

# Directional control valves, direct operated with electrical position feedback and integrated field bus (IFB Multi-Ethernet)

## Type 4WRPF



H8162+8164

- ▶ Sizes 6 and 10
- ▶ Component series 3X
- ▶ Maximum operating pressure 350 bar
- ▶ Rated flow 8, 18, 32, 50, 80 l/min ( $\Delta p = 5$  bar)



### Features

- ▶ Open
  - Integrated fieldbus (IFB Multi-Ethernet)
  - Bus connection/service interface (Sercos, Ether-CAT, EtherNet/IP, PROFINET RT, VARAN)
- ▶ Scalable
  - External (input 0 ... 10 V) or integrated pressure sensors
- ▶ Safe
  - Internal safety function (can be used up to category 4/PL e according to EN 13849-1)
  - CE conformity according to EMC Directive 2014/30/EU

### Contents

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**Ordering code**

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
<b>4</b>	<b>WRP</b>	<b>F</b>				<b>S</b>		<b>-</b>	<b>3X</b>	<b>/</b>		<b>/</b>	<b>24</b>		<b>D9</b>	<b>*</b>

01	4 main ports	<b>4</b>
02	Directional control valve, direct operated	<b>WRP</b>
03	With integrated fieldbus	<b>F</b>
04	Size 6	<b>6</b>
	Size 10	<b>10</b>
05	Symbols; possible version see page 3	

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

06	<b>- Size 6</b>	
	8 l/min (only symbols E, V and W)	<b>8</b>
	18 l/min (only symbols E, E1-, V, V1-, W and W1-)	<b>18</b>
	32 l/min	<b>32 <math>\diamond</math></b>
	<b>- Size 10</b>	
	50 l/min (only symbols E, E1-, V and W6-)	<b>50</b>
	80 l/min	<b>80 <math>\diamond</math></b>

**Flow characteristic**

07	Progressive	<b>S</b>
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**Overlap jump**

08	Without	<b>no code</b>
	With (opening point 5% command value with symbols E, E1-, W, W1-, W6- and W8-)	<b>J</b>
09	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions)	<b>3X</b>

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

10	NBR seals	<b>M <math>\diamond</math></b>
	FKM seals	<b>V</b>

**Pressure sensor** (pressure rating)

11	Without pressure rating	<b>0</b>
	Pressure rating 280 bar	<b>G</b>

**Internal pressure sensor** (position)

12	Without internal pressure sensors	<b>0</b>
	In port A	<b>A</b>
	In port B	<b>B</b>
	In ports A and B	<b>C</b>
13	Supply voltage 24 V	<b>24</b>

**Ethernet interface**

14	EtherNET/IP	<b>E</b>
	PROFINET RT	<b>N</b>
	Sercos	<b>S</b>
	EtherCAT (CANopen profile)	<b>T</b>
	VARAN	<b>V</b>

### Ordering code

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
4	WRP	F				S	-	3X	/			/	24		D9	*

#### Connector

15	Voltage supply, enable acknowledgment	D9
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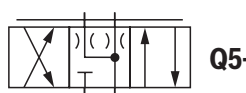
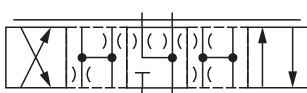
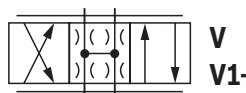
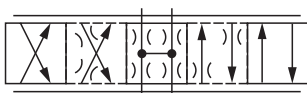
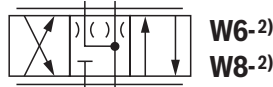
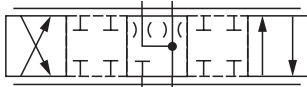
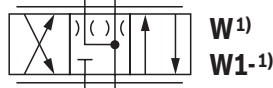
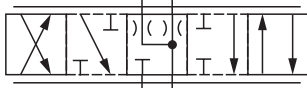
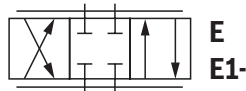
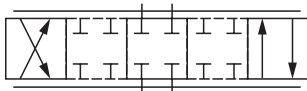
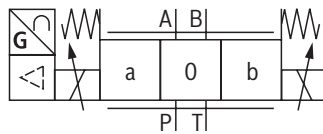
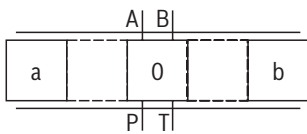
#### Pressure sensor interface

16	Without interface	0
	Analog, a maximum of 3 external pressure sensors (0 ... 10 VDC)	5 <sup>1)</sup>
17	Further details in the plain text	*

<sup>1)</sup> Only with version "0" at positions 11 and 12

**Notice:**  $\diamond$  = Preferred type

### Symbols



#### With symbols E1-, V1-, W1- and W8-:

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

<sup>1)</sup> Only size 6  
<sup>2)</sup> Only size 10

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

## Function

### General

The **IFB Multi-Ethernet** valve (Integrated **F**ield**b**us) is a digital directional control valve with integrated fieldbus.

The following operating modes are possible:

- ▶ Standard:
  - Valve direct control
  - Flow control
- ▶ With external (version "00..D95") or internal pressure sensors:
  - Pressure/force control
  - Active damping
  - Alternating control (flow – pressure/force); pQ function (flow-controlled)

Communication is done via the digital Multi-Ethernet interface (X7E1 or X7E2) only. The following data may be exchanged:

- ▶ Command values
- ▶ Actual values
- ▶ Configuration and setting of the system control parameters
- ▶ Status messages, faults or warnings

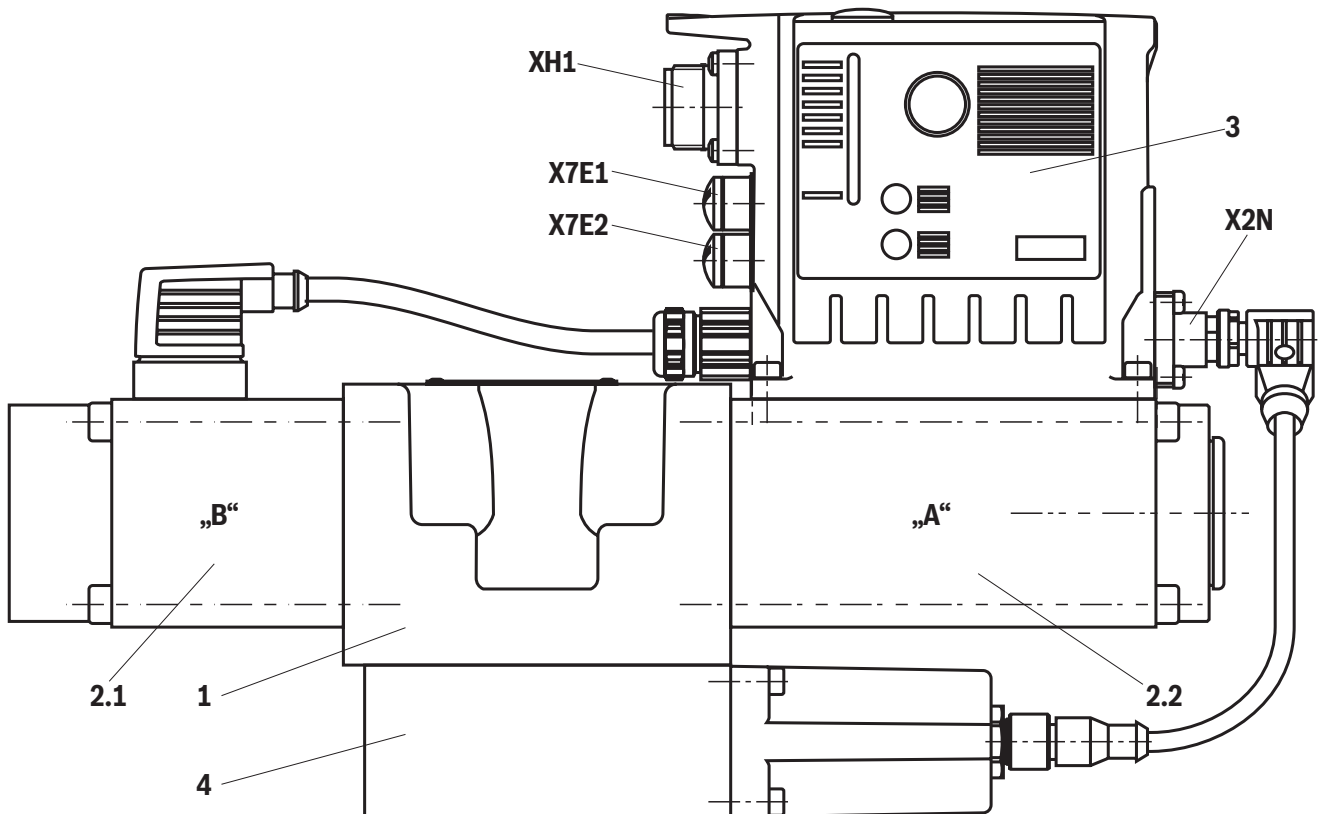
### Set-up

The directional control valve with IFB Multi-Ethernet electronics mainly consists of:

- ▶ Main housing with control spool (1)
- ▶ Control electronics with integrated fieldbus (3)
  - Connector, voltage supply, safety shut-down (XH1)
  - Ethernet interfaces (X7E1, X7E2)
  - Analog sensor interfaces (X2N), optional
- ▶ Pressure sensor sandwich plate (4), optional
- ▶ Stroke solenoid (2.1)
- ▶ Control solenoid with electrical position feedback (2.2)

#### Notice:

With version "V32", the control spool may rotate in case of single-sided flow through the supply flow edges (P–A or P–B) causing damage to or failure of the valve. This can be solved by reduction of the pressure differential over the supply flow edge to a maximum of 80 bar or by simultaneous use of both control edges (P–A/B–T or P–B/A–T).



## Function

The integrated electronics (OBE) compares the specified command value to the position actual value. In case of control deviations, the relevant solenoid (2) will be activated and will compensate the COMMAND/ACTUAL difference by changing the solenoid force. Stroke/control spool cross-section is regulated proportionally to the command value. In case of a command value presetting of "0", the electronics adjust the control spool (1) to central position (zero flow).

### Safety function

Thanks to the two control solenoids (enable pin D and E, low signal) at the connector (XH1), direction-dependent shut-off is enabled. The control spool of the valve is in spring-centered central position for this purpose (fail-safe position).

Enable acknowledgment pin C for solenoid A and pin F for solenoid B are "high". By connecting both control solenoids (enable pin D and E, high signal), the valve can be controlled by a command value presetting (command value positive, solenoid B or command value negative, solenoid A).

Enable acknowledgment pin C for solenoid A and pin F for solenoid B are "low".

Separate shut-off of solenoid A or solenoid B will moreover allow for the direction-dependent activation or shut-off of the drive.

The integrated electronics (OBE) of the valve enable additional shut-off of a channel according to EN 13849-1 in both directions (depending on the symbol, the valve can be considered as safely switched off). For this purpose, a suitable control system must be provided to perform the plausibility check between the direction-dependent valve signals "enable input" and "enable acknowledgment" (diagnosis signal fed back by the valve) and react in an error case.

When using symbol V, the valve cannot be used in a safety-relevant manner according to EN 13849-1.

### Monitoring

The digital control electronics enable comprehensive monitoring functions/error detection including:

- ▶ Undervoltage
- ▶ Communication error
- ▶ Cable break for analog sensor inputs
- ▶ Monitoring of the microcontroller (watchdog)
- ▶ Temperature of the integrated electronics

### IndraWorks DS PC program

To implement the project planning task and to parameterize the valve, the user may use the IndraWorks DS engineering tool (see accessories):

- ▶ Project planning
- ▶ Parameterization
- ▶ Commissioning
- ▶ Diagnosis
- ▶ Comfortable administration of all data on a PC
- ▶ PC operating systems: Windows 7-10

### Notes:

- ▶ When using symbol V, V1-, the enable inputs (enable pin D and E) may only be activated and deactivated together.
- ▶ For all other symbols, a unilateral shut-off will cause reduced performance data.
- ▶ 4/3 directional control valves do not have a leakage-free basic locking when deactivated. Leakage must be considered when designing the drive.
- ▶ Valve type 4WRPF can be used as shut-off element cat. 3 or 4 (up to PL e according to EN 13849-1) (not symbol V and V1-). For both categories, an additional shut-off element is required to achieve a two-channel shut-off. For further information on the safety application, see operating instructions 29391-B.

**Technical data**

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

General			
Size	NG	6	10
Type of connection	Subplate mounting		
Porting pattern	ISO 4401-03-02-0-05		ISO 4401-05-04-0-05
Weight	▶ Without pressure sensor sandwich plate	kg	3.9
	▶ With pressure sensor sandwich plate	kg	4.7
Installation position	any		
Ambient temperature range	°C	-20 ... +60	
Storage temperature range	°C	+5 ... +40	
Maximum storage time	years	1 (if the storage conditions are observed, refer to the operating instructions 07600-B)	
Maximum relative humidity (no condensation)	%	95	
Maximum 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)	
Can be used up to category according to EN ISO 13849-1	3 or 4 (up to PL e); as shut-off element (not symbol V and V1-)		
Vibration resistance	▶ Sine test according to DIN EN 60068-2-6	10 ... 2000 Hz/maximum of 10 g/10 cycles/3 axes	
	▶ Noise test according to DIN EN 60068-2-64	20 ... 2000 Hz / 10 g <sub>RMS</sub> / 30 g peak / 30 min. / 3 axes	
	▶ Transport shock according to DIN EN 60068-2-27	15 g / 11 ms / 3 shocks / 3 axes	
Conformity	▶ CE according to EMC directive 2014/30/EU, tested according to	EN 61000-6-2 and EN 61000-6-3	
	▶ RoHS directive	2011/65/EU <sup>1)</sup>	
Protection class according to EN 60529	IP65 (if suitable and correctly mounted mating connectors are used)		

Hydraulic			
Size	NG	6	10
Maximum operating pressure	▶ Ports A, B, P	bar	350
	▶ Port T	bar	200
Hydraulic fluid	see table page 7		
Hydraulic fluid temperature range (flown-through)	°C	-20 ... +70	
Viscosity range	▶ recommended	mm <sup>2</sup> /s	20 ... 100
	▶ maximum admissible	mm <sup>2</sup> /s	10 ... 800
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)	Class 18/16/13 <sup>2)</sup>		
Rated flow ( $\Delta p = 5$ bar/control edge <sup>3)</sup> )	l/min	8	18
		32	50
			80

- 1) The product fulfills the substance requirements of the RoHS directive 2011/65/EU.
- 2) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
- 3) Flow for deviating  $\Delta p$  (per control edge):

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

**Notice:**

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

## 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	ISO 15380	90221
		HEES		
	▶ Soluble in water	HEPG	ISO 15380	
Flame-resistant	▶ Water-free	HFDU (glycol base)	ISO 12922	90222
		HFDU (ester base)		
		HFDR		
	▶ Containing water	HFC (Fuchs: Hydrotherm 46M, Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	ISO 12922	90223



### Important information on hydraulic fluids:

- ▶ For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- ▶ There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- ▶ The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.
- ▶ **Bio-degradable and flame-resistant – containing water:** If components with galvanic zinc coating (e.g. version "J3" or "J5") or parts containing zinc are used, small amounts of dissolved zinc may get into the hydraulic system and cause accelerated aging of the hydraulic fluid. Zinc soap may form as a chemical reaction product, which may clog filters, nozzles and solenoid valves – particularly in connection with local heat input.

