DIRECTIONAL SPOOL VALVE TYPE WE10 ELECTRICALLY OPERATED

Q-HYDRAULIKA

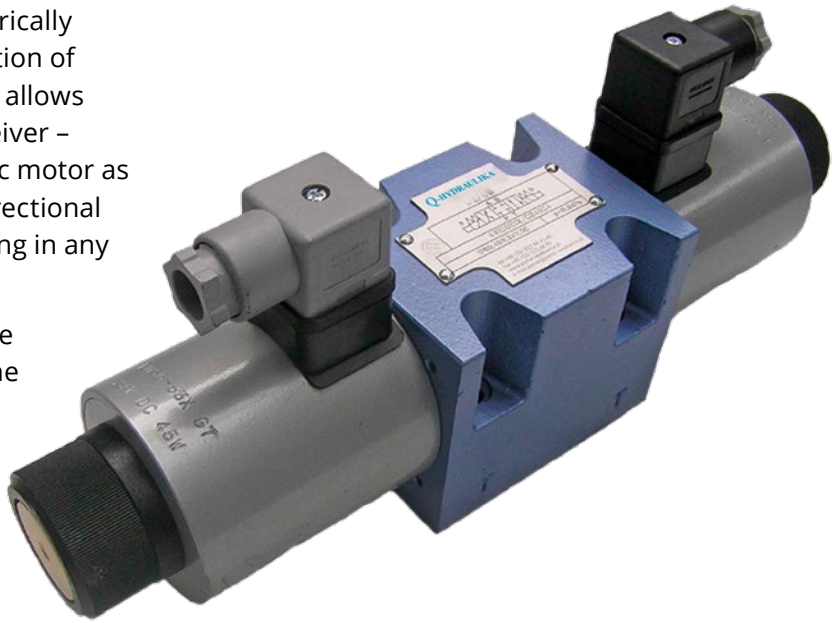
NS 10 | up to 31,5 MPa | up to 120 dm³/min

WK 499 780

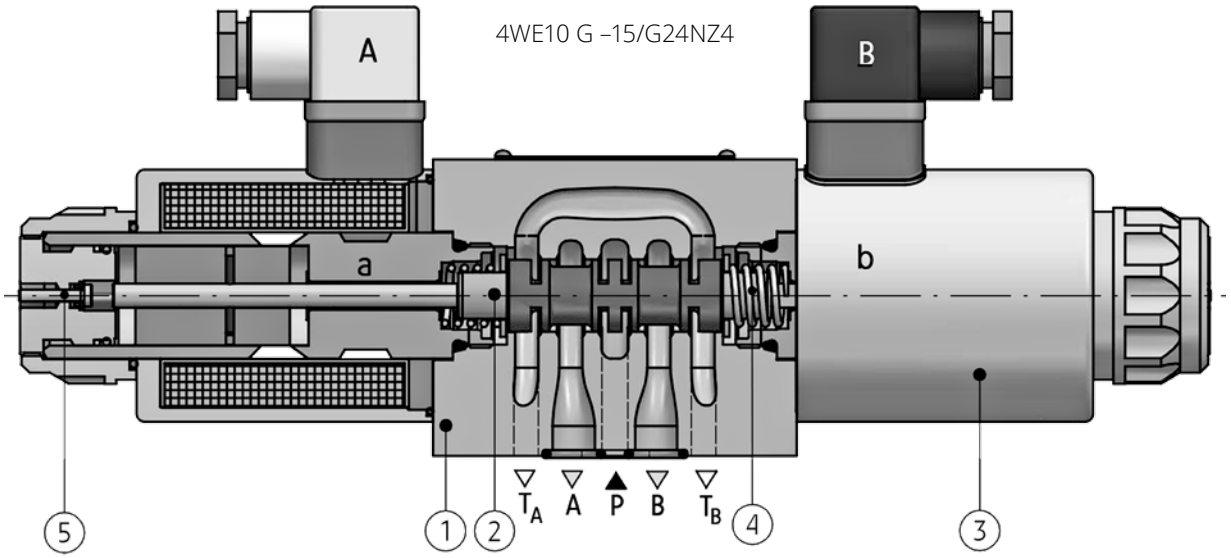
Directional spool valves type **WE10**... electrically operated are intended for change in direction of fluid flow in a hydraulic system and thus it allows to change direction of movement of a receiver – mostly piston rod of a cylinder or hydraulic motor as well to use functions: on and off. These directional spool valves are used for subplate mounting in any position in a hydraulic system.

Directional spool valve is complied with the regulations of directive **2006/95/WE** for the following voltages:

50 – 250 V for **AC**
75 – 250 V for **DC**



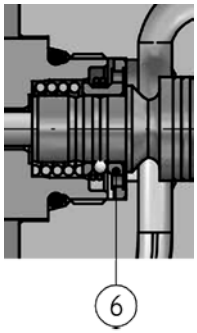
DESCRIPTION OF OPERATION



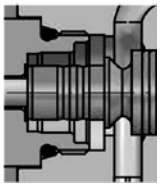
Main elements of directional spool valve type **WE10...** are: housing (1), solenoids (3), control spool (2), centering springs (4) and manual overrides (5). The spool (2) is shifted when it is moved into one of end positions by the force of solenoid (3) affecting it. The return of the spool into neutral position and centering are secured by the centering springs (4). The shape of the spool (control edge spacing) affects the configuration of connections among the ports: **A**, **B**, **P** and **T**.

In case of emergency, the spool can be shifted manually by means of the override (5) – only for version with manual override.

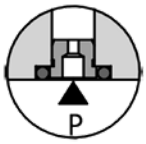
When the situation is anticipated, directional spool valve must be mounted in the way as to be available



WE10.../OF...– only for spools: **A**, **C**, **D**. Two-position directional spool valve without return springs with detent. The spool (2) is positioned and supported with detent (6), and its shift results from supplying voltage to one solenoid (3).



