (Data sheet 1.1-168) N.S35 / 19 x 50 (Data sheet 1.1-175)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**GENERAL SPECIFICATIONS**

Designation	Proportional 2-way flow control poppet valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	$\frac{3}{8}''$ -14 UNF
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,52 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Voltage tolerance	$\pm 10 \%$ with regard to nominal voltage
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1260 \text{ mA}$ ( $U_N = 12 \text{ VDC}$ ) $I_a = 620 \text{ mA}$ ( $U_N = 24 \text{ VDC}$ )

**Note!**


Other electrical specifications see data sheet 1.1-168 (slip-on coil V) and 1.1-175 (slip-on coil N)

**TYPE CODE**

Flow control valve	Q S P PU10 - 25 - <input type="text"/> / <input type="text"/> - <input type="text"/> # <input type="text"/>	
Normally closed		
Proportional		
Screw-in cartridge 7/8" - 14 UNF		
Nominal volume flow rate $Q_N$	25 l/min	
Nominal voltage $U_N$	12 VDC <input type="checkbox"/> G12 24 VDC <input type="checkbox"/> G24 without coil <input type="checkbox"/> X5	
Slip-on coil	Metal housing round <input type="checkbox"/> V Metal housing square <input type="checkbox"/> N	
Connection execution	Connector socket EN 175301-803 / ISO 4400 <input type="checkbox"/> D Connector socket AMP Junior-Timer <input type="checkbox"/> J Connector Deutsch DT04-2P <input type="checkbox"/> G	
Sealing material	NBR <input type="checkbox"/> FKM (Viton) <input type="checkbox"/> D1	
Manual override	without <input type="checkbox"/> HB0 with <input type="checkbox"/> HZ	
Design index (subject to change)		

214-028

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 35$ l/min
Minimum volume flow	$Q_{min} = 0,5$ l/min
Volume flow direction	3 → 2
Leakage oil	Poppet type, max. 0,5 ml / min (approx. 10 drop / min) at 30 cSt
Nominal volume flow range	$Q_N = 25$ l/min
Hysteresis	≤ 10 % at optimal dither signal
Repeatability	≤ 2 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6... 10 ≥ 75, see data sheet 1.0-50

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge type 7/8"-14 UNF
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 60$ Nm Screw-in cartridge $M_0 = 5$ Nm knurled nut $M_0 = 5,5$ Nm HZ $M_0 = 9,5$ Nm HB0

**ACCESSORIES**

Proportional amplifier	Register 1.13
Mating connector block (B)	Article no. 215.2002
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

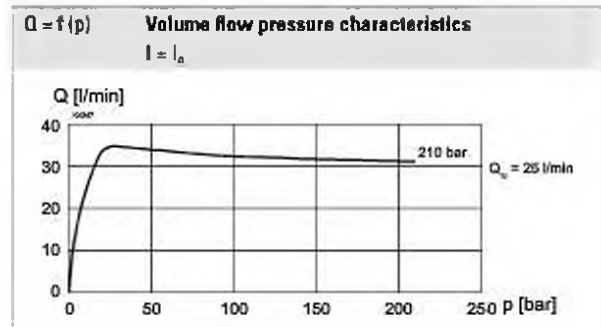
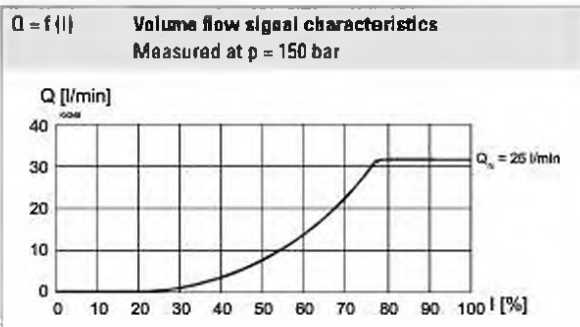
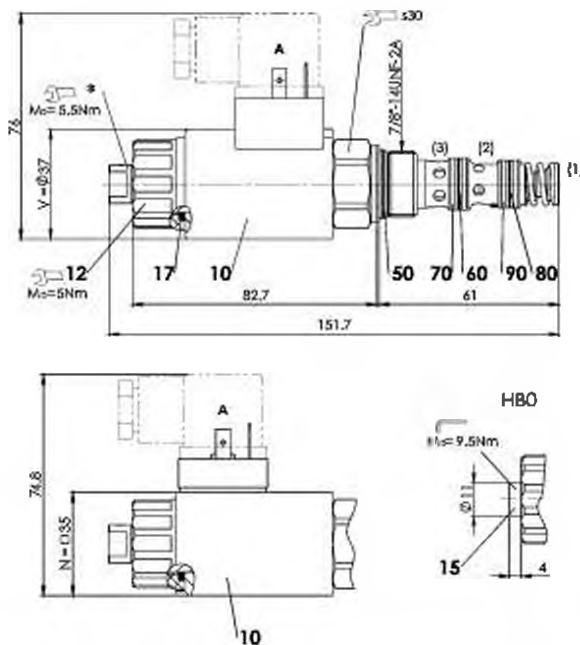
**MANUAL OVERRIDE**

 Screw plug (HB0), no actuation possible.  
 Optionally: HZ (pull)

**Attention!** The manual override HZ cannot be retrofitted.



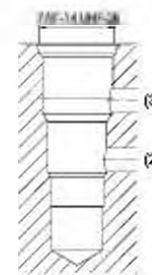

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**DIMENSIONS**


\*After loosening, open further only by hand (without tools).

**HYDRAULIC CONNECTION**

Cavity drawing according to UNF


**Attention!** For detailed cavity drawing and cavity tools see data sheet 2.13-1058

**PARTS LIST**

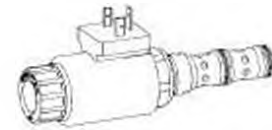
Position	Article	Description
10	206.2...	V.E37 / 19 x 50
	260.5...	N.S35 / 19 x 50
12	154.2700	Knurled nut
15	239.2033	Screw plug HBO (incl. seal)
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.8188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.8140	O-ring ID 14,00 x 1,78 (FKM)
70	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.8124	O-ring ID 12,42 x 1,78 (FKM)
80	049.8177	Back-up ring PTSM rd 12,4 x 15,3 x 1,4
90	049.8166	Backup ring PTSM rd 10,8 x 13,7 x 1,4

**STANDARDS**

Cartridge cavity	Wandfluh standard
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**Proportional 3-way flow control valve  
Screw-in cartridge**

- Direct operated, pressure compensated
- $Q_{max} = 40 \text{ l/min}$ ,  $p_{max} = 350 \text{ bar}$
- $Q_{Hmax} = 25 \text{ l/min}$

**M22x1,5**  
 ISO 7789

**DESCRIPTION**

Direct operated, pressure compensated proportional flow control valve as screw-in cartridge with a thread M22x1.5 for cavity acc. to ISO 7789. Three flow ranges are available. The volume flow is adjusted by a Wandfluh proportional solenoid (VDE standard 0580). The cartridge body is made of steel. A special surface treatment guarantees a good protection against corrosion and wear as well as very good low-friction characteristics of the pressure compensating- and throttle spool. The solenoid coil is zinc-nickel-coated.

**FUNCTION**

The 3-way flow control valve serves for maintaining the speed of a consumer constant independent of the load. Superfluous pump output flow is fed into the return flow system in a cost saving manner, and as a result, prevents an overheating of the hydraulic system. The power controlled, proportional solenoid running in oil acts directly on the throttle spool, which opens the throttle segments in the cartridge body. Proportional to the current demand of the proportional solenoid, the throttle aperture changes, and with this the volume flow. In case of a current-free solenoid, the throttle spool is held in closed position by a spring. For driving the valve, Wandfluh proportional amplifiers are available (see Register 1.13).

**APPLICATION**

Proportional flow control valves are suitable for feed control systems, where the consumer flow has to be maintained constant with a changing load. The screw-in cartridge is suitable for installation in control blocks as well as in flange- and sandwich valves of the size NG6. Cavity tools are available for machining the cartridge cavities in steel and aluminium (for hire or for purchase). Please refer to the data sheets in Reg. 2.13 of our documentation.

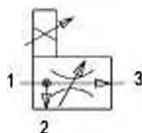
**TYPE CODE**

		Q D P PM22 - [ ] - [ ] / [ ] [ ] - [ ] [ ] # [ ]	
Flow control valve			
3-way			
Proportional			
Screw-in cartridge M22 x 1,5			
Nominal volume flow rate $Q_n$	8 l/min [ 8 ] 16 l/min [ 16 ] 25 l/min [ 25 ]		
Nominal voltage $U_n$	12 VDC [ G12 ] 24 VDC [ G24 ] without coil [ X5 ]		
Slip-on coil	Metal housing, round [ W ] Metal housing, square [ M* ]		
Connection execution	Connector socket EN 175301-803 / ISO 4400 [ D ] Connector socket AMP Junior-Timer [ J ] Connector Deutsch DT04-2P [ G ]		
Sealing material	NBR [ ] FKM (Viton) [ 01 ]		
Manual override	Armature tube closed (standard) [ ] Screwed sealing plug [ RB0 ] Manual emergency actuation [ HB4.5 ]		
Design-Index (Subject to change)			

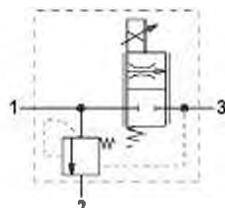
\* Only available in conjunction with other nominal voltages and connection versions. (See data sheet 1.1-174)

**SYMBOLS**

simplified



detailed


**GENERAL SPECIFICATIONS**

Description	3-way proportional flow control valve
Construction	Screw-in cartridge for cavity acc. to ISO 7789
Operation	Proportional solenoid
Mounting	Screw-in thread M22x1,5
Ambient temperature	-20... 50 °C
Mounting position	any
Fastening torque	$M_s = 50 \text{ Nm}$ for screw-in cartridge $M_b = 5 \text{ Nm}$ for knurled nut
Weight	$m = 0,68 \text{ kg}$
Flow direction	see symbol

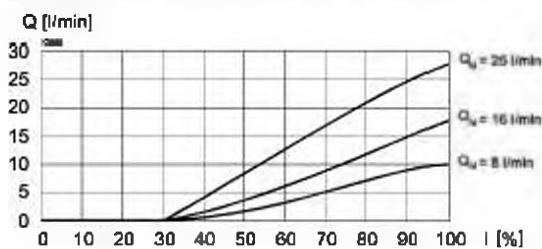
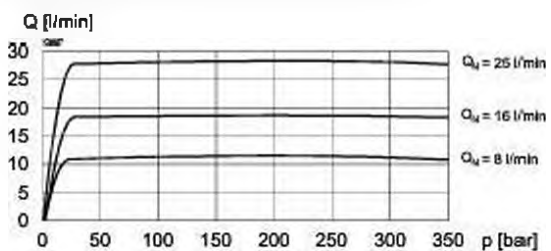
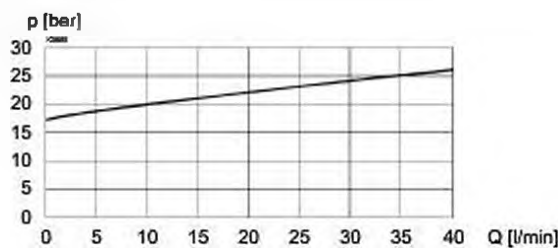
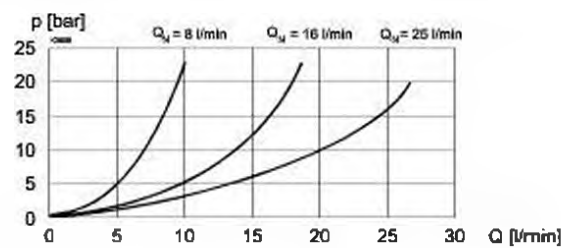
**ELECTRICAL SPECIFICATIONS**

Construction	Proportional solenoid, wet pin push type, pressure tight	
Standard nominal voltage	U = 12 VDC	U = 24 VDC
Limiting current	I <sub>lim</sub> = 1360 mA	I <sub>lim</sub> = 680 mA
Relative duty factor	100 % ED (see data sheet 1.1-430)	
Protection class acc. to EN 60529	Connection version D: IP65 J: IP68 G: IP67 and 69K	

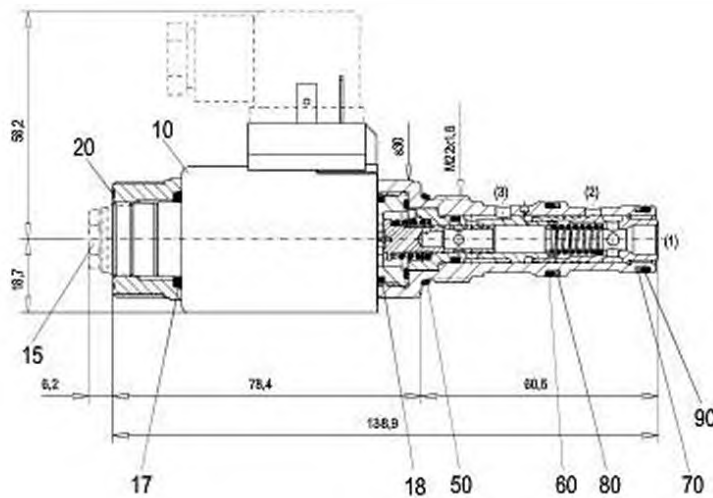
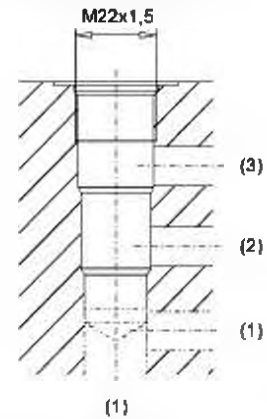
For further electrical specifications see data sheet 1.1-173 (W)  
1.1-174 (M)

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{8...10} \geq 75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	p <sub>max</sub> = 350 bar
Nominal volume flow rates	Q <sub>N</sub> = 8 l/min, 15 l/min, 25 l/min
Max. volume flow	Q <sub>max</sub> = 40 l/min (1 → 2)
Min. volume flow	Q <sub>min</sub> = 0,1 l/min
Hysteresis	≤ 7% * * at optimal dither signal

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
**Q = f (I)** Volume flow adjustment characteristics 1 → 3 (p<sub>1</sub> = 230 bar)

**Q = f (p)** Volume flow pressure characteristics (I = I<sub>N</sub>)

**Δp = f (Q)** Pressure drop-volume flow characteristics 1 → 2 (I = 0 mA)

**Δp = f (Q)** Pressure drop-volume flow characteristics 1 → 3 (I = I<sub>N</sub>)


## DIMENSIONS / SECTIONAL DRAWINGS


 Cavity drawing acc. to  
 ISO 7789-22-04-0-88

 For detailed cavity drawing and  
 cavity tools see data sheet 2.13-1004

## PARTS LIST

Position	Article	Description
10	206.2201	EN 175301 Solenoid coil WDS37/19x50-G24
	206.2200	Solenoid coil WDS37/19x50-G12
	206.2203	Junior-Timer Solenoid coil WJS37/19x50-G24
	206.2202	Solenoid coil WJS37/19x50-G12
	206.2205	Deutsch Solenoid coil WGS37/19x50-G24
	206.2204	Solenoid coil WGS37/19x50-G12
15	253.8000	HB 4,5 annual override (data sheet 1.1-300)
	239.2033	HB 0 Plug screw (data sheet 1.1-300)
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
20	154.2700	Knurled nut
50	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
60	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
70	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)
80	049.3198	Backup ring RD 16,1 x 19 x 1,4
90	049.3176	Backup ring RD 14,1 x 17 x 1,4

## ACCESSORIES

Flange/sandwich plate NG8	Data sheet 2.6-842
Line mount body	Data sheet 2.9-210
Proportional amplifier	Register 1.13
Mating connector EN 175301-803	Article no. 219.2002

Technical explanation see data sheet 1.0-100



**GENERAL SPECIFICATIONS**

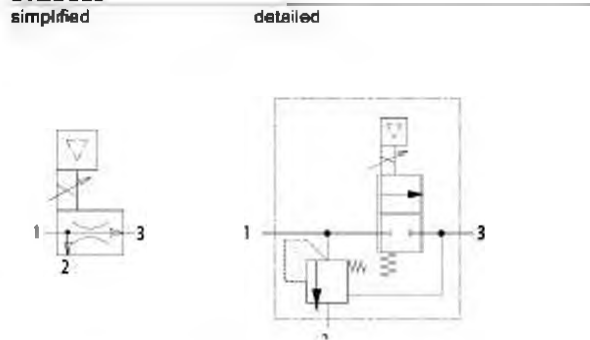
<b>Description</b>	3-way proportional flow control valve with integrated electronics
<b>Construction</b>	Screw-in cartridge for cavity acc. to ISO 7789
<b>Operations</b>	Proportional solenoid, wet pin push type, pressure light
<b>Mounting</b>	Screw-in thread M22x1,5
<b>Ambient temperature</b>	-20...65 °C (typical) <small>(The upper temperature limit is a guideline value for typical applications. In individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high/electronic temperature. More detailed information can be obtained from the operating instructions «DSVs».)</small>
<b>Mounting position</b>	any, preferably horizontal
<b>Fastening torque</b>	$M_D = 50 \text{ Nm}$ for screw-in cartridge $M_D = 5 \text{ Nm}$ for knurled nut
<b>Weight</b>	$m = 1,0 \text{ kg}$
<b>Flow direction</b>	see symbol

**HYDRAULIC SPECIFICATIONS**

<b>Fluid</b>	Mineral oil, other fluid on request
<b>Contamination efficiency</b>	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{0.1} \dots 10 \geq 75$ ) see data sheet 1.0-50/2
<b>Viscosity range</b>	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
<b>Fluid temperature</b>	-20...+70 °C
<b>Peak pressure</b>	$p_{max} = 350 \text{ bar}$
<b>Nominal volume flow rates</b>	$Q_N = 8 \text{ l/min}, 15 \text{ l/min}, 25 \text{ l/min}$
<b>Max. volume flow</b>	$Q_{max} = 40 \text{ l/min}$ (1 → 2)
<b>Min. volume flow</b>	$Q_{min} = 0,1 \text{ l/min}$
<b>Hysteresis</b>	≤ 5%

**ELECTRICAL SPECIFICATIONS**

<b>Protection class</b>	IP 67 acc. to EN 60 529 with suitable connector and closed electronics housing
<b>Supply voltage</b>	12 VDC or 24 VDC
<b>Ramps</b>	adjustable
<b>Parameterisation</b>	via fieldbus or USB
<b>Interface</b>	USB (Mini B) for parameterisation with «PASO» <small>under the closing screw of the housing cover, Preset ex-works</small>
<b>Analog interface:</b>	
<b>Device receptacle (male)</b>	M23, 12-poles
<b>Mating connector</b>	Plug (female), M23, 12-poles <small>(not incl. in delivery)</small>
<b>Preset value signal</b>	Input voltage / current as well as signal range can be set by software
<b>Fieldbus interface:</b>	
<b>Device receptacle supply (male)</b>	M12, 4-poles
<b>Mating connector</b>	Plug (female), M12, 4-poles <small>(not incl. in delivery)</small>
<b>Device receptacle CANopen (male)</b>	M12, 5-poles (acc. to DRP 303-1)
<b>Mating connector</b>	Plug (female), M12, 5-poles <small>(not incl. in delivery)</small>
<b>Device receptacle Profibus (female)</b>	M12, 5-poles, B-coded (acc. to IEC 947-5-2)
<b>Mating connector</b>	Plug (male), M12, 5-poles, B-coded <small>(not incl. in delivery)</small>
<b>Preset value signal</b>	Fieldbus

**SYMBOLS**

**CONNECTOR WIRING DIAGRAM**
**Analog Interface:**
**Device receptacle (male) X1**


- 1 = Supply voltage +
- 2 = Supply voltage 0 VDC
- 3 = Stabilised output voltage
- 4 = Preset value voltage +
- 5 = Preset value voltage -
- 6 = Preset value current +
- 7 = Preset value current -
- 8 = Reserved for extensions
- 9 = Reserved for extensions
- 10 = Enable control (Digital input)
- 11 = Error signal (Digital output)
- 12 = Chassis

Preset value voltage (PIN 4/5) resp. current (PIN 6/7) are selected with set-up and diagnosis software PASO.  
 Factory setting: Voltage (0...+10 V), (PIN 4/5)

**Fieldbus interface:**
**Device receptacle supply (male) X1**


- MAIN**
- 1 = Supply voltage +
  - 2 = Reserved for extensions
  - 3 = Supply voltage 0 VDC
  - 4 = Chassis

**Device receptacle CANopen (male) X3**


- CAN**
- 1 = not connected
  - 2 = not connected
  - 3 = CAN Gnd
  - 4 = CAN High
  - 5 = CAN Low

**Device receptacle Profibus (female) X3**


- PROFIBUS**
- 1 = VP
  - 2 = Rx/D/TxD - N
  - 3 = DGND
  - 4 = Rx/D/TxD - P
  - 5 = Shield

**Parameterisation interface (USB, Mini B) X2**

Under the closing screw of the housing cover


**NOTE!**

Detailed electrical characteristics and description of «DSV» electronics are shown on data sheet 1.13-76.

Free-of-charge download of the «PASO»-software and the instruction manual for the «DSV» hydraulic valves as well as the operation instruction CANopen eg. Profibus DP protocol with device profile DSP-408 for «DSV».

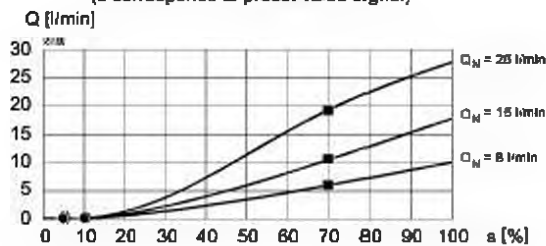
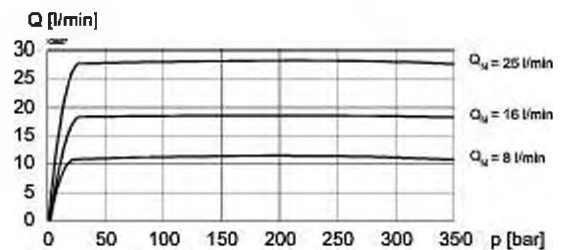
**START-UP**

For DSV amplifiers as a rule no parameter settings by the customer are required. The plugs have to be connected in accordance with the chapter «Pin assignments».


**NOTE!**

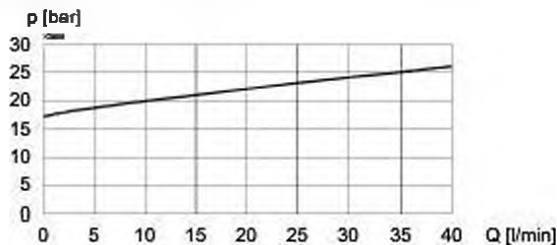
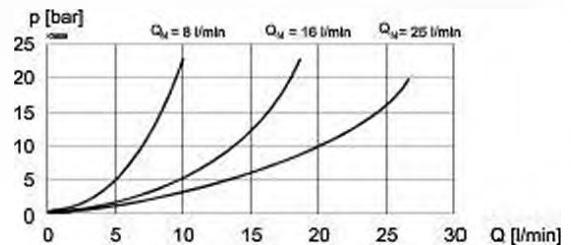
The mating connectors and the cable to adjust the settings are not part of the delivery. Refer to chapter «Accessories».

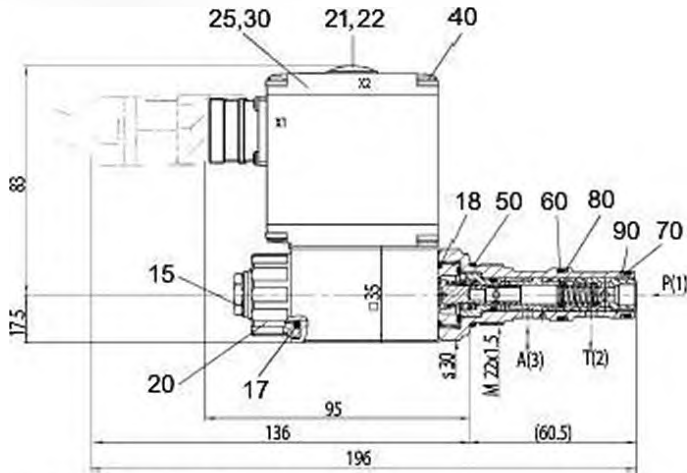
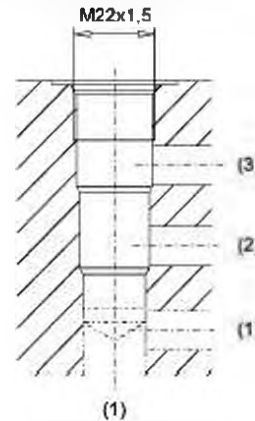
Additional information can be found on our website:

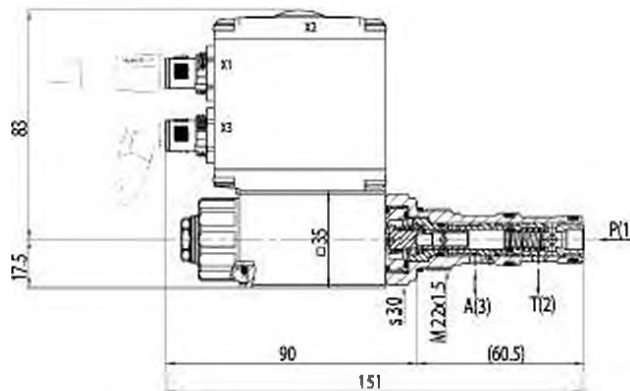
**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
**Q = f (I)** Volume flow adjustment characteristics [at p=50 bar] (s corresponds to preset value signal)

**Q = f (p)** Volume flow pressure characteristics

**Factory settings:**

Dither set for optimal hysteresis

- ◆ = Deadband: Solenoid switched off with command signal <5%
- = Opening point: at 10%
- = Flow p = 50 bar with 70% value signal
  - 18.5 l/min with Q<sub>M</sub> = 25 l/min (Q in interface 1 = 30 l/min)
  - 11.0 l/min with Q<sub>M</sub> = 15 l/min (Q in interface 1 = 30 l/min)
  - 6.4 l/min with Q<sub>M</sub> = 8 l/min (Q in interface 1 = 30 l/min)

**Δp = f (Q)** Pressure drop volume flow characteristics 1 → 2

**Δp = f (Q)** Pressure drop volume flow characteristics 1 → 3


**DIMENSIONS / SECTIONAL DRAWINGS**
**With analog interface**

 Cavity drawing acc. to  
 ISO 7789-22-04-0-98

 For detailed cavity drawing and cavity tools  
 see data sheet 2.13-1004

**With fieldbus interface**

**PARTS LIST**

Position	Article	Description
15	253.8000	HB 4,5 Manual override (data sheet 1.1-300)
17	180.2187	O-ring ID 18,72 x 2,62 (NBR)
18	180.2170	O-ring ID 17,17 x 1,78 (NBR)
20	154.2700	Knurled nut
21	223.1317	Dummy plug M16 x 1,5
22	180.6131	O-ring ID 13,00 x 1,5
25	062.0102	Cover square
30	072.0021	Gasket 33,2 x 59,9 x 2
40	208.0100	Socket head cap screw M4 x 10
50	180.2188	O-ring ID 18,77 x 1,78 (NBR)
	180.6188	O-ring ID 18,77 x 1,78 (FKM)
60	180.2156	O-ring ID 15,60 x 1,78 (NBR)
	180.6156	O-ring ID 15,60 x 1,78 (FKM)
70	180.2140	O-ring ID 14,00 x 1,78 (NBR)
	180.6141	O-ring ID 14,00 x 1,78 (FKM)
80	049.3196	Backup ring RD 16,1 x 19 x 1,4
90	049.3176	Backup ring RD 14,1 x 17 x 1,4

**ACCESSORIES**

- Flange/sandwich plate NG6 Data sheet 2.6-842  
 Line mount body Data sheet 2.9-210
- Set-up software see start-up
  - Cable to adjust the settings through interface USB article no. 219.2898  
 (from plug type A to Mini B, 3 m)
  - Mating connector (plug female) for the analogue interface:
    - straight, soldering contact article no. 219.2330
    - soldering contact article no. 219.2331
- Recommended cable size:**
- Outer diameter 9...10,5 mm
  - Single wire max. 1 mm<sup>2</sup>
  - Recommended wire size:
    - 0...25 m = 0,75 mm<sup>2</sup> (AWG18)
    - 25...50 m = 1 mm<sup>2</sup> (AWG17)

Technical explanation see data sheet 1.0-100


**NOTE!**

The cable connector is not part of the delivery. Regarding the dimensions see also the connector in the chapter «Accessories».






**Proportional 3-way flow control valve  
Screw-in cartridge**

- Direct operated, pressure compensated
- $Q_{max} = 40 \text{ l/min}$ ,  $p_{max} = 350 \text{ bar}$
- $Q_{Hmax} = 25 \text{ l/min}$

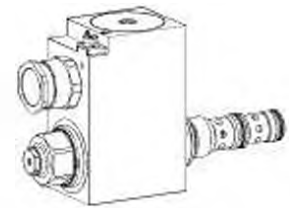
**M22x1,5**

ISO 7789

-  II 2 G Ex db IIC T6, T4
-  II 2 D Ex tb III C T80 °C, T130 °C
-  I M2 Ex db I Mb

Class I Division 1

Class I Zone 1


**DESCRIPTION**
**For explosion-hazard zones**

Direct operated, pressure compensated proportional flow control valve, as a screw-in cartridge with a thread M22x1,5 for cavity acc. to ISO 7789. A special surface treatment guarantees a good protection against corrosion and wear as well as very good low-friction characteristics of the pressure compensating- and throttle spool. The solenoid coil is zinc-/nickel-coated.

The flameproof enclosure prevents an explosion in the interior from getting outside.

The design prevents a surface temperature capable of igniting.

**FUNCTION**

The 3-way flow control valve serves for maintaining the speed of a consumer constant independent of the load. Superfluous pump output flow is fed into the return flow system in a cost saving manner, and as a result, prevents an overheating of the hydraulic system. The power controlled, proportional solenoid running in oil acts directly on the throttle spool, which opens the throttle segments in the cartridge body. Proportional to the current demand of the proportional solenoid, the throttle aperture changes, and with this the volume flow. In case of a current-free solenoid, the throttle spool is held in closed position by a spring. For driving the valve, Wandfluh proportional amplifiers are available (see Register 1.13).1.13).

**APPLICATION**

Proportional flow control valves are suitable for feed control systems, where the consumer flow has to be maintained constant with a changing load. These valves are suitable for applications in explosion-hazard zones, open cast and also in mines. The facility for electric remote controlling of the valve in conjunction with process control systems enables economic problem solutions with repeatable sequences. Installation of the screw-in cartridge in control blocks.

**TYPE CODE**

Q D B PM22-  -  / L15 /  -  #

Flow control valve			
3-way			
Proportional, Explosion proof execution Ex d			
Screw-in cartridge M22x1,5			
Nominal volume flow rate $Q_n$	8 l/min <input type="checkbox"/>	16 l/min <input type="checkbox"/>	25 l/min <input type="checkbox"/>
Nominal voltage $U_n$	12 VDC <input type="checkbox"/>	24 VDC <input type="checkbox"/>	G12 <input type="checkbox"/> G24 <input type="checkbox"/>
Nominal power $P_n$	15W		Ambient temp. by: 70 °C
Certificate	ATEX, IECEx, CCC, EAC Australia <input type="checkbox"/>	UL/CSA <input type="checkbox"/>	UL <input type="checkbox"/> MA <input type="checkbox"/>
Sealing material	NBR <input type="checkbox"/>	FKM (Viton) <input type="checkbox"/>	D1 <input type="checkbox"/>
Design-Index (Subject to change)			

**GENERAL SPECIFICATIONS**

Description	3-way proportional flow control valve
Construction	Screw-in cartridge for cavity acc. ISO 7789
Operations	Proportional solenoid
Mounting	Screw-in thread M22x1,5
Ambient temperature	-25...70 °C (operation as T1...T4/T130 °C)
Mounting position	any
Fastening torque	$M_a = 50 \text{ Nm}$ for screw-in cartridge $M_c = 9 \text{ Nm}$ for knurled nut
Weight	$m = 1,9 \text{ kg}$
Flow direction	see symbol

**CERTIFICATES**

	Surface	Mining	Standard -25 °C to...	M248 Electronic
ATEX	x	x	x	x
IECEx	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	
MA		x	x	x
UL/CSA	x		x	

**ELECTRICAL SPECIFICATIONS**

Construction	Proportional solenoid, wet pin push type, pressure tight	
Standard nominal voltage	$U_N = 12\text{VDC}, 24\text{VDC}$	
Limiting current	L15/50 °C	$I_c = 950\text{ mA}$ 450 mA
	L15/70 °C	$I_c = 910\text{ mA}$ 420 mA
Voltage tolerance	+ 10% of rated voltage	
Relative duty factor	100% ED	
Protection class	IP67 acc. to EN 60528	
Connection/Power supply	Through cable gland for cable $\varnothing 6.5 \dots 14\text{ mm}$	
Temperature class:	T1...T4 (acc. to EN 60079-0)	
Nominal power:	15W	

For further electrical characteristics, refer to the data sheet of the solenoid coil: 1.1-183

**HYDRAULIC SPECIFICATIONS**

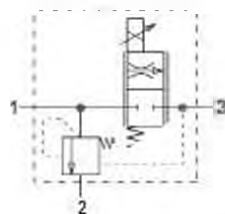
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/18/13 (Recommended filtration grade $\beta_{8 \dots 10} \geq 75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-25...+70 °C (operation as T1...T4/T130 °C)
Peak pressure	$p_{max} = 350\text{ bar}$
Nominal volume flow	$Q_N = 8/16/25\text{ l/min}$
Max. Volume flow	$Q_{max} = 40\text{ l/min}$ (1 → 2)
Min. Volume flow	$Q_{min} = 0,1\text{ l/min}$
Leakage volume flow	see characteristics
Repeatability	$\leq 3\%$
Hysteresis	$\leq 7\%$

\* at optimal dither signal

**SYMBOLS**

simplified

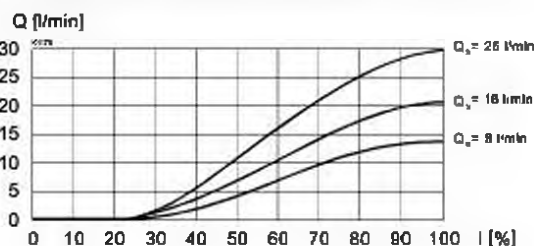
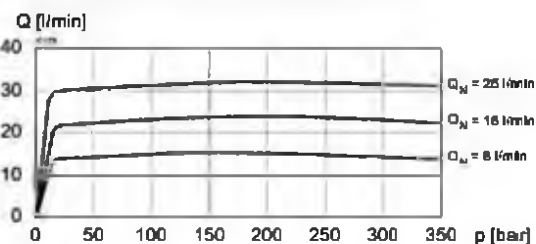
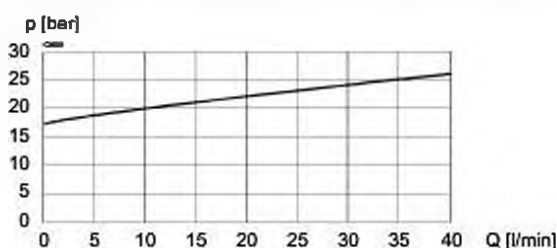
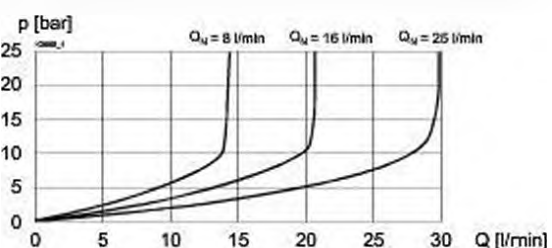
detailed

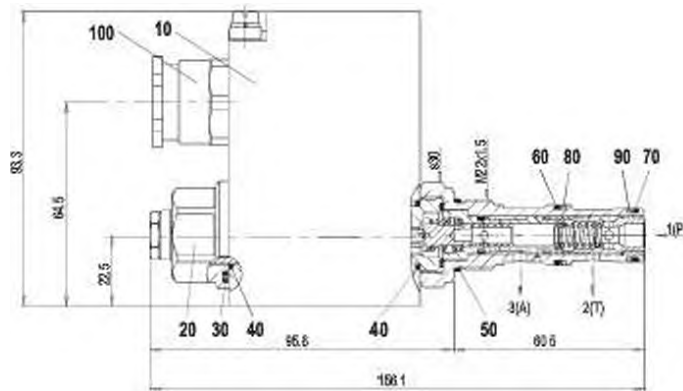
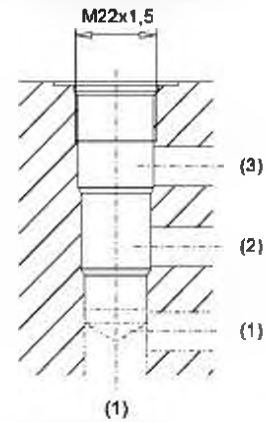

**SECURITY OPERATED**


The solenoid coil must only be put into operation, if the requirements of the operating instructions supplied are observed to their full extent  
 In case of non-observance, no liability can be assumed.

**INSTALLATION**

For stack assembly please observe the remarks in the operating instructions.

**CHARACTERISTICS** Oil viscosity  $\nu = 30\text{ mm}^2/\text{s}$ 
 $Q = f(I)$  Volume flow adjustment characteristics 1 → 3 ( $p_0 = 200\text{ bar}$ )

 $Q = f(p)$  Volume flow pressure characteristics (1 = 3)

 $\Delta p = f(Q)$  Pressure drop-volume flow characteristics 1 → 2 ( $i = 0\text{ mA}$ )

 $\Delta p = f(Q)$  Pressure drop-volume flow characteristics 1 → 3 ( $i = i_N$ )


**DIMENSIONS/SECTIONAL DRAWINGS**

 Cavity drawing acc. to  
 ISO 7789-22-04-0-98

 For detailed cavity drawing and  
 cavity tools see data sheet 2.13-1004

**PARTS LIST**

Position	Article	Description
10	263.6...	Slip-on coil MKY45/18 x 60-...
15	253.8000	Plug with integrated manual override HB4,5
20	154.2603	Knurled nut Ex
30	160.2251	O-ring ID 25,07 x 2,62 (NBR)
40	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2188 160.6188	O-ring ID 18,77 x 1,78 (NBR) O-ring ID 18,77 x 1,78 (FKM)
60	160.2158 160.6158	O-ring ID 15,60 x 1,78 (NBR) O-ring ID 15,60 x 1,78 (FKM)
70	160.2140 160.6141	O-ring ID 14,00 x 1,78 (NBR) O-ring ID 14,00 x 1,78 (FKM)
80	049.3198	Backup ring RD 16,1 x 19 x 1,4
90	049.3178	Backup ring RD 14,1 x 17 x 1,4
100	111.1080	Cable gland brass M20

**STANDARDS**

Cartridge cavity	ISO 7789
Explosion protection	Directive 2014/34/EU (ATEX)
Flameproof enclosure	EN/IEC/UL 60079-1.31
Cable entry	EN 60079-0, 1, 7, 15, 31
Protection class	EN 60529
Contamination efficiency	ISO 4406

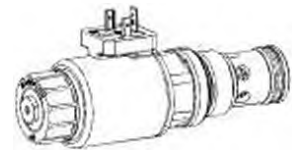
**ACCESSORIES**

Flange/sandwich plate NG8	Data sheet 2.6-842
Line mount body	Data sheet 2.9-210
Proportional amplifier	Register 1.13

Technical explanation see data sheet 1.0-100

**Proportional 2-way flow control cartridge**

- ◆ direct operated, pressure compensated
- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $Q_{Nmax} = 80 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**M33 x 2**  
**ISO 7789**

**DESCRIPTION**

Direct operated, pressure compensated proportional flow control valve as screw-in cartridge for cavity according to ISO 7789. With the solenoid deenergised, the control spool is held in the closed position (ON) or open position (DO) by a spring. The change of the electric current is followed by a proportional volume flow change. From the input (1), the fluid flows over the control and throttling spool to the controlled output (2). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

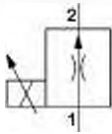
Proportional flow control valves are suitable for precise speed control, where the load current has to be maintained constant independent of the input and output pressure. The screw-in cartridge is perfectly suitable for installation in control blocks and is installed in sandwich- (vertical stacked systems) and in flange plates (corresponding data sheets in this register). For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

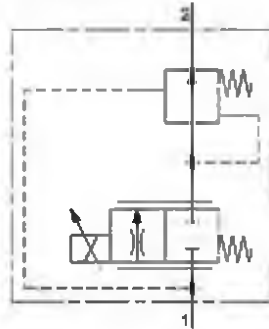
		Q		P		PM33		-		-		/		-		-		HB4,5		#							
Flow control valve																											
Normally closed		N																									
Normally open		O																									
Proportional																											
Screw-in cartridge M33 x 2																											
Nominal volume flow rate $Q_N$		normally closed				normally open																					
		32 l/min		63 l/min		80 l/min		32 l/min		63 l/min		80 l/min															
		32		63		80		32		63																	
Nominal voltage $U_N$		12 VDC				24 VDC				without coil																	
		G12				S24				XS																	
Slip-on coil		Metal housing round				Metal housing square																					
		W				M																					
Connection execution		Connector socket EN 175301-803 / ISO 4400				Connector socket AMP Junior-Timer				Connector Deutsch DT04-2P																	
		D				J				E																	
Sealing material		NBR				FKM (Viton)																					
		B1																									
Manual override																											
Design index (subject to change)																											

**SYMBOL**

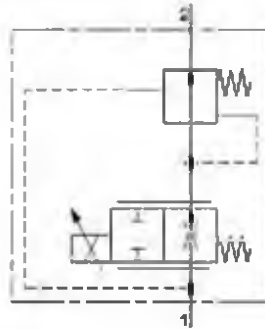
Simplified



Detailed QN...



Detailed QO...


**GENERAL SPECIFICATIONS**

Designation	Proportional 2-way flow control valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M33 x 2 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,95 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
Maximum volume flow	$Q_{max} = 80 \text{ l/min}$
Volume flow direction	1 → 2
Leakage oil	See characteristics
Nominal volume flow range	$Q_N = 32 \text{ l/min}$ , 63 l/min, 80 l/min (QN) $Q_N = 32 \text{ l/min}$ , 63 l/min (QO)
Hysteresis	≤ 6 % (QN); 10 % (QO) at optimal dither signal
Repeatability	≤ 2 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**MANUAL OVERRIDE**

HB4,5

Optionally: Screw plug (HB0), no actuation possible

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W S45 / 23 x 50 (Data sheet 1.1-180) M S45 / 23 x 50 (Data sheet 1.1-181)
Connection	Connector socket EN 175301 - 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 - 2P

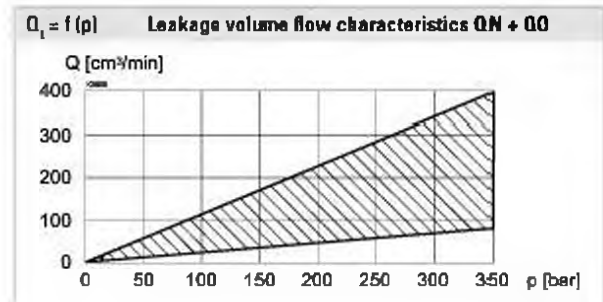
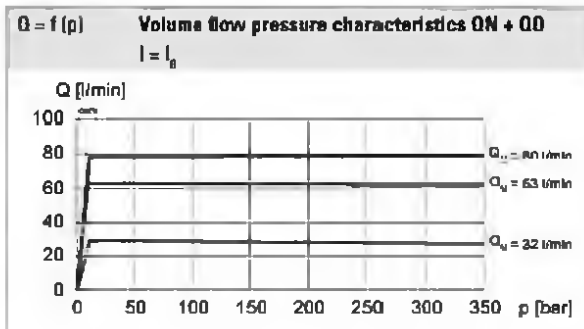
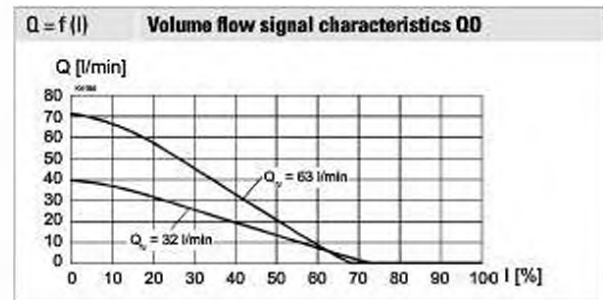
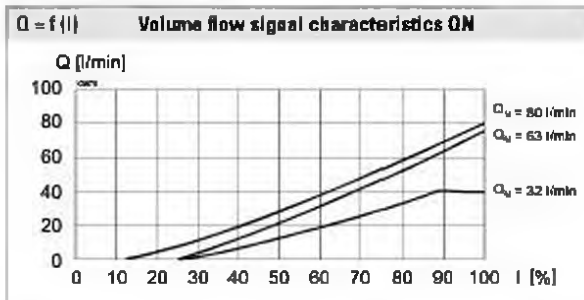
**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1560 \text{ mA}$ ( $U_N = 12\text{VDC}$ ) $I_a = 780 \text{ mA}$ ( $U_N = 24\text{VDC}$ )

**Nota!**


Other electrical specifications see data sheet 1.1-180 (slip-on coil W) and 1.1-181 (slip-on coil M)

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACCESSORIES**

Flange body / sandwich plate	Data sheet 2.6-680
Threaded body	Data sheet 2.9-205
Proportional amplifier	Register 1.13
Mating connector block (B)	Article no. 219.2002
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**SURFACE TREATMENT**

- ◆ The cartridge body is gas-nitro-carburised
- ◆ The armature tube and the slip-on coil are zinc- / nickel-coated

**SEALING MATERIAL**

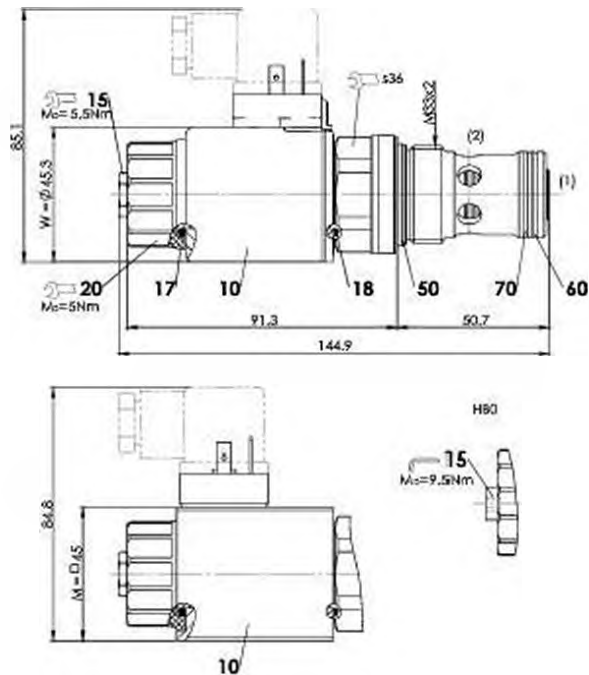
NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

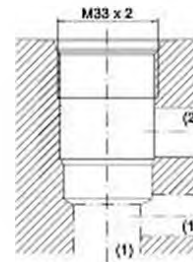
Mounting type	Screw-in cartridge M33 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 80 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-33-01-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1005

**PARTS LIST**

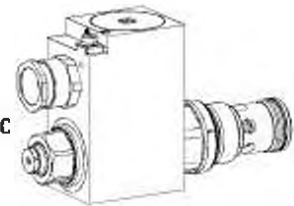
Position	Article	Description
10	206.12..	W.S45 / 23 x 50
	206.7...	M.S45 / 23 x 50
15	253.8000	HB4,5 manual override
	239.2033	HB0 Screw plug
17	160.2222	O-ring ID 22,22 x 2,62 (NBR)
18	160.2220	O-ring ID 21,95 x 1,78 (NBR)
20	154.2701	Knurled nut M23 x 1,5 x 19,7
50	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FMK)
60	160.2238	O-ring ID 23,81 x 2,62 (NBR)
	160.6238	O-ring ID 23,81 x 2,62 (FMK)
70	049.8297	Backup ring PTSM rd 22,1 x 26,6 x 1,4

**Proportional 2-way flow control cartridge**

- ◆ direct operated, pressure compensated
- ◆  $Q_{max} = 70 \text{ l/min}$
- ◆  $Q_{Nmax} = 55 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**M33 x 2**  
**ISO 7789**

- Ⓜ II 2 G Ex db IIC T6, T4
  - Ⓜ II 2 D Ex db III C T80 °C, T130 °C
  - Ⓜ I M2 Ex db I Mb
- Class I Division 1
- 
- Class I Zone 1


**DESCRIPTION**

Direct operated, pressure compensated proportional flow control valve as screw-in cartridge for cavity according to ISO 7789. When the solenoid is deenergised, the control spool closes practically leakage-free. The change of the electric current is followed by a proportional volume flow change. From the input (1), the fluid flows over the control and throttling spool to the controlled output (2). The pressure tight encapsulated Ex-protection solenoid coil prevents an explosion on the inside penetrating to the outside as well as an ignitable surface temperature.

**APPLICATION**

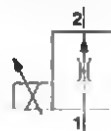
Proportional flow control valves are suitable for precise speed control, where the load current has to be maintained constant independent of the input and output pressure. These valves are suitable for applications in explosion-hazard areas, open cast and also in mines. The screw-in cartridge is perfectly suitable for installation in control blocks. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**CERTIFICATES**

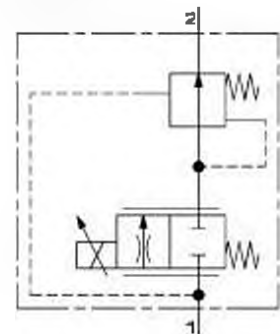
	Surface	Mining	Standard -25 °C to...	M248 Electronic
ATEX	x	x	x	x
IECEX	x	x	x	x
CCC	x	x	x	x
EAC	x	x	x	x
Australia	x	x	x	x
MA		x	x	x
UL / CSA	x		x	

**SYMBOL**

Simplified



Detailed QN...





**TYPE CODE**

Flow control valve			Q N B PM33 -	<input type="checkbox"/>	-	<input type="checkbox"/>	/	<input type="checkbox"/>	/	<input type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>	≠	<input type="checkbox"/>		
Normally closed																	
Proportional, explosion proof																	
Screw-in cartridge M33 x 2																	
Nominal volume flow rate $Q_N$	55 l/min	<input type="checkbox"/>	55														
Nominal voltage $U_N$	12 VDC	<input type="checkbox"/>	G12														
	24 VDC	<input type="checkbox"/>	G24														
Nominal power $P_N$	15 W	<input type="checkbox"/>	L15	Ambient temperature up to: 70 °C 70 °C (only UL / CSA)													
	17 W	<input type="checkbox"/>	L17														
Certification	ATEX, IECEx, EAC, CCC	<input type="checkbox"/>		UL / CSA	<input type="checkbox"/>	UL											
	Australia	<input type="checkbox"/>	AU														
	MA	<input type="checkbox"/>	MA														
Sealing material	NBR	<input type="checkbox"/>															
	FKM (Viton)	<input type="checkbox"/>	D1														
Options	without amplifier	<input type="checkbox"/>	M248														
Design index (subject to change)																	

21-08

**GENERAL SPECIFICATIONS**

Designation	Proportional 2-way flow control valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M33 x 2 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	Operation as T4 -25 ... +70 °C (L15 / L17)
Weight	2,3 kg
MTTFd	150 years

**ELECTRICAL SPECIFICATIONS**

Protection class	IP65 / 66 / 67	
Relative duty factor	100 % DF	
Voltage tolerance	± 10 % with regard to nominal voltage	
Standard nominal voltage	12 VDC, 24 VDC	
Limiting current at ... °C	<b>L15 / 17, 50 °C</b> $I_a = 950 \text{ mA (12 VDC)}$ $I_a = 450 \text{ mA (24 VDC)}$	
	<b>L15 / 17, 70 °C</b> $I_a = 910 \text{ mA (12 VDC)}$ $I_a = 420 \text{ mA (24 VDC)}$	
	Standard nominal power	15 W, 17 W
	Temperature class	Nominal power 15 W / 17 W: T1 ... T4

**Note!** Other electrical specifications see data sheet 1.1-183 and 1.1-184



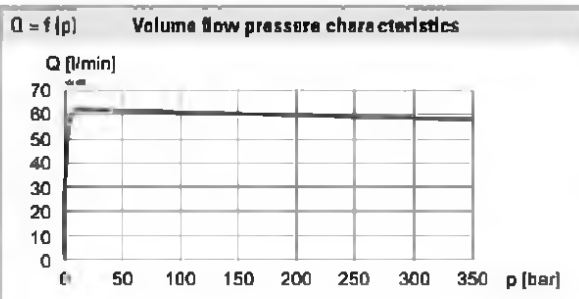
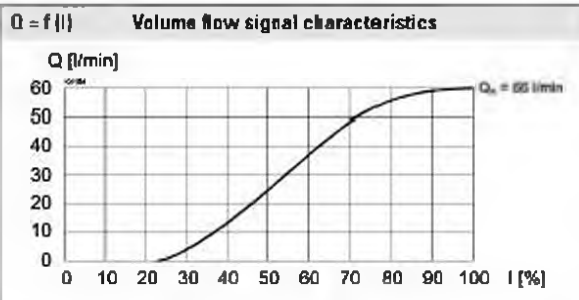
**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	MKY45 / 18x60 (data sheet 1.1-183) MKU45 / 18x60 (data sheet 1.1-184)
Connection	Cable gland for cable B 6,5...14 mm

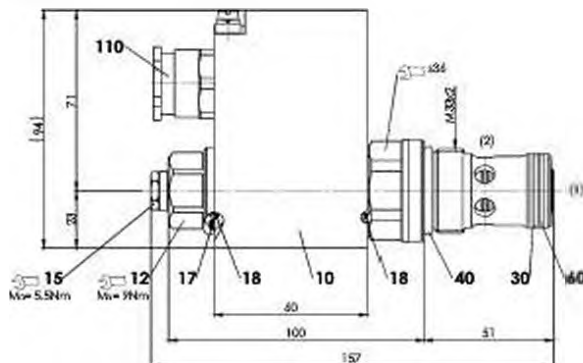
**Attention!** The UL execution is always supplied without cable gland


**PERFORMANCE SPECIFICATIONS**

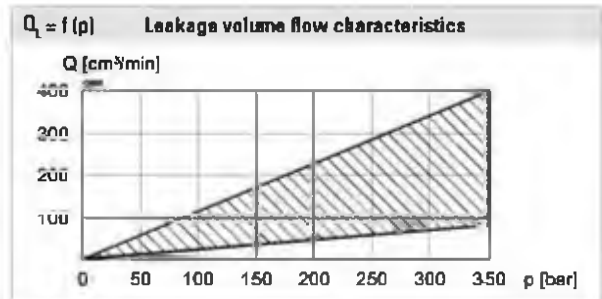
Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$



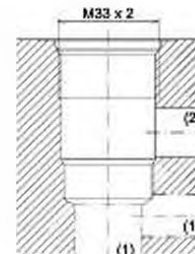
**Note!** With the L15 / L17 execution for ambient temperatures up to 70 °C, the performance specifications have been evaluated with an ambient temperature of 50 °C

**DIMENSIONS**

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{\text{max}} = 350 \text{ bar}$
Maximum volume flow	$Q_{\text{max}} = 70 \text{ l/min}$
Volume flow direction	1 → 2
Leakage oil	See characteristics
Nominal volume flow range	$Q_N = 55 \text{ l/min}$
Hysteresis	≤ 8 % at optimal dither signal
Repeatability	≤ 3 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	<b>Operation as T4</b> NBR -25...+70 °C (L15 / L17) FKM -20...+70 °C (L15 / L17)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50


**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-33-01-D-98



**Note!** For detailed cavity drawing and cavity tools see data sheet 2.13-1005



**PARTS LIST**

Position	Article	Description
10	263.6...	Solenoid coil MK.45 / 18 x 60
12	154.2603	Knurled nut Ex M18 x 1,5 x 18
15	253.8000	Manual override HB4,5
17	160.2251	O-ring ID 25,07 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
30	049.3297	Backup ring rd 24,5 x 29 x 1,4
40	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FKM)
60	160.2238	O-ring ID 23,81 x 2,62 (NBR)
	160.6238	O-ring ID 23,81 x 2,62 (FKM)
110	111.1080	Cable gland M20 x 1,5

**STANDARDS**

Cartridge cavity	ISO 7789
Explosion protection	Directive 2014 / 34 / EU (ATEX)
Flameproof enclosure	EN / IEC / UL 60079-1, 31
Cable entry	EN 60079-0, 1, 7, 15, 31
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**INSTALLATION NOTES**

Mounting type	Screw-in cartridge M33 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 80 \text{ Nm}$ Screw-in cartridge $M_0 = 9 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5

**SURFACE TREATMENT**

- ◆ The cartridge body is gas-nitro-carburised
- ◆ The armature tube and the slip-on coil are zinc- / nickel-coated

**ACCESSORIES**

Threaded body	Data sheet 2.9-205
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50
Relative duty factor	Data sheet 1.1-430

**MANUAL OVERRIDE**

HB4,5 as standard  
 Optionally: HN (K)  
 → see data sheet 1.1-311

**SEALING MATERIAL**

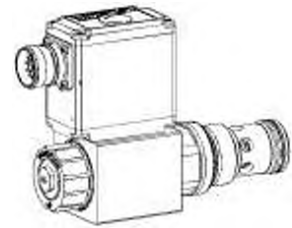
NBR or FKM (Viton) as standard, choice in the type code

**Proportional 2-way flow control cartridge with integrated electronics**

- ◆ direct operated
- ◆  $Q_{n\max} = 63 \text{ l/min}$
- ◆  $Q_{v1\max} = 63 \text{ l/min}$
- ◆  $p_{\text{act}} = 350 \text{ bar}$

**DESCRIPTION**

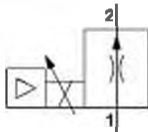
Direct operated, pressure compensated proportional flow control valve as screw-in cartridge for cavity according to ISO 7789. With the solenoid deenergised, the control spool is held in the closed position by a spring. The change of the electric current is followed by a proportional volume flow change. From the input (1), the fluid flows over the control and throttling spool to the controlled output (2). The control takes place via an analogue interface or a fieldbus interface (CANopen, J1939 or Profibus DP). The parameterisation takes place by means of the free of cost parameterisation and diagnostics software «PASO» or via fieldbus interface. For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**M33 x 2**  
**ISO 7789**

**APPLICATION**

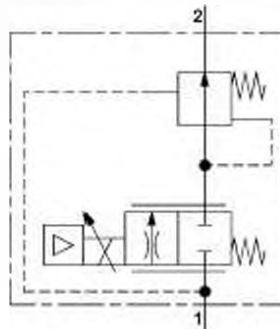
Proportional flow control valves with integrated electronics are perfectly suitable for demanding applications in which the volume flow frequently has to be changed. They are used in applications where high valve-to-valve reproducibility, easy installation, comfortable operation and high precision are very important. The integrated controller relieves the machine control and operates the volume flow control in a closed loop circuit. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**SYMBOL**

Simplified



Detailed


**MANUAL OVERRIDE**

HB4,5 as standard

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Connection	Via device receptacle

**ELECTRICAL SPECIFICATIONS**

Protection class	IP67 with suitable mating connector and closed housing cover
Ramps	Adjustable
Parameterisation	Via fieldbus or USB
Supply voltage	12 VDC, 24 VDC

**Note!**


Exact electrical specifications and detailed description of «DSV» electronics can be found on data sheet 1.13-76.

**TYPE CODE**

Flow control valve	D N P PM33 - <input type="checkbox"/> - <input type="checkbox"/> / M E <input type="checkbox"/> - <input type="checkbox"/> HB4,5 # <input type="checkbox"/>	
Normally closed	<input type="checkbox"/>	
Proportional	<input type="checkbox"/>	
Screw-in cartridge M33 x 2	<input type="checkbox"/>	
Nominal volume flow rate $Q_n$	32 l/min <input type="checkbox"/> 32	63 l/min <input type="checkbox"/> 63
Nominal voltage $U_n$	12 VDC <input type="checkbox"/> 12	24 VDC <input type="checkbox"/> 24
Slip-on coil	Metal housing square <input type="checkbox"/>	
Connection execution	Integrated electronics <input type="checkbox"/>	
Hardware configuration		
Analog command value signal	12 pole <input type="checkbox"/> A2	7 pole <input type="checkbox"/> D2 (0...10 V preset)
Analog command value signal	12 pole <input type="checkbox"/> A4	7 pole <input type="checkbox"/> D4 (4...20 mA preset)
CANopen according to DSP-408	<input type="checkbox"/> C1	
Profibus DP according to Fluid Power Technology	<input type="checkbox"/> P1	
CAN J1939 (on request)	<input type="checkbox"/> J1	
Function		
Amplifier	<input type="checkbox"/>	
Controller with current feedback value signal (0...20 mA / 4...20 mA)	<input type="checkbox"/> R1	
Controller with voltage feedback value signal (0...10 V)	<input type="checkbox"/> R2	
Sealing material	NBR <input type="checkbox"/>	FKM (Viton) <input type="checkbox"/> DT
Manual override	<input type="checkbox"/>	
Design index (subject to change)		

24-408


**GENERAL SPECIFICATIONS**


Designation	Proportional 2-way flow control valve with integrated electronics
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M33 x 2 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-20...+65 °C The upper temperature limit is a guideline for typical applications, in individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions „DSV“
Weight	1,5 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**


Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 63$ l/min
Minimum volume flow	$Q_{min} = 0,2$ l/min
Volume flow direction	1 → 2
Nominal volume flow range	$Q_n = 32; 63$ l/min
Hysteresis	≤ 5 % at optimal dither signal
Repeatability	≤ 2 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50


**ELECTRICAL CONNECTION**


X1	Analog interface (Main)
Device receptacle	M23, 12 pole male
	1 = Supply voltage + 2 = Supply voltage 0 VDC 3 = Stabilised output voltage 4 = Command value signal voltage + 5 = Command value signal voltage - 6 = Command value signal current + 7 = Command value signal current - 8 = Reserved for extensions 9 = Reserved for extensions 10 = Enable signal (Digital input) 11 = Error signal (Digital output) 12 = Chassis
Command value signal voltage (PIN 4/5) resp. current (PIN 6/7) are selected with parameterisation and diagnostics software PASO.	


X1	Fieldbus interface (Main)
Device receptacle	M12, 4 pole male
	1 = Supply voltage + 2 = Reserved for extensions 3 = Supply voltage 0 VDC 4 = Chassis

X2	Parameterisation interface
USB, Mini B	Under the screw plug of the housing cover Factory set

X1	Analog interface (Main)
Device receptacle	Connector DIN EN 175201 - 804
	7 pole male A = Supply voltage + B = Supply voltage 0 VDC C = Not connected D = Command value signal + E = Command value signal - F = Not connected G = Chassis
Command value signal: current (D4) or voltage (D2) to specify when placing the order	

X3	Profibus interface according to IEC 947-5-2
Device receptacle	M12, 5 pole female B-coded
	1 = VP 2 = Rx/D / Tx/D - N 3 = DGND 4 = Rx/D / Tx/D - P 5 = Shield

X3	CANopen interface according to DRP 303-1
Device receptacle	M12, 5 pole male
	1 = Not connected 2 = Not connected 3 = CAN Gnd 4 = CAN High 5 = CAN Low

X4 (controller only)	Feedback value interface (sensor)
Device receptacle	M12, 5 pole female
	1 = Supply voltage (output) + 2 = Feedback value signal + 3 = Supply voltage 0 VDC 4 = Not connected 5 = Stabilised output voltage
Feedback value signal: current (R1) or voltage (R2) to specify when placing the order	

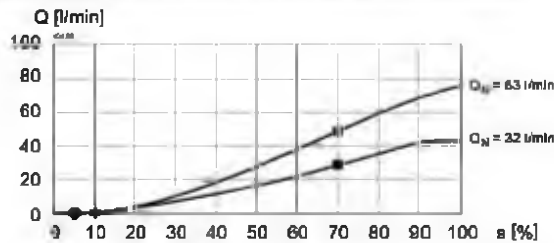
**Note!** The mating connector is not included in the delivery



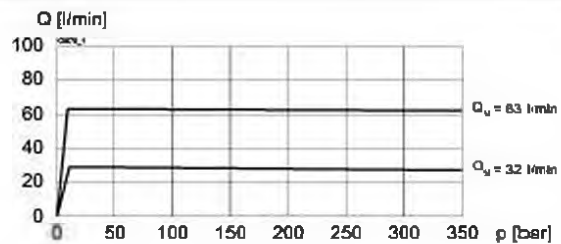
## PERFORMANCE SPECIFICATIONS

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

$Q = f(i)$  **Volume flow signal characteristics**  
 at 50 bar pressure difference /  
 s corresponds to command value signal



$Q = f(p)$  **Volume flow pressure characteristics**

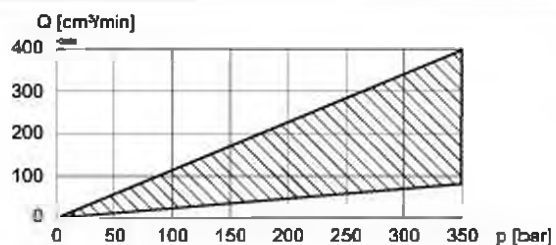


## FACTORY SETTINGS

Dither set for optimum hysteresis

- ◆ = Deadband: solenoid switched off at command value signal < 5 %
  - = Opening pressure at command value signal 10 %
  - = Volume flow at 70% command value signal,  $Q = 42 \text{ l/min}$
- |            |                                   |          |
|------------|-----------------------------------|----------|
| 29,0 l/min | at nominal volume flow rate $Q_N$ | 32 l/min |
| 47,5 l/min | at nominal volume flow rate $Q_N$ | 63 l/min |

$Q_l = f(p)$  **Leakage volume flow characteristics**



## COMMISSIONING

For DSV amplifiers as a rule no parameter adjustments by the customer are required. The plugs have to be connected in accordance with the chapter «Electrical connection».

