Rexroth
Bosch Group

2-way flow control valve

RE 28389/07.04 1/12
Replaces: 02.03

Types 2FRM..., 2FRH... and 2FRW...


H5552

Nominal sizes 10 and 16
Series 3X
Maximum operating pressure 315 bar
Maximum flow 160 L/min

Overview of contents

Features

- For subplate mounting,
  Porting pattern to DIN 24 340 Form G,
  ISO 6263 and CETOP–RP 121 H,
  Subplates to catalogue sheet RE 45066
  (separate order)
- Mechanical operation (type 2FRM..)
- Hydraulic operation (type 2FRH..)
- Electro-hydraulic operation (type 2FRW..)
- Pressure compensator stroke limiter, optional
- Start-up jump reduction
- Adjustable stroke limiter for the rack and pinion actuator (types 2FRH.. and 2FRW..)
- Flow control in both directions using a rectifier sandwich plate

- For further information see:

Pilot valves	
High performance directional valves	RE 23178
Subplates	RE 45066

Ordering details: 2-way flow control valve

2FR		–3X/			1)	1)	1)	1)	1)		*

2-way flow control valve

Mechanical operation = **M**
Hydraulic operation = **H**
Electro-hydraulic operation = **W**

Nominal size 10 = **10**
Nominal size 16 = **16**

Series 30 to 39 = **3X**
(30 to 39: unchanged installation and connection dimensions)

Flow range A to B

NS 10, linear

Up to 110 L/min = **10L**
Up to 116 L/min = **16L**
Up to 125 L/min = **25L**
Up to 150 L/min = **50L**

NS 16, linear

Up to 60 L/min = **60L**
Up to 100 L/min = **100L**
Up to 160 L/min = **160L**

Without pressure compensator stroke limiter = **No code**
With pressure compensator stroke limiter = **B**

Without actual value potentiometer = **No code**
With actual value potentiometer = **P**
(**not** availabale for type 2FRM)

Directional valve NS 6 with wet pin solenoid = **6E**

Further details in clear text

No code = NBR seals
V = FKM seals
(other seals on request)

⚠ Attention!
The compatibility of the seals and pressure fluid has to be taken into account!

Electrical connections

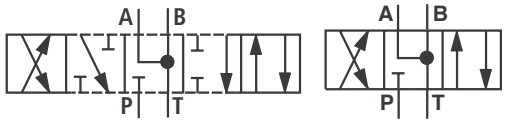
K4 [2] **=** **Without** plug-in connector with component plug DIN EN 175 301-803

No code = **Without** hand override
N9 = **With protected** hand override
N = **With** hand override

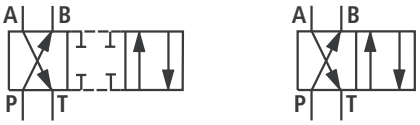
G24 = 24 DC
W230 = 230 V AC 50 Hz
(for other voltages and frequencies see RE 23178)

Symbols with cross-over position | **Symbols (switching characteristics)**

J =



Y =



[1] These ordering details **only** have to be entered for the electro-hydraulic operation type 2FRW!

[2] Plug-in connectors must be ordered separately (see page 12)

Preferred types, see page 4, are readily available

Ordering details: rectifier sandwich plate

Z4S	–	/	*

Nominal size 10 = **10**
Nominal size 16 = **16**

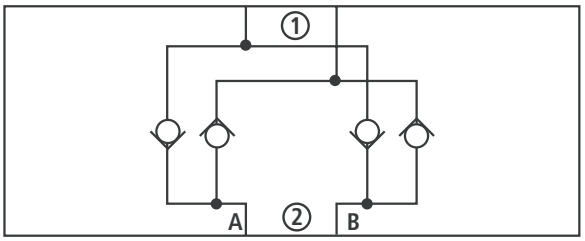
Series 30 to 39 **(NS 10)** = **3X**
(30 to 39: unchanged installation and connection dimensions)
Series 20 to 29 **(NS 16)** = **2X**
(20 to 29: unchanged installation and connection dimensions)

