

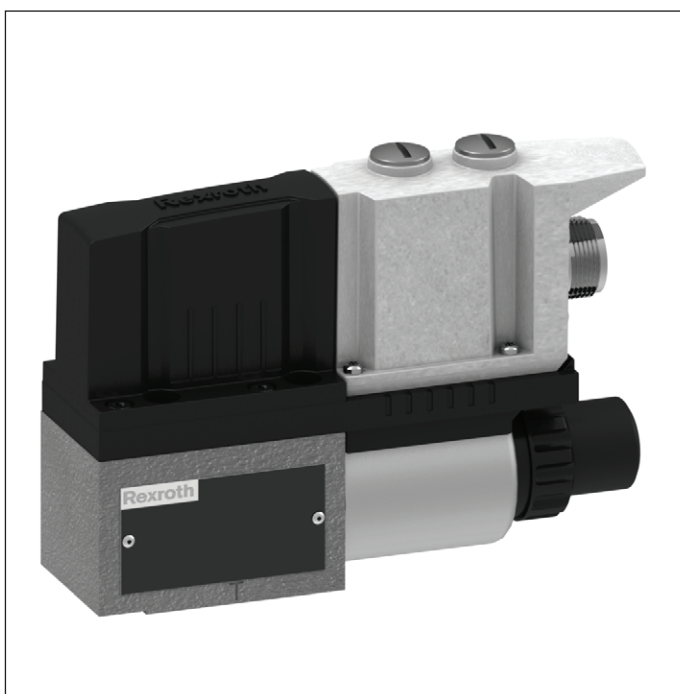
## Pressure-controlled directly operated proportional pressure relief valve with integrated electronics (OBE)

Type DBETA

**RE 29262**

Edition: 2014-02

Replaces: 04.13



- ▶ Size 6
- ▶ Component series 6X
- ▶ Maximum operating pressure 500 bar
- ▶ Maximum flow: 5 l/min



### Features

- ▶ Pressure-controlled, directly operated proportional valve for pressure relief (pilot valve)
- ▶ For subplate mounting:  
Porting pattern according to ISO 4401
- ▶ Integrated pressure sensor
- ▶ Actual pressure value can be read via analog output
- ▶ Pressure controller can be adjusted to different applications (easy setting via DIL switch)
- ▶ Linear command value pressure characteristic curve
- ▶ Virtually flow-independent pressure control
- ▶ CE conformity according to EMC Directive 2004/108/EC

### Contents

|  |      |
|--|------|
| Features                                   | 1    |
| Ordering code, symbols                     | 2    |
| Function, section                          | 3    |
| Technical data                             | 4, 5 |
| Information on environmental compatibility | 5    |
| Electrical connection                      | 6    |
| Integrated electronics (OBE)               | 7    |
| Characteristic curves                      | 8    |
| Dimensions                                 | 9    |
| Accessories                                | 10   |

Ordering code

|       |    |    |    |    |    |     |     |    |
|-------|----|----|----|----|----|-----|-----|----|
| 01    | 02 | 03 | 04 | 05 | 06 | 07  | 08  | 09 |
| DBETA | –  | 6X | /  | P  |    | G24 | K31 | *  |

|    |   |       |
|----|---|-------|
| 01 | Proportional pressure relief valve, pressure-controlled with integrated electronics (OBE) | DBETA |
| 02 | Component series 60 to 69 (60 to 69: Unchanged installation and connection dimensions)    | 6X    |
| 03 | Pressure measurement in channel P   | P     |

Maximum set pressure

|    |  |     |
|----|--|-----|
| 04 | Up to 50 bar                                 | 50  |
|    | Up to 100 bar                                | 100 |
|    | Up to 200 bar                                | 200 |
|    | Up to 350 bar                                | 350 |
|    | Up to 500 bar (only possible in version “M”) | 500 |

Supply voltage of the integrated electronics (OBE)

|    |                 |     |
|----|-----------------|-----|
| 05 | 24 V DC voltage | G24 |
|----|-----------------|-----|

Electrical connection

|    |                             |     |
|----|-----------------------------|-----|
| 06 | Connector DIN EN 175201-804 | K31 |
|----|-----------------------------|-----|

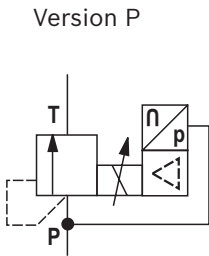
Electronics interface

|    |                          |    |
|----|--------------------------|----|
| 07 | Command value 0 to 10 V  | A1 |
|    | Command value 4 to 20 mA | F1 |

Seal material

|    |   |   |
|----|---|---|
| 08 | NBR seals   | M |
|    | FKM seals   | V |
|    | Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request) |   |
| 09 | Further details in the plain text   |   |

Symbols



## Function, section

### General information

DBETA proportional pressure relief valves are used for pressure relief. Operation is effected by means of a proportional solenoid. The pressure is regulated by the pressure sensor and the valve electronics. By means of these valves, the system pressure to be limited can be continuously adjusted and controlled depending on the electric command value.

