Rexroth
Bosch Group

2-way flow control valve

RE 28163/02.09 1/12
Replaces: 02.03

Type 2FRM

Size 6
Component series 3X
Maximum operating pressure 315 bar [1)]
Maximum flow 32 L/min

H5851+5852

Table of contents

Features

- Location of the ports according to DIN 24340 form A
- Subplates see data sheet RE 45052 (separate order)
- external closing of the pressure compensator, optional
- as threaded connection for panel mounting with connection thread G3/8
- Check valve, optional
- 2 adjustment types, optional:
  - Rotary knob with scale
  - lockable rotary knob with scale

Information on available spare parts:
www.boschrexroth.com/spc

[1)] For use of the component with a rectifier sandwich plate up to 210 bar

Order details: 2-way flow control valve

2FRM	6			6 –3X/		V	*

2-way flow control valve

Size 6 **= 6**

With closing of the pressure compensator **= A**
(suppression of the start-up jump)
Without closing of the pressure compensator **= B**
Without closing of the pressure compensator **= SB**
For panel mounting

Adjustment type
Lockable rotary knob with scale [1] **= 3**
Rotary knob with scale **= 7**

Zero position of the marking at port P **= 6**

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

[1] Key with the material no. **R900008158** is included in the delivery.

Preferred types and standard units are contained in the EPS (standard price list).

Further details in the clear text

Seal material
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with the hydraulic fluid used!

R = **With** check valve
M = **Without** check valve

Flow (A → B)
0.2Q = up to 0.2 l/min
0.6Q = up to 0.6 l/min
1.5Q = up to 1.5 l/min
3Q = up to 3.0 l/min
6Q = up to 6.0 l/min
10Q = up to 10.0 l/min
16Q = up to 16.0 l/min
25Q = up to 25.0 l/min
32Q = up to 32.0 l/min

Order details: Rectifier sandwich plate (only for version “B”)

Z4S	6 –1X/	V	*

Rectifier sandwich plate

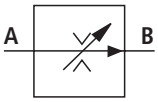
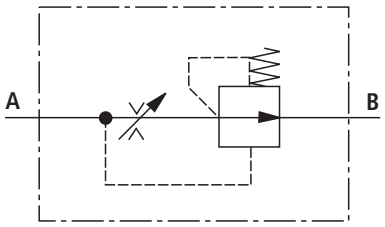
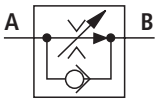
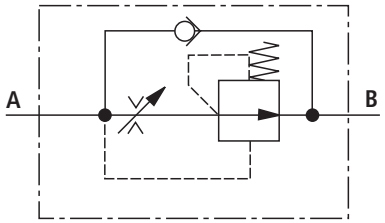
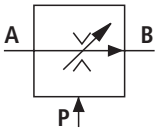
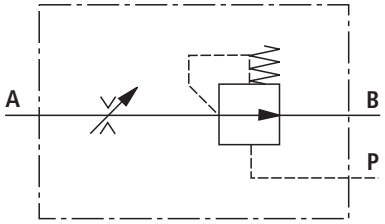
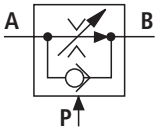
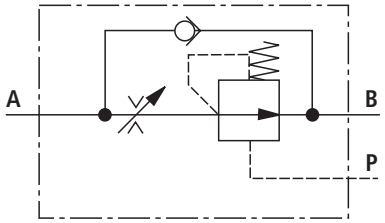
Size 6 **= 6**

Component series 10 to 19 **= 1X**
(10 to 19: unchanged installation and connection dimensions)

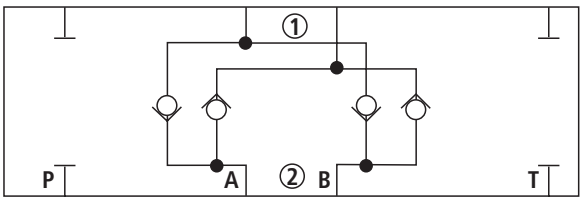
Further details in the clear text

Seal material
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with the hydraulic fluid used!

Symbols: 2-way flow control valves

	Simplified	Detailed
Without check valve; **without** external closing Type 2FRM 6 B…MV Type 2FRM 6 SB…MV		
With check valve; **without** external closing Type 2FRM 6 B…RV Type 2FRM 6 SB…RV		
Without check valve; **with** external closing Type 2FRM 6 A…MV		
With check valve; **with** external closing Type 2FRM 6 A…RV		

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



Function, section: Type 2FRM 6 **B**…

General

The flow control valve type 2 FRM is a 2-way flow control valve.

It is used for maintaining a constant flow, independent of pressure and temperature.

The valve basically comprises of a housing (1), a rotary knob (2), orifice bush (3), pressure compensator (4) and an optional check valve.

Flow control valve type 2FRM 6 B…MV
(**without** external closing**, without** check valve)

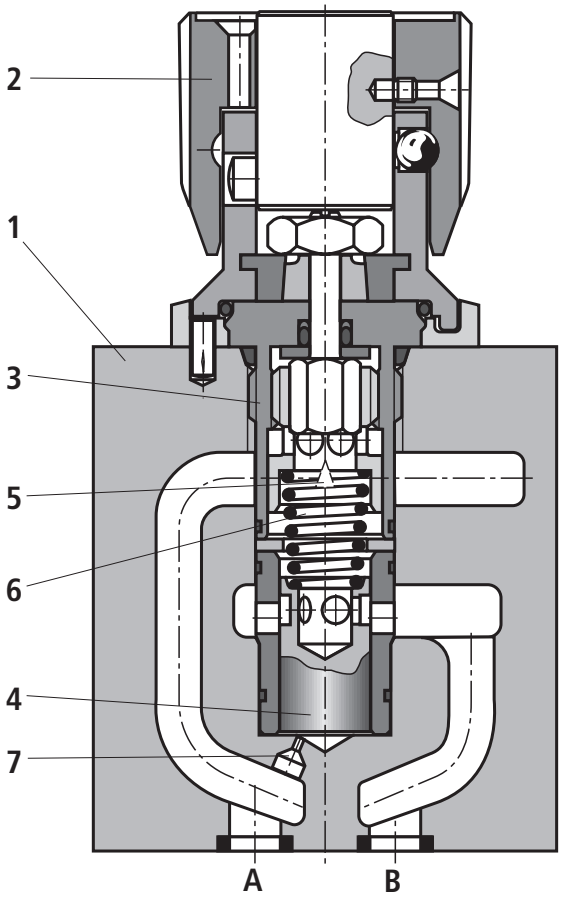
The flow from channel A to channel B is throttled at the throttling point (5). The throttle cross-section is set by turning the rotary knob (2).

In order to keep the flow in channel B constant, independent of the pressure, a pressure compensator (4) is fitted downstream of the throttling point (5).

