

2-way flow control valve

Type 2FRM, 2FRH, 2FRW

RE 28389

Edition: 2013-05

Replaces: 07.04



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

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Ordering code: 2-way flow control valve

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

01	2-way flow control valve	2FR
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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
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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)	6E¹⁾
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Symbols

09		J¹⁾
		Y¹⁾

10	Direct voltage 24 V	G24¹⁾
	AC voltage 230 V 50/60 Hz	W230¹⁾
	For more voltages and frequencies, please refer to data sheet 23178)	

1) Ordering code **only** required for type 2FRW!

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

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
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	
	Without mating connector; connector DIN EN 175301-803	K4 ^{1; 2)}

Seal material

13	NBR seals	no code
	FKM seals	V
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	

14	Further details in the plain text	
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Ordering code: Rectifier sandwich plate

01	02	03	04	05
Z4S		-	/	*

01	Rectifier sandwich plate	Z4S
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02	Size 10	10
	Size 16	16

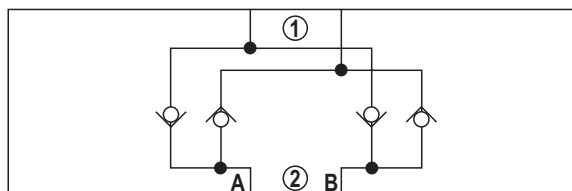
03	Component series 30 ... 39 (30 ... 39: Unchanged installation and connection dimension) - size 10	3X
	Component series 20 ... 29 (20 ... 29: Unchanged installation and connection dimension) - size 16	2X

Seal material

04	NBR seals	no code
	FKM seals	V
	Attention: Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	

05	Further details in the plain text	
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Symbols: Rectifier sandwich plate (① = component side, ② = plate side)



Symbols: 2-way flow control valve

	Simplified	Detailed
Type 2FRM		
Type 2FRM		
Type 2FRH		
		Symbol J¹⁾
Type 2FRW		
		Symbol Y²⁾
Type 2FRW...P		

1) **Symbol J:**
 Solenoid "a" switched → flow controller $q_{V \min}$
 Solenoid "b" switched → flow controller $q_{V \max}$

2) **Symbol Y:**
 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.

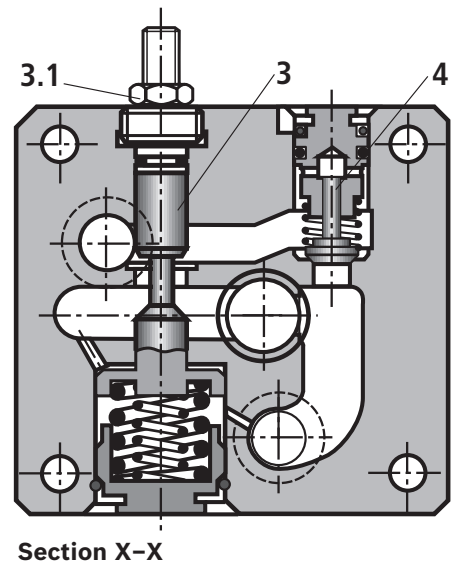
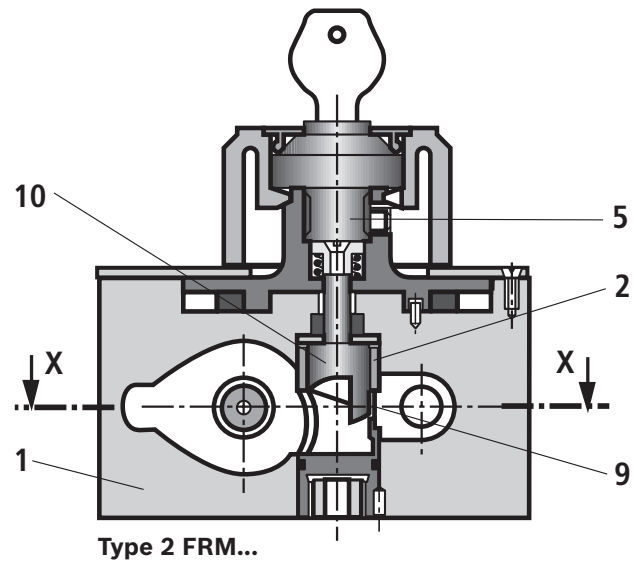
The flow from channel A to channel B is throttled at the throttling point (9). At type 2FRM, the throttle cross-section is set mechanically with the adjustment element (5) by turning the curved bolt (10). In the case of types 2FRH and 2FRW, this is achieved hydraulically by means of a geared piston drive (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 keep the flow at the throttling point (9) constant.

Temperature independence is achieved thanks to the orifice design of the throttling point.