Further details in clear text

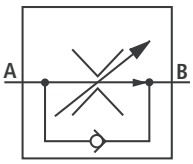
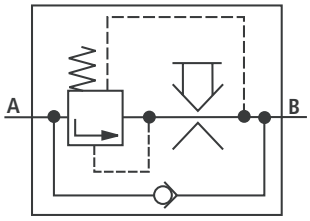
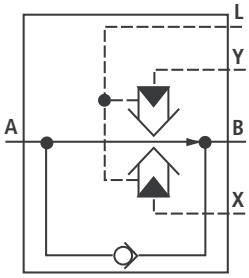
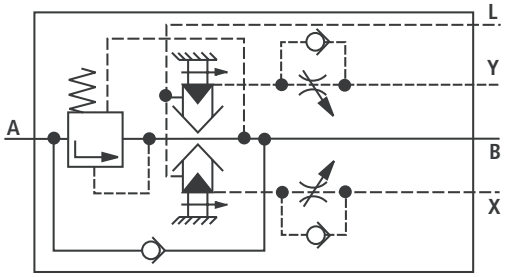
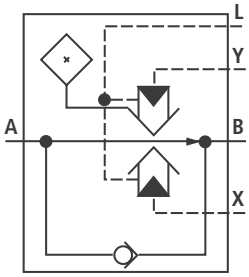
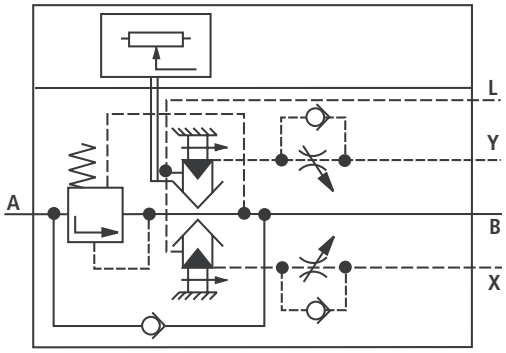
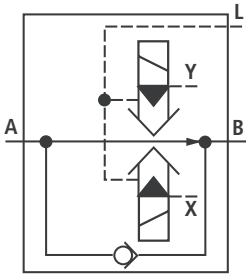
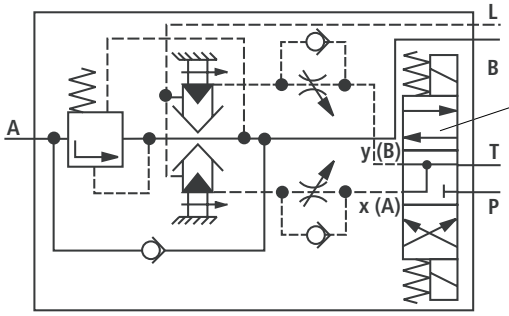
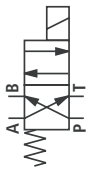
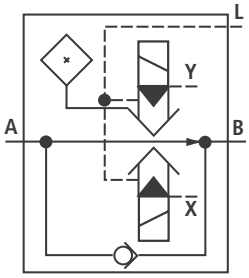
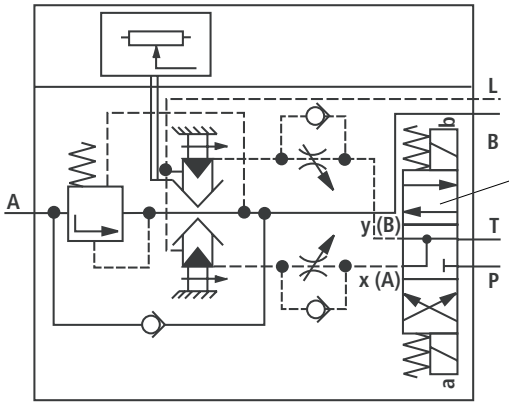
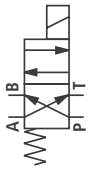
No code = NBR seals
V = FKM seals
(other seals on request)

⚠ Attention!
The compatibility of the seals and pressure fluid has to be taken into account!

Symbol: rectifier sandwich plate (① = component side, ② = subplate side)



Symbols: 2-way flow control valve

	Simplified	Detailed
Type 2FRM		
Type 2FRM		
Type 2FRM		
Type 2FRM		Solenoid "a" energised flow controller $q_{V\,min}$  Solenoid "b" energised flow controller $q_{V\,max}$ Symbol J  Symbol Y optional
Type 2FRM		Solenoid "a" energised flow controller $q_{V\,min}$  Solenoid "b" energised flow controller $q_{V\,max}$ Symbol J  Symbol Y optional

Preferred types (readily available)

Type	Material No.
2FRM 10-3X/10L	R900424887
2FRM 10-3X/10LB	R900423250
2FRM 10-3X/16L	R900423251
2FRM 10-3X/16LB	R900423252
2FRM 10-3X/25L	R900423255
2FRM 10-3X/25LB	R900423256
2FRM 10-3X/50L	R900420286
2FRM 10-3X/50LB	R900423261

Type	Material No.
2FRM 16-3X/100L	R900424905
2FRM 16-3X/100LB	R900420287
2FRM 16-3X/160L	R900424906
2FRM 16-3X/160LB	R900424902
2FRM 16-3X/160LV	R900427777
2FRM 16-3X/60L	R900423271
2FRM 16-3X/60LB	R900424903

Function, section

Flow control valves of types 2FRM.., 2FRH.. and 2FRW.. are 2-way flow control valves. They are used to maintain a flow constant virtually independent of pressure and temperature.

The valves basically consist of the housing (1), orifice bush (2), pressure compensator (3) with optional stroke limiter (3.1), check valve (4), adjustment element (5) for type 2FRM.. as well as a rack and pinion actuator (6), directional valve (7) and actual value potentiometer (8) for types 2FRH... and 2FRW...

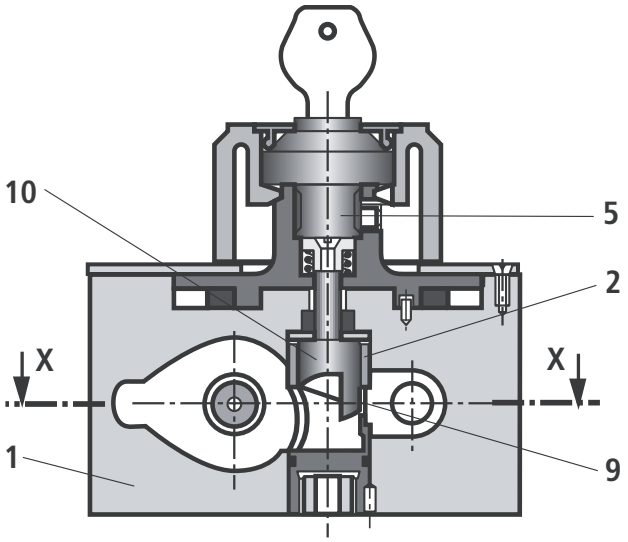
The flow from port A to port B is throttled at the orifice (9). On type 2FRM.. the throttling area is adjusted by rotating the curved pin (10) mechanically by means of the adjustment element (5), for types 2FRH.. and 2FRW.. hydraulically via a rack and pinion actuator (6), which is controlled by a built-on electrically operated directional valve (7). The control speed can be set by means of throttle check valves (6.3 and 6.4). In order to limit the required actuating range, the rack and pinion actuator (6) is fitted with adjustable stroke limiters on both ends (6.1 and 6.2). In order to to maintain the flow across the orifice (9) constant, a pressure compensator is connected upstream of the orifice (3).

