PONAR wadowice	**Directional spool valve types** **WMM10 hand lever operated** **WMD10 rotary knob operated** **WMR10 roller operated** **WH10 hydraulically operated**			**WK 430 700**
	NS10	**up to 35 MPa**	**up to 160 dm³/min**	04.2017

DATA SHEET - OPERATION MANUAL

APPLICATION

Directional spool valves are intended for change in direction of fluid flow in a hydraulic system and thus it allows 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*.
Directional spool valves can be made in differently operated design versions:

- hand lever operated type **WMM10**
- rotary knob operated type **WMD10**
- roller operated type **WMR10**
- hydraulically operated type **WH10**

The directional valves are intended for subplate mounting in any position in hydraulic system.

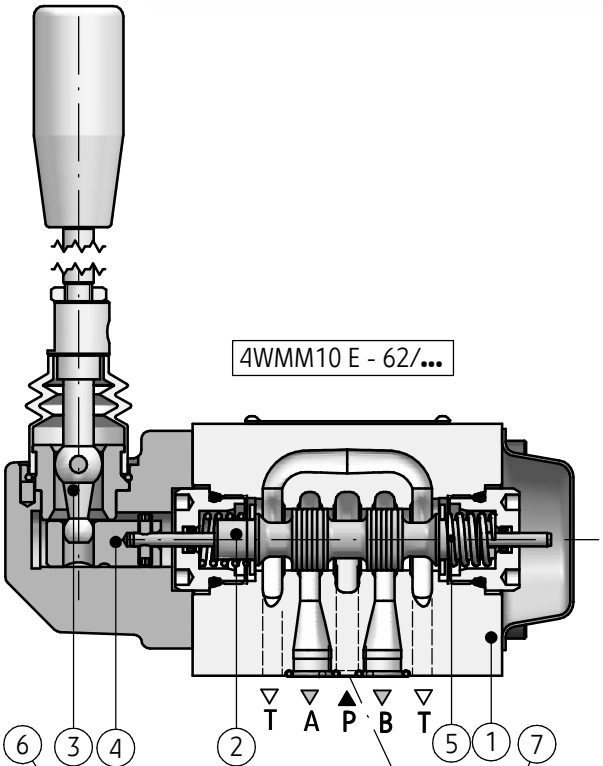
DESCRIPTION OF OPERATION

General information

Main bore and annular ports **P**, **T**, **A**, **B** are made in the housing (1) and connected to its subplate connection. Directional valve is switched by shifting the spool (2) into one end position. Various control functions result from the shape of control spool (2) which affects the change in configuration of the connections between ports **P**, **T**, **A** and **B** in the housing (1).

Directional spool valve - hand lever operated type WMM10

The spool (2) is shifted by changing the position of hand lever (3) by means of the pin (4). The spool return (2) to its rest position is secured by centering springs (5) - version WMM10…/**...** . Positions of the spool can be fixed by means of the detent (6) as well - version …WMM10…/**F**. Directional spool valve may be provided with the orifice (7) placed in port **P** - version …WMM10…/…**B**.



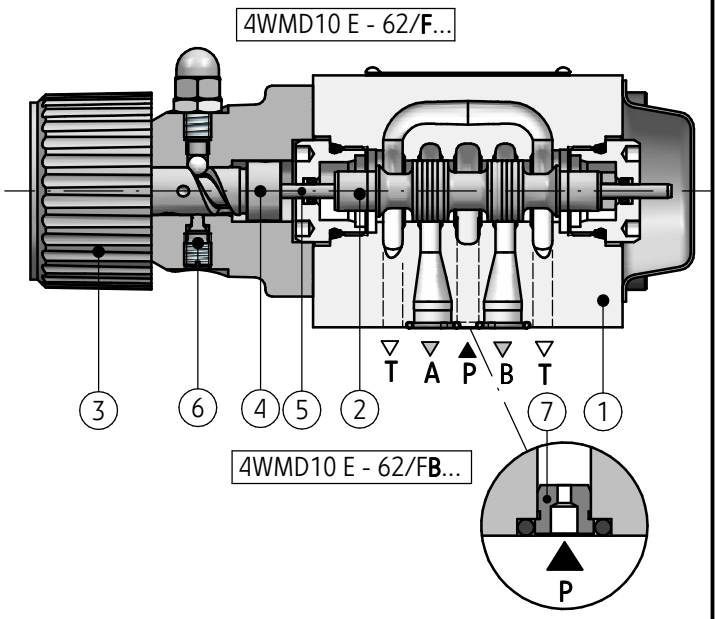
4WMM10 E - 62/**F**...

4WMM10 E - 62/...**B**...

DESCRIPTION OF OPERATION

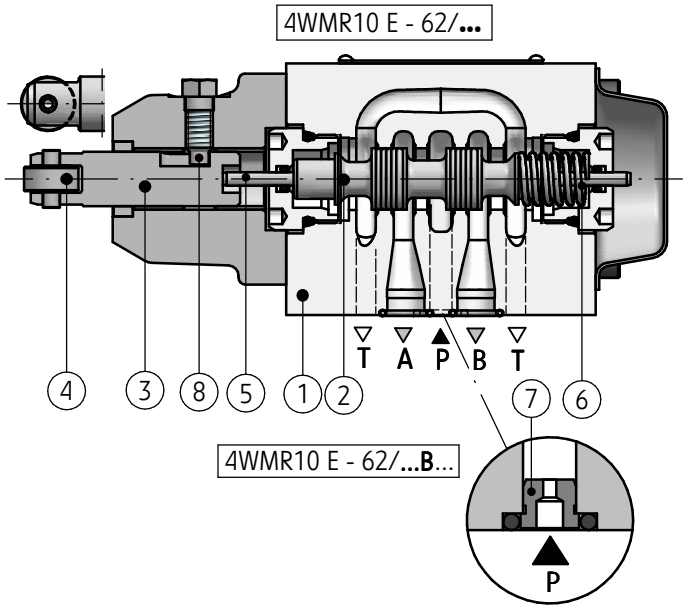
Directional spool valves - rotary knob operated type WMD10

The spool (2) is shifted by means of rotary knob (3) through the spindle (4) and by means of the plunger (5). The spool is positioned by means of detent (6) - WMD10…/**F**. Directional spool valve may be provided with orifice (7) placed in port **P** - version WMD10…/F**B**.



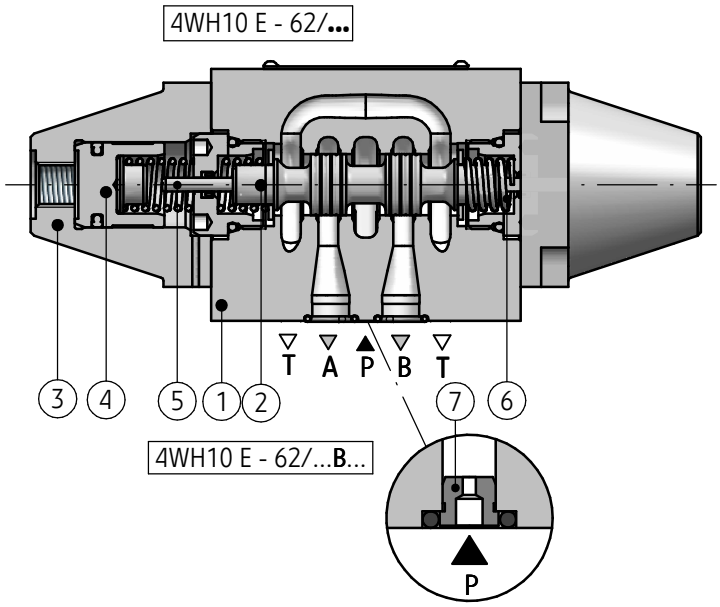
Directional spool valve - roller operated type WMR10

The spool (2) is shifted by means of the pin (3) with the roller (4) at the end of pin, through the plunger (5). Spool return (2) to its rest position is secured by the spring (6) - version WMR10…/**...**. The roller (4) may be mounted horizontally or vertically. The change of position is secured by rotating the pin (3) with roller (4). Screw (8) serves to fix position of the pin (3). Directional spool valve may be provided with orifice (7) placed in port **P** - version WMR…/…**B**.



Directional spool valve - hydraulically operated type WH10

The spool (2) is shifted by means of the pressure supplied to connections of the caps (3) and thus it allows to move spools (4) and plunger (5). Spool return (2) and its centering in neutral position (3-position directional valves) is secured by the springs (6) - version …WH10…/**...** or fixing end positions of the spool (2-position directional valves) is secured hydraulically (with oil pressure) - version WH6…/**O**… or by means of detent - version WH6…/**OF**. Directional spool valve may be provided with orifice (7) placed in port **P** - version WH6…/…**B**.



