

Directional control valves, pilot-operated,  
 with electrical position feedback and  
 integrated electronics (OBE)

Type 4WRTE

**RE 29083**

Edition: 2017-03

Replaces: 08.13



- ▶ Size 10 ... 35
- ▶ Component series 4X
- ▶ Maximum operating pressure 350 bar
- ▶ Rated flow 25 ... 1000 l/min

## Features

- ▶ Reliable – proven and robust design
- ▶ Safe
  - Automatic pressure compensation in the control chambers of the main stage by the pilot control valve
  - Control spool of the main stage in the spring-centered central position and/or in the offset position
  - Optionally with spool position monitoring
- ▶ Flexible – suitable for position, speed and pressure control
- ▶ Precise – high response sensitivity and little hysteresis

## Contents

|  |           |
|--|-----------|
| Features   | 1         |
| Ordering code                                    | 2, 3      |
| Symbols  | 3, 4      |
| Function, section                                | 5, 6      |
| Pilot oil supply                                 | 7, 8      |
| Technical data                                   | 8 ... 10  |
| Electrical connections and assignment            | 10        |
| Block diagram                                    | 11        |
| Characteristic curves                            | 12 ... 18 |
| Dimensions                                       | 19 ... 26 |
| Inductive position switch                        | 27        |
| Accessories                                      | 28        |
| Project planning, installation and commissioning | 29        |
| Further information                              | 29        |

## Ordering code

|    |     |    |    |    |    |    |    |    |    |    |    |     |    |     |    |    |   |
|----|-----|----|----|----|----|----|----|----|----|----|----|-----|----|-----|----|----|---|
| 01 | 02  | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13  | 14 | 15  | 16 | 17 |   |
| 4  | WRT | E  |    |    |    |    |    | -  | 4X | /  | 6E | G24 |    | K31 | /  |    | * |

|    |   |         |
|----|---|---------|
| 01 | 4 main ports  | 4       |
| 02 | Directional control valve, pilot-operated                   | WRT     |
| 03 | With integrated electronics                                 | E       |
| 04 | Without spool position monitoring                           | no code |
|    | With spool position monitoring (NG16 ... NG35 only)         | M       |
| 05 | Size 10   | 10      |
|    | Size 16   | 16      |
|    | Size 25   | 25      |
|    | Size 27   | 27      |
|    | Size 32   | 32      |
|    | Size 35   | 35      |
| 06 | Symbols e. g. E, E1-, W6- etc.; possible version see page 3 |         |

Rated flow ( $\Delta p = 5$  bar/control edge)

|            |   |     |
|------------|---|-----|
| 07         | <b>- Size 10</b>  |     |
|            | 25 l/min (symbol E, W6-, W8- and V only with flow characteristic "L") | 25  |
|            | 50 l/min (symbol E1-, W8- and V1 only with flow characteristic "L")   | 50  |
|            | 90 l/min  | 100 |
|            | <b>- Size 16</b>  |     |
|            | 150 l/min (symbol V1 only with flow characteristic "L")               | 150 |
|            | 220 l/min   | 220 |
|            | <b>- Size 25</b>  |     |
|            | 220 l/min   | 220 |
|            | 350 l/min   | 350 |
|            | <b>- Size 27</b>  |     |
|            | 500 l/min   | 500 |
|            | <b>- Size 32</b>  |     |
|            | 400 l/min   | 400 |
|            | 600 l/min   | 600 |
|            | <b>- Size 35</b>  |     |
| 1000 l/min | 1000  |     |

## Flow characteristic

|    |  |    |
|----|--|----|
| 08 | Linear   | L  |
|    | Linear with fine control range   | P  |
| 09 | Component series 40 ... 49 (40 ... 49: unchanged installation and mounting dimensions) | 4X |

## Pilot control valve

|    |  |     |
|----|--|-----|
| 10 | Proportional solenoid with detachable coil (NG6) | 6E  |
| 11 | Direct voltage 24 V                              | G24 |

## Pilot oil flow

|    |  |         |
|----|--|---------|
| 12 | External pilot oil supply, external pilot oil return | no code |
|    | Internal pilot oil supply, external pilot oil return | E       |
|    | External pilot oil supply, internal pilot oil return | T       |
|    | Internal pilot oil supply, internal pilot oil return | ET      |

## Electrical connection

|    |   |                   |
|----|---|-------------------|
| 13 | Without mating connector; connector DIN EN 175201-804 | K31 <sup>1)</sup> |
|----|---|-------------------|

## Ordering code

|    |     |    |    |    |    |    |    |    |    |    |     |    |     |    |    |    |
|----|-----|----|----|----|----|----|----|----|----|----|-----|----|-----|----|----|----|
| 01 | 02  | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12  | 13 | 14  | 15 | 16 | 17 |
| 4  | WRT | E  |    |    |    |    | -  | 4X | /  | 6E | G24 |    | K31 | /  |    | *  |

### Interfaces of the control electronics

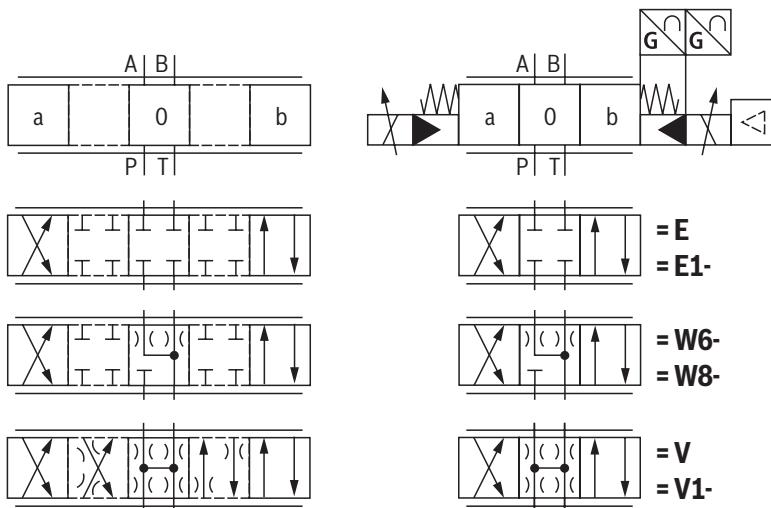
|    |  |                        |
|----|--|------------------------|
| 14 | Command value/actual value $\pm 10$ V                        | <b>A1</b>              |
|    | Command value/actual value 4 ... 20 mA                       | <b>F1</b>              |
|    | Command value/actual value $\pm 10$ V, enable signal (pin C) | <b>A5<sup>2)</sup></b> |

### Seal material

|    |   |                |
|----|---|----------------|
| 15 | NBR seals   | <b>M</b>       |
|    | FKM seals   | <b>V</b>       |
|    | Observe compatibility of seals with hydraulic fluid used. |                |
| 16 | <b>Without</b> electronics protection membrane            | <b>no code</b> |
|    | <b>With</b> electronics protection membrane               | <b>-967</b>    |
| 17 | Further details in the plain text                         | <b>*</b>       |

- 1) Mating connectors, separate order, see page 28 and data sheet 08006.
- 2) When replacing the component series 3X by component series 4X, the electronics interface is to be defined with A5 (enable signal at pin C).

## Symbols



### With symbol E1-, V1- and W8-:

$P \rightarrow A: q_{V \max}$      $B \rightarrow T: q_{V/2}$   
 $P \rightarrow B: q_{V/2}$      $A \rightarrow T: q_{V \max}$


#### Notices:

- Representation according to DIN ISO 1219-1. Hydraulic interim positions are shown by dashes.

## Symbols

| Design    | simple | detailed |
|-----------|--------|----------|
| "no code" |        |          |
| "E"       |        |          |
| "ET"      |        |          |
| "T"       |        |          |

- 1 Pilot control valve
- 2 Main valve
- 3 Integrated electronics (OBE)
- 4 Design with spool position monitoring "M"

 **Notice:**  
Representation according to DIN ISO 1219-1.

## Function, section

Valves of type 4WRTE are pilot-operated directional control valves with electrical position feedback, integrated electronics (OBE) and optional spool position monitoring.

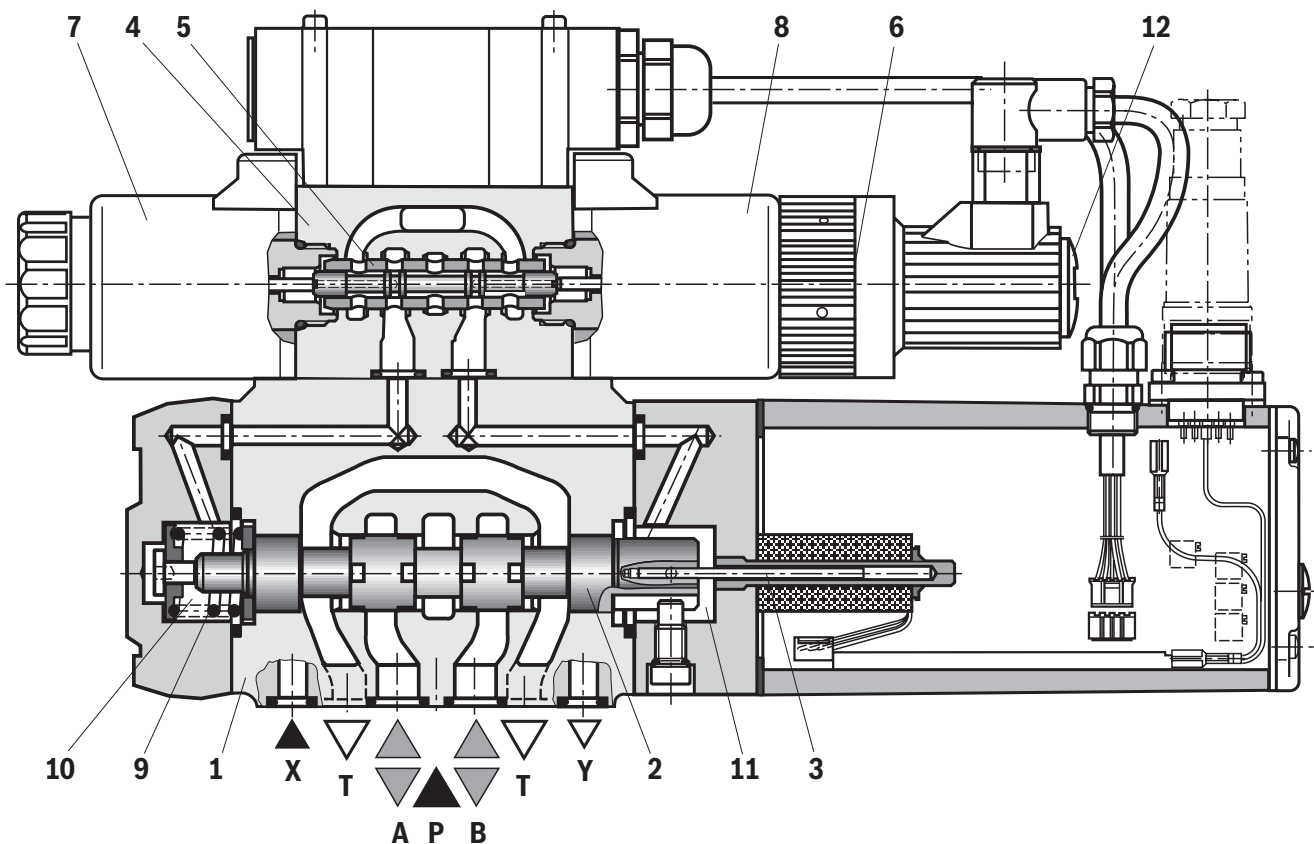
### Set-up

The valve basically consists of 3 main assemblies:

- ▶ Housing (1) with main stage control spool (2) and optional spool position monitoring (13)
- ▶ Integrated electronics (optionally with electronics protection membrane (14)) with inductive position transducer (3) of the main stage
- ▶ Pilot control valve (4) with control spool/socket unit (5), inductive position transducer (6) and pressure feed back for central position of the main stage control spool (2)

### Function

- ▶ With de-energized proportional solenoids (7; 8) central position of the main stage control spool (2) due to centering spring (9) and pressure feed back
- ▶ Control of the main stage control spool (2) via the pilot control valve (4) → the main stage control spool (2) is positioned in a regulated manner
- ▶ Controlling the control spool of the pilot control valve (4) by changing the solenoid force of the proportional solenoids (7; 8)
- ▶ Connection of the command and actual values in the integrated electronics
- ▶ Pilot oil supply to the pilot control valve internally via port P or externally via port X  
Pilot oil return internally via port T or externally via Y to the tank
- ▶ With a command value of 0 V, the electronics control the main stage control spool (2) in central position



## Function, section

### Spool position monitoring

The spool positions of the main stage control spool (2) are detected by the inductive position switch (13) and displayed via two switching outputs with a preset logic. If the fixedly set switching points are exceeded, the deviation from the zero position is monitored within the control spool overlap (see page 27).

The switching signals can be used in a superior control for monitoring functions. The electrical connection is implemented separately via a 4-pole connector M12x1 with two pins for signal output and two pins for voltage supply.

### Area of application

The valve can be used in safety-related two-channel applications (category 3, PL d and category 4, PL e according to EN 13849-1) as switch-off element for one channel. The valve meets the requirements of a secure start inhibitor according to EN 60204, stop category 0. If safety requirements are needed, the supply voltage of the valve must be safely disconnected based on the required safety level (category PL).

Depending on the application and the requirements of work equipment-specific standards according to EN 13849-1, the user must provide appropriate monitoring/plausibility checks which comply with the required diagnostic coverage DCavg using a superior control.

### Electronics protection membrane "967"

To prevent condensate formation in the housing of the integrated electronics (OBE), an electronics protection membrane (14) can be used.

