

DATA SHEET - SERVICE MANUAL

APPLICATION

Directional spool valves type **WE6...**, electrically operated, are used to control the direction of fluid flow in the system and thus allows the receiver (mostly piston rod or hydraulic motor) to change direction of movement and also to use two functions *on* and *off*. They are intended for subplate mounting in any position in hydraulic systems.

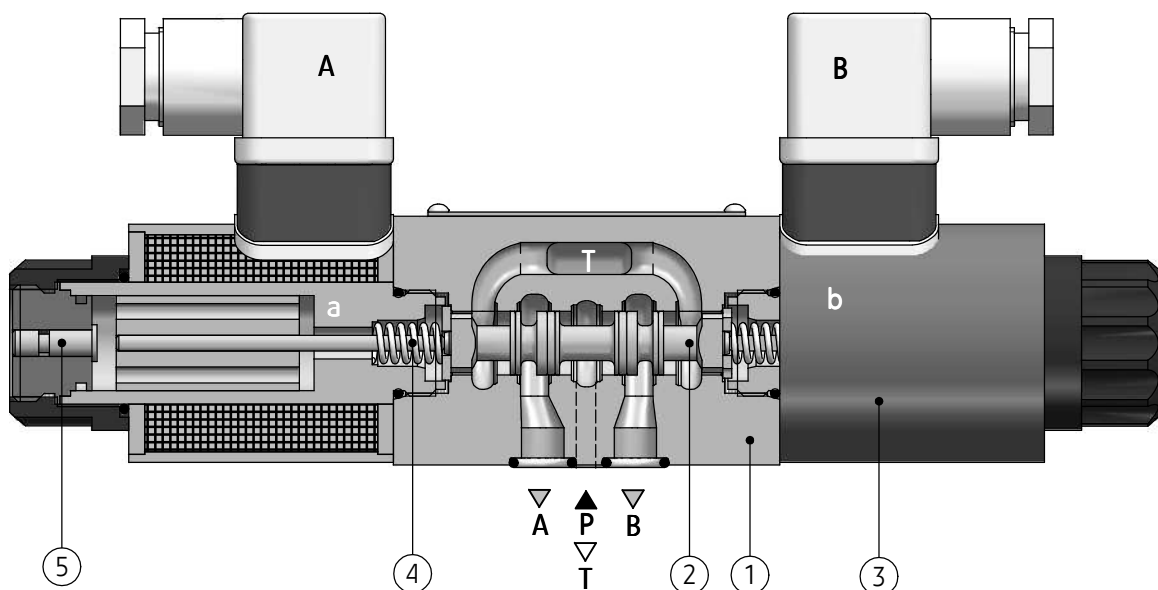
Directional spool valve is complied with the regulations of directive **2006/95/WE** for the following voltages:

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



DESCRIPTION OF OPERATION

4WE 6J -12/G42NZ4



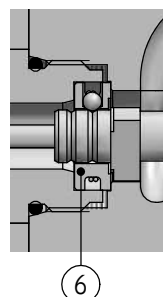
Main elements of directional spool valve type **WE6...** are: housing (1), solenoids (3), control spool (2), centering springs (4) and manual overrides (5).

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**.

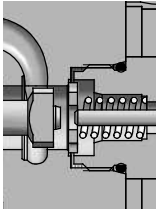
In case of emergency, the spool can be shifted manually by means of the override (5) – only for version with manual override.

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

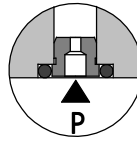


WE6...-12/OF... - only for spools: **A, C, D**. Two-position directional spool valve without return springs with detent. The spool (2) is positioned and supported with detent (6), and its shift results from supplying voltage to one solenoid (3).

DESCRIPTION OF OPERATION



WE6...-12/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.



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 °C | | | |
| Viscosity range | 2,8 up to 380 mm ² /s | | | |
| Fluid temperature range (in a tank) | recommended | 40 °C up to 55 °C | | |
| | max | -20 °C up to +70 °C | | |
| Ambient temperature range | - 20 °C up to +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 65 | | | |
| Solenoid coil temperature | max 150 °C | | | |

ASSEMBLY AND APPLICATION REQUIREMENTS

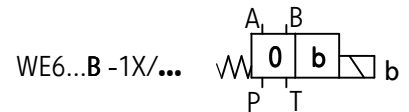
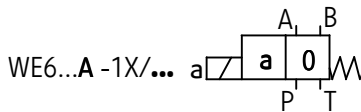
1. Only valve working properly and suitably installed may be connected to an electric system. Only skilled workers are allowed to connect and disconnect electric system.
2. Ground connection (\perp) must be connected with protective earth wire (PE \perp) in supply system according to instructions.
3. It is forbidden to use directional spool valve when tightness and appropriate clamp for cable in the plug gland is not secured.
4. It is forbidden to use directional spool valve when the plug is not precisely tightened to the solenoid socket.
5. Due to heating solenoid coils, directional spool valves should be put as 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

