

# Proportional directional valves, pilot-operated, with electrical position feedback and integrated electronics (OBE)

## Type 4WRKE



- ▶ Size 10 ... 35
- ▶ Component series 3X
- ▶ Maximum operating pressure 350 bar
- ▶ Maximum flow 4700 l/min



### Features

- ▶ Operation by means of proportional solenoids
- ▶ Control of flow direction and size
- ▶ For subplate mounting
- ▶ Porting pattern according to ISO 4401
- ▶ Electrical position feedback
- ▶ Spring-centered main control spool
- ▶ Pilot control by means of proportional directional valve
- ▶ Main stage with position control
- ▶ CE conformity according to EMC Directive 2014/30/EU

### Contents

|                                         |           |
|-----------------------------------------|-----------|
| Features                                | 1         |
| Ordering code                           | 2, 3      |
| Symbols                                 | 3, 4      |
| Function, section                       | 5, 6      |
| Technical data                          | 6 ... 10  |
| Block diagram/controller function block | 11 ... 13 |
| Electrical connections and assignment   | 14        |
| Characteristic curves                   | 15 ... 20 |
| Dimensions                              | 21 ... 27 |
| Accessories                             | 28        |
| Project planning information            | 28        |
| Further information                     | 28        |

**Ordering code**

|    |     |    |    |    |    |    |    |    |    |     |    |     |    |    |    |   |
|----|-----|----|----|----|----|----|----|----|----|-----|----|-----|----|----|----|---|
| 01 | 02  | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11  | 12 | 13  | 14 | 15 | 16 |   |
| 4  | WRK | E  |    |    |    | -  | 3X | /  | 6E | G24 |    | K31 | /  |    | D3 | * |

|    |                                                 |            |
|----|-------------------------------------------------|------------|
| 01 | 4 main ports                                    | <b>4</b>   |
| 02 | Proportional directional valves, pilot-operated | <b>WRK</b> |
| 03 | With integrated electronics (OBE)               | <b>E</b>   |
| 04 | Size 10                                         | <b>10</b>  |
|    | Size 16                                         | <b>16</b>  |
|    | Size 25                                         | <b>25</b>  |
|    | Size 27                                         | <b>27</b>  |
|    | Size 32                                         | <b>32</b>  |
|    | Size 35                                         | <b>35</b>  |
| 05 | Symbols; possible version see page 3            |            |

**Rated flow**

|    |                                                                       |             |   |
|----|-----------------------------------------------------------------------|-------------|---|
| 06 | <b>- Size 10</b>                                                      |             |   |
|    | 25 l/min (only symbol E, E1-, W6-, W8- and EA as well as version "L") | <b>25</b>   |   |
|    | 50 l/min                                                              | <b>50</b>   |   |
|    | 100 l/min                                                             | <b>100</b>  | ◇ |
|    | <b>- Size 16</b>                                                      |             |   |
|    | 150 l/min                                                             | <b>150</b>  |   |
|    | 220 l/min                                                             | <b>220</b>  | ◇ |
|    | <b>- Size 25</b>                                                      |             |   |
|    | 220 l/min                                                             | <b>220</b>  |   |
|    | 350 l/min                                                             | <b>350</b>  | ◇ |
|    | <b>- Size 27</b>                                                      |             |   |
|    | 500 l/min                                                             | <b>500</b>  | ◇ |
|    | <b>- Size 32</b>                                                      |             |   |
|    | 400 l/min                                                             | <b>400</b>  |   |
|    | 600 l/min                                                             | <b>600</b>  | ◇ |
|    | <b>- Size 35</b>                                                      |             |   |
|    | 1000 l/min                                                            | <b>1000</b> | ◇ |

**Flow characteristic**

|    |                                                                                          |            |   |
|----|------------------------------------------------------------------------------------------|------------|---|
| 07 | Linear                                                                                   | <b>L</b>   | ◇ |
|    | Linear with fine control range                                                           | <b>P</b>   |   |
| 08 | Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions) | <b>3X</b>  |   |
| 09 | Proportional solenoid with detachable coil                                               | <b>6E</b>  |   |
| 10 | Direct voltage 24 V                                                                      | <b>G24</b> |   |

**Pilot oil flow**

|    |                                                      |                |   |
|----|------------------------------------------------------|----------------|---|
| 11 | External pilot oil supply, external pilot oil return | <b>no code</b> | ◇ |
|    | Pilot oil supply internal, pilot oil return external | <b>E</b>       |   |
|    | Internal pilot oil supply, internal pilot oil return | <b>ET</b>      | ◇ |
|    | External pilot oil supply, internal pilot oil return | <b>T</b>       |   |

**Electrical connection**

|    |                                                       |                          |
|----|-------------------------------------------------------|--------------------------|
| 12 | Connector, 7-pole (6 + PE) according to EN 175201-804 | <b>K31</b> <sup>1)</sup> |
|----|-------------------------------------------------------|--------------------------|

## Ordering code

|    |     |    |    |    |    |    |    |    |    |     |    |     |    |    |    |
|----|-----|----|----|----|----|----|----|----|----|-----|----|-----|----|----|----|
| 01 | 02  | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11  | 12 | 13  | 14 | 15 | 16 |
| 4  | WRK | E  |    |    |    | -  | 3X | /  | 6E | G24 |    | K31 | /  | D3 | *  |

### Electrical interface

|    |                                                                                       |                         |   |
|----|---------------------------------------------------------------------------------------|-------------------------|---|
| 13 | Command value input $\pm 10$ V; actual value output $\pm 10$ V                        | <b>A1</b>               | ◇ |
|    | Command value input 4 ... 20 mA; actual value output 4 ... 20 mA                      | <b>F1</b>               |   |
|    | Command value input $\pm 10$ V; actual value output $\pm 10$ V, enable signal (pin C) | <b>A5</b> <sup>2)</sup> |   |
| 14 | With pressure reducing valve type ZDR 6 DP0-4X/40YM-W80 (permanently set)             | <b>D3</b>               |   |

### Seal material (observe compatibility of seals with hydraulic fluid used, see page 8)

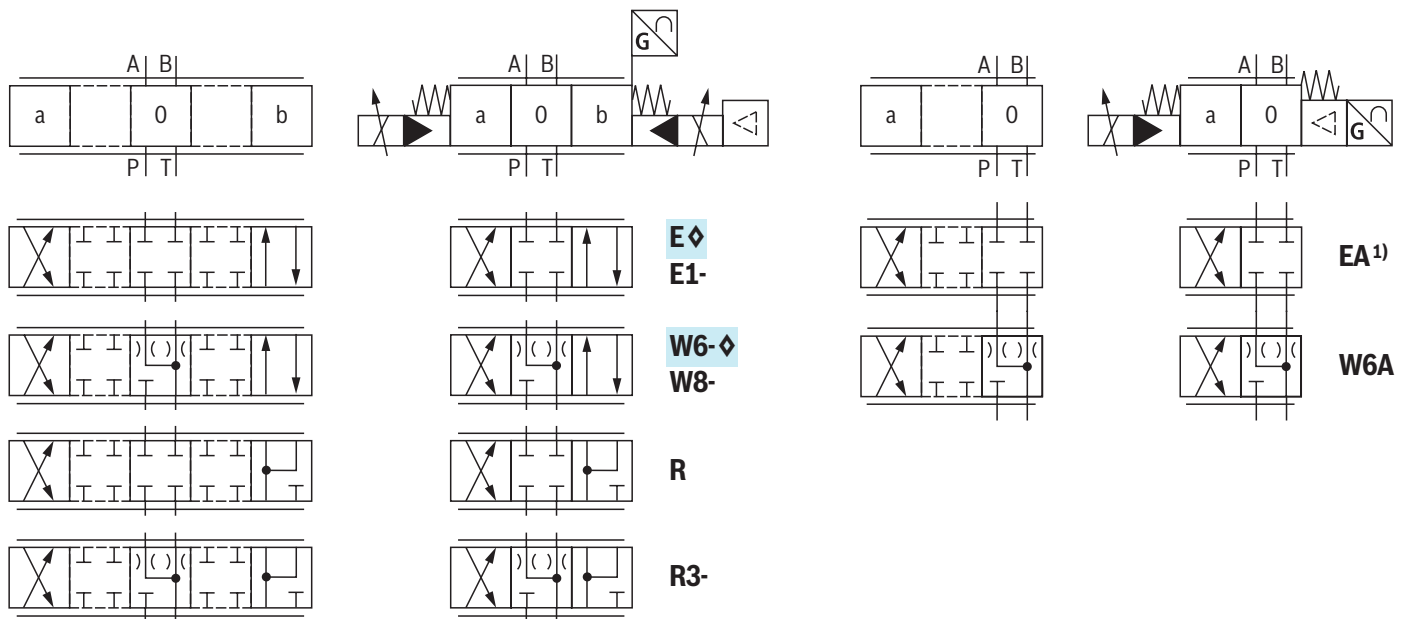
|    |                                   |          |   |
|----|-----------------------------------|----------|---|
| 15 | NBR seals                         | <b>M</b> | ◇ |
|    | FKM seals                         | <b>V</b> |   |
| 16 | Further details in the plain text | <b>*</b> |   |

1) Mating connectors can be ordered separately, see page 28.

2) See "Project planning information" page 28.

 **Notice:** ◇ = Preferred type

## Symbols



### With symbols E1- and W8-:

P→A:  $qV$  max      B→T:  $qV/2$   
P→B:  $qV/2$       A→T:  $qV$  max

### With symbols R and R3-:

P→A:  $qV$  max      B→P:  $qV/2$   
P→B:  $qV/2$       A→T:  $qV$  max

1) Example:

Symbol E with spool position "a" ordering code **..EA..**

### Information:

- Representation according to ISO 1219-1. Hydraulic interim positions are shown by dashes.
- With symbols W6-, W8- and R3-, there is a connection from A→T and B→T with approx. 2% of the relevant nominal cross-section in zero position.

Symbols

| Version   | Simple | Detailed |
|-----------|--------|----------|
| "no code" |        |          |
| "E"       |        |          |
| "ET"      |        |          |
| "T"       |        |          |



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

- 1 Pilot control valve type 4WRAP 6...
- 2 Main valve
- 3 Pressure reducing valve type ZDR 6 DP0-4X/40YM-W80
- 4 Integrated electronics (OBE)

## Function, section

Valves of type 4WRKE are 2-stage proportional directional valves. They control the flow direction and size.

The main stage is position-controlled so that the control spool position is independent from flow forces also in the case of bigger flows.

The valves mainly consist of the pilot control valve (1), the housing (8), the main control spool (7), the covers (5 and 6), the centering spring (4), the inductive position transducer (9) and the pressure reducing valve (3).

If there is no input signal, the main control spool (7) will be kept in the central position by the centering spring (4). Both control chambers in the covers (5 and 6) are connected to port T via the valve control spool (2).

The main control spool (7) is connected to suited control electronics via the inductive position transducer (9).

Both the position change of the main control spool (7) and the change of the command value at the junction summing of the amplifier create a voltage difference.

During the comparison of command value and actual value, a possible control deviation is determined via the electronics and the proportional solenoid of the pilot control valve (1) is supplied with current. The current induces a force in the solenoid which operates the control spool via a plunger in a row. The flow which is activated via the control cross-sections leads to an adjustment of the main control spool.

