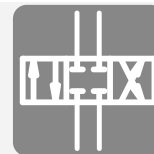


4/2- and 4/3-way directional spool valves type SWPM

Product documentation

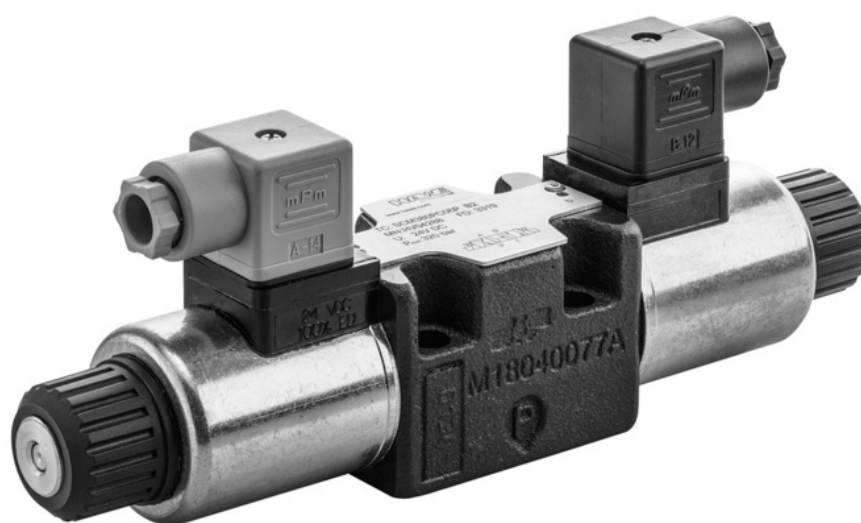


Operating pressure p_{\max} :

350 bar

Flow rate Q_{\max} :

100 lpm



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1 Overview of 4/2- and 4/3-way directional spool valve type SWPM

Directional spool valves are a type of directional valve. They control the direction of movement of single and double-acting hydraulic consumers.

The directional spool valve type SWPM is a 4/2- or 4/3-way directional valve with standard connection pattern NG 6 (CETOP 3) and NG 10 (CETOP 5). It is directly actuated and a binary valve.

The directional spool valve type SWPM is available as a manifold mounting valve. Intended applications for the directional spool valve type SWPM include industrial hydraulics, in particular machine tools.

Features and advantages

- Low pressure losses
- High power density
- Directly controlled
- Solenoid can be replaced easily
- Inductive monitoring of neutral position
- Standard hole pattern
- High flexibility by means of a variety of circuit symbols

Intended applications

- Hydraulic power packs
- Industrial hydraulics



4/3-way directional spool valve type SWPM



4/2-way directional spool valve type SWPM

2 Available versions

Ordering example

SWPM 06	B	/MG	S	-G 24	-AU
				2.5.1 "Connector M12 for inductive position switch"	
				2.5 "Solenoid voltage and connector"	
				2.4 "Position switch"	
				2.3 "Actuation"	
				2.2 "Circuit symbols"	
				2.1 "Basic type and size"	

2.1 Basic type and size

Type	Flow rate Q_{max} (lpm)	Pressure p_{max} (bar)		
		P, A, B	T	
			DC coil	AC coil
SWPM 06	80	350	250	160
SWPM 10	100	350	250	160

NOTICE

Depending on the pressure, the maximum switchable flow rate may be lower, see Chapter 3.4, "Characteristic lines".

2.2 Circuit symbols

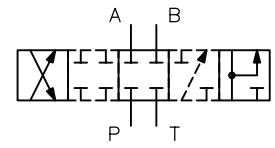
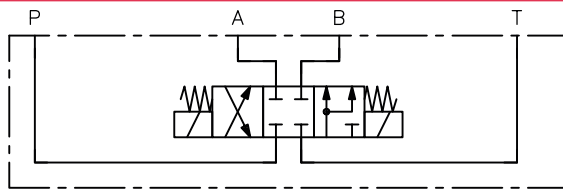
Coding	Circuit symbol	Overlap
G		

Coding

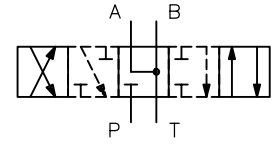
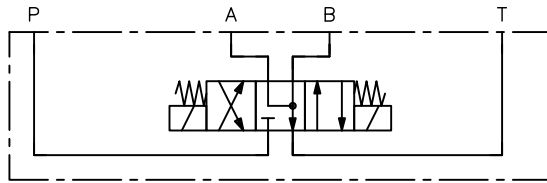
Circuit symbol

Overlap

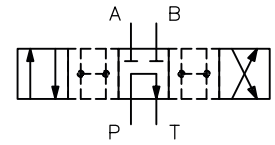
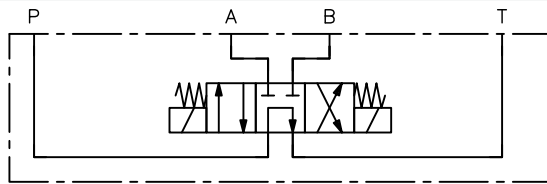
C



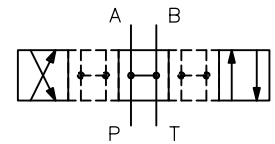
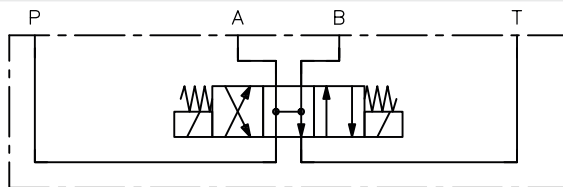
D



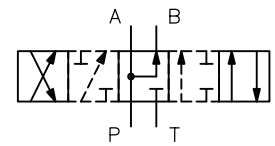
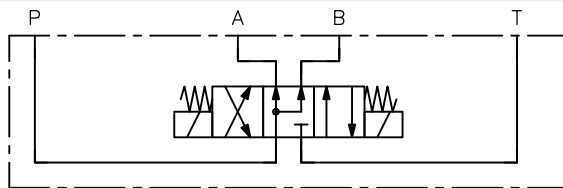
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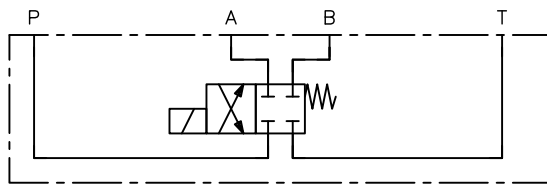
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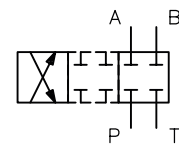
M



