Proportional directional cartridge valve, pilot-operated, with integrated electronics (OBE) or external control electronics

Type 2WFC and 2WFCE

RE 29403
Edition: 2018-09

H8069

- Size 16 ... 50
- Component series 1X
- Maximum operating pressure 420 bar
- Maximum flow 1500 l/min (***Δp*** = 5 bar)
- CE according to EMC Directive 2014/30/EU

CE

Features

- 2/2-way version
- Cartridge valve
- Robust
  - Pressure resistance up to 420 bar
  - High vibration resistance (acc. to DIN EN60068-2)
  - Ambient temperature up to +60 °C
- Precise
  - High response sensitivity and little hysteresis
- Reliable
  - High-quality and proven design
- Normalized
  - Installation dimensions according to ISO 7368
  - Connectors/interfaces
- Flexible
  - In connection with a pressure compensator pressure-compensated flow control possible
- Safe
  - Fail-safe position of the main stage in case of power failure, cable break or disconnected enable

Contents

Ordering code

01	02	03	04	05	06	07	08		09		10	11	12	13
2	**WFC**			**S**		**L**	**–**	**1X**	**/**		**/**				*****

01	2 main ports	**2**
02	Pilot-operated proportional directional valve (cartridge valve)	**WFC**
03	With external control electronics	**no code**
	With integrated electronics (OBE)	**E**
04	Size 16	**16**
	Size 25	**25**
	Size 32	**32**
	Size 40	**40**
	Size 50	**50**
05	Seat control spool	**S**

Rated flow at 5 bar pressure differential

06	**– Size 16**	
	125 l/min [1)]	**125**
	160 l/min [2)]	**160**
	– Size 25	
	220 l/min [1)]	**220**
	330 l/min [2)]	**330**
	– Size 32	
	320 l/min [1)]	**320**
	650 l/min [2)]	**650**
	– Size 40	
	500 l/min [1)]	**500**
	940 l/min [2)]	**940**
	– Size 50	
	1000 l/min [1)]	**1000**
	1500 l/min [2)]	**1500**

Flow characteristic

07	Linear	**L**
08	Component series 10 ... 19 (10 ... 19: unchanged installation and connection dimensions)	**1X**

Seal material

09	NBR seals	**M**
	FKM seals	**V**
	Observe compatibility of seals with hydraulic fluid used. (Other seals upon request)	

Electrical connection (version "With external control electronics")

10	Connector 3-pole (2 + PE) according to DIN EN 175301-803	**K4** [3; 4)]
11	Without supply voltage (version "With external control electronics")	**no code**
	Supply voltage 24 V (With integrated electronics (OBE) "E")	**24**

Ordering code

01	02	03	04	05	06	07		08		09		10	11	12	13
2	**WFC**			**S**		**L**	**–**	**1X**	**/**		**/**				*****

Electrical interface (With integrated electronics (OBE) "E")

12	0 ... 10 V DC (connector 6+PE)	**A1** [3]
	0 ... 10 V DC (connector 11+PE)	**B1** [3]
	4 ... 20 mA (connector 11+PE)	**G1** [3]

13	Further details in the plain text	*****

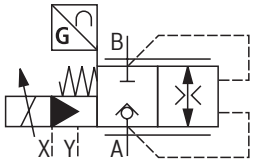
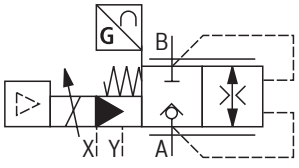
[1] Control spool Linear (standard)

[2] Control spool Linear–Progressive

[3] Mating connectors, separate order, see page24 and data sheet 08006.

[4] External control electronics, see page 24.

Symbols

With external control electronics "2WFC"	With integrated electronics (OBE) "2WFCE"
	

Notes:

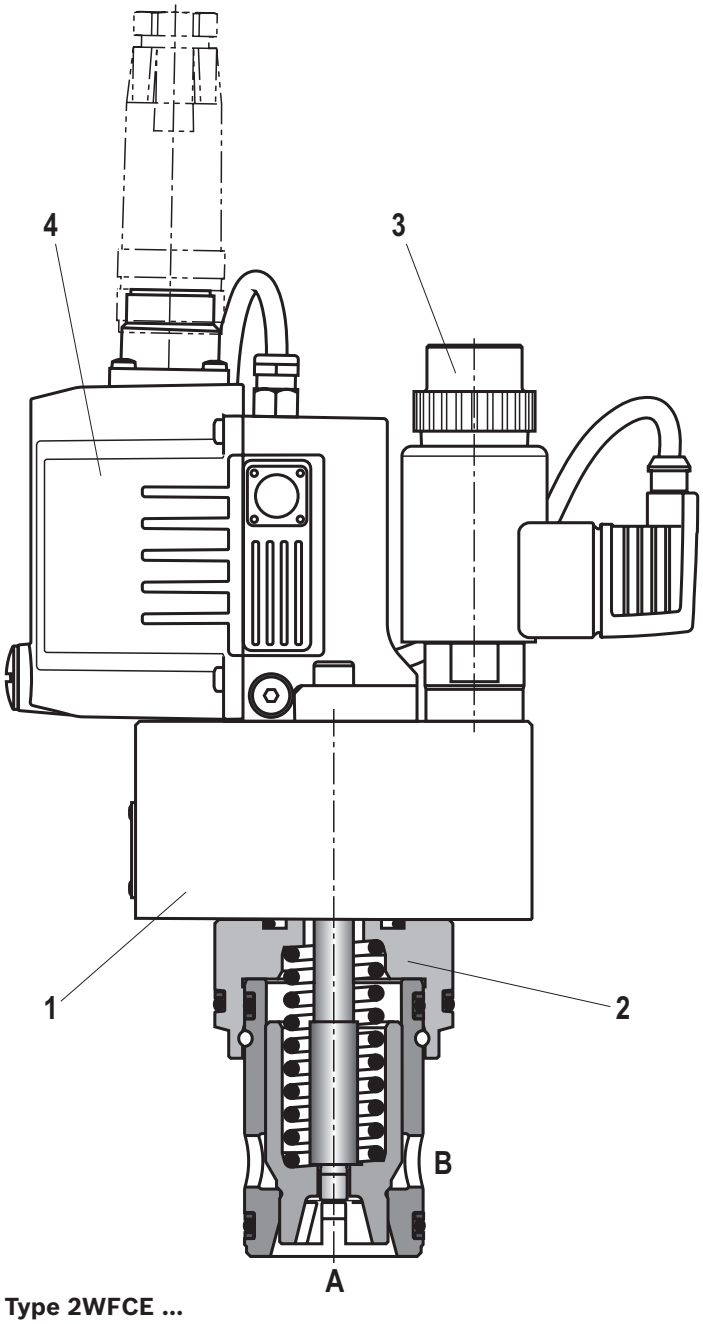
- Representation according to DIN ISO 1219-1.
- Direction of flow
  - A → B (X connected to A)
  - B → A (X connected to B)

Function, section

Set-up

The pilot-operated proportional directional cartridge valve type 2WFC(E) basically consists of:

- Cover (1)
- Main stage (2)
- Pilot control valve with proportional solenoid (3)
- Integrated electronics with position transducer and analog interface (4) or external control electronics as module amplifier



Type 2WFCE ...

The electronics (integrated or external) compare the specified command value to the position actual value of the control spool of the main stage (2). In case of control deviations, the solenoid of the pilot control valve (3) is activated. In this way, the control spool is adjusted. Depending on the control deviation, the control chamber of the main stage (2) is either pressurized with pilot oil (the main stage closes) or unloaded (the main stage opens). Stroke and orifice cross-section are controlled proportionally to the command value until the control deviation is remedied.

For proper function, the following has to be observed:

- Direction of flow A → B (X connected to A)
- Direction of flow B → A (X connected to B)
- Port Y depressurized to the tank

Failure of supply voltage

If the minimum supply voltage fails or is fallen below, the enable is disconnected (only interfaces B1 and G1) and in case of a cable break of the solenoid conductor, the electronics will de-energize the solenoid of the pilot control valve (3). The control spool of the main stage (2) moves securely to its seat using the pressure available at port X and the force of the main stage spring and blocks the flow between A and B.

Flow control function

In connection with a pressure compensator, the pilot-operated proportional directional cartridge valve can be used for the pressure-compensated control of a flow.

Technical data

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

general							
Size		NG	16	25	32	40	50
Weight	▶ Type 2WFC	kg	3.3	4.4	5.6	7.7	10.3
	▶ Type 2WFCE	kg	3.5	4.6	5.8	7.9	10.5
Installation position			any				
Ambient temperature range		°C	–30 ... +60 (NBR seals) –20 ... +60 (FKM seals)				
Maximum storage time		Years	1 (if the storage conditions are observed; refer to the operating instructions 07600-B)				
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_{RMS} / 30 g peak / 30 min. / 3 axes				
	▶ Transport shock according to DIN EN 60068-2-27		15 g / 11 ms / 3 axes				
Maximum relative humidity (no condensation)		%	95				
Maximum surface temperature (solenoid coil)		°C	150				
$MTTF_d$ value according to EN ISO 13849		Years	75 (for further details see data sheet 08012)				

hydraulic							
Maximum operating pressure	▶ Port A, B	bar	420				
Minimum operating pressure	▶ Port A (A → B) [1]	bar	12				
	▶ Port B (B → A) [1]	bar	20				
Maximum pilot pressure	▶ Port X	bar	420				
Maximum return flow pressure	▶ Port Y [1]	bar	100				
Rated flow (Δp = 5 bar [2])	▶ Linear	l/min	125	220	320	500	1000
	▶ Linear–Progressive	l/min	160	330	650	940	1500
Maximum pilot flow [3]		l/min	3	5	7	9	9
Leakage flow	▶ Pilot control valve (at 100 bar)	cm³/min	< 150	< 200	< 200	< 400	< 400
	▶ Main stage						
	– Interface A1 (0 V) [5; 6]	cm³/min	A → B and B → A blocked in a leakage-free manner (valve in seat position)				
	– Interface B1 (0 V)	cm³/min	depending on Δp, see characteristic curves on page 10 ...19				
	– Interface G1 (4 mA)	cm³/min	depending on Δp, see characteristic curves on page 10 ...19				
	– Interface B1, G1 [4; 5; 6]	cm³/min	A → B and B → A blocked in a leakage-free manner (valve in seat position)				
Pilot volume	▶ Main stage [2]	cm³	1	2.7	6.4	12.6	24.5
Direction of flow	▶ Pilot oil supply internal [1]						
	– A → B		A connected to X				
	– B → A		B connected to X				
	▶ Pilot oil supply external [1]						
	– A → B		Pressure in X ≥ pressure in A				
	– B → A		Pressure in X ≥ pressure in B				
Hydraulic fluid			see table page 6				
Viscosity range	▶ Recommended	mm²/s	20 ... 100				
	▶ Maximum admissible	mm²/s	15 ... 380				
Hydraulic fluid temperature range (flown-through)		°C	-20 ... +60				
Maximum admissible degree of contamination of the hydraulic fluid; cleanliness class according to ISO 4406 (c)			Class 18/16/13 [7]				

1) Counter pressure in port Y; values correspond to Y depressurized to the tank.

