Directional spool valves type WEH16 electrohydraulically operated are intended for change in direction of fluid flow in a 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.

The directional spool valve type WEH16... 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 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 are dependent on the spool (2) which affects the change in configuration of connections among ports P, T, A, B in the housing (1). The spool (2) is shifted from its neutral position by affecting pressure of hydraulic fluid supplied via pilot valve (4) into one chamber of caps (3). The pilot valve (4) – type WE6... is operated by means of solenoids (5). In case of failure, the pilot valve (4) may be shifted manually by means of manual overrides (6) – version ...4WEH16.../...N. The spool (2) is centered in neutral position by means of springs (7) – version ...4WEH16.../... or may be hydraulically operated by the fluid pressure from the pilot valve (4) – version ...4WEH16H.../... – for 3-position directional valves the centering is possible by means of the sleeve (8). Sealing of the directional valve to a subplate is secured by sealing rings. Sealing between mounting surface of the valve and subplate is assured by sealing rings.
Directional spool valves may be provided with the pilot choke adjustment (10) as well as with accessories such as: spool stroke limiter (11), spool end position monitor (12). Accessories may be mounted depending on version of directional valve like given on pages 16 – 20.

**TECHNICAL DATA**

<table>
<thead>
<tr>
<th>Hydraulic fluid</th>
<th>mineral oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required filtration</td>
<td>up to 16 µm</td>
</tr>
<tr>
<td>Recommended filtration</td>
<td>up to 10 µm</td>
</tr>
<tr>
<td>Nominal fluid viscosity</td>
<td>37 mm²/s at temperature 55°C</td>
</tr>
<tr>
<td>Viscosity range</td>
<td>2,8 up to 380 mm²/s</td>
</tr>
<tr>
<td>Fluid temperature range (in a tank)</td>
<td>recommended 40°C up to 55°C</td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>max –20°C up to +70°C</td>
</tr>
<tr>
<td></td>
<td>–20°C up to +50°C</td>
</tr>
</tbody>
</table>

| Max operating pressure | Ports A, B, P version H-4 WEH 16.../...
version 4 WEH 16.../...
Port T pilot fluid return Y- external pilot fluid return Y- internal (2-position and 3-position directional valve spring centered only, no 3-position version hydraulically centered with Y-internal) |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Max control pressure</td>
<td>25 MPa</td>
</tr>
<tr>
<td>Min control pressure</td>
<td>25 MPa</td>
</tr>
<tr>
<td></td>
<td>Pilot fluid supply X- external 3-position directional valve 2-position directional valve spring positioned 2-position directional valve hydraulically positioned Pilot fluid supply X- internal (when pre-load valve applied or when flow rate is suitably high) versions 4 WEH 16... with spools G,H,F,S,T versions H-4 WEH 16.../...D1... with spools G,H,F,S,T</td>
</tr>
<tr>
<td></td>
<td>0,8 MPa</td>
</tr>
<tr>
<td></td>
<td>1,0 MPa</td>
</tr>
<tr>
<td></td>
<td>0,5 MPa</td>
</tr>
<tr>
<td></td>
<td>0,45 MPa</td>
</tr>
<tr>
<td></td>
<td>0,7 MPa</td>
</tr>
</tbody>
</table>
### Fluid volume required to operate the valve

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Operation</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-position spring centered directional valve</td>
<td>from 0 (neutral) to operated position ( a )</td>
<td>5.75 cm³</td>
</tr>
<tr>
<td>3-position hydraulically centered directional valve</td>
<td>from 0 (neutral) to operated position ( b )</td>
<td>2.85 cm³</td>
</tr>
<tr>
<td>3-position hydraulically centered directional valve</td>
<td>from operated position ( a ) to 0 (neutral) position</td>
<td>5.75 cm³</td>
</tr>
<tr>
<td>3-position hydraulically centered directional valve</td>
<td>from operated position ( b ) to 0 (neutral) position</td>
<td>2.9 cm³</td>
</tr>
<tr>
<td>2-position directional spool valve</td>
<td></td>
<td>2.3 cm³</td>
</tr>
<tr>
<td>2-position directional spool valve</td>
<td></td>
<td>11.5 cm³</td>
</tr>
</tbody>
</table>