The valves mainly consist of the housing (1), the valve seat (3), the valve poppet (4), the proportional solenoid (2), the integrated electronics (7) and the pressure sensor (8).

### Basic principle

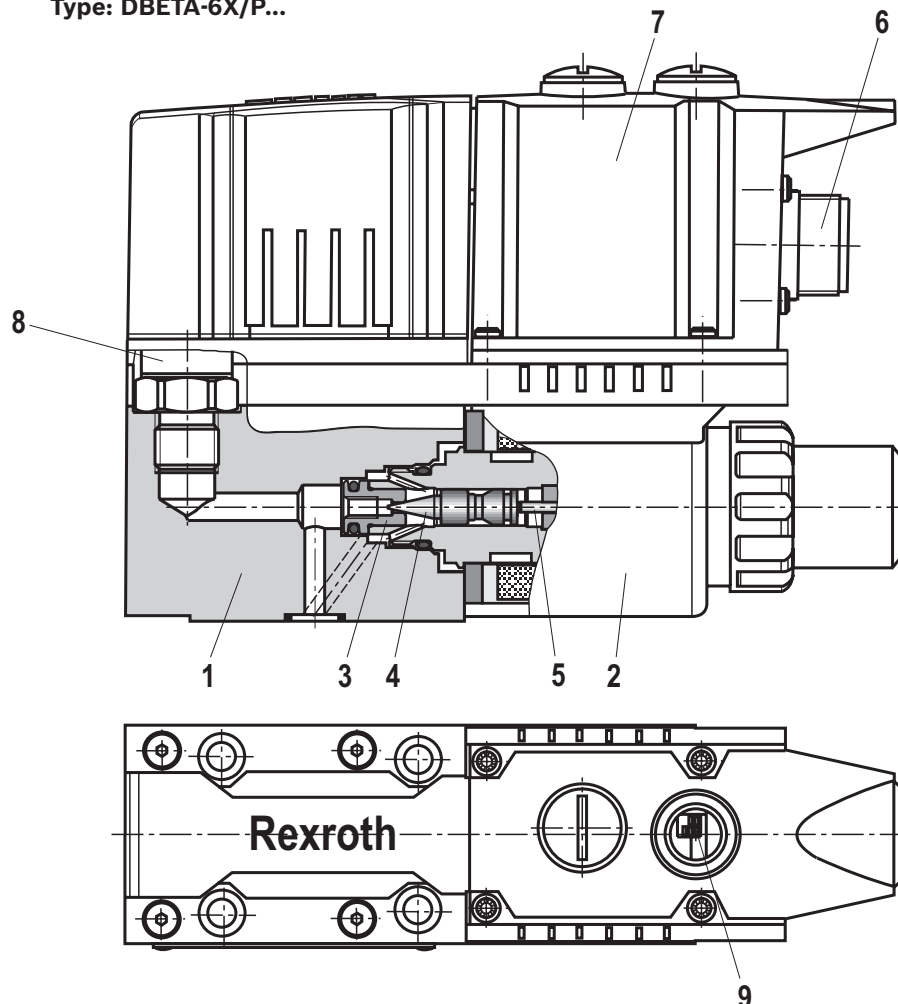
The supply voltage and the command value are applied to the connector (6). Depending on the command value the electronics converts the input signal into current. The proportional solenoid converts the electric current into mechanical force that acts directly on the valve poppet (4) via the armature plunger (5). The valve poppet (4) counter-

acts the hydraulic force in channel P. When the hydraulic force at the valve poppet (4) equals the solenoid force, the set pressure is reached. By increasing/reducing cross-section P to T, the pressure is maintained at the set level.

The pressure sensor (8) captures the pressure in channel P and/or B and the integrated electronics (7) controls the pressure independently of the flow.