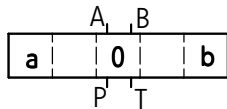


Graphic symbols for 2- position directional spool valves

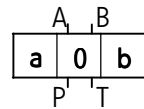


Graphic symbols for spools

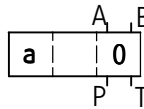
working and indirect positions



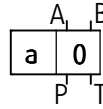
working positions



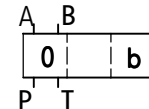
working and indirect positions



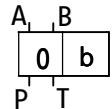
working positions



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:

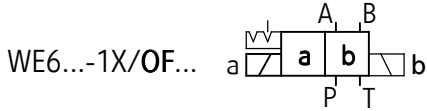
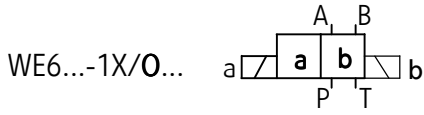
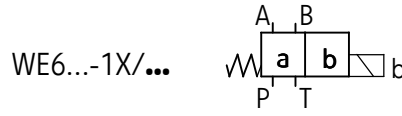
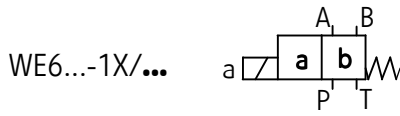
Spool **E** has the version **E1** with indirect positions like for spool **P**.