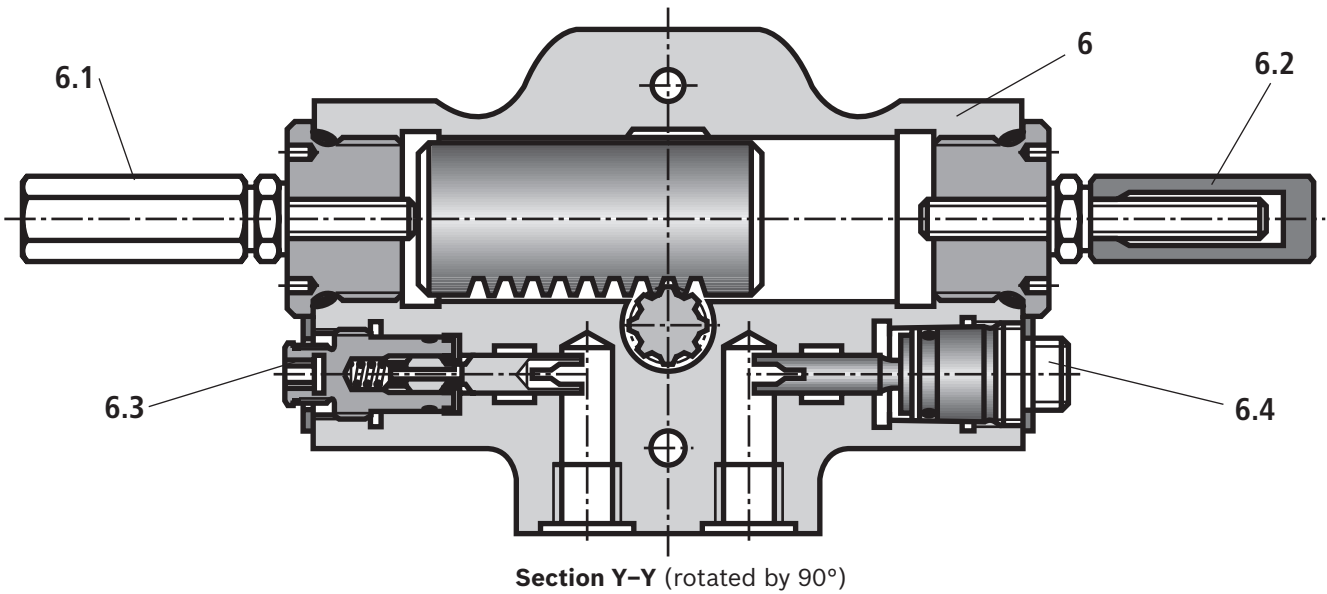
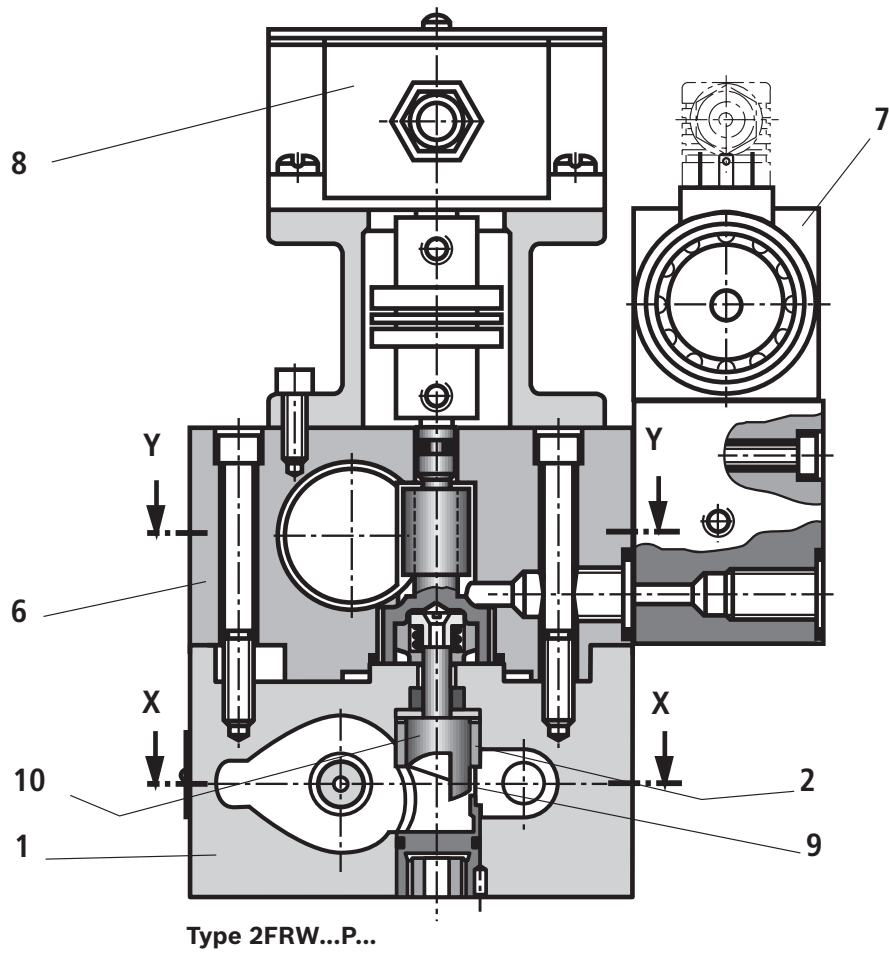
The free flow from channel B to channel A is via the check valve (4). For permanent monitoring of the throttle orifice position, types 2FRH and 2FRW can be equipped with an actual value potentiometer (8). In connection with an electrical command value presetting, electrical control components are offered.