WE10.../**O...** – only for spools: **A**, **C**, **D**. Two-position directional spool valve without return springs. The spool is positioned and supported with attached solenoid. There is no neutral position as the spool is not positioned.



WE10.../...**B...** – directional spool valve designation like that, has throttle insert in port **P**.

TECHNICAL DATA

Hydraulic fluid	mineral oil				
Required filtration	**up to 16 µm**				
Recommended filtration	up to 10 µm				
Nominal fluid viscosity	37 mm²/s at temperature 55 °C				
Viscosity range	2,8 up to 380 mm² /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 +50° C				
Maximum operating pressure	**Ports P, A, B**	**31,5 Mpa**			
	Port T	**21 Mpa**			
Flow section in central position (schemes on page 3)	spool	**Q**	**W**	**V**	
	flow direction	A →T	A →T	A →T	P →A
		B →T	B →T	B →T	P →B
	flow section	5,5 mm²	2,5 mm²	11 mm²	10 mm²
Switching time	ON	up to 60 ms			
	OF	up to 40 ms			
Maximum switching frequency	15000 on/h				
Weight	with 1 solenoid – max 4,6 kg				
	with 2 solenoids – max 6,2 kg				
Supply voltage of solenoids	**DC**		**AC** (plug-in connector with rectifier)		
	12 V	**24 V**	**110 V**	**230 V** – 50 Hz	**220 V** – 50 Hz	**110 V** – 50 Hz
Supply voltage tolerance	±10%				
Power requirement (DC)	45 W				
Insulation	**IP 65**				
Solenoid coil temperature	max. 150° C				

ASSEMBLY AND APPLICATION REQUIREMENTS

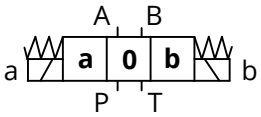
1. Only valve working properly and suitably installed may be connected to an electric system. Only skilled workers are allowed to connect and disconnect electric system.
2. Ground connection (⏚) must be connected with protective earth wire (PE ⏚) in supply system according to appropriate instructions.

3. It is forbidden to apply directional spool valve if the supply cable in the gland of plug-inconnector is not properly tightened.
4. It is forbidden to apply directional spool valve if the plug-in-connector is not properly tightened to the solenoid socket and is not secured by screwing bolt tightly.
5. Due to heating solenoid coils, directional spool valves should be placed in order to eliminate the possibility of incidental touch while using, or, they should be equipped with the coil covers (in accordance with the European standards **PN – EN ISO 13732-1** and **PN – EN 982**).

SCHEMES

Graphic symbols for 3- position directional spool valves

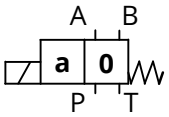
WE10...-1X/...



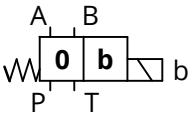
Graphic symbols for 2- position directional spool valves

working positions

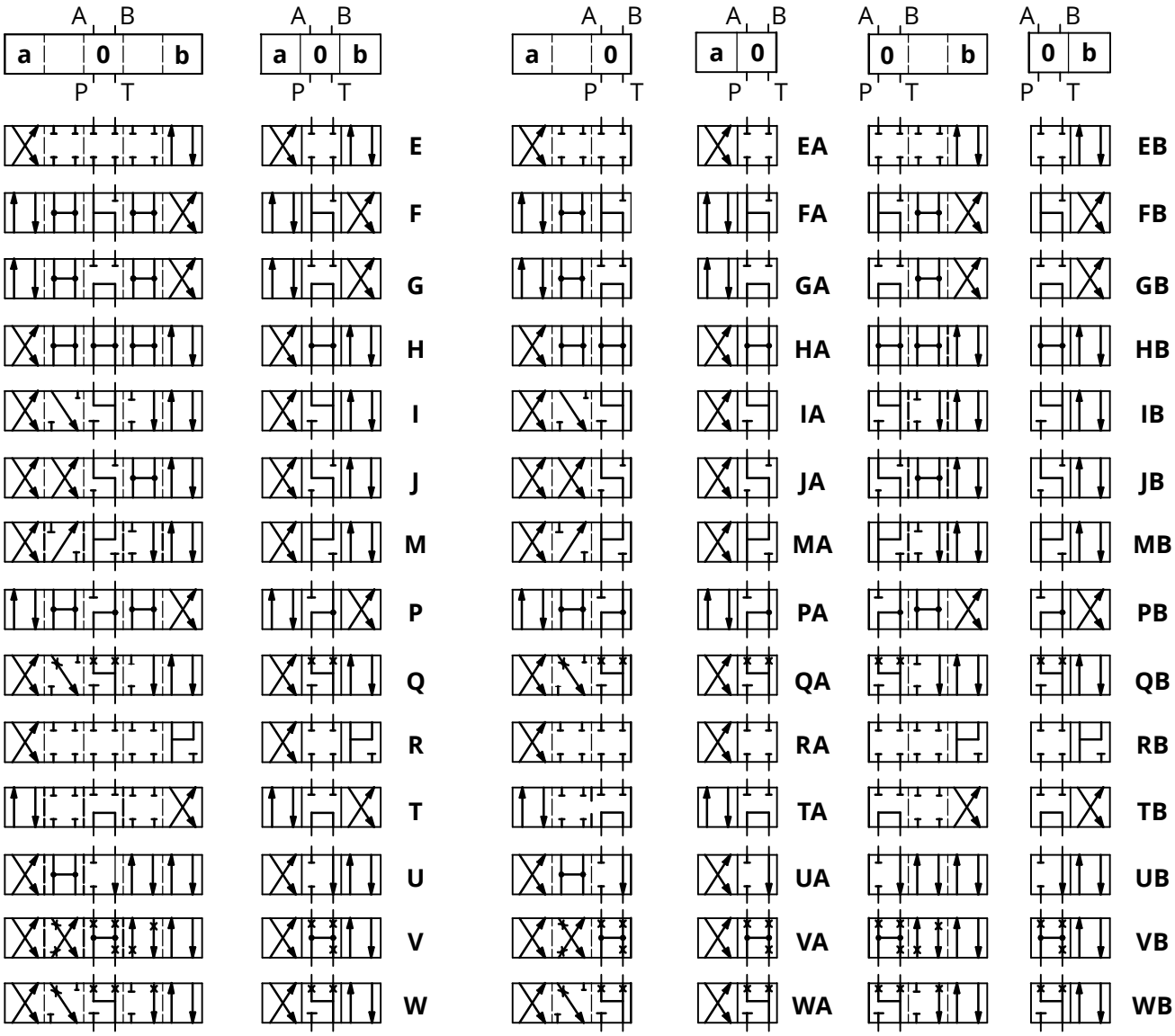
WE10...**A**-1X/...



