Directional spool valve type WE6 electrically operated

WK 499 502

NS 6 | **up to 31,5 MPa** | **up to 80 dm³/min**

01.2009

DATA SHEET - SERVICE MANUAL

APPLICATION

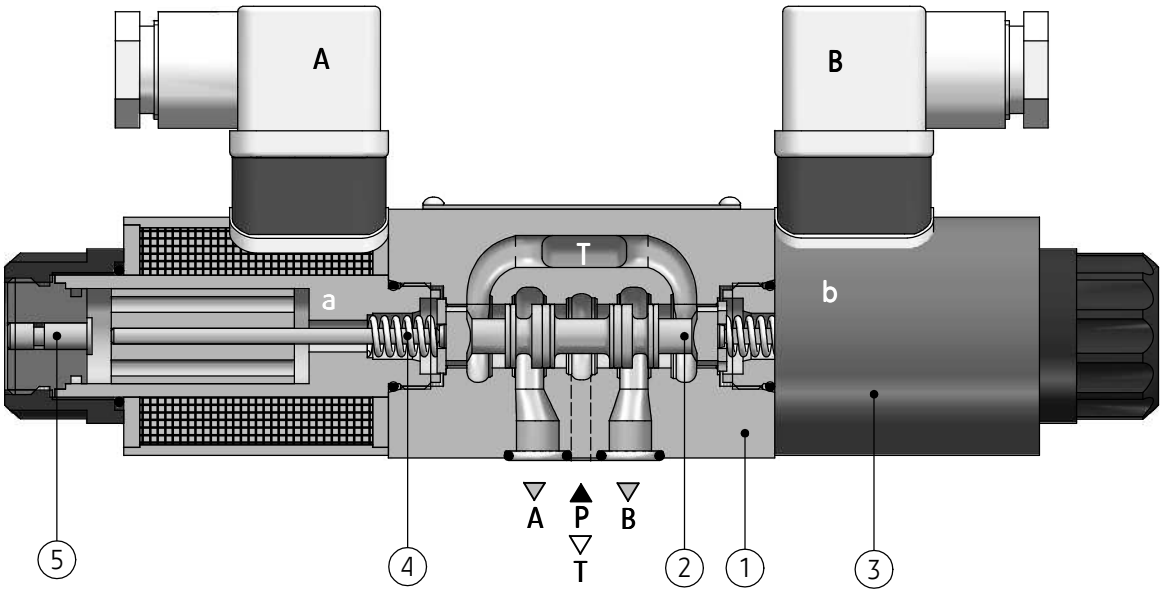
Directional spool valves type **WE6...** electrically operated are intended for change in direction of fluid flow in a hydraulic system and thus it allows to change direction of movement of a receiver - mostly piston rod of a cylinder or hydraulic motor as well to use functions: *on* and *off*. These 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

4WE 6J -12/G42NZ4



Main elements of directional spool valve type **WE6...** are: housing (1), solenoids (3), control spool (2), centering springs (4) and manual overrides (5).

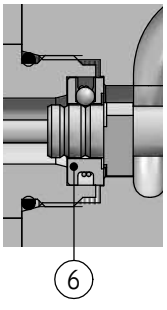
The spool (2) is shifted when it is moved into one of end positions by the force of solenoid (3) affecting it.

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**.

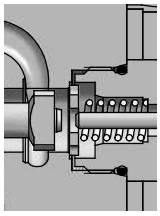
In case of emergency, the spool can be shifted manually by means of the override (5) – only for version with manual override.

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

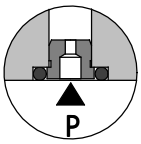


WE6...-12/**OF...-** only for spools: **A**, **C**, **D**. 2-position directional spool valve without return springs with detent. The spool (2) is positioned and supported with detent (6), and its shift results from supplying voltage to one solenoid (3).

DESCRIPTION OF OPERATION



WE6…-12/**O…-** only for spools: **A**, **C** , **D**. 2-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.