### Total time of spool shifting from neutral to end position

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Operation</th>
<th>Pilot Pressure</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-position spring centered directional valve</td>
<td>at pilot pressure ( p_{st} = 5 ) MPa</td>
<td></td>
<td>50 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( p_{st} = 15 ) MPa</td>
<td>45 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( p_{st} = 25 ) MPa</td>
<td>40 ms</td>
</tr>
<tr>
<td>3-position hydraulically centered directional valve</td>
<td>at pilot pressure ( p_{st} = 5 ) MPa</td>
<td>( a ) operation</td>
<td>40 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( p_{st} = 15 ) MPa</td>
<td>40 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( p_{st} = 25 ) MPa</td>
<td>40 ms</td>
</tr>
<tr>
<td></td>
<td>at pilot pressure ( p_{st} = 5 ) MPa</td>
<td>( b ) operation</td>
<td>50 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( p_{st} = 15 ) MPa</td>
<td>45 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( p_{st} = 25 ) MPa</td>
<td>40 ms</td>
</tr>
<tr>
<td>2-position directional valve</td>
<td>at pilot pressure ( p_{st} = 5 ) MPa</td>
<td></td>
<td>55 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( p_{st} = 15 ) MPa</td>
<td>50 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( p_{st} = 25 ) MPa</td>
<td>45 ms</td>
</tr>
</tbody>
</table>

### Total time of spool shifting from end to neutral position

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Operation</th>
<th>Pilot Pressure</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-position spring centered directional valve</td>
<td>at pilot pressure ( p_{st} = 5; 15; 25 ) MPa</td>
<td></td>
<td>40 ms</td>
</tr>
<tr>
<td>3-position hydraulically centered directional valve</td>
<td>( a ) operation</td>
<td>at pilot pressure ( p_{st} = 5 ) MPa</td>
<td>30 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( p_{st} = 15 ) MPa</td>
<td>25 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( p_{st} = 25 ) MPa</td>
<td>20 ms</td>
</tr>
<tr>
<td></td>
<td>( b ) operation</td>
<td>at pilot pressure ( p_{st} = 5 ) MPa</td>
<td>40 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( p_{st} = 15 ) MPa</td>
<td>35 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( p_{st} = 25 ) MPa</td>
<td>30 ms</td>
</tr>
<tr>
<td>2-position directional valve</td>
<td>at pilot pressure ( p_{st} = 5 ) MPa</td>
<td></td>
<td>35 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( p_{st} = 15 ) MPa</td>
<td>30 ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( p_{st} = 25 ) MPa</td>
<td>25 ms</td>
</tr>
</tbody>
</table>
### Pilot valve

<table>
<thead>
<tr>
<th>Type of pilot valve</th>
<th>4WE6 J</th>
</tr>
</thead>
<tbody>
<tr>
<td>for 3-position spring centered main directional valve</td>
<td>4WE6 M</td>
</tr>
<tr>
<td>for 3-position hydraulically centered main directional valve</td>
<td>4WE6 D .../... or</td>
</tr>
<tr>
<td>for 2-position main directional valve</td>
<td>4WE6 D .../O... or</td>
</tr>
<tr>
<td>4WE6 D .../OF...</td>
<td></td>
</tr>
</tbody>
</table>

### Nominal supply voltage for solenoids

<table>
<thead>
<tr>
<th>DC</th>
<th>12 V</th>
<th>24 V</th>
<th>110 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>230 V – 50 Hz</td>
<td>220 V – 50 Hz</td>
<td>110 V – 50 Hz</td>
</tr>
</tbody>
</table>

| Supply voltage tolerance | ±10% |
| Power requirement (DC) | 30 W |
| Temperature of solenoid coil | IP 65 |
| max 150 °C |

#### Inductive spool position sensors

| Type of sensors | two PNP inductive proximity sensors: |
|-----------------| normally closed – NC (contact breaker) + |
|                 | normally opened – NO (contact maker) |
| Supply voltage  | 10 – 30 V DC |
| Max load current | 200 mA |
| Connection type of sensor | sensor with M12 × 1 external thread, male connection |
| Connection type of conductor | plug with M12 × 1 internal thread, female plug |
| External diameter of conductor | configuration of connection according to PN-EN-61076-2-101 |
| Insulation      | ∅ 2,5 – 6,5 mm (PG7) |
|                 | IP 68 |
| Weight          | max 10,5 kg |

### 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 (utral) must be connected with protective earth wire (PE utral) 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).
Simplified and detailed hydraulic schemes for 3-position directional valves with various pilot supply (X) and pilot drain (Y)

3-position directional valves with spring centered spool at 0 position in main valve and pilot valve version ...4WEH16.../

<table>
<thead>
<tr>
<th>Internal supply X; internal drain Y version ...4WEH16.../...ET...</th>
<th>Internal supply X; internal drain Y version ...4WEH16H.../...ET...– impossible</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Diagram" /></td>
<td><img src="image2.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

3-position directional valves with hydraulically centered spool at 0 position in main valve and spring centered spool in pilot valve version ...4WEH16H.../

<table>
<thead>
<tr>
<th>External supply X; internal drain Y version ...4WEH16.../...T...</th>
<th>External supply X; internal drain Y version ...4WEH16H.../...T...– impossible</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3.png" alt="Diagram" /></td>
<td><img src="image4.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

3-position directional valves with internal supply X; external drain Y version ...4WEH16.../...E...