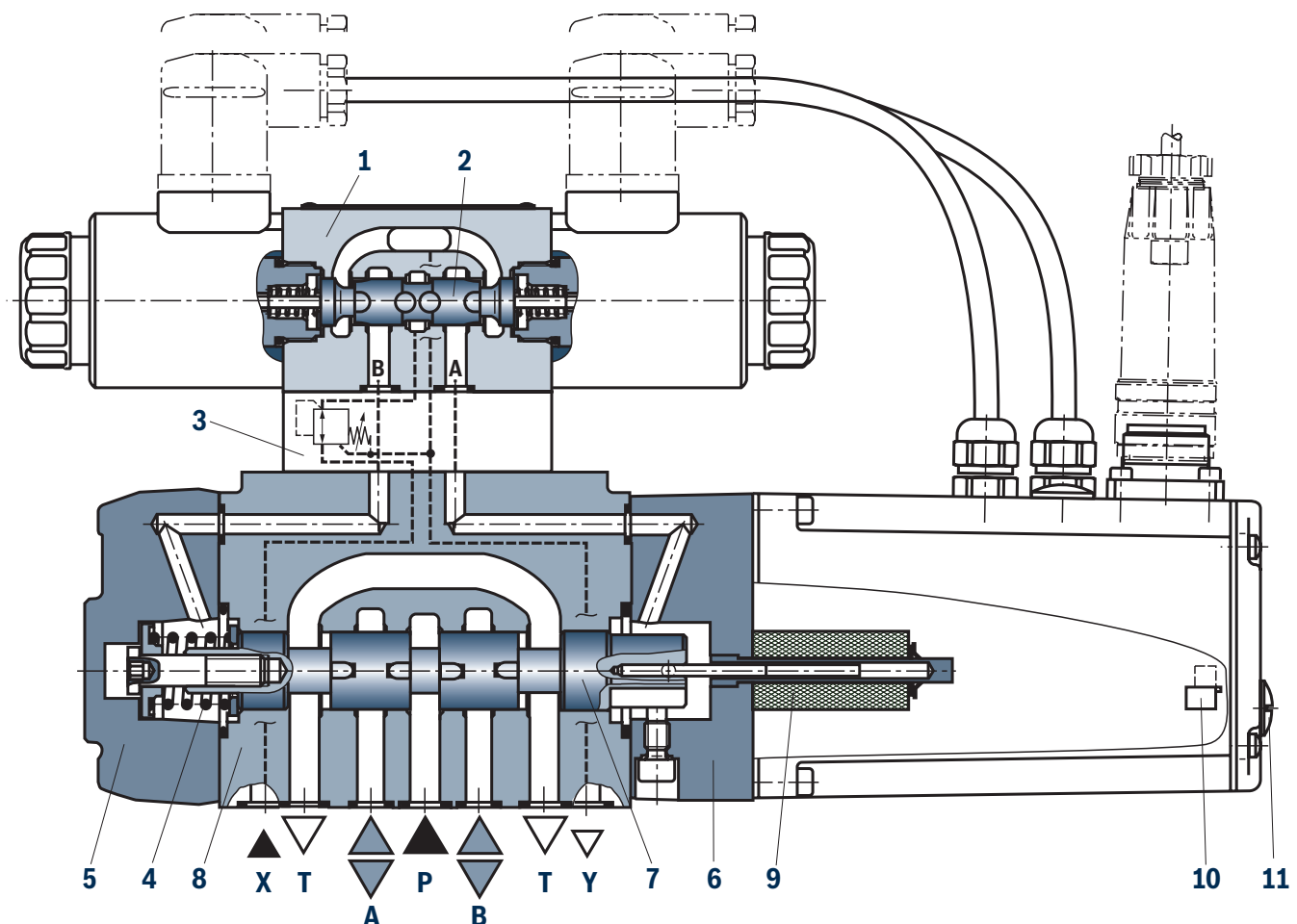
The main control spool (7) with the core of the inductive position transducer (9) attached to it is displaced until the actual value corresponds to the command value.

In controlled state, the main control spool (7) is force-balanced and kept in this controlled position.

The control spool stroke and the control opening change proportionally to the command value.

The control electronics is integrated in the valve.

By adjusting the valve and electronics, the deviation in series production of the devices is kept low.



## Function, section

### Information:

- ▶ The tank lines must not be allowed to run empty; with corresponding installation conditions, a preload valve (preload pressure approx. 2 bar) must be installed.
- ▶ The zero point adjustment at **"zero point main stage"** (10) is made at the factory and can be adjusted in a range of  $\pm 30\%$  of the nominal stroke via a potentiometer in the control electronics. Access with the integrated control electronics by removing a front-side plug screw (11) on the cover housing.
- ▶ When the pilot control valve or the control electronics are exchanged, they are to be re-adjusted. All adjustments may be implemented by instructed experts only.
- ▶ Changes in the zero point may result in damage to the system and may only be implemented by instructed specialists.

## Technical data

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

| General                                            |                                                                                                                                             |                                                                                         |                     |                     |                     |                     |                     |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Size                                               | NG                                                                                                                                          | 10                                                                                      | 16                  | 25                  | 27                  | 32                  | 35                  |
| Type of connection                                 | Subplate mounting                                                                                                                           |                                                                                         |                     |                     |                     |                     |                     |
| Porting pattern                                    |                                                                                                                                             | ISO 4401-05-05-0-05                                                                     | ISO 4401-07-07-0-05 | ISO 4401-08-08-0-05 | ISO 4401-08-08-0-05 | ISO 4401-10-09-0-05 | ISO 4401-10-09-0-05 |
| Weight                                             | kg                                                                                                                                          | 9                                                                                       | 11                  | 18                  | 19.5                | 37.5                | 75                  |
| Installation position                              |                                                                                                                                             | Any                                                                                     |                     |                     |                     |                     |                     |
| Ambient temperature range                          | °C                                                                                                                                          | -20 ... +50                                                                             |                     |                     |                     |                     |                     |
| Storage temperature range (with UV protection)     | °C                                                                                                                                          | +5 ... +40                                                                              |                     |                     |                     |                     |                     |
| Maximum storage time                               | Years                                                                                                                                       | 1 (if the storage conditions are observed, refer to the operating instructions 07600-B) |                     |                     |                     |                     |                     |
| Maximum relative humidity (no condensation)        | %                                                                                                                                           | 95                                                                                      |                     |                     |                     |                     |                     |
| Protection class according to EN 60529             |                                                                                                                                             | IP65 (if suitable and correctly mounted mating connectors are used)                     |                     |                     |                     |                     |                     |
| Maximum surface temperature                        | °C                                                                                                                                          | 150                                                                                     |                     |                     |                     |                     |                     |
| MTTF <sub>D</sub> values according to EN ISO 13849 | Years                                                                                                                                       | 75 (for further details see data sheet 08012)                                           |                     |                     |                     |                     |                     |
| Sine test according to EN 60068-2-6                |                                                                                                                                             | 10 ... 2000 Hz / maximum 10 g / 10 cycles / 3 axes                                      |                     |                     |                     |                     |                     |
| Noise test according to EN 60068-2-64              |                                                                                                                                             | 20 ... 2000 Hz / 10 g <sub>RMS</sub> / 30 g peak / 24 h / 3 axes                        |                     |                     |                     |                     |                     |
| Transport shock according to EN 60068-2-27         |                                                                                                                                             | 15 g / 11 ms / 3 shocks / 3 axes                                                        |                     |                     |                     |                     |                     |
| Conformity                                         | <ul style="list-style-type: none"> <li>▶ CE according to EMC Directive 2014/30/EU, tested according to</li> <li>▶ RoHS Directive</li> </ul> | EN 61000-6-2 and EN 61000-6-3                                                           |                     |                     |                     |                     |                     |
|                                                    |                                                                                                                                             | 2011/65/EU <sup>1)</sup>                                                                |                     |                     |                     |                     |                     |

<sup>1)</sup> The product fulfills the substance requirements of the RoHS Directive 2011/65/EU.

## Technical data

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

| Hydraulic                                                                                                      |                                    |                                                    |                                                      |             |            |     |            |      |      |
|----------------------------------------------------------------------------------------------------------------|------------------------------------|----------------------------------------------------|------------------------------------------------------|-------------|------------|-----|------------|------|------|
| Size                                                                                                           |                                    | NG                                                 | 10                                                   | 16          | 25         | 27  | 32         | 35   |      |
| Maximum operating pressure                                                                                     | ► Ports A, B, P                    |                                                    | 25 ... 350                                           |             |            |     |            |      |      |
|                                                                                                                | – Pilot control valve              | Pilot oil supply bar                               |                                                      |             |            |     |            |      |      |
|                                                                                                                | – Main valve                       | bar                                                | 350                                                  | 350         | 350        | 270 | 350        | 350  |      |
|                                                                                                                | ► Port T <sup>2)</sup>             | External pilot oil supply bar                      | 315                                                  | 250         | 250        | 210 | 250        | 350  |      |
|                                                                                                                |                                    | Internal pilot oil supply bar                      | Static < 10 (pilot control valve)                    |             |            |     |            |      |      |
| ► Port Y                                                                                                       |                                    | bar                                                | Static < 10 (pilot control valve)                    |             |            |     |            |      |      |
| Hydraulic fluid                                                                                                |                                    |                                                    | See table, page 8                                    |             |            |     |            |      |      |
| Hydraulic fluid temperature range                                                                              |                                    |                                                    | °C                                                   | –20 ... +80 |            |     |            |      |      |
| Viscosity range                                                                                                | ► Recommended                      | mm²/s                                              | 30 ... 45                                            |             |            |     |            |      |      |
|                                                                                                                | ► Maximum admissible               | mm²/s                                              | 20 ... 380                                           |             |            |     |            |      |      |
| Maximum admissible degree of contamination of the hydraulic fluid; cleanliness class according to ISO 4406 (c) | ► Pilot control valve              |                                                    | Class 17/15/12 <sup>3)</sup>                         |             |            |     |            |      |      |
|                                                                                                                | ► Main valve                       |                                                    | Class 20/18/15 <sup>3)</sup>                         |             |            |     |            |      |      |
| Rated flow ( $\Delta p$ = 5 bar per control edge; $\pm 10\%$ )                                                 |                                    |                                                    | 25<br>50<br>100                                      | 150<br>220  | 220<br>350 | 500 | 400<br>600 | 1000 |      |
| Maximum flow                                                                                                   |                                    |                                                    | l/min                                                | 170         | 460        | 870 | 1000       | 1600 | 4700 |
| Maximum leakage flow (inlet pressure 100 bar)                                                                  | ► Symbol E, E1-, R                 |                                                    | 0.13      0.27      0.51      0.51      0.3      1.5 |             |            |     |            |      |      |
|                                                                                                                | – Main valve                       | l/min                                              |                                                      |             |            |     |            |      |      |
|                                                                                                                | – Main valve + pilot control valve | l/min                                              | 0.43      0.57      0.81      0.81      0.6      1.8 |             |            |     |            |      |      |
|                                                                                                                | ► Symbol W6-, W8-, R3-             |                                                    | 0.25      0.55      1.0      1.0      0.6      3.0   |             |            |     |            |      |      |
|                                                                                                                | – Main valve                       | l/min                                              |                                                      |             |            |     |            |      |      |
| – Main valve + pilot control valve                                                                             | l/min                              | 0.55      0.85      1.3      1.3      0.9      3.3 |                                                      |             |            |     |            |      |      |
| Pilot flow (at port X and Y with stepped input signal from 0 ... 100%; 315 bar)                                |                                    |                                                    | l/min                                                | 7           | 9          | 12  | 12         | 14   | 17   |

<sup>2)</sup> See "Project planning information" page 28.

<sup>3)</sup> The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.

**Technical data**

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

| 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                                                                                                           | FKM                        | ISO 15380 | 90221      |
|                 |                      | HEES                                                                                                           | FKM                        |           |            |
|                 | ► Soluble in water   | HEPG                                                                                                           | FKM                        | ISO 15380 |            |
| Flame-resistant | ► Water-free         | HFDU (glycol base)                                                                                             | FKM                        | ISO 12922 | 90222      |
|                 |                      | HFDU (ester base)                                                                                              | FKM                        |           |            |
|                 |                      | HFDR                                                                                                           | FKM                        |           |            |
|                 | ► Containing water   | HFC (Fuchs: Hydrotherm 46M, Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046) | NBR                        | 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 50 K higher than the maximum surface temperature.
- **Bio-degradable and flame-resistant – containing water:**  
If components with galvanic zinc coating (e.g. version "J3" or "J5") or parts containing zinc are used, small amounts of dissolved zinc may get into the hydraulic system and cause accelerated aging of the hydraulic fluid. Zinc soap may form as a chemical reaction product, which may clog filters, nozzles and solenoid valves – particularly in connection with local heat input.

**► Flame-resistant – containing water:**

- Due to an increased cavitation tendency with the use of HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30% as compared to use with HLP mineral oil. In order to reduce the cavitation effect, it is recommended – if possible, specific to the installation – to back up the return flow pressure in ports T to approx. 20% of the pressure differential at the component.
- Dependent on the hydraulic fluid used, the maximum ambient and hydraulic fluid temperature must not exceed 50 °C. In order to reduce the heat input into the component, the command value profile is to be adjusted for proportional and high-response valves.

