

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

Type 4WRPE

**RE 29122**

Edition: 2017-05

 Replaces: 2014-11,  
 29024 and  
 29025 (NG10)


H8046+8047

- ▶ Size 10
- ▶ Component series 3X
- ▶ Maximum operating pressure 350 bar
- ▶ Rated flow 50, 80 l/min


**Features**

- ▶ Reliable – proven and robust design
- ▶ Energy-efficient – no pilot oil demand, high flows with low pressure differential
- ▶ Flexible – suitable for position and velocity control
- ▶ Precise – high response sensitivity and little hysteresis
- ▶ Safe – shut-off of the second solenoid by means of ISA adapter possible

**Contents**

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## Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15				
<b>4</b>	<b>WRP</b>	<b>E</b>	<b>10</b>			<b>S</b>	<b>J</b>	<b>-</b>	<b>3X</b>	<b>/</b>		<b>/</b>		<b>24</b>	<b>/</b>			<b>*</b>

01	4 main ports	<b>4</b>
02	Directional control valve, direct operated	<b>WRP</b>
03	With integrated electronics	<b>E</b>
04	Size 10	<b>10</b>
05	Symbols e.g. E, E1, W6 etc.; possible version see page 3	

**Rated flow ( $\Delta p = 5$  bar/control edge)**

06	50 l/min (only with symbols E, E1-, V and W6-)	<b>50</b>
	80 l/min	<b>80</b>

**Flow characteristic**

07	Progressive	<b>S</b>
08	Overlap jump (opening point 5 command value with symbols E, E1-, EA, W6- and W8-)	<b>J</b>
09	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions)	<b>3X</b>

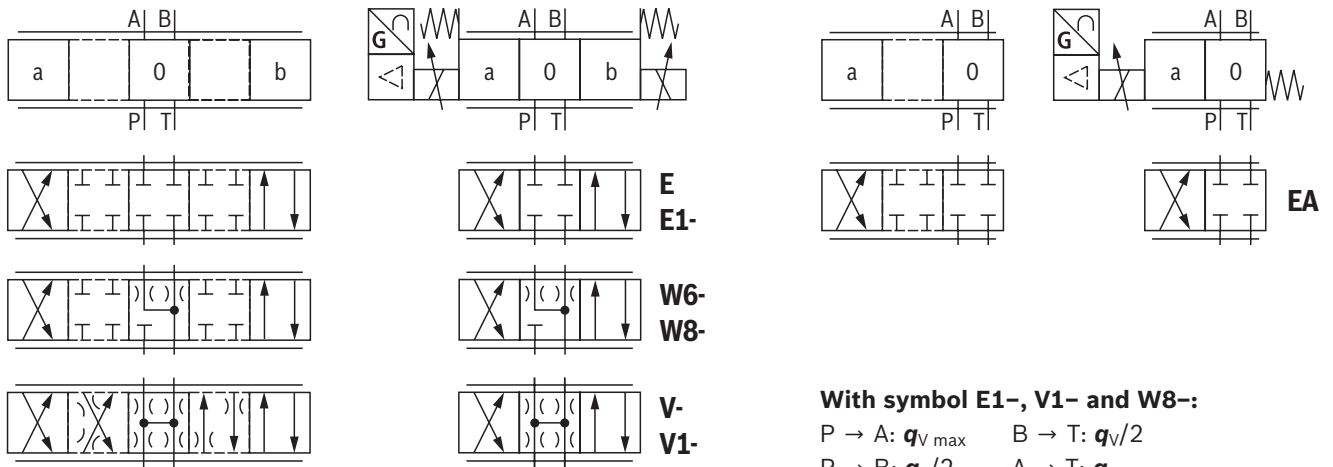
**Seal material**

10	NBR seals	<b>M</b>
	FKM seals	<b>V</b>
	Observe compatibility of seals with hydraulic fluid used!	
11	<b>Without</b> damping plate	<b>no code</b>
	<b>With</b> damping plate	<b>D</b>
12	Supply voltage 24 V	<b>24</b>

**Interfaces of the control electronics**

13	Command value input $\pm 10$ V	<b>A1</b>
	Command value input 4 ... 20 mA	<b>F1</b>
14	<b>Without</b> electronics protection membrane	<b>no code</b>
	<b>With</b> electronics protection membrane	<b>-967</b>
15	Further details in the plain text	

### Symbols



**With symbol E1-, V1- and W8--:**

P → A:  $q_{V \max}$     B → T:  $q_{V/2}$   
 P → B:  $q_{V/2}$     A → T:  $q_{V \max}$

**Notice:**

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

**Function, section (4/3 directional valve)**

The valve type 4WRPE is a direct operated directional control valve with electric position feedback and integrated electronics (OBE).

**Set-up**

The valve basically consists of:

- ▶ Valve housing (1)
- ▶ Control spool (2) with compression springs (3.1 and 3.2)
- ▶ Control solenoid with position transducer (4) (optional with electronics protection membrane (8))
- ▶ Stroke solenoid (7)
- ▶ Integrated control electronics (OBE) (5) with analog interface (6) (optional with damping plate (9))

**Function**

The integrated electronics (OBE) compares the specified command value to the position actual value. In case of control deviations, the relevant solenoid will be activated. Due to the changed magnetic force, the control spool (2) is adjusted against the corresponding spring. Stroke/control spool cross-section is controlled proportionally to the command value. In case of a command value presetting of 0 V, the electronics adjust the control spool (2) to central position.

**Error detection**

In the following cases of error, the electronics will de-energize the control solenoids:

- ▶ Falling below the minimum supply voltage  $\leq 15$  V (restarting  $\geq 17.5$  V).
- ▶ Design "F1": falling below the minimum current command value of 2 mA (comprises the cable break of the command value line (current loop))

The control spool (2) is kept in the mechanical central position by the compression springs (3.1 and 3.2) (does - with symbol V - not correspond to the hydraulic central position).

**Damping plate "D"**

The damping plate (9) reduces the acceleration amplitudes on the on-board electronics (frequencies  $>300$  Hz).

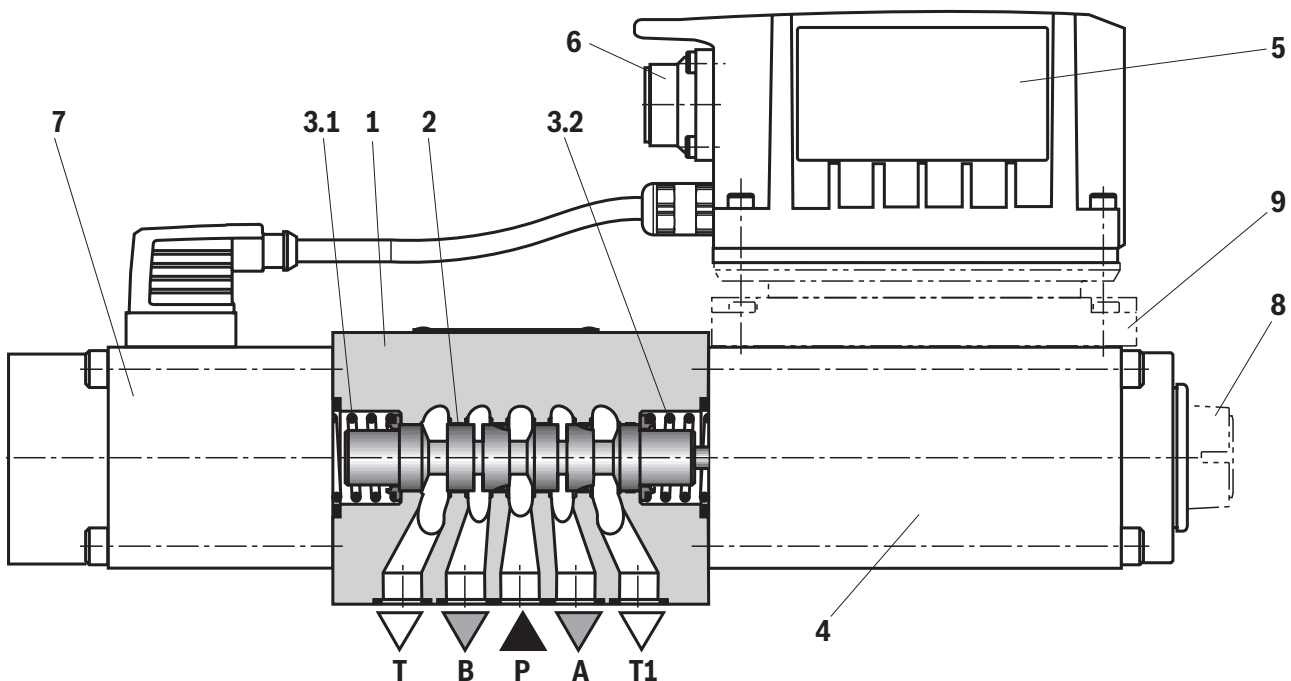
**Notice:**

Use of the damping plate is not recommended for applications with mainly low-frequency excitation  $<300$  Hz.

**Electronics protection membrane "-967"**

To prevent condensate formation in the housing of the integrated electronics (OBE), an electronics protection membrane (8) can be used.

Recommended for use outside industry-standard conditions with high ambient air humidity and significant cyclic temperature changes (e.g. outdoors).



## Function, section (4/2 directional valve)

The valve type 4WRPE is a direct operated directional control valve with electric position feedback and integrated electronics (OBE).

### Set-up

The valve basically consists of:

- ▶ Valve housing (1)
- ▶ Control spool (2) with compression springs (3)
- ▶ Control solenoid with position transducer (4) (optional with electronics protection membrane (8))
- ▶ Integrated control electronics (OBE) (5) with analog interface (6) (optional with damping plate (9))

### Function

The integrated electronics (OBE) compares the specified command value to the position actual value. In case of control deviations, the control solenoid will be activated. Due to the changed magnetic force, the control spool (2) is adjusted against the control spring. Stroke/control spool cross-section is controlled proportionally to the command value. With a positive command value presetting, the valve opens from P to B or A to T. Negative command values lead to no change in the control spool position.