Controllers are supplied configured as amplifiers. The adjustment of the mode of control and of the controller are carried out by the customer by means of the software adjustment (USB interface, Mini B). Further information can be found

Free- of charge download of the «PASQ» software and the operation instructions for «DSV» hydraulic valves as well as the operation instructions CANopen Protocol resp. Profibus DP Protocol, with Device Profile DSP-408 for «DSV».

**Note!** The mating connectors and the parameterisation cable are not part of the delivery. Refer to chapter «Accessories».

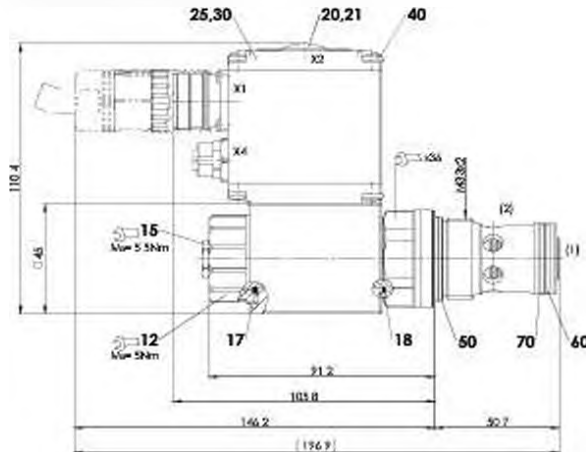
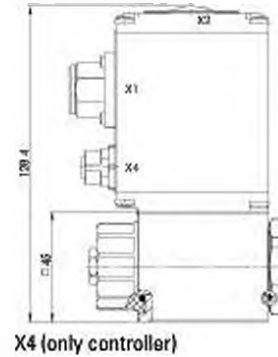
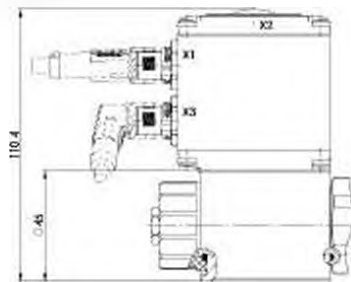
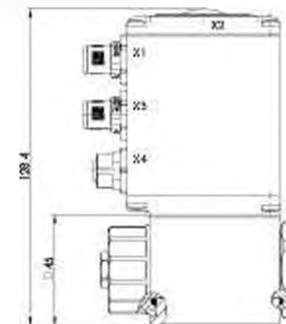


## ACCESSORIES

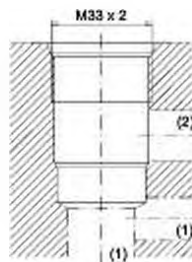
Parameterisation software	See start-up
Parameterisation cable for interface USB (from plug type A on Mini B, 3 m)	Article no. 219.2896
<b>Mating connector (plug female) for analog interface</b>	
straight, soldering contact M23, 12 pole	Article no. 219.2330
straight, soldering contact, 7 pole	Article no. 219.2335
angled, soldering contact M23, 12 pole	Article no. 219.2331
<b>Flange body / sandwich plate NG10</b>	
Threaded body	Data sheet 2.9-205
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

- Attention!** Auxiliary conditions for the cable:
- External diameter 12 pol: 3,5...14,7 mm
  - External diameter 7 pol: 8...10 mm
  - Wire cross section max. 1 mm<sup>2</sup>
  - Recommended wire cross section:  
 0...25 m = 0,75 mm<sup>2</sup> (AWG18)  
 25...50 m = 1 mm<sup>2</sup> (AWG17)



**DIMENSIONS**
**With analog interface, 12 pole connector**  
 Amplifier and controller

**With analog interface, 7 pole connector**  
 Amplifier and controller

**With fieldbus interface**  
 Amplifier

**With fieldbus interface**  
 Controller

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-33-01-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1005

**PARTS LIST**

Position	Article	Description
12	154.2700	Knurled nut
15	253.8000	Manual override HB4,5
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2220	O-ring ID 21,95 x 1,78 (NBR)
20	223.1317	Dummy plug M16 x 1,5
21	160.6131	O-ring ID 13,00 x 1,5 (FKM)
25	062.0102	Cover
30	072.0021	Gasket 33,2 x 59,9 x 2
40	208.0100	Socket head screw M4 x 10
50	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FKM)
60	160.2238	O-ring ID 23,81 x 2,62 (NBR)
	160.6238	O-ring ID 23,81 x 2,62 (FKM)
70	049.3297	Backup ring rd 24,5 x 29 x 1,4



## STANDARDS

Cartridge cavity	ISO 7789
CANopen	DRP 303-1
Profibus DP	IEC 947-5-2
Protection class	EN 60 529
Contamination efficiency	ISO 4406

## SURFACE TREATMENT

- ◆ The cartridge body is gas-nitro-carburised
- ◆ The slip-on coil is zinc- / nickel-coated
- ◆ The electronics housing / chassis is made of aluminium

## INSTALLATION NOTES

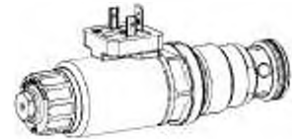
Mounting type	Screw-in cartridge M33 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 80$ Nm Screw-in cartridge $M_0 = 5$ Nm knurled nut

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

**Proportional 2-way flow control poppet cartridge**

- ◆ pilot operated
- ◆  $Q_{max} = 100 \text{ l/min}$
- ◆  $Q_{Nmax} = 80 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**M33 x 2**  
**ISO 7789**

**DESCRIPTION**

Pilot operated, load-compensated proportional flow control poppet valve as screw-in cartridge for cavity according to ISO 7789. When the solenoid is deenergised, the control spool closes practically leakage-free. With increasing solenoid current, the volume flow from the inlet port (2) to the regulated outlet port (1) increases almost independently of the load pressure. For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

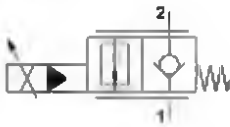
These valves are used in hydraulic systems, in which the positioning of loads and the simultaneous controlling of the lowering of these loads are demanded. The insensitivity to load changes and the very small leakage are a great advantage for this purpose. They are ideally used in the bypass to the pump. The screw-in cartridge is perfectly suitable for installation in control blocks. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

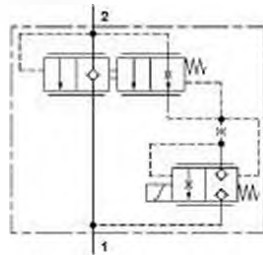
		Q S P PM33 - 80 - [ ] / [ ] - [ ] - [ ] HB4,5 # [ ]	
Flow control valve			
Seat construction			
Proportional			
Screw-in cartridge M33 x 2			
Nominal volume flow rate $Q_N$	80 l/min		
Nominal voltage $U_N$	12 VDC	G12	
	24 VDC	G24	
	without coil	X5	
Slip-on coil	Metal housing round	W	
	Metal housing square	M	
Connection execution	Connector socket EN 175301-803/ISO 4400	D	
	Connector socket AMP Junior - Timer	J	
	Connector Deutsch DT04-2P	G	
Sealing material	NBR		
	FKM (Viton)	D1	
Manual override			
Design index (subject to change)			

**SYMBOL**

Simplified



Detailed


**GENERAL SPECIFICATIONS**

Designation	Proportional 2-way flow control poppet valve
Construction	Pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M33 x 2 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,71 kg
MTTFd	150 years

**MANUAL OVERRIDE**

HB4,5

Optionally: Screw plug (HB0), no actuation possible

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W.S37 / 19 x 50 (Data sheet 1.1-173) M.S35 / 19 x 50 (Data sheet 1.1-174)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	See characteristic
Minimum volume flow	See characteristic
Volume flow direction	2 → 1
Leakage oil	See characteristic
Nominal volume flow range	$Q_n = 80$ l/min
Hysteresis	≤ 5 % at optimal dither signal (100 bar)
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

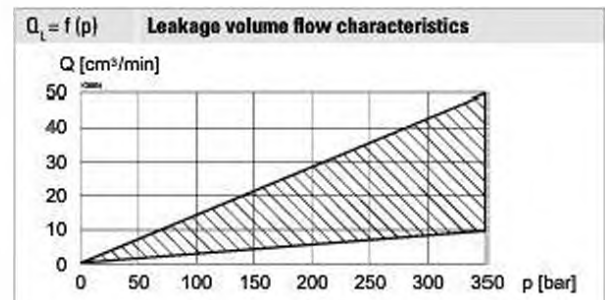
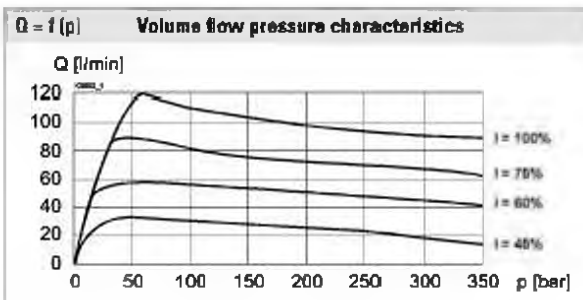
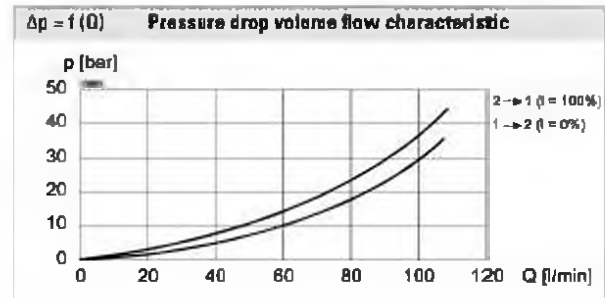
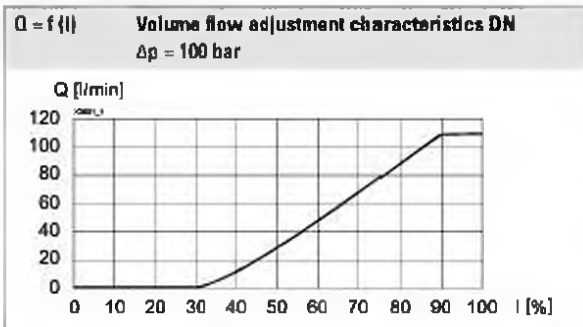
**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1320$ mA ( $U_n = 12$ VDC) $I_a = 660$ mA ( $U_n = 24$ VDC)

**Note!**


Other electrical specifications see data sheet 1.1-173 (slip-on coil W) and 1.1-174 (slip-on coil M)

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACCESSORIES**

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2002
Threaded body	Data sheet 2.9-205
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SURFACE TREATMENT**

- ◆ The cartridge body, the slip-on coil and the armature tube are zinc-nickel coated

**SEALING MATERIAL**

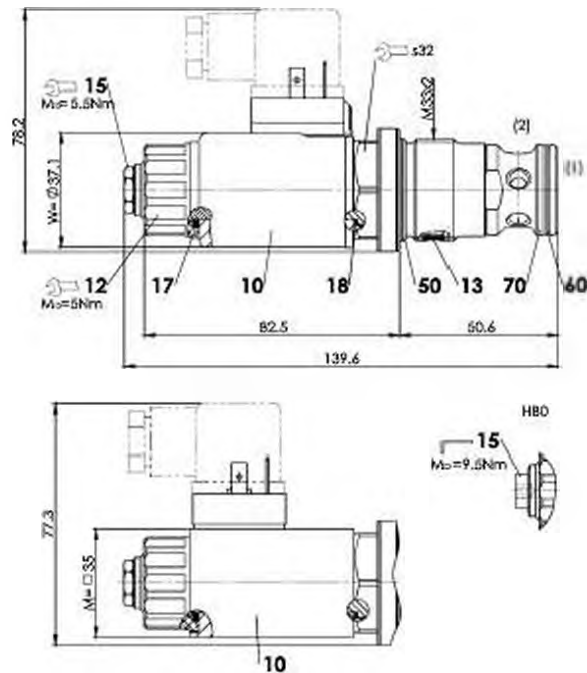
NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

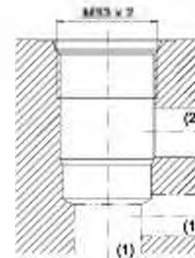
Mounting type	Screw-in cartridge M33 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 130 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-33-01-0-98


**Note!**

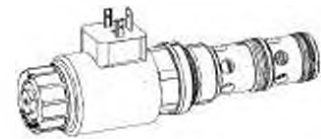

For detailed cavity drawing and cavity tools see data sheet 2.13-1005

**PARTS LIST**

Position	Article	Description
10	206.2...	W.S37 / 19 x 50
	260.5...	M.S35 / 19 x 50
12	154.2700	Knurled nut
13	212.0013	Plastic disc rd 7 x 1,5
15	253.8000	HB4,5 manual override
	239.2033	HBO Screw plug
17	160.2187	O-ring ID 18,72 x 2,62 (NBR)
18	160.2170	O-ring ID 17,17 x 1,78 (NBR)
50	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.8298	O-ring ID 29,82 x 2,62 (FKM)
60	160.2252	O-ring ID 25,12 x 1,78 (NBR)
	160.8252	O-ring ID 25,12 x 1,78 (FKM)
70	049.3296	Back-up ring rd 26,1 x 29,4 x 1,4

**Proportional 3-way flow control valve  
Screw-in cartridge**

- Direct operated, pressure compensated
- $Q_{max} = 100 \text{ l/min}$ ,  $p_{max} = 350 \text{ bar}$
- $Q_{H max} = 63 \text{ l/min}$

**M33 x 2**  
 ISO 7789

**DESCRIPTION**

Direct operated, pressure compensated proportional flow control valve as a screw-in cartridge with a thread M33x2 for cavity acc. to ISO 7788. Two flow ranges are available. The volume flow is adjusted by a Wandfluh proportional solenoid (VDE standard 0580). The cartridge body is made of steel. A special surface treatment guarantees a good protection against corrosion and wear as well as very good low-friction characteristics of the pressure compensating- and throttle spool. The solenoid coil is zinc-nickel-coated.

**FUNCTION**

The 3-way flow control valve serves for maintaining the speed of a consumer constant independent of the load. Superfluous pump output flow is fed into the return flow system in a cost saving manner, and as a result, prevents an overheating of the hydraulic system. The power controlled, proportional solenoid running in oil acts directly on the throttle spool, which opens the throttle segments in the cartridge body. Proportional to the current demand of the proportional solenoid, the throttle aperture changes, and with this the volume flow. In case of a current-free solenoid, the throttle spool is held in closed position by a spring. For driving the valve, Wandfluh proportional amplifiers are available (see Register 1.13).

**APPLICATION**

Proportional flow control valves are suitable for feed control systems, where the consumer flow has to be maintained constant with a changing load. The screw-in cartridge is suitable for installation in control blocks as well as in flange- and sandwich valves of the size NG10. Cavity tools are available for machining the cartridge cavities in steel and aluminium (for hire or for purchase). Please refer to the data sheets in Reg. 2.13 of our documentation.

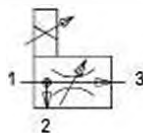
**TYPE CODE**

		Q D P PM33 - [ ] - [ ] / [ ] [ ] - [ ] [ ] # [ ]	
Flow control valve			
3-way			
Proportional			
Screw-in cartridge M33 x 2			
Nominal volume flow rates $Q_n$	32 l/min [32] 63 l/min [63]		
Nominal voltage $U_n$	12 VDC [G12] 24 VDC [G24] without coil [X6]		
Slip-on coil	Metal housing, round [W] Metal housing, square [M*]		
Connection execution	Connector socket EN 175301-803 / ISO 4400 [D] Connector socket AMP Junior-Timer [J] Connector Deutsch DT04-2P [G]		
Sealing material	NBR [ ] FKM (Viton) [D1]		
Manual override	Armature tube closed (standard) [ ] Screwed sealing plug [HB0 ] Manual emergency actuation [HB4 5]		
Design-Index (Subject to change)			

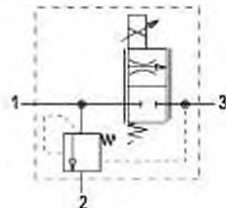
\* Only available in conjunction with other nominal voltages and connection versions. (See data sheet 1.1-181)

**SYMBOLS**

simplified



detailed


**GENERAL SPECIFICATIONS**

Description	3-way proportional flow control valve
Construction	Screw-in cartridge for cavity acc. to ISO 7789
Operation	Proportional solenoid
Mounting	Screw-in thread M33 x 2
Ambient temperature	-20... 50 °C
Mounting position	any
Fastening torque	$M_d = 80 \text{ Nm}$ for screw-in cartridge $M_f = 7 \text{ Nm}$ for knurled nut
Weight	$m = 1,00 \text{ kg}$
Flow direction	see symbol

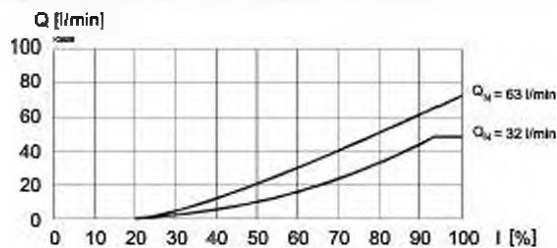
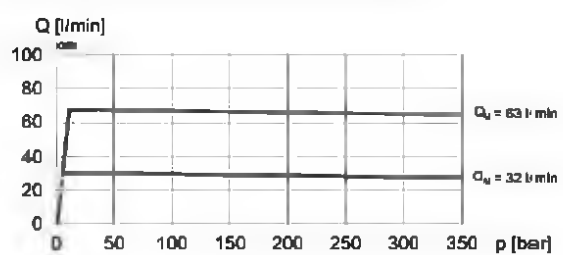
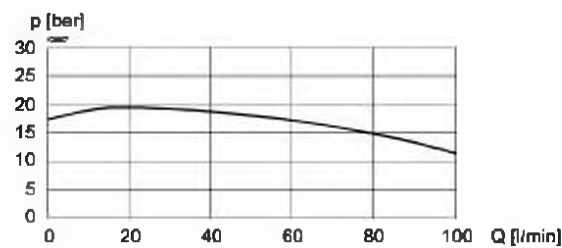
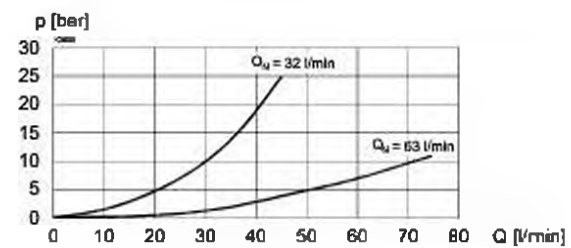
**ELECTRICAL SPECIFICATIONS**

Construction	Proportional solenoid, wet pin push type, pressure tight	
Standard nominal voltage	U = 12 VDC	U = 24 VDC
Limiting current	I <sub>lim</sub> = 1580 mA	I <sub>lim</sub> = 780 mA
Relative duty factor	100 % ED/DF (see data sheet 1.1-430)	
Protection class acc. to EN 60529	Connection version D: IP 65 J: IP 68 G: IP 67 and 69K	

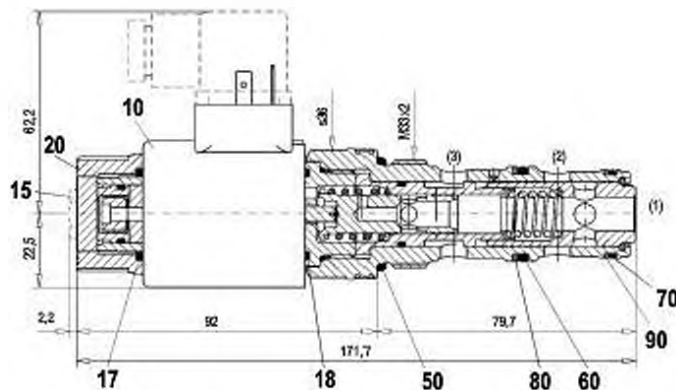
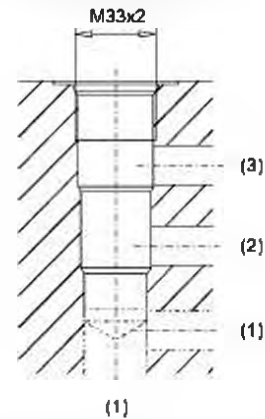
For further electrical specifications see data sheet 1.1-180 (W)  
1.1-181 (M)

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{8...10} \geq 75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	p <sub>max</sub> = 350 bar
Nominal volume flow rates	Q <sub>N</sub> = 32 l/min, 63 l/min
Max. volume flow	Q <sub>max</sub> = 100 l/min (1 → 2)
Min. volume flow	Q <sub>min</sub> = 0,4 l/min
Hysteresis	≤ 5% * * at optimal dither signal

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
**Q = f (I)** Volume flow adjustment characteristics 1 → 3 (p<sub>1</sub> = 100 bar)

**Q = f (p)** Volume flow pressure characteristics (I = I<sub>N</sub>)

**Δp = f (Q)** Pressure drop-volume flow characteristics 1 → 2 (I = 0 mA)

**Δp = f (Q)** Pressure drop-volume flow characteristics 1 → 3 (I = I<sub>N</sub>)


## DIMENSIONS / SECTIONAL DRAWINGS


 Cavity drawing acc. to  
 ISO 7789-33-04-0-88

 For detailed cavity drawing and  
 cavity tools see data sheet 2.13-1040

## PARTS LIST

Position	Article	Description
10	206.1200	EN 175301 Solenoid coil WDS45/23x50-G24
	206.1203	Solenoid coil WDS45/23x50-G12
	206.1201	Junior-Timer Solenoid coil WJS45/23x50-G24
	206.1204	Solenoid coil WJS45/23x50-G12
	206.1202	Deutsch Solenoid coil WGS45/23x50-G24
	206.1205	Solenoid coil WGS45/23x50-G12
15	253.8000	HB 4,5 annual override (data sheet 1.1-300)
	239.2033	HB 0 Plug screw (data sheet 1.1-300)
17	160.2222	O-ring ID 22,22 x 2,62 (NBR)
18	160.2220	O-ring ID 21,95 x 1,78 (NBR)
20	154.2701	Knurled nut
50	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FKM)
60	160.2238	O-ring ID 23,81 x 2,62 (NBR)
	160.6238	O-ring ID 23,81 x 2,62 (FKM)
70	160.2236	O-ring ID 23,52 x 1,78 (NBR)
	160.6236	O-ring ID 23,52 x 1,78 (FKM)
80	049.3297	Backup ring RD 24,5 x 29 x 1,4
	049.3276	Backup ring RD 24,1 x 27 x 1,4

## ACCESSORIES

Flange and sandwich bodies	Data sheet 2.6-862
Line mount body	Data sheet 2.9-210
Proportional amplifier	Register 1.13
Mating connector EN 175301-803	Article no. 218.2002

Technical explanation see data sheet 1.0-100





**GENERAL SPECIFICATIONS**

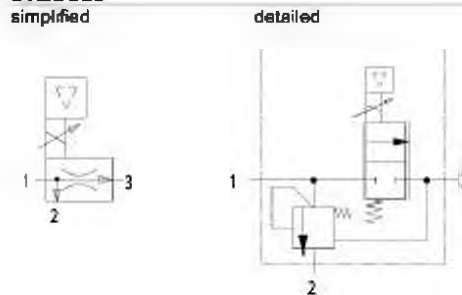
<b>Description</b>	3-way proportional flow control valve with integrated electronics
<b>Construction</b>	Screw-in cartridge for cavity acc. to ISO 7789
<b>Operations</b>	Proportional solenoid, wet pin push type, pressure light
<b>Mounting</b>	Screw-in thread M33x2
<b>Ambient temperature</b>	-20...85 °C (typical) <small>(The upper temperature limit is a guideline value for typical applications. In individual cases it may also be higher or lower. The electronics of the valve limit the power in case of a too high electronics temperature. More detailed information can be obtained from the operating instructions «DSVs».)</small>
<b>Mounting position</b>	any, preferably horizontal
<b>Fastening torque</b>	$M_D = 80 \text{ Nm}$ for screw-in cartridge $M_D = 5 \text{ Nm}$ for knurled nut
<b>Weight</b>	$m = 1,8 \text{ kg}$
<b>Flow direction</b>	see symbol

**HYDRAULIC SPECIFICATIONS**

<b>Fluid</b>	Mineral oil, other fluid on request
<b>Contamination efficiency</b>	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{8...10} \geq 75$ ) see data sheet 1.0-50/2
<b>Viscosity range</b>	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
<b>Fluid temperature</b>	-20...+70 °C
<b>Peak pressure</b>	$p_{max} = 350 \text{ bar}$
<b>Nominal volume flow rates</b>	$Q_N = 32 \text{ l/min}, 63 \text{ l/min}$
<b>Max. volume flow</b>	$Q_{max} = 100 \text{ l/min}$ (1 → 2)
<b>Min. volume flow</b>	$Q_{min} = 0,2 \text{ l/min}$
<b>Hysteresis</b>	≤ 5%

**ELECTRICAL SPECIFICATIONS**

<b>Protection class</b>	IP 67 acc. to EN 60 529 with suitable connector and closed electronics housing
<b>Supply voltage</b>	12 VDC or 24 VDC
<b>Ramps</b>	adjustable
<b>Parameterisation</b>	via fieldbus or USB
<b>Interface</b>	USB (Mini B) for parameterisation with «PASO» <small>under the closing screw of the housing cover, Preset ex-works</small>
<b>Analog interface:</b>	
<b>Device receptacle (male)</b>	M23, 12-poles
<b>Mating connector</b>	Plug (female), M23, 12-poles <small>(not incl. in delivery)</small>
<b>Preset value signal</b>	Input voltage / current as well as signal range can be set by software
<b>Fieldbus interface:</b>	
<b>Device receptacle supply (male)</b>	M12, 4-poles
<b>Mating connector</b>	Plug (female), M12, 4-poles <small>(not incl. in delivery)</small>
<b>Device receptacle CANopen (male)</b>	M12, 5-poles (acc. to DRP 303-1)
<b>Mating connector</b>	Plug (female), M12, 5-poles <small>(not incl. in delivery)</small>
<b>Device receptacle Profibus (female)</b>	M12, 5-poles, B-coded (acc. to IEC 947-5-2)
<b>Mating connector</b>	Plug (male), M12, 5-poles, B-coded <small>(not incl. in delivery)</small>
<b>Preset value signal</b>	Fieldbus

**SYMBOLS**

**CONNECTOR WIRING DIAGRAM**
**Analog Interface:**
**Device receptacle (male) X1**


- 1 = Supply voltage +
- 2 = Supply voltage 0 VDC
- 3 = Stabilised output voltage
- 4 = Preset value voltage +
- 5 = Preset value voltage -
- 6 = Preset value current +
- 7 = Preset value current -
- 8 = Reserved for extensions
- 9 = Reserved for extensions
- 10 = Enable control (Digital input)
- 11 = Error signal (Digital output)
- 12 = Chassis

Preset value voltage (PIN 4/5) resp. current (PIN 6/7) are selected with set-up and diagnosis software PASO.  
Factory setting: Voltage (0...+10 V), (PIN 4/5)

**Fieldbus interface:**
**Device receptacle supply (male) X1**


- MAIN**
- 1 = Supply voltage +
  - 2 = Reserved for extensions
  - 3 = Supply voltage 0 VDC
  - 4 = Chassis

**Device receptacle CANopen (male) X3**


- CAN**
- 1 = not connected
  - 2 = not connected
  - 3 = CAN Gnd
  - 4 = CAN High
  - 5 = CAN Low

**Device receptacle Profibus (female) X3**


- PROFIBUS**
- 1 = VP
  - 2 = Rx/D/TxD - N
  - 3 = DGND
  - 4 = Rx/D/TxD - P
  - 5 = Shield

**Parameterisation Interface (USB, Mini B) X2**

Under the closing screw of the housing cover



**NOTE!**  
 Detailed electrical characteristics and description of «DSV» electronics are shown on data sheet 1.13-76.

Free-of-charge download of the «PASO»-software and the instruction manual for the «DSV» hydraulic valves as well as the operation instruction **CANopen** eg. **Profibus DP** protocol with device profile **DSP-408** for «DSV».

**START-UP**

For DSV amplifiers as a rule no parameter settings by the customer are required. The plugs have to be connected in accordance with the chapter «Pin assignments».

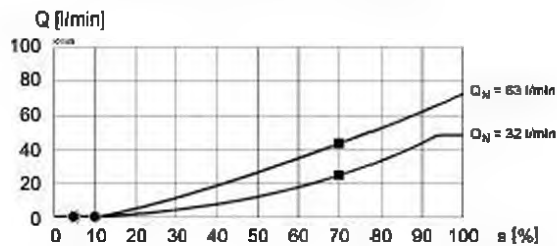

**NOTE!**

The mating connectors and the cable to adjust the settings are not part of the delivery. Refer to chapter «Accessories».

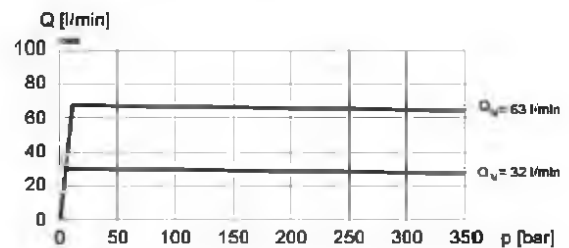
Additional information can be found on our website:

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

$Q = f(i)$  Volume flow adjustment characteristics  
 [at  $p=50 \text{ bar}$ ]  
 (a corresponds to preset value signal)



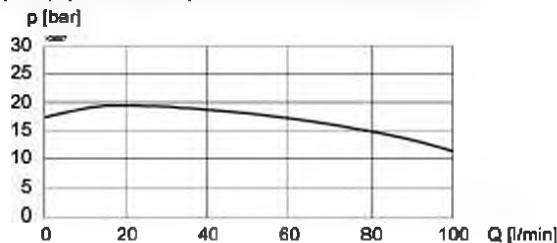
$Q = f(p)$  Volume flow pressure characteristics


**Factory settings:**

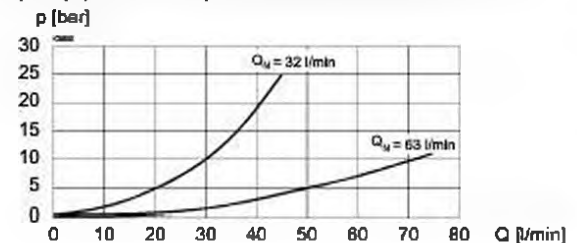
Dither set for optimal hysteresis

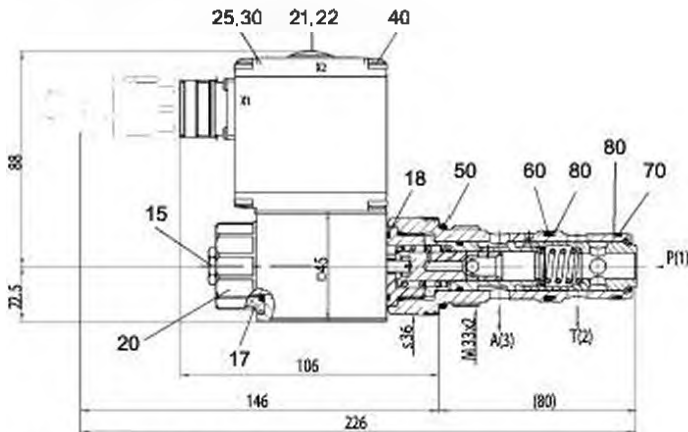
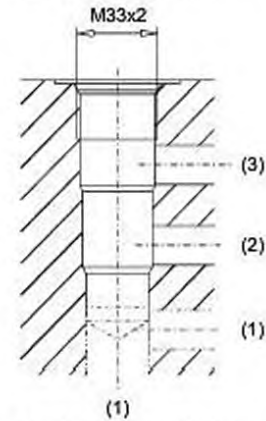
- = Deadband: Solenoid switched off with command signal <5%
- = Opening point: at 50%
- = Flow  $p = 50 \text{ bar}$  with 70% value signal  
 42 l/min with  $Q_N = 25 \text{ l/min}$  (Q in interface 1 = 80 l/min)  
 21 l/min with  $Q_N = 10 \text{ l/min}$  (Q in interface 1 = 40 l/min)

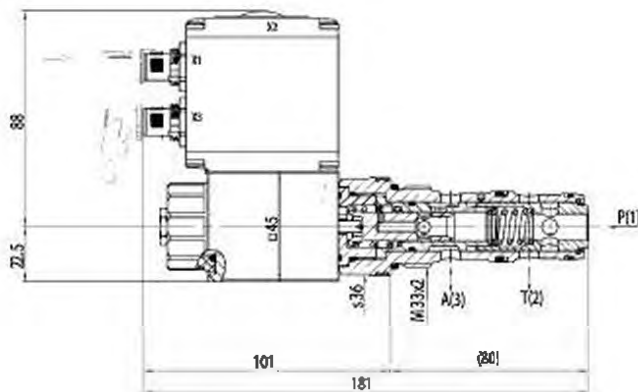
$\Delta p = f(Q)$  Pressure drop volume flow characteristics 1 → 2



$\Delta p = f(Q)$  Pressure drop volume flow characteristics 1 → 3



**DIMENSIONS / SECTIONAL DRAWINGS**
**With analog interface**

 Cavity drawing acc. to  
 ISO 7789-33-04-0-98

 For detailed cavity drawing and cavity tools  
 see data sheet 2.13-1040

**With fieldbus interface**

**PARTS LIST**

Position	Article	Description
15	253.8000	HB 4,5 Manual override (data sheet 1.1-300)
17	180.2187	O-ring ID 18,72 x 2,62 (NBR)
18	180.2220	O-ring ID 21,85 x 1,78 (NBR)
20	154.2700	Knurled nut
21	223.1317	Dummy plug M16 x 1,5
22	180.6131	O-ring ID 13,00 x 1,5
25	082.0102	Cover square
30	072.0021	Gasket 33,2 x 59,9 x 2
40	208.0100	Socket head cap screw M4 x 10
50	180.2298	O-ring ID 29,82 x 2,62 (NBR)
	180.6286	O-ring ID 29,82 x 2,62 (FKM)
80	180.2238	O-ring ID 23,81 x 2,62 (NBR)
	180.6238	O-ring ID 23,81 x 2,62 (FKM)
70	180.2236	O-ring ID 23,52 x 1,78 (NBR)
	180.6236	O-ring ID 23,52 x 1,78 (FKM)
80	049.3297	Backup ring RD 24,5 x 29 x 1,4
90	049.3276	Backup ring RD 24,1 x 27 x 1,4

**ACCESSORIES**

- Flange and sandwich bodies Data sheet 2.6-862
  - Line mount body Data sheet 2.9-210
  - Set-up software see start-up
  - Cable to adjust the settings through interface USB article no. 219.2896  
(from plug type A to Mini B, 3 m)
  - Mating connector (plug female) for the analogue interface:
    - straight, soldering contact article no. 219.2330
    - soldering contact article no. 219.2331
- Recommended cable size:**
- Outer diameter 9...10,5 mm
  - Single wire max. 1 mm<sup>2</sup>
  - Recommended wire size:
    - 0...25 m = 0,75 mm<sup>2</sup> (AWG18)
    - 25...50 m = 1 mm<sup>2</sup> (AWG17)

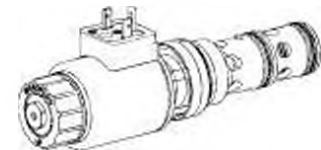
Technical explanation see data sheet 1.0-100


**NOTE!**

The cable connector is not part of the delivery. Regarding the dimensions see also the connector in the chapter «Accessories».

**Proportional 3-way flow control valve  
Screw-in cartridge**

- Direct operated, pressure compensated
- $Q_{max} = 100 \text{ l/min}$ ,  $p_{max} = 350 \text{ bar}$
- $Q_{Hmax} = 63 \text{ l/min}$

**1<sup>5</sup>/<sub>16</sub>"-12 UN**  
 Wandfluh standard

**DESCRIPTION**

Direct operated, pressure compensated proportional flow control valve as a screw-in cartridge with a thread 1<sup>5</sup>/<sub>16</sub>"-12 UN for cavity acc. to Wandfluh standard. Two flow ranges are available. The volume flow is adjusted by a Wandfluh proportional solenoid (VDE standard 0580). The cartridge body is made of steel. A special surface treatment guarantees a good protection against corrosion and wear as well as very good low-friction characteristics of the pressure compensating- and throttle spool. The solenoid coil is zinc-nickel-coated.

**FUNCTION**

The 3-way flow control valve serves for maintaining the speed of a consumer constant independent of the load. Superfluous pump output flow is fed into the return flow system in a cost saving manner, and as a result, prevents an overheating of the hydraulic system. The power controlled, proportional solenoid running in oil acts directly on the throttle spool, which opens the throttle segments in the cartridge body. Proportional to the current demand of the proportional solenoid, the throttle aperture changes, and with this the volume flow. In case of a current-free solenoid, the throttle spool is held in closed position by a spring. For driving the valve, Wandfluh proportional amplifiers are available (see Register 1.13).

**APPLICATION**

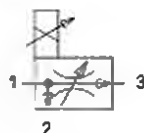
Proportional flow control valves are suitable for feed control systems, where the consumer flow has to be maintained constant with a changing load. The screw-in cartridge is suitable for installation in control blocs.

**TYPE CODE**

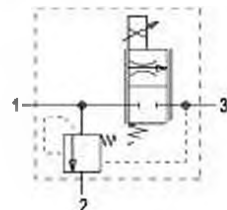
		Q D P PU16 - [ ] - [ ] / [ ] [ ] - [ ] [ ] # [ ]									
Flow control valve											
3-way											
Proportional											
Screw-in cartridge 1 <sup>5</sup> / <sub>16</sub> "-12 UN											
Nominal volume flow rate $Q_n$	32 l/min [32] 63 l/min [63]										
Nominal voltage $U_n$	12 VDC [G12] 24 VDC [G24] without coil [X5]										
Slip-on coil	Metal housing, round [W] Metal housing, square [M]										
Connection execution	Connector socket EN 175301-803 / ISO 4400 [D] Connector socket AMP Junior-Timer [J] Connector Deutsch DT04-2P [G]										
Sealing material	NBR [ ] FKM (Viton) [D1]										
Manual override	Armature tube closed (standard) [ ] Screwed sealing plug [HB0] Manual emergency actuation [HB4.5]										
Design-Index (Subject to change)											

**SYMBOLS**

simplified



detailed


**GENERAL SPECIFICATIONS**

Description	3-way proportional flow control valve
Construction	Screw-in cartridge for cavity according to Wandfluh Standard
Operation	Proportional solenoid
Mounting	Screw-in thread 1 <sup>5</sup> / <sub>16</sub> "-12 UN
Ambient temperature	-25...50°C
Mounting position	any
Fastening torque	$M_o = 80 \text{ Nm}$ for screw-in cartridge $M_n = 7 \text{ Nm}$ for knurled nut
Weight	$m = 1,00 \text{ kg}$
Flow direction	see symbol

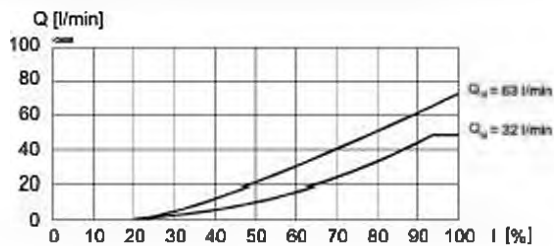
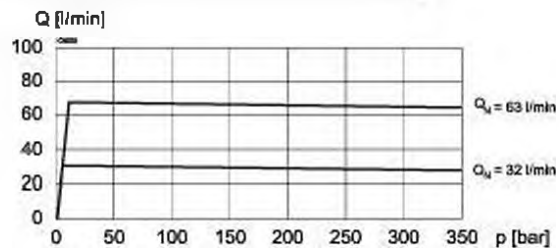
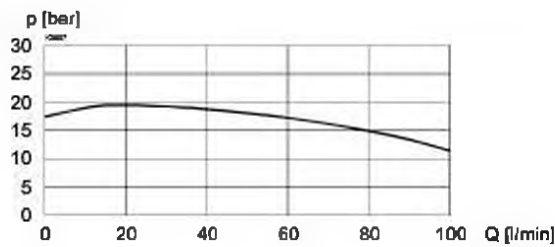
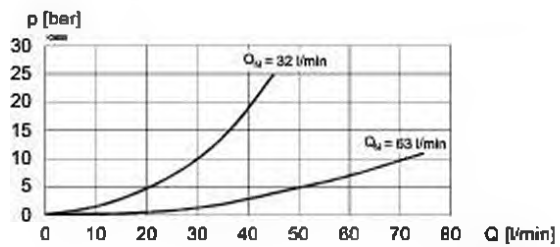
**ELECTRICAL SPECIFICATIONS**

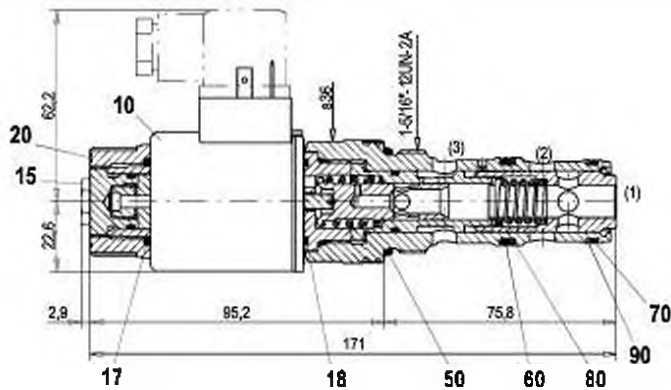
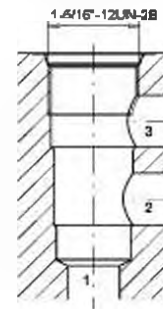
Construction	Proportional solenoid, wet pin push type, pressure tight	
Standard nominal voltage	U = 12 VDC	U = 24 VDC
Limiting current	I <sub>L</sub> = 1580 mA	I <sub>C</sub> = 780 mA
Relative duty factor	100% ED/DF (see data sheet 1.1-430)	
Protection class acc. to EN60529	Connection version D: IP65 J: IP66 G: IP67 and 69K	

For further electrical specifications see data sheet 1.1-180 (W)  
1.1-181 (M)

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{8...10} \geq 75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	p <sub>max</sub> = 350 bar
Nominal volume flow rates	Q <sub>N</sub> = 32 l/min, 63 l/min
Max. volume flow	Q <sub>max</sub> = 100 l/min (1 → 2)
Min. volume flow	Q <sub>min</sub> = 0,4 l/min
Hysteresis	≤ 5% * * at optimal dither signal

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
**Q = f (I) Volume flow adjustment characteristics 1 → 3 (p<sub>s</sub> = 100 bar)**

**Q = f (p) Volume flow pressure characteristics (I = I<sub>N</sub>)**

**Δp = f (Q) Pressure drop-volume flow characteristics 1 → 2 (I = 0 mA)**

**Δp = f (Q) Pressure drop-volume flow characteristics 1 → 3 (I = I<sub>N</sub>)**


**DIMENSIONS / SECTIONAL DRAWINGS**

 Cavity drawing acc. to  
 Wandfluh standard

 For detailed cavity drawing  
 see data sheet 2.13-1046

**PARTS LIST**

Position	Article	Description
10	206.1200	EN 175301 Solenoid coil WD45/23 x 50-G24
	206.1203	Solenoid coil WD45/23 x 50-G12
	206.1201	Junior-Timer Solenoid coil WJ45/23 x 50-G24
	206.1204	Solenoid coil WJ45/23 x 50-G12
	206.1202	Deutsch Solenoid coil WG45/23 x 50-G24
	206.1205	Solenoid coil WG45/23 x 50-G12
15	253.8000	HB 4,5 anual override (data sheet 1.1-300)
	239.2033	HB 0 Plug screw (data sheet 1.1-300)
17	160.2222	O-ring ID 22,22 x 2,62 (NBR)
18	160.2220	O-ring ID 21,95 x 1,78 (NBR)
20	154.2701	Knurled nut
50	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FKM)
60	160.2238	O-ring ID 23,81 x 2,62 (NBR)
	160.6238	O-ring ID 23,81 x 2,62 (FKM)
70	160.2236	O-ring ID 23,52 x 1,78 (NBR)
	160.6236	O-ring ID 23,52 x 1,78 (FKM)
80	049.3297	Backup ring RD 24,5 x 29 x 1,4
90	049.3276	Backup ring RD 24,1 x 27 x 1,4

**ACCESSORIES**

 Proportional amplifier  
 Mating connector EN 175301-803

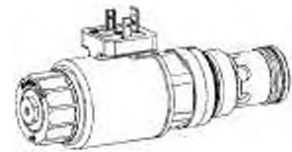
 Register 1.13  
 Article no. 218.2002

Technical explanation see data sheet 1.0-100



**Proportional 2-way flow control cartridge**

- ◆ direct operated
- ◆  $Q_{max} = 80$  l/min
- ◆  $Q_{Nmax} = 80$  l/min
- ◆  $p_{max} = 350$  bar

**1 1/16" - 12 UN**

**DESCRIPTION**

Direct operated, load compensated proportional flow control valve as screw-in cartridge for UNF cavity. When the solenoid is de-energised, the control spool closes practically leakage-free. The change of the electric current is followed by a proportional volume flow change. From the input (1), the fluid flows over the control and throttling spool to the controlled output (2). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

Proportional flow control valves are suitable for precise speed control, where the load current has to be maintained constant independent of the input and output pressure. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

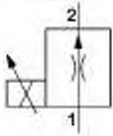
**TYPE CODE**

		Q N P PU16 - [ ] - [ ] / [ ] JC [ ] - [ ] HB4,5 # [ ]	
Flow control valve			
Normally closed			
Proportional			
Screw-in cartridge 1 1/16" - 12 UN			
Nominal volume flow rate $Q_N$	32 l/min [32]	80 l/min [80]	
	63 l/min [63]		
Nominal voltage $U_N$	12 VDC [G12]		
	24 VDC [G24]		
	without coil [X5]		
Slip-on coil	Metal housing round [W]		
	Metal housing square [M]		
Connection execution	Connector socket EN 175301-803/ISO 4400 [D]		
	Connector socket AMP Junior - Timer [J]		
	Connector Deutsch DTD4-2P [G]		
Sealing material	NBR [D1]		
	FKM (Viton)		
Manual override			
Design index (subject to change)			

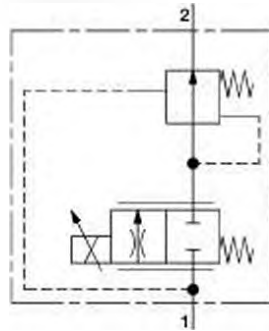


**SYMBOL**

Simplified



Detailed QN...


**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	W.S45 / 23 x 50 (Data sheet 1.1-180) M.S45 / 23 x 50 (Data sheet 1.1-181)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**GENERAL SPECIFICATIONS**

Designation	Proportional 2-way flow control valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	1 1/4" - 12 UN according to Wandfluh standard
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	0,95 kg
MTTFd	150 years

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 80$ l/min
Minimum volume flow	$Q_{min} = 0,2$ l/min
Volume flow direction	1 → 2
Leakage oil	See characteristics
Nominal volume flow range	$Q_n = 32; 63; 80$ l/min
Hysteresis	≤ 5 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s... 320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

**MANUAL OVERRIDE**

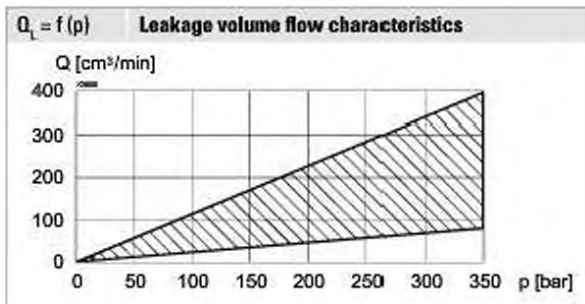
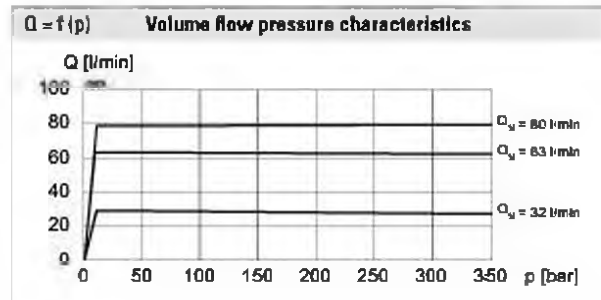
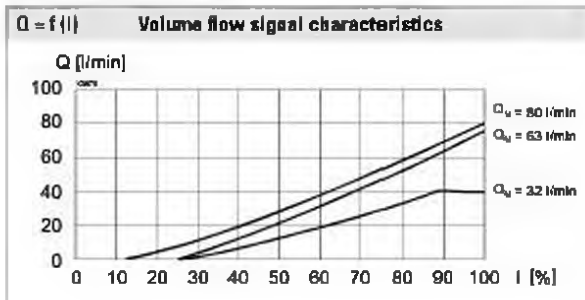
HB4,5

Optionally: Screw plug (HB0), no actuation possible

**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 1560$ mA ( $U_x = 12$ VDC) $I_a = 780$ mA ( $U_x = 24$ VDC)

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACCESSORIES**

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2002
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SURFACE TREATMENT**

- ◆ The cartridge body is gas-nitro-carburised
- ◆ The armature tube and the slip-on coil are zinc- / nickel-coated

**SEALING MATERIAL**

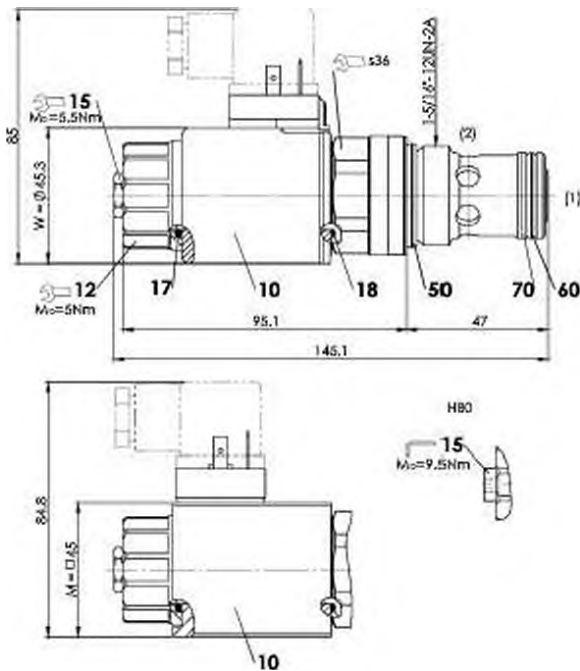
NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

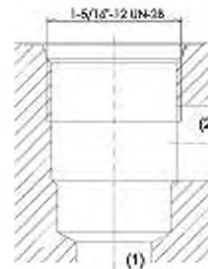
Mounting type	Screw-in cartridge 1 1/8" -12 UN
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 80 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HB4,5

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 – 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to Wandfluh standard

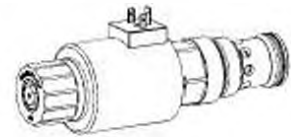

**Attention!** For detailed cavity drawing and cavity tools see data sheet 2.13-1049

**PARTS LIST**

Position	Article	Description
10	206.12..	W.S45 / 23 x 50
	206.7...	M.S45 / 23 x 50
12	154.2701	Knurled nut M23 x 1,5 x 19,7
15	253.8000	HB4,5 manual override
	239.2033	HBO Screw plug
17	160.2222	O-ring ID 22,22 x 2,62 (NBR)
18	160.2220	O-ring ID 21,95 x 1,78 (NBR)
50	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FMK)
60	160.2238	O-ring ID 23,81 x 2,62 (NBR)
	160.6238	O-ring ID 23,81 x 2,62 (FMK)
70	049.3297	Backup ring rd 24,5 x 29 x 1,4

**Proportional 2-way flow control cartridge**

- ◆ direct operated
- ◆  $Q_{Nmax} = 170$  l/min
- ◆  $Q_{Nmax} = 160$  l/min
- ◆  $p_{nom} = 350$  bar

**M42 x 2**  
**ISO 7789**

**DESCRIPTION**

Direct operated, pressure compensated proportional flow control valve in screw-in cartridge construction for cavity according to ISO 7789. With the solenoid deenergised, the control spool is held in the closed position by a spring. The change of the electric current is followed by a proportional volume flow change. From the input (1), the fluid flows over the control and throttling spool to the controlled output (2). For the control, Wandfluh proportional amplifiers are available (see register 1.13).

**APPLICATION**

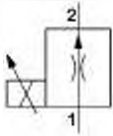
Proportional flow control valves are suitable for precise speed control, where the load current has to be maintained constant independent of the input and output pressure. The screw-in cartridge is perfectly suitable for installation in control blocks. For machining the cartridge cavity in steel and aluminum blocks, cavity tools are available (hire or purchase). Please refer to the data sheets in register 2.13.

**TYPE CODE**

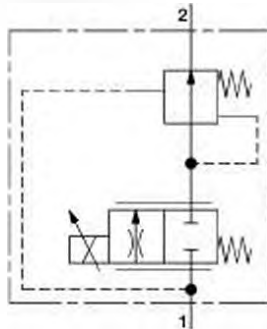
		Q N P PM42 -				/				#
Flow control valve										
Normally closed										
Proportional										
Screw-in cartridge M42 x 2										
Nominal volume flow rate $Q_N$	100 l/min									
	160 l/min									
Nominal voltage $U_N$	12 VDC									
	24 VDC									
	without coil									
Slip-on coil	Metal housing round									
	Metal housing square									
Connection execution	Connector socket EN 175301-803/ISO 4400									
	Connector socket AMP Junior - Timer									
	Connector Deutsch DT04-2P									
Sealing material	NBR									
	FKM (Viton)									
Manual override										
Design index (subject to change)										

**SYMBOL**

Simplified



Detailed QN...


**GENERAL SPECIFICATIONS**

Designation	Proportional 2-way flow control valve
Construction	Direct operated
Mounting	Screw-in cartridge construction
Nominal size	M42 x 2 according to ISO 7789
Actuation	Proportional solenoid
Ambient temperature	-25...+70 °C
Weight	2,26 kg
MTTFd	150 years

**MANUAL OVERRIDE**

HC8,5

Optionally: Screw plug (HB0), no actuation possible

**ACTUATION**

Actuation	Proportional solenoid, wet pin push type, pressure tight
Execution	WE64 / 31 x 72 (Data sheet 1.1-190) M..60 / 31 x 72 (Data sheet 1.1-193)
Connection	Connector socket EN 175301 – 803 Connector socket AMP Junior-Timer Connector Deutsch DT04 – 2P

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
Maximum volume flow	$Q_{max} = 170$ l/min
Minimum volume flow	$Q_{min} = 0,5$ l/min
Volume flow direction	1 → 2
Leakage oil	See characteristics
Nominal volume flow range	$Q_n = 100; 160$ l/min
Hysteresis	≤ 7 % at optimal dither signal
Repeatability	≤ 3 % at optimal dither signal
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 18 / 16 / 13
Filtration	Required filtration grade B 6...10 ≥ 75, see data sheet 1.0-50

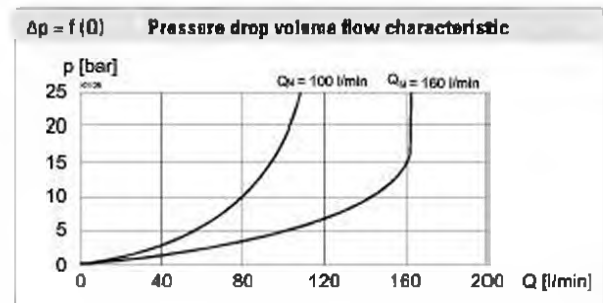
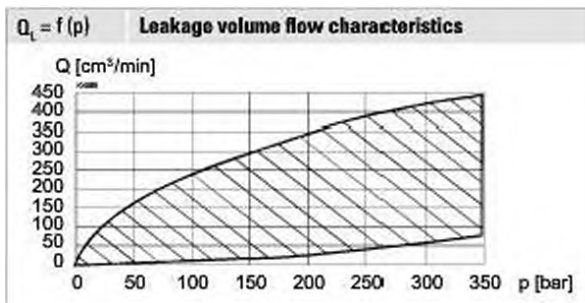
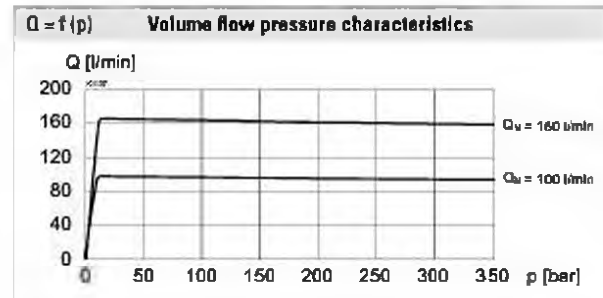
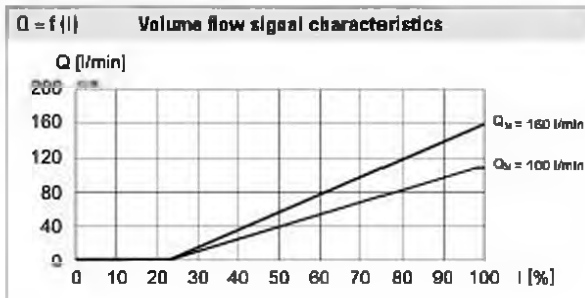
**ELECTRICAL SPECIFICATIONS**

Protection class	Connection execution D: IP65 Connection execution J: IP66 Connection execution G: IP67 and IP69K
Relative duty factor	100 % DF
Standard nominal voltage	12 VDC, 24 VDC
Limiting current at 50 °C	$I_a = 2255$ mA ( $U_n = 12$ VDC) $I_a = 1105$ mA ( $U_n = 24$ VDC)

**Nota!**


Other electrical specifications see data sheet 1.1-190 (slip-on coil W) and 1.1-193 (slip-on coil M)

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**ACCESSORIES**

Proportional amplifier	Register 1.13
Electric plug B (black)	Article no. 219.2002
Threaded body	Data sheet 2.9-205
Technical explanations	Data sheet 1.0-100
Filtration	Data sheet 1.0-50

**SURFACE TREATMENT**

- ◆ The cartridge body is gas-nitro-carburised
- ◆ The armature tube and the slip-on coil are zinc- / nickel-coated

**SEALING MATERIAL**

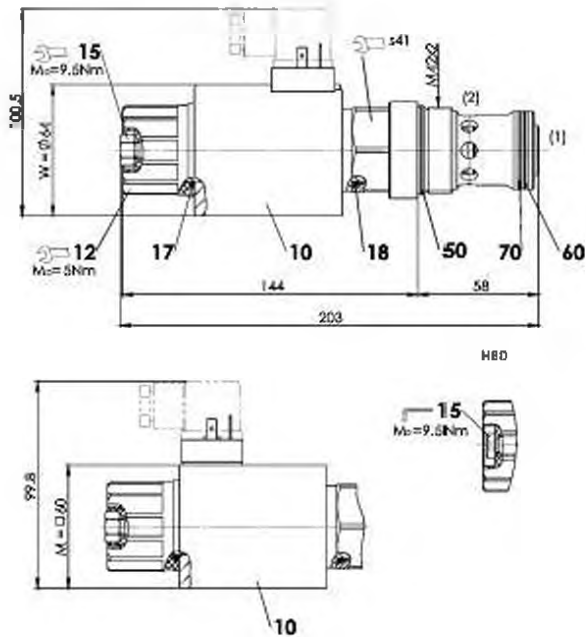
NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

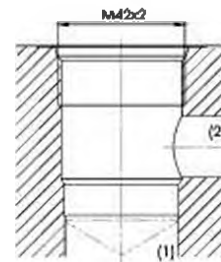
Mounting type	Screw-in cartridge M42 x 2
Mounting position	Any, preferably horizontal
Tightening torque	$M_0 = 280 \text{ Nm}$ Screw-in cartridge $M_0 = 5 \text{ Nm}$ knurled nut $M_0 = 9,5 \text{ Nm}$ HB0 $M_0 = 5,5 \text{ Nm}$ HC9,5

**STANDARDS**

Cartridge cavity	ISO 7789
Solenoids	DIN VDE 0580
Connection execution D	EN 175301 - 803
Protection class	EN 60 529
Contamination efficiency	ISO 4406

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-42-01-0-07


**Note!**

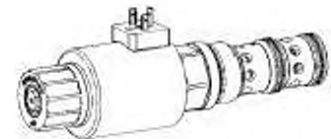
For detailed cavity drawing and cavity tools see data sheet 2.13-1050


**PARTS LIST**

Position	Article	Description
10	206.3...	WE64 / 31 x 72
	260.9...	M. 60 / 31 x 72
12	154.2706	Knurled nut
15	253.8022	HC8,5 manual override
	239.2033	HBD Screw plug
17	160.2282	O-ring ID 28,24 x 2,62 (NBR)
50	160.2377	O-ring ID 37,77 x 2,62 (NBR)
	160.8378	O-ring ID 37,77 x 2,62 (FKM)
60	160.2329	O-ring ID 32,99 x 2,62 (NBR)
	160.6325	O-ring ID 32,99 x 2,62 (FKM)
70	049.3384	Backup ring rd 33,5 x 38 x 1,4

**Proportional 3-way flow control valve  
Screw-in cartridge**

- Direct operated, pressure compensated
- $Q_{max} = 200 \text{ l/min}$ ,  $p_{max} = 350 \text{ bar}$
- $Q_{Hmax} = 160 \text{ l/min}$

**M42 x 2**  
 ISO 7789

**DESCRIPTION**

Direct operated, pressure compensated proportional flow control valve as a screw-in cartridge with a thread M42x2 for cavity acc. to ISO 7789. The volume flow is adjusted by a Wandfluh proportional solenoid (VDE standard 0580). The cartridge body is made of steel. A special surface treatment guarantees a good protection against corrosion and wear as well as very good low-friction characteristics of the pressure compensating- and throttle spool. The solenoid coil is zinc- / nickel-coated.

**FUNCTION**

The 3-way flow control valve serves for maintaining the speed of a consumer constant independent of the load. Superfluous pump output flow is fed into the return flow system in a cost saving manner, and as a result, prevents an overheating of the hydraulic system. The power controlled, proportional solenoid running in oil acts directly on the throttle spool, which opens the throttle segments in the cartridge body. Proportional to the current demand of the proportional solenoid, the throttle aperture changes, and with this the volume flow. In case of a current-free solenoid, the throttle spool is held in closed position by a spring. For driving the valve, Wandfluh proportional amplifiers are available (see Register 1.13).

**APPLICATION**

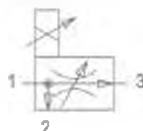
Proportional flow control valves are suitable for feed control systems, where the consumer flow has to be maintained constant with a changing load. The screw-in cartridge is suitable for installation in control blocs.

