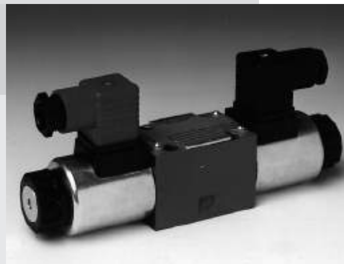
Rexroth
Bosch Group

4/2 and 4/3-Way Proportional Directional Control Valve Direct Operated

RA 29057/06.98
Replaces: 06.94

Model 4 WRA(E)B



Model 4 WRA B 6..-1X/.. Z45

Model 4 WRA E B 6..-X/.. DK26

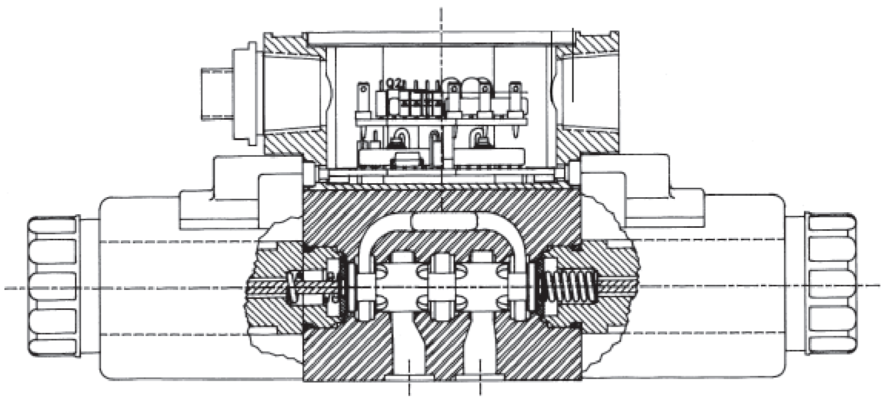
Size 6
Series 1X
Maximum operating pressure 350 bar (5100 PSI)
Maximum Flow 30 L/min (7.9 GPM)

Table of contents

Features

– Direct operated proportional directional control valves, which control both the direction and volume of a fluid flow
– Mounts on standard ISO 4401-3, NFPA T3.5.1MR1 D 03 and ANSI B 93.7 D 03 interface
– Two piece solenoid design with removable coils
– Integrated electronics available
– For subplates, see RE 45 052

Functional Description



Proportional directional control valves Model 4 WRA B 6 and 4 WRAE B 6 are direct operated spool valves. They control the direction and quantity of flow to an actuator, for smooth acceleration to a desired velocity. The valve is normally operated by integrated electronics or a suitable amplifier. The 4 WRA B can be operated as a switching valve if proportional control is not required.

These valves consist of a housing, control spool, springs, and proportional solenoids. Solenoid current increases the magnetic force to push the armature and spool against an opposing spring. The spool position is proportional to this force balance. Large spool notches meter fluid in and out of the actuator (P to B, A to T). Flow rate is based upon the notch size, spool position and pressure drop across the resulting throttle. Maximum flow is restricted by the power limit of the valve.

Covered manual overrides (N9) are standard to simplify troubleshooting. A recessed pin push is used to move the spool.

Coils can be replaced by removing a hand tightened ring. A molded central (D) box is available to mate with integral solenoid pins for uncomplicated installation and servicing. Electrical connections can be compression terminals in the box with 1/2" NPT conduit connections (DA). A 5-pin connector is available (DK25) to mate with molded cables per ANSI B93.55 M. Cable is not included. The DK25 is used for single solenoid valves (EA, WA use pins 2, 3, 4) and two solenoid valves. Individual connectors (Z45) are also available when a (D) box is not requested.

Integrated electronics requires a 6-pin connector (DK26). Mating plug/cable is not included. A shielded cable is recommended. Supply voltage must be 21V to 35V (G24) for integrated electronics. The 4 WRA E B 6 must be coded /G24, although it has a 12 volt coil.

Ordering Code

4	WRA		B	6			-1X /		N9			*

4-way **= 4**

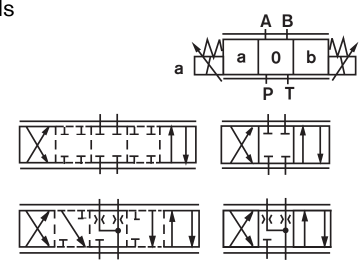
Proportional directional control valve, direct operated **= WRA**

Integrated electronics **= E**
(Must use 24V power supply)

Valve with removable coil **= B**

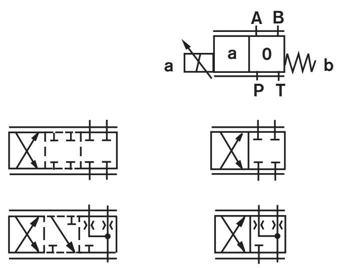
Size 6 ISO 4401 NFPA/ANSI D 03 **= 6**

Symbols



= E

= W



= EA

= WA

Nominal flow at 145 psi (10 bar) pressure drop
12 L/min (3.2 GPM) **= 12**
25 L/min (6.6 GPM) **= 25**

1X = Series 10 to 19
(10 to 19 externally interchangeable)

G12 = (without integrated electronics) solenoid voltage 12 VDC - Note 1*
G24 = (without integrated electronics) solenoid voltage 24 VDC - Note 2*
G24 = (integrated electronics) power supply voltage 24 VDC - Note 3*

N9 = Covered manual override

Central solenoid connections
DA = Terminal box for 1/2" NPT conduit
Plug-pin type connectors
(without mating connector)
DK25 = Terminal box with 5-pin connector
DK26 = Integrated electronics terminal box with 6-pin connector
Individual solenoid plug connections
K4 = Without angled plug connector(s)

MR = Buna-N (NBR) seats suitable for petroleum oils (HM, HL, HLP)
VR = Fluorocarbon (FPM) seals suitable for phosphate ester fluids (HFD-R)

Further details to be written in clear text

* See Notes, page 4

Technical Data (for applications outside these parameters, please consult us)

General

Weight (approx.)	-valve with 1 solenoid	kg (lbs)	1.6 (3.5)
	-valve with 2 solenoids	kg (lbs)	2.1 (4.6)
Mounting position			Optional
Ambient temperature range		°C (°F)	to 50 (+122)

Hydraulic

Valve Model			**4 WRA B 6**	**4 WRAE B 6**
Operating pressure	-ports A, B, P	bar (PSI)	350 (5075)	
	-port T	bar (PSI)	210 (3045)	
Recommended maximum pressure drop		bar (PSI)	$<$ 210 (3045)	
Maximum flow		L/min (GPM)	7.9 (30)	
Hydraulic fluid			Petroleum oils (HM, HL, HLP)	
			Phosphate ester fluids (HFD-R)	
Fluid temperature range	- NBR	°C (°F)	-30 to 80 (-22 to 176)	
	- FPM	°C (°F)	-20 to 80 (-4 to 176)	
Viscosity range		mm ^{2}/s (SUS)	2.8 to 500 (35 to 2320)	
Maximum allowable fluid cleanliness - Class 16/13 to 18/15 according to ISO 4406. Therefore, we recommend a filter with a minimum retention rate of $\beta_{10} \geq 75$				
Hysteresis		%	$<$ 3.5	
Repeatability		%	$<$ 1	
Sensitivity		%	$<$ 1	
Frequency response (-3 dB, signal ± 50%)		Hz	24	
Switching time to, or	ON or 0 - 100%	ms	18	30
Step response	OFF or 100% - 0	ms	20	40

Electrical

Valve Model			**4 WRA B 6**		**4 WRAE B 6**
Supply voltage		vdc	12V	24V	21 to 35V
			(± 10%)	(± 10%)	
Maximum current (at 24 vdc)		amps	2.5	1.25	1.1
Maximum power		W	30	30	23
Solenoid coil resistance,	cold value 68 °F (20 °C)	Ω	4.8	19.2	4.8
	warm value 122 °F (50 °C)	Ω	7.2	28.8	7.2
Inductance		mH	86	339	86
Duty cycle			Continuous		
Coil temperature range		°C (°F)	to 150 (+302)		
Electrical	Z45 - 3 prong plug and socket to ANSI/B93.94M,				
connections	DIN 43650 for 1/2" conduit or 6-14 mm cable ϕ		Z45		–
	Screw connection in resin box for 1/2" conduit		DA		–
	5-pin male receptacle (without mating plug)		DK25		–
	6-pin male receptacle (without mating plug)		–		DK26
Insulation			IP65, exceeds NEMA class B		
Analog input	(Re $>$ 10 k-Ω)	vdc	–		0 to ±10V
Associated electronic amplifier cards (some restrictions apply)			MDSD note 1	Not avail. note 2	Included

Note 1) The MDSD1 or MDSD will operate the 4 WRA B../G12 with 14 to 28 vdc from the power supply. The MDSD can be used with 10 to 14 vdc power, but valve performance may be affected. At higher temperatures, increased solenoid resistance may reduce the available flow. An amplifier is not required when using the 4 WRA B../G12 as a non-proportional (switching) valve at 12 vdc ±10%.

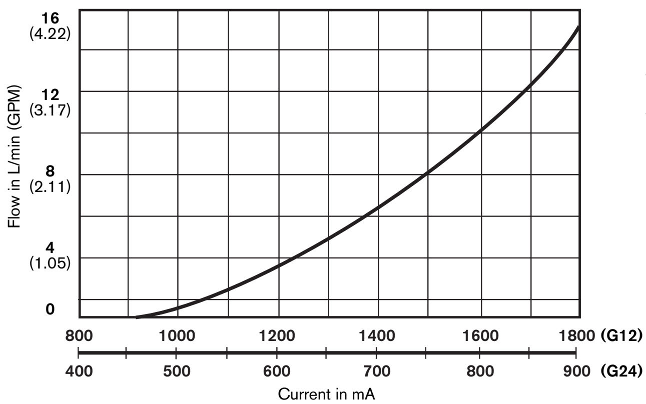
Note 2) The MDSD is not preferred for the 4 WRA B../G24, since this would require 27 to 28 vdc from the power supply. At 24 vdc and maximum coil temperature, the MDSD would only provide about 85% of full flow. An amplifier is not required when using the 4 WRA B../G24 as a non-proportional (switching) valve at 24 vdc ±10%.

Note 3) The 4 WRAE B (integrated electronics) will have the ../G24 designation indicating supply voltage for the amplifier. The solenoid coil will have 12 volt specifications.

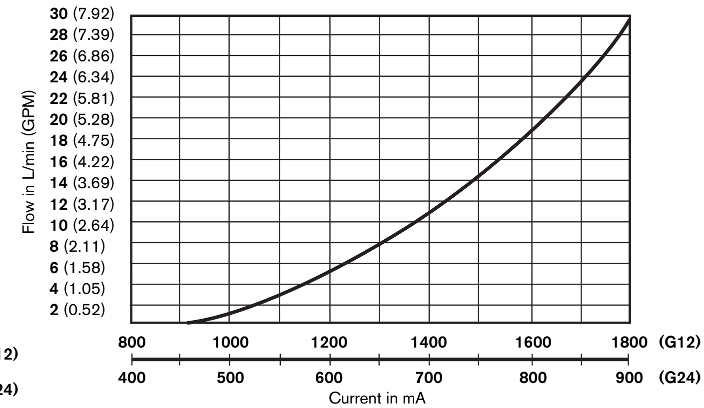
Performance Curves – measured at ν = 190 SUS (41 mm ²/s) and t = 122 °F (50 °C)

Flow at 145 psi (10 bar) ΔP

4WRAB6E12-1X

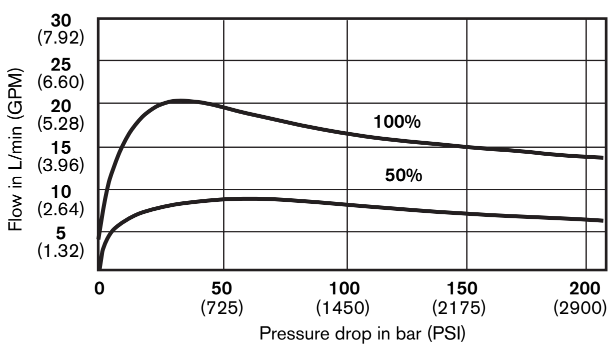


4WRAB6E25-1X

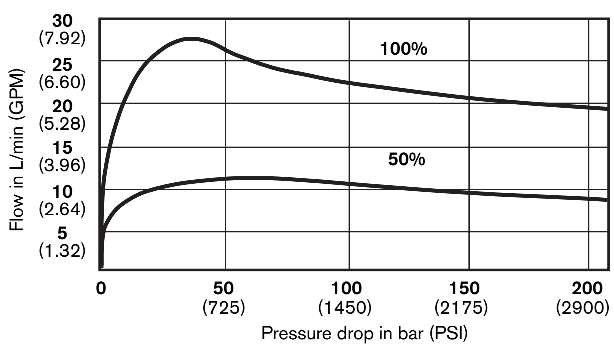


Power Limit

4WRAB6E12-1X

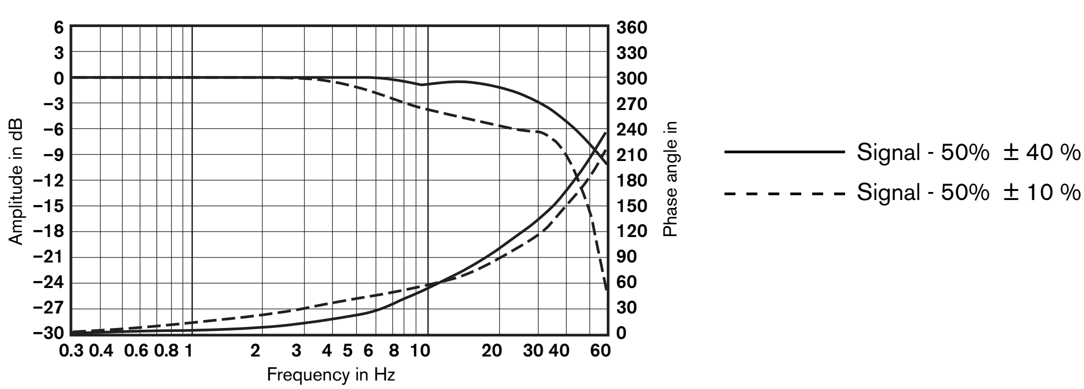


4WRAB6E25-1X



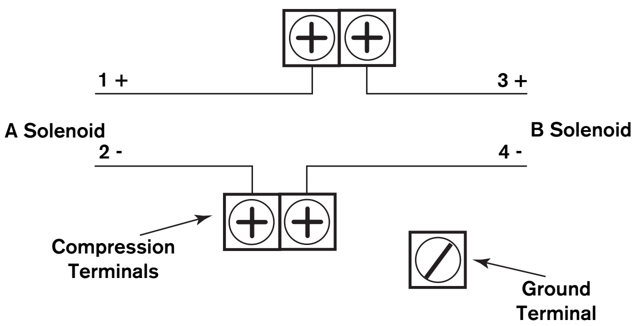
Frequency Response

Model 4 WRA(E) B 6...

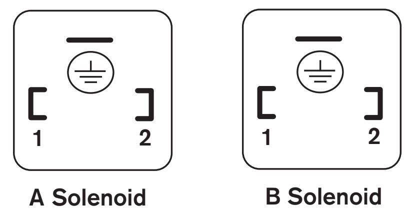


Electrical Connections

DA (non integrated)

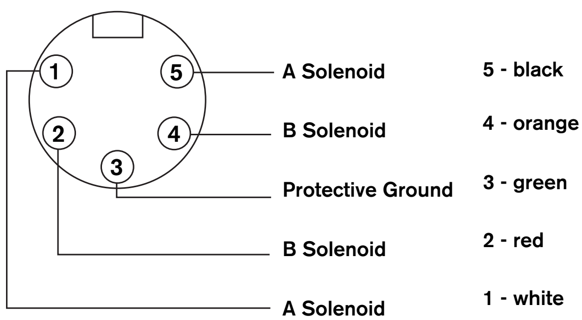


K4



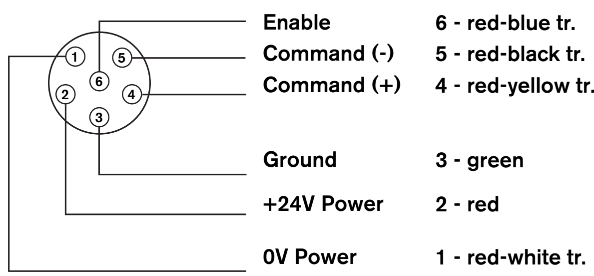
Coil connected to pins 1 and 2

DK25



DK25 mates with ANSI/B93.55M molded male connectors
0.875-16 UN-2A Coupling Thread
For single solenoid, use 2, 3, 4

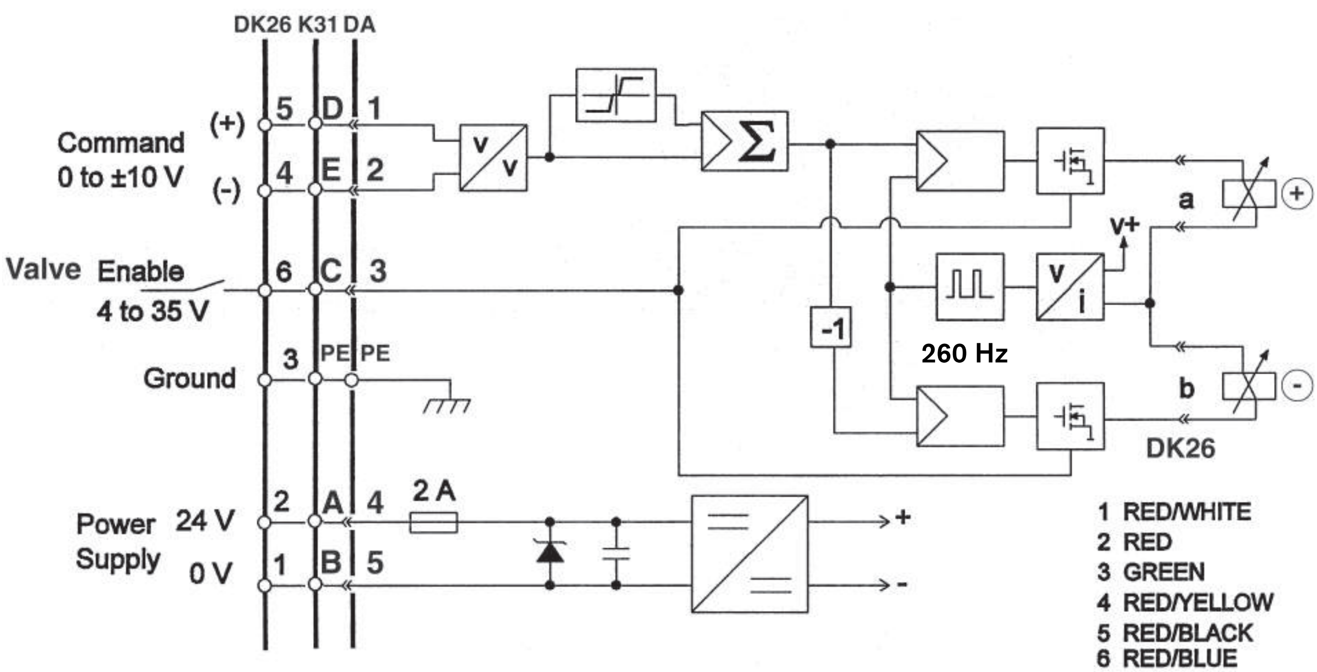
DK26



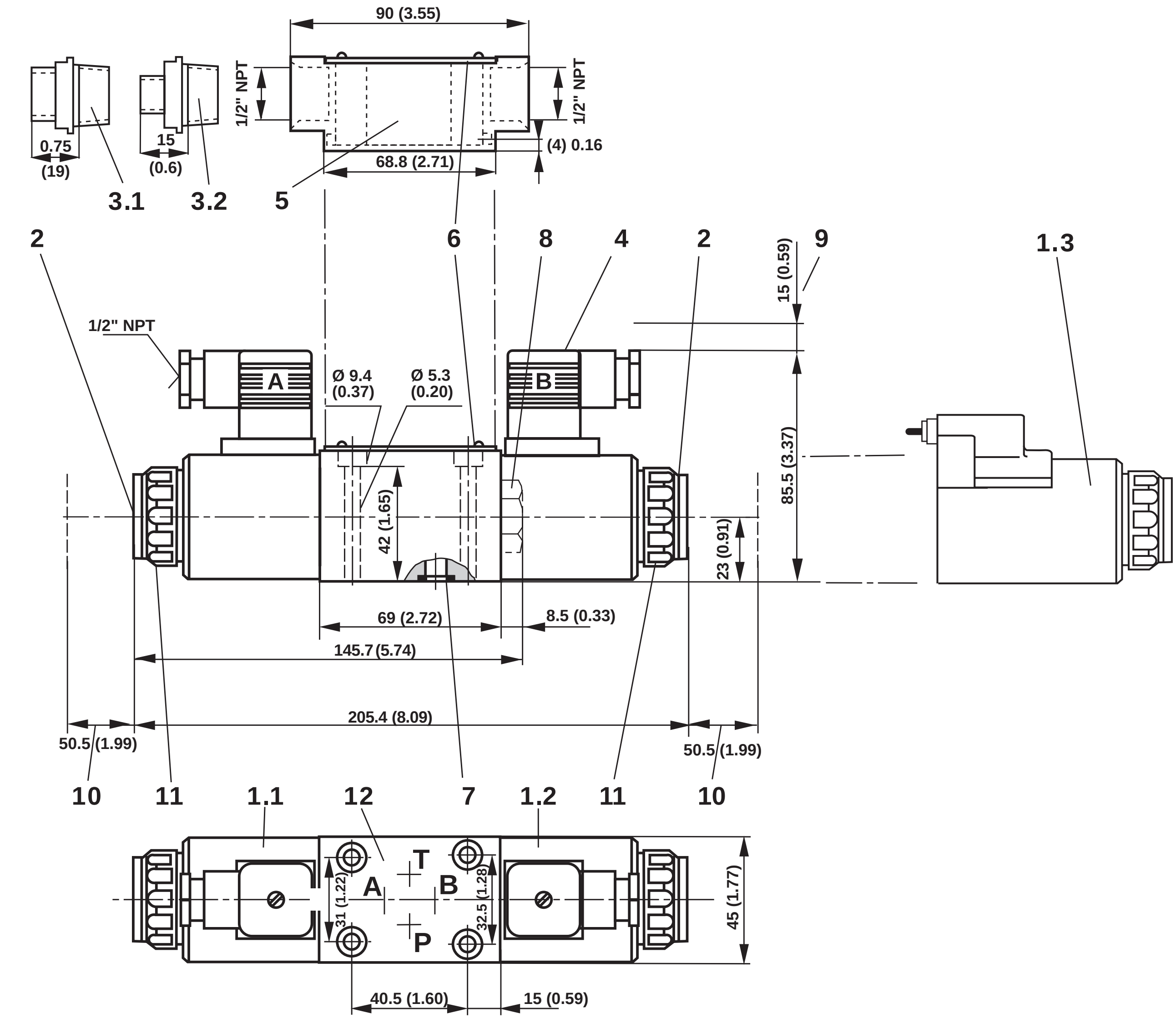
Only for integrated electronics

	Brad Harrison P/N
Straight mating connector for DK26, with shielded cable, is available from Daniel Woodhead, Brad Harrison ®	6 ft. – 70801 12 ft. – 70802 20 ft. – 70803

Terminal Connections and Block Diagram - 4 WRAE B 6...-1X/G24 N9 DK26 (K31) (DA)



Unit Dimensions, Model 4 WRAE B 6 – dimensions in millimeters (inches)



1.1 Solenoid a, plug color rust

1.2 Solenoid b, plug color black

1.3 Solenoid, with pins to D( )

2 Emergency operator "N9"
– Emergency operator can only be operated up to a tank pressure of approx. 725 psi (50 bar)
Avoid damage to emergency operator pin bore

3.1 DK25 connector 5-pin for single or double solenoid
Mates with ANSI/B93.55m cable assembly

3.2 DK26 connector 6-pin for integrated electronics

4 Angled plug Z45 to DIN 43 650
Not included

5 Standard terminal box with (2) 1/2" NPT entry ports both ends.

6 Nameplate

7 R ring 9.81 mm x 1.5 mm x 1.78 mm

8 Plug for single solenoid valve

9 Space required to remove plug

10 Space required to remove coil

11 Locknut
Tightening torque = 35 lb-in (4 Nm)

12 Mounting pattern to ISO 4401-3, NFPA T3.5.1M R1 and ANSI B 93.7 **D 03**
Subplates: G341/05 (1/4"NPT)
G341/12 (SAE-4;7/16-20)
G342/05 (3/8"NPT)
G342/12 (SAE-6;9/16-18)
G502/05 (1/2"NPT)
G502/12 (SAE-8;3/4-16)
to data sheet RA 45 052 and
valve fixing screws
Grade 8 M5 x 50 DIN 912-10.9
(10-24UNC x 2")
Tightening torque = 79 lb-in (8.9 Nm)
Must be ordered separately.

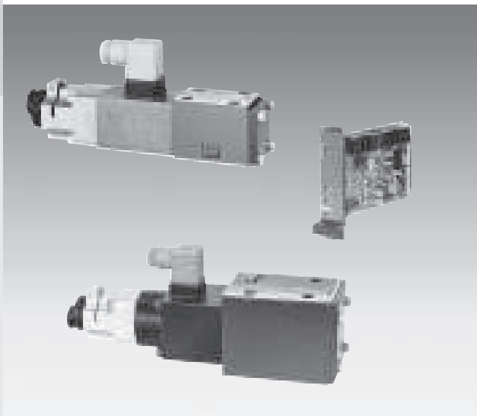
Notes

Bosch Rexroth Corp.
Industrial Hydraulics
2315 City Line Road
Bethlehem, PA 18017-2131
USA
Telephone (610) 694-8300
Facsimile (610) 694-8467
www.boschrexroth-us.com

4/2 servo solenoid valves with positive overlap and position feedback (Lvdt AC/AC)

RE 29020/08.05
Replaces: 01.05

Type 4WRP..EA..



Size 6, 10
Unit series 1X
Maximum working pressure of P, A, B 315 bar, T 250 bar
Nominal flow rate 8...28 l/min (NG6), 16...63 l/min (NG10)

List of contents

Features

– Directly operated NG6 and NG10 valves with positive overlap and external valve electronics
– Actuated on one side, symbol E
– Control solenoid with position feedback (Lvdt AC/AC)
– Suitable for use in electrohydraulic controls in production plants
– For subplate attachment, mounting hole configuration NG6 to ISO 4401-03-02-0-94 and NG10 with additional “L” port to ISO 4401-05-06-0-94
– External trigger electronics (order separately), see catalog section RE 30052 and RE 30054
– Subplates as per catalog section, NG6 RE 45053, NG10 RE 45055 (order separately)
– Solenoid and position transducer plug-in connectors included in scope of delivery

Variants on request
– For standard applications
– Special symbols and characteristic curves

Ordering data

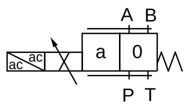
4WRP			E	A		S –1X / G24	Z4 / M	*

For **external** trigger electronics **= no code**

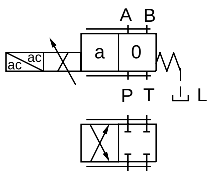
Size 6 **= 6**
Size 10 **= 10**

Symbols
4/2-way version

NG6

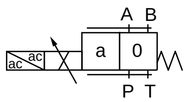


NG10[1)]



= E

Side of inductive position transducer



(Standard) **= A**

[1)] Type 4WRP10
Mounting hole configuration with additional "L" port

Further information in plain text

M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

Electrical connection
Z4 = **with** plug to DIN 43560-AM2 with line socket, line socket included in scope of delivery

Voltage supply of trigger electronics
G24 = +24 V DC

1X = Unit series (installation and connection dimensions unchanged)

Flow characteristic
S = Progressive

Nominal flow rate at 10 bar valve pressure difference (5 bar per metering notch)

Size 6	Size 10
08 = 8 l/min	**16 =** 16 l/min
16 = 16 l/min	**32 =** 32 l/min
28 = 28 l/min	**63 =** 63 l/min

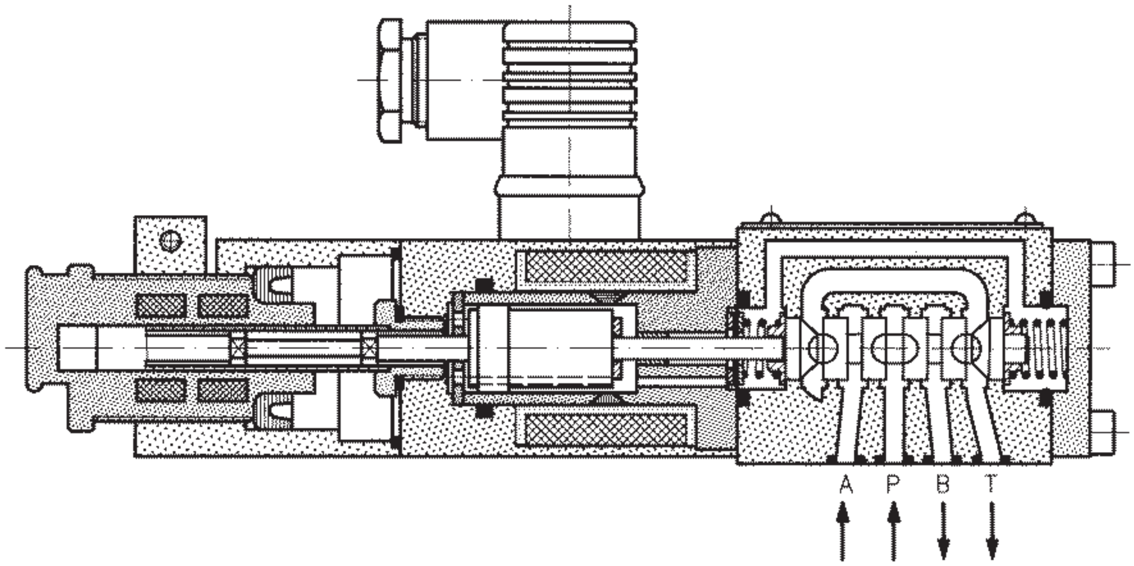
Preferred types

Type 4WRP6	Material No.	Typ 4WRP10	Material No.
4WRP6EA08S–1X/G24Z/M755 *)	0 811 403 100	4WRP10EA16S–1X/G24Z/M	0 811 403 003
4WRP6EA16S–1X/G24Z/M755 *)	0 811 403 101	4WRP10EA32S–1X/G24Z/M	0 811 403 002
4WRP6EA28S–1X/G24Z/M	0 811 403 126	4WRP10EA63S–1X/G24Z/M	0 811 403 001

*) Progressive characteristic curve, with triangular notch
(standard = semicircular notch)

Function, sectional diagram

Type 4WRP6E..



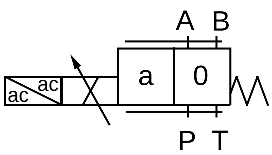
Position feedback
(Lvdt AC/AC)

Control solenoid with position transducer

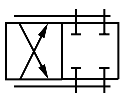
Valve body

Symbols

Position transducer: A-side



..E..



Accessories

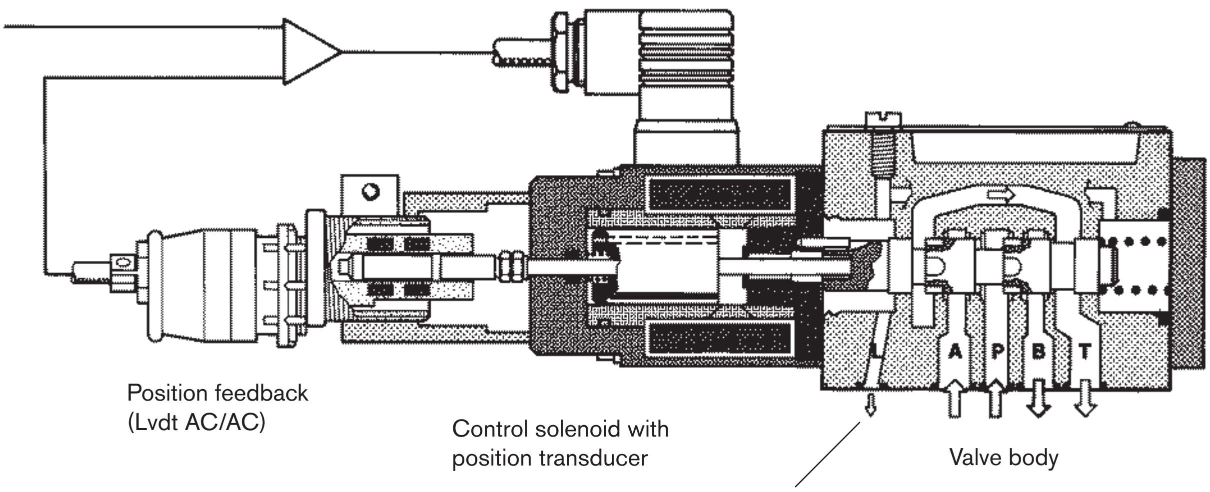
(4x) ISO 4762-M5x30-10.9	Fastening bolts	2 910 151 166
	VT-VRPA1-527-10/V0/QV, see RE 30052	0 811 405 098
	VT-VRPA1-527-10/V0/QV-RTP, see RE 30054	0 811 405 103
	VT-VRPA1-527-10/V0/QV-RTS, see RE 30056	0 811 405 177
 2P+PE 3P	Plug-in connector 2P+PE (M16x1.5) and 3P (Pg7) included in scope of delivery, see also RE 08008	

Testing and service equipment

– Test box type VT-PE-TB1, see RE 30063
– Test adapter type VT-PA-3, see RE 30070

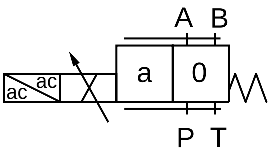
Function, sectional diagram

Type 4WRP10E..

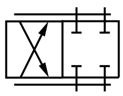


Symbols

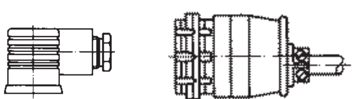
Position transducer: A-side



..E..



Accessories

(4x) ISO 4762-M6x35-10.9	Fastening bolts	2 910 151 207
	VT-VRPA1-537-10/V0/QV, see RE 30052	0 811 405 099
	VT-VRPA1-537-10/V0/QV-RTP, see RE 30054	0 811 405 104
	VT-VRPA1-537-10/V0/QV-RTS, see RE 30056	0 811 405 178
 2P+PE 3P	Plug-in connector 2P+PE (M16x1.5) and 3P (Pg7) included in scope of delivery, see also RE 08008	

Testing and service equipment

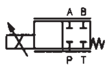
– Test box type VT-PE-TB1, see RE 30063
– Test adapter type VT-PA-3, see RE 30070

Technical data (type 4WRP6EA..)

General

Construction		Spool type valve		
Actuation		Proportional solenoid with position control, external amplifier		
Connection type		Subplate, mounting hole configuration NG6 (ISO 4401-03-02-0-94)		
Mounting position		Optional		
Ambient temperature range	°C	–20...+50		
Weight	kg	2.2		
Vibration resistance, test condition		Max. 25 g, shaken in 3 dimensions (24 h)		

Hydraulic (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Pressure fluid		Hydraulic oil to DIN 51524...535, other fluids after prior consultation		
Viscosity range recommended	mm^2/s	20...100		
max. permitted	mm^2/s	10...800		
Pressure fluid temperature range	°C	–20...+80		
Maximum permissible degree of contamination of pressure fluid Purity class to ISO 4406 (c)		Class 18/16/13 [1)]		
Direction of flow		See symbol		
Nominal flow at $\Delta p = 5$ bar per notch [2)]	l/min	8	16	28
Max. working pressure	bar	Port P, A, B: 315		
Max. pressure	bar	Port T: 250		
Leakage per metering edge ($\Delta p = 100$ bar)	$I_m = 0$	 $\leqq 80\ cm^3/min$		

Electrical

Cyclic duration factor	%	100
Power supply		24 V_{nom} (external amplifier)
Degree of protection		IP 65 to DIN 40050 and IEC 14434/5
Solenoid connection		Unit plug DIN 43650/ISO 4400, M16x1.5 (2P+PE)
Position transducer connection		Unit plug Pg7 (4P)
Max. solenoid current	A	2.7
Coil resistance R_{20}	Ω	3
Max. power consumption at 100 % load and operating temperature	VA	40

Static/Dynamic[3)]

Hysteresis	%	$\leqq$ 0.3
Range of inversion	%	$\leqq$ 0.2
Manufacturing tolerance for Q_{max}	%	≈ 10
Response time 100 % signal change	ms	≈ 12
10 % signal change	ms	≈ 7

[1)] The purity classes stated for the components must be complied with in hydraulic systems.
Effective filtration prevents problems and also extends the service life of components.
For a selection of filters, see catalog sections RE 50070, RE 50076 and RE 50081.

[2)] Flow rate at a different Δp $q_x = q_{nom} \cdot \sqrt{\frac{\Delta p_x}{5}}$

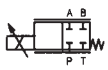
[3)] All specifications achieved in conjunction with proportional amplifier: 0 811 405 098

Technical data (type 4WRP10EA..)

General

Construction		Spool type valve
Actuation		Proportional solenoid with position control, external amplifier
Connection type		Subplate, mounting hole configuration NG10 (ISO 4401-05-06-0-94)
Mounting position		Optional
Ambient temperature range	°C	–20...+50
Weight	kg	7.0
Vibration resistance, test condition		Max. 25 g, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Pressure fluid			Hydraulic oil to DIN 51524...535, other fluids after prior consultation		
Viscosity range	recommended	mm^2/s	20...100		
	max. permitted	mm^2/s	10...800		
Pressure fluid temperature range		°C	–20...+80		
Maximum permissible degree of contamination of pressure fluid Purity class to ISO 4406 (c)			Class 18/16/13 [1)]		
Direction of flow			See symbol		
Nominal flow at $\Delta p = 5$ bar per notch [2)]		l/min	16	32	63
Max. working pressure		bar	Port P, A, B: 315		
Max. pressure		bar	Port T: 250		
		bar	Port L: 2		
Leakage per metering edge ($\Delta p = 100$ bar)		$I_m = 0$	 $\leqq 80\ cm^3/min$		

Electrical

Cyclic duration factor	%	100
Power supply		24 V_{nom} (external amplifier)
Degree of protection		IP 65 to DIN 40050 and IEC 14434/5
Solenoid connection		Unit plug DIN 43650/ISO 4400, M16x1.5 (2P+PE)
Position transducer connection		Unit plug Pg7 (4P)
Max. solenoid current	A	3.7
Coil restistance R_{20}	Ω	2.5
Max. power consumption at 100 % load and operating temperature	VA	60

Static/Dynamic[3)]

Hysteresis		%	$\leqq$ 0.3
Range of inversion		%	$\leqq$ 0.2
Manufacturing tolerance for Q_{max}		%	≈ 10
Response time	100 % signal change	ms	≈ 25
	10 % signal change	ms	≈ 15

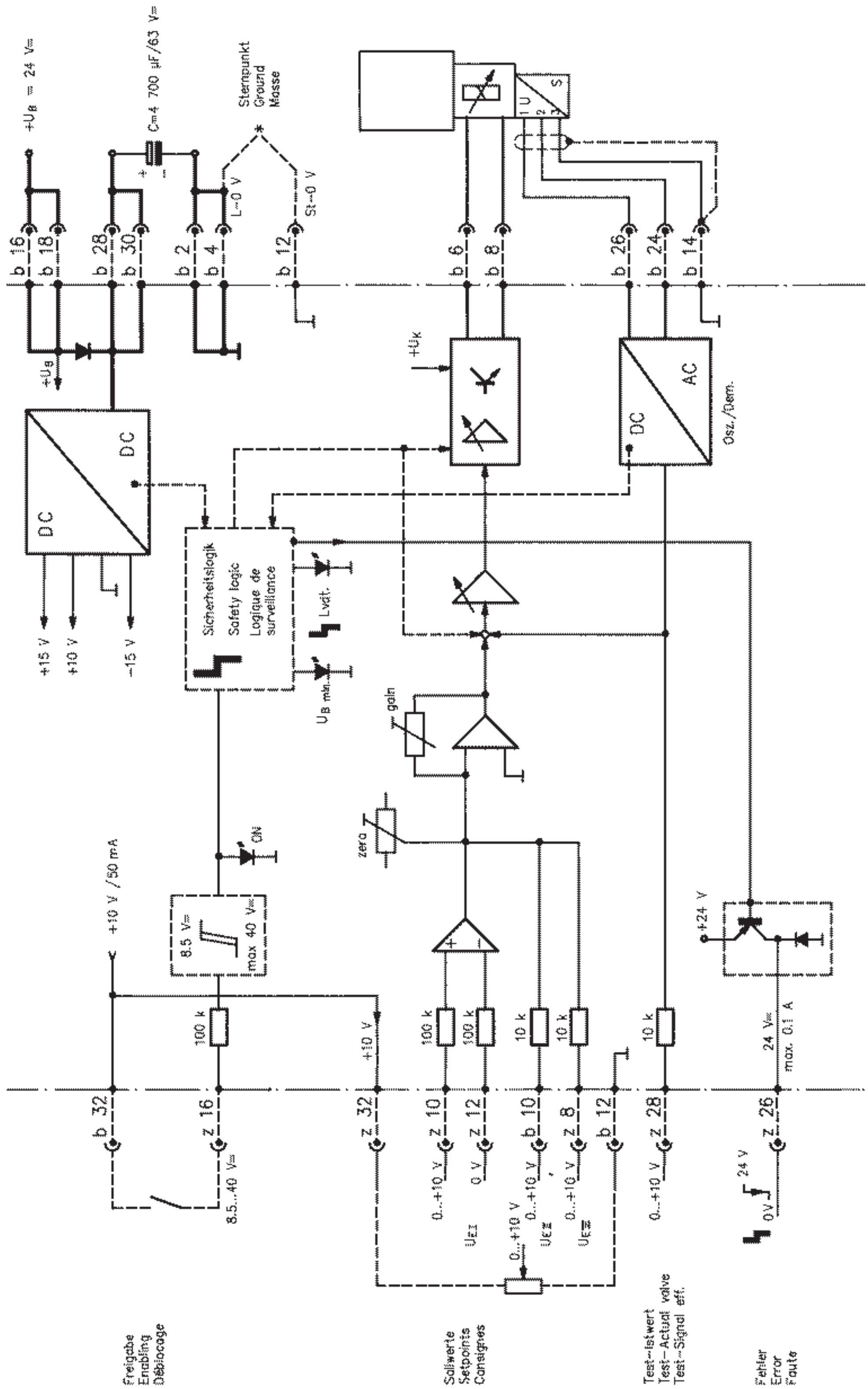
[1)] The purity classes stated for the components must be complied with in hydraulic systems. Effective filtration prevents problems and also extends the service life of components. For a selection of filters, see catalog sections RE 50070, RE 50076 and RE 50081.

[2)] Flow rate at a different Δp $\quad q_x = q_{nom} \cdot \sqrt{\frac{\Delta p_x}{5}}$

[3)] All specifications achieved in conjunction with proportional amplifier: 0 811 405 099

Valve with external trigger electronics (standard without ramps, RE 30052)

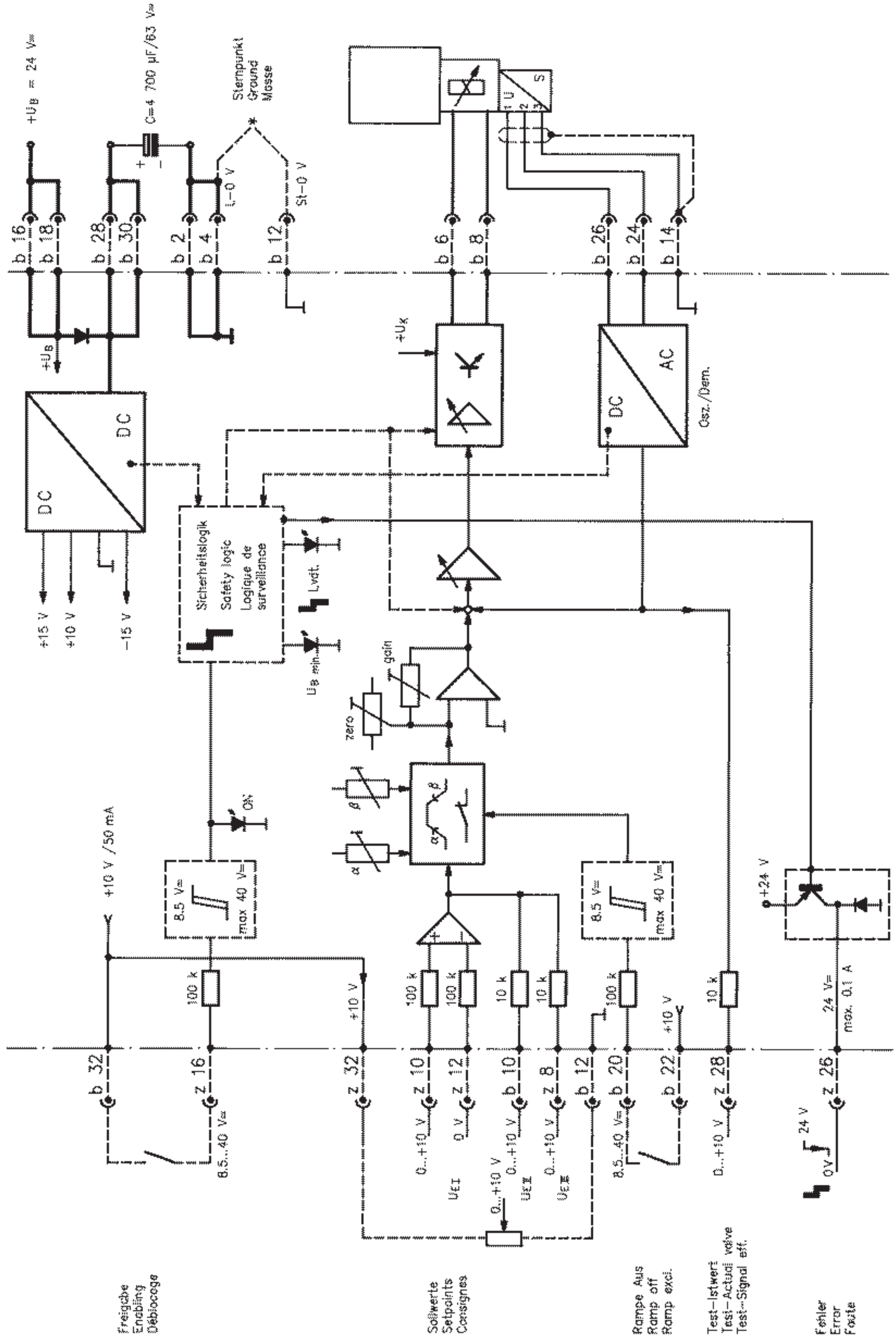
Circuit diagram/pin assignment



Versions of trigger electronics:
– With ramps, see page 8
and RE 30054

Valve with external trigger electronics (with ramps, RE 30054)

Circuit diagram/pin assignment

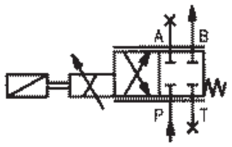


Versions of trigger electronics:
– With ramps, see page 7
  and RE 30052

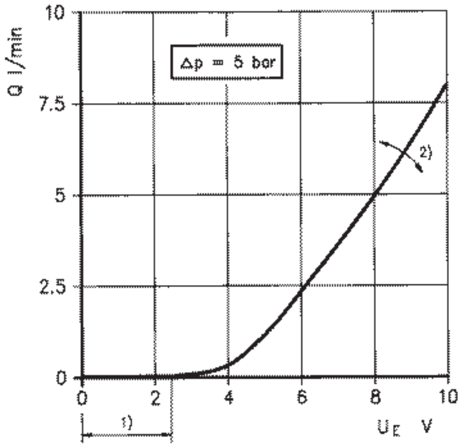
Characteristic curves type 4WRP6E.. (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Flow rate/Signal function (at $\Delta p = 5$ bar per notch)

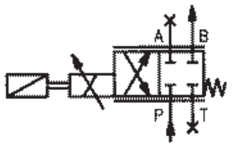
$Q_{nom} = 8$ l/min



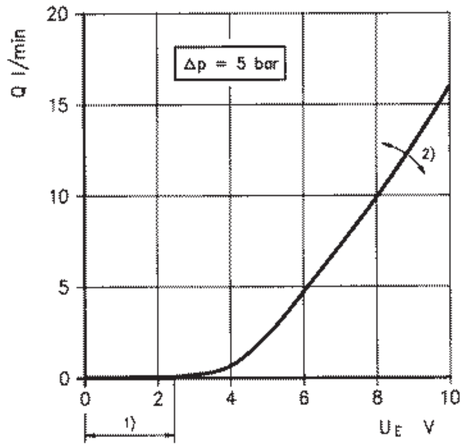
$p_{max} = 250$ bar, T —— x
$p_{max} = 315$ bar, T —



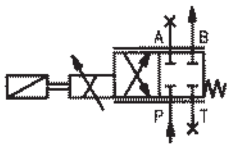
$Q_{nom} = 16$ l/min



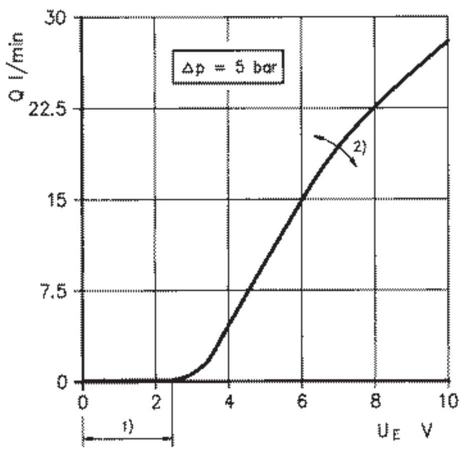
$p_{max} = 250$ bar, T —— x
$p_{max} = 315$ bar, T —



$Q_{nom} = 28$ l/min



$p_{max} = 250$ bar, T —— x
$p_{max} = 315$ bar, T —

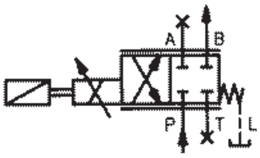


Valve amplifier
[1] Zero adjustment
[2] Sensitivity adjustment

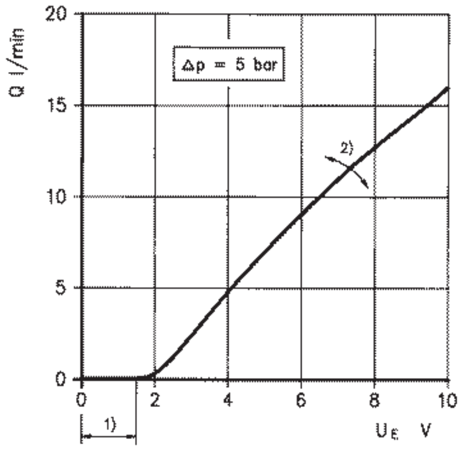
Characteristic curves type 4WRP10E.. (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Flow rate/Signal function (at $\Delta p = 5$ bar per notch)

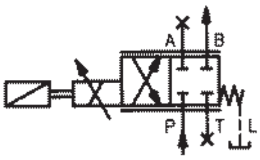
Q_{nom} **= 16 l/min**



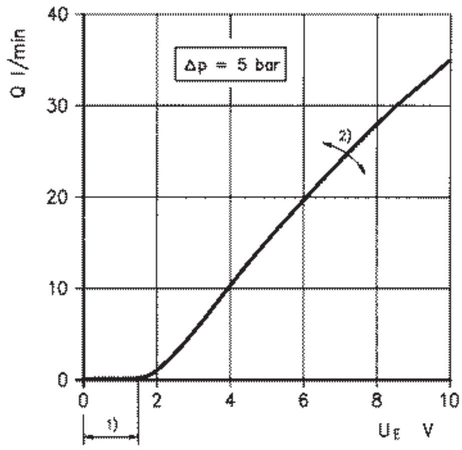
$p_{max} = 315$ bar



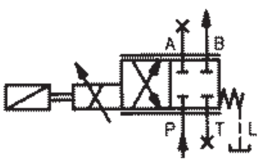
Q_{nom} **= 32 l/min**



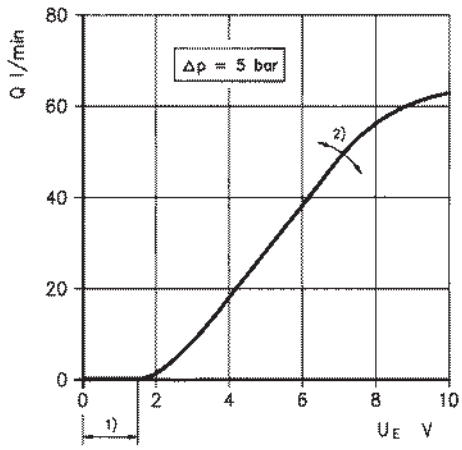
$p_{max} = 315$ bar



Q_{nom} **= 63 l/min**



$p_{max} = 315$ bar



Valve amplifier

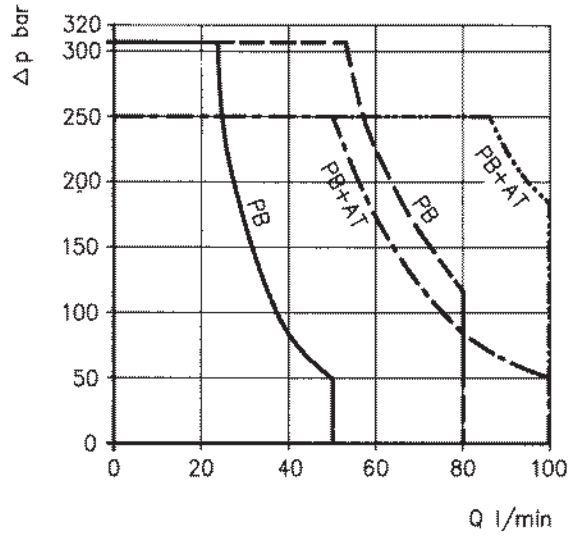
[1] Zero adjustment

[2] Sensitivity adjustment

Operating limits (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

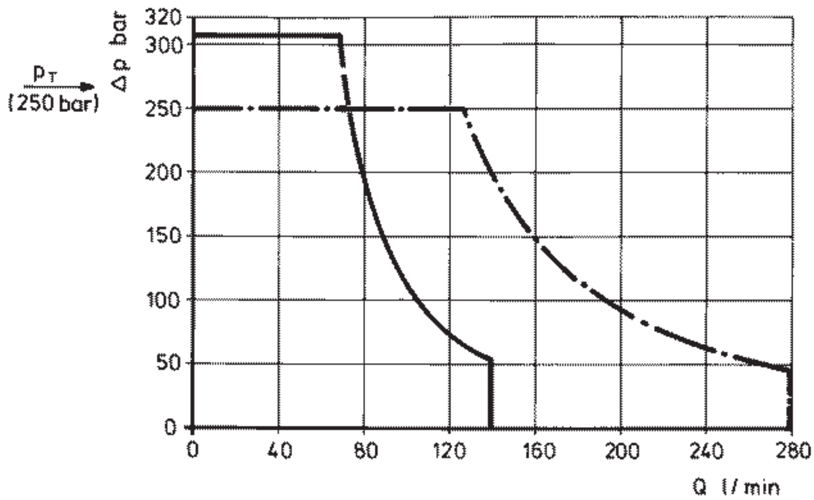
Type 4WRP6EA..

Q_N **16** ———— single flow
—·—·— double flow
Q_N **28** — — — single flow
——— ·· ——— double flow

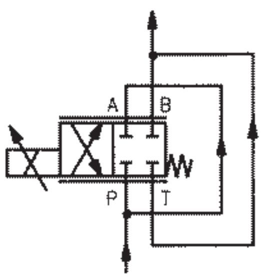


Type 4WRP10EA..

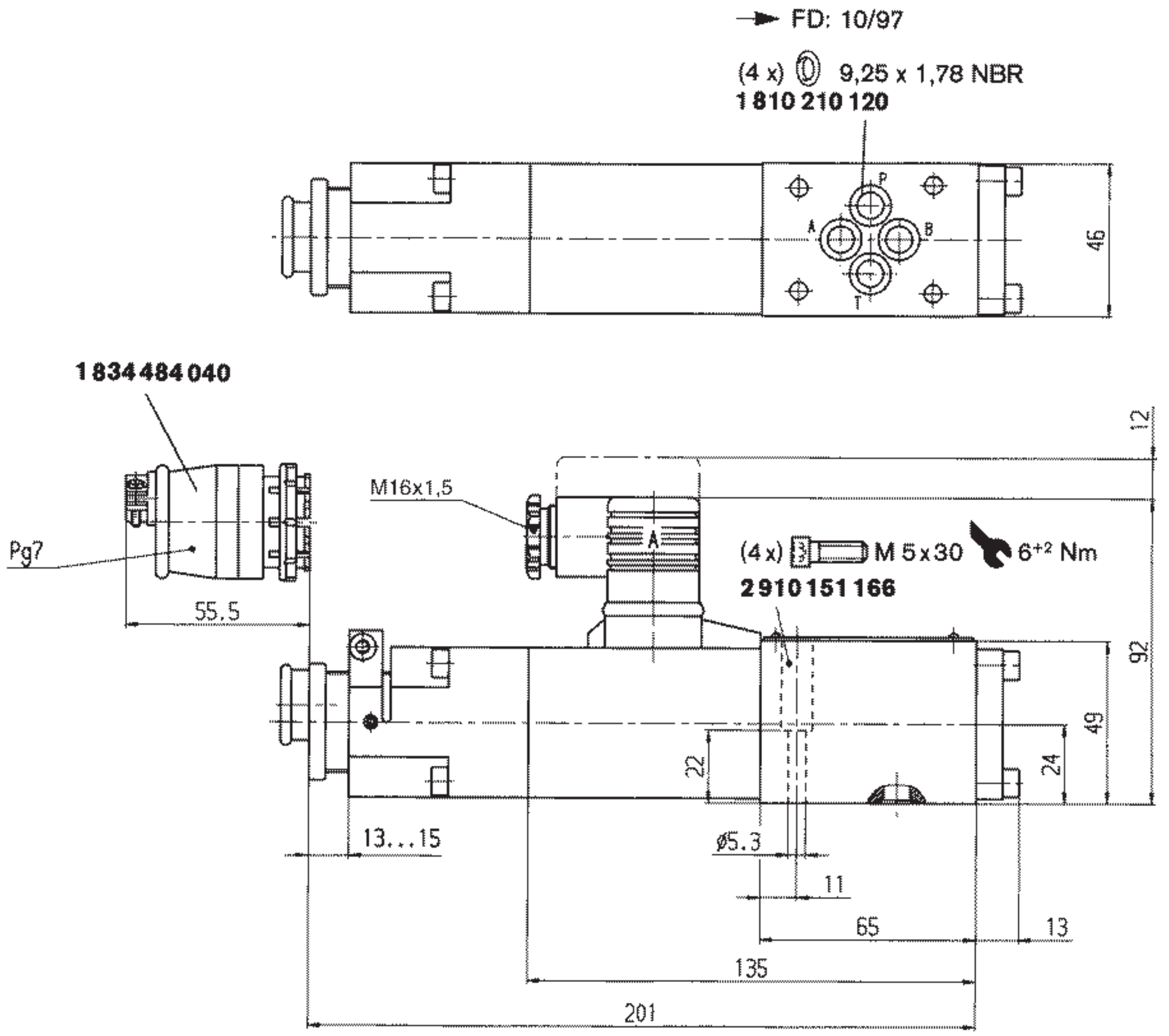
———— single flow
—·—·— double flow



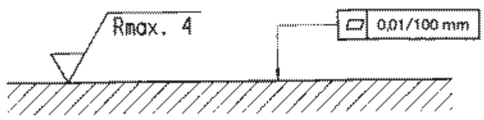
Doubled flow rate
$p_{max} = 250$ bar



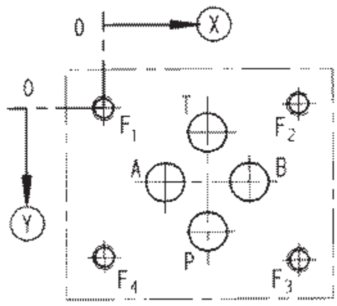
Unit dimensions type 4WRP6E.. (nominal dimensions in mm)



Required surface quality
of mating component



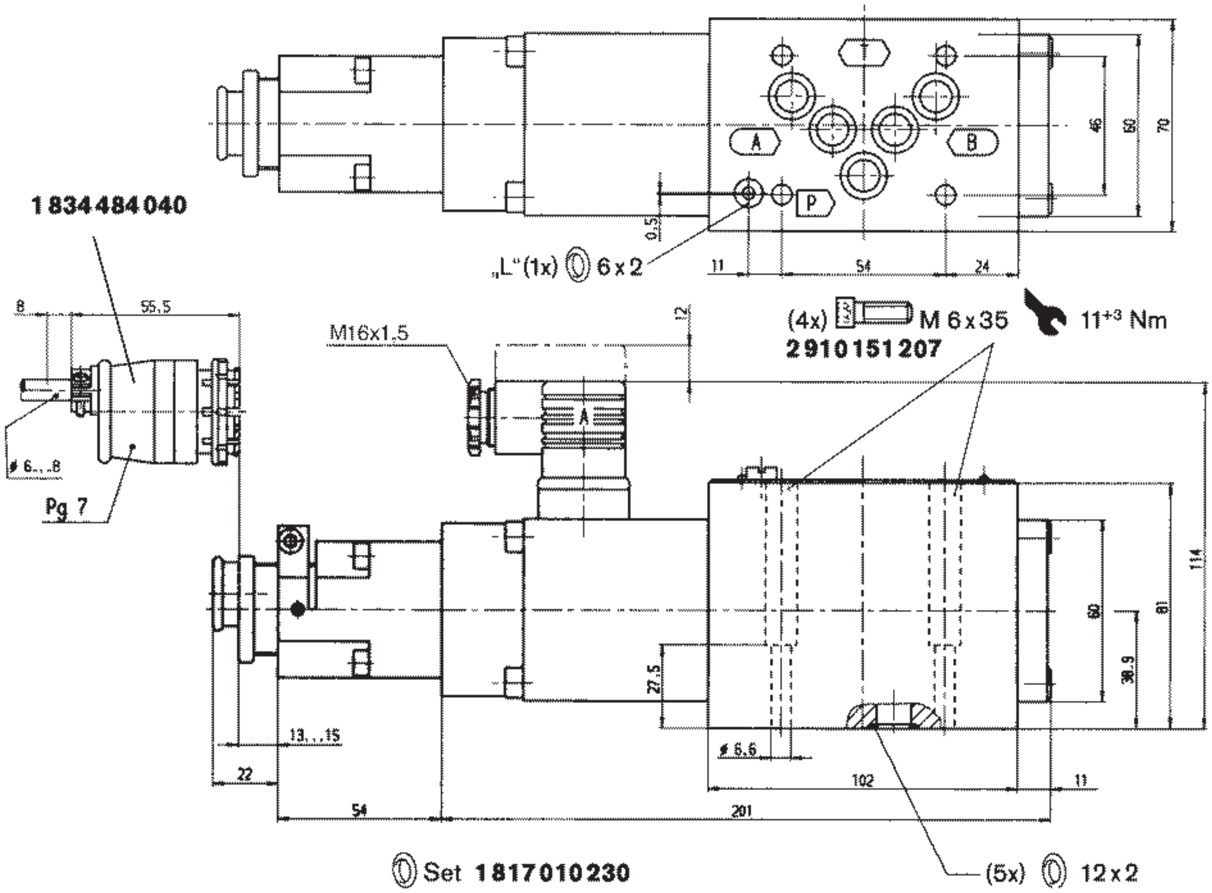
Mounting hole configuration: NG6 (ISO 4401-03-02-0-94)
For subplates, see catalog section RE 45053



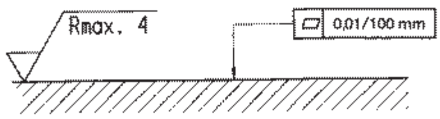
1) Deviates from standard
2) Thread depth:
Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

	P	A	T	B	F_1	F_2	F_3	F_4
X	21.5	12.5	21.5	30.2	0	40.5	40.5	0
Y	25.9	15.5	5.1	15.5	0	–0.75	31.75	31
Ø	8 1)	8 1)	8 1)	8 1)	M5 2)	M5 2)	M5 2)	M5 2)

Unit dimensions type 4WRP10E.. (nominal dimensions in mm)

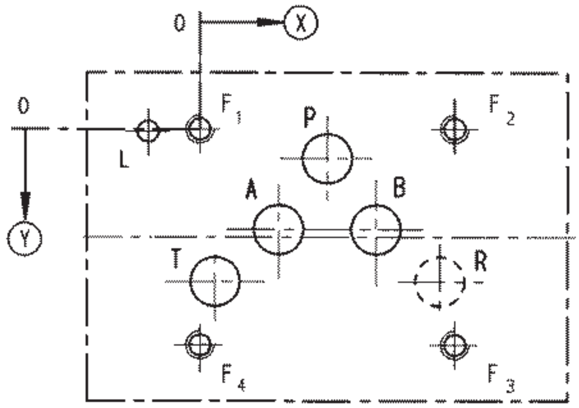


Required surface quality
of mating component



Mounting hole configuration: NG10 (ISO 4401-05-06-0-94)
Fur subplates, see catalog section RE 45055

[1] Deviates from standard
[2] Thread depth:
Ferrous metal 1.5 x Ø*
Non-ferrous 2 x Ø
* (NG10 min. 10.5 mm)



	P	A	T	B	F_1	F_2	F_3	F_4	R	L
X	27	16.7	3.2	37.3	0	54	54	0	50.8	–11
Y	6.3	21.4	32.5	21.4	0	0	46	46	32.5	0.5
Ø	10.5 [1]	10.5 [1]	10.5 [1]	10.5 [1]	M6 [2]	M6 [2]	M6 [2]	M6 [2]	10.5 [1]	4.5

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Notes

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www.boschrexroth.de

Rexroth
Bosch Group

4/3 servo solenoid valves with on-board electronics (OBE), positive overlap and position feedback

RE 29025/01.05
Replaces: 05.04

Type 4WRPE ..E.. / ..W..

Size 6, 10
Unit series 2X
Maximum working pressure of P, A, B 315 bar, T 200 bar
Nominal flow rate 8...32 l/min (NG6), 50...80 l/min (NG10)

List of contents

Features

– Directly operated NG6 and 10 valves with positive overlap, actuated on both sides and position-controlled, symbol E or W
– Control solenoid with on-board electronics (OBE), deadband compensation and gain calibrated at the factory
– Electrical connection 6P+PE (standard), signal input: differential amplifier with interface A1 = ±10 V (F1 on request)
– For subplate attachment, mounting hole configuration NG6 to ISO 4401-03-02-0-94 and NG10 to ISO 4401-05-04-0-94
– Plug-in connectors to DIN 43563-AM6, see catalog section RE 08008 (order separately)
– Subplates as per catalog section RE 45053 and RE 45055 (order separately)

Variants on request

– For standard applications, such as e.g.
  ● Valve electronics 11P+PE (plug-in connector)

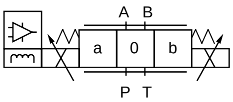
Ordering data and scope of delivery

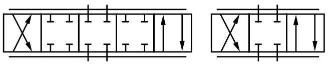
4WRP	E				S	J –2X/ G24	K0/		M	*

With **on-board** trigger electronics = E

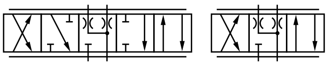
Size 6 = 6
Size 10 = 10

Symbols
4/3-way version





= E, E1



= W, W1

[1] F1 = 4...12...20 mA on request
[2] Valve electronics 11P+PE on request

Further information in plain text

M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

Interface for trigger electronics
A1 = setpoint input ±10 V
F1 = setpoint input 4...12...20 mA[1]

Electrical connection
K0 = **without** plug-in connector, with unit plug to DIN 43563-AM6 [2]
Order plug-in connector separately

Voltage supply of trigger electronics
G24 = +24 V DC

2X = Unit series (installation and connection dimensions unchanged)

Overlap compensating signal
J = See curve range 0...+0.5

Flow characteristic
S = Progressive

Nominal flow rate at 5 bar valve pressure difference per metering notch

Size 6		**Size 10**	
08 =	8 l/min	**50 =**	50 l/min
18 =	18 l/min	**80 =**	80 l/min
32 =	32 l/min		

Preferred types (available at short notice)

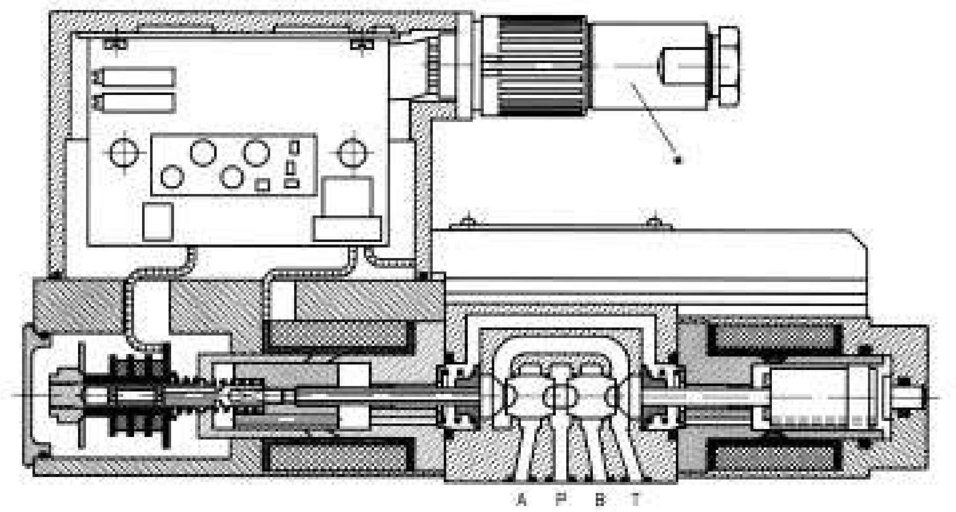
Type 4WRPE 6	Material No.
Symbol E	
4WRPE 6 E 08SJ–2X/G24K0/A1M	**0 811 404 148**
4WRPE 6 E 18SJ–2X/G24K0/A1M	**0 811 404 140**
4WRPE 6 E 32SJ–2X/G24K0/A1M	**0 811 404 141**
Symbol W	
4WRPE 6 W 08SJ–2X/G24K0/A1M	**0 811 404 145**
4WRPE 6 W 18SJ–2X/G24K0/A1M	**0 811 404 142**
4WRPE 6 W 18SJ–2X/G24K0/F1M	**0 811 404 146**
4WRPE 6 W 32SJ–2X/G24K0/A1M	**0 811 404 143**
4WRPE 6 W 32SJ–2X/G24K0/F1M	**0 811 404 147**

Type 4WRPE 10	Material No.
Symbol E, E1	
4WRPE 10 E 50SJ–2X/G24K0/A1M	**0 811 404 770**
4WRPE 10 E 80SJ–2X/G24K0/A1M	**0 811 404 771**
4WRPE 10 E1 80SJ–2X/G24K0/A1M	**0 811 404 774**
Symbol W, W1	
4WRPE 10 W 50SJ–2X/G24K0/A1M	**0 811 404 772**
4WRPE 10 W 50SJ–2X/G24K0/F1M	**0 811 404 778**
4WRPE 10 W 80SJ–2X/G24K0/A1M	**0 811 404 773**
4WRPE 10 W1 80SJ–2X/G24K0/A1M	**0 811 404 777**

Function, sectional diagram

Type 4WRPE 6 ..

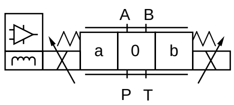
EN 61000-6-2
EN 61000-6-3

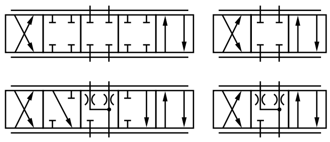


Control solenoid with position transducer Valve body Control solenoid

Symbols

Position transducer: A-side

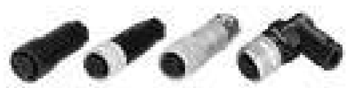




.. E ..

..W..

Accessories, not included in scope of delivery

(4 x) M5 x 30 DIN 912–10.9	Fastening bolts		**2 910 151 166**
* 	Plug-in connectors 6P+PE, see also RE 08008	KS	**1 834 482 022**
		KS	**1 834 482 026**
		MS	**1 834 482 023**
		MS	**1 834 482 024**
		KS 90°	**1 834 484 252**

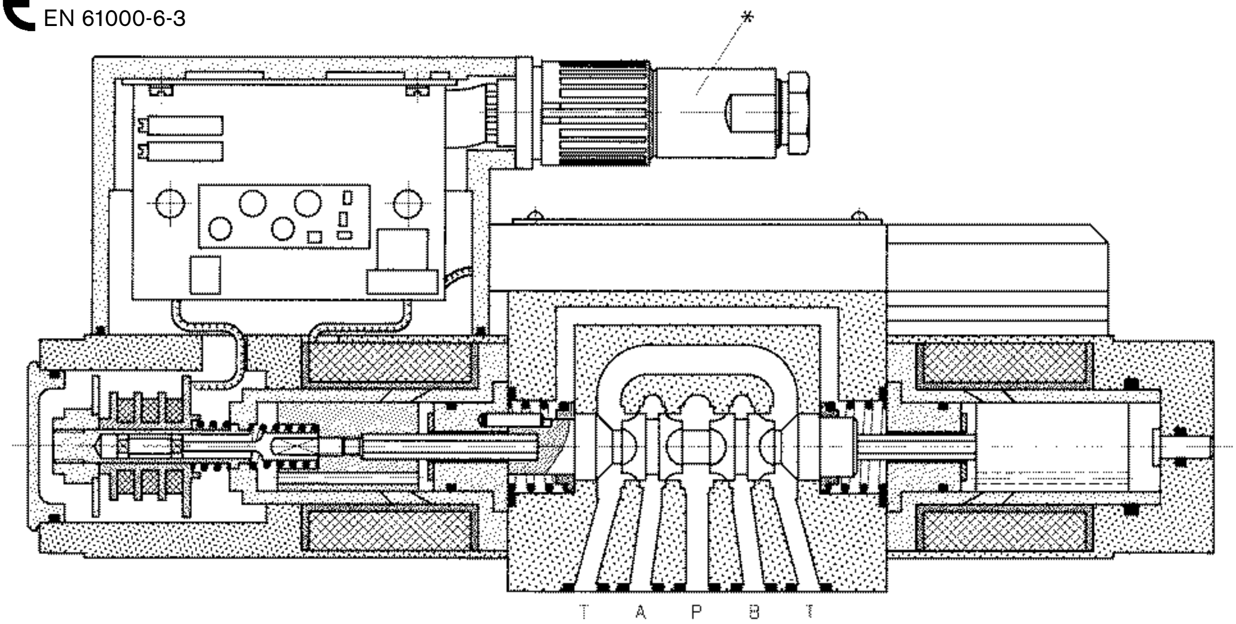
Testing and service equipment

– Test box type VT-PE-TB3, see RE 30065
– Test adapter type 6P+PE type VT-PA-2, see RE 30068

Function, sectional diagram

Type 4WRPE 10 ..

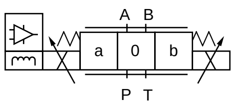
EN 61000-6-2
EN 61000-6-3

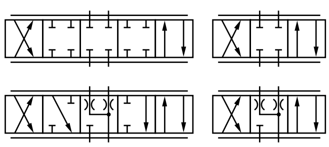


Control solenoid with position transducer Valve body Control solenoid

Symbols

Position transducer: A-side

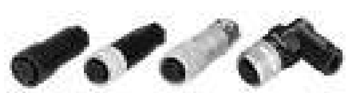




.. E ..
.. E1 ..

..W..
..W1..

Accessories, not included in scope of delivery

(4 x) M6 x 40 DIN 912–10.9	Fastening bolts		**2 910 151 209**
* 	Plug-in connectors 6P+PE, see also RE 08008	KS	**1 834 482 022**
		KS	**1 834 482 026**
		MS	**1 834 482 023**
		MS	**1 834 482 024**
		KS 90°	**1 834 484 252**

Testing and service equipment

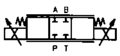
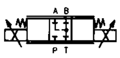
– Test box type VT-PE-TB3, see RE 30065
– Test adapter type 6P+PE type VT-PA-2, see RE 30068

Technical data (type 4WRPE 6 ..)

General

Construction		Spool type valve, directly operated, without steel sleeve
Actuation		Proportional solenoid with position control, OBE
Connection type		Subplate, mounting hole configuration NG6 (ISO 4401-03-02-0-94)
Mounting position		Optional
Ambient temperature range	°C	–20 … +50
Weight	kg	3.9
Vibration resistance, test condition		Max. 25 g, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, $\vartheta_{oil} = 40$ °C ±5 °C)

Pressure fluid			Hydraulic oil to DIN 51524 ... 535, other fluids after prior consultation		
Viscosity range	recommended	mm²/s	20 ... 100		
	max. permitted	mm²/s	10 ... 800		
Pressure fluid temperature range		°C	–20 ... +70		
Maximum permissible degree of contamination of pressure fluid Purity class to ISO 4406 (c)			Class 18/16/13 [1]		
Direction of flow			See symbol		
Nominal flow at		l/min	8	18	32
$\Delta p = 5$ bar per notch [2]		Q_A at 8 V	5.5 ±3 %	13 ±3 %	26 ±3 %
Max. working pressure		bar	Port P, A, B: 315		
Max. pressure		bar	Port T: 200		
Operating limits			See chart		
Leakage per metering edge ($\Delta p = 100$ bar)			 A → T = 80 cm³/min B → T = 80 cm³/min		
Leakage drain ($\Delta p = 5$ bar)			 A → T = 0.8...1.6 l/min B → T = 0.8...1.6 l/min		

Static/Dynamic

Hysteresis		%	≦ 0.3
Range of inversion		%	< 0.2
Manufacturing tolerance		%	≦ ±3
Response time	100 % signal change	ms	20
	10 % signal change	ms	5
Thermal drift			< 1% at $\Delta T = 40$ °C
Conformity			CE EN 61000-6-2 EN 61000-6-3

[1] The purity classes stated for the components must be complied with in hydraulic systems. Effective filtration prevents problems and also extends the service life of components. For a selection of filters, see catalog sections RE 50070, RE 50076 and RE 50081.

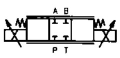
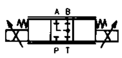
[2] Flow rate at a different Δp $q_x = q_{nom} \cdot \sqrt{\frac{\Delta p_x}{5}}$

Technical data (type 4WRPE 10 ..)

General

Construction		Spool type valve, directly operated, without steel sleeve	
Actuation		Proportional solenoid with position control, OBE	
Connection type		Subplate, mounting hole configuration NG10 (ISO 4401-05-04-0-94)	
Mounting position		Optional	
Ambient temperature range	°C	–20 … +50	
Weight	kg	8.3	
Vibration resistance, test condition		Max. 25 *g*, shaken in 3 dimensions (24 h)	

Hydraulic (measured with HLP 46, ϑ_{oil} = 40 °C ±5 °C)

Pressure fluid			Hydraulic oil to DIN 51524 ... 535, other fluids after prior consultation	
Viscosity range	recommended	mm²/s	20 ... 100	
	max. permitted	mm²/s	10 ... 800	
Pressure fluid temperature range		°C	–20 ... +70	
Maximum permissible degree of contamination of pressure fluid Purity class to ISO 4406 (c)			Class 18/16/13 [1]	
Direction of flow			See symbol	
Nominal flow at		l/min	50	80
Δp = 5 bar per notch [2]		Q_A at 8 V	40 ±3 %	70 ±3 %
Max. working pressure		bar	Port P, A, B: 315	
Max. pressure		bar	Port T: 200	
Operating limits			See chart	
Leakage per metering edge (Δp = 100 bar)				A → T = 80 cm³/min B → T = 80 cm³/min
Leakage drain (Δp = 5 bar)				A → T = 0.8...1.6 l/min B → T = 0.8...1.6 l/min

Static/Dynamic

Hysteresis		%	≦ 0.3
Range of inversion		%	< 0.2
Manufacturing tolerance		%	≦ ±3
Response time	100 % signal change	ms	40
	10 % signal change	ms	10
Thermal drift			< 1% at ΔT = 40 °C
Conformity			CE EN 61000-6-2 EN 61000-6-3

1) The purity classes stated for the components must be complied with in hydraulic systems. Effective filtration prevents problems and also extends the service life of components. For a selection of filters, see catalog sections RE 50070, RE 50076 and RE 50081.

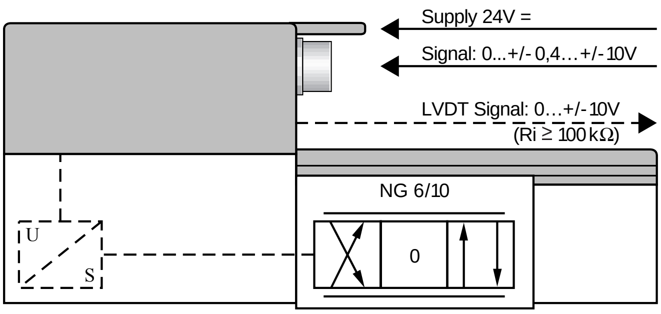
2) Flow rate at a different Δp $q_x = q_{nom} \cdot \sqrt{\frac{\Delta p_x}{5}}$

Technical data (type 4WRPE ..E.. / ..W..)

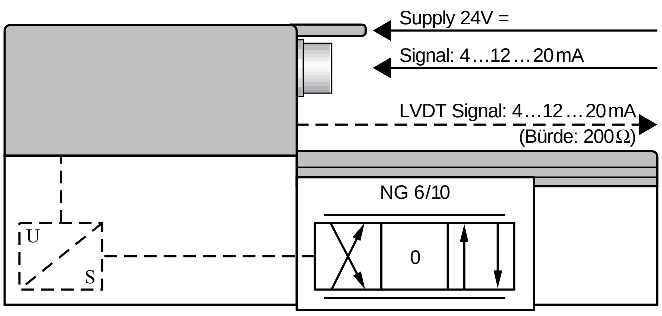
Electrical, trigger electronics integrated in the valve

Cyclic duration factor	%	100
Degree of protection		IP 65 to DIN 40050 and IEC 14434/5
Connection		Plug-in connector 6P+PE, DIN 43563
Power supply Terminal A: Terminal B: 0 V		24 V DC_{nom} min. 21 V DC/max. 40 V DC Ripple max. 2 V DC
Power consumption	NG6	Solenoid ◪ 45 mm = 40 VA max.
	NG10	Solenoid ◪ 60 mm = 60 VA max.
External fuse		2.5 A_F
Input, "Standard" version Terminal D: U_E Terminal E:	A1	Differential amplifier, $R_i = 100\ k\Omega$ 0 ... ±0.4 ... ±10 V 0 V
Input, "mA signal" version Terminal D: I_{D-E} Terminal E: I_{D-E}	F1	Burden, $R_{sh} = 200\ \Omega$ 4 ... 12 ... 20 mA Current loop I_{D-E} feedback
Max. differential input voltage at 0 V		D → B E → B } max. 18 V DC
Test signal, "Standard" version Terminal F: U_{Test} Terminal C:	A1	LVDT 0 ... ±0.4 ... ±10 V Reference 0 V
Test signal, "mA signal" version Terminal F: I_{F-C} Terminal C: I_{F-C}	F1	LVDT signal 4 ... 12 … 20 mA at external load 200 ... 500 Ω max. 4 ... 20 mA output Current loop I_{F-C} feedback
Safety earth conductor and shield		See pin assignment (installation conforms to CE)
Recommended cable		See pin assignment up to 20 m 7 x 0.75 mm² up to 40 m 7 x 1 mm²
Calibration		Calibrated at the factory, see valve curve

Version A1: Standard

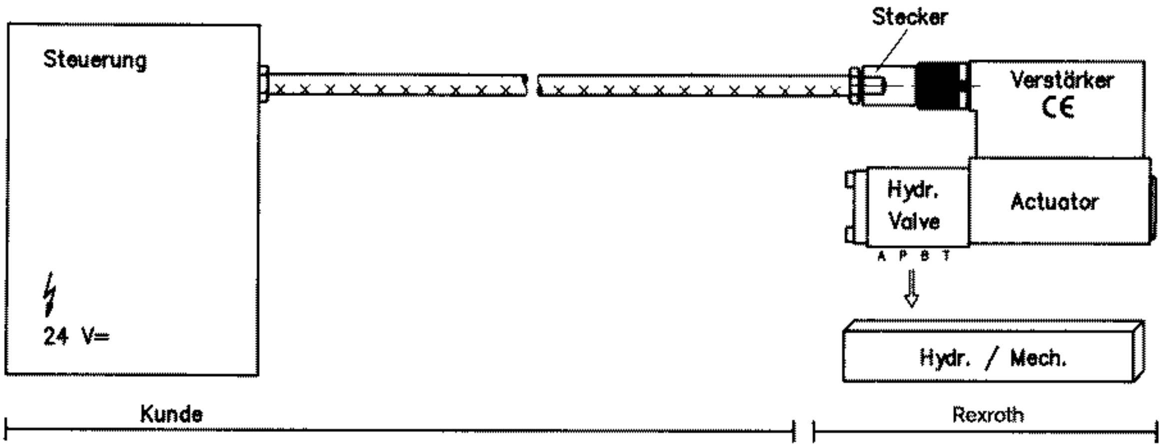


Version F1: mA-Signal



Connection

For electrical data see page 7 and
Operating Instructions **1 819 929 083**



Technical notes for the cable

Version:	– Multi-wire cable – Extra-finely stranded wire to VDE 0295, Class 6 – Safety earth conductor, green/yellow – Cu braided shield
Types:	– e.g. Ölflex-FD 855 CP (from Lappkabel company)
No. of wires:	– Determined by type of valve, plug types and signal assignment
Cable Ø:	– 0.75 mm² up to 20 m length – 1.0 mm² up to 40 m length
Outside Ø:	– 9.4 ... 11.8 mm – Pg11 – 12.7 ... 13.5 mm – Pg16

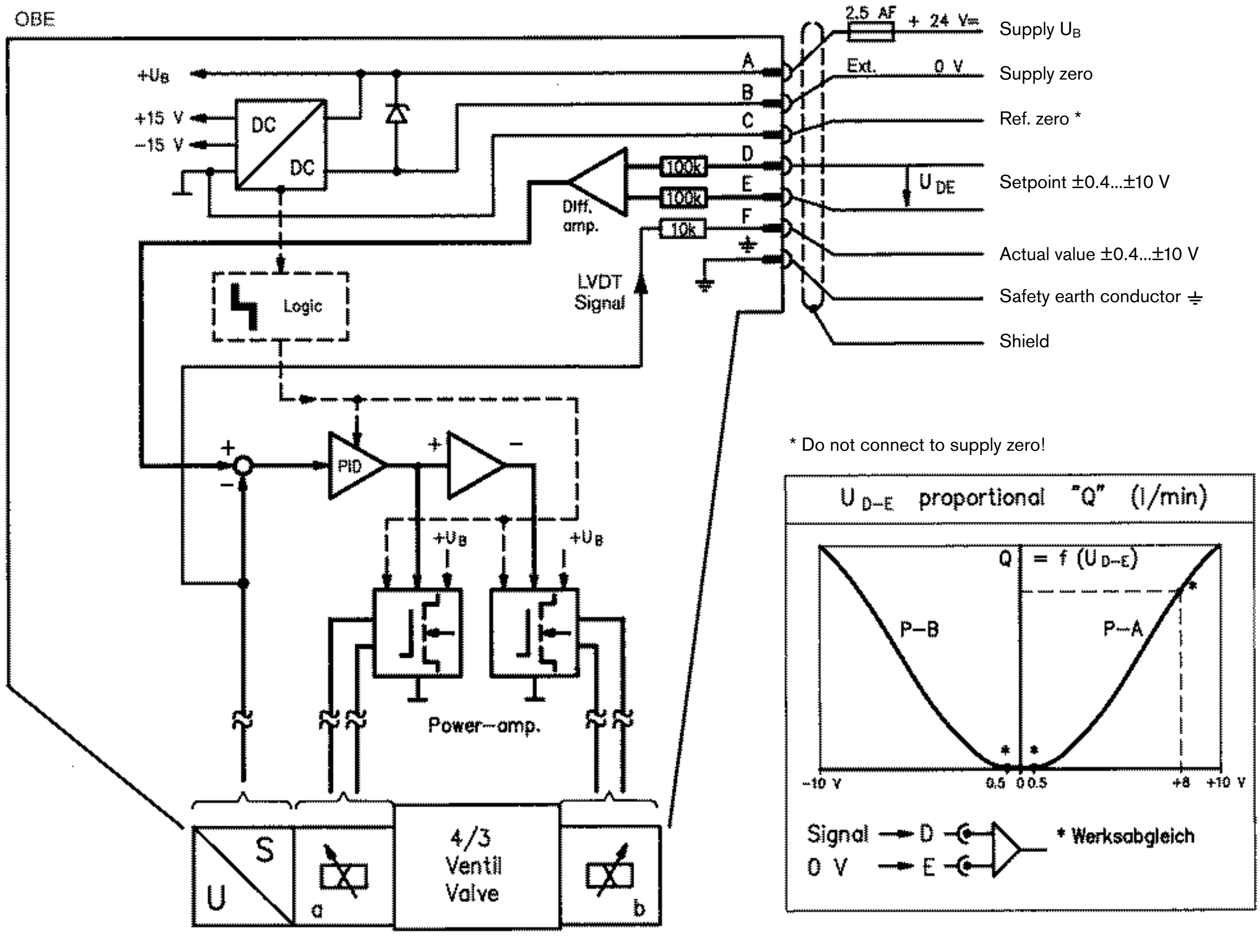
Important

Voltage supply 24 V DC nom,
if voltage drops below 18 V DC, rapid shutdown resembling "Enable OFF" takes place internally.
In addition, with the "mA signal" version:
$I_{D-E} \geqq 3$ mA – valve is active
$I_{D-E} \leqq 2$ mA – valve is deactivated.
Electrical signals emitted via the trigger electronics (e.g. actual values) must not be used to shut down safety-relevant machine functions!
(Also see European Standard, "Technical Safety Requirements for Fluid-Powered Systems and Components – Hydraulics", EN 982!)

On-board trigger electronics

Circuit diagram/pin assignment

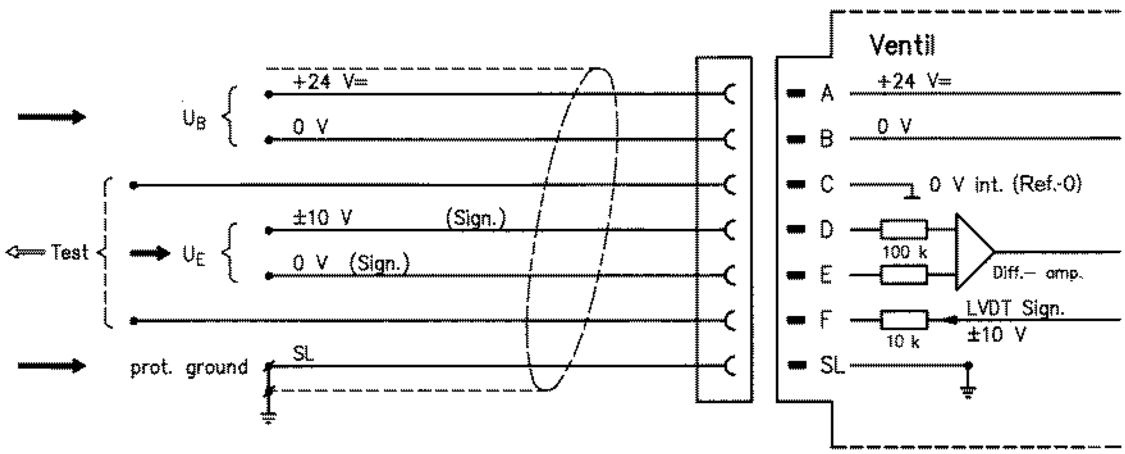
Version A1: U_{D-E} 0...±0.4...±10 V



Pin assignment 6P+PE

Version A1: U_{D-E} 0...±0.4...±10 V

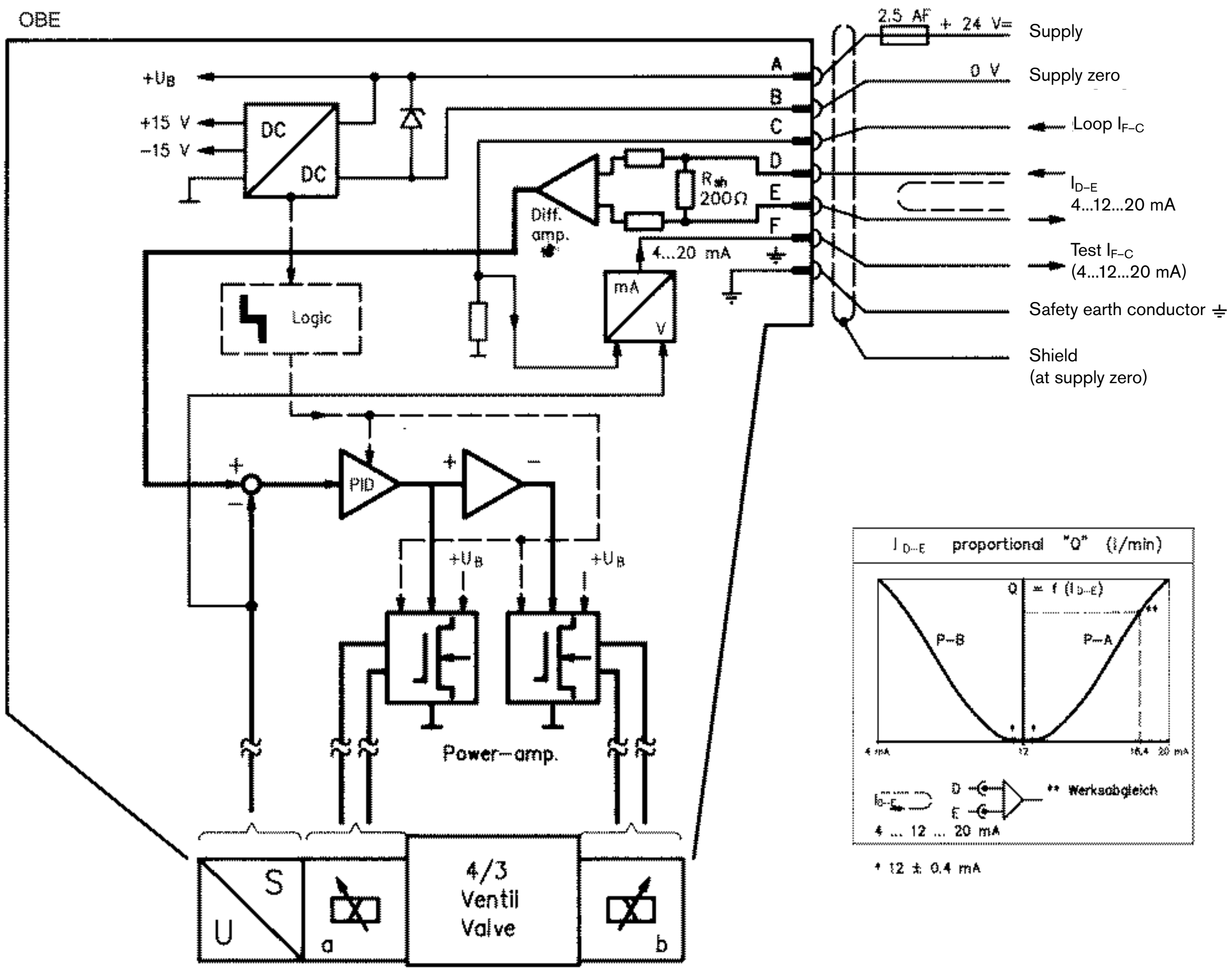
(R_i = 100 kΩ)



On-board trigger electronics

Circuit diagram/pin assignment

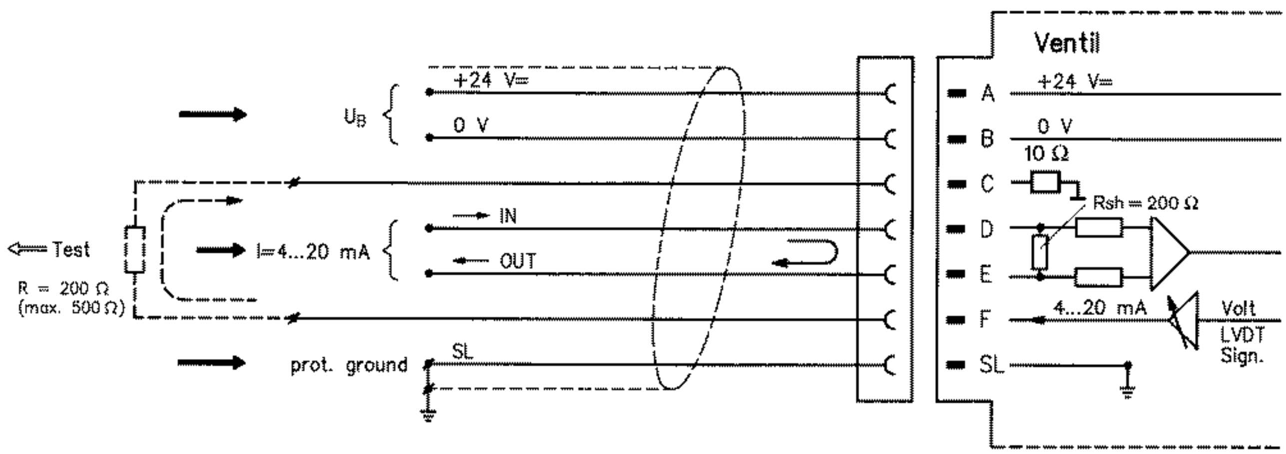
Version F1: I_{D-E} 4...12...20 mA



Pin assignment 6P+PE

Version F1: I_{D-E} 4...12...20 mA

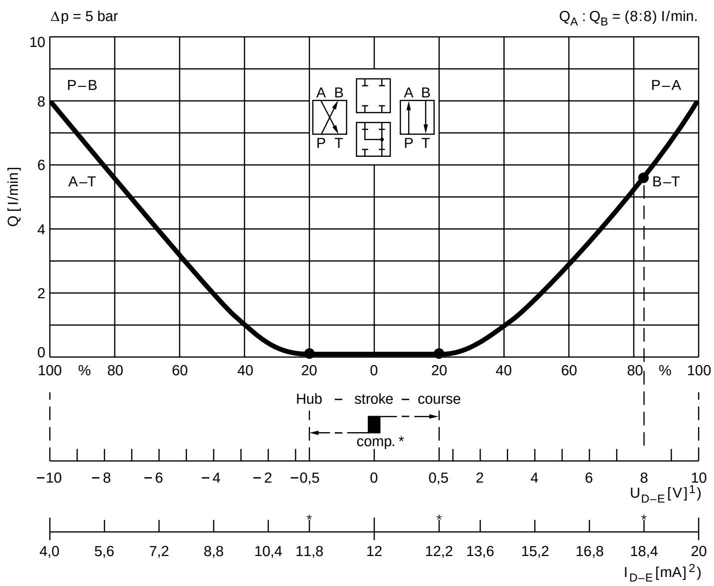
(R_{sh} = 200 kΩ)



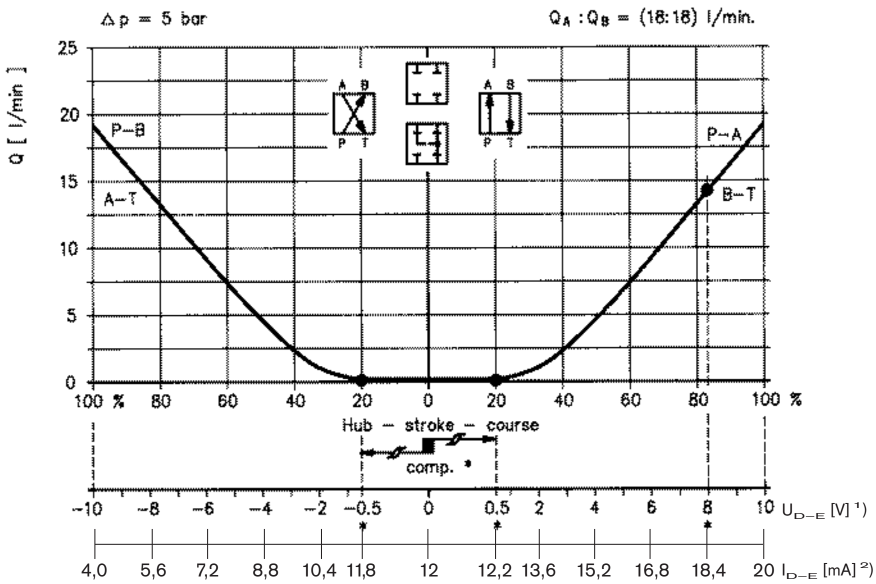
Characteristic curves type 4WRPE 6 .. (measured with HLP 46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Flow rate/Signal function (at $\Delta p = 5$ bar per notch)

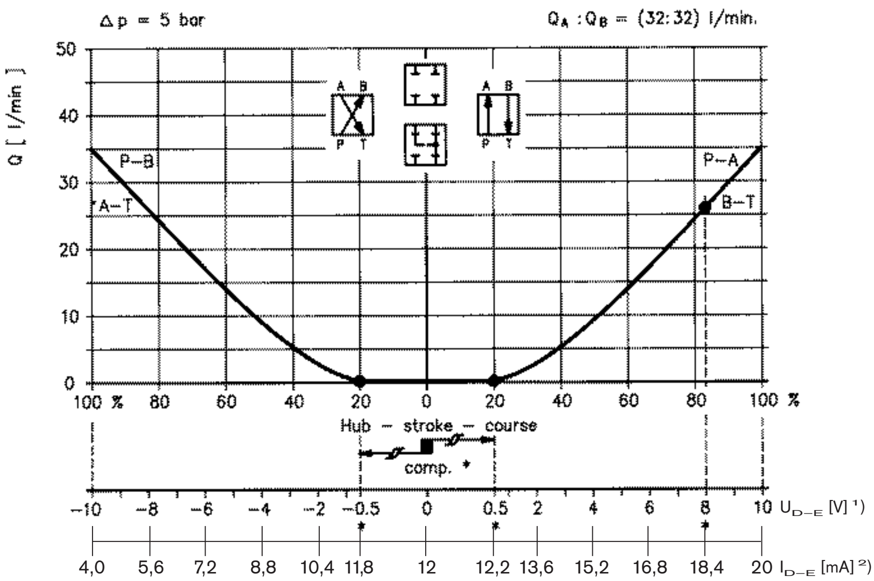
$Q_{nom} = 8$ **l/min**



$Q_{nom} = 18$ **l/min**



$Q_{nom} = 32$ **l/min**

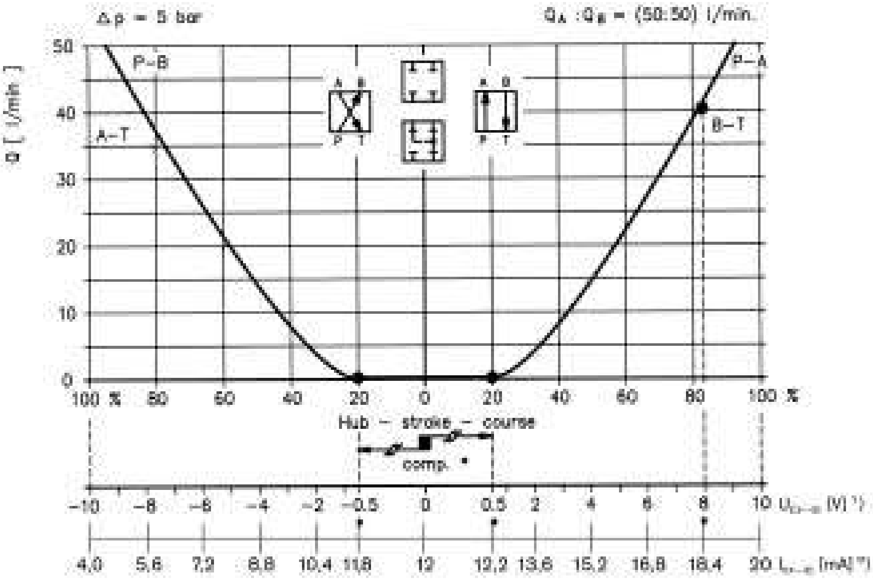


* Factory setting ≦ ±3 %
1) Version: $U_E = \pm 0.4 ... \pm 10$ V
2) Version: $I_E = 4 ... 12 ... 20$ mA

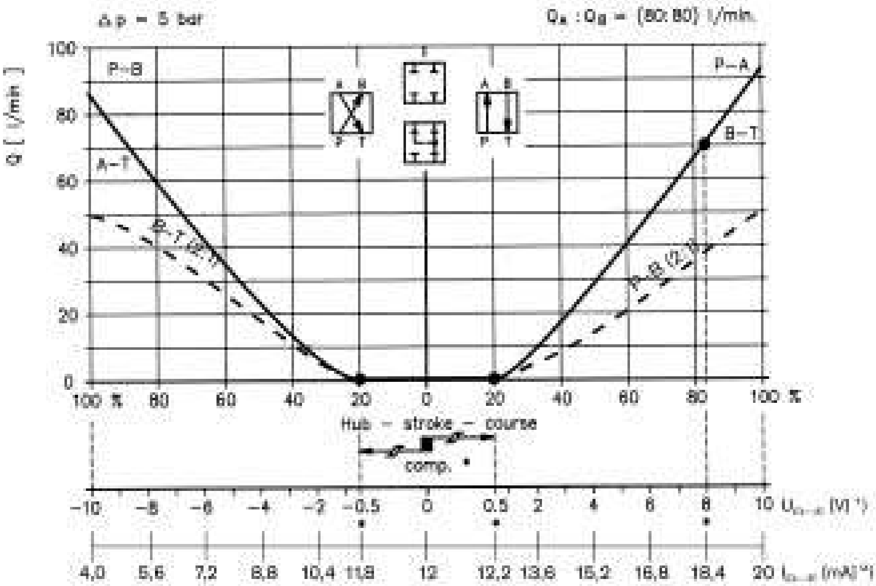
Characteristic curves type 4WRPE 10 .. (measured with HLP 46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Flow rate/Signal function (at $\Delta p = 5$ bar per notch)

$Q_{nom} = 50$ **l/min**



$Q_{nom} = 80$ **l/min**



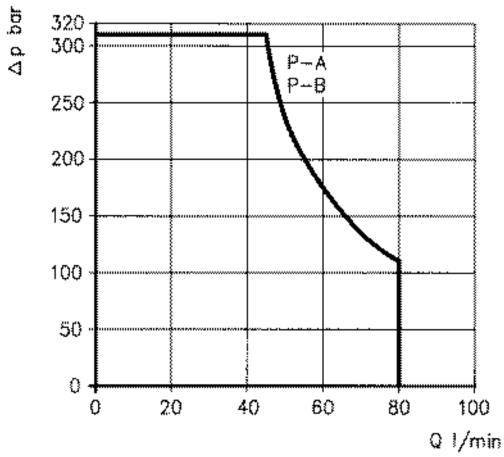
* Factory setting ≦ ±3 %

1) Version: $U_E = \pm 0.4\ ...\ \pm 10$ V

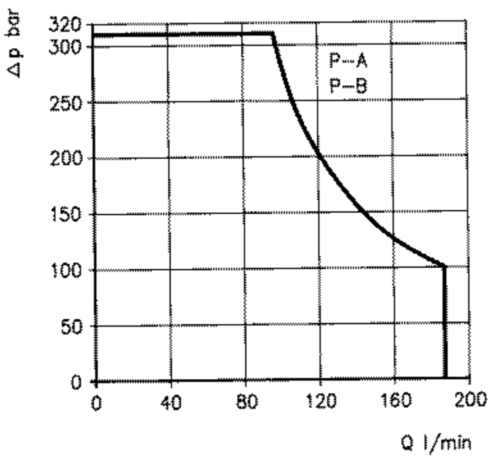
2) Version: $I_E = 4\ ...\ 12\ ...\ 20$ mA

Operating limits (measured with HLP 46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

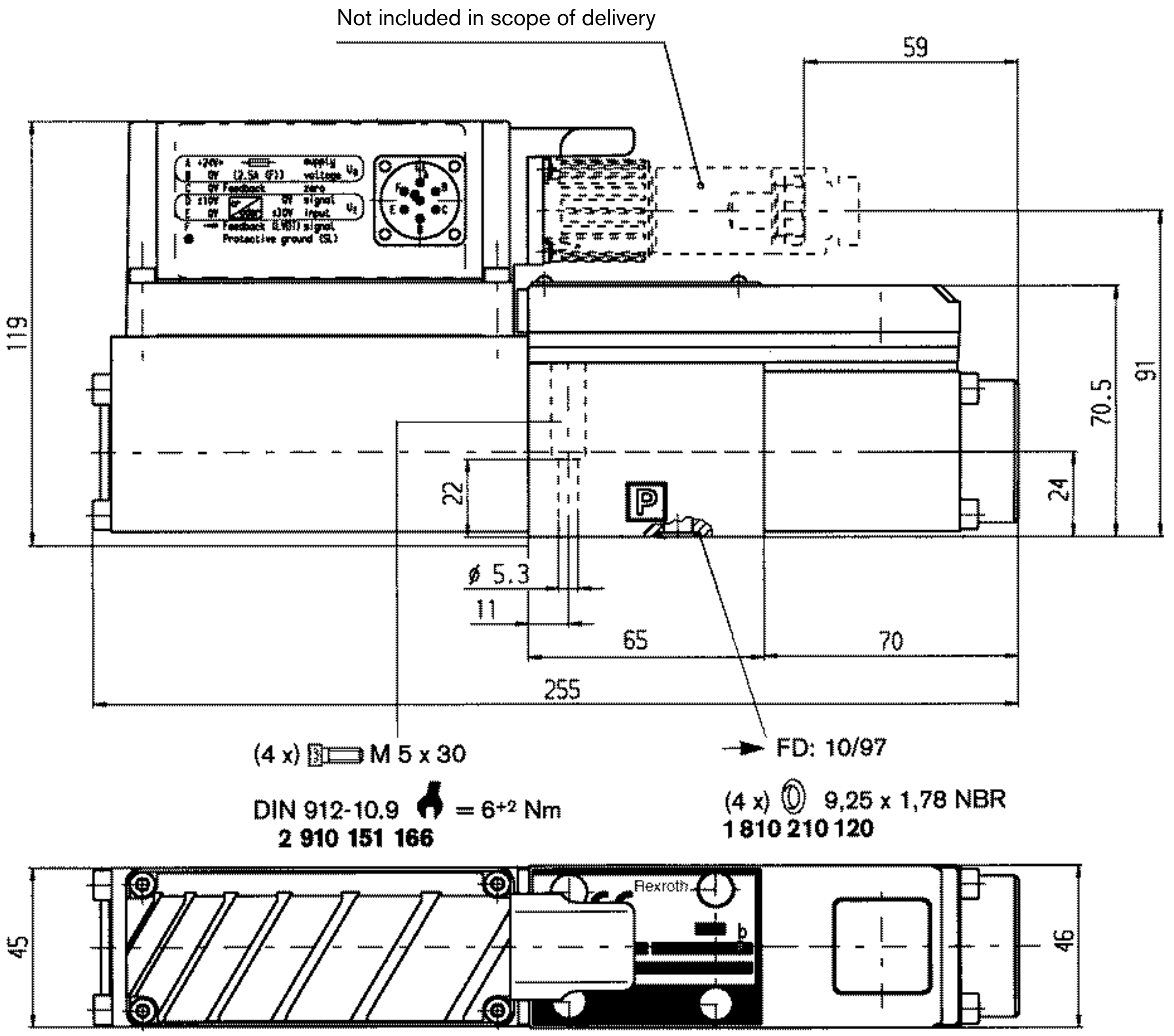
Type 4WRPE 6 ..



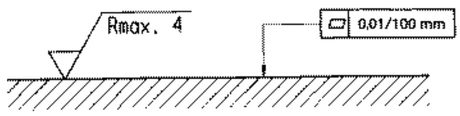
Type 4WRPE 10 ..



Unit dimensions type 4WRPE 6 .. (nominal dimensions in mm)

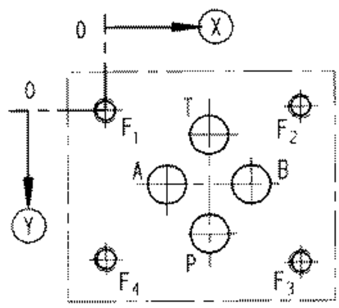


Required surface quality of mating component



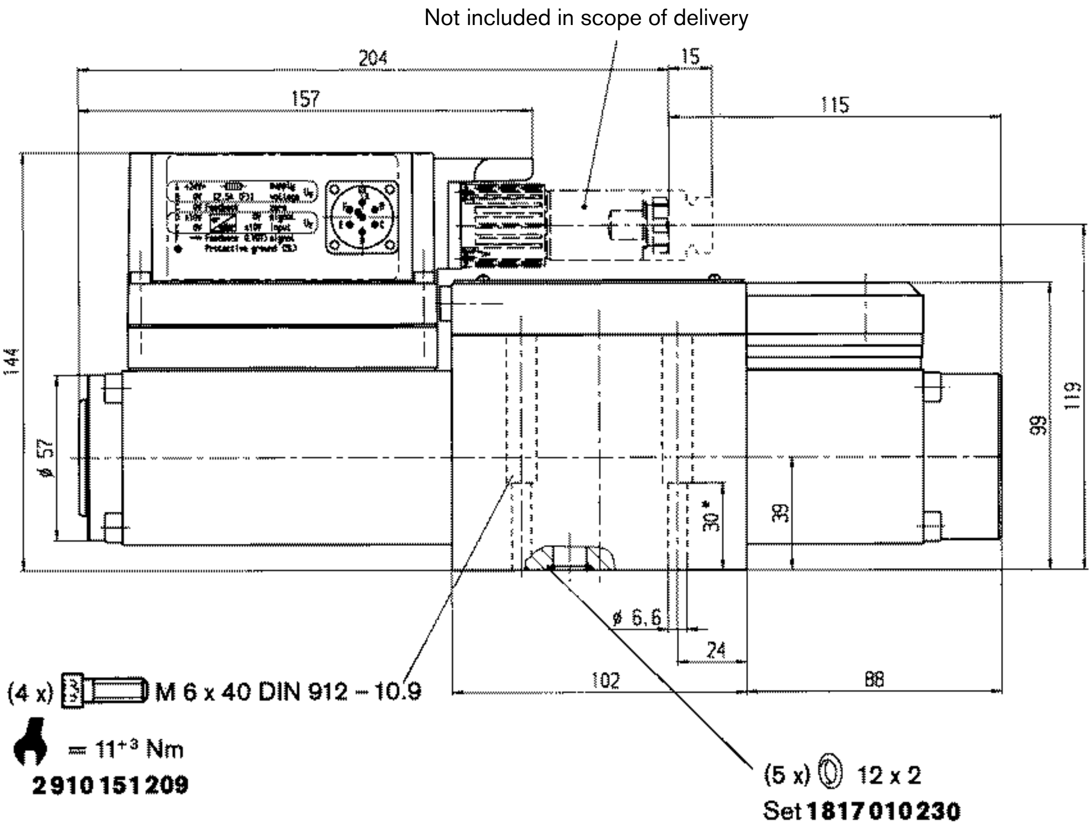
Mounting hole configuration: NG6 (ISO 4401-03-02-0-94)
For subplates, see catalog section RE 45053

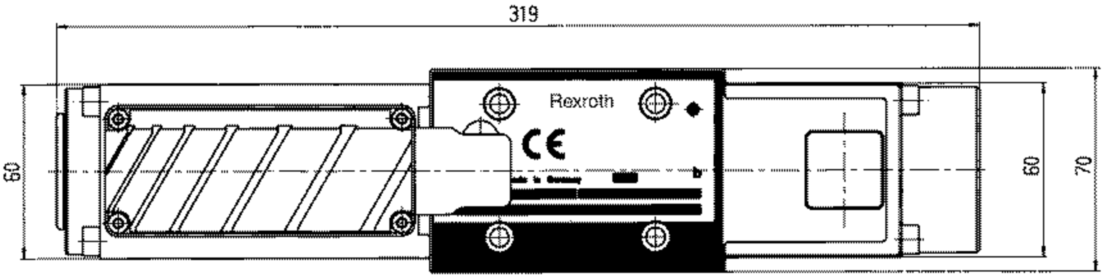
[1] Deviates from standard
[2] Thread depth:
Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø



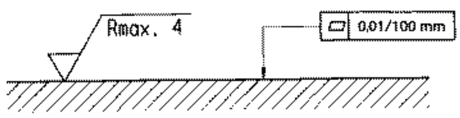
	P	A	T	B	F_1	F_2	F_3	F_4
Ⓧ	21.5	12.5	21.5	30.2	0	40.5	40.5	0
Ⓨ	25.9	15.5	5.1	15.5	0	–0.75	31.75	31
∅	8 [1]	8 [1]	8 [1]	8 [1]	M5 [2]	M5 [2]	M5 [2]	M5 [2]

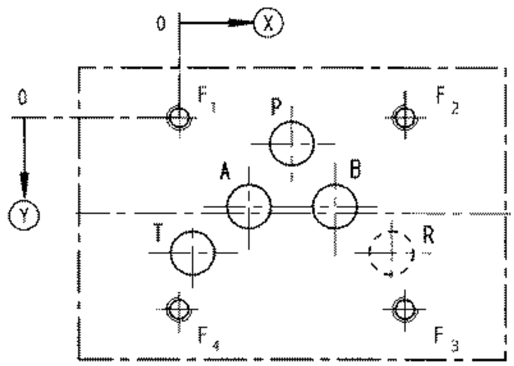
Unit dimensions type 4WRPE 10 .. (nominal dimensions in mm)





Required surface quality of mating component





Mounting hole configuration: NG10 (ISO 4401-05-04-0-94)
For subplates, see catalog section RE 45055

1) Deviates from standard
2) Thread depth:
Ferrous metal 1.5 x Ø*
Non-ferrous 2 x Ø
* (NG10 min. 10.5 mm)

	P	A	T	B	F_1	F_2	F_3	F_4	R
X	27	16.7	3.2	37.3	0	54	54	0	50.8
Y	6.3	21.4	32.5	21.4	0	0	46	46	32.5
Ø	10.5 1)	10.5 1)	10.5 1)	10.5 1)	M6 2)	M6 2)	M6 2)	M6 2)	10.5 1)

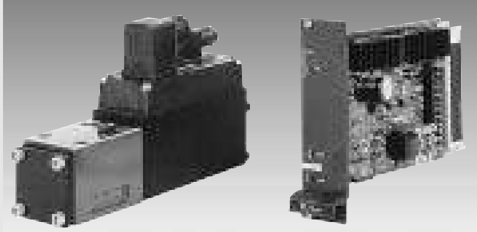
Notes

Bosch Rexroth AG
Industrial Hydraulics
Zum Eisengießer 1
D-97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Servo solenoid valves with electrical position feedback (Lvdt DC/DC ±10 V)

RE 29028/01.05
Replaces: 09.03

Type 4WRPH 6



Size 6
Unit series 2X
Maximum working pressure P, A, B 315 bar, T 250 bar
Nominal flow rate 2...40 l/min (Δp 70 bar)

List of contents

Features

- Directly operated servo solenoid valve NG6, with control piston and sleeve in servo quality
- Actuated on one side, 4/4 fail-safe position when switched off
- Control solenoid with integral position feedback and electronics for position transducer (Lvdt DC/DC)
- Suitable for electrohydraulic controllers in production and testing systems
- For subplate attachment, mounting hole configuration to ISO 4401-03-02-0-94
- Subplates as per catalogue section RE 45053 (order separately)
- Line sockets to DIN 43560-AM2
  Solenoid 2P+PE/M16 x 1.5, position transducer 4P/Pg7 in scope of delivery, see catalogue section RE 08008
- External trigger electronics (order separately)
  - Electric amplifier for standard curve “L”
    0 811 405 060, see catalogue section RE 30041
  - Electric amplifier for non-linear curve “P”
    40 % – 0 811 405 065 and 60 % – 0 811 405 066, see catalogue section RE 30040

Variants on request

- For standard applications
- Special symbols for plastic machines
- Sturdy “ruggedized” version for applications up to 40 g, valve with metal cap and central plug (7P).

Ordering data and scope of delivery

4WRP		H	6		B		–2X/G24	Z4/ M	*

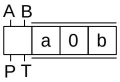
For **external** trigger eletronics **= no desig.**

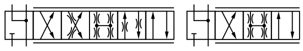
Control piston/sleeve **= H**

Size 6 **= 6**

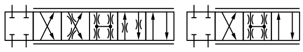
Symbols

4/4-way version





= C3, C5



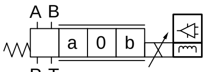
= C4, C1

With symbols C5 and C1: [3]

P → A: q_v B → T: $q_v/2$

P → B: $q_v/2$ A → T: q_v

Side of inductive position tranducer



(Standard) **= B**

[1] Only in connection with flow characteristic “p”

[2] Kink 60 % for NG6 with nominal flow rate “15” and “25”, otherwise kink 40 %

[3] q_v 2:1 only with nominal flow rate = 40 l/min

Further information in plain text

M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

Electronical connection

Z4 = with line socket, with plug to DIN 43560-AM2

Line socket in scope of delivery

Voltage supply of trigger electronics

G24 = +24 V DC

2X = Unit series 20 to 29 (installation and connection dimensions unchanged)

Flow characteristic

L = Linear

P = Non-linear curve [2]

Nominal flow rate at 70 bar valve pressure difference (35 bar /metering notch)

Size 6

02 = 2 l/min

04 = 4 l/min

12 = 12 l/min

15 [1] = 15 l/min

24 = 24 l/min

25 [1] = 25 l/min

40 [3] = 40 l/min

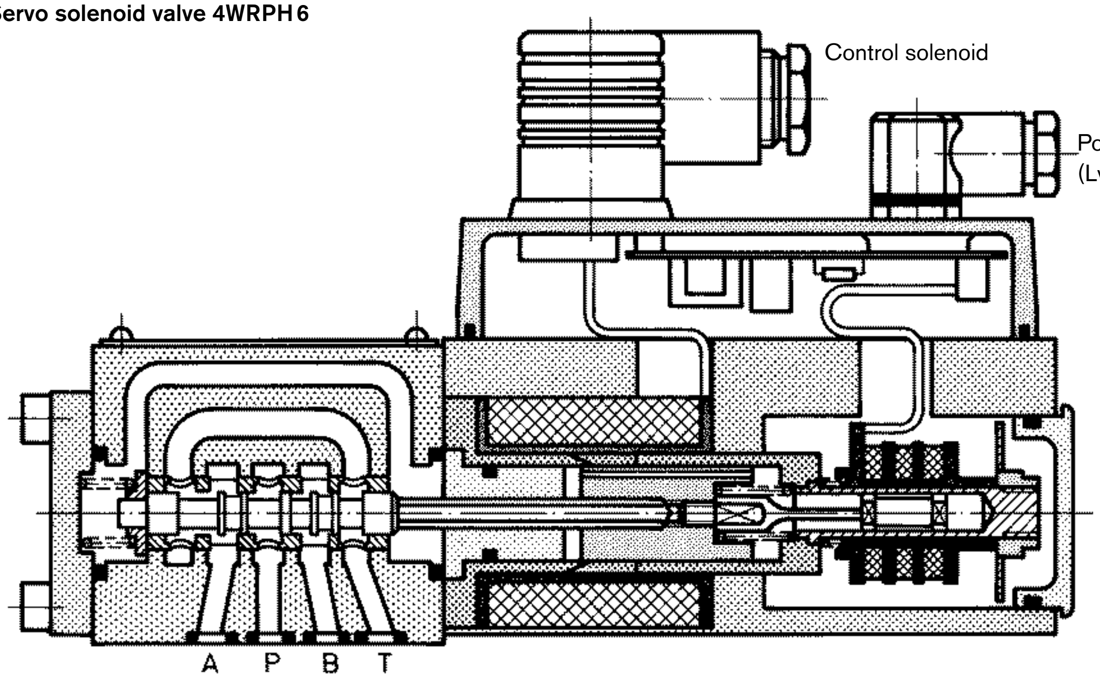
Preferred types (available at short notice)

Type 4WRPH 6	Material no.
C3/C5	
4WRPH 6 C3B02L –2X/G24Z4 /M	**0 811 404 041**
4WRPH 6 C3B04L –2X/G24Z4 /M	**0 811 404 033**
4WRPH 6 C3B12L –2X/G24Z4 /M	**0 811 404 034**
4WRPH 6 C3B24L –2X/G24Z4 /M	**0 811 404 035**
4WRPH 6 C3B40L –2X/G24Z4 /M	**0 811 404 036**
4WRPH 6 C5B40L –2X/G24Z4 /M	**0 811 404 510**
4WRPH 6 C3B15P –2X/G24Z4 /M	**0 811 404 047**
4WRPH 6 C3B25P –2X/G24Z4 /M	**0 811 404 043**
4WRPH 6 C3B40P –2X/G24Z4 /M	**0 811 404 044**
4WRPH 6 C5B40P –2X/G24Z4 /M	**0 811 404 511**

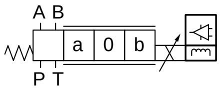
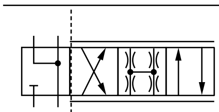
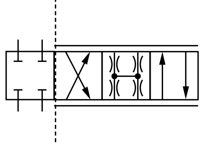
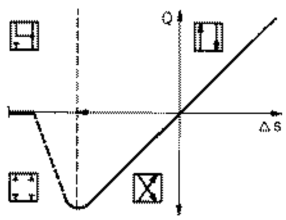
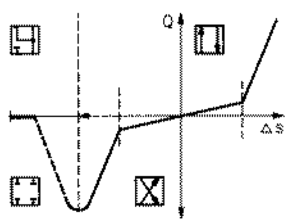
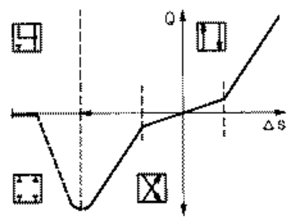
Type 4WRPH 6	Material no.
C1/C4	
4WRPH 6 C4B02L –2X/G24Z4 /M	**0 811 404 512**
4WRPH 6 C4B04L –2X/G24Z4 /M	**0 811 404 160**
4WRPH 6 C4B12L –2X/G24Z4 /M	**0 811 404 037**
4WRPH 6 C4B24L –2X/G24Z4 /M	**0 811 404 038**
4WRPH 6 C4B40L –2X/G24Z4 /M	**0 811 404 039**
4WRPH 6 C1B40L –2X/G24Z4 /M	**0 811 404 513**
4WRPH 6 C4B15P –2X/G24Z4 /M	**0 811 404 048**
4WRPH 6 C4B25P –2X/G24Z4 /M	**0 811 404 045**
4WRPH 6 C4B40P –2X/G24Z4 /M	**0 811 404 046**
4WRPH 6 C1B40P –2X/G24Z4 /M	**0 811 404 162**

Function, sectional diagram

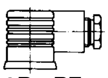
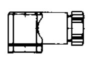
Servo solenoid valve 4WRPH 6



Symbols

	Linear	p: kink 60 % [q_n 15,25 l/min]	p: kink 40 % [q_n 40 l/min]
C3, C5  **C4, C1** 			
	C3, C5, C4, C1		
	Standard = 1:1, from q_n 40 l/min also 2:1		

Accessories, not included in scope of delivery

(4 x) M5 x 30 DIN 912–10.9	Fastening screws	**2 910 151 166**
 	VT-VRRA1-527-20 / V0, see RE 30041	**0 811 405 060**
	VT-VRRA1-527-20 / V0 / K60-AGC, see RE 30040	**0 811 405 066**
	VT-VRRA1-527-20 / V0 / K40-AGC, see RE 30040	**0 811 405 065**
 2P + PE  4P	2P + PE (M16 x 1.5) and 4P (Pg7) included in scope of delivery, see also RE 08008	

Application

– Valve amplifier with pressure compensator (p/Q), see RE 30058.

Testing and service equipment

– Test box type VT-PE-TB2, see RE 30064.
– Test adapter type VT-PA-3, see RE 30070.

Technical Data

General

Construction		Spool type valve, operated directly, with steel sleeve
Actuation		Proportional solenoid with position control, external amplifier
Type of mounting		Subplate, mounting hole configuration NG6 (ISO 4401-03-02-0-94)
Installation position		Optional
Ambient temperature range	°C	–20 … +50
Weight	kg	2.3
Vibration resistance, test condition		Max. 25 g, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Pressure fluid		Hydraulic oil to DIN 51524 … 535, other fluids after prior consultation					
Viscosity range recommended	mm²/s	20 … 100					
Viscosity range max. permitted	mm²/s	10 … 800					
Pressure fluid temperature range	°C	–20 … +80					
Maximum permissible degree of contamination of pressure fluid Purity class to ISO 4406 (c)		Class 18/16/13[1]					
Flow direction		See symbol					
Nominal flow at $\Delta p = 35$ bar per notch[2]	l/min	2	4	12	15	24	40
Max. working pressure	bar	Port P, A, B: 315					
Max. pressure	bar	Port T: 250					
Operating limits at Δp Pressure drop at valve $q_{Vnom}: > q_N$ valves	bar	315	315	315	315	315	160
	bar	315	315	315	280	250	100
Leakage at 100 bar	cm³/min	<150	<180	<300	–	<500	<900
	cm³/min	–	–	–	<180	<300	< 450

Electrical

Cyclic duration factor	%	100 ED
Power supply		24 V_{nom} (external amplifier)
Degree of protection		IP 65 to DIN 40050
Solenoid connector		Connector DIN 43650/ISO 4400 M16 x 1.5 (2P + PE)
Position transducer connector		Special Connector Pg7 (4P)
Max. solenoid current	A	2.7
Coil restistance R_{20}	Ω	2.5
Max. power consumption at 100 % load and operational temperature	VA	40
Position transducer DC/DC technology		Supply: +15 V/35 mA –15 V/35 mA; Signal: 0...±10 V ($R_L \geqq 10$ kΩ)

Static/Dynamic

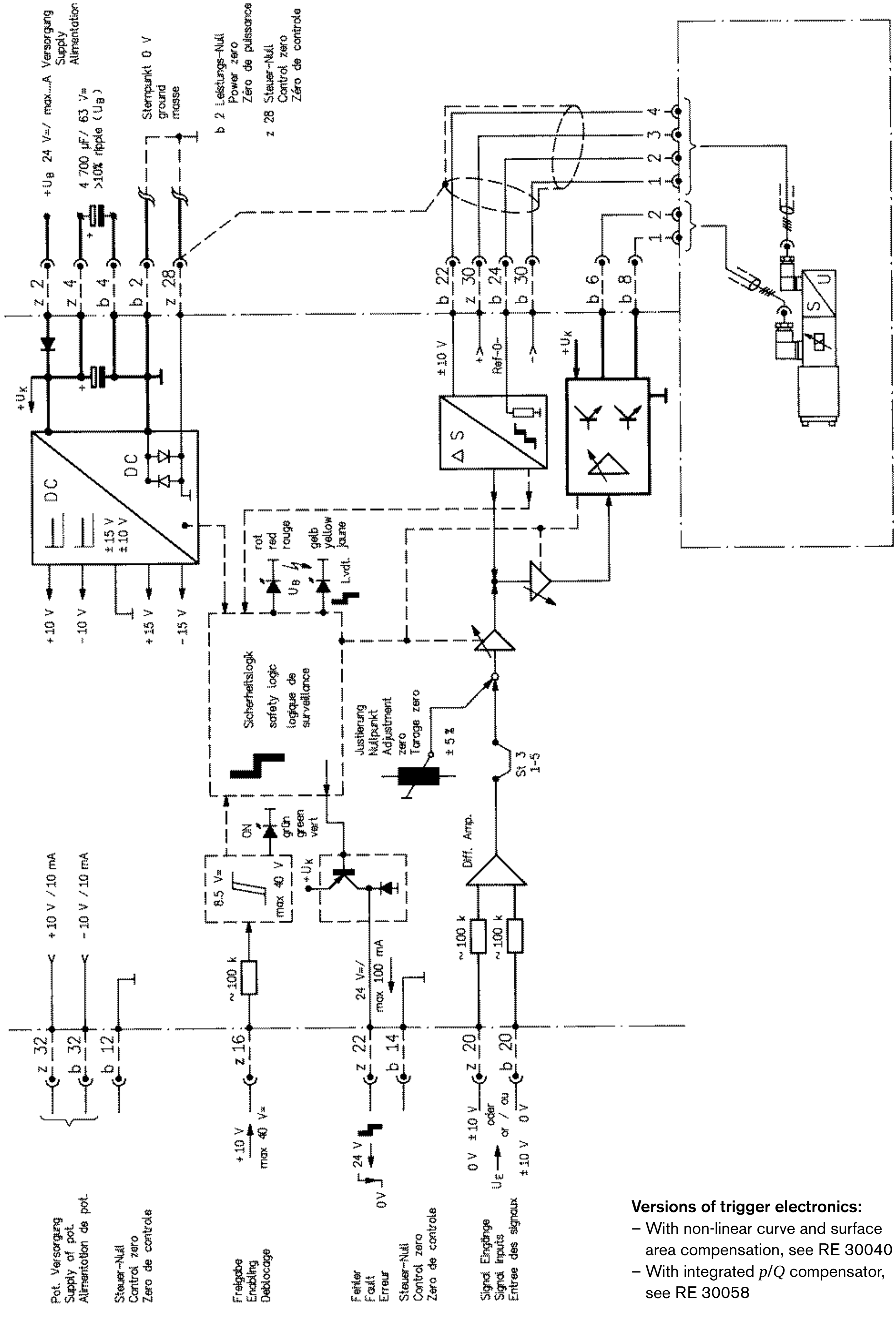
Hysteresis	%	≦ 0.2
Manufacturing tolerance for $q_{max.}$	%	< 10
Response time for signal change 0 … 100 %	ms	< 10
Thermal drift		Zero point displacement <1 % at $\Delta T = 40\,°C$

[1] The purity classes stated for the components must be complied with in hydraulic systems. Effective filtration prevents problems and also extends the service life of components. For a selection of filters, see catalogue sections RE 50070, RE 50076 and RE 50081.

[2] Flow rate at a different Δp $\quad q_x = q_{nom} \cdot \sqrt{\frac{\Delta p_x}{35}}$

Valve with external trigger electronics (standard linear curve: L)

Block diagram/pin assignment

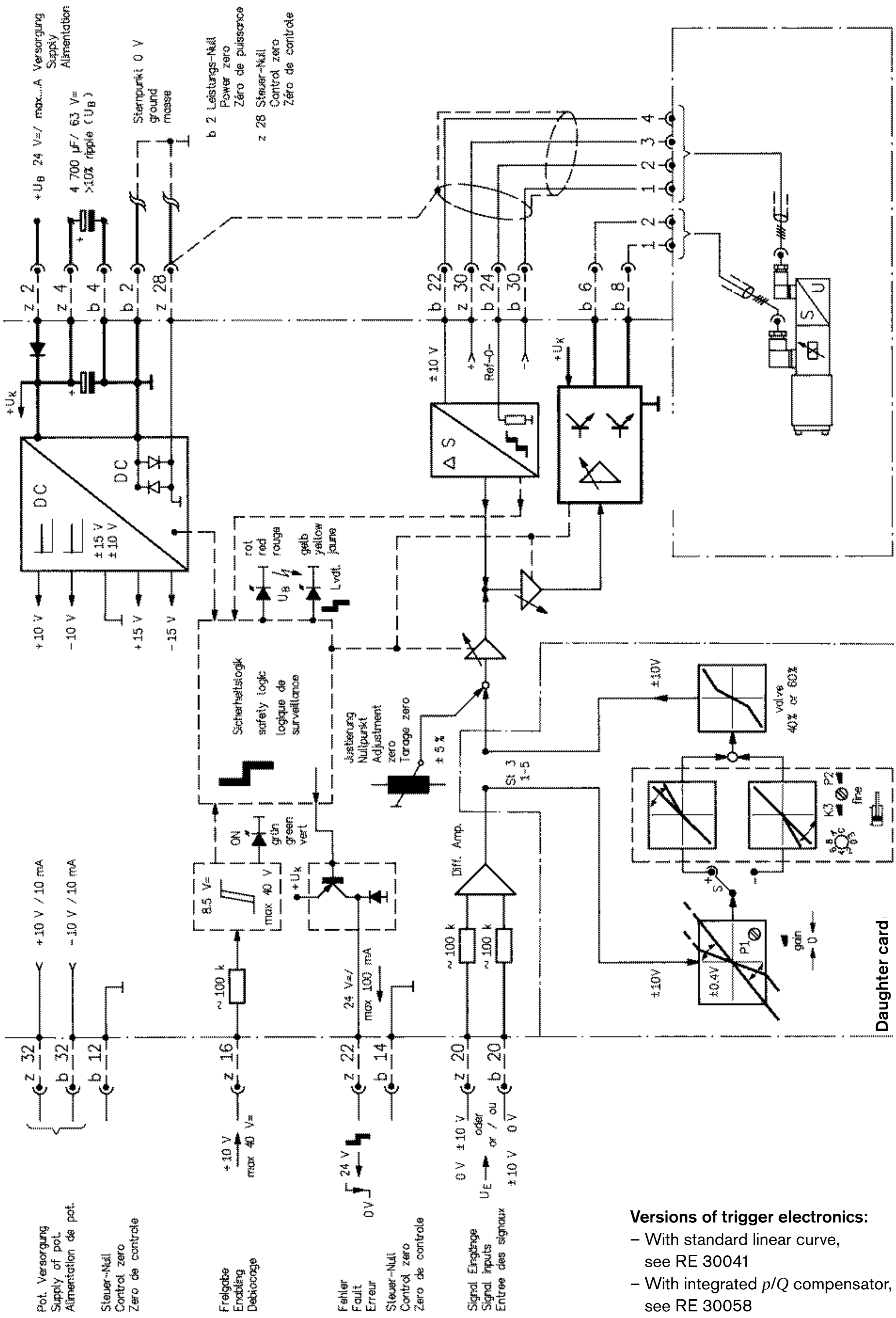


Versions of trigger electronics:

- With non-linear curve and surface area compensation, see RE 30040
- With integrated *p*/*Q* compensator, see RE 30058

Valve with external trigger electronics (non-linear curve: P)

Block diagram/pin assignment



Versions of trigger electronics:

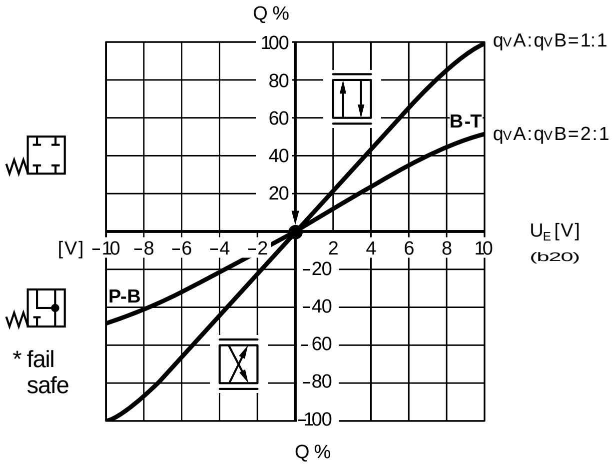
– With standard linear curve, see RE 30041

– With integrated *p*/*Q* compensator, see RE 30058

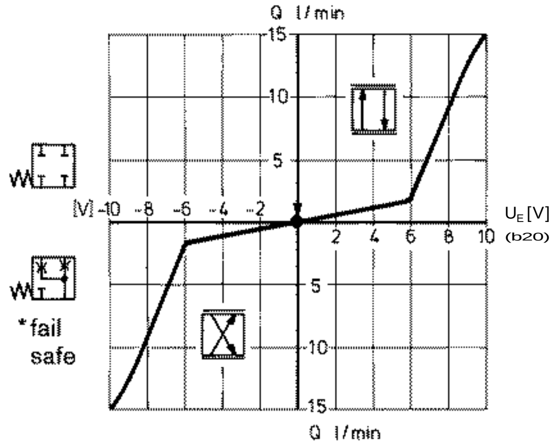
Performance curves (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Flow rate/Signal function $Q = f\,(U_E)$

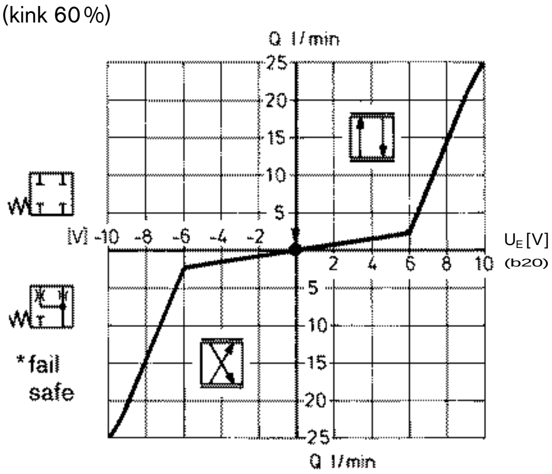
L: Linear



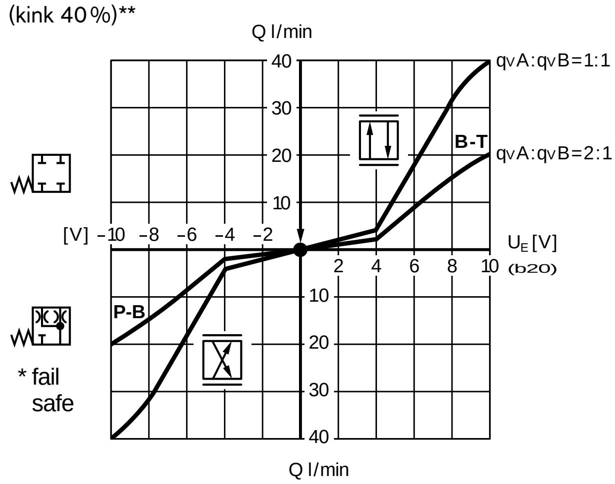
P: (kink 60 %)**



P: (kink 60 %)

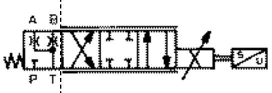
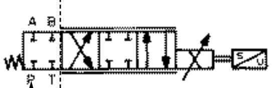


P: (kink 40 %)**



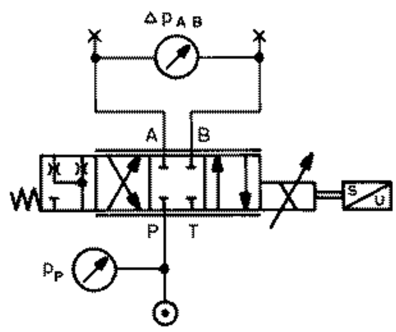
*Fail-safe when enabling is not released.
**Q-kink = 10 % Q_N.

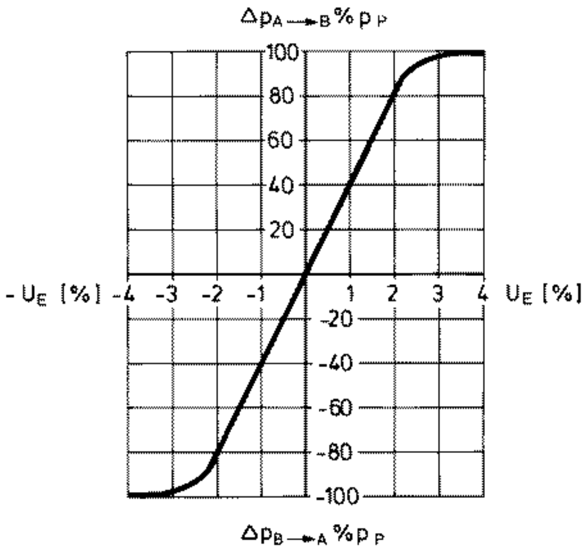
Fail-safe position

	Leakage at	100 bar	P–A P–B	50 cm^3/min 70 cm^3/min
	Flow rate at	$\Delta p = 35$ bar	A–T B–T	10 … 20 l/min 7 … 20 l/min
	Leakage at	100 bar	P–A P–B A–T B–T	50 cm^3/min 70 cm^3/min 70 cm^3/min 50 cm^3/min
Fail-safe	$p =$ 0 bar → 7 ms $p =$ 100 bar → 10 ms	Enable off		

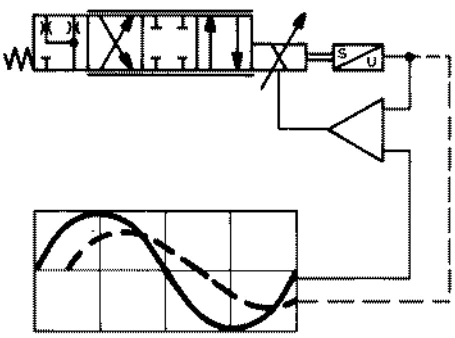
Performance curves (measured with HLP46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

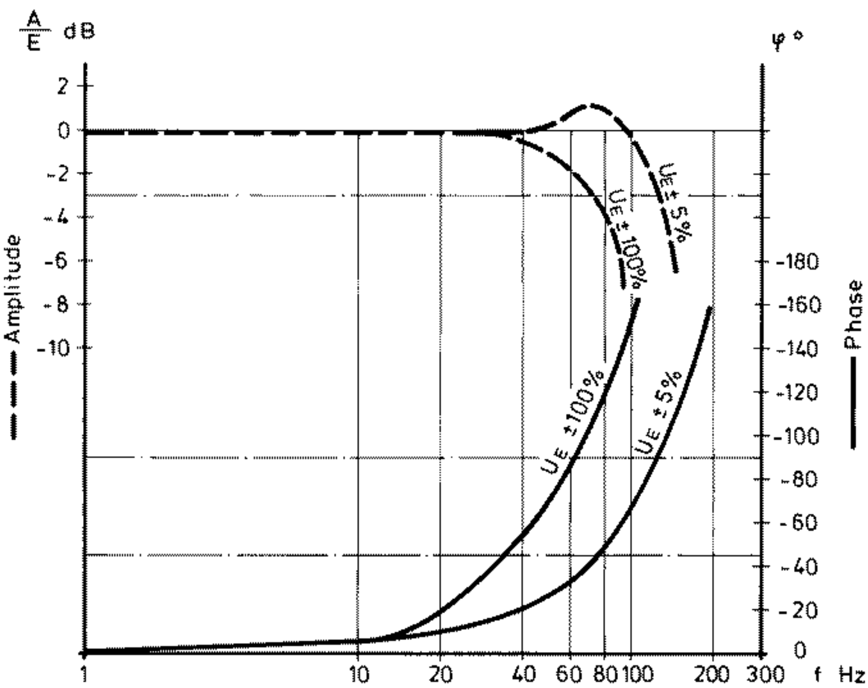
Pressure gain



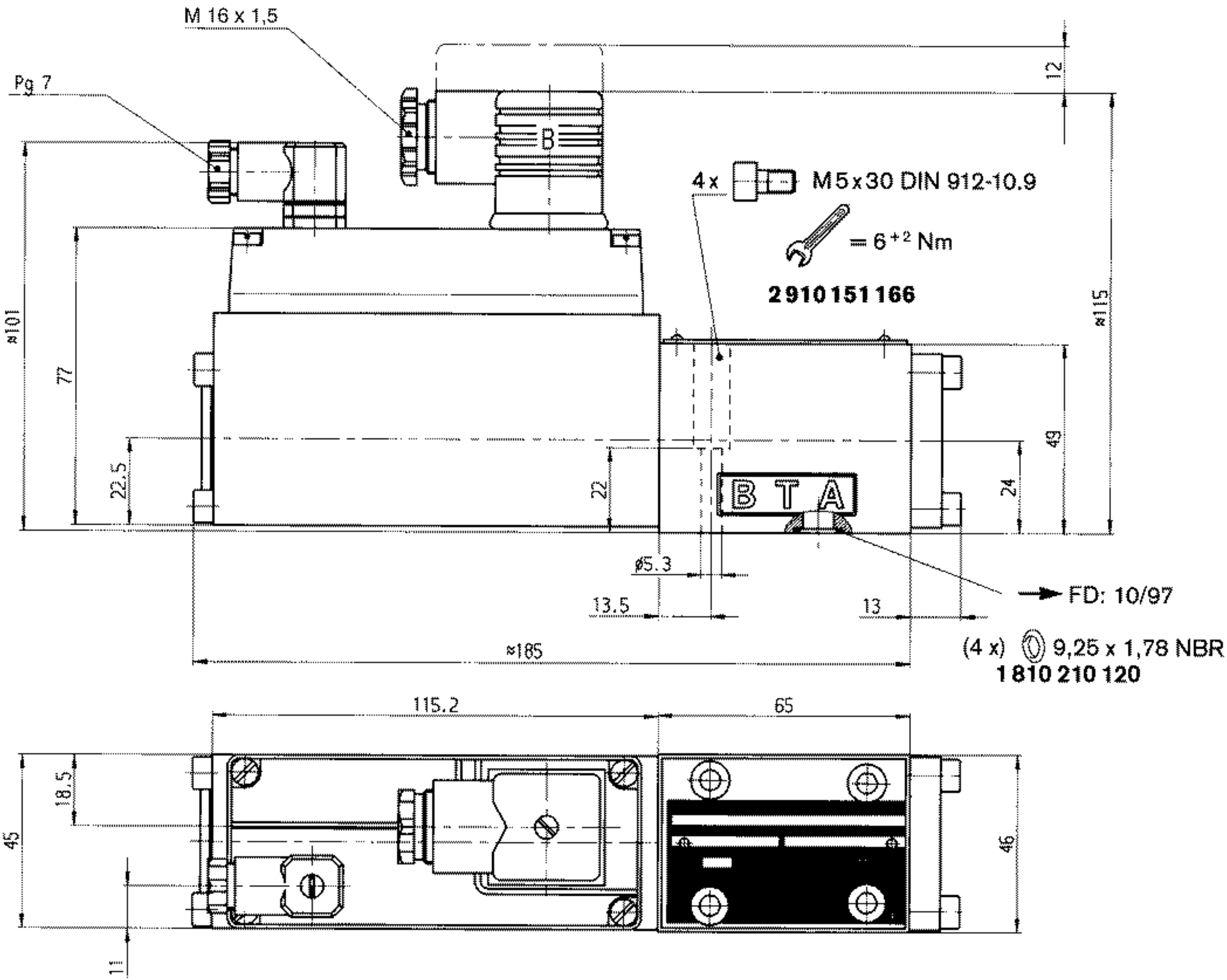


Bode diagram

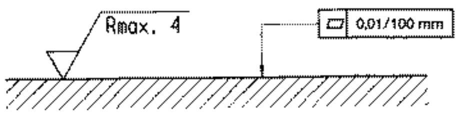




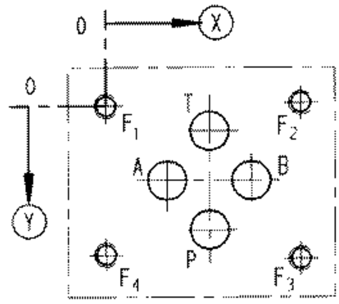
Unit dimensions (nominal dimensions in mm)



Required surface quality of mating component



Mounting hole configuration: NG6 (ISO 4401-03-02-0-94)
For subplates, see catalogue section RE 45053



1) Deviates from standard
2) Thread depth:
Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

	P	A	T	B	F_1	F_2	F_3	F_4
Ⓧ	21.5	12.5	21.5	30.2	0	40.5	40.5	0
Ⓨ	25.9	15.5	5.1	15.5	0	–0.75	31.75	31
∅	8 1)	8 1)	8 1)	8 1)	M5 2)	M5 2)	M5 2)	M5 2)

Notes

Bosch Rexroth AG
Industrial Hydraulics
Zum Eisengießer 1
D-97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Notes

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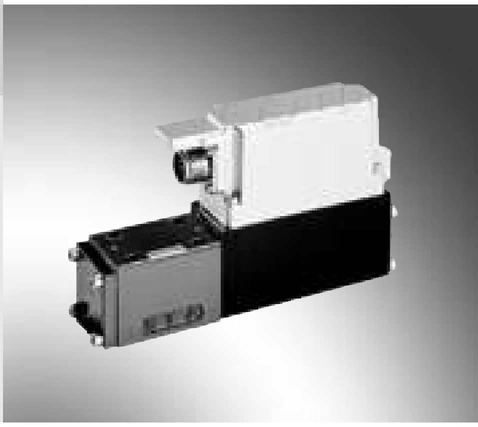
4/4-way servo solenoid directional control valves, directly operated, with electrical position feedback and on-board electronics (OBE)

RE 29035/10.10
Replaces: 05.10

Type 4WRPEH 6

Size 6
Unit series 2X
Maximum working pressure P, A, B 315 bar, T 250 bar
Nominal flow 2...40 l/min (Δ*p* 70 bar)



Type 4WRPEH6

List of contents

Contents	**Page**

Features

– Directly operated servo solenoid directional control valve, with control piston and sleeve in servo quality
– Actuated on one side, 4/4 fail-safe position when switched off
– Electrical position feedback and on-board electronics (OBE), calibrated at the factory
– Electrical connection 6P+PE
Signal input differential amplifier with interface A1 ±10 V or interface F1 4...20 mA (*R*sh = 200 Ω)
– Used in electrohydraulic controllers in production and testing systems

For information regarding the available spare parts see:
www.boschrexroth.com/spc

Ordering data

4WRP	E	H	6		B		–2X/	G24	K0/		M	*

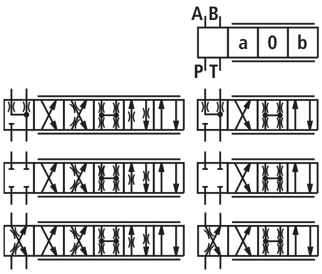
With **on-board** electronics **= E**

Control piston/sleeve **= H**

Size **= 6**

Control spool symbols

4/4-way version



= C3, C5

= C4, C1

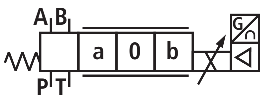
= C

With C5 and C1: [3]

P → A: Q_v B → T: $Q_v/2$

P → B: $Q_v/2$ A → T: Q_v

Assembly side of inductive position transducer



(Standard) **= B**

Nominal flow rate

at 70 bar valve pressure difference (35 bar per metering notch)

02 = 2 l/min [4]

04 = 4 l/min

12 = 12 l/min [5]

15 = 15 l/min [1]

24 = 24 l/min [5]

25 = 25 l/min [1]

40 = 40 l/min [3]

Flow characteristic

L = Linear

P = Non-linear curve [2]

2X = Unit series 20 to 29 (installation and connection dimensions unchanged)

Voltage supply of trigger electronics

G24 = +24 V DC

Electrical connection

K0 = **without** plug-in connector, with plug to DIN 43563-AM6

Order plug-in connector separately

Interface for trigger electronics

A1 = Setpoint input ±10 V

F1 = Setpoint input 4…20 mA

Seal material

M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

Further information in plain text

[1] Only in connection with flow characteristic “P”

[2] Kink 60 % for NG6 with nominal flow rate “15” and “25”, otherwise kink 40 %

[3] Q_v 2:1 only with nominal flow rate = 40 l/min

[4] Not in connection with flow characteristic “P”

[5] Only in connection with flow characteristic “L”

Function, sectional diagram

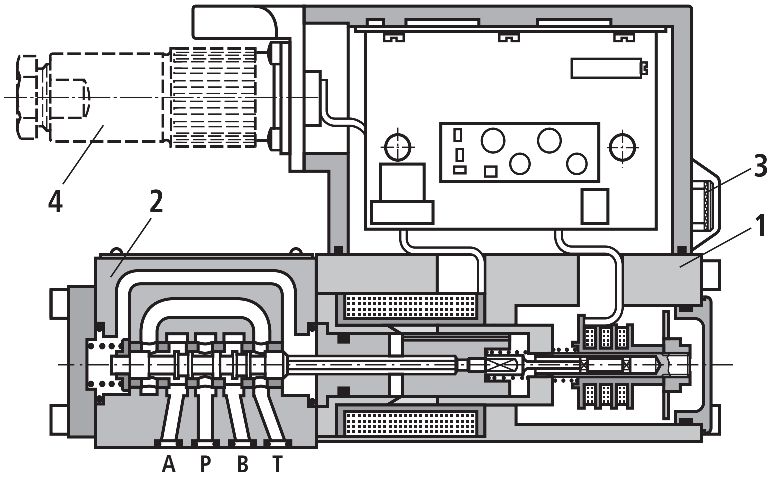
General

In the field of integrated electronics, the specified command value is compared with the actual position value. In case of deviations from the standard, the lifting solenoid is activated. Due to the changed magnetic force, the lifting solenoid adjusts the control valve against the spring.
Lifting/control cross-section are adjusted proportionally to the command value. In case of a command value provision of 0 V, the electronics adjusts the control valve against the spring to center position. In deactivated condition, the spring is unloaded to a maximum and the valve is in fail-safe position.

Switch-off behavior

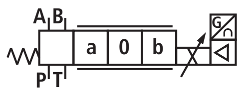
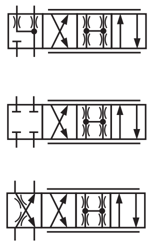
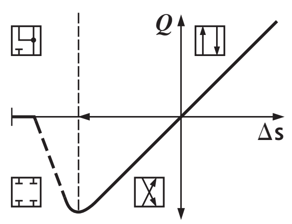
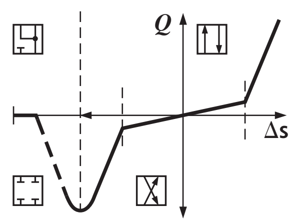
If the electronics is switched off, the valve immediately moves to the secured basic position (fail safe).

In this process, the P-B/A-T position is passed which might cause movements at the controlled component. This must be taken into account when designing the plant.



1 Control solenoid with position transducer
2 Valve body
3 Plug for possible 2nd stage
4 Plug in connector

Symbols

 	L: Linear	P: kink
 **C3, C5** **C4, C1** **C**	 	

Testing and service equipment

- Service case type VT-VETSY-1 with test device, see data sheet 29685
- Measuring adapter 6P+PE type VT-PA-2, see data sheet 30068

Technical data

General

Construction		Spool-type valve, directly operated, with steel sleeve
Actuation		Control solenoid with position control, OBE
Type of mounting		Subplate, mounting hole configuration (ISO 4401-03-02-0-05)
Installation position		Optional
Ambient temperature range	°C	–20...+50
Weight	kg	2.7
Vibration resistance, test condition		Max. 25 *g*, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, ϑ_{oil} = 40 °C ±5 °C)

Pressure fluid			Hydraulic oil to DIN 51524...535, other fluids after prior consultation					
Viscosity range	recommended	mm^2/s	20...100					
	max. permitted	mm^2/s	10...800					
Pressure fluid temperature range		°C	–20...+70					
Maximum permissible degree of contamination of pressure fluid Purity class to ISO 4406 (c)			Class 18/16/13 [1]					
Direction of flow			See symbol					
Nominal flow at Δp = 35 bar per notch [2]		l/min	2	4	12	15	24	40
Max. working pressure	Ports P, A, B	bar	315					
	Port T	bar	250					
Operating limits at Δp Pressure drop at valve	C, C3, C5	bar	315	315	315	315	315	160
Q_{Vnom}: > Q_N valves	C4, C1	bar	315	315	315	280	250	100
Max. recommended nominal flow at 100 bar	Linear characteristic curve L	cm^3/min	< 150	< 180	< 300	–	< 500	< 900
	Inflected characteristic curve P	cm^3/min	–	–	–	< 180	< 300	< 450
Fail-safe position								
C Flow at Δp = 35 bar per notch		l/min	2	4	10	13	18	20
C3, C5 Zero flow at 100 bar		cm^3/min	50 P–A					
		cm^3/min	70 P–B					
C3, C5 Flow at Δp = 35 bar per notch		l/min	10...20 A–T					
		l/min	7...20 B–T					
C4, C1 Zero flow at 100 bar		cm^3/min	50 P–A					
		cm^3/min	70 P–B					
		cm^3/min	70 A–T					
		cm^3/min	50 B–T					
Fail-safe position reached		0 bar	7 ms					
		100 bar	10 ms					

Static/Dynamic

Hysteresis	%	≦ 0.2
Manufacturing tolerance for Q_{max}	%	< 10
Response time for signal change 0...100 %	ms	≦ 10
Thermal drift		Zero point displacement < 1 % at ΔT = 40 °C
Zero adjustment		Factory-set ±1 %

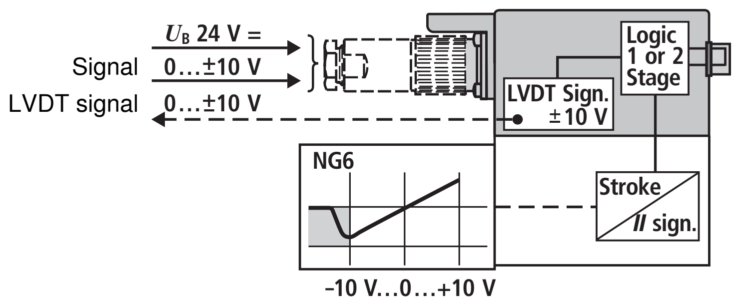
[1] The purity classes stated for the components must be complied with in hydraulic systems.
Effective filtration prevents problems and also extends the service life of components.
For a selection of filters, see www.boschrexroth.com/filter.

[2] Flow rate at a different Δp $Q_x = Q_{nom} \cdot \sqrt{\frac{\Delta p_x}{35}}$

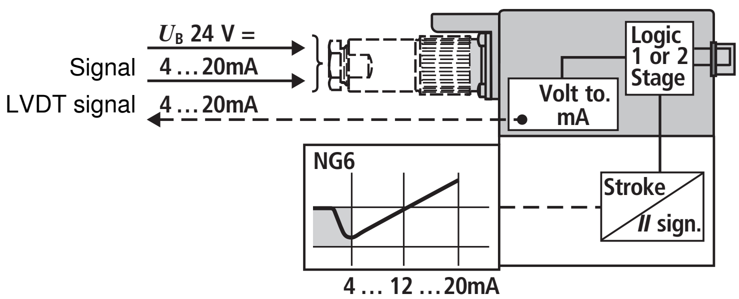
Technical data

Electrical, trigger electronics integrated in the valve		
Cyclic duration factor	%	100
Degree of protection		IP 65 to EN 60529 and IEC 14434/5
Connection		Plug-in connector 6P+PE, DIN 43563
Power supply Terminal A: Terminal B: 0 V		24 V DC_{nom} Min. 21 V DC/max. 40 V DC Ripple max. 2 V DC
Max. power consumption		40 VA
External fuse		2.5 A_F
Input, version A1 Terminal D: U_E Terminal E:		Differential amplifier, R_i = 100 kΩ 0...± 10 V 0 V
Input, version F1 Terminal D: I_{D-E} Terminal E: I_{D-E}		Burden, Rsh = 200 Ω 4...(12)...20 mA Current loop I_{D-E} feedback
Max. differential input voltage at 0 V		D → B E → B } max. 18 V=
Test signal, version A1 Terminal F: U_{Test} Terminal C:		LVDT 0...+ 10 V Reference 0 V
Test signal, version F1 Terminal F: I_{F-C} Terminal C: I_{F-C}		LVDT signal 4...20 mA at external load 200...500 Ω max. 4...20 mA output Current loop I_{F-C} feedback
Protective conductor and screen		See pin assignment (CE-compliant installation)
Calibration		Calibrated at the factory, see characteristic curve of the valve
Electromagnetic compatibility tested according to		EN 61000-6-2: 2005-08 EN 61000-6-3: 2007-01

Version A1:
Standard

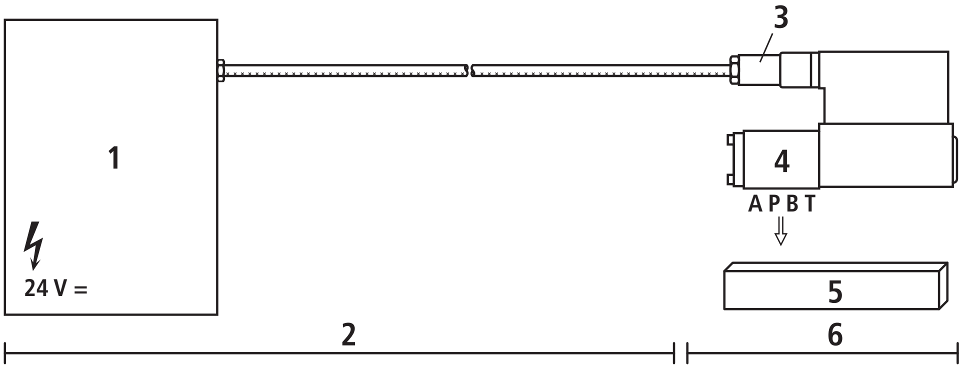


Version F1:
mA signal



Electric connection

For electrical data, see page 5



1 Control
2 Provided by customer
3 Plug-in connector
4 Valve
5 Connecting surface
6 Provided by Rexroth

Technical notes on the cable

Version:
- Multi-wire cable
- Extra-finely stranded wire to VDE 0295, Class 6
- Protective conductor, green/yellow
- Cu braided screen

Types:
- e.g. Ölflex-FD 855 CP (from Lappkabel company)

No. of wires:
- Determined by type of valve, plug types and signal assignment

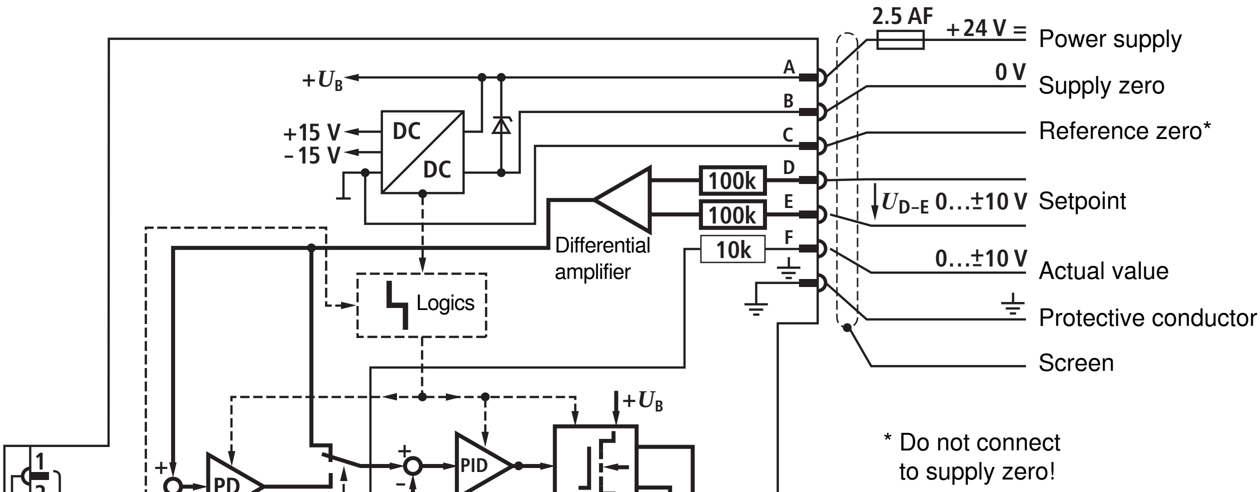
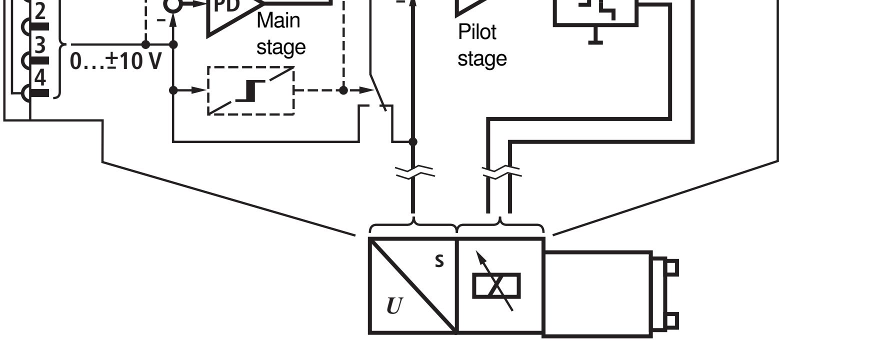
Cable Ø:
- 0.75 mm^2 to 20 m length
  1.0 mm^2 to 40 m length

Outside Ø:
- 9.4...11.8 mm – Pg11
  12.7...13.5 mm – Pg16

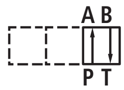
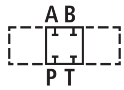
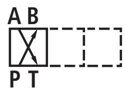
Note
Voltage supply 24 V DC$_{nom}$,
if voltage drops below 18 V DC, rapid shutdown resembling "Enable OFF" takes place internally.
In addition, with F1 version:
$I_{D-E} \geqq$ 3 mA – valve is active
$I_{D-E} \leqq$ 2 mA – valve is deactivated.
Electrical signals emitted via the trigger electronics (e.g. actual values) must not be used to shut down safety-relevant machine functions! (See European Standard, "Technical Safety Requirements for Fluid-Powered Systems and Components – Hydraulics", EN 982.)

On-board electronics

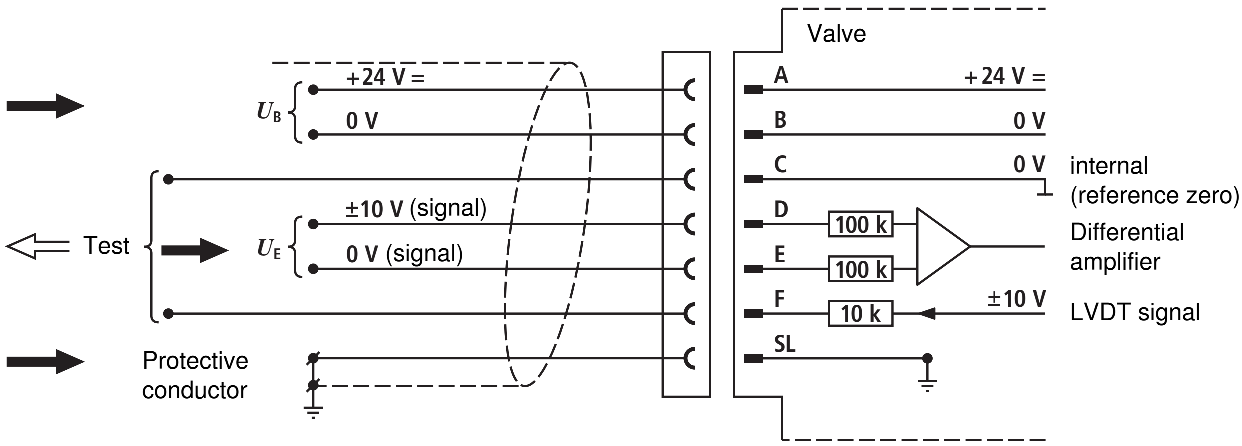
Block diagram/pin assignment
Version A1: U_{D-E} ±10 V

* Do not connect to supply zero!

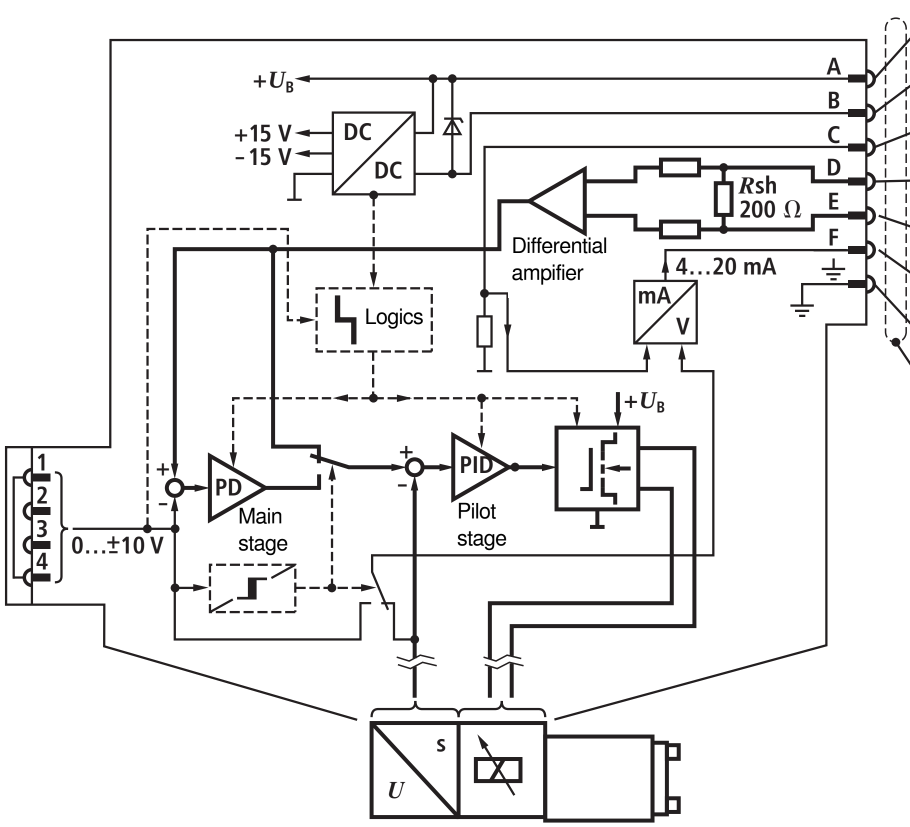
Signal	4/4-way servo solenoid directional control valve
U_{D-E} 0...+10 V	
U_{D-E} 0 V	
U_{D-E} 0...–10 V	

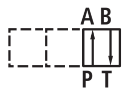
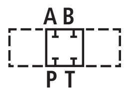
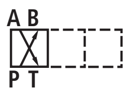
Pin assignment 6P+PE
Version A1: U_{D-E} ±10 V
(R_i = 100 kΩ)



On-board electronics

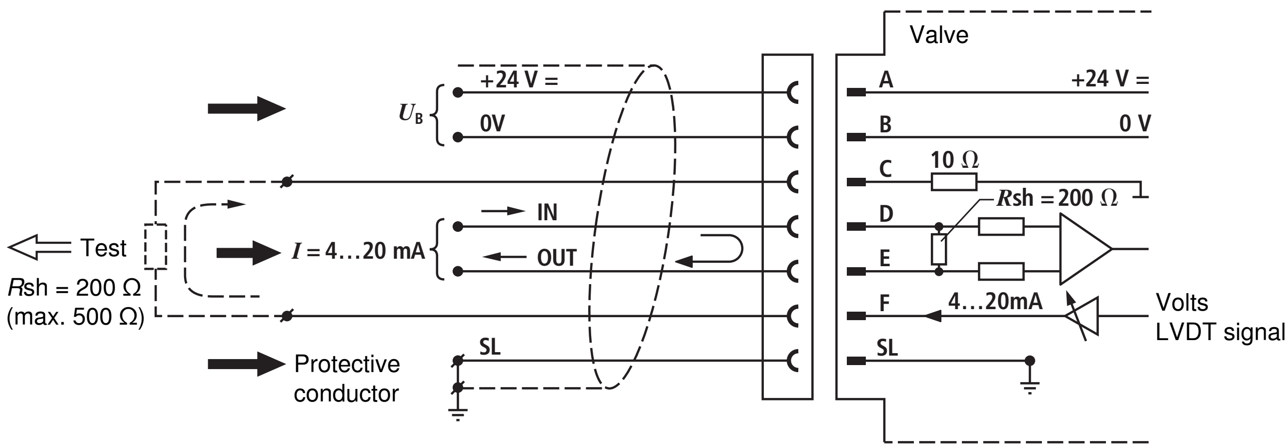
Block diagram/pin assignment
Version F1: I_{D-E} 4...12...20 mA



Signal	4/4-way servo solenoid directional control valve
I_{D-E} 12...20 mA	
I_{D-E} 12 mA	
I_{D-E} 4...12 mA	

$I_{D-E} \leqq 2$ mA: valve inactive

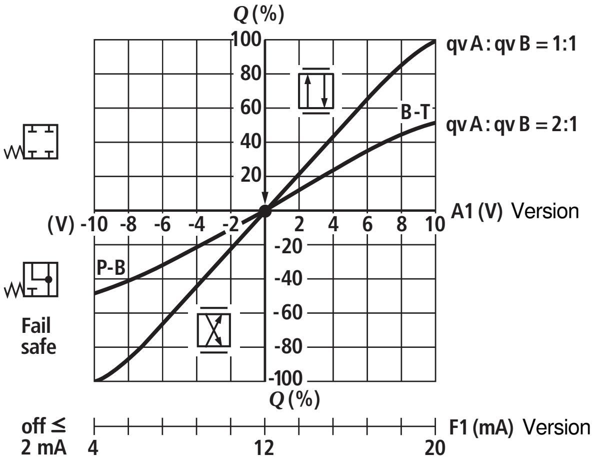
Pin assignment 6P+PE
Version F1: I_{D-E} 4...12...20 mA
(Rsh = 200 Ω)



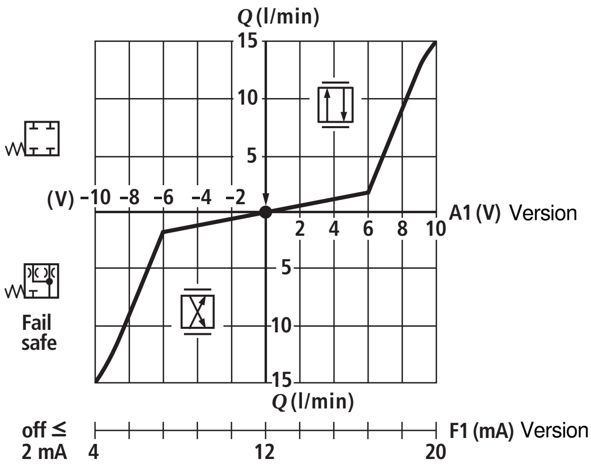
Characteristic curves (measured with HLP 46, ϑ_{oil} = 40 °C ± 5 °C)

Flow rate – signal function $Q = f(U_{D-E})$
$Q = f(I_{D-E})$

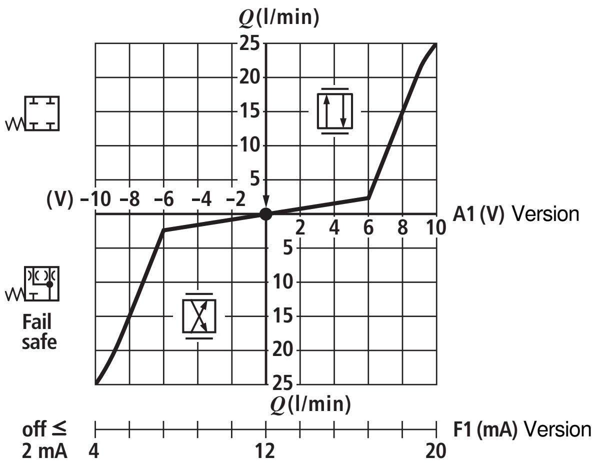
Flow characteristic
L: Linear



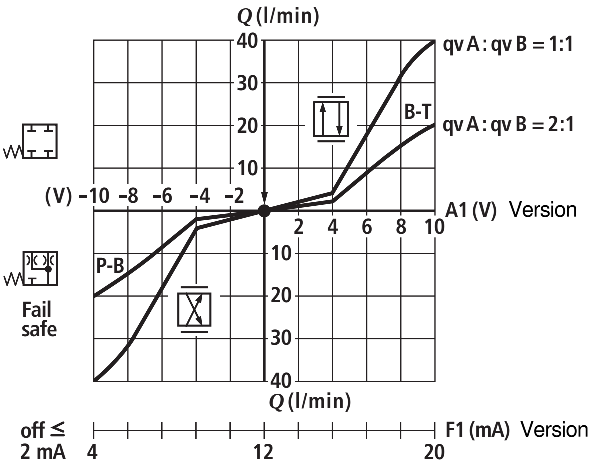
Flow characteristic
P: (kink 60 %) 15 l/min



Flow characteristic
P: (kink 60 %) 25 l/min

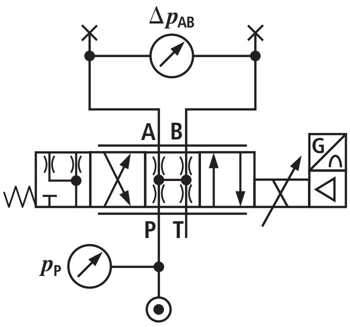


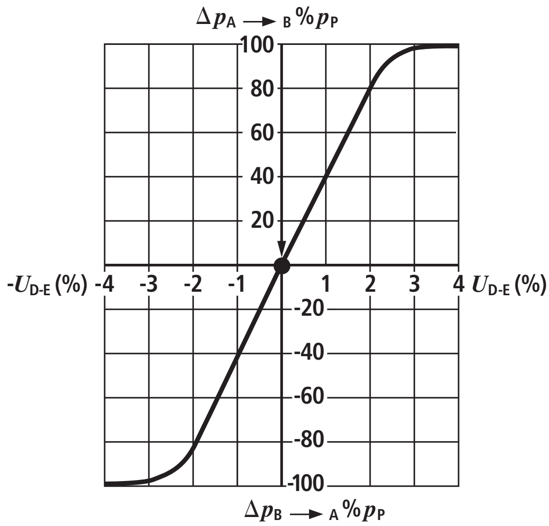
Flow characteristic
P: (kink 40 %) 40 l/min



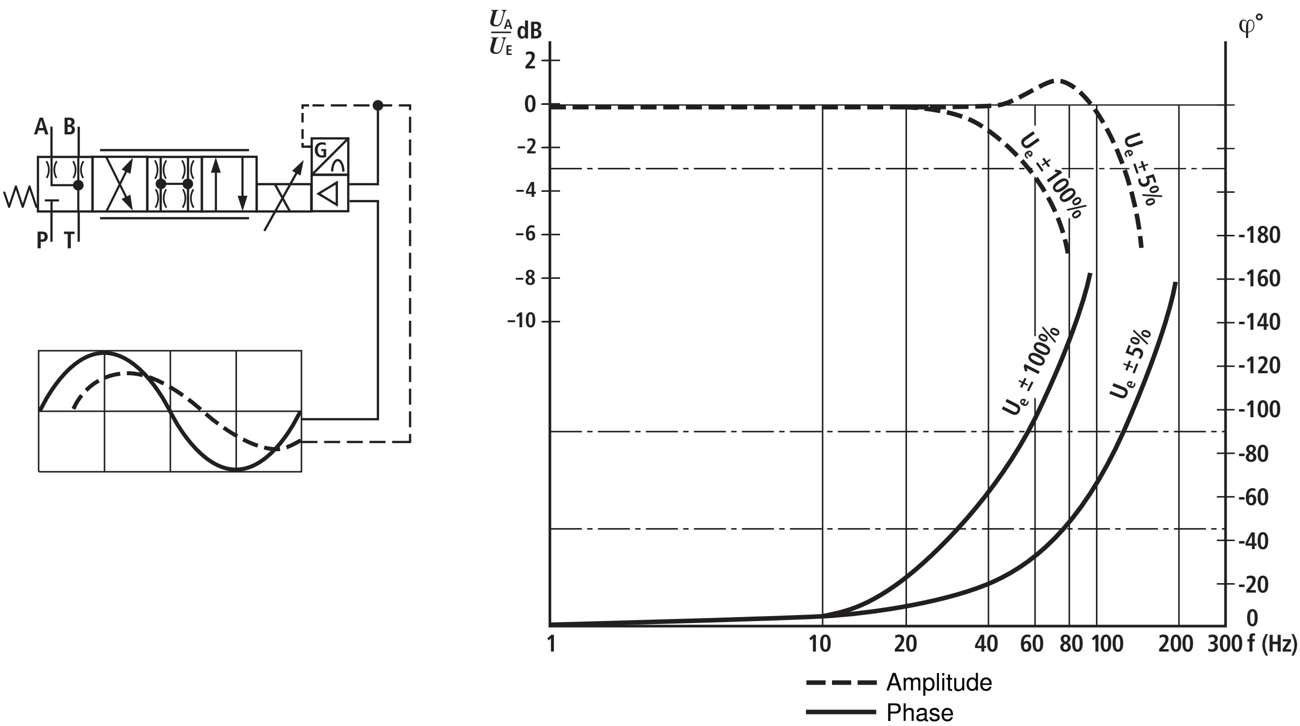
Characteristic curves (measured with HLP 46, ϑ_{oil} = 40 °C ± 5 °C)

Pressure gain

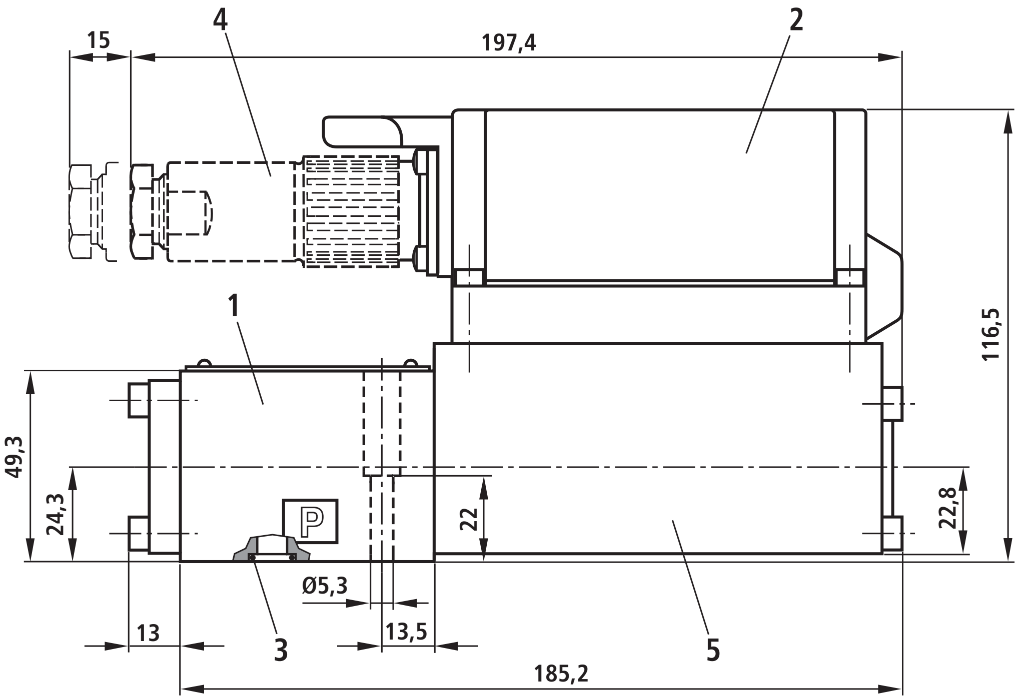


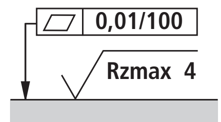


Bode diagram

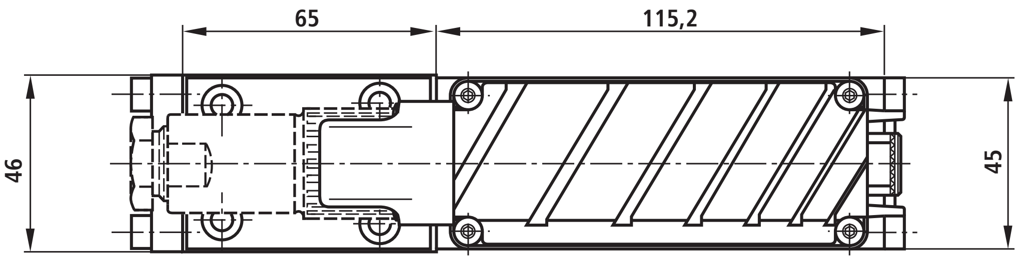


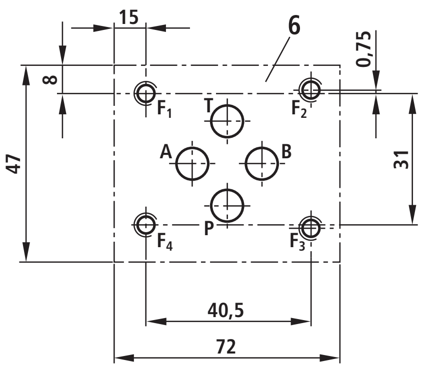
Unit dimensions (dimensions in mm)





Required surface quality of valve mounting face





1 Valve housing

2 On-board electronics

3 O-rings ∅ 9.25 x 1.78 (ports P, A, B, T)

4 Plug-in connector not included in scope of delivery, see data sheet 08008 (order separately)

5 Control solenoid with position transducer

6 Machined valve contact surface, mounting hole configuration to ISO 4401-03-02-0-05
Deviates from standard:
Ports P, A, B, T ∅ 8 mm
Minimum thread depth: Ferrous metal 1.5 x ∅
Non-ferrous 2 x ∅

Subplates, see data sheet 45053 (order separately)

Valve fastening bolts (order separately)
The following valve fastening bolts are recommended:
4 cheese-head bolts ISO 4762-M5x30-10.9-N67F82170
(galvanized in accordance with Bosch standard N67F82170)
Tightening torque M_A = 6 +2 Nm
Material no. **2910151166**
or
4 cheese-head bolts ISO 4762-M5x30-10.9
(coefficient of friction μ_{total} = 0.12–0.17)
Tightening torque M_A = 8.9 Nm ±10%

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

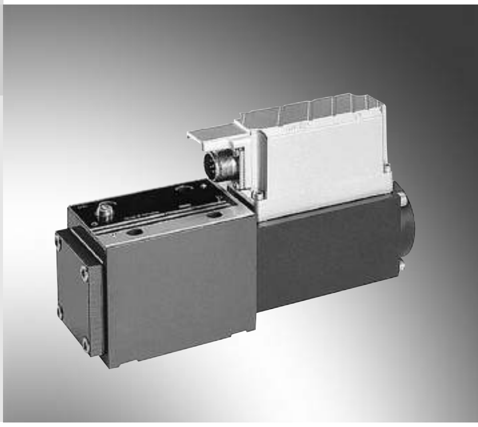
Rexroth
Bosch Group

4/4 controlled directional valve, directly operated, with electric position feedback and integrated electronics (OBE)

RE 29037/03.10
Replaces: 10.05

Type 4WRPEH10

Size 10
Component series 2X
Maximum operating pressure P, A, B 315 bar, T 250 bar
Rated flow 50...100 l/min (Δ*p* 70 bar)



Type 4WRPEH10

Table of contents

Features

– Directly actuated controlled directional valve, with control spool and sleeve in servo quality
– Single-side operated, 4/4 fail-safe position in deactivated state
– Electric position feedback and integrated electronics (OBE), calibrated in the factory
– Electric port 6P+PE
Signal input of differential amplifier with interface A1 ±10 V or interface F1 4...20 mA (R_{sh} = 200 Ω)
– Used for electro-hydraulic control systems in production and test plants

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

4WRP	E	H	10		B		– 2X /	G24	K0 /		M	*

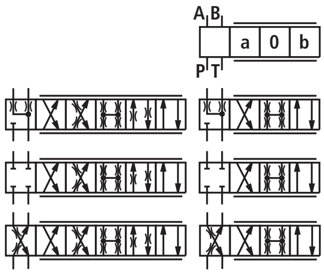
With **integrated** electronics **= E**

Control piston/sleeve **= H**

Size **= 10**

Control spool symbol

4/4 way design

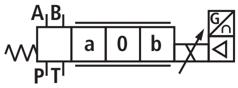


With symbols C5 and C1:

P → A: q_V B → T: $q_V/2$

P → B: $q_V/2$ A → T: q_V

Installation side of the inductive position transducer



(standard) **= B**

Rated flow

at 70 bar valve pressure difference (35 bar/control edge)

50 = 50 l/min

100 = 100 l/min

Flow characteristics

L = Linear

P = Inflected characteristic curve

2X = Component series 20 to 29 (identical installation and connection dimensions)

Supply voltage of the control electronics

G24 = +24 V direct current

Electric port

K0 = **Without** mating connector, With connector according to DIN 43563-AM6
Mating connector– separate order

Interface of the control electronics

A1 = Command value input ±10 V

F1 = Command value input 4...20 mA

Seal material

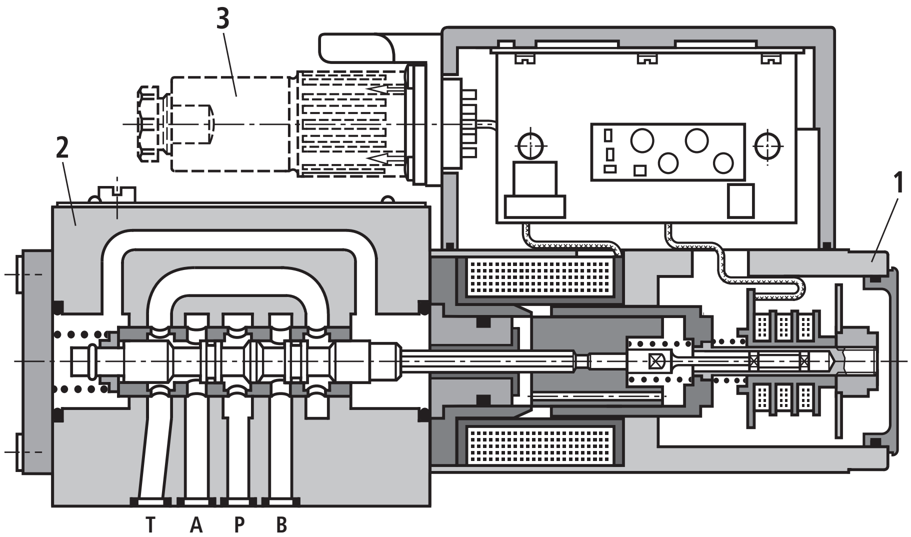
M = NBR seals, suitable for mineral oils (HL, HLP) according to DIN 51524

Further details in the plain text

Function, section

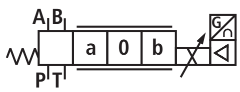
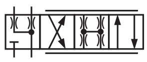
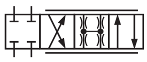
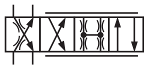
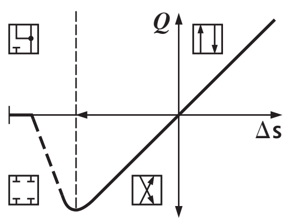
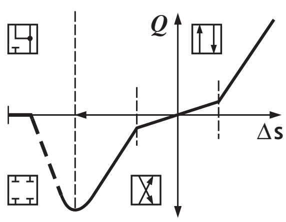
General
In the field of integrated electronics, the specified command value is compared with the actual position value. In case of deviations from the standard, the lifting solenoid is activated. Due to the changed magnetic force, the lifting solenoid adjusts the control valve against the spring.
Lifting/control cross-section are adjusted proportionally to the command value. In case of a command value provision of 0 V, the electronics adjusts the control valve against the spring to center position. In deactivated condition, the spring is unloaded to a maximum and the valve is in fail-safe position.

Switch-off behavior
If the electronics is switched off, the valve immediately moves to the secured basic position (fail safe).
In this process, the P-B/A-T position is passed which might cause movements at the controlled component. This must be taken into account when designing the plant.



1 Control solenoid
with position transducer
2 Valve bodies
3 Mating connectors

Symbols

	L: Linear	P: Inflection 40 %
 **C3, C5**  **C4, C1**  **C**		

Test and service device

– Service case Type VT-VETSY-1 with test device, see RE 29685
– Measuring adapter 6P+PE Type VT-PA-2, see RE 30068

Technical data

general						
Type			Gate valve, directly operated, with steel sleeve			
Actuation			Proportional solenoid with position control, OBE			
Type of connection			Plate port, porting pattern (ISO 4401-05-04-0-05)			
Installation position			Any			
Ambient temperature range		°C	–20...+50			
Weight		kg	7,1			
Vibration resistance, test condition			Max. 25 *g*, space vibration test in all directions (24 h)			
hydraulic (measured with HLP 46, ϑ_{oil} = 40 °C ± 5 °C)						
Hydraulic fluid			Hydraulic oil according to DIN 51524…535, other media upon request			
Viscosity range	Recommended	mm^2/s	20...100			
	Max admissible	mm^2/s	10...800			
Hydraulic fluid temperature range		°C	–20...+70			
Maximum admissible degree of contamination of the hydraulic fluid cleanliness class according to ISO 4406 (c)			Class 18/16/13 [1]			
Flow direction			According to symbol			
Rated flow at Δp = 35 bar per edge [2]		l/min	50 (1:1)	50 (2:1)	100 (1:1)	100 (2:1)
Max operating pressure	Port P, A, B	bar	315			
	Orifice T	bar	250			
Limitation of use Δp pressure loss at the valve	C, C3, C5	bar	315	315	160	160
Q_{Vnom}: > Q_N valves	C4, C1	bar	250	250	100	100
Zero flow at 100 bar	Linear characteristic curve L	cm^3/min	< 1200	< 1200	< 1500	< 1000
	Inflected characteristic curve P	cm^3/min	< 600	< 500	< 600	< 600
Fail-safe position						
C Flow at Δp = 35 bar per edge		l/min	50	50	100	100
C3, C5		cm^3/min	50 P–A			
Zero flow at 100 bar		cm^3/min	70 P–B			
C3, C5		l/min	110...100 A–T			
Flow at Δp = 35 bar per edge		l/min	10...25 B–T			
C4, C1		cm^3/min	50 P–A			
Zero flow at 100 bar		cm^3/min	70 P–B			
		cm^3/min	70 A–T			
		cm^3/min	50 B–T			
Reaching the fail-safe position		0 bar	12 ms			
		100 bar	16 ms			

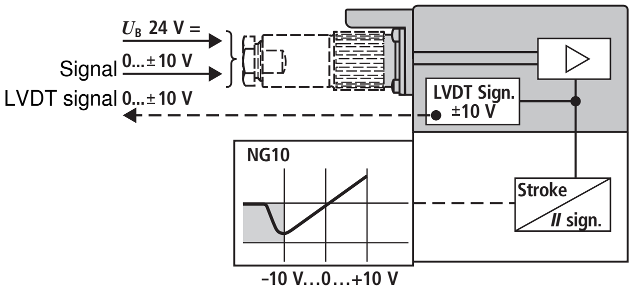
[1] In hydraulic systems, the cleanliness classes indicated for components must be observed.
Effective filtration prevents faults and at the same time increases the service life of the components.
For the choice of filters, see technical data sheets RE 50070, RE 50076 and RE 50081.