### Error detection

In the following cases of error, the electronics will de-energize the control solenoid:

- ▶ Falling below the minimum supply voltage  $\leq 15\text{ V}$  (restarting  $\geq 17.5\text{ V}$ ).
- ▶ Design "F1": falling below the minimum current command value of 2 mA (comprises the cable break of the command value line (current loop)).

### Damping plate "D"

The damping plate (9) reduces the acceleration amplitudes on the on-board electronics (frequencies  $>300\text{ Hz}$ ).

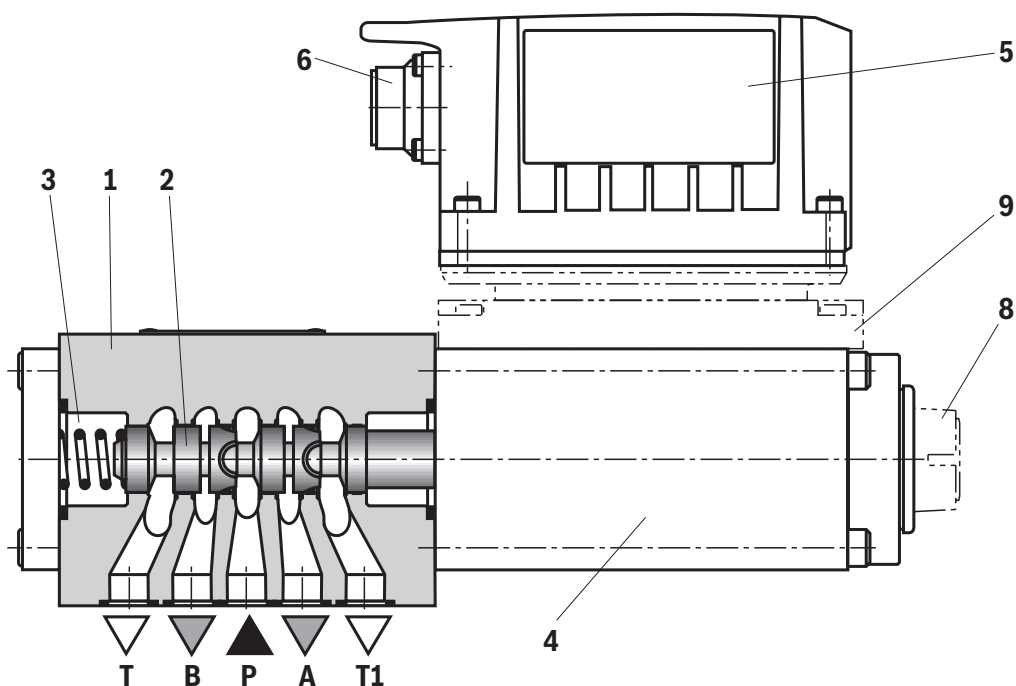
#### Notice:

Use of the damping plate is not recommended for applications with mainly low-frequency excitation  $<300\text{ Hz}$ .

### Electronics protection membrane "-967"

To prevent condensate formation in the housing of the integrated electronics (OBE), an electronics protection membrane (8) can be used.

Recommended for use outside industry-standard conditions with high ambient air humidity and significant cyclic temperature changes (e. g. outdoors).



## Technical data

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

general				
Design	Spool valve, direct operated			
Actuation	Proportional solenoid with position control, OBE			
Type of connection	Subplate mounting, porting pattern according to ISO 4401-05-04-0-05			
Installation position	Any			
Ambient temperature range	°C	-20 ... +60		
Storage temperature range with UV protection	°C	+10 ... +40		
Transport temperature	°C	-30 ... +80		
Maximum storage time	Years	1 (if the storage conditions are observed; refer to the operating instructions 07600-B)		
Sine test according to DIN EN 60068-2-6	▶ Without damping plate	10 ... 2000 Hz / maximum of 10 g / 10 cycles / 3 axes		
	▶ With damping plate <sup>1)</sup>	10 ... 2000 Hz / maximum of 10 g / 10 cycles / 3 axes		
Noise test according to DIN EN 60068-2-64	▶ Without damping plate	20 ... 2000 Hz / 10 g <sub>RMS</sub> / 30 g peak / 30 min. / 3 axes		
	▶ With damping plate <sup>1)</sup>	20 ... 2000 Hz / 10 g <sub>RMS</sub> / 30 g peak / 24 h / 3 axes		
Transport shock according to DIN EN 60068-2-27	▶ Without damping plate	15 g / 11 ms / 3 shocks / 3 axes		
	▶ With damping plate <sup>1)</sup>	15 g / 11 ms / 3 shocks / 3 axes		
Shock according to DIN EN 60068-2-27	▶ With damping plate <sup>1)</sup>	35 g / 6 ms / 1000 shocks / 3 axes		
Weight	▶ 4/3 directional design	kg	7.6	
	▶ 4/2 directional design	kg	6.0	
Maximum relative humidity (no condensation)	%	95		
Maximum solenoid surface temperature	°C	150 (individual operation)		
MTTF <sub>d</sub> value according to EN ISO 13849	Years	150 (for further details, see data sheet 08012)		
hydraulic				
Maximum operating pressure	▶ Port A, B, P	bar	350	
	▶ Port T	bar	200	
Rated flow ( $\Delta p = 5$ bar/control edge <sup>2)</sup> )	l/min	50	80	
Flow unloading central position ( $\Delta p = 5$ bar/control edge)	▶ Symbol W6-	l/min	A - T	B - T
	▶ Symbol W8-	l/min	0.7	0.7
Hydraulic fluid			0.7	0.7
Viscosity range	▶ recommended	mm <sup>2</sup> /s	20 ... 100	
	▶ maximum admissible	mm <sup>2</sup> /s	10 ... 800	
Hydraulic fluid temperature range (flown-through)	°C	-20 ... +70		
Maximum admissible degree of contamination of the hydraulic fluid cleanliness class according to ISO 4406 (c)		Class 18/16/13 <sup>3)</sup>		

1) Not recommended for applications with mainly low-frequency excitation < 300 Hz

2) Flow for deviating  $\Delta p$  (control edge):

$$q_x = q_{Vnom} \cdot \sqrt{\frac{\Delta p_x}{5}}$$

3) The cleanliness classes specified for the components must be adhered to 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](http://www.boschrexroth.com/filter).

### Notice:

The specified technical data were measured with HLP46 and  $\vartheta_{oil} = 40 \pm 5$  °C.

## Technical data

(For applications outside these parameters, 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	ISO 15380	90221
		HEES		
	▶ Soluble in water	HEPG	ISO 15380	
Flame-resistant	▶ Water-free	HFDU, HFDR	ISO 12922	90222
	▶ Containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	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 40 K higher than the maximum solenoid surface temperature.

### ▶ Flame-resistant – containing water:

- Maximum operating pressure 210 bar
- Maximum pressure differential per control edge 175 bar
- Pressure pre-loading at the tank port >20% of the pressure differential, otherwise increased cavitation erosion
- Life cycle as compared to operation with mineral oil HL, HLP 50 ... 100%
- Maximum hydraulic fluid temperature 50 °C

static / dynamic		
Hysteresis	%	< 0.25
Range of inversion	%	< 0.05
Response sensitivity	%	< 0.05
Manufacturing tolerance $q_{Vmax}$	%	< 10
Temperature drift (temperature range 20 °C ... 80 °C)		Zero shift < 0.2
Pressure drift	%/100 bar	Zero shift < 0.2
Zero compensation		Set in the plant to ±1%