WE6…-12/**…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 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 +50 ^{o}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**	
	flow section	6 % nominal flow		3 % nominal flow	
Switching time	ON	up to 60 ms			
	OFF	up to 40 ms			
Maximum switching frequency	15000 on/h				
Weight	with 1 solenoid	max 1,5 kg			
	with 2 solenoids	max 2,1 kg			
Supply voltage for solenoids	DC			AC (plug-in connector with rectifier)	
	12V	**24V**	**110V**	**230V - 50Hz**	**110V - 50Hz**
Supply voltage tolerances	±10%				
Power requirement (DC)	**30** W				
Insulation	**IP 65**				
Solenoid coil temperature	max 150 ^{o}C				

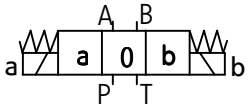
ASSEMBLY AND APPLICATION REQUIREMENTS

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-in-connector 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

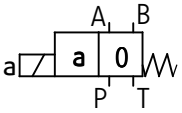
Graphic symbols for 3- position directional spool valves

WE6...-1X/**...**

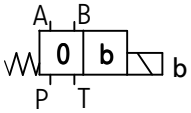


Graphic symbols for 2- position directional spool valves

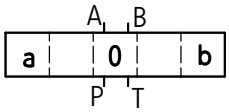
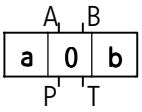
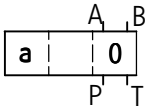
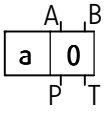
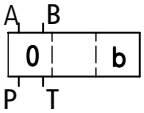
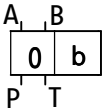
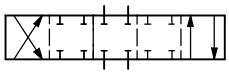
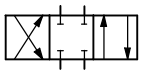
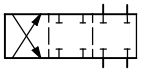
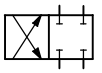
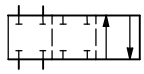
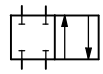
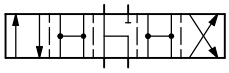
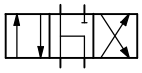
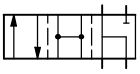
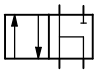
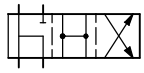
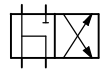
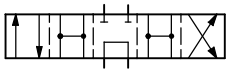
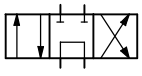
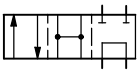
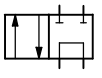
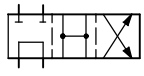
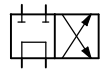
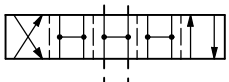
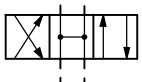
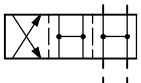
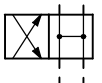
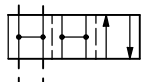
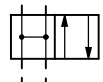
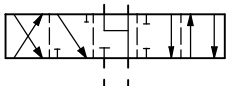
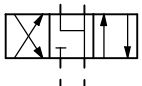
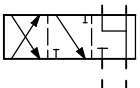
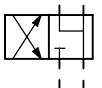
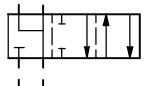
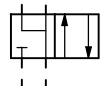
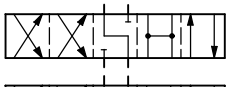
WE6...**A** -1X/**...**



WE6...**B** -1X/**...**



Graphic symbols for spools

working and indirect positions	working positions	working and indirect positions	working positions	working and indirect positions	working positions
					
	 **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**

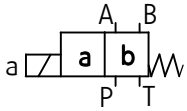
NOTES:

Spool **E** has the version **E1** with indirect positions like for spool **P**.
Spool **W** allows to open the flow in central position in 3% of nominal flow
Spool **Q** allows to open the flow in central position in 6% of nominal flow

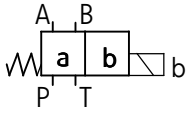
SCHEMES

Graphic symbols for 2- position directional spool valves

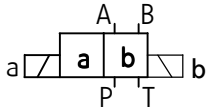
WE6...-1X/**...**



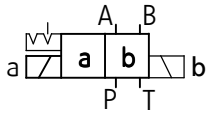
WE6...-1X/**...**



WE6...-1X/**O**...

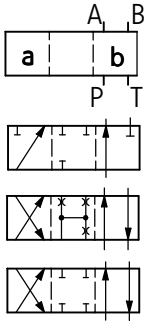


WE6...-1X/**OF**...

