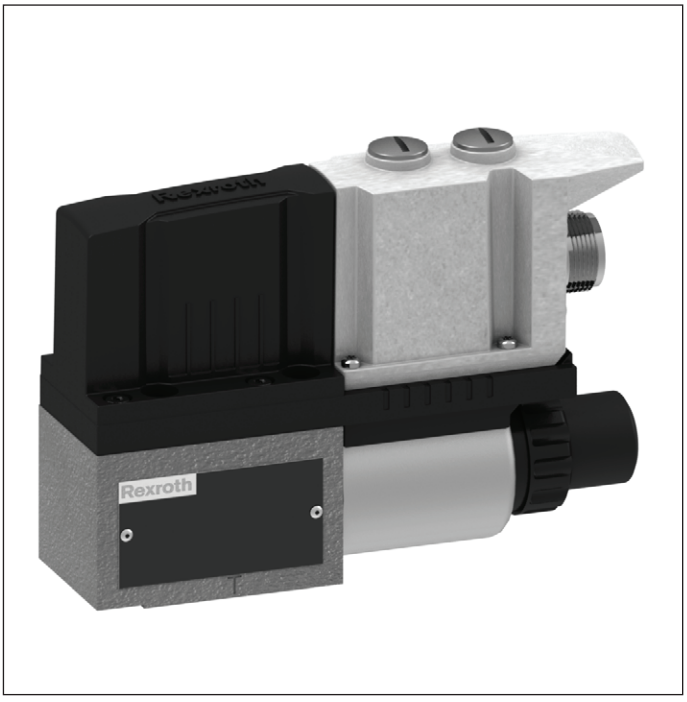
Pressure-controlled directly operated proportional pressure relief valve with integrated electronics (OBE)

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

CE

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

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**

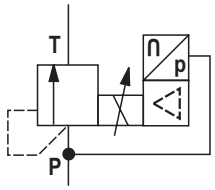
Seal material

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

Version P



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

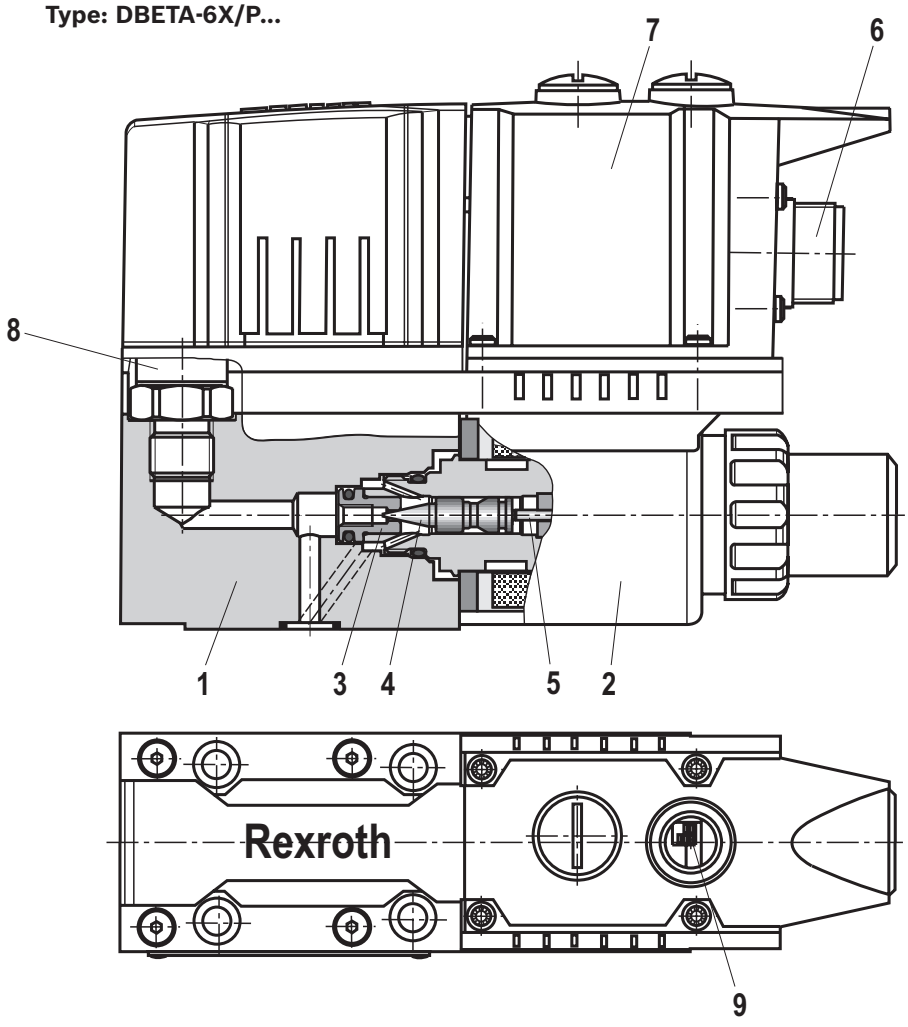
The supply voltage and the command value are applied to the connector (6). Depending on the command value the electronics converts the input signal into current. The proportional solenoid converts the electric current into mechanical force that acts directly on the valve poppet (4) via the armature plunger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