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 2FRW, see page 6.

Function, sections



Technical data

(for applications outside these parameters, 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		°C	-30 ... +80 (-30 ... +50 at type 2FRW) (NBR seals) -20 ... +80 (-20 ... +50 at type 2FRW) (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 $\Delta p = 315$ 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	mm ² /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	cm ³	22 (300 °)	
Pilot pressure range	bar	10 ... 100 (the maximum value must not be exceeded!) (at least 40 bar at a low regulating speed)	
Regulating speed (pilot pressure dependent)	°/s	Without potentiometer	With potentiometer
		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 the hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.
For the selection of the filters see www.boschrexroth.com/filter.

Technical data

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

Hydraulic fluid		Classification	Suitable sealing materials	Standards
Mineral oils		HL, HLP	NBR, FKM	DIN 51524
Bio-degradable	- insoluble in water	HETG	NBR, FKM	VDMA 24568
		HEES	FKM	
	- soluble in water	HEPG	FKM	VDMA 24568
Flame-resistant	- water-free	HFDU	FKM	ISO 12922
	- containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922

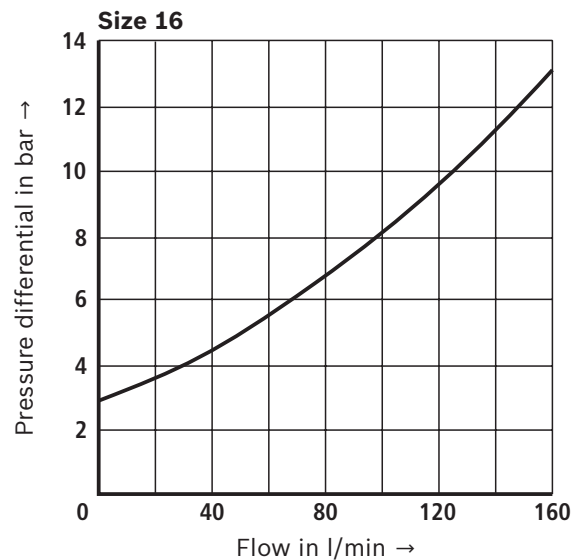
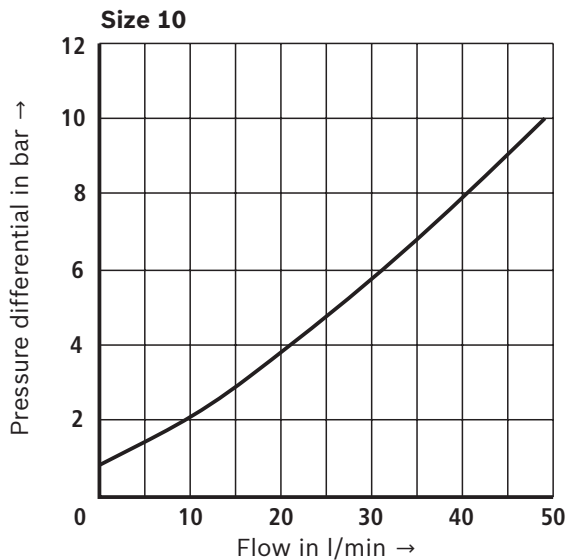
Important information on hydraulic fluids!

- ▶ For more information and data on the use of other hydraulic fluids, refer to data sheet 90220 or contact us!
- ▶ There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- ▶ The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.

▶ Flame-resistant – containing water:

