

Proportional pressure reducing valve, pilot-operated

Type DRE(E) and ZDRE(E)



- ▶ Size 6
- ▶ Component series 1X
- ▶ Maximum operating pressure 210 bar (DRE)
315 bar (ZDRE)
- ▶ Maximum flow 30 l/min



Features

- ▶ For pressure reduction in ports A and P[Ⓢ] with pressure limitation
- ▶ Operation by means of proportional solenoids
- ▶ Subplate mounting
- ▶ Sandwich plate design
- ▶ Porting pattern according to ISO 4401-03-02-0-05
- ▶ Low manufacturing tolerance of the command value pressure characteristic curve due to electrical adjustment for the operation with external control electronics
- ▶ Minimum set pressure in ports A or P[Ⓢ]
- ▶ Optionally with integrated electronics (OBE)
- ▶ CE conformity according to EMC Directive 2014/30/EU

Contents

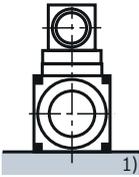
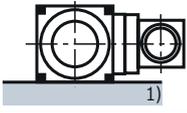
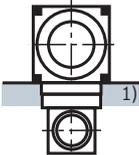
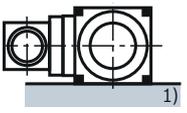
Features	1
Ordering code	2, 3
Symbols	3
Function, section	4, 5
Technical data	6 ... 8
Electrical connections and assignment	9
Characteristic curves	10 ... 14
Dimensions	15 ... 19
Accessories	19
EMC directive requirements	20
Further information	20

Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
	DRE		6			- 1X	/		M	G24				*

01	Subplate mounting	no code
	Sandwich plate design	Z
02	Proportional pressure reducing valve	DRE
03	For external control electronics	no code
	With integrated electronics (OBE)	E
04	Size 6	6
05	Pressure reduction in channel A (subplate mounting)	no code
	Pressure reduction in channel P \odot (sandwich plate design)	VP

Position of the mating connector (only sandwich plate design)

06		1
		2
		3
		4
07	Component series 10 to 19 (10 to 19: unchanged installation and connection dimensions)	1X

Pressure rating

08	50 bar	50
	100 bar	100
	210 bar	210
	315 bar	315²⁾
09	Without check valve	M

Supply voltage

10	Direct voltage 24 V	G24
11	With manual override	N9
	Without manual override	no code

Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
	DRE		6			- 1X	/	M	G24					*

Electrical connection

12	- Type DRE and ZDRE	
	Connector, 3-pole (2 + PE) according to EN 175301-803	K4 ³⁾
	- Type DREE and ZDREE	
	Connector 5-pole, M12 x 1	K24 ³⁾

Electrical interface

13	External control electronics	no code
	Command value input 0 ... 10 V; actual value output 0 ... 10 V	A1
	Command value input 4 ... 20 mA; actual value output 4 ... 20 mA	F1

Seal material (observe compatibility of seals with hydraulic fluid used, see page 7)

14	NBR seals	M
	FKM seals	V
09	For further information, see the plain text	

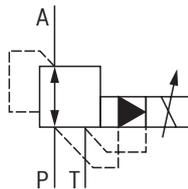
1) Valve contact surface (seal ring recesses in the housing)

2) Only available for "Z" version

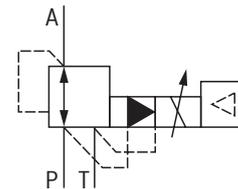
3) Mating connectors and cable sets, separate order, see page 19 and data sheet 08006.

Symbols (① = component side, ② = plate side)

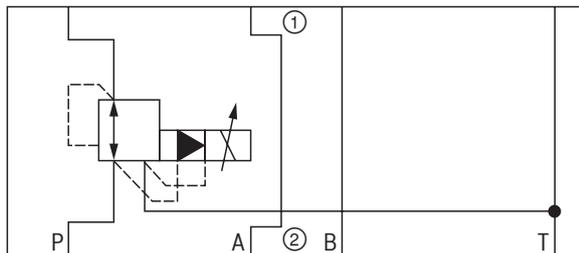
Type DRE



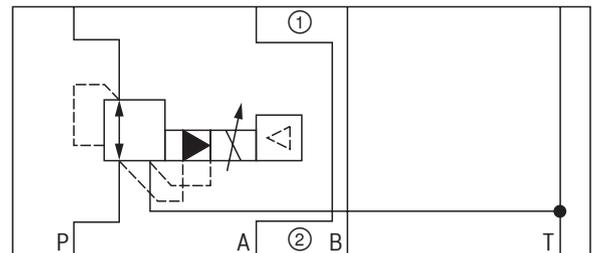
Type DREE



Type ZDRE



Type ZDREE



Function, section: Type (Z)DRE

The valve types DRE and ZDRE are electrically pilot-operated 3-way pressure reducing valves with pressure limitation of the actuator. They are used for reducing a system pressure.

The valve basically consists of a pilot control valve (1), proportional solenoid (2), main valve (3) with main control spool (4).

Type DRE

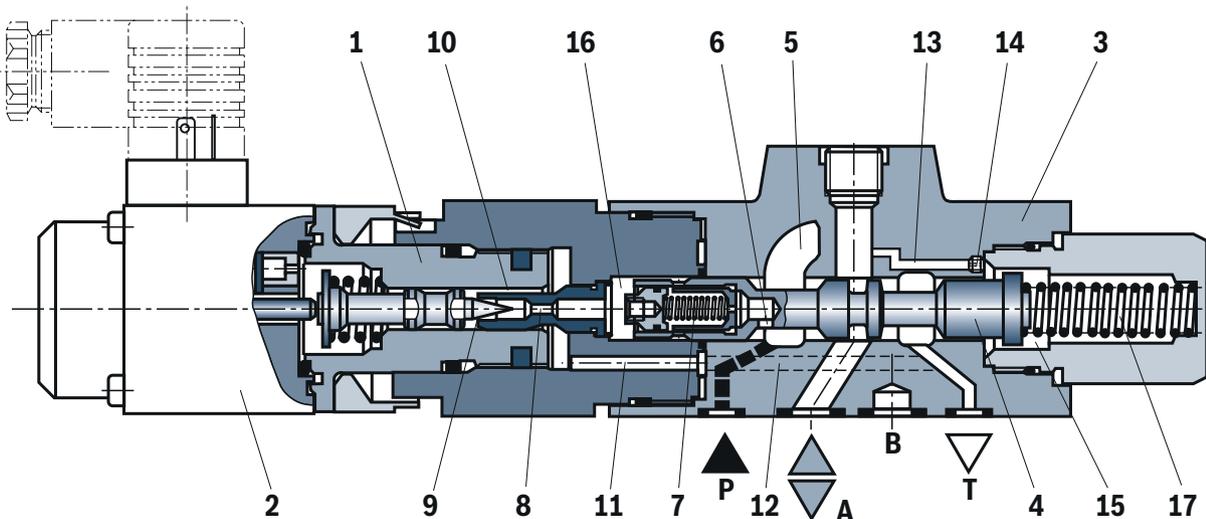
- ▶ Command value-dependent setting of the pressure to be reduced in channel A via the proportional solenoid (2).
- ▶ In the depressurized port P, the spring (17) holds the main control spool (4) in the initial position.
- ▶ Thus, opening the connection from A to T and blocking of the connection from P to A.
- ▶ Pressure connection from port P to the ring channel (5).
- ▶ Pilot oil flows from the bore (6) to port T, via the flow controller (7), the nozzle (8) to the pilot control valve (1), the throttle gap (9) to the longitudinal groove (10) and the bores (11, 12).

