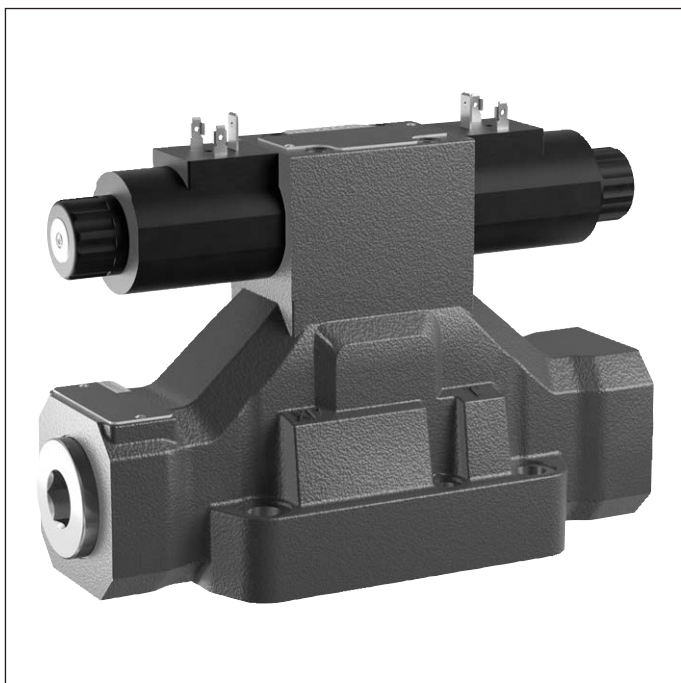


# Directional spool valves, pilot-operated, with electro-hydraulic or hydraulic actuation

## Type WEH and WH



- ▶ Size 16, 25
- ▶ Component series 1X
- ▶ Maximum operating pressure 350 bar
- ▶ Maximum flow 650 l/min

### Features

- ▶ 4/3-, 4/2-way version
- ▶ Types of actuation (internal or external pilot control):
  - Electro-hydraulic (type WEH)
  - Hydraulic (type WH)
- ▶ For subplate mounting
- ▶ Porting pattern according to ISO 4401
- ▶ Spring centering, spring end position
- ▶ DC solenoids
- ▶ Electrical connection as individual
- ▶ Manual override

### Contents

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**Ordering code**

|    |    |    |    |    |    |    |     |    |    |    |   |
|----|----|----|----|----|----|----|-----|----|----|----|---|
| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08  | 09 | 10 | 11 |   |
| 4  |    |    |    | 1X | /  | 6H | G24 | N9 |    | K4 | / |

|    |               |          |
|----|---------------|----------|
| 01 | 4-way version | <b>4</b> |
|----|---------------|----------|

**Types of actuation**

|    |                          |            |
|----|--------------------------|------------|
| 02 | Electro-hydraulic        | <b>WEH</b> |
|    | Hydraulic (only size 25) | <b>WH</b>  |

**Size**

|    |      |           |
|----|------|-----------|
| 03 | NG16 | <b>16</b> |
|    | NG25 | <b>25</b> |

|    |                               |  |
|----|-------------------------------|--|
| 04 | For symbols, see page 3 and 4 |  |
|----|-------------------------------|--|

|    |                                                                                         |           |
|----|-----------------------------------------------------------------------------------------|-----------|
| 05 | Component series 10 ... 19 (10 ... 19: unchanged installation and connection dimension) | <b>1X</b> |
|----|-----------------------------------------------------------------------------------------|-----------|

**Pilot control valve**

|    |                                |           |
|----|--------------------------------|-----------|
| 06 | Pilot valve (data sheet 23164) | <b>6H</b> |
|----|--------------------------------|-----------|

|    |                     |            |
|----|---------------------|------------|
| 07 | Direct voltage 24 V | <b>G24</b> |
|----|---------------------|------------|

|    |                                       |           |
|----|---------------------------------------|-----------|
| 08 | <b>With</b> concealed manual override | <b>N9</b> |
|----|---------------------------------------|-----------|

**Pilot oil flow**

|    |                                                                          |                |
|----|--------------------------------------------------------------------------|----------------|
| 09 | External pilot oil supply, external pilot oil return <sup>1)</sup>       | <b>no code</b> |
|    | Internal pilot oil supply, external pilot oil return <sup>1; 2; 4)</sup> | <b>E</b>       |
|    | Internal pilot oil supply, internal pilot oil return <sup>2; 4)</sup>    | <b>ET</b>      |
|    | External pilot oil supply, internal pilot oil return <sup>1)</sup>       | <b>T</b>       |

**Electrical connection**

|    |                                                              |                         |
|----|--------------------------------------------------------------|-------------------------|
| 10 | <b>Individual connection</b>                                 |                         |
|    | <b>Without</b> mating connector; connector DIN EN 175301-803 | <b>K4</b> <sup>3)</sup> |

**Throttle insert**

|    |                                                                              |                |
|----|------------------------------------------------------------------------------|----------------|
| 11 | <b>Without</b> throttle insert (possible only for external pilot oil supply) | <b>no code</b> |
|    | Throttle Ø1.0 mm                                                             | <b>B10</b>     |

<sup>1)</sup> Pilot oil supply X or return Y **external**:

- ▶ The maximum admissible operating parameters of the pilot control valve must be observed (see data sheet 23164).
- ▶ Minimum pilot pressure: please observe page 10.
- ▶ Maximum pilot pressure: please observe page 10.

<sup>2)</sup> Pilot oil supply **internal** (version "ET" and "E"):

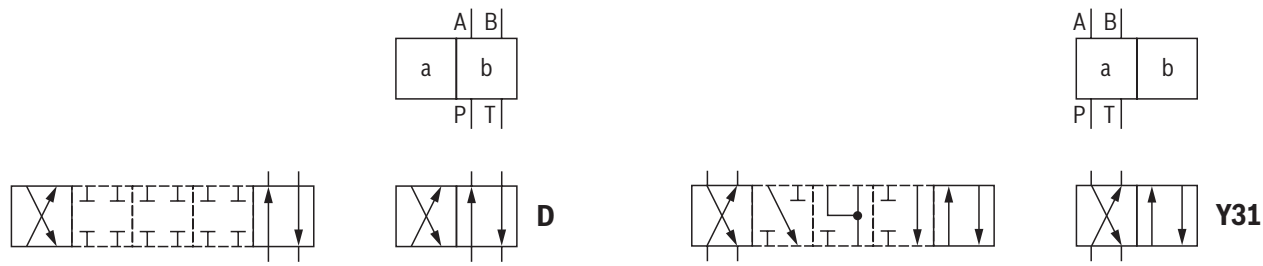
With this selection the maximum operating pressure reduces to maximum pilot pressure.