Connector (6) provides the pressure in channel P and/or B as an analog actual value (0 to 10 V and/or 4 to 20 mA). If the command value is zero, the control electronics only applies the minimum control current to the proportional solenoid (2) and the minimum set pressure is applied. With the DIL switch (9) the integrated pressure controller can be adjusted to different applications (see table on page 7).

Type: DBETA-6X/P...



**Technical data**

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

| <b>general</b>                                 |    |  |
|--|----|--|
| Weight   | kg | 1.9  |
| Mounting orientation                           |    | Any  |
| Ambient temperature range                      | °C | -20 ... +60  |
| Sine test according to DIN EN 60068-2-6        |    | 10...2000...10 Hz / maximum of 10 g / 10 cycles      |
| Noise test according to DIN EN 60068-2-64      |    | 20...2000 Hz / 10 g <sub>RMS</sub> / 30 g peak / 24h |
| Transport shock according to DIN EN 60068-2-27 |    | 15 g / 11ms  |
| Maximum relative moisture at 25 to 55 °C       | %  | 97   |

| <b>hydraulic</b>  |                           |                    |  |  |
|---|---------------------------|--------------------|--|--|
| Maximum operating pressure for pressure rating 200, 350 and 500 bar <sup>1)</sup>                               | – Port P, A, B            | bar                | 500  |  |
| Maximum operating pressure for pressure rating 100 bar <sup>1)</sup>  | – Port P                  | bar                | 300  |  |
| Maximum operating pressure for pressure rating 50 bar <sup>1)</sup>   | – Port P                  | bar                | 125  |  |
| Return flow pressure  | – Port T                  | bar                | Ideally at zero pressure to the tank <sup>2)</sup> |  |
| Maximum set pressure  | – Pressure rating 50 bar  | bar                | 50   |  |
|   | – Pressure rating 100 bar | bar                | 100  |  |
|   | – Pressure rating 200 bar | bar                | 200  |  |
|   | – Pressure rating 350 bar | bar                | 350  |  |
|   | – Pressure rating 500 bar | bar                | 500  |  |
| Minimum set pressure (at command value 0 V and/or 4 mA)   |                           | bar                | See characteristic curves page 8                   |  |
| Maximum flow <sup>3)</sup>  |                           | l/min              | 5  |  |
| Minimum line volume   |                           | ml                 | 20   |  |
| Hydraulic fluid   |                           |                    | See table page 5                                   |  |
| Hydraulic fluid temperature range   |                           | °C                 | –15 ... +80 (FKM seals)                            |  |
|   |                           |                    | –20 ... +80 (NBR seals)                            |  |
| Viscosity range   |                           | mm <sup>2</sup> /s | 20 ... 380, preferably 30 to 46                    |  |
| Maximum permitted degree of contamination of the hydraulic fluid<br>Cleanliness class according to ISO 4406 (c) |                           |                    | Class 20/18/15 <sup>4)</sup>                       |  |
| Hysteresis  |                           | %                  | < 1 of the maximum set pressure <sup>5)</sup>      |  |
| Range of inversion  |                           | %                  | < 0,25 of the maximum set pressure <sup>5)</sup>   |  |
| Response sensitivity  |                           | %                  | < 0,25 of the maximum set pressure <sup>5)</sup>   |  |
| Linearity   |                           | %                  | ±1 of the maximum set pressure <sup>5)</sup>       |  |
| Step response (Tu + Tg)   | 10 % → 90 %               | ms                 | 165 (depending on the system)                      |  |
| Line volume ~20 cm <sup>3</sup> ; <b>q</b> = 0.8 l/min  | 90 % → 10 %               | ms                 | 88 (depending on the system)                       |  |

<sup>1)</sup> The summated pressure of all ports must not exceed 1030 bar, e.g. port P 500 bar + port B 500 bar + port T 30 bar + port A 0 bar = 1030 bar

<sup>2)</sup> Tank preloading of 30 bar in addition.  
Attention: The tank preloading is added to the min. set pressure.  
A short-time static pressure of 300 bar is admissible.

<sup>3)</sup> Recommended operation range **q** > 0,5 l/min.

<sup>4)</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.  
For the selection of the filters see [www.boschrexroth.com/filter](http://www.boschrexroth.com/filter)

<sup>5)</sup> Accuracies apply for flow > 0.2 l/min and command value > 10%.