**TYPE CODE**

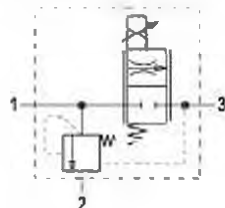
		Q D P PM42 - 160 - [ ] / W [ ] - [ ] [ ] # [ ]			
Flow control valve					
3-way					
Proportional					
Screw-in cartridge M42x2					
Nominal volume flow rate $Q_n$	160 l/min				
Nominal voltage $U_n$	12 VDC 24 VDC without coil	G12 G24 X5			
Slip-on coil	Metal housing, round				
Connection execution	Connector socket EN 175301-803 / ISO 4400 Connector socket AMP Junior-Timer Connector Deutsch DT04-2P	D J G			
Sealing material	NBR FKM (Viton)	D1			
Manual override	Screwed sealing plug Manual emergency actuation	H80 HC8.5			
Design-Index (Subject to change)					

**SYMBOLS**

simplified



detailed


**GENERAL SPECIFICATIONS**

Description	3-way proportional flow control valve
Construction	Screw-in cartridge for cavity acc. to ISO 7789
Operation	Proportional solenoid
Mounting	Screw-in thread M42 x 2
Ambient temperature	-20...70 °C
Mounting position	any
Fastening torque	$M_c = 100 \text{ Nm}$ for screw-in cartridge $M_b = 5 \text{ Nm}$ for knurled nut
Weight	$m = 2,34 \text{ kg}$
Flow direction	see symbol



**ELECTRICAL SPECIFICATIONS**

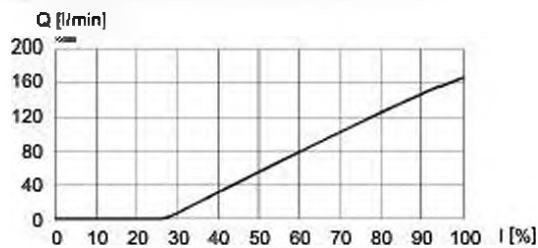
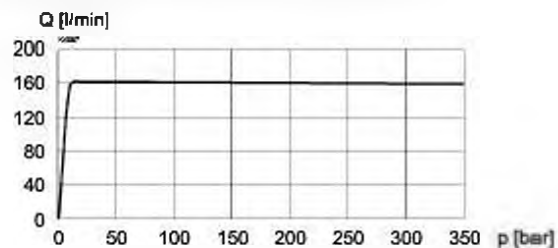
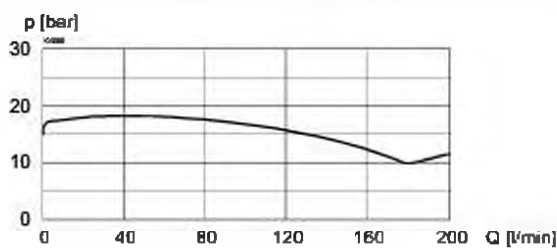
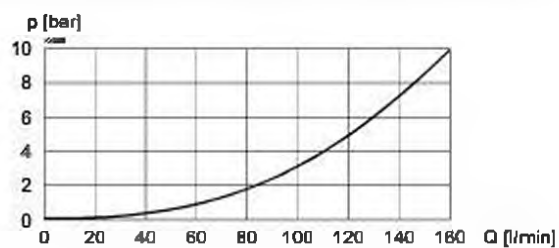
Construction	Proportional solenoid, wet pin push type, pressure tight	
Standard nominal voltage	U = 12 VDC	U = 24 VDC
Limiting current	I <sub>lim</sub> = 2255 mA	I <sub>lim</sub> = 1105 mA
Relative duty factor	100 % ED/DF (see data sheet 1.1-430)	
Protection class acc. to EN 60529	Connection version D: IP65 J: IP68 G: IP67 and 69K	

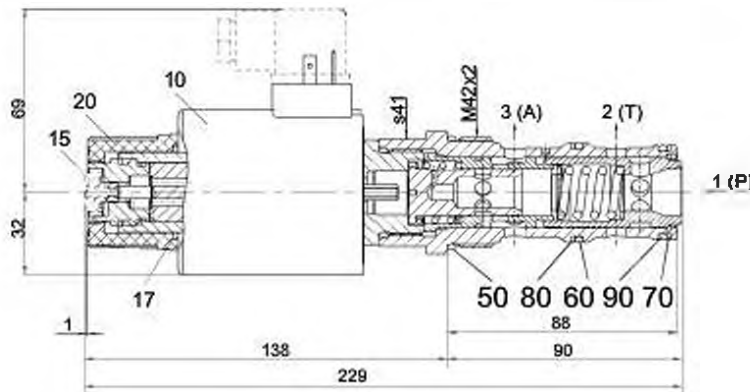
For further electrical specifications see data sheet 1.1-191

**HYDRAULIC SPECIFICATIONS**

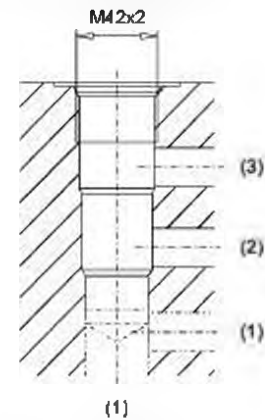
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade $\beta_{8...10} \geq 75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	p <sub>max</sub> = 350 bar
Nominal volume flow rates	Q <sub>N</sub> = 160 l/min
Max. volume flow	Q <sub>max</sub> = 200 l/min (1 → 2)
Min. volume flow	Q <sub>min</sub> = 0,5 l/min
Hysteresis	≤ 6% * * at optimal dither signal

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

 Q = f (I) Volume flow signal characteristics (p<sub>1</sub> = 100 bar)

 Q = f (p) Volume flow pressure characteristics (I = I<sub>N</sub>)

 $\Delta p = f(Q)$  Pressure drop-volume flow characteristics 1 → 2 (I = 0 mA)

 $\Delta p = f(Q)$  Pressure drop-volume flow characteristics 1 → 3 (I = I<sub>N</sub>)


**DIMENSIONS / SECTIONAL DRAWINGS**


Dimensions of the other connection versions: see data sheet 1.1-180

 Cavity drawing acc. to  
 ISO 7789-42-04-0-07

 For detailed cavity drawing see data sheet  
 2.13-1047

**PARTS LIST**

Position	Article	Description
10	208.3212	EN 175301 Solenoid coil WDE64/31 x 72-G12
	208.3213	Solenoid coil WDE64/31 x 72-G24
	206.3214	Junior-Timer Solenoid coil WJE64/31 x 72-G12
	206.3215	Solenoid coil WJE64/31 x 72-G24
	206.3216	Deutsch Solenoid coil WGE64/31 x 72-G12
	208.3217	Solenoid coil WGE64/31 x 72-G24
15	253.8022	HC 8.5 annual override (data sheet 1.1-300)
	239.2033	HB 0 Plug screw (data sheet 1.1-300)
17	160.2282	O-ring ID 28,24 x 2,62 (NBR)
20	154.2708	Knurled nut
50	160.2377	O-ring ID 37,77 x 2,62 (NBR)
	160.8378	O-ring ID 37,77 x 2,62 (FKM)
60	160.2329	O-ring ID 32,99 x 2,62 (NBR)
	160.8325	O-ring ID 32,99 x 2,62 (FKM)
70	160.2314	O-ring ID 31,42 x 2,62 (NBR)
	160.8315	O-ring ID 31,42 x 2,62 (FKM)
80	049.3384	Backup ring RD 33,5x38 x 1,4
90	049.3364	Backup ring RD 31,5x36 x 1,4

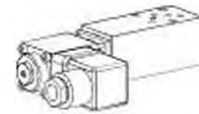
**ACCESSORIES**

Line mount body Data sheet	2.9-210
Proportional amplifier	Register 1.13
Mating connector EN 175301-803	Article no. 219.2002

Technical explanation see data sheet 1.0-100

**Proportional throttle valve**
**Flange and sandwich construction**

- Direct operated, not pressure compensated
- Throttle in one flow direction
- $Q_{max} = 12 \text{ l/min}$ ,  $p_{max} = 250 \text{ bar}$
- $Q_{N1max} = 6,3 \text{ l/min}$

**NG3-Mini<sup>30</sup>**

**DESCRIPTION**

Directly operated proportional throttle valve in flange or sandwich construction. Screw-in cartridge M18x1.5 in accordance with ISO 7789. Function optional „normally closed“ or „normally open“. In sandwich types for A and B line, a by-pass check valve for reversed free flow is incorporated. Two flow ranges are available. The volume flow is adjusted by a proportional solenoid (VDE standard 0580).

**FUNCTION**

The force controlled proportional solenoid running in the fluid acts directly on the control spool which opens or closes the triangular shaped throttling notches in the cartridge body. The throttle opening, and therefore the flow volume, changes proportionally to the current absorption of the proportional solenoid. When the solenoid is without current, the control spool is held in the closed position by a spring.

To control the valve proportional amplifiers are available from Wandfluh (see register 1.13).

**APPLICATION**

Proportional throttle valves are suitable for precise feed control systems. An extremely sensitive opening and closing response allows a smooth control of movements in stationary or mobile installations, e.g. machine tools, public vehicles. Mini-3 proportional throttle valves are used where hydraulic systems have to be both light and compact.

**TYPE CODE**

Throttle valve		D		P		A03		-		-		-		#		
Normally closed		N														
Normally open		O														
Proportional		F														
Flange construction		F														
Sandwich construction		S														
Mounting interface acc. to Wandfluh standard, NG3-Mini																
Type list / Function																
Flange construction	Sandwich construction															
A → B	A/B	in P	P	in A	A	in B	B	in A and B	AB	in T	T					
Nominal volume flow rates $Q_N$		4 l/min	4	6,3 l/min	6,3											
Nominal voltage $U_N$	12 VDC	G12	24 VDC	G24												
Design-Index (Subject to change)																

**GENERAL SPECIFICATIONS**

Description	Proportional throttle valve
Nominal size	NG3-Mini acc. to Wandfluh standard
Construction	Flange and sandwich
Operations	Proportional solenoid
Mounting	3 mounting holes for cyl.screws M4 or double ended screws M4
Connection	Threaded connection plates Multi-flange subplates Longitudinal stacking system
Ambient temperature	-20...50 °C
Mounting position	any
Fastening torque	$M_c = 2,8 \text{ Nm}$ (Qual. 8.8), fastening screws $M_f = 30 \text{ Nm}$ for screw-in cartridge
Weight	Depending on the type $m = 0,4...0,7 \text{ kg}$

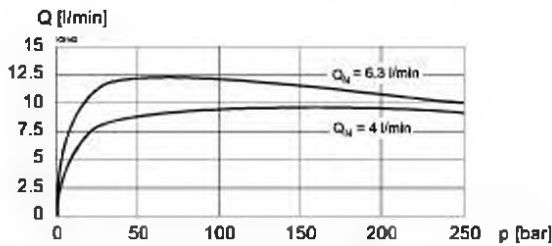
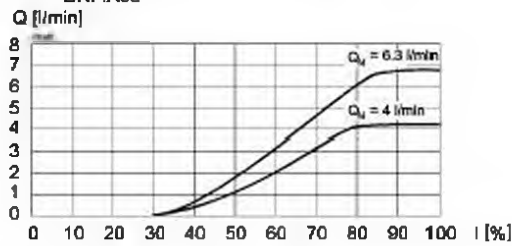
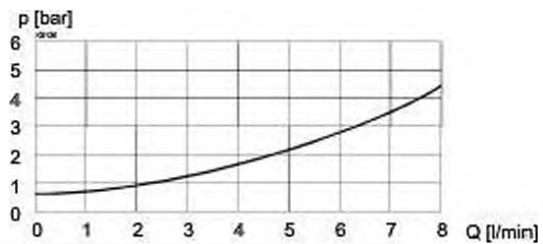
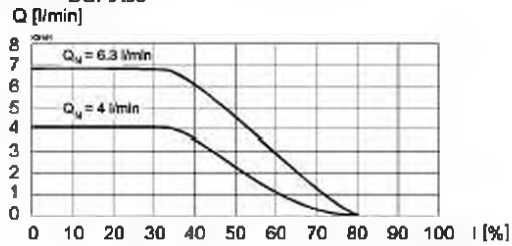
**HYDRAULIC SPECIFICATIONS**

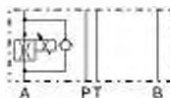
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 18/16/13 (Required filtration grade & $6...10 > 75$ ) see data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 250 \text{ bar}$
Nominal volume flow rates	$Q_N = 4 \text{ l/min}$ , $Q_N = 6,3 \text{ l/min}$ at 10 bar pressure drop
Max. Volume flow	$Q_{max} = 8 \text{ l/min}$
Leakage volume flow	see data sheet 2.6-510
Resolution	1 mA
Repeatability	≤ 1% •
Hysteresis	≤ 2% • • at optimal dither signal

For further hydraulic specifications see data sheet 2.6-510

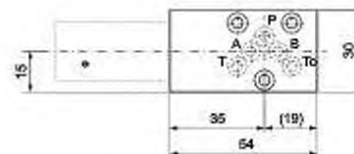
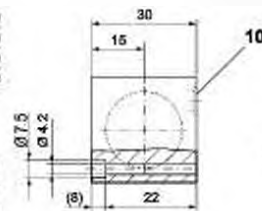
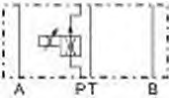
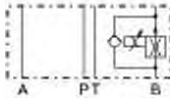
**ELEKTRICAL SPECIFIACATIONS**

Construction	Proportional solenoid, wet pin push type, pressure tight.	
Standard-Nominal volt.	U = 12 VDC	U = 24 VDC
Limiting current	$I_c = 1080 \text{ mA}$	$I_c = 540 \text{ mA}$
Relative duty factor	100% ED (see data sheet 1.1-430)	
Protection class	IP 65 to EN 60 529	
Connection/Power supply	Over device plug connection to ISO 4400/ DIN 43650 (2P+E)	
Other electrical specifications see data sheet 1.1-90 (PI29V)		

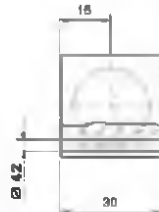
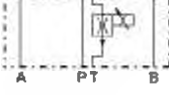
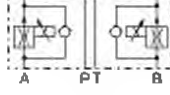
**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $Q = f(p)$  Volume flow pressure characteristics

 $Q = f(i)$  Volume flow adjustment characteristics  
 DNP.A03

 $\Delta p = f(Q)$  Pressure loss/flow characteristic over non-return valve

 $Q = f(i)$  Volume flow adjustment characteristics  
 DOP.A03

**SYMBOLS / DIMENSIONS**
**D.PFA03-A/B**

**D.PSA03-A**


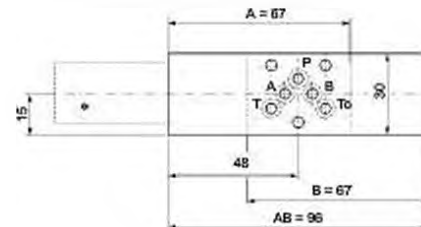
Flange construction D.PFA03-A/B


**D.PSA03-P**

**D.PSA03-B**


Sandwich construction D.PSA03-P, T


**D.PSA03-T**

**D.PSA03-AB**


Sandwich construction D.PSA03-A, B, AB


**PARTS LIST**

Position	Article	Description
10	160.2045	O-ring ID 4,5x1,50

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.
D.PPM18	Proportional throttle valve	2.6-510

\* The total length depends on the cartridge type, see data sheet 2.6-510

**ACCESSORIES**

Proportional amplifier

Register 1.13

Technical explanation see data sheet 1.0-100

**Proportional throttle valve**  
**Flange and sandwich construction**

- Direct operated, not pressure compensated
- $p_{max} = 350 \text{ bar}$

**NG4-Mini**

**DESCRIPTION**

Directly operated proportional throttle valve in sandwich construction. Screw-in cartridge M22x1,5 in accordance with ISO 7789. In sandwich types for A and B line, a by-pass check valve for reversed free flow is incorporated. The flange body is painted, the sandwich plates are phosphatised.

**FUNCTION**

The force controlled proportional solenoid running in the fluid acts directly on the control spool which opens or closes the triangular shaped throttling notches in the cartridge body. The throttle opening, and therefore the flow volume, changes proportionally to the current absorption of the proportional solenoid. When the solenoid is without current, the control spool is held in the closed position by a spring. To control the valve proportional amplifiers are available from Wandfluh (see register 1.13).

**APPLICATION**

Proportional throttle valves are suitable for precise feed control systems. An extremely sensitive opening and closing response allows a smooth control of movements in stationary or mobile installations, e.g. machine tools, public vehicles. Mini-4 proportional throttle valves are used where hydraulic systems have to be both light and compact.

**TYPE CODE**

Throttle valve		D		N		P		A04		-		-		#	
Normally closed															
Proportional															
Flange construction		F													
Sandwich construction		S													
Mounting interface acc. to Wandfluh standard, NG4-Mini															
Type list / Function															
Flange construction		Sandwich construction		in P		P		in A		A					
A → B		A/B		in T		T		in B		B					
								in A and B		AB					
Nominal volume flow level, nominal voltage, etc. of the built-in screw-in cartridge															
Examples:															
DNPPA04 - A/B - 8,3 - G24/WD - HBO															
DNPSA04 - P - 10 - G12/ME-A1D1															
Design-Index (Subject to change)															

**GENERAL SPECIFICATIONS**

Description	Proportional throttle valve
Nominal size	NG4-Mini acc. to Wandfluh standard
Construction	Flange and sandwich
Operations	Proportional solenoid
Mounting	3 mounting holes for cyl.screws M5 or double ended screws M5
Connection	Threaded connection plates Multi-flange subplates Longitudinal stacking system
Weight	Depending on the type $m = 0,85 \dots 1,2 \text{ kg}$

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.	$Q_{max}^*$
DNPPM22	normally closed	2.6-531	32 l/min
DNPPM22- JME	normally closed, with integrated electronics	2.6-541	32 l/min

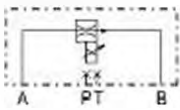
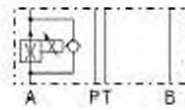
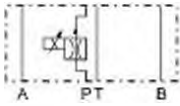
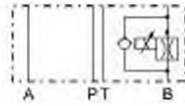
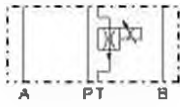
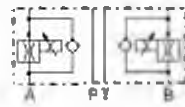
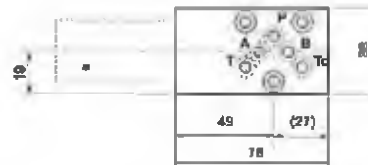
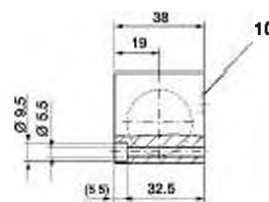
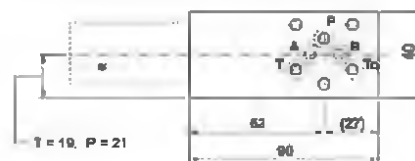
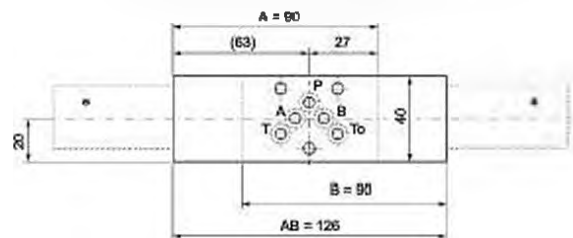
\* Can deviate from the values on the data sheets of the screw-in cartridges.


**REMARK!**

Detailed performance data and additional hydraulic and electric specifications may be drawn from the data sheets of the corresponding installed screw-in cartridge.


**CAUTION!**

The performance data, especially the „pressure-flow-characteristic“, on the data sheets of the screw-in cartridges, refer to the screw-in cartridges only. The additional pressure drop of the flange body, resp. sandwich body must be taken into consideration.

**SYMBOLS / DIMENSIONS**
**DN.FA04-A/B**

**DN.SA04-A**

**DN.SA04-P**

**DN.SA04-B**

**DN.SA04-T**

**DN.SA04-AB**

**Flange construction DN.FA04-A/B**

**Sandwich construction DN.SA04-P, T**

**Sandwich construction DN.SA04-A, B, AB**

**PARTS LIST**

Position	Article	Description
10	160.2052	O-ring ID 5.28x1.78

\* The envelop dimensions of the screw-in cartridge are show on their corresponding data sheets.

**ACCESSORIES**

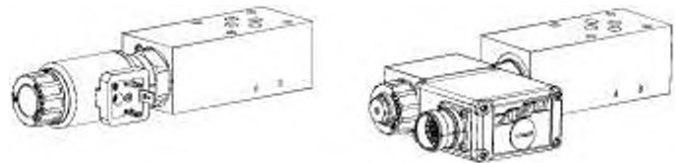
Proportional amplifier

Register 1.13

Technical explanation see data sheet 1.0-100

**Proportional throttle valve**
**Flange and sandwich construction**

- Direct operated, not pressure compensated
- $p_{max} = 350 \text{ bar}$

**NG6**  
 ISO 4401-03

**DESCRIPTION**

Directly operated proportional throttle valve in sandwich construction. Screw-in cartridge M22x1,5 in accordance with ISO 7789. In sandwich types for A and B line, a by-pass check valve for reversed free flow is incorporated. Three flow ranges are available. The volume flow is adjusted by a proportional solenoid (VDE standard 0580). The flange body is painted, the sandwich plates are phosphatised.

**FUNCTION**

The force controlled proportional solenoid running in the fluid acts directly on the control spool which opens or closes the triangular shaped throttling notches in the cartridge body. The throttle opening, and therefore the flow volume, changes proportionally to the current absorption of the proportional solenoid. When the solenoid is without current, the control spool is held in the closed position by a spring.

To control the valve proportional amplifiers are available from Wandfluh (see register 1.13).

**APPLICATION**

Proportional throttle valves are suitable for precise feed control systems. An extremely sensitive opening and closing response allows a smooth control of movements in stationary or mobile installations, e.g. machine tools, public vehicles.

**TYPE CODE**

		D N P <input type="checkbox"/>		A06 - <input type="checkbox"/>		- <input type="checkbox"/>		# <input type="checkbox"/>	
Throttle valve									
Normally closed									
Proportional									
Flange construction		F							
Sandwich construction		S							
International standard interface ISO, NG6									
Type list / Function									
Flange construction		Sandwich construction							
A → B	<input type="checkbox"/> A/B	in P	<input type="checkbox"/> P	in A	<input type="checkbox"/> A				
		in T	<input type="checkbox"/> T	in B	<input type="checkbox"/> B				
				in A and B	<input type="checkbox"/> AB				
Nominal volume flow level, nominal voltage, etc. of the built-in screw-in cartridge									
Examples:		DNPPA06 - A/B - 10 - G24WD - HB0 <input type="checkbox"/>							
		DNPSA06 - P - 25 - G12ME-A1D1 <input type="checkbox"/>							
Design-Index (Subject to change)									

**GENERAL SPECIFICATIONS**

Description	Proportional throttle valve
Nominal size	NG6 acc. to ISO 4401-03
Construction	Flange and sandwich
Operations	Proportional solenoid
Mounting	4 mounting holes for cyl. screws M5 or double ended screws M5
Connection	Threaded connection plates Multi-flange subplates Longitudinal stacking system
Weight	Depending on the type m = 1,05...1,65 kg

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.	$Q_{max}^*$
DNPPM22	normally closed	2.6-531	32 l/min
DNPPM22-..ME	normally closed, with integrated electronics	2.6-541	32 l/min

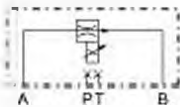
\* Can deviate from the values on the data sheets of the screw-in cartridges.

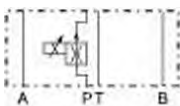
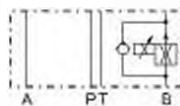
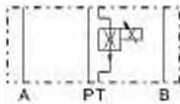
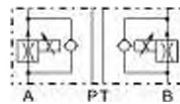
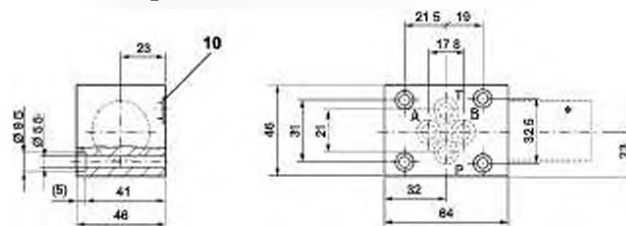
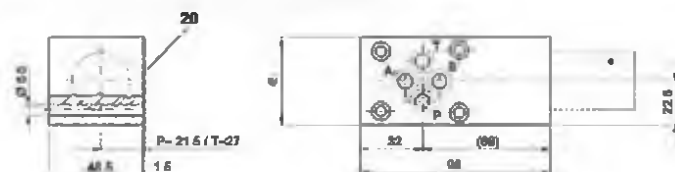

**REMARK!**

Detailed performance data and additional hydraulic and electric specifications may be drawn from the data sheets of the corresponding installed screw-in cartridge.


**CAUTION!**

The performance data, especially the „pressure-flow-characteristic“, on the data sheets of the screw-in cartridges, refer to the screw-in cartridges only. The additional pressure drop of the flange body, resp. sandwich body must be taken into consideration.

**SYMBOLS / DIMENSIONS**
**DN.FA06-A/B**

**DN.SA06-A**

**DN.SA06-P**

**DN.SA06-B**

**DN.SA06-T**

**DN.SA06-AB**

**Flange construction DN.FA06-A/B**

**Sandwich construction DN.SA06-P, T**

**Sandwich construction DN.SA06-A, B, AB**

**PARTS LIST**

Position	Article	Description
10	180.2093	O-ring ID 8.25x1,78
20	173.3850	Sealing plate ADB6

\* The envelop dimensions of the screw-in cartridge are shown on their corresponding data sheets.

**ACCESSORIES**

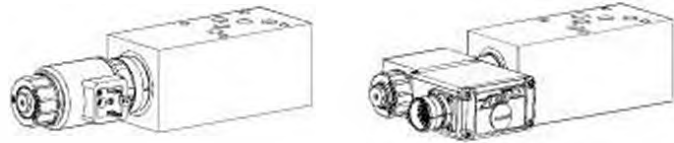
Proportional amplifier  
 Technical explanation see data sheet 1.0-100

Register 1.13



**Proportional throttle valve**
**Flange and sandwich construction**

- Direct operated, not pressure compensated
- $p_{max} = 350 \text{ bar}$

**NG10**  
 ISO 4401-05

**DESCRIPTION**

Directly operated proportional throttle valve in sandwich construction. Screw-in cartridge M33x2 in accordance with ISO 7789. In sandwich types for A and B line, a by-pass check valve for reversed free flow is incorporated. The flange body is painted, the sandwich plates are phosphatised.

**FUNCTION**

The force controlled proportional solenoid running in the fluid acts directly on the control spool which opens or closes the triangular shaped throttling notches in the cartridge body. The throttle opening, and therefore the flow volume, changes proportionally to the current absorption of the proportional solenoid. When the solenoid is without current, the control spool is held in the closed position by a spring.

To control the valve proportional amplifiers are available from Wandfluh (see register 1.13).

**APPLICATION**

Proportional throttle valves are suitable for precise feed control systems. An extremely sensitive opening and closing response allows a smooth control of movements in stationary or mobile installations, e.g. machine tools, public vehicles.

**TYPE CODE**

Throttle valve	<input type="checkbox"/>	D	<input type="checkbox"/>	N	<input type="checkbox"/>	P	<input type="checkbox"/>	A10	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Normally closed	<input type="checkbox"/>													
Proportional	<input type="checkbox"/>													
Flange construction	<input type="checkbox"/>													
Sandwich construction	<input type="checkbox"/>													
International standard interface ISO, NG10	<input type="checkbox"/>													
Type list / Function														
Flange construction														
A → B	<input type="checkbox"/>													
Sandwich construction														
in P	<input type="checkbox"/>													
in T	<input type="checkbox"/>													
in A	<input type="checkbox"/>													
in B	<input type="checkbox"/>													
in A and B	<input type="checkbox"/>													
Nominal volume flow level, nominal voltage, etc. of the built-in screw-in cartridge														
Examples:														
Design-Index (Subject to change)														

**GENERAL SPECIFICATIONS**

Description	Proportional throttle valve
Nominal size	NG10 acc. to ISO 4401-05
Construction	Flange and sandwich
Operations	Proportional solenoid
Mounting	4 mounting holes for. zyl. screws M6 or double ended screws M6
Connection	Threaded connection plates Multi-flange subplates Longitudinal stacking system
Weight	Depending on the type m = 3,0...6,0 kg

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.	Q <sub>max</sub> *
DNPPM33	normally closed	2.6-551	65 l/min
DNPPM33	normally closed, with integrated electronics	2.6-561	65 l/min

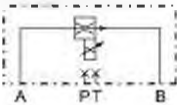
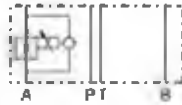
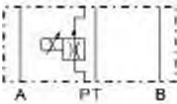
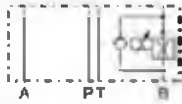
\* Can deviate from the values on the data sheets of the screw-in cartridges.

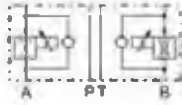

**REMARK!**

Detailed performance data and additional hydraulic and electric specifications may be drawn from the data sheets of the corresponding installed screw-in cartridge.


**CAUTION!**

The performance data, especially the „pressure-flow-characteristic“, on the data sheets of the screw-in cartridges, refer to the screw-in cartridges only. The additional pressure drop of the flange body, resp. sandwich body must be taken into consideration.

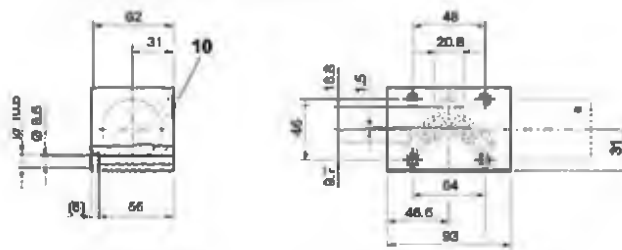
**SYMBOLS / DIMENSIONS**
**DN.FA10-A/B**

**DN.SA10-A**

**DN.SA10-P**

**DN.SA10-B**

**DN.SA10-T**

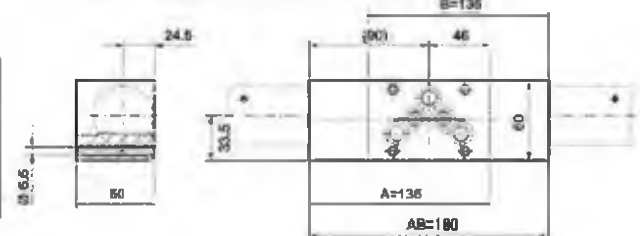
**DN.SA10-AB**


\* The envelop dimensions of the screw-in cartridge are shown on their corresponding data sheets.

**PARTS LIST**

Position	Article	Description
10	160.2140	sandwich construction P, T
	160.2120	O-Ring ID 12.42x1.78 for sandwich construction A, B, AB
	160.2132	O-Ring ID 13.10x2.62 in line with RV

**Flange construction DN.FA10-A/B**

**Sandwich construction DN.SA10-P, T**

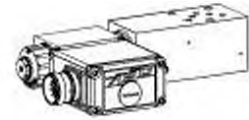
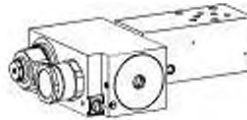
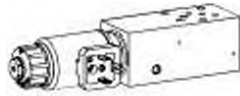
**Sandwich construction DN.SA10-A, B, AB**

**ACCESSORIES**

Proportional amplifier

Register 1.13

Technical explanation see data sheet 1.0-100

- Proportional 2-way flow control valve**  
**Flange- and sandwich construction**
- Direct operated, pressure compensated
  - $p_{max} = 350 \text{ bar}$

**NG4-Mini®**

**DESCRIPTION**

Direct operated, pressure compensated proportional flow control valve in flange- and sandwich construction. Proportional flow control screw-in cartridges M22x1,5 acc. to ISO 7789 are installed. In the sandwich plates for A, B and AB line, a bypass check valve for reversed free flow is installed. A bypass non-return valve plate for the flange valve, for free flow from B to A, can be ordered separately. The flange body is painted, the sandwich plates are phosphalized.

**FUNCTION**

The 2-way flow control valve with series connected pressure balance (primary controller) serves to maintain the speed of a consumer constant independent of the load.

**APPLICATION**

Proportional flow control valves in flange- and sandwich construction are suitable for precise feed control systems, where the supply flow has to be maintained constant with a changing load. Depending on the application, a distinction is made between controlling the forward flow or the return flow. Mini-4 proportional flow control valves are used where hydraulic systems have to be both light and compact.

**TYPE CODE**

		Q		N		A04 -		#	
Flow control valve									
Normally closed									
Proportional		P							
Proportional Ex-proof		B							
Flange construction		F							
Sandwich construction		S							
Mounting interface acc. to Wandfluh standard, NG4-Mini									
Type list / Function									
Flange construction		Sandwich construction		Sandwich construction		Sandwich construction			
				Meter-out flow control		Meter-in flow control			
A → B		A/B		in P		P		in A	
				in T		T		in B	
								in A und B	
								AV	
								BV	
								ABV	
Nominal volume flow level, nominal voltage, etc. of the built-in screw-in cartridge									
Examples: QNPFA04 - A/B - 8 - G24/WD - D1									
QNPFA04 - A - 16 - G12/MEA1									
Design-Index (Subject to change)									

**GENERAL SPECIFICATIONS**

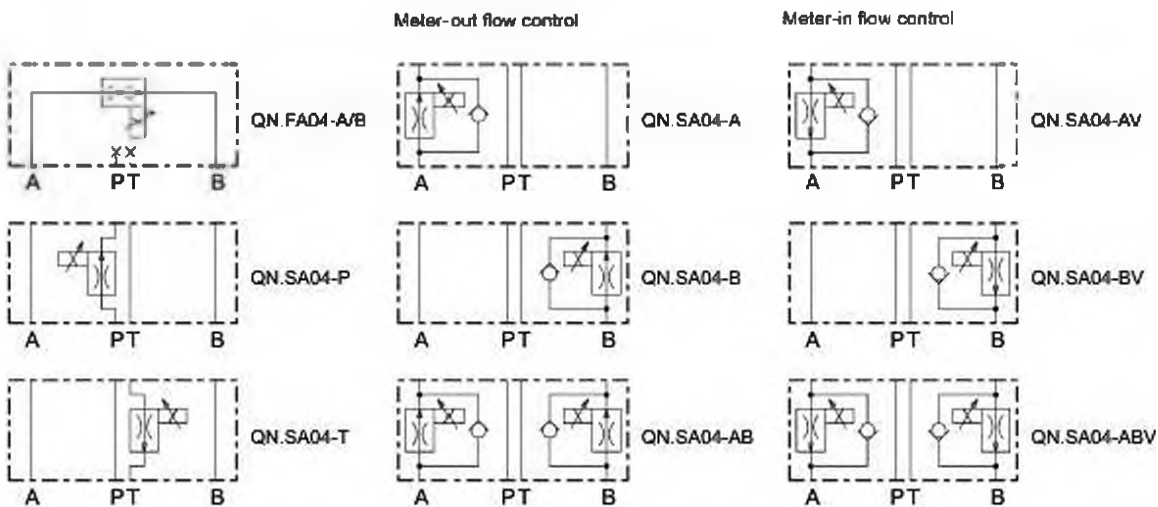
Description	Direct operated proportional 2-way flow control valve	
Nominal size	NG4-Mini according to Wandfluh standard	
Construction	Flange- and sandwich construction	
Operation	Proportional solenoid	
Mounting	3 holes for socket cap screws M5 or studs screws M5	
Connection	Threaded connection plates Multi-flange subplates Longitudinal stacking system	
Weight	• Flange type m = 0,46 kg	
(without screw-in cartridge)	• Sandwich type P,T,A,B m = 0,95 kg	
	• Sandwich type AB m = 1,22 kg	

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.	Q <sub>max</sub> *
QNPPM22	normally closed	2.8-631	25 l/min
QNPPM22-.../ME	normally closed, with integrated electronics	2.8-633	25 l/min
QNBPM22	normally closed, explosion proof Exd	2.8-634	25 l/min

\* Can deviate from the values on the data sheets of the screw-in cartridges

**TYPE CHARTS**


By turning around valves with meter-out function, meter-in function can be achieved:

- A turns into BV
- B turns into AV
- AB turns into ABV

Valves for flow control are supplied respectively with a sealing plate and an intermediate plate.


**REMARK!**

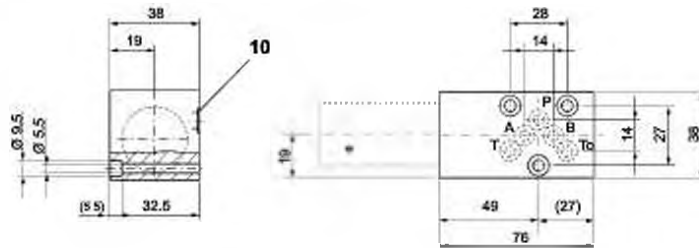
Detailed performance data and additional hydraulic and electric specifications may be drawn from the data sheets of the corresponding installed screw-in cartridge.


**CAUTION!**

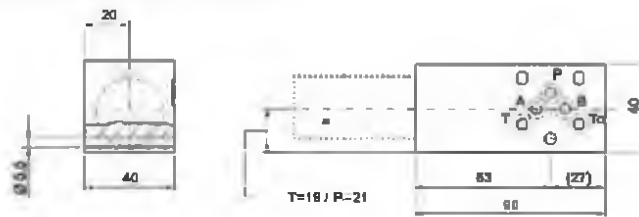
The performance data, especially the „pressure-flow-characteristic“, on the data sheets of the screw-in cartridges, refer to the screw-in cartridges only. The additional pressure drop of the flange body, resp. sandwich body must be taken into consideration.

**DIMENSIONS**

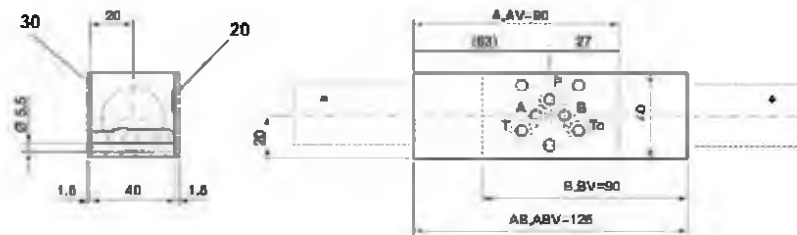
Flange construction QN.FA04 - A/B



Sandwich construction QN.SA04 - P, T



Sandwich construction QN.SA04 - A, B, AB, AV, BV, ABV



\* The envelop dimensions of the screw-in cartridge are shown on their corresponding data sheets.

**PARTS LIST**

Position	Article	Description
10	160.2052	O-ring ID 5,28x1,78
20	173.1700	Intermediate plate BZB4
30	173.1650	Sealing plate BDB4

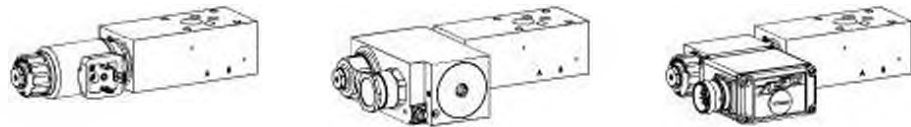
**ACCESSORIES**

Proportional amplifier

register 1.13

**Proportional 2-way flow control valve  
 Flange- and sandwich construction**

- Direct operated, pressure compensated
- $p_{max} = 350 \text{ bar}$

**NG6**  
 ISO 4401-03

**DESCRIPTION**

Direct operated, pressure compensated proportional flow control valve in flange- and sandwich construction. Proportional flow control screw-in cartridges M22x1,5 acc. to ISO 7789 are installed. In the sandwich plates for A, B and AB line, a bypass check valve for reversed free flow is installed. A bypass non-return valve plate for the flange valve, for free flow from B to A, can be ordered separately. The flange body is painted, the sandwich plates are phosphatized.

**FUNCTION**

The 2-way flow control valve with series connected pressure balance (primary controller) serves to maintain the speed of a consumer constant independent of the load.

**APPLICATION**

Proportional flow control valves in flange- and sandwich construction are suitable for precise feed control systems, where the supply flow has to be maintained constant with a changing load. used where the supply volume flow has to be kept constant even when the load fluctuates. Depending on the application, a distinction is made between controlling the forward flow or the return flow.

**TYPE CODE**

		Q		N		A06 -		#	
Flow control valve									
Normally closed									
Proportional		P							
Proportional Ex-proof		B							
Flange construction		F							
Sandwich construction		S							
International standard interface ISO, NG6									
Type list / Function									
Flange construction		Sandwich construction		Sandwich construction		Sandwich construction			
				Meter-out flow control		Meter-in flow control			
A → B		AB		P		A		AV	
		in P		T		B		BV	
		in T		in A		in B		in A und B	
				in A und B		AB		ABV	
Nominal volume flow level, nominal voltage, etc. of the built-in screw-in cartridge									
Examples: QNPFA06 - A/B - 8 - G24/WD - D1									
QNPFA06 - A - 16 - G12/MEA1									
Design-Index (Subject to change)									

**GENERAL SPECIFICATIONS**

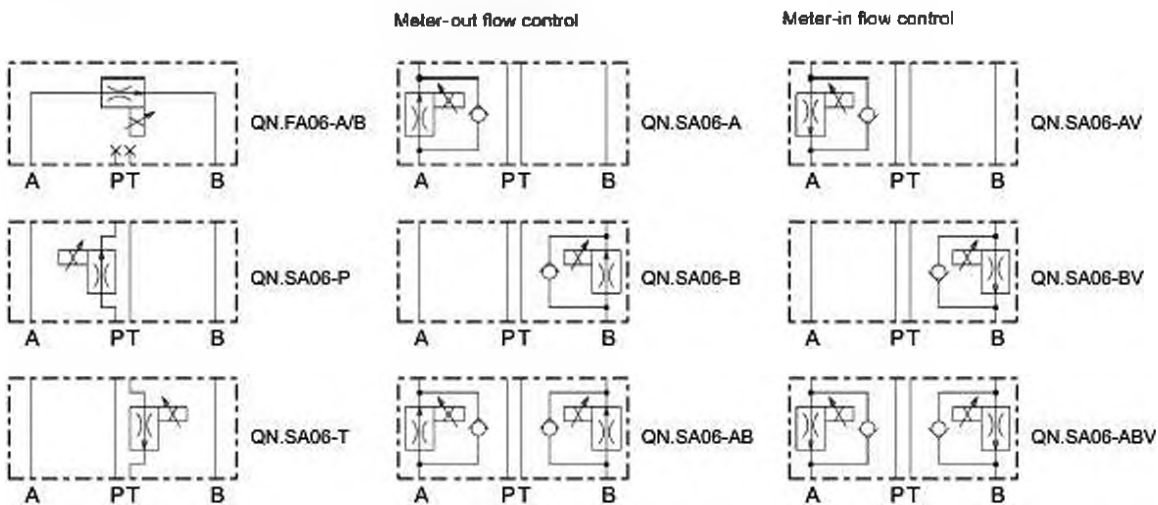
Description	Direct operated proportional 2-way flow control valve	
Nominal size	NG6, according to ISO 4401-03.	
Construction	Flange- and sandwich construction	
Operation	Proportional solenoid	
Mounting	4 holes for socket cap screws M5 or studs screws M5	
Connection	Threaded connection plates Multi-flange subplates Longitudinal stacking system	
Weight	• Flange type m = 0,81 kg	
(without screw-in cartridge)	• Sandwich type A,B m = 1,15 kg	
	• Sandwich type P,T, AB m = 1,45 kg	

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.	Q <sub>max</sub> <sup>*</sup>
QNPPM22	normally closed	2.6-831	25 l/min
QNPPM22-...ME	normally closed, with integrated electronics	2.6-833	25 l/min
QNBPM22	normally closed, explosion proof Exd	2.6-834	25 l/min

<sup>\*</sup> Can deviate from the values on the data sheets of the screw-in cartridges

**TYPE CHARTS**


By turning around valves with meter-out function, meter-in function can be achieved:

- A turns into AV
- B turns into BV
- AB turns into ABV


**REMARK!**

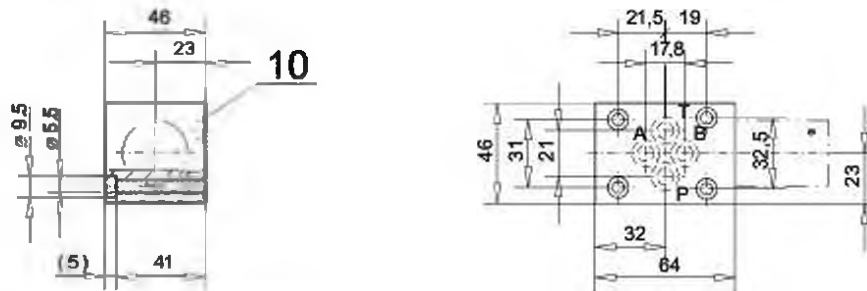
Detailed performance data and additional hydraulic and electric specifications may be drawn from the data sheets of the corresponding installed screw-in cartridge.


**CAUTION!**

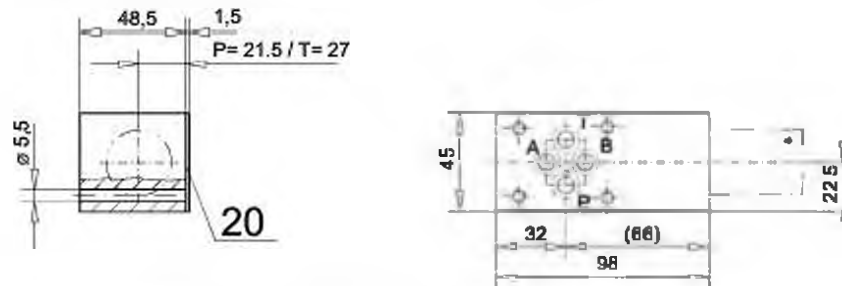
The performance data, especially the „pressure-flow-characteristic“, on the data sheets of the screw-in cartridges, refer to the screw-in cartridges only. The additional pressure drop of the flange body, resp. sandwich body must be taken into consideration.

**DIMENSIONS**

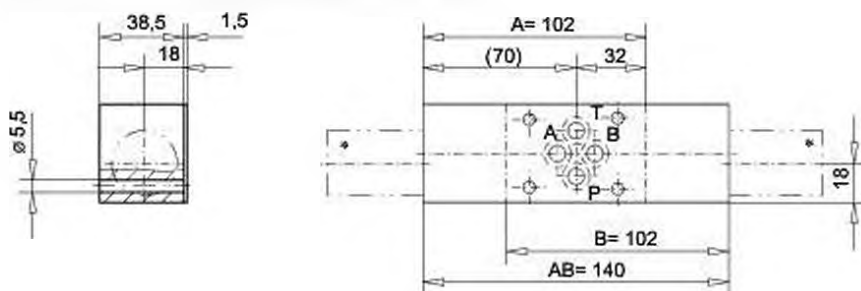
Flange construction QN.FA06 - A/B



Sandwich construction QN.SA06 - P, T



Sandwich construction QN.SA06 - A, B, AB, AV, BV, ABV



\* The envelop dimensions of the screw-in cartridge are shown on their corresponding data sheets.

**PARTS LIST**

Position	Article	Description
10	180.2093	O-ring ID 9,25x1,78
20	173.3650	Sealing plate ADB6

**ACCESSORIES**

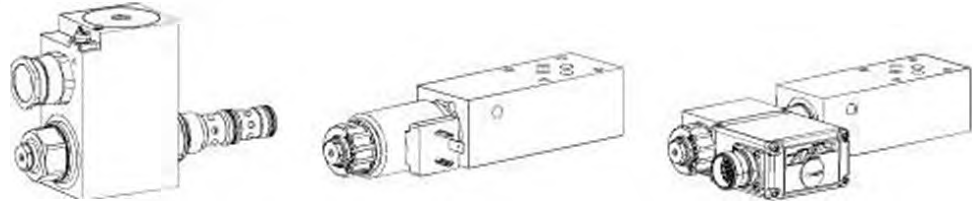
Proportional amplifier

register 1.13



**Proportional 3-way flow control valve  
 Flange- and sandwich construction**

- Direct operated, pressure compensated
- $p_{max} = 350 \text{ bar}$

**NG6**  
 ISO 4401-03

**DESCRIPTION**

Direct operated, pressure compensated proportional flow control valve in flange- and sandwich construction. Proportional flow control screw-in cartridges M22x1,5 acc. to ISO 7789 are installed. The flange body is painted, the sandwich plates are phosphatised.

**FUNCTION**

The 3-way flow control valve is designed to keep the oil flow to any actuator constant irrespective of the load.

**APPLICATION**

Proportional 3-way flow control valves are used where the supply volume flow has to be kept constant even when the load fluctuates. Depending on the application, a distinction is made between restricting the forward flow or the return flow.

**TYPE CODE**

Flow control valve	Q	D	<input type="checkbox"/>	<input type="checkbox"/>	A06	-	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
3-way											
Proportional	[P]										
Proportional Explosion protection	[B]										
Flange construction	[F]										
Sandwich construction	[S]										
International mounting interface ISO, NG6											
Type list / Function											
Flange construction	Sandwich construction										
A → B	[A/B] in P [P]										
Nominal volume flow level, nominal voltage, etc. of the built-in screw-in cartridge											
Examples:	QDPFA06 - A/B - 16 - G12/WD - HB4,5										
	QDPFA06 - P - 25 - G24/MEA-1										
Design-Index (Subject to change)											

**GENERAL SPECIFICATIONS**

Description	Proportional 3-way flow control valve
Nominal size	NG6 acc. to ISO 4401-03
Construction	Flange- and sandwich construction
Operations	Proportional solenoid
Mounting	4 holes for socket cap screws M5 or studs screws M5
Connection	Threaded connection plates Multi-flange subplate Longitudinal stacking system
Weight	• Flange type m = 1,10 kg
(without screw-in cartridge)	• Sandwich type m = 1,30 kg

**SCREW-IN CARTRIDGES INSTALLED**

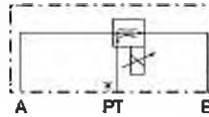
The following screw-in cartridges are used in either the flange body or the sandwich body:

Typ	Bezeichnung	Datenblatt Nr.	Q <sub>max</sub> *
QDPPM22	3-way-construction	2.8-644	40 l/min
QDPPM22-..ME	3-way-construction, with integrated electronics	2.8-647	40 l/min
QDBPM22	3-way-construction, Explosion protection	2.8-648	40 l/min

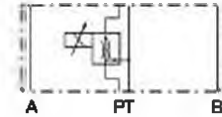
\* Can deviate from the values on the data sheets of the screw-in cartridges.

**TYPE CHARTS**

QD FA06-A/B



QD SA06-P


**REMARK!**

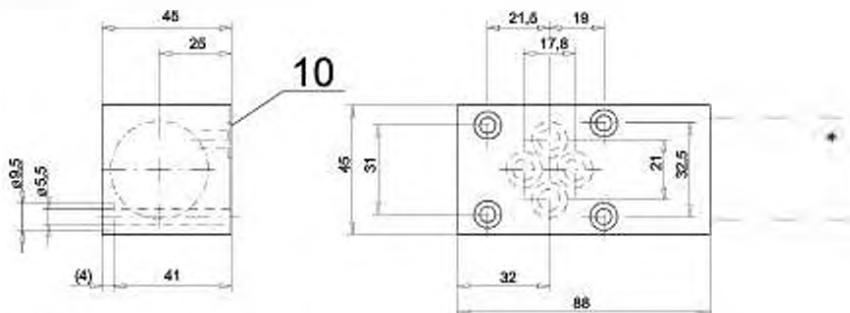
Detailed performance data and additional hydraulic and electric specifications may be drawn from the data sheets of the corresponding installed screw-in cartridge.


**REMARK!**

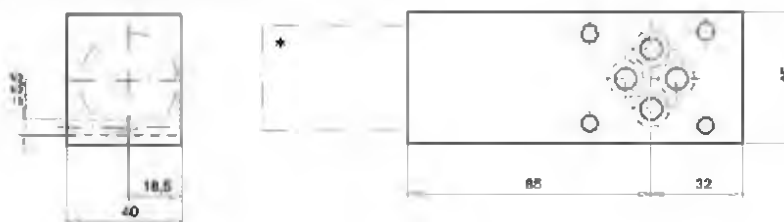
Detailed performance data and additional hydraulic and electric specifications may be drawn from the data sheets of the corresponding installed screw-in cartridge.

**DIMENSIONS**

Flange construction QD FA06-A/B



Sandwich construction QDPSA06-P



\* The envelop dimensions of the screw-in cartridge are shown on their corresponding data sheets.

**PARTS LIST**

Position	Article	Description
10	180.2093	O-ring ID 9,25x1,78

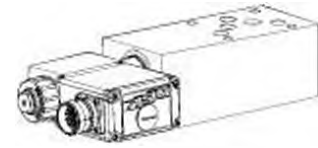
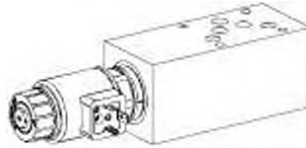
**ACCESSORIES**

Proportional amplifier

register 1.13

- Proportional 2-way flow control valve**  
**Flange- and sandwich construction**
- Direct operated, pressure compensated
  - $p_{max} = 350 \text{ bar}$

**NG10**  
 ISO 4401-05



#### DESCRIPTION

Direct operated, pressure compensated proportional flow control valve in flange- and sandwich construction. Proportional flow control screw-in cartridges M33x2 acc. to ISO 7789 are installed. In the sandwich plates for A, B and AB line, a bypass check valve for reversed free flow is installed. A bypass non-return valve plate for the flange valve, for free flow from B to A, can be ordered separately. Two flow ranges are available. The flange body is painted and the sandwich plates are phosphatized.

#### FUNCTION

The 2-way flow control valve with series connected pressure balance (primary controller) serves to maintain the speed of a consumer constant independent of the load.

#### APPLICATION

Proportional flow control valves in flange- and sandwich construction are suitable for precise feed control systems, where the supply flow has to be maintained constant with a changing load, used where the supply volume flow has to be kept constant even when the load fluctuates. Depending on the application, a distinction is made between controlling the forward flow or the return flow.

#### TYPE CODE

				Q	N	P	<input type="checkbox"/>	A10 -	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Flow control valve													
Normally closed													
Proportional													
Flange construction <input type="checkbox"/> F													
Sandwich construction <input type="checkbox"/> S													
International standard interface ISO, NG10													
Type list / Function:													
Flange construction													
Sandwich construction													
Sandwich construction meter-out flow control													
Sandwich construction meter-in flow control													
A → B	<input type="checkbox"/> A/B	in P	<input type="checkbox"/> P	in A	<input type="checkbox"/> A	in A	<input type="checkbox"/> AV						
		in T	<input type="checkbox"/> T	in B	<input type="checkbox"/> B	in B	<input type="checkbox"/> BV						
				in A and B	<input type="checkbox"/> AB	in A and B	<input type="checkbox"/> ABV						
Nominal volume flow level, nominal voltage, etc. of the built-in screw-in cartridge													
Examples: QNPPA10 - A/B - [ 32 - G24/WD - D1													
QNPSA10 - A - [ 83 - G12/ME - A1													
Design-Index (Subject to change)													

#### GENERAL SPECIFICATIONS

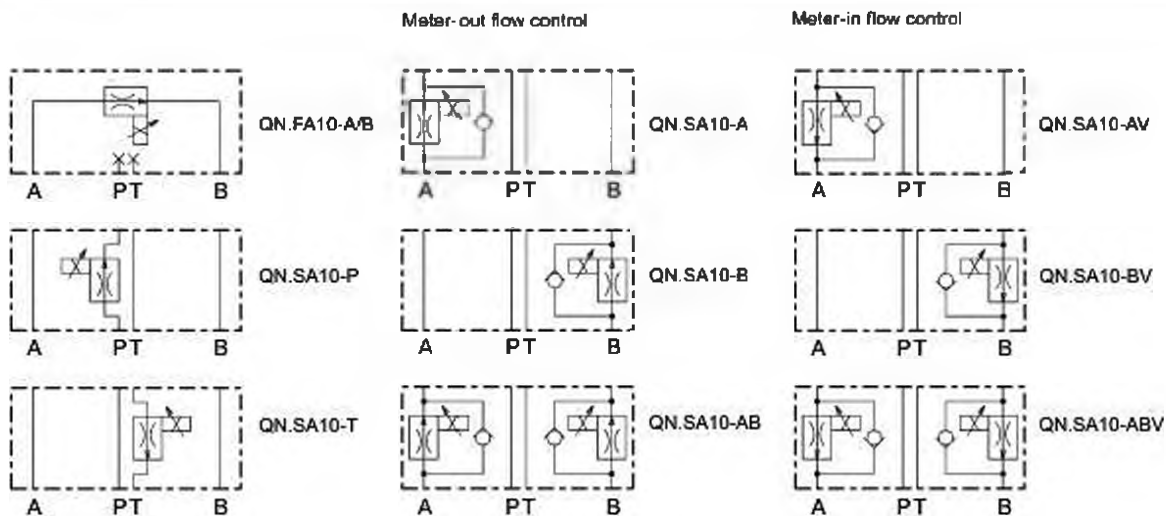
Description	Direct operated proportional 2-way flow control valve	
Nominal size	NG10 acc. to ISO 4401-05	
Construction	Flange- and sandwich construction	
Operation	Proportional solenoid	
Mounting	4 holes for socket cap screws M6 or studs screws M6	
Connection	Threaded connection plates Multi-flange subplates Longitudinal stacking system	
Weight (without screw-in cartridge)	• Flange type	m = 2,20 kg
	• Sandwich type P,T,A,B	m = 3,10 kg
	• Sandwich type AB	m = 3,75 kg

**SCREW-IN CARTRIDGES INSTALLED**

The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Designation	Data sheet no.	Q <sub>max</sub> *
QNPPM33	normally closed	2.6-651	80 l/min
QNPPM33-/ME	normally closed, with integrated electronics	2.6-659	63 l/min

- \* Can deviate from the values on the data sheets of the screw-in cartridges.
- Do not use anymore for new applications

**TYPE CHARTS**


By turning around valves with meter-out function, meter-in function can be achieved:

- A turns into BV
- B turns into AV
- AB turns into ABV

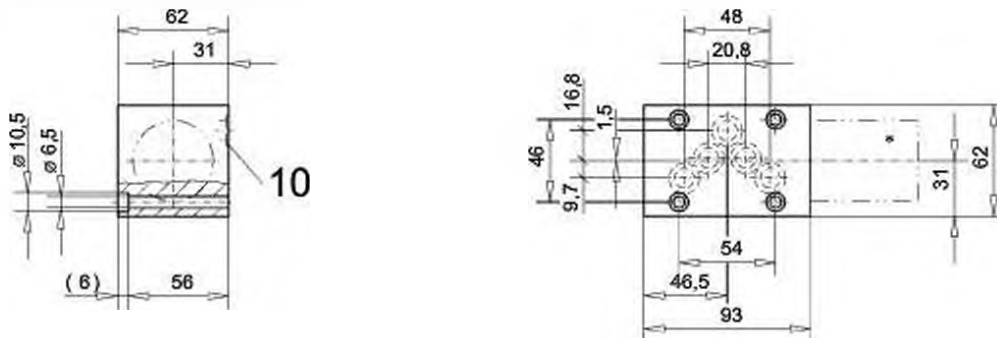
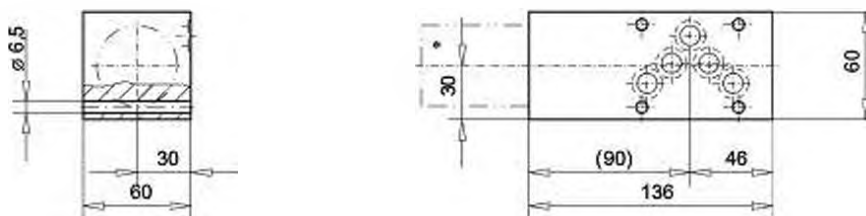
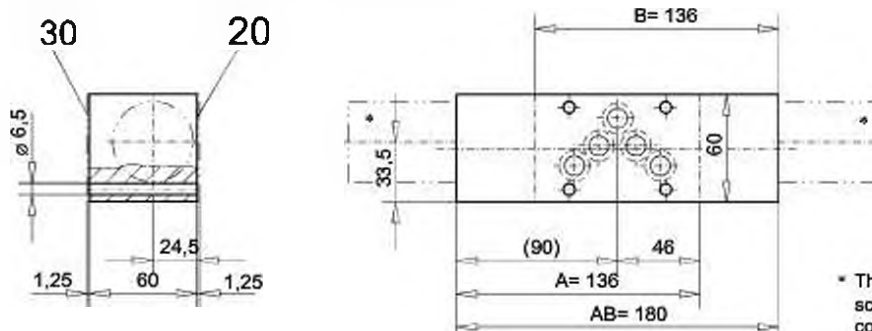
Valves for flow control are supplied respectively with a seating plate and an intermediate plate.


**REMARK!**

Detailed performance data and additional hydraulic and electric specifications may be drawn from the data sheets of the corresponding installed screw-in cartridge.


**CAUTION!**

The performance data, especially the „pressure-flow-characteristic., on the data sheets of the screw-in cartridges, refer to the screw-in cartridges only. The additional pressure drop of the flange body, resp. sandwich body must be taken into consideration.

**DIMENSIONS**
**Flange construction QN.FA10 - A/B**

**Sandwich construction QN.SA10 - P, T**

**Sandwich construction QN.SA10 - A, B, AB, AV, BV, ABV**


\* The envelop dimensions of the screw-in cartridge are shown on their corresponding data sheets.

**PARTS LIST**

Position	Article	Description
10	160.2140	O-ring ID 14.00x1,78 for flange and sandwich construction
	160.2120	O-Ring ID 12.42x1,78 for sandwich construction A, B, AB, VA, VB, VAB
	160.2132	O-Ring ID 13,10x2,62 in line with RV
20	173.4700	Intermediate plate AZB10
30	173.4650	Sealing plate ADB10

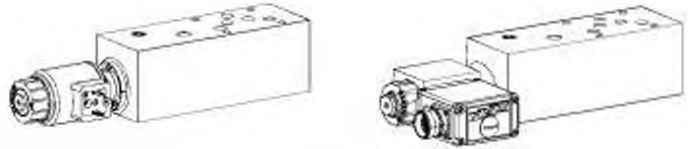
**ACCESSORIES**

Proportional amplifier

register 1.13

**Proportional 3-way flow control valve**  
**Flange- and sandwich construction**

- Direct operated, pressure compensated
- $p_{max} = 350 \text{ bar}$

**NG10**  
**ISO 4401-05**

**DESCRIPTION**

Direct operated, pressure compensated proportional flow control valve in flange- and sandwich construction. Proportional flow control screw-in cartridges M33x2 acc. to ISO 7789 are installed. The flange body is painted, the sandwich plates are phosphatised.

**FUNCTION**

The 3-way flow control valve is designed to keep the oil flow to any actuator constant irrespective of the load.

**APPLICATION**

Proportional 3-way flow control valves are used where the supply volume flow has to be kept constant even when the load fluctuates. Depending on the application, a distinction is made between restricting the forward flow or the return flow.

**TYPE CODE**

Flow control valve	Q	D	P	A10	-	-	#
3-way							
Proportional							
Flange construction							
Sandwich construction							
International mounting interface ISO, NG10							
Type list / Function							
Flange construction							
Sandwich construction							
A → B							
in P							
Nominal volume flow level, nominal voltage, etc. of the built-in screw-in cartridge							
Examples:	QDPFA10 - A/B - 32 - G12/WD - HBO						
	QDPFA10 - P - 63 - G24/ME-P1						
Design-Index (Subject to change)							

**GENERAL SPECIFICATIONS**

Description	Proportional 3-way flow control valve	
Nominal size	NG10 acc. to ISO 4401-05	
Construction	Flange- and sandwich construction	
Operations	Proportional solenoid	
Mounting	4 holes for socket cap screws M6 or studs screws M6	
Connection	Threaded connection plates Multi-flange subplate Longitudinal stacking system	
Weight	• Flange type	m = 2,40 kg
(without screw-in cartridge)	• Sandwich type	m = 3,75 kg

**SCREW-IN CARTRIDGES INSTALLED**

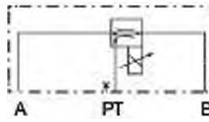
The following screw-in cartridges are used in either the flange body or the sandwich body:

Type	Description	Data sheet no.	Q <sub>max</sub> *
QDPPM33	3-way-construction	2.6-666	100 l/min
QDPPM33-.../ME	3-way-construction, with integrated electronics	2.6-668	100 l/min

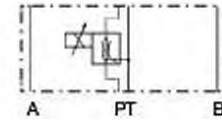
\* Can deviate from the values on the data sheets of the screw-in cartridges

**TYPE CHARTS**

QD.FA10-A/B



QD.SA10-P


**REMARK!**

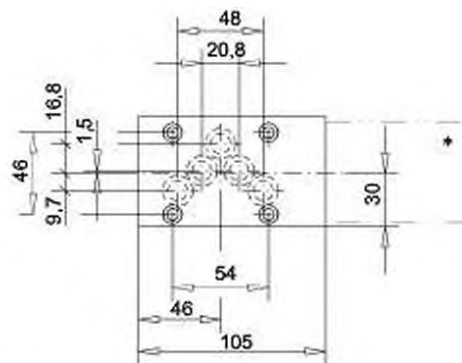
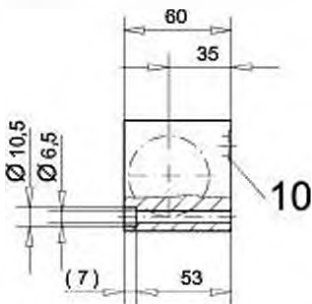
Detailed performance data and additional hydraulic and electric specifications may be drawn from the data sheets of the corresponding installed screw-in cartridge.


**CAUTION!**

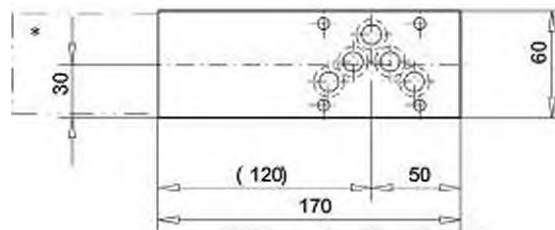
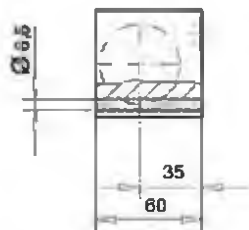
The performance data especially the „pressure-flow-characteristic., on the data sheets of the screw-in cartridges refers to the screw-in cartridges only. The additional pressure drop of the flange body respectively sandwich body must be taken into consideration.

**DIMENSIONS**

Flange construction QD.FA10-A/B



Sandwich construction QD.SA10-P



\* The envelop dimensions of the screw-in cartridge are shown on their corresponding data sheets.

**PARTS LIST**

Position	Article	Description
10	160.2140	O-ring ID 14,00x1,78

**ACCESSORIES**

Proportional amplifier

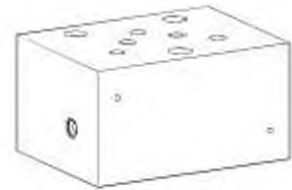
register 1.13

**Non-return valve**
**Sandwich construction**

- ◆  $Q_{max} = 20 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG4-Mini**

Wandfluh standard


**DESCRIPTION**

Non-return valves allow a free flow in one direction and close off the opposite direction by metalically sealing. In the free flow direction, the volume flow opens the spring loaded seat cone. In the opposite direction, the spring keeps the valve closed. The required opening pressure depends on the spring force.