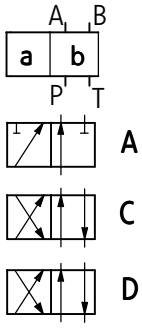


Graphic symbols for spools

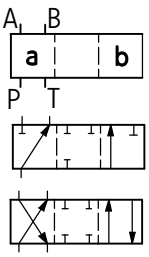
working and indirect positions



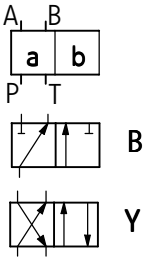
working positions



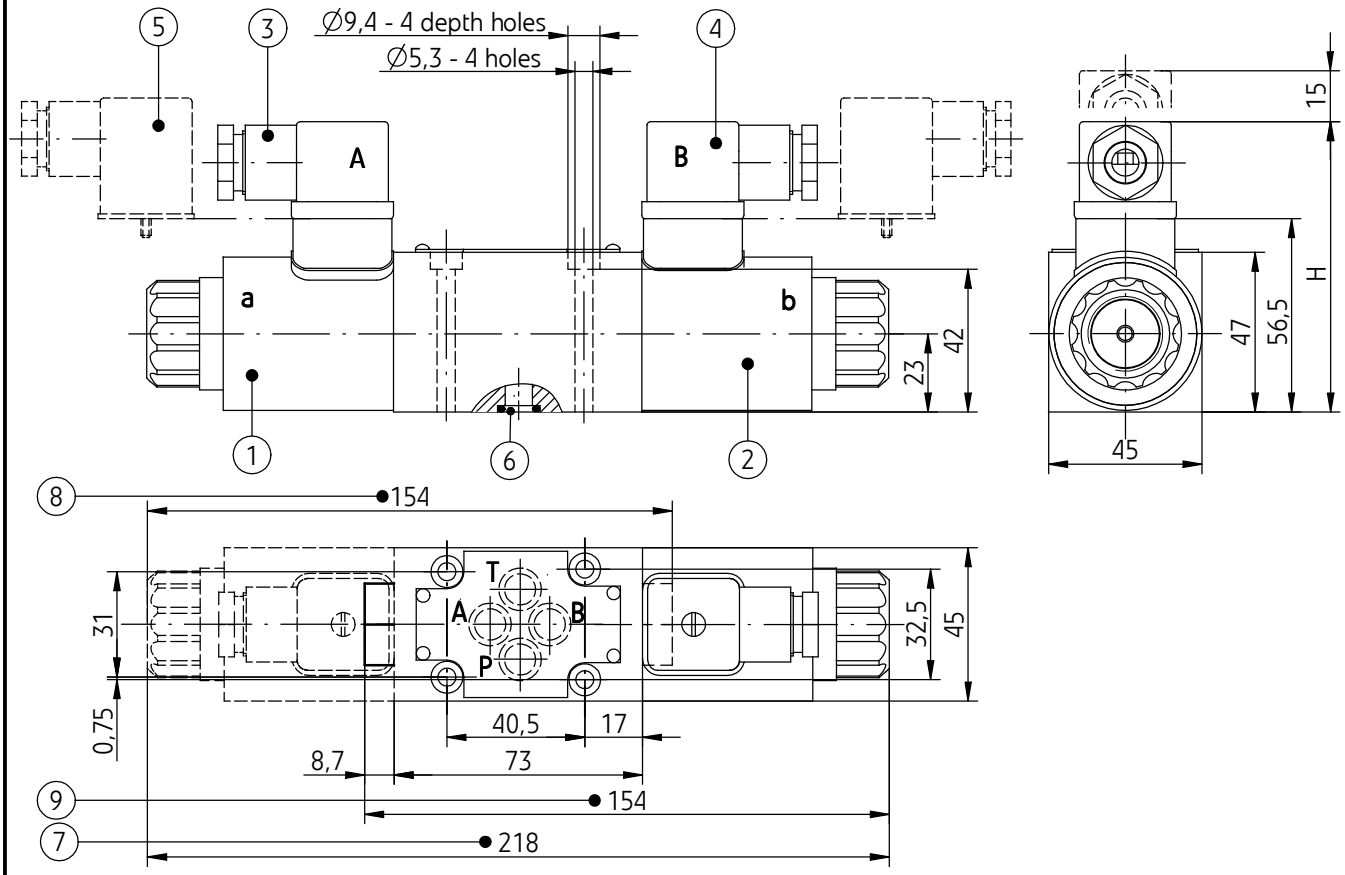
working and indirect positions



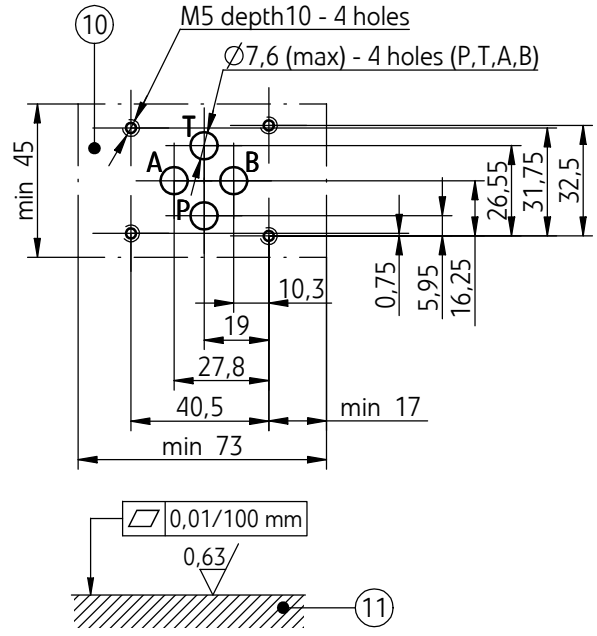
working positions



OVERALL AND CONNECTION DIMENSIONS



electrical connecti on type		dimension H
plug-in-connectors **ISO 4400 type**	control voltage - **DC 12V, 24V, 110V**	86
plug-in-connectors **ISO 4400 type with rectifier**	control voltage - **AC 110V, 230V**	93



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 9,2 x 1,8** - 4 pcs/kit
7 - Directional spool valve size with **2 solenoids - a, b**
- **3-position directional spool valve springs centered** (spool schemes: **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 schemes: **A**, **C**, **D** - according to page 4)

