

Directional high-response cartridge valve, pilot-operated, with integrated electronics (OBE)

Type 3WRCBEE



- ▶ Size 25, 32, and 50
- ▶ Component series 1X
- ▶ Maximum operating pressure 315 bar
- ▶ Maximum flow 2250 l/min

Features

- ▶ 3-way cartridge valves
- ▶ Control spool with anti-rotation feature and control edges in servo quality
- ▶ With inductive position transducer at the main control spool and pilot control valve
- ▶ Position-controlled with integrated electronics (OBE).
- ▶ Completely adjusted unit

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Ordering code

| | | | | | | | | | | | | | | | | |
|----|------|----|----|----|----|----|----|----|----|----|-----|-----|----|--|---|---|
| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | | | |
| 3 | WRCB | EE | | V | | | M | - | 1X | / | G24 | K31 | / | | M | * |

| | | |
|----|---|-------------|
| 01 | 3 main ports | 3 |
| 02 | Directional high-response cartridge valve, pilot-operated | WRCB |
| 03 | Integrated electronics (OBE) | EE |
| 04 | Size 25 | 25 |
| | Size 32 | 32 |
| | Size 50 | 50 |
| 05 | Control spool with zero overlap | V |

Area ratio at the control spool (determined at the factory)

| | | |
|----|---------------------|----------------|
| 06 | 1:1 (NG50) | no code |
| | 1:1.5 (NG25 and 32) | F |

Rated flow at 5 bar pressure differential

| | | |
|----|------------------|------------|
| 07 | - Size 25 | |
| | 190 l/min | 190 |
| | - Size 32 | |
| | 380 l/min | 380 |
| | - Size 50 | |
| | 750 l/min | 750 |

Flow characteristic

| | | |
|----|---|-----------|
| 08 | Inflected characteristic curve, progressive with linear fine control range | M |
| 09 | Component series 10... 19 (10 ... 19: unchanged installation and connection dimensions) | 1X |

Supply voltage

| | | |
|----|---------------------|------------|
| 10 | Direct voltage 24 V | G24 |
|----|---------------------|------------|

Electrical connection

| | | |
|----|--|--------------------------|
| 11 | Without mating connector; connector according to DIN EN 175201-804 | K31 ¹⁾ |
|----|--|--------------------------|

Electrical interface

| | | |
|----|---|-----------|
| 12 | Command value ± 10 V, actual value ± 10 V | A1 |
| | Command value 4 ... 20 mA, actual value 4 ... 20 mA | F1 |

Seal material (observe compatibility of seals with hydraulic fluid used, see page 6)

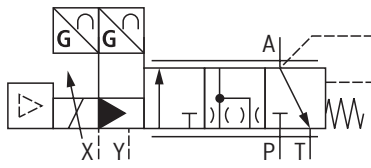
| | | |
|----|---|----------|
| 13 | NBR seals | M |
| 14 | For further details, see the plain text | |

¹⁾ Mating connectors, separate order, see page 20 and data sheet 08008.

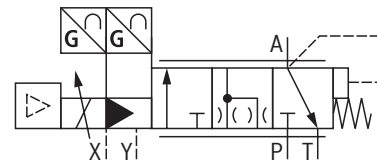
Symbols

Simplified

"No code" version (area ratio 1:1)

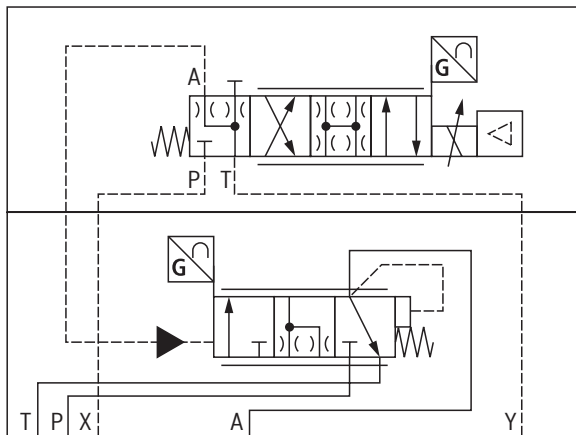


Version "F" (area ratio 1:1.5)



Detailed

Version "F"



Function, section

Valves of type 3WRCBEE are pilot-operated, 2-stage directional high-response cartridge valves. They control the flow direction and size.

Set-up

The valves consist of the following assemblies:

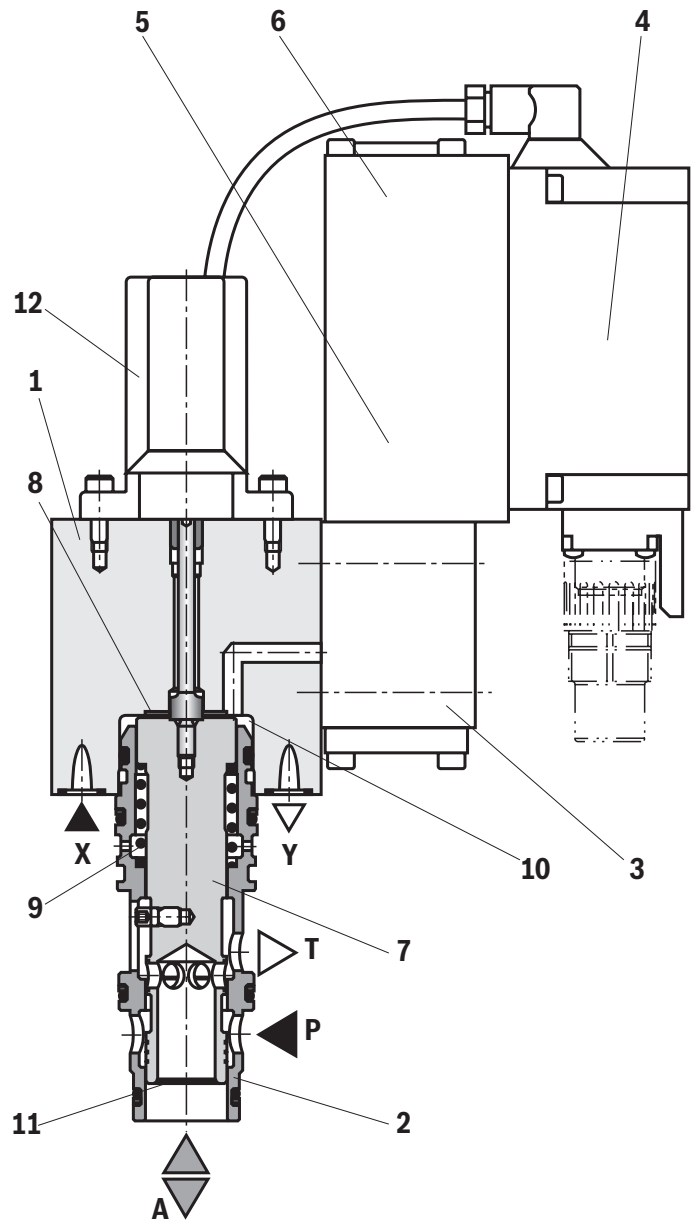
- ▶ Cover (1) with connection surfaces,
- ▶ Main control spool (7) with control edges,
- ▶ Socket (2),
- ▶ Pilot control valve (3) with paired control spool socket unit and inductive position transducer (6)
- ▶ Integrated electronics (OBE) (4) with inductive position transducer (12) of the main control spool

Function

- ▶ Switching of the main control spool (7) via the pilot control valve (3); pressure build-up in the control chamber (10) acts on the surface (8) – the pressure of the connection A counteracts on the area (11) and the spring force (9).
- ▶ Control of the control spool of the pilot control valve through the proportional solenoid (5) against the spring force in the pilot control valve.
- ▶ Linking the command values (4) and actual values (12 and 6) in the microcontroller of the integrated electronics (OBE) (4).
- ▶ Pilot oil supply Y to pilot control valve connection P; pilot oil drain via Y to the container.
- ▶ With a command value of 0 V or 12 mA, the electronics controls the main control spool (7) in central position. This way, fifty percent of the system pressure ($p_P/2$) will be set in connection A.
- ▶ Area ratio of area (11) to area (8) at:
 - Size 25 = 1:1.5
 - Size 32 = 1:1.5
 - Size 50 = 1:1

Failure of supply voltage

- ▶ Integrated electronics (OBE) de-energize the solenoid in case of supply voltage failure or cable break
- ▶ Depressurizing the control spool surface (8) via the pilot control valve (3) after Y to the container.
- ▶ Spring force (9) and pressure in connection A of the area (11) will cause the main control spool (7) to open the connection A to T and close P to A



Notice:

Supply voltage failure will cause an abrupt standstill of the control loop. The acceleration forces occurring in this connection may cause machine damage.