[2] Flow at different Δp $Q_x = Q_{nom} \cdot \sqrt{\frac{\Delta p_x}{35}}$

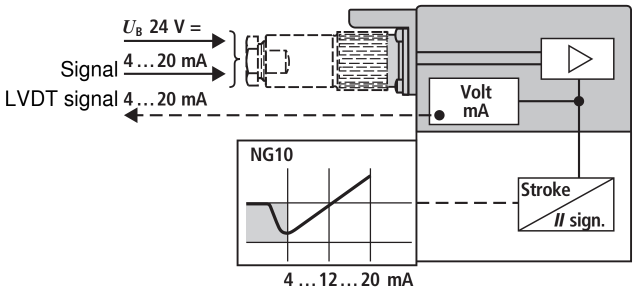
Technical data

static / dynamic		
Hysteresis	%	≦ 0,2
Manufacturing tolerance q_{max}	%	< 10
Actuating time for signal step 0...100 %	ms	≦ 25
Temperature drift		Zero shift < 1 % at ΔT = 40 °C
Zero compensation		ex factory ±1 %
electric, control electronics integrated in the valve		
Relative duty cycle	%	100 ED
Protection class		IP 65 according to DIN 40050 and IEC 14434/5
Port		Mating connector 6P+PE, DIN 43563
Supply voltage Terminal A: Terminal B: 0 V		24 V = $_{nom}$ min. 21 V = / max. 40 V = Ripple max. 2 V =
Max. power consumption		60 VA
Fuse protection, external		2.5 A_F
Input, version A1 Terminal D: U_E Terminal E:		Differential amplifier, R_i = 100 kΩ 0...±10 V 0 V
Input, version F1 Terminal D: I_{D-E} Terminal E: I_{D-E}		Load, R_{sh} = 200 Ω 4...(12)...20 mA Current loop I_{D-E} feedback
Max. voltage of the differential inputs almost 0 V		D → B, E → B } max. 18 V =
Test signal, version A1 Terminal F: U_{test} Terminal C:		LVDT 0...±10 V Reference 0 V
Test signal, version F1 Terminal F: I_{F-C} Terminal C: I_{F-C}		LVDT signal 4...20 mA, at external load 200...500 Ω max. 4...20 mA output Current loop I_{F-C} feedback
Protective earthing conductor and shielding		See pin assignment (CE-compliant installation)
Adjustment		Calibrated in the factory, see characteristic curve of the valve
Electromagnetic compatibility tested according to		EN 61000-6-2: 2005-08 EN 61000-6-3: 2007-01

Version A1:
Standard

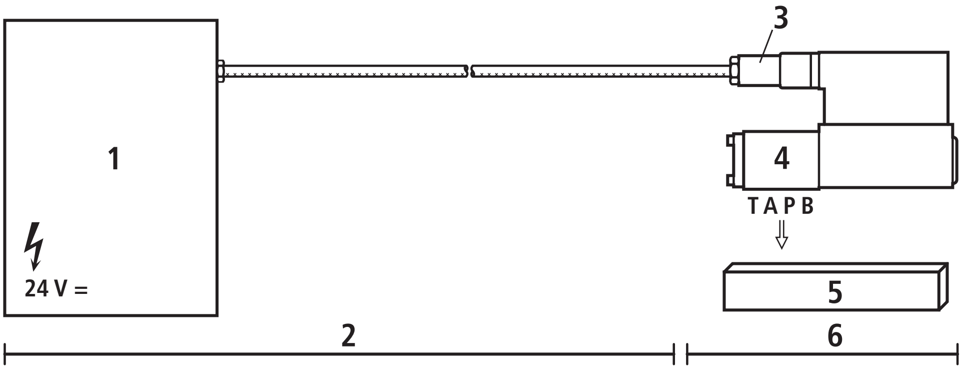


Version F1:
mA signal



Electrical connection

Electrical data, see page 5



1 Control
2 On the customer side
3 Mating connector
4 Valve
5 Contact surface
6 On Rexroth side

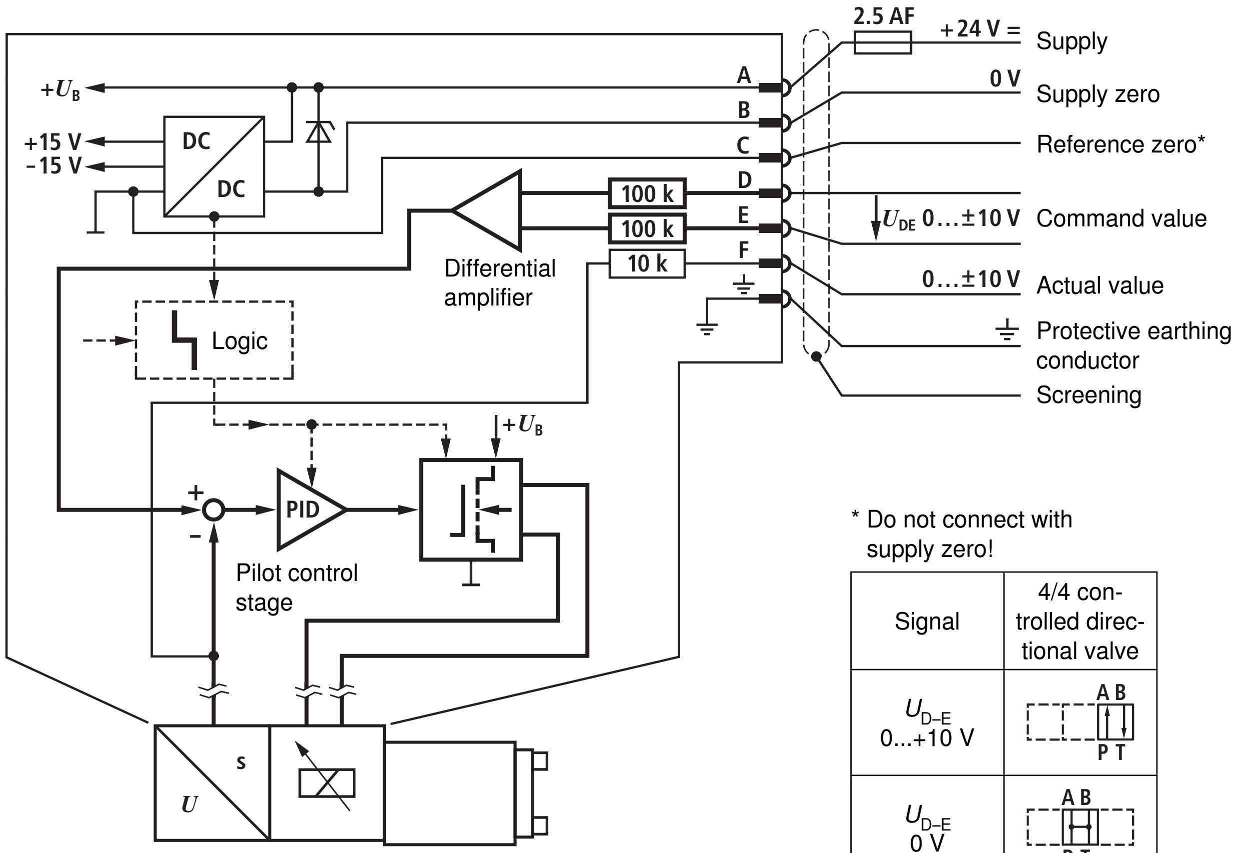
Technical notes with regard to cable

Version:	– Multi-core wire – Litz wire structure, extra fine wire according to VDE 0295, class 6 – Protective earthing conductor, green-yellow – Cu shielding braid
Type:	– e.g. Oilflex-FD 855 CP (Company Lappkabel)
Number of wires:	– Determined by the valve type, connector type and signal configuration
Line Ø:	– 0.75 mm² to 20 m of length 1.0 mm² to 40 m of length
OuterØ:	– 9.4...11.8 mm – Pg11 12.7...13.5 mm – Pg16

Note
Supply voltage 24 V = $_{nom}$,
if the value falls below 18 V = an internal
fast switch-off is effected which can be compared with
“Release OFF”.
Additionally for version F1:
$I_{D-E} \geqq 3$ mA – valve is active
$I_{D-E} \leqq 2$ mA – valve is deactivated.
Electric signals taken out via control electronics (e.g. actual value) may not be used for the switch-off of safety-relevant machine functions! (See also the European standard “Safety requirements for fluid power systems and their components - Hydraulics”, EN 982.)

Integrated electronics

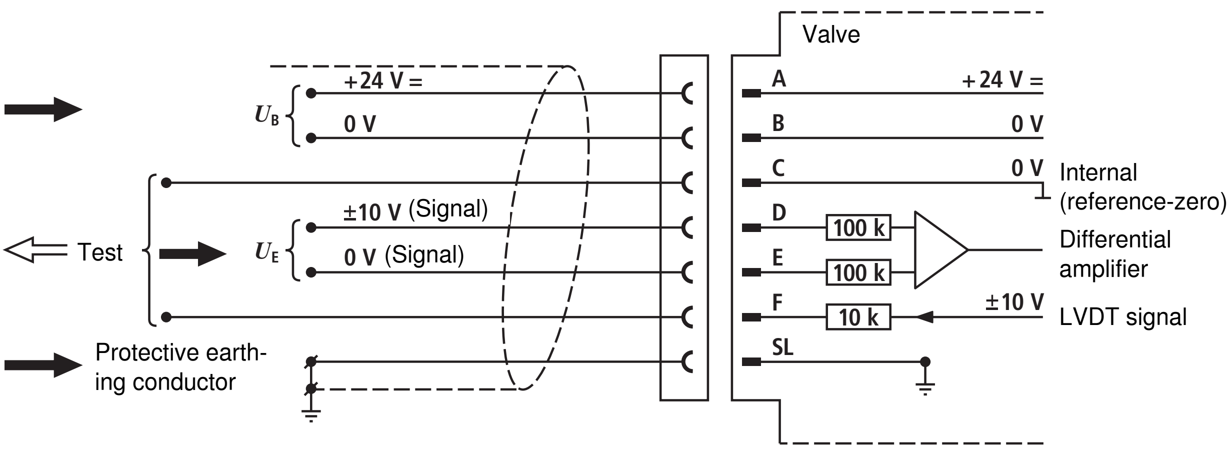
Block diagram/Pinout
Version A1: U_{D-E} ±10 V



* Do not connect with supply zero!

Signal	4/4 controlled directional valve
U_{D-E} 0...+10 V	A B / P T
U_{D-E} 0 V	A B / P T
U_{D-E} 0...–10 V	A B / P T

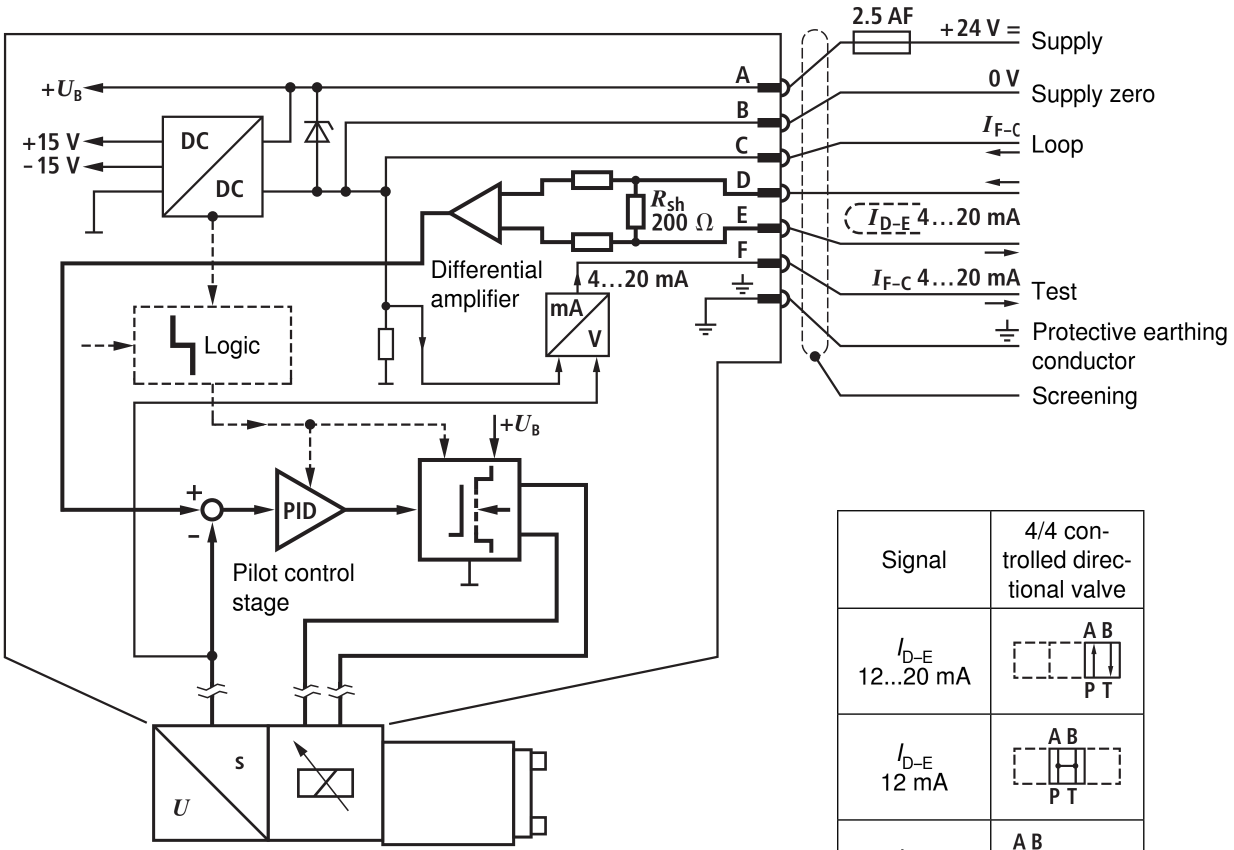
Pin assignment 6P+PE
Version A1: U_{D-E} ±10 V
(R_i = 100 kΩ)



Integrated electronics

Block diagram/Pinout

Version F1: I_{D-E} 4...12...20 mA



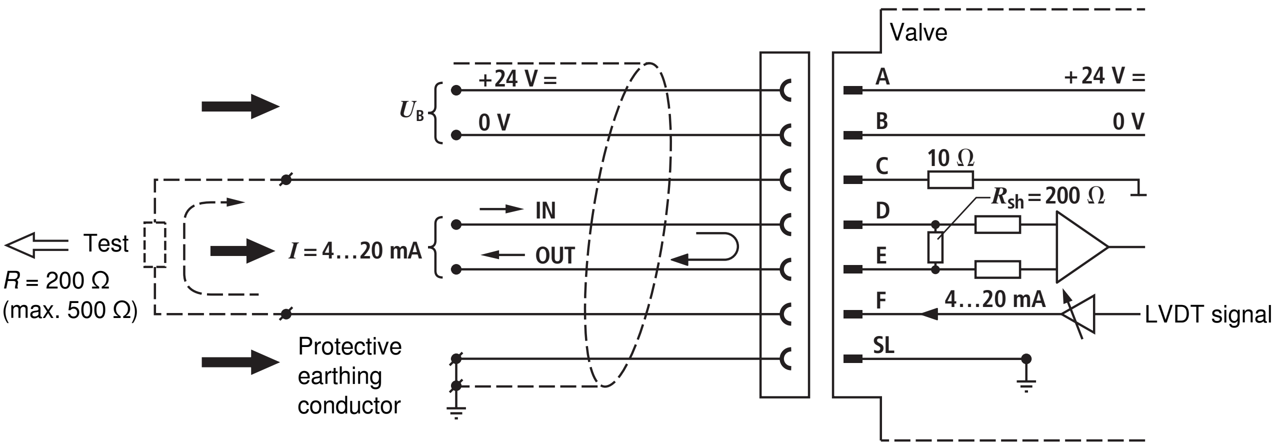
Signal	4/4 controlled directional valve
I_{D-E} 12...20 mA	A B P T
I_{D-E} 12 mA	A B P T
I_{D-E} 4..0.12 mA	A B P T

$I_{D-E} \leqq 2$ mA: Valve inactive

Pin assignment 6P+PE

Version F1: I_{D-E} 4...12...20 mA

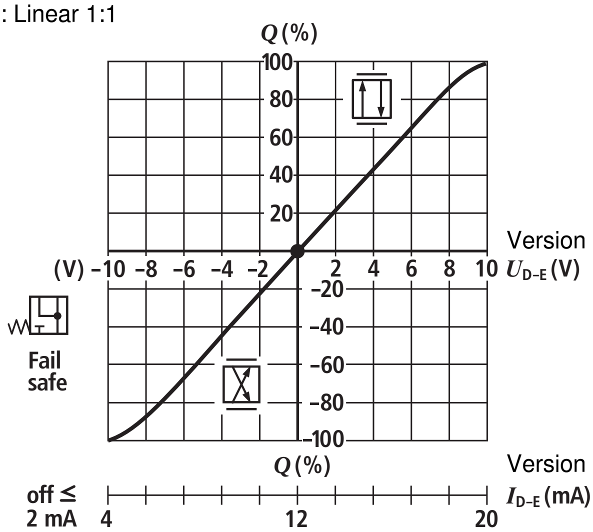
(R_{sh} = 200 Ω)



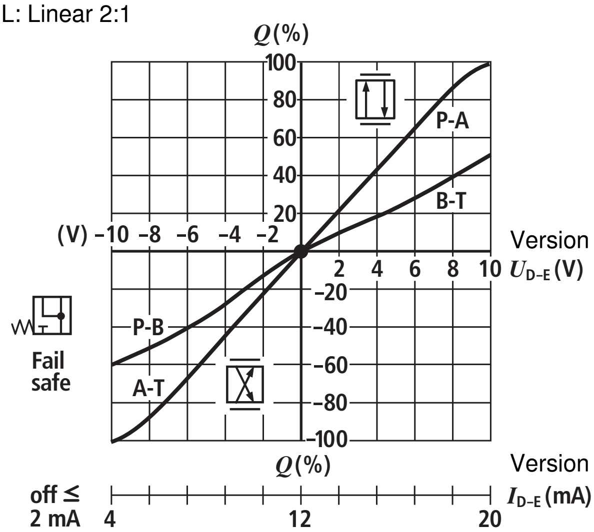
Characteristic curves (measured with HLP 46, ϑ_{oil} = 40 °C ± 5 °C)

Flow – signal function $Q = f\,(U_{D-E})$
$Q = f\,(I_{D-E})$

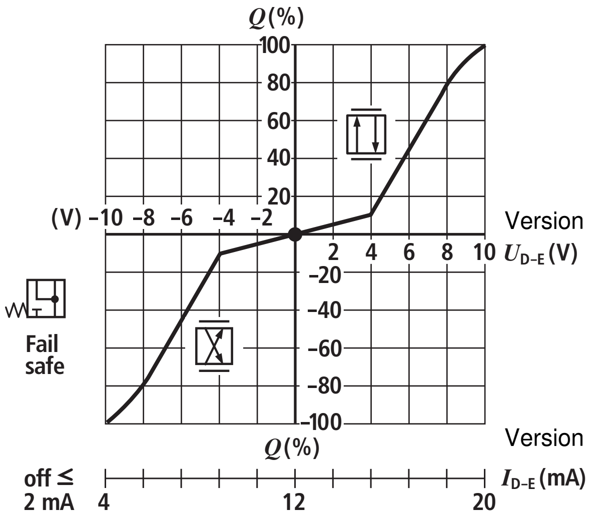
Flow characteristics
L: Linear 1:1



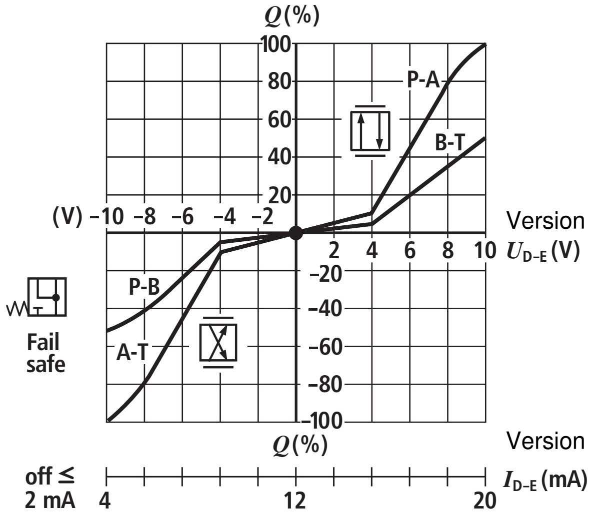
Flow characteristics
L: Linear 2:1



Flow characteristics
P: (Inflection 40%) 1:1

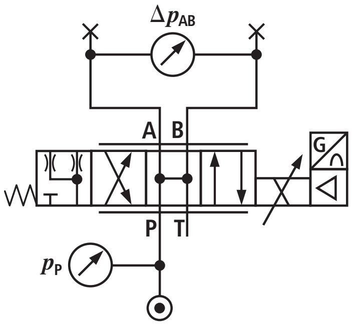


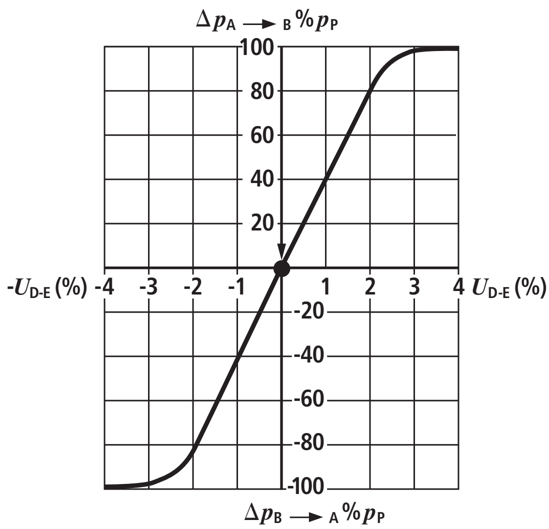
Flow characteristics
P: (Inflection 40%) 2:1



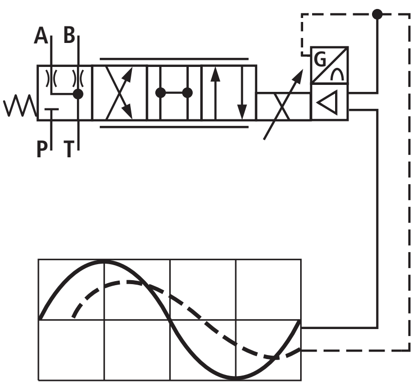
Characteristic curves (measured with HLP 46, ϑ_{oil} = 40 °C ± 5 °C)

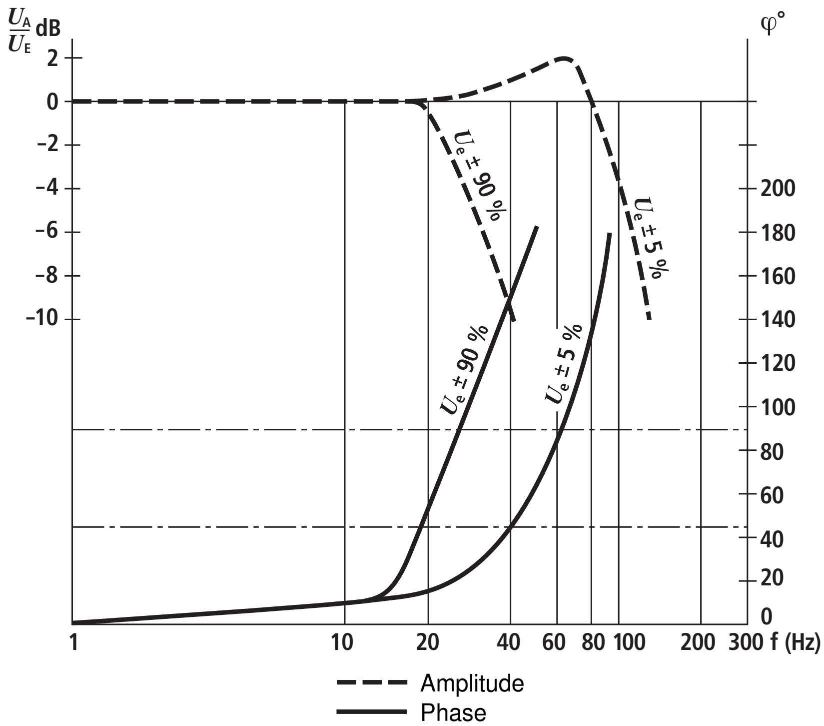
Pressure gain



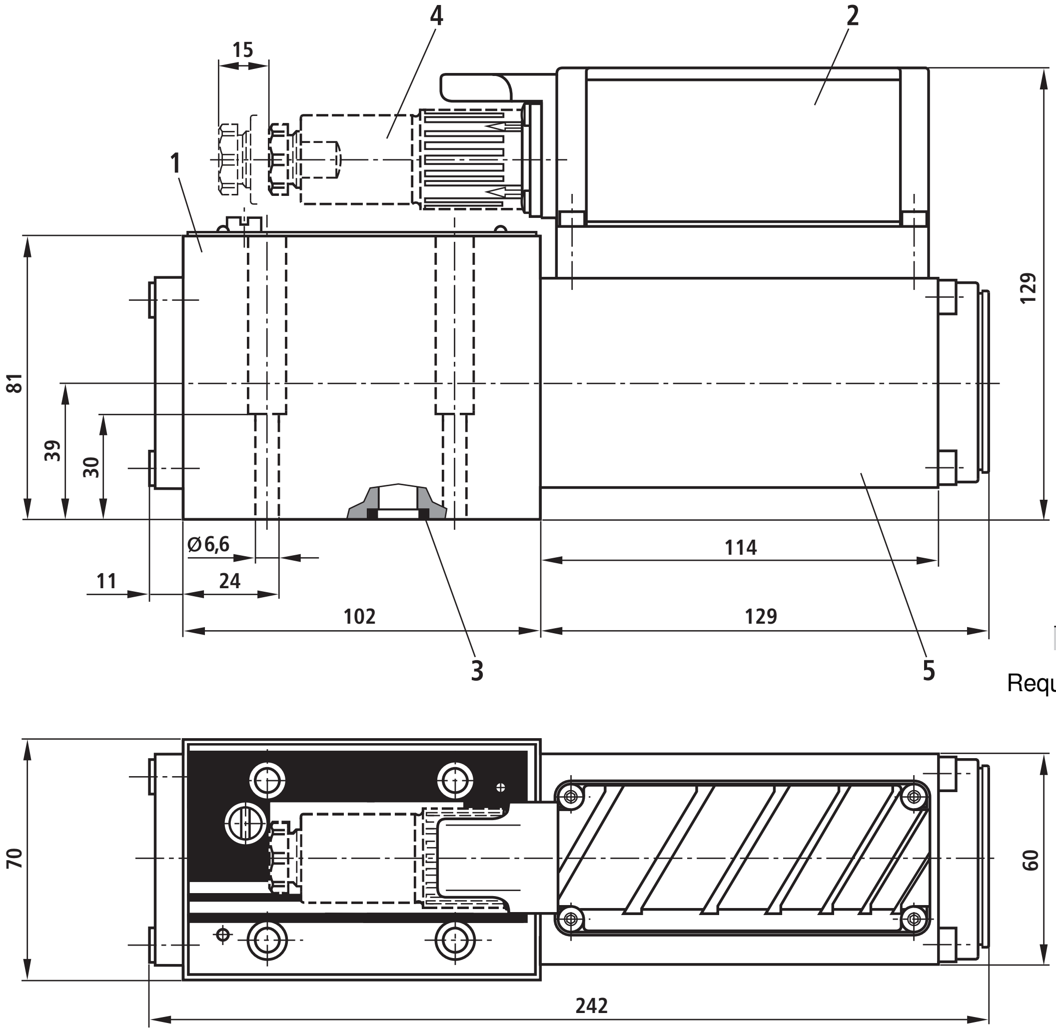


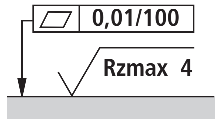
Bode diagram



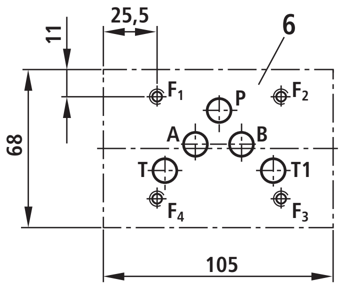


Unit dimensions (dimensions in mm)





Required surface quality of the valve mounting face



1 Valve housing

2 Integrated electronics

3 O-rings Ø 12 x 2 (ports P, A, B, T, T1)

4 Mating connector
see technical data sheet RE 08008
(separate order)

5 Control solenoids with position transducer

6 Machined valve mounting face, porting pattern according to ISO 4401-05-04-0-05
Deviating from the standard:
Ports P, A, B, T, T1 Ø 10.5 mm

Subplates, see technical data sheet RE 45055 (separate order)

Valve mounting screws (separate order)
The following valve mounting screws are recommended:
4 hexagon socket head cap screws
ISO 4762-M6x40-10.9-N67F82170
(galvanized according to N67F82170)
Tightening torque M_A = 11+3 Nm
Mat. no. 2910151209
or
4 hexagon socket head cap screws ISO 4762-M6x40-10.9
(friction rate μ_{total} = 0.12 – 0.17)

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

4/3 directional control valve, directly controlled, with electrical position feedback and integrated electronics (OBE)

RE 29041/03.10
Replaces: 01.05

Type 4WRREH 6

Size 6
Component series 1X
Maximum operating pressure P, A, B 315 bar, T 100 bar
Rated flow 4...40 l/min (Δp 70 bar)

Type 4WRREH 6

Table of contents

Features

– Directly operated high-response 4/3 directional control valvewith control spool and sleeve in servo quality
– Double stroke solenoid with electrical position feedback and integrated electronics (OBE), calibrated in the factory
– Prepared pilot valve, among others for 3/2 control cartridge with position transducer, position-controlled
– Electrical connection 11P-PE
signal input of differential amplifier with interface B5 ±10 V
– Use for electrohydraulic controls in production and test systems

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

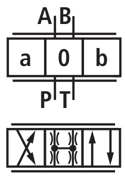
4WRR	E	H	6	V	B		–	1X	/	G24	K0	/	B5	M	*

with **integrated** electronics = **E**

Control spool/sleeve = **H**

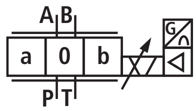
Size = **6**

Control spool symbols
4/3 directional design



= **V**

Assembly side of the inductive position transducer



(standard) = **B**

Further details in the plain text

Seal material
M = NBR seals, suitable for mineral oils (HL, HLP) according to DIN 51524

Interface of the control electronics
B5 = Command value input ±10 V

Electrical connection
K0 = **without** mating connector, with unit connector according to DIN 43563-AM6
mating connector - separate order

Supply voltage of control electronics
G24 = +24 V DC

1X = Component series 10 to 19 (identical installation and connection dimensions)

Flow characteristics
L = Linear
P = Inflected characteristic curve [2)]

Rated flow
at 70 bar valve pressure difference (35 bar/control edge)

04 =	4 l/min
08 =	8 l/min
12 =	12 l/min
15 =	15 l/min [1)]
24 =	24 l/min
25 =	25 l/min [1)]
40 =	40 l/min

1) Only in connection with flow characteristics “P”

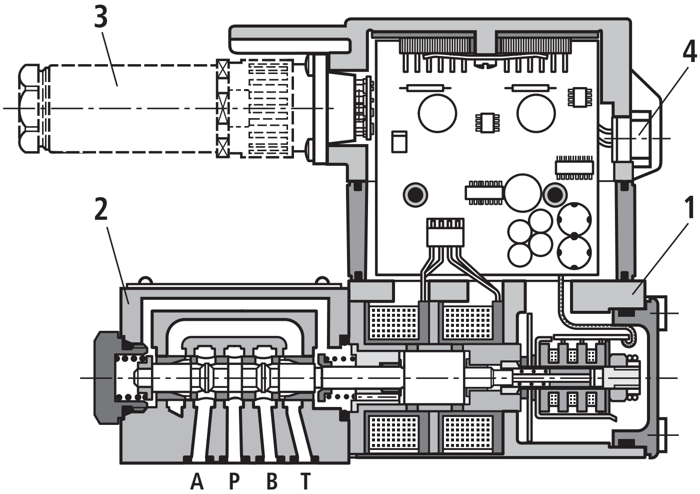
2) Inflection 60 % with rated flow “15” and “25”, otherwise 40 %

Function, section

General

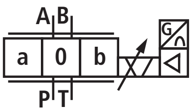
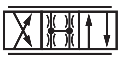
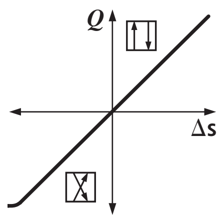
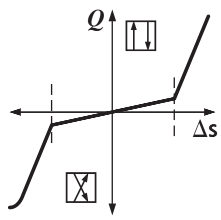
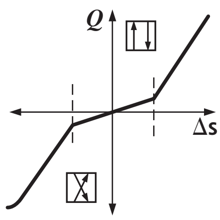
In the integrated electronics, the specified command value is compared with the actual position value. In case of control deviations, the double-stroke solenoid is activated which adjusts the control spool by means of changed solenoid force.

Stroke/control cross-section is controlled proportionally to the command value. In case of a command value specification of 0 V the electronics controls the control spool in center position. In switched-off state, the valve is undefined in P-B/A-T or P-A/B-T. Therefore, “additional isolation valves” are required in many applications and must be taken into account for the On/Off switching line.



1 Control solenoid with position transducer
2 Valve body
3 Mating connector
4 Plug-in connector prob. 2nd stage

Symbols

	L: Linear	P: Inflection 60 % [Q_n 15, 25 l/min]	P: Inflection 40 % [Q_n 15, 40 l/min]
			
	V		
	Standard = 1:1		

Test and service devices

– Type VT-VETSY-1 service case with test device, see RE 29685

– 11P+PE Type VT-PA-1 measuring adapter, see RE 30067

Technical data

general									
Type			Gate valve, directly operated, with steel sleeve						
Actuation			Proportional double-stroke solenoid with position control, OBE						
Type of connection			Plate connection, porting pattern according to ISO 4401-03-02-0-05						
Installation position			Any						
Ambient temperature range		°C	–20...+50						
Weight		kg	2.5						
Vibration resistance, test condition			Max. 25 *g*, room vibration test in all directions (24 h)						
hydraulic (measured with HLP 46, ϑ_{oil} = 40 °C ± 5 °C)									
Hydraulic fluid			Hydraulic oil according to DIN 51524…535, other media upon request						
Viscosity range	Recommended	mm^2/s	20...100						
	Max admissible	mm^2/s	10...800						
Hydraulic fluid temperature range		°C	–20...+65						
Maximum admissible degree of contamination of the hydraulic fluid cleanliness class according to ISO 4406 (c)			Class 18/16/13 [1]						
Flow direction			According to symbol						
Rated flow at Δp = 35 bar per edge [2]		l/min	4	8	12	15	24	25	40
Max operating pressure	Ports P, A, B	bar	315						
	Orifice T	bar	100						
Limitation of use Δp		bar	315	315	315	315	315	315	250
Zero flow at 100 bar	Linear characteristic curve L	cm^3/min	< 180	< 250	< 300	–	< 500	–	< 900
	Inflected characteristic curve P	cm^3/min	–	–	–	< 180	–	< 250	–
static/dynamic									
Hysteresis		%	≦ 0.2						
Manufacturing tolerance Q_{max}		%	< 10						
Actuating time for signal step 0 …100 %		ms	≦ 5						
Temperature drift			Zero shift < 1 % at ΔT = 40 °C						
Zero compensation			ex factory ±1 %						

[1] The cleanliness classes specified for the components must be complied with in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components. For the selection of filters see technical data sheets RE 50070, RE 50076 and RE 50081.

[2] Flow at different Δp $Q_x = Q_{nom} \cdot \sqrt{\frac{\Delta p_x}{35}}$

Technical data

electric, control electronics integrated in the valve			
Relative duty cycle	%	100 ED, max. power consumption 30 VA (24 V =)	
Protection class		IP 65 according to DIN 40050 and IEC 14434/5	
Port		Plug-in connector, 11P+PE	Data
Supply 24 V = $_{nom}$ [1]	[2]	1 2	+24 V = $_{nom}$, fuse protection 2.5 A_F (output stages) 0 V power ground
	[3]	9 10	+24 V = $_{nom}$ Signal part 0 V Signal ground
Input signal ±10 V	[4]	4 5	U_{IN} U_{IN} } Differential amplifier, R_i = 100 kΩ
Actual value signal (LVDT)		6 7	±10 V =, R_a = 1 kΩ 0 V, reference point
Release input		3	> 8.5 V to 24 V = $_{nom}$ (max. 40 V =) R_i = 10 kΩ
Messages	[5]	8 11	Enable acknowledgement +24 V = Error message: No error +24 V =
Protective earthing conductor		⏚	Connect only if the transformer of the 24 V = -System does not comply with the VDE 0551 standard
Electromagnetic compatibility tested according to		EN 61000-6-2: 2005-08 EN 61000-6-3: 2007-01	

[1] 24 V = $_{nom}$ – min. 21 V =
– max. 40 V =

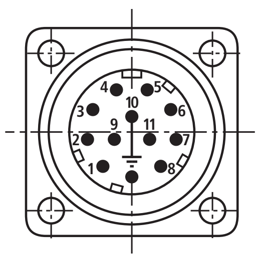
[2] U_B (Pin 1) = Output stage supply
– "OFF" valve < 13.4 V =
– "ON" valve > 16.8 V =
No error messagee (Pin 11)

[3] U_S (Pin 9) = Electronic supply
– "OFF" valve < 16.8 V =
Error message (Pin 11)
– "ON" valve > 19.5 V =
No error message (Pin 11)

[4] Inputs: Voltage resistant up to max. 50 V.

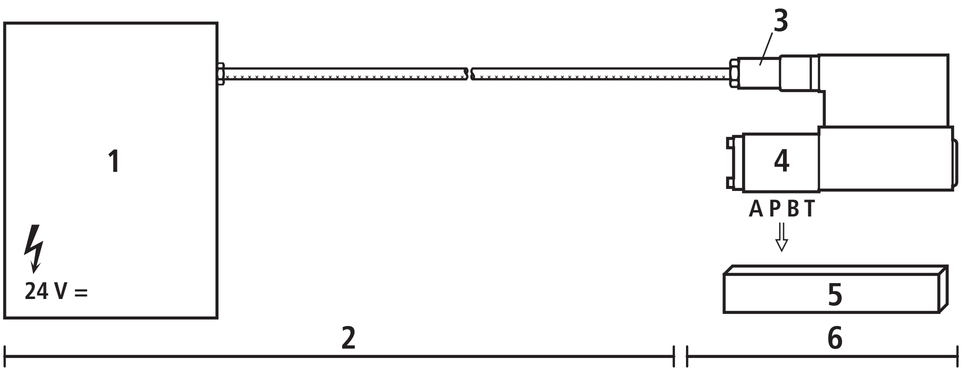
[5] Messages loadable up to max. 20 mA
and short-circuit-proof against earth.

11P+PE



Electrical connection

Electrical data, see page 5



1 Control
2 On customer side
3 Mating connector
4 Valve
5 Contact surface
6 On Rexroth side

Technical instructions for the cable

Version:
- Nulti-wire cable
- Litz wire structure, very fine wire according to VDE 0295, class 6
- Protective earthing conductor, green-yellow
- Cu shielding braid

Type:
- e.g. Oilflex-FD 855 CP (Lappkabel)

Number of wires:
- Depends on valve type, plug type and signal assignment

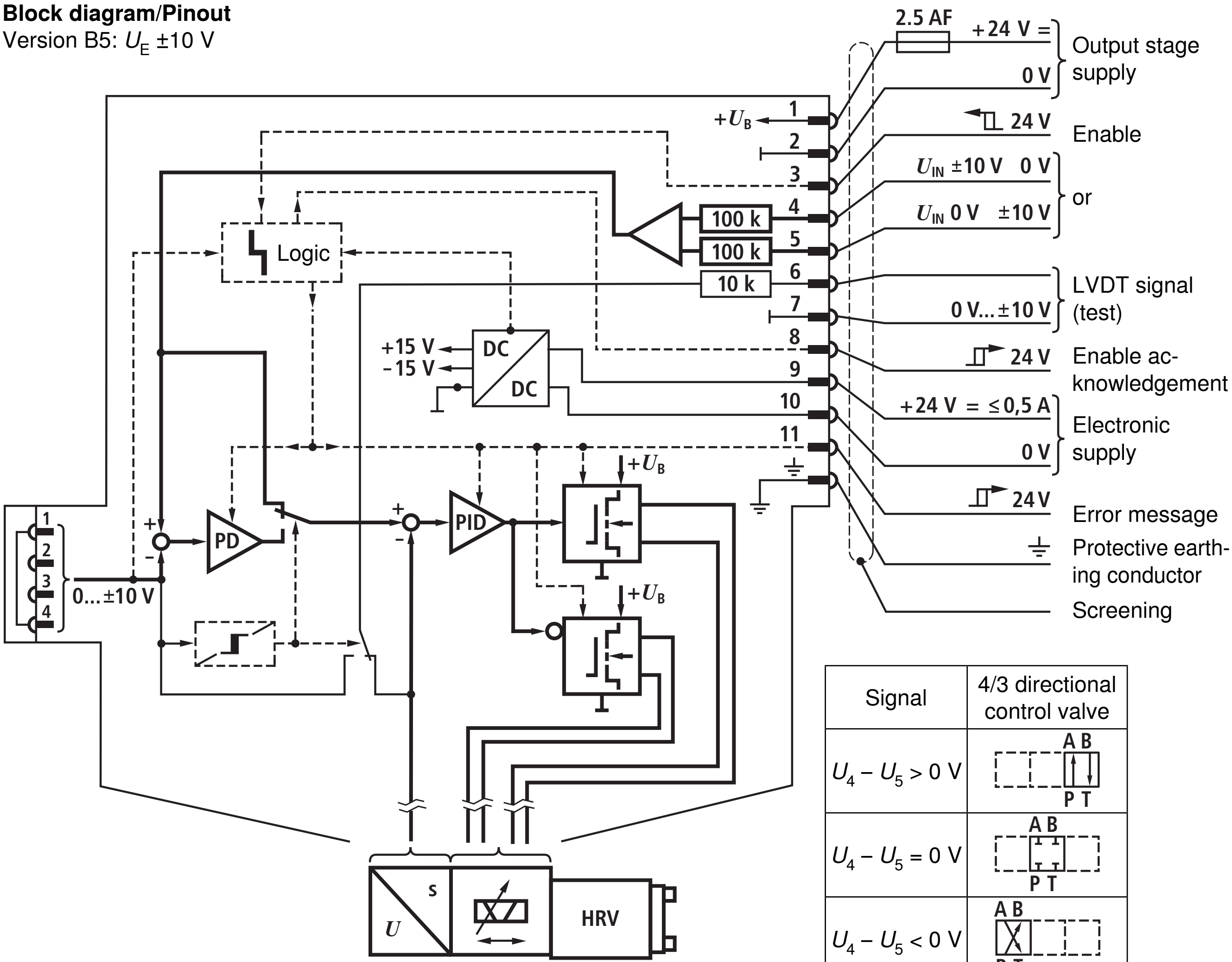
Line Ø:
- 0.75 mm^2 up to a length of 20 m
  1.0 mm^2 to 40 m of length

Outer Ø:
- 9.4...11.8 mm – Pg11
  12.7...13.5 mm – Pg16

Note
Electric signals taken out via control electronics (e.g. signal Actual value) may not be used for the switching off of safety-relevant machine functions!
(See also the European standard “Safety requirements for fluid power systems and their components – Hydraulics”, EN 982!)

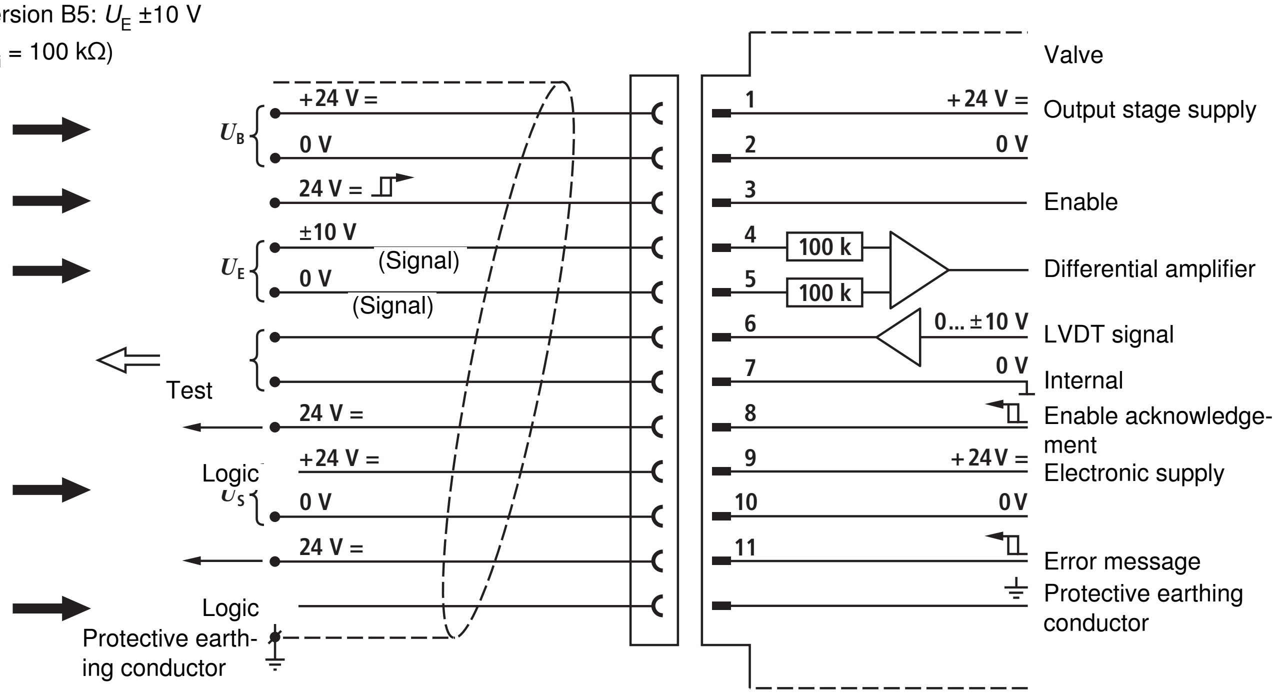
Integrated electronics

Block diagram/Pinout
Version B5: U_E ±10 V



Signal	4/3 directional control valve
$U_4 - U_5 > 0$ V	A B / P T
$U_4 - U_5 = 0$ V	A B / P T
$U_4 - U_5 < 0$ V	A B / P T

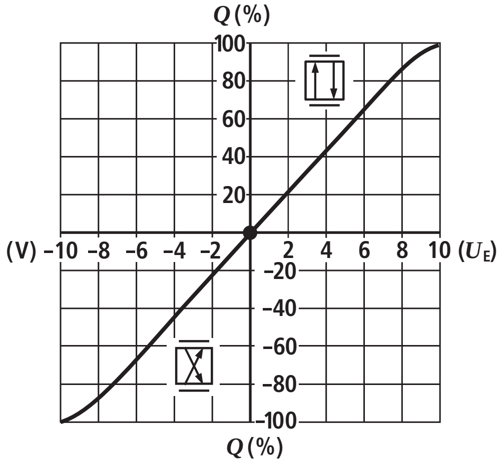
Pin assignment 11P+PE
Version B5: U_E ±10 V
(R_i = 100 kΩ)



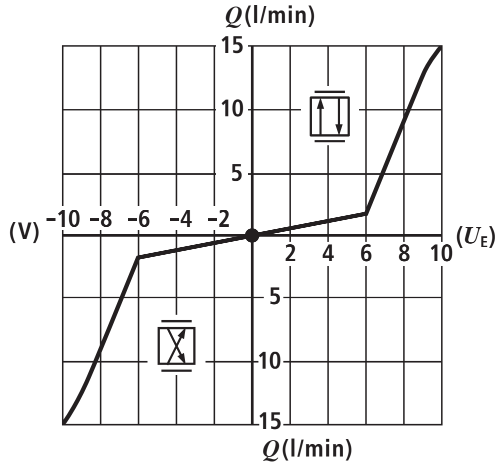
Characteristic curves (measured with HLP 46, ϑ_{oil} = 40 °C ± 5 °C)

Flow - signal function $Q = f\,(U_E)$

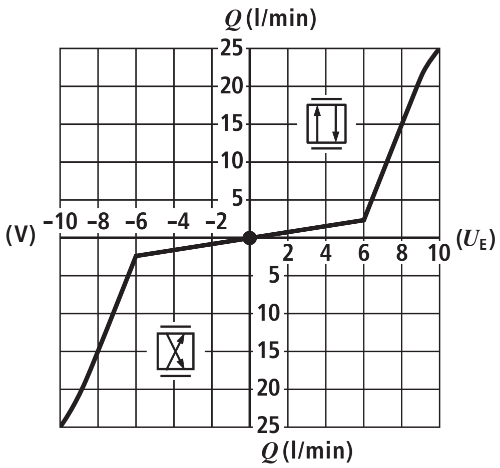
Flow characteristics
L: Linear



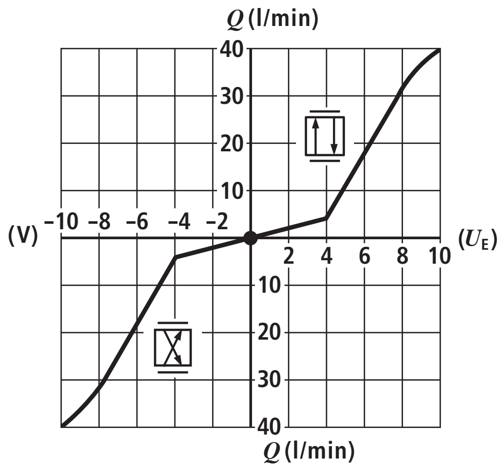
Flow characteristics
P: (Inflection 60 %)



Flow characteristics
P: (Inflection 60 %)

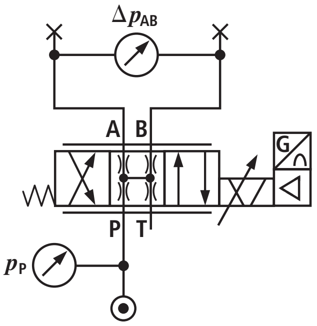


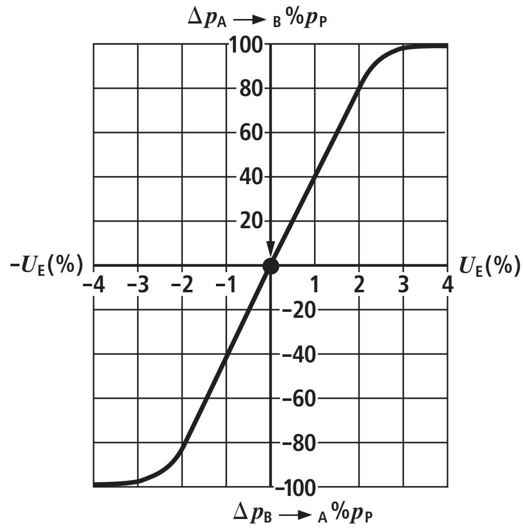
Flow characteristics
P: (Inflection 40 %)



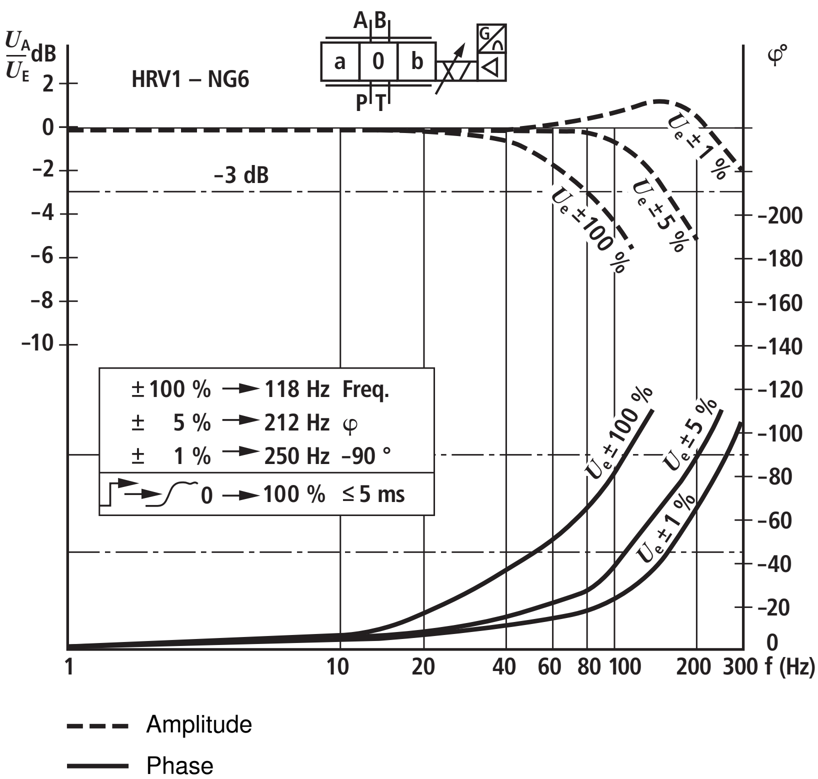
Characteristic curves (measured with HLP 46, ϑ_{oil} = 40 °C ± 5 °C)

Pressure gain

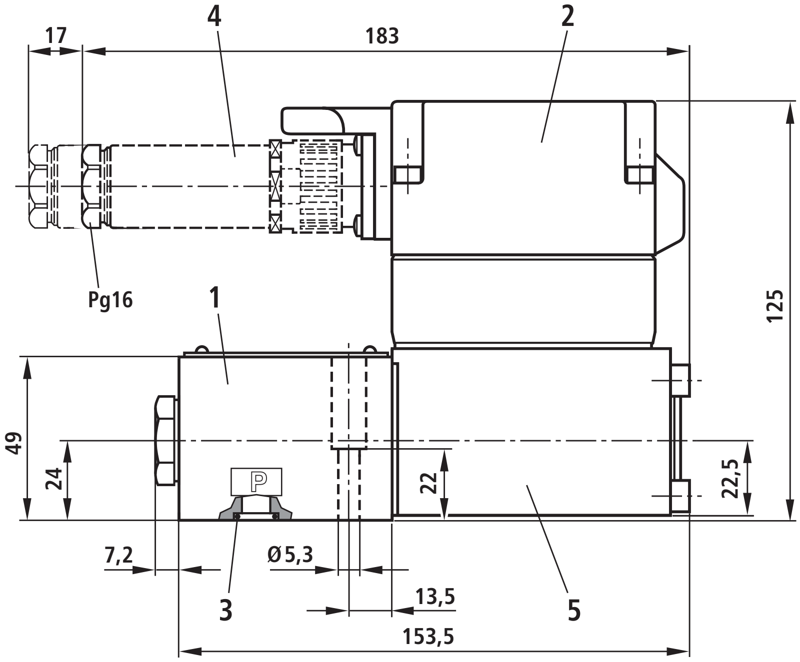


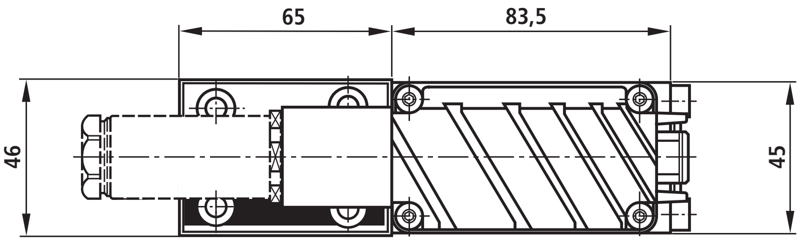


Bode diagram



Unit dimensions (dimensions in mm)





1 Valve housing

2 Integrated electronics

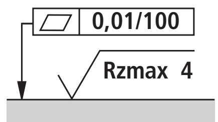
3 O-rings Ø 9.25x1.78 (ports P, A, B, T)

4 Mating connector no included in the scope of delivery, see technical data sheet RE 08008 (separate order)

5 Control solenoid with position transducer

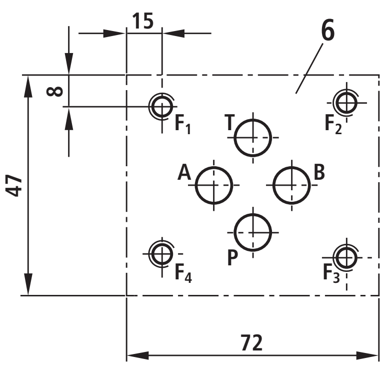
6 Machined valve mounting face, porting pattern according to ISO 4401-03-02-0-05
Deviating from the standard:
Ports P, A, B, T Ø 8 mm

Subplates according to technical data sheet RE 45053 (separate order)



Required surface quality of the valve mounting face

Valve mounting screws (separate order)
The following valve mounting screws are recommended:
4 cylinder screws ISO 4762-M5x30-10.9-N67F82170
(galvanized according to N67F82170)
Tightening torque M_A = 6+1 Nm
Mat.-no. 2910151166
or
4 cylinder screws ISO 4762-M5x30-10.9
(friction coefficient μ_{total} = 0.12–0.17)



Notes

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Servo solenoid valves with on-board electronics (OBE)

RE 29045/10.05
Replaces: 01.05

Type 5WRPE 10

Size 10
Unit series 2X
Maximum working pressure P_1, P_2, A, B 210 bar, T 50 bar
Nominal flow rate 70 l/min (Δp 11 bar)

List of contents

Features

– Directly operated servo solenoid valve NG10, with *p/Q* 5/3-way symbol in servo quality
– Actuated on one side, A-T fail-safe position when switched off
– Control solenoid with integral position feedback and on-board electronics (OBE), calibrated at the factory
– Electrical connection 6P+PE
Signal input difference amplifier with interface A1 ±10 V
– Suitable for electrohydraulic controllers in production and testing systems
– For subplate attachment, mounting hole configuration to ISO 4401-05-04-0-94
– Subplates as per catalogue section RE 45055 (order separately)
– Line sockets to DIN 43563-AM6, see catalogue section RE 08008 (order separately)

Variants on request

The 5 hydraulic connections are required for the function "Dual flow-through", $P_1 \rightarrow$ A and $P_2 \rightarrow$ B, see hole pattern on page 8. Closed-loop control of *p/Q* is achieved with an external pressure compensator (accessory).

Ordering data

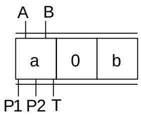
5WRP	E		10	F	B	70	L – 2X /	G24	K0 / A1	M	*

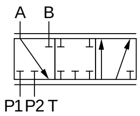
With **on-board** trigger electronics = **E**

Without sleeve **no designation**

Size 10 = **10**

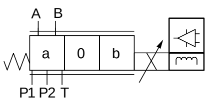
Symbols
5/3 way version





= **F**

Side of inductive position transducer



(Standard) = **B**

Further information in plain text

M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

Interface for trigger electronics
A1 = Setpoint input ±10 V

K0 = **Electrical connection**
without line socket with plug to DIN 43563-AM6
Order line socket separately

G24 = **Voltage supply of trigger electronics**
+24 V DC

2X = Unit series 20 to 29 (installation and connection dimensions unchanged)

L = **Flow characteristic**
Linear

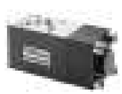
Nominal flow rate at 11 bar valve pressure difference (11 bar/metering notch)

Size 10
70 = 70 l/min

Preferred types

Type 5WRPE 10...F	Material No.
5WRPE10FB70L–2X/G24K0/A1M	0 811 402 107

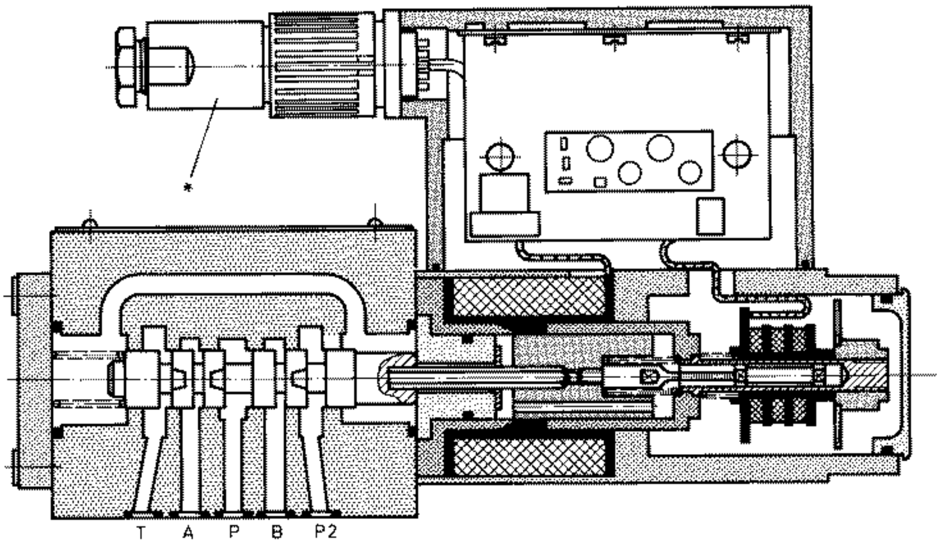
Accessory, pressure compensator

	See pressure compensator on pages 11 and 12	kg	**Material No.**
		6	0 811 401 219

Function, sectional diagram

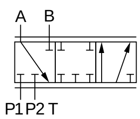
Servo solenoid valve 5WRPE 10

CE EN 61000-6-2: 2002-08
EN 61000-6-3: 2002-08

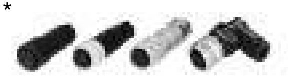


Valve body Control solenoid with position transducer

Symbol



Accessories, not included in scope of delivery

(4x) ISO 4762-M6x40-10.9	Fastening screws		2 910 151 209
* 	Line sockets 6P+PE, see also RE 08008	KS	1 834 482 022
		KS	1 834 482 026
		MS	1 834 482 023
		MS	1 834 482 024
		KS 90°	1 834 484 252

Testing and service equipment

– Test box type VT-PE-TB3, see RE 30065
– Test adapter 6P+PE type VT-PA-2, see RE 30068

Technical data

General		
Construction		Spool type valve, operated directly
Actuation		Proportional solenoid with position control, OBE
Type of mounting		Subplate, mounting hole configuration NG10 (ISO 4401-05-04-0-94)
Installation position		Optional
Ambient temperature range	°C	–20...+50
Weight	kg	7.1
Vibration resistance, test condition		Max. 25 g, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)			
Pressure fluid		Hydraulic oil to DIN 51524...535, other fluids after prior consultation	
Viscosity range recommended	mm^2/s	20...100	
Viscosity range max. permitted	mm^2/s	10...800	
Pressure fluid temperature range	°C	–20...+70	
Maximum permissible degree of contamination of pressure fluid Purity class to ISO 4406 (c)		Classe 18/16/13 [1]	
Flow direction		See symbol	
Nominal flow at $\Delta p = 11$ bar per notch [2]	l/min	$P_1 \rightarrow A$	70
		$P_1 \rightarrow A + P_2 \rightarrow B$	70+70
		$A \rightarrow T$	65
Max. working pressure	bar	Port P_1, P_2, A, B: 210	
Max. pressure	bar	Port T: 50	
Operating limits at Δp	bar	See diagram	
Leakage at 100 bar	cm^3/min	< 1,200	

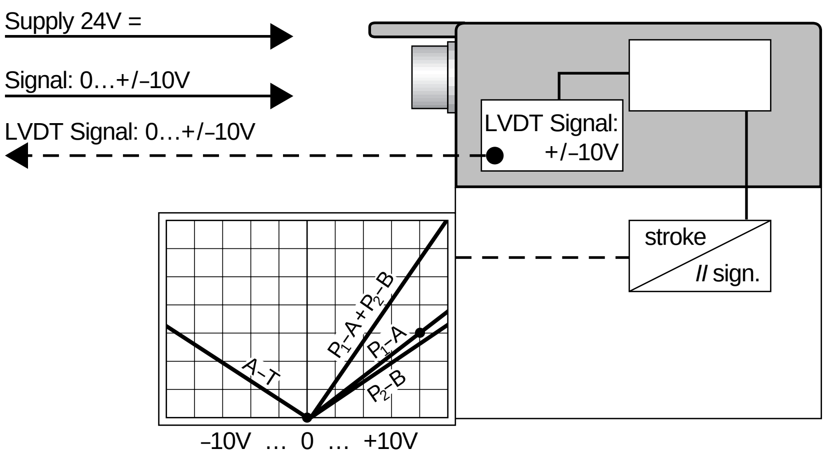
Static/Dynamic		
Hysteresis	%	≦ 0.3
Manufacturing tolerance for Q_{max}	%	< 10
Response time for signal change 0...100 %	ms	≦ 25
Thermal drift		Zero point displacement < 1 % at $\Delta T = 40\,°C$
Zero adjustment		Factory-set ±1 %
Conformity		CE EN 61000-6-2: 2002-08 EN 61000-6-3: 2002-08

[1] The purity classes stated for the components must be complied with in hydraulic systems.
Effective filtration prevents problems and also extends the service life of components.
For a selection of filters, see catalogue sections RE 50070, RE 50076 and RE 50081.

[2] Flow rate at a different Δp $\quad Q_x = Q_{nom} \cdot \sqrt{\frac{\Delta p_X}{11}}$

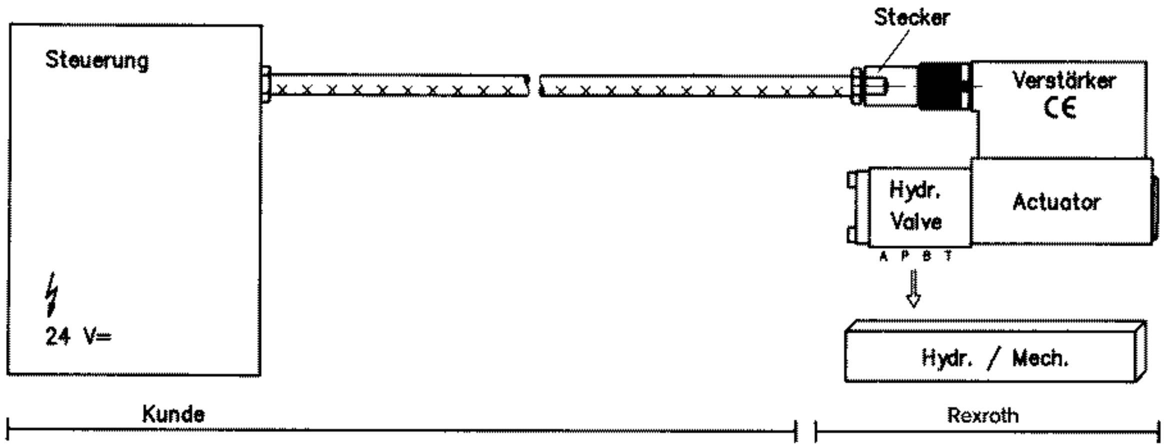
Technical data

Electrical, trigger electronics integrated in the valve	
Cyclic duration factor %	100
Degree of protection	IP 65 to DIN 40050 and IEC 14434/5
Connection	Line socket 6P+PE, DIN 43563
Power supply Terminal A: Terminal B: 0 V	24 V DC_{nom} min. 21 V DC/max 40 V DC Ripple max. 2 V DC
Power consumption	Solenoid ⌀ 60 mm = 60 VA max.
External fuse	2.5 A_F
Input, "Standard" version Terminal D: U_E Terminal E:	Difference amplifier, R_i = 100 kΩ 0...±10 V 0 V
Max. differential input voltage at 0 V	D → B D → B } max. 18 V DC
Test signal, "Standard" version Terminal F: U_{Test} Terminal C:	LVDT 0...±10 V Reference 0 V
Protective conductor and screen	See pin assignment (installation conforms to CE)
Recommended cable	See pin assignment up to 20 m 7x0.75 mm^2 up to 40 m 7x1 mm^2
Calibration	Calibrated at the factory, see valve performance curve



Connection

For electrical data, see page 5 and
Operating Instructions **1 819 929 083**



Technical notes on the cable

Version:
– Multi-wire cable
– Extra-finely stranded wire to VDE 0295, Class 6
– Protective conductor, green/yellow
– Cu braided screen

Types:
– e.g. Ölflex-FD 855 CP (from Lappkabel company)

No. of wires:
– Determined by type of valve, plug types and signal assignment

Cable Ø:
– 0.75 mm^2 up to 20 m length
– 1.0 mm^2 up to 40 m length

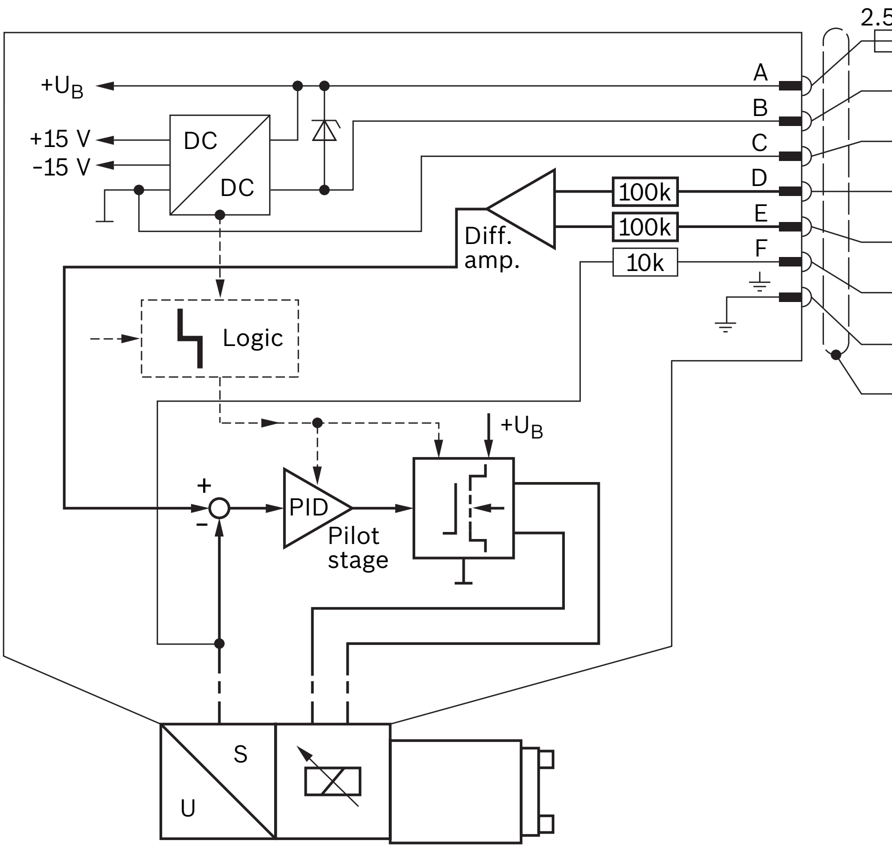
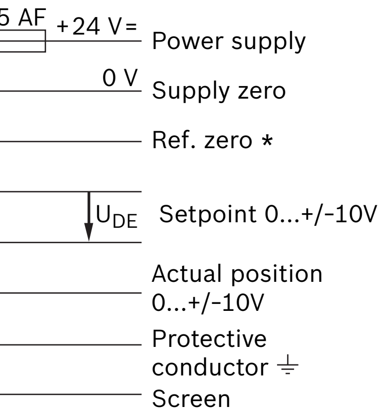
Outside Ø:
– 9.4...11.8 mm – Pg11
– 12.7...13.5 mm – Pg16

Note

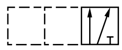
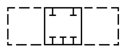
Voltage supply 24 V DC_{nom},
if voltage drops below 18 V DC, rapid shutdown resembling "Enable OFF" takes place internally.
Electrical signals emitted via the trigger electronics (e.g. actual values) must not be used to shut down safety-relevant machine functions! (See European Standard, "Technical Safety Requirements for Fluid-Powered Systems and Components – Hydraulics", EN 982.)

On-board trigger electronics

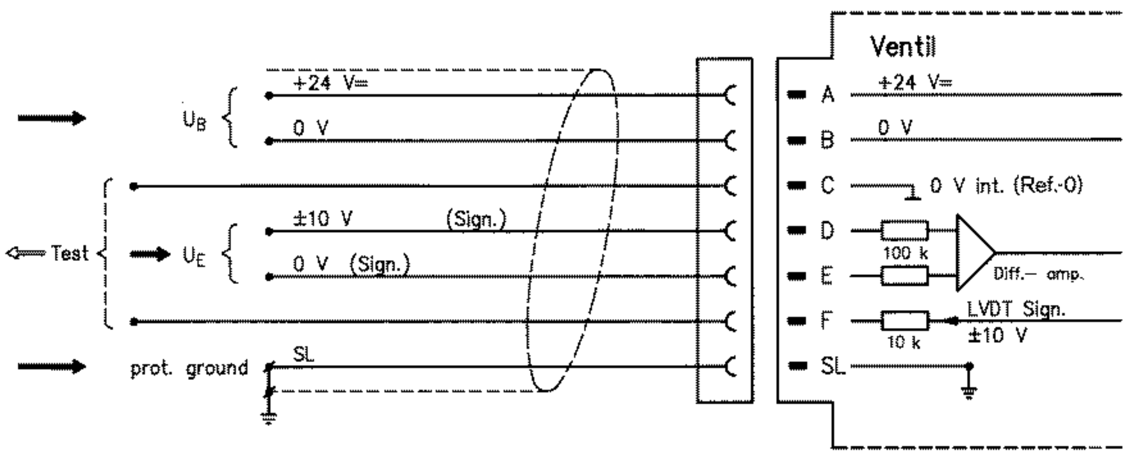
Block diagram/pin assignment
Version A1: U_{D-E} 0...±10 V

* Do not connect to supply zero!

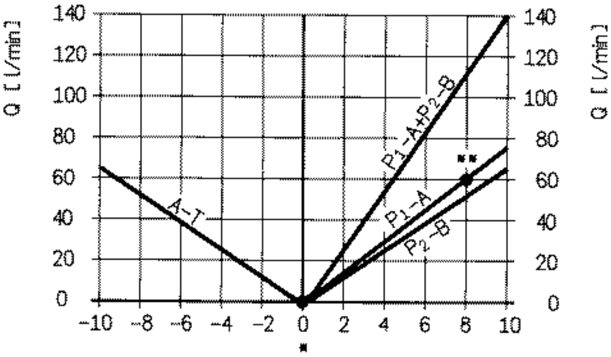
Signal	Symbol
U_{D-E} 0...+10 V	
U_{D-E} 0 V	
U_{D-E} 0...-10 V	

Pin assignment 6P+PE
Version A1: U_{D-E} ±10 V
(R_i = 100 kΩ



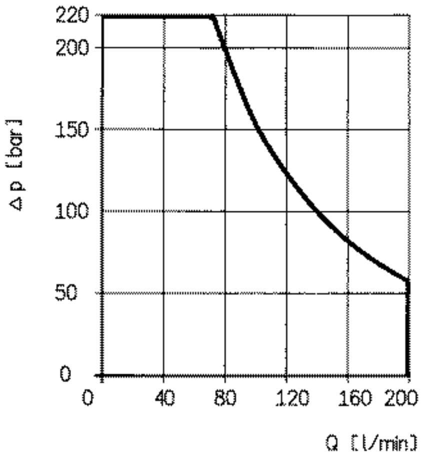
Performance curves (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Flow rate/Signal function

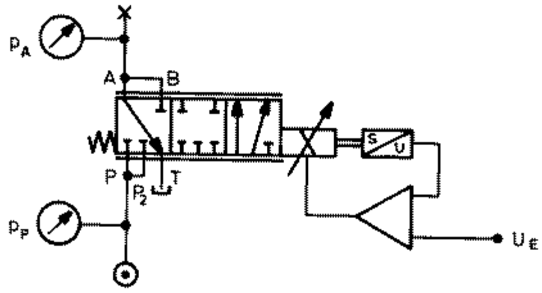


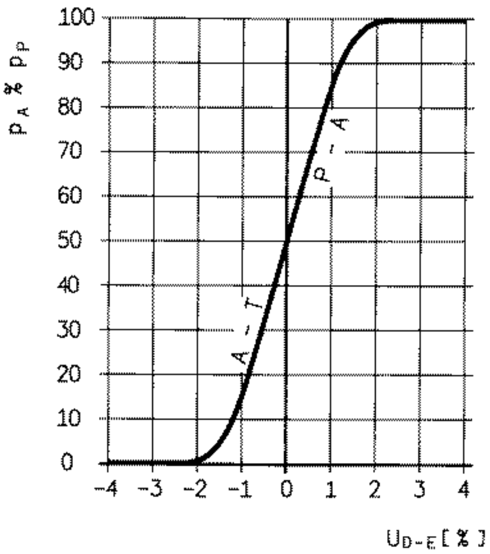
* calibrated ±1 %
** calibrated ±5 %

Operating limits

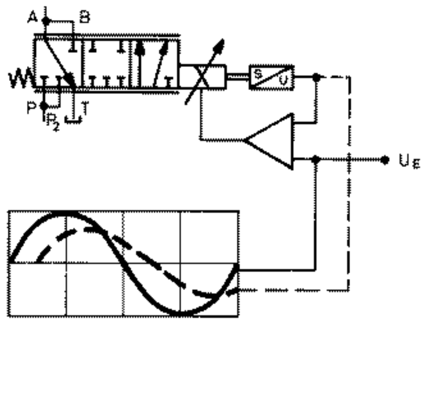


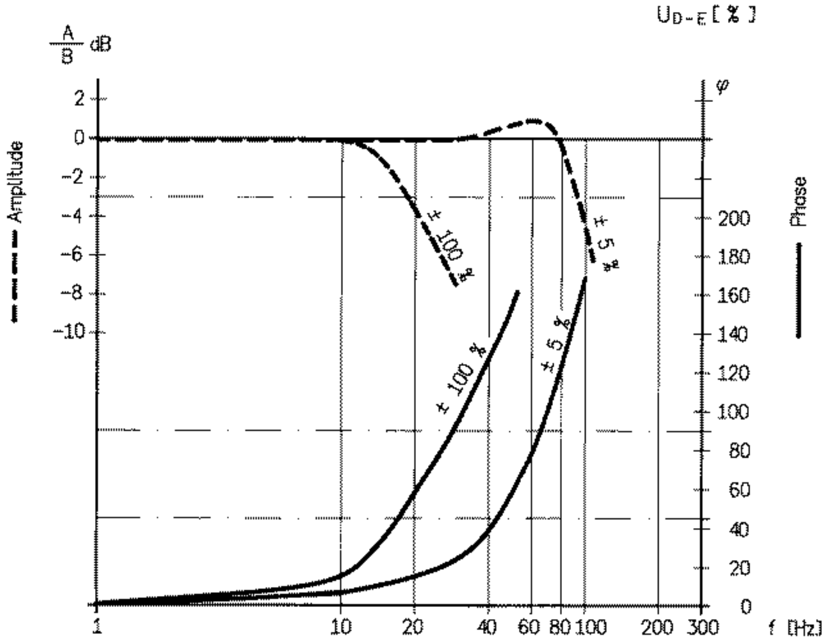
Pressure gain



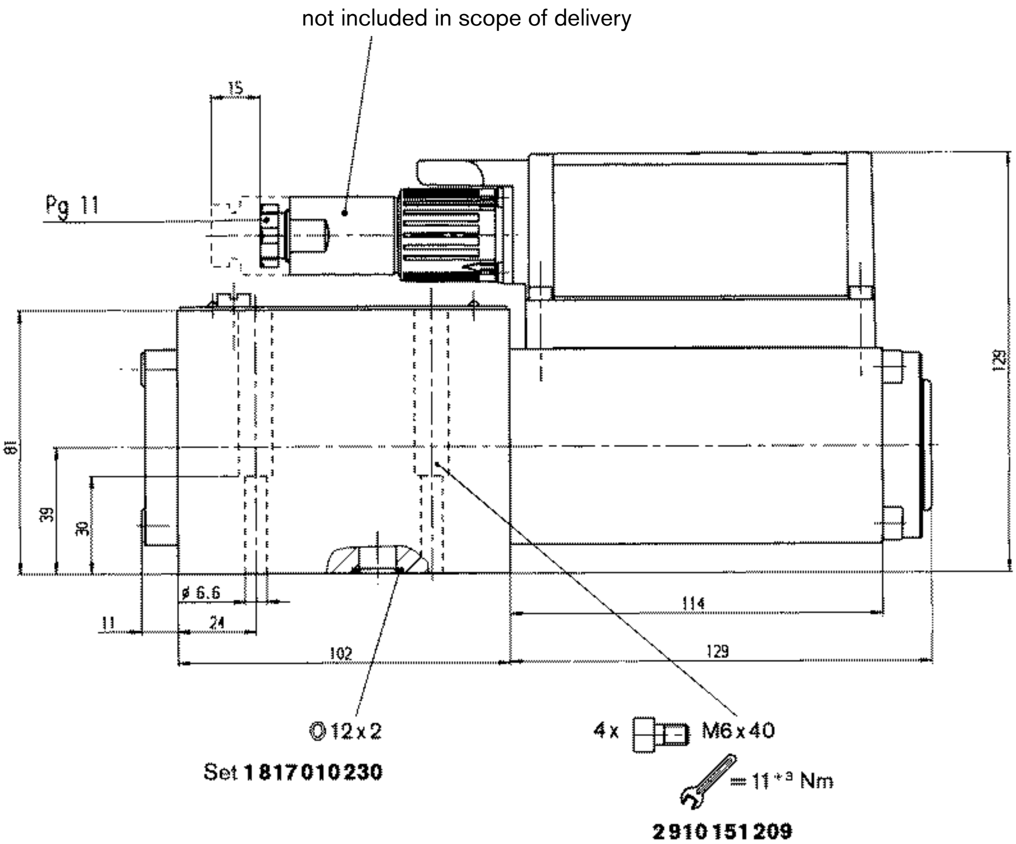


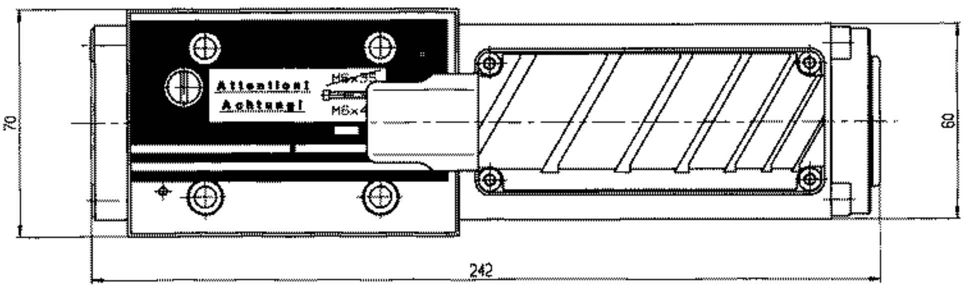
Bode diagram



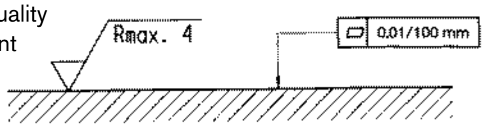


Unit dimensions (nominal dimensions in mm)





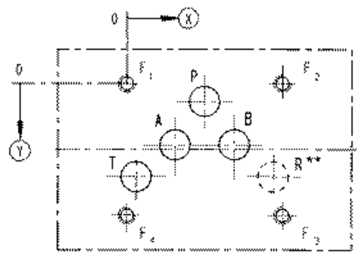
Required surface quality
of mating component



Mounting hole configuration: NG10 (ISO 4401-05-04-0-94)
For subplates, see catalogue section RE 45055

[1] Deviates from standard
[2] Thread depth:
Ferrous metal 1.5 x Ø*
Non-ferrous 2 x Ø
* (NG10 min. 10.5 mm)

** 5/3 – NG10
R = P_2



	P	A	T	B	F_1	F_2	F_3	F_4	R
X	27	16.7	3.2	37.3	0	54	54	0	50.8
Y	6.3	21.4	32.5	21.4	0	0	46	46	32.5
∅	10.5 [1]	10.5 [1]	10.5 [1]	10.5 [1]	M6 [2]	M6 [2]	M6 [2]	M6 [2]	10.5 [1]

Pressure compensator

Size 10

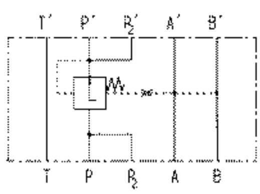
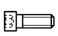
Application

A combination of flow rate control and pressure compensation. The **flow rate *Q*** is determined by the throttle cross-sections P_1, R, A and P_2, R, B. Either a single or a double flow may be selected. In many applications, the valve is combined with a variable-displacement pump. The pressure/flow compensator keeps the pressure drops through the valve at a constant level (see Fig. 1 on page 11).
The same function is achieved in constant-displacement pumps, too, by means of a pressure compensator. Here, Q_{max} is determined by the control springs of the pressure compensator (see Fig. 2 on page 11).

The **pressure *p*** is measured by an external pressure sensor and transmitted to an electronic pressure compensator as an actual value. Just as the build-up of pressure in the consumer takes place and approaches the setpoint value, the valve function is determined by the pressure compensator. Even in situations where the pressure is decreasing, the valve can regulate the oil as necessary via the A-T metering notch.
Pressure compensation can be achieved both by means of electronics provided by the customer and using a Rexroth pressure compensator.

Note

You will find more detailed information in the RE data sheets:
– Pressure sensors RE 30271
– *p/Q* regulator RE 30134.

Symbol		p_{max} [bar]	Δp [bar]	Q_{nom} [l/min]	[kg]	**Material No.**
	*p/Q*-NG10	210	8	120	6.0	0 811 401 219
	ISO 4762-M6x115–10.9					–
	ISO 4762-M6x120–10.9					2 910 151 227

Application

Figure 1: with variable-displacement pump

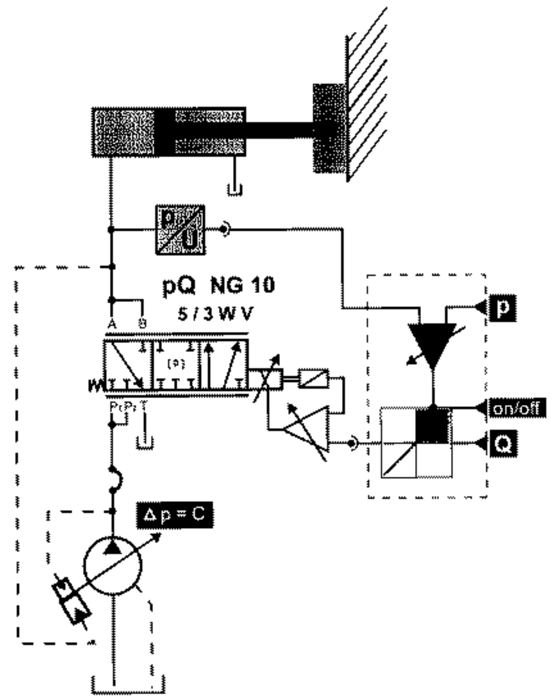
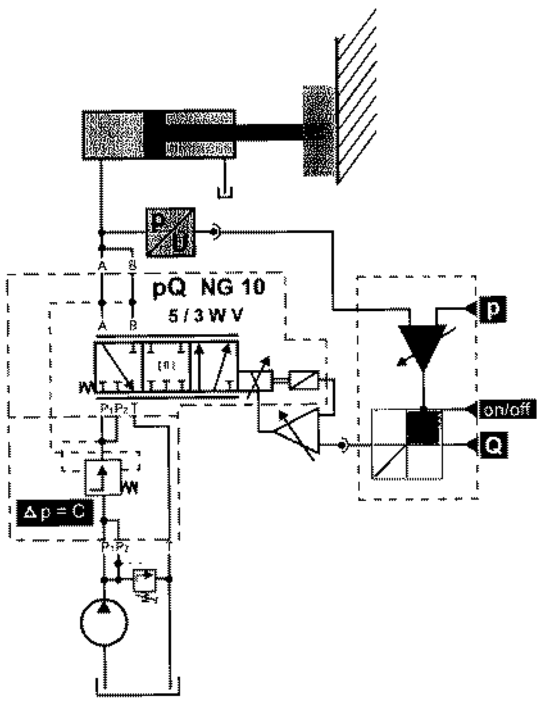
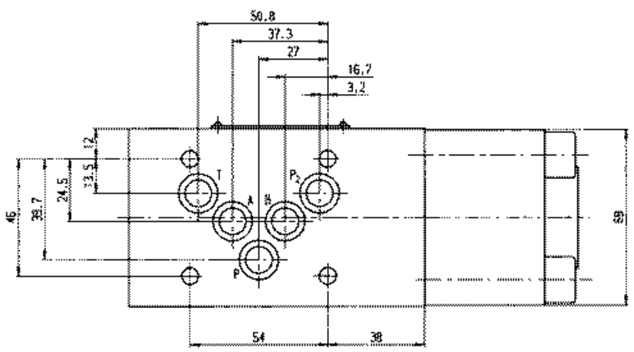
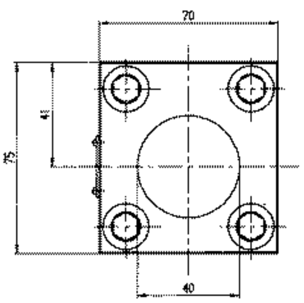


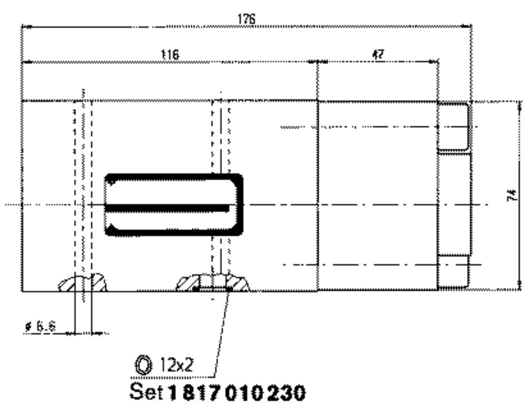
Figure 2: with pressure compensator 0 811 401 219



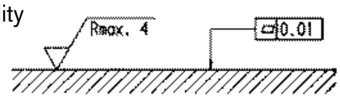
Unit dimensions (nominal dimensions in mm)







Required surface quality
of mating component



Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

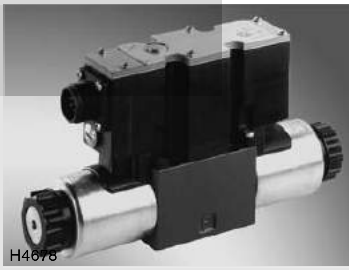
Rexroth
Bosch Group

4/2- and 4/3-way proportional directional valves, direct operated, without electrical position feedback, without/with integrated electronics (OBE)

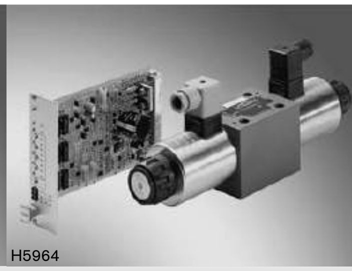
RE 29055/10.05
Replaces: 08.01

Types 4WRA and 4WRAE

Nominal sizes 6 and 10
Component series 2X
Maximum operating pressure 315 bar
Maximum flow: 42 l/min (NS6)
75 l/min (NS10)



Type 4WRAE 6 …-2X/G24K31/.V
with integrated electronics (OBE)



Typ 4WRA 10 …-2X/G24…K4/V
with plug-in connectors and associated control electronics (separate order)

Overview of contents

For information regarding the available spare parts see:
www.boschrexroth.com/spc

Features

– Direct operated proportional directional valve without electrical position feedback and integrated electronics (OBE) for type 4WRAE
– Control the direction and magnitude of a flow
– Actuation by means of proportional solenoids with central thread and removable coil
– For subplate mounting:
Connection position to ISO 4401
Subplates to catalogue sheets RE 45052 (NS6) or RE 45054 (NS10) separate order, see page 12 to 15
– Spring centred control spool
– Control electronics
  • 4WRAE:
    - integrated electronics (OBE) with voltage input or current input (A1 resp. F1)
  • 4WRA:
    - digital or analogue amplifier in Eurocard format (separate order)
    - analogue module amplifier

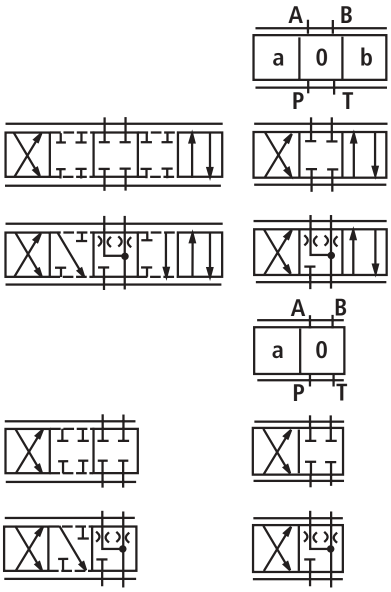
Ordering details

4WRA				–2X/	G24		/	V	*

Without integrated electronics (OBE) = **No code**
With integrated electronics (OBE) = **E**

Nominal size 6 = **6**
Nominal size 10 = **10**

Spool symbols



= **E**
E1–

= **W**
W1–

= **EA**

= **WA**

With spool symbols E1– and W1–:
P → A: $q_{V\,max}$ B → T: $q_V/2$
P → B: $q_V/2$ A → T: $q_{V\,max}$

Note:
With spools W and WA, in the neutral position, there is a connection from A to T and B to T with approx. 3 % of the relevant nominal cross-section.

Nominal flow at a valve pressure differential Δp = 10 bar

	NS6
07 =	7 l/min
15 =	15 l/min
30 =	26 l/min
	NS10
30 =	30 l/min
60 =	60 l/min

2X = Component series 20 to 29
(20 to 29: unchanged installation and connection dimensions)

G24 = Supply voltage 24 VDC

Special protection
No code = Without special protection
J [1] **=** Sea water resistant (only for NS6)
For details regarding the sea water resistant versions see RE 29055-M

Electrical connections
for 4WRA:
K4 [2] **=** **Without** plug-in connector, with component plug to DIN EN 175301-803
plug-in connector – separate order, see page 7
for 4WRAE:
K31 [2] **=** **Without** plug-in connector, with component plug to DIN EN 175201-804
plug-in connector – separate order, see page 7

Electronic interfaces A1 or F1 for 4WRAE
A1 = Command value input ± 10 V
F1 = Command value input 4 to 20 mA
No code = For 4WRA

Seal material
V = FKM seals, suitable for mineral oil (HL, HLP) to DIN 51524

Further details in clear text

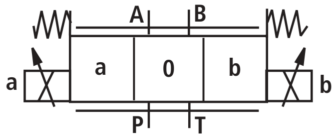
[1] Other types of electrical protection on request

[2] Only for NS6: for version "**J**" = sea water resistant only state "**K31**"!

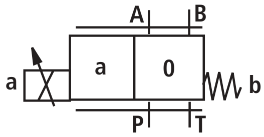
Symbols

Without integrated electronics

Type 4WRA…

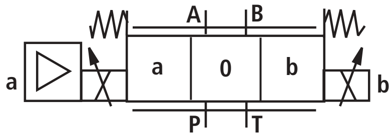


Types 4WRA…**EA**…; 4WRA…**WA**…

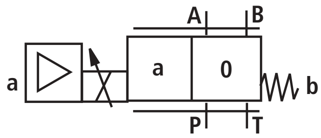


With integrated electronics (OBE)

Type 4WRAE…



Types 4WRAE…**EA**…; 4WRAE…**WA**…



Function, section

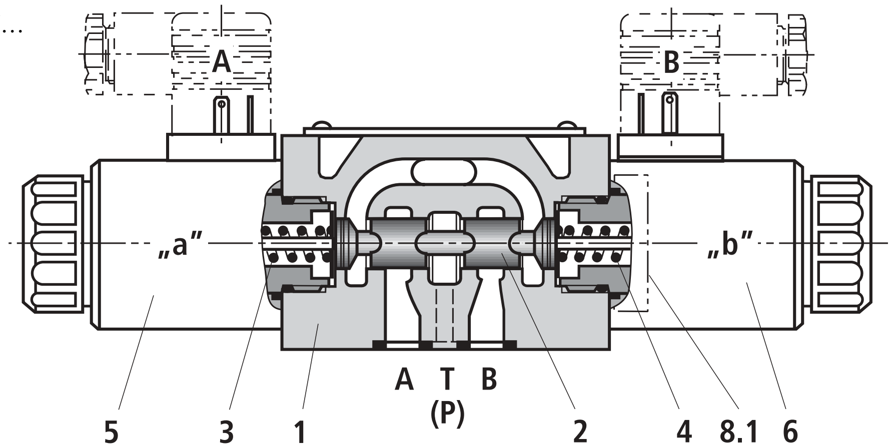
The 4/2- and 4/3-way proportioanl directional valves are designed as direct operated components for subplate mounting. They are actuated by means of proportional solenoids with central thread and removable coil. The solenoids are controlled either by external control electronics (type 4WRA) or by integrated control electronics (type 4WRAE).

Design:

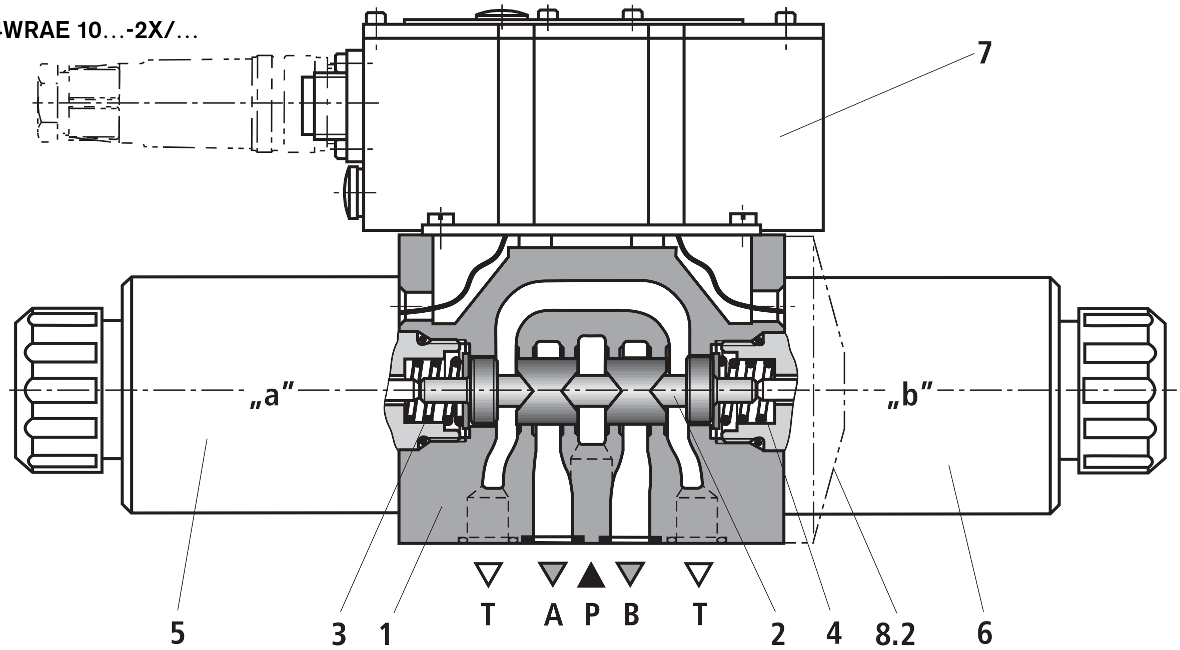
The valves basically consist of:
- Housing (1) with mounting surface
- Control spool (2) with compression springs (3 and 4)
- Solenoids (5 and 6) with central thread
- Optional integrated electronics (7)

Function:
- With the solenoids (5 and 6) de-energised, the control spool (2) is held in the central position by compression springs (3 and 4)
- Direct actuation of the control spool (2) by energising a proportional solenoid
  E.g. energinsaion of solenoid "b" (6)
  → The control spool (2) is moved to the left in proportion to the electrical input signal
  → connection from P to A and B to T via orifice-like cross-sections with progressive flow characterisics
- De-energisation of the solenoid (6)
  → The control spool (2) is returned to the central position by compression spring (3)

Type 4WRA 6…-2X/…



Type 4WRAE 10…-2X/…



Valve with 2 spool positions:

(Type 4WRA…**A**…)

In principle, the function of this valve version corresponds to that of the valve with 3 spool positions. However, the valves with 2 spool positions are **only fitted with solenoid "a"**. Instead of the the 2nd proportional solenoid a plug (8.1) is fitted for NS 6 or for NS 10 a cover (8.2).

Note for type 4WRA 6…-2X/…:

Draining of the tank line is to be avoided. With the appropriate installation conditions, a back pressure valve is to be installed (back pressure approx. 2 bar).

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

General

Nominal size		NS	**6**	**10**
Installation			optional, preferably horizontal	
Storage temperature range		°C	–20 to +80	
Ambient temperature range	4WRA	°C	–20 to +70	
	4WRAE	°C	–20 to +50	
Weight	4WRA	kg	2.0	6.6
	4WRAE	kg	2.2	6.8

Hydraulic (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Max. operating pressure	Ports A, B, P	bar	315	
	Port T	bar	210	
Nominal flow $q_{V\ nom}$ at $\Delta p = 10$ bar		l/min	7, 15, 26	30, 60
Max. permissible flow		l/min	42 (80)[1]	75 (140)[1]
Pressure fluid			mineral oil (HL, HLP) to DIN 51524 other pressure fluids on request!	
Pressure fluid temperature range		°C	–20 to +80 (preferably +40 to +50)	
Viscosity range		mm^2/s	20 to 380 (preferably 30 to 46)	
Max. permissible degree of pressure fluid contamination cleanlisness class to ISO 4406 (c)			class 20/18/15 [2]	
Hysteresis		%	≤ 5	
Reversal error		%	≤ 1	
Response sensitivity		%	≤ 0.5	

[1] Max. permissible flow with a dual flow path

[2] The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.
For the selection of filters see catalogue sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

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

Electical

Nominal size		NS	**6**	**10**
Voltage type			DC	
Command value signal with type WRAE	Voltage input „A1"	V	±10	
	Current input „F1"	mA	4 to 20	
Max. current per solenoid		A	2.5	
Solenoid coil resistance	Cold value at 20 °C	Ω	2	
	Max. warm value	Ω	3	
Duty		%	100	
Max. coil temperature [1]		°C	150	
Electrical connections see page 7	4WRA		with component plug to DIN EN 175301-803 or ISO 4400	
			plug-in connector to DIN EN 175301-803 or ISO 4400 [2]	
	4WRAE		with component plug to DIN EN 175201-804	
			plug-in connector DIN EN 175201-804 [2]	
Valve protection to EN 60529			IP65 with mounted and fixed plug-in connector	

Control electronics

For 4WRA	Digital amplifier in Eurocard format [2]		VT-VSPD-1-2X (to RE 30523 - middle of 2006)
	Analogue amplifier in Eurocard format [2]		VT-VSPA2-1-2X/… to RE 30110
	Analogue module amplifier [2]		VT-MSPA2-1-1X to RE 30228
For 4WRAE			integrated into the valves, see page 8
	Analogue command value module		VT- SWMA-1-1X/... to RE 29902
	Analogue command value module		VT-SWMKA-1-1X/... to RE 29903
	Digital command value card		VT-HACD-1-1X/… to RE 30143
	Analogue command value card		VT-SWKA-1-1X/... to RE 30255
Supply voltage 4WRAE, 4WRA [3]	Nominal voltage	VDC	24
	Lower limiting value	V	21 / 22 (4WRA); 19 (4WRAE)
	Upper limiting value	V	35
Amplifier current consumption	I_{max}	A	1.8
	Max. impulse current	A	3

[1] Due to the occurring surface temperature of the solenoid coils, the European Standards DIN EN 563 and DIN EN 982 must be taken into account!

[2] Separate order

[3] With Bosch Rexroth AG control electronics

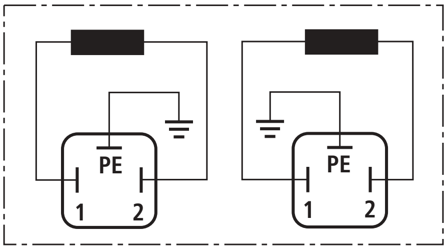
Note: For details regarding the **environmental simulation test** covering EMC (electro-magnetic compatibility), climate and mechanical loading see RE 29055-U (declaration regarding environmental compatibility).

Electrical connection, plug-in connectors

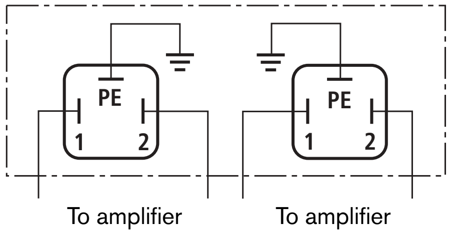
For type WRA

(**without** integrated electronics – **not** for version "**J**" = sea water resistant)

Connection on component plug



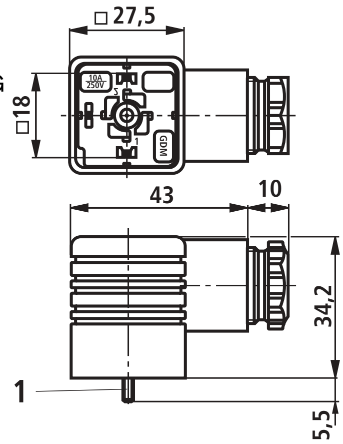
Connection on plug-in connector



Plug-in connector CECC 75 301-803-A002FA-H3D08-G
to DIN EN 175301-803 or ISO 4400

Solenoid **a**, colour grey
Separate order: Material No. **R901017010**

Solenoid **b**, colour black
Separate order: Material No. **R901017011**



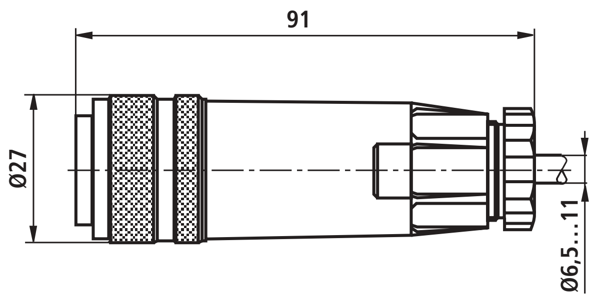
1 Fixing screws M3
Tightening torque M_A = 0.5 Nm

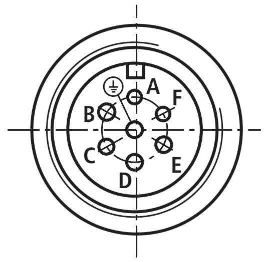
For type WRAE

(**with** integrated electronics (OBE) and for version "**J**" = sea water resistant)

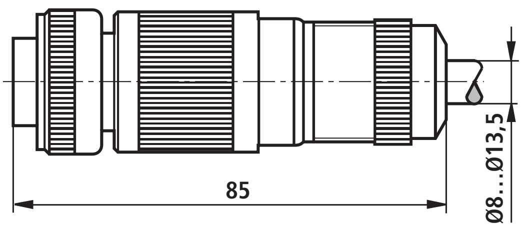
For pin allocation, see block circuit diagram on page 8

Plug-in connector to DIN EN 175201-804
Separate order: Material No. **R900021267**
(plastic version)



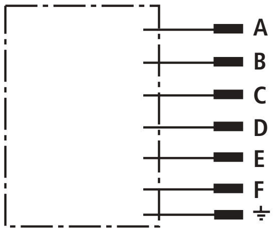


Plug-in connector to DIN EN 175201-804
Separate order: Material No. **R900223890**
(metal version)



Integrated electronics (OBE) for type WRAE

Pin allocation of the component plug



Integrated control electronics (see below)

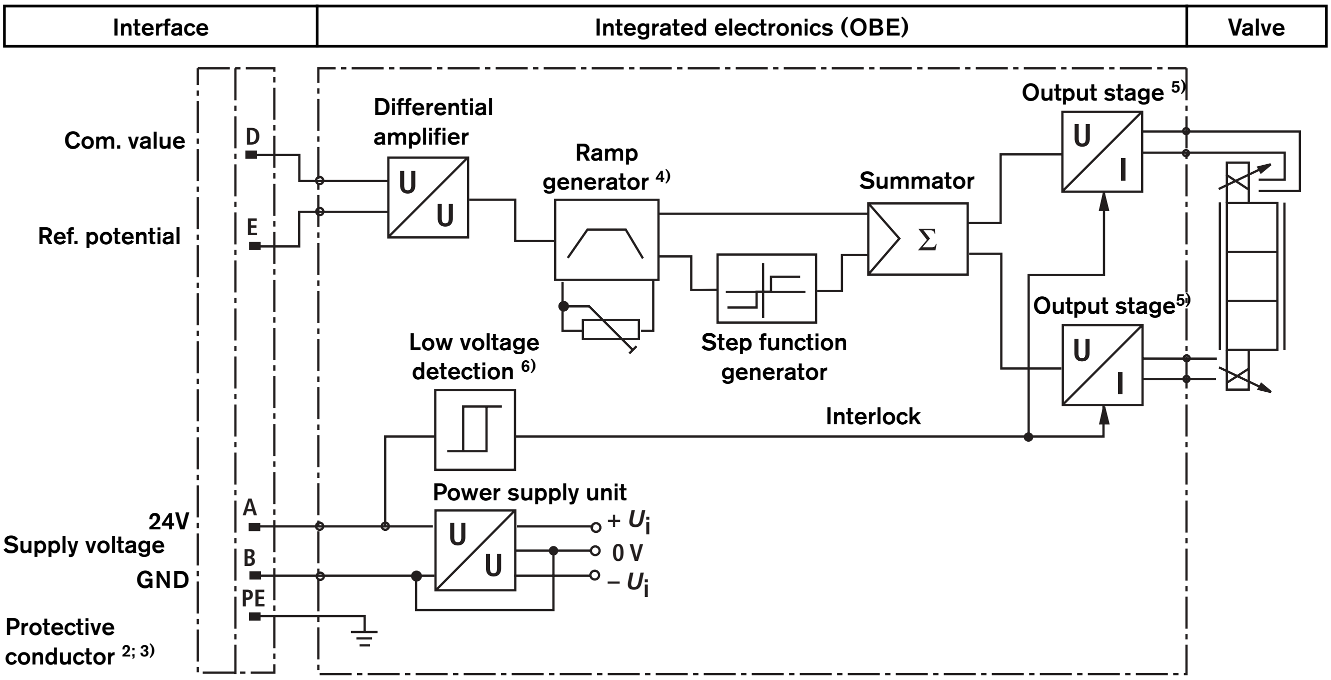
Pin allocation	Contact	Signal
Supply voltage	A	24 VDC (19 to 35 VDC)
	B	GND
	C	n.c. [1]
Differential amplifier input	D	Com. value (± 10 V / 4 to 20 mA)
	E	reference potential
	F	n.c.

Com. value: Positive command value (0 to 10 V or 12 to 20 mA) at D and reference potential to E causes flow from P to A and B to T.
Negative command value (0 to – 10 V or 12 to 4 mA) at D and reference potential to E causes flow from P to B and A to T.
For valves with a solenoid on side „A" (spool variants **EA** and **WA**) a positive command value at D and reference potential to E (NS 6: 4 to 20 mA and NS 10: 12 to 20 mA) causes flow from P to B and A to T.

Connection cable: Recommendation: – up to 25 m cable length type LiYCY 5 x 0.75 mm²
– up to 50 m calbe length type LiYCY 5 x 1.0 mm²
External diameter 6.5 to 11 mm
Connect screen to PE only on the supply side.

[1] Contacts C and F must not be connected!

Block circuit diagram / connection allocation



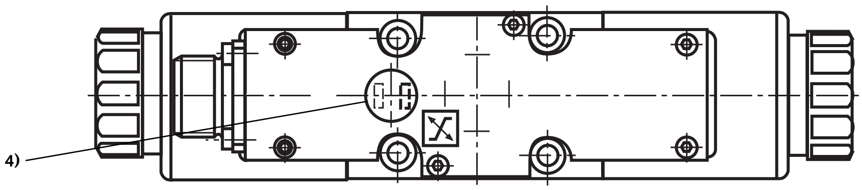
[2] PE is connected to the cooling body and the valve housing

[3] Protective conductor screwed to the valve housing and cover

[4] Ramp can be externally adjusted from 0 to 2.5 s; the same applies for T_{up} and T_{down}

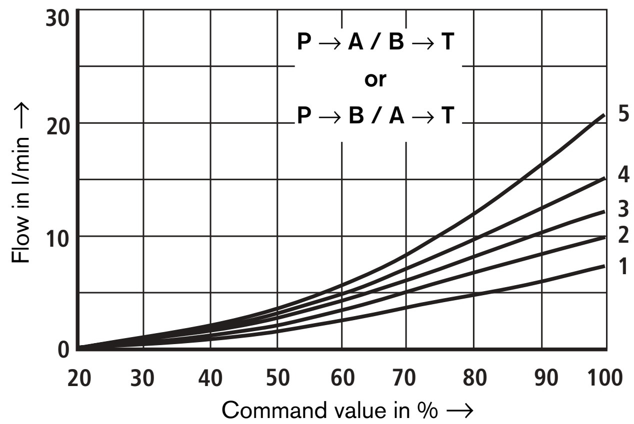
[5] Output stages current regulated

[6] Low voltage detection is **not** carried out for component type 4WRAE 10-2X.

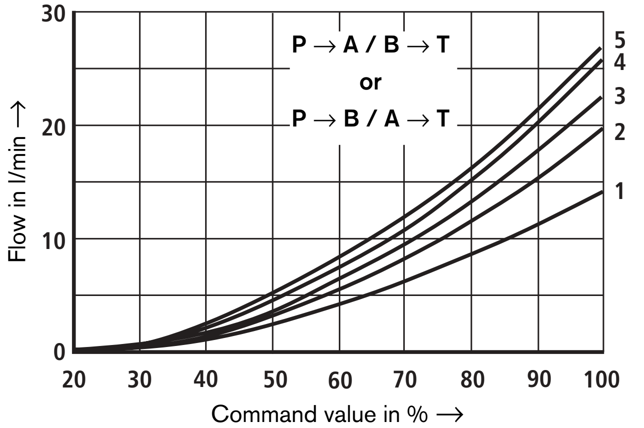


Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$) NS6

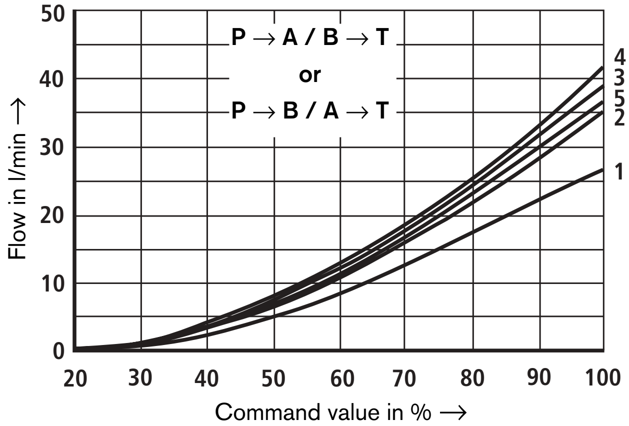
7 l/min nominal flow at 10 bar valve pressure differential



15 l/min nominal flow at 10 bar valve pressure differential



30 l/min nominal flow at 10 bar valve pressure differential

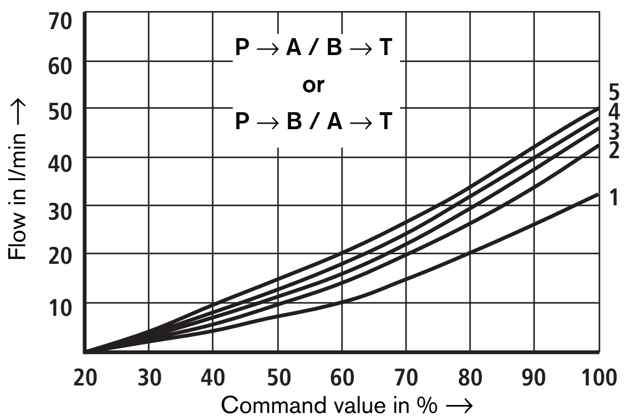


1 $\Delta p = 10$ bar constant
2 $\Delta p = 20$ bar constant
3 $\Delta p = 30$ bar constant
4 $\Delta p = 50$ bar constant
5 $\Delta p = 100$ bar contant

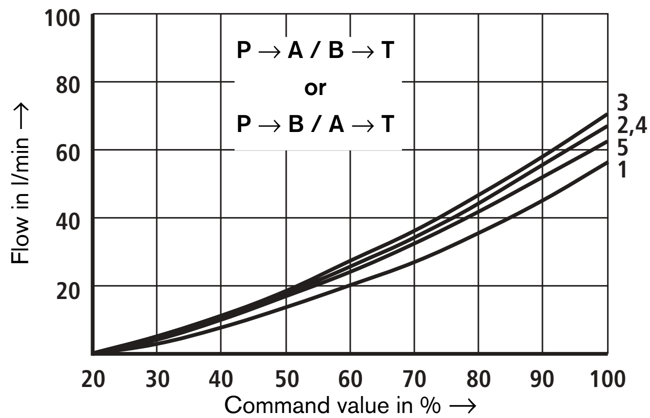
Δp = Valve pressure differential (inlet pressure p_P minus load pressure p_L and minus return pressure p_T)

Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$) NS10

30 l/min nominal flow at 10 bar valve pressure differential



60 l/min nominal flow at 10 bar valve pressure differential



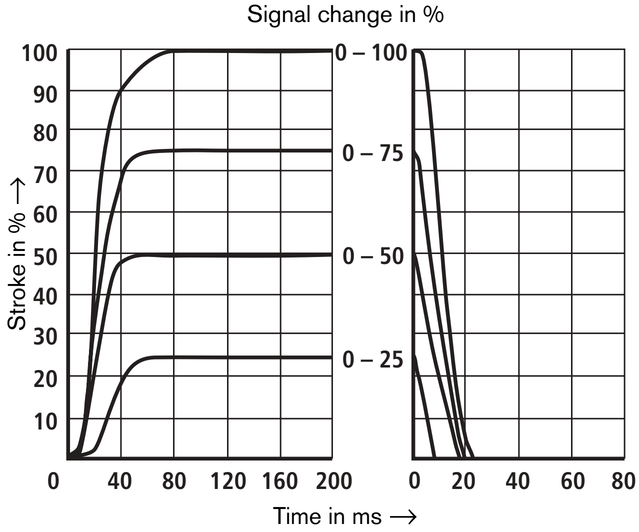
1 $\Delta p = 10$ bar constant
2 $\Delta p = 20$ bar constant
3 $\Delta p = 30$ bar constant
4 $\Delta p = 50$ bar constant
5 $\Delta p = 100$ bar contant

Δp = Valve pressure differential (inlet pressure p_P minus load pressure p_L and minus return pressure p_T)

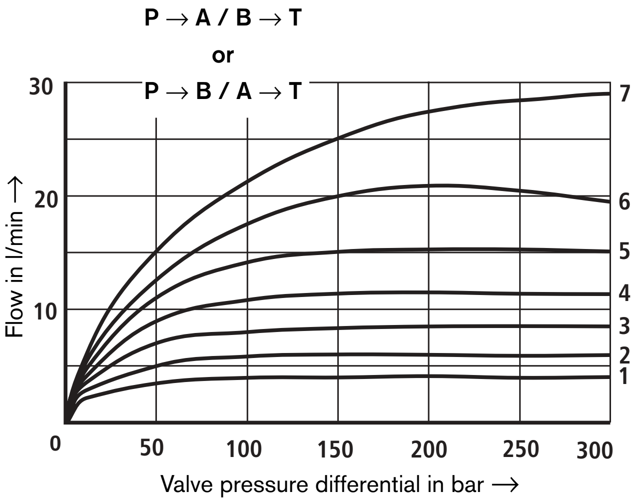
Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$) NS6

Transient functions with stepped form of electrical input signals

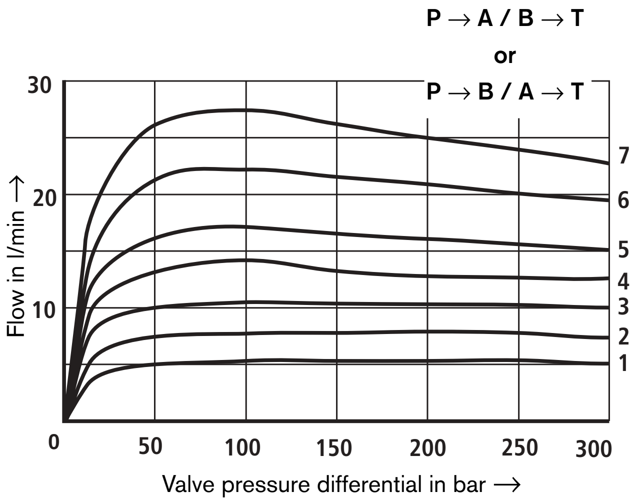
Types 4WRA and 4WRAE



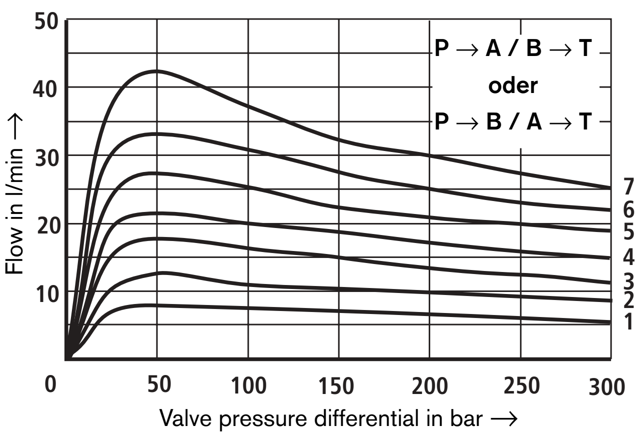
Performance limit, nominal flow 7 l/min



Performance limit, nominal flow 15 l/min



Performance limit, nominal flow 30 l/min

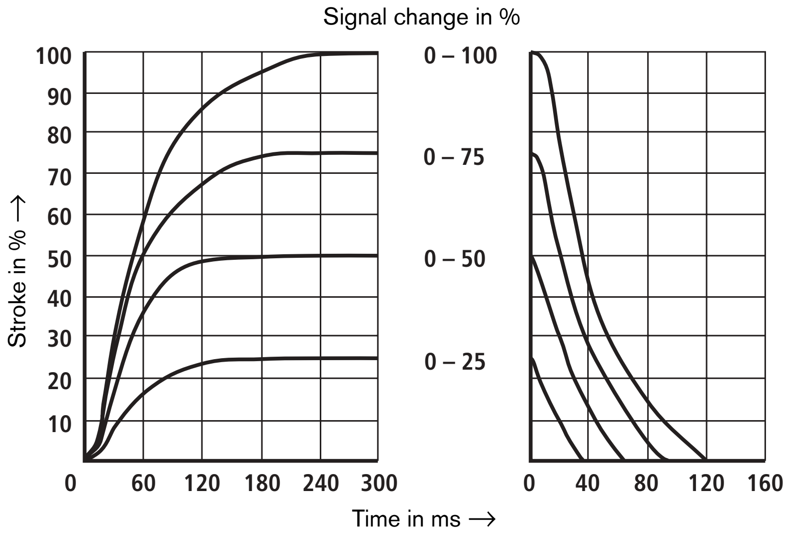


1 Com. value = 40 %
2 Com. value = 50 %
3 Com. value = 60 %
4 Com. value = 70 %
5 Com. value = 80 %
6 Com. value = 90 %
7 Com. value = 100 %

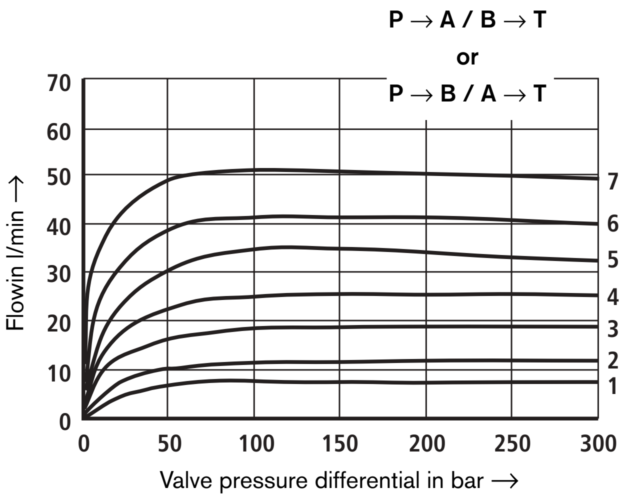
If the performance limits are exceeded then flow forces occur which lead to uncontrolled spool movements.

Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$) NS10

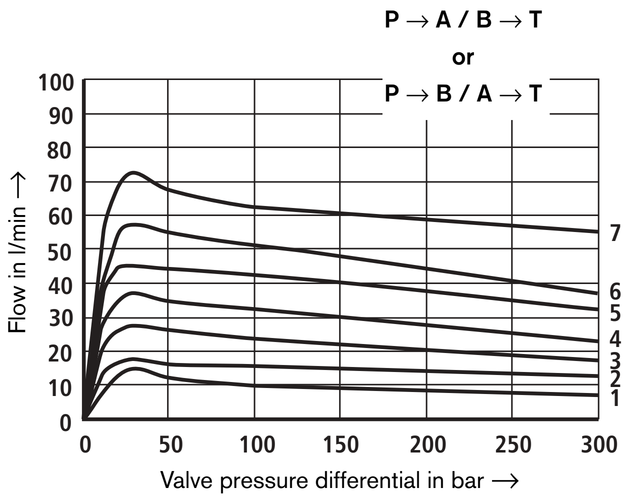
Transient functions with stepped form of electrical input signals



Performance limit, nominal flow 30 l/min



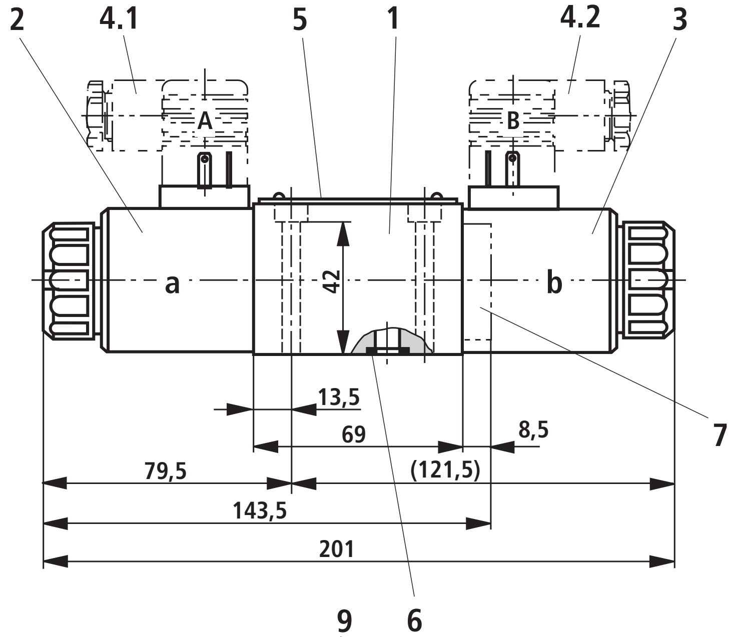
Performance limit, nominal flow 60 l/min

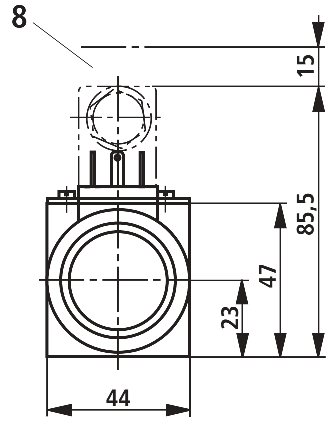


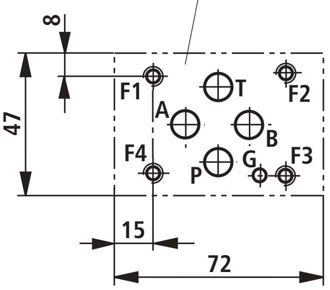
1 Com. value = 40 %
2 Com. value = 50 %
3 Com. value = 60 %
4 Com. value = 70 %
5 Com. value = 80 %
6 Com. value = 90 %
7 Com. value = 100 %

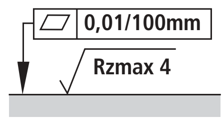
If the performance limits are exceeded then flow forces occur which lead to uncontrolled spool movements.

Unit dimensions: Type 4WRA 6 (nominal dimensions in mm) NS6









Required surface finish of the valve mounting surface

Tolerances to: – General tolerances ISO 2768-mK

1 Valve hounsing

2 Proportional solenoid "a"

3 Proportional solenoid "b"

4.1 Plug-in connector "A", colour grey, separate order, see page 7

4.2 Plug-in connector "B", colour black, separate order, see page 7

5 Name plate

6 Identical seal rings for ports A, B, P and T

7 Plug for valves with one solenoid (2 switched positions, versions **EA** or **WA**)

8 Space required to remove the plug-in connector

9 Machined valve mounting surface,
Connection location to ISO 4401 (**with** locating pin hole)
Code: 4401-03-02-0-94 (explanation to ISO 5783)
Deviation from the standard:
- without locating pin hole „G“
- ports P, A, B and T mit Ø8 mm

Subplates to catalogue sheet RE 45052 and valve fixing screws must be ordered separately.

Subplates: G341/01 (G1/4)
G342/01 (G3/8)
G502/01 (G1/2)

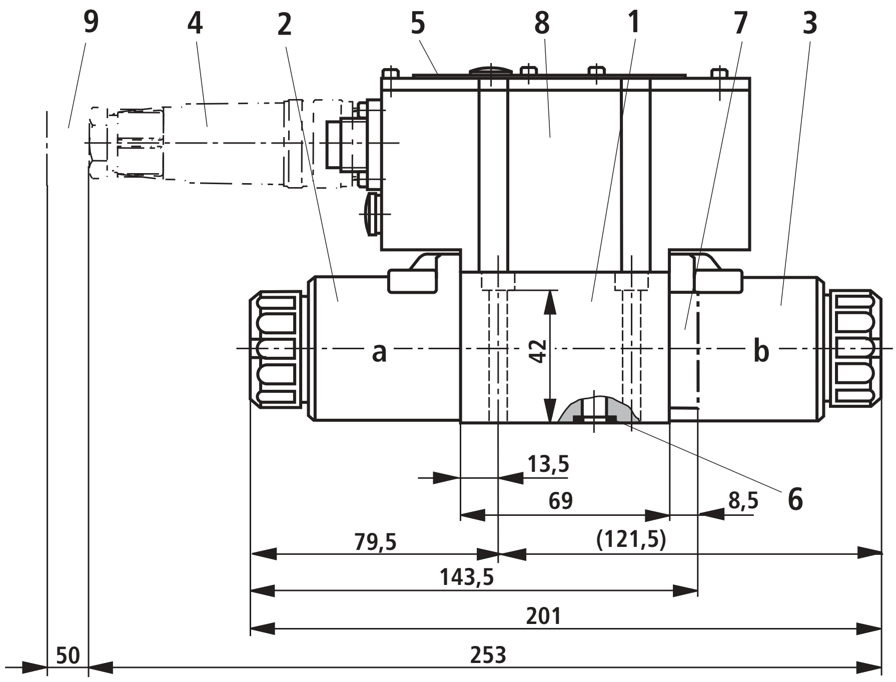
Valve fixing screws (separate order)
The following valve fixing screws are recommended:

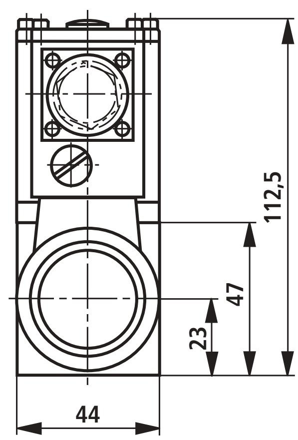
– **4 S.H.C.S. ISO 4762 - M5 x 50 - 10.9-flZn-240h-L**
(friction value μ_{total} = 0.09 to 0.14)
Tightening torque M_A = 7 Nm ± 10%
Material No. **R913000064** (separate order)

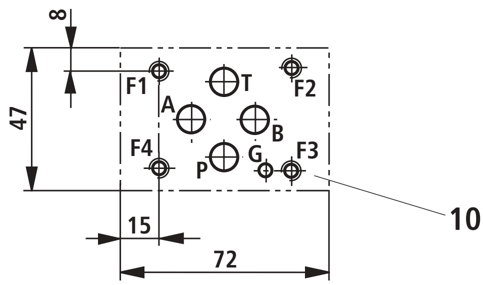
or

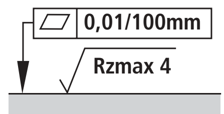
– **4 S.H.C.S. ISO 4762 - M5 x 50 - 10.9**
(friction value μ_{total} = 0.12 to 0.17)
Tightening torque M_A = 8.9 Nm ± 10%

Unit dimensions: Type 4WRAE 6 ...K31/..V (nominal dimensions in mm) NS6









Required surface finish of the valve mounting surface

Tolerance to: – General tolerances to ISO 2768-mK

1 Valve housing
2 Proportional solenoid "a"
3 Proportional solenoid "b"
4 Plug-in connector to DIN EN 175201-804, separate order, see page 7
5 Name plate
6 Identical seal rings for ports A, B, P und T
7 Plug for valves with one solenoid (2 switched positions, versions **EA** or **WA**)
8 Integrated electronics (OBE)
9 Space required for the connection cable and to remove the plug-in connector
10 Machined valve mounting surface,
Connection location to ISO 4401 (**with** locating pin hole)
Code: 4401-03-02-0-94 (explanation to ISO 5783)
Deviation from the standard:
- without locating pin hole „G“
- ports P, A, B and T mit Ø8 mm

Subplates to catalogue sheet RE 45052 and valve fixing screws must be ordered separately.

Subplates: G341/01 (G1/4)
G342/01 (G3/8)
G502/01 (G1/2)

Valve fixing screws (separate order)
The following valve fixing screws are recommended:

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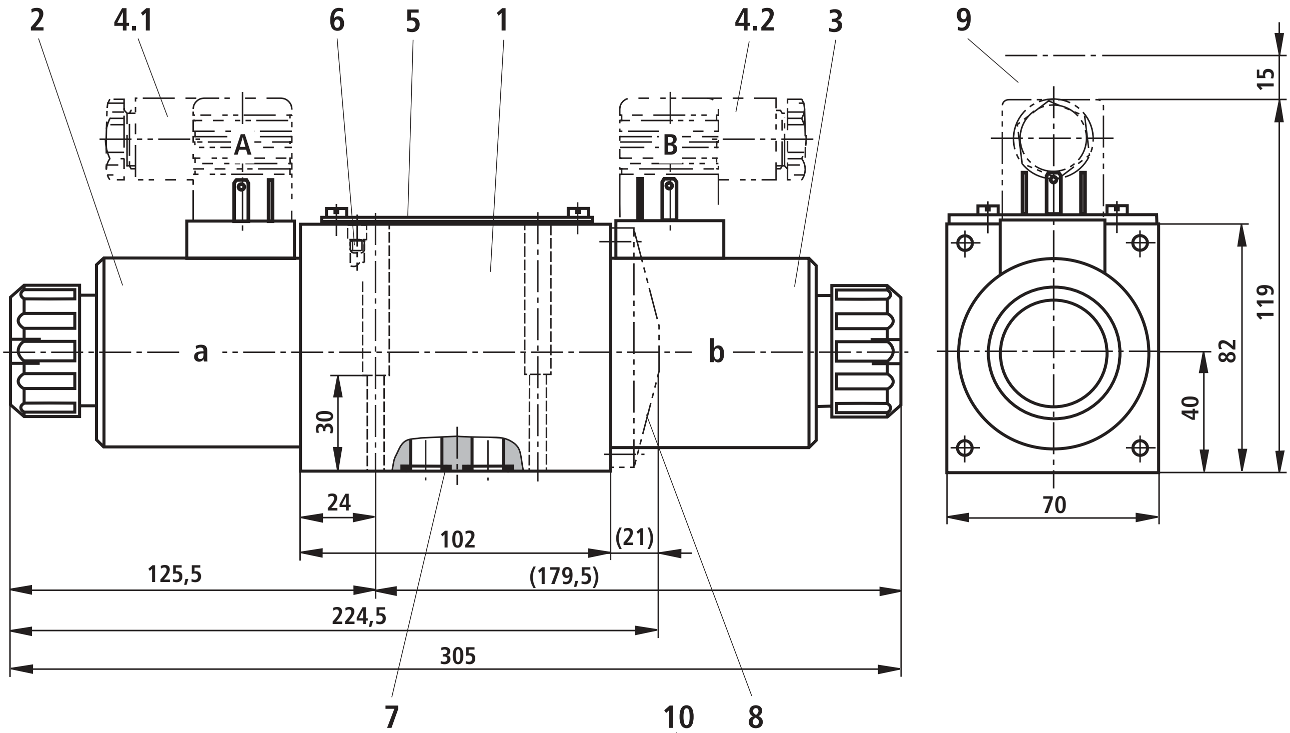
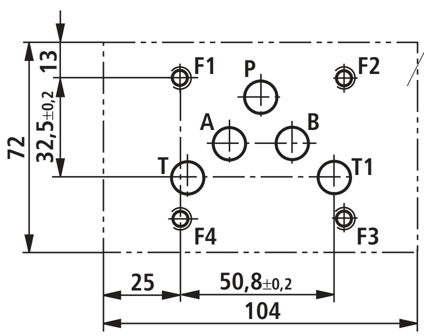
(friction value μ_{total} = 0.09 to 0.14)
Tightening torque M_A = 7 Nm ± 10%
Material No. **R913000064** (separate order)

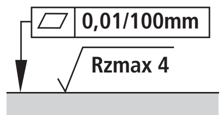
or

- **4 S.H.C.S. ISO 4762 - M5 x 50 - 10.9**
(friction value μ_{total} = 0.12 to 0.17)
Tightening torque M_A = 8.9 Nm ± 10%

Unit dimensions: Type 4WRA 10 (nominal dimensions in mm) NS10







Required surface finish of the valve mounting surface

Tolerances to: – General tolerances to ISO 2768-mK

1 Valve housing

2 Proportional solenoid "a"

3 Proportional solenoid "b"

4.1 Plug-in connector "A", colour grey, separate order, see page 7

4.2 Plug-in connector "B", colour black, separate order, see page 7

5 Name plate

6 Valve bleed screw
Note: The valves are bled before delivery.

7 Identical seal rings for ports A, B, P and T (T1)

8 Cover for valves with one solenoid
(2 switched positions, versions **EA** or **WA**)

9 Space required to remove the plug-in connector

10 Machined valve mounting surface,
Connection location to ISO 4401 (**with** locating pin hole)
Code: 4401-05-04-0-94 (explanation to ISO 5783)
Deviation from the standard: Port T1 Ø11.2 mm

Subplates to catalogue sheet RE 45054 and valve fixing screws must be ordered separately.

Subplates: G66/01 (G3/8)
G67/01 (G1/2)
G534/01 (G3/4)

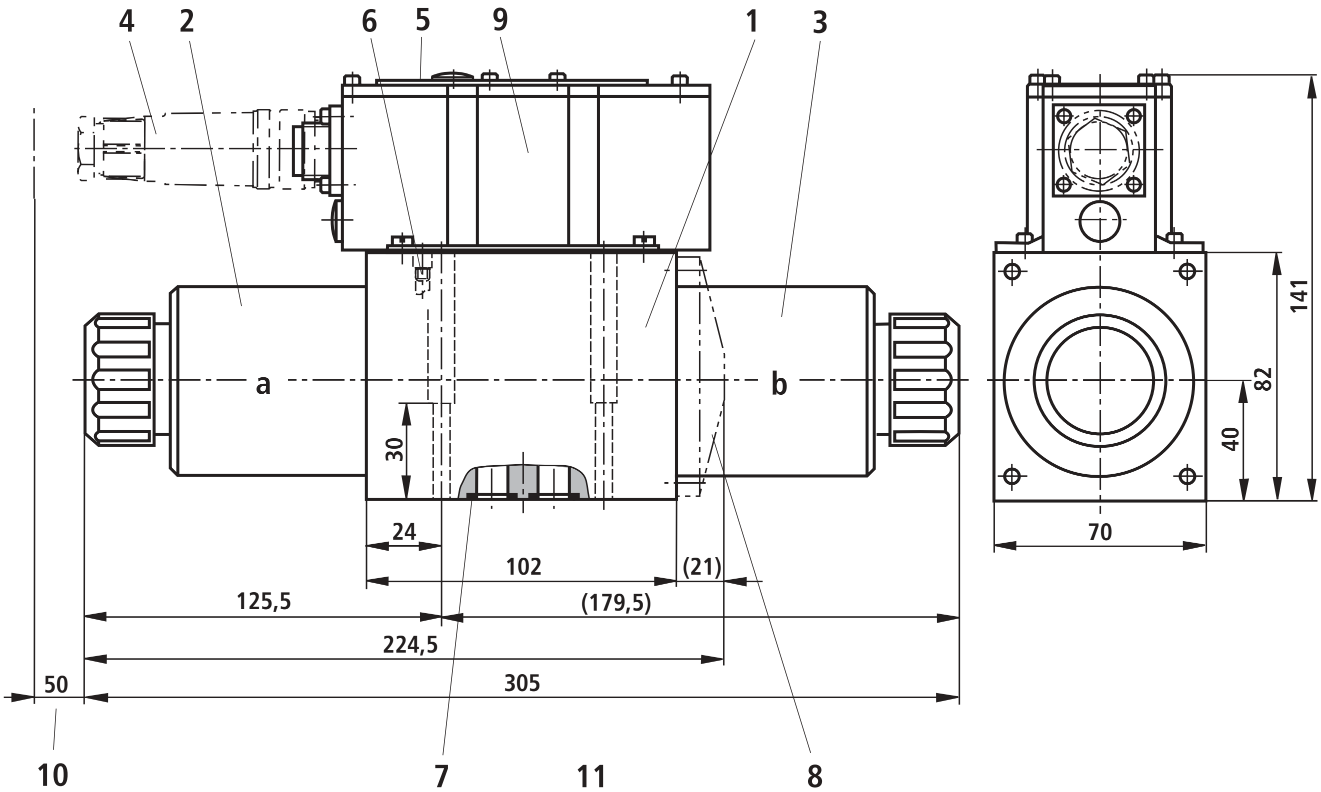
Valve fixing screws (separate order)
The following valve fixing screws are recommended:

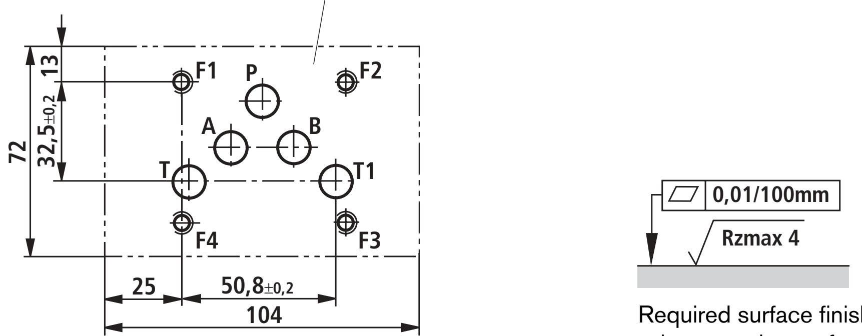
- **4 S.C.H.S. ISO 4762 - M6 x 40 - 10.9-flZn-240h-L**
(friction value μ_{total} = 0.09 to 0.14)
Tightening torque M_A = 12.5 Nm ± 10%,
Material No. **R913000058** (separate order)

or

- **4 S.C.H.S. ISO 4762 - M6 x 40 - 10.9**
(friction value μ_{total} = 0.12 to 0.17)
Tightening torque M_A = 15,5 Nm ± 10%

Unit dimensions: Type 4WRAE 10 (nominal dimensions in mm) NS10





Required surface finish of the valve mounting surface

1 Valve housing
2 Proportional solenoid "a"
3 Proportional solenoid "b"
4 Plug-in connector to DIN EN 175201-804, separate order, see page 7
5 Name plate
6 Valve bleed screw
Note: The valves are bled before delivery.
7 Identical seal rings for ports A, B, P, T
8 Cover for valves with one solenoid (2 switched positions, versions **EA** or **WA**)
9 Integrated electronics (OBE)
10 Space required for the connection cable and to remove the plug-in connector
11 Machined valve mounting surface, connection location to ISO 4401 (**with** locating pin hole)
Code: 4401-05-04-0-94 (explanation to ISO 5783)
Deviation from the standard: Port T1 Ø11.2 mm

Tolerances to: – General tolerances to ISO 2768-mK

Subplates to catalogue sheet RE 45054 and valve fixing screws must be ordered separately.

Subplates: G66/01 (G3/8)
G67/01 (G1/2)
G534/01 (G3/4)

Valve fixing screws(separate order)
The following valve fixing screws are recommended:

– **4 S.H.C.S. ISO 4762 - M6 x 40 - 10.9-flZn-240h-L**
(friction value μ_{total} = 0.09 to 0.14)
Tightening torque M_A = 12.5 Nm ± 10%,
Material No. **R913000058** (separate order)

or

– **4 S.H.C.S. ISO 4762 - M6 x 40 - 10.9**
(friction value μ_{total} = 0.12 to 0.17)
Tightening torque M_A = 15,5 Nm ± 10%

Notes

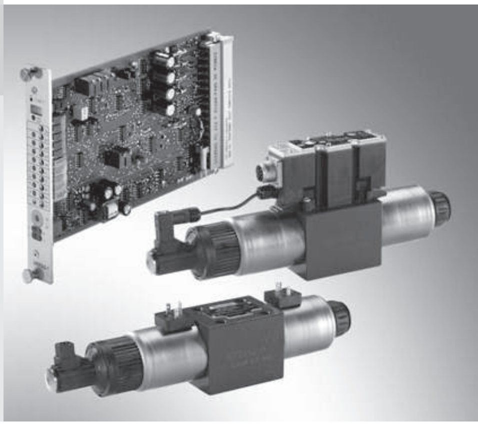
Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

4/2 and 4/3 proportional directional valves, direct operated, with electrical position feedback, without/with integrated electronics (OBE)

RE 29061/11.12
Replaces: 05.12

Type 4WRE and 4WREE



Size 6 and 10
Component series 2X
Maximum operating pressure 315 bar
Maximum flow: 80 l/min (size 6)
180 l/min (size 10)

Table of contents

Information on available spare parts:
www.boschrexroth.com/spc

Features

– Direct operated proportional directional valve with electrical position feedback and integrated electronics (OBE) with type 4WREE
– Control of flow direction and size
– Operation by means of proportional solenoids with central thread and detachable coil
– For subplate mounting: Porting pattern according to ISO 4401
– Spring-centered control spool
– Control electronics
  • Type 4WREE:
  integrated electronics (OBE) with voltage or current input (A1 and/or F1)
  • Type 4WRE (4/3 version), separate order:
  - digital and analog amplifier in Euro-card format
  - analog amplifier in modular design
  • Type 4WRE…A (4/2 version), separate order:
  - analog amplifier in modular design

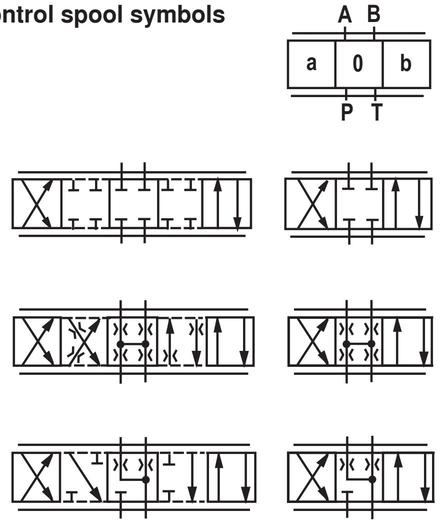
Ordering code

4WRE				–2X / G24	/	V	*

Without integrated electronics (OBE) **= no code**
With integrated electronics (OBE) **= E**

Size 6 **= 6**
Size 10 **= 10**

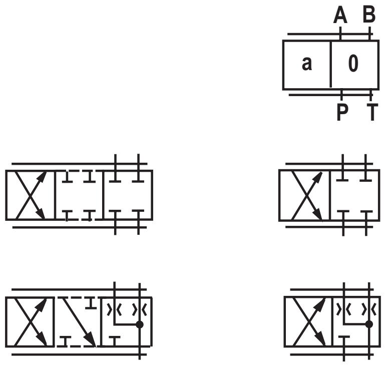
Control spool symbols



= **E**
E1–

= **V**
V1–

= **W**
W1–



= **EA**

= **WA**

With symbol E1–, V1– and W1–:
P → A: $\boldsymbol{q}_{V\,max}$ B → T: $\boldsymbol{q}_V/2$
P → B: $\boldsymbol{q}_V/2$ A → T: $\boldsymbol{q}_{V\,max}$

Notice:
In the zero position, spools W and WA have a connection from A to T and B to T with approx. 3 % of the relevant nominal cross-section.

Further details in the plain text

Seal material
V = FKM seals [1]

Electronic interface
A1 = Command value ±10 V
F1 = Command value 4 to 20 mA
no code = Type 4WRE

Electrical connection
Type 4WRE:
K4 = **Without** mating connector, with connector according to DIN EN 175301-803
Mating connector (solenoid, position transducer), separate order, see page 8
Type 4WREE:
K31 = **Without** mating connector, with connector according to DIN EN 175201-804
Mating connector – separate order, see page 9

Supply voltage
G24 = Direct voltage 24 V

2X = 20 to 29
(20 to 29: unchanged installation and connection dimensions)

Rated flow at valve pressure differential $\boldsymbol{\Delta p}$ = 10 bar

Size 6
04 = 4 l/min
08 = 8 l/min
16 = 16 l/min
32 = 32 l/min

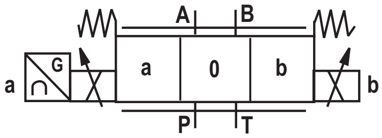
Size 10
25 = 25 l/min
50 = 50 l/min
75 = 75 l/min

[1] Design SO660 with NBR seals at the valve connection surface

Symbols

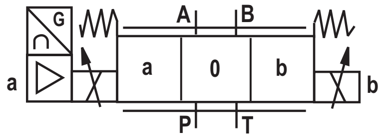
Proportional directional valve without integrated electronics

Type 4WRE…

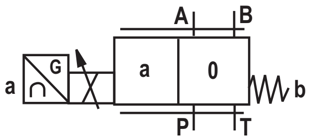


Proportional directional valve with integrated electronics

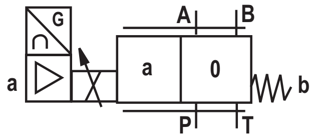
Type 4WREE…



Type 4WRE…**A**…



Type 4WREE…**A**…



Function, section

Type 4WRE …-2X/…

The 4/2 and 4/3 proportional directional valves are designed as direct operated devices in plate design. Operation is effected by proportional solenoids with central thread and detachable coil. The solenoids are controlled by external electronics.

Set-up:

The valve basically consists of:

- Housing (1) with connection surface
- Control spool (2) with compression springs (3 and 4) and spring plate (5 and 6)
- Solenoids (7 and 8) with central thread
- Position transducer (9)

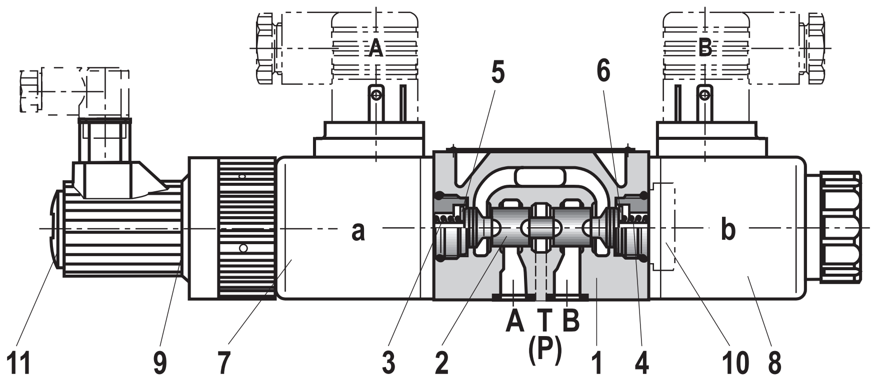
Important note!

The PG fitting (11) must not be opened. Mechanical adjustment of the adjustment nut located below is prohibited and damages the valve!

Function:

- With de-energized solenoids (7 and 8), central position of the control spool (2) by compression springs (3 and 4) between spring plates (5 and 6)
- Direct operation of the control spool (2) by controlling a proportional solenoid, e.g. solenoid "b" (8)
  - → Displacement of the control spool (2) to the left proportional to the electric input signal
  - → Connection from P to A and B to T via orifice-type cross-sections with progressive flow characteristic
- Switching off of the solenoid (8)
  - → The compression spring (3) brings the control spool (2) back into the central position

In the de-energized condition, the control spool (2) is held in a mechanical central position by the return springs. With control spool symbol "V", this position does not correspond to the hydraulic central position! When the electric valve control loop is closed, the control spool is positioned in the hydraulic central position.



Valve with 2 spool positions: (Type 4WRE…**A**…)

The function of this valve design basically corresponds to the valve with three spool positions. The 2 spool position valves are, however, only equipped with solenoid "a" (7). Instead of the 2nd proportional solenoid, there is a plug screw (10).

Notice!

Due to the design principle, internal leakage is inherent to the valves, which may increase over the life cycle.

Notice!

The tank line must not be allowed to run empty. With corresponding installation conditions, a pre-charge valve (pre-charging pressure approx. 2 bar) is to be installed.

Function, section

Type 4WREE …-2X/…

The 4/2 and 4/3 proportional directional valves are designed as direct operated devices in plate design. Operation is effected by proportional solenoids with central thread and detachable coil. The solenoids are controlled by the internal electronics.

Set-up:

The valve basically consists of:

- Housing (1) with connection surface
- Control spool (2) with compression springs (3 and 4) and spring plate (5 and 6)
- Solenoids (7 and 8) with central thread
- Position transducer (9)
- Integrated electronics (13)
- Electric zero point adjustment (12) accessible via Pg7

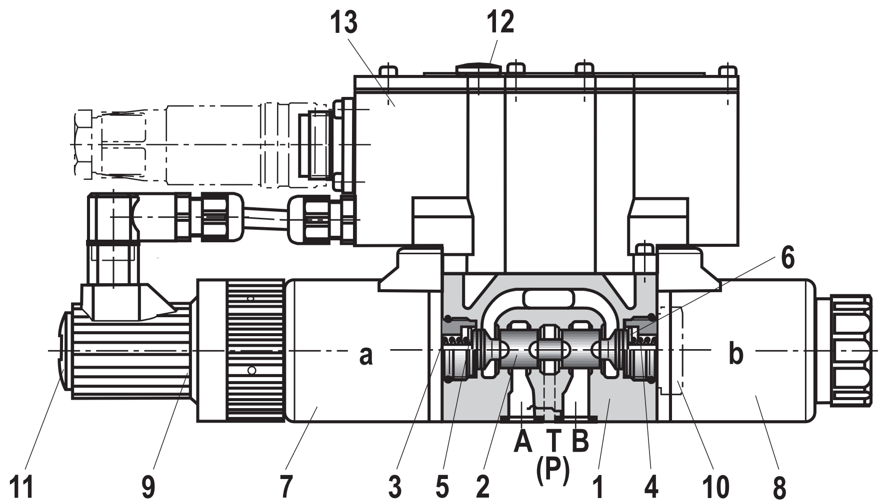
☞ **Important note!**

The PG fitting (11) must not be opened. Mechanical adjustment of the adjustment nut located below is prohibited and damages the valve!

Function:

- With de-energized solenoids (7 and 8), central position of the control spool (2) by compression springs (3 and 4) between spring plates (5 and 6)
- Direct operation of the control spool (2) by controlling a proportional solenoid, e.g. solenoid "b" (8)
  - → Displacement of the control spool (2) to the left proportional to the electric input signal
  - → Connection from P to A and B to T via orifice-type cross-sections with progressive flow characteristic
- Switching off of the solenoid (8)
  - → The compression spring (3) brings the control spool (2) back into the central position

In the de-energized condition, the control spool (2) is held in a mechanical central position by the return springs. With control spool symbol "V", this position does not correspond to the hydraulic central position! When the electric valve control loop is closed, the control spool is positioned in the hydraulic central position.



Valve with 2 spool positions: (Type 4WREE…**A**…)

The function of this valve design basically corresponds to the valve with three spool positions. The 2 spool position valves are, however, only equipped with solenoid "a" (7). Instead of the 2nd proportional solenoid, there is a plug screw (10).

☞ **Notice!**

Due to the design principle, internal leakage is inherent to the valves, which may increase over the life cycle.

☞ **Notice!**

The tank line must not be allowed to run empty. With corresponding installation conditions, a pre-charge valve (pre-charging pressure approx. 2 bar) is to be installed.

Technical data (For applications outside these parameters please consult us!)

general

Sizes		Size	6	10
Weight	– Type 4WRE	kg	2.2	6.3
	– Type 4WREE	kg	2.4	6.5
Installation position			Any, preferably horizontal	
Ambient temperature range	– Type 4WRE	°C	–20 to +70	
	– Type 4WREE	°C	–20 to +50	
Storage temperature range		°C	–20 to +80	
$MTTF_d$ values according to EN ISO 13849		Years	150 [1] (for more information see data sheet 08012)	

hydraulic (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C and p = 100 bar)

Maximum operating pressure	– Port A, B, P	bar	315	
	– Port T	bar	210	
Rated flow $q_{V\ rated}$ with Δp = 10 bar		l/min	4, 8, 16, 32	25, 50, 75
Recommended maximum flow		l/min	80	180
Hydraulic fluid			See table below	
Hydraulic fluid temperature range		°C	–20 to +80 (preferably +40 to +50)	
Viscosity range		mm^2/s	20 to 380 (preferably 30 to 46)	
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)			Class 20/18/15 [2]	
Hysteresis		%	≤ 0.1	
Range of inversion		%	≤ 0.05	
Response sensitivity		%	≤ 0.05	
Zero shift upon change of hydraulic fluid temperature and operating pressure		%/10 K	≤ 0.15	
		%/100 bar	≤ 0.1	

[1] With control spool types E, E1, EA, W, W1, WA; in longitudinal control spool direction, there is sufficient positive overlap without shock/vibration load; observe the installation orientation with regard to the main direction of acceleration.

[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 service life of the components.
For the selection of the filters see www.boschrexroth.com/filter

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils and related hydrocarbons		HL, HLP	NBR, FKM	DIN 51524
Flame-resistant	– 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 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!
- The flash point of the process and operating medium used must be 40 K higher than the maximum solenoid surface temperature.
- **Flame-resistant – water-containing**: Maximum pressure differential per control edge 175 bar. Pressure pre-loading at the tank port > 20 % of the pressure differential; otherwise, increased cavitation.

  Life cycle as compared to operation with mineral oil HL, HLP 50 % to 100 %.

Technical data (For applications outside these parameters please consult us!)

electric

Size		Size	6	10
Voltage type			Direct voltage	
Solenoid coil resistance	– Cold value at 20 °C	Ω	2.65	4.55
	– Maximum hot value	Ω	4.05	6.82
Duty cycle		%	100	
Maximum coil temperature [1]		°C	up to 150	
Electrical connection see page 8 and 9	– Type 4WRE		With connector according to DIN EN 175301-803 and ISO 4400	
			Mating connector according to DIN EN 175301-803 and ISO 4400 [2]	
	– Type 4WREE		With connector DIN EN 175201-804	
			Mating connector DIN EN 175201-804 [2]	
Protection class of the valve according to EN 60529			IP65 with mating connector mounted and locked	

Control electronics

Type 4WRE	4/3 version				
		Amplifier in euro-card format [2]	Digital	VT-VRPD-2-2X/V0/0 according to RE 30126	
			Analog	VT-VRPA2-1-1X/V0 according to data sheet 30119	VT-VRPA2-2-1X/V0 according to data sheet 30119
		Module amplifier [2]	Analog	VT-MRPA2-1 according to data sheet 30219	VT-MRPA2-2 according to data sheet 30219
Type 4WRE…A…	4/2 version				
		Module amplifier [2]	Analog	VT-MRPA1-1 according to data sheet 30219	VT-MRPA1-2 according to data sheet 30219
Type 4WREE				Integrated in the valve, see page 9	
		analog command value module		VT- SWMA-1-1X/... according to data sheet 29902	
		analog command value module		VT-SWMAK-1-1X/... according to data sheet 29903	
		analog command value card		VT-SWKA-1-1X/... according to data sheet 30255	
		digital command value card		VT-HACD -1-1X/... according to data sheet 30143	
Supply voltage		Nominal voltage	VDC	24	
		lower limit value	V	19.4	
		upper limit value	V	35	
Current consumption of the amplifier		I_{max}	A	< 2	
		Pulse current	A	3	

1) Due to the temperatures occurring at the surfaces of the solenoid coils, the European standards ISO 13732-1 and EN ISO 4413 need to be adhered to!

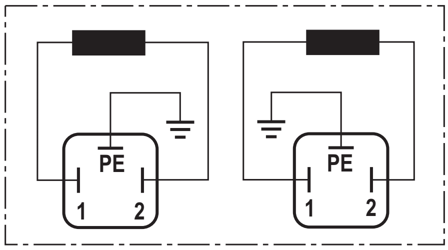
2) Separate order

☞ **Notice:** For information on the **environmental simulation testing** for the areas EMC (electromagnetic compatibility), climate and mechanical load see data sheet 29061-U (declaration on environmental compatibility).

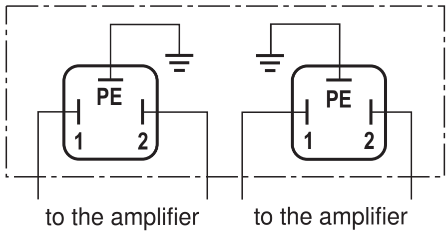
Electrical connection, mating connectors (dimensions in mm)

Type 4WRE (**without** integrated electronics)

Connection to connector



Connection to mating connector

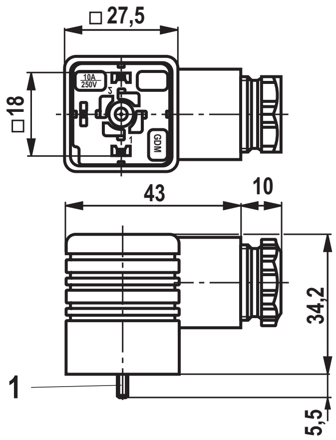


Mating connector CECC 75 301-803-A002FA-H3D08-G
according to DIN EN 175301-803 and ISO 4400

Solenoid **a**, color gray
separate order under the Material no. **R901017010**

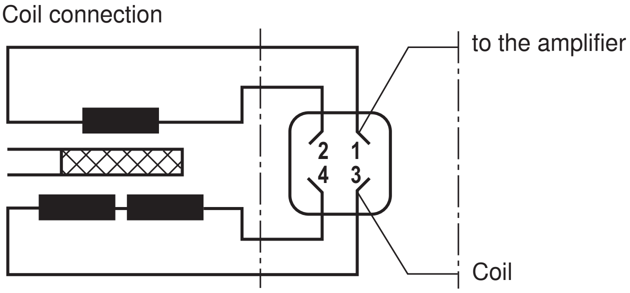
Solenoid **b**, color black
separate order under the Material no. **R901017011**

1 Mounting screw M3
Tightening torque $\boldsymbol{M}_A$ = 0.5 Nm + 0.1 Nm

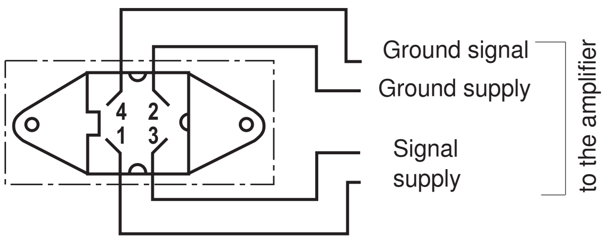


Inductive position transducer

Coil connection



Connection to plug-in connector

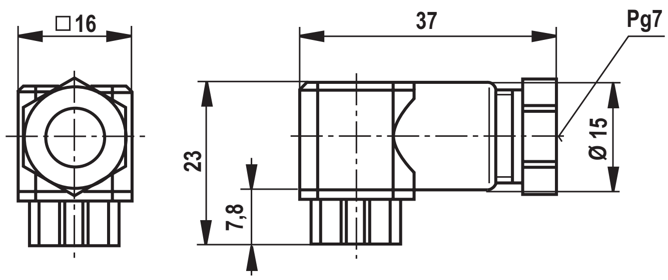


Mating connector 4-pole Pg7-G4W1F
separate order under the Material no. **R900023126**

Connection cable:

Recommendation:
up to 50 m cable length type LiYCY 4 x 0.25 mm^2

Connect shield to PE only on the supply side.



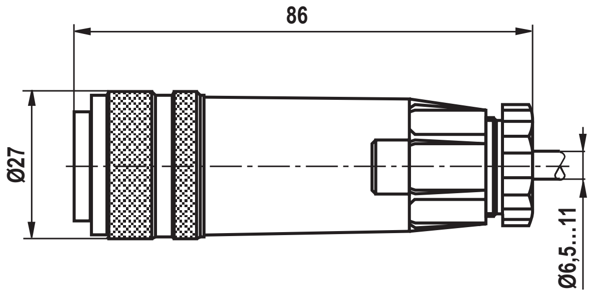
Electrical connection, mating connectors (dimensions in mm)

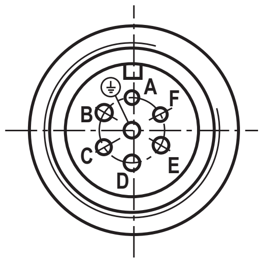
Type 4WREE (**with** integrated electronics (OBE)

Mating connector according to DIN EN 175201-804
separate order under the Material no. **R900021267** (plastic version)

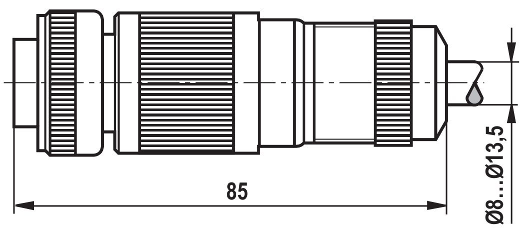
Angular design – separate order under the Material no. **R900217845**

Pin assignment see also block diagram page 10





Mating connector according to DIN EN 175201-804
separate order under the Material no. **R900223890** (metal version)



Device connector allocation	Contact	Signal with A1 interface	Signal with F1 interface
Supply voltage	A	24 VDC (u(t) = 19.4 to 35 V); I_{max} = 2 A	
	B	0 V	
Reference potential actual value	C	Reference contact F; R_e > 50 kΩ	Reference contact F; R_e < 10 Ω
Differential amplifier input	D	±10 V command value; R_e > 50 kΩ	4 to 20 mA command value; R_e > 100 Ω
	E	Reference potential command value	
Measuring output (actual value)	F	±10 V actual value (limit load 5 mA)	4 to 20 mA actual value, load resistance max. 300 Ω
	PE	Connected to cooling element and valve housing	

Command value: Positive command value 0 to +10 V (or 12 to 20 mA) at D and reference potential at E result in flow from P → A and B → T.
Negative command value 0 to –10 V (or 12 to 4 mA) at D and reference potential at E result in flow from P → B and A → T.

For valves with 1 solenoid on side a (e. g. variant **EA** and **WA**), a positive command value 0 to +10 V (or 4 to 20 mA) at D and reference potential at E result in flow from P → B and A → T.

Actual value: Actual value 0 to +10 V (or 12 to 20 mA) at F and reference potential at C result in flow from P → A and B → T, actual value 0 to –10 V (or 4 to 12 mA) result in flow from P → B and A → T.

With valves with 1 solenoid, a positive actual value 0 to +10 V (or 4 to 20 mA) at F and reference potential at C result in flow from P → B and A → T.

Connection cable: Recommendation: – up to 25 m cable length type LiYCY 7 x 0.75 mm^2
– up to 50 m cable length type LiYCY 7 x 1.0 mm^2

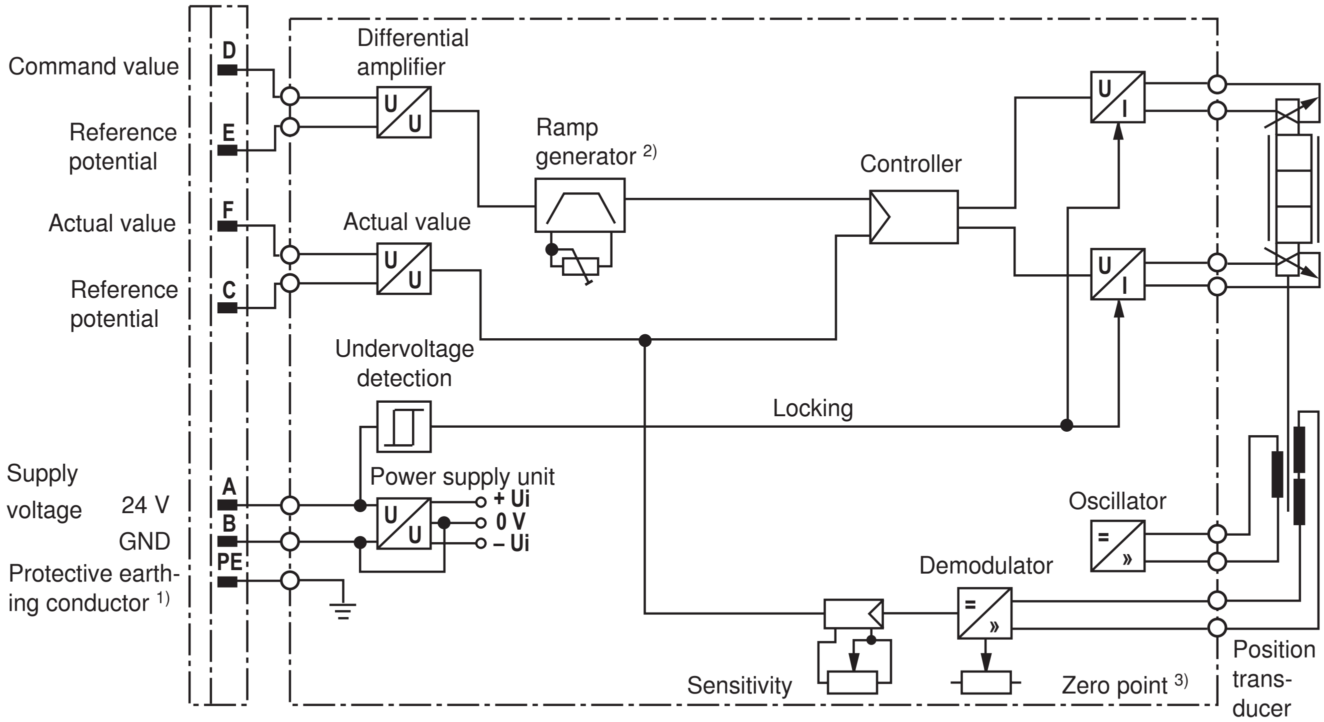
External diameter see sketch of mating connector

Connect shield to PE only on the supply side.

Integrated electronics (OBE) type 4WREE

Block diagram / pin assignment

Interface	Integrated electronics (OBE)	Valve

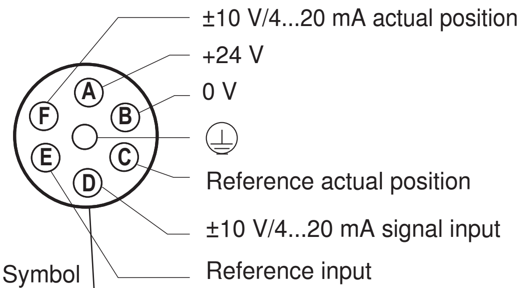


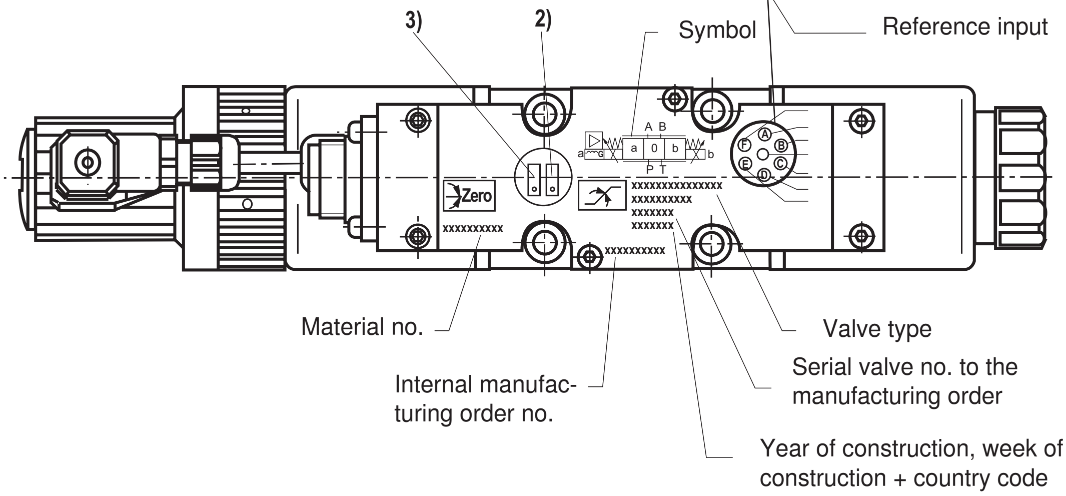
Notice: Electric signals taken out via control electronics (e.g. actual value) must not be used for switching off safety-relevant machine functions!

1) The protective earthing conductor (PE) is connected to cooling element and valve housing!

2) Ramp can be set from 0 to 2.5 s from the outside, identical for T_{up} and T_{down}

3) Zero point can be set from the outside

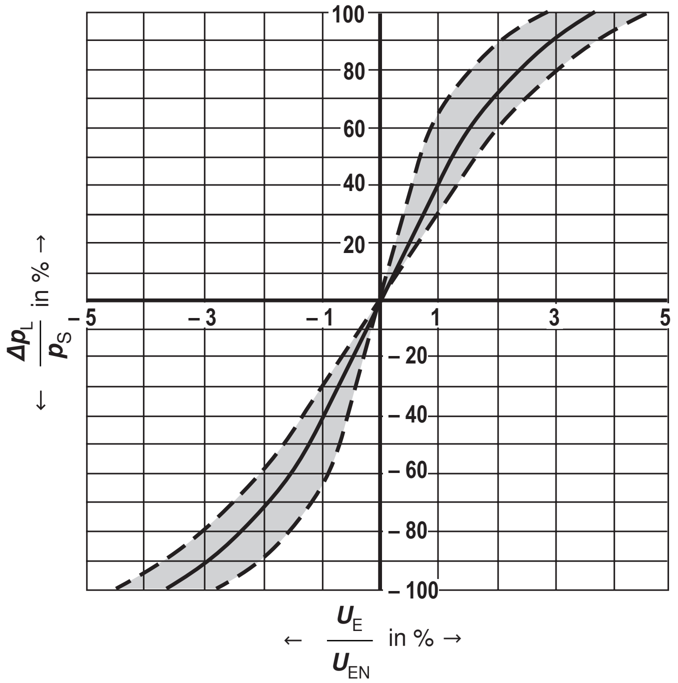




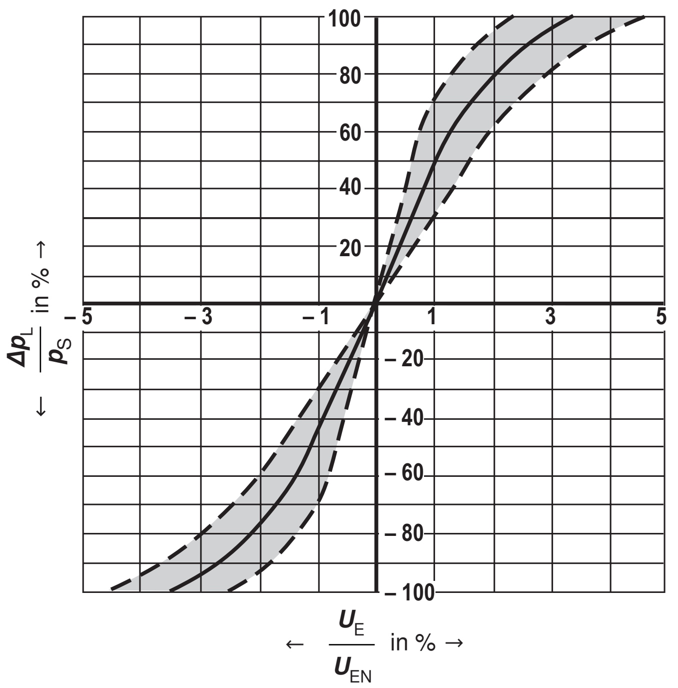
Characteristic curves: Type 4WREE (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C) Size 6 and 10

Pressure signal characteristic curve (control spool V),
p_s = 100 bar

Size 6



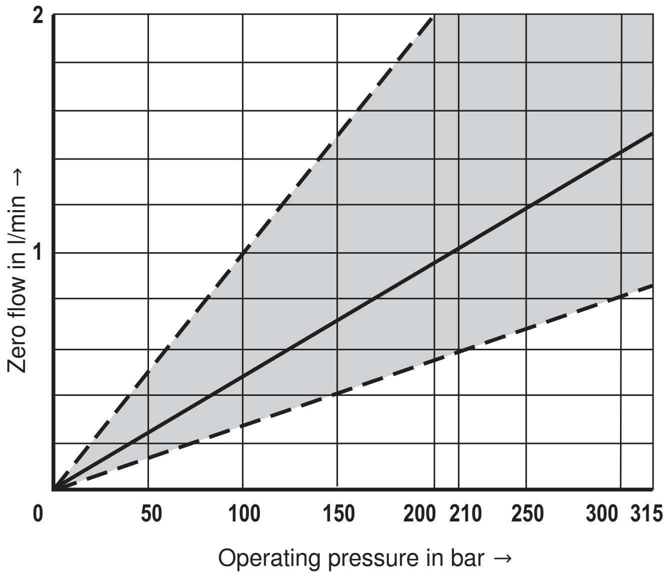
Size 10



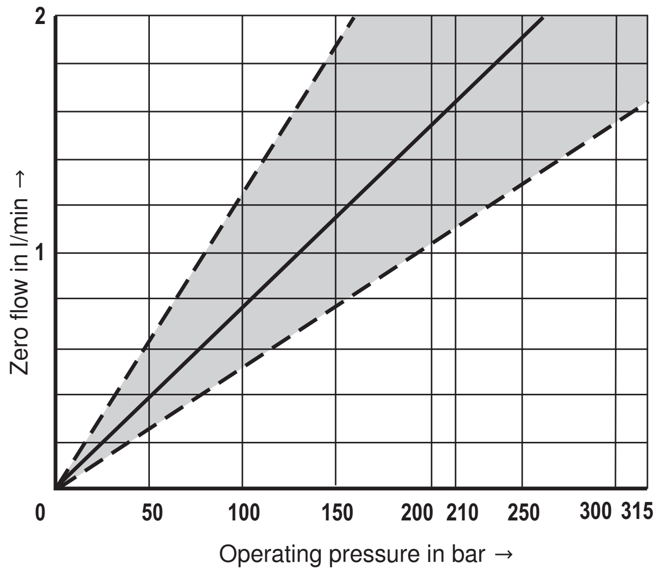
Characteristic curves: Type 4WREE (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C) Size 6 and 10

Zero flow with central control spool position

Type 4WREE 6 V32

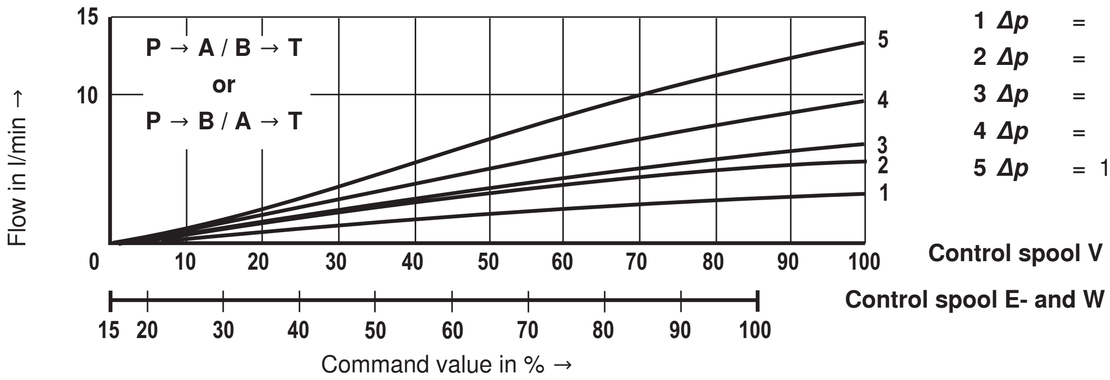


Type 4WREE 10 V75



Characteristic curves: Type 4WREE (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C and p = 100 bar) Size 6

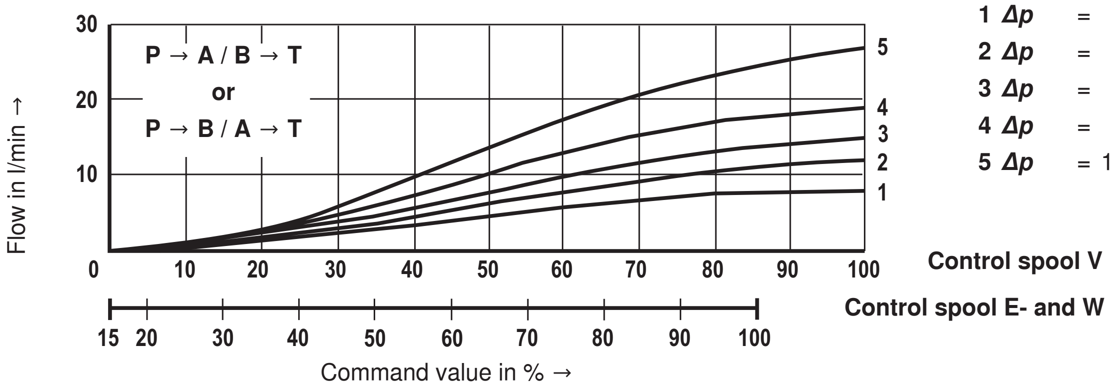
4 l/min rated flow with 10 bar valve pressure differential



1 Δp = 10 bar constant
2 Δp = 20 bar constant
3 Δp = 30 bar constant
4 Δp = 50 bar constant
5 Δp = 100 bar constant

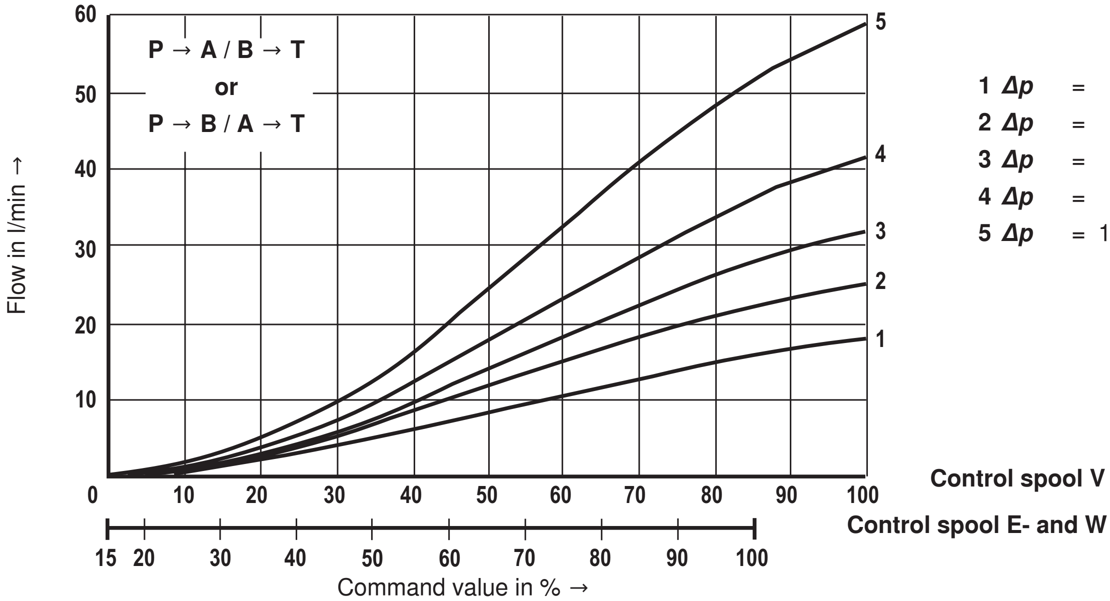
Characteristic curves: Type 4WREE (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C and p = 100 bar) Size 6

8 l/min rated flow with 10 bar valve pressure differential



1 ***Δp*** = 10 bar constant
2 ***Δp*** = 20 bar constant
3 ***Δp*** = 30 bar constant
4 ***Δp*** = 50 bar constant
5 ***Δp*** = 100 bar constant

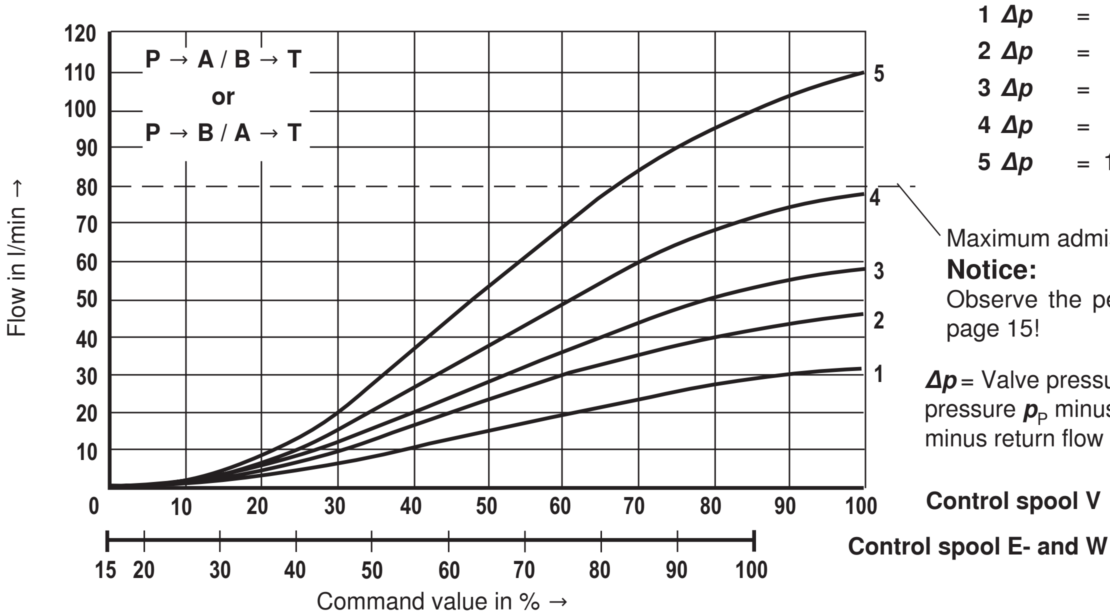
16 l/min rated flow with 10 bar valve pressure differential



1 ***Δp*** = 10 bar constant
2 ***Δp*** = 20 bar constant
3 ***Δp*** = 30 bar constant
4 ***Δp*** = 50 bar constant
5 ***Δp*** = 100 bar constant

32 l/min rated flow with 10 bar valve pressure differential

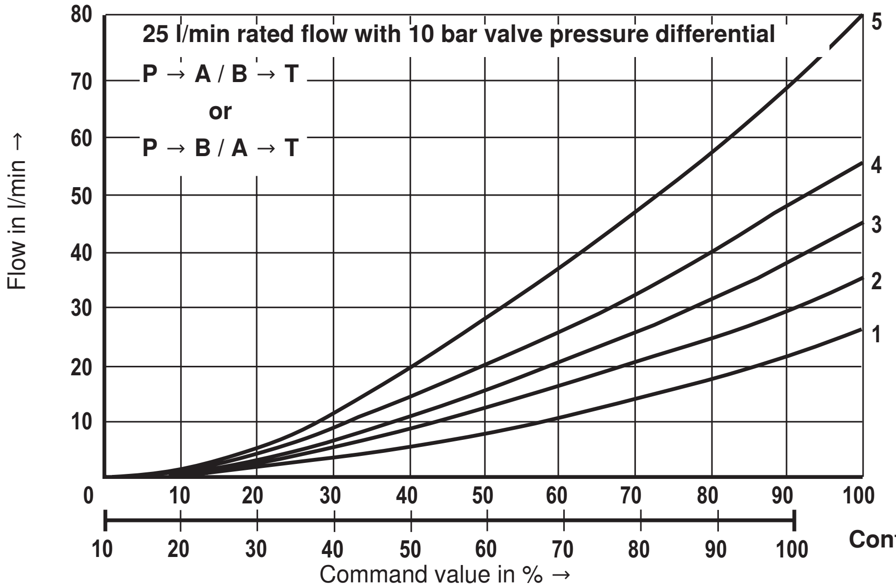
1 ***Δp*** = 10 bar constant
2 ***Δp*** = 20 bar constant
3 ***Δp*** = 30 bar constant
4 ***Δp*** = 50 bar constant
5 ***Δp*** = 100 bar constant



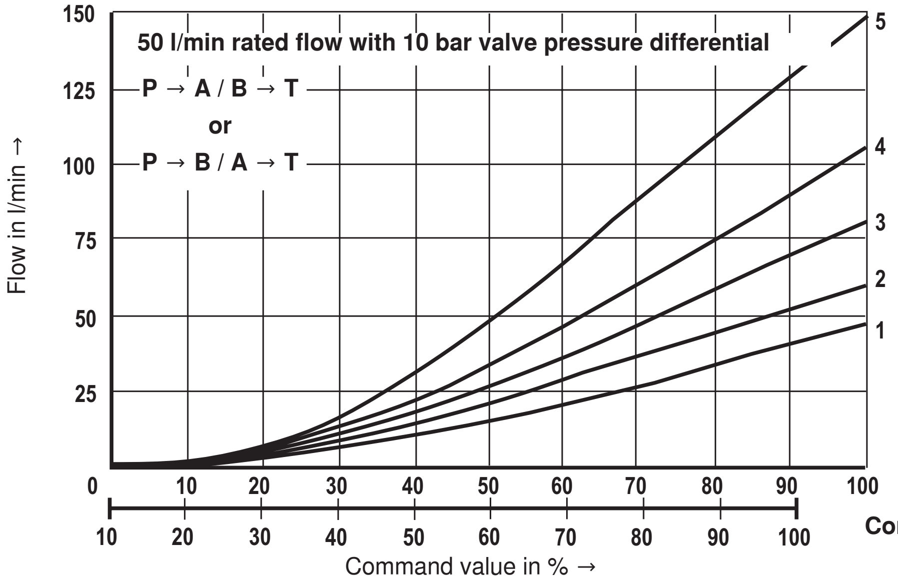
Notice:
Observe the performance limits on page 15!

Δp = Valve pressure differential (inlet pressure p_P minus load pressure p_L minus return flow pressure p_T)

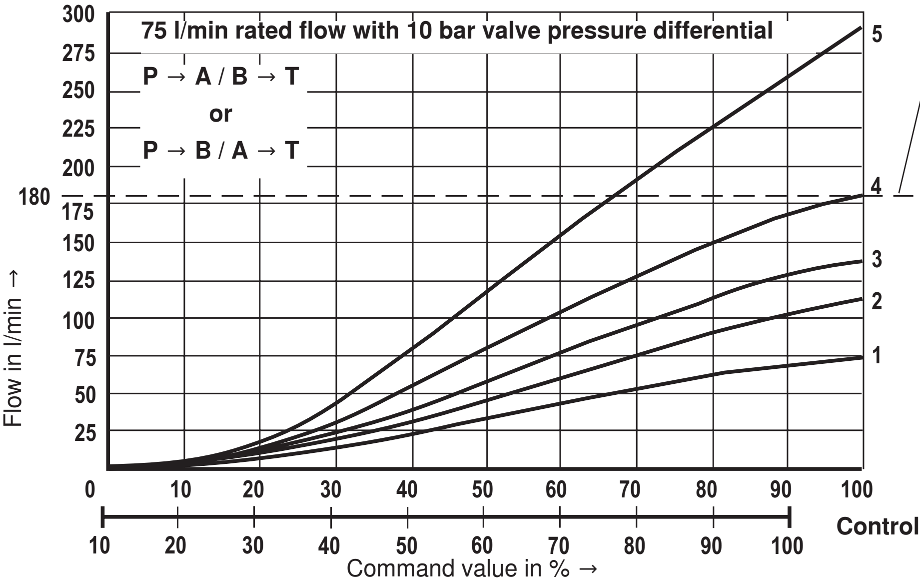
Characteristic curves: Type 4WREE (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C and p = 100 bar) Size 10



1 **Δp** = 10 bar constant
2 **Δp** = 20 bar constant
3 **Δp** = 30 bar constant
4 **Δp** = 50 bar constant
5 **Δp** = 100 bar constant



1 **Δp** = 10 bar constant
2 **Δp** = 20 bar constant
3 **Δp** = 30 bar constant
4 **Δp** = 50 bar constant
5 **Δp** = 100 bar constant



Maximum admissible flow

Notice:
Observe the performance limits on page 15!

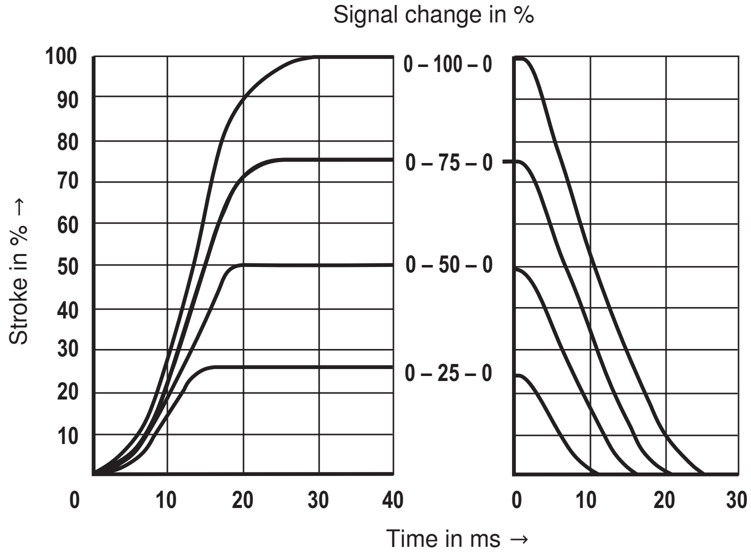
1 **Δp** = 10 bar constant
2 **Δp** = 20 bar constant
3 **Δp** = 30 bar constant
4 **Δp** = 50 bar constant
5 **Δp** = 100 bar constant

Δp = Valve pressure differential (inlet pressure p_P minus load pressure p_L minus return flow pressure p_T)

Transition function with stepped electric input signals: Type 4WREE Size 6
(measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C and p_s = 10 bar)

4/3 valve version

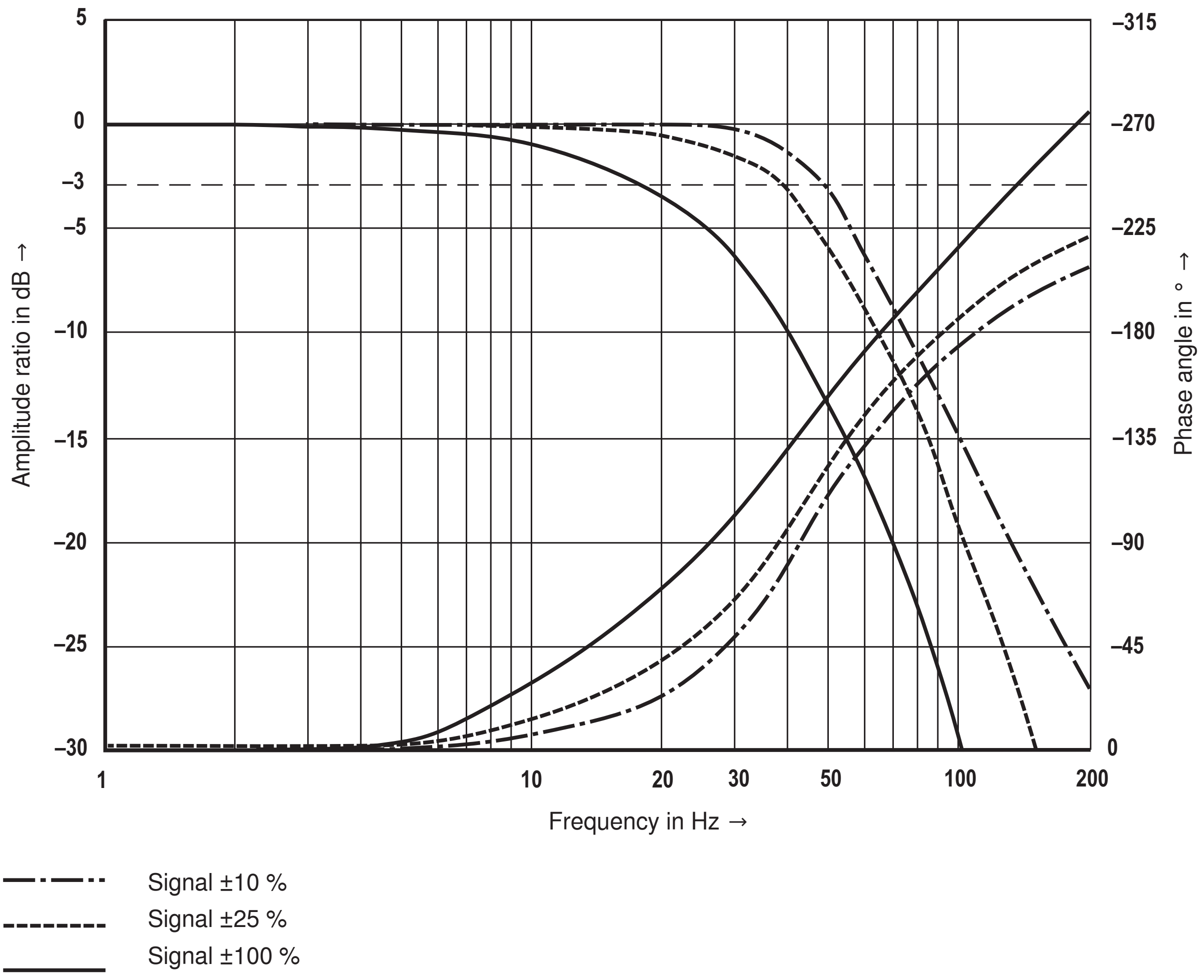
Control spool E



Frequency response characteristic curves: Type 4WREE
(measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C, p_s = 10 bar) Size 6

4/3 valve version

Control spool V

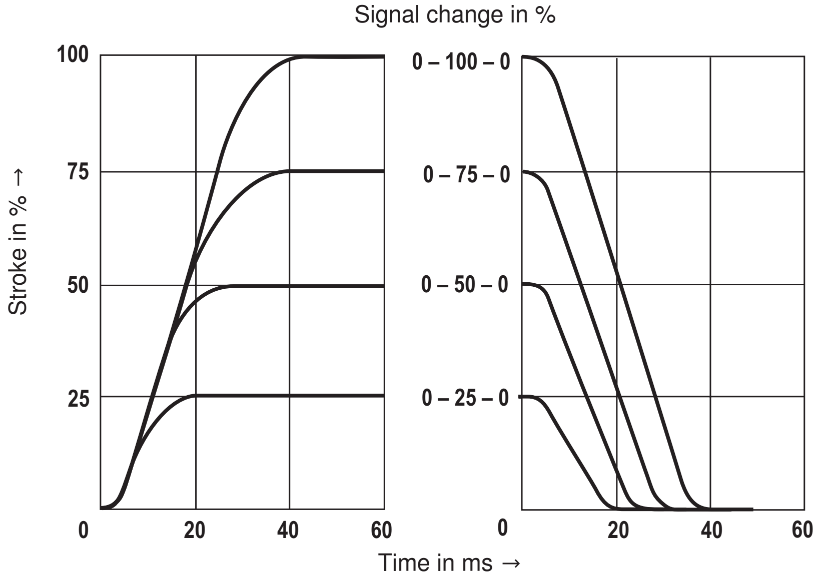


Transition function with stepped electric input signals: Type 4WREE Size 10

(measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C and p_s = 10 bar)

4/3 valve version

Control spool E

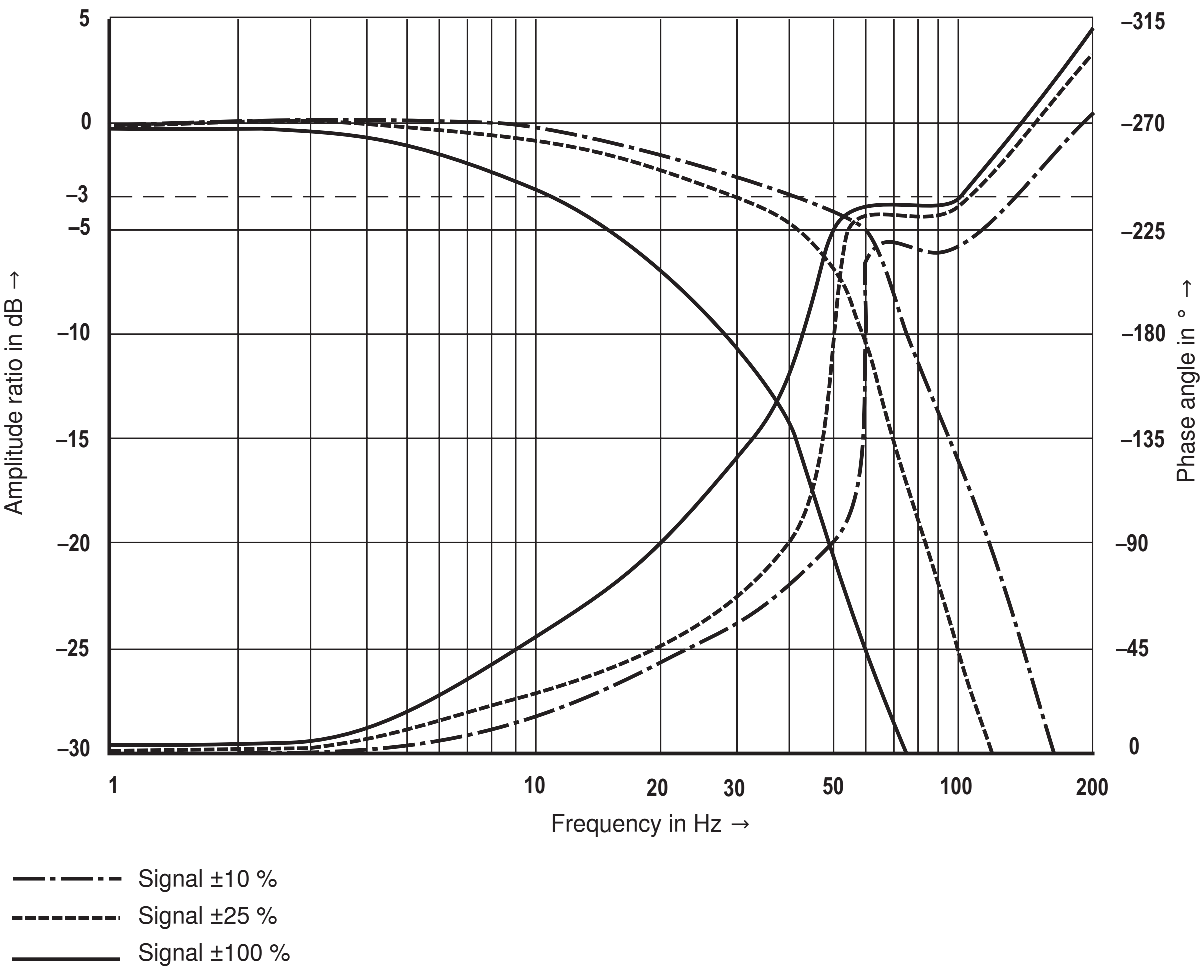


Frequency response characteristic curves: Type 4WREE

(measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C, p_s = 10 bar) **Size 10**

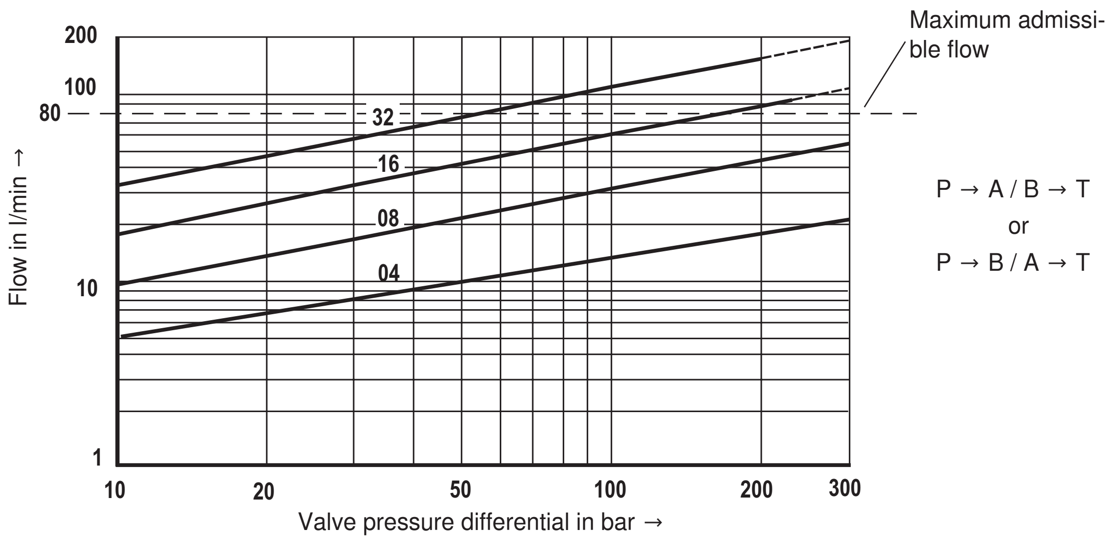
4/3 valve version

Control spool V



Flow: Type 4WREE (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C) Size 6

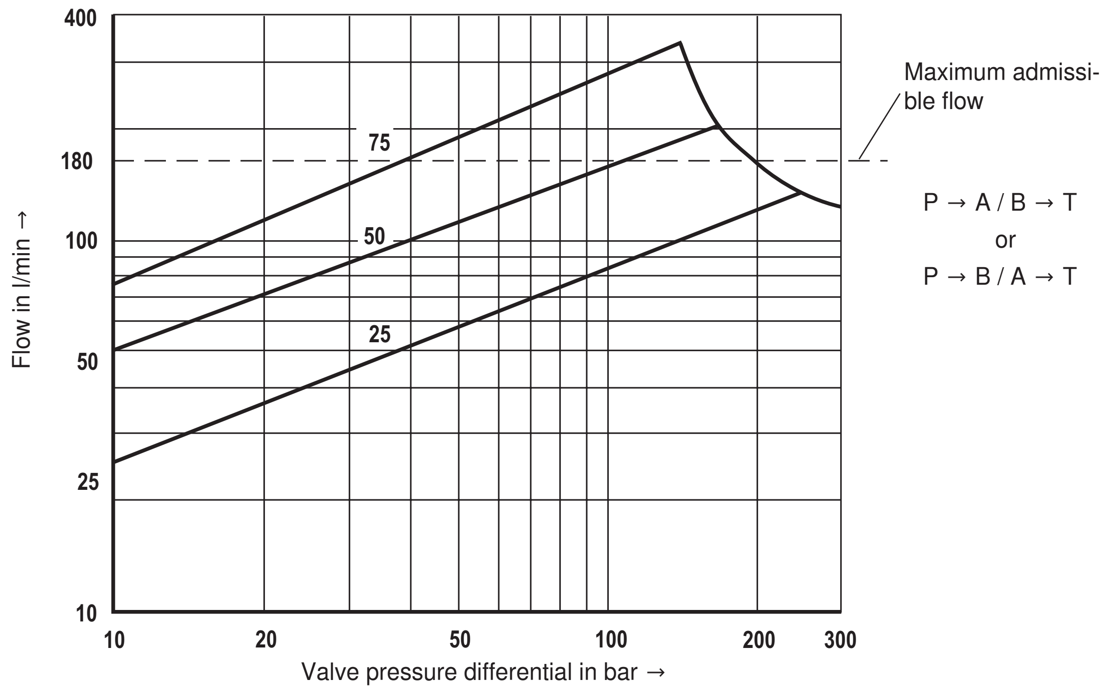
Load function with maximum valve opening
Rated flow 4, 8, 16 and 32 l/min
Control spool V



Observe the maximum admissible flow of 80 l/min!