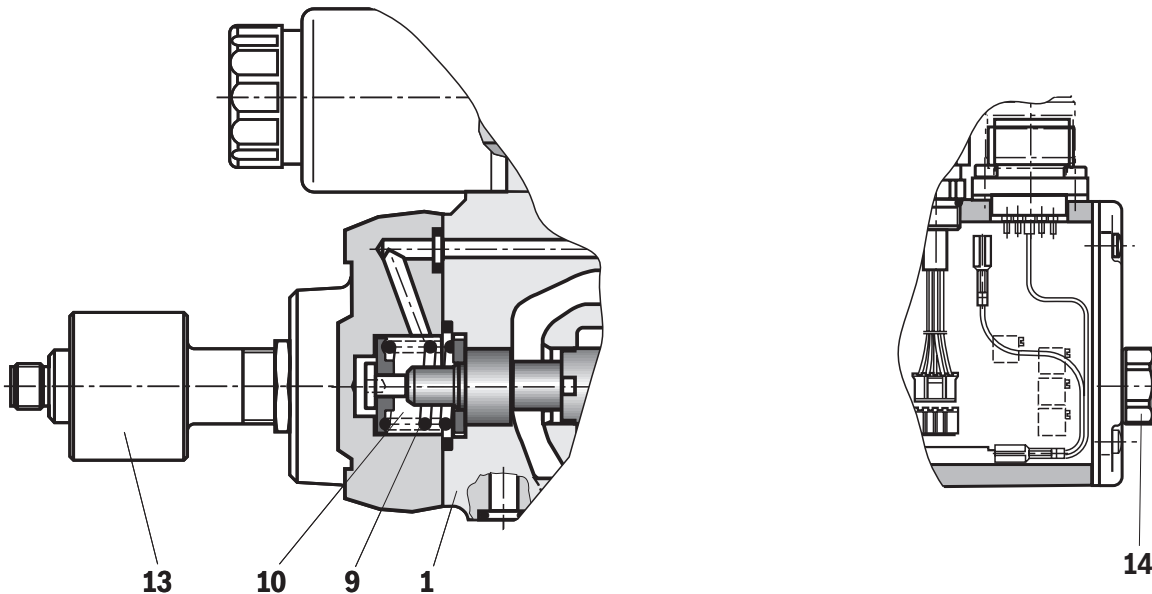
Recommended for use outside industry-standard conditions with high ambient air humidity and significant cyclic temperature changes (e. g. outdoors).

### Failure of supply voltage

- ▶ Integrated electronics de-energize the solenoid in case of supply voltage failure or cable break
- ▶ Automatic pressure control on the same level in the control chambers (10 and 11) by the pilot control valve
- ▶ In case of pressure supply failure, centering of the main stage control spool by centering spring (9)
- ▶ Central position of the main stage control spool (2)

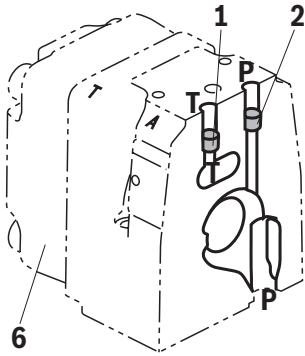
### Notices:

- ▶ Failure of the supply voltage will lead to an abrupt standstill of the control axis. The acceleration forces occurring in this connection may cause machine damage.  
With control spool symbols E, E1-, W6- and W8-, the centering spring (9) sets the main stage control spool (2) in central position, control spools V- and V1 are switched to the preferred direction P to B and A to T in a tolerance range of 1% to a maximum of 11% of the control spool stroke.
- ▶ The PG fitting (12) must not be opened. Mechanical adjustment of the adjustment nut located below is prohibited and damages the valve.
- ▶ The zero point has been adjusted at the factory. Changes in the zero point may result in damage to the system and may only be implemented by instructed specialists.
- ▶ If the pilot control valve or the electronics are exchanged, the zero point has to be adjusted once again by instructed specialists.

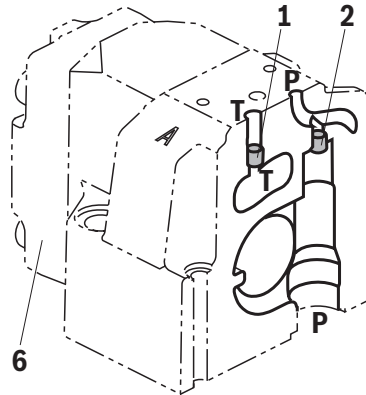


**Pilot oil supply** (schematic illustration)

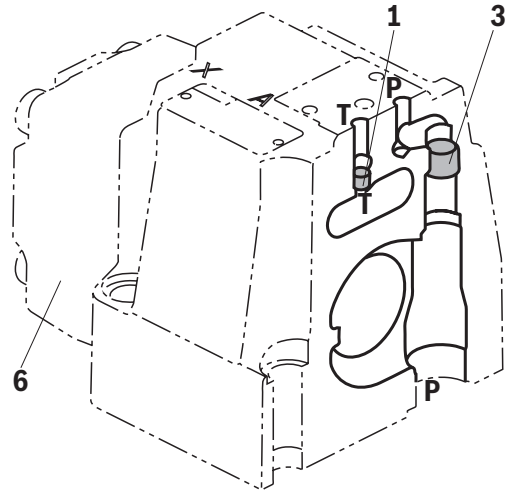
**NG10**



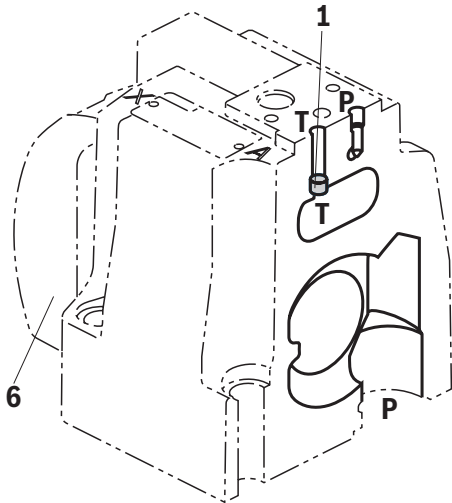
**NG16**



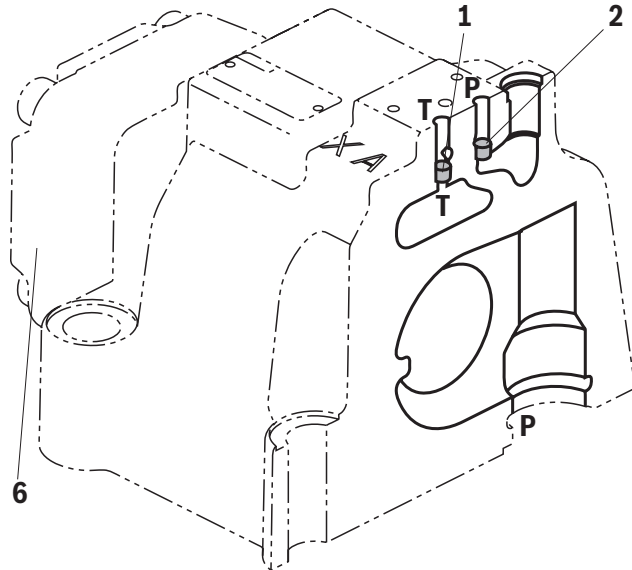
**NG25**



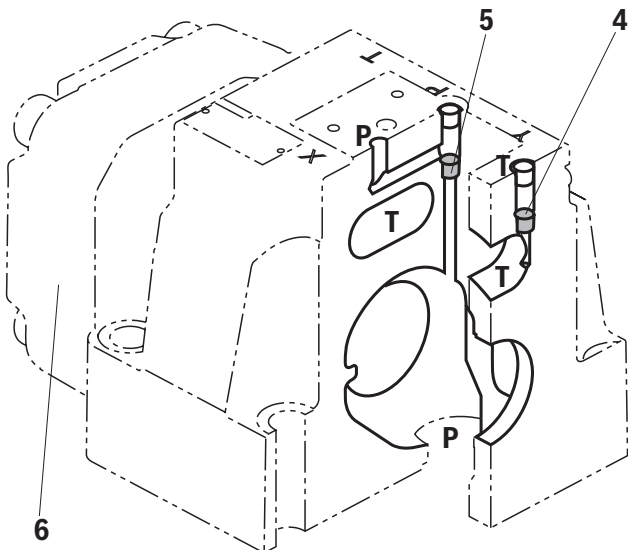
**NG27**



**NG32**



**NG35**



- 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
- 3 Plug screw M12 x 1.5 according DIN 906, wrench size 6 – pilot oil supply
- 4 Plug screw M10 x 1 according to DIN 906, wrench size 5 – pilot oil return
- 5 Plug screw M10 x 1 according DIN 906, wrench size 5 – pilot oil supply
- 6 Main stage housing cover (opposite the OBE)

| Pilot oil supply |                | Pilot oil return |             |
|------------------|----------------|------------------|-------------|
| external         | internal       | external         | internal    |
| <b>2, 3, 5</b>   | <b>2, 3, 5</b> | <b>1, 4</b>      | <b>1, 4</b> |
| closed           | open           | closed           | open        |

Further explanations on page 8.

## Pilot oil supply

### "No code" version

#### External pilot oil supply

#### External pilot oil return

In this version, the pilot oil is supplied from a separate control circuit (external).

The pilot oil return is not directed into channel T of the main valve, but is separately directed to the tank via port Y (external).

### Version "E"

#### Internal pilot oil supply

#### External pilot oil return

With this version, the pilot oil is supplied from channel P of the main valve (internally).

The pilot oil return is not directed into channel T of the main valve, but is separately directed to the tank via port Y (external).

In the subplate, port X is to be closed.

### Version "ET"

#### Internal pilot oil supply

#### Internal pilot oil return

With this version, the pilot oil is supplied from channel P of the main valve (internally).

The pilot oil is directly returned to channel T of the main valve (internally).

In the subplate, ports X and Y are to be closed.

### Version "T"

#### External pilot oil supply

#### Internal pilot oil return

In this version, the pilot oil is supplied from a separate control circuit (external).

The pilot oil is directly returned to channel T of the main valve (internally).

In the subplate, port Y is to be closed.

## Technical data

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

| general   |   |   |      |      |    |      |    |
|---|---|---|------|------|----|------|----|
| Sizes   | NG  | 10  | 16   | 25   | 27 | 32   | 35 |
| Weight  | kg  | 8.7   | 11.2 | 16.8 | 17 | 31.5 | 34 |
| Installation position and commissioning information | Preferably horizontal, see data sheet 07700   |   |      |      |    |      |    |
| Ambient temperature range                           | °C  | -20 ... +50   |      |      |    |      |    |
| Maximum storage time                                | Years   | 1 (if the storage conditions are observed; refer to the operating instructions 07600-B) |      |      |    |      |    |
| MTTF <sub>D</sub> values according to EN ISO 13849  | Years   | 150 <sup>1)</sup> (for more information see data sheet 08012)                           |      |      |    |      |    |
| Sine test according to DIN EN 60068-2-6             | 10 ... 2000 Hz / maximum of 10 g / 10 cycles / 3 axes                               |   |      |      |    |      |    |
| Noise test according to DIN EN 60068-2-64           | 20 ... 2000 Hz / 10 g <sub>RMS</sub> / 30 g peak / 30 min. / 3 axes                 |   |      |      |    |      |    |
| Transport shock according to DIN EN 60068-2-27      | 15 g / 11 ms / 3 shocks / 3 axes  |   |      |      |    |      |    |
| Damp heat, cyclic, according to DIN EN 60068-2-30   | Variant 2<br>+25 °C ... +55 °C, 90% ... 97% relative humidity, 2 cycles of 24 hours |   |      |      |    |      |    |

<sup>1)</sup> With symbol E, E1, W6 and W8: in longitudinal control spool direction, there is sufficient positive overlap without shock/vibration load; observe the installation orientation with regard to the main direction of acceleration.



## Technical data

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

| hydraulic  |                       |                                |                    |                                     |     |     |      |      |      |
|--|-----------------------|--------------------------------|--------------------|-------------------------------------|-----|-----|------|------|------|
| Sizes  |                       | NG                             | 10                 | 16                                  | 25  | 27  | 32   | 35   |      |
| Maximum operating pressure   | ▶ Pilot control valve | Pilot oil supply <sup>2)</sup> | bar                | 25 ... 315                          |     |     |      |      |      |
|  | ▶ Main valve          | Port P, A, B                   | bar                | 350                                 | 350 | 350 | 270  | 350  | 350  |
| Maximum return flow pressure   | ▶ Port T              | Internal pilot oil return      | bar                | Static < 10                         |     |     |      |      |      |
|  |                       | External pilot oil return      | bar                | 315                                 | 250 | 250 | 210  | 250  | 250  |
|  | ▶ Port Y              |                                | bar                | Static < 10                         |     |     |      |      |      |
| Rated flow $q_{Vnom} \pm 10\%$ <sup>3)</sup><br>with $\Delta p = 5$ bar/control edge                           |                       |                                | l/min              | 25                                  | 150 | –   | –    | –    | –    |
|  |                       |                                |                    | 50                                  | –   | 220 | –    | 400  | –    |
|  |                       |                                |                    | 100                                 | 220 | 350 | 500  | 600  | 1000 |
| Maximum flow (recommended)   |                       |                                | l/min              | 170                                 | 460 | 870 | 1000 | 1600 | 3000 |
| Pilot oil flow at port X or Y with stepped input signal from 0 to 100% (315 bar)                               |                       |                                | l/min              | 7                                   | 14  | 20  | 20   | 27   | 29   |
| Pilot oil volume 0 ... 100%  |                       |                                | cm <sup>3</sup>    | 1.1                                 | 2.9 | 6.8 | 6.8  | 17.7 | 33.9 |
| Hydraulic fluid  |                       |                                |                    | See table below                     |     |     |      |      |      |
| Hydraulic fluid temperature range (at the valve working ports)   |                       |                                | °C                 | –20 ... +80; preferably +40 ... +80 |     |     |      |      |      |
| Viscosity range  |                       |                                | mm <sup>2</sup> /s | 20 ... 380; preferably 30 ... 45    |     |     |      |      |      |
| Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c) |                       |                                |                    | Class 18/16/13 <sup>4)</sup>        |     |     |      |      |      |
| Hysteresis   |                       |                                | %                  | ≤ 0.1                               |     |     |      |      |      |
| Response sensitivity   |                       |                                | %                  | ≤ 0.05                              |     |     |      |      |      |
| Zero point calibration (ex works) <sup>5)</sup>  |                       |                                | %                  | ≤ 1                                 |     |     |      |      |      |
| Temperature drift  |                       |                                | %/10 °C            | Zero shift < 0.3                    |     |     |      |      |      |

| Hydraulic fluid | Classification             | Suitable sealing materials                          | Standards | Data sheet |
|-----------------|----------------------------|---|-----------|------------|
| Mineral oils    | HL, HLP, HLPD, HVLP, HVLPD | NBR, FKM  | DIN 51524 | 90220      |
| Bio-degradable  | ▶ Insoluble in water       | HETG  | ISO 15380 | 90221      |
|                 |                            | HEES  |           |            |
|                 | ▶ Soluble in water         | HEPG  | ISO 15380 |            |
| Flame-resistant | ▶ Water-free               | HFDU, HFDR  | ISO 12922 | 90222      |
|                 | ▶ Containing water         | HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620) | ISO 12922 | 90223      |



### Important information 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 40 K higher than the maximum solenoid surface temperature.