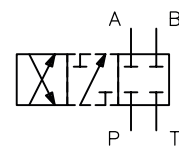
GW



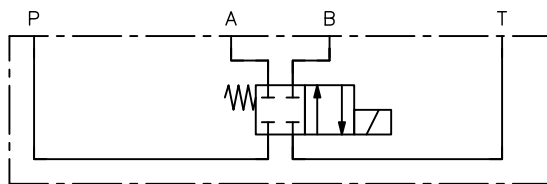
SWPM 06



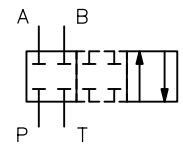
SWPM 10



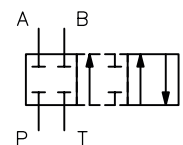
GB



SWPM 06



SWPM 10



Coding	Circuit symbol	Overlap
DW		
DB		
HW		
HB		
LW		
LB		
V		
U		
B		

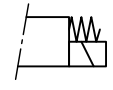
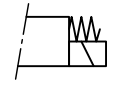
Coding	Circuit symbol	Overlap
W		
K		
EV		

NOTICE



Circuit symbol EV

- For **SWPM 10**:
 - Only possible in conjunction with actuation coding **MG**, see Chapter 2.3, "Actuation"
 - Only possible in conjunction with position switch coding **S**, see Chapter 2.4, "Position switch"
- For version with actuation coding **M**:
 - Only possible in conjunction with versions without position switch, see Chapter 2.4, "Position switch"
 - Only possible in conjunction with magnetic plug coding **X 24**, see Chapter 2.5, "Solenoid voltage and connector"
- For version with actuation coding **MG**:
 - Only possible in conjunction with inductive position switch coding **S**, see Chapter 2.4, "Position switch"
 - Only possible in conjunction with magnetic plug coding **G 24** and **X 24**, see Chapter 2.5, "Solenoid voltage and connector"

2.3 Actuation

Coding	Description	Circuit symbol
M	electrical actuation with override by tool	
MG	electrical actuation with closed cap without override <ul style="list-style-type: none"> ▪ Only possible in conjunction with magnetic plug coding G 24 and L 24, see Chapter 2.5, "Solenoid voltage and connector" ▪ Only possible in conjunction with position switch coding S, M, see Chapter 2.4, "Position switch" or <ul style="list-style-type: none"> ▪ For version without position switch, only possible in conjunction with circuit symbols B and W 	

2.4 Position switch

Coding	Description	Circuit symbol
Without coding	Without position switch	-
S	Inductive position switch <ul style="list-style-type: none"> ▪ Only in conjunction with magnetic plug coding G 24 and L 24 ▪ Only in conjunction with 4/2-way directional spool valve: <ul style="list-style-type: none"> – SWPM 06: Circuit symbol B, W, GB, GW, DB and EV – SWPM 10: Circuit symbol B, W, GB, GW and EV ▪ Only possible in conjunction with actuation coding MG (see Chapter 2.3, "Actuation") 	
M	Micro switch <ul style="list-style-type: none"> ▪ Only in conjunction with magnetic plug coding G 24 and L 24 ▪ Only in conjunction with 4/2-way directional spool valve: <ul style="list-style-type: none"> – SWPM 06: Circuit symbol B and W ▪ Only possible in conjunction with actuation coding MG (see Chapter 2.3, "Actuation") 	

NOTICE

The inductive position switch comes with an installed connector coding M12x1 (4-pin).

2.5 Solenoid voltage and connector

! NOTICE

Male connectors are only available for valves with position switch. For valves without position switch: male connectors need to be ordered separately if required (see Chapter 6, "Other information").

Coding	Electrical connection	Nominal voltage	Protection class (IEC 60529)
G 24	EN 175 301-803 A	24 V DC	IP 65
X 12	<ul style="list-style-type: none"> ▪ G: with male connector (MSD 3-309 acc. to D 7163) ▪ X: without male connector 	12 V DC	IP 65
X 24		24 V DC	
L 24	<ul style="list-style-type: none"> ▪ L: with male connector with LED (SVS 296365 acc. to D 7163) 	24 V DC	IP 65
X 115	EN 175 301-803 A <ul style="list-style-type: none"> ▪ X: AC coils without male connector 	115 V AC	IP 65
X 230		230 V AC	


The specifications regarding the IP protection class apply for versions featuring a properly assembled male connector.

2.5.1 Connector M12 for inductive position switch

Coding	Description
AU	Connector, angled unshielded see Chapter 4.3, "Position switch"

3 Parameters

3.1 General data

Designation	4/3- or 4/2-way directional spool valve
Design	Spool valve, directly actuated
Model	Single valve for manifold mounting
Material	<ul style="list-style-type: none"> ▪ Housing: cast ▪ Solenoid: steel
Installation position	any (horizontal preferred)
Line connection	Through holes, see Chapter 4, "Dimensions"
Ports/connections	<ul style="list-style-type: none"> ▪ P = Pump ▪ A, B = Consumers ▪ T = Reflux
Flow direction	According to circuit symbol
	<p> NOTICE Observe permissible pressure at reflux T.</p>
Hydraulic fluid	Hydraulic fluid, according to DIN 51 524 Parts 1 to 3; ISO VG 10 to 68 according to DIN ISO 3448 Viscosity range: 10 - 500 mm ² /s Optimal operating range: approx. 10 - 300 mm ² /s Also suitable for biologically degradable hydraulic fluids type HEPG (polyalkylene glycol) and HEES (synthetic ester) at operating temperatures up to approx. +70°C.
Cleanliness level	ISO 4406 <u>20/18/15</u>
Temperatures	Environment: approx. -25 ... +60 °C, hydraulic fluid: -25 ... +75 °C, ensure the correct viscosity range. Biologically degradable hydraulic fluids: note manufacturer specifications. With consideration for the seal compatibility, not above +70°C.