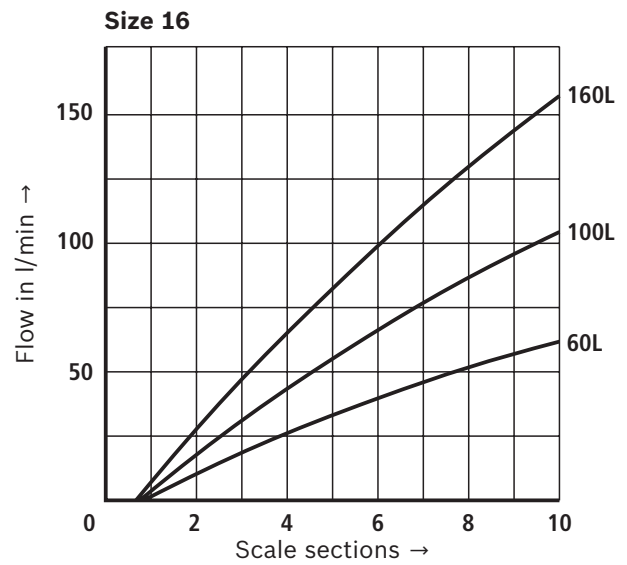
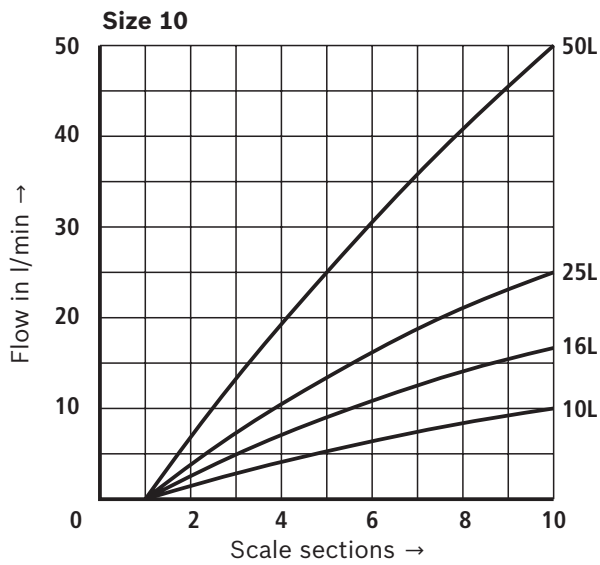
- Maximum pressure difference per control edge 50 bar
- Pressure pre-loading at the tank port >20% of the pressure differential, otherwise increased cavitation
- Life cycle as compared to operation with mineral oil HL, HLP 50 to 100%

- ▶ **Bio-degradable:** When using bio-degradable hydraulic fluids that are zinc-soluble, zinc may accumulate in the fluid (700 mg zinc per pole tube).

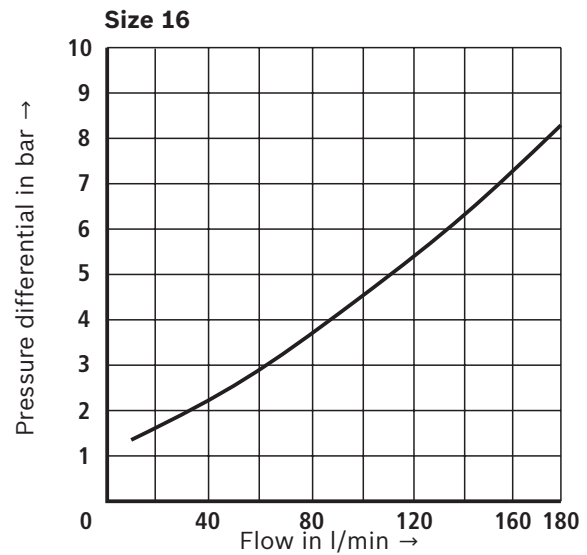
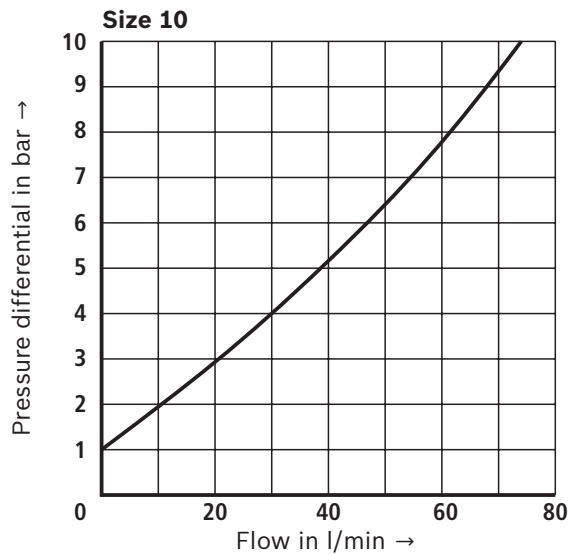
Characteristic curves: Rectifier sandwich plate
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$)**The pressure differential Δp in both flow directions corresponds to flow q_v from A to B (B to A)**

Characteristic curves: 2-way flow control valve
(measured with HLP46, $\vartheta_{oil} = 40 \pm 5 \text{ }^\circ\text{C}$)