2) Flow for deviating Δp:

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

3) Stepped input signal (seat position at 100%, pilot pressure 100 bar)

4) Pin 3: 0 V (release not set, see page 8)

5) Pilot oil supply internal: Observe leakage flow A → X or B → X via pilot control valve to Y (see technical data leakage flow – pilot control valve)

6) Pilot oil supply external: Leakage flow from A or B via the pilot control valve is avoided; a minimum leakage flow X → B up to 30 cm³/min is, however, possible

7) The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and simultaneously increases the life cycle of the components.
Available filters can be found at www.boschrexroth.com/filter.

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

Hydraulic fluid		Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524	90220
Bio-degradable	▶ Insoluble in water	HETG	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 Houghto 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:**
  wIf components with galvanic zinc coating or parts containing zinc are used, small amounts of dissolved zinc may get into the hydraulic system and cause accelerated aging of the flame-resistant hydraulic fluid. Zinc soap may form as a chemical reaction product, which may clog filters, nozzles or solenoid valves - particularly in connection with local heat input.
- **Flame-resistant – containing water:**
  - Due to 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 - to back 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	%	< 0.2
Range of inversion	%	< 0.1
Response sensitivity	%	< 0.1
Manufacturing tolerance q_{Vmax} (control spool Linear)	%	≤ 10
Temperature drift	%/40 K	< 1
Zero compensation		ex plant ±1%

electrical, integrated electronics (OBE)			
Relative duty cycle		%	100 (continuous operation)
Protection class according to EN 60529			IP 65 with mating connector mounted and locked
Supply voltage	▶ Nominal voltage	VDC	24
	▶ Lower limit value	VDC	18
	▶ Upper limit value	VDC	36
	▶ Maximum admissible residual ripple	Vpp	2.5 (Comply with absolute supply voltage limit value)
Current consumption	▶ Maximum	A	2
	▶ Impulse current	A	3
Maximum power consumption		W	50
Functional ground and screening			see connector pin assignment (CE-compliant installation) page 9
Required fuse protection, external		A	2.5 time-lag
Adjustment			calibrated in the plant, see characteristic curves page 10 ... 19
Conformity			▶ CE according to EMC directive 2014/30/EU, tested according to EN 61000-6-2 and EN 61000-6-3 ▶ RoHS directive 2015/65/EU ▶ REACH ordinance (EC) no. 1907/2006

Integrated electronics (OBE)

Function

1. Switch-on procedure/Fault behavior

After applying the supply voltage of 24 V, the electronics are ready for operation provided that the following conditions are met:

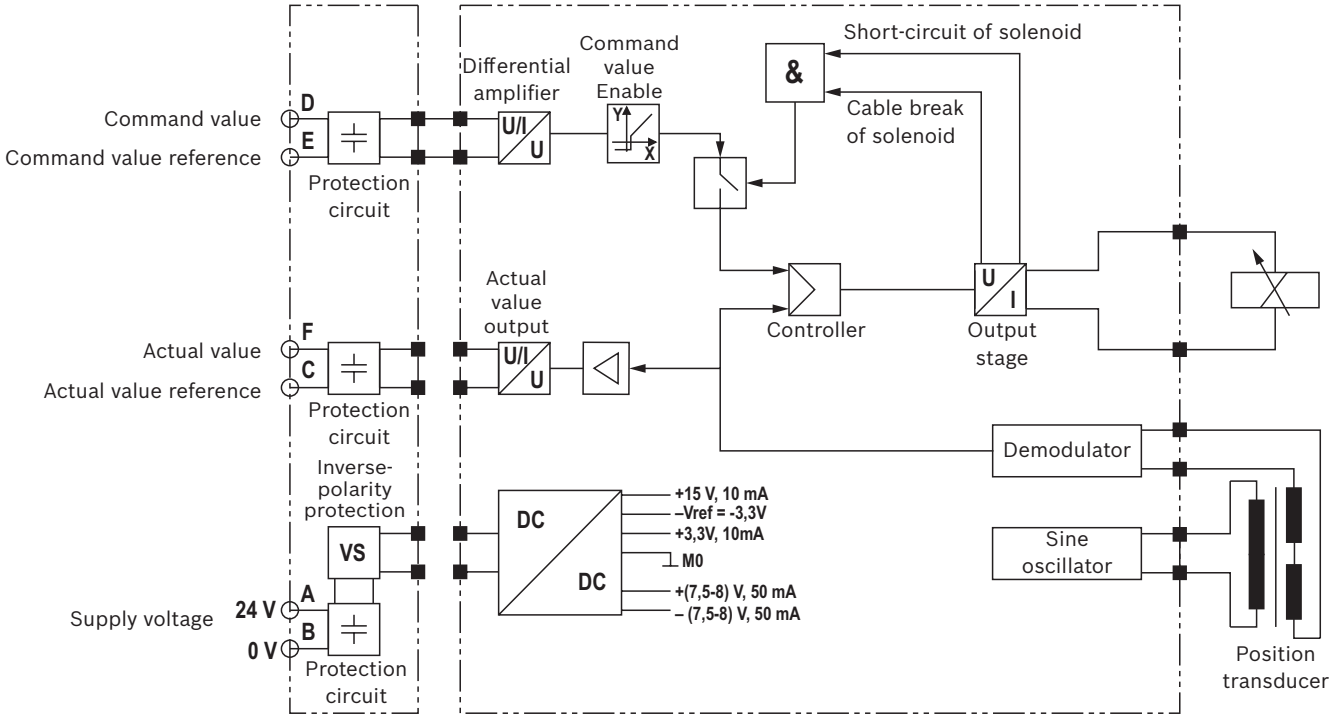
- Supply voltage U_B > 18 V DC
- Connection to solenoid not interrupted
- Command value line not interrupted and command value > 2.7 mA (interface "G1" only)

If one of the conditions is not met, the controllers and the output stage will be blocked and the ready for operation signal to pin 11 (interface "B1" and "G1" only) will be set to 0 V.

2. Actual value output signals

- Electrical interfaces "A1" (pin F) and "B1" (pin 6)
  - "A1": 0.35 V ... +10 V corresponds to 0% ... 100% valve opening; control spool in seat position if actual value < -2.5 V
  - "B1": 0 V ... +10 V corresponds to 0% ... 100% valve opening; control spool in seat position if actual value < -1.5 V
- Electrical interface "G1" (pin 6)
  - 4 mA ... 20 mA corresponds to 0% ... 100% valve opening; control spool in seat position if actual value < 2.7 mA

Block diagram/controller function block: Version 6 + PE

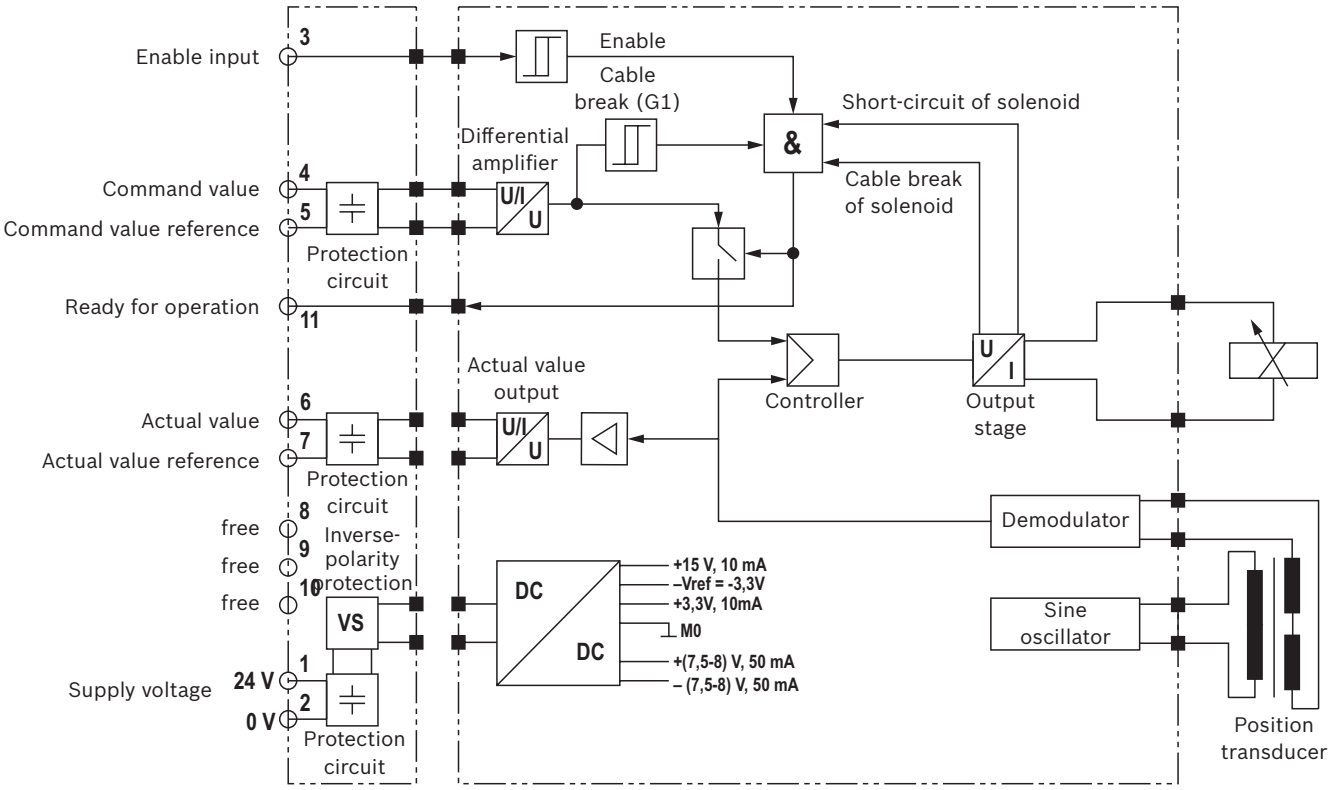


Notes:

