2-way flow control valve

Type 2FRM, 2FRH, 2FRW

RE 28389
Edition: 2019-02
Replaces: 2013-05 and 28389-M

H5552

- Sizes 10 and 16
- Component series 3X
- Maximum operating pressure 315 bar
- Maximum flow 160 l/min

Features

- For subplate mounting
- Porting pattern according to DIN 24340 form G and ISO 6263
- Mechanical actuation (type 2FRM)
- Hydraulic actuation (type 2FRH)
- Electro-hydraulic actuation (type 2FRW)
- Pressure compensator stroke limitation, optional
- Start-up jump reduction
- Stroke limitation of the geared piston drive adjustable on both sides (type 2FRH and 2FRW)
- Flow control in both directions by means of rectifier sandwich plate
- Corrosion-protected design

Contents

Ordering code: 2-way flow control valve

01	02	03		04		05	06	07	08	09	10	11	12	13	14	15
2FR			**–**	**3X**	**/**											*****

01	2-way flow control valve	**2FR**

Type of actuation

02	Mechanical	**M**
	Hydraulic	**H**
	Electro-hydraulic	**W**

03	Size 10	**10**
	Size 16	**16**

04	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimension)	**3X**

Flow range A to B

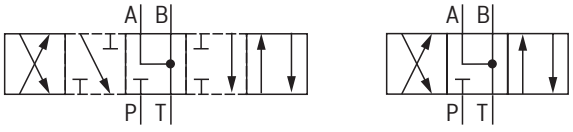
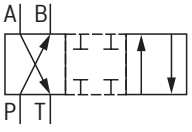
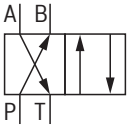
05	**– Size 10, linear**	
	up to 10 l/min	**10L**
	up to 16 l/min	**16L**
	up to 25 l/min	**25L**
	up to 50 l/min	**50L**
	– Size 16, linear	
	up to 60 l/min	**60L**
	up to 100 l/min	**100L**
	up to 160 l/min	**160L**

06	**Without** pressure compensator stroke limitation	**no code**
	With pressure compensator stroke limitation	**B**

07	**Without** actual value potentiometer	**no code**
	With actual value potentiometer (only types 2FRH and 2FRW)	**P**

08	Directional spool valve size 6 (data sheet 23178)	**6E** [1]

Symbols

09		**J** [1]
	 	**Y** [1]

10	Direct voltage 24 V	**G24** [1]
	AC voltage 230 V 50/60 Hz	**W230** [1]
	For more voltages and frequencies, please refer to data sheet 23178)	

[1] Ordering code **only** necessary for "FRW" version

[2] Mating connectors, separate order, see page 15 and data sheet 08006.

[3] Only for "FRM" version

☞ **Notice:** Preferred types and standard units are contained in the EPS (standard price list).

Ordering code: 2-way flow control valve

01	02	03		04		05	06	07	08	09	10	11	12	13	14	15
2FR			**–**	**3X**	**/**											*****

11	**With** concealed manual override (standard)	**N9** [1]
	With manual override	**N** [1]
	Without manual override	**no code**

Electrical connection

12	**Individual connection**	
	Connector 3-pole (2 + PE) according to DIN EN 175301-803	**K4** [1; 2]

Corrosion resistance (outside; thick film passivation according to DIN 50979 – Fe//Zn8//Cn//T0)

13	None (valve housing primed)	**no code**
	Improved corrosion protection	**J** [3]

Seal material

14	NBR seals	**no code**
	FKM seals	**V**
	Observe compatibility of seals with hydraulic fluid used. (Other seals upon request)	

15	Further details in the plain text	

Ordering code: Rectifier sandwich plate

01	02		03		04	05
Z4S		**–**		**/**		*****

01	Rectifier sandwich plate	**Z4S**

02	Size 10	**10**
	Size 16	**16**

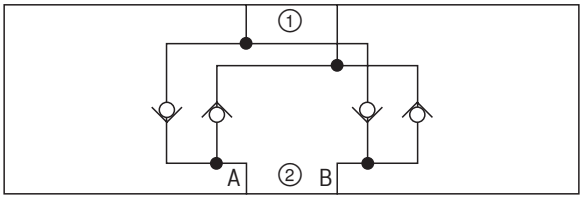
03	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimension) **– size 10**	**3X**
	Component series 20 ... 29 (20 ... 29: unchanged installation and connection dimension) **– size 16**	**2X**