TECHNICAL DATA

Hydraulic fluid	mineral oil							
Required fluid cleanliness class	ISO 4406 class 20/18/15							
Nominal fluid viscosity	37 mm ^{2}/s at temperature 55 ^{o}C							
Viscosity range	2,8 up to 380 mm ^{2}/s							
Fluid temperature range (in a tank)	recommended	40^{o}C up to 55^{o}C						
	max	-20^{o}C up to +70^{o}C						
Ambient temperature range	- 20^{o}C up to +70^{o}C							
Features	**type WMM10**		**type WMD10**		**type WMR10**		**type WH10**	
Max operating pressure	ports		ports		ports		ports	
	P, A, B	T	P, A, B	T	P, A, B	T	P, A, B	T
	35 MPa	16 MPa	35 MPa	16 MPa	35 MPa	16 MPa	35 MPa	16 MPa
Control pressure	—		—		—		min 0,5 MPa max 6,0 MPa	
Switching force	spring centering 20 - 27 N positioned with detent 16 - 23 N		—		2-position version 70 -120 N 3-position version 70 -160 N		—	
Tightening torque of rotary knob	—		70 - 135 Ncm		—		—	
Max angle of control cam	—		—		30°		—	
Weight	4 kg		3,7 kg		3,6 kg		version with 2 control ports 3,8 kg version with 1 control port 3,4 kg	
Flow section in *0* (central) position; diagrams acc. to pages 4, 6, 7, 8	spool type		Q		W		V	
	flow direction		A → T B → T		A → T B → T		A → T B → T	P → A P → B
	flow section		5,5 mm^2		2,5 mm^2		11 mm^2	10 mm^2

INSTALLATION AND OPERATION REQUIREMENTS

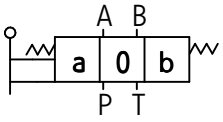
1. Only fully functional and operational directional valve must be used.
2. During the period of operation must be kept fluid viscosity acc. to requirements defined in this Data Sheet - Operation Manual
3. In order to ensure failure free and safe operation the following must be checked:
   - proper working of the directional valve
   - cleanliness of the hydraulic fluid
4. Due to heating of directional valve body to high temperature, the valve shall be placed in such way to eliminate the risk of accidental contact with the valve body during operation or to apply suitable covers acc. to European standards PN - EN ISO 13732 - 1 and PN - EN 4413
5. In order to provide tightness of the directional valve connection to the hydraulic system, one should keep the dimensions of the sealing rings, tightening torques and operating parameters of the directional valve, specified in this Data Sheet - Operation Manual.
6. A person that operates the directional valve must be thoroughly familiar with this Data Sheet - Operation Manual.

DIAGRAMS

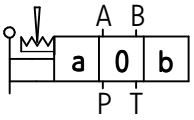
type WMM10...

Graphic symbols of 3-position directional spool valves

WMM10.../**...**



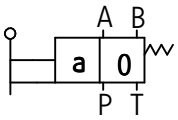
WMM10.../**F**...



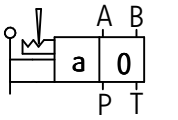
Graphic symbols of 2-position directional spool valves

versions with positions **a**, **0**

WMM10...**A**.../...

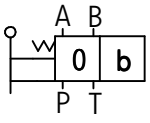


WMM10...**A**.../**F**...

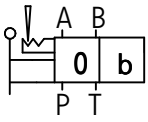


versions with positions **0**, **b**

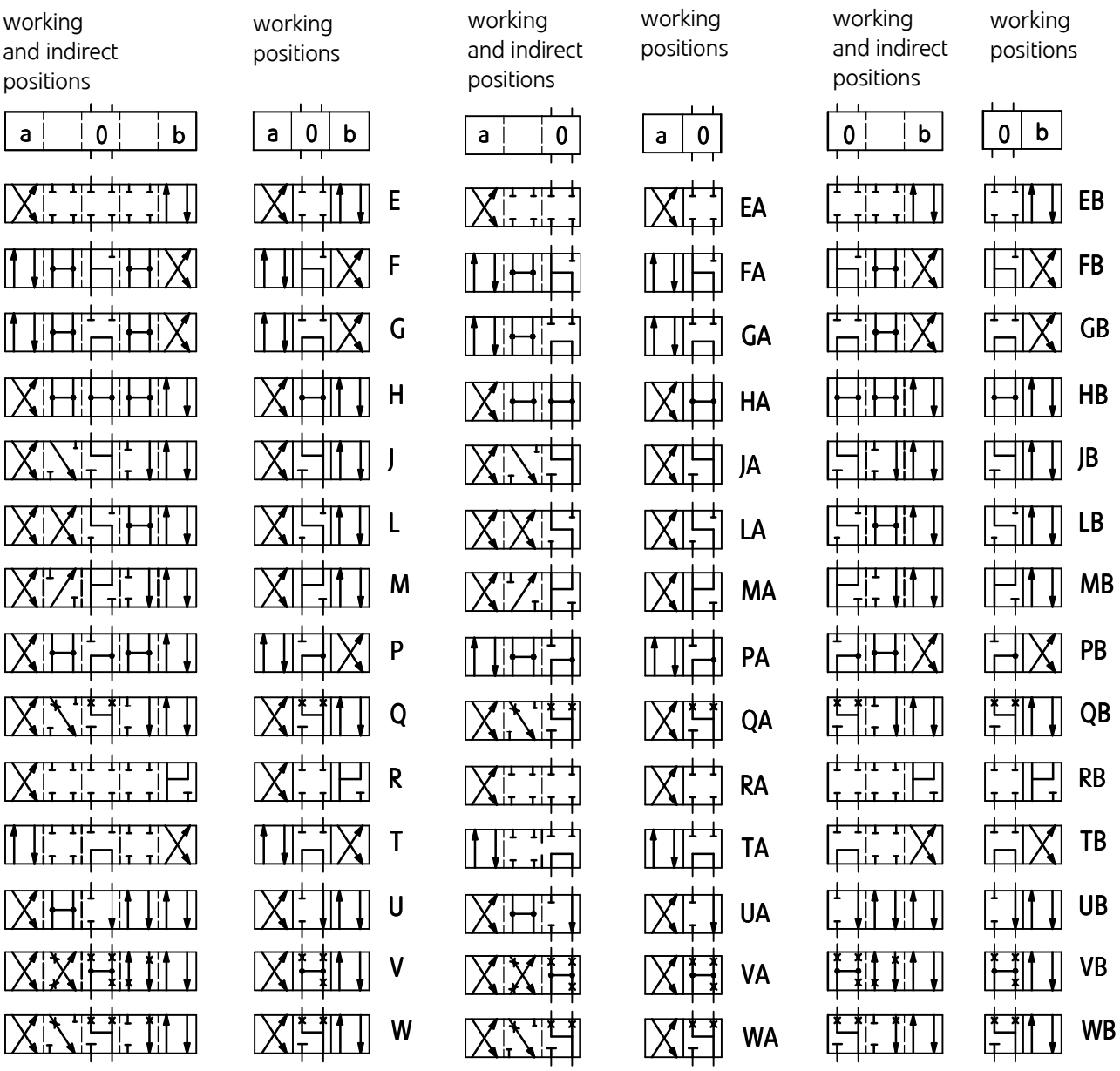
WMM10...**B**.../...



WMM10...**B**.../**F**...



Graphic symbols of spools



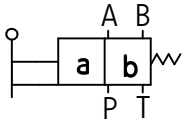
NOTE:
Flow sections in ***0*** (central) position for spools:
Q, **W**, **V** according to technical data on page 3

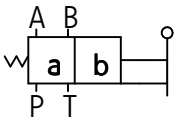
DIAGRAMS

type WMM10...

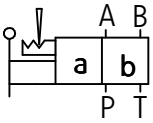
Graphic symbols of 2-position directional spool valves

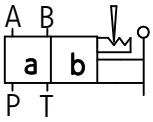
WMM10.../**...**





WMM10.../**F**...

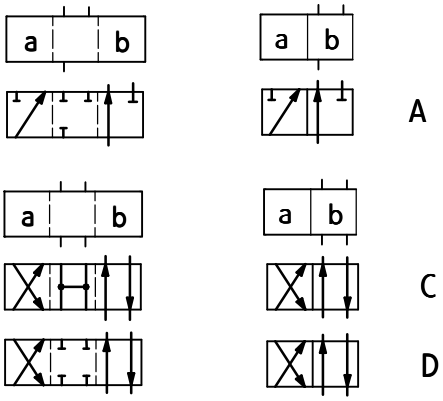




Graphic symbols of spools

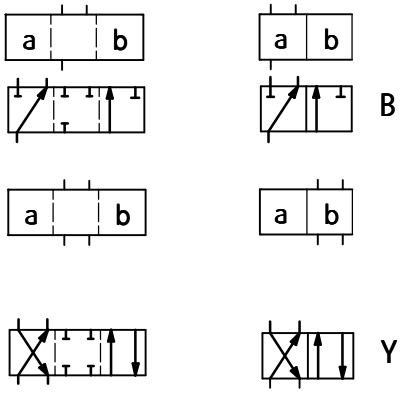
working and indirect positions

working positions



working and indirect positions

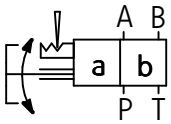
working positions



type WMD10...

