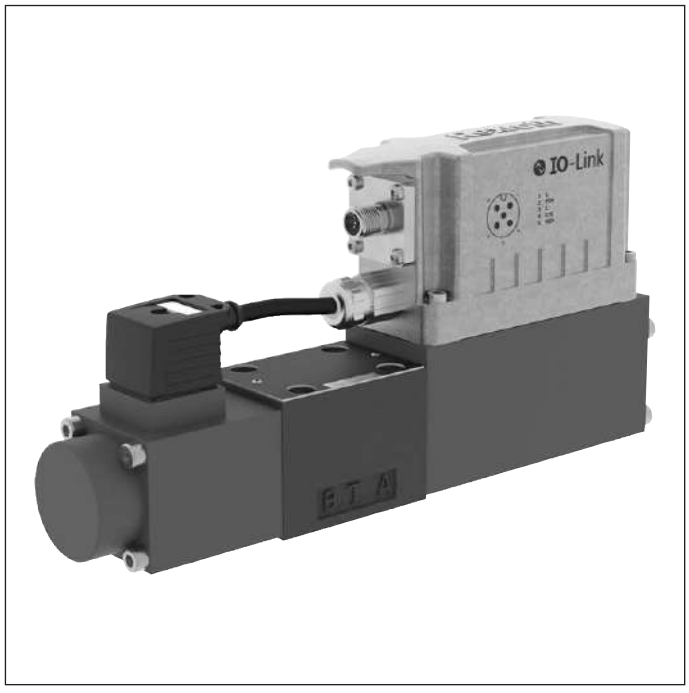
RE 29118
Edition: 2022-09
Replaces: 2021-07

rexroth
A Bosch Company

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

Type 4WRPE



- Size 6
- Component series 3X
- Maximum operating pressure 350 bar
- Rated flow 8, 18, 32 l/min
- Digital interface, IO-Link for I4.0

CE

IO-Link

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
- IO-Link interface; use of the valve with IO-Link as a shut-off element up to category 3, PL d according to EN 13849-1

Contents

Features	1
Ordering code	2
Symbols	3
Function, section	4, 5
Technical data	6 ... 8
Block diagram/controller function block	9
Electrical connections and assignment	10
Characteristic curves	11 ... 20
Dimensions	21, 22
Accessories	23
Further information	23

Ordering code

01	02	03	04	05	06	07	08		09		10		11	12	13	14	15
4	**WRP**	**E**	**6**			**S**		**–**	**3X**	**/**		**/**		**24**	**L1**		*****

01	4 main ports	**4**
02	Directional control valve, direct operated	**WRP**
03	With integrated electronics	**E**
04	Size 6	**6**
05	Symbols; possible version see page 3	

Rated flow (***Δp*** = 5 bar/control edge)

06	8 l/min	**08**
	18 l/min	**18**
	32 l/min	**32 ◊**

Flow characteristic

07	Progressive	**S**
08	Without overlap jump	**no code**
	With overlap jump (opening point 5% command value with symbols E, E1-, W and W1-)	**J**
09	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions)	**3X**

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

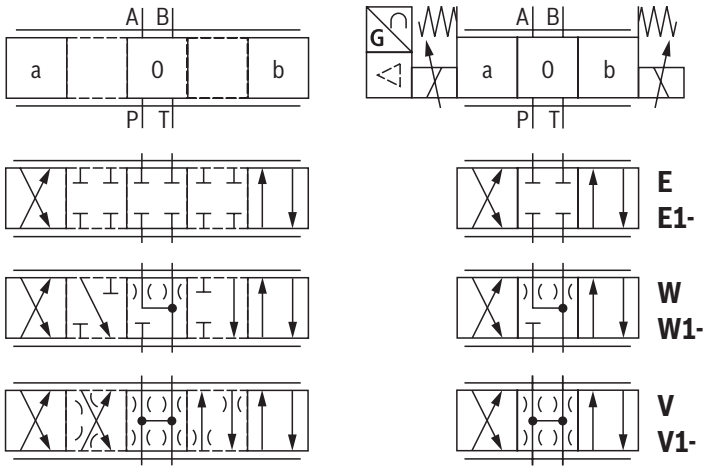
10	NBR seals	**M ◊**
	FKM seals	**V**
11	Without damping plate	**no code ◊**
	With damping plate	**D**
12	Supply voltage 24 V	**24**

Interfaces of the control electronics

13	IO-Link interface	**L1**
14	Without electronics protection membrane	**no code ◊**
	With electronics protection membrane	**-967**
15	Further details in the plain text	

☞ **Notice: ◊** = Preferred type

Symbols



With symbol E1-, V1- and W1-:

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.
- Only symbols E, E1-, W and W1- are suitable for applications according to EN 13849-1.
  Further measures must be taken according to EN 13849-1 and operating instructions 29118-B must be observed.

Function, section

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 (7))
- Stroke solenoid (6)
- On-board electronics (OBE) (5) with IO-Link interface (optionally with damping plate (8))

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.

Safety function (IO-Link shut-off)

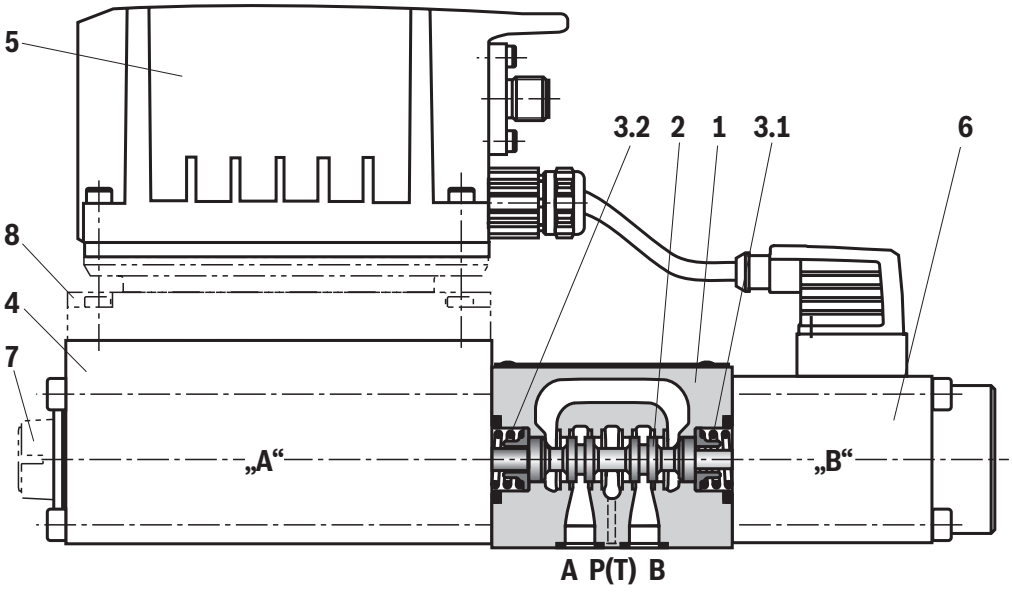
By shutting off the supply voltage at the IO-Link master (Class B-Port), pins 2 and 5, the IO-Link valve can be safely switched off. After shut-off of the supply voltage, the control spool of the valve is set to spring-centered central position. In order to also guarantee the hydraulic prerequisite for the safety shut-down, the overlap of control spool must also be considered.
Sufficient overlap is guaranteed by the symbols E, E1-, W and W1- ($MTTF_D$ values see data sheet 08012).
Depending on the category or application, additional safety measures must be taken according to EN 13849-1 and operating instructions 29118-B must be observed.
The safe shut-off is not part of the IO-Link valve and must be taken into account for the safe design of the machinery.