**Static/dynamic**

|                      |   |      |
|----------------------|---|------|
| Hysteresis           | % | ≤1   |
| Range of inversion   | % | ≤0.5 |
| Response sensitivity | % | ≤0.5 |

**Technical data**

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

| Electrical, integrated electronics (OBE) – interface "A1" |                                           |                 |                             |                |
|-----------------------------------------------------------|-------------------------------------------|-----------------|-----------------------------|----------------|
| Supply voltage                                            | ► Nominal value                           |                 | VDC                         | 24             |
|                                                           | ► Minimum                                 |                 | VDC                         | 18             |
|                                                           | ► Maximum                                 |                 | VDC                         | 36             |
|                                                           | ► Maximum residual ripple                 |                 | Vpp                         | 2.5            |
|                                                           | ► Maximum power consumption               |                 | VA                          | 40             |
|                                                           | ► Current consumption during operation 4) | Rated current   | Aeff                        | <2             |
|                                                           |                                           | Impulse current | A                           | 3              |
|                                                           | ► Fuse protection, external               |                 | AT                          | 2.5 (time-lag) |
| Charging capacity (externally effective)                  |                                           |                 | µF                          | <1000          |
| Relative duty cycle time according to VDE 0580            |                                           |                 | S1 (continuous operation)   |                |
| Functional ground and screening                           |                                           |                 | See pin assignment, page 14 |                |
| Maximum voltage of the differential inputs against 0 V    |                                           |                 | D→B; E→B (max. 18 V)        |                |
| Command value (differential amplifier)                    | ► Measurement range                       |                 | V                           | ±10            |
|                                                           | ► Input resistance                        |                 | kΩ                          | >100           |
| Actual value (test signal)                                | ► Output range                            |                 | V                           | ±10            |
|                                                           | ► Minimum load impedance                  |                 | kΩ                          | >1             |

| Electrical, integrated electronics (OBE) – interface "F1" |                                                      |                 |                             |                |
|-----------------------------------------------------------|------------------------------------------------------|-----------------|-----------------------------|----------------|
| Supply voltage                                            | ► Nominal value                                      |                 | VDC                         | 24             |
|                                                           | ► Minimum                                            |                 | VDC                         | 18             |
|                                                           | ► Maximum                                            |                 | VDC                         | 36             |
|                                                           | ► Maximum residual ripple                            |                 | Vpp                         | 2.5            |
|                                                           | ► Maximum power consumption                          |                 | VA                          | 40             |
|                                                           | ► Current consumption during operation <sup>4)</sup> | Rated current   | A <sub>eff</sub>            | <2             |
|                                                           |                                                      | Impulse current | A                           | 3              |
|                                                           | ► Fuse protection, external                          |                 | A <sub>T</sub>              | 2.5 (time-lag) |
| Charging capacity (externally effective)                  |                                                      |                 | µF                          | <1000          |
| Relative duty cycle time according to VDE 0580            |                                                      |                 | S1 (continuous operation)   |                |
| Functional ground and screening                           |                                                      |                 | See pin assignment, page 14 |                |
| Maximum voltage of the differential inputs against 0 V    |                                                      |                 | D→B; E→B (max. 18 V)        |                |
| Command value                                             | ► Input current range                                |                 | mA                          | 4 ... 20       |
|                                                           | ► Input resistance                                   |                 | Ω                           | 200            |
| Actual value (test signal)                                | ► Output range                                       |                 | mA                          | 4 ... 20       |
|                                                           | ► Maximum load                                       |                 | Ω                           | 500            |

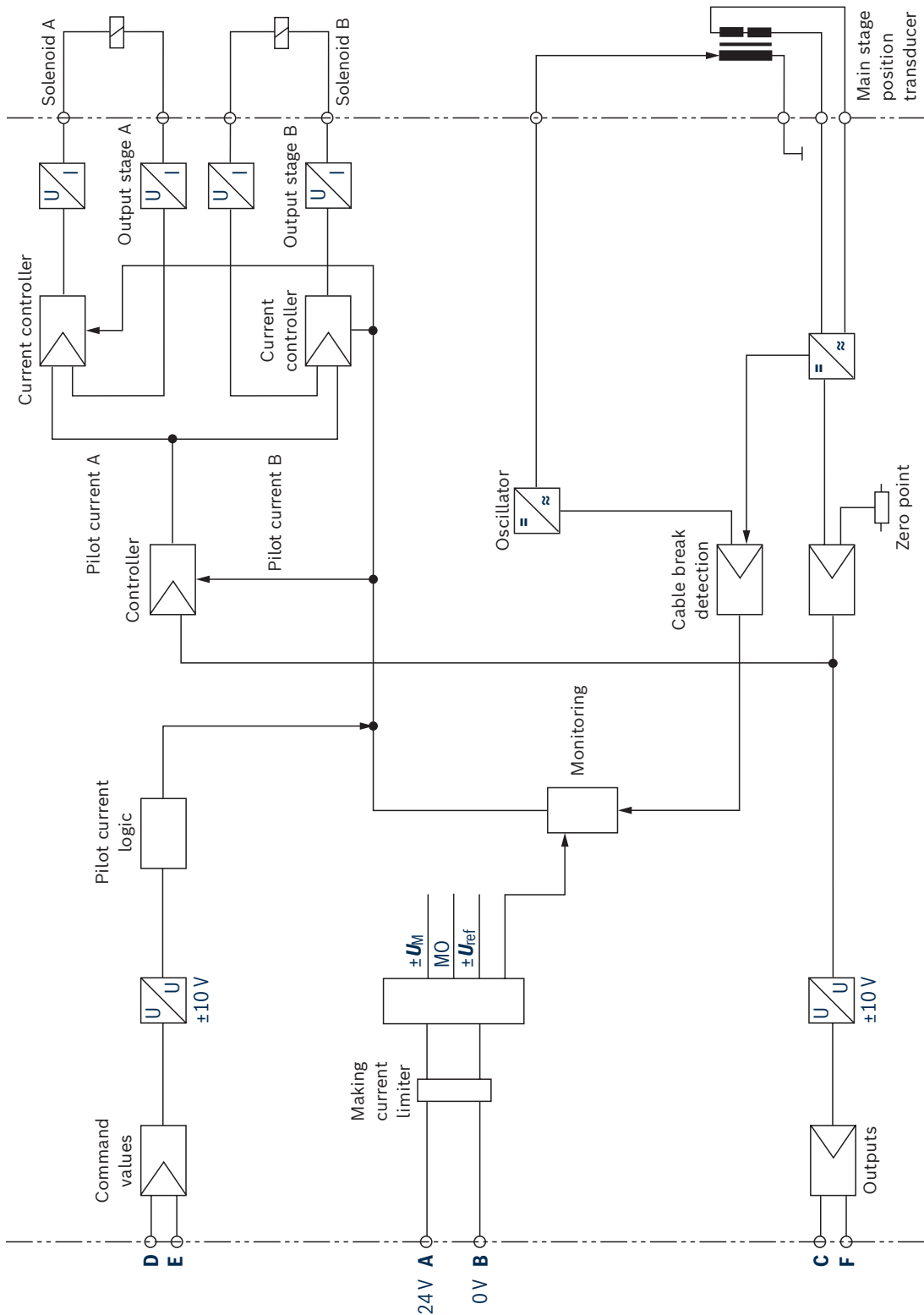
<sup>4)</sup> The making current peak is usually higher (depending on power supply unit, supply line, and capacities).

**Technical data**  
 (For applications outside these values, please consult us!)

| Electrical, integrated electronics (OBE) – interface "A5" |                                                      |                 |                                                           |    |
|-----------------------------------------------------------|------------------------------------------------------|-----------------|-----------------------------------------------------------|----|
| Supply voltage ( $U_B$ )                                  | ► Nominal value                                      | VDC             | 24                                                        |    |
|                                                           | ► Minimum                                            | VDC             | 18                                                        |    |
|                                                           | ► Maximum                                            | VDC             | 36                                                        |    |
|                                                           | ► Maximum residual ripple                            | Vpp             | 2.5                                                       |    |
|                                                           | ► Maximum power consumption                          | VA              | 40                                                        |    |
|                                                           | ► Current consumption during operation <sup>4)</sup> | Rated current   | A <sub>eff</sub>                                          | <2 |
|                                                           |                                                      | Impulse current | A                                                         | 3  |
|                                                           | ► Fuse protection, external                          | A <sub>T</sub>  | 2.5 (time-lag)                                            |    |
| Charging capacity (externally effective)                  |                                                      | µF              | <1000                                                     |    |
| Relative duty cycle time according to VDE 0580            |                                                      |                 | S1 (continuous operation)                                 |    |
| Functional ground and screening                           |                                                      |                 | See "Project planning information", page 28               |    |
| Command value                                             | ► Input current range                                | V               | ±10                                                       |    |
|                                                           | ► Input resistance                                   | kΩ              | >100                                                      |    |
| Actual value (test signal)                                | ► Output range                                       | V               | ±10                                                       |    |
|                                                           | ► Maximum load                                       | kΩ              | >1                                                        |    |
| Enable                                                    | ► Low level range                                    | V               | –3 ... 5                                                  |    |
|                                                           | ► High level range                                   | V               | 11 ... 36                                                 |    |
|                                                           | ► Maximum current consumption at high level          | mA              | 7.25 ( $U_B = 24\text{ V}$ )<br>11 ( $U_{B\text{ max}}$ ) |    |

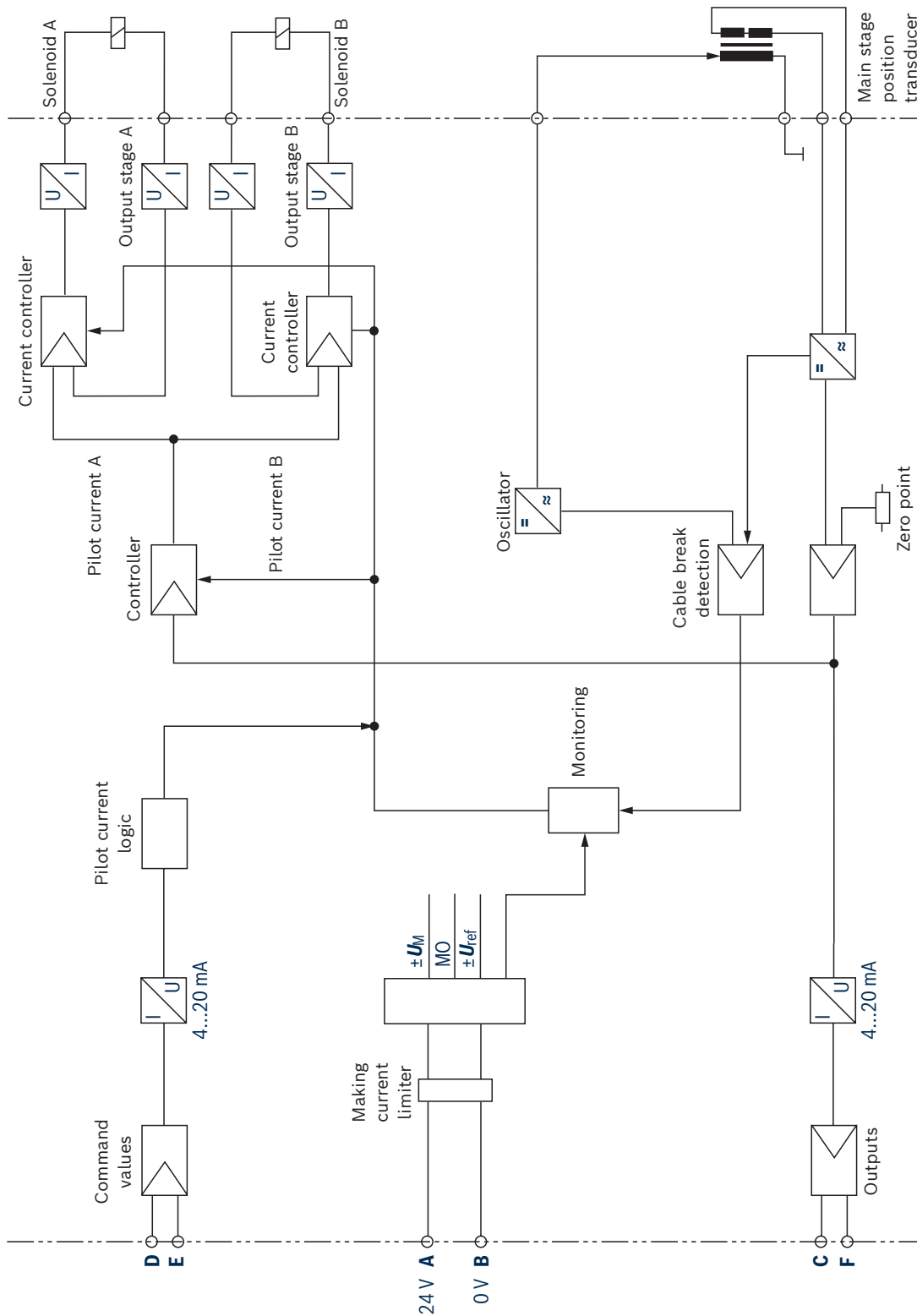
<sup>4)</sup> The making current peak is usually higher (depending on power supply unit, supply line, and capacities).