Seal material

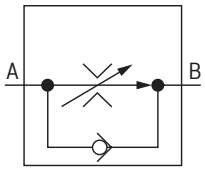
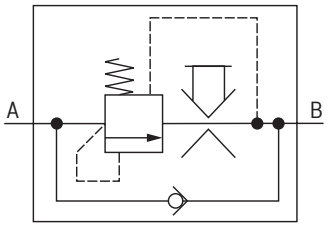
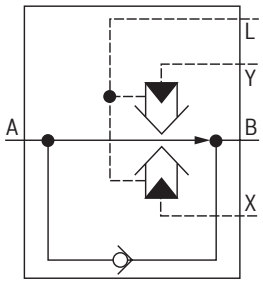
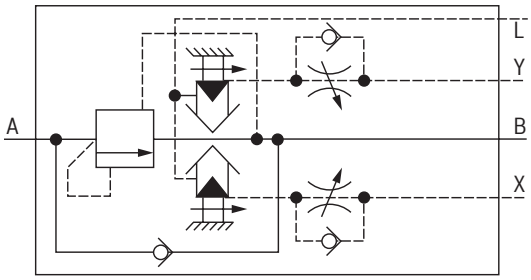
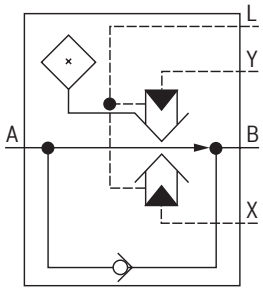
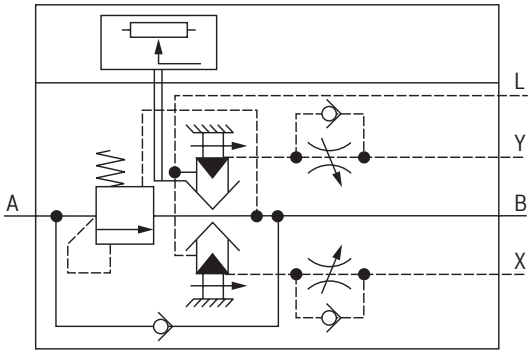
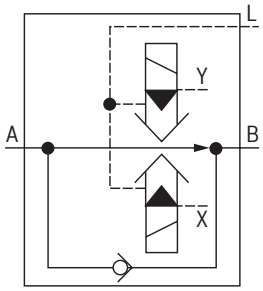
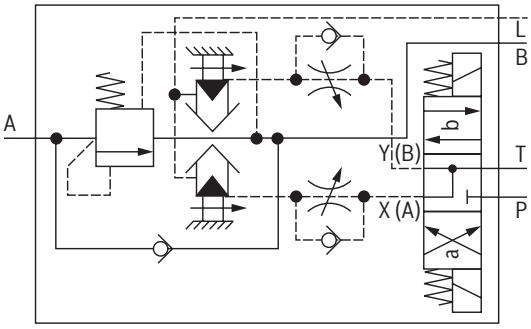
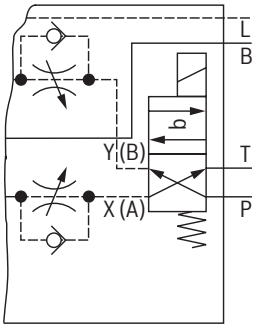
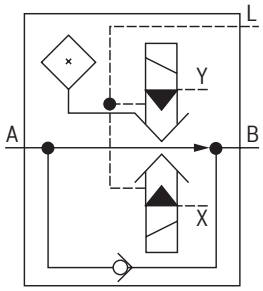
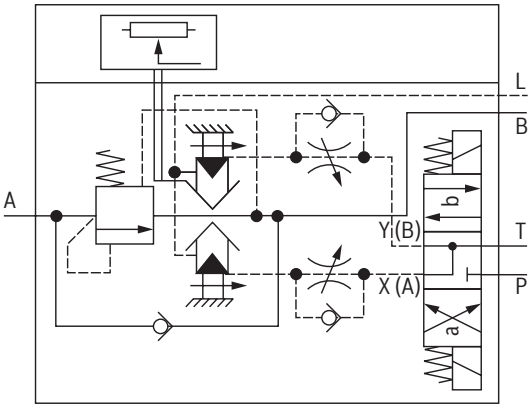
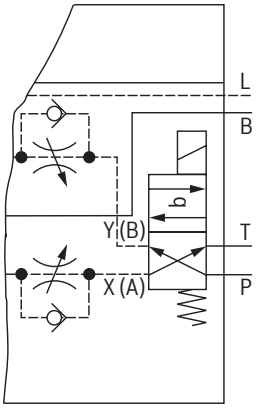
04	NBR seals	**no code**
	FKM seals	**V**
	Observe compatibility of seals with hydraulic fluid used. (Other seals upon request)	

05	Further details in the plain text	

Symbols: Rectifier sandwich plate (① = component side, ② = plate side)



Symbols: 2-way flow control valve

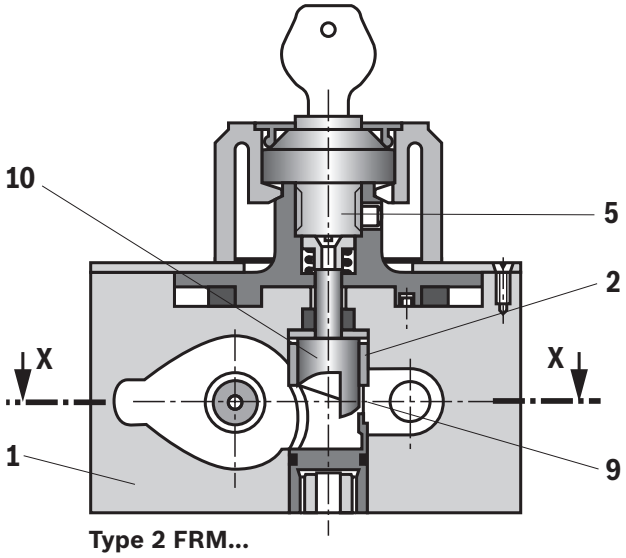
	simplified	detailed	
Type 2FRM			
Type 2FRH			
Type 2FRH...P			
		Symbol J [1]	**Symbol Y** [2]
Type 2FRW			
Type 2FRW...P			

[1] Solenoid "a" switched → Flow controller $q_{V\,min}$
Solenoid "b" switched → Flow controller $q_{V\,max}$

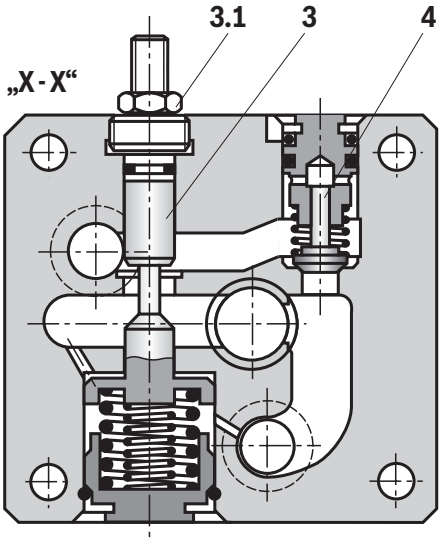
[2] Solenoid "b" not switched → Flow controller $q_{V\,min}$
Solenoid "b" switched → Flow controller $q_{V\,max}$

Function, section

Flow control valves type 2FRM, 2FRH and 2FRW are 2-way flow control valves. They are used to maintain a constant flow, mostly independent of pressure and temperature.
Generally, the valves consist of housing (1), orifice bush (2), pressure compensator (3) with optional stroke limitation (3.1), check valve (4), adjustment element (5) at type 2FRM as well as geared piston drive (6), directional valve (7) and actual value potentiometer (8) at type 2FRH and 2FRW.
The flow from channel A to channel B is throttled at the throttling point (9). At type 2FRM, the throttle cross-section is set mechanically with the adjustment element (5) by turning the curved bolt (10). In the case of types 2FRH and 2FRW, this is achieved hydraulically by means of a geared piston drive (6) controlled by an integrated electrically operated directional valve (7).
The regulating speed can be adjusted by means of the throttle check valve (6.3 and 6.4). To fix the required adjustment range, the geared piston drive (6) is equipped with an adjustable stroke limitation (6.1 and 6.2) on both sides. An upstream pressure compensator (3) is included to ensure a pressure-independent and constant flow at throttling point (9).
Temperature independence is achieved thanks to the orifice design of the throttling point.
The free return flow from channel B to channel A is via the check valve (4).
For permanent monitoring of the throttle orifice position, types 2FRH and 2FRW can be equipped with an actual value potentiometer (8). In connection with an electrical command value presetting, electrical control components are offered.
The regulated flow only flows from channel A to B.
For oscillating flows (forward and return flow), a rectifier sandwich plate type Z4S can be installed under the flow control valve.