### ▶ Flame-resistant – containing water:

- Due to the increased cavitation tendency with HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30% as compared to the use with mineral oil HLP. In order to reduce the cavitation effect, it is recommended – if possible specific to the installation – backing up the return flow pressure in ports T to approx. 20% of the pressure differential at the component.
- Dependent on the hydraulic fluid used, the maximum ambient and hydraulic fluid temperature must not exceed 50 °C. In order to reduce the heat input into the component, the command value profile is to be adjusted for proportional and high-response valves.

Static /dynamic		
Hysteresis	%	< 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 < 0.25
Pressure drift	%/100 bar	Zero shift < 0.2
Zero point calibration	%	±1 (ex works)

**Technical data**

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

<b>Electrical, integrated electronics (OBE)</b>			
Size		NG	6                      10
Supply voltage <sup>4)</sup>	▶ Nominal voltage	VDC	24
	▶ Minimum	VDC	18
	▶ Maximum	VDC	36
	▶ Maximum residual ripple	V <sub>pp</sub>	2.5 (comply with the absolute supply voltage limit values)
Current consumption (at nominal voltage)	▶ Maximum <sup>5)</sup>	A	2.5                      2.8
	▶ Impulse current	A	4
Maximum power consumption		W	40                      65
Relative duty cycle		%	100 (continuous operation)
Fuse protection, external		A	4, time-lag
Functional ground and screening			see connector pin assignment (CE-compliant installation) page 10
Booting time		s	<15
Switching input Enable XH1	▶ Quantity		1
	▶ Low level	V	-3 ... 5
	▶ High level	V	15 ... <b>U<sub>B</sub></b>
	▶ Maximum current consumption at high level	mA	<15
Switching output Enable acknowledgment XH1 <sup>6)</sup>	▶ Quantity		1
	▶ Low level	V	0 ... 3
	▶ High level	V	15 ... <b>U<sub>B</sub></b>
	▶ Current carrying capacity	mA	50 (short-circuit-proof)
Analog sensors X2N	▶ Quantity		3 (version "5")
	▶ Supply voltage	V	24
	▶ Maximum supply current	mA	50
	▶ Voltage inputs		
	- Measurement range	V	0 ... 10
- Input resistance	kΩ	100 +10%	

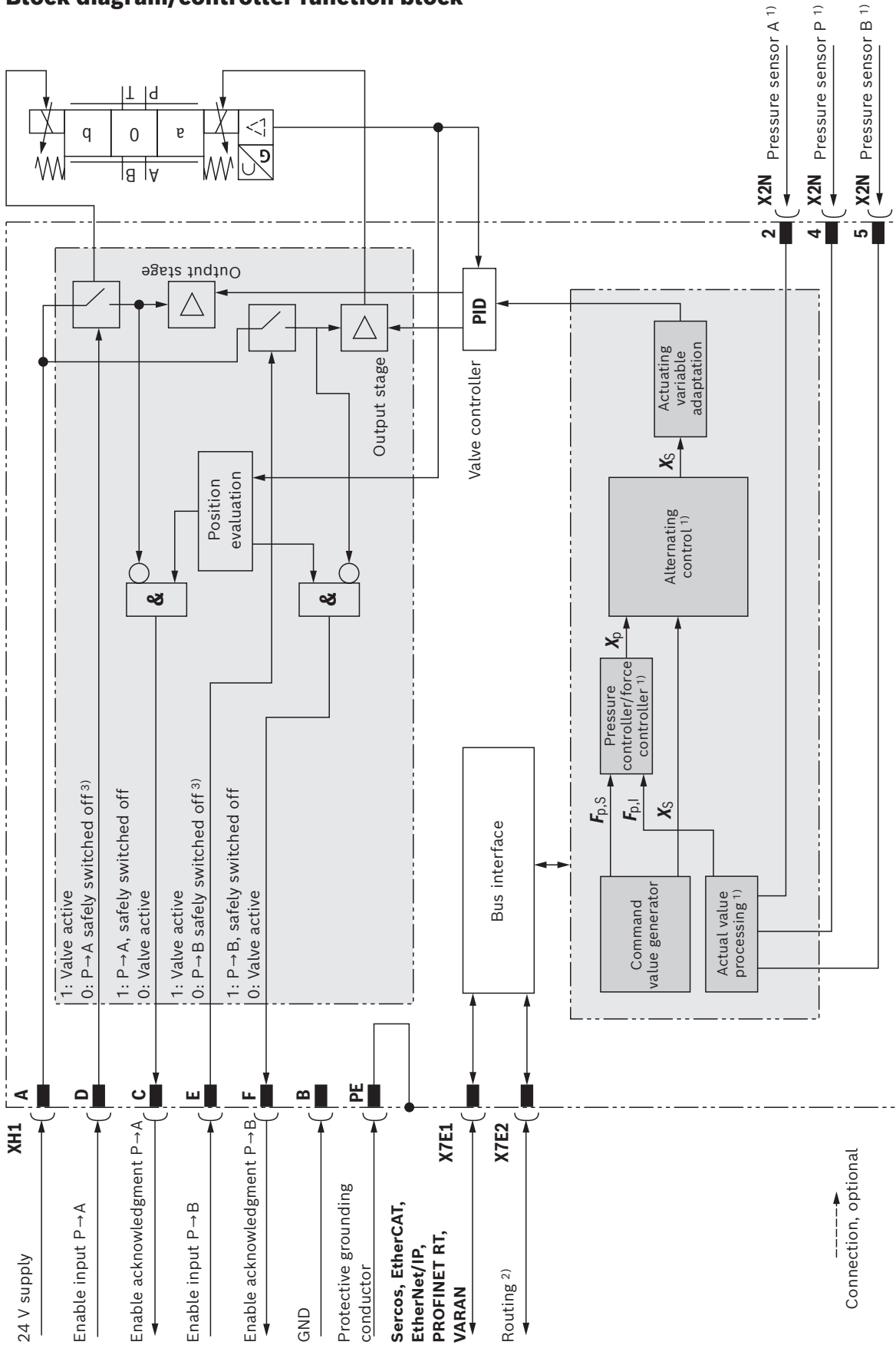
4) Voltage limit values must be observed directly at the connector of the valve (observe line length and cable cross-section!)

5) When using the sensor inputs or the switching output, the maximum current consumption will increase according to the external load

6) The enable acknowledgment outputs must always be loaded with current-consuming switching inputs.



### Block diagram/controller function block



1) Only with version "5"  
 2) Not with "VARAN"  
 3) Safe deactivation with simultaneous use of enable acknowledgment

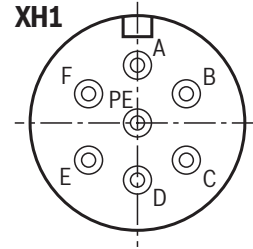
## Electrical connections, assignment

### Connector pin assignment XH1, 6-pole + PE according to DIN 43563

Pin	Assignment of interface D9
A	24 VDC supply voltage <sup>1)</sup>
B	GND
C	Enable acknowledgment 24 VDC ( $I_{\max} = 50 \text{ mA}$ ) <sup>2)</sup> (high $\geq 15 \text{ V}$ ; low $< 2 \text{ V}$ ); Flow from P→A
D	Enable input 24 VDC (high $\geq 15 \text{ V}$ ; low $< 2 \text{ V}$ ); Flow from P→A
E	Enable input 24 VDC (high $\geq 15 \text{ V}$ ; low $< 2 \text{ V}$ ); Flow from P→B
F	Enable acknowledgment 24 VDC ( $I_{\max} = 50 \text{ mA}$ ) <sup>2)</sup> (high $> 15 \text{ V}$ ; low $< 2 \text{ V}$ ); Flow from P→B
PE	Functional ground (connected directly to metal housing)

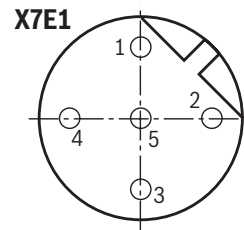
1) A load increases the current consumption on pin A

2) Enable acknowledgment is issued only if the valve has safely switched off according to EN 13849-1, see operating instructions 29391-B.



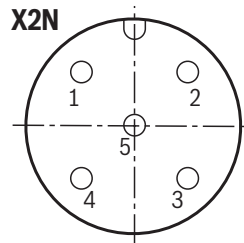
### Connector pin assignment for Ethernet interfaces "X7E1" and "X7E2" (coding D), M12, 4-pole, socket

Pin	Assignment
1	TxD +
2	RxD +
3	TxD -
4	RxD -
5	Not used



### Analog configurable sensor interface, port "X2N" (coding A), M12, 5-pole, socket

Pin	Assignment
1	+24 V voltage output
2	Analog sensor input 2 (0 ... 10 V)
3	GND
4	Analog sensor input 4 (0 ... 10 V)
5	Analog sensor input 3 (0 ... 10 V)



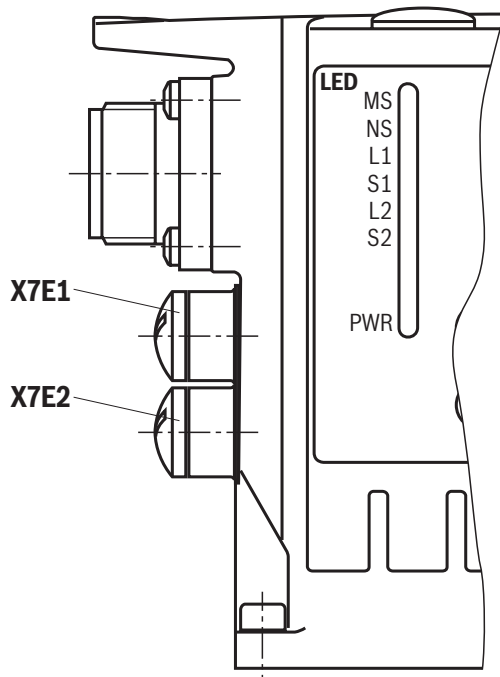
Only with version "5"

#### Notes:

- ▶ Reference potential for all signals: GND
- ▶ We recommend connecting the shields on both sides via the metal housings of the plug-in connectors.
- ▶ Using connector pins will affect the effectiveness of the shielding effect. Internal screens are not required.

## LED displays

LED	Interface	Sercos	EtherNET/IP	EtherCAT	PROFINET RT	VARAN
MS	Electronics module	Module status	Module status	Module status	Module status	Module status
NS		S	Network status and others	Network status and others	Network status and others	Network status and others
L1	X7E1	Link and others	Link and others	Link/activity	Link and others	Link and others
S1		Activity and others	Activity and others	not used	Activity and others	Active and others
L2	X7E2	Link and others	Link and others	Link/activity	Link and others	not used
S2		Activity and others	Activity and others	not used	Activity and others	not used
PWR	XH1	Power	Power	Power	Power	Power



### Displays of the status LEDs

Power LED (LED PWR)	Display status
Off	No voltage supply
Green	Operation

Module status LED (LED MS)	Display status
Off	No voltage supply
Green-red, flashing	Initialization
Green, flashing	Drive ready for operation
Green	Drive active
Orange, flashing	Warning
Red, flashing	Error
Green, rapidly flashing	Firmware must be loaded

Link LED (LED L1)	Display status
Permanently lit	Cable plugged in, connection established

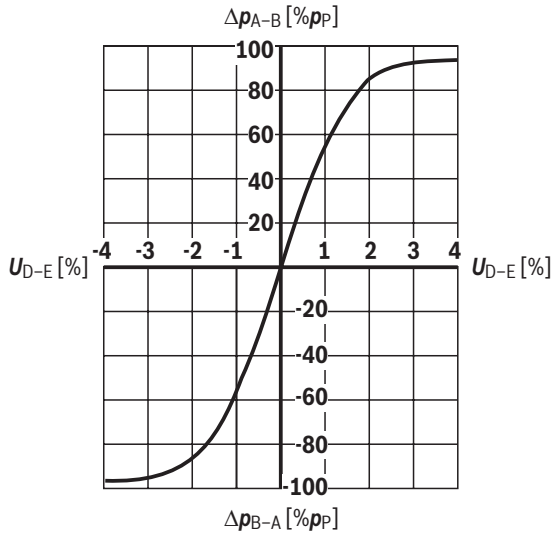
Activity LED (LED S1)	Display status
Flashing	Data sent/received

#### Notes:

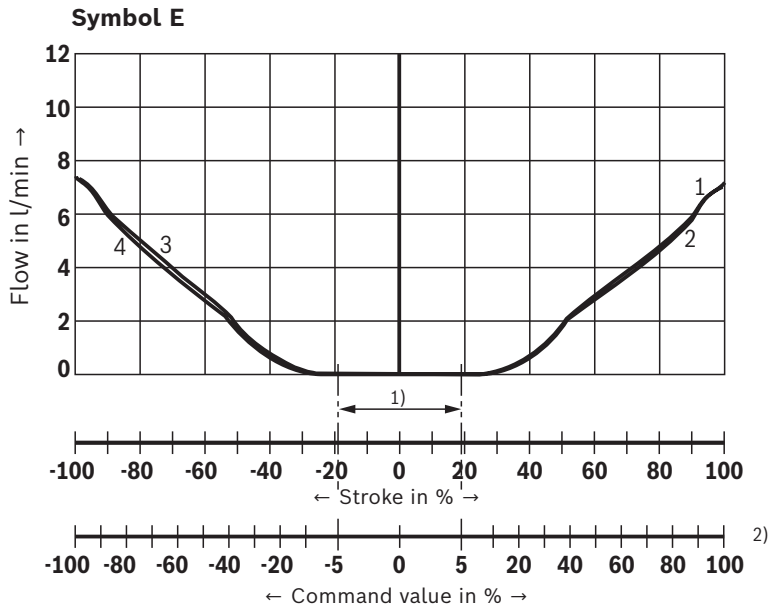
- ▶ For the connection to the M12 sockets, we recommend using self-locking mating connectors
- ▶ The MS module status LED relates to the electronics module
- ▶ The NS network status LED indicates the status of the control communication, see application description 30338-FK
- ▶ LEDs L1, S1, L2 and S2 relate to interfaces "X7E1" and "X7E2"
- ▶ For a detailed description of the diagnosis LEDs, please refer to the functional description Rexroth HydraulicDrive HDx.
- ▶ Function is only available after start-up of the electronics.