### ▶ Flame-resistant – containing water:

- Maximum operating pressure 210 bar
- Maximum pressure differential per control edge 175 bar
- Pressure pre-loading at the tank port >20% of the pressure differential, otherwise increased cavitation erosion
- Life cycle as compared to operation with mineral oil HL, HLP 50 ... 100%
- Maximum hydraulic fluid temperature 50 °C

<sup>2)</sup> For perfect system behavior, we recommend an external pilot oil supply for pressures above 210 bar.

<sup>3)</sup> Flow for deviating  $\Delta p$  (valve pressure differential):

$$q_x = q_{Vnom} \times \sqrt{\frac{\Delta p_x}{5}}$$

<sup>4)</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.

For the selection of the filters see [www.boschrexroth.com/filter](http://www.boschrexroth.com/filter)

<sup>5)</sup> Related to the pressure-signal characteristic curve (symbol V)



### Notice:

Technical data (hydraulic) measured with HLP46,  
 $\vartheta_{Oil} = 40 \text{ °C} \pm 5 \text{ °C}$

**Technical data**

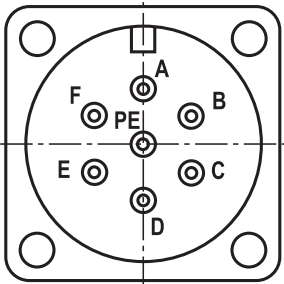
(For applications outside these parameters, please consult us!)

| <b>electrical, integrated electronics (OBE)</b> |                     |   |                             |
|---|---------------------|---|-----------------------------|
| Relative duty cycle                             | %                   | 100 (continuous operation)                            |                             |
| Protection class according to EN 60529          |                     | IP 65 with mounted and locked plug-in connectors      |                             |
| Supply voltage                                  | ▶ Nominal voltage   | VDC   | 24                          |
|   | ▶ Lower limit value | VDC   | 18                          |
|   | ▶ Upper limit value | VDC   | 35                          |
| Maximum admissible residual ripple              | V <sub>pp</sub>     | 2.5 (Comply with absolute supply voltage limit value) |                             |
| Current consumption                             | ▶ Maximum           | A   | 1.6                         |
|   | ▶ Impulse current   | A   | 2.7                         |
| Maximum power consumption                       | VA                  | 72 (average 24)                                       |                             |
| Required fuse protection, external              | A <sub>T</sub>      | 4 (time-lag)  |                             |
| Voltage input "A1"<br>(differential input)      | ▶ Measurement range | VDC   | -10 ... +10                 |
|   | ▶ Input resistance  | kΩ  | 100                         |
| Current input "F1"                              | ▶ Input current     | mA  | 4 ... (12) ... 20           |
|   | ▶ Input resistance  | Ω   | 100                         |
| Enable input "A5"                               | ▶ Low level         | VDC   | 0 ... 2                     |
|   | ▶ High level        | VDC   | 11 ... <b>U<sub>B</sub></b> |
| Maximum coil temperature <sup>6)</sup>          | °C                  | 150   |                             |

<sup>6)</sup> Due to the temperatures occurring at the surfaces of the solenoid coils, the European standards ISO 13732-1 and EN ISO 4413 need to be adhered to.

**Electrical connections and assignment****Connector pin assignment**

| Pin | Signal   | Interface A1  | Interface F1 | Interface A5                                   |
|-----|--|---|--------------|--|
| A   | Supply voltage                                   | 24 V DC   |              |  |
| B   |  | 0 V   |              |  |
| C   | Reference potential (actual value)/enable signal | Reference potential for actual value (pin F)                |              | Enable signal 11 ... <b>U<sub>B</sub></b> V DC |
| D   | Differential amplifier input (command value)     | ±10 V   | 4 ... 20 mA  | ±10 V  |
| E   |  | 0 V reference potential (pin D)                             |              | 0 V reference potential for pin D and F        |
| F   | Measuring output (actual value)                  | ±10 V   | 4 ... 20 mA  | ±10 V  |
| PE  |  | Functional ground (directly connected to the valve housing) |              |  |

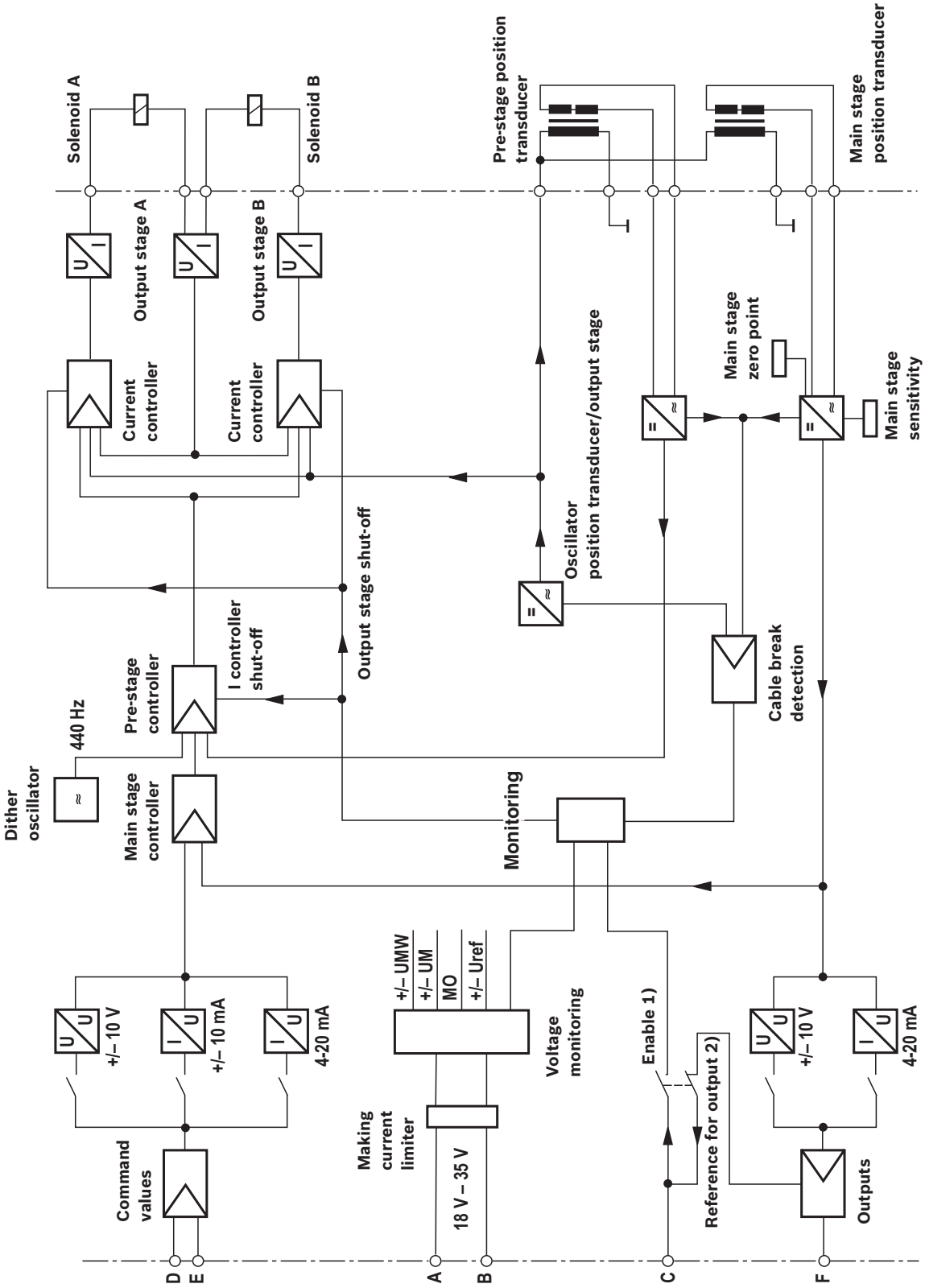


|   |   |
|---|---|
| <b>Command value:</b>                     | ▶ Reference potential at E and positive command value at D result in flow from P → A and B → T. |
|   | ▶ Reference potential at E and negative command value at D result in flow from P → B and A → T. |
| <b>Connection cable (recommendation):</b> | ▶ Up to 25 m cable length type LiYCY 7 x 0.75 mm <sup>2</sup>                                   |
|   | ▶ Up to 50 m cable length type LiYCY 7 x 1.0 mm <sup>2</sup>                                    |
|   | ▶ Connect shield on PE only on the supply side  |

**Notices:**

- ▶ Electrical signals provided via valve electronics (e.g. actual value) must not be used to switch off safety-relevant machine functions.
- ▶ Mating connectors, separate order, see page 28 and data sheet 08006.

**Block diagram: Integrated electronics (OBE)**

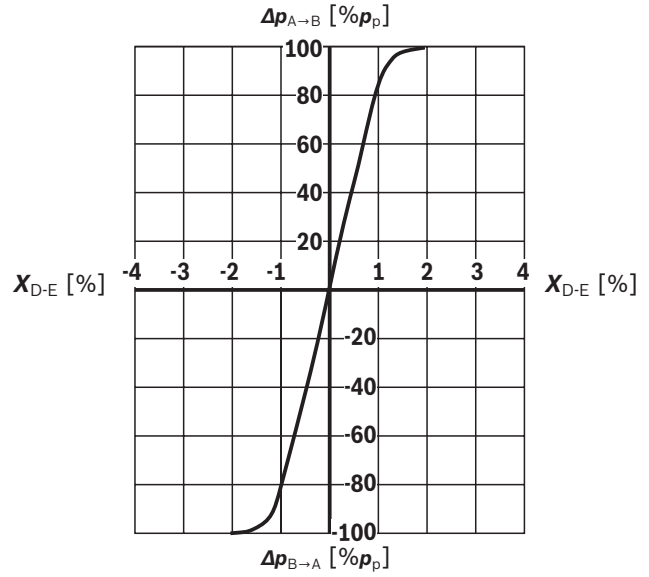
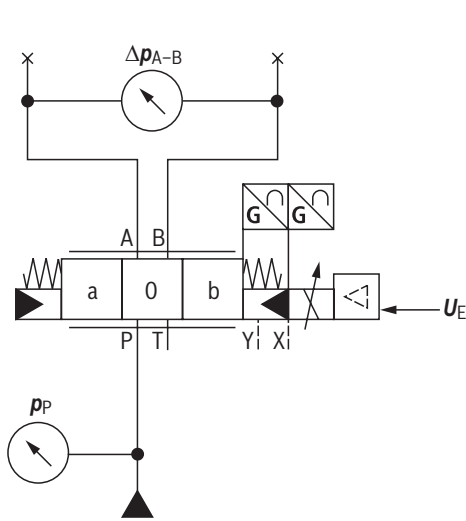


1) Only with electronics interface "A5"  
 2) Only with electronics interfaces "A1" and "F1"

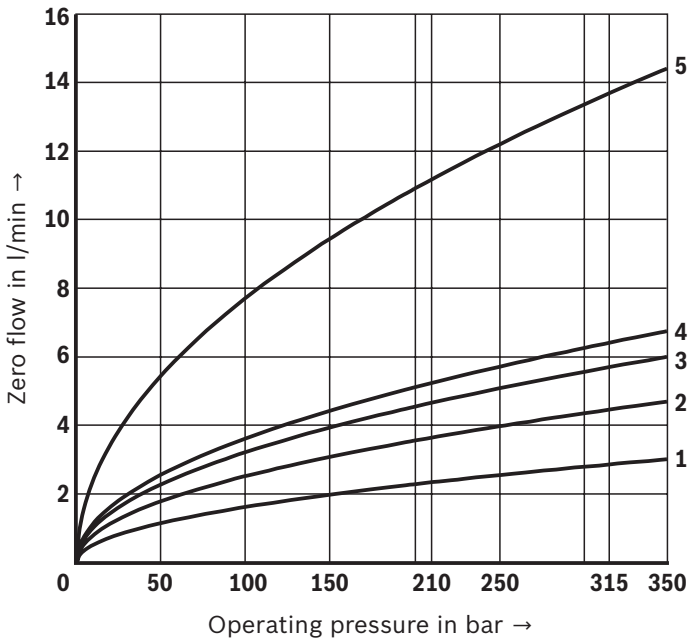
### Characteristic curves

(measured with HLP46,  $\vartheta_{Oil} = 40 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$  and  $p = 100 \text{ bar}$ )