## Technical data

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

| Hydraulic fluid                     | Classification                                      | Suitable sealing materials | Standards  |
|-------------------------------------|---|----------------------------|------------|
| Mineral oils                        | HL, HLP   | NBR, FKM                   | DIN 51524  |
| Bio-degradable – insoluble in water | HEES  | FKM                        | VDMA 24568 |
| Flame-resistant – water-free        | HFDU  | FKM                        | ISO 12922  |
| – containing water                  | HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620) | NBR                        | ISO 12922  |



### Important information on hydraulic fluids!

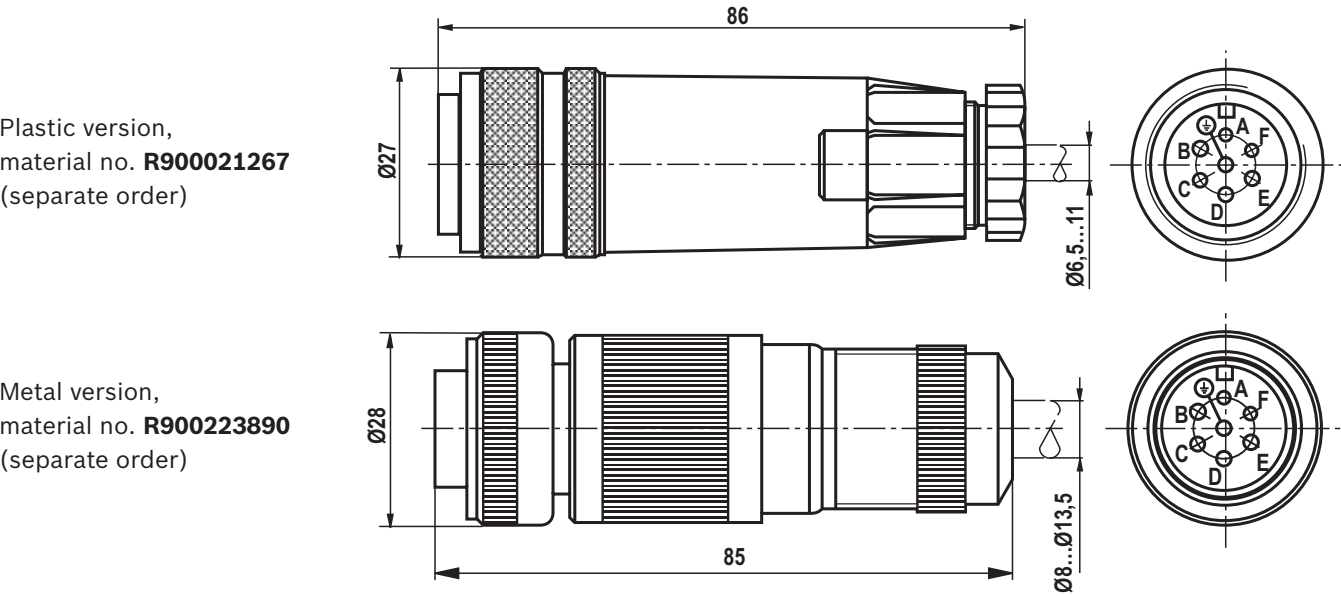
- For more information and data on the use of other hydraulic fluids refer to data sheet 90220, 90221, 90222 respectively 90223 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.
- **Flame-resistant – containing water:**
  - The maximum pressure differential per control edge is 210 bar, otherwise, increased cavitation erosion.
  - Life cycle as compared to operation with mineral oil HLP 30 % to 100 %.
  - Maximum fluid temperature 60 °C.
- **Bio-degradable:** When using bio-degradable hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate in the fluid (700 mg zinc per pole tube).

| electric  |  |  |  |
|---|--|--|--|
| Minimum solenoid current                            | mA   | ≤ 100                                    |  |
| Maximum solenoid current                            | mA   | 1600 ±10 %                               |  |
| Switch-on duration                                  | %  | 100                                      |  |
| Supply voltage                                      | – Nominal voltage  | VDC                                      | 24                                       |
|   | – Lower limit value  | VDC                                      | 18                                       |
|   | – Upper limit value  | VDC                                      | 36                                       |
| Current consumption                                 | A  | ≤ 1.5 (I <sub>max</sub> 2 A is possible) |  |
| Required fuse protection                            | A  | 2, time-lag                              |  |
| Inputs  | – Voltage  | V  | 0 to 10                                  |
| Pressure command value                              | – Current  | mA                                       | 4 to 20                                  |
| Outputs   | – Voltage  | V  | 0 to 10 ± 0 to 100 % of nominal pressure |
| Actual pressure value                               | – Current  | mA                                       | 4 to 20 ± 0 to 100 % of nominal pressure |
| Protection class of the valve according to EN 60529 | IP 65 with mating connector mounted and locked   |  |  |
| Conformity  | CE according to EMC Directive 2004/108/EC<br>Tested according to EN 61000-6-2 and EN 61000-6-3 |  |  |