- ▶ Minimum pilot pressure: please observe page 10.
- ▶ Maximum pilot pressure: please observe page 10.
- ▶ In order to prevent inadmissibly high pressure peaks, a **"B10" throttle insert** has to be provided in port P of the pilot control valve (see page 9).

<sup>3)</sup> Mating connectors, separate order, see page 17.

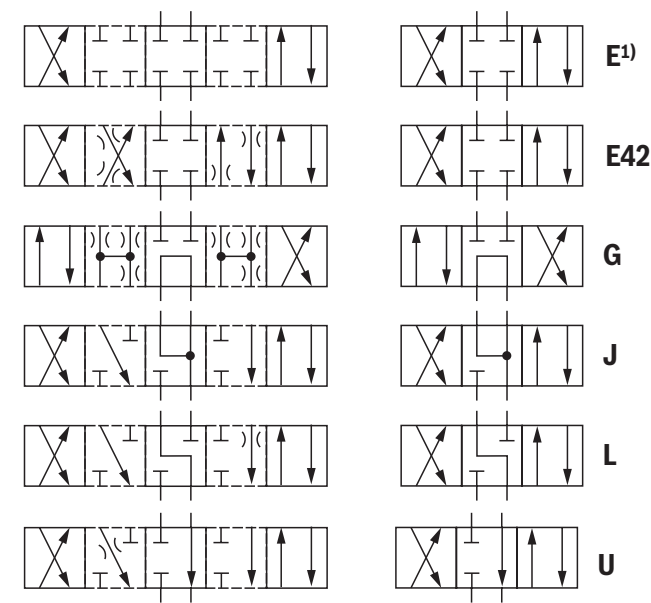
<sup>4)</sup> Not for connection P to T in zero position.

**Symbols:** 2 spool positions



| Ordering code |                      | Type of actuation   |                              |
|---------------|----------------------|---------------------|------------------------------|
| Symbol        | Control spool return | Type WH (hydraulic) | Type WEH (electro-hydraulic) |
| D             | ../..                |                     |                              |
| Y31           | ../..                |                     |                              |

**Symbols:** 3 spool positions



1) **Example:**  
Symbol E with actuating side "a" → ordering code ..EA..

| Ordering code |                |                      | Type of actuation   |                              |
|---------------|----------------|----------------------|---------------------|------------------------------|
| Symbol        | Actuating side | Control spool return | Type WH (hydraulic) | Type WEH (electro-hydraulic) |
| E, G, J, L, U |                | ../..                |                     |                              |
|               | .A             |                      |                     |                              |
|               | .B             |                      |                     |                              |

Symbols for valves with 2 spool positions

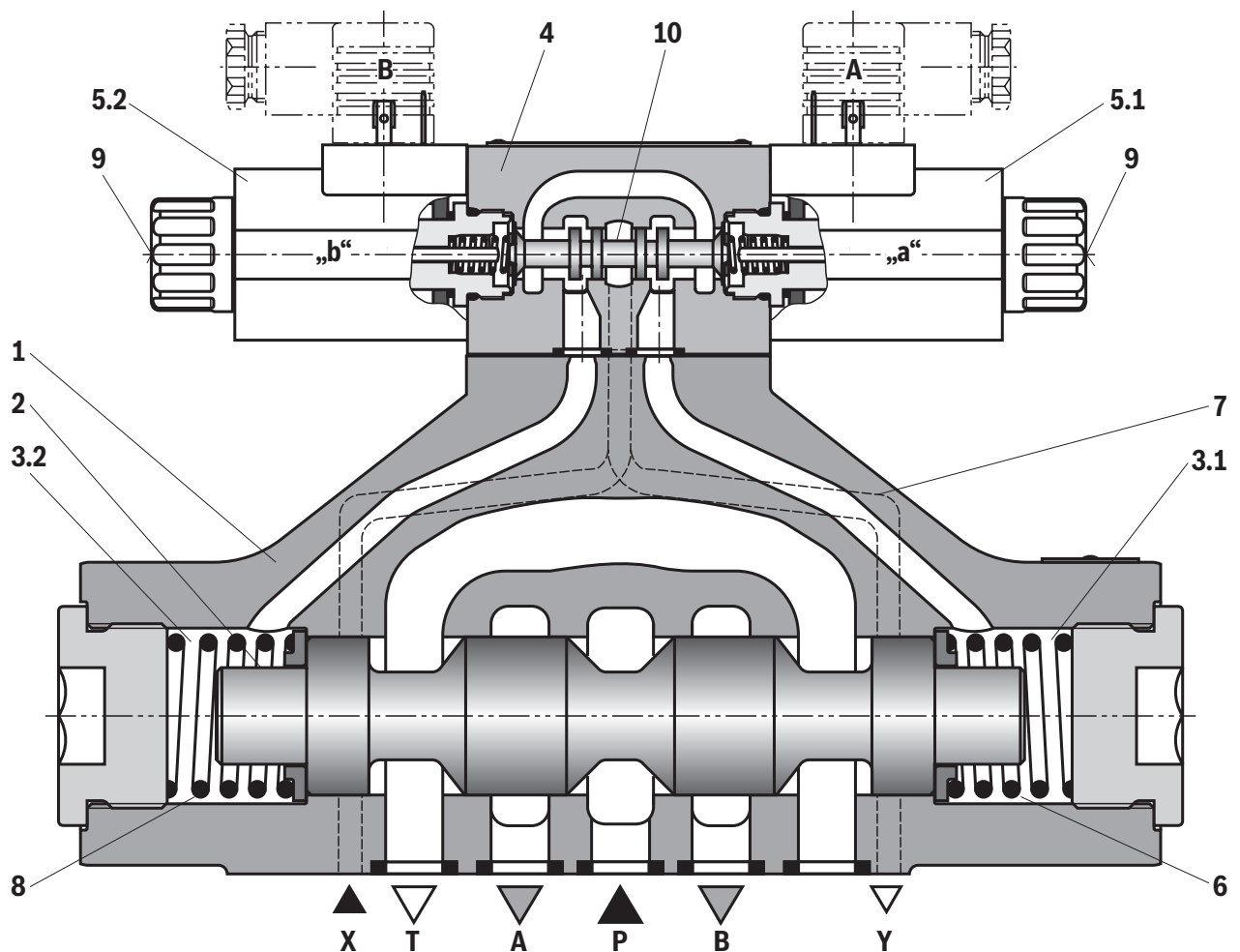
Valve with spring end position

|                                       | simplified                | detailed |
|---------------------------------------|---------------------------|----------|
| <div>X = external; Y = external</div> | <div>Type WEH.../..</div> |          |
| <div>X = internal; Y = external</div> |                           |          |
| <div>X = internal; Y = internal</div> |                           |          |
| <div>X = external; Y = internal</div> |                           |          |