- ▶ Pressure reduction
 - Build-up of the pilot pressure in the control chamber (16) as function of the command value.
 - Movement of the main control spool (4) to the right, hydraulic fluid flows from P to A.
 - Actuator pressure pending in port A to the spring chamber (15) via channel (13) and nozzle (14).
 - Increase in the pressure in port A to the set pressure of the pilot control valve (1) leads to the movement of the main control spool (4) to the left. Pressure in port A is almost identical with the set pressure at the pilot control valve (1).
- ▶ Pressure limitation
 - If the pressure in port A exceeds the set pressure of the pilot control valve (1), the main control spool (4) will be moved further to the left.
 - Thus, opening of the connection from A to T and limitation of the pressure pending in port A to the set command value.

Type ZDRE

In principle, the function of this valve version corresponds to the function of type DRE.

However, the pressure is reduced in channel P⊙.



Type DRE ...

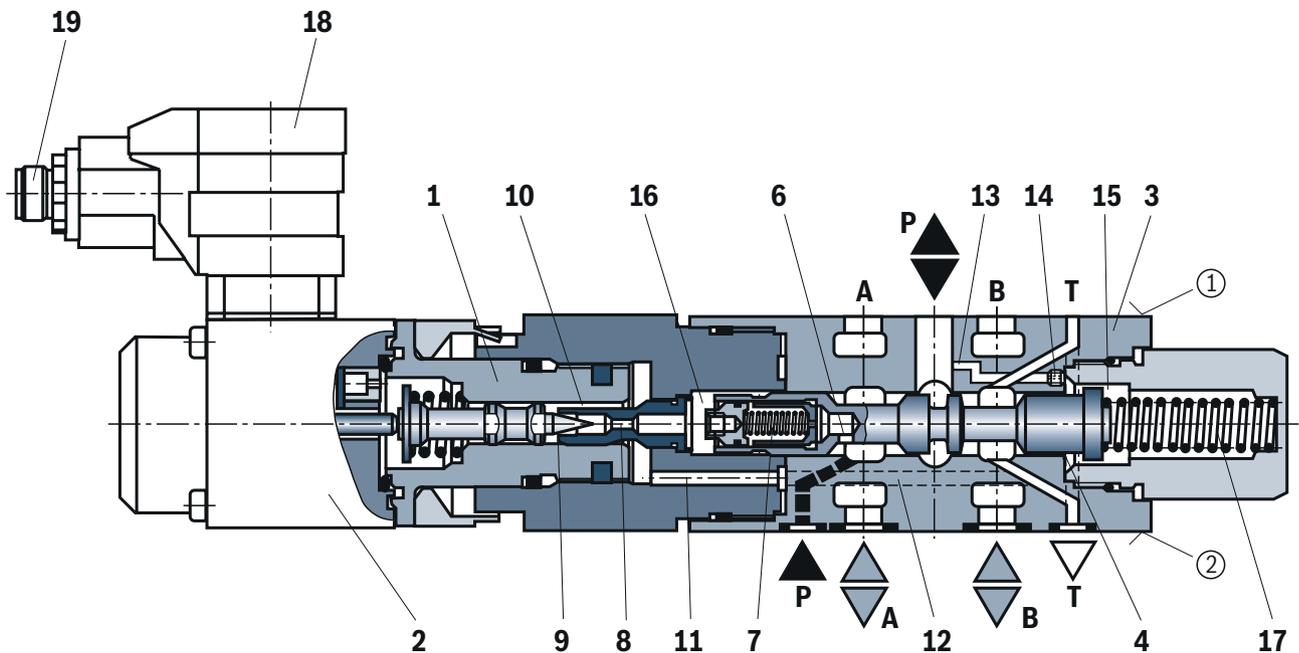
Function, section: Type (Z)DREE

Type (Z)DREE – with integrated electronics (OBE)

With regard to function and set-up, these valves correspond to type (Z)DREE. On the proportional solenoid (2), there is moreover a housing (18) with the control electronics.

Supply and command value voltage or command value current are applied at the connector (19).

At the factory, the command value pressure characteristic curve is adjusted with little manufacturing tolerance.



Type ZDREE ...

- ① = component side
- ② = plate side

Technical data

(For device application outside the specified values, please contact us!)

General			
Type of connection	Subplate mounting; sandwich plate design		
Porting pattern	ISO 4401-03-02-0-05		
Weight	▶ "(Z)DRE"	kg	2.0
	▶ "(Z)DREE"	kg	2.1
Installation position	Any		
Ambient temperature range	▶ "(Z)DRE"	°C	-20 ... +70 (NBR seals) -15 ... +70 (FKM seals)
	▶ "(Z)DREE"		-20 ... +60 (NBR seals) -15 ... +60 (FKM seals)
Storage temperature range (with UV protection)	°C	-20 ... +80	
Maximum storage time	Years	1 (if the storage conditions are observed, refer to the operating instructions 07600-B)	
Maximum relative humidity (no condensation)	%	97	
Protection class according to EN 60529	IP65 (if suitable and correctly mounted mating connectors are used)		
MTTF _D value according to EN ISO 13849	Years	150 (for further details see data sheet 08012)	
Conformity	▶ CE according to EMC Directive 2014/30/EU, tested according to	EN 61000-6-2 and EN 61000-6-3	
	▶ UKCA according to Electromagnetic Compatibility Regulations SI 2016/1091, tested according to	EN 61000-6-2 and EN 61000-6-3	
	▶ RoHS directive	2011/65/EU ¹⁾	

Hydraulic			
Maximum operating pressure	▶ Port P or P②	bar	315
	▶ Port P①, A and B	bar	210
	▶ Port T	bar	Separate and depressurized to the tank
Hydraulic fluid	See table on page 7		
Hydraulic fluid temperature range (at the valve working ports)	°C	-20 ... +80 (NBR seals) -15 ... +80 (FKM seals)	
Viscosity range	mm ² /s	15 ... 380	
Maximum admissible degree of contamination of the hydraulic fluid; cleanliness class according to ISO 4406 (c)	Class 20/18/15 ²⁾		
Maximum flow	l/min	30	
Maximum set pressure (channel P① and A)	bar	50; 100; 210; 315 ³⁾	
Minimum set pressure (command value 0 in port A or P①)	bar	See characteristic curves page 12	
Pilot flow	l/min	0.65	

- 1) The product fulfills the substance requirements of the RoHS directive 2011/65/EU.
- 2) 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.
- 3) Only version "Z".