## Block diagram/controller function block: Version "A1"

**Notice:**

Electrical signals provided via valve electronics (e.g. actual value) must not be used to switch off safety-relevant machine functions.

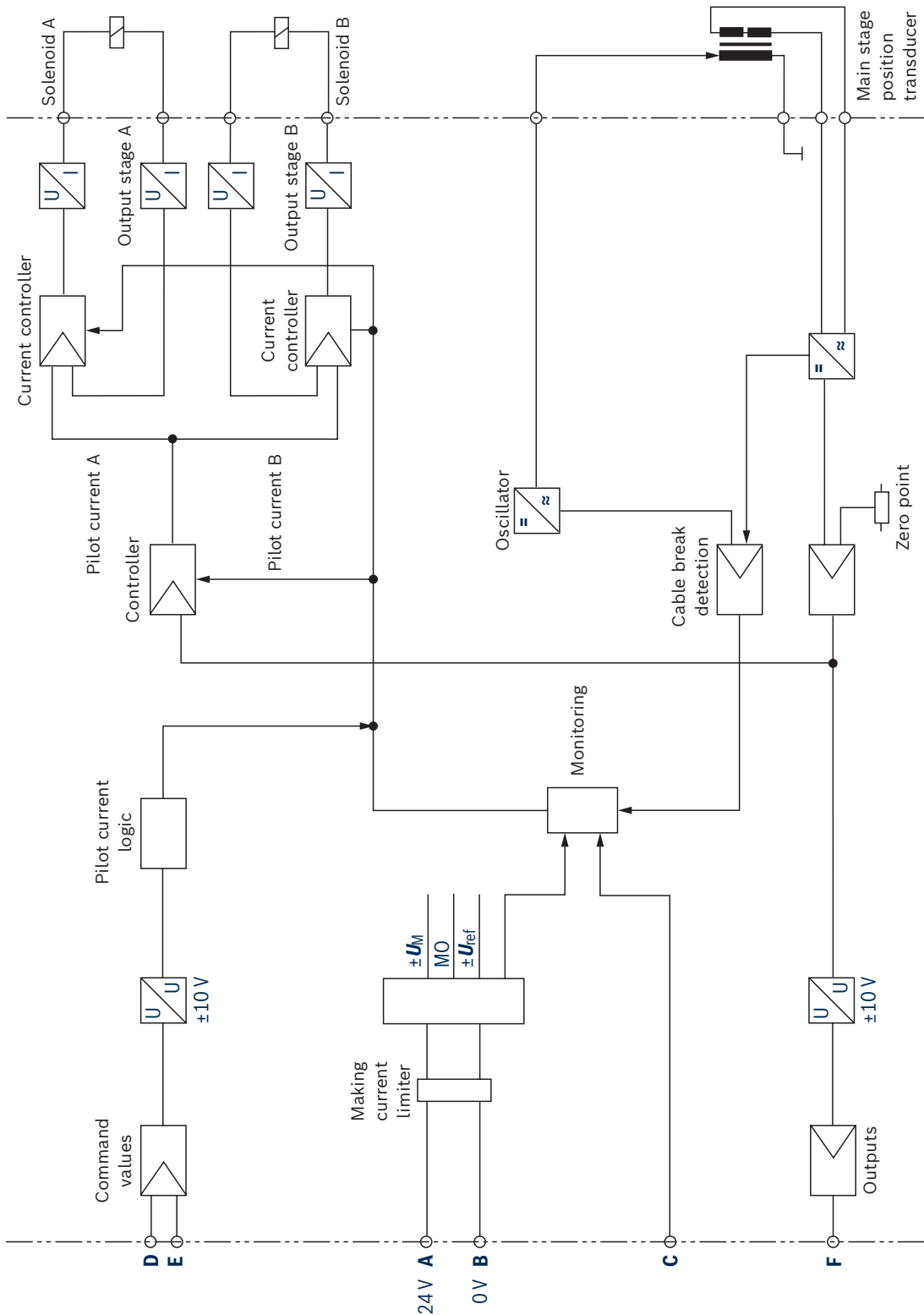
## Block diagram/controller function block: Version "F1"



### Notice:

Electrical signals provided via valve electronics (e.g. actual value) must not be used to switch off safety-relevant machine functions.

## Block diagram/controller function block: Version "A5"

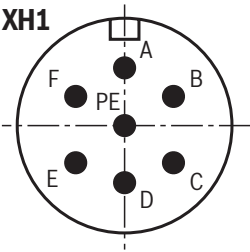
**Notice:**

Electrical signals provided via valve electronics (e.g. actual value) must not be used to switch off safety-relevant machine functions.

Electrical connections and assignment

Connector pin assignment "XH1", 6-pole + PE according to DIN 43563

| Pin | Interface assignment                                        |                                   |                                       |
|-----|-------------------------------------------------------------|-----------------------------------|---------------------------------------|
|     | "A1"                                                        | "F1"                              | "A5"                                  |
| A   | Supply voltage                                              | Supply voltage                    | Supply voltage                        |
| B   | GND                                                         | GND                               | GND, reference potential actual value |
| C   | Reference potential actual value                            | Reference potential actual value  | Enable input                          |
| D   | Command value                                               | Command value                     | Command value                         |
| E   | Reference potential command value                           | Reference potential command value | Reference potential command value     |
| F   | Actual value                                                | Actual value                      | Actual value                          |
| PE  | Functional ground (directly connected to the valve housing) |                                   |                                       |



3 spool positions

|          |      | Command value | Actual value | Spool position<br>"a"; "b" |
|----------|------|---------------|--------------|----------------------------|
| Positive | "A1" | 0 ... +10 V   | 0 ... +10 V  | P→A; B→T                   |
|          | "F1" | 12 ... 20 mA  | 12 ... 20 mA |                            |
|          | "A5" | 0 ... +10 V   | 0 ... +10 V  |                            |
| Negative | "A1" | 0 ... -10 V   | 0 ... -10 V  | P→B; A→T                   |
|          | "F1" | 12 ... 4 mA   | 12 ... 4 mA  |                            |
|          | "A5" | 0 ... -10 V   | 0 ... -10 V  |                            |

2 spool positions

|          |      | Command value | Actual value | Spool position<br>"a" |
|----------|------|---------------|--------------|-----------------------|
| Positive | "A1" | 0 ... +10 V   | 0 ... +10 V  | P→B; A→T              |
|          | "F1" | 4 ... 20 mA   | 4 ... 20 mA  |                       |
|          | "A5" | 0 ... +10 V   | 0 ... +10 V  |                       |

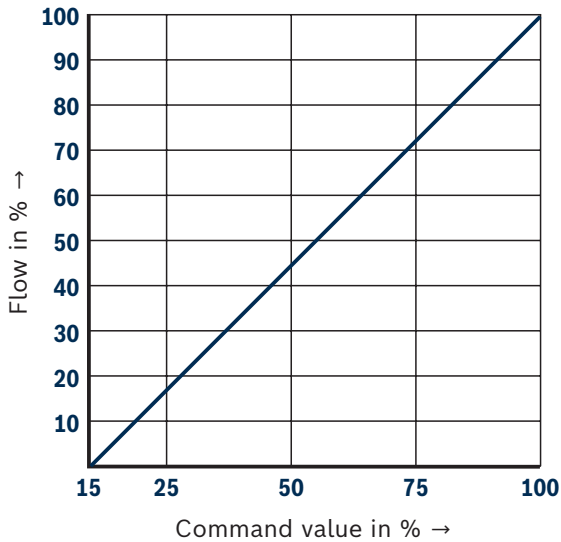
- Connection cable:
- ▶ Up to 20 m cable length type LiYCY 7 x 0.75 mm<sup>2</sup>
  - ▶ Up to 40 m cable length type LiYCY 7 x 1.0 mm<sup>2</sup>
  - ▶ EMC-compliant installation:
    - Apply screening to both line ends
    - Use metal mating connector (see page 28)
  - ▶ Alternatively up to 30 m cable length admissible
    - Apply screening on supply side
    - Plastic mating connector (see page 28) can be used

**Notice:**  
Mating connectors, separate order, see page 28 and data sheet 08006.

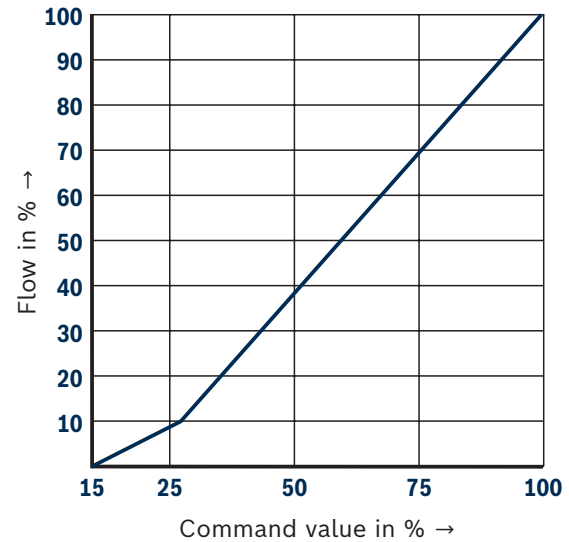
- Information:**
- ▶ As a consequence of overvoltage at the inputs, the inputs will be overridden.
  - ▶ Override of the inputs may lead to uncontrolled valve movements.
  - ▶ Reference signals not correctly connected may cause overvoltage or override.

**Characteristic curves**(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ } ^\circ\text{C}$ )**Flow signal function** ( $\Delta p = 10 \text{ bar}$ ; P→A; B→T or  $\Delta p = 5 \text{ bar}$  per control edge; P→A; A→T)**Version "L"**

Symbol E, W, and R

**Version "P"**

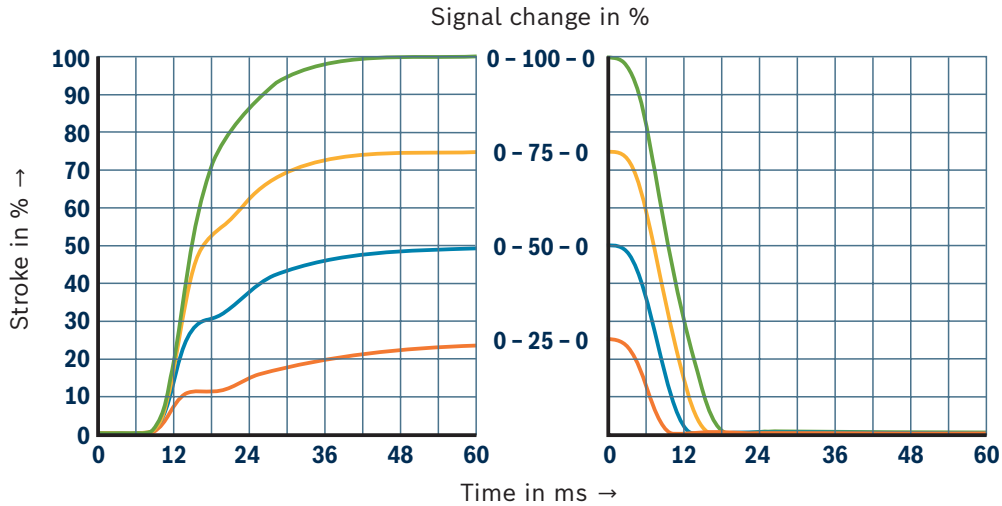
Symbol E, W, and R

**Notice:**

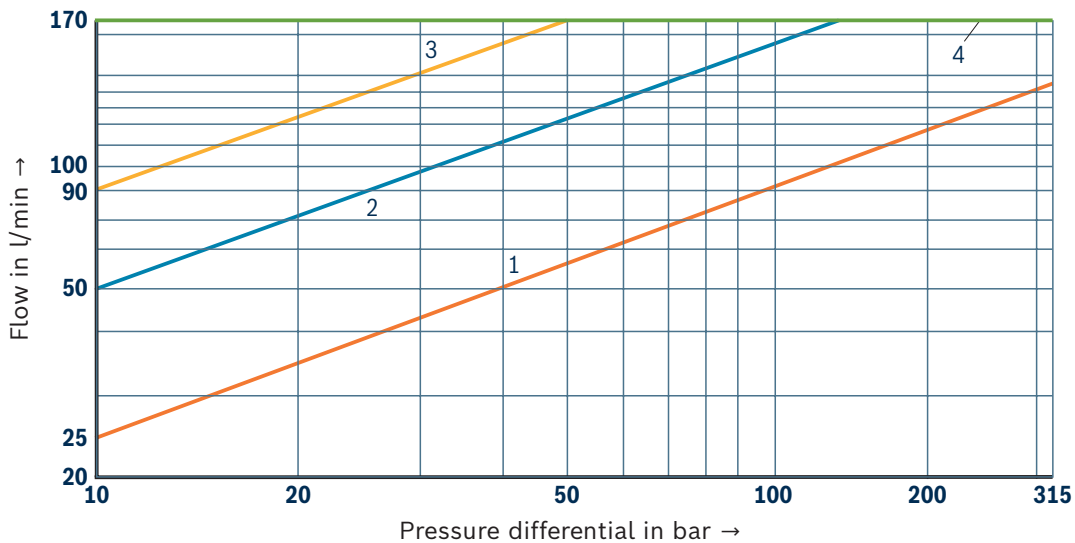
Typical characteristic curves which are subject to tolerance variations.