WE10...**B**-1X/...



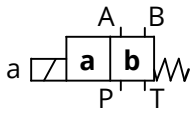
Diagrams for spools

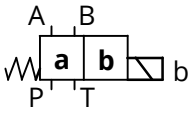


NOTE: Flow section in central position for spools: **Q**, **W**, **V** – according to page 2

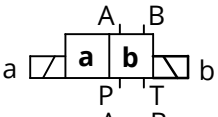
Graphic symbols for 2 – position directional spool valves

WE10...-1X/**...**

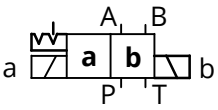




WE10...-1X/**O**...

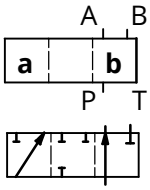


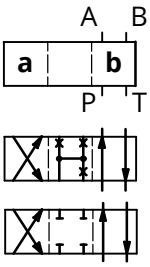
WE10...-1X/**OF**...



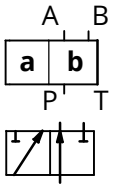
Graphic symbols for spools

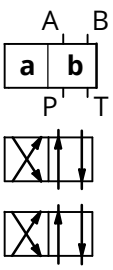
working and indirect positions



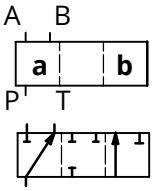


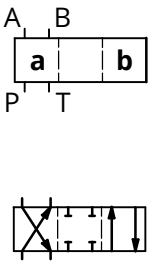
working positions



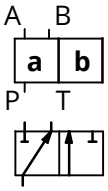


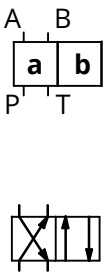
working and indirect positions



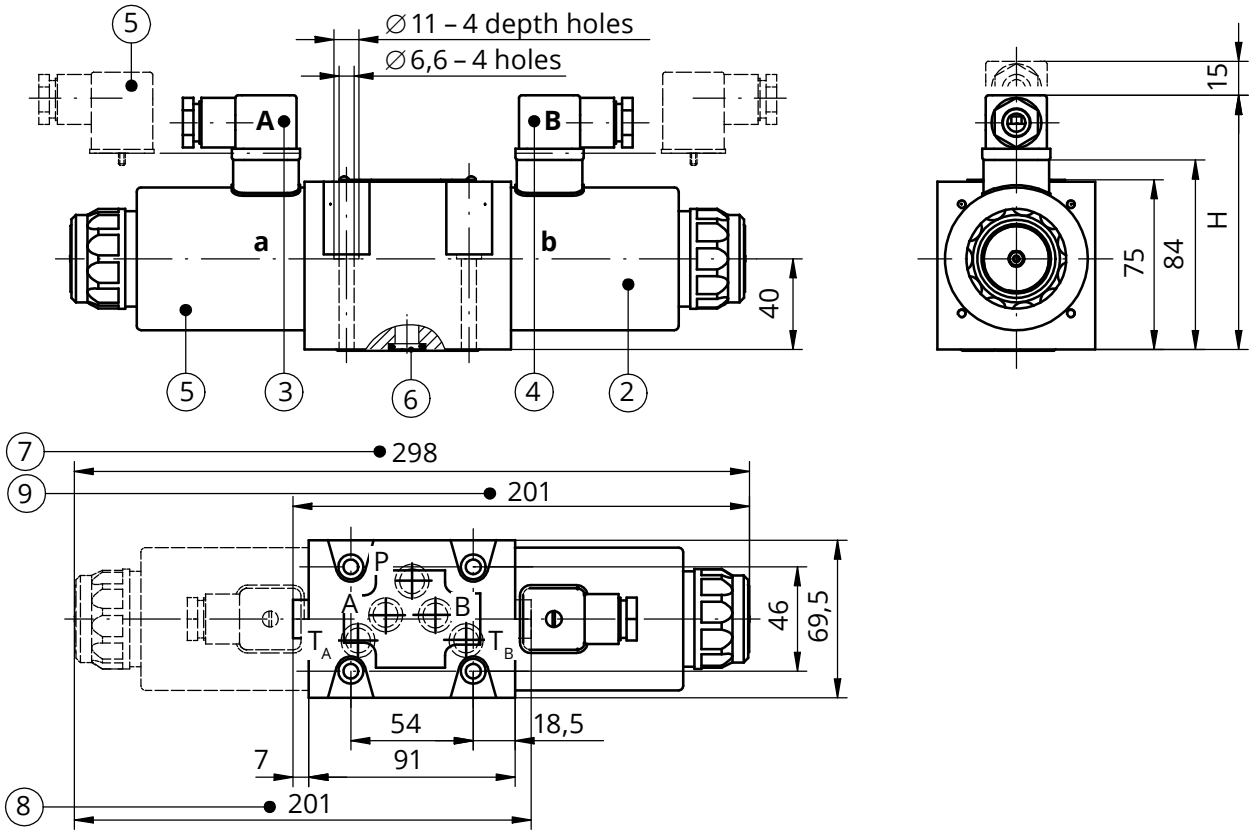


working positions

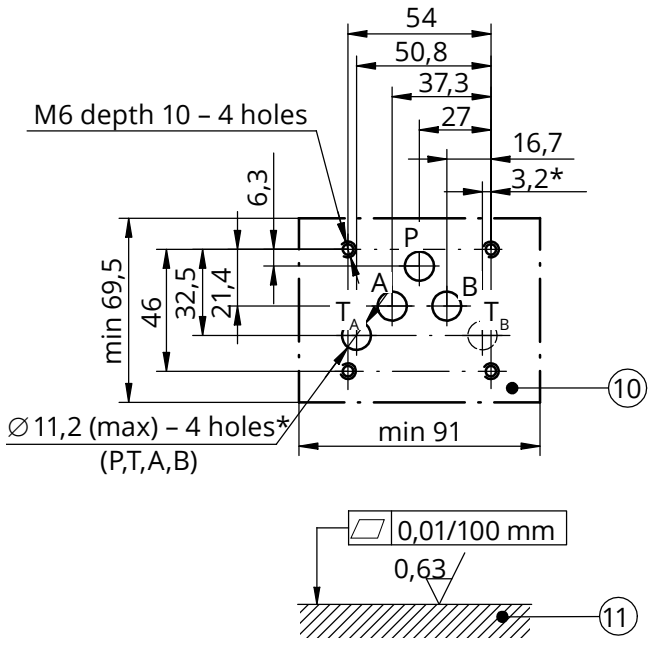




OVERALL AND CONNECTION DIMENSIONS



electrical connection type		dimension H
plug-in-connectors **ISO 4400 type**	control voltage **– DC 12V, 24V, 110V**	112
plug-in-connectors **ISO 4400 type with rectifier**	control voltage **– AC 110V, 220V, 230V**	119



1 – Solenoid **a**
2 – Solenoid **b**
3 – Plug-in-connector **A** (**ISO 4400** type)
4 – Plug-in-connector **B** (**ISO 4400** type)
5 – Plug-in-connector (ISO 4400 type) with rectifier
6 – **O-ring 12 × 2** – 5 pcs/kit **(P, T_A, T_B, A, B)**
7 – Directional spool valve size with 2 **solenoids – a, b**
- **3-position directional spool valve springs centered** (spool symbols: **E**, **F**, **G**, **H**, **J**, **L**, **M**, **Q**, **R**, **T**, **U**, **V**, **W** – according to page 3)
