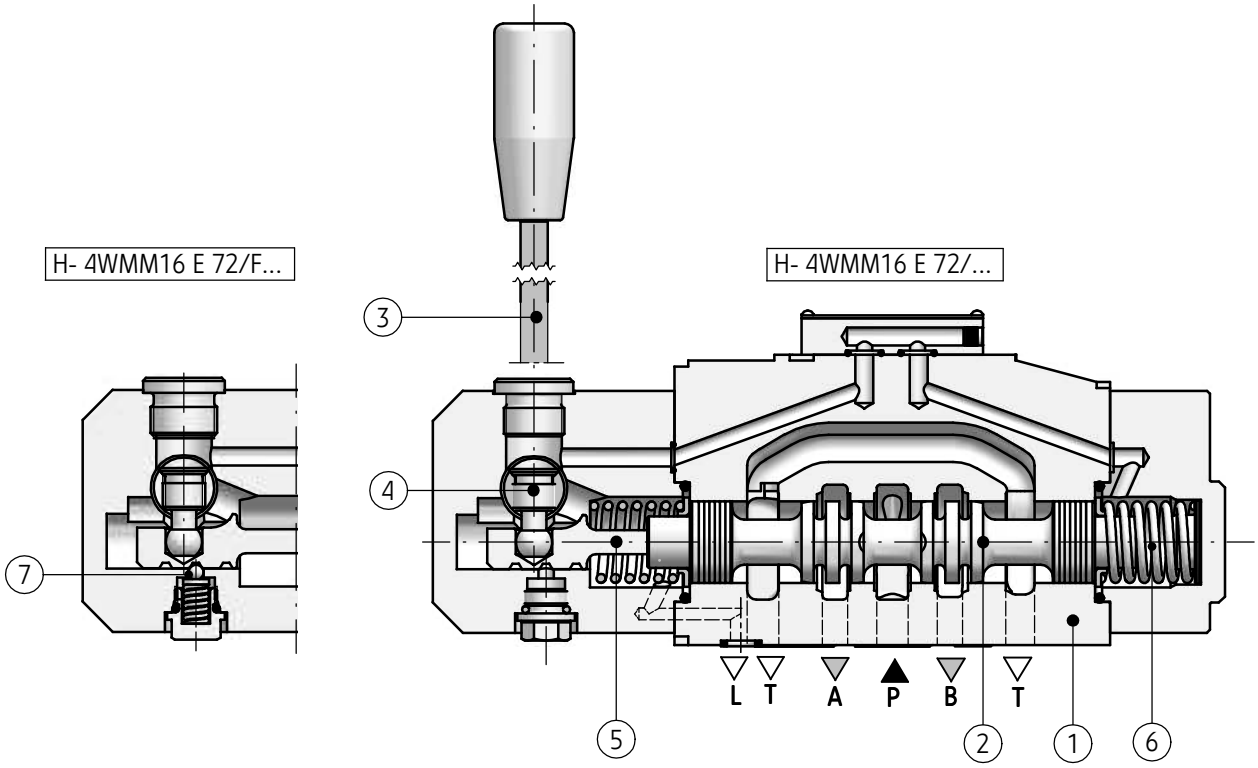
PONAR wadowice	Directional spool valve type WMM16 hand lever operated			WK 499 800
	NS16	up to 35 MPa	up to 240 dm^3/min	02.2011

APPLICATION

Directional spool valves type **WMM16...** hand lever operated are intended to change the direction of fluid flow in a system and thus allow to change direction of movement of a receiver - mostly piston rod of a cylinder or hydraulic motor as well to use functions: *on* and *off*. These directional spool valves are used for subplate mounting in any position in a hydraulic system.

DESCRIPTION OF OPERATION



Main bore and annular ports **P**, **T**, **A**, **B** are made in the housing (1) and are connected to plate connection. Directional valve is switched by shifting the spool (2) to end position. Various control functions are dependent on shape of the spool (2), which affects the change in configuration of connections among ports **P**, **T**, **A**, **B** in the housing (1). Sealing between mounting surface of the valve and subplate is assured by sealing rings. The spool (2) is shifted as a result of changing position of the hand lever (3), through the pin (4) and the plunger (5). The spool (2) return into starting position is caused by the springs (6) – versions ...WMM16.../**...** or the spool (2) is positioned by means of the detent (7) – versions ...WMM16.../**F**. 3-position directional valves can be equipped with spool end positions monitor – versions ...WMM16.../...**19**... (**contact breaker**) or ...WMM16.../...**23**... (**contact maker**).