Error detection

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

- Falling below the minimum supply voltage ≤15 V (restarting ≥17.5 V).
- Interface "L1":
  - Enable inactive, communication interruption (watchdog)
  - In case of internal IO-Link error

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



Function, section

Damping plate "D"
The damping plate (8) reduces the acceleration amplitudes on the on-board electronics (frequencies >300 Hz).

☞ **Notice:**
Using 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 (7) can be used.
Recommended for use outside industry-standard conditions with high ambient air humidity and significant cyclic temperature changes (e.g. outdoors).

☞ **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).
- 4/3 directional control valves do not have a leakage-free basic locking when deactivated. Leakage must be considered when designing the drive.
- When using the valve with IO-Link interface in compliance with category 3 according to EN 13849-1, adequate cyclic diagnosis or monitoring of the valve function outside of the valve by the control system must be implemented by the machine integrator. Without suitable diagnostic measures, only cat. B or 1 according to EN 13849-1.

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

General			
Type of connection			Subplate mounting
Porting pattern			ISO 4401-03-02-0-05
Weight		kg	7.6
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)
Maximum relative humidity (no condensation)		%	95
Protection class according to EN 60529			IP65 (if suitable and correctly mounted mating connectors are used)
Maximum surface temperature		°C	150 (individual operation)
$MTTF_d$ value according to EN ISO 13849		Years	150 (for further details see data sheet 08012)
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 [1]		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_{RMS} / 30 g peak / 24 h / 3 axes
	▶ With damping plate [1]		20 ... 2000 Hz / 10 g_{RMS} / 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 [1]		15 g / 11 ms / 3 shocks / 3 axes
Shock according to DIN EN 60068-2-27	▶ With damping plate [1]		35 g / 6 ms / 1000 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 [2]

Hydraulic			
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^2/s	20 ... 100
	▶ maximum admissible	mm^2/s	10 ... 800
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)			Class 18/16/13 [3]
Rated flow (Δp = 5 bar per control edge [5])		l/min	8; 18; 32
Maximum flow [4]		l/min	80

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

2) The product fulfills the substance requirements of the RoHS directive 2011/65/EU.

3) 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.

4) Recommended (flow velocity 30 m/s)

5) Flow for deviating Δp (per control edge):

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

Notice:
The specified technical data were measured with HLP46 and ϑ_{oil} = 40 ±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	FKM	ISO 15380	90221
		HEES	FKM		
	▶ Soluble in water	HEPG	FKM	ISO 15380	
Flame-resistant	▶ Water-free	HFDU (glycol base)	FKM	ISO 12922	90222
		HFDU (ester base)	FKM		
		HFDR	FKM		
	▶ Containing water	HFC (Fuchs: Hydrotherm 46M, Fuchs Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	NBR	ISO 12922	90223

☞ **Important information on hydraulic fluids:**

- For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum 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.

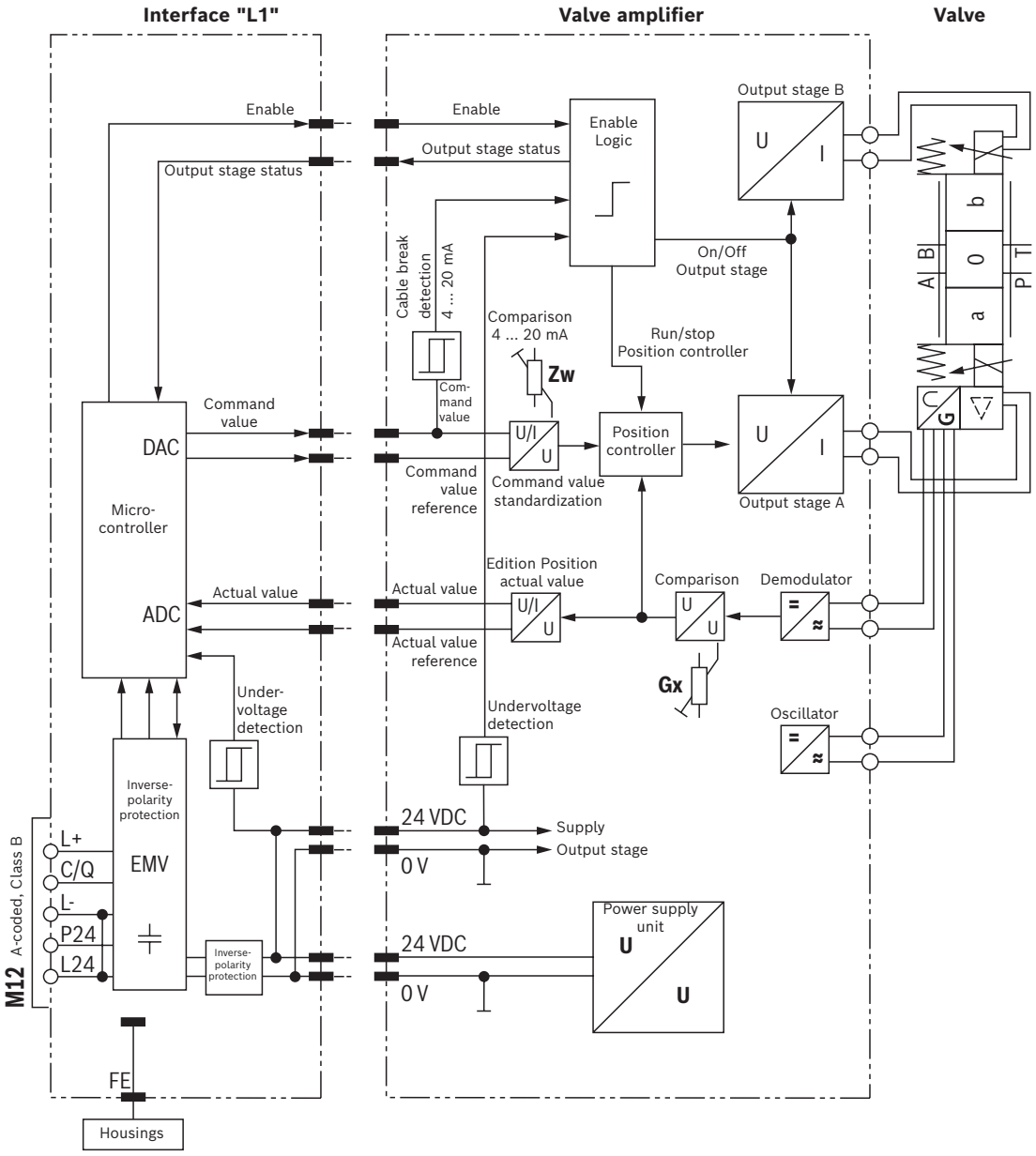
Static / dynamic		
Hysteresis	%	< 0.25
Range of inversion	%	<0.1
Response sensitivity	%	<0.1
Manufacturing tolerance q_{Vmax}	%	<10
Temperature drift (temperature range 20 °C ... 80 °C)	%/10 K	Zero shift < 0.2
Pressure drift	%/100 bar	Zero shift < 0.2
Zero point calibration	%	±1 (ex works)