**Notice:**

EMC directive requirements see page 20.

Technical data

(For device application outside the specified values, please contact 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	ISO 15380	90221
		HEES		
	▶ Soluble in water	HEPG	ISO 15380	
Flame-resistant	▶ Water-free	HFDU (glycol base)	ISO 12922	90222
		HFDU (ester base)		
		HFDR		
	▶ Containing water	HFC (Fuchs: Hydrotherm 46M, Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	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.
- Dependent on the hydraulic fluid used, the maximum environment 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		%	±2.5 ⁴⁾
Range of inversion		%	<0.1
Response sensitivity		%	<0.1
Manufacturing tolerance ⁵⁾	▶ "(Z)DRE"	%	±2 ⁴⁾
	▶ "(Z)DREE"	%	±3 ⁴⁾
Linearity		%	±3.5 ⁴⁾
Repetition accuracy		%	<±2 ⁴⁾

⁴⁾ Of the maximum set pressure

⁵⁾ Manufacturing tolerance of the command value pressure characteristic curve, related to the hysteresis characteristic curve, pressure increasing.

Technical data

(For device application outside the specified values, please contact us!)

Electrical			
Supply voltage	▶ Nominal value	VDC	24
Minimum solenoid current		mA	100
Maximum solenoid current		mA	1600
Solenoid coil resistance	▶ Cold value at 20 °C	Ω	5
	▶ Maximum hot value	Ω	7.5
Relative duty cycle time according to VDE 0580			S1 (continuous operation)

Electrical, integrated electronics (OBE) – interface "A1"				
Supply voltage	▶ Nominal value	VDC	24	
	▶ Minimum	VDC	18	
	▶ Maximum	VDC	35	
	▶ Maximum residual ripple	V _{pp}	2.5	
	▶ Maximum power consumption	VA	<40	
	▶ Current consumption during operation ⁶⁾			
	– Rated current	A _{eff}	<1.7	
	– Impulse current	A	3.2	
	▶ Fuse protection, external	A _T	2.0 (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 9	
Command value (differential amplifier)	▶ Measurement range	V	0 ... 10	
	▶ Input resistance	kΩ	>100	

Electrical, integrated electronics (OBE) – interface "F1"				
Supply voltage	▶ Nominal value	VDC	24	
	▶ Minimum	VDC	18	
	▶ Maximum	VDC	35	
	▶ Maximum residual ripple	V _{pp}	2.5	
	▶ Maximum power consumption	VA	<40	
	▶ Current consumption during operation ⁶⁾			
	– Rated current	A _{eff}	<1.7	
	– Impulse current	A	3.2	
	▶ Fuse protection, external	A _T	2.0 (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 9	
Command value	▶ Input current range	mA	4 ... 20	
	▶ Input resistance	Ω	>100	

⁶⁾ The making current peak is usually higher (depending on power supply unit, supply line, and capacities).

Electrical connections and assignment

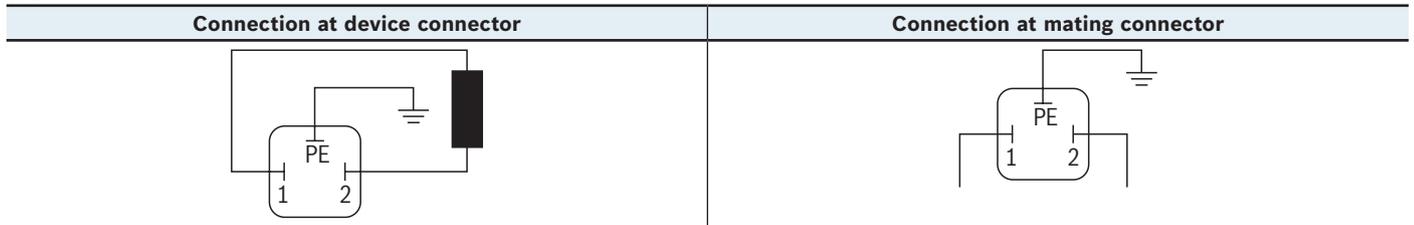
Connector pin assignment, 4-pole

Pin	Interface assignment	
	"A1"	"F1"
1	Supply voltage	Supply voltage
2	Command value	Command value
3	GND	GND
4	Reference potential command value	Reference potential command value

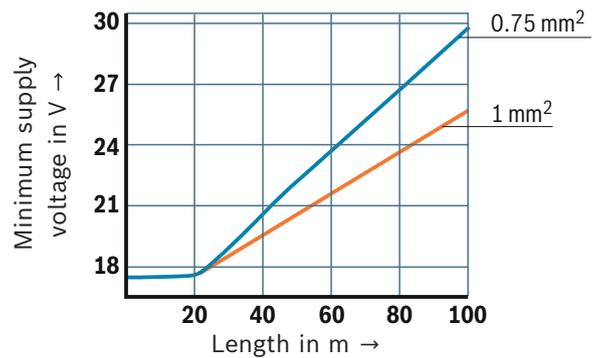

Notice:

Cable sets, separate order, see page 19 and data sheet 8006.

Type (Z)DRE

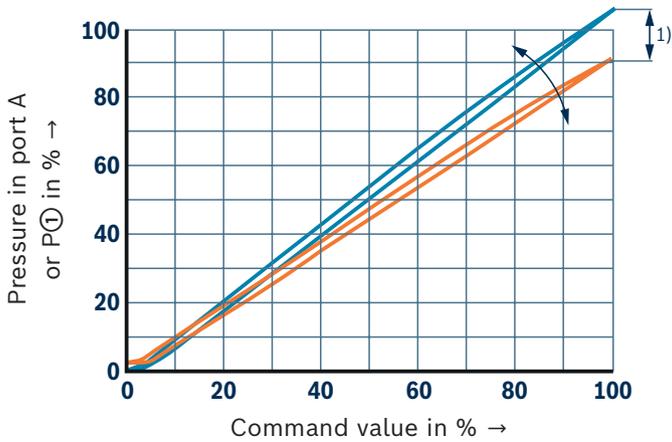

Connection cable (recommendation):

- ▶ 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).