TECHNICAL DATA

Hydraulic fluid	mineral oil	
Required filtration	**up to 16 µm**	
Recommended filtration	up to 10 µm	
Nominal fluid viscosity	37 mm ^{2}/s at temperature 55 °C	
Viscosity range	2,8 up to 380 mm ^{2}/s	
Fluid temperature range (in a tank)	recommended	40 °C up to 55 C
	max	-20 °C up to +70 C
Ambient temperature range	-20 °C up to +70 °C	
Maximum operating pressure	**ports P, A, B**	**35 MPa**
	port T	**25 MPa**
Type of sensors	**two PNP inductive proximity sensors**: **normally closed - NC** (contact breaker) + **normally opened - NO** (contact maker)	
Supply voltage	**10 - 30V DC**	
Max load current	**200 mA**	
Connection type of sensor	sensor with **M12x1 external thread**, **male connection**	
Connection type of conductor	plug with **M12 x 1 internal thread**, **female plug** configuration of connection according to **PN-EN-61076 -2-101**	
External diameter of conductor	**ϕ 2,5 - 6,5 mm** (PG7)	
Insulation	**IP 68**	
Required operating force	version with springs centering	~75 N
	version with detent positioning	~40 N
Weight	7,5 kg	

ACCESSORIES

End position monitor

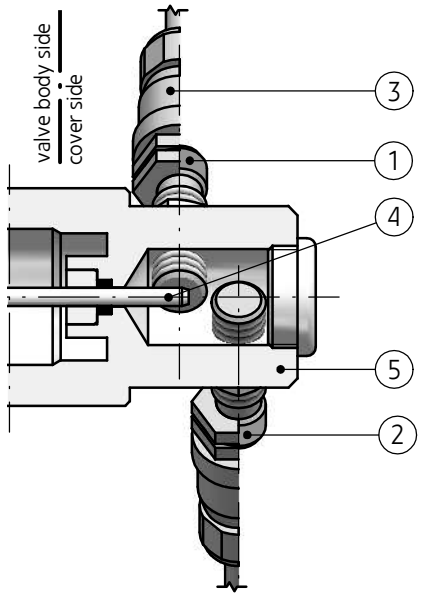
Directional valve type **4WMM16...72/...** - only in 3-position version – may be equipped with spool end position monitor, optionally contact maker or contact breaker, mounted in the valve cover on valve end B – versions: 4WMM16...72/...**19**... (**contact breaker**); ...**23**... (**contact maker**) - overall dimensions on page 5. Detailed information concerning proximity sensors and plug-in connectors are given on page 5.

signal level	**end position monitor with contact breakers** (versions 4WMM16.../...**19**...)			**end position monitor with contact makers** (versions 4WMM16.../...**23**...)		
	spool position			spool position		
	valve body side	central	cover side	valve body side	central	cover side
sensor (1) valve body side	0	1	1	1	0	0
sensor (2) cover side	1	1	0	0	0	1