Technical data

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

| General | | | | |
|---------------------------|----|--|------|------|
| Size | NG | 25 | 32 | 50 |
| Installation position | | any (for set-up of the valve on an actuator, avoid arranging the main control spool in parallel to the acceleration or delay direction of the actuator.) | | |
| Storage temperature range | °C | -20 ... +80 | | |
| Ambient temperature range | °C | -20 ... +50 | | |
| Weight | kg | 11.8 | 16.2 | 23.2 |

| Hydraulic | | | | |
|--|-----------------------|--------------------|------------------------------|-----------|
| Maximum operating pressure | ► Port P, A, T, X | bar | 315 | |
| Maximum return flow pressure | ► Port Y | bar | 250 | |
| Rated flow ($\Delta p = 5$ bar) | | l/min | 190 | 380 750 |
| Maximum flow | | l/min | 600 | 1000 2250 |
| Pilot flow ¹⁾ | | l/min | 12 | 16 30 |
| Maximum zero flow ($p_P = 315$ bar) | | l/min | 1.5 | 2.5 3.5 |
| Leakage in spring-centered position ($p_P = 315$ bar; command value -100%) | | l/min | 0.2 | 0.4 0.8 |
| Area ratio at the main control spool | | | 1:1.5 | 1:1.5 1:1 |
| Pressure differential main control spool spring on control spool area at port A | | bar | 2.5 | |
| Hydraulic fluid | | | see table page 6 | |
| Hydraulic fluid temperature range | | °C | -20 ... +80 | |
| Viscosity range | | mm ² /s | 15 ... 380 | |
| Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c) | ► Main stage | | Class 20/18/15 ²⁾ | |
| | ► Pilot control valve | | Class 18/16/13 ²⁾ | |
| Hysteresis | | % | ≤ 0.1 | |
| Response sensitivity | | % | ≤ 0.1 | |

¹⁾ X or Y for minimum actuating time (command value ±100%)

²⁾ 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.

Available filters can be found at www.boschrexroth.com/filter.

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 notices on hydraulic fluids:**

- For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.
- **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 increased cavitation tendency with HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30 % as compared to the use with mineral oil HLP. 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.

| Electric | | | | | |
|--|---------------------|--------|---|------|------|
| Sizes | | NG | 25 | 32 | 50 |
| Supply voltage | ► Nominal voltage | VDC | 24 | | |
| | ► Lower limit value | VDC | 21 | | |
| | ► Upper limit value | VDC | 35 | | |
| Current consumption | ► Maximum | A | 1.8 | | |
| | ► Impulse load | A | 3 | | |
| Duty cycle | | % | 100 | | |
| Protection class according to EN 60529 | | | IP65 (If suitable and correctly mounted mating connectors are used) | | |
| Temperature drift main control spool | | %/10 K | 0.16 | 0.34 | 0.02 |

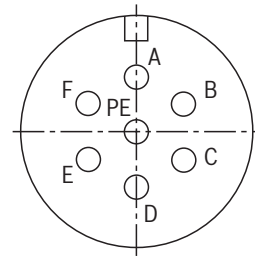
Electrical connections and assignment

Connector pin assignment

| Pin 6 + PE | Signal | Interface assignment | |
|---------------|----------------------------------|---|---------------------------|
| | | „A1“ | „F1“ |
| A | Supply voltage | 24 VDC | |
| B | | GND | |
| C | Reference potential actual value | Reference potential actual value | |
| D | Differential amplifier input | Command value ± 10 V | Command value 4 ... 20 mA |
| E | | Reference potential command value | |
| F | Measuring output (actual value) | Actual value ± 10 V | Actual value 4 ... 20 mA |
| PE | | Functional ground (directly connected to the valve housing) | |

Effect of the control:

- Version "A1"
 - Reference potential at pin E and positive command value at pin D causes volume flow P → A
 - Reference potential at pin E and negative command value at pin D causes volume flow A → T
- Version "F1"
 - Reference potential at pin E and signal 12 ... 20 mA at pin D causes volume flow P → A
 - Reference potential at pin E and signal 12 ... 4 mA at pin D causes volume flow A → T



Recommendation connection cable:

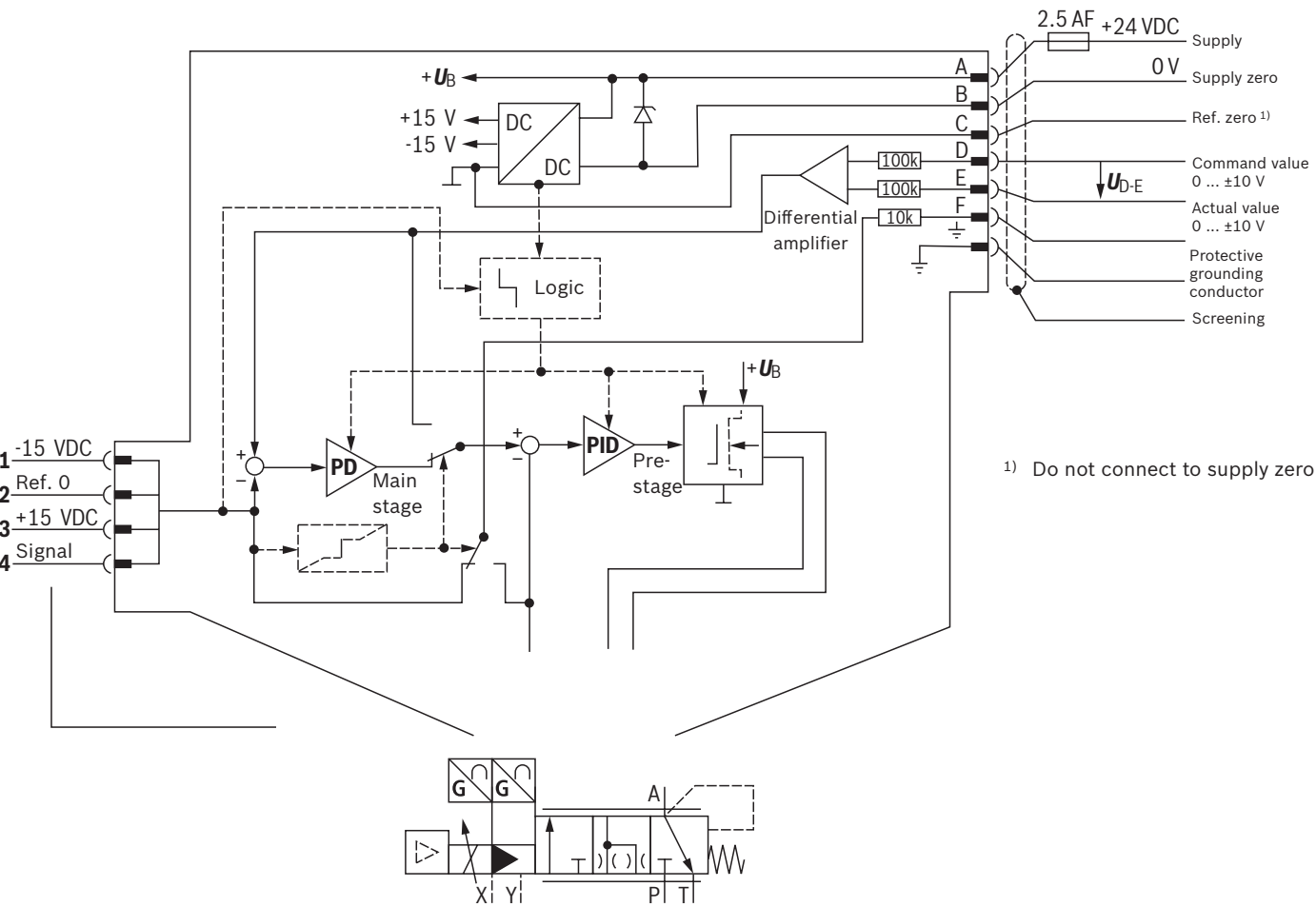
- Up to 25 m – min 0.75 mm² per conductor
- Up to 50 m – min 1.5 mm² per conductor
- With shield braid (connect screening on one side of the supply zero of the power supply unit)
- Maximum external diameter 7 ... 11 mm