8 - Directional spool valve size with **1 solenoid - a**
- **2-position springs centered** (spool schemes: **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 schemes: **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 connection holes in accordance with the following standards:
- **CETOP RP 121H** - identified by CETOP 4.2-4-03-320 (nominal size **CETOP 03**)
- **ISO 4401** - identified by ISO 4401-03-02-0-94

mounting bolts **M5 x 50 - 10.9** in accordance with **PN -EN ISO 4762** - 4 pcs/kit, tightening torque **Md = 9Nm**

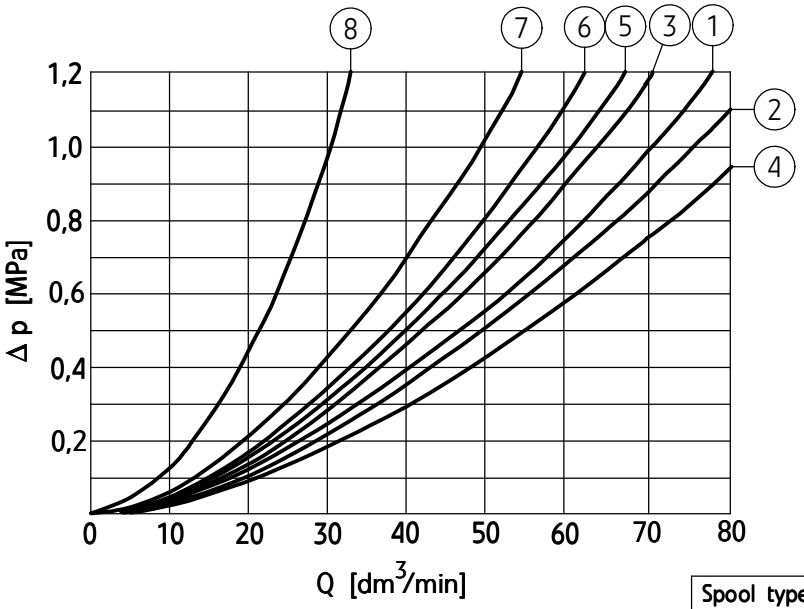
11 - Subplate surface required

PERFORMANCE CURVES

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

Flow resistance curves

Characteristic curves $\Delta p(Q)$ for directional spool valves type **WE6...-12/...** for various spool types

