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

Type 4WRPE

RE 29122
Edition: 2014-11

H8046+8047

- Size 10
- Component series 3X
- Maximum operating pressure 350 bar
- Rated flow 50, 80 l/min (***Δp*** = 10 bar)

CE

Features

- Reliable – proven and robust construction
- Energy efficient – no control oil required, high-volume flows at low differential pressure
- Flexible – suitable for position and speed control
- Precise – high response sensitivity and low hysteresis
- Reliable – option to switch the second solenoid by the ISA adapter

Content

Ordering codes

01	02	03	04	05	06	07	08		09	10		11		12	13
4	**WRP**	**E**	**10**			**S**	**J**	**–**	**3X**	**/**		**/**	**24**	**/**		*****

01	4 main ports	**4**
02	Directional control valve, direct operated	**WRP**
03	With integrated electronics	**E**
04	Size 10	**10**
05	Symbols e.g. E, E1, W6 etc.; possible design refer to page 3	

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

06	50 l/min (only for symbols E, EA, V and W6)	**50**
	80 l/min	**80**

Flow characteristics

07	Progressive	**S**
08	Overlap jump (opening points 2 ... 3% command value for symbols E, E1, EA, W6 and W8)	**J**
09	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions)	**3X**

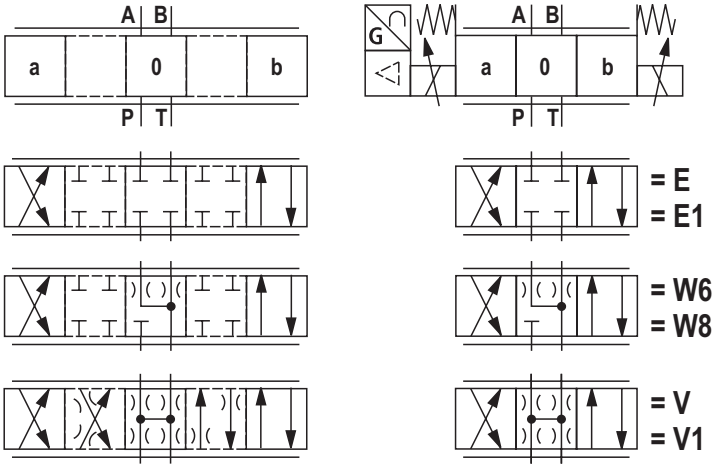
Seal material

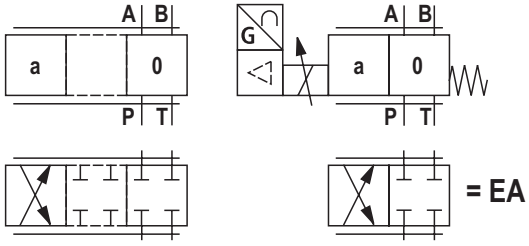
10	NBR seals	**M**
	FKM seals	**V**
	Observe compatibility of seals with hydraulic fluid used!	
11	Supply voltage 24 V	**24**

Interfaces of the control electronics

12	Command value input ±10 V	**A1**
	Command value input 4 ... 20 mA	**F1**
13	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-control valve)

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

Design

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)
- Lifting solenoid (7)
- Integrated control electronics (OBE) (5) with analog interface (6)

Position

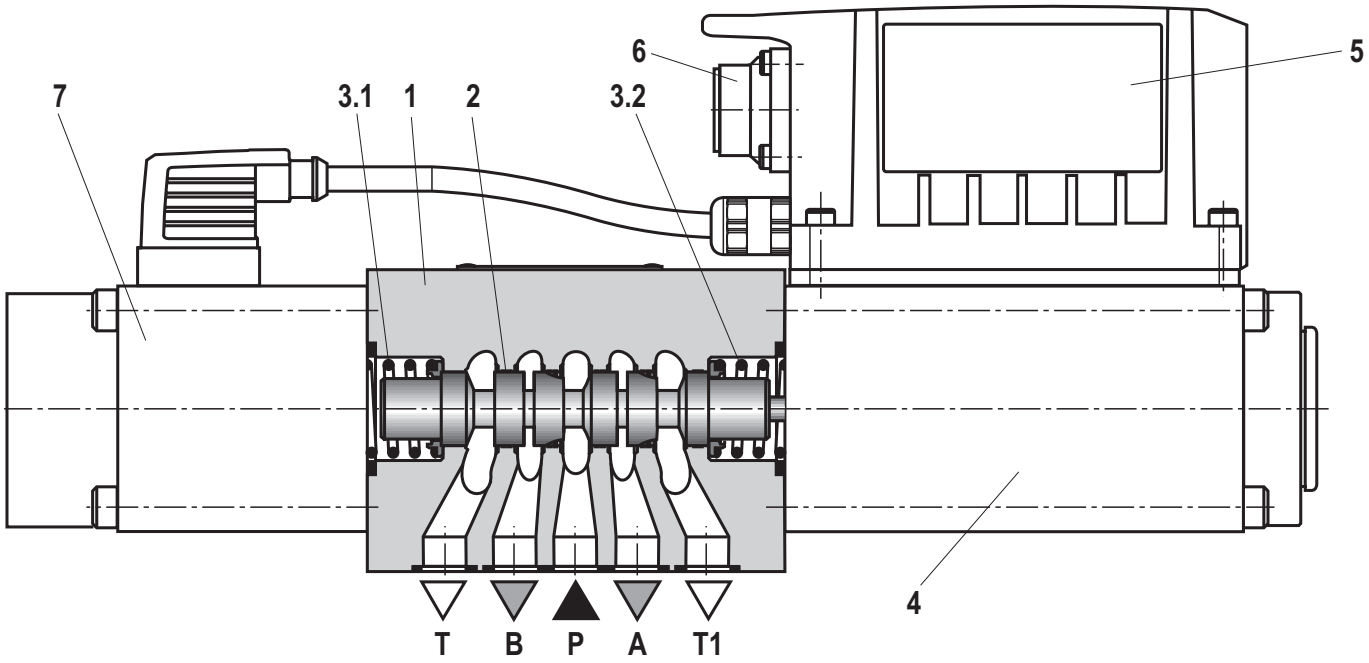
The integrated electronics (OBE) compares the specified command value to the actual position value. In the event of control deviation, the respective solenoid is controlled. By changing the solenoid force, the control spool (2) is misaligned against the corresponding spring. Lifting/control spool cross-section is proportionally regulated to the command value. With a specified command value of 0 V, the electronics regulates the control spool (2) in the center position.