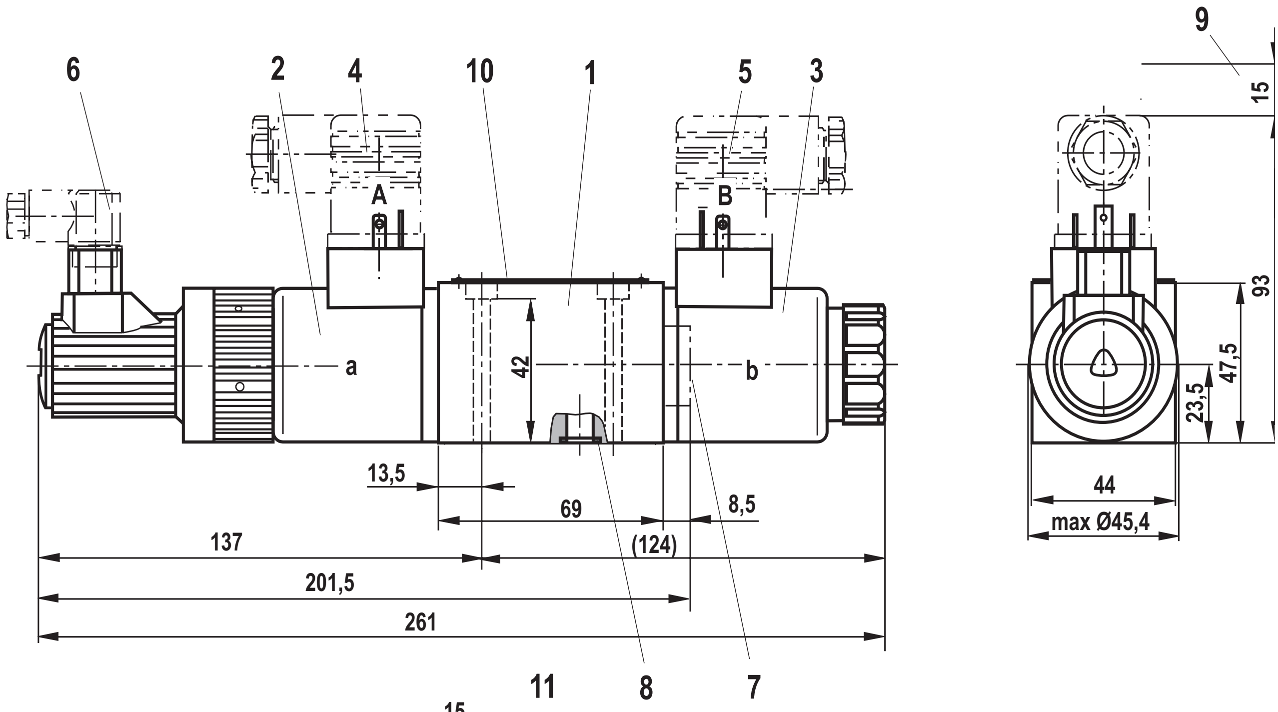
Flow: Type 4WREE (measured with HLP46, ϑ_{Oil} = 40 °C ± 5 °C) Size 10

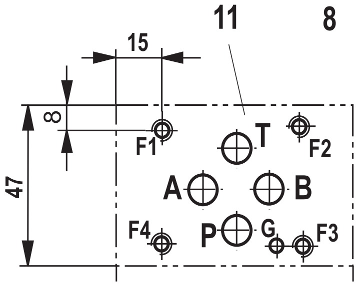
Load function with maximum valve opening
Rated flow 25, 50 and 75 l/min
Control spool V

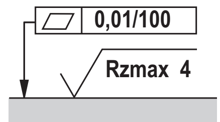


Observe the maximum admissible flow of 180 l/min!

Unit dimensions: Type 4WRE (dimensions in mm) Size 6





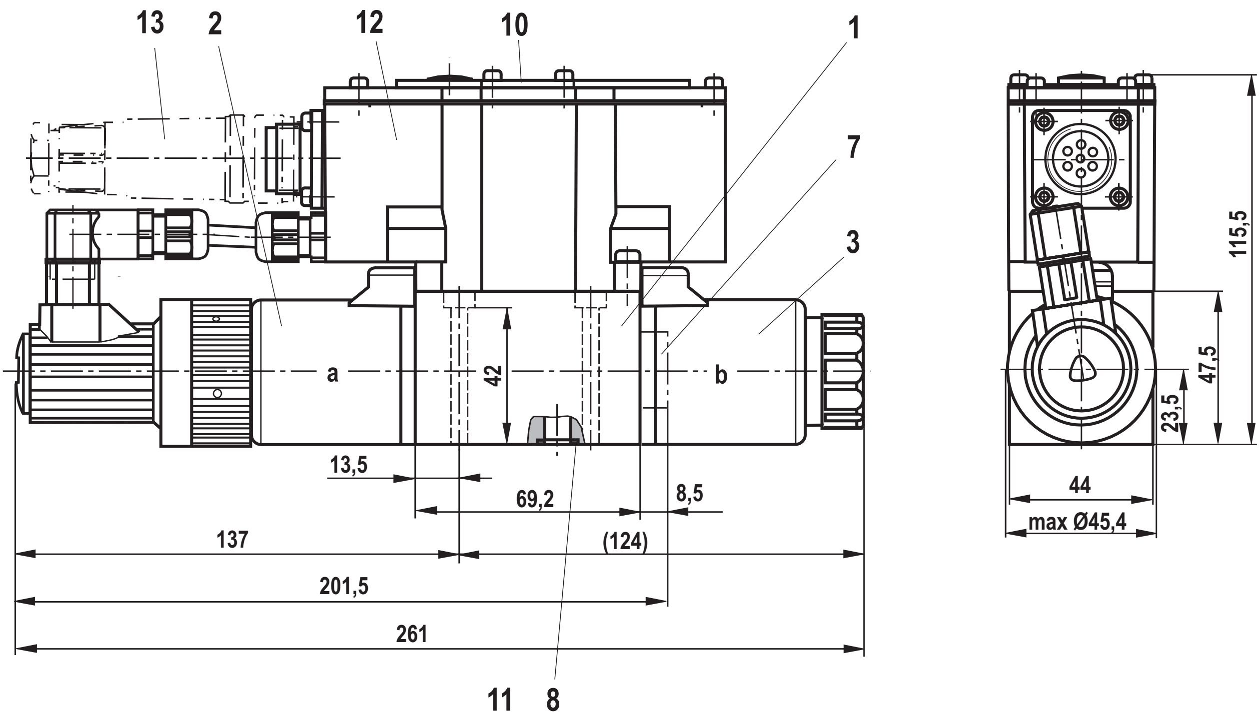


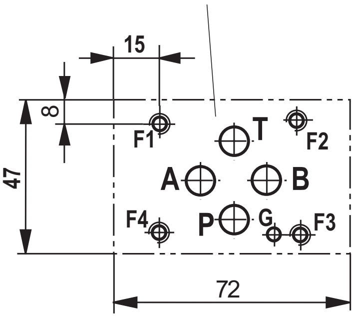
Required surface quality of the valve mounting face

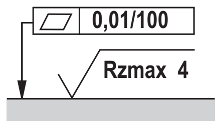
1 Valve housing
2 Proportional solenoid "a" with inductive position transducer
3 Proportional solenoid "b"
4 Mating connector "A", color gray, separate order – see page 8
5 Mating connector "B", color black, separate order – see page 8
6 Mating connector for inductive position transducer, separate order – see page 8
7 Plug screw for valve with one solenoid (2 spool positions, version **EA** or **WA**)
8 Identical seal rings for ports A, B, P, and T
9 Space required to remove the mating connector
10 Name plate
11 Machined valve mounting face, porting pattern according to ISO 4401-03-02-0-05 (**with** locating hole)
Deviating from the standard:
- without locating hole "G"
- Ports P, A, B and T with Ø 8 mm

Subplates and valve mounting screws see page 22

Unit dimensions: Type 4WREE (dimensions in mm) Size 6







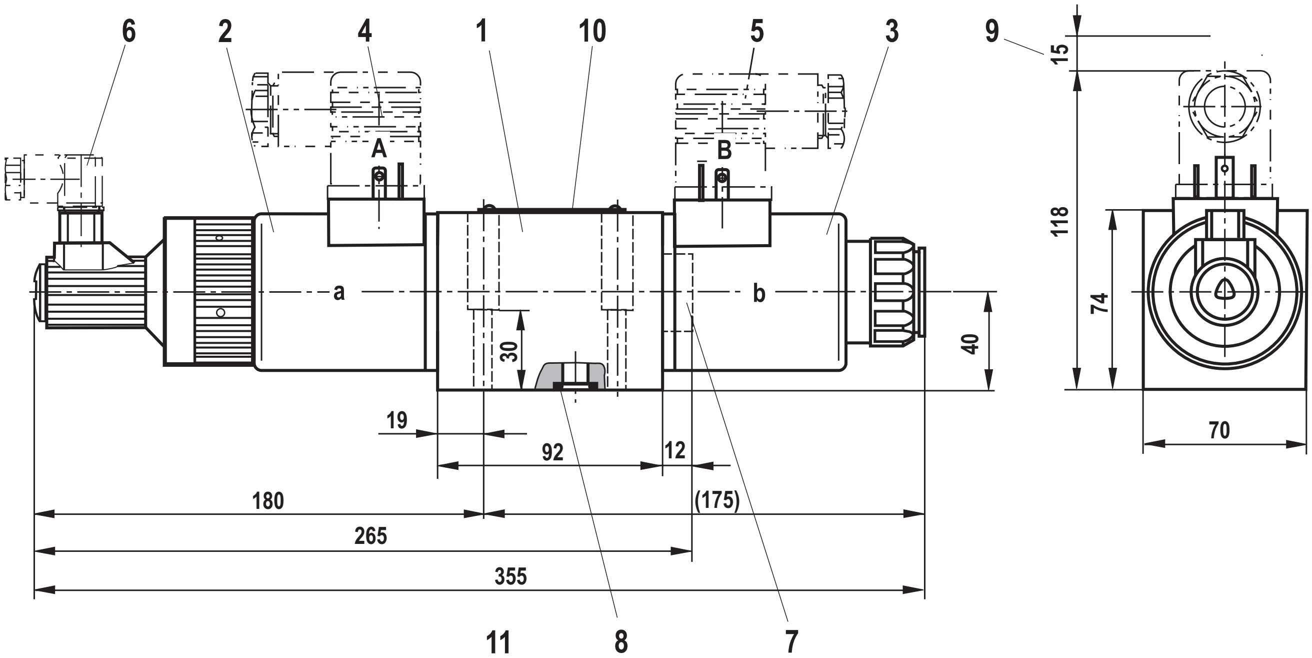
Required surface quality of the valve mounting face

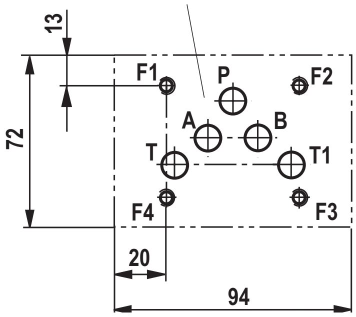
General tolerances according to ISO 2768-mK

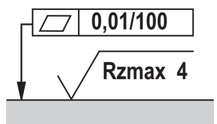
1 Valve housing
2 Proportional solenoid "a" with inductive position transducer
3 Proportional solenoid "b"
7 Plug screw for valve with one solenoid
(2 spool positions, version **EA** or **WA**)
8 Identical seal rings for ports A, B, P, and T
10 Name plate
11 Machined valve mounting face,
porting pattern according to ISO 4401-03-02-0-05
(**with** locating hole)
Deviating from the standard:
- without locating hole "G"
- Ports P, A, B and T with Ø 8 mm
12 Integrated electronics (OBE)
13 Mating connector,
separate order – see page 9

Subplates and valve mounting screws see page 22

Unit dimensions: Type 4WRE (dimensions in mm) **Size 10**







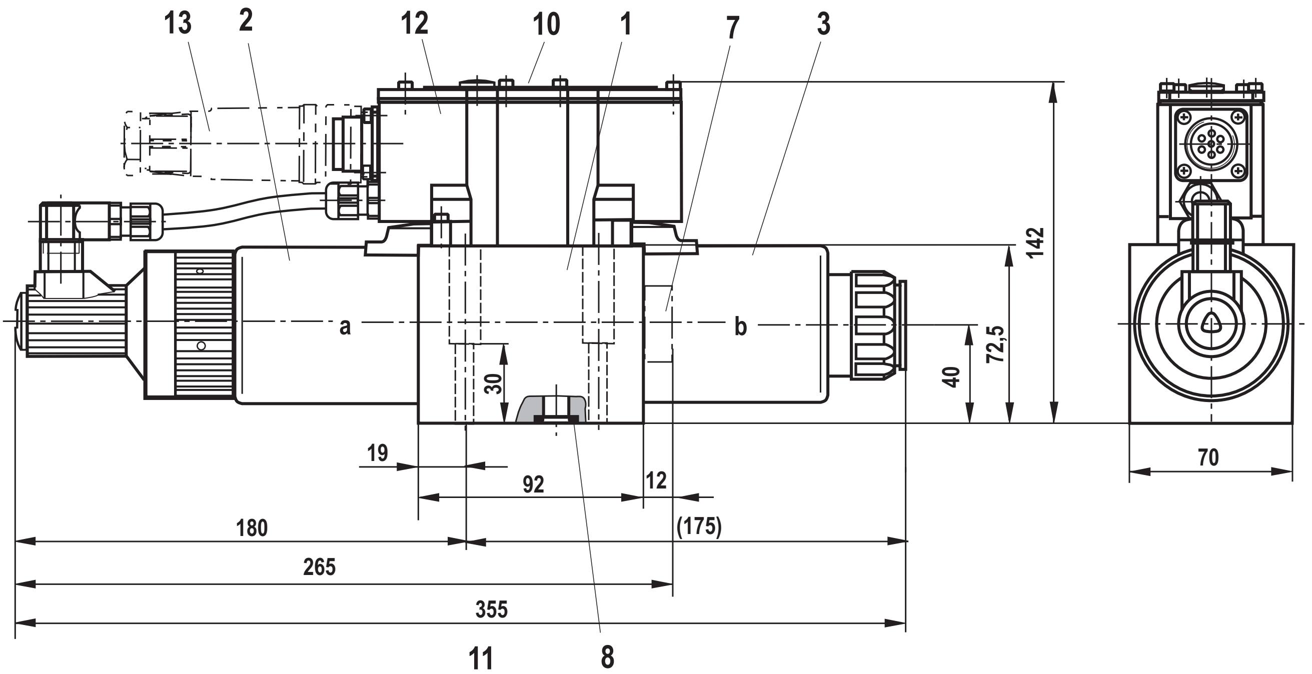
Required surface quality of the valve mounting face

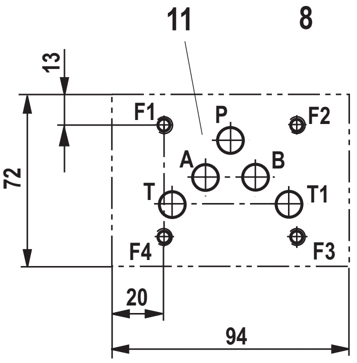
General tolerances according to ISO 2768-mK

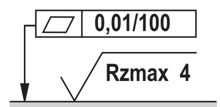
1 Valve housing
2 Proportional solenoid "a" with inductive position transducer
3 Proportional solenoid "b"
4 Mating connector "A", color gray, separate order – see page 8
5 Mating connector "B", color black, separate order – see page 8
6 Mating connector for inductive position transducer, separate order – see page 8
7 Plug screw for valve with one solenoid (2 spool positions, version **EA** or **WA**)
8 Identical seal rings for ports A, B, P, T and T1
9 Space required to remove the mating connector
10 Name plate
11 Machined valve contact surface, porting pattern according to ISO 4401-05-04-0-05 differing from the standard: Connection T1 Ø 11.2 mm

Subplates and valve mounting screws see page 22

Unit dimensions: Type 4WREE (dimensions in mm) size 10







Required surface quality of the valve mounting face

General tolerances according to ISO 2768-mK

1 Valve housing
2 Proportional solenoid "a" with inductive position transducer
3 Proportional solenoid "b"
7 Plug screw for valve with one solenoid (2 spool positions, version **EA** or **WA**)
8 Identical seal rings for ports A, B, P, T and T1
10 Name plate
11 Machined valve contact surface, porting pattern according to ISO 4401-05-04-0-05 differing from the standard: Connection T1 Ø 11.2 mm
12 Integrated electronics (OBE)
13 Mating connector, separate order – see page 9

Subplates and valve mounting screws see page 22

Unit dimensions

Hexagon socket head cap screws		Material number
Size 6	4x ISO 4762 - M5 x 50 - 10.9-flZn-240h-L Tightening torque $\boldsymbol{M}_A$ = 7 Nm ±10 % or 4x ISO 4762 - M5 x 50 - 10.9 Tightening torque $\boldsymbol{M}_A$ = 8.9 Nm ±10 %	R913000064
Size 10	4x ISO 4762 - M6 x 40 - 10.9-flZn-240h-L Tightening torque $\boldsymbol{M}_A$ = 12.5 Nm ±10 % or 4x ISO 4762 - M6 x 40 - 10.9 Tightening torque $\boldsymbol{M}_A$ = 15.5 Nm ±10 %	R913000058

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

Subplates	Data sheet
Size 6	45052
Size 10	45054

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

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www.boschrexroth.de

Rexroth
Bosch Group

4/3 directional high-response control valves, direct operated, with integrated control electronics (OBE)

RE 29067/11.05
Replaces: 02.03

Type 4WRSE

Sizes 6 and 10
Series 3X
Maximum operating pressure 315 bar
Maximum flow 180 l/min

Type 4WRSE 6 -...-3X/... with integrated control electronics (OBE)

Type 4WRSE 10 -...-3X/... with integrated control electronics (OBE)

Table of contents

Features

– Direct operated directional high-response control valve with integrated control electronics (OBE) for controlling the direction and magnitude of a flow
– Suitable for position and velocity control
– Actuation by control solenoids
– Electrical position feedback
– High response sensitivity and low hysteresis
– Integrated control electronics (OBE) with interface ±10 V or 4 … 20 mA
– For subplate mounting:
Porting pattern to DIN 24340 form A and ISO 4401
Subplates to data sheets RE 45052 and RE 45054 (separate order), see pages 12 and 13

Ordering code

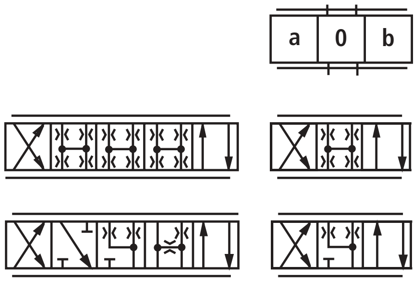
4WRS	E					–3X /	G24	K0 /		V	*

Integrated control electronics (OBE) = **E**

Without sleeve = **No code**

Size 6 = **6**
Size 10 = **10**

Spool symbols



= **V, V1-**

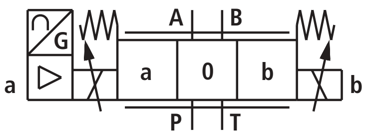
= **Q2-**

With symbol V1-:
P → A: q_V B → T: $q_V/2$
P → B: $q_V/2$ A → T: q_V

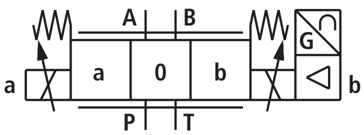
With symbol Q2-:
P → A: q_V B → T: q_V
P → B: $q_V/3$ A → T: q_V

Note:
Spools V and V1 have an overlap of –1.0 % … +1.0 %.

Side of inductive position transducer



= **No code** (standard)



= **C**

Nominal flow at 10 bar valve pressure differential

	Size 6
04 =	4 l/min (only with symbol V)
10 =	10 l/min
20 =	20 l/min
35 =	35 l/min
	Size 10
25 =	25 l/min
50 =	50 l/min
80 =	75 l/min

3X = Component series 30 … 39 (30 … 39: unchanged installation and connection dimensions)

Supply voltage of control electronics
G24 = 24 V DC

Electrical connection
K0 = With component plug to DIN EN 175201-804
Without cable socket
Cable socket – separate order, see page 5

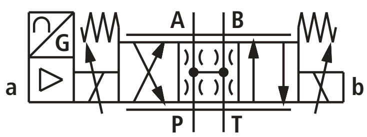
Interface of control electronics
A1 = Command value input ±10 V
F1 = Command value input 4 … 20 mA

Seal material
V = FKM seals, suitable for mineral oils (HL, HLP) to DIN 51524 and phosphate ester (HFD-R)

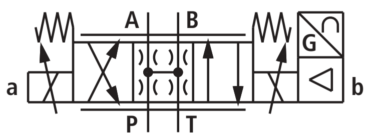
Further details in clear text

Symbols

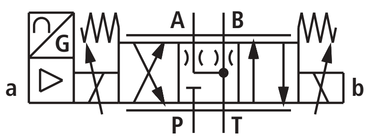
Type 4WRSE..**V** (standard)



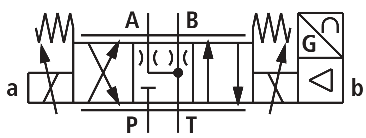
Type 4WRSE..**VC**



Type 4WRSE..**Q2** (standard)



Type 4WRSE..**Q2C**



Standard types

Size 6

Type	Material number
4WRSE 6 V04-3X/G24K0/A1V	R900938307
4WRSE 6 V1-10-3X/G24K0/A1V	R900909078
4WRSE 6 V1-20-3X/G24K0/A1V	R900906155
4WRSE 6 V1-35-3X/G24K0/A1V	R900904794
4WRSE 6 V10-3X/G24K0/A1V	R900558830
4WRSE 6 V20-3X/G24K0/A1V	R900576060
4WRSE 6 V35-3X/G24K0/A1V	R900579447

Size 10

Type	Material number
4WRSE 10 Q2-50-3X/G24K0/A1V	R900916872
4WRSE 10 V1-80-3X/G24K0/A1V	R900556812
4WRSE 10 V1-25-3X/G24K0/A1V	R900922997
4WRSE 10 V1-50-3X/G24K0/A1V	R900579140
4WRSE 10 V25-3X/G24K0/A1V	R900579637
4WRSE 10 V50-3X/G24K0/A1V	R900579943
4WRSE 10 V80-3X/G24K0/A1V	R900579286

Function, section

These 4/3 directional high-response valves are direct operated components of sandwich plate design. They are actuated by control solenoids. The solenoids are controlled by integrated control electronics (OBE).

Structure:

The valve basically consists of:

- Housing (1) with connection face
- Control spool (2) with compression springs (3 and 4)
- Solenoids (5 and 6)
- Position transducer (7)
- Integrated control electronics (OBE) (8)
- Zero point adjustment (9) accessible via Pg9 cover

Functional description:

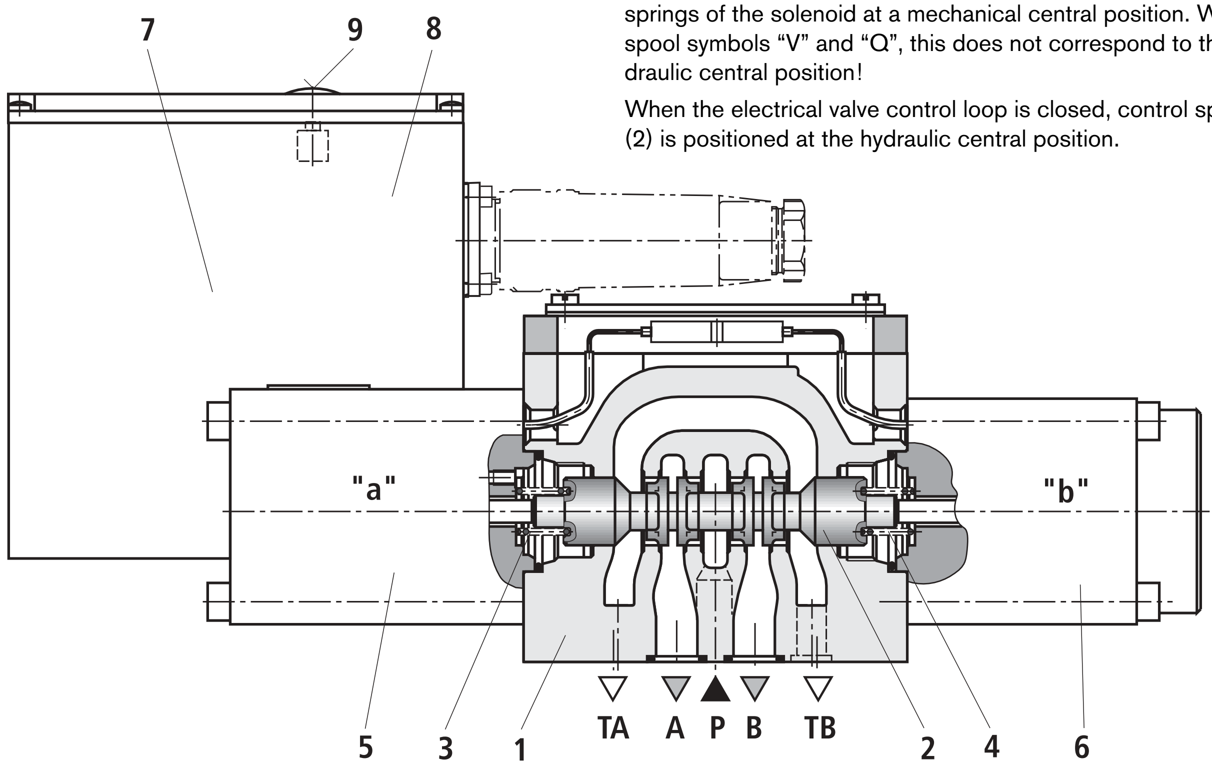
- When solenoids (5 and 6) are de-energised, control spool (2) is held by compression springs (3 and 4) in the central position
- Direct operation of control spool (2) through energisation of the control solenoid

  e.g. controlling of solenoid "b" (6)
  - Control spool (2) is pushed to the left in proportion to the electrical input signal
  - Connection open from P → A and B → T via orifice-like cross-sections with linear flow characteristics
- De-energisation of solenoid (6)
  Control spool (2) is returned by compression spring (3) to the central position

In the de-energised state, control spool (2) is held by the return springs of the solenoid at a mechanical central position. With spool symbols “V” and “Q”, this does not correspond to the hydraulic central position!

When the electrical valve control loop is closed, control spool (2) is positioned at the hydraulic central position.

Type 4WRSE 10 V…



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

General

Sizes		**Size 6**	**Size 10**
Weight	kg	3.0	7.3
Installation orientation		Optional, preferably horizontal	
Ambient temperature range	°C	–20 … +50	
Storage temperature range	°C	–20 … +80	

Hydraulic (measured with HLP46, $\vartheta_{oil} = 40$ °C ± 5 °C and $p = 100$ bar)

Operating pressure	Ports P, A, B	bar	up to 315	up to 315
	Port T	bar	up to 315	up to 315
Nominal flow $q_{V\,nom}$ ±10 % at $\Delta p = 10$ bar		l/min	4	25
			10	50
(Δp = valve pressure differential)			20	75
			35	–
Max. permissible flow		l/min	80	180
Hydraulic fluid			Mineral oil (HL, HLP) to DIN 51524 and phosphate ester (HFD-R), further hydraulic fluids on enquiry	
Hydraulic fluid temperature range		°C	–20 … +80	
Viscosity range		mm²/s	20 … 380, preferably 30 … 46	
Max. permissible degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 18/16/13 [1]	
Hysteresis		%	≤ 0.05	
Range of inversion		%	≤ 0.03	
Response sensitivity		%	≤ 0.03	
Zero point balancing		%	≤ 1	
Zero point drift with change in:			**Size 6**	**Size 10**
	Hydraulic fluid temperature	%/10 K	< 0.1	< 0.1
	Operating pressure	%/100 bar	< 0.5	< 0.3

Electrical

Operating voltage	Nominal value (limits)	VDC	24	(19.4 … 35)
Current consumption	Size 6	A	max. 2	Impulse load: 4 A
	Size 10	A	max. 2.8	Impulse load: 4 A
Interface “A1“	Command value signal	V	±10	$R_i > 50$ kΩ
	Actual value signal	V	±10	$I_{max} = 2$ mA
Interface “F1“	Command value signal	mA	4 … 20	$R_e > 100$ Ω
	Actual value signal	mA	4 … 20	max. load resistance 500 Ω
Duty cycle		%	100	
Coil temperature [1]		°C	up to 150	
Type of protection of valve to EN 60529			IP 65 with cable socket correctly mounted and locked	

1) Due to the surface temperatures of solenoid coils, observe European standards EN 563 and EN 982!

Note: For details with regard to environment simulation testing in the fields of EMC (electromagnetic compatibility), climate and mechanical stress, see RE 29067-U (declaration on environmental compatibility).

Electrical connection

Component plug pin assignment	Contact	Signal Interface A1	Signal Interface F1
Supply voltage	A	24 VDC (19.4 … 35 VDC), I_{max} = 2 A (size 6), I_{max} = 2.8 A (size 10), impulse load: 4 A	
	B	0 V	
Actual value reference potential	C	Connect reference potential for contact F to ⊥ on the control side (star-shape)	Reference potential for contact F
Comand value signal	D	±10 V, R_i > 50 kΩ	4 … 20 mA, R_i > 100 Ω
	E	Reference potential for contact D	
Actual value	F	±10 V I_{max} = 2 mA	4 … 20 mA, max. load resistance 500 Ω
Protective conductor	PE	Connected to heat sink and valve body	

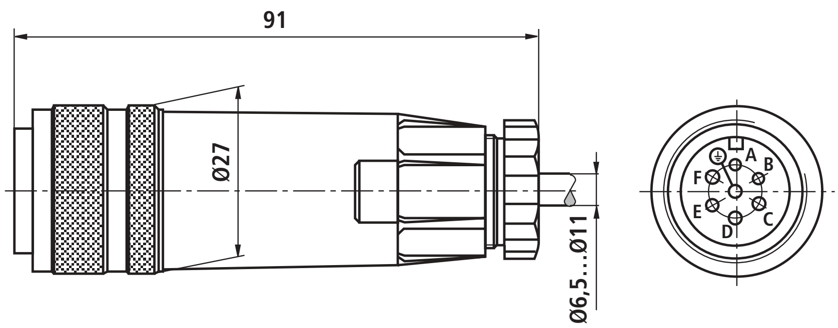
Command value: Positive command value at D (interface A1) or 12 ... 20 mA (interface F1) and reference potential at E causes a flow from P → A and B → T.
Negative command value at D (interface A1) or 12 ... 4 mA (interface F1) and reference potential at E causes a flow from P → B and A → T.

Actual value: Interface A1: Positive signal at F and reference potential at C means flow from P → A.
Interface F1: 12 ... 20 mA means flow from P → A.

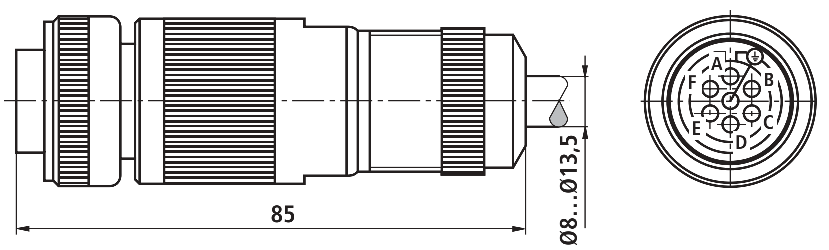
Connecting cable: Recommendation: – up to 25 m cable length: Type LiYCY 7 x 0.75 mm²
– up to 50 m cable length: Type LiYCY 7 x 1.0 mm²
Outer diameter 6.5 … 11 mm or 8 … 13.5 mm, respectively
Connect shield to ⊥ only on the supply side.

Cable sockets

Cable socket (plastic version)
to DIN EN 175201-804
Separate order,
material no. **R900021267**



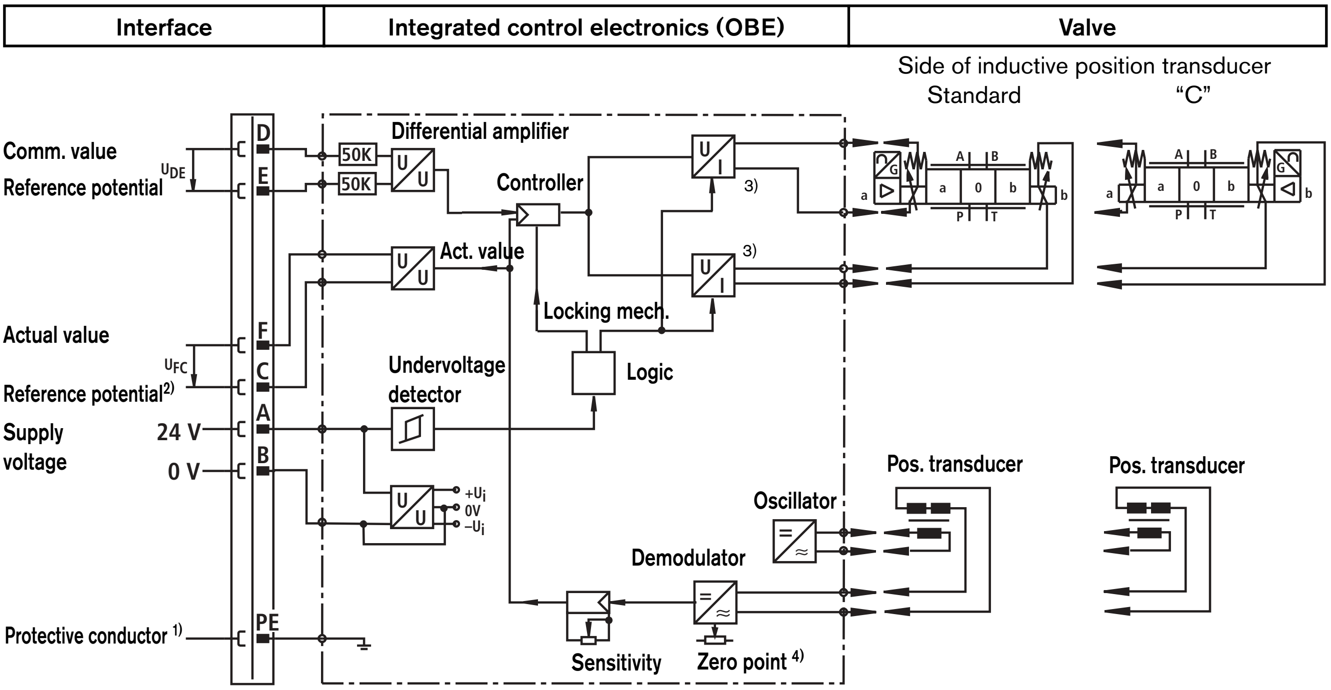
Cable socket (metal version)
to DIN EN 175201-804
Separate order,
material no. **R900223890**



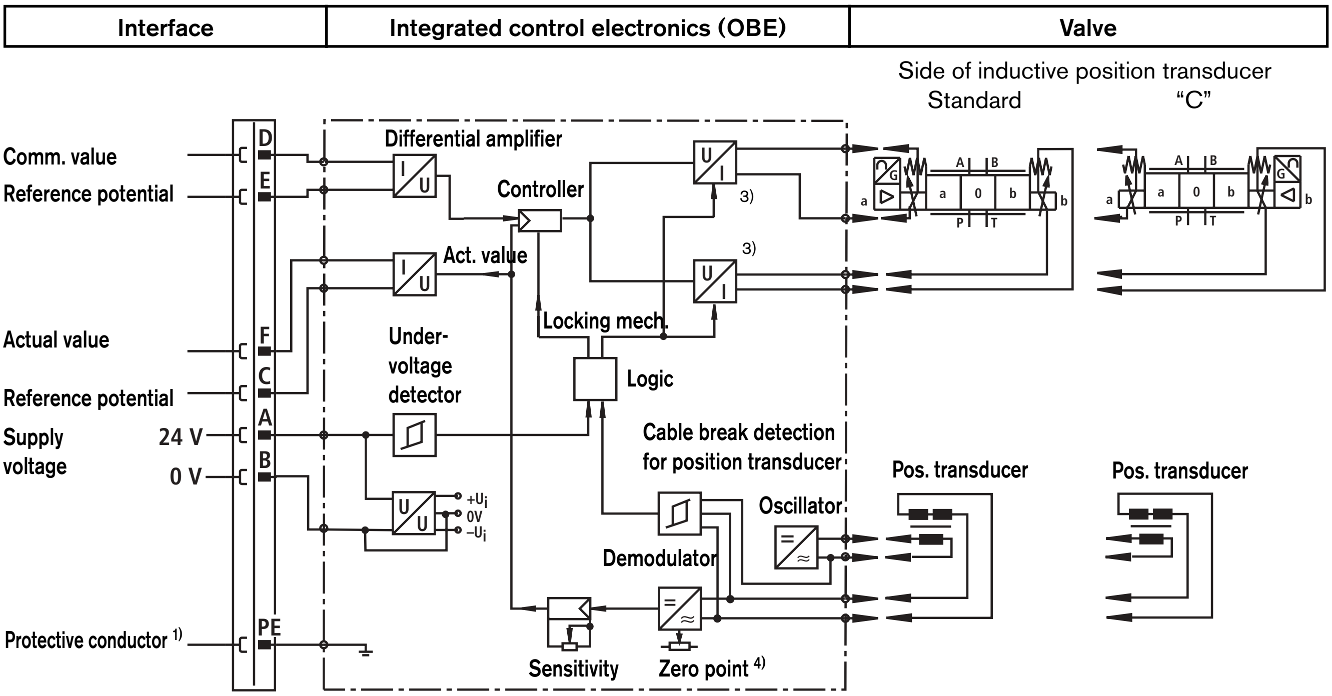
Integrated control electronics (OBE)

Block circuit diagram / pin assignment of integrated control electronics (OBE)

Interface A1



Interface F1



Note:

Electrical signals brought out via control electronics (e.g. actual value) must not be used for switching off safety-relevant machine functions! (See also European standard EN 982, "Safety requirements for fluid power systems and components - hydraulics")

1) PE connection connected to heat sink and valve body

2) Connect pin C to ⊥ on the control side

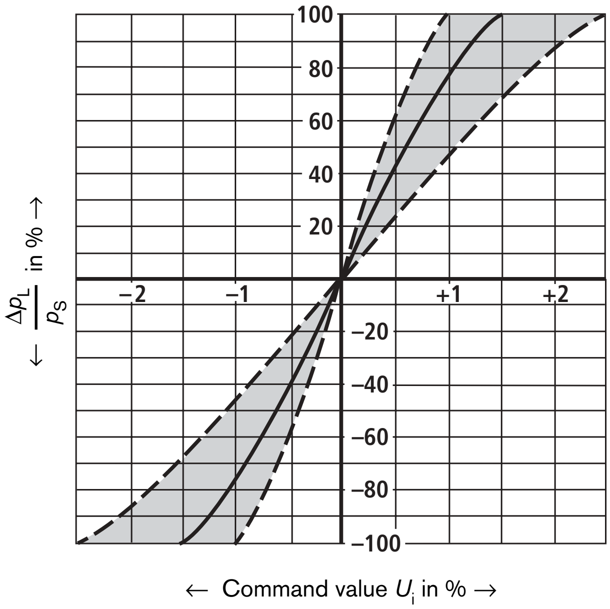
3) Output stage current regulated

4) Zero point externally adjustable

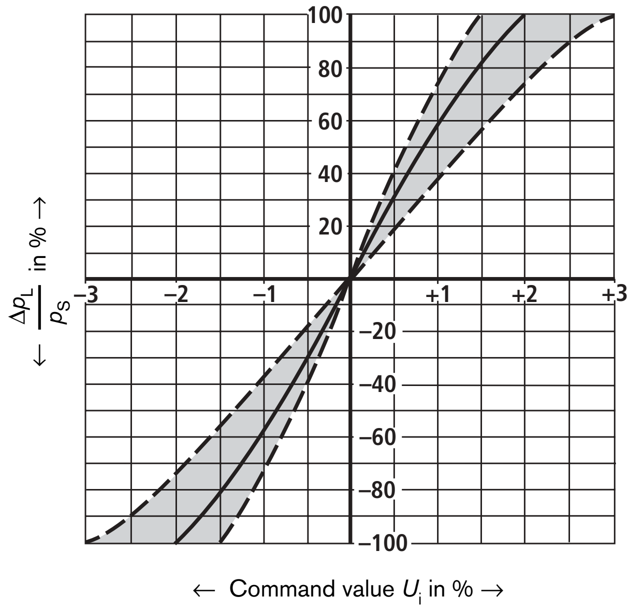
Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Pressure/signal characteristic curves (V spool) $p_S = 100$ bar

Size 6
Type 4WRSE 6 V…

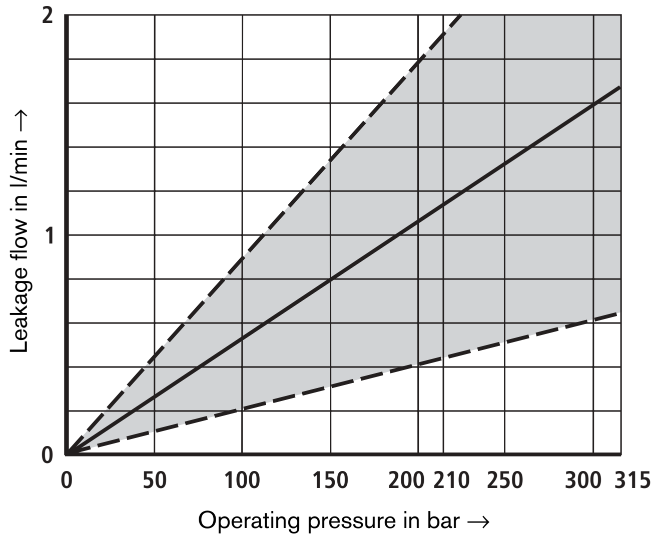


Size 10
Type 4WRSE 10 V…

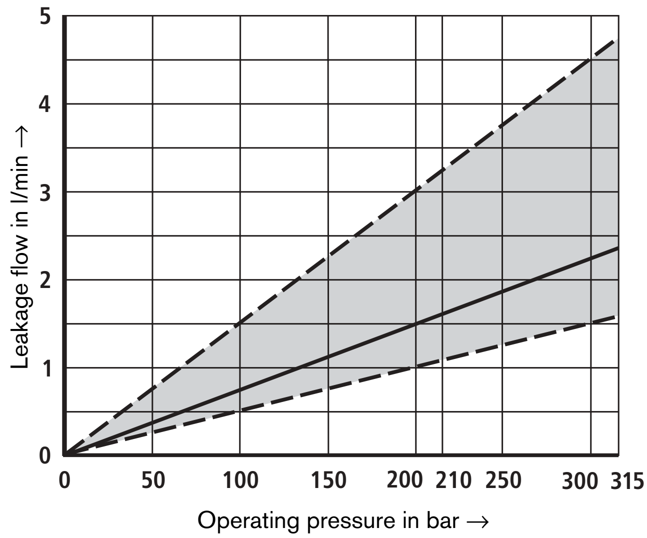


Typical leakage flow

Size 6
Type 4WRSE 6 V.35…



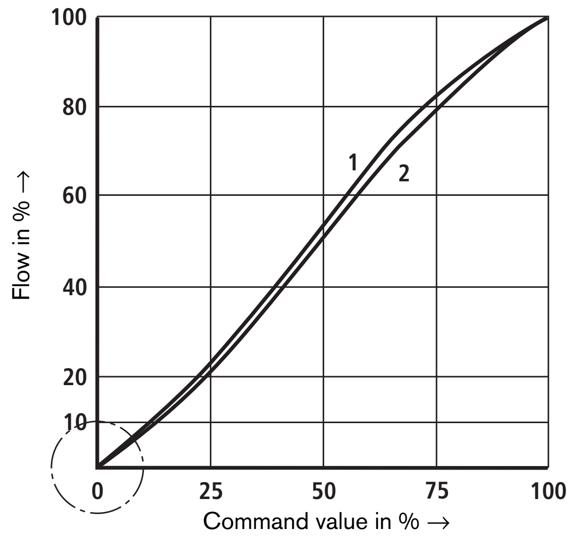
Size 10
Type 4WRSE 10 V.80…



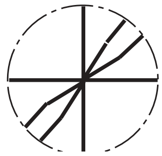
Characteristic curves of size 6 (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Typical flow characteristic curve (V, V1 spool)

at 10 bar valve pressure differential or 5 bar per control land



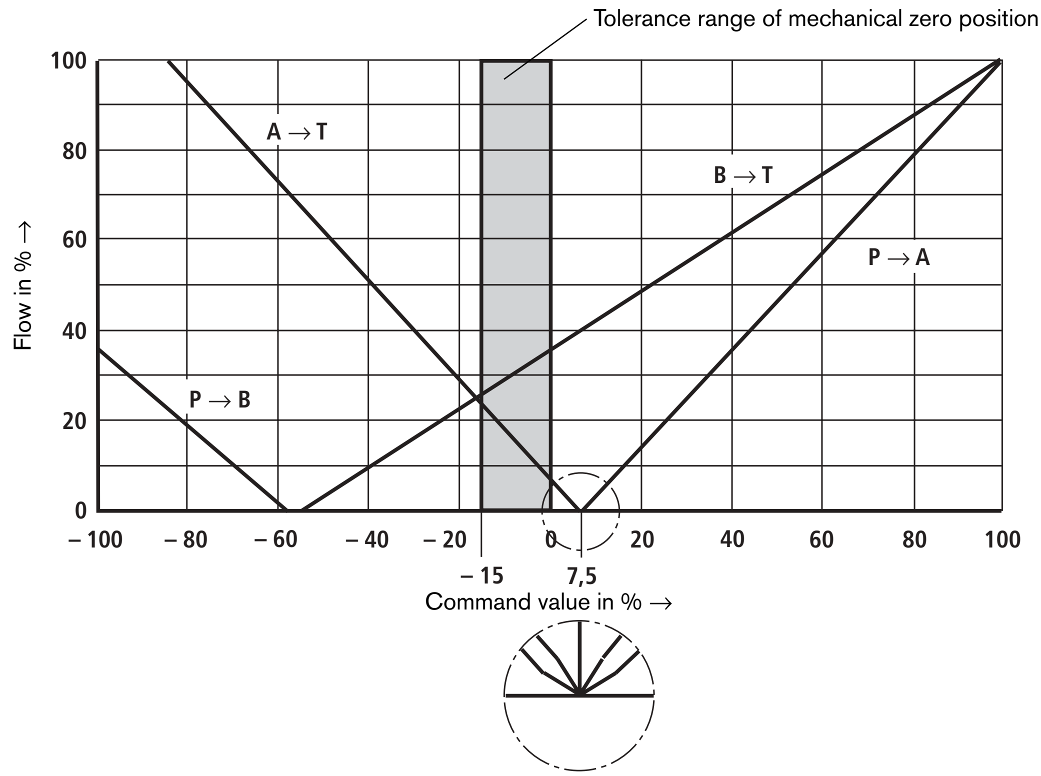
1 = Nominal flow 35 l/min
2 = Nominal flow 10 l/min
Spool … 20 between characteristic curves 1 and 2



Zero point passage depending on manufacturing tolerance
Valve overlap −1 % … +1 %

Typical flow characteristic curve (Q2 spool)

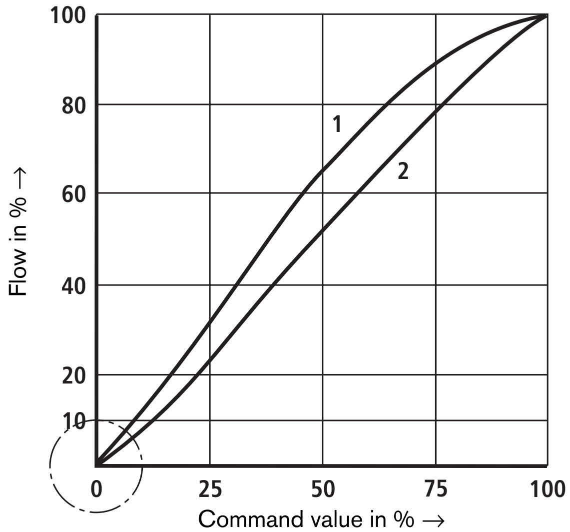
at 10 bar valve pressure differential or 5 bar per control land



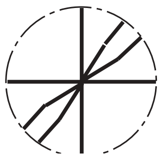
Characteristic curves of size 10 (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Typical flow characteristic curve (V, V1 spool)

at 10 bar valve pressure differential or 5 bar per control land



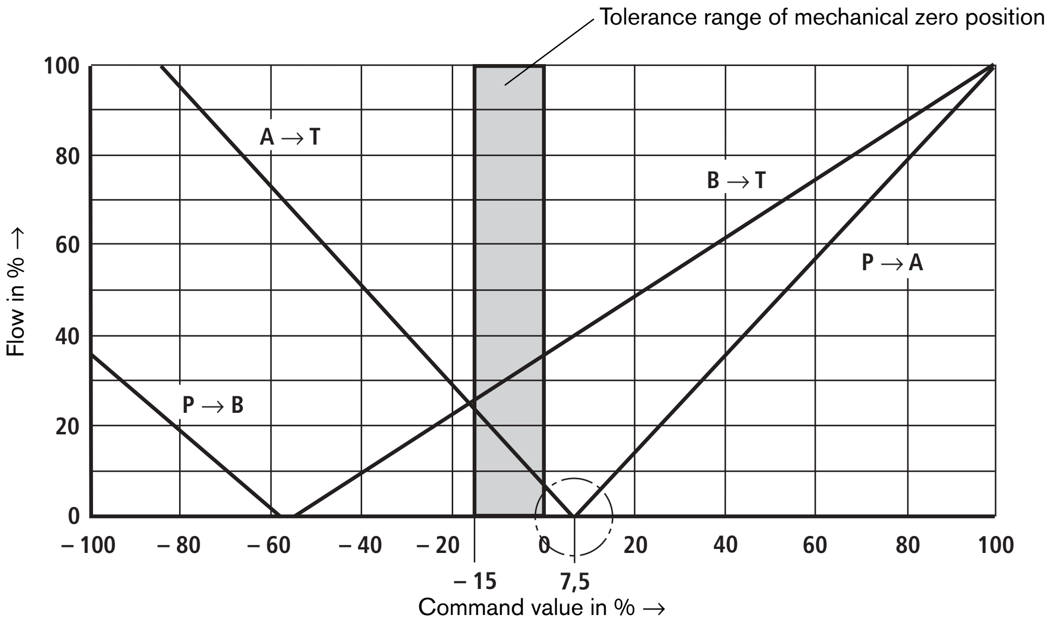
1 = Nominal flow 75 l/min
2 = Nominal flow 25 l/min
Spool … 50 between characteristic curves 1 and 2

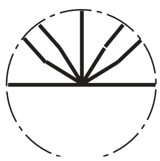


Zero point passage depending on manufacturing tolerance
Valve overlap –1 % … +1 %

Typical flow characteristic curve (Q2 spool)

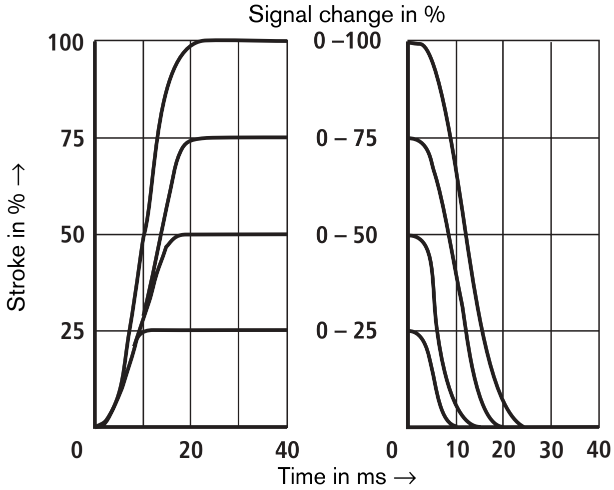
at 10 bar valve pressure differential or 5 bar per control land





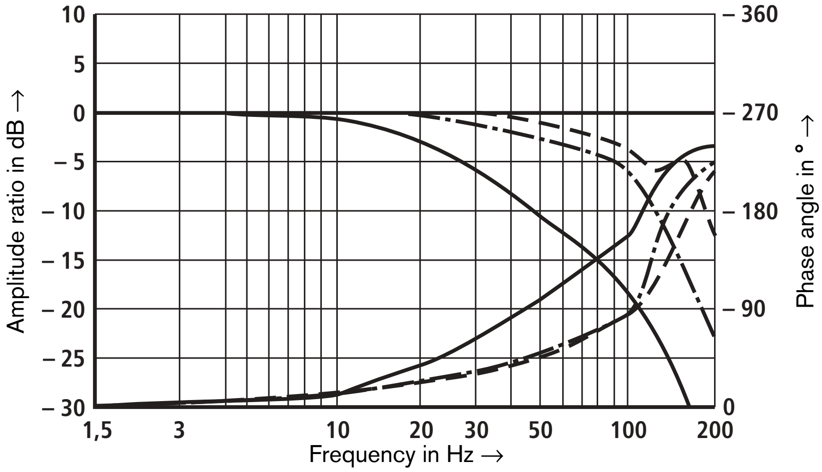
Characteristic curves of size 6 (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

Transient function with stepped electrical input signals



Measured at:
p_S = 10 bar
ν = 46 mm²/s
ϑ = 40 °C

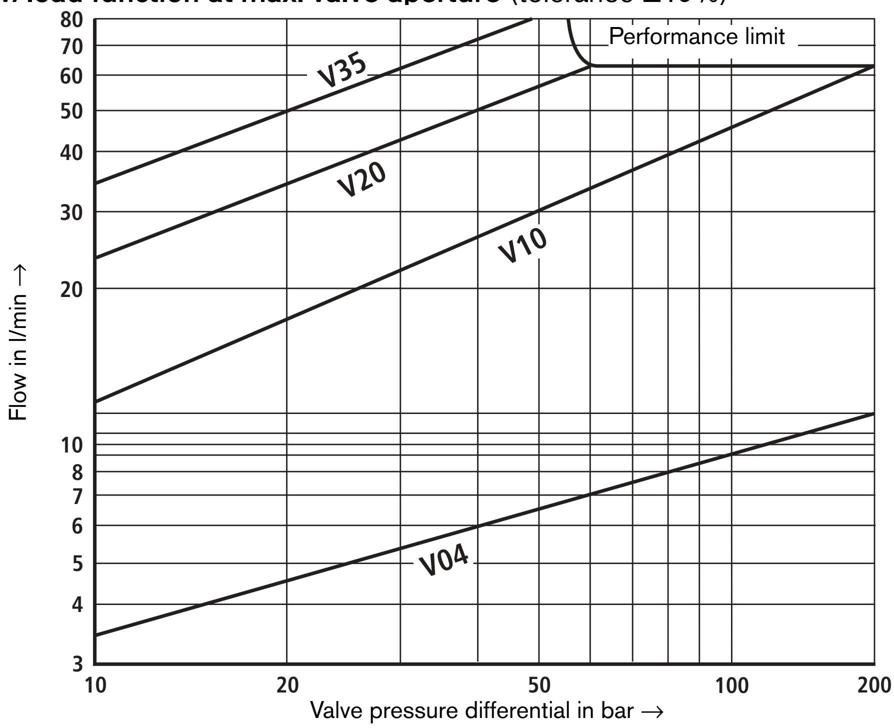
Frequency response characteristic curves



Measured at:
p_S = 10 bar
ν = 46 mm²/s
ϑ = 40 °C

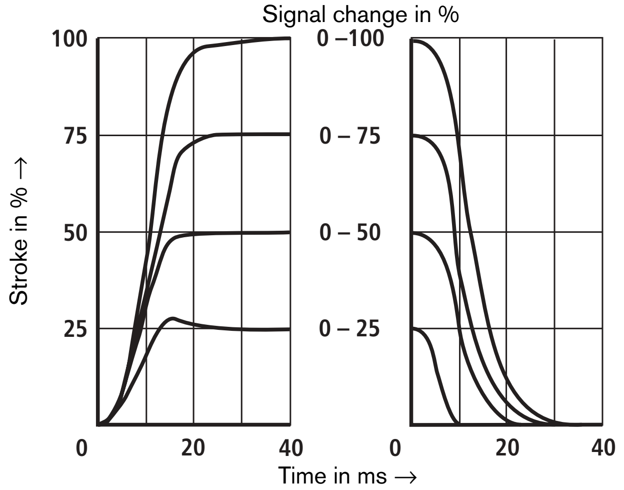
Signal ±10 %
Signal ±25 %
Signal ±100 %

Flow/load function at max. valve aperture (tolerance ±10%)



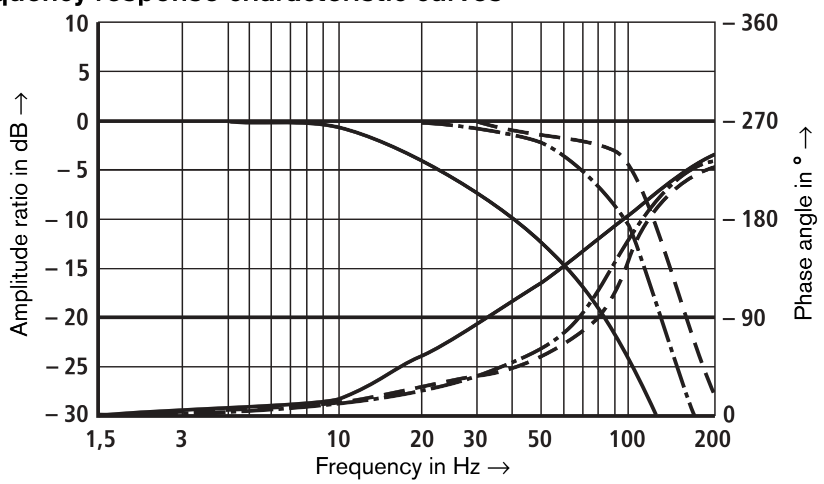
Characteristic curves of size 10 (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Transient function with stepped electrical input signals



Measured at:
$p_S = 10$ bar
$\nu = 46\ mm^2/s$
$\vartheta = 40\ °C$

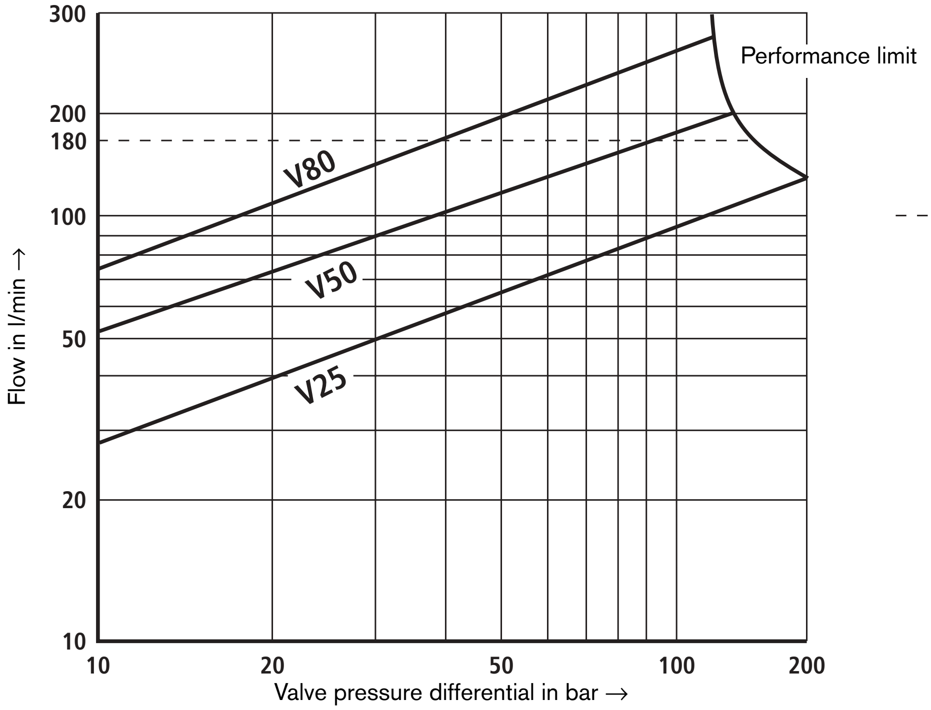
Frequency response characteristic curves



Measured at:
$p_S = 10$ bar
$\nu = 46\ mm^2/s$
$\vartheta = 40\ °C$

– – – Signal ±10 %
–·–· Signal ±25 %
—— Signal ± 100 %

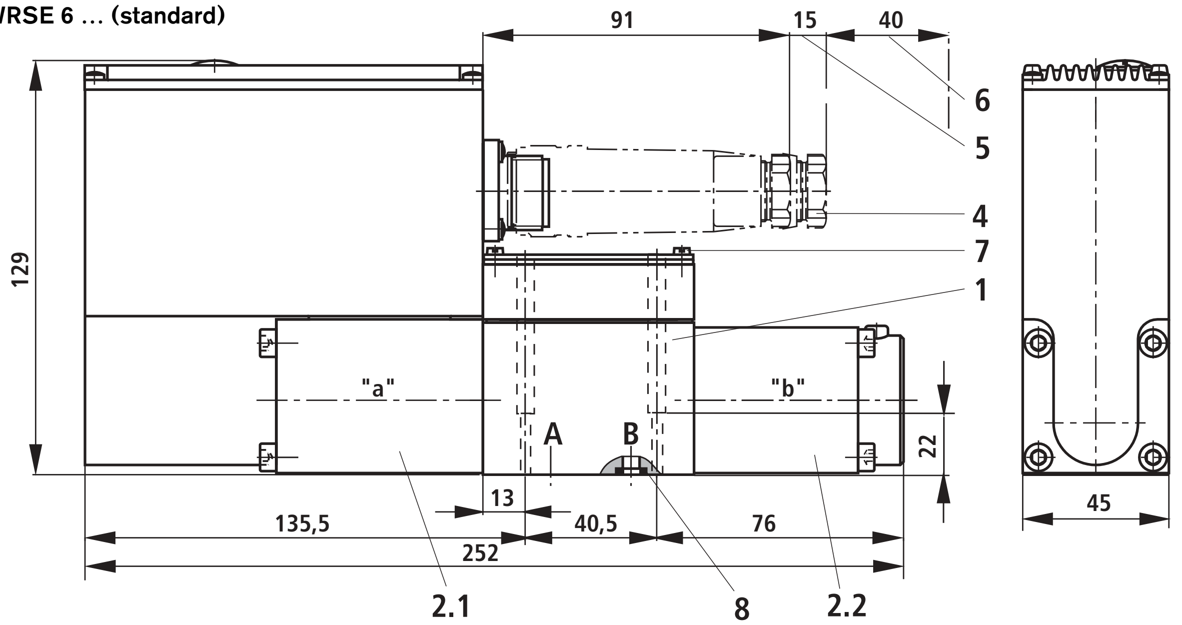
Flow/load function at max. valve aperture (tolerance ±10%)



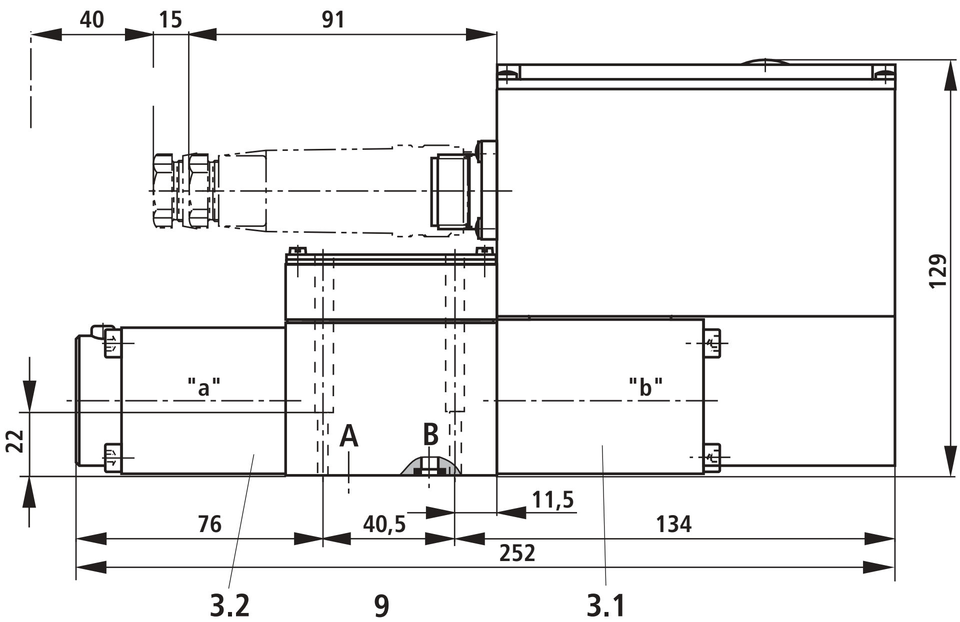
– – – Recommended flow limitation
$q_V = 180$ l/min

Unit dimensions of size 6 (nominal dimensions in mm)

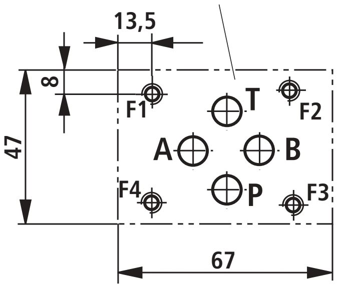
Type 4WRSE 6 … (standard)

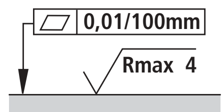


Type 4WRSE 6 C…



- **1** Valve housing
- **2.1** Control solenoid "a" with inductive position transducer
- **2.2** Control solenoid "b"
- **3.1** Control solenoid "b" with inductive position transducer
- **3.2** Control solenoid "a"
- **4** Cable socket to DIN EN 175201-804 (separate order, see page 5)
- **5** Space required to remove cable socket
- **6** Additional space required for bending radius of connecting cable
- **7** Nameplate
- **8** R-ring 9.81 x 1.5 x 1.78 (ports P, A, B, T)
- **9** Machined valve mounting face, position of ports to DIN 24340 form A6 and ISO 4401-03-02-0-94 without locating bore





Required surface quality of mating part

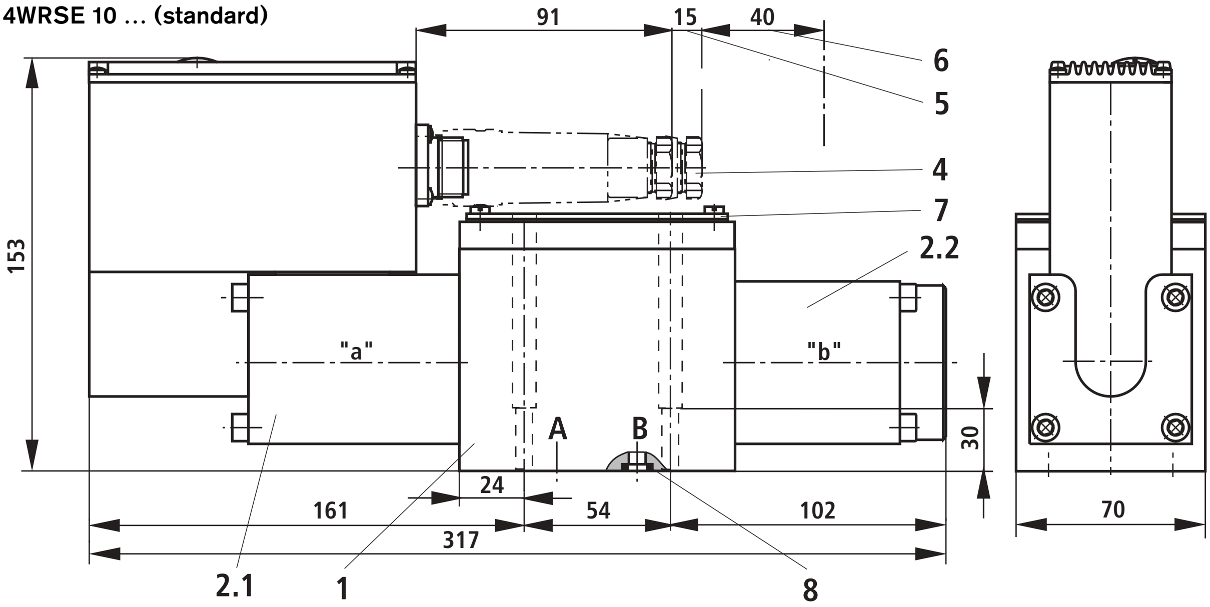
Subplates to data sheet RE 45052 and valve fixing screws must be ordered separately.

Subplates: G 341/01 (G1/4)
G 342/01 (G3/8)
G 502/01 (G1/2)

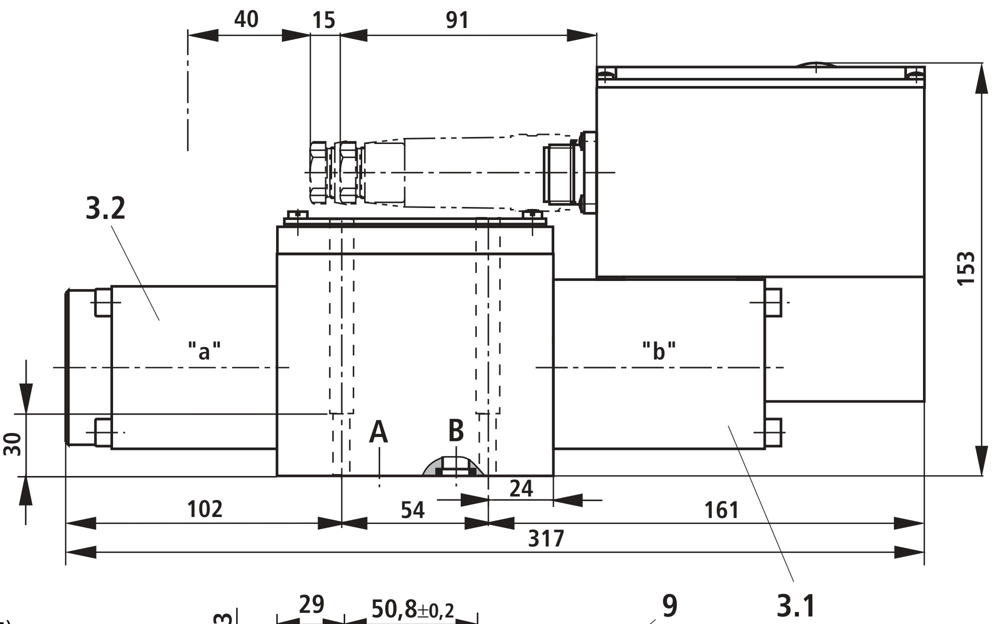
4 hexagon socket head cap screws
ISO 4762 – M5x30-10.9-flZn-240h-L
(friction coefficient total = 0.09 to 0.14)
Tightening torque M_T = 7 Nm ± 10%
material no. R913000316 (separate order)

Unit dimensions of size 10 (nominal dimensions in mm)

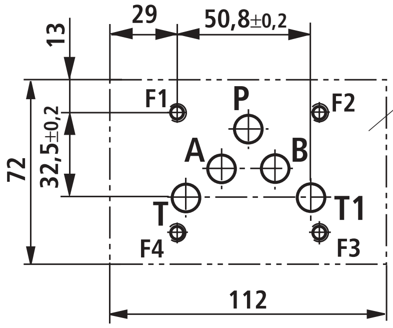
Type 4WRSE 10 … (standard)

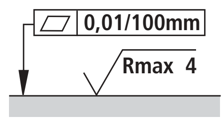


Type 4WRSE 10 C…



1 Valve housing
2.1 Control solenoid "a" with inductive position transducer
2.2 Control solenoid "b"
3.1 Control solenoid "b" with inductive position transducer
3.2 Control solenoid "a"
4 Cable socket to DIN EN 175201-804 (separate order, see page 5)
5 Space required to remove cable socket
6 Additional space required for bending radius of connecting cable
7 Nameplate
8 R-ring 13.0 x 1.6 x 2.0 (ports A, B, P, T)
9 Machined valve mounting face, position of ports to DIN 24340 form A10 and ISO 4401-05-04-0-94





Required surface quality of mating part

Subplates to data sheet RE 45054 and valve fixing screws must be ordered separately.

Subplates: G 66/01 (G3/8)
G 67/01 (G1/2)
G 534/01 (G3/4)

4 hexagon socket head cap screws
ISO 4762 – M6x40-10.9-flZn-240h-L
(friction coefficient total = 0.09 to 0.14)
Tightening torque M_T = 12.5 Nm ± 10%
material no. R913000058 (separate order)

Notes

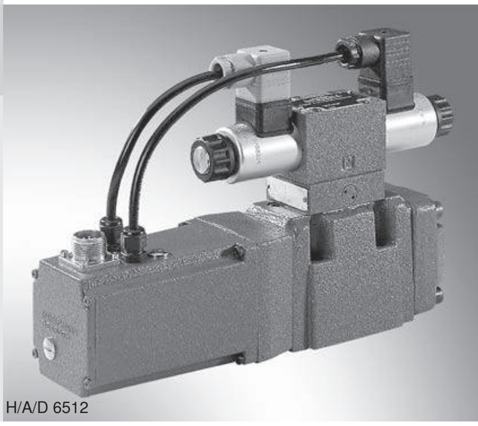
Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

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

RE 29075/08.13
Replaces: 08.04

Type 4WRKE

Size 10 to 35
Component series 3X
Maximum operating pressure 350 bar
Maximum flow 3,000 l/min



H/A/D 6512

Table of contents

Features

- Pilot operated 2-stage proportional directional valve with electrical position feedback of the main control spool and integrated electronics (OBE)
- Control of flow direction and size of a flow
- Operation by means of proportional solenoids
- Subplate mounting:
  Porting pattern according to ISO 4401
- Electrical position feedback
- Spring-centered main control spool
- Pilot control valve:
  Single-stage proportional directional valve
- Main stage with position control

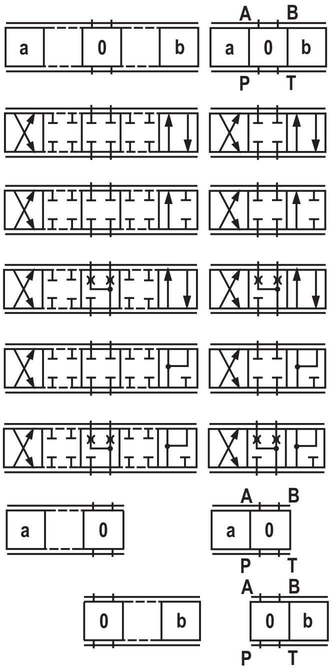
Ordering code

4WRKE				–3X/6E	G24		K31/		D3		*

Electrically operated 2-stage proportional directional valve in 4-way version with integrated electronics

Size 10	**= 10**
Size 16	**= 16**
Size 25	**= 25**
Size 27	**= 27**
Size 32	**= 32**
Size 35	**= 35**

Symbols



= E
= E1-
= E3-
= W6-
= W8-
= R
= R3-
= EA [1]
= W6A
= EB [1]
= W6B

With symbol E1-, W8-:
P → A : q_V B → T: $q_V/2$
P → B: $q_V/2$ A → T: q_V

With symbol R; R3:
P → A : q_V B → P: $q_V/2$
P → B : $q_V/2$ A → T: q_V

Notice:

In the zero position, spools W6-, W8- and R3- have a connection from A to T and B to T with approx. 2% of the relevant nominal cross-section.

Rated flow

25 = [2]	or **50 =** [3]	or **100 =**		Size 10
125 = [3]	or **150 =** [3]	or **200 =**	or **220 =**	Size 16
220 = [3]	or **350 =**			Size 25
500 =				Size 27
400 =	or **600 =**			Size 32
1000 =				Size 35

Characteristic curve form

L = Linear
P = Linear with fine control range

3X = Component series 30 to 39 (30 to 39: Unchanged installation and connection dimensions)

6E = Proportional solenoid with detachable coil

Supply voltage

G24 = Direct voltage 24 V

Pilot oil supply and drain

no code = Pilot oil supply external, pilot oil drain external
E = Pilot oil supply internal, pilot oil drain external
ET = Pilot oil supply internal, pilot oil drain internal
T = Pilot oil supply external, pilot oil drain internal

Electrical connection

K31 = **Without** mating connector with connector according to DIN EN 175201-804
Mating connector – separate order see page 21

Electronics interface

C1 = Command value/actual value ±10 mA
A1 = [4] Command value/actual value ±10 V
F1 = Command value/actual value 4 to 20 mA

D3 = With pressure reducing valve ZDR 6 DP0-4X/40YM-W80 (non-adjustable)

M = NBR seals
V = FKM seals

Further details in the plain text

[1] **Examples:** Spool with spool position "a" (P → B) ordering code ..**EA**.. or **W6A**
Spool with spool position "b" (P → A) ordering code ..**EB**.. or **W6B**

[2] Only E and W6- available with characteristic curve form **L** (linear)

[3] Only E1- and W8- available with characteristic curve form **L** (linear)

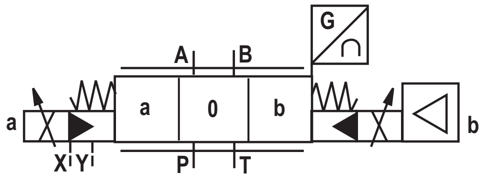
[4] When replacing the component series 2X with component series 3X the electronics interface is to be defined with **A5** (enable signal at pin C)

Symbols

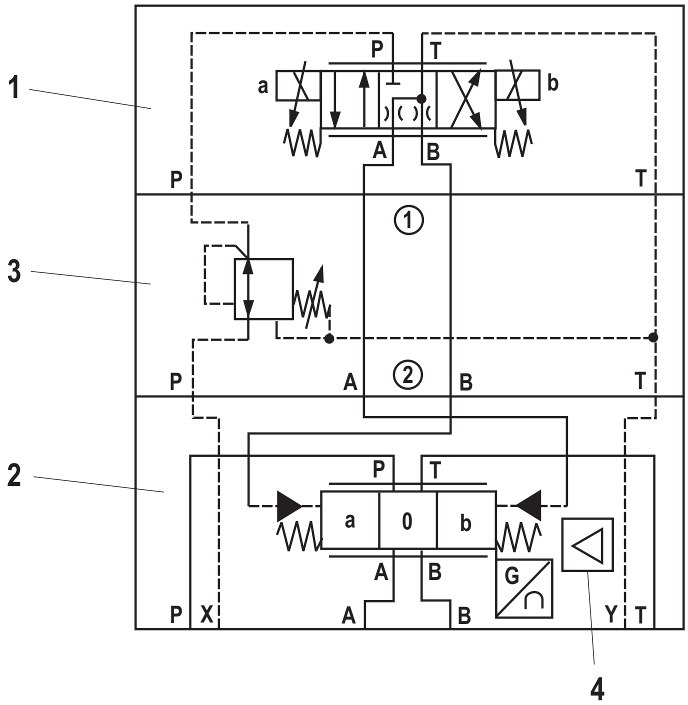
Simplified

Example:

Pilot oil supply external
Pilot oil drain external



Detailed



Example:

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

Pilot control valve type 4WRAP 6 W7.3X/G24… (1st stage)

The pilot control valve is a direct operated proportional valve. The control edge dimensions have been optimized for use as a pilot control valve for proportional directional valves type 4WRKE.

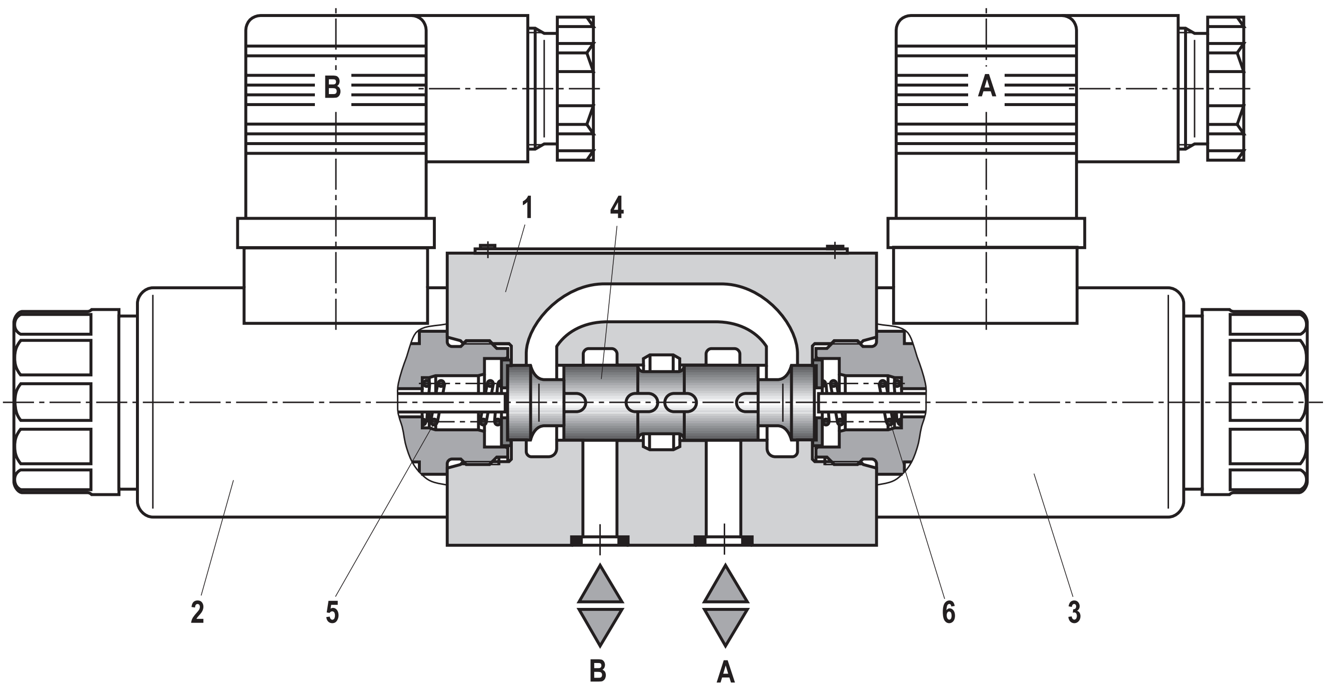
The proportional solenoids are pressure-tight, wet-pin AC solenoids with detachable coils. They transfer electric current proportionally into mechanical force. An increase of the current strength results in a correspondingly higher magnetic force. The set magnetic force remains the same during the total control stroke.

The pilot control valve mainly consists of the housing (1), the proportional solenoid (2 and 3), the valve control spool (4) and springs (5 and 6).

In a non-actuated state both actuators are connected to the tank. If one of the two solenoids (2 or 3) is excited, the magnetic force will move the valve control spool (4) towards the spring (5 or 6).

After having overcome the overlap area, the connection of one of the two actuators is blocked and the connection to the pressroom is made. There is a flow from P to the control chamber of the main stage.

Type 4WRAP 6 W7.3X/G24…



Function, section, valve particularities

Valves of type 4WRKE are 2-stage proportional directional valves.

They control the of 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 the tank via the valve control spool (2).

The main control spool (7) is connected to suitable control electronics via the inductive position transducer (9). Both the change of position of the main control spool (7) and the change of the command value at the junction summing of the amplifier create a differential voltage.

During the comparison of command 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.

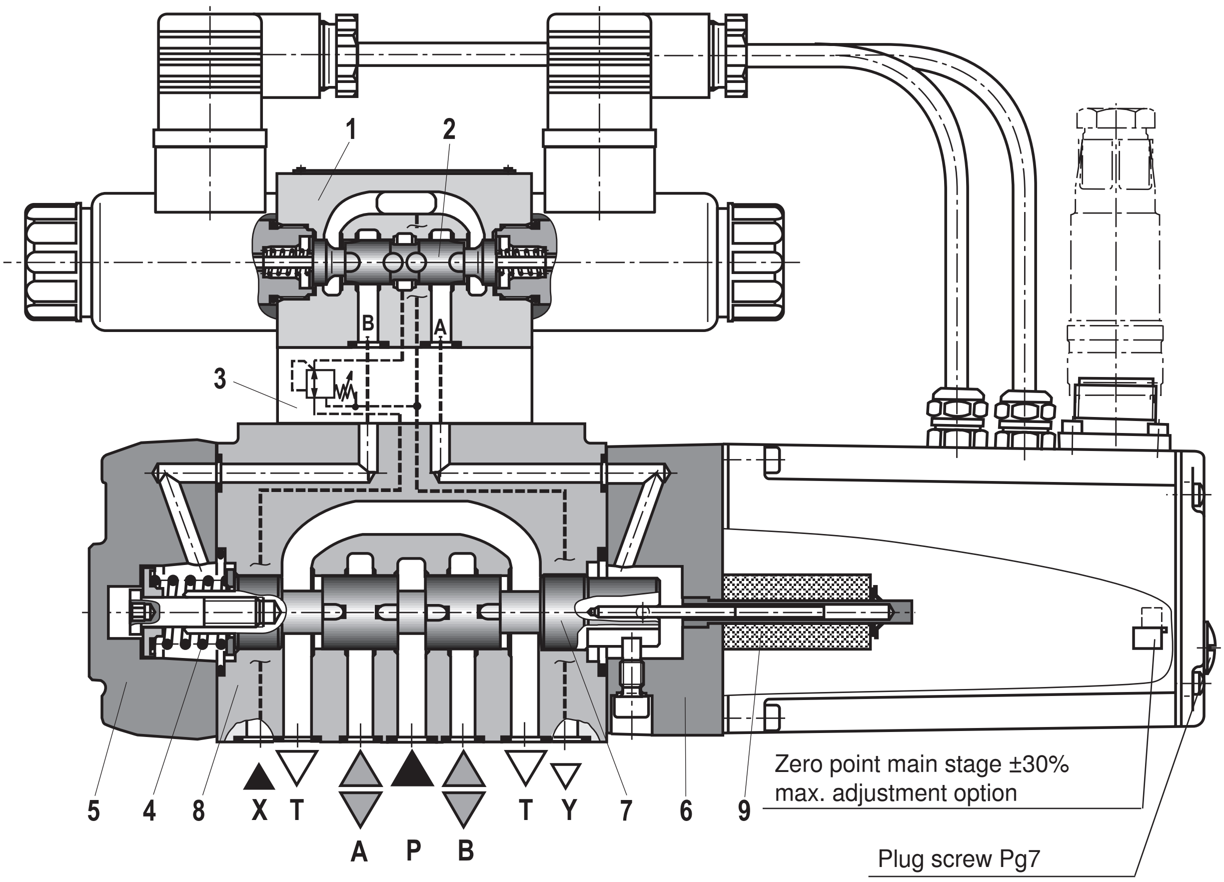
The current induces a force in the solenoid which operates the control spool via a plunger in a row. The flow which has been released via the control cross sections causes an adjustment of the main control spool.

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 a controlled state the main control spool (7) is balanced and kept in this control position.

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

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

The tank lines must not be allowed to run empty; a preload valve is to be installed in the case of a corresponding installation condition (counterbalance pressure approx. 2 bar).



Valve particularities

– The 2nd stage is mainly built up from components of our proportional valves.

– The zero point adjustment at **"zero point main stage"** is made at the factory and can be adjusted in a range of ±30% of the nominal stroke via a potentiometer in the control electronics. Access in the integrated control electronics by removing a plug screw on the front side of 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.

☞ **Notice!**

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 parameters, please consult us!)

general

Sizes	Size	10	16	25	27	32	35
Installation position and commissioning information		Preferably horizontal, see RE 07800					
Storage temperature range	°C	–20 to +80					
Ambient temperature range	°C	–20 to +50					
Weight	kg	8.7	11.2	16.8	17	31.5	34
Sine test according to DIN EN 60068-2-6:2008 [1)]		10 cycles, 10...2,000..10 Hz with logarithmic frequency changing speed of 1 oct./min, 5 to 57 Hz, amplitude 1.5 mm (p-p), 57 to 2,000 Hz, amplitude 10 g, 3 axes					
Random test according to DIN EN 60068-2-64:2009 [1)]		20…2,000 Hz, amplitude 0.05 g^2/Hz (10 g_{RMS}) 3 axes, testing time 30 min per axis					
Shock test according to DIN EN 60068-2-27:2010 [1)]		Half sine 15 g / 11 ms, 3 times in positive and 3 times in negative direction per axis, 3 axes					
Humid heat, cyclic according to DIN EN 60068-2-30:2006		Variant 2 +25 °C to +55 °C, 90% to 97% relative humidity, 2 cycles with 24 hours each					

1) The information on mechanical load applies to the fastening level of the integrated valve electronics.

hydraulic (measured at p = 100 bar with HLP46 at 40 °C ± 5 °C)

Operating pressure	Pilot control valve	Pilot oil supply	bar	25 to 315					
	Main valve, connection P, A, B		bar	Up to 315	Up to 350	Up to 350	Up to 210	Up to 350	Up to 350
Return flow pressure	Connection T	Pilot oil drain, internal	bar	Static < 10 (pilot control valve)					
		Pilot oil drain, external	bar	Up to 315	Up to 250	Up to 250	Up to 210	Up to 250	Up to 250
	Connection Y		bar	Static < 10 (pilot control valve)					
Rated flow q_{Vnom} ±10% with Δp = 10 bar Δp = valve pressure differential			l/min	– 25 50 100	125 150 200 220	– – 220 350	– – – 500	– – 400 600	– – – 1000
Recommended maximum flow			l/min	170	460	870	1000	1600	3000
Pilot oil flow at port X and/or Y with stepped input signal from 0 to 100% (315 bar)			l/min	4.1	8.5	11.7	11.7	13.0	13.0
Hydraulic fluid				See table page 7					
Maximum admissible degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)				Pilot control valve: Class 17/15/12 [1)] Main stage: Class 20/18/15 [1)]					
Hydraulic fluid temperature range			°C	–20 to +80, preferably +40 to +50					
Viscosity range			mm^2/s	20 to 380, preferably 30 to 45					
Hysteresis			%	≤ 1					
Response sensitivity			%	≤ 0.5					

1) The cleanliness classes stated for the components need to be maintained in hydraulic systems. Effective filtration prevents faults and simultaneously increases the life cycle of the components.
For the selection of the filters see www.boschrexroth.com/filter

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

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP	NBR, FKM	DIN 51524
Flame-resistant	– containing water	HFC (Fuchs HYDROTHERM 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922
Phosphoric acid ester		HFD-R	FKM	

Important information on hydraulic fluids!
- For more information and data on the use of other hydraulic fluids refer to data sheet 90220 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 process and operating medium used must be 40 K greater than the maximum solenoid surface temperature.
- **Flame-resistant – containing water**: Maximum pressure differential per control edge 175 bar. Pressure pre-loading at the tank port > 20% of the pressure differential; otherwise, increased cavitation.
- Life cycle as compared to operation with mineral oil HL, HLP 50% to 100%

electrical

Voltage type		Direct voltage
Signal type		Analog
Maximum power	W	72 (average = 24 W)
Electrical connection		Mating connector according to DIN EN 175201-804
Protection class of the valve according to EN 60529		IP65 with mating connector mounted and locked
Control electronics		Integrated in the valve, see page 8

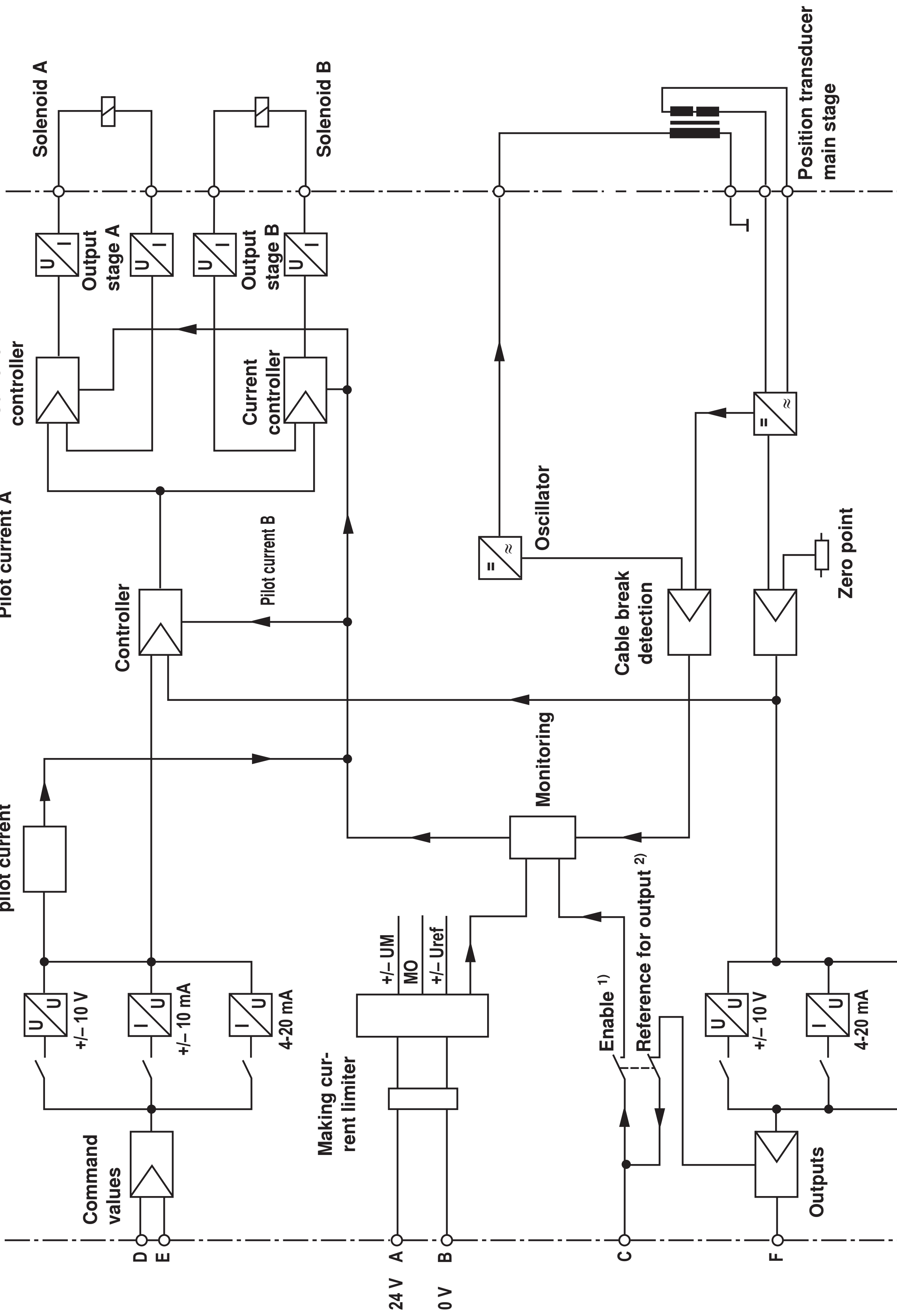
Connector pin assignment	Contact	Signal with A1	Signal with F1	Signal with A5
Supply voltage	A	24 VDC (18 to 35 VDC); I_{max} = 1.5 A; impulse load ≤ 3 A		
	B	0 V		
Reference (actual value)	C	Reference potential for actual value (contact "F")		Enable 4 to 24 V
Differential amplifier input	D	±10 V	4 to 20 mA	±10 V
(Command value)	E	0 V reference potential to pin D		0 V reference potential for pin D and F
Measuring output (actual value)	F	±10 V	4 to 20 mA	±10 V
	PE	Connected to cooling element and valve housing		

Command value: Reference potential at E and positive command value at D result in flow from P → A and B → T.
Reference potential at E and negative command value at D result in flow from P → B and A → T.

Connection cable: Recommendation: – Up to 25 m line length: Type LiYCY 7 x 0.75 mm^2
– Up to 50 m line length: Type LiYCY 7 x 1.0 mm^2
Only connect the shield to PE on the supply side.

Notice: **Electric signals taken out via valve electronics (e.g. actual value) must not be used for switching off safety-relevant machine functions!**

Block diagram of the integrated electronics (OBE)



1) Only available for A5 electronics

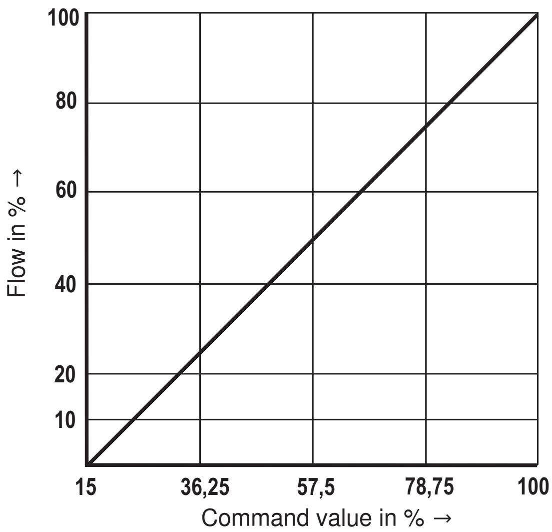
2) Only available for A1 and F1 electronics

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

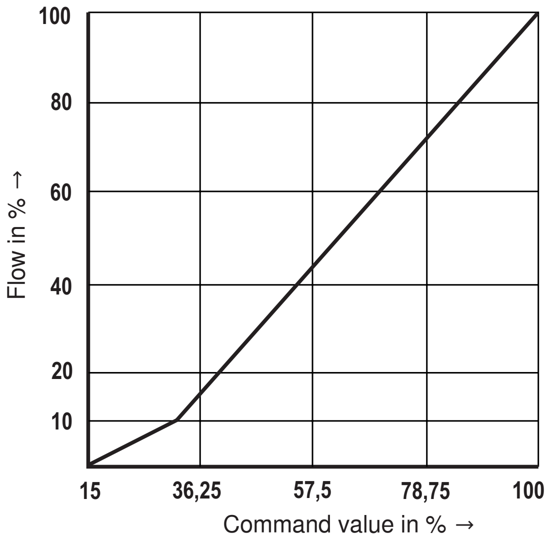
Flow command value function with e.g.
P → A / B → T 10 bar valve pressure differential or
P → A or A → T 5 bar per control edge

Control spool E, W, and R

Control spool with characteristic curve **L**

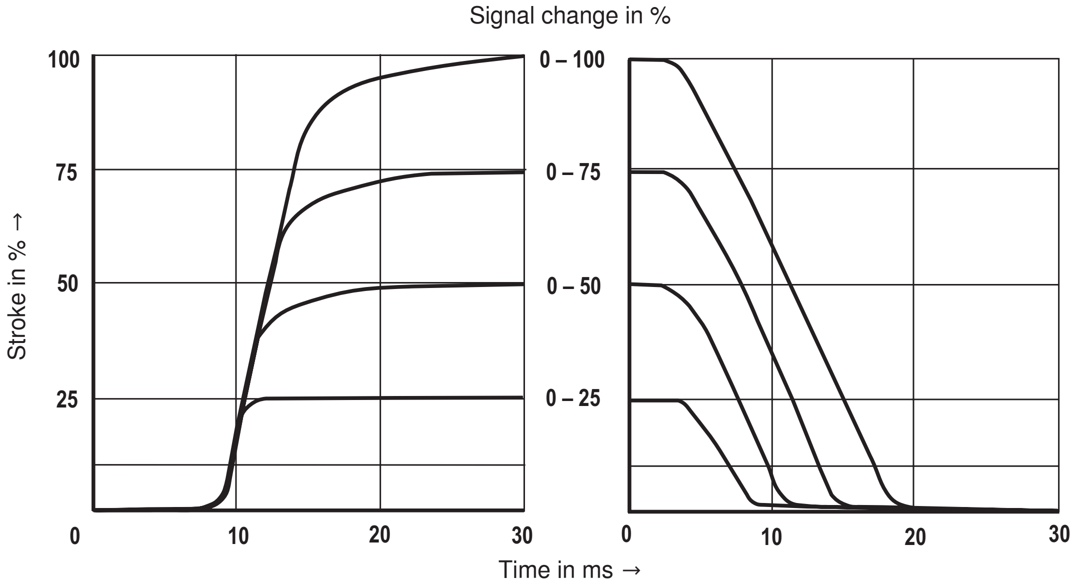


Control spool with characteristic curve **P**



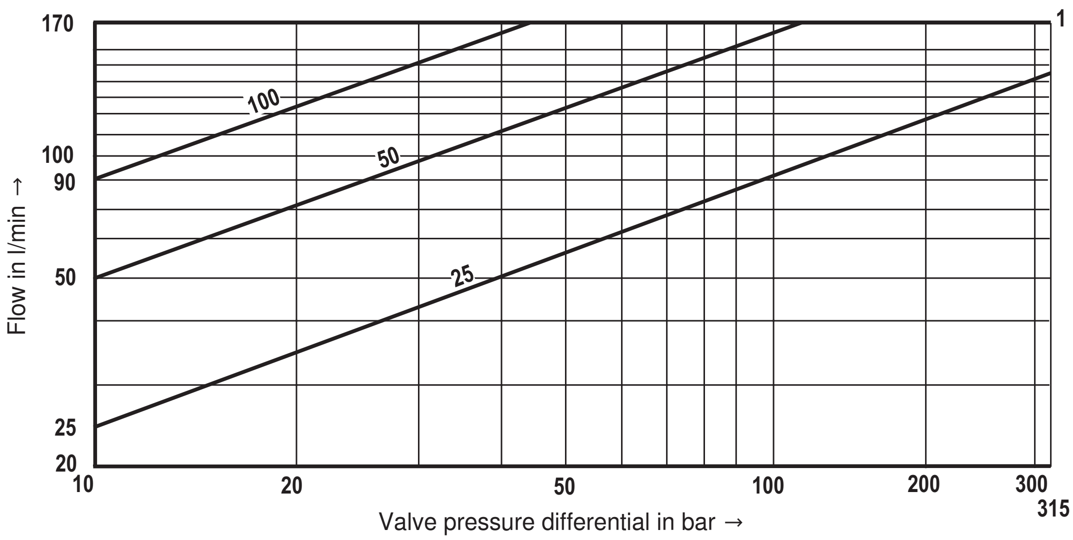
Characteristic curves: Size 10 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Transition function with stepped electric input signals



Measured with
p_S = 100 bar

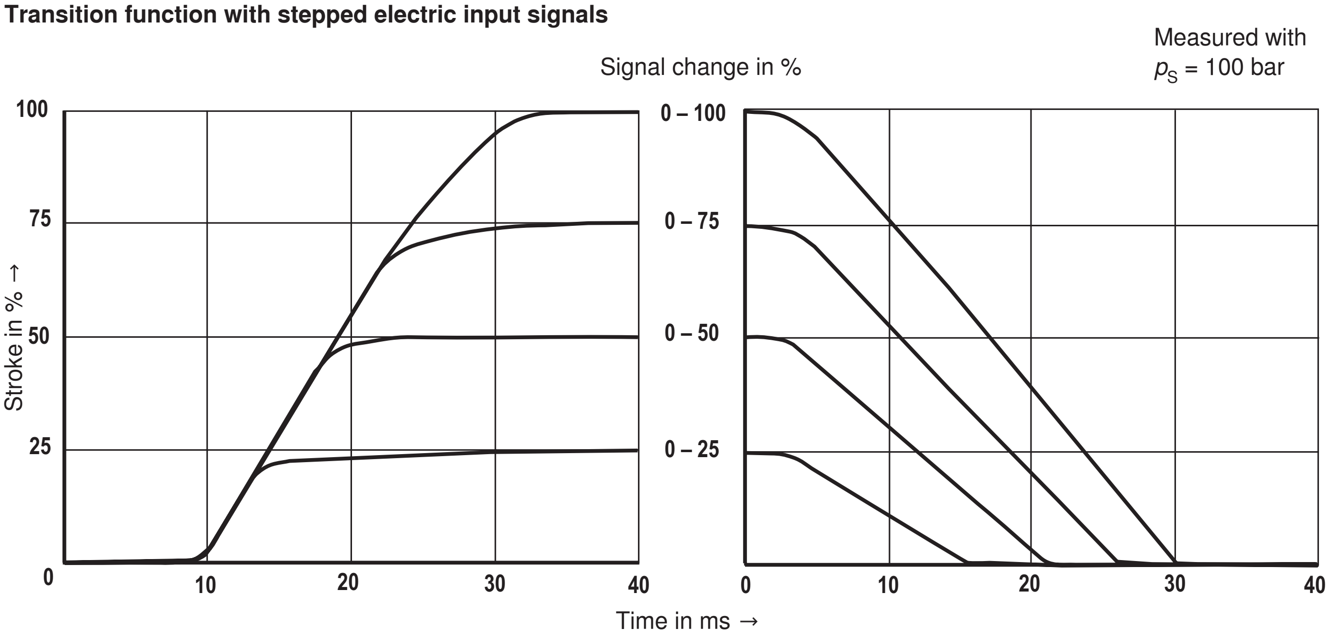
Flow/load function with maximum valve opening
(tolerance ±10%)



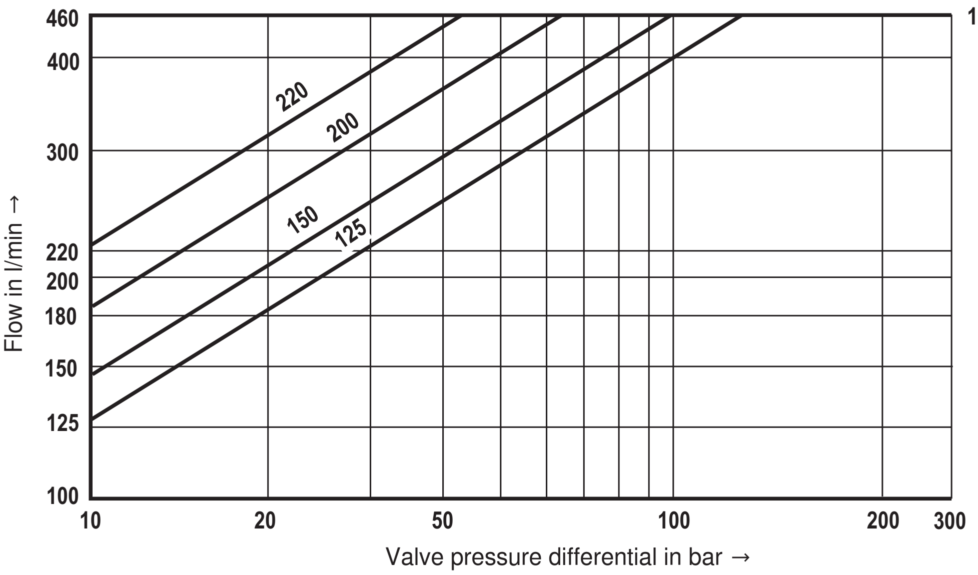
1 = Recommended flow limitation (flow velocity 30 m/s) in the valve connection bores

Characteristic curves: Size 16 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Transition function with stepped electric input signals



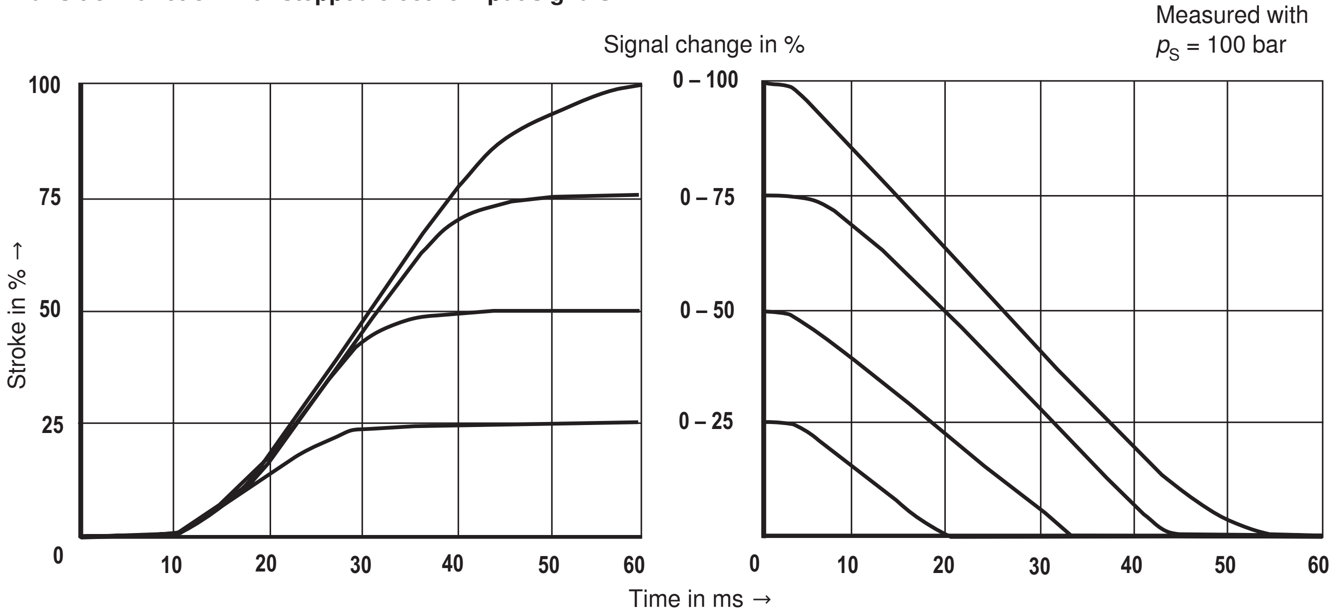
Flow/load function with maximum valve opening
(tolerance ±10%)



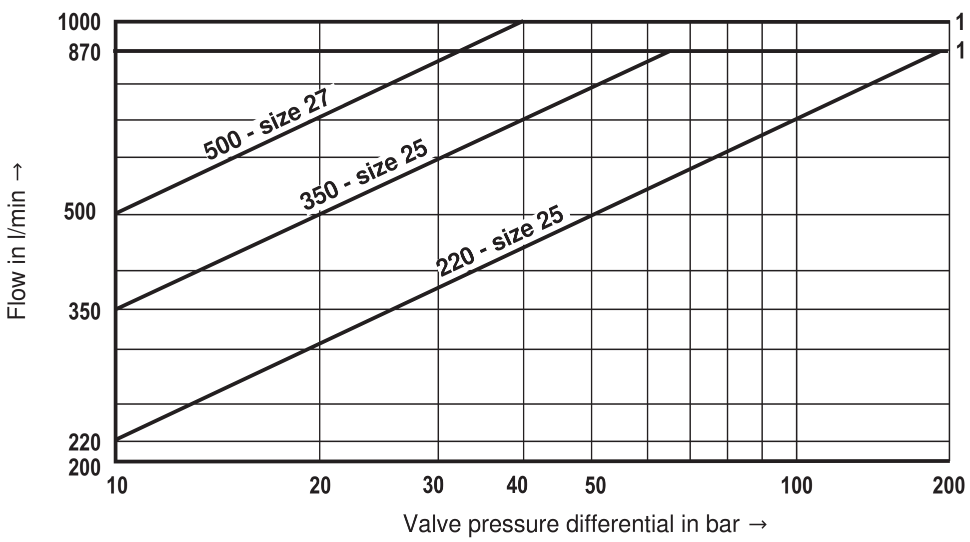
1 = Recommended flow limitation (flow velocity 30 m/s) in the valve connection bores

Characteristic curves: Size 25 and 27 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Transition function with stepped electric input signals



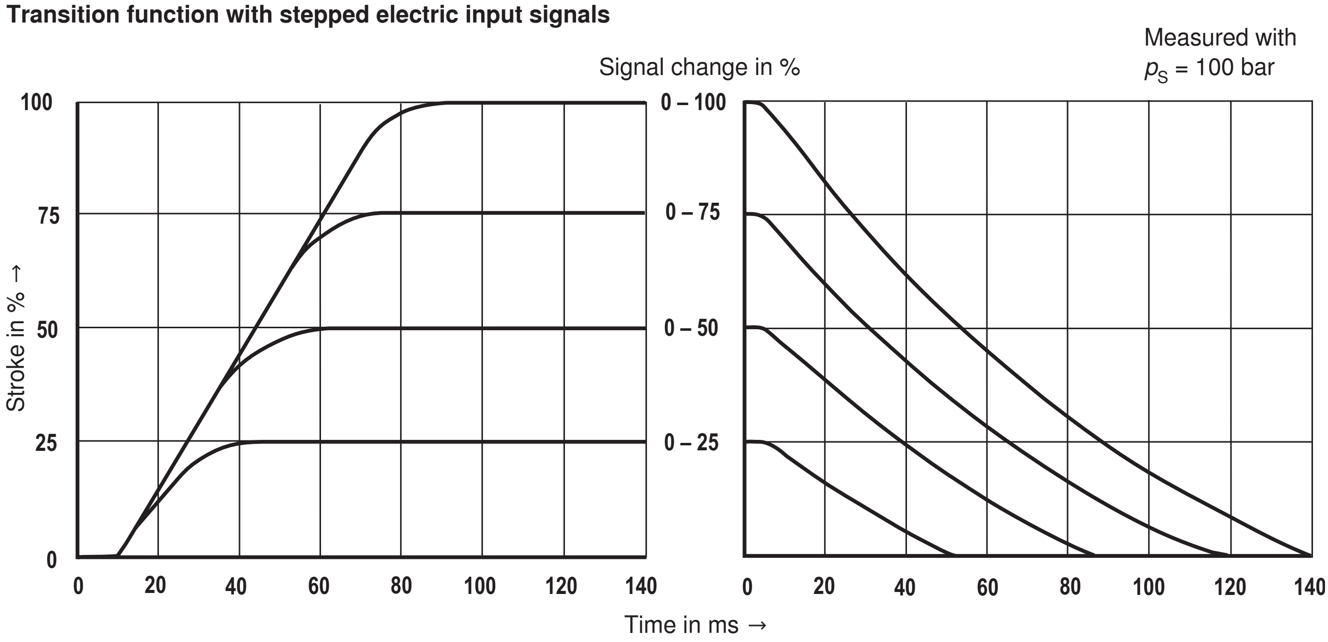
Flow/load function with maximum valve opening
(tolerance ±10%)



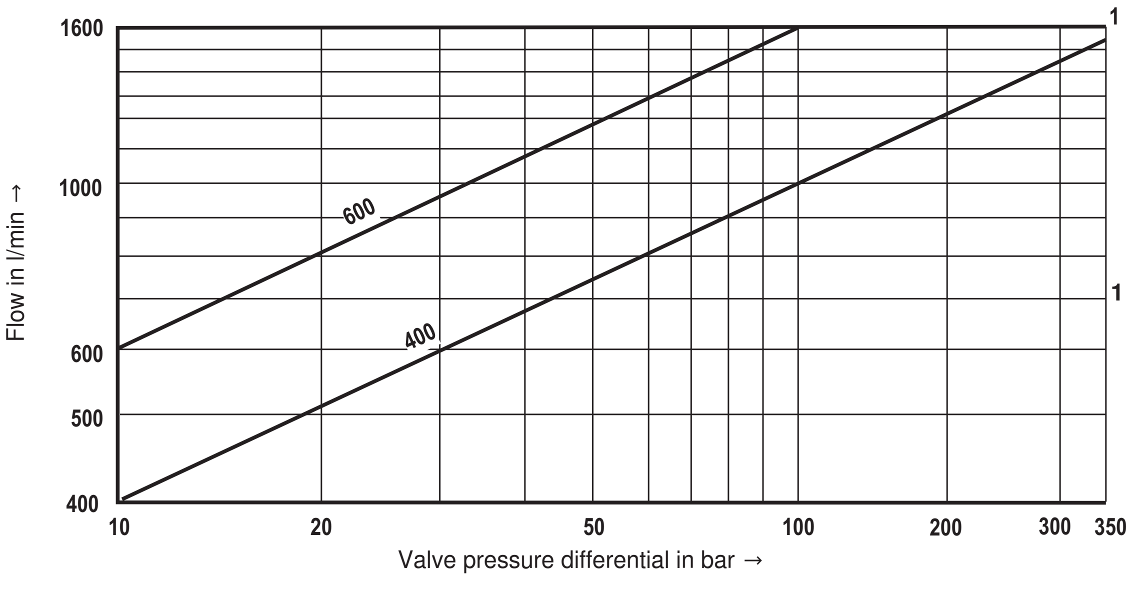
1 = Recommended flow limitation (flow velocity 30 m/s) in the valve connection bores

Characteristic curves: Size 32 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Transition function with stepped electric input signals



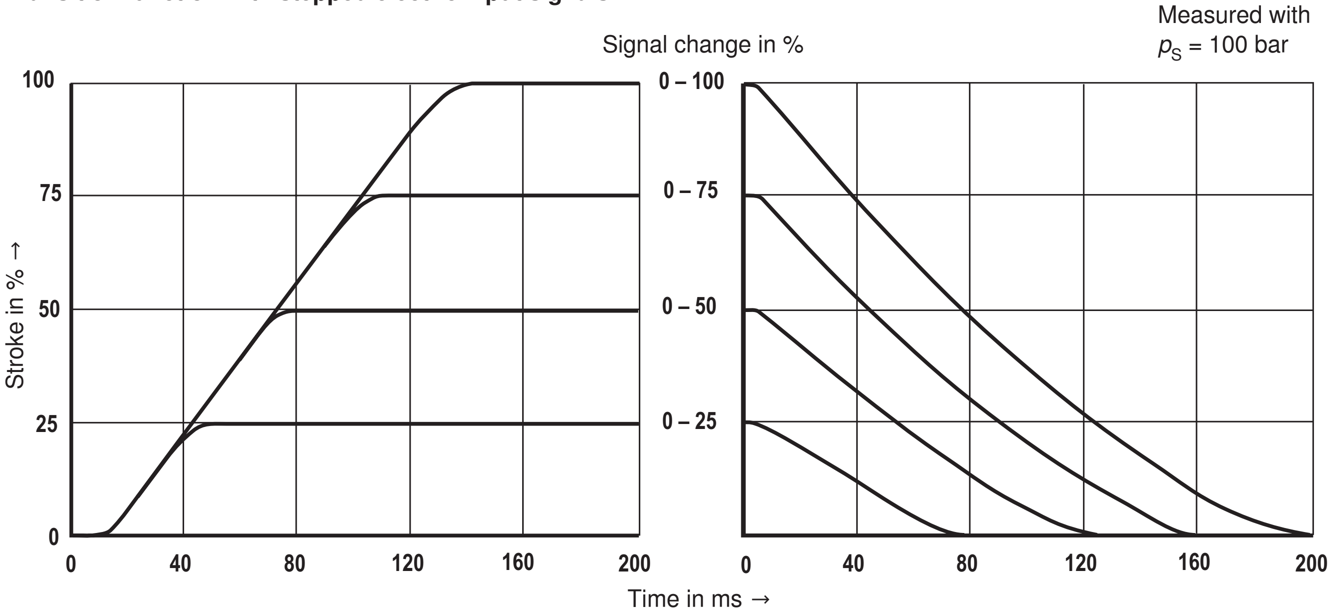
Flow/load function with maximum valve opening
(tolerance ±10%)



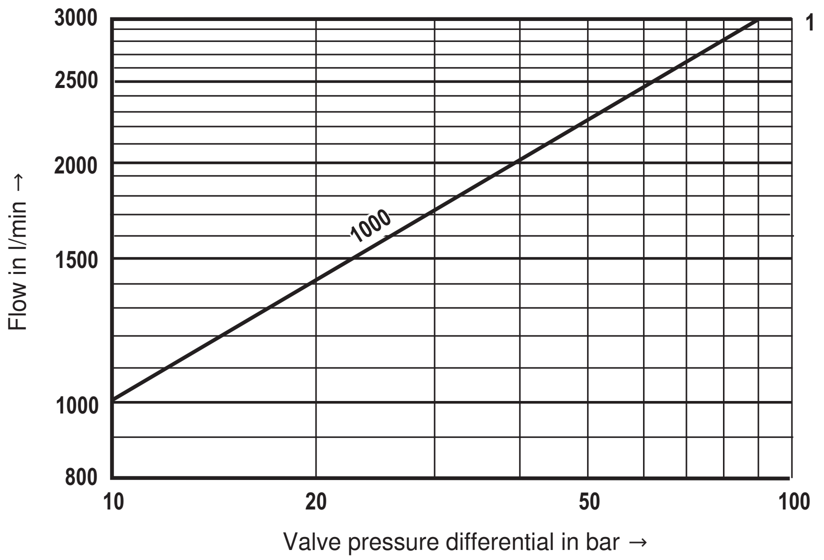
1 = Recommended flow limitation (flow velocity 30 m/s) in the valve connection bores

Characteristic curves: Size 35 (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Transition function with stepped electric input signals

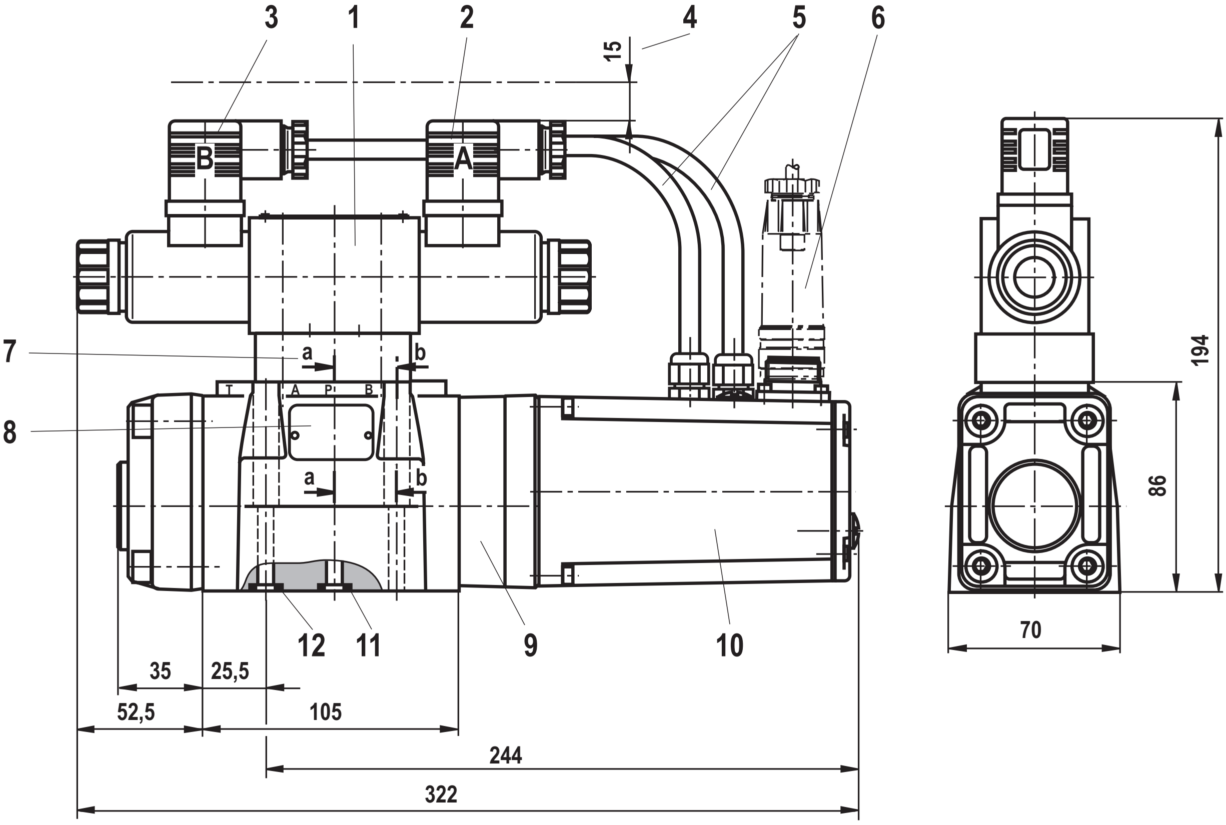


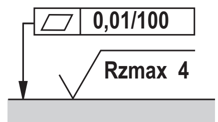
Flow/load function with maximum valve opening
(tolerance ±10%)



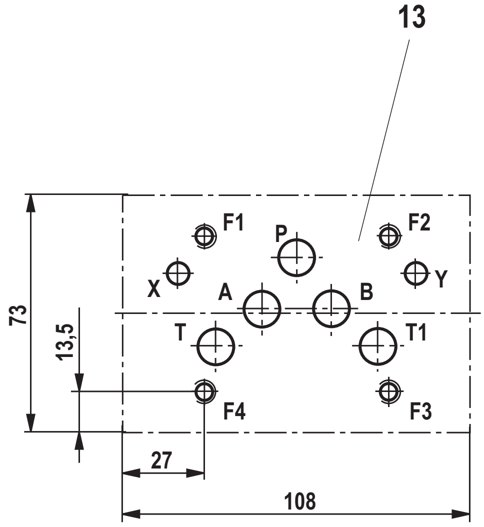
1 = Recommended flow limitation (flow velocity 30 m/s) in the valve connection bores

Dimensions: Size 10 (dimensions in mm)





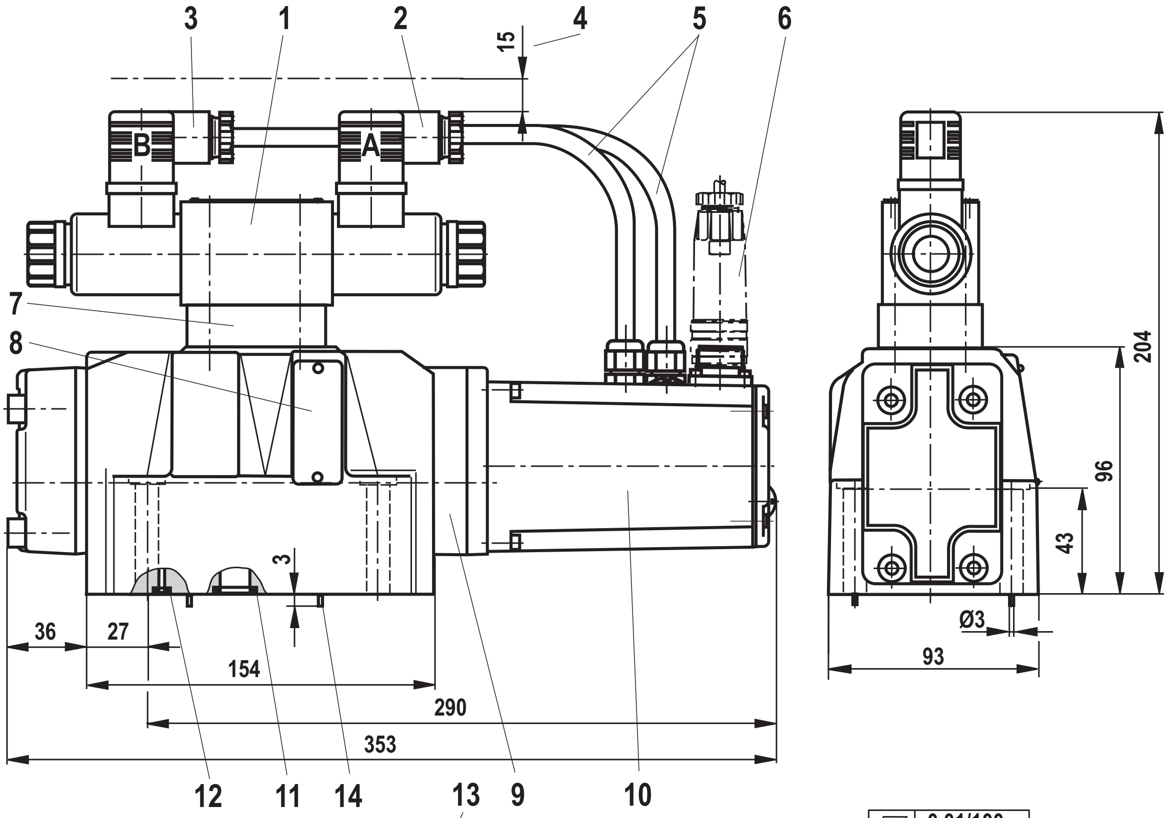
Required surface quality of the valve contact surface

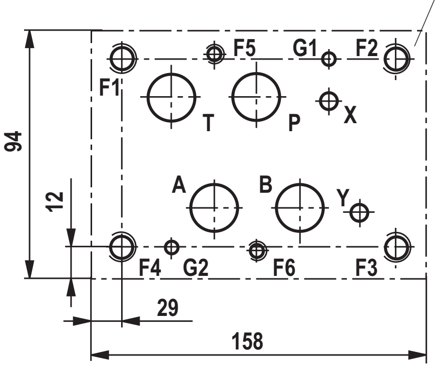


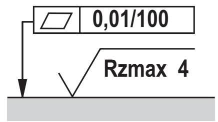
1 Pilot control valve
2 Mating connector "A", color gray
3 Mating connector "B", color black
4 Space required for connection cable and to remove the mating connector
5 Wiring
6 Mating connector, separate order, see page 21
7 Pressure reducing valve
8 Name plate
9 Main valve
10 Integrated electronics (OBE)
11 Identical seal rings for connection A, B, P, T
12 Identical seal rings for connection X, Y
13 Processed valve contact surface, porting pattern according to ISO 4401-05-05-0-05 (connection X, Y, as required)

Subplates and valve mounting screws see page 21

Dimensions: Size 16 (dimensions in mm)





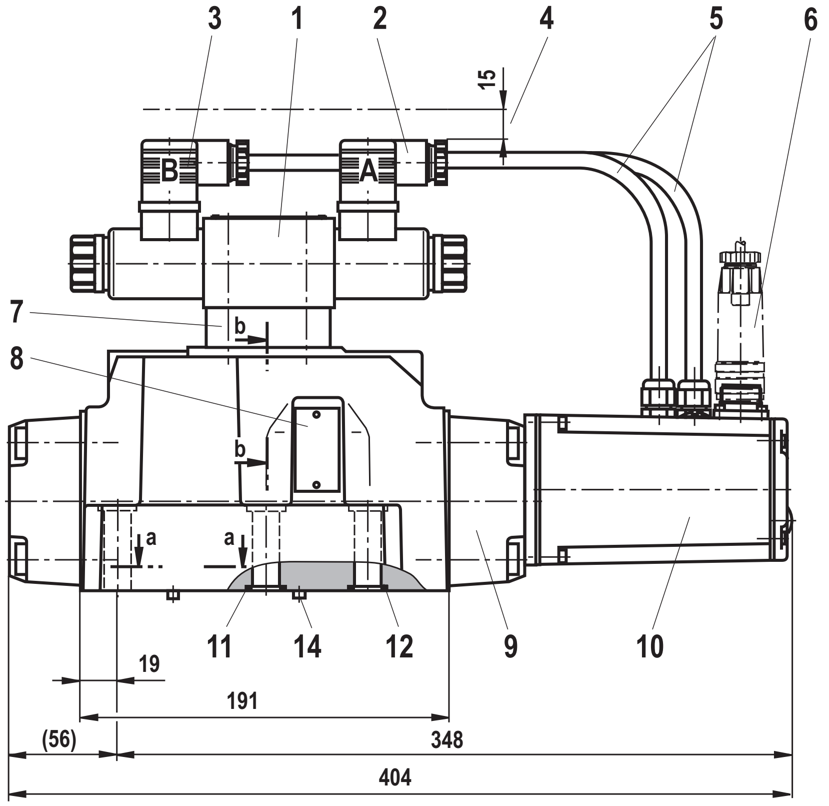


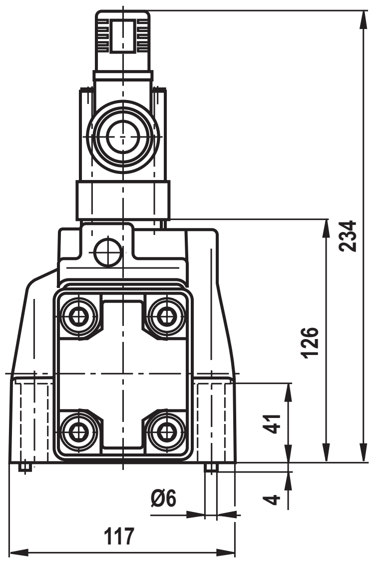
Required surface quality of the valve contact surface

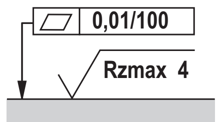
1 Pilot control valve
2 Mating connector "A", color gray
3 Mating connector "B", color black
4 Space required for connection cable and to remove the mating connector
5 Wiring
6 Mating connector, separate order, see page 21
7 Pressure reducing valve
8 Name plate
9 Main valve
10 Integrated electronics (OBE)
11 Identical seal rings for connection A, B, P, T
12 Identical seal rings for connection X, Y
13 Processed valve contact surface, porting pattern according to ISO 4401-07-07-0-05 (connection X, Y as required) deviating from the standard:
- Connection A, B, T and P Ø 20mm
14 Locking pin

Subplates and valve mounting screws see page 21

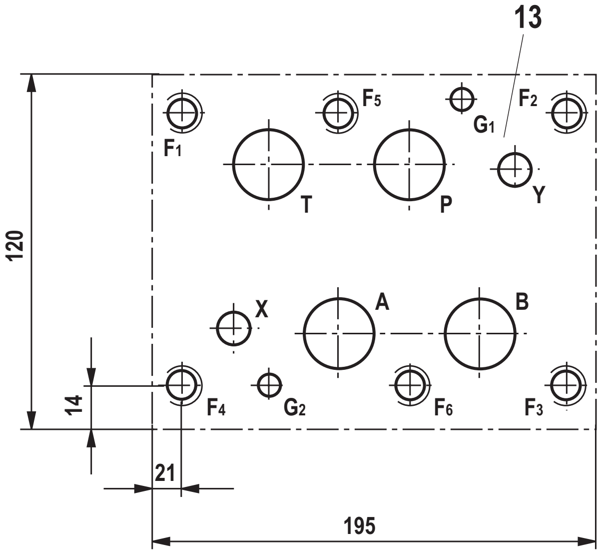
Dimensions: Size 25 (dimensions in mm)







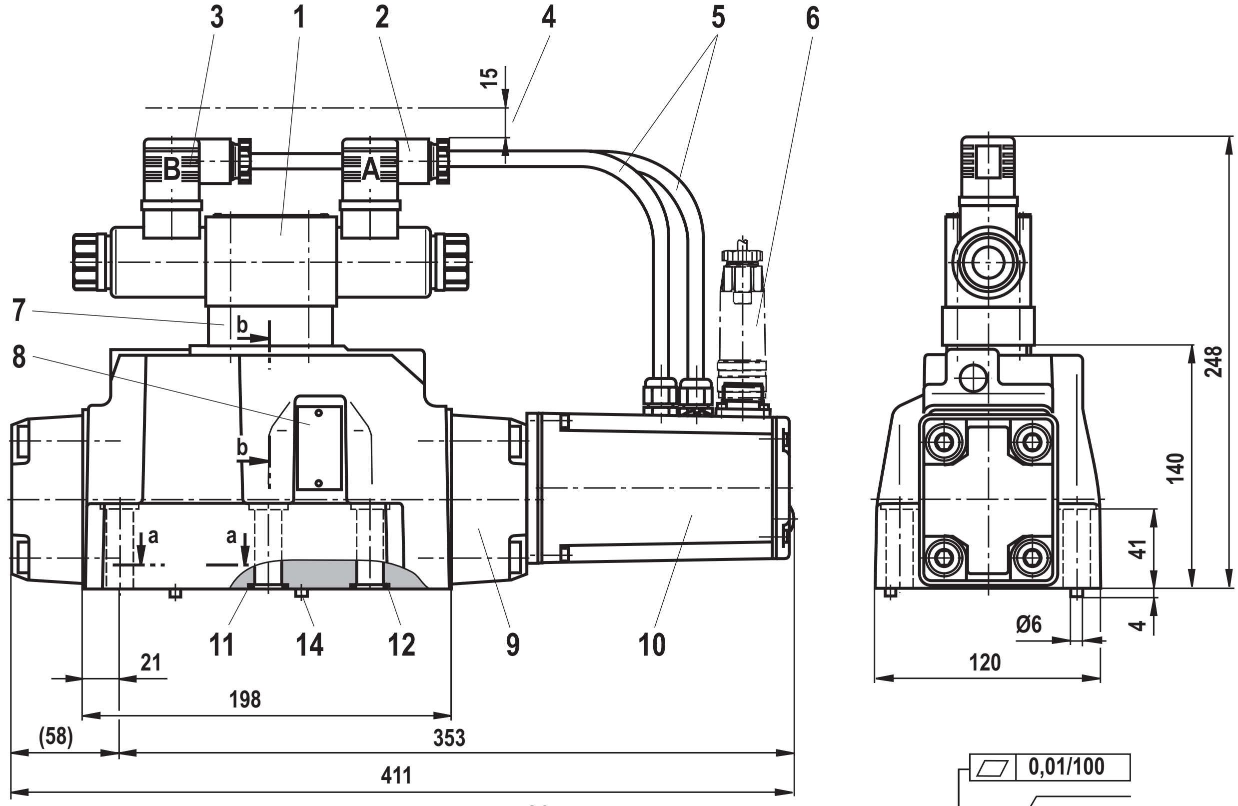
Required surface quality of the valve contact surface

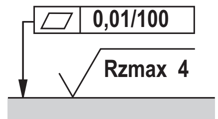


1 Pilot control valve
2 Mating connector "A", color gray
3 Mating connector "B", color black
4 Space required for connection cable and to remove the mating connector
5 Wiring
6 Mating connector, separate order, see page 21
7 Pressure reducing valve
8 Name plate
9 Main valve
10 Integrated electronics (OBE)
11 Identical seal rings for connection A, B, P, T
12 Identical seal rings for connection X, Y
13 Processed valve contact surface, porting pattern according to ISO 4401-08-08-0-05 (connection X, Y, as required)
14 Locking pin

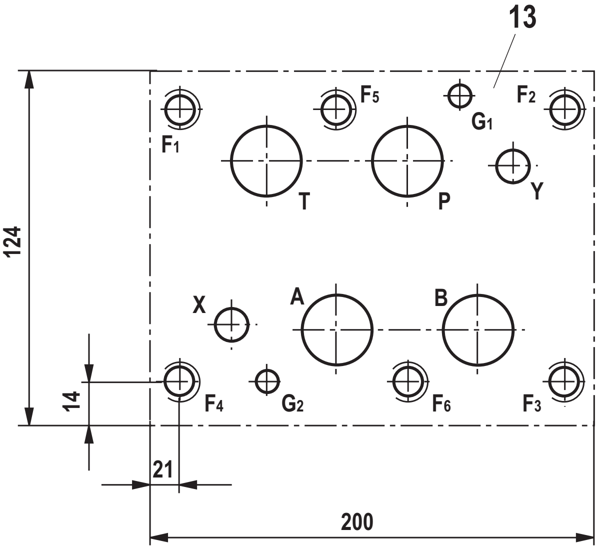
Subplates and valve mounting screws see page 21

Dimensions: Size 27 (dimensions in mm)





Required surface quality of the valve contact surface

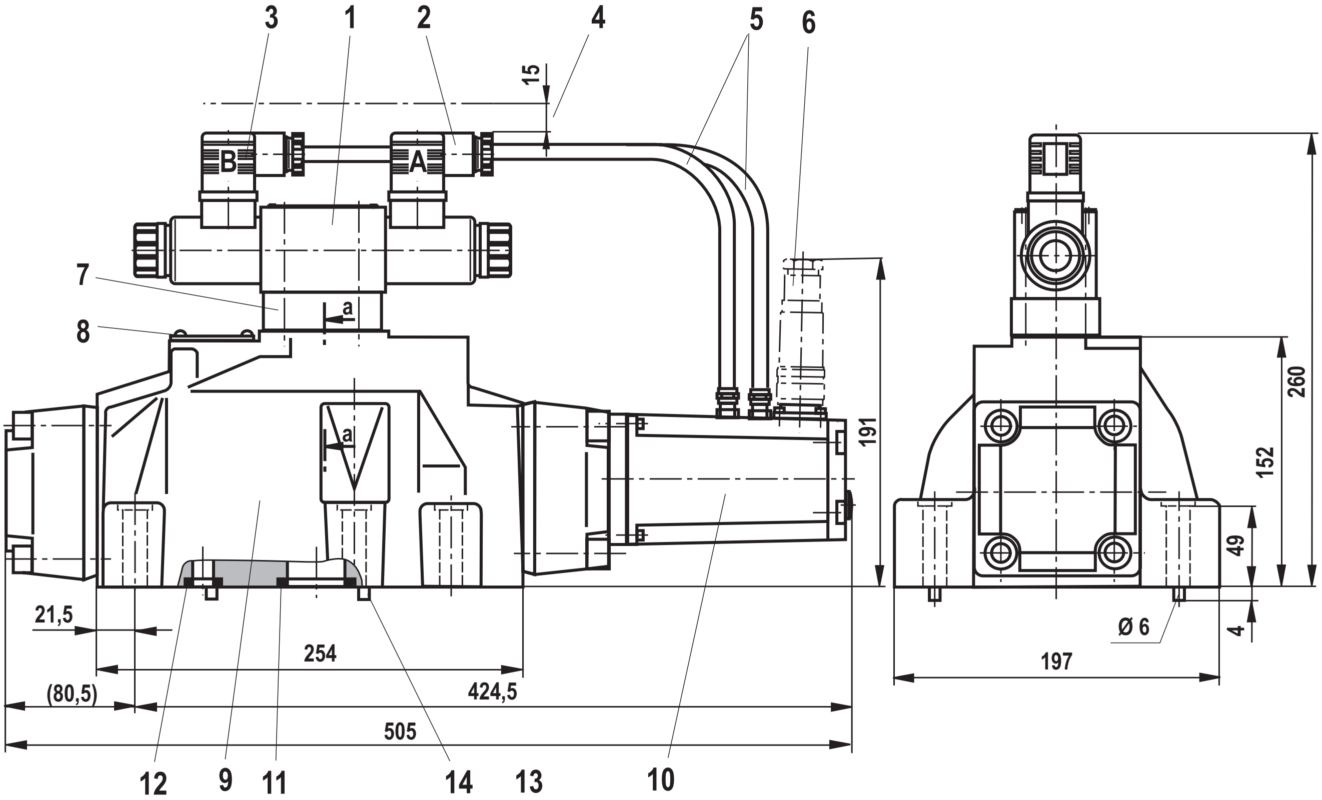


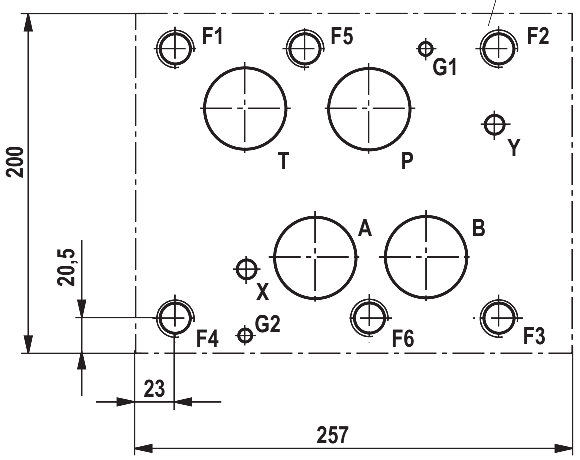
1 Pilot control valve
2 Mating connector "A", color gray
3 Mating connector "B", color black
4 Space required for connection cable and to remove the mating connector
5 Wiring
6 Mating connector, separate order, see page 21
7 Pressure reducing valve
8 Name plate
9 Main valve
10 Integrated electronics (OBE)
11 Identical seal rings for connection A, B, P, T
12 Identical seal rings for connection X, Y
13 Processed valve contact surface, porting pattern according to ISO 4401-08-08-0-05 (connection X, Y as required) deviating from the standard:
- Connection A, B, T and P Ø 32 mm

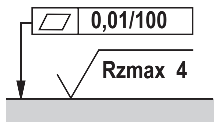
14 Locking pin

Subplates and valve mounting screws see page 21

Dimensions: Size 32 (dimensions in mm)







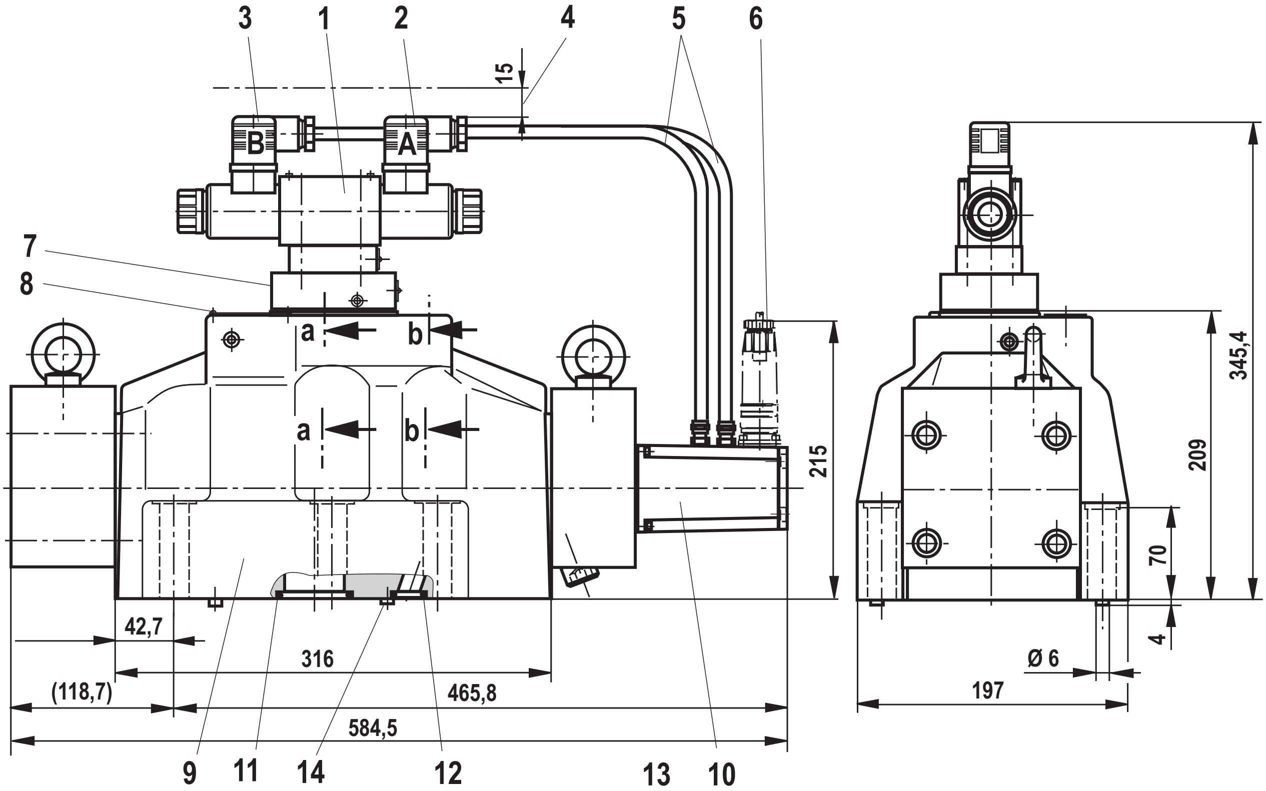
Required surface quality of the valve contact surface

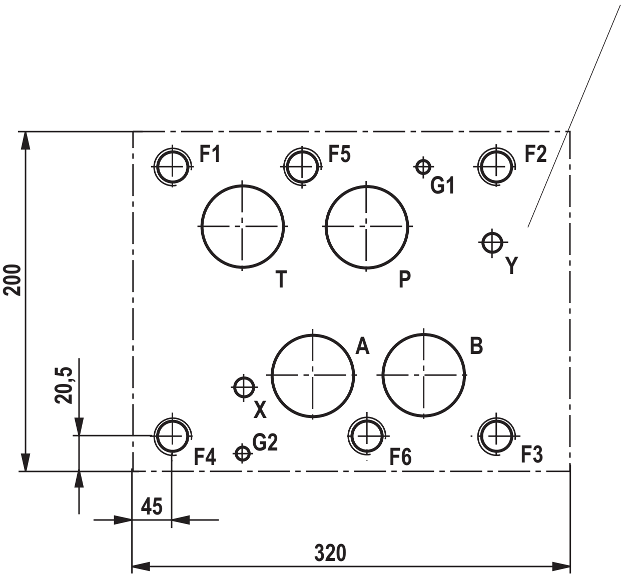
1 Pilot control valve
2 Mating connector "A", color gray
3 Mating connector "B", color black
4 Space required for connection cable and to remove the mating connector
5 Wiring
6 Mating connector, separate order, see page 21
7 Pressure reducing valve
8 Name plate
9 Main valve
10 Integrated electronics (OBE)
11 Identical seal rings for connection A, B, P, T
12 Identical seal rings for connection X, Y
13 Processed valve contact surface, porting pattern according to ISO 4401-10-09-0-05 (connection X, Y as required) deviating from the standard:
- Connection, B, T and P Ø 38 mm

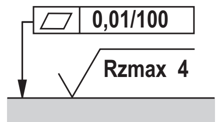
14 Locking pin

Subplates and valve mounting screws see page 21

Dimensions: Size 35 (dimensions in mm)







Required surface quality of the valve contact surface

1 Pilot control valve
2 Mating connector "A", color gray
3 Mating connector "B", color black
4 Space required for connection cable and to remove the mating connector
5 Wiring
6 Mating connector, separate order, see page 21
7 Pressure reducing valve
8 Name plate
9 Main valve
10 Integrated electronics (OBE)
11 Identical seal rings for connection A, B, P, T
12 Identical seal rings for connection X, Y
13 Processed valve contact surface, porting pattern according to ISO 4401-10-09-0-05 (connection X, Y as required) deviating from the standard:
  - Connection A, B, T and P Ø 50 mm
14 Locating pins

Subplates and valve mounting screws see page 21

Dimensions

Hexagon socket head cap screws		Material number
Size 10	4x ISO 4762 - M6 x 45 - 10.9-flZn-240h-L Tightening torque M_A = 13.5 Nm ±10% or 4x ISO 4762 - M6 x 45 - 10.9 Tightening torque M_A = 15.5 Nm ±10%	R913000258
Size 16	2x ISO 4762 - M6 x 60 - 10.9-flZn-240h-L Tightening torque M_A = 12.2 Nm ±10% 4x ISO 4762 - M10 x 60 - 10.9-flZn-240h-L Tightening torque M_A = 58 Nm ±20% or 2x ISO 4762 - M6 x 60 - 10.9 Tightening torque M_A = 15.5 Nm ±10% 4x ISO 4762 - M10 x 60 - 10.9 Tightening torque M_A = 75 Nm ±20%	R913000115 R913000116
Sizes 25 and 27	6x ISO 4762 - M12 x 60 - 10.9-flZn-240h-L Tightening torque M_A = 100 Nm ±20% or 6x ISO 4762 - M12 x 60 - 10.9 Tightening torque M_A = 130 Nm ±20%	R913000121
Size 32	6x ISO 4762 - M20 x 80 - 10.9-flZn-240h-L Tightening torque M_A = 340 Nm ±20% or 6x ISO 4762 - M20 x 80 - 10.9 Tightening torque M_A = 430 Nm ±20%	R901035246
Size 35	6x ISO 4762 - M20 x 100 - 10.9-flZn-240h-L Tightening torque M_A = 465 Nm ±20% or 6x ISO 4762 - M20 x 100 - 10.9 Tightening torque M_A = 610 Nm ±20%	R913000386

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

Subplates	Data sheet
Size 10	45054
Size 16	45056
Sizes 25 and 27	45058
Sizes 32 and 35	45060

Accessories (not included in the scope of delivery)

Mating connectors		Material number
Mating connector for high-response valve	DIN EN 175201-804, see data sheet 08006	e.g. R900021267 (plastic) e.g. R900223890 (metal)

Notes

Bosch Rexroth AG
Industrial Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

Notes

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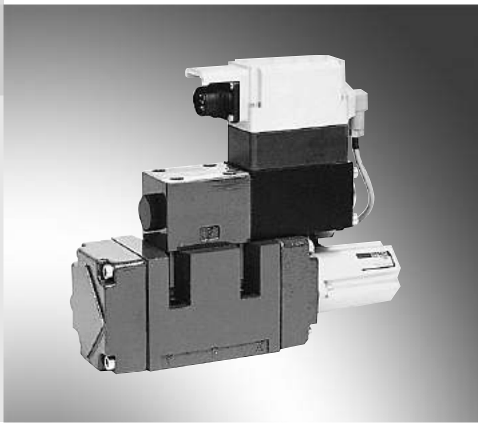
www.boschrexroth.de

4/3 directional control valve, pilot operated, with electric position feedback and integrated electronics (OBE)

RE 29077/03.10
Replaces: 01.09

Type 4WRVE 10...27, symbols V, V1

Sizes 10, 16, 25, 27
Component series 2X
Maximum operating pressure P, A, B 350 bar (size 27: 280 bar)
Rated flow 40...430 l/min (Δp = 10 bar)



Type 4WRVE 10

Table of contents

Features

– Pilot operated high-response 4/3 directional control valve size 10 to size 27, with control spool and bushing in servo quality
– Integrated electronics (OBE) with position controller for pilot control and main stage, calibrated in the factory
– Main stage in servo quality with position feedback
– Flow characteristics
  • M = progressive with fine control edge
  • P = inflected characteristic curve
  • L = linear
– Electric port 11P+PE
  Differential amplifier signal input with interface B5 ±10 V

Information on available spare parts:
www.boschrexroth.com/spc

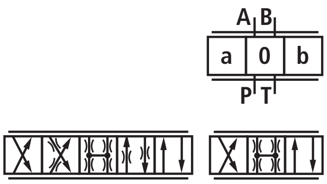
Ordering code

4WRV	E				–2X/	G24		K0/	B5	M	*

with **integrated** electronics = **E**

Size = **10**
= **16**
= **25**
= **27** [1]

Control spool symbols
4/3 directional design



= **V, V1**

For V1:
P → A: q_V B → T: $q_V/2$
P → B: $q_V/2$ A → T: q_V

Rated flow
at 10 bar valve pressure differential
(5 bar/control edge)

Size 10
- 40 l/min [2) = **40**
- 55 l/min [3] = **55**
- 70 l/min [2] = **70**
- 85 l/min [3] = **85**

Size 16
- 90 l/min [2] = **90**
- 120 l/min [3] = **120**
- 150 l/min [2] = **150**
- 200 l/min [3] = **200**

Size 25
- 300 l/min [2] = **300**
- 370 l/min [3] = **370**

Size 27
- 430 l/min [1] [3] = **430**

Flow characteristics
- **M =** Progressive with linear fine control (up to 20 %)
- **P =** Inflected characteristic curve, linear (inflection at 40 %)
- **L =** Linear

2X = Component series 20 to 29
(unchanged installation and connection dimensions)

Supply voltage of the electronics
G24 = +24 V direct current

Pilot oil supply "x", pilot oil return "y"

No code =	"x" = external,	"y" =external
E =	"x" = internal,	"y" =external
ET =	"x" = internal,	"y" = internal
T =	"x" = external,	"y" = internal

Electrical connection
K0 = without mating connector,
with unit connector
according to DIN 43563-AM6
Mating connector – separate order

Interface of the control electronics
B5 = Command value input ±10 V

Seal material
M = NBR seals
suitable for mineral oils
(HL, HLP)
according to DIN 51524

Further details
in the plain text

[1] Size 27 is the high-flow version of size 25, the connection bores P, A, B, T are designed with Ø32 mm in the main stage. In the manifold, ports P, A, B, T can be drilled with max. Ø30 mm in deviation from standard ISO 4401-08-08-0-05. Thus, the valves allow for higher flow values $Q_A : Q_B$

[2] Q_N: Flow characteristics "P"

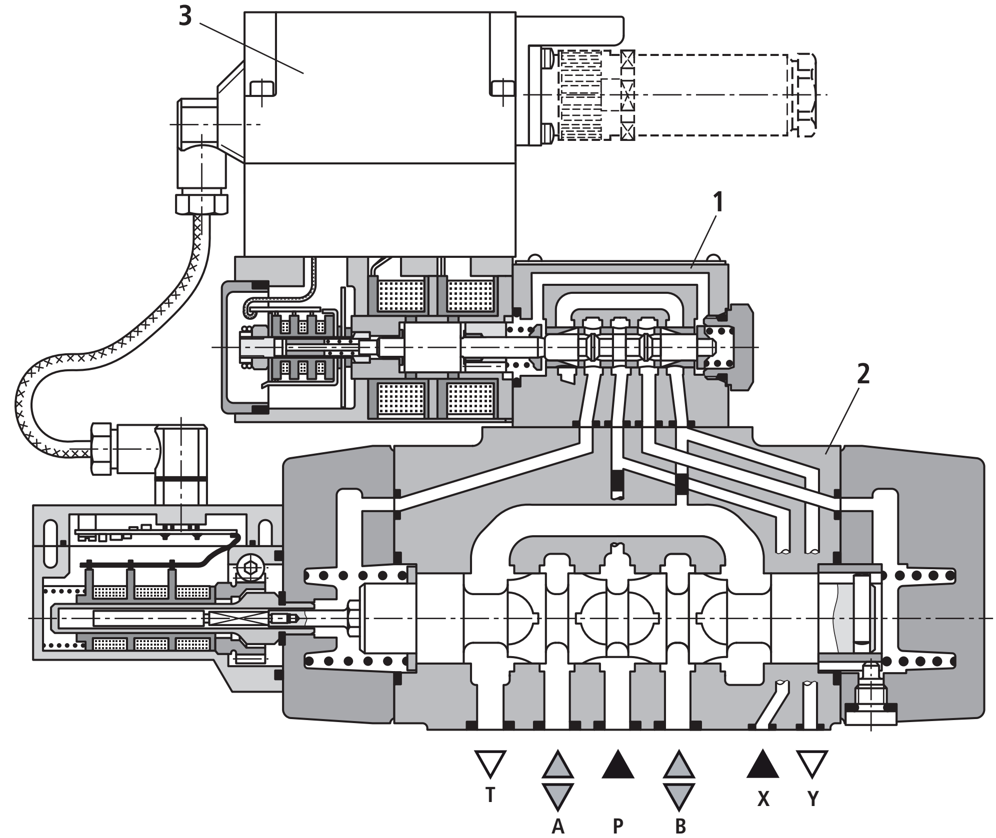
[3] Q_N: Flow characteristics "M" or "L"

Function, section

Structure

The valve consists of 3 main assemblies:

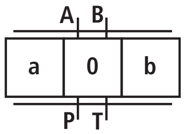
- Pilot control valve (1) with control spool and bushing, return springs, double stroke solenoid and inductive position transducer
- Main stage (2) with centering springs and position feedback
- Integrated control electronics (3)

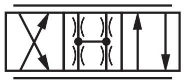


Functional description

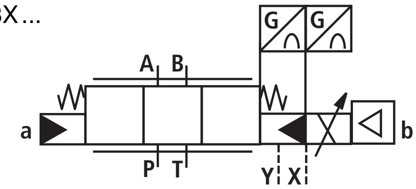
In the integrated electronics, the specified command value is compared with the actual position value of the main stage control spool. In case of control deviations, the double stroke solenoid is activated which adjusts the pilot control spool due to the changed magnetic force. The flow released through the control cross-sections causes the displacement of the main control spool, the stroke/control cross-section of which is controlled proportionally to the command value. If the command value is 0 V, the electronic controls the control spool of the main stage in the center position.
The pilot control valve is supplied with the pilot oil either internally through port P or externally through port X. The return to the tank can be implemented internally via port T or externally via port Y.
If deactivated or in case of no release, the pilot control valve is undefined in P-B/A-T (preferred) or P-A/B-T, the main stage can be completely controlled.

Symbols

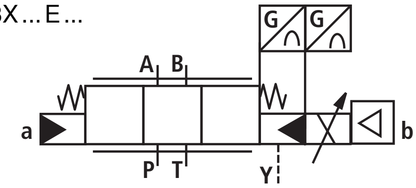




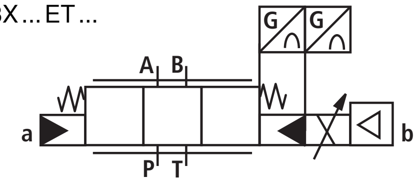
Type ... –3X ...



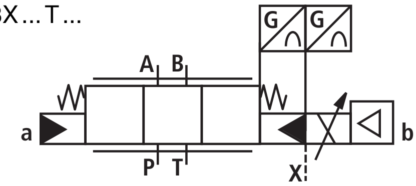
Type ... –3X ... E ...



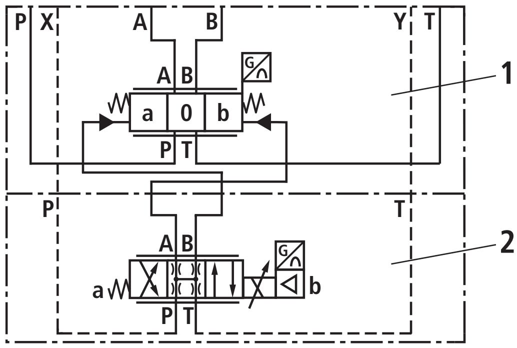
Type ... –3X ... ET ...



Type ... –3X ... T ...



Symbol, detailed
(pilot oil supply and pilot oil drain external)



1 Main valve
2 Pilot control valve

Test and service devices

– Type VT-VETSY-1 service case with test device, see RE 29685
– Measuring adapter 11P+PE type VT-PA-1, see RE 30067

Technical data

Parameter		Unit	Size 10	Size 16	Size 25	Size 27
general						
Type			Spool valve, pilot operated			
Actuation			Directional control valve size 6 - OBE, with position controller for pilot control valve and main stage			
Type of connection			Subplate mounting, porting pattern according to ISO 4401-...			
Installation position			Any			
Ambient temperature range		°C	–20...+50			
Weight		kg	**Size 10** 8.0	**Size 16** 10.4	**Size 25** 18.2	**Size 27** 18.2
Vibration resistance, test condition			Max. 25 *g*, room vibration test in all directions (24 h)			
hydraulic (measured with HLP 46, ϑ_{oil} = 40 °C ±5 °C)						
Hydraulic fluid			Hydraulic oil according to DIN 51524…535, other media upon request			
Viscosity range	recommended	mm^2/s	20...100			
	max admissible	mm^2/s	10...800			
Hydraulic fluid temperature range		°C	–20...+65			
Maximum admissible degree of contamination of the hydraulic fluid cleanliness class according to ISO 4406 (c)			Class 18/16/13 1)			
Flow direction			According to symbol			
Rated flow at Δp = 5 bar per edge 2)		l/min	40 / 55 / 70 / 85	90 / 120 / 150 / 200	300 / 370	430
Max. operating pressure	Ports P, A, B external pilot oil supply	bar	350	350	350	350
	Ports P, A, B internal pilot oil supply	bar	250			
	Ports T, X, Y	bar	250			
Min. pilot oil pressure "pilot control stage"		bar	10			
Q_{max}		l/min	170	450	900	1000
Q_N pilot control valve		l/min	8	24	40	40
Zero flow pilot control valve at 100 bar		cm^3/min	< 180	< 300	< 500	< 500
Zero flow main stage at 100 bar		cm^3/min	< 400 / < 600	< 1000	< 1000	< 1000
static / dynamic						
Hysteresis		%	< 0.1 hardly measurable			
Manufacturing tolerance Q_{max}		%	< 10			
Actuating time for signal step (at X = 100 bar)	0...100 %		12	15	23	23
	0...10 %		6	7	10	10
Actuating time for signal step (at X = 10 bar)	0...100 %		40	50	90	90
	0...10 %		20	20	30	30
Switch-off behavior			after electrical shut-off: Pilot control valve not defined in P-B/A-T or P-A/B-T, main stage can be completely controlled (PB/AT or PA/BT)			
Temperature drift			Zero shift < 1% at ΔT = 40 °C			
Zero compensation			ex factory ±1 %			

1) The cleanliness classes specified for the components must be complied with in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components. For the selection of the filters, see technical data sheets RE 50070, RE 50076 and RE 50081.

2) Flow with different Δp $\quad Q_x = Q_{nom} \cdot \sqrt{\frac{\Delta p_x}{5}}$

Technical data

electric, control electronics integrated in the valve		
Relative duty cycle %	100 ED, max. power consumption 30 VA (24 V=)	
Protection class	IP 65 according to DIN 40050	
Port	Plug-in connector, 11P+PE	Data
Supply [2] 24 V=$_{nom}$ [1]	1 2	+24 V=$_{nom}$, fuse protection 2.5 A_F (output stages) 0 V power ground
[3]	9 10	+24 V=$_{nom}$ Signal part 0 V Signal ground
Input signal [4] ±10 V	4 5	$\left.\begin{array}{l} U_{IN} \\ \overline{U}_{IN} \end{array}\right\}$ Differential amplifier, R_i = 100 kΩ
Actual value signal (LVDT)	6 7	±10 V=, R_a = 1 kΩ 0 V, reference point
Release input	3	> 8.5 V to 24 V=$_{nom}$ (max. 40 V=) R_i = 10 kΩ
Messages [5]	8 11	Acknowledgement release +24 V= Error message: no error +24 V=
Protective earthing conductor	⏚	Connect only if 24 V = system transformer does not comply with standard VDE 0551
Electromagnetic compatibility tested according to	EN 61000-6-2: 2005-08 EN 61000-6-3: 2007-01	

[1] 24 V=$_{nom}$ – min. 21 V=
– max. 40 V=

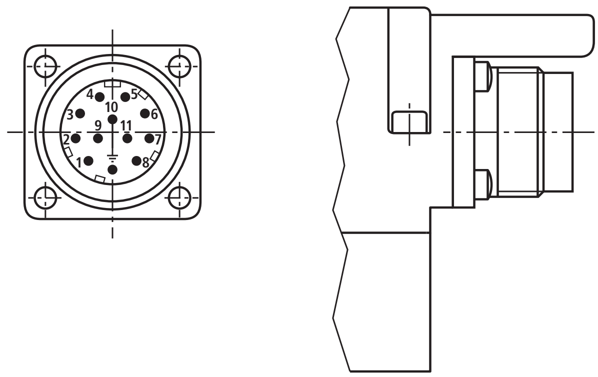
[2] U_B (pin 1) = output stage supply
– valve "OFF“ < 13.4 V=
– valve "ON" > 16.8 V=
no error message (pin 11)

[3] U_S (pin 9) = electronics supply
– valve "OFF“ < 16.8 V=
error message (pin 11)
– valve "ON“ > 19.5 V=
no error message (pin 11)

[4] inputs: voltage resistant up to max. 50 V

[5] Messages are loadable with max. 20 mA and short-circuit proof against ground

11P+PE

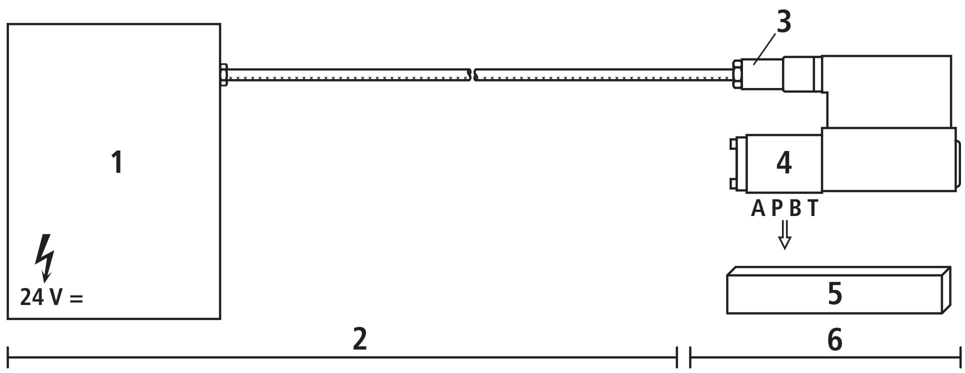


Note

Pilot operated 4/3 directional control valves fulfill their function only in active closed control loops and do not have a secured basic position when deactivated. Therefore, "additional isolator valves" are required in many applications and must be taken into account for the On/Off series.

Electrical connection

Electric data, see page 6



1 Control
2 Provided by the customer
3 Mating connector
4 Valve
5 Contact surface
6 Provided by Rexroth

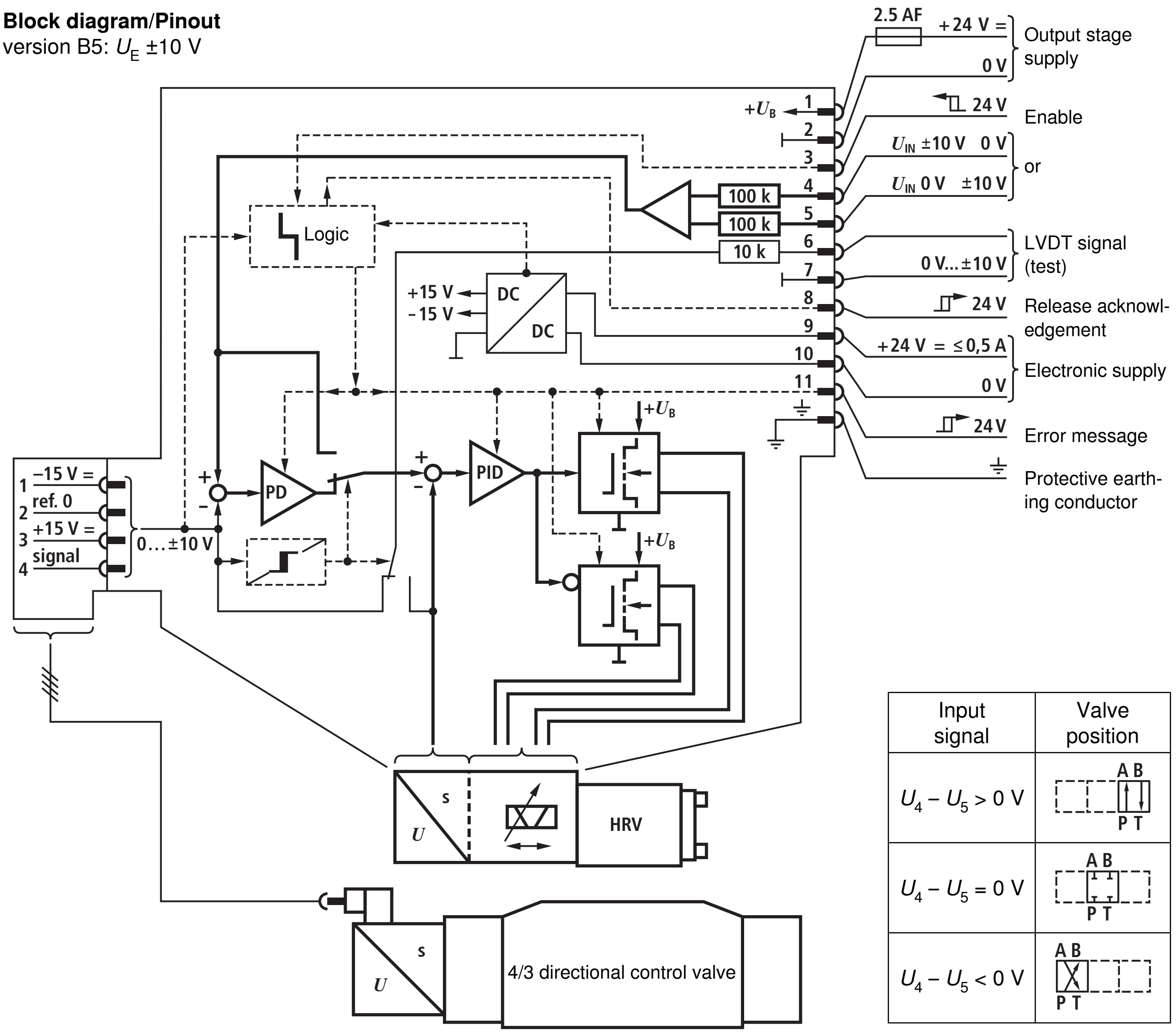
Technical notes for the cable

Version:	– Multi-wire cable – Litz wire structure, very fine wires according to VDE 0295, class 6 – Protective earthing conductor, green-yellow – Cu shield braid
Type:	– e. g. Oilflex-FD 855 CP (company Lappkabel)
Number of wires:	– Depends on the valve type, connector type and signal assignment
Line Ø:	– 0.75 mm^2 up to a length of 20 m 1.0 mm^2 up to a length of 40 m
Outer Ø:	– 9.4...11.8 mm – Pg11 12.7...13.5 mm – Pg16

Note
Electric signals taken out via control electronics (e.g. actual value) must not be used for the deactivation of safety-relevant machine functions!
(See also the European standard "Safety requirements for fluid power systems and their components - Hydraulics", EN 982!)

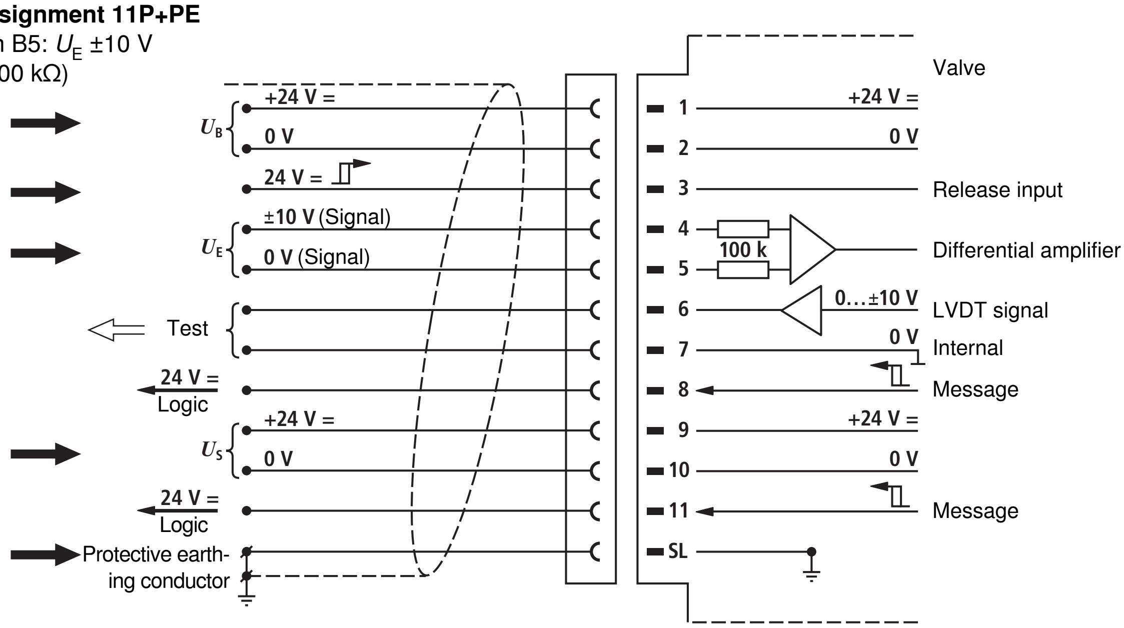
Integrated electronics

Block diagram/Pinout
version B5: U_E ±10 V



Input signal	Valve position
$U_4 - U_5 > 0$ V	A B P T
$U_4 - U_5 = 0$ V	A B P T
$U_4 - U_5 < 0$ V	A B P T

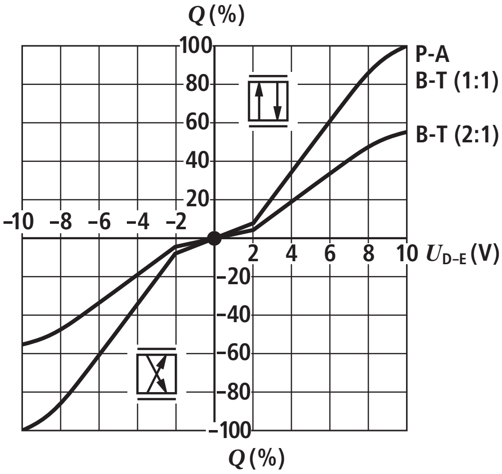
Pin assignment 11P+PE
version B5: U_E ±10 V
(R_i = 100 kΩ)



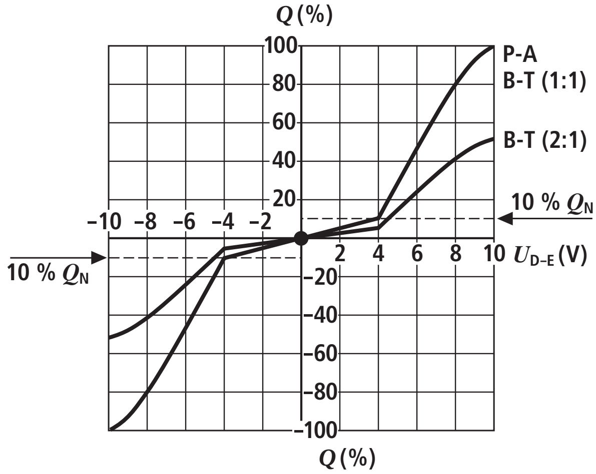
Characteristic curves (measured with HLP 46, ϑ_{Oil} = 40 °C ±5 °C)

Flow – signal function $Q = f\ (U_E)$

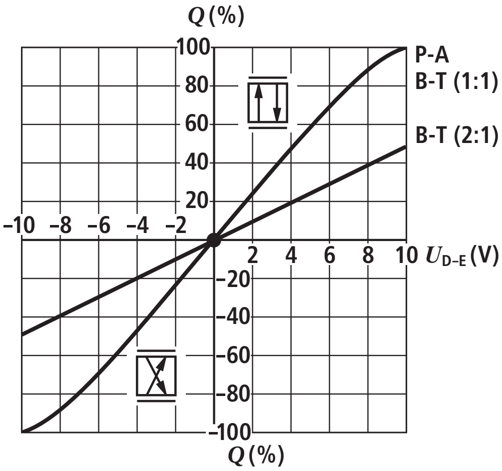
Flow characteristics M



Flow characteristics P

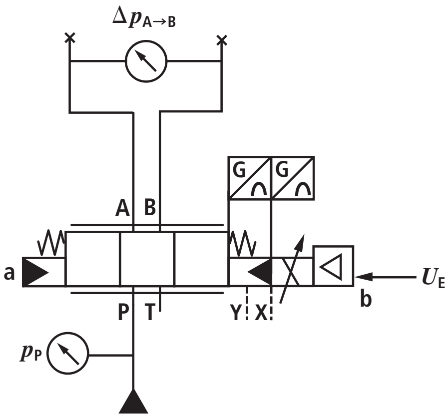


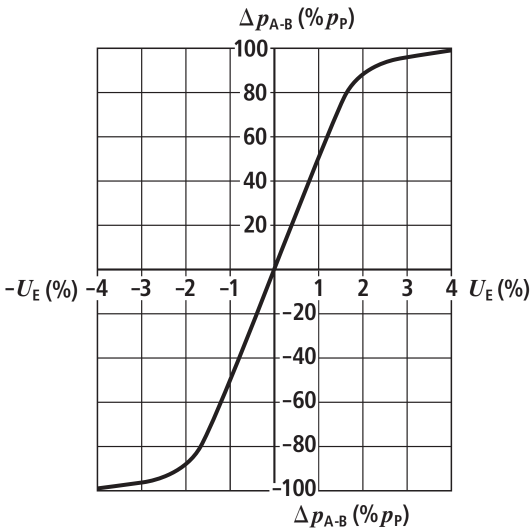
Flow characteristics L



Characteristic curves (measured with HLP 46, ϑ_{Oil} = 40 °C ±5 °C)

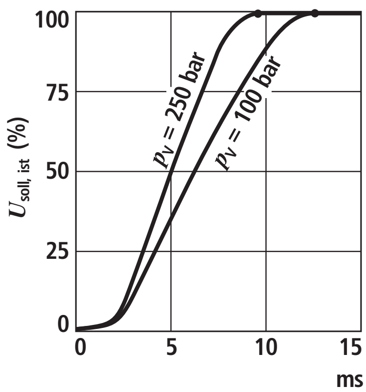
Pressure gain Δ = f (U_E)



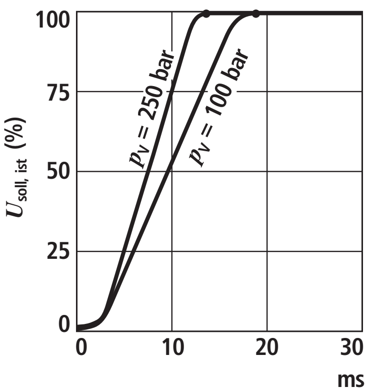


Step function 0 → 100 %

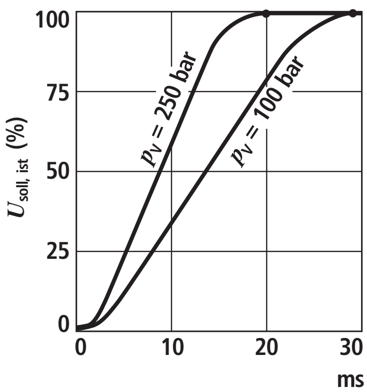
Size 10



Size 16



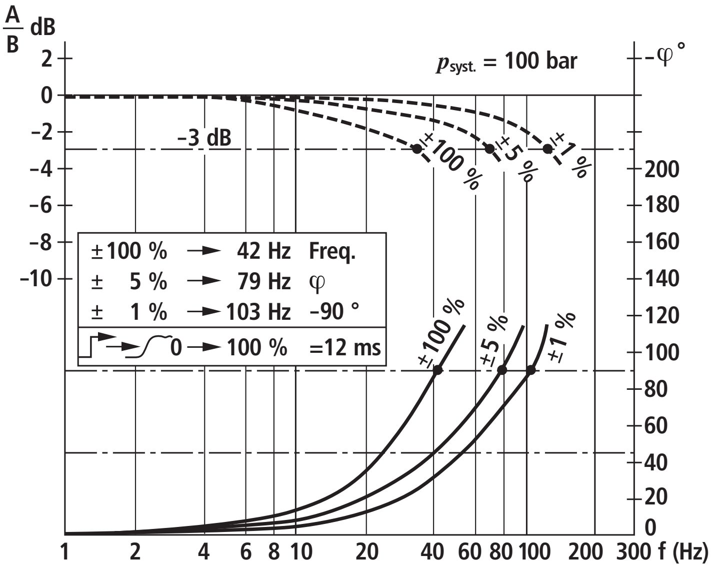
Size 25/27



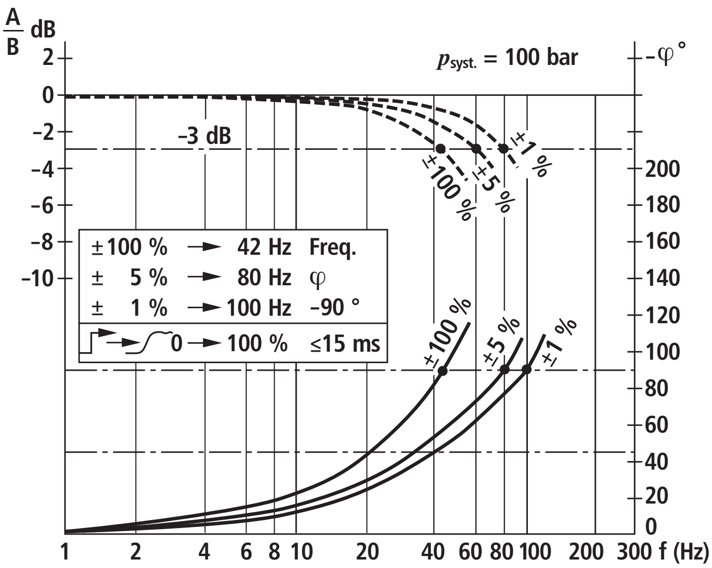
Characteristic curves (measured with HLP 46, ϑ_{Oil} = 40 °C ±5 °C)

Bode diagram

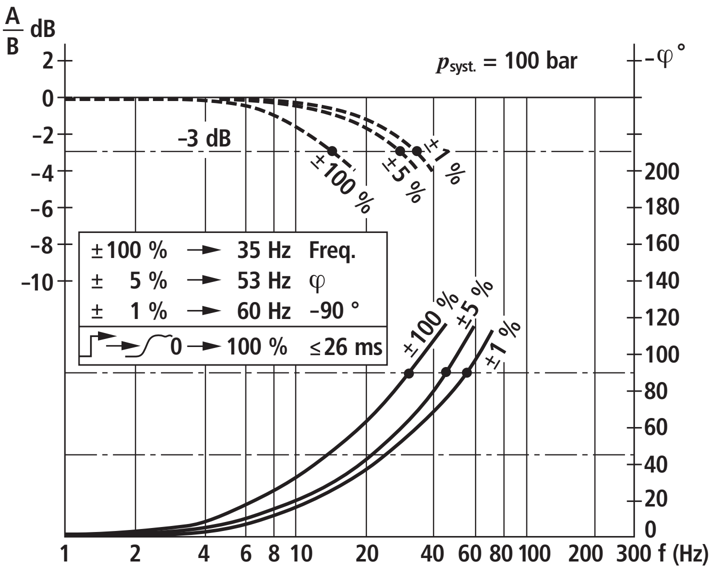
Size 10



Size 16

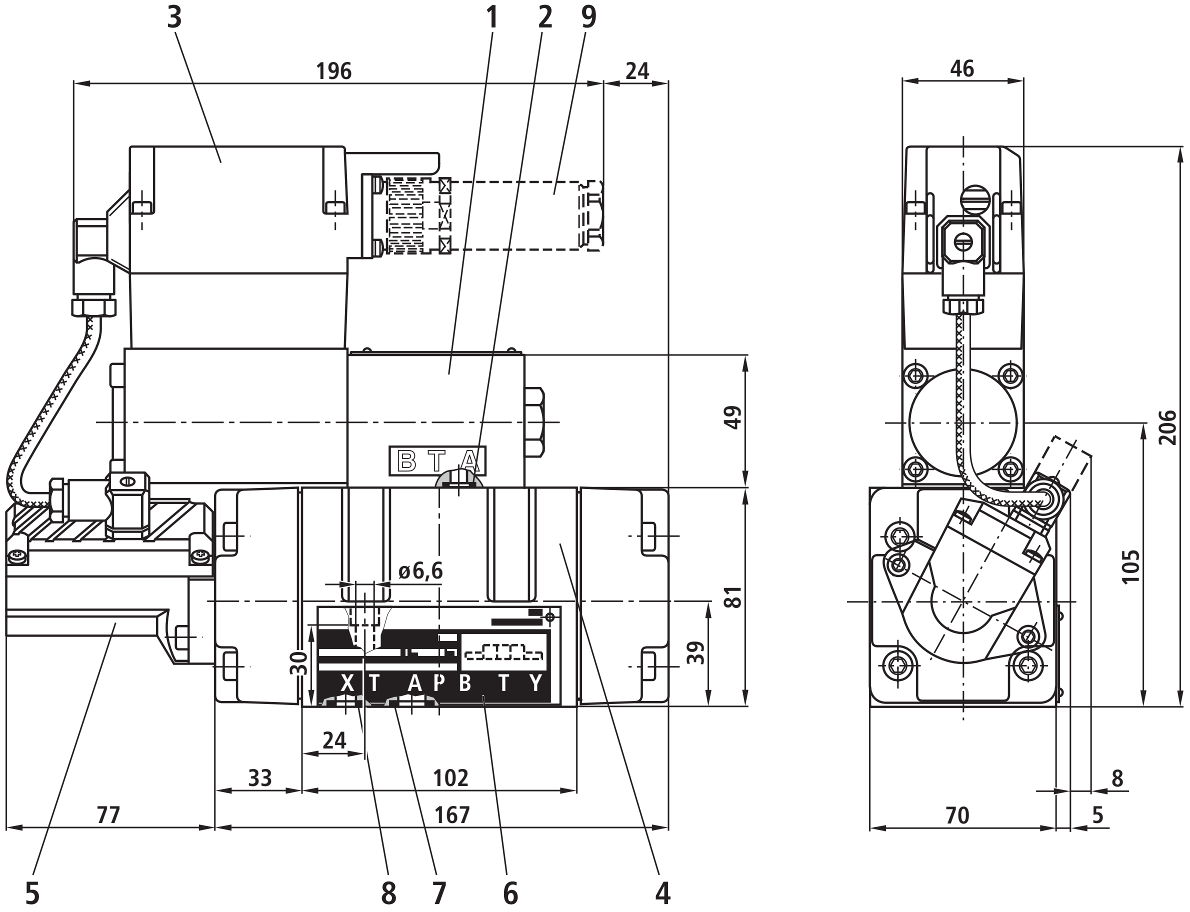


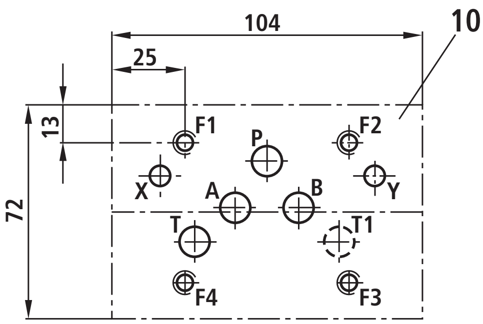
Size 25/27

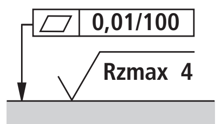


---- Amplitude
—— Phase

Unit dimensions size 10 (dimensions in mm)







Required surface quality
of the valve mounting face

1 Pilot control valve
2 O-ring 9.25x1.78 (ports P, A, B, T)
3 Integrated electronics
4 Main valve
5 Inductive position transducer (main valve)
6 Name plate
7 O-ring 12x2 (ports P, A, B, T, T1)
8 O-ring 10x2 (ports X, Y)
9 Mating connector not included in the scope of delivery, see technical data sheet RE 08008 (separate order)

10 Machined valve mounting face, porting pattern according to ISO 4401-05-05-0-05

Deviating from the standard:
ports P, A, B, T, T1 Ø 10.5 mm

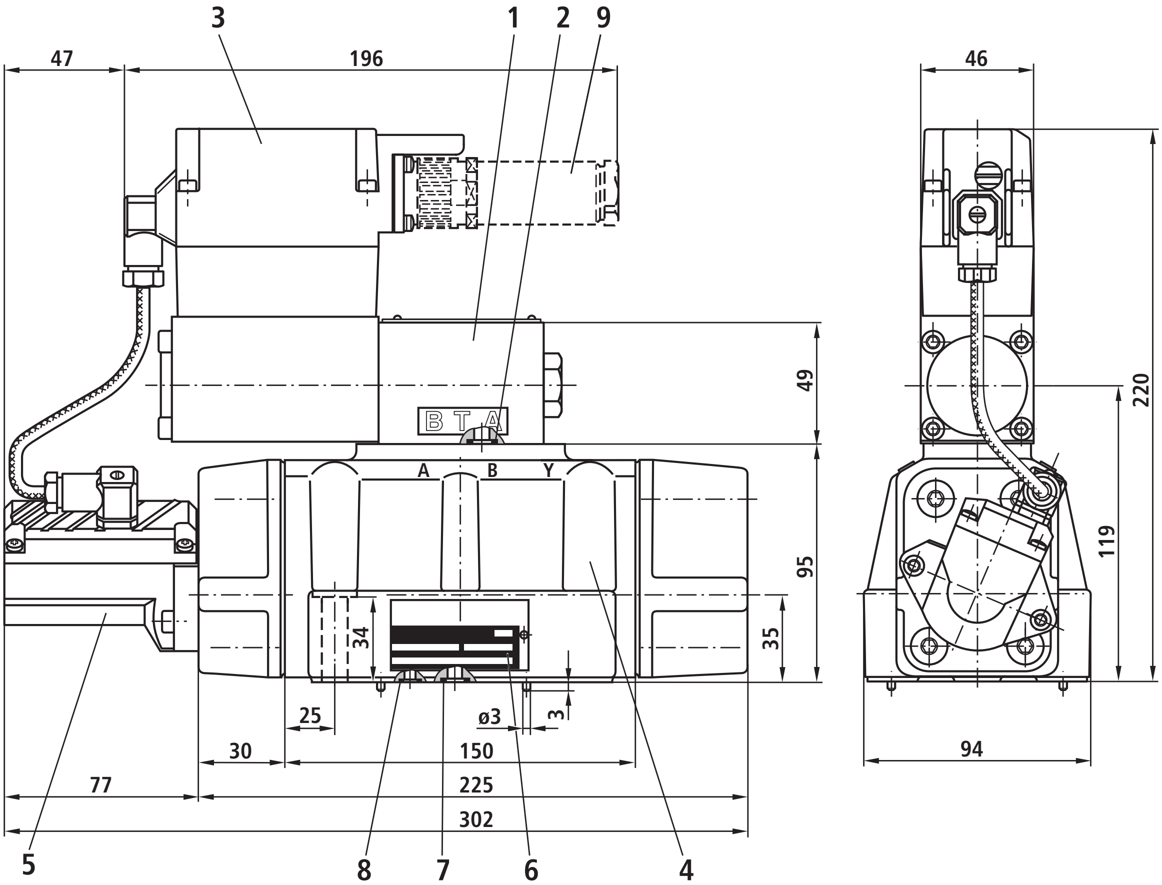
Subplates, see technical data sheet RE 45055 (separate order)

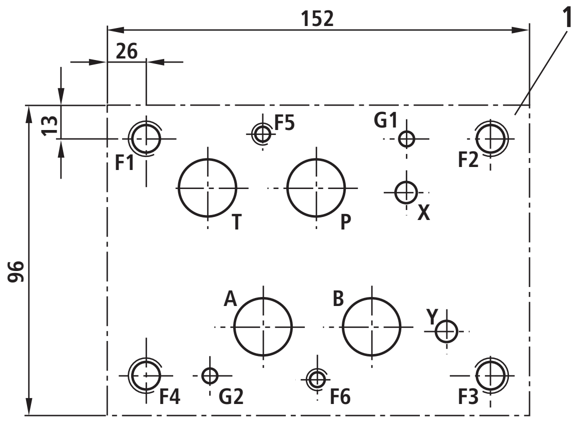
Valve mounting screws (separate order)
The following valve mounting screws are recommended:

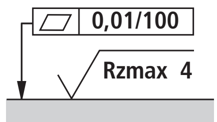
4 hexagon socket head cap screws
ISO 4762-M6x40-10.9-N67F821 70
(galvanized according to Bosch standard N67F821 70)
tightening torque M_A = 11+3 Nm

Mat. no. 2910151209

Unit dimensions size 16 (dimensions in mm)







Required surface quality
of the valve mounting face

1 Pilot control valve
2 O-ring 9.25x1.78 (ports P, A, B, T)
3 Integrated electronics
4 Main valve
5 Inductive position transducer (main valve)
6 Name plate
7 O-ring 23x2.5 (ports P, A, B, T)
8 O-ring 9x2 (ports X, Y)
9 Mating connector not included in the scope of delivery, see technical data sheet RE 08008 (separate order)
10 Machined valve mounting face, porting pattern according to ISO 4401-07-07-0-05

Deviating from the standard:
ports P, A, B, T Ø 20 mm

Subplates, see technical data sheet RE 45057 (separate order)

Valve mounting screws (separate order)
The following valve mounting screws are recommended:

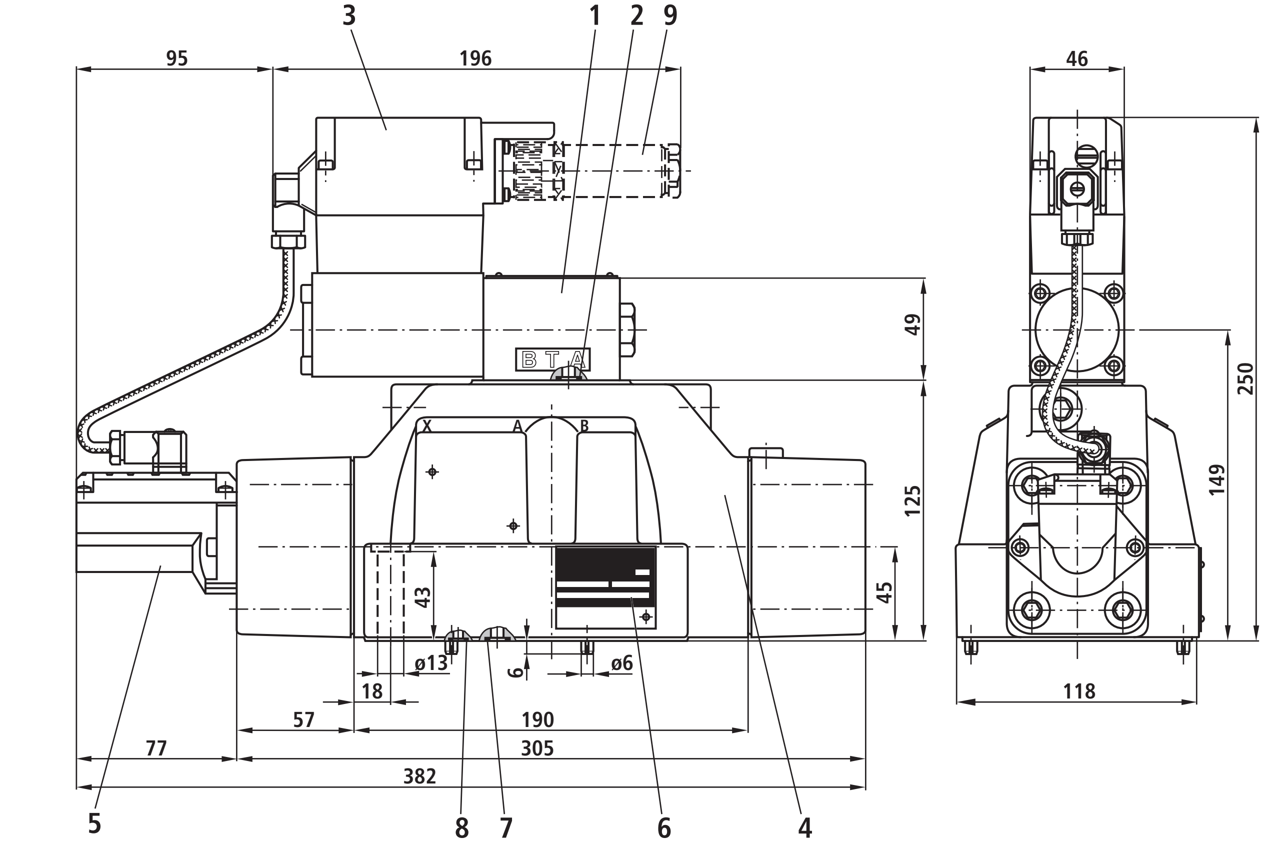
2 hexagon socket head cap screws
ISO 4762-M6x45-10.9-N67F821 70
(galvanized according to Bosch standard N67F821 70)
tightening torque M_A = 11+3 Nm

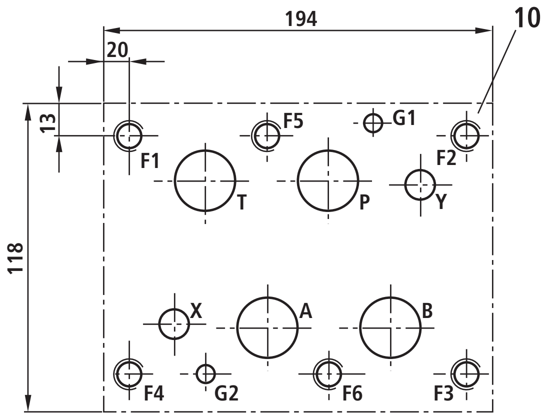
Mat. no. 2910151211

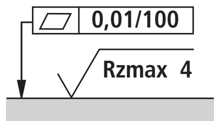
4 hexagon socket head cap screws
ISO 4762-M6x40-10.9-N67F821 70
(galvanized according to Bosch standard N67F821 70)
tightening torque M_A = 50+10 Nm

Mat. no. 2910151301

Unit dimensions size 25/27 (dimensions in mm)







Required surface quality
of the valve mounting face

1 Pilot control valve
2 O-ring 9.25x1.78 (ports P, A, B, T)
3 Integrated electronics
4 Main valve
5 Inductive position transducer (main valve)
6 Name plate
7 O-ring (ports P, A, B, T)
   Size 25: 28x3
   Size 27: 34.6x2.62
8 O-ring 15x2.5 (ports X, Y)
9 Mating connector not included in the scope of delivery, see technical data sheet RE 08008 (separate order)
10 Machined valve mounting face, porting pattern according to ISO 4401-08-08-0-05
   Deviating from the standard:
   size 25: Ports P, A, B, T Ø 25 mm
   size 27: Ports P, A, B, T Ø 32 mm

Subplates, see technical data sheet RE 45059 (separate order)

Valve mounting screws (separate order)
The following valve mounting screws are recommended:

6 hexagon socket head cap screws
ISO 4762-M12x60-10.9-N67F821 70
(galvanized according to Bosch standard N67F821 70)
tightening torquesize 25 M_A = 90+30 Nm,
size 27 M_A = 90±15 Nm

Mat. no. 2910151354

Notes

Notes

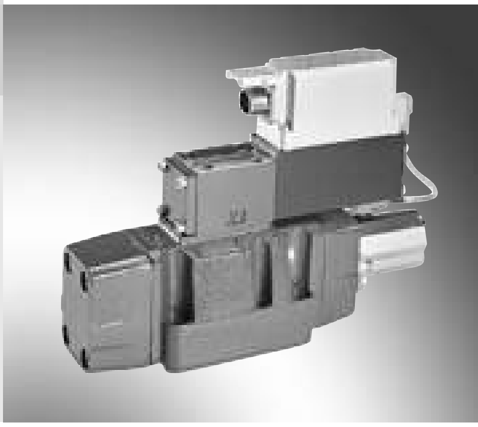
Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

4/3-way servo solenoid directional control valves, pilot operated, with electrical position feedback and on-board electronics (OBE)

RE 29088/10.10
Replaces: 01.09

Type 4WRLE 10...35, symbols V/V1

Sizes (NG) 10, 16, 25, 27, 35
Unit series 3X
Maximum working pressure P, A, B 350 bar (NG27: 280 bar)
Nominal flow 40…1000 l/min (Δp = 10 bar)



Type 4WRLE 10...35

List of contents

For information regarding the available spare parts see:
www.boschrexroth.com/spc

Features

- Pilot operated 4/3-way servo solenoid directional control valves NG10 to NG35
- Pilot valve NG6, with control piston and sleeve in servo quality, actuated on one side, 4/4 fail-safe position when switched off
- Control solenoid with electric position feedback and on-board electronics (OBE), calibrated at the factory
- Main stage in servo quality with position feedback
- Flow characteristic
  - M = Progressive with fine metering notch
  - P = Non-linear curve
  - L = Linear
- Electrical connection 6P+PE
  Signal input of differential amplifier with interface A1 ±10 V, or interface F1 4...20 mA (Rsh = 200 Ω)

Ordering data

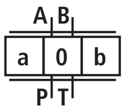
4WRL	E				–3X / G24		K0 /		M	*

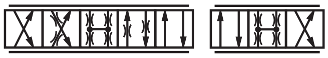
With **on-board** electronics **= E**

Sizes **= 10**
= 16
= 25
= 27 [1]
= 35 [2]

Control spool symbols

4/3-way version





= V, V1

With V1:
P → A: Q_v B → T: $Q_v/2$
P → B: $Q_v/2$ A → T: Q_v

Nominal flow rate
at 10 bar valve pressure difference
(5 bar per metering notch)

NG10
40 l/min [3] **= 40**
55 l/min [4] **= 55**
70 l/min [3] **= 70**
85 l/min [4] **= 85**

NG16
90 l/min [3] **= 90**
120 l/min [4] **= 120**
150 l/min [3] **= 150**
200 l/min [4] **= 200**

NG25
300 l/min [3] **= 300**
370 l/min [4] **= 370**

NG27
430 l/min [1] [4] **= 430**

NG35
1000 l/min [2] [4] **= 1000**

Further information in plain text

Seal material
M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

Interface for trigger electronics
A1 = Setpoint input ±10 V
F1 = Setpoint input 4…20 mA

Electrical connection
K0 = **without** plug-in connector, with plug to DIN 43563-AM6
Order plug-in connector separately

Control oil inlet "x" control oil return "y"

No desig. =	"x" = external	"y" = external
E =	"x" = internal	"y" = external
ET =	"x" = internal	"y" = internal
T =	"x" = external	"y" = internal

Power supply of trigger electronics
G24 = +24 V DC

3X = Unit series 30 to 39
(installation and connection dimensions unchanged)

Flow characteristic
M = Progressive with linear fine metering
P = Non-linear curve, linear (kink at 40 %)
L = Linear

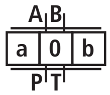
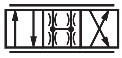
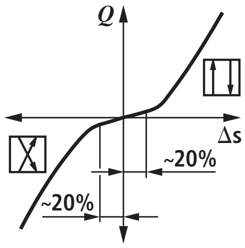
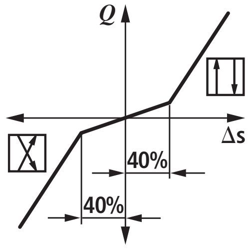
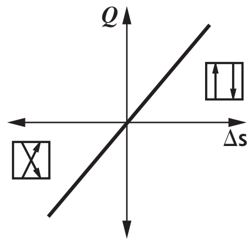
[1] NG27 is a high-flow version of NG25, ports P, A, B and T have Ø 32 mm in the main stage. Contrary to standard ISO 4401-08-08-0-05, ports P, A, B and T may be drilled to max. Ø 30 mm in the control block. These valves therefore offer higher flow rates $Q_A : Q_B$

[2] NG35 is a high-flow version of NG32, ports P, A, B and T have Ø 50 mm in the main stage. Contrary to standard ISO 4401-10-09-0-05, ports P, A, B and T may be drilled to max. Ø 48 mm in the control block. These valves therefore offer higher flow rates $Q_A : Q_B$

[3] Q_N: Flow characteristic "P"

[4] Q_N: Flow characteristic "M" or "L"

Symbols

	M: Progressive with fine metering	P: Non-linear, linear (40 %)	L: Linear
			

Testing and service equipment

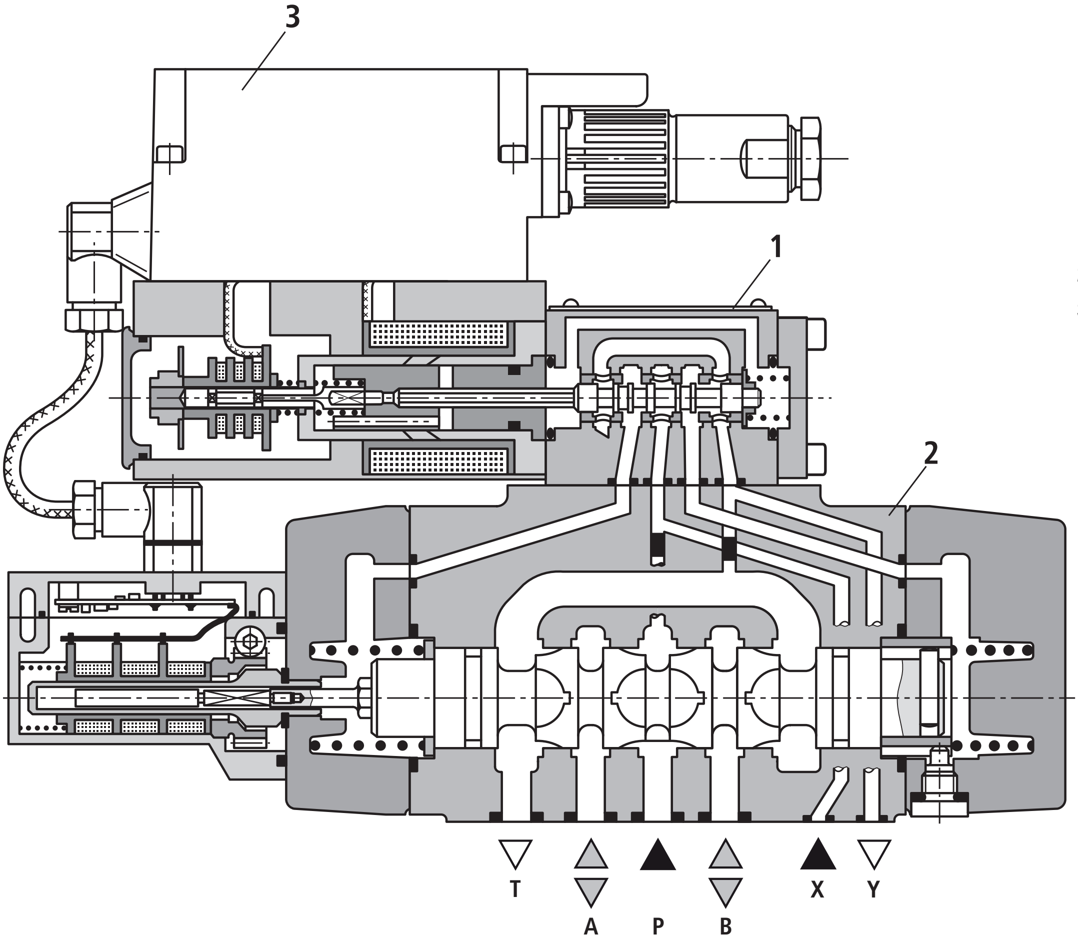
- Service case type VT-VETSY-1 with test device, see data sheet 29685
- Measuring adapter 6P+PE type VT-PA-2, see data sheet 30068

Function, sectional diagram

Construction

The valve consists of three main assemblies:

– Pilot valve (1) with control spool and sleeve, return springs, control solenoid and inductive position transducer
– Main stage (2) with centering springs and position feedback
– On-board trigger electronics (3)



1 Pilot valve
2 Main stage
3 Trigger electronics

Functional description

When the control solenoid is not actuated, the control spool is held by springs in the fail-safe position, and the main stage spool remains in spring-centered offset position at 1…6 % of the stroke in the direction P-B/A-T.
In the on-board electronics, the pre-defined setpoint is compared with the actual value for the position of the main stage control spool. In the event of an error signal, the control solenoid is actuated, and the pilot spool is moved as the magnetic force changes. The flow released through the control cross-sections causes the main control spool to move. The stroke/control cross-section of the main control spool is controlled proportionately to the setpoint. If the input setpoint is 0 V, the electronics move the main stage control spool to mid position.
The control oil is conveyed to the pilot valve either internally via port P or externally via port X. The oil returns to the tank internally via port T or externally via port Y.