ACCESSORIES

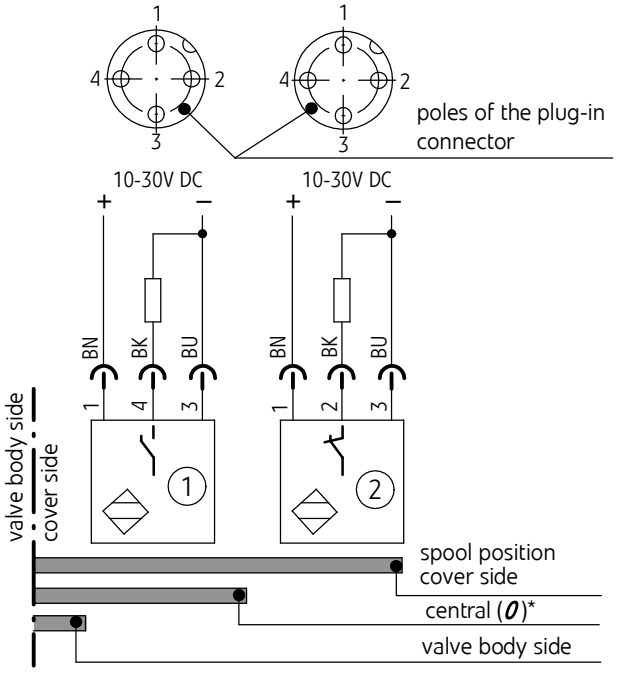
End position monitor

...4WMM16...**72**/...**19**...



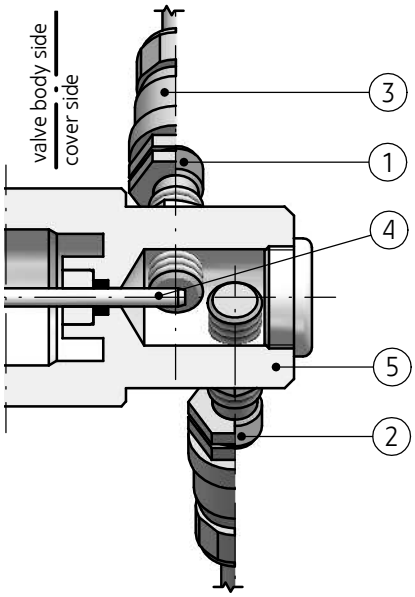
1 - Inductive sensor contact maker **PNP NO**
according to page 4
2 - Inductive sensor contact breaker **PNP NC**
according to page 4
3 - Plug-in cable connector (straight, female plug-in connectors - according to page 2 - 2 pcs delivered with the valve
4 - Mandrel of the main spool
5 - Sensors cover

scheme of electrical connection of sensors set contact breaker



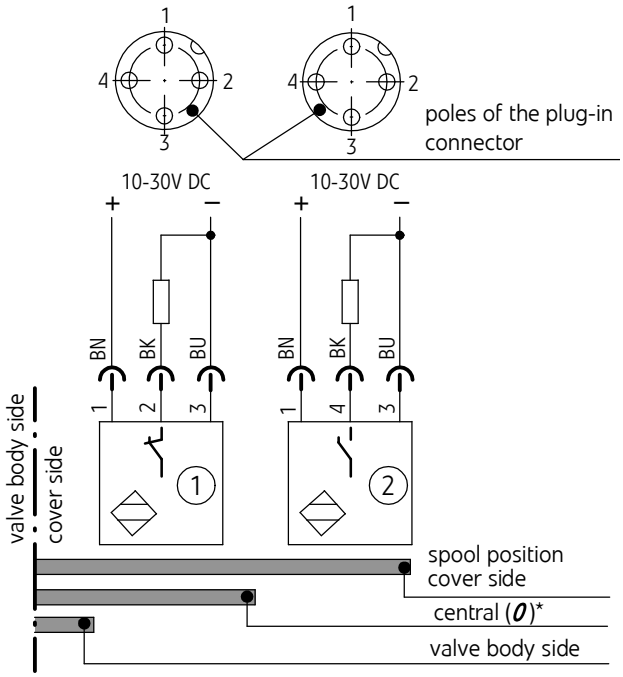
NOTE:
(*) - Only for 3-position directional valves

...4WMM16...**72**/...**23**...



1 - Inductive sensor contact breaker **PNP NC**
according to page 4
2 - Inductive sensor contact maker **PNP NO**
according to page 4
3 - Plug-in cable connector (straight, female plug-in connectors - according to page 2 - 2 pcs delivered with the valve
4 - Mandrel of the main spool
5 - Sensors cover

scheme of electrical connection of sensors set contact maker

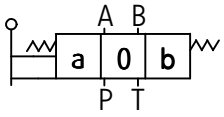


NOTE:
(*) - Only for 3-position directional valves

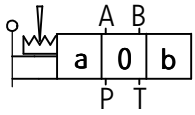
SCHEMES

Graphic symbols for 3-position directional valves

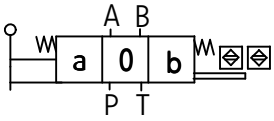
WMM16...7X/**...**



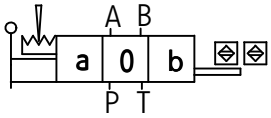
WMM16...7X/**F**...