<table>
<thead>
<tr>
<th>Internal supply X; external drain Y version ...4WEH16H.../...E...</th>
<th>Internal supply X; external drain Y version ...4WEH16H.../...E...</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image5.png" alt="Diagram" /></td>
<td><img src="image6.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

3-position directional valves with external supply X; external drain Y version...4WEH16.../

<table>
<thead>
<tr>
<th>External supply X; external drain Y version...4WEH16.../...</th>
<th>External supply X; external drain Y version...4WEH16H.../...</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image7.png" alt="Diagram" /></td>
<td><img src="image8.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>
Simplified and detailed hydraulic schemes for 2-position directional valves with various pilot supply (X) and pilot drain (Y)

2-position directional valves with spring positioned spool in main valve and pilot valve version ...4WEH16.../...

2-position directional valves with hydraulically positioned spool in main valve and spring positioned spool in pilot valve version ...4WEH16H.../...

**internal** supply X; **internal** drain Y version ...4WEH16.../...ET...

**external** supply X; **internal** drain Y version ...4WEH16.../...T...

**internal** supply X; **external** drain Y version ...4WEH16.../...E...

**external** supply X; **external** drain Y version...4WEH16.../...
Simplified and detailed hydraulic schemes for 2-position directional valves with various pilot supply (X) and pilot drain (Y)

<table>
<thead>
<tr>
<th>2-position directional valves with hydraulically positioned spool in main valve, pilot valve without return spring</th>
<th>2-position directional valves with hydraulically positioned spool in main valve, pilot valve without return spring, with detent on...</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>internal</strong> supply X; <strong>internal</strong> drain Y version...4WEH16H.../O...</td>
<td><strong>internal</strong> supply X; <strong>internal</strong> drain Y version...4WEH16H.../OF...</td>
</tr>
<tr>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
</tr>
<tr>
<td><strong>external</strong> supply X; <strong>internal</strong> drain Y version...4WEH16H.../O...</td>
<td><strong>external</strong> supply X; <strong>internal</strong> drain Y version...4WEH16H.../OF...</td>
</tr>
<tr>
<td><img src="image3" alt="Diagram" /></td>
<td><img src="image4" alt="Diagram" /></td>
</tr>
<tr>
<td><strong>internal</strong> supply X; <strong>external</strong> drain Y version...4WEH16H.../O...</td>
<td><strong>internal</strong> supply X; <strong>external</strong> drain Y version...4WEH16H.../OF...</td>
</tr>
<tr>
<td><img src="image5" alt="Diagram" /></td>
<td><img src="image6" alt="Diagram" /></td>
</tr>
<tr>
<td><strong>external</strong> supply X; <strong>external</strong> drain Y version...4WEH16H.../O...</td>
<td><strong>external</strong> supply X; <strong>external</strong> drain Y version...4WEH16H.../OF...</td>
</tr>
<tr>
<td><img src="image7" alt="Diagram" /></td>
<td><img src="image8" alt="Diagram" /></td>
</tr>
</tbody>
</table>
### SCHEMES

#### Graphic symbols for spools

**3-position working and indirect positions**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>0</td>
</tr>
<tr>
<td>P</td>
<td>T</td>
</tr>
</tbody>
</table>

**working positions**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>0</td>
</tr>
<tr>
<td>P</td>
<td>T</td>
</tr>
</tbody>
</table>

**2-position working and indirect positions**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>0</td>
</tr>
<tr>
<td>P</td>
<td>T</td>
</tr>
</tbody>
</table>

**working positions**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>b</td>
</tr>
<tr>
<td>P</td>
<td>T</td>
</tr>
</tbody>
</table>
OVERALL AND CONNECTION DIMENSIONS

3-position standard versions ...4WEH16...7X/...S...D1...