The compression spring (6) presses the pressure compensator (4) downwards against its stop and keeps the pressure compensator (4) in the open position when there is no flow through the valve. When fluid flows through the valve, the pressure present in port A applies a force to the pressure compensator (4) via orifice (7).

The pressure compensator (4) moves to the control position until the forces are in balance. When the pressure in channel A rises, the pressure compensator (4) moves in the closing direction until a balance of forces is once again attained. Due to this continuous compensation of the pressure compensator (4), a constant flow is obtained.

In order to control a flow through the valve in both directions, a rectifier sandwich plate type Z4S 6 may be fitted below this flow control valve.



Type 2FRM 6 B76-3X/.MV

Function, section: Type 2FRM 6 SB…

General

The flow control valve type 2 FRM is a 2-way flow control valve.

It is used for maintaining a constant flow, independent of pressure and temperature.

The valve basically comprises of a housing (1), a rotary knob (2), orifice bush (3), pressure compensator (4) and an optional check valve (8).

Flow control valve type 2FRM 6 SB…RV
(**without** external closing**, with** check valve, with threaded connection **for panel mounting**)

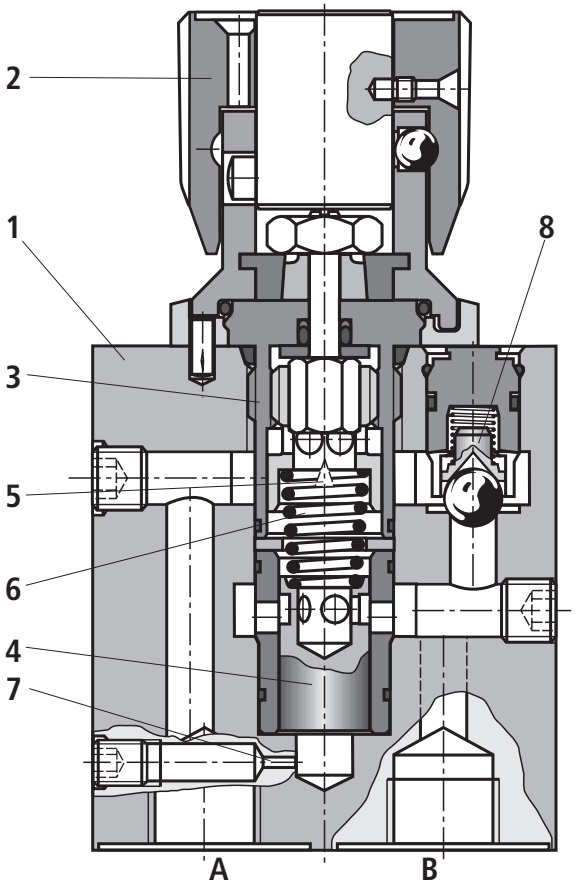
The flow from channel A to channel B is throttled at the throttling point (5). The throttle cross-section is set by turning the rotary knob (2).

In order to keep the flow in channel B constant, independent of the pressure, a pressure compensator (4) is fitted downstream of the throttling point (5).

The compression spring (6) presses the pressure compensator (4) downwards against its stop and keeps the pressure compensator (4) in the open position when there is no flow through the valve. When fluid flows through the valve, the pressure present in port A applies a force to the pressure compensator (4) via orifice (7).

The pressure compensator (4) moves to the control position until the forces are in balance. When the pressure in channel A rises, the pressure compensator (4) moves in the closing direction until a balance of forces is once again attained. Due to this continuous compensation of the pressure compensator (4), a constant flow is obtained.

The free return flow from channel B to channel A is directed via the check valve (8).



Type 2FRM 6 SB76-3X/..RV

Function, section, sample circuit: Type 2FRM 6 **A**…

General

The flow control valve type 2 FRM is a 2-way flow control valve.

It is used for maintaining a constant flow, independent of pressure and temperature.

The valve basically comprises of a housing (1), a rotary knob (2), orifice bush (3), pressure compensator (4) and an optional check valve (8).

Flow control valve type 2FRM 6 A…RV
(**with** external closing**, with** check valve)

The function of this valve is basically the same as that of valve type 2FRM 6 B...MV.

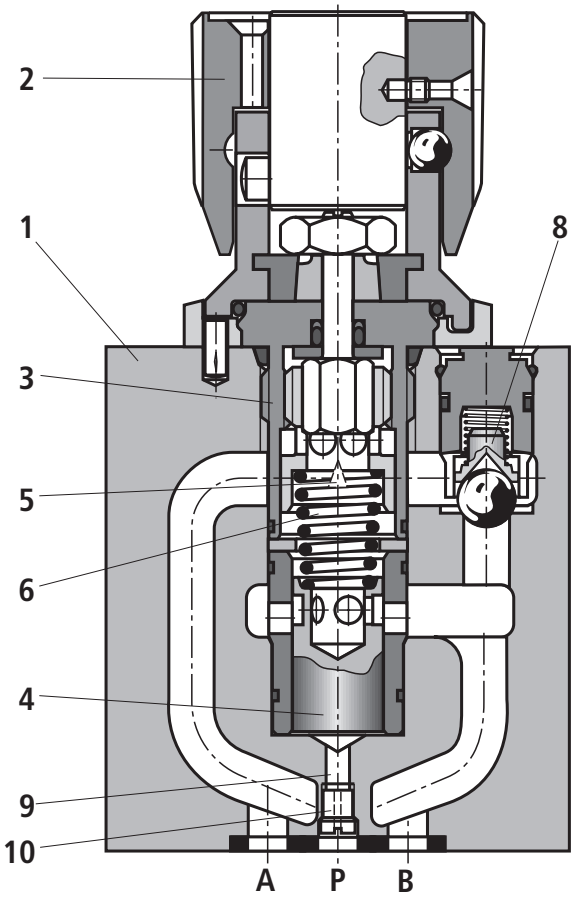
However, the flow control valve features external closing of the pressure compensator (4) via channel P (9). The external pressure acting in channel P (9) via orifice (10), holds the pressure compensator (4) closed against the compression spring (6). When the connected directional valve (11) is actuated to permit flow from P to B, control is achieved as with type 2 FRM 6 B. Thus, a start-up jump is avoided.

The version with closing of the pressure compensator can only be used for meter-in control.

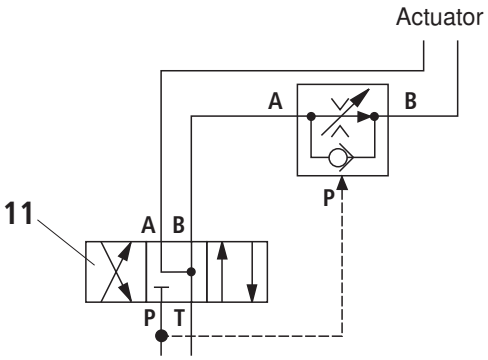
The free return flow from channel B to channel A is directed via the check valve (8).