Error detection

In the following errors, the electronics deenergize the control solenoids:

- The supply voltage is less than the minimum ≤ 15 V (restarting ≥ 17.5 V).
- Version “F1”: The current command value is less than the minimum of 2 mA (includes the broken cable of the command value line (current loop)

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



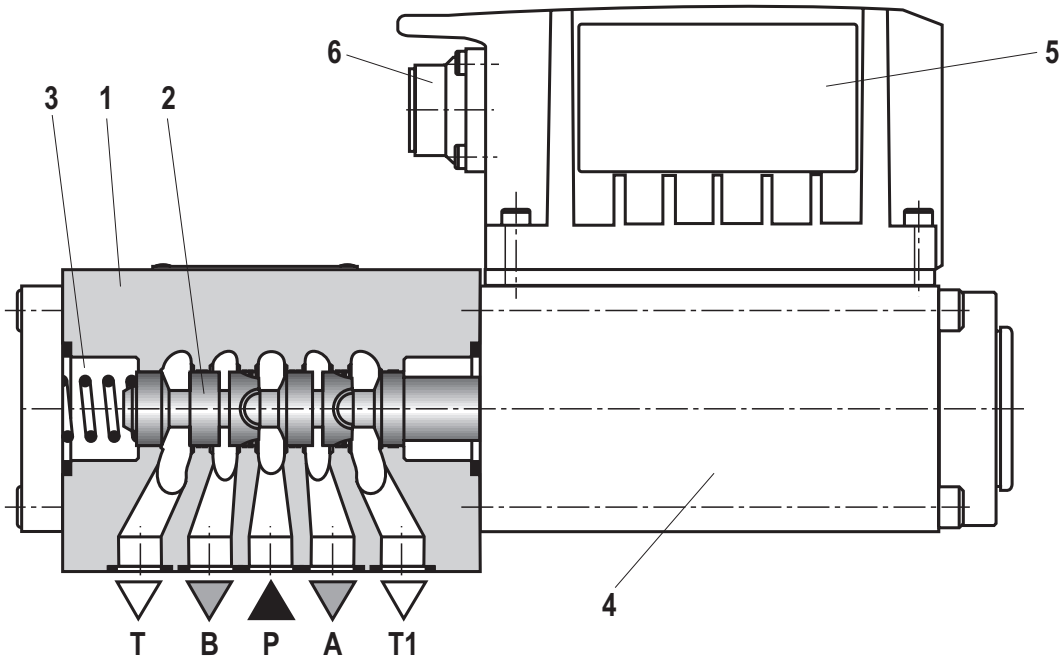
Function, section(4/2-control valve)

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

Design
The valve basically consists of:
- Valve housing (1)
- Control spool (2) with compression spring (3)
- Control solenoid with position transducer (4)
- Integrated control electronics (OBE) (5) with analog interface (6)

Position
The integrated electronics (OBE) compares the specified command value to the actual position value. In the event of control deviation, the respective control solenoid is controlled. By changing the solenoid force, the control spool (2) is misaligned against the control spring. Lifting/control spool cross-section is proportionally regulated to the command value. If the command value specification is positive, the valve opens from P to B or A to T. Negative command values result in no change to the position of the control spool.

Error detection
In the following errors, the electronics deenergize the control solenoids:
- The supply voltage is less than the minimum ≤ 15 V (restarting ≥ 17.5 V).
- Version “F1”: The current command value is less than the minimum of 2 mA (includes the broken cable of the command value line (current loop).



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

General			
Design			Spool valve, direct operated
Actuation			Proportional solenoid with position control, OBE
Connection type			Subplate mounting, porting pattern according to ISO 4401-05-04-0-05
Installation position			Any
Ambient temperature range		°C	–20 ... +60
Bearing temperature range under UV protection		°C	+10 ... +40
Transport temperature		°C	–30 ... +80
Sine test according to DIN EN 60068-2-6			10 ... 2000 Hz / maximum 10 g / 10 cycles / 3 axles
Noise test according to DIN EN 60068-2-64			20 ... 2000 Hz / 10 g_{RMS} / 30 g peak / 30 min / 3 axles
Transport shock according to DIN EN 60068-2-27			15 g / 11 ms / 3 axles
Earth	▶ 4/3-way version	kg	7.6
	▶ 4/2-way version	kg	6.0
Maximum relative humidity (no condensation)		%	95
Maximum solenoid surface temperature		°C	150 (individual operation)
MTTFd-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 (***Δp*** = 10 bar per summated edge [2])		l/min	50	80
Hydraulic fluid			see table below	
Viscosity range	▶ recommended	mm^2/s	20 ... 100	
	▶ Maximum admissible	mm^2/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 [1]	

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, HFDR	FKM	ISO 12922	90222
	▶ containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922	on request

☞ **Important information about hydraulic fluids:**
- ▶ For more information and data about the use of other hydraulic fluids, refer to data sheets above 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 50 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%

[1] 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.

[2] Flow with deviating ***Δp:***

$$q_x = q_{Vnom} \times \sqrt{\frac{\Delta p_x}{10}}$$

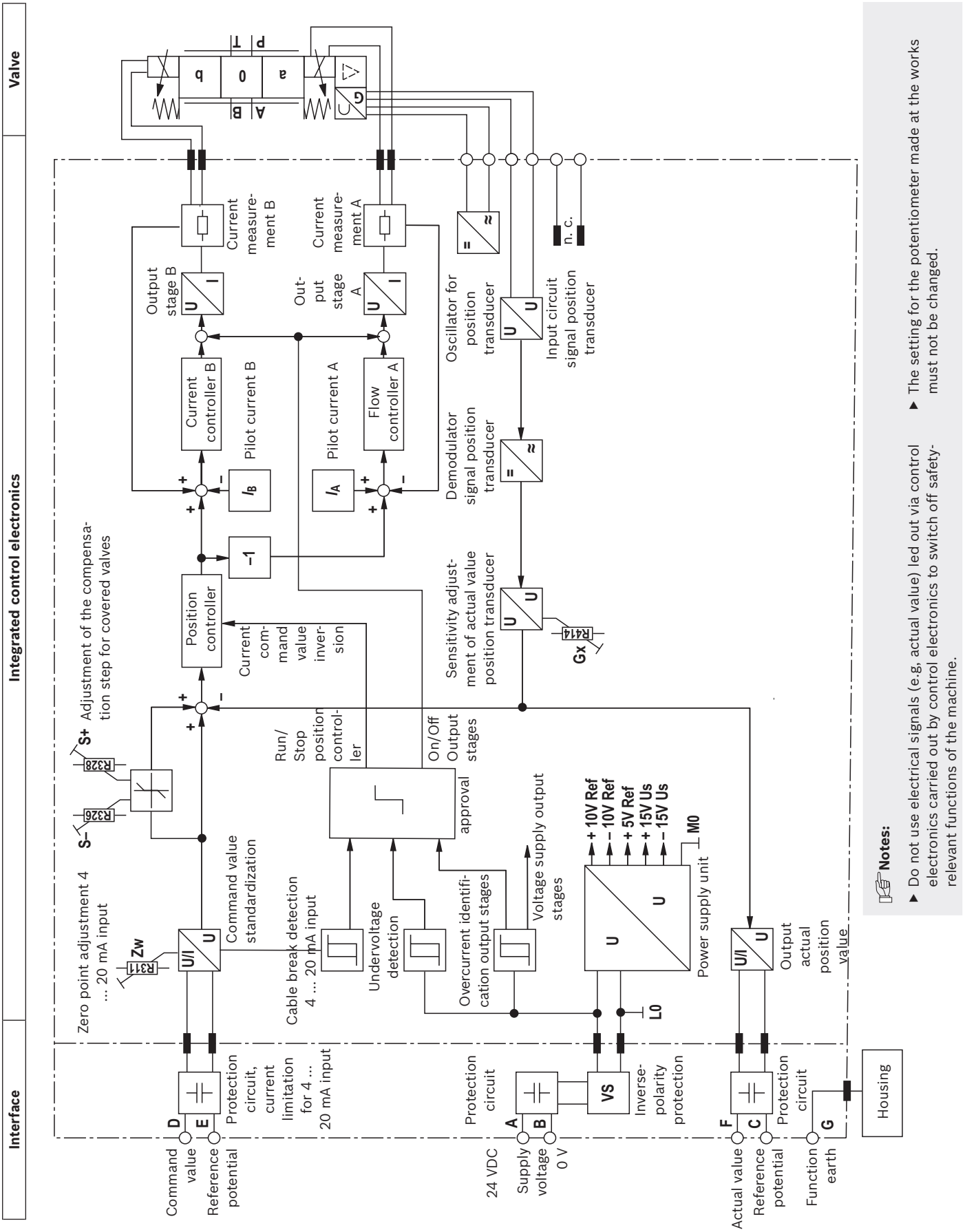
☞ **Note:**
The technical data given has been measured using HLP46 and ϑ_{oil} = 40 ± 5 °C.