**Characteristic curves:** Size 6  
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ } ^\circ\text{C}$ )

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



**Flow/signal function (rated flow 8 l/min with  $\Delta p = 5 \text{ bar/control edge}$ )**

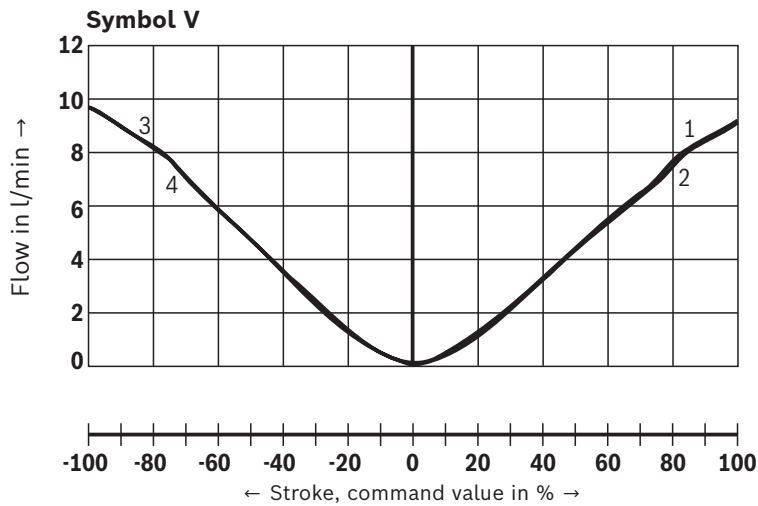
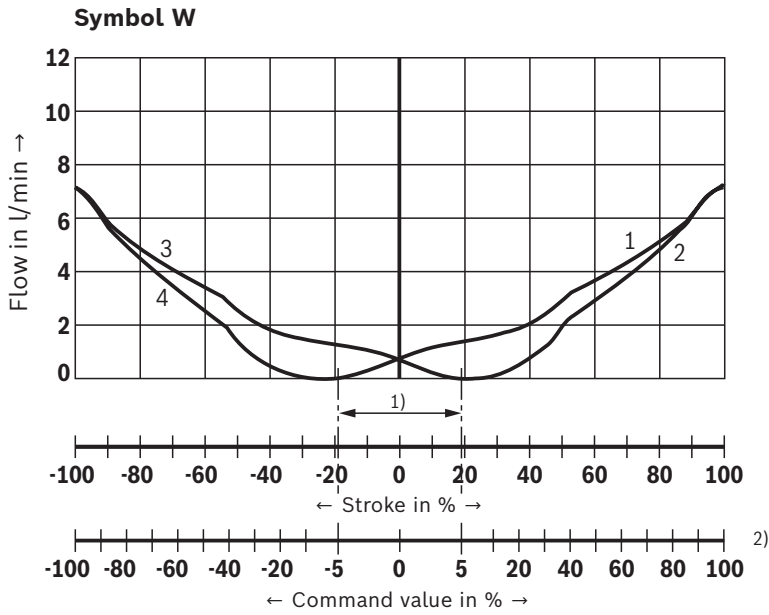


- 1 P-A
  - 2 B-T
  - 3 P-B
  - 4 A-T
- 1) Step compensation  
2) Version "J"

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

**Characteristic curves: Size 6**  
 (measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ } ^\circ\text{C}$ )

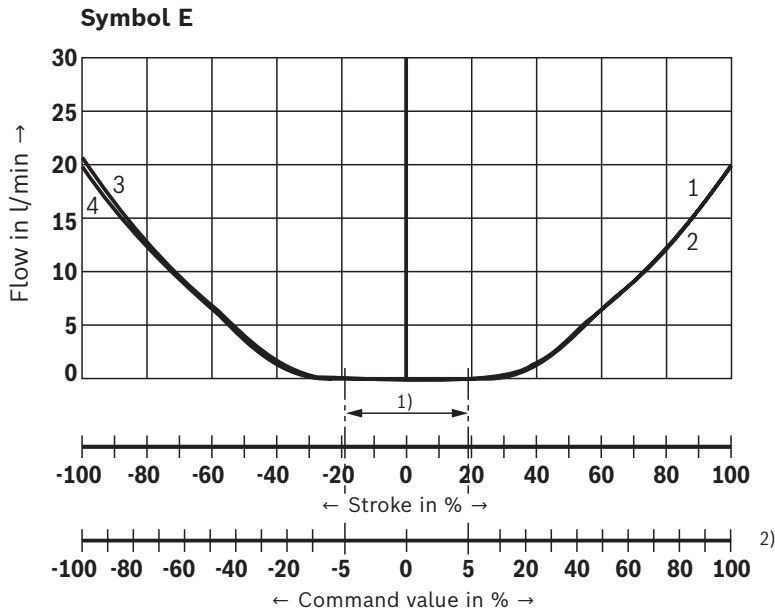
**Flow/signal function** (rated flow 8 l/min with  $\Delta p = 5 \text{ bar/control edge}$ )



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

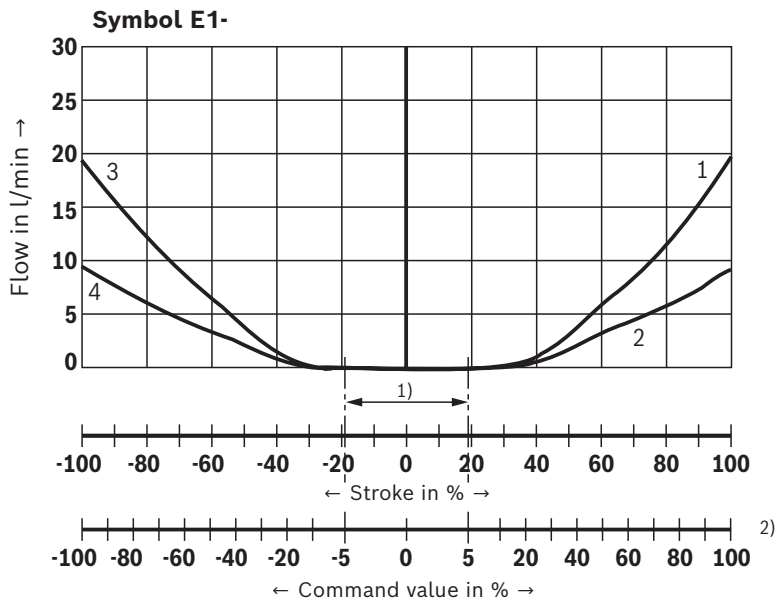
**Characteristic curves: Size 6**  
 (measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

**Flow/signal function** (rated flow 18 l/min with  $\Delta p = 5 \text{ bar/control edge}$ )



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

- 1) Step compensation
- 2) Version "J"



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

- 1) Step compensation
- 2) Version "J"

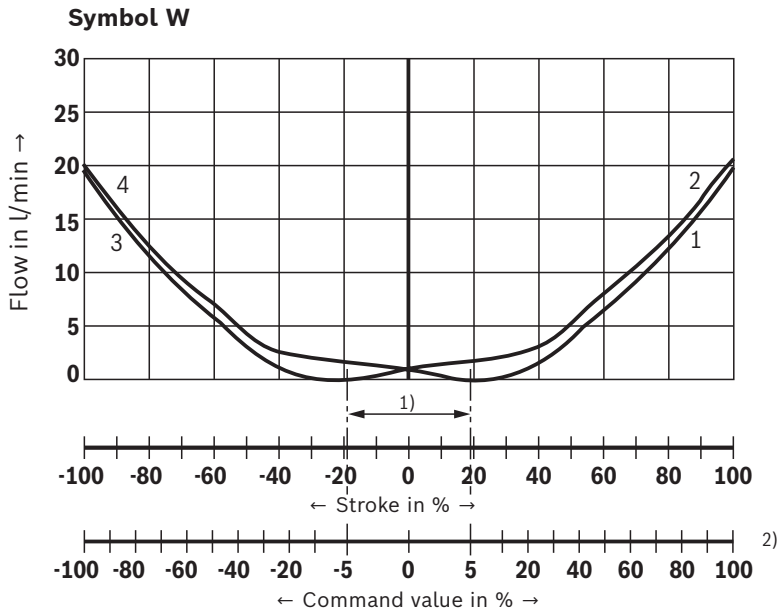


**Notice:**

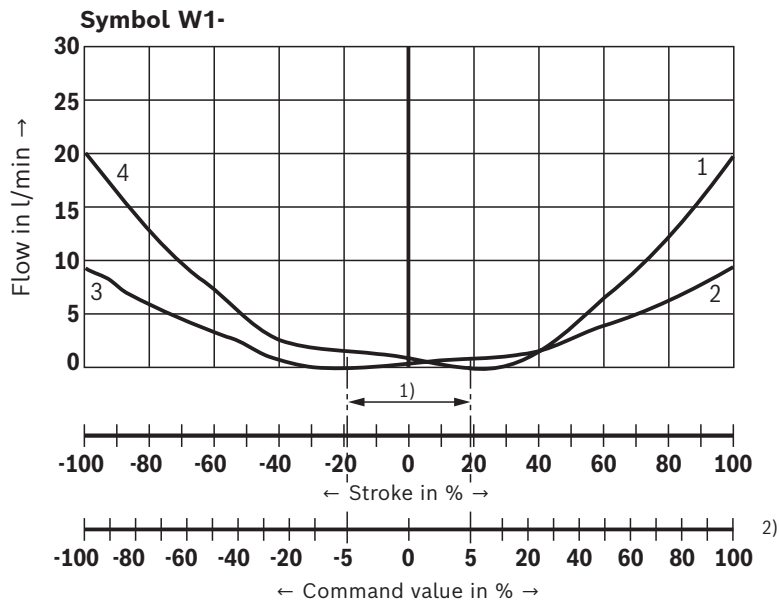
Typical characteristic curves which are subject to tolerance variations.

**Characteristic curves: Size 6**  
 (measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

**Flow/signal function** (rated flow 18 l/min with  $\Delta p = 5 \text{ bar/control edge}$ )



- 1 P-A
  - 2 B-T
  - 3 P-B
  - 4 A-T
- 1) Step compensation  
 2) Version "J"



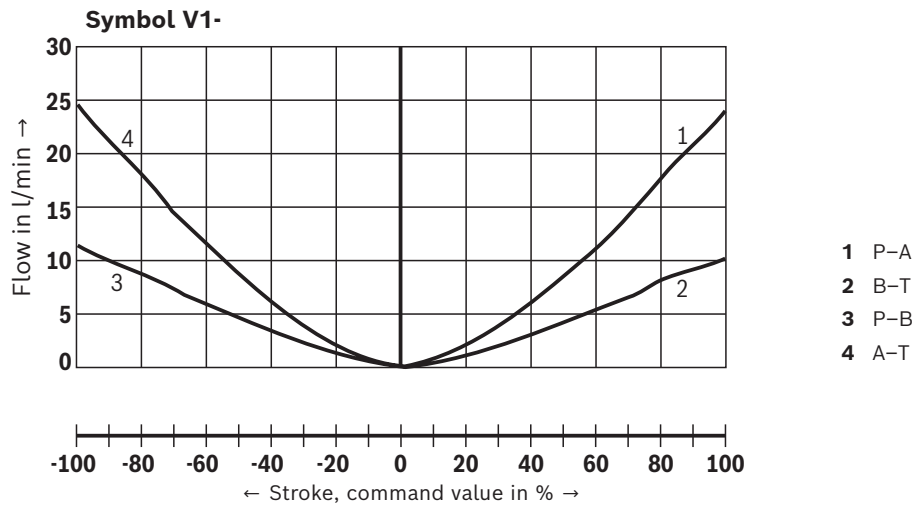
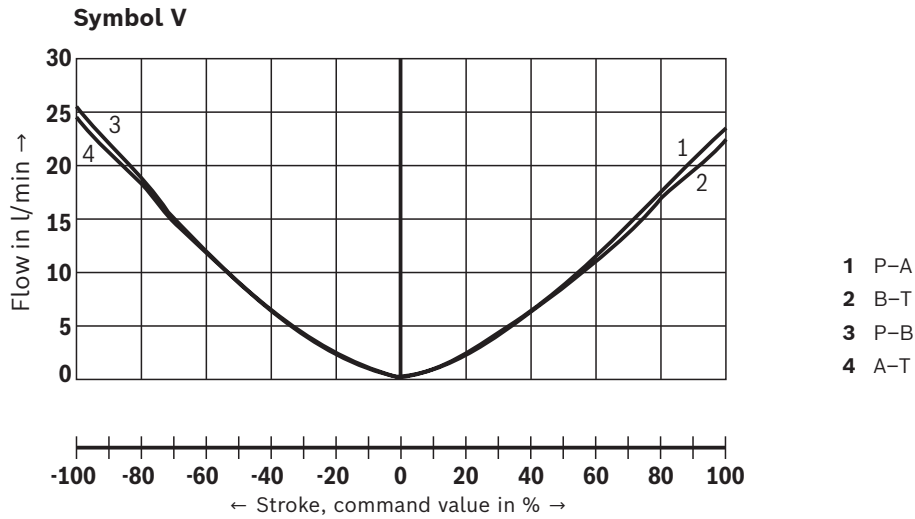
- 1 P-A
  - 2 B-T
  - 3 P-B
  - 4 A-T
- 1) Step compensation  
 2) Version "J"

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

**Characteristic curves: Size 6**

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

**Flow/signal function** (rated flow 18 l/min with  $\Delta p = 5 \text{ bar/control edge}$ )



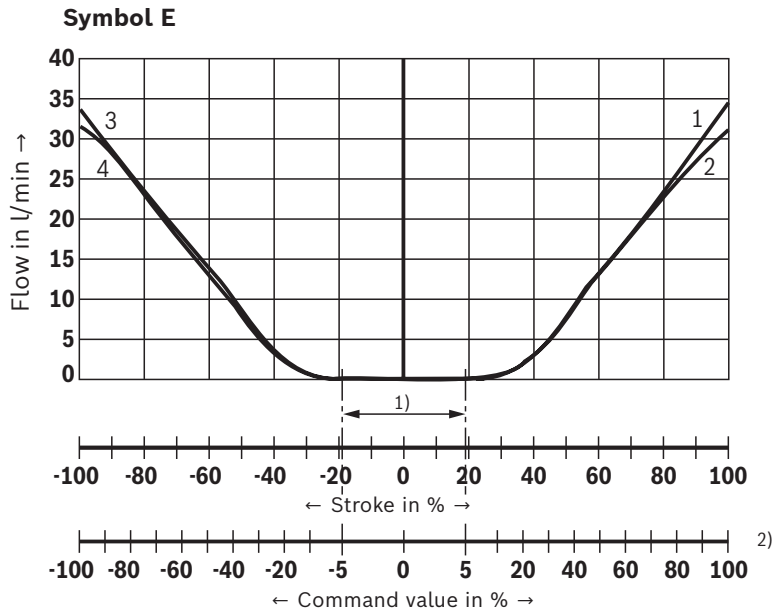
**Notice:**

Typical characteristic curves which are subject to tolerance variations.