- **2-position directional spool valve without return springs**
- **2-position directional spool valve without springs and with detent** (spool symbols: **A**, **C**, **D** – according to page 4)

8 – Directional spool valve size with 1 solenoid – a
- **2-position springs centered** (spool symbols: **A**, **C**, **D**, **EA**, **FA**, **GA**, **HA**, **JA**, **LA**, **MA**, **PA**, **QA**, **RA**, **TA**, **UA**, **VA**, **WA** – according to page 3 and 4)

9 – Directional spool valve size with **1 solenoid – b**
- **2-position springs centered** (spool symbols: **B**, **Y**, **EB**, **FB**, **GB**, **HB**, **JB**, **LB**, **MB**, **PB**, **QB**, **RB**, **TB**, **UB**, **VB**, **WB** – according to page 3 and 4)

10 – Porting pattern for directional spool valve configuration of subplate holes in accordance with the following standards:
- **CETOP RP 121H** – identified by CETOP 4.2-4-05 (nominal size **CETOP 05**)
- **ISO 4401** – identified by **ISO 4401**-05-04-0-94 (*) – connection with 1 hole **T** from the side of the hole **A** or **B** is enough – holes T_A and T_B are connected with the port in the housing of directional spool valve mounting bolts **M6 × 50** –ß **10.9** in accordance with **PN -EN ISO 4762** – 4 pcs/kit tightening torque **Md = 15 Nm**.

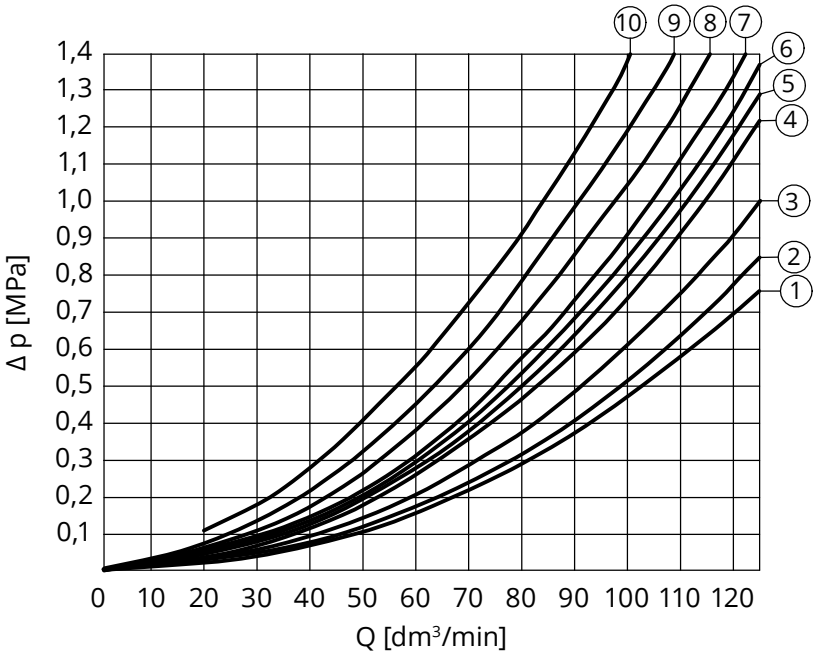
11 – Subplate surface required

PERFORMANCE CURVES

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

Flow resistance curves

characteristic curves **Δp(Q)** for directional spool valves type **WE10...-15/...** for various spool types