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

**Transition function with stepped electric input signals**  
(measured at a pilot pressure of 100 bar)



**Flow/load function** (at maximum valve opening; tolerance  $\pm 10 \%$ )



**Rated flow**

- 1 25 l/min
- 2 50 l/min
- 3 100 l/min
- 4 Recommended flow limitation (flow velocity 30 m/s)

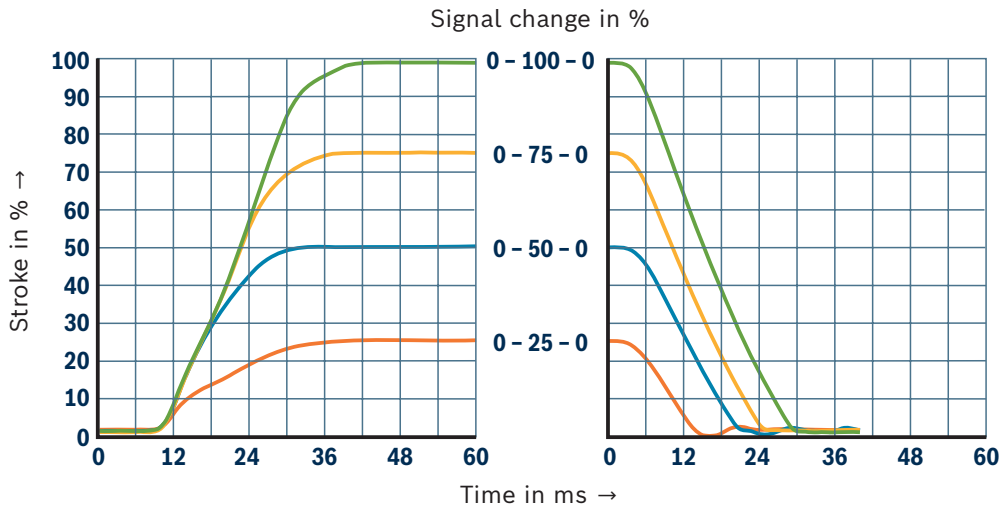


**Notice:**

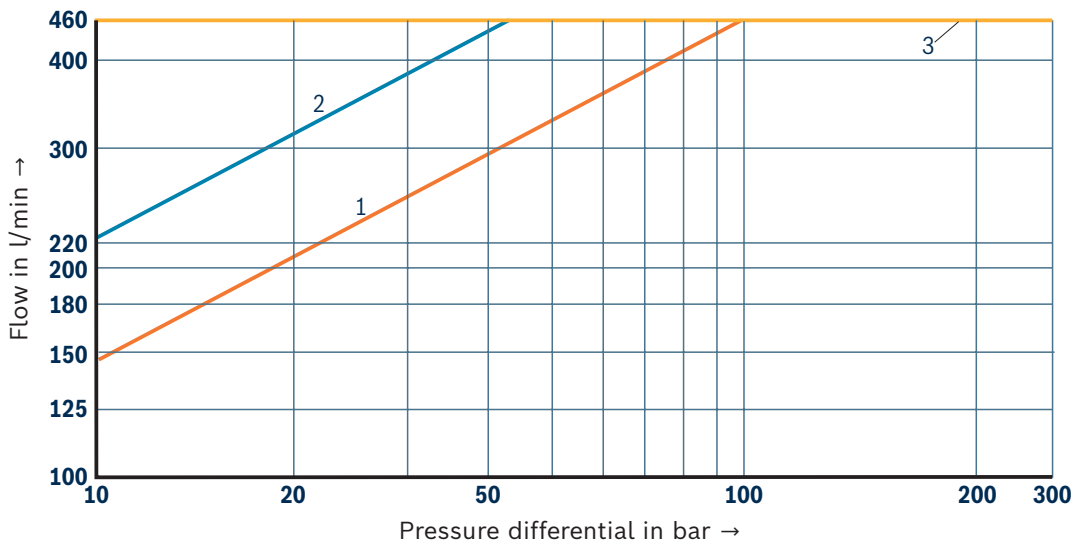
Typical characteristic curves which are subject to tolerance variations.

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

**Transition function with stepped electric input signals**  
(measured at a pilot pressure of 100 bar)



**Flow/load function** (at maximum valve opening; tolerance  $\pm 10 \text{ } \%$ )



**Rated flow**

- 1 150 l/min
- 2 220 l/min
- 3 Recommended flow limitation (flow velocity 30 m/s)

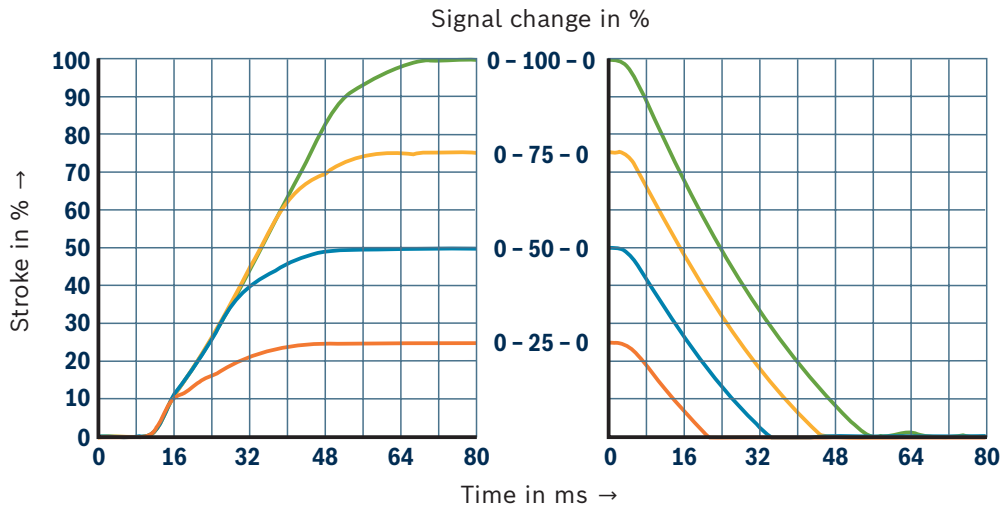


**Notice:**

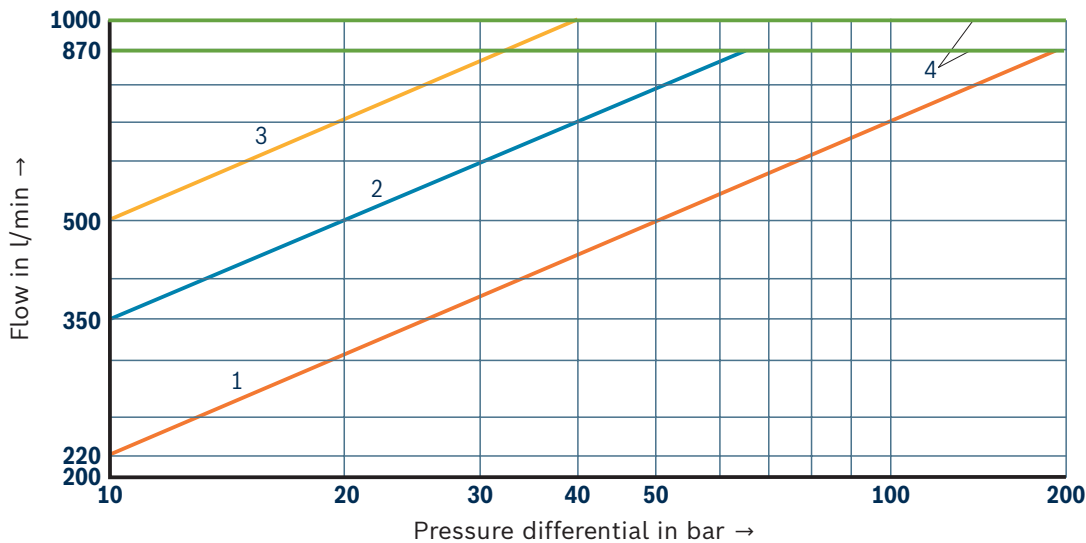
Typical characteristic curves which are subject to tolerance variations.

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

#### Transition function with stepped electric input signals (measured at a pilot pressure of 100 bar)



#### Flow/load function (at maximum valve opening; tolerance $\pm 10 \%$ )



#### Rated flow

- 1 220 l/min
- 2 350 l/min
- 3 500 l/min
- 4 Recommended flow limitation (flow velocity 30 m/s)

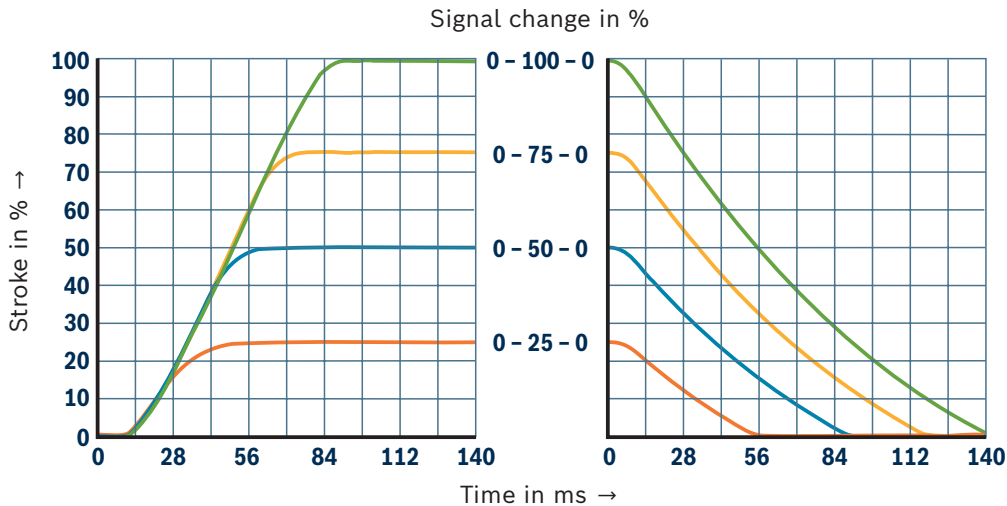


#### Notice:

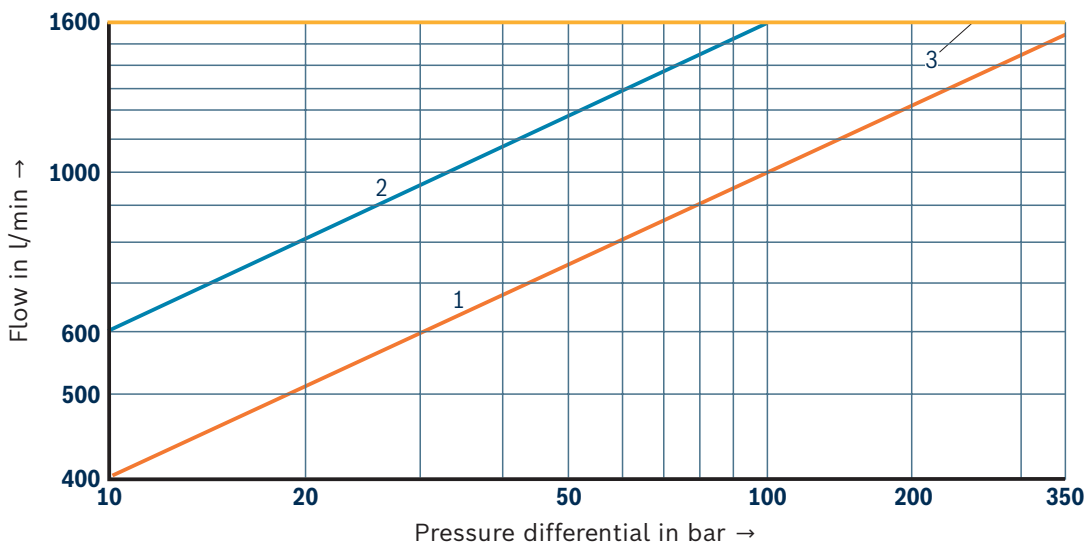
Typical characteristic curves which are subject to tolerance variations.