**APPLICATION**

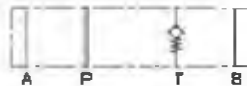
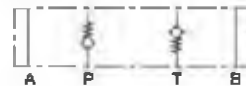
Non-return valves in the P port prevent the pump from backward rotation. When installed in the T port, the spring controlled opening pressure prevents a hydraulic system from draining to the tank. Miniature valves are used where both, reduced dimensions and weight are important.

**SYMBOL**
**BRVA4**

**BRVB4**

**BRVAB4**

**BRVP4**

**BRVT4**

**BRVPT4**

**TYPE CODE**

Mounting interface according to Wandfluh standard

B RV 4 - #

Non-return valve

Type list / Function

in A

 A

in B

 B

in A and B

 AB

in P

 P

in T

 T

in P and T

 PT

Nominal size 4-Mini

Sealing material

 NBR

 FKM (Viton)

 NBR 872


Design index (subject to change)

27-20

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**STANDARDS**

Mounting interface	Wandfluh standard
Contamination efficiency	ISO 4406

**SURFACE TREATMENT**

- ◆ The sandwich bodies made of steel are zinc-phosphated



**GENERAL SPECIFICATIONS**

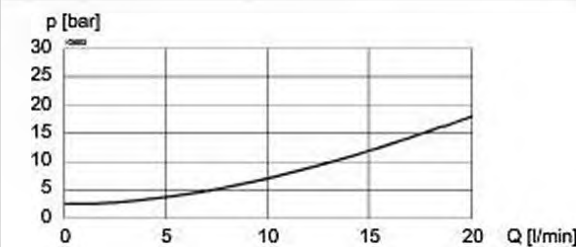
Designation	Non-return valve
Mounting	Sandwich construction
Nominal size	NG4-Mini according to Wandfluh standard
Actuation	None
Ambient temperature	-25...+70 °C
Weight	0.46 kg

**HYDRAULIC SPECIFICATIONS**

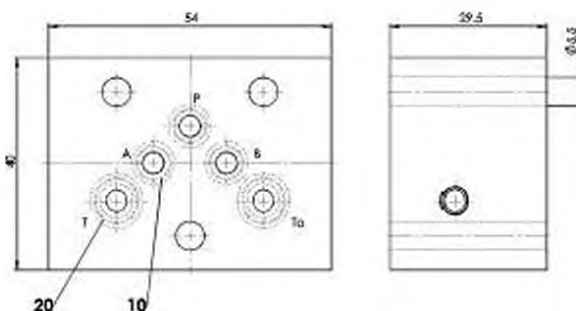
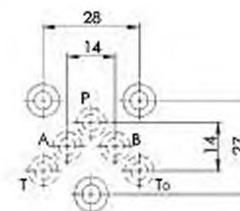
Working pressure	$p_{max} = 350$ bar
Opening pressure	$p_o = 2,2$ bar
Maximum volume flow	$Q_{max} = 20$ l/min
Leakage oil	Seat tight, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+70 °C (NBR) -20...+70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10...16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

 $\Delta p = f(Q)$  Pressure drop volume flow characteristic

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-10
Multi-station subplates	Data sheet 2.9-50
Modula type manifold blocks	Data sheet 2.9-90
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**DIMENSIONS**

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)
20*	160.2067	O-ring ID 6,75 x 1,78 (NBR)
	160.6067	O-ring ID 6,75 x 1,78 (FKM)

**Note!** \* in A or / and B, when non-return valve in A, B or AB. In T, when non-return valve in T.

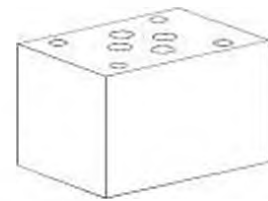

**INSTALLATION NOTES**

Mounting type	Sandwich mounting 3 fixing holes for socket head screws or studs M5
Mounting position	Any
Tightening torque	Fixing screws $M_0 = 5,2$ Nm (screw quality 8.8, zinc coated)

**Non-return valve**
**Sandwich construction**

- $Q_{max} = 80 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**NG6**  
ISO 4401-03


**DESCRIPTION**

Sandwich type pilot operated non-return valve NG6 with interface according to ISO 4401-03. The valves allow a free flow in one direction and shut off in the opposite direction. 6 different standard versions are available. The steel sandwich body is phosphatised. Good performance data and attractive design are the hall marks of this quality product.

**FUNCTION**

In the free flow direction, the volume flow opens the spring loaded valve seat. The spring keeps the valve closed in the opposite direction. The opening pressure required depends on the spring force.

**APPLICATION**

Non-return valves allow the volume flow in one direction and shuts off in the opposite direction, preventing the pressurised fluid from flowing back. Non-return valves in the P port prevents backward rotation of the pump. When installed in the T port, the spring controlled opening pressure prevents a hydraulic system from draining to the tank. Sandwich type elements NG6 make this a highly flexible system.

**TYPE CODE**

RNN SA06 -  #

Non-return valve, sandwich construction

International standard interface ISO, NG6

Type list / Function					
in P	P	in T	T	in P and T	PT
in A	A	in B	B	in A and B	AB
in AV	AV	in BV	BV	in AV and BV	ABV

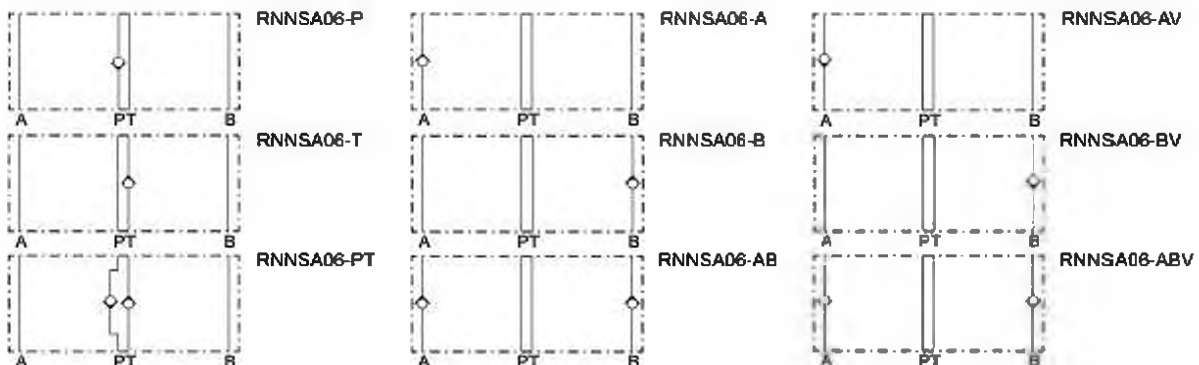
Design-Index (Subject to change)

**GENERAL SPECIFICATIONS**

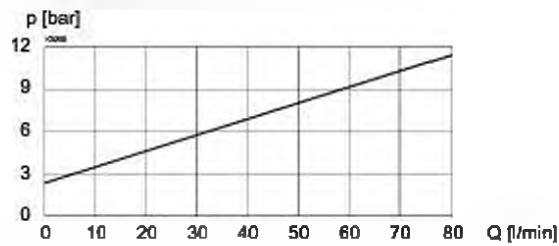
Description	Non-return valve
Nominal size	NG6 acc. to ISO 4401-03
Construction	Sandwich construction
Mounting	4 holes for hexagon socket screw M5 or studs M5
Connections	Connection plates Multi-station flange subplate Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_a = 5,5 \text{ Nm}$ (Quality 8.8)
Weight	$m = 0,85 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

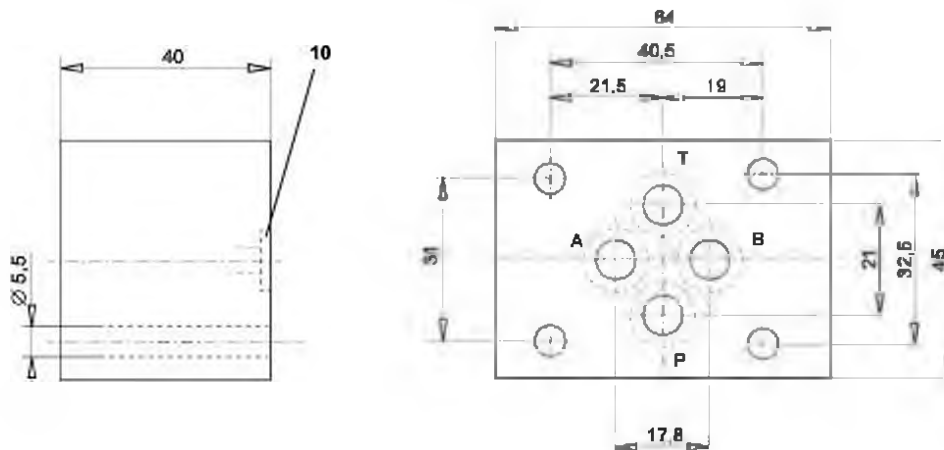
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4408:1999, class 20/18/14 (Required filtration grade $\beta_{10...16} \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 350 \text{ bar}$
Opening pressure	$p_o = 2 \text{ bar}$
Max. volume flow	$Q_{max} = 80 \text{ l/min}$

**SYMBOLS/TYPES**


**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$   
 $\Delta p = f(Q)$  Performance limit



**DIMENSIONS**



**PARTS LIST**

Position	Article	Description
10	160.2093	O-ring ID 9,25x1,78

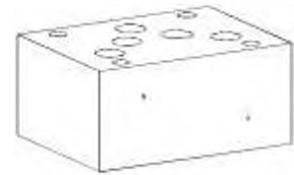
Technical explanation see data sheet 1.0-100

**Non-return valve**
**Sandwich construction**

- ◆  $Q_{max} = 100 \text{ l/min}$
- ◆  $p_{max} = 350 \text{ bar}$

**NG10**

ISO 4401-05


**DESCRIPTION**

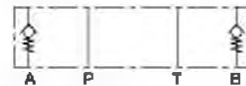
Non-return valves allow a free flow in one direction and close off the opposite direction by metalically sealing. In the free flow direction, the volume flow opens the spring loaded seat cone. In the opposite direction, the spring keeps the valve closed. The required opening pressure depends on the spring force.

**APPLICATION**

Non-return valves in the P port prevent the pump from backward rotation. When installed in the T port, the spring controlled opening pressure prevents a hydraulic system from draining to the tank.

**SYMBOL**
**ARVA10**

**ARVB10**

**ARVAB10**

**ARVP10**

**ARVT10**

**ARVPT10**

**TYPE CODE**

International standard interface ISO

 A RV  10 -  # 

Non-return valve

Type list / Function

in A	<input type="text" value="A"/>	in B	<input type="text" value="B"/>	in A and B	<input type="text" value="AB"/>
in P	<input type="text" value="P"/>	in T	<input type="text" value="T"/>	in P and T	<input type="text" value="PT"/>

Nominal size 10

Sealing material

NBR	<input type="text" value="NBR"/>
FKM (Viton)	<input type="text" value="FKM"/>
NBR 872	<input type="text" value="872"/>

Design index (subject to change)

27-20

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**STANDARDS**

Mounting interface	ISO 4401-05
Contamination efficiency	ISO 4406

**SURFACE TREATMENT**

- ◆ The sandwich bodies made of steel are zinc-phosphated

**GENERAL SPECIFICATIONS**

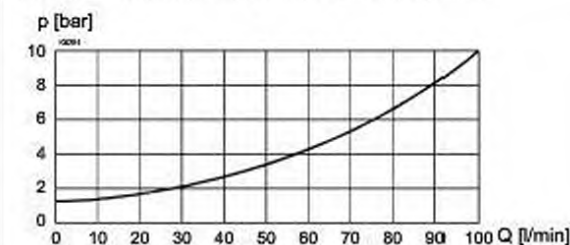
Designation	Non-return valve
Mounting	Sandwich construction
Nominal size	NG10 according to ISO 4401-05
Actuation	None
Ambient temperature	-25 ... +70 °C
Weight	1,2 kg

**HYDRAULIC SPECIFICATIONS**

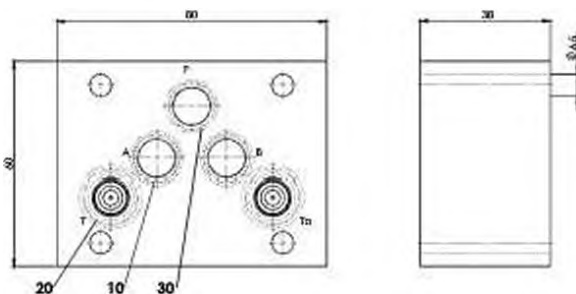
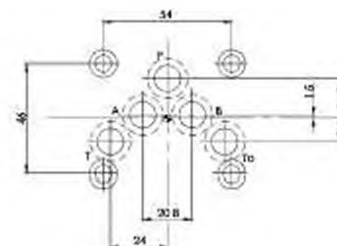
Working pressure	$p_{max} = 350$ bar
Opening pressure	$p_o = 0,8$ bar
Maximum volume flow	$Q_{max} = 100$ l/min
Leakage oil	Seat tight, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +70 °C (NBR) -20 ... +70 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10 ... 16 ≥ 75, see data sheet 1.0-50

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30$  mm<sup>2</sup>/s

 $\Delta p = f(Q)$  Pressure drop volume flow characteristic

**ACCESSORIES**

Fixing screws	Data sheet 1.0-60
Threaded subplates	Data sheet 2.9-40
Multi-station subplates	Data sheet 2.9-70
Modula type manifold blocks	Data sheet 2.9-110
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**DIMENSIONS**

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.6124	O-ring ID 12,42 x 1,78 (FKM)
20*	160.2132	O-ring ID 13,10 x 2,62 (NBR)
	160.6132	O-ring ID 13,10 x 2,62 (FKM)
30	160.2140	O-ring ID 14,00 x 1,78 (NBR)
	160.6141	O-ring ID 14,00 x 1,78 (FKM)

**INSTALLATION NOTES**

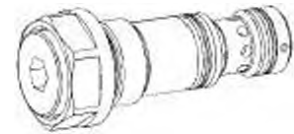
Mounting type	Sandwich mounting 4 fixing holes for socket head screws or studs M6
Mounting position	Any
Tightening torque	Fixing screws $M_0 = 8,9$ Nm (quality 8.8, zinc coated)

## Non-return valve hydraulically pilot operated

### Screw-in cartridge construction

- ◆  $Q_{max} = 80 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**M22 x 1,5**  
**ISO 7789**



### DESCRIPTION

Hydraulically pilot operated non-return valve in screw-in cartridge construction for cavity according to ISO 7789. In the free flow direction (2 → 1), the volume flow opens the spring loaded seat cone. In the opposite direction (1 → 2), the spring keeps the valve closed. If pressure is built up in connection x, the pilot control spool is shifted and the non-return valve of the closed off port is opened by this. The required pilot control pressure depends on the pilot ratio.

### APPLICATION

Pilot operated non-return valves are used for closing off pressurised hydraulic cylinders leak free, for example in lifting or clamping devices. The spool valve that directs the volume flow to port x, should have both service ports connected to the tank in the rest position for reasons of operational safety.

### SYMBOL



### INSTALLATION NOTES

Mounting type	Screw-in cartridge M22 x 1,5
Mounting position	Any
Tightening torque	$M_p = 60 \text{ Nm}$ Screw-in cartridge

### TYPE CODE

Non-return valve hydraulically pilot operated		RNX PM22 -	<input type="checkbox"/>	-	<input type="checkbox"/>	≠	<input type="checkbox"/>
Screw-in cartridge M22 x 1,5							
Opening pressure $p_o$	2 bar	<input type="checkbox"/>	2				
	5 bar	<input type="checkbox"/>	5				
Sealing material	NBR	<input type="checkbox"/>					
	FKM (Viton)	<input type="checkbox"/>	D1				
	NBR 872	<input type="checkbox"/>	Z604				
Design index (subject to change)							

27-01

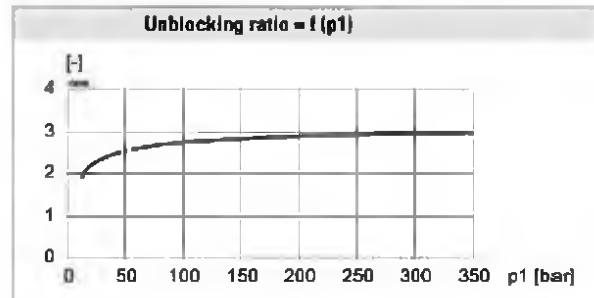
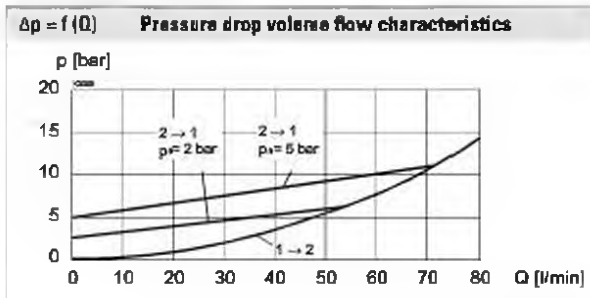
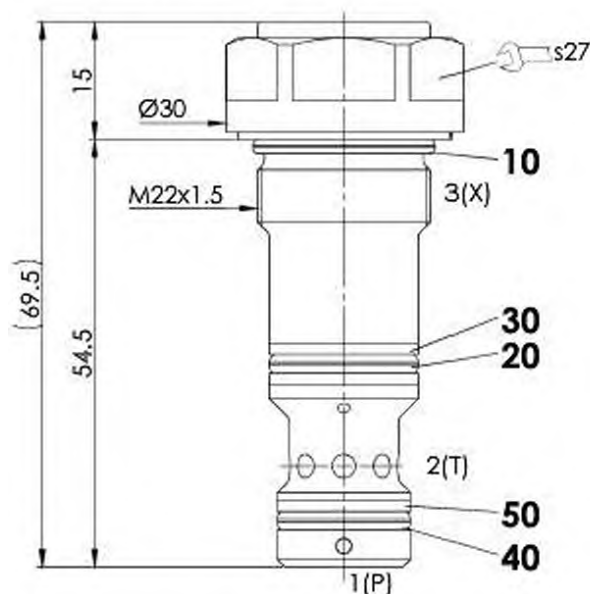
### GENERAL SPECIFICATIONS

Designation	Non-return valve hydraulically pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M22 x 1,5 according to ISO 7789
Actuation	None
Ambient temperature	-25...+90 °C
Weight	0,15 kg

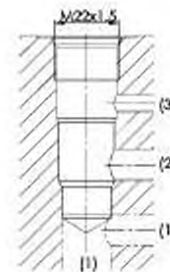
### HYDRAULIC SPECIFICATIONS

Working pressure	$p_{nom} = 350 \text{ bar}$
Opening pressure	$p_o = 2; 5 \text{ bar}$
Maximum volume flow	$Q_{max} = 80 \text{ l/min}$
Leakage oil	Seat tight, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Temperature range fluid	-25...+90 °C (NBR) -20...+90 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade $\beta_{10} \dots 16 \geq 75$ , see data sheet 1.0-50
Pilot ratio	See characteristic
Area ratio	$i = 1 : 3$

**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-22-06-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1006

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**SURFACE TREATMENT**

- ◆ The cartridge body is zinc-nickel coated

**PARTS LIST**

Position	Article	Description
10	160.2188	O-ring ID 18,77 x 1,78 (NBR)
	160.6188	O-ring ID 18,77 x 1,78 (FKM)
20	160.2156	O-ring ID 15,60 x 1,78 (NBR)
	160.6156	O-ring ID 15,60 x 1,78 (FKM)
30	049.3196	Backup ring rd 16,1 x 19 x 1,4
40	160.2120	O-ring ID 12,42 x 1,78 (NBR)
	160.6124	O-ring ID 12,42 x 1,78 (FKM)
50	049.3176	Backup ring rd 14,1 x 17 x 1,4

**STANDARDS**

Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

**ACCESSORIES**

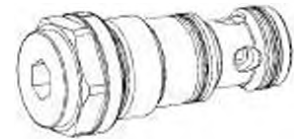
Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

## Non-return valve hydraulically pilot operated

### Screw-in cartridge construction

- ◆  $Q_{max} = 150 \text{ l/min}$
- ◆  $p_{nom} = 350 \text{ bar}$

**M33 x 2**  
**ISO 7789**



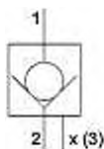
### DESCRIPTION

Hydraulically pilot operated non-return valve in screw-in cartridge construction for cavity according to ISO 7789. In the free flow direction (2 → 1), the volume flow opens the spring loaded seat cone. In the opposite direction (1 → 2), the spring keeps the valve closed. If pressure is built up in connection x, the pilot control spool is shifted and the non-return valve of the closed off port is opened by this. The required pilot control pressure depends on the pilot ratio.

### APPLICATION

Pilot operated non-return valves are used for closing off pressurised hydraulic cylinders leak free, for example in lifting or clamping devices. The spool valve that directs the volume flow to port x, should have both service ports connected to the tank in the rest position for reasons of operational safety.

### SYMBOL



### INSTALLATION NOTES

Mounting type	Screw-in cartridge M33 x 2
Mounting position	Any
Tightening torque	$M_0 = 80 \text{ Nm}$ screw-in cartridge

### TYPE CODE

Non-return valve hydraulically pilot operated		RNX PM33 -	<input type="checkbox"/>	-	<input type="checkbox"/>	#	<input type="checkbox"/>
Screw-in cartridge M33 x 2							
Opening pressure $p_0$	2 bar	<input type="checkbox"/>	2				
	5 bar	<input type="checkbox"/>	5				
Sealing material	NBR	<input type="checkbox"/>					
	FKM (Viton)	<input type="checkbox"/>	D1				
	NBR 872	<input type="checkbox"/>	Z604				
Design index (subject to change)							
27-02							

### GENERAL SPECIFICATIONS

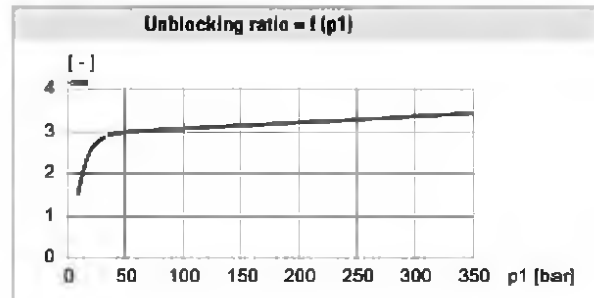
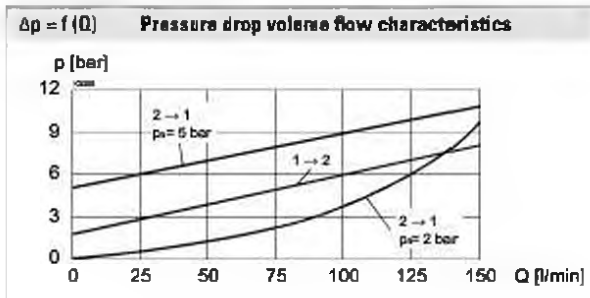
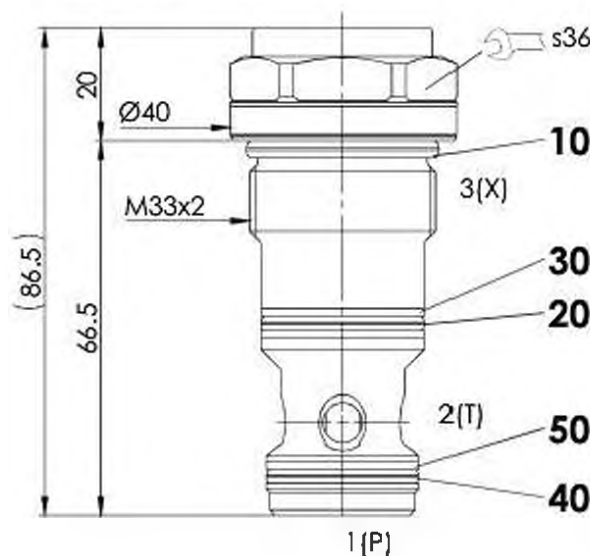
Designation	Non-return valve hydraulically pilot operated
Mounting	Screw-in cartridge construction
Nominal size	M33 x 2 according to ISO 7789
Actuation	None
Ambient temperature	-25 ... +90 °C
Weight	0,37 kg

### HYDRAULIC SPECIFICATIONS

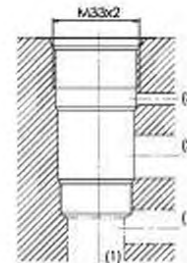
Working pressure	$p_{nom} = 350 \text{ bar}$
Opening pressure	$p_0 = 2; 5 \text{ bar}$
Maximum volume flow	$Q_{max} = 150 \text{ l/min}$
Leakage oil	Seat tight, max. 0,15 ml / min (approx. 3 drops / min) at 30 cSt
Fluid	Mineral oil, other fluid on request
Viscosity range	12 mm <sup>2</sup> /s ... 320 mm <sup>2</sup> /s
Temperature range fluid	-25 ... +90 °C (NBR) -20 ... +90 °C (FKM)
Contamination efficiency	Class 20 / 18 / 14
Filtration	Required filtration grade B 10 ... 16 ≥ 75, see data sheet 1.0-50
Pilot ratio	See characteristic
Area ratio	$i = 1 : 3,2$



**PERFORMANCE SPECIFICATIONS**

 Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 

**DIMENSIONS**

**HYDRAULIC CONNECTION**

Cavity drawing according to ISO 7789-33-06-0-98


**Note!**


For detailed cavity drawing and cavity tools see data sheet 2.13-1011

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**PARTS LIST**

Position	Article	Description
10	160.2298	O-ring ID 29,82 x 2,62 (NBR)
	160.6296	O-ring ID 29,82 x 2,62 (FKM)
20	160.2252	O-ring ID 25,12 x 1,78 (NBR)
	160.6252	O-ring ID 25,12 x 1,78 (FKM)
30	049.3296	Back-up ring rd 26,1 x 29,4 x 1,4
40	160.2236	O-ring ID 23,52 x 1,78 (NBR)
	160.6236	O-ring ID 23,52 x 1,78 (FKM)
50	049.3276	Back-up ring rd 24,1 x 27 x 1,4

**SURFACE TREATMENT**

- ◆ The cartridge body is zinc-nickel coated

**STANDARDS**

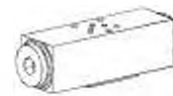
Cartridge cavity	ISO 7789
Contamination efficiency	ISO 4406

**ACCESSORIES**

Technical explanations	Data sheet 1.0-100
Hydraulic fluids	Data sheet 1.0-50
Filtration	Data sheet 1.0-50

**Non-return valve  
hydraulic pilot  
Sandwich construction**

- $Q_{max} = 8 \text{ l/min}$
- $p_{max} = 315 \text{ bar}$

**NG3-Mini**

**DESCRIPTION**

Sandwich type non-return valve NG3-Mini with hydraulic pilot with interface according to Wandfluh standard. The valves allow a free flow in one direction and shut off in the opposite direction. 3 different standard versions are available. The steel sandwich body is phosphatised. Good performance data and attractive design are the hall marks of this quality product.

**FUNCTION**

In the free flow direction, the volume flow opens the valve seat against a spring. The spring helps the valve close in the opposite direction. If pressure builds up in the opposite oil part, this displaces the pilot piston and opens the non-return valve of the closed port. The pilot pressure required is dependent on the pressure held by the valve seat.

**APPLICATION**

Pilot operated non-return valves are used to shut off pressurised hydraulic cylinders, e.g. in lifting or clamping fixtures, without leaking. The hydraulic cylinder can only be moved in the shut off direction if a directional valve directs the volume flow into the opposite port and releases the valve. Reliability in operation is increased by a directional valve which connects both oil ports to the tank in the neutral position. Sandwich type elements NG3 mean that the system is highly flexible and save both space and weight.

**TYPE CODE**

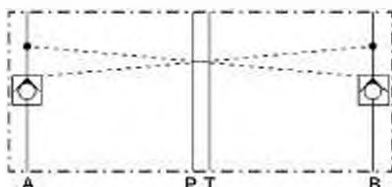
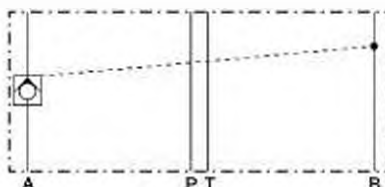
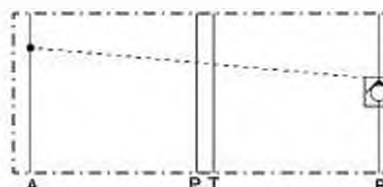
	8	3	#
Mounting interface acc. to Wandfluh standard			
Type list / Function			
in A and B	DERV		
in A	ERVA		
in B		ERVB	
Nominal size 3-Mini			
Design-Index (Subject to change)			

**GENERAL SPECIFICATIONS**

Description	Non-return valve hydraulic pilot
Nominal size	NG3-Mini acc. to Wandfluh standard
Construction	Sandwich construction
Mounting	3 holes for hexagon socket screw M4 or studs M4
Connections	Connection plates Multi-station flange subplate Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_c = 2,8 \text{ Nm}$ (Quality 8.8)
Weight	$m = 0,56 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

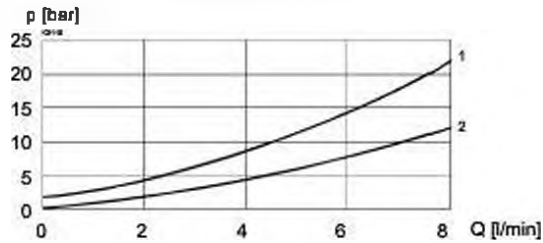
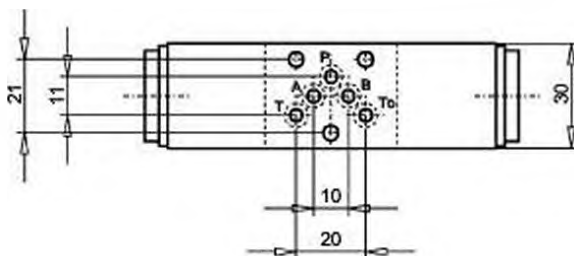
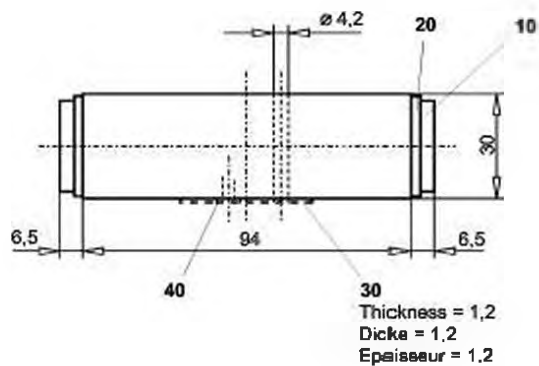
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 20/18/14 (Required filtration grade B 10...18≥75) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 315 \text{ bar}$
Opening pressure	$p_a = 2 \text{ bar}$
Pilot ratio	$i = 1:8$
Max. volume flow	$Q_{max} = 8 \text{ l/min}$

**SYMBOLS / TYPES**
**BDERV3**

**BERVA3**

**BERVB3**


**CHARACTERISTICS** Oil viscosity  $\nu_1 = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$ 

Pressure drop characteristic

 1 Pressure drop A  $\rightarrow$  Cyl. or B  $\rightarrow$  Cyl.

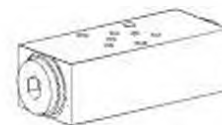
 2 Pressure drop Cyl.  $\rightarrow$  A or Cyl.  $\rightarrow$  B  
 with check valve fully open

**DIMENSIONS**

**PARTS LIST**

Position	Article	Description
10	239.2003	Plug G1/2"
20	49.2212	Bounded seal 21,5x28,7x2,5
30	173.0650	Seal plate PDSA03
40	160.2045	O-Ring ID 4,5x1,5

Technical explanation see data sheet 1.0-100

**Non-return valve  
hydraulic pilot  
Sandwich construction**

- $Q_{max} = 20 \text{ l/min}$
- $p_{max} = 315 \text{ bar}$

**NG4-Mini<sup>®</sup>**

**DESCRIPTION**

Sandwich type non-return valve NG4-Mini with hydraulic pilot with interface according to Wandfluh standard. The valves allow a free flow in one direction and shut off in the opposite direction. 3 different standard versions are available. The steel sandwich body is phosphatised. Good performance data and attractive design are the hall marks of this quality product.

**FUNCTION**

In the free flow direction, the volume flow opens the valve seat against a spring. The spring helps the valve close in the opposite direction. If pressure builds up in the opposite oil port, this displaces the pilot piston and opens the non-return valve of the closed port. The pilot pressure required is dependent on the pressure held by the valve seat.

**APPLICATION**

Pilot operated non-return valves are used to shut off pressurised hydraulic cylinders, e.g. in lifting or clamping fixtures, without leaking. The hydraulic cylinder can only be moved in the shut off direction if a directional valve directs the volume flow into the opposite port and releases the valve. Reliability in operation is increased by a directional valve which connects both oil ports to the tank in the neutral position. Sandwich type elements NG4-Mini mean that the system is highly flexible and save both space and weight.

**TYPE CODE**

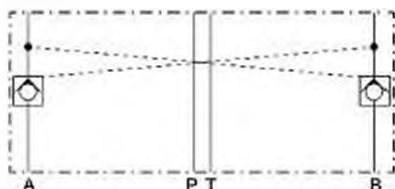
	B	4	#	
Mounting interface acc. to Wandfluh standard				
Type list / Function				
in A and B				
in A	ERVA	in B	DERV	
			ERVB	
Nominal size 4-Mini				
Design-Index (Subject to change)				

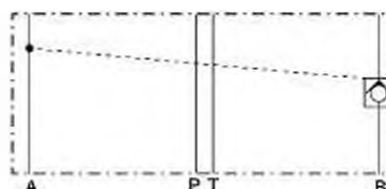
**GENERAL SPECIFICATIONS**

Description	Non-return valve hydraulic pilot
Nominal size	NG4-Mini acc. to Wandfluh standard
Construction	Sandwich construction
Mounting	3 holes for hexagon socket screw M5 or studs M5
Connections	Connection plates Multi-station flange subplate Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_0 = 5,5 \text{ Nm}$ (Quality 8.8)
Weight	$m = 0,85 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 20/18/14 (Required filtration grade $\beta_{10...16} \geq 75$ ) (refer to data sheet 1.0-50)
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 315 \text{ bar}$
Opening pressure	$p_A = 2 \text{ bar}$
Pilot ratio	$i = 1:8$
Max. volume flow	$Q_{max} = 20 \text{ l/min}$

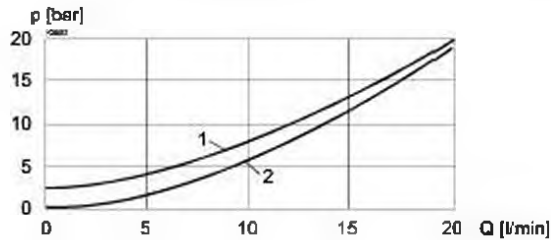
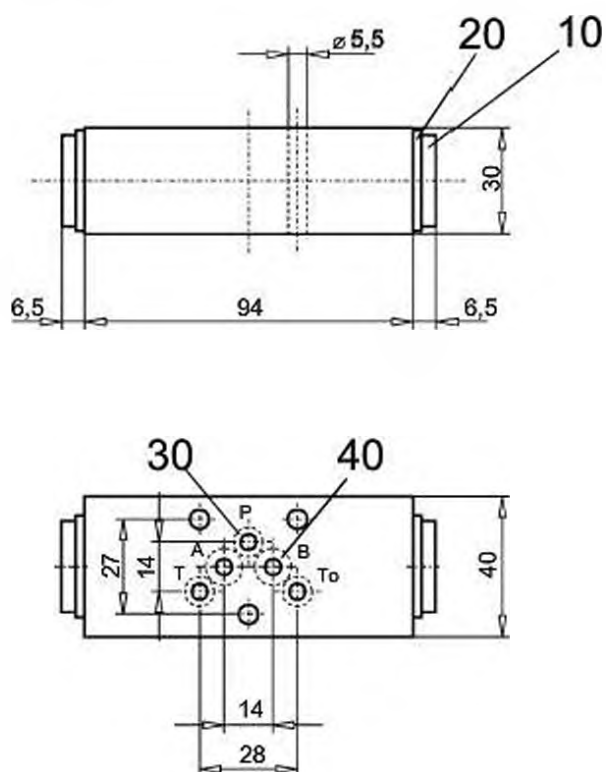
**SYMBOLS / TYPES**
**BDERV4**

**BERVA4**

**BERVB4**


**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$ 

Pressure drop characteristic

 1 Pressure drop A  $\rightarrow$  Cyl. or B  $\rightarrow$  Cyl.

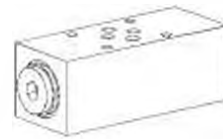
 2 Pressure drop Cyl.  $\rightarrow$  A or Cyl.  $\rightarrow$  B  
 with check valve fully open

**DIMENSIONS**

**PARTS LIST**

Position	Article	Description
10	239.2003	Plug G1/4"
20	049.2212	Bounded seal 21,5x28,7x2,5
30	160.2052	O-Ring ID 5.28x1,78
40	160.2076	O-Ring ID 7.85x1,78

Technical explanation see data sheet 1.0-100

**Non-return valve  
hydraulic pilot  
Sandwich construction**

- $Q_{max} = 30 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**NG6**  
 ISO 4401-03

**DESCRIPTION**

Sandwich type non-return valve NG6 with hydraulic pilot. The valves allow a free flow in one direction and shut off in the opposite direction. 3 different standard versions are available. The steel sandwich body is phosphalised. Good performance data and attractive design are the hall marks of this quality product.

**FUNCTION**

In the free flow direction, the volume flow opens the valve seat against a spring. The spring helps the valve close in the opposite direction. If pressure builds up in the opposite oil port, this displaces the pilot piston and opens the non-return valve of the closed port. The pilot pressure required is dependant on the pressure held by the valve seat.

**APPLICATION**

Pilot operated non-return valves are used to shut off pressurised hydraulic cylinders, e.g. in lifting or clamping fixtures, without leaking. The hydraulic cylinder can only be moved in the shut off direction if a directional valve directs the volume flow into the opposite port and releases the valve. Reliability in operation is increased by a directional valve which connects both oil ports to the tank in the neutral position. Sandwich type elements NG6 mean that the system is highly flexible.

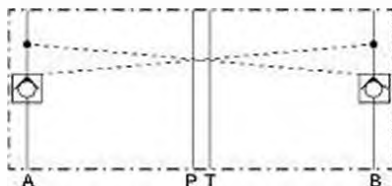
**TYPE CODE**

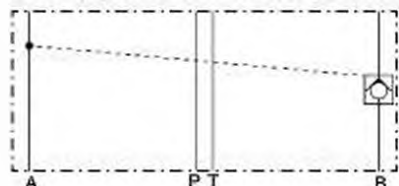
**GENERAL SPECIFICATIONS**

Description	Non-return valve hydraulic pilot
Nominal size	NG6 acc. to ISO 4401-03
Construction	Sandwich construction
Mounting	4 holes for socket cap screws M5 or studs M5
Connections	Connection plates Multistation flange subplate Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_0 = 5,5 \text{ Nm}$ (Quality 8.8)
Weight	$m = 1,6 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

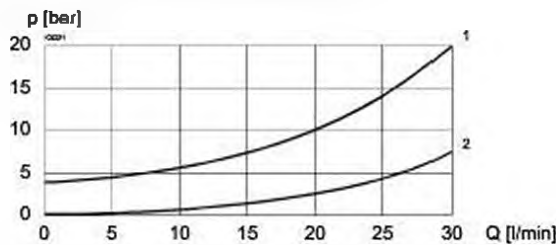
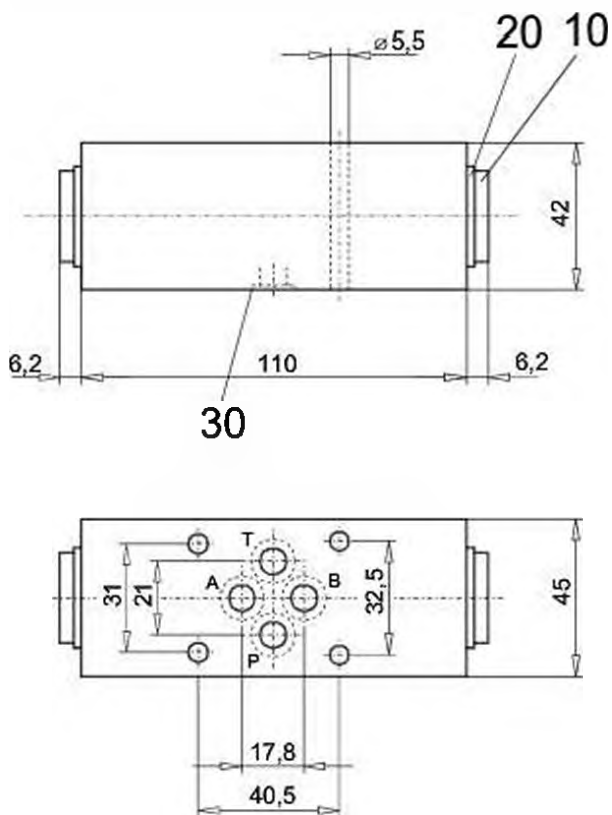
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 20/18/14 (Required filtration grade $\beta_{10} \dots 16 > 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 350 \text{ bar}$
Opening pressure	$p_o = 3 \text{ bar}$
Pilot ratio	$i = 1:5$
Max. volume flow	$Q_{max} = 30 \text{ l/min}$

**SYMBOLS/TYPES**
**ADERV6**

**AERVA6**

**AERVB6**


**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$ 
**Pressure drop characteristic**

 1 Pressure drop A  $\rightarrow$  Cyl. or B  $\rightarrow$  Cyl.

 2 Pressure drop Cyl.  $\rightarrow$  A or Cyl.  $\rightarrow$  B  
 with check valve fully open

**DIMENSIONS**

**PARTS LIST**

Position	Article	Description
10	239.2100	Plug G1/2"
20	049.2212	Bonded seal 21,5x28,7x2,5
30	160.2093	O-Ring ID 9,25x1,78

Technical explanation see data sheet 1.0-100

**Non-return valve  
hydraulic pilot  
Sandwich construction**

- $Q_{max} = 100 \text{ l/min}$
- $p_{max} = 250 \text{ bar}$

**NG10**  
 ISO 4401-05

**DESCRIPTION**

Sandwich type non-return valve NG10 with hydraulic pilot acc. to ISO 4401-05. The valves allow a free flow in one direction and shut off in the opposite direction. 3 different standard versions are available. The sandwich body made of steel is zinc-nickel coated.

**FUNCTION**

In the free flow direction, the volume flow opens the valve seat against a spring. The spring helps the valve close in the opposite direction. If pressure builds up in the opposite oil port, this displaces the pilot piston and opens the non-return valve of the closed port. The pilot pressure required is dependent on the pressure held by the valve seat.

**APPLICATION**

Pilot operated non-return valves are used to shut off pressurised hydraulic cylinders, e.g. in lifting or clamping fixtures, without leaking. The hydraulic cylinder can only be moved in the shut off direction if a directional valve directs the volume flow into the opposite port and releases the valve. Reliability in operation is increased by a directional valve which connects both oil ports to the tank in the neutral position. Sandwich type elements NG10 mean that the system is highly flexible.

**TYPE CODE**

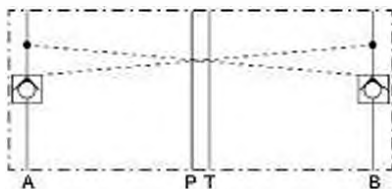
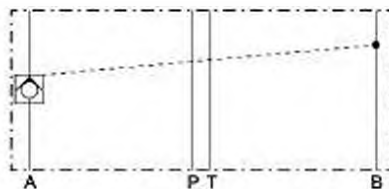
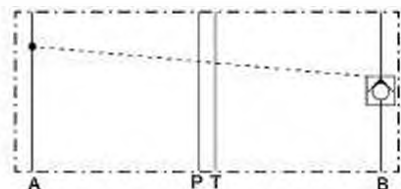
A		10 #	
International standard interface ISO			
Type list / Function			
in A and B <b>DERV</b>			
in A <b>ERVA</b> in B <b>ERVB</b>			
Nominal size 10			
Design-Index (Subject to change)			

**GENERAL SPECIFICATIONS**

Description	Non-return valve hydraulic pilot
Nominal size	NG10 acc. to ISO 4401-05
Construction	Sandwich construction
Mounting	4 holes for socket cap screws M6 or studs M8
Connections	Connection plates Multi-station flange subplate Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_c = 9,5 \text{ Nm}$ (quality 8.8)
Weight	$m = 2,1 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

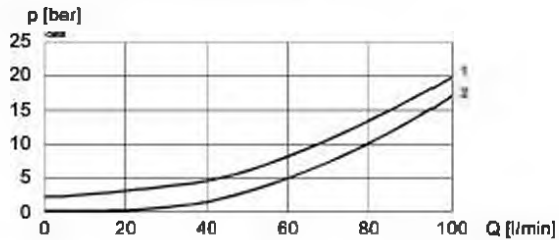
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 20/18/14 (Required filtration grade $\beta_{10} \dots 16 > 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 250 \text{ bar}$
Opening pressure	$p_o = 2 \text{ bar}$
Pilot ratio	$i = 1:5$
Max. volume flow	$Q_{max} = 100 \text{ l/min}$

**SYMBOLS/TYPES**
**ADERV10**

**AERVA10**

**AERVB10**




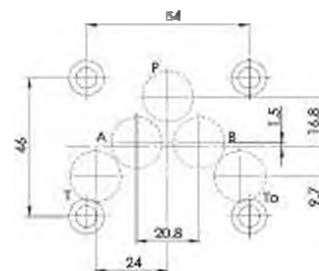
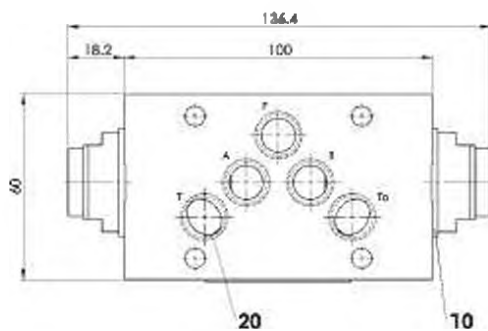
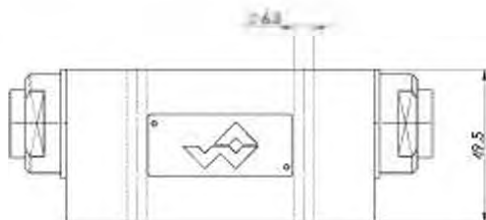
**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$ 
**Pressure drop characteristic**

1 Pressure drop A → Cyl. or B → Cyl.

 2 Pressure drop Cyl. → A or Cyl. → B  
 with check valve fully open

**DIMENSIONS**

ADERV.10

AERV.10

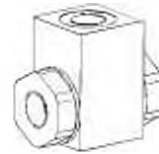

**PARTS LIST**

Position	Article	Description
10	049.2262	Bonded seal 26.7x35x2
20	180.2140	O-ring ID 14.00x1.78

Technical explanation see data sheet 1.0-100

**Shuttle valve  
for installation in pipes**

- $Q_{max} = 40 \text{ l/min}$
- $p_{max} = 210 \text{ bar}$


**DESCRIPTION**

Shuttle valve for installation in pipes with two tapped mounting holes for fixation. Main body has a phosphated surface while the two bushes for the side ports P1 and P2 are zinc coated.

**FUNCTION**

The shuttle valve opens the oil passage from P1 → A or P2 → A. The port (P1, P2) with the higher pressure will open. The low pressure port is sealed off leak free by a soft seal. Flow from A → P1 or A → P2 is possible in shifted spool position.

**APPLICATION**

This shuttle valve is used where an oil consumer is fed from two separate supplies with priority to the supply with the higher pressure. See application example.

**TYPE CODE**

	WRV	6	38	#	<input type="checkbox"/>
Shuttle valve					
Nominal size 6					
Threaded connection G3/8"					
Design-Index (Subject to change)					

**GENERAL SPECIFICATIONS**

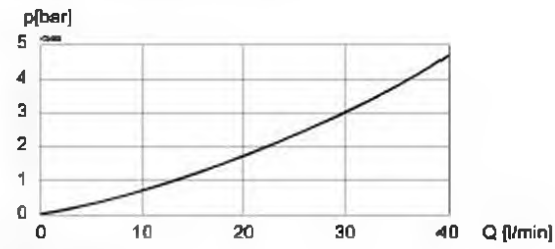
Designation	Shuttle valve
Construction	Threaded body
Mounting	Installation in pipes, mounting panels
Connection type	Threaded connections G3/8"
Ambient temperature	-20 ... +50 °C
Mounting position	any
Weight	m = 0,6 kg

**HYDRAULIC SPECIFICATIONS**

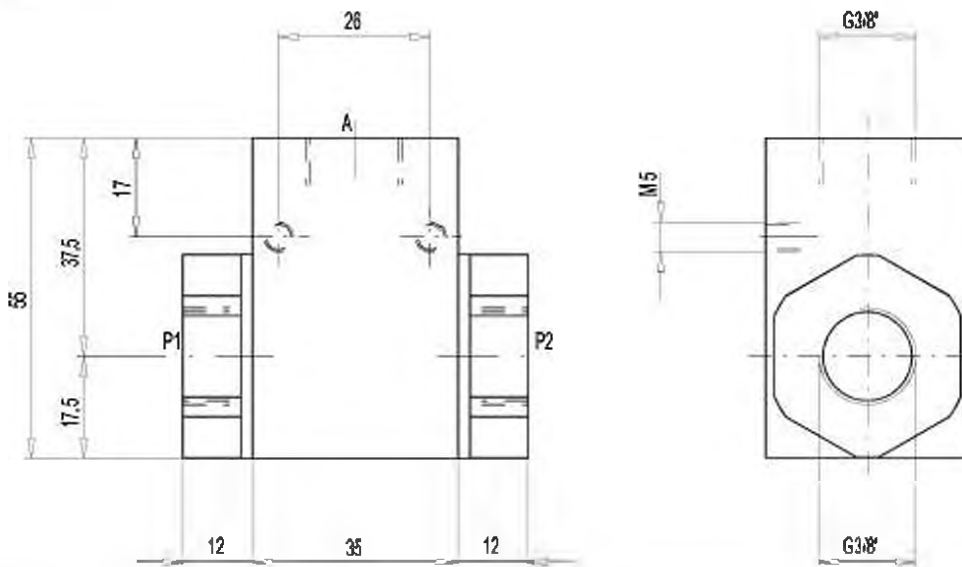
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 20/18/14...21/19/15 (Required filtration grade & 10...25>75) refer to data sheet 1.0-50/2
Viscosity range	12mm <sup>2</sup> /s...320mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 210 \text{ bar}$
Max. volume flow	$Q_{max} = 40 \text{ l/min}$

**SYMBOLS**

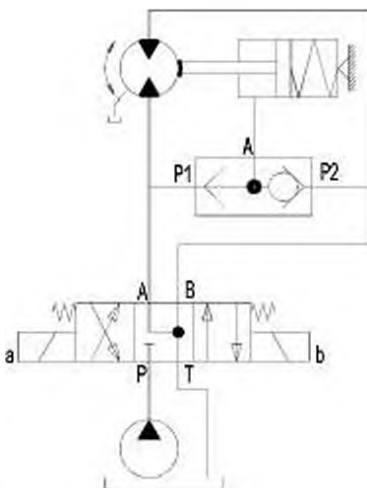

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$   
 $\Delta p = f(Q)$  Pressure loss - volume flow - curve  
 P1  $\rightarrow$  A and P2  $\rightarrow$  A



**DIMENSIONS**



**APPLICATION EXAMPLE**



Technical explanation see data sheet 1.0-100

**Pipe failure valve**  
**For installation in pipes**

- $Q_{max} = 20 \text{ l/min}$
- $p_{max} = 210 \text{ bar}$

**NG6**

**DESCRIPTION**

Pipe failure valve NG6 for line mounting. The valve is screwed directly into the component which has to be protected. Thread size for port A: male G3/8". For port P: female G1/4" for type RBSG638 or female G3/8" for type RBSW638. This pipe failure valve is available in a straight version and in a 90° version. Housing and banjo bolt are zinc coated.

**FUNCTION**

Fluid can pass the valve in both flow directions. In flow direction A to P the valve closes if the amount of flow exceeds the adjusted value. Amount of flow which causes the valve to close (cut-off flow) can be adjusted by means of an adjustment screw. The valve is set at 10 l/min at the factory. Turning the adjustment screw clockwise reduces the cut-off flow.

**APPLICATION**

Pipe failure valves are used where loads must be protected against uncontrolled lowering after a line rupture, for example in scissor lifts or leveling platforms. **Caution:** Pipe failure valves are not suitable for applications where pressure and flow changes rapidly under normal working conditions.

**TYPE CODE**

		RBS	<input type="checkbox"/>	6	38	* <input type="checkbox"/>
Pipe failure valve						
Straight execution	G					
Angled execution	W					
Nominal size 6						
Threaded connection G3/8"						
Design-Index (subject to change)						

**GENERAL SPECIFICATIONS**

Description	Pipe failure valve
Construction	Threaded body
Mounting	Threaded part, line mounting
Connections	Threaded part male G3/8" Threaded part female G1/4" (RBSG638) Threaded part female G3/8" (RBSW638)
Ambient temperature	-20...+50 °C
Mounting position	any
Weight RBSG638	m = 0,18 kg
RBSW638	m = 0,28 kg

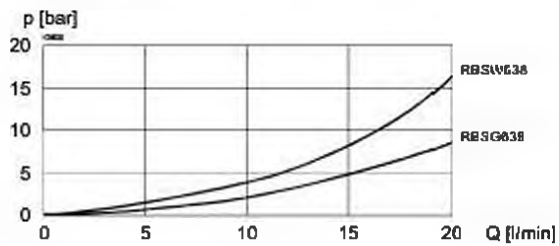
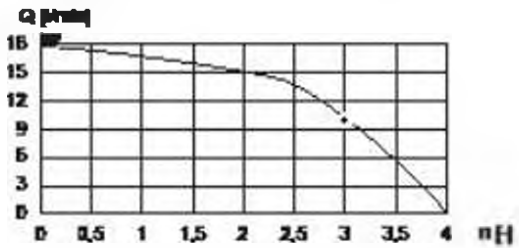
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 20/18/14 (Required filtration grade β 10...25≥75) refer to data sheet 1.0-50/2
Viscosity range	12mm <sup>2</sup> /s...320mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 210 \text{ bar}$
Max. volume flow	P → A: $Q_{max} = 20 \text{ l/min}$ A → P: $Q_{max} = 18 \text{ l/min}$

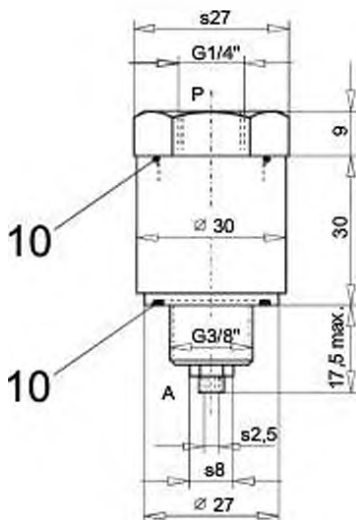
**SYMBOLS**

simplified                      detailed

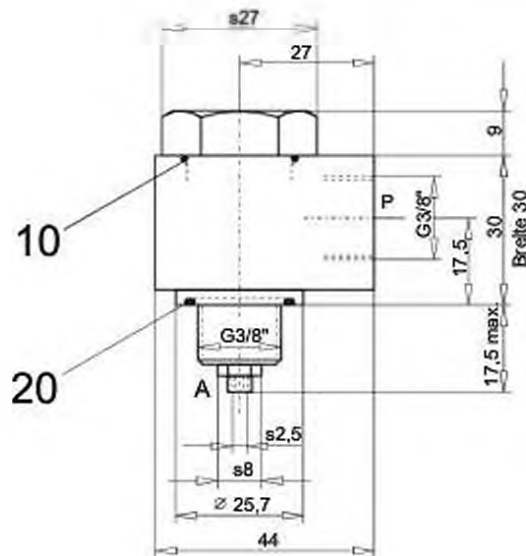


**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure drop characteristic  
 P → A

 $Q = f(p)$  Cut-off volume flow characteristic  
 A → P

**DIMENSIONS**

RBSG638



RBSW638


**PARTS LIST**

Position	Article	Description
10	160.2215	O-ring ID 21,00x1,50
20	160.2188	O-ring ID 18,77x1,78

Technical explanation see data sheet 1.0-100

**Pipe failure valve**
**For installation in pipes**

- $Q_{max} = 30 \text{ l/min}$
- $p_{max} = 210 \text{ bar}$

**NG10**

**DESCRIPTION**

Pipe failure valve NG10 for line mounting. The valve is screwed directly into the component which has to be protected. Thread size for port A: male G1/2". For port P: female G3/8" for type RBSG1012 or female G1/2" for type RBSW1012. This pipe failure valve is available in a straight version and in a 90° version. Housing and banjo ball are zinc coated.

**FUNCTION**

Fluid can pass the valve in both flow directions. In flow direction A to P the valve closes if the amount of flow exceeds the adjusted value. Amount of flow which causes the valve to close (cut-off flow) can be adjusted by means of an adjustment screw. The valve is set at 20–25 l/min (at the factory. Turning the adjustment screw clockwise reduces the cut-off flow.

**APPLICATION**

Pipe failure valves are used where loads must be protected against uncontrolled lowering after a line rupture, for example in scissor lifts or leveling platforms.

**Caution:**

Pipe failure valves are not suitable for applications where pressure and flow changes rapidly under normal working conditions.

**TYPE CODE**

		RBS	<input type="checkbox"/>	10	12	#	<input type="checkbox"/>
Pipe failure valve							
Straight execution	<input type="checkbox"/>	G					
Angled execution	<input type="checkbox"/>	W					
Nominal size 10							
Threaded connection G1/2"							
Design-Index (subject to change)							

**GENERAL SPECIFICATIONS**

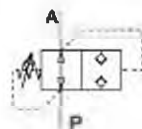
Description	Pipe failure valve
Construction	Threaded body
Mounting	Threaded port, line mounting
Connections	Threaded port male G1/2" Threaded port female G3/8" (RBSG1012) Threaded port female G1/2" (RBSW1012)
Ambient temperature	-20...+50°C
Mounting position	any
Weight RBSG1012	m = 0,26 kg
RBSW1012	m = 0,38 kg

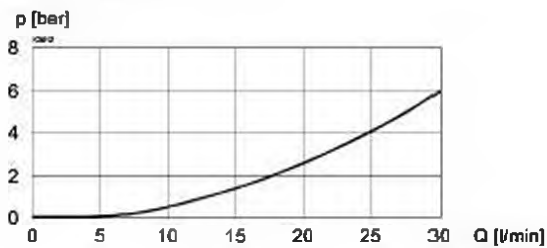
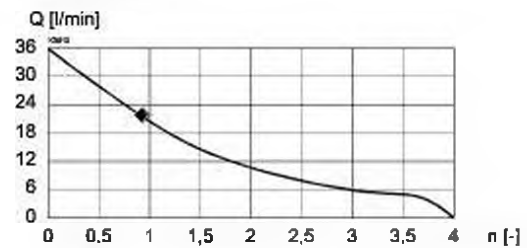
**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 20/18/14 (Required filtration grade $\beta_{10...25} \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12mm <sup>2</sup> /s...320mm <sup>2</sup> /s
Fluid temperature	-20...+70°C
Peak pressure	$p_{max} = 210 \text{ bar}$
Max. volume flow	P → A: $Q_{max} = 30 \text{ l/min}$ A → P: $Q_{max} = 35 \text{ l/min}$

**SYMBOLS**

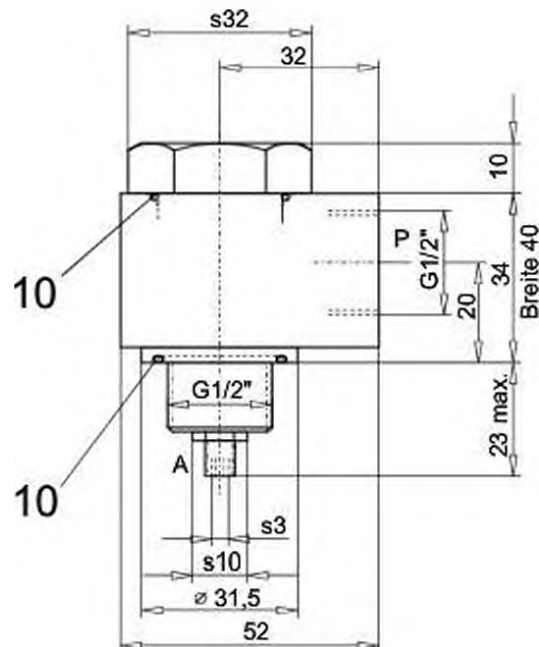
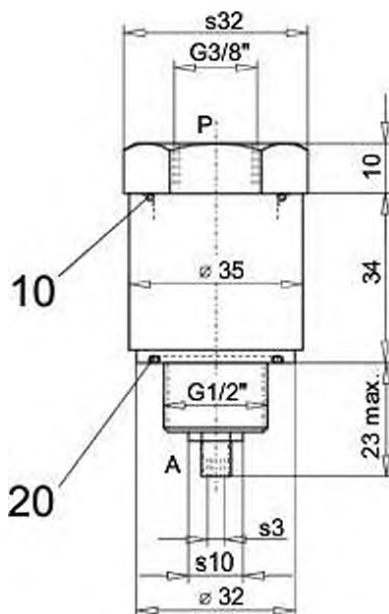
simplified                      detailed



**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure drop characteristic  
 P → A

 $Q = f(n)$  Cut-off volume flow characteristic  
 A → P

**DIMENSIONS**

RBSG1012

RBSW1012


**PARTS LIST**

Position	Article	Description
10	160.2236	O-ring ID 23,52 x 1,78
20	160.2253	O-ring ID 25,00 x 2,00

Technical explanation see data sheet 1.0-100

**Drain valve**
**Sandwich construction**

- $Q_{max} = 25 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**NG4-Mini<sup>®</sup>**

**DESCRIPTION**

Drain valve NG4-Mini with interface acc. to Wandfluh standard. Sandwich design. Valves for 3 flow directions are available. The sandwich body is made from phosphated steel. The turn knob from anodised aluminium.

**FUNCTION**

Aspherical, hardened closing element seals the pressurised part leak free against tank port. By turning the knob the connection to tank will be opened. Knob may be blocked in any position by a set screw.

**APPLICATION**

Drain valves are mainly used in systems with an accumulator which need to be depressurised for revisions. Among the benefits from NG 4 Mini sandwich elements are flexibility in system lay-out, small space requirement and low weight.

**TYPE CODE**

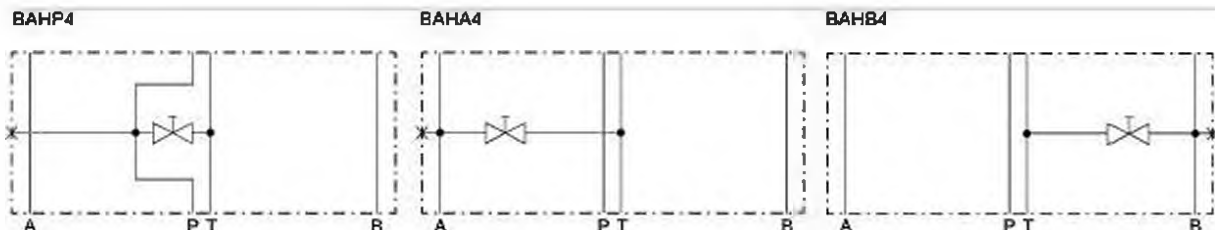
		B	AH	<input type="checkbox"/>	4	/	<input type="checkbox"/>	#	<input type="checkbox"/>
Mounting interface acc. to Wandfluh standard									
Drain valve									
Type list / Function									
P → T		P							
A → T		A							
B → T		B							
Normal size 4-Mini									
Threaded connection open		O							
Screw plug		V							
Minimes screw coupling		M							
Design-Index (Subject to change)									

**GENERAL SPECIFICATIONS**

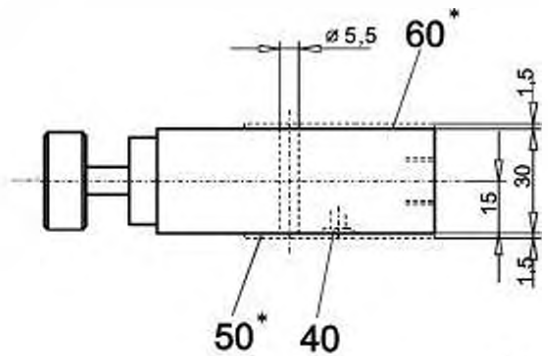
Description	Drain valve
Nominal size	NG4-Mini acc. to Wandfluh standard
Construction	Sandwich construction
Mounting	3 holes for hexagon socket screw M5 or studs M5
Connections	Connection plates Multistation flange subplate Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_0 = 5,5 \text{ Nm}$ (Quality 8.8)
Weight	$m = 0,75 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4408:1999, class 20/18/14 (Required filtration grade $\beta_{10...16} \geq 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> s...320 mm <sup>2</sup> s
Fluid temperature	-20...+70 °C
Peak pressure in ports A, B, P	$p_{max} = 350 \text{ bar}$
Peak pressure port T	$p_{max} = 50 \text{ bar}$
Max. volume flow	$Q_{max} = 25 \text{ l/min}$

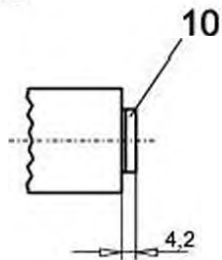
**SYMBOLS/TYPES**




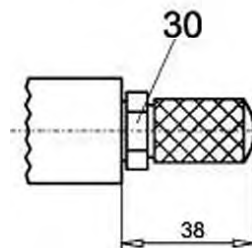
**DIMENSIONS**


\* only BAHB4/

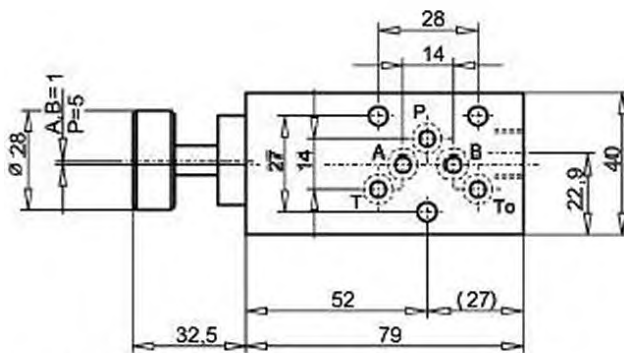
BAH.4/O



BAH.4/V



BAH.4/M



On types BAHB, P4 the adjustment is located on B-side

**PARTS LIST**

Position	Article	Description
10	238.2204	Plug VSTI G1/4"-ED
30	152.9101	Mini-mess fitting 1620/1/4"
40	160.2052	O-ring ID 5,28x1,78
50	173.1700	Intermediate plate BZB4
80	173.1650	Sealing plate BDB4

Technical explanation see data sheet 1.0-100

**Drain valve**

**Sandwich construction**

- $Q_{max} = 40 \text{ l/min}$
- $p_{max} = 350 \text{ bar}$

**NG6**  
ISO 4401-03



**DESCRIPTION**

Drain valve NG6 with interface according to ISO 4401-03. Sandwich design. Valves for 3 flow directions are available. The sandwich body is made from phosphated steel. The turn knob from anodised aluminium.