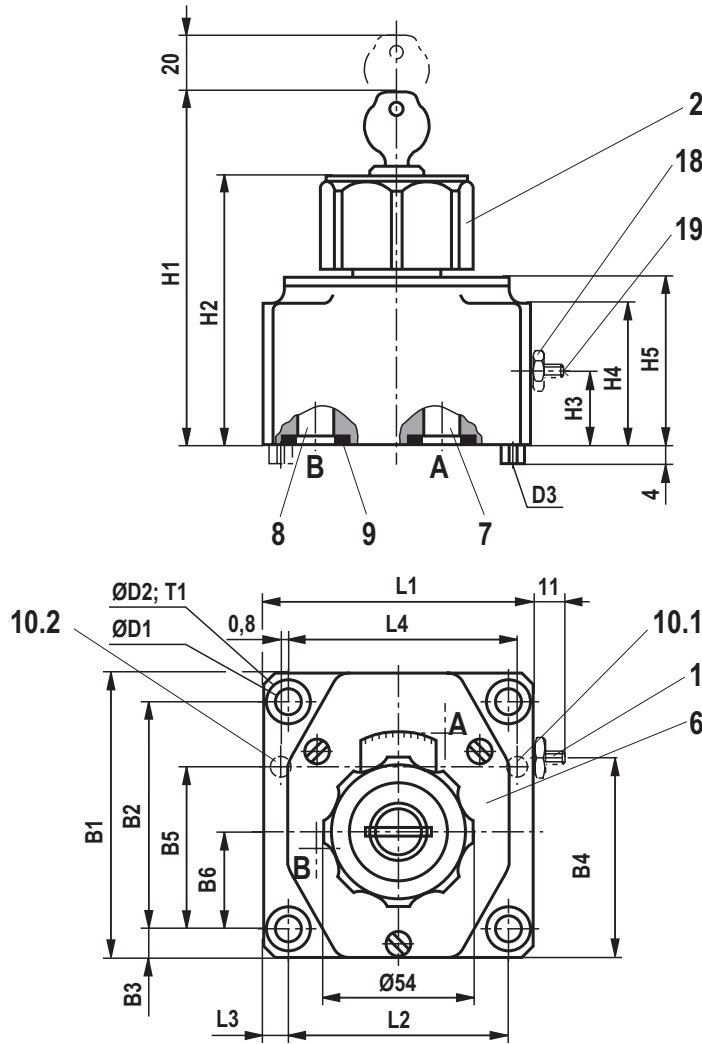
Flow control (A to B)



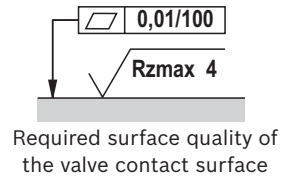
Free return flow (B to A)



Dimensions: 2-way flow control valve type 2FRM
(dimensions in mm)



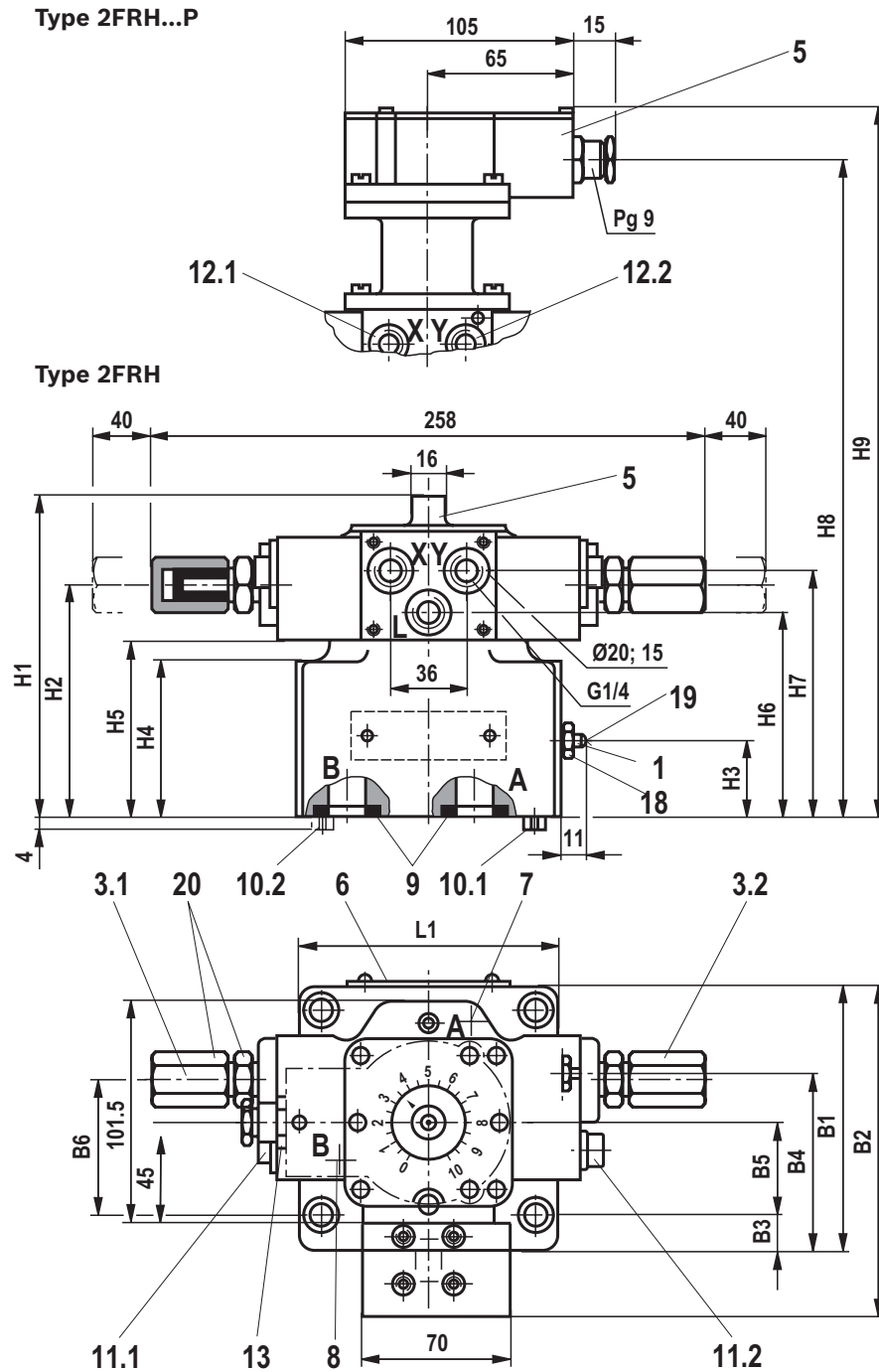
- 1 Pressure compensator stroke limitation, optional
- 2 Adjustment element, rotary knob security lock (all positions can be locked), rotation range 300 ° = 10 scale sections, $M_d \approx 0.7 \text{ Nm}$
- 6 Name plate
- 7 Input A
- 8 Output B
- 9 Seal ring
- 10.1 Locating pin (sizes 10 and 16)
- 10.2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