2 – 3 – position directional valve (pilot valve) type WE6...12/... according to data sheet WK 499 502 (spool types according to technical data on page 4)
3 – Solenoid a
4 – Solenoid b
5 – Plug-in-connector A – ISO 4400 (DIN 43650 – A)
6 – Plug-in-connector B – ISO 4400 (DIN 43650 – A)
7 – Manual override
8 – Pilot choke adjustment (optional accessories)
9 – Pressure ratio valve (optional accessories)
10 – Square cross-section sealing ring 22,5 × 2,1 – 4 pcs/kit (P, T, A, B)
11 – Square cross-section sealing ring 10 × 2 – 3 pcs/kit (X, Y, L)
12 – Dimension for directional valve with the spool position 0 (neutral) spring centered (version ...4WEH16...7X/...)
13 – Dimension for directional valve with the spool position 0 (neutral) hydraulically centered (version ...4WEH16H...7X/...)
14 – Dimension for electrical connection for DC
15 – Dimension for electrical connection for AC (plug-in-connector with rectifier)
16 – Porting pattern – configuration of surface holes in subplate in accordance with the following standards:
   · CETOP RP 121H – identified by CETOP 4.2-4-07 (nominal size CETOP 07)
   · ISO 4401 – identified by ISO 4401-07-06-0-94 mounting bolts in accordance with PN -EN ISO 4762
   M10 × 60 - 10.9 – 4 pcs/kit tightening torque Md = 62 Nm
   M6 × 60 - 10.9 – 2 pcs/kit tightening torque Md =12.5 Nm
   NOTE: (*) – only for 3-position versions with 0 (neutral) position of the spool hydraulically centered
17 – Subplate surface required

NOTE: (*) – only for 3-position versions with 0 (neutral) position of the spool hydraulically centered

2 – 3 – position directional valve (pilot valve) type WE6...12/... according to data sheet WK 499 502 (spool types according to technical data on page 4)
3 – Solenoid a
4 – Solenoid b
5 – Plug-in-connector A – ISO 4400 (DIN 43650 – A)
6 – Plug-in-connector B – ISO 4400 (DIN 43650 – A)
7 – Manual override
8 – Pilot choke adjustment (optional accessories)
9 – Pressure ratio valve (optional accessories)
10 – Square cross-section sealing ring 22,5 × 2,1 – 4 pcs/kit (P, T, A, B)
11 – Square cross-section sealing ring 10 × 2 – 3 pcs/kit (X, Y, L)
12 – Dimension for directional valve with the spool position 0 (neutral) spring centered (version ...4WEH16...7X/...)
13 – Dimension for directional valve with the spool position 0 (neutral) hydraulically centered (version ...4WEH16H...7X/...)
14 – Dimension for electrical connection for DC
15 – Dimension for electrical connection for AC (plug-in-connector with rectifier)
16 – Porting pattern – configuration of surface holes in subplate in accordance with the following standards:
   · CETOP RP 121H – identified by CETOP 4.2-4-07 (nominal size CETOP 07)
   · ISO 4401 – identified by ISO 4401-07-06-0-94 mounting bolts in accordance with PN -EN ISO 4762
   M10 × 60 - 10.9 – 4 pcs/kit tightening torque Md = 62 Nm
   M6 × 60 - 10.9 – 2 pcs/kit tightening torque Md =12.5 Nm
   NOTE: (*) – only for 3-position versions with 0 (neutral) position of the spool hydraulically centered
17 – Subplate surface required
OVERALL AND CONNECTION DIMENSIONS

2-position standard versions ...4WEH16..7X/...S...D...

1 – 2 – position main directional valve (spool schemes: C, D, K, Z – on page 8)
2 – 2 – position directional valve (pilot valve) type WE6...12/... according to data sheet WK 499 502 (spool types according to technical data on page 4)
3 – Solenoid a
4 – Solenoid b – only for versions: ...4WEH16...7X/O, ...4WEH16...7X/OF...
5 – Plug-in-connector A - ISO 4400 (DIN 43650 - A)
6 – Plug-in-connector B - ISO 4400 (DIN 43650 - A) – only for version like item 4:
7 – Manual override
8 – Pilot choke adjustment (optional accessories)
9 – Pressure ratio valve (optional accessories)
10 – Square cross-section sealing ring 22,5 × 2,1 – 4 pcs/kit (P, T, A, B)
11 – Square cross-section sealing ring 10 × 2 – 3 pcs/kit (X, Y, L)
12 – Dimension for directional valve with spring positioned spool (version ...4WEH16...7X/...)
13 – Dimension for directional valve with hydraulically positioned spool (version ...4WEH16H...7X/...)
14 – Dimension for electrical connection for DC
15 – Dimension for electrical connection for DC
16 – Porting pattern – configuration of surface holes in subplate in accordance with the following standards:
   · CETOP RP 121H – identified by CETOP 4.2-4-07 (nominal size CETOP 07)
   · ISO 4401 – identified by ISO 4401-07-06-094 mounting bolts in accordance with PN
   · EN ISO 4762
   · M10 × 60 – 10.9 – 4 pcs/kit
   · M6 × 60 – 10.9 – 2 pcs/kit
   · Tightening torque Md = 62 Nm
   · M6 × 60 – 10.9 – 2 pcs/kit
   · Tightening torque Md = 12.5 Nm
   · NOTE: (*) – only for 3-position versions with 0 (neutral) position of the spool hydraulically centered
17 – Subplate surface required
**ACCESSORIES FOR STANDARD DIRECTIONAL VALVE**