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

**Transition function with stepped electric input signals**  
(measured at a pilot pressure of 100 bar)



**Flow/load function** (at maximum valve opening; tolerance  $\pm 10 \text{ } \%$ )



**Rated flow**

- 1 400 l/min
- 2 600 l/min
- 3 Recommended flow limitation (flow velocity 30 m/s)

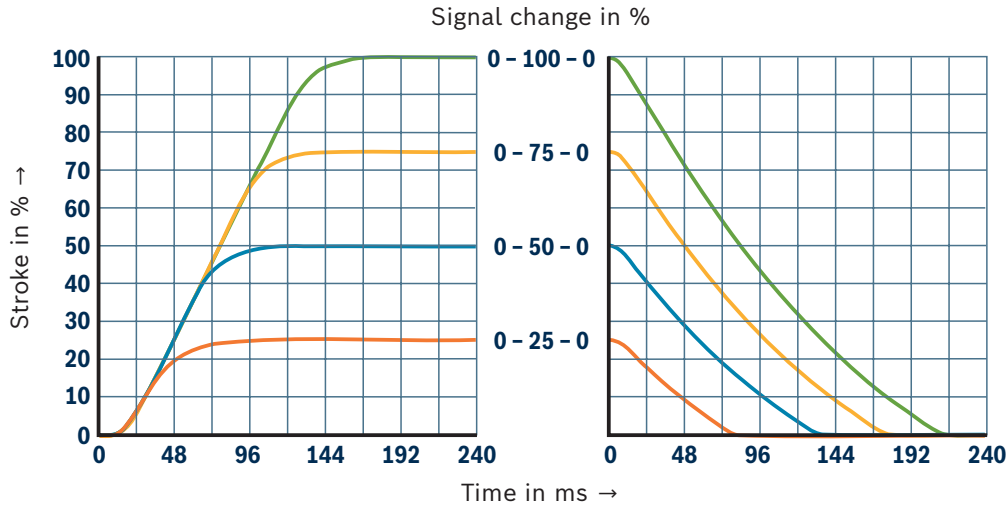


**Notice:**

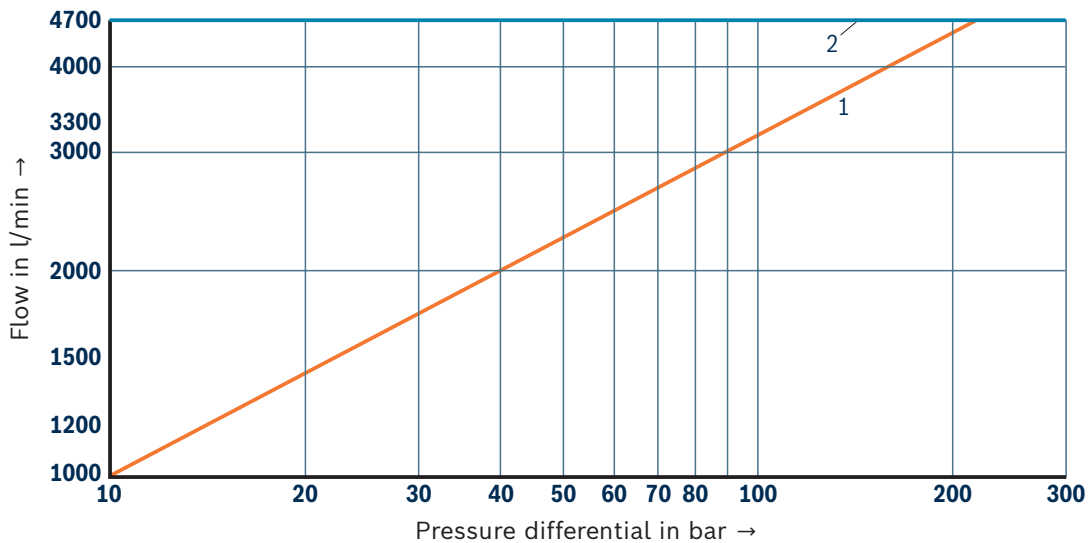
Typical characteristic curves which are subject to tolerance variations.

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

**Transition function with stepped electric input signals**  
(measured at a pilot pressure of 100 bar)



**Flow/load function** (at maximum valve opening; tolerance  $\pm 10 \text{ } \%$ )



#### Rated flow

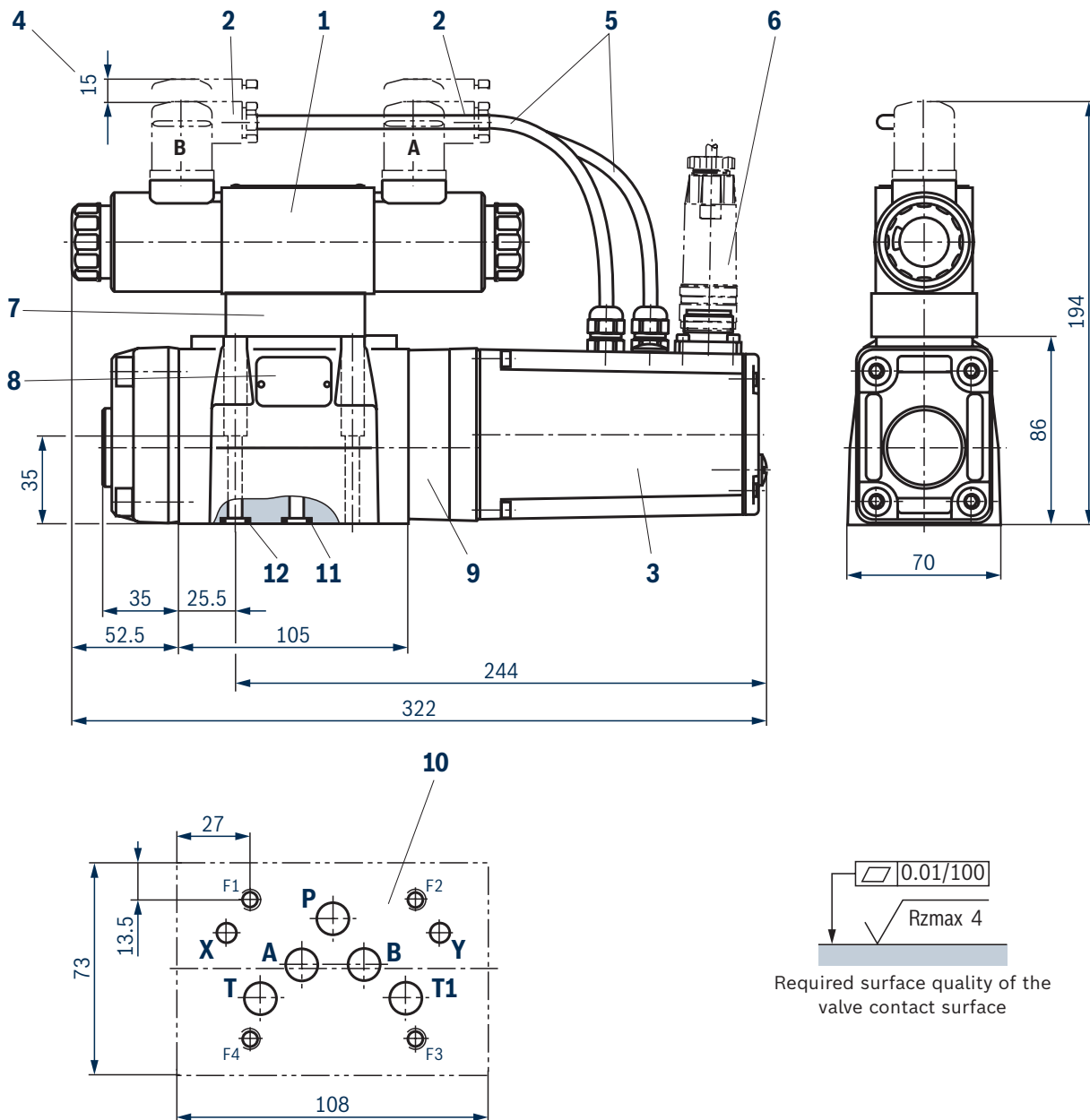
- 1 1000 l/min
- 2 Recommended flow limitation (flow velocity 30 m/s)



#### Notice:

Typical characteristic curves which are subject to tolerance variations.

## Dimensions: Size 10 (dimensions in mm)



- 1 Pilot control valve
- 2 Mating connector (A gray; B black)
- 3 Integrated electronics (OBE)
- 4 Space required for connection cable and to remove the mating connector
- 5 Wiring
- 6 Mating connector for connector "K31" (separate order, see page 28 and data sheet 08006)
- 7 Pressure reducing valve
- 8 Name plate
- 9 Main valve
- 10 Machined valve contact surface, porting pattern according to ISO 4401-05-05-0-05 (port X, Y as required)

- 11 Identical seal rings for connection A, B, P, T
- 12 Identical seal rings for connection X, Y

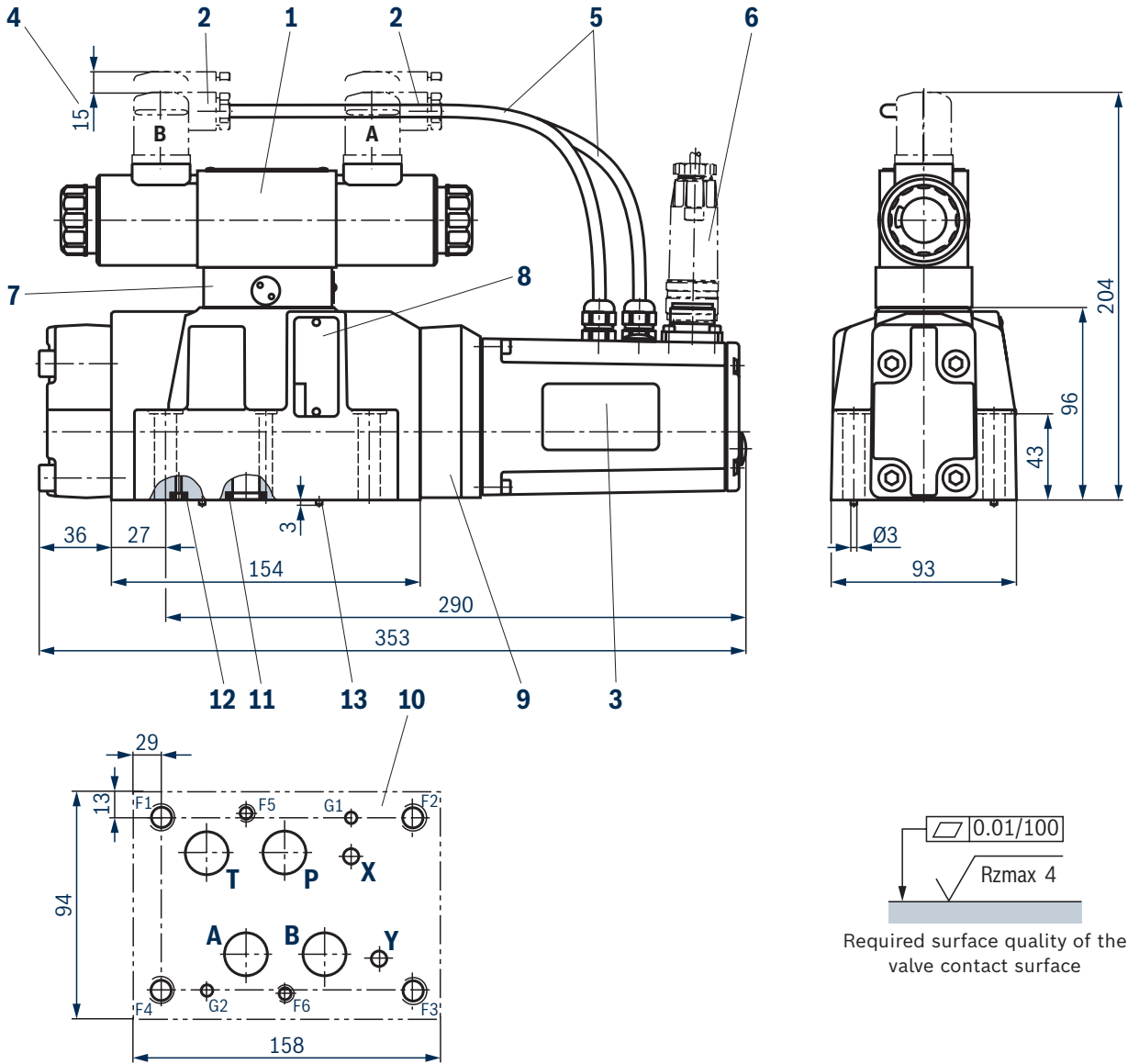
**Valve mounting screws and subplates**, see page 27.