general			
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_{RMS} / 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

hydraulic			
Maximum operating pressure for pressure rating 200, 350 and 500 bar [1]	– Port P, A, B	bar	500
Maximum operating pressure for pressure rating 100 bar [1]	– Port P	bar	300
Maximum operating pressure for pressure rating 50 bar [1]	– Port P	bar	125
Return flow pressure	– Port T	bar	Ideally at zero pressure to the tank [2]
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 [3]		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^2/s	20 ... 380, preferably 30 to 46
Maximum permitted degree of contamination of the hydraulic fluid Cleanliness class according to ISO 4406 (c)			Class 20/18/15 [4]
Hysteresis		%	< 1 of the maximum set pressure [5]
Range of inversion		%	< 0,25 of the maximum set pressure [5]
Response sensitivity		%	< 0,25 of the maximum set pressure [5]
Linearity		%	±1 of the maximum set pressure [5]
Step response (Tu + Tg) Line volume ~20 cm^3; $\boldsymbol{q}$ = 0.8 l/min	10 % → 90 %	ms	165 (depending on the system)
	90 % → 10 %	ms	88 (depending on the system)

1) 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

2) 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.

3) Recommended operation range $\boldsymbol{q}$ > 0,5 l/min.

4) 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

5) 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).

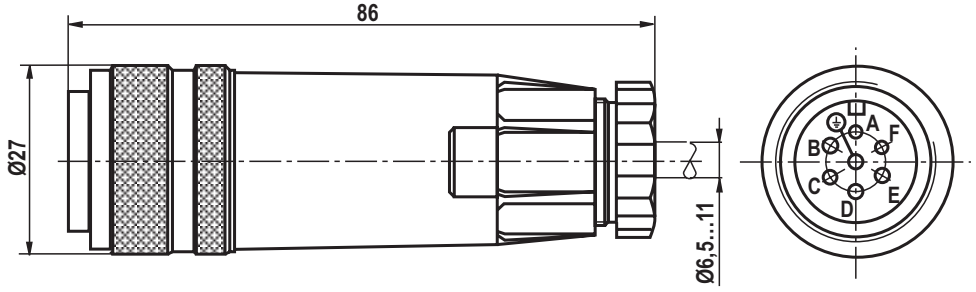
electric			
Minimum solenoid current		mA	≤ 100
Maximum solenoid current		mA	1600 ±10 %
Switch-on duration		%	100
Supply voltage	– Nominal voltage	VDC	24
	– Lower limit value	VDC	18
	– Upper limit value	VDC	36
Current consumption		A	≤ 1.5 (I_{max} 2 A is possible)
Required fuse protection		A	2, time-lag
Inputs Pressure command value	– Voltage	V	0 to 10
	– Current	mA	4 to 20
Outputs Actual pressure value	– Voltage	V	0 to 10 ≙ 0 to 100 % of nominal pressure
	– 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 Tested according to EN 61000-6-2 and EN 61000-6-3