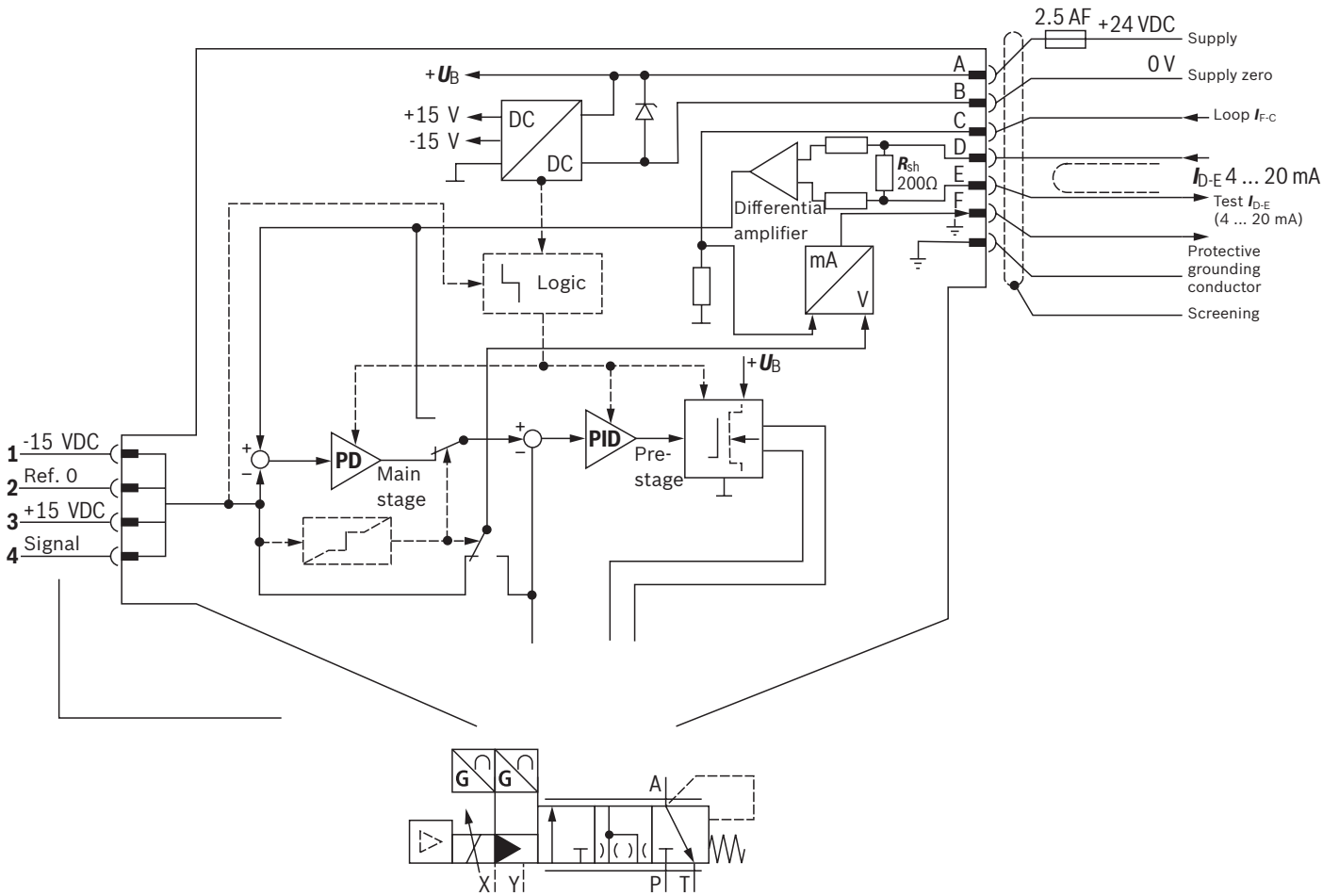
Notices:

- Do not connect PE if the valve has already been grounded via the system.
- Mating connectors, separate order, see page 20 and data sheet 08008.

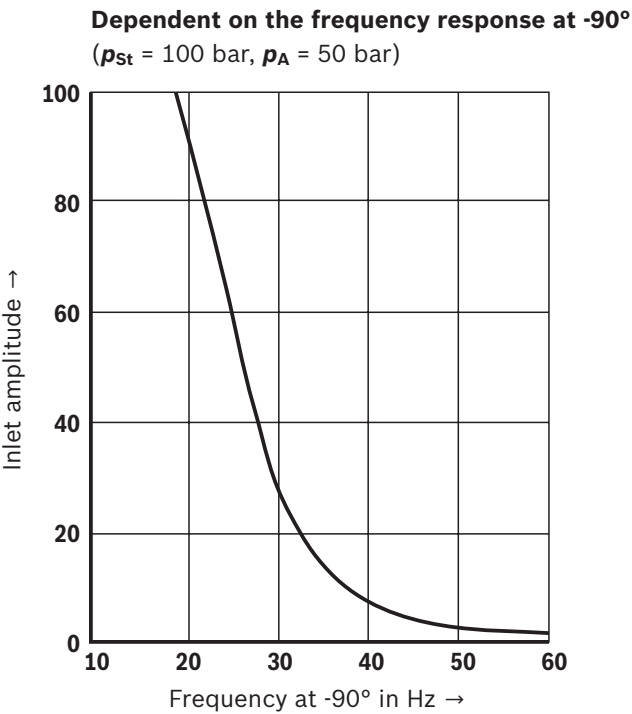
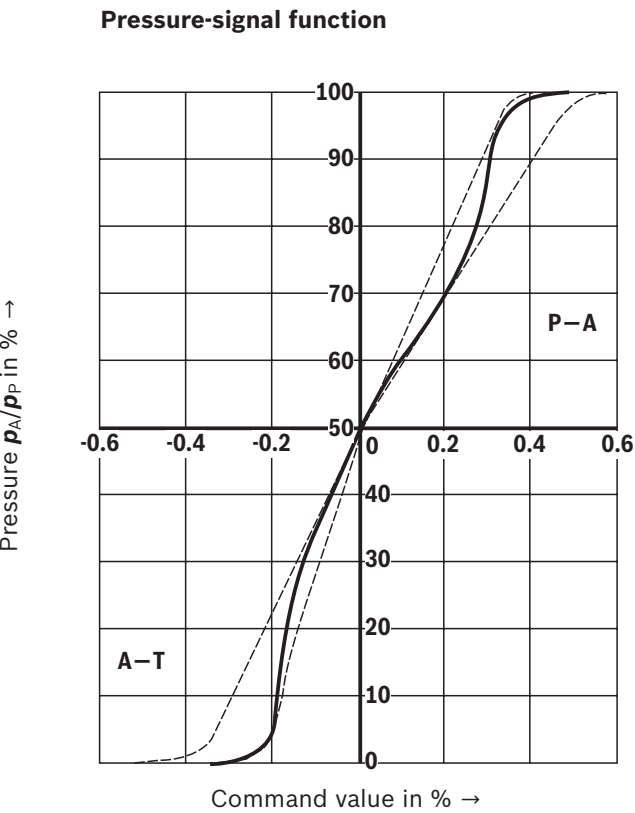
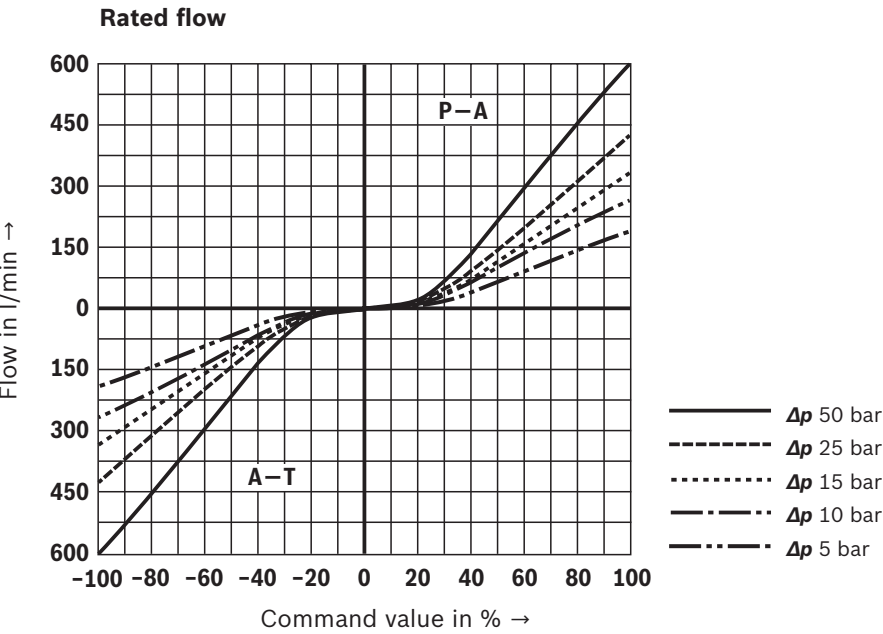
Block diagram/controller function block: Version "A1"