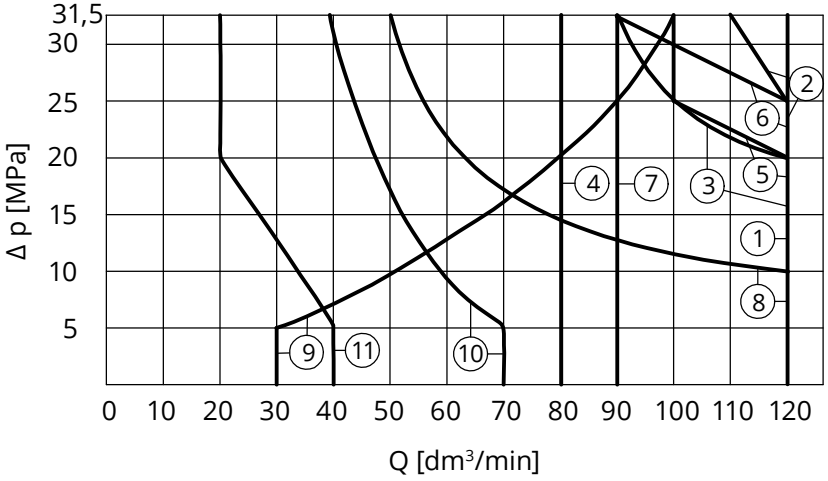
Spool type schemes according to page 3, 4	performance diagram number			
	flow direction			
	P→A	P→B	A→T	B→T
A, B	3	3	–	–
C	3	3	4	5
D, Y	5	5	6	6
E	1	1	4	4
F	2	3	7	4
G	3	3	6	7
H	1	1	6	7
J	1	1	3	3
L	2	2	3	5
M	1	1	4	5
P	4	2	5	7
Q	1	2	1	3
R	3	6	4	–
T	3	3	6	7
U, V	2	2	3	3
W	2	2	4	5

Spool type central position (***0***) scheme – page 3	performance diagram number					
	flow direction					
	P→A	P→B	P→T	A→T	B→T	B→A
F	4	–	9	9	–	–
P	–	5	10	–	8	–
G, T	–	–	9	–	–	–
H	–	–	3	–	–	–

Spool type shifted position scheme – page 3	performance diagram number					
	flow direction					
	P→A	P→B	P→T	A→T	B→T	B→A
R	–	–	–	–	–	9

Flow limit curves

Characteristic curves **p-Q** for directional spool valves type **WE10...-15/..** with DC solenoids for various spool types



Spool type schemes according to page 3, 4	performance diagram number
C, C/O, C/OF D, D/O, D/OF, Y, M	1
E	2
J	3
H, Q, W	4
R	5
L	6
U	7
A, A/OF, B	8
V	9
F, P, G	10
T	11

NOTES:

Above flow 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 flows out from.

ACCESSORIES

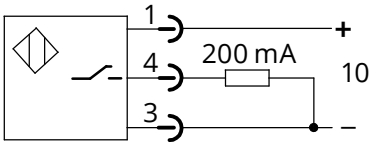
Spool position monitoring

Additional technical data

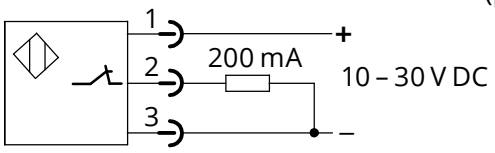
Inductive switch	
Type of switches	**PNP inductive proximity switches** **normally closed – NC** **normally opened – NO**
Range of supply voltage for switch	**10 – 30 V DC**
Max load current	**200 mA**
Type of switch connection	**external thread M12×1 ; male connection; 4 contacts** (pins)
Insulation	**IP 65**
Weight	
with one solenoid and one switch	max 5,6 kg
with two solenoids and one switch	max 7,2 kg
with two solenoids and two switches	max 8,5 kg

Scheme of electrical connection of inductive switch

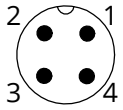
Normally open (NO)– **S1**



Normally closed (NC)– **S2**



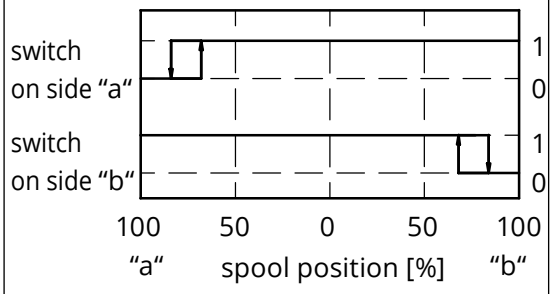
contact allocation
(pins of switch connector)



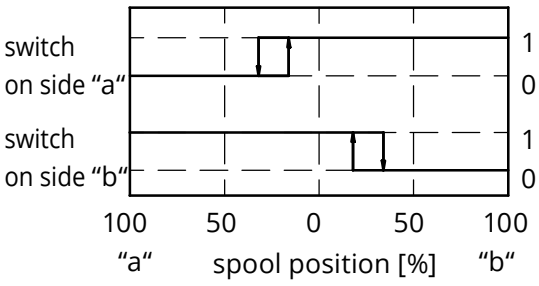
Graphic symbols for directional control valves and initial positions of switches