The flow is maintained largely independent of temperature due to the orifice design.

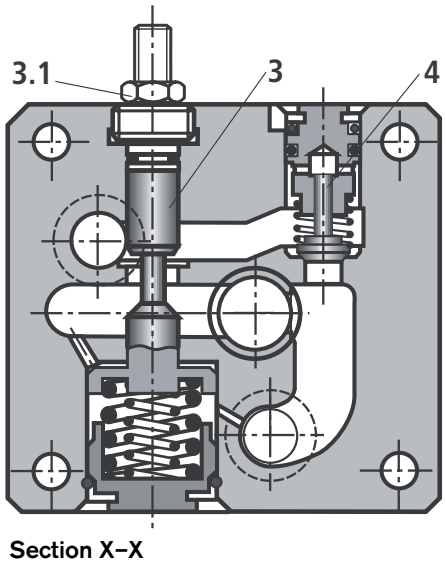
Free return flow from port B to port A is via the check valve (4).

In order to permit the orifice position in valve types 2FRH.. and 2FRW.. to be continuously monitored, an actual value potentiometer (8) can be fitted. Suitable electrical control components are available for electrical command value pre-selection.

The flow is only controlled from A to B. In order to control the flow in both directions a rectifier sandwich plate type Z4S (supply and return) can be installed under the flow control valve.

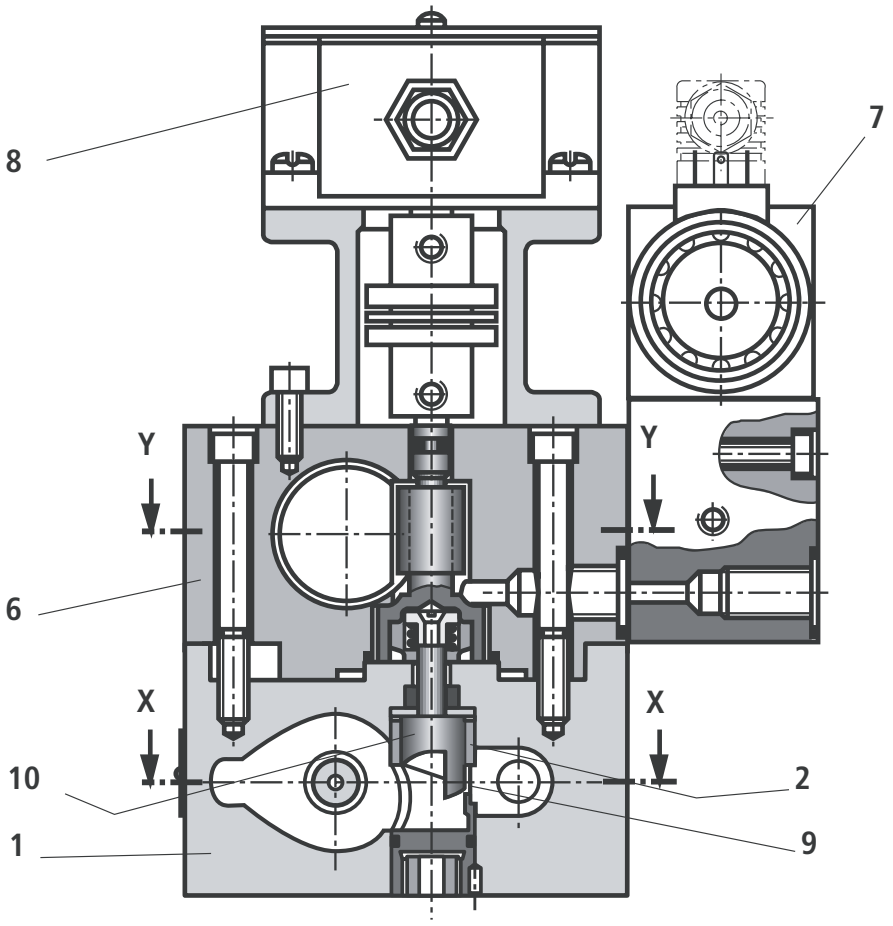


Type 2 FRM...