3.2 Pressure and volumetric flow

Operating pressure	<p>$p_{\max} = 350$ bar (ports P, A and B)</p> <p>Return pressure at port T:</p> <ul style="list-style-type: none"> ▪ with DC coil: $p_{\max} = 250$ bar ▪ with AC coil: $p_{\max} = 160$ bar
Flow rate	see Chapter 2.1, "Basic type and size"

3.3 Weight

SWPM 06	DC solenoids	G, C, D, L, H, M, K	= 2.0 kg
		GW, GB, DW, DB, HW, HB, LW, LB, V, U, B, W	= 1.65 kg
	AC solenoids	G, C, D, L, H, M, K	= 1.72 kg
		GW, GB, DW, DB, HW, HB, LW, LB, V, U, B, W	= 1.31 kg
SWPM 10	DC solenoids	G, C, D, L, H, M, K	= 5.1 kg
		GW, GB, DW, DB, HW, HB, LW, LB, V, U, B, W	= 4.0 kg
	AC solenoids	G, C, D, L, H, M, K	= 4.3 kg
		GW, GB, DW, DB, HW, HB, LW, LB, V, U, B, W	= 3.5 kg

3.4 Characteristic lines

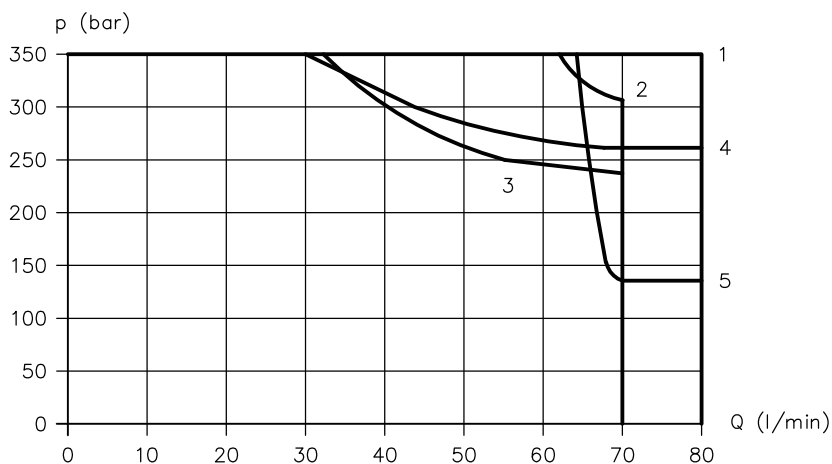
Viscosity of the hydraulic fluid approx. 46 mm²/s

Switchable flow rates SWPM 06

! NOTICE

In the event of unilateral flow, values may sometimes be lower than those shown.

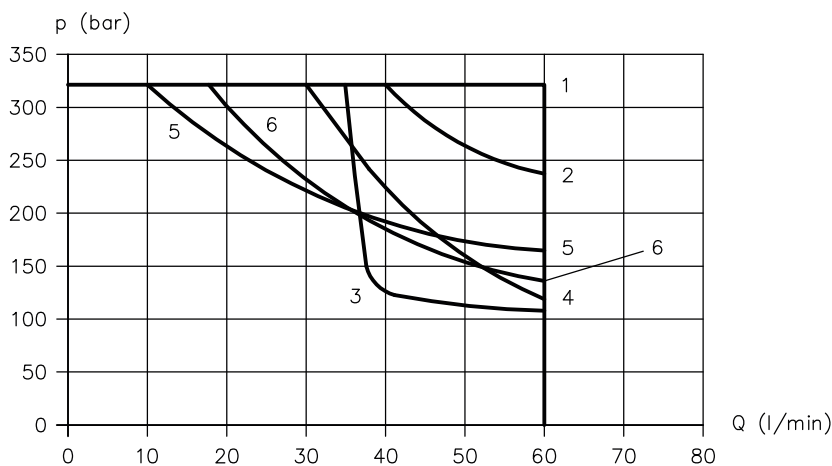
DC voltage



Q flow rate (lpm); p pressure (bar)

- 1 G, GW, GB, H, HW, HB, M
- 2 L, LW, LB
- 3 D, DW, DB
- 4 C
- 5 B, W

AC voltage

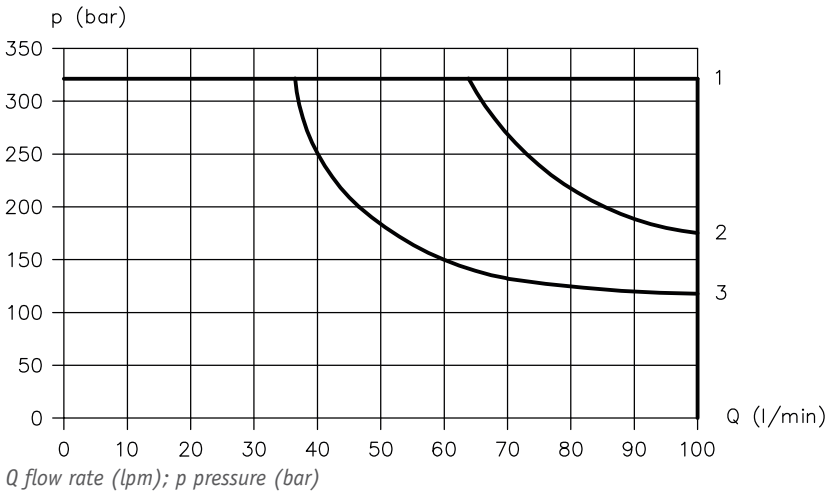


Q flow rate (lpm); p pressure (bar)