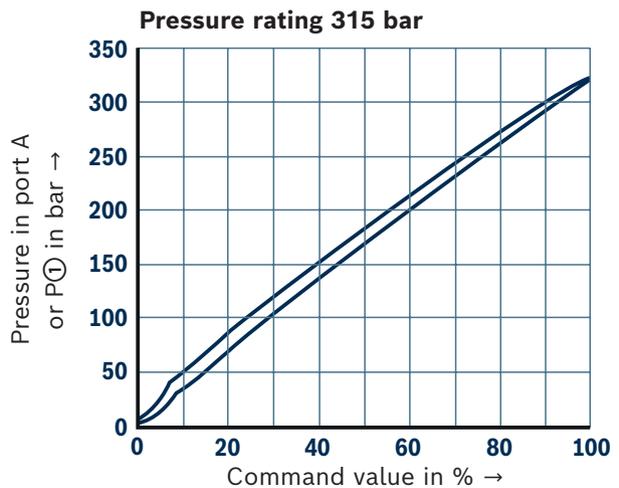
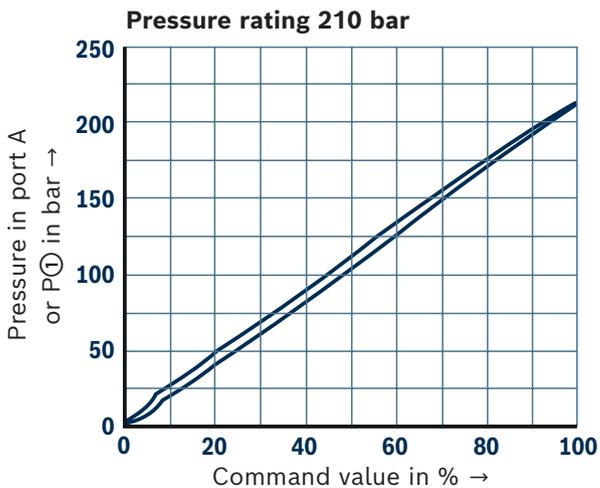
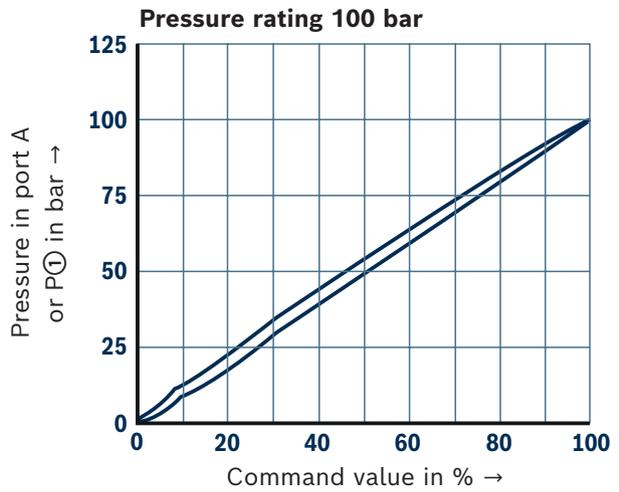
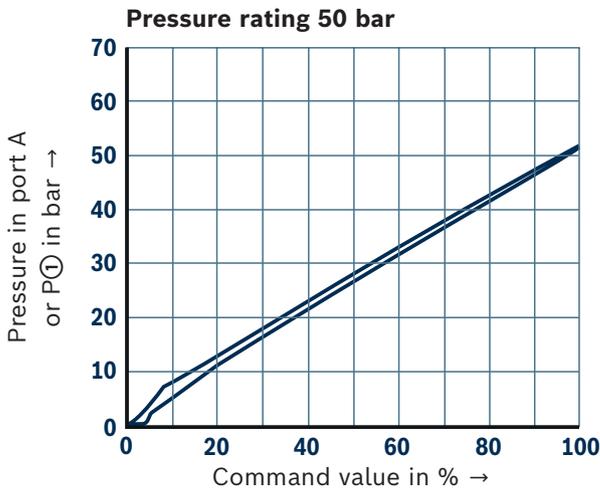
Characteristic curves: Type (Z)DRE
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ } ^\circ\text{C}$)

Pressure in port A or P[ⓐ] dependent on the command value (manufacturing tolerance)



1) In order to be able to adjust several valves to the same characteristic curve, the manufacturing tolerance can - with version "(Z)DRE" - be changed at the external amplifier (see page 19) using the command value attenuator "G". In this connection, do not set the pressure higher than the maximum set pressure of the pressure rating with command value 100%.

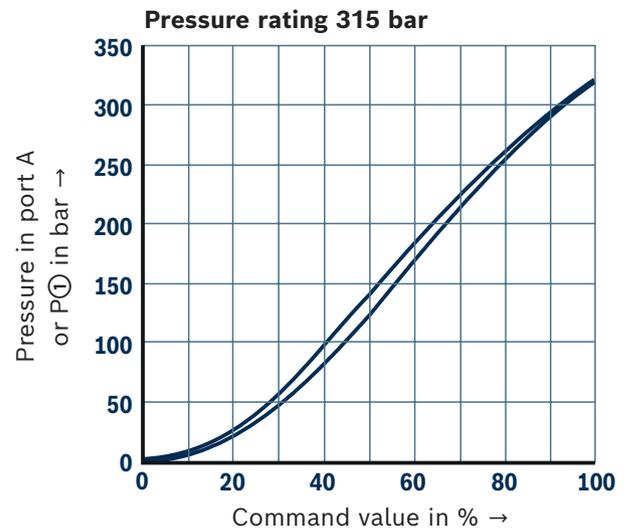
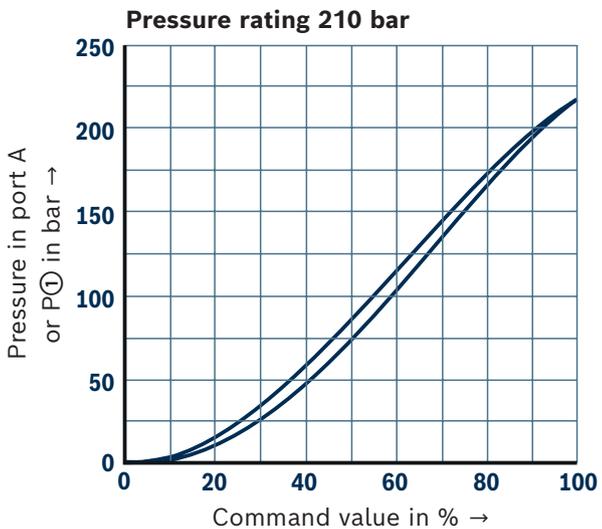
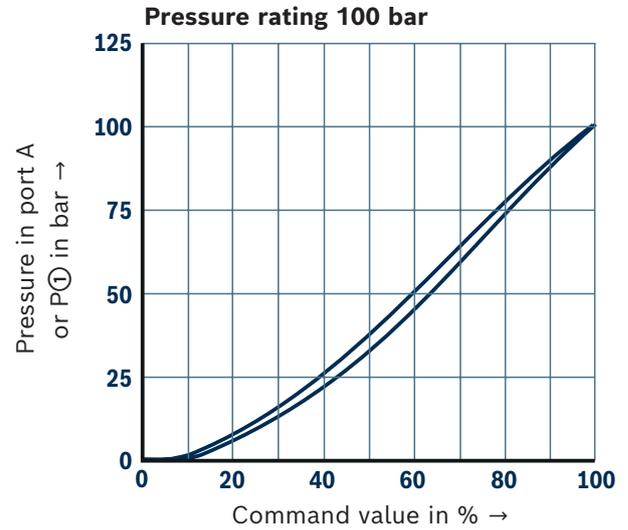
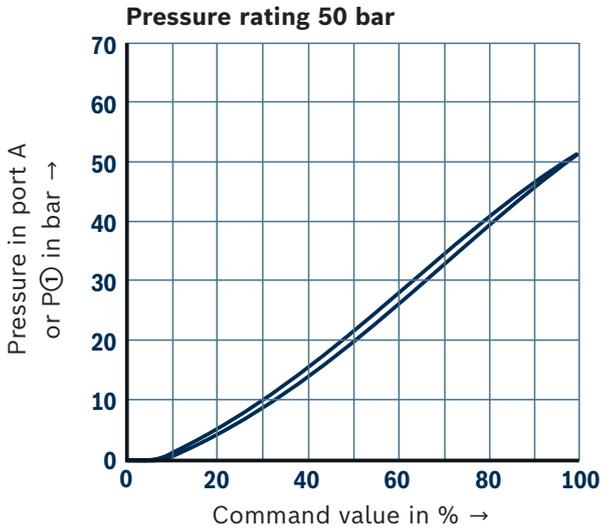
Pressure in port A or P[ⓐ] dependent on the command value