Technical data

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

Electrical, integrated electronics (OBE) – Interface "L1"			
Supply voltage	▶ Valve amplifiers		
	– Nominal value	VDC	24
	– Minimum	VDC	18
	– Maximum	VDC	30
	– Maximum residual ripple	Vpp	1.3
	– Maximum power consumption	VA	40
	▶ IO-Link interface		
	– Nominal value	VDC	24
	– Minimum	VDC	18
	– Maximum	VDC	30
	– Maximum residual ripple	Vpp	1.3
	– Maximum power consumption	VA	1.2
Relative duty cycle time according to VDE 0580		%	S1 (continuous operation)
Functional ground and screening			Provide via valve block
Bit rate COM3		kBaud (kbit/s)	230.4
Required master port class			Class B
Directive			IO-Link Interface and System Specification Version 1.1.2

Block diagram/controller function block

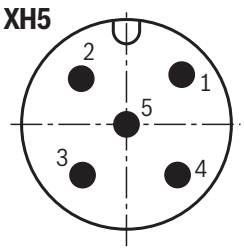


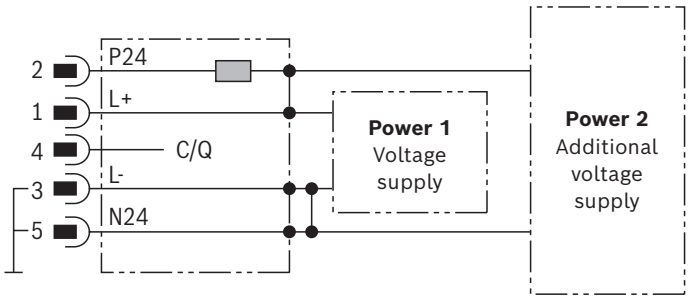
Notice:

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

Electrical connections and assignment

Connector pin assignment "L1" (M12-5, A-coded, class B)





☞ **Notice:**

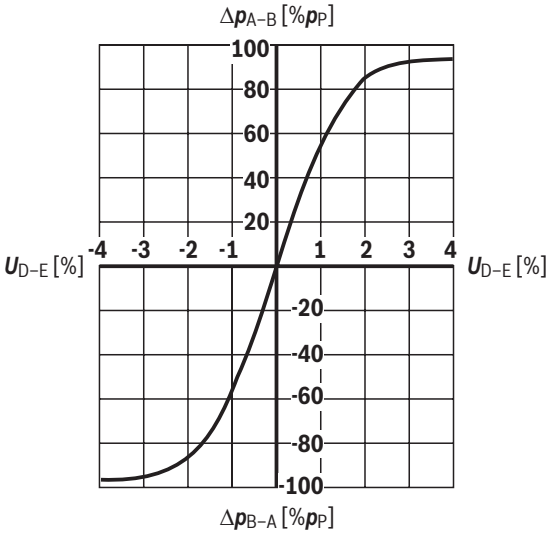
- M12 sensor/actuator connection line, 5-pole; M12 connector/bush, A-coded, without shield, maximum cable length 20 m. Observe the voltage drop over the cable. Line cross-section at least 0.34 mm².
- Mating connectors, separate order, see page 23.
- For the communication and parameter description see data sheet 29400-PA
- With a line cross-section of 0.34 mm² (standard line), a maximum cable length of 10 m is possible. For a maximum cable length of 20 m, the cross-section must be doubled.

Pin	Signal	Allocation interface "L1"
1	L+	Voltage supply IO-Link
2	P24	Voltage supply valve electronics and power part (current consumption 2 A)
3	L-	Reference potential pin 1 [1)]
4	C/Q	Data line IO-Link (SDCI)
5	N24	Reference potential pin 2 [1)]

1) Pin 3 and 5 are linked with each other in the valve electronics. The reference potentials L- and N24 of the two supply voltages must also be linked with each other on the power supply unit side.

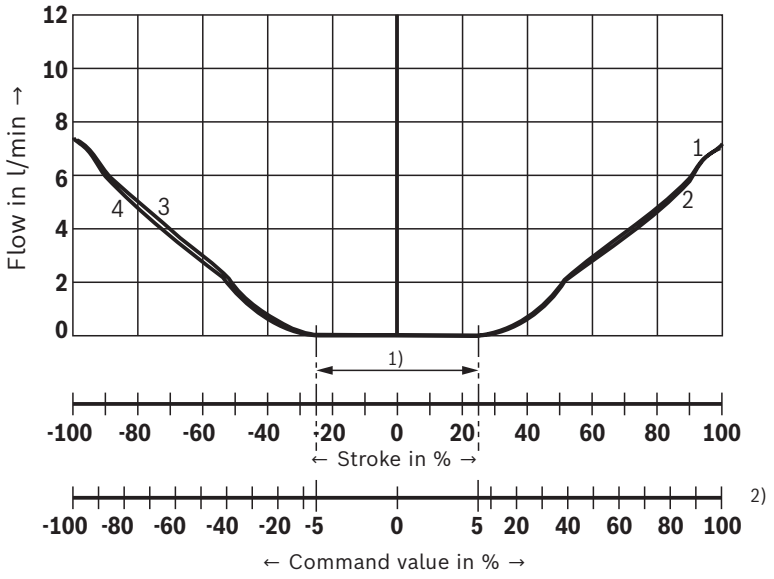
Characteristic curves
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Pressure/signal characteristic curve (symbol V)



Flow/signal function (rated flow 8 l/min with Δp = 5 bar/control edge)

Symbol E



1 P–A
2 B–T
3 P–B
4 A–T

1) Step compensation
2) Version "J"

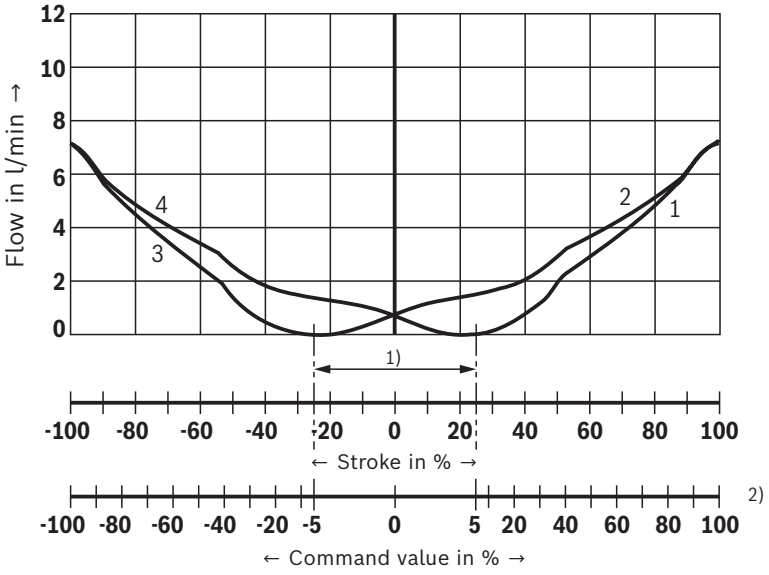
☞ **Notice:**
Typical characteristic curves which are subject to tolerance variations.