WMM16...7X/...**19**...
WMM16...7X/...**23**...

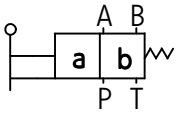


WMM16...7X/**F 19**...
WMM16...7X/**F 23**...

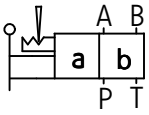


Graphic symbols for 2-position directional valves

WMM16...7X/**...**

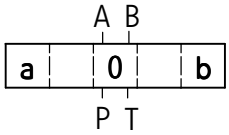


WMM16...7X/**F**...

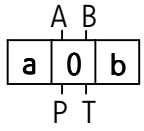


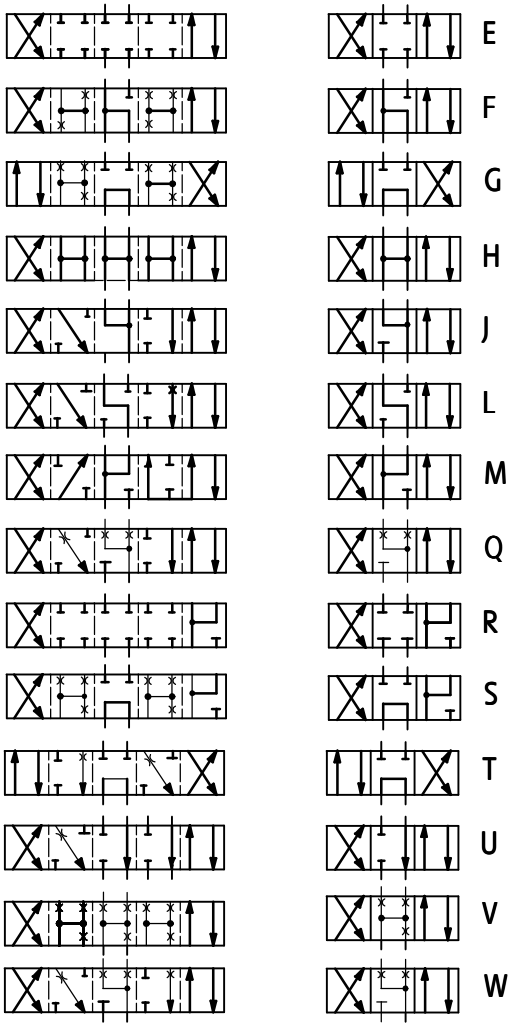
Graphic symbols for spools

working and indirect positions

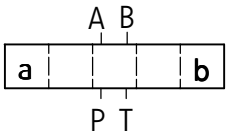


working positions

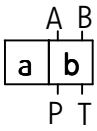


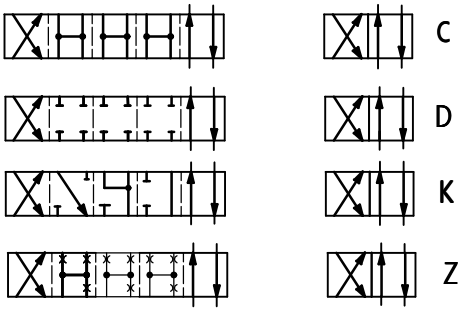


working and indirect positions



working positions