Graphic symbols of 2-position directional spool valves

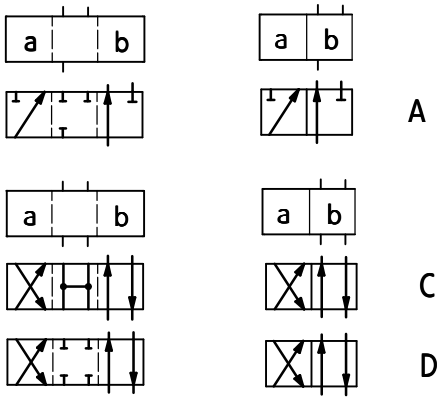
WMD10.../F...



Graphic symbols of spools

working and indirect positions

working positions

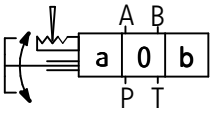


DIAGRAMS

type WMD10...

Graphic symbols of 3-position directional spool valves

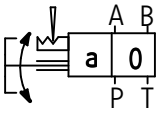
WMD10.../F...



Graphic symbols of 2-position directional spool valves

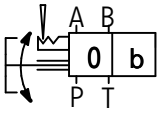
versions with positions **a**, **0**

WMD10...**A**.../F...

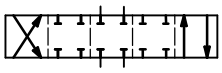
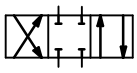
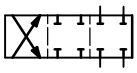
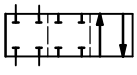
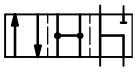
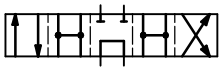
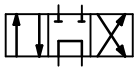
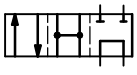
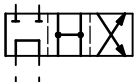
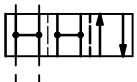
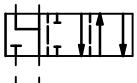
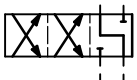
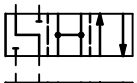
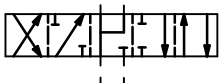
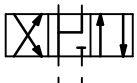
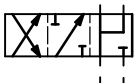
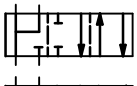
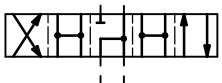
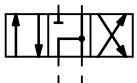
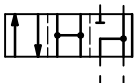
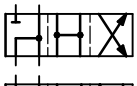
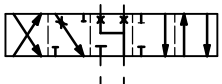
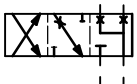
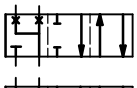
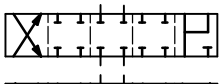
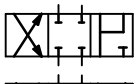
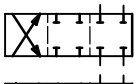
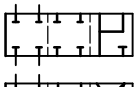
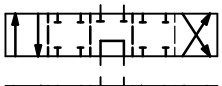
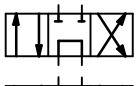
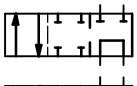
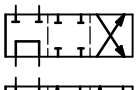
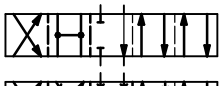
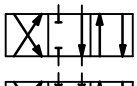
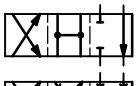
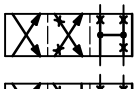
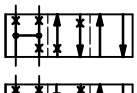
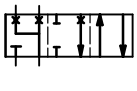


versions with positions **0**, **b**

WMD10...**B**.../F...



Graphic symbols of spools

working and indirect positions	working positions		working and indirect positions	working positions		working and indirect positions	working positions	
a 0 b	a 0 b		a 0	a 0		0 b	0 b	
		E			EA			EB
		F			FA			FB
		G			GA			GB
		H			HA			HB
		J			JA			JB
		L			LA			LB
		M			MA			MB
		P			PA			PB
		Q			QA			QB
		R			RA			RB
		T			TA			TB
		U			UA			UB
		V			VA			VB
		W			WA			WB

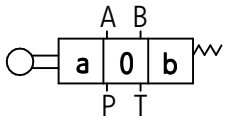
NOTE:
Flow sections in ***0*** (central) position for spools:
Q, **W**, **V** according to technical data on page 3

DIAGRAMS

type WMR10...

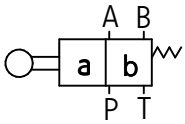
Graphic symbols of 3-position directional spool valves

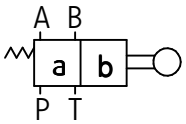
WMR10...



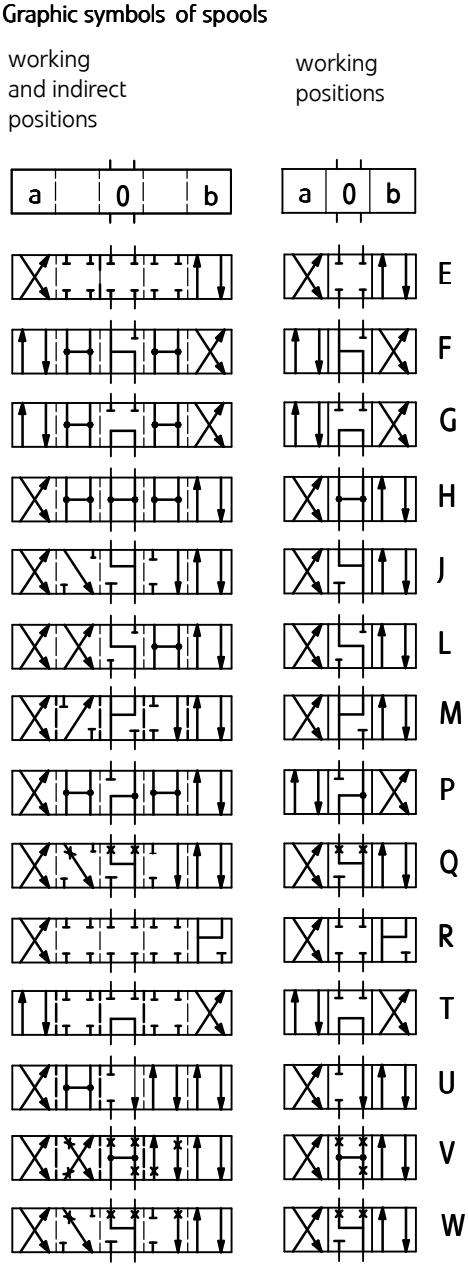
Graphic symbols of 2-position directional spool valves

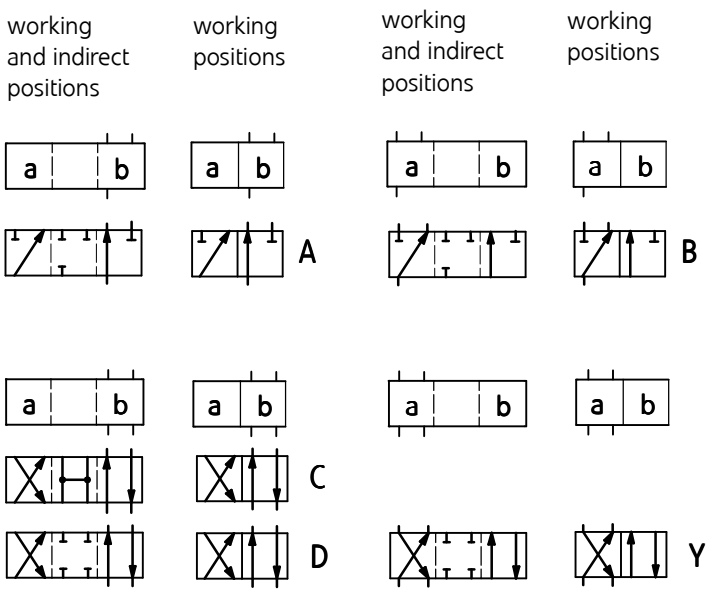
WMR10...





Graphic symbols of spools





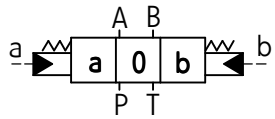
NOTE:
Flow sections in *0* (central) position for spools:
Q, **W**, **V** according to technical data on page 3

DIAGRAMS

type WH10...