Attention!

The pressure loss of port P upstream of the directional valve to port A upstream of the flow control valve makes itself felt by a reduced flow.



Type 2FRM 6 A76-3X/..RV



Technical data: 2-way flow control valve
(For applications of the component outside the specified values, please contact us!)

general

Weight	– Version “A” and “B”	kg	ca. 1.3
	– Version “SB”	kg	ca. 1.5
Installation position			Any
Ambient temperature range		°C	–20 to +50

hydraulic

Maximum operating pressure (port A)			bar	315						
Pressure differential Δp with free return flow B → A			bar	See characteristic curves page 8						
Minimum pressure differential			bar	6 to 14						
Pressure stability up to Δp = 315 bar			%	±2 ($q_{V\,max}$)						
Maximum flow			l/min	0.2	0.6	1.5	3.0	6.0	10.0	16.0	25.0	32.0
Minimum flow	– up 100 bar		cm^3/min	15	15	15	15	25	50	70	100	250
	– up 315 bar		cm^3/min	25	25	25	25	25	50	70	100	250
Hydraulic fluid				Mineral oil (HL, HLP) according to DIN51524; other hydraulic fluids upon request						
Hydraulic fluid temperature range			°C	–20 to +80						
Viscosity range			mm^2/s	10 to 800						
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)				Class 20/18/15 [1)]						

[1)] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Efficient filtration prevents malfunctions and at the same time prolongs the service life of components.

For the selection of the filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087, and RE 50088.

Technical data: Rectifier sandwich plate
(For applications of the component outside the specified values, please contact us!)

general

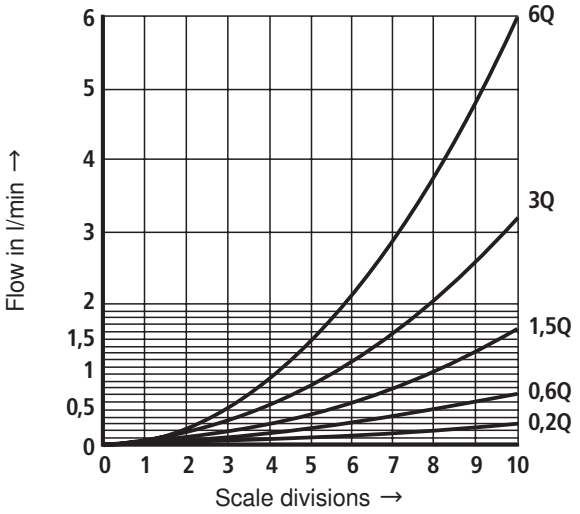
Weight	kg	ca. 0.9

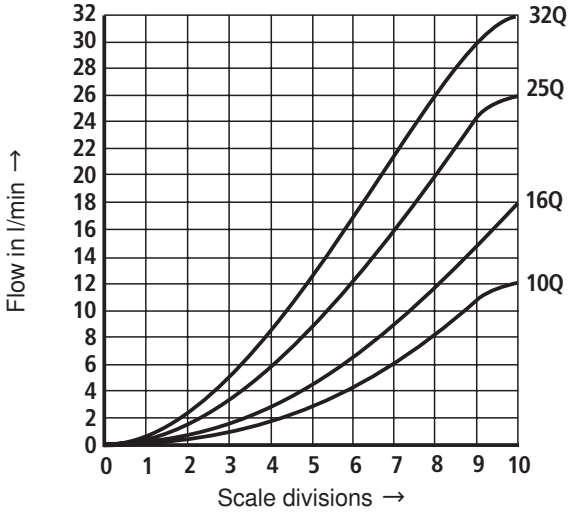
hydraulic

Maximum operating pressure	bar	210
Cracking pressure	bar	0.7
Maximum flow	l/min	32

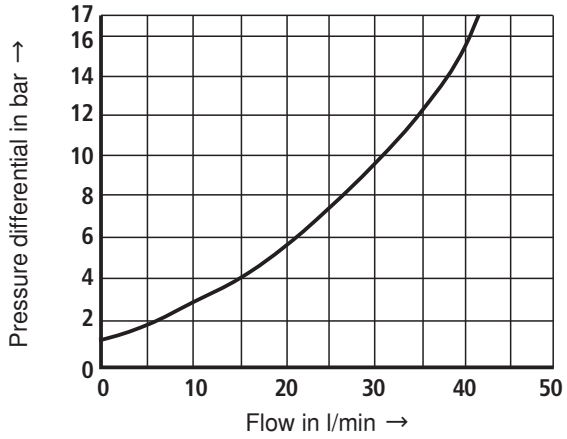
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 ± 5°C)

Flow dependency on the scale setting (flow control A → B)

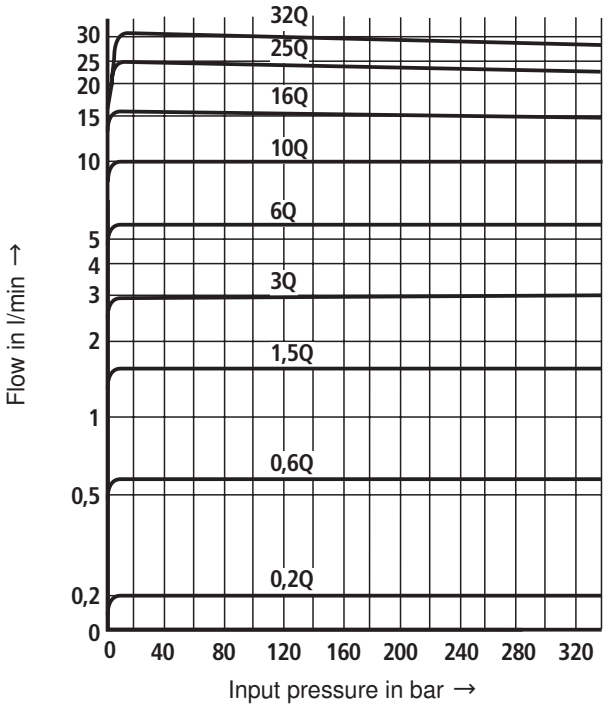




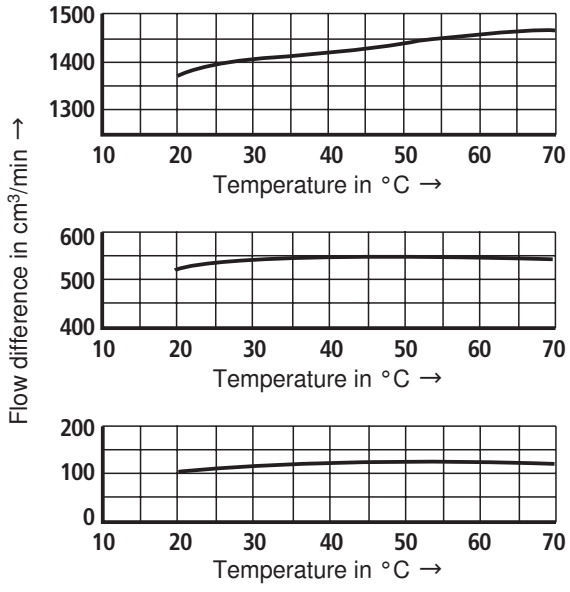
***Δp*-q_V characteristic curve** via check valve B → A;
Orifice closed