Electrical connection (dimensions in mm)

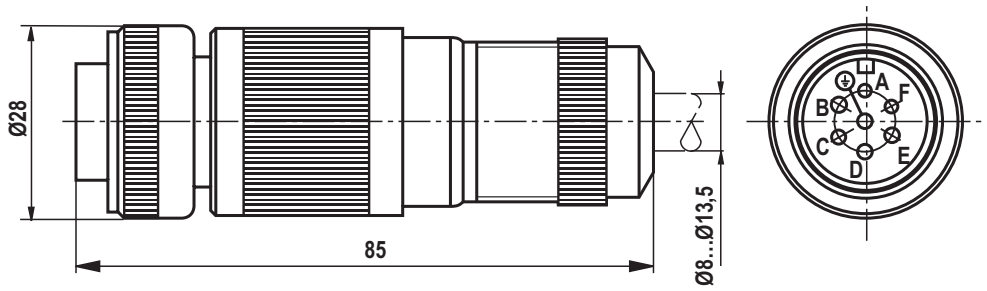
Connector pin assignment	Contact	Allocation interface "A1"	Allocation interface "F1"
Supply voltage	A	24 VDC (u(t) = 18 V to 36 V); I_{max} ≤ 2.0 A	
	B	0 V	
Reference potential actual value	C	Reference potential for contact F; at R_i (drain) < 50 kΩ connect (star-like) to ground ⊥ on the control side	Reference contact F
Differential amplifier input	D	0 to 10 V; R_E > 100 kΩ	4 to 20 mA; R_E = 100 Ω
	E	Reference potential command value	
Actual pressure value	F	0 to +10 V actual value; I_{max} = 5 mA	4 to 20 mA; maximum load resistance 600 Ω
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

Plastic version,
material no. **R900021267**
(separate order)

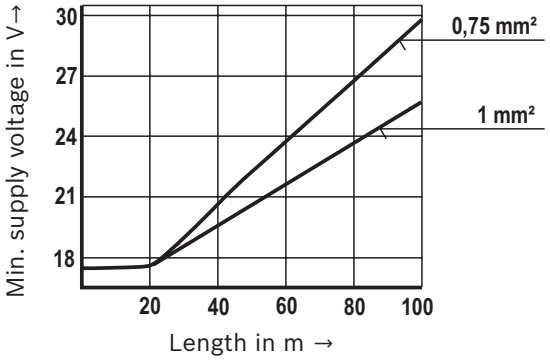


Metal version,
material no. **R900223890**
(separate order)



Connection cable [1)]
- 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).