- 1 G, GW, GB, H, HW, HB
- 2 D, DW, DB
- 3 B, W
- 4 L, LW, LB
- 5 M
- 6 C

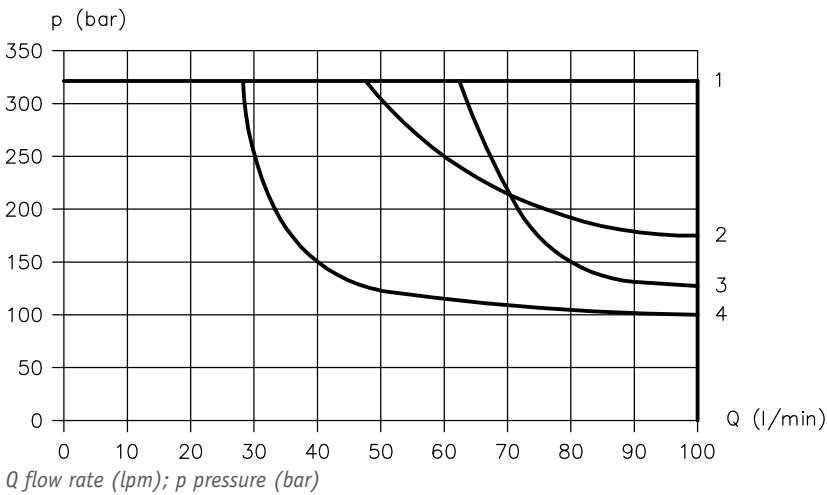
Switchable flow rates SWPM 10

DC voltage



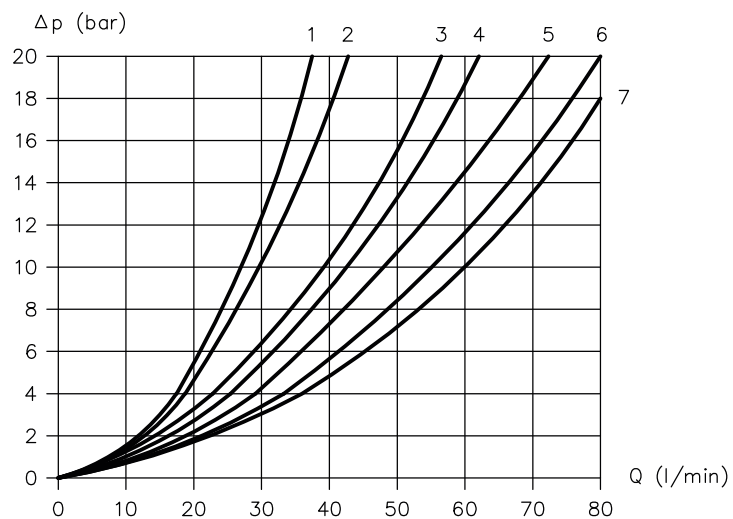
- 1 G, GW, GB, H, HW, HB, M, B, W
- 2 D, DW, DB
- 3 L, LW, LB

AC voltage



- 1 H, HW, HB, M, B, W
- 2 D, DW, DB
- 3 G, GW, GB
- 4 L, LW, LB

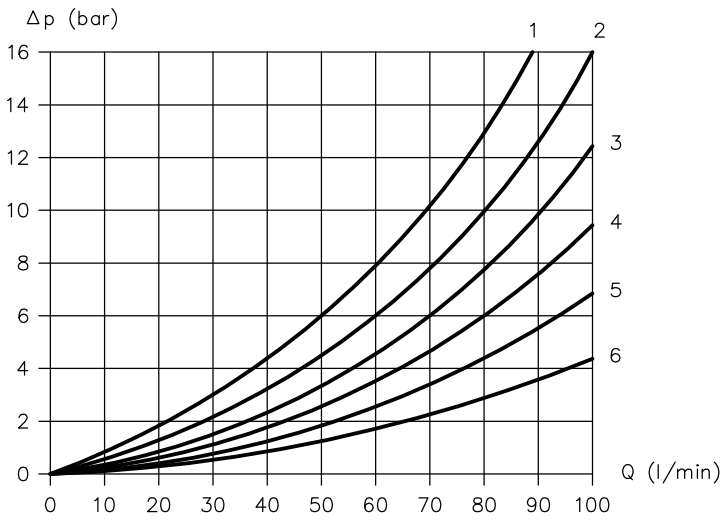
Flow resistance SWPM 06



Q flow rate (lpm); Δp pressure difference (bar)

Coding Circuit symbol	Flow direction				
	P → A	P → B	A → T	B → T	P → T
GW, GB, G	5	5	5	5	
HW, HB, H	7	7	7	7	6
DW, DB, D	5	5	6	6	
B, W	5	5	4	4	
V, U	3	4			
C		5	5		
L, LW, LB	2	2	2	2	4
K	4	4	4	4	
M	7	7	5	5	

Flow resistance SWPM 10



Q flow rate (lpm); Δp pressure difference (bar)

Coding Circuit symbol	Flow direction				
	P → A	P → B	A → T	B → T	P → T
G, GW, GB	2	2	5	5	
H, HW, HB	3	3	6	6	3
D, DW, DB	2	2	6	6	
L, LW, LB	3	3	4	4	1
M	3	3	5	5	
C		4	5		
B, W	2	2	4	5	
V, U	3	3			
K	3	3	4	5	

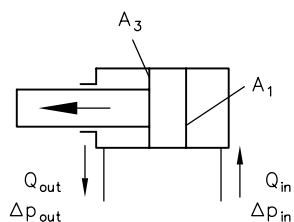
SWPM 06 and SWPM 10

Flow resistance per control edge:

The characteristic lines always apply to the specified flow direction. For 4/3 or 4/2-way directional spool valves, the overall resistance Δp , measured at input P, is composed of the inflow side element Δp_{in} and the outflow side element Δp_{out} . Here it is to be noted that on consumers with a cylinder area ratio not equal to one φ (differential cylinders) the return flow Q_{out} may be less than or greater than the inflow Q_{in} , depending on the direction of movement!

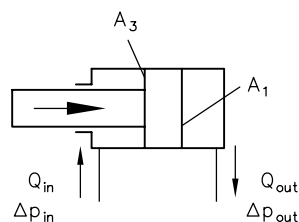
$$\Delta p = \Delta p_{in} + \frac{\Delta p_{out}}{\varphi}$$

$$Q_{out} = \frac{Q_{in}}{\varphi}$$



$$\Delta p = \Delta p_{in} + \Delta p_{out} \cdot \varphi$$

$$Q_{out} = Q_{in} \cdot \varphi$$



$$\varphi = \frac{A_1}{A_3}$$

Δp = Overall resistance

Δp_{in} = Pressure loss inflow side

Δp_{out} = Pressure loss outlet side

Q_{in} = Flow rate inflow side

Q_{out} = Flow rate outlet side

φ = Cylinder area ratio

A_1 = Area piston side

A_3 = Area rod side

3.5 Electrical data

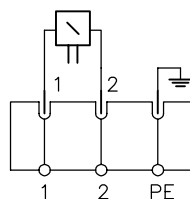
Coding		X 12	X 24 G 24 L 24	X 115	X 230
Nominal voltage		12 V DC	24 V DC	115 V AC	230 V AC
Permissible voltage deviation		± 10 %			
Nominal current I _N	SWPM 06	2.50 A	1.25 A	0.43 A	0.22 A
	SWPM 10	3.75 A	1.87 A	1.0 A	0.48 A
Nominal power P _N	SWPM 06	30 W	30 W	50 VA	50 VA
	SWPM 10	45 W	45 W	113 VA	110 VA
Solenoid connection		Male connector acc. to EN 175 301-803 A			
Relative duty cycle		100%			
Switching times	SWPM 06	<ul style="list-style-type: none"> DC coil: on = 30 to 50 ms, off = 10 to 30 ms AC coil: on = 8 to 30 ms, off = 15 to 55 ms 			
	SWPM 10	<ul style="list-style-type: none"> DC coil: on = 60 to 95 ms, off = 25 to 70 ms AC coil: on = 12 to 30 ms, off = 10 to 55 ms 			
Switching operations	SWPM 06	18,000 switching operations/h			
	SWPM 10	18,000 switching operations/h			
Protection class (IEC 60529)		IP 65 (plugs mounted correctly)			
Insulation material class		H			
Contact temperature		<ul style="list-style-type: none"> DC coil: max. 110 °C at 25 °C ambient temperature AC coil: max. 138 °C at 25 °C ambient temperature 			

Electrical connection

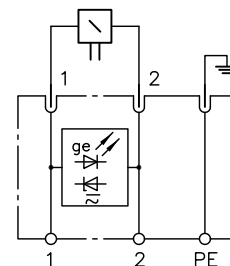
EN 175 301-803 A
IP 65 (IEC 60529)



X 12, X 24, G 24
X 115, X 230



L 24



The specifications regarding the IP protection class apply for versions featuring a properly assembled male connector.