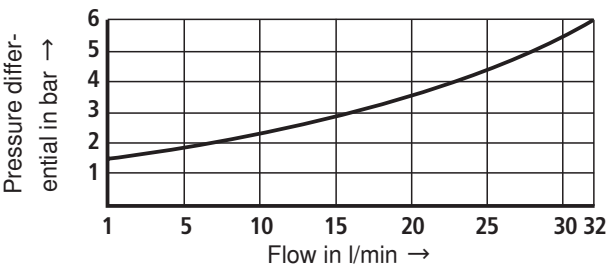
p_E-q_V characteristic curve



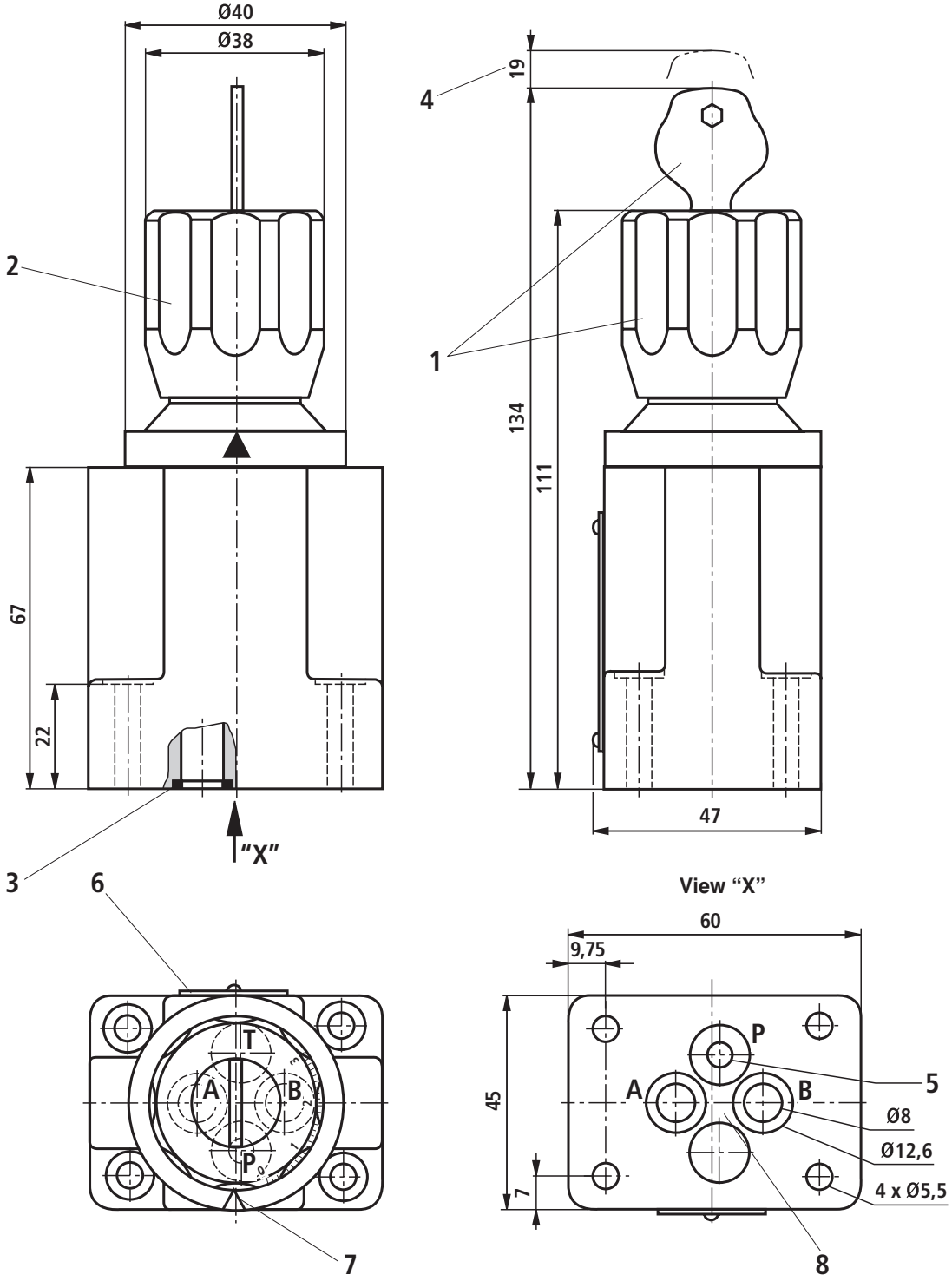
Temperature dependency at ***Δp*** = 20 bar



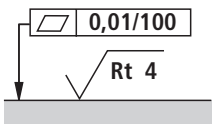
Rectifier sandwich plate
***Δp*-q_V characteristic curve**



Unit dimensions: Subplate mounting – Version “A” and “B” (dimensions in mm)