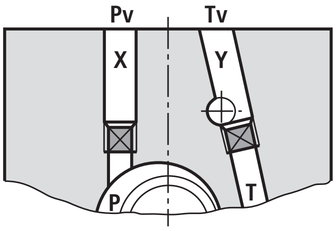
Power failure

In the event of a power failure or an open circuit, the on-board electronics cut off the electricity to the control solenoid and the pilot spool moves to the fail-safe position, relieving the control oil chambers of the main stage.
The main stage control spool is held by springs in the offset position.

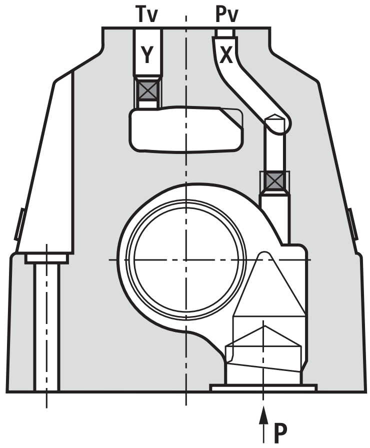
Control oil supply

The pilot valve can be supplied both via ports X and Y (externally) and via the main flow channels P and T.

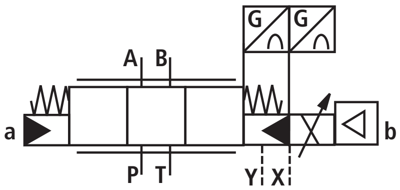
NG10, 25, 27, 35



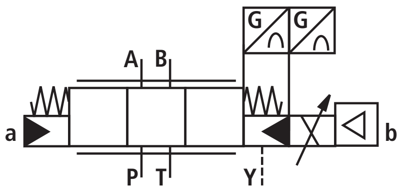
NG16



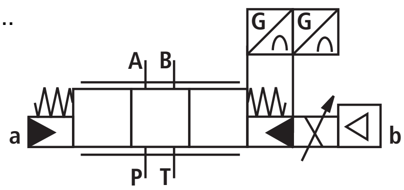
Type...–3X...



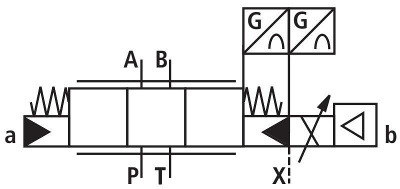
Type...–3X...E...



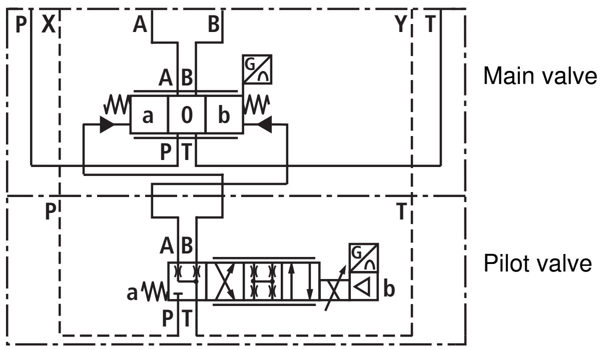
Type...–3X...ET...



Type...–3X...T...



Symbol in detail
(external control oil inlet and outlet)



No designation =	"x" = external	"y" = external
E =	"x" = internal	"y" = external
ET =	"x" = internal	"y" = internal
T =	"x" = external	"y" = internal

Important

Hydraulic symbols are largely derived from the symbols of the switching valves. 4/3-way servo solenoid directional control valves (pilot operated) do not have a closed mid position when switched off! They only perform their function in an active, closed control loop, even if the pilot valve features a fail-safe 4th position. See technical data for details on "switch-off behavior".

Technical data

General

Construction	Spool type valve, pilot operated
Actuation	Servo solenoid directional control valve NG6 OBE, with position controller for pilot valve and main stage
Type of mounting	Subplate, mounting hole configuration NG10...35 to ISO 4401-...
Installation position	Optional
Ambient temperature range °C	–20...+50
Weight kg	**NG10** 8.7 | **NG16** 10.6 | **NG25** 18.4 | **NG27** 18.4 | **NG35** 81
Vibration resistance, test condition	Max. 25 *g*, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, ϑ_{oil} = 40 °C ±5 °C)

Pressure fluid	Hydraulic oil to DIN 51524…535, other fluids after prior consultation
Viscosity range – recommended mm^2/s	20...100
Viscosity range – max. permitted mm^2/s	10...800
Pressure fluid temperature range °C	–20...+70
Maximum permissible degree of contamination of pressure fluid Purity class to ISO 4406 (c)	Class 18/16/13 [1]
Flow direction	See symbol

	Unit	NG10	NG16	NG25	NG27	NG35
Nominal flow at Δp = 5 bar per notch [2]	l/min	40 | 55 | 70 | 85	90 | 120 | 150 | 200	300 | 370	430	1000
Max. working pressure – Ports P, A, B, External control oil inlet	bar	350	350	350	280	350
Max. working pressure – Ports P, A, B, Internal control oil inlet	bar	250				
Max. working pressure – Ports T, X, Y	bar	250				
Min. control oil pressure in “pilot stage”	bar	10				
Q_{max}	l/min	170	450	900	1000	3500
Q_N pilot valve	l/min	4	12	24	24	40
Nominal flow of pilot valve at 100 bar	cm^3/min	< 180	< 300	< 500	< 500	< 900
Nominal flow of main stage at 100 bar	cm^3/min	< 400 | < 600	< 1000	< 1000	< 1000	< 6000

Static/Dynamic

Hysteresis %	< 0.1, scarcely measurable
Manufacturing tolerance for Q_{max} %	≦ 10

		NG10	NG16	NG25	NG27	NG35
Response time for signal change (at X = 100 bar)	0...100 %	25	26	32	32	90
	0...10 %	14	15	18	18	40
Response time for signal change (at X = 10 bar)	0...100 %	85	80	120	120	350
	0...10 %	50	30	50	50	150

Switch-off behavior	After electrical switch-off: Pilot valve in fail-safe Main stage moves to spring-centered “offset position”: 1…6% P-B/A-T
Thermal drift	Zero point displacement < 1 % at ΔT = 40 °C
Zero adjustment	Factory-set ±1 %

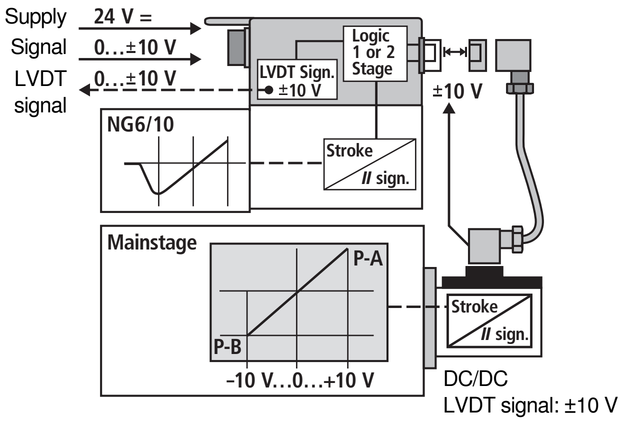
[1] The purity classes stated for the components must be complied with in hydraulic systems.
Effective filtration prevents problems and also extends the service life of components.
For a selection of filters, see www.boschrexroth.com/filter.

[2] Flow rate at a different Δp $Q_x = Q_{nom} \cdot \sqrt{\frac{\Delta p_x}{35}}$

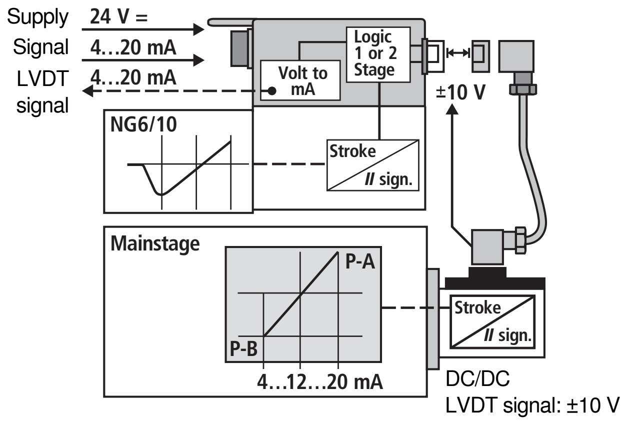
Technical data

Electric pilot valve NG6, trigger electronics integrated in the valve	
Cyclic duration factor %	100 ED
Degree of protection	IP 65 to EN 60529 and IEC 14434/5
Connection	Plug-in connector 6P+PE, DIN 43563
Power supply Terminal A: Terminal B: 0 V	24 V DC_{nom} min. 21 V DC/max. 40 V DC Ripple max. 2 V DC
Max. power consumption	40 VA
External fuse	2,5 A_F
Input, “Standard” version Terminal D: U_E Terminal E:	Differential amplifier, R_i = 100 kΩ 0... ±10 V 0 V
Input, “mA signal” version Terminal D: $I_{D–E}$ Terminal E: $I_{D–E}$	Burden, Rsh = 200 Ω 4...(12)...20 mA Current loop $I_{D–E}$ feedback
Max. differential input voltage at 0 V	D → B E → B } max. 18 V DC
Test signal, “Standard” version Terminal F: U_{Test} Terminal C:	LVDT 0...±10 V Reference 0 V
Test signal, “mA signal” version Terminal F: $I_{F–C}$ Terminal C: $I_{F–C}$	LVDT signal 4...20 mA at external load 200...500 Ω max. 4...20 mA output Current loop $I_{F–C}$ feedback
Protective conductor and screen	See pin assignment (CE-compliant installation)
Calibration	Calibrated at the factory, see valve characteristic curve
Electromagnetic compatibility tested according to	EN 61000-6-2: 2005-08 EN 61000-6-3: 2007-01

Version A1: Standard



Version F1: mA signal

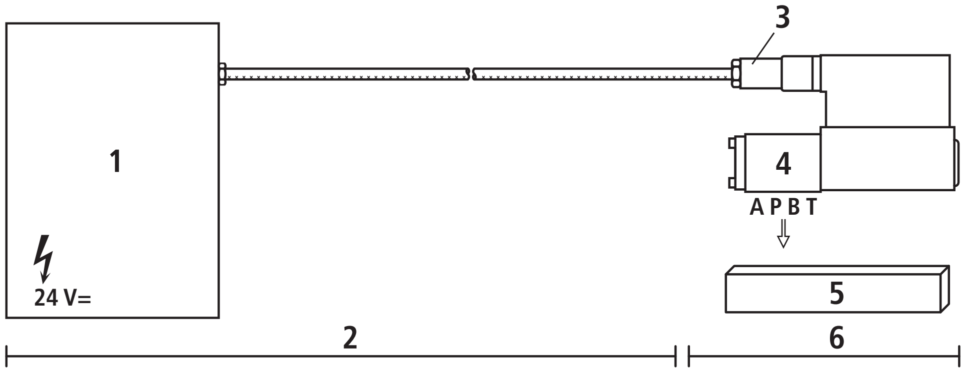


Important

Pilot operated 4/3-way servo solenoid directional control valves only perform their function in an active closed control loop and do not have a fail-safe position when switched off. For this reason, many applications require the use of “external check valves”, which must be taken into account during the On/Off switching sequence.

Electric connection

For electrical data, see page 7



1 Control
2 Provided by customer
3 Plug-in connector
4 Valve
5 Connecting surface
6 Provided by Rexroth

Technical notes on the cable

Version: – Multi-wire cable
– Extra-finely stranded wire to VDE 0295, Class 6
– Protective conductor, green/yellow
– Cu braided screen

Types: – e.g. Ölflex-FD 855 CP (from Lappkabel company)

No. of wires: – Determined by type of valve, plug types and signal assignment

Cable Ø: – 0.75 mm² to 20 m length
1.0 mm² to 40 m length

Outside Ø: – 9.4...11.8 mm – Pg11
12.7...13.5 mm – Pg16

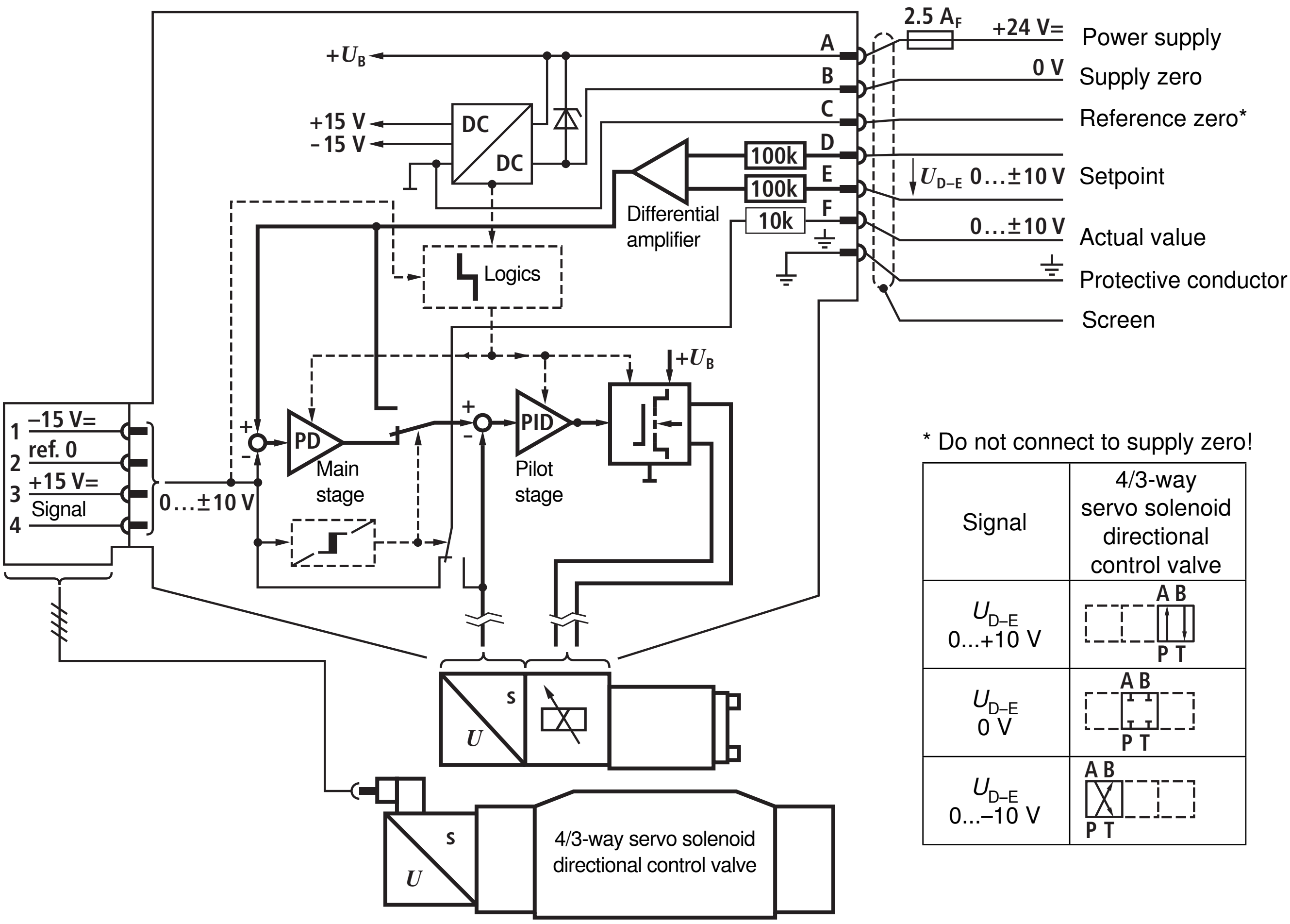
Note
Voltage supply 24 V $DC_{nom.}$,
if voltage drops below 18 V DC, rapid shutdown resembling "Enable OFF" takes place internally.
In addition, with the "mA signal" version:
$I_{D-E} \geqq 3$ mA – valve is active
$I_{D-E} \leqq 2$ mA – valve is deactivated.
Electrical signals emitted via the trigger electronics (e.g. actual values) must not be used to shut down safety-relevant machine functions!

(See European Standard, "Technical Safety Requirements for Fluid-Powered Systems and Components – Hydraulics", EN 982.)

On-board electronics

Block diagram/pin assignment

Version A1: U_{D-E} ±10 V

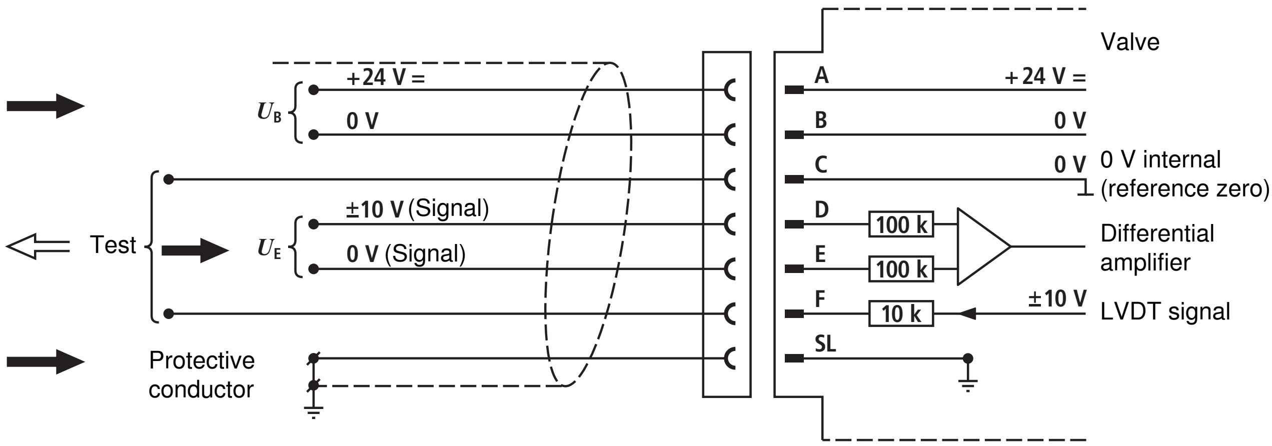


* Do not connect to supply zero!

Signal	4/3-way servo solenoid directional control valve
U_{D-E} 0...+10 V	A B / P T
U_{D-E} 0 V	A B / P T
U_{D-E} 0...–10 V	A B / P T

Pin assignment 6P+PE

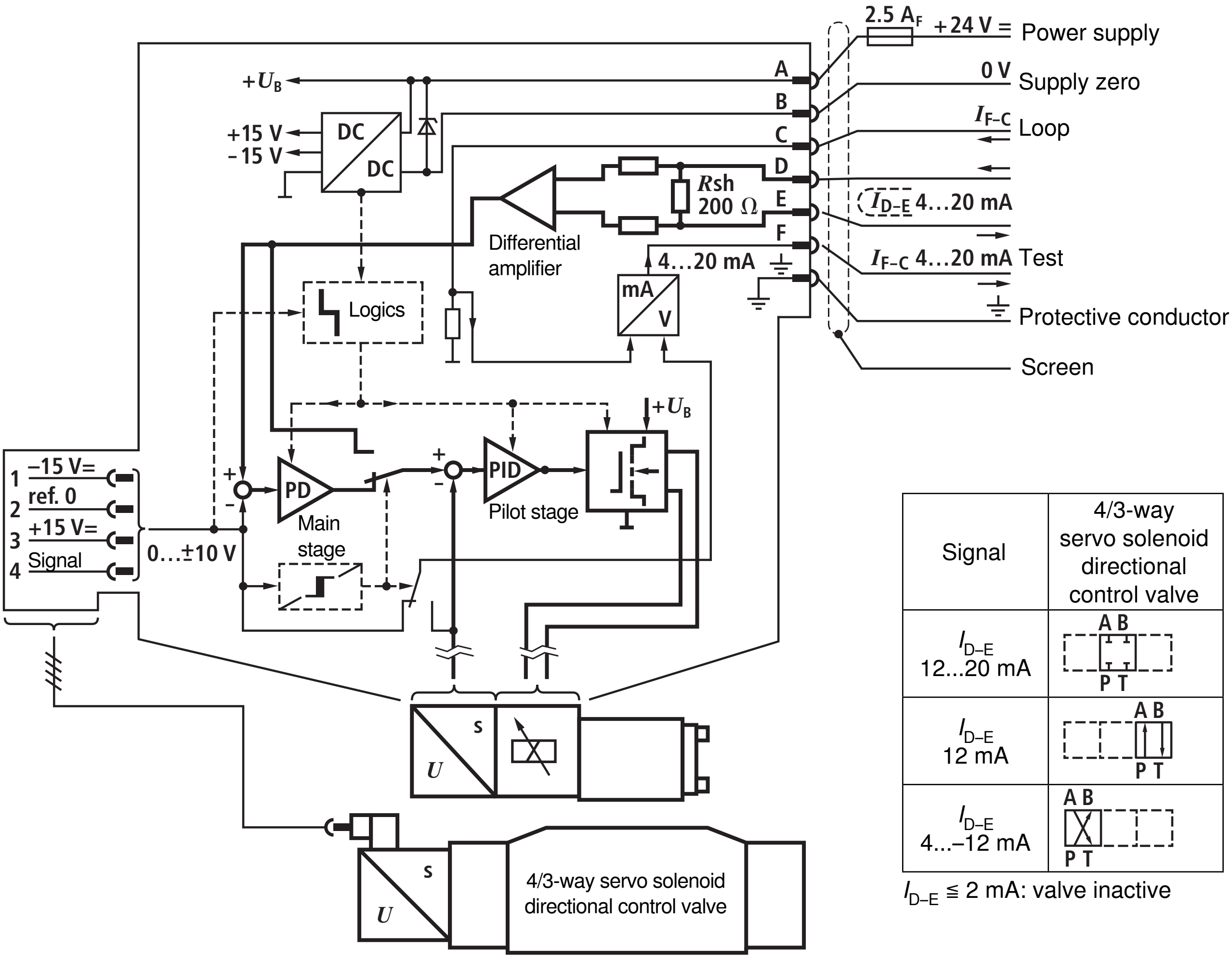
Version A1: U_{D-E} ±10 V
(R_i = 100 kΩ)



On-board electronics

Block diagram/pin assignment

Version F1: I_{D-E} 4...12...20 mA

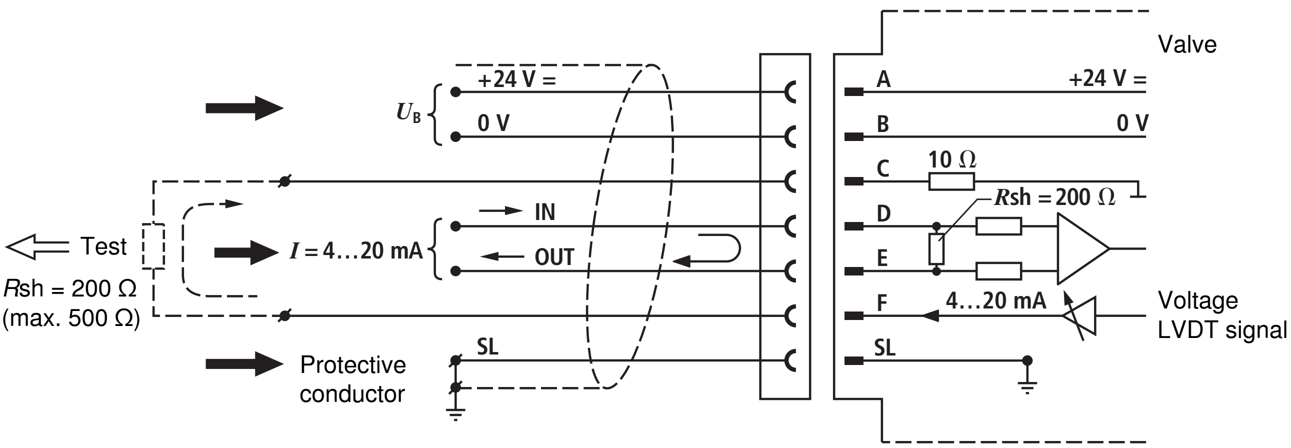


Signal	4/3-way servo solenoid directional control valve
I_{D-E} 12...20 mA	A B P T
I_{D-E} 12 mA	A B P T
I_{D-E} 4...–12 mA	A B P T

I_{D-E} ≦ 2 mA: valve inactive

Pin assignment 6P+PE

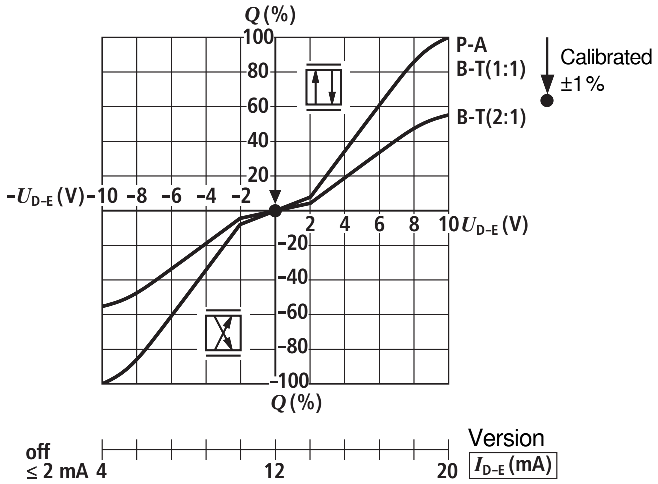
Version F1: I_{D-E} 4...12...20 mA
(Rsh = 200 Ω)



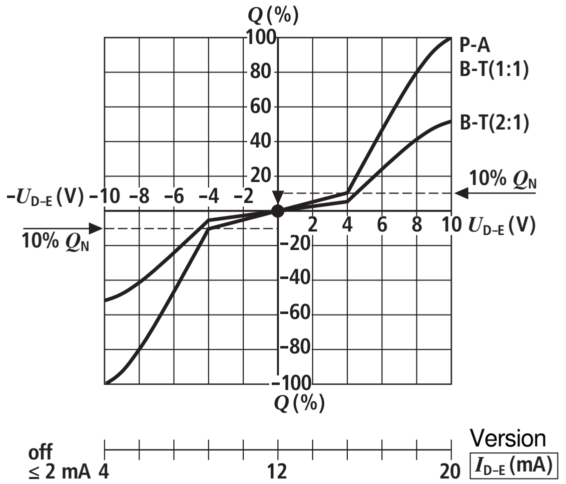
Characteristic curves (measured with HLP 46, ϑ_{oil} = 40 °C ±5 °C)

Flow rate – signal function $Q = f(U_{D-E})$
$Q = f(I_{D-E})$

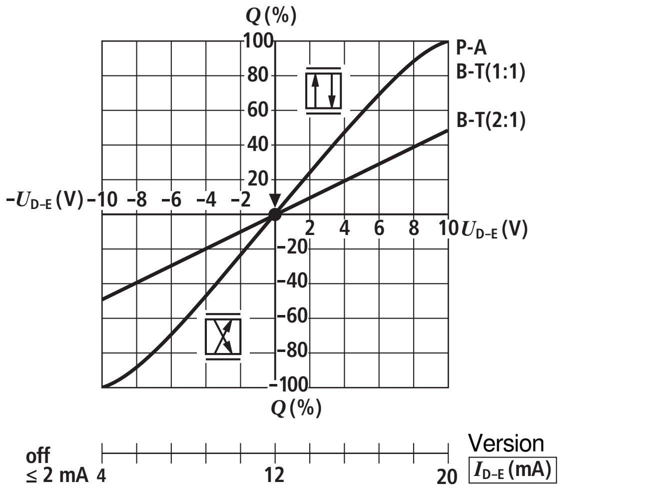
Flow characteristic M



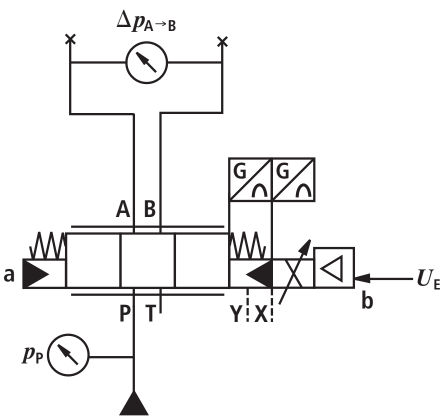
Flow characteristic P

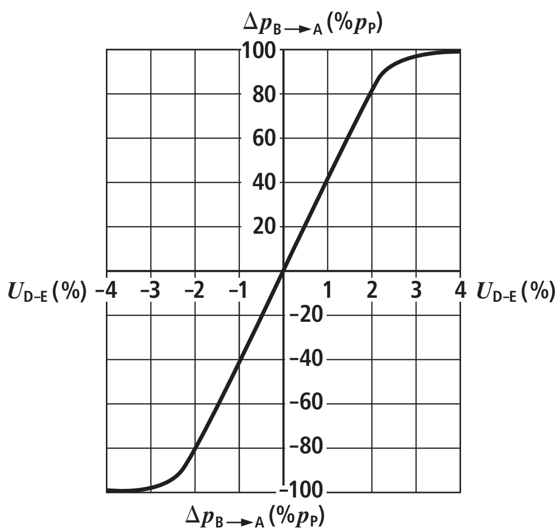


Flow characteristic L



Pressure gain

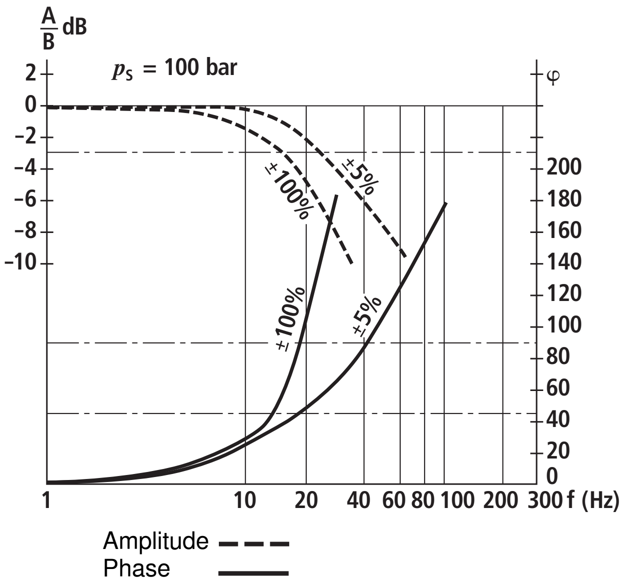




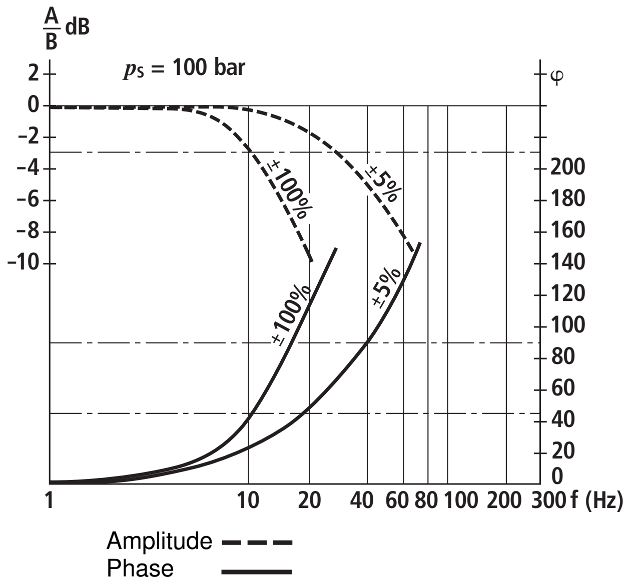
Characteristic curves (measured with HLP 46, ϑ_{oil} = 40 °C ±5 °C)

Bode diagram

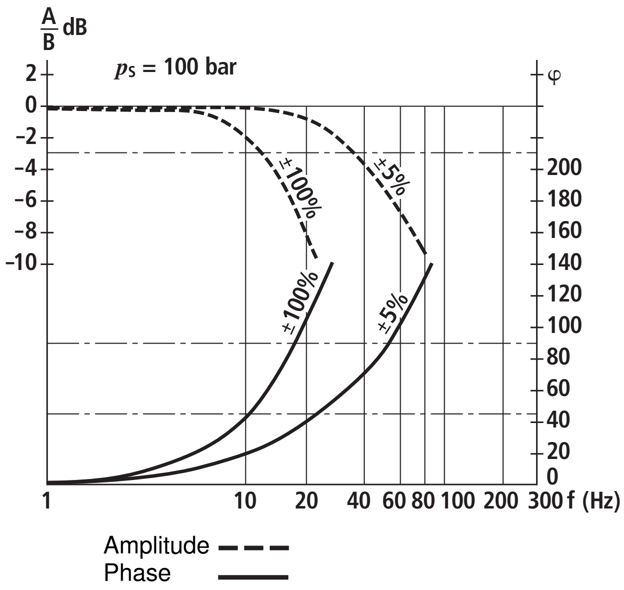
NG10



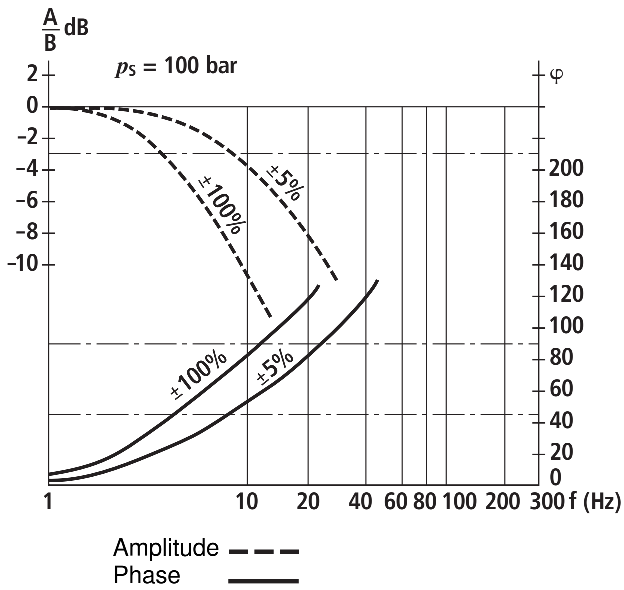
NG16



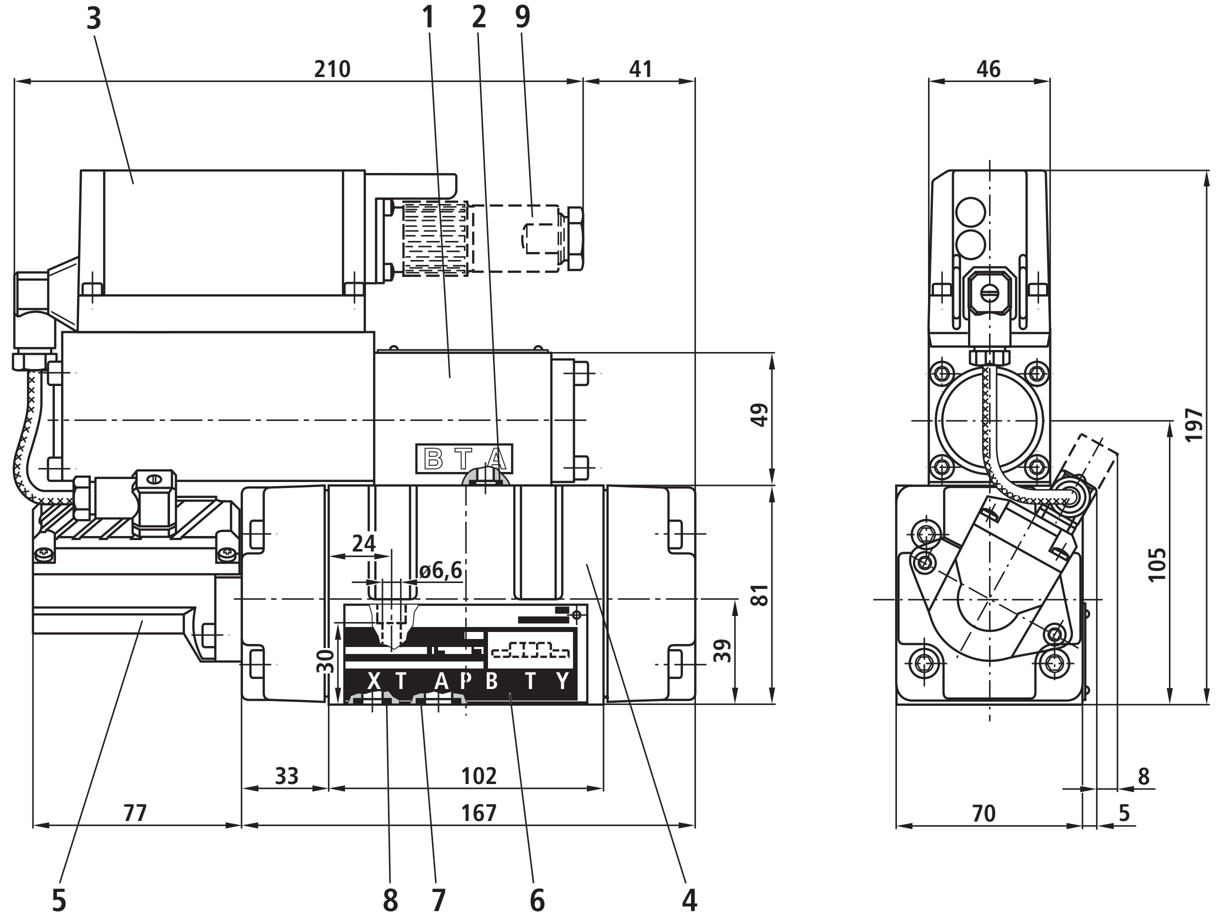
NG25/27

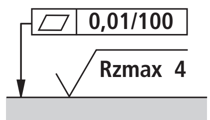


NG35

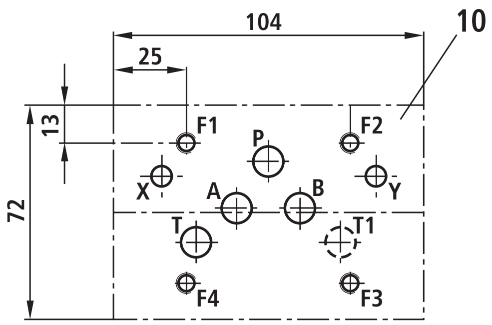


Unit dimensions NG10 (dimensions in mm)





Required surface quality
of valve mounting face



1 Pilot valve
2 O-ring 9.25 x 1.78 (ports P, A, B, T)
3 On-board electronics
4 Main valve
5 Inductive position transducer (main valve)
6 Nameplate
7 O-ring 12 x 2 (ports P, A, B, T, T1)
8 O-ring 10 x 2 (ports X, Y)
9 Plug-in connector not included in delivery, see data sheet 08008 (order separately)
10 Machined valve contact surface, mounting hole configuration according to ISO 4401-05-05-0-05

Deviates from standard:
Ports P, A, B, T, T1 ∅ 10.5 mm
Minimum thread depth: Ferrous metal 1.5 x ∅
Non-ferrous 2 x ∅

Subplates, see data sheet 45055 (order separately)

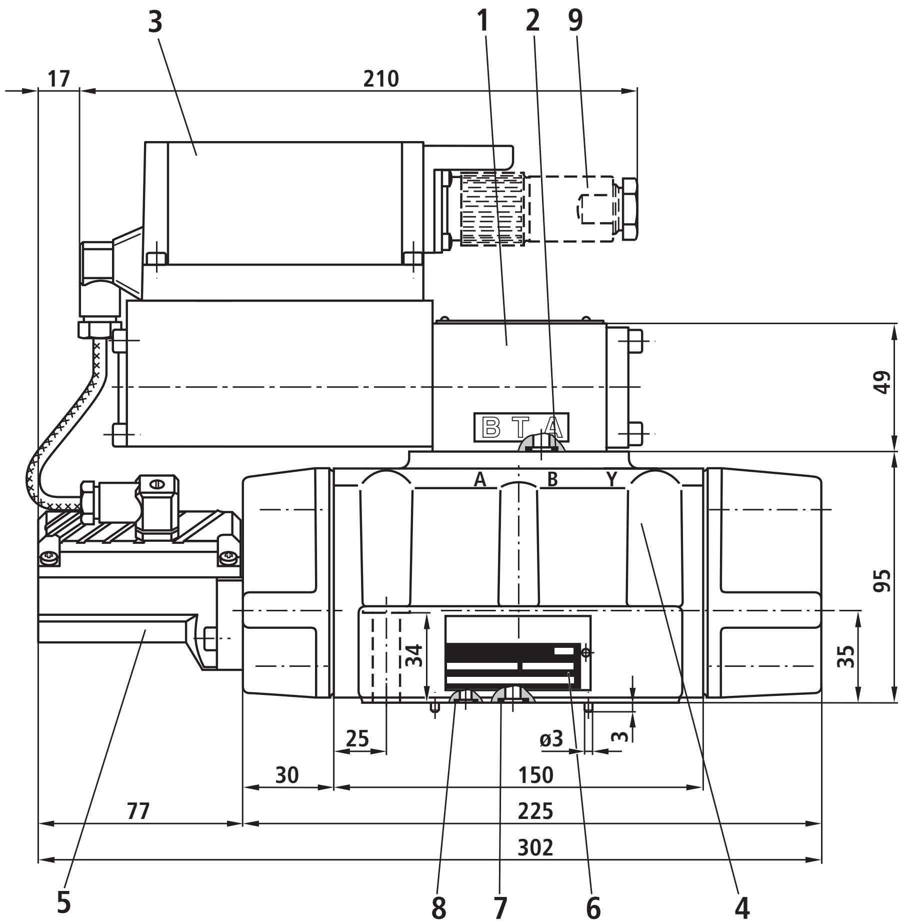
Valve fastening bolts (order separately)
The following valve fastening bolts are recommended:

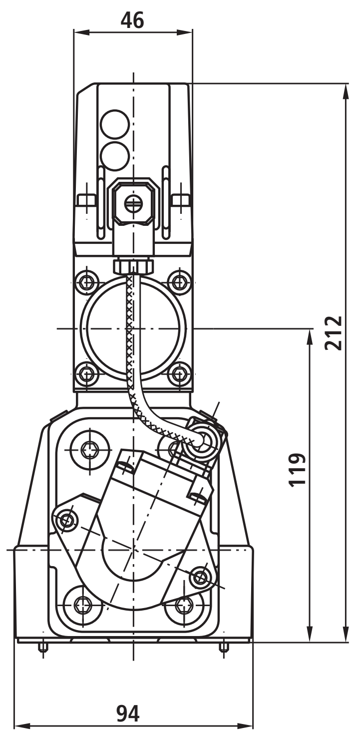
4 cheese-head bolts ISO 4762-M6x40-10.9-N67F821 70
(galvanized in accordance with Bosch standard N67F821 70)

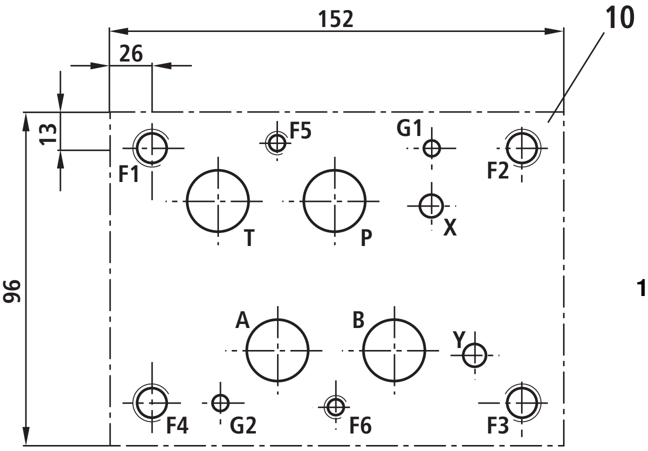
Tightening torque M_A = 11+3 Nm

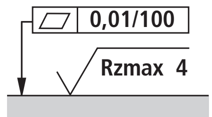
Material no. **2910151209**

Unit dimensions NG16 (dimensions in mm)









Required surface quality of valve mounting face

9 Plug-in connector not included in delivery, see data sheet 08008 (order separately)

10 Machined valve contact surface, mounting hole configuration according to ISO 4401-07-07-0-05

Deviates from standard:
Ports P, A, B, T ∅ 20 mm
Minimum thread depth: Ferrous metal 1.5 x ∅
Non-ferrous 2 x ∅

Subplates, see data sheet 45057 (order separately)

Valve fastening bolts (order separately)
The following valve fastening bolts are recommended:

2 cheese-head bolts ISO 4762-M6x45-10.9-N67F821 70
(galvanized in accordance with Bosch standard N67F821 70)
Tightening torque M_A = 11+3 Nm

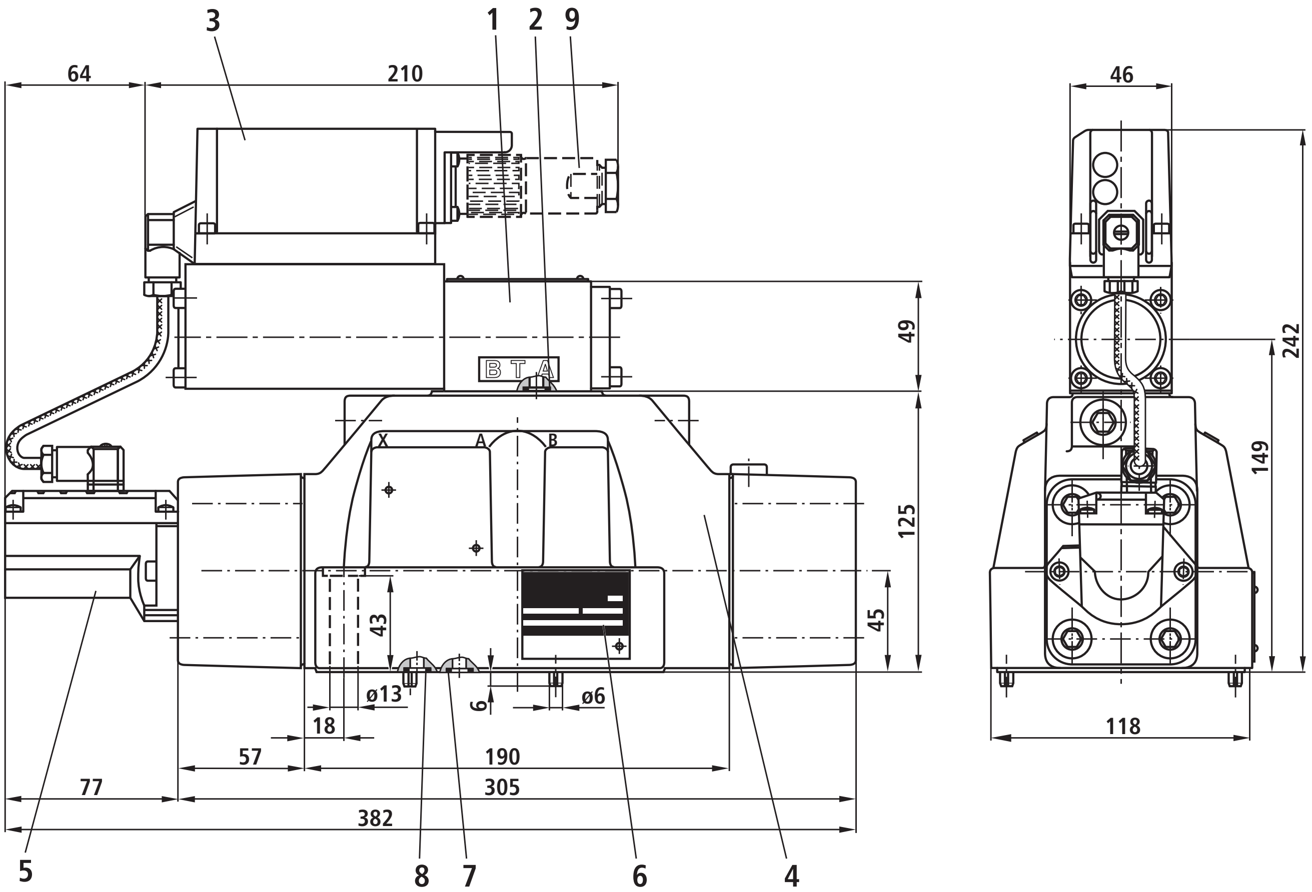
Material no. **2910151211**

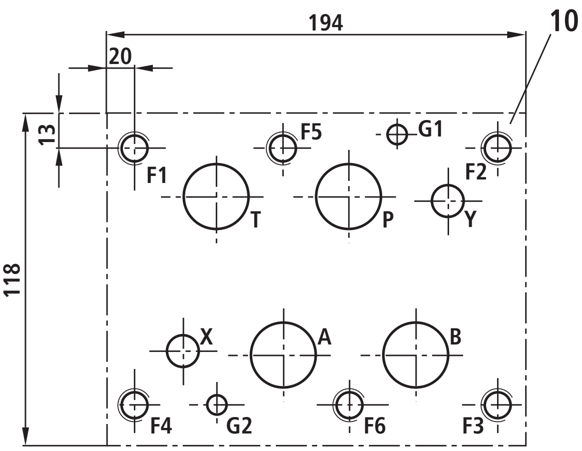
4 cheese-head bolts ISO 4762-M10x50-10.9-N67F821 70
(galvanized in accordance with Bosch standard N67F821 70)
Tightening torque M_A = 50+10 Nm

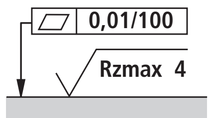
Material no. **2910151301**

1 Pilot valve
2 O-ring 9.25 x 1.78 (ports P, A, B, T)
3 On-board electronics
4 Main valve
5 Inductive position transducer (main valve)
6 Nameplate
7 O-ring 23 x 2.5 (ports P, A, B, T)
8 O-ring 9 x 2 (ports X, Y)

Unit dimensions NG25/27 (dimensions in mm)







Required surface quality
of valve mounting face

1 Pilot valve

2 O-ring 9.25 x 1.78 (ports P, A, B, T)

3 On-board electronics

4 Main valve

5 Inductive position transducer (main valve)

6 Nameplate

7 O-ring (ports P, A, B, T)
NG25: 28 x 3
NG27: 34.6 x 2.62

8 O-ring 15 x 2.5 (ports X, Y)

9 Plug-in connector not included in delivery, see data sheet 08008 (order separately)

10 Machined valve contact surface, mounting hole configuration according to ISO 4401-08-08-0-05
Deviates from standard:
NG25: Ports P, A, B, T Ø 25 mm
NG27: Ports P, A, B, T Ø 32 mm
Minimum thread depth: Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

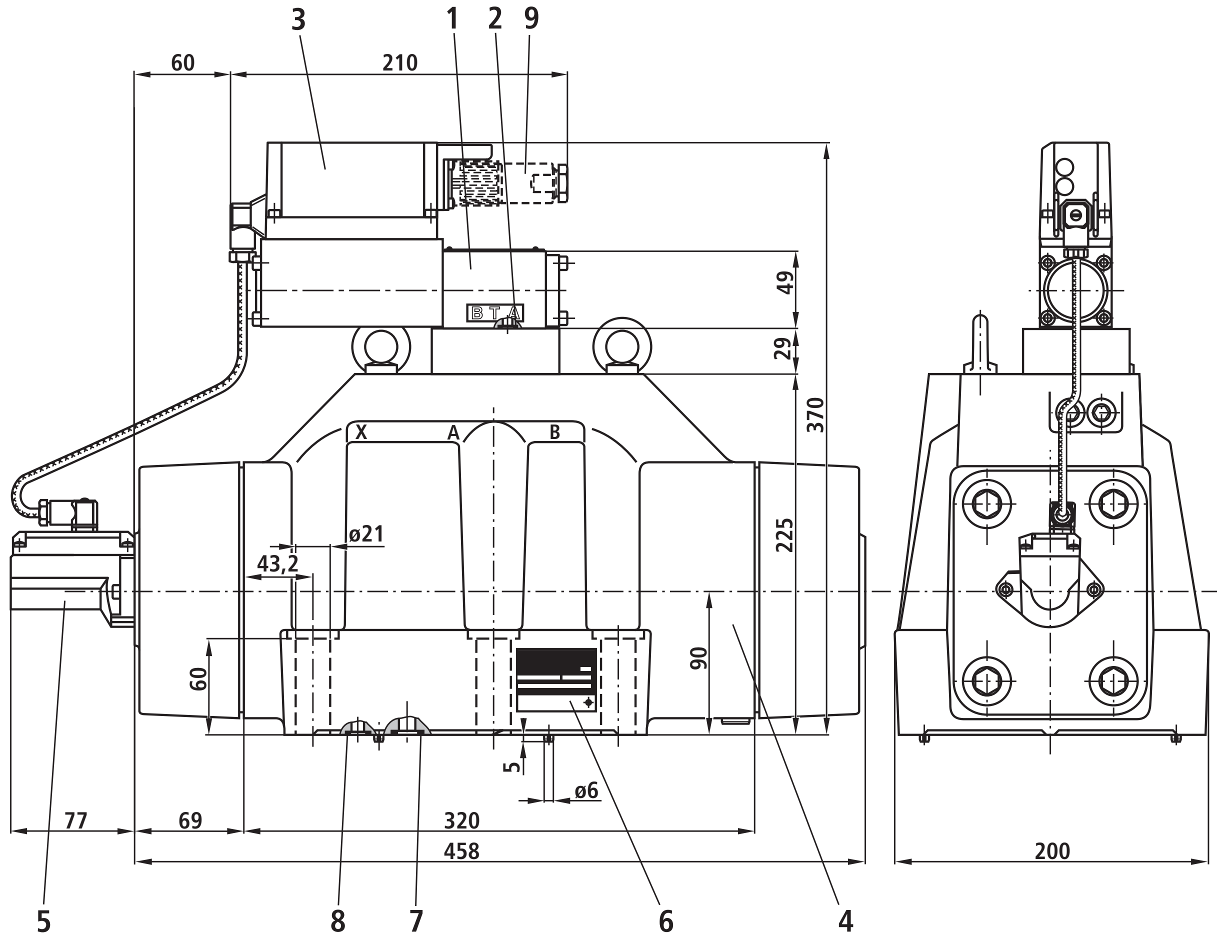
Subplates, see data sheet 45059 (order separately)

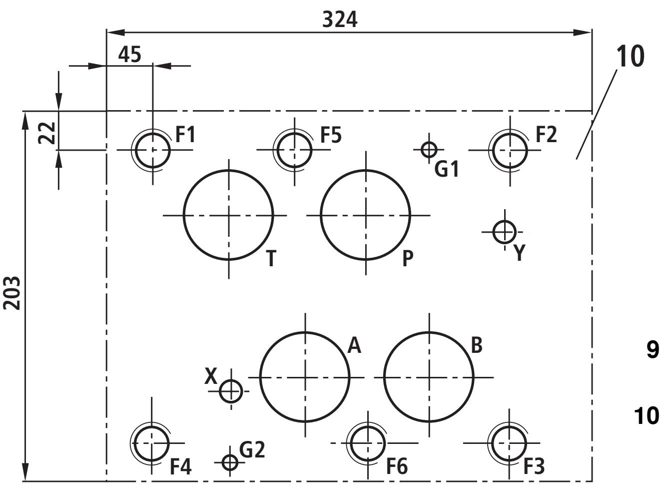
Valve fastening bolts (order separately)
The following valve fastening bolts are recommended:

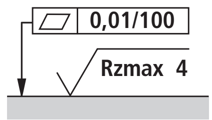
6 cheese-head bolts ISO 4762-M12x60-10.9-N67F821 70
(galvanized in accordance with Bosch standard N67F821 70)
Tightening torque NG25 M_A = 90+30 Nm,
NG27 M_A = 90±15 Nm

Material no. **2910151354**

Unit dimensions NG35 (dimensions in mm)







Required surface quality
of valve mounting face

1 Pilot valve

2 O-ring 9.25 x 1.78 (ports P, A, B, T)

3 On-board electronics

4 Main valve

5 Inductive position transducer (main valve)

6 Nameplate

7 O-ring 53.57 x 3.53 (ports P, A, B, T)

8 O-ring 15 x 2.5 (ports X, Y)

9 Plug-in connector not included in delivery, see data sheet 08008 (order separately)

10 Machined valve contact surface, mounting hole configuration according to ISO 4401-10-09-0-05

Deviates from standard:
Ports P, A, B, T ∅ 48 mm
Minimum thread depth: Ferrous metal 1.5 x ∅
Non-ferrous 2 x ∅

Subplates, see data sheet 45060 (order separately)

Valve fastening bolts (order separately)
The following valve fastening bolts are recommended:

6 cheese-head bolts ISO 4762-M20x90-10.9-N67F821 70
(galvanized in accordance with Bosch standard N67F821 70)
Tightening torque M_A = 450+110 Nm

Material no. **2910151532**

Notes

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
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Zum Eisengießer 1
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Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

4/3-way servo solenoid directional control valves, pilot operated, with electrical position feedback and on-board electronics

RE 29089/01.09
Replaces: 01.05

Type 4WRLE 10...35, symbols E./W.

Sizes (NG) 10, 16, 25, 27, 35
Unit series 3X
Maximum working pressure P, A, B 350 bar (NG27: 280 bar)
Nominal flow rate 50...1100 l/min (Δp = 10 bar)

List of contents

For information regarding the available spare parts see:
www.boschrexroth.com/spc

Features

– Pilot operated 4/3-way servo solenoid directional control valves NG10 to NG35, with approx. 20 % overlap
– Pilot valve NG6, with control piston and sleeve in servo quality, actuated on one side, 4/4 fail-safe position when switched off
– Control solenoid with electrical position feedback and on-board electronics (OBE), calibrated at the factory
– Main stage with position feedback
– Electronically calibrated and compensated overlap
– Spool with linear travel, with anti-rotation element
– Flow characteristic
  • S = Progressive
  • NG16, 25 and 27 with load tap C1/C2
– For subplate attachment, mounting hole configuration NG10 to ISO 4401-05-05-0-05, NG16 to ISO 4401-07-07-0-05, NG25/27 to ISO 4401-08-08-0-05 and NG35 to ISO 4401-10-09-0-05
– Subplates as per Technical Data Sheet, NG10 RE 45055, NG16 RE 45057, NG25/27 RE 45059 and NG35 RE 45060 (order separately)
– Plug-in connectors to DIN 43563-AM6, see Technical Data Sheet RE 08008 (order separately)

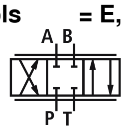
Ordering data

4WRL	E					S	J	–3X	/	G24		K0	/	A1	M	*

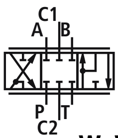
With **on-board** electronics = **E**

NG10 = **10**
NG16 = **16**
NG25 = **25**
NG27 [1] = **27**
NG35 [2] = **35**

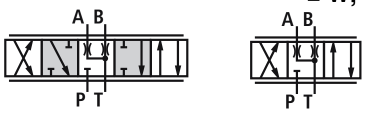
Control spool symbols = E, E1



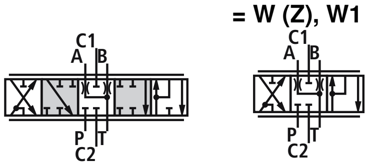
= E (Z), E1 (Z)



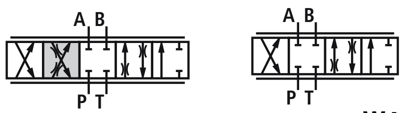
= W, W1



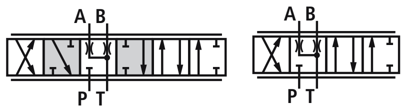
= W (Z), W1 (Z)



= E4



= W4



Transitional symbols

With symbol E1, E1(Z), E4, W1(Z), W4:
P → A: q_v B → T: $q_v/2$
P → B: $q_v/2$ A → T: q_v

With load tap C1/C2 (NG16, 25, 27) = **Z**

Nominal flow rate at 10 bar valve pressure difference (5 bar per metering notch)

NG10
50 = 50 l/min
80 = 80 l/min
NG16
180 = 180 l/min
NG25
350 = 350 l/min
NG27
430 = 430 l/min [1]
NG35
1100 = 1100 l/min [2]

Flow characteristic
S = Progressive

J = Overlap compensation signal
See characteristic curve range: +0.5 V

3X = Unit series 30 to 39
(installation and connection dimensions unchanged)

Voltage supply of trigger electronics
G24 = +24 V DC

Control oil supply "x", control oil return "y"
No desig. = "x" = external, "y" = external
E = "x" = internal, "y" = external
ET = "x" = internal, "y" = internal
T = "x" = external, "y" = internal

Electrical connection
K0 = without plug-in connector, with plug to DIN 43563-AM6
Order plug-in connector separately

Interface for trigger electronics
A1 = Setpoint input ±10 V

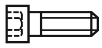
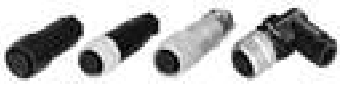
M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

Further information in plain text

[1] NG27 is a high-flow version of NG25, ports P, A, B and T have ∅ 32 mm in the main stage. Contrary to standard ISO 4401-08-08-0-05, ports P, A, B and T may be drilled to max. ∅ 30 mm in the control block. These valves therefore offer higher flow rates $Q_A : Q_B$

[2] NG35 is a high-flow version of NG32, ports P, A, B and T have ∅ 50 mm in the main stage. Contrary to standard ISO 4401-10-09-0-05, ports P, A, B and T may be drilled to max. ∅ 48 mm in the control block. These valves therefore offer higher flow rates $Q_A : Q_B$

Accessories, not included in delivery

Fastening bolts 	NG10	4 x ISO 4762-M6 x 40-10.9-N67F821 70	**2 910 151 209**
	NG16	2 x ISO 4762-M6 x 45-10.9-N67F821 70	**2 910 151 211**
		4 x ISO 4762-M10 x 50-10.9-N67F821 70	**2 910 151 301**
	NG25/27	6 x ISO 4762-M12 x 60-10.9-N67F821 70	**2 910 151 354**
	NG35	6 x ISO 4762-M20 x 90-10.9-N67F821 70	**2 910 151 532**
	Plug-in connectors 6P+PE, also see RE 08008	KS	**1 834 482 022**
		KS	**1 834 482 026**
		MS	**1 834 482 023**
		MS	**1 834 482 024**
		KS 90°	**1 834 484 252**

Testing and service equipment

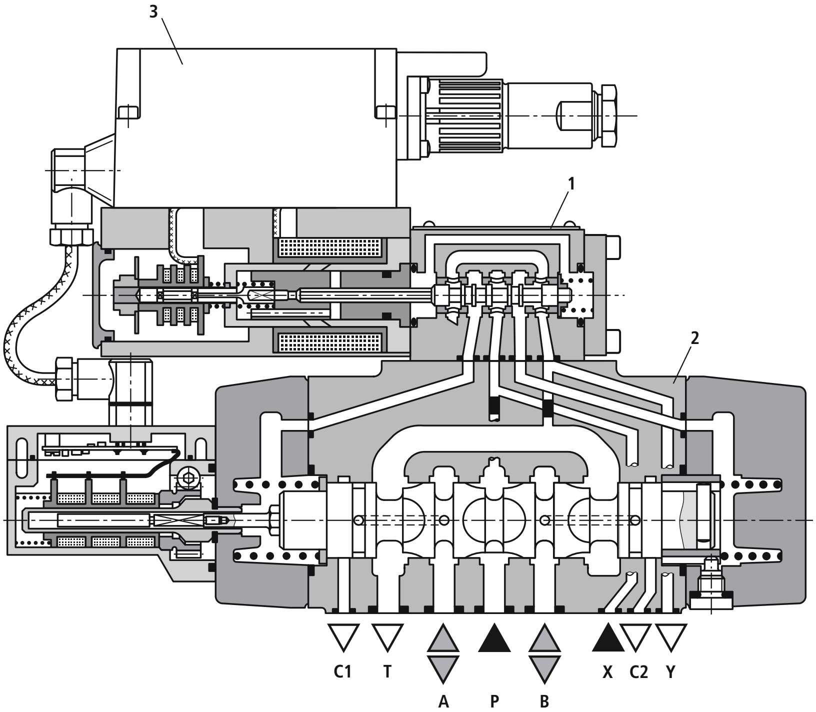
– Test box type VT-PE-TB3, see RE 30065

– Test adapter 6P+PE type VT-PA-2, see RE 30068

Function, sectional diagram

Construction

The valve consists of three main assemblies:
– Pilot valve (1) with control spool and sleeve, return springs, control solenoid and inductive position transducer
– Main stage (2) with centering springs and position feedback
– On-board trigger electronics (3)



Functional description

When the control solenoid is not actuated, the control spool is held by springs in the fail-safe position, and the main stage spool remains in its spring-centered mid position.
In the on-board electronics, the pre-defined setpoint is compared with the actual value for the position of the main stage control spool. In the event of an error signal, the control solenoid is actuated, and the pilot spool is moved as the magnetic force changes. The flow released through the control cross-sections causes the main control spool to move. The spool stroke is controlled proportionately to the setpoint of 0.5...10 V between 20...100 %. If the input setpoint is < ± 0.5 V, the control spool is held in the spring-centered, overlapped mid position.

The control oil is conveyed to the pilot valve either internally via port P or externally via port X. The oil returns to the tank internally via port T or externally via port Y.

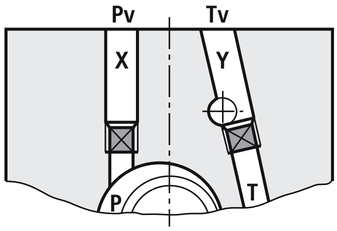
Power failure

In the event of a power failure or an open circuit, the on-board electronics cut off the electricity to the control solenoid and the pilot spool moves to the fail-safe position, relieving the control oil chambers of the main stage. The main stage control spool is held by springs in mid position.

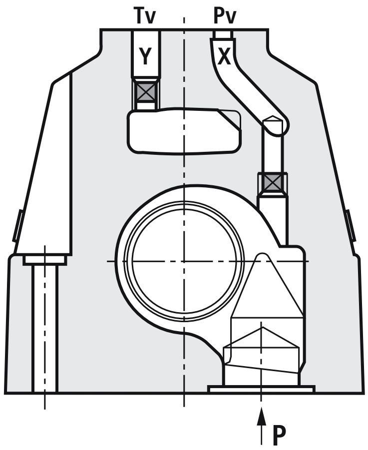
Control oil supply

The pilot valve can be supplied both via ports X and Y (externally) and via the main flow channels P and T.

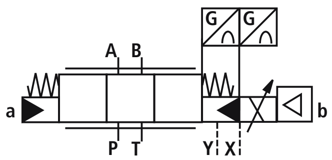
NG10, 25, 27, 35



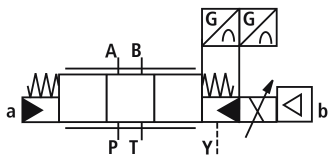
NG16



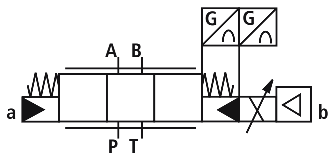
Type...–3X...



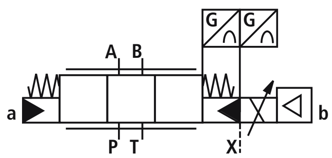
Type...–3X...E...



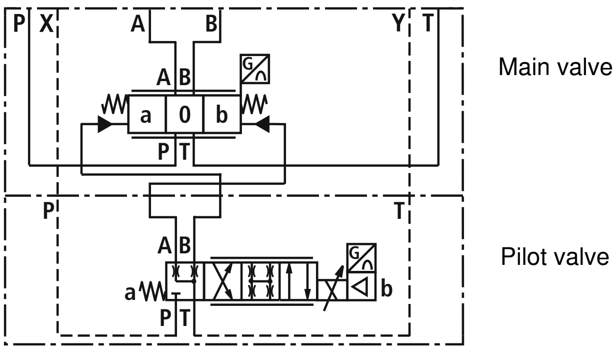
Type...–3X...ET...



Type...–3X...T...



Symbol in detail
(external control oil inlet and outlet)



No designation =	"x" = external	"y" = external
E =	"x" = internal	"y" = external
ET =	"x" = internal	"y" = internal
T =	"x" = external	"y" = internal

Technical data

General

Construction		Spool type valve, pilot operated
Actuation		Servo solenoid directional control valve NG6, with position controller for pilot valve and main stage
Type of mounting		Subplate, mounting hole configuration NG10...35 to ISO 4401-...
Installation position		Optional
Ambient temperature range	°C	–20...+50
Weight	kg	**NG10** 8.7 / **NG16** 10.6 / **NG25** 18.4 / **NG27** 18.4 / **NG35** 81
Vibration resistance, test condition		Max. 25 g, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, ϑ_{oil} = 40 °C ±5 °C)

Pressure fluid		Hydraulic oil to DIN 51524...535, other fluids after prior consultation				
Viscosity range recommended	mm^2/s	20...100				
Viscosity range max. permitted	mm^2/s	10...800				
Pressure fluid temperature range	°C	–20...+70				
Maximum permissible degree of contamination of pressure fluid Purity class to ISO 4406 (c)		Class 18/16/13 [1]				
Flow direction		See symbol				
Nominal flow at		**NG10**	**NG16**	**NG25**	**NG27**	**NG35**
Δp = 5 bar per notch [2]	l/min	50, 80	180	350	430	1100
Max. working pressure – Ports P, A, B (external control oil inlet)	bar	350	350	350	280	350
Max. working pressure – Ports P, A, B, X	bar	280				
Max. working pressure – Ports T, Y	bar	250				
Min. control oil pressure in “pilot stage”	bar	8				
Q_{max}	l/min	170	450	900	1000	3500
Q_N pilot valve (inlet) Δp = 35 bar	l/min	2	4	12	12	40
Leakage of pilot valve at X = 100 bar	cm^3/min	<150	<180	<350	<500	<1100
Leakage of main stage control spool symbols “E” at P = 100 bar	l/min	<0.25	<0.4	<0.6	<0.6	<1.1

Static/Dynamic

Overlap in mid position		≈18...22 % of spool stroke, electrically compensated for U_{D-E} ±0.5 V				
Spool stroke, main stage	± mm	4	7	10	10	12,5
Control oil volume of main stage 100 %	cm^3	1.1	4.3	11.3	11.3	41.5
Control oil requirement 0...100 %, (at X = 100 bar)	l/min	2.2	4.7	11.7	11.7	15.6
Hysteresis	%	<0.1, scarcely measurable				
Manufacturing tolerance	%	< ±5 (Q_{max})				
Response time for 0...100 %, (at X = 100 bar)	ms	<40	<80	<80	<80	<130
Response time for 0...100 %, (at X = 10 bar)	ms	<150	<250	<250	<250	<500
Switch-off behavior		After electrical switch-off (pilot valve in fail-safe) Main stage moves to spring-centered overlapped mid position				
Thermal drift		<1 % at ΔT = 40 °C				
Calibration		At the factory ±1 %, see flow curve				
Electromagnetic compatibility		EN 61000-6-2: 2002-08 EN 61000-6-3: 2002-08				

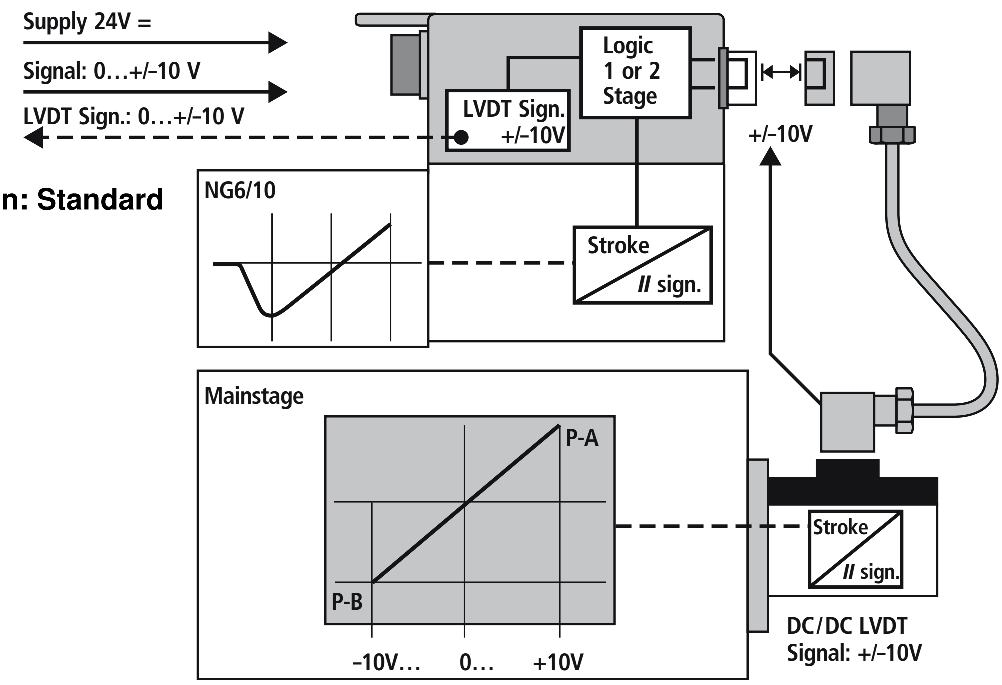
[1] The purity classes stated for the components must be complied with in hydraulic systems. Effective filtration prevents problems and also extends the service life of components. For a selection of filters, see Technical Data Sheets RE 50070, RE 50076 and RE 50081.

[2] Flow rate at a different Δp $Q_x = Q_{nom} \cdot \sqrt{\frac{\Delta p_x}{5}}$

Technical data

Electric pilot valve NG6, trigger electronics integrated in the valve		
Cyclic duration factor	%	100 ED
Degree of protection		IP 65 to DIN 40050 and IEC 14434/5
Connection		Plug-in connector 6P+PE, DIN 43563
Power supply Terminal A: Terminal B: 0 V		24 V DC_{nom} min. 21 V DC/max. 40 V DC Ripple max. 2 V DC
Power consumption		Solenoid ⊠ 45 mm = 40 VA max.
External fuse		2,5 A_F
Input, “Standard” version Terminal D: U_E Terminal E:		Differential amplifier, R_i = 100 kΩ 0...±10 V 0 V
Max. differential input voltage at 0 V		D → B, E → B: max. 18 V DC
Test signal, “Standard” version Terminal F: U_{Test} Terminal C:		LVDT 0...±10 V Reference 0 V
Protective conductor and screen		See pin assignment
Recommended cable		See pin assignment up to 20 m 7 x 0.75 mm² up to 40 m 7 x 1 mm²
Calibration		Overlap and P–A at +8 V, calibrated at the factory, see valve characteristic curve

Version: Standard

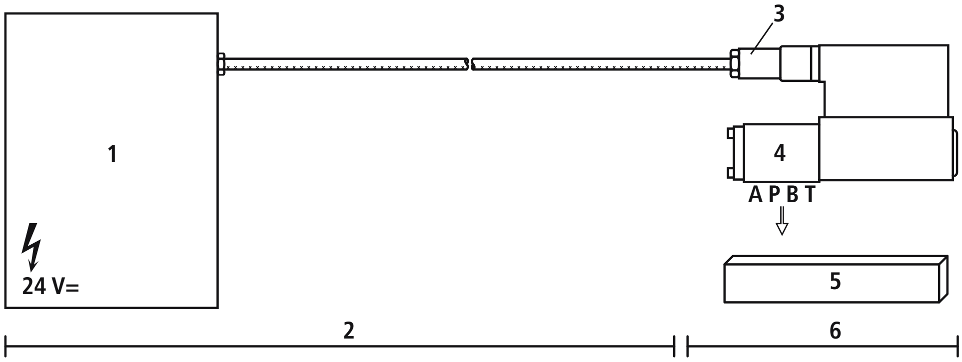


Important

Pilot operated 4/3-way servo solenoid directional control valves with positive overlap perform their function in open or closed-loop-controlled axes and have approx. 20 % overlap when switched off.
This condition does not constitute an active fail-safe position. For this reason, many applications require the use of “external check valves” or certain sandwich-mounted valves, which must be taken into account during the On/Off switching sequence.

Connection

For electrical data, see page 6



1 Control
2 Provided by customer
3 Plug-in connector
4 Valve
5 Connecting surface
6 Provided by Rexroth

Technical notes on the cable

Version: – Multi-wire cable
– Extra-finely stranded wire to VDE 0295, Class 6
– Protective conductor, green/yellow
– Cu braided screen

Types: – e.g. Ölflex-FD 855 CP (from Lappkabel company)

No. of wires: – Determined by type of valve, plug type and signal assignment

Cable Ø: – 0.75 mm² to 20 m length
– 1.0 mm² to 40 m length

Outside Ø: – 9.4...11.8 mm – Pg11
– 12.7...13.5 mm – Pg16

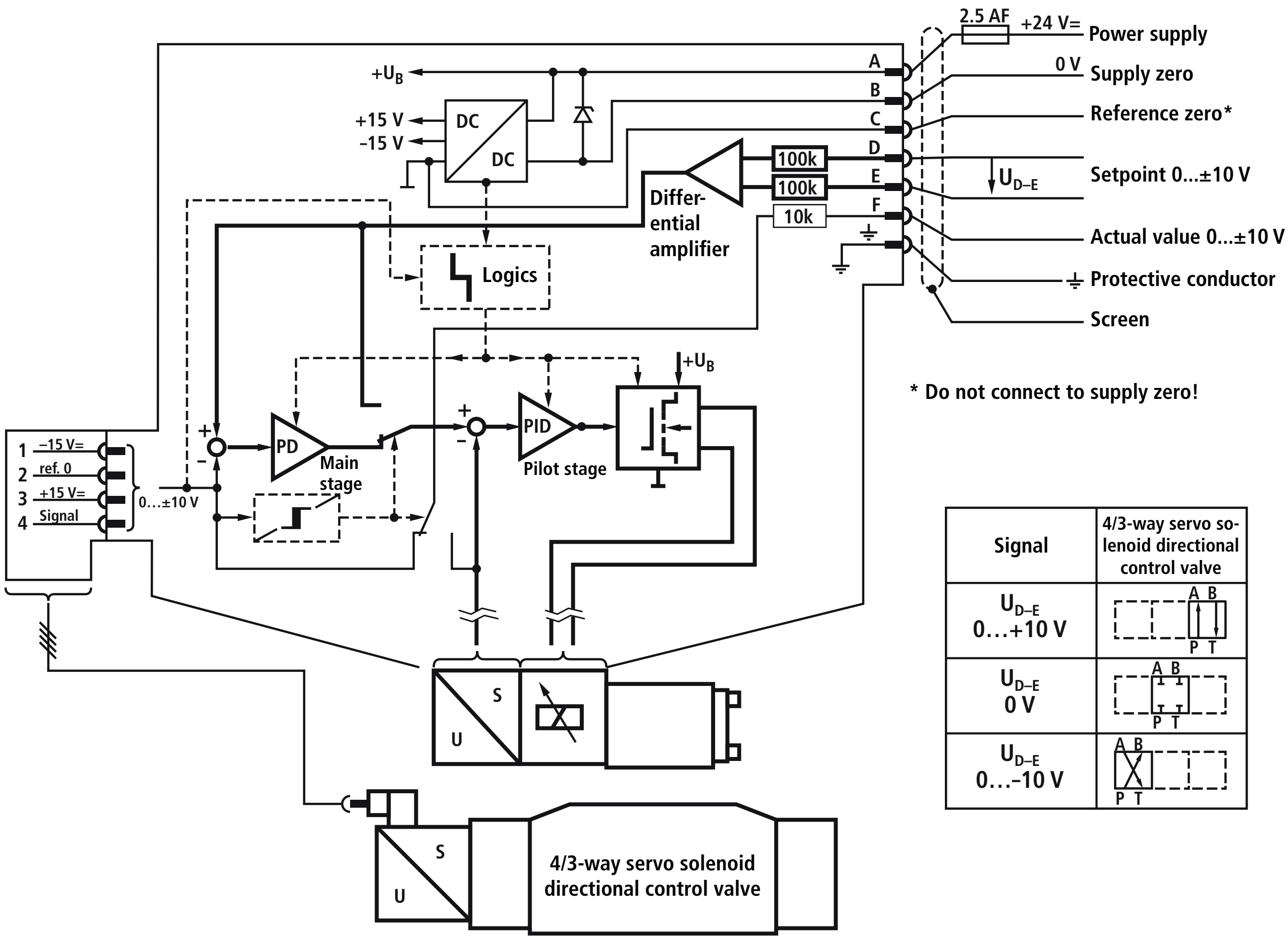
Important

Voltage supply 24 V $DC_{nom.}$,
if voltage drops below 18 V DC, rapid shutdown resembling "Enable OFF" takes place internally.
In addition, with the "mA signal" version:
$I_{D-E} \geqq 3$ mA – valve is active
$I_{D-E} \leqq 2$ mA – valve is deactivated.
Electrical signals emitted via the trigger electronics (e.g. actual values) must not be used to shut down safety-relevant machine functions! (See European Standard, "Technical Safety Requirements for Fluid-Powered Systems and Components – Hydraulics", EN 982.)

On-board electronics

Block diagram/pin assignment

Version A1: U_{D-E} ±10 V

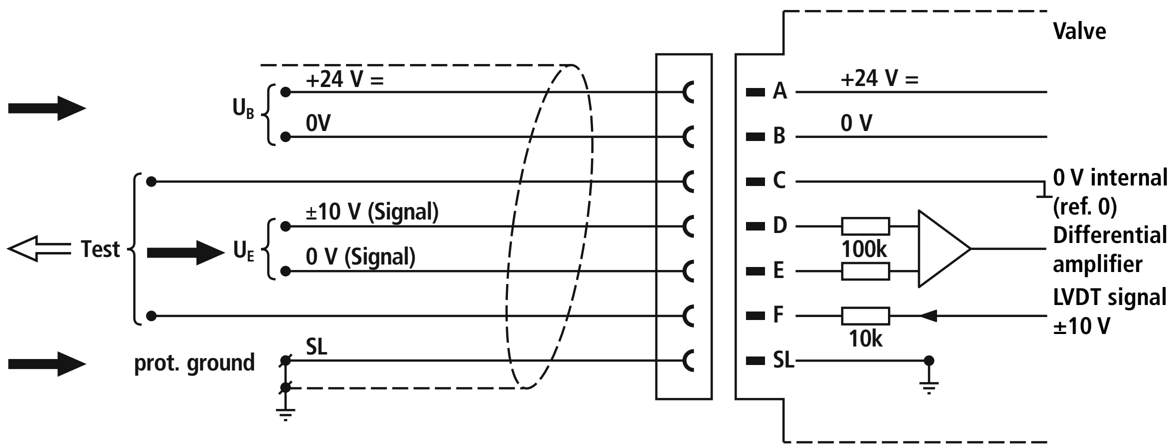


* Do not connect to supply zero!

Signal	4/3-way servo solenoid directional control valve
U_{D-E} 0…+10 V	A B P T
U_{D-E} 0 V	A B P T
U_{D-E} 0…–10 V	A B P T

Pin assignment 6P+PE

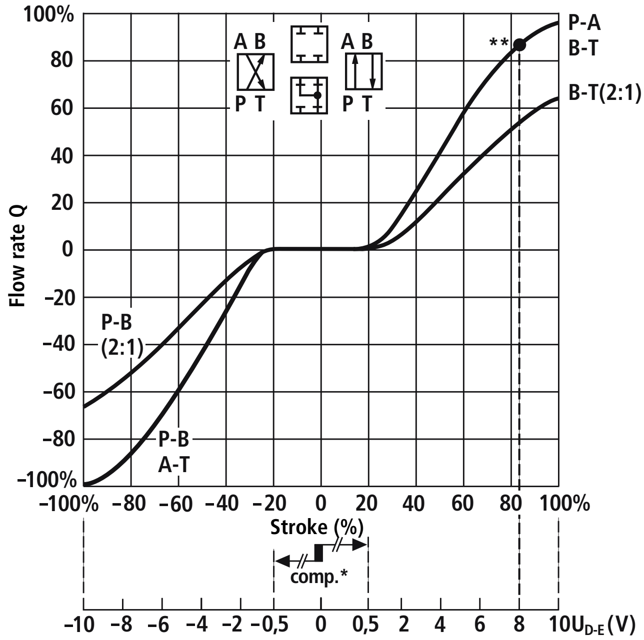
Version A1: U_{D-E} ±10 V
(R_i = 100 kΩ)



Characteristic curves (measured with HLP 46, ϑ_{oil} = 40 °C ±5 °C)

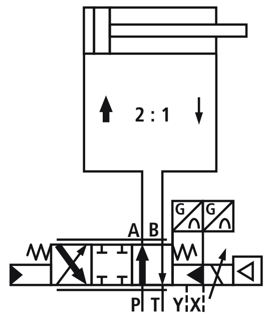
Flow rate – signal function
Q = f (U_{D-E})

Symbol E(Z), W(Z) (Q_A:Q_B = 1:1)
E1(Z), W1(Z) (Q_A:Q_B = 2:1)



Control spool with asymmetric metering notches

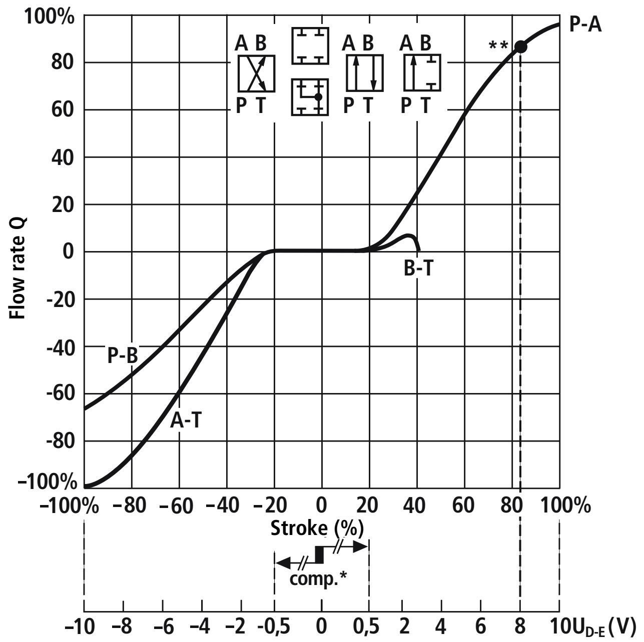
Control spools with asymmetric metering notches are available in a ratio of 2:1 for the purpose of adaptation to differential cylinders.



Flow in mid position, "leakage oil pressure relief"

With symbol "E", leakage oil in the two work chambers A and B of the control piston gives rise to a build-up of pressure in A or B, which then causes a connecting cylinder to drift out of position.
In many cases, the "W" symbol is a better solution. With a setpoint of "0", the control piston moves into the overlapped mid position. In this mid position, pressure is then relieved from ports A and B with 1 % ±0.5% Q_N to T.
This also supports the function of external check valves.

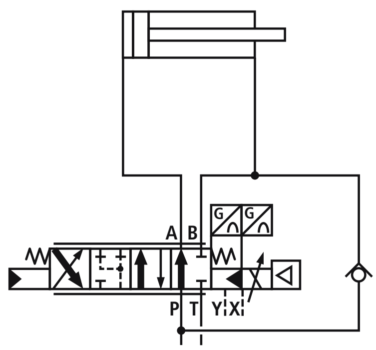
Symbol E4, W4 (Q_A:Q_B = 2:1)



Control spools in a differential circuit

In order to produce differential circuits, valve spools with a 4th position are available.
It is sufficient to install a check valve in the consumer lines.

In addition, a control spool (symbol) with internal B-P connection is employed for certain branch-oriented solutions. However, we recommend that you consult the BRH Application Center with regard to these special symbols, as a simulation or knowledge of this type of system is usually required.



* Comp. U_{D-E} ±0.5 V factory setting ±1 %
** Q_{P-A} at +8 V [U_{D-E}] manufacturing tolerance Q_{max} ≦ ±5 %

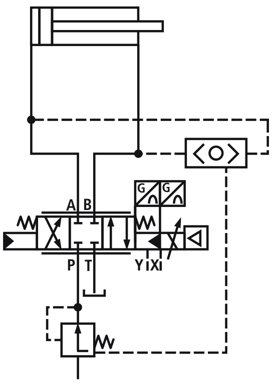
Characteristic curves (measured with HLP 46, ϑ_{oil} = 40 °C ± 5 °C)

Load tap C1/C2

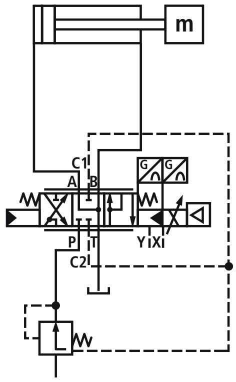
To compensate for fluctuations in the load or supply pressure, 4/3-way servo solenoid directional control valves are combined with pressure compensators. The load is tapped via a shuttle valve for the NG10 and 35, and via two additional ports C1 and C2 for the NG16, 25 and 27.

The pressure compensator therefore always receives the correct pressure signal even in the event of negative load. When using pressure compensators, an external control oil supply should always be selected.

NG10, 35



NG16, 25, 27

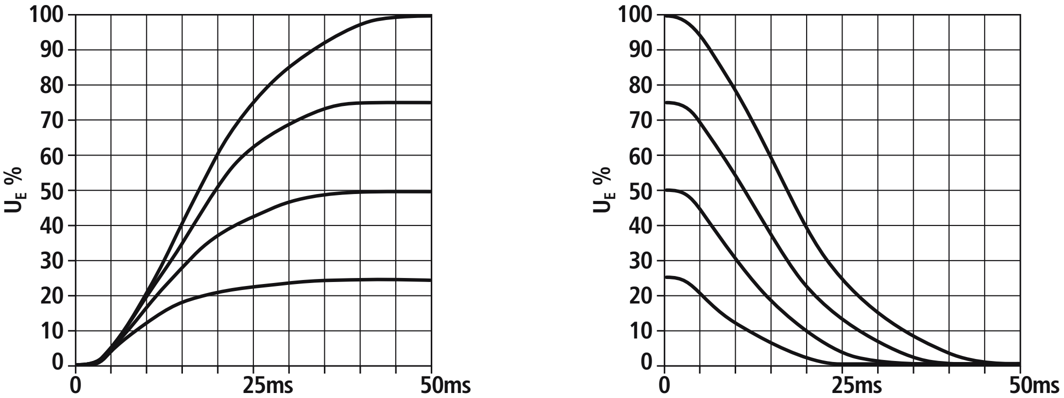


Characteristic curves (measured with HLP 46, ϑ_{oil} = 40 °C ± 5 °C)

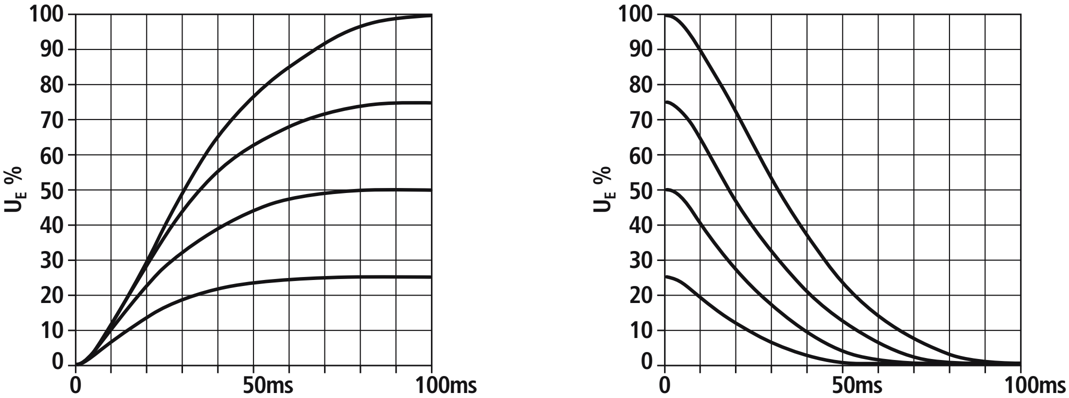
Response time (at X = 100 bar)

Open **Close**

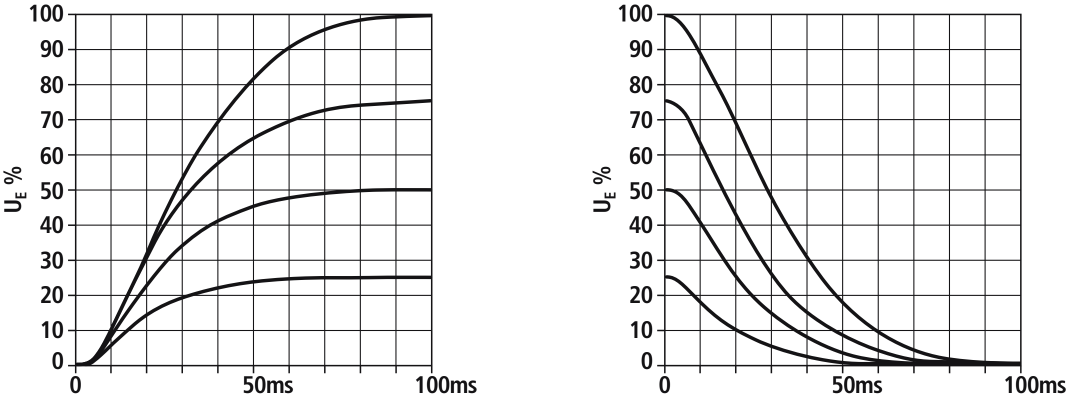
NG10



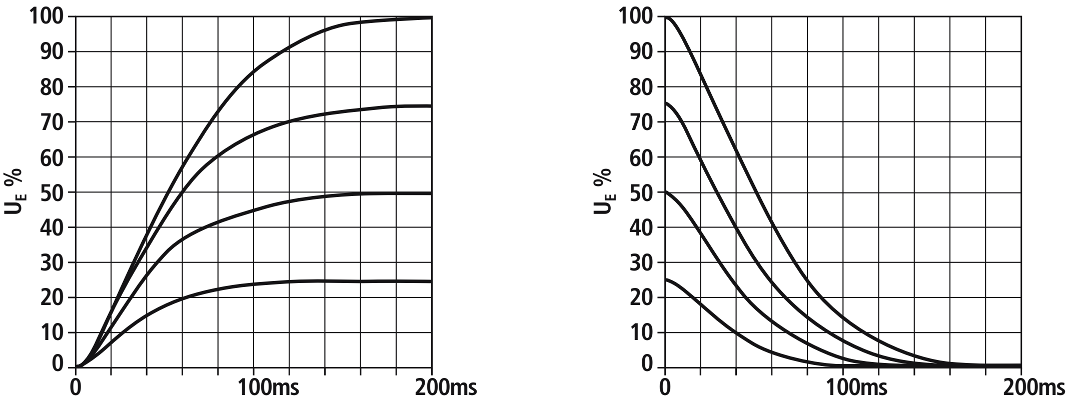
NG16



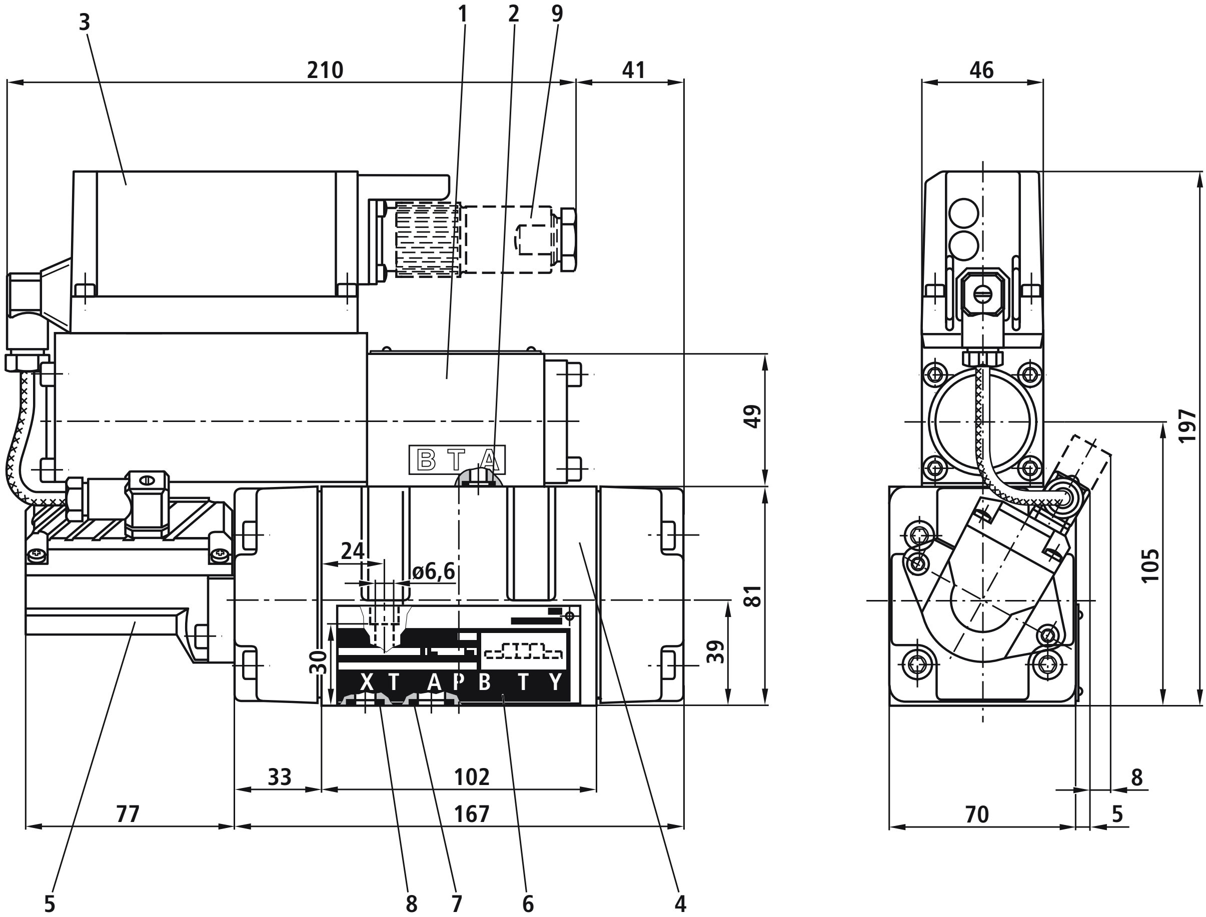
NG25/27

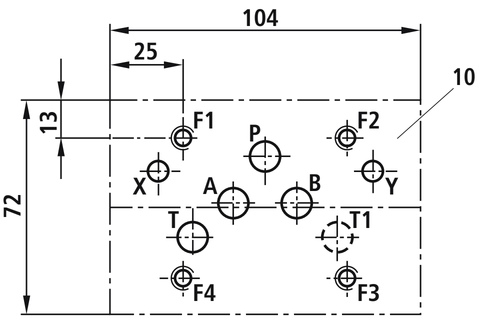


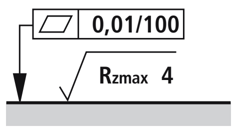
NG35



Unit dimensions NG10 (nominal dimensions in mm)







Required surface quality
of mating component

1 Pilot valve
2 O-ring 9.25 x 1.78 (ports P, A, B, T)
3 On-board electronics
4 Main valve
5 Inductive position transducer (main valve)
6 Nameplate
7 O-ring 12 x 2 (ports P, A, B, T, T1)
8 O-ring 10 x 2 (ports X, Y)
9 Plug-in connector not included in delivery (order separately)

10 Machined valve contact surface, mounting hole configuration according to ISO 4401-05-05-0-05
Deviates from standard:
Ports P, A, B, T, T1 Ø 10,5 mm
Minimum thread depth: Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

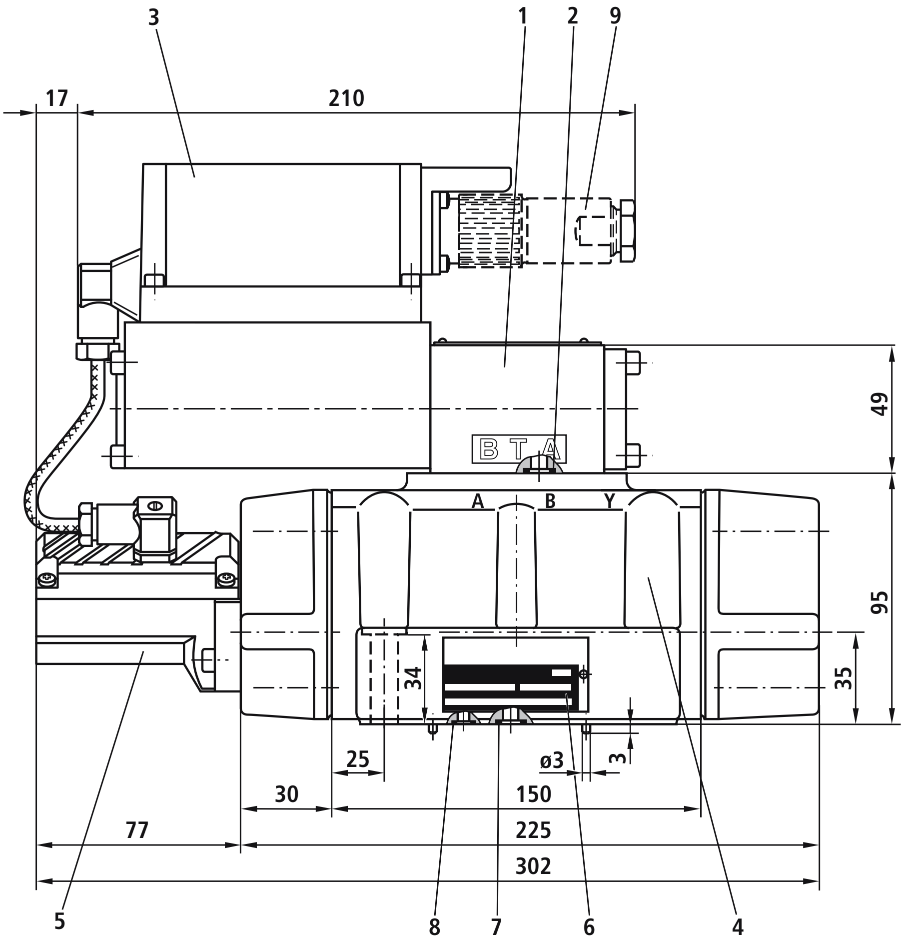
Subplates, see Technical Data Sheet RE 45055

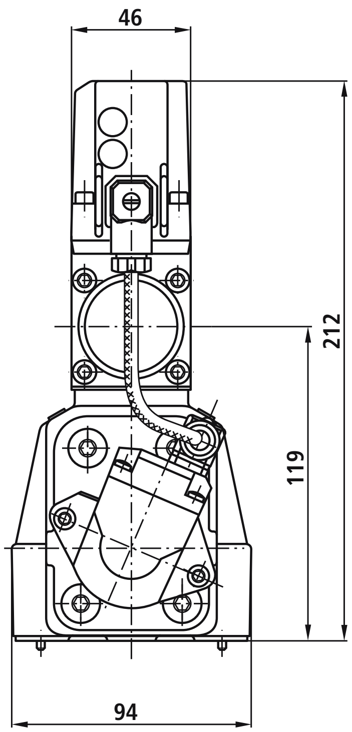
Valve fastening bolts (order separately)
The following valve fastening bolts are recommended:

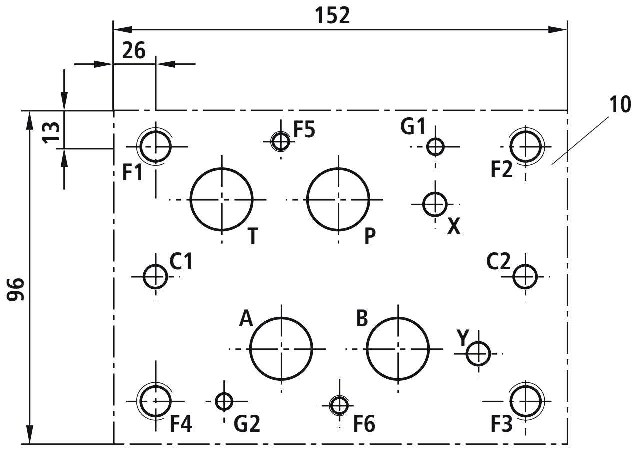
4 cheese-head bolts ISO 4762-M6x40-10.9-N67F821 70
(galvanized in accordance with Bosch standard N67F821 70)
Tightening torque M_A = 11+3 Nm

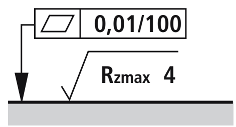
Material no. **2910151209**

Unit dimensions NG16 (nominal dimensions in mm)









Required surface quality
of mating component

1 Pilot valve

2 O-ring 9.25 x 1.78 (ports P, A, B, T)

3 On-board electronics

4 Main valve

5 Inductive position transducer (main valve)

6 Nameplate

7 O-ring 23 x 2.5 (ports P, A, B, T)

8 O-ring 9 x 2 (ports X, Y, C1, C2)

9 Plug-in connector not included in delivery (order separately)

10 Machined valve contact surface, mounting hole configuration according to ISO 4401-07-07-0-05

Deviates from standard:
Ports P, A, B, T Ø 20 mm
Minimum thread depth: Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

Subplates, see Technical Data Sheet RE 45057

Valve fastening bolts (order separately)
The following valve fastening bolts are recommended:

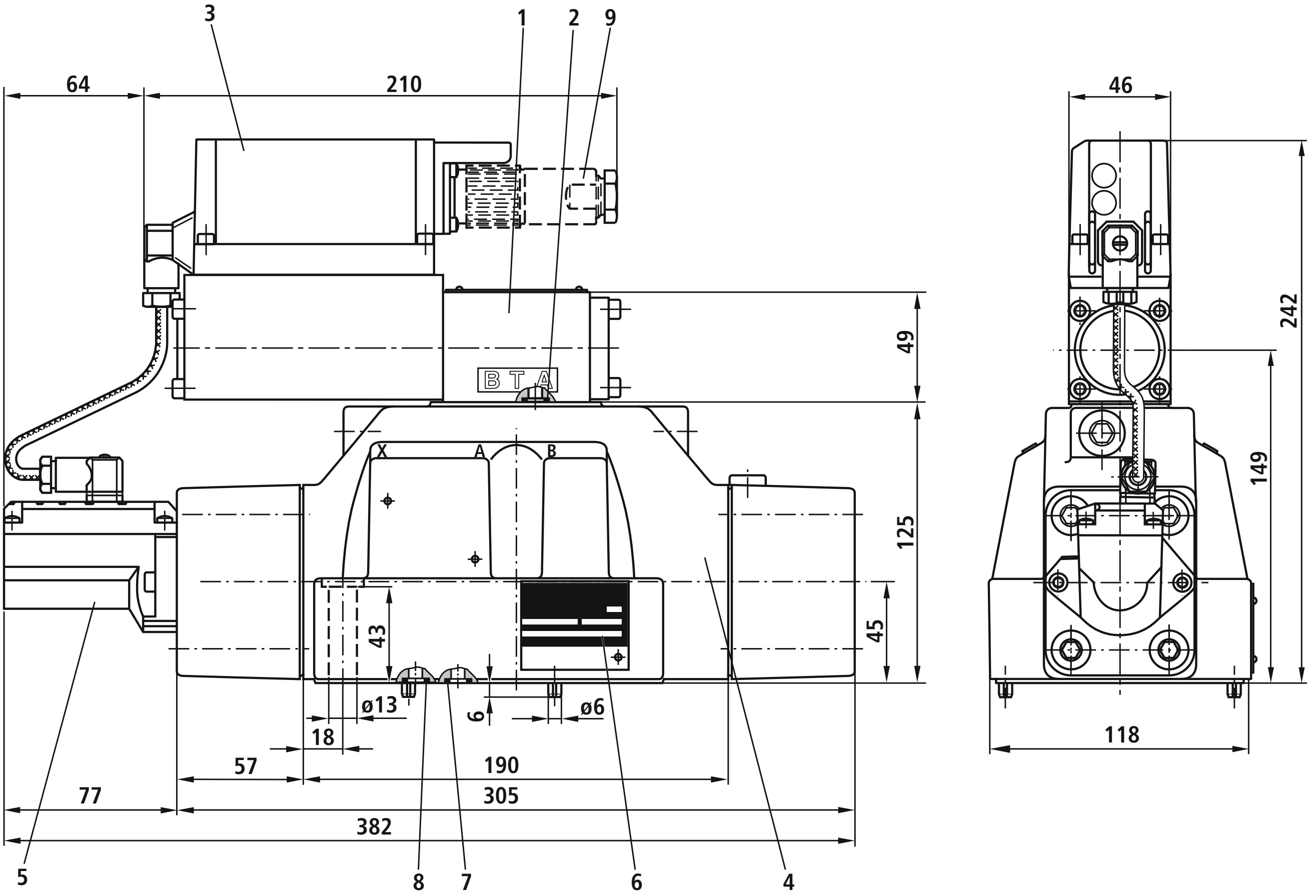
2 cheese-head bolts ISO 4762-M6x45-10.9-N67F821 70
(galvanized in accordance with Bosch standard N67F821 70)
Tightening torque M_A = 11+3 Nm

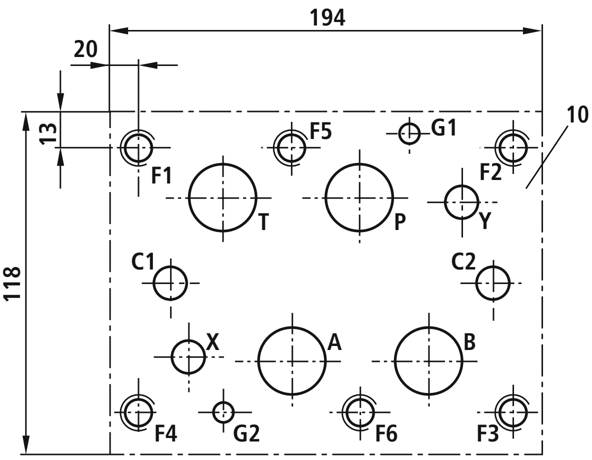
Material no. **2910151211**

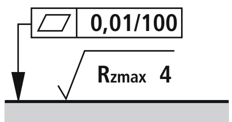
4 cheese-head bolts ISO 4762-M10x50-10.9-N67F821 70
(galvanized in accordance with Bosch standard N67F821 70)
Tightening torque M_A = 50+10 Nm

Material no. **2910151301**

Unit dimensions NG25/27 (nominal dimensions in mm)







Required surface quality
of mating component

1 Pilot valve

2 O-ring 9.25 x 1.78 (ports P, A, B, T)

3 On-board electronics

4 Main valve

5 Inductive position transducer (main valve)

6 Nameplate

7 O-ring (ports P, A, B, T)
NG25: 28 x 3
NG27: 34.6 x 2.62

8 O-ring 15 x 2.5 (ports X, Y, C1, C2)

9 Plug-in connector not included in delivery (order separately)

10 Machined valve contact surface, mounting hole configuration according to ISO 4401-08-08-0-05
Deviates from standard:
NG25: Ports P, A, B, T Ø 25 mm
NG27: Ports P, A, B, T Ø 32 mm
Minimum thread depth: Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

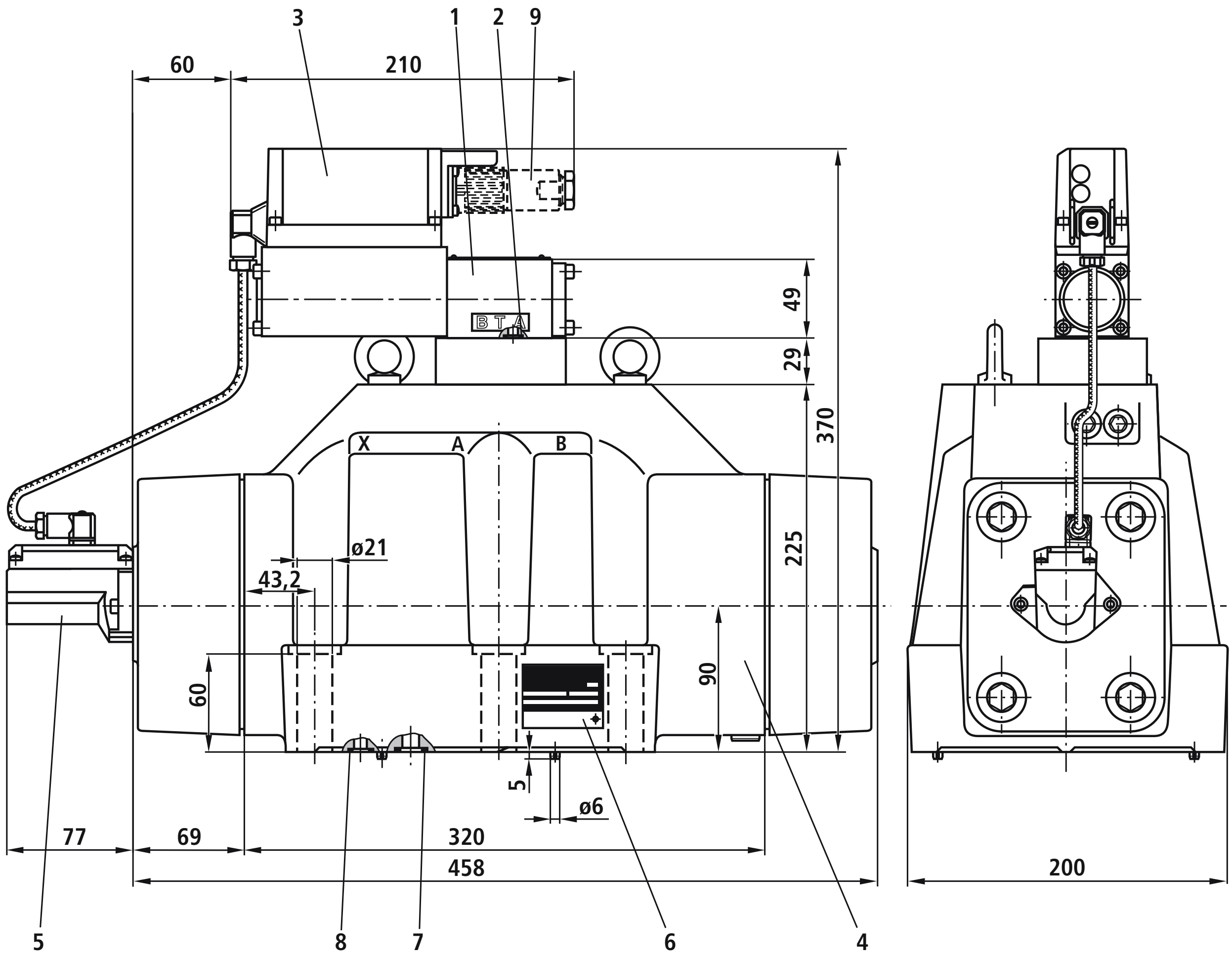
Subplates, see Technical Data Sheet RE 45059

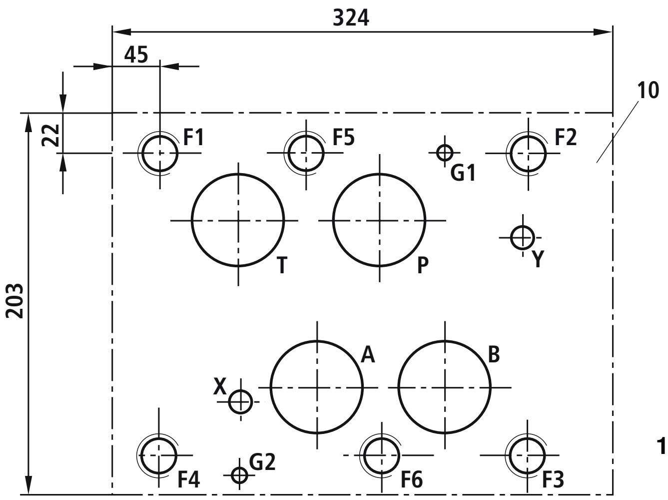
Valve fastening bolts (order separately)
The following valve fastening bolts are recommended:

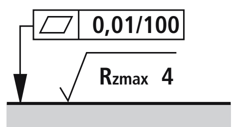
6 cheese-head bolts ISO 4762-M12x60-10.9-N67F821 70
(galvanized in accordance with Bosch standard N67F821 70)
Tightening torque NG25 M_A = 90+30 Nm,
NG27 M_A = 90±15 Nm

Material no. **2910151354**

Unit dimensions NG35 (nominal dimensions in mm)







Required surface quality
of mating component

1 Pilot valve
2 O-ring 9.25 x 1.78 (ports P, A, B, T)
3 On-board electronics
4 Main valve
5 Inductive position transducer (main valve)
6 Nameplate
7 O-ring 53.57 x 3.53 (ports P, A, B, T)
8 O-ring 15 x 2.5 (ports X, Y)
9 Plug-in connector not included in delivery (order separately)

10 Machined valve contact surface, mounting hole configuration according to ISO 4401-10-09-0-05
Deviates from standard:
Ports P, A, B, T Ø 48 mm
Minimum thread depth: Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

Subplates, see Technical Data Sheet RE 45060

Valve fastening bolts (order separately)
The following valve fastening bolts are recommended:

6 cheese-head bolts ISO 4762-M20x90-10.9-N67F821 70
(galvanized in accordance with Bosch standard N67F821 70)
Tightening torque M_A = 450+110 Nm

Material no. **2910151532**

Notes

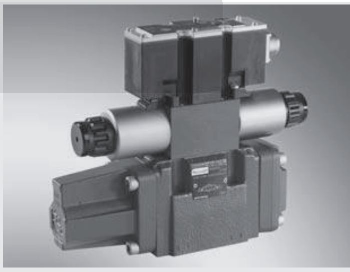
Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

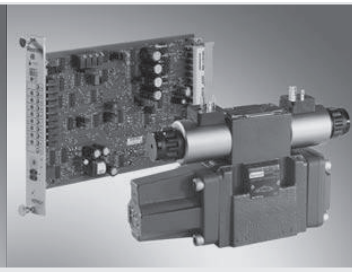
4/2, 4/3, and 5/2, 5/3 proportional directional valve, pilot operated, without electrical position feedback without/with integrated electronics (OBE)

RE 29115/08.13
Replaces: 10.05

Type .WRZ…, .WRZE… and .WRH…



Type 4WRZE 10 …-7X/...K31/...
with integrated electronics (OBE)



Type 4WRZ 10 …-7X/…K4/...
with the corresponding control electronics (separate order)

Sizes 10 to 52
Component series 7X
Maximum operating pressure 350 bar
Maximum flow 2800 l/min

Table of contents

Information on available spare parts:
www.boschrexroth.com/spc

Features

– Pilot operated, 2-stage proportional directional valve with integrated electronics (OBE) with type 4WRZE
– Control of flow direction and size
– Operation by means of proportional solenoids with central thread and detachable coil
– For subplate mounting:
  Porting pattern according to ISO 4401
– Manual override, optional
– Spring-centered control spool
– Control electronics
  • Type .WRZE…
    - Integrated electronics (OBE) with voltage or current input (A1 and/or F1)
  • Type .WRZ…
    - Digital or analog amplifier in Euro-card format
    - Analog amplifier in modular design

Ordering codes (types 4WRZ and 4WRH; sizes 10 to 32 subplate mounting; size 52 flange connection)

4WR_				–7X	/					

Hydraulic actuation	= **H**
Electro-hydraulic actuation	= **Z**
Type WRZ:	
For external electronics	= **no code**
With integrated electronics	= **E**
Size 10	= **10**
Size 16	= **16**
Size 25	= **25**
Size 32	= **32**
Size 52	= **52**
For **control spool symbols,** see page 3	
Rated flow in l/min at valve pressure differential ***Δp*** = 10 bar	
Size 10	
25 l/min	= **25**
50 l/min	= **50**
85 l/min	= **85**
Size 16	
100 l/min	= **100**
125 l/min	= **125**
150 l/min	= **150**
180 l/min	= **180**
Size 25	
220 l/min	= **220**
325 l/min	= **325**
Size 32	
360 l/min	= **360**
520 l/min	= **520**
Size 52	
1000 l/min	= **1000**
Component series 70 to 79 (70 to 79: Unchanged installation and connection dimensions)	= **7X**
For subplate mounting	= **no code**
For flange connection (size 52 only)	= **F**
Pilot control valve size 6	
Proportional solenoid with detachable coil	= **6E** [1)]
Supply voltage	
Direct voltage 24 V	= **G24** [1)]
Without manual override	= **no code**
With concealed manual override	= **N9** [1, 2)]
Without special type of protection	= **no code**
Seawater-resistant	= **J** [3)]
Pilot oil supply and return	
External pilot oil supply, external pilot oil return	= **no code**
Internal pilot oil supply, external pilot oil return	= **E**
Internal pilot oil supply, internal pilot oil return	= **ET**
External pilot oil supply, internal pilot oil return (only possible without code for size 52 and type 4WRH)	= **T**

| | | | | * |

For further details, see the plain text

M = NBR seals
V = FKM seals

no code = Without pressure reducing valve
D3 [1] **=** With pressure reducing valve ZDR 6 DP0-4X/40YM-W80 (not adjustable)

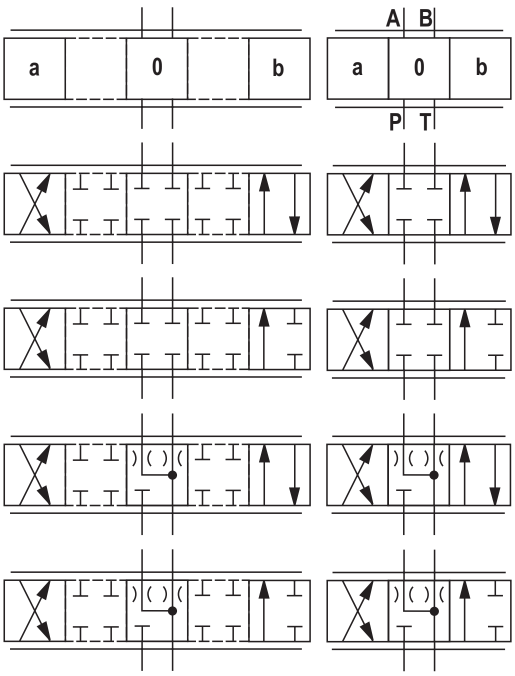
Electronics interface
A1 = Command value ±10 V
F1 = Command value 4 to 20 mA
no code = For types WRZ and WRH

Electrical connection type WRZ:
K4 [1, 4] **=** **Without** mating connector, with connector according to DIN EN 175301-803
Mating connector, separate order, see page 27
Type WRZE:
K31 [1, 4] **=** **Without** mating connector, with connector according to DIN EN 175201-804
Mating connector, separate order, see page 27

[1] Not applicable with types 4WRH
[2] For version "J"→"N" instead of "N9"
[3] For information on the seawater-resistant version, see data sheet 29115-M
[4] For version "J" = seawater-resistant **only** "K31"

Electric special types of protection available on request.

Control spool symbols

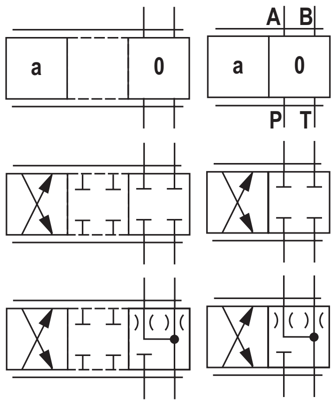


= E
E1-

= E3-

= W6-
W8-

= W9-



= EA [1]

= W6A [1]

[1] Not for type 4WRH

With symbols E1- and W8-: P → A: q_V B → T: $q_V/2$
P → B: $q_V/2$ A → T: q_V
With symbols E3- and W9-: P → A: q_V B → T: Blocked
P → B: $q_V/2$ A → T: q_V
(differential circuit, piston top at port A)

Notice: With symbols W6-, W8-, W9-, W6A, there is a connection from A → T and B → T with less than 2% of the respective nominal cross-section in switching position "0".

Ordering codes (types 4WRZ 52 and 4WRH 52; subplate mounting)

5WR_		52		1000 – 7X /									*

Hydraulic actuation = **H**
Electro-hydraulic actuation = **Z**

Type WRZ:
For external electronics = **no code**
With integrated electronics = **E**

Size 52 = **52**

For **control spool symbols,** see page 5

Rated flow in l/min at valve pressure differential ***Δp*** = 10 bar
1000 l/min = **1000**

Component series 70 to 79 = **7X**
(70 to 79: Unchanged installation and connection dimensions)

Pilot control valve size 6
Proportional solenoid with detachable coil = **6E** [1)]

Supply voltage
Direct voltage 24 V = **G24** [1)]

Without manual override = **no code**
With concealed manual override = **N9** [1, 2)]

Without special type of protection = **no code**
Seawater-resistant = **J** [3)]

Electrical connection type WRZ:
Without mating connector, with connector according to DIN EN 175301-803 = **K4** [1, 4]
Mating connector, separate order, see page 27
Type WRZE:
Without mating connector, with connector according to DIN EN 175201-804 = **K31** [1, 4]
Mating connector, separate order, see page 27

Electronics interface
Command value ±10 V = **A1**
Command value 4 to 20 mA = **F1**
For types WRZ and WRH = **no code**

Without pressure reducing valve = **no code**
With pressure reducing valve ZDR 6 DP0-4X/40YM-W80 (not adjustable) = **D3** [1)]

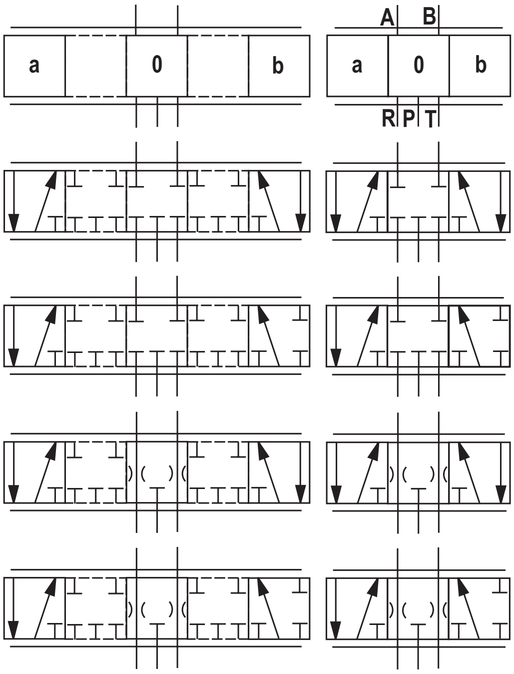
NBR seals = **M**
FKM seals = **V**

For further details, see the plain text

[1)] Not applicable with types 4WRH
[2)] For version "J"→"N" instead of "N9"
[3)] For information on the seawater-resistant version, see data sheet 29115-M
[4)] For version "J" = seawater-resistant **only** "K31"

Electric special types of protection available on request.

Control spool symbols

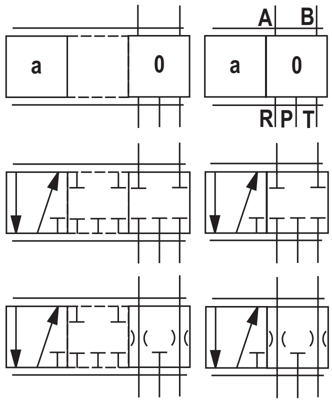


= E
E1-

= E3-

= W6-
W8-

= W9-



= EA [1)]

= W6A [1)]

[1)] Not for type 4WRH

With symbols E1- and W8-: P → A: q_V B → T: q_V/2
P → B: q_V/2 A → R: q_V

With symbols E3- and W9-: P → A: q_V B → T: Blocked
P → B: q_V/2 A → R: q_V

(differential circuit, piston top at port A)

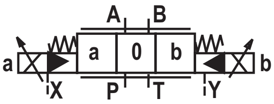
Notice:

- Only external pilot oil supply and return possible
- With control spool W6-, W8-, W9-, W6A, there is a connection from A → R and B → T with less than 2% of the respective nominal cross-section in switching position "0".

Symbols (simplified)

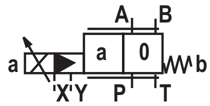
With electro-hydraulic actuation and for external electronics

Type 4WRZ…-7X./… and
type 4WRZ 52…-7XF/…

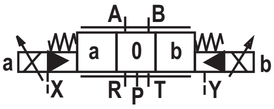


X = external
Y = external

Type 4WRZ…A-7X./… and
type 4WRZ 52 A…-7XF/…

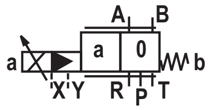


Type 5WRZ 52-7X./…

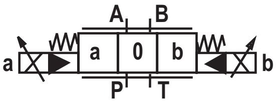


X = external
Y = external

Type 5WRZ 52 A-7X./…

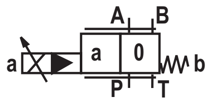


Type 4WRZ…-7X./…ET…



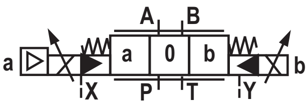
X = internal
Y = internal

Type 4WRZ.A…-7X./…ET…



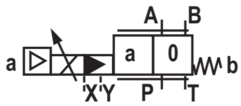
With electro-hydraulic actuation and for integrated electronics

Type 4WRZE…-7X./… and
type 4WRZE 52…-7XF/…

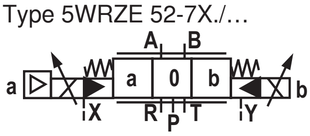


X = external
Y = external

Type 4WRZE…A-7X./… and
type 4WRZE 52 A…-7XF/…

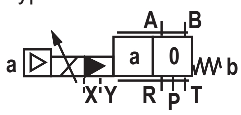


Type 5WRZE 52-7X./…

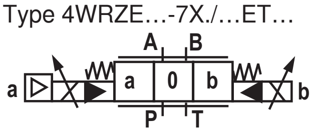


X = external
Y = external

Type 5WRZE 52 A-7X./…

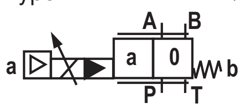


Type 4WRZE…-7X./…ET…



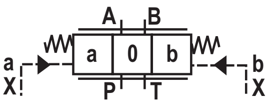
X = internal
Y = internal

Type 4WRZE.A…-7X./…ET…



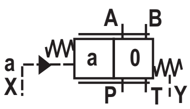
With hydraulic actuation

Type 4WRH…-7X./… and
type 4WRH 52…-7XF/…

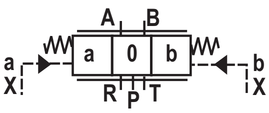


X = external
Y = external

Type 4WRH…A…-7X./… and
type 4WRH 52…-7XF/…

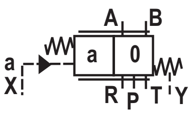


Type 5WRH 52…-7X.



X = external
Y = external

Type 5WRH 52 A…-7X./…



Function, section

Pilot control valve type 3DREP 6…

The pilot control valve is a 3-way pressure reducing valve that is actuated by a proportional solenoid. It converts an electrical input signal into a proportional pressure output signal and is used for all valves of the type 4WRZ... and 5WRZ...

The proportional solenoids are controllable, wet-pin DC solenoids with a central thread and a detachable coil. The solenoids are controlled by external electronics (type .WRZ...).

Set-up:

The valve basically consists of:

– Housing (1)
– Control spool (2) with pressure measuring spool (3 and 4)
– Solenoids (5 and 6) with central threads

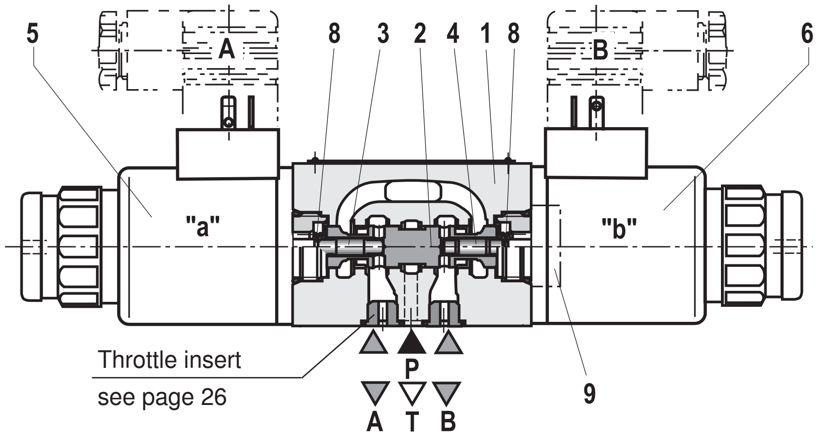
Function:

The pressure in A or B is set by means of the proportional solenoids. The amount of the pressure depends on the current. With de-energized solenoids (5, 6), the control spool (2) is held in the central position by means of the pressure springs (8). Ports A and B are connected with T so that the hydraulic fluid can flow to the tank without obstructions.

By energizing a proportional solenoid, e.g. solenoid "a" (5), the pressure measuring spool (3) and with it the control spool (2) are moved to the right. This opens the connection from P to B and A to T via orifice-type cross-sections with progressive flow characteristic. With the surface of the pressure measuring spool (4) the pressure that builds up in channel B acts on the control spool and against the solenoid force. The pressure measuring spool (4) is supported by solenoid "b". If the pressure exceeds the value set at solenoid "a", the control spool (2) is pushed back against the solenoid force and connects B with T until the set pressure is reached again. The pressure is proportional to the solenoid current.

When the solenoid is switched off, the control spool (2) is returned into the central position by the compression springs (8).

Type 3DREP 6…



Pilot control valve with two switching positions
(type 3DREP 6…B…)

The operation of this valve version basically corresponds to the valve with 3 switching positions. However, this 2 spool position valve is only equipped with solenoid "a" (5). In the place of the second proportional solenoid there is a plug screw (9).

Information on type 3DREP 6:
Prevent the tank line from draining. If this is possible due to installation conditions, install a preload valve (with a preload pressure of approx. 2 bar).

Function, section

Pilot control valve type 3DREPE 6…

The pilot control valve is a 3-way pressure reducing valve that is actuated by a proportional solenoid. It converts an electrical input signal into a proportional pressure output signal and is used for all valves of the type 4WRZE... and 5WRZE...

The proportional solenoids are controllable, wet-pin DC solenoids with a central thread and a detachable coil. The solenoids are controlled by the integrated electronics (type .WRZE...).

Set-up:

The valve basically consists of:
- Housing (1)
- Control spool (2) with pressure measuring spool (3 and 4)
- Solenoids (5 and 6) with central threads
- Integrated electronics (7)

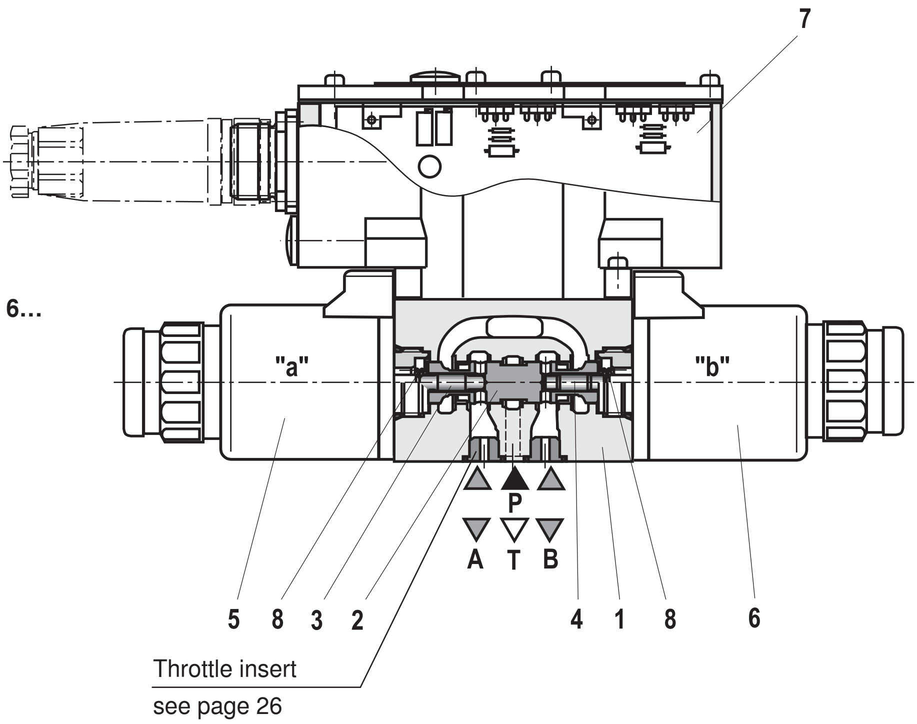
Function:

The pressure in A or B is set by means of the proportional solenoids. The amount of the pressure depends on the current. With de-energized solenoids (5, 6), the control spool (2) is held in the central position by means of the pressure springs (8). Ports A and B are connected with T so that the hydraulic fluid can flow to the tank without obstructions.

By energizing a proportional solenoid, e.g. solenoid "a" (5), the pressure measuring spool (3) and with it the control spool (2) are moved to the right. This opens the connection from P to B and A to T via orifice-type cross-sections with progressive flow characteristic. With the surface of the pressure measuring spool (4) the pressure that builds up in channel B acts on the control spool and against the solenoid force. The pressure measuring spool (4) is supported by solenoid "b". If the pressure exceeds the value set at solenoid "a", the control spool (2) is pushed back against the solenoid force and connects B with T until the set pressure is reached again. The pressure is proportional to the solenoid current.

When the solenoid is switched off, the control spool (2) is returned into the central position by the compression springs (8).

Type 3DREPE 6…



Function, section

Pilot operated proportional directional valves
Types 4WRZ… and 5WRZ.52…

Valves of type 4WRZ... are pilot operated 4-way directional valves that are actuated by proportional solenoids. They control the flow direction and size.

Valves of type 5WRZ... are equipped with an additional port "R" (only size 52).

Set-up:

The valve basically consists of:
- Pilot control valve (9) with proportional solenoids (5 and 6)
- Main valve (10) with main control spool (11) and centering spring (12)

☞ **Notice!**

Due to the design principle, internal leakage is inherent to the valves, which may increase over the life cycle.

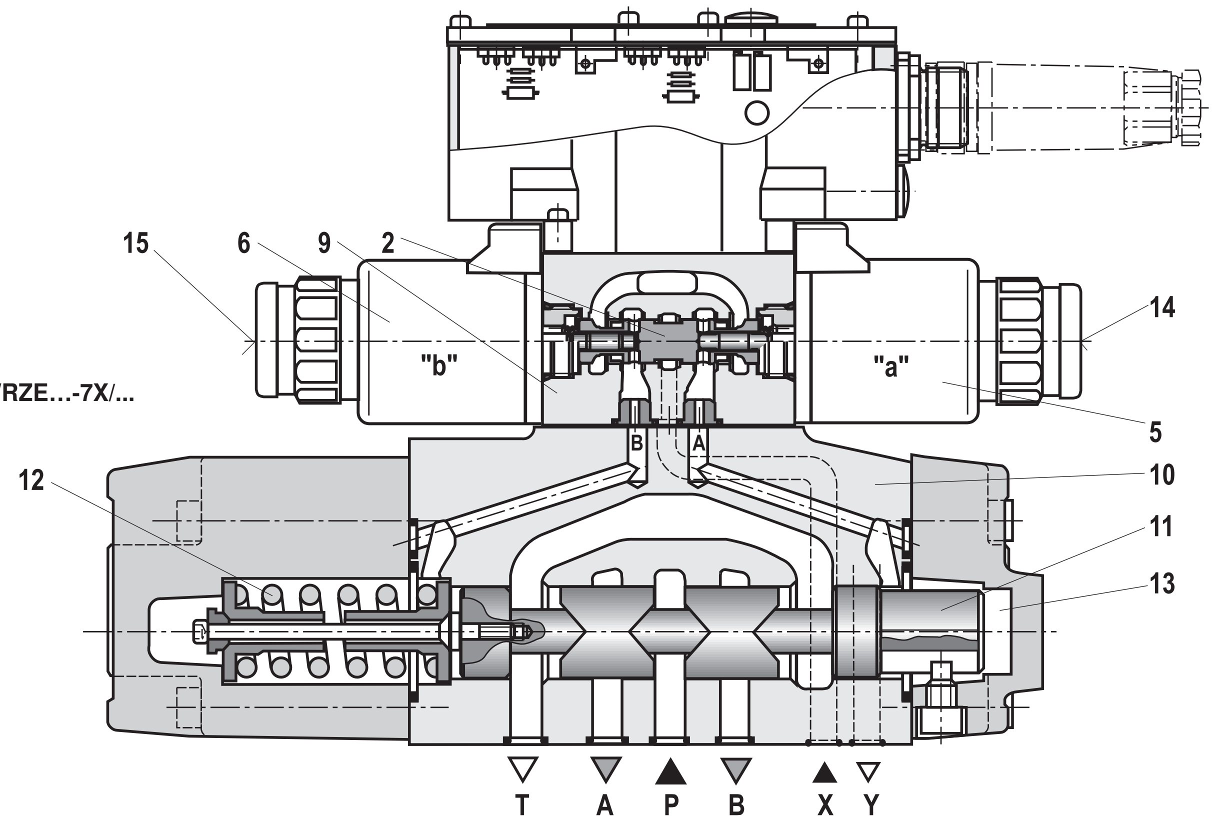
Function:

- With de-energized solenoids (5, 6), the main control spool (11) is held in the central position by means of the centering spring (12).
- The main control spool (11) is controlled by the pilot control valve (9); the main control spool is proportionally moved, e.g. by actuating solenoid "b" (6).
  - → The control spool (2) is moved to the right, pilot oil enters the pressure chamber (13) via the pilot control valve (9) and deflects the main control spool (11) according to the electric input signal.
  - → This opens the connection from P to B and A to T via orifice-type cross-sections with progressive flow characteristic.
- Pilot oil is internally supplied to the pilot control valve via port P or externally via port X.
- Switching the solenoid off (6)
  - → The control spool (2) and main control spool (11) are moved back into the central position.
- Depending on the switching position, flow occurs from P to A and B to T or P to B and A to T (R).

An optional manual override (14 and 15) can be used to move the control spool (2) without solenoid energization.

☞ **Notice:**
Inadvertent activation of the manual override may result in uncontrollable machine movements.

Type 4WRZE…-7X/...



Function, section

Externally pilot operated proportional directional valves Types 4WRH… and 5WRH.52…

Valves of the type .WRH... are pilot operated proportional directional valves for external actuation via pressure control valves.

Set-up:
The valve basically consists of:
- Main valve (10) with main control spool (11) and centering spring (12)
- Diversion plate (16)

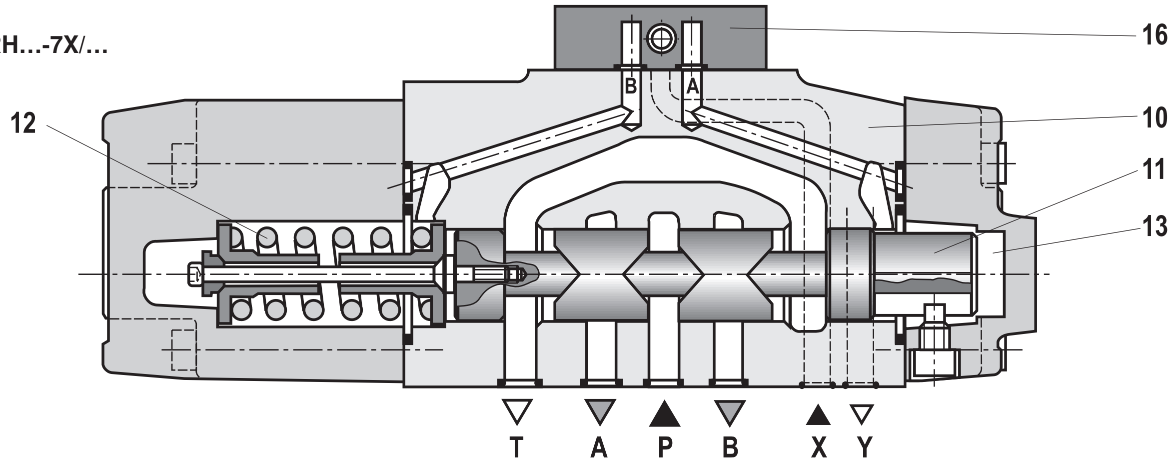
Notice!

Due to the design principle, internal leakage is inherent to the valves, which may increase over the life cycle.

Function:
- The diversion plate (16) connects control port A that leads to the pressure chamber (13) with port Y and control port B with port X.
- If port X is pressurized, the main control spool (11) is moved to the right (P to B and A to T). If port Y is pressurized, the main control spool is moved to the left (P to A and B to T).

The pilot pressure at the main valve must not exceed 25 bar (16 bar with size 52)!

Type .WRH…-7X/…



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

general

Valve type				.WRZ	.WRZE	.WRH
Installation position				Any, preferably horizontal (for commissioning information, see data sheet 07800)		
Storage temperature range			°C	–20 to +80		
Ambient temperature range			°C	–20 to +70	–20 to +50	–20 to +70
Weight	– Subplate mounting	Size 10	kg	7.8	8.0	6.1
		Size 16	kg	11.9	12.1	9.7
		Size 25	kg	18.2	18.4	18.0
		Size 32	kg	42.2	42.2	41.5
		Size 52	kg	79.5	79.7	
	– Flange connection	Size 52	kg	77.5	77.7	
	– With "D3"		kg	+0.5 in addition		
Sine test according to DIN EN 60068-2-6:2008				10 cycles, 10...2000...10 Hz with logarithmic frequency changing speed of 1 oct./min., 5 to 57 Hz, amplitude 1.5 mm (p-p), 57 to 2000 Hz, amplitude 10 g, 3 axes		
Random test according to DIN EN 60068-2-64:2009				20…2000 Hz, amplitude 0.05 g^2/Hz (10 g_{RMS}) 3 axes, 30 min testing time per axis		
Shock test according to DIN EN 60068-2-27:2010				Half sine 15 g/11 ms, 3 times in positive/3 times in negative direction per axis, 3 axes		
Humid heat, cyclic according to DIN EN 60068-2-30:2006				Variant 2 +25 °C to +55 °C, 90% to 97% relative humidity, 2 cycles at 24 hours each		

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

hydraulic (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and p = 100 bar)

<table>
<tr><td>Size</td><td></td><td>Size</td><td>10</td><td>16</td><td>25</td><td>32</td><td>52</td></tr>
<tr><td colspan="3">Operating pressure</td><td colspan="4" rowspan="3">30 to 100</td><td rowspan="2">20 to 100</td></tr>
<tr><td>– Pilot control valve</td><td>External pilot oil supply</td><td>bar</td></tr>
<tr><td></td><td>Internal pilot oil supply</td><td></td><td>–</td></tr>
<tr><td></td><td></td><td>bar</td><td>100 to 315 only with "D3"</td><td colspan="4">100 to 350 only with "D3"</td></tr>
<tr><td>– Main valve</td><td></td><td>bar</td><td>Up to 315</td><td>Up to 350</td><td>Up to 350</td><td>Up to 350</td><td>Up to 350</td></tr>
<tr><td rowspan="3">Return flow pressure</td><td>– Port T (port R)
(external pilot oil return)</td><td>bar</td><td>Up to 315</td><td>Up to 250</td><td>Up to 250</td><td>Up to 150</td><td>Up to 250</td></tr>
<tr><td>– Port T
(internal pilot oil return)</td><td>bar</td><td>Up to 30</td><td>Up to 30</td><td>Up to 30</td><td>Up to 30</td><td>–</td></tr>
<tr><td>– Port Y</td><td>bar</td><td>Up to 30</td><td>Up to 30</td><td>Up to 30</td><td>Up to 30</td><td>Up to 30</td></tr>
<tr><td colspan="2">Flow of the main valve</td><td>l/min</td><td>Up to 170</td><td>Up to 460</td><td>Up to 870</td><td>Up to 1600</td><td>Up to 2800</td></tr>
<tr><td colspan="2">Pilot flow at ports X and Y
with stepped input signal 0 → 100%</td><td>l/min</td><td>3.5</td><td>5.5</td><td>7</td><td>15.9</td><td>7</td></tr>
<tr><td colspan="2">Pilot volume
for switching process 0 → 100%</td><td>cm³</td><td>1.7</td><td>4.6</td><td>10</td><td>26.5</td><td>54.3</td></tr>
<tr><td colspan="3">Hydraulic fluid</td><td colspan="5">See table below</td></tr>
<tr><td colspan="2">Hydraulic fluid temperature range
(at the valve working ports)</td><td>°C</td><td colspan="5">–20 to +80 (preferably +40 to +50)</td></tr>
<tr><td colspan="2">Viscosity range</td><td>mm²/s</td><td colspan="5">20 to 380 (preferably 30 to 46)</td></tr>
<tr><td colspan="3">Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)</td><td colspan="5"></td></tr>
<tr><td></td><td colspan="2">– Pilot control valve</td><td colspan="5">Class 18/16/13 [1)]</td></tr>
<tr><td></td><td colspan="2">– Main valve</td><td colspan="5">Class 20/18/15 [1)]</td></tr>
<tr><td colspan="2">Hysteresis</td><td>%</td><td colspan="5">≤ 6</td></tr>
</table>

[1)] 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

Hydraulic fluid	**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils and related hydrocarbons	HL, HLP	NBR, FKM	DIN 51524
Flame-resistant – 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 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 process and operating medium used must be 40 K greater than the maximum solenoid surface temperature.
- **Flame-resistant – containing water**: The maximum pressure differential per control edge is 175 bar. Pressure pre-loading at the tank port > 20% of the pressure differential; otherwise, increased cavitation.
- Life cycle as compared to operation with mineral oil HL, HLP 50% to 100%

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

electric

Valve type			.WRZ [1]	.WRZE
Voltage type			Direct voltage	
Command value overlap		%	15	
Maximum current		A	1.5	2.5
Solenoid coil resistance	– Cold value at 20 °C	Ω	4.8	2
	– Maximum hot value	Ω	7.2	3
Duty cycle		%	100	
Maximum coil temperature [3]		°C	150	
Protection class of the valve according to EN 60529			IP65 with mating connectors mounted and locked	

Control electronics

Type 4WRZ	Digital amplifier in Euro-card format [2]		VT-VSPD-1-2X/... according to data sheet 30523	
	Analog amplifier in Euro-card format [2] with 1 ramp time		VT-VSPA2-1-2X/V0/T1, according to data sheet 30110	
	Analog amplifier in Euro-card format [2] with 5 ramp times		VT-VSPA2-1-2X/V0/T5, according to data sheet 30110	
	Analog module amplifier [2]		VT-11118-1X/... according to data sheet 30218	
Type 4WRZE			Integrated in the valve, see page 14	
	Analog command value module [2]		VT- SWMA-1-1X/... according to data sheet 29902	
	Analog command value module [2]		VT-SWMAK-1-1X/... according to data sheet 29903	
	Digital command value card [2]		VT-HACD-1-1X/… according to data sheet 30143	
	Analog command value card [2]		VT-SWKA-1-1X/... according to data sheet 30255	
Current consumption	I_{max}	A	–	1.8
	– Impulse current	A	–	3
Command value signal	– Voltage input "A1"	V	–	±10
	– Current input "F1"	mA	–	4 to 20

1) With Bosch Rexroth AG control electronics

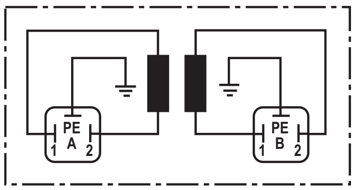
2) Separate order

3) Due to the temperatures occurring at the surfaces of the solenoid coils, the European standards ISO 13732-1 and EN 982 need to be adhered to.

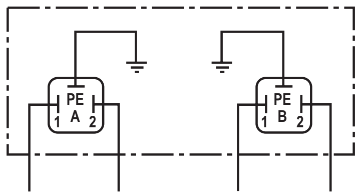
Electrical connection

For type .WRZ... (**for** external electronics – **not** with version **"J"** = seawater-resistant)
For mating connectors, see page 27

Connection at the connector

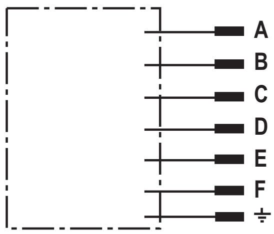


Connection to mating connector



to the amplifier to the amplifier

For type .WRZ... (**for** external electronics – with version **"J"** = seawater-resistant)
For mating connectors, see page 27



External electronics

Contact	Connection with
A	Solenoid A
B	Solenoid B
C	Solenoid A
D	Solenoid B
E	n.c.
F	n.c.
PE	Valve housing

For type .WRZE... (**with** integrated electronics (OBE) and with version **"J"** = seawater-resistant)
For mating connectors, see page 27

Connector pin assignment	Contact	Signal with A1	Signal at F1
Supply voltage	A	24 VDC ($\boldsymbol{u}$(t) = 19.4 to 35 V); $\boldsymbol{I}_{max}$ = 2 A	
	B	0 V	
Reference (actual value)	C	Cannot be used [1]	
Differential amplifier input	D	±10 V; $\boldsymbol{R}_e$ > 50 kΩ	4 to 20 mA; $\boldsymbol{R}_e$ > 100 Ω
(Command value)	E	Command value reference potential	
	F	Cannot be used [1]	
Protective grounding conductor	PE	Connected to cooling element and valve housing	

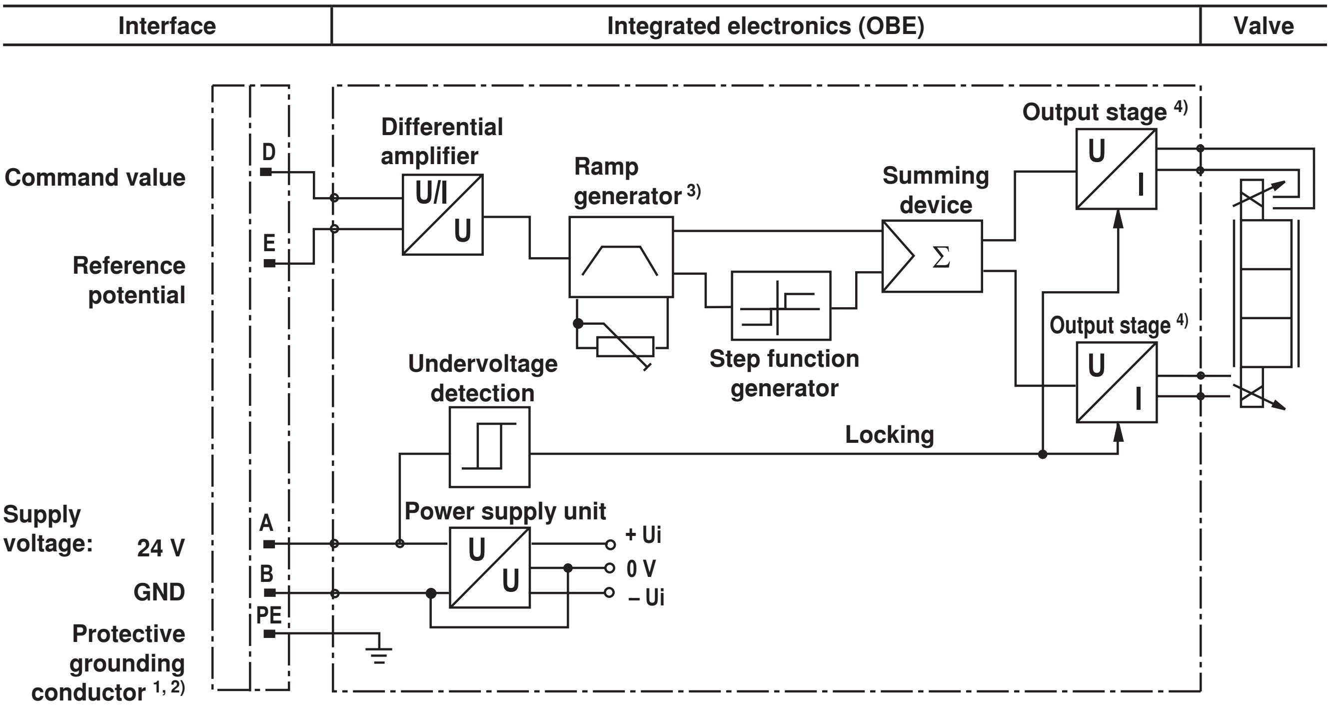
[1] Contacts C and F must not be connected!

Command value: A positive command value (0 to 10 V or 12 to 20 mA) at D and a reference potential at E result in a flow from P to A and B to T.
A negative command value (0 to –10 V or 12 to 4 mA) at D and a reference potential at E result in a flow from P to B and A to T.
If the valve and the solenoid are on side "a" (control spool variants EA and W6A), a positive command value at D and a reference potential at E result in flow from P to B and A to T.

Connection cable: Recommendation:
– Up to 25 m cable length, type LiYCY 5 x 0.75 mm^2
– Up to 50 m 25 m cable length, type LiYCY 5 x 1.0 mm^2

External diameter 6.5 to 11 mm
Only install the shield on the supply side on the protective grounding conductor.

Block diagram of the integrated electronics (OBE) for type WRZE

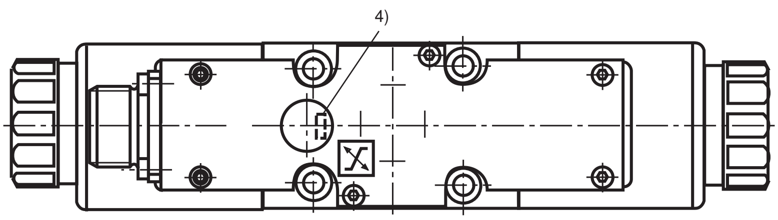


[1] Port PE is connected to the cooling element and the valve housing

[2] The protective grounding conductor is screwed to the valve housing and cover

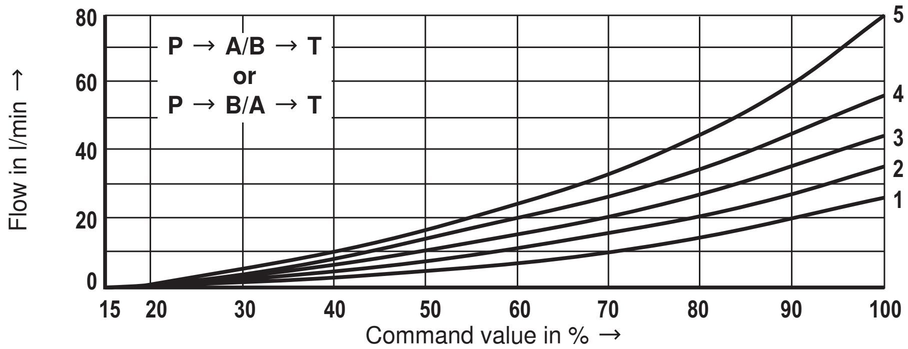
[3] Ramp can be set from 0 to 2.5 s from the outside, identical for T_{up} and T_{down}

[4] The output stages are current-controlled



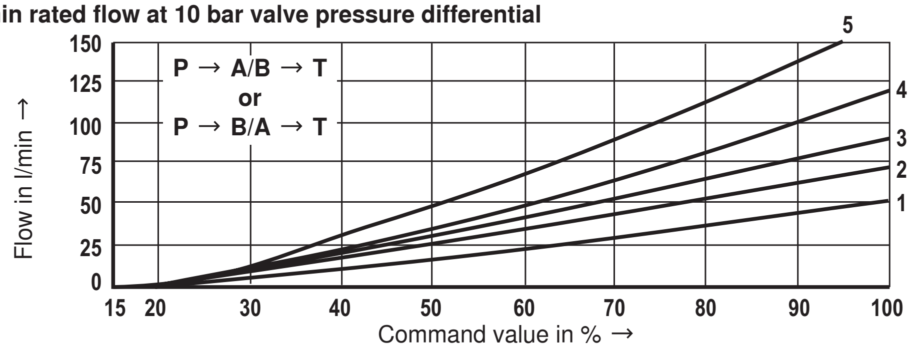
Characteristic curves size 10 (control spool "E, W6-, EA, W6A" as well as HLP46, ϑ_{oil} = 40 °C ±5 °C and p = 100 bar)

25 l/min rated flow at 10 bar valve pressure differential



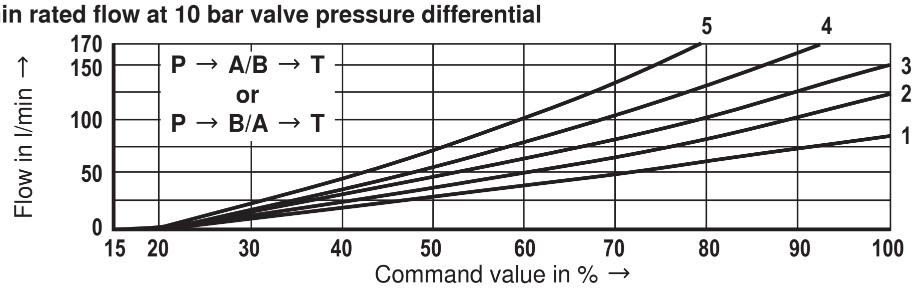
1 **Δp** = 10 bar, constant
2 **Δp** = 20 bar, constant
3 **Δp** = 30 bar, constant
4 **Δp** = 50 bar, constant
5 **Δp** = 100 bar, constant

50 l/min rated flow at 10 bar valve pressure differential



1 **Δp** = 10 bar, constant
2 **Δp** = 20 bar, constant
3 **Δp** = 30 bar, constant
4 **Δp** = 50 bar, constant
5 **Δp** = 100 bar, constant

85 l/min rated flow at 10 bar valve pressure differential

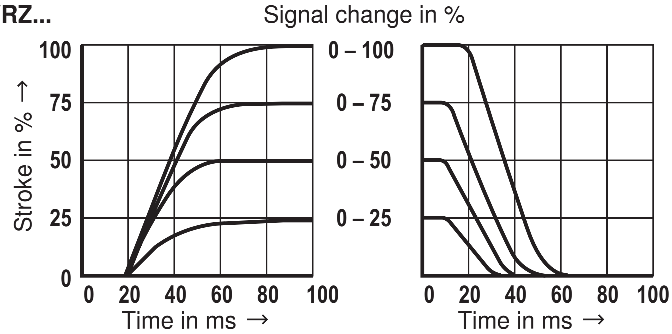


1 **Δp** = 10 bar, constant
2 **Δp** = 20 bar, constant
3 **Δp** = 30 bar, constant
4 **Δp** = 50 bar, constant
5 **Δp** = 100 bar, constant

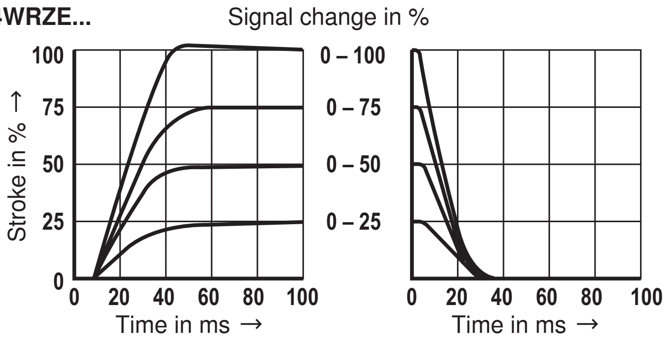
Δp = valve pressure differential according to DIN 24311 (inlet pressure p_P minus load pressure p_L minus return flow pressure p_T)

Transition functions with stepped, electric input signals, measured at p_{St} = 50 bar

Type 4WRZ...

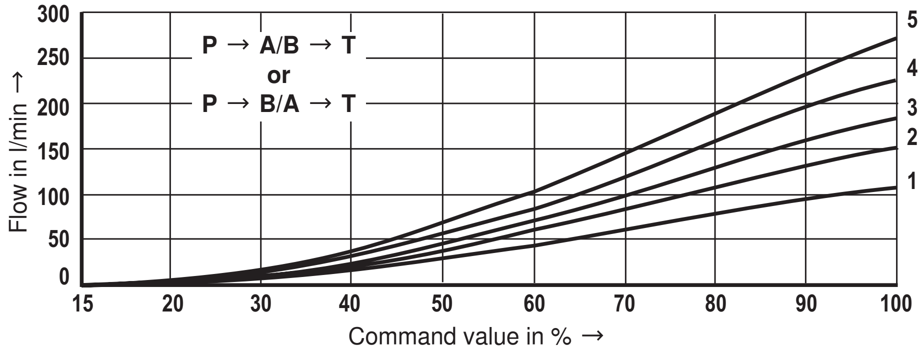


Type 4WRZE...



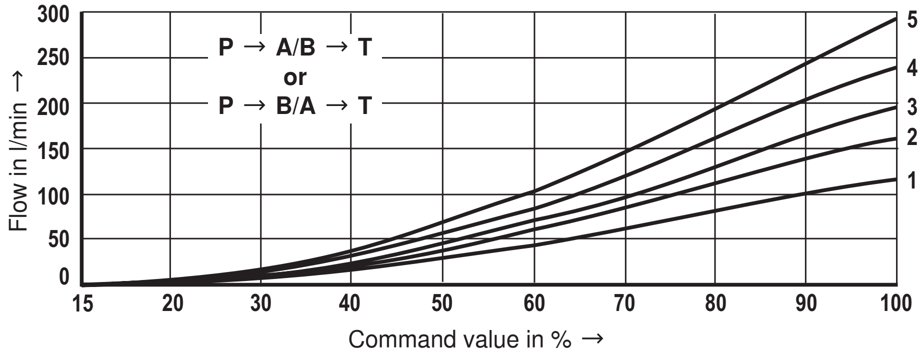
Characteristic curves size 16 (control spool "E, W6-, EA, W6A" as well as HLP46, ϑ_{oil} = 40 °C ±5 °C and p = 100 bar)

100 l/min rated flow at 10 bar valve pressure differential



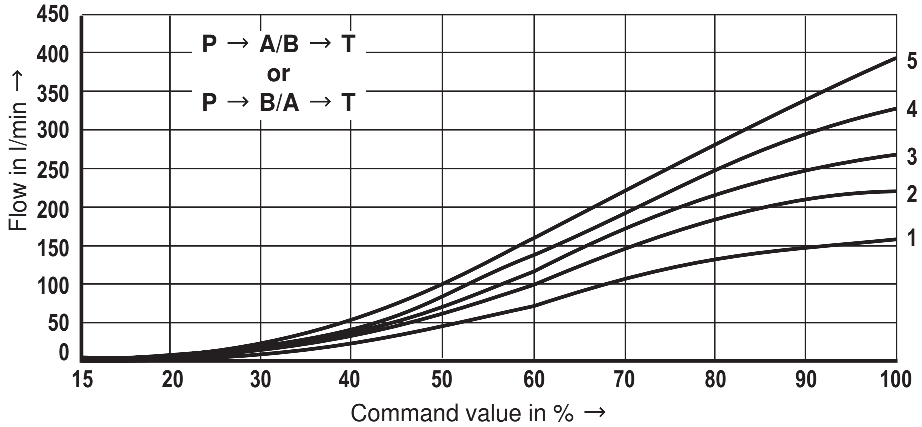
1 **Δp** = 10 bar, constant
2 **Δp** = 20 bar, constant
3 **Δp** = 30 bar, constant
4 **Δp** = 50 bar, constant
5 **Δp** = 100 bar, constant

125 l/min rated flow at 10 bar valve pressure differential



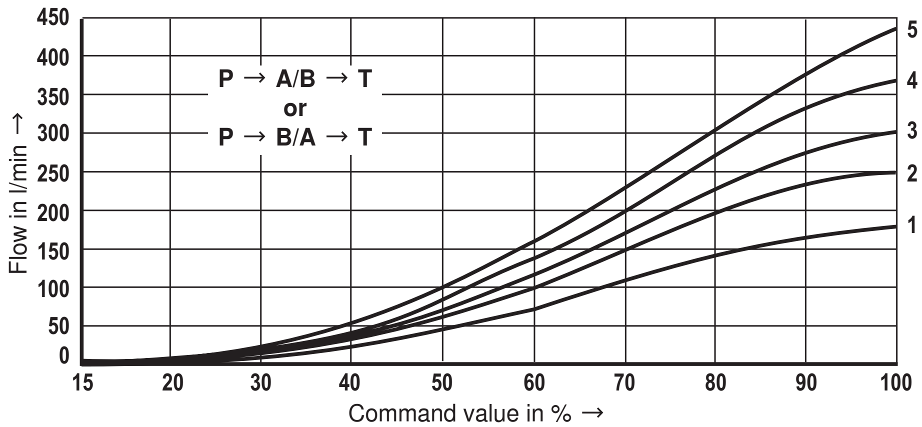
1 **Δp** = 10 bar, constant
2 **Δp** = 20 bar, constant
3 **Δp** = 30 bar, constant
4 **Δp** = 50 bar, constant
5 **Δp** = 100 bar, constant

150 l/min rated flow at 10 bar valve pressure differential



1 **Δp** = 10 bar, constant
2 **Δp** = 20 bar, constant
3 **Δp** = 30 bar, constant
4 **Δp** = 50 bar, constant
5 **Δp** = 100 bar, constant

180 l/min rated flow at 10 bar valve pressure differential



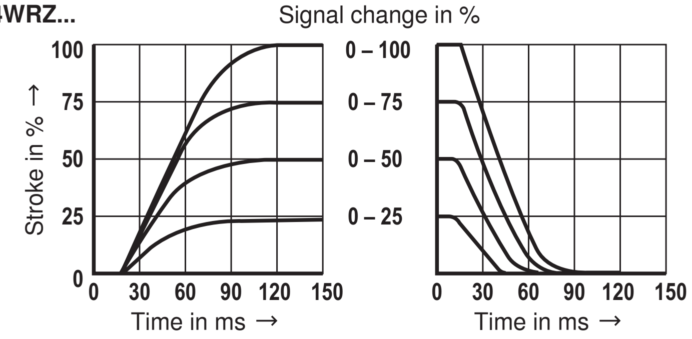
1 **Δp** = 10 bar, constant
2 **Δp** = 20 bar, constant
3 **Δp** = 30 bar, constant
4 **Δp** = 50 bar, constant
5 **Δp** = 100 bar, constant

Δp = valve pressure differential according to DIN 24311 (inlet pressure p_P minus load pressure p_L minus return flow pressure p_T)

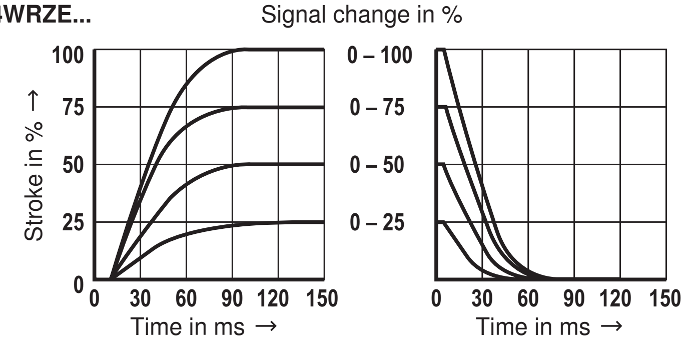
Characteristic curves size 16 (control spool "E, W6-, EA, W6A" as well as HLP46, ϑ_{oil} = 40 °C ±5 °C and p = 100 bar)

Transition functions with stepped, electric input signals, measured at p_{St} = 50 bar

Type 4WRZ...

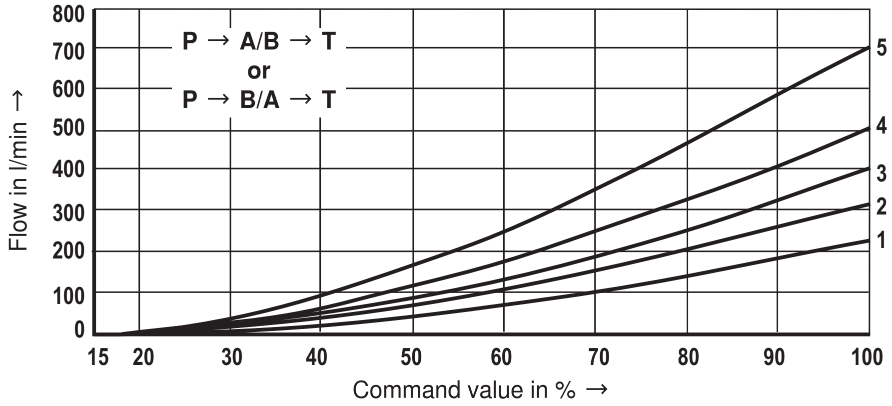


Type 4WRZE...



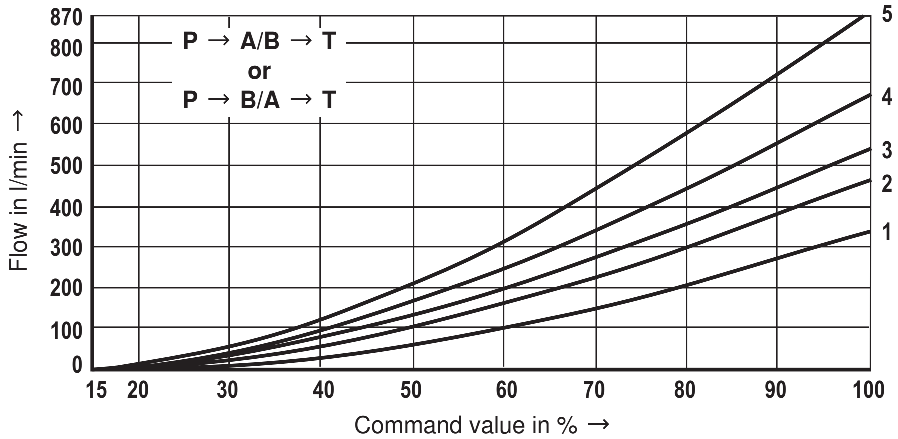
Characteristic curves size 25 (control spool "E, W6-, EA, W6A" as well as HLP46, ϑ_{oil} = 40 °C ±5 °C and p = 100 bar)

220 l/min rated flow at 10 bar valve pressure differential



1 Δp = 10 bar, constant
2 Δp = 20 bar, constant
3 Δp = 30 bar, constant
4 Δp = 50 bar, constant
5 Δp = 100 bar, constant

325 l/min rated flow at 10 bar valve pressure differential

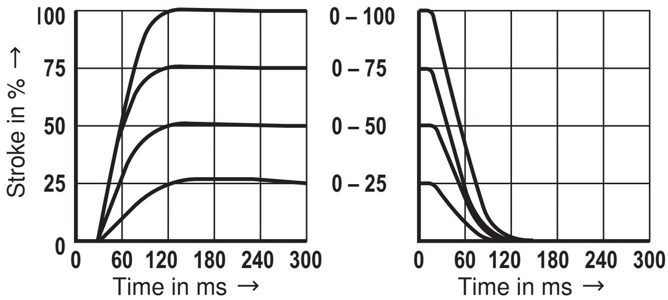


1 Δp = 10 bar, constant
2 Δp = 20 bar, constant
3 Δp = 30 bar, constant
4 Δp = 50 bar, constant
5 Δp = 100 bar, constant

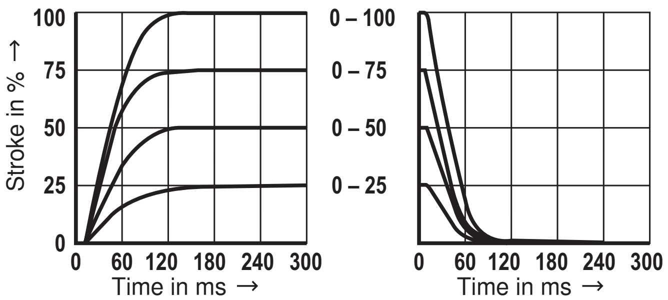
Δp = valve pressure differential according to DIN 24311 (inlet pressure p_P minus load pressure p_L minus return flow pressure p_T)

Transition functions with stepped, electric input signals, measured at p_{St} = 50 bar

Type 4WRZ... Signal change in %

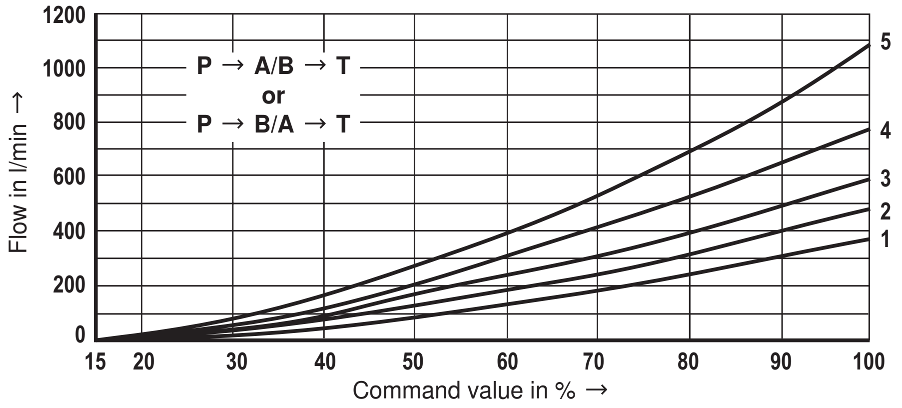


Type 4WRZE... Signal change in %



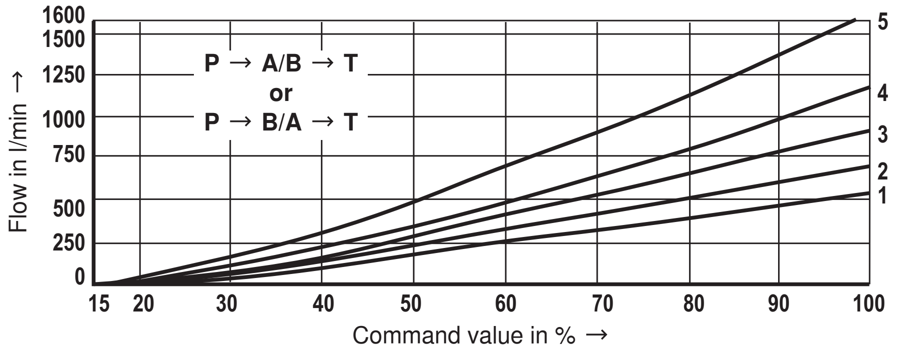
Characteristic curves size 32 (control spool "E, W6-, EA, W6A" as well as HLP46, ϑ_{oil} = 40 °C ±5 °C and p = 100 bar)

360 l/min rated flow at 10 bar valve pressure differential



1 Δp = 10 bar, constant
2 Δp = 20 bar, constant
3 Δp = 30 bar, constant
4 Δp = 50 bar, constant
5 Δp = 100 bar, constant

520 l/min rated flow at 10 bar valve pressure differential



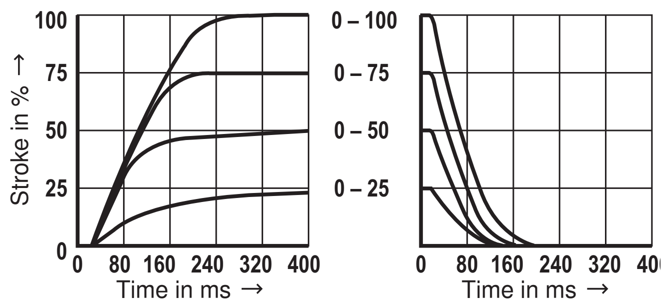
1 Δp = 10 bar, constant
2 Δp = 20 bar, constant
3 Δp = 30 bar, constant
4 Δp = 50 bar, constant
5 Δp = 100 bar, constant

Δp = valve pressure differential according to DIN 24311 (inlet pressure p_P minus load pressure p_L minus return flow pressure p_T)

Transition functions with stepped, electric input signals, measured at p_{St} = 50 bar

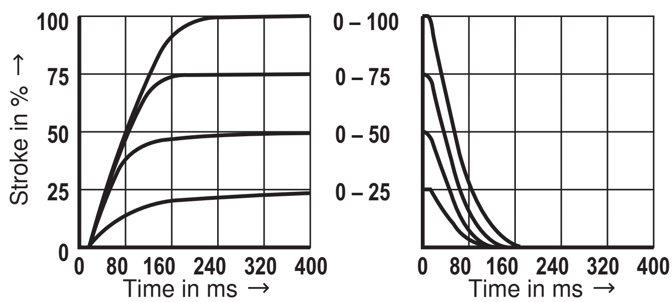
Type 4WRZ...

Signal change in %



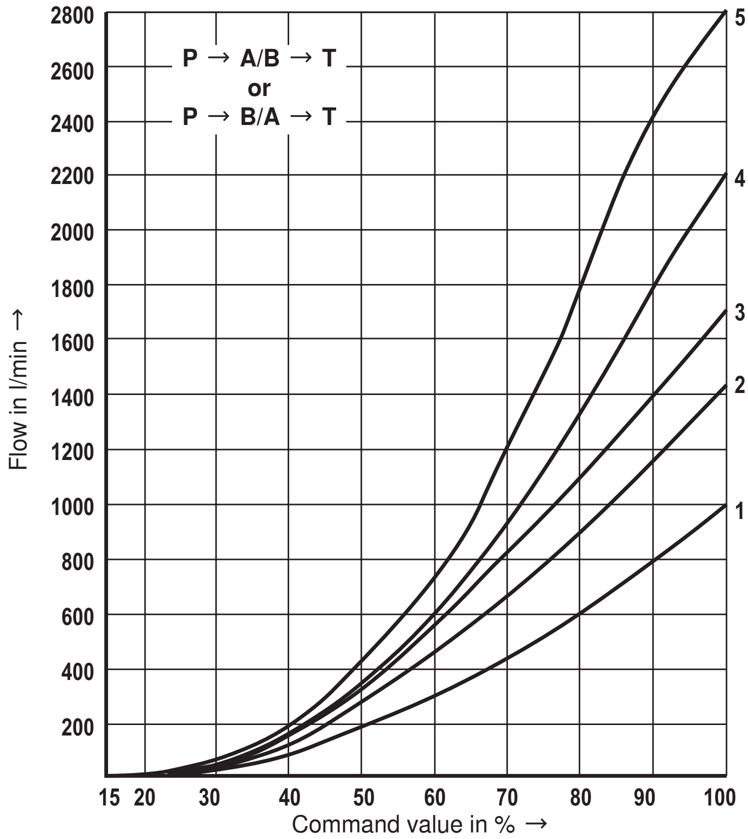
Type 4WRZE...