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

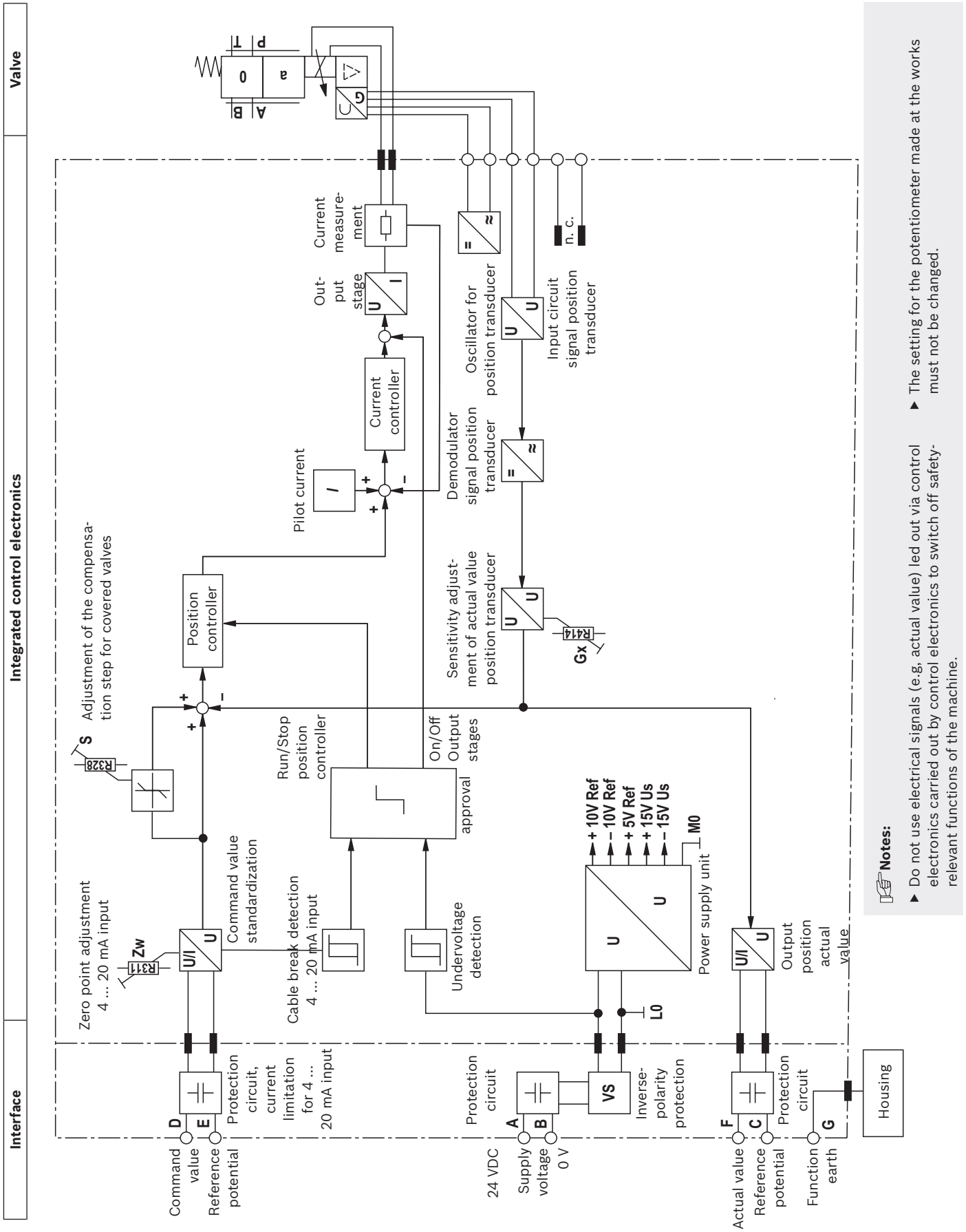
static / dynamic		
Hysteresis	%	< 0.25
Range of inversion	%	< 0.05
Response sensitivity	%	< 0.05
Manufacturing tolerance q_{Vmax}	%	< 10
Temperature drift (temperature range 20 °C ... 80 °C)	% / 10 K	Zero shift < 0.2
Pressure drift	% / 100 bar	Zero shift < 0.2
Zero compensation		Ex factory ±1%

electrical, integrated electronics (OBE)		
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	Vpp	2,5
Maximum power consumption	PI	65
Fuse protection, external	A_T	3.15 (time-lag)
Input, version “A1”		Differential amplifier, R_i = 100 kΩ
▶ Terminal D (U_E)	VDC	0 ... ±10 (4/3-Way version) 0 ... +10 (4/2-Way version)
▶ Terminal E	VDC	0
Input, version “F1”		Load, R_{sh} = 200 Ω
▶ Terminal D (I_{D-E})	mA	4 ... (12) ... 20 (4/3-Way version) 4 ... 20 (4/2-Way version)
▶ Terminal E (I_{D-E})		Current loop I_{D-E} feedback
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 (4/3-Way version) 0 ... +10 (4/2-Way version)
▶ Terminal C		Reference 0 V
Test signal, version “F1”		LVDT signal 4 ... 20 mA on external load 200 ... 500 Ω maximum
▶ Terminal F (I_{F-C})	mA	4 ... (12) ... 20 (4/3-Way version) 4 ... 20 (4/2-Way version)
▶ Terminal C (I_{F-C})		Current loop I_{F-C} feedback
Function earth and screening		refer to page 10 (CE-compliant installation)
Adjustment		calibrated before delivery, refer to the valve characteristic curves page 11 ... 16
Conformity		CE according to EMC Directive 2004/108/EC tested according to EN 61000-6-2 and EN 61000-6-3