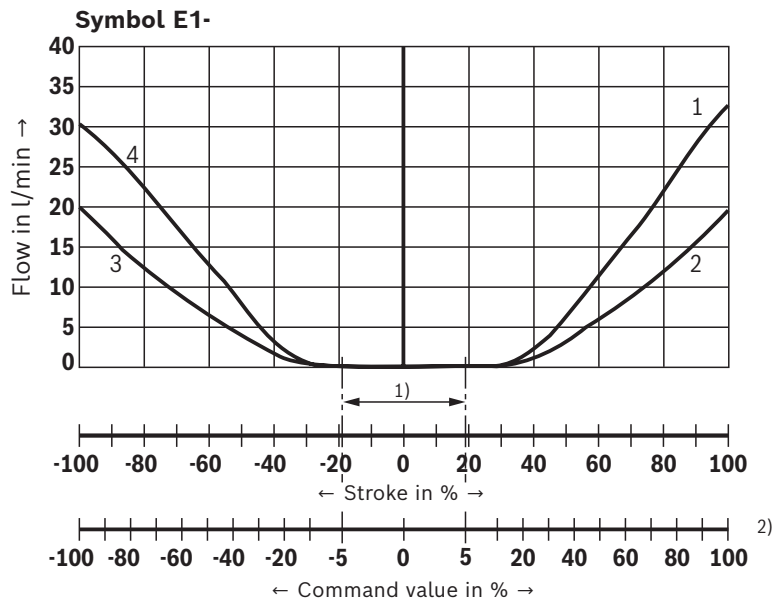


**Characteristic curves: Size 6**  
 (measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

**Flow/signal function** (rated flow 32 l/min with  $\Delta p = 5 \text{ bar/control edge}$ )



- 1 P-A
  - 2 B-T
  - 3 P-B
  - 4 A-T
- 1) Step compensation  
 2) Version "J"

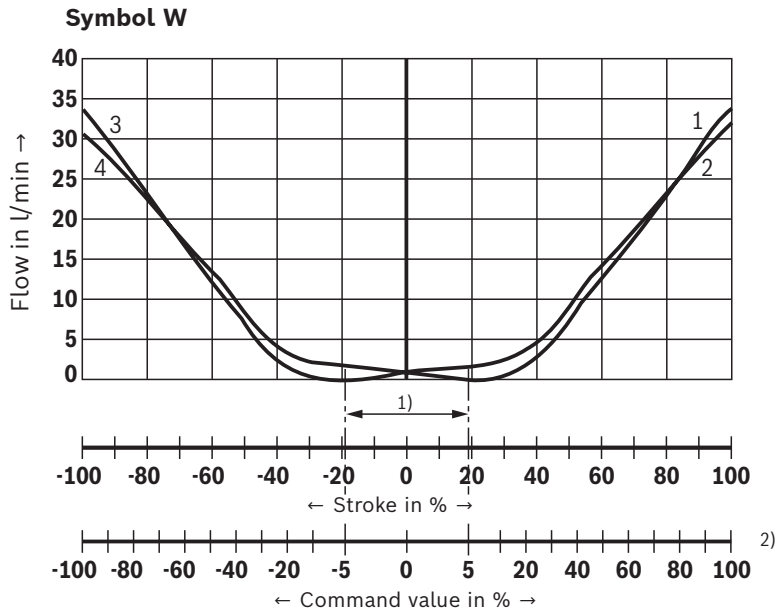


- 1 P-A
  - 2 B-T
  - 3 P-B
  - 4 A-T
- 1) Step compensation  
 2) Version "J"

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

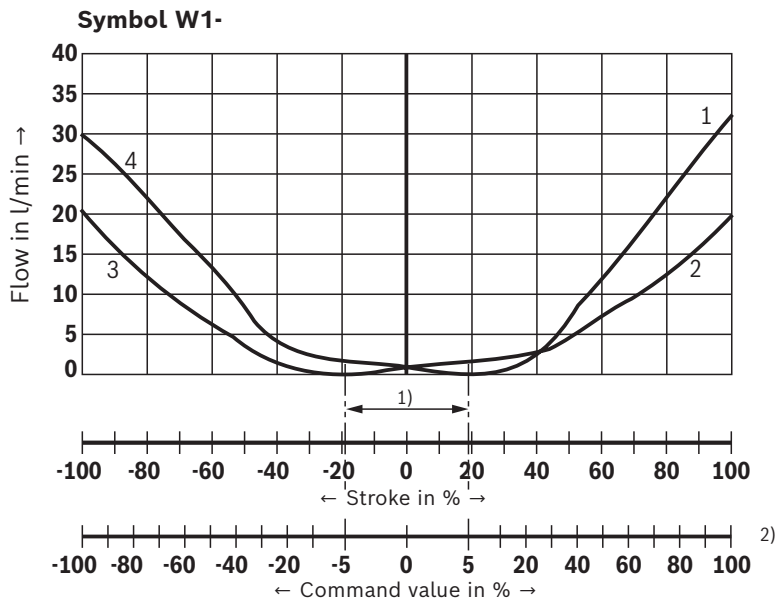
**Characteristic curves: Size 6**  
 (measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

**Flow/signal function** (rated flow 32 l/min with  $\Delta p = 5 \text{ bar/control edge}$ )



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

- 1) Step compensation
- 2) Version "J"



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

- 1) Step compensation
- 2) Version "J"

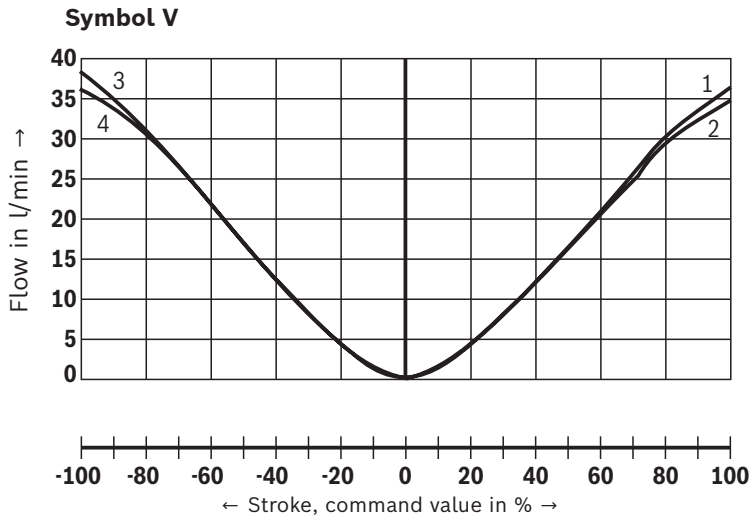


**Notice:**

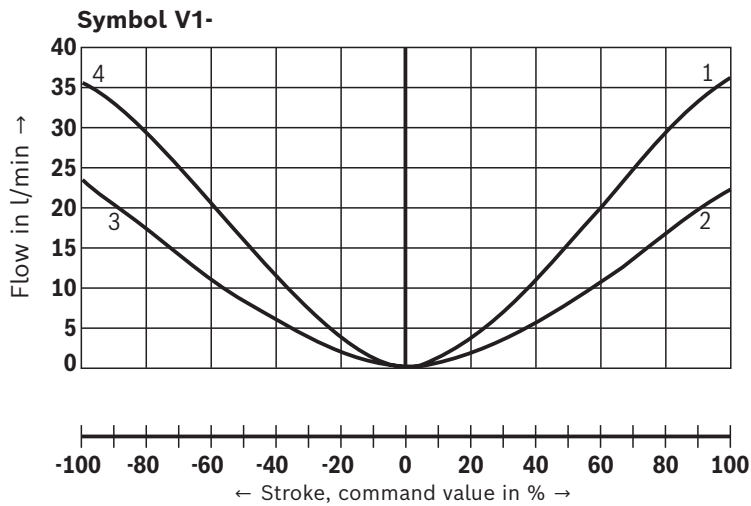
Typical characteristic curves which are subject to tolerance variations.

**Characteristic curves: Size 6**  
 (measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ } ^\circ\text{C}$ )

**Flow/signal function** (rated flow 32 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



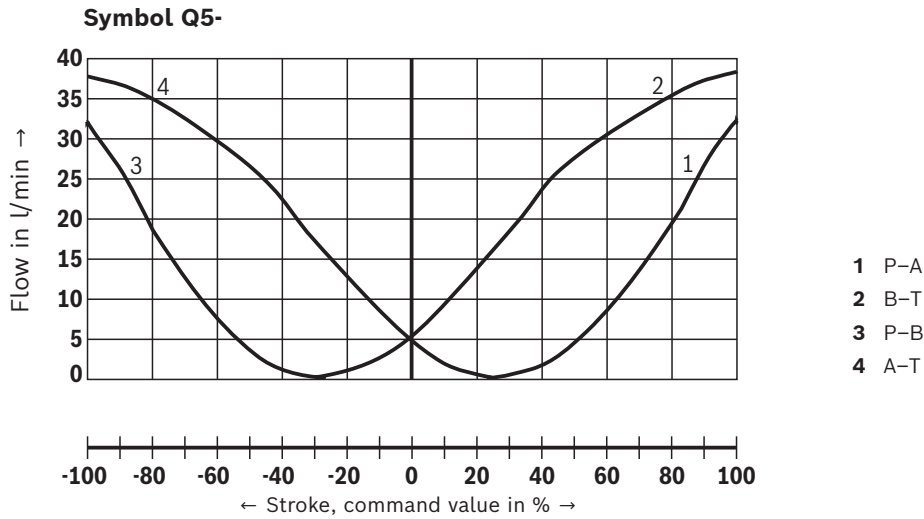
**Notice:**

Typical characteristic curves which are subject to tolerance variations.

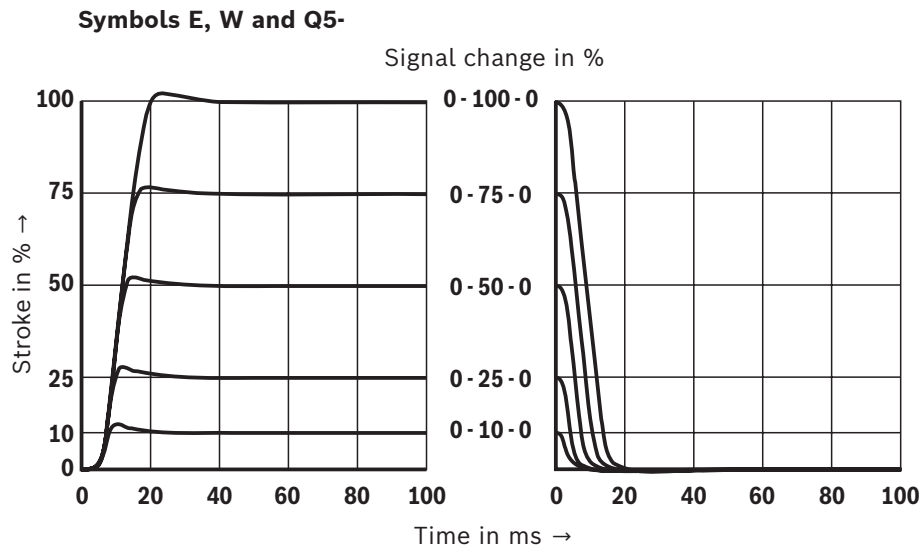
**Characteristic curves: Size 6**

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

**Flow/signal function** (rated flow 32 l/min with  $\Delta p = 5 \text{ bar/control edge}$ )



**Transition function with stepped electric input signals**

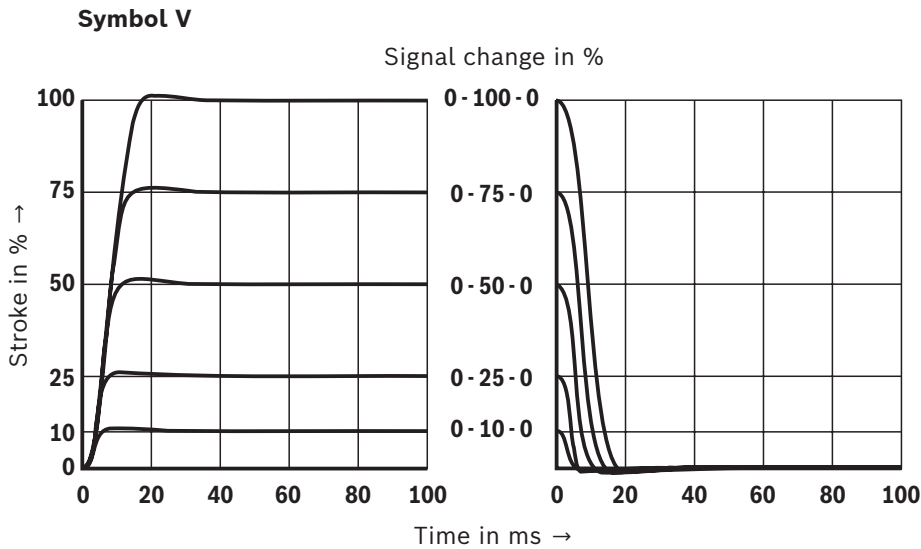


**Notice:**

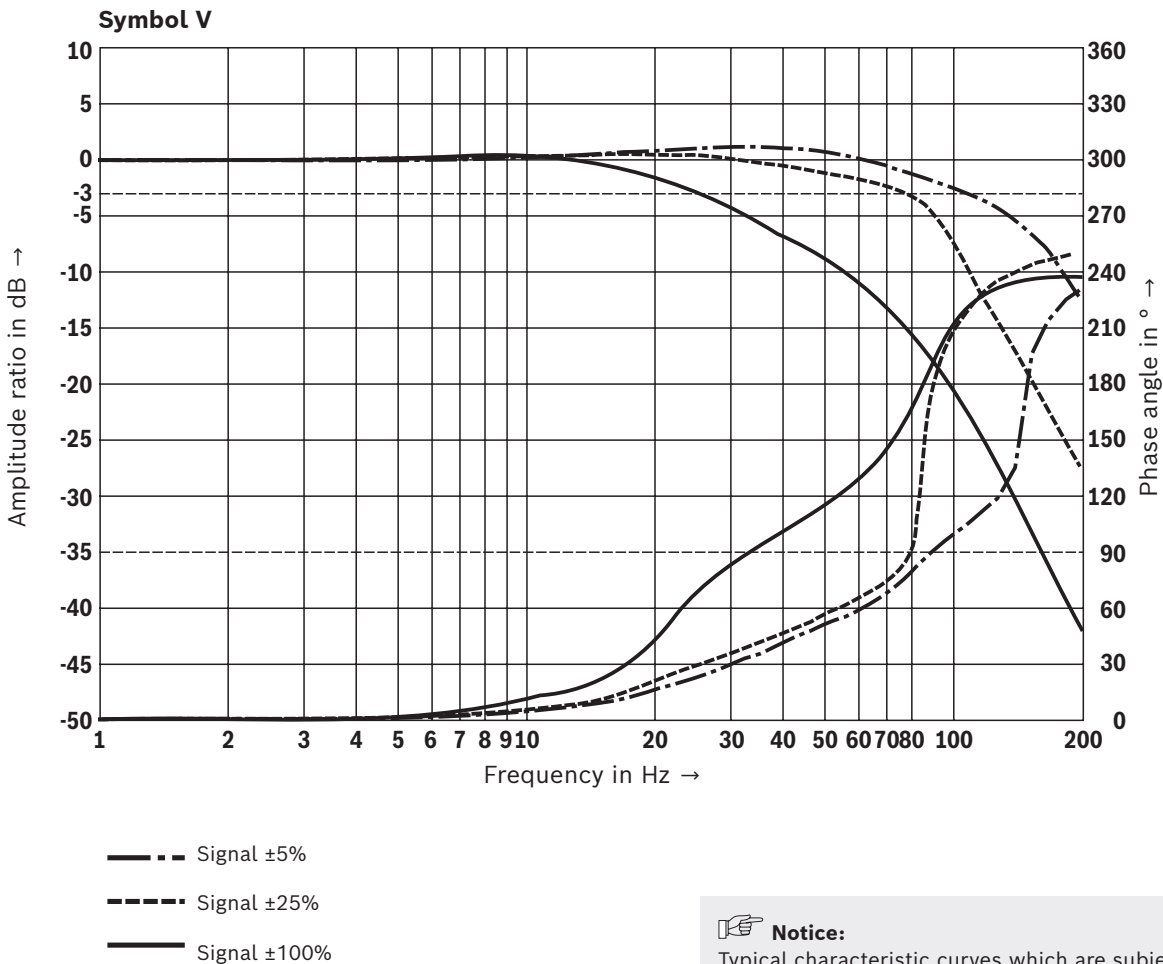
Typical characteristic curves which are subject to tolerance variations.