Signal change in %



Characteristic curves size 52 (control spool "E, W6-, EA, W6A" as well as HLP46, ϑ_{oil} = 40 °C ±5 °C and p = 100 bar)

1000 l/min rated flow at 10 bar valve pressure differential

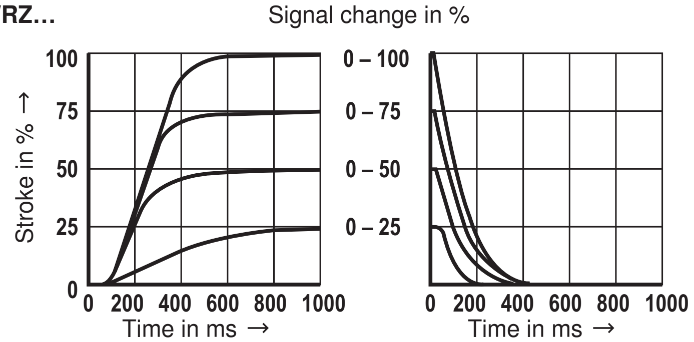


1 **Δp** = 10 bar, constant
2 **Δp** = 20 bar, constant
3 **Δp** = 30 bar, constant
4 **Δp** = 50 bar, constant
5 **Δp** = 100 bar, constant

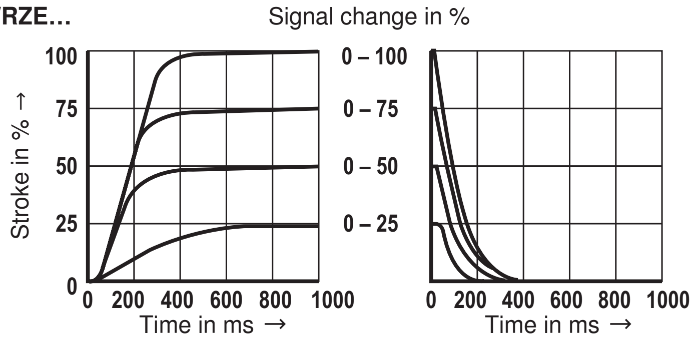
Δp = valve pressure differential according to DIN 24311 (inlet pressure p_P minus load pressure p_L minus return flow pressure p_T)

Transition functions with stepped, electric input signals, measured at p_{St} = 50 bar

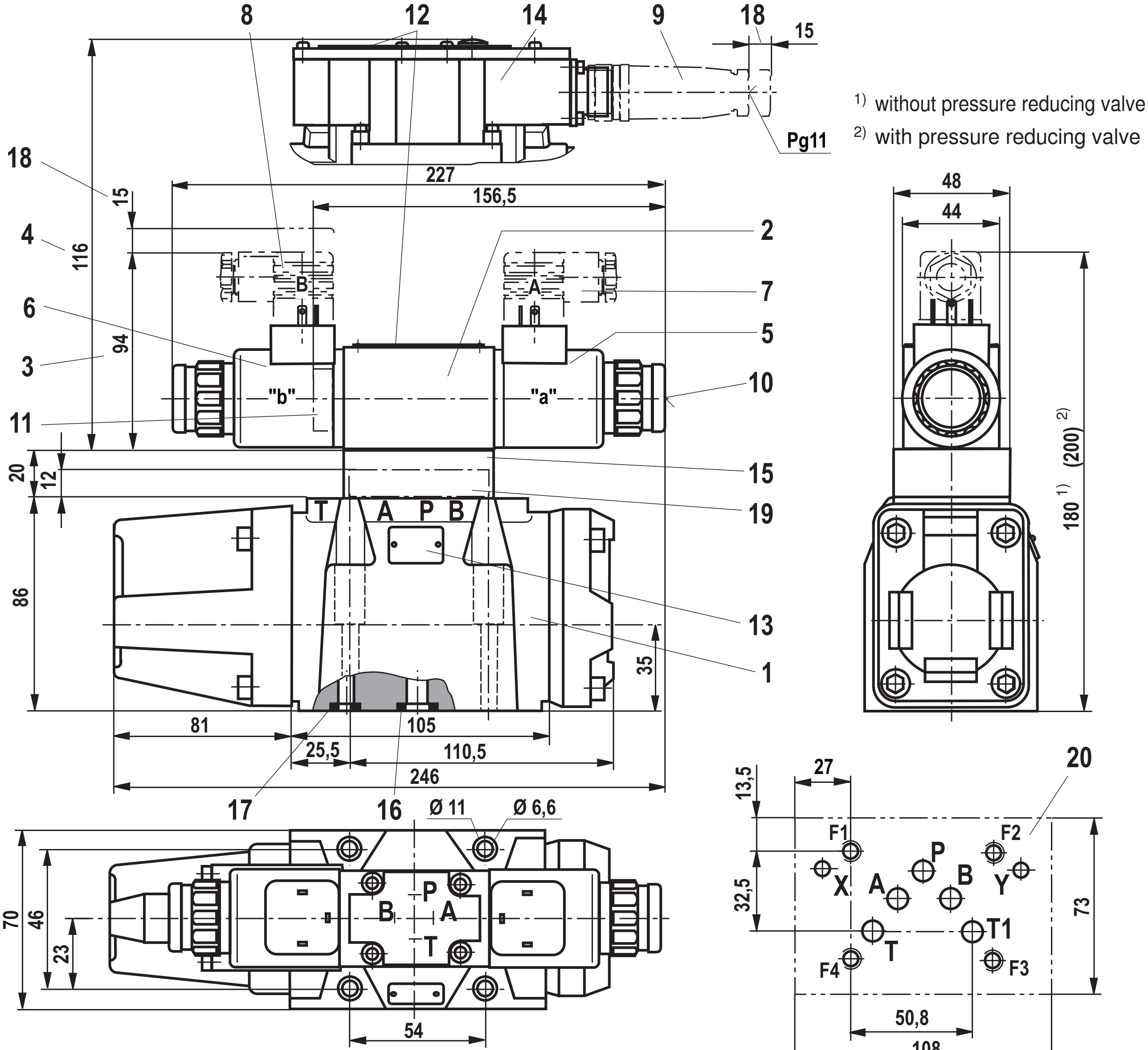
Type .WRZ…



Type .WRZE…

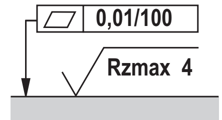


Dimensions: Size 10 (dimensions in mm)



1) without pressure reducing valve

2) with pressure reducing valve

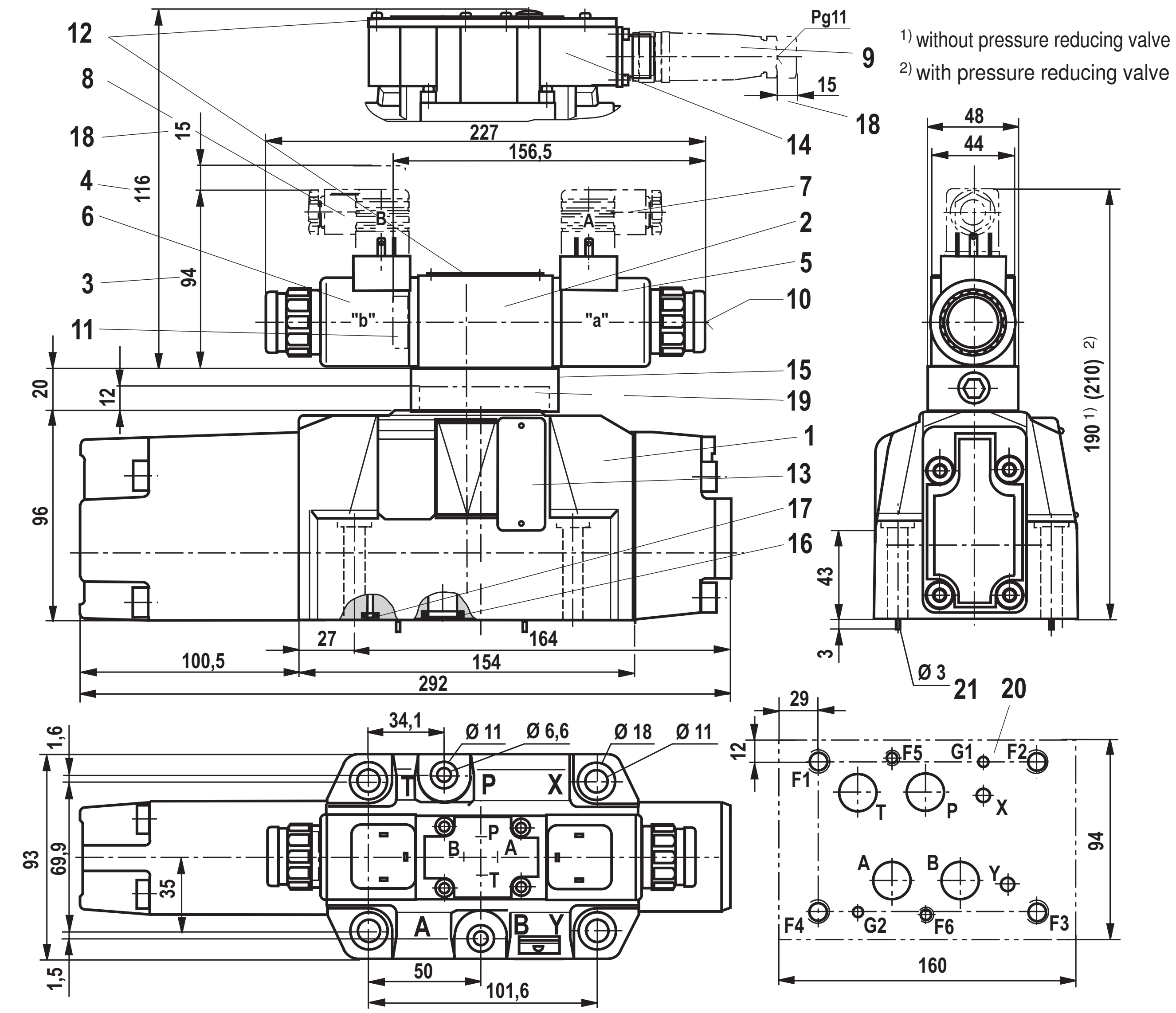


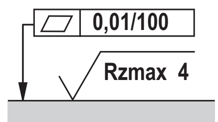
Required surface quality of the valve contact surface

1 Main valve
2 Pilot control valve
3 Dimension for version "4WRZ..." (**not** seawater-resistant)
4 Dimension for version "4WRZE..."
5 Proportional solenoid "a"
6 Proportional solenoid "b"
7 Mating connector "A", separate order, see page 27
8 Mating connector "B", separate order, see page 27
9 Mating connector, separate order, see page 27
10 Concealed manual override "N9"
11 Plug screw for valves with one solenoid
12 Name plate for pilot control valve
13 Name plate for main valve
14 Integrated electronics (OBE)
15 Pressure reducing valve "D3"
16 Identical seal rings for ports A, B, P, T, and T1
17 Identical seal rings for ports X and Y
18 Space required to remove the mating connector
19 Diversion plate (type 4WRH...)
20 Machined installation surface, porting pattern according to ISO 4401-05-05-0-05, ports X and Y as required

For subplates and valve mounting screws, see page 27

Dimensions: Size 16 (dimensions in mm)



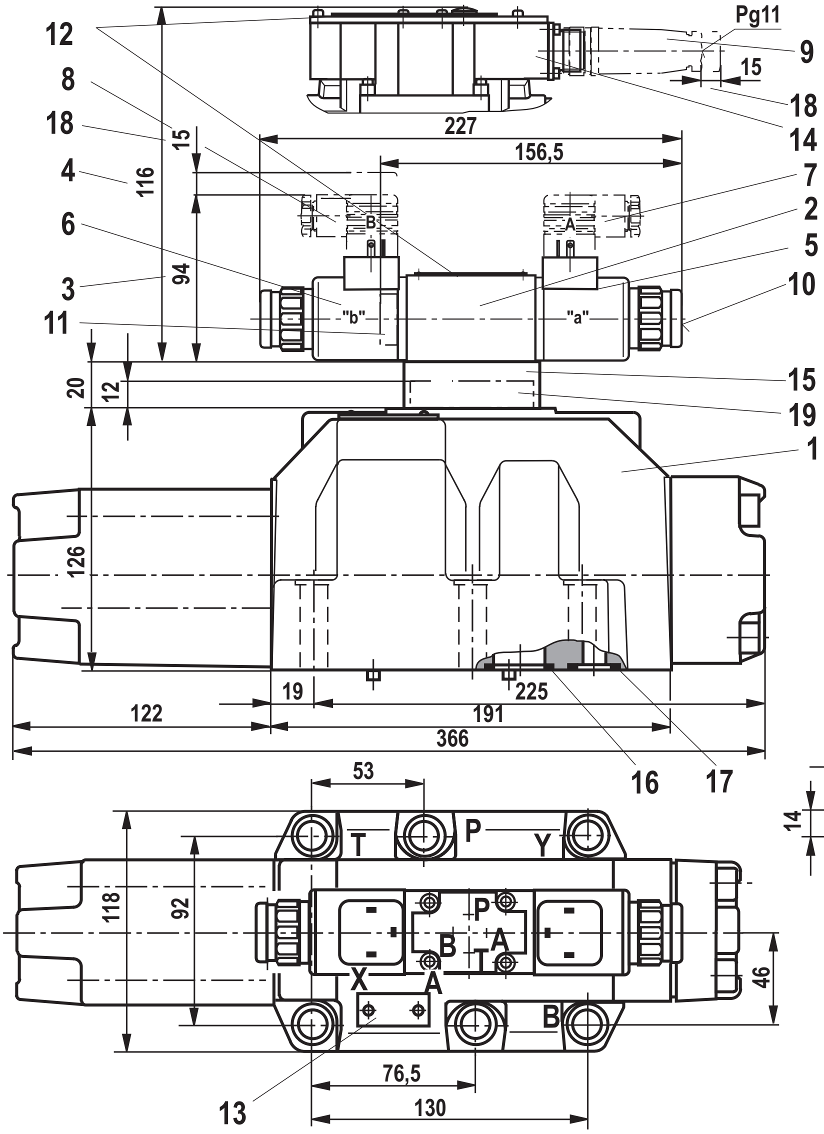


Required surface quality of the valve contact surface

1 Main valve
2 Pilot control valve
3 Dimension for version "4WRZ..." (**not** seawater-resistant)
4 Dimension for version "4WRZE..."
5 Proportional solenoid "a"
6 Proportional solenoid "b"
7 Mating connector "A", separate order, see page 27
8 Mating connector "B", separate order, see page 27
9 Mating connector, separate order, see page 27
10 Concealed manual override "N9"
11 Plug screw for valves with one solenoid
12 Name plate for pilot control valve
13 Name plate for main valve
14 Integrated electronics (OBE)
15 Pressure reducing valve "D3"
16 Identical seal rings for ports A, B, P, and T
17 Identical seal rings for ports X and Y
18 Space required to remove the mating connector
19 Diversion plate (type 4WRH...)
20 Machined installation surface, porting pattern according to ISO 4401-07-07-0-05, ports X and Y as required deviating from the standard: Ports A, B, P, T Ø20 mm.
21 Locking pin

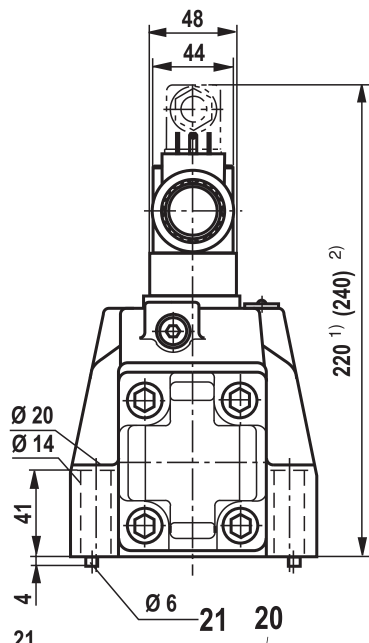
For subplates and valve mounting screws, see page 27

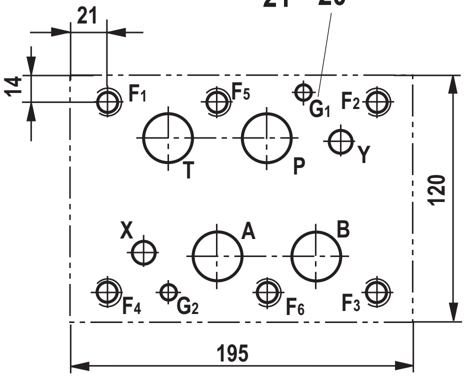
Dimensions: Size 25 (dimensions in mm)

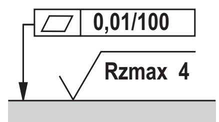


1) without pressure reducing valve

2) with pressure reducing valve





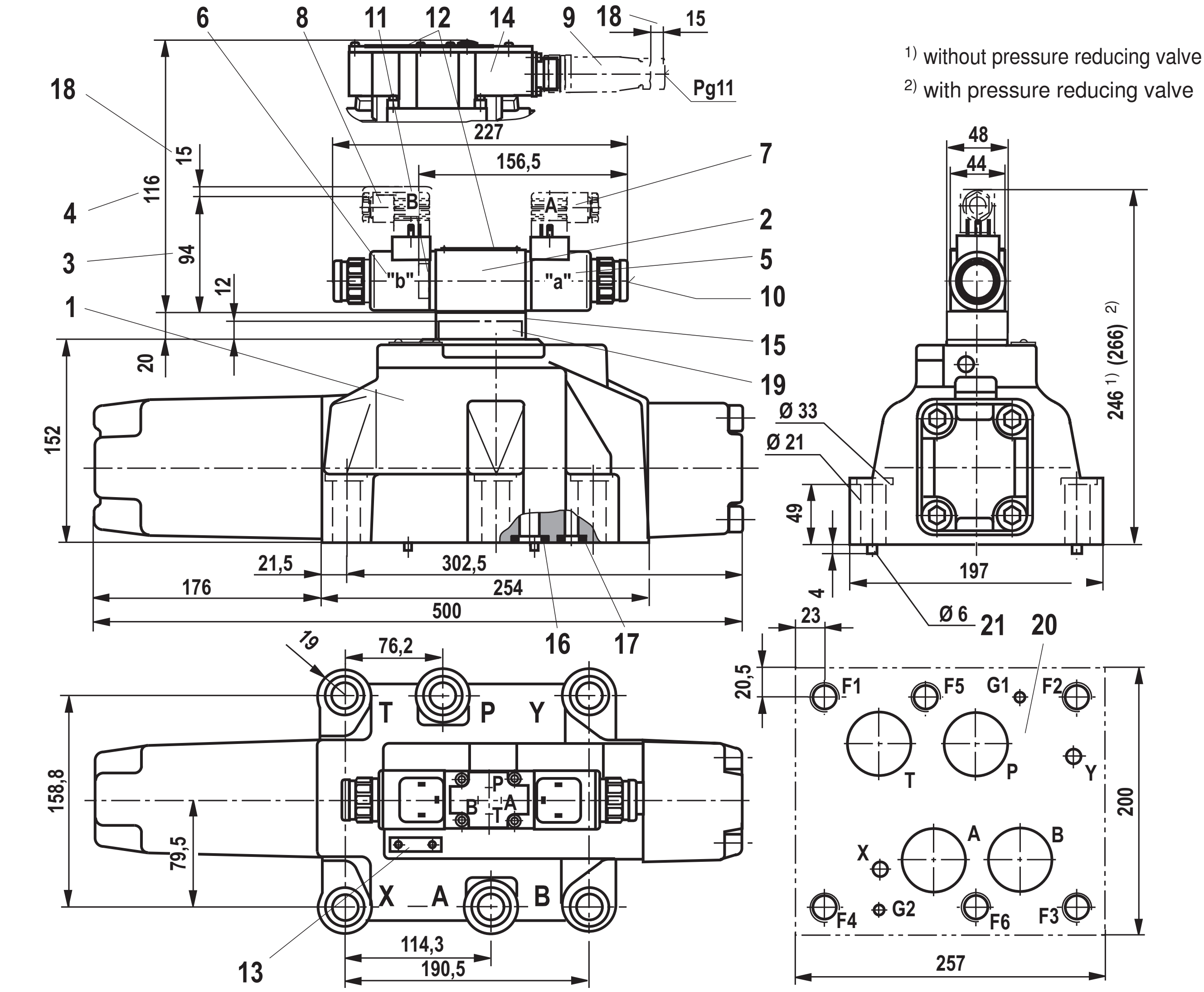


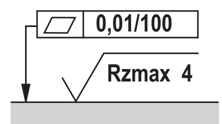
Required surface quality of the valve contact surface

1 Main valve
2 Pilot control valve
3 Dimension for version "4WRZ..." (**not** seawater-resistant)
4 Dimension for version "4WRZE..."
5 Proportional solenoid "a"
6 Proportional solenoid "b"
7 Mating connector "A", separate order, see page 27
8 Mating connector "B", separate order, see page 27
9 Mating connector, separate order, see page 27
10 Concealed manual override "N9"
11 Plug screw for valves with one solenoid
12 Name plate for pilot control valve
13 Name plate for main valve
14 Integrated electronics (OBE)
15 Pressure reducing valve "D3"
16 Identical seal rings for ports A, B, P, and T
17 Identical seal rings for ports X and Y
18 Space required for removing the mating connector
19 Diversion plate (type 4WRH...)
20 Machined installation surface, porting pattern according to ISO 4401-08-08-0-05, ports X and Y as required
21 Locking pin

For subplates and valve mounting screws, see page 27

Dimensions: Size 32 (dimensions in mm)





Required surface quality of the valve contact surface

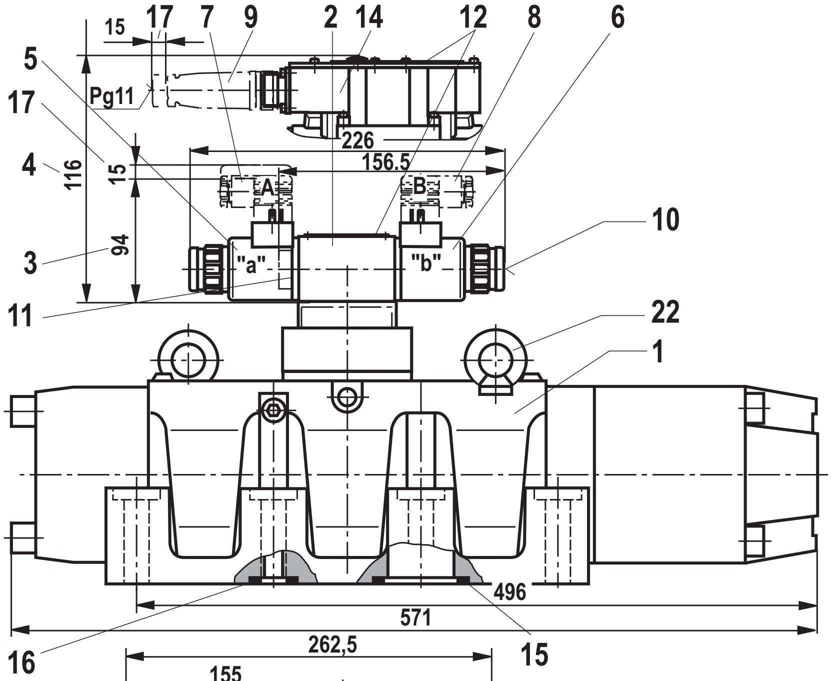
1. Main valve
2. Pilot control valve
3. Dimension for version "4WRZ..." (**not** seawater-resistant)
4. Dimension for version "4WRZE..."
5. Proportional solenoid "a"
6. Proportional solenoid "b"
7. Mating connector "A", separate order, see page 27
8. Mating connector "B", separate order, see page 27
9. Mating connector, separate order, see page 27
10. Concealed manual override "N9"
11. Plug screw for valves with one solenoid
12. Name plate for pilot control valve
13. Name plate for main valve
14. Integrated electronics (OBE)
15. Pressure reducing valve "D3"
16. Identical seal rings for ports A, B, P, and T
17. Identical seal rings for ports X and Y
18. Space required for removing the mating connector
19. Diversion plate (type 4WRH...)
20. Machined installation surface, porting pattern according to ISO 4401-10-09-0-05, ports X and Y as required deviating from the standard:
    – Ports A, B, T and P Ø38 mm.
21. Locking pin

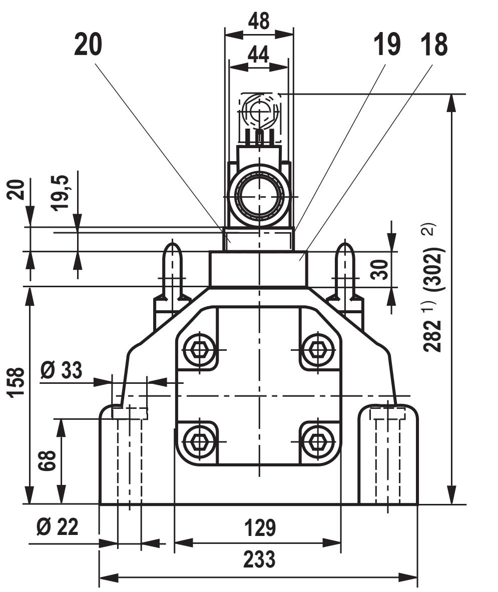
For subplates and valve mounting screws, see page 27

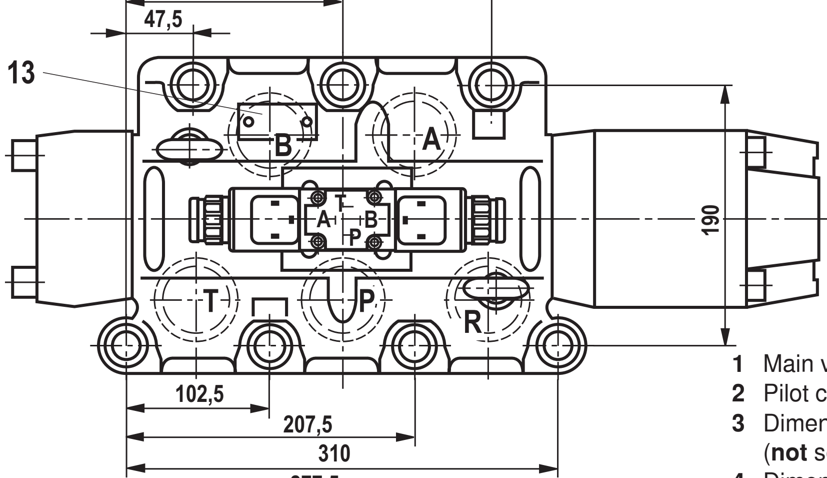
Dimensions: Subplate mounting size 52 (dimensions in mm)

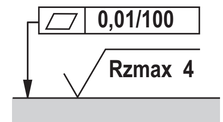
1) without pressure reducing valve

2) with pressure reducing valve

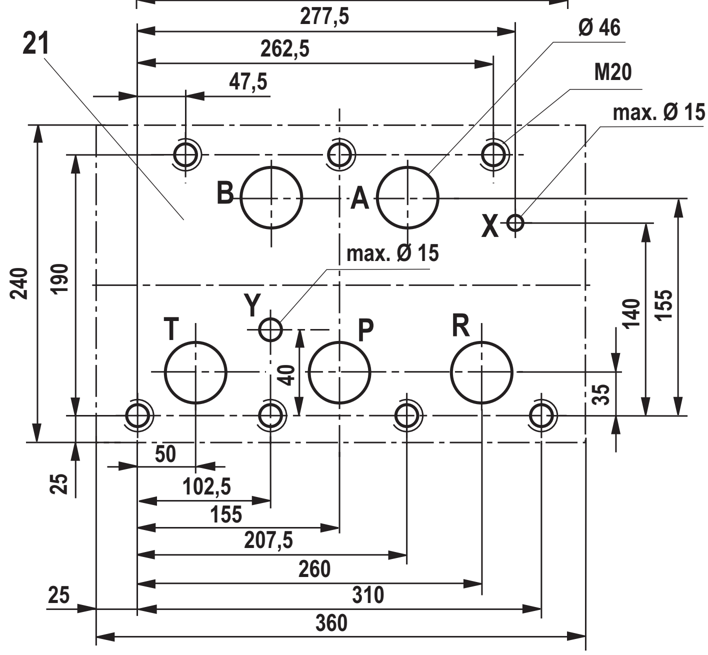








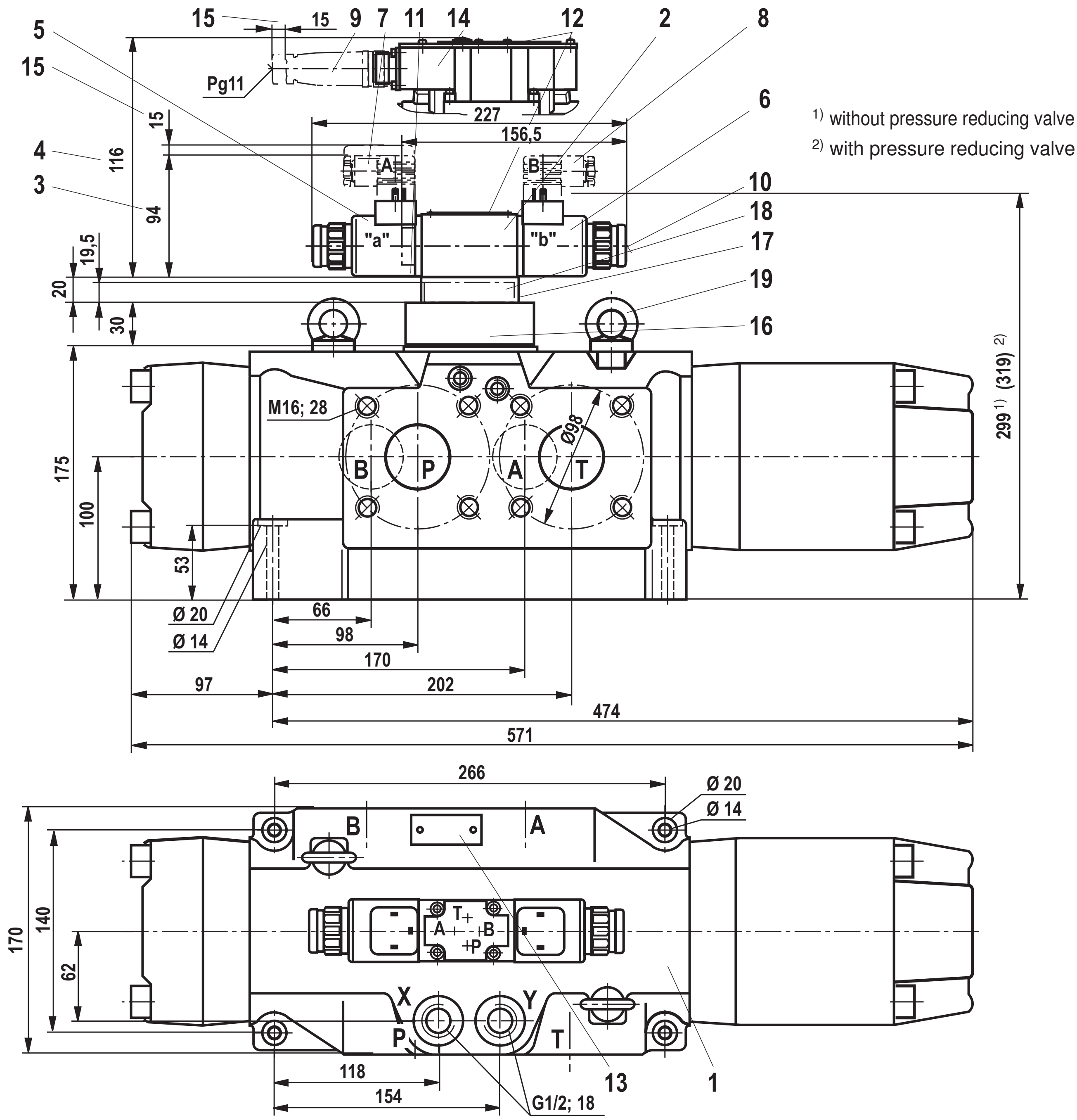
Required surface quality of the valve contact surface



1 Main valve
2 Pilot control valve
3 Dimension for version "4WRZ..." (**not** seawater-resistant)
4 Dimension for version "4WRZE..."
5 Proportional solenoid "a"
6 Proportional solenoid "b"
7 Mating connector "A"
8 Mating connector "B"
9 Mating connector, separate order, see page 27
10 Concealed manual override "N9"
11 Plug screw for valves with one solenoid
12 Name plate for pilot control valve
13 Name plate for main valve
14 Integrated electronics (OBE)
15 Identical seal rings for ports A, B, P, T, and R
16 Identical seal rings for ports X, Y, and L
17 Space required to remove the mating connector
18 Adapter plate
19 Pressure reducing valve "D3"
20 Diversion plate (type 4WRH...)
21 Machined installation surface, porting pattern, ports X and Y as required
22 Transport aid

For subplates and valve mounting screws, see page 27

Dimensions: Flange connection size 52 (dimensions in mm)



1 Main valve
2 Pilot control valve
3 Dimension for version "4WRZ..." (**not** seawater-resistant)
4 Dimension for version "4WRZE..."
5 Proportional solenoid "a"
6 Proportional solenoid "b"
7 Mating connector "A", separate order, see page 27
8 Mating connector "B", separate order, see page 27
9 Mating connector, separate order, see page 27
10 Concealed manual override "N9"
11 Plug screw for valves with one solenoid
12 Name plate for pilot control valve
13 Name plate for main valve
14 Integrated electronics (OBE)
15 Space required to remove the mating connector
16 Adapter plate
17 Pressure reducing valve "D3"
18 Diversion plate (type 4WRH...)
19 Transport aid

For subplates and valve mounting screws, see page 27

Accessories (not included in the scope of delivery)

Mating connectors			Material number
Mating connector for 4WRZ	DIN EN 175301-803	Solenoid "a", grey	R901017010
		Solenoid "b", black	R901017011
Mating connector for 4WRZE and 4WRZE...J...	DIN EN 175201-804		e.g. R900021267 (plastic)
			e.g. R900223890 (metal)

Hexagon socket head cap screws		Material number
Size 10	4x ISO 4762 - M6 x 45 - 10.9-flZn-240h-L Tightening torque M_A = 13.5 Nm ±10% or 4x ISO 4762 - M6 x 45 - 10.9 Tightening torque M_A = 15.5 Nm ±10%	R913000258
Size 16	2x ISO 4762 - M6 x 60 - 10.9-flZn-240h-L Tightening torque M_A = 12.2 Nm ±10% 4x ISO 4762 - M10 x 60 - 10.9-flZn-240h-L Tightening torque M_A = 58 Nm ±20% or 2x ISO 4762 - M6 x 60 - 10.9 Tightening torque M_A = 15.5 Nm ±10% 4x ISO 4762 - M10 x 60 - 10.9 Tightening torque M_A = 75 Nm ±20%	R913000115 R913000116
Size 25	6x ISO 4762 - M12 x 60 - 10.9-flZn-240h-L Tightening torque M_A = 100 Nm ±20% or 6x ISO 4762 - M12 x 60 - 10.9 Tightening torque M_A = 130 Nm ±20%	R913000121
Size 32	6x ISO 4762 - M20 x 80 - 10.9-flZn-240h-L Tightening torque M_A = 340 Nm ±20% or 6x ISO 4762 - M20 x 80 - 10.9 Tightening torque M_A = 430 Nm ±20%	R901035246
Size 52 (5WRZ52)	With a steel installation surface: 7x ISO 4762 - M20 x 90 - 10.9-flZn-240h-L Tightening torque M_A = 465 Nm ±20% With a cast iron installation surface: 7x ISO 4762 - M20 x 100 - 10.9-flZn-240h-L Tightening torque M_A = 465 Nm ±20% or With a steel installation surface: 7x ISO 4762 - M20 x 90 - 10.9 Tightening torque M_A = 610 Nm ±20% With a cast iron installation surface: 7x ISO 4762 - M20 x 100 - 10.9 Tightening torque M_A = 610 Nm ±20%	R913000397 R913000386
Size 52 (4WRZ52)	4x ISO 4762 - M12 x 70 - 10.9-flZn-240h-L Tightening torque M_A = 100 Nm ±20% or 4x ISO 4762 - M12 x 70 - 10.9 Tightening torque M_A = 130 Nm ±20%	R913000515

Subplates/connection flanges	Data sheet
Size 10	45054
Size 16	45056
Size 25	45058
Size 32	45060
Size 52	45501

When using type 4WRZ..., use the following throttle inserts in channel A and B of the pilot control valve:

Throttle insert	Ø in mm	Material number
Size 10	1.8	R900158510
Size 16	2.0	R900158547
Size 25	2.8	R900157948
Size 32	-	-
Size 52	-	-

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

Proportional pressure relief valve with position feedback (Lvdt AC/AC)

Type DBETBX

Nominal size 6
Unit series 1X
Maximum working pressure P 315 bar, T 2 bar
Nominal flow rate Q_{nom} 1 l/min

List of contents

Features

- Directly operated valves with position feedback for limiting system pressure
- Adjustable through the position of the armature against the compression spring
- Position-controlled at a high magnetic force, minimal hysteresis < 0.3 %, see Technical data and Characteristic curve
- Pressure limitation to a safe level even with faulty electronics (solenoid current $I > I_{max}$)
- For subplate attachment, mounting hole configuration to ISO 4401-03-02-0-94
  Subplates as per catalog sheet RE 45053
  (order separately)
- Plug-in connector for solenoid to DIN 43650-AM2 and plug-in connector for position transducer, included in scope of delivery
- Data for the external trigger electronics
  - $U_B = 24$ V_{nom} DC
  - Adjustment of valve curve Np and gain
  - With and without ramp generator
  - Europe card format, setpoint 0...+10 V (order separately)

Ordering data

DBETB	X	–	1X	/		G24	–	37	Z4	M	*

Proportional pressure relief valve with position control and inductive position transducer on the cone = DBETB

Mounting hole configuration to ISO 4401-03-02-0-94 **= X**

Unit series 10 to 19 (10 to 19: installation and connection dimensions unchanged) **= 1X**

Max. pressure stage

up to 28 bar	**= 28**
up to 80 bar	**= 80**
up to 180 bar	**= 180**
up to 250 bar	**= 250**
up to 315 bar	**= 315**

Voltage supply of trigger electronics 24 V DC **= G24**

Solenoid type (current)
37 = Solenoid current 3.7 A max.

Electrical connection
Z4 = Unit plug to DIN 43650-AM2
Plug-in connector included in scope of delivery

M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

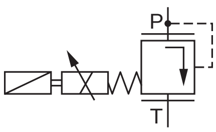
Further information in plain text
2 = Sealed seat adjustment[1)]

Preferred types

Type	Material Number
DBETBX–1X/28G24–37Z4M	0 811 402 013
DBETBX–1X/80G24–37Z4M2 [1)]	0 811 402 007
DBETBX–1X/180G24–37Z4M	0 811 402 003
DBETBX–1X/250G24–37Z4M2 [1)]	0 811 402 001
DBETBX–1X/315G24–37Z4M	0 811 402 004

Symbol

For external trigger electronics



Function, sectional diagram

General

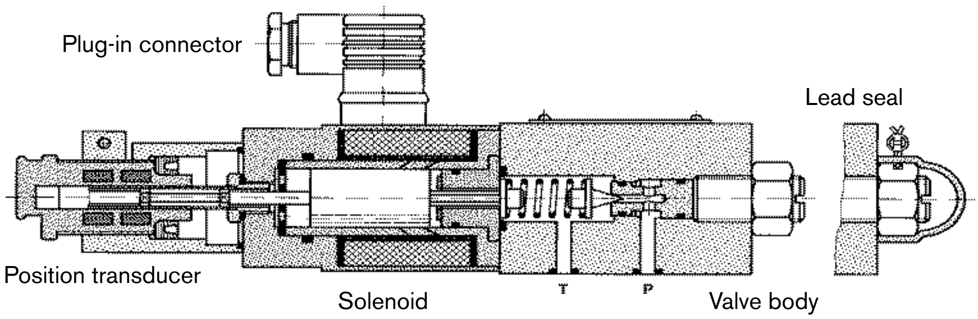
Type DBETBX proportional pressure relief valves are remote-controlled (pilot) valves in conical seat design. They are used to limit system pressure.
The valves are actuated by means of a position-controlled proportional solenoid.
With these valves, the system pressure that needs to be limited can be infinitely adjusted in relation to the position of the solenoid by means of external trigger electronics.

Basic principle

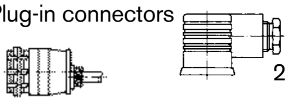
To adjust the system pressure, a setpoint is set in the trigger electronics. Based on this setpoint, the electronics control the position of the armature on the compression spring by means of the signal from the position transducer.
The position control ensures extremely low hysteresis: the position is maintained even in the event of external disturbances.
An "additional" spring between the cone and the seat contributes to stability and a minimal residual pressure.
The spring force acting on the cone and the pressure in the valve seat balance one another at a constant oil flow (0.7...1 l/min).
The "p_{max}" pressure stage is determined by the cone and seating bore configuration.

Pressure limitation for maximum safety

If a fault occurs in the electronics, so that the solenoid current (I_{max}) would exceed its specified level in an uncontrolled manner, the pressure cannot rise above the level determined by the maximum spring force.



Accessories

Type			Material Number
(4 x) ISO 4762-M5x50-10.9	Cheese-head bolts		2 910 151 174
Europe card 	VT-VRPA1-537-10/V0/PV	RE 30052	0 811 405 097
Europe card 	VT-VRPA1-537-10/V0/PV-RTP	RE 30054	0 811 405 102
Europe card 	VT-VRPA1-537-10/V0/PV-RTS	RE 30056	0 811 405 179
Plug-in connectors  2P+PE	Plug-in connector 2P+PE (M16x1.5) for the solenoid and plug-in connector for the position transducer, included in scope of delivery, see also RE 08008.		

Testing and service equipment

Test box type VT-PE-TB1, see RE 30063
Test adapter for Europe cards type VT-PA-3, see RE 30070

Technical data

General		
Construction		Poppet valve
Actuation		Proportional solenoid with position control, external amplifier
Connection type		Subplate, mounting hole configuration NG6 (ISO 4401-03-02-0-94)
Mounting position		Horizontal, vertical with solenoid at top
Ambient temperature range	°C	–20...+50
Weight	kg	4.5
Vibration resistance, test condition		Max. 25 g, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, ϑ_{oil} = 40 °C ±5 °C)						
Pressure fluid		Hydraulic oil to DIN 51524...535, other fluids after prior consultation				
Viscosity range recommended	mm^2/s	20...100				
Viscosity range max. permitted	mm^2/s	10...800				
Pressure fluid temperature range	°C	–20...+80				
Maximum permitted degree of contamination of pressure fluid Purity class to ISO 4406 (c)		Class 18/16/13 [1]				
Direction of flow		See symbol				
Max. set pressure (at Q = 1 l/min)	bar	28	80	180	250	315
Minimum pressure (at Q = 1 l/min)	bar	1.5	3	4	5	6
		Note: At Q_{max} = 3 l/min the pressure levels stated here increase				
Max. mechanical pressure limitation level, e.g. when solenoid current $I > I_{max}$	bar	<29	<85	<186	<258	<325
Max. working pressure (at Q = 1 l/min)	bar	Port P: 315				
Max. pressure	bar	Port T: ≦ 2				

Electrical		
Cyclic duration factor	%	100
Degree of protection		IP 65 to DIN 40050 and IEC 14434/5
Solenoid connection		Unit plug DIN 43650/ISO 4400, M16 x 1.5 (2P+PE)
Position transducer connection		Special plug
Max. solenoid current	I_{max}	3.7
Coil resistance R_{20}	Ω	2.5
Max. power consumption at 100 % load and operating temperature	VA	60

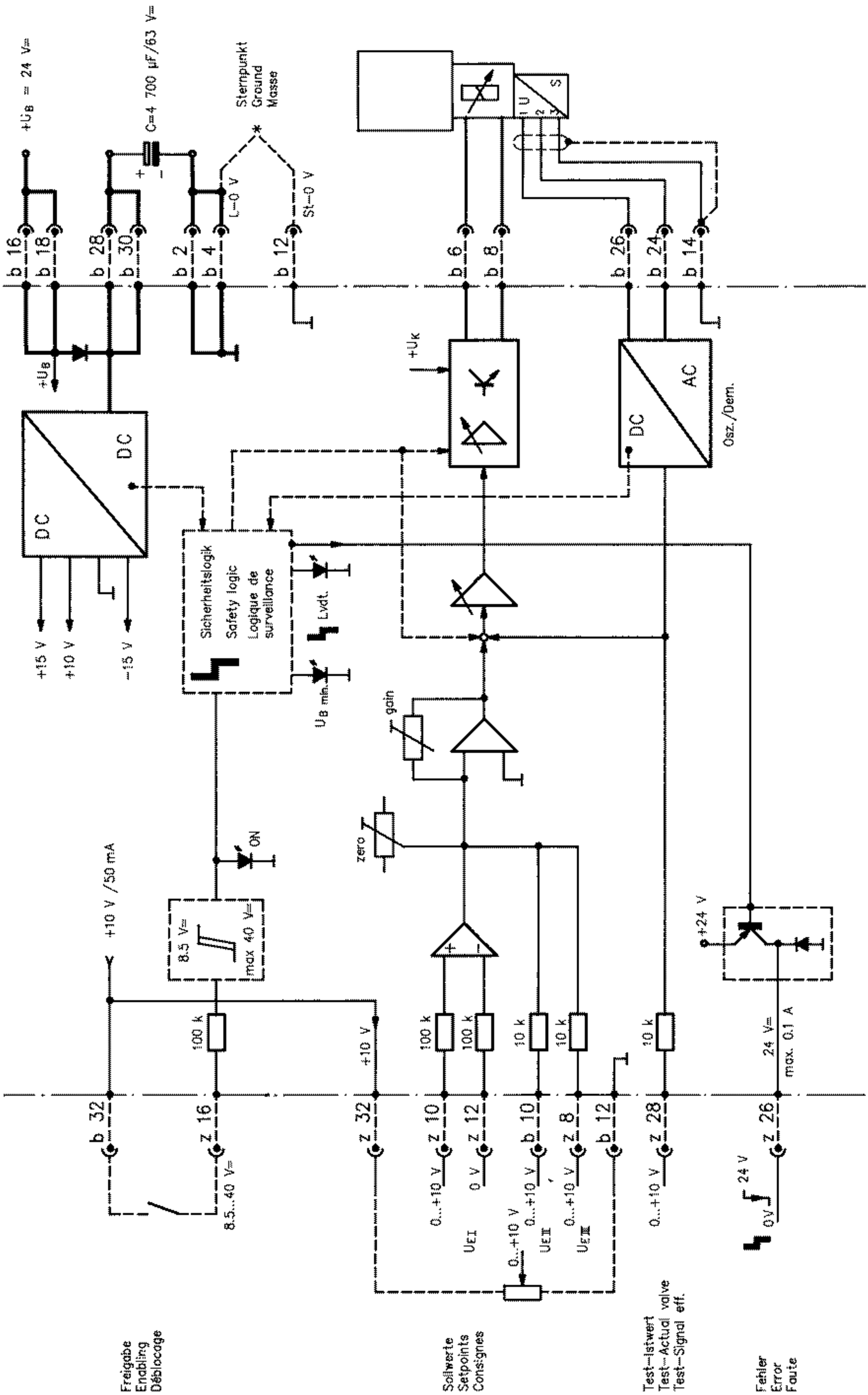
Static/Dynamic [2]		
Hysteresis	%	≤ 0.3
Range of inversion	%	≤ 0.2
Manufacturing tolerance for Q_{max}	%	≈ 6
Response time 100 % signal change	ms	On <45 / Off <25

[1] The purity classes stated for the components must be complied with in hydraulic systems. Effective filtration prevents problems and also extends the service life of components.
For a selection of filters, see catalog sheets RE 50070, RE 50076 and RE 50081.

[2] All characteristic values ascertained using amplifier 0 811 405 097 for the position-controlled 3.7 A solenoid.

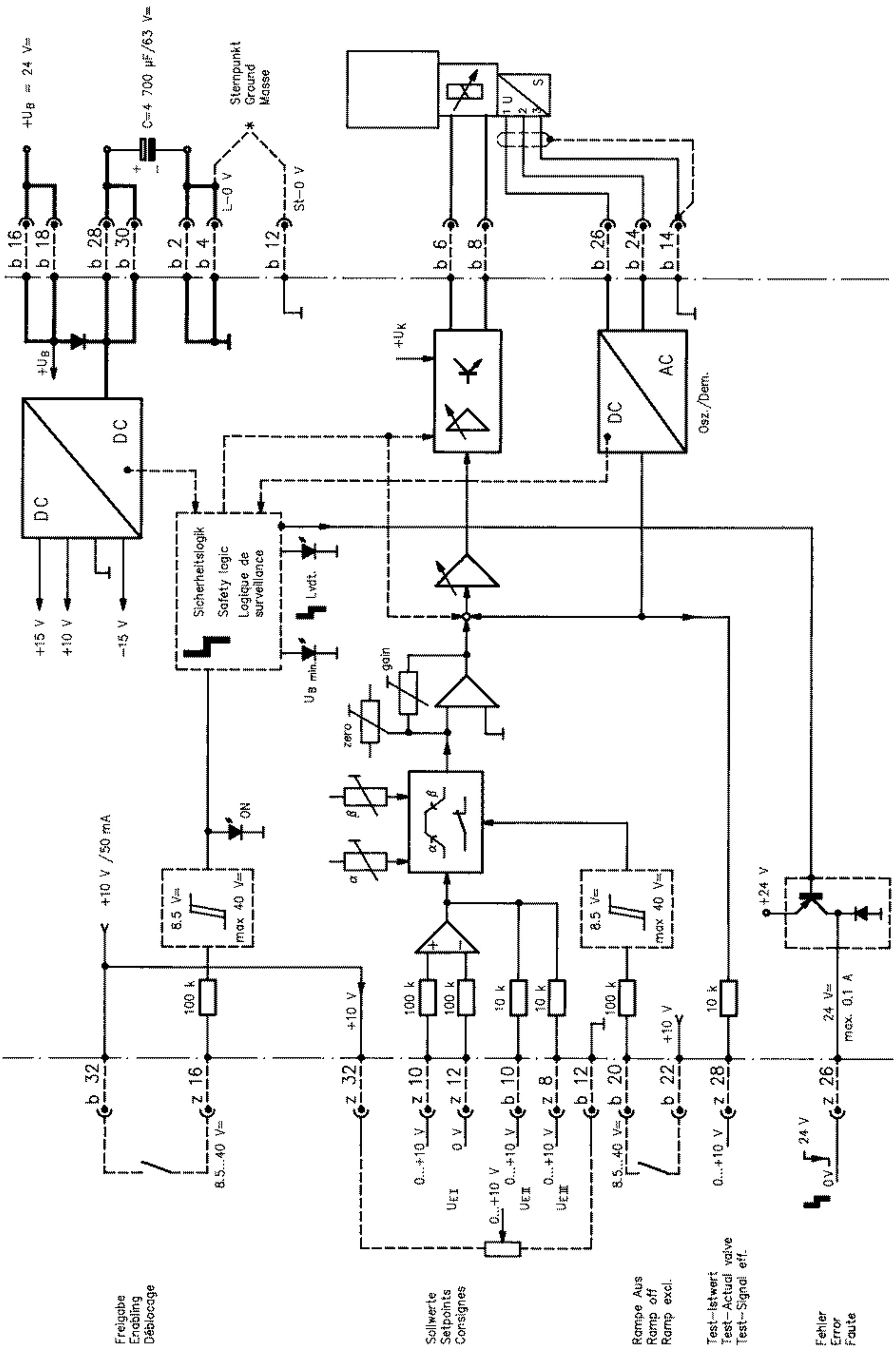
Valve with external trigger electronics (europe card without ramp, RE 30052)

Circuit diagram/pin assignment



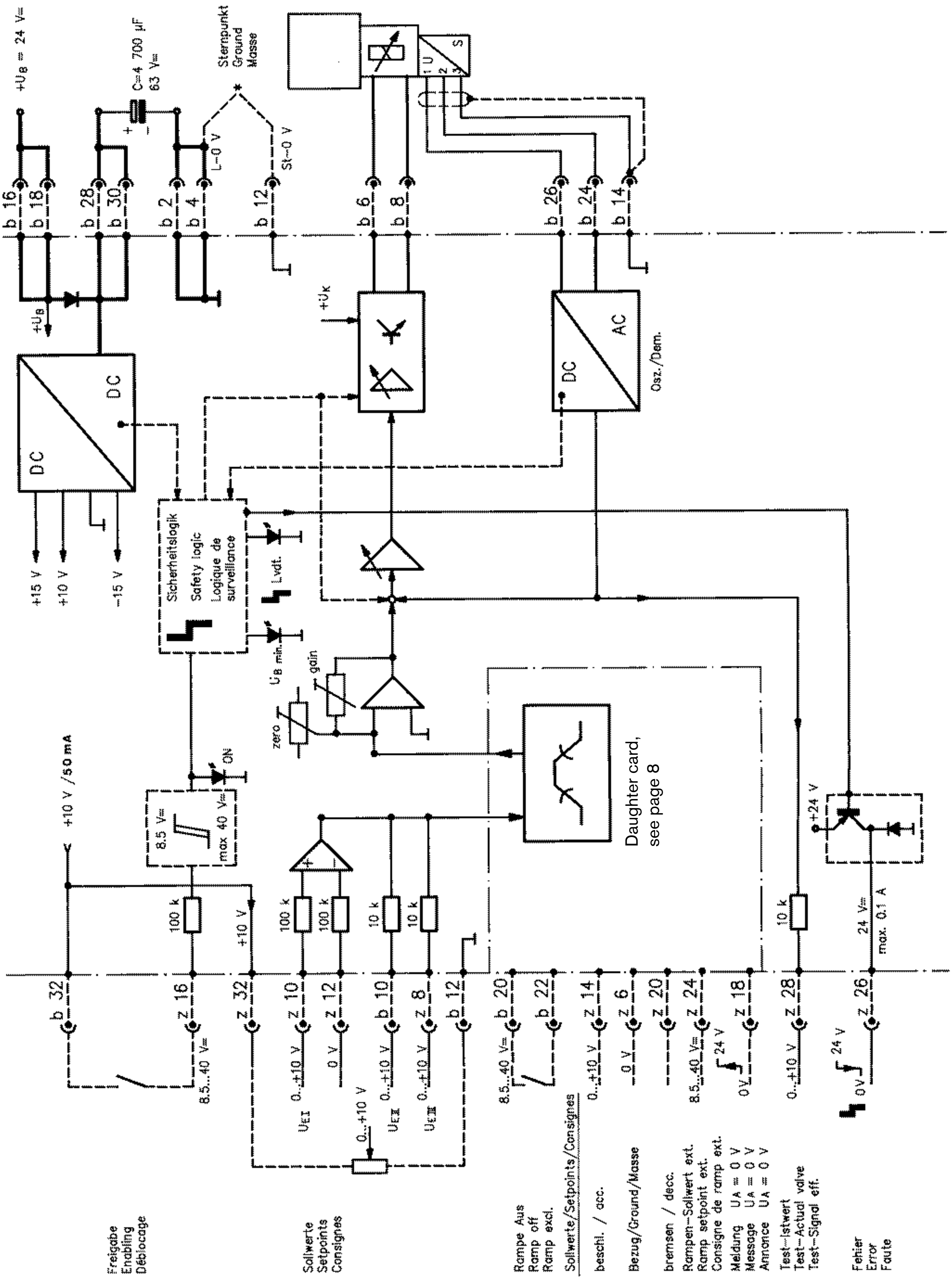
Valve with external trigger electronics (europe card with ramp, RE 30054)

Circuit diagram/pin assignment



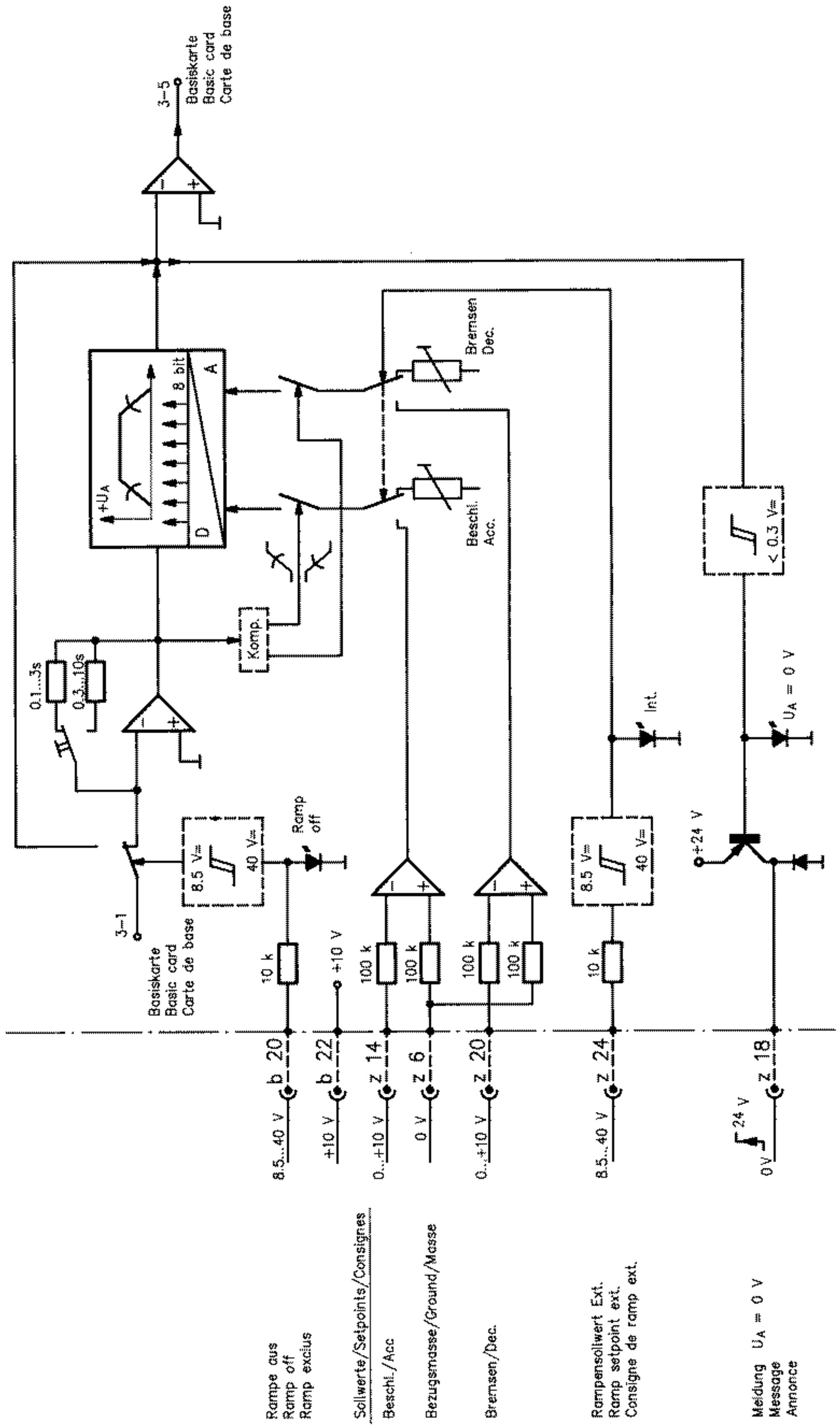
Valve with external trigger electronics (europe card with ramp, RE 30056)

Circuit diagram/pin assignment



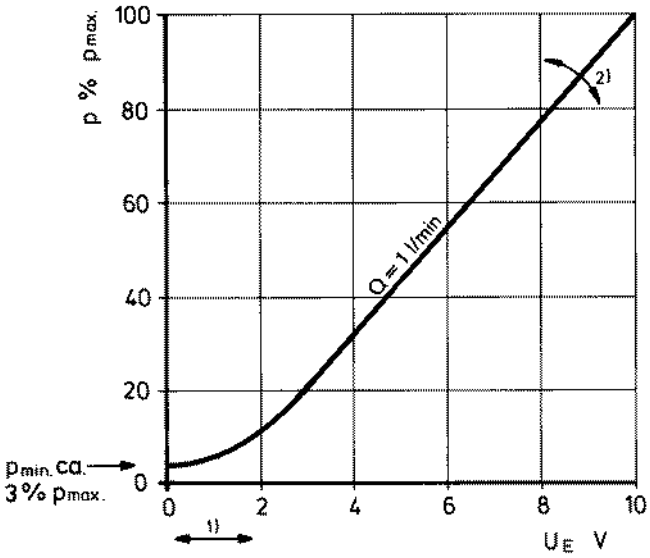
Valve with external trigger electronics (europe card with ramp, RE 30056)

Circuit diagram/pin assignment **Daughter card**



Characteristic curve (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Pressure in port P as a function of the setpoint
Nominal flow rate = 1 l/min

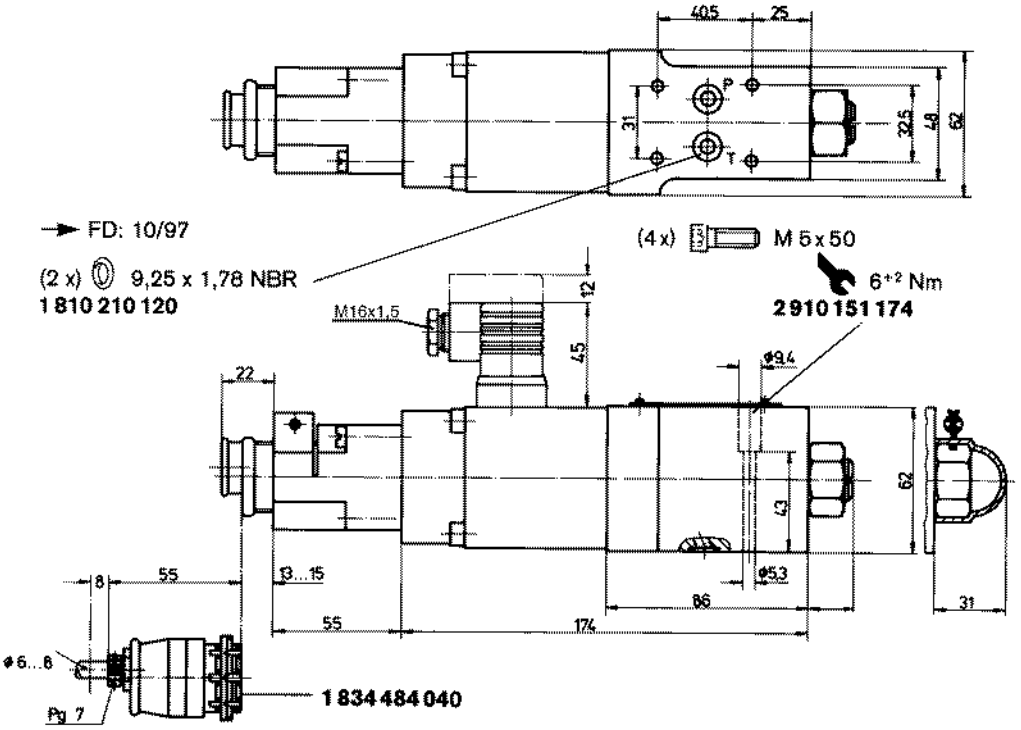


Valve amplifier

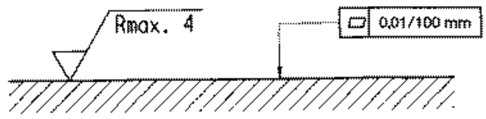
1) Zero adjustment

2) Sensitivity adjustment

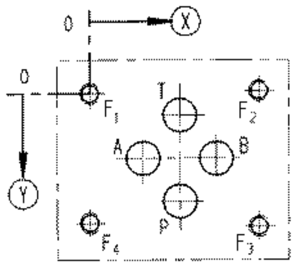
Unit dimensions (nominal dimensions in mm)



Required surface quality
of mating component



Mounting hole configuration: NG6 (ISO 4401-03-02-0-94)
For subplates, see catalog sheet RE 45053



1) Deviates from standard
2) Thread depth:
Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

	P	A	T	B	F_1	F_2	F_3	F_4
X	21.5	12.5	21.5	30.2	0	40.5	40.5	0
Y	25.9	15.5	5.1	15.5	0	–0.75	31.75	31
Ø	8 1)	8 1)	8 1)	8 1)	M5 2)	M5 2)	M5 2)	M5 2)

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
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Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Proportional pressure relief valve with on-board electronics (OBE) and position feedback

Type DBETBEX

Nominal size 6
Unit series 1X
Maximum working pressure P 315 bar, T 250 bar
Nominal flow rate Q_{nom} 1l/min

List of contents

Features

– Directly operated valves with position feedback and on-board electronics for limiting system pressure
– Adjustable through the position of the armature against the compression spring
– Position-controlled, minimal hysteresis < 0.2 %, rapid response times, see Technical data
– Pressure limitation to a safe level even with faulty electronics (solenoid current $I > I_{max}$)
– For subplate attachment, mounting hole configuration to ISO 4401-03-02-0-94. Subplates as per catalog sheet RE 45053 (order separately)
– Plug-in connector to DIN 43563-AM6, see catalog sheet RE 08008 (order separately)
– Data for the on-board trigger electronics
  • Complies with CE, EMC directives EN 61000-6-2: 2002-08 and EN 61000-6-3: 2002-08
  • $U_B = 24$ V_{nom} DC
  • Electrical connection 6P+PE
  • Signal actuation
    – Standard 0...+10 V (A1)
    – Version 4...20 mA (F1)
  • Valve curve calibrated at the factory

Ordering data

DBETB	E	X	–1X /		G24	K31		M	*

Proportional pressure relief valve with inductive position transducer on the cone

With on-board electronics **= E**

Mounting hole configuration to ISO 4401-03-02-0-94 **= X**

Unit series 10 to 19 **= 1X**
(10 to 19: installation and connection dimensions unchanged)

Max. pressure stage
up to 80 bar **= 80**
up to 180 bar **= 180**
up to 250 bar **= 250**
up to 315 bar **= 315**

Voltage supply of trigger electronics 24 V DC **= G24**

K31 = **Electrical connection**
without plug-in connector,
with unit plug to DIN 43563-AM6
Order plug-in connector separately

Interface for trigger electronics
A1 = Setpoint input 0...+10 V
F1 = Setpoint input 4...20 mA

M = NBR seals,
suitable for mineral oils
(HL, HLP) to DIN 51524

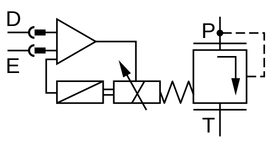
Further information in plain text

Preferred types

Type ....A1 (0...+10 V)	**Material Number**	**Type ....F1 (4...20 mA)**	**Material Number**
DBETBEX–1X/80G24K31A1M	0 811 402 072	DBETBEX–1X/80G24K31F1M	0 811 402 140
DBETBEX–1X/180G24K31A1M	0 811 402 071	DBETBEX–1X/180G24K31F1M	0 811 402 075
DBETBEX–1X/250G24K31A1M	0 811 402 073	DBETBEX–1X/315G24K31F1M	0 811 402 141
DBETBEX–1X/315G24K31A1M	0 811 402 070		

Symbol

For on-board electronics



Function, sectional diagram

General

Type DBETBEX proportional pressure relief valves are remote-controlled (pilot) valves in conical seat design. They are used to limit system pressure.
The valves are actuated by means of a proportional solenoid with on-board electronics.
With these valves, rapid response times with low hysteresis can be achieved.

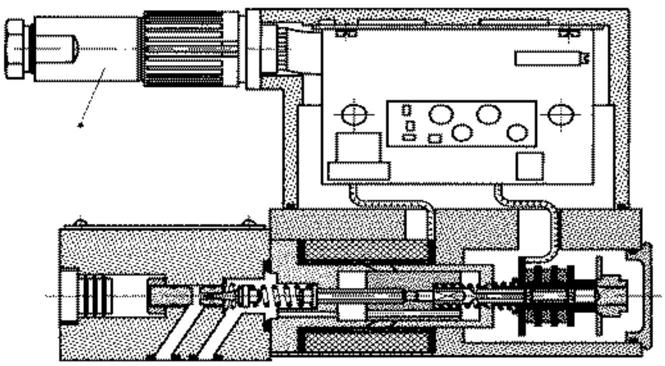
Basic principle

To adjust the system pressure, a setpoint is set in the trigger electronics. Based on this setpoint, the electronics control the position of the armature on the conical seat and on the compression spring.
The position control ensures extremely low hysteresis. The magnetic force determines the spring force until a new position is reached.

Pressure limitation for maximum safety

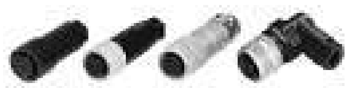
If a fault occurs in the electronics, so that the solenoid current (I_{max}) would exceed its specified level in an uncontrolled manner, the pressure cannot rise above the level determined by the maximum spring force.

EN 61000-6-2: 2002-08
EN 61000-6-3: 2002-08



Valve body Proportional solenoid with position transducer

Accessories

Type			Material Number
(4 x) ISO 4762-M5x30-10.9	Cheese-head bolts		2 910 151 166
* 	Plug-in connectors 2P+PE, see also RE 08008.	KS	1 834 482 022
		KS	1 834 482 026
		MS	1 834 482 023
		MS	1 834 482 024
		KS 90°	1 834 484 252

Testing and service equipment

Test box type VT-PE-TB3, see RE 30065
Measuring adapter 6P+PE type VT-PA-2, see RE 30068

Technical data

General

Construction		Poppet valve
Actuation		Proportional solenoid with position control and OBE
Connection type		Subplate, mounting hole configuration NG6 (ISO 4401-03-02-0-94)
Mounting position		Optional
Ambient temperature range	°C	–20...+50
Weight	kg	2.7
Vibration resistance, test condition		Max. 25 g, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Pressure fluid		Hydraulic oil to DIN 51524...535, other fluids after prior consultation			
Viscosity range recommended	mm^2/s	20...100			
Viscosity range max. permitted	mm^2/s	10...800			
Pressure fluid temperature range	°C	–20...+70			
Maximum permitted degree of contamination of pressure fluid Purity class to ISO 4406 (c)		Class 18/16/13 [1)]			
Direction of flow		See symbol			
Max. set pressure (at $Q = 1$ l/min)	bar	80	180	250	315
Minimum pressure (at $Q = 1$ l/min)	bar	3	4	5	8
		Note: At $Q_{max} = 1.5$ l/min the pressure levels stated here increase			
Max. mechanical pressure limitation level, e.g. when solenoid current $I > I_{max}$	bar	<85	<186	<258	<325
Max. working pressure (at $Q = 1$ l/min)	bar	Port P: 315			
Max. pressure	bar	Port T: 250			

Static/Dynamic

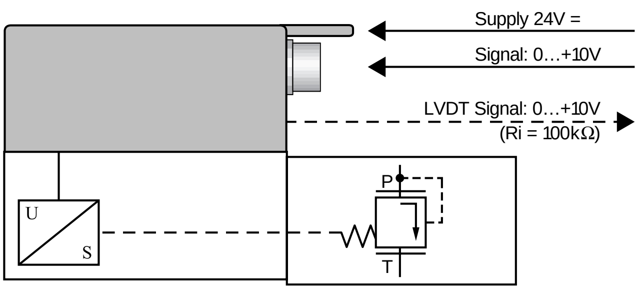
Hysteresis	%	$\leqq 0.2$
Range of inversion	%	$\leqq 0.1$
Manufacturing tolerance	%	$\leqq \pm 5$
Response time 100 % signal change	ms	30
Response time 10 % signal change	ms	10
Thermal drift		<1 % at $\Delta T = 40\,°C$
Conformity		CE EN 61000-6-2: 2002-08 EN 61000-6-3: 2002-08

1) The purity classes stated for the components must be complied with in hydraulic systems.
Effective filtration prevents problems and also extends the service life of components.
For a selection of filters, see catalog sheets RE 50070, RE 50076 and RE 50081.

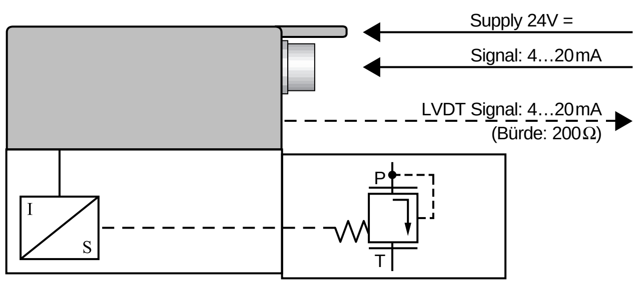
Technical data

Electrical, trigger electronics integrated in valve	
Cyclic duration factor %	100
Degree of protection	IP 65 to DIN 40050 and IEC 14434/5
Connection	Plug-in connector 6P+PE, DIN 43563
Supply voltage Terminal A: Terminal B: 0 V	24 V DC Min. 21 V DC/max. 40 V DC Ripple max. 2 V DC
Power consumption	Solenoid ⧄ 45 mm = 40 VA max.
External fuse	2.5 A_F
Input, “standard” version A1 Terminal D: U_E Terminal E:	Differential amplifier, R_i = 100 kΩ 0...+10 V 0 V
Input, “mA signal” version F1 Terminal D: I_{D-E} Terminal E: I_{D-E}	Burden, R_{sh} = 200 Ω 4...20 mA Current loop I_{D-E} feedback
Max. voltage to differential inputs over 0 V	$\left.\begin{array}{l}D \rightarrow B\\ E \rightarrow B\end{array}\right\}$ max. 18 V DC
Test signal, “standard” version A1 Terminal F: U_{Test} Terminal C:	LVDT 0...+10 V Reference 0 V
Test signal, “mA signal” version F1 Terminal F: I_{F-C} Terminal C: I_{F-C}	LVDT signal 4...20 mA at external load 200...500 Ω max. 4...20 mA output Current loop I_{F-C} feedback
Safety earth conductor and shield	See pin assignment (installation in conformity with CE)
Recommended cable	See pin assignment up to 20 m 7 x 0.75 mm^2 up to 40 m 7 x 1 mm^2
Calibration	Calibrated at the factory, see valve curve

Version A1:
Standard

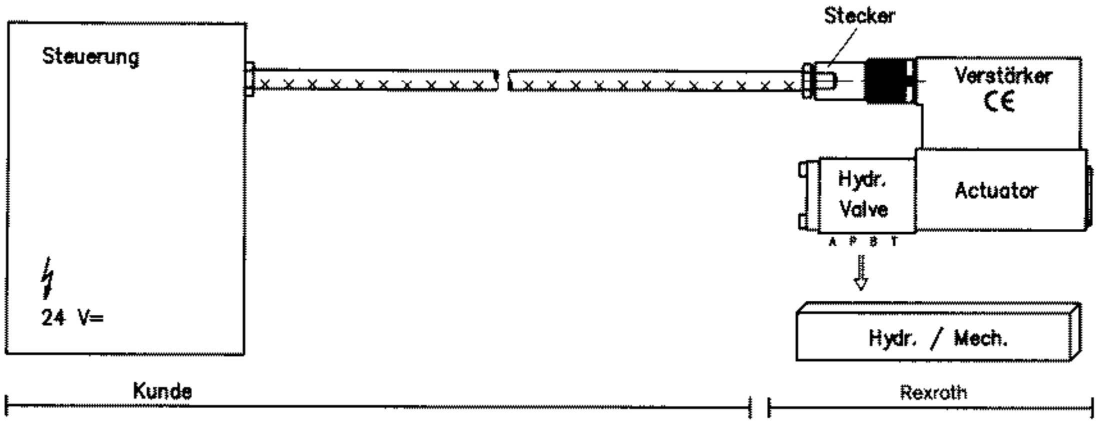


Version F1:
mA signal



Connection

For electrical data, see page 5
and Operating Instructions **1 819 929 083**



Technical notes for the cable

Version:
- Multi-wire cable
- Extra-finely stranded wire to VDE 0295, Class 6
- Safety earth conductor, green/yellow
- Cu-braided shield

Type:
- e.g. Ölflex-FD 855 CP (from Lappkabel company)

No. of wires:
- Determined by type of valve, plug type and signal assignment

Cable Ø:
- 0.75 mm^2 up to 20 m long
- 1.0 mm^2 up to 40 m long

Outside Ø:
- 9.4...11.8 mm – Pg11
- 12.7...13.5 mm – Pg16

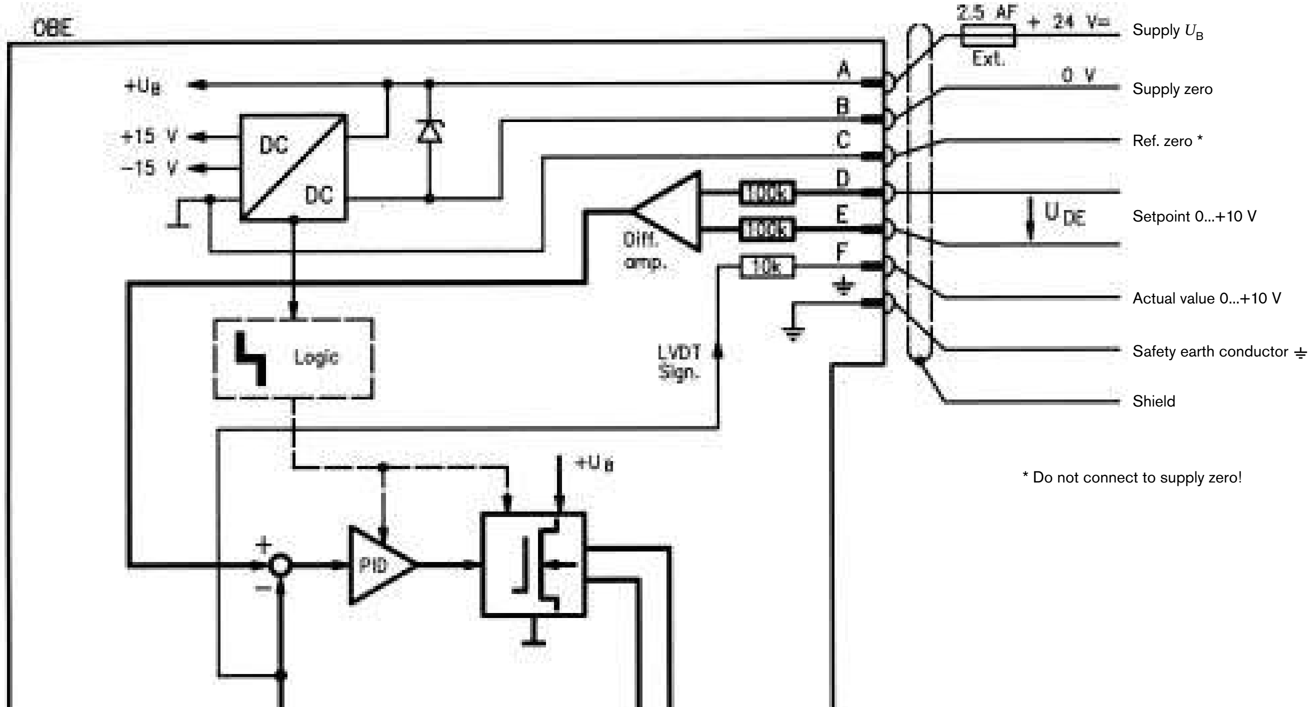
Important

Voltage supply 24 V DC nom,
if voltage drops below 18 V DC, rapid shutdown resembling "Enable OFF" takes place internally.
In addition, with the "mA signal" version:
$I_{D-E} \geqq 3$ mA – valve is active
$I_{D-E} \leqq 2$ mA – valve is deactivated.
Electrical signals emitted via the trigger electronics (e.g. actual values) must not be used to shut down safety-relevant machine functions!
(See also European Standard, "Technical Safety Requirements for Fluid-Powered Systems and Components – Hydraulics", EN 982.)

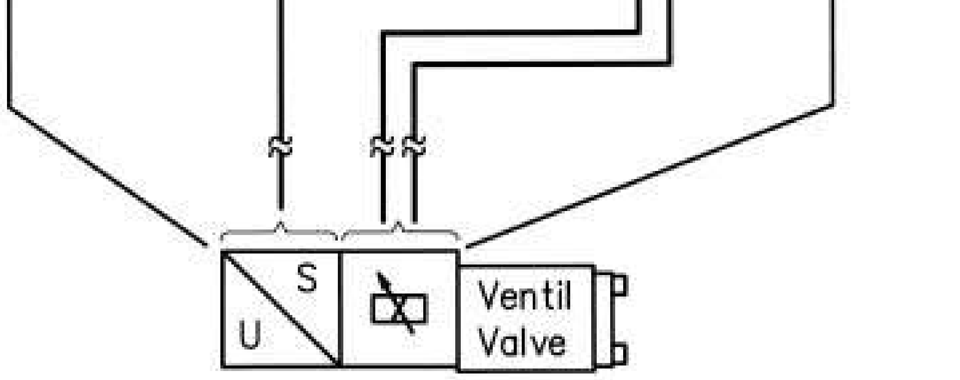
On-board trigger electronics

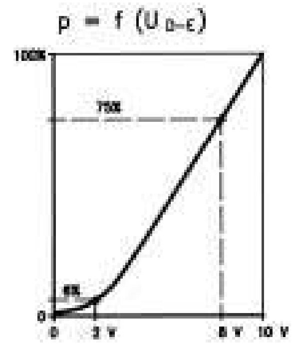
Circuit diagram/pin assignment

Version A1: U_{D-E} 0...+10 V



* Do not connect to supply zero!

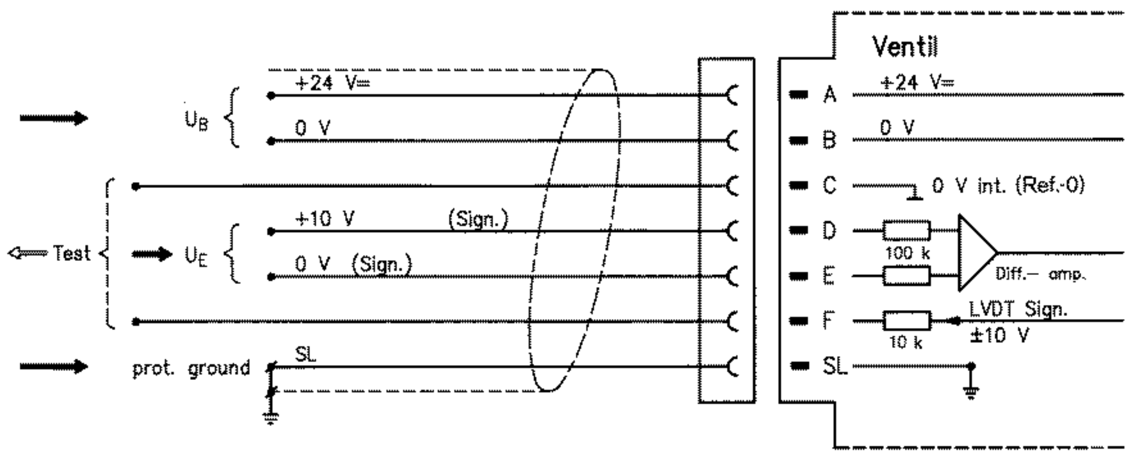




Pin assignment

Version A1: U_{D-E} 0...+10 V

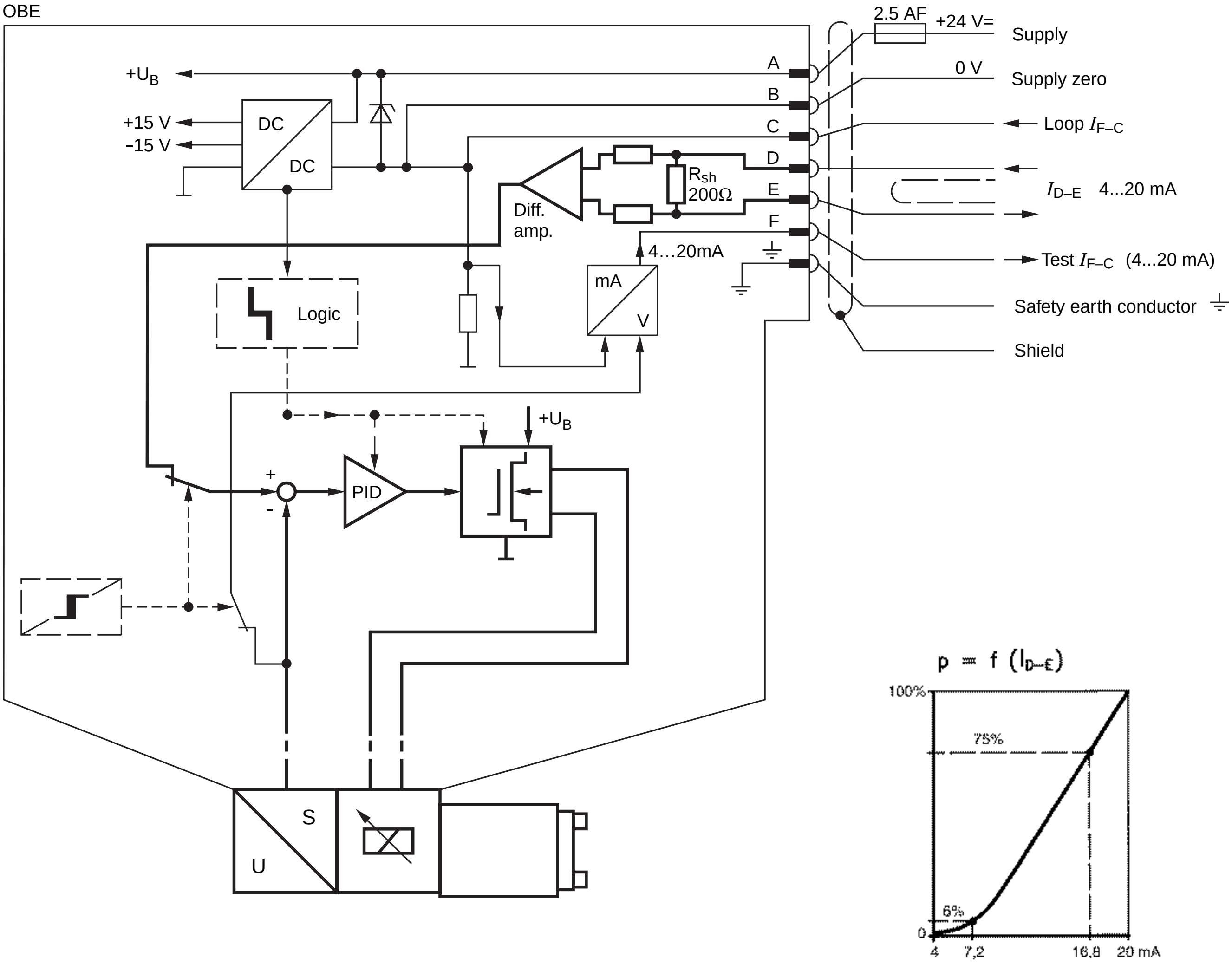
(R_i = 100 kΩ)



On-board trigger electronics

Circuit diagram/pin assignment

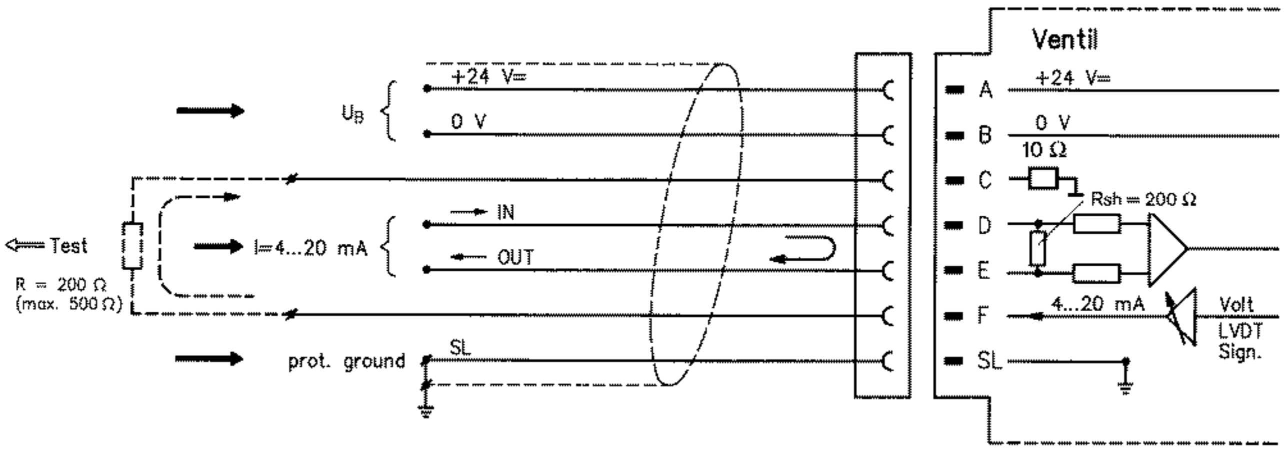
Version F1: I_{D-E} 4...20 mA



Pin assignment

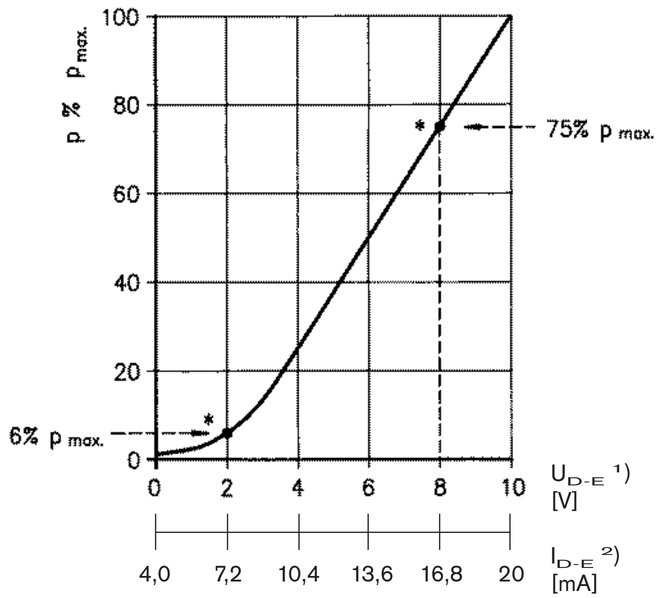
Version F1: I_{D-E} 4...20 mA

(R_{sh} = 200 kΩ)



Characteristic curve (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Pressure in port P as a function of the setpoint
Nominal flow rate = 1 l/min

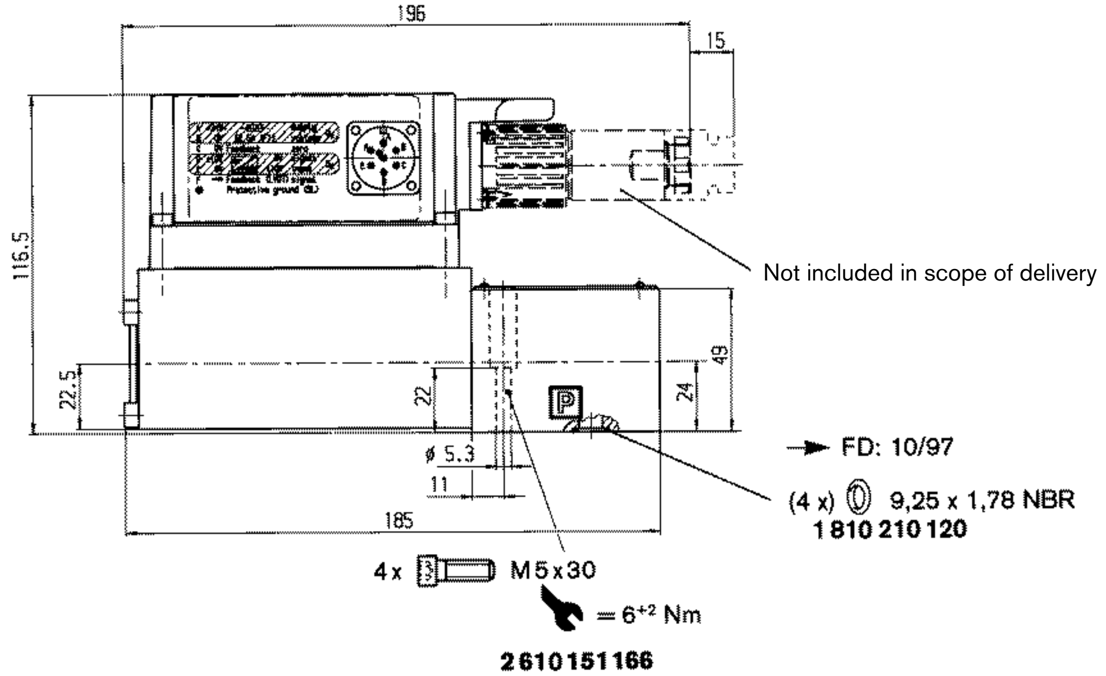


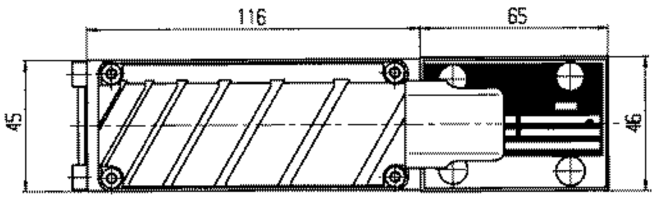
* Factory setting at Q = 1 l/min
±2 % manufacturing tolerance

1) Version: U_{D-E} = 0...+10 V

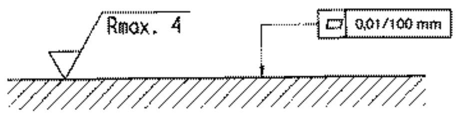
2) Version: I_{D-E} = 4...20 mA

Unit dimensions (nominal dimensions in mm)

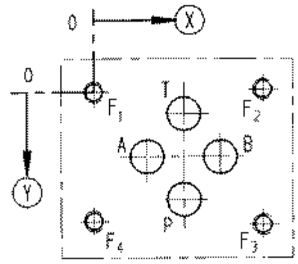




Required surface quality
of mating component



Mounting hole configuration: NG6 (ISO 4401-03-02-0-94)
For subplates, see catalog sheet RE 45053



[1] Deviates from standard

[2] Thread depth:
Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

	P	A	T	B	F_1	F_2	F_3	F_4
X	21.5	12.5	21.5	30.2	0	40.5	40.5	0
Y	25.9	15.5	5.1	15.5	0	–0.75	31.75	31
∅	8 [1]	8 [1]	8 [1]	8 [1]	M5 [2]	M5 [2]	M5 [2]	M5 [2]

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Notes

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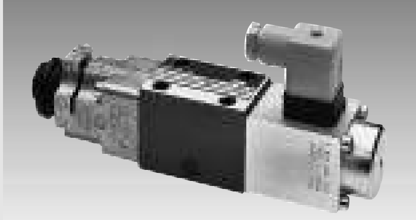
Proportional pressure relief valve with linear curve (Lvdt AC/AC)

Type DBETFX



Nominal size 6
Unit series 1X
Maximum working pressure P 315 bar, T 200 bar
Nominal flow rate Q_{nom} 1 l/min

List of contents

Features

– Directly operated valves with position feedback for limiting system pressure
– Adjustable through the set position (force) of the cone against the main spring (see Basic principle, page 3)
– Position-controlled, linear curve with minimal hysteresis <1 %, see Technical data
– Pressure limitation to a safe level even with faulty electronics (solenoid current $I > I_{max}$)
– For subplate attachment, mounting hole configuration to ISO 4401-03-02-0-94
Subplates as per catalog sheet RE 45053 (order separately)
– Plug-in connector for solenoid to DIN 43650-AM2 and plug-in connector for position transducer, included in scope of delivery
– Data for the external trigger electronics
  • $U_B = 24\ V_{nom}$ DC
  • Adjustment of valve curve Np and gain with and without ramp generator
  • Europe card format, setpoint 0...+10 V (order separately)

Ordering data

DBETF	X	– 1X /		G24 –	27	N	Z4	M	*

Proportional pressure relief valve with linear curve and inductive position transducer on the cone

Mounting hole configuration to ISO 4401-03-02-0-94 = **X**

Unit series 10 to 19 (10 to 19: installation and connection dimensions unchanged) = **1X**

Max. pressure stage

up to 80 bar	= **80**
up to 180 bar	= **180**
up to 250 bar	= **250**
up to 315 bar	= **315**

Voltage supply of trigger electronics 24 V DC = **G24**

Solenoid type (current)

27 = Solenoid current 2.7 A max.

N = **Manual auxiliary override**

Z4 = **Electrical connection**
Unit plug to DIN 43650-AM2
Plug-in connector included in scope of delivery

M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

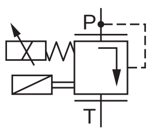
Further information in plain text

Preferred types

Type	Material Number
DBETFX–1X/80G24–27NZ4M	0 811 402 023
DBETFX–1X/180G24–27NZ4M	0 811 402 022
DBETFX–1X/250G24–27NZ4M	0 811 402 021
DBETFX–1X/315G24–27NZ4M	0 811 402 020

Symbol

For external trigger electronics



Function, sectional diagram

General

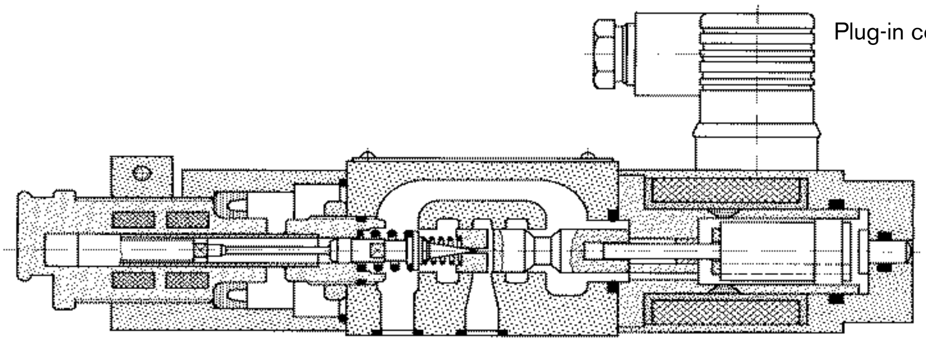
Type DBETFX proportional pressure relief valves have position feedback and are used to limit system pressure.
The position of the valve cone is measured by the Lvdt AC/AC position transducer, and the position of the cone-solenoid position is controlled by external trigger electronics, resulting in a linear curve.

Basic principle

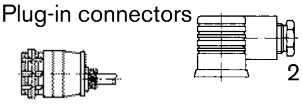
To adjust the system pressure, a setpoint is set in the trigger electronics. Based on this setpoint, the electronics control the position of the armature on the conical seat and of the spring. The position transducer is situated on the cone. The position control ensures extremely low hysteresis. The magnetic force determines the spring force until a new position is reached.

Pressure limitation for maximum safety

If a fault occurs in the electronics, so that the solenoid current (I_{max}) would exceed its specified level in an uncontrolled manner, the pressure cannot rise above the level determined by the maximum spring force.



Accessories

Type			Material Number
(4 x) ISO 4762-M5x30-10.9	Cheese-head bolts		2 910 151 166
Europe card 	VT-VRPA1-527-10/V0	RE 30052	0 811 405 095
Europe card 	VT-VRPA1-527-10/V0/RTP	RE 30054	0 811 405 100
Europe card 	VT-VRPA1-527-10/V0/RTS	RE 30056	0 811 405 175
Plug-in connectors  2P+PE	Plug-in connector 2P+PE (M16x1.5) for the solenoid and plug-in connector for the position transducer, included in scope of delivery, see also RE 08008.		

Testing and service equipment

Test box type VT-PE-TB1, see RE 30063
Test adapter for Europe cards type VT-PA-3, see RE 30070

Technical data

General

Construction		Poppet valve
Actuation		Proportional solenoid with position control and external amplifier
Connection type		Subplate, mounting hole configuration NG6 (ISO 4401-03-02-0-94)
Mounting position		Horizontal, vertical with solenoid at top
Ambient temperature range	°C	–20...+50
Weight	kg	2.3
Vibration resistance, test condition		Max. 25 g, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Pressure fluid		Hydraulic oil to DIN 51524...535, other fluids after prior consultation			
Viscosity range recommended	mm^2/s	20...100			
Viscosity range max. permitted	mm^2/s	10...800			
Pressure fluid temperature range	°C	–20...+80			
Maximum permitted degree of contamination of pressure fluid Purity class to ISO 4406 (c)		Class 18/16/13 [1]			
Direction of flow		See symbol			
Max. set pressure (at $Q = 1$ l/min)	bar	80	180	250	315
Minimum pressure (at $Q = 1$ l/min)	bar	3	4	5	6
		Note: At $Q_{max} = 3$ l/min the pressure levels stated here increase			
Max. mechanical pressure limitation level, e.g. when solenoid current $I > I_{max}$	bar	<85	<186	<258	<325
Max. working pressure (at $Q = 1$ l/min)	bar	Port P: 315			
Max. pressure	bar	Port T: 200			

Electrical

Cyclic duration factor	%	100
Degree of protection		IP 65 to DIN 40050 and IEC 14434/5
Solenoid connection		Unit plug DIN 43650/ISO 4400, M16 x 1.5 (2P+PE)
Position transducer connection		Special plug
Max. solenoid current	I_{max}	2.7
Coil resistance R_{20}	Ω	3
Max. power consumption at 100 % load and operating temperature	VA	35

Static/Dynamic [2]

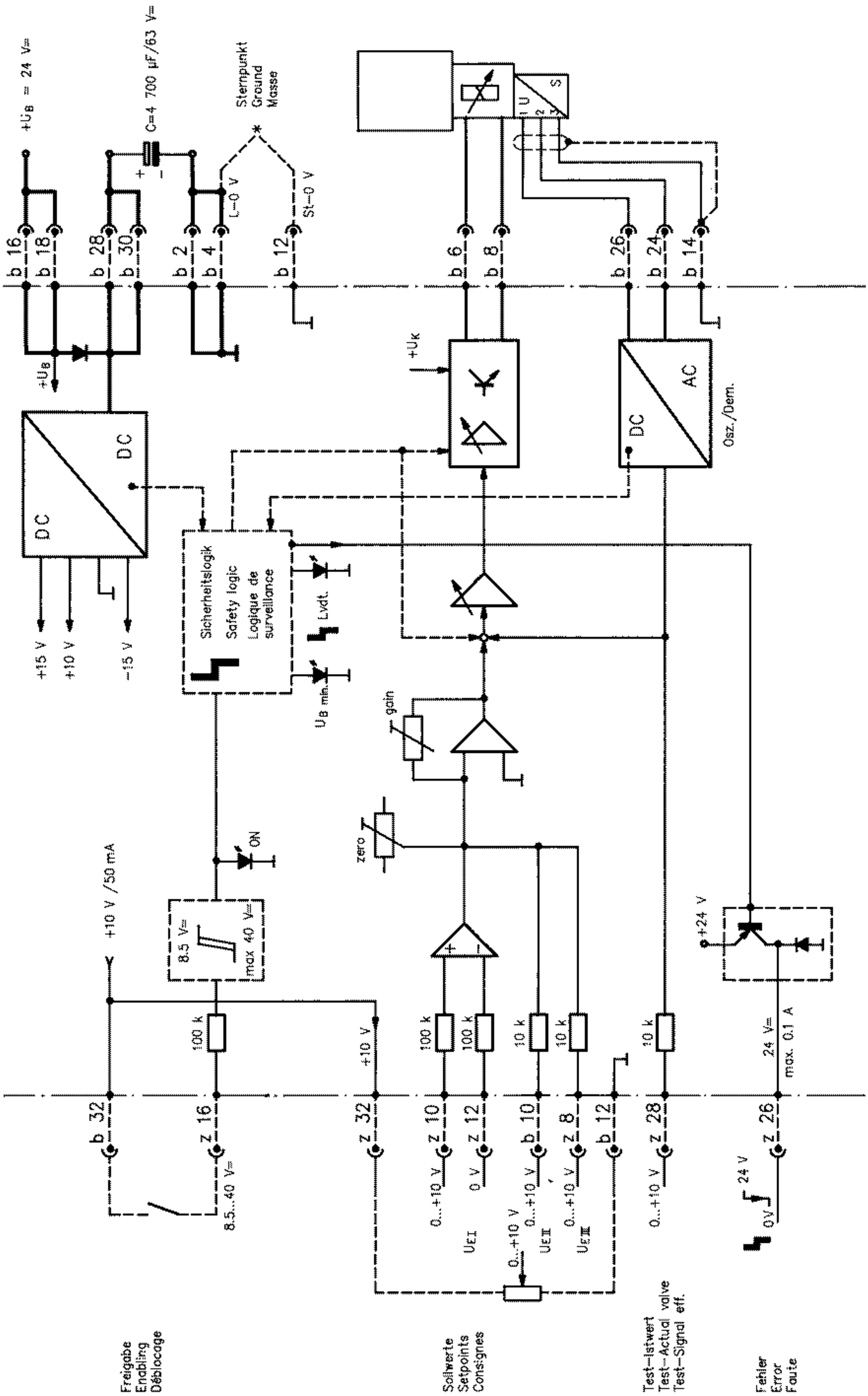
Hysteresis	%	≤ 1
Range of inversion	%	≤ 0.8
Manufacturing tolerance for Q_{max}	%	≤ 2
Response time 100 % signal change	ms	On <45 / Off <25

[1] The purity classes stated for the components must be complied with in hydraulic systems. Effective filtration prevents problems and also extends the service life of components.
For a selection of filters, see catalog sheets RE 50070, RE 50076 and RE 50081.

[2] All characteristic values ascertained using amplifier 0 811 405 095 for the position-controlled 2.7 A solenoid.

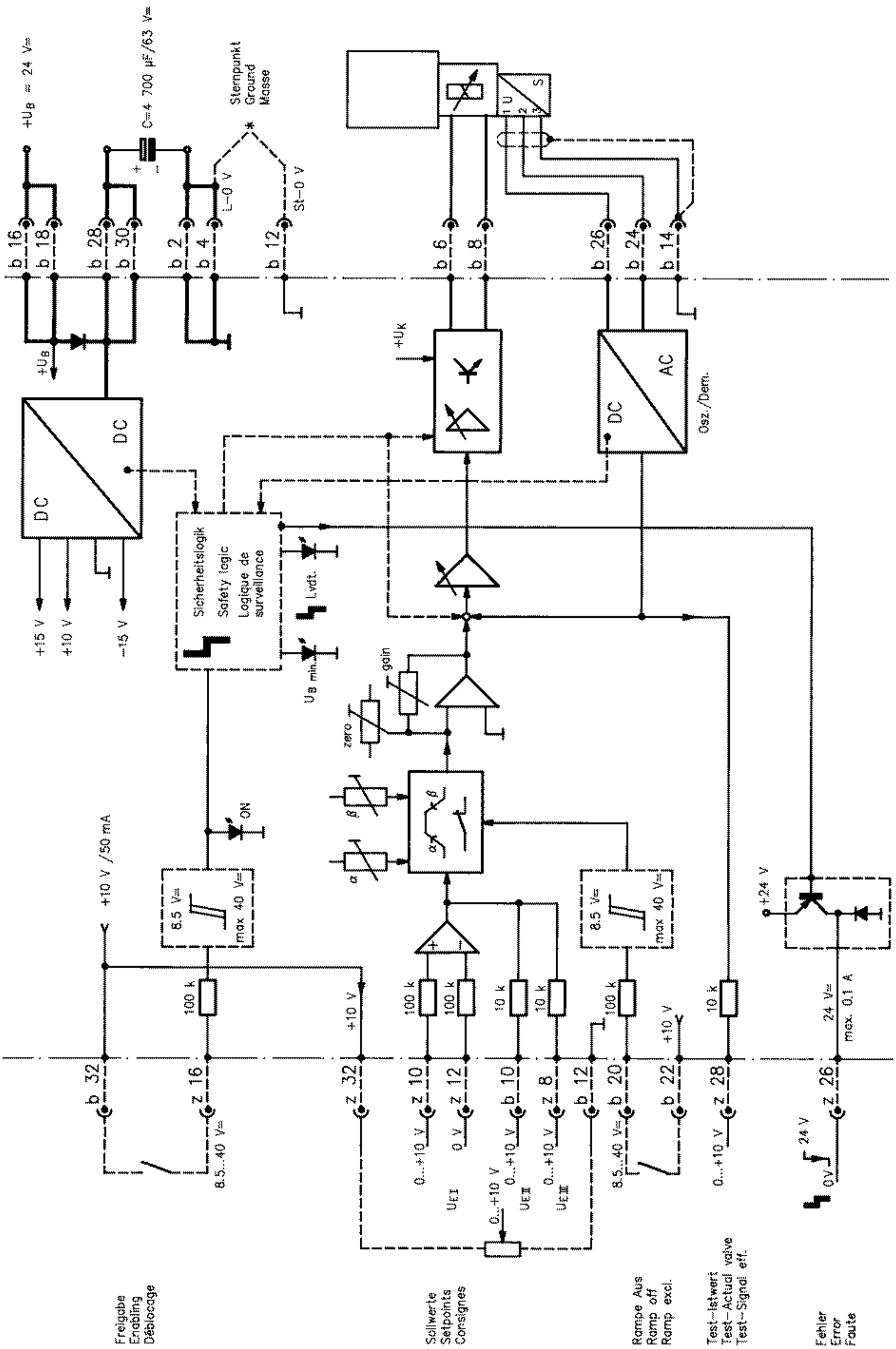
Valve with external trigger electronics (europe card without ramp, RE 30052)

Circuit diagram/pin assignment



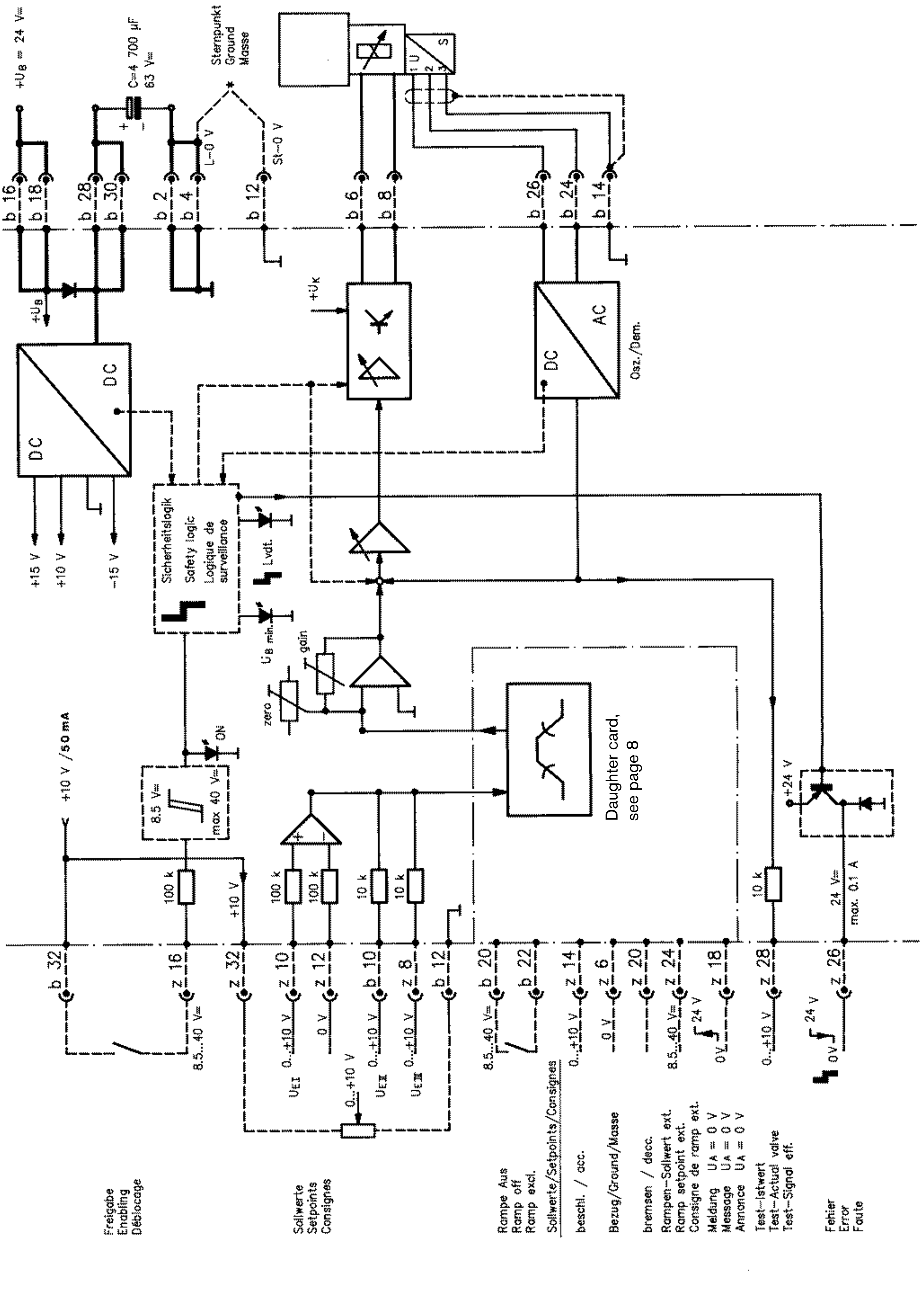
Valve with external trigger electronics (europe card with ramp, RE 30054)

Circuit diagram/pin assignment



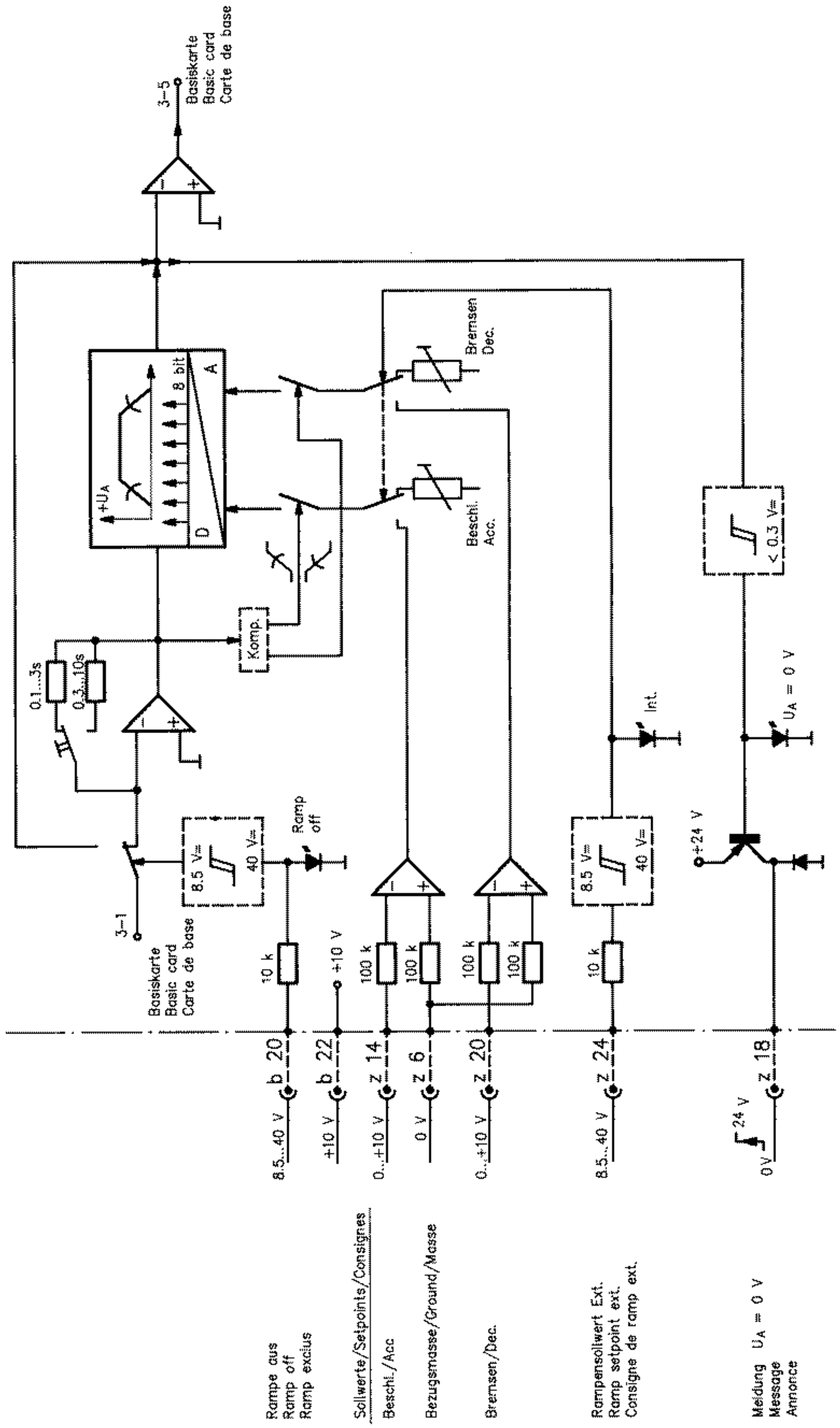
Valve with external trigger electronics (europe card with ramp, RE 30056)

Circuit diagram/pin assignment



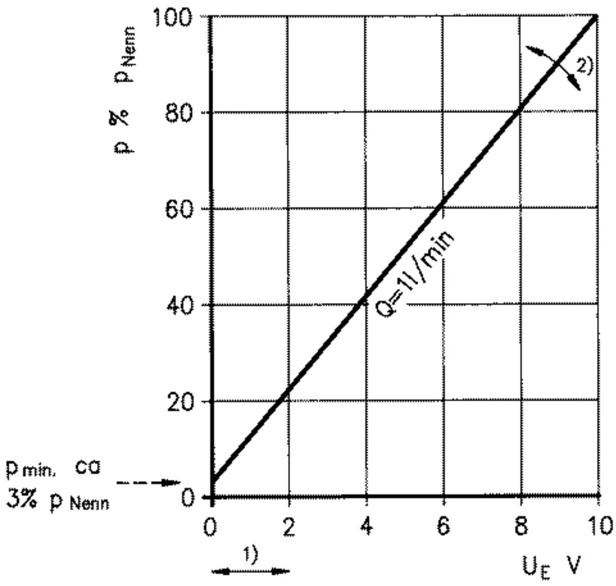
Valve with external trigger electronics (europe card with ramp, RE 30056)

Circuit diagram/pin assignment **Daughter card**



Characteristic curve (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Pressure in port P as a function of the setpoint
Nominal flow rate = 1 l/min

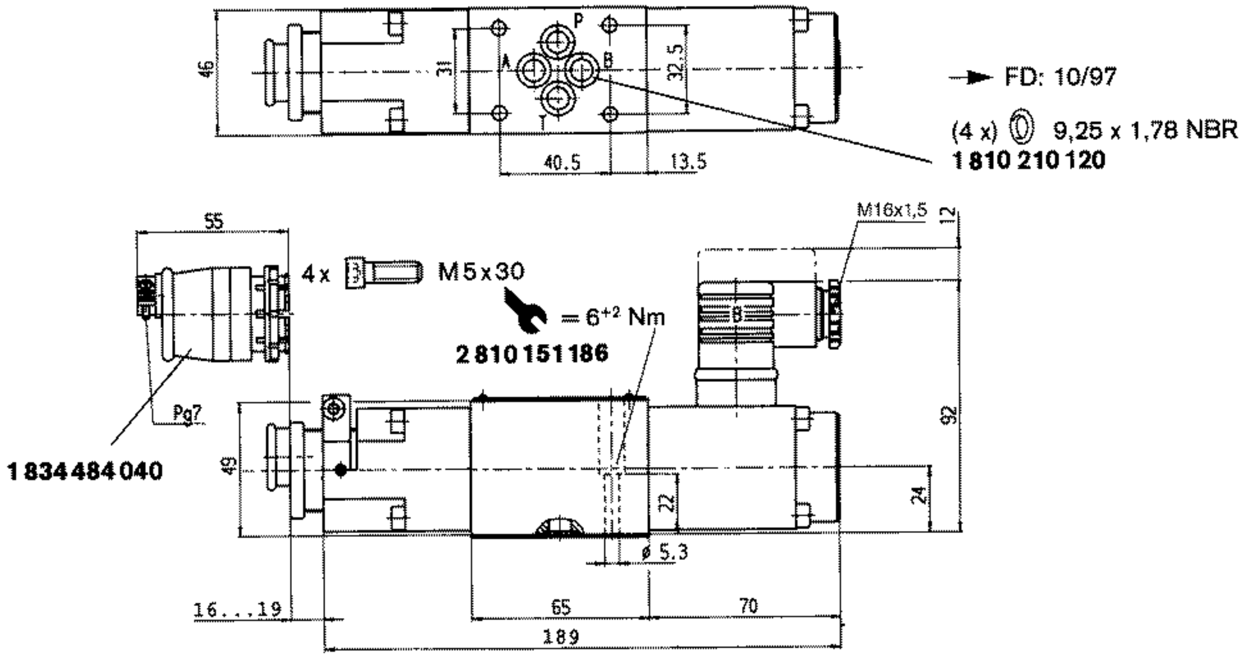


Valve amplifier

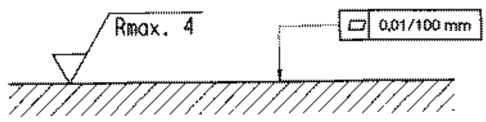
1) Zero adjustment

2) Sensitivity adjustment

Unit dimensions (nominal dimensions in mm)

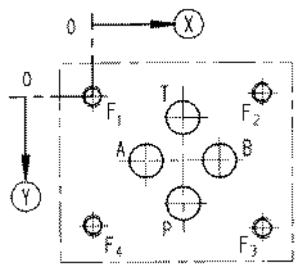


Required surface quality
of mating component



Mounting hole configuration: NG6 (ISO 4401-03-02-0-94)
For subplates, see catalog sheet RE 45053

[1] Deviates from standard
[2] Thread depth:
Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø



	P	A	T	B	F_1	F_2	F_3	F_4
X	21.5	12.5	21.5	30.2	0	40.5	40.5	0
Y	25.9	15.5	5.1	15.5	0	–0.75	31.75	31
Ø	8 [1]	8 [1]	8 [1]	8 [1]	M5 [2]	M5 [2]	M5 [2]	M5 [2]

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Notes

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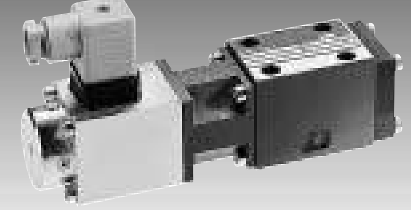
documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

Proportional pressure relief valve, pilot operated

Type DBE6X



Nominal size 6
Unit series 1X
Maximum working pressure P 315 bar, T 250 bar
Maximum flow rate 40 l/min

List of contents

Features

– Pilot operated valves (pilot valves) for limiting system pressure (pilot oil internal only)
– Adjustable by means of the solenoid current, see Characteristic curve, Technical data and selected valve electronics
– Solenoid versions $I_{max} = 0.8$ A or $I_{max} = 2.5$ A
– Pressure limitation to a safe level even with faulty electronics (solenoid current $I > I_{max}$)
– For subplate attachment, mounting hole configuration to ISO 4401-03-02-0-94
Subplates as per catalog sheet RE 45053 (order separately)
– Plug-in connector to DIN 43650-AM2 included in scope of delivery
– External trigger electronics with ramps and valve calibration in the following versions/designs (order separately)
• Plug, setpoint 0...+10 V or 4...20 mA, RE 30264
• Module, setpoint 0...+10 V, RE 30222
• Europe card, setpoint 0...+10 V, RE 30109

Ordering data

DBE6 X – 1X / G24 – N Z4 M *

Proportional pressure relief valve NG6, pilot operated

Mounting hole configuration to ISO 4401-03-02-0-94 **= X**

Unit series 10 to 19 (10 to 19: installation and connection dimensions unchanged) **= 1X**

Max. pressure stage

up to 80 bar **= 80**

up to 180 bar **= 180**

up to 315 bar **= 315**

Voltage supply of trigger electronics 24 V DC **= G24**

Further information in plain text

M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

Z4 = **Electrical connection** Unit plug to DIN 43650-AM2 Plug-in connector included in scope of delivery

N = **Manual auxiliary override**

Solenoid type (current)

8 = Solenoid current 0.8 A max.

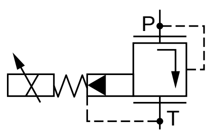
25 = Solenoid current 2.5 A max.

Preferred types

Solenoid 0.8 A		Solenoid 2.5 A	
Type	**Material Number**	**Type**	**Material Number**
DBE6X–1X/80G24–8NZ4M	0 811 402 045	DBE6X–1X/80G24–25NZ4M	0 811 402 040
DBE6X–1X/180G24–8NZ4M	0 811 402 044	DBE6X–1X/180G24–25NZ4M	0 811 402 041
DBE6X–1X/315G24–8NZ4M	0 811 402 043	DBE6X–1X/315G24–25NZ4M	0 811 402 042

Symbol

For external trigger electronics



Function, sectional diagram

General

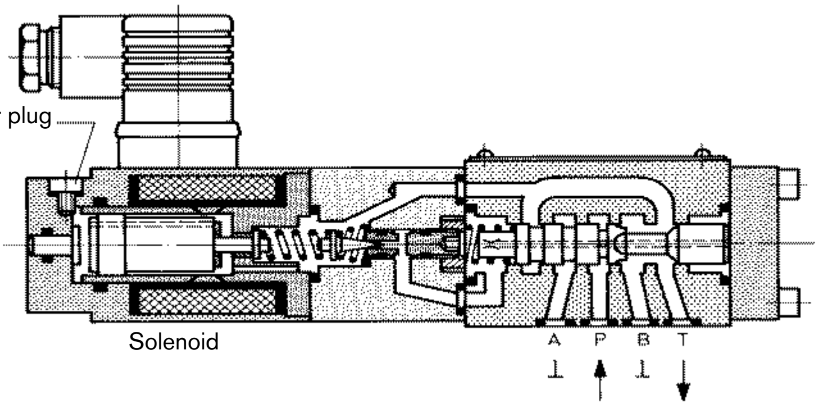
Type DBE6X proportional pressure relief valves are pilot operated pressure relief valves.
The internal pilot stage in the conical seat version and the main stage in the spool version are located in the valve body.
The valves are actuated by means of a proportional solenoid. The solenoid is cushioned by restrictors in the armature to aid dynamic stability. The interior of the solenoid is connected to port T and is filled with pressure fluid. Bleeding is achieved by means of a screw plug.
With these valves, the system pressure that needs to be limited can be infinitely adjusted in relation to the solenoid current.

Basic principle

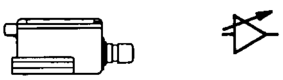
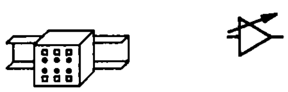
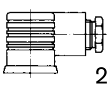
To adjust the system pressure, a setpoint is set in the trigger electronics. Based on this setpoint, the electronics control the solenoid coil with regulated PWM (pulse-width-modulated) current.
The regulated current is additionally modulated with a dither, ensuring low hysteresis.
The proportional solenoid converts the current to a mechanical force, which acts on a main spring in the pilot stage by means of the armature plunger. The pilot stage is supplied with pilot oil via a bore at < 0.6 l/min.
The "p_{max}" pressure stage is determined by the cone and seating bore configuration.

Pressure limitation for maximum safety

If a fault occurs in the electronics, so that the solenoid current (I_{max}) would exceed its specified level in an uncontrolled manner, the pressure cannot rise above the level determined by the maximum spring force.



Accessories

Type				Material Number
(4 x) ISO 4762-M5x30-10.9	Cheese-head bolts			2 910 151 166
Plug 	VT-SSPA1-525-20/V0	(2.5 A)	RE 30264	0 811 405 143
	VT-SSPA1-508-20/V0	(0.8 A)		0 811 405 144
	VT-SSPA1-525-20/V0/I	(2.5 A)		0 811 405 145
	VT-SSPA1-508-20/V0/I	(0.8 A)		0 811 405 162
Module 	VT-MSPA1-525-10/V0	(2.5 A)	RE 30222	0 811 405 127
	VT-MSPA1-508-10/V0	(0.8 A)		0 811 405 126
Europe card 	VT-VSPA1-525-10/V0/RTP	(2.5 A)	RE 30109	0 811 405 079
	VT-VSPA1-508-10/V0/RTP	(0.8 A)		0 811 405 081
Plug-in connector  2P+PE	Plug-in connector 2P+PE (M16x1.5) included in scope of delivery, see also RE 08008.			

Testing and service equipment

Test box type VT-PE-TB1, see RE 30063
Current measuring adapter type VT-PA-5, see RE 30073

Technical data

General

Construction	Pilot stage	Poppet valve
	Main stage	Spool valve
Actuation		Proportional solenoid without position control, external amplifier
Connection type		Subplate, mounting hole configuration NG6 (ISO 4401-03-02-0-94)
Mounting position		Optional
Ambient temperature range	°C	–20...+50
Weight	kg	2.2
Vibration resistance, test condition		Max. 25 g, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Pressure fluid		Hydraulic oil to DIN 51524...535, other fluids after prior consultation		
Viscosity range, recommended	mm²/s	20...100		
max. permitted	mm²/s	10...800		
Pressure fluid temperature range	°C	–20...+80		
Maximum permitted degree of contamination of pressure fluid Purity class to ISO 4406 (c)		Class 18/16/13 [1)]		
Direction of flow		See symbol		
Max. set pressure (at $Q = 1$ l/min)	bar	80	180	315
Minimum pressure (at $Q_{min} = 1$ l/min)	bar	7	8	10
Max. mechanical pressure limitation level, e.g. when solenoid current $I > I_{max}$	bar	<90	<190	<325
Max. working pressure	bar	Port P: 315		
Max. pressure	bar	Port T: 250		
Pilot oil flow	l/min	approx. 0.6		
Max. flow	l/min	40		

Electrical

Cyclic duration factor	%	100	
Degree of protection		IP 65 to DIN 40050 and IEC 14434/5	
Solenoid connection		Unit plug DIN 43650/ISO 4400, M16 x 1.5 (2P+PE)	
Valve with solenoid type		0.8 A	2.5 A
Max. solenoid current	I_{max}	0.8 A	2.5 A
Coil resistance R_{20}	Ω	22	3
Max. power consumption at 100 % load and operating temperature	VA	25	30

Static/Dynamic [2)]

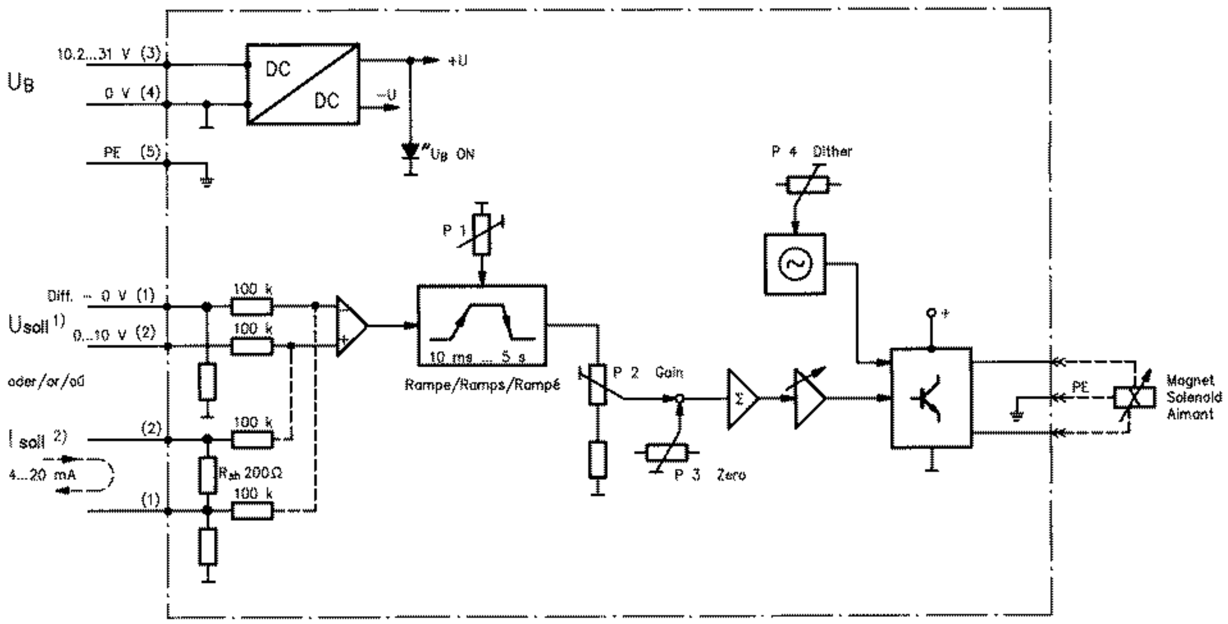
Hysteresis	%	≤ 4
Range of inversion	%	≤ 3
Manufacturing tolerance for p_{max}	%	≤ 10
Response time 100 % signal change	ms	On 200 / Off < 250

[1)] The purity classes stated for the components must be complied with in hydraulic systems. Effective filtration prevents problems and also extends the service life of components. For a selection of filters, see catalog sheets RE 50070, RE 50076 and RE 50081.

[2)] All characteristic values ascertained using amplifier 0 811 405 079 for the 2.5 A solenoid and 0 811 405 081 for the 0.8 A solenoid.

Valve with external trigger electronics (plug, RE 30264)

Circuit diagram/pin assignment

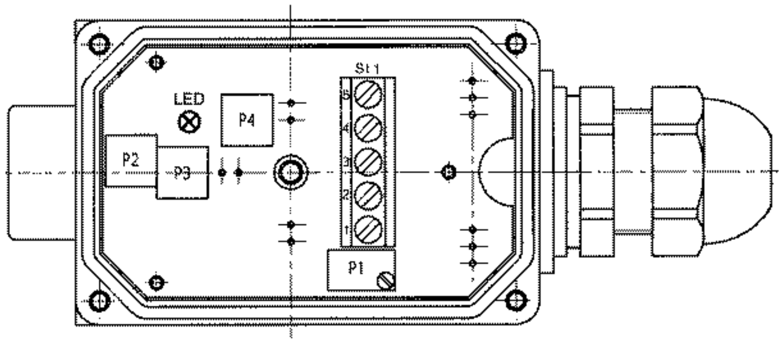


[1)] Version with 0...+10 V signal

[2)] Version with 4...20 mA signal

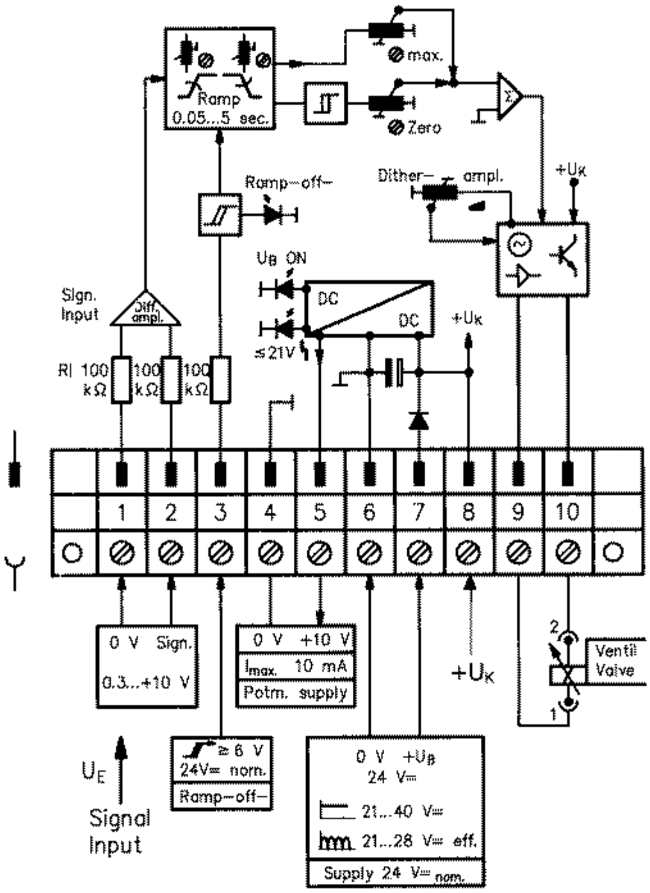
Connection/calibration

P1 – Ramp time
P2 – Sensitivity
P3 – Zero
P4 – Dither frequency
St1 – Terminal
LED – U_B display

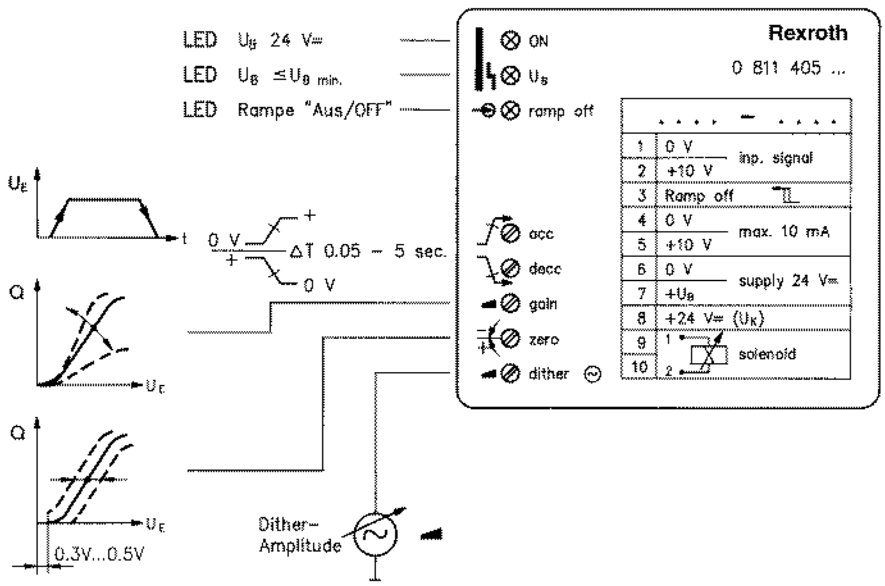


Valve with external trigger electronics (module, RE 30222)

Circuit diagram/pin assignment

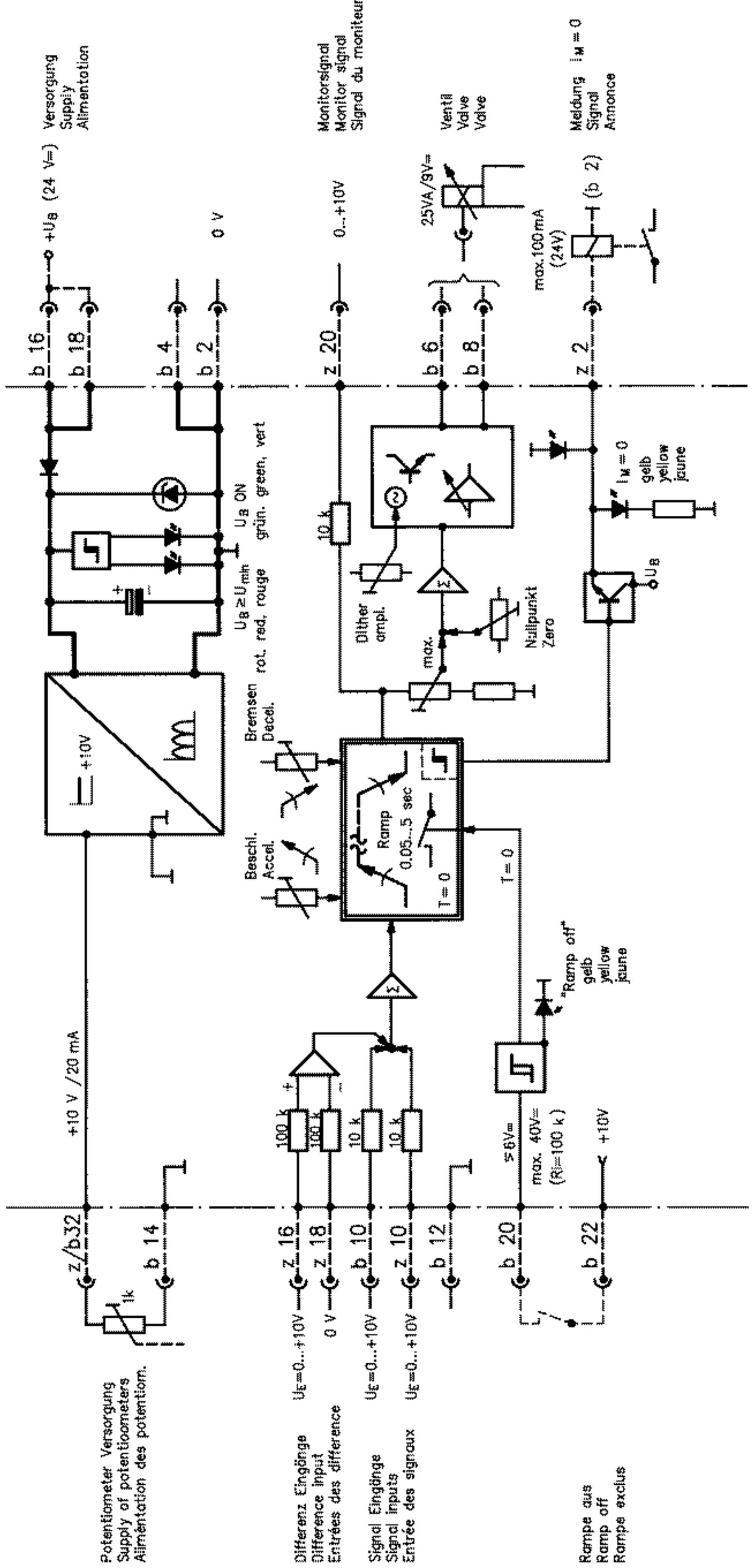


Front view/calibration



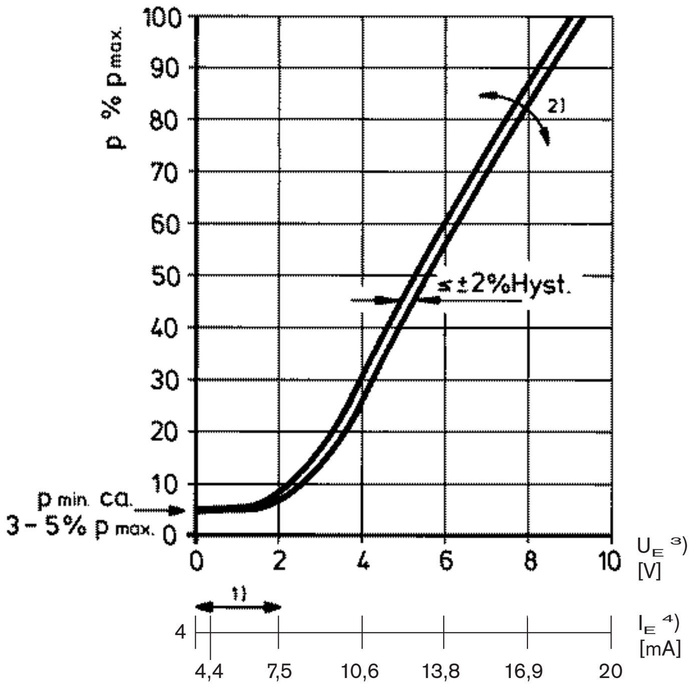
Valve with external trigger electronics (europe card, RE 30109)

Circuit diagram/pin assignment



Characteristic curves (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Pressure in port P as a function of the setpoint



Valve amplifier

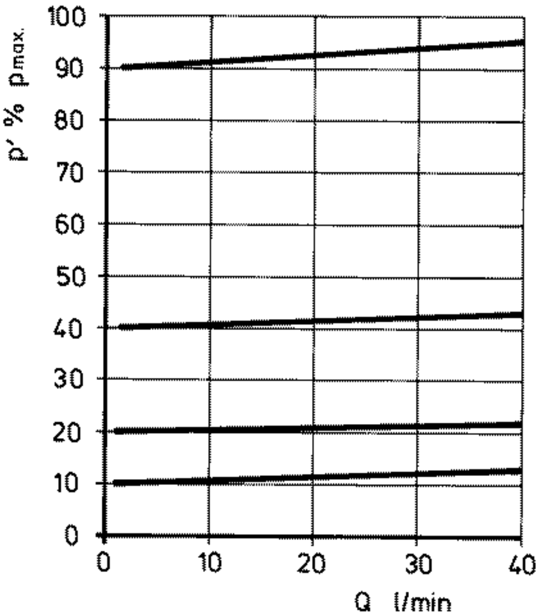
1) Zero adjustment

2) Sensitivity adjustment

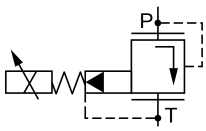
3) Version: $U_E = 0 ... +10$ V

4) Version: $I_E = 4 ... 20$ mA

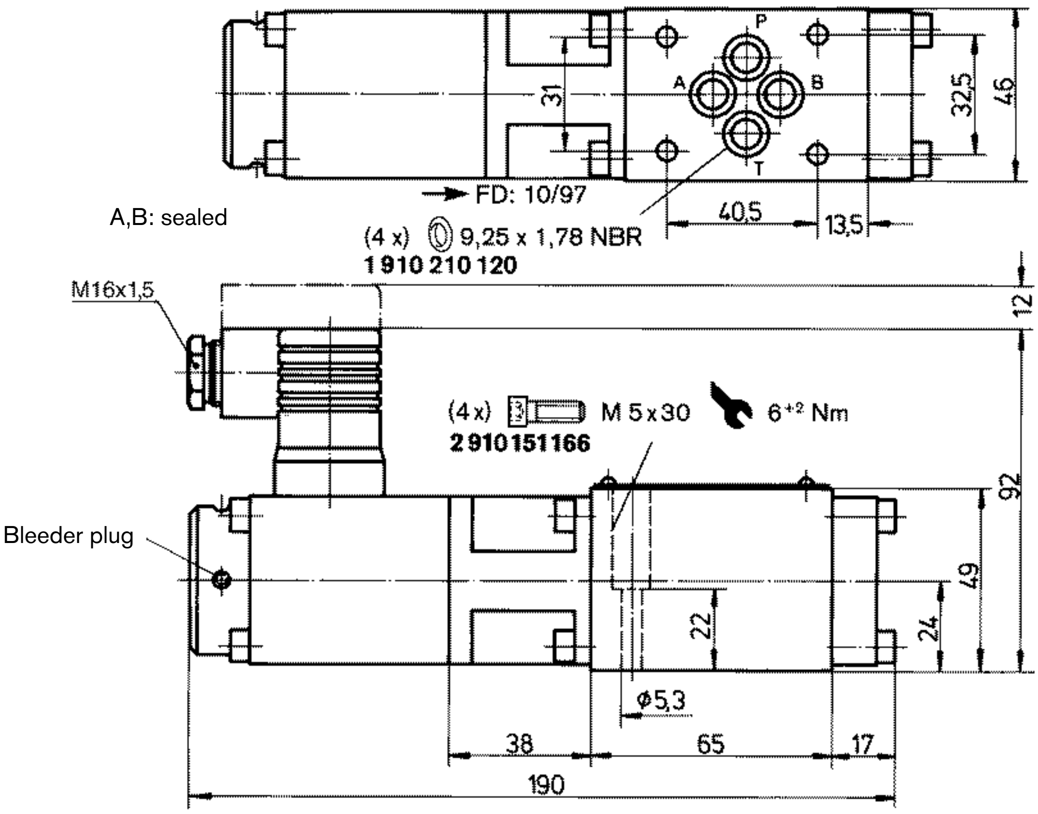
Pressure in port P proportionate to the maximum flow of the main stage



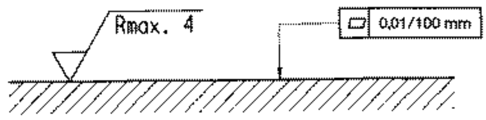
Set pressure
$p' = f\ (Q_{P-T})$



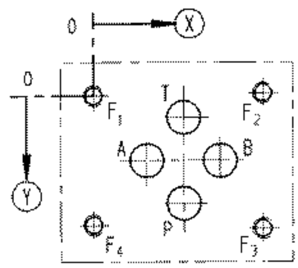
Unit dimensions (nominal dimensions in mm)



Required surface quality
of mating component



Mounting hole configuration: NG6 (ISO 4401-03-02-0-94)
For subplates see catalog sheet RE 45053



1) Deviates from standard
2) Thread depth:
Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

	P	A	T	B	F_1	F_2	F_3	F_4
X	21.5	12.5	21.5	30.2	0	40.5	40.5	0
Y	25.9	15.5	5.1	15.5	0	–0.75	31.75	31
∅	8 1)	8 1)	8 1)	8 1)	M5 2)	M5 2)	M5 2)	M5 2)

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

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Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

Proportional pressure relief valve, pilot operated, with on-board electronics (OBE) and position feedback

Type DBEBE6X

Nominal size 6
Unit series 1X
Maximum working pressure P 315 bar, T 250 bar
Maximum flow rate 40 l/min

List of Contents

Features

– Pilot operated valves with position feedback and on-board electronics for limiting system pressure (pilot oil internal only)
– Adjustable through the position of the armature against the compression spring
– Position-controlled, minimal hysteresis <1%, rapid response times, see Technical Data
– Pressure limitation to a safe level even with faulty electronics (solenoid current $I > I_{max}$)
– For subplate attachment, mounting hole configuration to ISO 4401-03-02-0-94. Subplates as per catalog sheet RE 45053 (order separately)
– Plug-in connector to DIN 43563-AM6, see catalog sheet RE 08008 (order separately)
– Data for the on-board trigger electronics
  • Complies with CE, EMC directives EN 61000-6-2: 2002-08 and EN 61000-6-3: 2002-08
  • U_B = 24 V_{nom}DC
  • Electrical connection 6P+PE
  • Signal actuation
    – Standard 0...+10 V (A1)
    – Version 4...20 mA (F1)
  • Valve curve calibrated at the factory

Ordering data

DBEB	E	6	X	–1X /		G24	K31		M	*

Proportional pressure relief valve with inductive position transducer on the cone

With on-board electronics **= E**

Nominal size **= 6**

Mounting hole configuration to ISO 4401-03-02-0-94 **= X**

Unit series 10 to 19 **= 1X**
(10 to 19: installation and connection dimensions unchanged)

Max. pressure stage
up to 80 bar **= 80**
up to 180 bar **= 180**
up to 315 bar **= 315**

Voltage supply of trigger electronics 24 V DC **= G24**

K31 = **Electrical connection**
without plug-in connector,
with unit plug to DIN 43563-AM6
Order plug-in connector separately

Interface for trigger electronics
A1 = Setpoint input 0...+10 V
F1 = Setpoint input 4...20 mA

M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

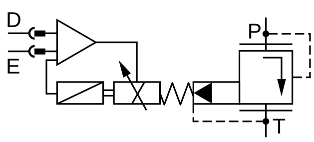
Further information in plain text

Preferred types

Type ....A1 (0...+10 V)	**Material Number**	**Type ....F1 (4...20 mA)**	**Material Number**
DBEBE6X–1X/80G24K31A1M	0 811 402 078	DBEBE6X–1X/80G24K31F1M	0 811 402 084
DBEBE6X–1X/180G24K31A1M	0 811 402 077	DBEBE6X–1X/180G24K31F1M	0 811 402 079
DBEBE6X–1X/315G24K31A1M	0 811 402 076		

Symbol

For on-board electronics



Function, sectional diagram

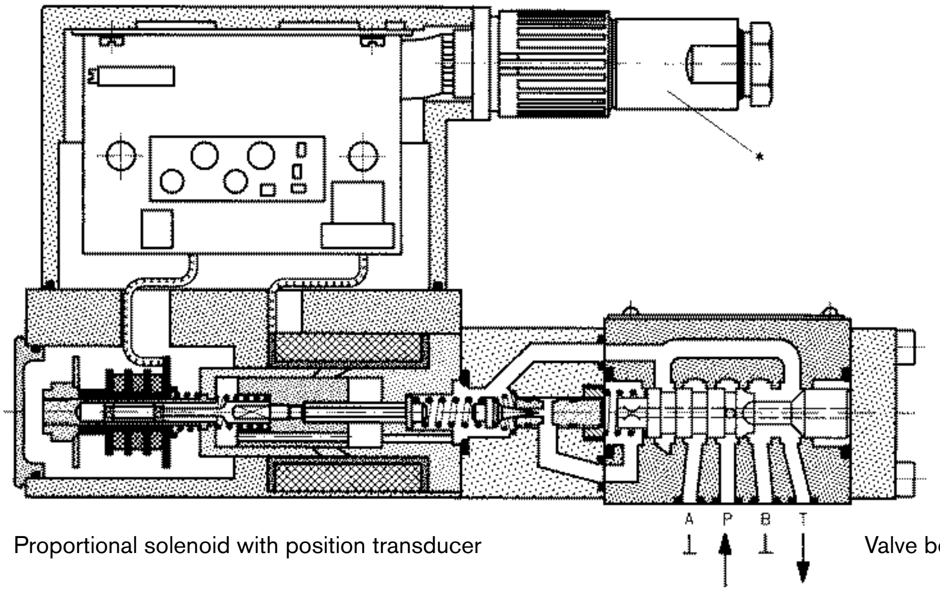
General

Type DBEBE6X proportional pressure relief valves are pilot valves that are used to limit system pressure. The valves are actuated by means of a position-controlled proportional solenoid with on-board electronics.
With these valves, rapid response times with low hysteresis can be achieved.

CE EN 61000-6-2: 2002-08
EN 61000-6-3: 2002-08

Basic principle

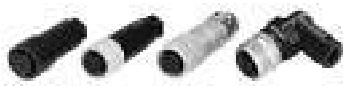
To adjust the system pressure, a setpoint is set in the trigger electronics. Based on this setpoint, the electronics control the position-controlled solenoid.
The proportional solenoid maintains its position against a spring force, which is proportionate to the system pressure. The pilot stage is supplied with pilot oil through a bore hole at <0.6 l/min. The "p_{max}" pressure stage is determined by the cone and seating bore configuration.
Pressure limitation for maximum safety
If a fault occurs in the electronics, so that the solenoid current (I_{max}) would exceed its specified level in an uncontrolled manner, the pressure cannot rise above the level determined by the maximum spring force.



Proportional solenoid with position transducer

Valve body

Accessories

Type			Material Number
(4 x) ISO 4762-M5x30-10.9	Cheese-head bolts		2 910 151 166
* 	Plug-in connectors 6P+PE, see also RE 08008	KS	1 834 482 022
		KS	1 834 482 026
		MS	1 834 482 023
		MS	1 834 482 024
		KS 90°	1 834 484 252

Testing and service equipment

Test box type VT-PE-TB3, see RE 30065
Measuring adapter 6P+PE type VT-PA-2, see RE 30068

Technical data

General

Construction	Pilot stage	Poppet valve
	Main stage	Spool valve
Actuation		Proportional solenoid with position control and OBE
Connection type		Subplate, mounting hole configuration NG6 (ISO 4401-03-02-0-94)
Mounting position		Optional
Ambient temperature range	°C	–20...+50
Weight	kg	3.4
Vibration resistance, test condition		Max. 25 g, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, ϑ_{oil} = 40 °C ±5 °C)

Pressure fluid			Hydraulic oil to DIN 51524...535, other fluids after prior consultation		
Viscosity range	recommended	mm²/s	20...100		
	max. permitted	mm²/s	10...800		
Pressure fluid temperature range		°C	–20...+70		
Maximum permitted degree of contamination of pressure fluid Purity class to ISO 4406 (c)			Class 18/16/13 [1]		
Direction of flow			See symbol		
Max. set pressure (at Q = 1 l/min)		bar	80	180	315
Minimum pressure (at Q = 1 l/min)		bar	7	8	10
Max. mechanical pressure limitation level, e.g. when solenoid current $I > I_{max}$		bar	<90	<190	<325
Max. working pressure		bar	Port P: 315		
Max. pressure		bar	Port T: 250		
Pilot oil flow		l/min	approx. 0.6		
Max. flow		l/min	40		

Static/Dynamic

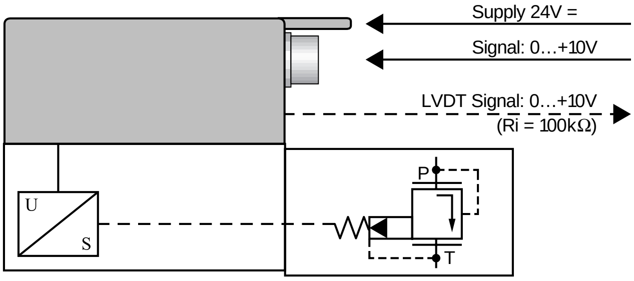
Hysteresis		%	≦ 1	
Manufacturing tolerance		%	≦ ±5	
Response time	100 % signal change	ms	70	Response time at: Q = 10 l/min (values depend on the dead volume)
	10 % signal change	ms	15	
Thermal drift			<1 % at ΔT = 40 °C	
Conformity			CE EN 61000-6-2: 2002-08 EN 61000-6-3: 2002-08	

[1] The purity classes stated for the components must be complied with in hydraulic systems.
Effective filtration prevents problems and also extends the service life of components.
For a selection of filters, see catalog sheets RE 50070, RE 50076 and RE 50081.

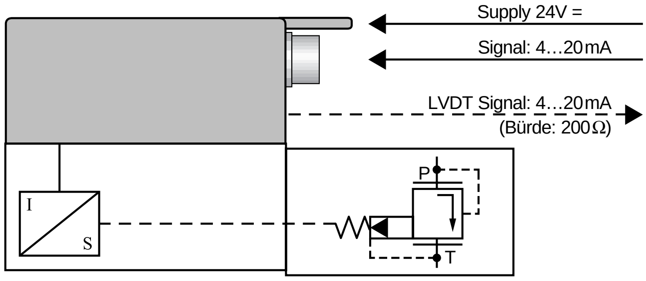
Technical data

Electrical, trigger electronics integrated in valve	
Cyclic duration factor %	100
Degree of protection	IP 65 to DIN 40050 and IEC 14434/5
Connection	Plug-in connector 6P+PE, DIN 43563
Supply voltage Terminal A: Terminal B: 0 V	24 V DC_{nom} Min. 21 V DC/max. 40 V DC Ripple max. 2 V DC
Power consumption	Solenoid ⍁ 45 mm = 40 VA max.
External fuse	2.5 A_F
Input, “standard” version A1 Terminal D: U_E Terminal E:	Differential amplifier, R_i = 100 kΩ 0...+10 V 0 V
Input, “mA signal” version F1 Terminal D: I_{D-E} Terminal E: I_{D-E}	Burden, R_{sh} = 200 Ω 4...20 mA Current loop I_{D-E} feedback
Max. voltage to differential inputs over 0 V	$\left.\begin{array}{l}D \rightarrow B\\E \rightarrow B\end{array}\right\}$ max. 18 V DC
Test signal, “standard” version A1 Terminal F: U_{Test} Terminal C:	LVDT 0...+10 V Reference 0 V
Test signal, “mA signal” version F1 Terminal F: I_{F-C} Terminal C: I_{F-C}	LVDT signal 4...20 mA at external load 200...500 Ω max. 4...20 mA output Current loop I_{F-C} feedback
Safety earth conductor and shield	See pin assignment (installation in conformity with CE)
Recommended cable	See pin assignment up to 20 m 7 x 0.75 mm^2 up to 40 m 7 x 1 mm^2
Calibration	Calibrated at the factory, see valve curve

Version A1: Standard

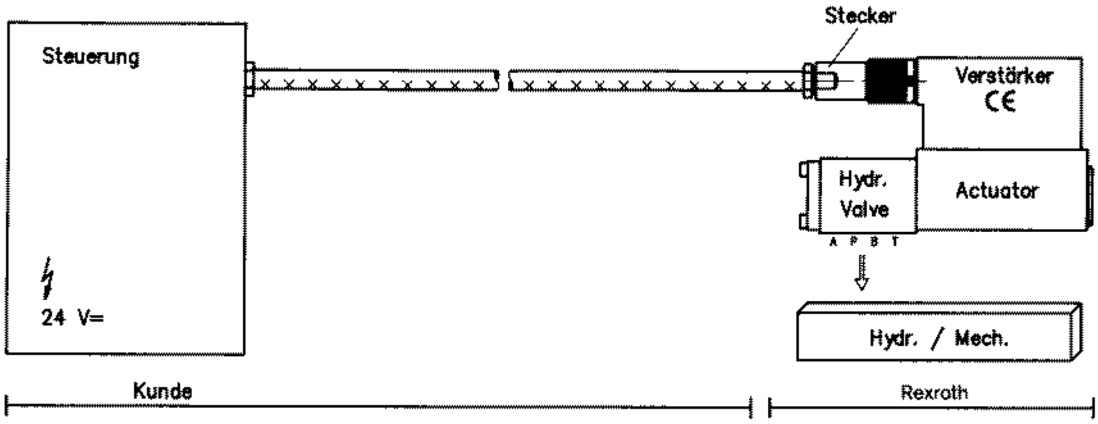


Version F1: mA signal



Connection

For electrical data, see page 5 and
Operating Instructions **1 819 929 083**



Technical notes for the cable

Version: – Multi-wire cable
– Extra-finely stranded wire to VDE 0295, Class 6
– Safety earth conductor, green/yellow
– Cu braided shield

Type: – e.g. Ölflex-FD 855 CP (from Lappkabel company)

No. of wires: – Determined by type of valve, plug type and signal assignment

Cable Ø: – 0.75 mm^2 up to 20 m long
– 1.0 mm^2 up to 40 m long

Outside Ø: – 9.4...11.8 mm – Pg11
– 12.7...13.5 mm – Pg16

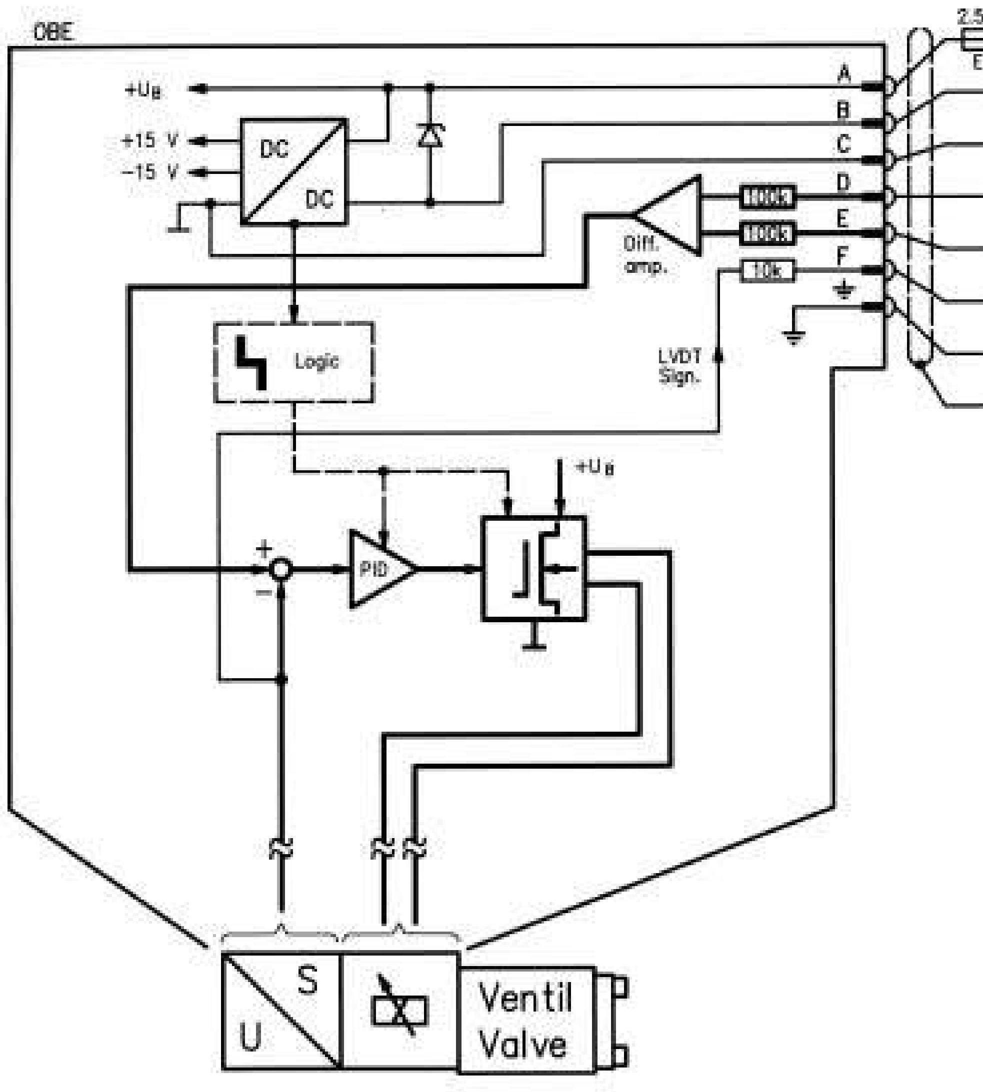
Important

Power supply 24 V DC nom,
if voltage drops below 18 V DC, rapid shutdown resembling "Enable OFF" takes place internally.
In addition, with the "mA signal" version:
$I_{D-E} \geqq 3$ mA – valve is active
$I_{D-E} \leqq 2$ mA – valve is deactivated.
Electrical signals emitted via the trigger electronics (e.g. actual values) must not be used to shut down safety-relevant machine functions!
(See also European Standard, "Technical Safety Requirements for Fluid-Powered Systems and Components – Hydraulics", EN 982).

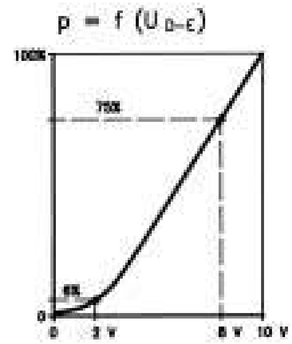
On-board trigger electronics

Circuit diagram/pin assignment

Version A1: U_{D-E} 0...+10 V

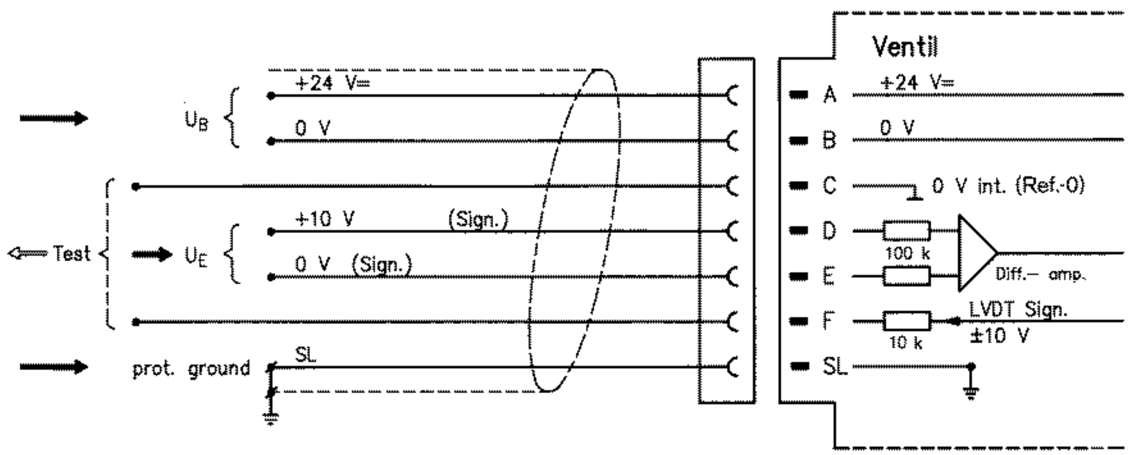


* Do not connect to supply zero!



Pin assignment

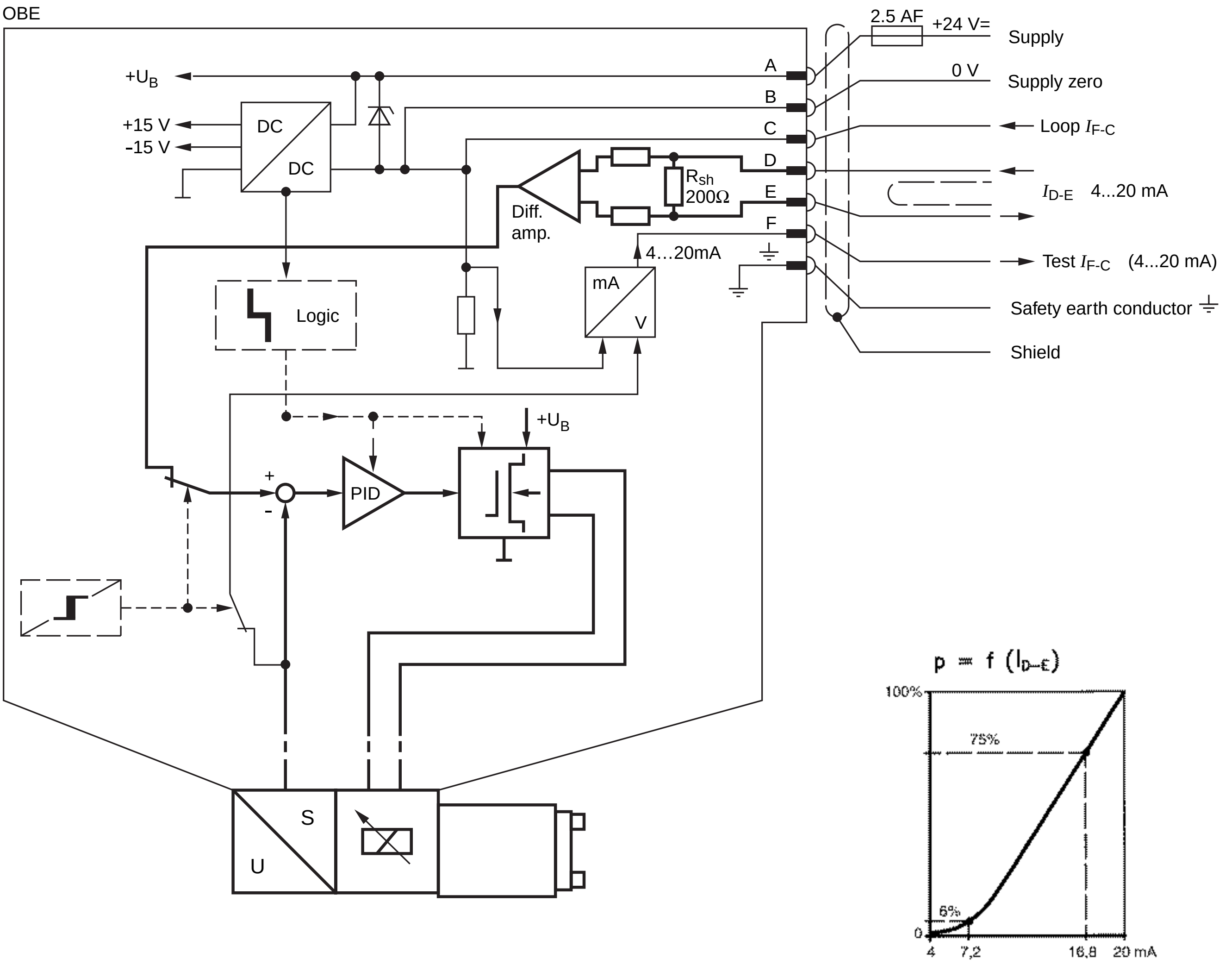
Version A1: U_{D-E} 0...+10 V
(R_i = 100 kΩ)



On-board trigger electronics

Circuit diagram/pin assignment

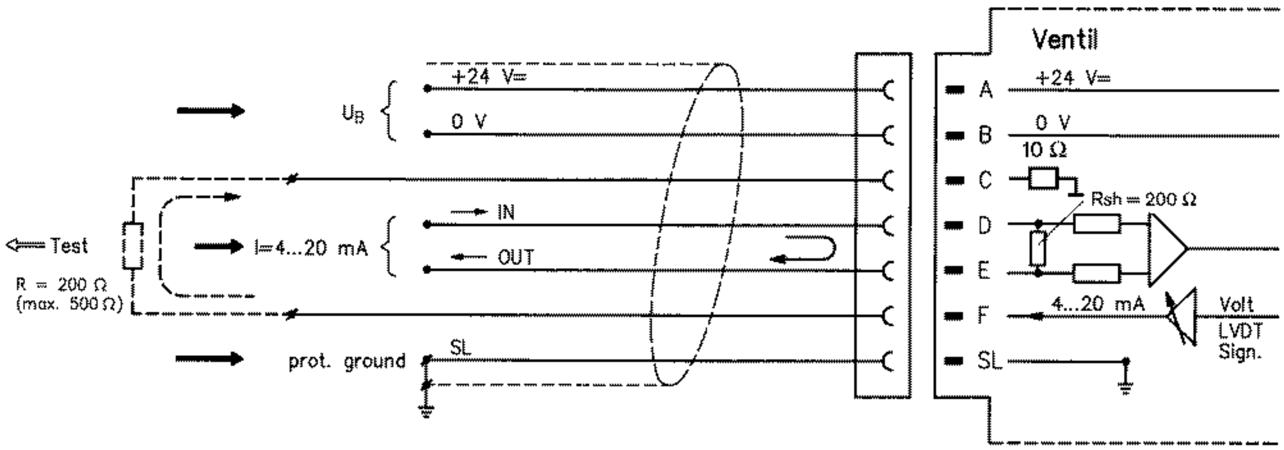
Version F1: I_{D-E} 4...20 mA



Pin assignment 6P+PE

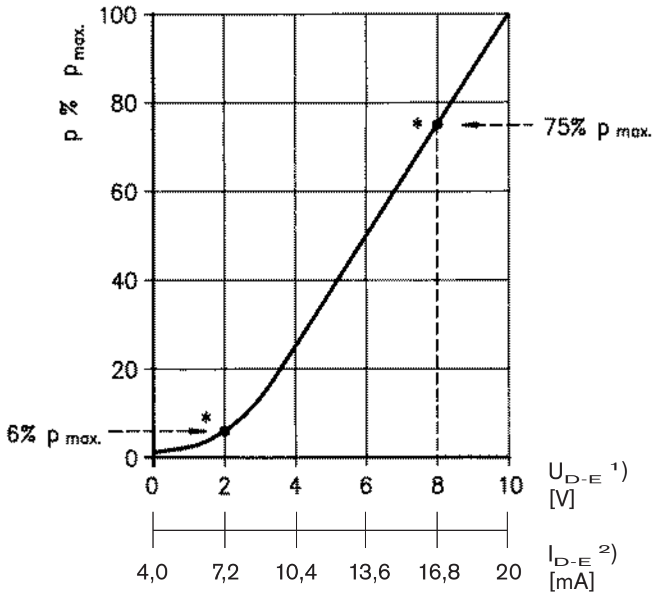
Version F1: I_{D-E} 4...20 mA

(R_{sh} = 200 kΩ)



Characteristic curves (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Pressure in port P as a function of the setpoint

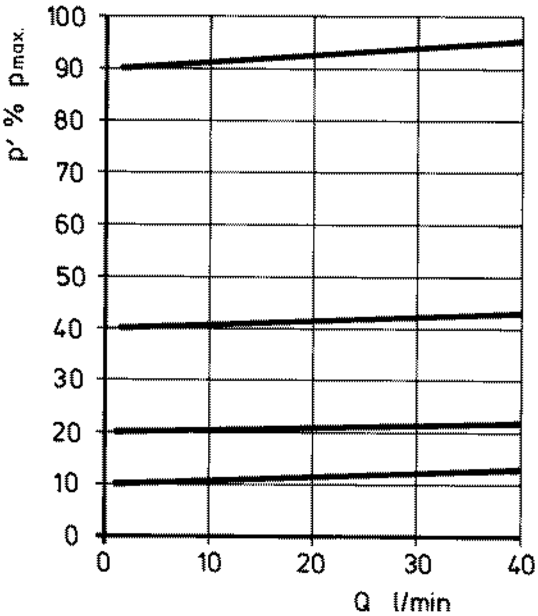


* Factory setting at $Q = 1$ l/min ±5 % manufacturing tolerance

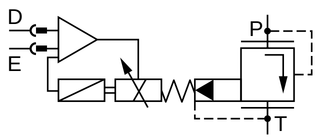
1) Version: $U_{D-E} = 0...+10$ V

2) Version: $I_{D-E} = 4...20$ mA

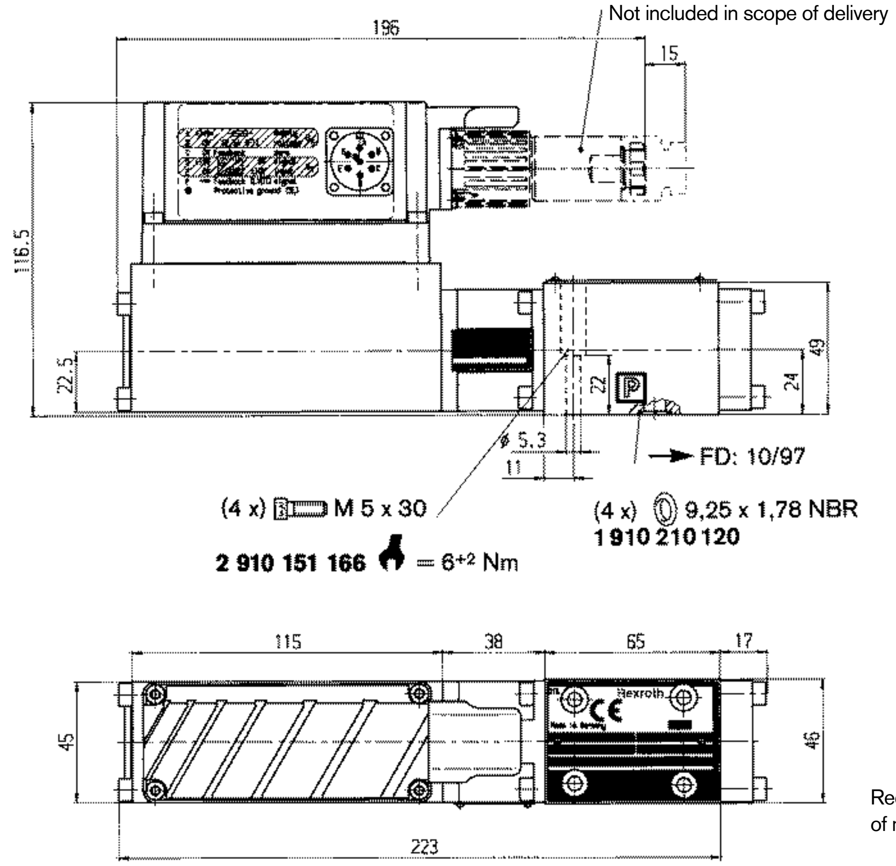
Pressure in port P proportionate to the maximum flow rate of the main stage



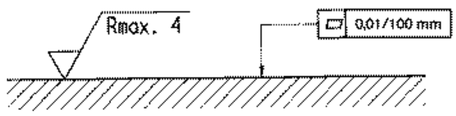
Set pressure
$p' = f\,(Q_{P-T})$



Unit dimensions (nominal dimensions in mm)

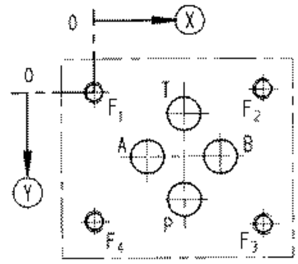


Required surface quality of mating component



Mounting hole configuration: NG6 (ISO 4401-03-02-0-94)
For subplates see catalog sheet RE 45053

1) Deviates from standard
2) Thread depth:
Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø



	P	A	T	B	F_1	F_2	F_3	F_4
X	21.5	12.5	21.5	30.2	0	40.5	40.5	0
Y	25.9	15.5	5.1	15.5	0	–0.75	31.75	31
Ø	8 1)	8 1)	8 1)	8 1)	M5 2)	M5 2)	M5 2)	M5 2)

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Notes

Bosch Rexroth AG
Hydraulics
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Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

Proportional pressure relief valve

Type DBETX

Nominal size 6
Unit series 1X
Maximum working pressure P 315 bar, T 250 bar
Nominal flow rate Q_{nom} 1 l/min

List of contents

Features

– Directly operated valves (pilot valves) for limiting system pressure
– Adjustable by means of the solenoid current, see Characteristic curve, Technical data and selected valve electronics
– Solenoid versions I_{max} = 0.8 A or I_{max} = 2.5 A
– Pressure limitation to a safe level even with faulty electronics (solenoid current $I > I_{max}$)
– For subplate attachment, mounting hole configuration to ISO 4401-03-02-0-94
Subplates as per catalog sheet RE 45053 (order separately)
– Plug-in connector to DIN 43650-AM2 included in scope of delivery
– External trigger electronics with ramps and valve calibration in the following versions/designs (order separately)
• Plug, setpoint 0...+10 V or 4...20 mA, RE 30264
• Module, setpoint 0...+10 V, RE 30222
• Europe card, setpoint 0...+10 V, RE 30109

Ordering data

DBET	X	–1X	/		G24–		N	Z4	M	*

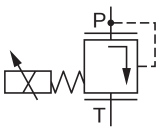
Proportional pressure relief valve	
Mounting hole configuration to ISO 4401-03-02-0-94	**= X**
Unit series 10 to 19 (10 to 19: installation and connection dimensions unchanged)	**= 1X**
Max. pressure stage	
up to 50 bar	**= 50**
up to 80 bar	**= 80**
up to 180 bar	**= 180**
up to 250 bar	**= 250**
up to 315 bar	**= 315**
Voltage supply of trigger electronics 24 V DC	**= G24**
Solenoid type (current)	
8 =	Solenoid current 0.8 A max.
25 =	Solenoid current 2.5 A max.
N =	**Manual auxiliary override**
Z4 =	**Electrical connection** Unit plug to DIN 43650-AM2 Plug-in connector included in scope of delivery
M =	NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524
*	Further information in plain text

Preferred types

Solenoid 0.8 A		**Solenoid 2.5 A**	
Type	**Material Number**	**Type**	**Material Number**
DBETX–1X/50G24–8NZ4M	0 811 402 036	DBETX–1X/50G24–25NZ4M	0 811 402 034
DBETX–1X/80G24–8NZ4M	0 811 402 018	DBETX–1X/80G24–25NZ4M	0 811 402 030
DBETX–1X/180G24–8NZ4M	0 811 402 017	DBETX–1X/180G24–25NZ4M	0 811 402 031
DBETX–1X/250G24–8NZ4M	0 811 402 019	DBETX–1X/250G24–25NZ4M	0 811 402 035
DBETX–1X/315G24–8NZ4M	0 811 402 016	DBETX–1X/315G24–25Z4M	0 811 402 032

Symbol

For external trigger electronics



Function, sectional diagram

General

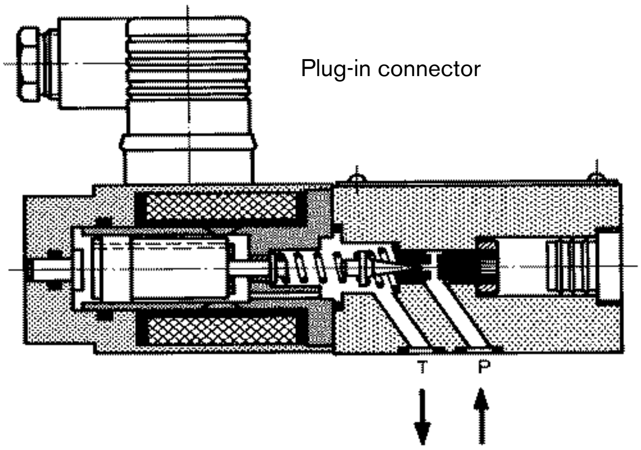
Type DBETX proportional pressure relief valves are remote-controlled (pilot) valves in conical seat design. They are used to limit system pressure.
The valves are actuated by means of a proportional solenoid. The interior of the solenoid is connected to port T and is filled with pressure fluid.
With these valves, the system pressure that needs to be limited can be infinitely adjusted by the valve amplifier electronics in relation to the solenoid current, at an oil flow ≤ 1 l that is as close as possible to constant.

Basic principle

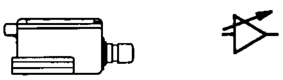
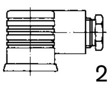
To adjust the system pressure, a setpoint is set in the trigger electronics. Based on this setpoint, the electronics control the solenoid coil with regulated PWM (pulse-width-modulated) current. The proportional solenoid converts the current to a mechanical force, which acts on a main spring by means of the armature plunger. An “additional” spring between the cone and the seat contributes to stability and a minimal residual pressure. The spring force acting on the cone and the pressure in the valve seat balance one another at a constant oil flow (0.7...1 l/min). The “p_{max}” pressure stage is determined by the cone and seating bore configuration.

Pressure limitation for maximum safety

If a fault occurs in the electronics, so that the solenoid current (I_{max}) would exceed its specified level in an uncontrolled manner, the pressure cannot rise above the level determined by the maximum spring force.



Accessories

Type				Material Number
(4 x) ISO 4762-M5x30-10.9	Cheese-head bolts			2 910 151 166
Plug 	VT-SSPA1-525-20/V0	(2.5 A)	RE 30264	0 811 405 143
	VT-SSPA1-508-20/V0	(0.8 A)		0 811 405 144
	VT-SSPA1-525-20/V0/I	(2.5 A)		0 811 405 145
	VT-SSPA1-508-20/V0/I	(0.8 A)		0 811 405 162
Module 	VT-MSPA1-525-10/V0	(2.5 A)	RE 30222	0 811 405 127
	VT-MSPA1-508-10/V0	(0.8 A)		0 811 405 126
Europe card 	VT-VSPA1-525-10/V0/RTP	(2.5 A)	RE 30109	0 811 405 079
	VT-VSPA1-508-10/V0/RTP	(0.8 A)		0 811 405 081
Plug-in connector  2P+PE	Plug-in connector 2P+PE (M16x1 .5) included in scope of delivery, see also RE 08008.			

Testing and service equipment

Test box type VT-PE-TB1, see RE 30063
Current measuring adapter type VT-PA-5, see RE 30073

Technical data

General		
Construction		Spool valve
Actuation		Proportional solenoid without position control, external amplifier
Connection type		Subplate, mounting hole configuration NG6 (ISO 4401-03-02-0-94)
Mounting position		Optional
Ambient temperature range	°C	–20...+50
Weight	kg	1.9
Vibration resistance, test condition		Max. 25 g, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)						
Pressure fluid		Hydraulic oil to DIN 51524...535, other fluids after prior consultation				
Viscosity range recommended	mm^2/s	20...100				
Viscosity range max. permitted	mm^2/s	10...800				
Pressure fluid temperature range	°C	–20...+80				
Maximum permitted degree of contamination of pressure fluid Purity class to ISO 4406 (c)		Class 18/16/13 [1)]				
Direction of flow		See symbol				
Max. set pressure (at $Q = 1$ l/min)	bar	50	80	180	250	315
Minimum pressure (at $Q = 1$ l/min)	bar	2	3	4	5	8
		Note: At $Q_{max} = 1.5$ l/min the pressure levels stated here increase				
Max. mechanical pressure limitation level, e.g. when solenoid current $I > I_{max}$	bar	<55	<85	<186	<258	<325
Max. working press. (at $Q = 1$ l/min)	bar	Port P: 315 [2)]				
Max. pressure	bar	Port T: 250				

Electrical			
Cyclic duration factor	%	100	
Degree of protection		IP 65 to DIN 40050 and IEC 14434/5	
Solenoid connection		Unit plug DIN 43650/ISO 4400, M16x1.5 (2P+PE)	
Valve with solenoid type		0.8 A	2.5 A
Max. solenoid current	I_{max}	0.8 A	2.5 A
Coil resistance R_{20}	Ω	22	3
Max. power consumption at 100 % load and operating temperature	VA	25	30

Static/Dynamic [3)]		
Hysteresis	%	≤ 4
Range of inversion	%	≤ 3
Manufacturing tolerance	%	≤ 10
Response time 100% signal change	ms	On < 60 / Off < 70

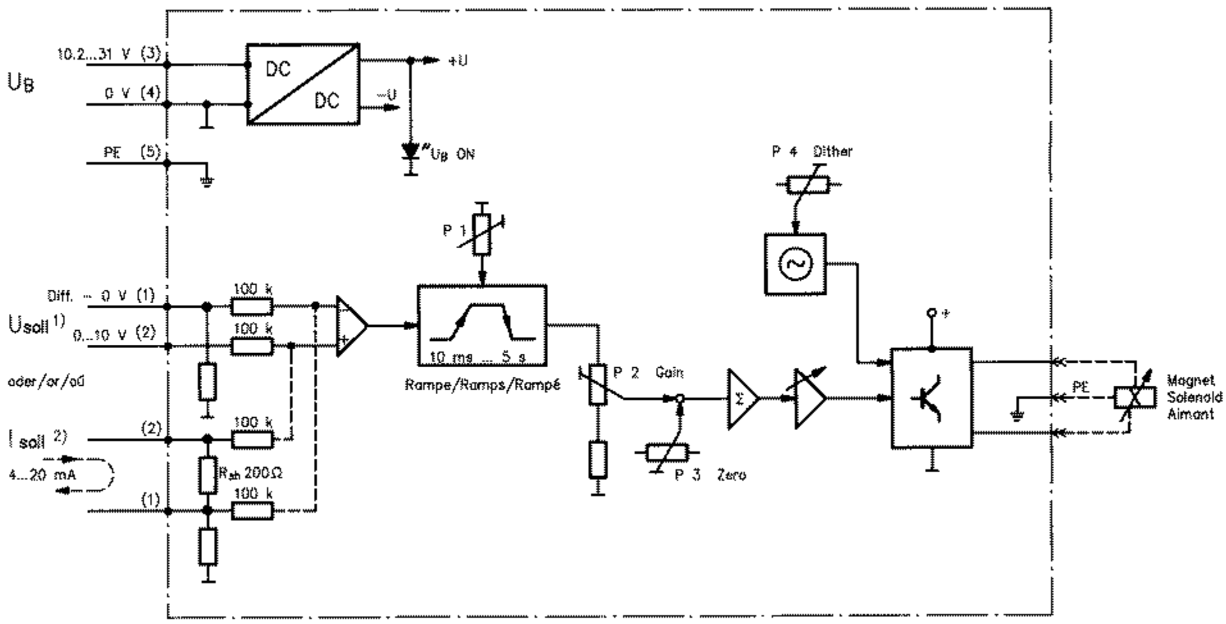
1) The purity classes stated for the components must be complied with in hydraulic systems. Effective filtration prevents problems and also extends the service life of components. For a selection of filters, see catalog sheets RE 50070, RE 50076 and RE 50081.

2) The maximum pressure in P is 315 bar in the standard version. 350 bar is available on request.

3) All characteristic values ascertained using amplifier 0 811 405 079 for the 2.5 A solenoid and 0 811 405 081 for the 0.8 A solenoid.

Valve with external trigger electronics (plug, RE 30264)

Circuit diagram/pin assignment



[1] Version with 0...+10 V signal

[2] Version with 4...20 mA signal

Connection/calibration

P1 – Ramp time

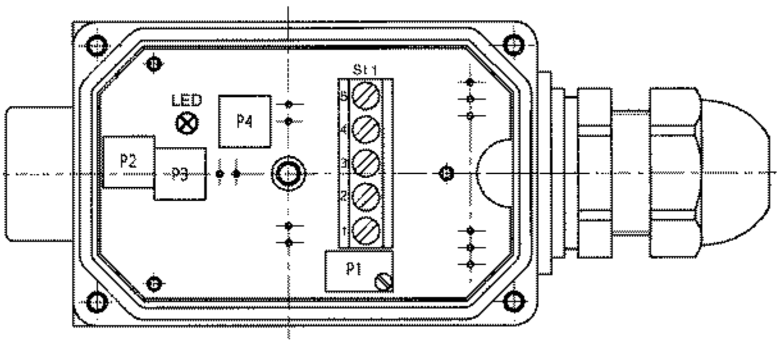
P2 – Sensitivity

P3 – Zero

P4 – Dither frequency

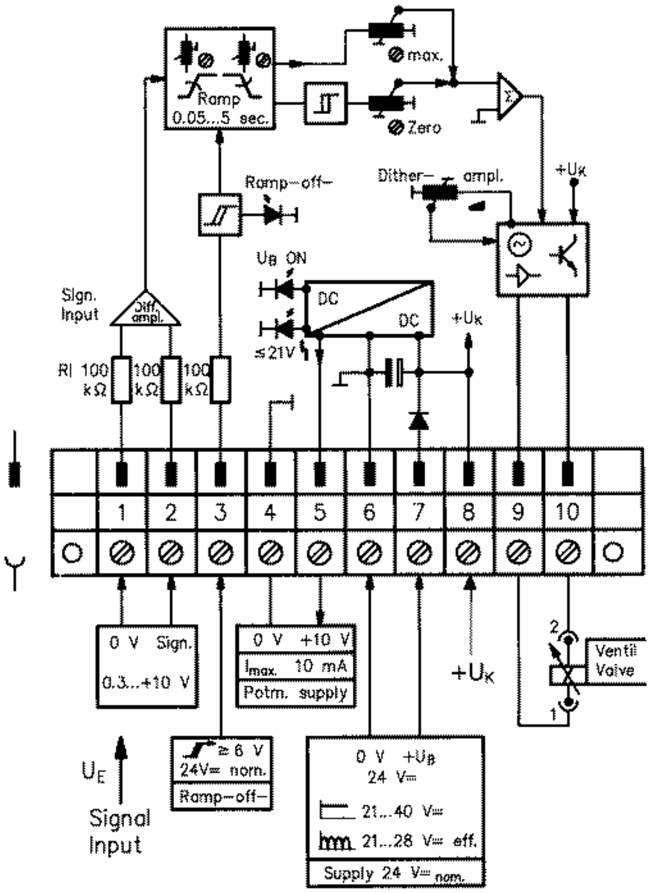
St1 – Terminal

LED – U_B display

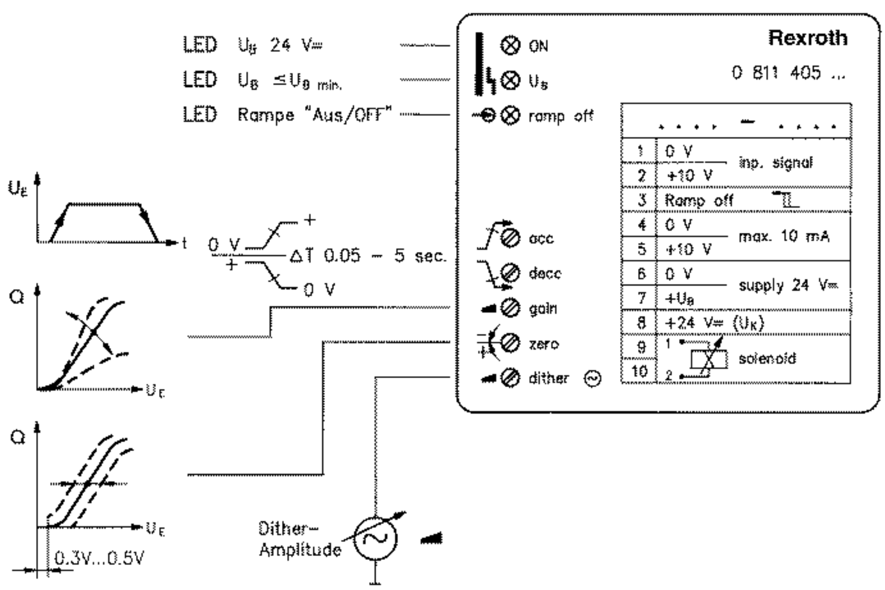


Valve with external trigger electronics (module, RE 30222)

Circuit diagram/pin assignment

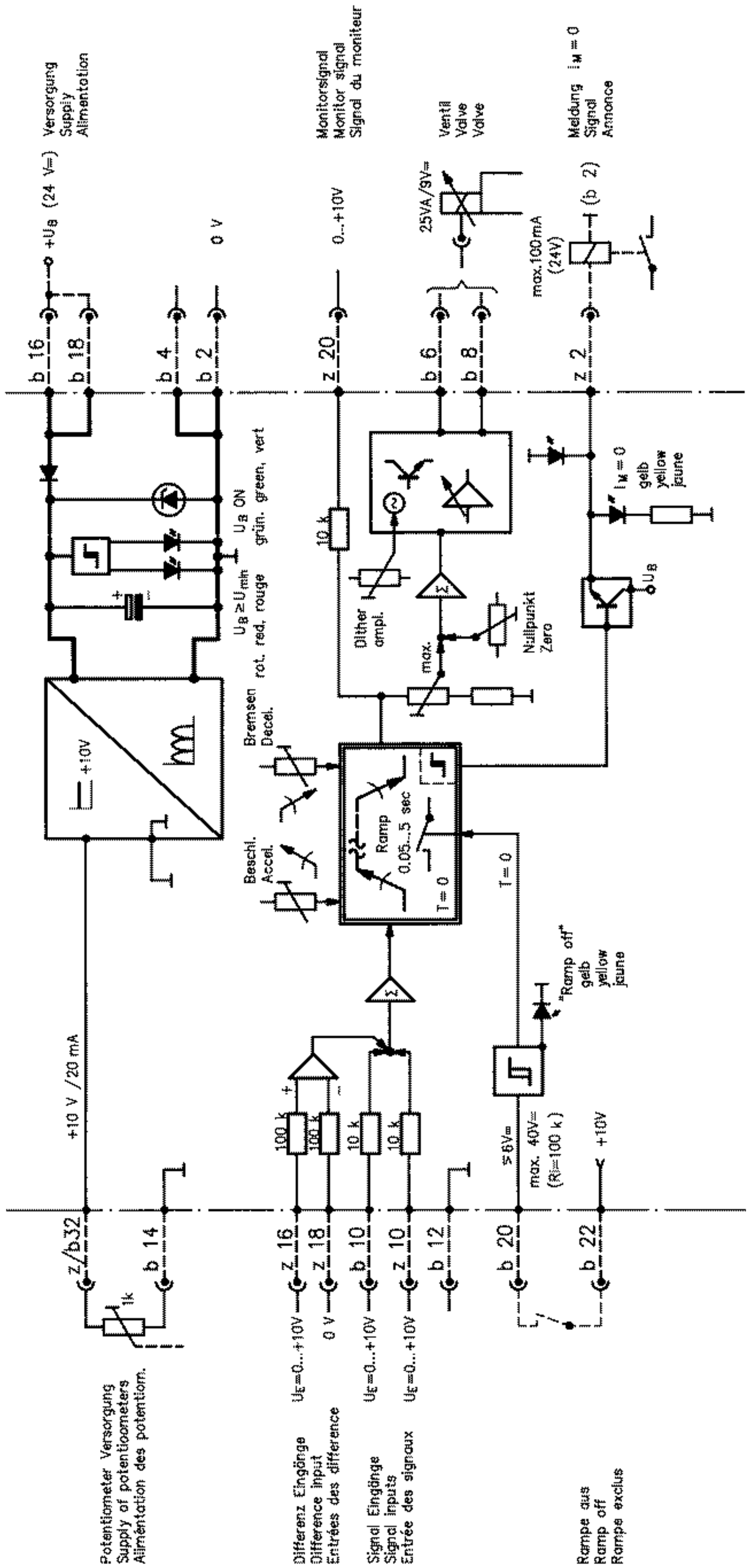


Front view/calibration



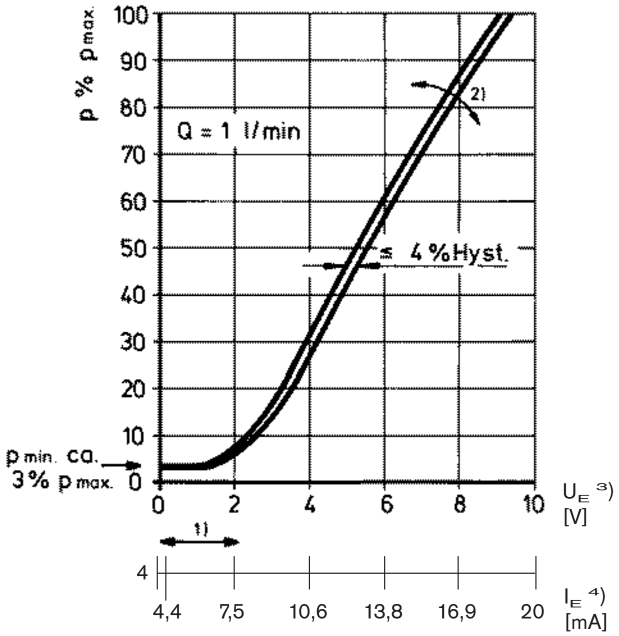
Valve with external trigger electronics (europe card, RE 30109)

Circuit diagram/pin assignment



Characteristic curve (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Pressure in port P as a function of the setpoint
Nominal flow rate = 1 l/min



Valve amplifier

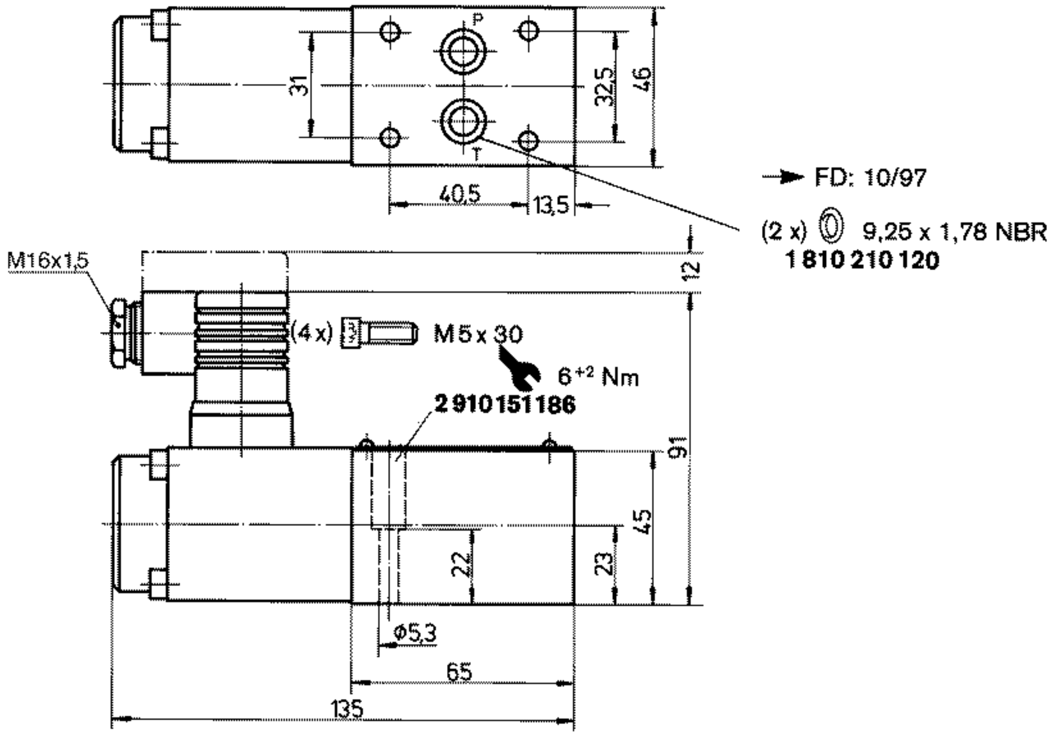
1) Zero adjustment

2) Sensitivity adjustment

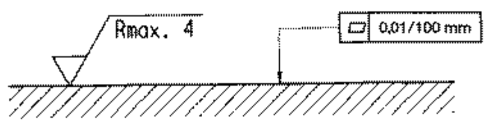
3) Version: U_E = 0...+10 V

4) Version: I_E = 4...20 mA

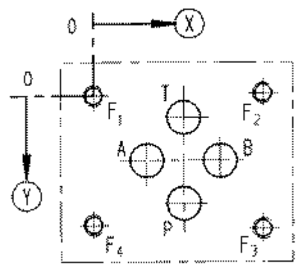
Unit dimensions (nominal dimensions in mm)



Required surface quality
of mating component



Mounting hole configuration: NG6 (ISO 4401-03-02-0-94)
For subplates, see catalog sheet RE 45053



1) Deviates from standard

2) Thread depth:
Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

	P	A	T	B	F_1	F_2	F_3	F_4
X	21.5	12.5	21.5	30.2	0	40.5	40.5	0
Y	25.9	15.5	5.1	15.5	0	–0.75	31.75	31
∅	8 1)	8 1)	8 1)	8 1)	M5 2)	M5 2)	M5 2)	M5 2)

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

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documentation@boschrexroth.de
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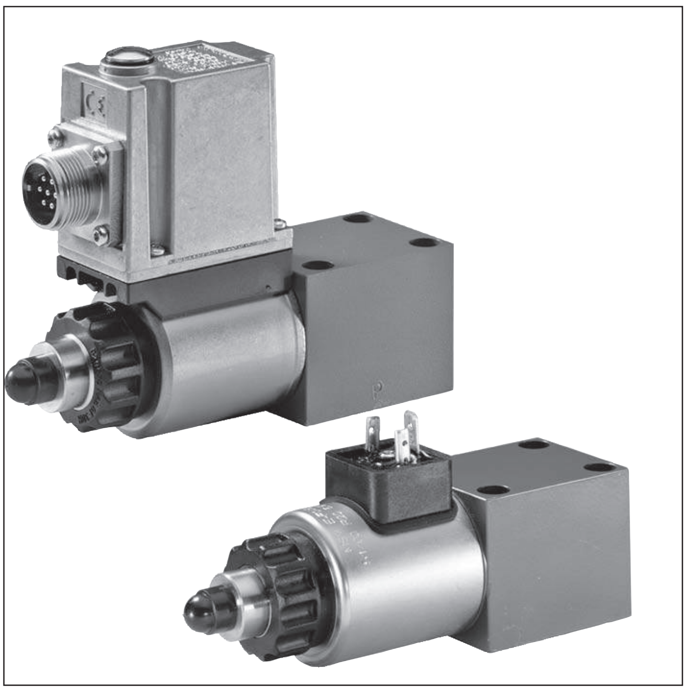
Proportional pressure relief valve, directly operated, without/with integrated electronics (OBE)

Type DBET and DBETE

RE 29162
Edition: 2013-06
Replaces: 04.13



- Size 6
- Component series 6X
- Maximum operating pressure 420 bar
- Maximum flow: 2 l/min

Features

- Directly operated valves for limiting a system pressure
- Operation by means of proportional solenoid
- Proportional solenoid with central thread and detachable coil
- For subplate mounting:
  Porting pattern according to ISO 4401
- Integrated electronics (OBE) with type DBETE:
  Little manufacturing tolerance of the command value pressure characteristic curve
- External control electronics with type DBET:
  Amplifier with modular design, Euro-card format and as plug-in amplifier, individually adjustable upwards and downwards ramp, fine adjustment of the command value pressure characteristic curve is possible

Contents

Ordering code

01	02		03		04	05	06	07	08	09	10	11
DBET		–	6X	/			G24					*

01	Proportional pressure relief valve	**DBET**

02	For external control electronics	**no code**
	With integrated electronics	**E**

03	Component series 60 to 69 (60 to 69: Unchanged installation and connection dimensions)	**6X**

Maximum pressure rating

04	Up to 50 bar	**50**
	Up to 100 bar	**100**
	Up to 200 bar	**200**
	Up to 315 bar	**315**
	Up to 350 bar	**350**
	Up to 420 bar	**420**

05	Pilot oil return internal	**no code**
	Pilot oil return, external	**Y**

Supply voltage of the integrated electronics (OBE)

06	24 V DC voltage	**G24**

07	1600 mA coil	**no code**
	800 mA coil (only possible for DBET-6X (external control electronics))	**–8** 1)

Electrical connection

08	**For type DBET:**	
	Without mating connector; connector DIN EN 175301-803	**K4** 2)
	For type DBETE:	
	Without mating connector; connector DIN EN 175201-804	**K31** 2)

Electronics interface

09	Command value 0 to 10 V	**A1**
	Command value 4 to 20 mA	**F1**
	with DBET	**no code**

Seal material

10	NBR seals	**M**
	FKM seals	**V**
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	

11	Further details in the plain text	

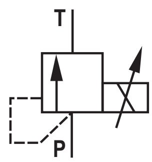
1) Replacement for series 5X (for comparison, see characteristic curve on page 9). All hydraulic characteristics specified in the data sheet refer to the version with a 1600 mA coil.