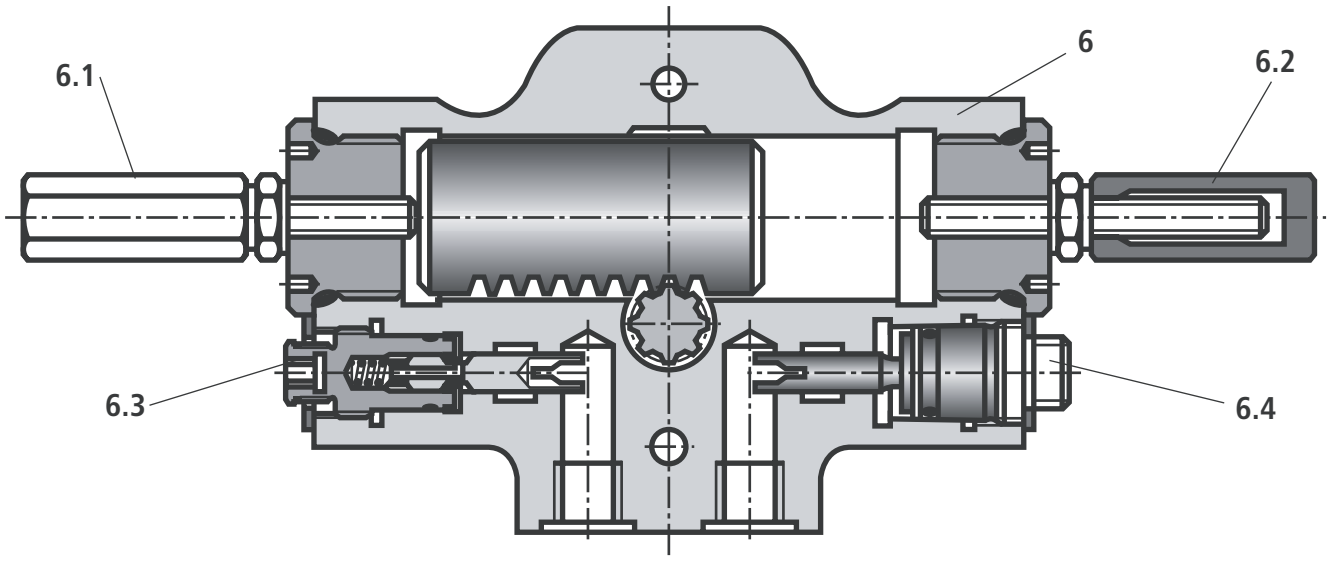


Section X–X

Function, section



Type 2FRW...P...



Section Y–Y (rotated through 90°)

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

General

Weight				**NS 10**	**NS 16**
	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	Type 2FRM			Installation	
	Types 2FRH and 2FRW			Actuator horizontal (rack and pinion)	
Pressure fluid				Mineral oil (HL, HLP) to DIN 51 524 [1]; Fast bio-degradable pressure fluids to VDMA 24 568 (also see RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycole) [2]; HEES (Synthetic ester) [2]; other pressure fluids on request	
Ambient temperature range		NBR seals	°C	–30 to +80 (–30 to +50 **for** type 2FRW)	
		FKM seals	°C	–20 to +80 (–20 to +50 **for** type 2FRW)	
Pressure fluid temperature range		NBR seals	°C	–30 to +80	
		FKM seals	°C	–20 to +80	
Viscosity range			mm^2/s	10 to 800	
ISO code cleanliness class				Maximum permissible degree of contamination of the pressure fluid is to ISO 4406 (C) class 20/18/15 [3]	

[1] Suitable for NBR **and** FKM seals

[2] **Only** suitable for FKM seals

[3] The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.

For the selection of filters see catalogue sheets RE 50070, RE 50076 and RE 50081.

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

2-way flow control valves types 2FRM..., 2FRH... and 2FRW...

			NS 10				NS 16		
Maximum flow		L/min	10	16	25	50	60	100	160
Pressure differential with free-flow from B to A, q_V dependent		bar	2	2.5	3.5	6	2.8	4.3	7.3
Minimum pressure differential		bar	3 to 7				5 to 12		
Flow control	• Temperature, stable (-20 to +80°C)		± 2 % ($q_{V\,max}$)				± 2 % ($q_{V\,max}$)		
	• Pressure, stable (up to Dp = 315 bar)		± 2 % ($q_{V\,max}$)				< ± 5 % ($q_{V\,max}$)		
Maximum operating pressure, port A		bar	315						

2-way flow control valves types 2FRH... and 2FRW...

Pilot volume for the max. adjustment range	cm^3	22 (300°)	
Pilot pressure range	bar	10 to 100 (max. value must **not** be exceeded!)	
Adjustment speed (dependent on the pilot pressure)		**Without** potentiometer	**With** potentiometer
(Dependent on the pilot pressure)		5 to 2000°/s	5 to 300°/s
Maximum flow (directional valve)	L/min	10	See RE 23178
Maximum operating pressure (directional valve)	bar	Up to 315	See RE 23178

Potentiometer

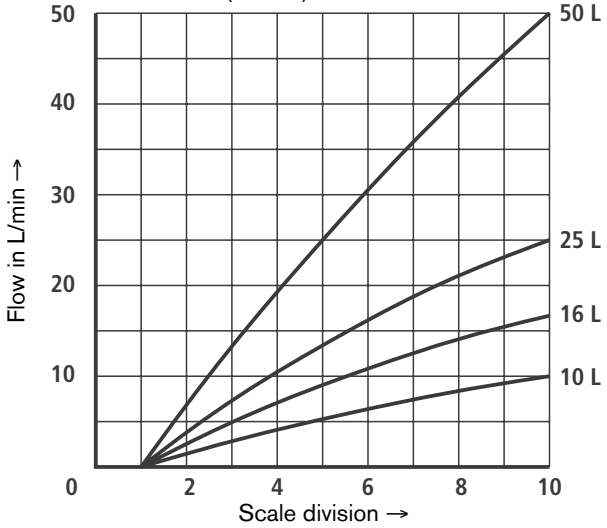
		Actual value potentiometer
Resistance	Ω	1000
Loadability	W	5
Maximum wiper current	A	0.12
Protection to DIN 40 050		IP 65
Adjustment end position error (dependent on the adjustment speed)		±1.5° at 10°/s

Rectifier sandwich plate Z4S...