**FUNCTION**

A spherical, hardened closing element seals the pressurised part leak free against tank port. By turning the knob the connection to tank will be opened. Knob may be blocked in any position by a set screw.

**APPLICATION**

Drain valves are mainly used in systems with an accumulator which need to be depressurised for revisions.

**TYPE CODE**

	A	AH	<input type="checkbox"/>	6	/	<input type="checkbox"/>	#	<input type="checkbox"/>
International standard interface ISO								
Drain valve								
Type list / Function								
P → T	[P]							
A → T	A							
B → T	B							
Normal size 6								
Threaded connection open	O							
Screw plug	V							
Minimes screw coupling	M							
Design-Index (Subject to change)								

**GENERAL SPECIFICATIONS**

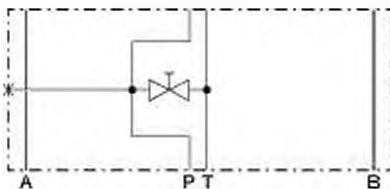
Description	Drain valve
Nominal size	NG6 acc. to ISO 4401-03
Construction	Sandwich construction
Mounting	4 holes for hexagon socket screw M5 or studs M5
Connections	Connection plates Multistation flange subplate Longitudinal stacking system
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_0 = 5,5 \text{ Nm}$ (Quality 8.8)
Weight	$m = 1,5 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

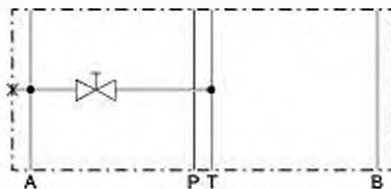
Fluid	Mineral oil, other fluid on request
Contamination efficiency	ISO 4406:1999, class 20/18/14 (Required filtration grade $\beta_{10} \dots 16 > 75$ ) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure in ports A, B, P	$p_{max} = 350 \text{ bar}$
Peak pressure in port T	$p_{max} = 50 \text{ bar}$
Max. volume flow	$Q_{max} = 40 \text{ l/min}$

**SYMBOLS / TYPES**

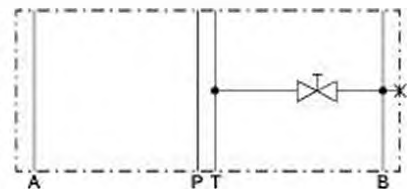
AAHP6

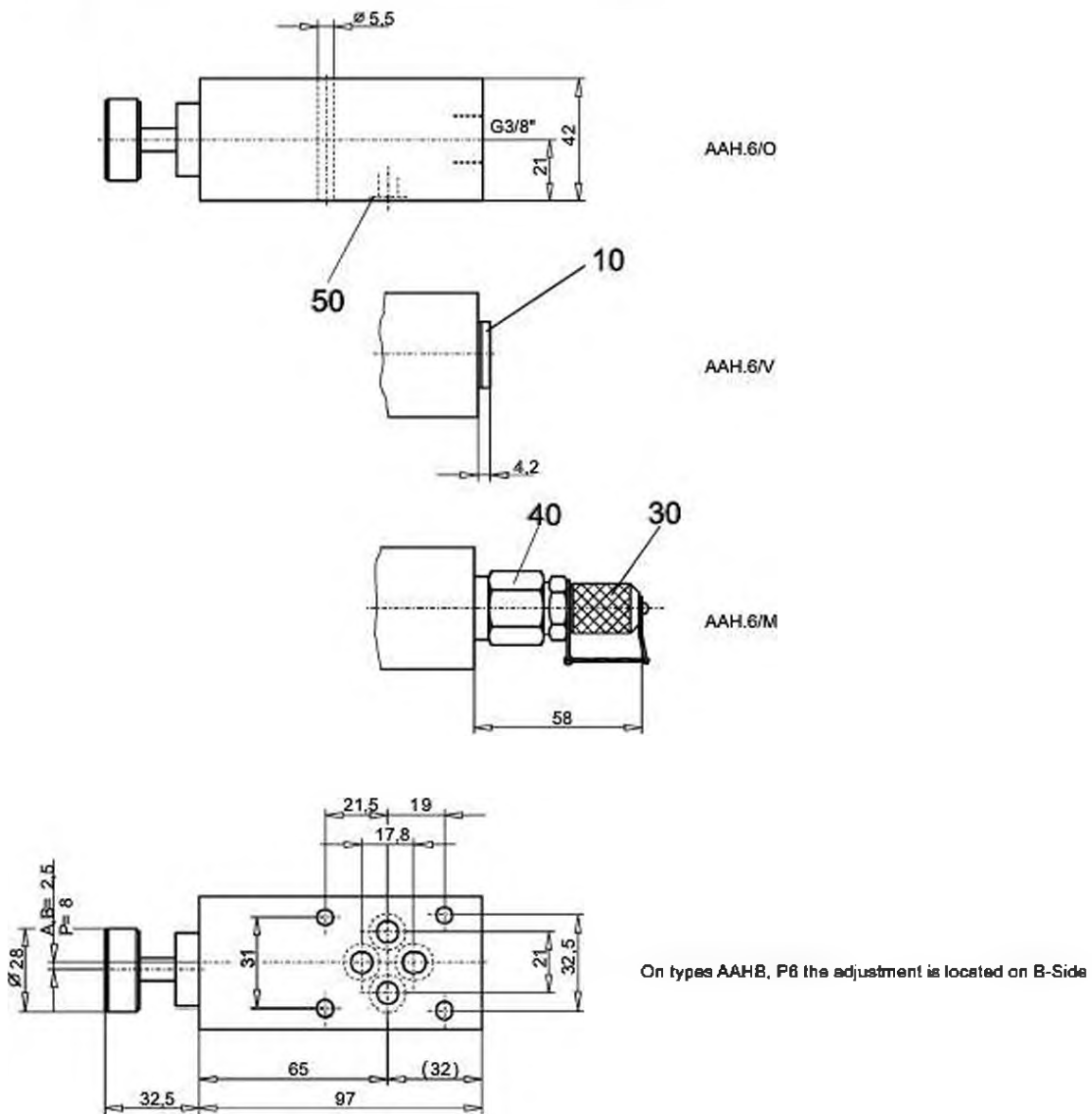


AAHA6



AAHB6



**DIMENSIONS**

**PARTS LIST**

Position	Article	Description
10	238.3202	Plug VSTI G3/8"-ED
30	152.9101	Mini-mess fitting 1620/1/4"
40	241.1621	Fitting RI 3/8" x 1/4"
50	160.2093	O-ring ID 9,25 x 1,78

**3-way shifting valve  
Screw-In cartridge**

- $Q_{max} = 20 \text{ l/min}$
- $p_{max} = 210 \text{ bar}$

**G1/2"**  
Wandfluh standard


**DESCRIPTION**

Shifting valve cartridge for cavity according to Wandfluh standard. Port size G1/2". Valve body made from steel. If P-port drilled from the side into the cavity port G1/2" may be plugged. Port G1/2" may also be used to screw a pipe or hose fitting directly into it.

**FUNCTION**

If P-port is pressurised oil flows to A-port through the check valve mounted in the poppet spool. Pressure drop over the check valve and area ratio P to A result in a force moving the poppet spool into its seat. T port is sealed off leakfree. If P-port is depressurised poppet spool will be pushed open by the pressure in A-port. Flow passes from A to T. The check valve in the poppet spool prevents leak to P-port.

**APPLICATION**

See application example

**TYPE CODE**

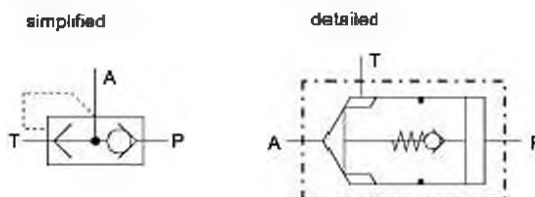
			DWW	404	-		/	2,5	#	
3-way shifting valve										
Normal size 4										
Nominal volume flow rate $Q_n$	15 l/min									
	20 l/min									
Non-return valve, Opening pressure $p_b$								2,5 bar		
Design-Index (Subject to change)										

**GENERAL SPECIFICATIONS**

Description	3-way shifting valve
Construction	Screw-in cavity acc. to Wandfluh standard
Mounting	Screw-in thread G1/2"
Ambient temperature	-20...+50 °C
Mounting position	any
Fastening torque	$M_c = 60 \text{ Nm}$
Weight	$m = 0,04 \text{ kg}$

**HYDRAULIC SPECIFICATIONS**

Fluid	Mineral oil, other fluid on request
Contamination efficiency-	ISO 4406:1999, class 18/18/13 (Required filtration grade &B...10≥75) refer to data sheet 1.0-50/2
Viscosity range	12 mm <sup>2</sup> /s...320 mm <sup>2</sup> /s
Fluid temperature	-20...+70 °C
Peak pressure	$p_{max} = 210 \text{ bar}$
Opening pressure over non-return valve	$p_b = 2,5 \text{ bar}$
Nominal volume flow	$Q_n = 15 \text{ l/min}$
at $\Delta p$ 10 bar	$Q_n = 20 \text{ l/min}$
Max. volume flow	$Q_{max} = 20 \text{ l/min}$
Area ratio of the inner spool	P : A = 1,2 : 1

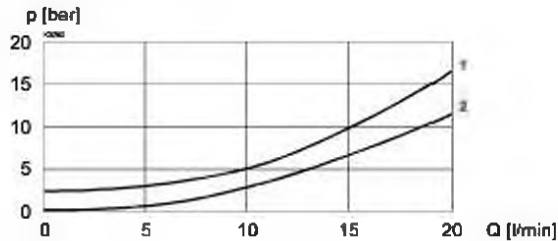
**SYMBOLS**

**CONTROL MECHANICAL**

Fixed setting

**CHARACTERISTICS** Oil viscosity  $\nu = 30 \text{ mm}^2/\text{s}$ 
 $\Delta p = f(Q)$  Pressure drop characteristic

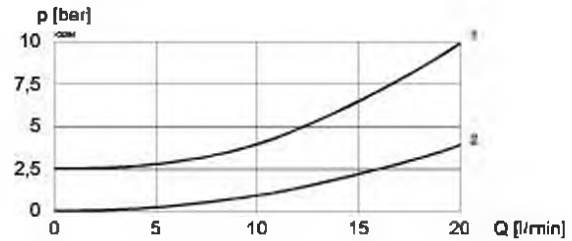
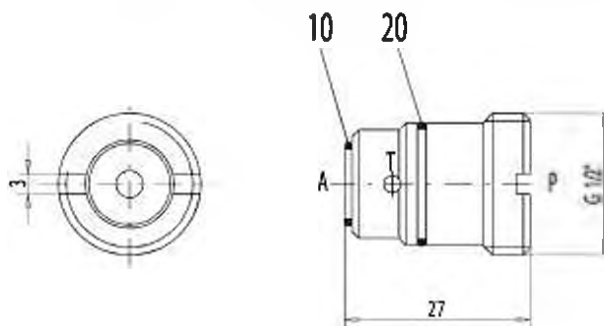
1 = Flow direction P→A

2 = Flow direction A→T

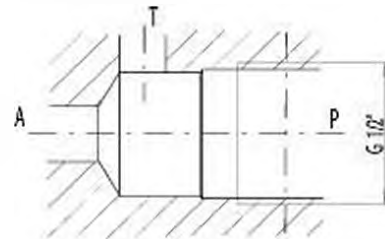
 $Q_n = 15 \text{ l/min}$ 

 $\Delta p = f(Q)$  Pressure drop characteristic

1 = Flow direction P→A

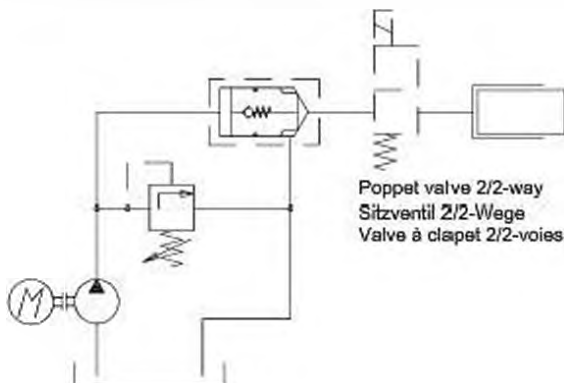
2 = Flow direction A→T

 $Q_n = 20 \text{ l/min}$ 

**DIMENSIONS**


Cavity drawing acc. to Wandfluh-Norm



For detailed cavity drawing see register 2.13-1033

**EXAMPLE OF APPLICATION**


Possible functions:

1. Motor running, cylinder extends
2. Motor stopped, cylinder automatically lowered by gravity load
3. By using a 2-way, 2-position poppet valve, the cylinder can be held in any desired position

**PARTS LIST**

Position	Article	Description
10	180.2093	O-Ring ID 9,24x1,78
20	180.1181	O-Ring ID 18,00x1,00

Technical explanation see data sheet 1.0-100

**ACCESSORIES**

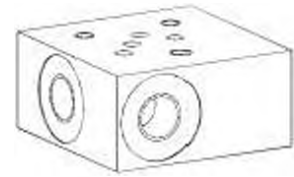
Assembly tools 983.6000 to 3-way shifting valve DWW404

**Threaded subplate**

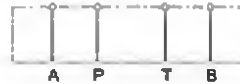
- ◆  $p_{nom} = 350 \text{ bar}$
- ◆ Connections G1/8"

**NG3-Mini**

Wandfluh standard


**DESCRIPTION**

Threaded subplate with mounting interface for vertical stacking and threaded connection of the connections A, B, P, T.

**SYMBOL**

**TYPE CODE**

Mounting interface according to Wandfluh standard

Threaded subplate

Nominal size 3-Mini

Type list

Connections A, B, P, T on the side

Design index (subject to change)

23-05

**B G 3 S 4**
**GENERAL SPECIFICATIONS**

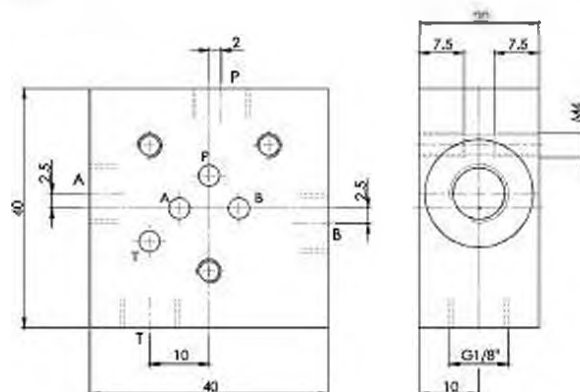
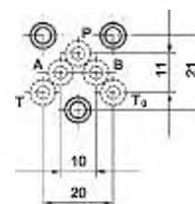
Designation	Threaded subplate
Construction	Installation in pipes
Nominal size	NG3-Mini according to Wandfluh standard
Weight	0,2 kg

**SURFACE TREATMENT**

- ◆ The plates made of steel are zinc-nickel coated

**DIMENSIONS**

BG3S


**HYDRAULIC CONNECTION**

**INSTALLATION NOTES**

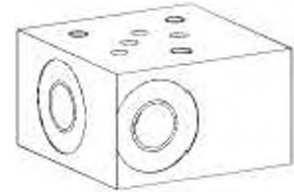
Mounting type	3 fixing threads for M4
Mounting position	Any
Threaded connections	G1/8" in A, B, P, T

**Threaded subplate**

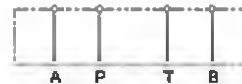
- ◆  $p_{nom} = 350$  bar
- ◆ Connections G1/4"

**NG4-Mini**

Wandfluh standard


**DESCRIPTION**

Threaded subplate with mounting interface for vertical stacking and threaded connection of the connections A, B, P, T.

**SYMBOL**

**TYPE CODE**

Mounting interface ecc. to Wandfluh standard

Threaded subplate

Nominal size-4 Mini

Type list

Connections on the side P, T, A, B

Connections on the bottom P, T, A, B

Connections location A, B side, P, T bottom

S
---

U
---

SU
----

Design index (subject to change)

23-10

 BG4  # 
**GENERAL SPECIFICATIONS**

Designation	Threaded subplate
Mounting	Installation in pipes
Nominal size	NG4-Mini according to Wandfluh standard
Weight	0,50 kg (BG4S) 0,75 kg (BG4U) 0,90 kg (BG4SU)

**INSTALLATION NOTES**

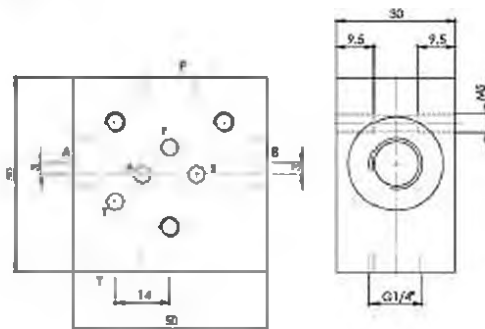
Mounting type	BG4S: 3 fixing threads for M5
	BG4U: 22 fixing holes for M5
	BG4SU: 2 fixing threads for M5
Mounting position	Any
Threaded connections	G1/4" in A, B, P, T

**SURFACE TREATMENT**

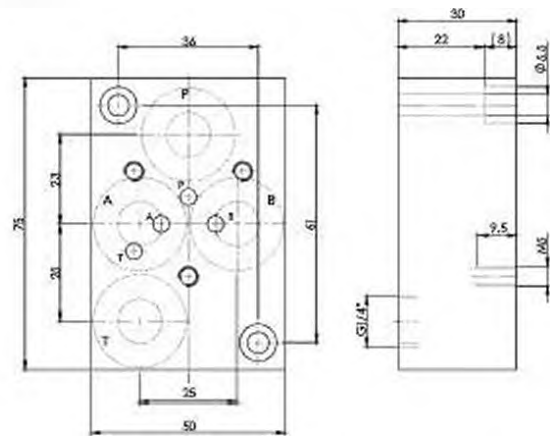
- ◆ The plates made of steel are zinc-nickel coated

**DIMENSIONS**

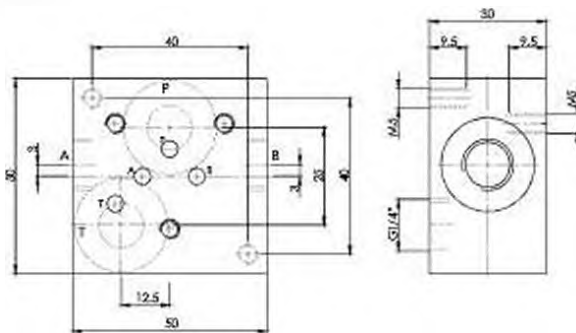
**BG4S**



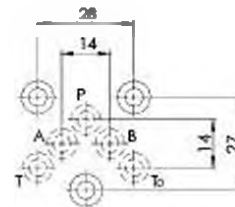
**BG4U**



**BG4SU**



**HYDRAULIC CONNECTION**





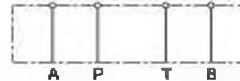
**Threaded subplate**
**Installation in pipes**

- ◆  $p_{nom} = 350 \text{ bar}$
- ◆ Connections G3/8"

**NG6**  
 ISO 4401-03

**DESCRIPTION**

Threaded subplate with mounting interface for vertical stacking and threaded connection of the connections A, B, P, T.

**SYMBOL**

**TYPE CODE**

International standard interface ISO

Threaded subplate

Nominal size 6

Type list

Connections A, B, P, T on the side

Connections A, B, P, T at the bottom

Connections A, B, on the side and P, T at the bottom



Design index (subject to change)

 A G 6  # 
**GENERAL SPECIFICATIONS**

Designation	Threaded subplate
Mounting	Installation in pipes
Nominal size	NG6 according to ISO 4401-03
Weight	1,0 kg (AG6S)
	1,0 kg (AG6U)
	1,4 kg (AG6SU)

**INSTALLATION NOTES**

Mounting type	4 fixing holes for M5
Mounting position	Any
Threaded connections	G3/8" in A, B, P, T

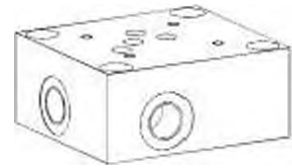
**SURFACE TREATMENT**

- ◆ The plates made of steel are zinc-nickel coated

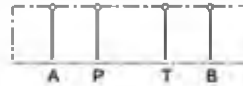


**Threaded subplate**
**Installation in pipes**

- ◆  $p_{nom} = 350$  bar
- ◆ Connections G1/2"

**NG10**  
 ISO 4401-05

**DESCRIPTION**

Threaded subplate with mounting interface for vertical stacking and threaded connection of the connections A, B, P, T.

**SYMBOL**

**TYPE CODE**

International standard interface ISO

 A G 10  

Threaded subplate

Nominal size 10

Type list

Connections A, B, P, T on the side

 S

Connections A, B, P, T at the bottom

 U

Connections A, B, on the side and P, T at the bottom

 SU

Design index (subject to change)

21-4

**GENERAL SPECIFICATIONS**

Designation	Threaded subplate
Mounting	Installation in pipes
Nominal size	NG10 according to ISO 4401-05
Weight	3,65 kg (AG10S)
	3,75 kg (AG10U)
	3,70 kg (AG10SU)

**INSTALLATION NOTES**

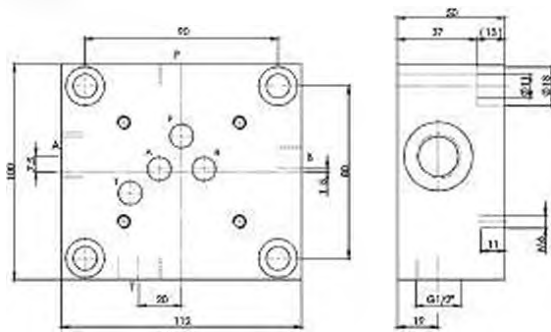
Mounting type	4 fixing holes for M10
Mounting position	Any
Threaded connections	G1/2" in A, B, P, T

**SURFACE TREATMENT**

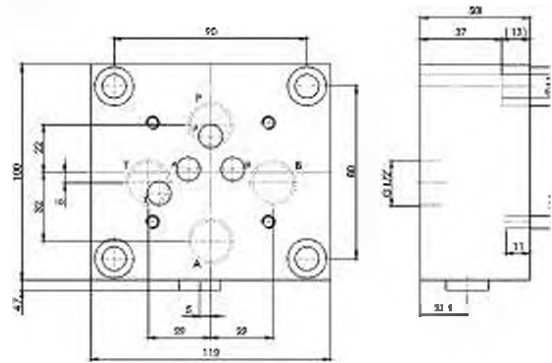
- ◆ The plates made of steel are zinc-nickel coated

**DIMENSIONS**

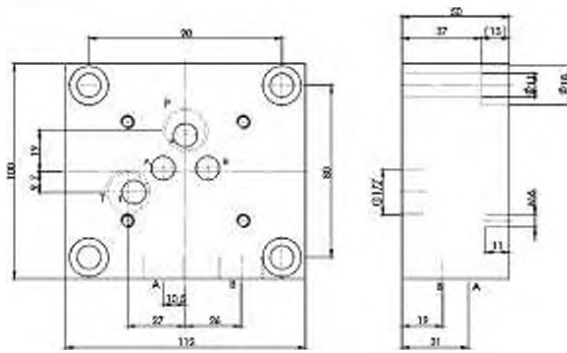
AG10S



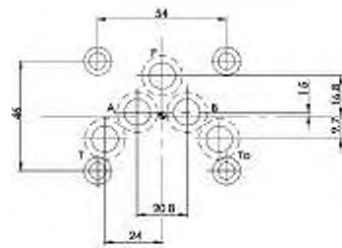
AG10U



AG10SU

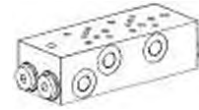


**HYDRAULIC CONNECTION**



**Multi-station subplate**

- Threaded connection G1/8"
- $p_{max} = 350$  bar

**NG3-Mini<sup>00</sup>**

**DESCRIPTION**

Multi-station subplates with interfaces for 2 to 7 valves NG3-Mini acc. to Wandfluh standard. The multistation subplates are made from phosphated steel.

**TYPE CODE**

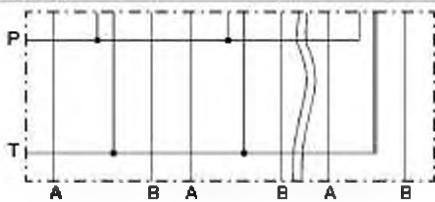
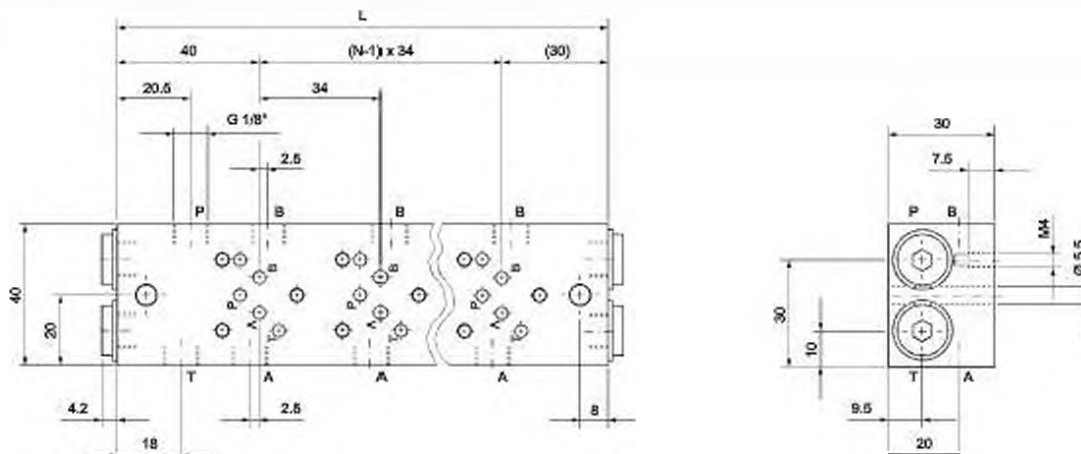
	B 3 J <input type="checkbox"/> # <input type="checkbox"/>
Mounting interface acc. to Wandfluh standard	
Nominal size 3-Mini	
Number of valves	
Design-Index (Subject to change)	

**GENERAL CHARACTERISTICS**

Designation	Multi-station subplate
Nominal size	NG3-Mini acc. to Wandfluh standard
Fastening	2 location holes for cylinder screw M5
Connection	Threaded connections A, B, P, T G1/8"
Mounting position	any
Weight	see chart

**HYDRAULIC SPECIFICATIONS**

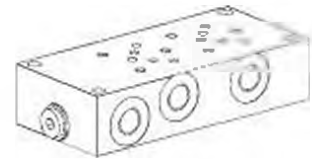
Working pressure	$p_{max} = 350$ bar
------------------	---------------------

**SYMBOL**

**DIMENSIONS**


Type	No. of valves N	Dimension L	Weight m
B3/2	2	104	0,85 kg
B3/3	3	138	1,12 kg
B3/4	4	172	1,39 kg
B3/5	5	206	1,66 kg
B3/6	6	240	1,93 kg
B3/7	7	274	2,20 kg

**Multi-station subplate**

- Threaded connection G1/4"
- $p_{max} = 350$  bar

**NG4-Mini<sup>00</sup>**

**DESCRIPTION**

Multi-station subplates with interfaces for 2 to 8 valves NG4-Mini acc. to Wandfluh standard. The multi-station subplates are made from phosphated steel.

**TYPE CODE**

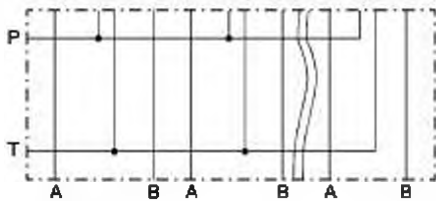
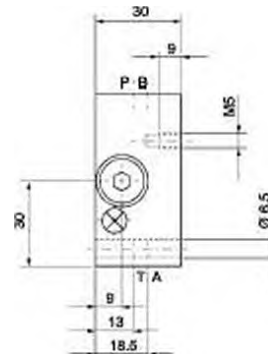
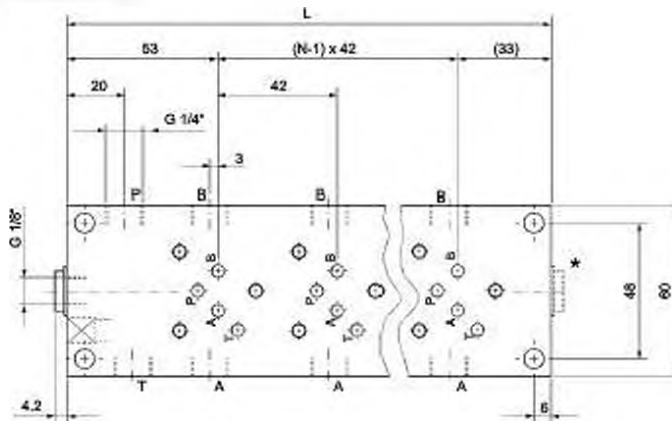
	B 4 J <input type="checkbox"/> # <input type="checkbox"/>
Mounting interface acc. to Wandfluh standard	
Nominal size 4-Mini	
Number of valves	
Design-Index (Subject to change)	

**GENERAL CHARACTERISTICS**

Designation	Multi-station subplate
Nominal size	NG4-Mini acc. to Wandfluh standard
Fastening	4 location holes for cylinder screw M8
Connection	Threaded connections A, B, P, T G1/4"
Mounting position	any
Weight	see chart

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
------------------	---------------------

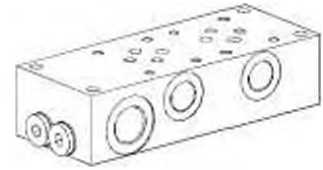
**SYMBOL**

**DIMENSIONS**


Type	No. of valves N	Dimension L	Weight m
B4/2	2	128	1,50 kg
B4/3	3	170	2,00 kg
B4/4	4	212	2,50 kg
B4/5	5	254	3,00 kg
B4/6	6	296	3,50 kg
B4/7	7	338	4,00 kg
B4/8	8	380	4,50 kg

\* only with B4/7 and B4/8

**Multi-station subplate**

- Threaded connection **P and T G1/2"**  
**A and B G3/8"**
- $p_{max} = 350 \text{ bar}$

**NG6**  
 ISO 4401-03

**DESCRIPTION**

Multi-station subplates with interfaces for 2 to 7 valves NG6 acc. to ISO 4401-03. The multi-station subplates are made from phosphated steel.

**TYPE CODE**

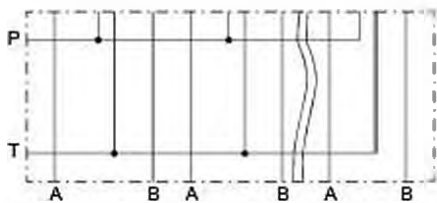
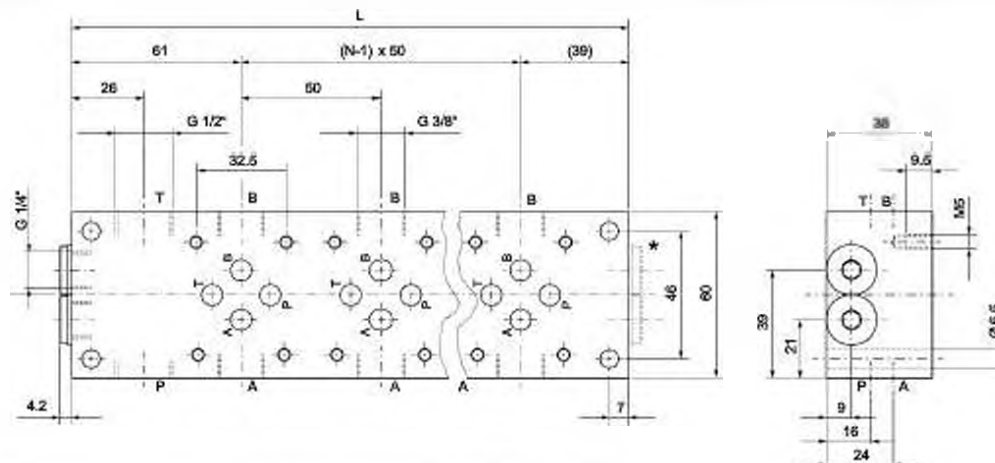
	A	6	J	<input type="checkbox"/>	#	<input type="checkbox"/>
International standard interface ISO						
Nominal size 6						
Number of valves						
Design-Index (Subject to change)						

**GENERAL CHARACTERISTICS**

Designation	Multi-station subplate
Nominal size	NG6 acc. to ISO 4401-03
Fastening	4 location holes for cylinder screw M8
Connection	Threaded connections <b>P and T G1/2"</b> <b>A and B G3/8"</b>
Mounting position	any
Weight	see chart

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
------------------	-----------------------------

**SYMBOL**

**DIMENSIONS**


Type	No. of valves N	Dimension L	Weight m
A6/2	2	150	2,00 kg
A6/3	3	200	2,65 kg
A6/4	4	250	3,30 kg
A6/5	5	300	3,95 kg
A6/6	6	350	4,60 kg
A6/7	7	400	5,30 kg

\* only with A6/7

**Multi-station subplate**

- Threaded connection G1/2"
- $p_{max} = 350$  bar

**NG10**  
 ISO 4401-05

**DESCRIPTION**

Multi-station subplates with interfaces for 2 to 4 valves NG10 acc. to ISO 4401-05. The multi-station subplates are made from phosphated steel.

**TYPE CODE**

 A 10 /  # 

International standard interface ISO

Nominal size 10

Number of valves

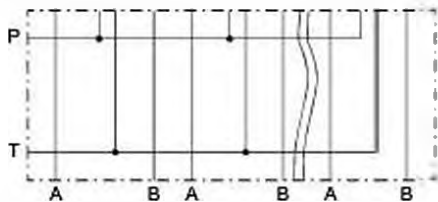
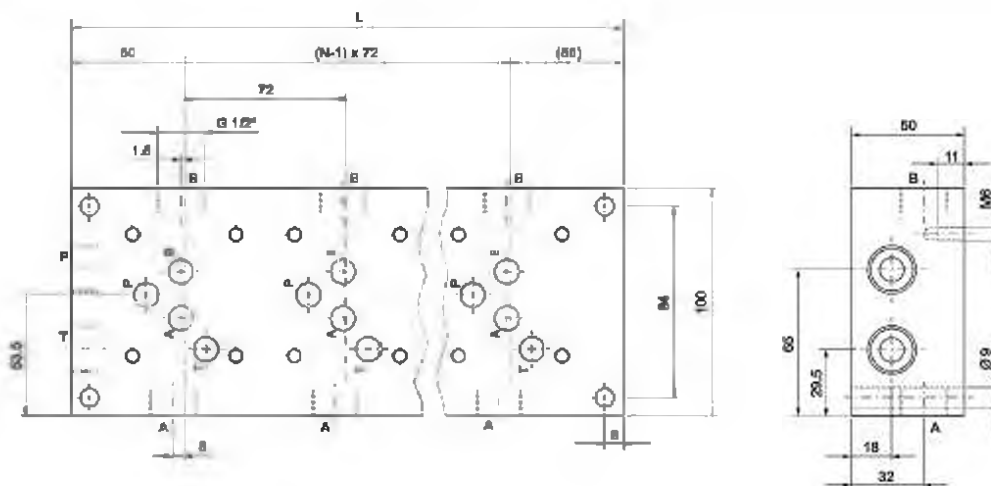
Design-Index (Subject to change)

**GENERAL CHARACTERISTICS**

Designation	Multi-station subplate
Nominal size	NG10 selon ISO 4401-05
Fastening	4 location holes for cylinder screw M8
Connection	Threaded connections A, B, P, T G1/2"
Mounting position	any
Weight	see chart

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350$ bar
------------------	---------------------

**SYMBOL**

**DIMENSIONS**


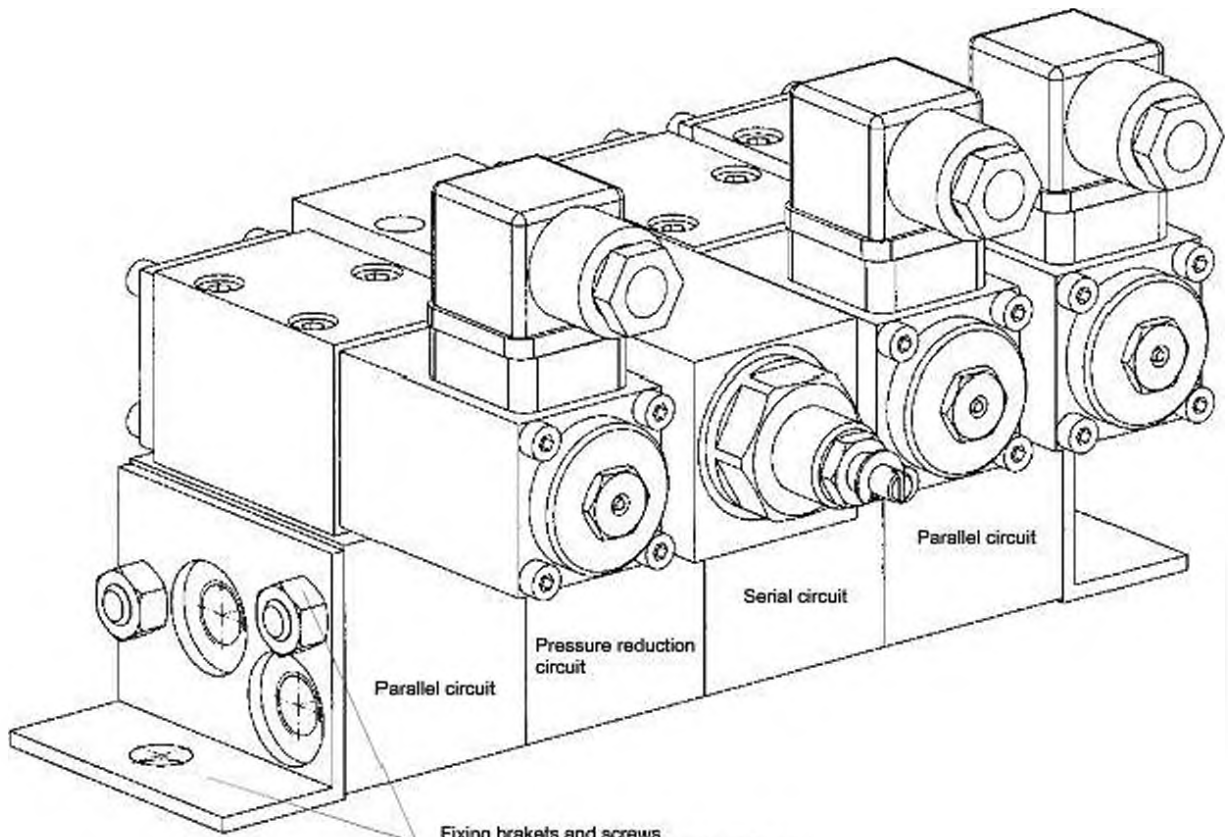
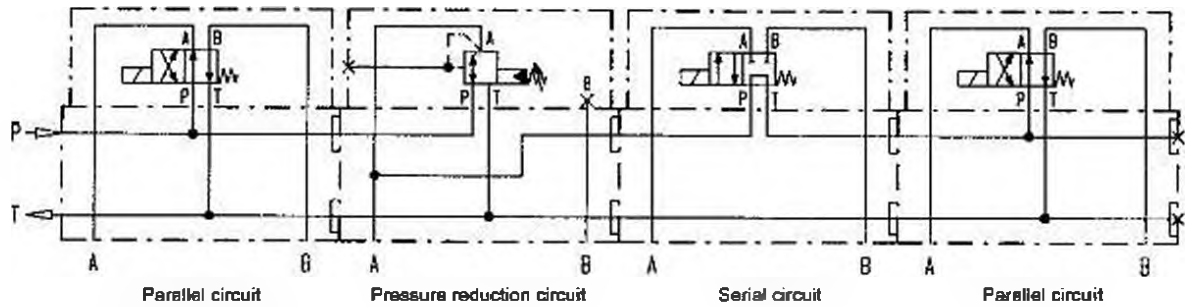
Type	No. of valves N	Dimension L (mm)	Weight m (kg)
A10/2	2	172	5,80
A10/3	3	244	8,30
A10/4	4	316	10,80

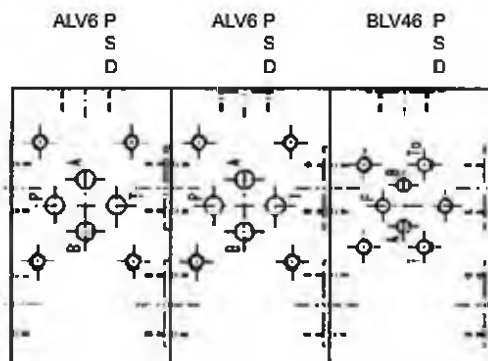
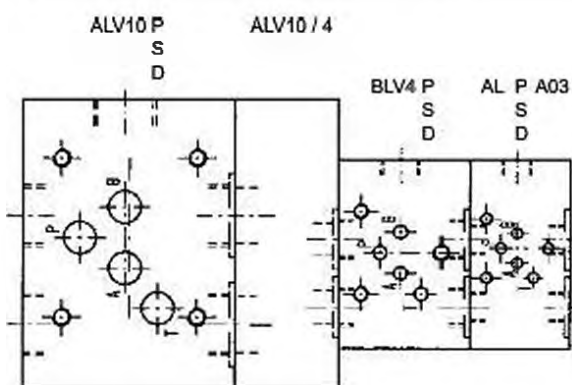
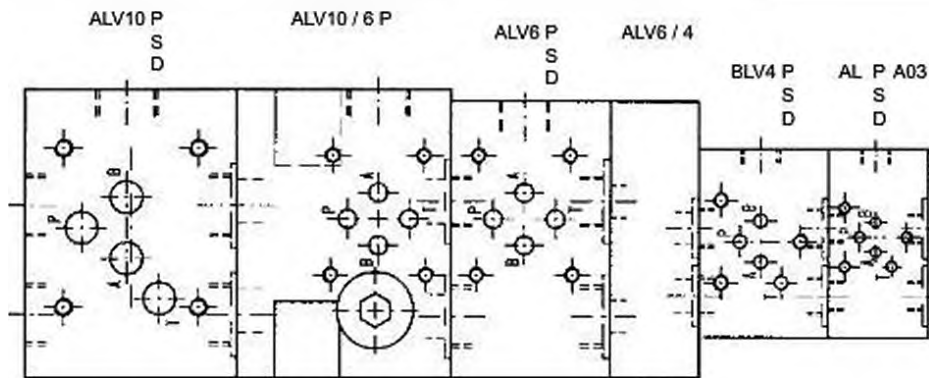


General informations on  
module type manifolds blocks

**NG3-Mini**<sup>30</sup>  
**NG4-Mini**<sup>30</sup>  
**NG6** ISO 4401-03  
**NG10** ISO 4401-05

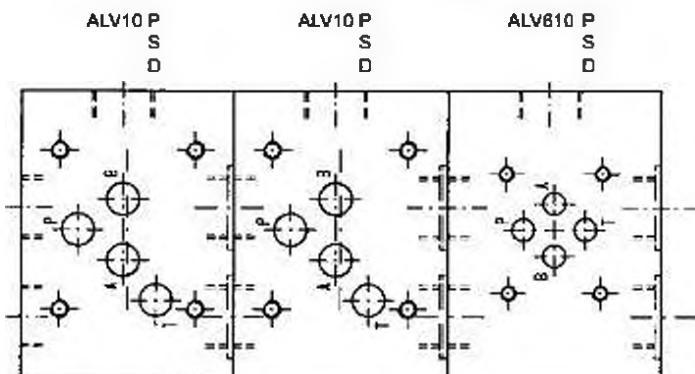
**EXAMPLE OF BLOCK COMBINATIONS**



**POSSIBLE MOUNTING COMBINATIONS for NG3-Mini, NG4-Mini, NG6 and NG10:**


For further informations refer to data sheets:

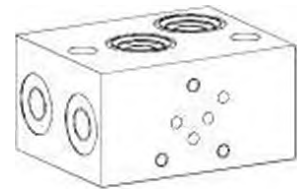
AL . A03	2.9-85
BLV4.	2.9-90
ALV6.	2.9-100
ALV10.	2.9-110



**Module type manifold blocks**

 ◆  $p_{nom} = 315 \text{ bar}$ 
**NG3-Mini**

Wandfluh standard


**DESCRIPTION**

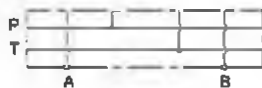
The module type manifold blocks are available with 2 different basic functions: parallel and pressure reduction circuit. The bore interface is identical with NG4-Mini, this allows a direct combination with NG4-Mini module type manifold blocks. Together with adapter plates and connecting blocks, combinations with NG6 and NG10 are also possible (see also data sheet 2.9-80).

**APPLICATION**

With this block system, expensive special blocks can be replaced. By adding or removing several blocks, the existing circuits can later be modified.

**SYMBOL**
**Block for parallel circuit**

ALPA03


**Block for pressure reduction circuit**

ALDA03


**SURFACE TREATMENT**

◆ The plates made of aluminium are untreated

**TYPE CODE**

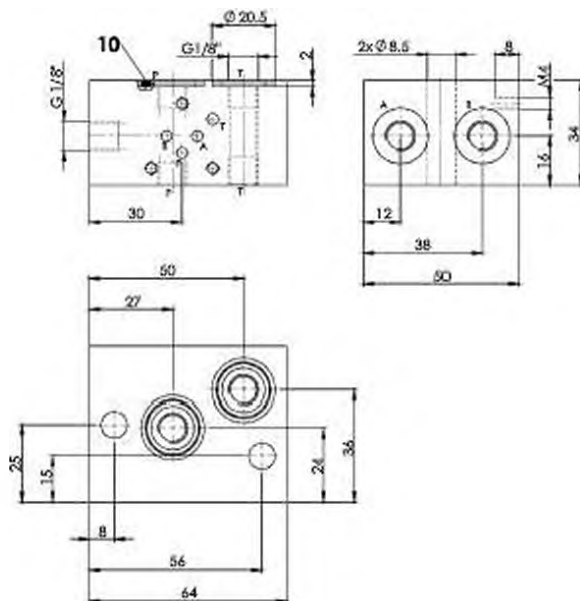
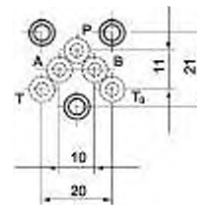
Module type manifold		AL	A03	#
Type list				
Parallel circuit	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Pressure reduction circuit	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
Nominal size 3-Mini				
Sealing material	NBR	<input type="checkbox"/>		
	FKM (Viton)	<input checked="" type="checkbox"/>		
	NBR 872	<input type="checkbox"/>		
Design index (subject to change)				

**GENERAL SPECIFICATIONS**

Designation	Parallel and pressure reduction circuit block
Mounting	See data sheet 2.9-122
Nominal size	NG3-Mini according to Wandfluh standard
Connection	Threaded connection A, B, P, T G1/8"
Weight	0,26 kg

**HYDRAULIC SPECIFICATIONS**

 Working pressure  $p_{nom} = 315 \text{ bar}$

**DIMENSIONS**

**HYDRAULIC CONNECTION**

**PARTS LIST**

Position	Article	Description
10	160.2155	O-ring ID 15,54 x 2,62 (NBR)
	160.6155	O-ring ID 15,54 x 2,62 (FKM)

**ACCESSORIES**

Module type manifold	Data sheet 2.9-80
Fastening	Data sheet 2.9-122

**STANDARDS**

Mounting interface	Wandfluh standard
--------------------	-------------------

**SEALING MATERIAL**

NBR or FKM (Viton) as standard, choice in the type code

**INSTALLATION NOTES**

Mounting type	Fixing bracket and fixing screws (see data sheet 2.9-122)
Mounting position	Any

**Module type manifold blocks**

- $p_{max} = 350 \text{ bar}$

**NG4-Mini<sup>00</sup>**

**DESCRIPTION**

Module type manifold blocks with interface NG4-Mini according to Wandfluh standard. The drilling pattern is identical with NG3-Mini. This allows direct combination with the NG4-Mini module type manifold blocks. Using an adapter plate and connecting blocks, combinations with NG6 and NG10 are also possible (see also data sheet 2.9-80). The module type manifold blocks are made from steel and are phosphated.

**FUNCTION**

The module type manifold blocks are available with 3 different basic circuits, namely parallel, serial and pressure reduction circuit. An intermediate block serves as spacer where required.

**APPLICATION**

This block system can be used as a replacement for expensive special blocks. Existing systems may be extended or reduced by adding or removing modular blocks.

**TYPE CODE**

			B	LV	4	<input type="checkbox"/>	#	<input type="checkbox"/>
Mounting interface acc. to Wandfluh standard								
Module type manifold								
Nominal size 4-Mini								
Type list								
Parallel circuit					P			
Serial circuit					S			
Pressure reduction circuit					D			
Intermediate block					Z			
Design-Index (Subject to change)								

**GENERAL SPECIFICATIONS**

Description	Parallel-, serial- and pressure reduction circuit, intermediate block
Nominal size	NG4-Mini acc. to Wandfluh standard
Fastening	see data sheet 2.9-122
Connection	Threaded connections A, B, P, T G 1/4"
Mounting position	any
Weight: BLV4P, S, D	m = 0,9 kg
BLV4Z	m = 0,3 kg

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
------------------	-----------------------------

**SYMBOLS**

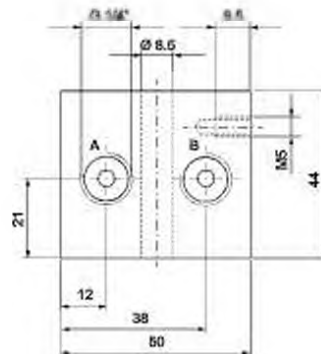
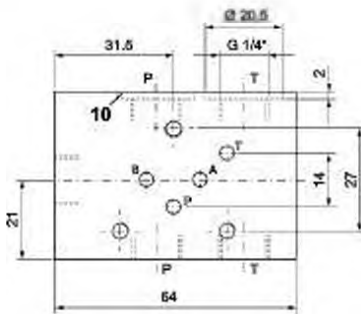
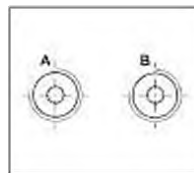
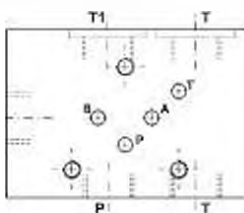
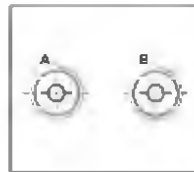
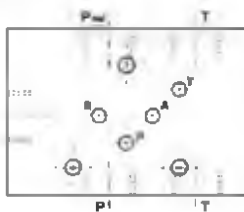
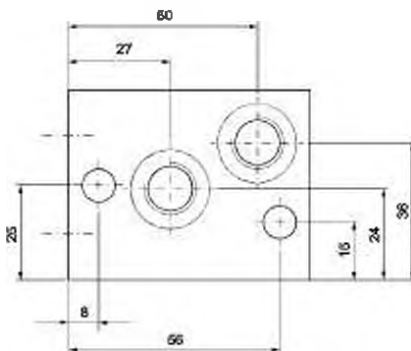
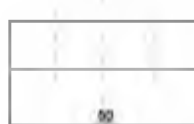
 Block for parallel circuit  
 BLV4P

 Block for serial circuit  
 BLV4S

 Block for pressure reduction circuit  
 BLV4D

 Intermediate block  
 BLV4Z


**DIMENSIONS**

 Block for parallel circuit  
 BLV4P

 Block for serial circuit  
 BLV4S

 Block for pressure reduction circuit  
 BLV4D

 Intermediate block  
 BLV4Z

**PARTS LIST**

Position	Article	Description
10	180.2155	O-ring ID 15,54x2,62

**ACCESSORIES**

 Fixing brackets BB41/BB42 and studs  
 see data sheet 2.9-122

**Module type manifold blocks**

- $p_{max} = 350 \text{ bar}$

**NG6**  
 ISO 4401-03

**DESCRIPTION**

Module type manifold blocks with interface NG6 acc. to ISO 4401-03. Using an adapter plate and connecting blocks, combinations with NG3-Mini, NG4-Mini and NG10 are also possible (see also data sheet 2.9-80). The module type manifold blocks are made from steel and are zinc-nickel coated.

**FUNCTION**

The module type manifold blocks are available with 3 different basic circuits, namely parallel, serial and pressure reduction circuit.

**APPLICATION**

This block system can be used as a replacement for expensive special blocks. Existing systems may be extended or reduced by adding or removing modular blocks.

**TYPE CODE**

	A	LV	6	<input type="checkbox"/>	#	<input type="checkbox"/>
International standard interface ISO						
Module type manifold						
Nominal size 6						
Type list						
Parallel circuit	<input checked="" type="checkbox"/> P					
Pressure reduction circuit	<input type="checkbox"/> D					
Design-Index (Subject to change)						

**GENERAL SPECIFICATIONS**

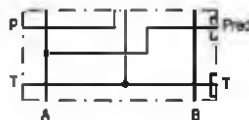
Description	Parallel- and pressure reduction circuit
Nominal size	NG6 acc. to ISO 4401-03
Fastening	see data sheet 2.9-124
Connection	Threaded connections P, P <sub>red</sub> , T1, A, B = G3/8" T = G1/2"
Mounting position	any
Weight:	m = 2,0 kg

**HYDRAULIC SPECIFICATIONS**

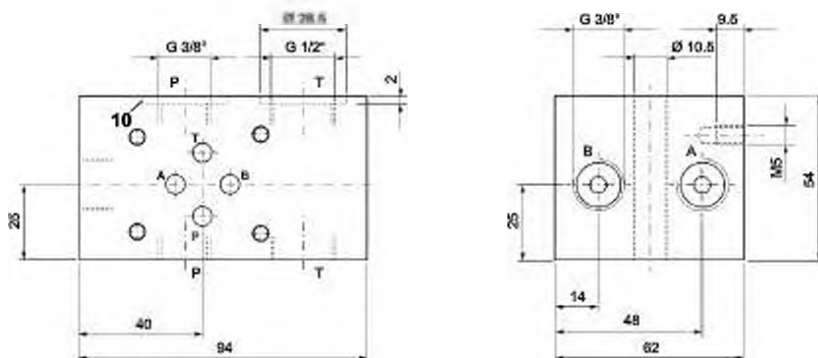
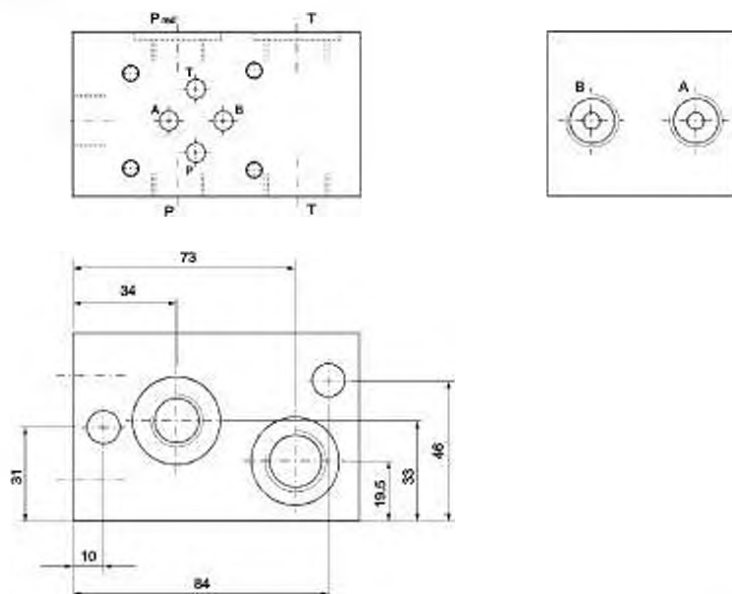
Working pressure	$p_{max} = 350 \text{ bar}$
------------------	-----------------------------

**SYMBOLS**

 Block for parallel circuit  
 ALV6P

 Block for pressure reduction circuit  
 ALV6D


**DIMENSIONS**

 Block for parallel circuit  
 ALV6P

 Block for pressure reduction circuit  
 ALV6D

**PARTS LIST**

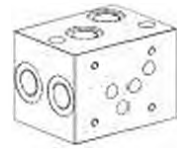
Position	Article	Description
10	160.2238	O-ring ID 23,81x2,62

**ACCESSORIES**

 Fixing brackets AB61/AB62 and studs  
 see data sheet 2.9-124



**Module type manifold blocks**

 •  $p_{max} = 350 \text{ bar}$ 
**NG10**  
 ISO 4401-05

**DESCRIPTION**

Module type manifold blocks with interface NG10 acc. to ISO 4401-05. Using an adapter plate and connecting blocks, combinations with NG3-Mini, NG4-Mini and NG6 are also possible (see also data sheet 2.9-80). The module type manifold blocks are made from steel and are phosphated.

**FUNCTION**

The module type manifold blocks are available with 3 different basic circuits, namely parallel, serial and pressure reduction circuit.

**APPLICATION**

This block system can be used as a replacement for expensive special blocks. Existing systems may be extended or reduced by adding or removing modular blocks.

**TYPE CODE**

International standard interface ISO	A	LV	10	<input type="checkbox"/>	#	<input type="checkbox"/>
Module type manifold						
Nominal size 10						
Type list						
Parallel circuit	P					
Serial circuit	S					
Pressure reduction circuit	D					
Design-Index (Subject to change)						

**GENERAL SPECIFICATIONS**

Description	Parallel-, serial- and pressure reduction circuit
Nominal size	NG10 acc. to ISO 4401-05
Fastening	see data sheet 2.9-126
Connection	Threaded connections A, B, P, T G1/2"
Mounting position	any
Weight:	m = 2,9 kg

**HYDRAULIC SPECIFICATIONS**

Working pressure	$p_{max} = 350 \text{ bar}$
------------------	-----------------------------

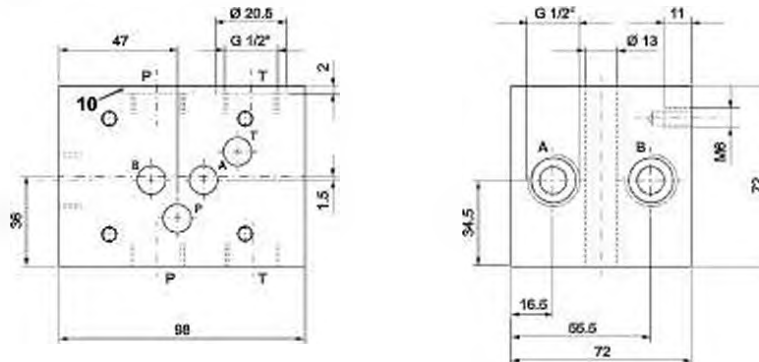
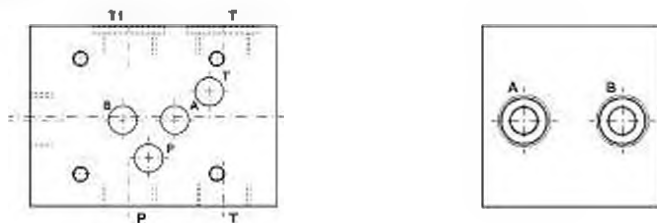
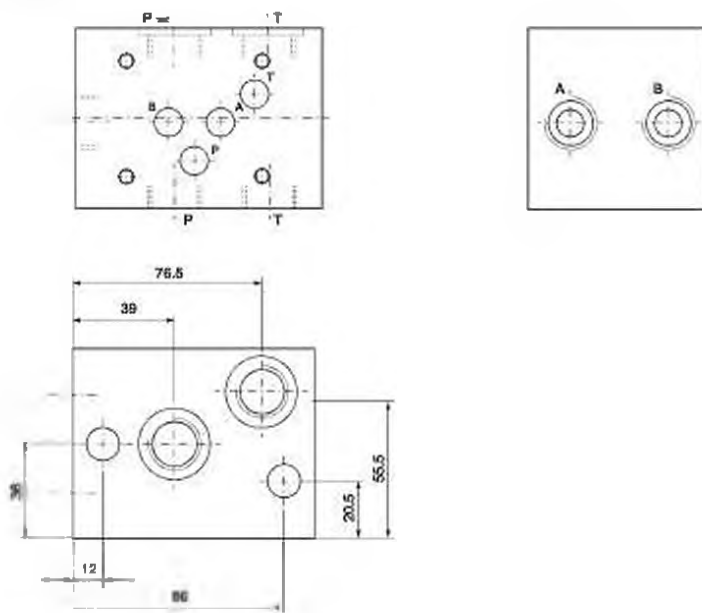
**SYMBOLS**

 Block for parallel circuit  
 ALV10P

 Block for serial circuit  
 ALV10S

 Block for pressure reduction circuit  
 ALV10D


**DIMENSIONS**

 Block for parallel circuit  
 ALV10P

 Block for serial circuit  
 ALV10S

 Block for pressure reduction circuit  
 ALV10D

**PARTS LIST**

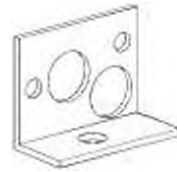
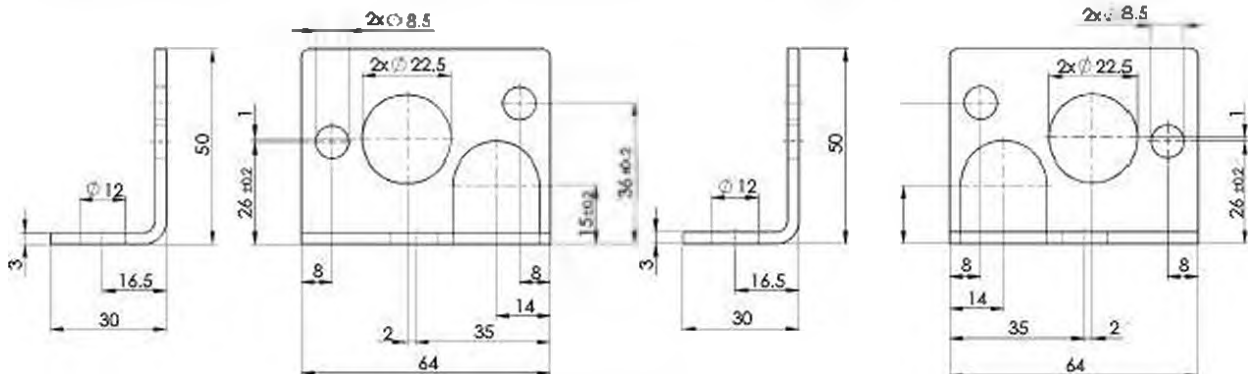
Position	Article	Description
10	180.2238	O-ring ID 23.81x2.62

**ACCESSORIES**

 Fixing brackets AB101/AB102 and studs  
 see data sheet 2.9-126

**Fixation for module type manifold**

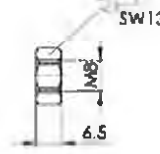
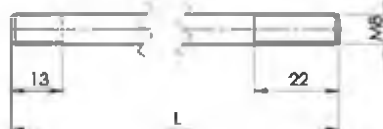
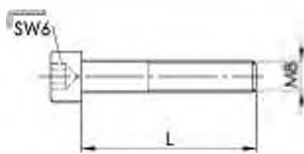
- Fixing brackets
- Fixing screws

**NG3-Mini<sup>®</sup>**  
**NG4-Mini<sup>®</sup>**

**FIXING BRACKET**
**BB41 zinc coated**
**Article No. 171.1005**
**BB42 zinc coated**
**Article No. 171.1004**


For mounting a complete assembly NG3-Mini or NG4-Mini 2 fixing brackets are required.