Graphic symbols of 3-position directional spool valves

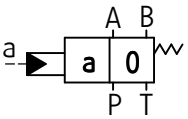
WH10.../...



Graphic symbols of 2-position directional spool valves

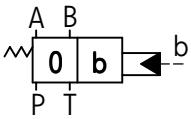
versions with positions **a**, **0**

WH10...**A**/...



versions with positions **0**, **b**

WH10...**B**/...



Graphic symbols of spools

working and indirect positions	working positions		working and indirect positions	working positions		working and indirect positions	working positions	
a 0 b	a 0 b		a 0	a 0		0 b	0 b	
		E			EA			EB
		F			FA			FB
		G			GA			GB
		H			HA			HB
		J			JA			JB
		L			LA			LB
		M			MA			MB
		P			PA			PB
		Q			QA			QB
		R			RA			RB
		T			TA			TB
		U			UA			UB
		V			VA			VB
		W			WA			WB

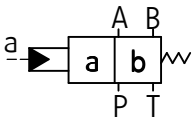
NOTE:
Flow sections in *0* (central) position for spools:
Q, **W**, **V** according to technical data on page 3

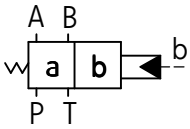
DIAGRAMS

type WH10...

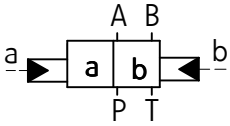
Graphic symbols of 2-position directional spool valves

WH10.../**...**

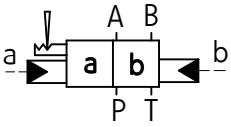




WH10.../**O**...

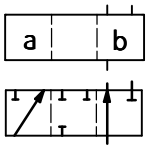


WH10.../**OF**...

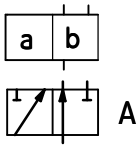


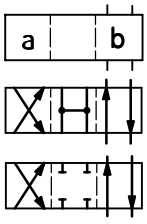
Graphic symbols of spools

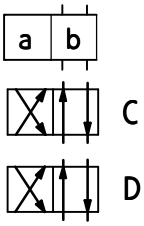
working and indirect positions



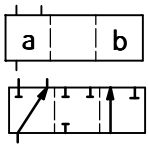
working positions

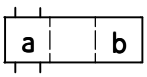


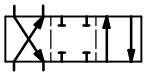




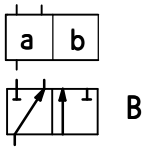
working and indirect positions

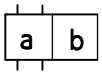


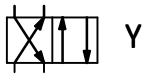




working positions

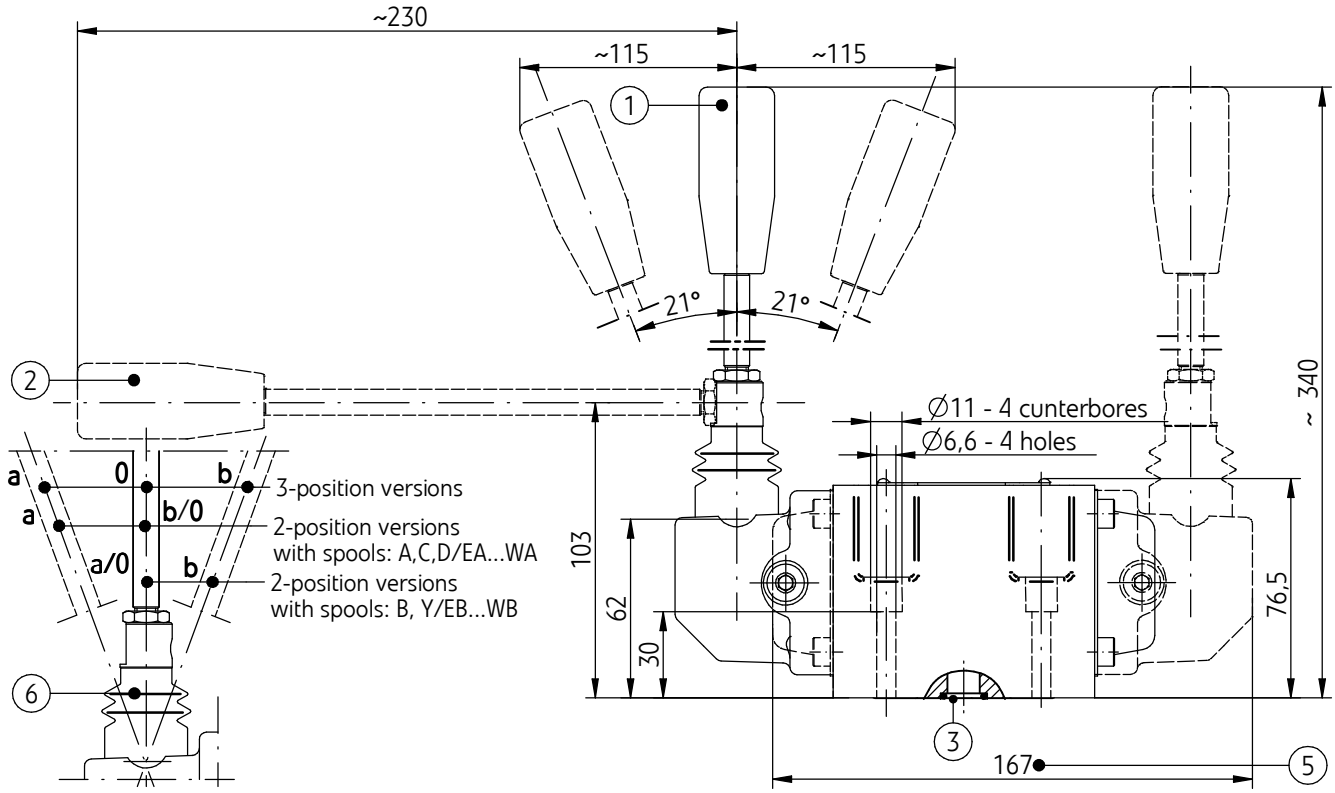


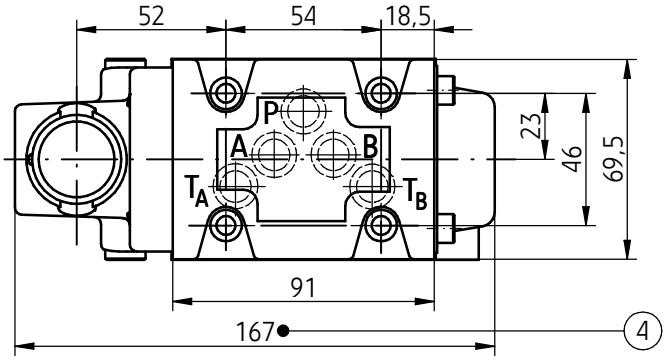


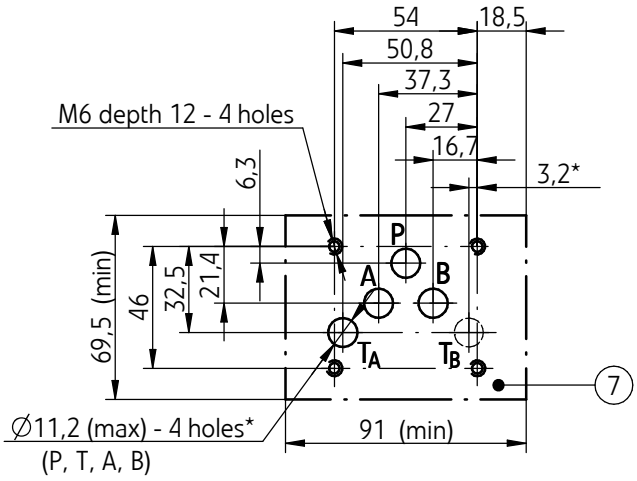


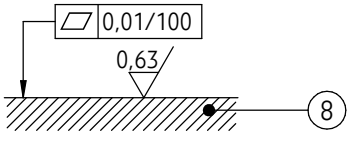
OVERALL AND CONNECTION DIMENSIONS

type WMM10...