Symbols for valves with 3 spool positions

Valve with spring-centered zero position

|                            | simplified                  | detailed |
|----------------------------|-----------------------------|----------|
| X = external; Y = external | <p>Type WEH.../..</p>       |          |
| X = internal; Y = external | <p>Type WEH.../...E...</p>  |          |
| X = internal; Y = internal | <p>Type WEH.../...ET...</p> |          |
| X = external; Y = internal | <p>Type WEH.../...T...</p>  |          |

**Function, section: Type WEH**

The valve type WEH is a directional spool valve with electro-hydraulic actuation. It controls the start, stop and direction of a flow.

The directional valve basically consists of the main valve with housing (1), the main control spool (2), one or two return springs (3.1) and (3.2), as well as the pilot control valve (4) with one or two solenoids "a" (5.1) and/or "b" (5.2).

The main control spool (2) in the main valve is held in the zero or initial position by the springs or by means of pressurization. In the initial position, the two spring chambers (6) and (8) are connected with the tank in a depressurized form via the pilot control valve (4). Via the control line (7), the pilot control valve is supplied with pilot oil. Supply can be implemented internally or externally (externally via port X). Upon actuation of the pilot control valve, e.g. solenoid "a", the pilot control spool (10) is moved to the left and thus, the spring chamber (8) is pressurized with pilot pressure. The spring chamber (6) remains depressurized.

The pilot pressure acts on the left side of the main control spool (2) and moves it against the spring (3.1).

This connects port P with B and A with T in the main valve.

On switching off of solenoid, the pilot control spool (10) returns to its initial position. The spring chamber (8) is unloaded to the tank.

The pilot oil return is implemented internally (via channel T) or externally (via channel Y).

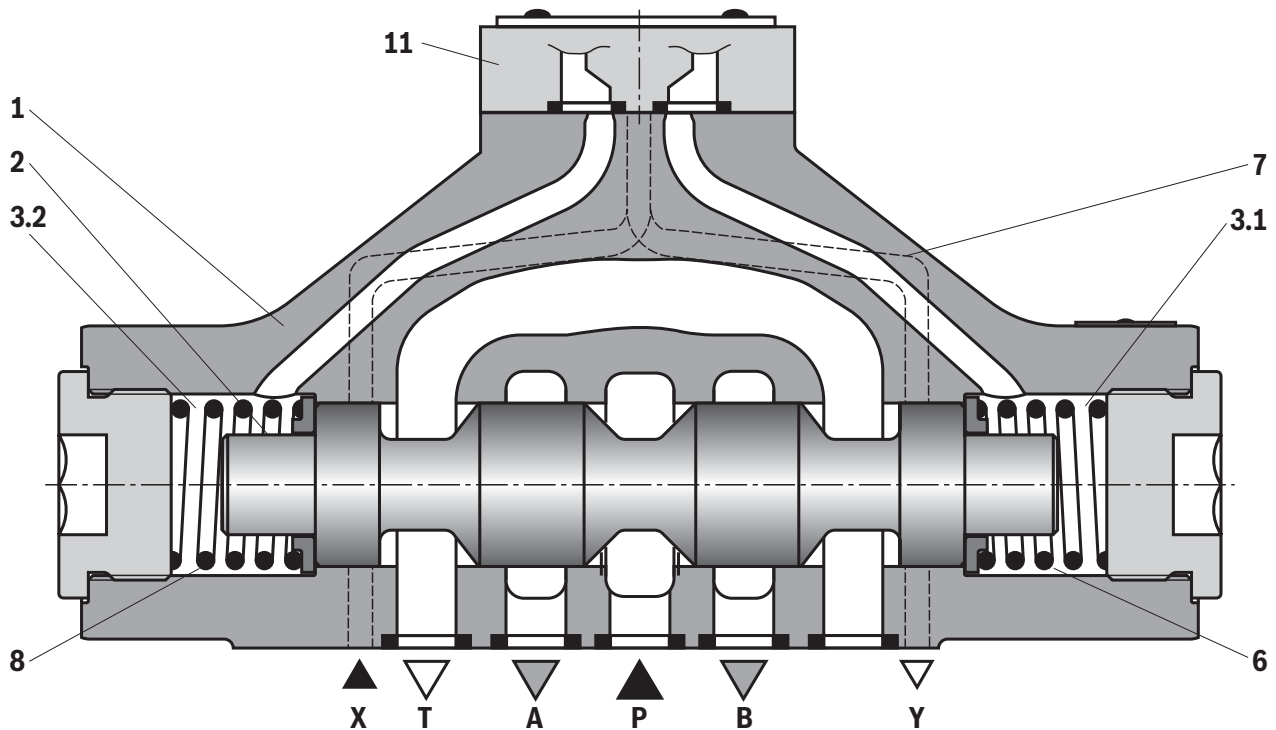
An optional manual override (9) allows for moving of the pilot control spool (10) without solenoid energization.

**Notices:**

The return springs (3.1) and (3.2) in the spring chambers (6) and (8) hold the main control spool (2) in central position without pilot pressure even with, for example, vertical valve positioning.

**Due to the design principle, internal leakage is inherent to the valves, which may increase over the life cycle.**

**For pilot oil supply, see page 9.**

**Function, section:** Type WH**Directional valves type WH...**

Valve type WH is a directional spool valve with hydraulic actuation. It controls the start, stop and direction of a flow.

The directional valve basically consists of the valve housing (1), the main control spool (2), one or two return springs (3.1) and (3.2) at valves with spring return or spring centering as well as the diversion plate (11).

The main control spool (2) is actuated directly by pressurization.