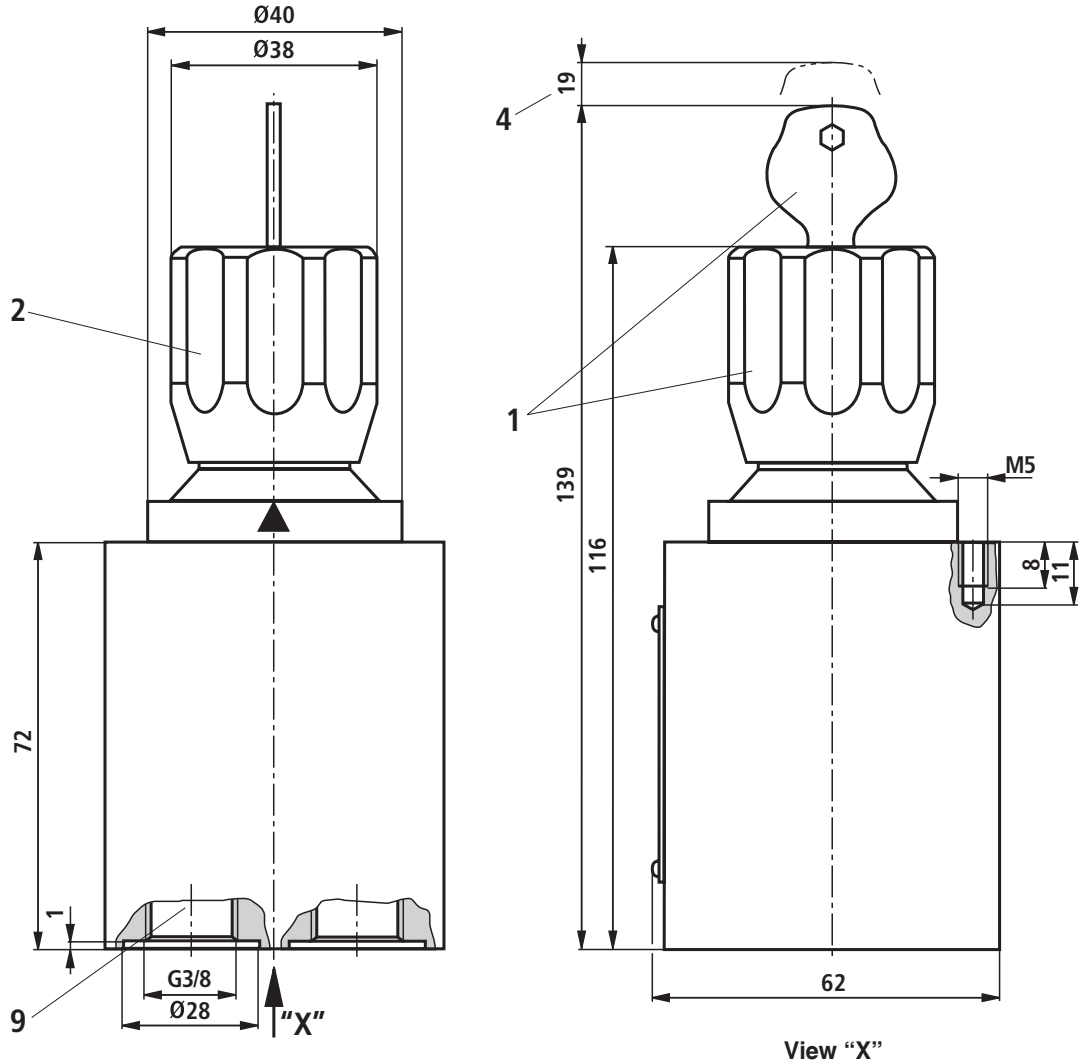


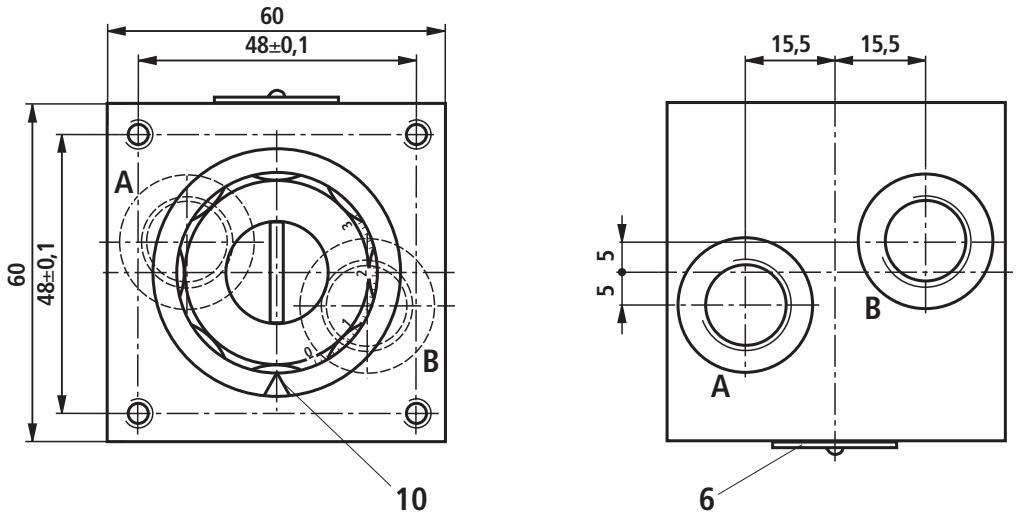
For explanation of items, subplates, and valve mounting bolts, see page 11.



Required surface quality of the valve mounting face

Unit dimensions: Threaded connection for panel mounting – version “SB”
(dimensions in mm)





For explanation of items and valve mounting bolts, see page 11.

Unit dimensions

1 Adjustment type “3” (lockable rotary knob with scale)
2 Adjustment type “7” (rotary knob with scale)
3 Identical seal rings for ports A, B, P, and T
4 Space required to remove the key
5 Ø3 bore in version “B” not bored (without external closing)
6 Nameplate
7 Position of the marking at port P
8 Porting pattern according to DIN 24340 form A
9 Connection thread G3/8 according to ISO 228-1
10 Position of the marking vis-à-vis nameplate

Panel mounting (version “SB”):

Valve mounting screws (separate order)

4 hexagon socket head cap screws
ISO 4762 - M5 - 8.8-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_A = 7 Nm ±10%,
(minimum useable thread depth = 6.5 mm)

Subplate mounting (version “A” and “B”):

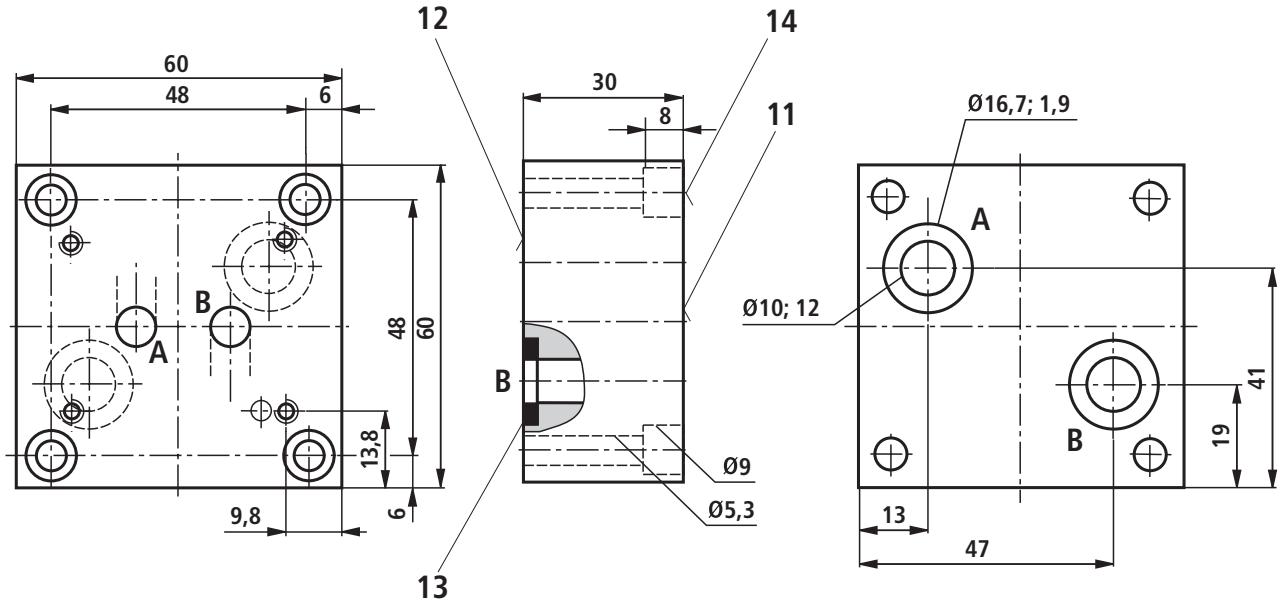
Subplates according to data sheet RE 45052 (separate order)
Type G 341/01 (G1/4)
Type G 342/01 (G3/8)
Type G 502/01 (G1/2)