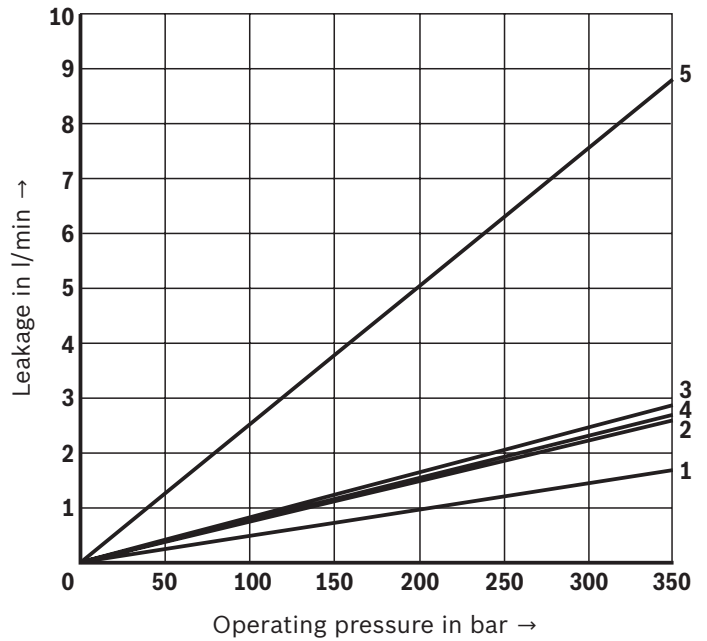
#### Pressure amplification



**Maximum zero flow of the main stage (symbol V) with pilot control valve**



**Maximum internal leakage of the main stage (symbol W) with pilot control valve**



- 1 Size 10
- 2 Size 16
- 3 Sizes 25, 27
- 4 Size 32
- 5 Size 35

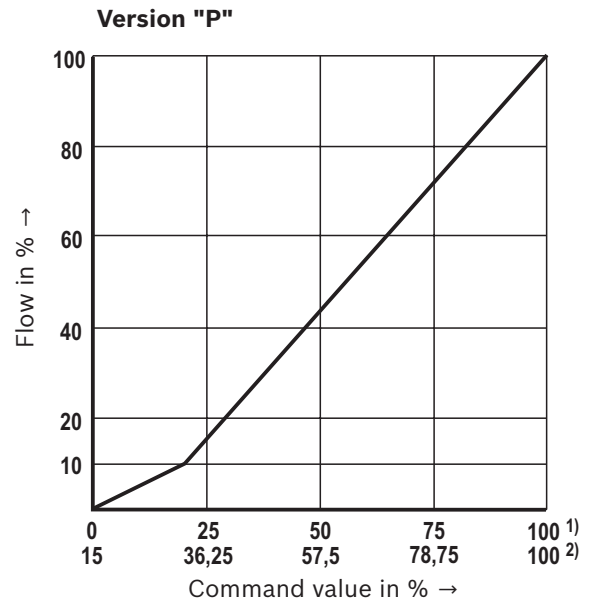
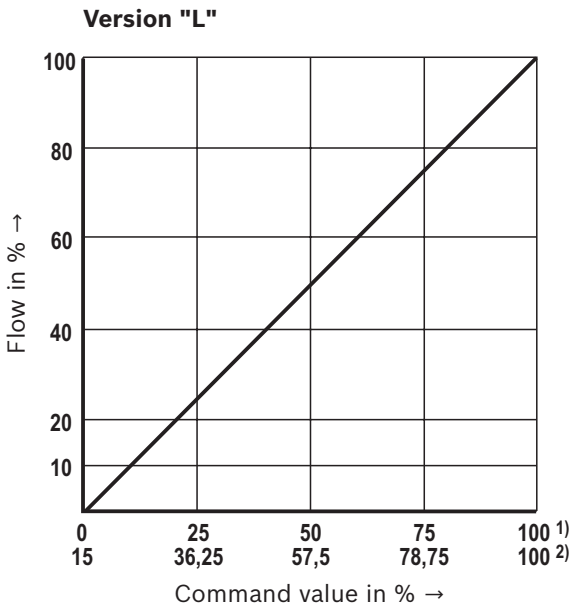
**Characteristic curves**

(measured with HLP46,  $\vartheta_{oil} = 40 \text{ °C} \pm 5 \text{ °C}$ )

**Flow command value function**

( $\Delta p = 5 \text{ bar/control edge}$ )

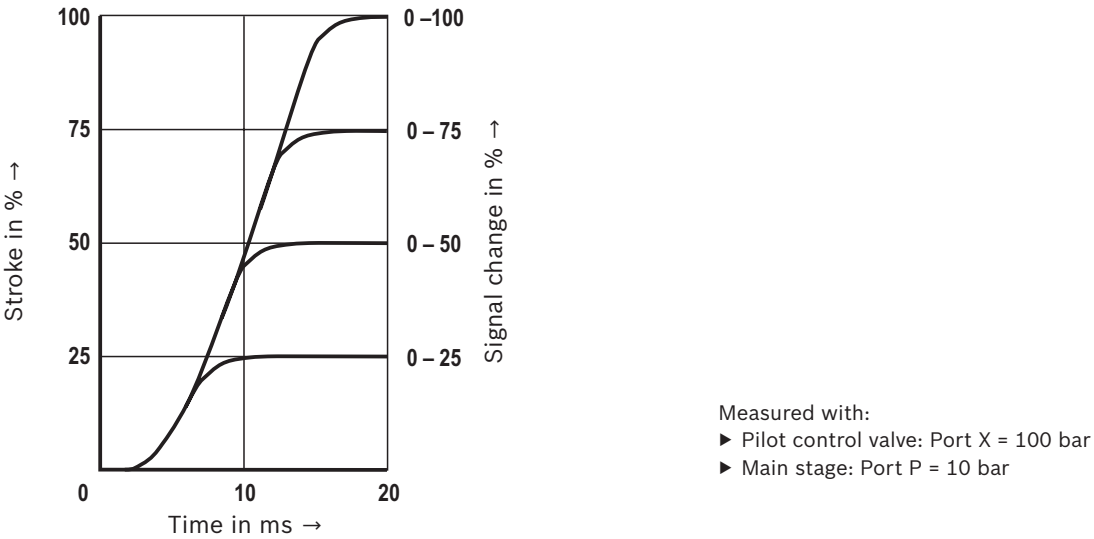
**Symbol E, W, and V**



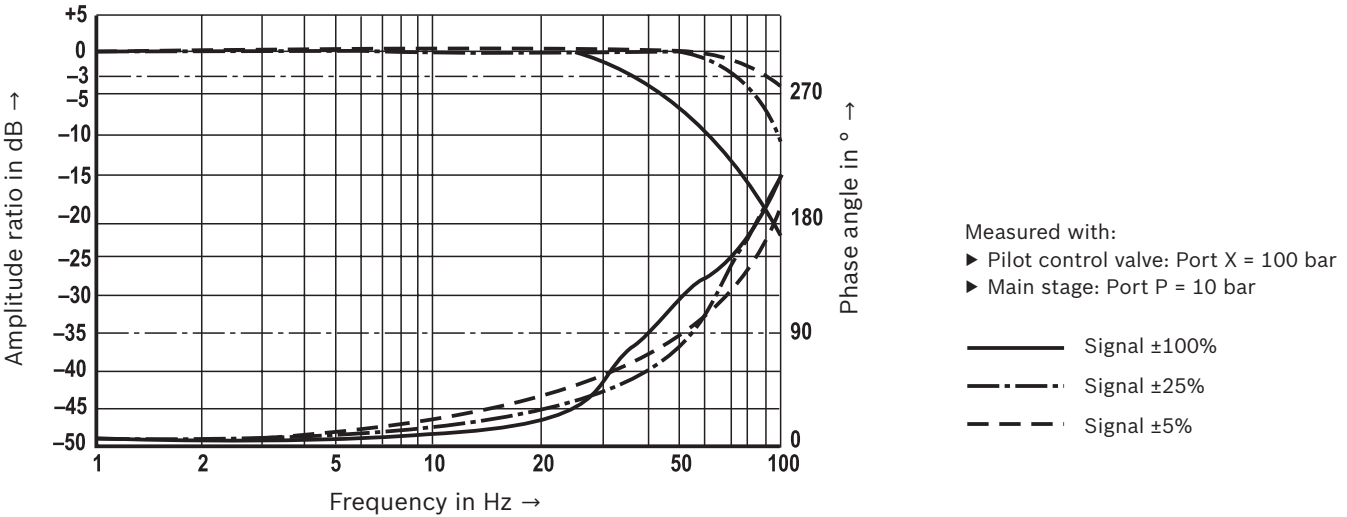
- 1) Positive overlap 0 ... 0.5% at symbol V
- 2) Positive overlap 15% at symbol E and W

**Characteristic curves: Size 10**  
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

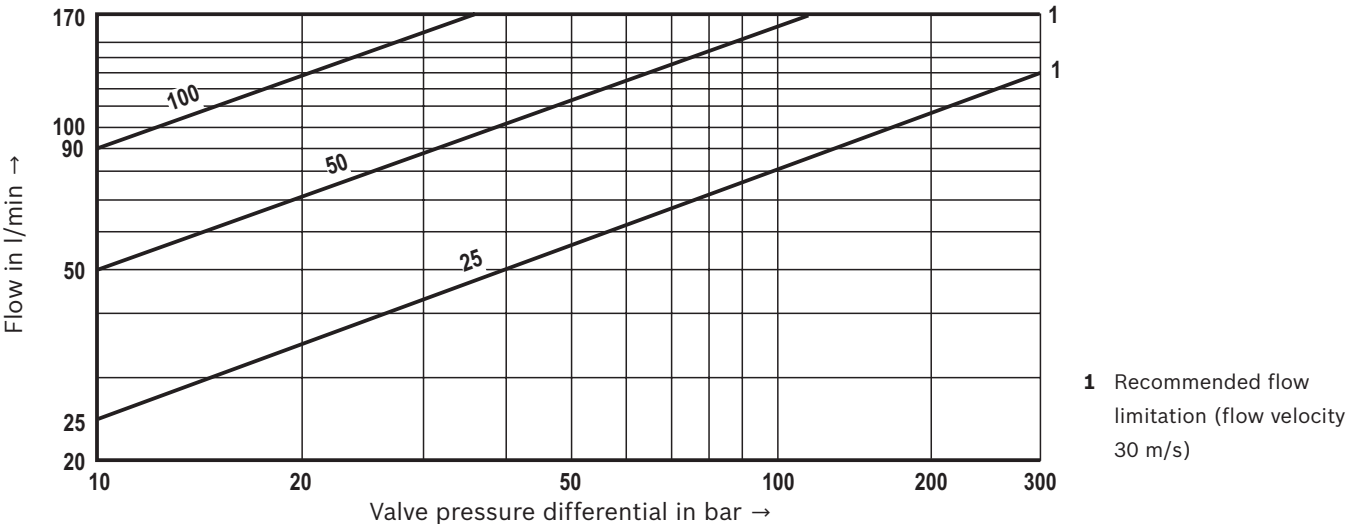
**Transition function with stepped electric input signals**



**Frequency response characteristic curves**

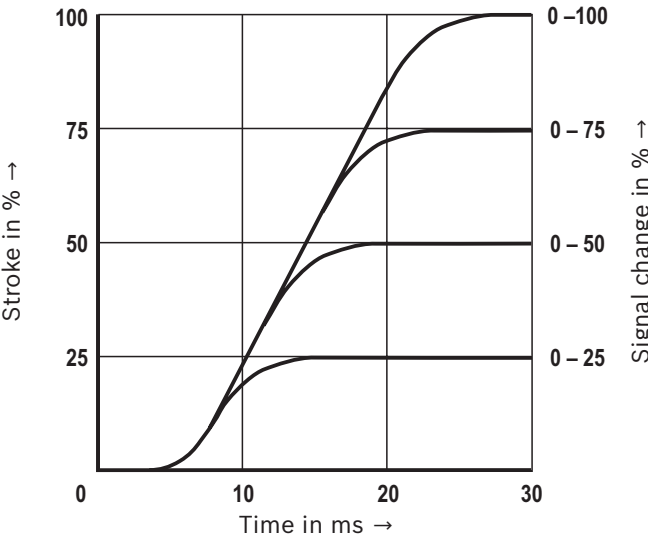


**Flow/load function with maximum valve opening (tolerance ±10%)**



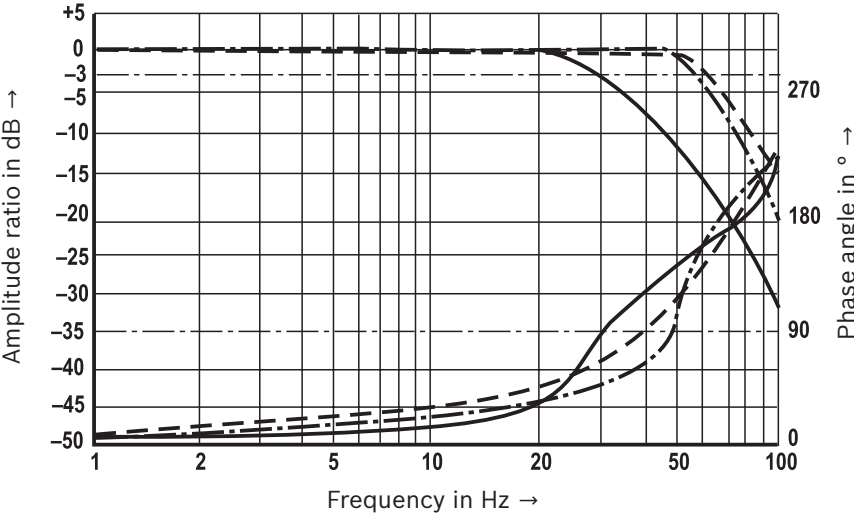
**Characteristic curves: Size 16**  
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

**Transition function with stepped electric input signals**



Measured with:  
 ▶ Pilot control valve: Port X = 100 bar  
 ▶ Main stage: Port P = 10 bar

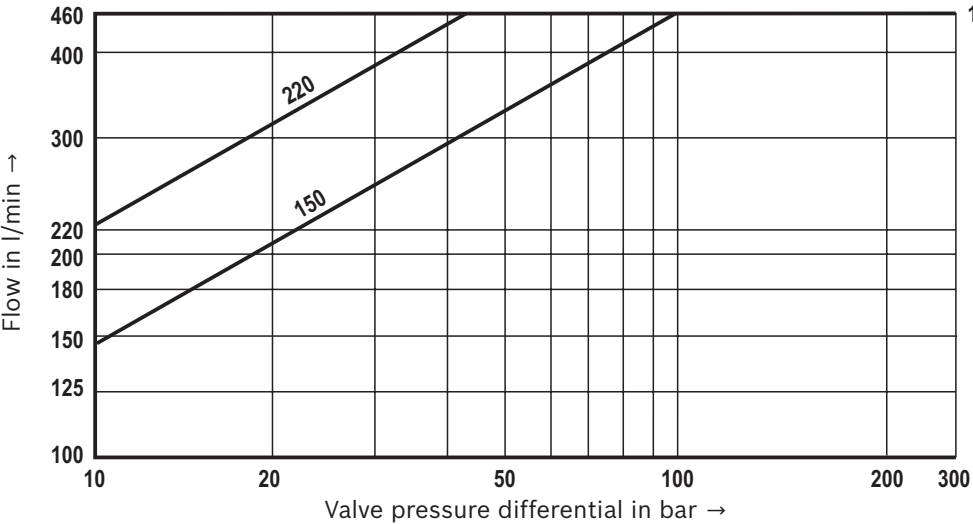
**Frequency response characteristic curves**