2) Mating connectors, separate order, see pages 7 and 14.

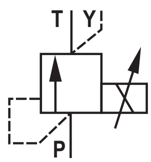
Symbols

For external control electronics (type DBET)

Pilot oil return internal

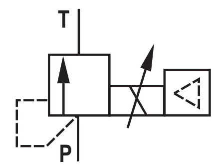


Pilot oil return, external (Y)

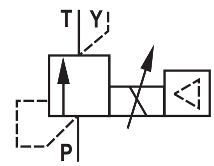


With integrated electronics (type DBETE)

Pilot oil return internal



Pilot oil return, external (Y)

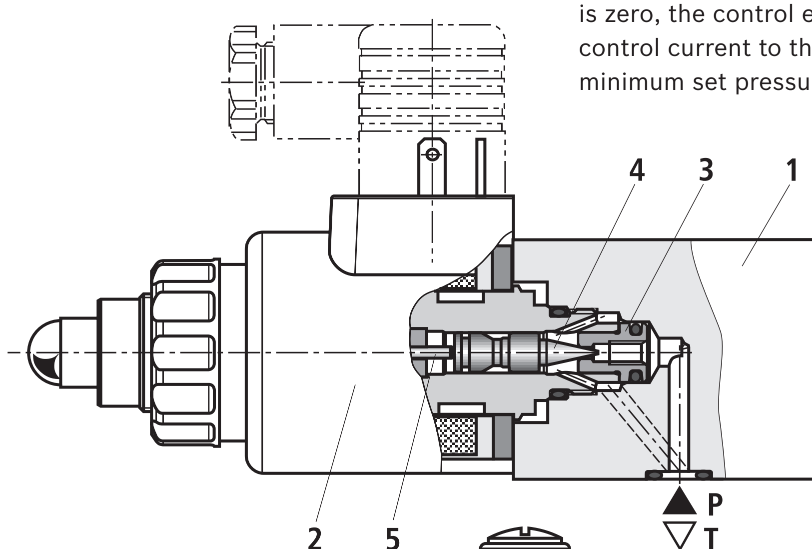


Function, section

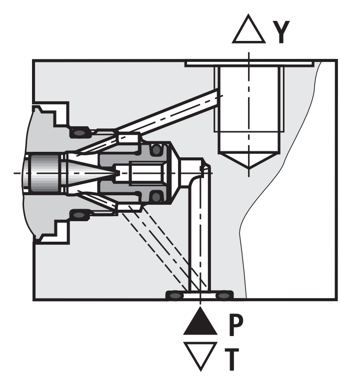
General information
Type DBET proportional pressure relief valves are remote control valves with seat design and are used to limit a system pressure. Operation by means of a proportional solenoid with central thread and detachable coil. The interior of the solenoid is connected to port T or Y and is filled with the hydraulic fluid. Depending on the electric command value, these valves can be used to smoothly set the system pressure to be limited.
The valves mainly consist of the housing (1), the proportional solenoid (2), the valve seat (3) and the valve poppet (4).

Basic principle
For the setting of the system pressure, a command value is specified at the control electronics. Depending on the command value, the electronics actuate the solenoid with electric current. The proportional solenoid converts the electric current into mechanical force that acts on the valve poppet (4) via the armature plunger (5). The valve poppet (4) presses on the valve seat (3) and interrupts the connection between port P and T or Y. If the hydraulic force on the valve poppet (4) equals the solenoid force, the valve controls the set pressure by lifting the valve poppet (4) off the valve seat (3) and thus enabling hydraulic fluid to flow from port P to T or Y. 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.

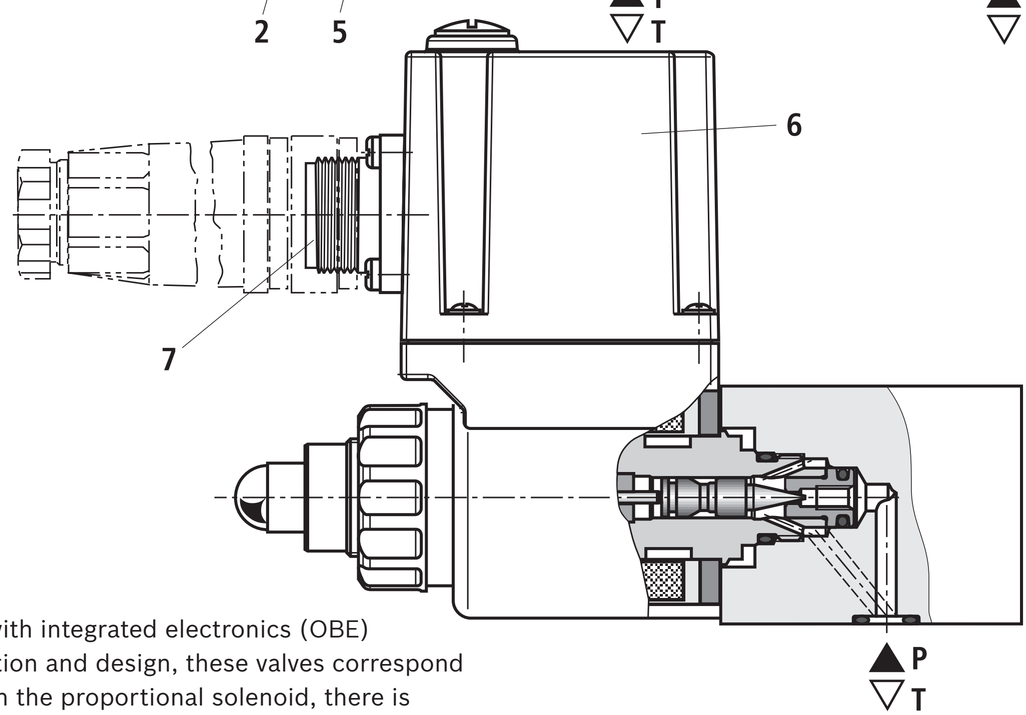
Type DBET



Type DBET...Y
Pilot oil return, external



Type DBETE



Type DBETE – with integrated electronics (OBE)
In terms of function and design, these valves correspond to type DBET. On the proportional solenoid, there is a housing (6) with the control electronics.
Supply and command value voltage are applied at the connector (7). At the factory, the command value pressure characteristic curve is adjusted with little manufacturing tolerance.

For more information on the control electronics, see page 8.

Technical data
(for applications outside these parameters, please consult us.)

general			
Weight	– Type DBET	kg	2.0
	– Type DBETE	kg	2.15
Mounting orientation			Any
Ambient temperature range		°C	–20 to +70 (DBET) –20 to +50 (DBETE)

hydraulic			
Maximum operating pressure	– Port P	bar	420
Maximum set pressure	– Pressure rating 50 bar	bar	50
	– Pressure rating 100 bar	bar	100
	– Pressure rating 200 bar	bar	200
	– Pressure rating 315 bar	bar	315
	– Pressure rating 350 bar	bar	350
	– Pressure rating 420 bar	bar	420
Minimum set pressure (at command value 0 V or 4 mA)		bar	See characteristic curves on page 11
Return flow pressure	Port T and/or Y	bar	Separately at zero pressure to the tank
Maximum flow		l/min	2 [1]
Hydraulic fluid [1]			See table on page 6
Hydraulic fluid temperature range		°C	–20 to +80
Viscosity range		mm^2/s	20 to 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 [2]
Hysteresis		%	< 4 of the maximum set pressure
Range of inversion		%	< 0.5 of the maximum set pressure
Response sensitivity		%	< 0.5 of the maximum set pressure
Linearity (flow 0.8 l/min)		%	±3 of the maximum set pressure
Manufacturing tolerance of the command value pressure characteristic curve, related to 0.8 l/min; pressure increasing	at command value 20 %	%	< ±1.5 of the maximum set pressure [3]
	at command value 100 %	%	< ±5 of the maximum set pressure (type DBET) [4] < ±1.5 of the maximum set pressure (type DBETE)
Step response (Tu + Tg) 0 → 100 % or 100 % → 0 line volume < 20 cm^3; ***Q*** = 0.8 l/min		ms	80 (depending on the system)

1) Observe flow limitation for pressure ratings 315, 350 and 420 bar (page 10).

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.
For the selection of the filters, see www.boschrexroth.com/filter.

3) Zero point calibration at the factory.

4) Possible comparison of the external control electronics.

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 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, there is 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 zinc-solving, zinc may accumulate in the fluid (700 mg zinc per pole tube).

electric			**G24**	**G24-8**
Minimum solenoid current		mA	≤ 100	≤ 100
Maximum solenoid current		mA	1600 ± 10 %	800 ± 5 %
Solenoid coil resistance	– Cold value at 20 °C	Ω	5,5	20,6
	– Maximum hot value	Ω	8,05	33
Switch-on duration		%	100	100

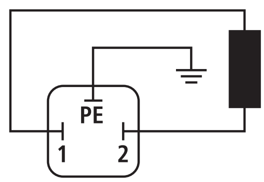
electric, integrated electronics (OBE)			
Supply voltage	– Nominal voltage	VDC	24
	– Lower limit value	VDC	21
	– Upper limit value	VDC	35
Current consumption		A	≤ 1,5
Required fuse protection		A	2, slow-blowing
Inputs	– Voltage	V	0 to 10
	– Current	mA	4 to 20
Output	– Actual current value	mV	1 mV ≙ 1 mA
Protection class of the valve according to EN 60529			IP 65 with mating connector mounted and locked

Notice!
Information on the environment simulation testing for the areas EMC (electromagnetic compatibility), climate and mechanical load, see data sheet 29162-U (declaration on environmental compatibility).

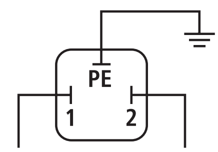
Electrical connection (dimensions in mm)

Type DBET

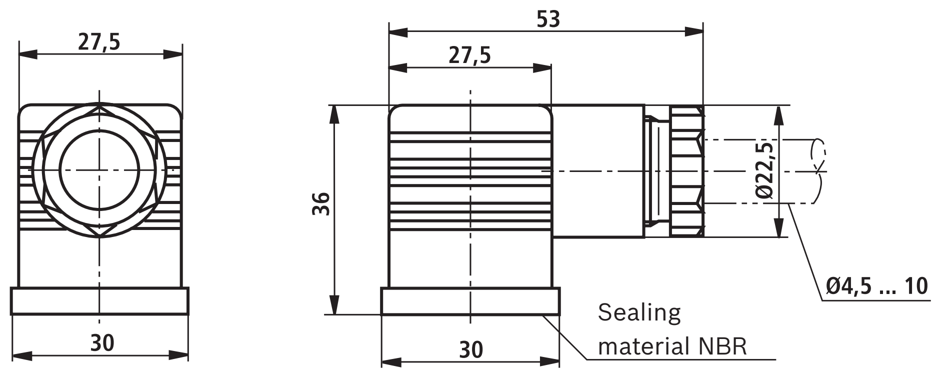
Connection at the connector



Connection at mating connector



Mating connector (black) according to DIN EN 175301-803, material no. **R901017011** (separate order)

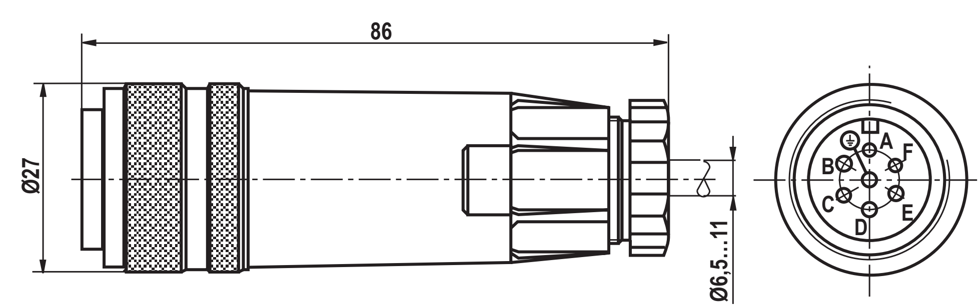


Type DBETE

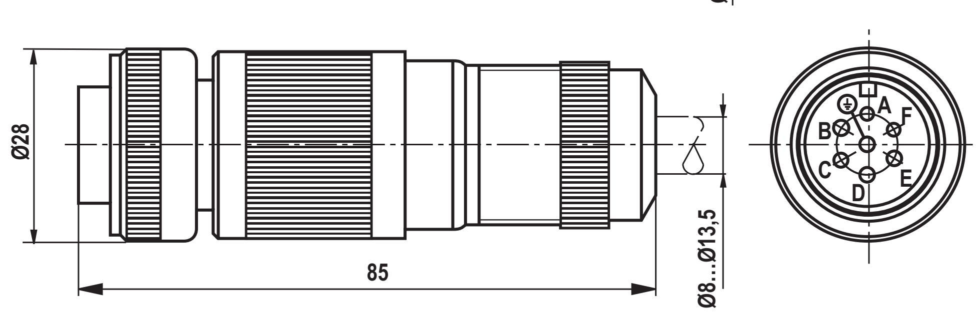
Connector pin assignment	Contact	Allocation interface "A1"	Allocation interface "F1"
Supply voltage	A	24 VDC (u(t) = 21 V to 35 V); I_{max} ≤ 1.5 A	
	B	0 V	
Reference potential actual value	C	Reference contact F; 0 V	Reference contact F; 0 V
Differential amplifier input	D	0 to 10 V; R_E = 100 kΩ	4 to 20 mA; R_E = 100 Ω
	E	Reference potential command value	
Measuring output (actual value)	F	0 to 1.6 V actual value (1 mV ≙ 1 mA) Load resistance > 10 kΩ	
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)



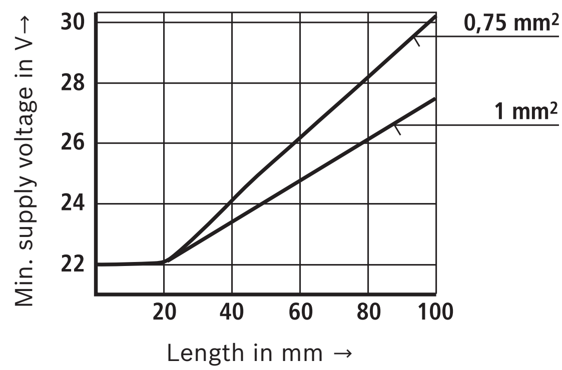
Metal version, material no. **R900223890** (separate order)



Electrical connection

Connection cable for type DBETE
- 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).



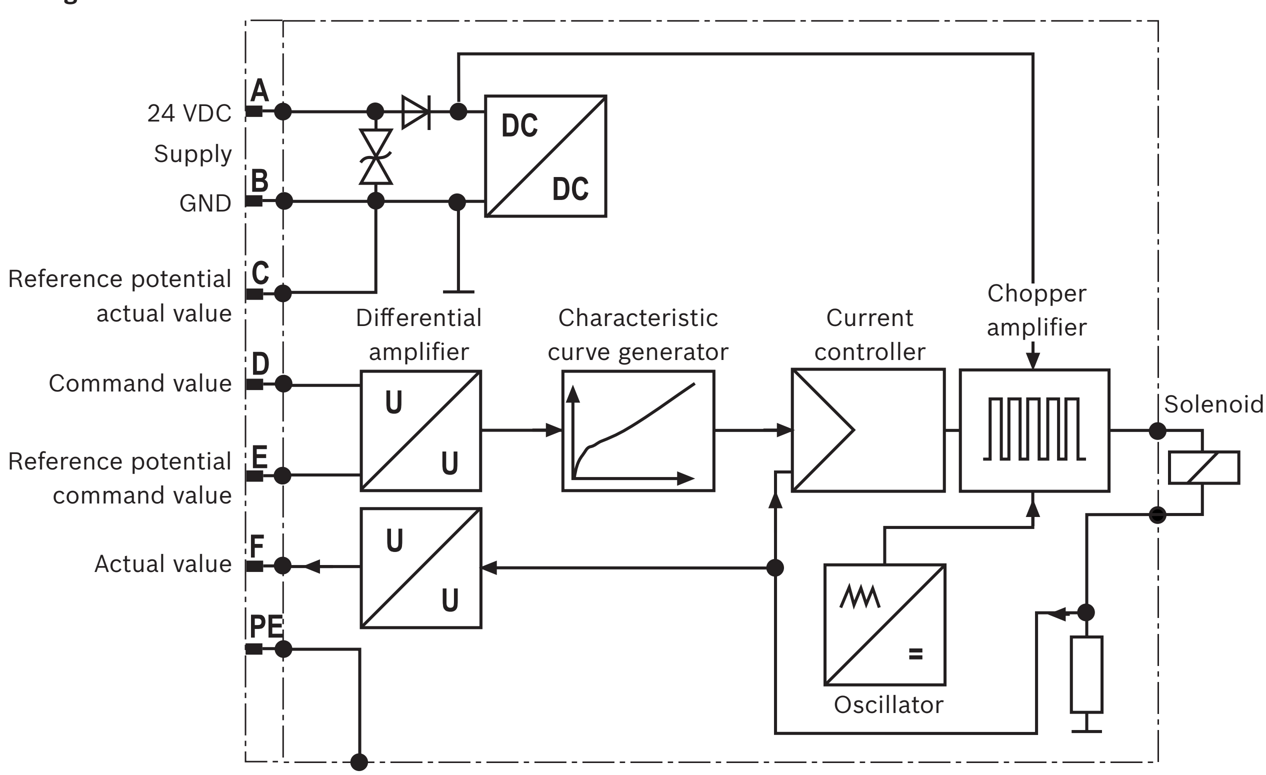
Integrated integrated (OBE) with type DBETE

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.
Via the characteristic curve generator, the command value solenoid current characteristic curve is adjusted to the valve so that non-linearities in the hydraulic system are compensated and thus, a linear command value pressure characteristic curve is created.
The current controller controls the solenoid current independently of the solenoid coil resistance.

The power stage of the electronics for controlling the proportional solenoid is a chopper amplifier with a cycle frequency of approx. 180 Hz to 400 Hz. The output signal is pulse-width modulated (PWM).
In order to check the solenoid current, a voltage can be measured at the connector between pin F(+) and pin C(–) that is proportional to the solenoid current. **1 mV** corresponds to **1 mA** solenoid current.

Block diagram

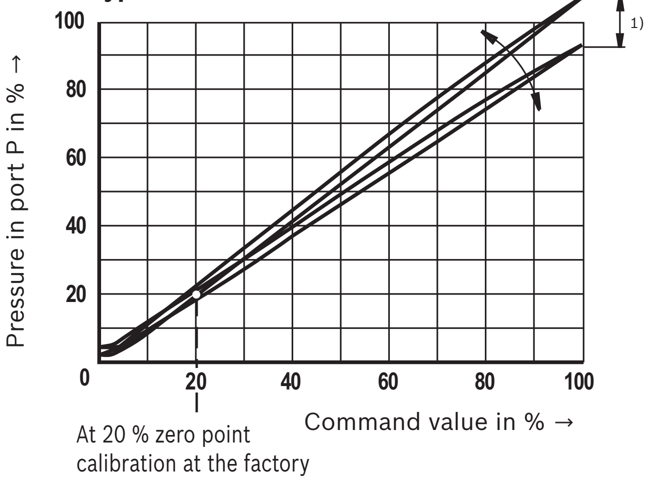


Characteristic curves

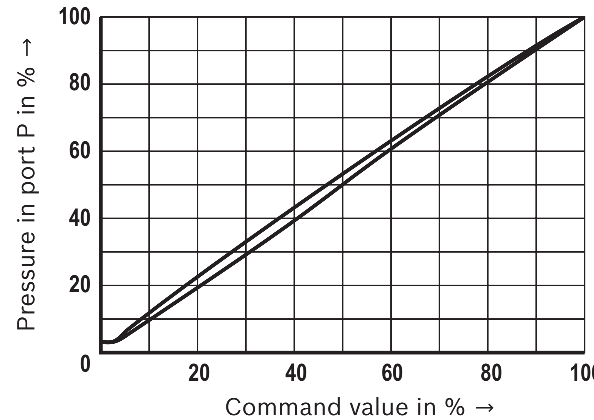
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

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

Type DBET



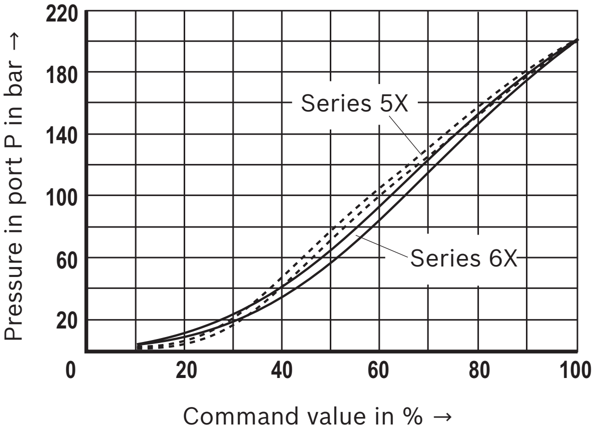
Type DBETE



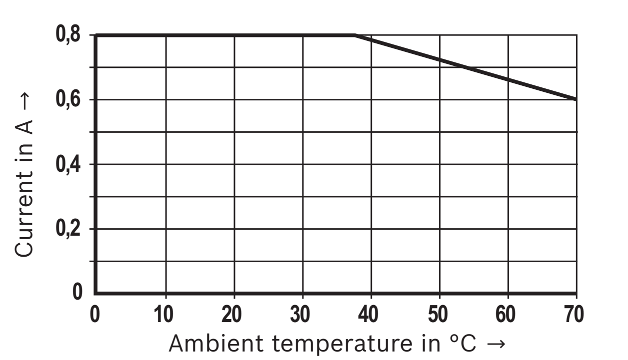
1) With valve type DBET, the manufacturing tolerance at the **external amplifier** (type and data sheet, see page 14) can be changed using the command value attenuator potentiometer "**Gw**". The digital amplifier is set using the parameter "Limit".
In this context, the control current according to the technical data must not be exceeded.
In order that several valves can be adjusted to the same characteristic curve, do not set the pressure higher than the maximum set pressure of the pressure rating with command value 100 %.

Pressure in port P depending on the command value

Comparison DBET series 5X-6X / pressure rating 200 bar (with amplifier VT-VSPA1-1-1X with 800 mA coil)



Current drop as ambient temperature rises, 24 V and 100 % duty cycle

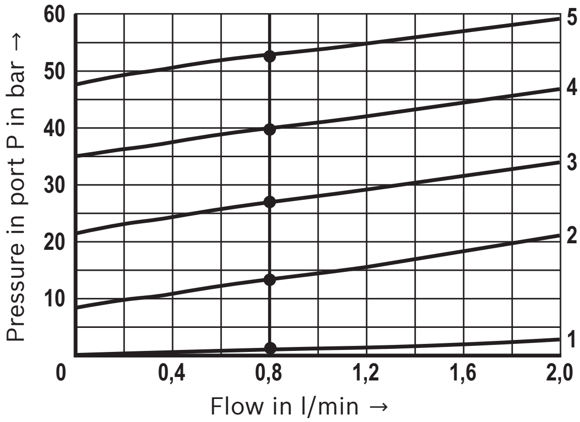


Note!
At increased temperature, the solenoid current drops, which results in a corresponding deviation of the set pressure.

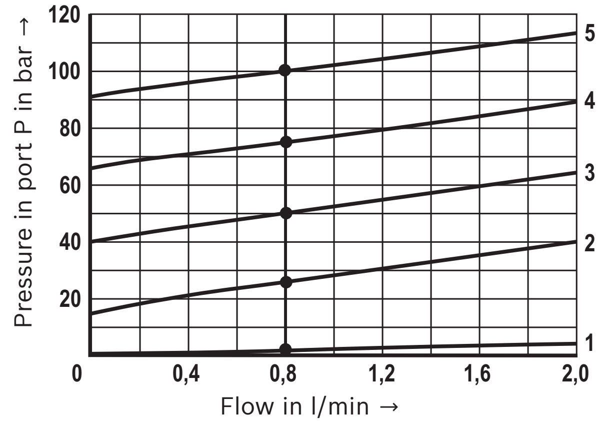
Characteristic curves
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

Pressure in port P depending on the flow

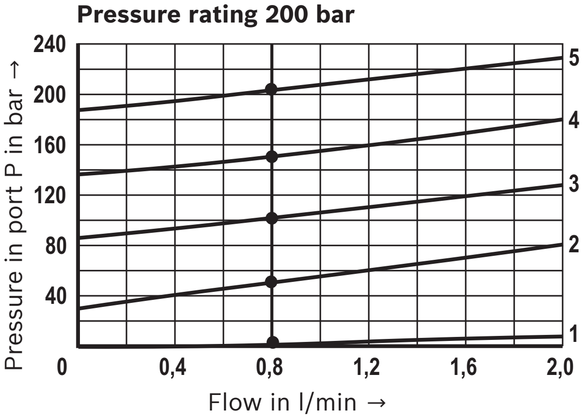
Pressure rating 50 bar



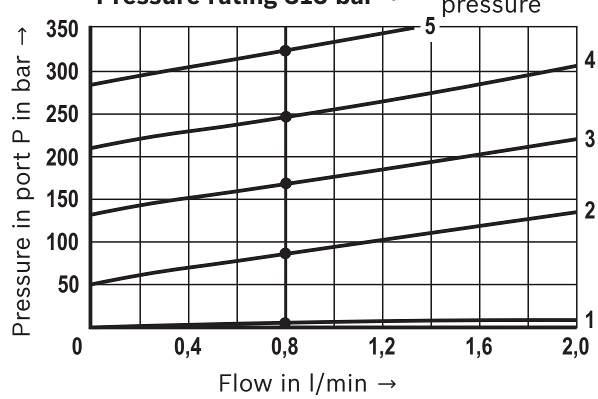
Pressure rating 100 bar



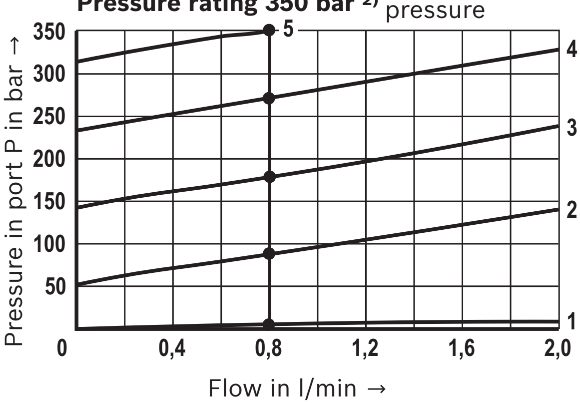
Pressure rating 200 bar



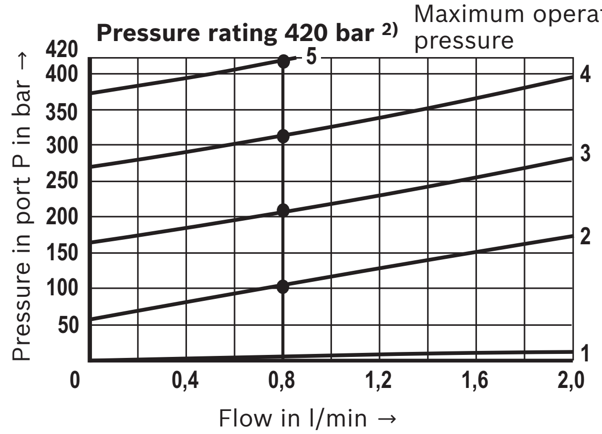
Pressure rating 315 bar [1)]



Pressure rating 350 bar [2)]



Pressure rating 420 bar [2)]



Applicable for all pressure ratings:
Curve **1** at 0 % of the command value
Curve **2** at 25 % of the command value
Curve **3** at 50 % of the command value
Curve **4** at 75 % of the command value
Curve **5** at 100 % of the command value [1; 2)]
The characteristic curves were measured without counter pressure in port T. ($\boldsymbol{p}_T$ = 0 bar)

1) In the case of characteristic curve 5, the command value may not exceed the maximum flow of 1.4 l/min

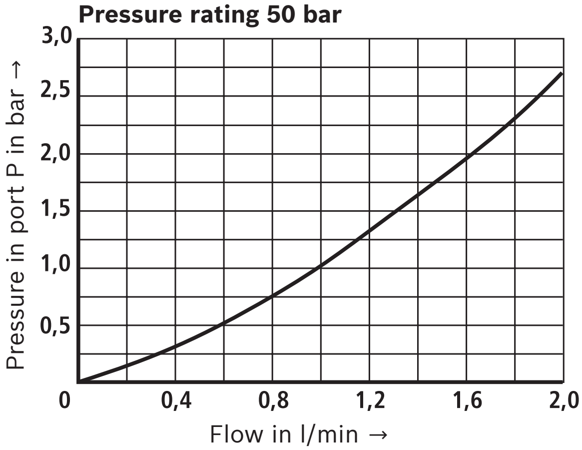
2) In the case of characteristic curve 5, the command value may not exceed the maximum flow of 0.8 l/min

Characteristic curves

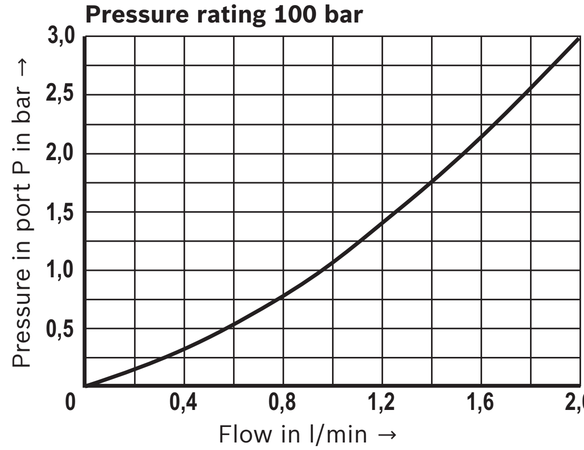
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

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

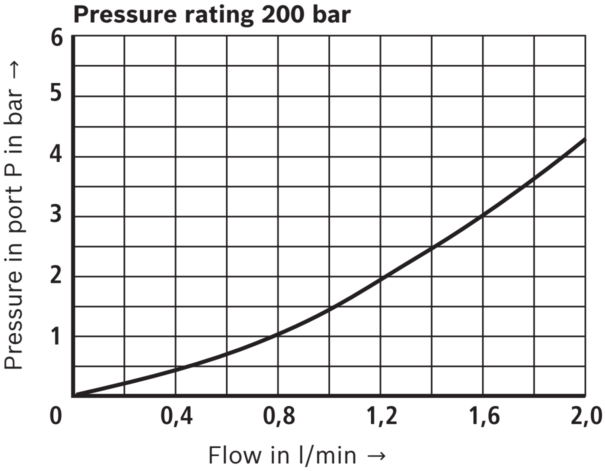
Pressure rating 50 bar



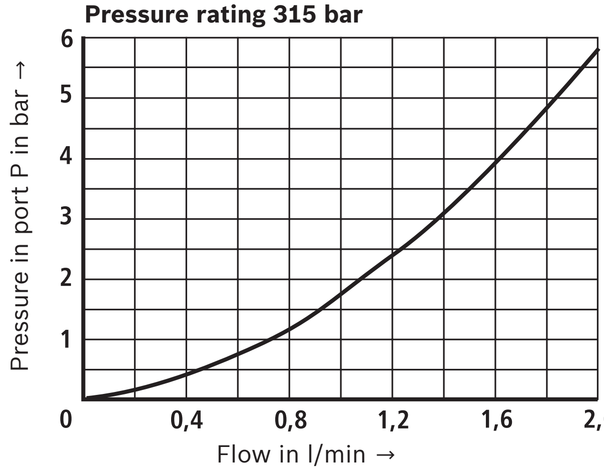
Pressure rating 100 bar



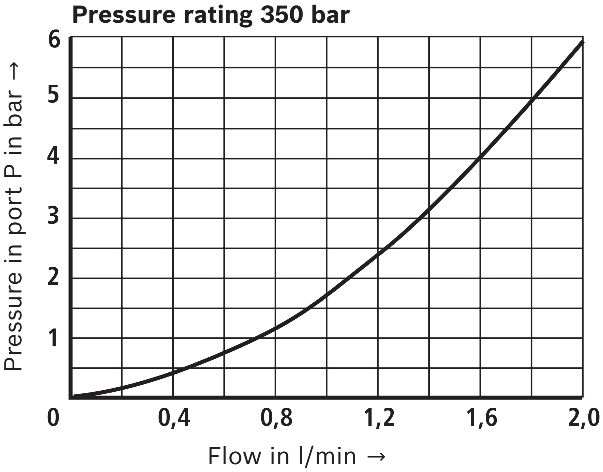
Pressure rating 200 bar



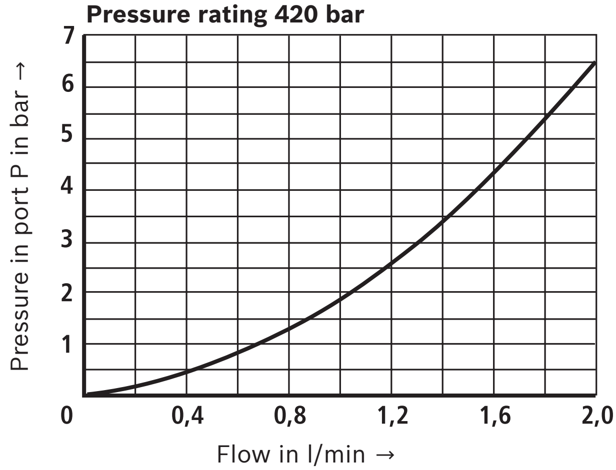
Pressure rating 315 bar



Pressure rating 350 bar



Pressure rating 420 bar



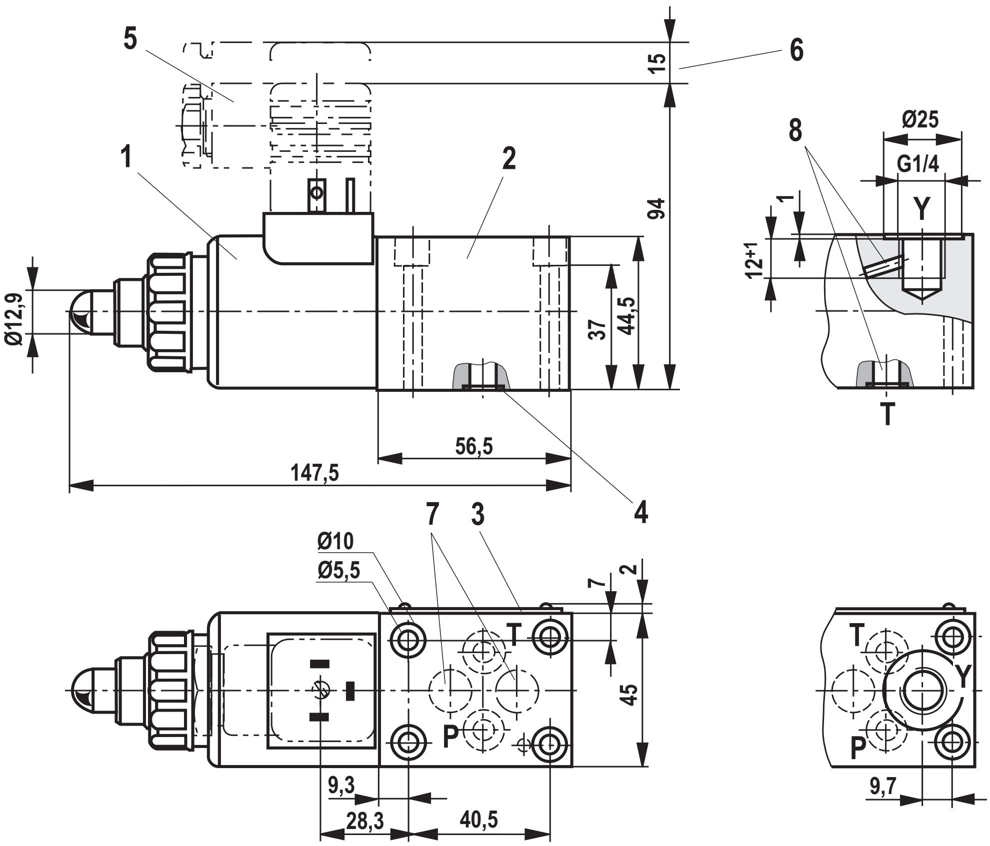
Notice

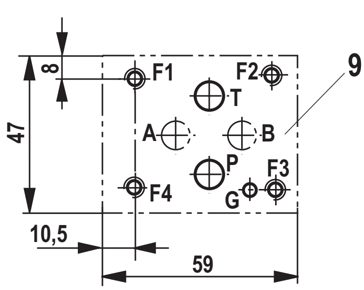
The characteristic curves were measured without counter pressure in port T. ($\boldsymbol{p}_T$ = 0 bar)

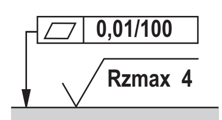
Minimum control current ≤ 100 mA

(This current is reached with a command value of 0 V and/or 4 mA.)

Dimensions: Type DBET
(dimensions in mm)





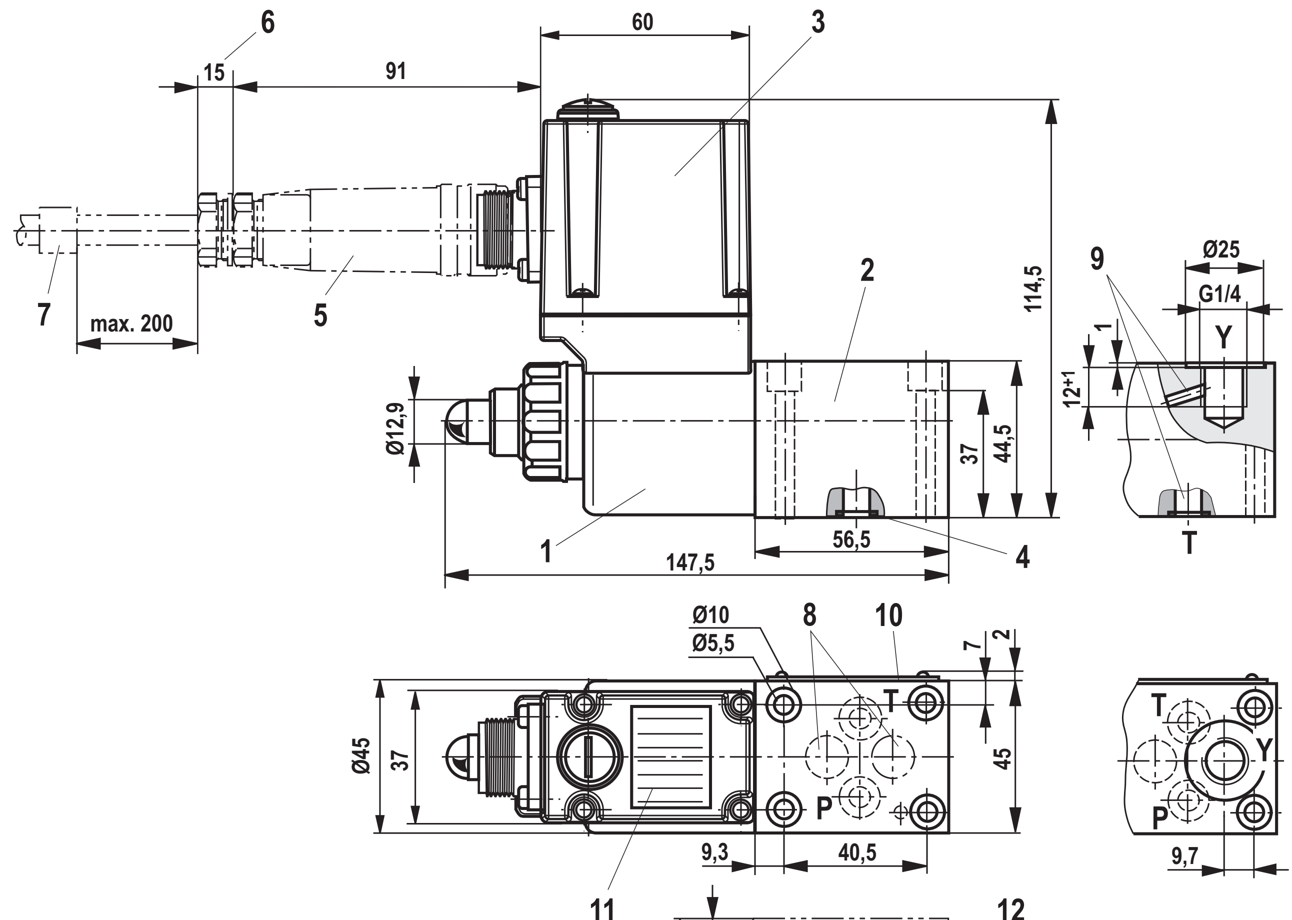


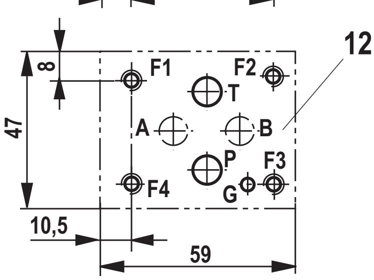
Required surface quality of the valve contact surface

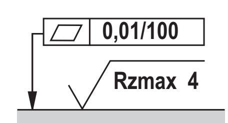
1 Proportional solenoid
2 Valve housing
3 Name plate
4 Identical seal rings for ports P, T, A and B
5 Mating connector according to DIN EN 175301-803
6 Space required for removing the mating connector
7 Blind counterbores A and B
8 With version ..Y.. (external pilot oil return) port Y is internally connected to port T. Port T is not plugged.
9 Machined valve contact surface, porting pattern according to ISO 4401-03-02-0-05 Deviating from the standard: "A" and "B" channels not drilled locating pin not included in the scope of delivery

For valve mounting screws and **subplates,** see page 14.

Dimensions: Type DBETE
(dimensions in mm)







Required surface quality of the valve contact surface

1 Proportional solenoid
2 Valve housing
3 Integrated electronics (OBE)
4 Identical seal rings for ports P, T, A and B
5 Mating connectors according to DIN EN 175301-804
6 Space required for removing the mating connector
7 Cable fastening
8 Blind counterbores A and B
9 With version ..Y.. (external pilot oil return) port Y is internally connected to port T. Port T is not plugged.
10 Name plate
11 Block diagram of the integrated electronics (OBE)
12 Machined valve contact surface, porting pattern according to ISO 4401-03-02-0-05 Deviating from the standard: "A" and "B" channels not drilled locating pin not included in the scope of delivery

For valve mounting screws and **subplates,** see page 14.

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 = 7 Nm ± 10 %	R913000140

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

Subplates	Data sheet	Material number
G 341/01 (G1/4) G 341/60 (G3/8)	45052 45052	R900424447 R901027119

Accessories (not included in the scope of delivery)

External control for type DBET	Data sheet	Material number
VT-MSPA1-1-1X/V0/... in modular design (analog) VT-VSPD-1-2X/V0/.-0-1 in euro-card format (digital) VT-VSPA1-2-1X/V0/...in euro-card format (analog) VT-SSPA1-1-1X/V0/0-24 as a plug-in amplifier (analog) Limitations: No linearization of the command value pressure characteristic curve, higher hysteresis and range of inversion	30223 30523 30115 30265	

External control for type DBET ...G24-8...	Data sheet	Material number
VT-2000-5X/... in euro-card format VT-MSPA1-1-30 with modular design	29904 30224	

Mating connectors (details see page 7)	Data sheet	Material number
For type DBET: Mating connectors according to DIN EN 175301-803 For type DBETE: Mating connectors according to DIN EN 175201-804	08006 08006	R901017011 R900021267 (plastic) R900223890 (metal)

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

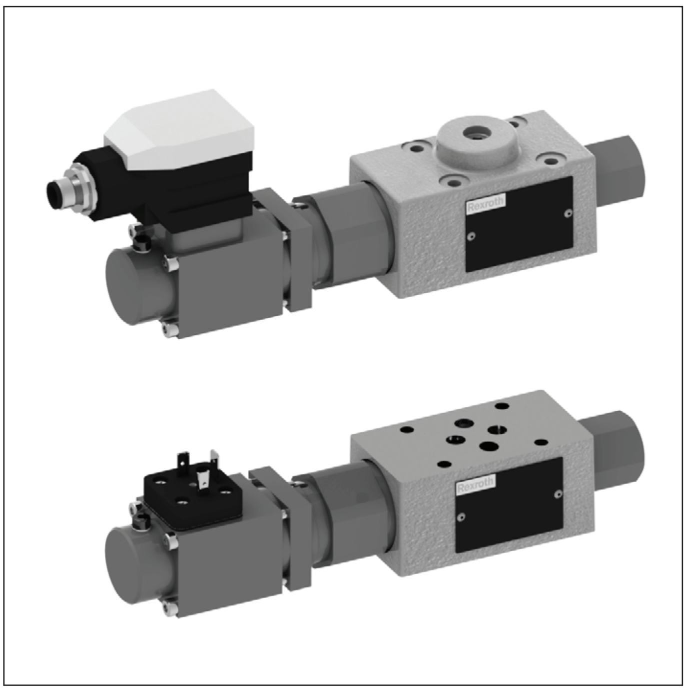
Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

The Drive & Control Company

Proportional pressure reducing valve, pilot operated

Type DRE(E) and ZDRE(E)

RE 29175
Edition: 2013-06
Replaces: 01.12



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

Features

- Pilot operated pressure reducing valve in ports A and P1 with pressure limitation
- Operation by means of proportional solenoids
- For subplate mounting or 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 P1, see page 12
- Types DREE and ZDREE with integrated electronics (OBE)
- CE conformity according to EMC Directive 2004/108/EC

Contents

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	**Z**

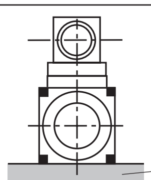
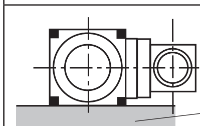
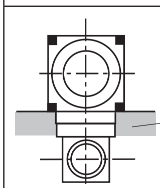
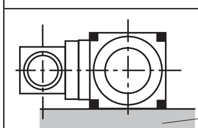
02	Proportional pressure reducing valve	**DRE**

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 P1 (sandwich plate)	**VP**

Position of the mating connector (omitted in case of subplate mounting)

06	 Valve contact surface (seal ring recesses in the housing)	**1**
	 Valve contact surface (seal ring recesses in the housing)	**2**
	 Valve contact surface (seal ring recesses in the housing)	**3**
	 Valve contact surface (seal ring recesses in the housing)	**4**

07	Component series 10 ... 19 (10 ... 19: Unchanged installation and connection dimensions)	**1X**

Pressure rating

08	50 bar	**50**
	100 bar	**100**
	210 bar	**210**
	315 bar	**315** [1]

09	**Without** check valve	**M**

Supply voltage

10	Direct voltage 24 V	**G24**

11	**With** manual override	**N9**
	Without manual override	**no code**

[1] Only available for "Z" version

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; ZDRE:**	
	Without mating connector; connector DIN EN 175301-803 Mating connector, separate order, see page 18	**K4**
	Type DREE; ZDREE:	
	Without mating connector; connector M12 Cable set, separate order, see page 18	**K24**

Interface electronics

13	Command value 0 to 10 V	**A1**
	Command value 4 to 20 mA	**F1**
	Type (Z)DRE	**no code**

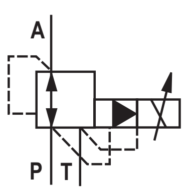
Seal material

14	NBR seals	**M**
	FKM seals	**V**

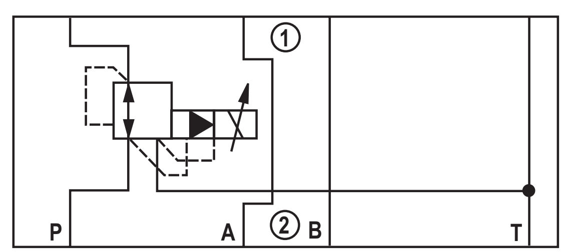
09	Further details in the plain text	

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

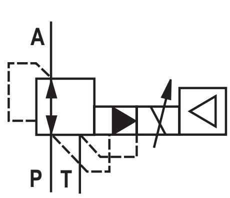
Type DRE 6...



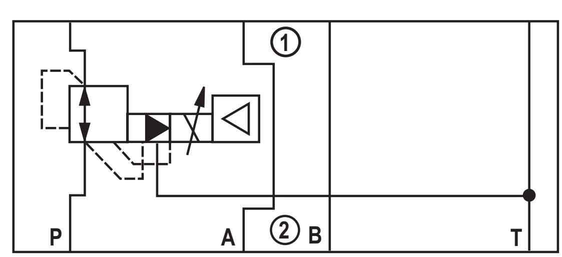
Type ZDRE 6 VP...



Type DREE 6...



Type ZDREE 6 VP...



Function, section

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.

Technical set-up:

The valve consists of three main assemblies:

- Pilot control valve (1)
- Proportional solenoid (2)
- Main valve (3) with main control spool (4)

Function:

Type DRE

General function:

- 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. The pressure in port A is almost equal to the pressure set at the pilot control valve (1).

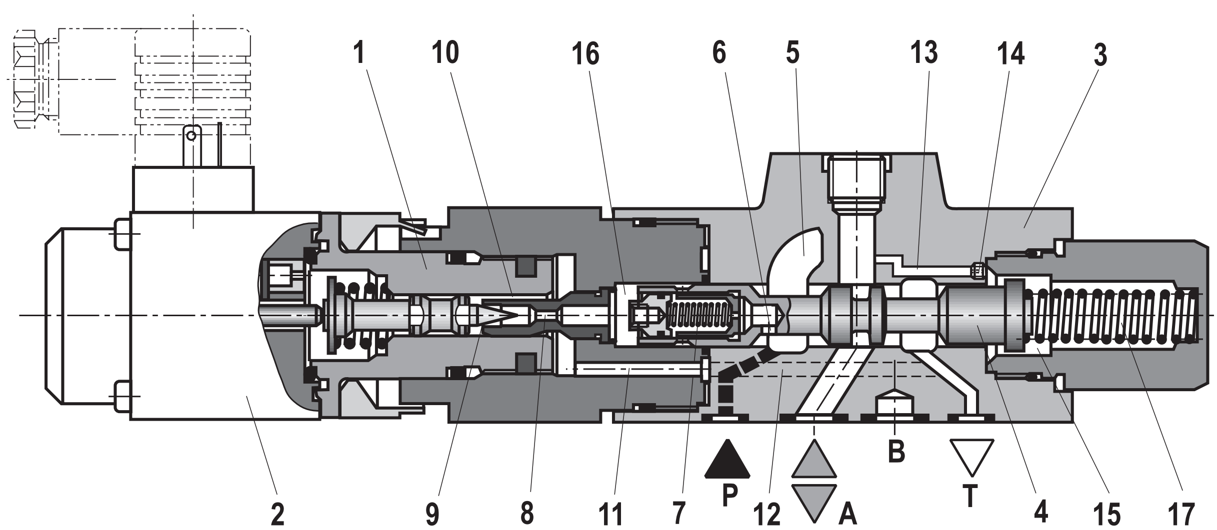
Pressure limitation:

- If the pressure in port A exceeds the set pressure of the pilot control valve (1), the main control spool (4) is 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 corresponds to the function of type DRE 6.
The pressure is, however, reduced in channel P1.

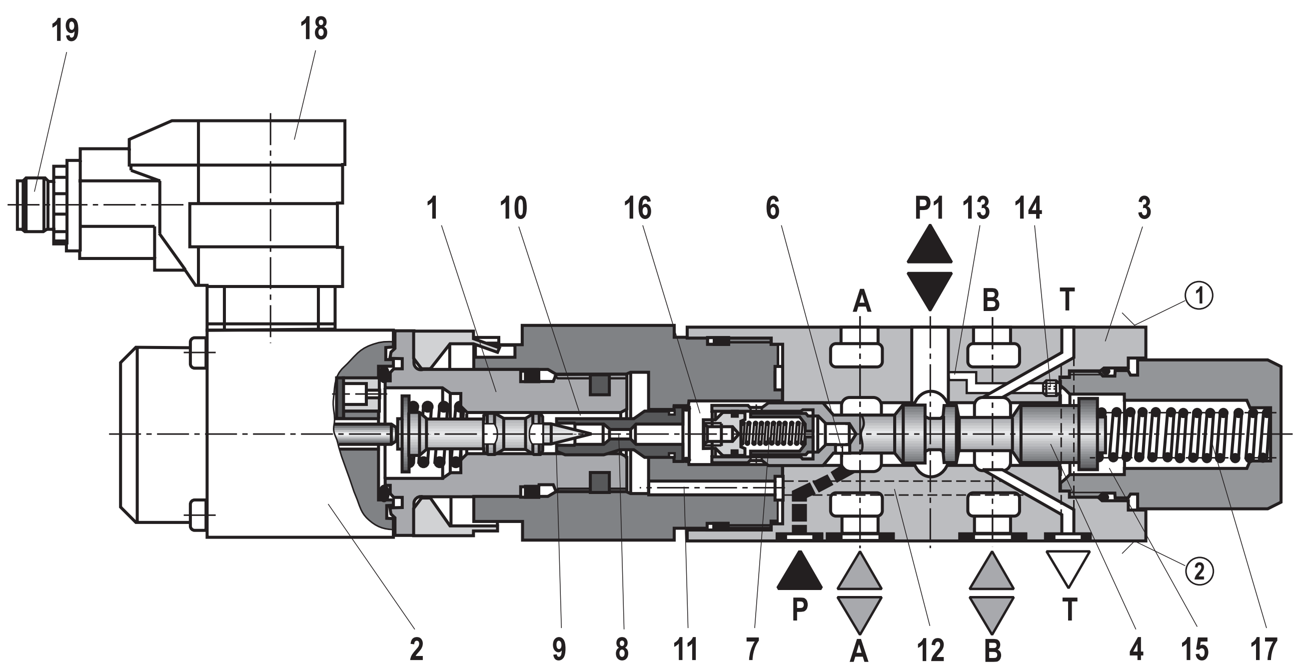
Type DRE 6-1X/...K4...



Function, section

Type (Z)DREE – with integrated electronics (OBE)
With regard to function and structure, these valves correspond to type (Z)DRE. 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 to the connector (19).
In the factory, the command value pressure characteristic curve is adjusted with little manufacturing tolerance.

Type ZDREE 6 VP1-1X/...K24...
(① = component side, ② = plate side)



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

general				
Weight	–Type (Z)DRE 6	kg	2.0	
	–Type (Z)DREE 6	kg	2.1	
Installation position			Any	
Storage temperature range		°C	–20 ... +80	
Ambient temperature range		°C	–20 ... +70	

hydraulic (measured with HLP46, ϑ_{oil} = 40 ±5 °C)				
Maximum operating pressure	– Port P or P2	bar	315	
	– Port P1, A, and B	bar	210	
	– Port T	bar	Separately and to the tank at zero pressure	
Maximum set pressure in channels P1 and A	– Pressure rating 50 bar	bar	50	
	– Pressure rating 100 bar	bar	100	
	– Pressure rating 210 bar	bar	210	
	– Pressure rating 315 bar	bar	315 [1]	
Minimum set pressure with command value 0 in channels P1 and A		bar	See characteristic curves page 12	
Pilot flow		l/min	0.65	
Maximum flow		l/min	30	
Hydraulic fluid			See table page 7	
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)			Class 20/18/15 [2]	
Hysteresis		%	±2.5 of the maximum set pressure	
Repetition accuracy		%	< ±2 of the maximum set pressure	
Linearity	– Type (Z)DRE 6	%	±3.5 of the maximum set pressure	
Manufacturing tolerance of the command value pressure characteristic curve, related to the hysteresis characteristic curve, pressure increasing	– Type (Z)DRE 6	%	±2 of the maximum set pressure	
	– Type (Z)DREE 6	%	±3 of the maximum set pressure	
Step response $T_u + T_g$	10% → 90%	ms	~150	Measured with 1 liter standing hydraulic fluid column
	90% → 10%	ms	~150	

[1] Only available for "Z" version.

[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. For the selection of the filters see www.boschrexroth.com/filter

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

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP	NBR, FKM	DIN 51524
Environmentally compatible	– insoluble in water	HETG	NBR, FKM	ISO 15380
		HEES	FKM	
	– soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– sater-free	HFDU, HFDR	FKM	ISO 12922
	– containing water	HFC (Fuchs Hydrotherm 464 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 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!
- The flash point of the process and operating medium used must be at least 40 K higher than the maximum solenoid surface temperature.
- **Flame-resistant – containing water**:
  - Maximum operating pressure 210 bar
  - Maximum hydraulic fluid temperature 60 °C
  - Expected life cycle as compared to HLP hydraulic oil 30% to 100%

electrical			
Supply voltage		V	24 direct voltage
Minimum control current		mA	100
Maximum control current		mA	1600
Solenoid coil resistance	– Cold value at 20 °C	Ω	5
	– Maximum hot value	Ω	7.5
Switch-on duration		%	100
Protection class of the valve according to EN 60529			IP 65 with mating connector mounted and locked

electrical, integrated electronics (OBE)			
Supply voltage	– Nominal voltage	VDC	24
	– Lower limit value	VDC	18
	– Upper limit value	VDC	35
Current consumption		A	≤ 1.5
Required fuse protection		A	2.0 time-lag
Inputs	– Voltage	V	0 to 10
	– Current	mA	4 to 20
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

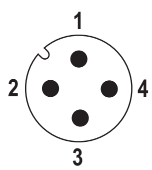
Electrical connection (dimensions in mm)

Type (Z)DREE

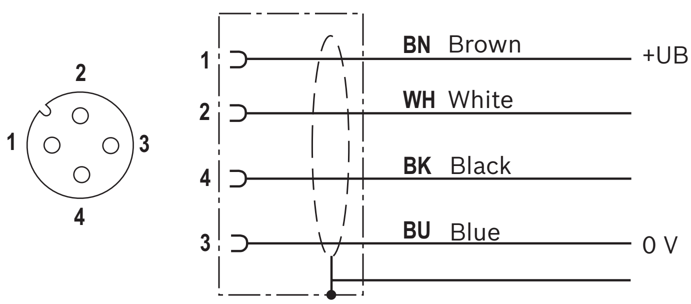
Connector pin assignment	Contact	Allocation interface "A1"	Allocation interface "F1"
Supply voltage	1	24 VDC (u(t) = 21 V to 35 V); $\boldsymbol{I}_{max} \leq 1.5$ A	
Command value input	2	0 to 10 V; $\boldsymbol{R}_E$ = 20 kΩ	4 to 20 mA; $\boldsymbol{R}_E$ = 100 Ω
Weight	3	0 V	
	4	Reference potential command value	

M12 plug-in connector port

Connector on amplifier

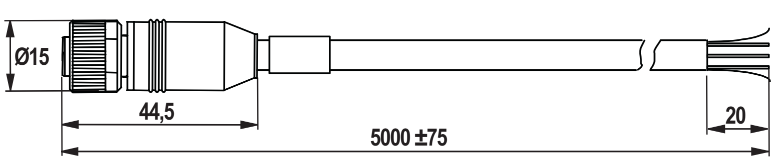


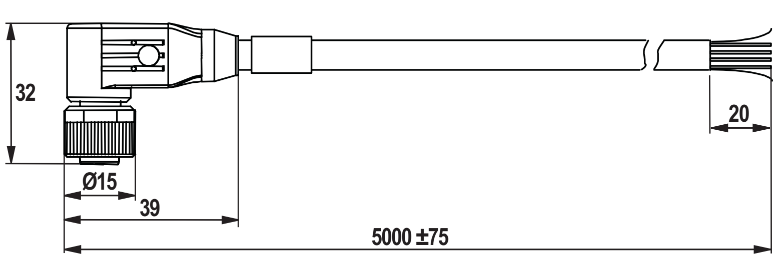
Mating connector and wire colors with pre-assembled cable set
Please order the cable set separately, see page 18



The connection for the protective earthing conductor is not provided

Connection cross-section:
4 x 0.75 mm² shielded
(connect shield in control cabinet)

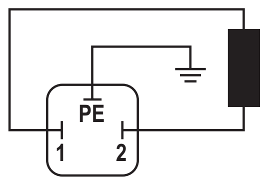




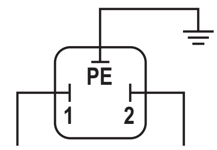
Electrical connection

Type (Z)DRE

Connection to connector



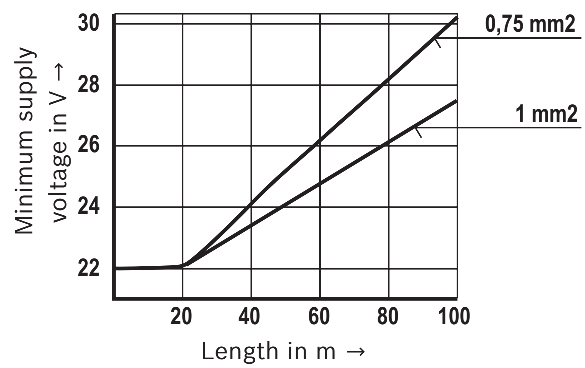
Connection to mating connector



Connection cable for type (Z)DRE

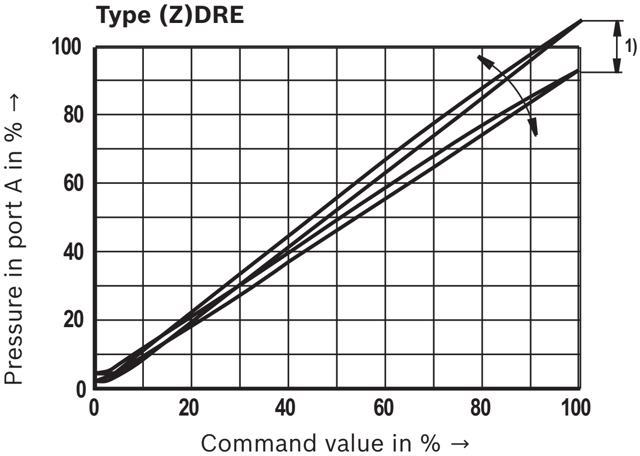
- Recommendation 6-wire, 0.75 or 1 mm² plus protective earthing conductor and screening
- Only connect the screening to PE on the supply side
- Maximum admissible length = 100 m

The minimum supply voltage at the power supply unit depends on the length of the supply line (see diagram).



Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

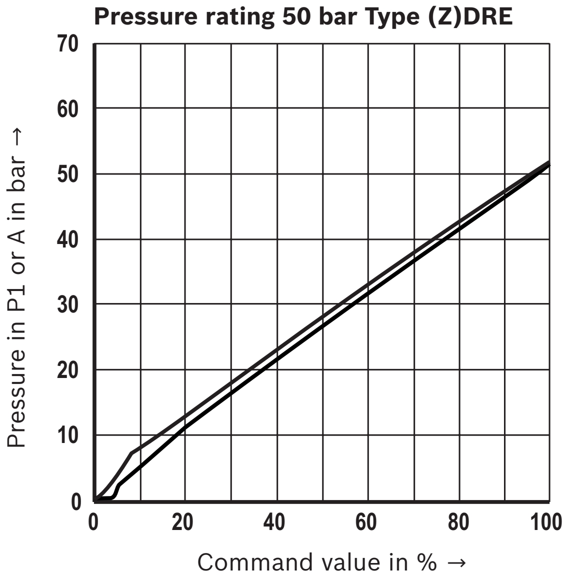
Pressure in port A depending on the command value (manufacturing tolerance)
without flow

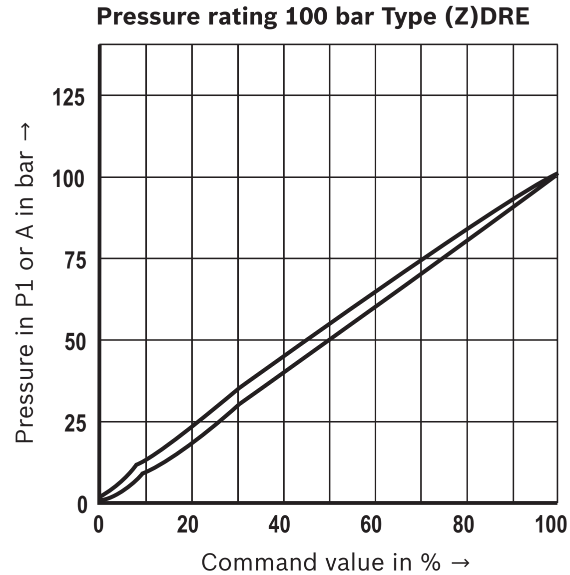


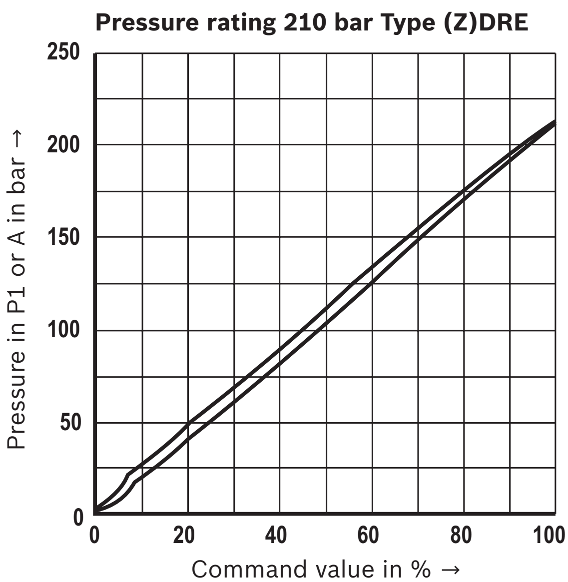
1) With type (Z)DRE, the manufacturing tolerance at the **external amplifier** (type and data sheet see page 7) can be adjusted using the command value attenuator potentiometer "**Gw**". Digital amplifiers are adjusted using the parameter "**Limit**".
The control current indicated in the technical data must not be exceeded!
In order to be able to adjust several valves to the same characteristic curve, the pressure must - with a command value of 100 % - not exceed the maximum set pressure of the relevant pressure rating at any valve.

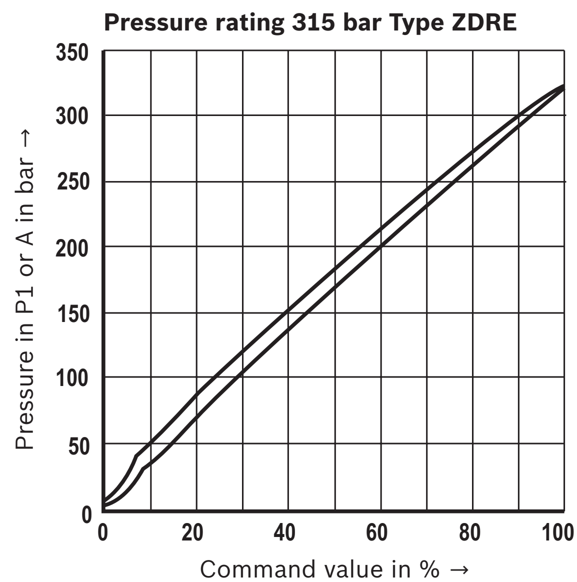
Characteristic curves: Type (Z)DRE (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Type (Z)DRE: Pressure in port P1 or A depending on the command value





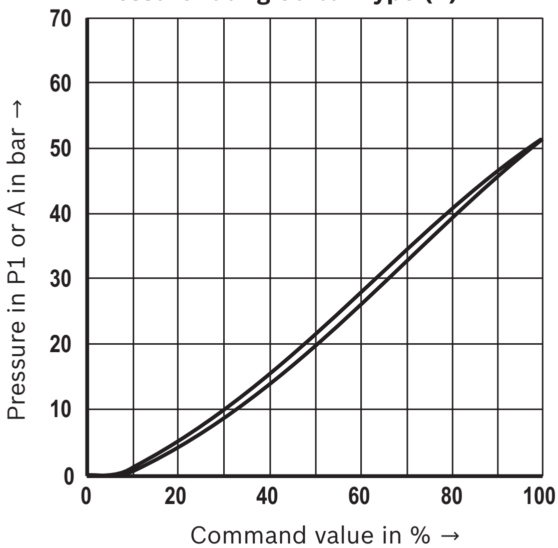




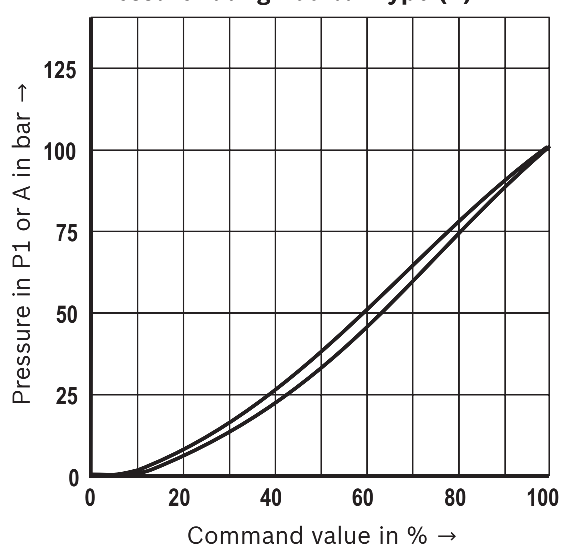
Characteristic curves: Type (Z)DREE (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Type (Z)DRE(E): Pressure in port P1 or A depending on the command value

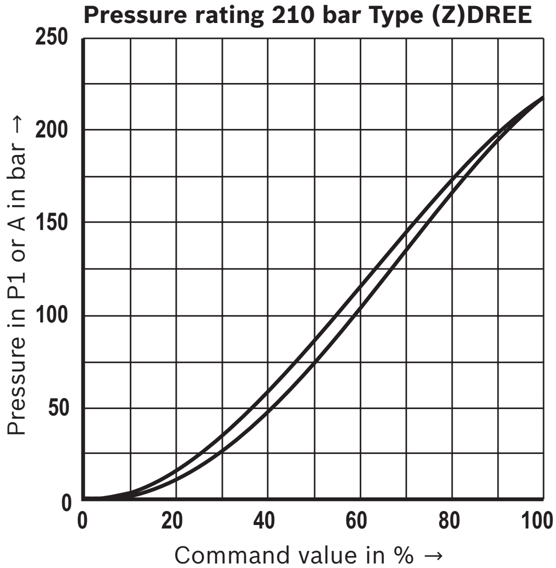
Pressure rating 50 bar Type (Z)DREE



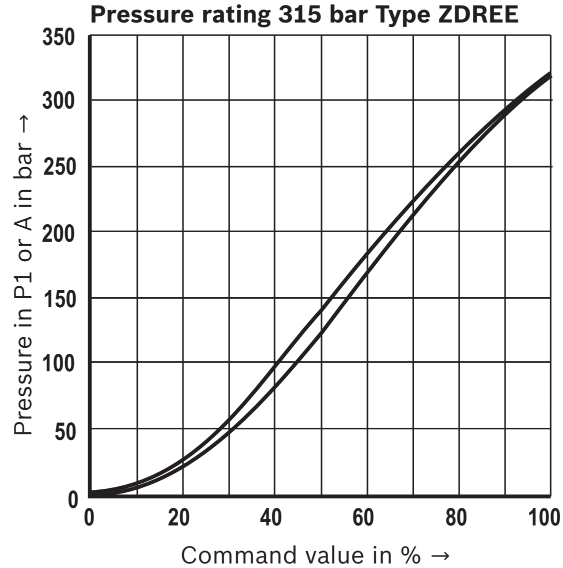
Pressure rating 100 bar Type (Z)DREE



Pressure rating 210 bar Type (Z)DREE



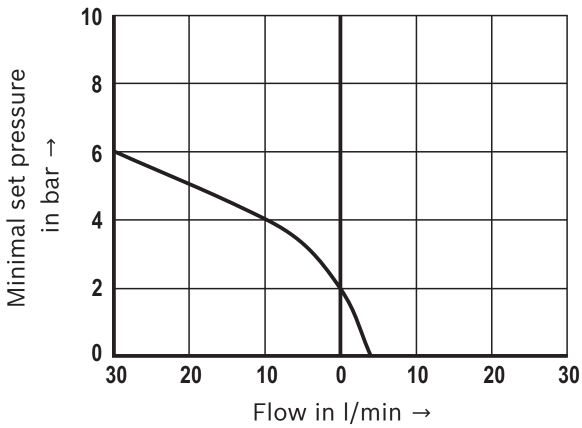
Pressure rating 315 bar Type ZDREE



Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

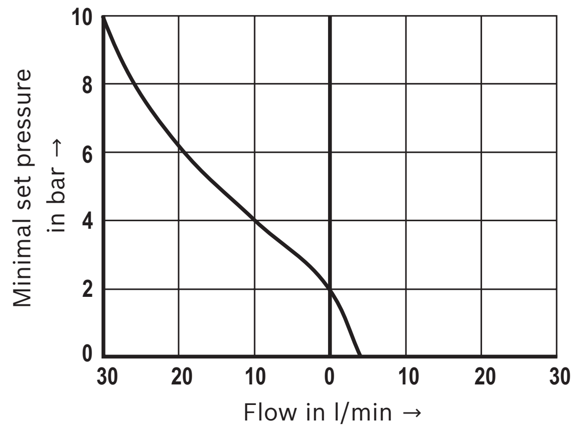
Minimum set pressure in port P1 or A with command value 0 V (without counter pressure in channel T)

Pressure rating 50 bar



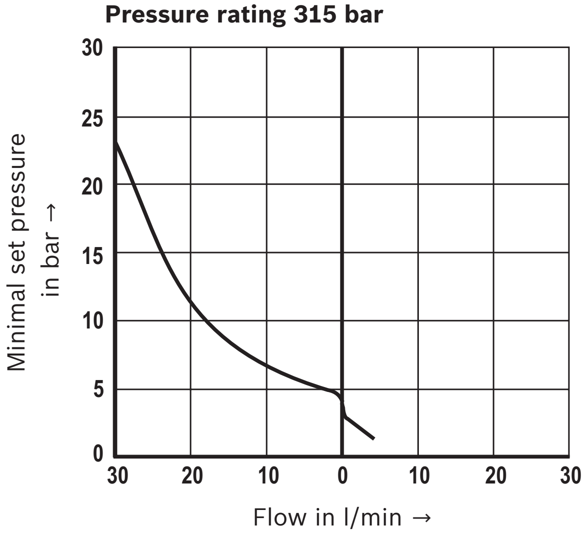
Type DRE A → T Type DRE P → A
Type ZDRE P1 → T Type ZDRE P → P1

Pressure rating 100 bar/210 bar



Type DRE A → T Type DRE P → A
Type ZDRE P1 → T Type ZDRE P → P1

Pressure rating 315 bar

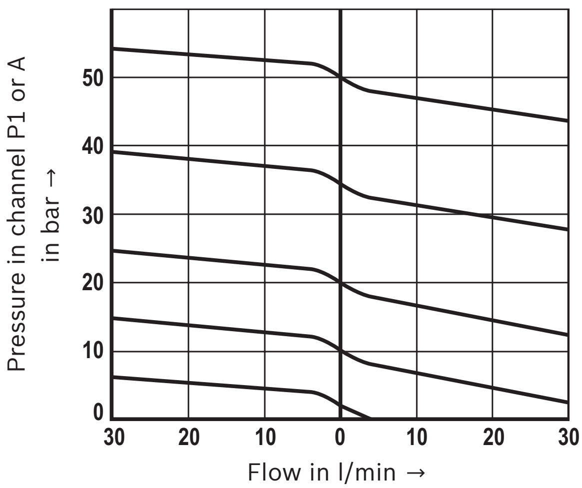


Type ZDRE P1 → T Type ZDRE P → P1

Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Pressure in channel P1 or A – flow

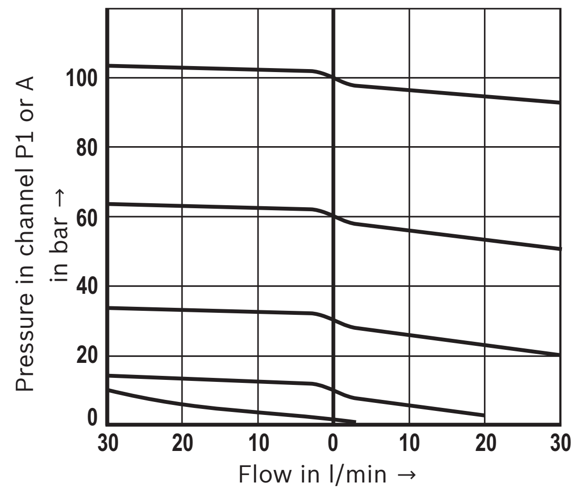
Pressure rating 50 bar



Type DRE A → T Type DRE P → A

Type ZDRE P1 → T Type ZDRE P → P1

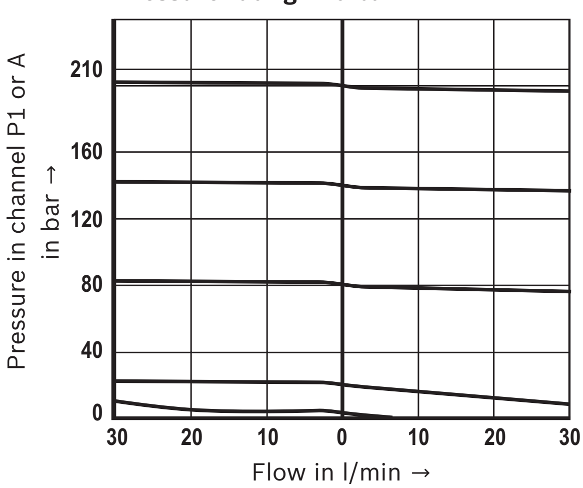
Pressure rating 100 bar



Type DRE A → T Type DRE P → A

Type ZDRE P1 → T Type ZDRE P → P1

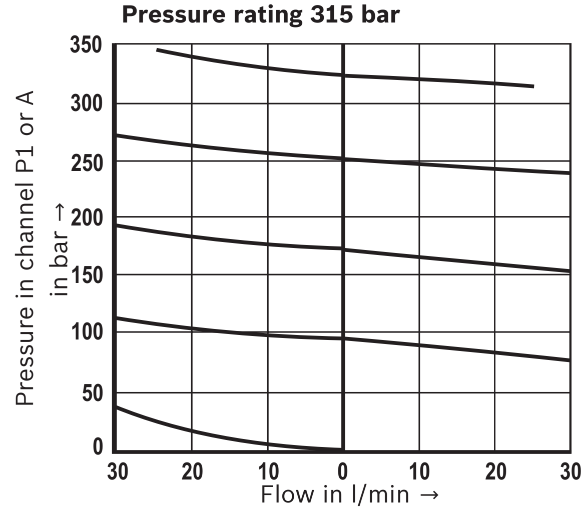
Pressure rating 210 bar



Type DRE A → T Type DRE P → A

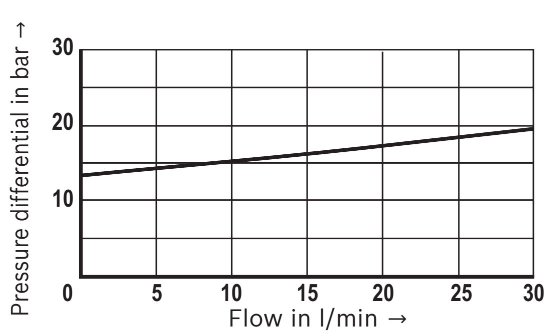
Type ZDRE P1 → T Type ZDRE P → P1

Pressure rating 315 bar



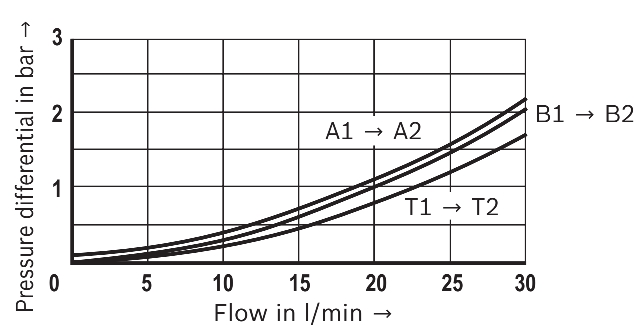
Type ZDRE P1 → T Type ZDRE P → P1

Δp-q_V characteristic curves



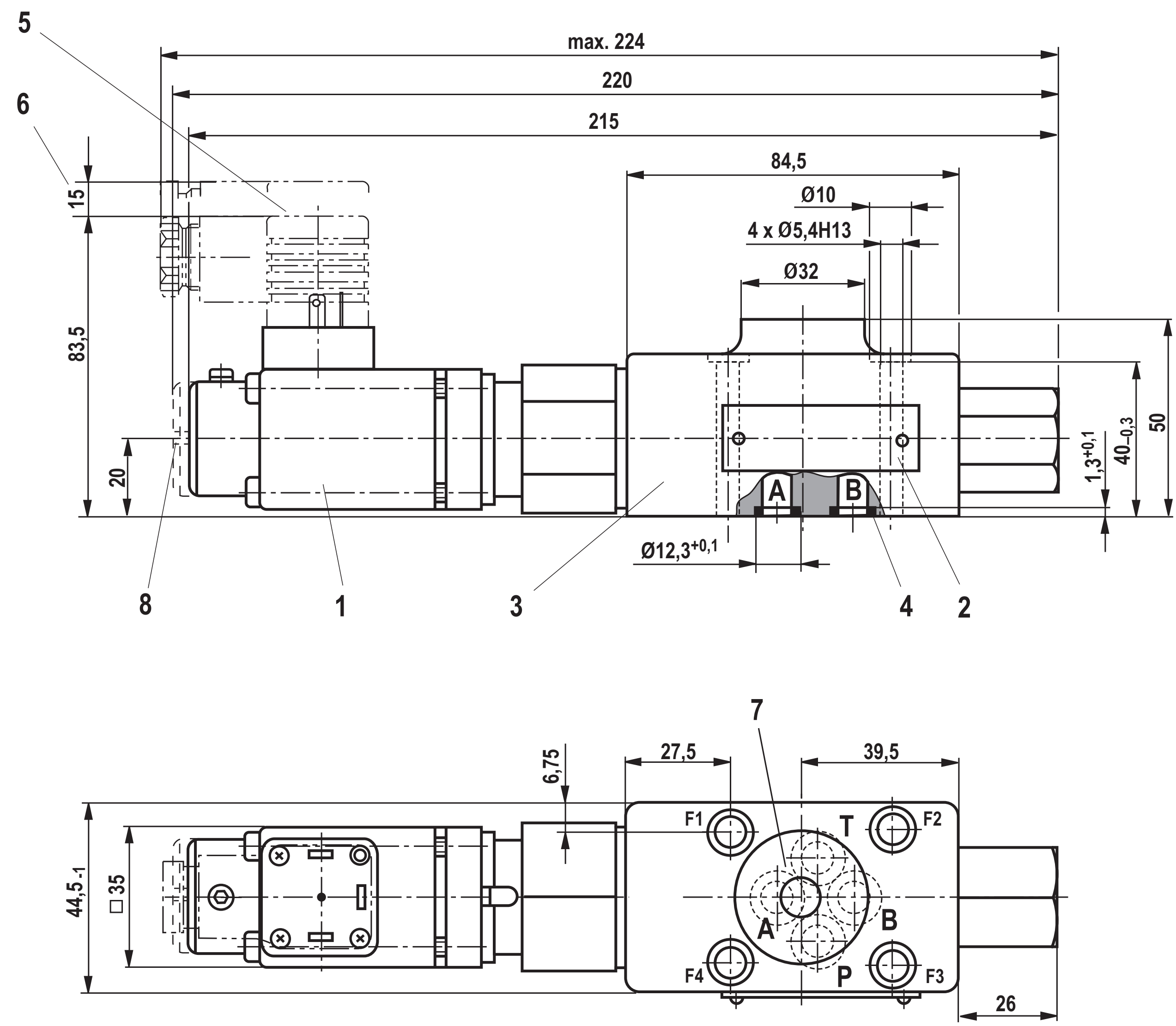
Type DRE(E) P → A

Type ZDRE(E) P2 → P1

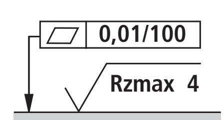


Notice!
The shown Δp value corresponds to the minimum pressure available in port P (P2) minus the maximum pressure to be controlled in port A (P1).

Dimensions: Type DRE
(dimensions in mm)



1 Proportional solenoid **without** manual override
2 Name plate
3 Valve housing
4 Identical seal rings for ports A, B, P and T
5 Mating connector, separate order, see page 18
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

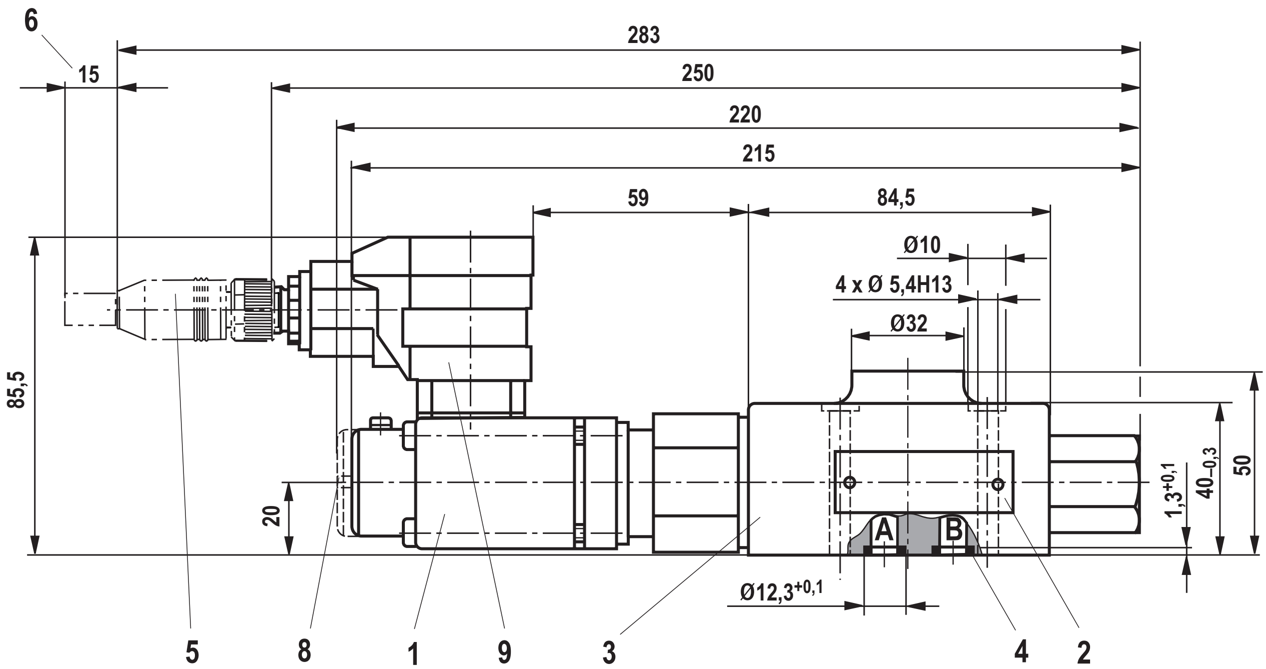


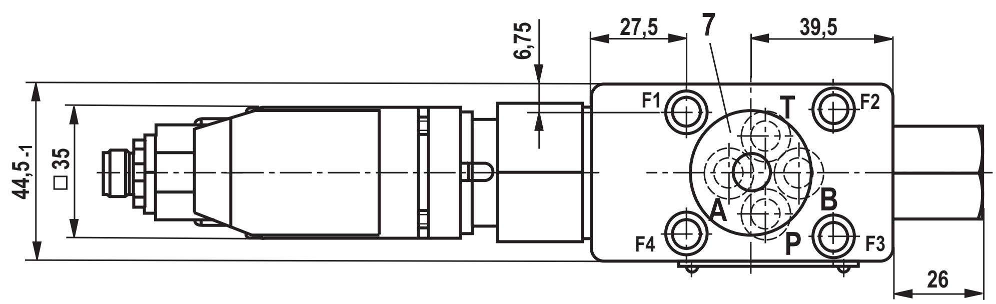
Required surface quality of the valve contact surface

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

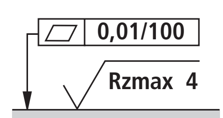
Valve mounting screws and **subplates** see page 18.

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 and T
5 Mating connector, separate order, see page 18
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
9 Integrated electronics (OBE)

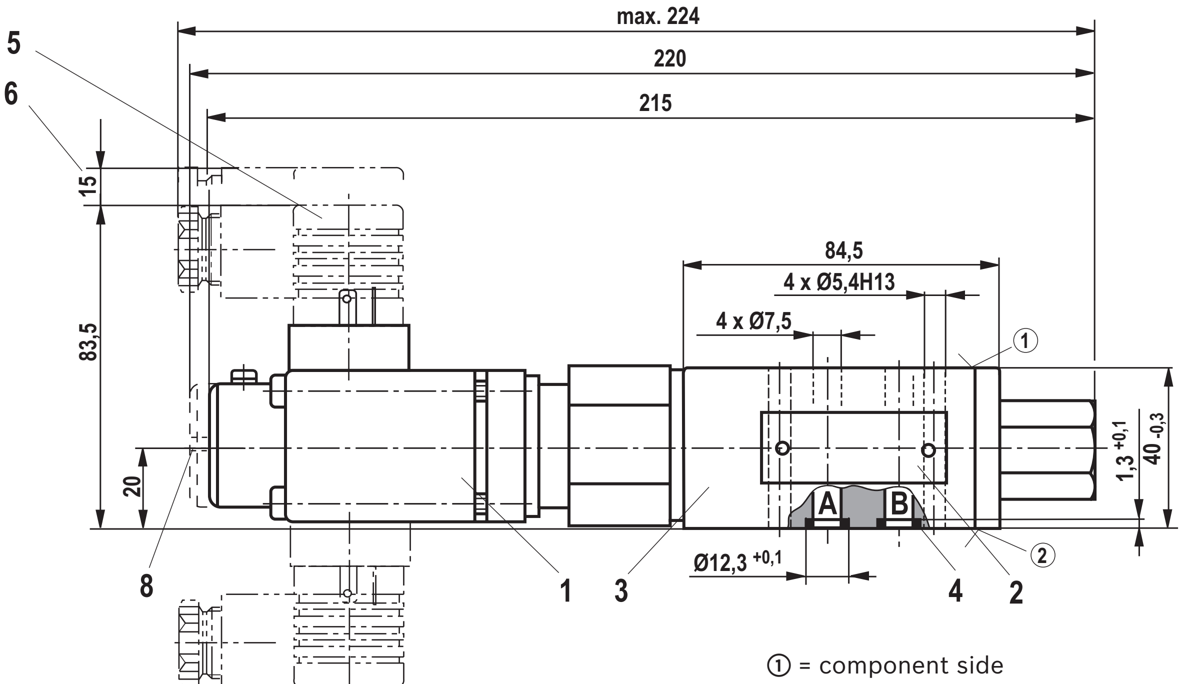


Required surface quality of the valve contact surface

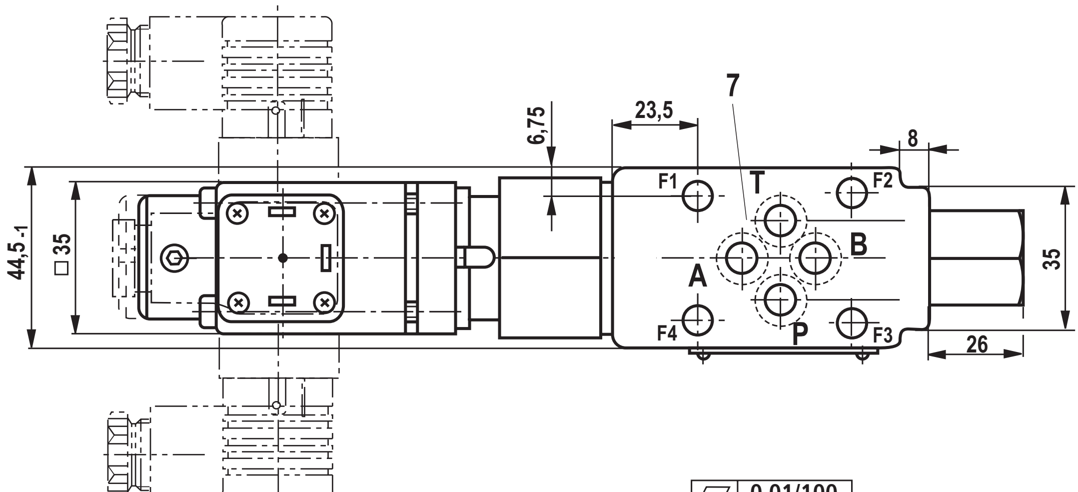
Notice!
The dimensions are nominal dimensions which are subject to tolerances.

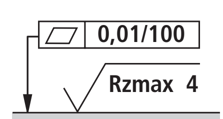
Valve mounting screws and **subplates** see page 18.

Dimensions: Type ZDRE
(dimensions in mm)



① = component side
② = plate side



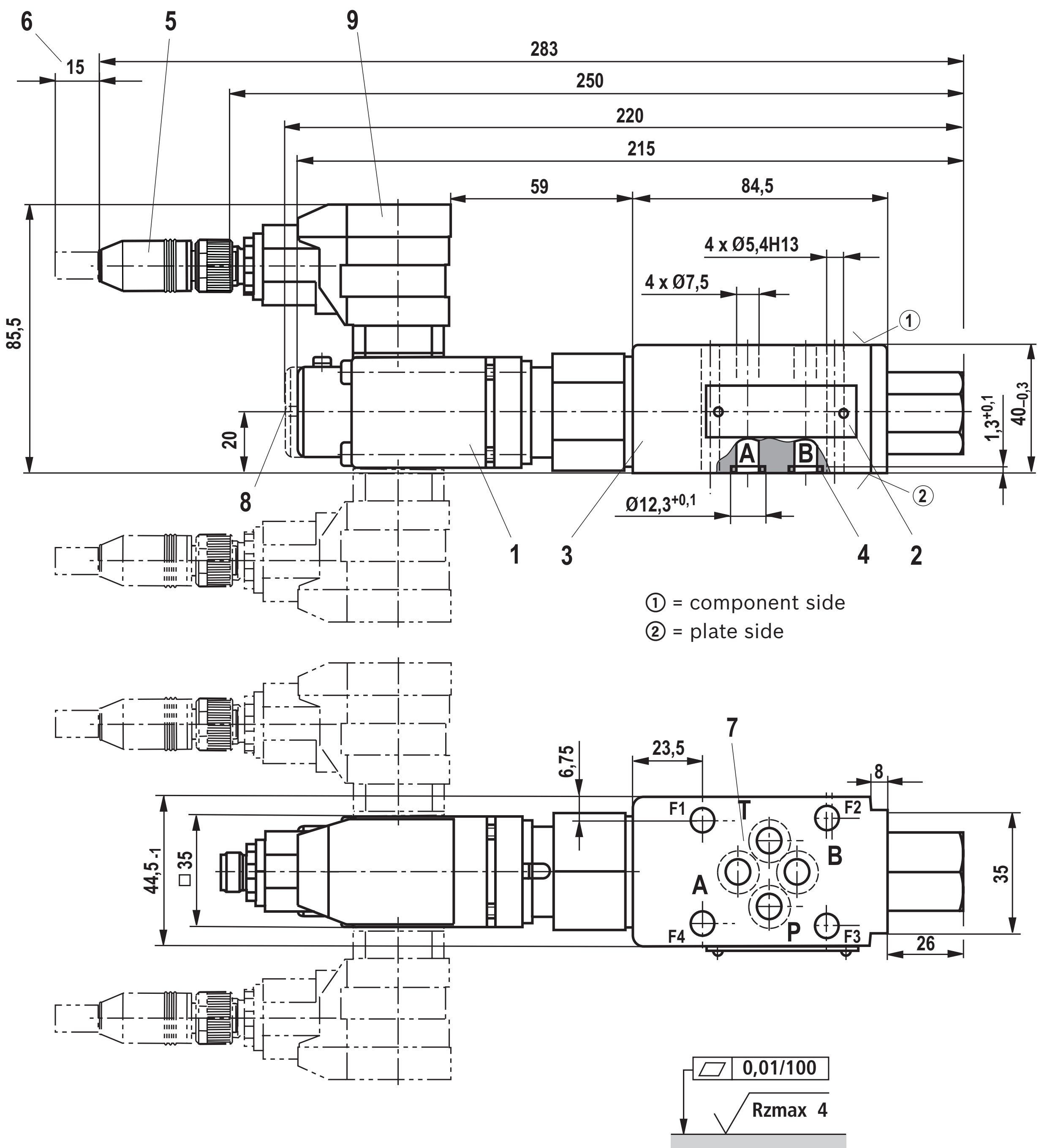


Required surface quality of the
valve contact surface

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

Item explanations see type DRE on page 14,
valve mounting screws and **subplates** see page 18.

Dimensions: Type ZDREE
(dimensions in mm)



Required surface quality of the valve contact surface

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

Item explanations see type DREE on page 15, **valve mounting screws** and **subplates** see page 18.

Dimensions

Hexagon socket head cap screws		Material number
Type DRE(E)	4x ISO 4762 - M5 x 50 - 10.9-flZn-240h-L (friction coefficient μ_{total} = 0.09 to 0.14) tightening torque M_A = 7 Nm ±10%	
Type ZDRE(E)	4x ISO 4762 - M5 - 10.9-flZn-240h-L (friction coefficient μ_{total} = 0.09 to 0.14) tightening torque M_A = 7 Nm ±10%	

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

Subplates	Data sheet
Size 6	45052

Accessories (not included in the scope of delivery)

Proportional amplifier for type (Z)DRE	Data sheet	Material number
VT-MSPA1-10 in modular design VT-VSPD-1 in Euro-card format VT-VSPA1-10 in Euro-card format	30223 30523 30100	R901142355 R901077287 R901152628

Mating connector for type (Z)DRE	Data sheet	Material number
Mating connector (black) DIN EN 175301-803	08006	R901017011

Cable sets for type (Z)DREE		Material number
Cable set VT-SSPA1-1X/M12/1/V00	Assembled cable with straight mating connector	R901241656
Cable set VT-SSPA1-1X/M12/2/V00	Assembled cable with angular mating connector	R901241651

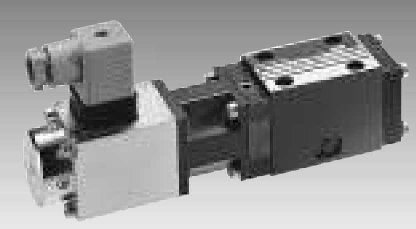
Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

Proportional pressure reducing valve, pilot operated

Type DRE6X



Nominal size 6
Unit series 1X
Maximum working pressure P 315 bar, T 250 bar
Maximum flow rate 40 l/min

List of Contents

Features

– Pilot operated valves for reducing system pressure at the consumer (pilot oil internal only)
– 3-way version (P–A/A–T), $p_{min} = p$ in T
– Adjustable by means of the solenoid current, see Characteristic Curve, Technical Data and selected valve electronics
– Solenoid type $I_{max} = 0.8$ A
– Pressure limitation to a safe level even with faulty electronics (solenoid current $I > I_{max}$)
– For subplate attachment, mounting hole configuration to ISO 4401-03-02-0-94
Subplates as per catalog sheet RE 45053 (order separately)
– Plug-in connector to DIN 43650-AM2 included in scope of delivery
– External trigger electronics with ramps and valve calibration in the following versions/designs (order separately)
  • Plug, setpoint 0...+10 V or 4...20 mA, RE 30264
  • Module, setpoint 0...+10 V, RE 30222
  • Europe card, setpoint 0...+10 V, RE 30109

Ordering data

DRE6	X	–1X	/	M	G24–	8	N	Z4	M	*

Proportional 3-way pressure reducing valve NG6, pilot operated

Mounting hole configuration to ISO 4401-03-02-0-94 **= X**

Unit series 10 to 19 (10 to 19: installation and connection dimensions unchanged) **= 1X**

Max. pressure stage
up to 75 bar **= 75**
up to 175 bar **= 175**
up to 310 bar **= 310**

Without non-return valve **= M**

Voltage supply of trigger electronics 24 V DC **= G24**

Solenoid type (current)
8 = Solenoid current 0.8 A max.

N = **Manual auxiliary override**

Z4 = **Electrical connection**
Unit plug to DIN 43650-AM2
Plug-in connector included in scope of delivery

M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

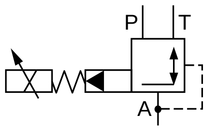
***** Further information in plain text

Preferred types

Solenoid 0.8 A	
Type	**Material Number**
DRE6X–1X/75MG24–8NZ4M	0 811 402 059
DRE6X–1X/175MG24–8NZ4M	0 811 402 055
DRE6X–1X/310MG24–8NZ4M	0 811 402 058

Symbol

For external trigger electronics



Function, sectional diagram

General

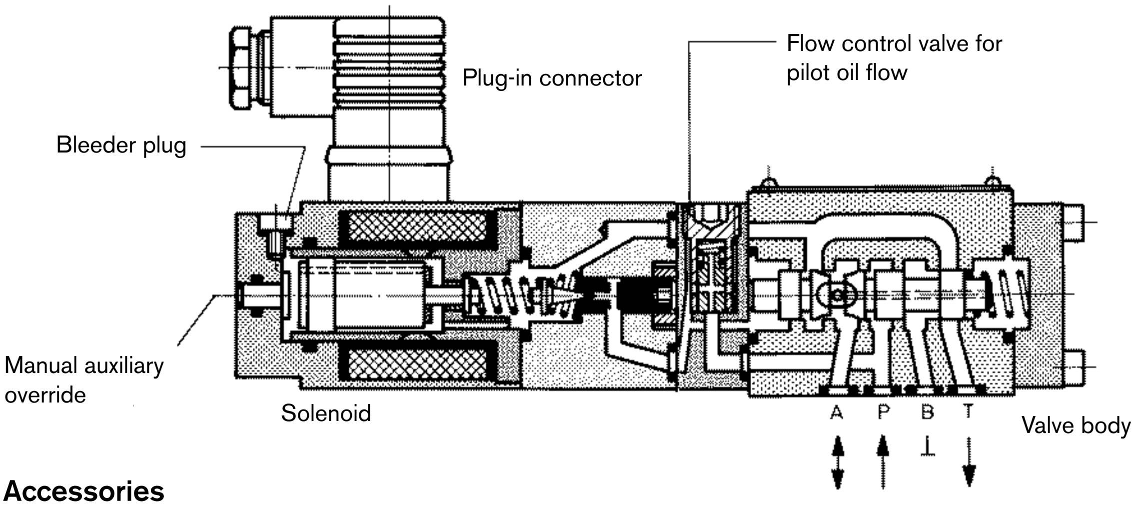
Type DRE6X proportional pressure reducing valves are pilot operated, with a 3-way main stage. The pilot valve (pressure relief valve pilot stage) is supplied internally with a controlled flow of pilot oil via P.
The valves are actuated by a proportional solenoid acting against a spring. The solenoid armature is cushioned to aid stability. The interior of the solenoid is filled with pressure fluid and connected via T.
Bleeding is achieved by means of a screw plug.
With these valves, the pressure in A (consumer) can be infinitely adjusted and reduced in relation to the solenoid current.

Basic principle

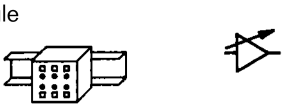
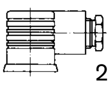
To adjust the system pressure in A, a setpoint is set in the trigger electronics. Based on this setpoint, the electronics control the solenoid coil with regulated PWM (pulse-width-modulated) current. The current is modulated with a dither, to ensure minimal hysteresis.
The proportional solenoid converts the current to a mechanical force, and the armature plunger pre-stresses the main spring in the pilot stage. The pilot stage is supplied with oil from P at a flow rate of <0.6 l/min via a flow control valve. The pilot pressure is compared with the consumer pressure (plus spring) in A and regulated (P-A/A-T).
The spring results in $p_{Amin} = p$ in T.

Pressure limitation for maximum safety

If a fault occurs in the electronics, so that the solenoid current (I_{max}) would exceed its specified level in an uncontrolled manner, the pressure cannot rise above the level determined by the maximum spring force.



Accessories

Type				Material Number
(4 x) ISO 4762-M5x30-10.9	Cheese-head bolts			2 910 151 166
Plug 	VT-SSPA1-508-20/V0	(0.8 A)	RE 30264	0 811 405 144
	VT-SSPA1-508-20/V0/I	(0.8 A)		0 811 405 162
Module 	VT-MSPA1-508-10/V0	(0.8 A)	RE 30222	0 811 405 126
Europe card 	VT-VSPA1-508-10/V0/RTP	(0.8 A)	RE 30109	0 811 405 081
Plug-in connector  2P+PE	Plug-in connector 2P+PE (M16x1.5) included in scope of delivery, see also RE 08008			

Testing and service equipment

Test box type VT-PE-TB1, see RE 30063
Current measuring adapter type VT-PA-5, see RE 30073

Technical data

General

Construction	Pilot stage		Poppet valve
	Main stage		Spool valve
Actuation			Proportional solenoid without position control, external amplifier
Connection type			Subplate, mounting hole configuration NG6 (ISO 4401-03-02-0-94)
Mounting position			Optional
Ambient temperature range		°C	–20...+50
Weight		kg	2.3
Vibration resistance, test condition			Max. 25 g, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, $\vartheta_{Öil} = 40\,°C \pm 5\,°C$)

Pressure fluid			Hydraulic oil to DIN 51524...535, other fluids after prior consultation		
Viscosity range	recommended	mm^2/s	20...100		
	max. permitted	mm^2/s	10...800		
Pressure fluid temperature range		°C	–20...+80		
Maximum permitted degree of contamination of pressure fluid Purity class to ISO 4406 (c)			Class 18/16/13 [1]		
Direction of flow			See symbol		
Max. set pressure in A (at $Q_{min} = 1$ l/min)		bar	75	175	310
Minimum pressure in A		bar	0 (relative) or pressure in T		
Min. inlet pressure in P		bar	$p_P = p_A + \geq 5$		
Max. working pressure		bar	Port P: 315		
Max. pressure		bar	Port T: 250 (B sealed)		
Internal pilot oil flow		l/min	approx. 0.6 (with closed-loop control)		
Max. flow		l/min	40		

Electrical

Cyclic duration factor	%	100
Degree of protection		IP 65 to DIN 40050 and IEC 14434/5
Solenoid connection		Unit plug DIN 43650/ISO 4400, M16x1.5 (2P+PE)
Max. solenoid current	I_{max}	0.8 A
Coil resistance R_{20}	Ω	22
Max. power consumption at 100 % load and operating temperature	VA	25

Static/Dynamic [2]

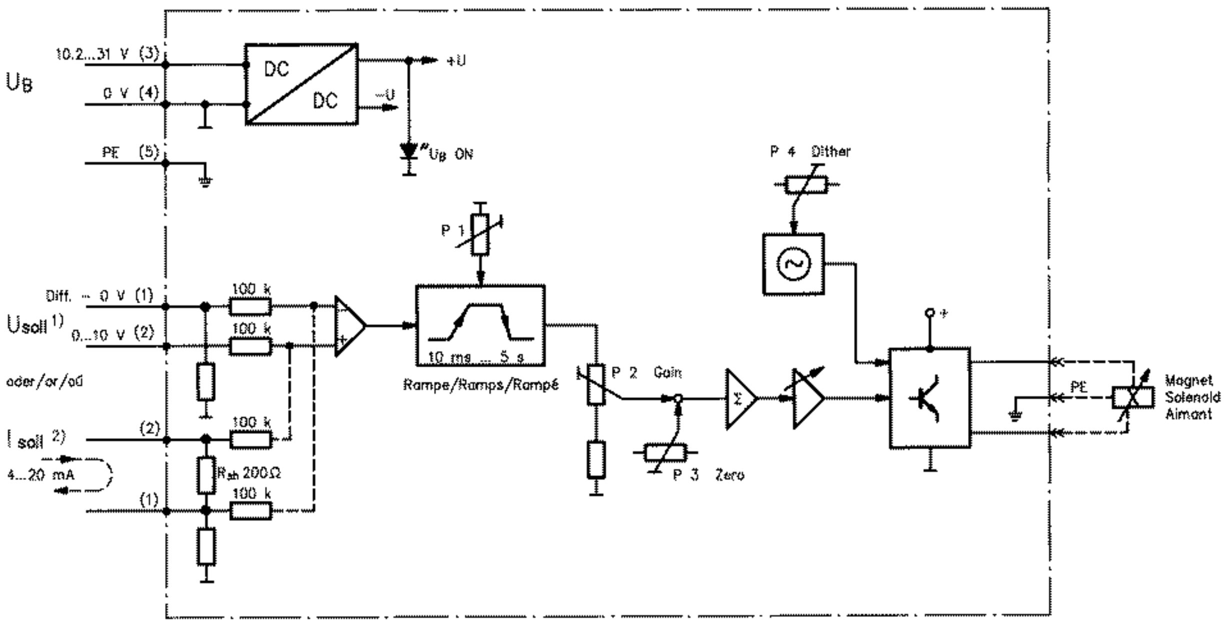
Hysteresis	%	≤ 4	
Manufacturing tolerance for p_{max}	%	≤ 10	
Response time 100 % signal change	ms	On 200	Response time at: $Q = 10$ l/min (values depend on the dead volume)
		Off < 250	

[1] The purity classes stated for the components must be complied with in hydraulic systems. Effective filtration prevents problems and also extends the service life of components. For a selection of filters, see catalog sheets RE 50070, RE 50076 and RE 50081.

[2] All characteristic values ascertained using amplifier 0 811 405 081 for the 0.8 A solenoid.

Valve with external trigger electronics (plug, RE 30264)

Circuit diagram/pin assignment



[1)] Version with 0...+10 V signal

[2)] Version with 4...20 mA signal

Connection/calibration

P1 – Ramp time

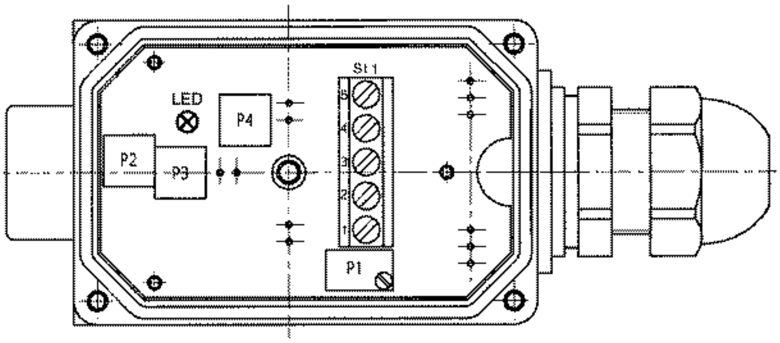
P2 – Sensitivity

P3 – Zero

P4 – Dither frequency

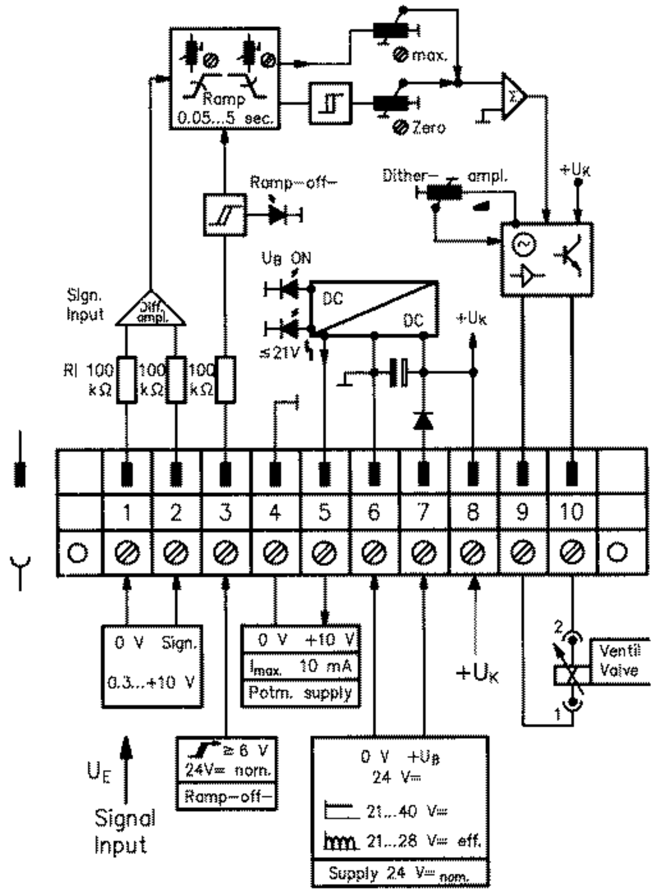
St1 – Terminal

LED – U_B display

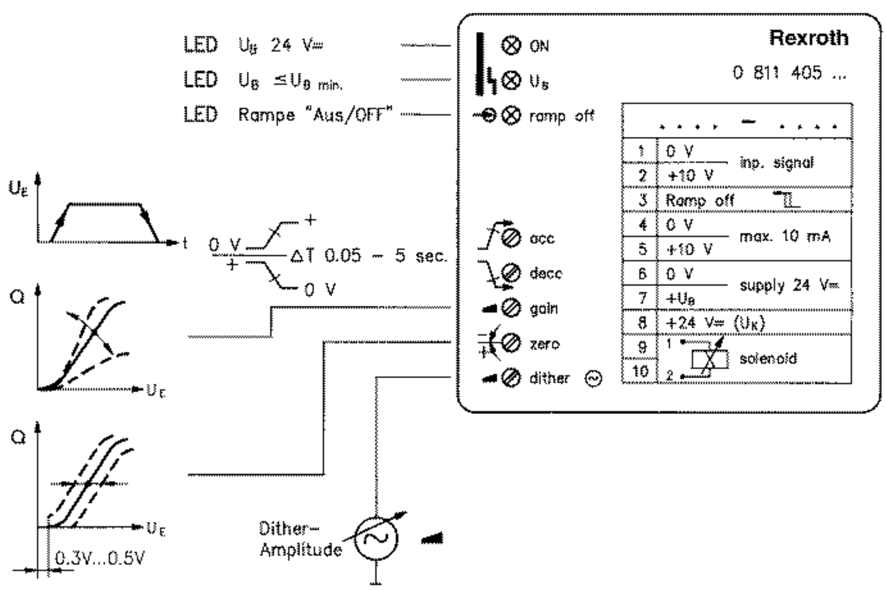


Valve with external trigger electronics (module, RE 30222)

Circuit diagram/pin assignment

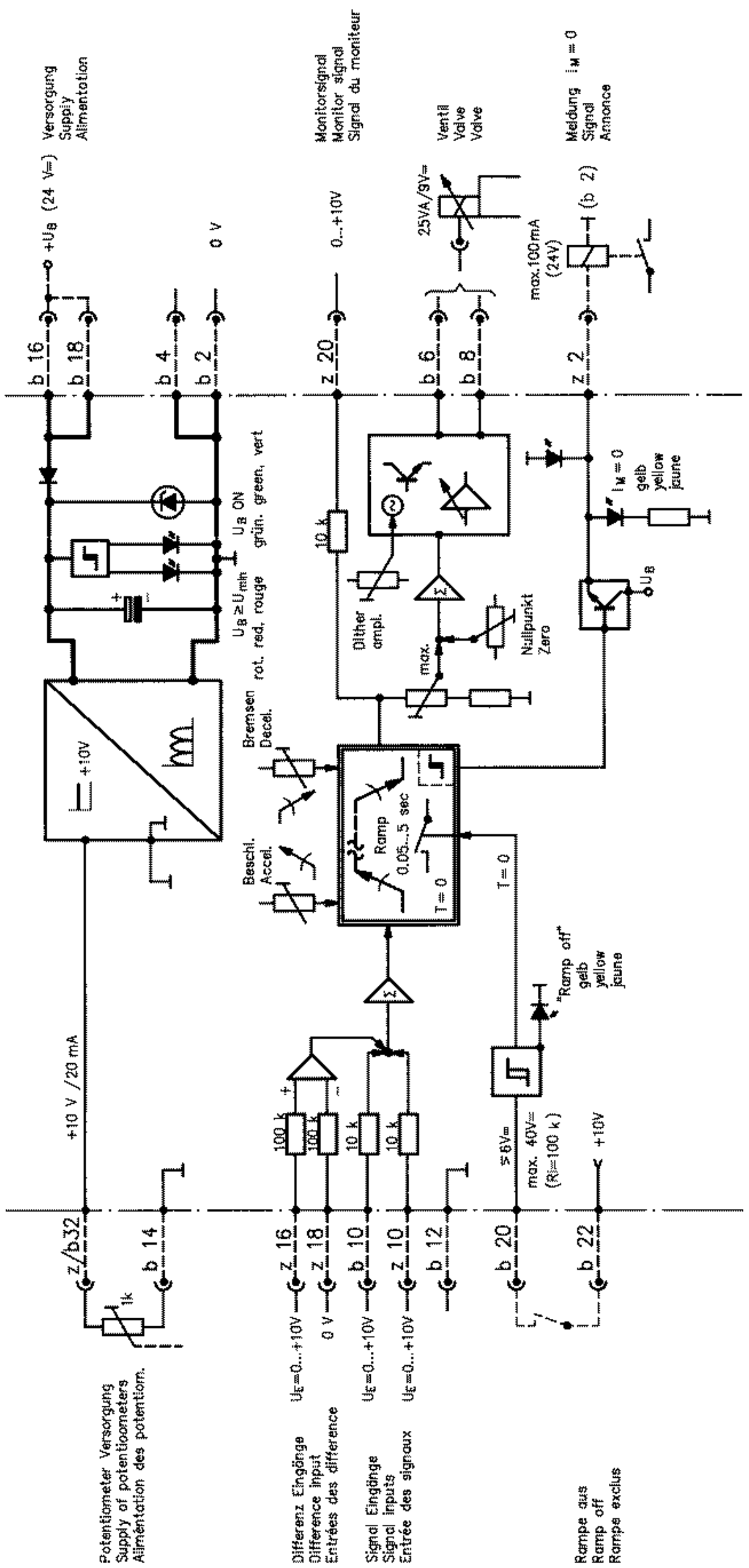


Front view/calibration



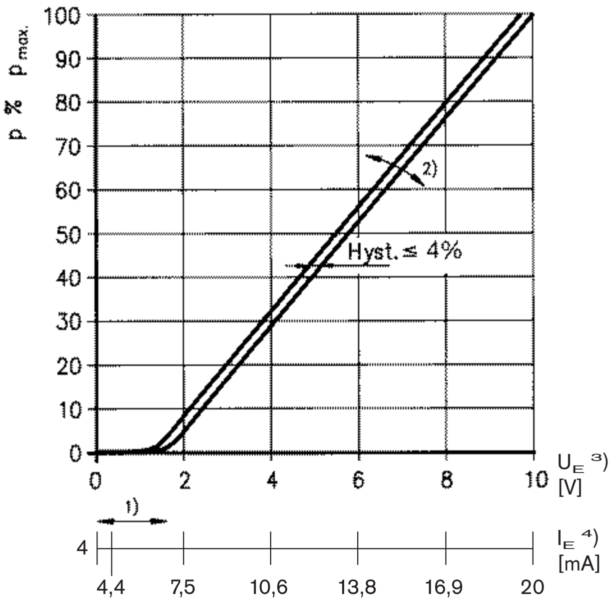
Valve with external trigger electronics (europe card, RE 30109)

Circuit diagram/pin assignment



Characteristic curves (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Pressure in port A as a function of the setpoint



Valve amplifier

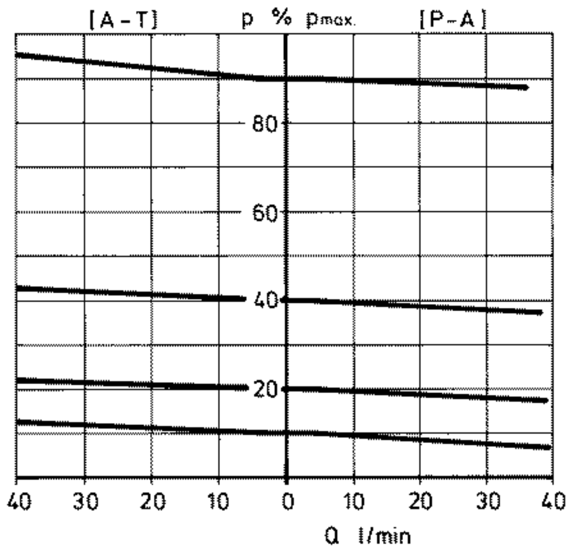
1) Zero adjustment

2) Sensitivity adjustment

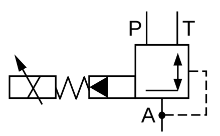
3) Version: $U_E = 0...+10$ V

4) Version: $I_E = 4...20$ mA

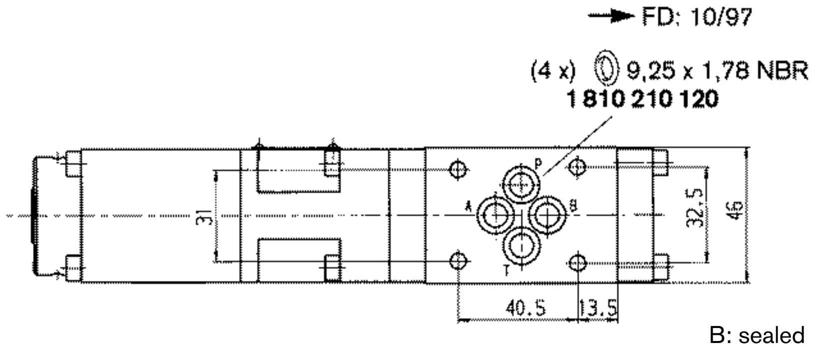
Pressure in port A proportionate to the maximum flow rate of the main stage

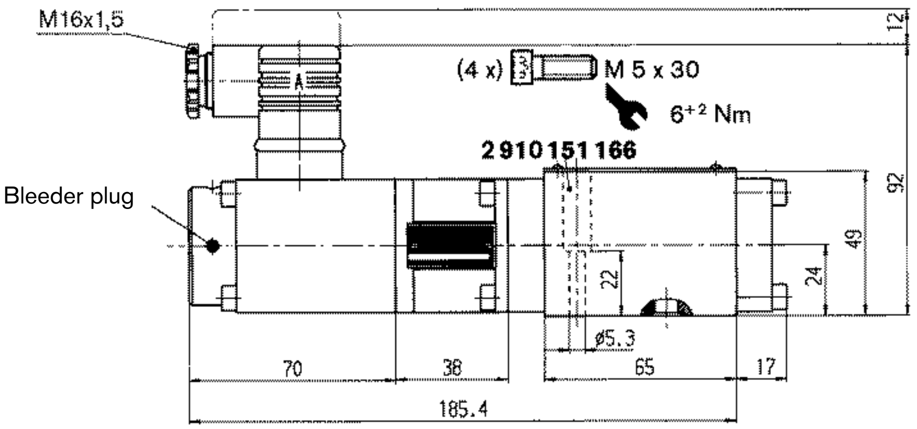


Set pressure
$p\ \%\ p_{max} = f\ (Q_{P-A}/Q_{A-T})$

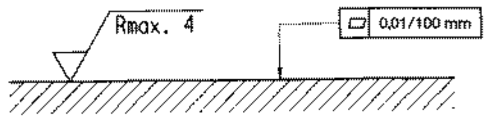


Unit dimensions (nominal dimensions in mm)

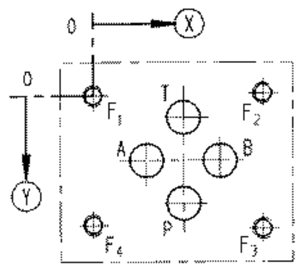




Required surface quality
of mating component



Mounting hole configuration: NG6 (ISO 4401-03-02-0-94)
For subplates see catalog sheet RE 45053



[1] Deviates from standard

[2] Thread depth:
Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

	P	A	T	B	F_1	F_2	F_3	F_4
Ⓧ	21.5	12.5	21.5	30.2	0	40.5	40.5	0
Ⓨ	25.9	15.5	5.1	15.5	0	–0.75	31.75	31
∅	8 [1]	8 [1]	8 [1]	8 [1]	M5 [2]	M5 [2]	M5 [2]	M5 [2]

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
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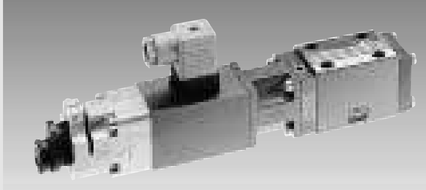
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Proportional pressure reducing valve, pilot operated, with inductive position transducer

Type DREB6X



Nominal size 6
Unit series 1X
Maximum working pressure P 315 bar, T 250 bar
Maximum flow rate 40 l/min

List of Contents

Features

– Pilot operated valves for reducing system pressure at the consumer (pilot oil internal only)
– 3-way version (P–A /A–T), $p_{min} = p_T$
– Adjustable through the position of the armature against the compression spring
– Position-controlled, minimal hysteresis < 1 %, rapid response times, see Technical data
– Pressure limitation to a safe level even with faulty electronics (solenoid current $I > I_{max}$)
– For subplate attachment, mounting hole configuration to ISO 4401-03-02-0-94
  Subplates as per catalog sheet RE 45053 (order separately)
– Plug-in connector to DIN 43650-AM2 for the solenoid and plug-in connector for the position transducer, included in scope of delivery
– Data for the external trigger electronics
  • $U_B = 24\ V_{nom}$ DC
  • Adjustment of valve curve Np and gain with and without ramp generator
  • Europe card format, setpoint 0...+10 V (order separately)

Ordering data

DREB6	X	–	1X	/		M	G24	–	25	Z4	M	*

Proportional 3-way pressure reducing valve with inductive position transducer, NG6, pilot operated

Mounting hole configuration to ISO 4401-03-02-0-94 **= X**

Unit series 10 to 19 (10 to 19: installation and connection dimensions unchanged) **= 1X**

Max. pressure stage

up to 75 bar **= 75**
up to 175 bar **= 175**
up to 310 bar **= 310**

Without non-return valve **= M**

Voltage supply of trigger electronics 24 V DC **= G24**

Further information in plain text

M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

Z4 = Electrical connection
Unit plug to DIN 43650-AM2
Plug-in connector included in scope of delivery

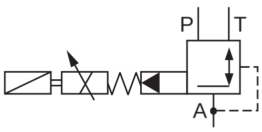
Solenoid type (current)
25 = Solenoid current 2.5 A max.

Preferred types

Solenoid 2.5 A	
Type	**Material Number**
DREB6X–1X/75MG24–25Z4M	0 811 402 050
DREB6X–1X/175MG24–25Z4M	0 811 402 051
DREB6X–1X/310MG24–25Z4M	0 811 402 052

Symbol

For external trigger electronics



Function, sectional diagram

General

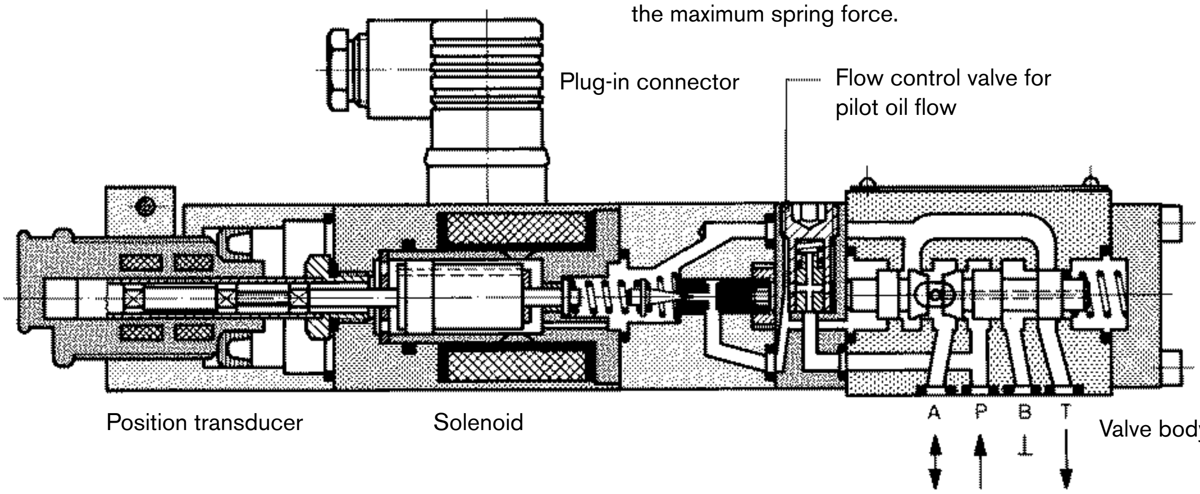
Type DREB6X proportional pressure reducing valves are pilot operated, with a 3-way main stage.
The pilot valve (pressure relief valve pilot stage) is supplied internally with a controlled flow of pilot oil via P.
The valves are actuated by a proportional solenoid, which is position-controlled against a spring. This ensures rapid response times and minimal hysteresis.
With these valves, the pressure in A (consumer) can be infinitely adjusted and reduced in relation to the solenoid current.

Basic principle

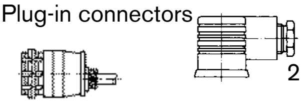
To adjust the system pressure in A, a setpoint is set in the trigger electronics. Based on this setpoint, the electronics control the solenoid coil with regulated PWM (pulse-width-modulated) current.
The proportional solenoid is positioned precisely on the spring characteristic curve. The pilot stage is supplied with oil from P at a flow rate of $<$ 0.6 l/min via a flow control valve. The pilot pressure is compared with the consumer pressure (plus spring) in A and regulated (P–A/A–T).
The spring results in $p_{\text{Amin}} = p$ in T.

Pressure limitation for maximum safety

If a fault occurs in the electronics, so that the solenoid current (I_{max}) would exceed its specified level in an uncontrolled manner, the pressure cannot rise above the level determined by the maximum spring force.



Accessories

Type				Material Number
(4 x) ISO 4762-M5x30-10.9	Cheese-head bolts			2 910 151 166
Europe card 	VT-VRPA1-527-10/V0/PV	RE 30052		0 811 405 096
Europe card 	VT-VRPA1-527-10/V0/PV-RTP	RE 30054		0 811 405 101
Europe card 	VT-VRPA1-527-10/V0/PV-RTS	RE 30056		0 811 405 176
Plug-in connectors  2P+PE	Plug-in connector 2P+PE (M16x1.5) for the solenoid and plug-in connector for the position transducer, included in scope of delivery, see also RE 08008			

Testing and service equipment

Test box type VT-PE-TB1, see RE 30063
Test adapter for Europe cards type VT-PA-3, see RE 30070

Technical data

General				
Construction	Pilot stage	Poppet valve		
	Main stage	Spool valve		
Actuation		Proportional solenoid with position control, external amplifier		
Connection type		Subplate, mounting hole configuration NG6 (ISO 4401-03-02-0-94)		
Mounting position		Optional		
Ambient temperature range	°C	–20...+50		
Weight	kg	2.4		
Vibration resistance, test condition		max. 25 g, shaken in 3 dimensions (24 h)		

Hydraulic (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)					
Pressure fluid			Hydraulic oil to DIN 51524...535, other fluids after prior consultation		
Viscosity range	recommended	mm^2/s	20...100		
	max. permitted	mm^2/s	10...800		
Pressure fluid temperature range		°C	–20...+80		
Maximum permitted degree of contamination of pressure fluid Purity class to ISO 4406 (c)			Class 18/16/13 [1]		
Direction of flow			See symbol		
Max. set pressure in A (at $Q_{min} = 1$ l/min)		bar	75	175	310
Minimum pressure in A		bar	0 (relative) or pressure in T		
Min. inlet pressure in P		bar	$p_P = p_A + \geq 5$		
Max. working pressure		bar	Port P: 315		
Max. pressure		bar	Port T: 250 (B sealed)		
Internal pilot oil flow		l/min	approx. 0.6 (with closed-loop control)		
Max. flow		l/min	40		

Electrical		
Cyclic duration factor	%	100
Degree of protection		IP 65 to DIN 40050 and IEC 14434/5
Solenoid connection		Unit plug DIN 43650/ISO 4400, M16 x 1.5 (2P+PE)
Position transducer connection		Special plug
Max. solenoid current	I_{max}	2.5 A
Coil resistance R_{20}	Ω	3
Max. power consumption at 100% load and operating temperature	VA	30

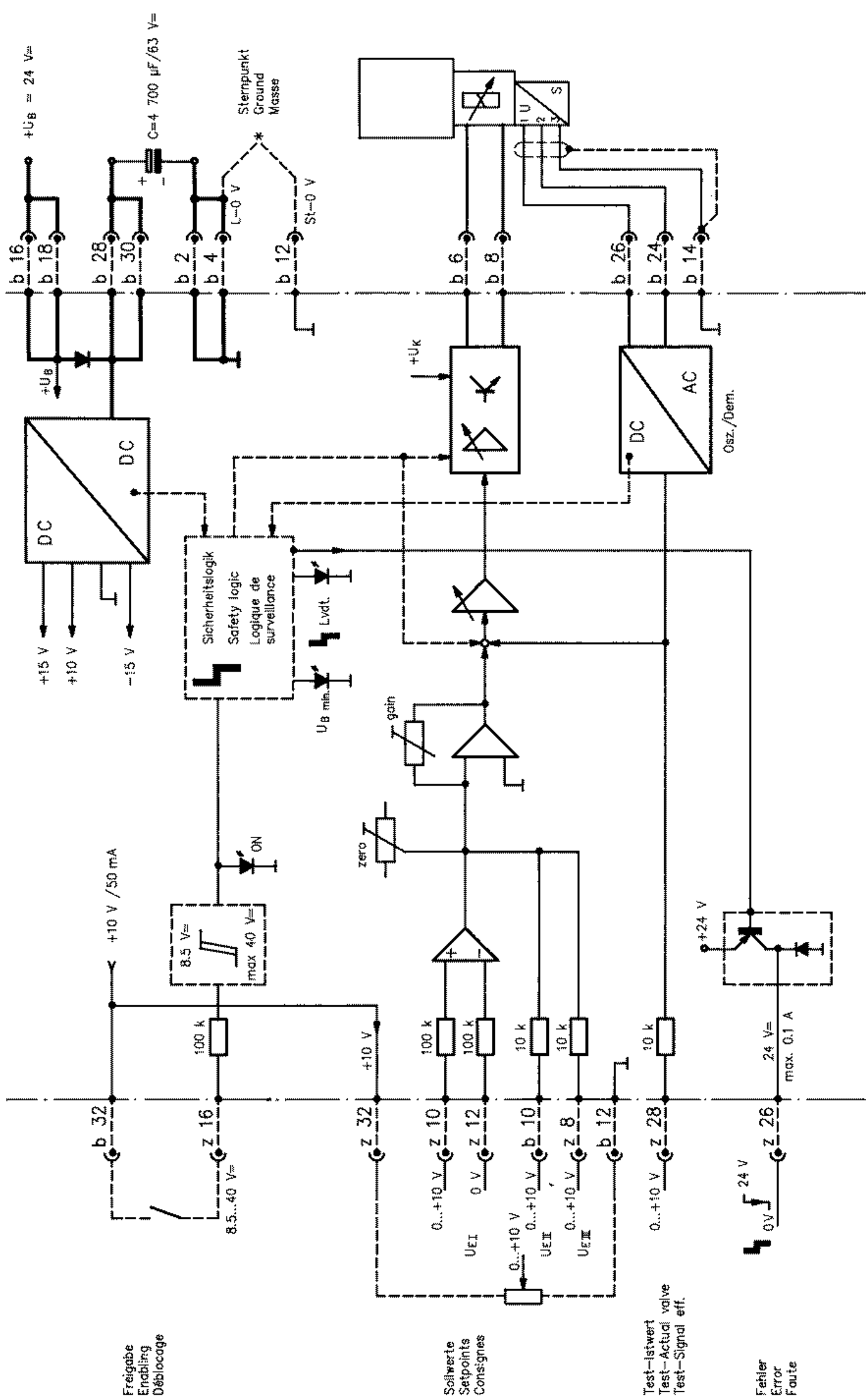
Static/Dynamic [2]			
Hysteresis	%	≤ 1	
Manufacturing tolerance for p_{max}	%	≤ 10	
Response time 100 % signal change	ms	On <50	Response time at: $Q = 10$ l/min (values depend on the dead volume)
		Off <20	

[1] The purity classes stated for the components must be complied with in hydraulic systems. Effective filtration prevents problems and also extends the service life of components. For a selection of filters, see catalog sheets RE 50070, RE 50076 and RE 50081.

[2] All characteristic values ascertained using amplifier 0 811 405 096 (without ramp).

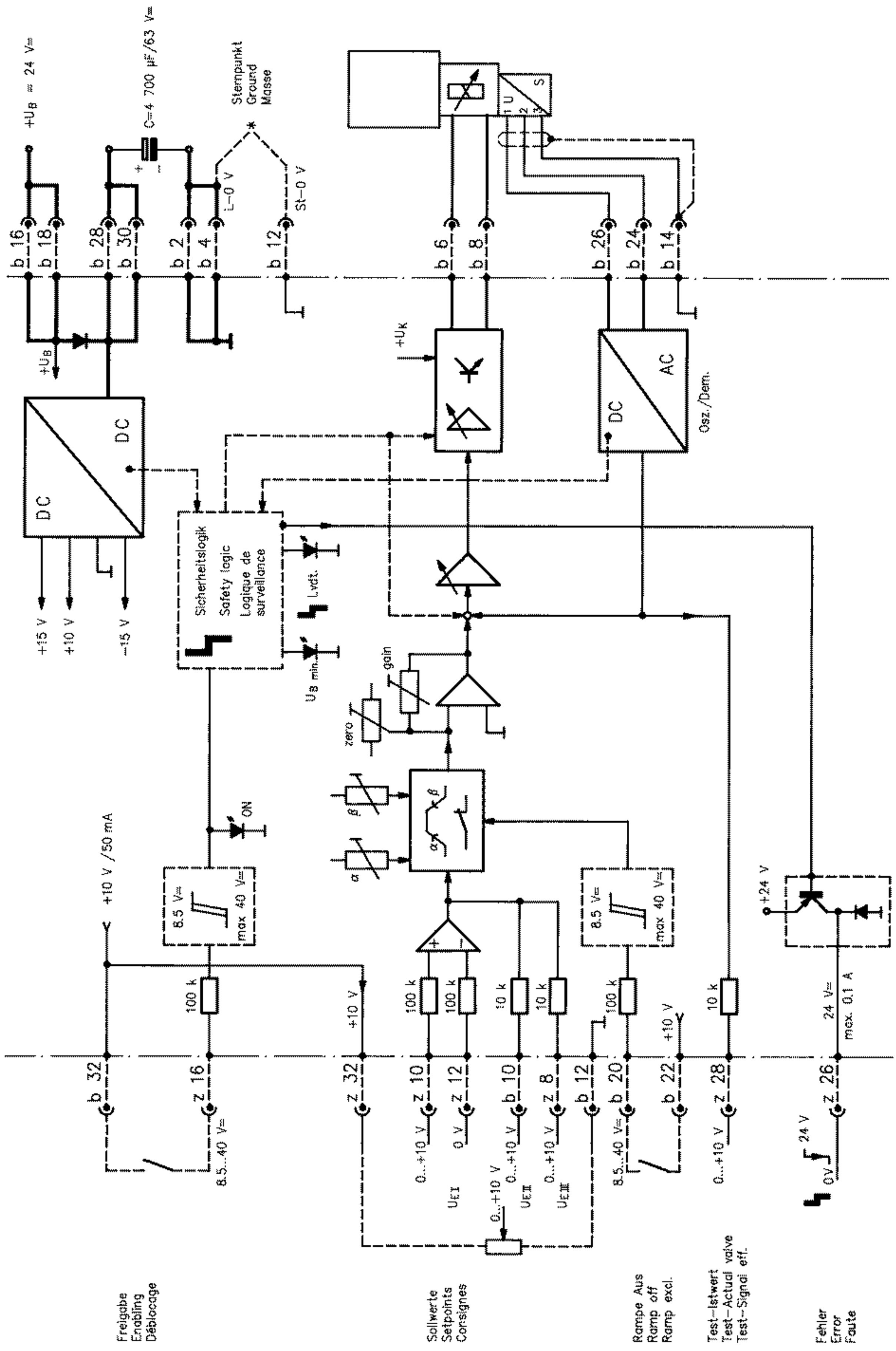
Valve with external trigger electronics (europe card without ramp, RE 30052)

Circuit diagram/pin assignment



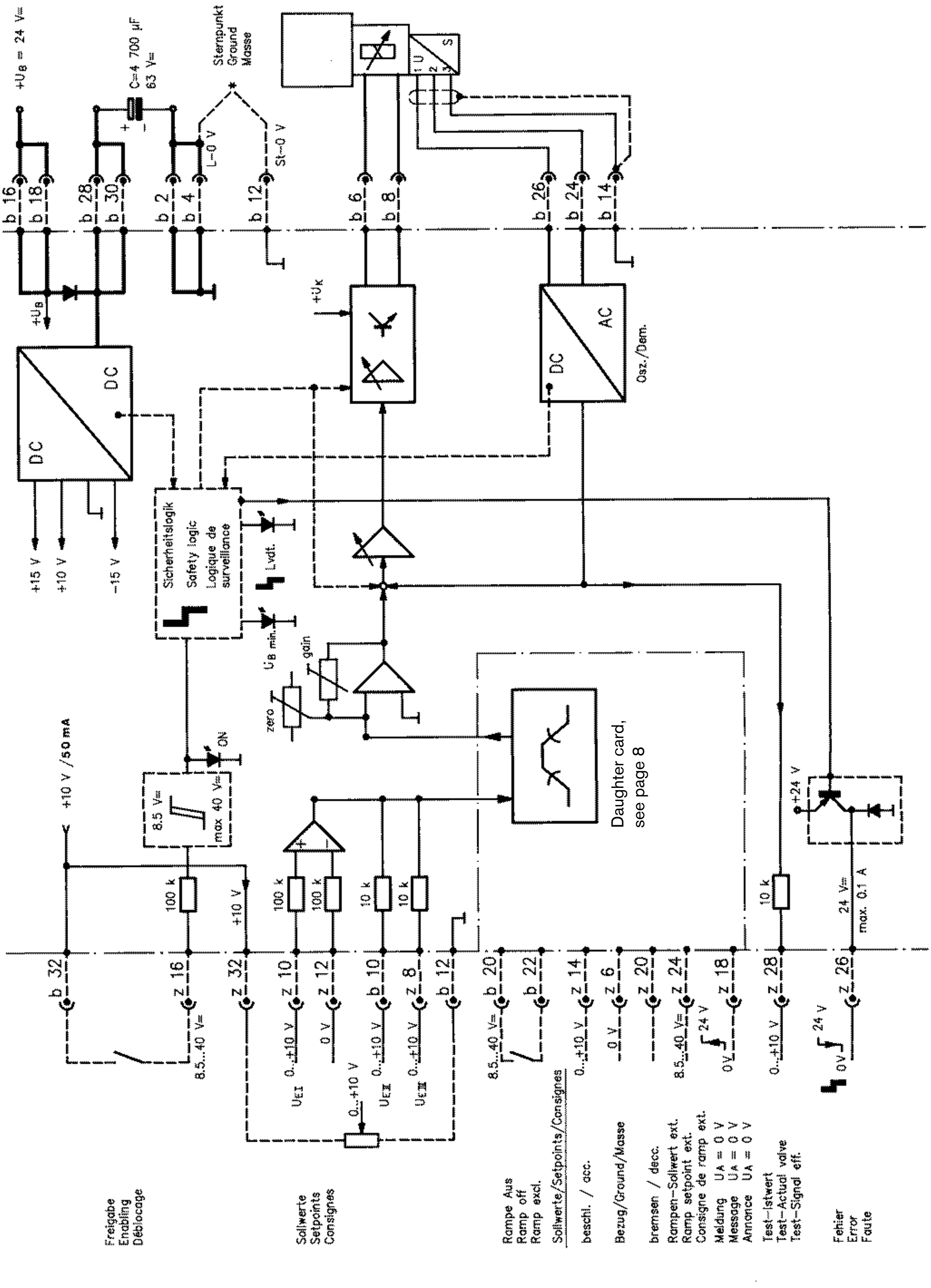
Valve with external trigger electronics (europe card without ramp, RE 30054)

Circuit diagram/pin assignment



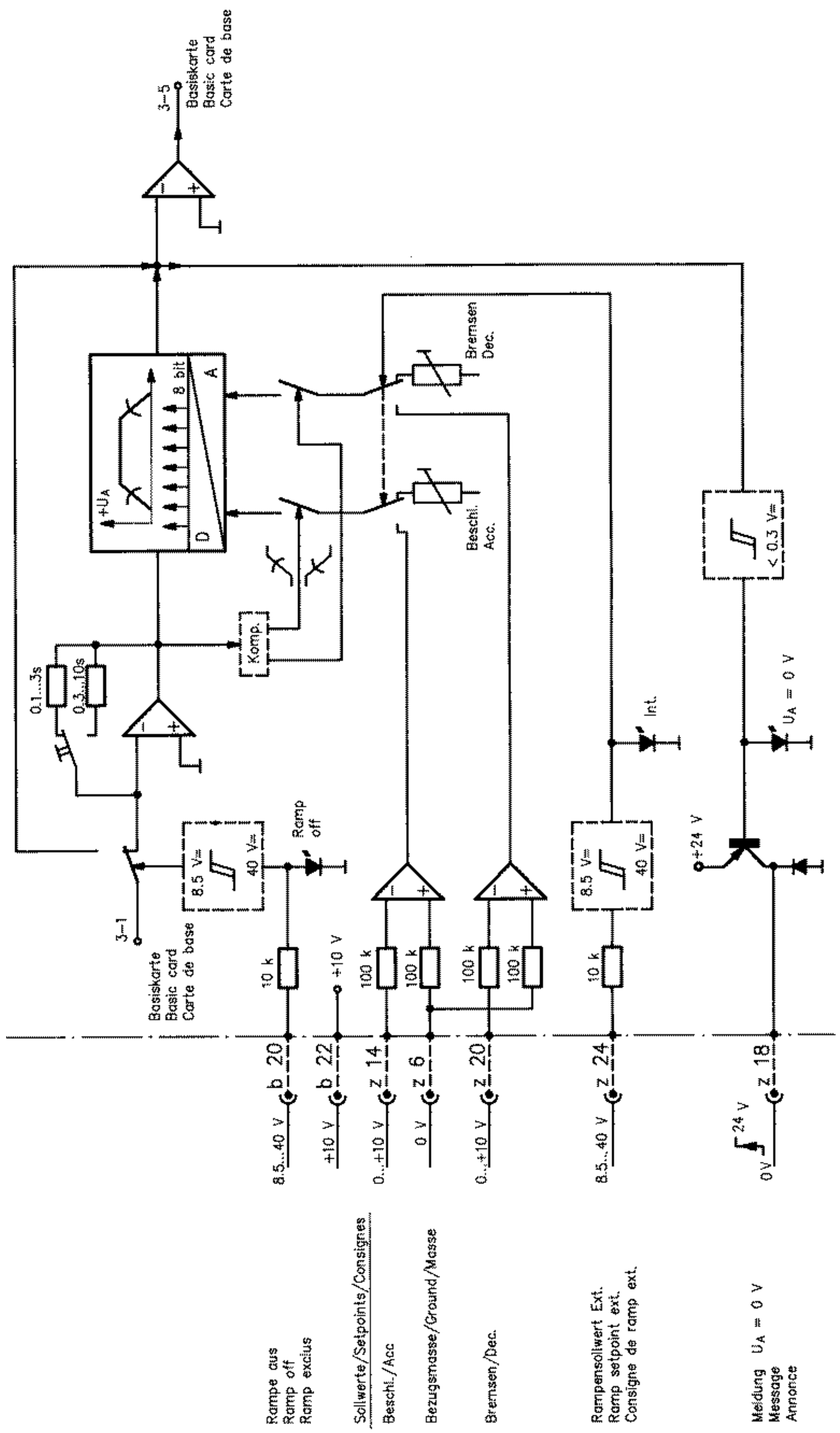
Valve with external trigger electronics (europe card without ramp, RE 30056)

Circuit diagram/pin assignment



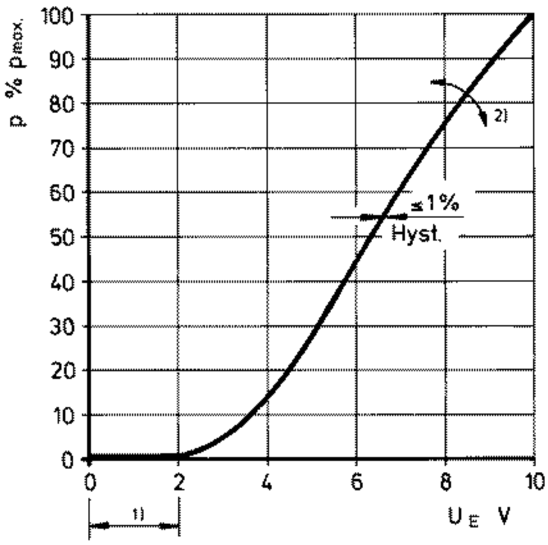
Valve with external trigger electronics (europe card without ramp, RE 30056)

Circuit diagram/pin assignment **Daughter card**



Characteristic curves (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Pressure in port A as a function of the setpoint

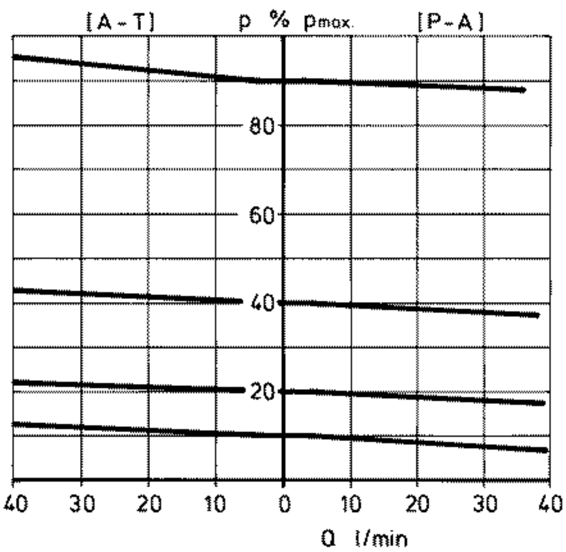


Valve amplifier

1) Zero adjustment

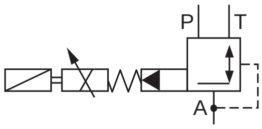
2) Sensitivity adjustment

Pressure in port A proportionate to the maximum flow rate of the main stage

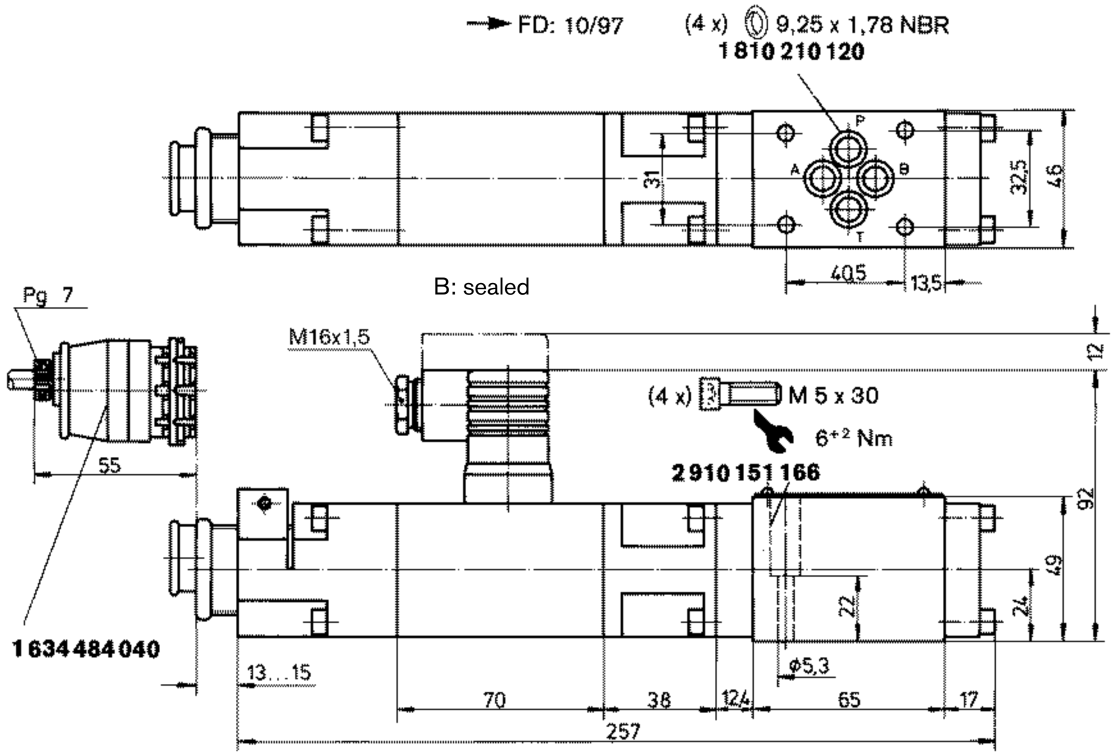


Set pressure

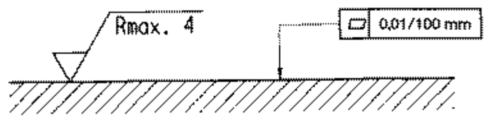
$p\%\ p_{max} = f\ (Q_{P-A}/Q_{A-T})$



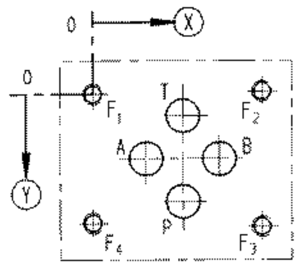
Unit dimensions (nominal dimensions in mm)



Required surface quality of mating component



Mounting hole configuration: NG6 (ISO 4401-03-02-0-94)
For subplates, see catalog sheet RE 45053



1) Deviates from standard
2) Thread depth:
Ferrous metal 1.5 x Ø
Non-ferrous 2 x Ø

	P	A	T	B	F_1	F_2	F_3	F_4
X	21.5	12.5	21.5	30.2	0	40.5	40.5	0
Y	25.9	15.5	5.1	15.5	0	–0.75	31.75	31
Ø	8 1)	8 1)	8 1)	8 1)	M5 2)	M5 2)	M5 2)	M5 2)

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Notes

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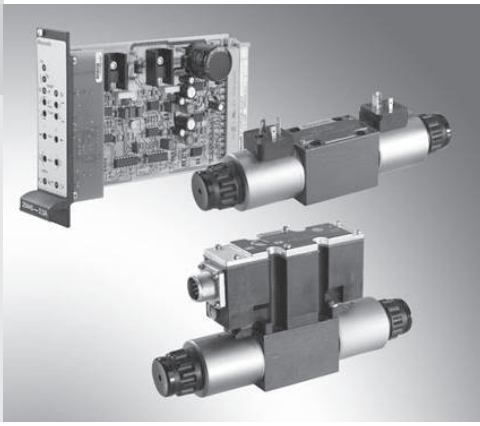
Proportional pressure reducing valve, in 3-way version

RE 29184/06.11
Replaces: 12.02

Type 3DREP and 3DREPE



Size 6
Component series 2X
Maximum operating pressure 100 bar
Maximum flow 15 l/min

Table of contents

Features

– Direct operated proportional valves for controlling a pressure and the direction of a flow
– Operation by means of proportional solenoids with central thread and detachable coil
– Subplate mounting:
  Porting pattern according to ISO 4401
– Manual override, optional
– Spring-centered control spool
– Type 3DREPE with integrated control electronics
– External control electronics for type 3DREP:
  - Analog amplifiers type VT-VSPA2-1-2X/… in Eurocard format (separate order), see page 5
  - Digital amplifier type VT-VSPD-1-1X/… in Eurocard format (separate order), see page 5
  - Electric amplifier type VT 11118 in modular design (separate order), see page 5

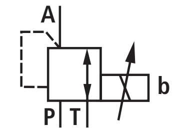
Ordering code

3DREP		6	–2X/		E	G24			/		*

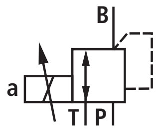
For **external** control electronics = **No code**
With **integrated** control electronics = **E**

Size
Size 6 = **6**

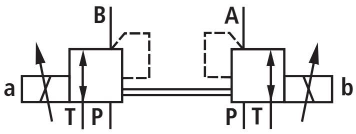
Symbols (simplified)



= **A**



= **B**



= **C**

Component series 20 to 29 = **2X**
(20 to 29: Unchanged installation and connection dimensions)

Pressure rating
16 bar = **16**
25 bar = **25**
45 bar = **45**

Further details in the plain text

Seal material
M = NBR seals
V = FKM seals

No code = For DREP
For DREPE
A1 = Command value/ actual value ±10 V
F1 = Command value/ actual value 4 to 20 mA

Electrical connection for DREP
K4 = 1) **Without** mating connectors, with connector according to DIN EN 175 301-803
Mating connectors - separate order see page 7

For DREPE
K31 = 1) **Without** mating connectors, with connector according to DIN EN 175 301-804
Mating connectors - separate order see page 7

No code = Without special type of protection
J = 2) Sea water-resistant

No code = Without manual override
N9 = 3) With concealed manual override

Supply voltage
G24 = +24 V direct voltage

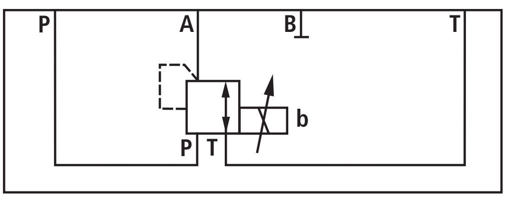
E = Proportional solenoid with detachable coil

1) With version "J" = sea water-resistant only specify "K31"
2) Only with version 3DREP6
3) With version "J" = "N" instead of "N9"

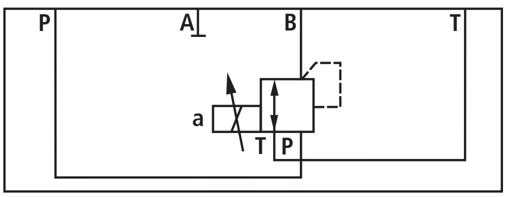
Electric special types of protection on request!

Symbols

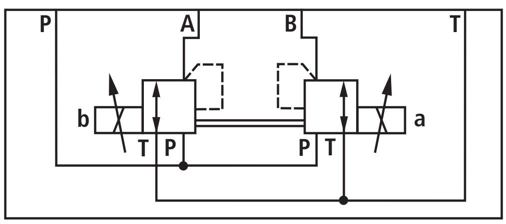
Type 3DREP..6 **A** 2X/..E (detailed)



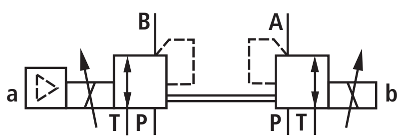
Type 3DREP..6 **B** 2X/..E (detailed)



Type 3DREP..6 **C** 2X/..E (detailed)



Example of valve with integrated control electronics
Type 3DREP**E**..6 **C** 2X/..E (simplified)



Function, section

The 3-way pressure reducing valve type 3 DREP 6.. is direct operated by proportional solenoids. It is used to convert an electric input signal into a proportional pressure output signal. The proportional solenoids are controllable wet-pin DC solenoids with central thread and detachable coil. The solenoids are optionally actuated by external control electronics (type 3DREP) or by the internal control electronics (type 3DREPE).

Set-up:

The valve basically consists of:

– Housing (1) with connection surface
– Control spool (2) with pressure measuring spool (3, 4)
– Solenoids (5, 6) with central thread
– Optionally integrated control electronics (7)

Function:

The pressure in A or B is set by means of the proportional solenoids. The amount of the pressure depends on the current. With de-energized solenoids (5, 6), the control spool (2) is held in the central position by means of the pressure springs (8). Ports A and B are connected with T so that the hydraulic fluid can flow off to the tank without obstructions.

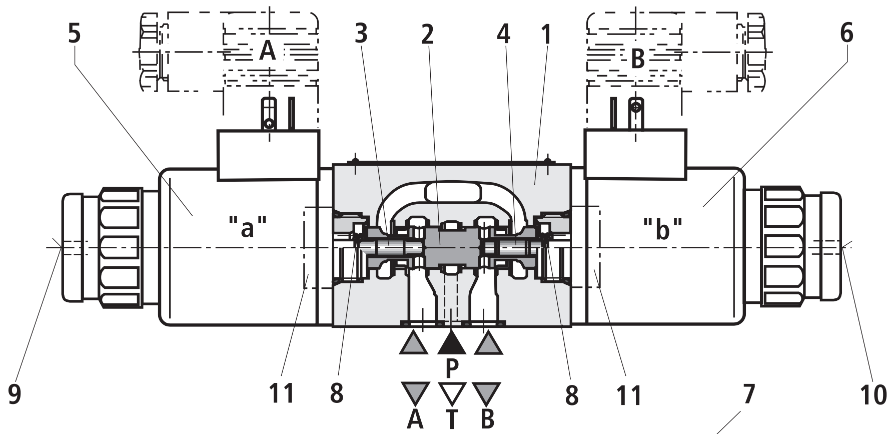
By energizing a proportional solenoid e.g. solenoid "a" (5), the pressure measuring spool (3) and with it the control spool (2) are moved to the right. This opens the connection from P to B and A to T via orifice-type cross-sections with progressive flow characteristic. The pressure that builds up in channel B acts with the surface of the pressure measuring spool (4) on the control spool and against the solenoid force. The pressure measuring spool (4) is supported by the solenoid "b". If the pressure exceeds the value set at solenoid "a", the control spool (2) is pushed back against the solenoid force and connects B with T until the set pressure is achieved again. The pressure is proportional to the solenoid current.

After shut-down of the solenoid, the control spool (2) is returned into the central position by the compression springs (8). An optional hand override (9, 10) allows for the displacement of the control spool (2) without solenoid energization.

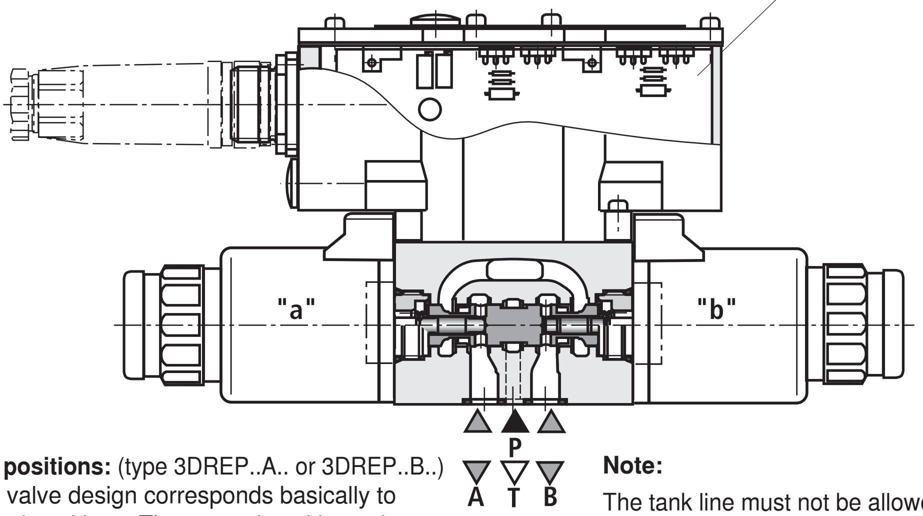
☞ **Note:**

The unwanted activation of the hand override may lead to uncontrolled machine movements!

Type 3DREP 6..



Type 3DREPE 6..



Valve with 2 spool positions: (type 3DREP..A.. or 3DREP..B..) The function of this valve design corresponds basically to the valve with 3 spool positions. The 2 spool position valves are, however, only equipped with solenoid "a" (5) or solenoid "b" (6). Instead of the 2nd proportional solenoid, there is a plug screw (11).

Note:

The tank line must not be allowed to run empty. With corresponding installation conditions, a pre-charge valve (pre-charging pressure approx. 2 bar) must be installed.

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

general

Valve type		3DREP	3DREPE
Weight	kg	2.0	2.2
Installation position		Any, preferably horizontal	
Storage temperature range	°C	–20 to +80	
Ambient temperature range	°C	–20 to +70	–20 to +50

hydraulic (measured with HLP 32, ϑ_{oil} = 40 °C ± 5 °C)

Operating pressure range	Port P	bar	20 to 100 for pressure rating 16
		bar	30 to 100 for pressure rating 25
		bar	50 to 100 for pressure rating 45
	Port T	bar	0 to 30
Maximum flow		l/min	15 (Δp = 50 bar)
Hydraulic fluid			See table below
Hydraulic fluid temperature range (at the valve working ports)		°C	–20 to +80, preferably +40 to +50
Viscosity range		mm²/s	20 to 380, preferably 30 to 46
Maximum admissible degree of contamination of the hydraulic fluid cleanliness class according to ISO 4406 (c)			Class 17/15/12 [1)]
Hysteresis		%	≤ 5
Repeatability		%	≤ 1
Response sensitivity		%	≤ 0.5
Range of inversion		%	≤ 1

[1)] 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 service life of the components.

For the selection of the filters see www.boschrexroth.com/filter

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP	NBR, FKM	DIN 51524
Flame-resistant	– Water-containing	HFC	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 or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, service life, maintenance intervals, etc.)!
- The flash point of the process and operating medium used must be 40 K higher than the maximum solenoid surface temperature.
- **Flame-resistant – water-containing**: Maximum pressure differential per control edge 175 bar, otherwise, increased cavitation erosion!
  Tank pre-loading < 1 bar or > 20 % of the pressure differential. The pressure peaks should not exceed the maximum operating pressures!

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

electric

Valve type			3DREP	3DREPE
Voltage type			Direct voltage	
Type of signal			Analog	
Command value signal	Voltage input "A1"	V	-	±10
	Current input "F1"	mA		4 to 20
Maximum current per solenoid		A	1.5	2.5
Solenoid coil resistance	Cold value at 20 °C	Ω	5.2	2.15
	Maximum hot value	Ω	7.6	3.3
Duty cycle		%	100	
Maximum coil temperature [1]		°C	up to 150	
Protection class according DIN EN 60529/VDE 0470 part 1			IP 65 with mating connector mounted and locked	

[1] Due to the temperatures occurring at the surfaces of the solenoid coils, the European standards ISO 13732-1 and EN 982 need to be adhered to!

Control electronics

For 3DREP	Digital amplifier in Eurocard format [1]		VT-VSPD-1-2X/... according to data sheet 30523
	Analog amplifier in Eurocard format [1]		VT-VSPA2-1-2X/… according to data sheet 30110
	Analog module amplifier [1]		VT11118-1X/... according to data sheet 30218
For 3DREPE			Integrated in the valve, see page 8
	Analog command value module		VT- SWMA-1-1X/... according to data sheet 29902
	Analog command value module		VT-SWMKA-1-1X/... according to data sheet 29903
	Digital command value card		VT-HACD-1-1X/… according to data sheet 30143
	Analog command value card		VT-SWKA-1-1X/... according to data sheet 30255
Supply voltage 3DREPE, 3DREP [2]	Nominal voltage	VDC	24
	Lower limit value	V	19
	Upper limit value	V	35
Current consumption of the amplifier	I_{max}	A	1.8
	Maximum impulse current	A	3

[1] Separate order

[2] With Bosch Rexroth AG control electronics

Note: Information on the **environment simulation testing** for the areas EMC (electromagnetic compatibility), climate and mechanical load see RE 29055-U (declaration on environmental compatibility).

Block diagram of the integrated electronics (OBE) for type 3DREPE

Device connector allocation	Contact	Signal with A1	Signal with F1
Supply voltage	A	24 VDC ($\boldsymbol{u}$(t) = 19.4 to 35 V); $\boldsymbol{I}_{max}$ = 2 A	
	B	0 V	
Reference (actual value)	C	Cannot be used [1]	
Differential amplifier input	D	±10 V; $\boldsymbol{R}_e$ > 50 kΩ	4 to 20 mA; $\boldsymbol{R}_e$ > 100 Ω
(command value)	E	Reference potential command value	
	F	Cannot be used [1]	
	PE	Connected to cooling element and valve housing	

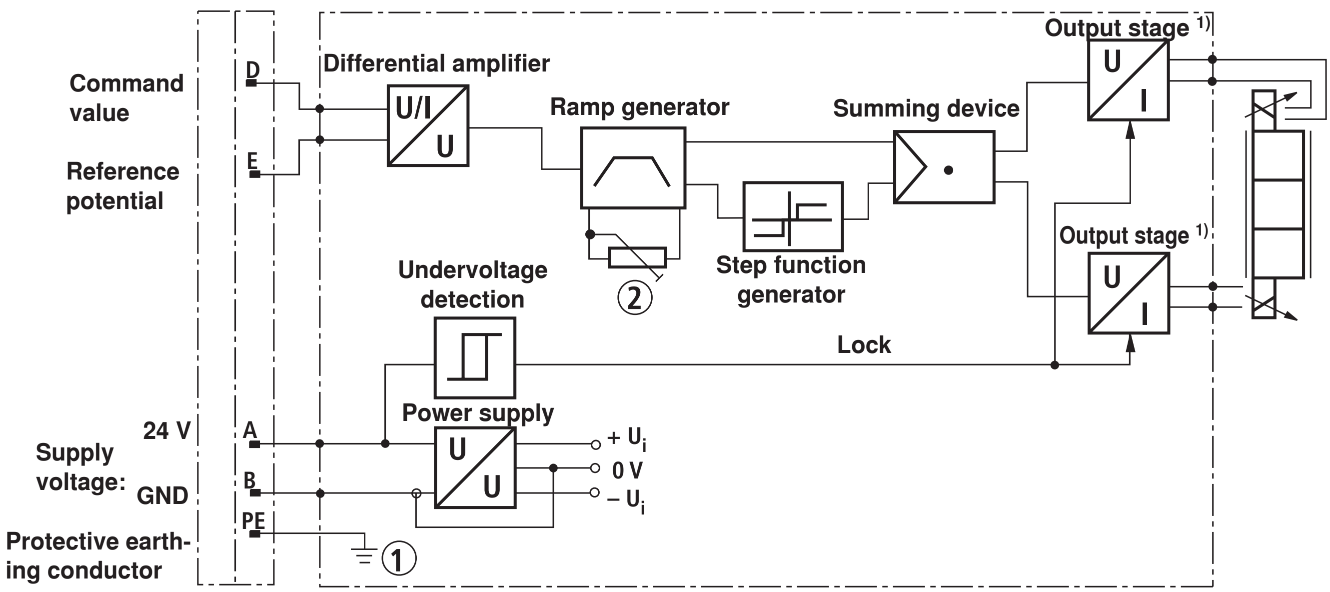
[1] Slots C and F must not be connected!

Command value: Reference potential at E and positive command value (or 12 to 20 mA) at D result in pressure in A.
Reference potential at E and negative command value (or 12 to 4 mA) at D result in pressure in B.
With valves with 1 solenoid on side b (design A):
Reference potential at E and positive command value at D (4 to 20 mA) result in pressure in A.
With valves with 1 solenoid on side a (design B):
Reference potential at E and positive command value at D (4 to 20 mA) result in pressure in B.

Connection cable: Recommendation:
– Up to 25 m line length: Type LiYCY 5 x 0.75 mm^2
– Up to 50 m line length: Type LiYCY 5 x 1.0 mm^2

External diameter 6.5 to 11 mm
Connect shield on PE only on the supply side.

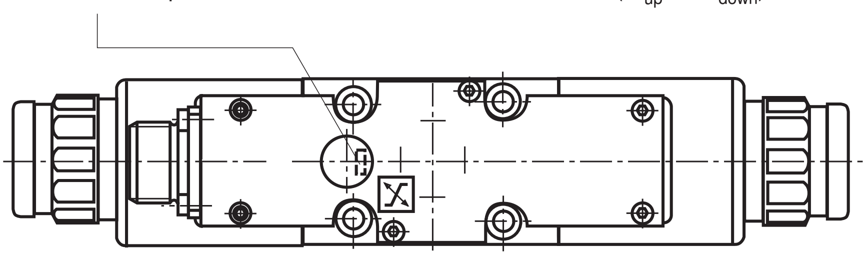
Interface	Integrated control electronics	Valve



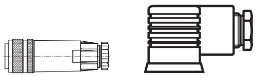
[1] Output stages current-controlled

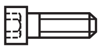
1 Protective earthing conductor screwed to valve housing and cover

2 Ramp can be set from 0 to 5 s from the outside ($T_{up} \triangleq T_{down}$)



Accessories (not included in scope of delivery)

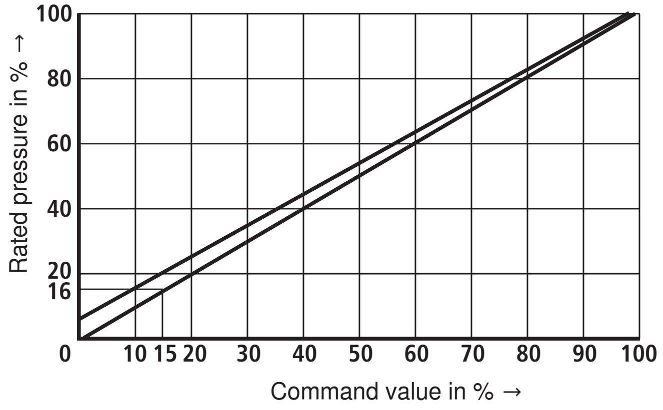
Mating connectors			**Material number**
Mating connector for		Solenoid **a**, color gray	R900074683
3DREP	DIN EN 175301-803	Solenoid **b**, color black	R900074684
Mating connector for			e.g. R900021267 (plastic)
3DREPE and **3DREPE...J...**	DIN EN 175201-804		e.g. R900223890 (metal)
			e.g. R900217845 (plastic 90°)
Mating connector for			
3DREP...J...	DIN EN 175201-804		R900021267 (plastic)

Hexagon socket head cap screws		**Material number**
Size 6	4 x ISO 4762 - M5 x 50 - 10.9 Tightening torque M_A = 8.9 Nm ±10 %	

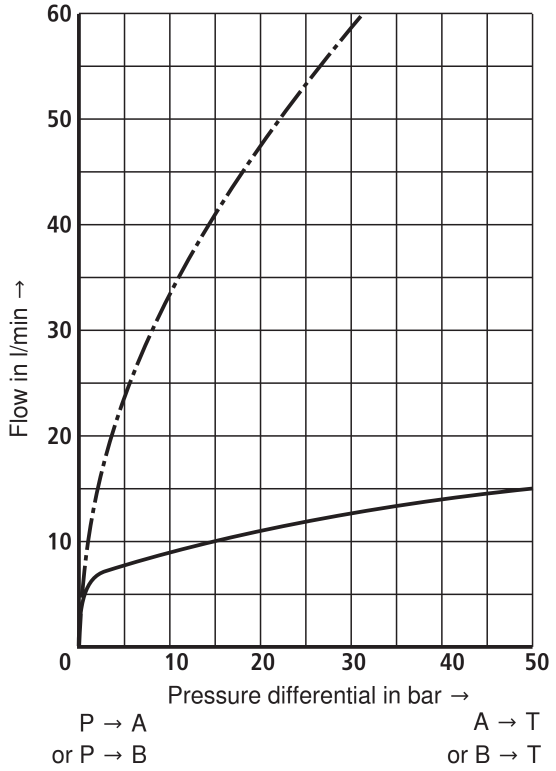
Subplates	**Data sheet**
Size 6	45052

Characteristic curves (measured with HLP 46, ϑ_{oil} = 40 °C ± 5 °C and p = 100 bar)

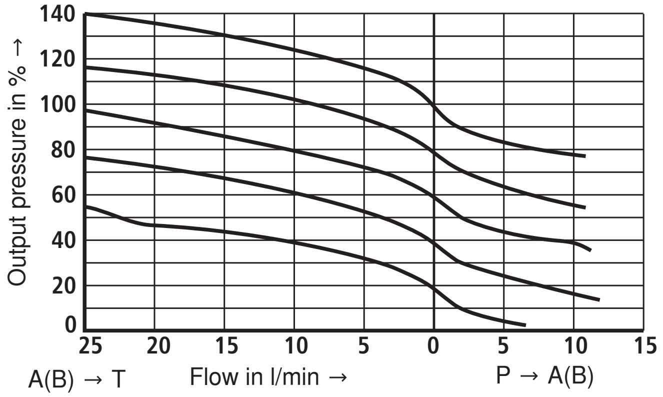
Pressure rating 16, 25 and 45 bar



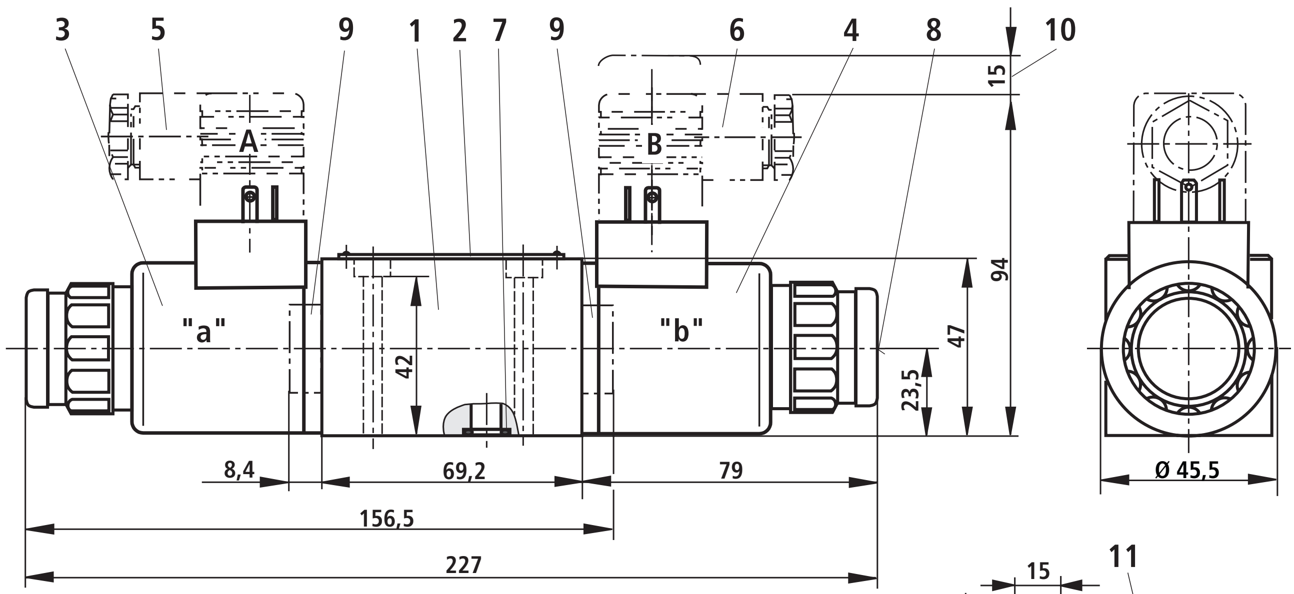
Pressure rating 16, 25 and 45 bar

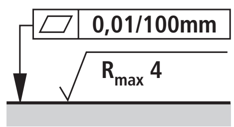


Pressure/flow dependency



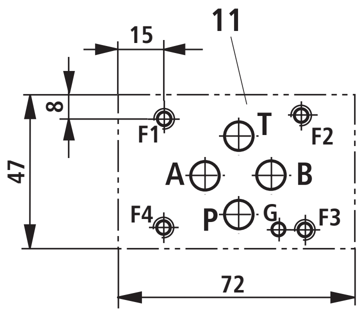
Unit dimensions: Type 3DREP (dimensions in mm)





Required surface quality of the valve mounting face

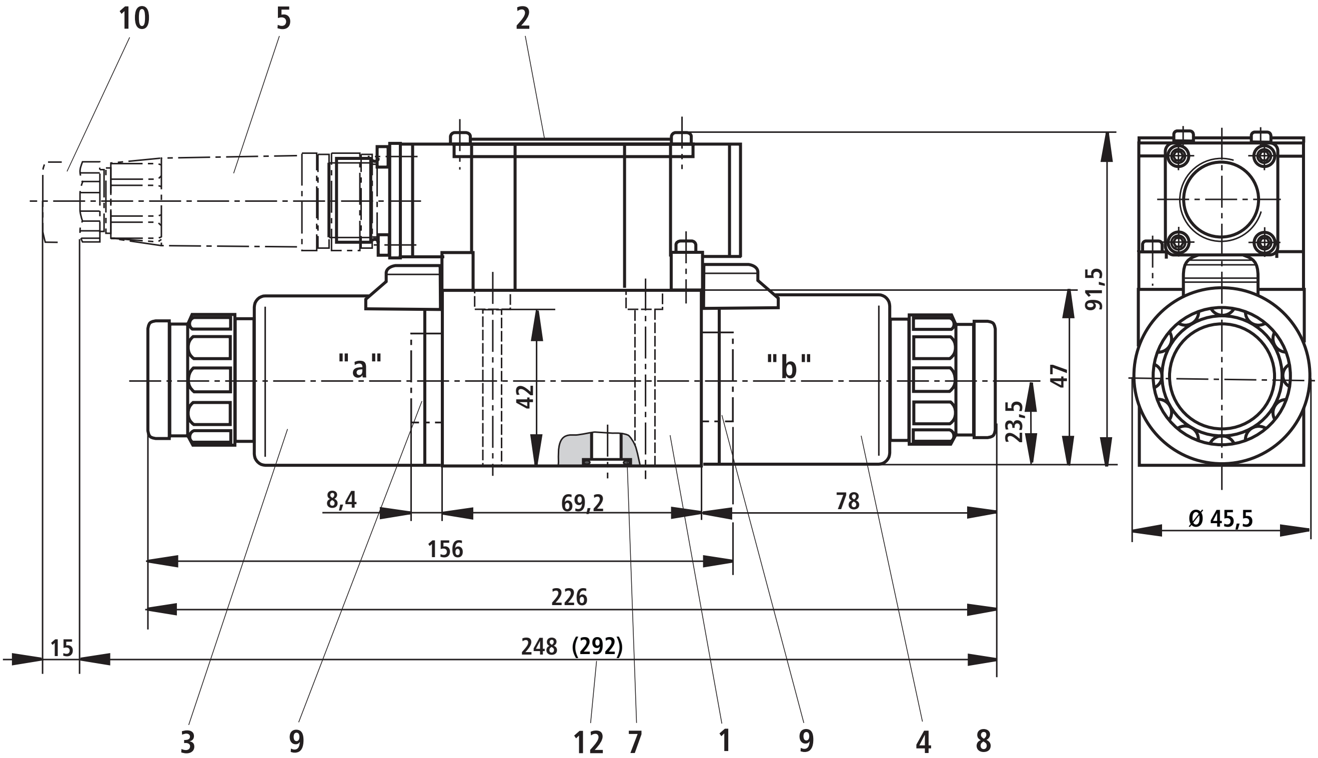
General tolerances according to ISO 2768-mK

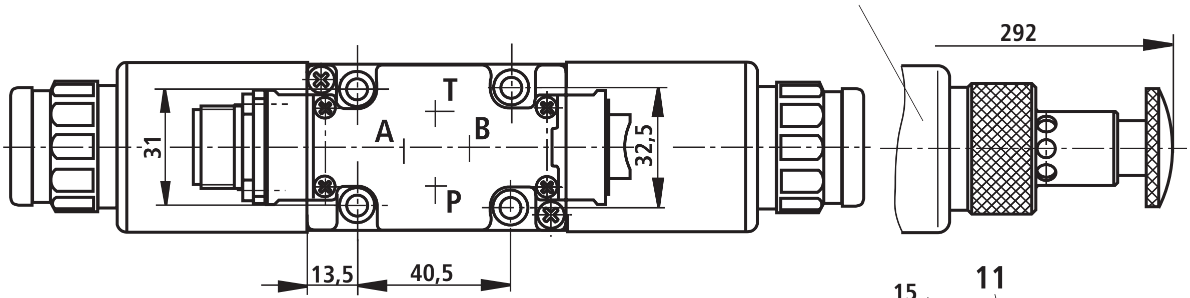


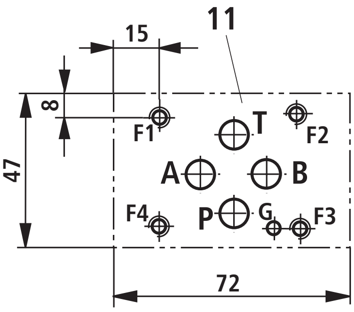
- **1** Valve housing
- **2** Name plate
- **3** Proportional solenoid "a"
- **4** Proportional solenoid "b"
- **5** Mating connector "A", color gray (order separately, see page 5)
- **6** Mating connector "B", color black (order separately, see page 5)
- **7** Identical seal rings for ports A, B, P, and T
- **8** Concealed manual override "N9"
- **9** Plug screw for valves with 1 solenoid (version "A" or "B")
- **10** Space required for removing the mating connector
- **11** Machined valve mounting face, porting pattern according to ISO 4401-03-02-0-05

Subplates and valve mounting screws see page 7.

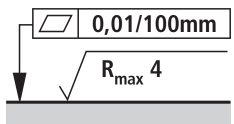
Unit dimensions: Type 3DREP...J - sea water-resistant (dimensions in mm)







- **1** Valve housing
- **2** Name plate
- **3** Proportional solenoid "a"
- **4** Proportional solenoid "b"
- **5** Mating connector (order separately, see page 5)
- **7** Identical seal rings for ports A, B, P, and T
- **8** Concealed manual override "N"
- **9** Plug screw for valves with 1 solenoid (version "A" or "B")
- **10** Space required for removing the mating connector
- **11** Machined valve mounting face, porting pattern according to ISO 4401-03-02-0-05
- **12** Dimension for version "N"

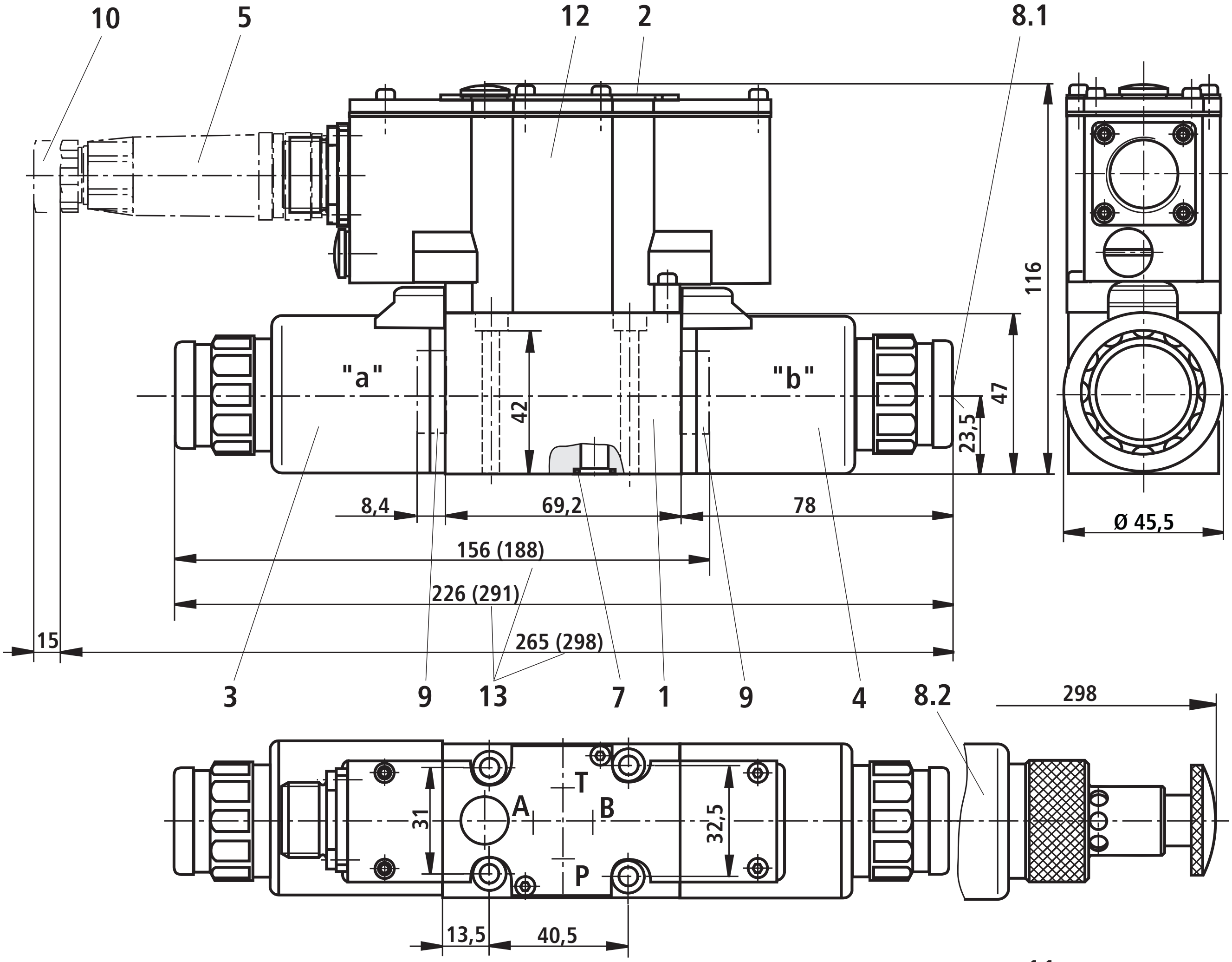


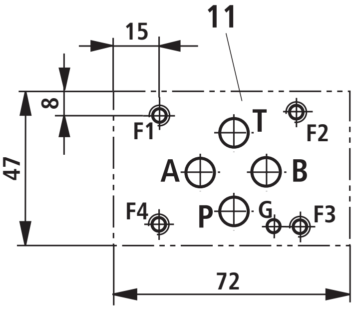
Required surface quality of the valve mounting face

Subplates and valve mounting screws see page 7

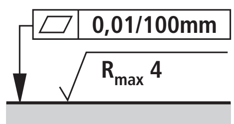
General tolerances according to ISO 2768-mK

Unit dimensions: Type 3DREPE and 3DREPE...J - sea water-resistant (dimensions in mm)





1 Valve housing
2 Name plate
3 Proportional solenoid "a"
4 Proportional solenoid "b"
5 Mating connector
(order separately, see page 5)
7 Identical seal rings for ports A, B, P, and T
8.1 Concealed manual override "N9"
8.2 Manual override "N" for sea water-resistant version "J"
9 Plug screw for valves with 1 solenoid (version "A" or "B")
10 Space required for removing the mating connector
11 Machined valve mounting face, porting pattern according to ISO 4401-03-02-0-05
12 Integrated control electronics
13 Dimension ( ) for sea water-resistant version "J"



Required surface quality of the valve mounting face

General tolerances according to ISO 2768-mK

Subplates and valve mounting screws see page 7

Throttle insert

When using a proportional directional valve type 4WRZ..., the following throttle inserts are to be used in channel A and B:

Size	**10**	**16**	**25**	**32**	**52**
Ø in mm	1.8	2.0	2.8	–	–
Material no.	R900158510	R900158547	R900158548	–	–

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

Proportional pressure reducing valve, pilot operated, with on-board electronics (OBE) and position feedback

Type DREBE10Z

Nominal size 10
Unit series 1X
Maximum working pressure A, B, X 315 bar, Y 2 bar
Maximum flow rate Q_{nom} 120 l/min

List of contents

Features

- Pilot operated valves with position feedback and on-board electronics for reducing system pressure (pilot oil internal only, with relief port X)
- Adjustable through the position of the armature against the compression spring
- With position control, minimal hysteresis <1%, rapid response times, see Technical Data
- Pressure limitation to a safe level even with faulty electronics (solenoid current $I > I_{max}$)
- For subplate attachment, mounting hole configuration to ISO 5781-AG-06-2-A
  Subplates as per catalog sheet RE 45055
  (order separately)
- Plug-in connector to DIN 43563-AM6, see catalog sheet RE 08008 (order separately)
- Data for the on-board trigger electronics
  - Complies with CE, EMC directives EN 61000-6-2: 2002-08 and EN 61000-6-3: 2002-08
  - $U_B = 24\ V_{nom}$ DC
  - Electrical connection 6P+PE
  - Signal actuation
    – Standard 0...+10 V (A1)
  - Valve curve calibrated at the factory

Ordering data

DREB	E	10	Z	–1X /		XY	M	G24	K31	A1	M	*

Proportional pressure reducing valve with inductive position transducer on the cone

With on-board electronics = **E**

Nominal size = **10**

Mounting hole configuration to ISO 5781-AG-06-2-A = **Z**

Unit series 10 to 19 (10 to 19: installation and connection dimensions unchanged) = **1X**

Max. pressure stage
up to 180 bar = **180**
up to 315 bar = **315**

Relief port X
Pilot oil port Y = **XY**

M = Without non-return valve

G24 = Voltage supply of trigger electronics 24 V DC

K31 = **Electrical connection**
without plug-in connector,
with unit plug to DIN 43563-AM6
Order plug-in connector separately

Interface for trigger electronics*
A1 = Setpoint input 0...+10 V

M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

Further information in plain text

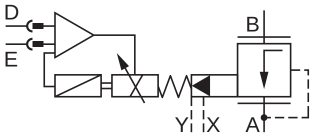
* Variant “F1” (4...20 mA version) available on request

Preferred types

Type ....A1 (0...+10 V)	**Material Number**
DREBE10Z–1X/180XYMG24K31A1M	0 811 402 155
DREBE10Z–1X/315XYMG24K31A1M	0 811 402 152

Symbol

For on-board electronics



Function, sectional diagram

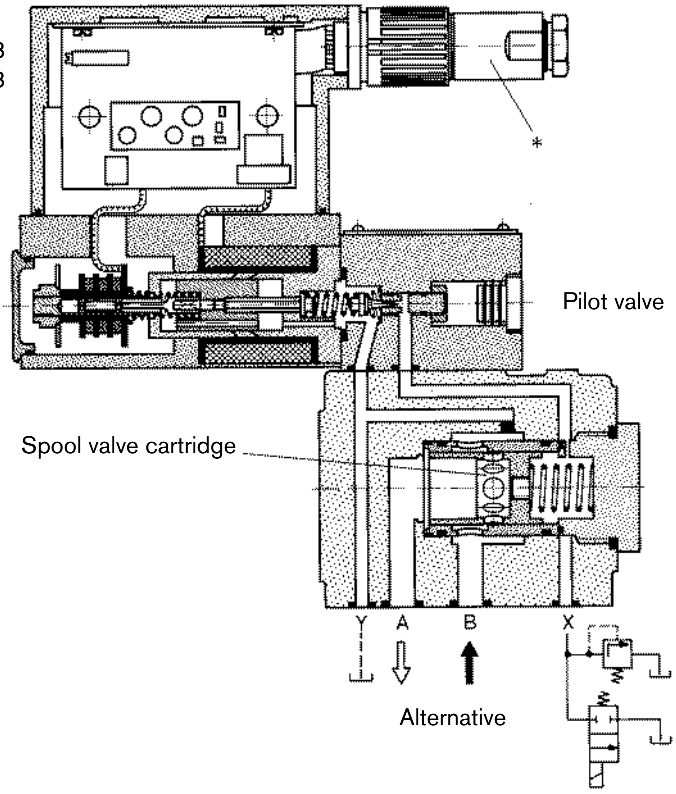
General

Type DREBE10Z proportional pressure reducing valves are pilot operated and are used to reduce system pressure.
They are actuated by means of a position-controlled proportional solenoid with on-board electronics.
The valve body contains a logic element (spool valve) of the "normally open" type. This is pilot operated and is in conical seat design.