- Electrical interface "A1"
  - in opening direction: Valve active if command value ≥ 0.5 V
  - in closing direction: Valve deactivated if command value ≤ 0.3 V ("on seat")
- Electrical interfaces "B1" and "G1"
  - in opening direction: Valve active if enable pin 3 is set, command value > -1 V ("B1") or > 2 mA ("G1")
  - in closing direction: Valve deactivated if enable pin 3 is not set, command value < -1 V ("B1") or < 2 mA ("G1") ("on seat")

Command value	"B1" and "G1"	"A1"
Without enable		–
0 V		
>0 V ... 0,35 V		
>0,35 V ... <0,5 V		
>0,5 V		

Block diagram/controller function block: Version 11 + PE



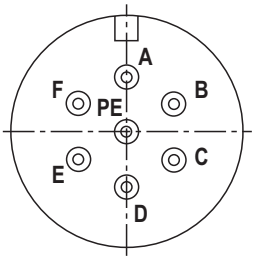
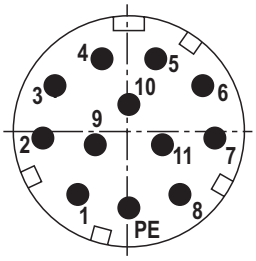
Notes:

- Electrical interface "A1"
  - in opening direction: Valve active if command value ≥ 0.5 V
  - in closing direction: Valve deactivated if command value ≤ 0.3 V ("on seat")
- Electrical interfaces "B1" and "G1"
  - in opening direction: Valve active if enable pin 3 is set, command value > -1 V ("B1") or > 2 mA ("G1")
  - in closing direction: Valve deactivated if enable pin 3 is not set, command value < -1 V ("B1") or < 2 mA ("G1") ("on seat")

Command value	**"1"** and **"G1"**	**"A1"**
Without enable		–
0 V		
>0 V ... 0,35 V		
>0,35 V ... <0,5 V		
>0,5 V		

Electrical connections and assignment

Connector pin assignment

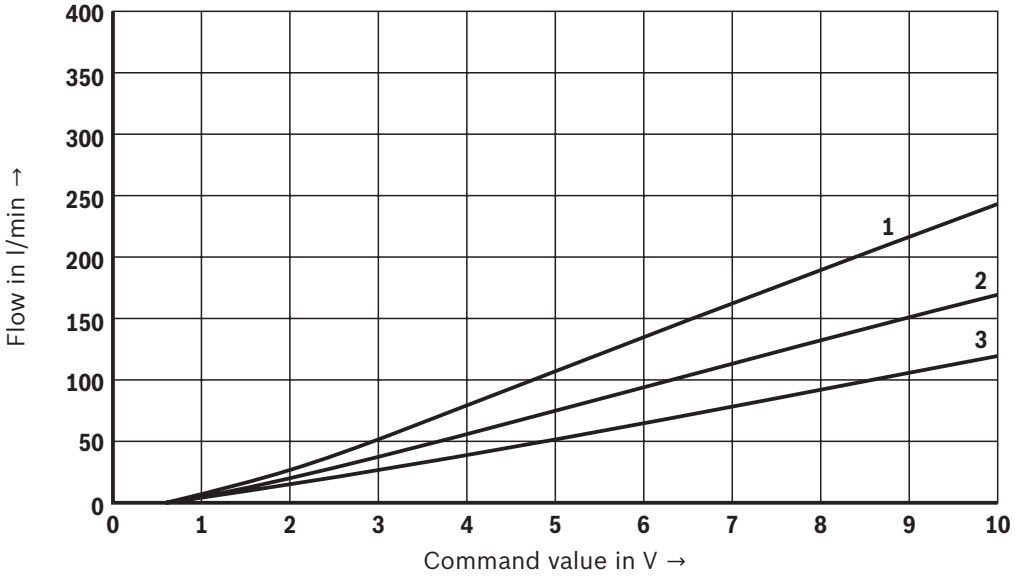
Pin		Core marking [1]	Interface assignment		
6 + PE	**11 + PE**		**"A1"** (6 + PE)	**"B1"**(11 + PE)	**"G1"**(11 + PE)
A	1	1	Supply voltage 24 VDC		
B	2	2	GND		
C	3	3	Reference potential actual value	Enable input 24 VDC (high ≥ 12 V; low ≤5 V)	
D	4	4	Command value 0 ... 10 V		Command value 4 ...20 mA
E	5	5	Reference potential command value		
F	6	6	Actual value 0 ... 10 V		Actual value 4 ... 20 mA
	7	7		Reference potential actual value	
	8	8	–		
	9	9	–		
	10	10	–		
	11	11	–	Switching output 24 V – fault-free operation (supply voltage -1 V)/error (0 V) or power circuit signal), maximum 50 mA	
PE	PE	green-yellow	Functional ground (directly connected to the valve housing)		
					

[1] Core marking of the connection lines for mating connector with cable set, see accessories, page 24.

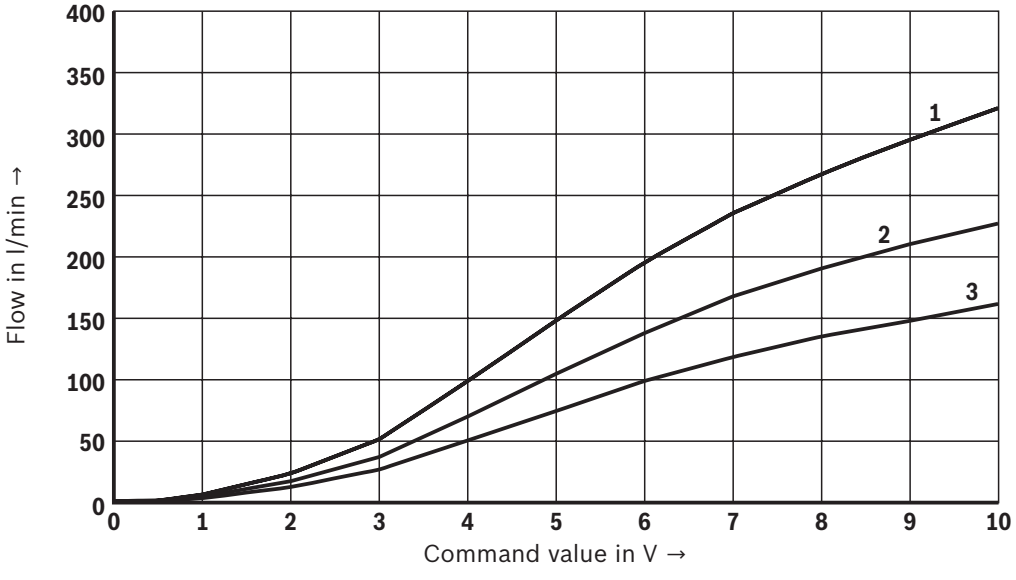
Characteristic curves: Size 16
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

Flow/signal function

Version "125" (A → B; B → A; linear)



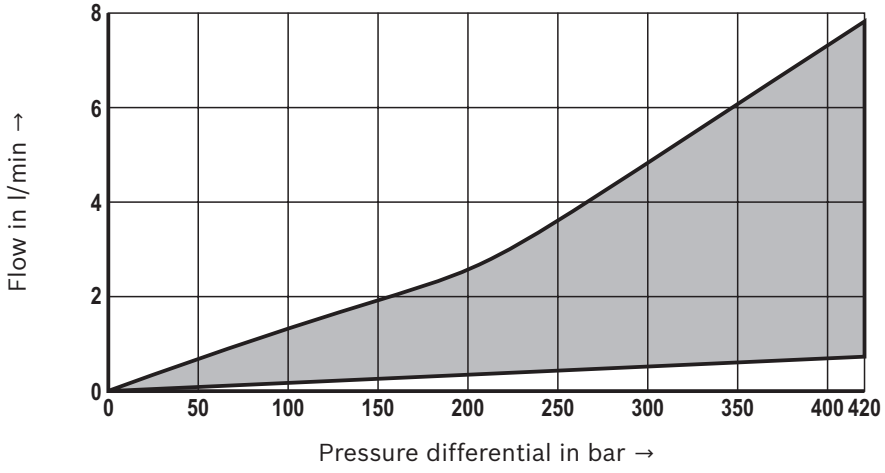
Version "160" (A → B; B → A; linear-progressive)



1 Pressure differential 20 bar
2 Pressure differential 10 bar
3 Pressure differential 5 bar

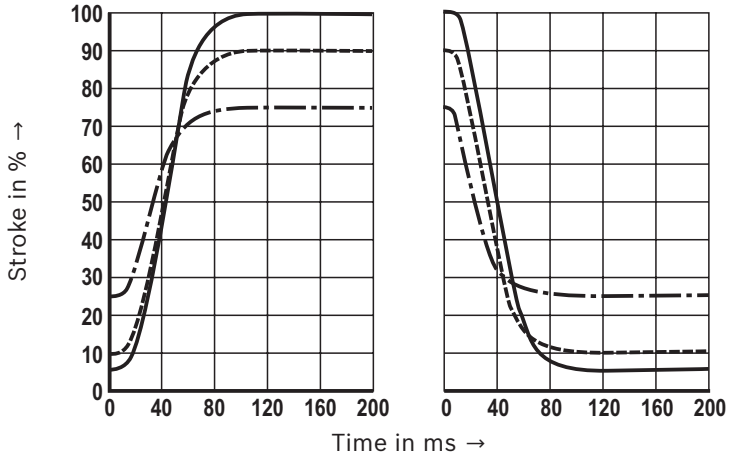
Characteristic curves: Size 16
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

Leakage as a function of the pressure differential
(Command value: A1 – 0.5 V; B1 – 0 V; G1 – 4 mA)