Block diagram/controller function block (4/3-Way version)



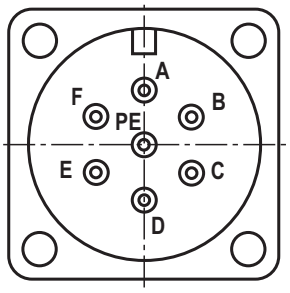
Block diagram/controller function block (4/2-Way version)



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 ±10 V	Command value 4 ... 20 mA
E		Reference potential command value - Pin D	
F	Measuring output (actual value)	Actual value ±10 V	Actual value 4 ... 20 mA
PE		Function earth (directly connected to the valve housing)	

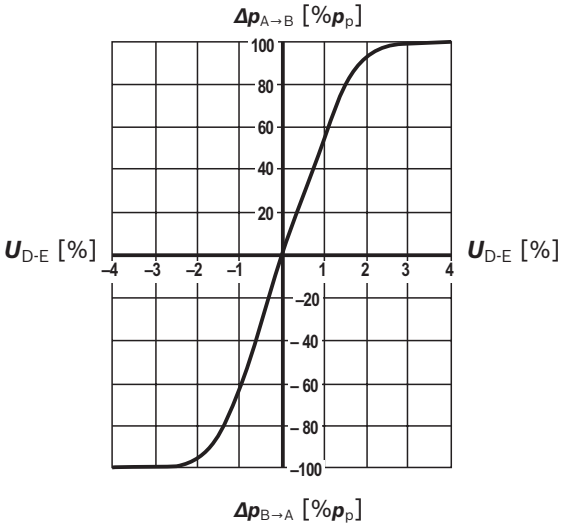


Command value:	▶ Positive command value (0 ... 10 V or 12 ... 20 mA) at pin D and reference potential at E results in flow from P → A and B →T.
	▶ Negative command value (0 ... –10 V or 12 ... 4 mA) at pin D and reference potential at E results in flow from P → B and A → T.
	▶ For valves with solenoid on side a (symbol EA) results in a positive command value 0 ... +10 V or 4 ... 20 mA at D and reference potential at E a flow P → B and A → T.
Connecting cable (recommended)**:**	▶ Up to 20 m cable length type LiYCY 7 x 0.75 mm²
	▶ Up to 40 m cable length type LiYCY 7 x 1.0 mm²
	Only connect the screening to PE on the supply side

☞ **Notice:**
Mating connectors, separate ordering, refer to page 19 and data sheet 08006.

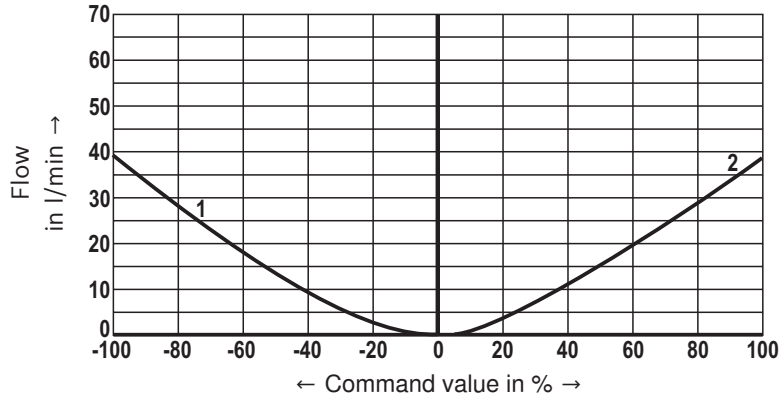
Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ± 5 °C)

Pressure-signal characteristic curve (symbol V)



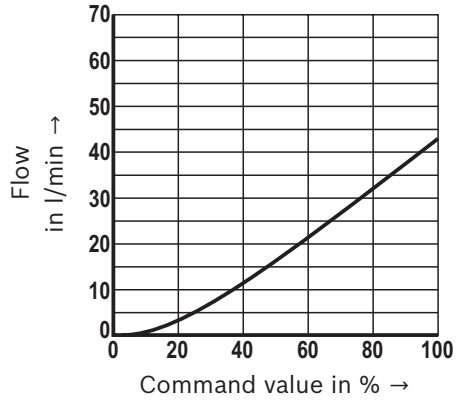
Flow signal function (rated flow 50 l/min at valve pressure differential 10 bar)

Symbol E



1 P–B; A–T
2 P–A; B–T

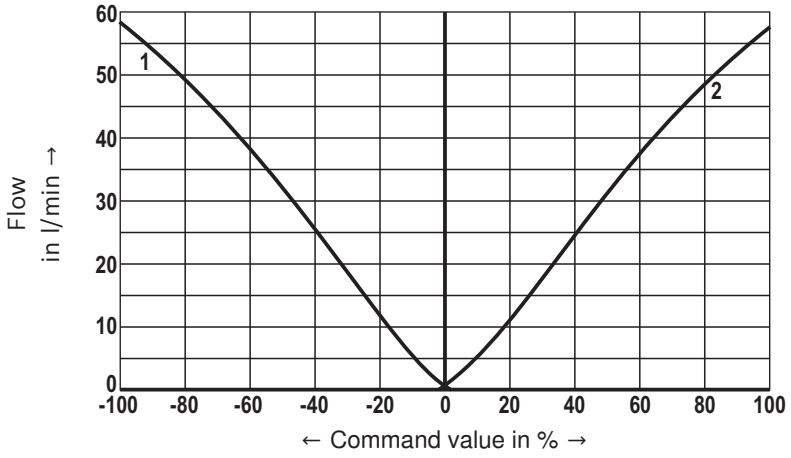
Symbol EA



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

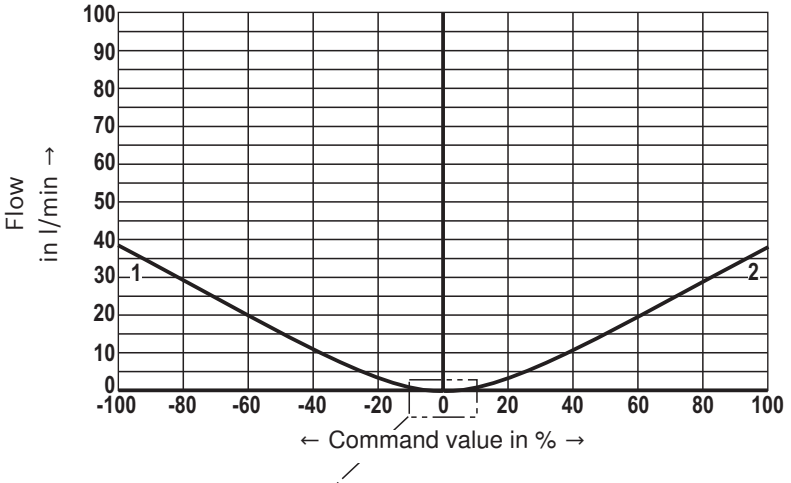
Flow signal function (rated flow 50 l/min at valve pressure differential 10 bar)