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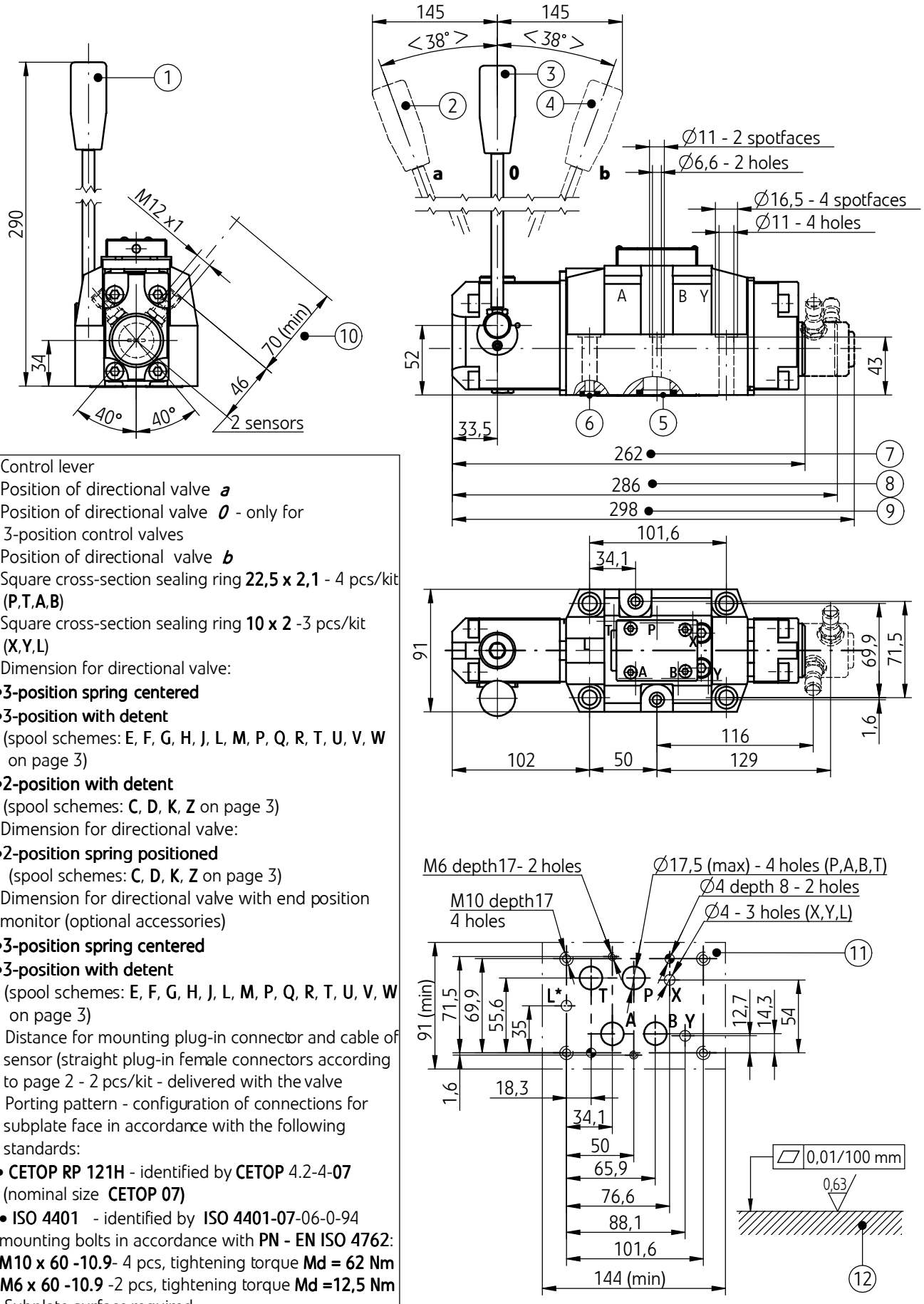


1 - Control lever
2 - Position of directional valve ***a***
3 - Position of directional valve ***0*** - only for 3-position control valves
4 - Position of directional valve ***b***
5 - Square cross-section sealing ring **22,5 x 2,1** - 4 pcs/kit (**P**,**T**,**A**,**B**)
6 - Square cross-section sealing ring **10 x 2** -3 pcs/kit (**X**,**Y**,**L**)
7 - Dimension for directional valve:
- **3-position spring centered**
- **3-position with detent**

(spool schemes: **E**, **F**, **G**, **H**, **J**, **L**, **M**, P, Q, R, T, **U**, V, **W** on page 3)
- **2-position with detent**