### Notice:

The dimensions are nominal dimensions which are subject to tolerances.

## Dimensions: Size 16 (dimensions in mm)



- 1 Pilot control valve
- 2 Mating connector (A gray; B black)
- 3 Integrated electronics (OBE)
- 4 Space required for connection cable and to remove the mating connector
- 5 Wiring
- 6 Mating connector for connector "K31" (separate order, see page 28 and data sheet 08006)
- 7 Pressure reducing valve
- 8 Name plate
- 9 Main valve
- 10 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, T and P with  $\varnothing 20$  mm
- 11 Identical seal rings for connection A, B, P, T

- 12 Identical seal rings for connection X, Y
- 13 Locking pin

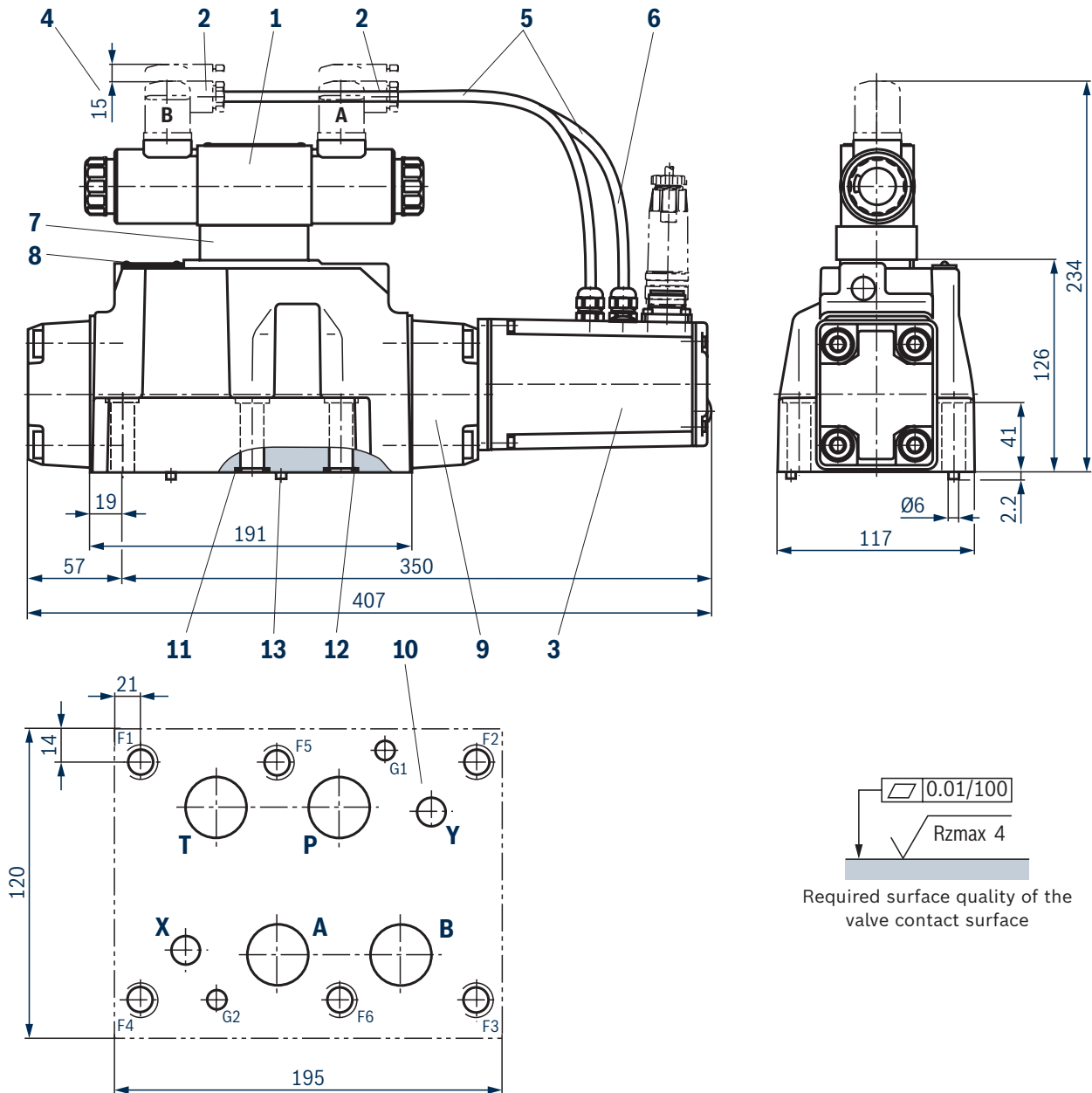
**Valve mounting screws and subplates**, see page 27.



### Notice:

The dimensions are nominal dimensions which are subject to tolerances.

## Dimensions: Size 25 (dimensions in mm)



- 1 Pilot control valve
- 2 Mating connector (A gray; B black)
- 3 Integrated electronics (OBE)
- 4 Space required for connection cable and to remove the mating connector
- 5 Wiring
- 6 Mating connector for connector "K31" (separate order, see page 28 and data sheet 08006)
- 7 Pressure reducing valve
- 8 Name plate
- 9 Main valve
- 10 Machined valve contact surface, porting pattern according to ISO 4401-08-08-0-05 (port X, Y as required)

- 11 Identical seal rings for connection A, B, P, T
- 12 Identical seal rings for connection X, Y
- 13 Locking pin

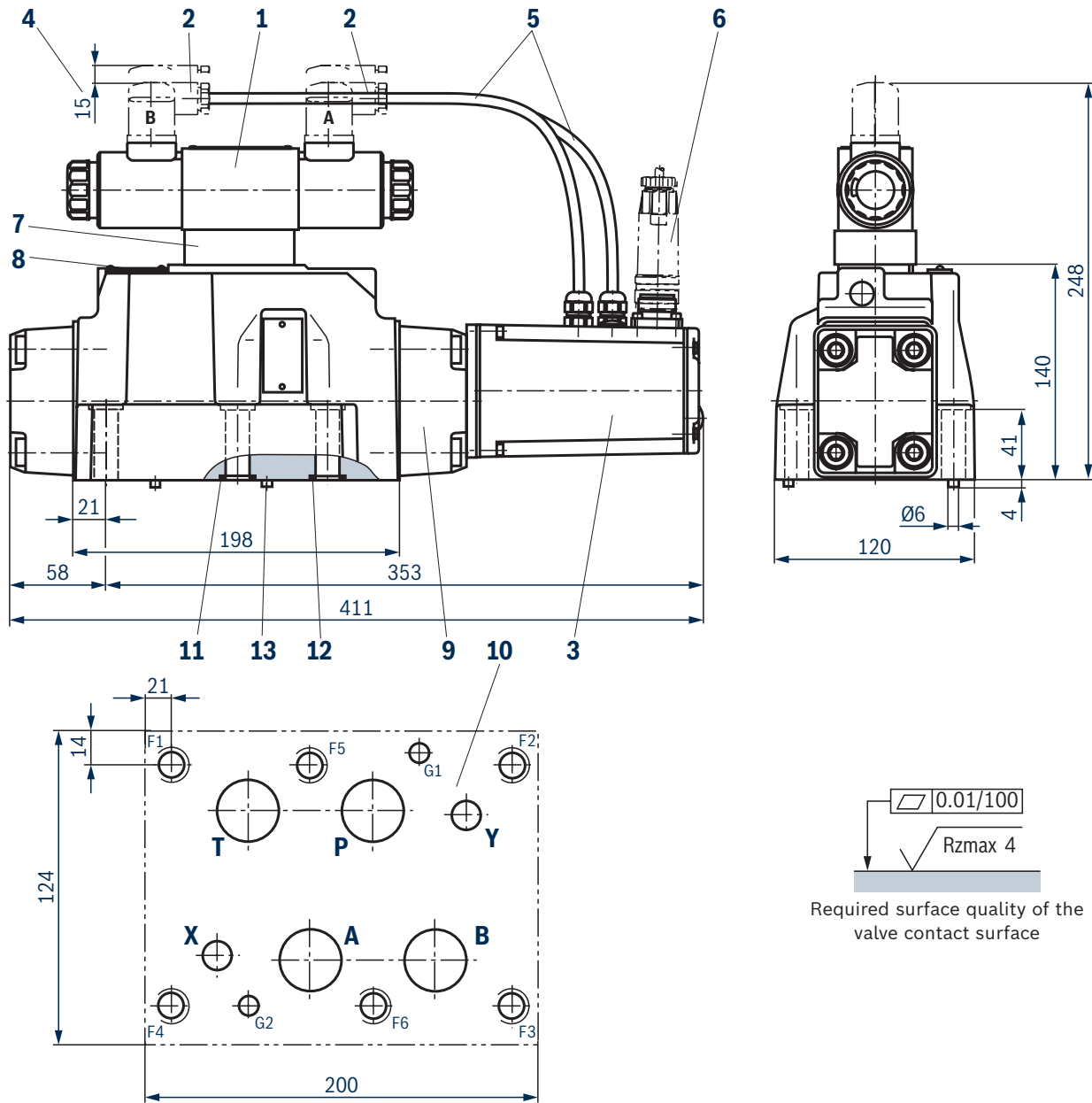
**Valve mounting screws and subplates**, see page 27.



### Notice:

The dimensions are nominal dimensions which are subject to tolerances.

## Dimensions: Size 27 (dimensions in mm)



- 1 Pilot control valve
- 2 Mating connector (A gray; B black)
- 3 Integrated electronics (OBE)
- 4 Space required for connection cable and to remove the mating connector
- 5 Wiring
- 6 Mating connector for connector "K31" (separate order, see page 28 and data sheet 08006)
- 7 Pressure reducing valve
- 8 Name plate
- 9 Main valve
- 10 Machined valve contact surface, porting pattern according to ISO 4401-08-08-0-05 (port X, Y as required)  
Deviating from the standard: port A, B, T and P Ø32 mm

- 11 Identical seal rings for connection A, B, P, T
- 12 Identical seal rings for connection X, Y
- 13 Locking pin

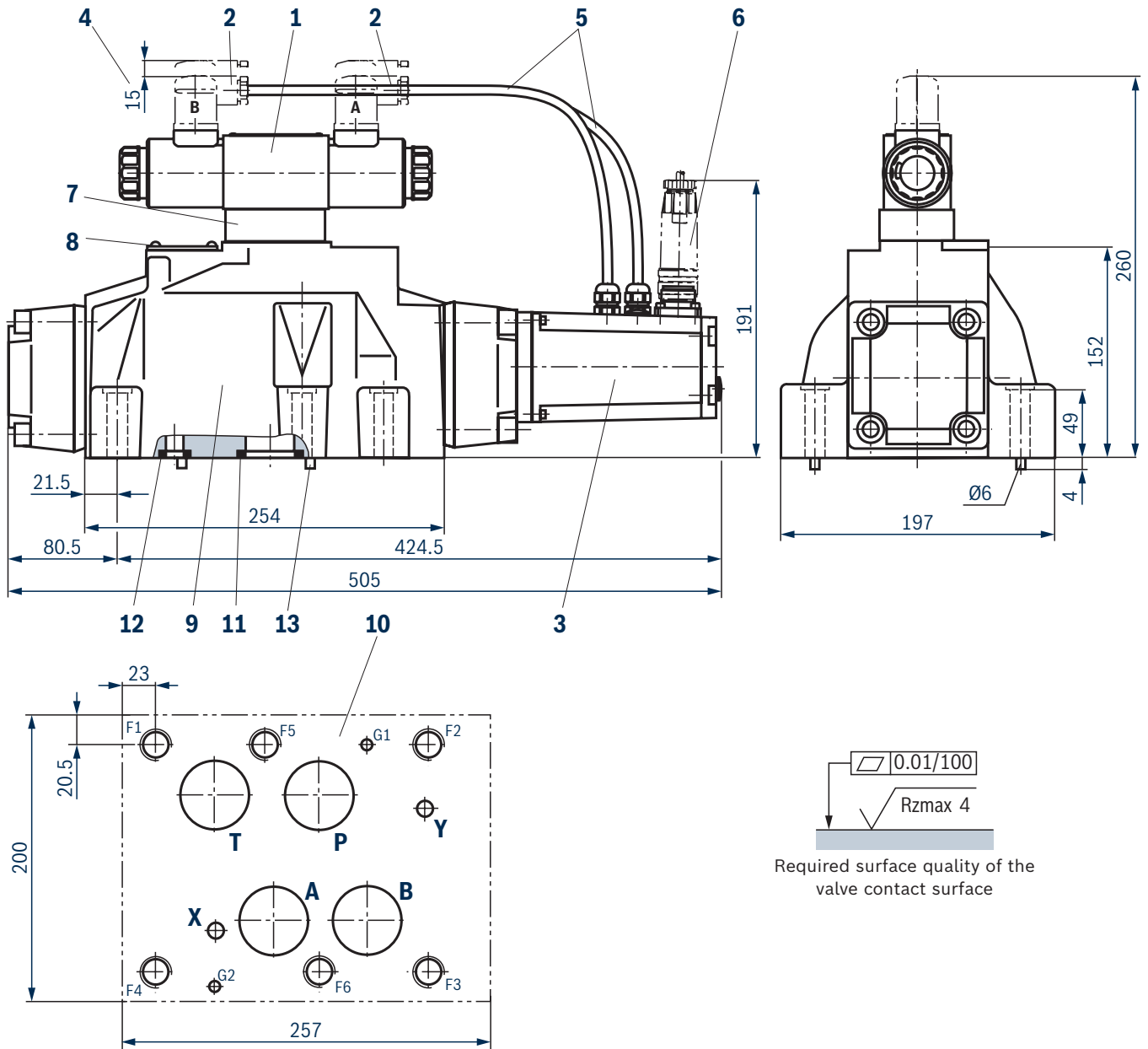
**Valve mounting screws and subplates, see page 27.**



### Notice:

The dimensions are nominal dimensions which are subject to tolerances.

