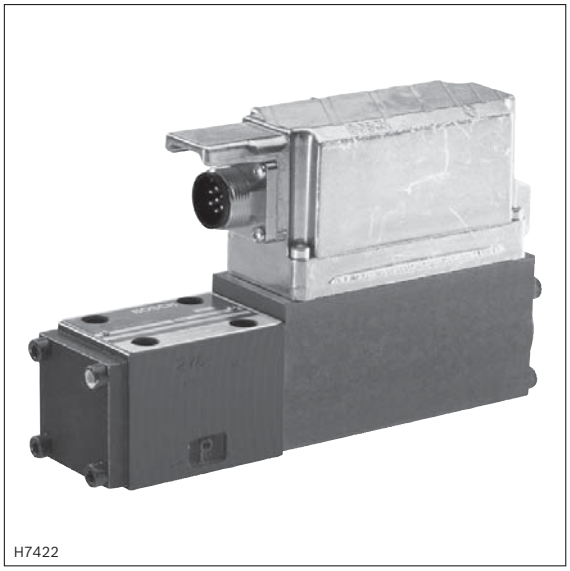
The Drive & Control Company

Rexroth
Bosch Group

Directional control valves, direct operated, with electrical position feedback and integrated electronics (OBE)

Type 4WRPEH

RE 29035
Edition: 2017-04
Replaces: 2015-02



H7422

- Size 6
- Component series 2X
- Maximum operating pressure of 315 bar
- Rated flow 2 ... 40 l/min (***Δp*** = 70 bar)

Features

- 4/4-way version
- With control spool and sleeve in servo quality
- Operated on one side, 4/4-fail-safe position in switched off state
- Electric position feedback and integrated electronics (OBE), calibrated in the factory
- Electrical connection 6P+PE; signal input differential amplifier with interface “A1” ± 10V or interface “F1” 4 ... 20 mA (R_{sh} = 200 Ω)
- Use for electro-hydraulic controls in production and testing systems

Contents

Features	1
Ordering codes	2
Symbols	3
Function, section	4
Technical data	5, 6
Integrated electronics	7, 8
Electrical connection	9
Characteristics	10, 11
Dimensions	12, 13
Accessories	13
Further information	13

Ordering codes

01	02	03	04	05	06	07	08	09		10		11	12		13	14	15
4	**WRP**	**E**	**H**	**6**		**B**			**–**	**2X**	**/**	**G24**	**K0**	**/**		**M**	*****

01	4 main ports	**4**
02	Directional control valve, direct operated	**WRP**
03	With integrated electronics	**E**
04	Control spool/sleeve	**H**
05	Size 6	**6**
06	Symbols e.g. C, C3, C5 etc; possible design see page 3	

Installation side of the inductive position transducer

07	Valve side B (standard) (see standard symbol 3)	**B**

Rated flow of with 70 bar pressure differential (35 bar/control edge)

08	2 l/min (only version “L”)	**02**
	4 l/min	**04**
	12 l/min (only version “L”)	**12**
	15 l/min (only version “P”)	**15**
	24 l/min (only version “L”)	**24**
	25 l/min (only version “P”)	**25**
	40 l/min	**40**

Flow characteristics (see symbols page 3)

09	Linear	**L**
	Inflected characteristic curve (inflection 60 % with version “15” and “25”, otherwise 40 %)	**P**
10	Component series 20 ... 29 (20 ... 29: unchanged installation and connection dimensions)	**2X**

Supply voltage of the control electronics

11	24 V DC voltage	**G24**

Electrical connection

12	**Without** mating connector; connector DIN 43563-AM6	**K0** [1]

Interfaces of the control electronics

13	Command value input ±10 V	**A1**
	Command value input 4 ... 20 mA	**F1**

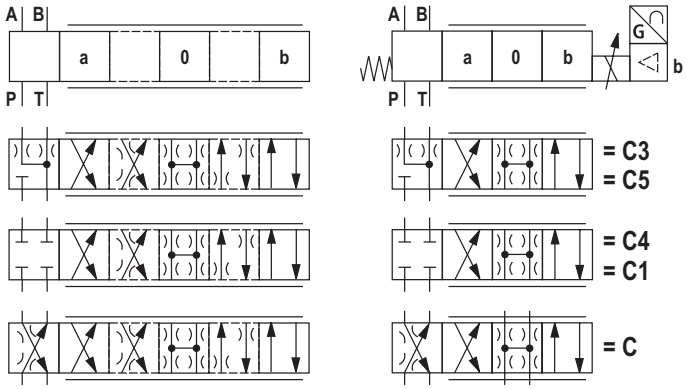
Seal material

14	NBR seals	**M**
	Observe compatibility of seals with hydraulic fluid used! (Other seals on request)	
15	Further details in plain text	*****

[1] Mating connectors, separate order, see page 13 and data sheet 08006.