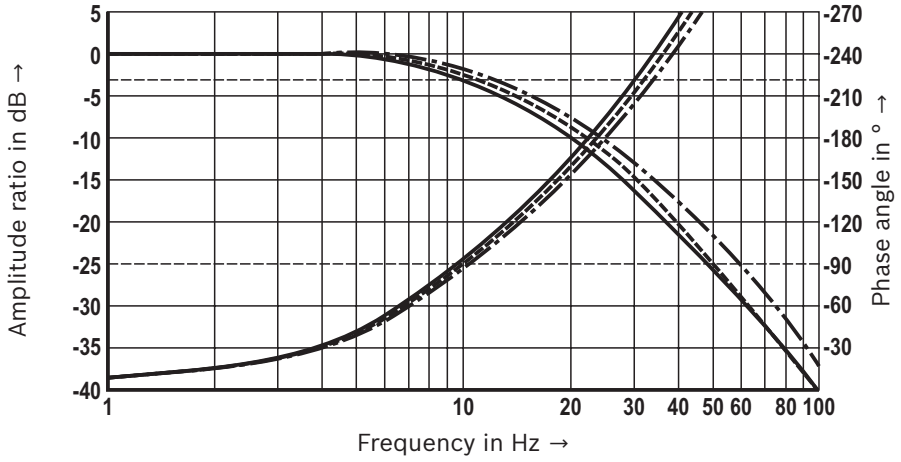
Scatter range

Transition function with stepped electric input signals
(p_A = p_B = 100 bar; port B closed)



Step responses in %:
- 5 – 100 – 5
- 10 – 90 – 10
- 25 – 75 – 25

Frequency response (p_A= 100 bar)

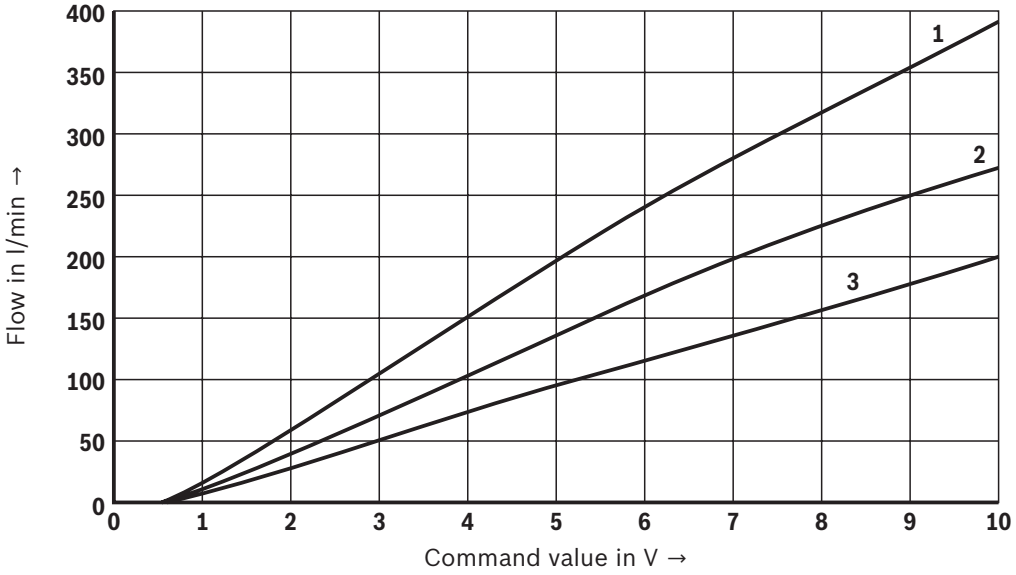


Signals in %:
- 5 – 100 – 5
- 10 – 90 – 10
- 25 – 75 – 25

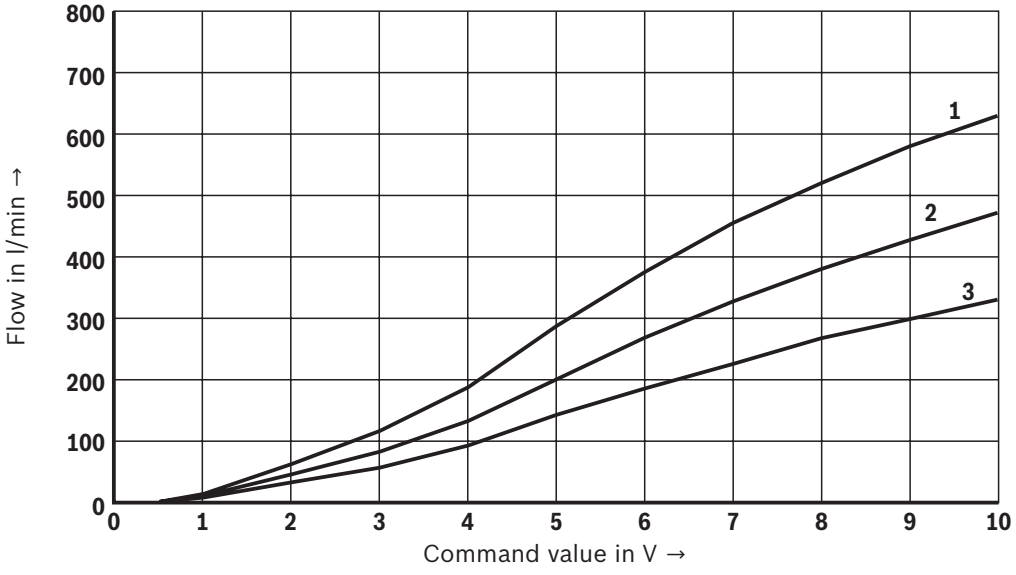
Characteristic curves: Size 25
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

Flow/signal function

Version "220" (A → B; B → A; linear)



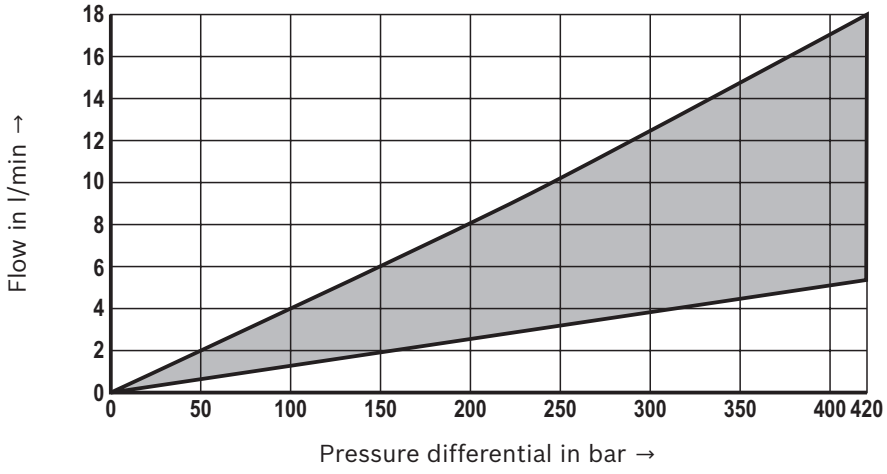
Version "330" (A → B; B → A; linear-progressive)



1 Pressure differential 20 bar
2 Pressure differential 10 bar
3 Pressure differential 5 bar

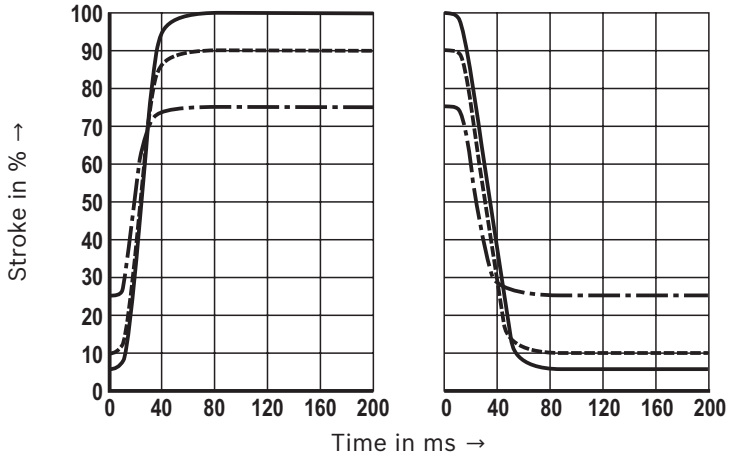
Characteristic curves: Size 25
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

Leakage as a function of the pressure differential
(Command value: A1 – 0.5 V; B1 – 0 V; G1 – 4 mA)



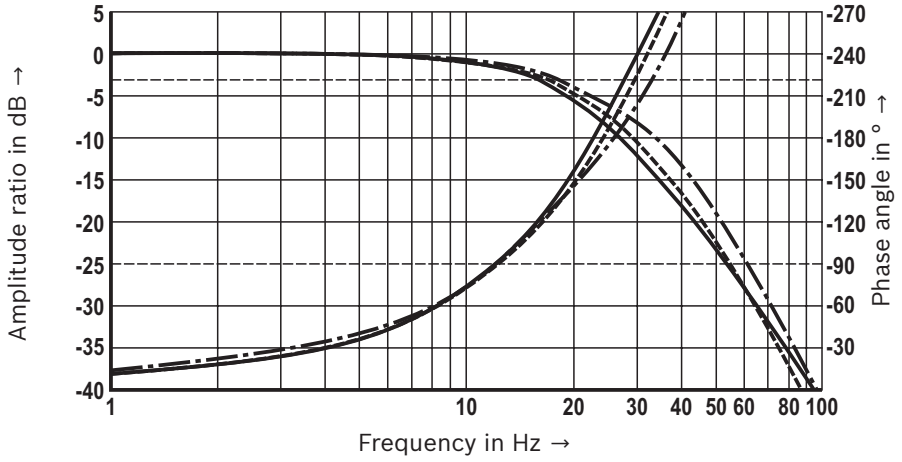
Scatter range

Transition function with stepped electric input signals
(p_A = p_B = 100 bar; port B closed)



Step responses in %:
- 5 – 100 – 5
- 10 – 90 – 10
- 25 – 75 – 25

Frequency response (p_A= 100 bar)