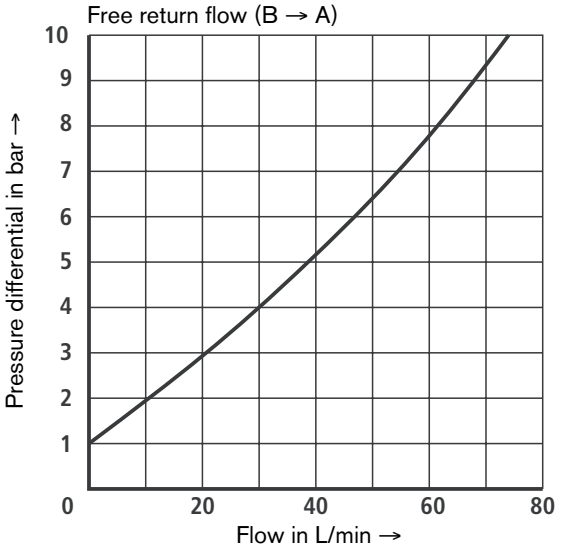
Flow, max.	L/min	50	160
Operating pressure, max.	bar	315	
Opening pressure	bar	1.5	

Characteristic curves (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

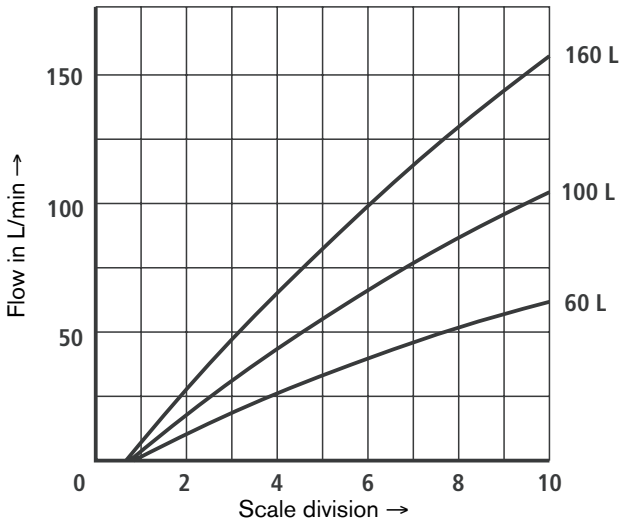
NS 10
Flow control (A → B)



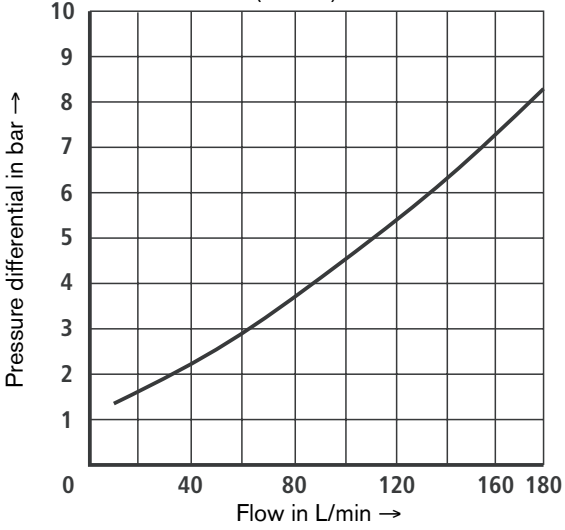
NS 10
Free return flow (B → A)



NS 16
Flow control (A → B)



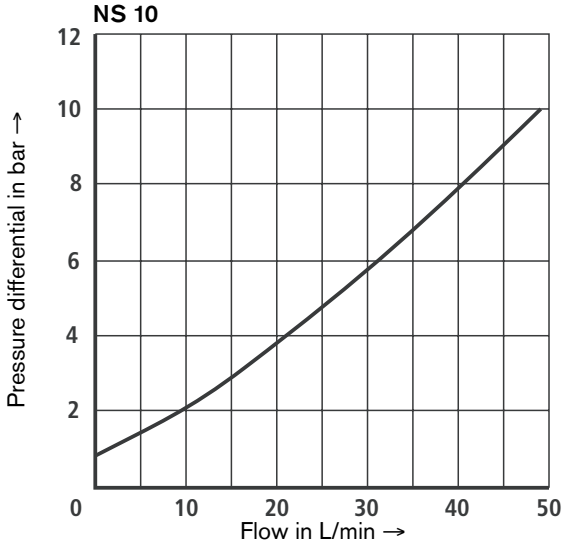
NS 16
Free return flow (B → A)



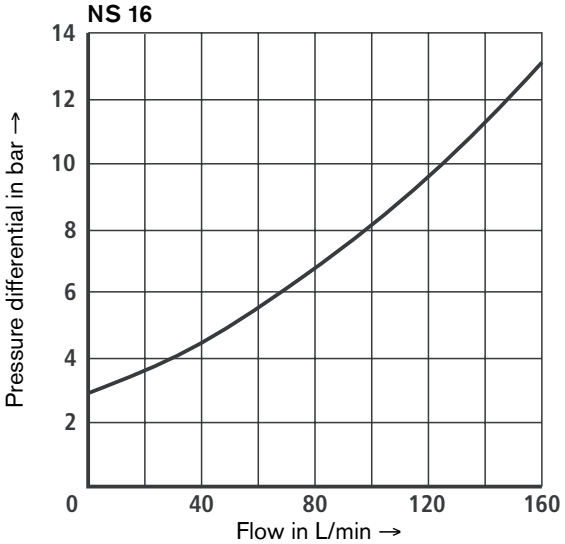
Characteristic curves: rectifier sandwich plate (measured with HLP46, $\vartheta_{oil} = 40\ °C \pm 5\ °C$)