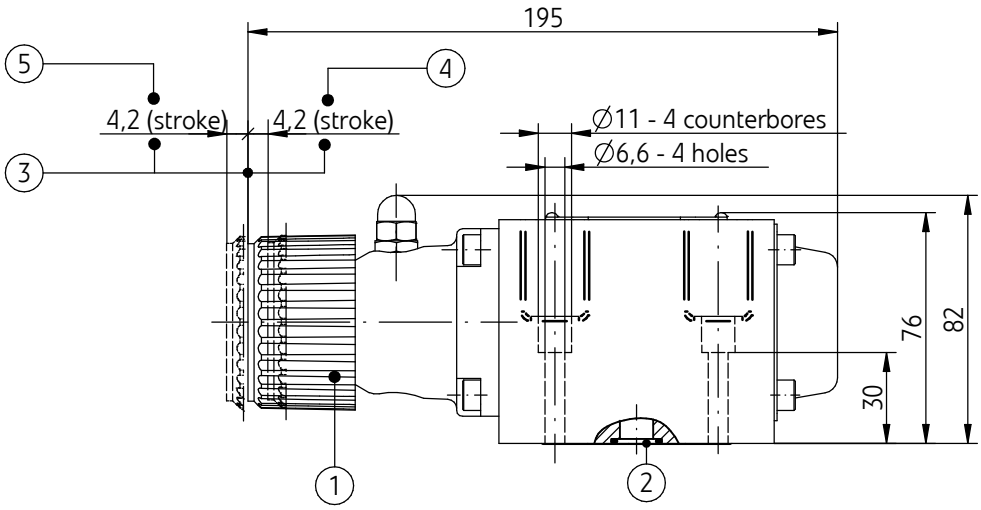
1 - Hand lever
2 - Hand lever (optionally mounted)
3 - Sealing ring **o-ring 12,42 x 1,78** - pcs 5/set (**P**,T_A, T_B, **A**, **B**)
4 - Overall dimension of directional spool valve:
- **3-position springs centered**
- **3-position positioned with detent**
(spool diagrams: **E**, **F**, **G**, **H**, **J**, **L**, **M**, **Q**, **R**,**T**, **U**, **V**, **W** - acc. to page 4)
- **2-position positioned with spring**
- **2-position positioned with detent**
(positions **a**, **b** - spool diagrams: **A**, **C**, **D** - acc. to page 5)
positions **a**, **0** - spool diagrams: **EA**, **FA**, **GA**, **HA**, **JA**, **LA**, **MA**, **PA**, **QA**, **RA**,**TA**, **UA**, **VA**, **WA** - acc. to page 4
positions **0**, **b** - spool diagrams: **EB**, **FB**, **GB**, **HB**, **JB**, **LB**, **MB**, **PB**, **QB**, **RB**, **TB**, **UB**, **VB**, **WB** - acc. to page 4)

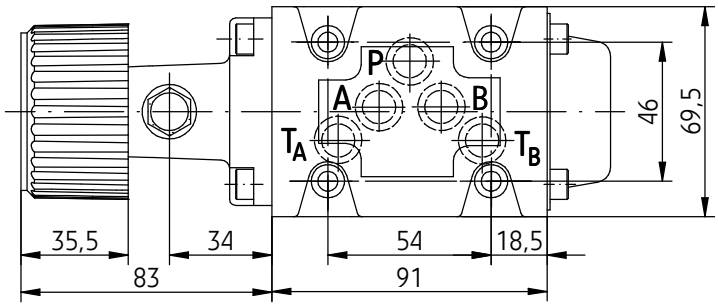
5 - Overall dimension of directional spool valve:
- **2-position positioned with spring**
- **2-position positioned with detent**
(positions **a**, **b** - spool diagrams: **B**, **Y** - acc. to page 5)

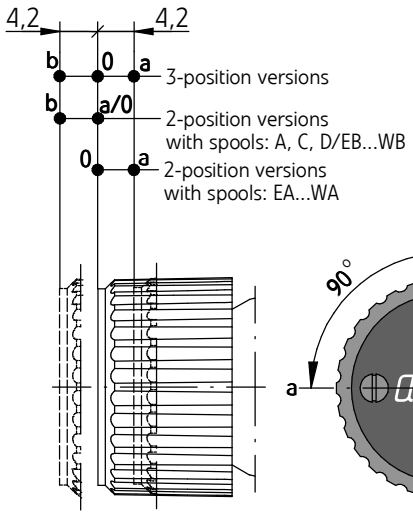
6 - Positions of hand lever
7 - Porting pattern of the subplate surface compliant with **ISO 4401*** standard
designation **ISO 4401**-05-04-0-94 (CETOP 05)
fixing screws **M6 x 40 -10.9** acc. to **PN - EN ISO 4762**
pcs 4/set; tightening torque **Md = 15 Nm**
(*) - connection with 1 hole **T** from port side **A** or **B** is sufficient - holes T_A and T_B are connected to the port **T** in the housing of directional spool valve;
8 - Subplate surface required

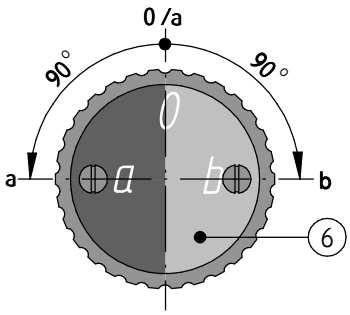
OVERALL AND CONNECTION DIMENSIONS

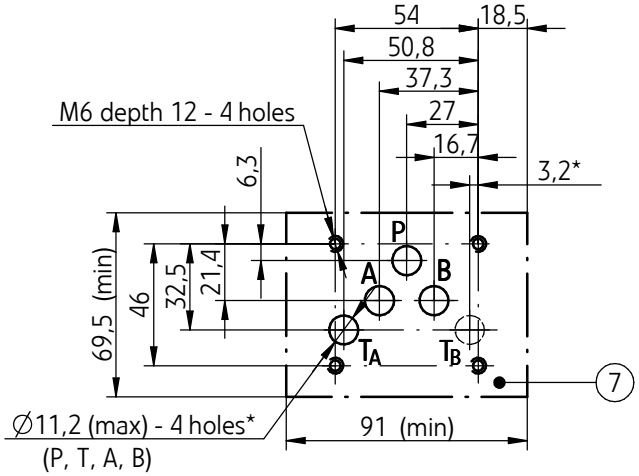
type WMD10...