Symbol V

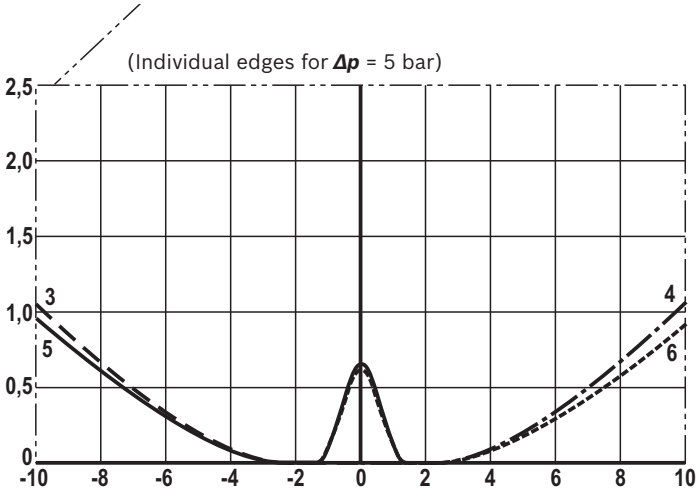


1 P–B; A–T
2 P–A; B–T

Symbol W6



1 P–B; A–T
2 P–A; B–T



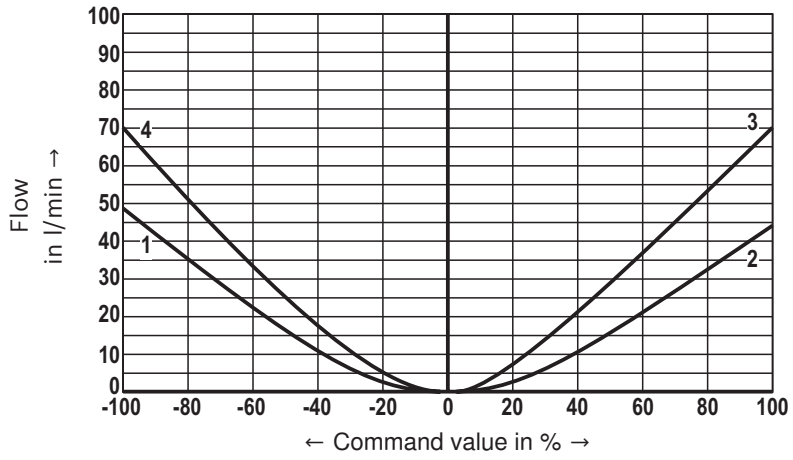
3 P–B
4 P–A
5 A–T
6 B–T

Characteristic curves

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

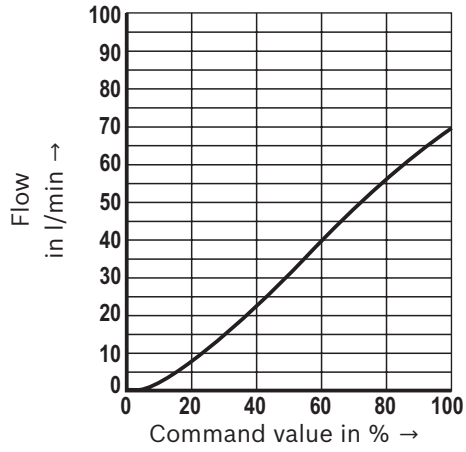
Flow signal function (rated flow 80 l/min at valve pressure differential 10 bar)

Symbol E and E1

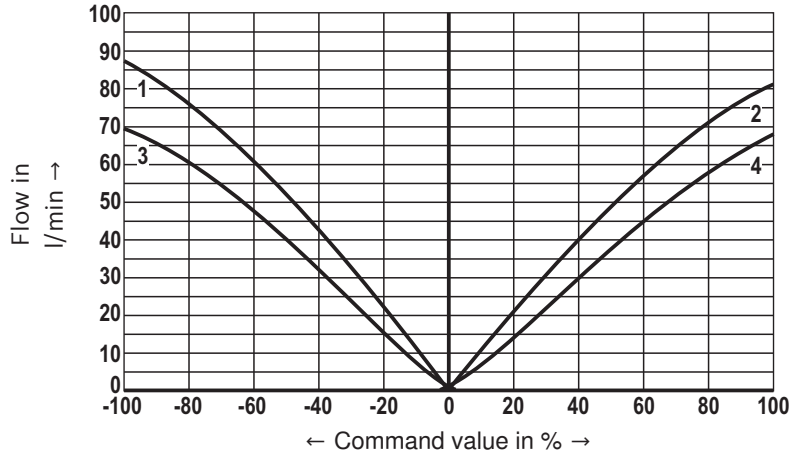


1 P–B; A–T (Symbol E1)
2 P–A; B–T (Symbol E1)
3 P–A; B–T (Symbol E)
4 P–B; A–T (Symbol E)

Symbol EA



Symbol V and V1

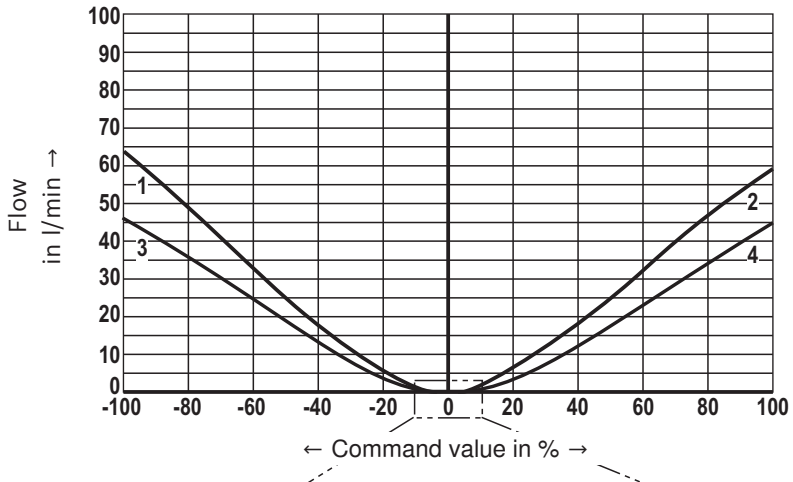


1 P–B; A–T (Symbol V)
2 P–A; B–T (Symbol V)
3 P–B; A–T (Symbol V1)
4 P–A; B–T (Symbol V1)

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

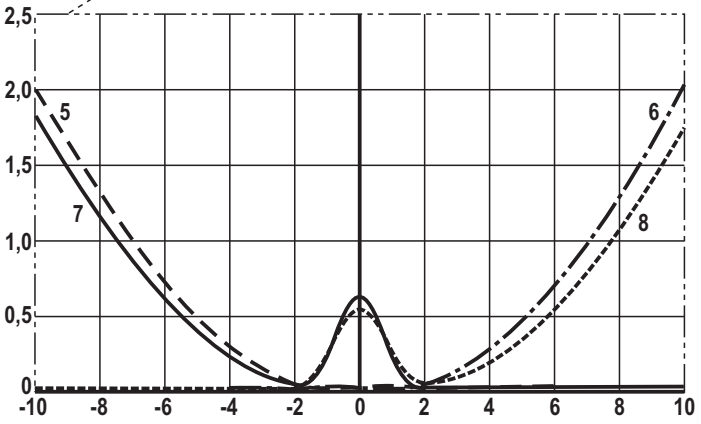
Flow signal function (rated flow 80 l/min at valve pressure differential 10 bar)