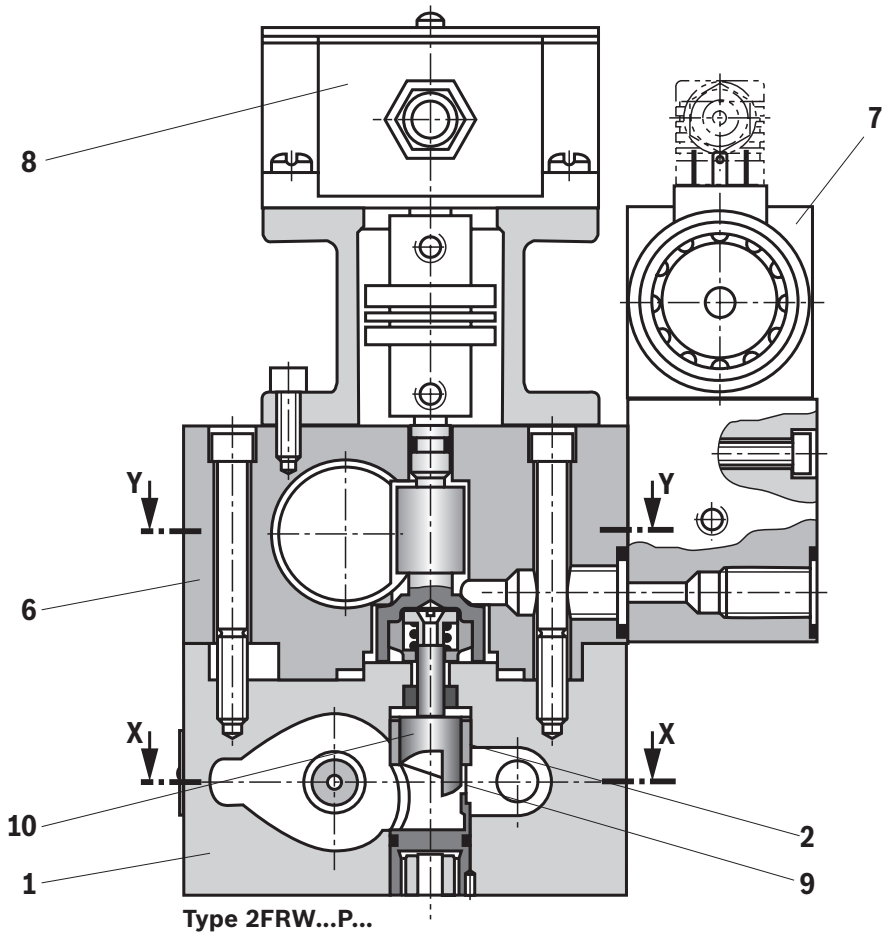


Type 2 FRM...

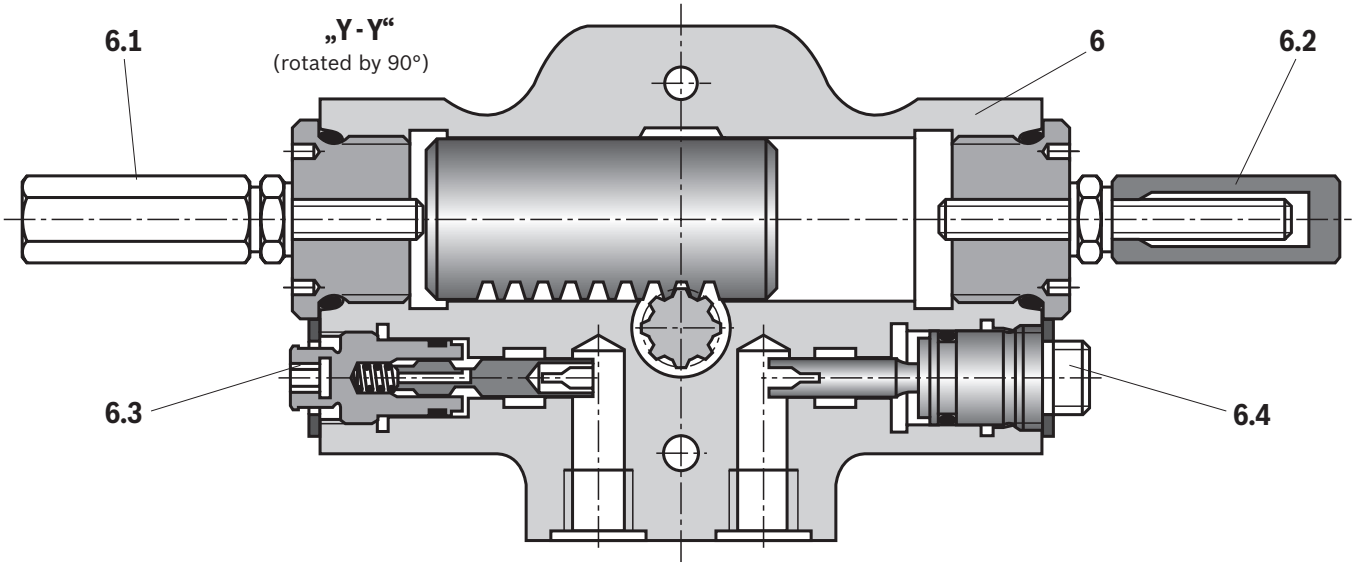


Type 2FRW, see page 6.

Function, sections



Type 2FRW...P...