3.6 Electrical data for position switch

Sensor electronics

Supply voltage U_B	24 V, $\pm 10\%$, regulated, residual ripple < 10%
Protected against polarity reversal	Integrated, up to max. 60 V DC
Current consumption I_B	< 50 mA (without external switching load)

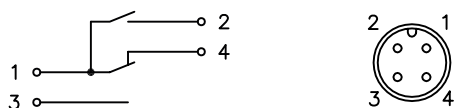
Switch output

Max. switching current I_S	< 150 mA
Residual voltage of switch output	< 2.5 V
Type	N/C contact / N/O contact, positive switching, protected against overload
Min. load resistance	200 Ω

Electrical connection

Sensor connector

M12x1, 4-pole (see Chapter 4.3, "Position switch")



PIN	Connection
1	24 V DC supply
2	N/O contact +
3	Ground
4	N/C contact +

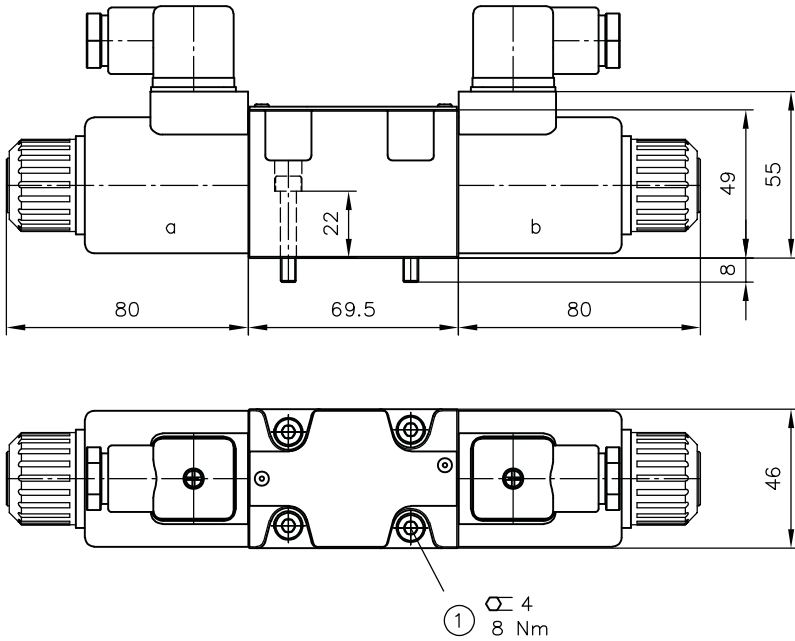
4 Dimensions

All dimensions in mm, subject to change.

4.1 SWPM 06

4/3-way directional spool valve

Circuit symbols **G, C, D, L, H, M, K**



1 Cylinder screw M5x30-8.8 ISO 4762 mechanically zinc-plated (not in scope of delivery)

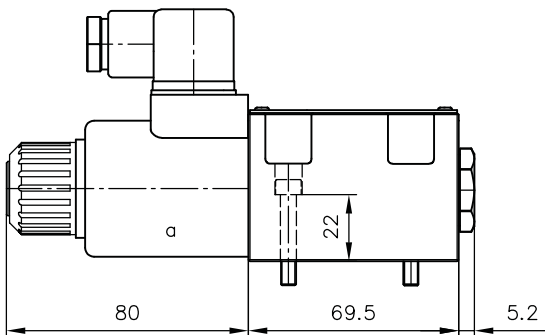
NOTICE

Circuit symbol K

- Only available in conjunction with DC coils, see Chapter 2.5, "Solenoid voltage and connector"

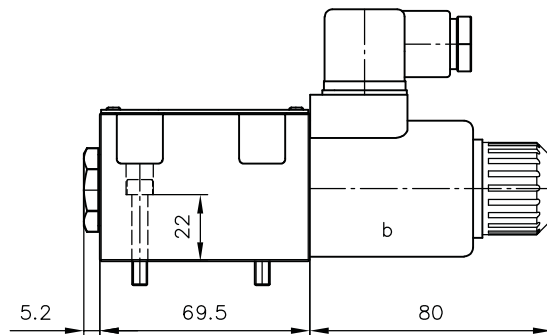
4/2-way directional spool valve

Circuit symbols **GW, DW, HW, LW, V, B, EV**



4/2-way directional spool valve

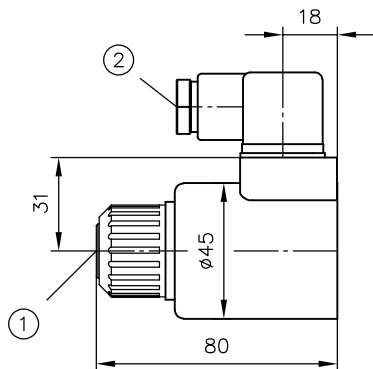
Circuit symbols **GB, DB, HB, LB, U, W**



Actuation

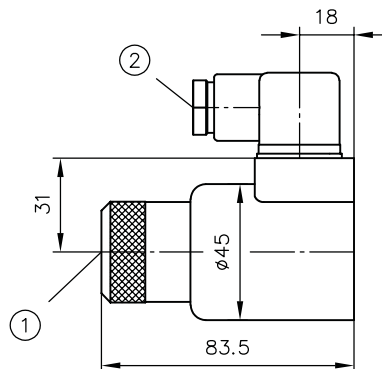
DC voltage

Coding **M**



- 1 Manual override
- 2 Cable fitting

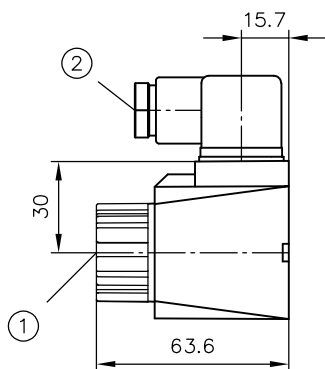
Coding **MG**



- 1 Closed cap
- 2 Cable fitting

AC voltage

Coding **M**



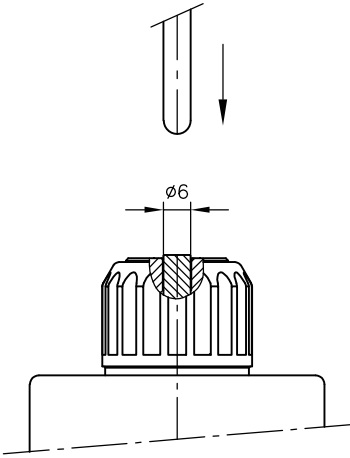
- 1 Manual override
- 2 Cable fitting

NOTICE

Note restriction for **MG**: see "Notes for electrical actuation", page 9

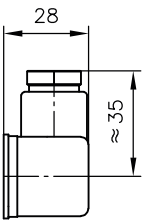
Manual override M

Auxiliary tool for actuation
(do not use any parts with sharp edges)