Characteristic curves

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

Flow/signal function (rated flow 8 l/min with Δp = 5 bar/control edge)

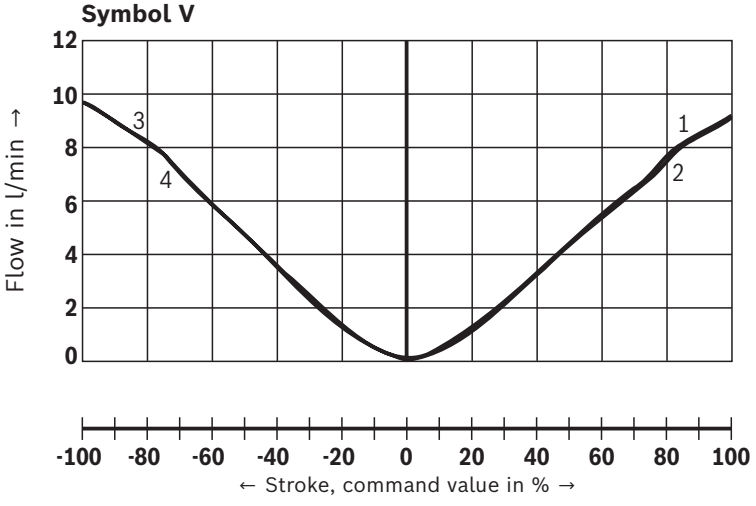
Symbol W



1 P–A
2 B–T
3 P–B
4 A–T

1) Step compensation
2) Version "J"

Symbol V



1 P–A
2 B–T
3 P–B
4 A–T

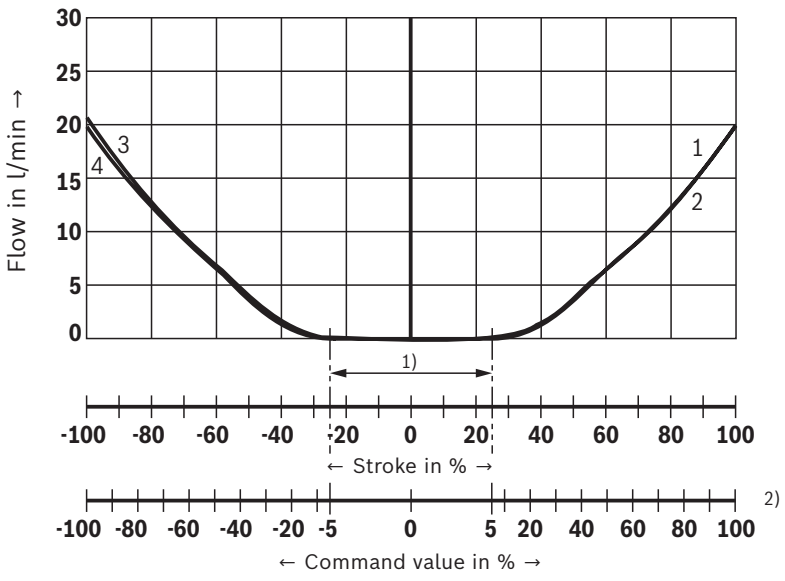
☞ **Notice:**
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Characteristic curves

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

Flow/signal function (rated flow 18 l/min with Δp = 5 bar/control edge)

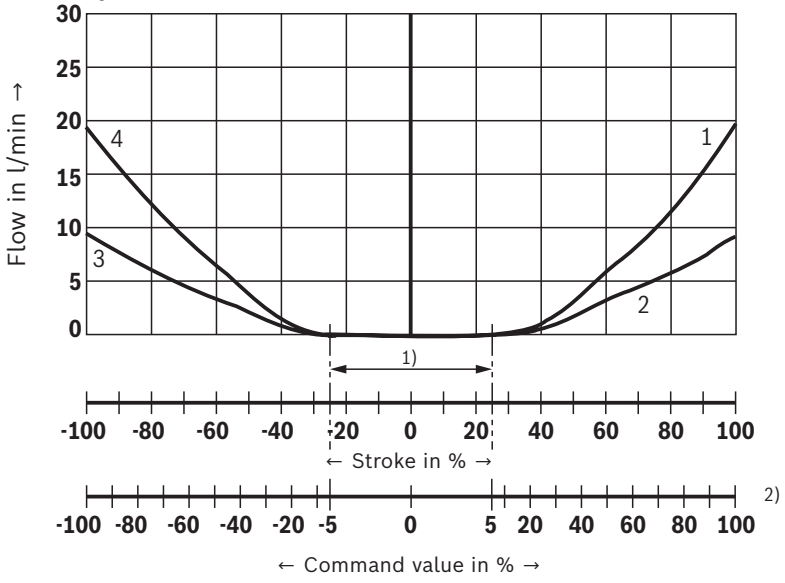
Symbol E



1 P–A
2 B–T
3 P–B
4 A–T

1) Step compensation
2) Version "J"

Symbol E1-



1 P–A
2 B–T
3 P–B
4 A–T

1) Step compensation
2) Version "J"

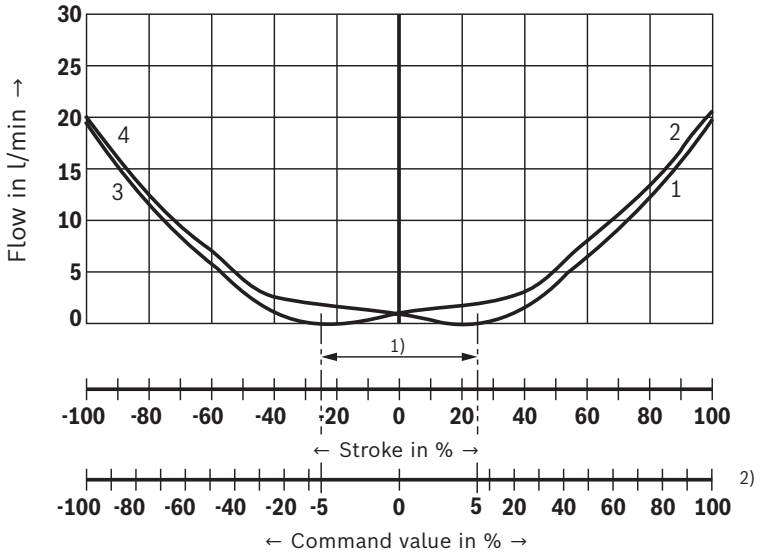
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Characteristic curves

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Flow/signal function (rated flow 18 l/min with Δp = 5 bar/control edge)