1 off BB41

1 off BB42 (mounted on black side with O-ring counter bore)

**FIXING SCREWS**
**Socket head cap screw**
**Stud**
**Nut zinc coated**
**Article No. 153.1401**
**Fastening torque**
**23,5 Nm**

**FOR NG3-MINI**

Number	Description and dimension (M8xL)	Article No.
1 block	Cap screw M8x45 Steel 8.8	246.4145
2 blocks	Cap screw M8x80 Steel 8.8	246.4181
3 blocks	Stud M8x124 K8	224.4046

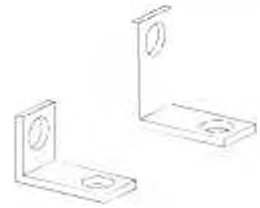
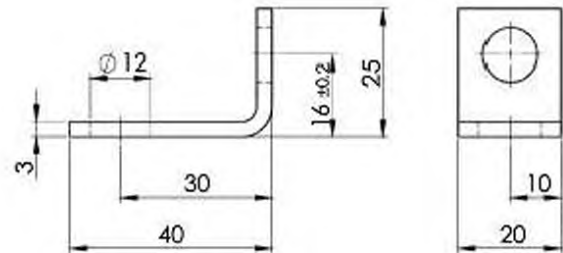
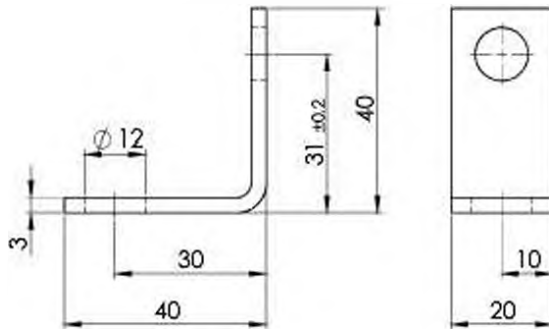
**FOR NG4-MINI (without BLV42)**

Number	Description and dimension (M8xL)	Article No.
1 block	Cap screw M8x55 Steel 8.8	246.4155
2 blocks	Stud M8x110 K8	224.4038
3 blocks	Stud M8x154 K8	224.4039
4 blocks	Stud M8x198 K8	224.4036
5 blocks	Stud M8x242 K8	224.4040
6 blocks	Stud M8x286 K8	224.4041
7 blocks	Stud M8x330 K8	224.4042
8 blocks	Stud M8x374 K8	224.4043

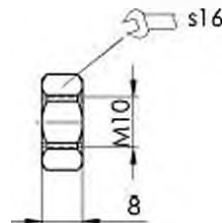
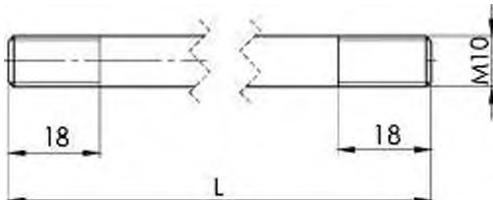
K8 = Material 1.4057

**Fixation for module type many fold**

- Fixing brackets
- Fixing screws

**NG6**

**FIXING BRACKET**
**AB61 zinc-nickel coated**
**Article No. 171.1001**
**AB62 zinc-nickel coated**
**Article No. 171.1000**


For mounting a complete assembly 4 fixing brackets are required.  
 2 each AB61 and AB62

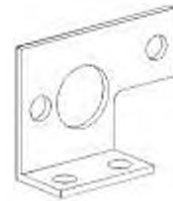
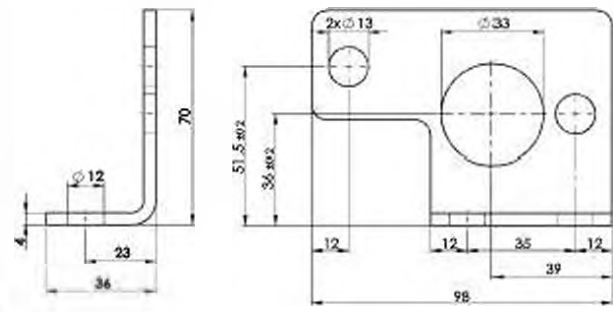
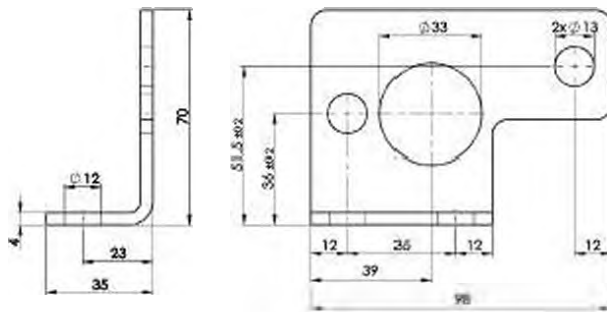
**FIXING SCREWS**
**Stud**
**Nut zinc coated**  
**Article No. 153.1501**
**Fastening torque**  
**46 Nm**


Number	Description and dimension (M10xL)	Article No.
1 block	Stud M10x76 K8	224.5007
2 blocks	Stud M10x134 K8	224.5056
3 blocks	Stud M10x188 K8	224.5055
4 blocks	Stud M10x242 K8	224.5057
5 blocks	Stud M10x298 K8	224.5058
6 blocks	Stud M10x350 K8	224.5059
7 blocks	Stud M10x404 K8	224.5060
8 blocks	Stud M10x458 K8	224.5061

Material: Stainless steel 1.4057

**Fixation for module type many fold**

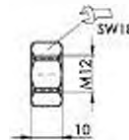
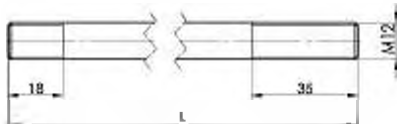
- Fixing brackets
- Fixing screws

**NG10**

**FIXING BRACKET**
**AB101 zinc coated**
**Article No. 171.1003**
**AB102 zinc coated**
**Article No. 171.1002**


For mounting a complete assembly 2 fixing brackets are required.

1 off AB101

1 off AB102 (mounted on block side with O-ring counter bores)

**FIXING SCREWS**
**Stud**
**Nut zinc coated**
**Article No. 153.1602**
**Fastening torque**
**80 Nm**


Number	Description and dimension (M12xL)	Article No.
1 block	Stud M12x114 K8	224.6035
2 blocks	Stud M12x186 K8	224.6031
3 blocks	Stud M12x258 K8	224.6032
4 blocks	Stud M12x330 K8	224.6033
5 blocks	Stud M12x402 K8	224.6036
6 blocks	Stud M12x474 K8	224.6034
7 blocks	Stud M12x546 K8	224.6038
8 blocks	Stud M12x618 K8	224.6037

Material: Stainless steel 1.4057

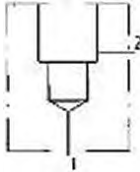
**Line mount body**

- for pressure relief valves
- in screw-in cartridge construction
- $p_{max} = 400 \text{ bar}$

**M18x1,5**  
**M22x1,5**  
**M33x2**  
**M42x22**

**VARIATIONS**

Types

**C02**

**TYPE CODE**

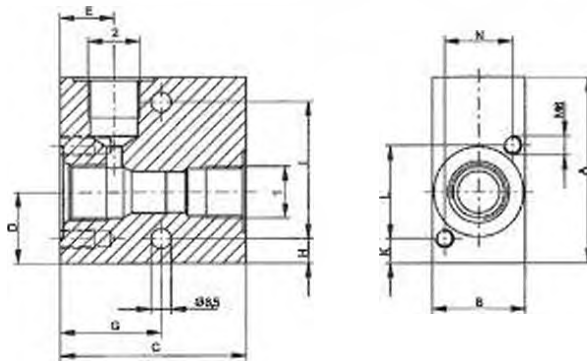
Line mount body made of steel

Port size	G 1/4"	G14	G 3/8"	G38
	G 1/2"	G12	G 3/4"	G34
	G 1 1/4"	G114		

Cavity thread diameter	M18x1,5	18	G 1/4" and G 3/8"
	M22x1,5	22	G 3/8" and G 1/2"
	M33x2	33	G 3/4"
	M42x2	42	G 1 1/4"

Variations/Types C02

Design index (subject to change)

 KG  - C02 
**DIMENSIONS C02**

**TYPE C02**

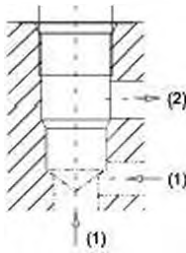
Ordering code	Size	Ports		Dimensions (in mm)										Wight	
		1	2	A	B	C	D	E	G	H	I	K	L		N
KG1418-C02	M18x1,5	G 1/4"	G 1/4"	60	30	60	23	17.3	32.5	8	44	8	30	22	0.65 kg
KG3818-C02	M18x1,5	G 3/8"	G 3/8"	60	30	60	23	17.3	32.5	8	44	8	30	22	0.65 kg
KG3822-C02	M22x1,5	G 3/8"	G 3/8"	60	45	60	23	22.5	40	8	44	8	30	32	1.05 kg
KG1222-C02	M22x1,5	G 1/2"	G 1/2"	60	45	60	23	22.5	40	8	44	8	30	32	1.05 kg
KG3433-C02	M33x2	G 3/4"	G 3/4"	80	50	80	32.5	30.5	50	11	58	10	45	34	2.05 kg
KG11442-C02	M42x2	G 1 1/4"	G 1 1/4"	100	60	100	40	33.5	62	11	79	12.5	55	44	3.60 kg

**GENERAL SPECIFICATIONS**

Description	Line mount body
Mounting	2 location holes 2 tapped holes
Connection	Threaded connections
Mounting position	see valve data sheet
Surface protection	zinc coated

**HYDRAULIC SPECIFICATIONS**

Peak pressure	$p_{max.} = 400 \text{ bar}$
---------------	------------------------------

**CARTRIDGE CAVITY**


Type	Cavity according to:	For detailed cavity drawing see data sheet:
M18x1,5	ISO 7789-18-02-0-98	2.13-1001
M22x1,5	ISO 7789-22-02-0-98	2.13-1003
M33x2	ISO 7789-33-02-0-98	2.13-1041
M42x2	ISO 7789-42-02-0-07	2.13-1048

**SCREW-IN CARTRIDGES INSTALLED**

According to the type the following screw-in cartridges can be installed in the line mount bodies:

**Type** **Data sheet no.**

**M18x1,5**

BV.PM18	2.1-510
BS.PM18	2.1-520
BS.PM18-Z36	2.1-522
BVPPM18	2.3-510
BDPPM18	2.3-520

**M22x1,5**

BV.PM22	2.1-530
BVTPM22	2.1-532
BVEPM22	2.1-536
BA.PM22	2.1-540
BK.PM22	2.1-542
BS.PM22-Z36	2.1-543
BVPPM22	2.3-529
BVPPM22-./ME	2.3-537
BNIPM22	2.3-533
BV8PM22	2.3-536
BDPPM22	2.3-539
BDPPM22-./ME	2.3-561
BDIPM22	2.3-548
BDIPM22-./ME	2.3-562
BDBPM22	2.3-547

**M33x2**

BV.PM33	2.1-550
BVPPM33	2.3-551
BVPPM33-./ME	2.3-553

**M42x2**

BVPPM42	2.3-590
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**CAUTION!**

The performance data refer to the screw-in cartridges only. The additional pressure drop in the line mount body must be taken into consideration.

Technical explanation see data sheet 1.0-100

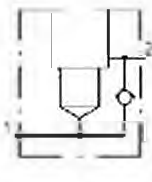
- Line mount body
- for 2-way-valves
  - in screw-in cartridge construction
  - $p_{max} = 400 \text{ bar}$

**M18x1,5**  
**M22x1,5**  
**M33x2**  
**M42x2**

**VARIATIONS**

Types

**A01**

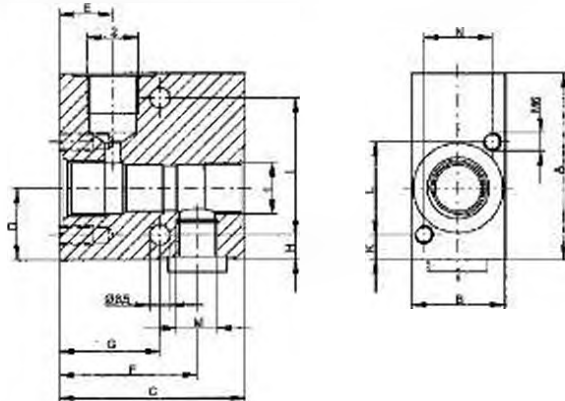
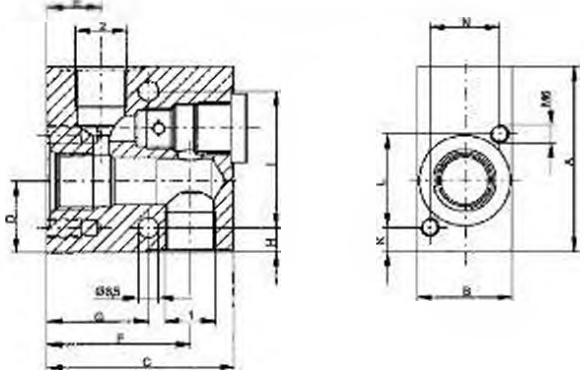
**B01**

**TYPE CODE**

Line mount body made of steel

Port size	G 3/8"	G38	G 1/2"	G12
	G 3/4"	G34	G 1 1/4"	G114
Cavity thread diameter	M18x1,5	18	G 3/8"	
	M22x1,5	22	G 1/2"	
	M33x2	33	G 3/4"	
	M42x2	42	G 1 1/4"	

Variations/Types	A01	A01
	B01	B01

Design index (subject to change)

 KG  -  # 
**DIMENSIONS A01**

**DIMENSIONS B01**

**TYPE A01**

Ordering code	Size	Ports			Dimensions (in mm)													Wight
		1	2	M	A	B	C	D	E	F	G	H	I	K	L	N		
KGG3818-A01	M18x1,5	G 3/8"	G 3/8"	G 1/4"	60	30	65	23	17.3	44.5	32.5	8	44	8	30	22	0.75	
KGG1222-A01	M22x1,5	G 1/2"	G 1/2"	G 1/4"	60	45	80	23	22.5	53.5	40	8	44	8	30	32	1.45	
KGG3433-A01	M33x2	G 3/4"	G 3/4"	G 1/4"	80	50	80	32.5	30.5	81.5	50	11	58	10	45	34	1.90	
KGG11442-A01	M42x2	G 1 1/4"	G 1 1/4"	G 1/4"	100	60	100	40	33.5	80	82	11	78	12.5	55	44	3.20	

**TYPE B01**

Ordering code	Size	Ports			Dimensions (in mm)													Wight
		1	2	M	A	B	C	D	E	F	G	H	I	K	L	N		
KGG1222-B01	M22x1,5	G 1/2"	G 1/2"		60	45	80	23	22.5	60	40	8	44	8	30	32	1.45	

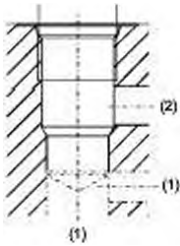


**GENERAL SPECIFICATIONS**

Description	Line mount body
Mounting	2 location holes
	2 tapped holes
Connection	Threaded connections
Mounting position	see valve data sheet
Surface protection	zinc coated

**HYDRAULIC SPECIFICATIONS**

Peak pressure	$P_{max.} = 400 \text{ bar}$
---------------	------------------------------

**CARTRIDGE CAVITY**


Type	Cavity according to:	For detailed cavity drawing see data sheet:
M18x1,5	ISO 7789-18-01-0-88	2.13-1002
M22x1,5	ISO 7789-22-01-0-88	2.13-1008
M33x2	ISO 7789-33-01-0-88	2.13-1005
M42x2	ISO 7789-42-01-0-07	2.13-1050

**SCREW-IN CARTRIDGES INSTALLED**

According to the type the following screw-in cartridges can be installed in the line mount bodies:

**Type** **Data sheet no.**

**M18x1,5**

SDSPM18-BA/AB	1.11-2050
SDYPM18-BA/AB	1.11-2052
SDZPM18-BA/AB	1.11-2054
SVSPM18-BC/CB	1.11-2080
DN.PM18	2.4-510
DR.PM18	2.4-610
QA.PM18	2.5-510
D.PPM18	2.6-510

**M22x1,5**

SDSPM22-BA/AB	1.11-2060
SDYPM22-BA/AB	1.11-2064
SVSPM22-BC/CB	1.11-2082
SVYPM22-BC/CB	1.11-2084
QRSPM22	2.5-530
QZ.PM22	2.5-535
DNPPM22	2.6-531
DNPPM22-.ME	2.6-541
QNPPM22	2.6-631
QNPPM22-.ME	2.6-633

**M33x2**

SVSPM33-BC/CB	1.11-2076
SVSPM33-BA/AB	1.11-2078
SVYPM33-BC/CB	1.11-2085
SVYPM33-BA/AB	1.11-2085
QZ.PM33	2.5-550
DNPPM33	2.6-551
DNPPM33-.ME	2.6-581
QNPPM33	2.6-651
QNPPM33-.ME	2.6-659
QSPPM33	2.6-681

**M42x2**

SVSPM42-BA/AB	1.11-2091
QNPPM42	2.6-690

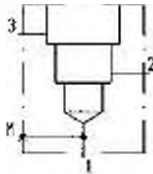

**CAUTION!**

The performance data refer to the screw-in cartridges only. The additional pressure drop in the line mount body must be taken into consideration.

Technical explanation see data sheet 1.0-100

- Line mount body
- for 3-way-valves
  - In screw-in cartridge construction
  - $p_{max} = 400 \text{ bar}$

**M16x1,5**      **M33x2**  
**M18x1,5**      **M42x2**  
**M22x1,5**

**TYPES**
**TYPE CODE**
**F04**

 KG   - F04 # 

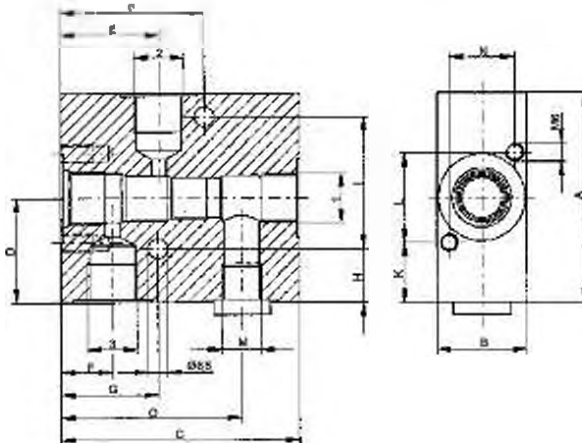
Line mount body made of steel

Part size	G 1/4" G14	G 3/8" G38	G 1/2" G12
	G 3/4" G34	G 1 1/4" G114	

Cavity thread diameter	M16x1,5	18	G 1/4"
	M18x1,5	18	G 3/8"
	M22x1,5	22	G 3/8" und G 1/2"
	M33x2	33	G 3/4"
	M42x2	42	G 1 1/4"

Variations F04

Design index (subject to change)

**DIMENSIONS F04**

**TYPE F04**

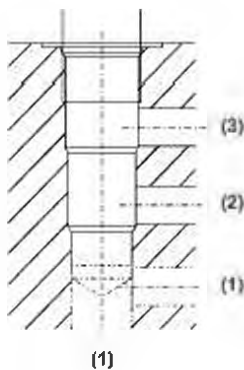
Ordering code	Size	Ports				Dimensions (in mm)														Weight
		1	2	3	M	A	B	C	D	E	F	G	H	I	K	L	N	O	P	
KGG1416-F04	M16x1,5	G 1/4"	G 1/4"	G 1/4"	G 1/4"	60	40	60	30	20.3	13	28	8	44	15	30	30	44	38	0.98
KGG3818-F04	M18x1,5	G 3/8"	G 3/8"	G 3/8"	G 1/4"	70	30	80	35	32.8	17.3	32.5	18	44	20	30	22	60.5	48	1.10
KGG3822-F04	M22x1,5	G 3/8"	G 3/8"	G 3/8"	G 1/4"	80	45	100	40	44	22.5	55	11	58	25	30	32	77	25	2.45
KGG1222-F04	M22x1,5	G 1/2"	G 1/2"	G 1/2"	G 1/4"	80	45	100	40	44	22.5	55	11	58	25	30	32	77	25	2.45
KGG3433-F04	M33x2	G 3/4"	G 3/4"	G 3/4"	G 1/4"	100	50	110	50	58.5	30.5	70	11	80	27.5	45	34	89.5	35	3.40
KGG11442-F04	M42x2	G 1 1/4"	G 1 1/4"	G 1 1/4"	G 1/4"	120	60	130	60	66.5	33.4	72	15	88	32.5	55	44	100	25	5.40

**GENERAL SPECIFICATIONS**

Description	Line mount body
Mounting	2 location holes 2 tapped holes
Connection	Threaded connections
Mounting position	see valve data sheet
Surface protection	zinc-nickel coated

**HYDRAULIC SPECIFICATIONS**

Peak pressure	$p_{max} = 400$ bar
---------------	---------------------

**CARTRIDGE CAVITY**


Type	Cavity according to:	For detailed cavity drawing see data sheet:
M16x1,5	WAG-Norm	2.13-1051
M18x1,5	WAG-Norm	2.13-1020
M22x1,5	ISO 7789-22-04-0-88	2.13-1004
M33x2	ISO 7789-33-04-0-88	2.13-1040
M42x2	ISO 7789-42-04-0-07	2.13-1047

**SCREW-IN CARTRIDGES INSTALLED**

According to the type the following screw-in cartridges can be installed in the line mount bodies:

Type	Data sheet no.
<b>M18x1,5</b>	
MD.PM16	2.2-508
MDBPM16	2.3-602
MDIPM16	2.3-603
MDPPM16	2.3-605
MGPPM16	2.3-607
MGBPM16	2.3-608
<b>M18x1,5</b>	
SDSPM18-FG	1.11-2051
SDYPM18-FG	1.11-2052
SDZPM18-FG	1.11-2054
MV.PM18	2.2-510
MVPPM18	2.3-610
<b>M22x1,5</b>	
SDSPM22-FG	1.11-2061
SDYPM22-FG	1.11-2064
SLYPM22-FG	1.11-2066
MV.PM22	2.2-530
MVEPM22	2.2-538
MPPPM22	2.2-625
MPBPM22	2.2-627
MVPPM22	2.3-629
MVPPM22-.JME	2.3-632
MVBPM22	2.3-635
MQPPM22	2.3-641
MQPPM22-.JME	2.3-643
QD.PM22	2.5-540
QDPPM22	2.6-644
QDPPM22-.JME	2.6-647
<b>M33x2</b>	
MVPPM33	2.3-649
MVPPM33-.JME	2.3-652
MVBPM33	2.3-654
QD.PM33	2.5-555
QDPPM33	2.6-666
QDPPM33-.JME	2.6-668
<b>M42x2</b>	
MVPPM42	2.3-690
QDPPM42	2.6-695


**CAUTION!**

The performance data refer to the screw-in cartridges only. The additional pressure drop in the line mount body must be taken into consideration.

Technical explanation see data sheet 1.0-100

**Threaded ports sandwich body**

 •  $p_{max} = 350 \text{ bar}$ 
**NG3-Mini<sup>®</sup>**

**DESCRIPTION**

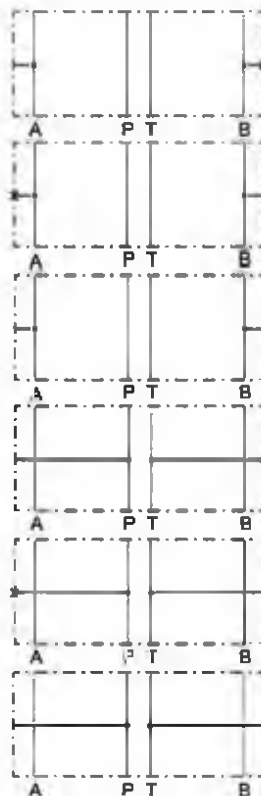
Sandwich bodies NG3-Mini acc. to Wandfluh standard with ports G1/8" for external connection to A and B or P and T lines. Sandwich bodies with one external connection (A, B, P, T) will have the second port plugged with plug G1/8" (article 238.1405). The sandwich bodies are zinc coated and will be supplied inclusive 5 O-rings ID 4.50x1.50 (article 180.2045). The connections T and To are not connected together.

**APPLICATION**

Threaded ports sandwich bodies in stacking systems to connect gauges, sensors or control elements.

**TYPE CODE**

	PG	S	A03		#
Sandwich threaded body					
Sandwich construction					
Mounting interface acc. to Wandfluh standard, NG3-Mini					
Type list / Function					
in A	<b>A</b>	in P	<b>P</b>		
in B	<b>B</b>	in T	<b>T</b>		
in A and B	<b>AB</b>	in P and T	<b>PT</b>		
Design-Index (Subject to change)					

**TYPES**

 PGSA03-A  
 (article 203.0501)

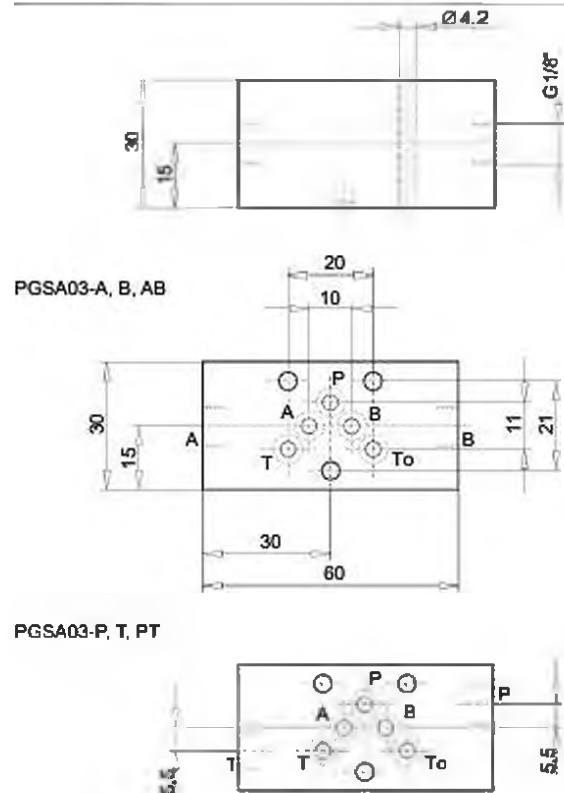
 PGSA03-B  
 (article 203.0502)

 PGSA03-AB  
 (article 203.0500)

 PGSA03-P  
 (article 203.0504)

 PGSA03-T  
 (article 203.0505)

 PGSA03-PT  
 (article 203.0503)

**DIMENSIONS**


**Threaded ports sandwich body**

 •  $p_{max} = 350 \text{ bar}$ 
**NG4-Mini**
**DESCRIPTION**

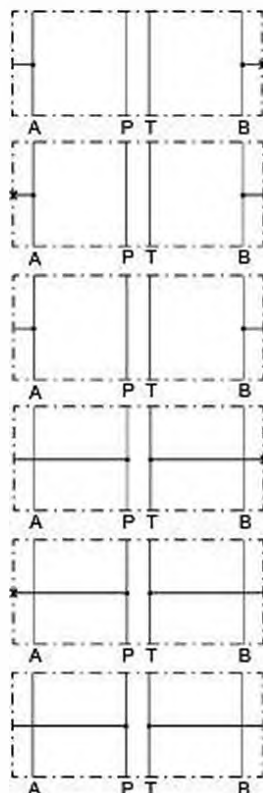
Sandwich bodies NG4-Mini according to Wandfluh standard with ports G1/4" for external connection to A and B or P and T lines. Sandwich bodies with one external connection (A, B, P, T) will have the second port plugged with plug G1/4" (article 238.2406). The sandwich bodies are zinc coated and will be supplied inclusive 5 O-rings ID 5,28x1,78 (article no. 180.2052). The connections T and To are not connected together.

**APPLICATION**

Threaded ports sandwich bodies in stacking systems to connect gauges, sensors or control elements.

**TYPE CODE**

	B	SGK	<input type="text"/>	4	#	<input type="text"/>
Mounting interface acc. to Wandfluh standard						
Sandwich threaded body						
Type list / Function	in A <input type="text" value="A"/> in B <input type="text" value="B"/> in A and B <input type="text" value="AB"/>		in P <input type="text" value="P"/> in T <input type="text" value="T"/> in P and T <input type="text" value="PT"/>			
Nominal size 4-Mini						
Design-Index (Subject to change)						

**TYPES**


BSGKA4  
(article 203.1501)

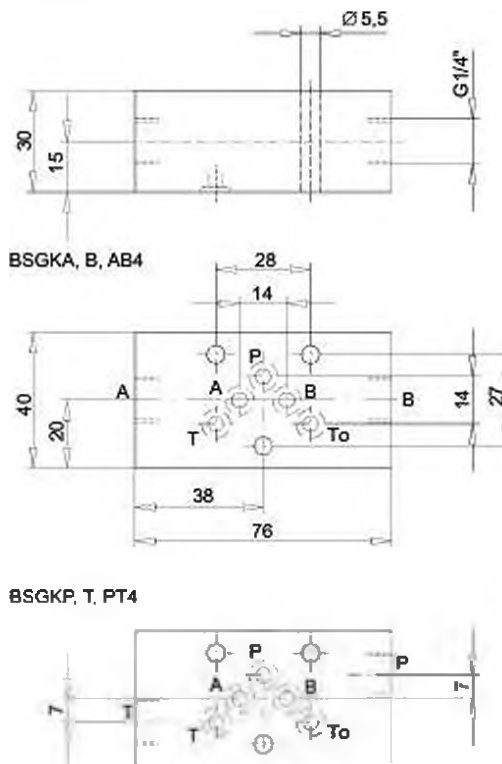
BSGKB4  
(article 203.1502)

BSGKAB4  
(article 203.1500)

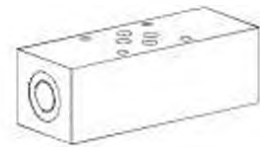
BSGKP4  
(article 203.1504)

BSGKT4  
(article 203.1505)

BSGKPT4  
(article 203.1503)

**DIMENSIONS**


**Threaded ports sandwich body**

 •  $p_{max} = 350 \text{ bar}$ 
**NG6**  
 ISO 4401-03

**DESCRIPTION**

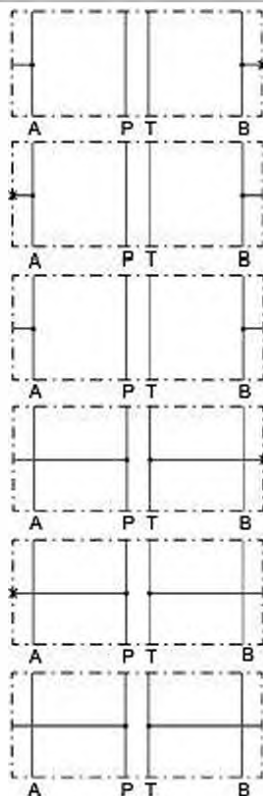
Sandwich bodies NG6 according to ISO 4401-03 with ports G3/8" for external connection to A and B or P and T lines. Sandwich bodies with one external connection (A, B, P, T) will have the second port plugged with plug G3/8" (article 238.3402). The sandwich bodies are zinc coated and will be supplied inclusive 4 O-rings ID 9,25x1,78 (article no. 160.2093).

**APPLICATION**

Threaded ports sandwich bodies in stacking systems to connect gauges, sensors or control elements.

**TYPE CODE**

			A	SGK	<input type="text"/>	6	#
International standard interface ISO							
Sandwich threaded body							
Type list / Function	in A	<input type="text" value="A"/>	in P	<input type="text" value="P"/>			
	in B	<input type="text" value="B"/>	in T	<input type="text" value="T"/>			
	in A and B	<input type="text" value="AB"/>	in P and T	<input type="text" value="PT"/>			
Nominal size 6							
Design-Index (Subject to change)							

**TYPES**

**ASGKA6**  
 (article 203.3501)

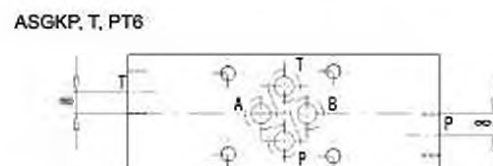
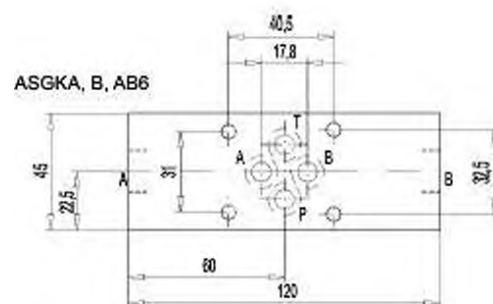
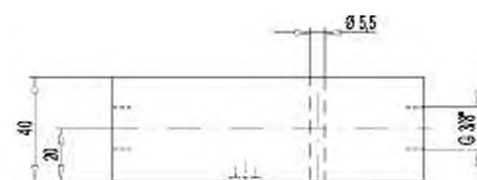
**ASGKB6**  
 (article 203.3502)

**ASGKAB6**  
 (article 203.3500)

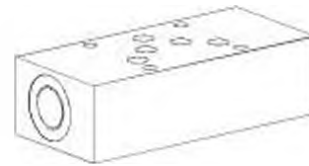
**ASGKP6**  
 (article 203.3504)

**ASGKT6**  
 (article 203.3505)

**ASGKPT6**  
 (article 203.3503)

**DIMENSIONS**


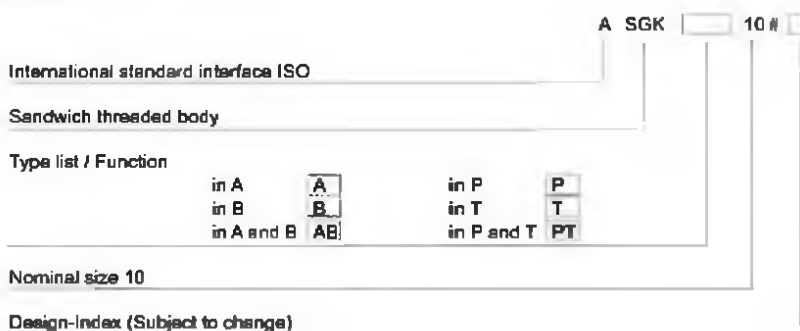
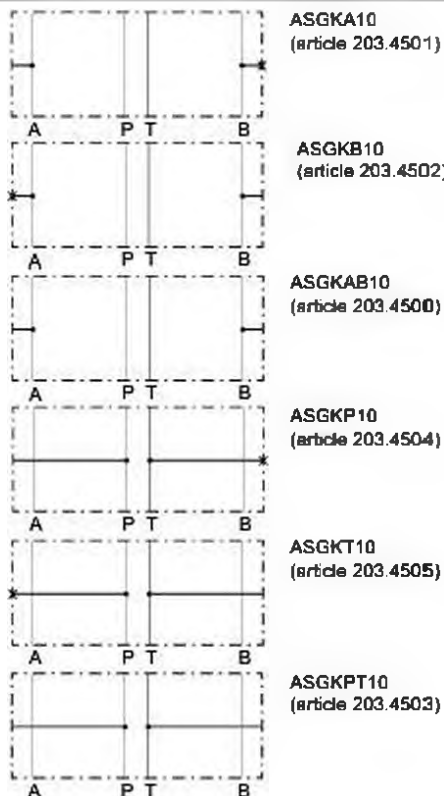
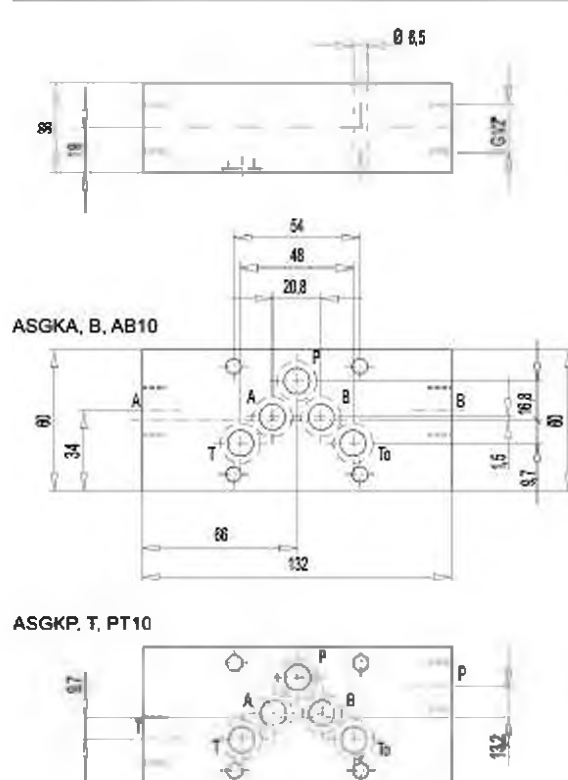
**Threaded ports sandwich body**

 •  $p_{max} = 350 \text{ bar}$ 
**NG10**  
 ISO 4401-05

**DESCRIPTION**

Sandwich bodies NG10 acc. to ISO 4401-05 with ports G1/2" for external connection to A and B or P and T lines. Sandwich bodies with one external connection (A, B, P, T) will have the second port plugged with plug G1/2" (article 238.5405). The sandwich bodies are zinc coated and will be supplied inclusive 5 O-rings ID 14,00x1,78 (article 160.2140). The connections T and To are not connected together.

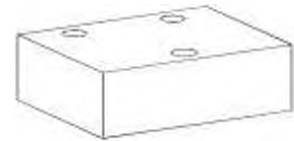
**APPLICATION**

Threaded ports sandwich bodies in stacking systems to connect gauges, sensors or control elements.

**TYPE CODE**

**TYPES**

**DIMENSIONS**


**Blanking or linking plate**
**Flange construction**

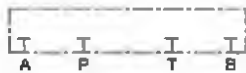
 ◆  $p_{n,max}$  = 350 bar

**NG3-Mini**
**Wandfluh standard**

**DESCRIPTION**

Blanking plates are used for sealing all ports of the mounting interface. With linking plates, the selected links of the oil ports are connected. The other ports are closed.

**TYPE CODE**

Blanking plate	<input type="checkbox"/> PB	PB F A03 -	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Linking plate	<input type="checkbox"/> PU	PU F A03 -	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flange construction							
Mounting interface according to Wandfluh standard, NG3-Mini							
Connections of oil ports according to type list / symbol							
Sealing material	NBR FKM (Viton) NBR 872	<input type="checkbox"/> D1 <input type="checkbox"/> Z804					
Design index (subject to change)	293113						

**SYMBOL**
**Blanking plate**
**PBFA03**

**Linking plate**
**PUFA03-A/B**

**Linking plate**
**PUFA03-A/T**

**Linking plate**
**PUFA03-P/A**

**Linking plate**
**PUFA03-P/B**

**Linking plate**
**PUFA03-P/T**

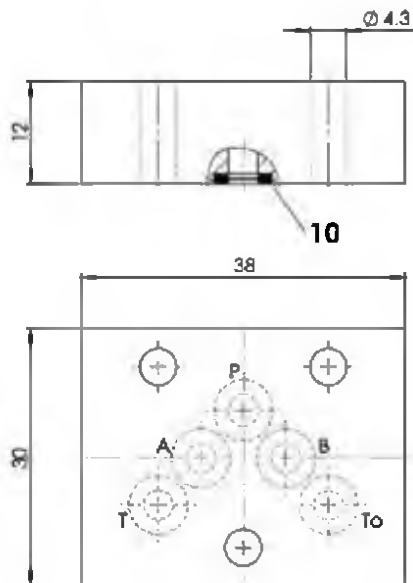
**Linking plate**
**PUFA03-P/A/B**

**Linking plate**
**PUFA03-P/A-B/T**

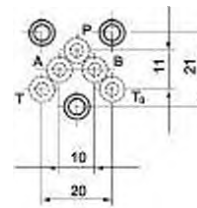
**Linking plate**
**PUFA03-P/B-A/T**




## DIMENSIONS



## HYDRAULIC CONNECTION



## PARTS LIST

Position	Article	Description
10	160 2045	O-ring ID 4,50 x 1,50 (NBR)
	160 6045	O-ring ID 4,50 x 1,50 (FKM)

## SURFACE TREATMENT

- ◆ The plates made of steel are zinc-nickel coated

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## STANDARDS

Mounting interface Wandfluh standard

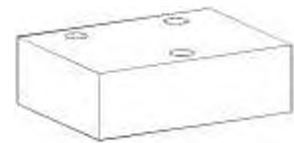
**Blanking or linking plate**

Flange construction

◆  $p_{nom} = 350 \text{ bar}$

**NG4-Mini**

Wandfluh standard



**DESCRIPTION**

Blanking plates are used for sealing all ports of the mounting interface. With linking plates, the selected links of the oil ports are connected. The other ports are closed.

**TYPE CODE**

Mounting interface according to Wandfluh standard		B BP 4	-		#
Blanking plate		BP			
Linking plate		U			
Nominal size 4-Mini					
Connections of oil ports according to type list / symbol					
Sealing material	NBR				
	FKM (Viton)	D1			
	NBR 872	Z804			
Design index (subject to change)					
110-122					

**SYMBOL**

Blanking plate

BBP4



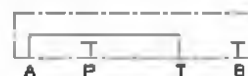
Linking plate

BU4 / A-B



Linking plate

BU4 / A-T



Linking plate

BU4 / P-A



Linking plate

BU4 / P-B



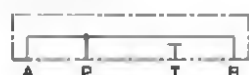
Linking plate

BU4 / P-T



Linking plate

BU4 / P-A-B



Linking plate

BU4 / P-A / B-T

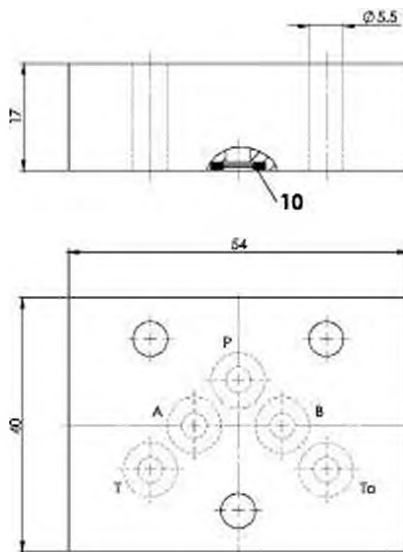


Linking plate

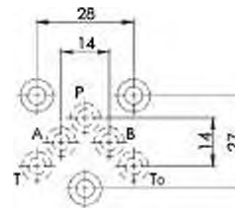
BU4 / P-B / A-T



## DIMENSIONS



## HYDRAULIC CONNECTION



## PARTS LIST

Position	Article	Description
10	160.2052	O-ring ID 5,28 x 1,78 (NBR)
	160.6052	O-ring ID 5,28 x 1,78 (FKM)

## SURFACE TREATMENT

- ◆ The plates made of steel are zinc-nickel coated

## SEALING MATERIAL

NBR or FKM (Viton) as standard, choice in the type code

## STANDARDS

Mounting interface      Wandfluh standard

Blanking plate  
 Linking plate  
 •  $p_{max} = 350$  bar

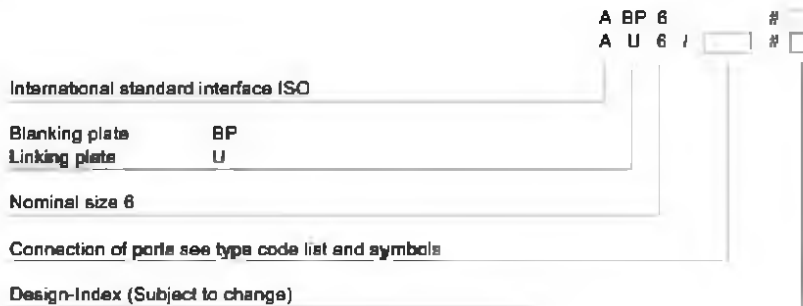
**NG6**  
 ISO 4401-03


**DESCRIPTION**

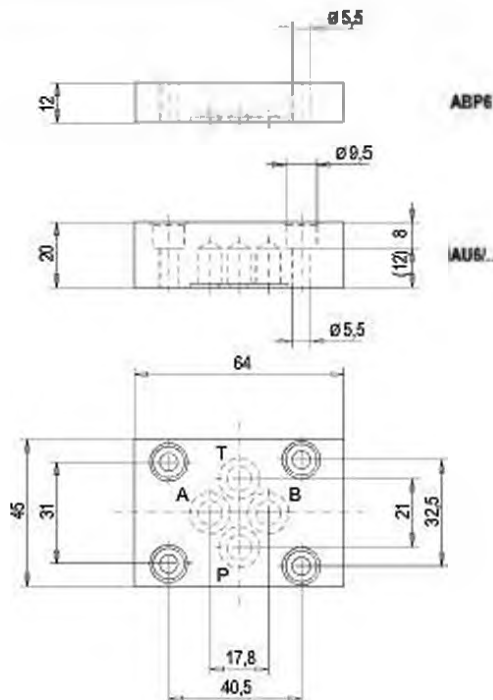
Blanking and linking plates NG6 acc. to ISO 4401-03. The plates are zinc coated and will be supplied inclusive 4 O-rings ID 9,25x1,78 (article 160.2093).

**APPLICATION**

Blanking plates are used to seal all ports (P, A, B, T) of a NG6 interface.  
 With linking plates selected parts of a NG6 interface can be connected. Other ports not in use are sealed.

**TYPE CODE**

**DIMENSIONS**

Blanking and linking plate


**TYPES**

Types	Article no.	Symbols
<i>Blanking plate:</i>		
ABP6	173.3150	
<i>Linking plate:</i>		
AU6 / P-B / A-T	173.3250	
AU6 / P-A / B-T	173.3251	
AU6 / P-A	173.3252	
AU6 / P-B	173.3253	
AU6 / P-T	173.3254	
AU6 / A-T	173.3255	
AU6 / B-T	173.3256	
AU6 / A-B-T	173.3257	
AU6 / A-B	173.3258	
AU6 / P-A-B	173.3259	

Blanking plate  
 Linking plate  
 •  $p_{max} = 350 \text{ bar}$

**NG10**  
 ISO 4401-05



#### DESCRIPTION

Blanking and linking plates NG10 acc. to ISO 4401-05. The plates are zinc coated and will be supplied inclusive 5 O-rings ID 14,00x1,78 (article 160.2140). The connections T and To are connected together.

#### APPLICATION

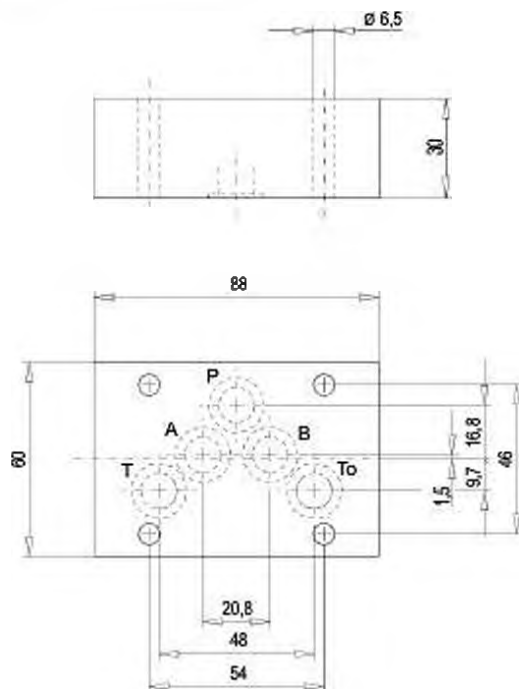
Blanking plates are used to seal all ports (P, A, B, T, T0) of a NG10 interface. With linking plates selected ports of a NG10 interface can be connected. Other ports not in use are sealed.

#### TYPE CODE



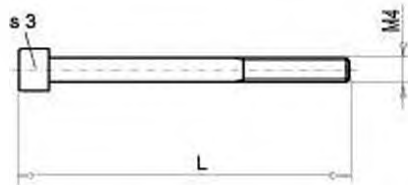
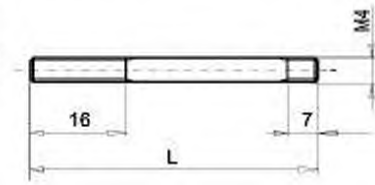
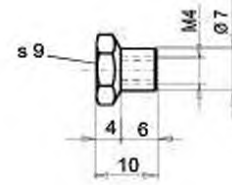
#### DIMENSIONS

Blanking and linking plate



#### TYPES

Types	Article no.	Symbols
<i>Blanking plate:</i>		
ABP10	173.4150	
<i>Linking plate:</i>		
AU10 / P-B / A-T	173.4250	
AU10 / P-A / B-T	173.4251	
AU10 / P-A	173.4252	
AU10 / P-B	173.4253	
AU10 / P-T	173.4254	
AU10 / A-T	173.4255	
AU10 / B-T	173.4256	
AU10 / A-B-T	173.4260	
AU10 / A-B	173.4257	
AU10 / P-A-B	173.4258	

**Stack assembly**
**NG3-Mini<sup>®</sup>**
**SOCKET HEAD CAP SCREW M4xL**

**STUD M4xL**

**STEP NUT M4**
**Art. Nr. 154.7404**

**FIXATION WITH SOCKET HEAD CAP SCREWS**

Effective stack length	Description and dimension ( M4xL )	Fastening torque	Article No
38 ... 40	Cap screw M4x45 Steel 8.8 zinc coated DIN 912	2,6 Nm	246.1146
43 ... 45	Cap screw M4x50 Steel 8.8 zinc coated DIN 912	2,6 Nm	246.1151
48 ... 50	Cap screw M4x55 Steel 8.8 zinc coated DIN 912	2,6 Nm	246.1156
53 ... 55	Cap screw M4x60 Steel 8.8 zinc coated DIN 912	2,6 Nm	246.1181
56 ... 58	Cap screw M4x63 Steel 8.8 zinc coated	2,6 Nm	249.1007
58 ... 60	Cap screw M4x65 Steel 12.9 black DIN 912	5 Nm	246.1365
61 ... 63	Cap screw M4x68 Steel 8.8 zinc coated	2,6 Nm	249.1005
63 ... 65	Cap screw M4x70 Steel 8.8 zinc coated DIN 912	2,6 Nm	246.1171
68 ... 70	Cap screw M4x75 Steel 8.8 zinc coated	2,6 Nm	249.1004
73 ... 75	Cap screw M4x80 Steel 8.8 zinc coated DIN 912	2,6 Nm	246.1181

**FIXATION WITH STUDS AND STEP NUTS**

Effective stack length	Description and dimension ( M4xL )	Fastening torque	Article No
52 ... 60	Stud M4x73 St 329 black	2,8 Nm	224.1006
84 ... 92	Stud M4x105 St 329 black	2,8 Nm	224.1007
93 ... 101	Stud M4x114 St 329 black	2,8 Nm	224.1009
115 ... 123	Stud M4x136 St 329 black	2,8 Nm	224.1005
146 ... 154	Stud M4x167 St 329 black	2,8 Nm	224.1004

Effective stack length = Length between head of screw and top of base plate

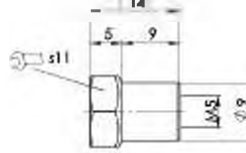
## Stack assembly

## NG4-Mini, NG6

**SOCKET HEAD CAP SCREW M5xL**

**STEP NUT M5**

Art. Nr. 154.7402



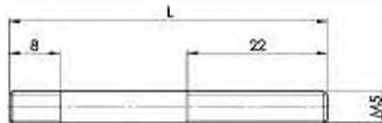
Fastening torque: 5.5Nm

**SOCKET HEAD CAP SCREWS**

Effective stack length	Dimension	Article No.
41 ... 44	M5x50	248.2151
46 ... 49	M5x55	248.2156
51 ... 54	M5x60	248.2160
56 ... 59	M5x65	248.2165
61 ... 64	M5x70	248.2171
66 ... 69	M5x75	248.2176
69 ... 72	M5x78	249.2003
71 ... 74	M5x80	248.2181
76 ... 79	M5x85	248.2385

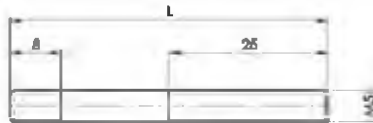
Effective stack length	Dimension	Article No.
79 ... 82	M5x88	249.2006
81 ... 84	M5x90	248.2190
86 ... 89	M5x95	249.2004
91 ... 94	M5x100	248.2193
101 ... 104	M5x110	248.2191
111 ... 114	M5x120	248.2192

 Material: Steel 8.8  
 Surface: zinc coated

**STUD M5XL...**


Effective stack length	Dimension	Article No.
83 ... 88	M5x112	224.2016
89 ... 104	M5x118	224.2025
95 ... 110	M5x124	224.2001
106 ... 121	M5x135	224.2023
113 ... 128	M5x142	224.2002
124 ... 140	M5x154	224.2003
136 ... 151	M5x165	224.2013
143 ... 158	M5x172	224.2004
154 ... 170	M5x184	224.2005
166 ... 181	M5x195	224.2011
173 ... 188	M5x202	224.2006
184 ... 200	M5x214	224.2007
196 ... 212	M5x226	224.2008
208 ... 223	M5x237	224.2028
219 ... 234	M5x248	224.2026
227 ... 242	M5x256	224.2020
246 ... 261	M5x275	224.2032
251 ... 266	M5x280	224.2030
292 ... 307	M5x321	224.2029

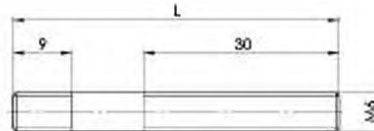
 Material: ETG100  
 Surface: burnished

**STUD M5XL...K8**


Effective stack length	Dimension	Article No.
74 ... 88	M5x112	224.2082
80 ... 104	M5x118	224.2084
86 ... 110	M5x124	224.2073
97 ... 121	M5x135	224.2083
104 ... 128	M5x142	224.2072
115 ... 140	M5x154	224.2074
127 ... 151	M5x165	224.2081
134 ... 158	M5x172	224.2075
145 ... 170	M5x184	224.2076
157 ... 181	M5x195	224.2080
164 ... 188	M5x202	224.2077
175 ... 200	M5x214	224.2078
187 ... 212	M5x226	224.2079
199 ... 223	M5x237	224.2085
229 ... 254	M5x268	224.2086
237 ... 261	M5x275	224.2087
262 ... 276	M5x280	224.2090
283 ... 307	M5x321	224.2088

Material: Stainless steel 1.4057

**Stack assembly**
**NG10**
**STUD M6xL**

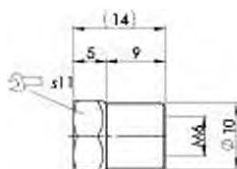
**STUD M6xL K8**


Effective stack length	Dimension	Article No.
73 ... 89	M6x106	224.3000
82 ... 98	M6x115	224.3002
86 ... 112	M6x129	224.3003
108 ... 124	M6x141	224.3004
120 ... 136	M6x153	224.3008
128 ... 144	M6x181	224.3007
140 ... 156	M6x173	224.3008
149 ... 165	M6x182	224.3009
159 ... 175	M6x192	224.3010
175 ... 191	M6x205	224.3011
187 ... 203	M6x220	224.3012
198 ... 212	M6x229	224.3013
204 ... 220	M6x237	224.3014
213 ... 229	M6x246	224.3019
225 ... 241	M6x258	224.3015
234 ... 250	M6x287	224.3016
252 ... 268	M6x285	224.3020
292 ... 308	M6x325	224.3018
360 ... 378	M6x393	224.3021

Effective stack length	Dimension	Article No.
68 ... 89	M6x106	224.3083
77 ... 96	M6x115	224.3050
91 ... 112	M6x129	224.3051
103 ... 124	M6x141	224.3052
115 ... 136	M6x153	224.3053
135 ... 156	M6x173	224.3054
144 ... 165	M6x182	224.3055
154 ... 175	M6x192	224.3056
170 ... 191	M6x205	224.3057
182 ... 203	M6x220	224.3058
191 ... 212	M6x229	224.3060
199 ... 220	M6x237	224.3059
220 ... 241	M6x258	224.3082
247 ... 268	M6x285	224.3081
259 ... 280	M6x297	224.3066
355 ... 378	M6x393	224.3085

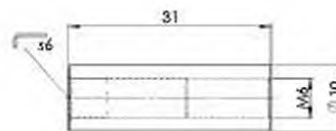
Material: ETG100  
 Surface: burnished

Material: Stainless steel 1.4057

**STEP NUT M6**
**Article No. 154.7400**


Tightening torque: 9.5 Nm

For A.4x10 (1.2-71)

**STEP NUT M6**
**Article No. 154.0602**


Tightening torque: 9.5 Nm

For WDMFA10 (1.2-78)



Sealing plate  
Intermediate plate  
•  $p_{max} = 350 \text{ bar}$

**NG3-Mini<sup>30</sup>**



**DESCRIPTION**

Sealing and intermediate plates NG3-Mini acc. to Wandfluh standard. The plates are zinc. Sealing plates will be supplied inclusive 5 O-rings ID 4.5x1,5 (article 160.2045).

**APPLICATION**

Sealing and intermediate plates are required if certain sandwich valves have to be transformed from meter-out control to meter-in control eg throttle valves with by pass check (DRDSA03-AB) for meter-out control adapted for meter-in control (DRDSA03-ABV).

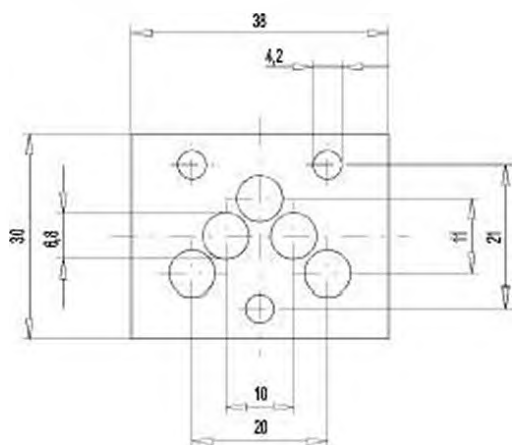
**TYPE CODE**



**DIMENSIONS**

PDSA03

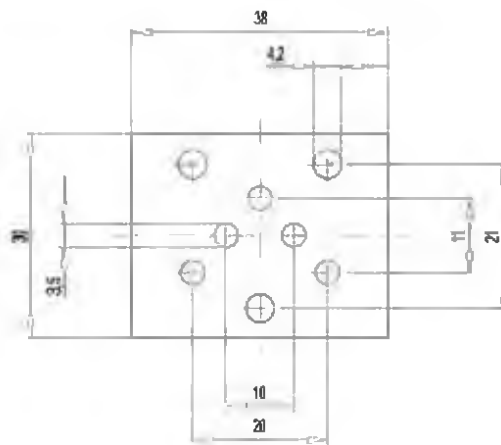
Article no. 173.0850



Thickness = 1,2

PZSA03

Article no. 173.0700



Thickness = 1,2

Sealing plate  
Intermediate plate  
•  $p_{max} = 350 \text{ bar}$

**NG4-Mini<sup>®</sup>**



**DESCRIPTION**

Sealing and intermediate plates NG4-Mini acc. Wandfluh standard. The plates are zinc. Sealing plates will be supplied inclusive 5 O-rings ID 5.28x1.78 (article 160.2052).

**APPLICATION**

Sealing and intermediate plates are required if certain sandwich valves have to be transferred from meter-out control to meter-in control eg throttle valves with by pass check (BURDV4) for meter-out control adapted for meter-in control (BURD4).

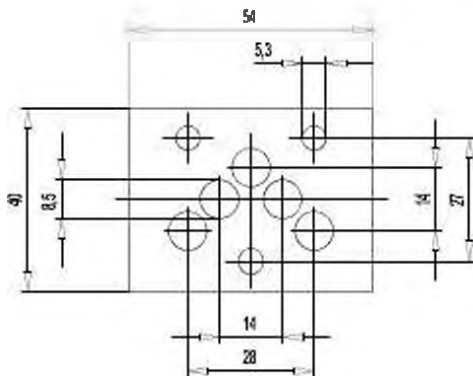
**TYPE CODE**

	B	<input type="text"/>	4	#	<input type="text"/>
Mounting interface acc. to Wandfluh standard					
Sealing plate		DB			
Intermediate plate		ZB			
Nominal size 4-Mini					
Design-Index (Subject to change)					

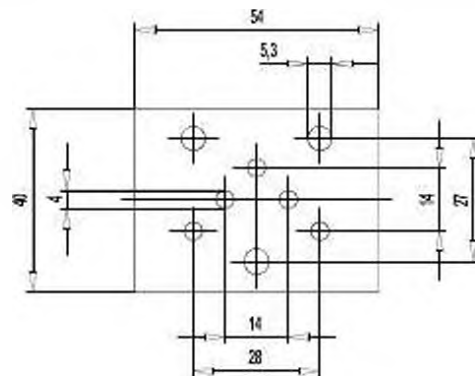
**DIMENSIONS**

BDB4 Article no. 173.1650

BZB4 Article no. 173.1700



Thickness = 1,25



Thickness = 1,25



**Sealing plate**  
**Intermediate plate**  
•  $p_{max} = 350 \text{ bar}$

**NG6**  
ISO 4401-03



**DESCRIPTION**

Sealing and intermediate plates NG6 to ISO 4401-03. The plates are zinc. Sealing plates will be supplied inclusive 4 O-rings ID 9.25x 1,78 (article 180.2093).

**APPLICATION**

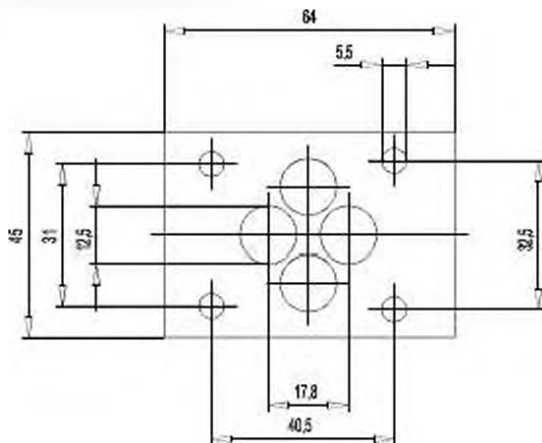
Sealing and intermediate plates are required if certain sandwich valves have to be transferred from meter-out control to meter-in control eg throttle valves with by pass check (AURDV6) for meter-out control adapted for meter-in control (AURD6).

**TYPE CODE**



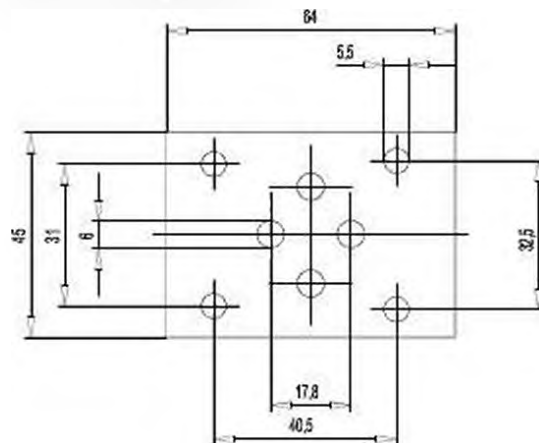
**DIMENSIONS**

A DB6 Article no. 173.3650



Thickness = 1,25

A ZB6 Article no. 173.3700



Thickness = 1,25

Sealing plate  
Intermediate plate  
•  $p_{max} = 350 \text{ bar}$

**NG10**  
ISO 4401-05



**DESCRIPTION**

Sealing and intermediate plates NG10 to ISO 4401-05. The plates are zinc. Sealing plates will be supplied inclusive 5 O-rings ID 14.00x1.78 (article 160.2140).

**APPLICATION**

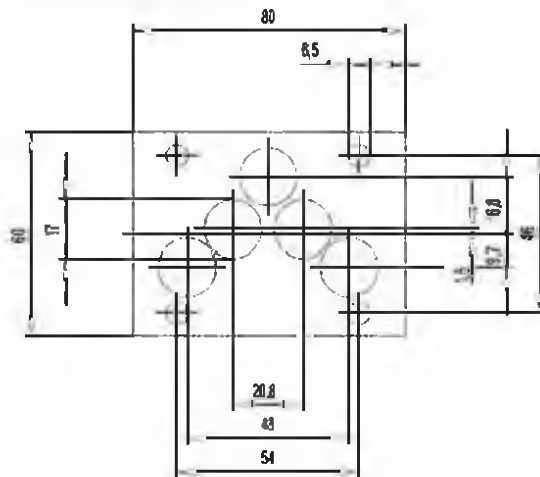
Sealing and intermediate plates are required if certain sandwich valves have to be transferred from meter-out control to meter-in control eg throttle valves with by pass check (AURDV10) for meter-out control adapted for meter-in control (AURD10).

**TYPE CODE**



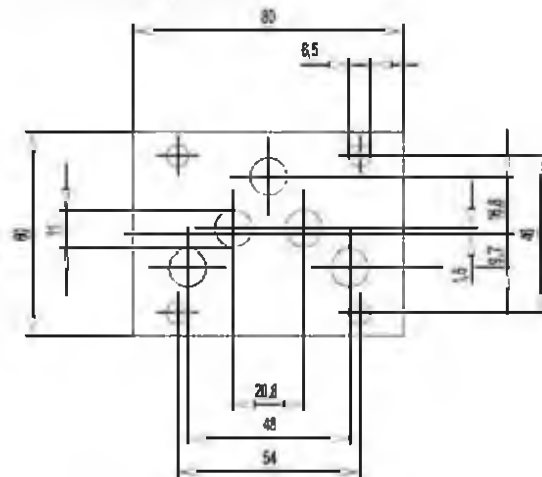
**DIMENSIONS**

ADB10 Article no. 173.4850



Thickness = 1,25

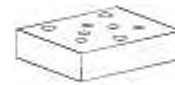
AZB10 Article no. 173.4700



Thickness = 1,25



**Distance plates**

 •  $p_{max} = 350 \text{ bar}$ 
**NG4-Mini**

**DESCRIPTION**

Distance plates NG4-Mini acc. to Wandfluh standard. The plates are zinc-nickel coated and are supplied including 5 O-rings ID 5,28x1,78 (article 160.2052). The connections T and T<sub>a</sub> are not connected together.