Electrical connection (dimensions in mm)

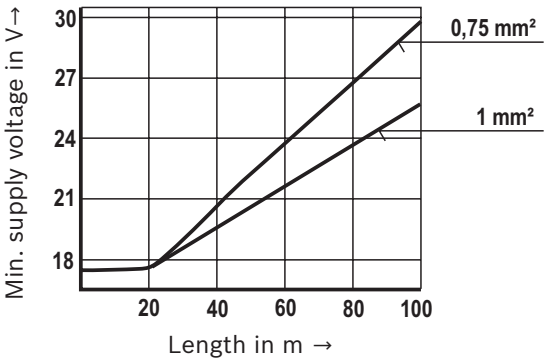
| Connector pin assignment         | Contact | Allocation interface "A1"   | Allocation interface "F1"                        |
|----------------------------------|---------|---|--|
| Supply voltage                   | A       | 24 VDC ( $u(t) = 18\text{ V to }36\text{ V}$ ); $I_{\text{max}} \leq 2.0\text{ A}$  |  |
|                                  | B       | 0 V   |  |
| Reference potential actual value | C       | Reference potential for contact F;<br>at $R_i$ (drain) < 50 k $\Omega$ connect<br>(star-like) to ground $\perp$ on the control side | Reference contact F                              |
| Differential amplifier input     | D       | 0 to 10 V; $R_E > 100\text{ k}\Omega$   | 4 to 20 mA; $R_E = 100\text{ }\Omega$            |
|                                  | E       | Reference potential command value   |  |
| Actual pressure value            | F       | 0 to +10 V actual value; $I_{\text{max}} = 5\text{ mA}$   | 4 to 20 mA; maximum load resistance 600 $\Omega$ |
| Protective ground                | PE      | Connected to solenoid and valve housing   |  |

Mating connectors according to DIN EN 175201-804, solder contacts for line cross-section 0.5 to 1.5 mm²



Connection cable <sup>1)</sup>

- Recommendation 6-wire, 0.75 or 1 mm² plus protective grounding conductor and screening
  - Only connect the screening to PE on the supply side
  - Maximum admissible length = 100 m
- The minimum supply voltage at the power supply unit depends on the length of the supply line (see diagram).



<sup>1)</sup> To comply with the provisions of EMC directive 2004/108/EC the metal version mating connector (R900223890) and a screened cable are required.