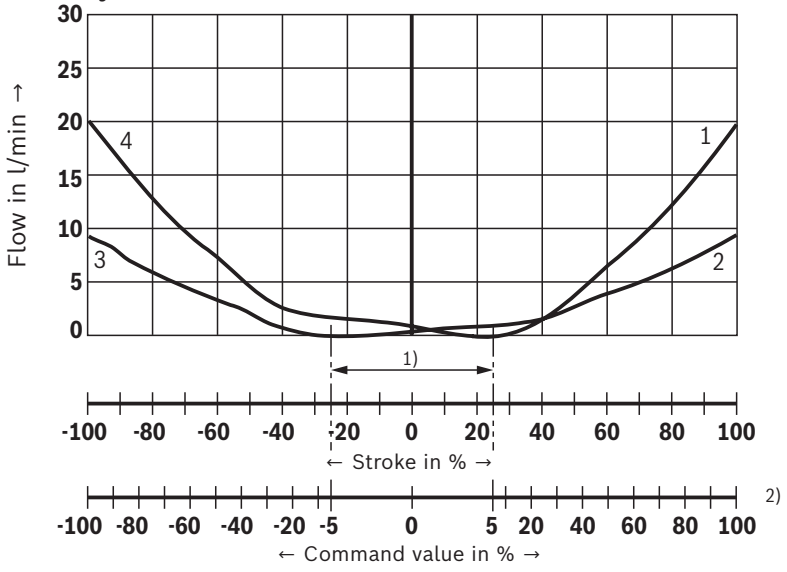
Symbol W



1 P–A
2 B–T
3 P–B
4 A–T

1) Step compensation
2) Version "J"

Symbol W1-



1 P–A
2 B–T
3 P–B
4 A–T

1) Step compensation
2) Version "J"

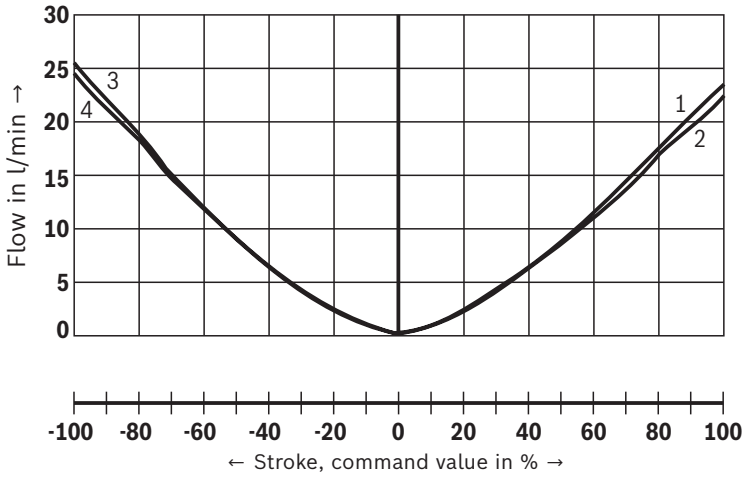
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Characteristic curves

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

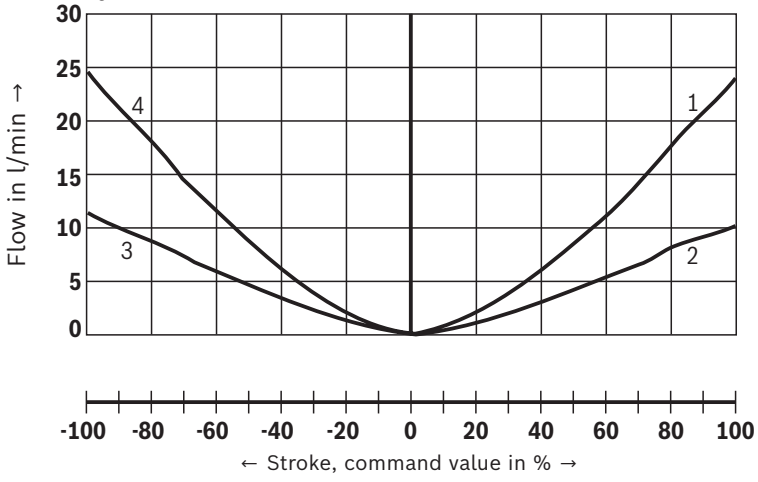
Flow/signal function (rated flow 18 l/min with Δp = 5 bar/control edge)

Symbol V



1 P–A
2 B–T
3 P–B
4 A–T

Symbol V1-



1 P–A
2 B–T
3 P–B
4 A–T

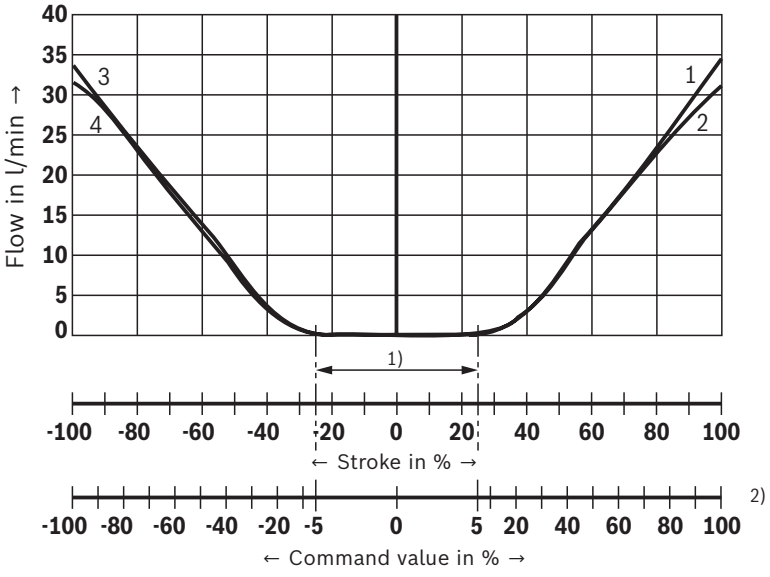
☞ **Notice:**
Typical characteristic curves which are subject to tolerance variations.

Characteristic curves

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

Flow/signal function (rated flow 32 l/min with Δp = 5 bar/control edge)

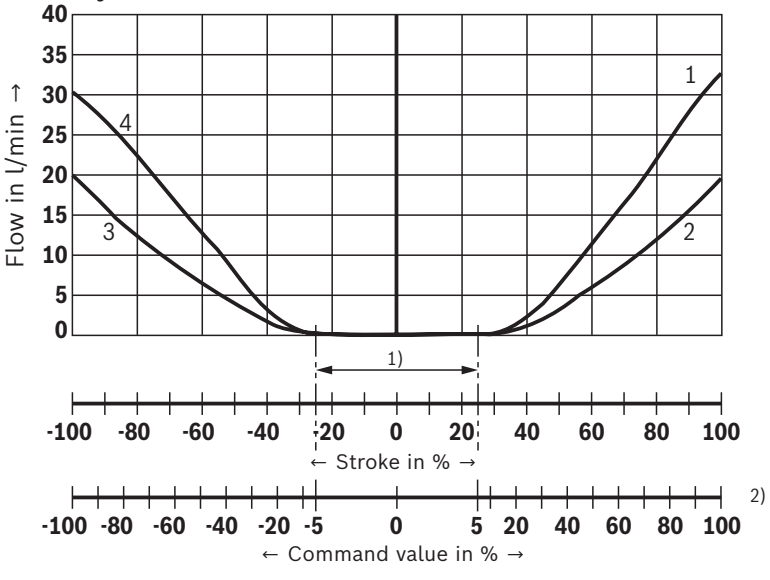
Symbol E



1 P–A
2 B–T
3 P–B
4 A–T

1) Step compensation
2) Version "J"

Symbol E1-



1 P–A
2 B–T
3 P–B
4 A–T

1) Step compensation
2) Version "J"