Measured with:  
 ▶ Pilot control valve: Port X = 100 bar  
 ▶ Main stage: Port P = 10 bar

— Signal ±100%  
 - - - Signal ±25%  
 - · - · Signal ±5%

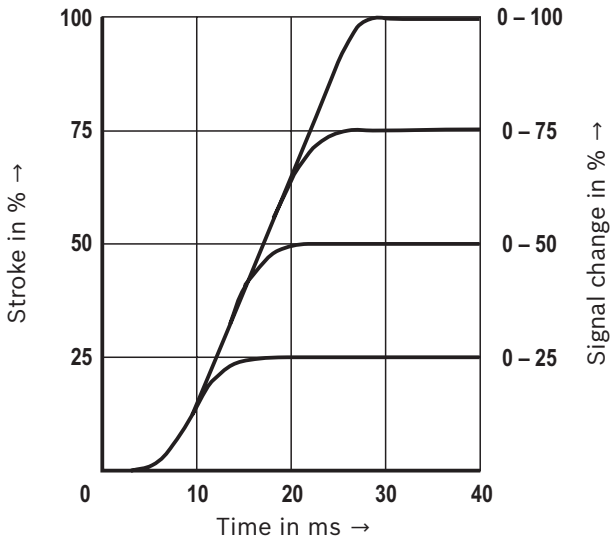
**Flow/load function with maximum valve opening (tolerance ±10%)**



**1** Recommended flow limitation (flow velocity 30 m/s)

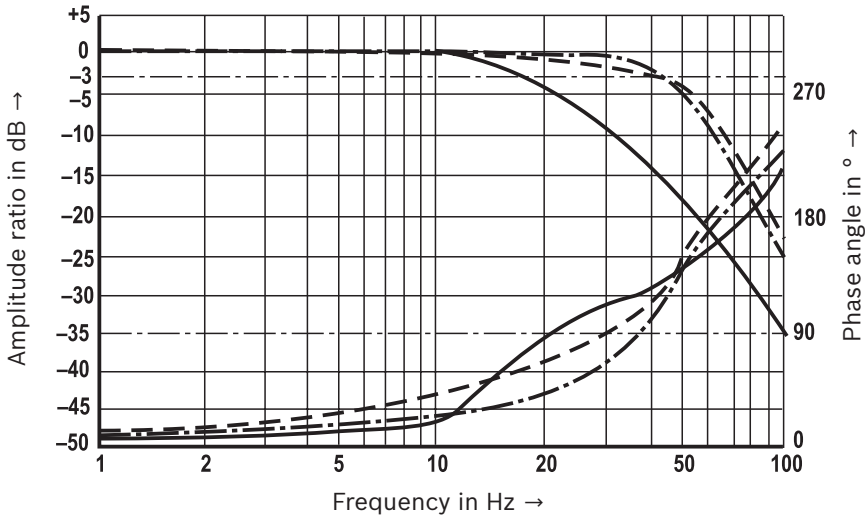
**Characteristic curves: Size 25 and 27**  
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

**Transition function with stepped electric input signals**



Measured with:  
 ▶ Pilot control valve: Port X = 100 bar  
 ▶ Main stage: Port P = 10 bar

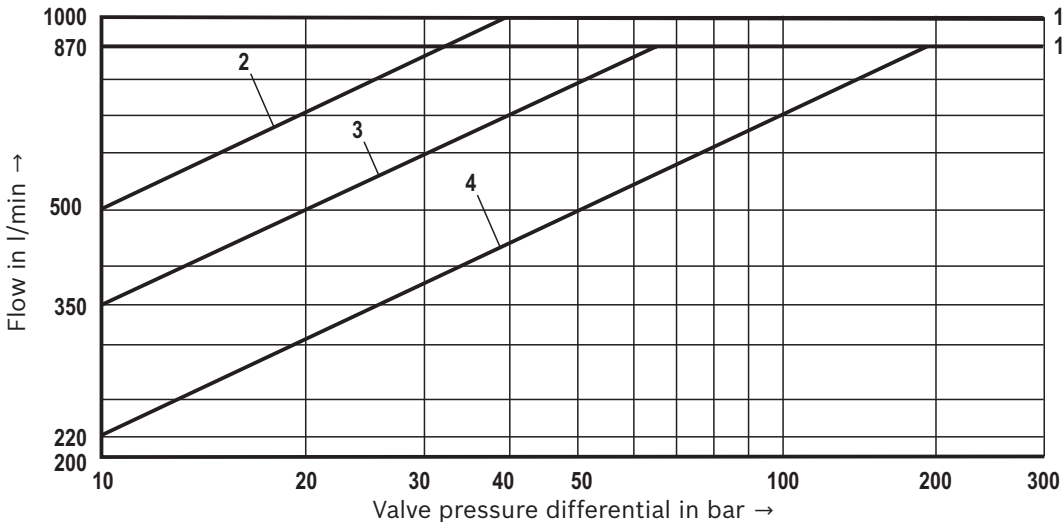
**Frequency response characteristic curves**



Measured with:  
 ▶ Pilot control valve: Port X = 100 bar  
 ▶ Main stage: Port P = 10 bar

— Signal ±100%  
 - - - Signal ±25%  
 - · - · Signal ±5%

**Flow/load function with maximum valve opening (tolerance ±10%)**

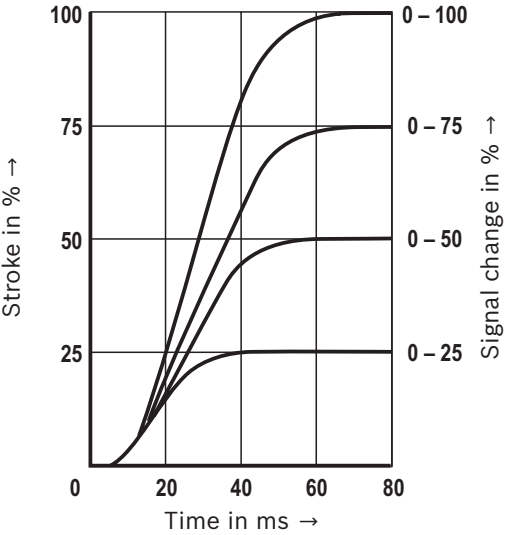


1 Recommended flow limitation (flow velocity 30 m/s)  
 2 500 – NG27  
 3 350 – NG25  
 4 220 – NG25



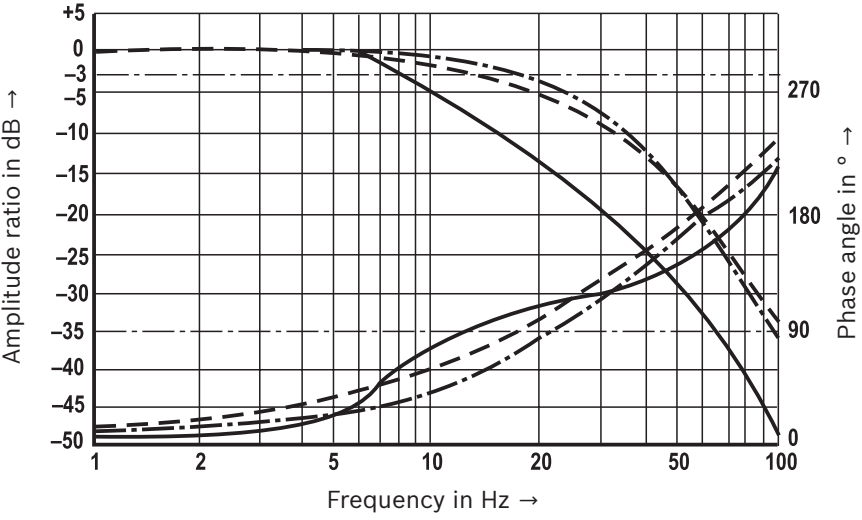
**Characteristic curves: Size 32**  
 (measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

**Transition function with stepped electric input signals**



Measured with:  
 ▶ Pilot control valve: Port X = 100 bar  
 ▶ Main stage: Port P = 10 bar

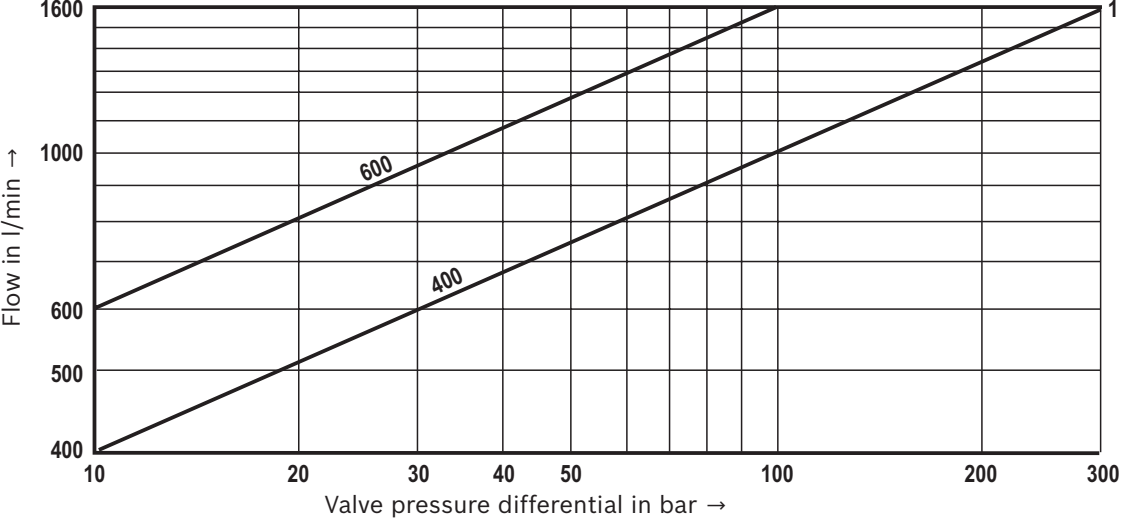
**Frequency response characteristic curves**



Measured with:  
 ▶ Pilot control valve: Port X = 100 bar  
 ▶ Main stage: Port P = 10 bar

— Signal ±100%  
 - · - Signal ±25%  
 - - - Signal ±5%

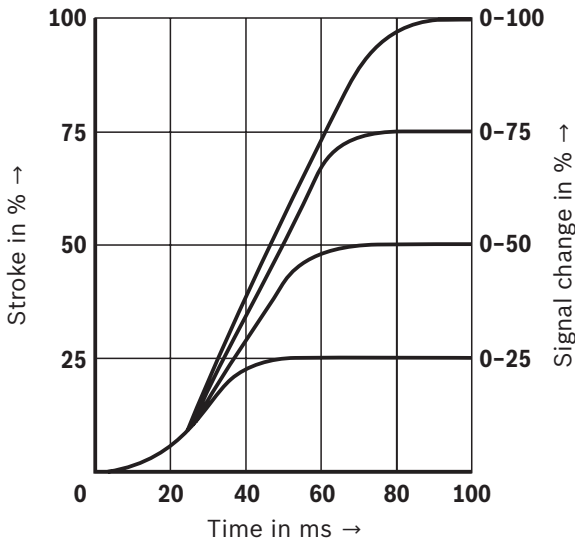
**Flow/load function with maximum valve opening (tolerance ±10%)**



**1** Recommended flow limitation (flow velocity 30 m/s)

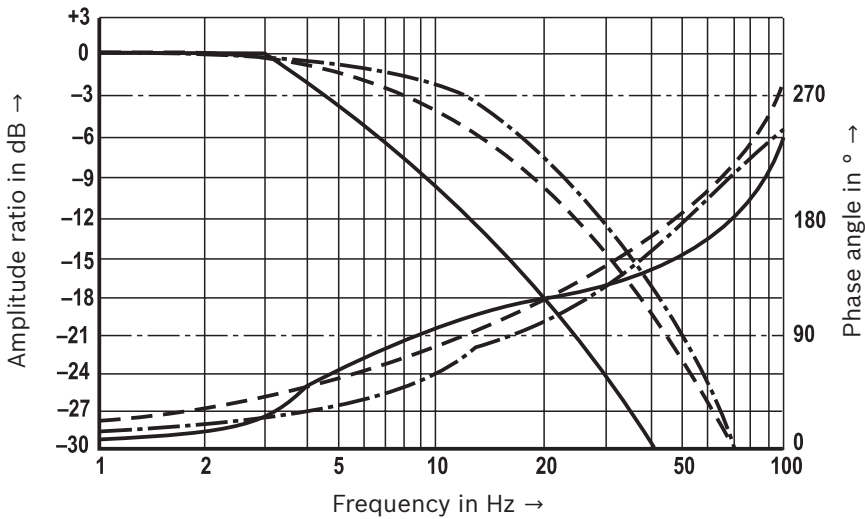
**Characteristic curves: Size 35**  
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ } ^\circ\text{C}$ )

**Transition function with stepped electric input signals**



Measured with:  
 ▶ Pilot control valve: Port X = 100 bar  
 ▶ Main stage: Port P = 10 bar

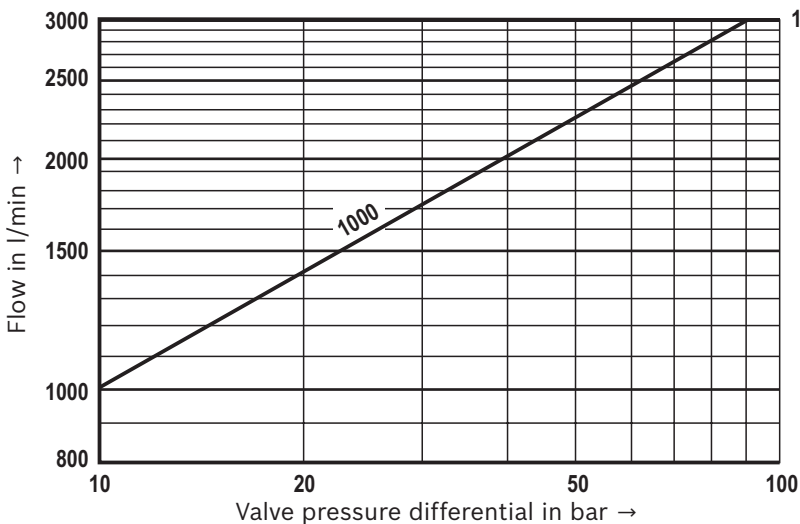
**Frequency response characteristic curves**