Initial position of inductive switch depending on the spool position **0** – off neutral state on output coctact (**NO** – contact 4; **NC** – contact 2) **1** – on state on uotput contact (**NO** – contact 4; **NC** – contact 2)	**Graphic symbol for directional control valve**
3-position directional control valve	

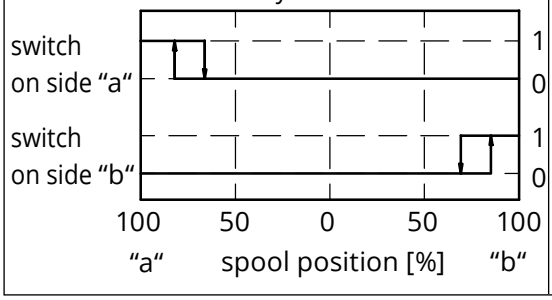
position monitored **a** and **b**
Normally open



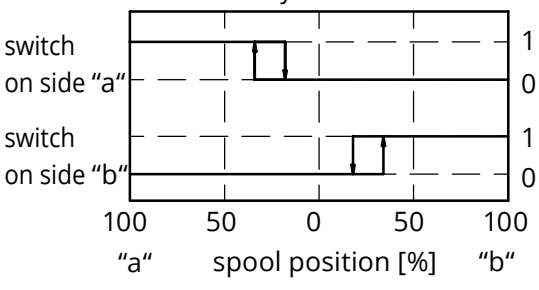
position monitored **0**
Normally open

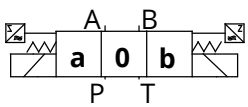


Normally closed



Normally closed





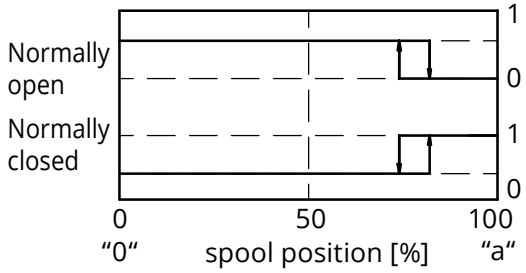
ACCESSORIES

Spool position monitoring

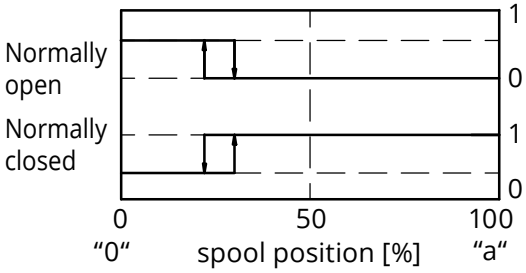
Initial position of inductive switch depending on the spool position	Graphic symbol for directional control valve

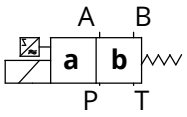
2-position directional control valve WE10...**A (**positions**: a, 0)**
solenoid and switch on side „a“

position monitored **a**



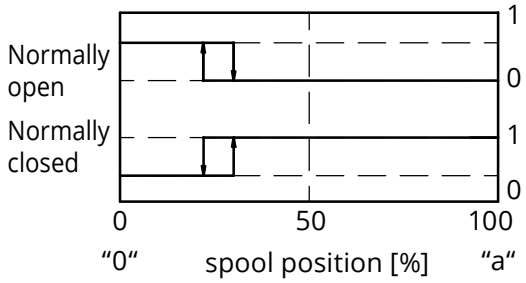
position monitored **0**



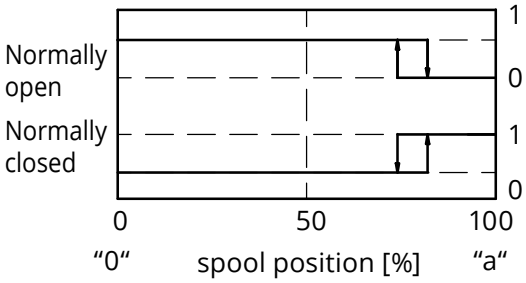


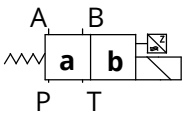
2-position directional control valve WE10...B (positions: **0, b)**
solenoid and switch on side „b“

position monitored **0**



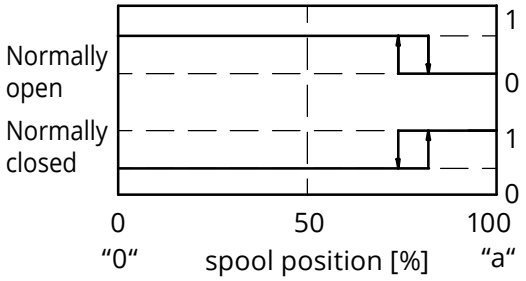
position monitored **b**



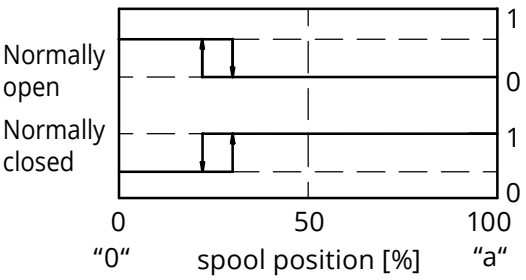


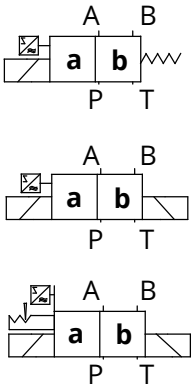
2-position directional control valve WE10 A, D, C; .../O; .../OF
switch on side „a“