Notice:
Typical characteristic curves which are subject to tolerance variations.

Characteristic curves: Type (Z)DREE
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ } ^\circ\text{C}$)

Pressure in port A or P① dependent on the command value



Notice:

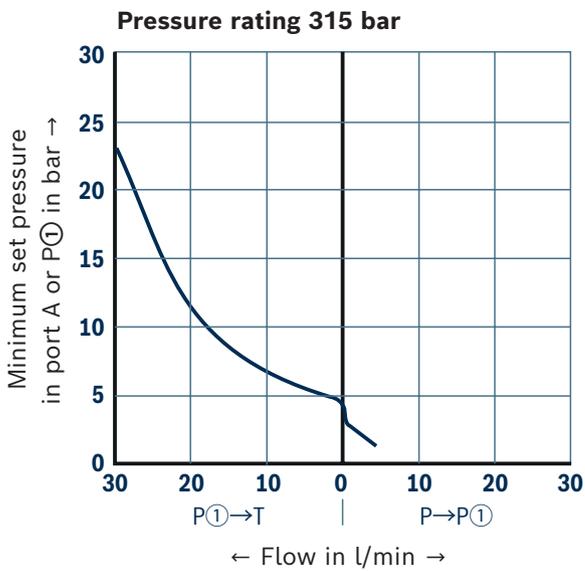
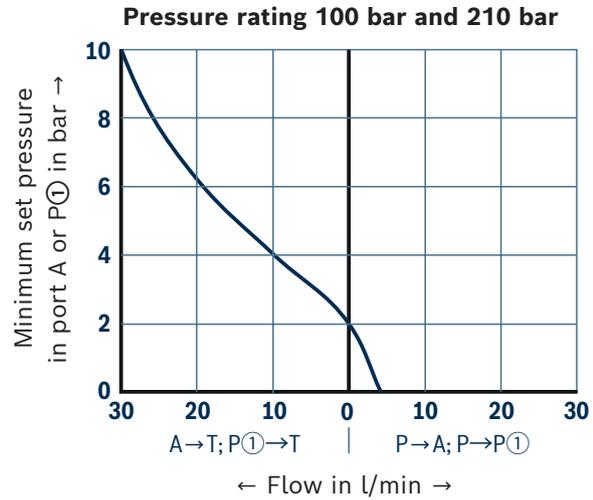
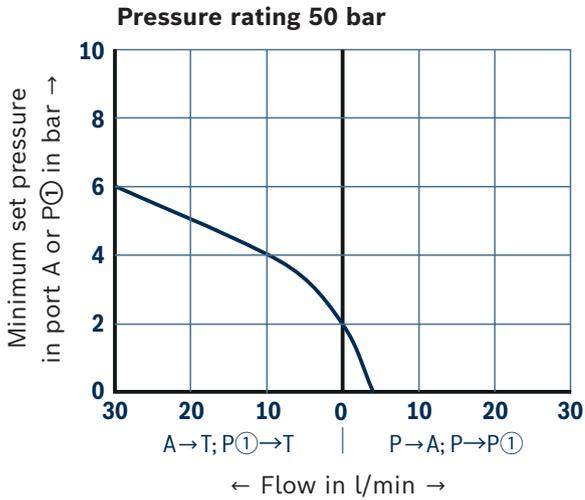
Typical characteristic curves which are subject to tolerance variations.

Characteristic curves

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

Minimum set pressure in port A or P① dependent on the flow

(Command value 0 V; without counter pressure in channel T)