(spool schemes: **C**, **D**, **K**, **Z** on page 3)

8 - Dimension for directional valve:
- **2-position spring positioned**

(spool schemes: **C**, **D**, **K**, **Z** on page 3)

9 - Dimension for directional valve with end position monitor (optional accessories)
- **3-position spring centered**
- **3-position with detent**

(spool schemes: **E**, **F**, **G**, **H**, **J**, **L**, **M**, P, Q, R, T, **U**, V, **W** on page 3)

10 - Distance for mounting plug-in connector and cable of sensor (straight plug-in female connectors according to page 2 - 2 pcs/kit - delivered with the valve
11 - Porting pattern - configuration of connections for subplate face in accordance with the following standards:
- **CETOP RP 121H** - identified by **CETOP** 4.2-4-**07** (nominal size **CETOP 07)**
- **ISO 4401** - identified by **ISO 4401-07**-06-0-94

mounting bolts in accordance with **PN - EN ISO 4762**:
M10 x 60 -10.9- 4 pcs, tightening torque **Md = 62 Nm**
M6 x 60 -10.9 -2 pcs, tightening torque **Md =12,5 Nm**
12 - Subplate surface required

PERFORMANCE CURVES

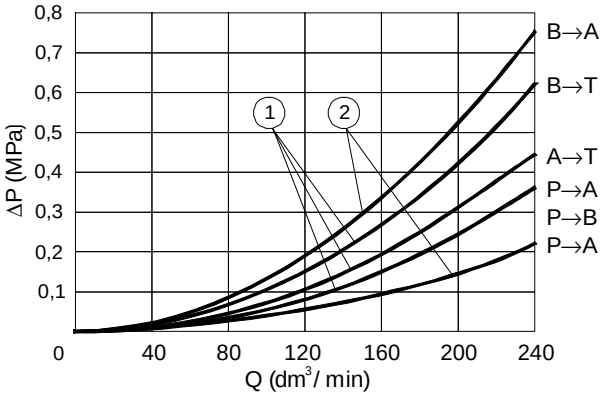
measured at viscosity $\nu = 41\ mm^2/s$ and temperature $t = 50^{\circ}C$

Pressure resistance curves

Performance curves **Δp (Q)** for directional valves type **4WMM16...** with spools **E** and **R**

1 - spools: **E**, **R**

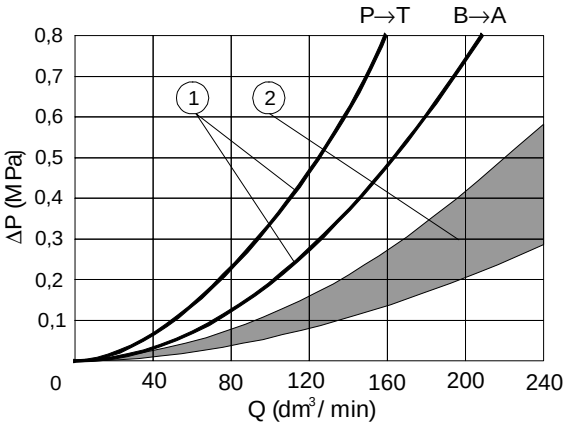
2 - spool **R**- flow direction **P→A** and **B → A**



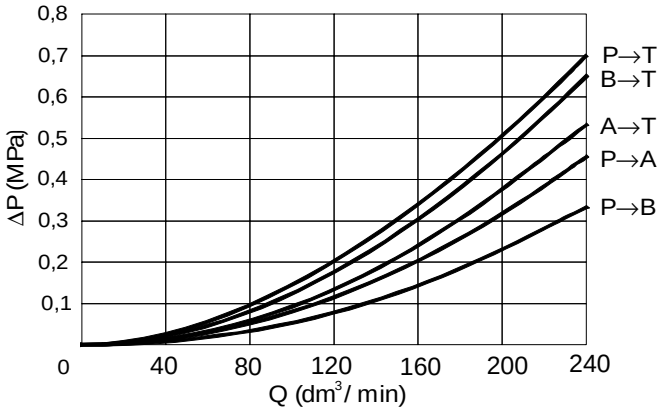
Performance curves **Δp (Q)** for directional valves type **4WMM16...** with spools: **F**,**H**,**J**,**L**,**M**,**Q**,**S**,**U**,**V**,**W**,**C**,**D**,**K**,**Z**