Bosch Rexroth AG, RE 29035, edition: 2017-04

Symbols

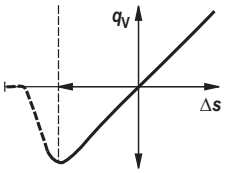
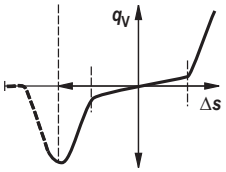
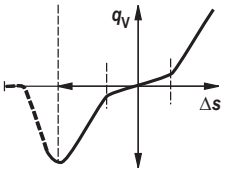
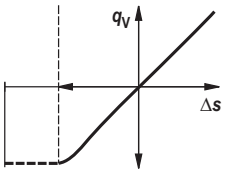
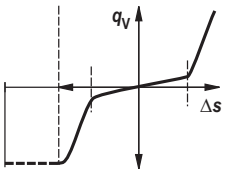
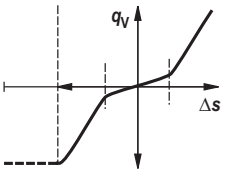


For symbols C5 and C1: [1]
P → A: $q_{V\,nom}$ B → T: $q_{V\,nom}/2$
P → B: $q_{V\,nom}/2$ A → T: $q_{V\,nom}$

[1] Standard = 1:1, $q_{V\,nom}$ 2:1 only with rated flow 40 l/min (version “40”)

Note:
Representation according to DIN ISO 1219-1.
Hydraulic interim positions are shown by dashes.

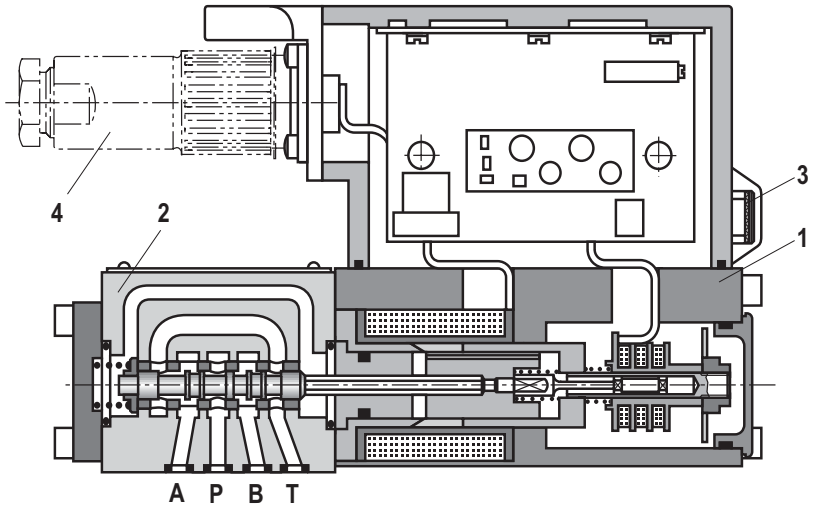
Flow characteristics

Symbol	Linear characteristic curve (version “L”)	Inflected characteristic curve (version “P”)	
		Inflection 60% ($q_{V\,nom}$ = 15.25 l/min)	Inflection 40%
C3, C5 C4, C1			
C			

Function, section

General
The 4WRPEH type high-response valve is a pilot-operated directional control valve with electrical position feedback and integrated electronics (OBE).
The specified command value is compared with the actual position value in the integrated electronics (OBE). In the event of a control deviation, the stroke solenoid is activated, which adjusts the control spool against the spring due to the change in the magnetic force.
Lifting/control cross-section is proportionally regulated to the command value. In case of a command value presetting of 0 V, the electronics adjusts the control spool against the spring to central position. In deactivated condition, the spring is untensioned to a maximum and the valve is in fail-safe position.

Switch-off behavior
With the electronics switched off, the valve moves immediately into the relevant safe basic position (fail-safe). The switch position P–B/A–T is passed through during this process, which can result in movements on the controlled component. This must be taken into account in system designs.