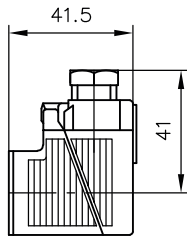


Solenoid version

G 24



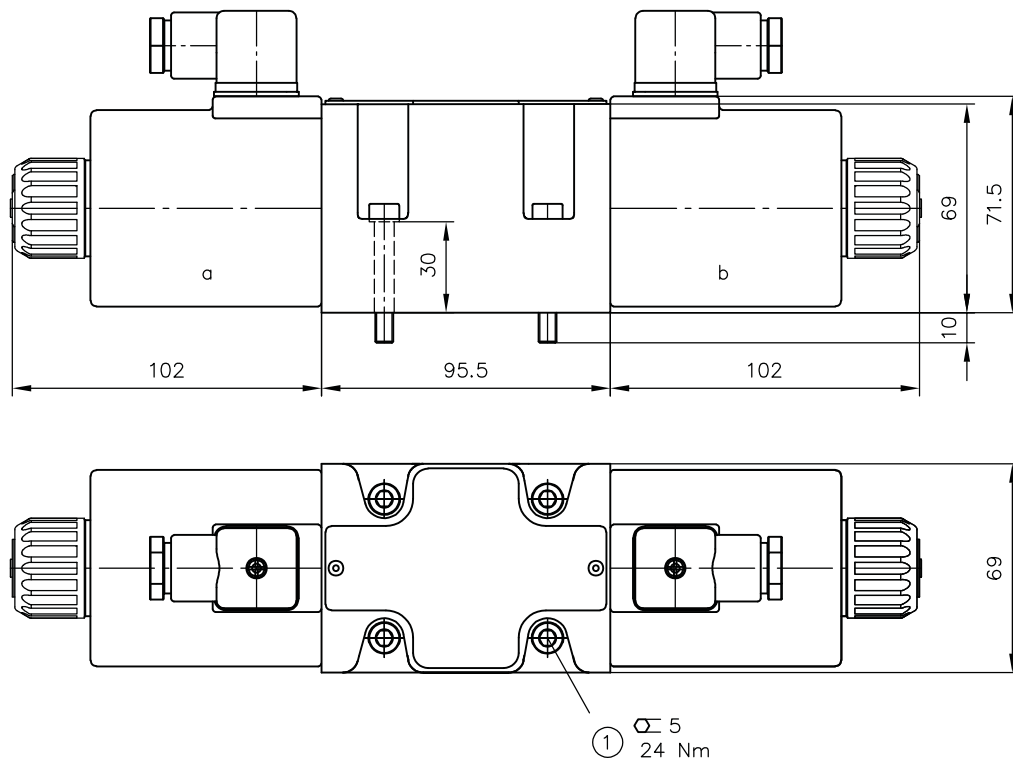
L 24



4.2 SWPM 10

4/3-way directional spool valve

Circuit symbol **G, C, D, L, H, M, K**



1 Cylinder screw M6x40-8.8 ISO 4762 mechanically zinc-plated (not in scope of delivery)

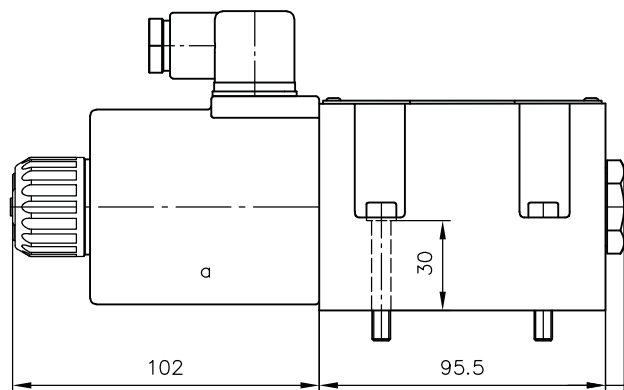
NOTICE

Circuit symbol **K**

- Only available in conjunction with DC coils, see Chapter 2.5, "Solenoid voltage and connector"