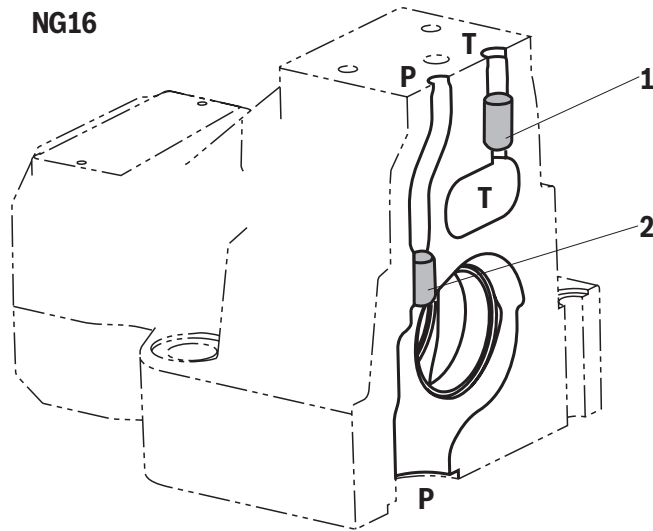
The main control spool (2) is held in zero or initial position by springs or pressurization. Pilot oil supply and return are external (see page 9).

**4/3 directional valve with spring centering of the control spool**

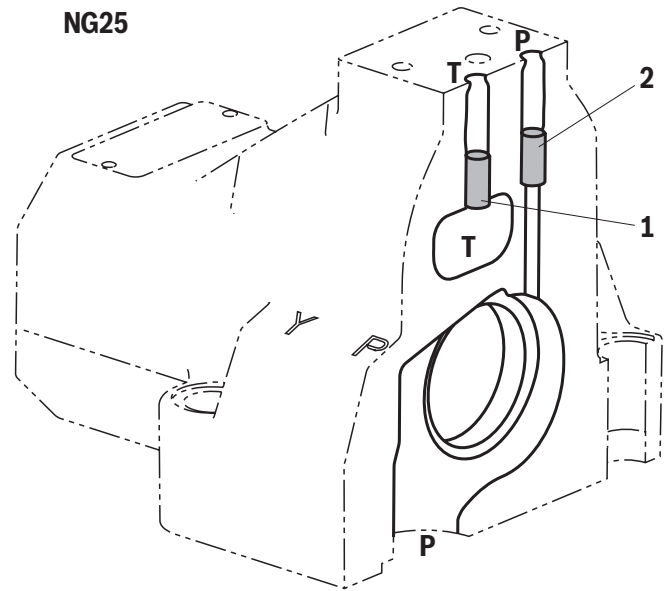
With this version, the main control spool (2) is held in zero position by two return springs (3.1) and (3.2). Via the diversion plate (11), the spring chamber (6) is connected to port Y, the spring chamber (8) to port X. With pilot pressure loading of one of the two front sides of the main control spool (2), the spool is moved to the spool position. In the valve, the required ports are connected in this way.

The spring on the opposite side returns the spool to the zero or initial position at pressure relief of the pressurized control spool area.

**For pilot oil supply, see page 9.**

**Pilot oil supply** (schematic illustration)

- 1 Plug screw M6 according to DIN 906, wrench size 3 – pilot oil return
- 2 Plug screw M6 according to DIN 906, wrench size 3 – pilot oil supply

**Pilot oil supply**

external: 2 closed  
internal: 2 open

**Pilot oil return**

external: 1 closed  
internal: 1 open

**Type WH...**

The pilot oil supply and return is implemented **externally** via channel X and Y.

**Type WEH...**

The pilot oil supply is implemented **externally** - via channel X - from a separate pressure supply.

The pilot oil return is implemented **externally** - via channel Y - into the tank.

**Type WEH...E...**

The pilot oil supply is implemented **internally** from channel P of the main valve.

The pilot oil return is implemented **externally** - via channel Y - into the tank. In the subplate, port X is closed.

**Type WEH...ET...**

The pilot oil supply is implemented **internally** from channel P of the main valve.

The pilot oil return is implemented **internally** - via channel T - into the tank. In the subplate, ports X and Y are closed.

**Type WEH...T...**

The pilot oil supply is implemented **externally** - via channel X - from a separate pressure supply.

The pilot oil return is implemented **internally** - via channel T - into the tank. In the subplate, port Y is closed.

**Notices:**

**The modification of the pilot oil supply may only be performed by authorized specialists or at the factory.**

► Pilot oil supply X or return Y **external**:

- The maximum admissible operating parameters of the pilot control valve must be observed (see data sheet 23164).
- Maximum pilot pressure: please observe page 10.

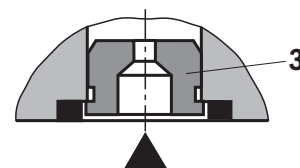
► Pilot oil supply **internal** (version "ET" and "E"):

- Minimum pilot pressure: please observe page 10.
- In order to prevent inadmissibly high pressure peaks, a **"B10" throttle insert** has to be provided in port P of the pilot control valve (see above).

**Throttle insert**

Use of the throttle insert (3) is necessary if the pilot oil supply in channel P of the pilot control valve is to be limited (see below).

The throttle insert (3) is inserted in channel P of the pilot control valve.



**Technical data**

(For application outside these values, please consult us!)

| general                                            |                                             |                                                                                                    |                                                                             |
|----------------------------------------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Sizes                                              | NG                                          | 16                                                                                                 | 25                                                                          |
| Weight, approx.                                    | ► Valve with one solenoid                   | kg                                                                                                 | 7.5                                                                         |
|                                                    | ► Valve with two solenoids, spring-centered | kg                                                                                                 | 7.8                                                                         |
| Installation position                              |                                             | Any; With suspended installation, higher sensitivity to contamination – horizontal is recommended. |                                                                             |
| Ambient temperature range                          |                                             | °C                                                                                                 | –20 ... +50                                                                 |
| Storage temperature range                          |                                             | °C                                                                                                 | see operating instruction 07600-B                                           |
| Surface protection (valve body)                    |                                             | Coating, layer thickness max. 100 µm                                                               |                                                                             |
| MTTF <sub>D</sub> values according to EN ISO 13849 |                                             | Years                                                                                              | 75 (type WEH), 150 (type WH)<br>(For further details, see data sheet 08012) |