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

Bosch Rexroth AG, RE 29035, edition: 2017-04

Technical data

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

General			
Design			Spool valve, direct operated, with steel sleeve
Actuation			Proportional solenoid with position control, OBE
Connection type			Subplate mounting, porting pattern according to ISO 4401-03-02-0-05
Installation position			Any
Ambient temperature range		°C	–20 ... +50
Weight		kg	2,7
Maximum vibration resistance (test condition)		%	25 g; shake test in all directions (24 h)
$MTTF_D$-value according to EN ISO 13849		Years	150 (for further details see data sheet 08012)

Hydraulic								
Maximum operating pressure	▶ Port A, B, P	bar	315					
	▶ Port T	bar	250					
Rated flow (***Δp*** = 35 bar per edge [1])		l/min	2	4	12	15	24	40
Leakage flow (at 100 bar)	▶ Linear characteristic curve “L”	cm³/min	< 150	< 180	< 300	–	< 500	< 900
	▶ Inflected characteristic curve “P”	cm³/min	–	< 150	–	< 180	< 300	< 450
Operating limits (Pressure drop ***Δp*** at valve $q_{Vnom} > q_{V\,N}$)	▶ Symbol C, C3, C5	bar	315	315	315	315	315	160
	▶ Symbol C4, C1	bar	315	315	315	280	250	100
Hydraulic fluid			see table on page 6					
Viscosity range	▶ Recommended	mm²/s	20 ... 100					
	▶ Maximum admissible	mm²/s	10 ... 800					
Hydraulic fluid temperature range (flow through)		°C	–20 ... +70					
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)			Class 18/16/13 [2]					
Fail-safe position:								
Rated flow (***Δp*** = 35 bar per edge)	▶ Symbol C	l/min	2	4	10	13	18	20
Leakage flow at 100 bar	▶ Symbol C3, C5	cm³/min	50 (P → A)					
		cm³/min	70 (P → B)					
Rated flow (***Δp*** = 35 bar per edge)	▶ Symbol C3, C5	l/min	10 ... 20 (A → T)					
		l/min	7 ... 20 (B → T)					
Leakage flow at 100 bar	▶ Symbol C4, C1	cm³/min	50 (P → A)					
		cm³/min	70 (P → B)					
		cm³/min	70 (A → T)					
		cm³/min	50 (B → T)					
Reaching the fail-safe position	▶ 0 bar	ms	7					
	▶ 100 bar	ms	10					

static / dynamic		
Hysteresis	%	≤ 0,2
Manufacturing tolerance q_{Vmax}	%	< 10
Actuating time for signal step 0 ... 100%	ms	≤ 10
Temperature drift		Zero shift < 1% at ***Δϑ*** = 40 °C
Zero compensation		Ex factory ±1%

[1] Flow with deviating ***Δp:***

$$q_x = q_{Vnom} \times \sqrt{\frac{\Delta p_x}{35}}$$

[2] The cleanliness classes stated for the components need to be maintained 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.

RE 29035, edition: 2017-04, **Bosch Rexroth AG**

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

Hydraulic fluid		Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524	90220
Bio-degradable	▶ Insoluble in water	HETG	NBR, FKM	ISO 15380	90221
		HEES	FKM		
	▶ Soluble in water	HEPG	FKM	ISO 15380	
Flame-resistant	▶ Water-free	HFDU (glycol base)	FKM	ISO 12922	90222
		HFDU (ester base)	FKM		
		HFDR	FKM		
	▶ Containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922	90223

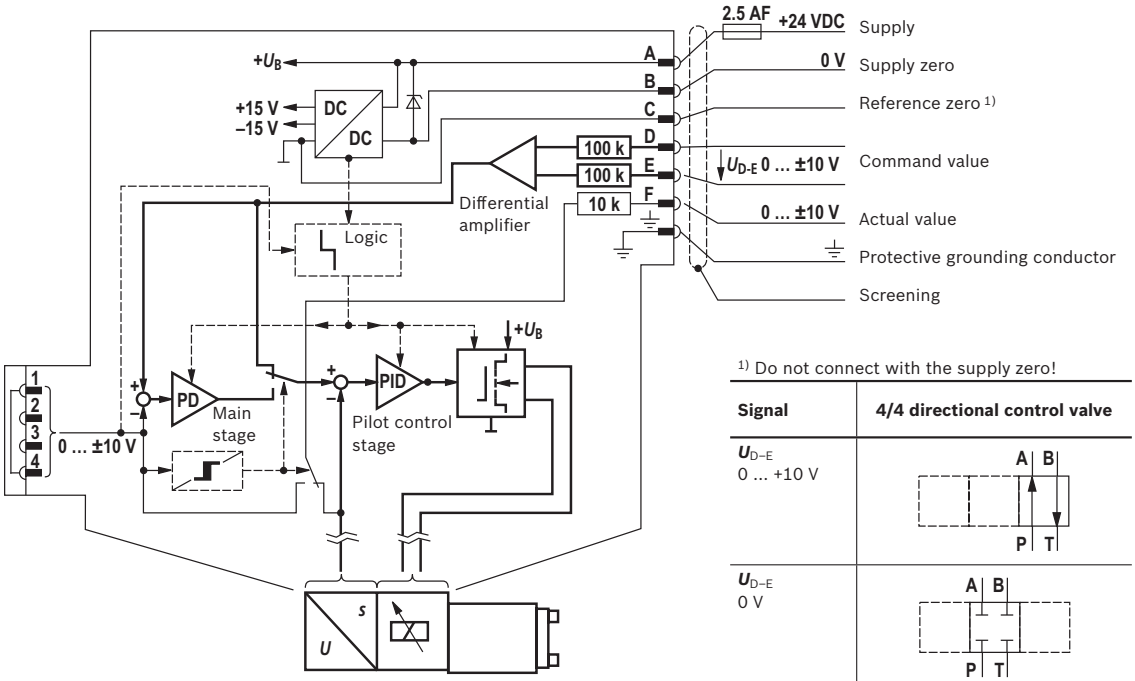
☞ **Important information on hydraulic fluids:**
- For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum 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 ... 100 %
  - Maximum hydraulic fluid temperature 60 °C
- **Bio-degradable and flame-resistant:** If this hydraulic fluid is used, small amounts of dissolved zinc may get into the hydraulic system.