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

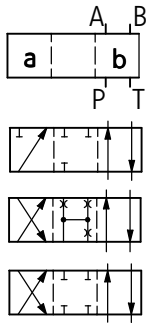
SCHEMES

Graphic symbols for 2- position directional spool valves

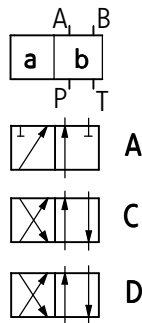


Graphic symbols for spools

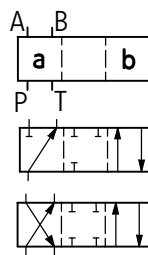
working and indirect positions



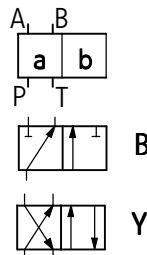
working positions



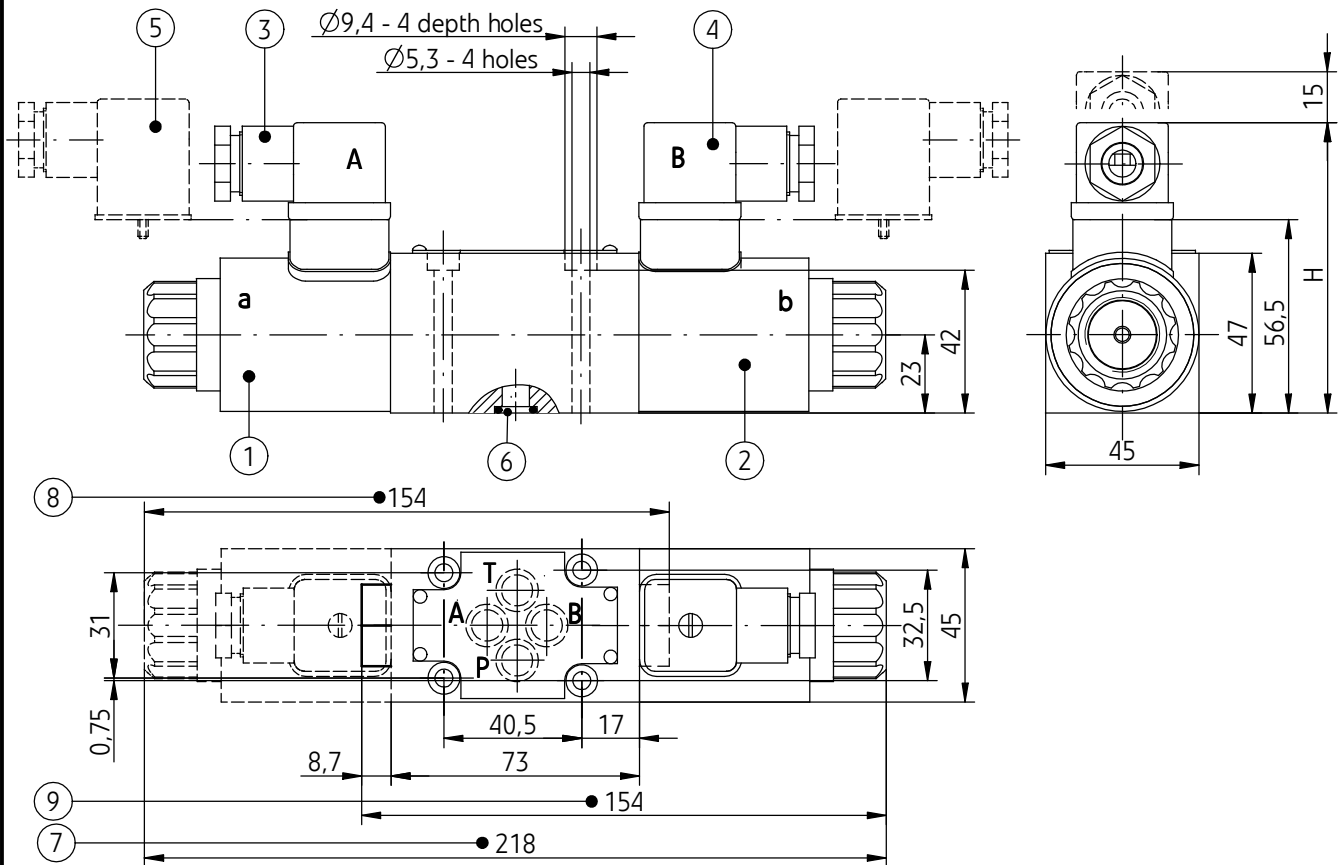
working and indirect positions



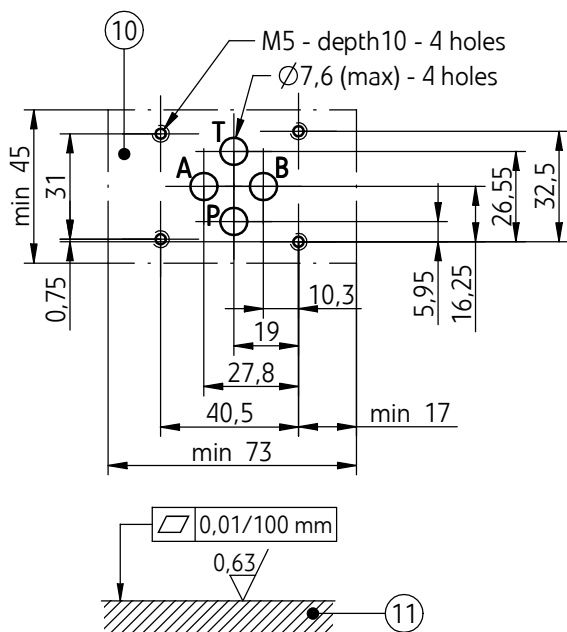
working positions



OVERALL AND CONNECTION DIMENSIONS



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



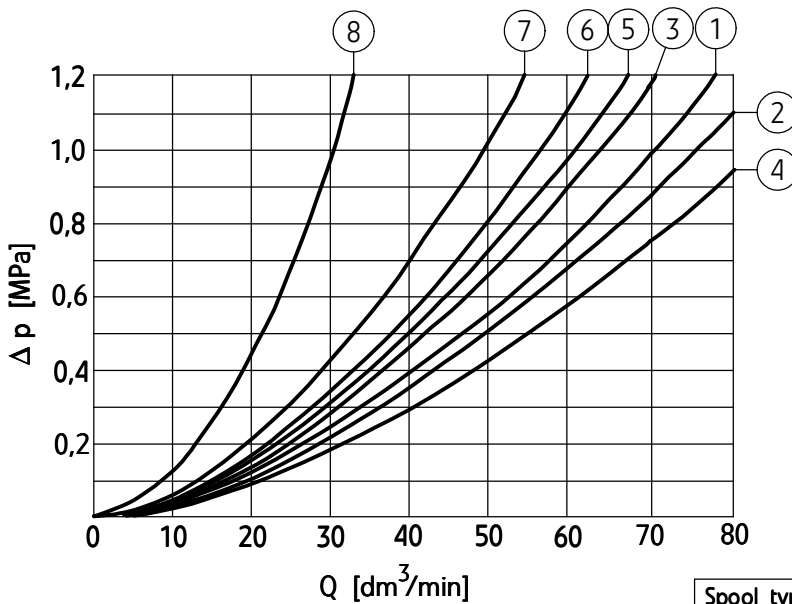
- 1 - Solenoid **a**
- 2 - Solenoid **b**
- 3 - Plug-in-connector **A** (ISO 4400 type)
- 4 - Plug-in-connector **B** (ISO 4400 type)
- 5 - Plug-in-connector (ISO 4400 type) with rectifier
- 6 - **O-ring 9,2 x 1,8** - 4 pcs/kit
- 7 - Directional spool valve size with **2 solenoids - a, b**
 - **3-position 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 $\nu = 41 \text{ mm}^2/\text{s}$ and temperature $t = 50^\circ\text{C}$