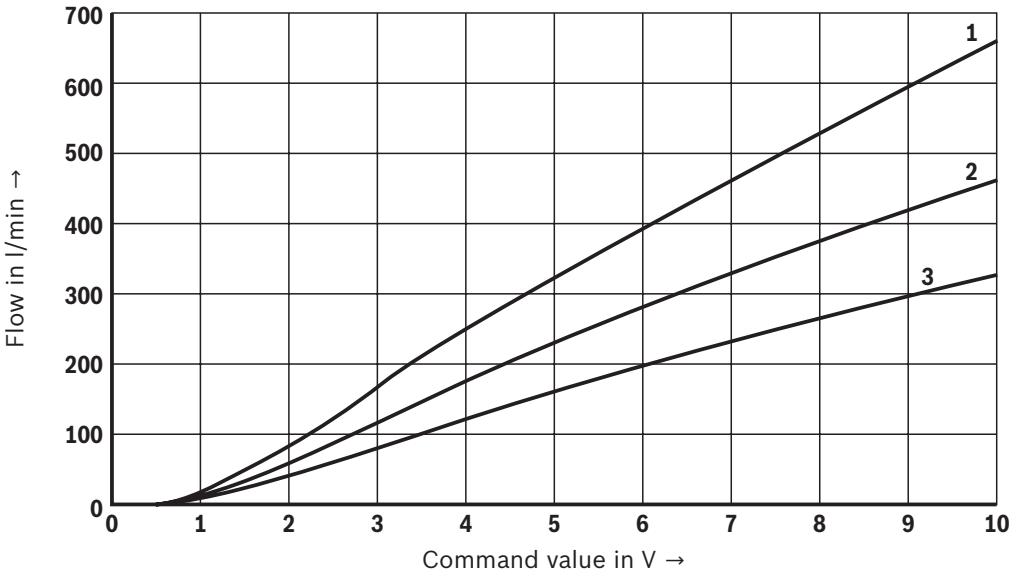


Signals in %:
- 5 – 100 – 5
- 10 – 90 – 10
- 25 – 75 – 25

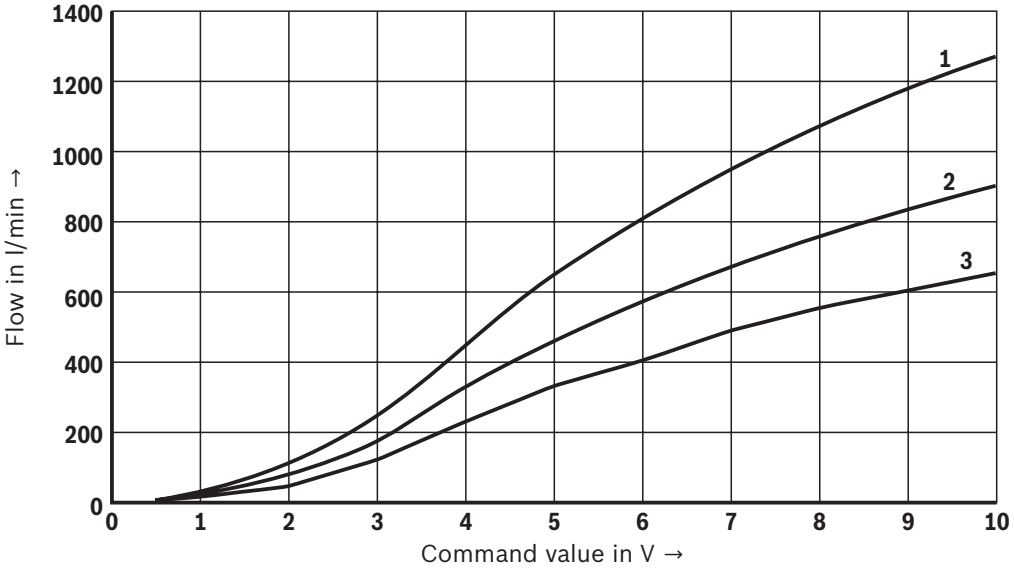
Characteristic curves: Size 32
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

Flow/signal function

Version "320" (A → B; B → A; linear)



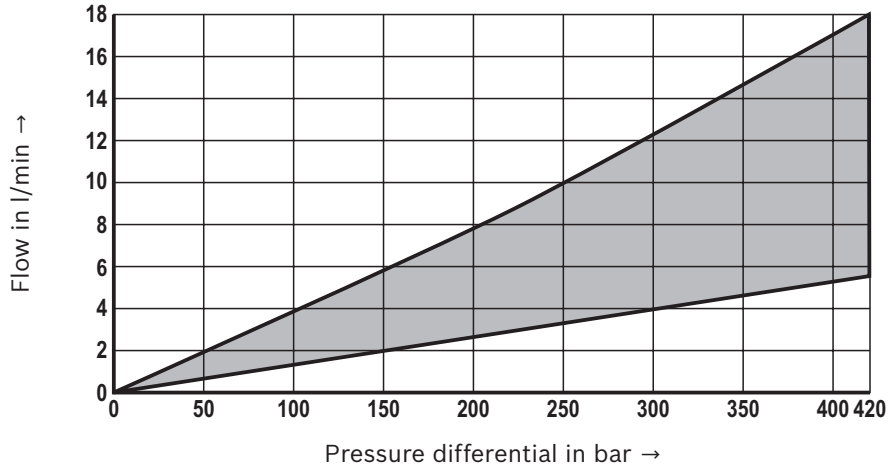
Version "650" (A → B; B → A; linear-progressive)



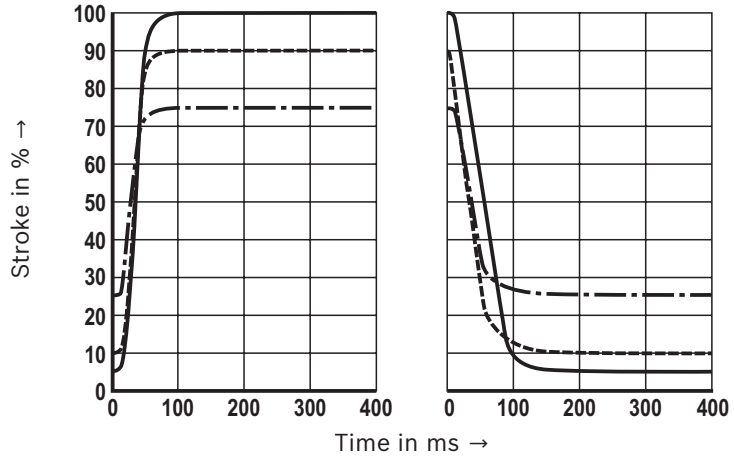
1 Pressure differential 20 bar
2 Pressure differential 10 bar
3 Pressure differential 5 bar

Characteristic curves: Size 32
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

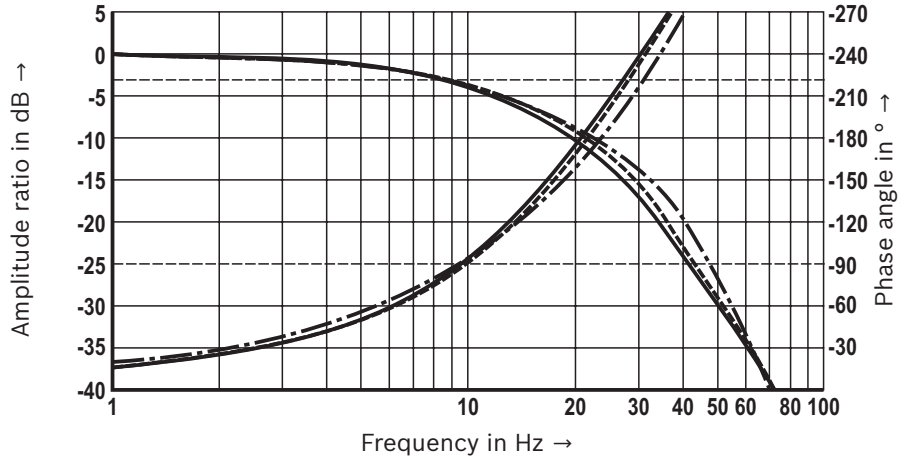
Leakage as a function of the pressure differential
(Command value: A1 – 0.5 V; B1 – 0 V; G1 – 4 mA)



Transition function with stepped electric input signals
(p_A = p_B = 100 bar; port B closed)



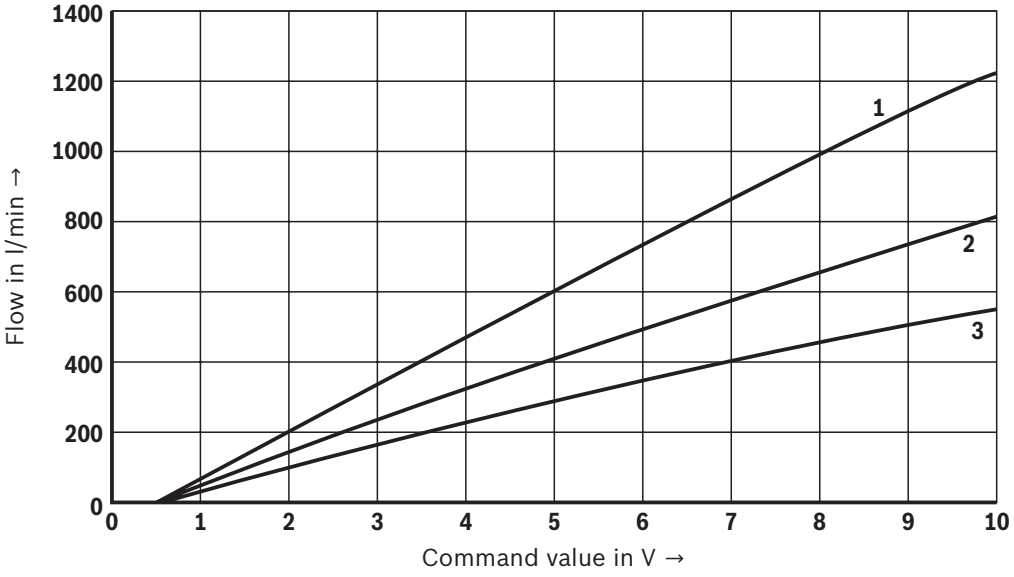
Frequency response (p_A= 100 bar)