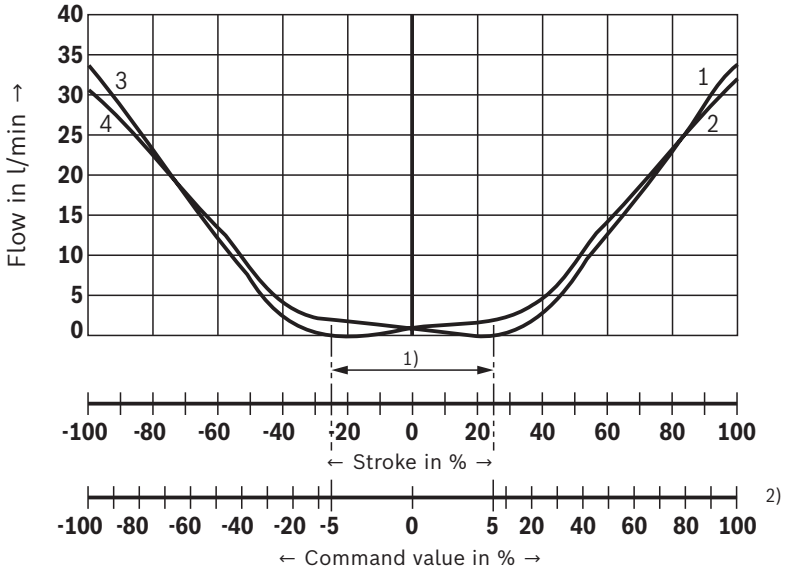
☞ **Notice:**
Typical characteristic curves which are subject to tolerance variations.

Characteristic curves

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

Flow/signal function (rated flow 32 l/min with Δp = 5 bar/control edge)

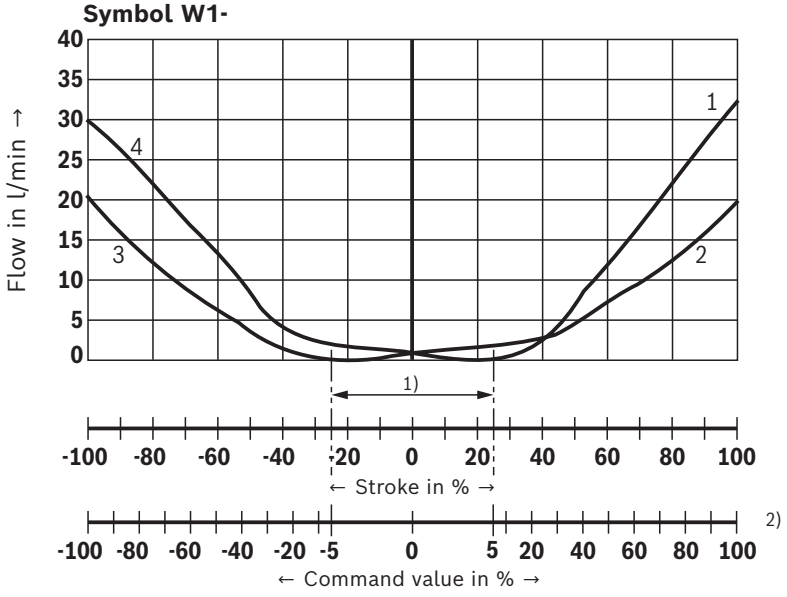
Symbol W



1 P–A
2 B–T
3 P–B
4 A–T

1) Step compensation
2) Version "J"

Symbol W1-



1 P–A
2 B–T
3 P–B
4 A–T

1) Step compensation
2) Version "J"

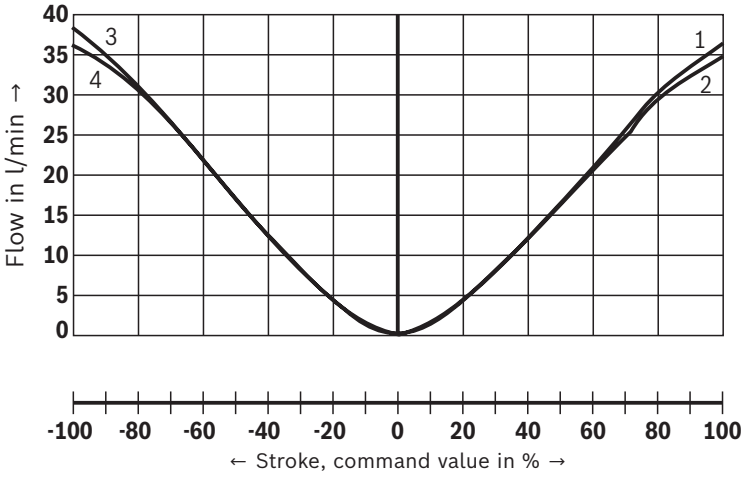
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Characteristic curves

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

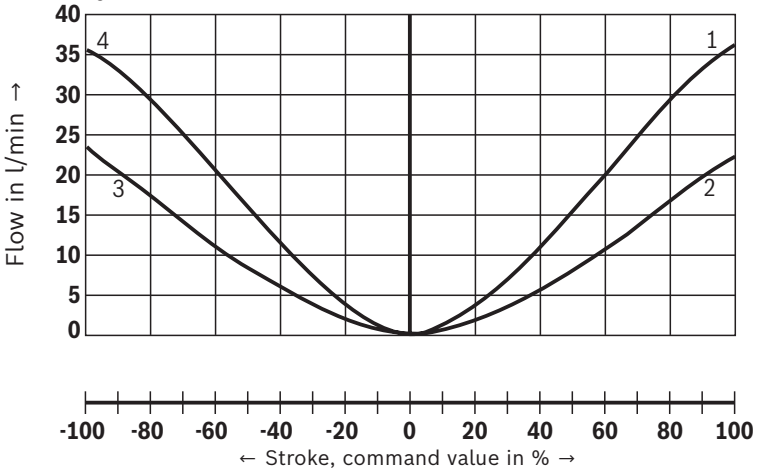
Flow/signal function (rated flow 32 l/min with Δp = 5 bar/control edge)

Symbol V



1 P–A
2 B–T
3 P–B
4 A–T

Symbol V1-



1 P–A
2 B–T
3 P–B
4 A–T

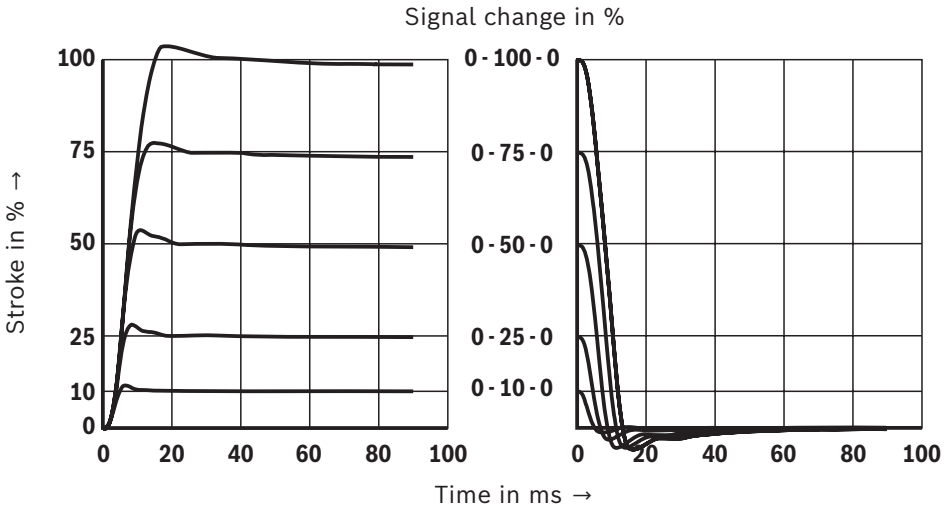
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Typical characteristic curves which are subject to tolerance variations.