**Pilot choke adjustment**

versions: ...4WEH16.../...S...
...4WEH16.../...S2...

Directional spool valves type ...4WEH16... may be optionally provided with pilot choke adjustment (throttle check valve type Z2F56...) which allows to adjust switching time of directional spool valve.

The change of adjustment method of switching time (flow throttling):

- on inlet – version ...4WEH16.../...
- on outlet – version ...4WEH16.../...

is made while mounting by rotating the pilot choke adjustment (3) by 180 degrees around its longitudinal axis.

Rotation of the adjusting screw (5) clockwise increases and counterclockwise decreases switching time of the valve.

The pilot choke adjustment (3) is fixed by means of bolts M5 × 80 – 10.9 – 4 pcs/kit in accordance with PN – EN ISO 4762 with tightening torque of Md = 5 Nm.

**Pressure ratio valve**

versions: H- 4WEH16.../...ET...D1...
H- 4WEH16.../...E...D1...

When pilot pressure exceeds 25 MPa, the directional valves type ...WEH16... must be equipped with pressure ratio valve (6). It causes the pilot pressure is reduced in the ratio 1: 0,66 = 1,515. Directional valves in the following versions: H - 4WEH16.../...ET...; H - 4WEH16.../...E... are provided with the pressure ratio valve (6). The pressure ratio valve (6) and pilot choke adjustment (3) must be fixed by means of bolts M5 × 105 – 10.9 – 4 pcs/kit in accordance with PN – EN ISO 4762 with tightening torque of Md = 5 Nm.
ACCESSORIES FOR STANDARD DIRECTIONAL VALVE

Pre-load valve
versions: ...4WEH16.../...P4,5...
...4WEH16.../...P7...

Directional valves type ...WEH16... with internal pilot oil supply (Y) – versions:
...4WEH16.../...E
...4WEH16.../...ET...
with spools with pressureless circulation of hydraulic fluid must be equipped with the pre-load valve (2) fixed in port P of the main valve (1).
Cracking pressure for pre-load valves:
valve P 4,5 – 0,45 MPa
valve P 7 – 0,7 MPa
For directional valves with fixed pressure ratio valve – versions: ...4WEH16.../...D...the pre-load valve P7 must be applied.

Performance curves for pre-load valves
measured at viscosity n = 41 mm /s and temperature t = 50 °C
version ...4WEH16.../...P4,5...
version ...4WEH16.../...P4,5...
version ...4WEH16.../...P7...

Throttle insert
versions ...4WEH16.../...B...
Directional valves type ...WEH16... may be equipped with throttle insert (3) in port P in pilot valve (2) which allows to delay switching time of the main valve.
ACCESSORIES FOR STANDARD DIRECTIONAL VALVE

Pilot oil supply and pilot oil drain

Pilot oil supply **X – external**  
Pilot oil drain **Y – external**  
version ...4WEH16.../...

In version ...4WEH16.../..., the hole screw plugs (3) and (5) and plugs (4) and (6) must be mounted in the position like given on the drawing.

Pilot oil supply **X – internal**  
Pilot oil drain **Y – external**  
version ...4WEH16.../...E...

In version ...4WEH16.../...E..., the hole screw plug (3) must be dismounted whereas the hole screw plug (5), plugs (4) and (6) must be mounted and port X in a subplate should be plugged.

Pilot oil supply **X – internal**  
Pilot oil drain **Y – internal**  
version ...4WEH16.../...ET...