Block diagram/controller function block: Version "F1"



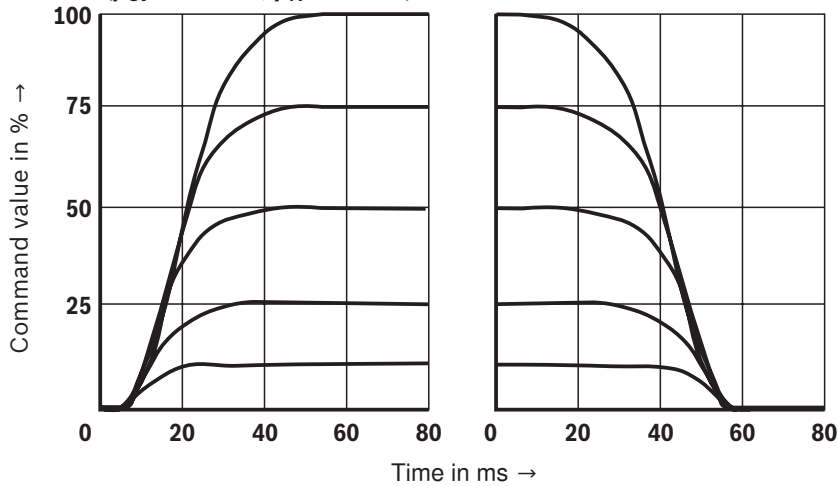
Characteristic curves: Size 25
(measured with HLP32, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)



Characteristic curves: Size 25
(measured with HLP32, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)

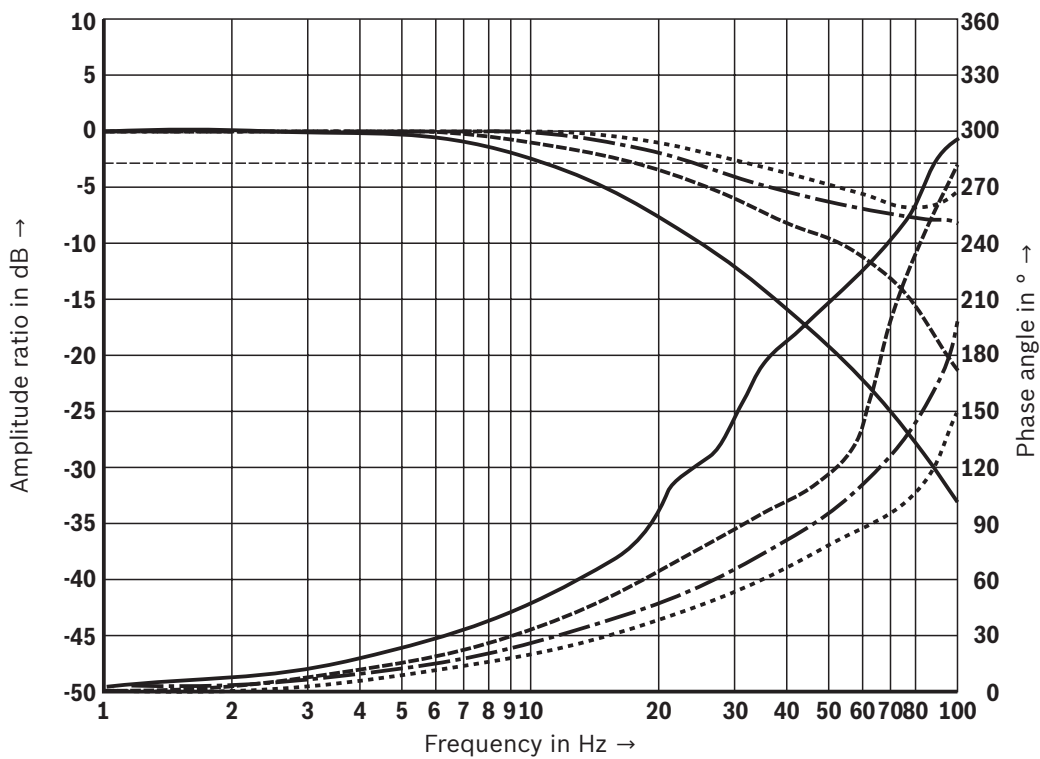
Transition function with stepped electric input signal

($p_{St} = 100 \text{ bar}$, $p_A = 50 \text{ bar}$)



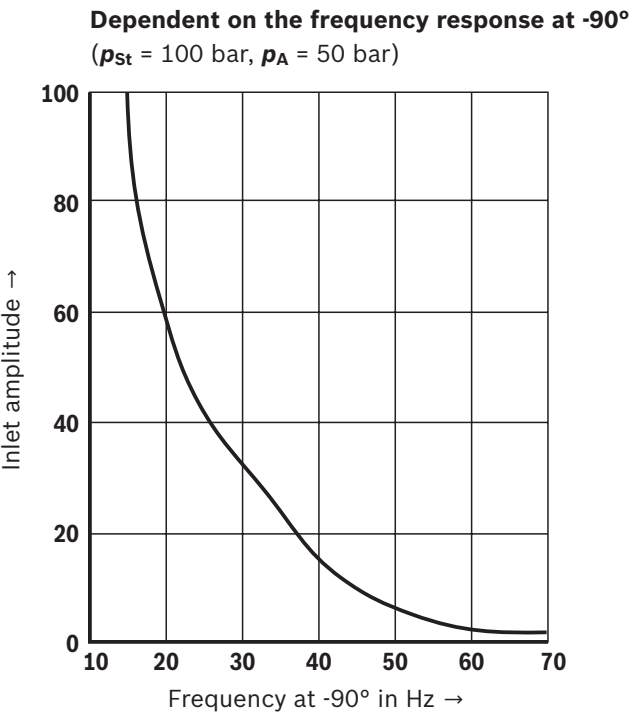
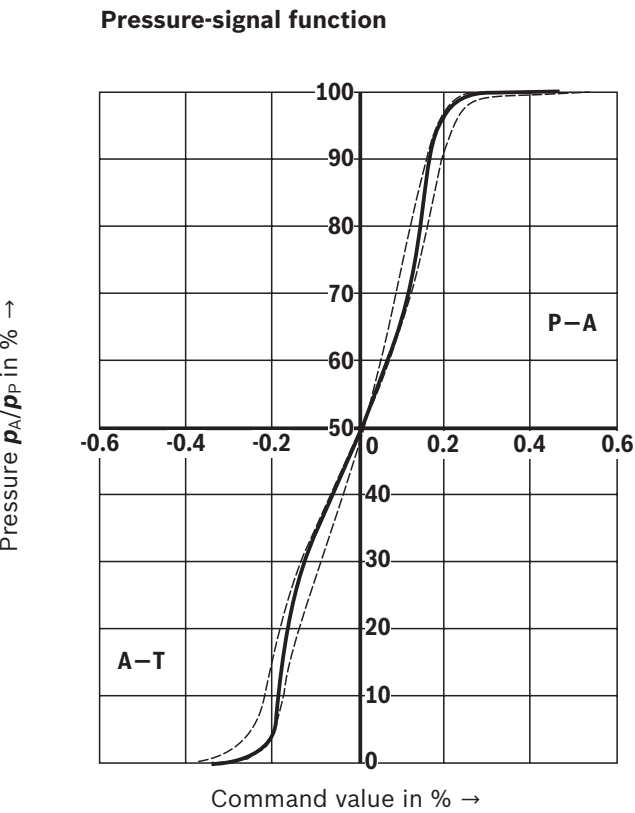
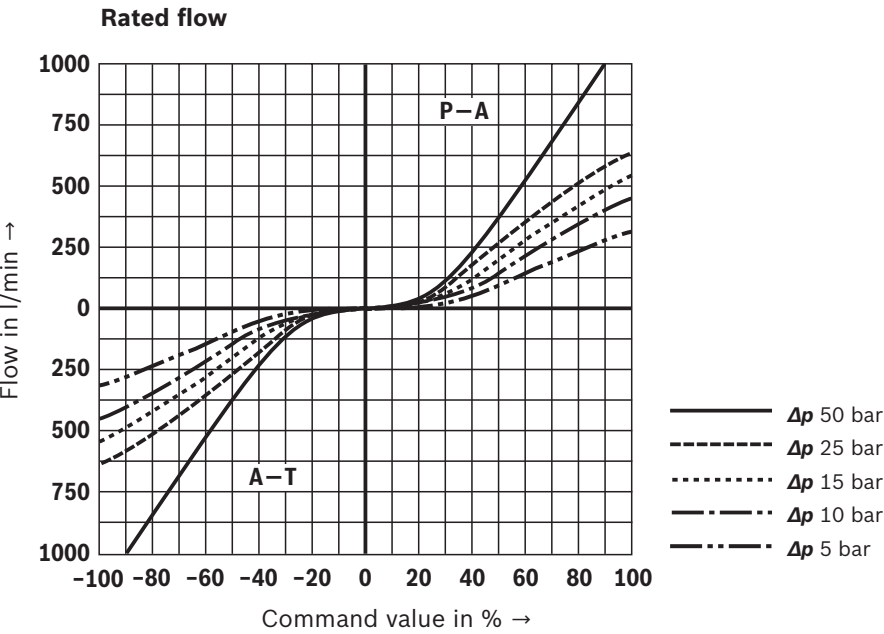
Frequency response