**Characteristic curves: Size 6**  
 (measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ } ^\circ\text{C}$ )

**Transition function with stepped electric input signals**



**Frequency response**

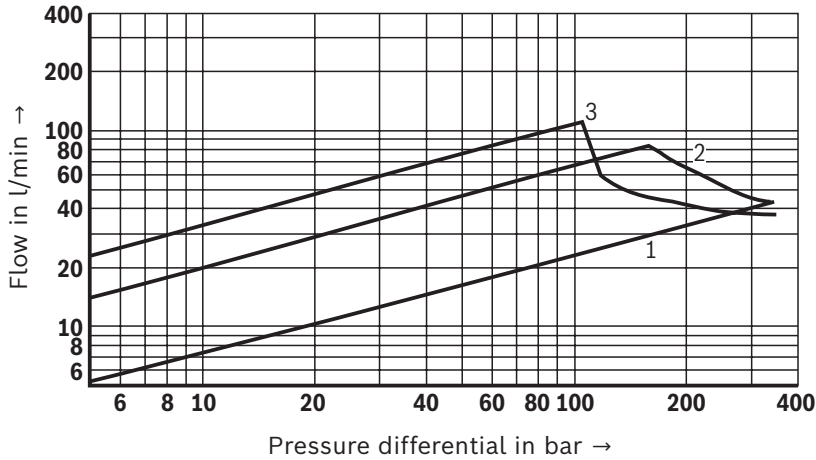


**Notice:**  
 Typical characteristic curves which are subject to tolerance variations.

**Characteristic curves: Size 6**  
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

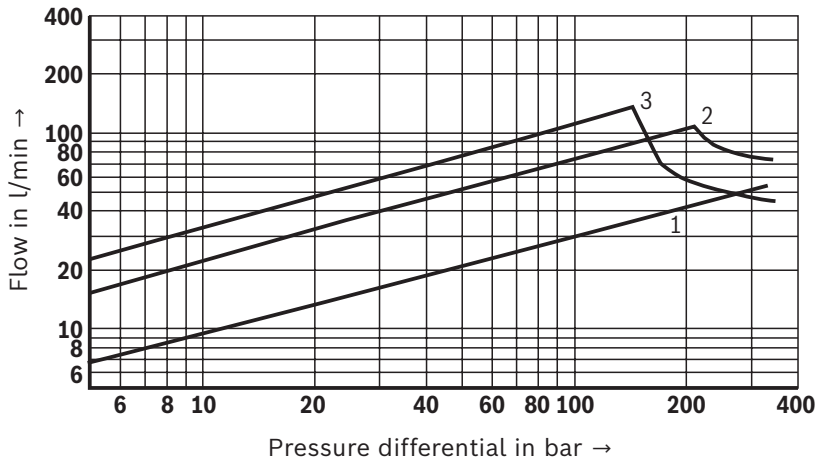
**Flow/load function with maximum valve opening** (tolerance  $\pm 10\%$ ) (4/3-way version)

**Symbol E**



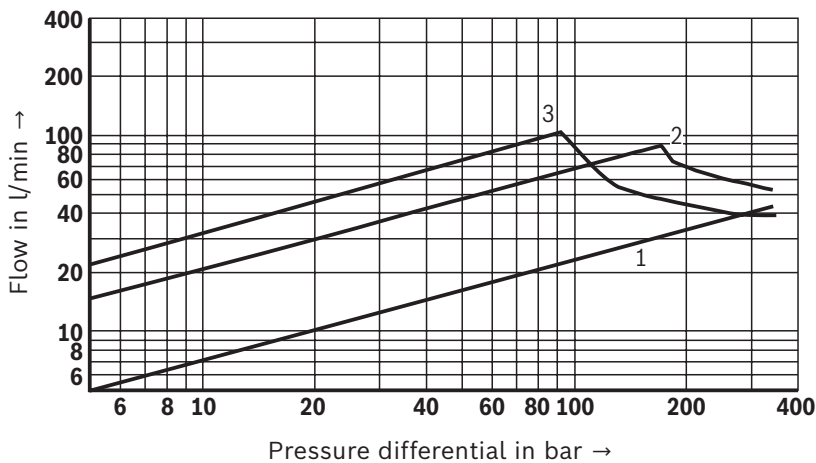
- 1 8 l/min (summated edge)
- 2 18 l/min (summated edge)
- 3 32 l/min (summated edge)

**Symbol V**



- 1 8 l/min (summated edge)
- 2 18 l/min (summated edge)
- 3 32 l/min (summated edge)

**Symbol W**



- 1 8 l/min (summated edge)
- 2 18 l/min (summated edge)
- 3 32 l/min (summated edge)

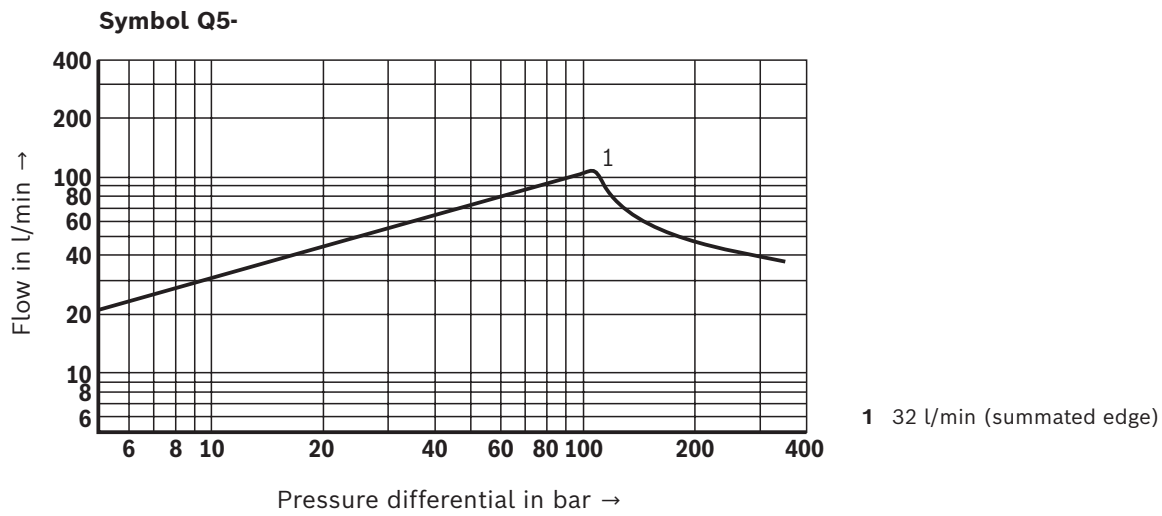


**Notice:**

Typical characteristic curves which are subject to tolerance variations.

**Characteristic curves:** Size 6  
(measured with HLP46,  $\vartheta_{\text{oil}} = 40 \pm 5 \text{ }^\circ\text{C}$ )

**Flow/load function with maximum valve opening** (tolerance  $\pm 10\%$ ) (4/3-way version)

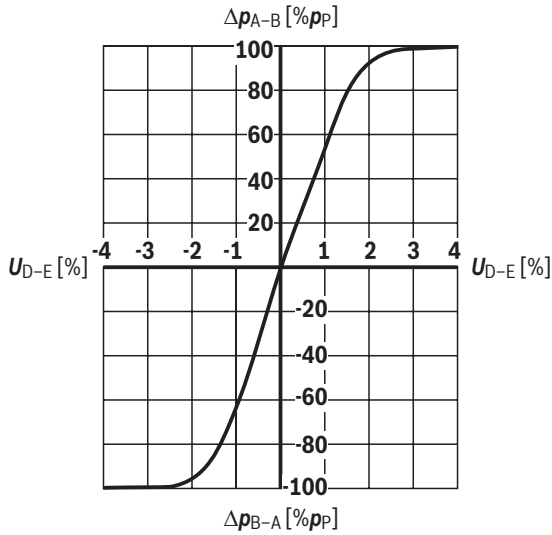


**Notice:**

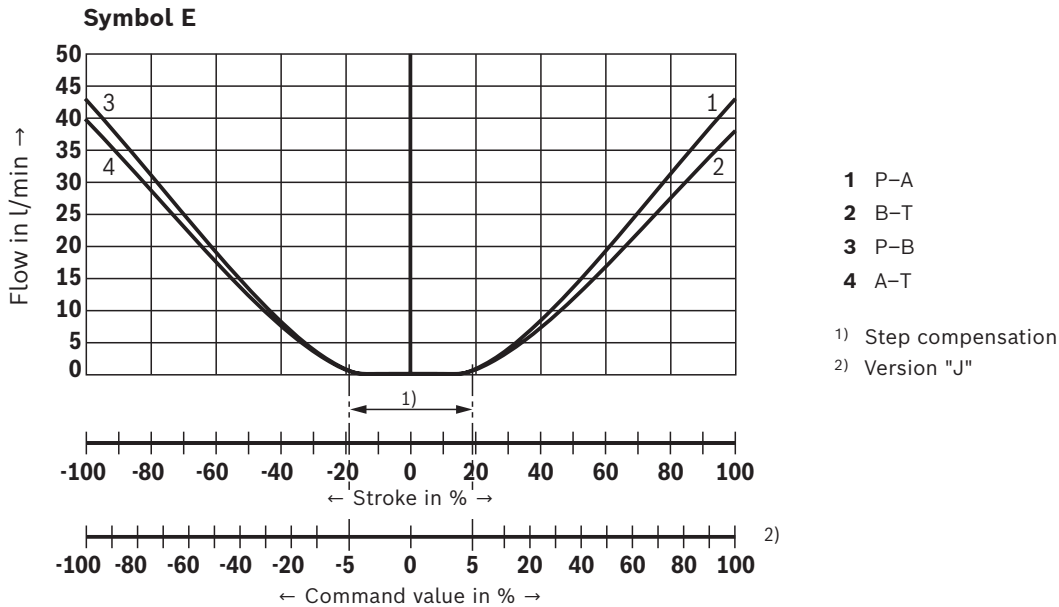
Typical characteristic curves which are subject to tolerance variations.

**Characteristic curves:** Size 10  
 (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  $\Delta p = 5 \text{ bar/control edge}$ )**



**Notice:**

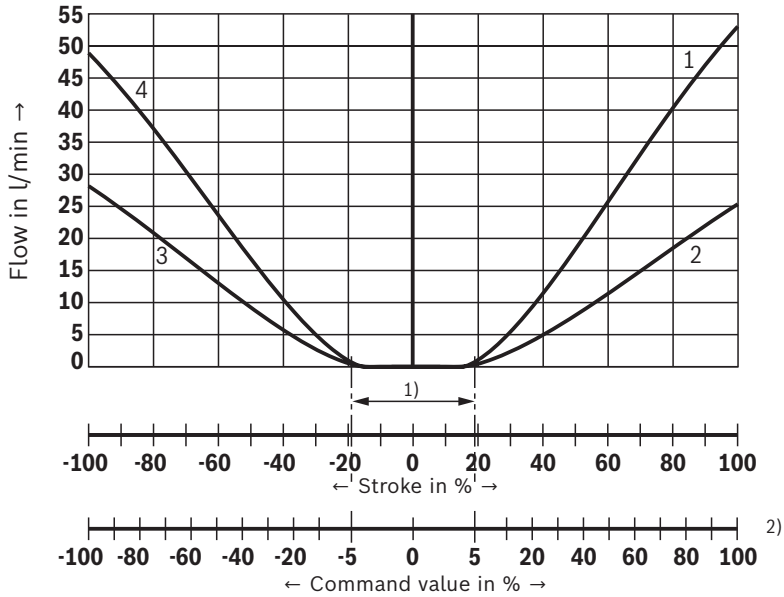
Typical characteristic curves which are subject to tolerance variations.



**Characteristic curves:** Size 10  
 (measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

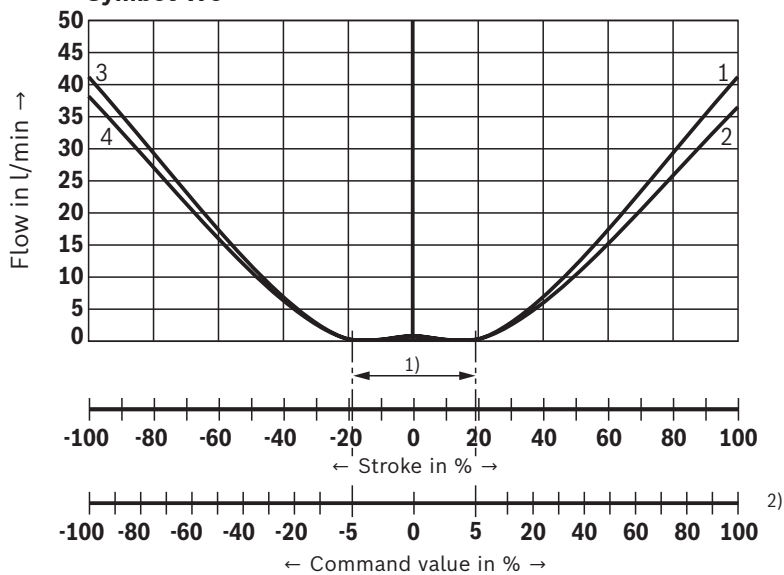
**Flow/signal function** (rated flow 50 l/min with  $\Delta p = 5 \text{ bar/control edge}$ )

**Symbol E1-**



- 1 P-A
  - 2 B-T
  - 3 P-B
  - 4 A-T
- 1) Step compensation  
 2) Version "J"

**Symbol W6-**



- 1 P-A
  - 2 B-T
  - 3 P-B
  - 4 A-T
- 1) Step compensation  
 2) Version "J"

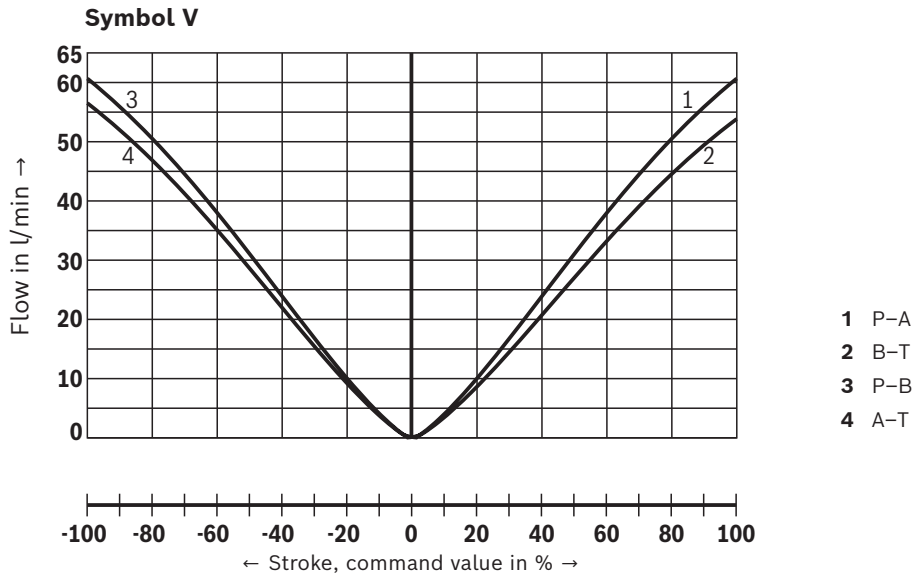


**Notice:**

Typical characteristic curves which are subject to tolerance variations.

**Characteristic curves: Size 10**  
 (measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

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

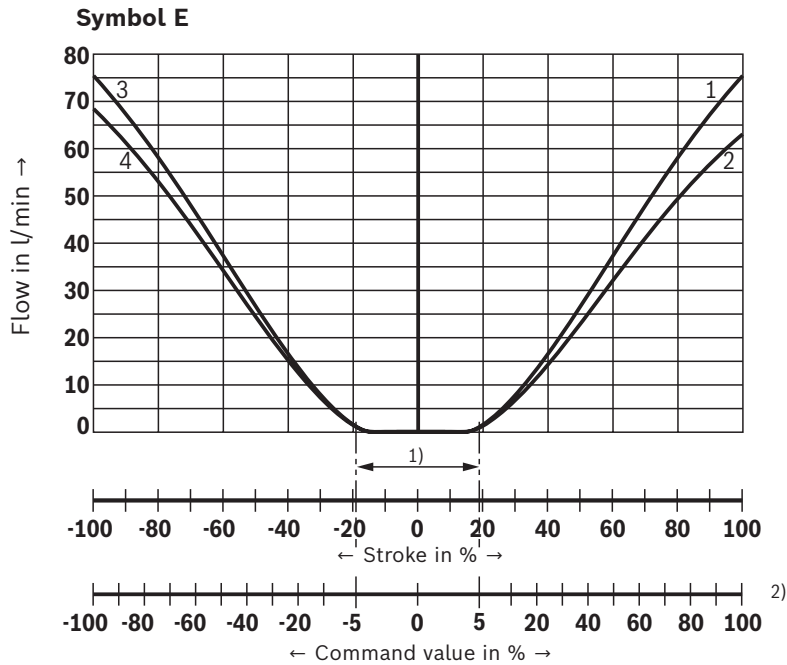


**Notice:**

Typical characteristic curves which are subject to tolerance variations.