In version ...4WEH16.../...ET..., the hole screw plugs (3) and (5) must be dismounted whereas the plugs (4) and (6) must be mounted and ports X and Y in a subplate must be plugged.

Pilot oil supply **X – external**  
Pilot oil drain **Y – internal**  
version ...4WEH16.../...T...

In version ...4WEH16.../...T..., the hole screw plug (3) must be mounted whereas the hole screw plug (5) must be dismounted. The plugs (4) and (6) must be mounted and the port Y in a subplate must be plugged.

NOTES:

Versions with internal oil drain:...ET...; ...T... are non-applicable for directional valves with main spool hydraulically centered (versions...4WEH16H...).

The hole screw plug (3) in port X is accessible after screwing out a side cover (2) in the main valve (1). The hole screw plug (5) in port Y is accessible after dismounting the pilot valve (7).
OPTIONAL ACCESSORIES FOR DIRECTIONAL VALVE

Stroke limiter

Stroke limiter of the spool may be mounted: ...

- stroke limiter on valve ends A and B version ...4WEH16.../...10...
- stroke limiter on valve end A version ...4WEH16.../...11...
- stroke limiter on valve end B version ...4WEH16.../...12...

Adjustment of the stroke of the main spool is by rotating the pin (3) and securing with locknut (4). Rotating the pin (3) clockwise reduces the stroke of the main spool (2). While adjusting the stroke the control chamber must be at zero pressure.

End position monitor

End position monitor may be mounted:

- on valve end A versions: ...4WEH16.../...18... (contact breaker) ...4WEH16.../...22... (contact maker)
- on valve end B versions: ...4WEH16.../...19... (contact breaker) ...4WEH16.../...23... (contact maker)

Directional valves type WEH16.../... may be equipped with spool end position monitor, optionally contact maker or contact breaker, mounted depending on the version, in main valve cover on valve end A or B – overall dimensions on pages 16 – 19.

Detailed information concerning proximity sensors and plug-in connectors given on page 4.

<table>
<thead>
<tr>
<th>Spool type</th>
<th>end position monitor with contact breakers (versions 4WEH16.../...18...; ...19...)</th>
<th>end position monitor with contact makers (versions 4WEH16.../...22...; ...23...)</th>
</tr>
</thead>
<tbody>
<tr>
<td>sensor 1</td>
<td>valve body side</td>
<td>central</td>
</tr>
<tr>
<td>sensor 2</td>
<td>valve body side</td>
<td>0</td>
</tr>
</tbody>
</table>
End position monitor

...4WEH16/...19...

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

scheme of electrical connection of sensors set
contact breaker

1 2 1 2

10 – 30V DC

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

...4WEH16/...23...

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

scheme of electrical connection of sensors set
contact maker

1 2 1 2

10 – 30V DC

NOTE:
(* ) – Only for 3-position directional valves
OVERALL DIMENSIONS OF DIRECTIONAL VALVE WITH OPTIONAL ACCESSORIES

Versions with stroke limiter

### 3-position directional valves with the main spool spring centered

Stroke limiter may be mounted:
- on valve end A – version ...4WH16.../...11...
- on valve end B – version ...4WH16.../...12...
- on valve ends A and B – version ...4WH16.../...10...

### 2-position directional valves with the main spool hydraulically positioned

Stroke limiter may be mounted:
- on valve end A – version ...4WEH16H.../...11...
- on valve end B – version ...4WEH16H.../...12...
- on valve end A and B – version ...4WEH16H.../...10...

2 solenoids (a, b) only for versions 4 WEH16H...72/O...; OF...

### 3-position directional valves with the main spool hydraulically centered

Stroke limiter may be mounted:
- on valve end B – version ...4WEH16H.../...12...

### 2-position directional valves with the main spool spring positioned

Stroke limiter may be mounted:
- on valve end A – version ...4WEH16.../...11...

...4WEH16.../...10...

...4WEH16H.../...10...