Flow resistance curves

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

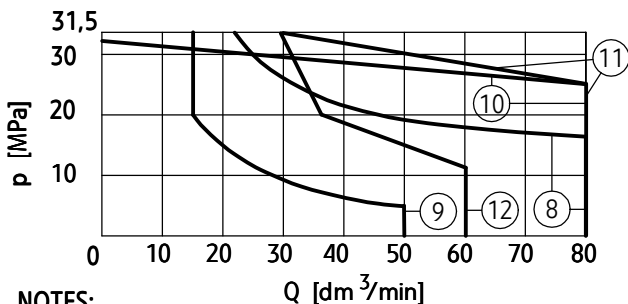
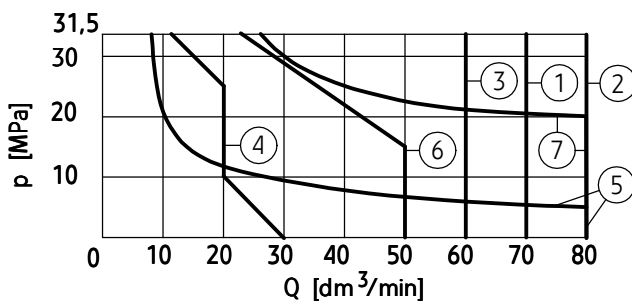


| Spool type schemes according to page 3, 4 | Performance diagram number | | | |
|---|----------------------------|-------|-------|-------|
| | flow direction | | | |
| | P → A | P → B | A → T | B → T |
| A, B | 3 | 3 | - | - |
| C | 1 | 1 | 3 | 1 |
| D, Y | 5 | 5 | 3 | 3 |
| E | 3 | 3 | 1 | 1 |
| F | 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 | | | | | |
|---|----------------------------|-------|-------|-------|-------|-------|
| | flow direction | | | | | |
| G - in central position (P → T scheme- page 3) | 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



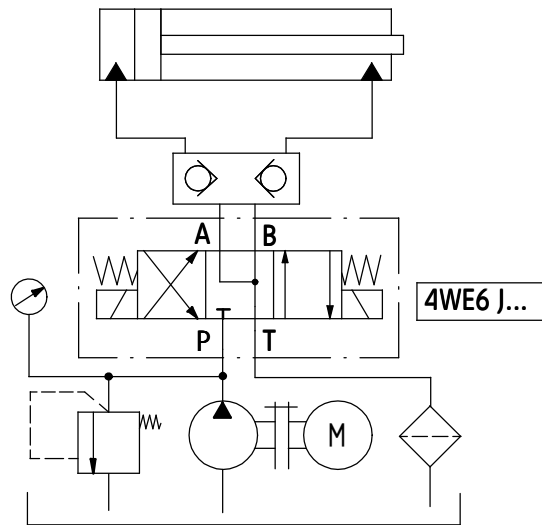
NOTES:

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.

| 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 |

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.