($p_{St} = 100 \text{ bar}$, $p_A = 50 \text{ bar}$)



- Signal $\pm 1 \%$
- Signal $\pm 5 \%$
- - - - - Signal $\pm 25 \%$
- Signal $\pm 100 \%$

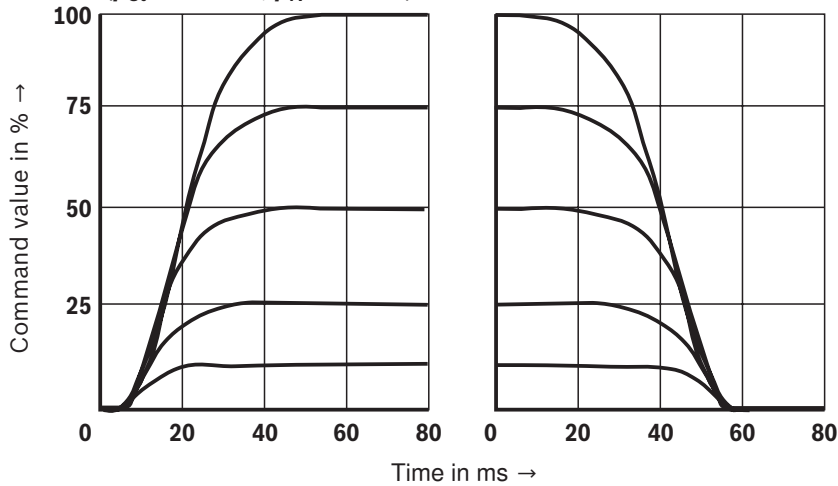
Characteristic curves: Size 32
(measured with HLP32, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)



Characteristic curves: Size 32
(measured with HLP32, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)

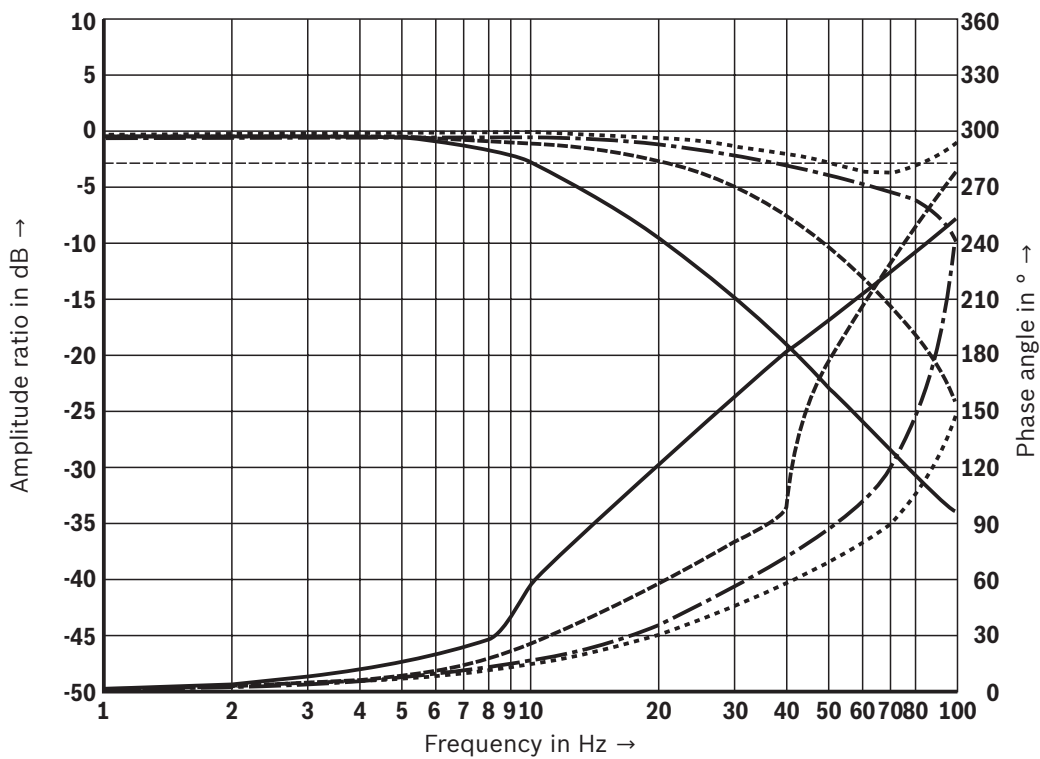
Transition function with stepped electric input signal

($p_{St} = 100 \text{ bar}$, $p_A = 50 \text{ bar}$)



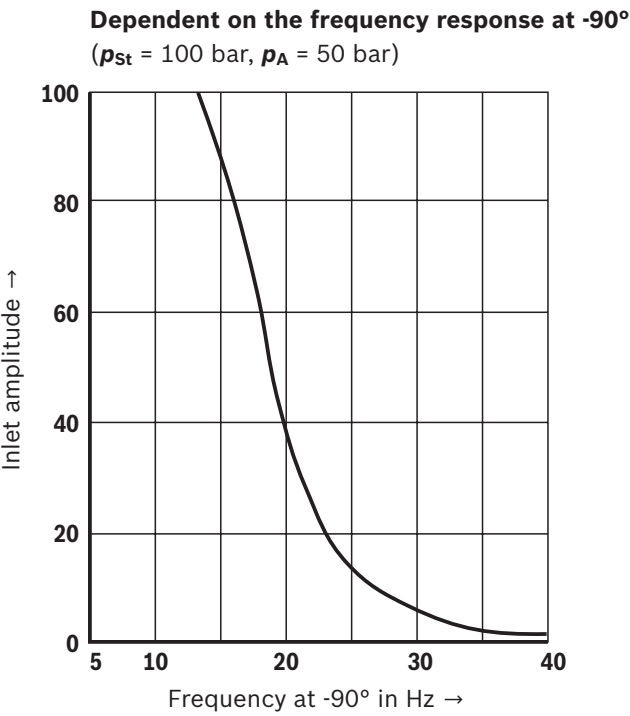
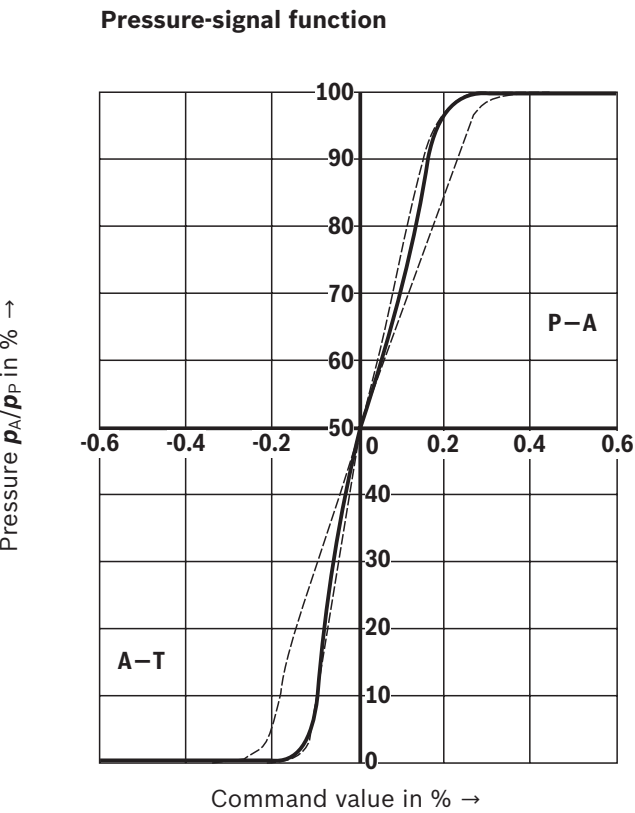
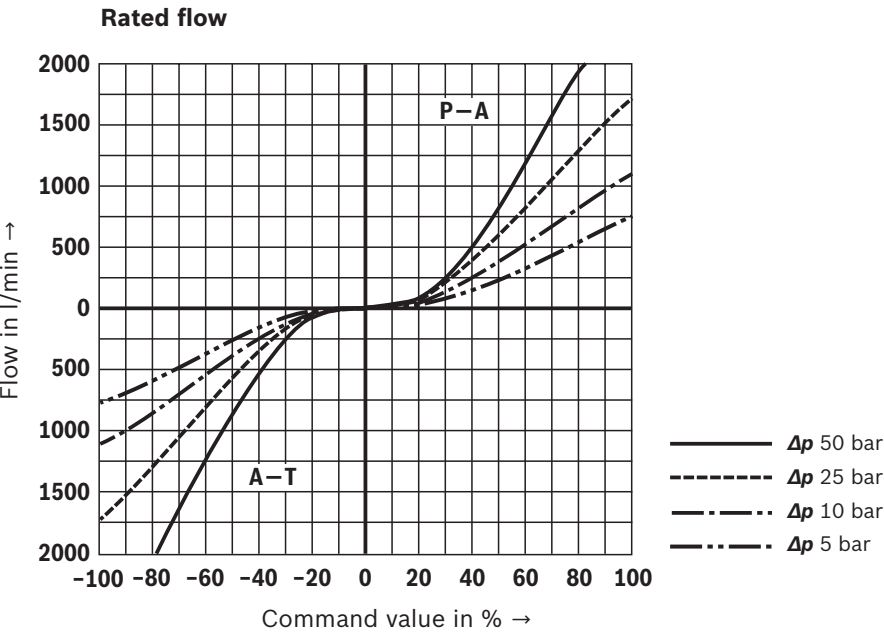
Frequency response