lectrical, integrated electronics (OBE)		
Relative duty cycle	%	100 (continuous operation)
Protection class according to EN 60529		IP 65 (with mating connector mounted and locked)
Supply voltage	VDC	24
▶ Terminal A	VDC	min. 21 / max. 40
▶ Terminal B	VDC	0 (ripple max. 2)
Maximum power consumption	PI	40
Fuse protection, external	A_F	2,5
Input, version “A1”		Differential amplifier, R_i = 100 kΩ
▶ Terminal D (U_E)	VDC	0 ... ±10
▶ Terminal E	VDC	0
Input, version “F1”		Load, R_{sh} = 200 Ω
▶ Terminal D (I_{D-E})	mA	4 ... (12) ... 20
▶ Terminal E (I_{D-E})		Current loop I_{D-E} return
Maximum voltage for the differential inputs compared to 0 V		D → B; E → B (max. 18 V)
Test signal, version “A1”		LVDT
▶ Terminal F (U_{Test})	V	0 ... ±10
▶ Terminal C		Reference 0 V
Test signal, version “F1”		LVDT signal 4 ... (12) ... 20 mA on external load 200 ... 500 Ω maximum
▶ Terminal F (I_{F-C})	mA	4 ... (12) ... 20 (output)
▶ Terminal C (I_{F-C})		Current loop I_{F-C} return
Function earth and screening		see pin assignment page 7 and 8 (CE-compliant installation)
Adjustment		calibrated before delivery, see characteristic curves page 10 and 11.
Electro-magnetic compatibility		tested in accordance with EN 61000-6-2:2005-08 and EN 61000-6-3:2007-01

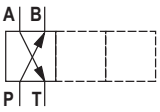
Bosch Rexroth AG, RE 29035, edition: 2017-04

Integrated electronics: Version “A1”

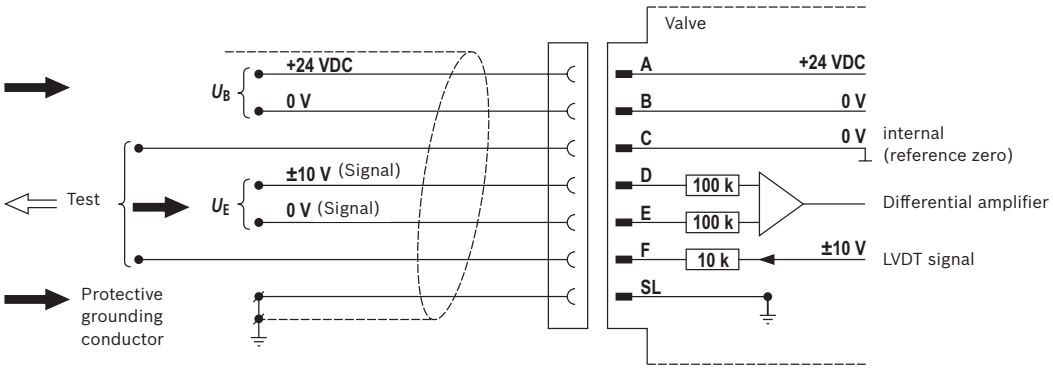
Block diagram/pin assignment
U_{D-E} ±10 V



1) Do not connect with the supply zero!