Characteristic curves

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

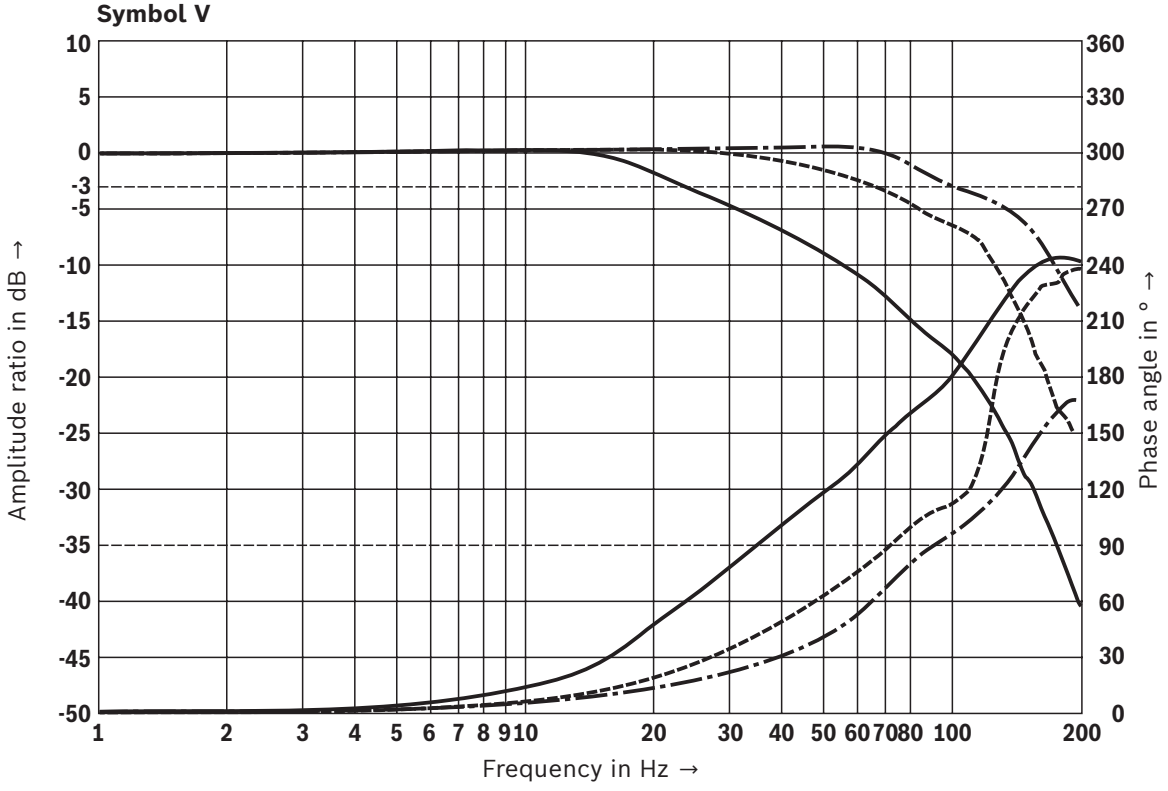
Transition function with stepped electric input signals

Symbol V



Frequency response

Symbol V



Signal ±5%

Signal ±25%

Signal ±100%

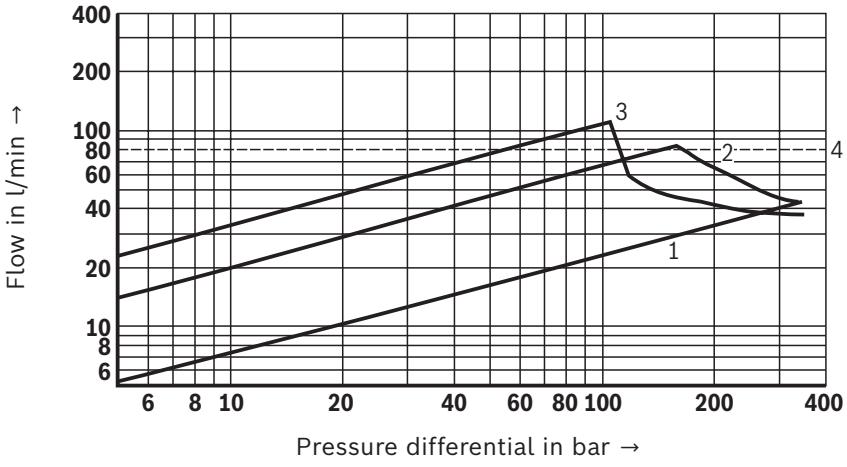
☞ **Notice:**
Typical characteristic curves which are subject to tolerance variations.

Characteristic curves

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

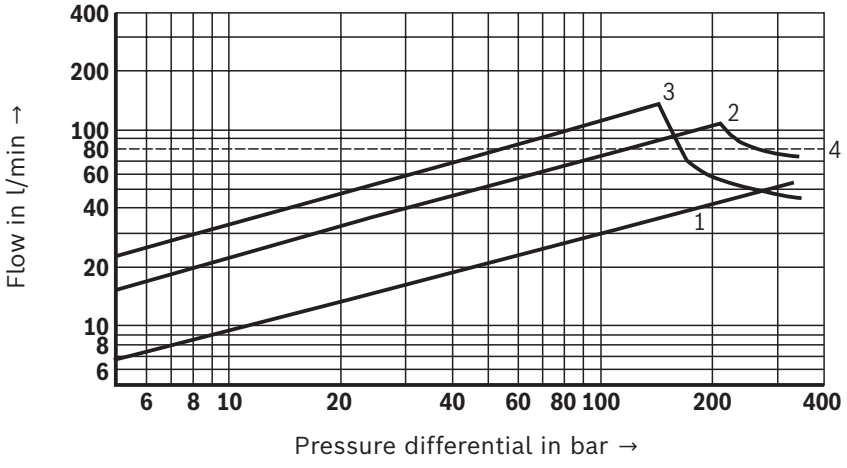
Flow/load function with maximum valve opening (tolerance ±10%)