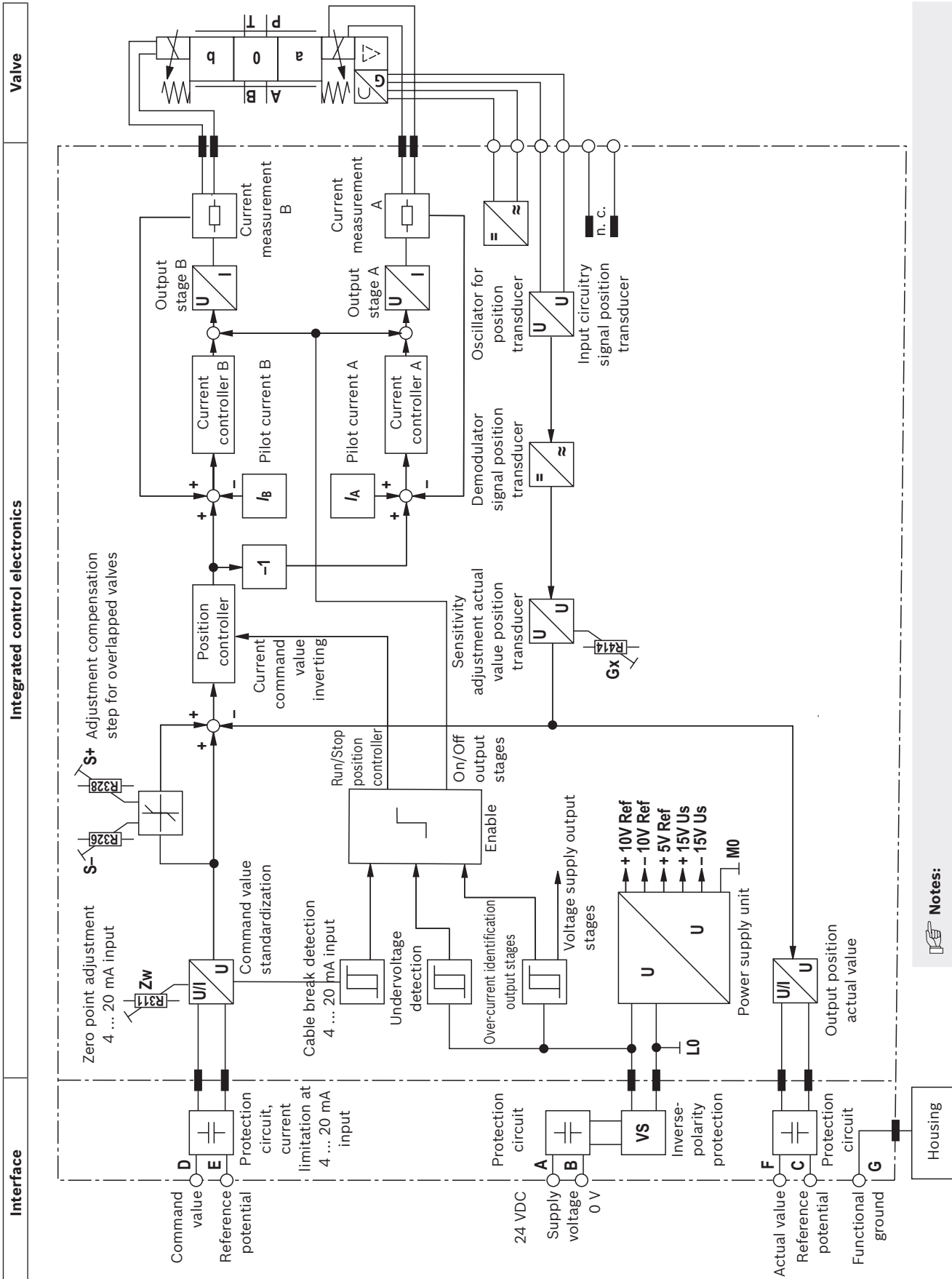
**Technical data**

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

<b>electrical, integrated electronics (OBE)</b>		
Relative duty cycle	%	100 (continuous operation)
Protection class according to EN 60529		IP 65 with mounted and locked plug-in connectors
Supply voltage	VDC	24
▶ Terminal A	VDC	min. 19 / max. 36
▶ Terminal B	VDC	0
Maximum admissible residual ripple	V <sub>pp</sub>	2.5
Maximum power consumption	VA	65
Fuse protection, external	A <sub>T</sub>	3.15 (time-lag)
Input, version "A1"		Differential amplifier, <b>R<sub>i</sub></b> = 100 kΩ
▶ Terminal D ( <b>U<sub>E</sub></b> )	VDC	0 ... ±10 (4/3 directional design) 0 ... +10 (4/2 directional design)
▶ Terminal E	VDC	0
Input, version "F1"		Load, <b>R<sub>sh</sub></b> = 200 Ω
▶ Terminal D ( <b>I<sub>D-E</sub></b> )	mA	4 ... (12) ... 20 (4/3 directional design) 4 ... 20 (4/2 directional design)
▶ Terminal E ( <b>I<sub>D-E</sub></b> )		Current loop <b>I<sub>D-E</sub></b> feedback
Maximum voltage of the differential inputs against 0 V		D → B; E → B (max. 18 V)
Test signal, version "A1"		LVDT
▶ Terminal F ( <b>U<sub>Test</sub></b> )	V	0 ... ±10 (4/3 directional design) 0 ... +10 (4/2 directional design)
▶ Terminal C		Reference 0 V
Test signal, version "F1"		LVDT signal 4 ... 20 mA on external load 200 ... 500 Ω maximum
▶ Terminal F ( <b>I<sub>F-C</sub></b> )	mA	4 ... (12) ... 20 (4/3 directional design) 4 ... 20 (4/2 directional design)
▶ Terminal C ( <b>I<sub>F-C</sub></b> )		Current loop <b>I<sub>F-C</sub></b> feedback
Functional ground and screening		See page 11 (CE-compliant installation)
Adjustment		Calibrated in the plant, see valve characteristic curves page 12 ... 20
Conformity		CE according to EMC Directive 2014/30/EU tested according to EN 61000-6-2 and EN 61000-6-3



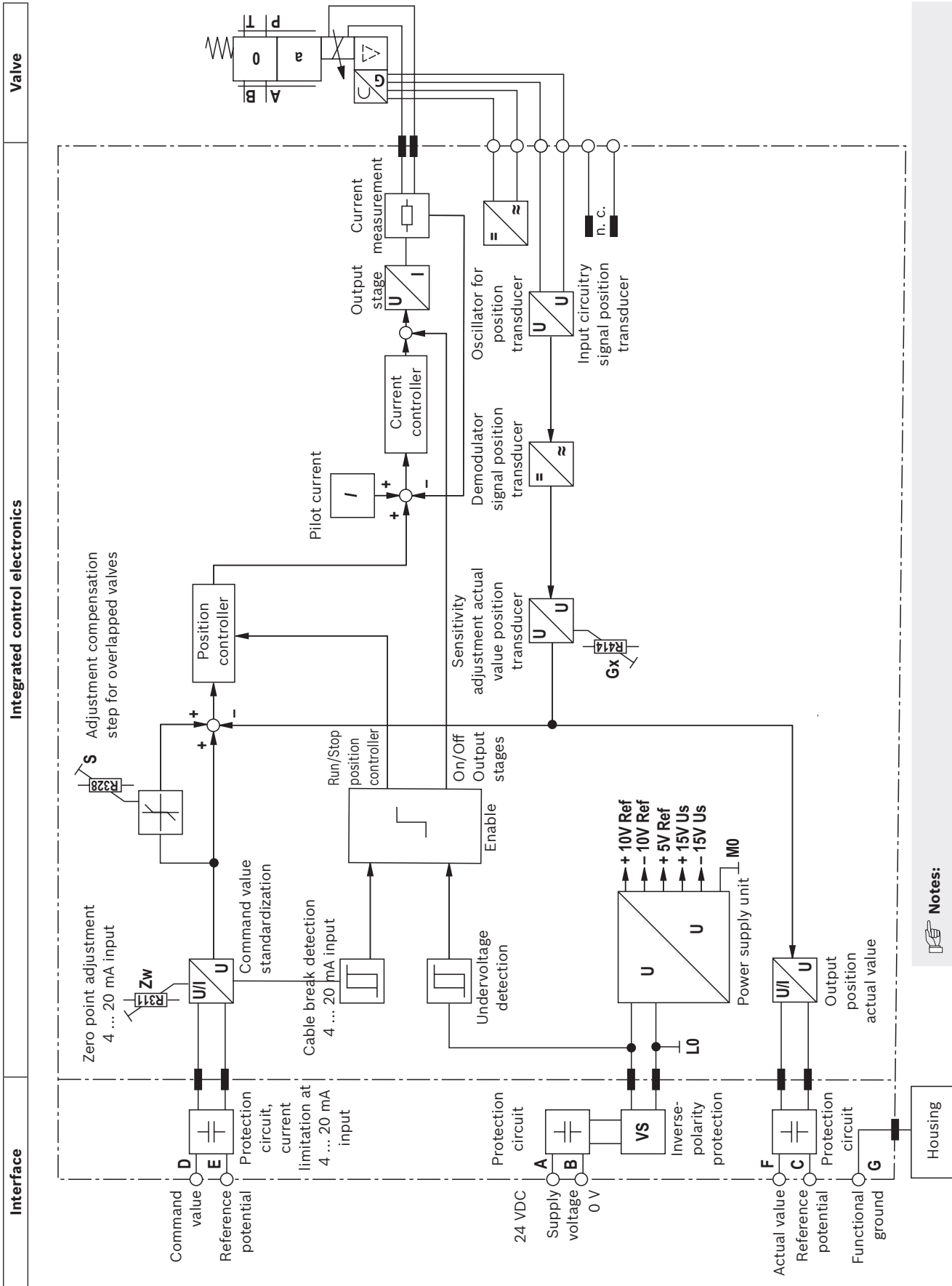
### Block diagram/controller function block (4/3 directional design)



**Notes:**

- ▶ Electrical signals provided via control electronics (e.g. actual value) must not be used for switching off safety-relevant machine functions.
- ▶ The factory setting of the potentiometer must not be changed.

Block diagram/controller function block (4/2 directional design)



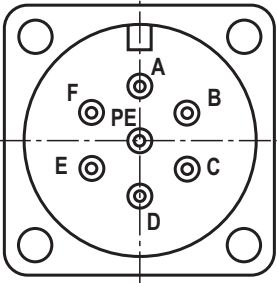
**Notes:**

- ▶ Electrical signals provided via control electronics (e.g. actual value) must not be used for switching off safety-relevant machine functions.
- ▶ The factory setting of the potentiometer must not be changed.