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

General				
Size			**Size 10**	**Size 16**
Weight	▶ Type 2FRM	kg	5.6	11.3
	▶ Type 2FRH	kg	9.2	14.9
	▶ Type 2FRH...P	kg	10.3	16
	▶ Type 2FRW	kg	11.3	17
	▶ Type 2FRW...P	kg	12.4	18.1
	▶ Rectifier sandwich plate	kg	3.0	8.1
Installation position	▶ Type 2FRM		any	
	▶ Types 2FRH and 2FRW		Control cylinder (geared piston drive) horizontal	
Ambient temperature range	▶ Types 2FRH and 2FRM	°C	–30 ... +80 (NBR seals) –20 ... +80 (FKM seals)	
	▶ Type 2FRW	°C	–30 ... +50 (NBR seals) –20 ... +80 (FKM seals)	

Hydraulic – 2-way flow control valve type 2FRM, 2FRH, 2FRW									
Size			**Size 10**				**Size 16**		
Maximum flow		l/min	10	16	25	50	60	100	160
Maximum operating pressure (port A)		bar	315						
Pressure differential with free return flow B to A, q_V dependent		bar	2	2.5	3.5	6	2.8	4.3	7.3
Minimum pressure differential		bar	3 ... 7				5 ... 12		
Flow control	▶ Temperature stability (–20 ... +80 °C)		±2 % ($q_{V\,max}$)				±2 % ($q_{V\,max}$)		
	▶ Pressure stability (up to Δp = 315 bar)		±2 % ($q_{V\,max}$)				< ±5 % ($q_{V\,max}$)		
Hydraulic fluid			see table page 8						
Hydraulic fluid temperature range		°C	–30 ... +80 (NBR seals) –20 ... +80 (FKM seals)						
Viscosity range		mm²/s	10 ... 800						
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)			class 20/18/15 [1]						

Hydraulic – 2-way flow control valve type 2FRH, 2FRW			
Pilot volume at maximum adjustment range		cm³	22 (only 300 °)
Pilot pressure range		bar	10 ... 100 (The maximum value **must not** be exceeded!) (With smaller regulating speed at least 40 bar)
Positioning velocity (depending on pilot pressure)			**Without** potentiometer / **With** potentiometer
		°/s	5 ... 2000 / 5 ... 300
Maximum flow (directional valve)		l/min	10 / see data sheet 23178
Maximum operating pressure (directional valve)		bar	315 / see data sheet 23178

Hydraulic – rectifier sandwich plate type Z4S			
Maximum flow		l/min	50 / 160
Maximum operating pressure		bar	315
Cracking pressure		bar	1.5

Electrical – actual value potentiometer		
Resistance	Ω	1000
Load capacity	W	5
Maximum wiper current	A	0.12
Protection class according to DIN EN 60529		IP 65
Control limit error (regulating speed dependent)		±1.5 ° at 10 °/s

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and simultaneously increases the life cycle of the components.

For the selection of filters, see www.boschrexroth.com/filter.

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, Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	NBR	ISO 12922	90223

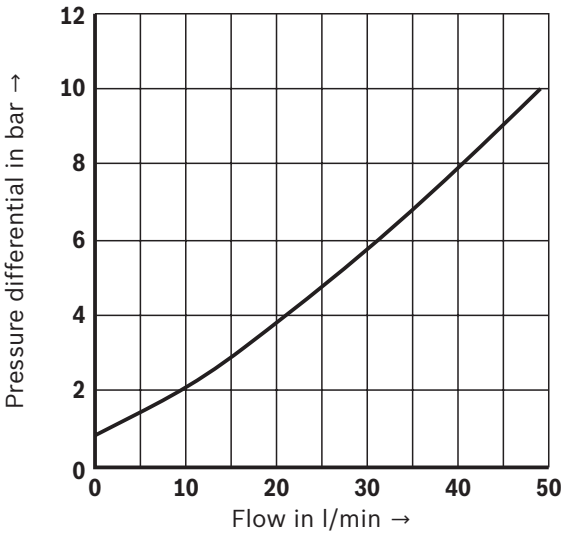
☞ **Important information on hydraulic fluids:**

- 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 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.

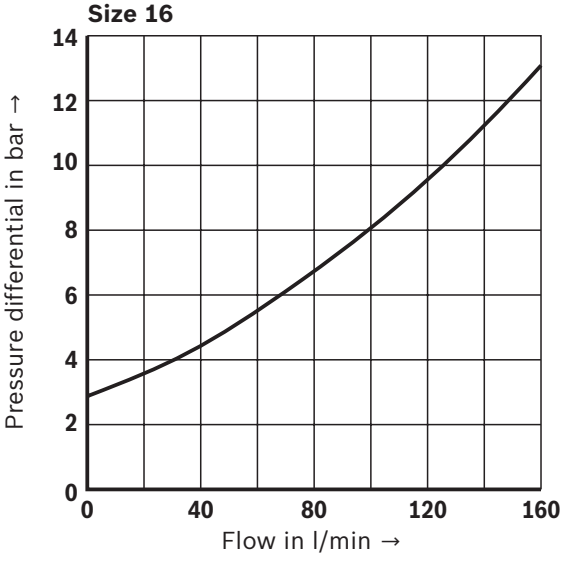
Characteristic curves: Rectifier sandwich plate
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

The pressure differential Δp in both directions of flow is equal; flow q_V from A → B (B → A)