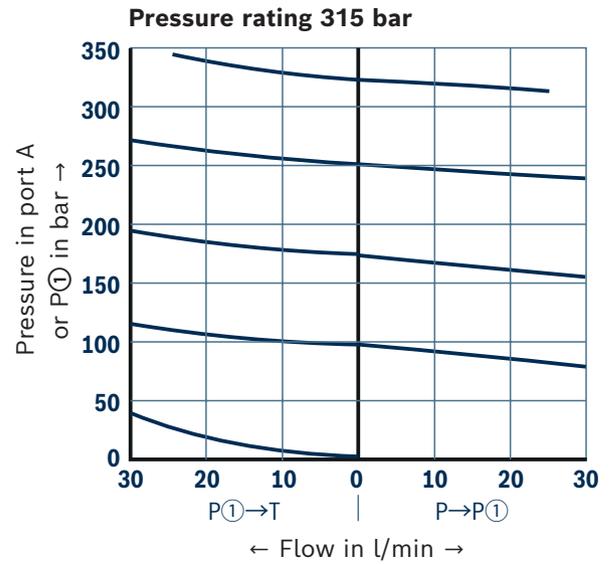
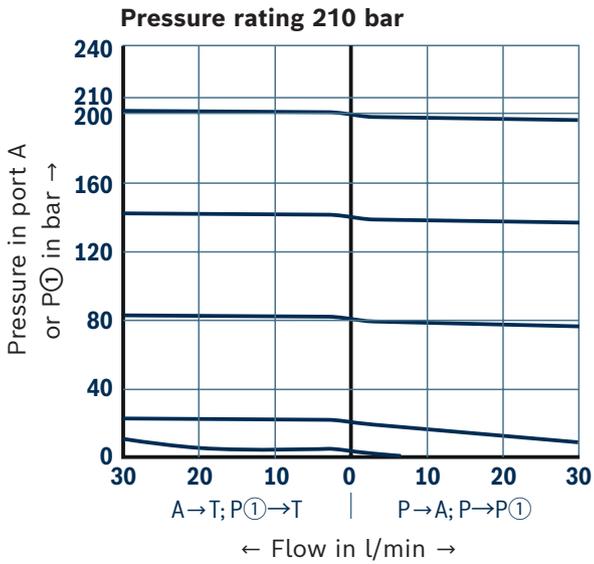
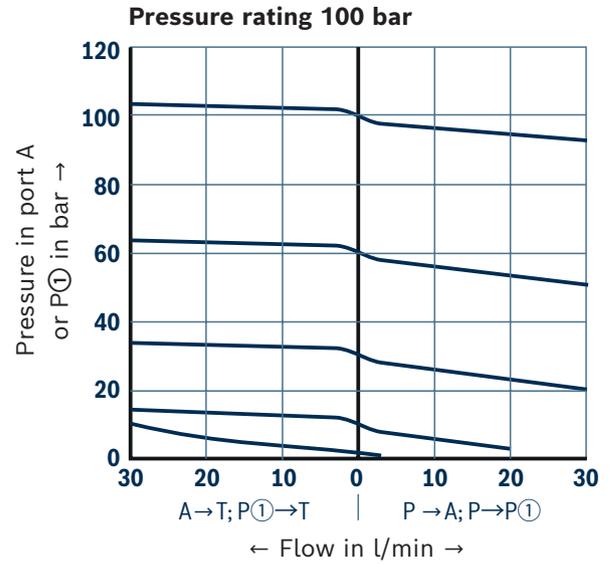
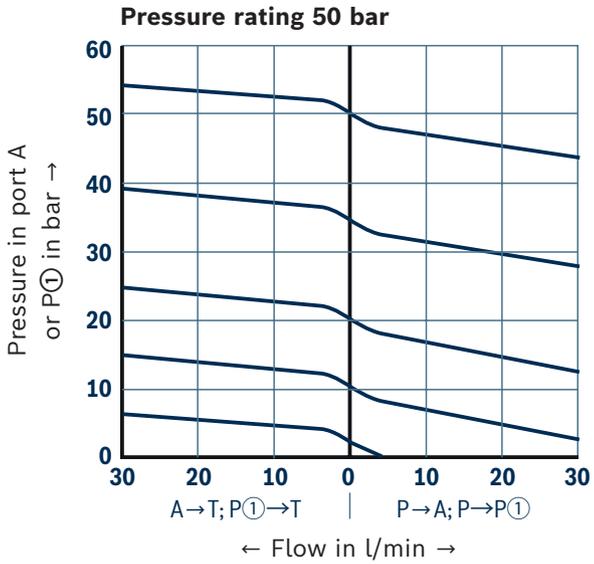
Notice:

Typical characteristic curves which are subject to tolerance variations.

Characteristic curves

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

Pressure in port A or P① dependent on the flow



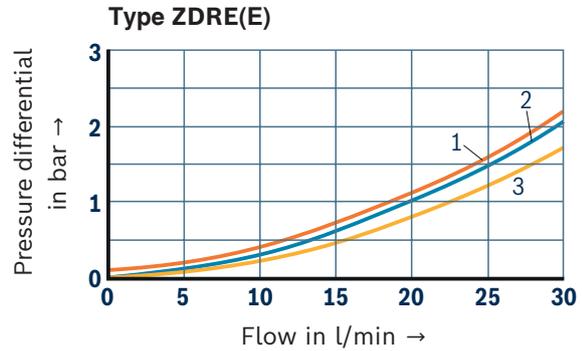
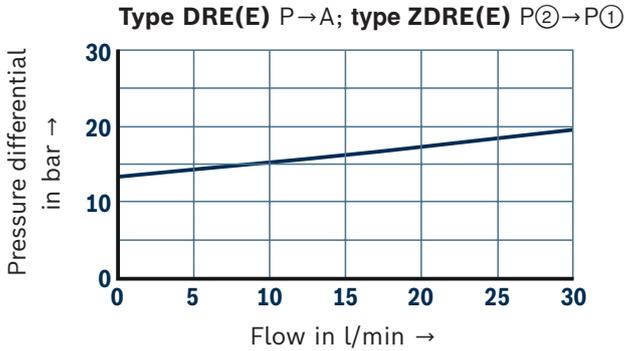
Notice:

Typical characteristic curves which are subject to tolerance variations.