## Electrical connections and assignment

### Connector pin assignment

Pin	Signal	Assignment interface A1	Assignment interface F1
A	Supply voltage	24 VDC	
B		0 V	
C	Reference potential actual value	Reference potential actual value - pin F	
D	Differential amplifier input	Command value $\pm 10$ V	Command value 4 ... 20 mA
E		Reference potential command value - pin D	
F	Measuring output (actual value)	Actual value $\pm 10$ V	Actual value 4 ... 20 mA
PE		Functional ground (directly connected to the valve housing)	



<b>Command value:</b>	▶ Positive command value (0 ... 10 V or 12 ... 20 mA) at D and reference potential at E cause flow from P → A and B → T.
	▶ Negative command value (0 ... -10 V or 12 ... 4 mA) at D and reference potential at E cause flow from P → B and A → T.
	▶ With valves with solenoid on side a (symbol EA), a positive command value 0 ... +10 V or 4 ... 20 mA at D and reference potential at E result in flow from P → B and A → T.
<b>Connection cable (recommendation):</b>	▶ Up to 20 m cable length type LiYCY 7 x 0.75 mm <sup>2</sup>
	▶ Up to 40 m cable length type LiYCY 7 x 1.0 mm <sup>2</sup>
	▶ EMC-compliant installation: <ul style="list-style-type: none"> <li>- Apply screening to both line ends</li> <li>- Use metal mating connector (see page 23)</li> </ul>
	▶ Alternatively up to 30 m cable length admissible (not with version with damping plate) <ul style="list-style-type: none"> <li>- Apply screening on supply side</li> <li>- Plastic mating connector (see page 23) can be used</li> </ul>

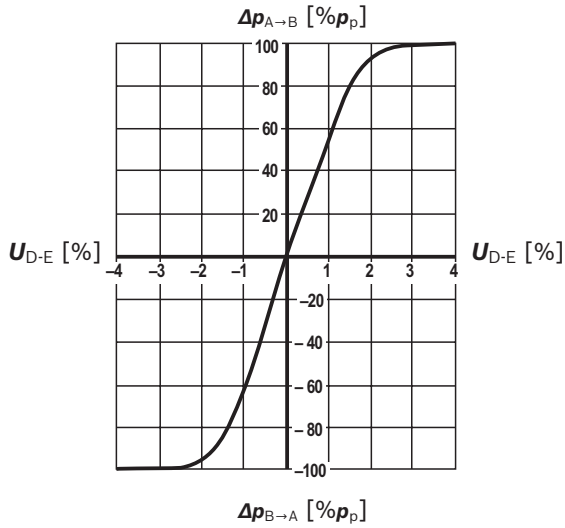

**Notice:**

Mating connectors, separate order, see page 23 and data sheet 08006.

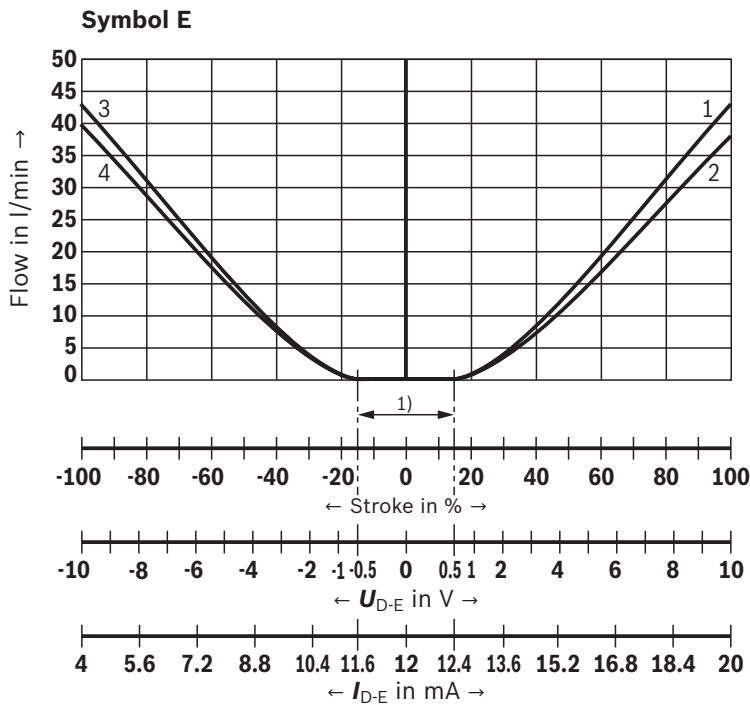
### Characteristic curves

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

#### Pressure/signal characteristic curve (symbol V)



#### Flow/signal function (rated flow 50 l/min with $\Delta p = 5 \text{ bar/control edge}$ )



1) Step compensation

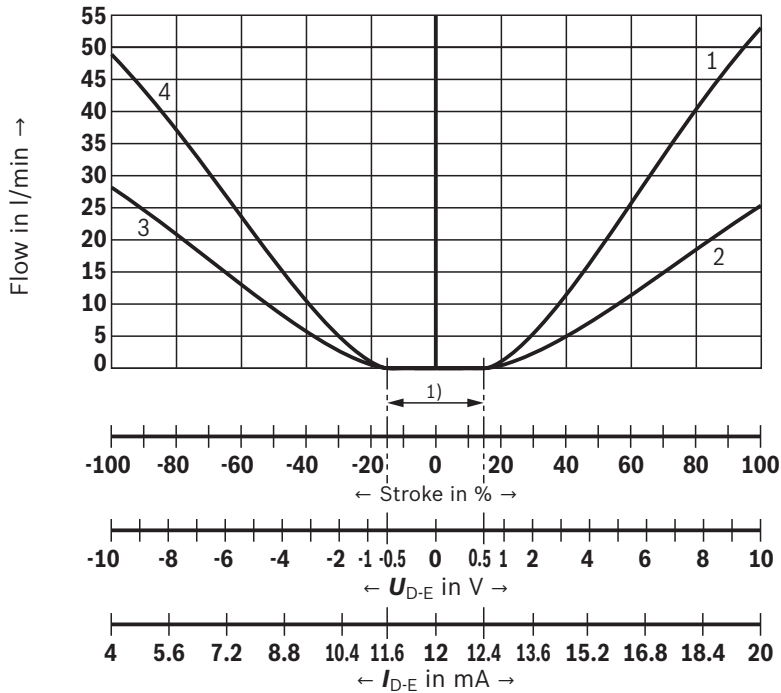
- 1 P-A
- 2 B-T
- 3 P-B
- 4 A-T

### Characteristic curves

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

Flow/signal function (rated flow 50 l/min with  $\Delta p = 5 \text{ bar}$ /control edge)

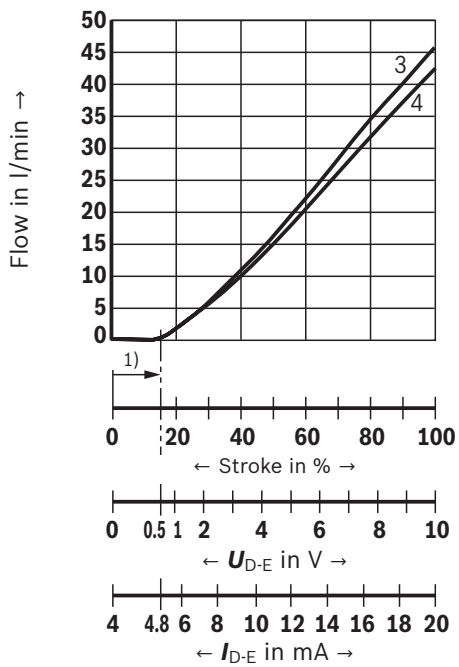
Symbol E1-



1) Step compensation

- 1 P-A
- 2 B-T
- 3 P-B
- 4 A-T

Symbol EA



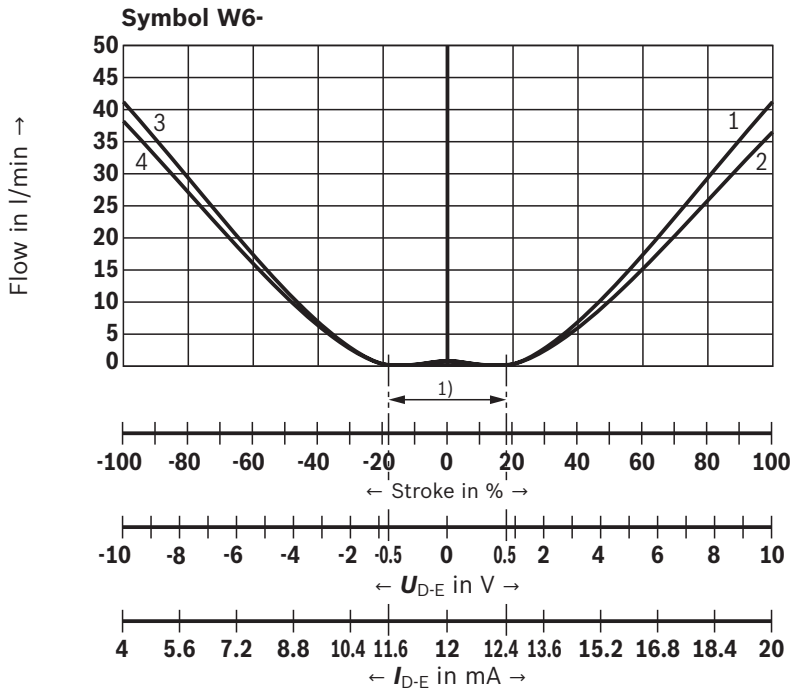
1) Step compensation

- 3 P-B
- 4 A-T

### Characteristic curves

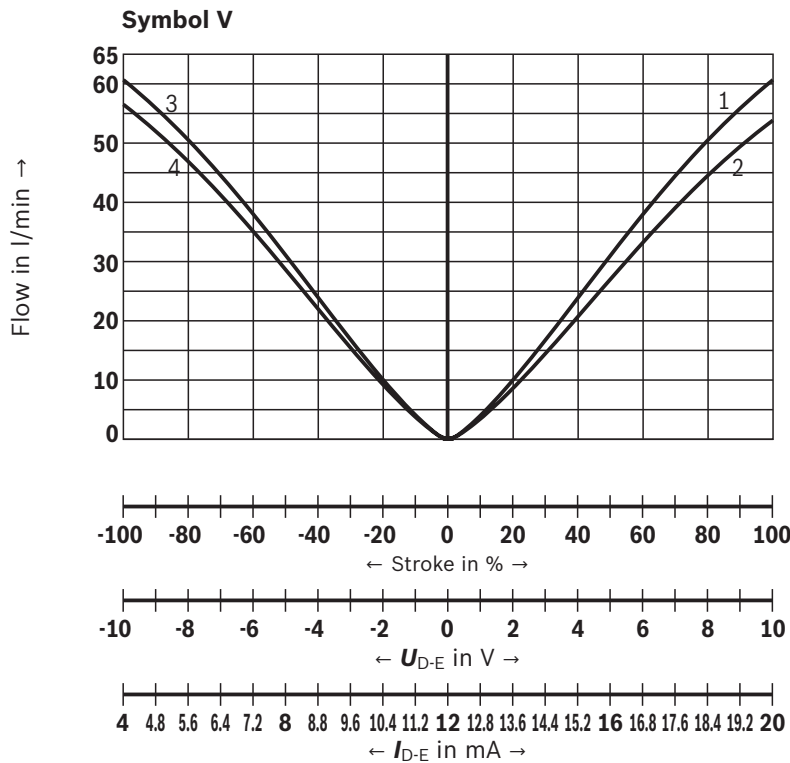
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