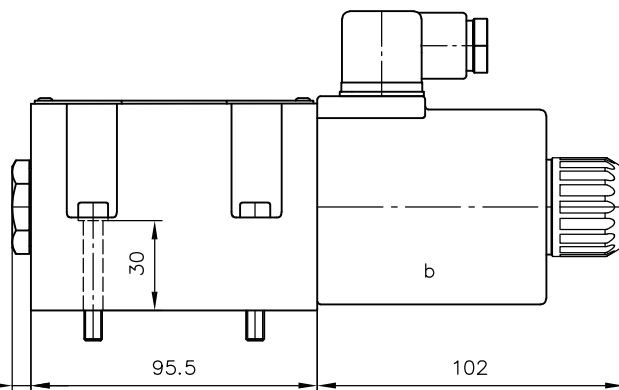
4/2-way directional spool valve

Circuit symbols **GW, DW, HW, LW, V, B**



4/2-way directional spool valve

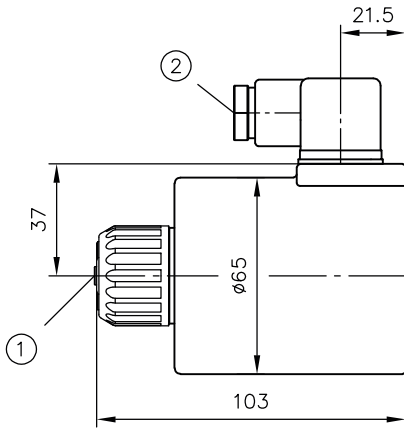
Circuit symbol **GB, DB, HB, LB, U, W**



Actuation

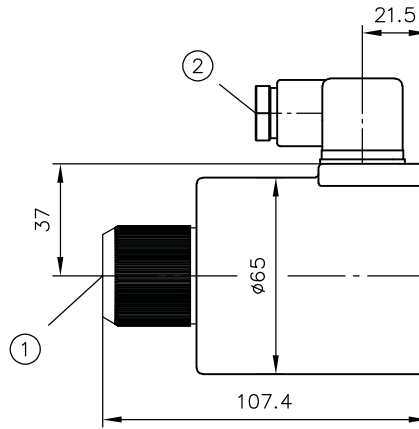
DC voltage

Coding **M**



- 1 Manual override
- 2 Cable fitting

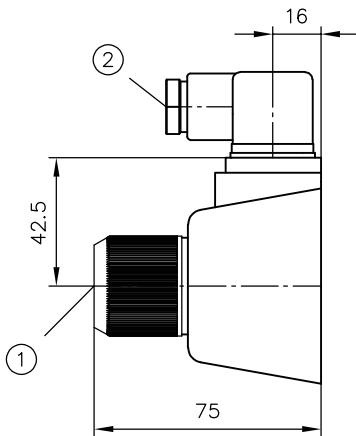
Coding **MG**



- 1 Closed cap
- 2 Cable fitting

AC voltage

Coding **M**



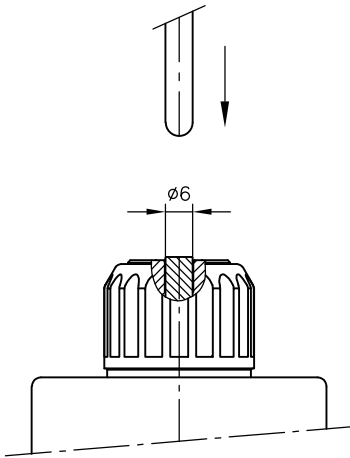
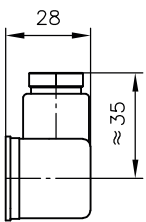
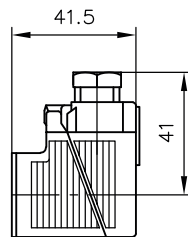
- 1 Manual override
- 2 Cable fitting

NOTICE

Note restriction for **MG**: see "Notes for electrical actuation", page 9

Manual override M

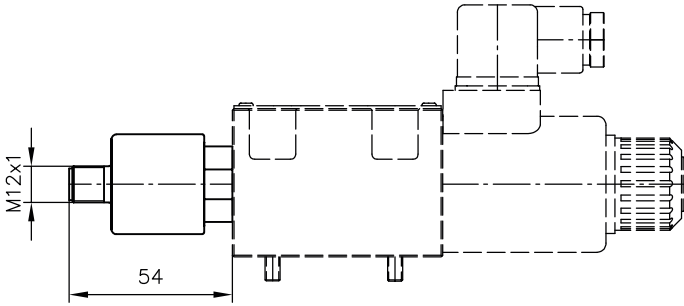
Auxiliary tool for actuation
(do not use any parts with sharp edges)

**Solenoid version****G 24****L 24**

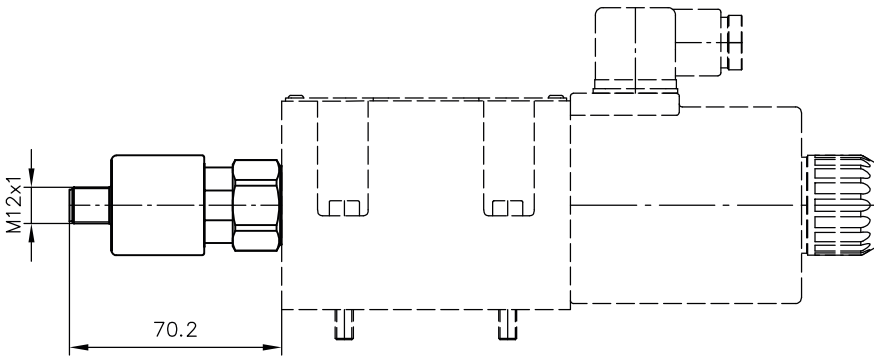
4.3 Position switch

Inductive position switch

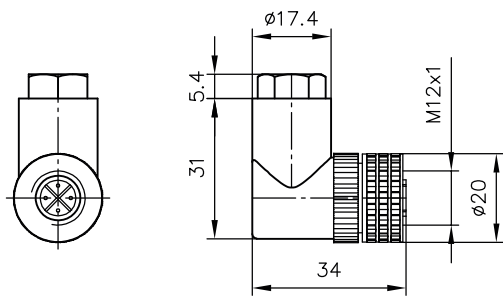
SWPM 06



SWPM 10

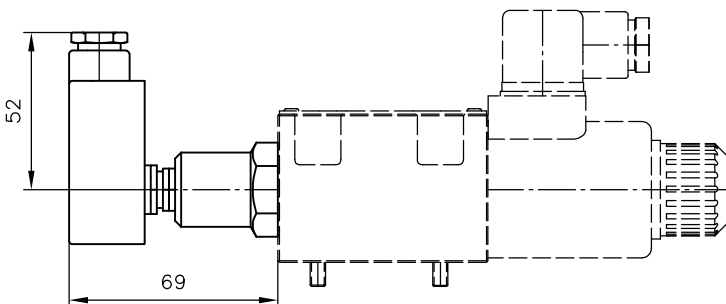


Connector M12 for inductive position switch



Micro switch

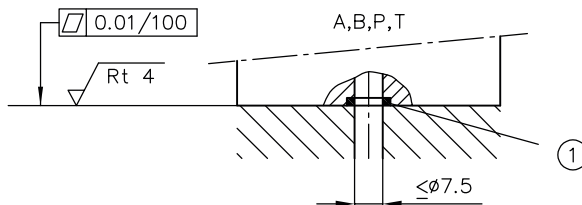
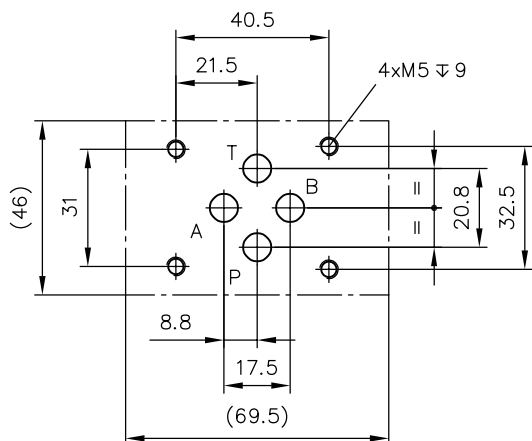
SWPM 06