Size 10

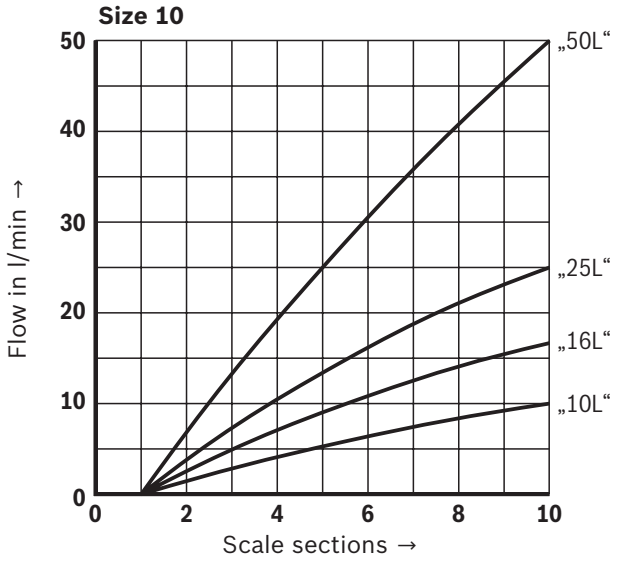


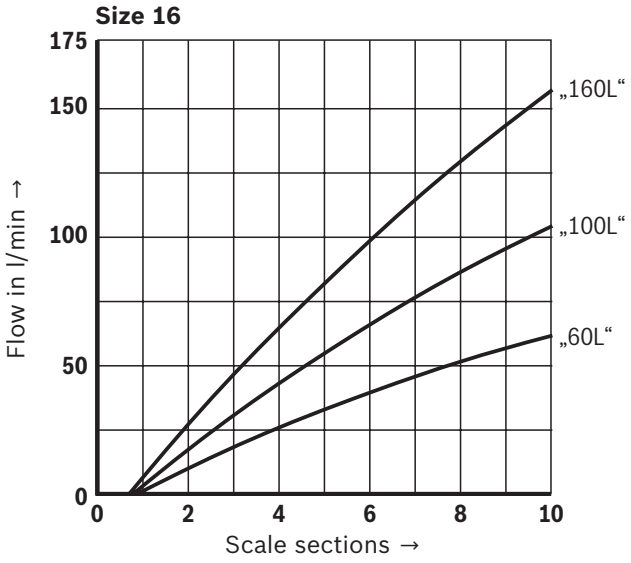
Size 16



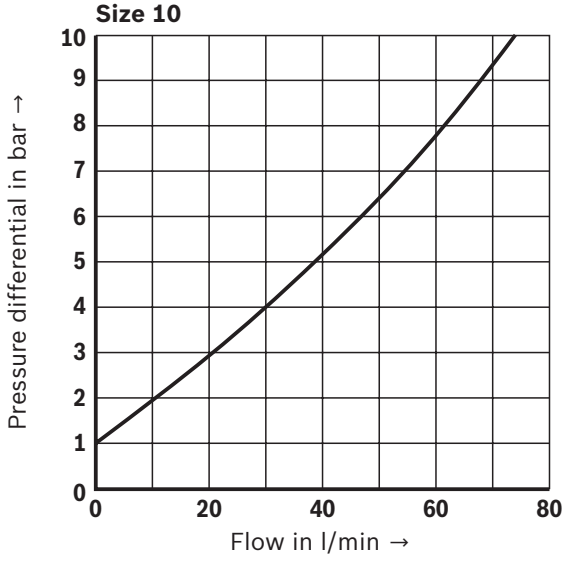
Characteristic curves: 2-way flow control valve
(measured with HLP46, ϑ_{oil} = 40 ±5 °C)

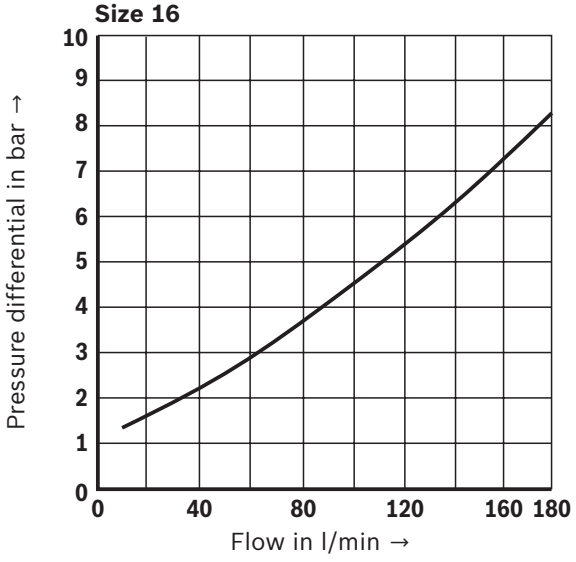
Flow control (A → B)



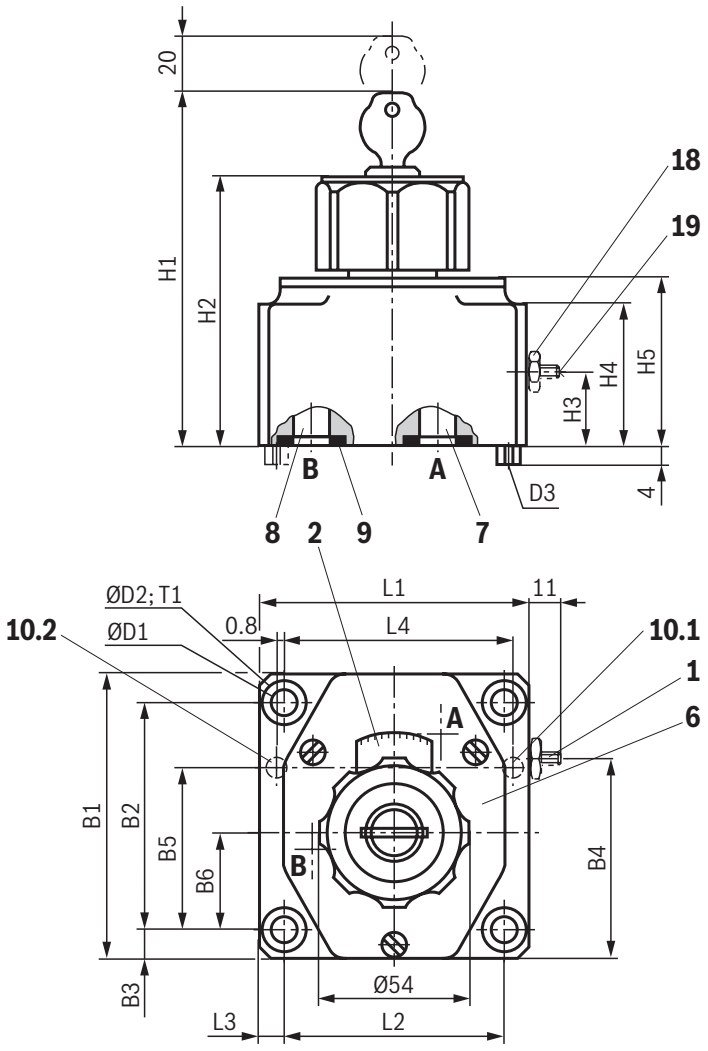


Free return flow (B → A)

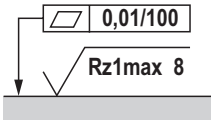




Dimensions: 2-way flow control valve – version "2FRM"
(dimensions in mm)



1 Pressure compensator stroke limitation, optional
2 Adjustment element, rotary knob security lock (all positions can be locked), rotation range 300° = 10 scale sections, M_d ≈ 0.7 Nm
6 Name plate
7 Input A
8 Output B
9 Seal ring
10.1 Locating pin (sizes 10 and 16)
10.2 Locating pin (size 16)
18 Hexagon SW10
19 Internal hexagon SW3