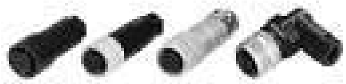
Basic principle

To adjust the system pressure, a setpoint is set in the trigger electronics. Based on this setpoint, the electronics control the position-controlled solenoid.
The proportional solenoid maintains its position against a spring force, which is proportionate to the system pressure.
The pilot stage is supplied with pilot oil at a flow rate of $<$ 0.8 l/min through a bore. The "p_{max}" pressure stage is determined by the cone and seating bore configuration.
Pressure limitation for maximum safety
If a fault occurs in the electronics, so that the solenoid current (I_{max}) would exceed its specified level in an uncontrolled manner, the pressure cannot rise above the level determined by the maximum spring force.

CE EN 61000-6-2: 2002-08
EN 61000-6-3: 2002-08



Accessories

Type			Material Number
(4 x) ISO 4762-M10x80-10.9	Cheese-head bolts		2 910 151 309
* 	Plug-in connectors 6P+PE, see also RE 08008	KS	1 834 482 022
		KS	1 834 482 026
		MS	1 834 482 023
		MS	1 834 482 024
		KS 90°	1 834 484 252

Testing and service equipment

Test box type VT-PE-TB3, see RE 30065
Measuring adapter 6P+PE type VT-PA-2, see RE 30068

Technical data

General			
Construction	Pilot stage		Poppet valve
	Main stage		Pressure reducing valve
	Valve cartridge		Spool valve, normally open
Actuation			Proportional solenoid with position control and OBE
Connection type			Subplate, mounting hole configuration NG10 (ISO 5781-AG-06-2-A)
Mounting position			Optional
Ambient temperature range		°C	–20...+50
Weight		kg	7.8
Vibration resistance, test condition			Max. 25 g, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)				
Pressure fluid			Hydraulic oil to DIN 51524...535, other fluids after prior consultation	
Viscosity range	recommended	mm^2/s	20...100	
	max. permitted	mm^2/s	10...800	
Pressure fluid temperature range		°C	–20...+70	
Maximum permitted degree of contamination of pressure fluid Purity class to ISO 4406 (c)			Class 18/16/13 [1]	
Direction of flow			See symbol	
Max. set pressure (at $Q_{min} = 1$ l/min)		bar	180	315
Minimum pressure (at $Q_{min} = 1$ l/min)		bar	6	8
Max. mechanical pressure limitation level, e.g. when solenoid current $I > I_{max}$		bar	< 190	< 325
Max. working pressure		bar	Port A, B: 315	
			Port Y: ≤ 2 external pilot oil drain	
			Port X: 315 relief port	
Internal pilot oil flow		l/min	≤ 0.8	
Max. flow		l/min	120 for Q_{max}, see Characteristic Curves	

Static/Dynamic		
Hysteresis	%	≦ 1
Manufacturing tolerance for p_{max}	%	≦ ±5, see Characteristic Curves
Response time 100 % signal change	ms	≈ 80 dependent on dead volume or system volume
Thermal drift		< 1 % at $\Delta T = 40\,°C$
Conformity		CE EN 61000-6-2: 2002-08 EN 61000-6-3: 2002-08

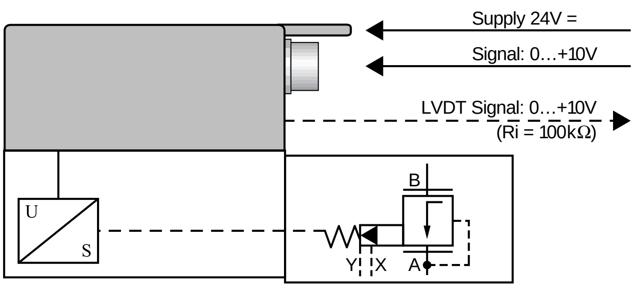
[1] The purity classes stated for the components must be complied with in hydraulic systems.
Effective filtration prevents problems and also extends the service life of components.
For a selection of filters, see catalog sheets RE 50070, RE 50076 and RE 50081.

Technical data

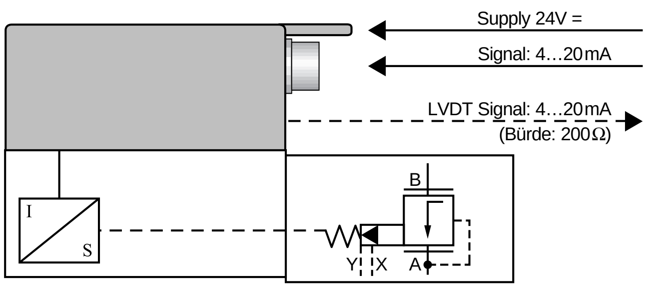
Electrical, trigger electronics integrated in valve	
Cyclic duration factor %	100 %
Degree of protection	IP 65 to DIN 40050 and IEC 14434/5
Connection	Plug-in connector 6P+PE, DIN 43563
Supply voltage Terminal A: Terminal B: 0 V	24 V DC_{nom} Min. 21 V DC/max. 40 V DC Ripple max. 2 V DC
Power consumption	Solenoid ⧄ 45 mm = 40 VA max.
External fuse	2.5 A_F
Input, "standard" version A1 Terminal D: U_E Terminal E:	Differential amplifier, R_i = 100 kΩ 0...+10 V 0 V
Input, "mA signal" version F1* Terminal D: I_{D-E} Terminal E: I_{D-E}	Burden, R_{sh} = 200 Ω 4...20 mA Current loop I_{D-E} feedback
Max. voltage to differential inputs over 0 V	$\left.\begin{array}{l}D \rightarrow B\\E \rightarrow B\end{array}\right\}$ max. 18 V=
Test signal, "standard" version A1 Terminal F: U_{Test} Terminal C:	LVDT 0...+10 V Reference 0 V
Test signal, "mA signal" version F1* Terminal F: I_{F-C} Terminal C: I_{F-C}	LVDT signal 4...20 mA at external load 200...500 Ω max. 4...20 mA output Current loop I_{F-C} feedback
Safety earth conductor and shield	See pin assignment (installation in conformity with CE)
Recommended cable	See pin assignment up to 20 m 7 x 0.75 mm^2 up to 40 m 7 x 1 mm^2
Calibration	Calibrated at the factory, see valve curve

* Variant "F1" (4...20 mA version) available on request

Version A1: Standard

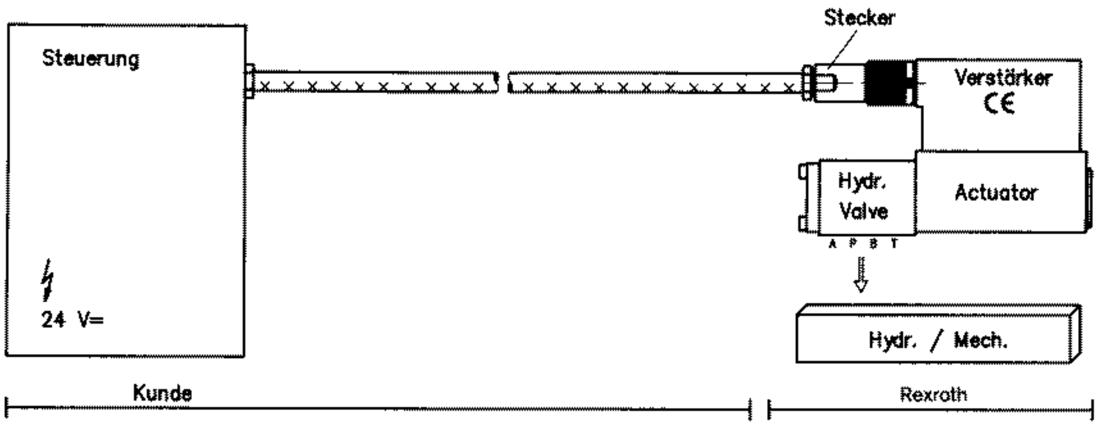


* Version F1: mA signal



Connection

For electrical data, see page 5 and
Operating Instructions **1 819 929 083**



Technical notes for the cable

Version: – Multi-wire cable
– Extra-finely stranded wire to VDE 0295, Class 6
– Safety earth conductor, green/yellow
– Cu braided shield

Type: – e.g. Ölflex-FD 855 CP (from Lappkabel company)

No. of wires: – Determined by type of valve, plug type and signal assignment

Cable Ø: – 0.75 mm^2 up to 20 m long
– 1.0 mm^2 up to 40 m long

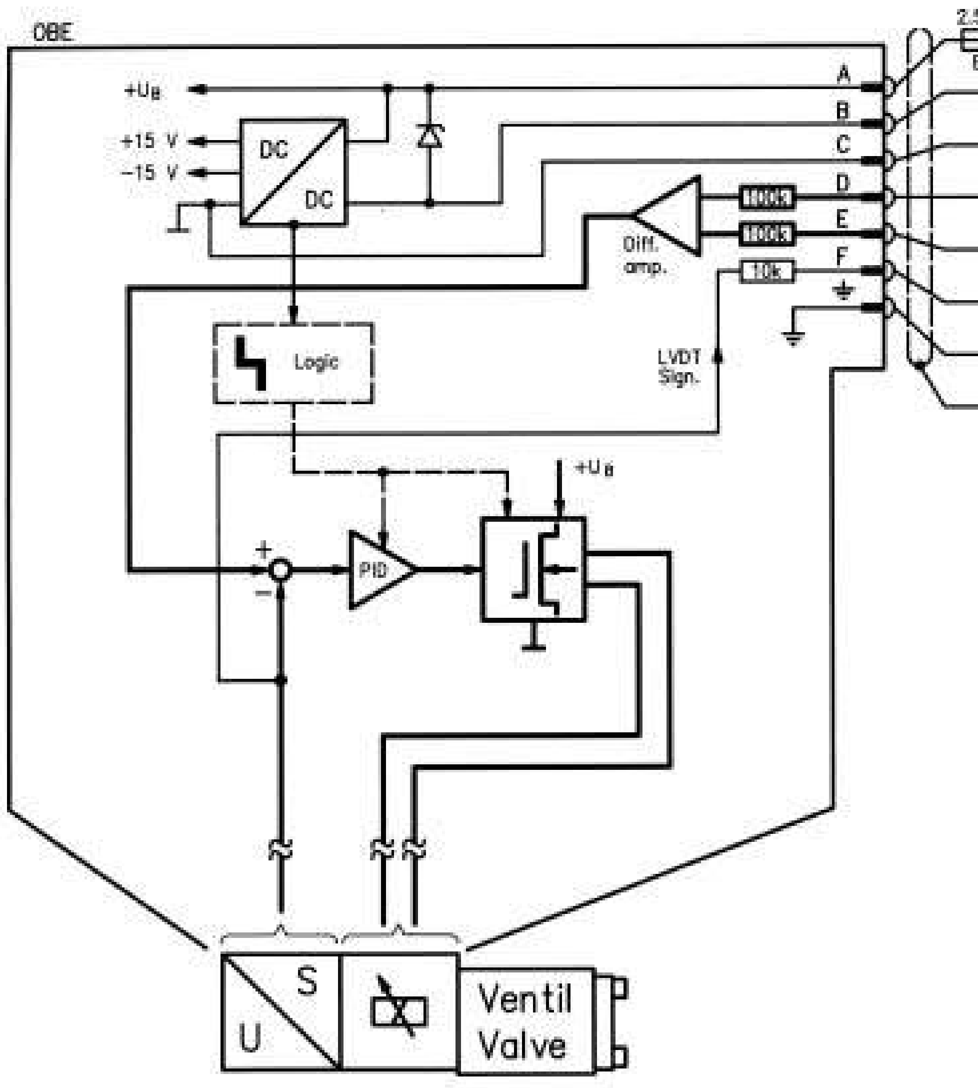
Outside Ø: – 9.4...11.8 mm – Pg 11
– 12.7...13.5 mm – Pg 16

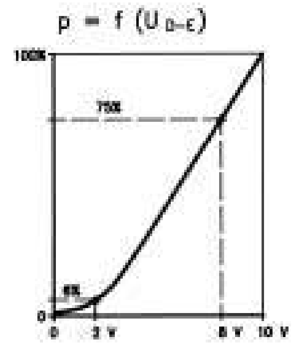
Important

Power supply 24 V DC nom.,
if voltage drops below 18 V DC, rapid shutdown resembling "Enable OFF" takes place internally.
In addition, with the "mA signal" version:
$I_{D-E} \geqq 3$ mA – valve is active
$I_{D-E} \leqq 2$ mA – valve is deactivated.
Electrical signals emitted via the trigger electronics (e.g. actual values) must not be used to shut down safety-relevant machine functions!
(See also European Standard, "Technical Safety Requirements for Fluid-Powered Systems and Components – Hydraulics", EN 982).

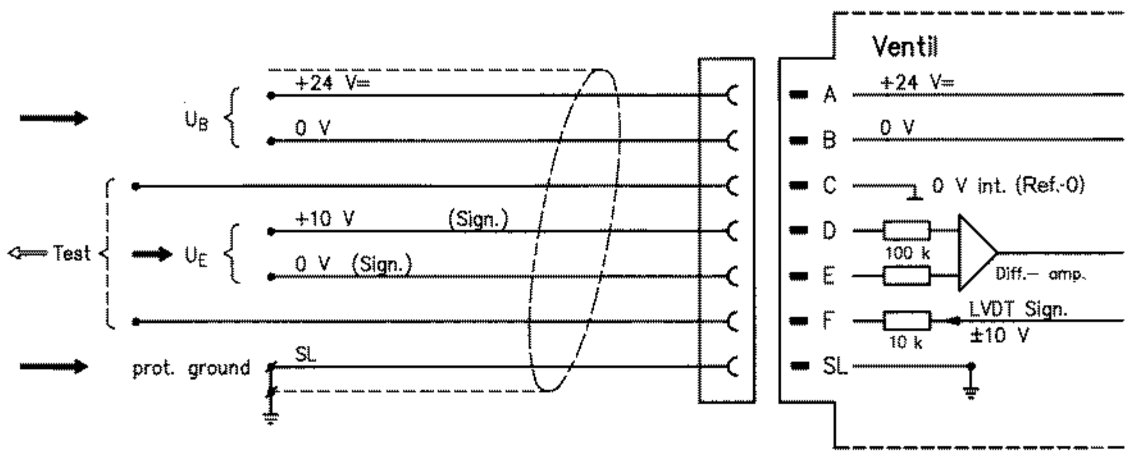
On-board trigger electronics

Circuit diagram/pin assignment
Version A1: U_{D-E} 0...+10 V





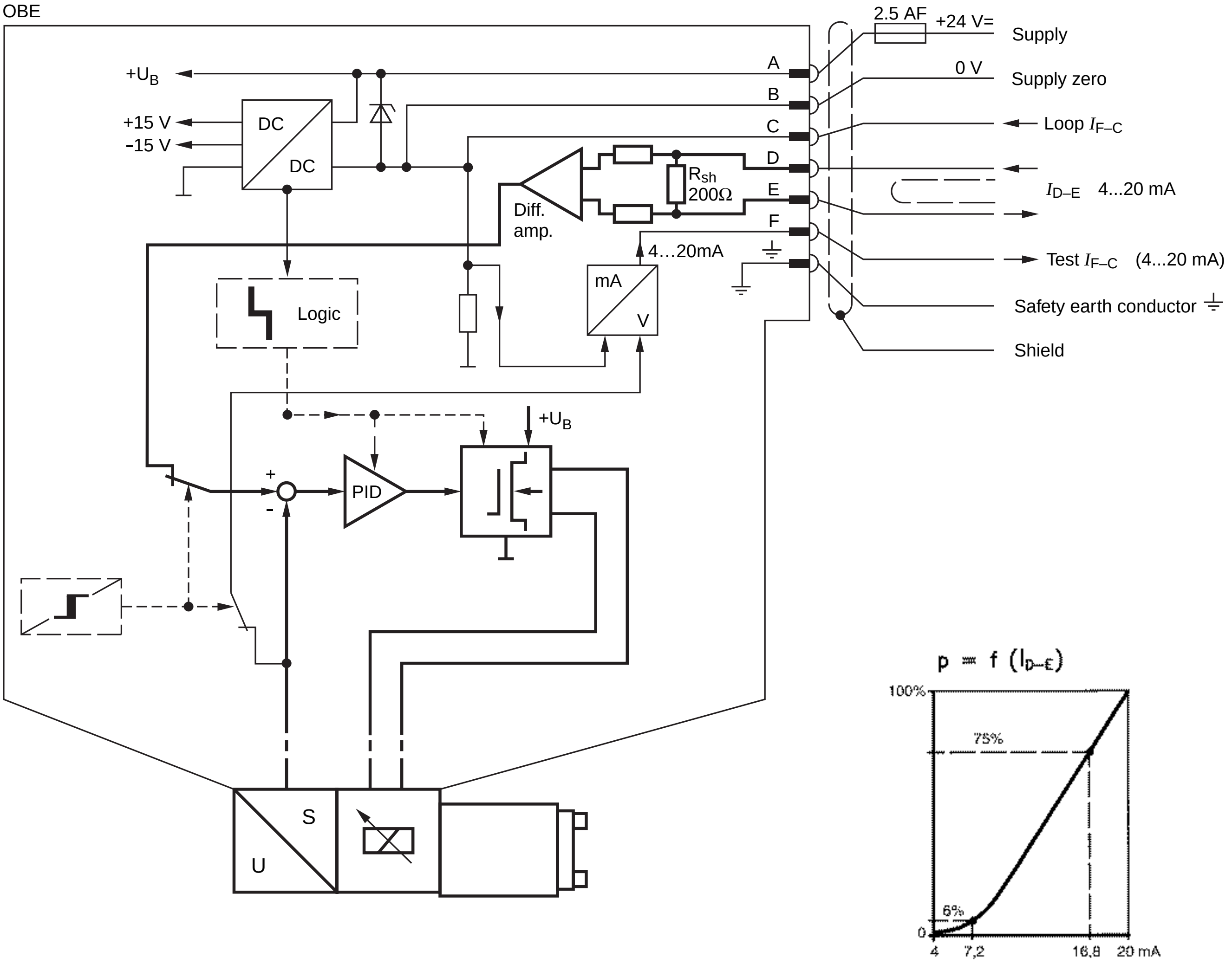
Pin assignment
Version A1: U_{D-E} 0...+10 V
($R_i = 100\ k\Omega$)



On-board trigger electronics

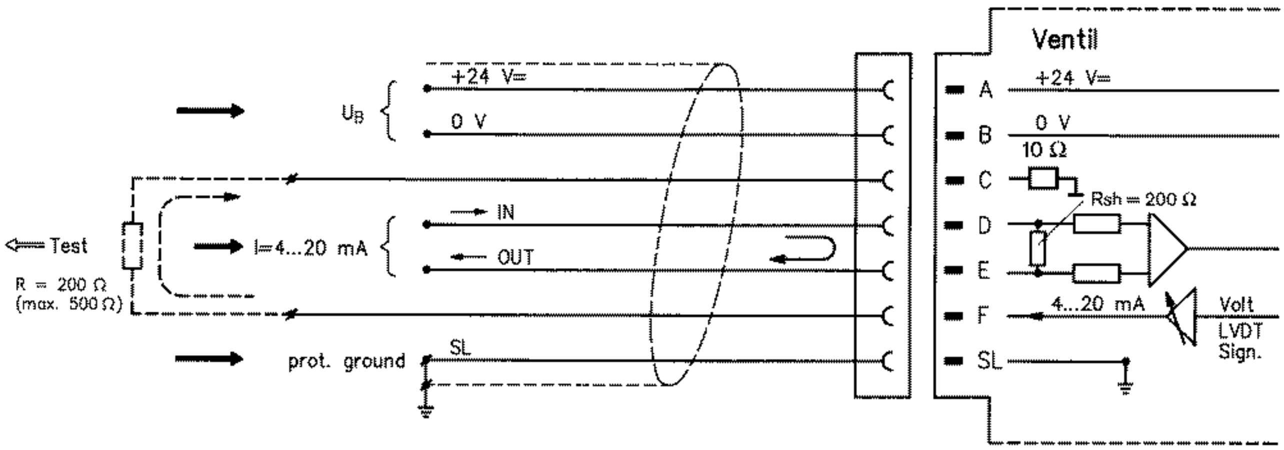
Circuit diagram/pin assignment

Version F1: I_{D-E} 4...20 mA



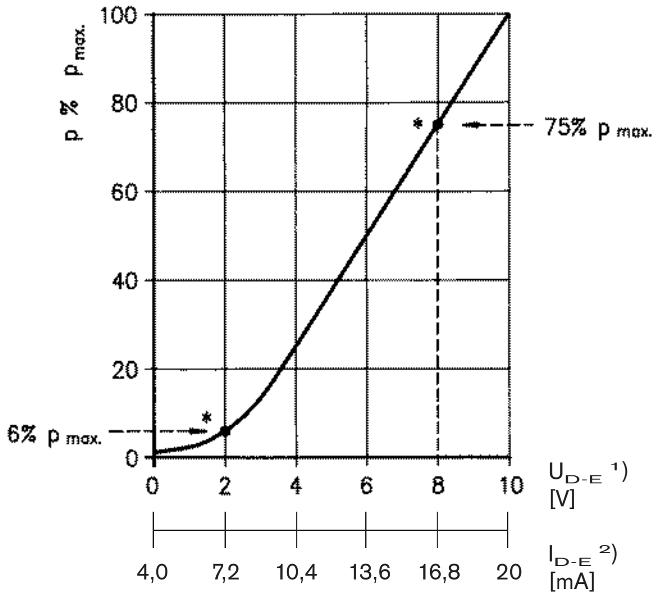
Pin assignment 6P+PE

Version F1: I_{D-E} 4...20 mA
(R_{sh} = 200 kΩ)



Characteristic curves (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Pressure in port A as a function of the setpoint



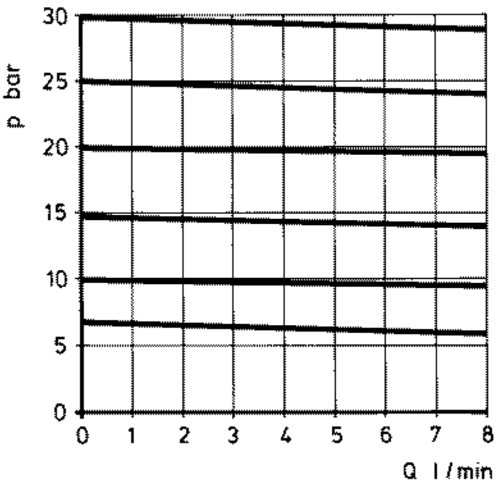
* Factory setting at $Q = 1$ l/min
±5 % manufacturing tolerance

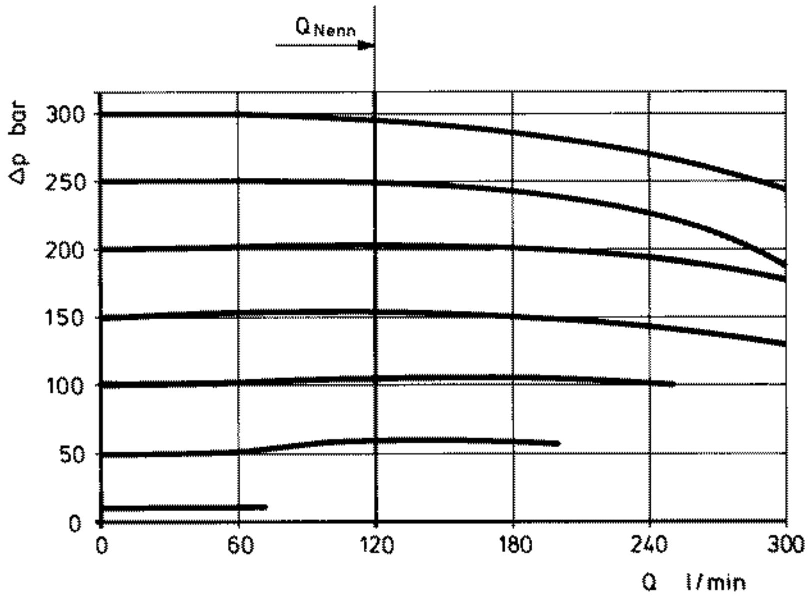
1) Version: $U_{D-E} = 0...+10$ V

2) Version: $I_{D-E} = 4...20$ mA

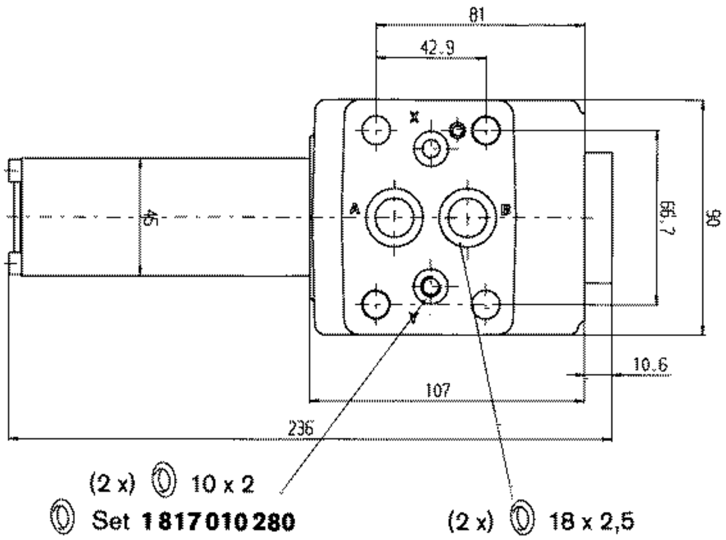
Pressure in port A as a function
of the main stage nominal flow rate

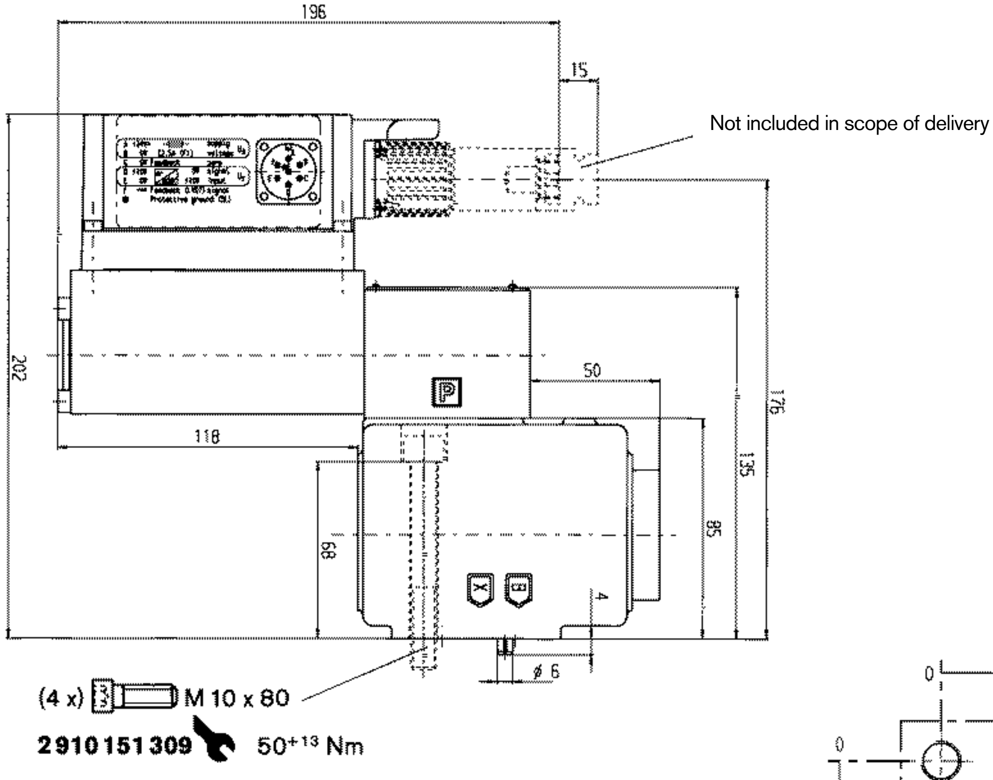
$p = \mathrm{f}\,(Q)$

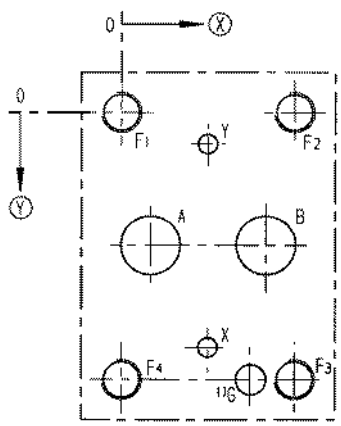




Unit dimensions (nominal dimensions in mm)

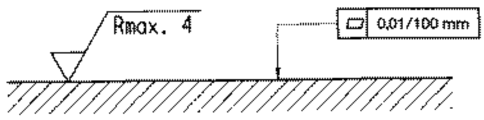






Mounting hole configuration: NG10 (ISO 5781-AG-06-2-A)
For subplates see catalog sheet RE 45055

Required surface quality
of mating component



1) Deviates from standard
2) Thread depth:
Ferrous metal 1.5 x Ø*
Non-ferrous 2 x Ø
* NG10 min. 10.5 mm

	A	B	X	Y	G	F_1	F_2	F_3	F_4
X	7,2	35,8	21,4	21,4	31,8	0	42,9	42,9	0
Y	33,35	33,35	58,7	7,9	66,7	0	0	66,7	66,7
∅	14,7	14,7	4,8	4,8	7,5	M10 2)	M10 2)	M10 2)	M10 2)

Notes

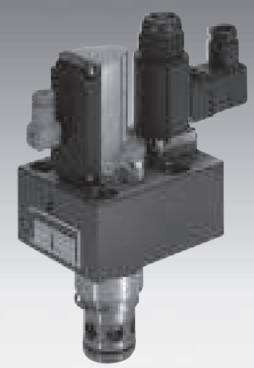
Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

Proportional cartridge throttle valve, with inductive position transducer, pilot operated

Type FESX



Nominal size 16, 25, 32, 40, 50
Unit series 1X
Maximum working pressure A, B, X 315 bar, Y 100 bar
Nominal flow rate Q_{nom} 980 l/min

Overview of Contents

Features

– Pilot operated throttle valves with inductive position transducer
– Design: cartridge type DIN 24342, ISO/DIS 7368
  Control oil external X and Y
– Adjustable via the position-controlled main stage by means of the position transducer and the external valve electronics
– Hysteresis $<$0.2 %, positioning accuracy $>$0.5 %, see Technical Data
– Plug-in connector to DIN 43650-AM2 for the solenoid and plug-in connector for the position transducer, included in scope of delivery
– Data for the external trigger electronics
  • U_B = 24 V_{nom} DC
  • Adjustment of valve curve Np and gain, with and without ramp generator
  • Europe card format, setpoint 0...+10 V (order separately)

Ordering data

FESX		C	A	–1X/		L	Z4	M	*

Proportional throttle valve with inductive position transducer (pilot operated)

Nominal size = 16
Mounting hole configuration = 25
DIN 24342, ISO/DIS 7368 = 32
= 40
= 50

Connection type = C
(cartridge)

Direction of flow A → B = A
(customer may implement B → A)

Unit series 10 to 19 = 1X
(10 to 19: installation and connection dimensions unchanged)

Nominal flow rate
Q_{nom} in l/min
Δp = 5 bar
125 =
210 =
320 =
500 =
980 =

L = **Flow characteristic**
Linear

Z4 = **Electrical connection**
Unit plug to DIN 43650-AM2
Plug-in connector included in scope of delivery

M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

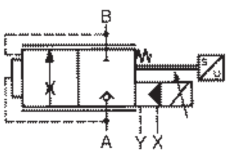
Further information in plain text

Preferred types

Type	Material Number
FESX16CA–1X/125LZ4M	0 811 402 452
FESX25CA–1X/210LZ4M	0 811 402 515
FESX32CA–1X/320LZ4M	0 811 402 614
FESX40CA–1X/500LZ4M	0 811 402 620
FESX50CA–1X/980LZ4M	0 811 402 633

Symbol

For external trigger electronics



Function, sectional diagram

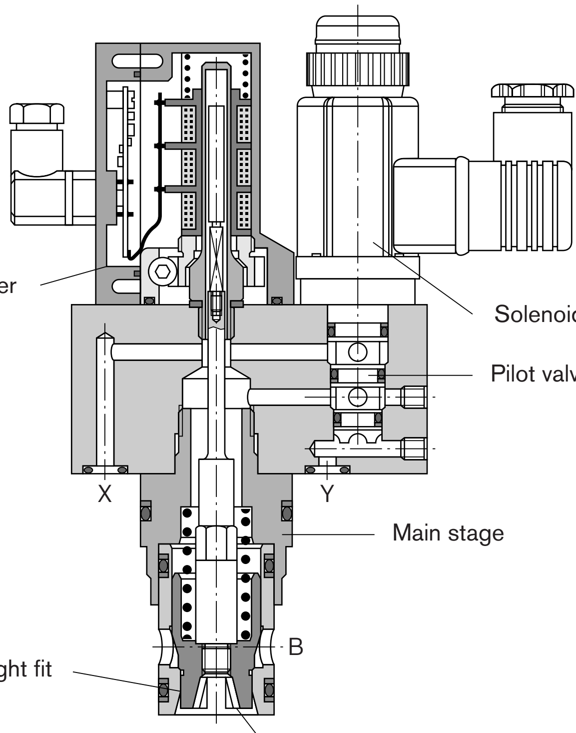
General

Type FESX proportional throttle valves are pilot operated and in “cartridge” design. This results in their compact form despite high flow rates.
The electronics, which take the form of an external valve amplifier in Europe card format, trigger the solenoid of the pilot valve and thus control the position of the main stage.
Hysteresis is <0.2 %, and a position accuracy of >0.5 % is achieved.

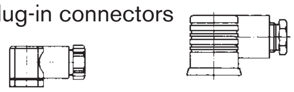
Basic principle

Pilot operated 2/2-way cartridge valves.
There is a free choice of directions of flow, A → B or B → A, but please note:
- Always route “Y” externally
- Pressure at “X” must always be equal to or greater than at “A” and not below 12 bar when A → B.
- Pressure at “X” must always be equal to or greater than at “B” and not below 20 bar when B → A.

If the valve is shut down electrically and is supplied externally with sufficient pressure at “X”, the main stage A → B may be employed as a poppet valve.



Accessories

Type			Material Number
(4 x) ISO 4762	Cheese-head bolts included in scope of delivery		
Europe card 	VT-VRPA1-527-20/V0/2/2V	RE 30055	0 811 405 076
Europe card 	VT-VRPA1-527-20/V0/RTS-2/2V	RE 30053	0 811 405 074
Plug-in connectors  4P 2P+PE	Plug-in connector 2P+PE (M16x1.5) for the solenoid and plug-in connector 4P (Pg7) for the position transducer. Included in scope of delivery, see also RE 08008.		

Testing and service equipment

Test box type VT-PE-TB2, see RE 30064
Test adapter for Europe cards type VT-PA-3, see RE 30070

Technical data

General

Construction	Cartridge type throttle valve, spool valve with closed-loop position control via Europe card
Actuation	Pilot operated, proportional 3/2-way directional control valve in valve cover, without position control
Main stage	Position control via external trigger electronics and position transducer LVDT DC/DC
Connection type	Cartridge type, mounting hole configuration to DIN 24342, ISO/DIS 7368
Mounting position	Horizontal if possible, or position transducer at the bottom
Ambient temperature range °C	–20...+50
Vibration resistance, test condition	Max. 25 g, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

Pressure fluid		Hydraulic oil to DIN 51524...535, other fluids after prior consultation				
Viscosity range, recommended	mm^2/s	20...100				
max. permitted	mm^2/s	10...800				
Pressure fluid temperature range	°C	–20...+80				
Maximum permitted degree of contamination of pressure fluid Purity class to ISO 4406 (c)		Class 18/16/13 [1)]				
Direction of flow		A → B or B → A (when X supplied "internally", or "externally" when pressure higher)				
Nominal flow rate at $\Delta p = 5$ bar per edge*		**NG16**	**NG25**	**NG32**	**NG40**	**NG50**
	l/min	125	210	320	500	980
Weight	kg	2.8	3.9	5.1	7.1	9.7
Max. working pressure in A, B, X	bar	315	315	315	315	315
Max. working pressure in Y	bar	100	100	100	100	100
Q_{max}	l/min	350	600	1000	1500	3000
Q_N pilot valve (supply) $\Delta p = 5$ bar	l/min	5	15	15	28	28
Leakage X → Y Pilot valve at 100 bar	cm^3/min	< 150	< 200	< 200	< 400	< 400
Min. flow rate at $U_E = 0$ V adjustable Valve active ($\Delta p = 5$ bar)	cm^3/min	2000	2000	3000	3000	4000
Leakage in main stage at $\Delta p = 100$ bar (valve shut down electrically)		A → B = tight (poppet valve) B → A = tight (poppet valve) **Note:** min. leakage X → B, possible when X = external				
Minimum supply pressure A → B	bar	12	12	12	12	12
Minimum supply pressure B → A	bar	20	20	20	20	20

* Flow for other values of Δp $Q_X = Q_{nom} \cdot \sqrt{\frac{\Delta p_X}{5}}$

[1)] The purity classes stated for the components must be complied with in hydraulic systems. Effective filtration prevents problems and also extends the service life of components.
For a selection of filters, see catalog sheets RE 50070, RE 50076 and RE 50081 .

Technical data

Static/Dynamic [1)]

		NG16	NG25	NG32	NG40	NG50
Spool stroke/characteristic curve	+ mm	4	5	7	10	12.5
Overlap on shutdown	– mm	3	3	3	3	3
Control oil volume of main stage 100 %	cm^3	1.02	2.66	6.36	12.57	24.54
Required control oil 0...100 %, x = 100 bar	l/min	3	5	7	9	9
Hysteresis	%	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Positioning accuracy	%	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Manufacturing tolerance		See flow curves, adjustable via external trigger electronics				
Response time (x = 100 bar)	ms					
Signal change 0...100 %	"open"	< 70	< 70	< 90	< 90	< 110
Signal change 100... 0 %	"close"	< 70	< 70	< 90	< 130	< 300
Signal change 0... 10 %	"open"	< 50	< 50	< 70	< 70	< 80
Signal change 10... 0 %	"close"	< 40	< 40	< 50	< 70	< 100
Switch-off behavior, enable "OFF"		After electrical shutdown (pilot valve opens "X" to the main stage), main stage moves to closed end position				
Thermal drift		< 1 % at $\Delta T = 40$ °C				

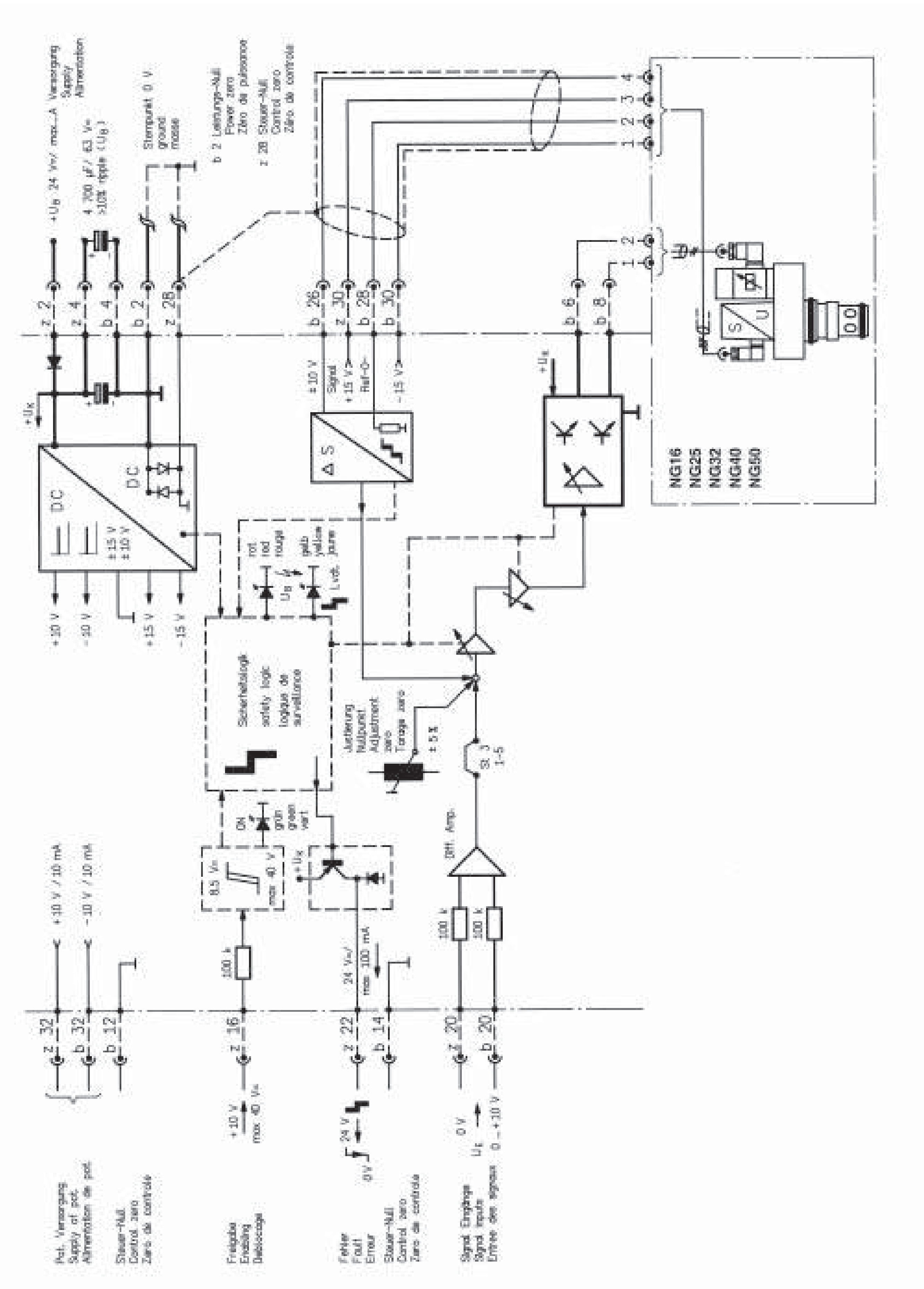
Electrical

Cyclic duration factor	%	100	
Degree of protection		IP 65 to DIN 40050 and IEC 14434/5	
Solenoid connection		Unit plug DIN 43650/ISO 4400, M16x1.5 (2P+PE)	
Position transducer connection		Special plug (4P/Pg7)	
Max. solenoid current	I_{max}	2.7 A	
Coil resistance R_{20}	Ω	2.5	
Max. power consumption at 100 % load and operating temperature	VA	40	
Position transducer DC/DC technology		Supply: +15 V/35 mA –15 V/25 mA	Signal: 0...±10 V (R_L ≥10 kΩ)

[1)] All characteristic values ascertained using amplifier 0 811 405 076 (without ramp).

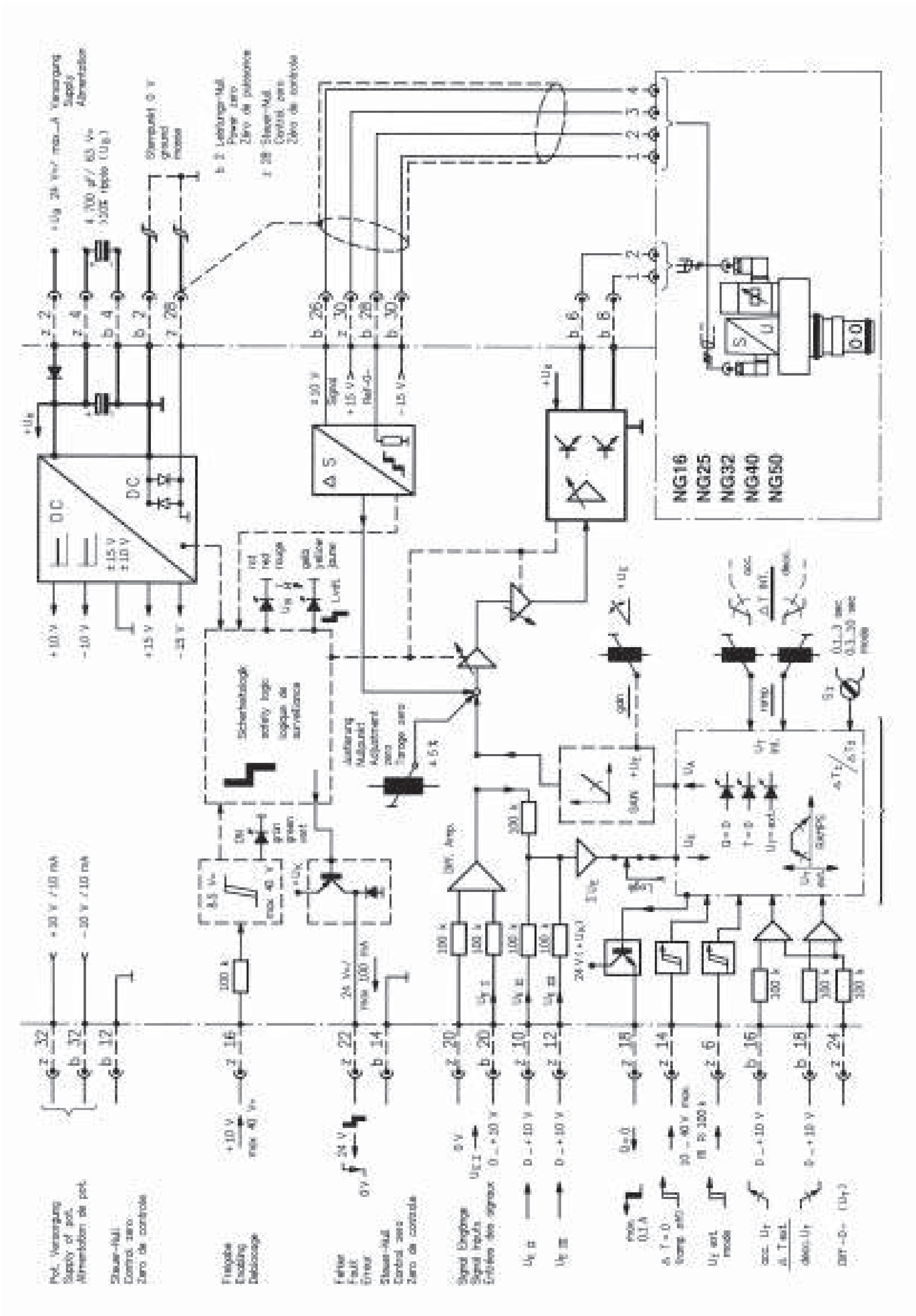
Valve with external trigger electronics (europe card without ramp, RE 30055)

Circuit diagram/pin assignment



Valve with external trigger electronics (europe card without ramp, RE 30053)

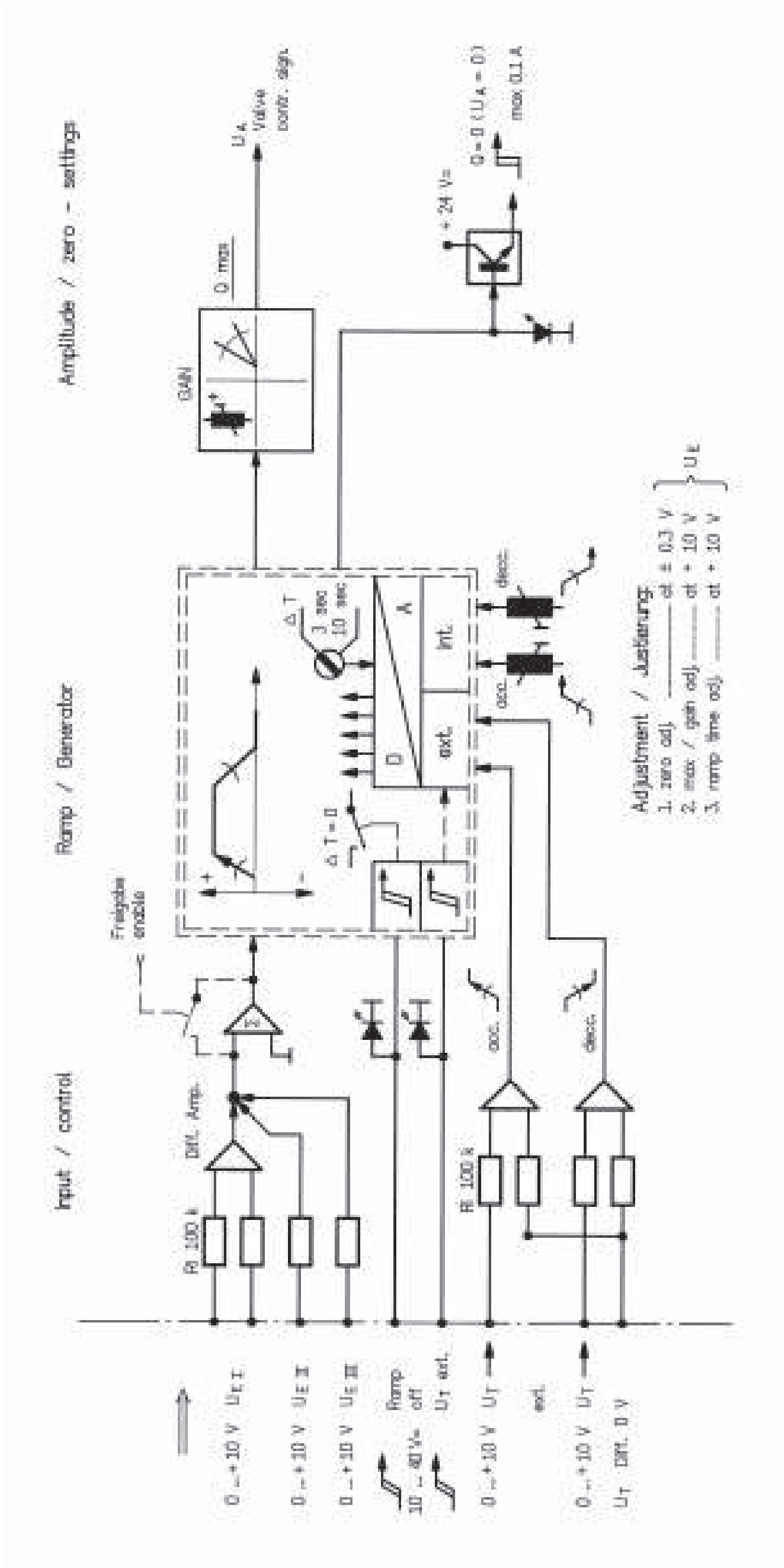
Circuit diagram/pin assignment



See functional diagram of ramp control on page 8

Valve with external trigger electronics (europe card with ramp, RE 30053)

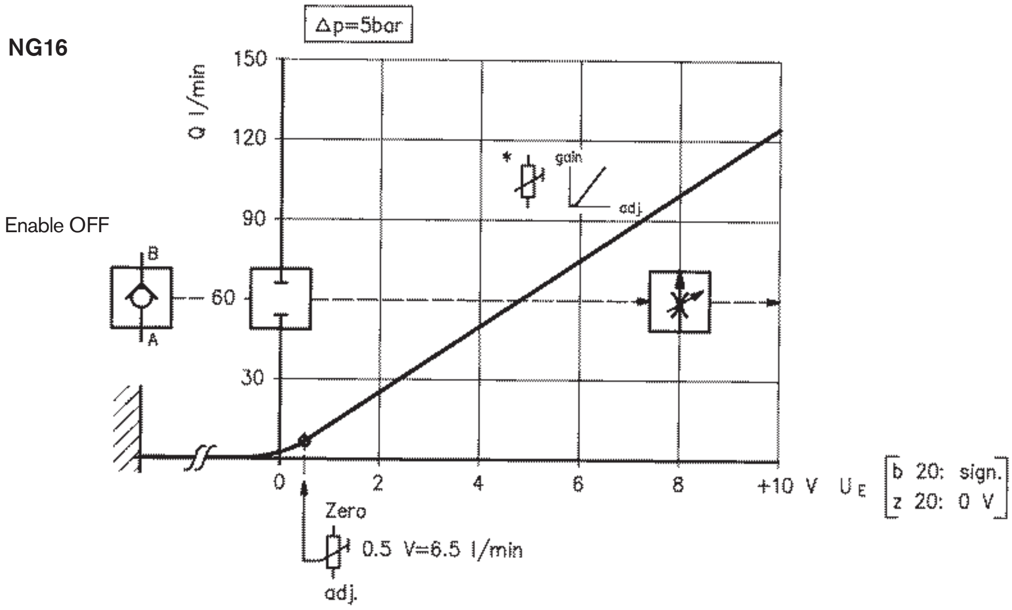
Functional diagram of ramp control



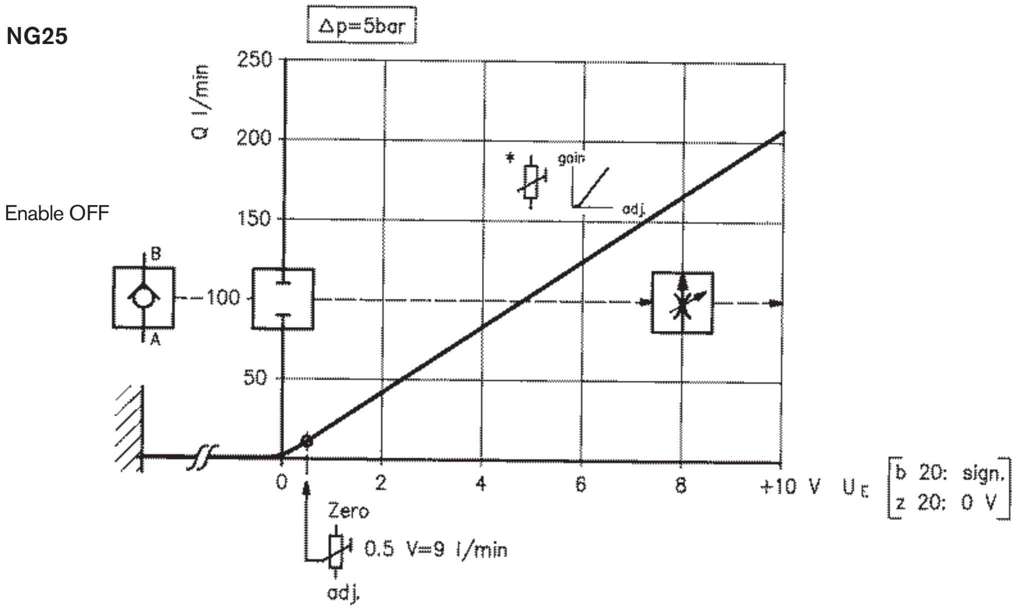
Characteristic curves (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

$\Delta p = 5$ bar
$\upsilon = 36\ mm^2/s$

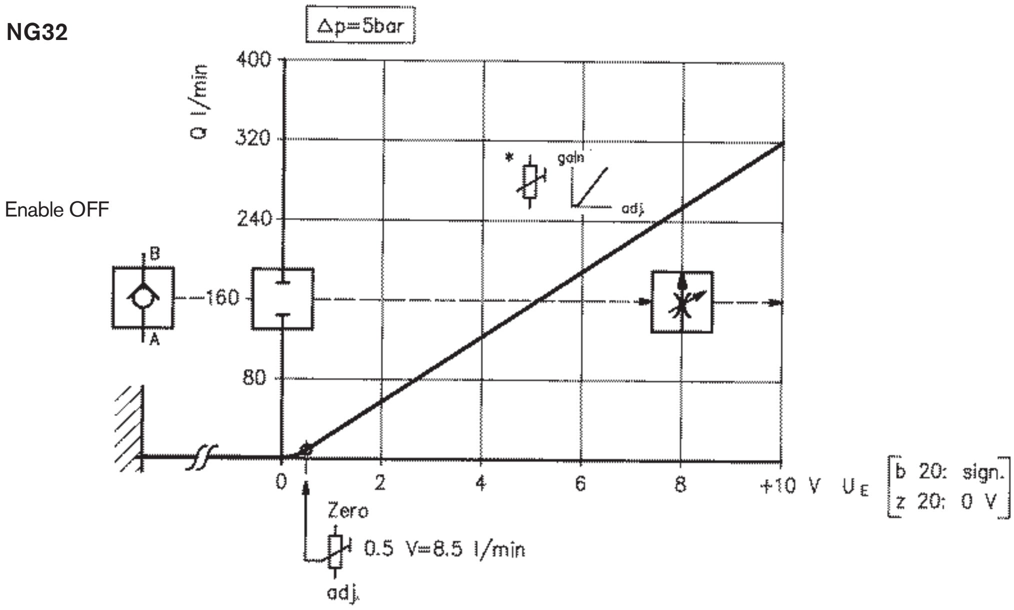
NG16



NG25



NG32



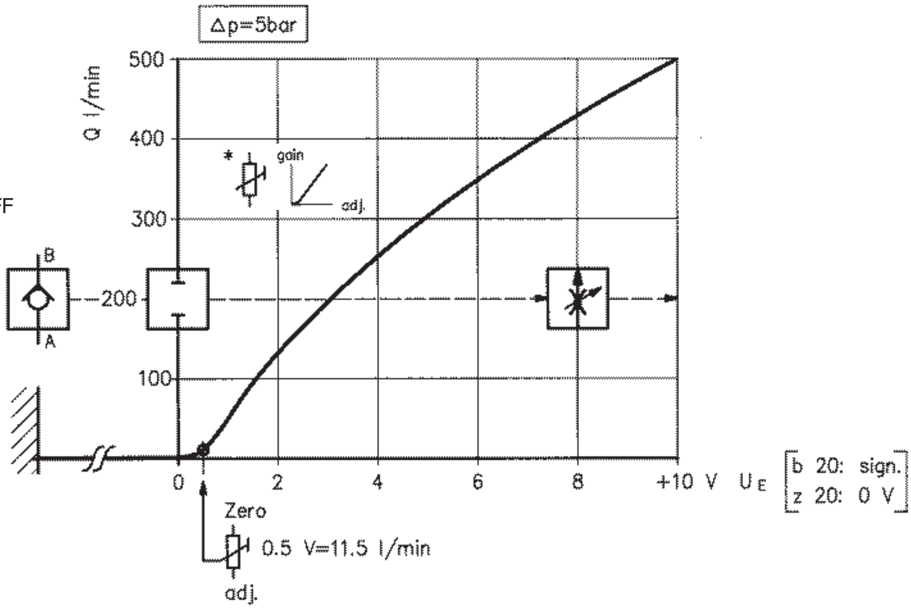
* Amplifier

Characteristic curves (measured with HLP 46, $\vartheta_{oil} = 40\,°C \pm 5\,°C$)

$\Delta p = 5$ bar
$\upsilon = 36$ mm²/s

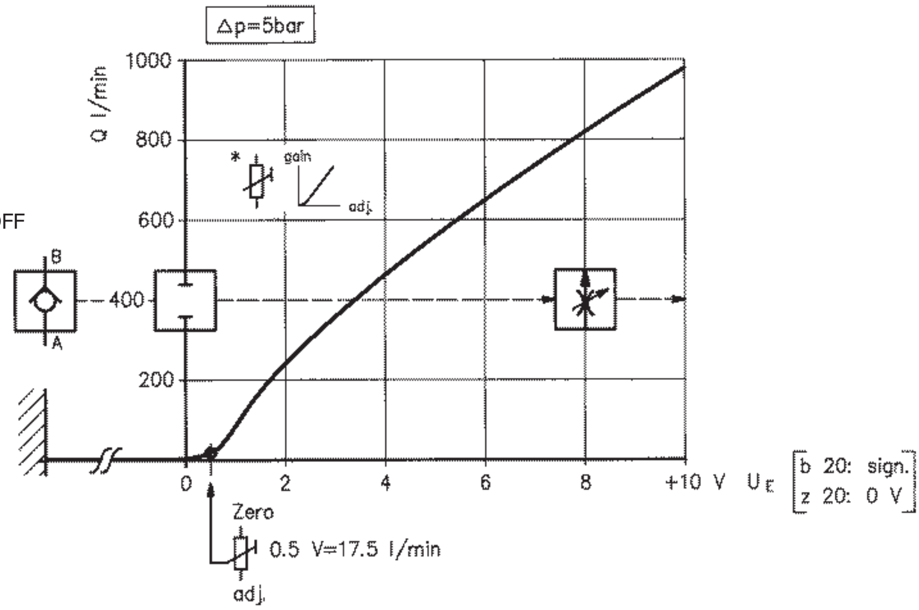
NG40

Enable OFF



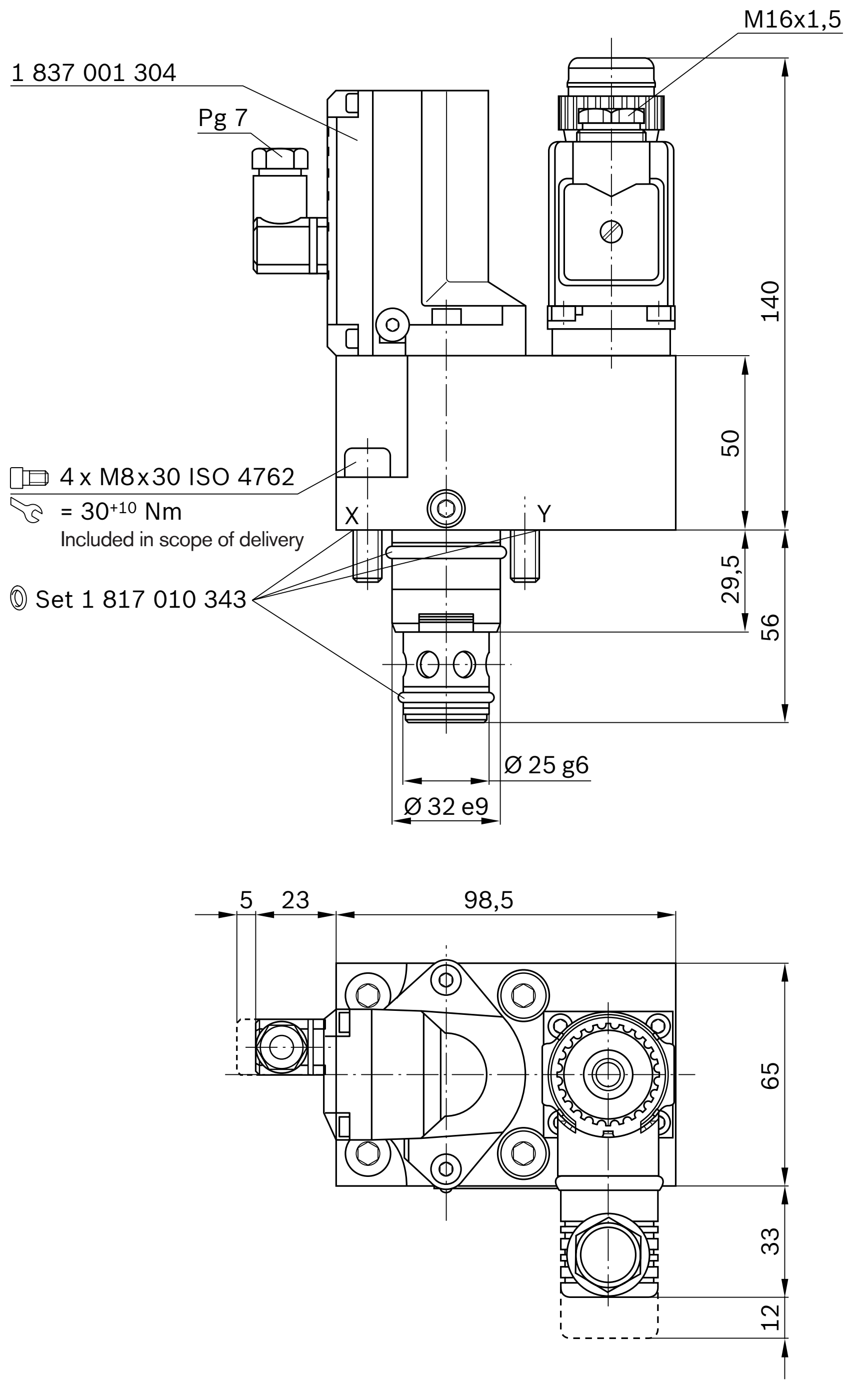
NG50

Enable OFF



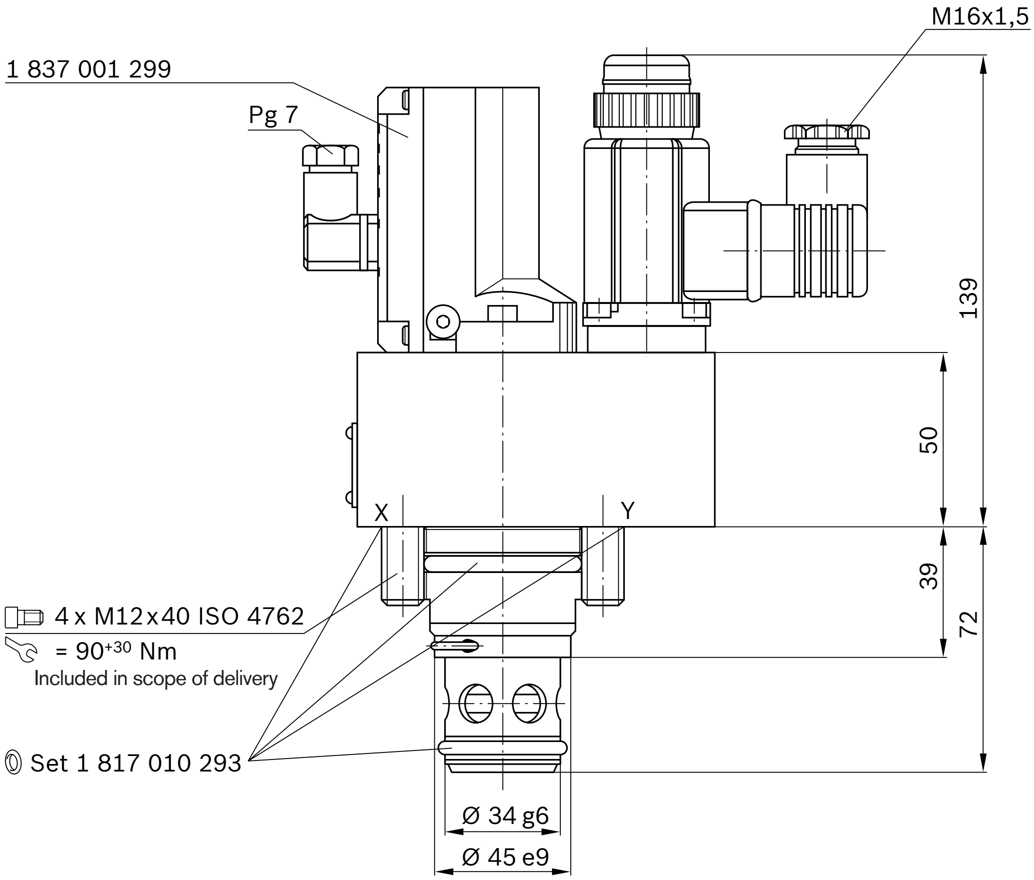
* Amplifier

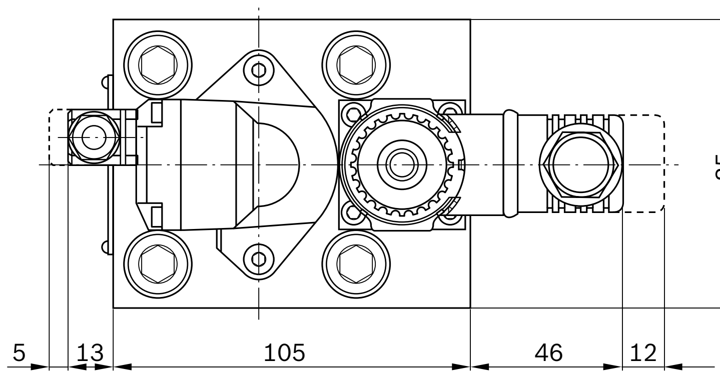
Unit dimensions NG16 (nominal dimensions in mm)



See installation dimensions on page 16

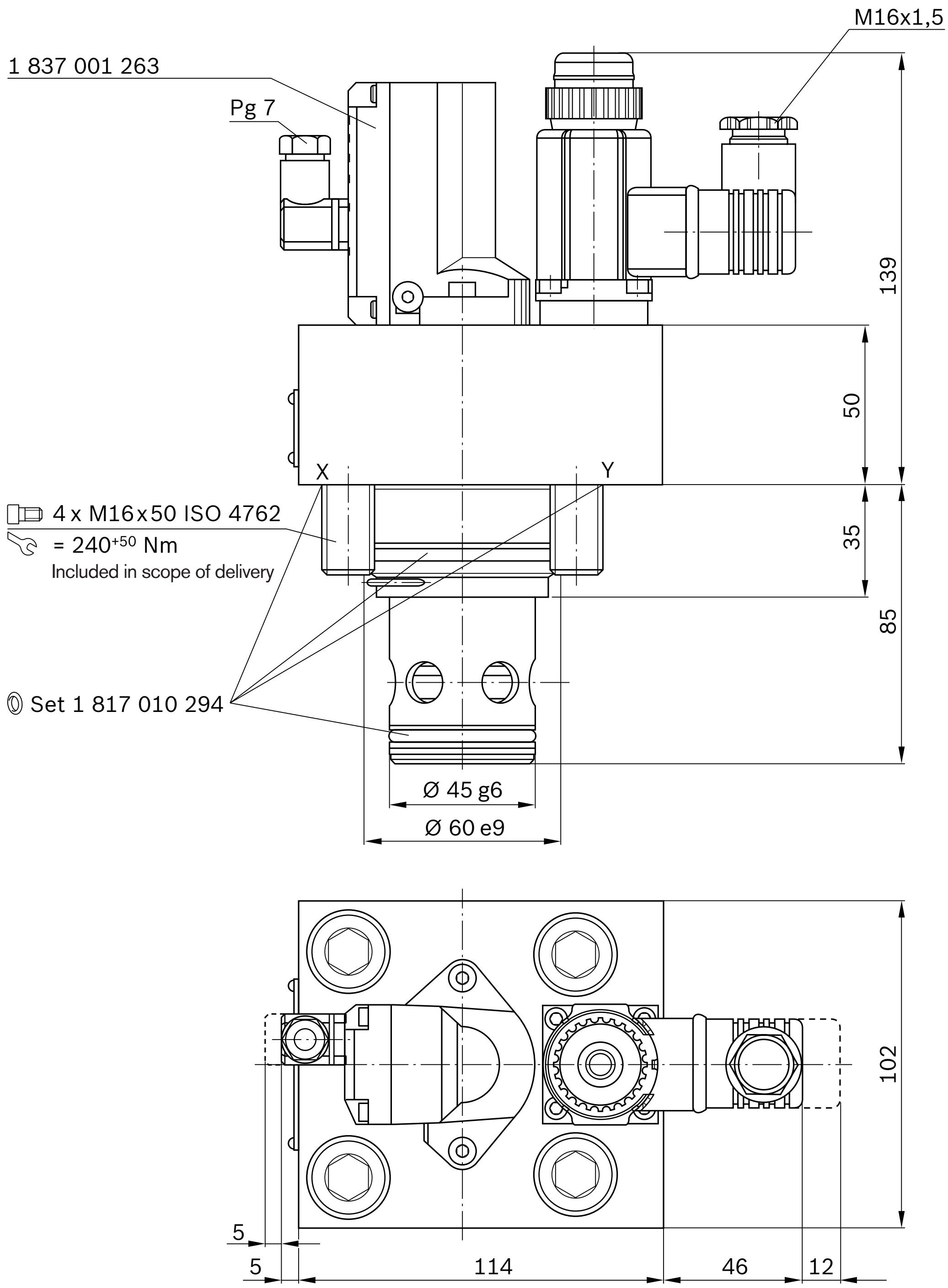
Unit dimensions NG25 (nominal dimensions in mm)





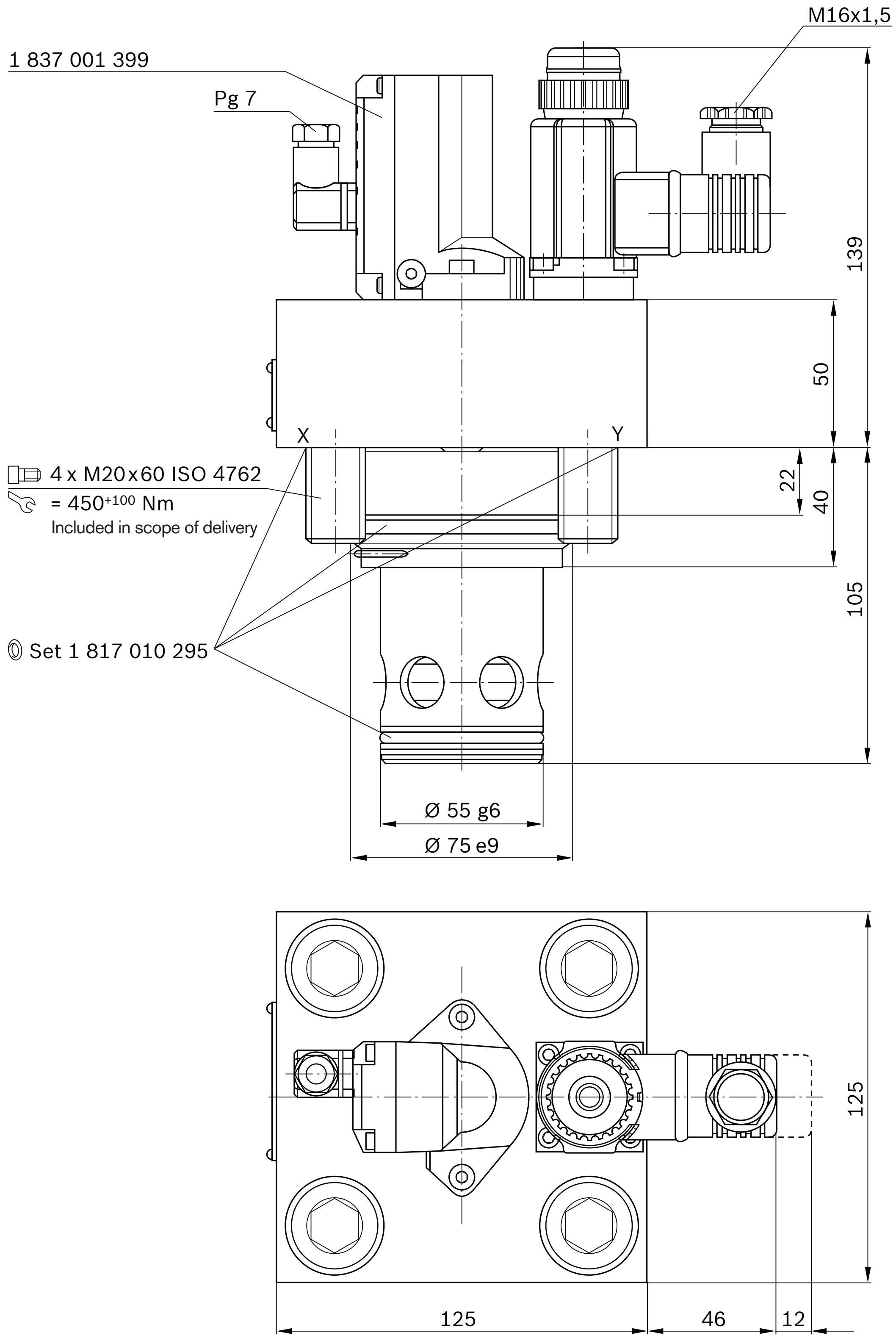
See installation dimensions on page 16

Unit dimensions NG32 (nominal dimensions in mm)



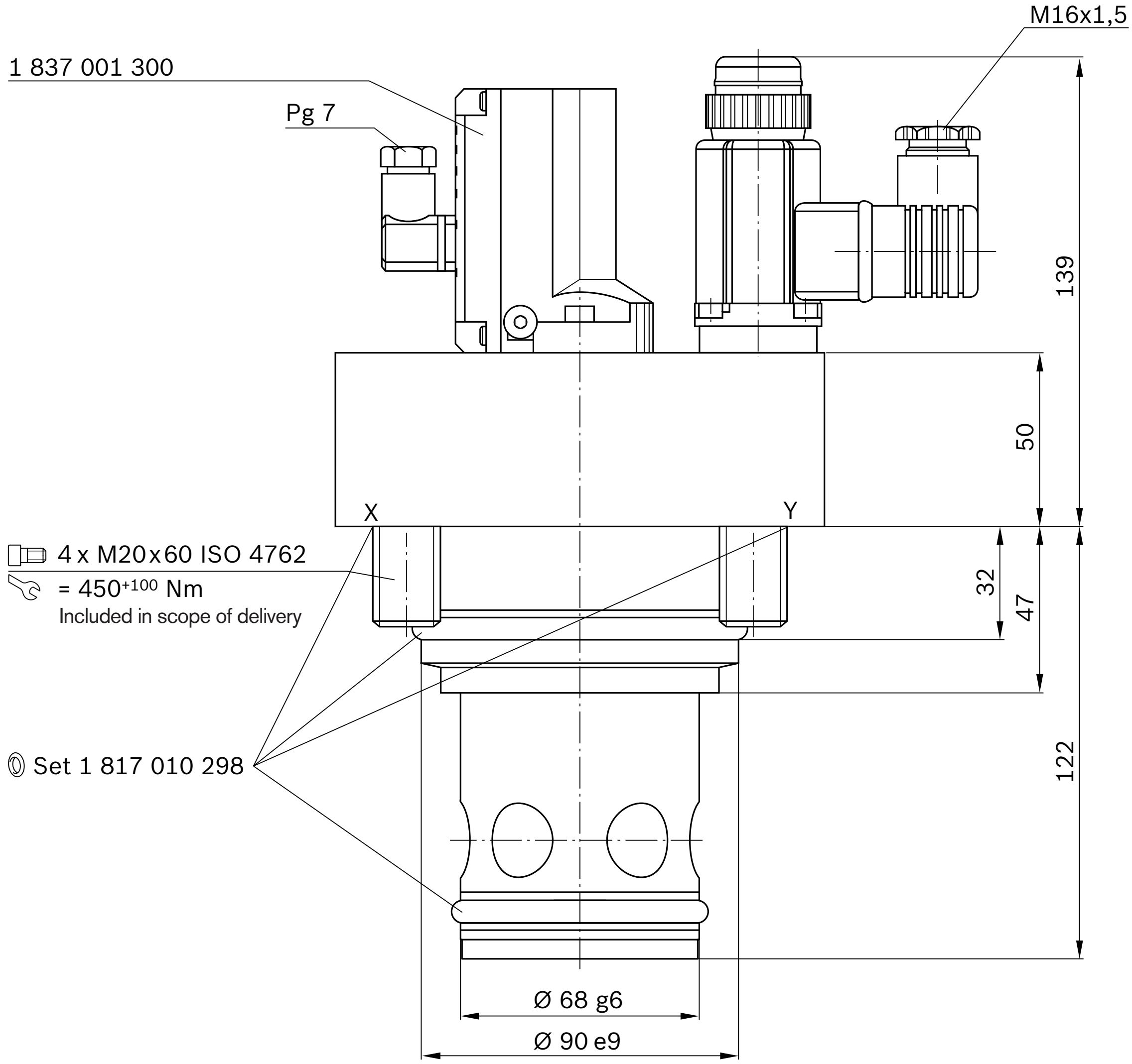
See installation dimensions on page 16

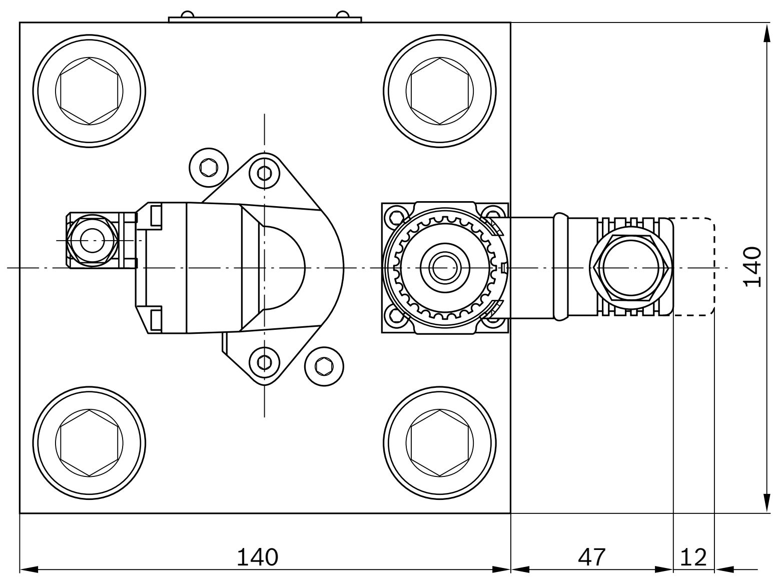
Unit dimensions NG40 (nominal dimensions in mm)



See installation dimensions on page 17

Unit dimensions NG50 (nominal dimensions in mm)

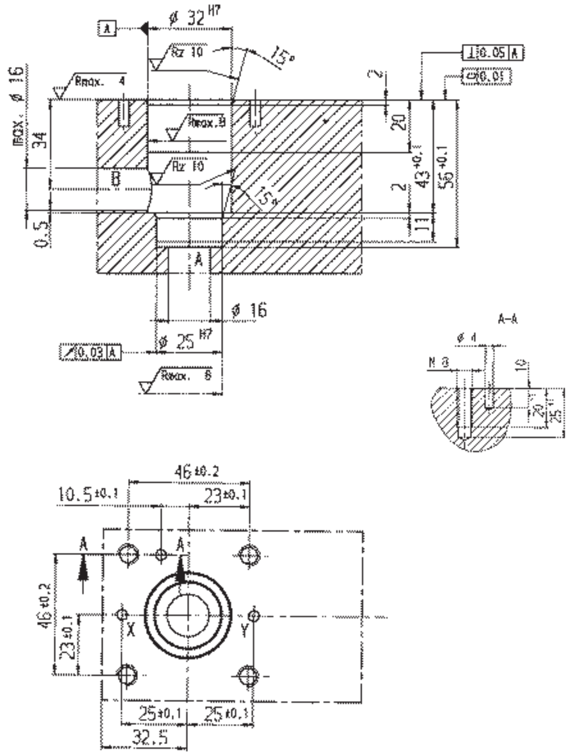




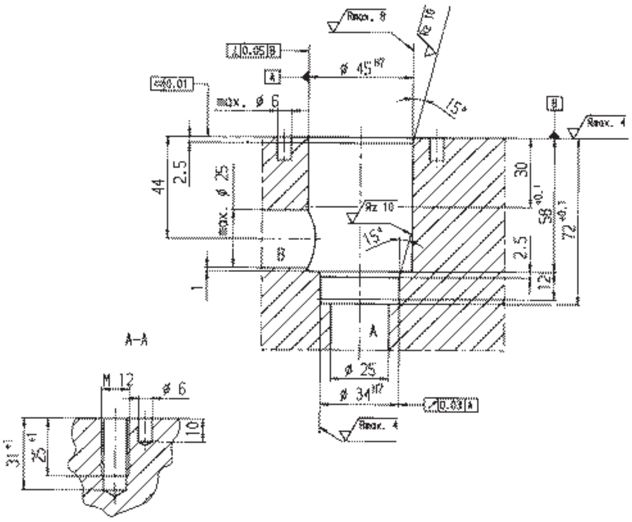
See installation dimensions on page 17

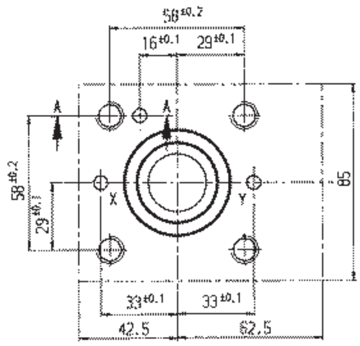
Installation dimensions DIN 24342, ISO/DIS 7368 (nominal dimensions in mm)

NG16

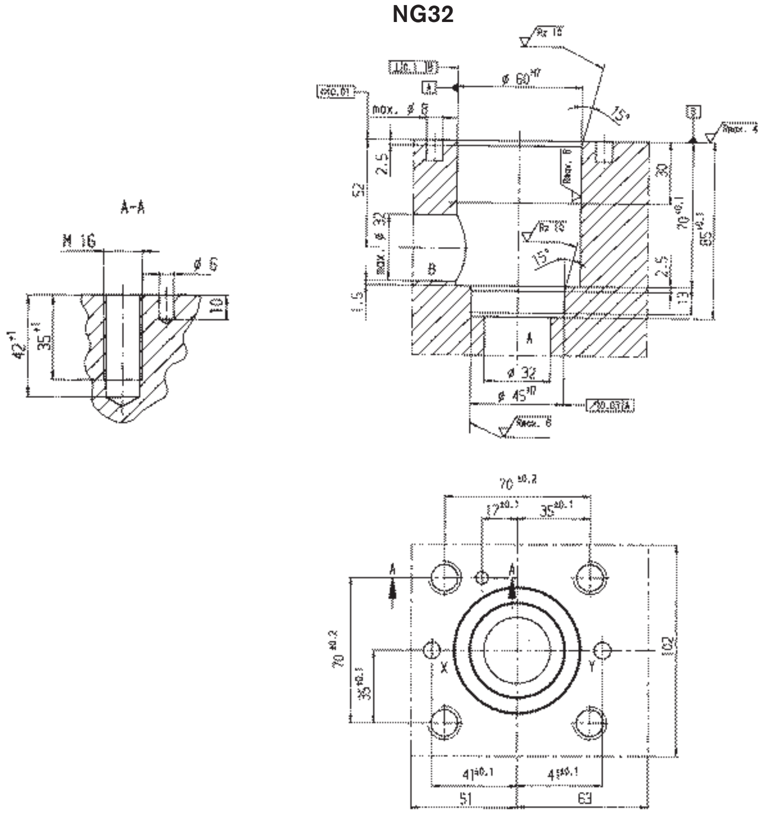


NG25



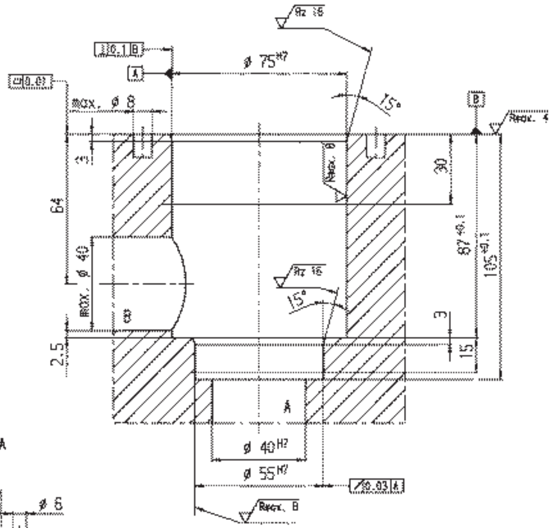


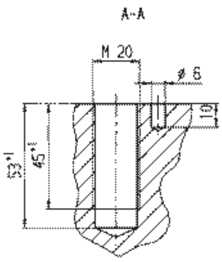
NG32

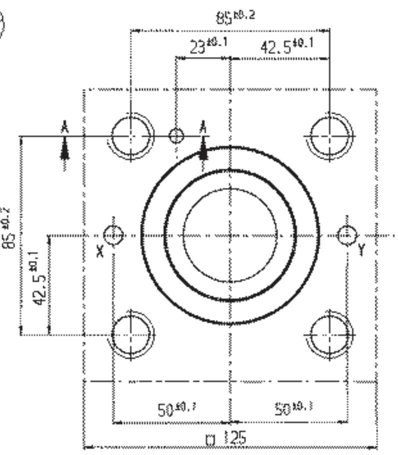


Installation dimensions DIN 24342, ISO/DIS 7368 (nominal dimensions in mm)

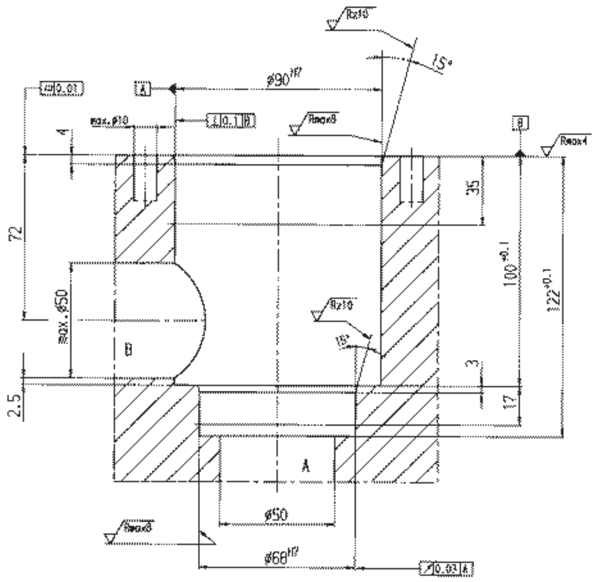
NG40

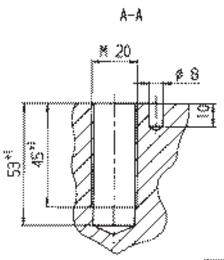


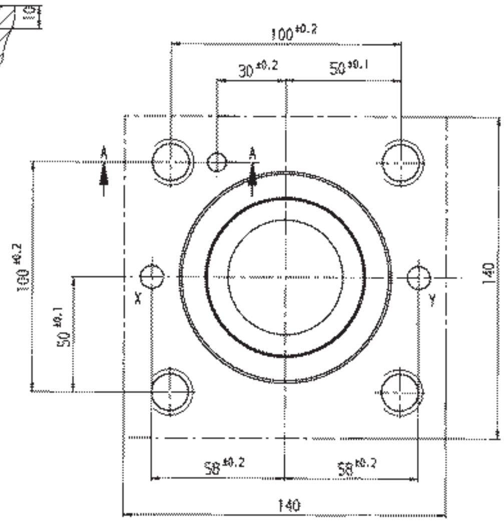




NG50







Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Notes

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Rexroth Bosch Group

Proportional cartridge throttle valve, with on-board electronics (OBE) and inductive position transducer, pilot operated

RE 29216/12.07
Replaces: 09.05

Type FESXE

Nominal size (NG) 16, 25, 32, 40, 50
Unit series 1X
Maximum working pressure A, B, X 315 bar, Y 100 bar
Nominal flow rate Q_{nom} 980 l/min

List of contents

Features

- Pilot operated throttle valves with on-board electronics (OBE) and inductive position transducer
- Design: cartridge type DIN 24342, ISO/DIS 7368
  Control oil external X and Y
- Adjustable via the position-controlled main stage by means of the position transducer and on-board electronics
- Hysteresis < 0.2 %, positioning accuracy > 0.5 %, see Technical data
- Plug-in connector to DIN 43563-AM6 for the electrical connection, see catalog page RE 08008 (order separately)
- Data for the on-board trigger electronics
  - Complies with CE, EMC directives EN 61000-6-2: 2002-08 and EN 61000-6-3: 2002-08
  - U_B = 24 V_{nom} DC
  - Electrical connection 6P+PE
  - Signal actuation
    – Standard 0...+10 V (A1)
  - Valve curve calibrated at the factory

Ordering data

FESX	E		C	A	–1X /		L	K0	B1	M	*

Proportional throttle valve with inductive position transducer (pilot operated)

With on-board electronics = **E**

Nominal size
Mounting hole configuration DIN 24342, ISO/DIS 7368
= **16**
= **25**
= **32**
= **40**
= **50**

Connection type (cartridge) = **C**

Direction of flow A → B (customer may implement B → A) = **A**

Unit series 10 to 19 (10 to 19: installation and connection dimensions unchanged) = **1X**

125 =
210 =
320 =
500 =
980 =
Nominal flow rate
Q_{nom} in l/min
Δp = 5 bar

L = **Flow characteristic**
Linear

K0 = **Electrical connection**
without plug-in connector, with unit plug to DIN 43563-AM6
Order plug-in connector separately

B1 = **Interface for trigger electronics**
Setpoint input 0.5...+10 V

M = NBR seals, suitable for mineral oils (HL, HLP) to DIN 51524

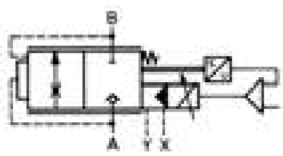
Further information in plain text

Preferred types

Material Number	Type
0 811 402 454	FESXE16CA–1X/125LK0B1M
0 811 402 517	FESXE25CA–1X/210LK0B1M
0 811 402 616	FESXE32CA–1X/320LK0B1M
0 811 402 622	FESXE40CA–1X/500LK0B1M
0 811 402 642	FESXE50CA–1X/980LK0B1M

Symbol

For on-board trigger electronics



Function, sectional diagram

General

Type FESXE proportional throttle valves are pilot operated and in “cartridge” design. This results in their compact form despite high flow rates.
The position of the main spool is closed-loop controlled by the on-board electronics (OBE). Hysteresis is < 0.2 %, and a position accuracy of > 0.5 % is achieved.
For external valve shutdown (bypassing the valve electronics), the ISA adapter is available as an accessory. This adapter protects the solenoid and the switch contacts during shutdown.

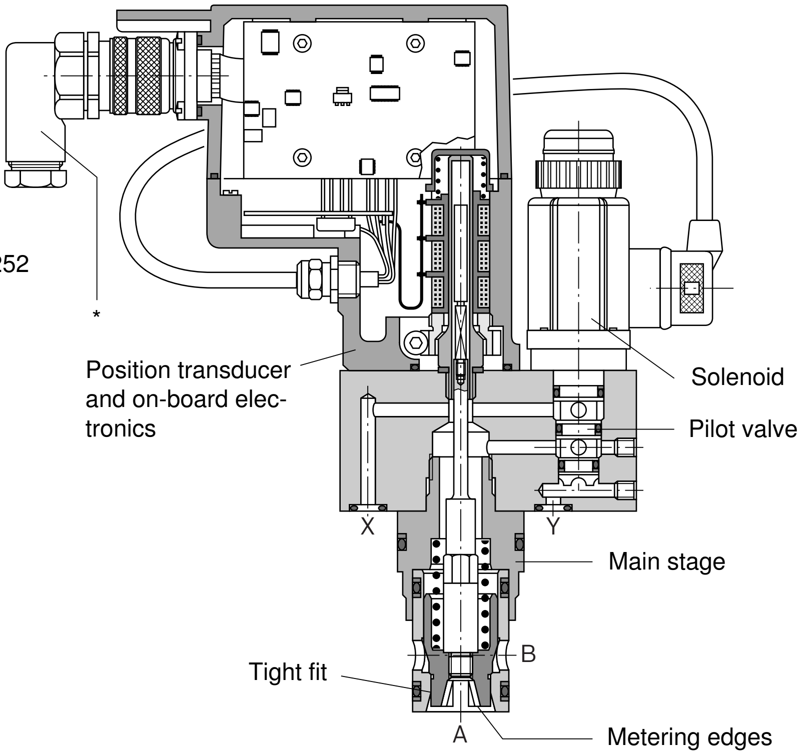
CE EN 61000-6-2: 2002-08
EN 61000-6-3: 2002-08

Basic principle

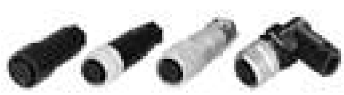
Pilot operated 2/2-way cartridge type valves.
There is a free choice of directions of flow, A → B or B → A, but please note:
- Always route “Y” externally
- Pressure at “X” must always be equal to or greater than at “A” and not below 12 bar when A → B.
- Pressure at “X” must always be equal to or greater than at “B” and not below 20 bar when B → A.

If the valve is shut down electrically and is supplied externally with sufficient pressure at “X”, the main stage A → B may be employed as a poppet valve.

* Use of 90° plug 1 834 484 252 is preferable, not included in scope of delivery.



Accessories

Type			Material Number
(4 x) ISO 4762	Cheese-head bolts included in scope of delivery		
* 	Plug-in connectors 2P+PE, see also RE 08008	KS	**1 834 482 022**
		KS	**1 834 482 026**
		MS	**1 834 482 023**
		MS	**1 834 482 024**
		KS 90°	**1 834 484 252**
	ISA adapter for external solenoid shutdown, see page 8		**1 834 484 245**

Testing and service equipment

Test box type VT-PE-TB3, see RE 30065
Measuring adapter 6P+PE type VT-PA-2, see RE 30068

Technical data

General

Construction	Cartridge type throttle valve, spool valve with closed-loop position control via OBE
Actuation	Pilot operated, proportional 3/2-way directional control valve in valve cover, without position control
Main stage	Position control via OBE and position transducer LVDT DC/DC
Connection type	Cartridge type, mounting hole configuration to DIN 24342, ISO/DIS 7368
Mounting position	Horizontal if possible, or position transducer at the bottom
Ambient temperature range °C	–20...+50
Vibration resistance, test condition	Max. 25 g, shaken in 3 dimensions (24 h)

Hydraulic (measured with HLP 46, ϑ_{oil} = 40 °C ±5 °C)

Pressure fluid	Hydraulic oil to DIN 51524...535, other fluids after prior consultation				
Viscosity range recommended mm^2/s	20...100				
max. permitted mm^2/s	10...800				
Pressure fluid temperature range °C	–20...+70				
Maximum permitted degree of contamination of pressure fluid Purity class to ISO 4406 (c)	Class 18/16/13 [1)]				
Direction of flow	A → B or B → A (when X supplied "internally", or "externally" when pressure higher)				
Nominal flow rate at	**NG16**	**NG25**	**NG32**	**NG40**	**NG50**
Δp = 5 bar per edge [2)] l/min	125	210	320	500	980
Weight kg	3.5	4.6	5.8	7.9	10.5
Max. working pressure in A, B, X bar	315	315	315	315	315
Max. working pressure in Y bar	100	100	100	100	100
Q_{max} l/min	350	600	1,000	1,500	3,000
Q_N pilot valve (supply) Δp = 5 bar l/min	5	15	15	28	28
Leakage X → Y Pilot valve at 100 bar cm^3/min	< 150	< 200	< 200	< 400	< 400
Min. flow rate at U_E = 0 V adjustable Valve active (Δp = 5 bar) cm^3/min	2,000	2,000	3,000	3,000	4,000
Leakage in main stage at Δp =100 bar (valve shut down electrically)	A → B = tight (poppet valve) B → A = tight (poppet valve) **Note**: min. leakage X → B possible when X = external				
Minimum supply pressure A → B bar	12	12	12	12	12
Minimum supply pressure B → A bar	20	20	20	20	20

Static/Dynamic

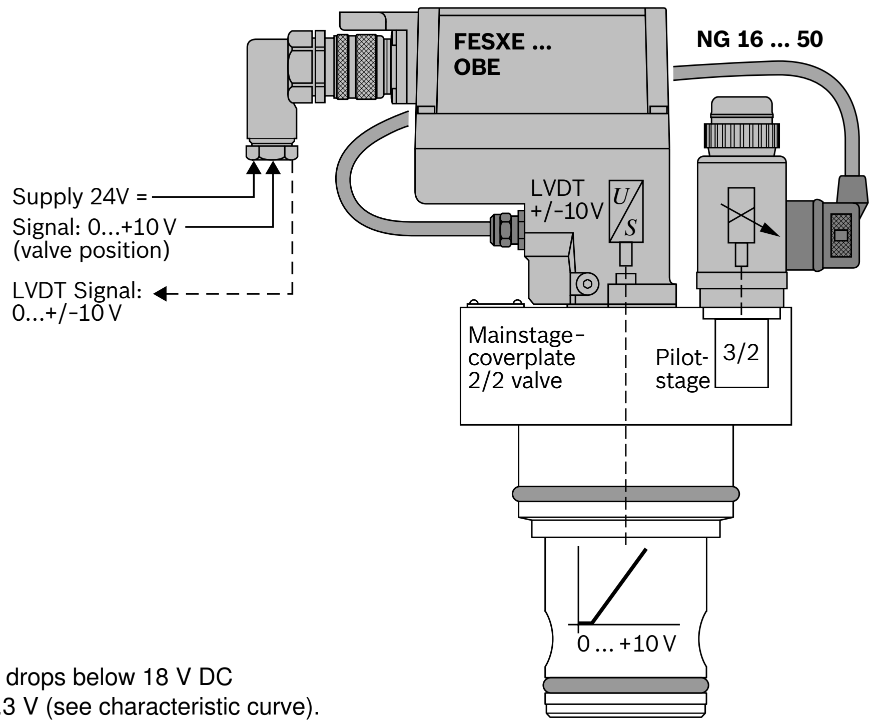
Spool stroke/characteristic curve + mm	4	5	7	10	12.5
Overlap on shutdown – mm	3	3	3	3	3
Control oil volume of main stage 100 % cm^3	1.02	2.66	6.36	12.57	24.54
Required control oil 0...100 %, x = 100 bar l/min	3	5	7	9	9
Hysteresis %	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Positioning accuracy %	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Manufacturing tolerance (Q_{max}) %	≤ ±5				
Response time (x = 100 bar) ms					
Signal change 0...100 % "open"	< 70	< 70	< 90	< 90	< 110
Signal change 100... 0 % "close"	< 70	< 70	< 90	< 130	< 300
Signal change 0... 10 % "open"	< 50	< 50	< 70	< 70	< 80
Signal change 10... 0 % "close"	< 40	< 40	< 50	< 70	< 100
Switch-off behavior U_B = OFF or $U_{D-E} \leqq 0.3$ V	After electrical shutdown (pilot valve opens "X" to the main stage), main stage moves to closed end position				
Thermal drift	< 1 % at ΔT = 40 °C				
Calibration	At the factory ±1 %, when U_{D-E} = 0.5 V, see characteristic curves				

Technical data

Electrical, trigger electronics integrated in valve		
Cyclic duration factor	%	100
Degree of protection		IP 65 to DIN 40050 and IEC 14434/5
Connection		Plug-in connector 6P+PE, DIN 43563
Supply voltage Terminal A: Terminal B: 0 V		24 V DC_{nom} Min. 21 V DC/max. 40 V DC Ripple max. 2 V DC
Power consumption		40 VA max.
External fuse		2.5 A_F
Input, “standard” version Terminal D: U_{D-E} Terminal E:		Differential amplifier, R_i = 100 kΩ 0...0.5...+10 V (see curve) 0 V
Max. voltage to differential inputs over 0 V		D → B, E → B: max. 18 V DC
Test signal, “standard” version Terminal F: U_{Test} Terminal C:	A1	LVDT 0...+10 V Reference 0 V
Safety earth conductor and shield		See pin assignment (installation in conformity with CE)
Recommended cable		See pin assignment up to 20 m 7 x 0.75 mm² up to 40 m 7 x 1 mm²
Calibration		Calibrated at the factory, see valve curve
Conformity		CE EN 61000-6-2: 2002-08 EN 61000-6-3: 2002-08

[1] The purity classes stated for the components must be complied with in hydraulic systems.
Effective filtration prevents problems and also extends the service life of components.
For a selection of filters, see catalog sheets RE 50070, RE 50076 and RE 50081.

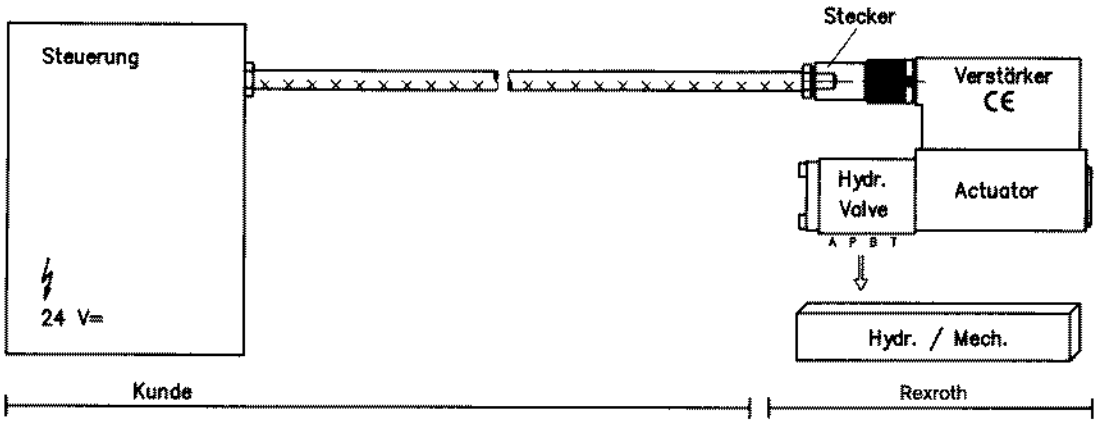
[2] Flow for other values of Δp $Q_X = Q_{nom} \cdot \sqrt{\frac{\Delta p_X}{5}}$



Note
Rapid shutdown takes place if:
– The supply voltage 24 V_{nom} (U_{A-B}) drops below 18 V DC
– The signal setpoint drops below 0.3 V (see characteristic curve).

Connection

For electrical data, see page 7 and
Operating Instructions **1 819 929 083**



Technical notes for the cable

Design: – Multi-wire cable
– Extra-finely stranded wire to VDE 0295, Class 6
– Safety earth conductor, green/yellow
– Cu braided shield

Type: – e.g. Ölflex-FD 855 CP (from Lappkabel company)

No. of wires: – Determined by type of valve, plug type and signal assignment

Cable Ø: – 0.75 mm² up to 20 m long
– 1.0 mm² up to 40 m long

Outside Ø: – 9.4...11.8 mm – Pg11
– 12.7...13.5 mm – Pg16

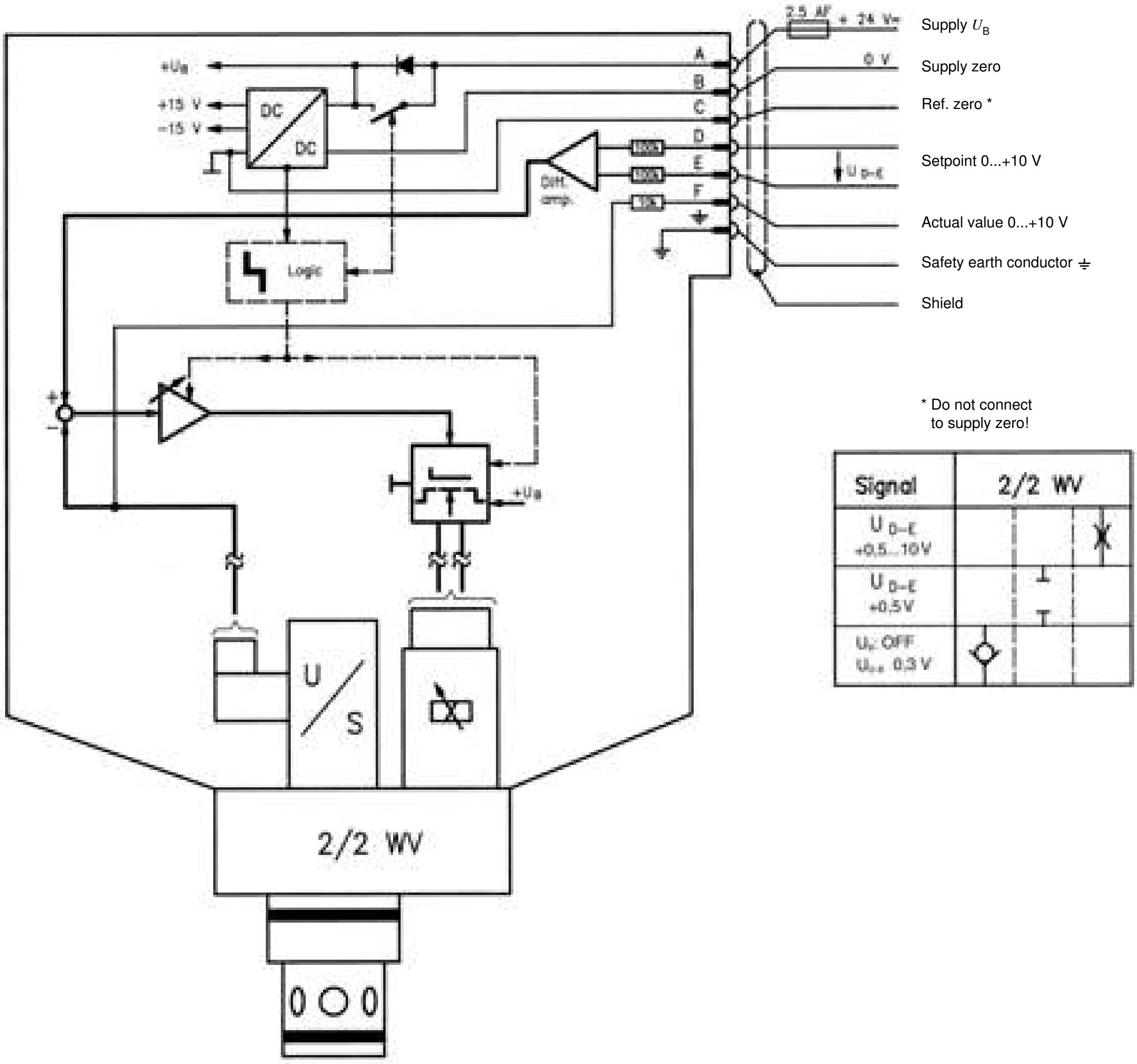
Important

Power supply 24 V DC nom.,
if voltage drops below 18 V DC, rapid shutdown resembling "Enable OFF" takes place internally.
In addition, with the "mA signal" version:
$I_{D-E} \geqq 3$ mA – valve is active
$I_{D-E} \leqq 2$ mA – valve is deactivated.
Electrical signals (e.g. actual values) emitted via the trigger electronics must not be used to shut down safety-relevant machine functions!
(Also see European Standard, "Technical Safety Requirements for Fluid-Powered Systems and Components – Hydraulics", EN 982.)

On-board trigger electronics

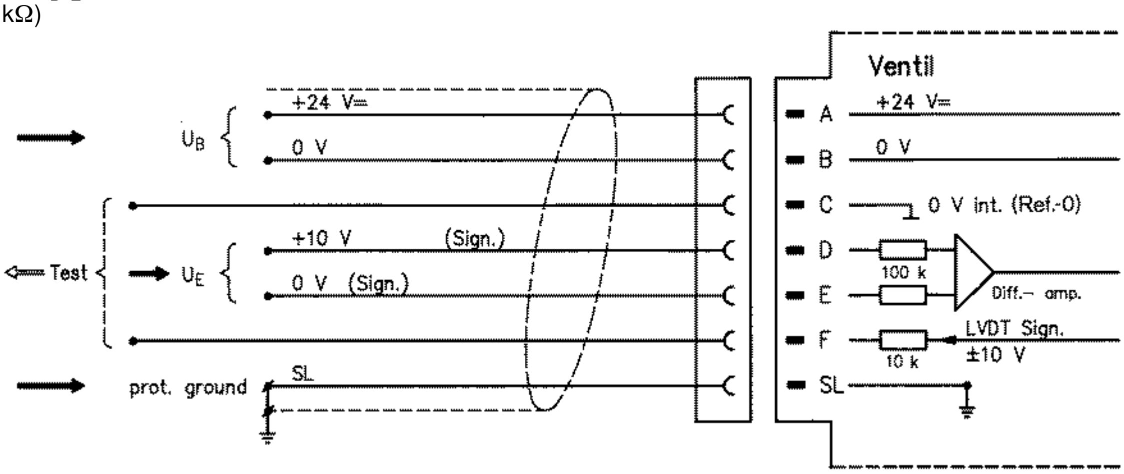
Circuit diagram/pin assignment

Version B1: U_{D-E} 0...0.5...+10 V



Pin assignment

Version B1: U_{D-E} 0...0.5...+10 V
(R_i = 100 kΩ)

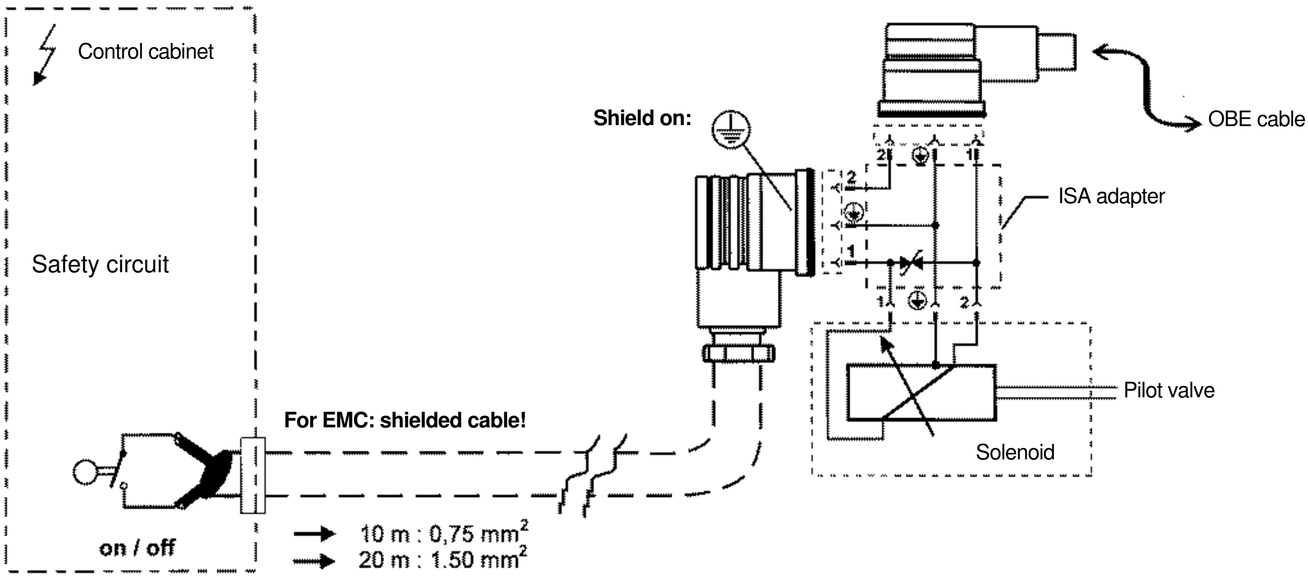


Accessory for external shutdown (ISA adapter)

Function

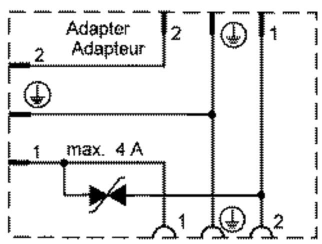
Interrupt **S**afety **A**dapter, protective circuit and plug connection for external solenoid shutdown (emergency stop circuit).

Circuit with ISA adapter



Note

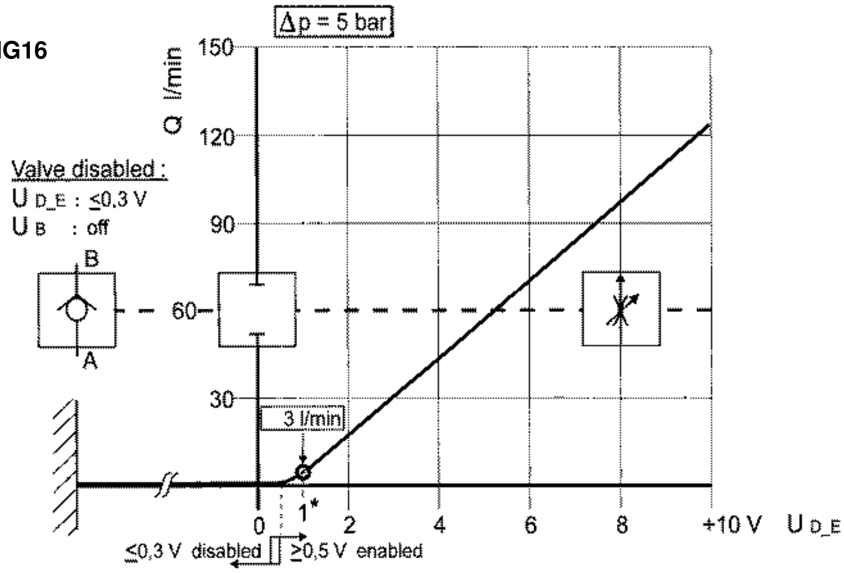
The manufacturer of the complete system is responsible for installation in accordance with EMC guidelines.

Symbol	Application	kg	**Material Number**
	ISA adapter for Rexroth control solenoids up to 50 VA	0.07	**1 834 484 245**

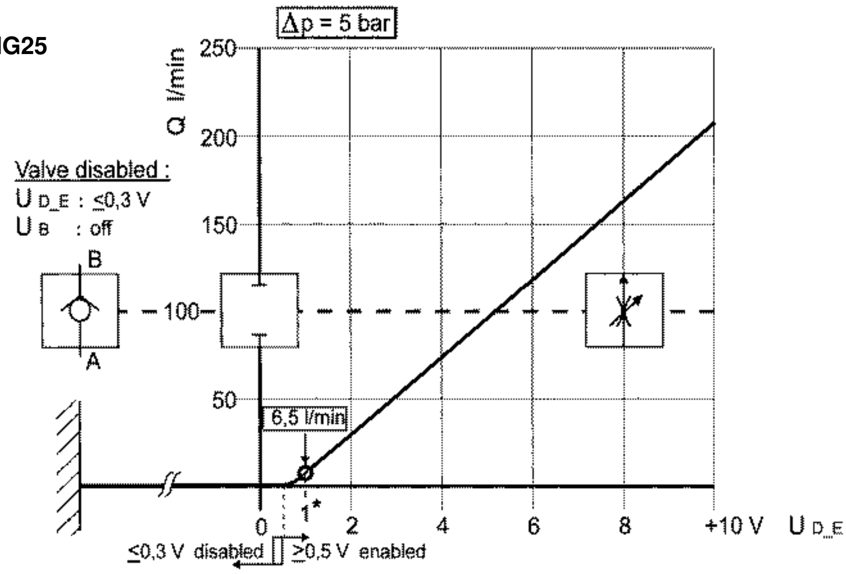
Characteristic curves (measured with HLP 46, ϑ_{oil} = 40 °C ± 5 °C)

Δp = 5 bar
ν = 36 mm²/s

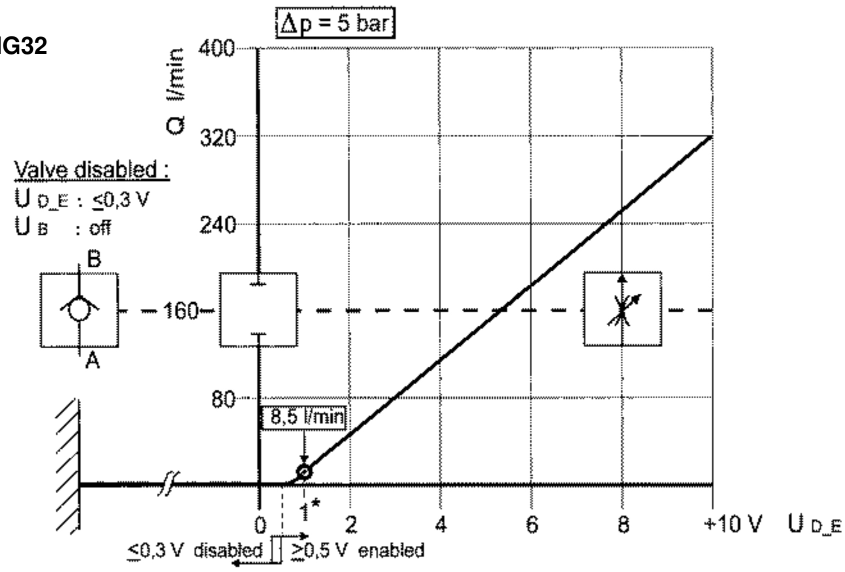
NG16



NG25



NG32

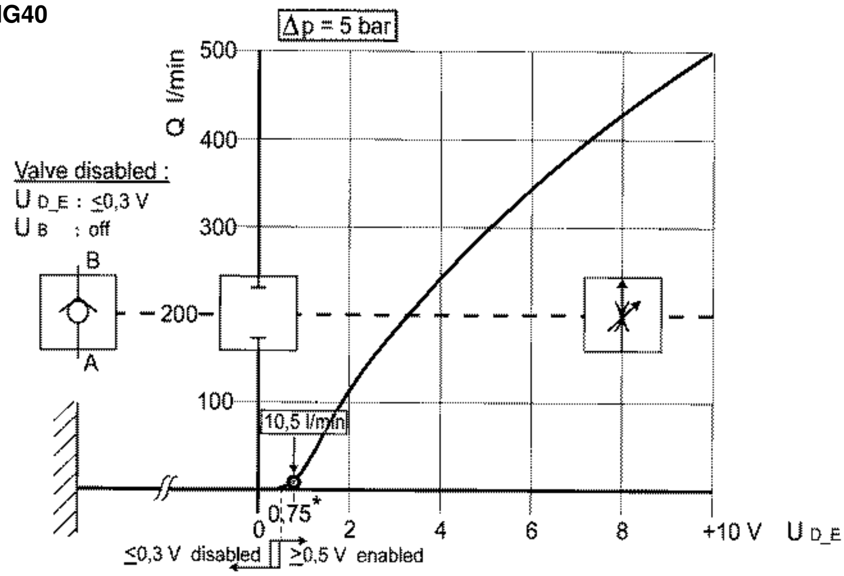


* Factory setting

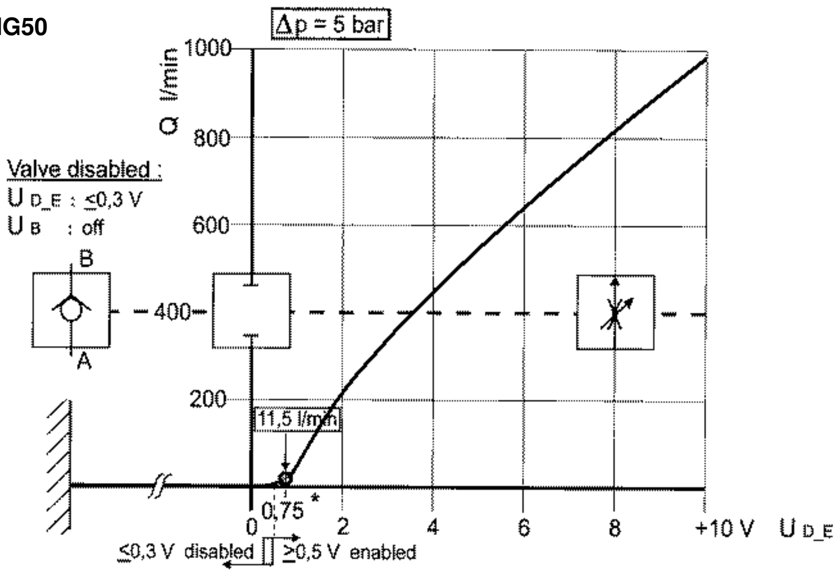
Characteristic curves (measured with HLP 46, ϑ_{oil} = 40 °C ± 5 °C)

Δp = 5 bar
ν = 36 mm²/s

NG40



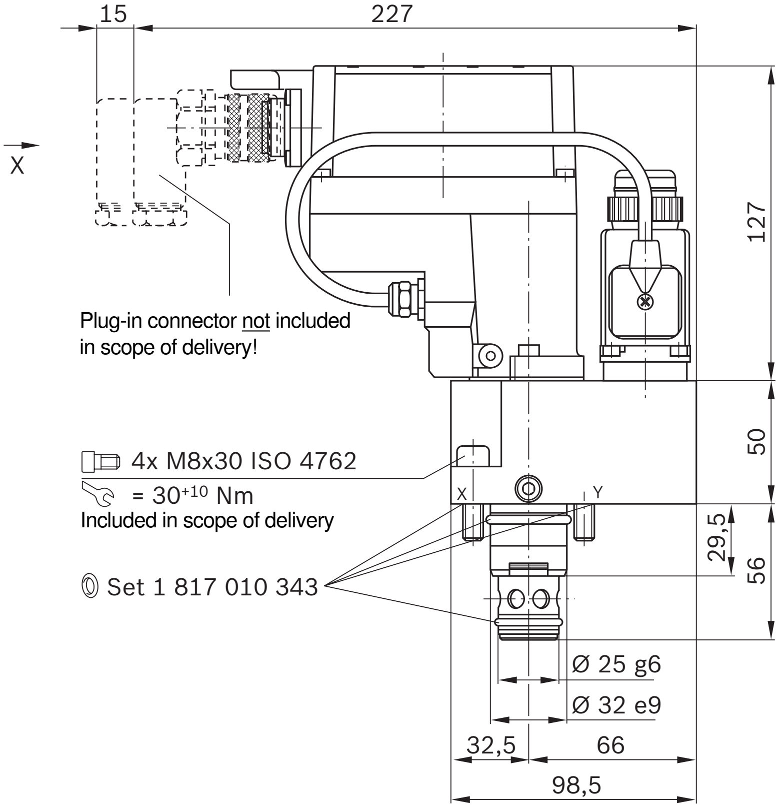
NG50

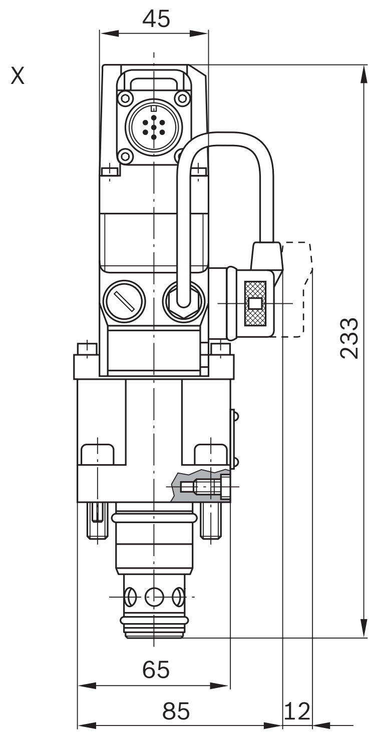


* Factory setting

Note
The output stage is shut down at $U_{D-E} \leqq 0.3$ V. The valve goes into poppet position.
The output stage with position control is switched on at $U_{D-E} \geqq 0.5$ V. The spool position is determined by the setpoint.

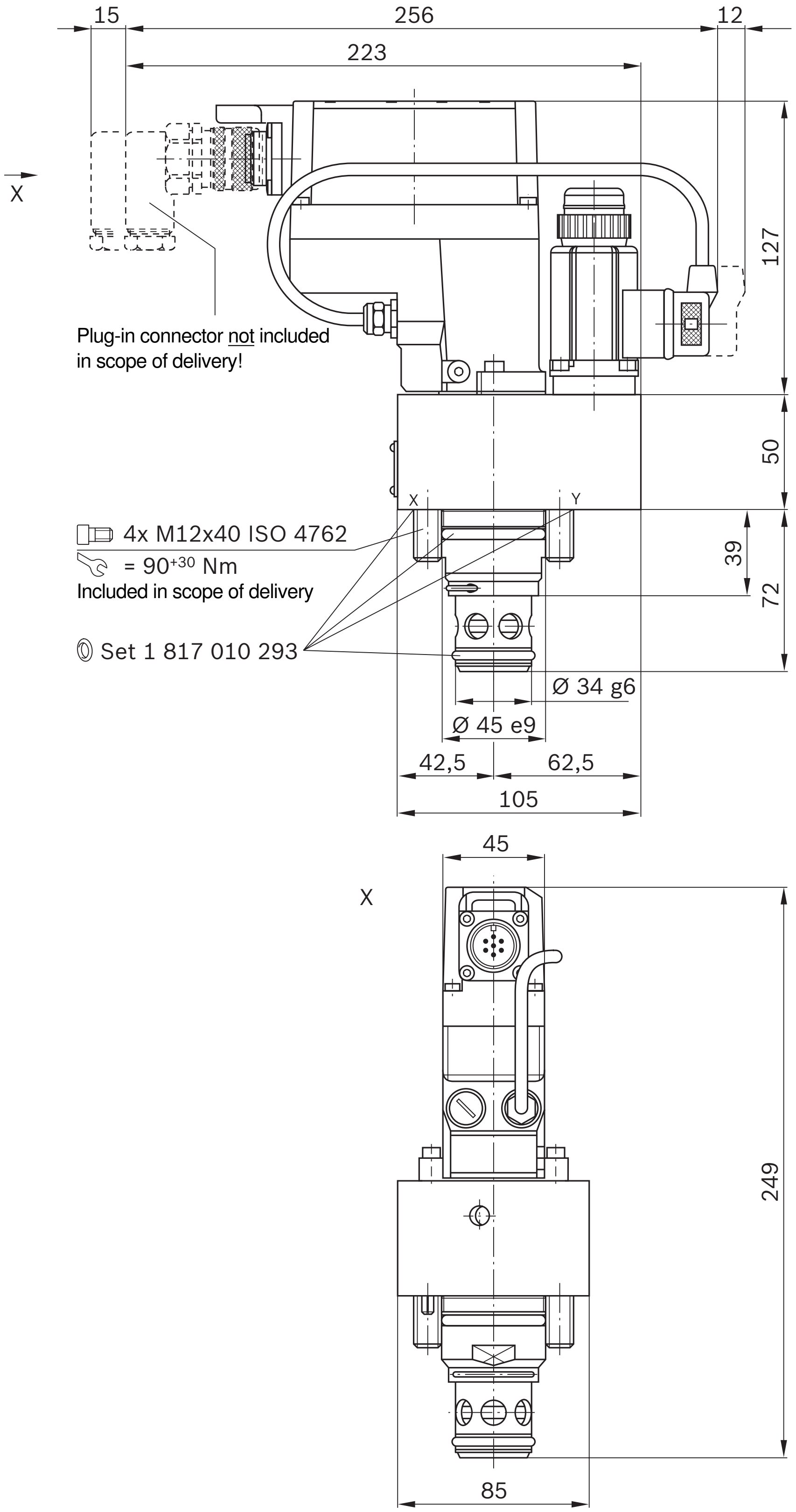
Unit dimensions NG16 (in mm)





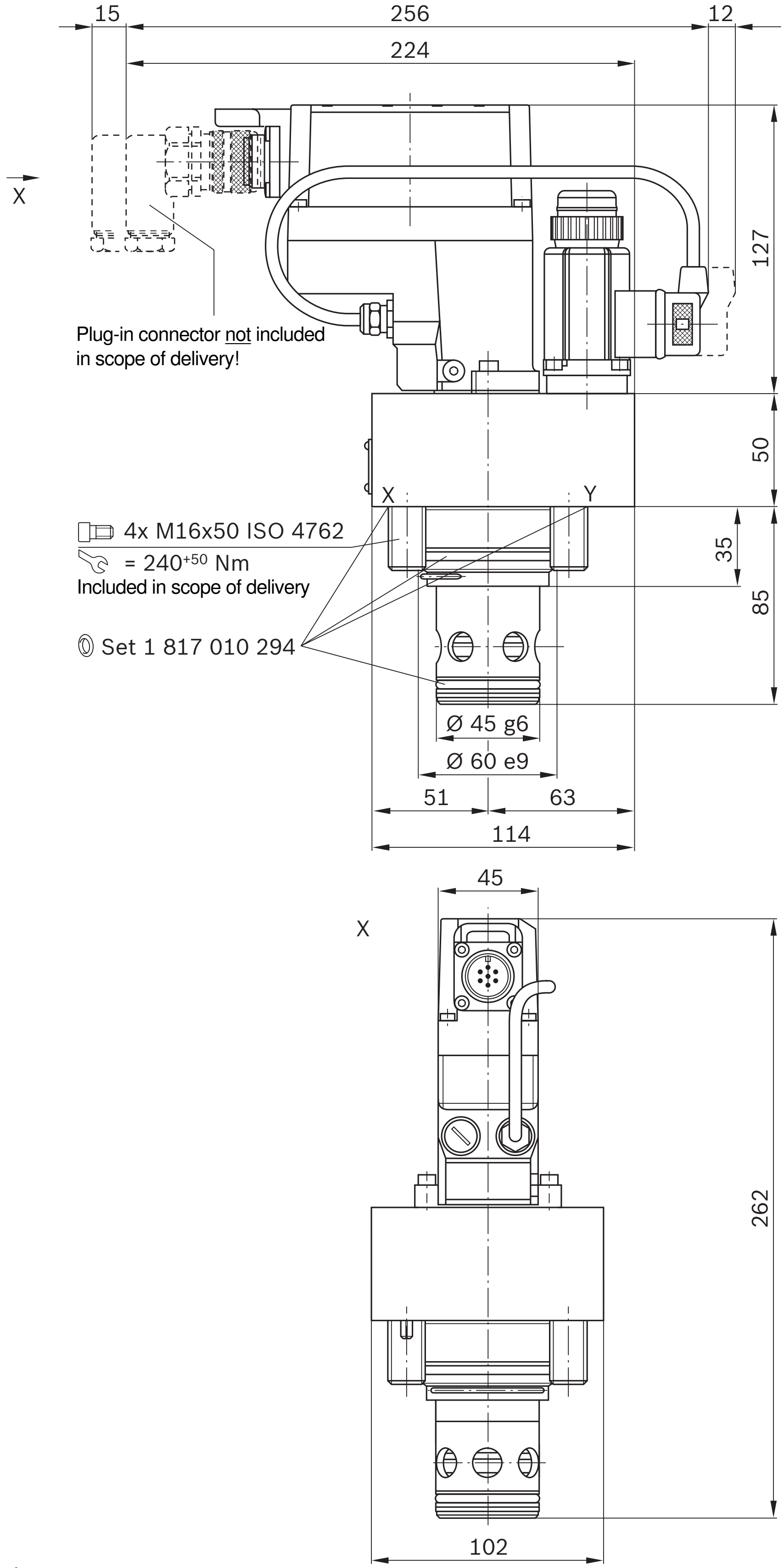
See installation dimensions on page 16

Unit dimensions NG25 (in mm)



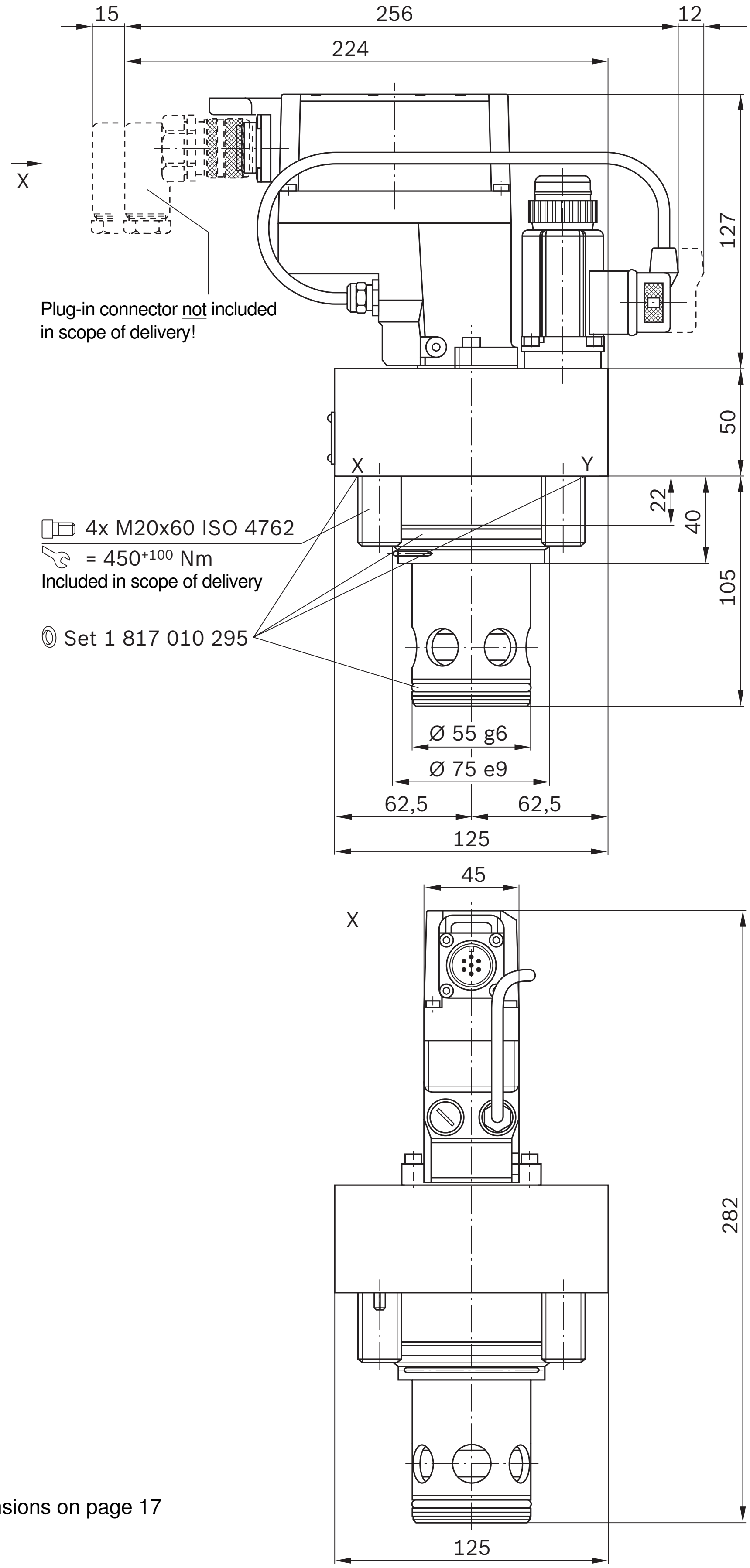
See installation dimensions on page 16

Unit dimensions NG32 (in mm)



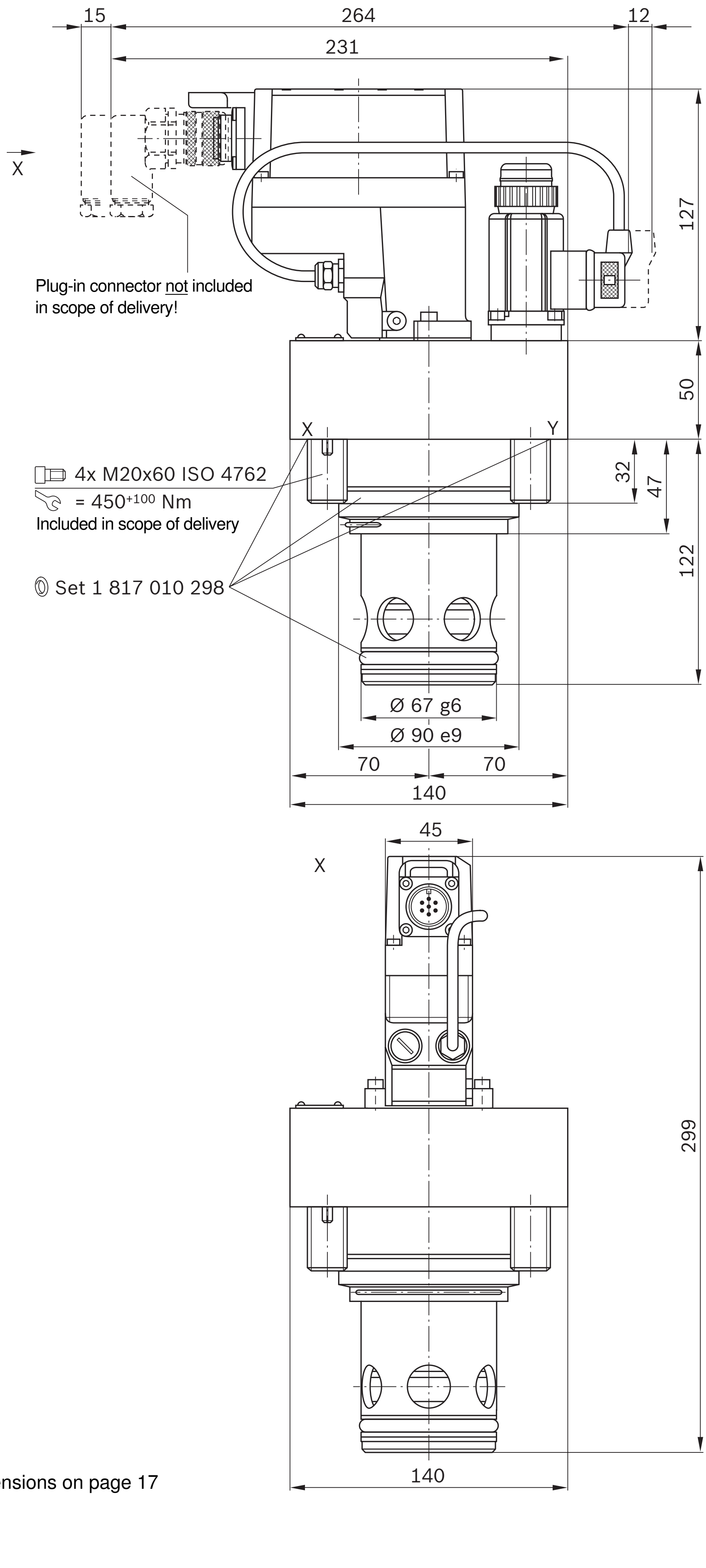
See installation dimensions on page 16

Unit dimensions NG40 (in mm)



See installation dimensions on page 17

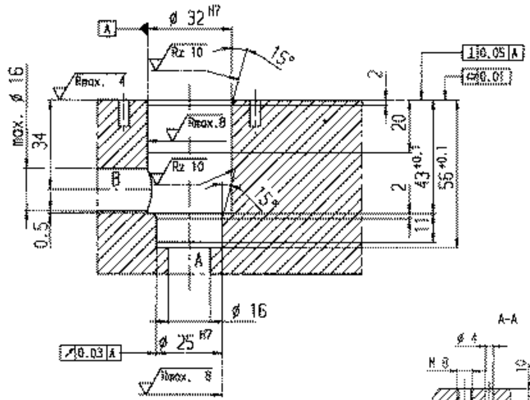
Unit dimensions NG50 (in mm)

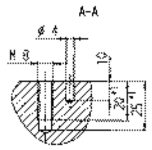


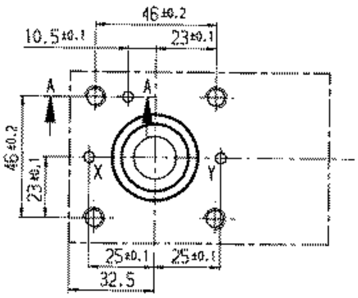
See installation dimensions on page 17

Installation dimensions DIN 24342, ISO/DIS 7368 (in mm)

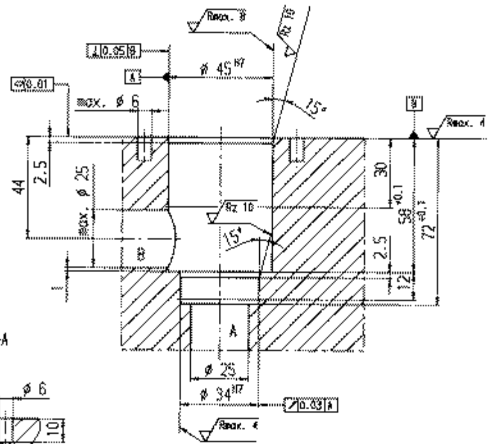
NG16

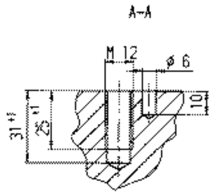


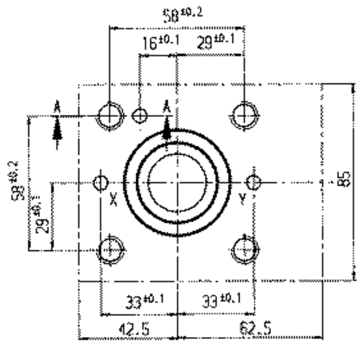




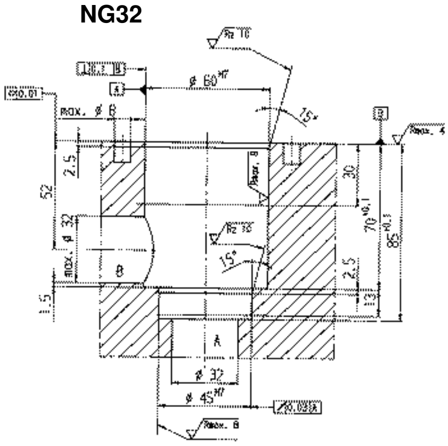
NG25

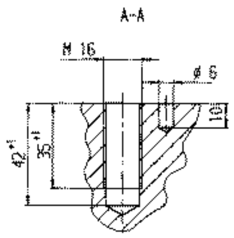


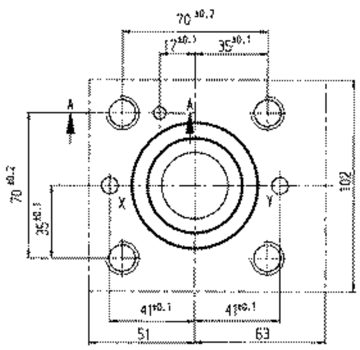




NG32

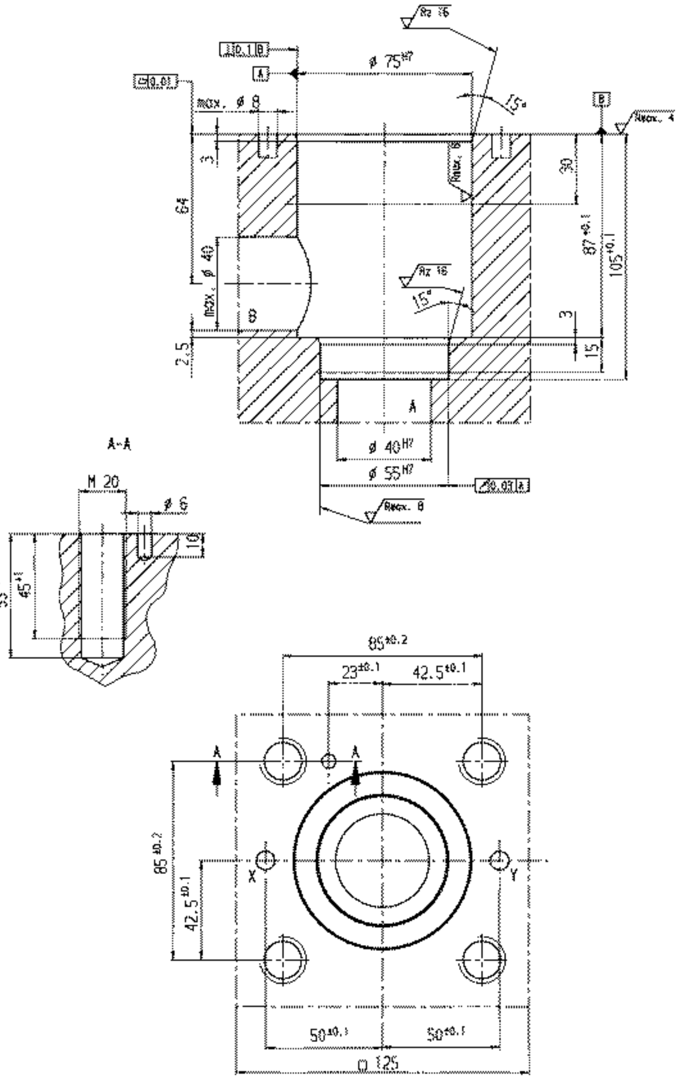




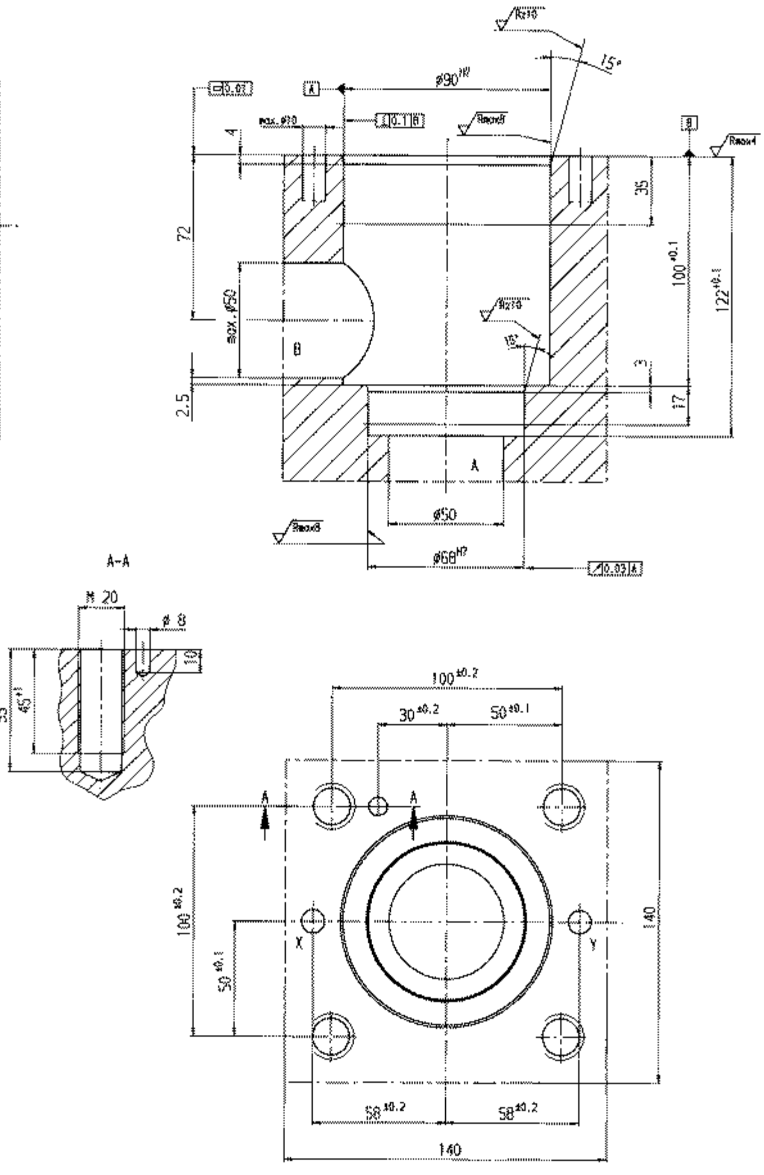


Installation dimensions DIN 24342, ISO/DIS 7368 (in mm)

NG40



NG50



Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Telefon +49 (0) 93 52 / 18-0
Telefax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Notes

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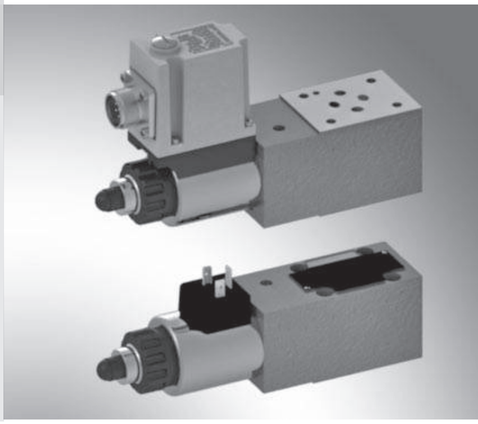
Proportional pressure relief valve, pilot operated

RE 29258/11.11
Replaces: RE 29158

Types (Z)DBE and (Z)DBEE



Size 6
Component series 2X
Maximum operating pressure 350 bar
Maximum flow 30 l/min

Table of contents

Features

– Pilot operated valve for limiting a system pressure
– Operation by means of proportional solenoids
– Proportional solenoid with rotatable and detachable coil
– For subplate mounting or sandwich plate design: Porting pattern according to ISO 4401-03-02-0-05 and DIN 24340
– Valve and control electronics from a single source
– External control electronics for types DBE and ZDBE
– Linear command value pressure characteristic curve
– Types DBEE and ZDBEE with integrated electronics (OBE):
  • Low manufacturing tolerance of the command value pressure characteristic curve

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

	DBE		6		2	–2X /		G24				*

Subplate mounting = **no code**
Sandwich plate = **Z**

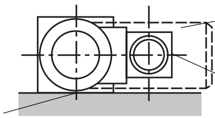
Proportional pressure relief valve = **DBE**

for external control electronics = **no code**
with integrated electronics (OBE) = **E**

Size 6 = **6**

Subplate mounting = **no code**
Pressure limitation in channel P = **VP**

Preferred position of mating connector = **2**



The mating connector can be brought to the desired position after the nut was loosened (see page 17, 18).

1) Valve mounting face (seal ring recesses in the housing)

Component series 20 to 29 = **2X**
(20 to 29: Unchanged installation and connection dimensions)

Maximum setting pressure

Pressure rating 25 bar	**= 25**
Pressure rating 50 bar	**= 50**
Pressure rating 100 bar	**= 100**
Pressure rating 200 bar	**= 200**
Pressure rating 315 bar	**= 315**
Pressure rating 350 bar	**= 350**

no code = Pilot oil return, internal (recommendation: Subplate mounting up to Q_{Vmax} =15 l/min)
Y = Pilot oil return, external (only possible with subplate mounting)

Supply voltage
G24 = +24 V direct voltage

Electrical connection
for DBE; ZDBE:
K4 = **without** mating connector, with connector according to DIN EN 175301-803
Mating connector – separate order see page 8

for DBEE; ZDBEE:
K31 = **without** mating connector, with connector according to DIN EN 175201-804
Mating connector – separate order see page 8

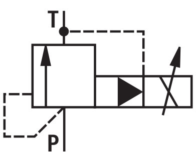
Interface electronics
A1 = Command value 0 to 10 V
F1 = Command value 4 to 20 mA
no code = for (Z)DBE

Seal material
M = NBR seals
V = FKM seals

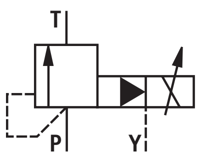
Further details in plain text = *

Symbols (for sandwich plate symbol: ① = component side, ② = plate side)

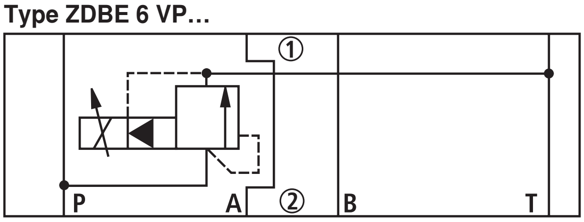
Type DBE 6…



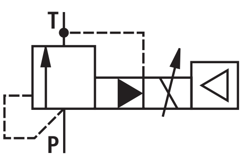
Type DBE 6…Y..



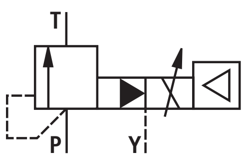
Type ZDBE 6 VP…



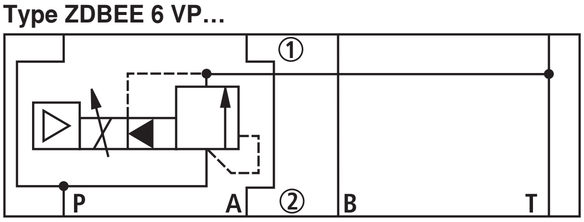
Type DBEE 6…



Type DBEE 6…Y..



Type ZDBEE 6 VP…



Function, cross-section

Types DBE and ZDBE

The pilot operated proportional pressure relief valves of the types DBE and ZDBE are operated by means of a proportional solenoid. These valves are used to limit a system pressure. With these valves it is possible to steplessly adjust the system pressure to be limited depending on the electrical command value.

These valves basically consist of a pilot control stage and a main stage.

The pilot control stage consists of a proportional solenoid (1), the poppet (2) and the valve seat (3). The main stage consists of a housing (4) and the main spool cartridge assembly (5). The proportional solenoid proportionally converts the electrical current into a mechanical force. An increase in the current intensity causes a corresponding rise in the magnetic force. The system pressure is adjusted by means of the proportional solenoid (1) depending on the command value. Pressure applied by the system in port P acts on the right hand side of the main spool cartridge assembly (5). At the same time, the system pressure acts via the pilot line (7), which is provided with an nozzle (6), on the spring-loaded side of the spool.

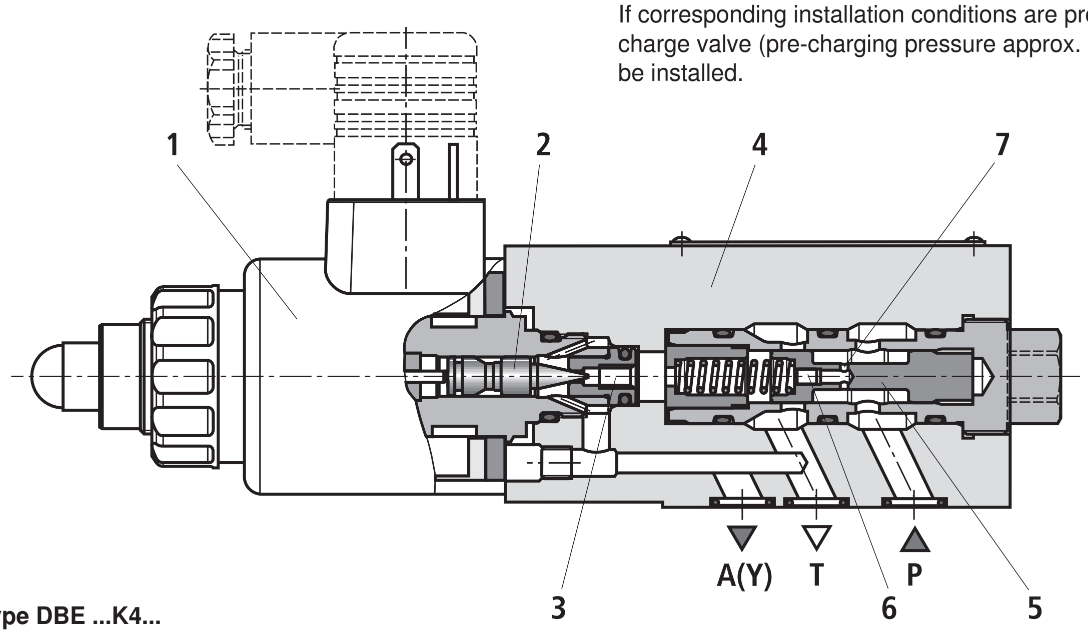
Via the valve seat in the pilot line (3), the pressure at the poppet (2) in the spring chamber acts against the force of the proportional solenoid (1).

Once the pressure has reached the pre-set value, the poppet (3) is lifted from the seat. The pilot oil can now (depending on the model) drain externally via port A (Y) or internally into the tank, which results in a limitation of the pressure on the spring-loaded side of the main spool (5). If the system pressure continues to rise slightly, the higher pressure on the right hand side of the spool will push the spool to the left into the control position P to T.

At a minimum control current (corresponds to a command value of zero), the minimum setting pressure will be set.

Notice!

– The tank lines should be prevented from running empty. If corresponding installation conditions are provided, a pre-charge valve (pre-charging pressure approx. 1 bar) is to be installed.



Type DBE ...K4...

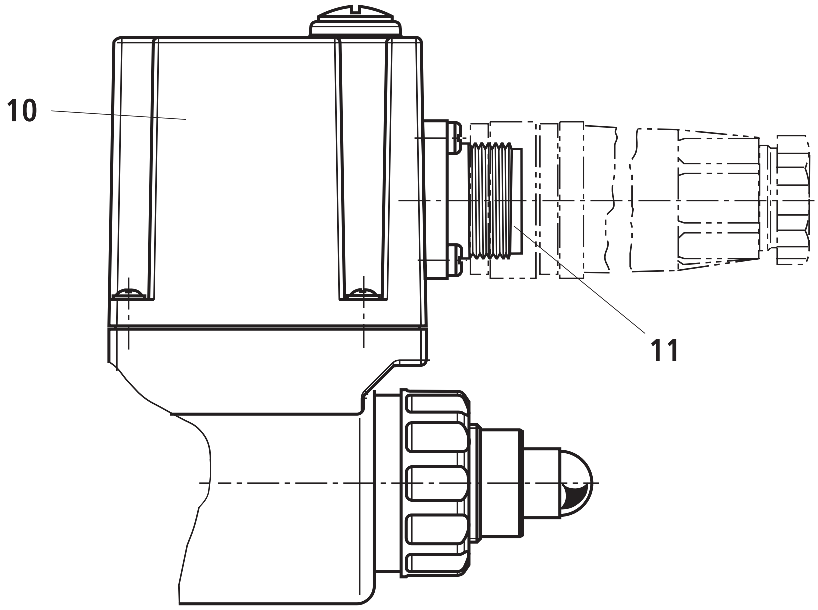
Function, cross-section

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

In terms of function and design, these valves correspond to type (Z)DBE. An additional housing (10) is fitted on the proportional solenoid which accommodates the control electronics.

Supply and command value voltage are applied at the connector (11).
In the factory, the command value pressure characteristic curve is adjusted with little manufacturing tolerance.

For more information on the control electronics, see page 9.



Type (Z)DBEE…-2X/…YG24K31...

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

general

Weight	– DBE and ZDBE	kg	2.4
	– DBEE and ZDBEE	kg	2.5
Installation position			Any
Storage temperature range		°C	–20 to +80
Ambient temperature range	– DBE and ZDBE	°C	–20 to +70
	– DBEE and ZDBEE	°C	–20 to +50

hydraulic (measured with HLP 46; ϑ_{oil} = 40 °C ± 5 °C)

Maximum operating pressure	– Port P; P1 – P2 A1 – A2; B1 – B2	bar	350
	– Port T	bar	50
Maximum setting pressure	– Pressure rating 25 bar	bar	25
	– Pressure rating 50 bar	bar	50
	– Pressure rating 100 bar	bar	100
	– Pressure rating 200 bar	bar	200
	– Pressure rating 315 bar	bar	315
	– Pressure rating 350 bar	bar	350
Minimum setting pressure at command value 0		bar	See characteristic curves on page 14 and 15
Return flow pressure in port A; with external pilot oil return (Y)			Separately at zero pressure to the tank
Pilot flow		l/min	0.6 to 1.2
Maximum flow		l/min	30
Hydraulic fluid			See table page 6
Hydraulic fluid temperature range		°C	–20 to +80
Viscosity range		mm^2/s	15 to 380
Maximum admissible degree of contamination of the hydraulic fluid cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1)]
Hysteresis		%	±3 of the maximum setting pressure
Repeatability		%	< ±2 of the maximum setting pressure
Linearity		%	±3.5 of the maximum setting pressure
Manufacturing tolerance of the command value pressure characteristic curve, related to the hysteresis characteristic curve, pressure increasing	– DBE and ZDBE	%	±5 of the maximum setting pressure
	– DBEE and ZDBEE	%	±1.5 of the maximum setting pressure
Step response $T_u + T_g$	10 % → 90 %	ms	130 – Depending on system
at Q_V = 5 l/min	90 % → 10 %	ms	110 – Depending on system

1) The cleanliness classes specified for the components must be complied with in hydraulic systems. An effective filtration prevents faults and at the same time increases the service life of the components.

For the selection of the filters see www.boschrexroth.com/filter.

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

hydraulic

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP	NBR, FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HEES	FKM	ISO 15380
		HEPR	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Water-containing	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 or contact us!

– The flash point of the process and operating medium used must be 40 K higher than the maximum solenoid surface temperature.

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

Maximum pressure differential 210 bar, otherwise increased cavitation erosion! The pressure peaks should not exceed the maximum operating pressures!

Service life as compared to HLP 30 - 100 %

Maximum fluid temperature 60 °C

electric

Minimum solenoid current		mA	≤ 100
Maximum solenoid current		mA	1600 ± 10 %
Solenoid coil resistance	Cold value at 20 °C	Ω	5.5
	Maximum hot value	Ω	8.05
Duty cycle		%	100

electrical, integrated electronics (OBE)

Supply voltage	Nominal voltage	VDC	24
	Lower limit value	VDC	21
	Upper limit value	VDC	35
Current consumption		A	≤ 1.5
Required fuse protection		A	2, time-lag
Inputs	Voltage	V	0 to 10
	Current	mA	4 to 20
Output	Actual current value	mV	1 mV ≙ 1 mA
Protection class of the valve according to EN 60529			IP 65 with mating connector mounted and locked

Accessories (not included in scope of delivery)

Proportional amplifier for type (Z)DBE		Material number
VT-MSPA1-11-1X/ in modular design VT-VSPD-2 in eurocard format VT-MSPA1-11-1X/ in eurocard format VT-SSPA1-1-1X plug-in amplifier	according to data sheet 30223 according to data sheet 30523 according to data sheet 30100 according to data sheet 30116	

Mating connector for type (Z)DBE		Material number
Mating connector (black)	according to DIN EN 175301-803	R901017011

Mating connector for type (Z)DBEE		Material number
Mating connector	according to DIN EN 175201-804	e.g. R900021267 (plastic) e.g. R900223890 (metal)

Hexagon socket head cap screws		Material number
Type DBE(E)	4x ISO 4762 - M5 x 50 - 10.9-flZn-240h-L (friction coefficient μ_{total} = 0.09 to 0.14) Tightening torque M_A = 7 Nm ±10 %	
Type ZDBE(E)	4x ISO 4762 - M5 - 10.9-flZn-240h-L (friction coefficient μ_{total} = 0.09 to 0.14) Tightening torque M_A = 7 Nm ±10 %	

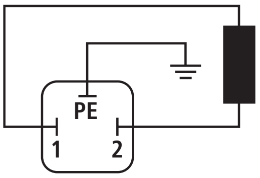
Notice: The tightening torque of the hexagon head cap screws refers to the maximum admissible operating pressure!

Subplates	Data sheet
Size 6	45052

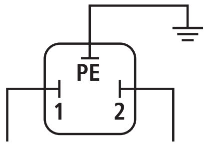
Electrical connection (dimensions in mm)

(Z)DBE

Connection to connector

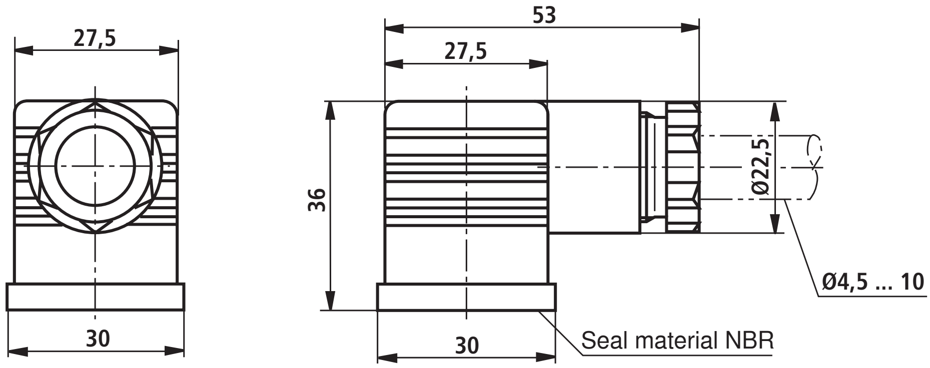


Connection to mating connector



to the amplifier

Mating connector (black)
according to DIN EN 175301-803
Material no. **R901017011**
(separate order)

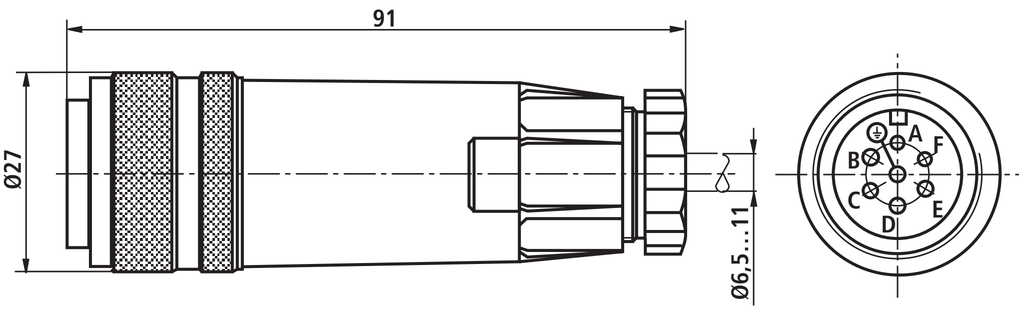


(Z)DBEE

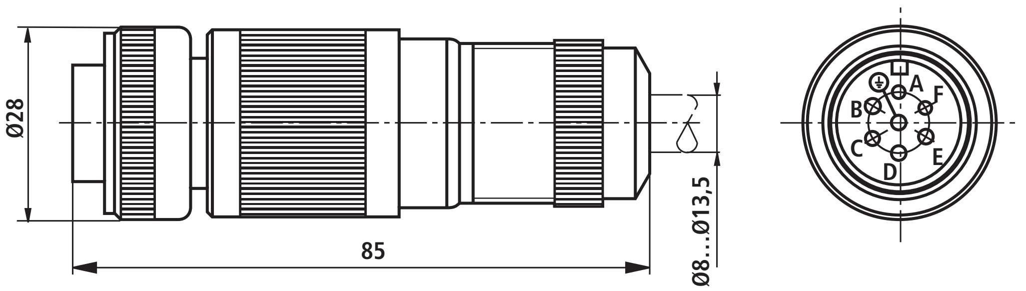
Device connector allocation	Contact	Assignment interface "A1"	Assignment interface "F1"
Supply voltage	A	24 VDC (u(t) = 21 V to 35 V); I_{max} ≤ 1.5 A	
	B	0 V	
Reference potential actual value	C	Reference contact F; 0 V	Reference contact F; 0 V
Differential amplifier input	D	0 to 10 V; R_E = 100 kΩ	4 to 20 mA; R_E = 100 Ω
	E	Reference potential command value	
Measuring output (actual value)	F	0 to 1.6 V actual value (1 mV ≙ 1 mA) Load resistance > 10 kΩ	
	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)

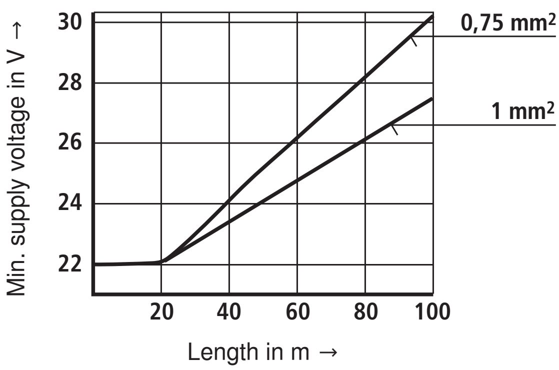


Electrical connection

Connection cable for (Z)DBEE

- Recommendation: 6-wire, 0.75 or 1 mm^2 plus protective earthing conductor and screening
- Only connect the screening to PE on the supply side
- Max. admissible length 100 m

The minimum supply voltage at the power supply unit depends on the length of the supply line (see diagram).



Integrated electronics (OBE) for type (Z)DBEE

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.

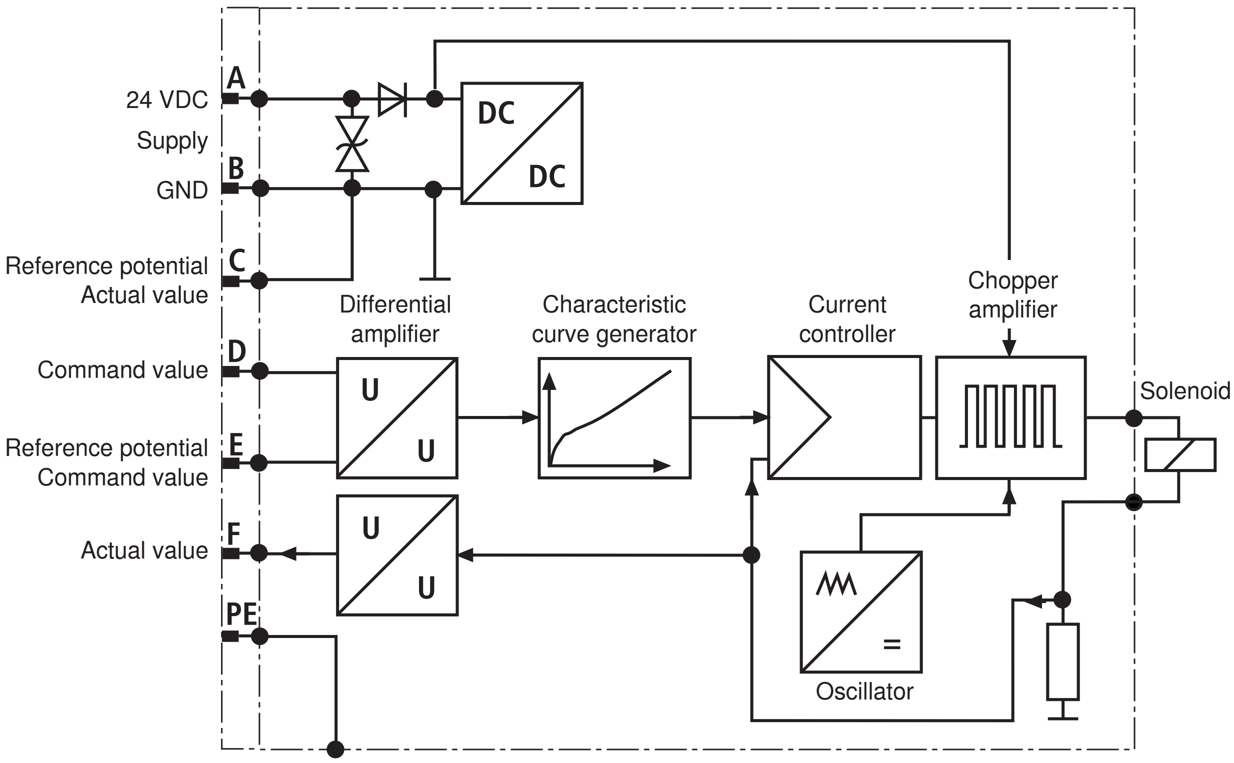
Via the characteristic curve generator, the command value solenoid current characteristic curve is adjusted to the valve so that non-linearities in the hydraulic system are compensated for and a linear command value pressure characteristic curve is created.

The current controller controls the solenoid current independent of the solenoid coil resistance.

The power section of the electronics for controlling the proportional solenoid is a chopper amplifier with a cycle frequency of approx. 180 Hz to 400 Hz. The output signal is pulse-width modulated (PWM).

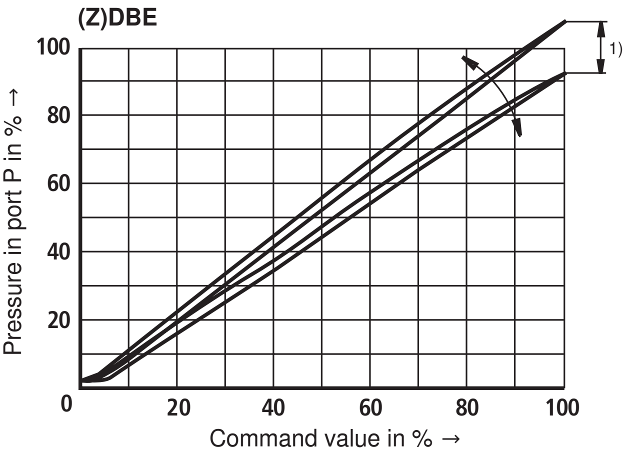
For checking the solenoid current, a voltage can be measured between pin F(+) and pin C(–) that is proportional to the solenoid current. **1 mV** corresponds to a solenoid current of **1 mA**.

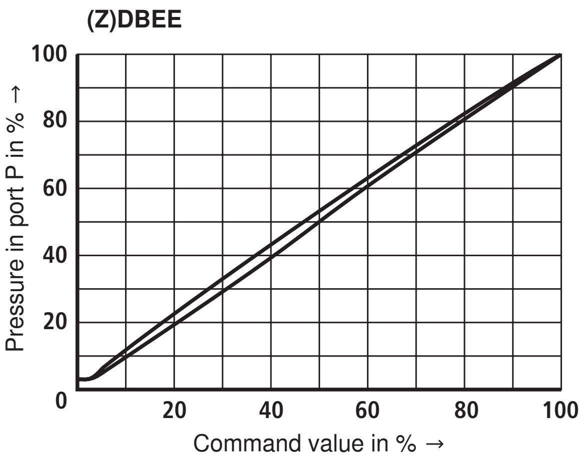
Block diagram



Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

Pressure in port P depending on the command value (Q_V = 5 l/min)

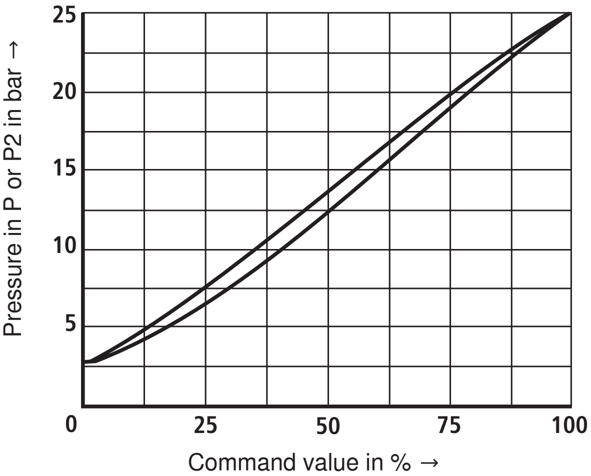




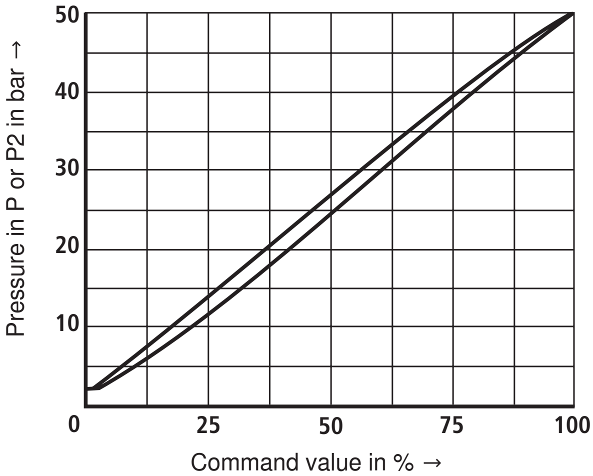
1) On valve DRE(M), the manufacturing tolerance can be adjusted at the **external analog amplifier** (for type and data sheet see page 7) using the command value attenuator potentiometer **"Gw"**. The digital amplifier can be set by means of the parameter "limit".
Here, the control current according to the technical data must not be exceeded.
In order to match several valves to the same characteristic curve, at a command value of 100 %, the pressure must not exceed the maximum setting pressure of the relevant pressure rating at no valve.

Pressure in port P or P2 depending on the command value (Q_V = 5 l/min)

Pressure rating 25 bar ("y" external and internal)

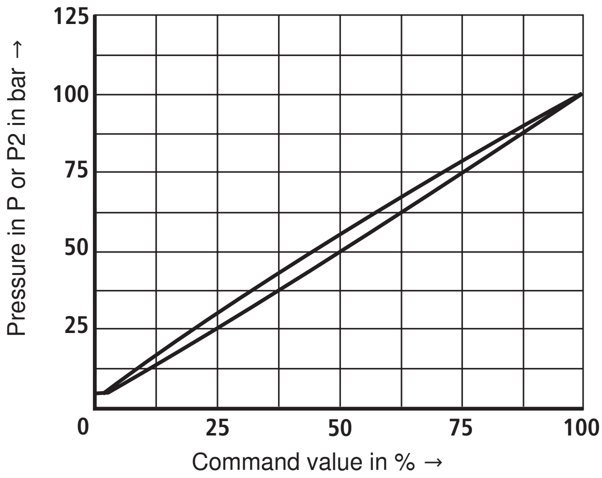


Pressure rating 50 bar ("y" external and internal)

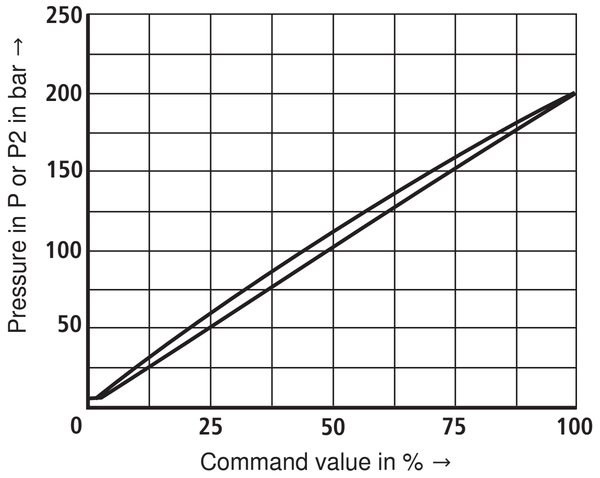


Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

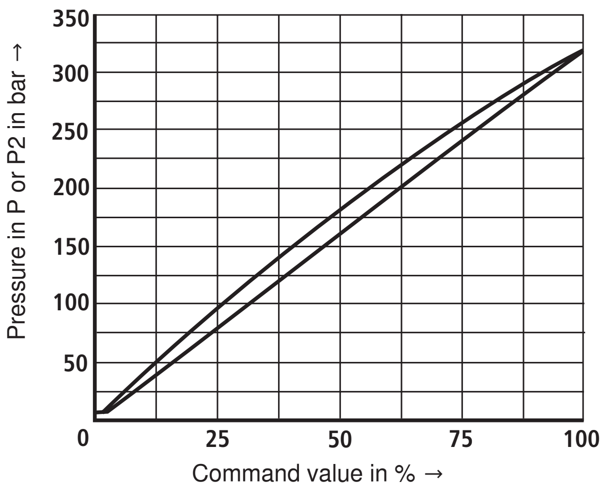
Pressure rating 100 bar ("y" external and internal)



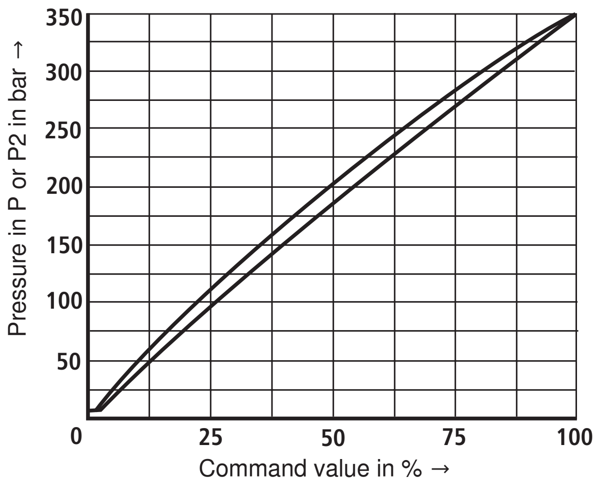
Pressure rating 200 bar ("y" external and internal)



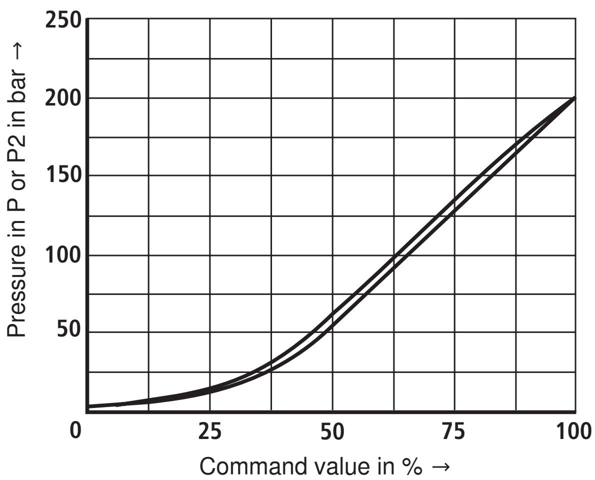
Pressure rating 315 bar ("y" external and internal)



Pressure rating 350 bar ("y" external and internal)

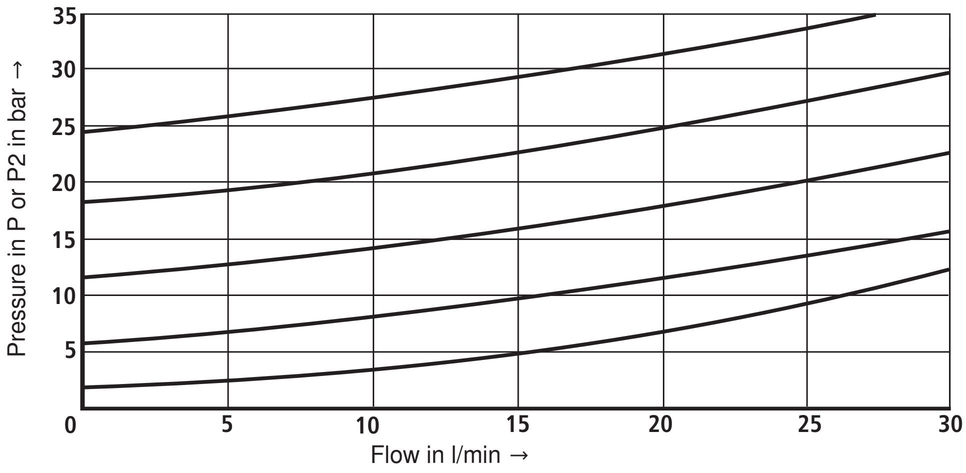


Pressure rating 200 bar (with VT-SSPA1) plug-in amplifier

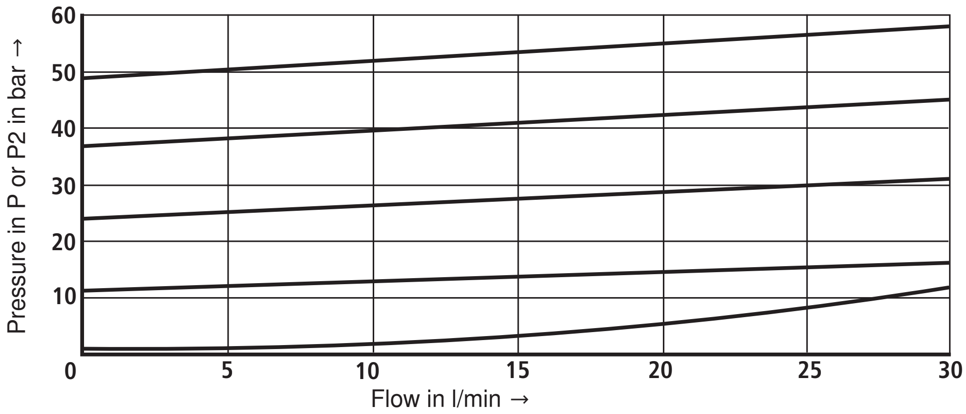


Characteristic curves (measured with HLP 46; ϑ_{oil} = 40 °C ± 5 °C)

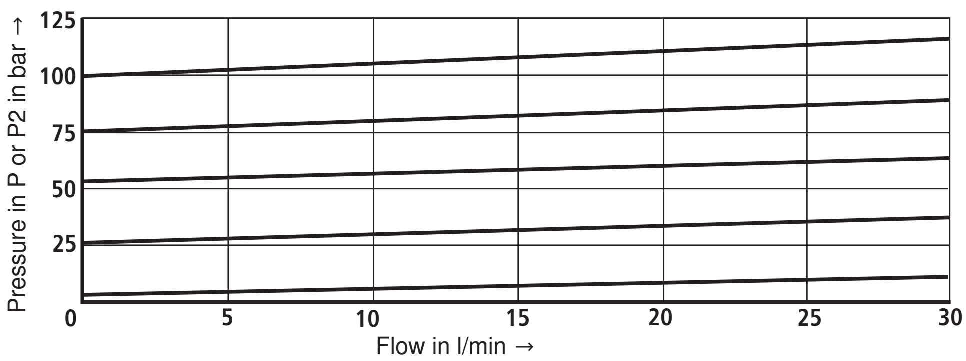
Pressure in channel P or P2 depending on the flow Q_v
Pressure rating 25 bar



Pressure rating 50 bar

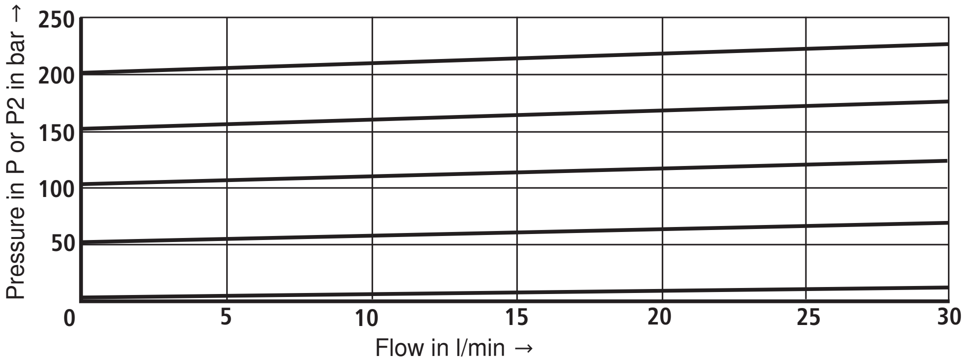


Pressure rating 100 bar

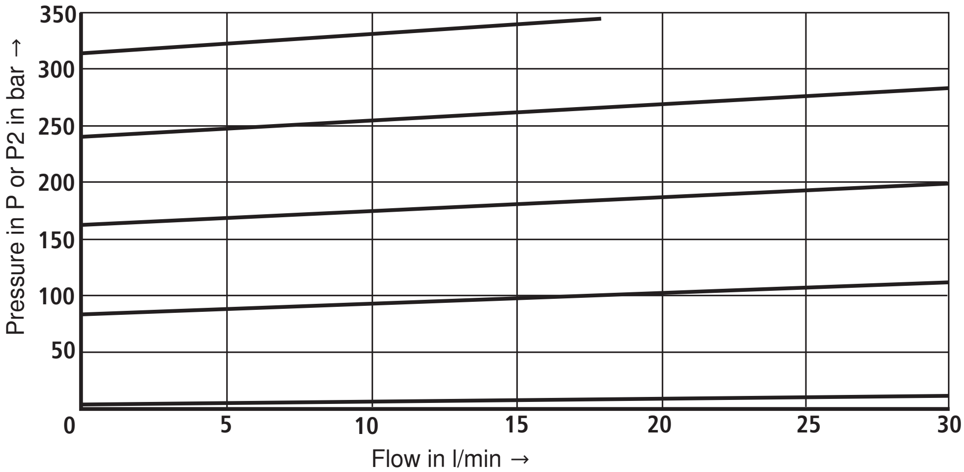


Characteristic curves (measured with HLP 46; ϑ_{oil} = 40 °C ± 5 °C)

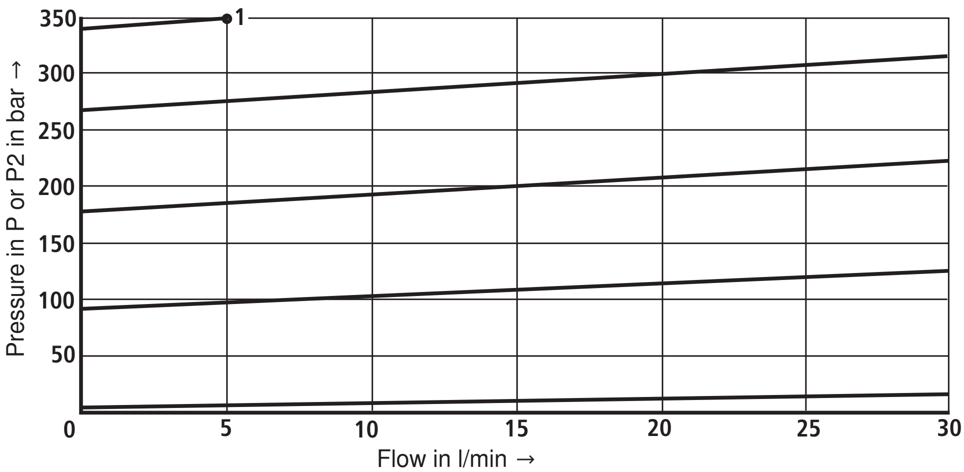
Pressure rating 200 bar



Pressure rating 315 bar



Pressure rating 350 bar [1)]



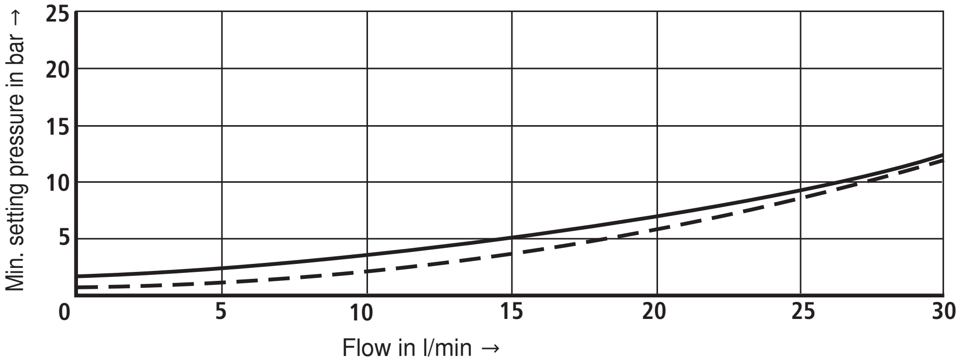
[1)] In case of characteristic curve 1, the command value may not exceed the maximum flow of 5 l/min

The characteristic curves were measured without counter pressure in port A (external pilot oil return) and T (internal pilot oil return). With internal pilot oil return, the pressure in P or P2 increases by the output pressure present in port T.

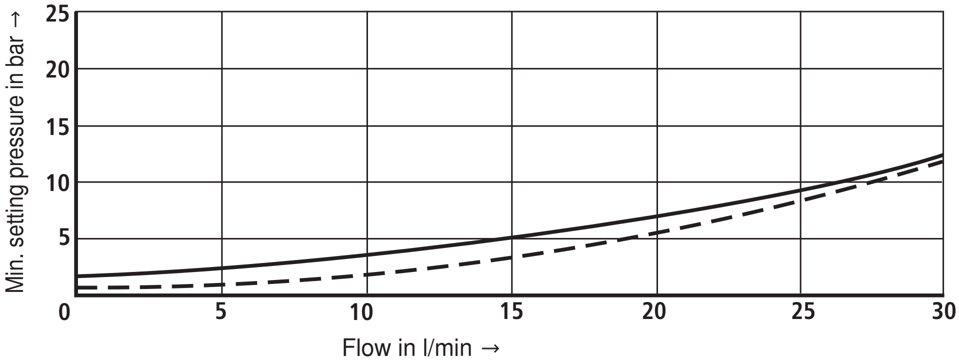
Characteristic curves (measured with HLP 46; ϑ_{oil} = 40 °C ± 5 °C)

Min. setting pressure in port P or P2 or at command value 0.