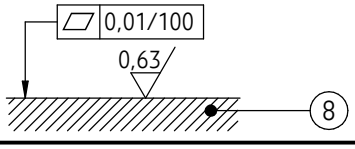








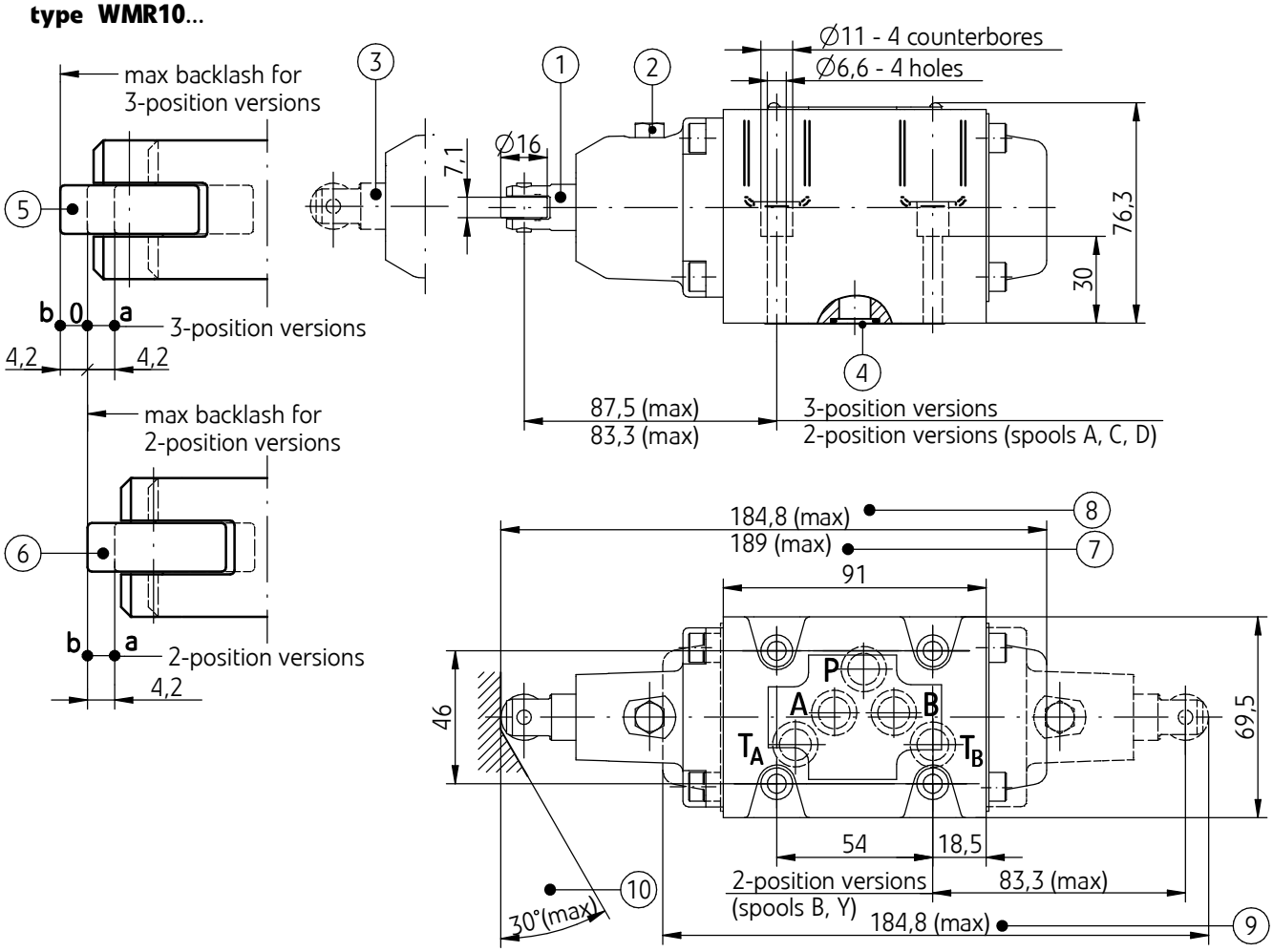


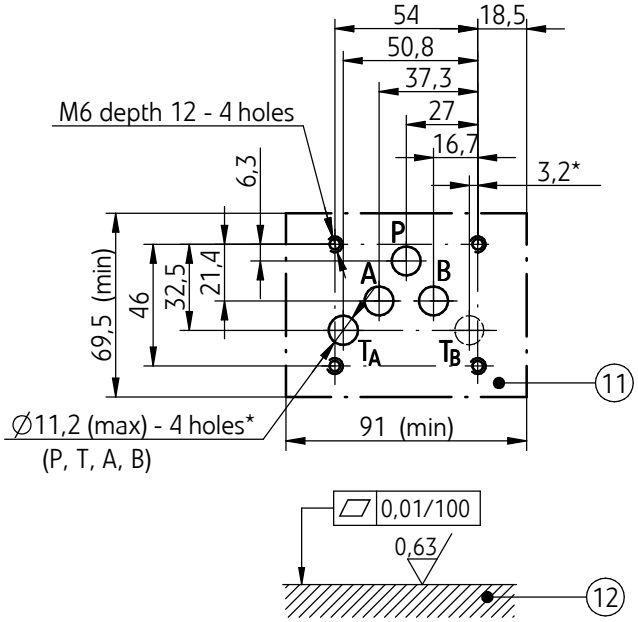


1 - Rotary knob
2 - Sealing ring **o-ring 12,42 x 1,78** - pcs 5/set (**P**,**T_A**, **T_B**, **A**, **B**)
3 - Stroke of rotary knob for **3-position** directional spool valve (spool diagrams: **E**, **F**, **G**, **H**, **J**, **L**, **M**, **Q**, **R**, **T**, **U**, **V**, **W** - acc. to page 6)
4 - Stroke of rotary knob for **2-position** directional spool valve (positions **a**, **0** - version WMD10...**A**...; spool diagrams: **EA**, **FA**, **GA**, **HA**, **JA**, **LA**, **MA**, **PA**, **QA**, **RA**, **TA**, **UA**, **VA**, **WA** - acc. to page 6
5 - Stroke of rotary knob for **2-position** directional spool valve (positions **0**, **b** - version WMD10...**B**...; spool diagrams: **EB**, **FB**, **GB**, **HB**, **JB**, **LB**, **MB**, **PB**, **QB**, **RB**, **TB**, **UB**, **VB**, **WB** - acc. to page 6; positions **a**, **b**; spool diagrams: **A**, **C**, **D** - acc. to page 5)
6 - Positions of rotary knob
7 - Porting pattern of the subplate surface compliant with **ISO 4401*** standard
designation **ISO 4401**-05-04-0-94 (CETOP 05)
fixing screws **M6 x 40 -10.9** acc. to **PN - EN ISO 4762**
pcs 4/set; tightening torque **Md = 15 Nm**
(*) - connection with 1 hole **T** from port side **A** or **B** is sufficient - holes **T_A** and **T_B** are connected to the port **T** in the housing of directional spool valve;
8 - Subplate surface required

OVERALL AND CONNECTION DIMENSIONS

type WMR10...