Pressure differential Δp is the same for both directions of flow q_V from A to B (B to A)

NS 10

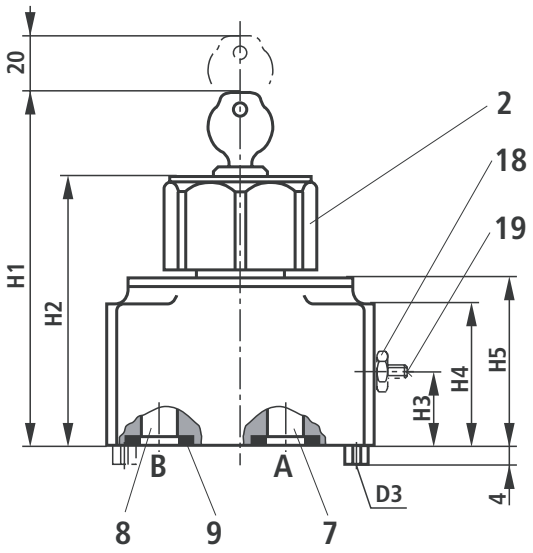


NS 16



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

1 Pressure compenstor stroke limiter, optional
2 Adjustment element, lockable rotary knob (may be locked in any position)
Turning range 300° = 10 scale divisions
$M_d \approx 0.7$ Nm
6 Name plate
7 Input "A"
8 Output "B"
9 Seal ring
10.1 Locating pin (NS 10 and 16)
10.2 Locating pin (NS 16)
18 Hexagon 10A/F
19 Internal hexagon 3A/F



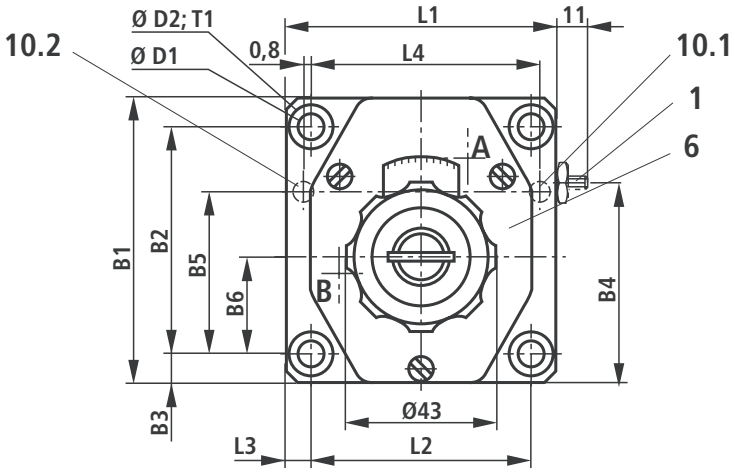
Subplates for:

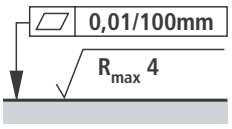
Nominal size 10: G 279/01 (G 1/2)
G 280/01 (G 3/4)
Nominal size 16: G 281/01 (G 1)
G 282/01 (G 1 1/4)

to catalogue sheet RE 45066 and

Valve fixing screws

Nominal size 10
M8 x 50 DIN 912-10.9; $M_A = 37$ Nm
Nominal size 16
M10 x 80 DIN 912-10.9; $M_A = 75$ Nm
must be ordered separately.





Required surface finish of the mating piece

NS	B1	B2	B3	B4	B5	B6	Ø D1	Ø D2	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

Unit dimensions: 2-way flow control valve types 2FRW, 2FRH (in mm)

1 Pressure compensator stroke limiter, optional

2 Flow indicator, rotation range 300° = 10 scale divisions

3.1 Rack and pinion actuator stroke limiter for min. flow 1 turn = approx. 12° (of 300°)

3.2 Rack and pinion actuator stroke limiter for max. flow 1 turn = approx. 12° (of 300°)

4 Directional valve NS 6, symbols J or Y (Y de-energised = $q_{V\,min}$) For detailed dimensions of the directional valve, see RE 23178

4.1 Cover for valve type Y

5 Actual value potentiometer

6 Name plate

7 Input "A"

8 Output "B"

9 Seal ring

10.1 Locating pin (NS 10 and 16)

10.2 Locating pin (NS 16)

11.1 Speed adjustment throttle towards min. flow (v_0 to $v_{max.}$ = 5 turns); Internal hexagon 6A/F

11.2 Speed adjustment throttle towards max. flow (v_0 to $v_{max.}$ = 5 turns); Internal hexagon 6A/F

12.1 Pressure in X = opening of the orifice

12.2 Pressure in Y = closing of the orifice

13 Scale disc

18 Hexagon 10A/F

19 Internal hexagon 3A/F

20 Hexagon 13A/F

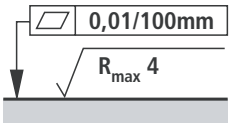
For subplates and valve fixing screws and valve connection dimensions see page 9.