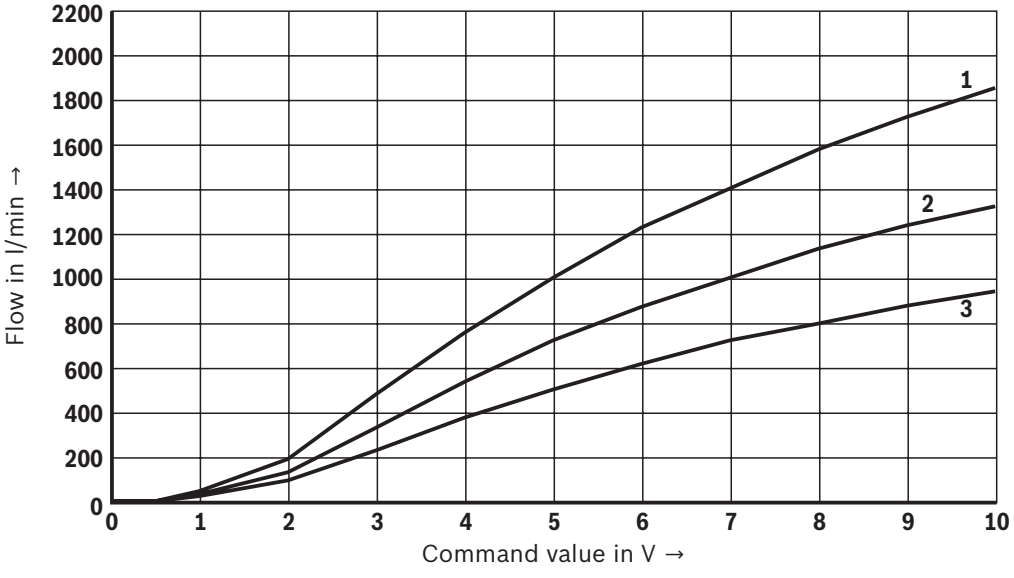
Characteristic curves: Size 40
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

Flow/signal function

Version "500" (A → B; B → A; linear)



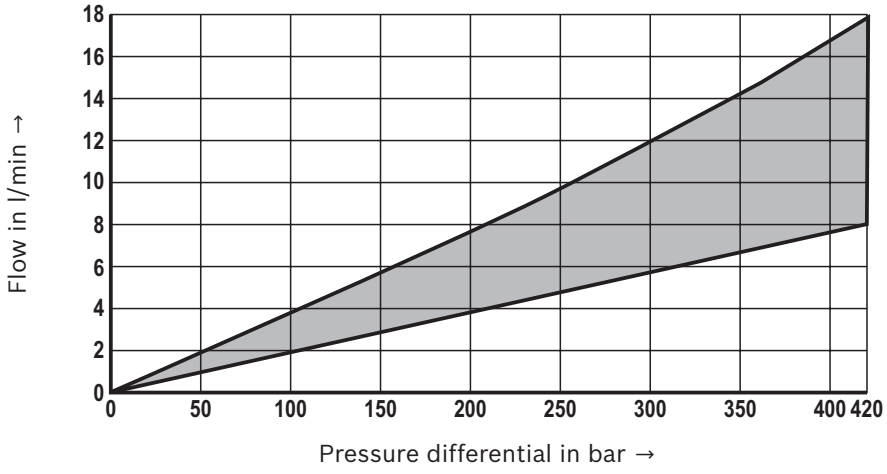
Version "940" (A → B; B → A; linear-progressive)



1 Pressure differential 20 bar
2 Pressure differential 10 bar
3 Pressure differential 5 bar

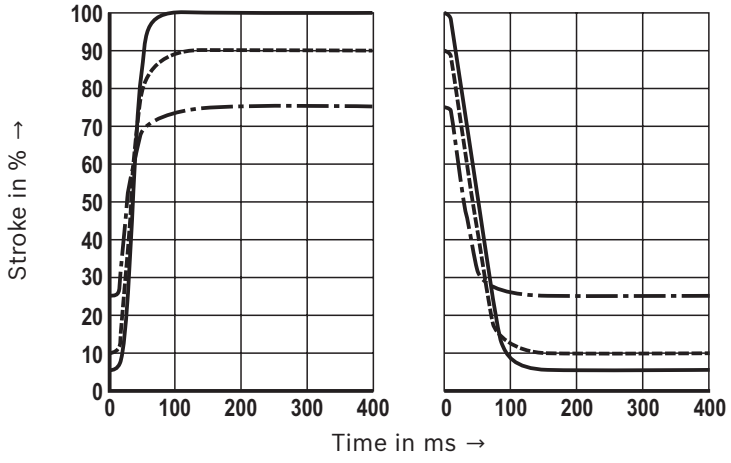
Characteristic curves: Size 40
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

Leakage as a function of the pressure differential
(Command value: A1 – 0.5 V; B1 – 0 V; G1 – 4 mA)



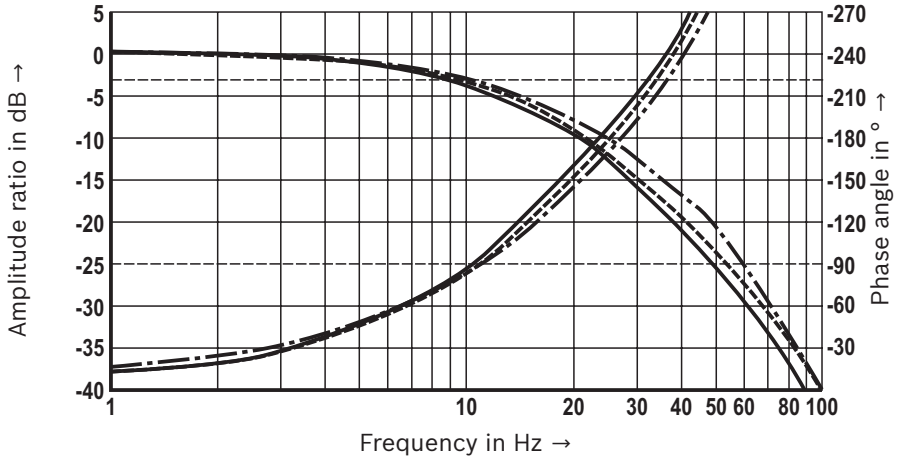
Scatter range

Transition function with stepped electric input signals
(p_A = p_B = 100 bar; port B closed)



Step responses in %:
- 5 – 100 – 5
- 10 – 90 – 10
- 25 – 75 – 25

Frequency response (p_A= 100 bar)

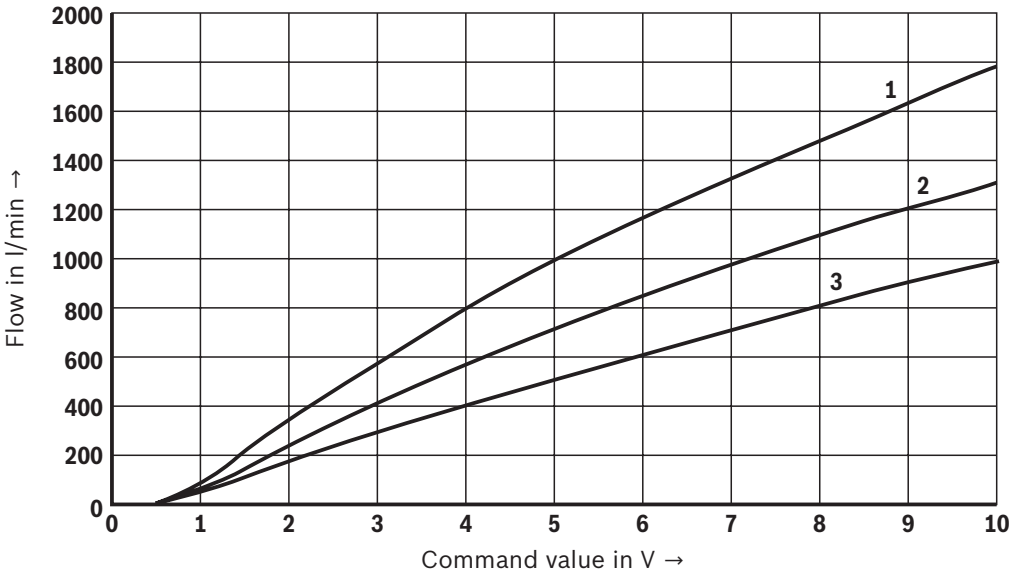


Signals in %:
- 5 – 100 – 5
- 10 – 90 – 10
- 25 – 75 – 25

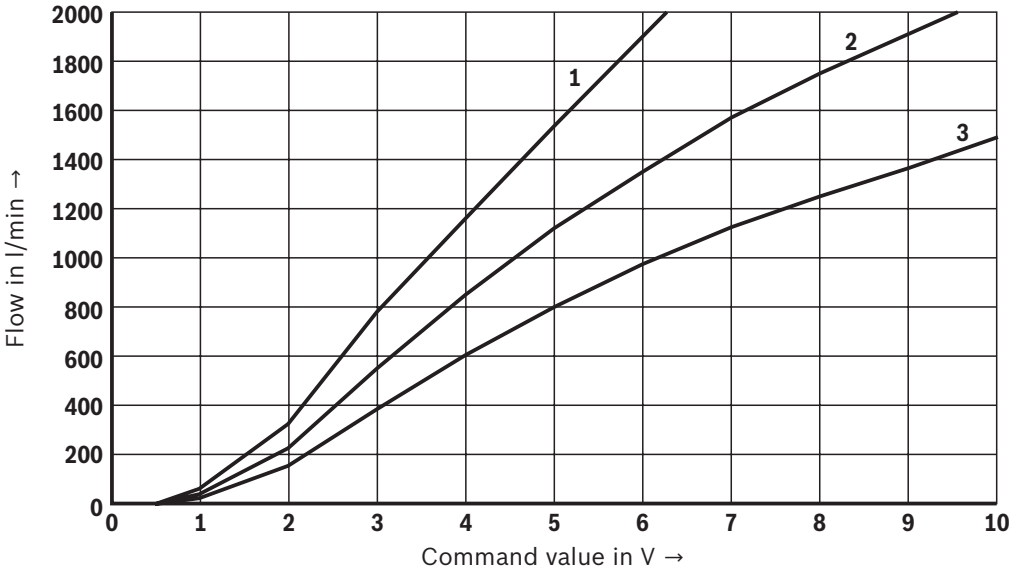
Characteristic curves: Size 50
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

Flow/signal function

Version "1000" (A → B; B → A; linear)