Flow/signal function (rated flow 50 l/min with  $\Delta p = 5 \text{ bar/control edge}$ )



1) Step compensation

- 1 P-A
- 2 B-T
- 3 P-B
- 4 A-T

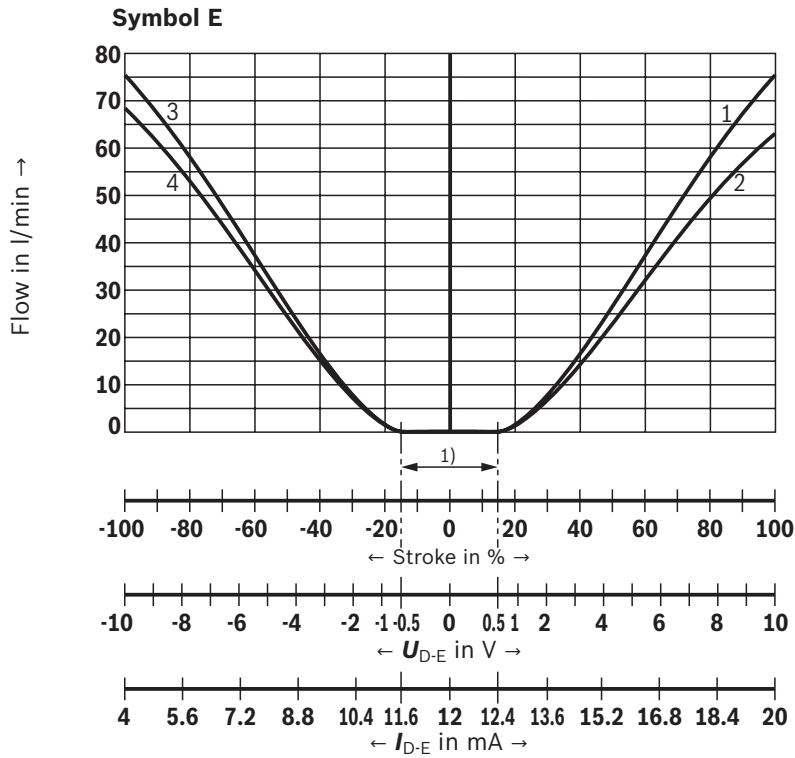


- 1 P-A
- 2 B-T
- 3 P-B
- 4 A-T

### Characteristic curves

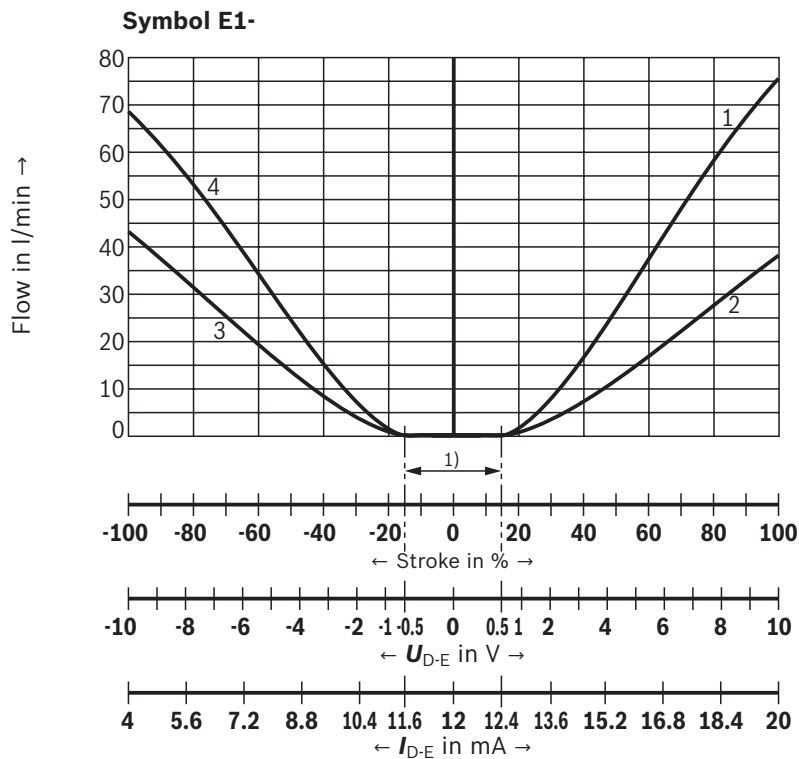
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

Flow/signal function (rated flow 80 l/min with  $\Delta p = 5 \text{ bar}$ /control edge)



1) Step compensation

- 1 P-A
- 2 B-T
- 3 P-B
- 4 A-T



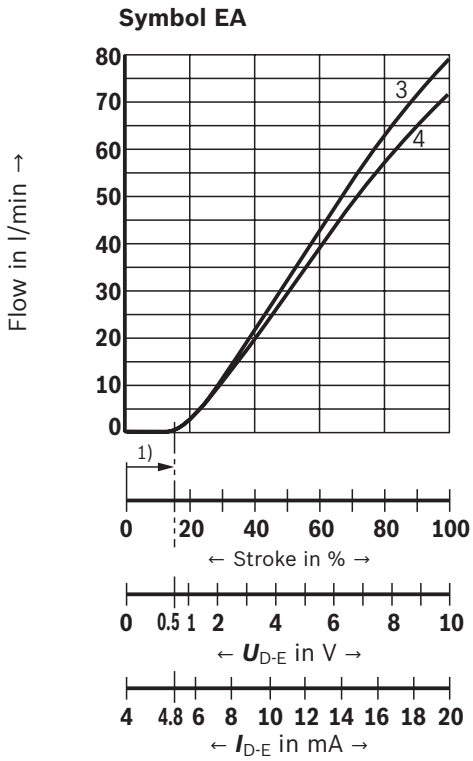
1) Step compensation

- 1 P-A
- 2 B-T
- 3 P-B
- 4 A-T

### Characteristic curves

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

**Flow/signal function** (rated flow 80 l/min with  $\Delta p = 5 \text{ bar/control edge}$ )

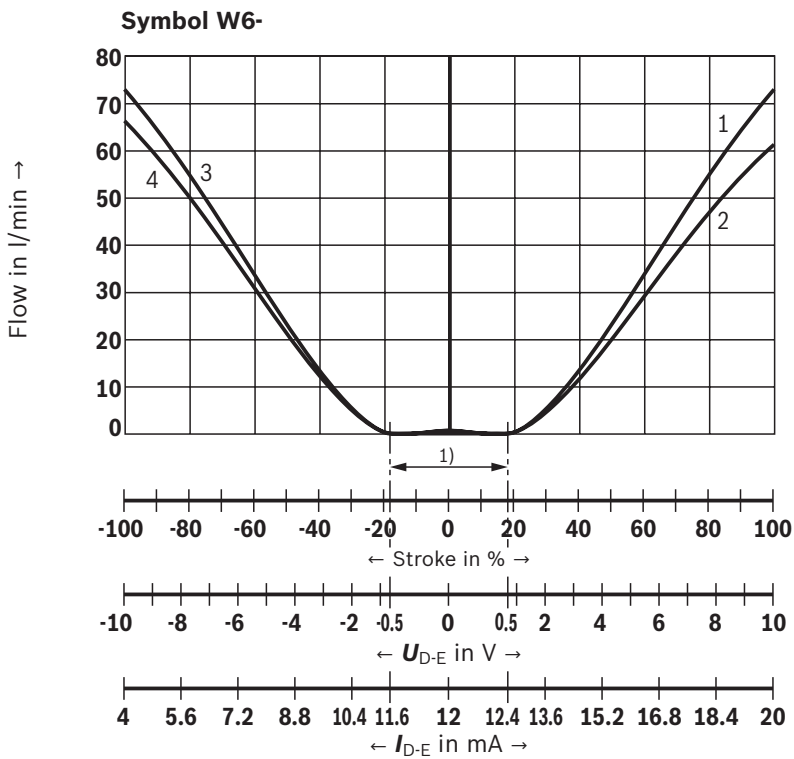




### Characteristic curves

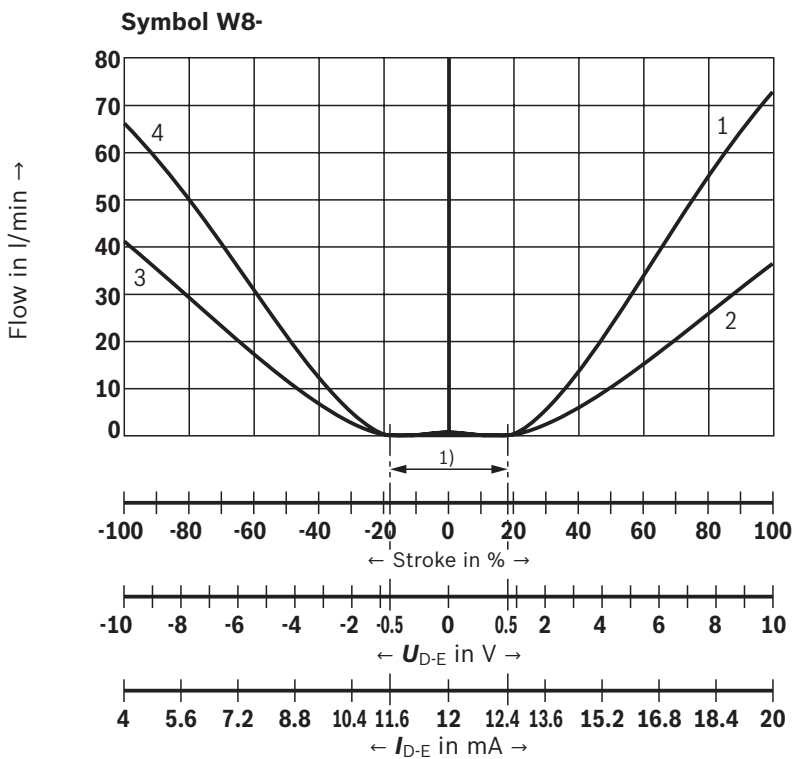
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