For valve mounting screws and subplates, see page 14.

Size	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 type 2FRH
(dimensions in mm)

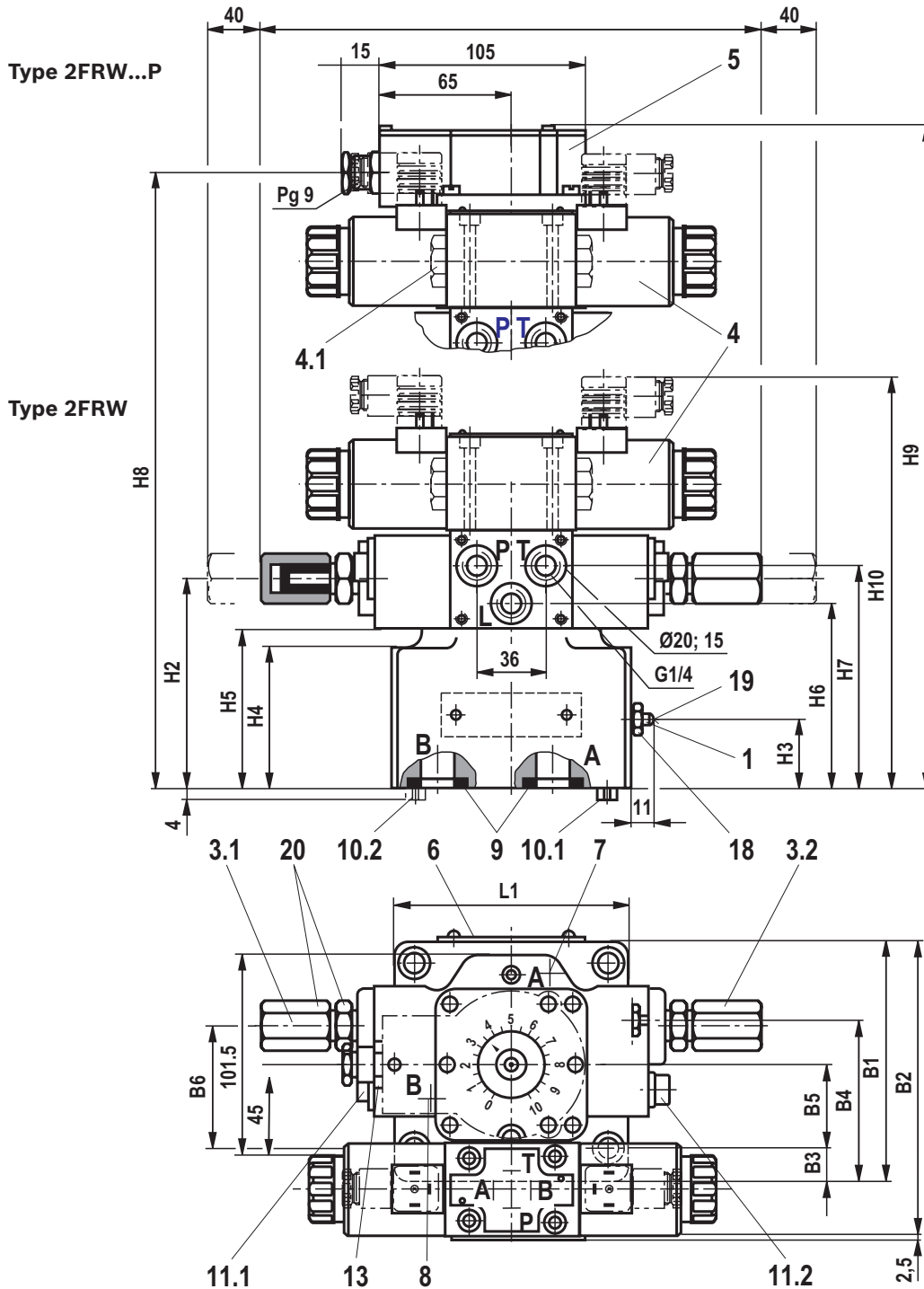


For item explanations, valve mounting screws and sub-plates, see page 14. For valve connection dimensions, see page 10.

0,01/100
 Rzmax 4
 Required surface quality of the valve contact surface

Size	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 type 2FRW
(dimensions in mm)



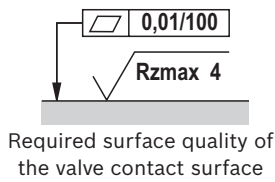
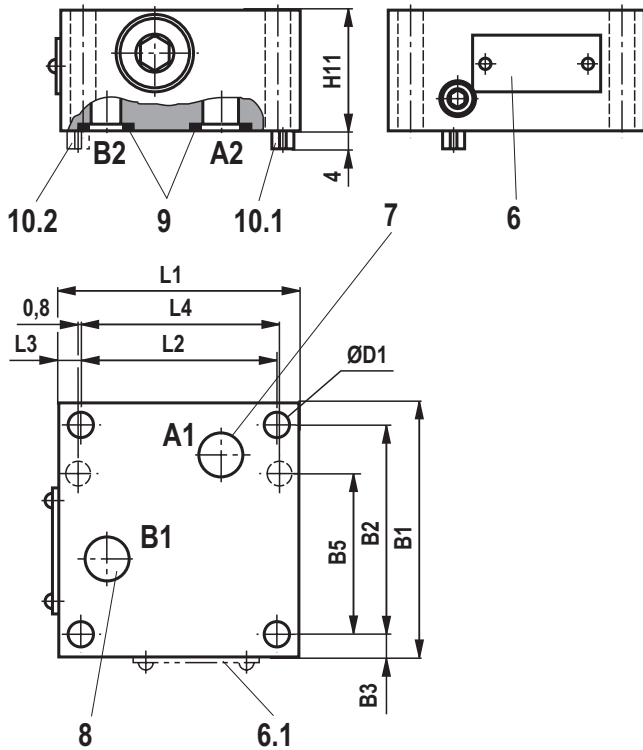
0,01/100
Rzmax 4
Required surface quality of the valve contact surface

- 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 sub-plates see page 14. For valve connection dimensions, see page 10.

Size	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

Dimensions: Rectifier sandwich plate
(dimensions in mm)