Characteristic curves

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

Δp - q_v characteristic curves



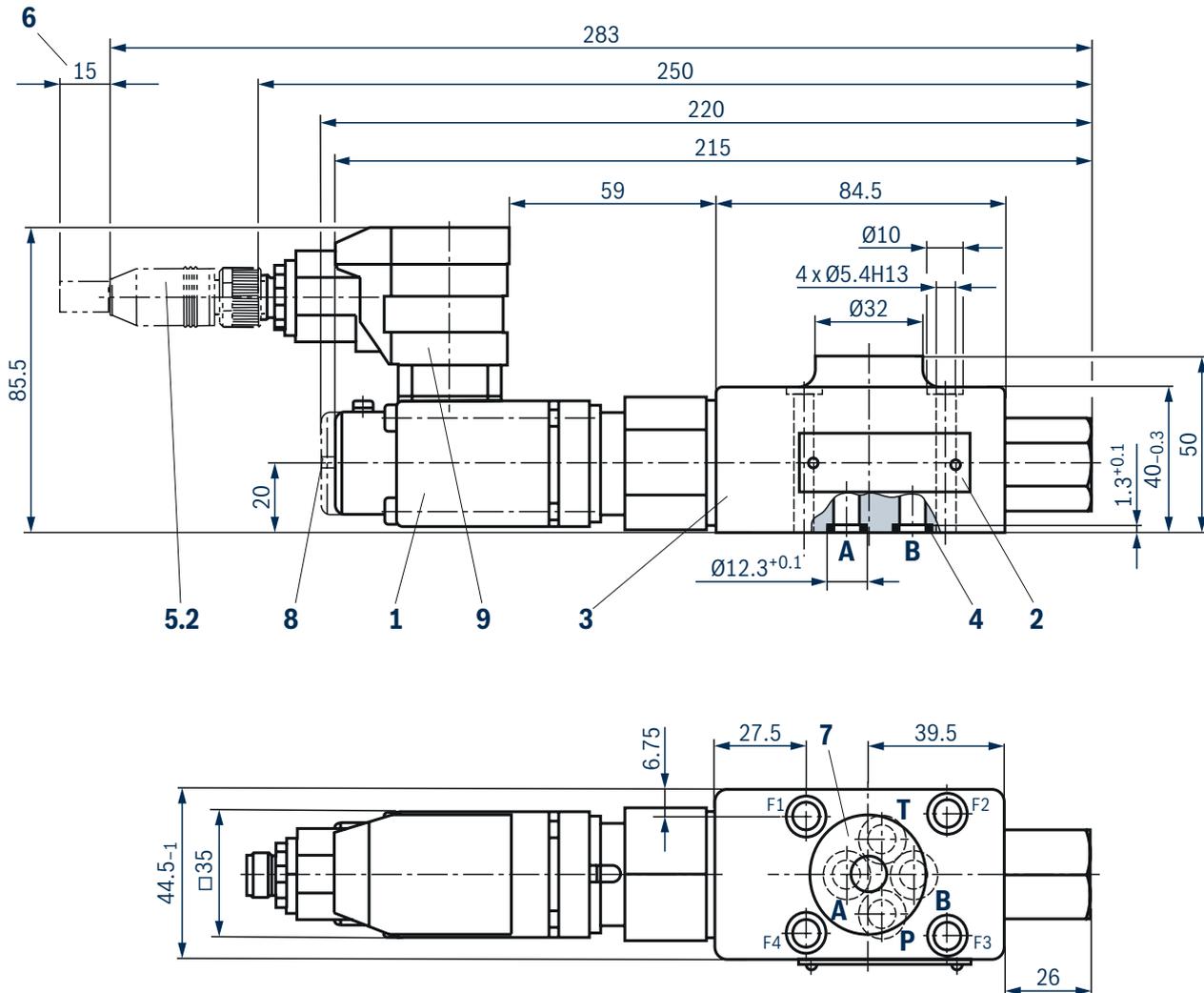
- 1 A①→A②
- 2 B①→B②
- 3 T①→T②



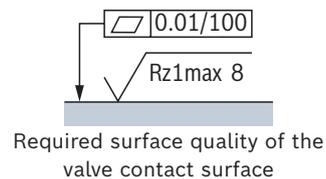
Information:

- ▶ The specified pressure differential corresponds to the minimum pressure available in port P (P②) minus the maximum pressure to be controlled in port A (P①).
- ▶ Typical characteristic curves which are subject to tolerance variations.

Dimensions: Type DREE
(Dimensions in mm)



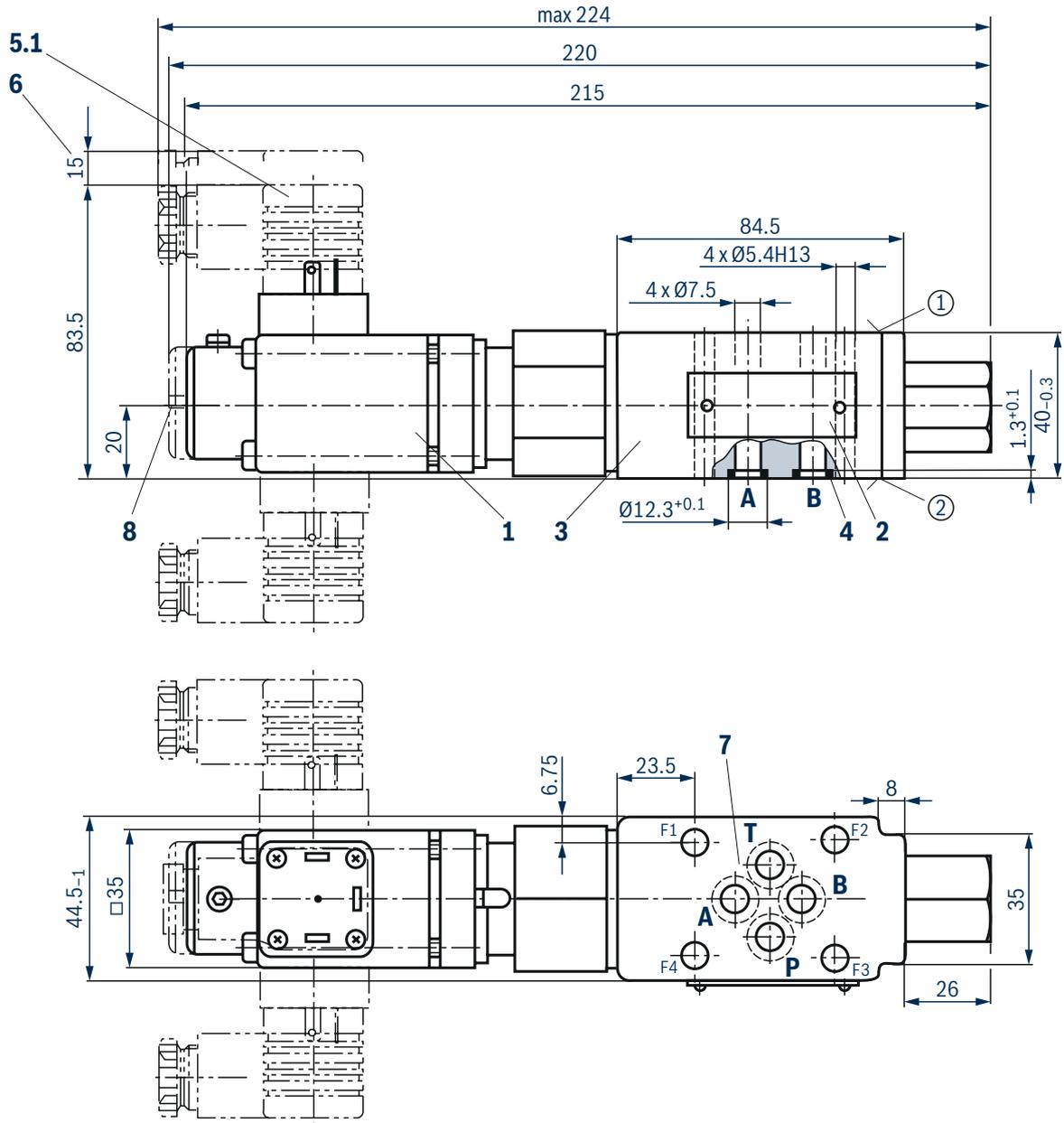
- 1 Proportional solenoid without manual override
- 2 Name plate
- 3 Valve housing
- 4 Identical seal rings for ports A, B, P, T
- 5,2 Cable set, separate order, see page 19
- 6 Space required to remove the cable set
- 7 Porting pattern according to ISO 4401-03-02-0-05
- 8 Proportional solenoid with manual override
- 9 Integrated electronics (OBE)



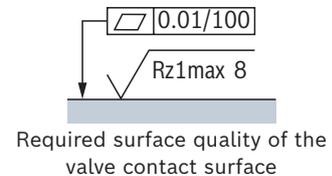
Valve mounting screws and **subplates**, see page 19.

Notice:

The dimensions are nominal dimensions which are subject to tolerances.