($p_{St} = 100 \text{ bar}$, $p_A = 50 \text{ bar}$)



- Signal $\pm 1 \%$
- Signal $\pm 5 \%$
- - - - - Signal $\pm 25 \%$
- Signal $\pm 100 \%$

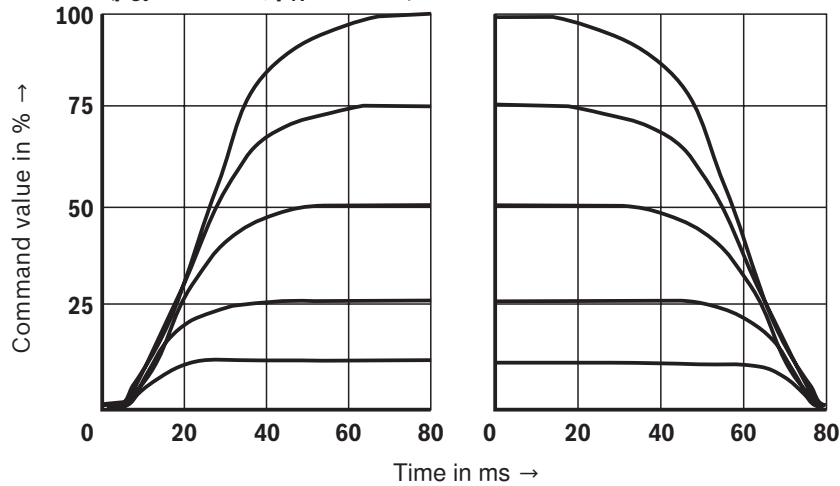
Characteristic curves: Size 50
(measured with HLP32, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)



Characteristic curves: Size 50
(measured with HLP32, $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$)

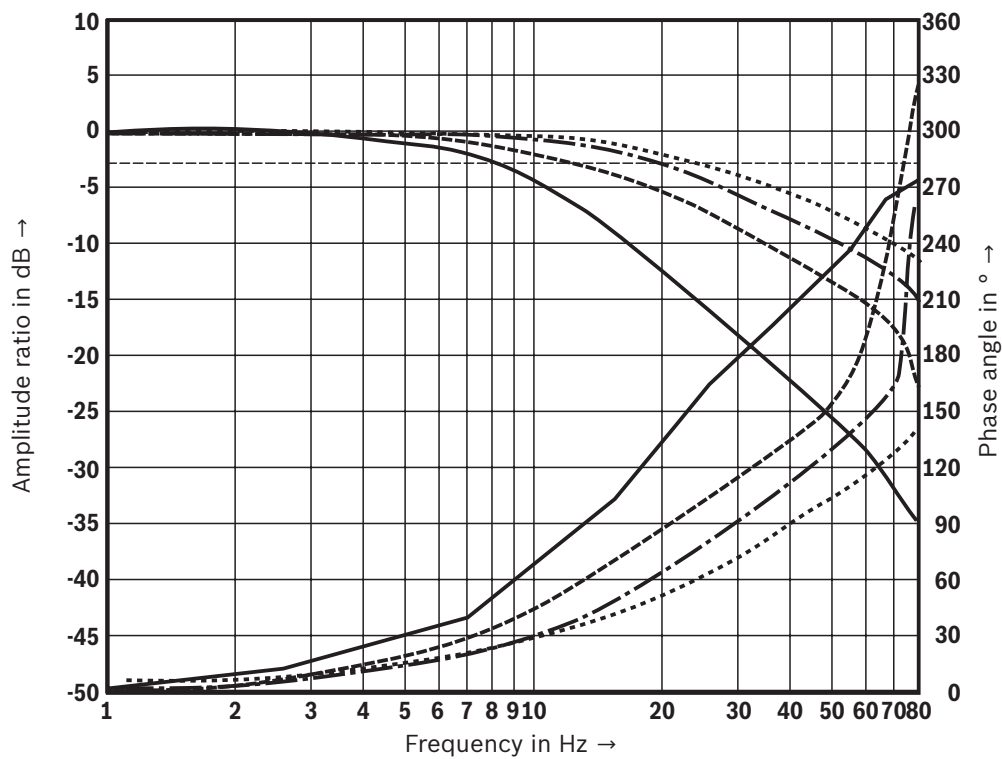
Transition function with stepped electric input signal

($p_{St} = 100 \text{ bar}$, $p_A = 50 \text{ bar}$)



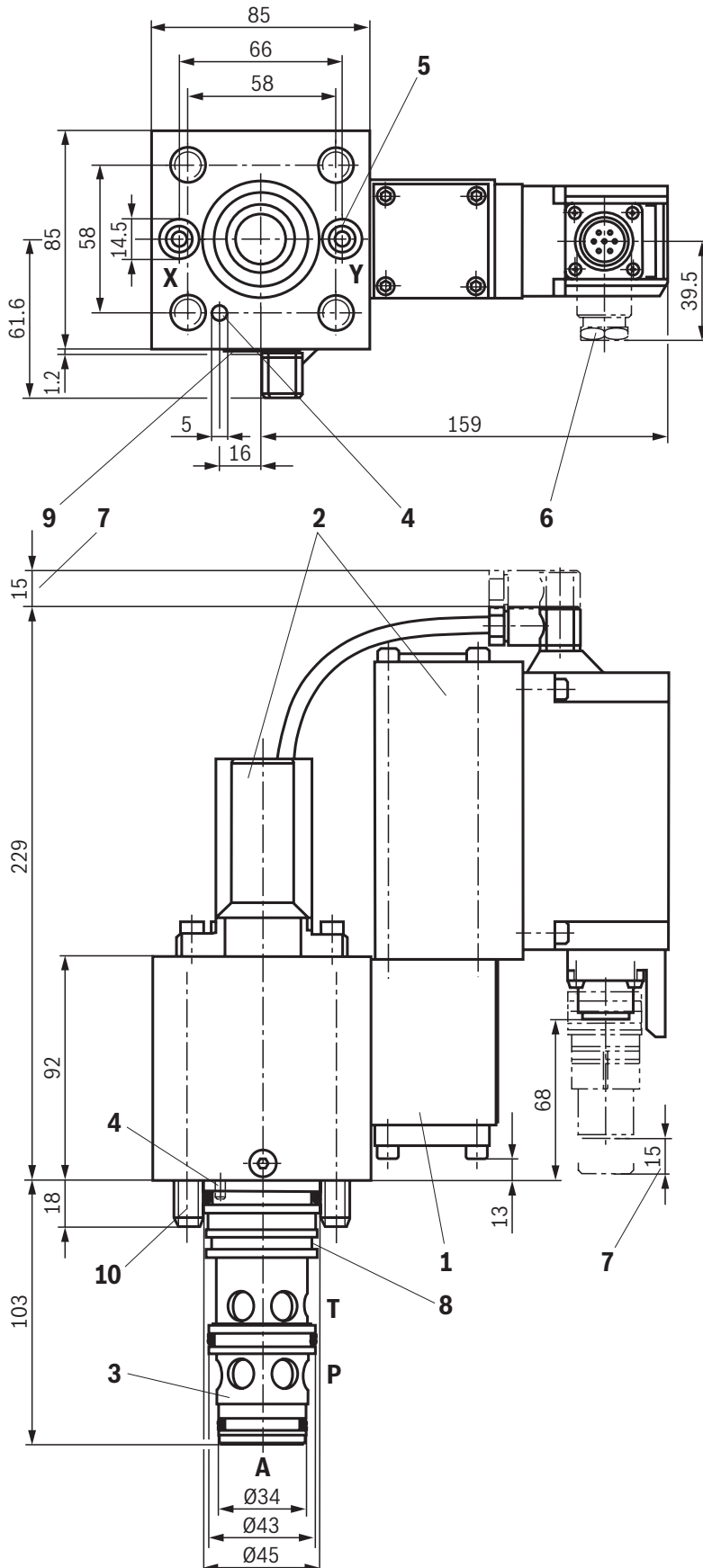
Frequency response

($p_{St} = 100 \text{ bar}$, $p_A = 50 \text{ bar}$)