| hydraulic                                                                                                        |                                                   |                              |             |
|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|------------------------------|-------------|
| Maximum operating pressure                                                                                       |                                                   |                              |             |
| ► Port P, A, B                                                                                                   | bar                                               | 350                          | 350         |
| ► Port T                                                                                                         | – External pilot oil return Y                     | bar                          | 350         |
|                                                                                                                  | – Internal pilot oil return Y                     | bar                          | 160         |
| ► Port Y                                                                                                         | – External pilot oil return                       | bar                          | 160         |
| Hydraulic fluid                                                                                                  |                                                   | see table on page 11         |             |
| Hydraulic fluid temperature range<br>(at the valve working ports)                                                |                                                   | °C                           | –20 ... +80 |
| Viscosity range                                                                                                  |                                                   | mm <sup>2</sup> /s           | 2.8 ... 500 |
| Maximum admissible degree of contamination of the hydraulic fluid<br>Cleanliness class according to ISO 4406 (c) |                                                   | Class 20/18/15 <sup>1)</sup> |             |
| Maximum pilot pressure                                                                                           |                                                   | bar                          | 315         |
| Minimum pilot pressure                                                                                           |                                                   |                              | 260         |
| ► External pilot oil supply X (all symbols)<br>internal pilot oil supply (only symbols D, E, J, L, U, Y31)       |                                                   |                              |             |
|                                                                                                                  | – 3-spool position valve, spring-centered         | bar                          | 14          |
|                                                                                                                  | – 2-spool position valve with spring end position | bar                          | 14          |
| Pilot volume for switching process                                                                               |                                                   |                              |             |
| ► 3-spool position valve, spring-centered                                                                        | cm <sup>3</sup>                                   | 5.2                          | 11.7        |
| ► 2-spool position valve                                                                                         | cm <sup>3</sup>                                   | 10.3                         | 23.4        |
| Pilot flow for shortest switching time, approx.                                                                  |                                                   | l/min                        | 35          |

<sup>1)</sup> The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and simultaneously increases the life cycle of the components.

## Technical data

(For applications outside these parameters, please consult us!)

| Hydraulic fluid | Classification             | Suitable sealing materials | Standards | Data sheet |
|-----------------|----------------------------|----------------------------|-----------|------------|
| Mineral oils    | HL, HLP, HLPD, HVLP, HVLPD | NBR                        | DIN 51524 | 90220      |



### Important notices on hydraulic fluids:

- For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.

## Switching times

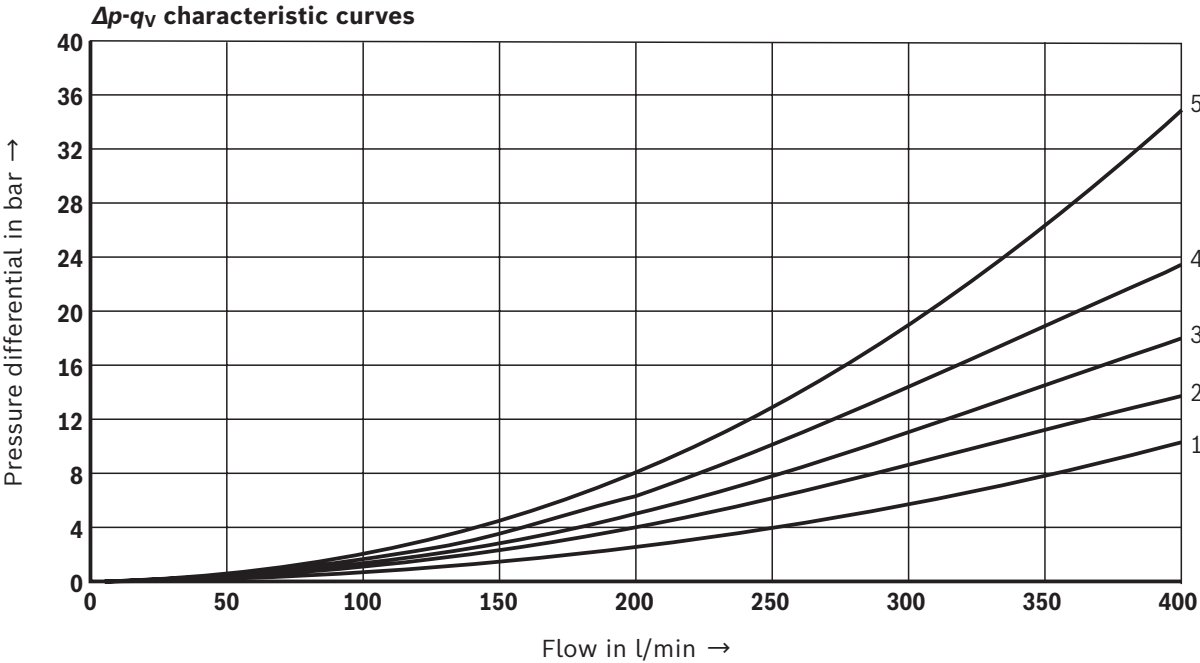
| Pilot pressure |                           |                         |  | bar | 70          | 250         | Spring      |
|----------------|---------------------------|-------------------------|--|-----|-------------|-------------|-------------|
|                |                           |                         |  |     | ON          |             | OFF         |
| NG16           | ► Without throttle insert | D, Y31, E, E42, L, U, J |  | ms  | 50 ... 80   | 40 ... 100  | 40 ... 50   |
|                | ► With throttle insert    | D, Y31, E, E42, L, U, J |  | ms  | 100 ... 160 | 80 ... 100  | 40 ... 50   |
| NG25           | ► Without throttle insert |                         |  | ms  | 70 ... 100  | 50 ... 70   | 100 ... 130 |
|                | ► With throttle insert    |                         |  | ms  | 200 ... 280 | 120 ... 170 | 180 ... 400 |