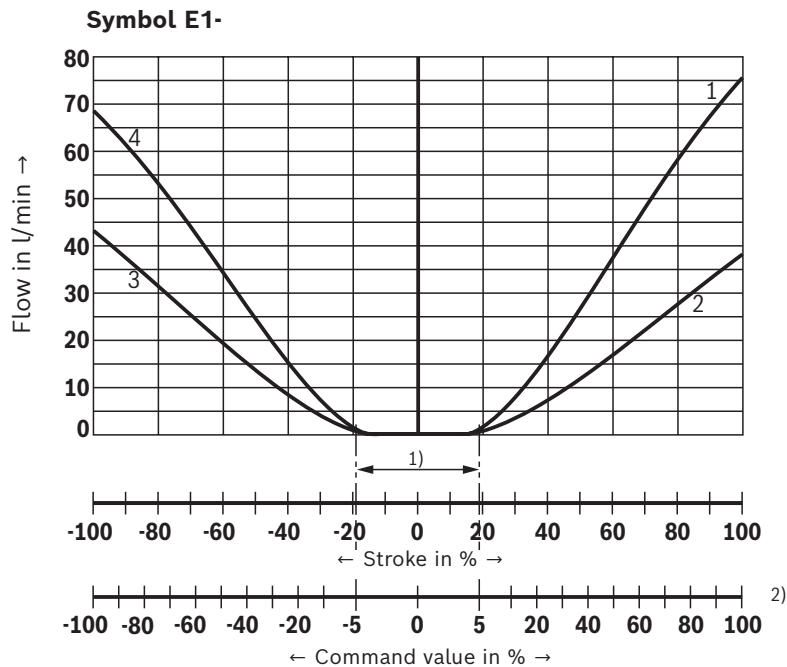
**Characteristic curves:** Size 10  
 (measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ } ^\circ\text{C}$ )

**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) Step compensation
- 2) Version "J"



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

- 1) Step compensation
- 2) Version "J"

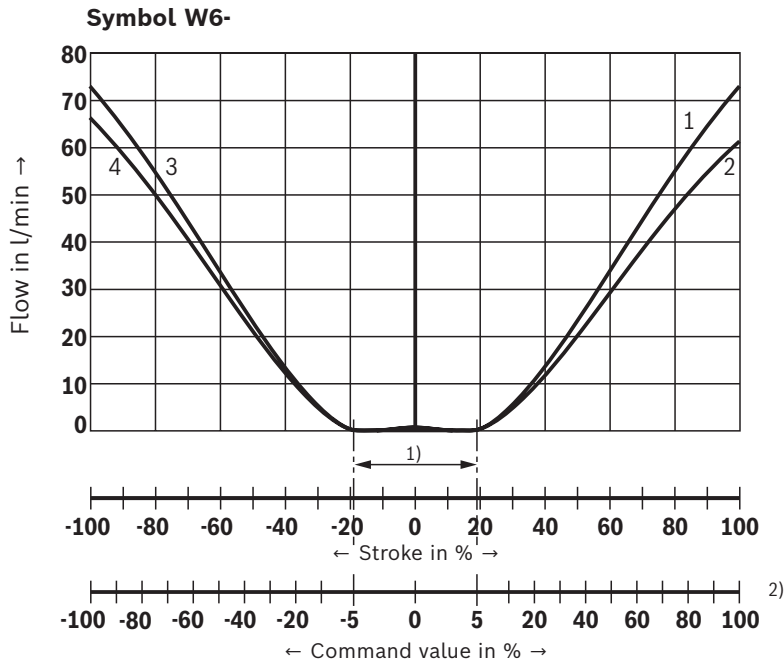


**Notice:**

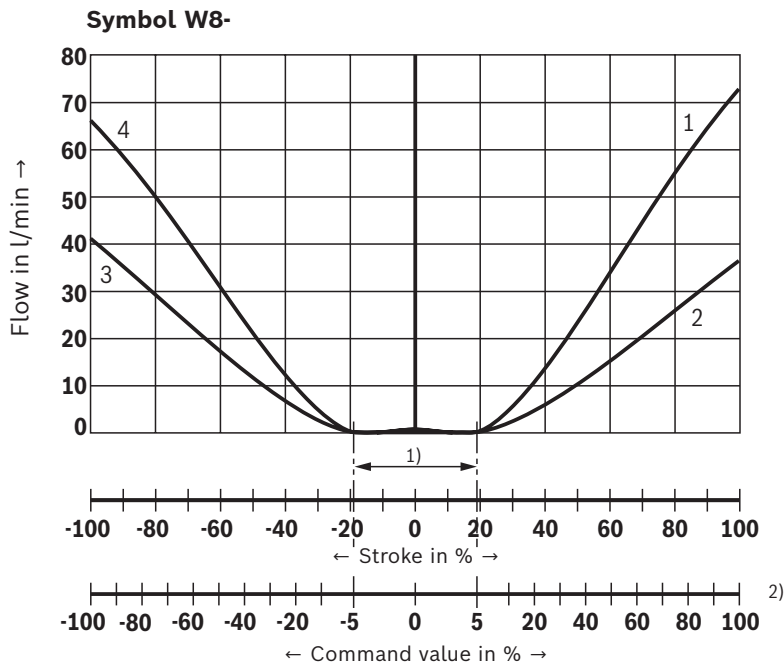
Typical characteristic curves which are subject to tolerance variations.

**Characteristic curves: Size 10**  
(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) Step compensation  
2) Version "J"



- 1 P-A
  - 2 B-T
  - 3 P-B
  - 4 A-T
- 1) Step compensation  
2) Version "J"

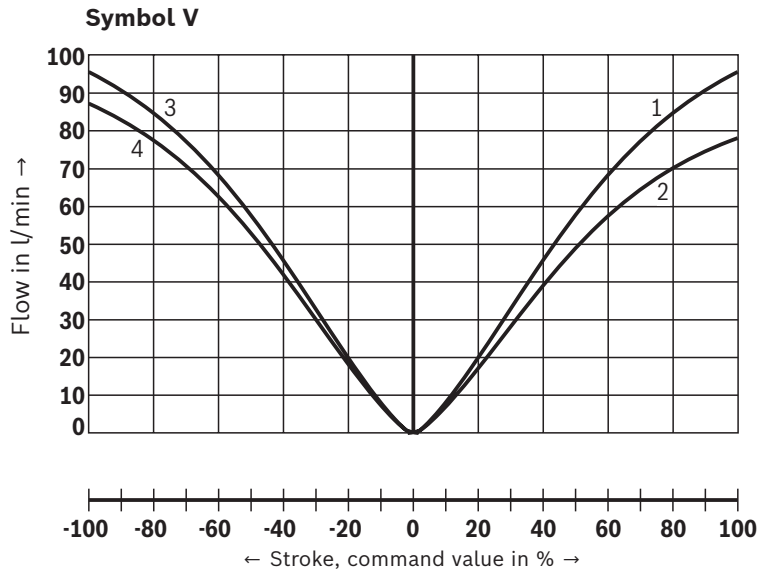


**Notice:**

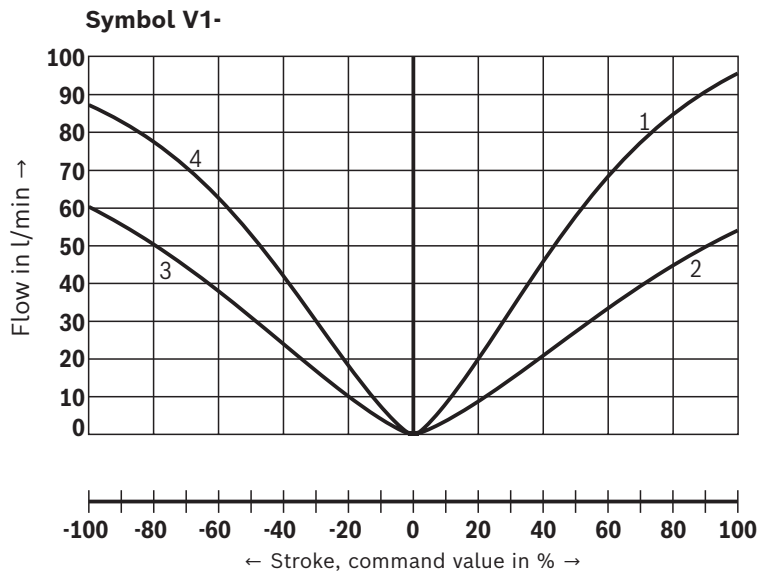
Typical characteristic curves which are subject to tolerance variations.

**Characteristic curves:** Size 10  
 (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

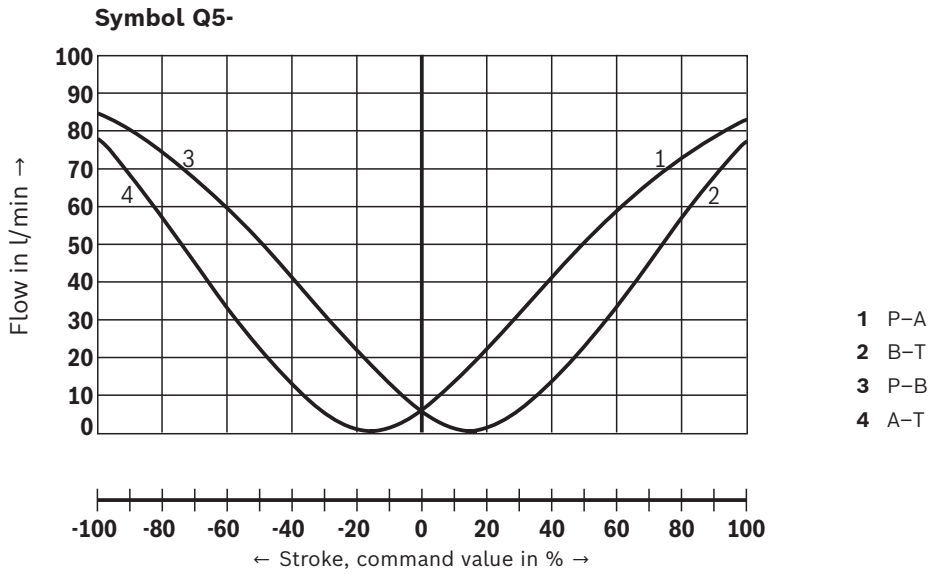


- 1 P-A
- 2 B-T
- 3 P-B
- 4 A-T

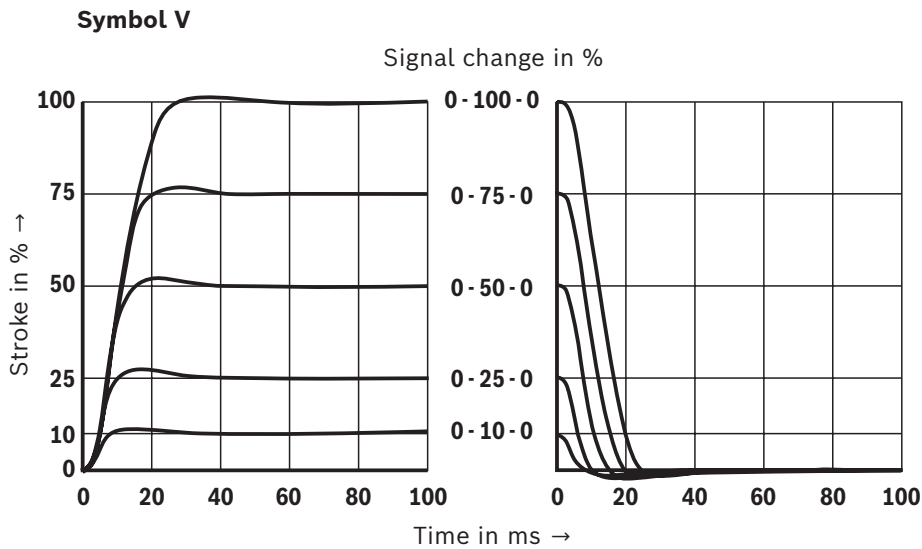
**Notice:**  
 Typical characteristic curves which are subject to tolerance variations.

**Characteristic curves: Size 10**  
 (measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

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



**Transition function with stepped electric input signals**

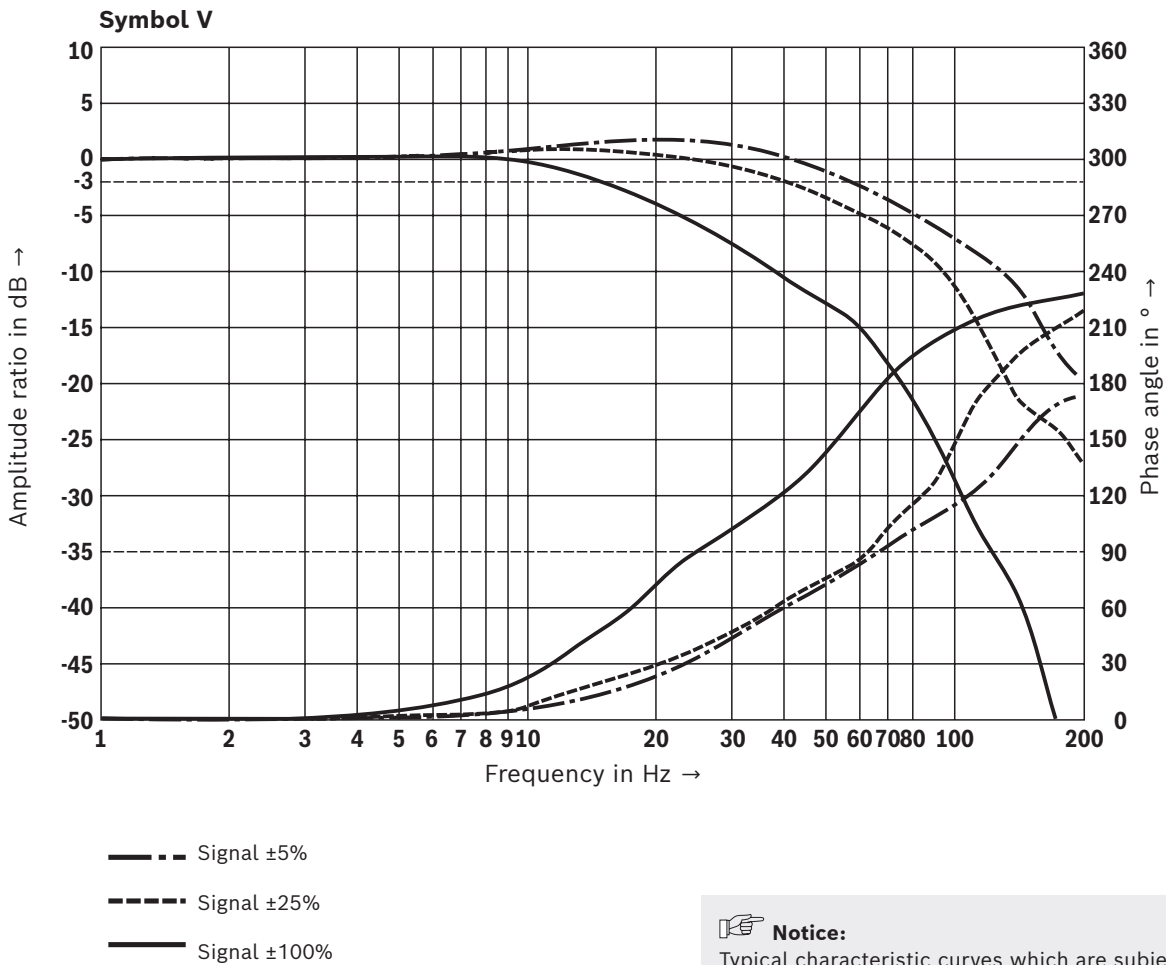


**Notice:**

Typical characteristic curves which are subject to tolerance variations.