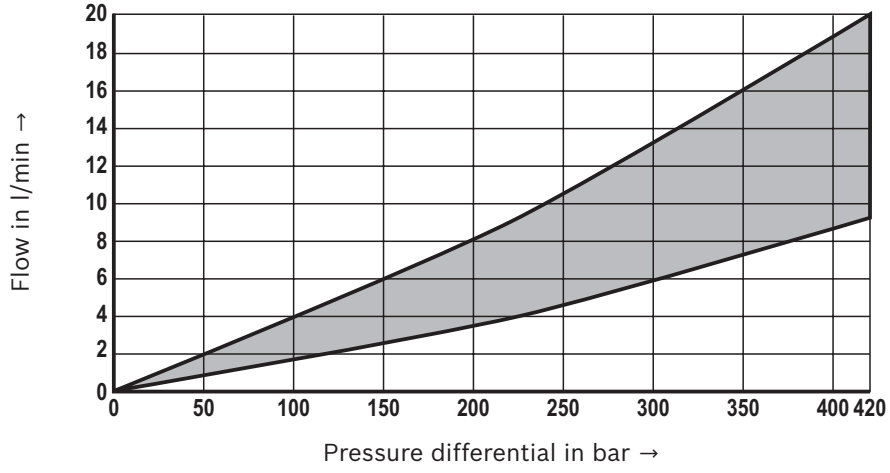
Version "1500" (A → B; B → A; linear-progressive)



1 Pressure differential 20 bar
2 Pressure differential 10 bar
3 Pressure differential 5 bar

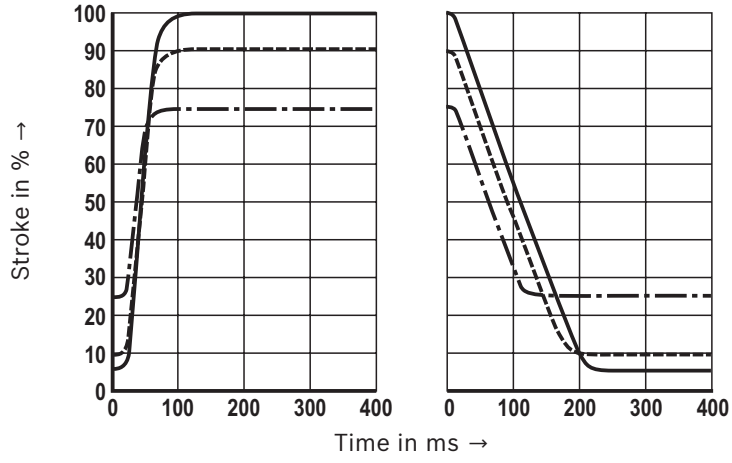
Characteristic curves: Size 50
(measured with HLP46, ϑ_{Oil} = 40 ±5 °C)

Leakage as a function of the pressure differential
(Command value: A1 – 0.5 V; B1 – 0 V; G1 – 4 mA)



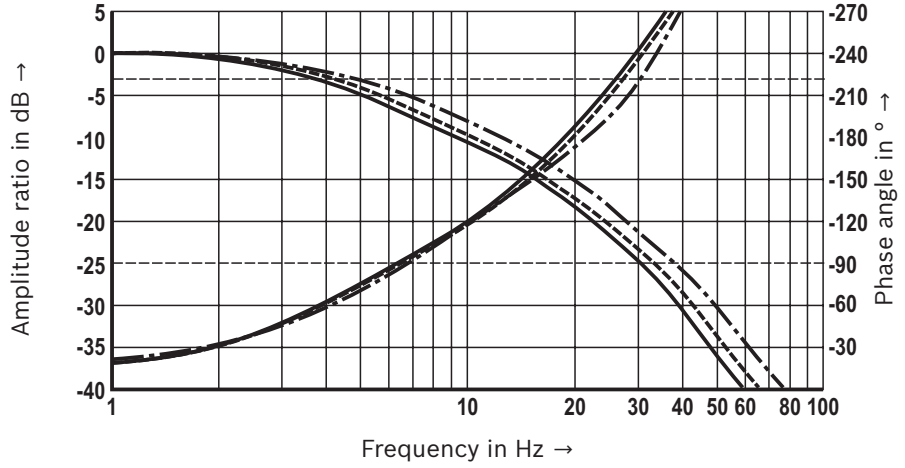
Scatter range

Transition function with stepped electric input signals
(p_A = p_B = 100 bar; port B closed)



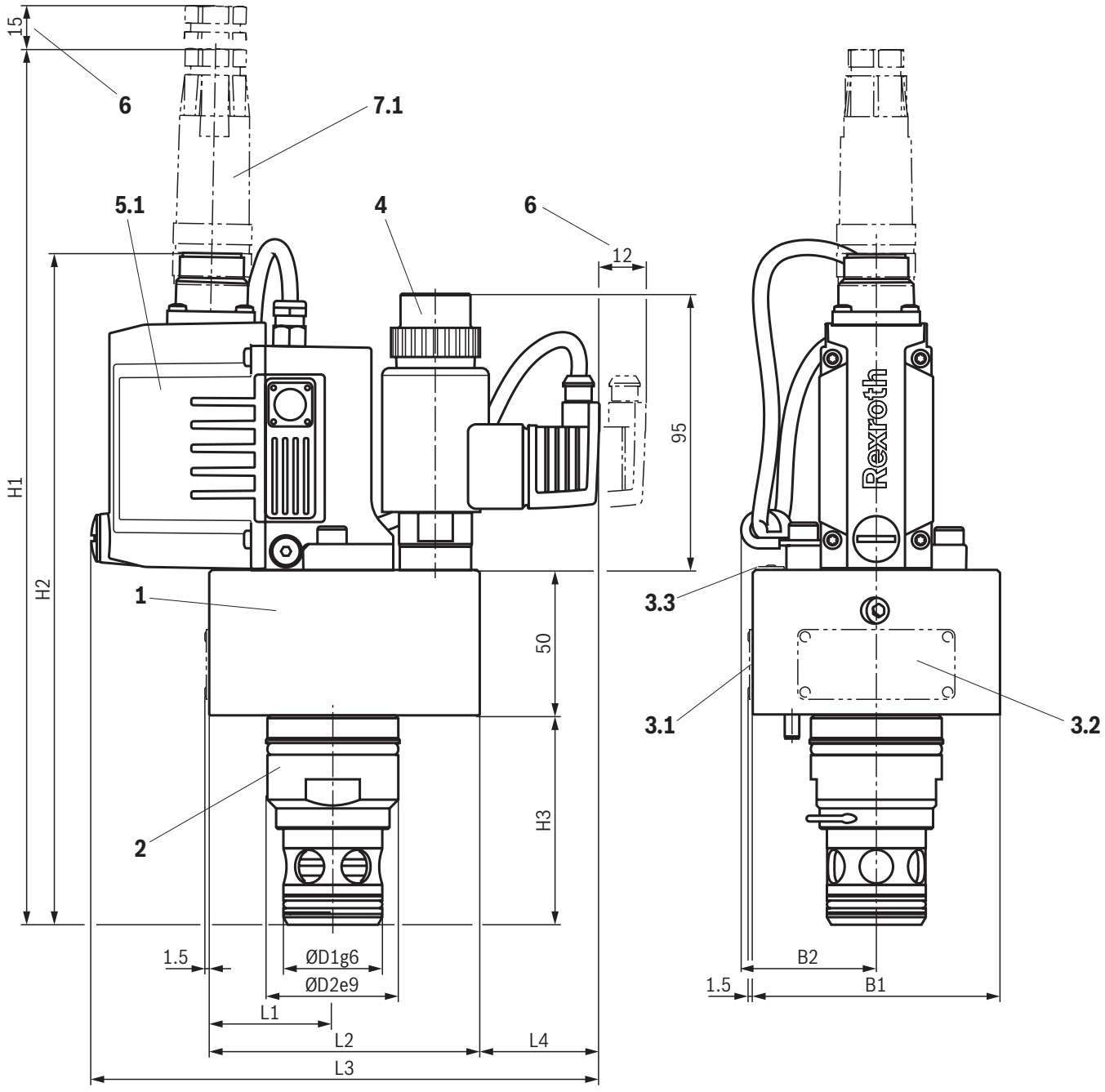
Step responses in %:
- 5 – 100 – 5
- 10 – 90 – 10
- 25 – 75 – 25

Frequency response (p_A= 100 bar)



Signals in %:
- 5 – 100 – 5
- 10 – 90 – 10
- 25 – 75 – 25

Dimensions: With integrated electronics (OBE) "E"
(dimensions in mm)