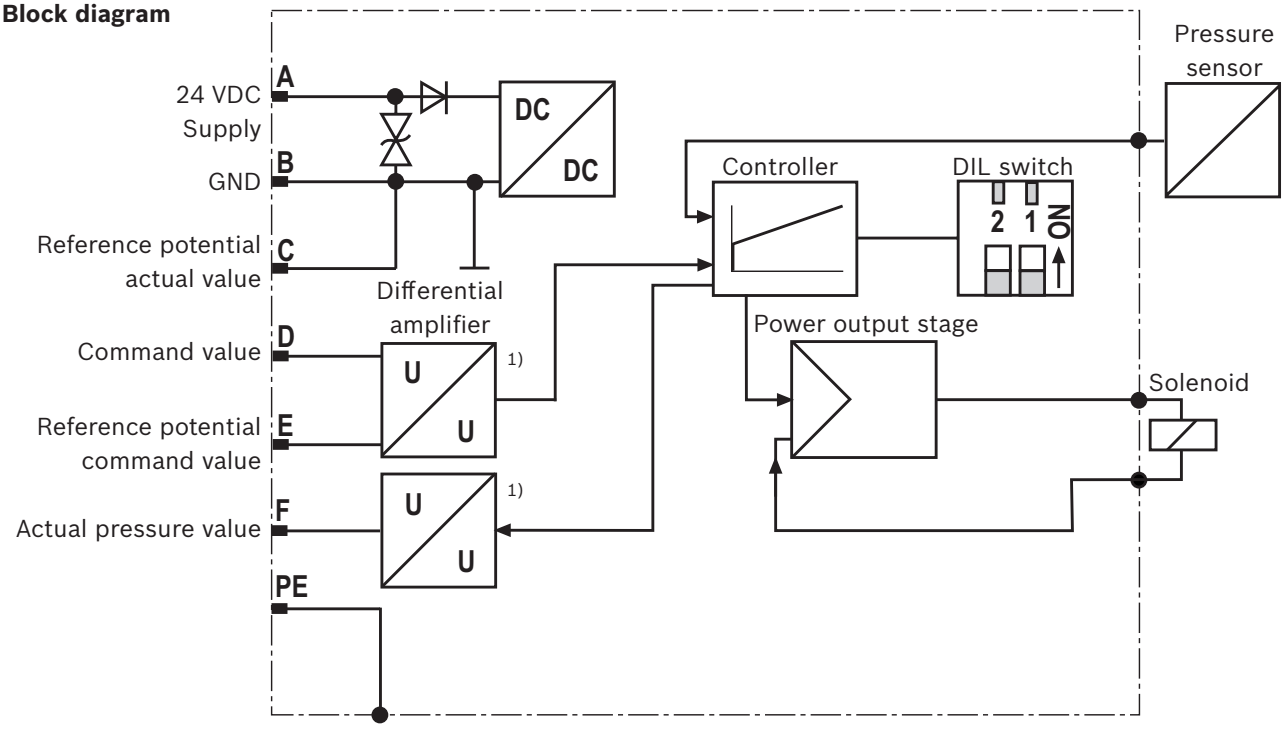
[1)] To comply with the provisions of EMC directive 2004/108/EC the metal version mating connector (R900223890) and a screened cable are required.

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



1) For variant "F1":

☞ **Notice!** If the pressure sensor fails, the valve switches to controlled operation. Port PIN F reports 0 V and/or 4 mA.

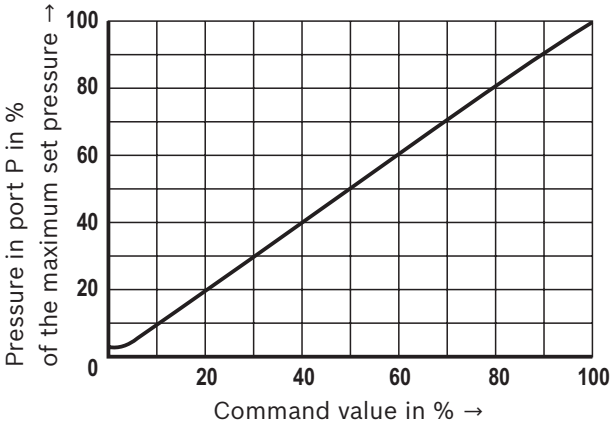
☞ **Notice!** If the flow changes, the pressure controller is automatically adjusted to these operating conditions. In the first cycles, this may lead to changes in the transition behavior.