## Dimensions: Size 32 (dimensions in mm)



- 1 Pilot control valve
- 2 Mating connector (A gray; B black)
- 3 Integrated electronics (OBE)
- 4 Space required for connection cable and to remove the mating connector
- 5 Wiring
- 6 Mating connector for connector "K31" (separate order, see page 28 and data sheet 08006)
- 7 Pressure reducing valve
- 8 Name plate
- 9 Main valve
- 10 Machined valve contact surface, porting pattern according to ISO 4401-10-09-0-05 (port X, Y as required)  
Deviating from the standard: port A, B, T and P Ø38 mm

- 11 Identical seal rings for connection A, B, P, T
- 12 Identical seal rings for connection X, Y
- 13 Locking pin

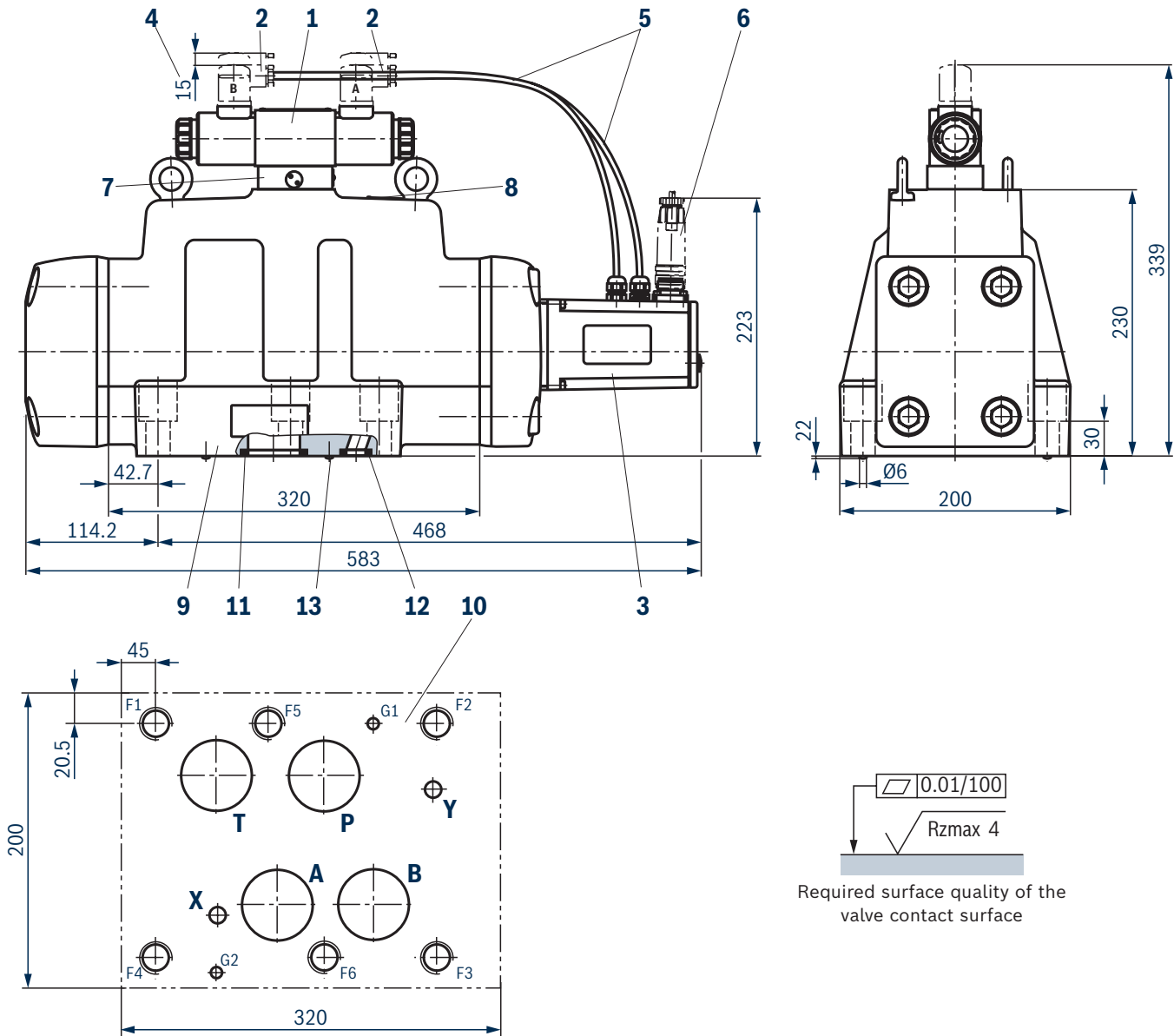
**Valve mounting screws and subplates**, see page 27.



### Notice:

The dimensions are nominal dimensions which are subject to tolerances.

## Dimensions: Size 35 (dimensions in mm)



- 1 Pilot control valve
- 2 Mating connector (A gray; B black)
- 3 Integrated electronics (OBE)
- 4 Space required for connection cable and to remove the mating connector
- 5 Wiring
- 6 Mating connector for connector "K31" (separate order, see page 28 and data sheet 08006)
- 7 Pressure reducing valve
- 8 Name plate
- 9 Main valve
- 10 Machined valve contact surface, porting pattern according to ISO 4401-10-09-0-05 (port X, Y as required)  
Deviating from the standard: port A, B, T and P Ø50 mm

- 11 Identical seal rings for connection A, B, P, T
- 12 Identical seal rings for connection X, Y
- 13 Locking pin

**Valve mounting screws and subplates, see page 27.**



### 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>Friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$ ; 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>Friction coefficient $\mu_{\text{total}} = 0.12 \dots 0.17$ ; 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>Friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$ ; tightening torque $M_A = 12.2 \text{ Nm} \pm 10\%$ | <b>R913043410</b>                          |
|        | 4        | <b>ISO 4762 - M10 x 60 - 10.9-fZn/nc/480h/C</b><br>Friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$ ; tightening torque $M_A = 58 \text{ Nm} \pm 20\%$           | <b>R913014770</b>                          |
|        | or       |                                                                                                                                                                             |                                            |
|        | 2        | <b>ISO 4762 - M6 x 60 - 10.9</b><br>Friction coefficient $\mu_{\text{total}} = 0.12 \dots 0.17$ ; 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>Friction coefficient $\mu_{\text{total}} = 0.12 \dots 0.17$ ; tightening torque $M_A = 75 \text{ Nm} \pm 10\%$                         |                                            |
| 25, 27 | 6        | <b>ISO 4762 - M12 x 60 - 10.9-fZn/nc/480h/C</b><br>Friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$ ; tightening torque $M_A = 100 \text{ Nm} \pm 20\%$          | <b>R913015613</b>                          |
|        | or       |                                                                                                                                                                             |                                            |
|        | 6        | <b>ISO 4762 - M12 x 60</b><br>Friction coefficient $\mu_{\text{total}} = 0.12 \dots 0.17$ ; tightening torque $M_A = 100 \text{ Nm} \pm 10\%$                               | Not included in the Rexroth delivery range |
| 32     | 6        | <b>ISO 4762 - M20 x 80 - 10.9-fZn/nc/480h/C</b><br>Friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$ ; tightening torque $M_A = 340 \text{ Nm} \pm 20\%$          | <b>R913008472</b>                          |
|        | or       |                                                                                                                                                                             |                                            |
|        | 6        | <b>ISO 4762 - M20 x 80</b><br>Friction coefficient $\mu_{\text{total}} = 0.12 \dots 0.17$ ; tightening torque $M_A = 430 \text{ Nm} \pm 10\%$                               | Not included in the Rexroth delivery range |
| 35     | 6        | <b>ISO 4762 - M20 x 60 - 10.9-fZn/nc/480h/C</b><br>Friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$ ; tightening torque $M_A = 465 \text{ Nm} \pm 20\%$          | <b>R913014726</b>                          |
|        | or       |                                                                                                                                                                             |                                            |
|        | 6        | <b>ISO 4762 - M20 x 60 - 10.9</b><br>Friction coefficient $\mu_{\text{total}} = 0.12 \dots 0.17$ ; tightening torque $M_A = 610 \text{ Nm} \pm 10\%$                        | Not included in the Rexroth delivery range |



#### Notice:

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

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

## Accessories (separate order)

### Mating connectors and cable sets

| Item <sup>1)</sup> | Designation                                                          | Version                 | Short designation | Material number   | Data sheet |
|--------------------|----------------------------------------------------------------------|-------------------------|-------------------|-------------------|------------|
| 6                  | Mating connector;<br>for valves with round connector,<br>6-pole + PE | Straight, metal, PG11   | 7PZ31...M         | <b>R900223890</b> | 08006      |
|                    |                                                                      | Straight, plastic, PG11 | 7PZ31...K         | <b>R900021267</b> |            |
|                    |                                                                      | Angled, plastic, PG11   | 7PZ31...K         | <b>R900217845</b> |            |
|                    | Cable sets;<br>for valves with round connector,<br>6-pole + PE       | Plastic, 3.0 m          | 7PZ31 BF6         | <b>R901420483</b> |            |
|                    |                                                                      | Plastic, 5.0 m          |                   | <b>R901420491</b> |            |
|                    |                                                                      | Plastic, 10.0 m         |                   | <b>R901420496</b> |            |
|                    |                                                                      | Plastic, 20.0 m         |                   | <b>R901448068</b> |            |
|                    |                                                                      |                         |                   |                   |            |

<sup>1)</sup> See dimensions page 21 ... 26.

## Project planning information

- ▶ When replacing the component series 2X by component series 3X, the electronics interface must be defined with "A5" (enable signal at pin C).
- ▶ The maximum operating pressure of 350 bar at port T is possible with size 35 from component series 36. For component series ≤35, the valve may be operated up to a maximum of 250 bar.

## Further information

- ▶ Hydraulic valves for industrial applications Data sheet 07600-B
- ▶ 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
- ▶ General product information on hydraulic products Data sheet 07008
- ▶ Installation, commissioning and maintenance of servo valves and high-response valves Data sheet 07700
- ▶ Assembly, commissioning and maintenance of hydraulic systems Data sheet 07900
- ▶ Information on available spare parts [www.boschrexroth.com/spc](http://www.boschrexroth.com/spc)

Bosch Rexroth AG  
Industrial Hydraulics  
Zum Eisengießer 1  
97816 Lohr am Main, Germany  
Phone +49 (0) 93 52/40 30 20  
[my.support@boschrexroth.com](mailto:my.support@boschrexroth.com)  
[www.boschrexroth.com](http://www.boschrexroth.com)

© All rights reserved to Bosch Rexroth AG, also regarding any disposal, exploitation, reproduction, editing, distribution, as well as in the event of applications for industrial property rights.  
The data specified above only serve to describe the product. As our products are constantly being further developed, no statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.