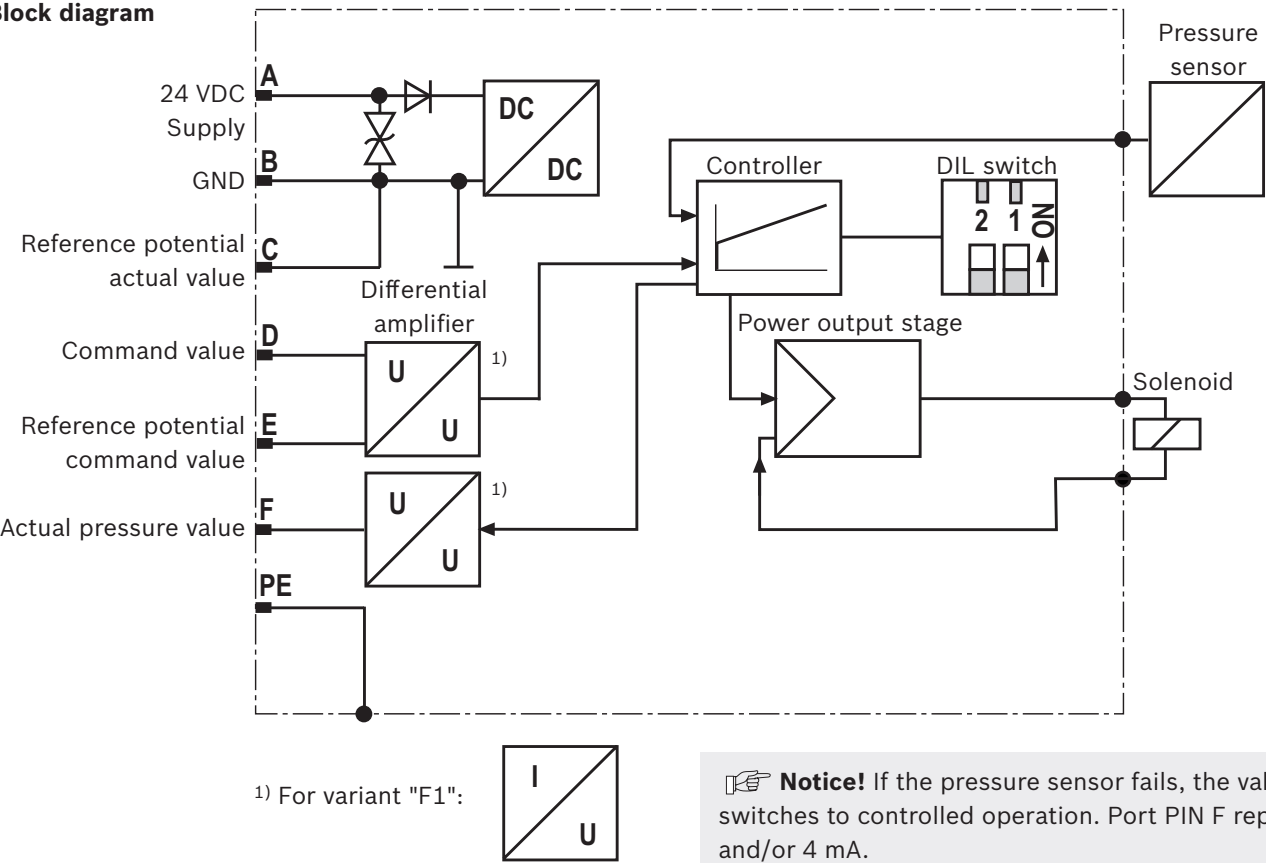
Integrated electronics (OBE)

Function

The electronics are supplied with voltage via ports A and B. The command value is applied to the differential amplifier ports D and E. The actual pressure value is captured by the integrated pressure sensor. The pressure command value is processed in the controller and compared to the actual pressure value. The power output stage processes the control output of the controller and controls the solenoid current.

The actual pressure value is reported at port F (reference port C).  
With the DIL switch, the controller characteristics can be adjusted to certain applications (see table "DIL switch position").  
For the system analysis, the pressure controller can be deactivated using the DIL switches. This corresponds to the function of a force-controlled pressure relief valve (DBETE).

Block diagram



- Notice!** If the pressure sensor fails, the valve switches to controlled operation. Port PIN F reports 0 V and/or 4 mA.
- Notice!** If the flow changes, the pressure controller is automatically adjusted to these operating conditions. In the first cycles, this may lead to changes in the transition behavior.

DIL switch position

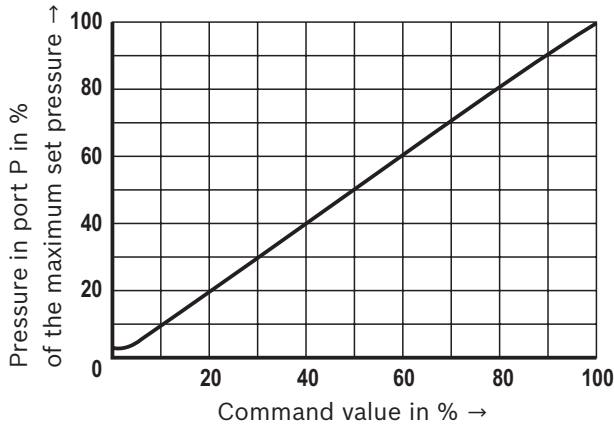
| Switch (position) |     | Function  | Examples of application  |
|-------------------|-----|---|--|
| 2                 | 1   |   |  |
| off               | off | open loop pressure, without sensor              | Commissioning / system analysis  |
| off               | on  | smallest dead volume (from 20 cm <sup>3</sup> ) | Systems with little damping  |
| on                | off | pilot operated, large dead volume               | Pilot valve for logic e.g. LC40  |
| on                | on  | pilot operated, small dead volume               | Pilot valve for logic e.g. LC16, LC25<br>Remote pump control DRG control |

Adjust the switch position of the application before the commissioning.  
Default setting: both switches to on (pilot operated, small dead volume)