Flow/signal function (rated flow 80 l/min with  $\Delta p = 5 \text{ bar/control edge}$ )



1) Step compensation

- 1 P-A
- 2 B-T
- 3 P-B
- 4 A-T



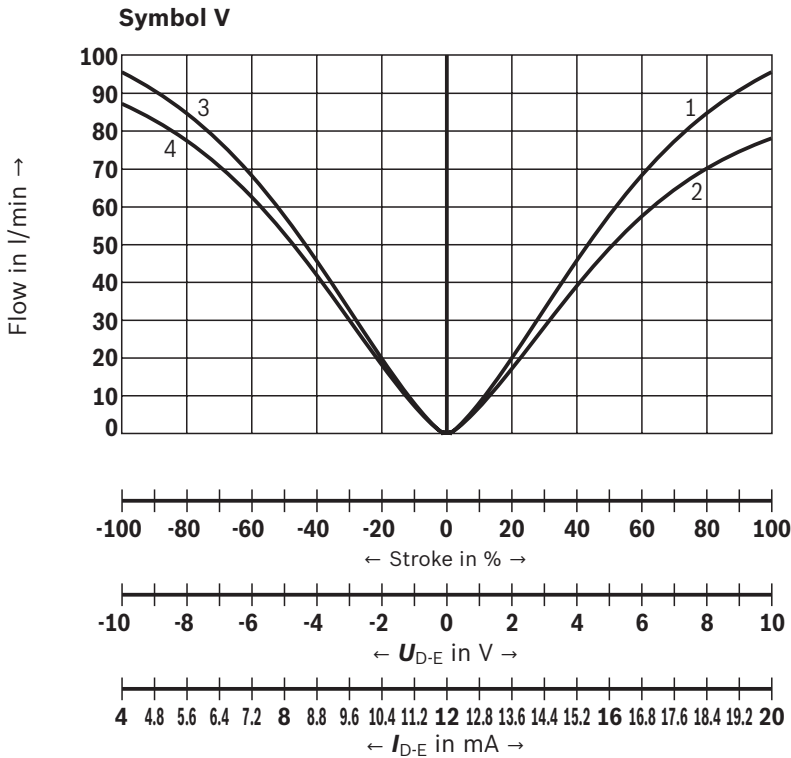
1) Step compensation

- 1 P-A
- 2 B-T
- 3 P-B
- 4 A-T

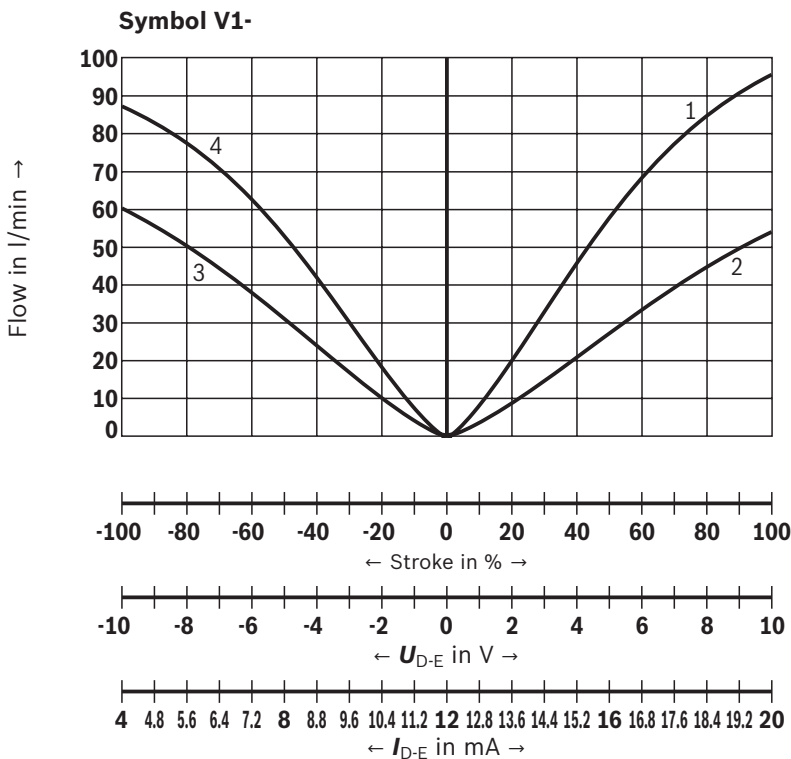
### Characteristic curves

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

Flow/signal function (rated flow 80 l/min with  $\Delta p = 5 \text{ bar}$ /control edge)