position monitored **a**



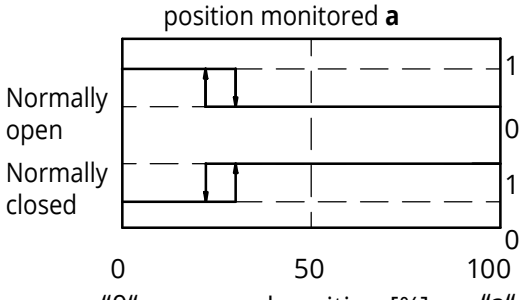
position monitored **b**



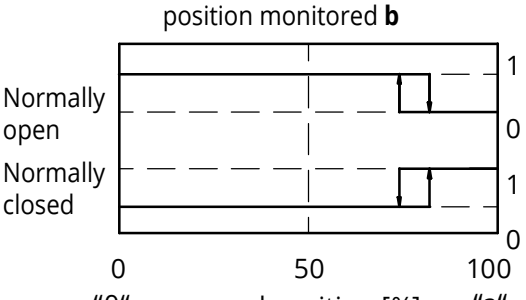


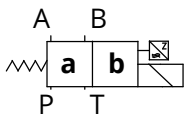
2-position directional control valve WE10B, Y
switch on side „b“

position monitored **a**



position monitored **b**



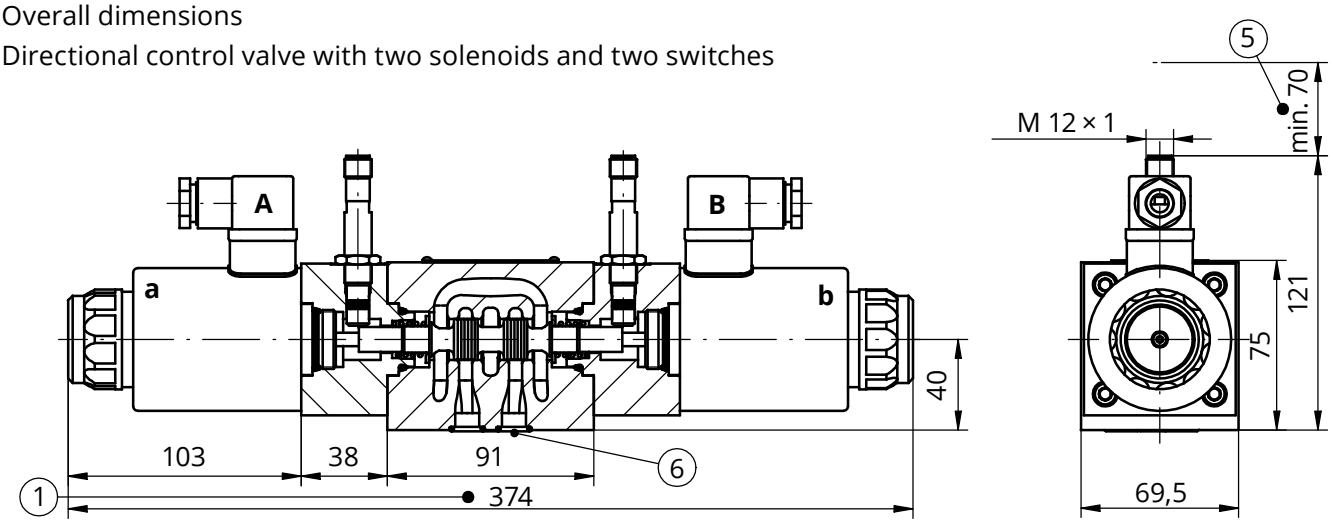


ACCESSORIES

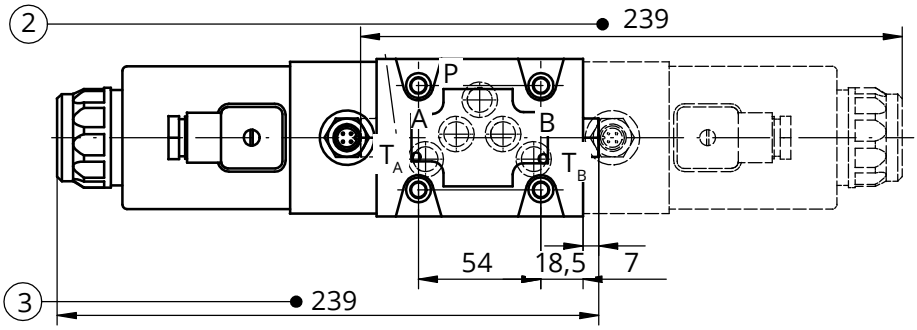
Spool position monitoring

Overall dimensions

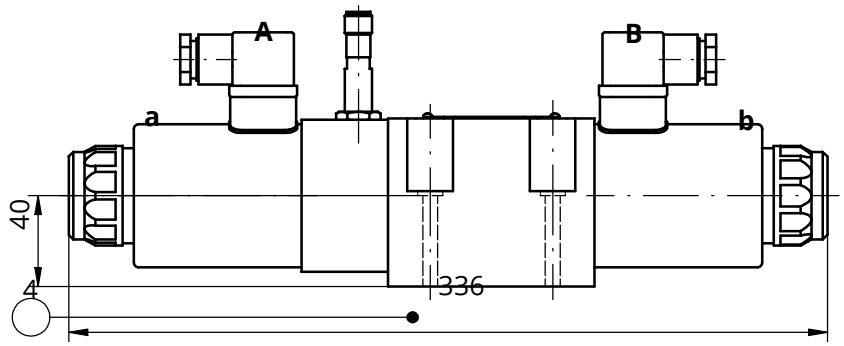
Directional control valve with two solenoids and two switches



Directional control valve with one solenoid and one switch



Directional control valve with two solenoids and one switch



NOTE:
Directional control valve with spool position switch is adjusted. Any adjustments may be made only by the manufacturer.
In case of a faulty switch or valve complete directional control valve must be changed.