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 | | | | |

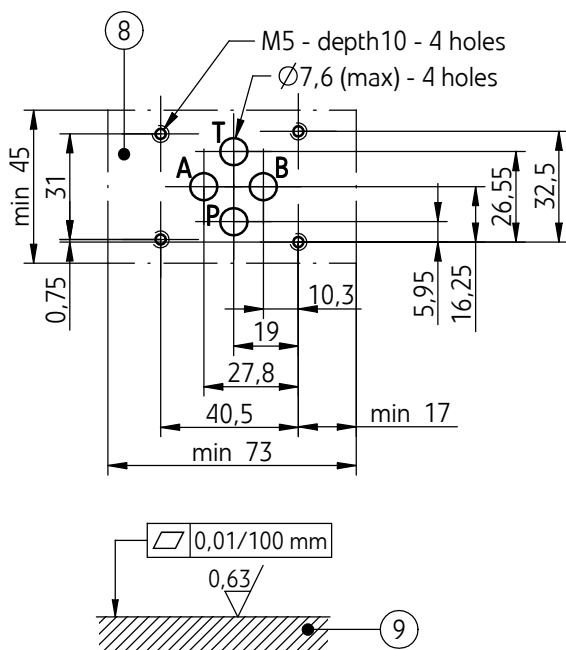
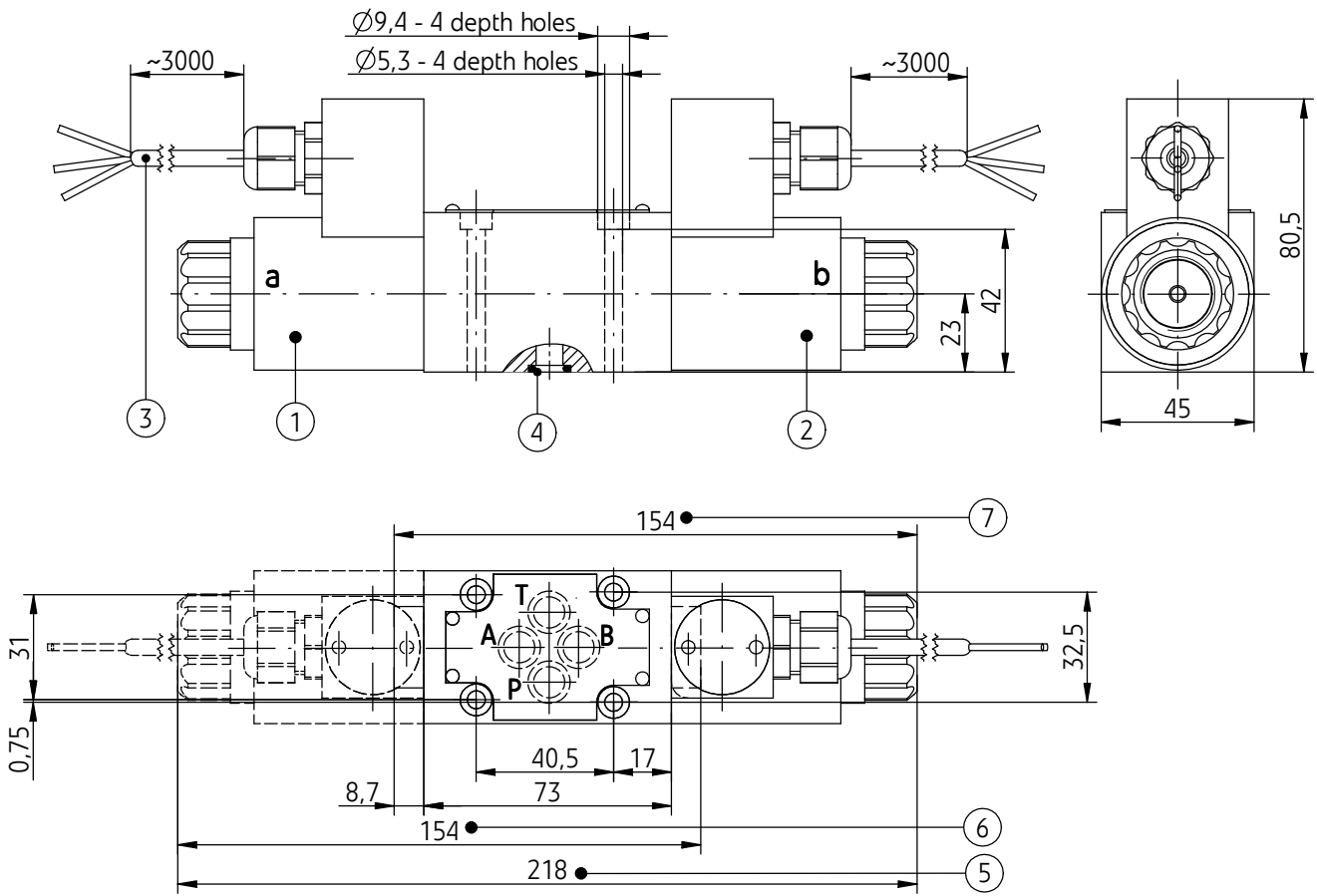
ASSEMBLY AND APPLICATION REQUIREMENTS

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 put as 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** - identified by **CETOP 4.2-4-03-320** (nominal size **CETOP 03**)
 - **ISO 4401** - identified by **ISO 4401-03-02-0-94**
- 9 - 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 service ports = 4

Nominal size (NS)

NS6 = 6

Spool type

spool schemes - on page 3, 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 = 0
without springs return with detent = OF

Control voltage for solenoids

DC voltage 12V DC = G12
DC voltage 24V DC = G24
DC voltage 110V DC = G110

Manual override

solenoids with manual override = N

Electrical connection

electric cable 3 x 0,5 mm²; 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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