DIL switch position

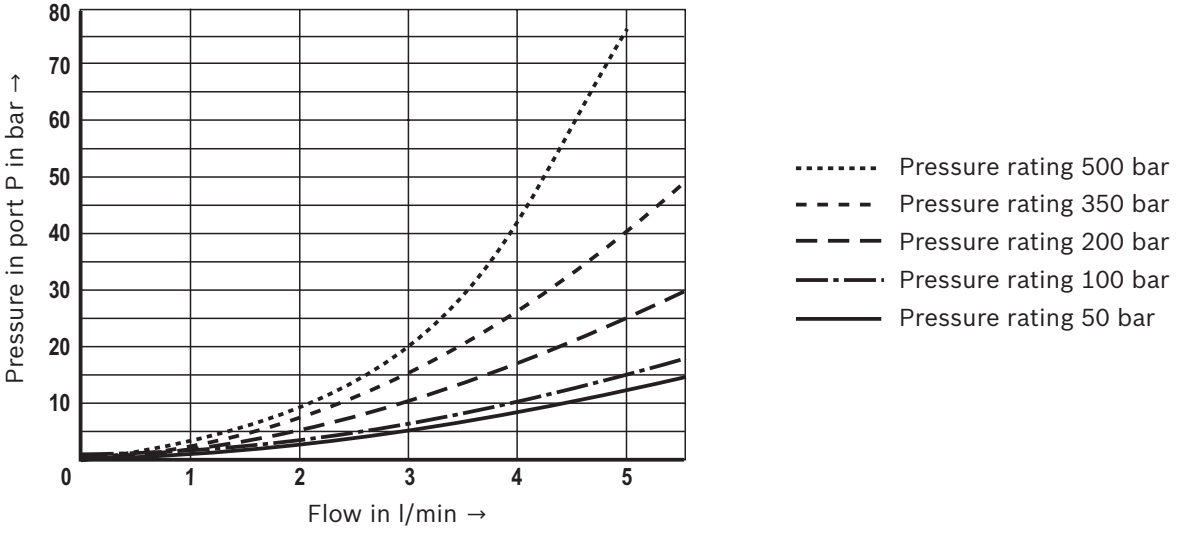
Switch (position)		Function	Examples of application
2	1		
off	off	open loop pressure, without sensor	Commissioning / system analysis
off	on	smallest dead volume (from 20 cm^3)	Systems with little damping
on	off	pilot operated, large dead volume	Pilot valve for logic e.g. LC40
on	on	pilot operated, small dead volume	Pilot valve for logic e.g. LC16, LC25 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, ϑ_{Oil} = 40 ±5 °C)

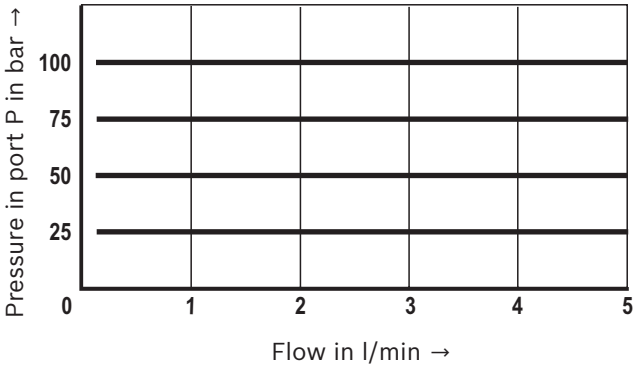
Pressure in port P depending on the command value (flow = 0.8 l/min)