Symbol W6 and W8

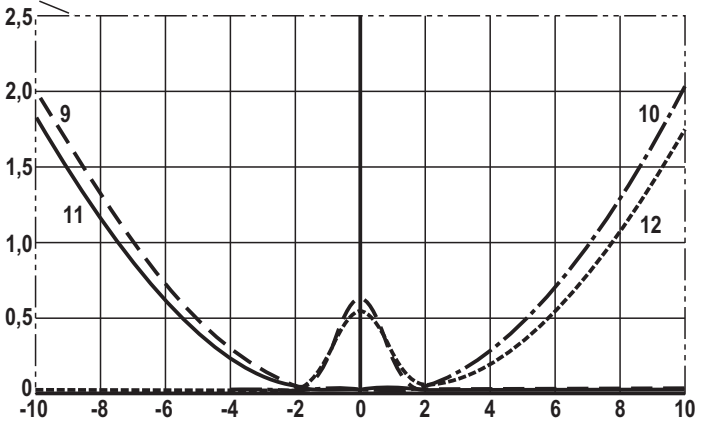


1 P–B; A–T (Symbol W6)
2 P–A; B–T (Symbol W6)
3 P–B; A–T (Symbol W8)
4 P–A; B–T (Symbol W8)

Symbol W6 (individual edges for ***Δp*** = 5 bar)



Symbol W8 (individual edges for ***Δp*** = 5 bar)

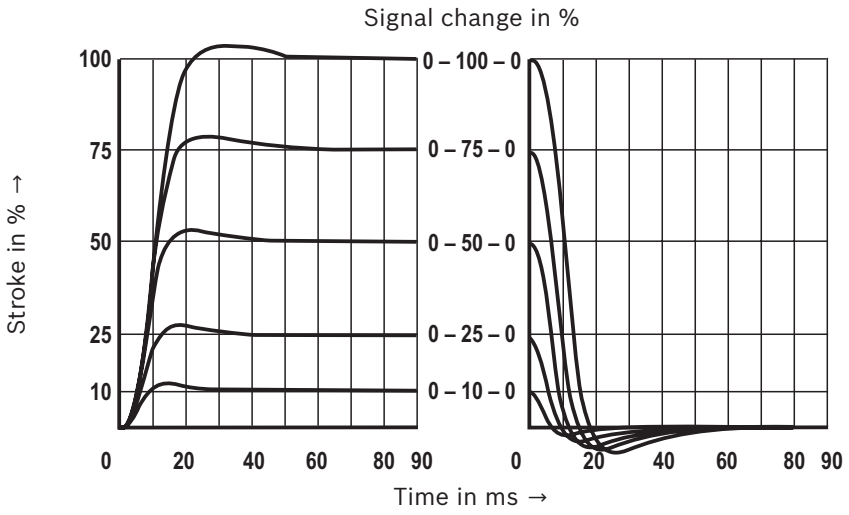


5 P–B (Symbol W6)
6 P–A (Symbol W6)
7 A–T (Symbol W6)
8 B–T (Symbol W6)
9 A–T (Symbol W8)
10 P–A (Symbol W8)
11 P–B (Symbol W8)
12 B–T (Symbol W8)

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

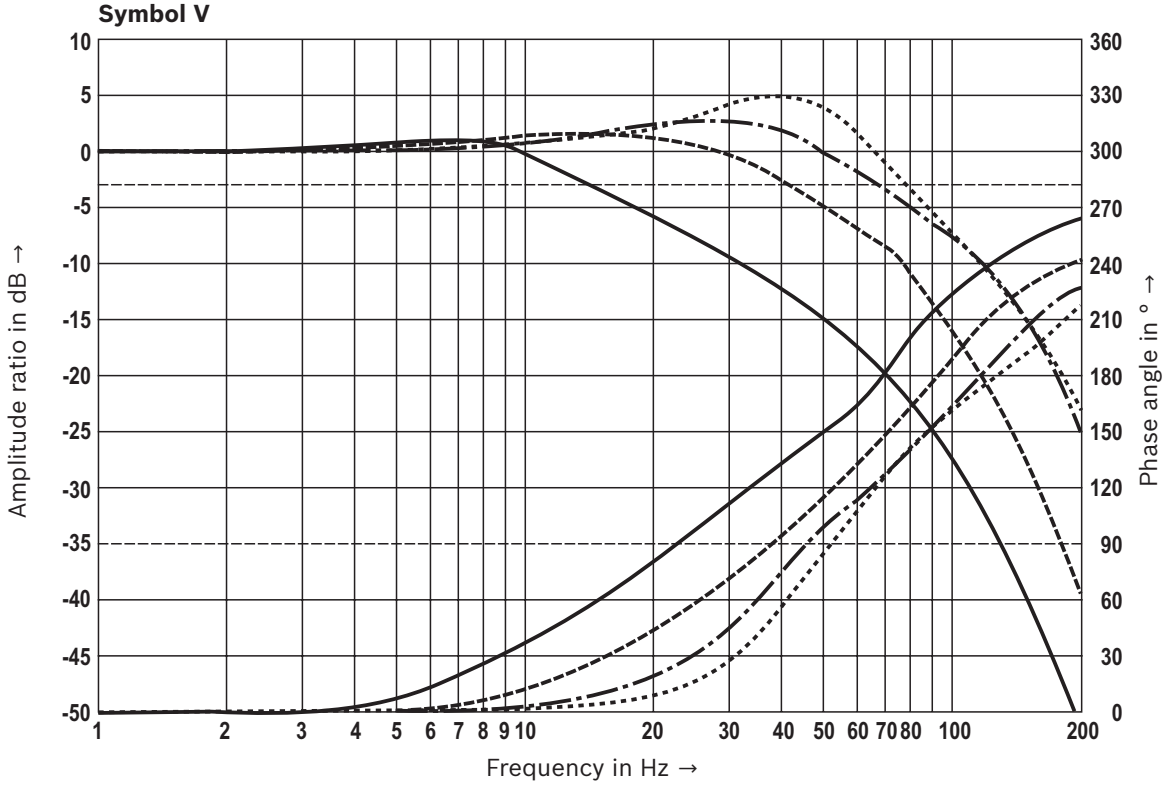
Transition function with stepped electric input signals (4/3-way design)