**APPLICATION**

Distance plates serve to create a distance between to elements.

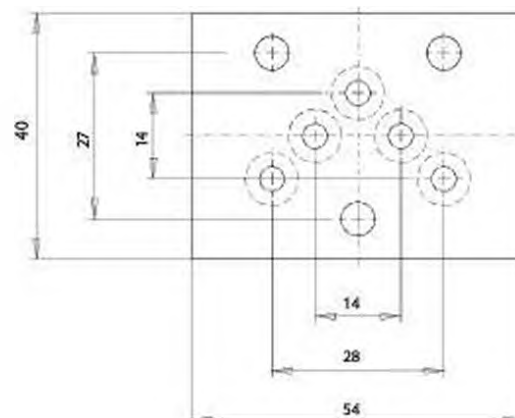
In case of plates with the additional designation S1391, nozzles can be additionally screwed into the connections P,A,B,T,T<sub>a</sub>. Thread M5 (5,5 mm deep).

**TYPE CODE**

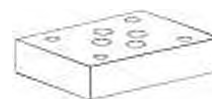
				B	DP	4	/		-		#	
Mounting interface acc. to Wandfluh standard												
Distance plate												
Nominal size 4-Mini												
Thickness H	12 mm	12										
	17 mm	17										
			Standard									
Thread M5 in the connections P,A,B,T,T <sub>a</sub>								S1391	only for BDP4/12			
Design-Index (Subject to change)												

**TYPES**

BDP4/12	article 173.1450
BDP4/12-S1391	article 173.1454
BDP4/17	article 173.1464

**DIMENSIONS**


**Distance plates**

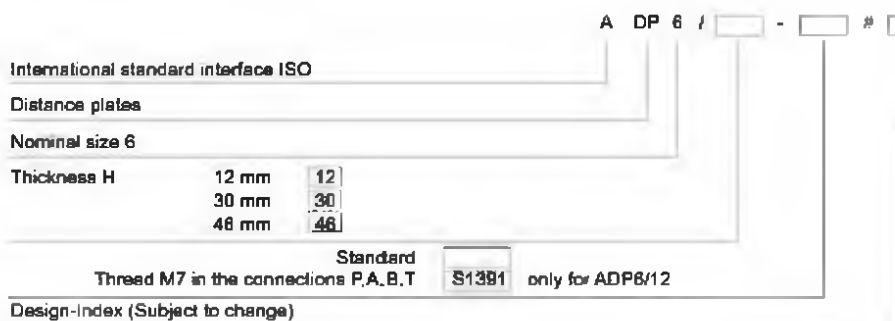
 •  $p_{max} = 350 \text{ bar}$ 
**NG6**  
 ISO 4401-03

**DESCRIPTION**

Distance plates NG6 acc. to ISO 4401-03. The plates are zinc coated and are supplied including 4 O-rings ID 9,25x1,78 (article 160.2093).

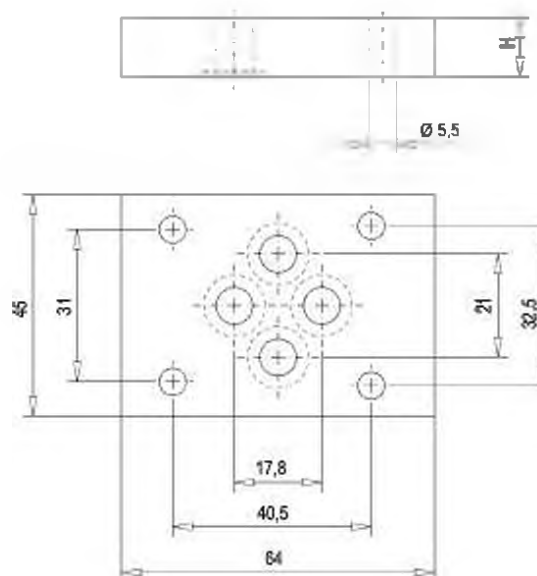
**APPLICATION**

Distance plates serve to create a distance between two elements.

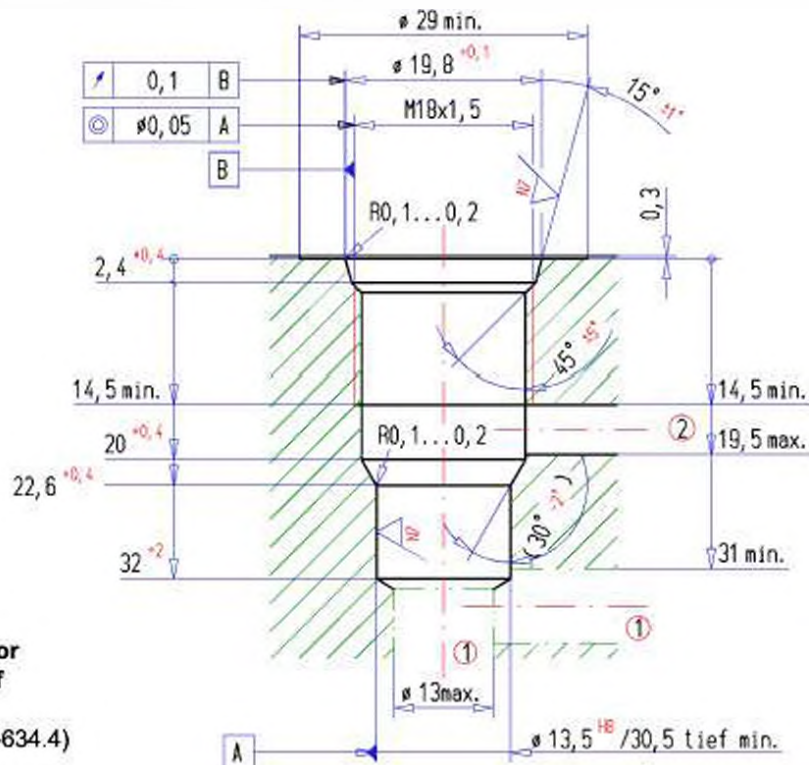
In case of plates with the additional designation S1391, nozzles can be additionally screwed into the connections P,A,B,T. Thread M7 (8 mm deep).

**TYPE CODE**

**TYPES**

ADP6/12	article 173.3451
ADP6/12-S1391	article 173.3452
ADP6/30	article 173.3453
ADP6/46	article 173.3454

**DIMENSIONS**


**Cartridge cavity ISO 7789-18-02-0-98**



**2-way-cavity for pressure relief**

(Drawing no. 2-634.4)

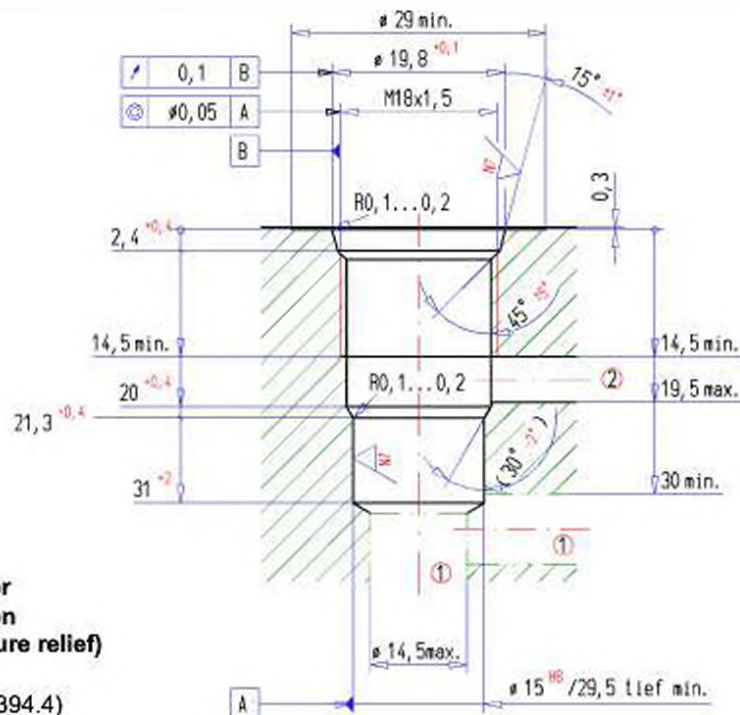
Edges according to ISO 13715 	Surface texture NB	General tolerances ISO 2768 Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	Extract general tolerances ISO-2768-1															
			<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120														
Linear dim.	±0.1	±0.1	±0.2	±0.3														
Radiuses, chamfer height	±0.2	±0.5	±1															

**Cavity tools**

<b>Denomination:</b> Ecoline 2-way M18 x 1,5	<b>Article number:</b> 983.4803	<b>Content:</b> Form drill Form reamer	<b>Article number:</b>
<b>Tool kit 2-way M18 x 1,5</b>	<b>983.4800</b>	<b>Form drill Form reamer Tap</b>	<b>983.4100 983.4200 983.0600</b>

**Application**

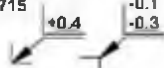
<b>Cartridge type:</b> BV.PM18-... BS.PM18-... BVPPM18-... BDPPM18-...	<b>Data sheet number:</b> 2.1-510 2.1-520 2.3-510 2.3-520	<b>Cartridge type:</b>	<b>Data sheet number:</b>
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**Cartridge cavity ISO 7789-18-01-0-98**


**2-way-cavity for  
general function  
(without pressure relief)**

(Drawing-no. 3-394.4)

Edges according to  
ISO 13715



Surface texture



Length dimensions, curves, chamfers  
Angles  
Straightness, flatness  
Perpendicularity, symmetry  
Radial runout, axial runout  
Envelope condition acc. to ISO 14405 (p)

m Extract general tolerances ISO-2768-1

	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120
M	Linear dim.	±0.1	±0.1	±0.2	±0.3
H	Radiuses, chamfer height	±0.2	±0.5	±1	

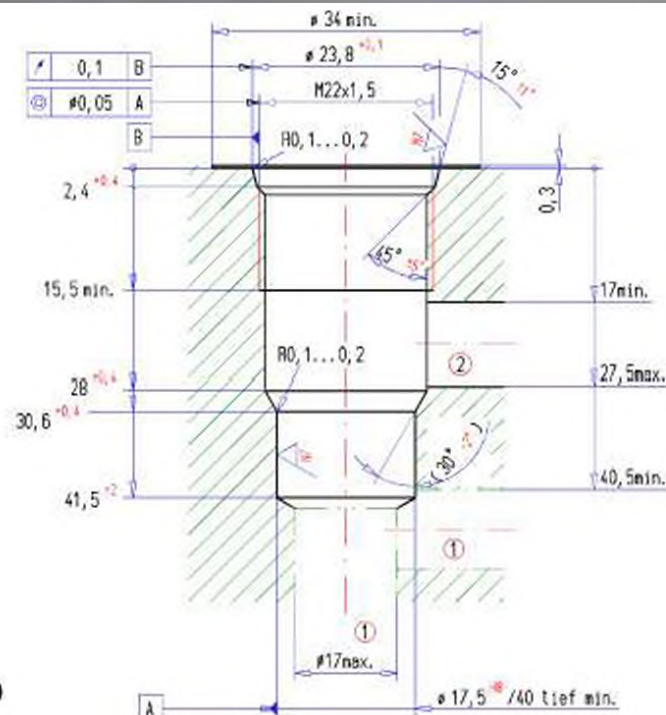
**Cavity tools**

Denomination:	Article number:	Content:	Article number:
Ecoline 2-way M18 x 1,5	983.0809	Form drill Form reamer	
Tool kit 2-way M18 x 1,5	983.0800	Form drill Form reamer Tap	983.0100 983.0200 983.0600

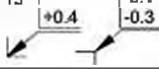

**Application**

Cartridge type:	Data sheet number:	Cartridge type:	Data sheet number:
SDSPM18-...	1.11-2051	DNIPM18-...	2.4-512
SDYPM18-...	1.11-2052	DR.PM18-...	2.4-610
SDZPM18-...	1.11-2054	QA.PM18-...	2.5-510
SVSPM18-...	1.11-2080	D.PPM18-...	2.6-510
DN.PM18-...	2.4-510		



**Cartridge cavity ISO 7789-22-02-0-98**

**2-way-cavity for pressure relief**

(Drawing-no. 2-632.4)

Edges according to ISO 13715 	Surface texture NB 	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405®	General tolerances ISO 2768 m H H H	Extract general tolerances ISO-2768-1 Nominal dim. >0.5-3 >3-6 >6-30 >30-120 Linear dim. ±0.1 ±0.1 ±0.2 ±0.3 Radiuses, chamfer height ±0.2 ±0.5 ±1
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**Cavity tools**

Denomination:	Article number:	Content:	Article number:
Ecoline 2-way M22 x 1,5	983.4804	Form drill Form reamer	
Tool kit 2-way M22 x 1,5	983.4801	Form drill Form reamer Tap	983.4101 983.4201 983.0601

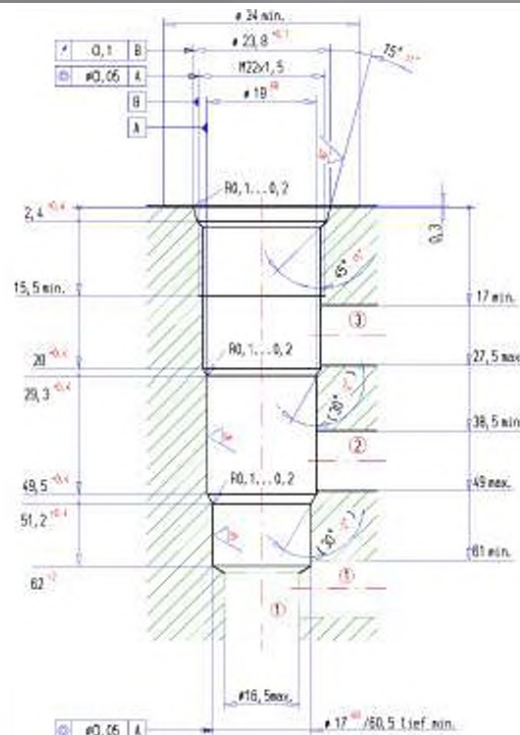
**Application**

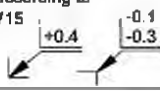
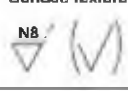
Cartridge type:	Data sheet number:	Cartridge type:	Data sheet number:
BV.PM22-...	2.1-530 / 530S	BNIPM22-...	2.3-533
BVTPM22-...	2.1-532	BVBPM22-...	2.3-535 / 536
BVEPM22-...	2.1-536	BVPPM22-.../ME	2.3-537
BC..PM22-...	2.1-538	BDPPM22-...	2.3-540 / 539
BESPM22-...	2.1-539	BDVPM22-...	2.3-541
BA.PM22-...	2.1-540 / 540S	BDIPM22-...	2.3-542 / 548
BK.PM22-...	2.1-542	BDWPM22-...	2.3-543
BVPPM22-...	2.3-530/529	BDBPM22-...	2.3-545 / 547
BVVP22-...	2.3-531	BDPPM22-.../ME	2.3-561
BVIPM22-...	2.3-532 / 528		

**Cartridge cavity ISO 7789-22-04-0-98**

**3-way-cavity for  
general function  
(without pressure relief)**

(Drawing-no. 2-633.4)



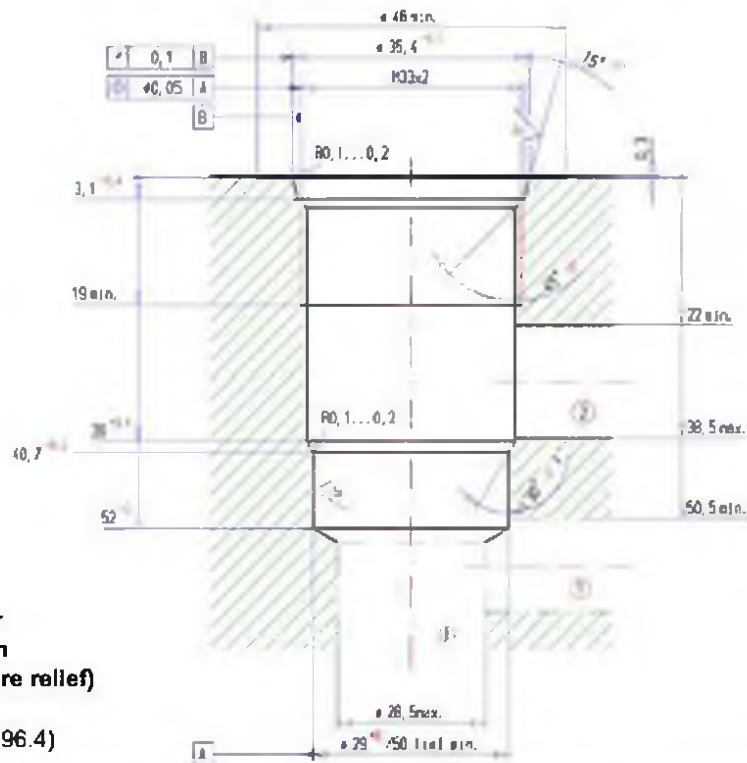
Edges according to ISO 13715 	Surface texture 	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	Extract general tolerances ISO-2768-1															
		General tolerances ISO 2768	<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120														
Linear dim.	±0.1	±0.1	±0.2	±0.3														
Radiuses, chamfer height	±0.2	±0.5	±1															

**Cavity tools**

Denomination:	Article number:	Content:	Article number:
Ecoline 3-way M22 x 1,5	983.0810	Form drill Form reamer	
Tool kit 3-way M22 x 1,5	983.0802	Form drill Form reamer Tap	983.0102 983.0202 983.0601

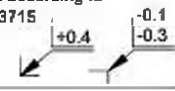
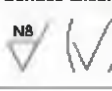
**Application**

Cartridge type:	Data sheet number:	Cartridge type:	Data sheet number:
SDSPM22-FG-...	1.11-2061, 2061S	MVBPM22-...	2.3-635
SDYPM22-FG-...	1.11-2064, 2064S	MQPPM22-...	2.3-641
SLYPM22-FG-...	1.11-2066, 2066S	MQPPM22-.../ME	2.3-643
MV.PM22-...	2.2-530, 530S	MQBPM22-...	2.3-644
MVEPM22-...	2.2-536	QD.PM22-...	2.5-540
MPPPM22-...	2.3-625	QDPPM22-...	2.6-644
MPBPM22-...	2.3-627	QDPPM22-.../ME	2.6-647
MVPPM22-...	2.3-629	QDBPM22-...	2.6-648
MVPPM22-.../ME	2.3-632		

**Cartridge cavity ISO 7789-33-01-0-98**


**2-way-cavity for  
general function  
(without pressure relief)**

(Drawing-no. 3-396.4)

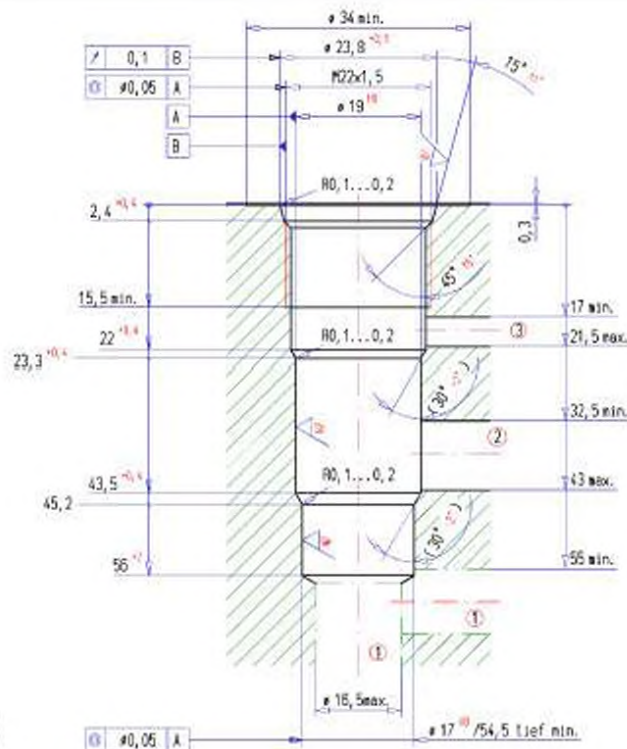
Edges according to ISO 13715 	Surface texture NB 	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405 ©	General tolerances ISO 2768	Extract general tolerances ISO-2768-1
				Nominal dim. >0.5-3 >3-6 >6-30 >30-120
				Linear dim. ±0.1 ±0.1 ±0.2 ±0.3
				Radiuses, chamfer height ±0.2 ±0.5 ±1

**Cavity tools**

Denomination:	Article number:	Content:	Article number:
Ecoline 2-way M33 x 2	983.0811	Form drill Form reamer	
Tool kit 2-way M33 x 2	983.0803	Form drill Form reamer Tap	983.0103 983.0203 983.0602

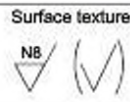
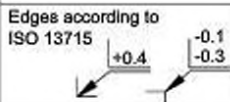
**Application**

Cartridge type:	Data sheet number:	Cartridge type:	Data sheet number:
SVSPM33-...	1.11-2075 / 2076	DNPPM33-.../ME	2.6-561
SVYPM33-...	1.11-2078/2079 / 2085	QNPPM33-...	2.6-650/651
DNIPM33-...	2.4-552	QNBPM33-...	2.6-655
QZ.PM33-...	2.5-550	QNPPM33-.../ME	2.6-659
DNPPM33-...	2.6-550/551	QNVPM33-...	2.6-660
DNVPM33-...	2.6-560	QSPPM33-...	2.6-661

**Cartridge cavity ISO 7789-22-06-0-98**


**2-way-cavity with  
pilot port for  
general function**

(Drawing-no. 3-387.4)



Length dimensions, curves, chamfers  
Angles  
Straightness, flatness  
Perpendicularity, symmetry  
Radial runout, axial runout  
Envelope condition acc. to ISO 14405 ©

Extract general tolerances ISO-2768-1				
Nominal dim.	>0,5-3	>3-6	>6-30	>30-120
Linear dim.	±0.1	±0.1	±0.2	±0.3
Radiuses, chamfer height	±0.2	±0.5	±1	

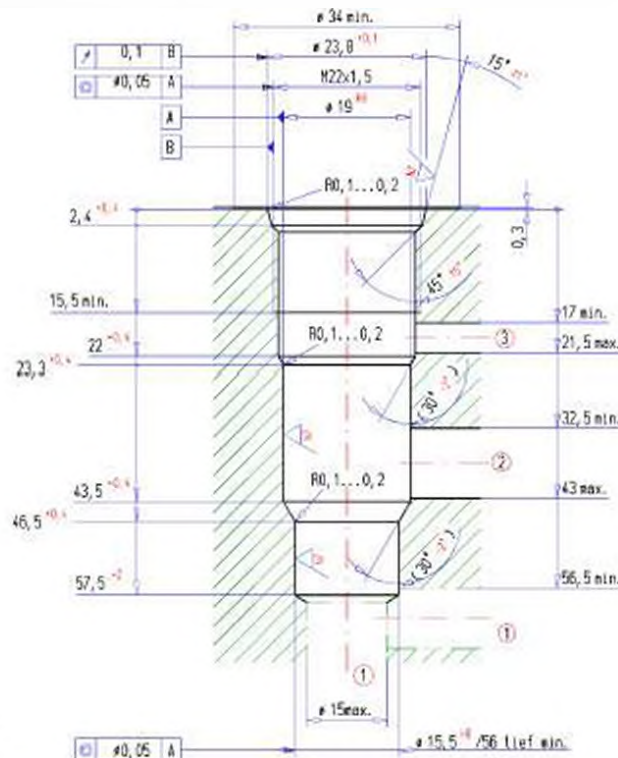
**Cavity tools**

Denomination:	Article number:	Content:	Article number:
Ecoline 2-way M22 x 1,5	983.0812	Form drill Form reamer	
Tool kit 2-way M22 x 1,5	983.0801	Form drill Form reamer Tap	983.0101 983.0201 983.0601

**Application**

Cartridge type:	Data sheet number:	Cartridge type:	Data sheet number:
FV.PM22-...	2.1-546		
US.PM22-...	2.1-548		
U.FPM22-...	2.5-630		

**Cartridge cavity ISO 7789-22-07-0-98**



**2-way-cavity with pilot port for pressure relief**

(Drawing-no. 3-397.4)

Edges according to ISO 13715 	Surface texture NB	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	General tolerances ISO 2768	Extract general tolerances ISO-2768-1															
				<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120															
Linear dim.	±0.1	±0.1	±0.2	±0.3															
Radiuses, chamfer height	±0.2	±0.5	±1																

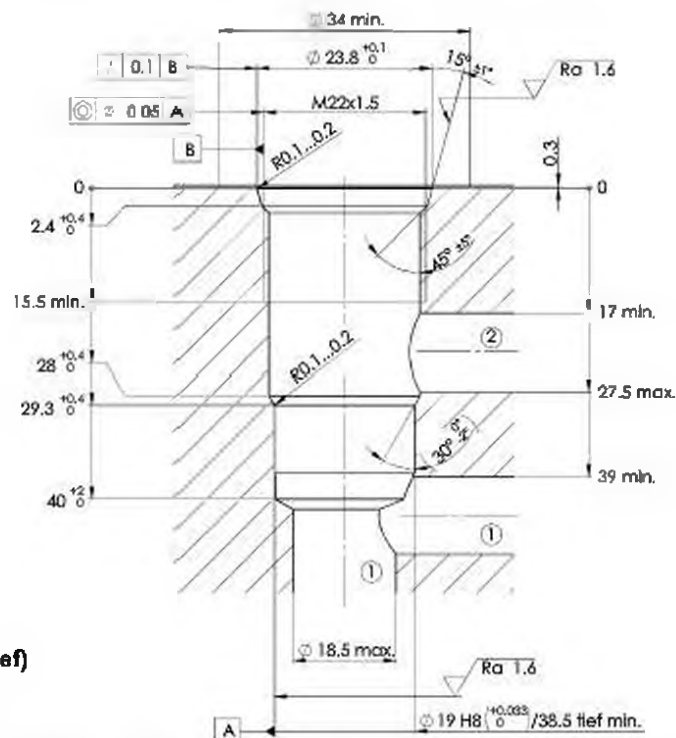
**Cavity tools**

<b>Denomination:</b> Ecoline 2-way M22 x 1,5	<b>Article number:</b> 983.4805	<b>Content:</b> Form drill Form reamer	<b>Article number:</b>
<b>Denomination:</b> Tool kit 2-way M22 x 1,5	<b>Article number:</b> 983.4802	<b>Content:</b> Form drill Form reamer Tap	<b>Article number:</b> 983.4102 983.4202 983.0601

**Application**

<b>Cartridge type:</b> BV.PM22-...-Z9	<b>Data sheet number:</b> 2.1-534	<b>Cartridge type:</b>	<b>Data sheet number:</b>
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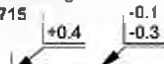


**Cartridge cavity ISO 7789-22-01-0-98**


**2-way-cavity for  
general function  
(without pressure relief)**

(Drawing-no. 3-395.4)

Edges according to  
ISO 13715



Surface texture



Length dimensions, curves, chamfers  
Angles  
Straightness, flatness  
Perpendicularity, symmetry  
Radial runout, axial runout  
Envelope condition acc. to ISO 14405

Extract general tolerances ISO-2768-1

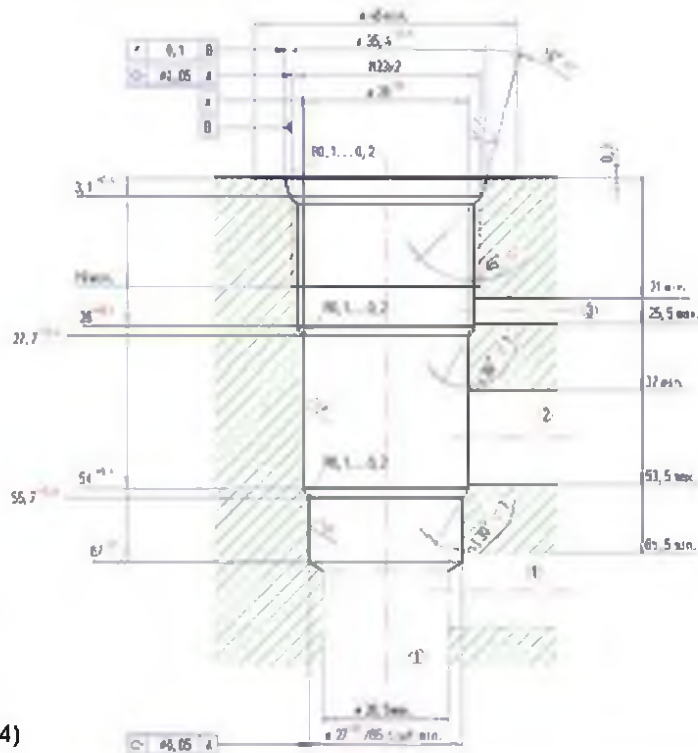
Nominal dim	>0.5-3	>3-6	>6-30	>30-120
Linear dim.	±0.1	±0.1	±0.2	±0.3
Radiuses, chamfer height	±0.2	±0.5	±1	

**Cavity tools**

Denomination:	Article number:	Content:	Article number:
2-way M22 x 1,5	983.0804	Form drill	983.0104
		Form reamer	983.0204
		Tap	983.0601

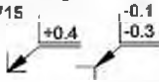

**Application**

Cartridge type:	Data sheet number:	Cartridge type:	Data sheet number:
SDSPM22-BA/AB-...	1.11-2060	QZ PM22-...	2.5-535
SDSPM22-BA/AB-...	1.11-2061	D.PPM22-...	2.6-531
SDYPM22-BA/AB-...	1.11-2064	D.BPM22-...	2.6-535
SVSPM22-BC/CB-...	1.11-2082	DNPPM22-./ME	2.6-541
SVYPM22-...	1.11-2084	QNPPM22-...	2.6-631
MS PM22	2.2-532	QNPPM22-./ME	2.6-633
DNIPM22-...	2.4-532	QNBPM22-...	2.6-634
QRSPM22-...	2.5-530		

**Cartridge cavity ISO 7789-33-06-0-98**


**2-way-cavity with  
pilot port for  
general function**

(Drawing-no. 3-385.4)

Edges according to ISO 13715 	Surface texture Ra 0.1 	General tolerances ISO 2768 Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	Extract general tolerances ISO-2768-1															
			<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120														
Linear dim.	±0.1	±0.1	±0.2	±0.3														
Radiuses, chamfer height	±0.2	±0.5	±1															

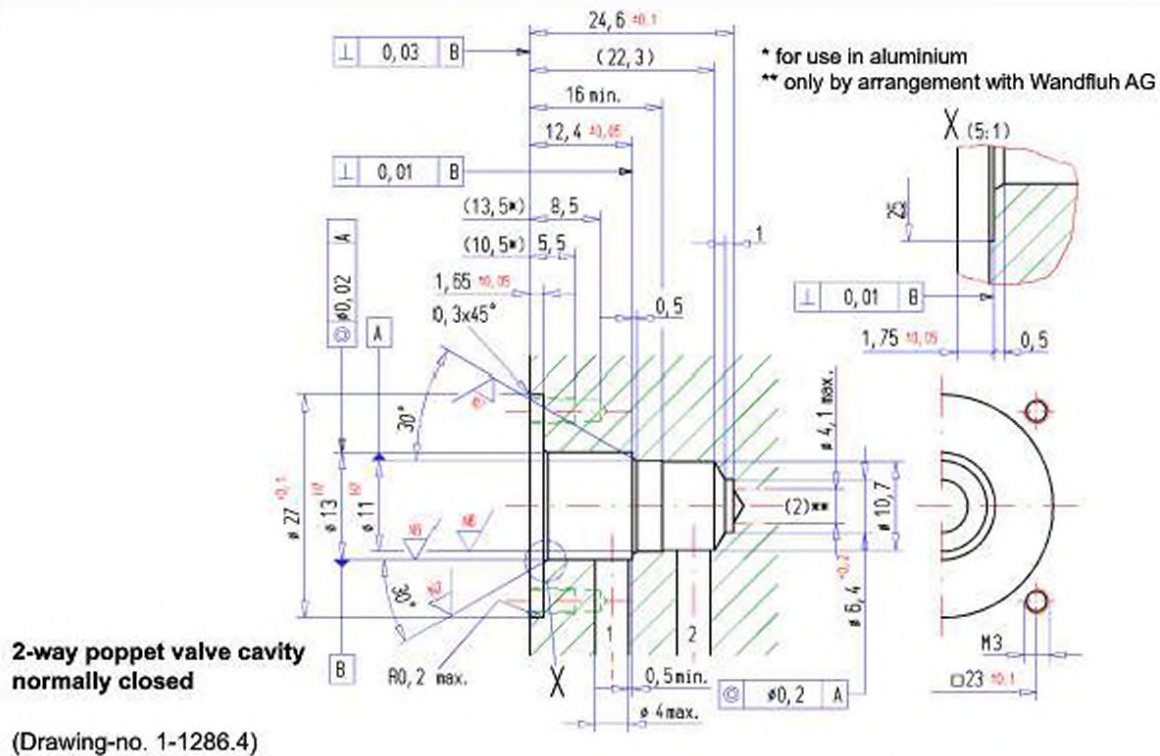
**Cavity tools**

<b>Denomination:</b> Ecoline 2-way M33 x 2	<b>Article number:</b> 983.0814	<b>Content:</b> Form drill Form reamer	<b>Article number:</b>
<b>Tool kit 2-way M33 x 2</b>	<b>983.0806</b>	<b>Form drill Form reamer Tap</b>	<b>983.0106 983.0206 983.0602</b>

**Application**

<b>Cartridge type:</b> U.FPM33-... RNXP33-...	<b>Data sheet number:</b> 2.5-650 2.7-62	<b>Cartridge type:</b>	<b>Data sheet number:</b>
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**Cavity for poppet valve cartridge NG3**



Edges according to ISO 13715 +0.4 -0.1 -0.3	Surface texture N8	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	General tolerances ISO 2768	Extract general tolerances ISO-2768-1
				Nominal dim. >0.5-3 >3-6 >6-30 >30-120
				Linear dim. ±0.1 ±0.1 ±0.2 ±0.3
				Radiuses, chamfer height ±0.2 ±0.5 ±1

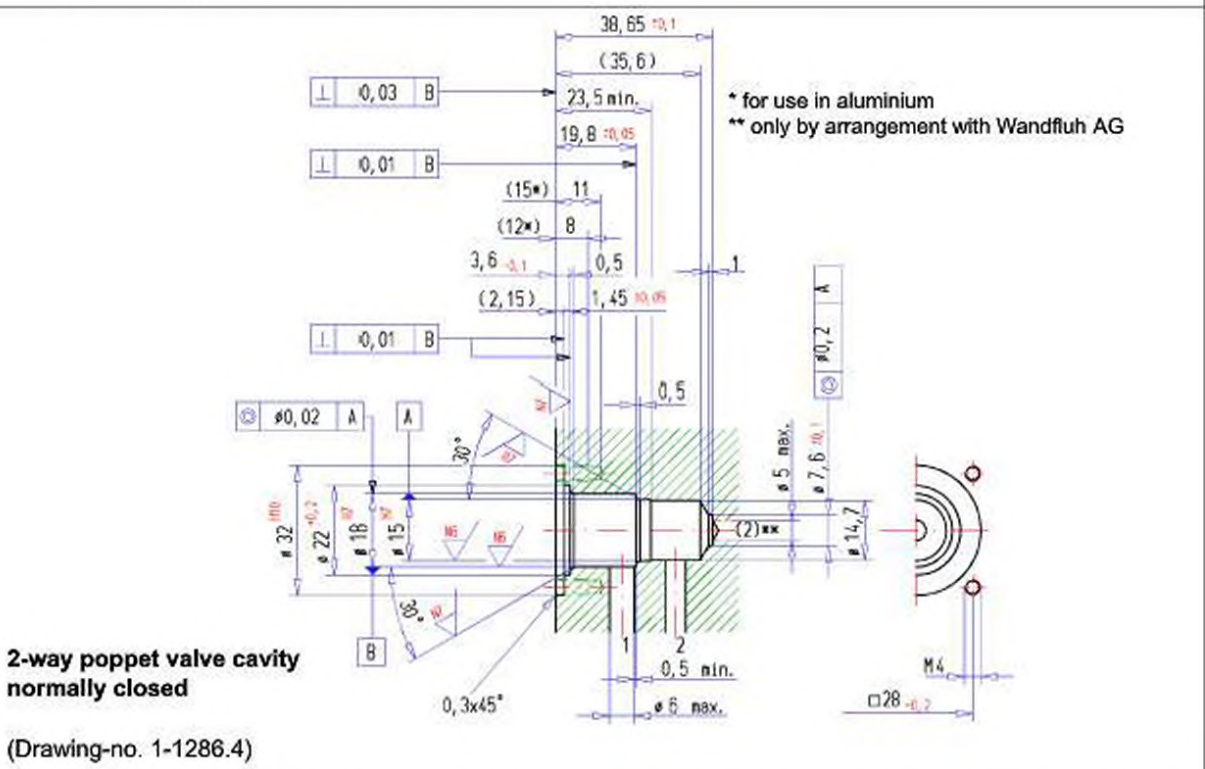
**Cavity tools**

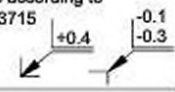
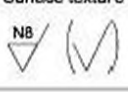
<b>Denomination:</b> Tool kit 2-way	<b>Article number:</b> 983.2806	<b>Content:</b> Form drill Form reamer	<b>Article number:</b> 983.2101 983.2201
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**Application**

<b>Cartridge type:</b> .2203-...	<b>Data sheet number:</b> 1.11-2010	<b>Cartridge type:</b>	<b>Data sheet number:</b>
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**Cavity for poppet valve cartridge NG4**


Edges according to ISO 13715 	Surface texture 	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405®	m m H H H	Extract general tolerances ISO-2768-1
		General tolerances ISO 2768		Nominal dim. >0.5-3 >3-6 >6-30 >30-120 Linear dim. ±0.1 ±0.1 ±0.2 ±0.3 Radiuses, chamfer height ±0.2 ±0.5 ±1

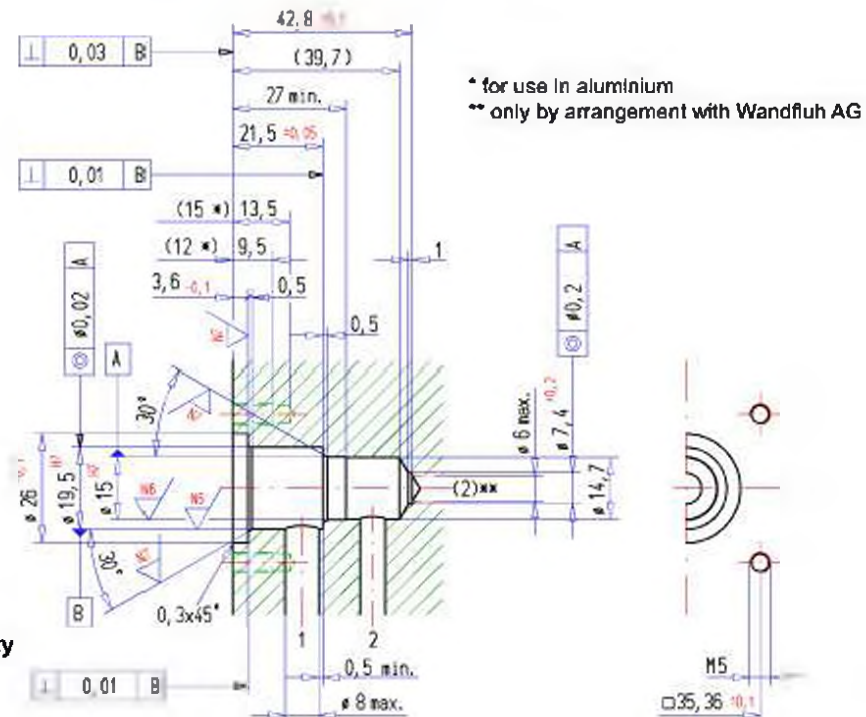
**Cavity tools**

<b>Denomination:</b> Tool kit 2-way	<b>Article number:</b> 983.2807	<b>Content:</b> Form drill Form reamer	<b>Article number:</b> 983.2100 983.2200
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**Application**

<b>Cartridge type:</b> .2204-...	<b>Data sheet number:</b> 1.11-2020	<b>Cartridge type:</b>	<b>Data sheet number:</b>
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**Cavity for poppet valve cartridge NG6**



**2-way poppet valve cavity normally closed**

(Drawing-no. 1-852.4)

Edges according to ISO 13715	+0.4 -0.1 -0.3
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Surface texture	N8
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Length dimensions, curves, chamfers  
Angles  
Straightness, flatness  
Perpendicularity, symmetry  
Radial runout, axial runout  
Envelope condition acc. to ISO 14405

Extract general tolerances ISO-2768-1			
m	Nominal dim.	>0.5-3	>3-6
H	Linear dim.	±0.1	±0.1
H	Radiuses, chamfer height	±0.2	±0.5

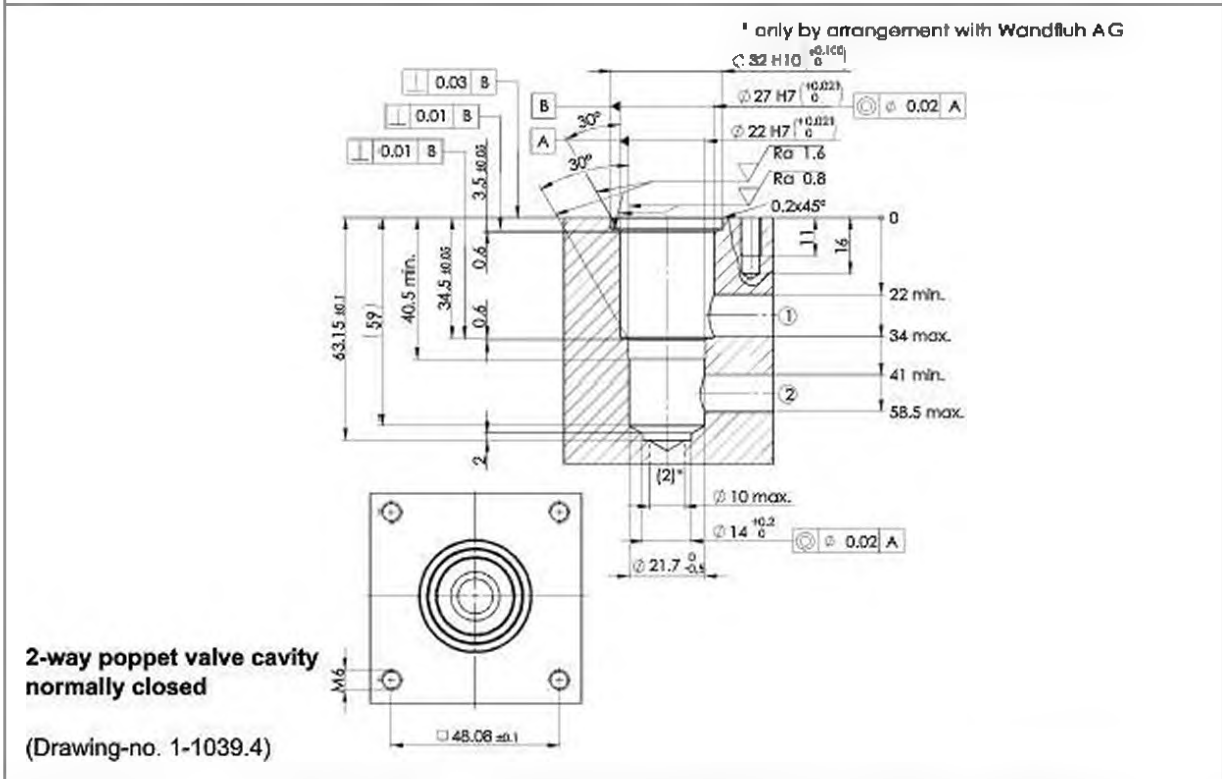
**Cavity tools**

<b>Denomination:</b>	<b>Article number:</b>	<b>Content:</b>	<b>Article number:</b>
Tool kit 2-way	983.2802	Form drill Form reamer	983.2102 983.2202

**Application**

<b>Cartridge type:</b>	<b>Data sheet number:</b>	<b>Cartridge type:</b>	<b>Data sheet number:</b>
.2206-...	1.11-2030		

**Cavity for poppet valve cartridge NG10**



Edges according to ISO 13715 	Surface texture N8 	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	General tolerances ISO 2768	Extract general tolerances ISO-2768-1
				Nominal dim. >0.5-3 >3-6 >6-30 >30-120
				Linear dim. ±0.1 ±0.1 ±0.2 ±0.3
				Radiuses, chamfer height ±0.2 ±0.5 ±1

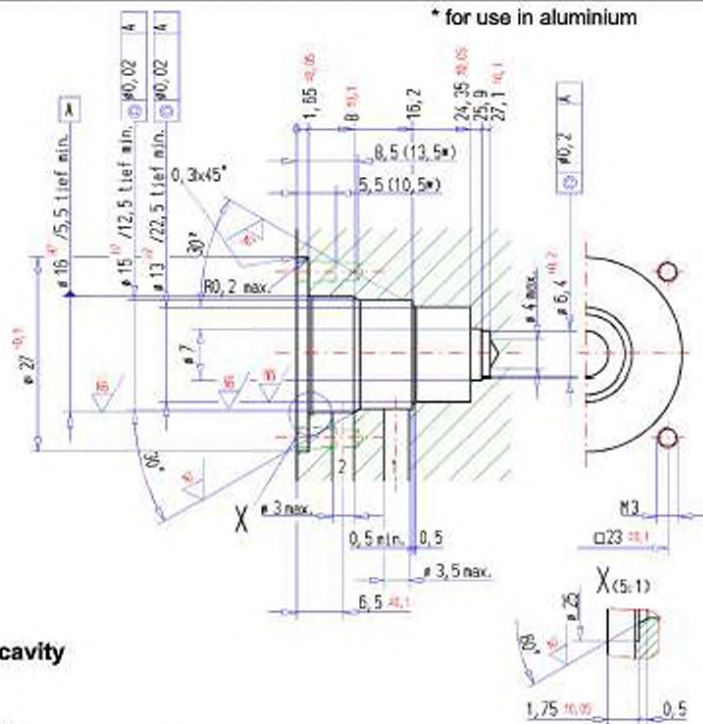
**Cavity tools**

<b>Denomination:</b> Tool kit 2-way	<b>Article number:</b> 983.2803	<b>Content:</b> Form drill Form reamer	<b>Article number:</b> 983.2103 983.2203
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**Application**

<b>Cartridge type:</b> .2210-...	<b>Data sheet number:</b> 1.11-2040	<b>Cartridge type:</b>	<b>Data sheet number:</b>
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**Cavity for poppet valve cartridge NG3**



**2-way poppet valve cavity normally open**

(Drawing-no. 1-1293.4)

Edges according to ISO 13715 	Surface texture NB	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405 ©	General tolerances ISO 2768 m H H H	Extract general tolerances ISO-2768-1 Nominal dim. >0,5-3 >3-6 >6-30 >30-120 Linear dim. $\pm 0,1$ $\pm 0,1$ $\pm 0,2$ $\pm 0,3$ Radiuses, chamfer height $\pm 0,2$ $\pm 0,5$ $\pm 1$
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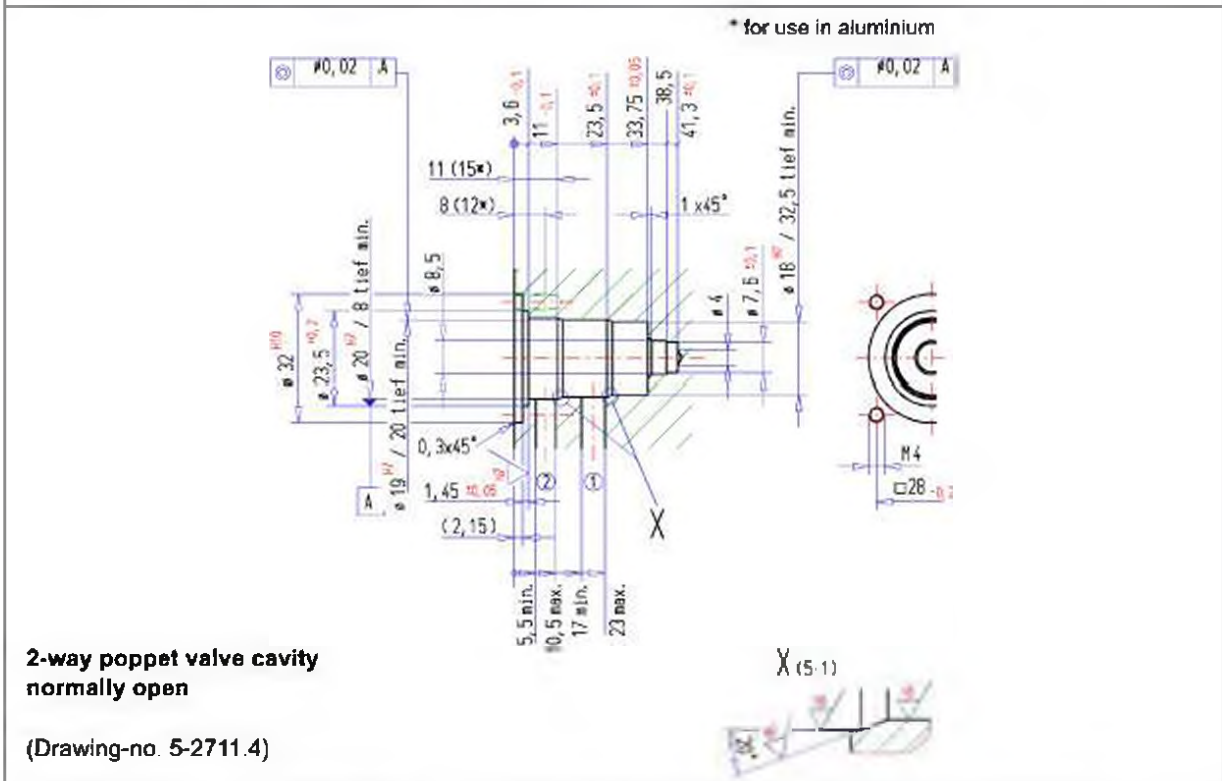
**Cavity tools**

<b>Denomination:</b>	<b>Article number:</b>
Form drill	983.2107
Form reamer	983.2207
<b>Form tool set</b>	983.2805
consisting of; form drill and form reamer	

**Application**

<b>Cartridge type:</b>	<b>Data sheet number:</b>	<b>Cartridge type:</b>	<b>Data sheet number:</b>
.22030-S1265-...	1.11-2015		

**Cavity for poppet valve cartridge NG4**



Edges according to ISO 13715 	Surface texture Ra 0.8 	General tolerances ISO 2768 Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	Extract general tolerances ISO-2768-1															
			<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120														
Linear dim.	±0.1	±0.1	±0.2	±0.3														
Radiuses, chamfer height	±0.2	±0.5	±1															

**Cavity tools**

<b>Denomination:</b>	<b>Article number:</b>
Form drill	983.2104
Form reamer	983.2204
<b>Form tool set</b>	983.2800
consisting of; form drill and form reamer	

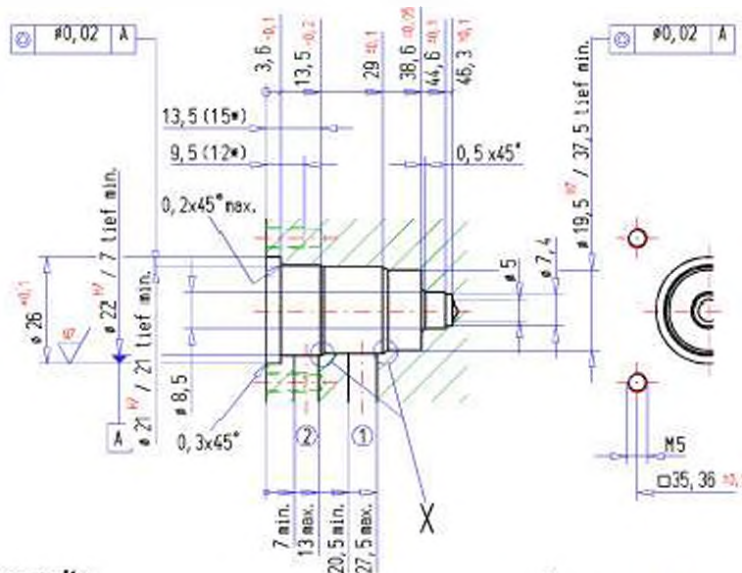
**Application**

<b>Cartridge type:</b>	<b>Data sheet number:</b>	<b>Cartridge type:</b>	<b>Data sheet number:</b>
.22040-S1265-...	1.11-2025		

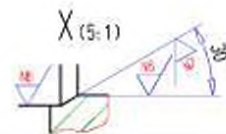


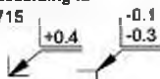
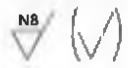
**Cavity for poppet valve cartridge NG6**

\* for use in aluminium


**2-way poppet valve cavity  
normally open**

(Drawing-no. 5-2843.4)



Edges according to ISO 13715 	Surface texture NB 	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	Extract general tolerances ISO-2768-1																		
		General tolerances ISO 2768	<table border="1"> <tr> <td>m</td> <td>Nominal dim.</td> <td>&gt;0,5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>H</td> <td>Linear dim.</td> <td><math>\pm 0,1</math></td> <td><math>\pm 0,1</math></td> <td><math>\pm 0,2</math></td> <td><math>\pm 0,3</math></td> </tr> <tr> <td>H</td> <td>Radiuses, chamfer height</td> <td><math>\pm 0,2</math></td> <td><math>\pm 0,5</math></td> <td colspan="2"><math>\pm 1</math></td> </tr> </table>	m	Nominal dim.	>0,5-3	>3-6	>6-30	>30-120	H	Linear dim.	$\pm 0,1$	$\pm 0,1$	$\pm 0,2$	$\pm 0,3$	H	Radiuses, chamfer height	$\pm 0,2$	$\pm 0,5$	$\pm 1$	
m	Nominal dim.	>0,5-3	>3-6	>6-30	>30-120																
H	Linear dim.	$\pm 0,1$	$\pm 0,1$	$\pm 0,2$	$\pm 0,3$																
H	Radiuses, chamfer height	$\pm 0,2$	$\pm 0,5$	$\pm 1$																	

**Cavity tools**
**Denomination:**

Form drill

Form reamer

**Article number:**

983.2106

983.2206

**Form tool set**

consisting of; form drill and form reamer

983.2804

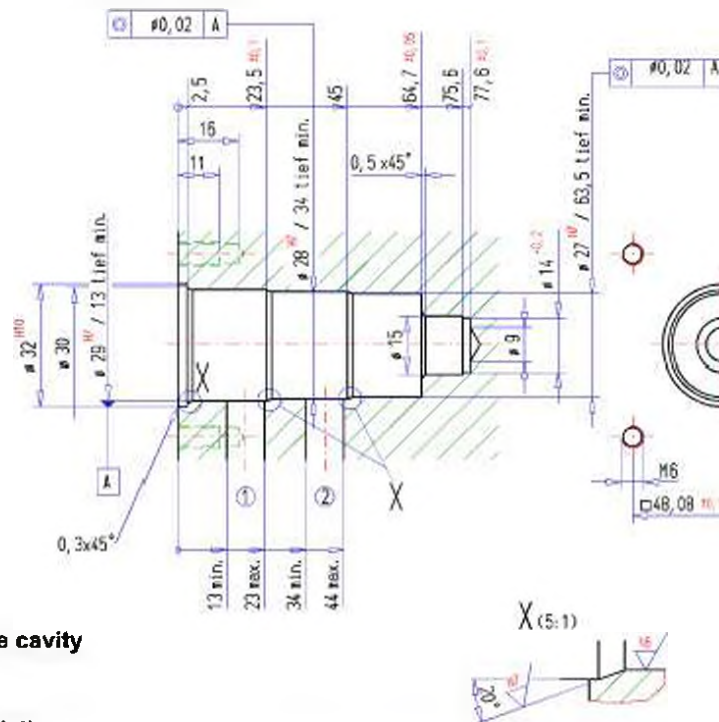
**Application**
**Cartridge type:**

.22060-S1265-...

**Data sheet number:**

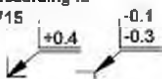

1.11-2035

**Cartridge type:**
**Data sheet number:**

**Cavity for poppet valve cartridge NG10**


**2-way poppet valve cavity  
normally open**

(Drawing-no. 5-2754.4)

Edges according to ISO 13715 	Surface texture Ra 0.3 	General tolerances ISO 2768 Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	Extract general tolerances ISO-2768-1															
			<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120														
Linear dim.	±0.1	±0.1	±0.2	±0.3														
Radiuses, chamfer height	±0.2	±0.5	±1															

**Cavity tools**

**Denomination:**

Form drill  
Form reamer

**Article number:**

983.2105  
983.2205

**Form tool set**

consisting of; form drill and form reamer

983.2801

**Application**

**Cartridge type:**

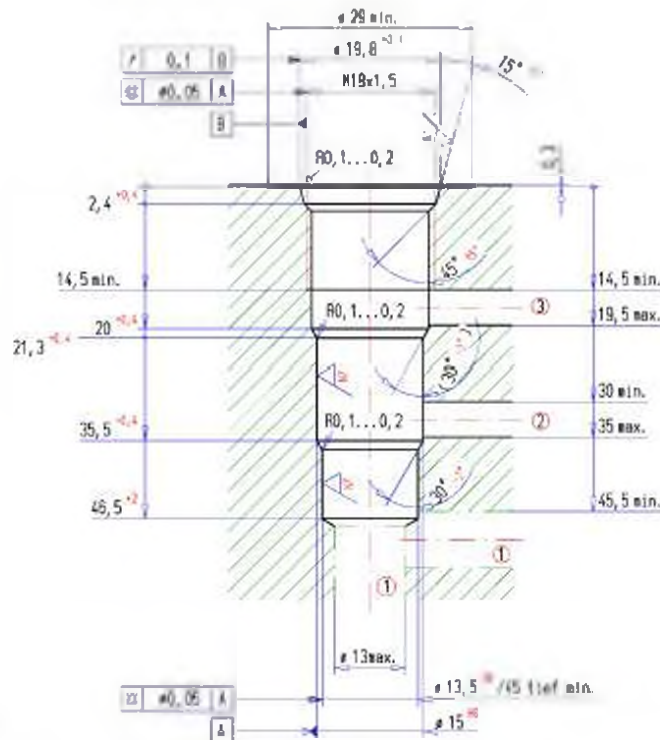
.22100-S1265-...

**Data sheet number:**

1.11-2045

**Cartridge type:**

**Data sheet number:**

**Cartridge cavity Wandfluh standard**

**3-way-cavity**

(Drawing-no. 3-399.4)

Edges according to ISO 13715 +0.4 / -0.1 -0.3	Surface texture NB	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	m Extract general tolerances ISO-2768-1															
		General tolerances ISO 2768	<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Raduaee, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Raduaee, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120														
Linear dim.	±0.1	±0.1	±0.2	±0.3														
Raduaee, chamfer height	±0.2	±0.5	±1															

**Cavity tools**

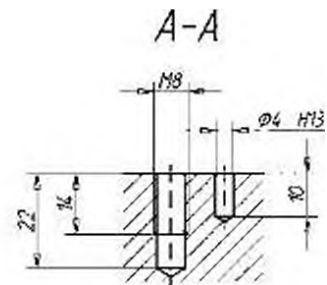
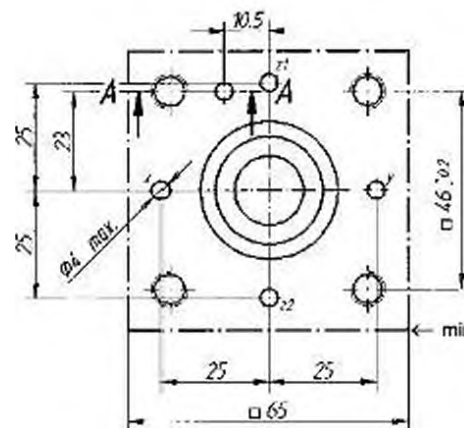
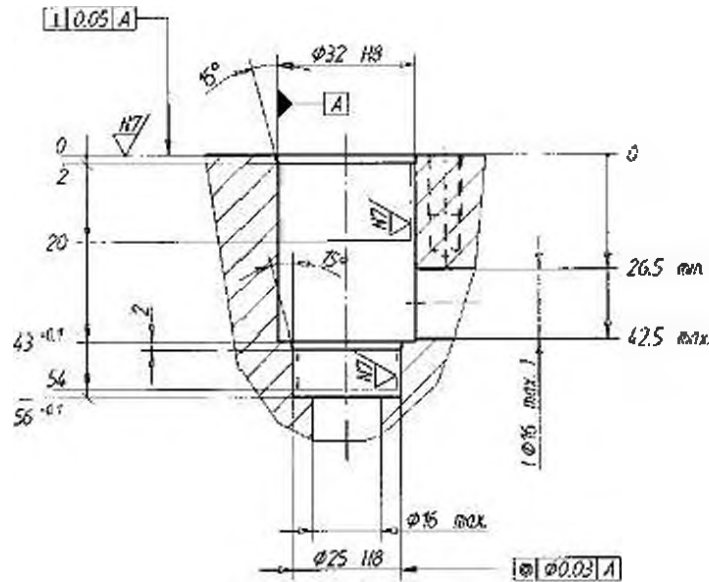
Denomination:	Article number:	Content:	Article number:
Ecoline 3-way M18 x 1,5	983.0816	Form drill Form reamer	
Tool kit 3-way M18 x 1,5	983.0805	Form drill Form reamer Tap	983.0105 983.0205 983.0600

**Application**

Cartridge type:	Data sheet number:	Cartridge type:	Data sheet number:
SDSPM18-FG	1.11-2051		
MV.PM18-...	2.2-510		
MVPPM18-...	2.3-610		



**Cartridge cavity CS16, CM16, CD16**



(Drawing no. 8-001.4)

**Application**

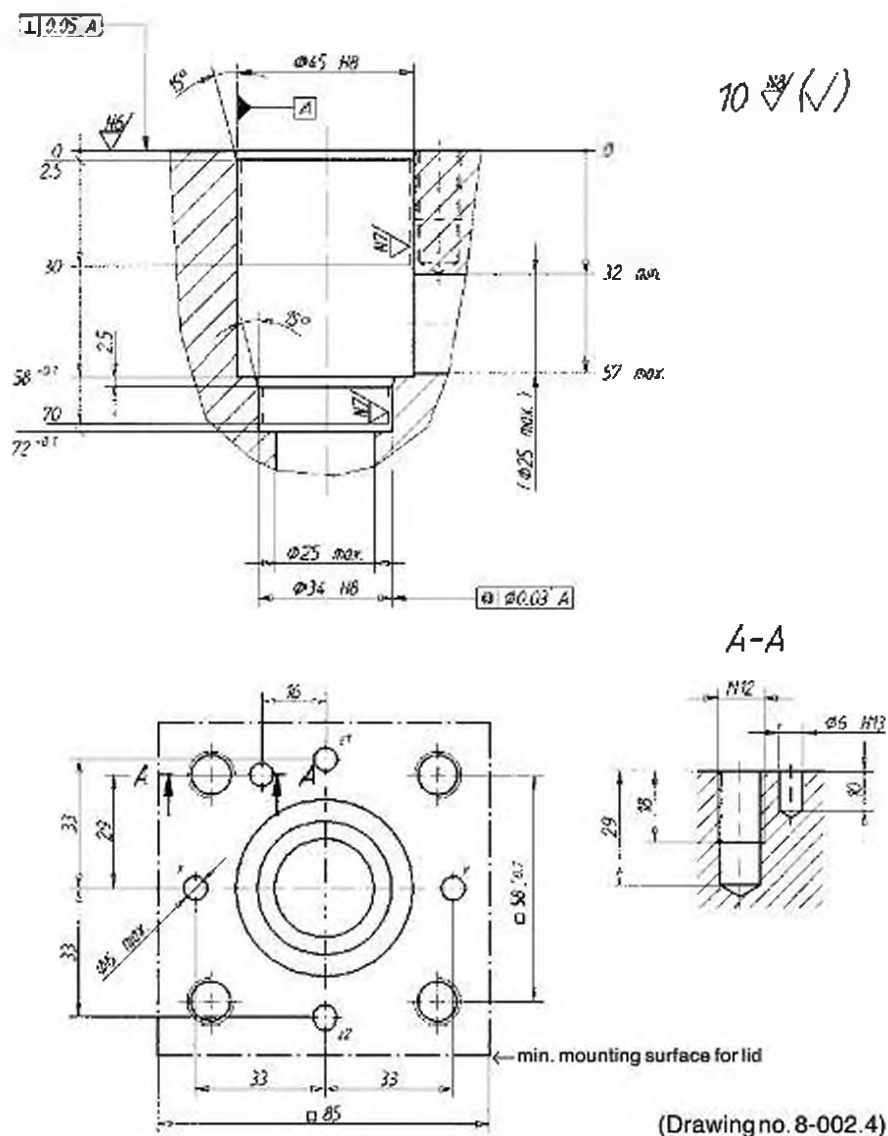
**Cartridge type:**  
C.16-...