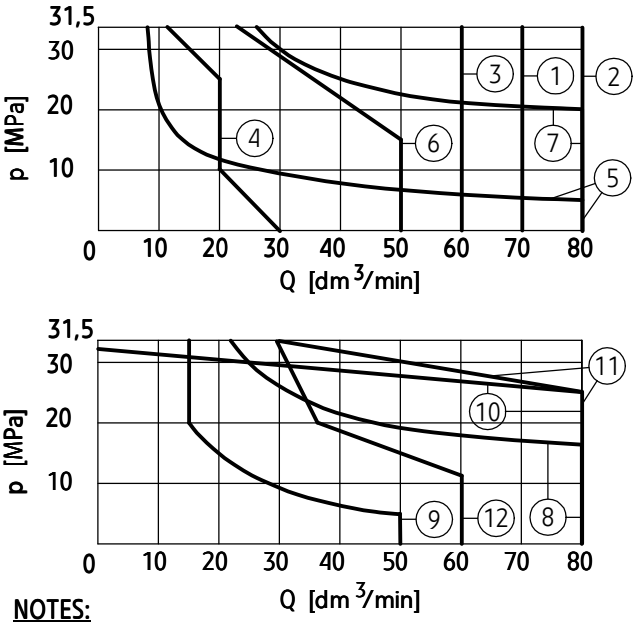


Spool type schemes according to page 3, 4	Performance diagram number			
	flow direction			
	P → A	P → B	A → T	B → T
A, B	3	3	-	-
C	1	1	3	1
D, Y	5	5	3	3
E	3	3	1	1
F	2	3	3	5
G	5	3	6	6
H	2	4	2	2
J	1	1	2	1
L, W	1	1	2	2
M	2	4	3	3
P	2	3	3	5
Q	1	1	2	1
R	5	5	4	-
T	5	3	6	6
U	3	1	3	3
V	1	2	1	1

Spool type	Performance diagram number					
G - in central position (P → T scheme- page 3)	flow direction					
	P → A	P → B	P → T	A → T	B → T	B → A
	-	-	7	-	-	-
R - in shifted position (B → A, scheme- page 3)	flow direction					
	P → A	P → B	P → T	A → T	B → T	B → A
	-	-	-	-	-	8

Flow limits curves

Characteristic curves **p-Q** for directional spool valves type **WE6...-12/...** with DC solenoids for various spool types



Spool type schemes according to page 3, 4	Performance diagram number
E, L, U	1
H, J, M, W, C/OF, D/OF	2
C/O, D/O	3
F, P	4
A, B	5
V	6
A/O	7
R	8
T	9
C, D	10
Q	11
G	12

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 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

	WE	6		/						★

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

Nominal size (NS)
NS6 = **6**

Spool type
spool schemes - according to **page 3**, **4**

Series number
(10-19) - connection and installation dimensions unchanged = 1X
series 12 = **12**

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
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 ϕ 0,8 = B 08
throttle insert ϕ 1,0 = B 10
throttle insert ϕ 1,2 = B 12

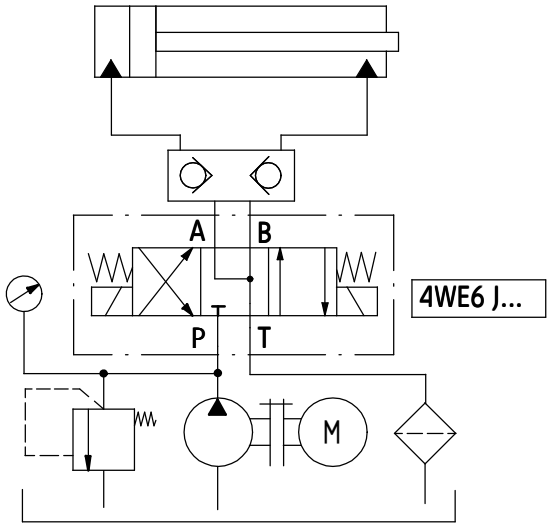
Sealing
NBR (for fluids on mineral oil base) = **no designation**
FPM (for fluids on phosphate ester base) = V

Further requirements in clear 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 in short delivery time.
Coding example: 4WE6 E – 12/G24 N Z4 B08

EXAMPLE OF APPLICATION IN HYDRAULIC SYSTEM



SUBPLATES AND MOUNTING BOLTS

Subplates must be ordered according to the data sheet **WK 496 480**. Subplates:
G 341/01 - threaded connection **G 1/4**
G 342/01 - threaded connection **G 3/8**
G 341/02 - threaded connection **M14 x1,5**
G 342/02 - threaded connection **M16 x1,5**