- 1 P-A
- 2 B-T
- 3 P-B
- 4 A-T

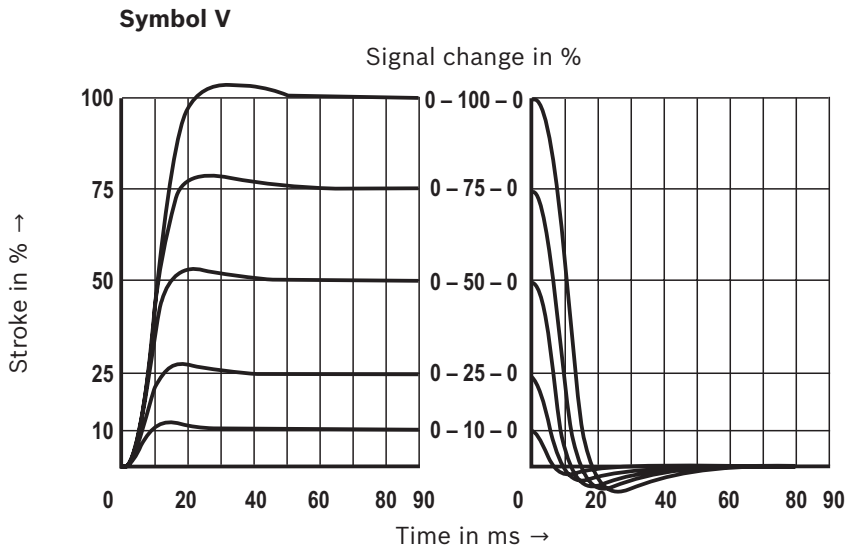


- 1 P-A
- 2 B-T
- 3 P-B
- 4 A-T

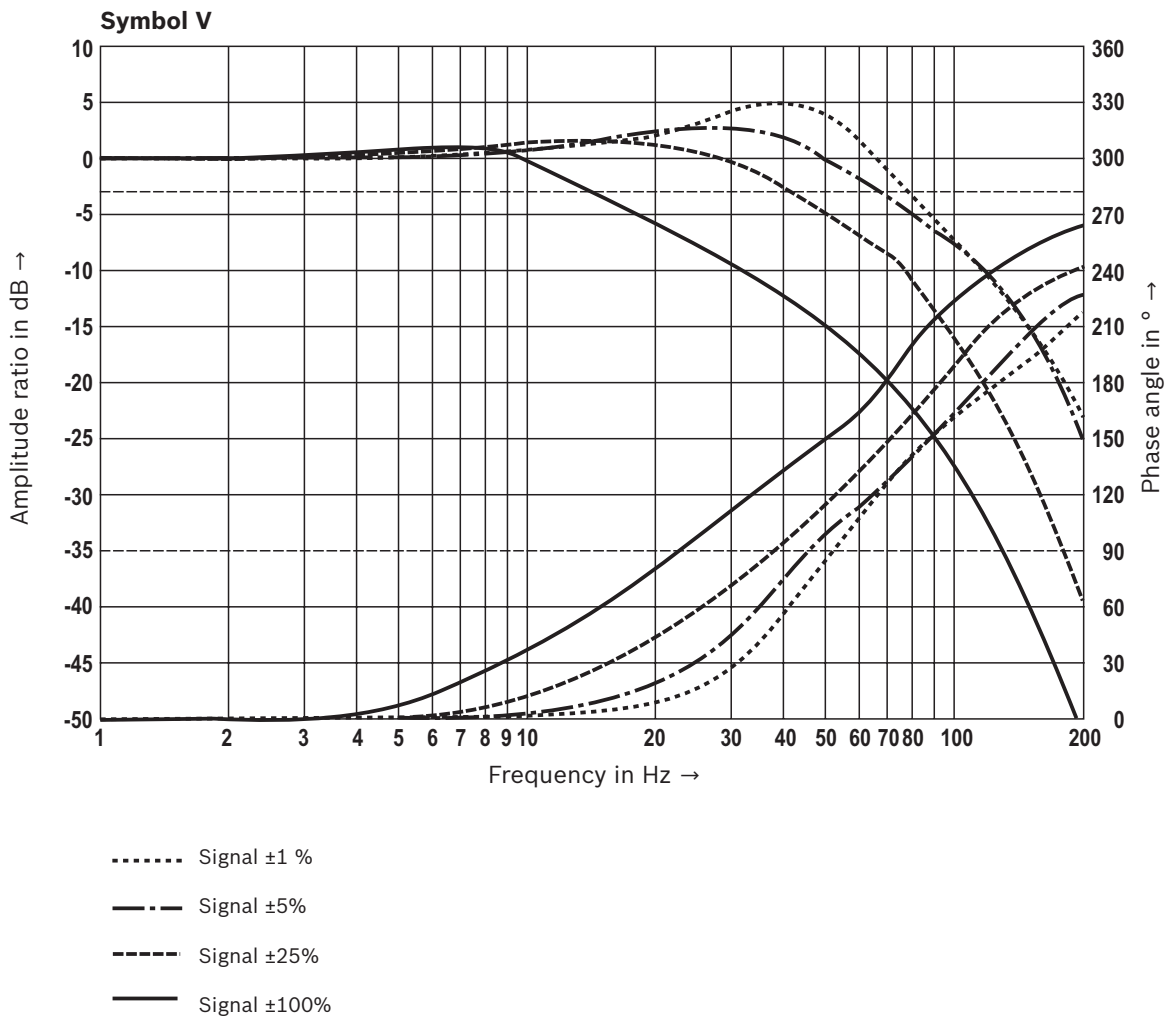
### Characteristic curves

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

#### Transition function with stepped electric input signals (4/3 directional design)



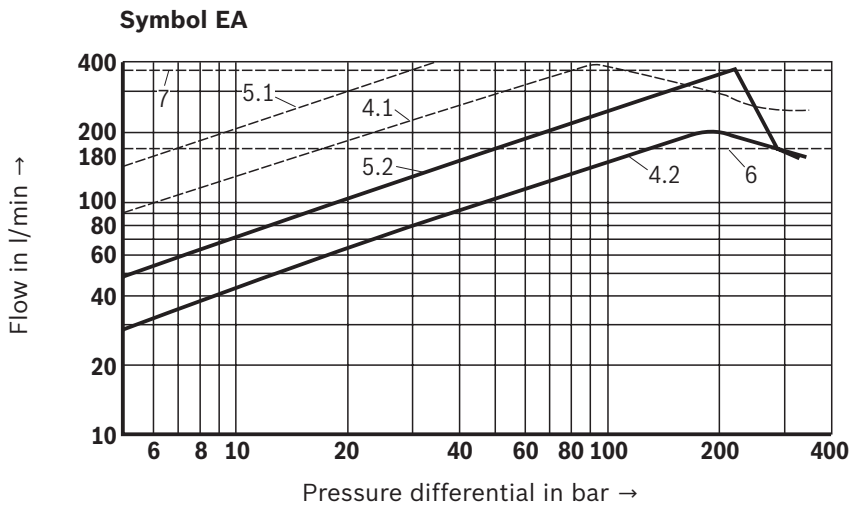
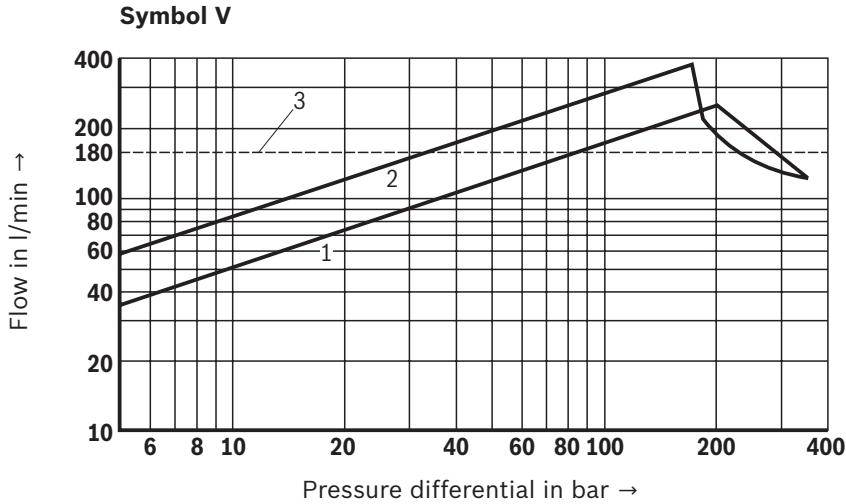
#### Frequency response characteristic curves



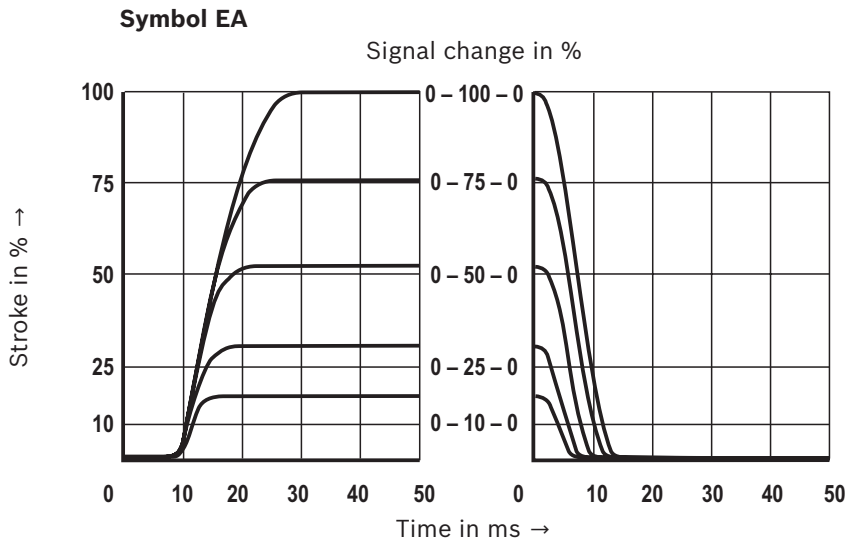
### Characteristic curves

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

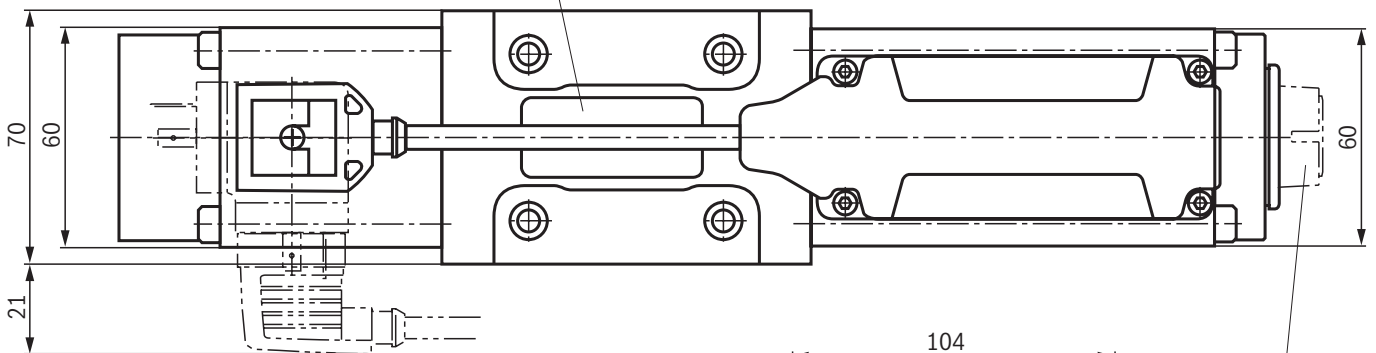
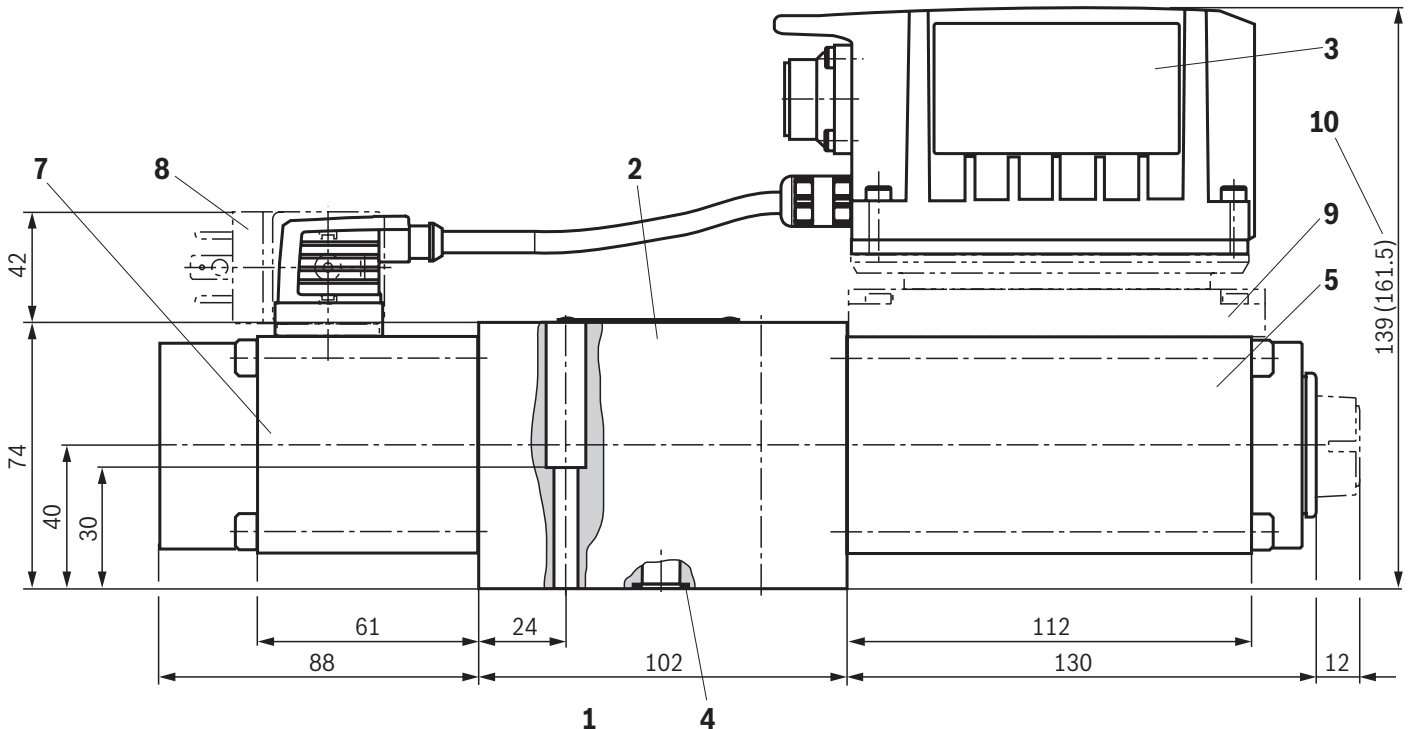
**Flow/load function with maximum valve opening** (tolerance  $\pm 10 \%$ ) (4/3 directional design)