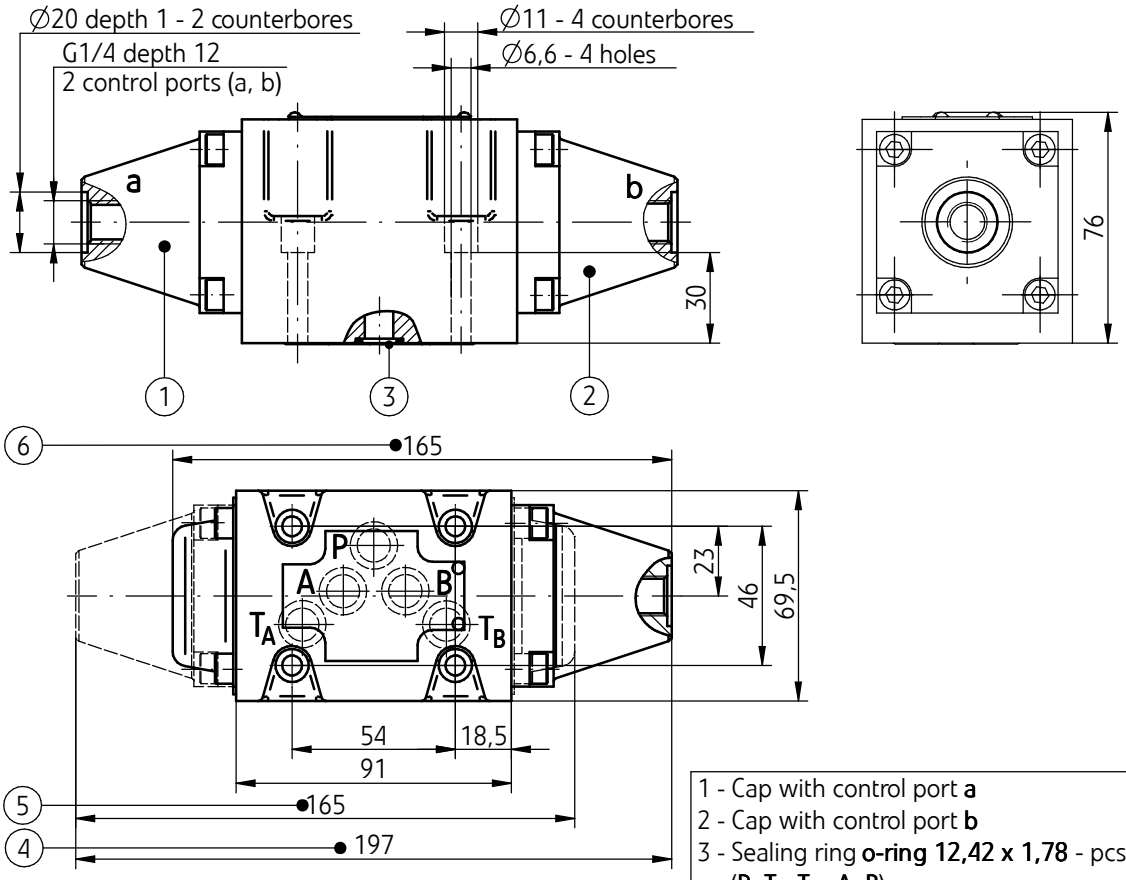


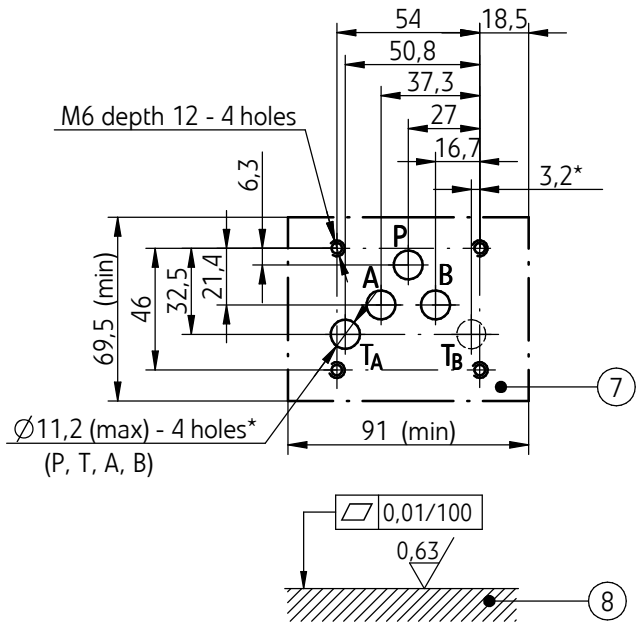


1 - Pin with roller
2 - Screw fixing the position of the pin with roller
3 - Pin with roller (item 1) - optionally mounted after screwing off the screw - item 2)
4 - Sealing ring **o-ring 12,42 x 1,78** - pcs 5/set (P, T_A, T_B, A, B)
5 - Stroke of roller for **3-position** directional spool valve (spool diagrams: **E**, **F**, **G**, **H**, **J** ,**L**, **M**, **Q**, **R**, **T**, **U**, **V**, **W** - acc. to page 7)
6 - Stroke of roller for **2-position** directional spool valve (spool diagrams: **A**, **C**, **D**, **B** ,**Y** - acc. to page 7)
7 - Overall dimension of **3-position** directional spool valve
8 - Overall dimension of **2-position** directional spool valve (spool diagrams: **A**, **C**, **D** - acc. to page 7)
9 - Overall dimension of **2-position** directional spool valve (spool diagrams: **B**, **Y** - acc. to page 7)
10 - Max angle of control cam
11 - Porting pattern of the subplate surface compliant with **ISO 4401*** standard
designation **ISO 4401**-05-04-0-94 (CETOP 05)
fixing screws **M6 x 40 -10.9** acc. to **PN - EN ISO 4762** pcs 4/set; tightening torque **Md = 15 Nm**
(*) - connection with 1 hole **T** from port side **A** or **B** is sufficient - holes T_A and T_B are connected to the port **T** in the housing of directional spool valve;
12- Subplate surface required

OVERALL AND CONNECTION DIMENSIONS

type WH10...





1 - Cap with control port **a**
2 - Cap with control port **b**
3 - Sealing ring **o-ring 12,42 x 1,78** - pcs 5/set
(**P**, **T_A**,**T_B**, **A**, **B**)
4 - Overall dimension of directional spool valve:
- **3-position springs centered**
(spool diagrams: **E**, **F**, **G**, **H**, **J**, **L**, **M**, **Q**, **R**, **T**, **U**, **V**, **W** - acc. to page 8)
- **2-position without springs and without detent**
(spool diagrams: **A**, **C**, **D** - acc. to page 9)
- **2-position without springs and with detent**
(spool schemes: **A**, **C**, **D** - acc. to page 9)

5 - Overall dimension of directional spool valve:
- **2-position positioned with spring** (positions **a**, **0**; spool diagrams: **EA**, **FA**, **GA**, **HA**, **JA**, **LA**, **MA**, **QA**, **RA**, **TA**, **UA**, **VA**, **WA** - acc. to page 8
positions **a**, **b**; spool diagrams: **A**, **C**, **D** - acc. to page 9)

6 - Overall dimension of directional spool valve:
- **2-position positioned with spring** (positions **0**, **b**; - spool diagrams: **EB**, **FB**, **GB**, **HB**, **JB**, **LB**, **MB**, **QB**, **RB**, **TB**, **UB**, **VB**, **WB** - acc. to page 8
positions **a**, **b**; spool diagrams: **B**, **Y** - acc. to page 9)

7 - Porting pattern of the subplate surface compliant with **ISO 4401*** standard
designation **ISO 4401**-05-04-0-94 (CETOP 05)
fixing screws **M6 x 40 -10.9** acc. to **PN - EN ISO 4762**
pcs 4/set; tightening torque **Md = 15 Nm**
(*) - connection with 1 hole **T** from port side **A** or **B** is sufficient - holes **T_A** and **T_B** are connected to the port **T** in the housing of directional spool valve

8 - Subplate surface required

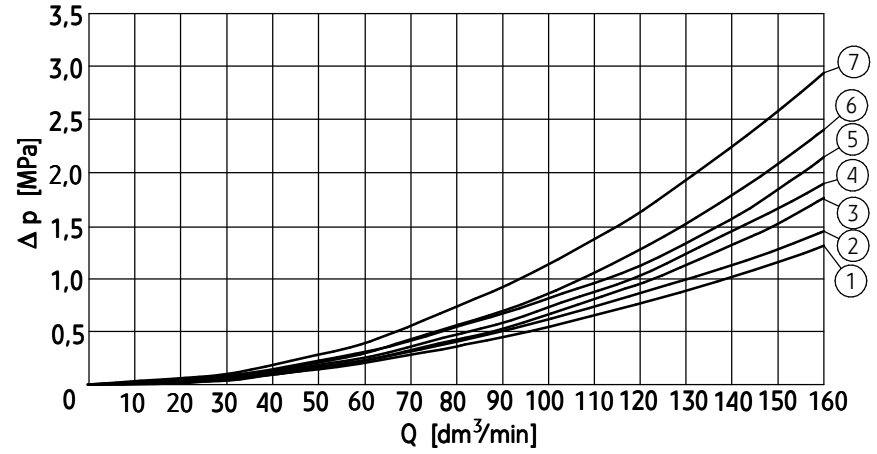
PERFORMANCE CURVES

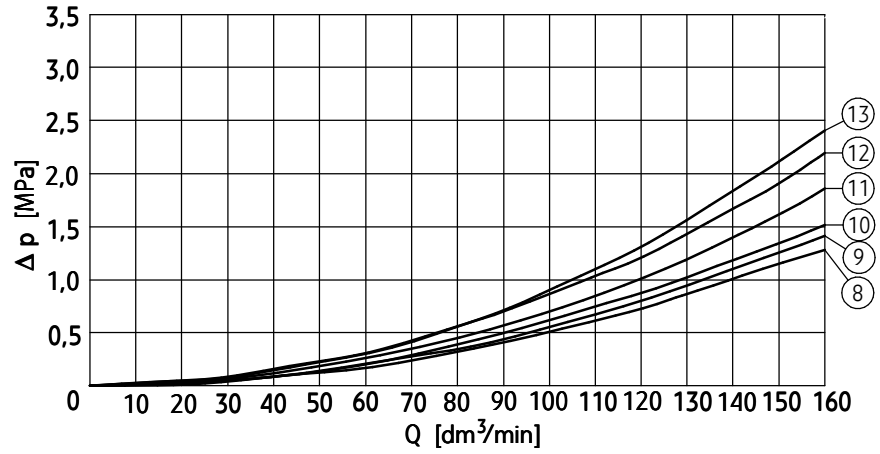
measured at viscosity ν = 41 mm²/s and temperature t = 50°C

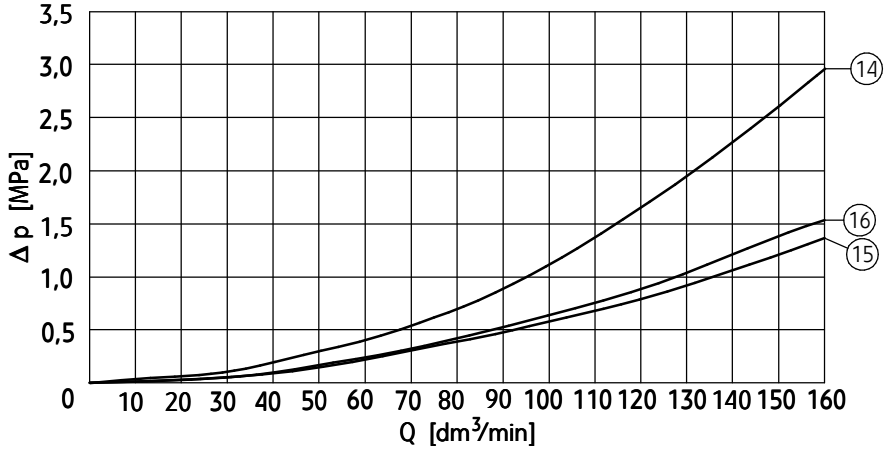
Flow resistance curves

- **type WMM10**.../...; **WMM10**.../**F**...
- **type WMD10**.../**F**...
- **type WMR10**...
- **type WH10**...; **WH10**.../**O**...; **WH10**.../**OF**...

characteristic curves Δ**p** (**Q**) for directional spool valves with various spool types







spool symbol	characteristic curve number			
diagrams acc. to pages 8, 9	flow direction			
	P → A	P → B	A → T	B → T
A	6	6	–	–
B	12	12	–	–
C	12	12	8	8
D	5	5	16	16
Y	9	9	7	7
E	3	3	8	8
F	11	12	6	7
G	14	14	12	12
H	3	3	2	2
J	3	3	12	12
L	13	13	12	12
M	4	4	1	1
P	12	11	7	6
Q	13	13	1	6
R	14	16	8	–
T	2	2	10	10
U, V	13	13	10	10
W	13	13	1	15