Measured with:  
 ▶ Pilot control valve: Port X = 100 bar  
 ▶ Main stage: Port P = 10 bar

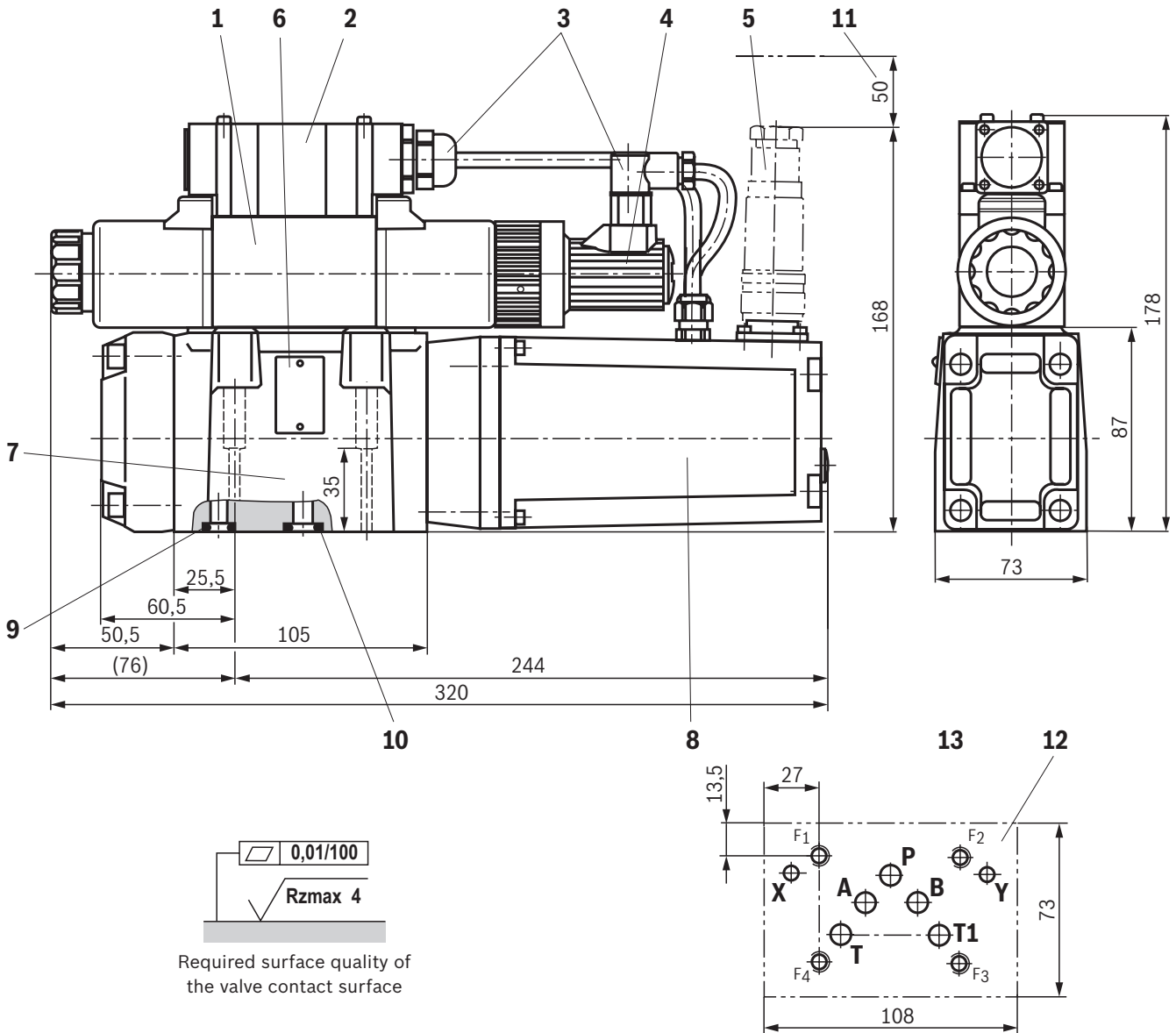
— Signal ±100%  
 - · - Signal ±25%  
 - - - Signal ±5%

**Flow/load function with maximum valve opening (tolerance ±10%)**



**1** Recommended flow limitation  
(flow velocity 30 m/s)

**Dimensions:** Size 10  
(dimensions in mm)



- 1 Pilot control valve
- 2 Electrical connection
- 3 Wiring and mating connector
- 4 Inductive position transducer (pilot control valve)
- 5 Mating connector 6-pole + PE (separate order, see page 28 and data sheet 08006)
- 6 Name plate
- 7 Main valve
- 8 Integrated electronics (OBE) and inductive position transducer (main valve)
- 9 Identical seal rings for ports X, Y
- 10 Identical seal rings for ports A, B, P, T, T1
- 11 Space required for connection cable and to remove the mating connector
- 12 Machined valve contact surface, porting pattern according to ISO 4401-05-05-0-05 (ports X, Y as required)

**Subplates** (separate order) with porting pattern according to ISO 4401-05-05-0-05 see data sheet 45100.



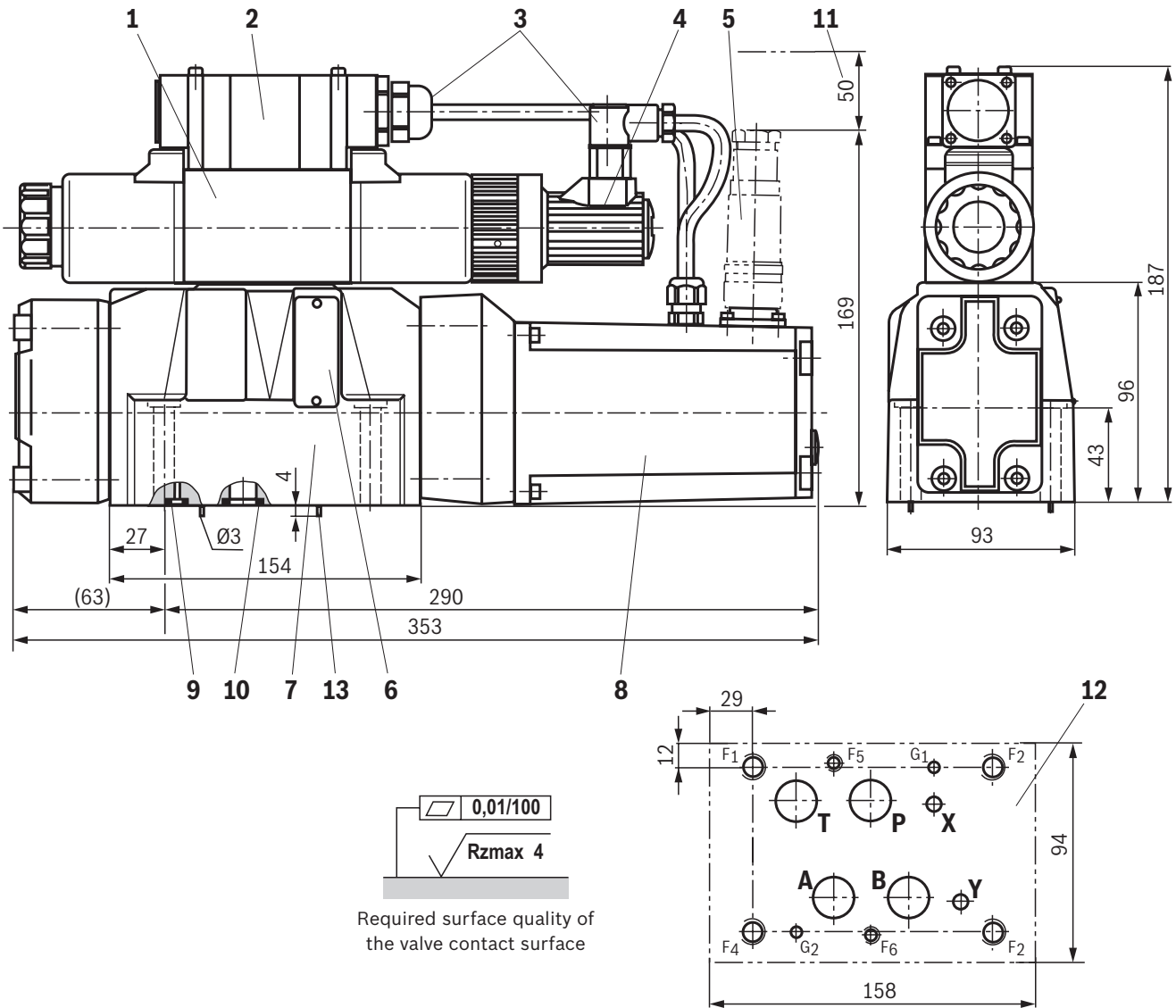
**Notice:**

The dimensions are nominal dimensions which are subject to tolerances.

**Dimensions for electronics protection membrane "-967"** see page 25.

**Valve mounting screws** see page 26.

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



- 1 Pilot control valve
- 2 Electrical connection
- 3 Wiring and mating connector
- 4 Inductive position transducer (pilot control valve)
- 5 Mating connector 6-pole + PE (separate order, see page 28 and data sheet 08006)
- 6 Name plate
- 7 Main valve
- 8 Integrated electronics (OBE) and inductive position transducer (main valve)
- 9 Identical seal rings for ports X, Y
- 10 Identical seal rings for ports A, B, P, T
- 11 Space required for connection cable and to remove the mating connector
- 12 Machined valve contact surface, porting pattern according to ISO 4401-07-07-0-05 (ports X, Y as required)  
Deviating from the standard: ports A, B, P, T – Ø20 mm
- 13 Locking pin

**Subplates** (separate order) with porting pattern according to ISO 4401-07-07-0-05 see data sheet 45100.

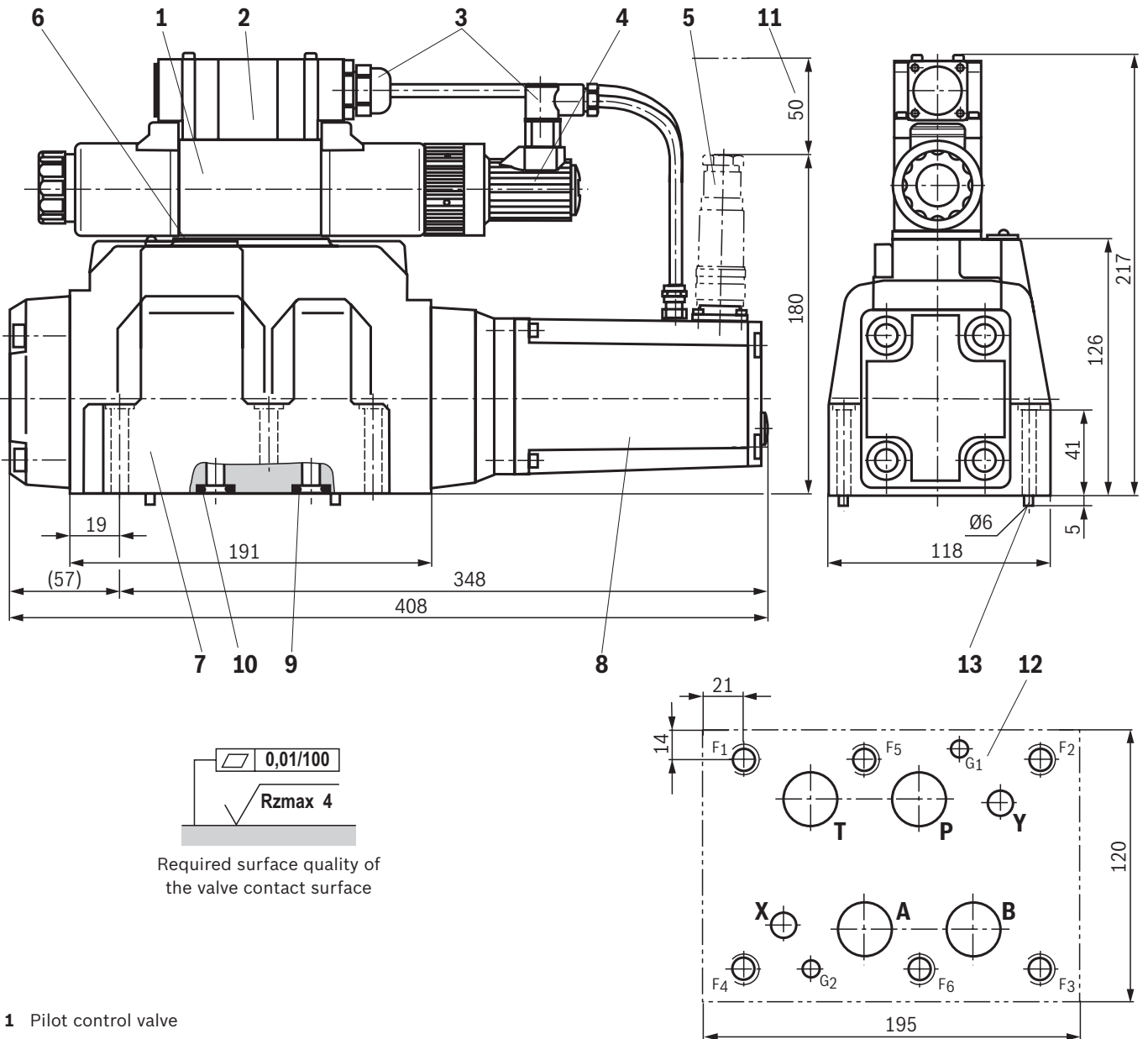
**Notice:**

The dimensions are nominal dimensions which are subject to tolerances.