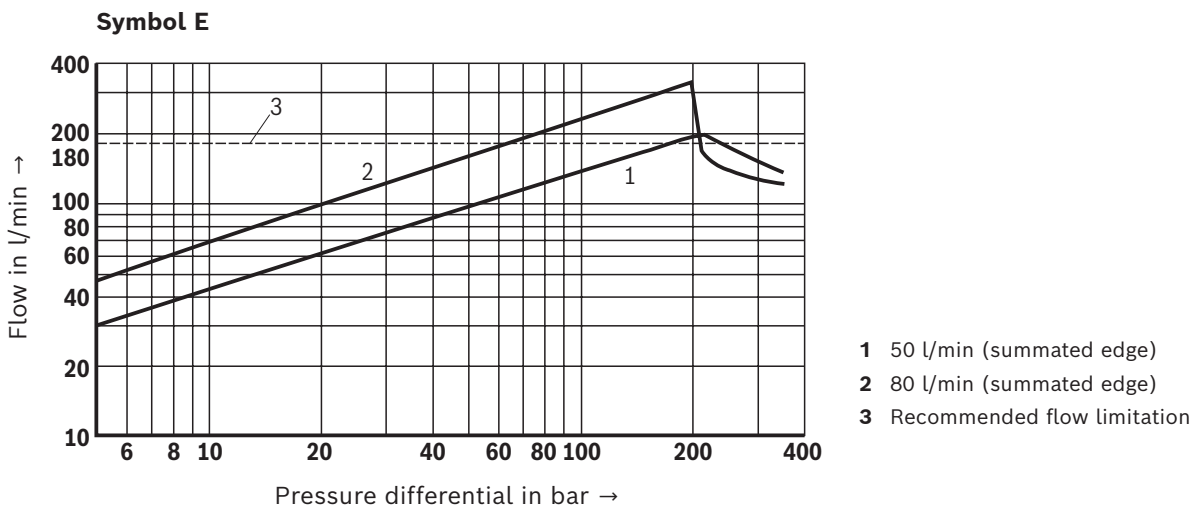
**Characteristic curves: Size 10**  
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

**Frequency response characteristic curves**



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

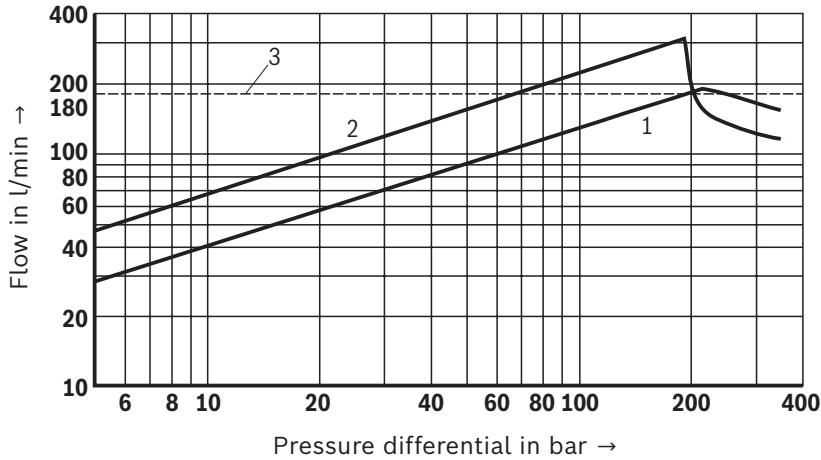
**Flow/load function with maximum valve opening (tolerance  $\pm 10\%$ ) (4/3-way version)**



**Characteristic curves: Size 10**  
(measured with HLP46,  $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$ )

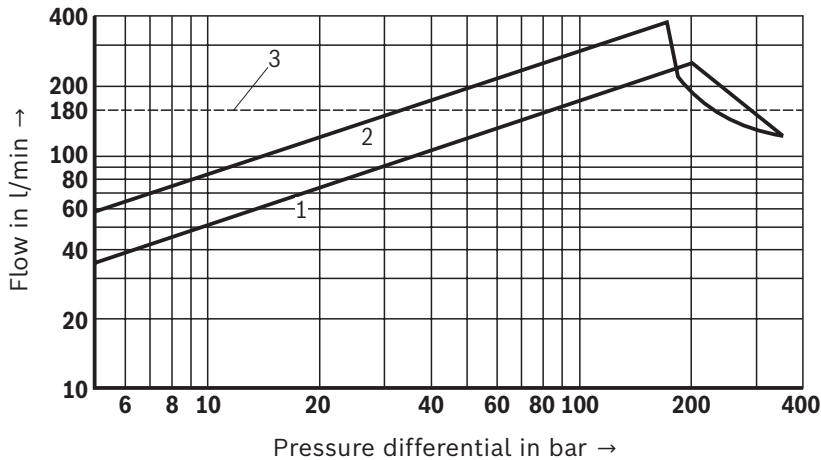
**Flow/load function with maximum valve opening** (tolerance  $\pm 10\%$ ) (4/3-way version)

**Symbol W6-**



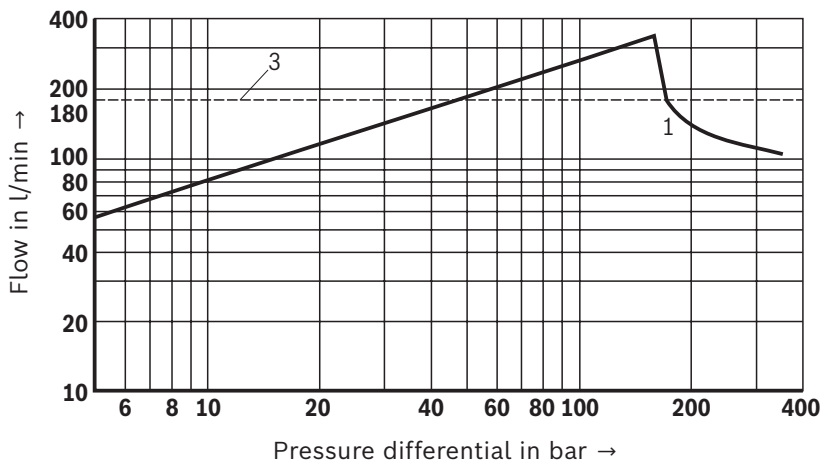
- 1 50 l/min (summated edge)
- 2 80 l/min (summated edge)
- 3 Recommended flow limitation

**Symbol V**



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

**Symbol Q5-**



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

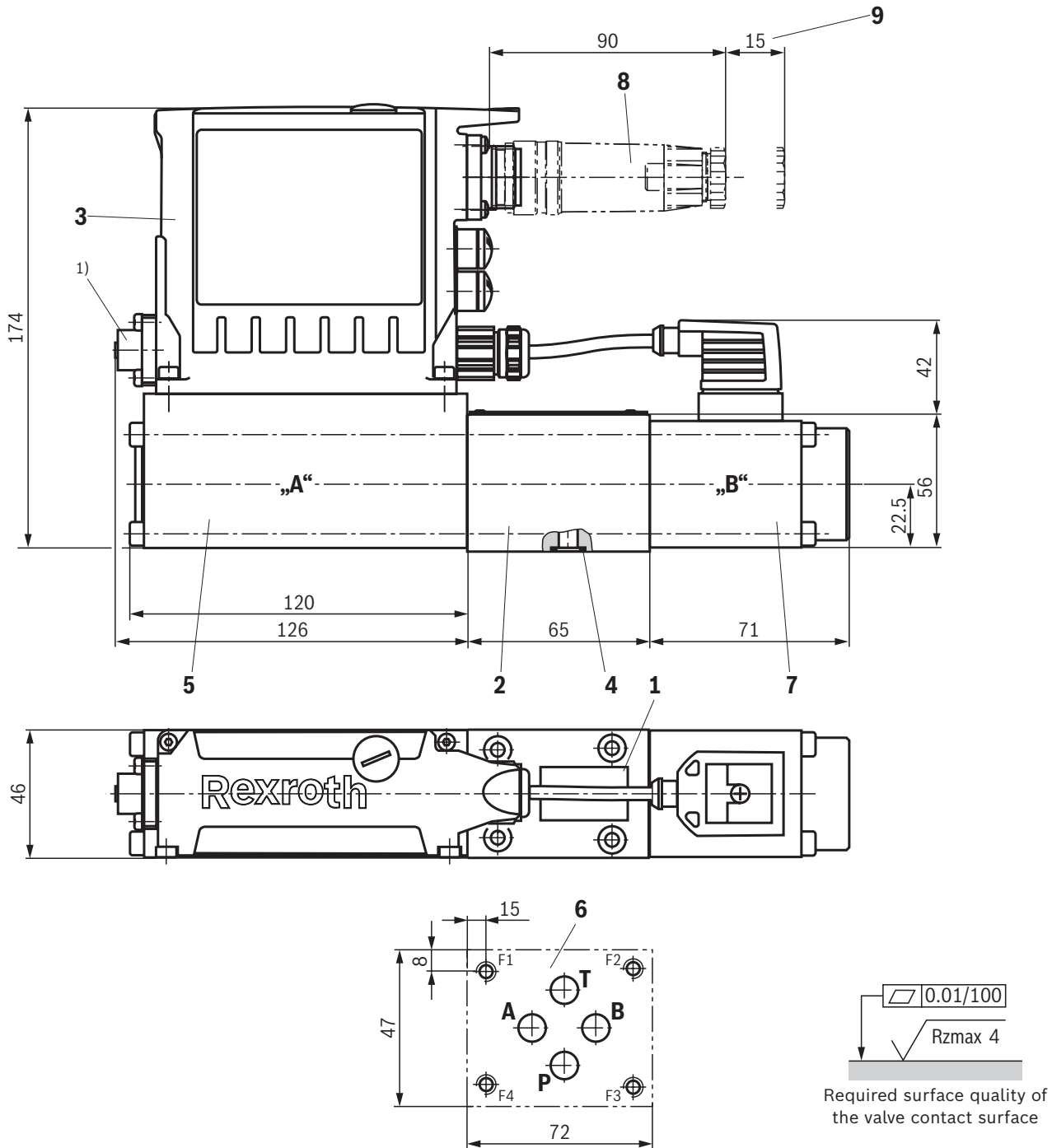


**Notice:**

Typical characteristic curves which are subject to tolerance variations.



**Dimensions:** Size 6 – versions "00..D90" and "00..D95"  
(dimensions in mm)



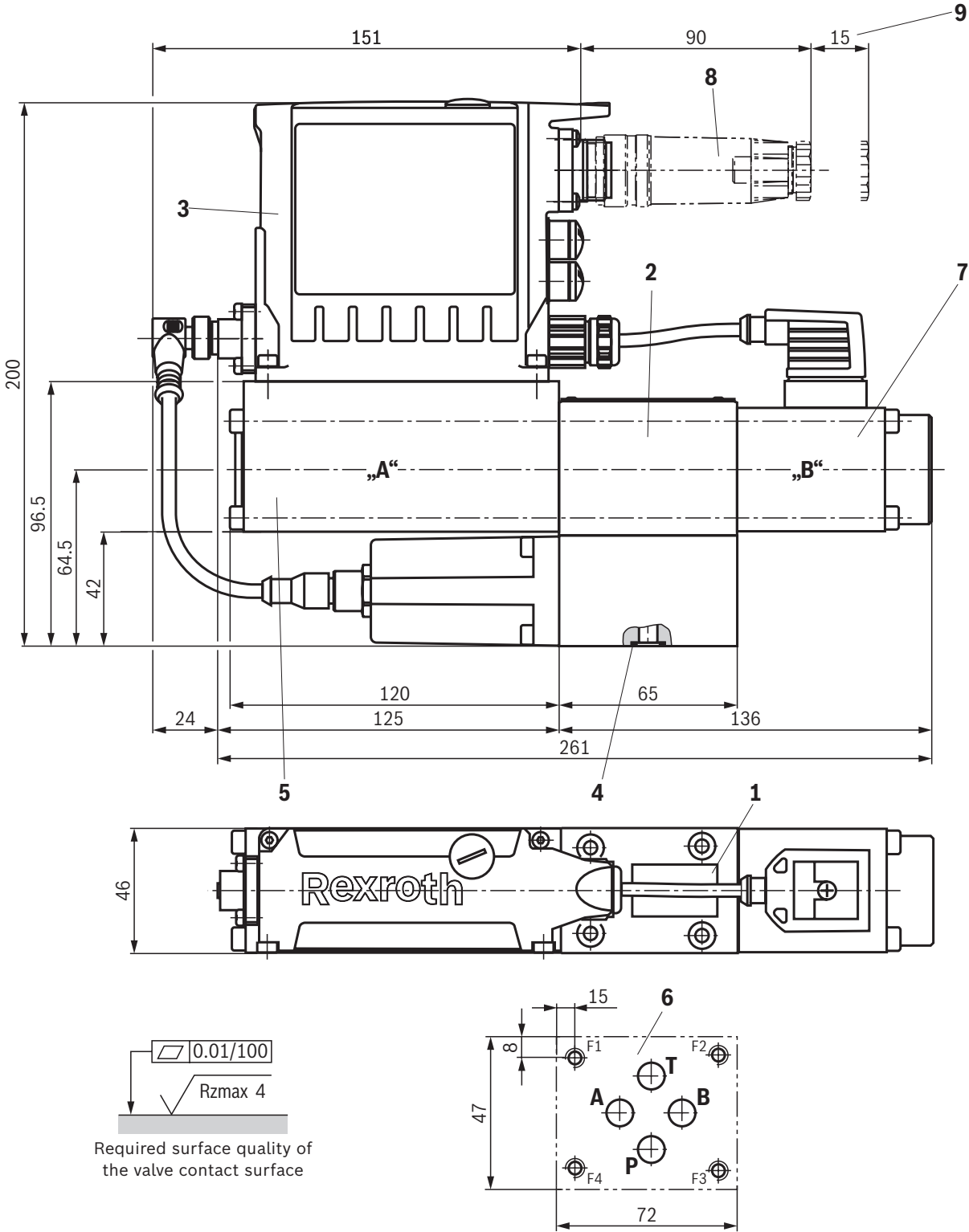
**Notes:**

- ▶ The dimensions are nominal dimensions which are subject to tolerances.
- ▶ Mating connectors, separate order, see page 38 and data sheet 08006.