[1] Type 2FRH

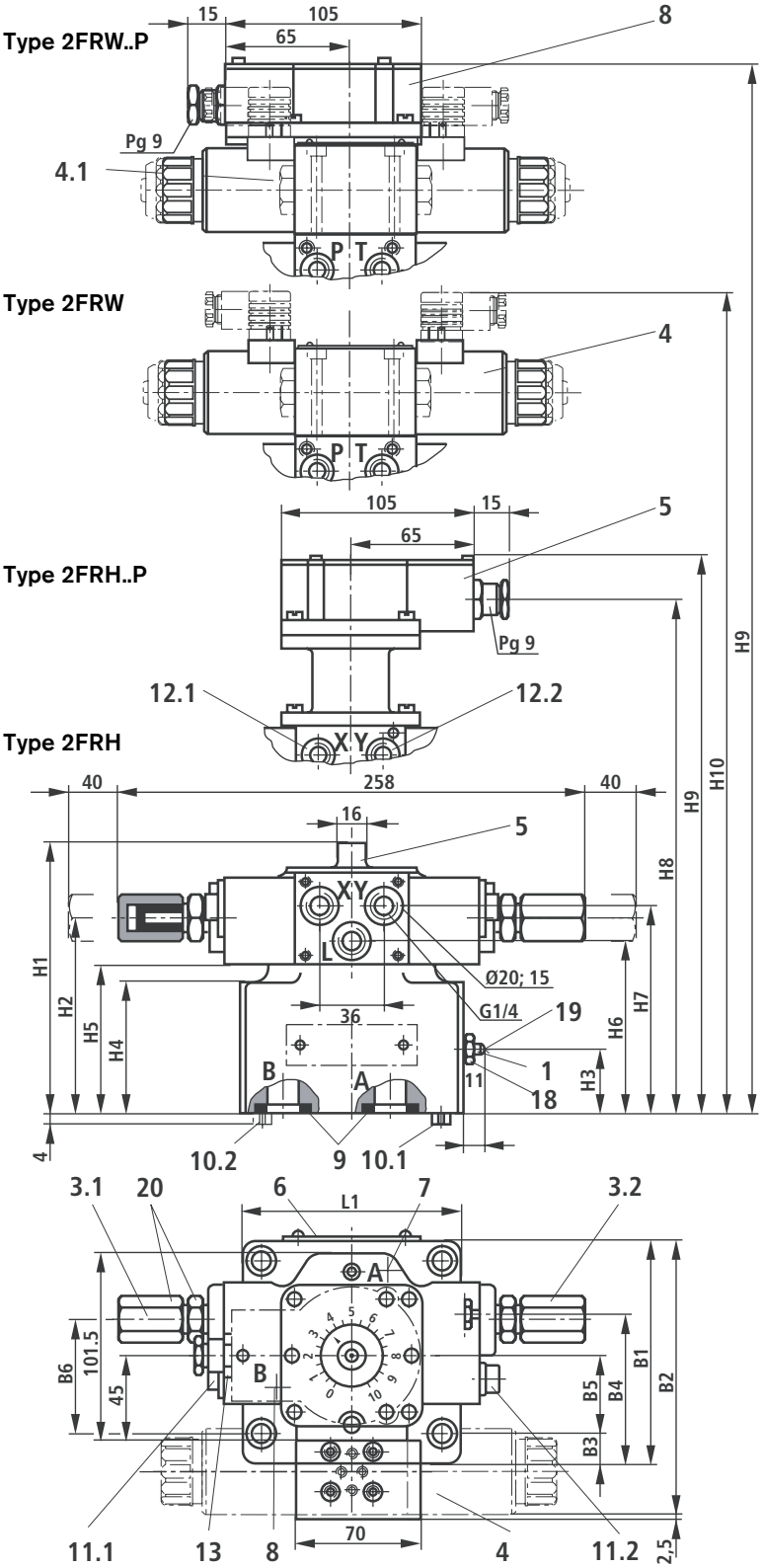
[2] Type 2FRW

[3] Dimension with plug-in connection **without** circuitry to DIN EN 175 301–802 and ISO 4400

[4] Dimension with plug-in connector **with** circuitry to DIN EN 175 301–802 and ISO 4400

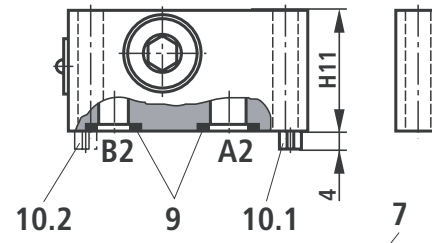


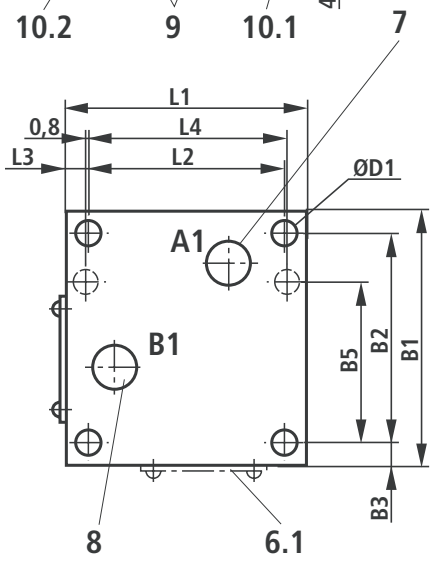
Required surface finish of the mating piece