**Dimensions for electronics protection membrane "-967"** and **spool position monitoring "M"** see page 25.

**Valve mounting screws** see page 26.

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



Required surface quality of the valve contact surface

- 1 Pilot control valve
- 2 Electrical connection
- 3 Wiring and mating connector
- 4 Inductive position transducer (pilot control valve)
- 5 Mating connector 6-pole + PE (separate order, see page 28 and data sheet 08006)
- 6 Name plate
- 7 Main valve
- 8 Integrated electronics (OBE) and inductive position transducer (main valve)
- 9 Identical seal rings for ports X, Y
- 10 Identical seal rings for ports A, B, P, T
- 11 Space required for connection cable and to remove the mating connector
- 12 Machined valve contact surface; porting pattern according to ISO 4401-08-08-0-05 (ports X, Y as required)
- 13 Locking pin

**Subplates** (separate order) with porting pattern according to ISO 4401-08-08-0-05 see data sheet 45100.

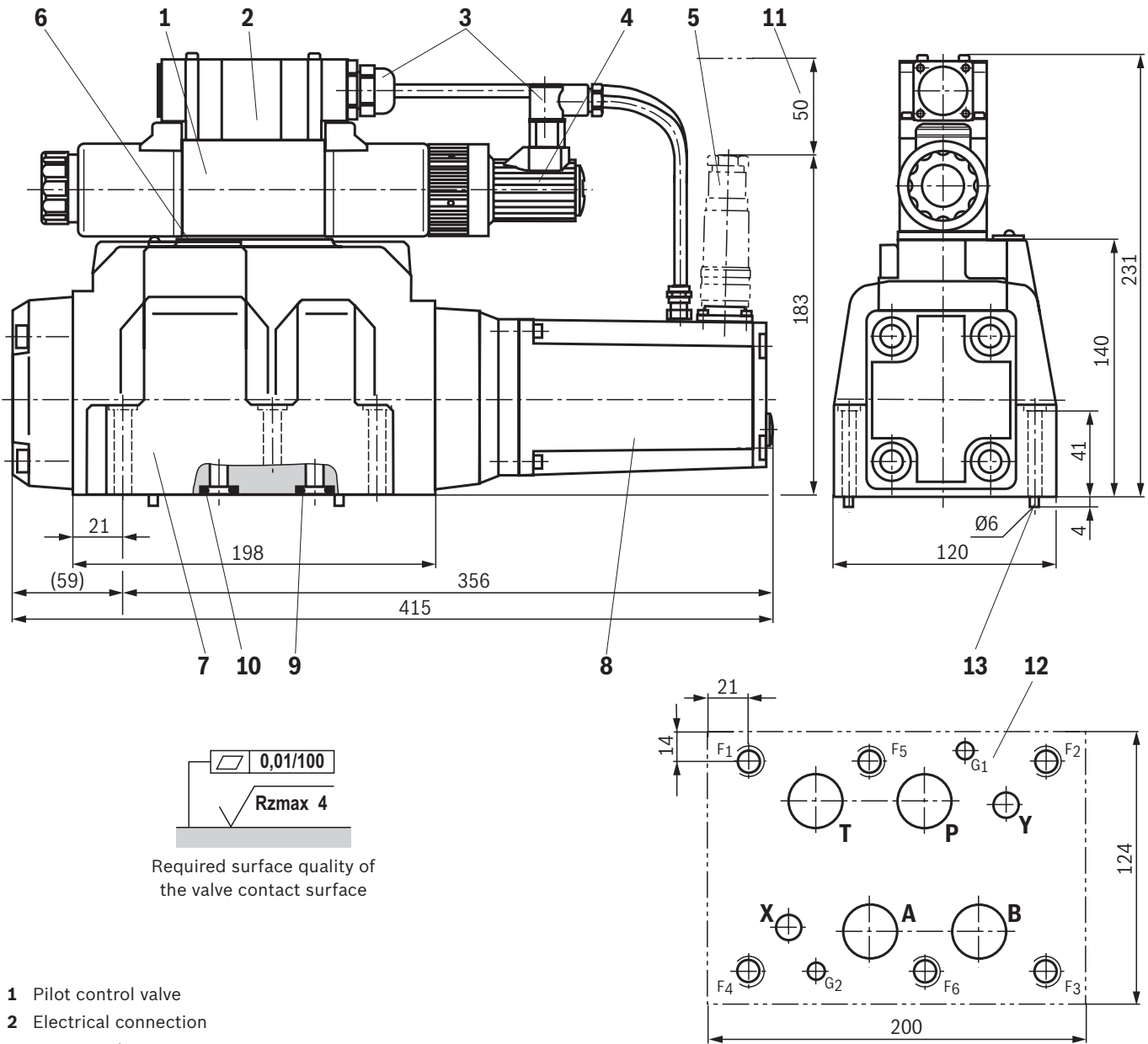


**Notice:**

The dimensions are nominal dimensions which are subject to tolerances.

**Dimensions for electronics protection membrane "-967" and spool position monitoring "M"** see page 25.  
**Valve mounting screws** see page 26.

**Dimensions:** Size 27  
(dimensions in mm)



- 1 Pilot control valve
- 2 Electrical connection
- 3 Wiring and mating connector
- 4 Inductive position transducer (pilot control valve)
- 5 Mating connector 6-pole + PE (separate order, see page 28 and data sheet 08006)
- 6 Name plate
- 7 Main valve
- 8 Integrated electronics (OBE) and inductive position transducer (main valve)
- 9 Identical seal rings for ports X, Y
- 10 Identical seal rings for ports A, B, P, T
- 11 Space required for connection cable and to remove the mating connector
- 12 Machined valve contact surface; porting pattern according to ISO 4401-08-08-0-05 (ports X, Y as required) Deviating from the standard: ports A, B, P, T – Ø32 mm
- 13 Locking pin

**Subplates** (separate order) with porting pattern according to ISO 4401-08-08-0-05 see data sheet 45100.

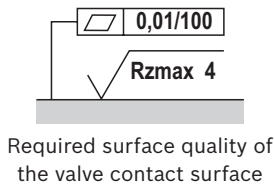
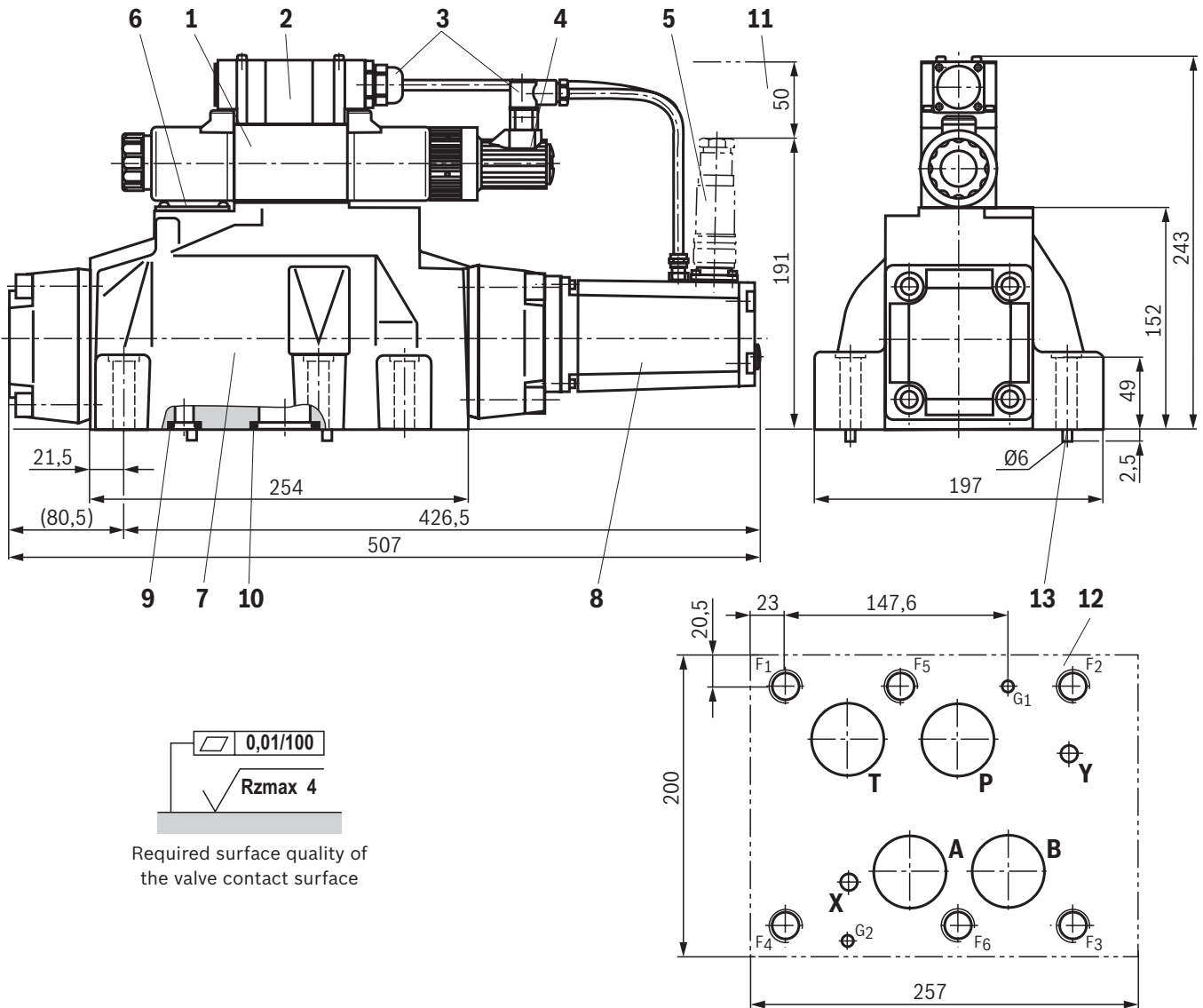


**Notice:**

The dimensions are nominal dimensions which are subject to tolerances.

**Dimensions for electronics protection membrane "-967"** and **spool position monitoring "M"** see page 25.  
**Valve mounting screws** see page 26.

**Dimensions:** Size 32  
(dimensions in mm)



- 1 Pilot control valve
- 2 Electrical connection
- 3 Wiring and mating connector
- 4 Inductive position transducer (pilot control valve)
- 5 Mating connector 6-pole + PE (separate order, see page 28 and data sheet 08006)
- 6 Name plate
- 7 Main valve
- 8 Integrated electronics (OBE) and inductive position transducer (main valve)
- 9 Identical seal rings for ports X, Y
- 10 Identical seal rings for ports A, B, P, T
- 11 Space required for connection cable and to remove the mating connector
- 12 Machined valve contact surface; porting pattern according to ISO 4401-10-09-0-05 (ports X, Y as required)  
Deviating from the standard:
  - ▶ Ports A, B, P, T – Ø38 mm
  - ▶ Dimension G<sub>1</sub> according to DIN 24340 Form A
- 13 Locking pin

**Subplates** (separate order) with porting pattern according to ISO 4401-10-09-0-05 see data sheet 45100.

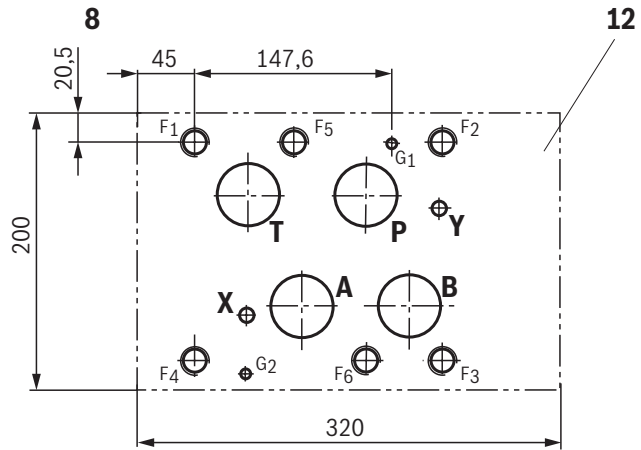
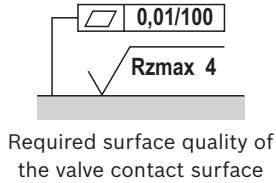
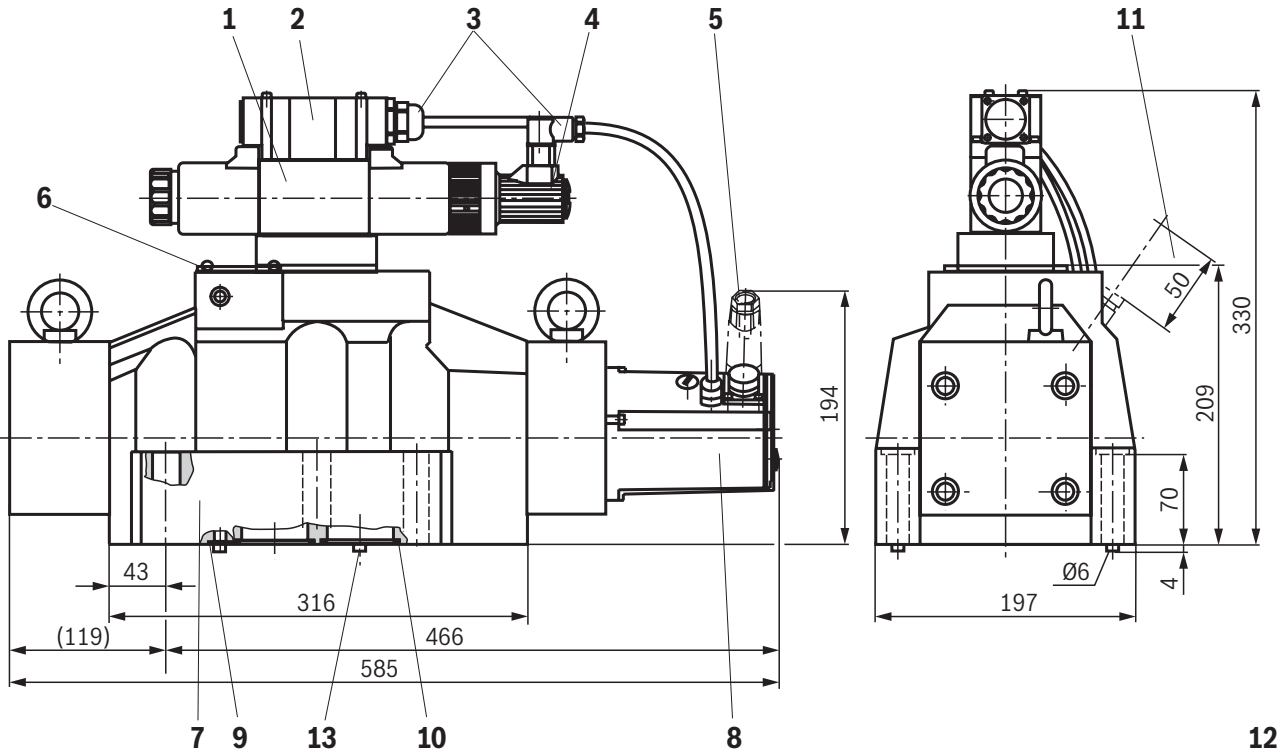


**Notice:**

The dimensions are nominal dimensions which are subject to tolerances.