**For item explanations, valve mounting screws and subplates, see page 37.**

<sup>1)</sup> Version "00..D95" only

**Dimensions:** Size 6 – versions "GA..D90", "GB..D90" and "GC..D90"  
(dimensions in mm)

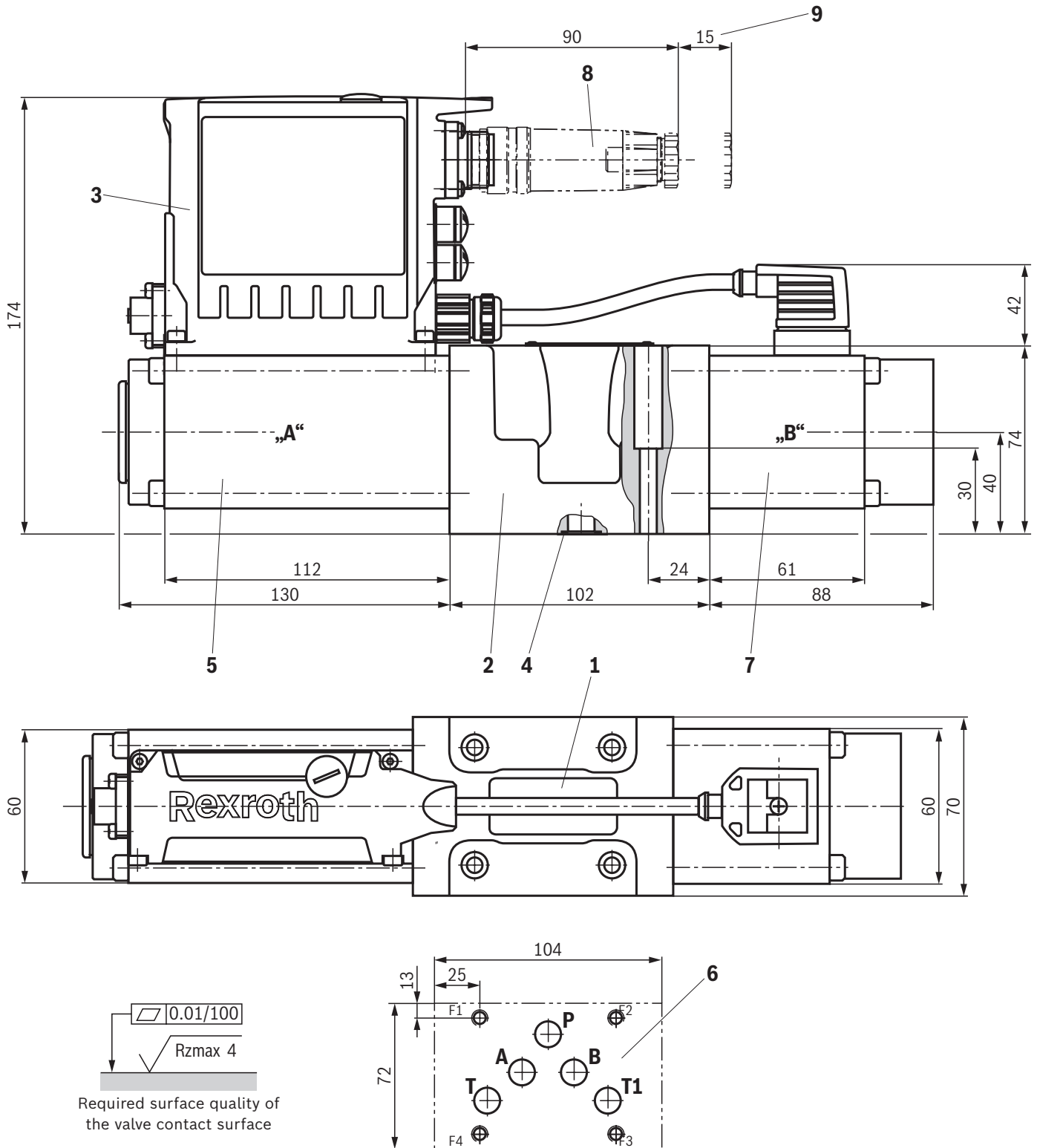


**Notes:**

- ▶ The dimensions are nominal dimensions which are subject to tolerances.
- ▶ Mating connectors, separate order, see page 38 and data sheet 08006.

**For item explanations, valve mounting screws and subplates, see page 37.**

**Dimensions:** Size 10 – versions "00..D90" and "00..D95"  
(dimensions in mm)

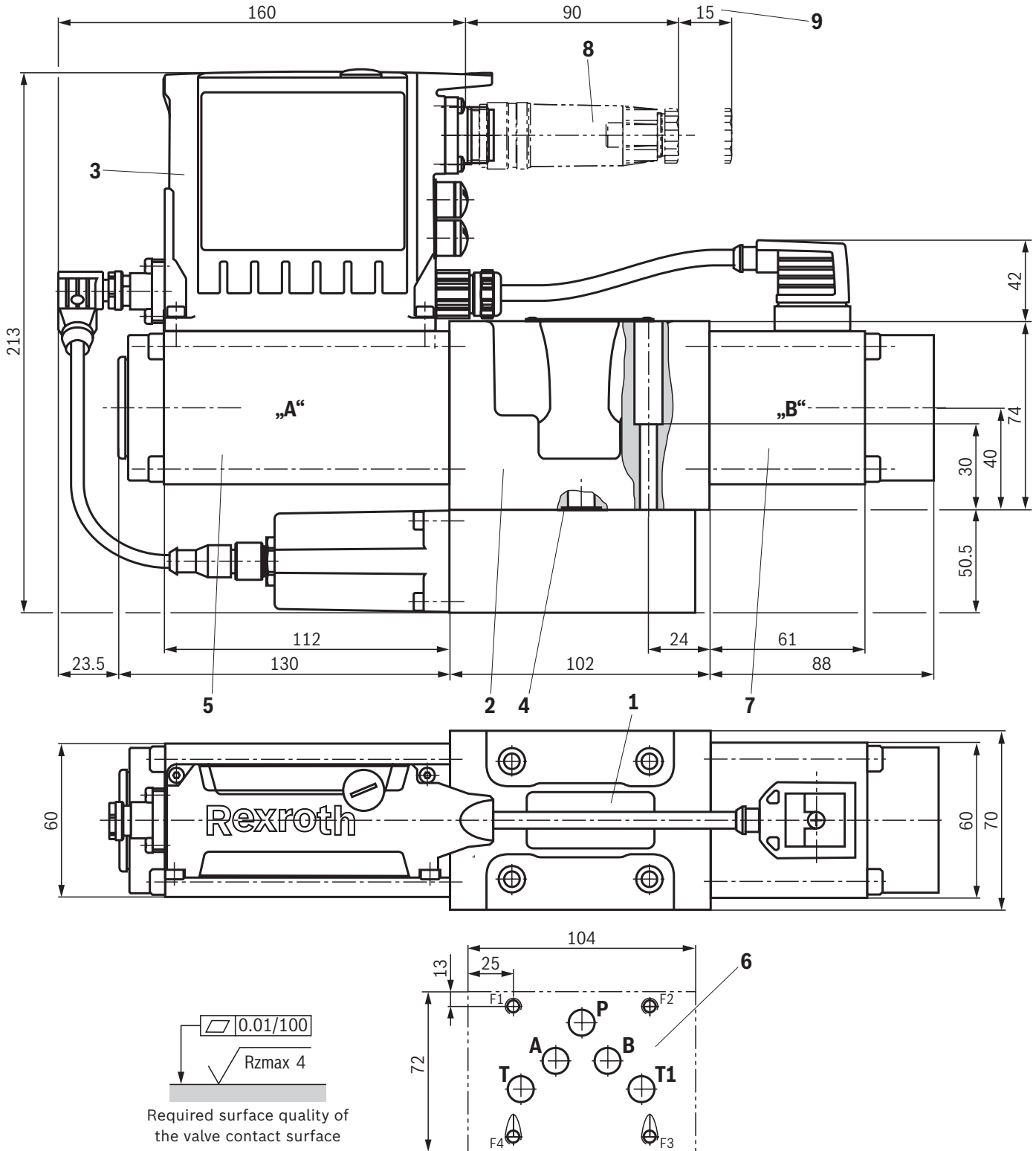


**Notes:**

- ▶ The dimensions are nominal dimensions which are subject to tolerances.
- ▶ Mating connectors, separate order, see page 38 and data sheet 08006.

**For item explanations, valve mounting screws and subplates, see page 37.**

**Dimensions:** Size 10 – versions "GA..D90", "GB..D90" and "GC..D90"  
(dimensions in mm)



**Notes:**

- ▶ The dimensions are nominal dimensions which are subject to tolerances.
- ▶ Mating connectors, separate order, see page 38 and data sheet 08006.

**For item explanations, valve mounting screws and subplates, see page 37.**

## Dimensions

- 1 Name plate
- 2 Valve housing
- 3 Integrated digital control 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 4401-03-02-0-05 (NG6) and ISO 4401-05-04-0-05 (NG10)
- 7 Stroke solenoid
- 8 Mating connectors, separate order, see page 38 and data sheet 08006.
- 9 Space required for removing the mating connector

### Valve mounting screws (separate order)

Size	Version	Quantity	Hexagon socket head cap screws	Material number	
6	"00..D90", "00..D95"	4	<b>ISO 4762 - M5 x 30 - 10.9-CM-Fe-ZnNi-5-Cn-T0-H-B</b> Friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$ ; tightening torque $M_A = 7 \text{ Nm} \pm 10\%$	<b>R913048086</b>	
		or			
	4	<b>ISO 4762 - M5 x 30 - 10.9</b> Tightening torque $M_A = 8.9 \text{ Nm} \pm 10\%$	Not included in the Rexroth delivery range		
	"GA..D90", "GB..D90", "GC..D90"	4	<b>ISO 4762 - M5 x 70 - 10.9-CM-Fe-ZnNi-5-Cn-T0-H-B</b> Friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$ ; tightening torque $M_A = 8.9 \text{ Nm} \pm 10\%$	<b>R913043762</b>	
		or			
	4	<b>ISO 4762 - M5 x 70 - 10.9</b> Tightening torque $M_A = 8.9 \text{ Nm} \pm 10\%$	Not included in the Rexroth delivery range		
10	"00..D90", "00..D95"	4	<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>	
		or			
	4	<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		
	"GA..D90", "GB..D90", "GC..D90"	4	<b>ISO 4762 - M6 x 80 - 10.9-CM-Fe-ZnNi-5-Cn-T0-H-B</b> Friction coefficient $\mu_{\text{total}} = 0.09 \dots 0.14$ ; tightening torque $M_A = 13 \text{ Nm} \pm 10\%$	<b>R913049927</b>	
		or			
	4	<b>ISO 4762 - M6 x 80 - 10.9</b> Tightening torque $M_A = 13 \text{ Nm} \pm 10\%$	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, see data sheet 45100.


**Accessories** (separate order)**Mating connectors and cable sets**

Port	Designation	Version	Short designation	Material number	Data sheet	
<b>XH1</b>	Mating connector; for valves with round connector, 6-pole + PE	Straight, metal	7PZ31...M	<b>R900223890</b>	08006	
		Straight, plastic	7PZ31...K	<b>R900021267</b>		
		Angled, plastic	–	<b>R900217845</b>	–	
	Cable sets; for valves with round connector, 6-pole + PE	Plastic, 3.0 m	7P Z31 BF6	–	<b>R901420483</b>	08006
		Plastic, 5.0 m			<b>R901420491</b>	
		Plastic, 10.0 m			<b>R901420496</b>	
		Plastic, 20.0 m	–	<b>R901448068</b>	–	
<b>X7E1, X7E2</b>	Cable set; shielded, 4-pole, D coding	Straight connector M12, on straight connector M12, line cross-section 0.25 mm <sup>2</sup> , CAT 5e, length freely selectable (= xx.x)	–	<b>R911172111</b> <sup>1)</sup>	–	
	Cable set; shielded, 4-pole	Straight connector M12, on straight connector RJ45, line cross-section 0.25 mm <sup>2</sup> , CAT 5e, length freely selectable (= xx.x)	–	<b>R911172135</b> <sup>2)</sup>	–	
<b>X2N</b> <sup>3)</sup>	Cable set; shielded, 5-pole, for connecting Rexroth pressure sensors, type HM20, A coding	PUR/PVC, straight connector M12, on straight socket M12, line cross-section 0.34 mm <sup>2</sup> , 0.6 m	–	<b>R901111709</b>	–	
		PUR/PVC, straight connector M12, on straight socket M12, line cross-section 0.34 mm <sup>2</sup> , 1.0 m	–	<b>R901111712</b>	–	
		PUR/PVC, straight connector M12, on straight socket M12, line cross-section 0.34 mm <sup>2</sup> , 2.0 m	–	<b>R901111713</b>	–	
	Cable set; shielded, 5-pole, A coding	Straight connector M12, on free line end, line cross-section 0.34 mm <sup>2</sup> , 1.5 m	–	<b>R901111752</b>	–	
		Straight connector M12, on free line end, line cross-section 0.34 mm <sup>2</sup> , 3.0 m	–	<b>R901111754</b>	–	
		Straight connector M12, on free line end, line cross-section 0.34 mm <sup>2</sup> , 5.0 m	–	<b>R901111756</b>	–	
		Straight connector M12, on free line end, line cross-section 0.34 mm <sup>2</sup> , 10.0 m	–	<b>R913005147</b>	–	

1) Additional indication of type designation RKB0040/xx.x

2) Additional indication of type designation RKB0044/xx.x

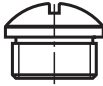
3) Only with connection of an external sensor, type HM20

 **Notes:**

- ▶ Tighten the M12 connector with a manual torque wrench by 1 Nm.
- ▶ Self-locking M12 cables must be used.
- ▶ It must be ensured that cables are secured without radial force.
- ▶ All cables connected to "XH1", "X7E1" and "X7E2" must be bundled in a wire harness after 20 cm the latest. The wire harness must be fixed after further 20 ... 30 cm. Make sure that there is no relative motion between the fixation and the valve.
- ▶ Before the fixation point, there must not be any cable loops.
- ▶ In general, the information on installation provided by the cable manufacturers must be observed.
- ▶ Respectively, the cable of "X2N" (if used) is also fixed as described above.
- ▶ For further information, see operating instructions 29391-B

## Accessories (separate order)

### Protective cap

Protective cap M12	Version	Material number
		<b>R901075563</b>

### Parameterization

The following is required for the parameterization with PC		Material number/download
1 Commissioning software	IndraWorks, Indraworks D, Indraworks DS	<a href="http://www.boschrexroth.com/IFB">www.boschrexroth.com/IFB</a>
2 Connection cable, 3 m	Shielded, M12 on RJ45, length can be freely selected (= xx.x)	<b>R911172135</b> (additional indication of type designation RKB0044/xx.x)

## Project planning and maintenance instructions

- ▶ The supply voltage must be permanently connected; otherwise, bus communication is not possible.
- ▶ If electro-magnetic interference is to be expected, take appropriate measures for ensuring the function (depending on the application, e.g. shielding, filtration).
- ▶ The devices have been tested in the plant and are supplied with default settings.
- ▶ Only complete devices can be repaired. Repaired devices are returned with default settings. User-specific settings will not be applied. The machine end-user will have to retransfer the corresponding user parameters.

**Further information**

▶ High-response/proportional valve with Multi-Ethernet interface	Operating instructions 29391-B
▶ Operation fieldbus electronics (xx = software version):	
– Functional description Rexroth HydraulicDrive HDx-20	30338-FK
– Parameter description Rexroth HydraulicDrive HDS-16, HDx-17 ... 20	30330-PA
– Description of diagnosis Rexroth HydraulicDrive HDS-16, HDx-17 ... 20	30330-WA
▶ 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	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
▶ General product information on hydraulic products	Data sheet 07008
▶ Hydraulic valves for industrial applications	Data sheet 07600-B
▶ Assembly, commissioning and maintenance of hydraulic systems	Data sheet 07900
▶ Information on available spare parts	<a href="http://www.boschrexroth.com/spc">www.boschrexroth.com/spc</a>
▶ "IFB" hydraulic field bus valves	<a href="http://www.boschrexroth.com/ifb">www.boschrexroth.com/ifb</a>

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