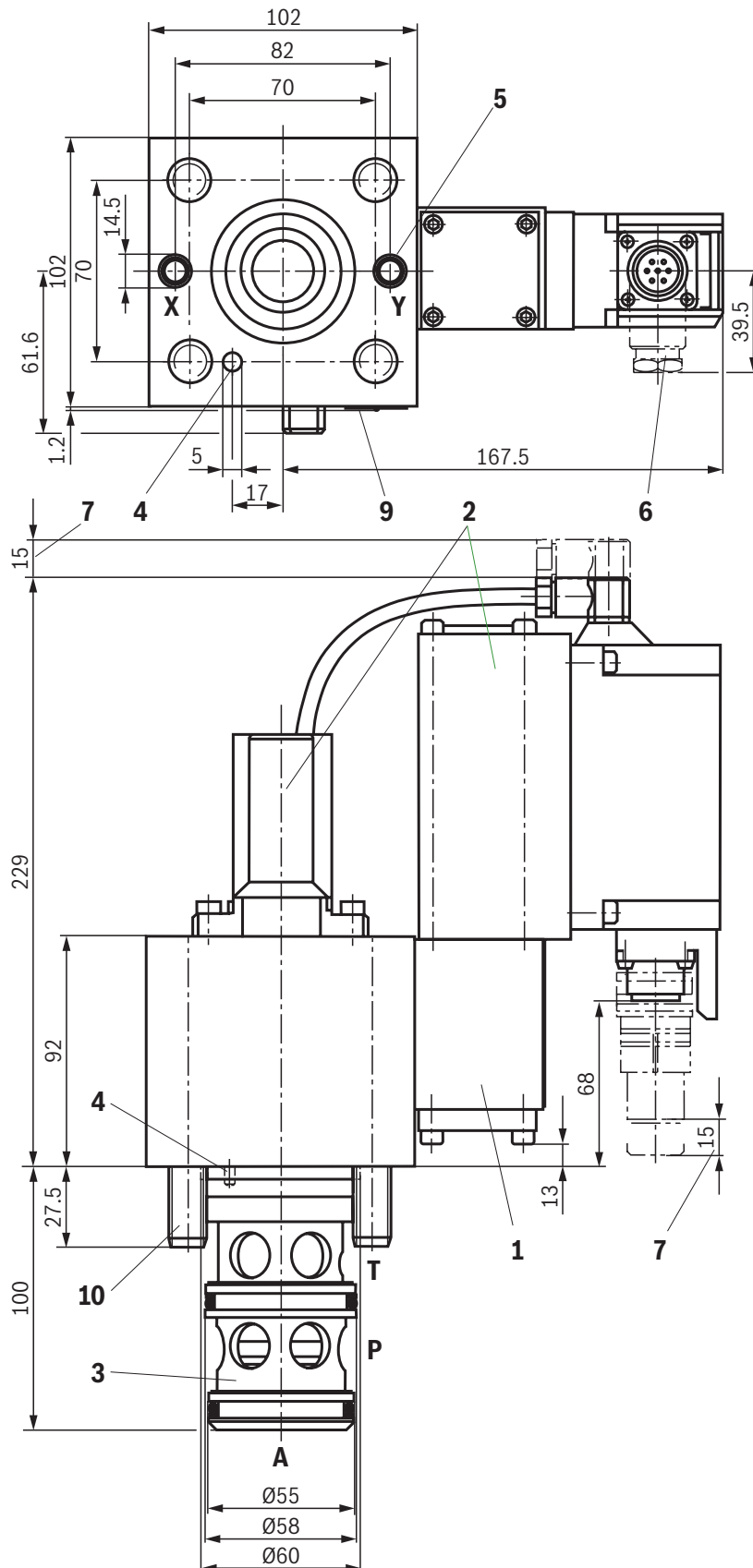
- Signal $\pm 1 \%$
- Signal $\pm 5 \%$
- Signal $\pm 25 \%$
- Signal $\pm 100 \%$

Dimensions: Size 25
(dimensions in mm)



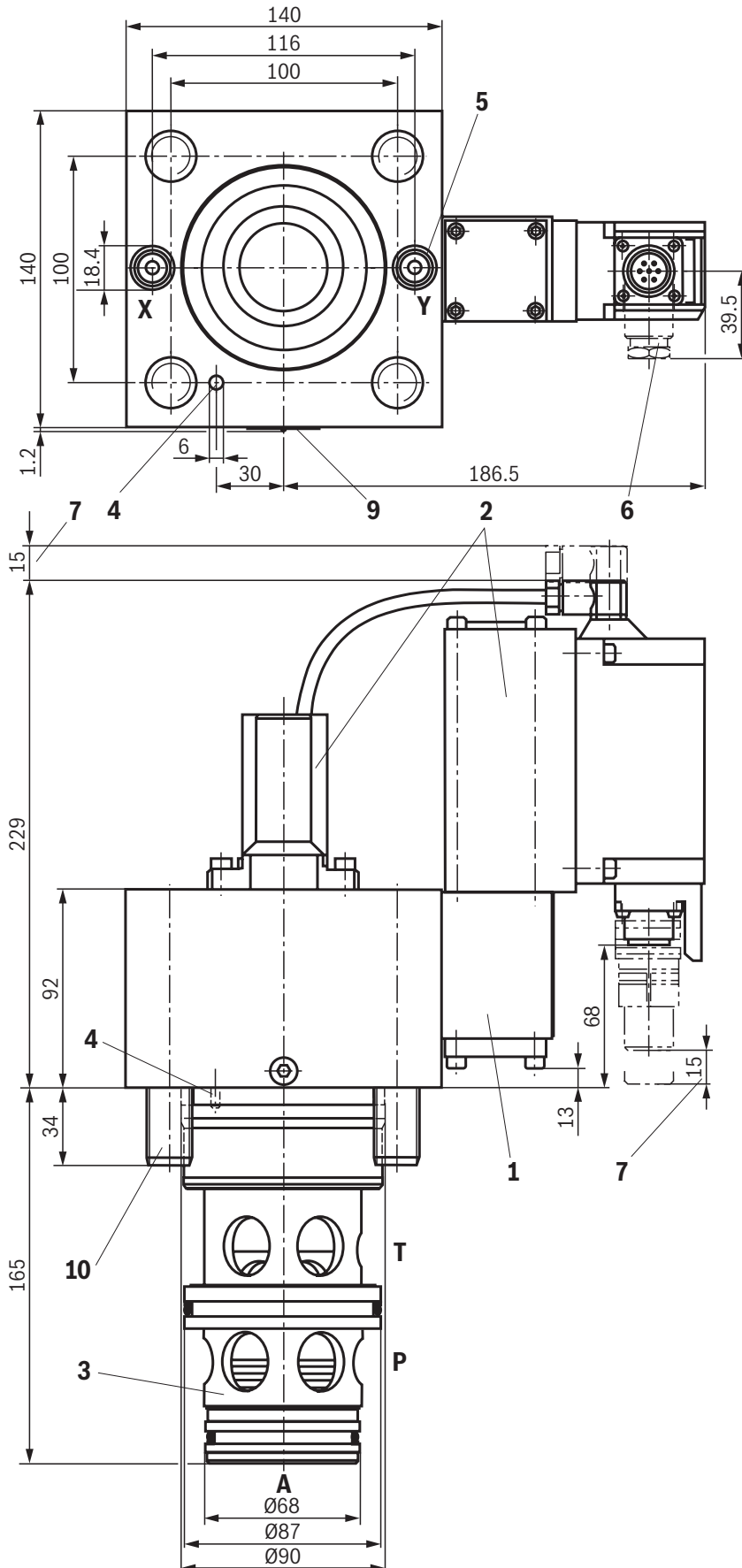
- 1 Pilot control valve with integrated electronics (OBE)
- 2 Position transducer pilot control and main stage
- 3 Bushing
- 4 Locating pin
- 5 Identical seal rings for ports X and Y
- 6 Mating connector (separate order, see page 20)
- 7 Space required for removing the mating connector
- 8 No seal admissible
- 9 Name plate
- 10 Valve mounting screws (included in the scope of delivery), see page 20