**Data sheet number:**  
1.12-210

**Cartridge type:**

**Data sheet number:**

**Cartridge cavity CS25, CM25, CD25**



**Application**

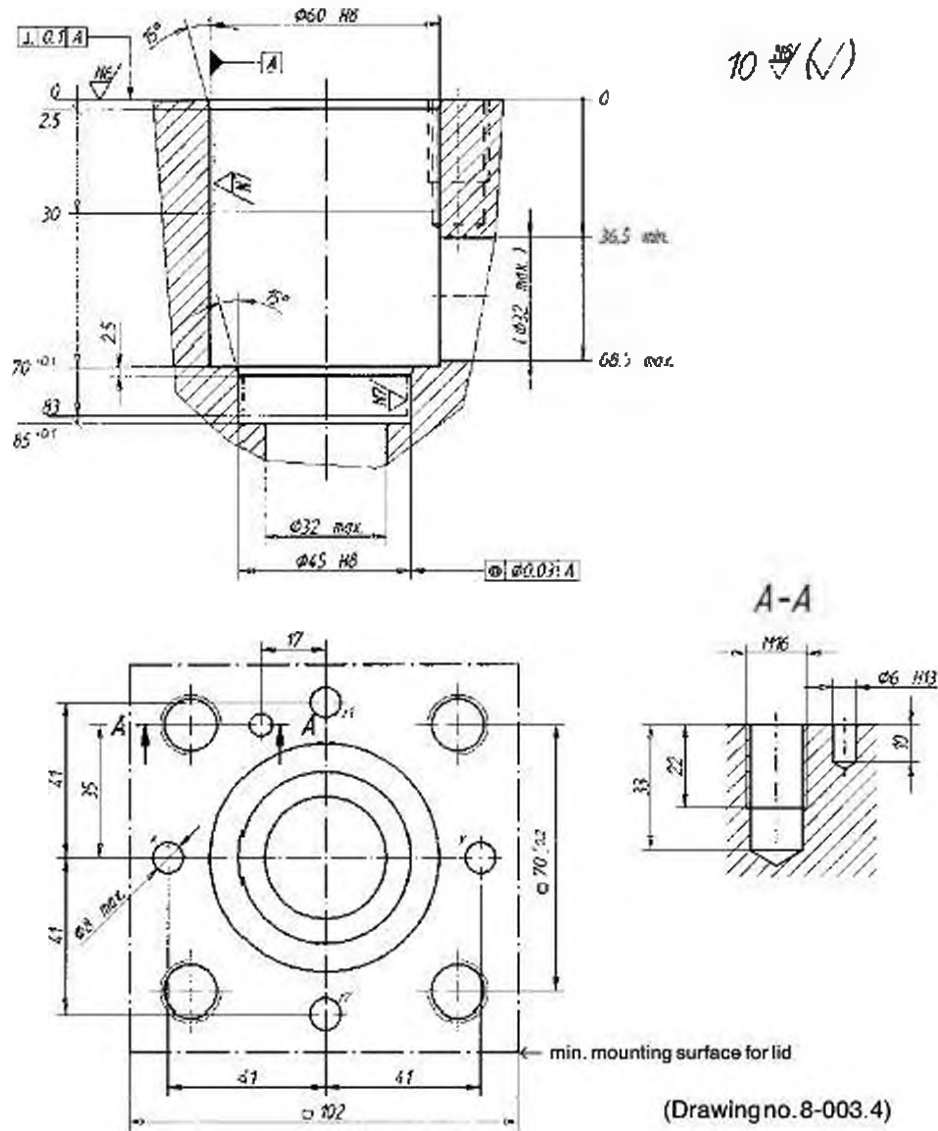
Cartridge type:  
C.25-...

Data sheet number:  
1.12-220

Cartridge type:

Data sheet number:

**Cartridge cavity CS32, CM32, CD32**



**Application**

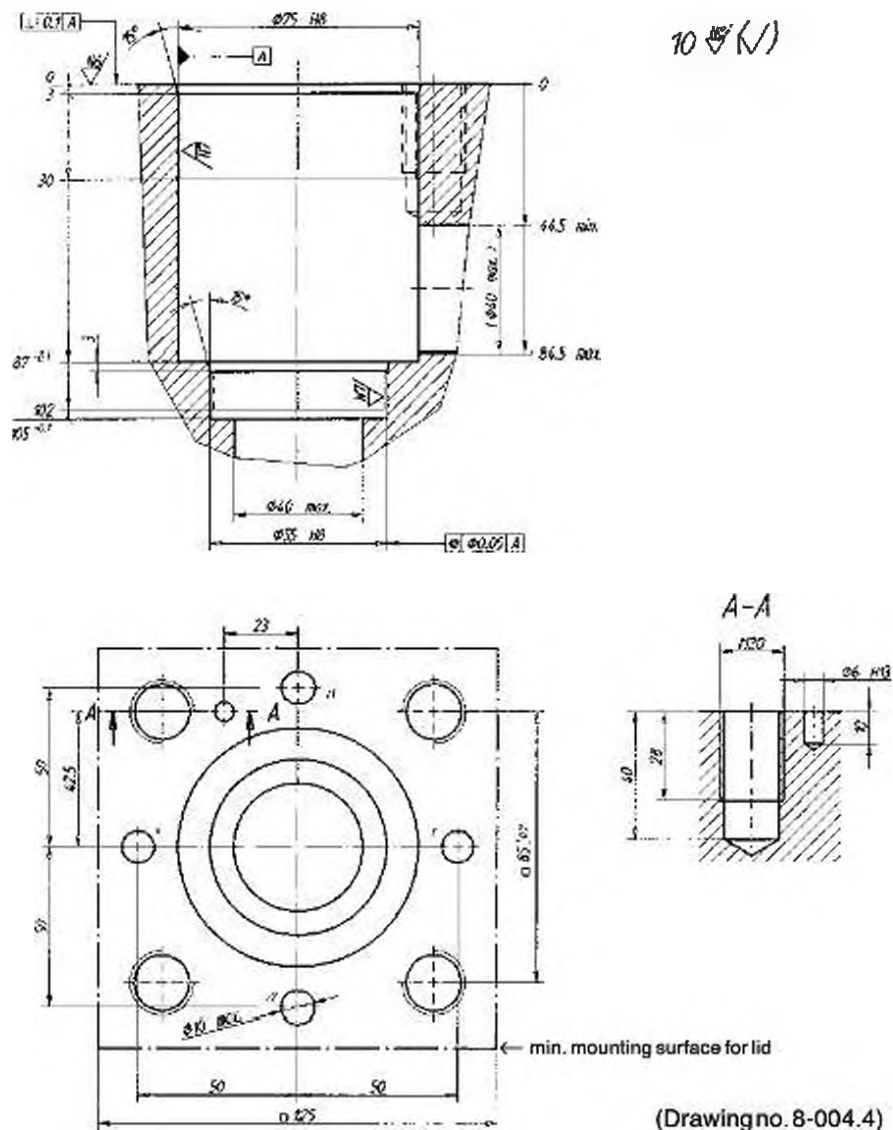
Cartridge type:  
C.32-...

Data sheet number:  
1.12-230

Cartridge type:

Data sheet number:

**Cartridge cavity CS40, CM40, CD40**



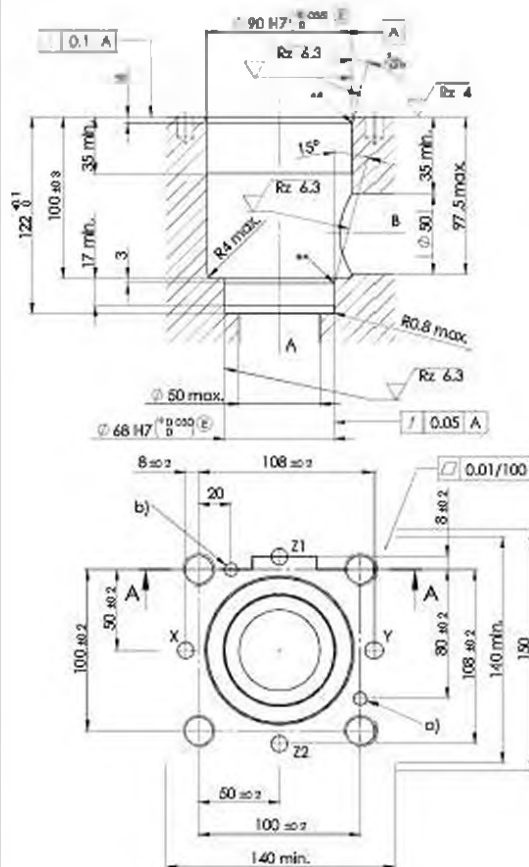
**Application**



Cartridge type:  
C.40-...

Data sheet number:  
1.12-240

Cartridge type:

Data sheet number:

**Cavity 2-way built-in valve C.EN50**


 min. support surface for cover  
 min. distance for cover with min. two slip in cartridge valves

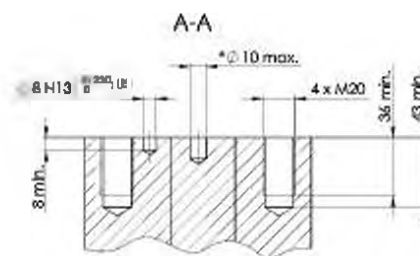
\* Control lines X, Y, Z1 and Z2 (Ø 10 max.) are drilled only when required

\*\* Rounded burr-free

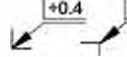

a) Hole for fixing pin main pressure limitation

b) Hole for fixing pin other functions

Further information can be found in standard ISO 7368:2016



(Drawing-no. 8-005.3)

Edges according to ISO 13715  +0.4 / -0.1 / -0.3	Surface texture  Ra 3.2	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405®	General tolerances ISO 2768 n H H H	Extract general tolerances ISO-2768-1															
				<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-8</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-8	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-8	>6-30	>30-120															
Linear dim.	±0.1	±0.1	±0.2	±0.3															
Radiuses, chamfer height	±0.2	±0.5	±1																

**Cavity tools**
**Denomination:**
**Article number:**
**Dismounting tool**
**DW-C.E.50**  
**DW-C.50**
**983.3011**  
**983.3021**
**Application**
**Cartridge type:**

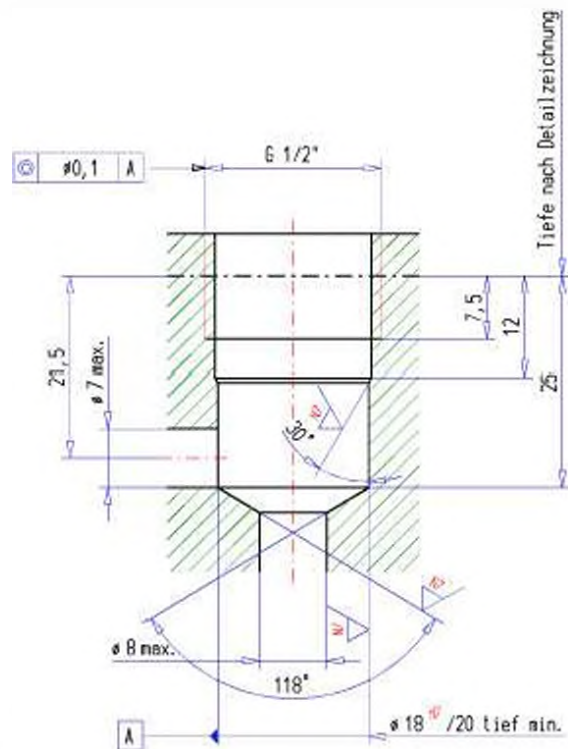
C.EN50-...

**Data sheet number:**

1.12-255

**Cartridge type:**
**Data sheet number:**

**Cartridge cavity**



**3-way-cavity**

(Drawing-no. 1-1301.4)

Edges according to ISO 13715 +0.4 / -0.1 -0.3	Surface texture N8	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405 ©	Extract general tolerances ISO-2768-1															
		General tolerances ISO 2768	<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0,5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0,5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0,5-3	>3-6	>6-30	>30-120														
Linear dim.	±0.1	±0.1	±0.2	±0.3														
Radiuses, chamfer height	±0.2	±0.5	±1															

**Cavity tools**

Denomination:

Article number:

Form tool set

**Application**

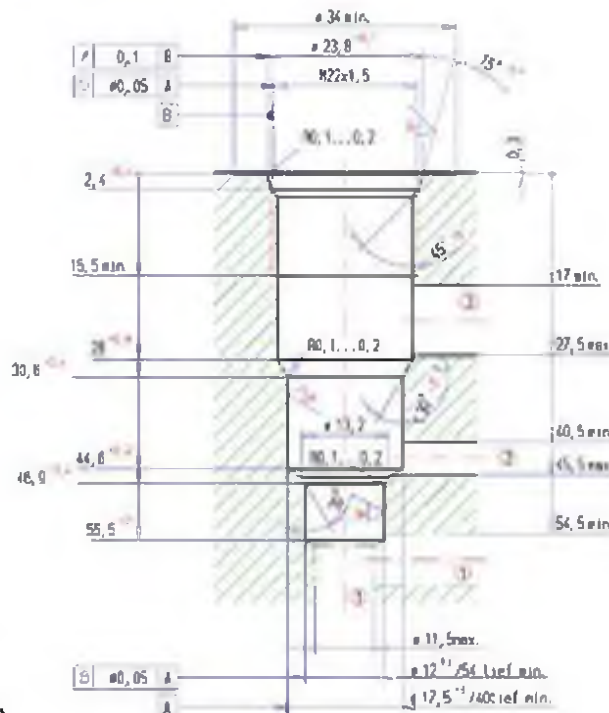
Cartridge type:  
DWW404-...

Data sheet number:  
2.7-180

Cartridge type:

Data sheet number:

**Cartridge cavity Wandfluh standard**



**2-way-cavity with pilot port**

(Drawing-no. 2-641.4)

Edges according to ISO 13715 	Surface texture Ra 0.1 	General tolerances ISO 2768 Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	Extract general tolerances ISO-2768-1															
			<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120														
Linear dim.	±0.1	±0.1	±0.2	±0.3														
Radiuses, chamfer height	±0.2	±0.5	±1															

**Cavity tools**

**Denomination:**

- Form drill
- Form reamer
- Tap

**Form tool set**

**Article number:**

**Application**

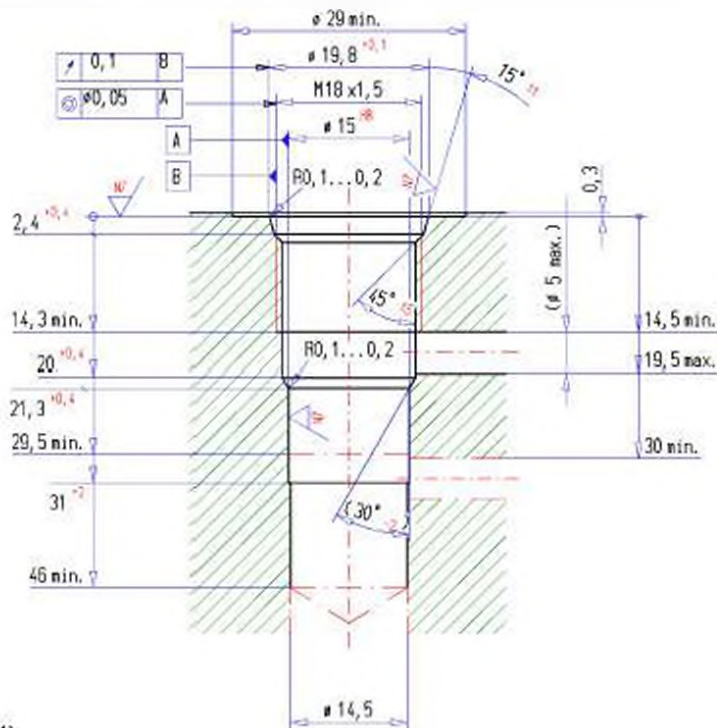
**Cartridge type:**  
BX / BY.PM22-...

**Data sheet number:**  
2.1-544

**Cartridge type:**

**Data sheet number:**

**Cartridge cavity Wandfluh standard**



**2-way-cavity**

(Drawing-no. 1-1311.4)

Edges according to ISO 13715 	Surface texture N8 	General tolerances ISO 2768 Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	Extract general tolerances ISO-2768-1															
			<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0,5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0,5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0,5-3	>3-6	>6-30	>30-120														
Linear dim.	±0.1	±0.1	±0.2	±0.3														
Radiuses, chamfer height	±0.2	±0.5	±1															

**Cavity tools**

**Denomination:**

Form drill

Form reamer

Tap

**Form tool set**

**Article number:**

**Application**

**Cartridge type:**

QZPPM18-...

**Data sheet number:**

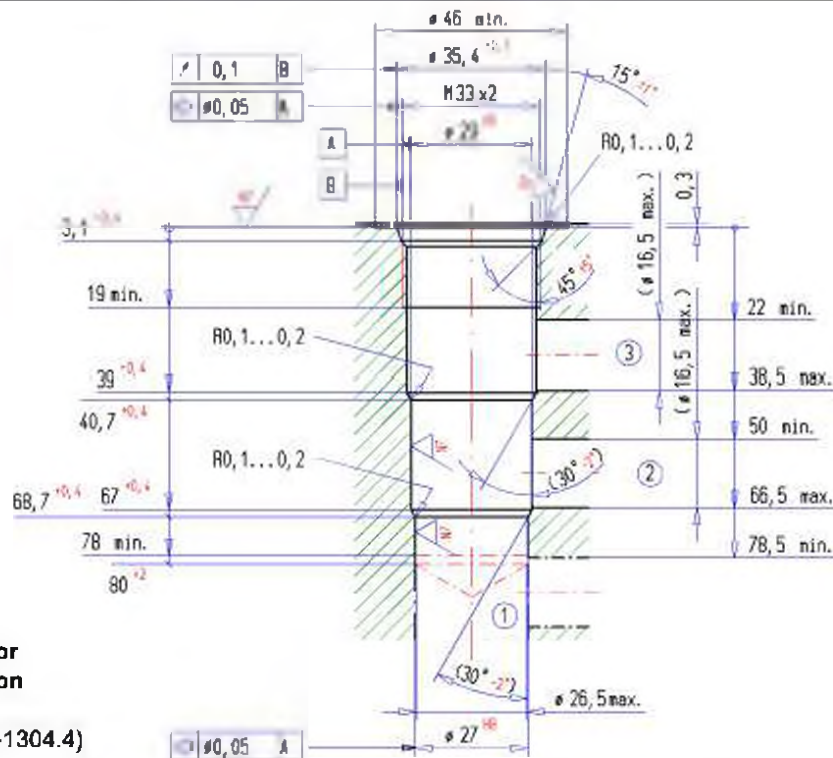
2.6-610

**Cartridge type:**

**Data sheet number:**



**Cartridge cavity ISO 7789-33-04-0-98**



**3-way-cavity for general function**

(Drawing-no. 1-1304.4)

Edges according to ISO 13715 	Surface texture N8 	General tolerances ISO 2768	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	Extract general tolerances ISO-2768-1															
				<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120															
Linear dim.	±0.1	±0.1	±0.2	±0.3															
Radiuses, chamfer height	±0.2	±0.5	±1																

**Cavity tools**

**Denomination:**

Form drill

Form reamer

Tap

**Form tool set**

consisting of; form drill, form reamer and tap

**Article number:**

983.0108

983.0208

983.0602

983.0808

**Application**

**Cartridge type:**

MVPPM33-...

MVVPM33-...

MVPPM33-.../ME

MVBPM33

QD PM33-...

**Data sheet number:**

2.3-649/650

2.3-651

2.3-652

2.3-654

2.5-555

**Cartridge type:**

QDPPM33-...

QDVPM33-...

QDPPM33-.../ME

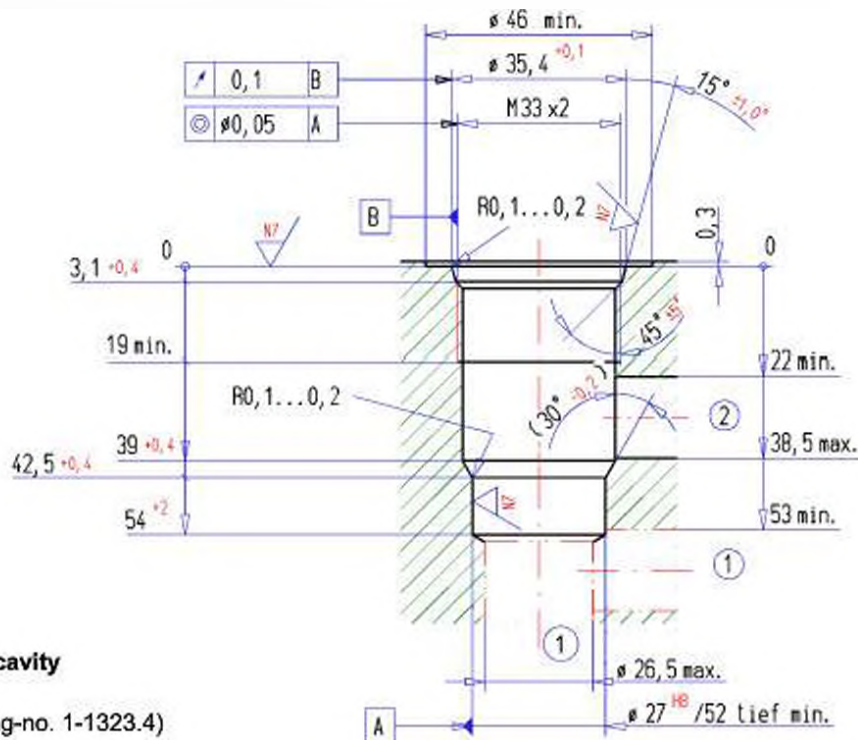
**Data sheet number:**

2.6-665/666

2.6-667

2.6-668

**Cartridge cavity ISO 7789-33-02-0-98**



**2-way-cavity**

(Drawing-no. 1-1323.4)

Edges according to ISO 13715 +0.4 -0.1 -0.3	Surface texture N8	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405 ©	General tolerances ISO 2768 m H H H	Extract general tolerances ISO-2768-1 Nominal dim. >0,5-3 >3-6 >6-30 >30-120 Linear dim. ±0.1 ±0.1 ±0.2 ±0.3 Radiuses, chamfer height ±0.2 ±0.5 ±1
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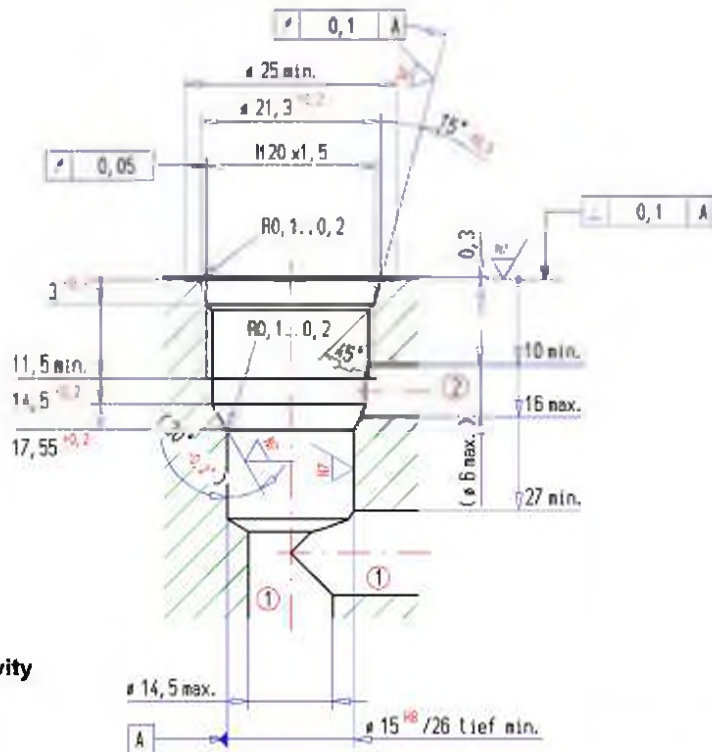
**Cavity tools**

<b>Denomination:</b>	<b>Article number:</b>
Form drill	983.0107
Form reamer	983.0207
Tap	983.0602
<b>Form tool set</b>	983.0807
consisting of; form drill, form reamer and tap	

**Application**

<b>Cartridge type:</b>	<b>Data sheet number:</b>	<b>Cartridge type:</b>	<b>Data sheet number:</b>
BV.PM33	2.1-550		
BVPPM33-...	2.3-551		
BVVPM33-...	2.3-552		
BVPPM33-...ME	2.3-553		

**Cartridge cavity Wandfluh standard**



**2-way poppet valve cavity**

(Drawing-no. 1-1353.4)

Edges according to ISO 13715 	Surface texture N8 	General tolerances ISO 2768 Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	Extract general tolerances ISO-2768-1															
			<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120														
Linear dim.	±0.1	±0.1	±0.2	±0.3														
Radiuses, chamfer height	±0.2	±0.5	±1															

**Cavity tools**

**Denomination:**

- Form drill
- Form reamer
- Tap

**Form tool set**

**Article number:**

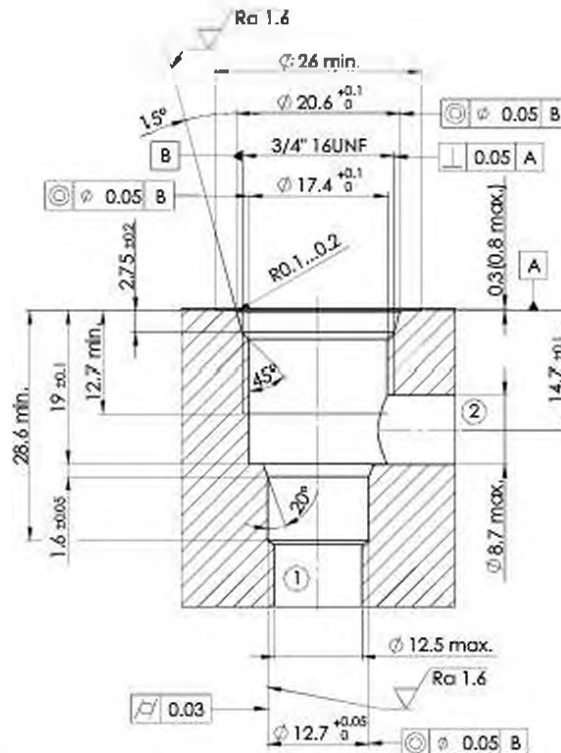
**Application**

**Cartridge type:**

**Data sheet number:**

**Cartridge type:**

**Data sheet number:**

**Cartridge cavity 3/4" - 16 UNF**


(Drawing-Nr. 1-1352.4)

Edges according to ISO 13715 +0.4 / -0.1 / -0.3	Surface texture Ra 3.2	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	Extract general tolerances ISO-2768-1															
		General tolerances ISO 2768	<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120														
Linear dim.	±0.1	±0.1	±0.2	±0.3														
Radiuses, chamfer height	±0.2	±0.5	±1															

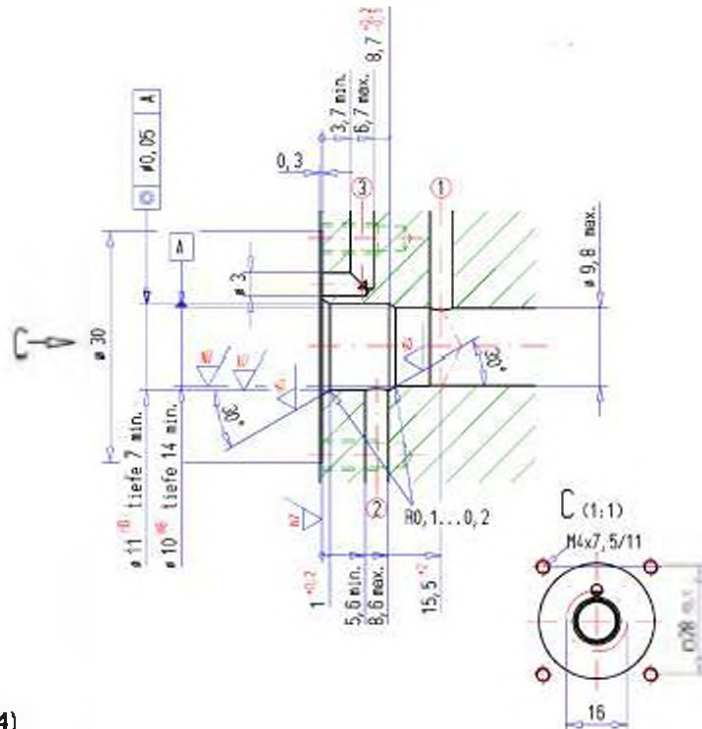
**Cavity tools**

<b>Denomination:</b>	<b>Article number:</b>	<b>Content</b>	<b>Article number:</b>
Ecoline 2-way 3/4" - 16 UNF	983.2814	Form drill Form reamer	

**Application**

<b>Cartridge type:</b>	<b>Data sheet number:</b>	<b>Cartridge type:</b>	<b>Data sheet number:</b>
SDEPU08	1.11-205B		
SVEPU08	1.11-208B		
BESPU08	2.1-523		

**Cartridge cavity Wandfluh standard**



**3-way-cavity**

(Drawing-no. 1-1357.4)

Edges according to ISO 13715 	Surface texture N8 	General tolerances ISO 2768 Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	m M H H H	Extract general tolerances ISO-2768-1
				Nominal dim. >0.5-3 >3-6 >6-30 >30-120
				Linear dim. ±0.1 ±0.1 ±0.2 ±0.3
				Radiuses, chamfer height ±0.2 ±0.5 ±1

**Cavity tools**

**Denomination:**

- Form drill
- Form reamer
- Tap

**Form tool set**

**Article number:**

**Application**

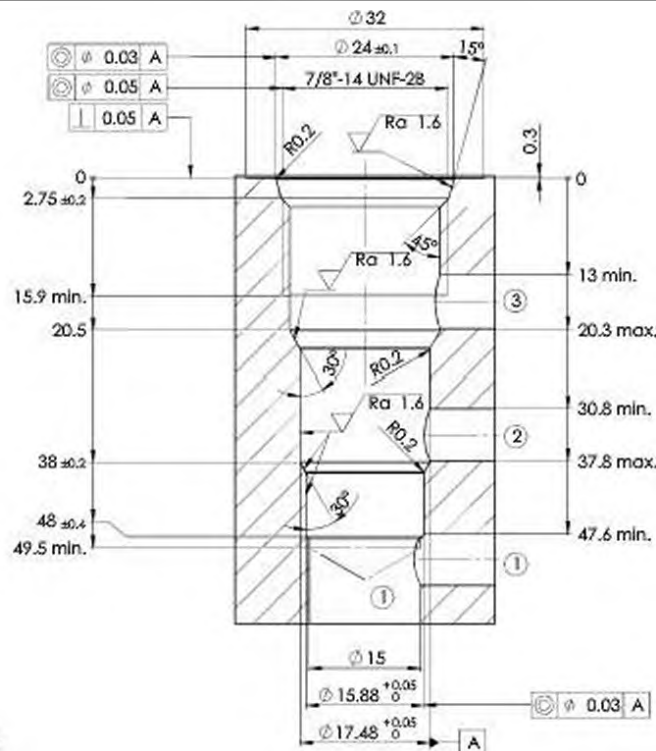
**Cartridge type:**  
MDPPR11...

**Data sheet number:**  
2.3-671

**Cartridge type:**

**Data sheet number:**

**Cartridge cavity Wandfluh standard**



**3-way-cavity**

(Drawing-no. 1-1344.4)

Edges according to ISO 13715 +0.4 / -0.1 / -0.3	Surface texture Ra 3.2	General tolerances ISO 2768 Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	Extract general tolerances ISO-2768-1															
			<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120														
Linear dim.	±0.1	±0.1	±0.2	±0.3														
Radiuses, chamfer height	±0.2	±0.5	±1															

**Cavity tools**

**Denomination:**  
Form drill  
Form reamer  
Tap

**Article number:**

**Form tool set**

**Application**

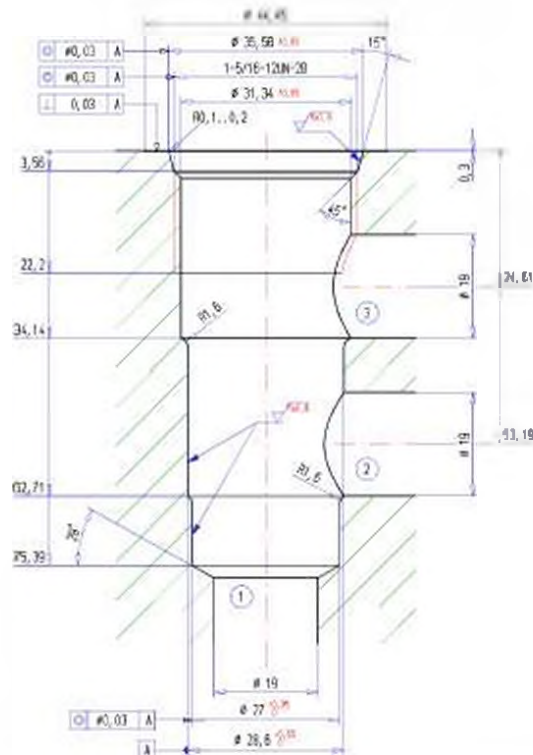
**Cartridge type:**  
MVPPU10-...

**Data sheet number:**  
2.3-672

**Cartridge type:**

**Data sheet number:**

**Cartridge cavity Wandfluh standard**



**3-way-cavity**

(Drawing-no. 1-1364.4)

Edges according to ISO 13715 	Surface texture N8 	General tolerances ISO 2768 Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	Extract general tolerances ISO-2768-1															
			<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120														
Linear dim.	±0.1	±0.1	±0.2	±0.3														
Radiuses, chamfer height	±0.2	±0.5	±1															

**Cavity tools**

**Denomination:**

- Form drill
- Form reamer
- Tap

**Form tool set**

**Article number:**

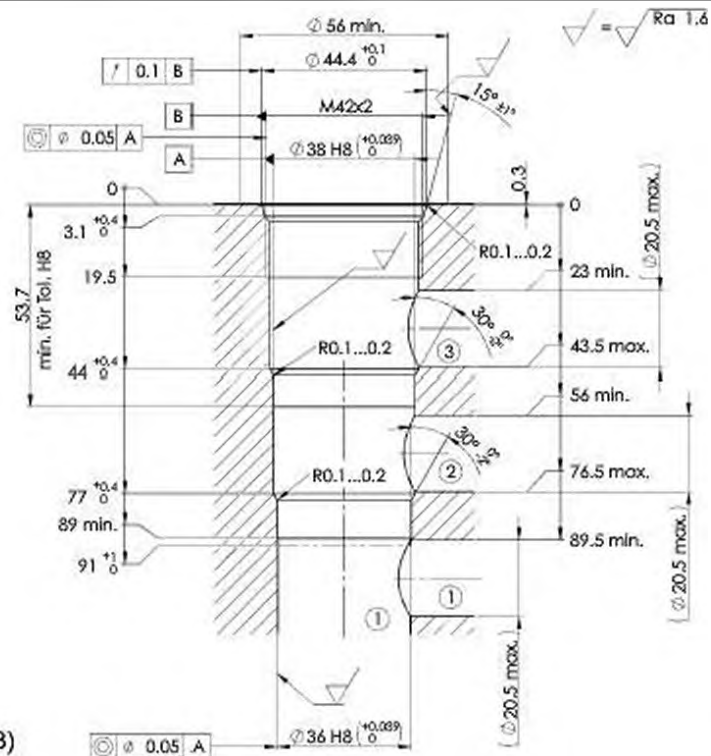
**Application**

**Cartridge type:**  
QDPPU16-...


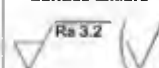
**Data sheet number:**  
2.6-670

**Cartridge type:**

**Data sheet number:**

**Cartridge cavity ISO 7789-42-04-0-07**

**3-way-cavity for  
general function**

(Drawing-no. 1-1322.3)

Edges according to ISO 13715 	Surface texture 	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405 ©	General tolerances ISO 2768 m H H H	Extract general tolerances ISO-2768-1
				Nominal dim. >0.5-3 >3-6 >6-30 >30-120
				Linear dim. ±0.1 ±0.1 ±0.2 ±0.3
				Radiuses, chamfer height ±0.2 ±0.5 ±1

**Cavity tools**
**Denomination:**

Form drill

Form reamer

Tap

**Form tool set**
**Article number:**
**Application**
**Cartridge type:**

MVPPM42-...

QDPPM42-...

**Data sheet number:**

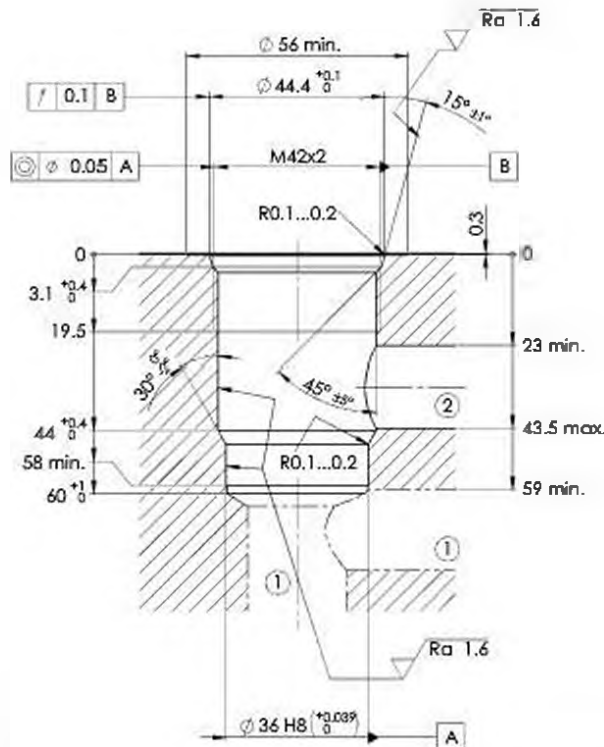
2.3-690

2.6-695

**Cartridge type:**
**Data sheet number:**



**Cartridge cavity ISO 7789-42-02-0-07**



**2-way-cavity for pressure relief**

(Drawing-no. 1-1372.4)

Edges according to ISO 13715 	Surface texture 	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	General tolerances ISO 2768	Extract general tolerances ISO-2768-1															
				<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120															
Linear dim.	±0.1	±0.1	±0.2	±0.3															
Radiuses, chamfer height	±0.2	±0.5	±1																

**Cavity tools**

**Denomination:**

- Form drill
- Form reamer
- Tap

**Form tool set**

**Article number:**

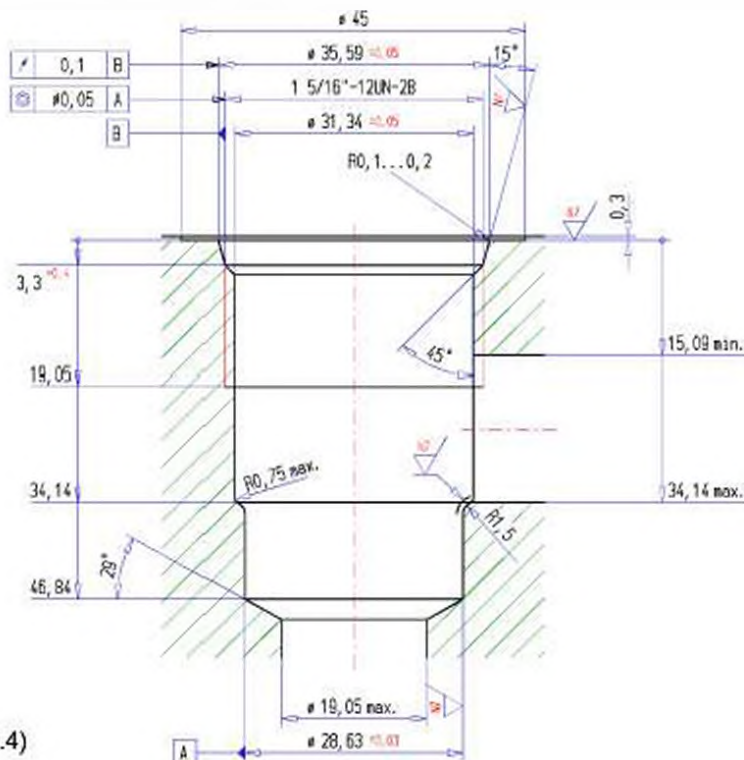
**Application**

**Cartridge type:**  
BVPPM42-...

**Data sheet number:**  
2.3-590

**Cartridge type:**

**Data sheet number:**

**Cartridge cavity Wandfluh standard**

**2-way-cavity**

(Drawing-no. 5-3129.4)

Edges according to ISO 13715 +0.4 / -0.1 -0.3	Surface texture NB	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405 ©	Extract general tolerances ISO-2768-1															
General tolerances ISO 2768			<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120														
Linear dim.	±0.1	±0.1	±0.2	±0.3														
Radiuses, chamfer height	±0.2	±0.5	±1															

**Cavity tools**
**Denomination:**

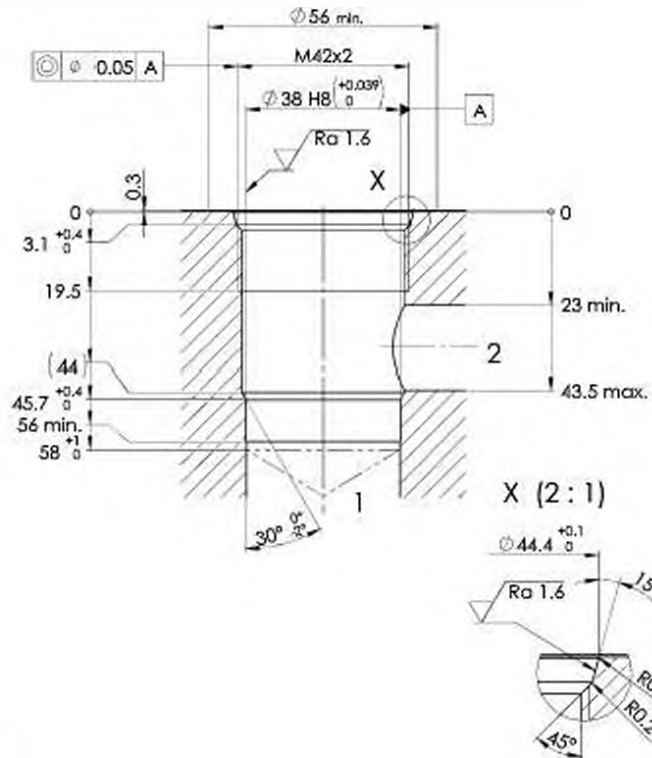
- Form drill
- Form reamer
- Tap

**Form tool set**
**Article number:**
**Application**
**Cartridge type:**  
 QNPPU16-...

**Data sheet number:**  
 2.6-675

**Cartridge type:**
**Data sheet number:**

**Cartridge cavity ISO 7789-42-01-0-07**



**2-way-cavity for general function**

(Drawing-no. 1-1373.4)

Edges according to ISO 13715 	Surface texture 	General tolerances ISO 2768 Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	Extract general tolerances ISO-2768-1															
			<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120														
Linear dim.	±0.1	±0.1	±0.2	±0.3														
Radiuses, chamfer height	±0.2	±0.5	±1															

**Cavity tools**

**Denomination:**

- Form drill
- Form reamer
- Tap

**Form tool set**

**Article number:**

**Application**

**Cartridge type:**

- SVSPM42-...
- QNPPM42-...

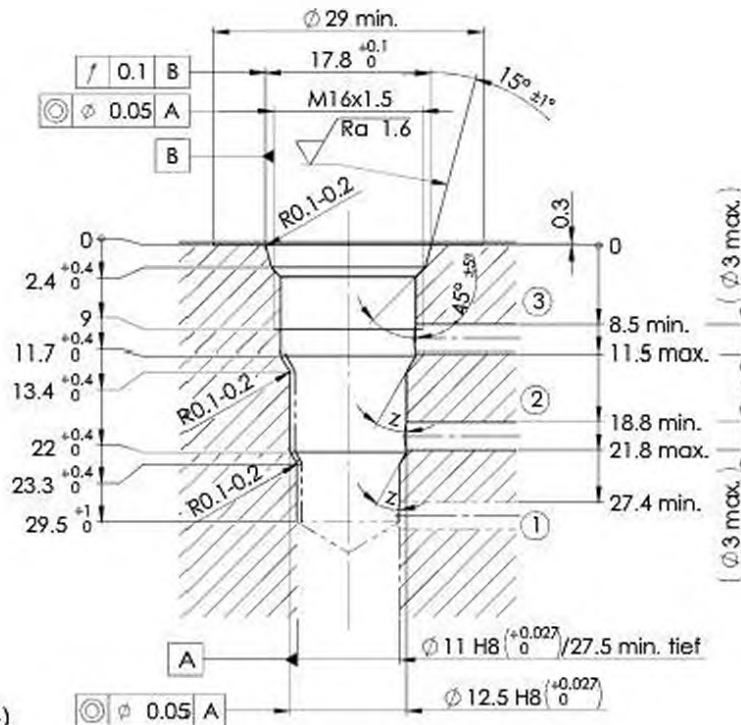
**Data sheet number:**

- 1.11-2091
- 2.6-690

**Cartridge type:**

**Data sheet number:**

**Cartridge cavity Wandfluh standard**



**3-way-cavity**

(Drawing-no. 1-1325.4)

Edges according to ISO 13715 +0.4 -0.1 -0.3	Surface texture Ra 3.2	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	General tolerances ISO 2768 m H H H	Extract general tolerances ISO-2768-1 Nominal dim. >0.5-3 >3-6 >6-30 >30-120 Linear dim. ±0.1 ±0.1 ±0.2 ±0.3 Radiuses, chamfer height ±0.2 ±0.5 ±1
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**Cavity tools**

**Denomination:**

- Form drill
- Form reamer
- Tap

**Form tool set**

**Article number:**

**Application**

**Cartridge type:**  
MDPPM16-...

**Data sheet number:**  
2.3-605

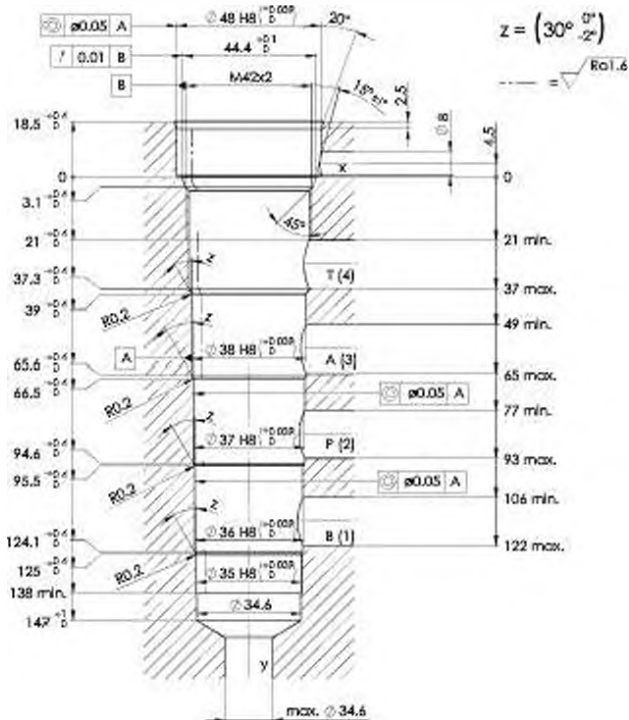
**Cartridge type:**

**Data sheet number:**

**Cartridge cavity Wandfluh standard**

**4-way-cavity with  
2 pilot ports**

(Drawing-no. 1-1367.4)



Edges according to ISO 13715 	Surface texture 	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405 ©	General tolerances ISO 2768	Extract general tolerances ISO-2768-1															
				<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120															
Linear dim.	±0.1	±0.1	±0.2	±0.3															
Radiuses, chamfer height	±0.2	±0.5	±1																

**Cavity tools**

**Denomination:**

- Form drill
- Form reamer
- Tap

**Form tool set**

**Article number:**

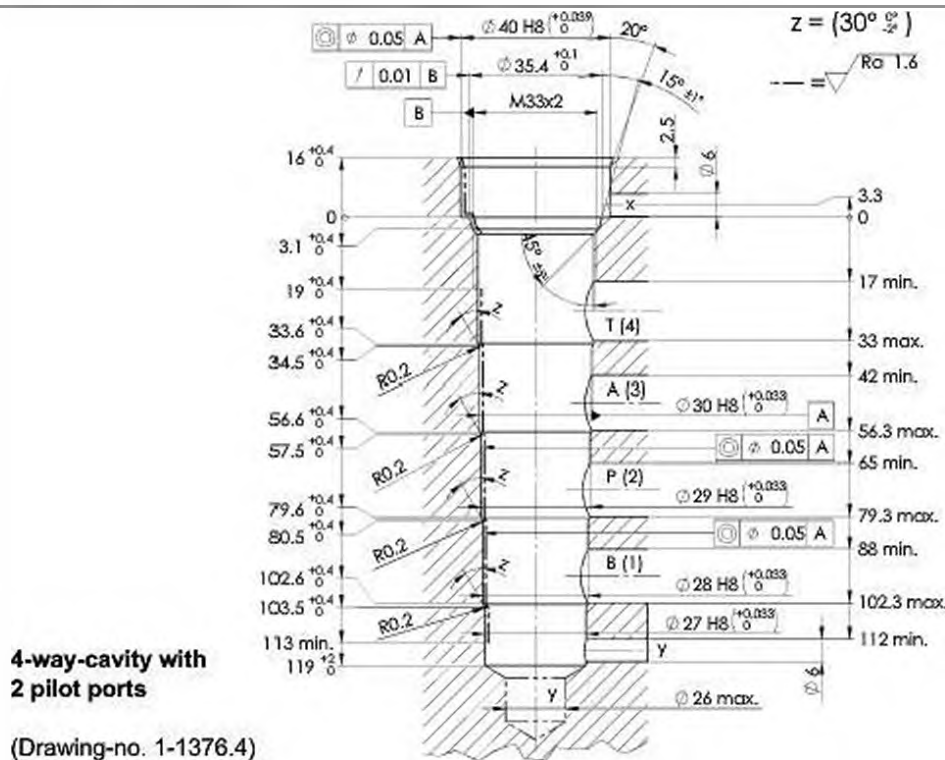
**Application**

**Cartridge type:**  
WVPPM42

**Data sheet number:**  
1.10-2410

**Cartridge type:**

**Data sheet number:**

**Cartridge cavity Wandfluh standard**


Edges according to ISO 13715 +0.4 / -0.1 -0.3	Surface texture Ra 3.2	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405 (B)	General tolerances ISO 2768 m m H H H	Extract general tolerances ISO-2768-1
				Nominal dim. >0.5-3 >3-6 >6-30 >30-120
				Linear dim. ±0.1 ±0.1 ±0.2 ±0.3
				Radiuses, chamfer height ±0.2 ±0.5 ±1

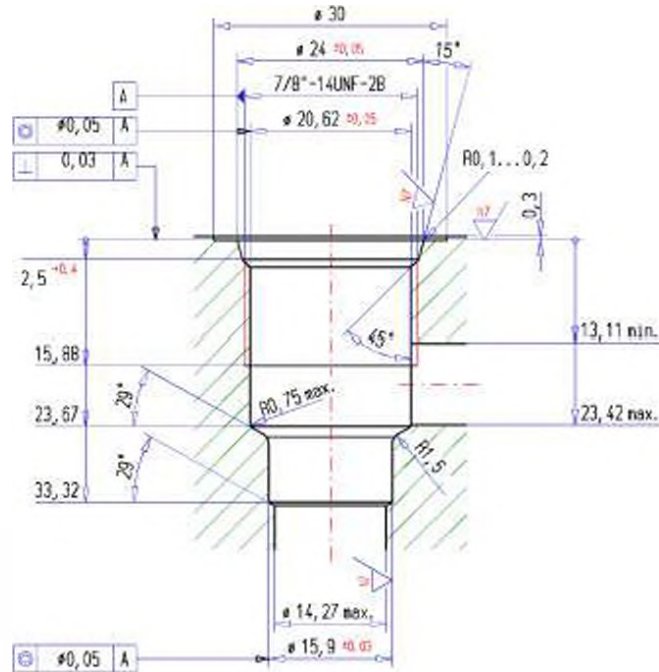
**Cavity tools**
**Denomination:**

 Form drill  
 Form reamer  
 Tap


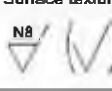
**Form tool set**
**Article number:**
**Application**
**Cartridge type:**  
 WVPPM33

**Data sheet number:**  
 1.10-2310

**Cartridge type:**
**Data sheet number:**

**Cartridge cavity Wandfluh standard**

**2-way-cavity**

(Drawing-no. 5-3128.4)

Edges according to ISO 13715 	Surface texture N8 	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405 (E)	General tolerances ISO 2768	Extract general tolerances ISO-2768-1															
				<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0,5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0,1</td> <td>±0,1</td> <td>±0,2</td> <td>±0,3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0,2</td> <td>±0,5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0,5-3	>3-6	>6-30	>30-120	Linear dim.	±0,1	±0,1	±0,2	±0,3	Radiuses, chamfer height	±0,2	±0,5	±1	
Nominal dim.	>0,5-3	>3-6	>6-30	>30-120															
Linear dim.	±0,1	±0,1	±0,2	±0,3															
Radiuses, chamfer height	±0,2	±0,5	±1																

**Cavity tools**
**Denomination:**
**Article number:**

Form drill

Form reamer

Tap

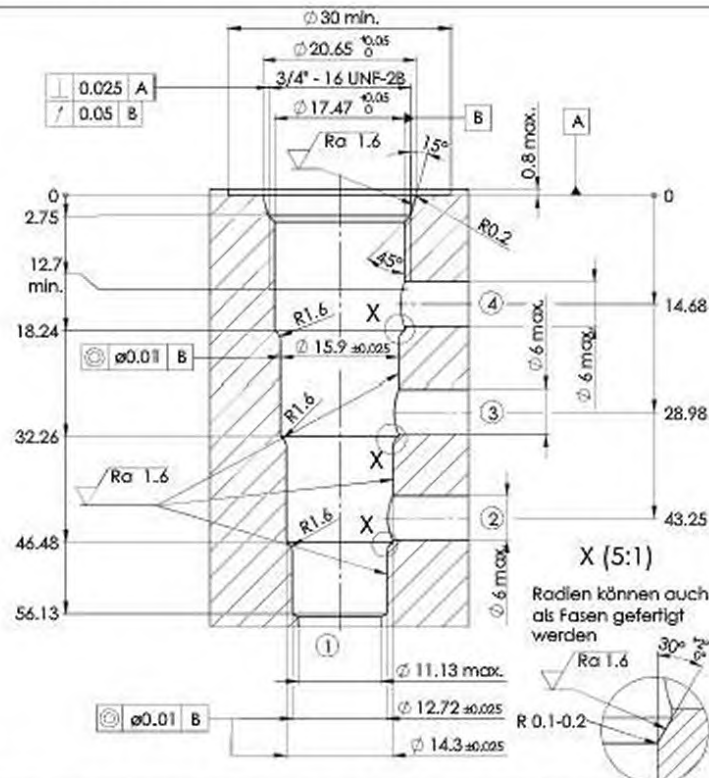
**Form tool set**
**Application**
**Cartridge type:**

BESPUI0-...

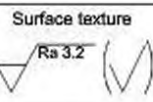
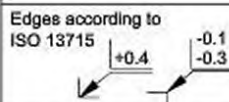
**Data sheet number:**

2.1-590

**Cartridge type:**
**Data sheet number:**

**Cartridge cavity Wandfluh standard**

**4-way-cavity**

(Drawing-no. 1-1375.4)



General tolerances ISO 2768

Length dimensions, curves, chamfers  
 Angles  
 Straightness, flatness  
 Perpendicularity, symmetry  
 Radial runout, axial runout  
 Envelope condition acc. to ISO 14405

Extract general tolerances ISO-2768-1

	>0,5-3	>3-6	>6-30	>30-120
Nominal dim.				
Linear dim.	±0.1	±0.1	±0.2	±0.3
Radiuses, chamfer height	±0.2	±0.5	±1	

**Cavity tools**
**Denomination:**

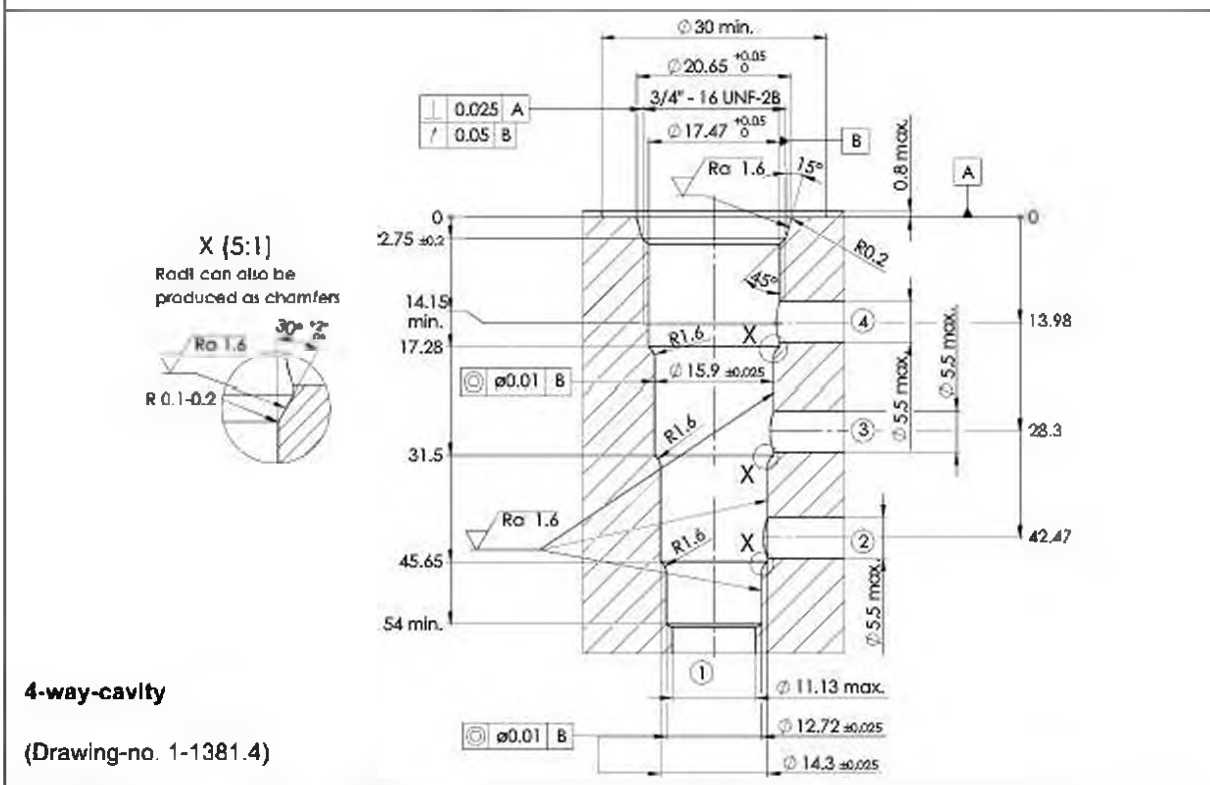
 Form drill  
 Form reamer  
 Tap

**Article number:**
**Form tool set**
**Application**
**Cartridge type:**  
 WDPPI08-...

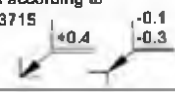
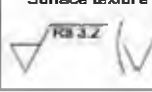
**Data sheet number:**  
 1.10-2710

**Cartridge type:**
**Data sheet number:**



**Cartridge cavity Wandfluh standard**

**4-way-cavity**

(Drawing-no. 1-1381.4)

Edges according to ISO 13715 	Surface texture 	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405 (E)	General tolerances ISO 2768	Extract general tolerances ISO-2768-1															
				<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120															
Linear dim.	±0.1	±0.1	±0.2	±0.3															
Radiuses, chamfer height	±0.2	±0.5	±1																

**Cavity tools**
**Denomination:**
**Article number:**

Form drill

Form reamer

Tap

**Form tool set**
**Application**
**Cartridge type:**

WDPPU08-...

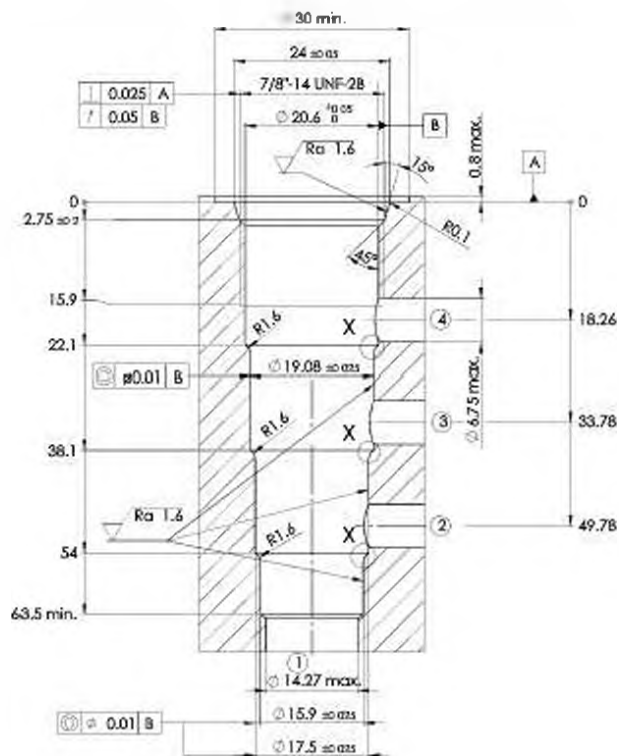
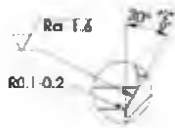
**Data sheet number:**

1.10-2710

**Cartridge type:**
**Data sheet number:**

**Cartridge cavity Wandfluh standard**

X [5 : 1]  
Radl can also be produced as chamfers



**4-way-cavity**

(Drawing-no. 1-1359.4)

Edges according to ISO 13715 ±0.4 -0.1 -0.3	Surface texture Ra 3.2	Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405	General tolerances ISO 2768	Extract general tolerances ISO-2768-1															
				<table border="1"> <tr> <td>Nominal dim.</td> <td>&gt;0.5-3</td> <td>&gt;3-6</td> <td>&gt;6-30</td> <td>&gt;30-120</td> </tr> <tr> <td>Linear dim.</td> <td>±0.1</td> <td>±0.1</td> <td>±0.2</td> <td>±0.3</td> </tr> <tr> <td>Radiuses, chamfer height</td> <td>±0.2</td> <td>±0.5</td> <td colspan="2">±1</td> </tr> </table>	Nominal dim.	>0.5-3	>3-6	>6-30	>30-120	Linear dim.	±0.1	±0.1	±0.2	±0.3	Radiuses, chamfer height	±0.2	±0.5	±1	
Nominal dim.	>0.5-3	>3-6	>6-30	>30-120															
Linear dim.	±0.1	±0.1	±0.2	±0.3															
Radiuses, chamfer height	±0.2	±0.5	±1																

**Cavity tools**

**Denomination:**

- Form drill
- Form reamer
- Tap

**Article number:**

**Form tool set**

**Application**

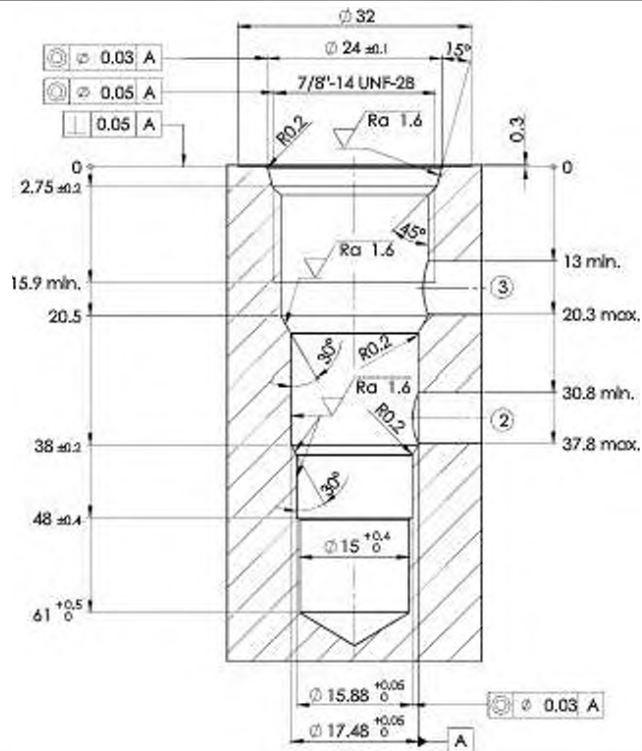
**Cartridge type:**  
WDPPU10-...

**Data sheet number:**  
1.10-2720

**Cartridge type:**

**Data sheet number:**

**Cartridge cavity 7/8 " - 14 UNF - 2B**



**2-way-cavity for QSPPU10**

(Drawing-no. 1-1391.4)

Edges according to ISO 13715 	Surface texture 	General tolerances ISO 2768 Length dimensions, curves, chamfers Angles Straightness, flatness Perpendicularity, symmetry Radial runout, axial runout Envelope condition acc. to ISO 14405 (M)	Extract general tolerances ISO-2768-1 m H H H H
			Nominal dim. >0.5-3 >3-6 >6-30 >30-120
			Linear dim. ±0.1 ±0.1 ±0.2 ±0.3
			Radiuses, chamfer height ±0.2 ±0.5 ±1

**Cavity tools**

<b>Denomination:</b>	<b>Article number:</b>	<b>Content:</b>	<b>Article number:</b>

**Application**

<b>Cartridge type:</b> QSPPU10	<b>Data sheet number:</b> 2.6-638	<b>Cartridge type:</b>	<b>Data sheet number:</b>
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