1 - spool **S**

2 - spools: **F**, **H**, **J**, **L**, **M**, **Q**, **U**, **V**, **W**, **C**, **D**, **K**, **Z**



Performance curves **Δp (Q)** for directional valves type **4WMM16...** with spools **G** and **T**



Flow limits

2 and 3-position spring centered directional valves					
spool type	pressure **p** [MPa]				
	7	14	21	28	35
	flow rate **Q** [dm³/ min]				
E, J, L, M ,Q, R, U V, W, C, D, K, Z	240	240	205	180	170
F	200	145	115	100	90
G, H, S, T	220	160	130	110	100
2 and 3-position directional valves with detent					
spool type	pressure **p** [MPa]				
	7	14	21	28	35
	flow rate **Q** [dm³/ min]				
all spools	240	240	240	240	240

HOW TO ORDER

H	–	4	WMM	16			/	–			*

Version
high pressure up to 35 MPa = **H**

Number of service ports
4 = ***4***

Nominal size (NS)
NS16 = **16**

Spool type
spool types - **on page 4**

Series number
(70-79) - installation and connection dimensions unchanged = 7X
series 72 = **72**

Spool centering/positioning
by means of springs = **no designation**
by means of detent = F

Accessories (applicable only to 3-position directional spool valves)
without accessories = **no designation**
end position monitor cotact breaker on valve end B = 19
end position monitor cotact maker on valve end B = 23

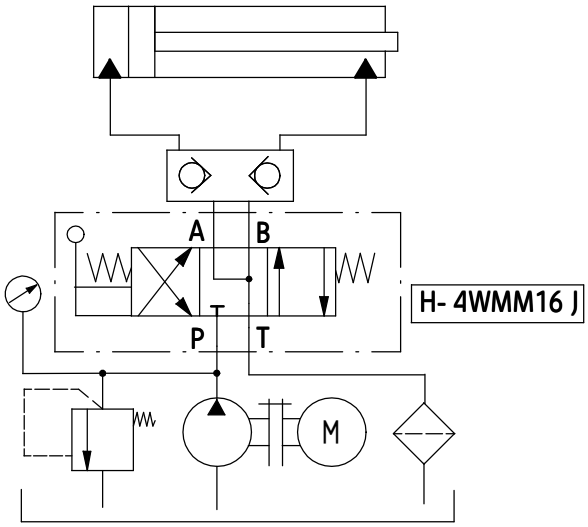
Sealing
NBR (for fluids on mineral oil base) = **no designation**
FKM (for fluids on phosphate ester base) = V

Further requirements in clear text (to be agreed with the manufacturer)

NOTES:

The directional spool valve should be ordered according to the above coding.
The symbols in bold are preferred versions in short delivery time.
Coding example: H -4 WMM16 E 72

EXAMPLE OF APPLICATION IN HYDRAULIC SYSTEM



SUBPLATES AND MOUNTING BOLTS

Subplates must be ordered according to data sheet **WK 450 788**. Subplate types:

G174/01	- threaded connections	**P, T, A, B** -	**G 1**
		X, Y ,L -	**G1/4**
G174/02	- threaded connections	P, T, A, B -	M33 x 2
		X, Y ,L -	M14 x 1,5
G172/01	- threaded connections	P, T, A, B -	G3/4
		X, Y, L -	G1/4
G172/02	- threaded connections	P, T, A, B -	M27 x 2
		X, Y ,L -	M14 x 1,5

Subplates and bolts for mounting directional spool valve in accordance with **PN - EN ISO 4762**:
M10 x 60 -10,9 - 4 pcs/kit
M 6 x 60 -10.9 - 2 pcs/kit
must be ordered separately.
Tightening torques for bolts:
M10 x 60 - Md = 62 Nm
M 6 x 60 - Md = 12,5 Nm

NOTE:
Subplate symbols in bold are preferred versions in short delivery time.

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