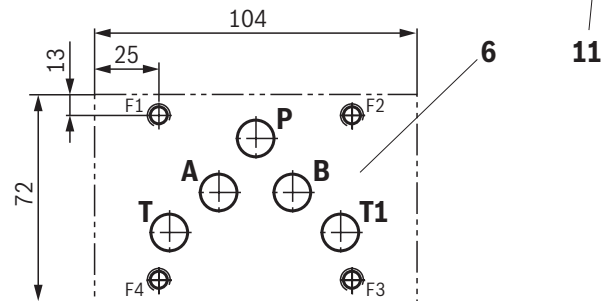
**Transition function with stepped electric input signals** (4/2 directional design)



## Dimensions (4/3 directional design) (dimensions in mm)



0,01/100  
 Rzmax 4  
 Required surface quality  
 of the valve contact surface



- 1 Name plate
- 2 Valve housing
- 3 Integrated electronics
- 4 Identical seal rings for ports A, B, P, T, T1
- 5 Control solenoid with position transducer
- 6 Machined valve contact surface, porting pattern according to ISO 4401-05-04-0-05
- 7 Stroke solenoid
- 8 ISA adapter, separate order, see page 23
- 9 Damping plate "D"
- 10 Dimension in ( ) for version with damping plate "D"
- 11 Electronics protection membrane "-967"

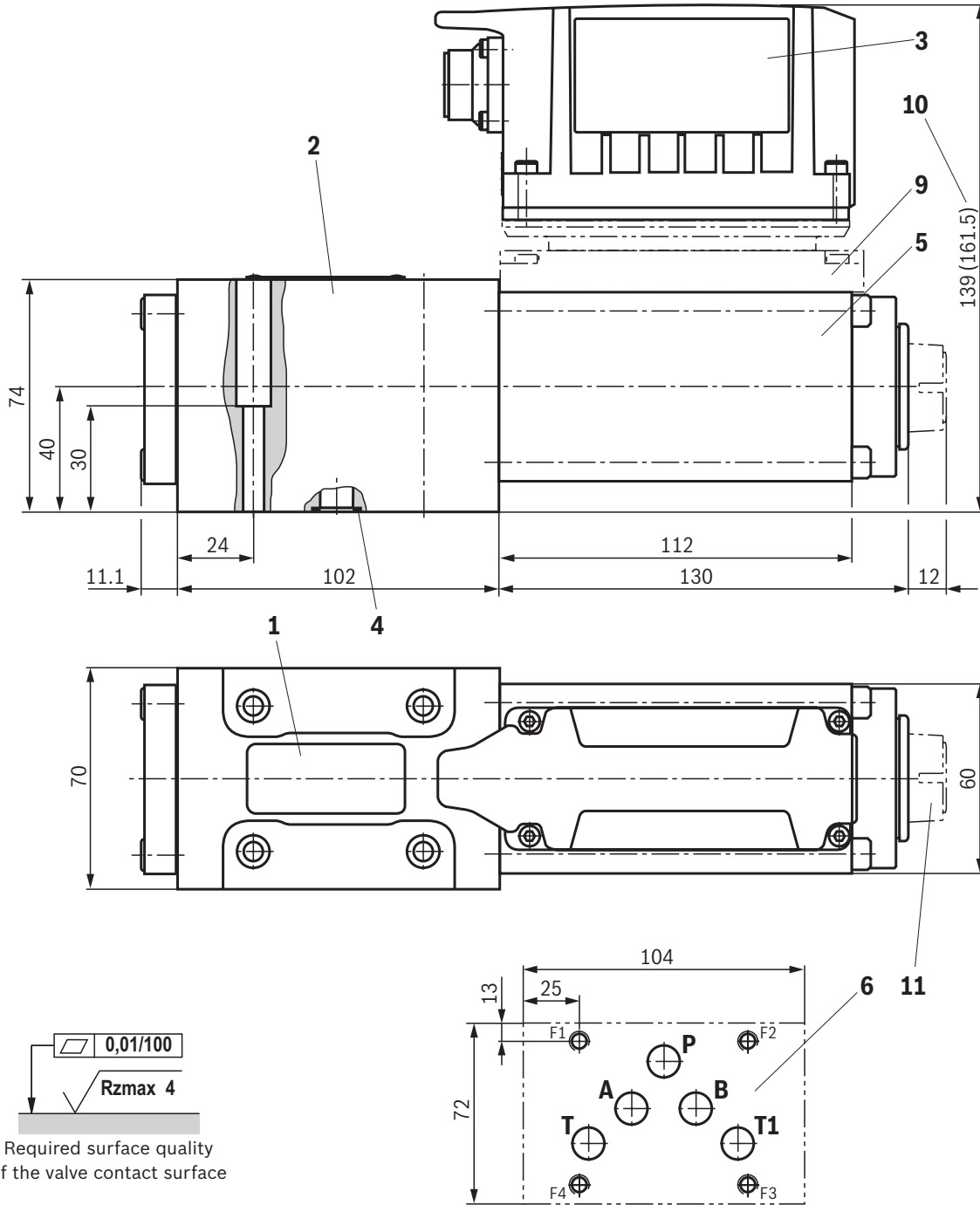


### Notes:

- ▶ The dimensions are nominal dimensions which are subject to tolerances.
- ▶ Mating connectors, separate order, see page 23 and data sheet 08006.

**Valve mounting screws and subplates, see page 23.**

**Dimensions** (4/2 directional design)  
(dimensions in mm)



- 1 Name plate
- 2 Valve housing
- 3 Integrated electronics
- 4 Identical seal rings for ports A, B, P, T, T1
- 5 Control solenoid with position transducer
- 6 Machined valve contact surface, porting pattern according to ISO 4401-05-04-0-05
- 9 Damping plate "D"
- 10 Dimension in ( ) for version with damping plate "D"
- 11 Electronics protection membrane "-967"

**Notes:**

- ▶ The dimensions are nominal dimensions which are subject to tolerances.
- ▶ Mating connectors, separate order, see page 23 and data sheet 08006.

**Valve mounting screws and subplates, see page 23.**

## Dimensions

### Valve mounting screws (separate order)

4 hexagon socket head cap screws	Material number
<b>ISO 4762 - M6 x 40 - 10.9-CM-Fe-ZnNi-5-Cn-T0-H-B</b> (friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$ ) tightening torque $M_A = 12.5 \text{ Nm} \pm 10 \%$	<b>R913051533</b>
<b>ISO 4762 - M6 x 40 - 10.9</b> tightening torque $M_A = 15.5 \text{ Nm} \pm 10 \%$	Not included in the Rexroth delivery range



#### Notice:

The tightening torque of the hexagon socket head cap screws refers to the maximum operating pressure.

**Subplates** (separate order) with porting pattern according to ISO 4401-05-04-0-05 see data sheet 45100.

## Accessories (separate order)

### Valve with integrated electronics

Mating connectors 6-pole + PE	Design	Version	Material number	Data sheet
For the connection of valves with integrated electronics, round connector 6+PE, line cross-section 0.5 ... 1.5 mm <sup>2</sup>	straight	Metal	<b>R900223890</b>	08006
	straight	Plastic	<b>R900021267</b>	08006
	angled	Plastic	<b>R900217845</b>	–

Cable sets 6-pole + PE	Length in m	Material number	Data sheet
For the connection of valves with integrated electronics, round connector 6+PE, straight connector, shielded, potted-in mating connector, line cross-section 0.75 mm <sup>2</sup>	3.0	<b>R901420483</b>	08006
	5.0	<b>R901420491</b>	08006
	10.0	<b>R901420496</b>	08006
	20.0	<b>R901448068</b>	–

### Test and service device

	Material number	Data sheet
Service case with test device for proportional servo valves with integrated electronics (OBE)		29685

	Material number	Data sheet
<b>ISA adapter</b> ISA adapter for external shut-off of the second solenoid (tightening torque $M_A = 0.5^{+0.1} \text{ Nm}$ )	<b>1834484245</b>	–

## Further information

▶ Subplates	Data sheet 45100
▶ Hydraulic fluids on mineral oil basis	Data sheet 90220
▶ Environmentally compatible hydraulic fluids	Data sheet 90221
▶ Flame-resistant, water-free hydraulic fluids	Data sheet 90222
▶ Flame-resistant hydraulic fluids - containing water (HFAE, HFAS, HFB, HFC)	Data sheet 90223
▶ Reliability characteristics according to EN ISO 13849	Data sheet 08012
▶ Hexagon socket head cap screw, metric/UNC	Data sheet 08936
▶ Installation, commissioning and maintenance of servo valves and high-response valves	Data sheet 07700
▶ Hydraulic valves for industrial applications	Data sheet 07600-B
▶ Assembly, commissioning and maintenance of hydraulic systems	Data sheet 07900
▶ Selection of the filters	<a href="http://www.boschrexroth.com/filter">www.boschrexroth.com/filter</a>
▶ Information on available spare parts	<a href="http://www.boschrexroth.com/spc">www.boschrexroth.com/spc</a>

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