Subplate surface required according to page 5

1 – Dimension of directional control valve with **two solenoids** – **a**, **b** and **two position switches**
· **3-position, springs centered** WE10.../...S1...; ...S2... (spool symbols: **E**, **F**, **G**, **H**, **J**, **L**, **M**, **P**, **Q**, **R**, **T**, **U**, **V**, **W** – on page 3)

2 – Dimension of directional control valve with **one solenoid** – **a** and **one position switch**
· 2-position, springs centered WE10.../**...**S1; ...S2... (spool symbols: **A**, **C**, **D**, **EA**, **FA**, **GA**, **HA**, **JA**, **LA**, **MA**, **PA**, **QA**, **RA**, **TA**, **UA**, **VA**, **WA** – on pages 3, 4)

3 – Dimension of directional control valve with **one solenoid – b**
· **2-position, springs centered** WE10.../**...**S1...; ...S2... (spool symbols: **B**, **Y**, **EB**, **FB**, **GB**, **HB**, **JB**, **LB**, **MB**, **PB**, **QB**, **RB**, **TB**, **UB**, **VB**, **WB** – on pages 3, 4)

4 – Dimension of directional control valve with **two solenoids** – **a**, **b** and position **switch** at **A** side
· **2-position, without spring return** WE10.../**O**...S1...; ...S2...
· **2-position, without spring return, with detent** WE10.../**OF**...S1...; ...S2... (spool symbols: **A**, **C**, **D** – on page 4)

5 – Distance for mounting plug-in-connector and cable of switch (plug-in-connectors not showed in the drawing must be ordered separately according to data sheet **WK 499 963**).

6 – **O-ring 12 × 2** – 5 pcs/kit (**P**, **T_A**, **TB**, **A**, **B**)

HOW TO ORDER

WE 10 /

Number of service ports
3-way – only for spools A, B = **3**
4-way – for the other spools = **4**

Nominal size (NS)
NS10 **= 10**

Spool symbol
spool diagrams – according to **page 3**, **4**

Series number
(10 – 19) – connection and installation dimensions unchanged = 1X
series 15 **= 15**

Spool positioning
spring centering **= no designation**
without springs return = O
without springs return with detent = OF

Control voltage for solenoids
12V DC = G12
24V DC **= G24**
110V DC = G110
110V AC 50Hz (plug-in-connector with rectifier) = W110R
220V AC 50Hz (plug-in-connector with rectifier) = W220R
230V AC 50Hz (plug-in-connector with rectifier) **= W230R**

Manual override
solenoids without manual override = no designation
solenoids with manual override **= N**

Electrical connection
plug-in-connector ISO 4400 type without LED = Z4
plug-in-connector ISO 4400 type with LED = Z4L

Throttle insert (in port P)
without throttle insert = **no designation**
throttle insert ∅ 0,8 = B 08
throttle insert ∅ 1,0 = B 10
throttle insert ∅ 1,2 = B 12
throttle insert ∅ 3,0 = B 30

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

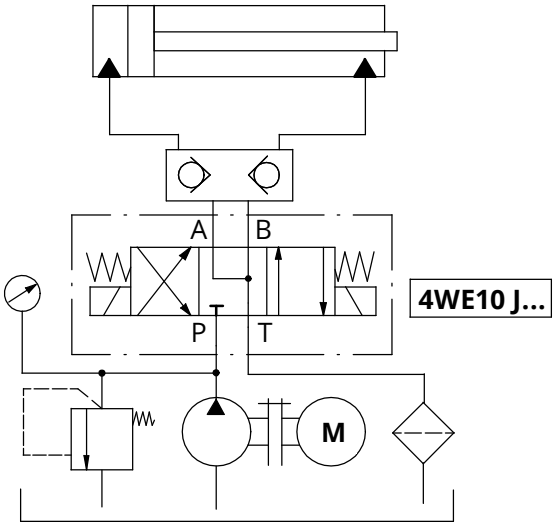
Further requirements in clear text
(to be agreed with the manufacturer)

Spool position monitoring
monitored position „0“– „zero“ *(3 and 2- position directional control valves with positions (a, 0) or (0, b))* = *0*
monitored position „a“ *(2- position directional control valves with positions (a, 0) or (a, b) with spools A, D, C, .../O; .../OF and B, Y)* = *A*
monitored position „b“ *(2- position directional control valves with positions (0, b) or (a, b) with spools A, D, C, .../O .../OF and B, Y)* = *B*
monitored positions „a“ and „b“ *(3- position directional control valves)* = *AB*

Spool position switch
normally open = S1
normally closed = S2

NOTES:
Directional spool valve should be ordered according to the above coding.
The symbols in bold are preferred versions in short delivery time.
Coding example: 4WE10 E – 15/G24 N Z4 B08 S1 – AB

EXAMPLE OF APPLICATION IN HYDRAULIC SYSTEM



SUBPLATES AND FIXING SCREWS

Subplates must be ordered according to the data sheet **WK 496 520**. Subplates:
G 66/01 – threaded connection G 3/8
G 67/01 – threaded connection **G 1/2**
G 89/01 – threaded connection G1/4
G 67/02 – threaded connection M22 × 1,5

Subplates and bolts fixing directional valve **M6 × 50 – 10,9** in accordance with **PN-EN ISO 4762** – 4 pcs/kit must be ordered separately.
Tightening torque for bolts **Md = 15 Nm**
The subplate symbol in bold is the preferred version available in short delivery time.