Symbol E



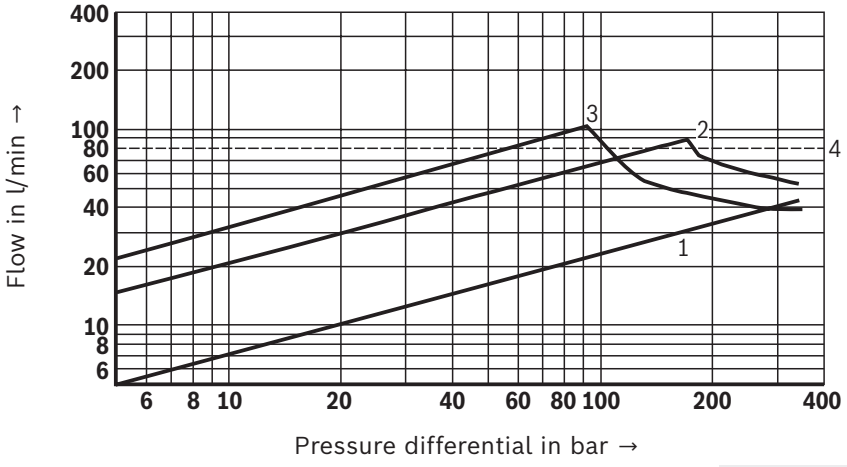
1 8 l/min (summated edge)
2 18 l/min (summated edge)
3 32 l/min (summated edge)
4 Recommended flow (flow velocity 30 m/s)

Symbol V



1 8 l/min (summated edge)
2 18 l/min (summated edge)
3 32 l/min (summated edge)
4 Recommended flow (flow velocity 30 m/s)

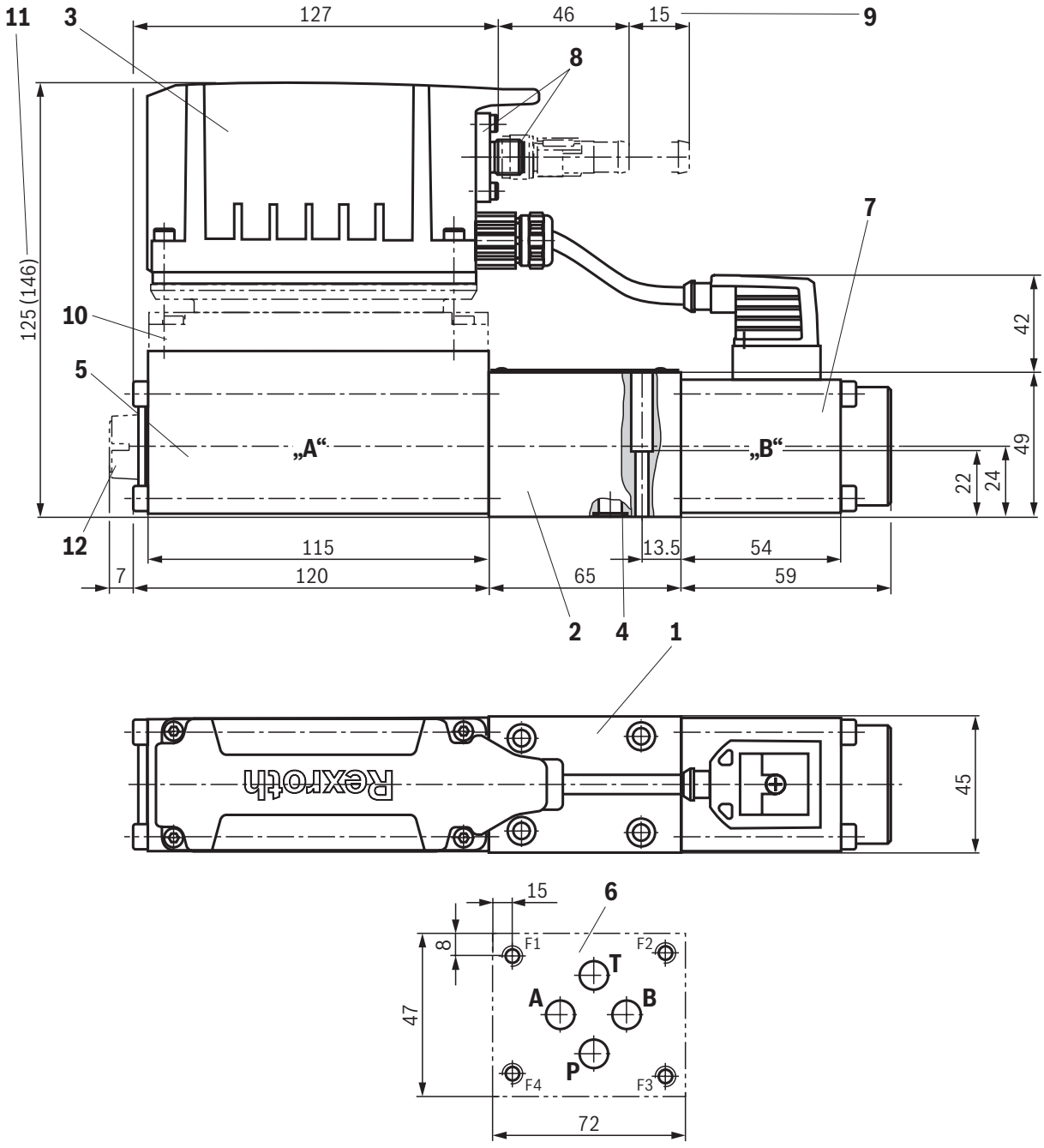
Symbol W

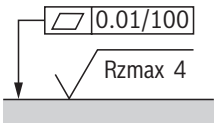


1 8 l/min (summated edge)
2 18 l/min (summated edge)
3 32 l/min (summated edge)
4 Recommended flow (flow velocity 30 m/s)

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

Dimensions
(dimensions in mm)





Required surface quality of the valve contact surface

☞ **Notice:**
- The dimensions are nominal dimensions which are subject to tolerances.
- Mating connectors, separate order, see page 23.

For **item explanations, valve mounting screws** and **subplates,** see page 22.

Dimensions

1 Name plate
2 Valve housing
3 Integrated electronics (OBE)
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
7 Stroke solenoid
8 Mating connectors for version "L1", separate order, see page 23.
9 Space required for removing the mating connector
10 Damping plate "D"
11 Dimension in () for version with damping plate "D"
12 Electronics protection membrane "-967"

Valve mounting screws (separate order)

Size	Quantity	Hexagon socket head cap screws	Material number
6	4	**ISO 4762 - M5 x 30 - 10.9-CM-Fe-ZnNi-5-Cn-T0-H-B** (Friction coefficient μ_{total} = 0.09 … 0.14) Tightening torque M_A = 7 Nm ±10%	**R913048086**
	or		
	4	**ISO 4762 - M5 x 30 - 10.9** Tightening torque M_A = 8.9 Nm ±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 4401-03-02-0-05 see data sheet 45100.

Accessories (separate order)

Valves with integrated electronics and IO-Link interface

Cable sets for IO-Link	**Length** in m	**Material number**	**Data sheet**
For the connection of valves with IO-Link interface, M12-5, A-coded, unshielded, line cross-section 5 x 0.34 mm²	1.5	**R901508849**	–
	3.0	**R901554223**	–
	5.0	**R901415747**	–

Further information

▶ Hydraulic valves for industrial applications	Data sheet 07600-B
▶ 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
▶ Assembly, commissioning and maintenance of hydraulic systems	Data sheet 07900
▶ Directional control valves, direct operated, with electrical position feedback and IO-Link interface	Data sheet 29400-PA
▶ Directional control and proportional directional valves with IO-Link interface	Operating instructions 29118-B
▶ Information on available spare parts	www.boschrexroth.com/spc
▶ Connecting hydraulic systems via IO-Link	www.boschrexroth.com/io-link

Notes

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It must be remembered that our products are subject to a natural process of wear and aging.

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