...4WEH16.../...11...
OVERALL DIMENSIONS OF DIRECTIONAL VALVE WITH OPTIONAL ACCESSORIES

Versions with end position monitor

3-position directional valves with spring centered main spool
end position monitor may be mounted:
• on valve end A – versions: ...4WEH16.../...18... (contact breaker) ;...22... (contact maker)
• on valve end B – versions: ...4WEH16.../...19... (contact breaker) ;...23... (contact maker)

NOTE:
(*) – Distance for mounting plug-in connector and cable of sensor (plug-in connectors according to page 4 – 2 pcs not shown on drawing, delivered with the valve)

3-position directional valves with hydraulically centered main spool
direct position monitor may be mounted:
• on valve end B – versions: ...4WEH16H.../...19... (contact breaker) ;...23... (contact maker)

NOTE:
(*) – Distance for mounting plug-in connector and cable of sensor (plug-in connectors according to page 4 – 2 pcs not shown on drawing, delivered with the valve)
OVERALL DIMENSIONS OF DIRECTIONAL VALVE WITH OPTIONAL ACCESSORIES

Versions with end position monitor

2-position directional valves with spring positioned main spool
end position monitor may be mounted:

- on valve end A – versions: ...4WEH16.../...18... (contact breaker)
  ...4WEH16.../...22... (contact maker)

2-position directional valves with hydraulically positioned main spool
end position monitor may be mounted:

- on valve end A – versions: ...4WEH16H.../...18... (contact breaker)
  ...4WEH16.../...22... (contact maker)
- on valve end B – versions: ...4WEH16H.../...19... (contact breaker)
  ...4WEH16H.../...23... (contact maker)

NOTE:
(*) – Distance for mounting plug-in connector and cable of sensor
(plug-in connectors according to page 4 – 2 pcs not shown on drawing, delivered with the valve)
OVERALL DIMENSIONS OF DIRECTIONAL VALVE WITH OPTIONAL ACCESSORIES

Versions with stroke limiter and end position monitor

3-position directional valves with spring centered main spool
Stoke limiter and end position monitor may be mounted:

- stroke limiter on valve end A and end position monitor
  contact breaker on valve end B – version ...4WH16.../...20...
- stroke limiter on valve end A and end position monitor
  contact maker on valve end B – version ...4WH16.../...24...
- stroke limiter on valve end B and end position monitor
  contact breaker on valve end A – version ...4WH16.../...21...
- stroke limiter on valve end B and end position monitor
  contact maker on valve end A – version ...4WH16.../...25...

...4WEH16.../...20...
...4WEH16.../...24...

NOTE:
(*) – Distance for mounting plug-in connector and cable of sensor (plug-in connectors according to page 4 –2 pcs not shown on drawing, delivered with the valve)
OVERALL DIMENSIONS OF DIRECTIONAL VALVE WITH OPTIONAL ACCESSORIES

Versions with stroke limiter and end position monitor

2-position directional valves with hydraulically positioned main spool

Stroke limiter and end position monitor may be mounted:

- stroke limiter on valve end A and end position monitor **contact breaker** on valve end B – version ...4WH16.../...20...
- stroke limiter on valve end A and end position monitor **contact maker** on valve end B – version ...4WH16.../...24...
- stroke limiter on valve end B and end position monitor **contact breaker** on valve end A – version ...4WH16.../...21...
- stroke limiter on valve end B and end position monitor **contact maker** on valve end A – version ...4WH16.../...25...

2 solenoids (a, b) only for versions 4WEH16H.../O...;...OF...

2 solenoids (a, b) only for versions 4WEH16.../...21...

2 solenoids (a, b) only for versions 4WEH16.../...25...

**NOTE:**

(*) – Distance for mounting plug-in connector and cable of sensor (plug-in connectors according to page 4 – 2 pcs not shown on drawing, delivered with the valve)
PERFORMANCE CURVES

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

**Pressure resistance curves**
Performance curves $\Delta p(Q)$ for directional valves type 4WEH16... with spools E and R

1 – spools: E, R
2 – spool R - flow direction P→A and B→A

Performance curves $\Delta p(Q)$ for directional valves type 4WEH16... with spools: F, H, J, L, M, Q, S, U, V, W, C, D, K, Z

1 – spool S

**Flow limits**

<table>
<thead>
<tr>
<th>spool type</th>
<th>pressure $p$ [MPa]</th>
<th>flow rate $Q$ [dm$^3$/min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td></td>
<td>200 145 115 100 90</td>
</tr>
<tr>
<td>G, H, S, T</td>
<td></td>
<td>220 160 130 110 100</td>
</tr>
</tbody>
</table>

**NOTE:**

Above flow limits are related to standard application of 4-way directional control valve using two flow directions, e.g. P to A and simultaneously B to T.
When 4-way directional control valve with only one flow direction is used, e.g. P to A (B plugged) or A to T (B plugged), then the actual flow limits are considerably lower.
# HOW TO ORDER

Version
working pressure
up to 28 MPa = no designation
working pressure
up to 35 MPa = H