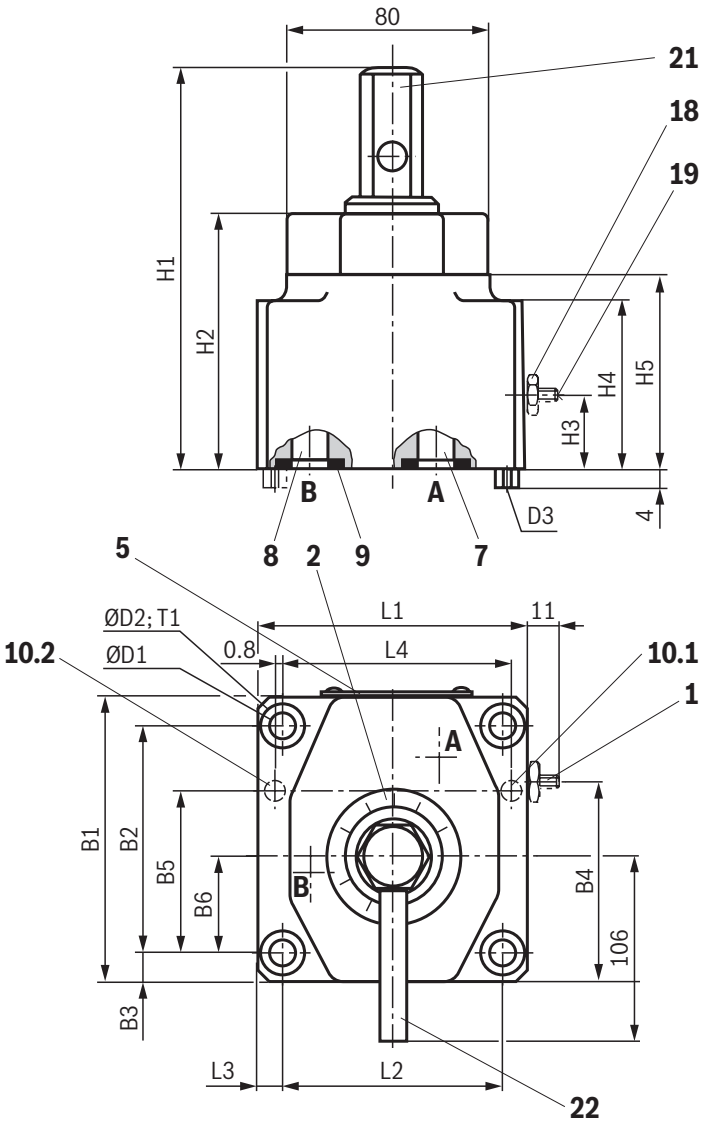


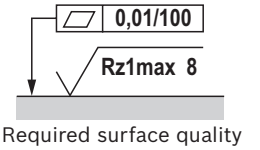
Required surface quality
of the valve contact surface

Valve mounting screws and **subplates,** see page 15.

NG	B1	B2	B3	B4	B5	B6	ØD1	ØD2	D3	H1	H2	H3	H4	H5	L1	L2	L3	L4	T1
10	101.5	82.5	9.5	68	58.7	35.5	9	15	6	125	95	26	51	60	95	76	9.5	79.4	13
16	123.5	101.5	11	81.5	72.9	41.5	11	18	6	147	117	34	72	82	123.5	101.5	11	102.4	12

Dimensions: 2-way flow control valve – version "2FRM...**J**"
(dimensions in mm)





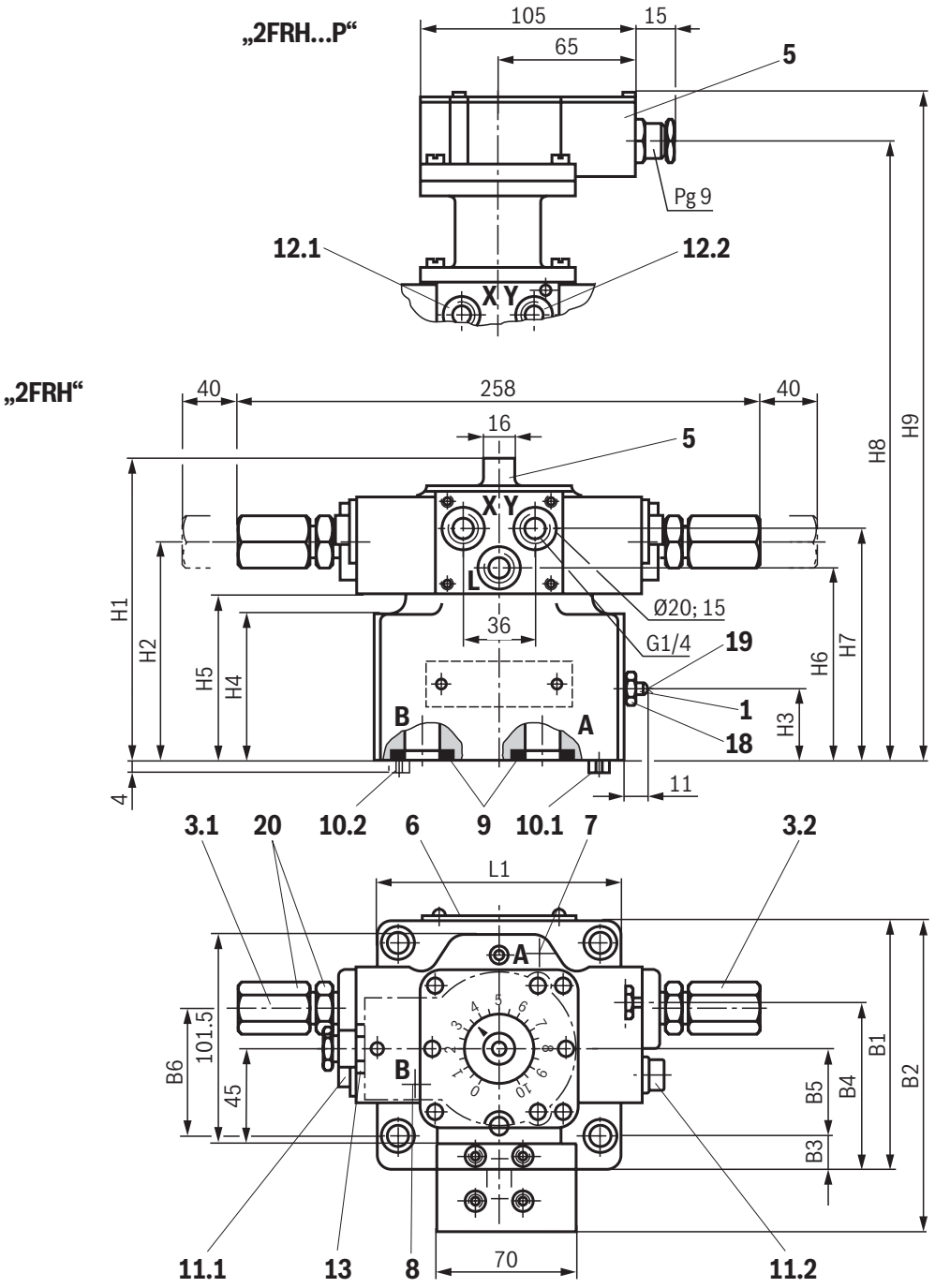
Required surface quality
of the valve contact surface

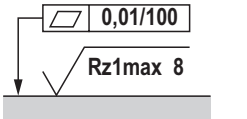
1 Pressure compensator stroke limitation, optional
2 Adjustment element, rotary knob security lock (all positions can be locked), rotation range 300° = 10 scale sections, M_d ≈ 0.7 Nm
6 Name plate
7 Input A
8 Output B
9 Seal ring
10.1 Locating pin (sizes 10 and 16)
10.2 Locating pin (size 16)
18 Hexagon SW10
19 Internal hexagon SW3
21 Lock nut SW24
22 Lever

Valve mounting screws and **subplates,** see page 15.