Valve mounting screws (separate order)

– without rectifier sandwich plate
4 hexagon socket head cap screws
ISO 4762 - M5 x 30 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_T = 7 Nm ±10%,
Material no. **R913000316**

– with rectifier sandwich plate
4 hexagon socket head cap screws
ISO 4762 - M5 x 70 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_T = 7 Nm ±10%,
Material no. **R913000325**

Unit dimensions: Adapter plate HSE 05 G06A001-3X/V00 (dimensions in mm)

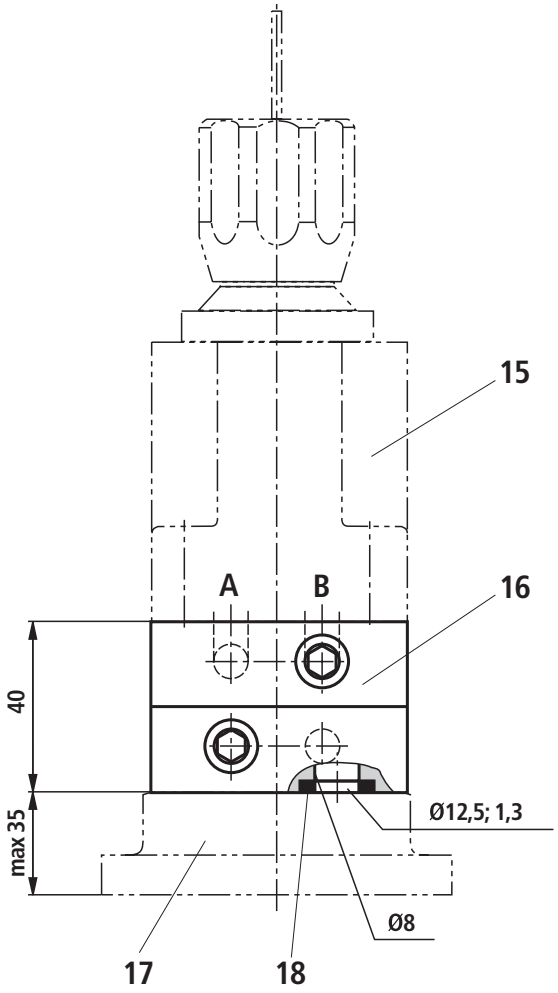


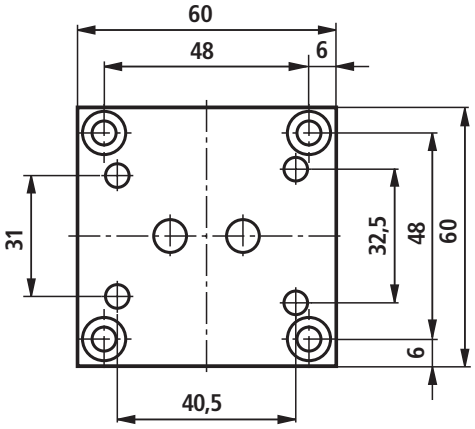
11 Connection surface for flow control valve type 2FRM 6
12 Connection surface for flow control valve type 2FRM 5
13 Seal ring
14 Mounting screws for adapter plate,
4 cylinder bolts
ISO 4762 - M5 x 30 - 10.9-flZn-240h-L
with friction coefficient μ_{total} = 0.09 to 0.14,
tightening torque M_T = 7 Nm ±10%,
are included in the delivery.

☞ **Note!**

The adapter plate (**Material no. R900496121**) is required for mounting a flow control valve type 2FRM 6 B..-3X/.. to an existing flow control valve type 2FRM 5 -3X/...

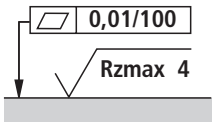
Unit dimensions: Rectifier sandwich plate type Z4S 6-1X/V (dimensions in mm)





Attention!

The rectifier sandwich plate type Z4S 6 -1X/V can **only** be used in connection with the flow control valve type 2FRM 6 **B**..-3X/.. (without closing of the pressure compensator)!



Required surface quality of the valve mounting face

15 2-way flow control valve

16 Rectifier sandwich plate

17 Subplate according to data sheet RE 45052 and valve mounting screws, see page 11.

18 Seal ring

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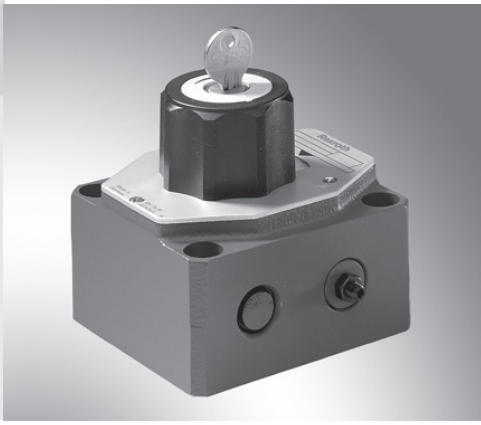
Rexroth
Bosch Group

2-way flow control valve

RA 28389/07.04 1/12
Replaces: 06.98

Models 2FRM..., 2FRH... and 2FRW...



Nominal sizes 10 and 16
Series 3X
Maximum operating pressure 315 bar (4600 PSI)
Maximum flow 160 L/min (42.5 GPM)

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Features

- For subplate mounting,
  Mounts on standard ISO 6263-**06-2**, **07-2**; NFPA T3.5.1M R1 **2 FO 6**, **2 FO 7** interface
  For subplates see catalog 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

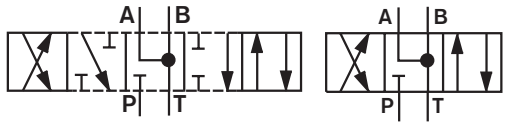
K4 [2] = **Without** plug-in connector with component plug DIN EN 175 301-803

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 =



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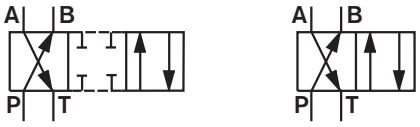


[1] These ordering details **only** have to be entered for the electro-hydraulic operation type 2FRW!