Subplates and bolts fixing directional valve **M5 x 50 - 10,9** in accordance with **PN - EN ISO 4762** - 4 pcs/kit) must be ordered separately.
Tightening torque for bolts: **Md = 9 Nm**

Directional spool valve type WE6.../SO 472 electrically operated special version

APPLICATION, DESCRIPTION OF OPERATION

like in standard, according to **page 1**

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 do 55 °C			
	max	-20 °C do +70 °C			
Ambient temperature range	- 20 °C do +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**	
	flow section	6 % nominal flow		3 % nominal flow	
Switching time	ON	up to 60 ms			
	OFF	up to 40 ms			
Maximum switching frequency	15000 on/h				
Weight	with 1 solenoid	max 1,5 kg			
	with 2 solenoids	max 2,1 kg			
Supply voltage for solenoids	**DC**			**AC** (plug-in connector with rectifier)	
	12V	**24V**	**110V**	**230V - 50Hz**	**110V - 50Hz**
Supply voltage tolerances	±10%				
Power requirement (DC)	**30** W				
Insulation	**IP 67**				
Solenoid coil temperature	max 150 °C				

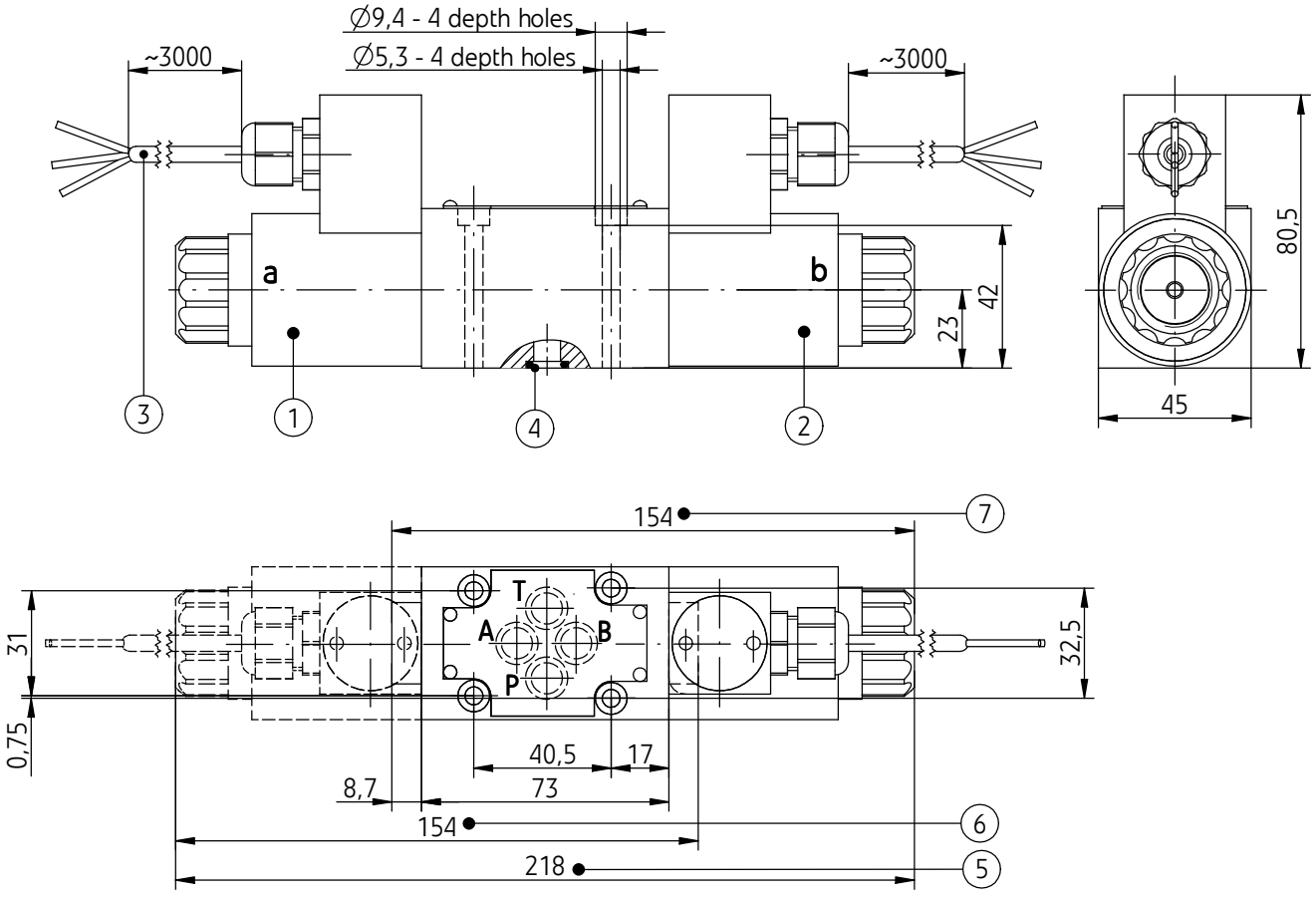
ASSEMBLY AND APPLICATION REQUIREMENTS

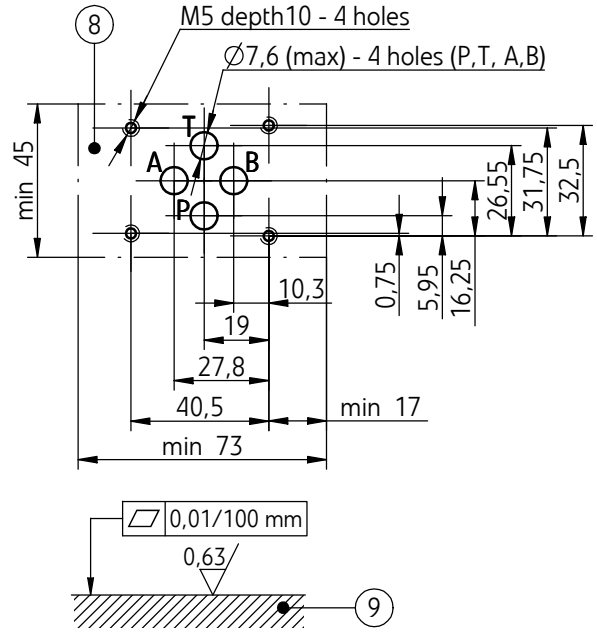
1. Only valve working properly and suitably installed may be connected to an electric system. Only skilled workers are allowed to connect and disconnect electric system.
2. Due to heating solenoid coils, directional spool valves should be placed in order to eliminate the possibility of incidental touch 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, PERFORMANCE CURVES

like in standard, according to **pages**: **3, 4, 6**

OVERALL AND CONNECTION DIMENSIONS





1 - Solenoid **a**
2 - Solenoid **b**
3 - Electric feeder cable **3 x 0,5 mm²**
4 - **O-ring 9,2 x 1,8** - 4 pcs /kit