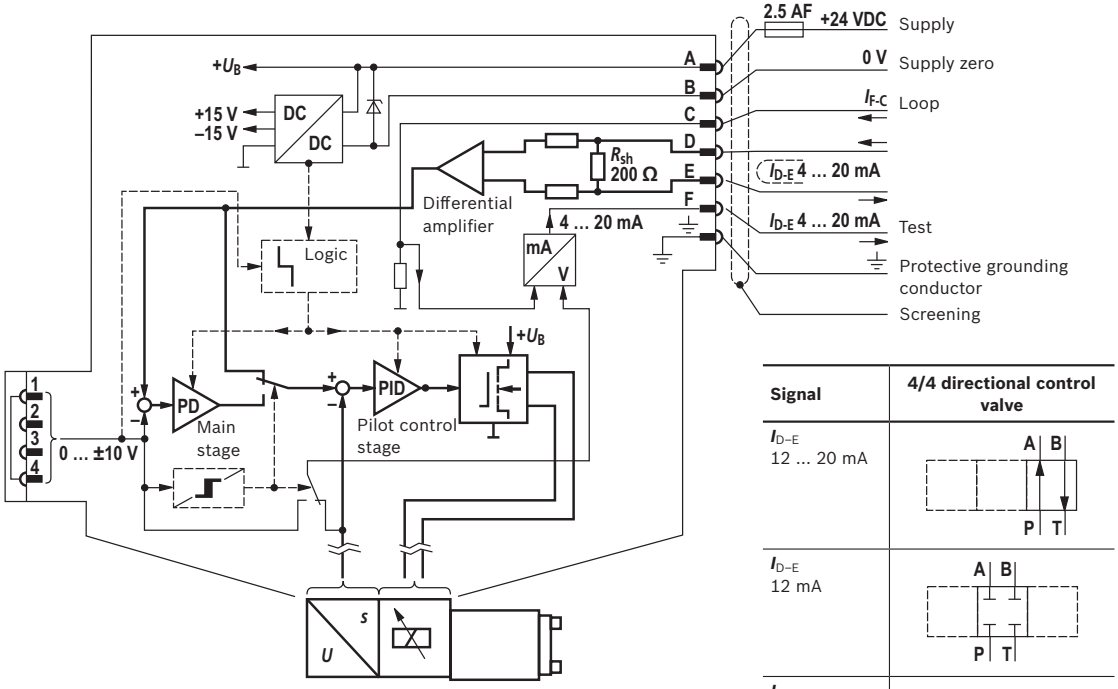
Signal	4/4 directional control valve
U_{D-E} 0 ... +10 V	
U_{D-E} 0 V	
U_{D-E} 0 ... -10 V	

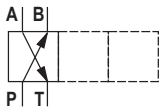
in assignment 6P+PE
U_{D-E} ±10 V (R_i = 100 kΩ)



Integrated electronics: Version “F1”

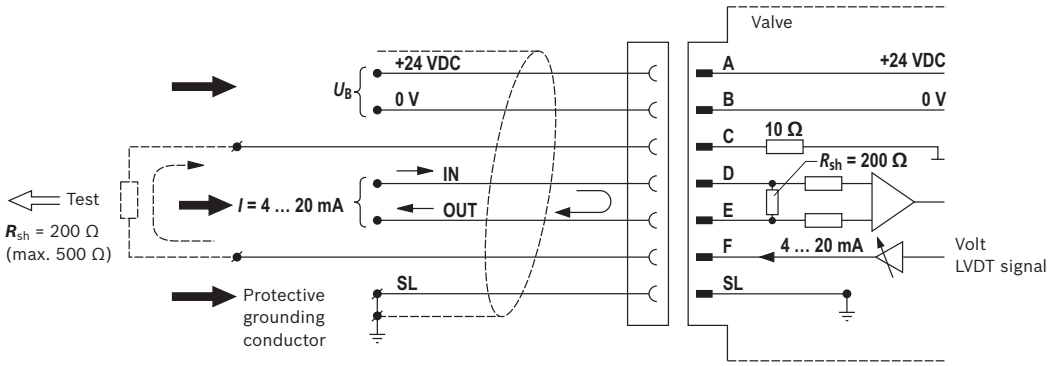
Block diagram/pin assignment
I_{D-E} 4 ... 12 ... 20 mA



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

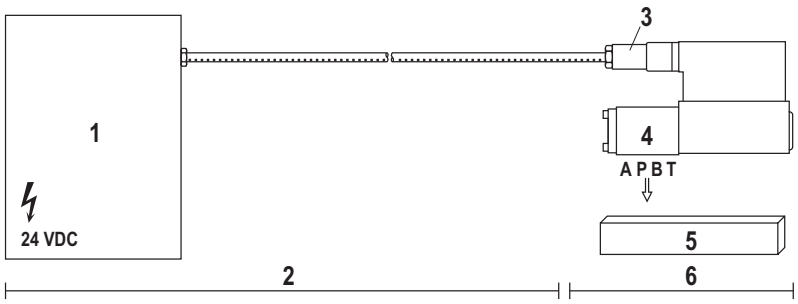
$I_{D-E} \leq 2$ mA: Valve inactive

in assignment 6P+PE
I_{D-E} 4 ... 12 ... 20 mA (R_{sh} = 200 Ω)



Bosch Rexroth AG, RE 29035, edition: 2017-04

Electrical connection



1 Control
2 Customer-side
3 Mating connector
4 Valve
5 Connection surface
6 Rexroth-side

For electrical data, see page 6.