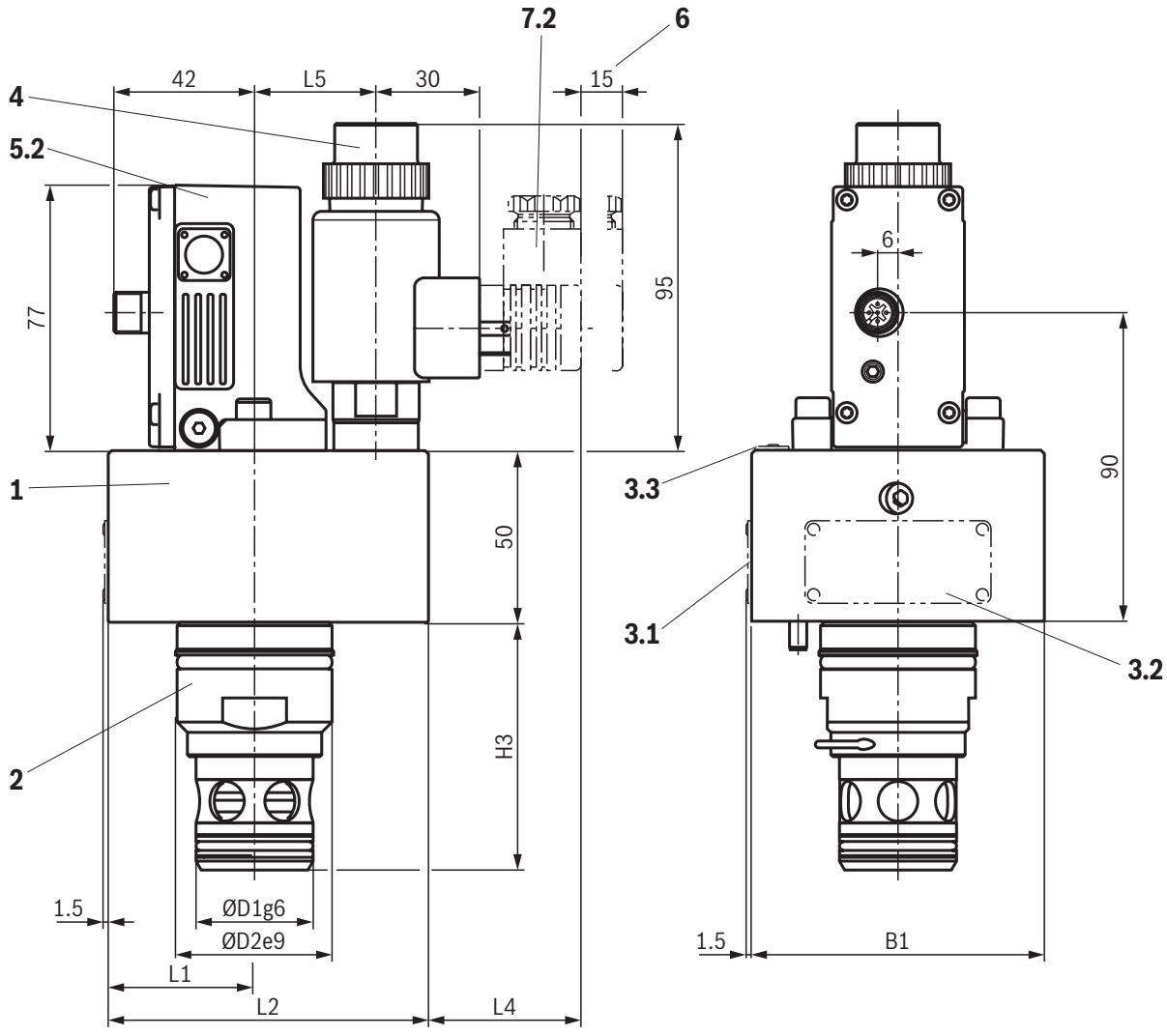


NG	B1	B2	H1	H2	H3	L1	L2	L3	L4	ØD1	ØD2
16	65	47	286	215	56	32.5	83	175	42	24	32
25	85	47	302	231	72	42.5	93	175	42	34	45
32	100	–	315	244	85	50	100	175	42	45	60
40	125	–	335	264	105	62.5	125	190	45	55	75
50	140	–	352	281	122	70	140	190	38	68	90

☞ **Notice:**
The dimensions are nominal dimensions which are subject to tolerances.

Item explanations and **valve mounting screws** see page 23.

Dimensions: With external control electronics
(dimensions in mm)

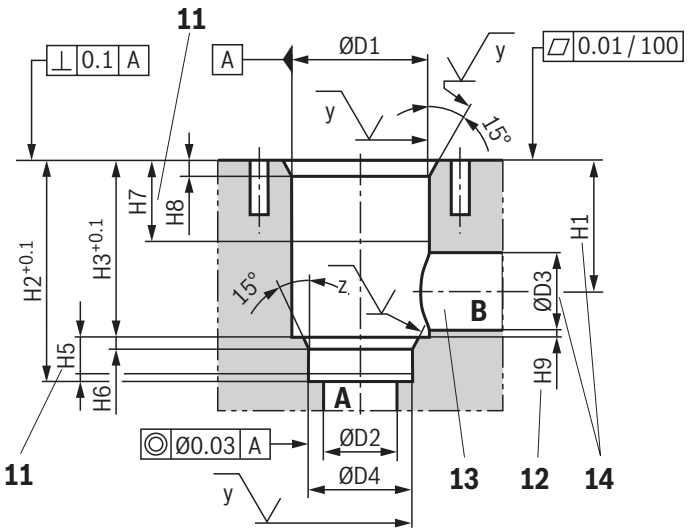


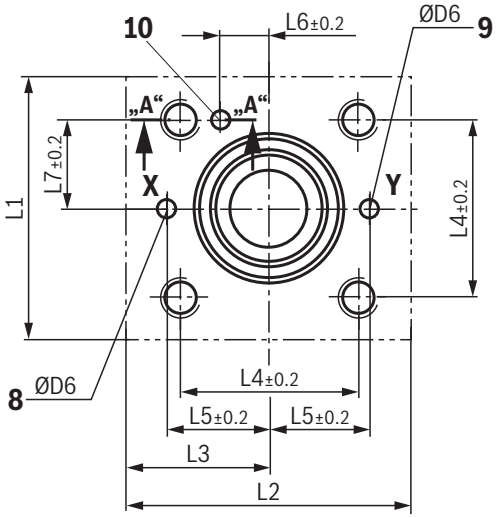
NG	B1	H3	L1	L2	L4	L5	ØD1	ØD2
16	65	56	32.5	83	42	36	24	32
25	85	72	42.5	93	42	36	34	45
32	100	85	50	100	42	36	45	60
40	125	105	62.5	125	45	42	55	75
50	140	122	70	140	38	46.5	68	90

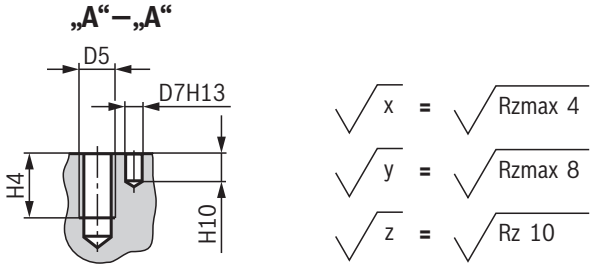
☞ **Notice:**
The dimensions are nominal dimensions which are subject to tolerances.

Item explanations and **valve mounting screws** see page 23.

Installation bore
(dimensions in mm)







Installation dimensions according to DIN ISO 7368

NG	16	25	32	40	50
ØD1H7	32	45	60	75	90
ØD2	16	25	32	40	50
ØD3	16	25	32	40	50
max. ØD3	25	32	40	50	63
ØD4H7	25	34	45	55	68
D5	M8	M12	M16	M20	M20
max. ØD6	4	6	8	8	10
ØD7H13	4	6	6	6	8
H1	34	44	52	64	72
H1 [1]	29.5	40.5	48	59	65.5
H2	56	72	85	105	122
H3	43	58	70	87	100
H4	20	25	35	45	45
min. H5	11	12	13	15	17
H6	2	2.5	2.5	3	3
min. H7	20	30	30	30	35
H8	2	2.5	2.5	3	4
min. H9 [2]	0.5	1	1.5	2.5	2.5
min. H10	8	8	8	8	8
L1	65	85	100	125	140
L2	83	93	100	125	140
L3	32.5	42.5	50	62.5	70
L4	46	58	70	85	100
L5	25	33	41	50	58
L6	10.5	16	17	23	30
L7	23	29	35	42.5	50

NG	Installation dimensions according to DIN ISO 7368
16	ISO 7368-BA-06-2-A
25	ISO 7368-BB-08-2-A
32	ISO 7368-BC-09-2-A
40	ISO 7368-BD-10-2-A
50	ISO 7368-BE-11-2-A

Tolerances according to: General tolerances ISO 2768-mK

Item explanations and **valve mounting screws**
see page 23.

[1] Bore center at ØD3 max.
[2] Control dimension

Dimensions

1 Cover
2 Main stage
3.1 Name plate NG16
3.2 Name plate NG25 ... 40
3.3 Name plate NG50
4 Pilot control valve with proportional solenoid
5.1 Integrated electronics with position transducer and analog interface
5.2 External control electronics with position transducer. Mating connectors for valves with "M12" connector (separate order, see page 24 and data sheet 08006)
6 Space required for removing the mating connectors
7.1 Mating connectors/cable set for valves with round connector (separate order, see page 24 and data sheet 08006)
7.2 Mating connectors for valves with "K4" connector (separate order, see page 24 and data sheet 08006)
8 Port X
9 Port Y
10 Locating hole for locking pin
11 Depth of fit
12 Control dimension
13 Port B may be at any position around the central axis of port A. However, it must be observed that the mounting bores and the control bores are not damaged.
14 If a different diameter is used for port B than indicated in the dimensional table, the distance from the cover support surface to the bore center must be calculated.

Valve mounting screws (separate order)

Size	Hexagon socket head cap screws	Material number
16	**4 hexagon socket head cap screws ISO 4762 - M8 x 30 - 10.9** tightening torque M_A = 35 ±5 Nm	**R913022205**
25	**4 hexagon socket head cap screws ISO 4762 - M12 x 40 - 10.9** tightening torque M_A = 105 ±15 Nm	**R913022052**
32	**4 hexagon socket head cap screws ISO 4762 - M16 x 50 - 10.9** tightening torque M_A = 265 ±25 Nm	**R913015664**
40	**4 hexagon socket head cap screws ISO 4762 - M20 x 60 - 10.9** tightening torque M_A = 500 ±50 Nm	**R913022102**
50		

Accessories (separate order)

Mating connectors and cable sets

Item [1]	Designation	Version	Short designation	Material number	Data sheet
5.2	Mating connectors; for sensors and valves with "M12 x 1" connector, 4-pole	straight, PG7	4PZ24	**R900773042**	08006
		straight, PG9		**R900031155**	
		angled, PG7		**R900779509**	
		angled, PG9		**R900082899**	
7.1	Mating connector; for valves with round connector, 6-pole + PE and 6-pole	straight, metal	7PZ31...M	**R900223890**	
		straight, plastic	7PZ31...K	**R900021267**	
	Cable sets; for valves with round connector, 6-pole + PE	Plastic, 3.0 m	7P Z31 BF6	**R901420483**	
		Plastic, 5.0 m		**R901420491**	
		Plastic, 10.0 m		**R901420496**	
	Mating connector; for valves with round connector, 11-pole + PE	Metal, shielded	12PN11... EMC	**R901268000**	
		Plastic, two cable outlets	12PN11...2XD8	**R900884671**	
	Cable sets; For valves with round connector, 11-pole + PE	Metal, shielded, 5.0 m	12PN11REFS EMC...BG	**R901272854**	
		Metal, shielded, 20.0 m		**R901272852**	
		Plastic, shielded, 5.0 m	12PN11REFF 2X...	**R900032356**	
		Plastic, shielded, 20.0 m		**R900860399**	
7.2	Mating connector; for valves with "K4" connector, 2-pole + PE, design A	Without circuitry, 12 ... 240 V, "a"	Z4	**R901017010**	
		Without circuitry, 12 ... 240 V, "b"		**R901017011**	

[1] See dimensions page 20 and 21.

External control electronics

	Designation	Version	Material no.	Data sheet
Modular design	VT-MRPA1-2X	Command value 0 ... 10 V	R901476413	30220
		Command value 4 ... 20 mA	R901476414	

Further information

- 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
- Hydraulic valves for industrial applications — Operating instructions 07600-B
- Selection of filters — www.boschrexroth.com/filter
- Information on available spare parts — www.boschrexroth.com/spc

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