Dimensions: Type ZDRE
 (Dimensions in mm)


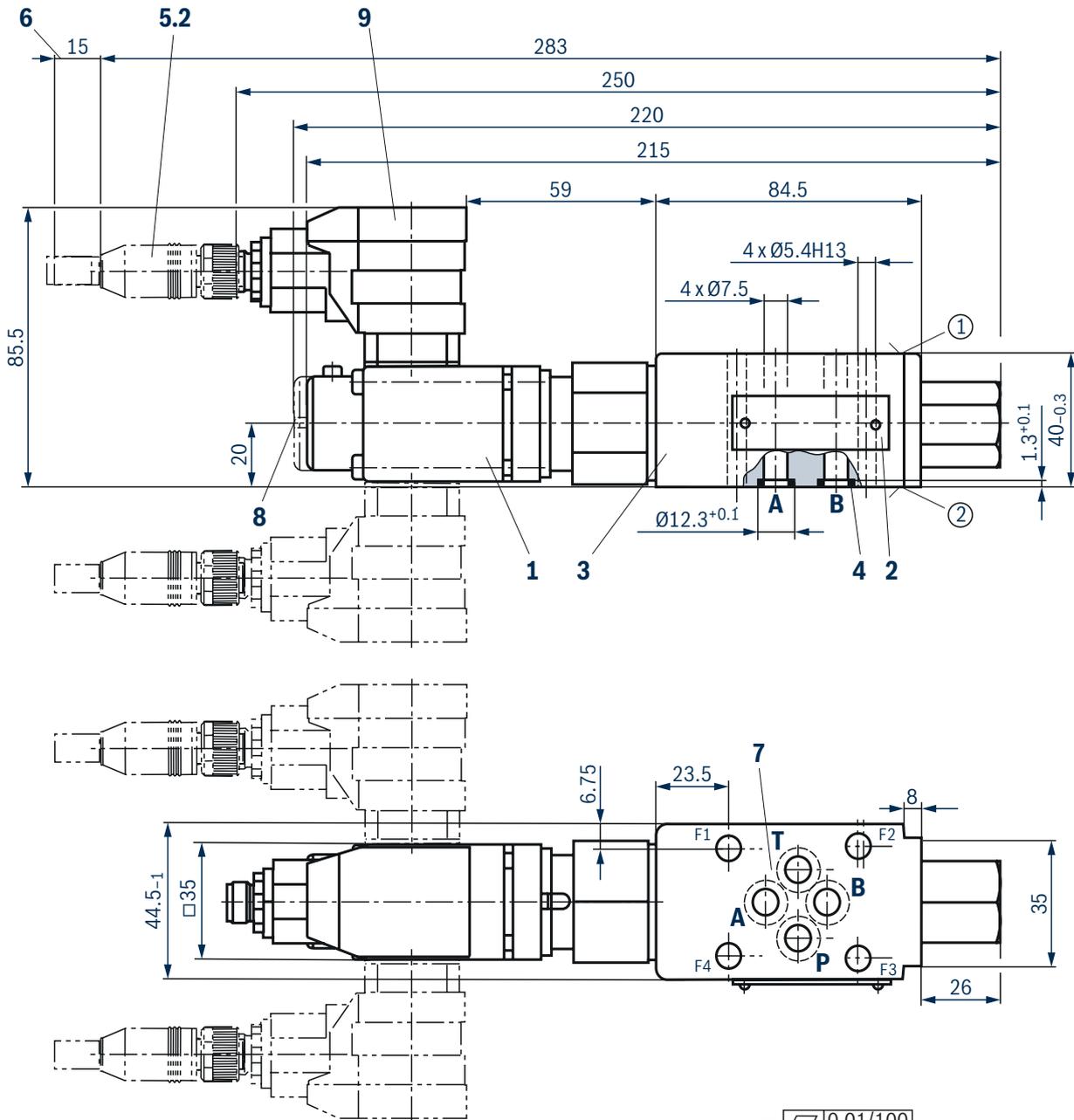
- ① component side
- ② plate side
- 1 Proportional solenoid without manual override
- 2 Name plate
- 3 Valve housing
- 4 Identical seal rings for ports A, B, P, T
- 5,1 Mating connector, separate order, see page 19
- 6 Space required for removing the mating connector
- 7 Porting pattern according to ISO 4401-03-02-0-05
- 8 Proportional solenoid with manual override



Valve mounting screws and **subplates**, see page 19.

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

Dimensions: Type ZDREE
(Dimensions in mm)



- ① component side
- ② plate side
- 1 Proportional solenoid without manual override
- 2 Name plate
- 3 Valve housing
- 4 Identical seal rings for ports A, B, P, T
- 5,2 Cable set, separate order, see page 19
- 6 Space required to remove the cable set
- 7 Porting pattern according to ISO 4401-03-02-0-05
- 8 Proportional solenoid with manual override
- 9 Integrated electronics (OBE)

Required surface quality of the valve contact surface

Valve mounting screws and subplates, see page 19.

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

Dimensions

Valve mounting screws (separate order)

Type	Quantity	Hexagon socket head cap screws	Material number
DRE(E) ...	4	ISO 4762 - M5 x 50 - 10.9-CM-Fe-ZnNi-5-Cn-T0-H-B Friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$; Tightening torque $M_A = 7 \text{ Nm} \pm 10\%$	R913043758
ZDRE(E) ...	4	ISO 4762 - M5 - 10.9	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 4401-03-02-0-05 see data sheet 45100.

Accessories (separate order)

Mating connectors and cable sets

Item ¹⁾	Designation	Version	Short designation	Material number	Data sheet
5,1	Mating connector; for valves with "K4" connector, 2-pole + PE, design A	Without circuitry, M16 x 1.5, 0 ... 250 V, "b"	Z4	R901017011	08006
5,2	Cable sets; for sensors and valves with "K24", "K35" and "K72" connectors, 4-pole	Straight, 5.0 m	CABLE SET VT-SSPA1-1X/M12/1/V00	R901241656	
		Angled, 5.0 m	CABLE SET VT-SSPA1-1X/M12/2/V00	R901241651	

¹⁾ See dimensions on pages 15 and 18.

External control electronics

	Type	Data sheet
Modular design	VT-MSPA1-2X	30232

EMC directive requirements

- ▶ Shielded connection cables must be used for the electrical connection. The shielding must be placed on both sides.
- ▶ A metal mating connector must be used to make contact between the cable shielding and the valve.
- ▶ A separate EMC-approved power supply unit must be provided for each valve, e.g. one that is CE-compliant.
- ▶ The production of a low impedance connection is established via the professional installation of the valve on a grounded metal manifold block in the system.
- ▶ For electric supply lines over 30 m, overvoltage protection must be provided in the control cabinet.
- ▶ In a strong electro-magnetic environment, further EMC measures may be required, such as shielding of the complete device via metal housings or the use of ferrites on supply and signal lines.

Further information

- ▶ Hydraulic valves for industrial applications
 - ▶ Subplates
 - ▶ 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)
 - ▶ Reliability characteristics according to EN ISO 13849
 - ▶ Assembly, commissioning and maintenance of hydraulic systems
 - ▶ Information on available spare parts
- Operating instructions 07600-B
Data sheet 45100
Data sheet 90220
Data sheet 90221
Data sheet 90222
Data sheet 90223
Data sheet 08012
Data sheet 07900
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
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.