Technical data for the cable

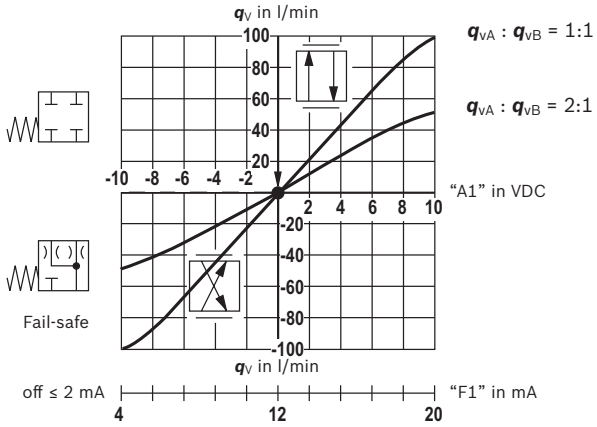
Version:	▶ Multi-wired cable
	▶ Strand construction, finest wire in accordance with VDE 0295, class 6
	▶ Protective grounding conductor, green/yellow
	▶ Cu-shielding braid
Type:	▶ e.g. Ölflex-FD 855 CP (Lappkabel)
Number of wires:	▶ Is determined by the valve type, connector type and signal assignment
Line Ø:	▶ 0.75 mm^2 ... 20 m Length 1.0 mm^2 ... 40 m Length
Outer-Ø:	▶ 9.4 ... 11.8 mm – Pg 11 12.7 ... 13.5 mm – Pg 16

Notice:
Supply voltage 24 VDC_{nom}, if the value falls below 18 VDC, a fast shut-down takes place internally, comparable with “Enable OFF”.
Also with version “F1”:
$I_{D-E} \geq 3$ mA – valve is active
$I_{D-E} \leq 2$ mA – Valve is deactivated.
Electric signals taken out via control electronics (e.g. actual value) must not be used for switching off safety-relevant machine functions!
(see also the European standard “Safety requirements for fluid power systems and their components – Hydraulics”, EN ISO 982)

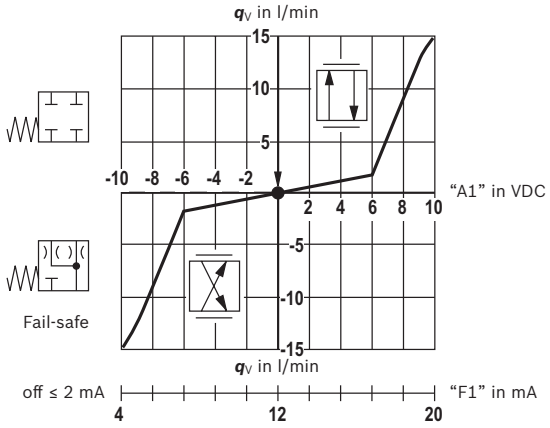
Characteristic curves: Characteristic curves (measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

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

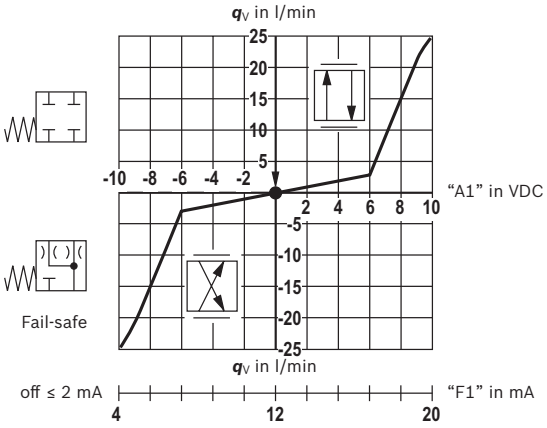
Linear characteristic curve (version "L")