NG	B1	B2	B3	B4	B5	B6	ØD1	ØD2	D3	H1	H2	H3	H4	H5	L1	L2	L3	L4	T1
10	101.5	82.5	9.5	58.8	58.7	35.5	9	15	6	137	81	26	51	60	95	76	9.5	79.4	13
16	123.5	101.5	11	70.5	72.9	41.5	11	18	6	159	103	34	72	82	123.5	101.5	11	102.4	12

Dimensions: 2-way flow control valve – version "2FRH"
(dimensions in mm)



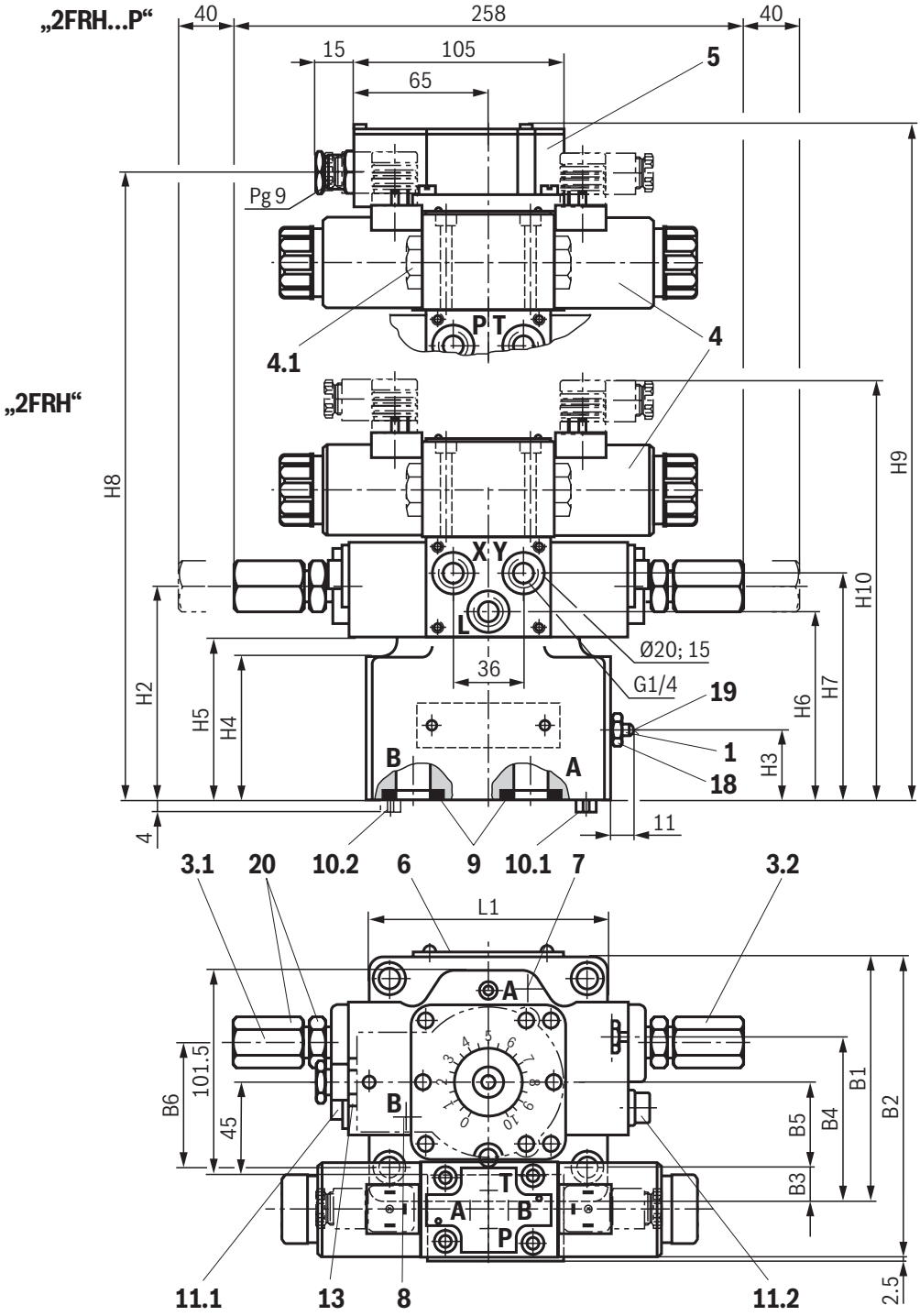


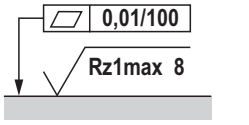
Required surface quality
of the valve contact surface

For **item explanations, valve mounting screws** and **subplates,** see page 15. **For valve connection dimensions,** see page 10.

NG	B1	B2	B3	B4	B5	B6	H1	H2	H3	H4	H5	H6	H7	H8	H9	L1
10	101.5	148.5	9.5	68	35.5	54.5	125.5	84	26	51	58	70	89	179	203	95
16	123.5	163	11	81.5	41.5	60.5	147.5	106	34	72	80	92	111	201	225	123.5

Dimensions: 2-way flow control valve – version "2FRW"
(dimensions in mm)