## Characteristic curves

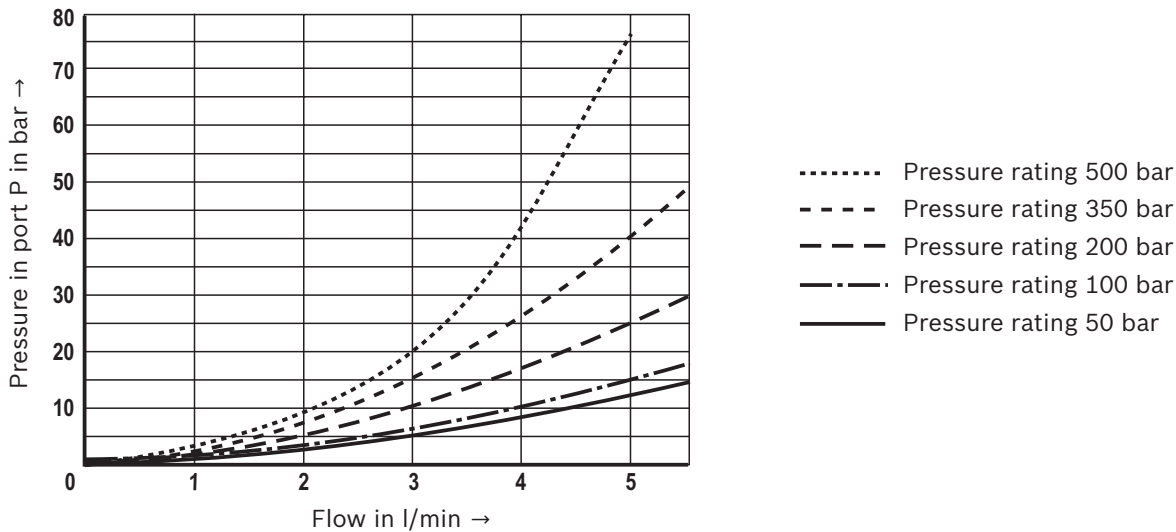
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^{\circ}\text{C}$ )

**Pressure in port P depending on the command value** (flow = 0.8 l/min)

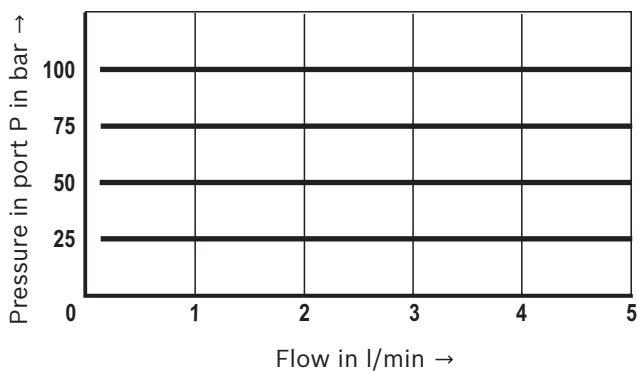


**Minimum set pressure in port P with command value 0 V and/or 4 mA depending on the flow**

(return flow pressure = 0 bar)