<table>
<thead>
<tr>
<th>Number of service ports</th>
<th>= 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal size (NS)</td>
<td>= 16</td>
</tr>
<tr>
<td>Centering/spool positioning of the main valve</td>
<td></td>
</tr>
<tr>
<td>spring centering = no designation</td>
<td></td>
</tr>
<tr>
<td>hydraulic off-set = H</td>
<td></td>
</tr>
<tr>
<td>Type of the main spool</td>
<td></td>
</tr>
<tr>
<td>spool schemes – according to page 8</td>
<td></td>
</tr>
<tr>
<td>Series number</td>
<td></td>
</tr>
<tr>
<td>(70 – 79) – connection and installation dimensions unchanged = 7X</td>
<td></td>
</tr>
<tr>
<td>series 72 = 72</td>
<td></td>
</tr>
</tbody>
</table>

Centering/positioning of spool of the pilot valve
(applicable only to 2-position valves WEH16HC... /...HD... /...HK... /...HZ...)
by means of spring (solenoid a) = no designation
without spring (solenoid a and b) = O
without spring, with detent (solenoid a and b) = OF

Supply voltage for solenoids at pilot valve
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

Pilot oil supply and pilot oil drain
external pilot oil supply, external pilot oil drain = no designation
internal pilot oil supply, external pilot oil drain = E
internal pilot oil supply, internal pilot oil drain = ET
external pilot oil supply, internal pilot oil drain = T

Switching time adjustment
without switching time adjustment = no designation
switching time adjustment as meter-in control = S
switching time adjustment as meter-out control = S2
### Further requirements in clear text
(to be agreed with the manufacturer)

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

#### Pressure ratio valve
- without pressure ratio valve = no designation
- with pressure ratio valve = D1

#### Pre-load valve
- without pre-load valve = no designation
  - pre-load valve with cracking pressure 0.45 MPa = P 4,5
  - pre-load valve with cracking pressure 0.7 MPa = P 7

#### Throttle insert in port P of the pilot valve
- without throttle insert = no designation
  - throttle insert ∅ 0,8 = B 08
  - throttle insert ∅ 1,0 = B 10
  - throttle insert ∅ 1,2 = B 12

#### Accessories

<table>
<thead>
<tr>
<th>Designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>= no designation</td>
<td>without accessories</td>
</tr>
<tr>
<td>10</td>
<td>stroke limiter on valve ends A and B</td>
</tr>
<tr>
<td>11</td>
<td>stroke limiter on valve end A</td>
</tr>
<tr>
<td>12</td>
<td>stroke limiter on valve end B</td>
</tr>
<tr>
<td>18</td>
<td>end position monitor contact breaker on valve end A</td>
</tr>
<tr>
<td>19</td>
<td>end position monitor contact breaker on valve end B (not applicable for 2-position valves with spring positioning)</td>
</tr>
<tr>
<td>20</td>
<td>stroke limiter on valve end A and end position monitor contact breaker on valve end B</td>
</tr>
<tr>
<td>21</td>
<td>stroke limiter on valve end B and end position monitor contact breaker on valve end A</td>
</tr>
<tr>
<td>22</td>
<td>end position monitor contact maker on valve end A</td>
</tr>
<tr>
<td>23</td>
<td>end position monitor contact maker on valve end B (not applicable for 2-position valves with spring positioning)</td>
</tr>
<tr>
<td>24</td>
<td>stroke limiter on valve end A and end position monitor contact maker on valve end B</td>
</tr>
<tr>
<td>25</td>
<td>stroke limiter on valve end B and end position monitor contact maker on valve end A</td>
</tr>
</tbody>
</table>

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

**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: H- 4 WEH16 E 72/G24 N ET Z4
EXAMPLE OF APPLICATION IN HYDRAULIC SYSTEM

SUBPLATES AND MOUNTING BOLTS

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

G174/01 – threaded connections P, T, A, B – G1
X, Y, L – G1/4

G174/02 – threaded connections P, T, A, B – M33 × 2
X, Y, L – M14 × 1,5

G172/01 – threaded connections P, T, A, B – G3/4
X, Y, L – G1/4

G172/02 – threaded connections P, T, A, B – M27 × 2
X, Y, L – M14 × 1,5

Subplates and bolts for mounting directional spool valve in accordance with PN - EN ISO 4762:

M10 × 60 -10,9 – 4 pcs/kit
M 6 × 60 -10.9 – 2 pcs/kit

must be ordered separately.

Tightening torques for bolts:

M10 × 60 – Md = 62 Nm
M 6 × 60 – Md = 12,5 Nm

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