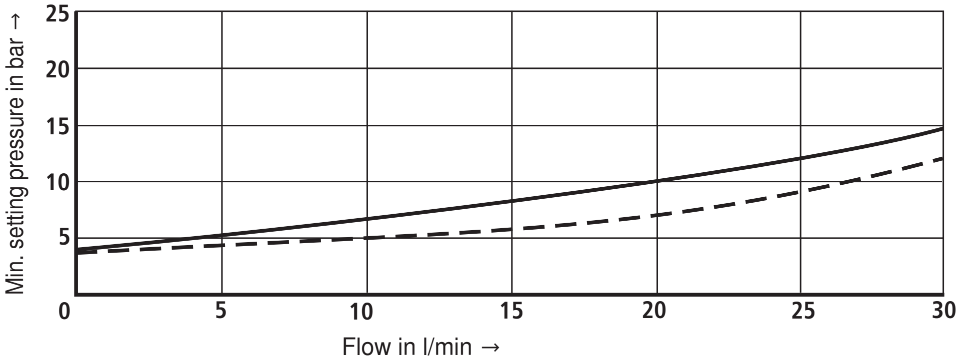
Pressure rating 25 bar



Pressure rating 50 bar



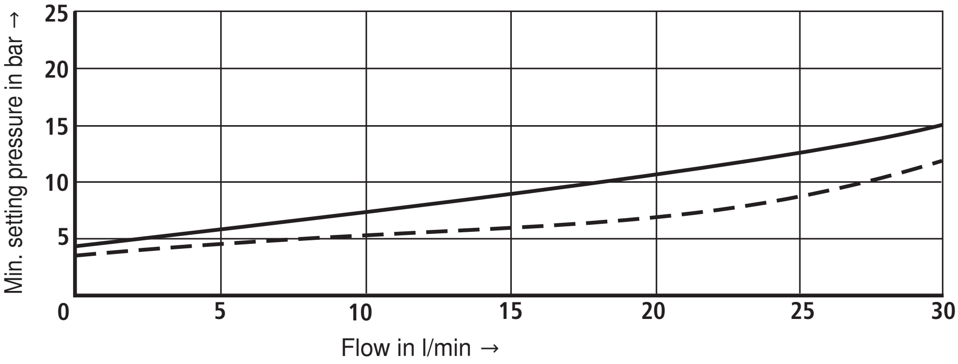
Pressure rating 100 bar



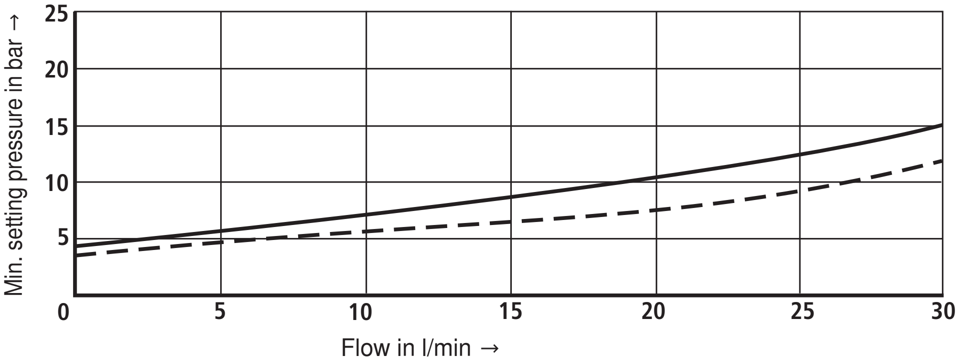
Pilot oil return ——— Internal – – – External

Characteristic curves (measured with HLP 46; ϑ_{oil} = 40 °C ± 5 °C)

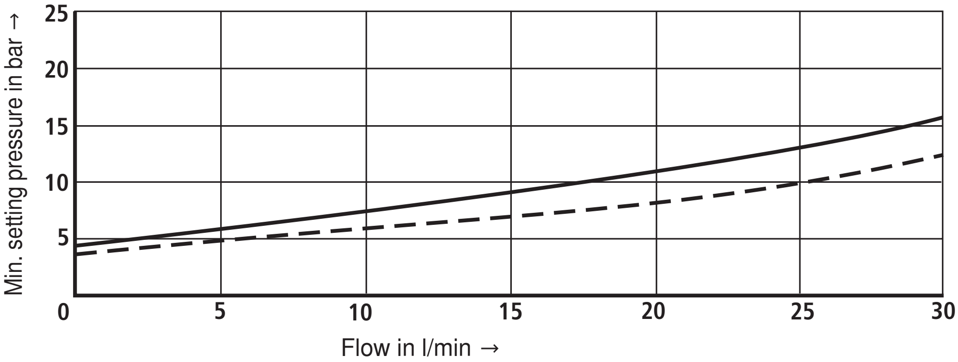
Pressure rating 200 bar



Pressure rating 315 bar



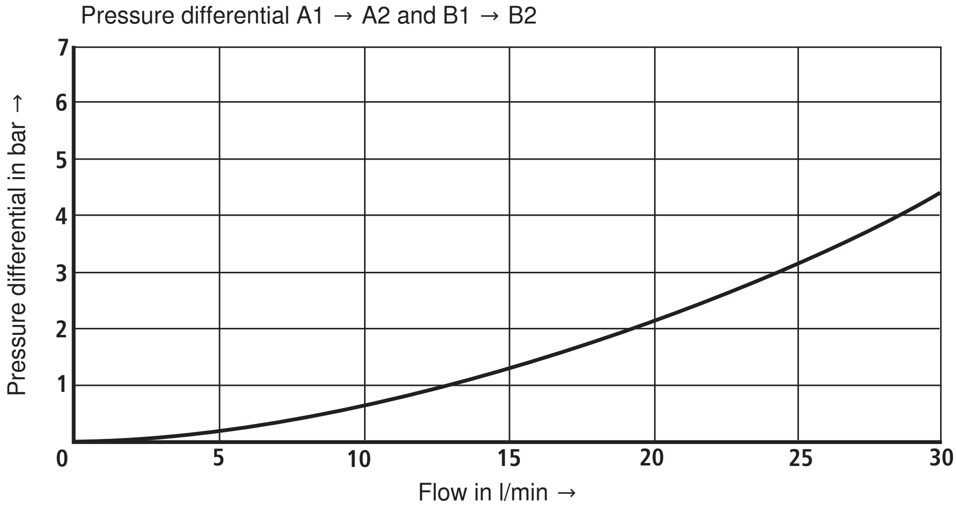
Pressure rating 350 bar

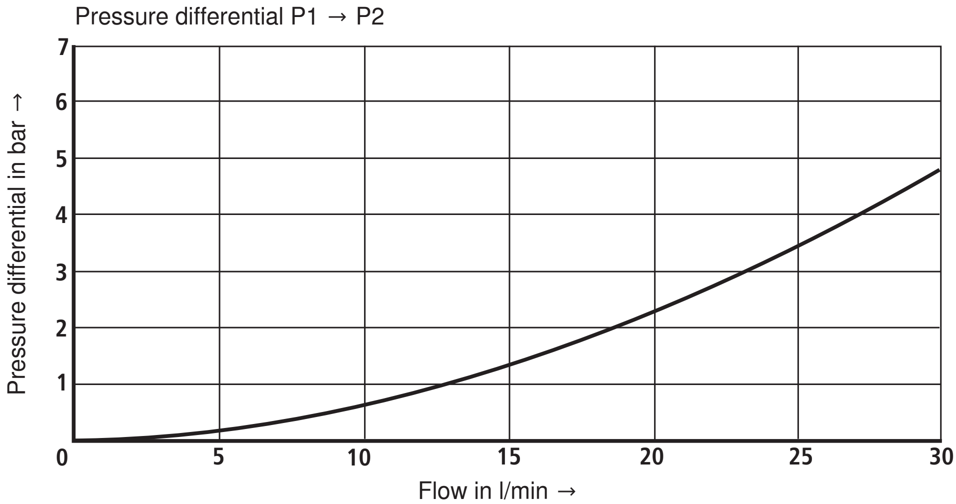


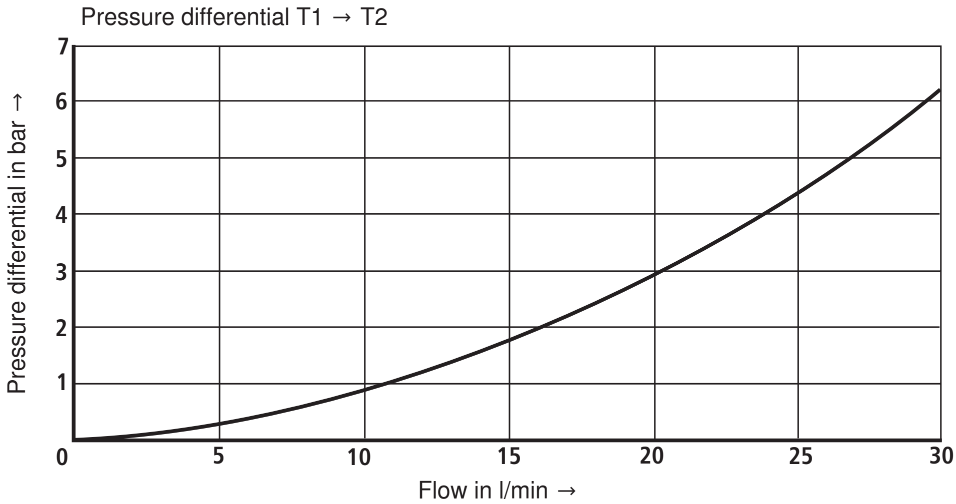
Pilot oil return ——— Internal – – – External

The characteristic curves were measured without counter pressure in port A (external pilot oil return) and T (internal pilot oil return). With internal pilot oil return, the pressure in P or P2 increases by the output pressure present in port T.

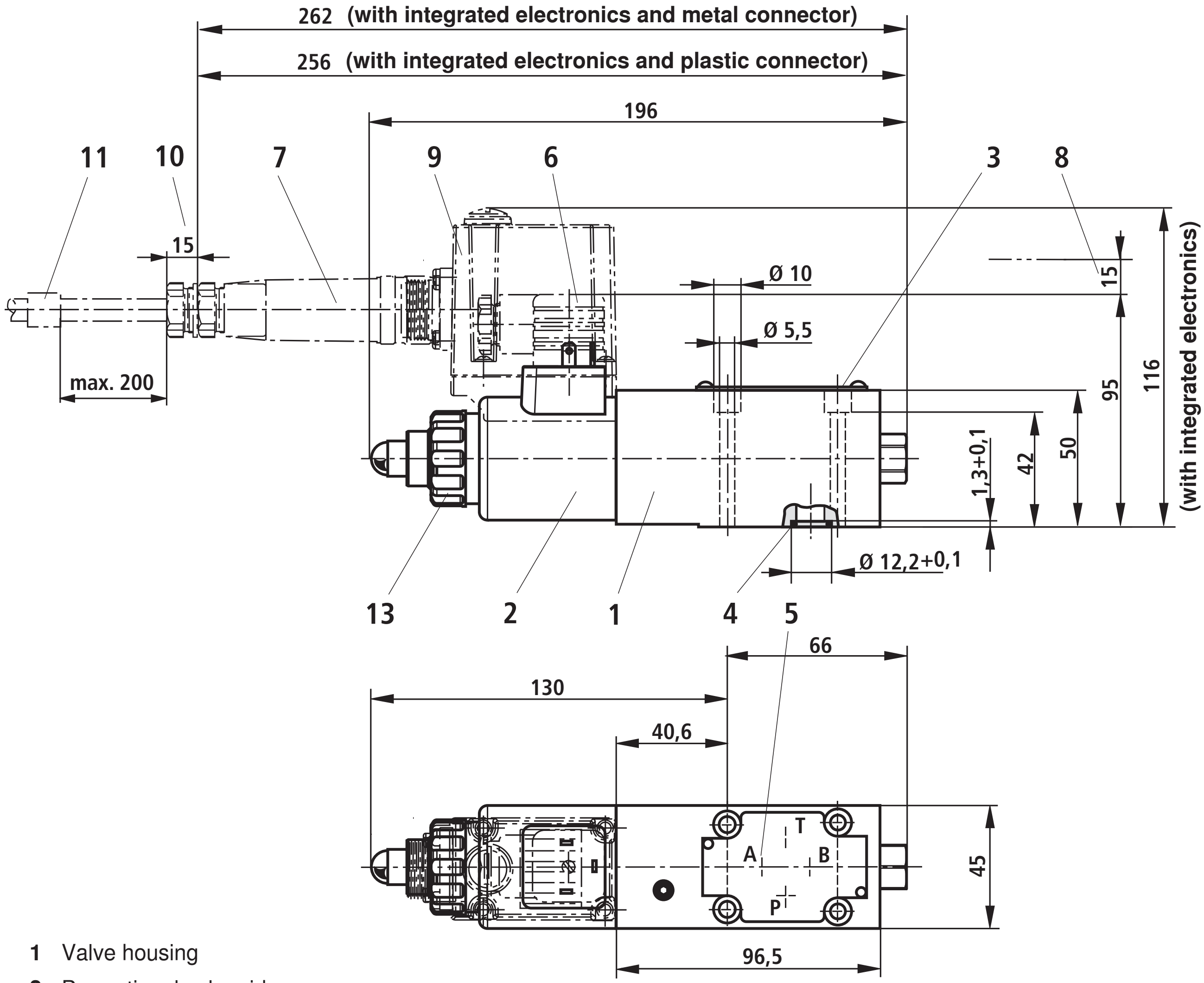
Characteristic curves (measured with HLP 46; ϑ_{oil} = 40 °C ± 5 °C)



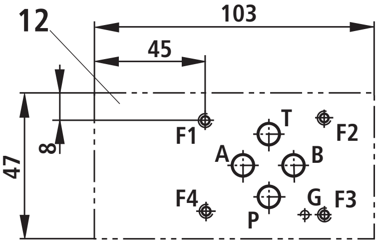


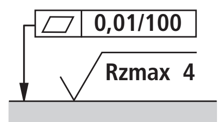


Unit dimensions: Types DBE and DBEE (dimensions in mm)



1 Valve housing
2 Proportional solenoid
3 Name plate
4 Identical seal rings for ports A, B, P, and T
5 With version Y, pilot oil return external via port A (Y)
6 Mating connector according to DIN EN 175301-803
7 Mating connector according to DIN EN 175201-804
8 Space required for removing the mating connector
9 Integrated electronics (OBE)
10 Space required for removing the mating connector
11 Cable fastening
12 Machined installation surface, porting pattern according to DIN 24340 (**without** locating hole) and ISO 4401-03-02-0-05 (**with** locating hole)
13 O-ring and plastic nut SW 32 for coil fixation
The nut can be loosened by rotating it anticlockwise (1 turn). The solenoid coil can then be rotated to the required position before fixing it again by tightening the nut.
Tightening torque: 4+1 Nm.



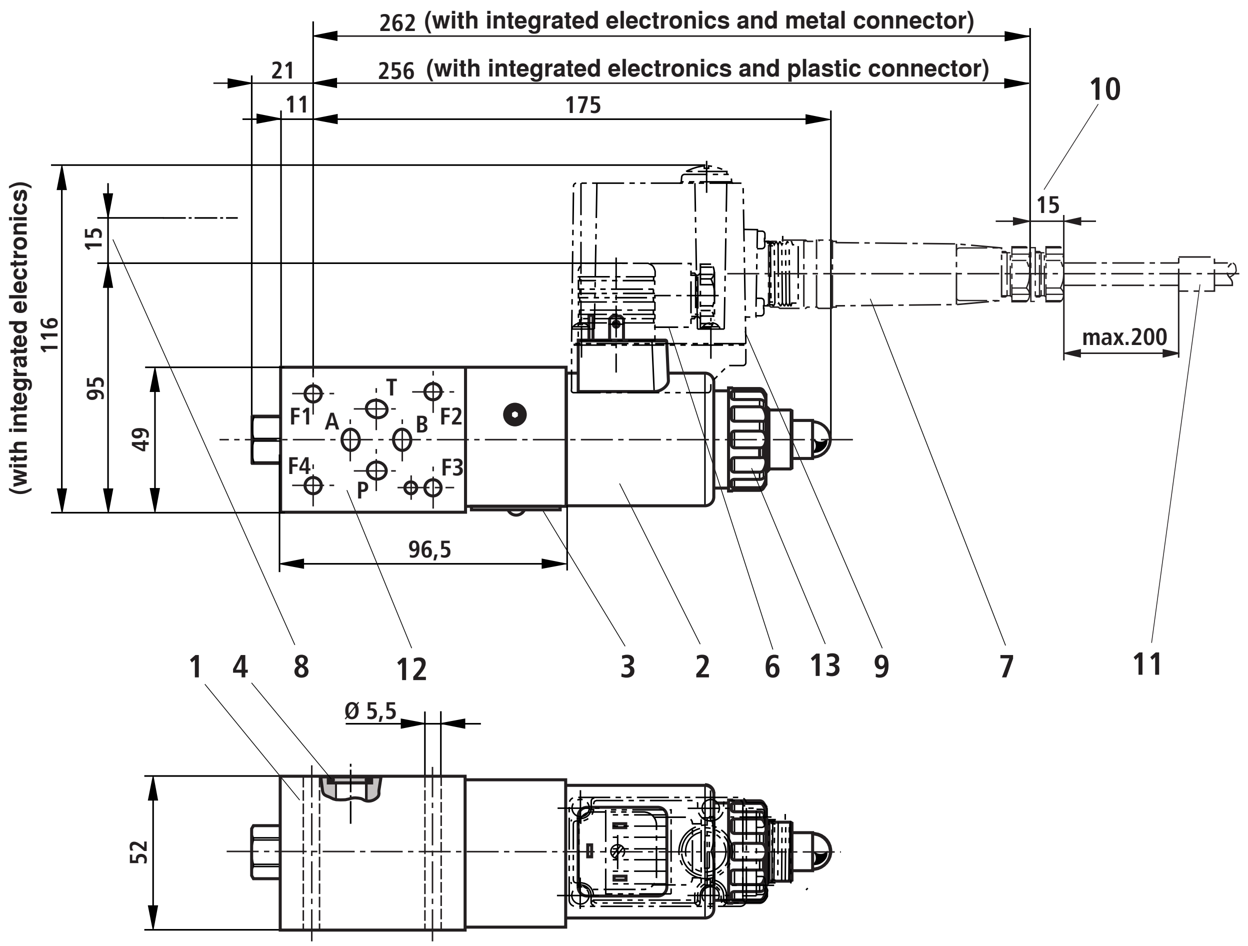


Required surface quality of the valve contact surface

Tolerances according to: – General tolerances ISO 2768-mK
– Tolerancing principle ISO 8015

Subplates and valve mounting screws see page 7

Unit dimensions: Types ZDBE and ZDBEE (dimensions in mm)



1 Valve housing
2 Proportional solenoid
3 Name plate
4 Identical seal rings for ports A, B, P, and T
6 Mating connector for type ZDBE (separate order, see page 6)
7 Mating connector for type ZDBEE (separate order see page 6)
8 Space required for removing the mating connector
9 Integrated electronics (OBE)
10 Space required for removing the mating connector
11 Cable fastening
12 Machined installation surface, porting pattern according to DIN 24340 (**without** locating hole) and ISO 4401-03-02-0-05 (**with** locating hole)
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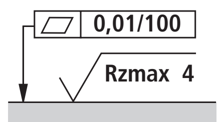
The nut can be loosened by rotating it anticlockwise (1 turn). The solenoid coil can then be rotated to the required position before fixing it again by tightening the nut.
Tightening torque: 4+1 Nm.



Required surface quality of the valve contact surface

Tolerances according to: – General tolerances ISO 2768-mK
– Tolerancing principle ISO 8015

Subplates and valve mounting screws see page 7

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

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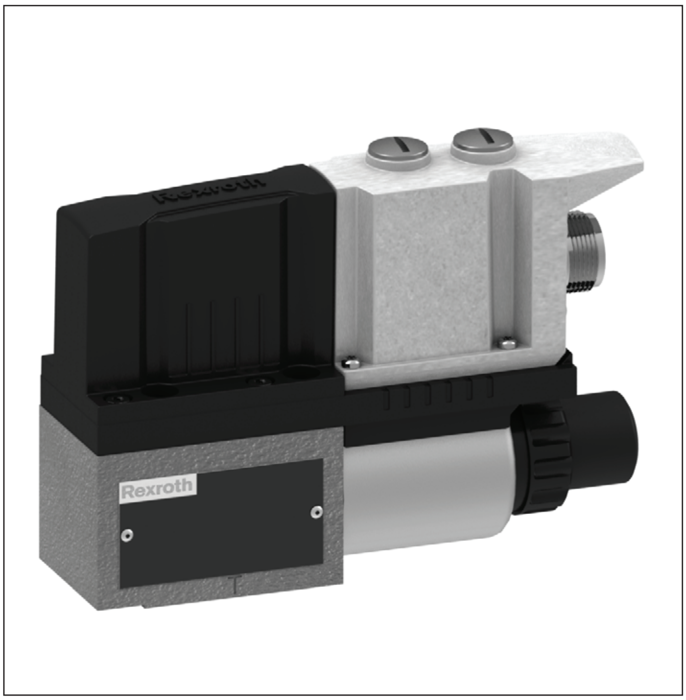
The Drive & Control Company

Rexroth
Bosch Group

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

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**

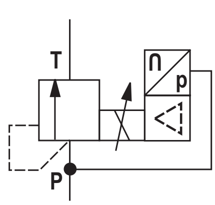
Seal material

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

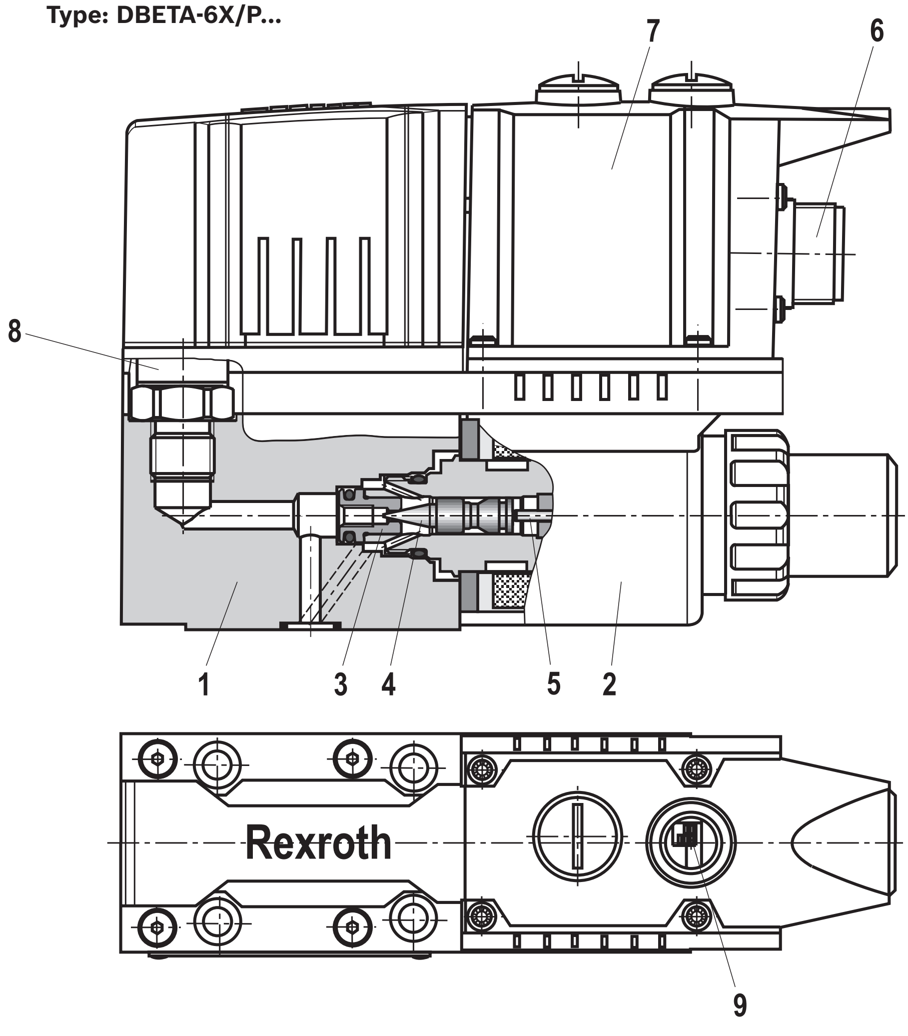
The supply voltage and the command value are applied to the connector (6). Depending on the command value the electronics converts the input signal into current. The proportional solenoid converts the electric current into mechanical force that acts directly on the valve poppet (4) via the armature plunger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

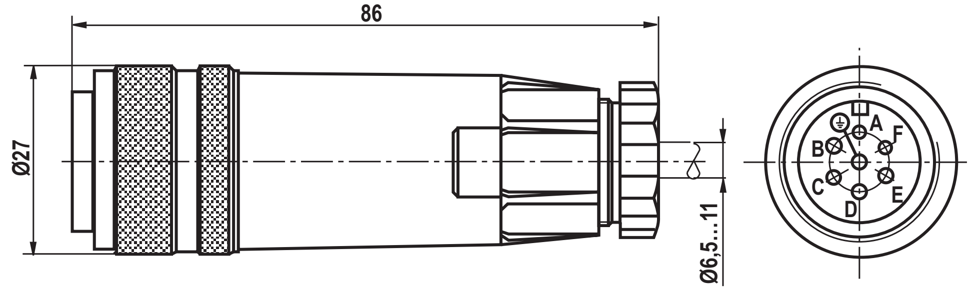
electric			
Minimum solenoid current		mA	≤ 100
Maximum solenoid current		mA	1600 ±10 %
Switch-on duration		%	100
Supply voltage	– Nominal voltage	VDC	24
	– Lower limit value	VDC	18
	– Upper limit value	VDC	36
Current consumption		A	≤ 1.5 (I_{max} 2 A is possible)
Required fuse protection		A	2, time-lag
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)

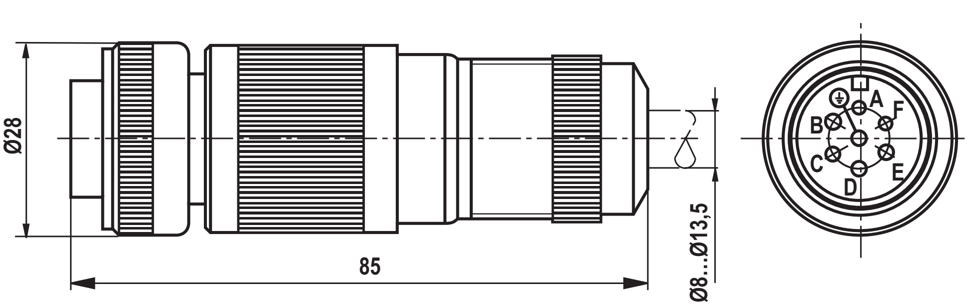
Connector pin assignment	Contact	Allocation interface "A1"	Allocation interface "F1"
Supply voltage	A	24 VDC (u(t) = 18 V to 36 V); I_{max} ≤ 2.0 A	
	B	0 V	
Reference potential actual value	C	Reference potential for contact F; at R_i (drain) < 50 kΩ connect (star-like) to ground ⊥ on the control side	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

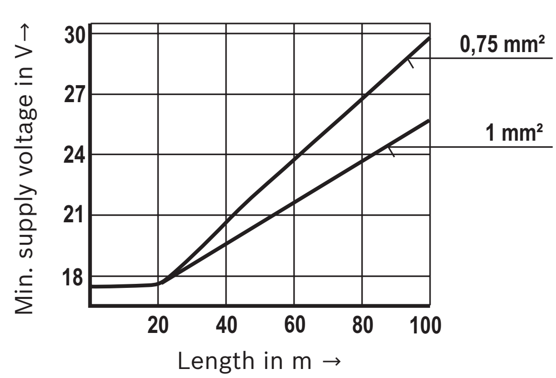
Plastic version,
material no. **R900021267**
(separate order)



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.

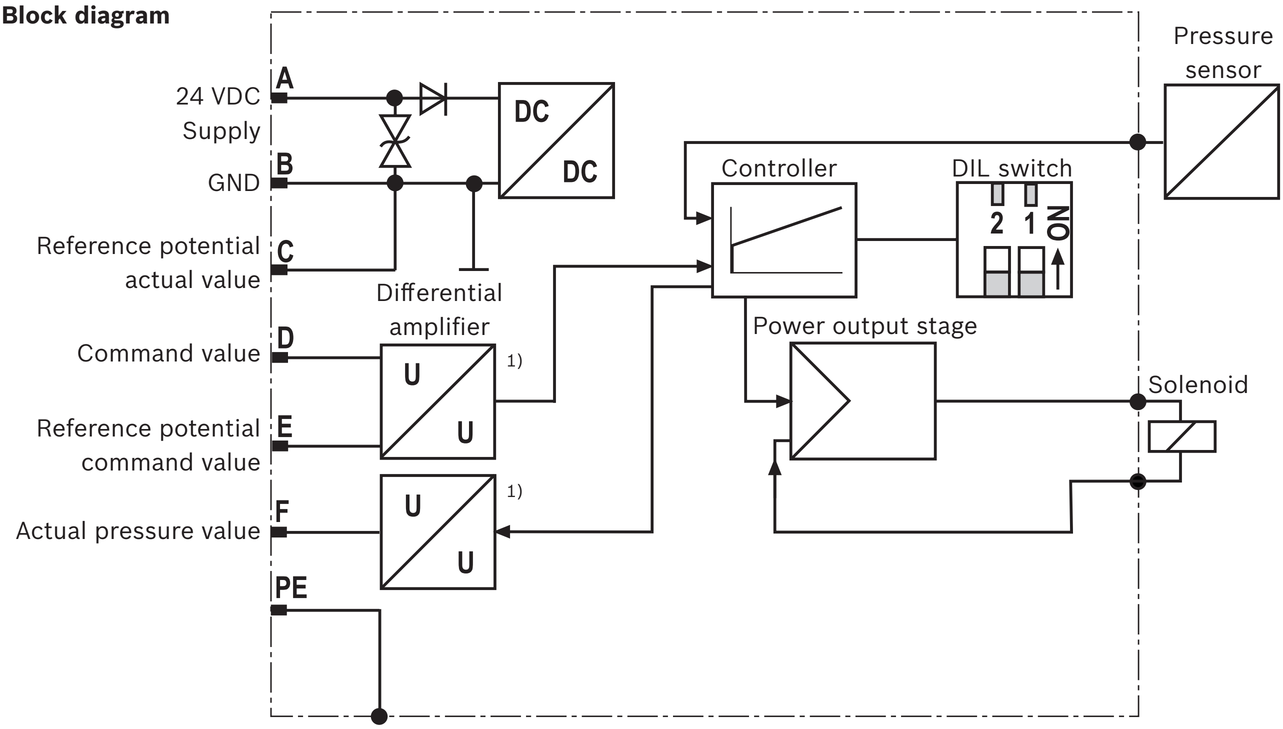
The actual pressure value is captured by the integrated pressure sensor. The pressure command value is processed in the controller and compared to the actual pressure value. The power output stage processes the control output of the controller and controls the solenoid current.

The actual pressure value is reported at port F (reference port C).

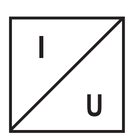
With the DIL switch, the controller characteristics can be adjusted to certain applications (see table "DIL switch position").

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.

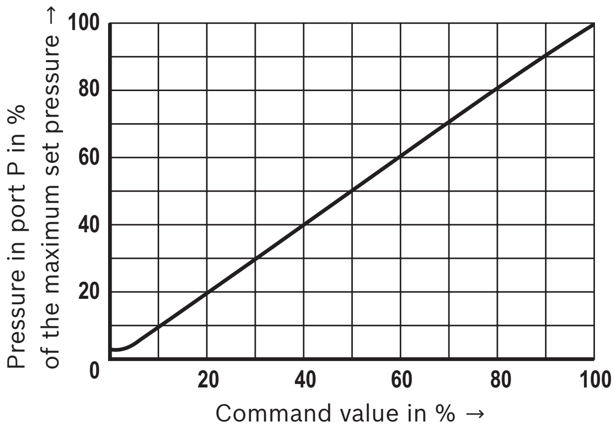
☞ **Notice!** If the flow changes, the pressure controller is automatically adjusted to these operating conditions. In the first cycles, this may lead to changes in the transition behavior.

DIL switch position

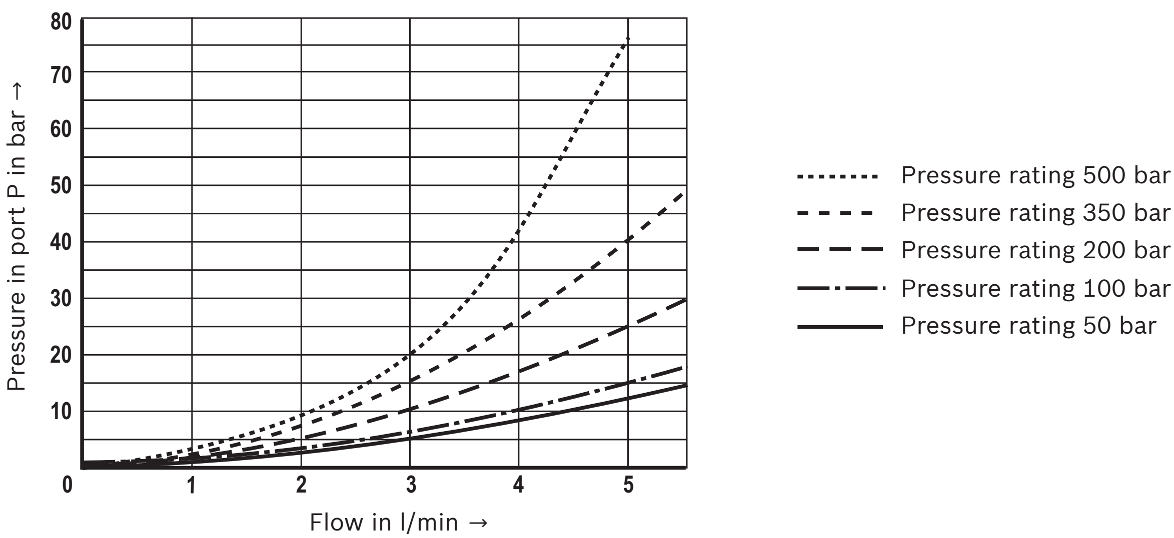
Switch (position)		Function	Examples of application
2	**1**		
off	off	open loop pressure, without sensor	Commissioning / system analysis
off	on	smallest dead volume (from 20 cm³)	Systems with little damping
on	off	pilot operated, large dead volume	Pilot valve for logic e.g. LC40
on	on	pilot operated, 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)

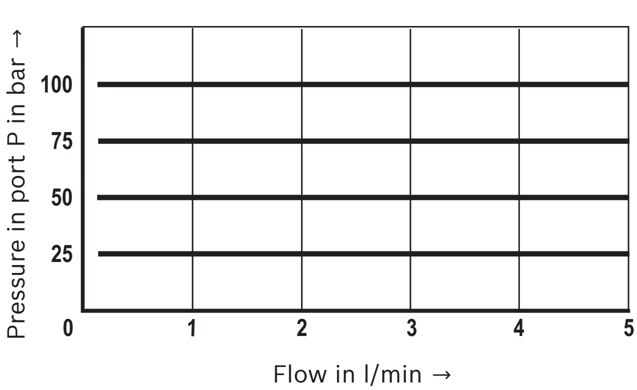
Pressure in port P depending on the command value (flow = 0.8 l/min)



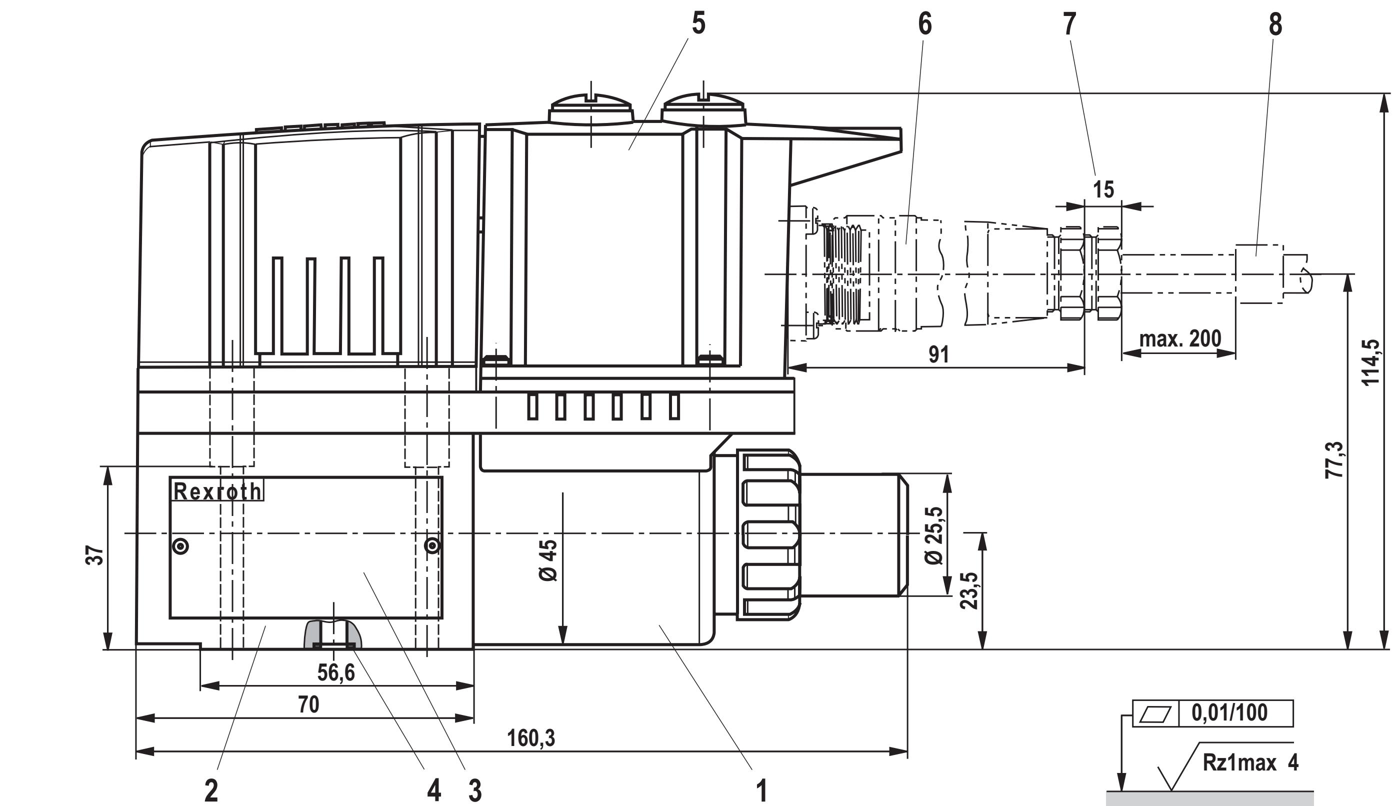
Minimum set pressure in port P with command value 0 V and/or 4 mA depending on the flow
(return flow pressure = 0 bar)



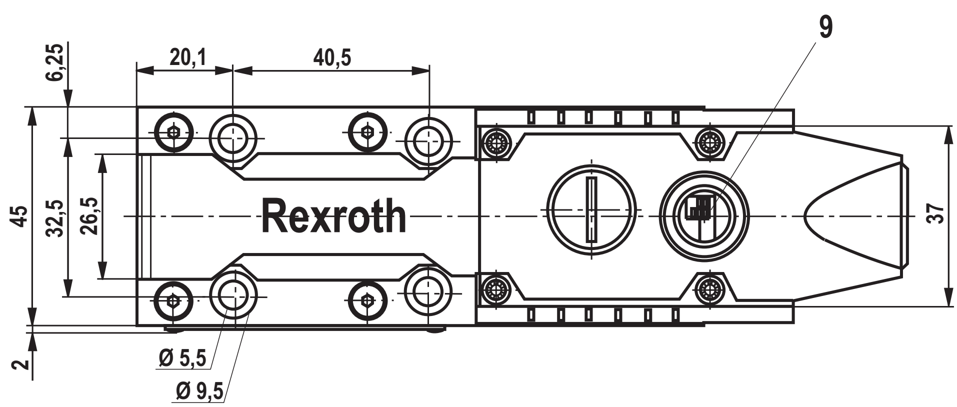
Pressure in port P depending on the flow (applies to all pressure ratings)

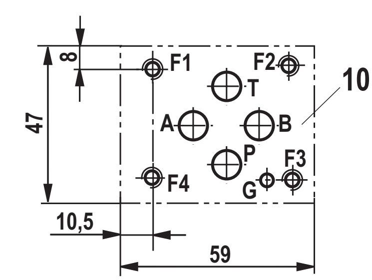


Dimensions:
(dimensions in mm)



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 $\boldsymbol{M_A}$ = 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) G 341/60 (G3/8)	45052 45052	R900424447 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)

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

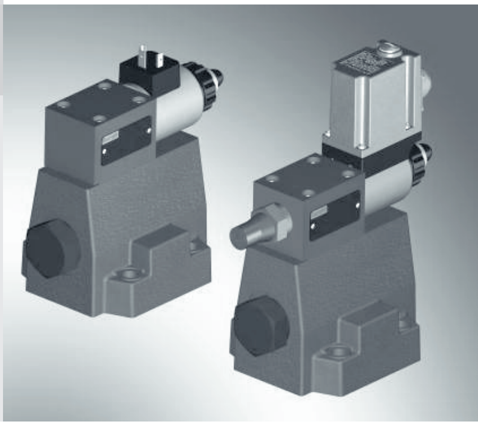
Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de

Rexroth
Bosch Group

Proportional pressure reducing valve, pilot operated

RE 29276/03.11
Replaces: 01.10

Type DRE(M) and DRE(M)E



Sizes 10 and 25 [1)]
Component series 6X
Maximum operating pressure 315 bar
Maximum flow 300 l/min

Table of contents

Contents	Page

[1)] Size 32 see data sheet RE 29278

Information on available spare parts:
www.boschrexroth.com/spc

Features

- Valve for reducing an operating pressure
- Operation by means of proportional solenoids
- Proportional solenoid with rotatable and detachable coil
- For subplate mounting:
  Porting pattern according to ISO 5781,
  Subplates according to data sheet RE 45062
  (separate order), see page 11
- Third path A to Y (Ø 7.5 mm)
- Minimum setting pressure 2 bar with command value zero
- Linearized command value-pressure characteristic curve
- Good transient response
- Optional check valve between A and B
- Maximum pressure limitation optional
- Type DRE(M)E with integrated electronics (OBE):
  - Little manufacturing tolerance of the command value-pressure characteristic curve

Ordering code

DRE			–	6X /		Y		G24					*

without maximum pressure limitation = **no code**
with maximum pressure limitation [1)] = **M**

For external control electronics = **no code**
with integrated electronics (OBE) = **E**

Size 10 = **10**
Size 25 = **20**

Component series 60 to 69 = **6X**
(60 to 69: Unchanged installation and connection dimensions)

Pressure rating
50 bar = **50**
100 bar = **100**
200 bar = **200**
315 bar = **315**

Pilot oil return always external separately and at zero pressure to the tank = **Y**

with check valve between A and B = **no code**
without check valve = **M**

Supply voltage of the control electronics
G24 = Direct voltage 24 V

no code = 1600 mA design
- 8 = 800 mA design [2)]

Electrical connection
for DRE(M):
K4 = **without** mating connector, with connector according to DIN EN 175301-803
Mating connector - separate order see page 8
for DRE(M)E:
K31 = **without** mating connector, with connector according to DIN EN 175201-804
Mating connector - separate order see page 8

Interface electronics
A1 = Command value 0 to 10 V
F1 = Command value 4 to 20 mA
no code = with DRE

Seal material
M = NBR seals
V = FKM seals

Further details in the plain text

Accessories (not included in scope of delivery)

– External control for type DRE (only standard version G24 (1.6 A solenoid)):
  - Analog amplifier VT-MSPA1-11-1X/ in modular design according to data sheet RE 30223
  - Digital amplifier VT-VSPD-2 in Eurocard format according to data sheet RE 30523
  - Analog amplifier VT-VSPA1-11-1X/ in Eurocard format according to data sheet RE 30100
  - Proportional plug-in amplifier VT-SSPA1-1-1X plug-in amplifier according to data sheet RE 30116 connection M12 - 4-pole

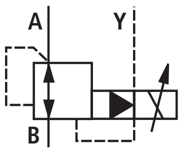
– Mating connectors (details, see page 8)
  - For DRE(M): According to DIN EN 175301-803, Material no. **R901017011**
  - For DRE(M)E: According to DIN EN 175201-804, Material no. **R900021267** or **R900223890**

1) In case of an error (e.g. in case of contamination or overcurrent), the maximum pressure limitation prevents an inadmissibly high overpressure at the valve.

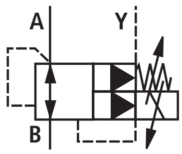
2) Replacement series 5X (Attention! External amplifiers only suitable for G24 = 1.6 A solenoid), see accessories.

Symbols

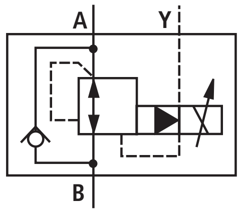
DRE -6X/...**YM**…



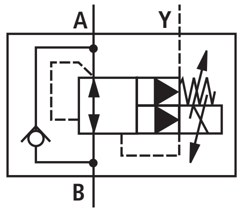
DREM -6X/...**YM**…



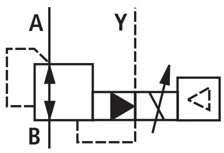
DRE -6X/...**Y**…



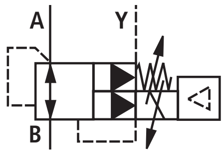
DREM -6X/...**Y**…



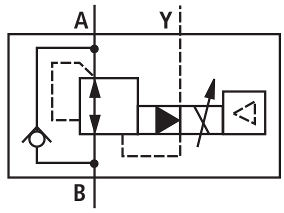
DREE -6X/...**YM**…



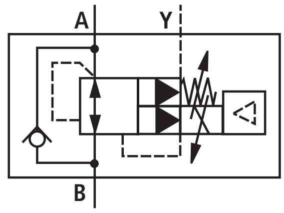
DREME -6X/...**YM**…



DREE -6X/...**Y**…



DREME -6X/...**Y**…



Function, section

Valves of type DRE(M) are pilot controlled pressure reducing valves. They are used for reducing an operating pressure.

These valves basically comprise of a pilot control valve (1) with proportional solenoid (2), main valve (3) with main spool insert (4), as well as an optional check valve (5).

Type DRE...

The pressure in channel A is set in a command value-dependent form via the proportional solenoid (2).

In rest position - no pressure in channel B -, the spring (17) holds the main spool (4) in its initial position. The connection from channel B to A is closed. A start-up jump is thus suppressed.

Via the bore (6), the pressure in channel A acts on the surface (7) of the main spool. The pilot oil is taken from channel B and flows via the bore (8) to the constant flow controller (9) keeping the pilot flow constant, independent of the pressure drop between channel A and B. From the constant flow controller (9), the pilot flow flows into the spring chamber (10), through the bores (11) and (12) via the valve seat (13) into the Y channel (14, 15, 16) and from there to the return.

The pressure required in channel A is preset at the related amplifier. The proportional solenoid moves the valve poppet (20) in the direction of the valve seat (13) and limits the pressure in the spring chamber (10) to the set value. If the pressure in channel A is lower than the specified command value, the higher pressure in the spring chamber (10) pushes the main spool to the right. The connection from B to A is opened.

If the set pressure in A is achieved, the forces at the main spool are balanced - the main spool is in control position.

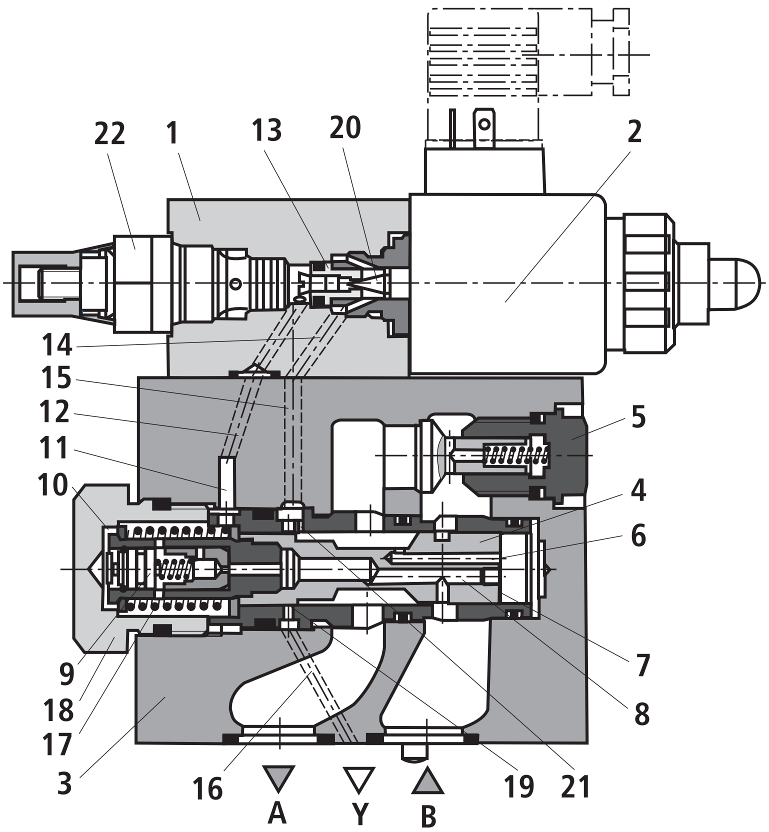
Pressure in channel A • Spool face (7) =
Pressure in the spring chamber (10) • Spool face – Spring force (17)

If in a standing hydraulic fluid column (e.g. cylinder piston to stop), the pressure in A is to be reduced, a lower command value is (e.g.) specified at the control electronics and thus, a lower pressure is pre-selected that is immediately applied to the spring chamber (10). The higher pressure in A at the face (7) of the main spool pushes the main spool against the plug screw (18) to stop. The connection A to B is blocked and A to Y is open. The force of spring (17) now acts against the hydraulic force at the face (7) of the main spool. In this main spool position, the hydraulic fluid can flow from channel A via the control edge (19) to Y into the return.

If the pressure in A has been reduced to the pressure in the spring chamber (10) plus Δp from spring (17), the main spool at the control edge A to Y closes the large control bores in the socket.

The remaining differential pressure of approx. 10 bar to the new command value pressure in A is only discharged via the fine control bore (21). This results in a good transient response without pressure undershoots.

For the free return flow from channel A to B, a check valve (5) can optionally be installed. A part of this flow from channel A simultaneously flows via the open control edge (19) of the main spool from A to Y into the return.



Type DREM…-6X/…YG24K4... (**with** check valve)

Type DREM...

For hydraulic protection against an inadmissibly high electric control current at the proportional solenoid, which imperatively results in increased pressures in port A, you can optionally install a spring-loaded pressure relief valve as maximum pressure limitation (22). The maximum pressure limitation is pre-set referred to the relevant pressure rating (table page 6).

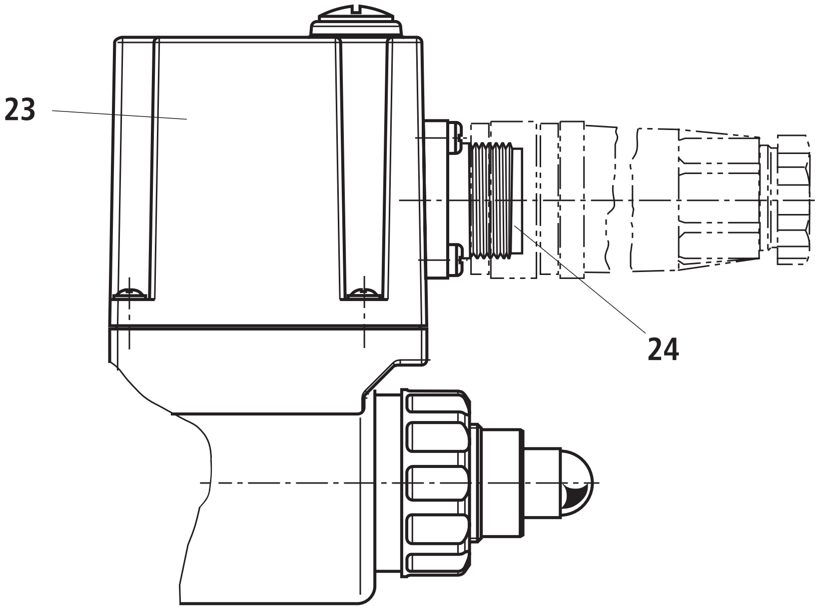
Function, section

Type DRE(M) – with integrated electronics (OBE)

With regard to function and structure, these types correspond to type DRE. On the proportional solenoid, there is moreover a housing (23) with the control electronics.

Supply and command value voltage are applied at the connector (24).
In the factory, the command value pressure characteristic curve is adjusted with little manufacturing tolerance.

For more information on the control electronics see page 8.



Type DRE(M)E…-6X/…YG24K31...

Technical Data (For applications outside these parameters, please consult us!)

general

Size		Size	10	25
Weight	– DRE and DREM	kg	4.7	6.0
	– DREE and DREME	kg	4.8	6.1
Installation position			Any	
Storage temperature range		°C	–20 to +80	
Ambient temperature range	– DRE(M)	°C	–20 to +70	
	– DRE(M)E	°C	–20 to +50	

hydraulic (measured with HLP 46, ϑ_{oil} = 40 °C ± 5 °C)

Size		Size	10	25
Max. operating pressure	– Port A and B	bar	315	
	– Port Y		Separately and to the tank at zero pressure (internal pipe Ø ≥ 5 mm; pipe length < 2500 mm)	
Max. setting pressure in channel A	– Pressure rating 50 bar	bar	50	
	– Pressure rating 100 bar	bar	100	
	– Pressure rating 200 bar	bar	200	
	– Pressure rating 315 bar	bar	315	
Min. setting pressure in channel A with command value zero		bar	2	
Maximum pressure limitation (fixedly set)			Set in the factory:	
	– Pressure rating 50 bar	bar	To 70 bar	
	– Pressure rating 100 bar	bar	To 130 bar	
	– Pressure rating 200 bar	bar	To 230 bar	
	– Pressure rating 315 bar	bar	To 350 bar	
Max. flow of the main valve		l/min	200	300
Pilot flow		l/min	0.8	
Hydraulic fluid			On mineral oil basis and related hydrocarbons (HL, HLP, HLPD, HLPP) according to DIN 51524 [1)] Flame-resistant – water-free (HFDU(G), HFDU(E), HFDR) according to ISO12922 [2), 4)] Flame-resistant – containing water (HFC: Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620) according to ISO12922 [3), 4)]	
Hydraulic fluid temperature range		°C	–20 to +80	
Viscosity range		mm^2/s	15 to 380	
Max. admissible degree of contamination of the hydraulic fluid Cleanliness class according to ISO 4406 (c)			Class 20/18/15 [5)]	
Hysteresis		%	±3.5 of the max. setting pressure [6)]	
Repeatability		%	< ±2 of the max. setting pressure [6)]	
Linearity		%	±2 of the max. setting pressure [6)]	
Manufacturing tolerance of the command value pressure characteristic curve, related to the hysteresis characteristic curve, pressure increasing	– DRE(M)	%	±3.5 of the max. setting pressure [6)]	
	– DRE(M)E	%	±1.5 of the max. setting pressure [6)]	
Step response $T_u + T_g$	10 → 90 %	ms	~130	Measured with standing hydraulic fluid column, 1 liter at port A
	90 → 10 %	ms	~160	
Step response $T_u + T_g$	10 → 90 %	ms	~150	Measured with standing hydraulic fluid column, 5 liters at port A
	90 → 10 %	ms	~150	

Foot notes see next page

Technical Data (For applications outside these parameters, please consult us!)

[1] Suitable with NBR **and** FKM seals

[2] Suitable **only** with FKM seals

[3] Suitable **only** with NBR seals

[4] When using flame-resistant hydraulic fluids HFC, the following limitations are to be observed:
- Max. operating pressure 210 bar
- Max. hydraulic fluid temperature 60 °C
- Expected service life 30...100 % as compared to HLP

[5] 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 service life of the components.

For the selection of the filters see www.boschrexroth.com/filter

[6] Does not apply to types "G24 - 8"

electric

			"G24"	"G24-8"
Minimum solenoid current		mA	≤ 100	≤ 100
Maximum solenoid current		mA	1600 ± 10 %	800 ± 5 %
Solenoid coil resistance	Cold value at 20 °C	Ω	5.5	20.6
	Max. hot value	Ω	8	33
Duty cycle		%	100	100

electrical, integrated electronics (OBE)

Supply voltage	Nominal voltage	VDC	24
	Lower limit value	VDC	21
	Upper limit value	VDC	35
Current consumption		A	≤ 1.5
Required fuse protection		A	2, time-lag
Inputs	Voltage	V	0 to 10
	Current	mA	4 to 20
Output	Actual current value	mV	1 mV ≙ 1 mA
Protection class of the valve according to EN 60529			IP 65 with mating connector mounted and locked

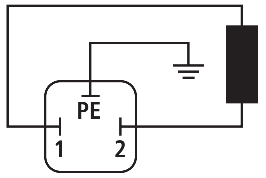
Caution!

With an ambient temperature of 70 °C and a duty cycle of 100 % with max. current, the coil of the 800 mA solenoid reaches temperatures of up to 170 °C. In case of contact with the coil, this may lead to burns.

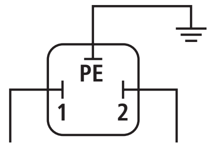
Electrical connection (dimensions in mm)

DRE(M)

Connection at connector

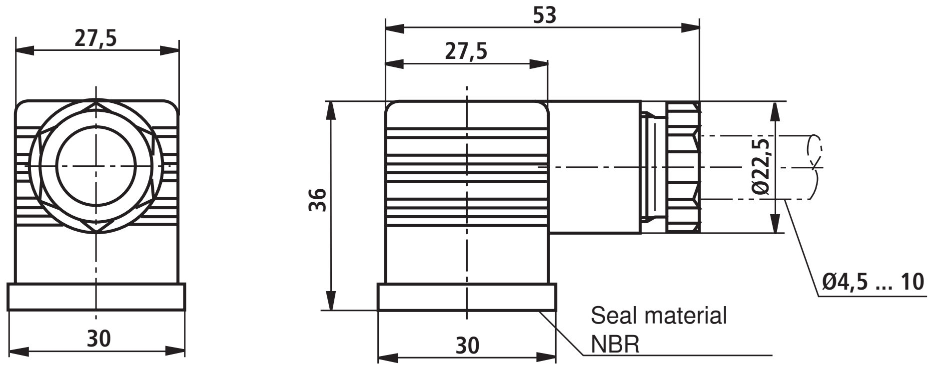


Connection at mating connector



To the amplifier

Mating connector (black) according to DIN EN 175301-803
Material no. **R901017011**
(separate order)

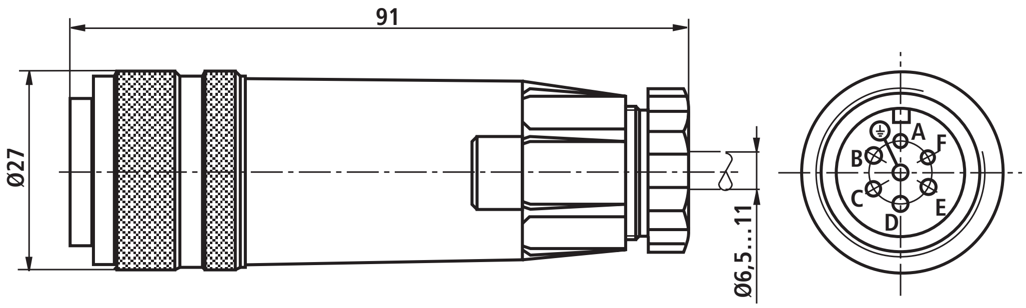


DRE(M)E

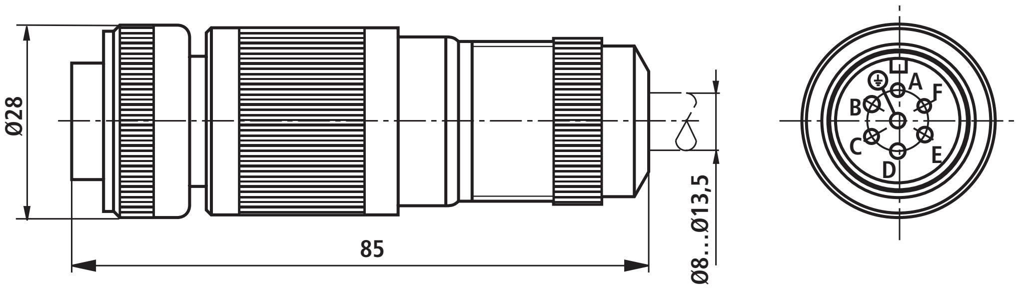
Device connector allocation	Contact	Allocation interface "A1"	Allocation interface "F1"
Supply voltage	A	24 VDC (u(t) = 21 V to 35 V); $I_{max} \leq 1.5$ A	
	B	0 V	
Reference potential actual value	C	Reference contact F; 0 V	Reference contact F; 0 V
Differential amplifier input	D	0 to 10 V; R_E = 100 kΩ	4 to 20 mA; R_E = 100 kΩ
	E	Reference potential command value	
Measuring output (actual value)	F	0 to 1.6 V actual value (1 mV ≙ 1 mA) Load resistance > 10 kΩ	
	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 mm^2

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



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

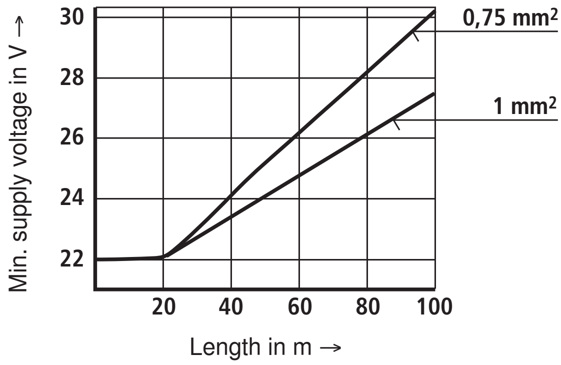


Electrical connection

Connection cable for DRE(M)E

- Recommendation 6-wire, 0.75 or 1 mm^2 plus protective earthing conductor and screening
- Only connect the screening to PE on the supply side
- Max. admissible length 100 m

The minimum supply voltage at the mains adapter depends on the length of the supply line (see diagram).



Integrated electronics (OBE) with type DRE(M)E

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.

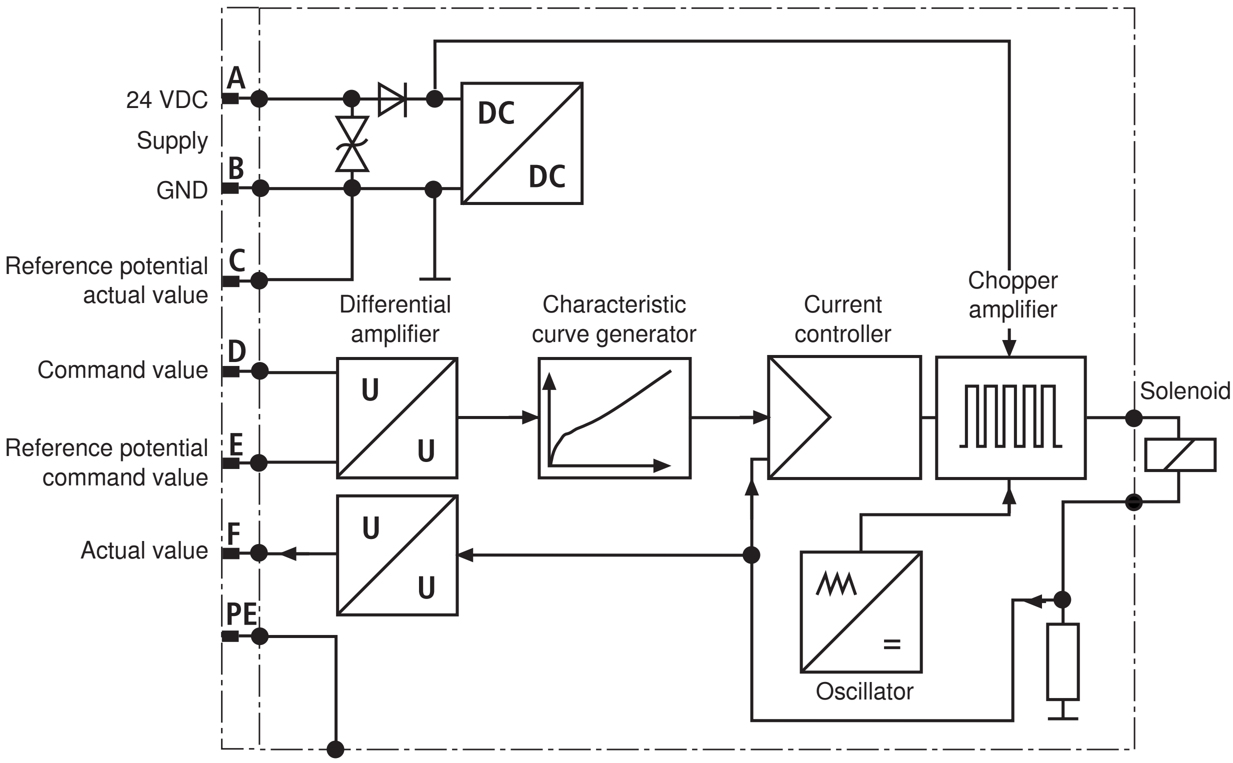
Via the characteristic curve generator, the command value solenoid current characteristic curve is adjusted to the valve so that non-linearities in the hydraulic system are compensated and thus, a linear command value pressure characteristic curve is created.

The current controller controls the solenoid current independent of the solenoid coil resistance.

The power section of the electronics for controlling the proportional solenoid is a chopper amplifier with a cycle frequence of approx. 180 Hz to 400 Hz. The output signal is pulse-width modulated (PWM).

For checking the solenoid current, a voltage can be measured between pin F(+) and pin C(–) that is proportional to the solenoid current. **1 mV** corresponds to **1 mA** solenoid current.

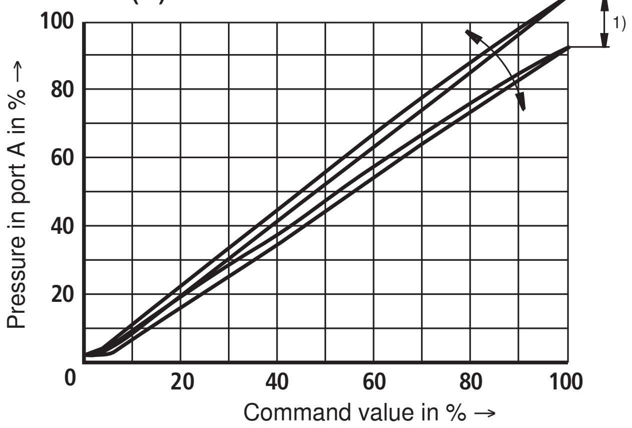
Block diagram



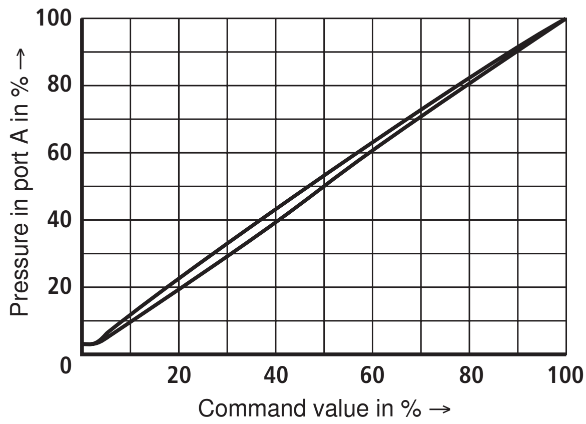
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

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

DRE(M)



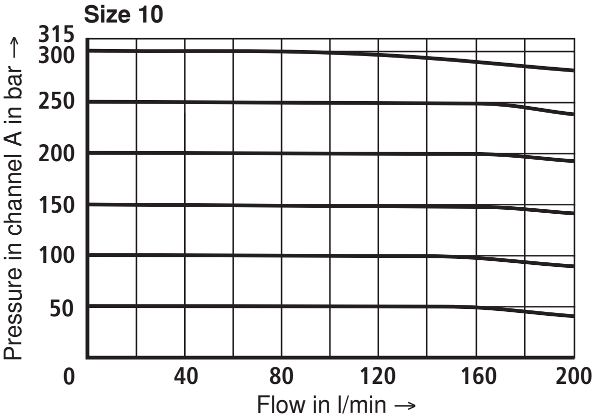
DRE(M)E



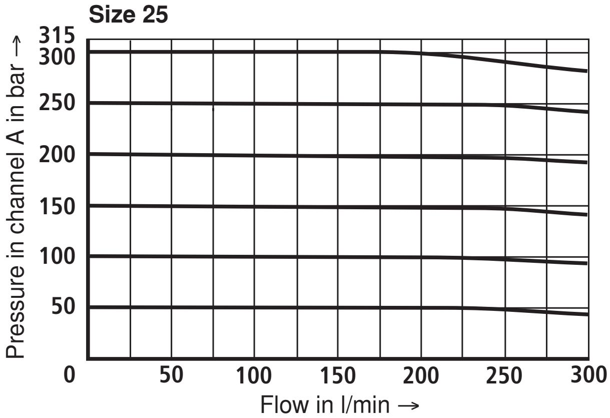
1) With valve DRE(M), the manufacturing tolerance at the **external amplifier** (type and data sheet see page 2) can be changed using the command value attenuator potentiometer "**Gw**". With the digital amplifier, the setting is made using the "Limit" parameter.
In this connection, the control current according to the technical data must not be exceeded.
In order to be able to adjust several valves to the same characteristic curve, the pressure must - with a command value of 100 % - at no valve not exceed the maximum setting pressure of the relevant pressure rating.

Pressure in channel A dependent on the flow q_v (characteristic curve with constant Δp)

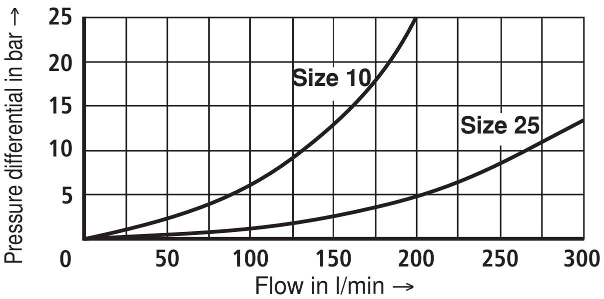
Size 10



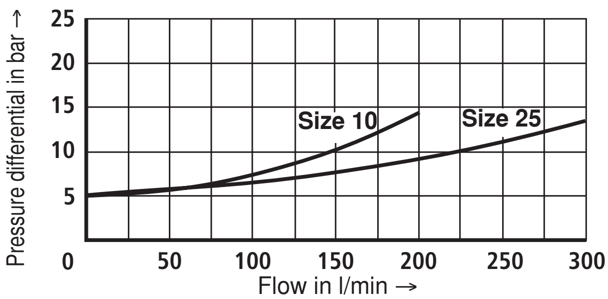
Size 25



Pressure differential via the check valve from A to B



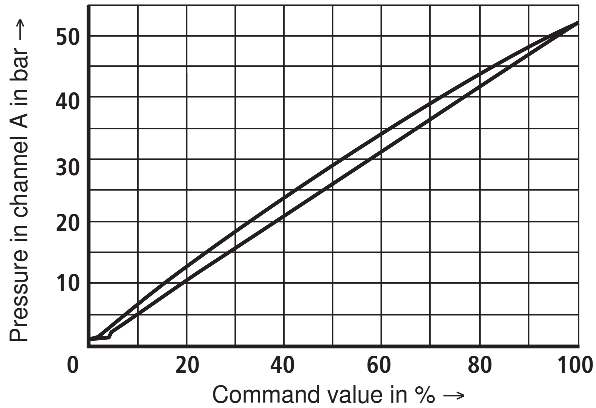
Pressure differential from B to A



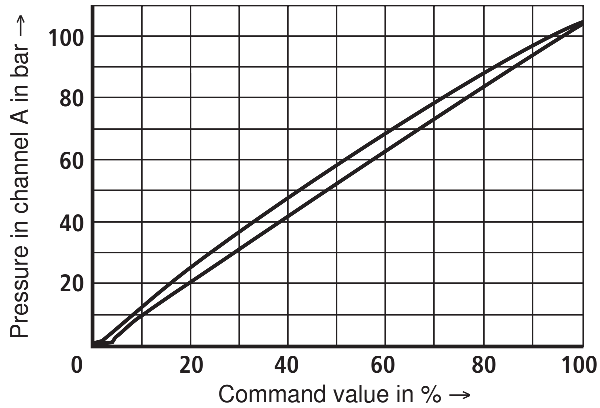
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C and amplifier VT VSPA1-11-1X, 1600 mA coil...)

Pressure in channel A depending on the command value

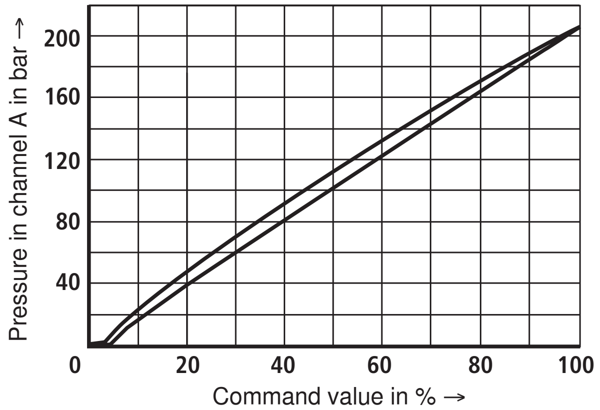
Pressure rating 50 bar



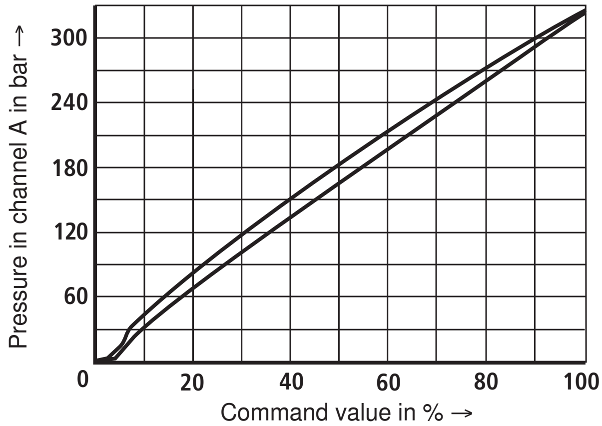
Pressure rating 100 bar



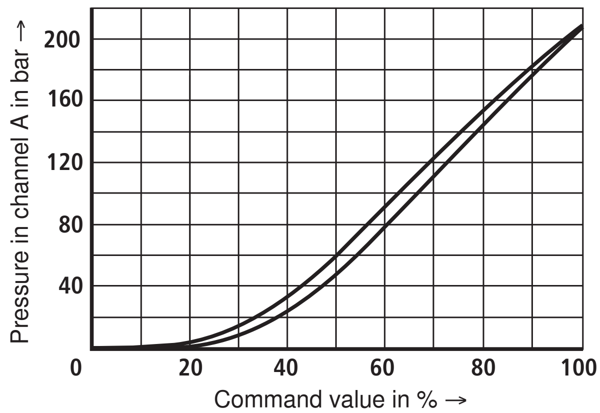
Pressure rating 200 bar



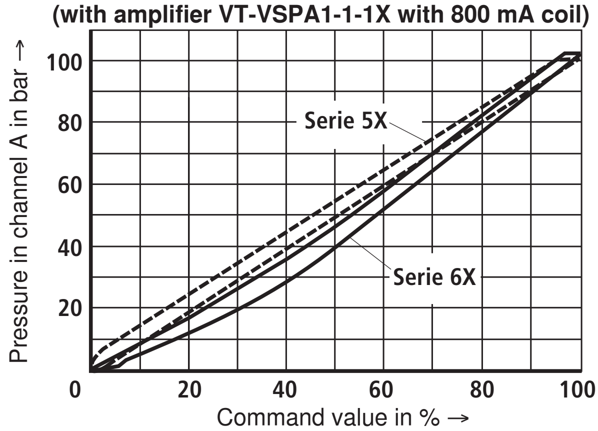
Pressure rating 315 bar



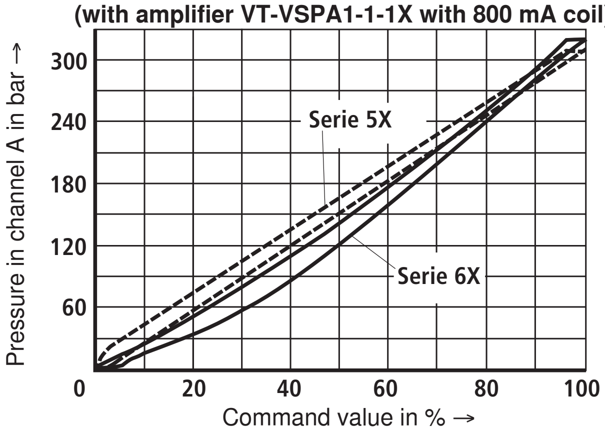
Pressure rating 200 bar (with VT-SSPA1)



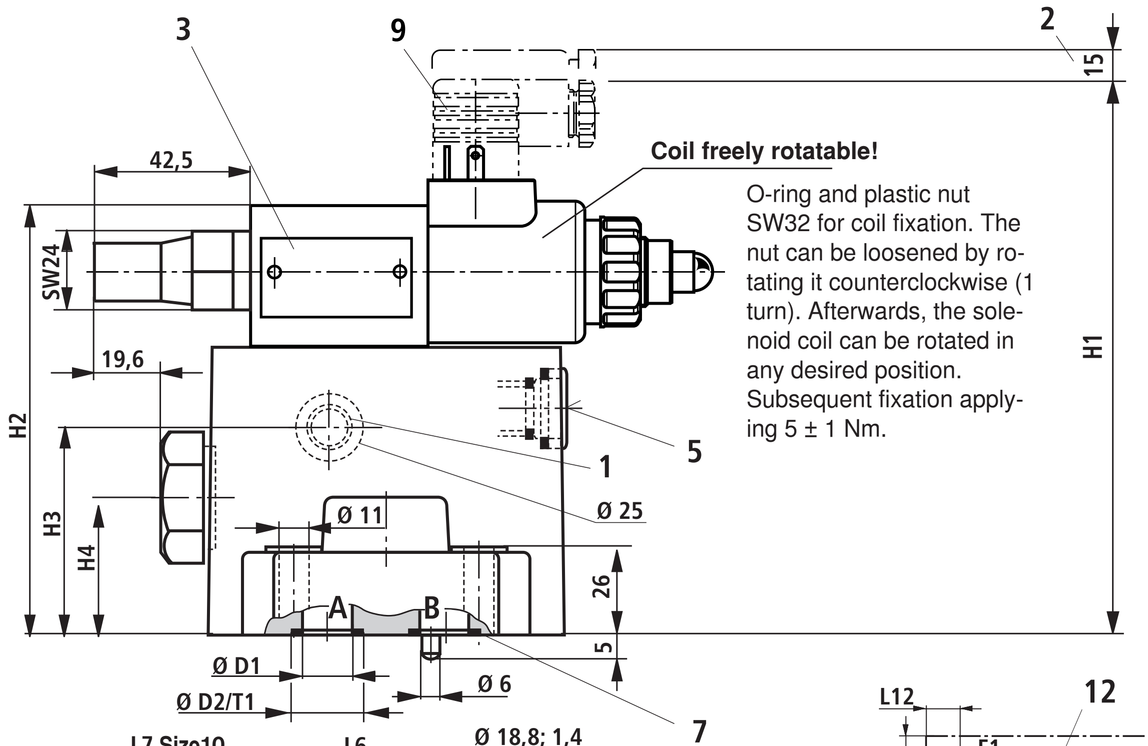
Comparison series 5X-6X / pressure rating 100 bar (with amplifier VT-VSPA1-1-1X with 800 mA coil)



Comparison series 5X-6X / pressure rating 315 bar (with amplifier VT-VSPA1-1-1X with 800 mA coil)

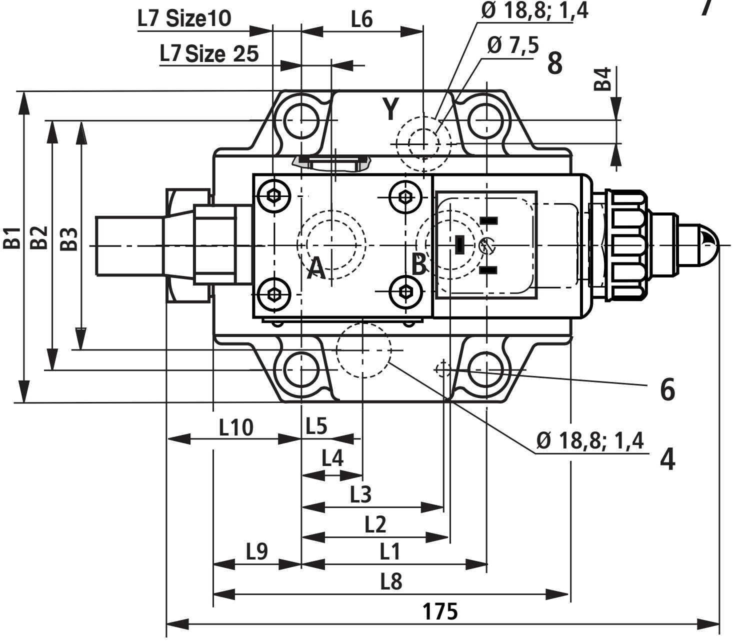


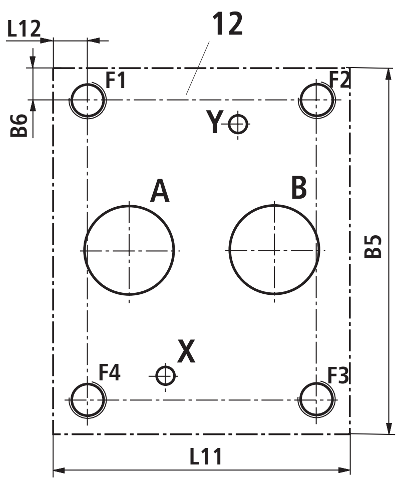
Unit dimensions type DRE(M) (dimensions in mm)

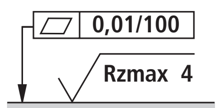


Coil freely rotatable!

O-ring and plastic nut SW32 for coil fixation. The nut can be loosened by rotating it counterclockwise (1 turn). Afterwards, the solenoid coil can be rotated in any desired position. Subsequent fixation applying 5 ± 1 Nm.







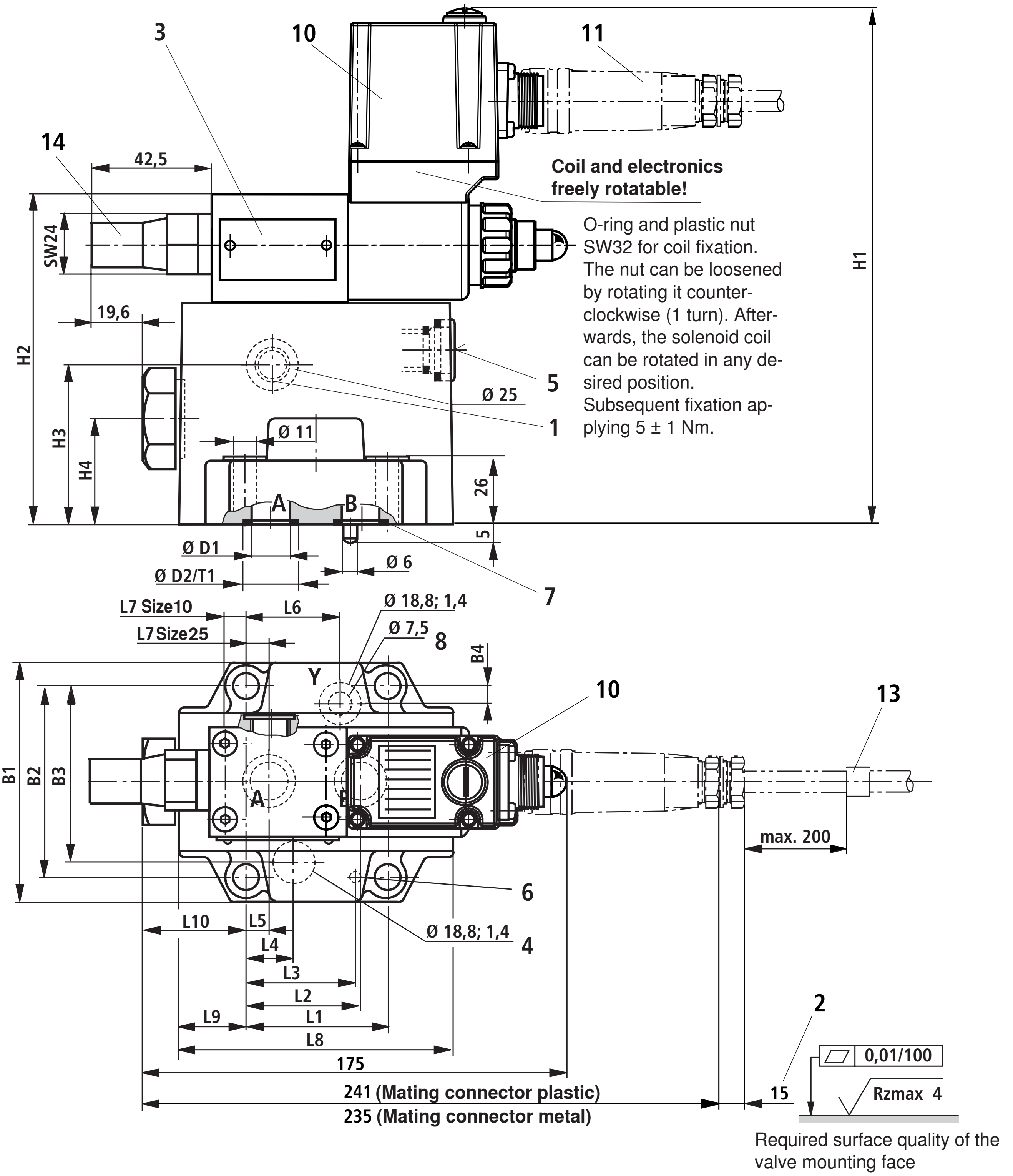
Required surface quality of the valve mounting face

Size	B1	B2	B3	B4	ØD1	ØD2 H11	H1	H2	H3	H4
10	85	66.7	58.8	7.9	15	21.8	171	123	58	36
25	102	79.4	73	6.4	25	34.8	185	137	64	44

Size	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	T1
10	42.9	35.8	31.8	21.5	7.2	21.5	5	116	44.5	59.5	2.0
25	60.3	49.2	44.5	20.6	11.1	39.7	12.2	116	27.3	42	2.9

Size	B5	B6	L11	L12
10	84	8.65	61	9.05
25	97	8.8	78	8.85

Unit dimensions type DRE(M)E (dimensions in mm)



Required surface quality of the valve mounting face

Size	B1	B2	B3	B4	ØD1	ØD2[H11]	H1	H2	H3	H4
10	85	66.7	58.8	7.9	15	21.8	192	123	58	36
25	102	79.4	73	6.4	25	34.8	206	137	64	44

Size	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	T1
10	42.9	35.8	31.8	21.5	7.2	21.5	5	116	44.5	59.5	2.0
25	60.3	49.2	44.5	20.6	11.1	39.7	12.2	116	27.3	42	2.9

Unit dimensions (continued)

1 Upon delivery, this port (G1/4) is closed. After removal of the blanking plug, an external and separate pilot oil return at zero pressure to the tank is, however, also possible here.

2 Space required for removing the mating connector

3 Name plate

4 Blind counterbore

5 Check valve, optional

6 Locating pin

7 Identical seal rings for ports A and B
Identical seal rings for port Y and blind counterbore (item 4)

8 Pilot oil return always external and separately at zero pressure to the tank, or optionally at item 1

9 Mating connector according to DIN EN 175301-803

10 Integrated electronics (OBE), type DRE(M)E with connector "K31"

11 Mating connector according to DIN EN 175201-804

12 Processed installation surface, porting pattern according to
ISO 5781-06-07-0-00 (size 10)
ISO 5781-08-10-0-00 (size 25)

13 Cable fastening

14 Maximum pressure limitation with version DREM and DREME

Subplates according to data sheet RE 45062 and valve mounting screws must be ordered separately.

Subplates:

Size 10: G 460/01 (G 3/8)
G 461/01 (G 1/2)

Size 25: G 412/01 (G 3/4)
G 413/01 (G 1)

Valve mounting screws:
4 hexagon socket head cap screws
ISO 4762-M10x45-10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque M_A = 59 Nm ± 10 %

or

4 hexagon socket head cap screws ISO 4762-M10x45-10.9
(friction coefficient μ_{total} = 0.12 to 0.17)
Tightening torque M_A = 75 Nm ± 10 %

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Notes

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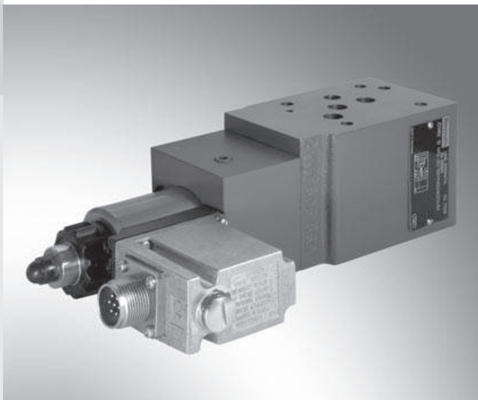
www.boschrexroth.de

Proportional pressure reducing valve, pilot operated

RE 29279/12.10
Replaces: 01.09

Types ZDRE; ZDREE

Size 10
Component series 2X
Maximum pressure setting 315 bar
Maximum flow 80 l/min



TB0220

Table of contents

Features

- Pilot operated valve for reducing a system pressure
- Actuation by proportional solenoid, which can be rotated
- Sandwich plate design
- Porting pattern to DIN 24340-A and ISO 4401
- 4 pressure ratings
- Valve and control electronics from a single source
- External control electronics for type ZDRE
- Linear command value/pressure characteristic curve
- Integrated electronics (OBE) with type ZDREE, with low manufacturing tolerance of the command value/pressure characteristic curve

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z	DRE		10	VP	2	–2X /		M	G24				*

Sandwich plate = **Z**

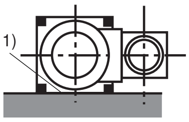
Proportional pressure reducing valve = **DRE**

For external electronics = **No code**
With integrated electronics = **E**

Size 10 = **10**

Pressure reduction in channel P1 = **VP**

Preferred position of mating connector = **2**



The mating connector can be brought to the desired position after the nut was loosened (see page 13)

[1] Valve contact face (O-ring recesses in the housing)

Component series 20 to 29 = **2X**
(20 to 29: unchanged installation and connection dimensions)

Pressure rating

Up to 50 bar	= **50**
Up to 100 bar	= **100**
Up to 200 bar	= **200**
Up to 315 bar	= **315**

Further details in clear text

Seal material
M = NBR seals,
V = FKM seals

Electronics interface
A1 = Command value 0 to 10 V
F1 = Command value 4 to 20 mA
No code = For ZDRE

Electrical connection
for ZDRE
K4 = **Without** mating connector, with component plug to DIN EN 175301-803
for ZDREE
K31 = **Without** mating connector, with component plug to DIN EN 175201-804

Supply voltage of control electronics
G24 = DC voltage 24 V

M = Without check valve

Pilot oil supply/drain
Y = Pilot oil supply for directional valve from port P2, external pilot oil drain for directional valve and ZDRE
XY = External pilot oil supply for directional valve, external pilot oil drain for directional valve and ZDRE
L = Pilot oil supply for directional valve from P2, internal pilot oil drain for directional valve and external for ZDRE
XL = Pilot oil supply from P2 to X is plugged (direct operated directional valve needs **no** pilot oil), pilot oil drain of directional valve is plugged (direct operated directional valve needs **no** pilot oil drain), external pilot oil drain for ZDRE

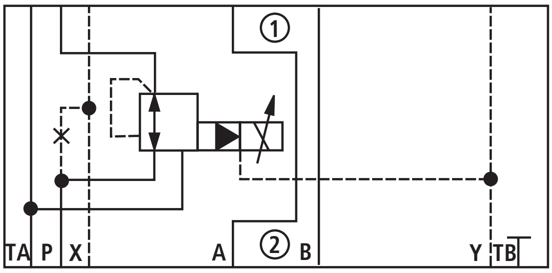
Note: If no pilot oil supply is provided on the subplate, use sandwich plate HSZ 10 B097-3X/M01 for the supply.

Accessories (not included in scope of supply)

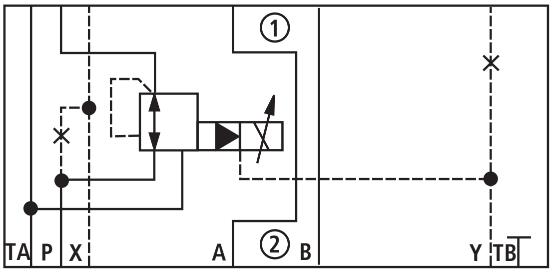
- Sandwich plate with X and Y port (for details, see page 3)
  Type HSZ 10 B097-3X/M01
  Material no.: **R900320785**
- Subplates to data sheet RE 45054
  - G 535/01 (G3/4), Material no. **R900476061**
  - G 536/01 (G1), Material no. **R900476059**
- External control for type ZDRE:
  - Analog amplifier VT-MSPA1-11-1X/V0 of modular design to data sheet RE 30223
  - Digital amplifier VT-VSPD-1-2X/V0/.-0-1 of Euro-card format to data sheet RE 30523
  - Analog amplifier VT-VSPA1-11-1X/V0/0 of Euro-card format to data sheet RE 30100
- Mating connectors (for details, see page 8)
  - For ZDRE: to DIN EN 175301-803, Material no. **R901017011**
  - For ZDREE: to DIN EN 175201-804, Material no. **R900021267** or **R900223890**

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

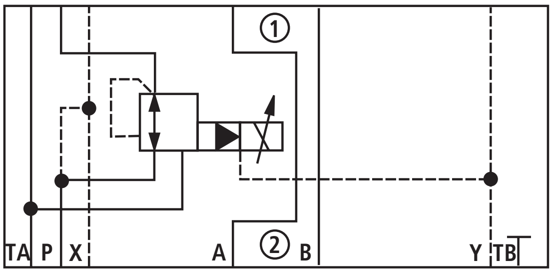
Type ZDRE



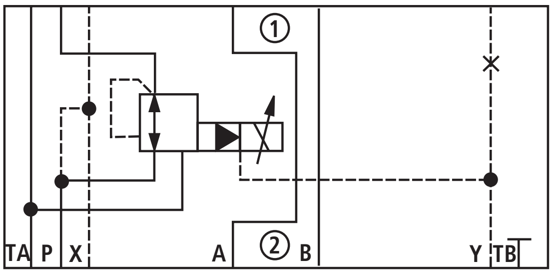
Type ZDRE10VP…**XY**



Type ZDRE10VP…**XL**

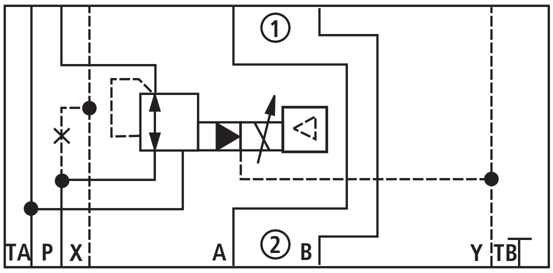


Type ZDRE10VP…**Y**

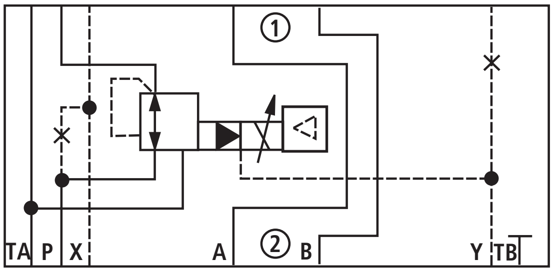


Type ZDRE10VP…**L**

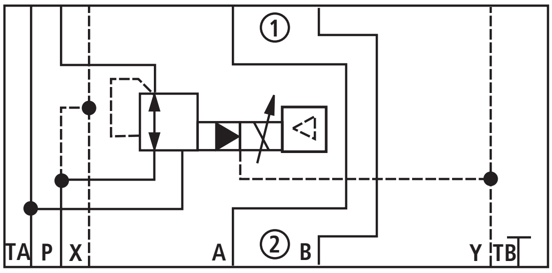
Type ZDREE



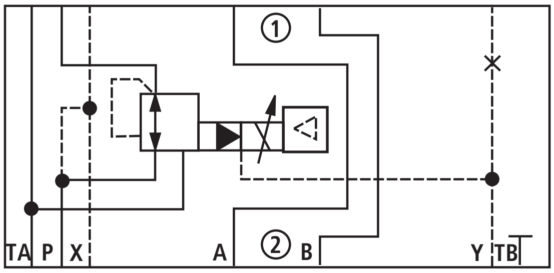
Type ZDREE10VP…**XY**



Type ZDREE10VP…**XL**

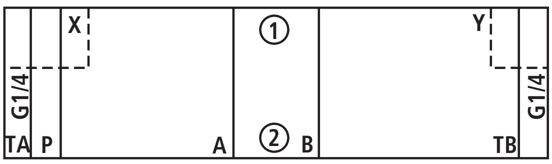


Type ZDREE10VP…**Y**



Type ZDREE10VP…**L**

Type sandwich plate HSZ



Sandwich plate HSZ 10 B097-3X/M01

- Dimensions (length x width x height): 100 x 70 x 30 mm
- Weight: 2.5 kg
- Size of ports X and Y: G1/4
- Dimensional sheet no.: R900262648

Function, section

Type ZDRE

Valves of type ZDRE... are pilot operated pressure reducing valves of sandwich plate design in 3-way variant, i.e. with pressure limitation of the actuator pressure.

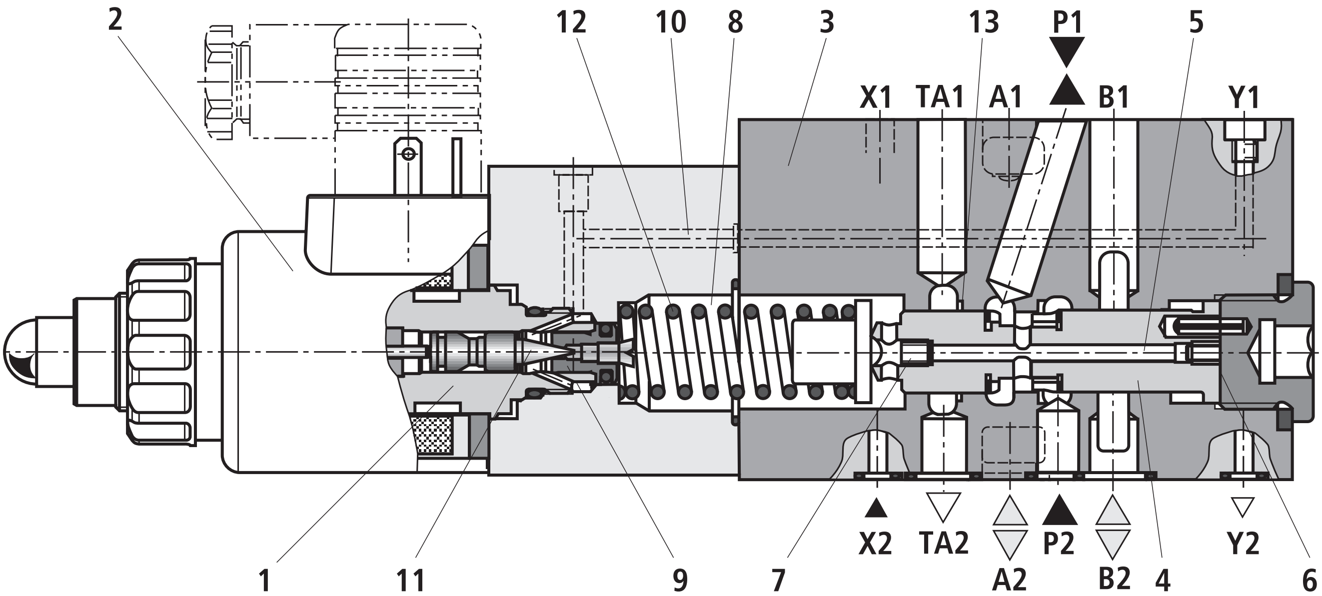
They are used for reducing a system pressure.

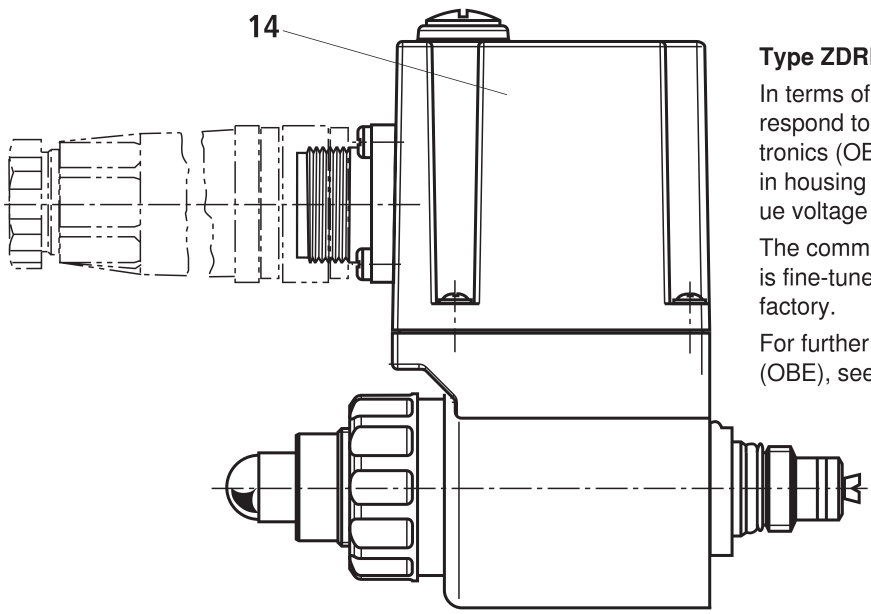
They basically consist of pilot part (1) with proportional solenoid (2), main valve (3) and control spool (4). The pressure in channel P1 is adjusted in dependence on the command value via proportional solenoid (2).

In the rest position, i.e. when no pressure is present in channel P2, control spool (4) opens the connection from channel P2 to P1.

The pressure in channel P1 acts via bore (5) onto spool area (6). The pilot oil for the pilot valve is taken from channel P1 and flows via bore (5), orifice (7), to spring chamber (8). From there, it is fed via valve seat (9), bore (10) and Y-line back to the tank.

The pressure required in channel P1 is pre-selected on the associated amplifier. The proportional solenoid moves valve poppet (11) towards valve seat (9) and increases the pressure in spring chamber (8). Thus, the pressure in both chambers (6) and (8) is balanced, and compression spring (12) pushes spool (4) to the right in the opening direction P2 to P1. As soon as actuator pressure P1 has increased to the value set on the pilot valve, valve poppet (11) opens and limits the pressure in spring chamber (8). Control spool (4) now moves to the left to the control position. When actuator pressure P1 exceeds the value set on the pilot valve, the control spool is pushed further to the left. It closes the connection from P2 to P1 and opens the connection P1 to tank TA1 at control land (13) until this pressure falls again to the set value.





Type ZDREE – with integrated electronics (OBE)

In terms of function and structure, these valves correspond to type ZDRE, except for the integrated electronics (OBE). The electronics (OBE) accommodated in housing (14) receives its supply and command value voltage via the mating connector.

The command value/pressure characteristic curve is fine-tuned with low manufacturing tolerance in the factory.

For further details on the integrated electronics (OBE), see page 9.

Pilot oil supply for directional valve mounted above

Notes

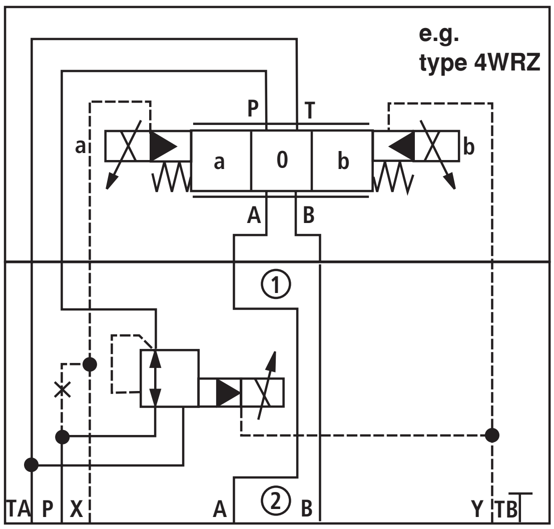
– On the **direct operated** directional valve, the seals for ports X and Y are missing on the connection faces of the housing. To prevent hydraulic fluid from flowing out, the pilot oil supply from P2 to X and the pilot oil drain between the directional valve and the ZDRE(E) must be plugged (variant XL).

– Leakage through the spool clearance from P to B can result in pressure building up in channel B!

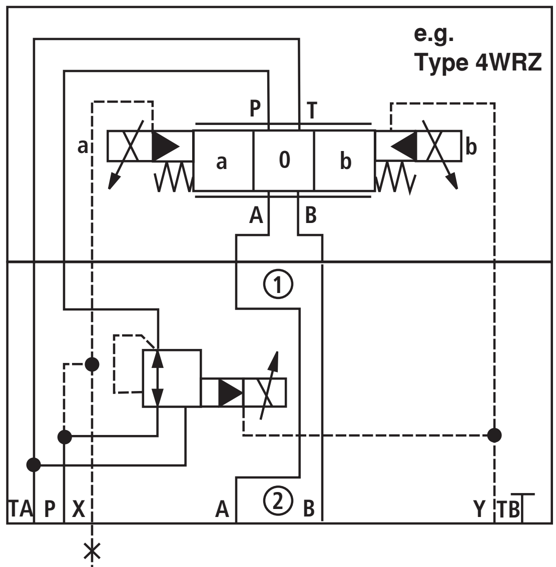
– A **pilot operated** proportional directional valve in conjunction with the ZDRE(E) must have an **external pilot oil supply**.

On variants XY and XL the connection between P2 and X is plugged.

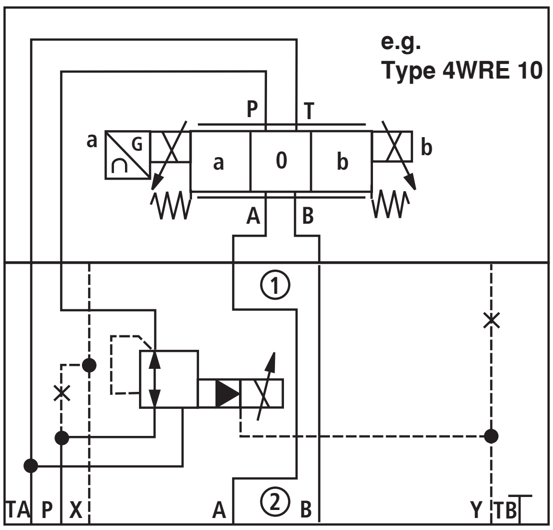
On variants Y and L port X must be plugged on the subplate.



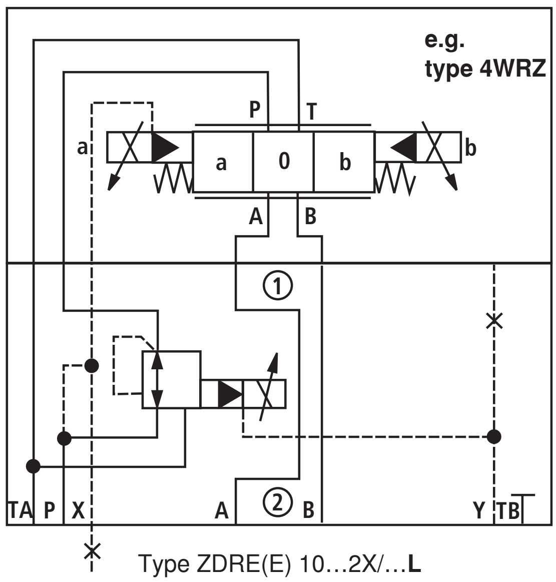
Type ZDRE(E) 10…2X/…**XY**



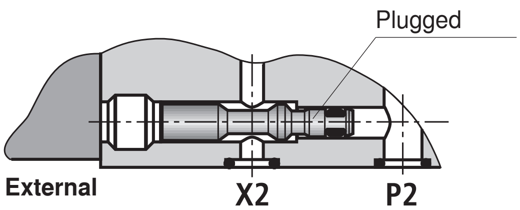
Type ZDRE(E) 10…2X/…**Y**

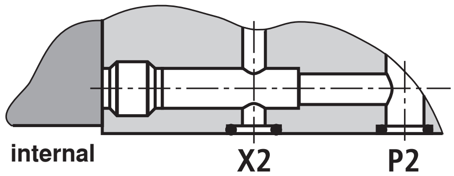


Type ZDRE(E) 10…2X/…**XL**



Type ZDRE(E) 10…2X/…**L**





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

General

Weight	ZDRE	kg	5.1
	ZDREE	kg	5.2
Installation orientation			Preferred orientation of the proportional solenoid: pointing downwards or horizontal
Storage temperature range		°C	–20 to +80
Ambient temperature range	ZDRE	°C	–20 to +70
	ZDREE	°C	–20 to +50

Hydraulic (measured with HLP 46; ϑ_{oil} = 40 °C ± 5 °C)

Maximum operating pressure	Port P1	bar	315	The pressure in an P2 must be about 20 bar higher than the required set pressure, which is to be achieved in P1.
	Ports P2; A; B; X	bar	350	
	Port T	bar	250	
	Port Y or L		Line separately and at zero pressure to tank	
Maximum set pressure in port P1	Pressure rating 50 bar	bar	50	
	Pressure rating 100 bar	bar	100	
	Pressure rating 200 bar	bar	200	
	Pressure rating 315 bar	bar	315	
Min. set pressure in channel P1 with zero command value		bar	See $p_{E\ min}$-q_v characteristic curve on page 12	
Permissible max. flow		l/min	80	
Pilot flow		l/min	0.6 to 0.9	
Hydraulic fluid			Mineral oil (HL, HLP) to DIN 51524, further hydraulic fluids on request	
Hydraulic fluid temperature range		°C	–20 to +80	
Viscosity range		mm²/s	15 to 380	
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 20/18/15 [1)]	
Hysteresis		%	±3 of maximum set pressure	
Repeatability		%	< ±2 of maximum set pressure	
Linearity		%	±3.5 of maximum set pressure	
Manufacturing tolerance of command value/pressure characteristic curve, referred to hysteresis characteristic curve	ZDRE [2)]	%	±5 of set max. pressure	
	ZDREE [3)]	%	±1.5 of set max. pressure	
Step response $T_u + T_g$	10 → 90%	ms	~160	Measured with 5 liters of a standing hydraulic fluid column in port P1
	90 → 10%	ms	~160	

[1)] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

[2)] For details, see page 10

[3)] Adjustment in the factory

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

Electrical

Minimum solenoid current		mA	100
Maximum solenoid current		mA	1600 ± 10 %
Solenoid coil resistance	Cold value at 20 °C	Ω	5.5
	Max. warm value	Ω	8.05
Duty cycle		%	100

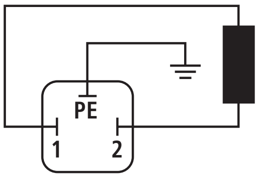
Electrical, integrated electronics (OBE)

Supply voltage	Nominal voltage	VDC	24
	Lower limit value	VDC	21
	Upper limit value	VDC	35
Current consumption		A	≤ 1.5
Required fuses		A	2, slow-blowing
Inputs	Voltage	V	0 to 10
	Current	mA	4 to 20
Output	Actual current value	mV	1 mV ≙ 1mA
Type of protection of the valve to EN 60529			IP 65 with mating connector mounted and locked

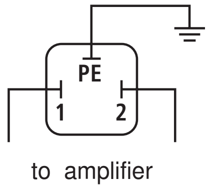
Electrical connection (dimensions in mm)

ZDRE

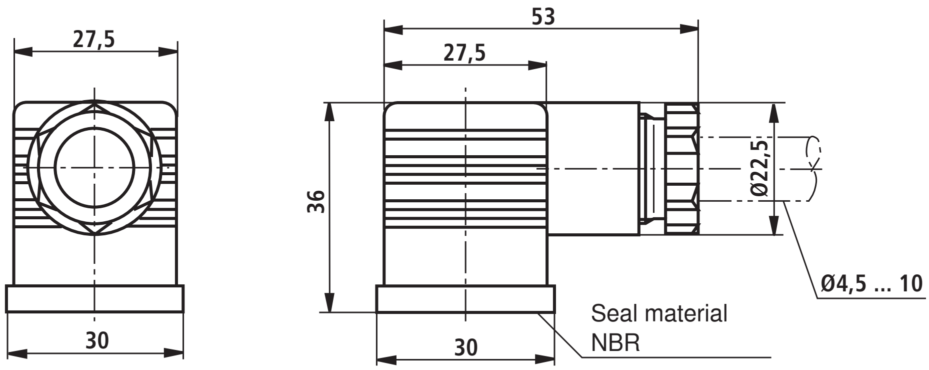
Connection to component plug



Connection to mating connector



Mating connector (black) to
DIN EN 175301-803
Material no. **R901017011**
(separate order)

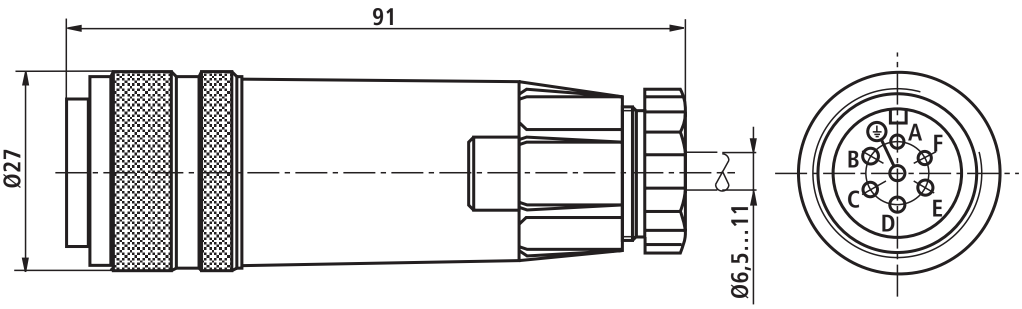


ZDREE

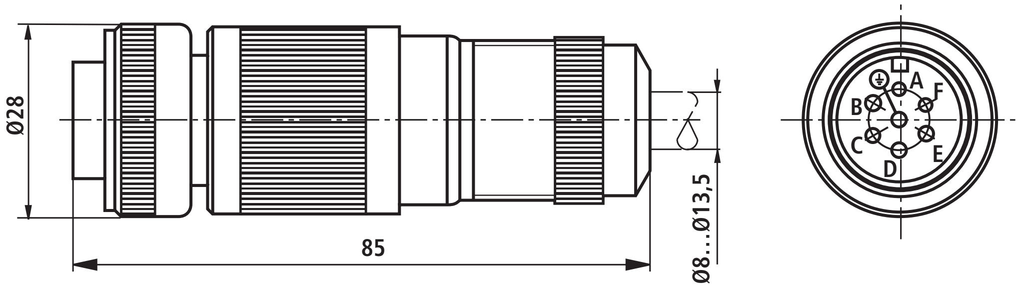
Component plug pinout	Contact	Pinout of interface “A1“	Pinout of interface “F1“
Supply voltage	A	24 VDC (u(t) = 21 V to 35 V); $I_{max} \leq 1.5$ A	
	B	0 V	
Actual value reference potential	C	Reference contact F; 0 V	Reference contact F; 0 V
Differential amplifier input	D	0 to 10 V; R_i = 100 kΩ	4 to 20 mA; R_i = 100 Ω
	E	Command value reference potential	
Measurement output (actual value)	F	0 to 1.6 V actual value (1 mV ≙ 1 mA) Load resistance > 10 kΩ	
	PE	Connected to solenoid and valve housing	

Mating connectors to DIN EN 175201-804, soldered contacts for cable cross-section 0.5 to 1.5 mm²

Plastic variant,
Material no. **R900021267,**
(separate order)



Metal variant,
Material no. **R900223890**
separate order

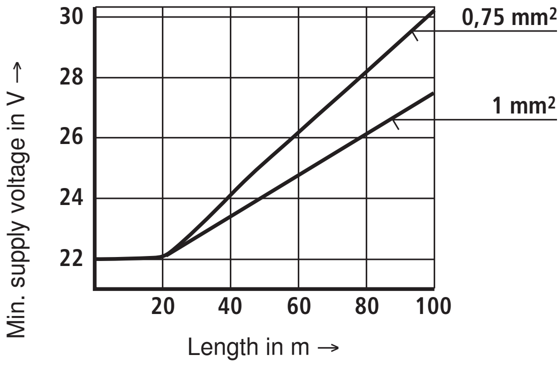


Electrical connection

Connection cable for ZDREE

– Recommendation: 6-wire, 0.75 or 1 mm^2 plus protective earth conductor and shield
– Connect shield only on the supply side to PE
– Permissible max. length 100 m

The minimum supply voltage on the power supply unit depends on the length of the supply cable (see diagram).



Integrated electronics (OBE) of type ZDREE

Function

Power supply to electronics via connections A and B. The command value is applied to differential amplifier connections D and E.

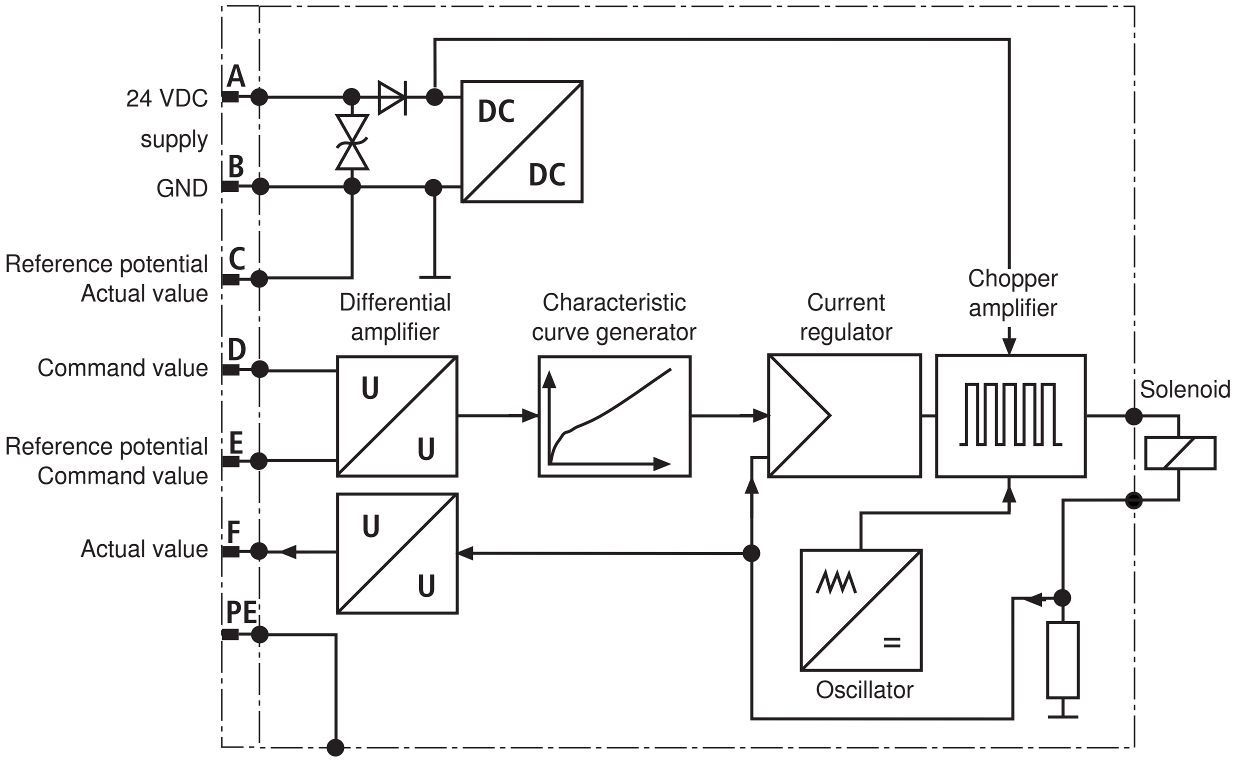
The characteristic curve generator adapts the command value/solenoid current characteristic curve to the valve so that non-linearities in the hydraulics are compensated for and a linear command value/pressure characteristic curve is obtained.

The current regulator regulates the solenoid current independently of the solenoid coil resistance.

A chopper amplifier with a clock frequency of ca. 180 Hz to 400 Hz forms the power output stage of the electronics for controlling the proportional solenoid. The output signal is pulse-width-modulated (PWM).

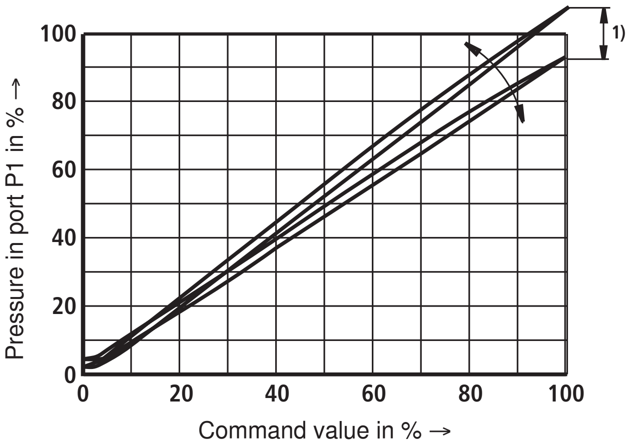
For testing the solenoid current, a voltage, which is proportional to the solenoid current, can be measured between pin F(+) and pin C(–) on the plug-in connector. **1 mV** corresponds to a solenoid current of **1 mA**.

Block circuit diagram



Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

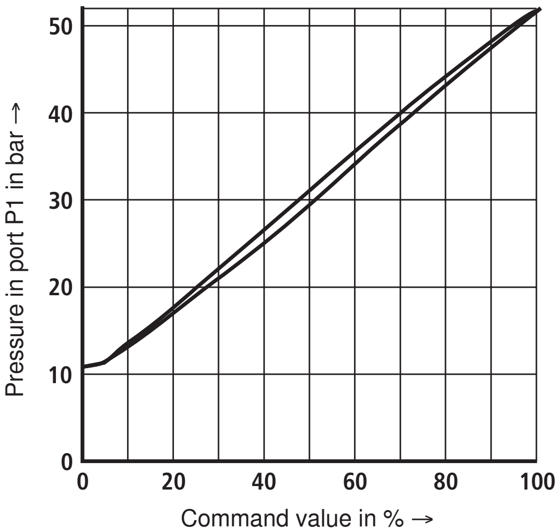
Reduced pressure in port P1 in dependence upon the command value (manufacturing tolerance)



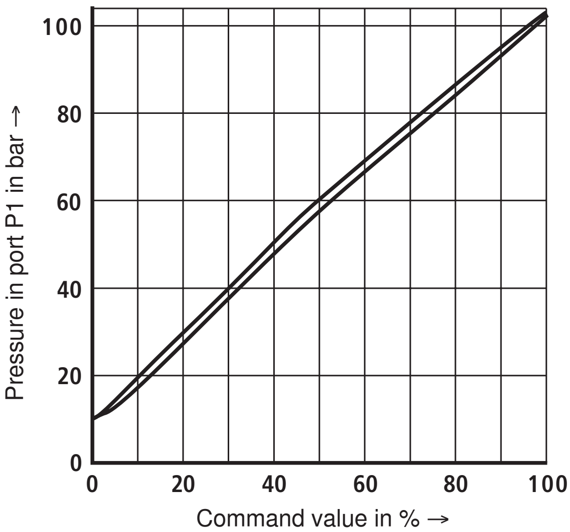
[1] For valve ZDRE the tolerance can be modified on the **external amplifier** (for type and data sheet, see page 2) using command value attenuator potentiometer "**Gw**" . The digital amplifier can be adjusted by means of parameter "Limit".
Here, the control current specified in the technical data must not be exceeded.
In order that several valves can be matched to the same characteristic curves, the pressure at a command value of 100 % must not be set higher than the maximum pressure setting of the pressure rating.

Pressure in port P1 in dependence upon the command value (at flow 0 l/min)

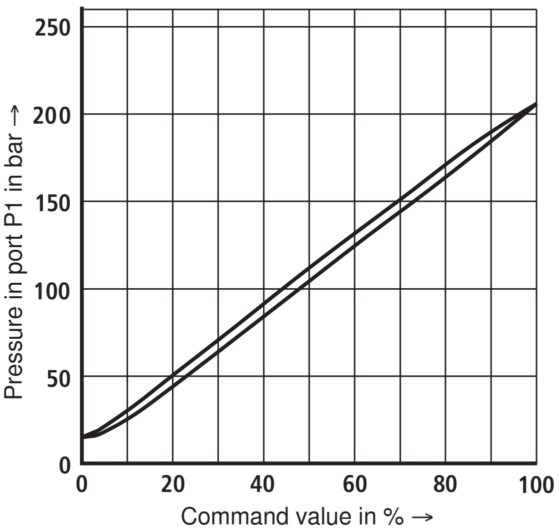
Pressure rating 50 bar



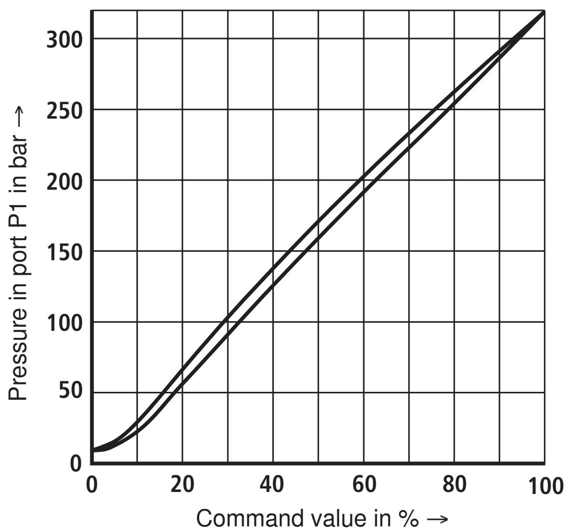
Pressure rating 100 bar



Pressure rating 200 bar

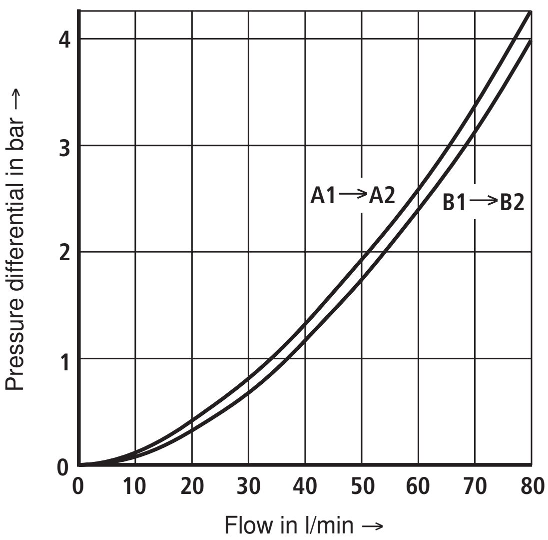


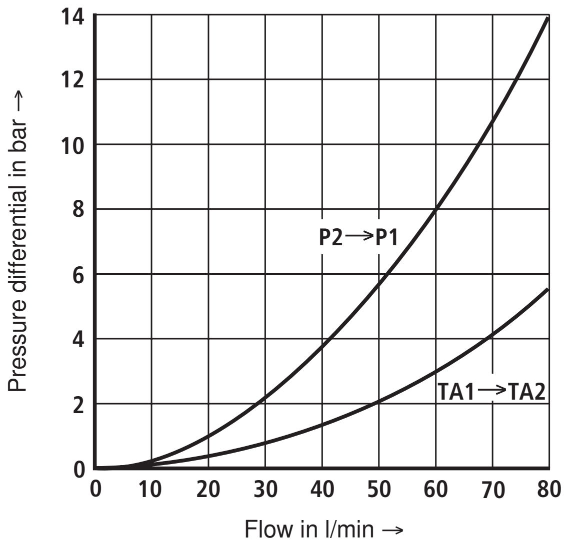
Pressure rating 315 bar



Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

Pressure differential in dependence upon the flow

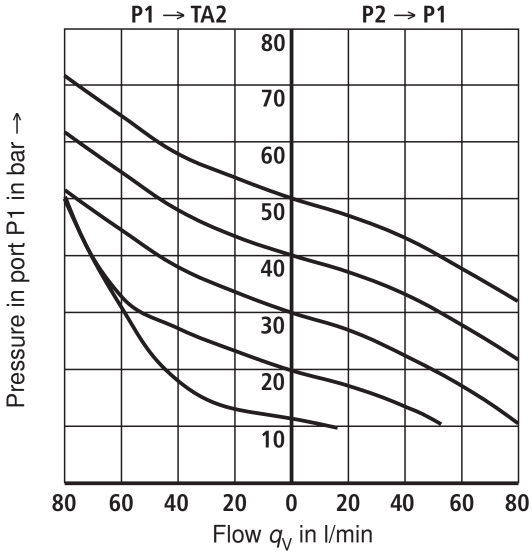




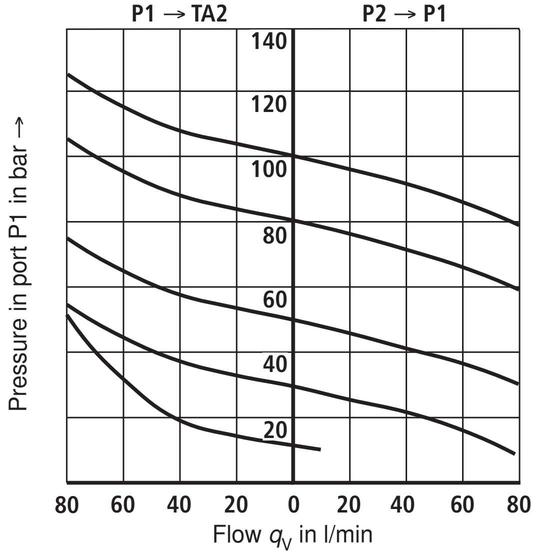
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

Pressure in port P1 in dependence upon the flow

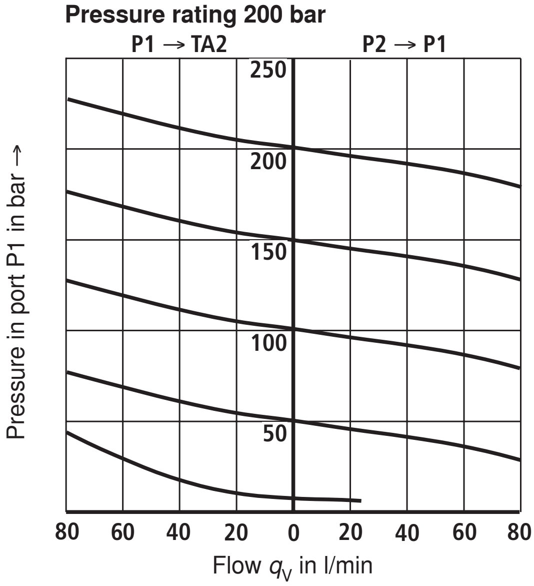
Pressure rating 50 bar



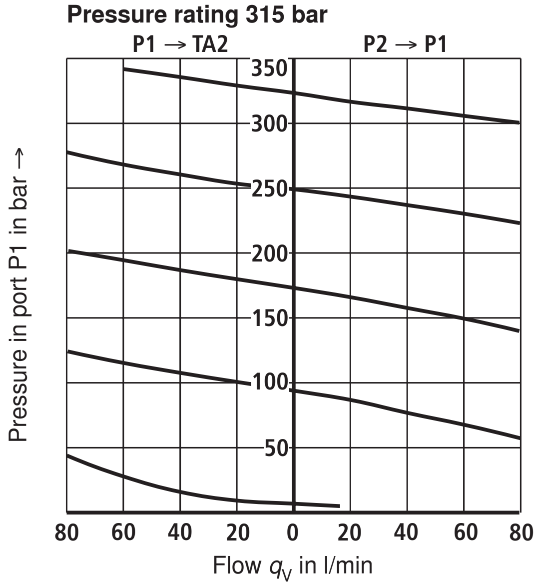
Pressure rating 100 bar



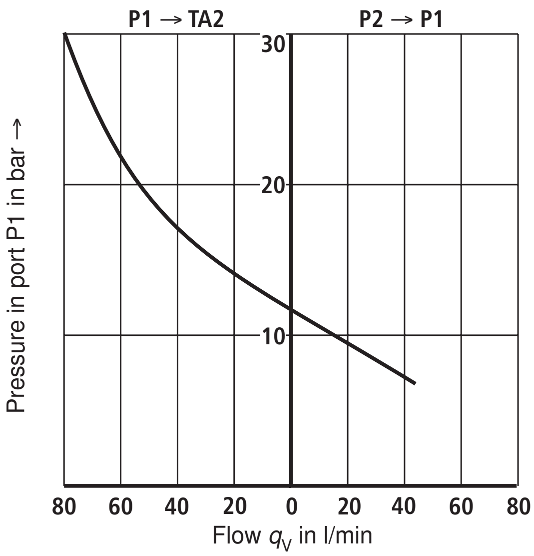
Pressure rating 200 bar



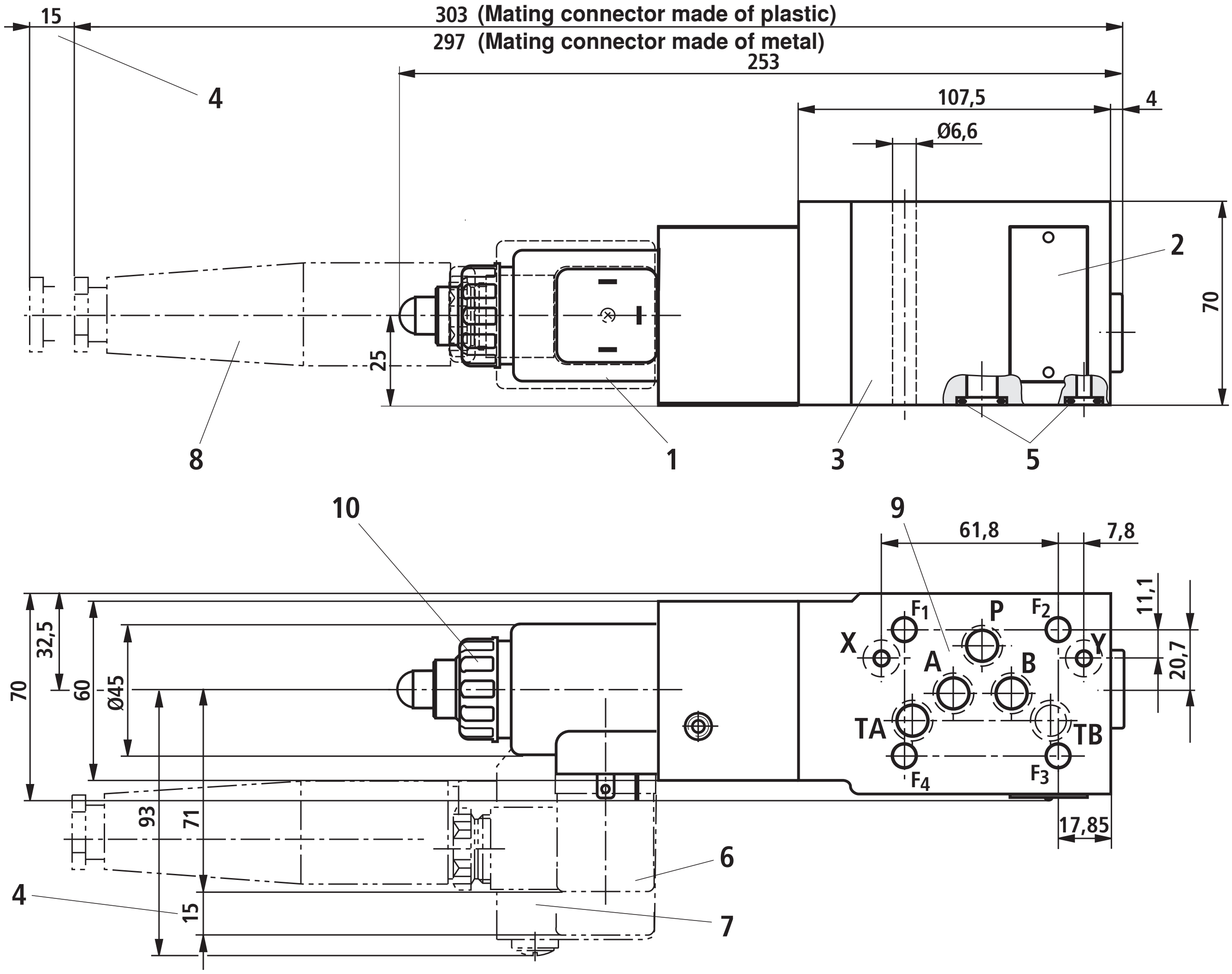
Pressure rating 315 bar



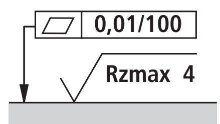
Min. set pressure in dependence upon the flow at zero command value



Unit dimensions (dimensions in mm)



1 Solenoid coil
2 Nameplate
3 Valve housing
4 Space required to remove mating connector
5 Identical seal rings for ports A2, B2, P2, TA2, TB2
Identical seal rings for ports X2, Y2
6 Mating connector for type ZDRE
(separate order)
7 Integrated electronics (type ZDREE) with component plug
8 Mating connector for type ZDREE,
plastic or metal variant,
(separate order)
9 Porting pattern to DIN 24340-A10
and ISO 4401-05-05-0-05 (X, Y as required)
10 O-ring and plastic nut A/F 32 for coil mounting
The nut can be loosened by turning it counter-clockwise (1 turn). The solenoid coil can then be rotated to the desired position and fixed by tightening the nut.
Tightening torque: 4+1 Nm



Required surface quality
of valve mounting face

Valve mounting screws

4 hexagon socket head cap screws ISO 4762-M6-10.9-flZn-240h-L
(Friction coefficient μ_{total} = 0.09 to 0.14);
tightening torque M_T = 12.5 Nm ± 10 %

or

4 hexagon socket head cap screws ISO 4762-M6-10.9
(Friction coefficient μ_{total} = 0.12 to 0.17);
tightening torque M_T = 15.5 Nm ± 10 %

Screw length as required

Notes

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
Fax +49 (0) 93 52 / 18-23 58
documentation@boschrexroth.de
www.boschrexroth.de

Notes

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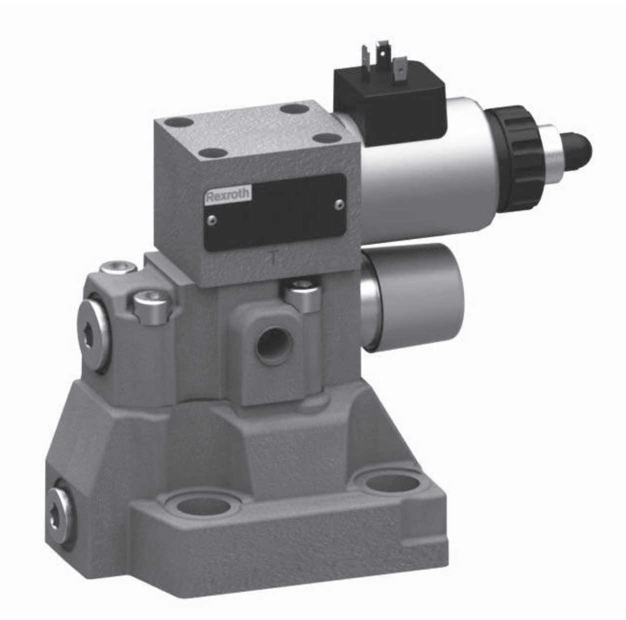
Proportional pressure relief valve, pilot operated

Type DBEM and DBEME

RE 29361
Edition: 2013-07
Replaces: 2012-12



Similar figure

- Size 10 to 32
- Component series 7X
- Maximum operating pressure 350 bar
- Maximum flow: 700 l/min

Features

- Pilot operated valves for limiting a system pressure
- Operation by means of proportional solenoid
- For subplate mounting and threaded connection: Porting pattern according to ISO 6264
- Maximum pressure limitation
- Valve and control electronics from a single source
- Integrated electronics (OBE) with type DBEME: Little manufacturing tolerance of the command value pressure characteristic curve
- External control electronics with type DBEM (separate order)

Contents

Ordering code

01	02	03	04	05		06		07	08	09	10	11	12	13	14	15
DBE	M				–	7X	/			G24						*

01	Proportional pressure relief valve	**DBE**

02	**With** maximum pressure limitation	**M** 1)

03	For external control electronics	**no code**
	With integrated electronics (OBE)	**E**

Size

04	Size 10	**10**
	Size 25	**20**
	Size 32	**30**

05	Subplate mounting	**no code**
	Threaded connection	**G**

06	Component series 70 to 79 (70 to 79: Unchanged installation and connection dimensions)	**7X**

Pressure rating 2)

07	Up to 50 bar	**50**
	Up to 100 bar	**100**
	Up to 200 bar	**200**
	Up to 315 bar	**315**
	Up to 350 bar	**350**

08	Pilot oil return external	**Y**
	Unloading port X, pilot oil return external	**XY**

Supply voltage

09	24 V DC voltage	**G24**

10	1600 mA coil	**no code**
	800 mA coil	**–8** 3)

1) The maximum pressure limitation only serves as protection against overpressure in case of an error in the pilot valve (e.g. in case of contamination or overcurrent).

2) Special version DBEME-SO699 in size 10 and 20 available up to pressure rating 500 bar.

3) Replacement for series 3X and series 5X SO1 (comparison see characteristic curve page 12). All characteristics (hydraulic and electric) specified in the data sheet refer to the version with 1600 mA coil.

Ordering code

01	02	03	04	05		06		07	08	09	10	11	12	13	14	15
DBE	**M**				**–**	**7X**	**/**			**G24**						*****

Electrical connection

11	**For type DBEM:**	
	Without mating connector; connector DIN EN 175301-803	**K4** 4)
	For type DBEME:	
	Without mating connector; connector DIN EN 175201-804	**K31** 4)

Electronics interface

12	Command value 0 to 10 V	**A1**
	Command value 4 to 20 mA	**F1**
	With DBEM	**no code**

Seal material

13	NBR seals	**M**
	FKM seals	**V**
	Attention: Observe compatibility of seals with hydraulic fluid used!	

14	Pipe thread to DIN ISO228-1	**no code** 5)
	UNF-thread to ASME B1.1	**/12** 5)

15	Further details in the plain text	

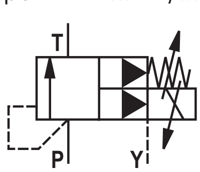
4) Mating connectors, separate order, see page 8 and 19

5) possible only for version G

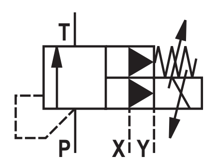
Symbols

For external control electronics:

Type DBEM...-7X/...Y...

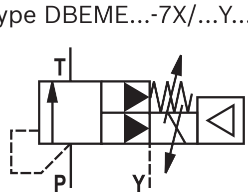


Type DBEM...-7X/...XY...

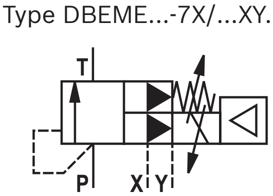


With integrated electronics:

Type DBEME...-7X/...Y...



Type DBEME...-7X/...XY...

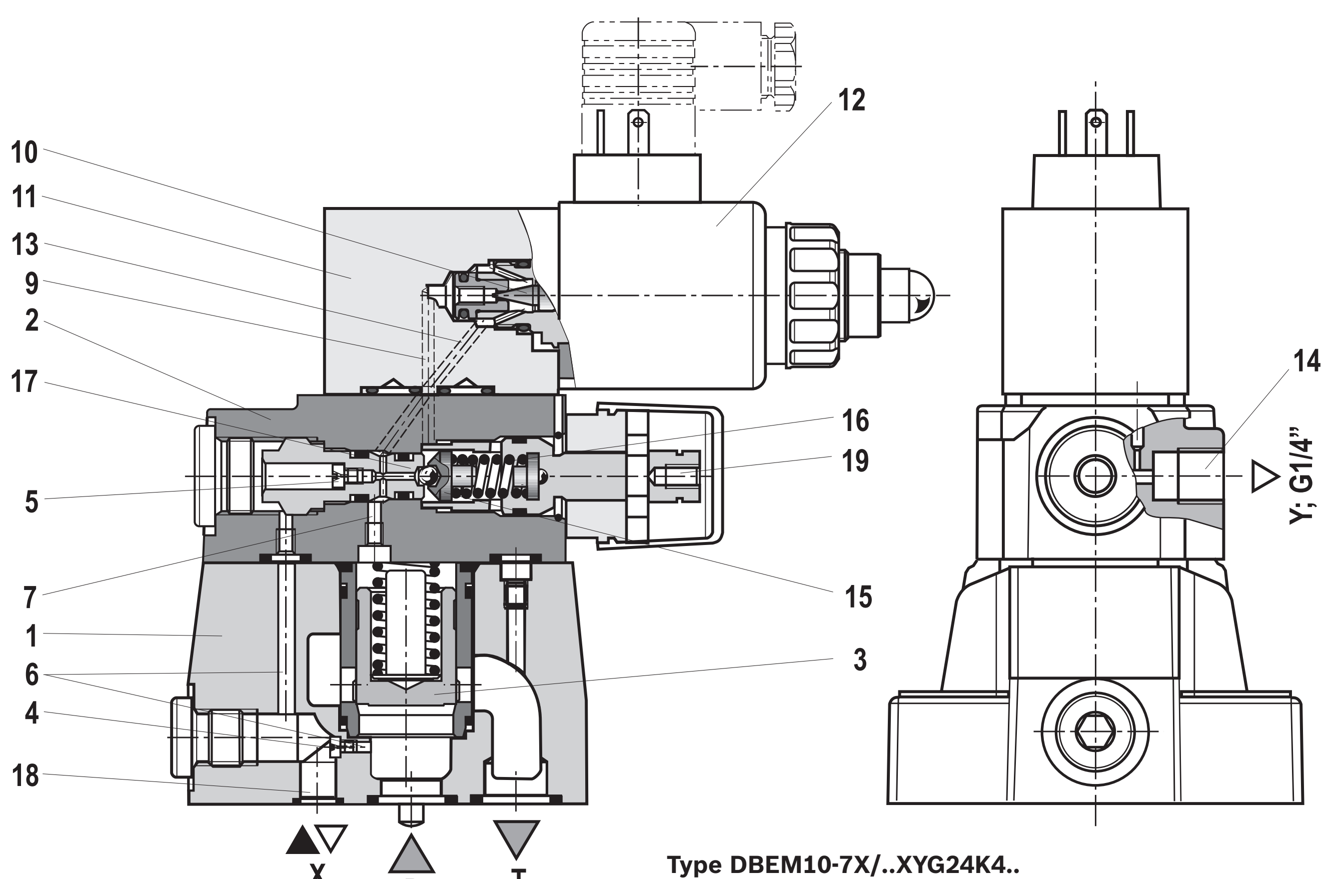


Function, section

Valves of type DBEM are pilot operated pressure relief valves. They are used to limit the operating pressure in hydraulic systems. By means of these valves, the pressure to be limited can be continuously adjusted depending on the electric command value.
These valves basically consist of the housing (1) with main spool insert (3), the sandwich plate valve with maximum pressure limitation (2) and the proportional pilot control valve (11).

Type DBEM...

The pressure applied to channel P acts on the main spool (3). At the same time, the pressure at port P is applied to the spring loaded side of the main spool (3) via the control lines (6, 7) provided with nozzles (4, 5). Via the connection bore (9), the pressure is simultaneously applied to the poppet (10) of the proportional pilot control valve (11). The hydraulic force at the pilot poppet (10) acts against the command value-dependent force of the proportional solenoid (12).
If the hydraulic force exceeds the solenoid force, the pilot poppet is opened (10). The pilot oil can now flow via the control line (13) into port Y (14) and to the tank; thus, a pressure drop results at the main spool (3) over the control lines (6, 7). The connection from port P to T is released. The main spool (3) controls the set operating pressure at port P.
As hydraulic protection against inadmissibly high pressures, a spring-loaded pressure relief valve (2) has been integrated. This maximum pressure limitation is pre-set to the relevant pressure rating (see table page 6). In the operating range of the valve, the poppet (15) is held on the valve seat (17) by the spring (16) and is thus closed. If the pressure in the spring chamber of the main spool (3) exceeds the maximum admissible set pressure of the valve, the poppet (15) is pressed against the compression spring (16) and the connection into the spring chamber is opened. Via port Y (14), the pilot oil flows into the tank. Due to the control lines (6, 7), a pressure drop occurs at the main spool (3). The connection from port P to T is released. The main spool (3) controls the set maximum operating pressure in port P. Via the adjustment element (19), the pre-set pressure can be reduced, if necessary. Port Y (14) must be externally piped to the tank. The connection to the tank should be pressureless. Via port X (18), the valve may be unloaded or the maximum pressure may be limited.



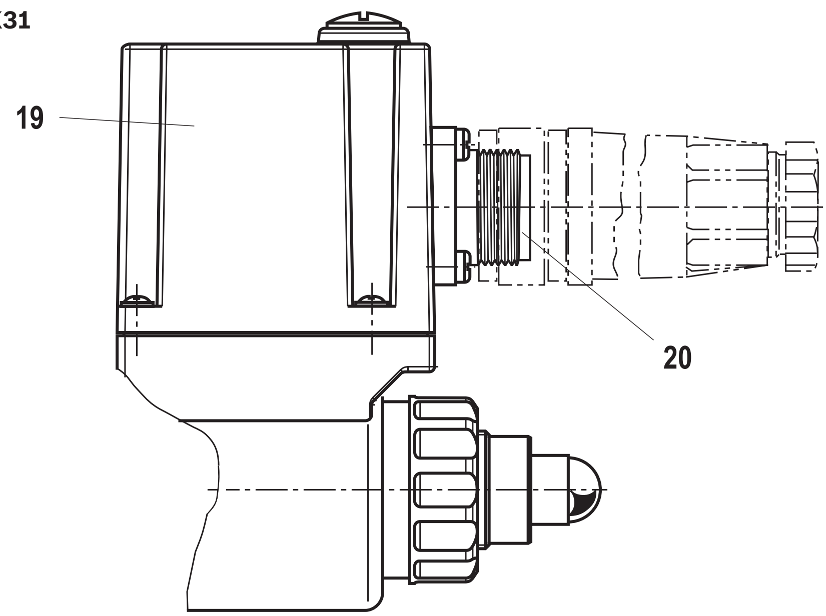
Type DBEM10-7X/..XYG24K4..

Function, section

Type DBEME – with integrated electronics (OBE)
In terms of function and design, these valves correspond to type DBEM. On the proportional solenoid, there is moreover a housing (19) with the control electronics.
Supply and command value voltage are applied to the connector (20).
In the factory, the command value pressure characteristic curve is adjusted with little manufacturing tolerance.

For more information on the control electronics, see page 9.

Type DBEME...-7X/...YG24K31



Technical data

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

general			**Size 10**	**Size 25**	**Size 32**
Weight	– Type DBEM	kg	4.5	5.3	6.4
	– Type DBEME	kg	4.7	5.5	6.6
	– Type DBEMG	kg	7	6,74	6.4
	– Type DBEMEG	kg	7,2	6,94	6.6
Installation position			Any		
Storage temperature range		°C	–20 to +80		
Ambient temperature range	– Type DBEM	°C	–20 to +70		
	– Type DBEME	°C	–20 to +50		

hydraulic (measured with HLP46, ϑ_{Oil} = 40 ±5 °C)			**Size 10**	**Size 25**	**Size 32**
Maximum operating pressure	– Port P and X	bar	350		
	– Port T	bar	315		
	– Port Y	bar	Separately and to the tank at zero pressure		
Maximum set pressure	– Pressure rating 50 bar	bar	50		
	– Pressure rating 100 bar	bar	100		
	– Pressure rating 200 bar	bar	200		
	– Pressure rating 315 bar	bar	315		
	– Pressure rating 350 bar	bar	350		
Minimum set pressure with command value zero		bar	See characteristic curve page 10		
Maximum pressure limitation, set upon delivery			If necessary, the value may be reduced		
	– Pressure rating 50 bar	bar	to 75 bar		
	– Pressure rating 100 bar	bar	to 135 bar		
	– Pressure rating 200 bar	bar	to 240 bar		
	– Pressure rating 315 bar	bar	to 350 bar		
	– Pressure rating 350 bar	bar	to 390 bar		
Maximum flow		l/min	275 [1]	550	700
Pilot flow		l/min	0.4 to 1	0.4 to 1.5	0.4 to 1.5
Hydraulic fluid			See table page 7		
Hydraulic fluid temperature range		°C	–20 to +80		
Viscosity range		mm^2/s	15 to 380		
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)			Class 20/18/15 [2]		
Hysteresis (see command value pressure characteristic curve)		%	≤ 5 of the maximum set pressure		
Linearity		%	±3.5 of the maximum set pressure		
Manufacturing tolerance of the command value pressure characteristic curve, related to the hysteresis characteristic curve; pressure increasing	– Type DBEM	%	±5 of the maximum set pressure		
	– Type DBEME	%	±1.5 of the maximum set pressure		
Step response $T_u + T_g$	10 % → 90 %	ms	~100	Measured with standing hydraulic fluid column, 0.2 liters at port A	
	90 % → 10 %	ms	~100		
Step response $T_u + T_g$	10 % → 90 %	ms	~200	Measured with standing hydraulic fluid column, 5 liters at port A	
	90 % → 10 %	ms	~200		

[1] Version G to 200 l/min

[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. For the selection of the filters see www.boschrexroth.com/filter.

Technical data

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

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils and related hydrocarbons		HL, HLP	NBR, FKM	DIN 51524
Bio-degradable	– Insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	– Soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Containing water	HFC	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 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**: Maximum pressure differential per control edge 210 bar, otherwise, increased cavitation erosion. Life cycle as compared to HLP 30 to 100 %
  Fluid temperature maximum 60 °C
- **Bio-degradable:** When using bio-degradable hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate in the fluid (per pole tube 700 mg zinc).

electric			**G24**	**G24-8**
Minimum solenoid current		mA	≤ 100	≤ 100
Maximum solenoid current		mA	1600 ± 10 %	800 ± 5 %
Solenoid coil resistance	– Cold value at 20 °C	Ω	5.5	20.6
	– Maximum hot value	Ω	8.05	33
Duty cycle		%	100	100

electrical, integrated electronics (OBE)			
Supply voltage	– Nominal voltage	VDC	24
	– Lower limit	VDC	21
	– Upper limit	VDC	35
Current consumption		A	≤ 1.5
Required fuse protection		A	2, time-lag
Inputs	– Voltage	V	0 to 10
	– Current	mA	4 to 20
Output	– Actual current value	mV	1 mV ≙ 1 mA
Protection class of the valve according to EN 60529			IP 65 with mating connector mounted and locked

Caution!

At an ambient temperature of 70 °C and a duty cycle of 100 % with max. current, the coil reaches temperatures of up to 170 °C. Contact with the coil may lead to burns.

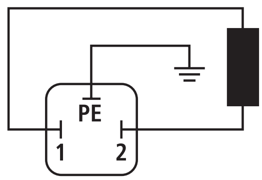
Notice!

Information on the environment simulation testing for the areas EMC (electromagnetic compatibility), see declaration on environmental compatibility data sheet 29162-U.

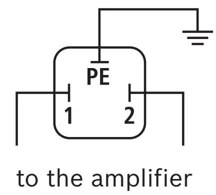
Electrical connection
(dimensions in mm)

Type DBEM

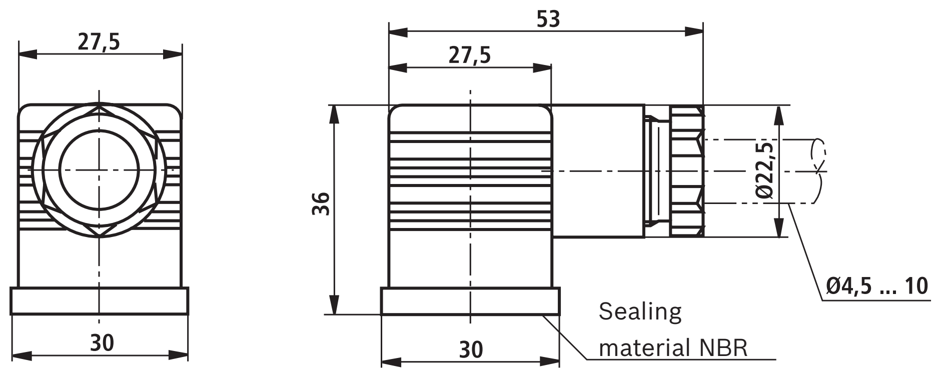
Connection at the connector



Connection at mating connector



Mating connector (black) according to DIN EN 175301-803
Material no. **R901017011**
(separate order)

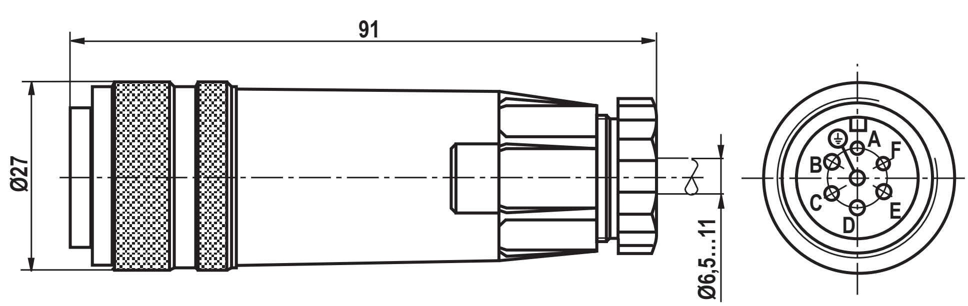


Type DBEME

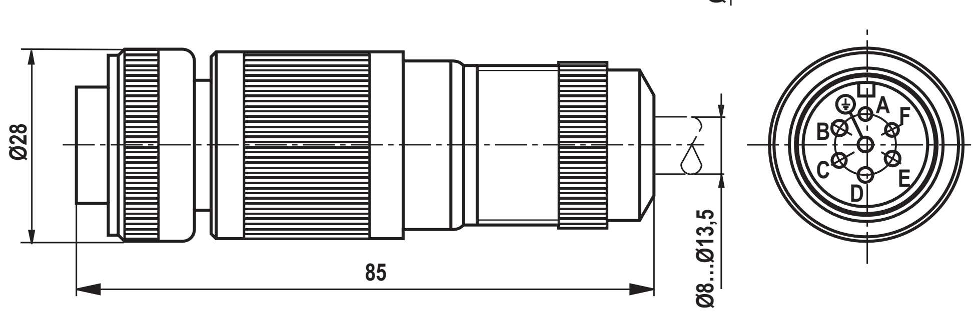
Device connector allocation	Contact	Allocation interface "A1"	Allocation interface "F1"
Supply voltage	A	24 VDC (u(t) = 21 V to 35 V); $\boldsymbol{I}_{max}$ ≤ 1.5 A	
	B	0 V	
Reference potential actual value	C	Reference contact F; 0 V	Reference contact F; 0 V
Differential amplifier input	D	0 to 10 V; $\boldsymbol{R}_E$ = 100 kΩ	4 to 20 mA; $\boldsymbol{R}_E$ = 100 Ω
	E	Reference potential command value	
Measuring output (actual value)	F	0 to 1.6 V actual value (1 mV ≙ 1 mA) load resistance > 10 kΩ	
Protective earth	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 mm^2

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



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

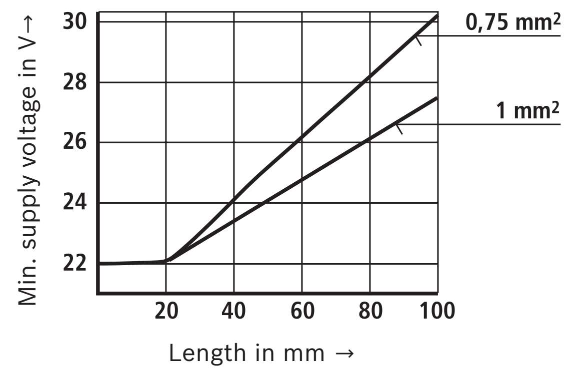


Electrical connection

Connection cable for type DBEME

- Recommendation 6-wire, 0.75 or 1 mm² plus protective earthing 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).



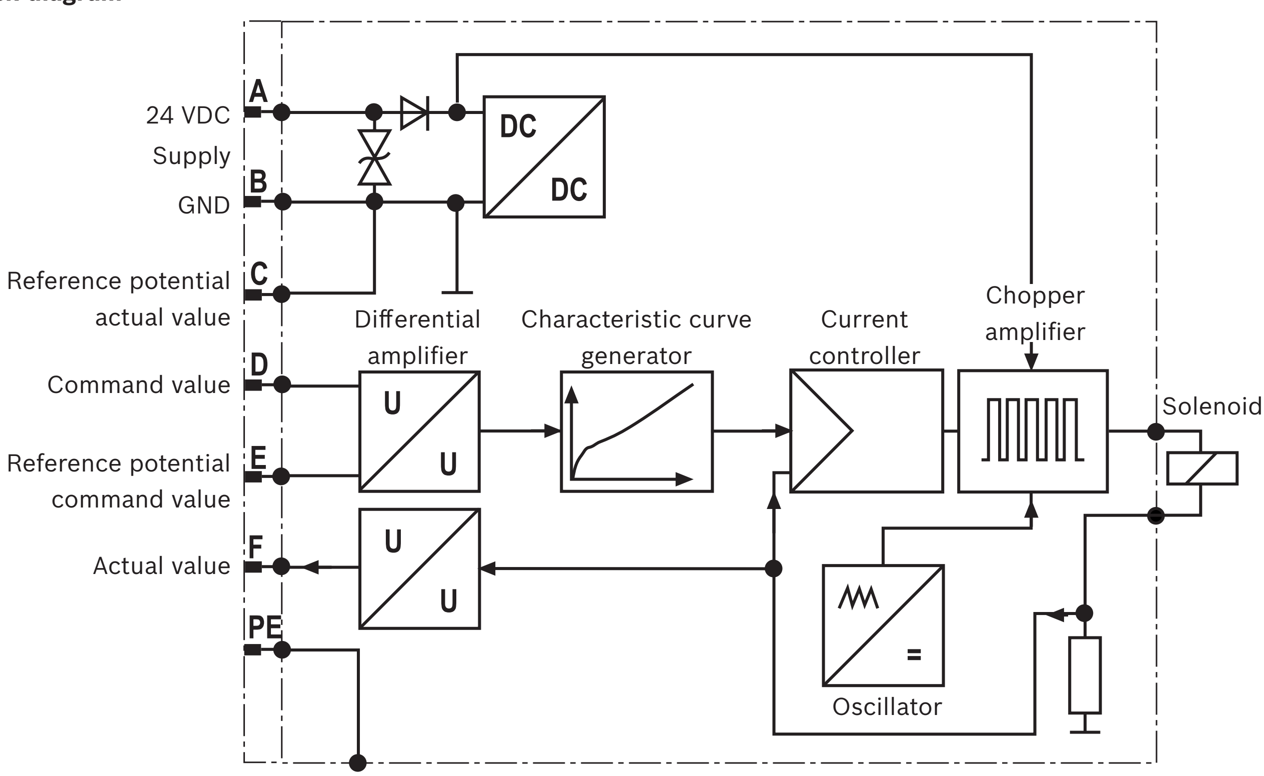
Integrated electronics (OBE) for type DBEME

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.
Via the characteristic curve generator, the command value solenoid current characteristic curve is adjusted to the valve so that non-linearities in the hydraulic system are compensated for and a linear command value pressure characteristic curve is created.
The current controller controls the solenoid current independent of the solenoid coil resistance.

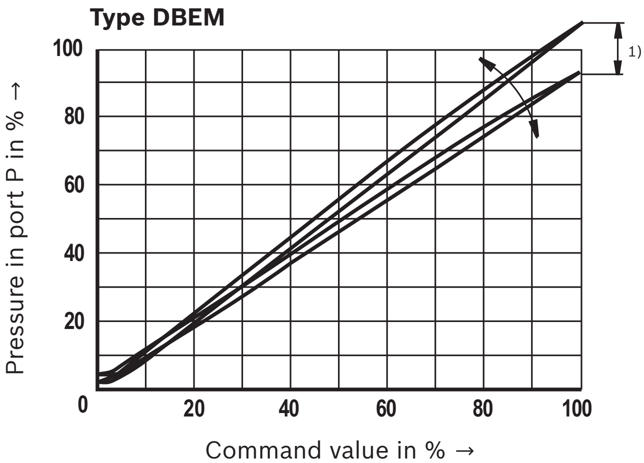
The power stage of the electronics for controlling the proportional solenoid is a chopper amplifier with a cycle frequency of approx. 180 Hz to 400 Hz. The output signal is pulse-width modulated (PWM).
For checking the solenoid current, a voltage can be measured at the connector between pin F(+) and pin C(–) that is proportional to the solenoid current. **1 mV** corresponds to **1 mA** solenoid current

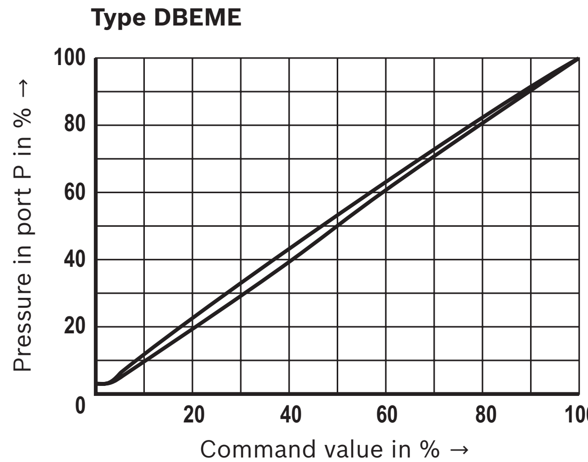
Block diagram



Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

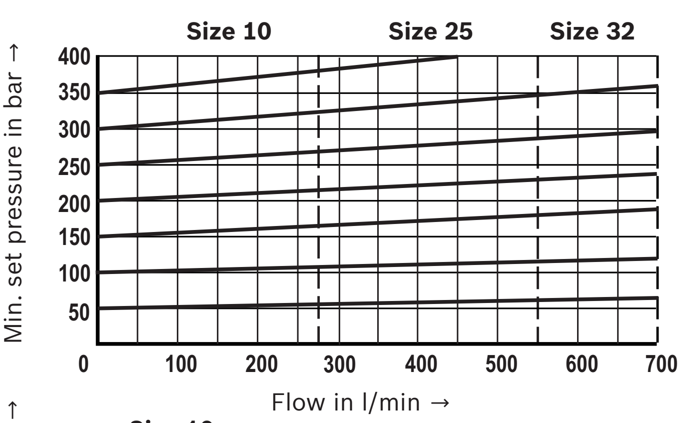
Pressure in port P depending on the command value (flow = 24 l/min)

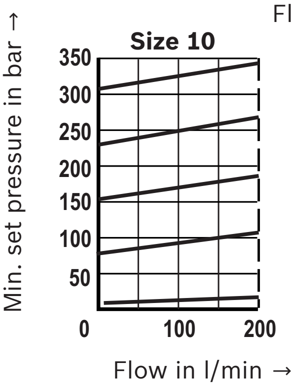




1) With valve type DBEM, the manufacturing tolerance at the **external amplifier** (type and data sheet see page 16) can be changed using the command value attenuator potentiometer "**Gw**". The digital amplifier is set using the parameter "Limit".
In this connection, the control current according to the technical data must not be exceeded.
In order to be able to adjust several valves to the same characteristic curve, don't set the pressure higher than the maximum set pressure of the pressure rating with command value 100 %.

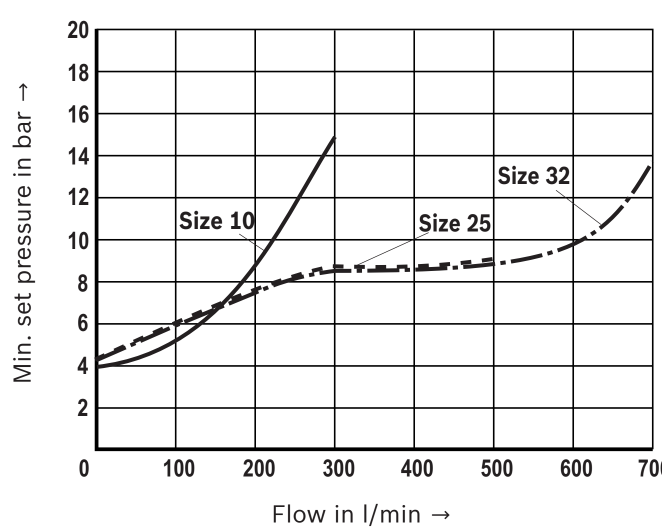
Set pressure depending on the flow





Version G
(Characteristic curves for size 25 and size 30 identical to version „subplate mounting“)

Min. set pressure with command value 0

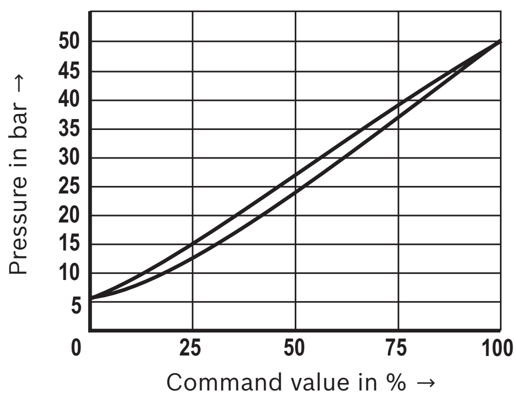


The characteristic curves apply to output pressure in T or Y = 0 bar in the total flow range.
Notice: So that the minimum set pressure is achieved, the pilot current must not exceed 100 mA.

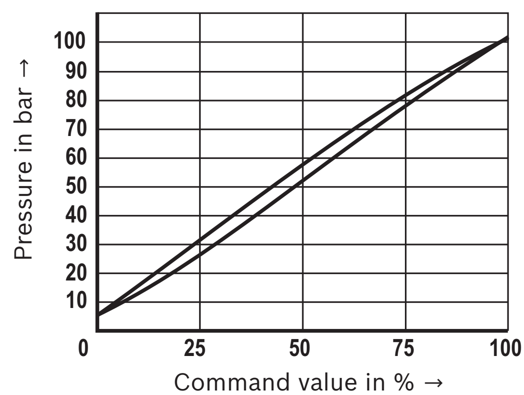
Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Command value pressure characteristic curves (measured with a flow of 24 l/min and with amplifier VT-MSPA1-1)

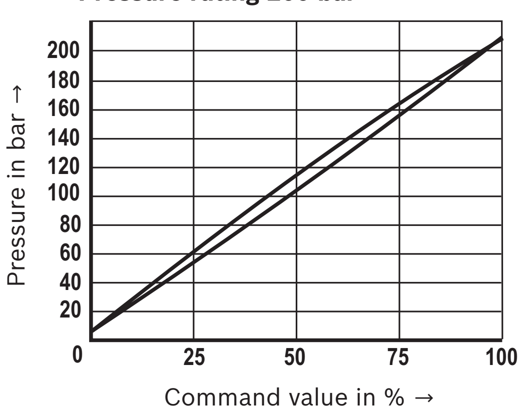
Pressure rating 50 bar



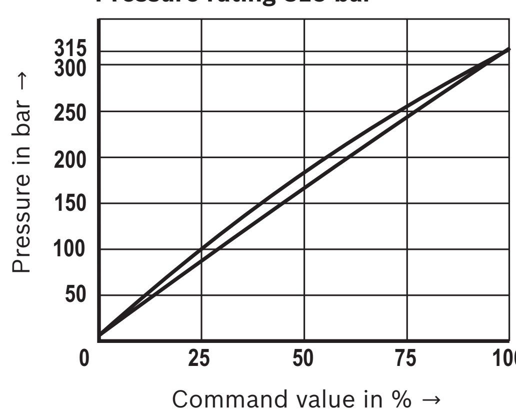
Pressure rating 100 bar



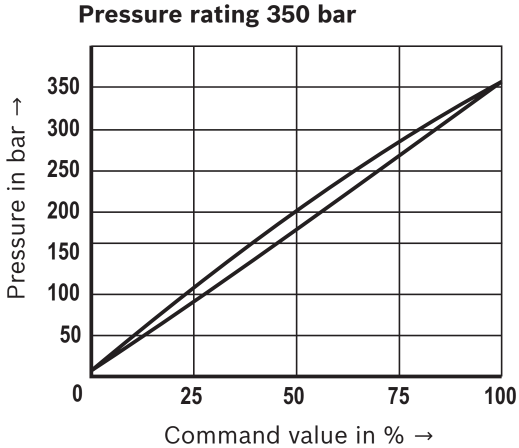
Pressure rating 200 bar



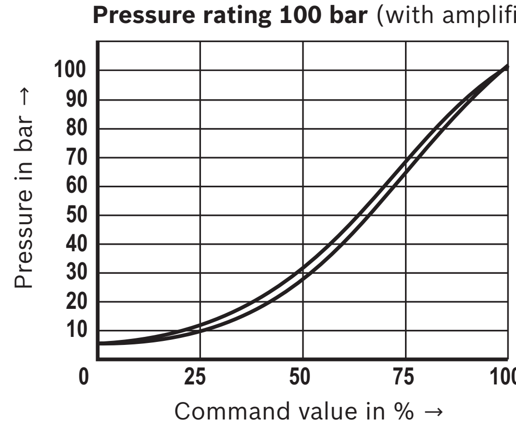
Pressure rating 315 bar



Pressure rating 350 bar



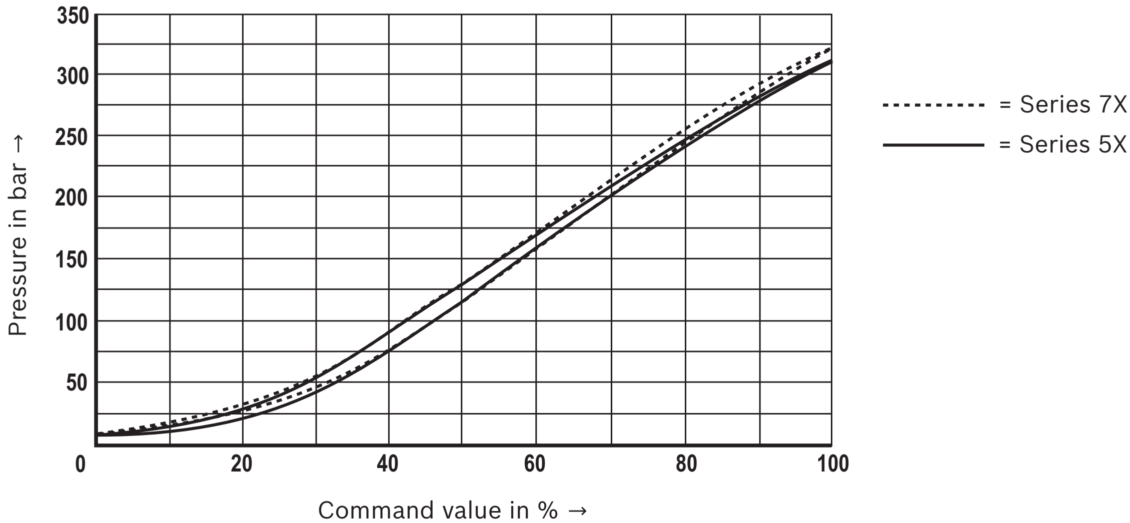
Pressure rating 100 bar (with amplifier VT-VSPA1-1)



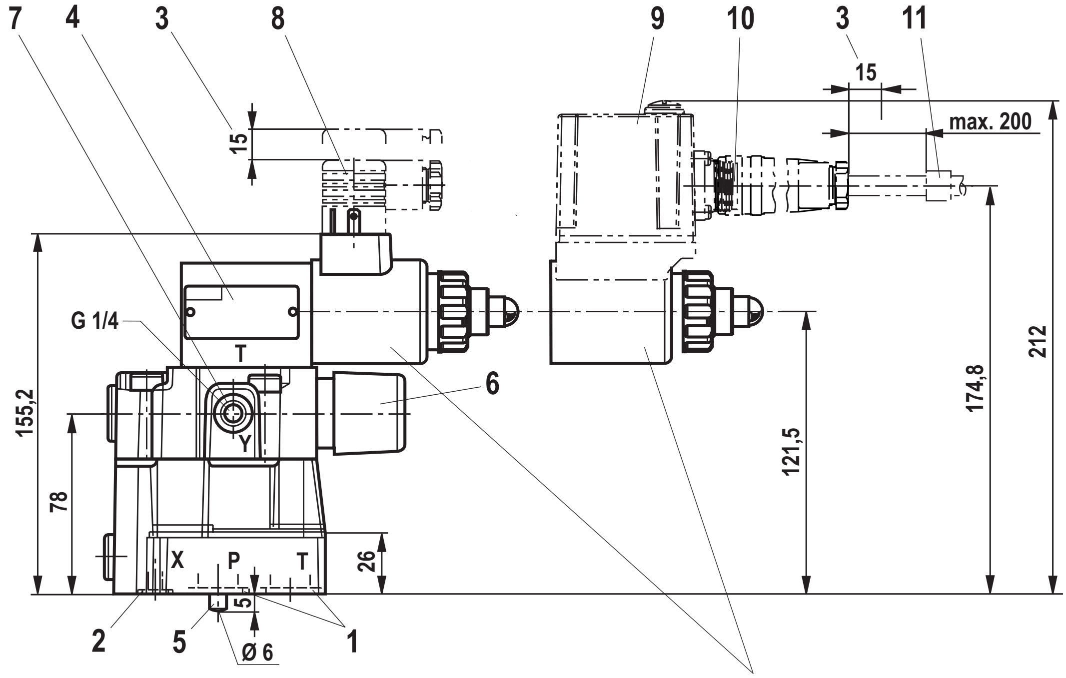
Characteristic curves

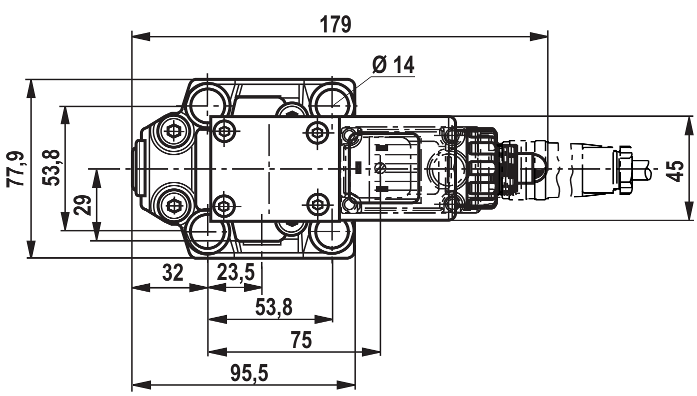
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Comparison series 5X and 7X using the pressure rating 315 bar as example (with amplifier VT-SSPA1-1-1X with 800 mA coil)



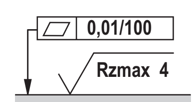
Dimensions: Type DBEM(E) 10
(dimensions in mm)





Coil and electronics freely rotatable!

O-ring and plastic nut for coil fixation. The nut can be loosened by rotating it counterclockwise (1 turn). Afterwards, the solenoid coil can be rotated in any desired position. Subsequent fixation applying 5±1 Nm.



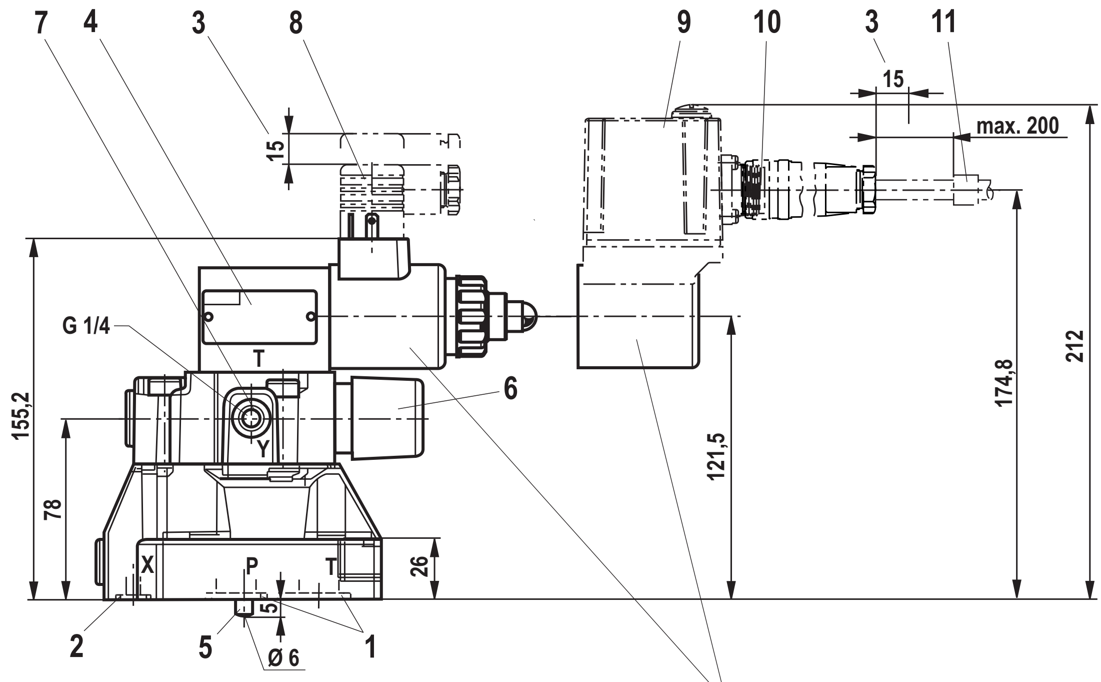
Required surface quality of the valve contact surface

1 Seal rings for ports P and T
2 Seal ring for ports X
3 Space required to remove the mating connector
4 Name plate
5 Locating pin
6 Maximum pressure limitation
7 External pilot oil return,
separately and to the tank at zero pressure
8 Mating connector for type DBEM
9 Integrated electronics (OBE)
10 Mating connector for type DBEME
11 Cable fastening

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

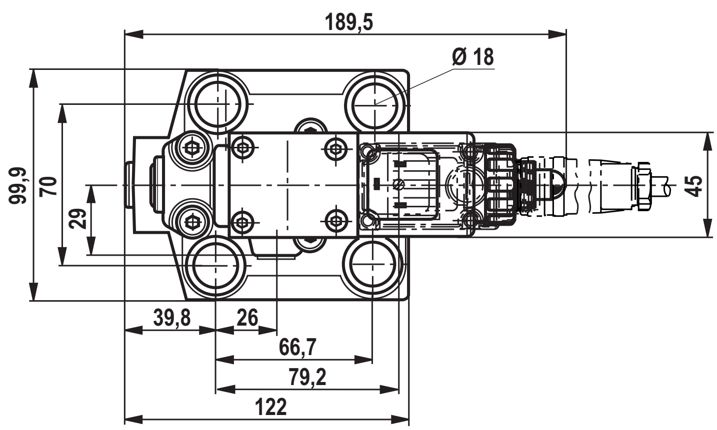
Valve mounting screws and **subplates** see page 19.

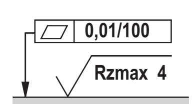
Dimensions: Type DBEM(E) 25
(dimensions in mm)



Coil and electronics freely rotatable!

O-ring and plastic nut for coil fixation. The nut can be loosened by rotating it counterclockwise (1 turn). Afterwards, the solenoid coil can be rotated in any desired position. Subsequent fixation applying 5±1 Nm.





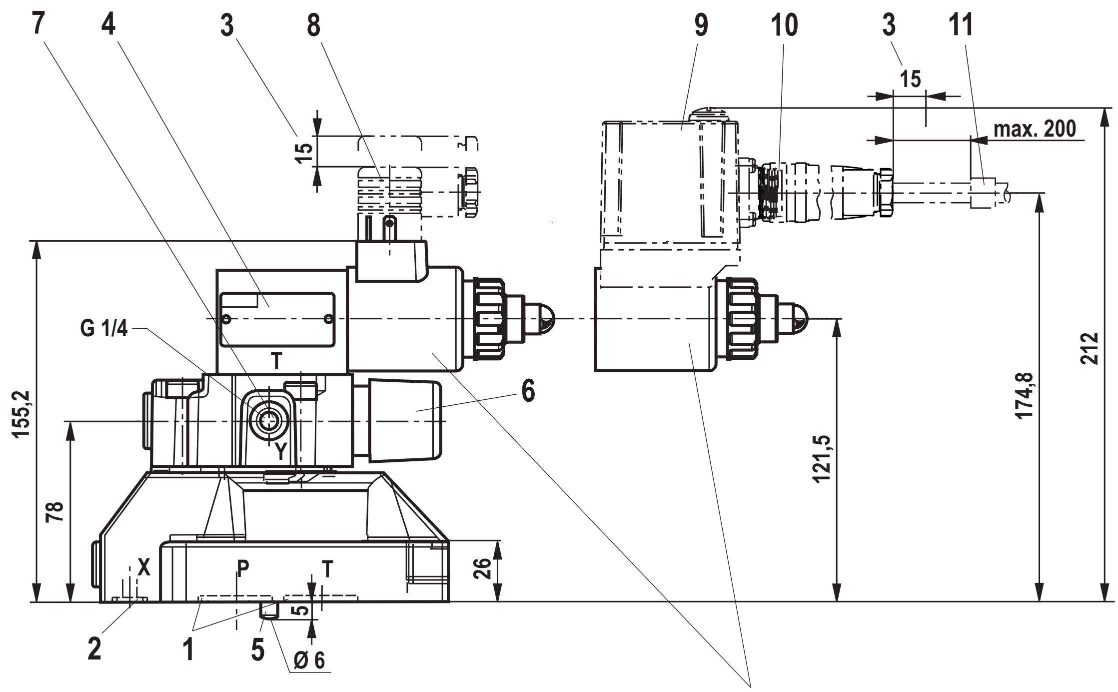
Required surface quality of the valve contact surface

1 Seal rings for ports P and T
2 Seal ring for ports X
3 Space required to remove the mating connector
4 Name plate
5 Locating pin
6 Maximum pressure limitation
7 External pilot oil return, separately and to the tank at zero pressure
8 Mating connector for type DBEM
9 Integrated electronics (OBE)
10 Mating connector for type DBEME
11 Cable fastening

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

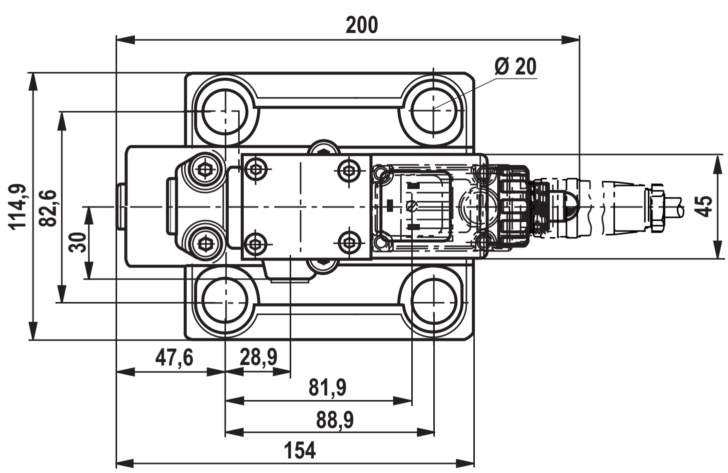
Valve mounting screws and **subplates** see page 19.

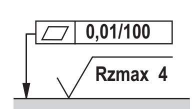
Dimensions: Type DBEM(E) 32
(dimensions in mm)



Coil and electronics freely rotatable!

O-ring and plastic nut for coil fixation. The nut can be loosened by rotating it counterclockwise (1 turn). Afterwards, the solenoid coil can be rotated in any desired position. Subsequent fixation applying 5±1 Nm.





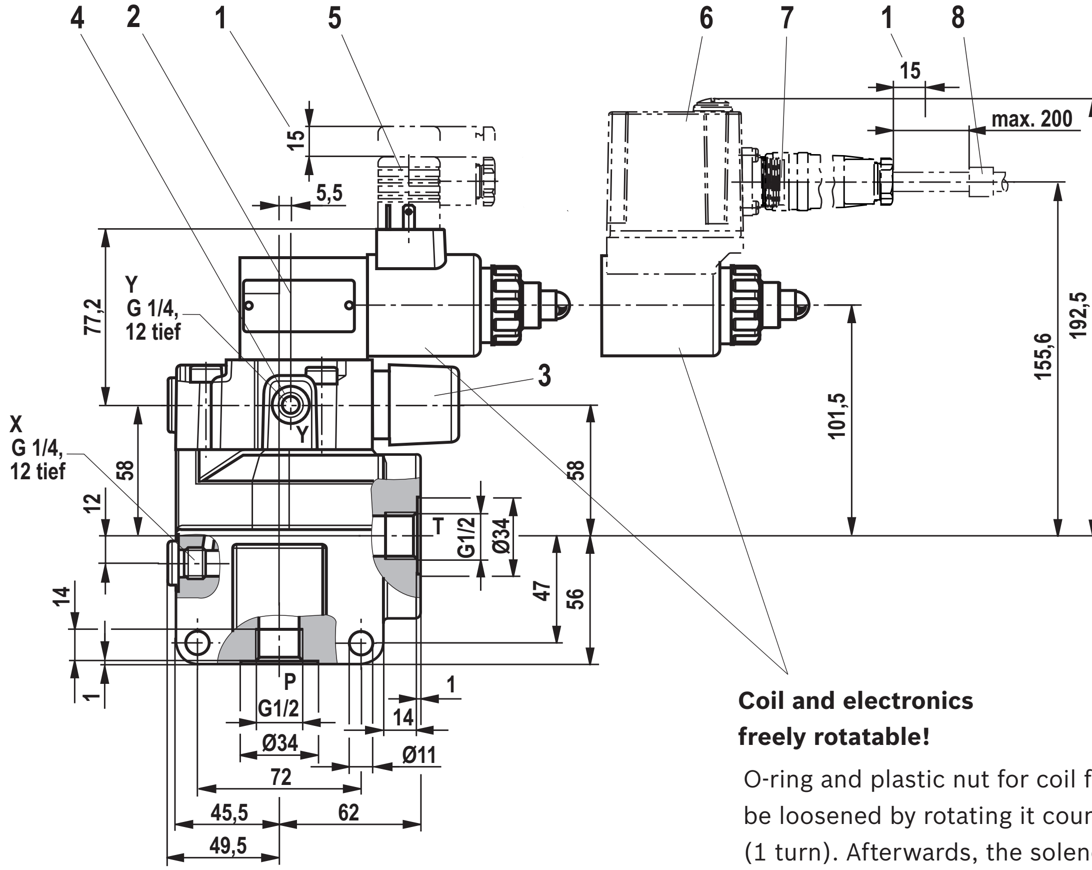
Required surface quality of the valve contact surface

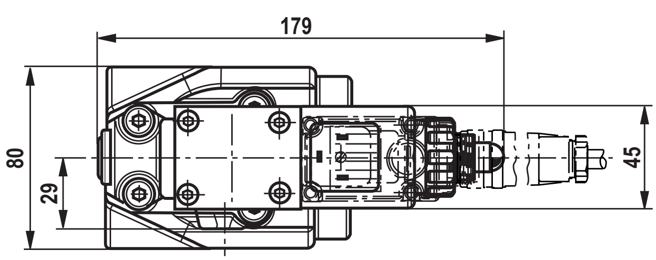
1 Seal rings for ports P and T
2 Seal ring for ports X
3 Space required to remove the mating connector
4 Name plate
5 Locating pin
6 Maximum pressure limitation
7 External pilot oil return, separately and to the tank at zero pressure
8 Mating connector for type DBEM
9 Integrated electronics (OBE)
10 Mating connector for type DBEME
11 Cable fastening

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

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

Dimensions: Type DBEM(E) 10G
(dimensions in mm)





Coil and electronics freely rotatable!

O-ring and plastic nut for coil fixation. The nut can be loosened by rotating it counterclockwise (1 turn). Afterwards, the solenoid coil can be rotated in any desired position. Subsequent fixation applying 5±1 Nm.

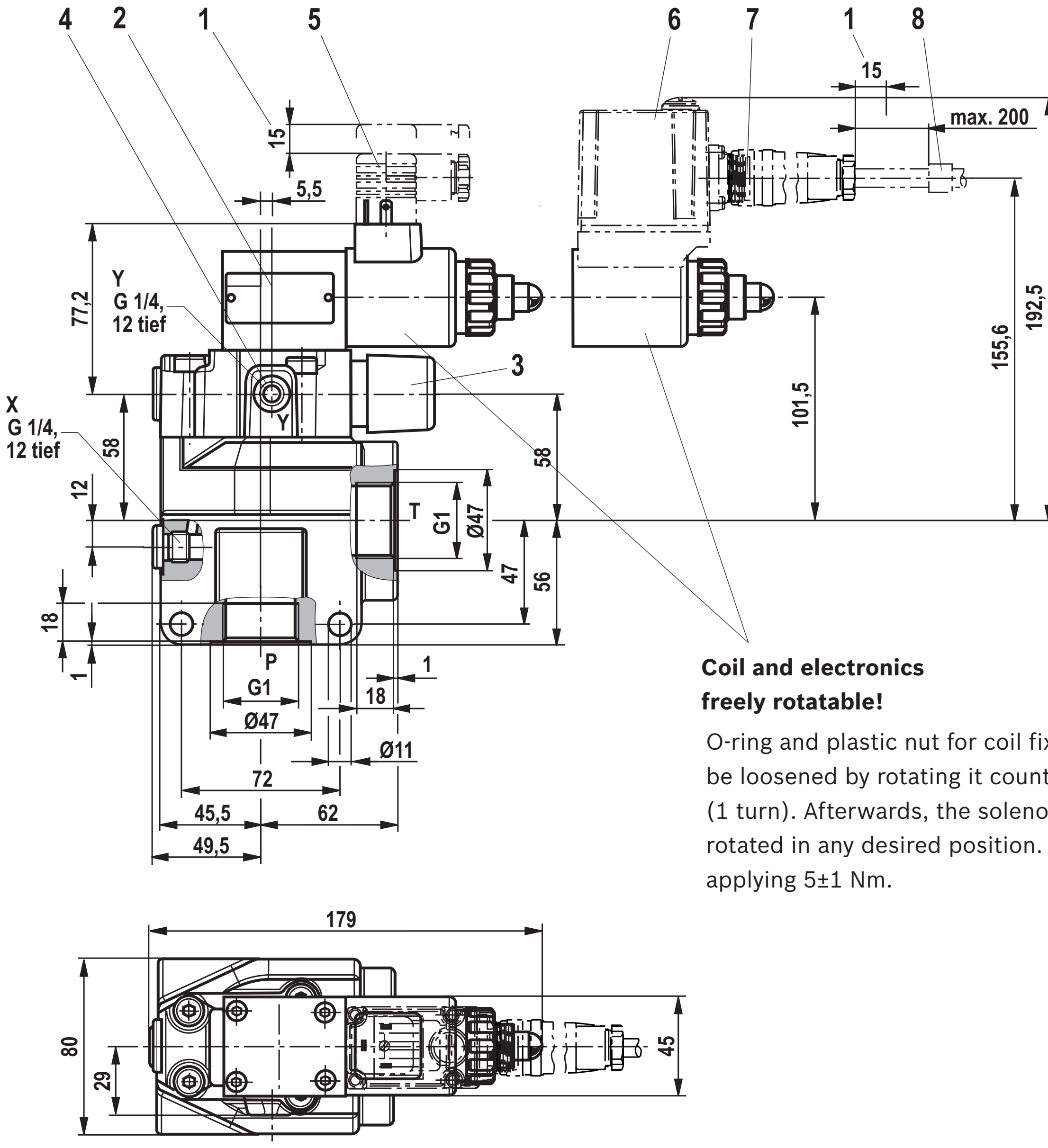
1 Space required to remove the mating connector
2 Name plate
3 Maximum pressure limitation
4 External pilot oil return,
separately and to the tank at zero pressure
5 Mating connector for type DBEM
6 Integrated electronics (OBE)
7 Mating connector for type DBEME
8 Cable fastening

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

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

Dimensions: Type DBEM(E) 25G

(dimensions in mm)



Coil and electronics freely rotatable!

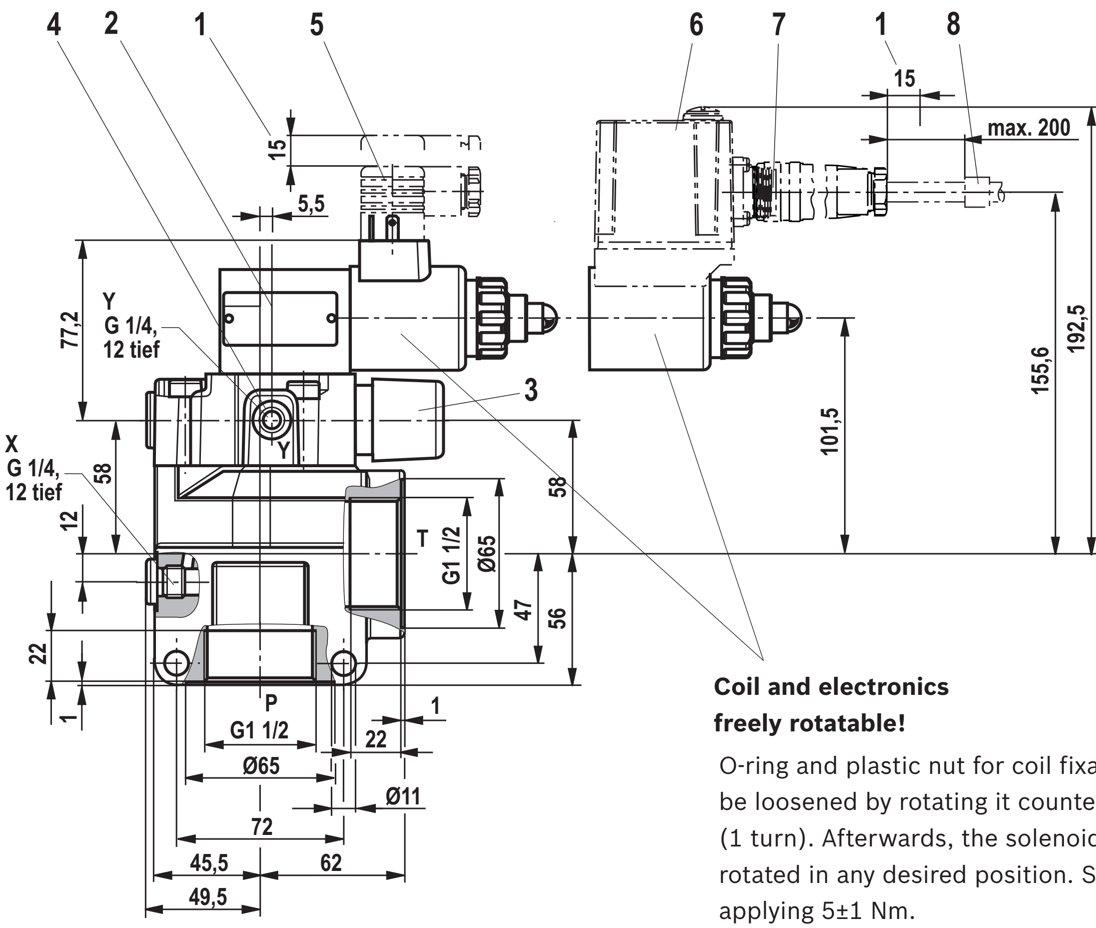
O-ring and plastic nut for coil fixation. The nut can be loosened by rotating it counterclockwise (1 turn). Afterwards, the solenoid coil can be rotated in any desired position. Subsequent fixation applying 5±1 Nm.

1 Space required to remove the mating connector
2 Name plate
3 Maximum pressure limitation
4 External pilot oil return, separately and to the tank at zero pressure
5 Mating connector for type DBEM
6 Integrated electronics (OBE)
7 Mating connector for type DBEME
8 Cable fastening

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

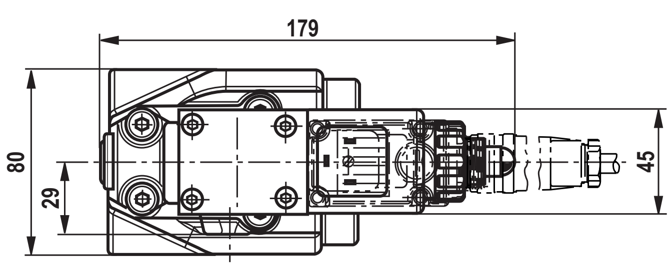
Valve mounting screws and **subplates** see page 19.

Dimensions: Type DBEM(E) 32G
(dimensions in mm)



Coil and electronics freely rotatable!

O-ring and plastic nut for coil fixation. The nut can be loosened by rotating it counterclockwise (1 turn). Afterwards, the solenoid coil can be rotated in any desired position. Subsequent fixation applying 5±1 Nm.



1 Space required to remove the mating connector
2 Name plate
3 Maximum pressure limitation
4 External pilot oil return,
separately and to the tank at zero pressure
5 Mating connector for type DBEM
6 Integrated electronics (OBE)
7 Mating connector for type DBEME
8 Cable fastening

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

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

Dimensions

Hexagon socket head cap screws (separate order)		**Material number**
Size 10	4x ISO 4762 - M12 x 50 - 10.9-flZn-240h-L Friction coefficient μ_{total} = 0.09 to 0.14; Tightening torque M_A = 75 Nm ±10 %	R913000283
Size 25	4x ISO 4762 - M16 x 50 - 10.9-flZn-240h-L Friction coefficient μ_{total} = 0.09 to 0.14; Tightening torque M_A = 185 Nm ±10 %	R913000378
Size 32	4x hexagon socket head cap screw DIN 912 - M18 x 50 - 10.9-flZnnc-240h-L Friction coefficient μ_{total} = 0.09 to 0.14; Tightening torque M_A = 248 Nm ±10 %	R913031952

Notice: For reasons of stability, exclusively these valve mounting screws may be used. The tightening torque of the hexagon socket head cap screws refers to the maximum operating pressure!

Subplates	**Data sheet**	**Material number**
Size 10, 25, 32	45064	

Accessories
(not included in the delivery)

External control for type DBEM (only standard version G24)	**Data sheet**	**Material number**
VT-MSPA1-1-1X/V0/... in modular design (analog) VT-VSPD-1-2X/V0/.-0-1 in Euro-card format (digital) VT-VSPA1-2-1X/V0/...in Euro-card format (analog) VT-SSPA1-1-1X/V0/0-24 as plug-in amplifier	30223 30523 30115 30116	

Additionally (800 mA version G24-8)	**Data sheet**	**Material number**
VT-2000-5X/X/V0/... in Euro-card format VT-MSPA1-30 in modular design (analog)	29904 30224	

Mating connectors (details see page 7)	**Data sheet**	**Material number**
For type DBEM: Mating connectors according to DIN EN 175301-803 For type DBEME: Mating connectors according to DIN EN 175201-804	08006 08006	R901017011 R900021267 (plastic) R900223890 (metal)

Bosch Rexroth AG
Hydraulics
Zum Eisengießer 1
97816 Lohr am Main, Germany
Phone +49 (0) 93 52 / 18-0
documentation@boschrexroth.de
www.boschrexroth.de