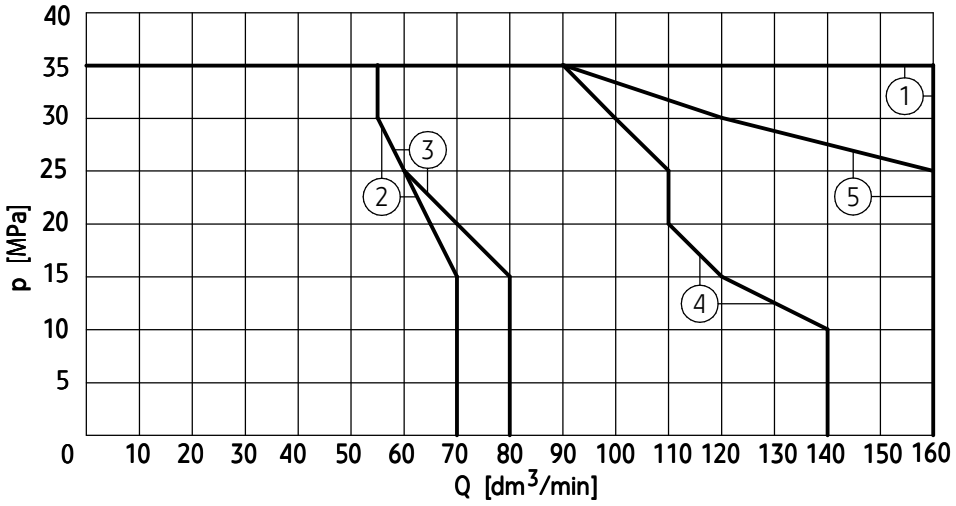
PERFORMANCE CURVES

measured at viscosity ν = 41 mm^2/s and temperature t = 50°C

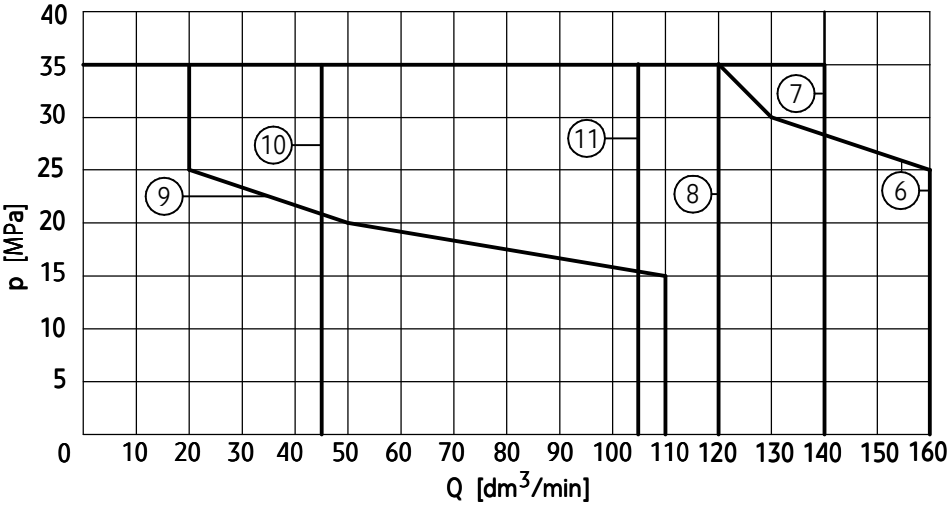
Operating limits curves

- **type WH10**...; **WH10**.../**O**...; **WH10**.../**OF**...

characteristic curves **p -Q** for directional spool valves with various spool types



spool symbol diagrams acc. to pages 8, 9	characteristic curve number
C, D, Y, E, H, L, M, Q, W	1
F	2
P	3
G	4
A, B	5



spool symbol diagrams acc. to pages 8, 9	characteristic curve number
R	6
J, U	7
V	8
T	9
C/O, D/O, Y/O	10
C/OF, D/OF, Y/OF	11

NOTES:

Above operating limits are related to symmetrical flow through all ports i.e. if the oil flows from port **P** to port **A**, then the same flow rate is from port **B** to port **T** (applied to directional control valves with 4 service ports). Degree of asymmetry affects adversely the parameters.

HOW TO ORDER

		10	+	/			★

Number of service ports

3-way - only for spools **A**, **B**	= **3**
4-way - for the other spools	= **4**

Type of operation

hand lever operated	= **WMM**
rotary knob operated	= **WMD**
roller operated	= **WMR**
hydraulically operated	= **WH**

Nominal size (NS)

NS10	= **10**

Spool type

spool diagrams for directional spool valve:

type **WMM**	- according to pages **4**, **5**
type **WMD**	- according to pages **5**, **6**
type **WMR**	- according to page **7**
type **WH**	- according to pages **8**, **9**

Series number

(60-69) - connection and installation dimensions unchanged	= 6X
series 62	= **62**

Spool centering/positioning

spring centering - **available to types**: **WMM, WMR, WH**	= **no designation**
with detent - available to types: WMM, WMD	= F
without return springs, without detent - available only to type WH	= O
without return springs, with detent - available only to directional spool valves type WH	= OF

Throttle insert (in port **P**)

without throttle insert	= **no designation**
throttle insert ϕ 0,8	= B 08
throttle insert ϕ 1,0	= B 10
throttle insert ϕ 1,2	= B 12
throttle insert ϕ 3,0	= B 30

Sealing

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

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

NOTES:

Directional spool valve should be ordered according to the above coding.

The symbols in bold are preferred versions available in short delivery time.

Coding examples: 4WMM10 J - 62/B08; 4WMD10E - 62/F B08; 4WMR10E - 62/B08; 4WH10 J - 62/B08

SUBPLATES AND FIXING SCREWS

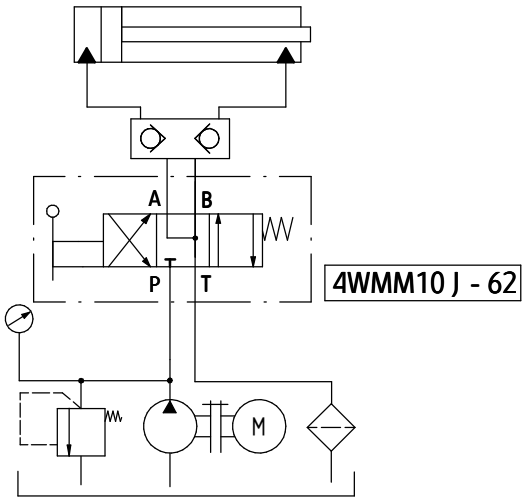
Subplates must be ordered according to data sheet **WK 496 520**. Subplate symbols:
G 66/01 - threaded connections G 3/8
G 67/01 - threaded connections **G 1/2**
G 89/01 - threaded connections G 1/4
G 67/02 - threaded connections M22 x 1,5
G 534/01 - threaded connections G 3/4

NOTE:
Subplate symbol in bold is the preferred version available in short delivery time.

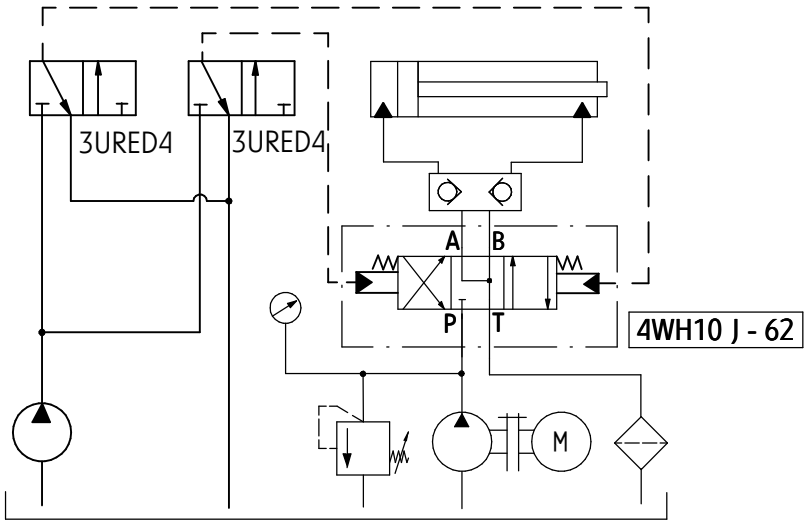
Subplates and fixing screws **M6 x 40 - 10,9** - pcs 4/set according to **PN - EN ISO 4762** must be ordered separately.
Tightening torque **Md = 15 Nm**

EXAMPLES OF APPLICATION IN HYDRAULIC SYSTEM

type WMM10



type WH10



PONAR Wadowice S.A.
ul. Wojska Polskiego 29
34-100 Wadowice
tel. +48 33 488 21 00
fax.+48 33 488 21 03
www.ponar-wadowice.pl