### Notices:

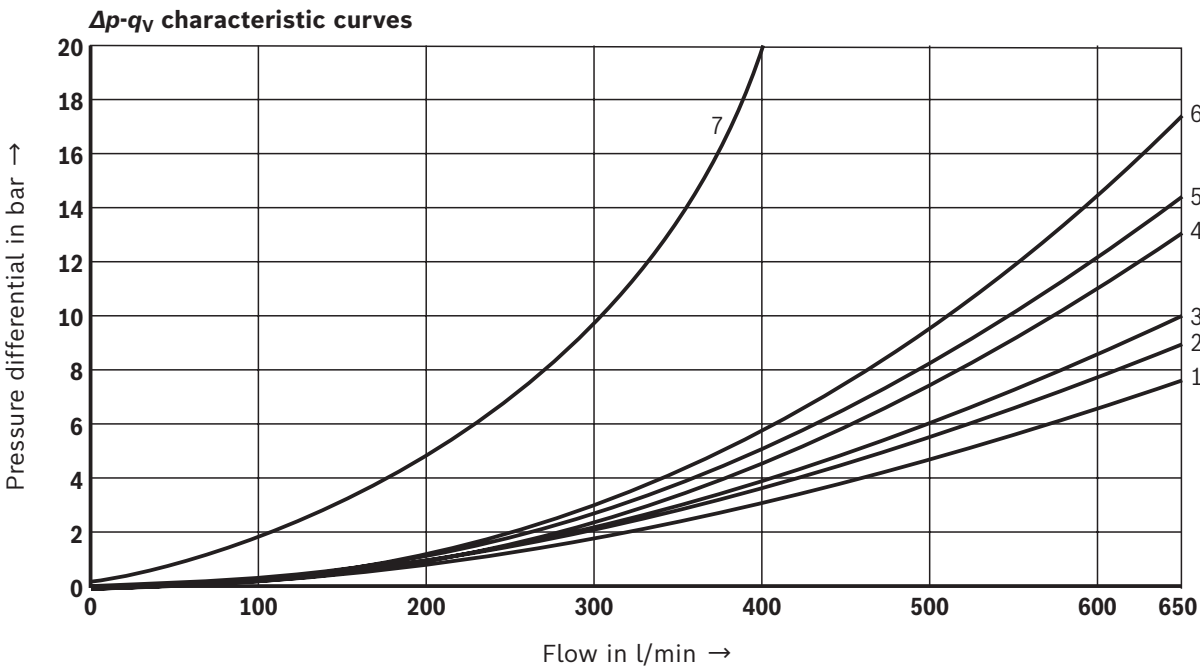
- Switching times = Contacting at the pilot control valve until start of opening of the control edge in the main valve and change in the control spool stroke by 95%)
- The switching times are measured according to ISO 6403 with HLP46,  $\vartheta_{oil} = 40\text{ °C} \pm 5\text{ °C}$ .  
With different oil temperatures, variations are possible!
- The switching times were determined using DC solenoids.
- The shut-off of the solenoids creates voltage peaks, which can be reduced by the use of suitable diodes.
- The switching times have been determined under ideal conditions and may differ in the system, depending on the application conditions.

**Characteristic curves:** Size 16  
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$ )



| Symbol | Spool position |       |       |       |
|--------|----------------|-------|-------|-------|
|        | P – A          | P – B | A – T | B – T |
| D      | 1              | 1     | 1     | 2     |
| E      | 1              | 1     | 1     | 2     |
| E42    | 4              | 4     | 3     | 5     |
| J      | 1              | 1     | 1     | 2     |
| L      | 1              | 1     | 1     | 2     |
| U      | 1              | 1     | 1     | 2     |
| Y31    | 1              | 1     | 1     | 2     |

**Characteristic curves:** Size 25  
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$ )



| Symbol | Spool position |       |       |       |       |
|--------|----------------|-------|-------|-------|-------|
|        | P - A          | P - B | A - T | B - T | P - T |
| D      | 1              | 1     | 2     | 4     | -     |
| E      | 1              | 1     | 2     | 5     | -     |
| G      | 3              | 3     | 4     | 6     | 7     |
| J      | 1              | 1     | 3     | 5     | -     |
| L      | 1              | 1     | 3     | 4     | -     |
| U      | 1              | 1     | 2     | 5     | -     |
| Y31    | 1              | 1     | 3     | 5     | -     |

Performance limits  
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$ )



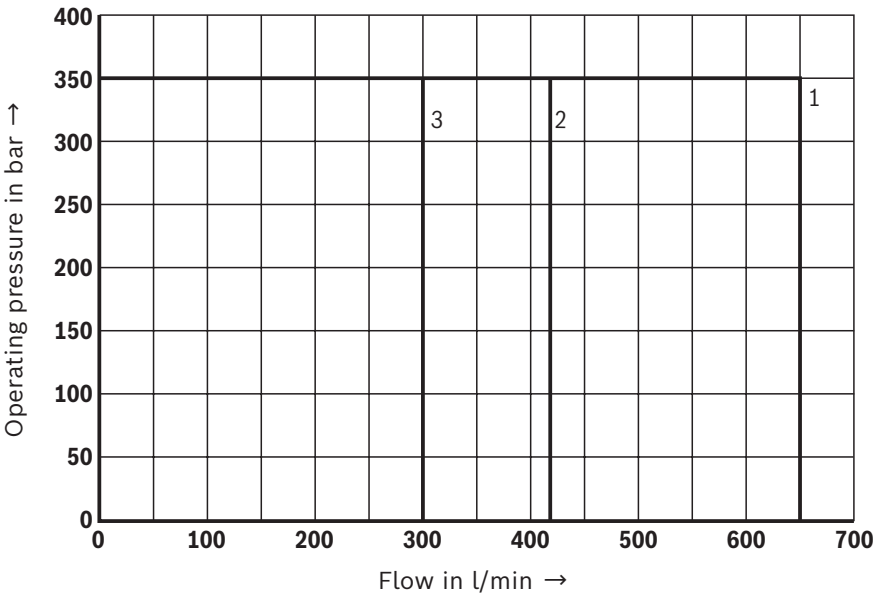
Notice:

The specified performance limits apply to the use with two directions of flow (e.g. from P to A and simultaneous return flow from B to T at a ratio of 1:1). Due to the flow forces acting within the valves, the admissible switching power limit may be considerably lower with only one direction of flow (e.g. from P to A

while port B is blocked, with flow in the same or in different directions).