5 - Directional spool valve size with **2 solenoids - a, b**
- **3-position directional spool valve springs centered** (spool schemes: **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 schemes: **A**, **C**, **D** - according to page 4)

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

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

8 - Porting pattern for directional spool valve configuration of connection holes in accordance with the following standards:
- **CETOP RP 121H** - idetified by **CETOP** 4.2-4-**03**-320 (nominal size **CETOP 03**)
- **ISO 4401** - identified by **ISO 4401**-03-02-0-94

mounting bolts **M5 x 50 - 10.9** in accordance with **PN -EN ISO 4762** - 4 pcs/kit
tightening torque **Md = 9 Nm**.

9 - Subplate surface required

HOW TO ORDER

4	WE	6		–	/			N	Z4	/		/	SO 472

Number of service ports
4-way = 4

Nominal size (NS)
NS6 = 6

Spool type
spool schemes- according to page3, 4- without spools A,B

Series number
(10-19) - connection and installation dimensions unchanged = 1X
series 12 = 12

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

Manual override
solenoids with manual override = N

Electrical connection
electric cable 3 x 0,5 mm^2; 3m length = Z4

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

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

Special version
DC solenoids equipped with electric feeder cable of 3m length, **insulation IP67** = **SO 472**

NOTES:

Directional spool valve should be ordered according to the above coding.
Coding example: 4WE6 J – 12/G24 N Z4 / B08 /SO 472

SUBPLATES AND MOUNTING BOLTS

like in standard, according to **page 8**

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