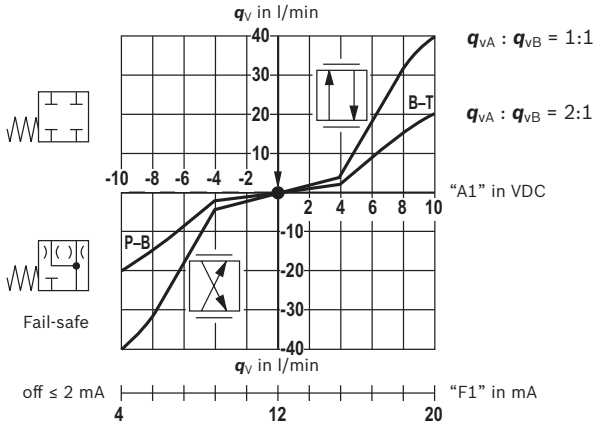
Inflected characteristic curve "P", inflection at **60%**; 15 l/min



Inflected characteristic curve "P", inflection at **60%**; 25 l/min

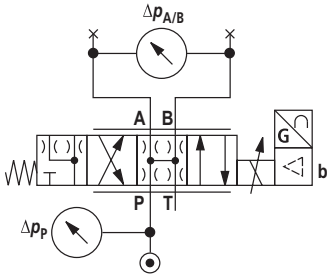


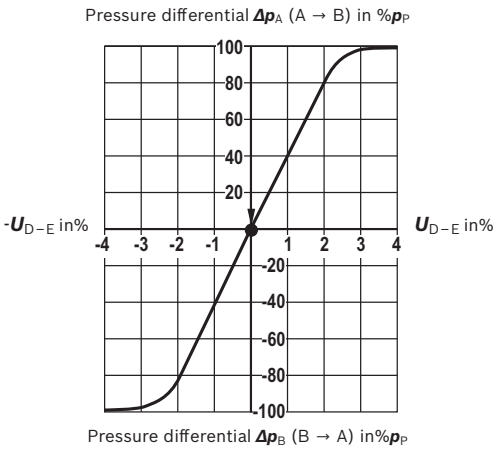
Inflected characteristic curve "P", inflection at **40%**



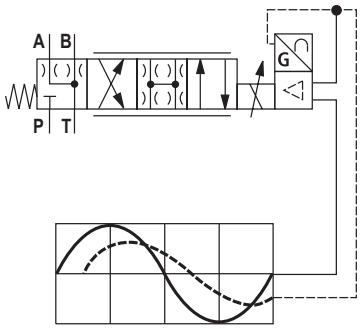
Bosch Rexroth AG, RE 29035, edition: 2017-04

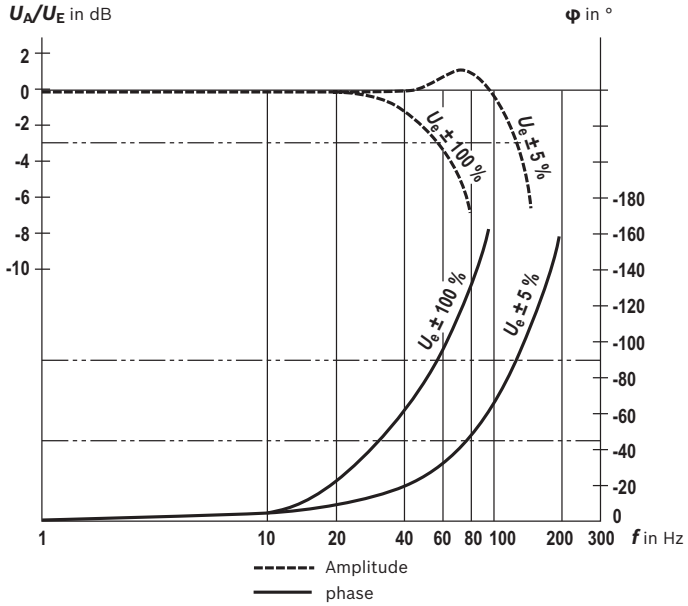
Characteristic curves: Pressure amplification
(measured with HLP46, ϑ_{Oil} = 40 ± 5 °C)