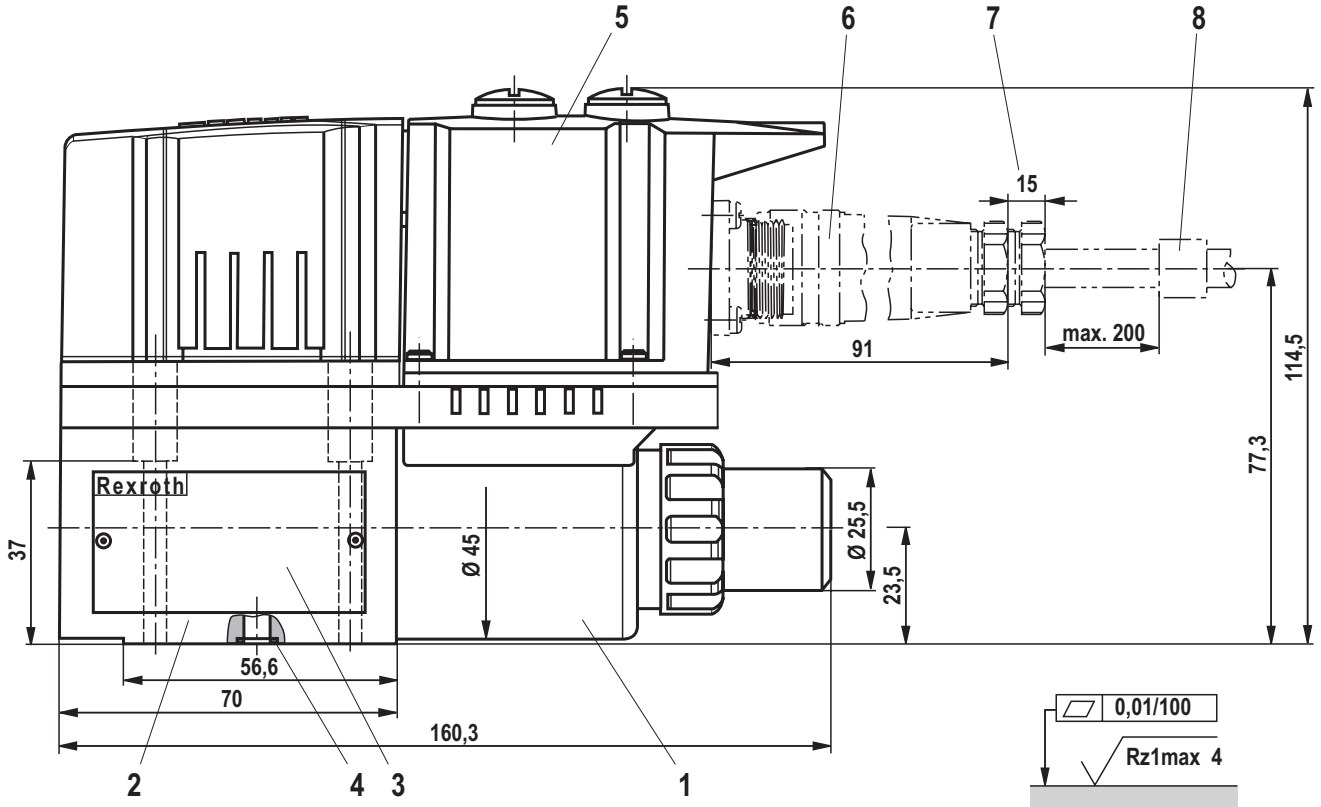
Minimum set pressure in port P with command value 0 V and/or 4 mA depending on the flow
(return flow pressure = 0 bar)



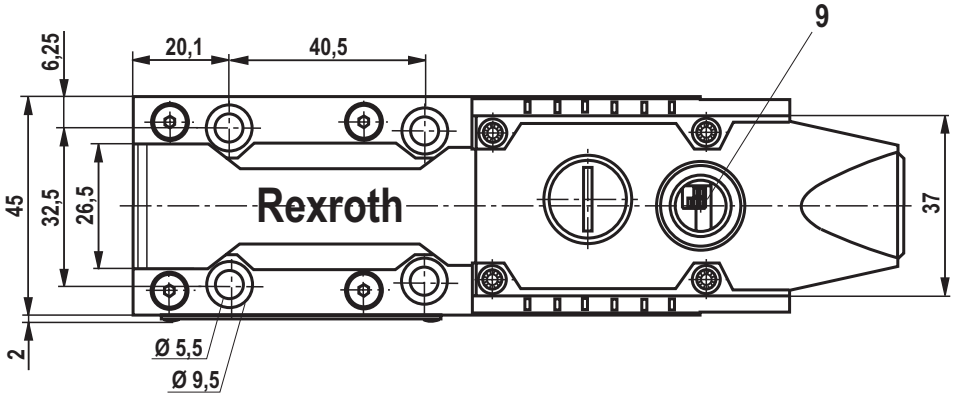
Pressure in port P depending on the flow (applies to all pressure ratings)

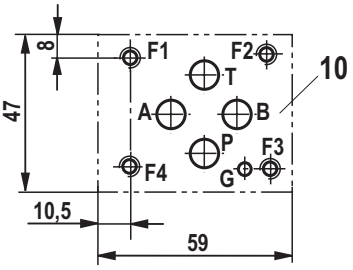


Dimensions:
(dimensions in mm)



Required surface quality of the valve connection surface





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 Tightening torque M_A = 6 Nm ±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) R900223890 (metal)

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