Dimensions: Size 32
(dimensions in mm)



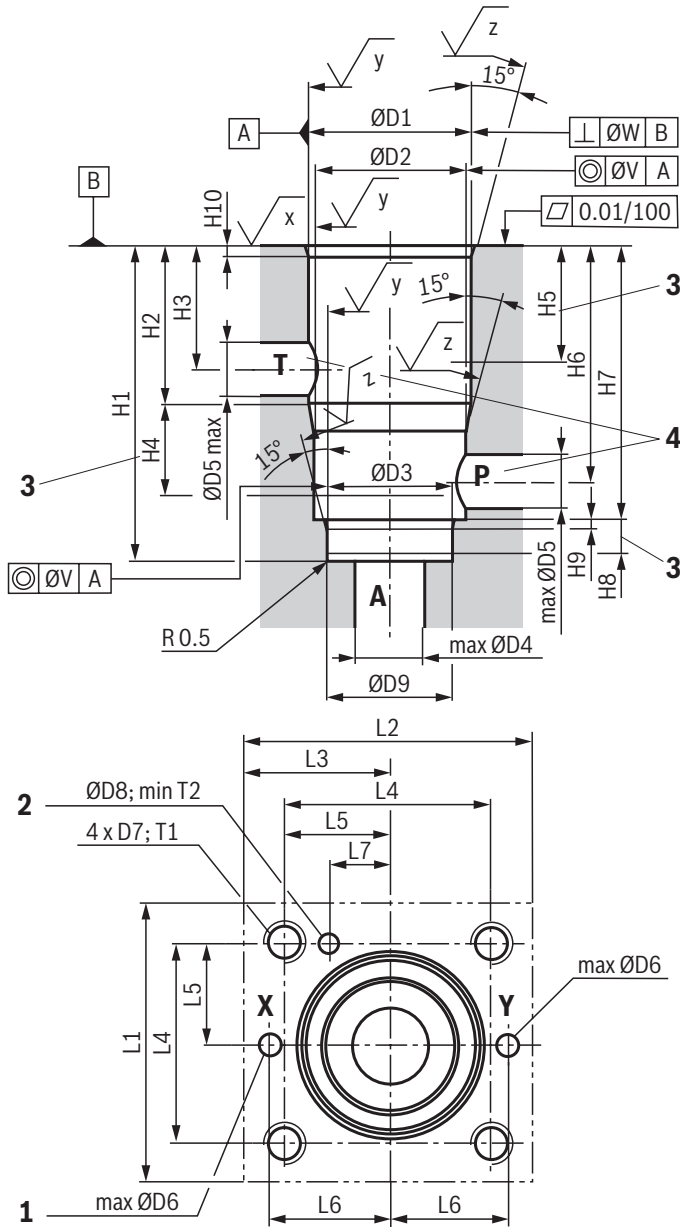
- 1 Pilot control valve with integrated electronics (OBE)
- 2 Position transducer pilot control and main stage
- 3 Bushing
- 4 Locating pin
- 5 Identical seal rings for ports X and Y
- 6 Mating connector (separate order, see page 20)
- 7 Space required for removing the mating connector
- 9 Name plate
- 10 Valve mounting screws (included in the scope of delivery, see page 20)

Dimensions: Size 50
(dimensions in mm)



- 1 Pilot control valve with integrated electronics (OBE)
- 2 Position transducer pilot control and main stage
- 3 Bushing
- 4 Locating pin
- 5 Identical seal rings for ports X and Y
- 6 Mating connector (separate order, see page 20)
- 7 Space required for removing the mating connector
- 9 Name plate
- 10 Valve mounting screws (included in the scope of delivery, see page 20)

Installation bore (dimensions in mm)



$$\sqrt{x} = \sqrt{Rz_{\max 4}}$$

$$\sqrt{y} = \sqrt{Rz_{\max 8}}$$

$$\sqrt{z} = \sqrt{Rz_{16}}$$

| NG | 25 | 32 | 50 |
|---------------------|------|------|------|
| L1 | 85 | 102 | 140 |
| L2 | 85 | 102 | 140 |
| L3 | 42.5 | 51 | 70 |
| L4 ^{±0.2} | 58 | 70 | 100 |
| L5 ^{±0.1} | 29 | 35 | 50 |
| L6 ^{±0.2} | 33 | 41 | 58 |
| L7 ^{±0.2} | 16 | 17 | 30 |
| H1 ^{±0.1} | 103 | 100 | 165 |
| H2 | 56 | 43.5 | 87 |
| H3 | 45 | 30 | 66 |
| H4 | 15 | 16 | 40 |
| H5 | 15 | 18 | 20 |
| H6 ^{±0.3} | 78 | 70.5 | 122 |
| H7 ^{±0.3} | 89 | 85 | 143 |
| H8 | 11.5 | 13.5 | 18 |
| H9 | 2.5 | 3 | 3 |
| H10 | 2.5 | 2.5 | 4 |
| ØD1H7 [°] | 45 | 60 | 90 |
| ØD2H7 [°] | 43 | 58 | 87 |
| ØD3H7 [°] | 34 | 55 | 68 |
| max. ØD4 | 20 | 30 | 35 |
| max. ØD5 | 20 | 24 | 35 |
| max. ØD6 | 6 | 8 | 10 |
| D7 | M12 | M16 | M20 |
| ØD8H13 | 6 | 6 | 8 |
| ØD9 ^{±0.2} | 33.7 | 54.7 | 67.7 |
| T1 | 25 | 35 | 45 |
| min. T2 | 10 | 10 | 10 |
| V | 0.03 | 0.03 | 0.03 |
| W | 0.05 | 0.1 | 0.1 |

Tolerances according to: General tolerances ISO 2768-mK

Valve mounting screws see page 20.

- 1 Connect port X to port P or connect externally
- 2 Bore for locating pin
- 3 Depth of fit
- 4 The ports P and T can be positioned around the central axis of port A. However, it must be observed that the mounting bores and the control bores are not damaged.

Accessories

Valve mounting screws (included in the scope of delivery)

| Size | Quantity | Hexagon socket head cap screws | Material number |
|------|----------|---|-----------------|
| 25 | 4 | ISO 4762 - M12 x 35 -10.9-fIZn-240h-L Friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$; tightening torque $M_A = 110 \text{ Nm} \pm 10\%$ | – |
| 32 | 4 | ISO 4762 - M16 x 50 - 10.9-fIZn/nc/480h/C Friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$; tightening torque $M_A = 250 \text{ Nm} \pm 10\%$ | – |
| 50 | 4 | ISO 4762 - M20 x 70 -10.9-fIZn-240h-L Friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$; tightening torque $M_A = 540 \text{ Nm} \pm 10\%$ | – |

Mating connectors and cable sets (separate order)

| Item ¹⁾ | Designation | Version | Short designation | Material number | Data sheet |
|--------------------|---|---|-------------------|-------------------|------------|
| 6 | Mating connectors; for valves with installed electronics (OBE) | 6P+PE, angled, plastic, PG 11, crimp technology | – | 1834484252 | 08008 |

¹⁾ See dimensions page 16 ... 18.

Further information

- ▶ Hydraulic fluids on mineral oil basis
- ▶ Environmentally compatible hydraulic fluids
- ▶ Flame-resistant, water-free hydraulic fluids
- ▶ Flame-resistant hydraulic fluids - containing water (HFAE, HFAS, HFB, HFC)
- ▶ Mating connectors for controlling electrically operated valves and sensors
- ▶ Hydraulic valves for industrial applications

- ▶ Selection of filters
- ▶ Information on available spare parts

Data sheet 90220
 Data sheet 90221
 Data sheet 90222
 Data sheet 90223
 Data sheet 08008
 Operating instructions
 07600-B
www.boschrexroth.com/filter
www.boschrexroth.com/spc

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 It must be remembered that our products are subject to a natural process of wear and aging.