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

Ordering details: rectifier sandwich plate

Z4S	–	/	*

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

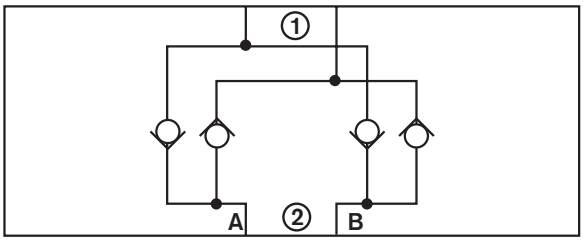
Series 30 to 39 **(NS 10)** = **3X**
(30 to 39: unchanged installation and connection dimensions)
Series 20 to 29 **(NS 16)** = **2X**
(20 to 29: unchanged installation and connection dimensions)

Further details in clear text

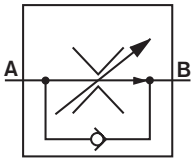
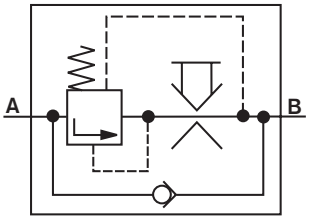
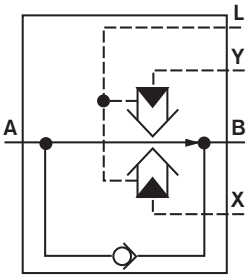
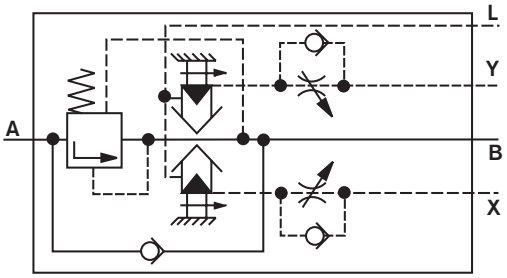
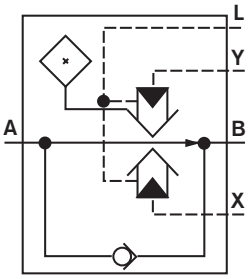
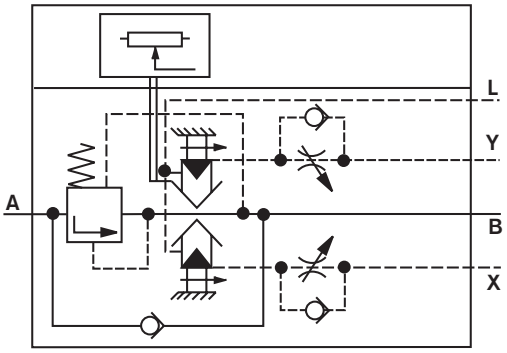
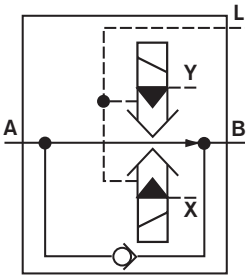
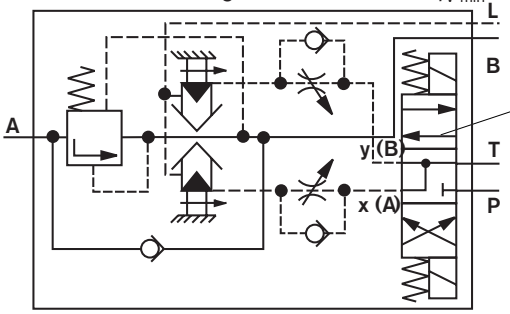
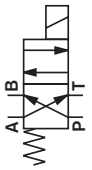
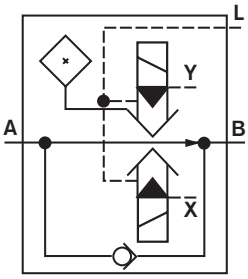
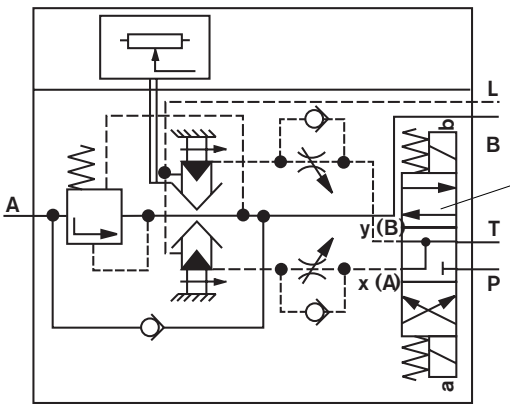
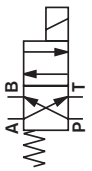
No code = NBR seals
V = FKM seals
(other seals on request)

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

Standard types

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

Functional description, cross-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...

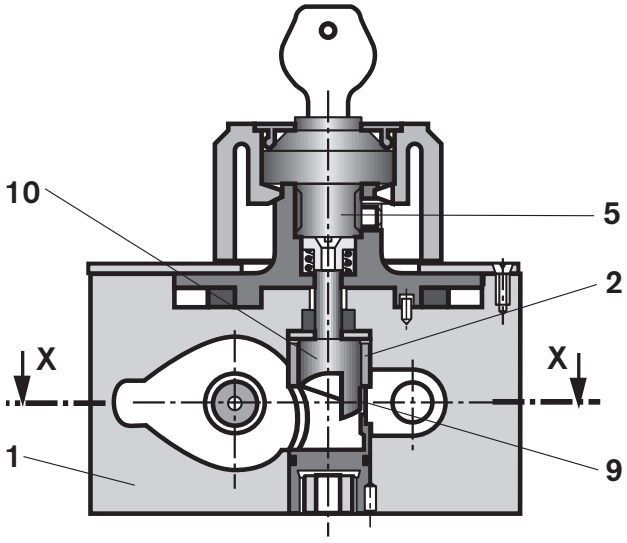
The flow from port A to port B is throttled at the orifice (9). On type 2FRM.. the throttling area is adjusted by rotating the curved pin (10) mechanically by means of the adjustment element (5), for types 2FRH.. and 2FRW.. hydraulically via a rack and pinion actuator (6), which is controlled by a built-on 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.