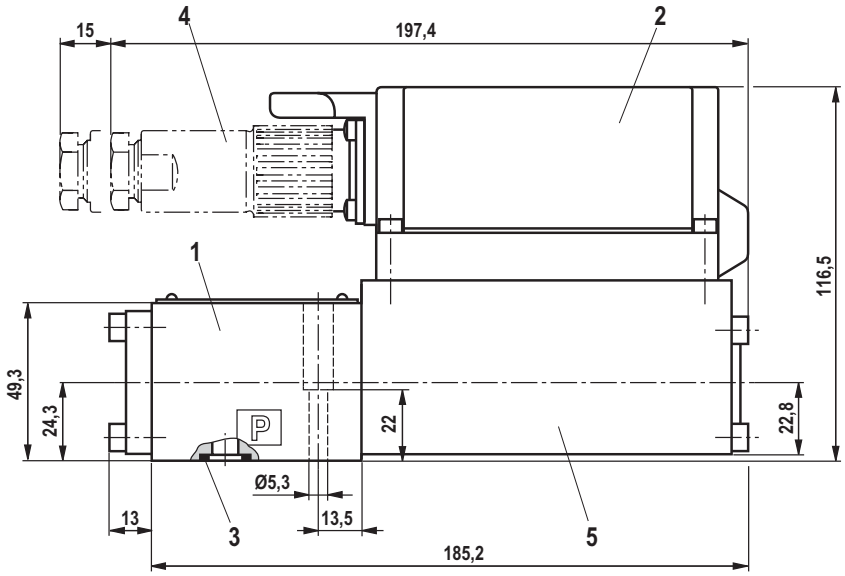


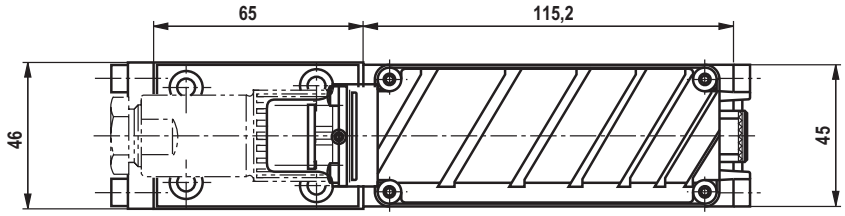
Characteristic curves: Bode diagram
(measured with HLP46, ϑ_{Oil} = 40 ± 5 °C)

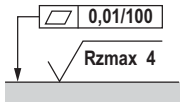




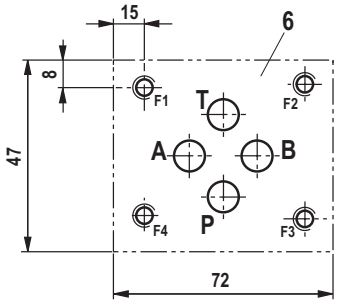
Dimensions
(dimensions in mm)







Required surface quality of the valve contact surface



1 Valve housing
2 Integrated electronics (OBE)
3 Identical seal rings for ports P, A, B, T
4 Mating connectors (separate order, see page 13 and data sheet 08006)
5 Control solenoid with position transducer
6 Machined valve contact surface, porting pattern according to ISO 4401-03-02-0-05
Deviating from the standard:
ports P, A, B, T Ø 8 mm
Minimum screw-in depth: Ferrous metal 1.5 x Ø,
non-ferrous 2 x Ø

Valve mounting screws and **subplates** see page 13.

Bosch Rexroth AG, RE 29035, edition: 2017-04

Dimensions

Valve mounting screws (separate order)

4 hexagon socket head cap screws	Material number
ISO 4762 - M5 x 30 - 10.9-CM-Fe-ZnNi-5-Cn-T0-H-B Tightening torque M_A = 7 Nm ± 10%	**R913048086**
ISO 4762 - M5 x 30 - 10.9 Tightening torque M_A = 8.9 Nm ± 10%	Not in the Rexroth product range

☞ **Note:**
The tightening torque of the hexagon socket-head screws refers to the maximum operating pressure.

Subplates (separate order) with porting pattern according to ISO 4401-03-02-0-05 see data sheet 45100.

Accessories (separate order)

		Data sheet	Material number
Mating connectors	For valves with round connectors in accordance with EN 175201-804, 6-pin + PE and 6-pin, compatible with VG 95328	08006	e.g. **R900021267** (plastic) e.g. **R900223890** (metal)
Test and service devices	Service case with test device for proportional valves with integrated electronics (OBE)	29685	–
Measuring adapter	6P+PE, type VT-PA-2	30068	0811405163

Further information

▶ Subplates	Datasheet 45100
▶ Mineral oil-based hydraulic fluids	Datasheet 90220
▶ Environmentally compatible hydraulic fluids	Datasheet 90221
▶ Flame-resistant, water-free hydraulic fluids	Datasheet 90222
▶ Reliability characteristics according to EN ISO 13849	Datasheet 08012
▶ General product information on hydraulic products	Datasheet 07008
▶ Installation, commissioning and maintenance of servo valves and high-response valves	Datasheet 07700
▶ Hydraulic valves for industrial applications	Data sheet 07600-B
▶ Assembly, commissioning and maintenance of hydraulic systems	Datasheet 07900
▶ Filter range	www.boschrexroth.com/filter

RE 29035, edition: 2017-04, **Bosch Rexroth AG**