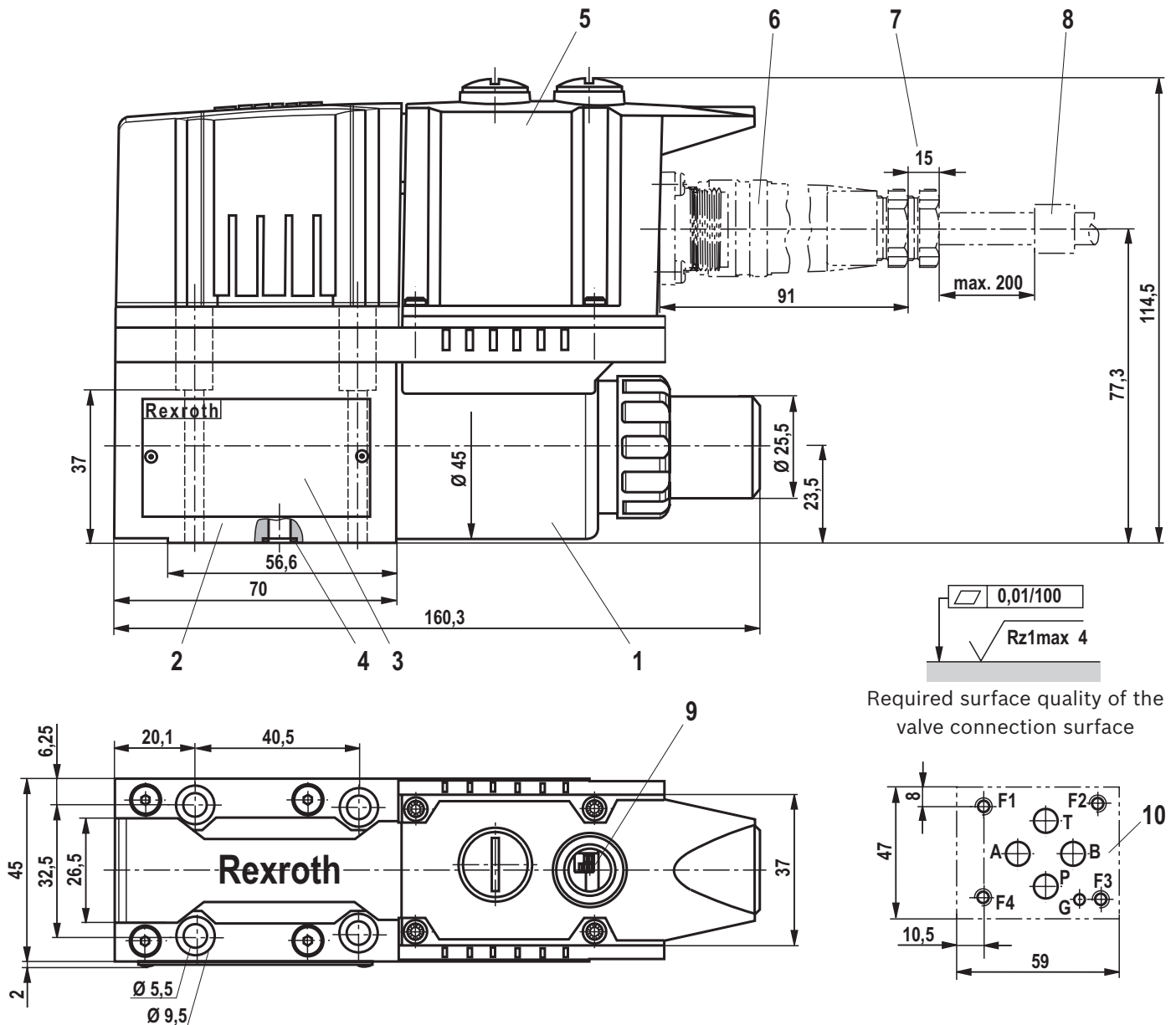
**Pressure in port P depending on the flow** (applies to all pressure ratings)





## Dimensions:

(dimensions in mm)



- 1 Proportional solenoid
- 2 Valve housing
- 3 Name plate
- 4 Identical seal rings for ports P, T, A and B
- 5 Integrated electronics (OBE)
- 6 Mating connector
- 7 Space required for removing the mating connector
- 8 Cable fastening

- 9 DIL switch for adjustment to various line volumes (see page 7)
- 10 Valve connection surface, porting pattern according to ISO 4401-03-02-0-05  
Deviating from the standard:  
"A" channel not drilled, blind counterbore with sealing  
"B" channel not drilled, blind counterbore with sealing (with version "P")  
Locating pin not included in the scope of delivery

### Notice!

The dimensions are nominal dimensions which are subject to tolerances.

**For valve mounting screws and subplates, see page 10.**

## Dimensions

| Hexagon socket head cap screws |  | Material number |
|--------------------------------|--|-----------------|
| Size 6                         | 4x ISO 4762 - M5 x 45 - 10.9-flZn-240h-L<br>Tightening torque $M_A = 6 \text{ Nm} \pm 10 \%$ | R913000140      |

**Notice:** The tightening torque of the hexagon socket head cap screws refers to the maximum operating pressure!

| Subplates (only admissible up to 350 bar) | Data sheet | Material number |
|---|------------|-----------------|
| G 341/01 (G1/4)                           | 45052      | R900424447      |
| G 341/60 (G3/8)                           | 45052      | R901027119      |

## Accessories (not included in the scope of delivery)

| Mating connectors (details see page 6)           | Data sheet | Material number                            |
|--|------------|--|
| Mating connectors according to DIN EN 175201-804 | 08006      | R900021267 (plastic)<br>R900223890 (metal) |

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