**Dimensions for electronics protection membrane "967" and spool position monitoring "M" see page 25. Valve mounting screws see page 26.**

**Dimensions:** Size 35  
(dimensions in mm)



- 1 Pilot control valve
- 2 Electrical connection
- 3 Wiring and mating connector
- 4 Inductive position transducer (pilot control valve)
- 5 Mating connector 6-pole + PE (separate order, see page 28 and data sheet 08006)
- 6 Name plate
- 7 Main valve
- 8 Integrated electronics (OBE) and inductive position transducer (main valve)
- 9 Identical seal rings for ports X, Y
- 10 Identical seal rings for ports A, B, P, T
- 11 Space required for connection cable and to remove the mating connector
- 12 Machined valve contact surface; porting pattern according to ISO 4401-10-09-0-05 (ports X, Y as required)  
Deviating from the standard:
  - ▶ Ports A, B, P, T –  $\varnothing 50$  mm
  - ▶ <sup>1)</sup> Dimension G<sub>1</sub> according to DIN 24340 Form A
- 13 Locking pin

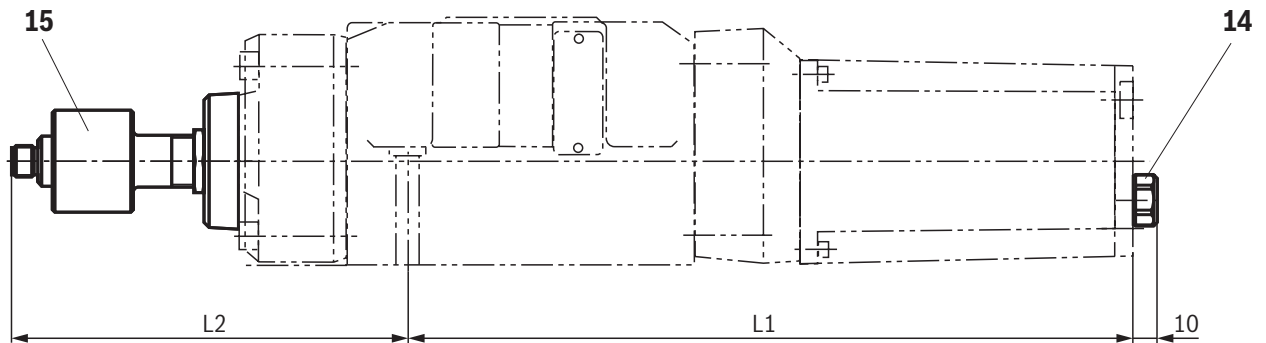
**Subplates** (separate order) with porting pattern according to ISO 4401-10-09-0-05 see data sheet 45100.

**Notice:**  
The dimensions are nominal dimensions which are subject to tolerances.

**Dimensions for electronics protection membrane "-967"** and **spool position monitoring "M"** see page 25.  
**Valve mounting screws** see page 26.



**Dimensions:** Spool position monitoring "M" and electronics protection membrane "-967"  
(dimensions in mm)



| NG | L1  | L2  |
|----|-----|-----|
| 10 | 240 | -   |
| 16 | 286 | 151 |
| 25 | 347 | 143 |
| 27 | 353 | 144 |
| 32 | 422 | 168 |
| 35 | 463 | 201 |

**14** Electronics protection membrane "-967"

**15** Spool position monitoring "M", optional




**Notice:**

The dimensions are nominal dimensions which are subject to tolerances.

## Dimensions

### Valve mounting screws (separate order)

| Size   | Quantity  | Hexagon socket head cap screws  | Material number                            |
|--------|---|---|--|
| 10     | 4   | <b>ISO 4762 - M6 x 45 - 10.9-CM-Fe-ZnNi-5-Cn-T0-H-B</b><br>tightening torque $M_A = 13.5 \text{ Nm} \pm 10\%$ | <b>R913043777</b>                          |
|        | or  |   |  |
|        | 4   | <b>ISO 4762 - M6 x 45 - 10.9</b><br>tightening torque $M_A = 15.5 \text{ Nm} \pm 10\%$                        | Not included in the Rexroth delivery range |
| 16     | 2   | <b>ISO 4762 - M6 x 60 - 10.9-CM-Fe-ZnNi-5-Cn-T0-H-B</b><br>tightening torque $M_A = 12.2 \text{ Nm} \pm 10\%$ | <b>R913043410</b>                          |
|        | 4   | <b>ISO 4762 - M10 x 60 - 10.9-flZn/nc/480h/C</b><br>tightening torque $M_A = 58 \text{ Nm} \pm 20\%$          | <b>R913014770</b>                          |
|        | or  |   |  |
|        | 2   | <b>ISO 4762 - M6 x 60 - 10.9</b><br>tightening torque $M_A = 15.5 \text{ Nm} \pm 10\%$                        | Not included in the Rexroth delivery range |
| 4      | <b>ISO 4762 - M10 x 60 - 10.9</b><br>tightening torque $M_A = 75 \text{ Nm} \pm 20\%$ |   |  |
| 25, 27 | 6   | <b>ISO 4762 - M12 x 60 - 10.9-flZn/nc/480h/C</b><br>tightening torque $M_A = 100 \text{ Nm} \pm 20\%$         | <b>R913015613</b>                          |
|        | or  |   |  |
|        | 6   | <b>ISO 4762 - M12 x 60</b><br>tightening torque $M_A = 130 \text{ Nm} \pm 20\%$                               | Not included in the Rexroth delivery range |
| 32     | 6   | <b>ISO 4762 - M20 x 80 - 10.9-flZn/nc/480h/C</b><br>tightening torque $M_A = 340 \text{ Nm} \pm 20\%$         | <b>R913008472</b>                          |
|        | or  |   |  |
|        | 6   | <b>ISO 4762 - M20 x 80 - 10.9</b><br>tightening torque $M_A = 430 \text{ Nm} \pm 20\%$                        | Not included in the Rexroth delivery range |
| 35     | 6   | <b>ISO 4762 - M20 x 100 - 10.9-flZn/nc/480h/C</b><br>tightening torque $M_A = 465 \text{ Nm} \pm 20\%$        | <b>R913015670</b>                          |
|        | or  |   |  |
|        | 6   | <b>ISO 4762 - M20 x 100 - 10.9</b><br>tightening torque $M_A = 610 \text{ Nm} \pm 20\%$                       | Not included in the Rexroth delivery range |

 **Notice:**

The tightening torque of the hexagon socket head cap screws refers to maximum operating pressure.

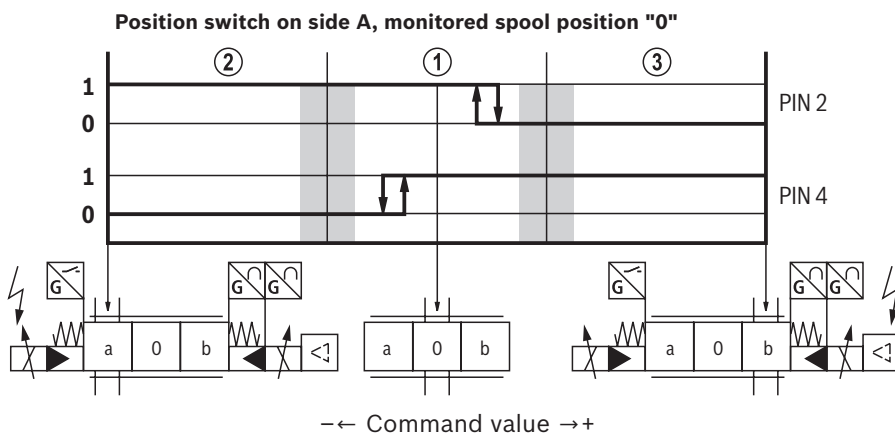
## Inductive position switch: Electrical connection

The electrical connection is realized via a 4-pole mating connector (separate order, see page 28) with connection thread M12 x 1.

|                                   |   |
|-----------------------------------|---|
| <b>Switching point</b>            | Within positive valve overlap   |
| <b>Supply voltage</b>             | 20...32 V DC  |
| <b>Admissible residual ripple</b> | ≤ 10%   |
| <b>Current consumption</b>        | approx. 25 mA (no load)   |
| <b>Outputs</b>                    | 2   |
| <b>Output function</b>            | PNP   |
| <b>Low level "0"</b>              | < 0.5 V DC  |
| <b>High level "1"</b>             | $U_B - 2$ V DC  |
| <b>Current carrying capacity</b>  | ≤ 400 mA  |
| <b>Signal delay time</b>          | ≤ 15 ms (electrical, without switching time of valve)   |
| <b>Reference potential</b>        | GND   |
| <b>Pinout:</b>                    | <b>1</b> +24 V<br><b>2</b> Switching output: 400 mA (valve opening P→A)<br><b>3</b> 0 V, GND<br><b>4</b> Switching output: 400 mA (valve opening P→B) |



## Inductive position switch: Switching logics



- ① Central position (mechanical control spool overlap)
- ② Valve opening P→B
- ③ Valve opening P→A

**Accessories:** Mating connectors and cable sets (separate order)**Valve with integrated electronics**

| <b>Mating connectors 6-pole + PE</b>   | <b>Design</b> | <b>Design</b> | <b>Material number</b> | <b>Data sheet</b> |
|--|---------------|---------------|------------------------|-------------------|
| For the connection of valves with integrated electronics, round connector 6+PE, line cross-section 0.5 ... 1.5 mm <sup>2</sup> | straight      | Metal         | <b>R900223890</b>      | 08006             |
|  | straight      | Plastic       | <b>R900021267</b>      | 08006             |
|  | angled        | Plastic       | <b>R900217845</b>      | –                 |

| <b>Cable sets 6-pole + PE</b>   | <b>Length in m</b> | <b>Material number</b> | <b>Data sheet</b> |
|---|--------------------|------------------------|-------------------|
| For the connection of valves with integrated electronics, round connector 6+PE, straight connector, shielded, potted-in mating connector, line cross-section 0.75 mm <sup>2</sup> | 3.0                | <b>R901420483</b>      | 08006             |
|   | 5.0                | <b>R901420491</b>      | 08006             |
|   | 10.0               | <b>R901420496</b>      | 08006             |
|   | 20.0               | <b>R901448068</b>      | –                 |

**Sensors**

| <b>Mating connectors 4-pole</b>  | <b>Design</b> | <b>Line fitting</b> | <b>Material number</b> | <b>Data sheet</b> |
|--|---------------|---------------------|------------------------|-------------------|
| For the connection of sensors with connector "K24", "K35" and "K72", line cross-section 0.75 mm <sup>2</sup> | straight      | PG7                 | <b>R900773042</b>      | 08006             |
|  | straight      | PG9                 | <b>R900031155</b>      | 08006             |
|  | angled        | PG7                 | <b>R900779509</b>      | 08006             |
|  | angled        | PG9                 | <b>R900082899</b>      | 08006             |

| <b>Cable sets 4-pole</b>   | <b>Design</b> | <b>Screening</b> | <b>Length in m</b> | <b>Material number</b> | <b>Data sheet</b> |
|--|---------------|------------------|--------------------|------------------------|-------------------|
| For the connection of sensors with connector "K24", "K35" and "K72", line cross-section 0.34 mm <sup>2</sup> | straight      | yes              | 2.0                | <b>R900773031</b>      | 08006             |
|  | straight      | no               | 3.0                | <b>R900064381</b>      | 08006             |
|  | straight      | yes              | 5.0                | <b>R900779498</b>      | 08006             |
|  | straight      | no               | 10.0               | <b>R913005668</b>      | 08006             |
|  | angled        | yes              | 2.0                | <b>R900779504</b>      | 08006             |
|  | angled        | yes              | 5.0                | <b>R900779503</b>      | 08006             |
|  | angled        | no               | 10.0               | <b>R913011722</b>      | 08006             |

## Project planning, installation and commissioning

- ▶ When designing safety-related controls, observe the applicable industry-specific standards and regulations.
- ▶ Due to the flexible use of valves in systems, the user has to check and ensure that the product properties comply with all functional and safety requirements of the overall system.
- ▶ Make sure that there are no switching shocks and that the valve control spool does not vibrate.
- ▶ Valves with spool position indicator may only be installed, adjusted, commissioned and maintained by specialists trained in hydraulics and electronics.
- ▶ Improper work at safety-related parts of controls may result in personal injury and damage to property.

### The following applies to all work carried out at the valve:

- ▶ Valves with spool position indicator must not be disassembled.
- ▶ The parts of the valves must not be exchanged.
- ▶ Integrated throttles must not be removed or modified.
- ▶ The spool position indicator may only be adjusted by the valve manufacturer.

## 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   |
| ▶ General product information on hydraulic products                                    | Data sheet 07008   |
| ▶ Installation, commissioning and maintenance of servo valves and high-response valves | Data sheet 07700   |
| ▶ Hydraulic valves for industrial applications   | Data sheet 07600-B   |
| ▶ Assembly, commissioning and maintenance of hydraulic systems                         | Data sheet 07900   |
| ▶ Selection of filters   | <a href="http://www.boschrexroth.com/filter">www.boschrexroth.com/filter</a> |
| ▶ Information on available spare parts   | <a href="http://www.boschrexroth.com/spc">www.boschrexroth.com/spc</a>       |

## Notes

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