Symbol V



Frequency response characteristic curves

Symbol V



Signal ±1%

Signal ±5%

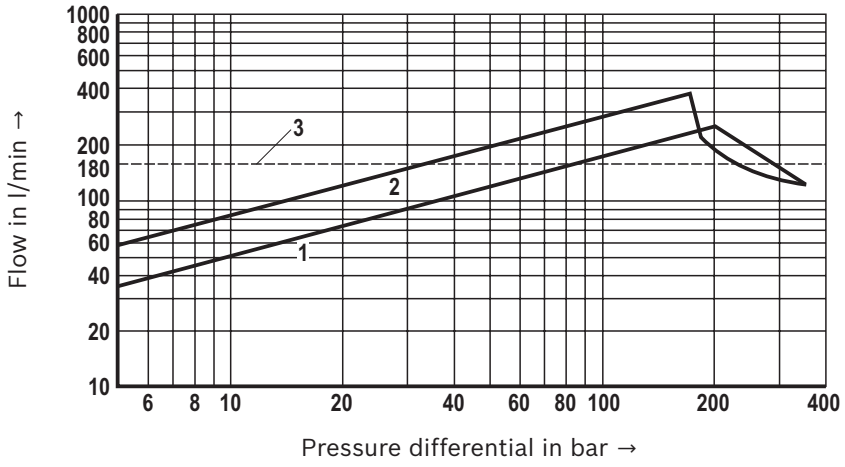
Signal ±25%

Signal ±100%

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

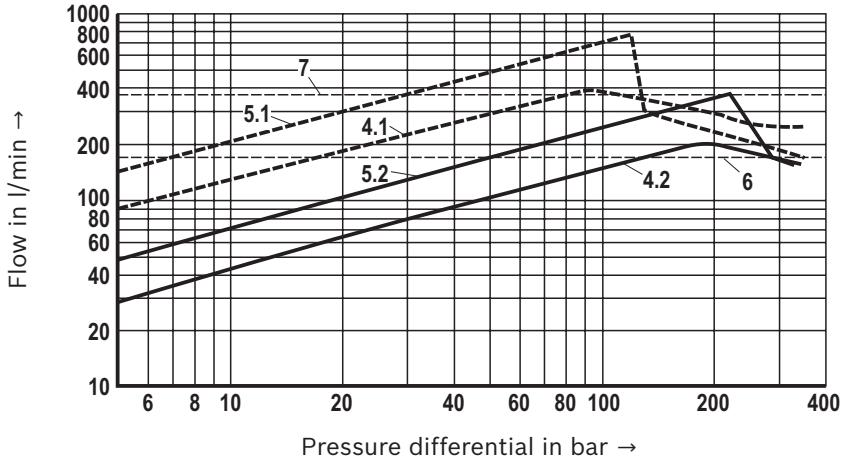
Flow/load function with maximum valve opening (tolerance ±10%) (4/3-way design)

Symbol V



1 50 l/min (summated edge)
2 80 l/min (summated edge)
3 Recommended flow limitation

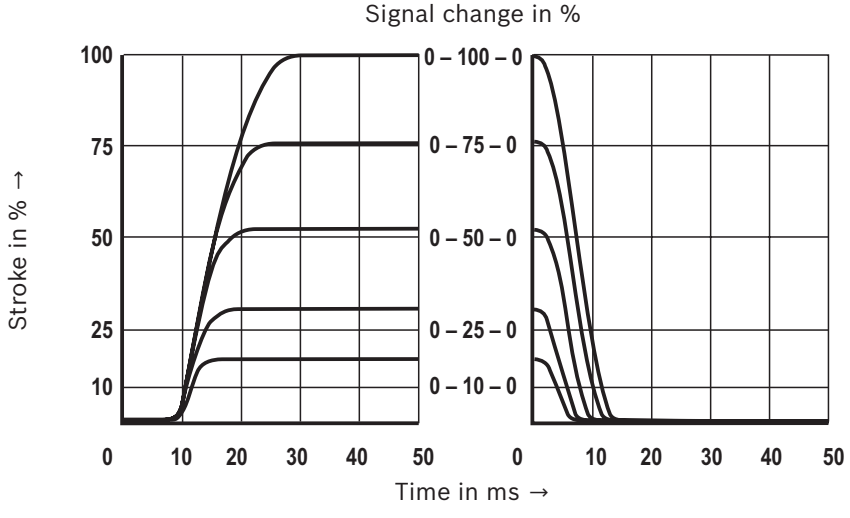
Symbol EA



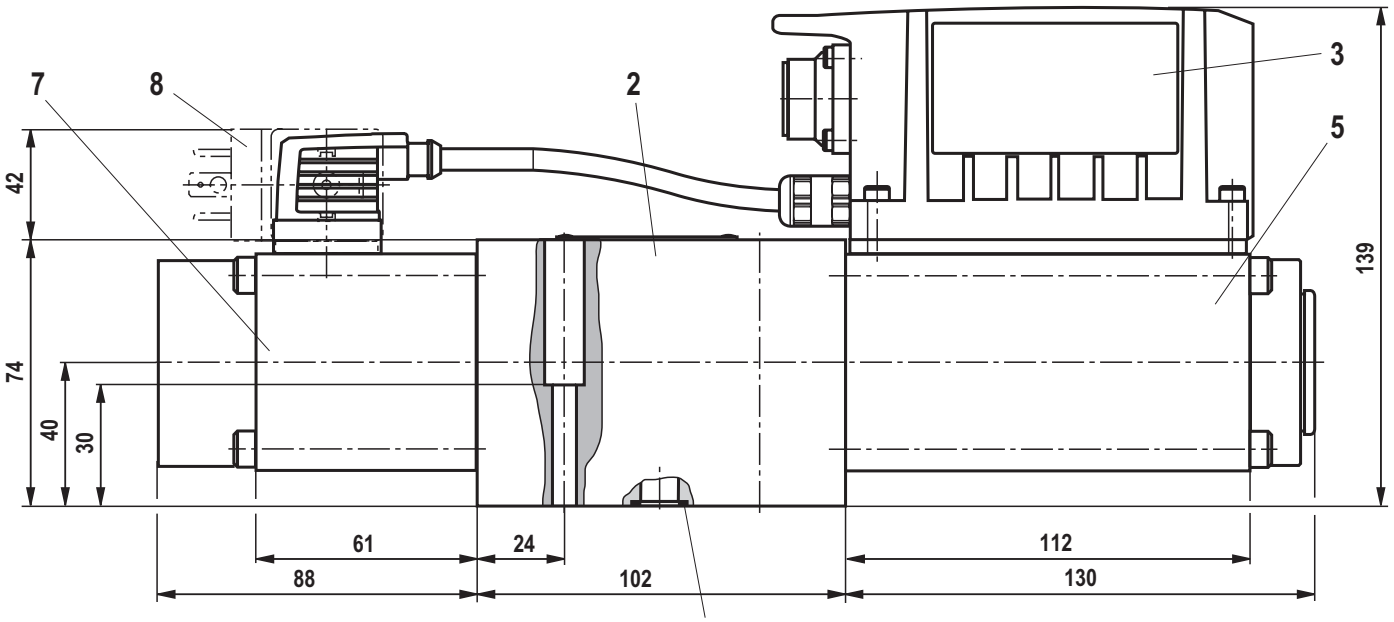
4.1 50 l/min, double flown through (summated edge)
4.2 50 l/min (summated edge)
5.1 80 l/min, double flown through (summated edge)
5.2 80 l/min (summated edge)
6 Recommended flow limitation with individual flow through (180 l/min)
7 Recommended flow limitation with double flow through (360 l/min)