4.4 Hole pattern of the base plate

SWPM 06

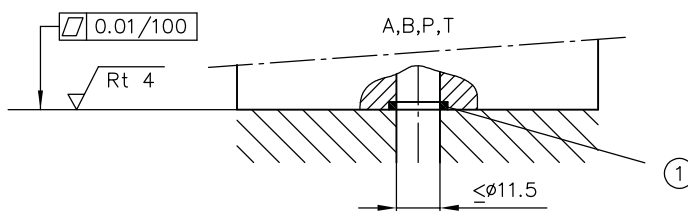
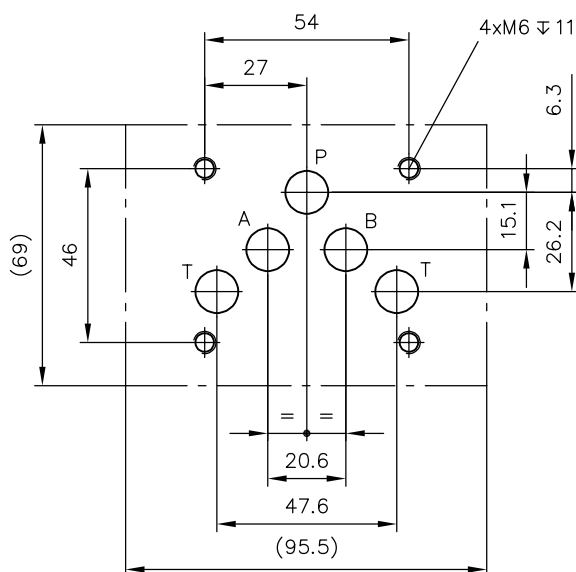
Base plate according to ISO 4401-03 or DIN 24 340-A6



1 Sealing for ports A, B, P, T: O-ring 9.25x1.78 NBR 90 Sh

SWPM 10

Base plate according to ISO 4401-05 or Hydraulic valves – hole patterns and connection plates



1 Sealing for ports A, B, P, T: O-ring 12.42x1.78 NBR 90 Sh

Observe the document B 5488 "General operating instructions for assembly, commissioning, and maintenance."

5.1 Intended use

This product is intended exclusively for hydraulic applications (fluid technology).

The user must observe the safety measures and warnings in this document.

Essential requirements for the product to function correctly and safely:

- ▶ All information in this documentation must be observed. This applies in particular to all safety measures and warnings.
- ▶ The product must only be assembled and put into operation by specialist personnel.
- ▶ The product must only be operated within the specified technical parameters described in detail in this document.
- ▶ All components must be suitable for the operating conditions when using an assembly.
- ▶ The operating instructions for the components, assemblies and the specific complete system must also always be observed.

If the product can no longer be operated safely:

1. Remove the product from operation and mark it accordingly.
 - ✓ It is then not permitted to continue using or operating the product.

5.2 Assembly information

The product must only be installed in the complete system with standard and compliant connection components (screw fittings, hoses, pipes, fixtures etc.).

The product must be shut down correctly prior to disassembly (in particular in combination with hydraulic accumulators).

DANGER

Sudden movement of the hydraulic drives when disassembled incorrectly

Risk of serious injury or death

- ▶ Depressurise the hydraulic system.
- ▶ Perform safety measures in preparation for maintenance.

5.3 Operating instructions

Observe product configuration and pressure/flow rate.

The statements and technical parameters in this document must be strictly observed.

The instructions for the complete technical system must also always be followed.

NOTICE

- ▶ Read the documentation carefully before usage.
- ▶ The documentation must be accessible to the operating and maintenance staff at all times.
- ▶ Keep documentation up to date after every addition or update.

CAUTION

Overloading components due to incorrect pressure settings.

Risk of minor injury.

- Pay attention to the maximum operating pressure of the pump, valves and fittings.
- Always monitor the pressure gauge when setting and changing the pressure.

Purity and filtering of the hydraulic fluid

Fine contamination can significantly impair the function of the product. Contamination can cause irreparable damage.

Examples of fine contamination include:

- Swarf
- Rubber particles from hoses and seals
- Dirt due to assembly and maintenance
- Mechanical debris
- Chemical ageing of the hydraulic fluid

! NOTICE

New hydraulic fluid from the manufacturer may not have the required purity.

Damage to the product is possible.

- ▶ Filter new hydraulic fluid to a high quality when filling.
- ▶ Do not mix hydraulic fluids. Always use hydraulic fluid that is from the same manufacturer, of the same type, and with the same viscosity properties.

For smooth operation, pay attention to the cleanliness level of the hydraulic fluid (cleanliness level [see Chapter 3, "Parameters"](#)).

Additionally applicable document: [D 5488/1](#) Oil recommendations

5.4 Maintenance information

Check regularly (at least once a year) by visual inspection whether the hydraulic connections are damaged. If external leakages are found, shut down and repair the system.

Clean the surface of the device regularly (at least once a year) (dust deposits and dirt).

6 Other information

6.1 Accessories, spare and individual parts

To purchase spare parts, please see [HAWE Hydraulik interactive contact map](#).

Line connectors

Version	Order coding	
Line connector (black)	MSD 3-309	6217 0002-00
Line connector (grey)	MSD 3-309 gr	6217 0003-00
Line connector with LED	SVS 3129020	6217 8024-00
Line connector with LED, 5 m cable	L5K	6217 8088-00
Line connector with LED, 10 m cable	L10K	6217 8090-00
Line connector with clamp diode	MSD 3-209 C1	6236 5002-00

Cylinder screws

M5x30-8.8 - ISO 4762	6005 0174-00
M6x40-8.8 - ISO 4762	6005 0233-00

Sealing

O-ring 9.25x1.78 NBR 90 Sh	6096 9276-00
O-ring 12.42x1.78 NBR 90 Sh	6096 9196-00

References

Additional versions

- Directional spool valve type NSWP 2: D 7451 N
- Directional seated valve type NBVP 16: D 7765 N
- Clamping module type NSMD: D 7787
- Intermediate plate type NZP: D 7788 Z
- Directional spool valve type SWPA: D 6450/1
- Proportional directional valve type SWPL D 6394/1
- Proportional directional valve type SWPH D 6418/1

Application

- Valve bank (nominal size 6) type BA: D 7788
- Press control systems type MPLM: D 6334
- Press control systems type SAKB: D 6335
- Press control systems type SAMB, SAPB: D 6336
- Press control systems type SPLM: D 6337
- Press control systems type SPVM: D 6338
- Hydraulic power pack type H 650: D 6346
- Scissor systems type CSB: D 6538