Required surface quality
of the valve contact surface

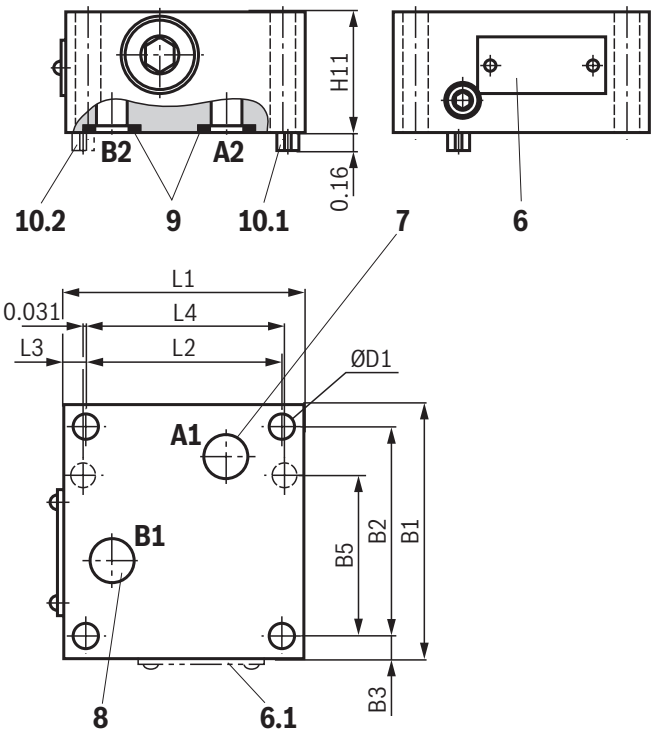
NG	B1	B2	B3	B4	B5	B6	H2	H3	H4	H5	H6	H7	H8	H9	H10 [1]	H10 [2]	L1
10	101.5	146	9.5	68	35.5	54.5	84	26	51	58	70	87	179	203	201	206	95
16	123.5	160.5	11	81.5	41.5	60.5	106	34	72	80	92	109	201	225	223	228	123.5

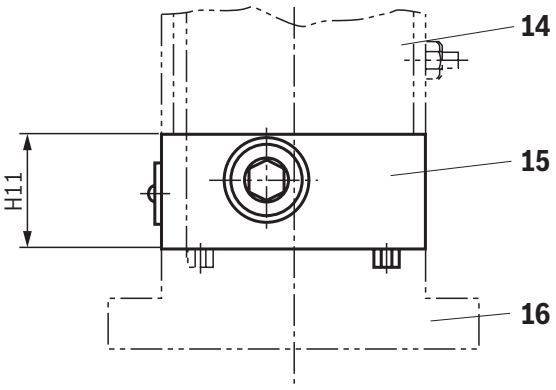
1) Dimensions for valve with mating connector **without** circuitry for connector "K4" (separate order, see page 15 and data sheet 08006)

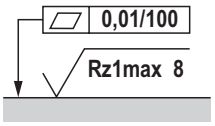
2) Dimensions for valve with mating connector **with** circuitry for connector "K4" (separate order, see page 15 and data sheet 08006)

For item explanations, valve mounting screws and **subplates,** see page 15. **For valve connection dimensions,** see page 10.

Dimensions: Rectifier sandwich plate (dimensions in mm)







Required surface quality
of the valve contact surface

Valve mounting screws for the installation of a rectifier sandwich plate between subplate and flow control valve (separate order)

- Size 10:
  4 hexagon socket head cap screws
  ISO 4762 - M8 x 100 - 10.9-flZn/nc/480h/C
  (friction coefficient μ_{total} = 0.09 ... 0.14)
  Tightening torque M_A = 30 Nm ±10%
  Material no. **R913014764**
- Size 16:
  4 hexagon socket head cap screws
  ISO 4762 - M10 x 160 - 10.9-flZn/nc/480h/C
  (friction coefficient μ_{total} = 0.09 ... 0.14)
  Tightening torque M_A = 64 Nm ±10%
  Material no. **R913015565**

For item explanations and **subplates,** see page 15.
For valve connection dimensions, see page 10.

NG	B1	B2	B3	B5	Ø D1	H11	L1	L2	L3	L4
10	101.5	82.5	9.5	58.7	9	50	95	76	9.5	79.4
16	123.5	101.5	11	72.9	11	85	123.5	101.5	11	102.4

Dimensions

1 Pressure compensator stroke limitation, optional
2 Flow display, rotation range 300° = 10 scale sections
3 Geared piston drive
3.1 Geared piston drive stroke limitation for minimum flow; 1 rotation = approx. 12° (of 300°)
3.2 Geared piston drive stroke limitation for maximum flow; 1 rotation = approx. 12° (of 300°)
4 Directional spool valve size 6, symbol J or Y (Y de-energized = $q_{V\,min}$)(see data sheet 23178)
4.1 Cover for symbol Y
5 Actual value potentiometer
6 Name plate
6.1 Name plate (size 16)
7 Input A
8 Output B
9 Seal ring
10.1 Locating pin (sizes 10 and 16)
10.2 Locating pin (size 16)
11.1 Regulating speed throttle in the direction of the minimum flow (v_0 ... $v_{max.}$ = 5 rotations); internal hexagon SW6
11.2 Regulating speed throttle in the direction of the maximum flow (v_0 ... $v_{max.}$ = 5 rotations); internal hexagon SW6
12.1 Pressure loading at X = opening the orifice
12.2 Pressure loading at Y = closing the orifice
13 Scale disc
14 2-way flow control valve
15 Rectifier sandwich plate
16 Subplate (see right)
18 Hexagon SW10
19 Internal hexagon SW3
20 Hexagon SW13

Valve mounting screws (separate order)

Size	Quantity	Hexagon socket head cap screws	Material number
10	4	**ISO 4762 - M8 x 50 - 10.9-flZn/nc/480h/C** Friction coefficient μ_{total} = 0.09 ... 0.14; tightening torque M_A = 30 Nm ±10 %	**R913015800**
16	4	**ISO 4762 - 10 x 80 - 10.9-flZn/nc/480h/C** Friction coefficient μ_{total} = 0.09 ... 0.14; tightening torque M_A = 64 Nm ±10 %	**R913014560**

Subplates (separate order) with porting pattern according to ISO 4401, see data sheet 45100.

Accessories (separate order)

Mating connectors and cable sets

Designation	Version	Short designation	Material number	Data sheet
Mating connector; for valves with "K4" connector, 2-pole + PE, design A	Without circuitry, 12 ... 240 V, "a"	Z4	**R901017010**	08006
	Without circuitry, 12 ... 240 V, "b"		**R901017011**	
	With indicator light, 12 ... 240 V	Z5L	**R901017022**	
	With rectifier, 12 ... 240 V	RZ5	**R901017025**	
	Z-diode-suppressor 24 V	Z5L1	**R901017026**	

Further information

▶ Directional spool valve	Data sheet 23178
▶ 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
▶ Use of non-electrical hydraulic components in a potentially explosive environment (ATEX)	Data sheet 07011
▶ Mating connectors and cable sets for valves and sensors	Data sheet 08006
▶ 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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