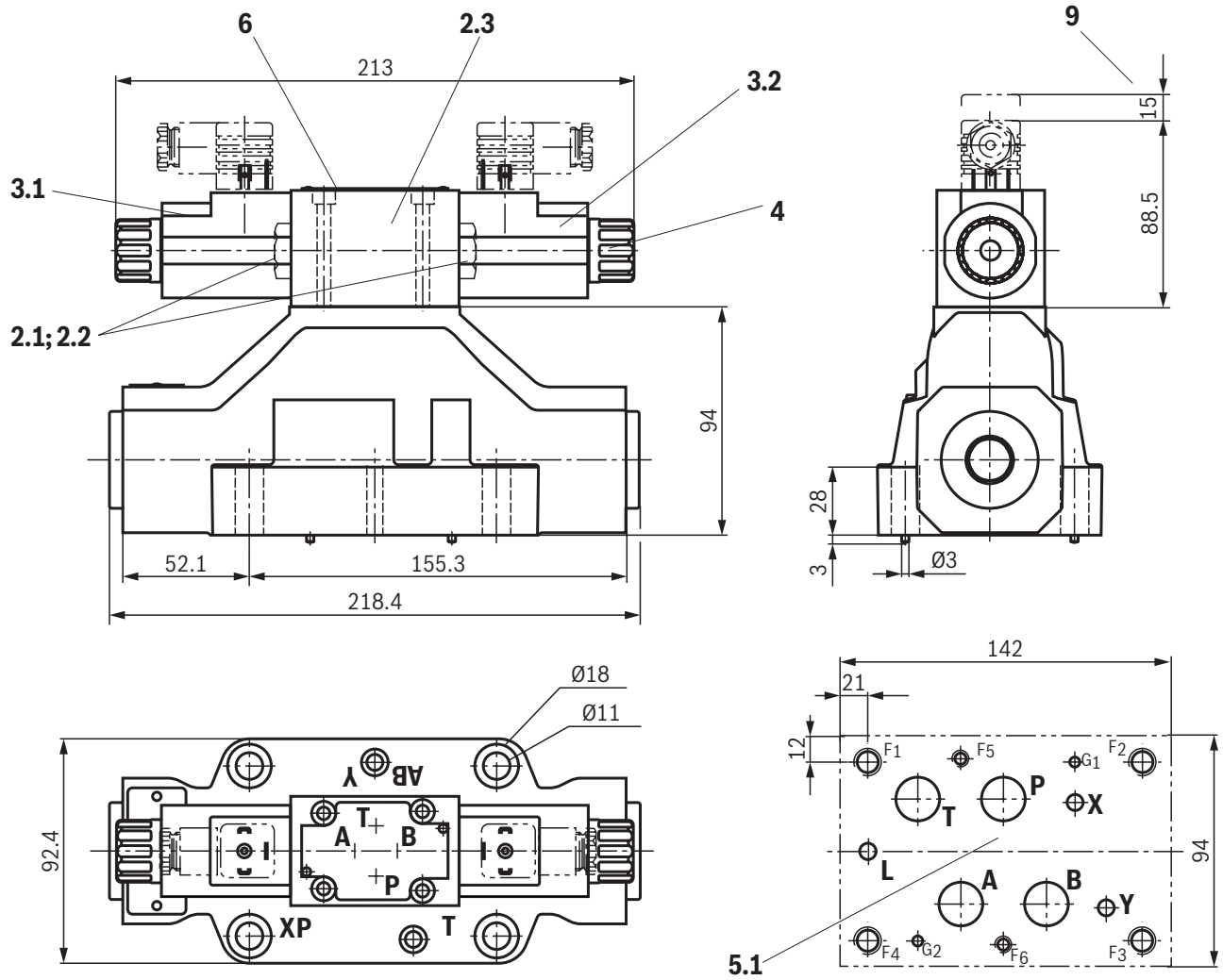
In such cases of use, please consult us.

**The performance limits were determined when the solenoids were at operating temperature, at 10% undervoltage and without tank preloading.**



| Size | Characteristic curve | Symbol                  |
|------|----------------------|-------------------------|
| 16   | 3                    | D, E, E42, J, L, U, Y31 |
| 25   | 1                    | D, E, J, L, U, Y31      |
|      | 2                    | G                       |

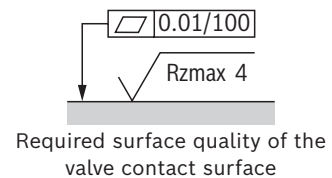
**Dimensions:** Size 16  
(dimensions in mm)



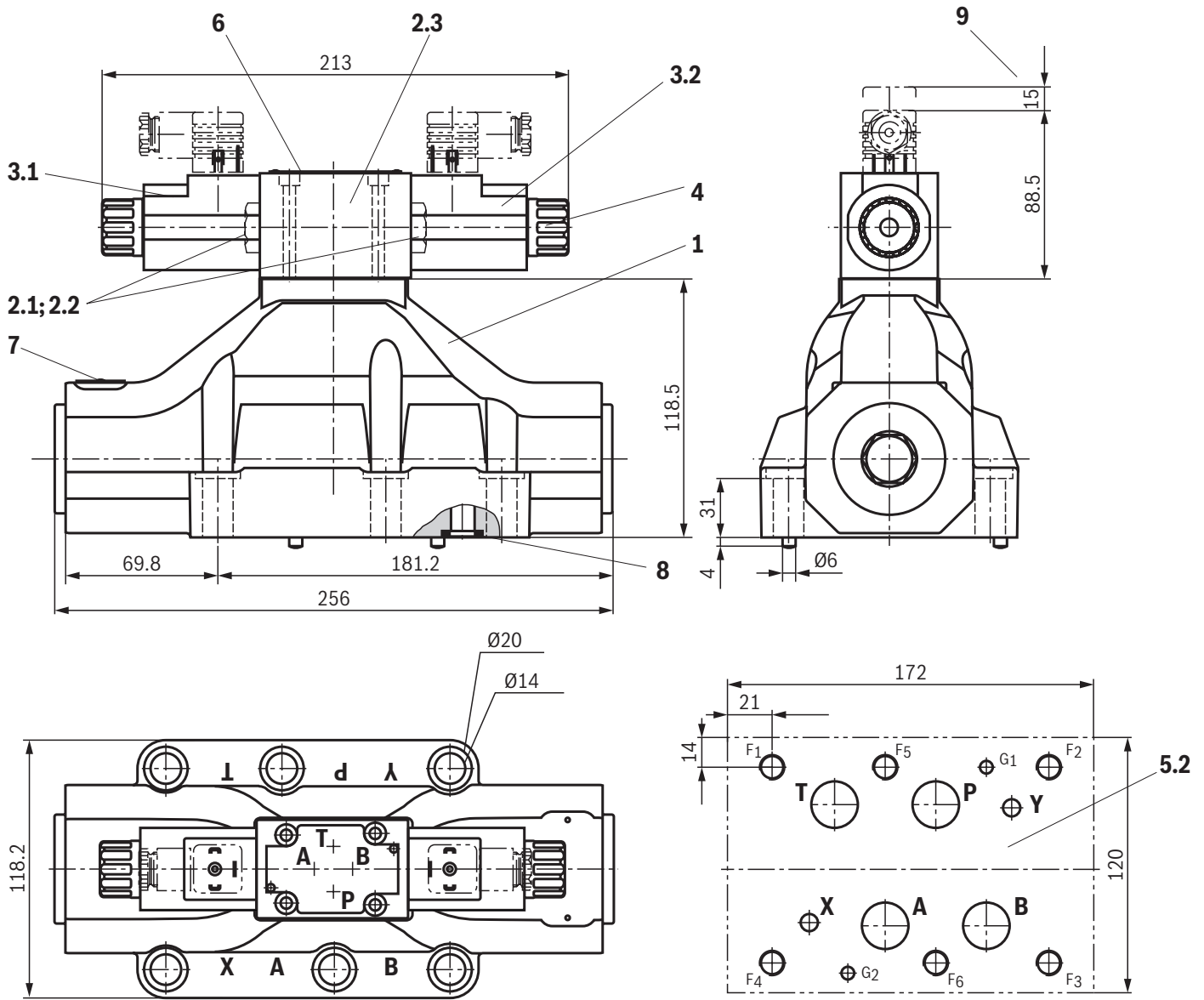
For item explanations, subplates and valve mounting screws see page 17.