Required surface quality of the valve contact surface

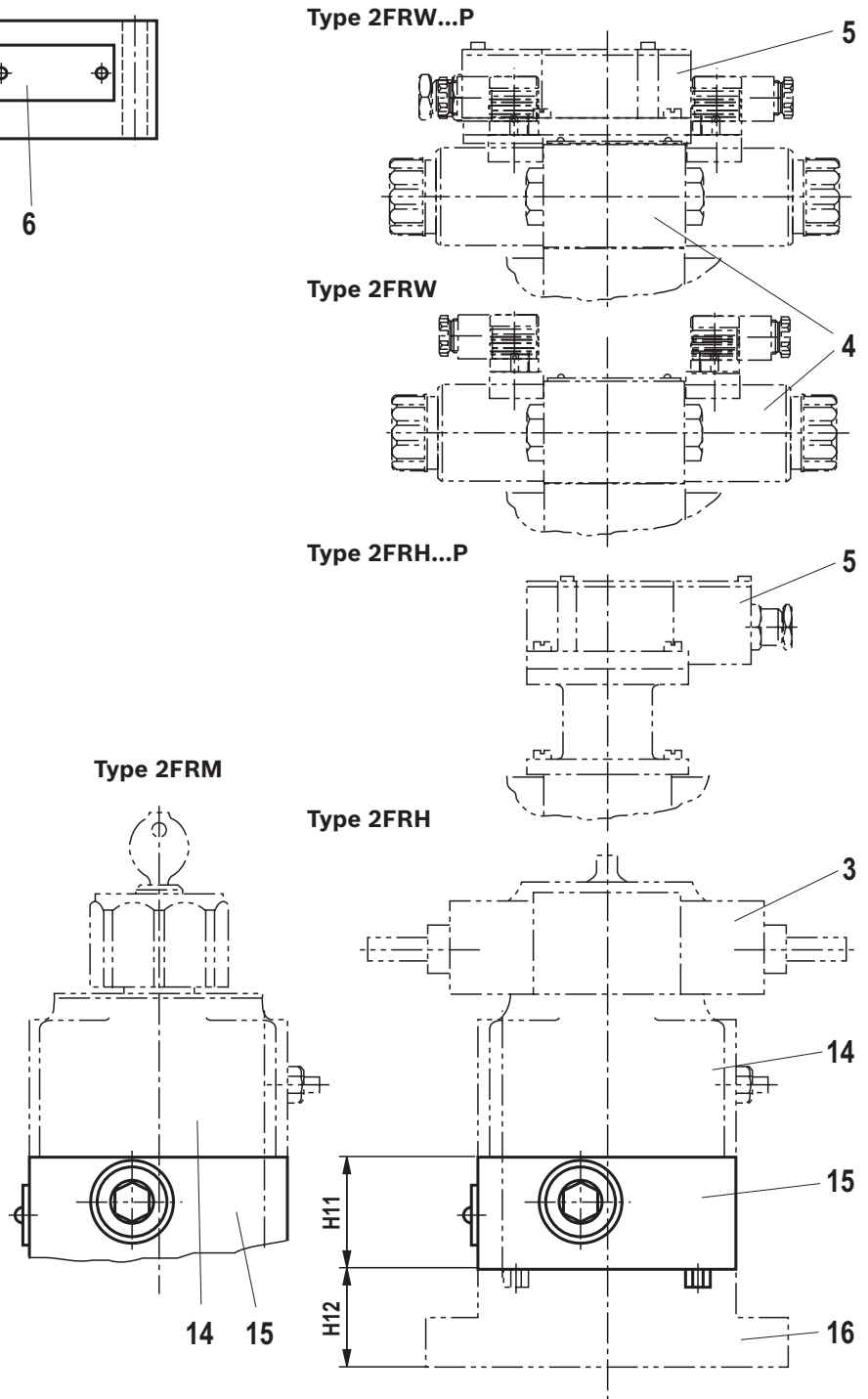
Valve mounting screws for the installation of a rectifier sandwich plate between subplate and flow control valve (separate order)

► Size 10:

4 hexagon socket head cap screws
ISO 4762 - M8 x 100 - 10.9-fIZn-240h-L
(friction coefficient $\mu_{total} = 0.09$ to 0.14);
tightening torque $M_A = 30 \text{ Nm} \pm 10\%$,
material no. **R913000379**

► Size 16:

4 hexagon socket head cap screws
ISO 4762 - M10 x 160 - 10.9-fIZn-240h-L
(friction coefficient $\mu_{total} = 0.09$ to 0.14);
tightening torque $M_A = 64 \text{ Nm} \pm 10\%$,
material no. **R913000072**



For item explanations and subplates see page 14. **For valve connection dimensions**, see page 10.

Size	B1	B2	B3	B5	Ø D1	H11	H12	L1	L2	L3	L4
10	101.5	82.5	9.5	58.7	9	50	30	95	76	9.5	79.4
16	123.5	101.5	11	72.9	11	85	40	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 ($v_0 \dots v_{max.} = 5$ rotations); internal hexagon SW6
- 11.2 Regulating speed throttle in the direction of the maximum
flow ($v_0 \dots v_{max.} = 5$ 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

Subplates according to data sheet 45066 (separate order)

Size 10:	G 279/01 (G 1/2)
	G 280/01 (G 3/4)
Size 16:	G 281/01 (G 1)
	G 282/01 (G 1 1/4)

Valve mounting screws (separate order)

► Size 10:

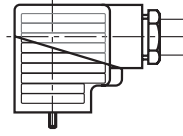
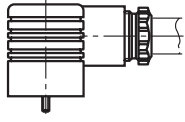
**4 hexagon socket head cap screws
ISO 4762 - M8 x 50 - 10.9-fIZn-240h-L**
(friction coefficient $\mu_{total} = 0.09$ to 0.14);
tightening torque $M_A = 30$ Nm \pm 10%,
material no. **R913000543**

► Size 16:

**4 hexagon socket head cap screws
ISO 4762 - M10 x 80 - 10.9-fIZn-240h-L**
(friction coefficient $\mu_{total} = 0.09$ to 0.14);
tightening torque $M_A = 64$ Nm \pm 10%,
material no. **R913000496**

Mating connectors according to DIN EN 175301-803

For details and more mating connectors see data sheet 08006



Valve side	Farbe	Material number			
		Without circuitry	With indicator light 12 ... 240 V	With rectifier 12 ... 240 V	With indicator light and Zener diode suppression circuit 24 V
a	Gray	R901017010	-	-	-
b	Black	R901017011	-	-	-
a/b	Black	-	R901017022	R901017025	R901017026