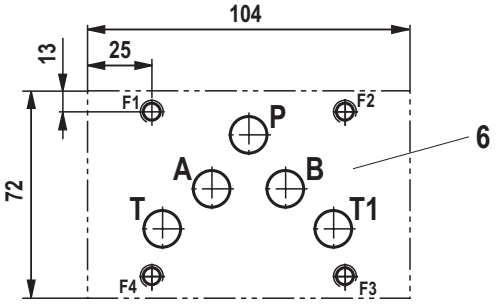
Transition function with stepped electric input signals (4/2-way design)

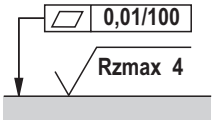
Symbol EA



Dimensions (4/3-way design)
(dimensions in mm)







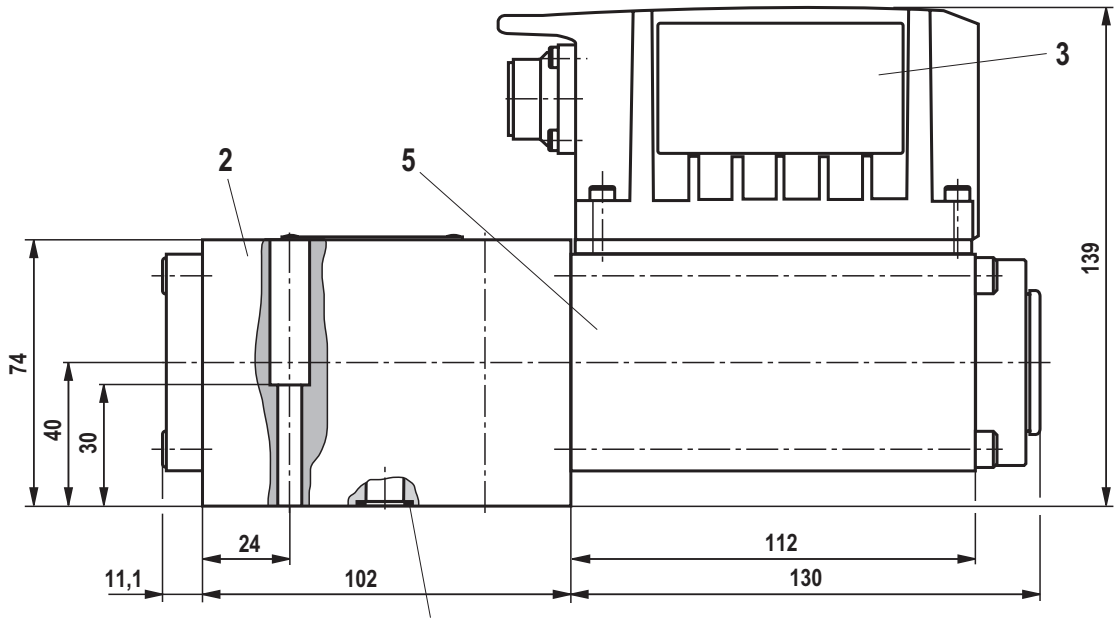
Required surface quality of the valve contact surface

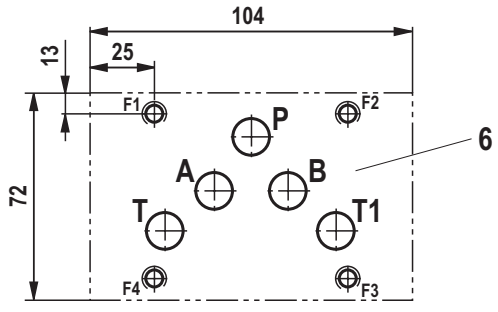
1 Name plate
2 Valve housing
3 Integrated electronics
4 Identical seal rings for ports A, B, P, T, T1
5 Control solenoid with position transducer
6 Machined valve contact surface, porting pattern according to ISO 4401-05-04-0-05
7 Lifting solenoid
8 ISA-Adapter, separate ordering, refer to page 19

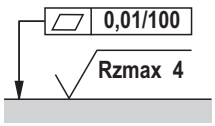
Notices:
- The dimensions are nominal dimensions which are subject to tolerances.
- Mating connectors, separate ordering, refer to page 19 and data sheet 08006.

For valve mounting screws and **subplates,** see page 19.

Dimensions (4/2-way design)
(dimensions in mm)







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

Notices:
- The dimensions are nominal dimensions which are subject to tolerances.
- Mating connectors, separate ordering, refer to page 19 and data sheet 08006.

For valve mounting screws and **subplates,** see page 19.

Dimensions

Valve mounting screws (separate ordering)

4 hexagon socket head cap screws	Material number
ISO 4762 - M6 x 40 - 10.9-flZn-240h-L (Friction coefficient μ_{tot} = 0.09 to 0.14) Tightening torque M_A = 12.5 Nm ±10%	**R913000058**
ISO 4762 - M6 x 40 - 10.9 Tightening torque M_A = 15.5 Nm ±10%	Not in the Rexroth product range

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

Subplates (separate ordering)

Size	Data sheet	Material number
10	45054	–

Accessories (separate ordering)

		Data sheet	Material number
Mating connectors	Round plug according to EN 175201-804, 6-pole + PE as well as 6-pole, 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	–
ISA-Adapter	ISA-Adapter for external deactivation of the second solenoid (tightening torque $M_A = 0.5^{+0.1}$ Nm)	–	**1834484245**

More information

▶ Subplates	Data sheet 45054
▶ Mineral oil-based hydraulic fluids	Data sheet 90220
▶ Environmentally compatible hydraulic fluids	Data sheet 90221
▶ Flame-resistant, water-free hydraulic fluids	Data sheet 90222
▶ Reliability characteristics according to EN ISO 13849	Data sheet 08012
▶ Hexagon socket-head screws metric/UNC	Datasheet 08936
▶ General product information on hydraulic products	Data sheet 07008
▶ 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
▶ Filter range	www.boschrexroth.com/filter

Notes

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