**Notice:**

The dimensions are nominal dimensions which are subject to tolerances.



**Dimensions:** Size 25  
(dimensions in mm)

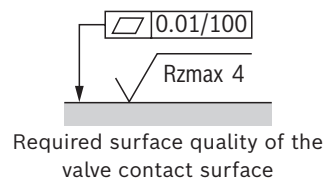


**For item explanations, subplates and valve mounting screws see page 17.**



**Notice:**

The dimensions are nominal dimensions which are subject to tolerances.



## Dimensions

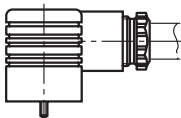
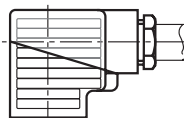
- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>1 Main valve</li> <li>2 Pilot control valve type 4WE 6 ... (data sheet 23164):</li> <li>2.1 Plug screw „b“ and solenoid „a“ for main valves with symbol D, EA, LA, etc.</li> <li>2.2 Plug screw „a“ and solenoid „b“ for main valves with symbol Y31, EB, LB, etc.</li> <li>2.3 2 solenoids for main valves with 3 spool positions</li> <li>3.1 Solenoid „a“</li> <li>3.2 Solenoid „b“</li> <li>4 Solenoid with concealed manual override „N9“</li> <li>5.1 Machined valve contact surface; porting pattern according to ISO 4401-07-07-0-05</li> <li>5.2 Machined valve contact surface; porting pattern according to ISO 4401-08-08-0-05</li> </ul> | <ul style="list-style-type: none"> <li>6 Name plate pilot control valve</li> <li>7 Name plate complete valve</li> <li>8 Seal rings</li> <li>9 Space required for removing the mating connector</li> </ul> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Valve mounting screws (separate order)

| Size | Quantity | Hexagon socket head cap screws                                                                                                                              | Material number                            |
|------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| 16   | 4        | ISO 4762 - M10 x 45 - 10.9-flZn/nc/480h/C<br>Friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$ ; Tightening torque $M_A = 58 \text{ Nm} \pm 10\%$ | R913015578                                 |
|      | 2        | ISO 4762 - M6 x 45 - 10.9-flZn-240h-L<br>Friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$ ; Tightening torque $M_A = 12,5 \text{ Nm} \pm 10\%$   | R913000258                                 |
|      | or       |                                                                                                                                                             |                                            |
|      | 4        | UNC 3/8-16 UNC x 1 3/4" ASTM-A574                                                                                                                           | Not included in the Rexroth delivery range |
|      | 2        | UNC 1/4-20 UNC x 1 3/4" ASTM-A574                                                                                                                           |                                            |
| 25   | 6        | ISO 4762 - M12 x 50 - 10.9-flZn-240h-L<br>Friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$ ; Tightening torque $M_A = 100 \text{ Nm} \pm 10\%$   | R913000283                                 |
|      | or       |                                                                                                                                                             |                                            |
|      | 6        | UNC 1/2-13 UNC x 2" ASTM-A574                                                                                                                               | Not included in the Rexroth delivery range |

**Subplates** (separate order) with porting pattern according to ISO 4401 see data sheet 45100.

### Mating connectors according to DIN EN 175301-803

| For details and more mating connectors see data sheet 08006 |       |  |                                      |  |                                                                     |
|-------------------------------------------------------------|-------|-------------------------------------------------------------------------------------|--------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------|
|                                                             |       | <b>Material no.</b>                                                                 |                                      |                                                                                      |                                                                     |
| Valve side                                                  | Color | Without circuitry                                                                   | With indicator light<br>12 ... 240 V | With rectifier<br>12 ... 240 V                                                       | With indicator light and<br>Zener diode suppression circuit<br>24 V |
| a                                                           | Gray  | <b>R901017010</b>                                                                   | -                                    | -                                                                                    | -                                                                   |
| b                                                           | Black | <b>R901017011</b>                                                                   | -                                    | -                                                                                    | -                                                                   |
| a/b                                                         | Black | -                                                                                   | <b>R901017022</b>                    | <b>R901017025</b>                                                                    | <b>R901017026</b>                                                   |

## Further information

|                                                                              |                                                                        |
|------------------------------------------------------------------------------|------------------------------------------------------------------------|
| ► Subplates                                                                  | Data sheet 45100                                                       |
| ► Hydraulic fluids on mineral oil basis                                      | Data sheet 90220                                                       |
| ► Environmentally compatible hydraulic fluids                                | Data sheet 90221                                                       |
| ► Flame-resistant, water-free hydraulic fluids                               | Data sheet 90222                                                       |
| ► Flame-resistant hydraulic fluids - containing water (HFAE, HFAS, HFB, HFC) | Data sheet 90223                                                       |
| ► Reliability characteristics according to EN ISO 13849                      | Data sheet 08012                                                       |
| ► Hexagon socket head cap screw, metric/UNC                                  | Data sheet 08936                                                       |
| ► Hydraulic valves for industrial applications                               | Operating instructions 07600-B                                         |
| ► Information on available spare parts                                       | <a href="http://www.boschrexroth.com/spc">www.boschrexroth.com/spc</a> |

## Notes

## Notes

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