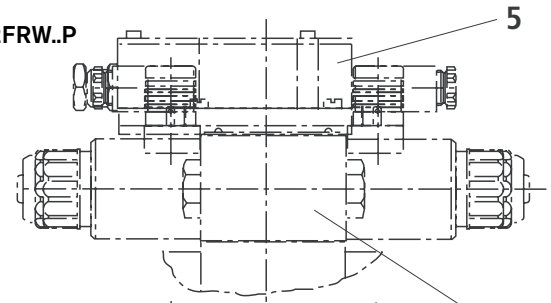
NS	B1	B2	B3	B4	B5	B6	H1	H2	H3	H4	H5	H6	H7[1]	H7[2]	H8	H9	H10[3]	H10[4]	L1
10	101.5	146	9.5	68	35.5	54.5	125.5	84	26	51	58	70	89	87	179	203	201	206	95
16	123.5	160.5	11	81.5	41.5	60.5	147.5	106	34	72	80	92	111	109	201	225	223	228	123.5

Unit dimensions: rectifier sandwich plate Z4S... (in mm)





Type 2FRW..P



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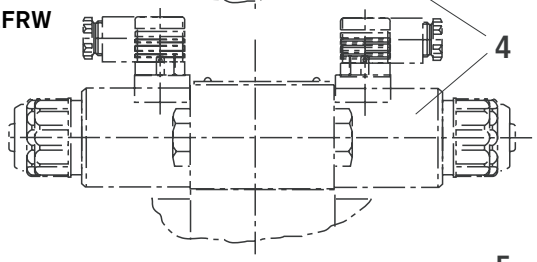

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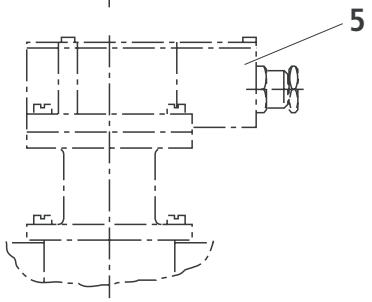
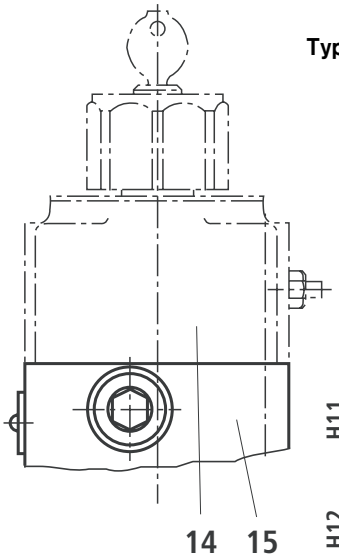
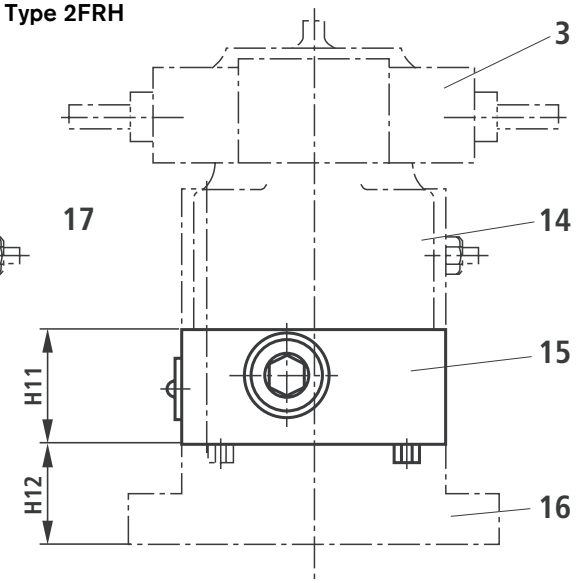


Type 2FRM



Type 2FRH

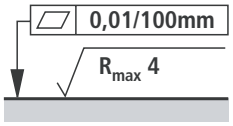


3 Rack and pinion actuator
4 Directional valve NS 6
5 Actual value potentiometer
6 Name plate (NS 10)
6.1 Name plate (NS 16)
7 Input "A"
8 Output "B"
9 Seal ring
10.1 Locating pin (NS 10 and 16)
10.2 Locating pin (NS 16)
14 2-way flow control valve
15 Rectifier sandwich plate
16 Subplates, see page 6
17 **Valve fixing screws**

Nominal size 10:
M8 x 100 DIN 912-10.9; $M_A = 37$ Nm

Nominal size 16:
M10 x 160 DIN 912-10.9; $M_A = 75$ Nm

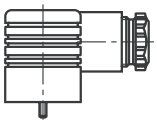
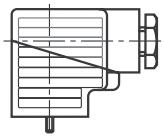
Valve fixing screws for inserting a rectifier sandwich plate between the flow control valve and subplate must be ordered separately.



Required surface finish of the mating piece

NS	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

Ordering details: plug-in connectors to DIN EN 175 301-803 and ISO 4400 for component plug "K4"

For further plug-in connectors see RE 08006					
		Material No.			
Valve side	**Colour**	Without circuitry	With indicator light 12 … 240 V	With rectifier 12 … 240 V	With indicator light and Z-diode protective circuitry 24 V
a	Grey	**R901017010**	**–**	**–**	**–**
b	Black	**R901017011**	**–**	**–**	**–**
a/b	Black	**–**	**R901017022**	**R901017025**	**R901017026**

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