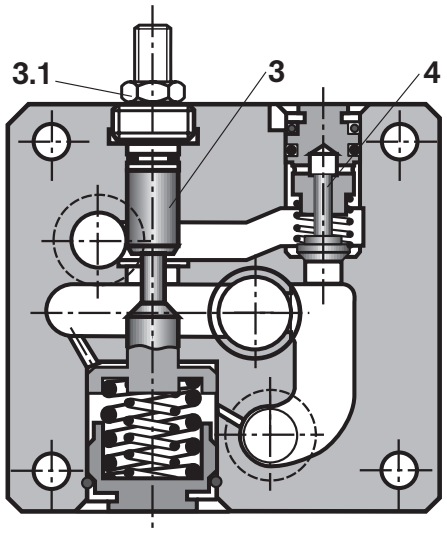
Free return flow from port B to port A is via the check valve (4).

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.

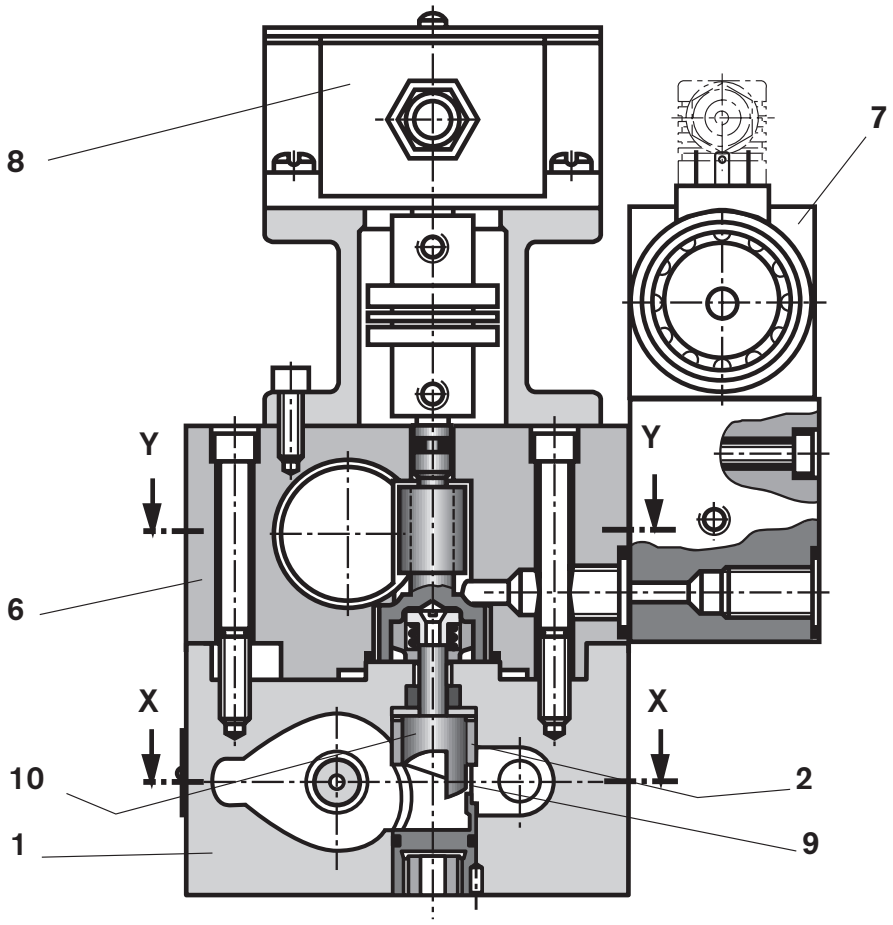


Type 2 FRM...

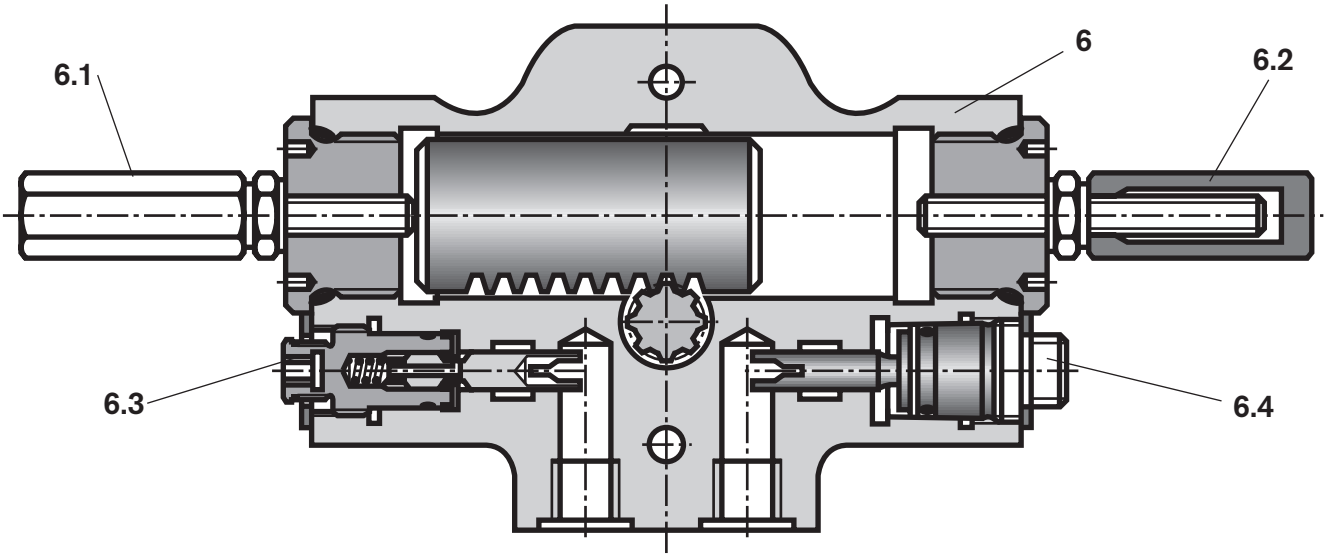


Section X–X

Functional description, cross-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 (lbs)	5.6 (12.3)	11.3 (24.9)
	Type 2FRH		kg (lbs)	9.2 (20.3)	14.9 (32.8)
	Type 2FRH..P		kg (lbs)	10.3 (22.7)	16 (35.3)
	Type 2FRW		kg (lbs)	11.3 (24.9)	17 (37)
	Type 2FRW..P		kg (lbs)	12.4 (27.3)	18.1 (39.8)
	Rectifier sandwich plate		kg (lbs)	3.0 (6.6)	8.1 (17.8)
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 (°F)	–30 to 80 (–22 to 176) [–30 to 50 (–22 to 122) for type 2FRW]	
		FKM seals	°C (°F)	–20 to 80 (–4 to 176) [–20 to 50 (–4 to 122) for type 2FRW]	
Pressure fluid temperature range		NBR seals	°C (°F)	–30 to +80 (–22 to 176)	
		FKM seals	°C (°F)	–20 to +80 (–4 to 176)	
Viscosity range			mm2/s (SUS)	10 to 800 (60 to 3710)	
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.

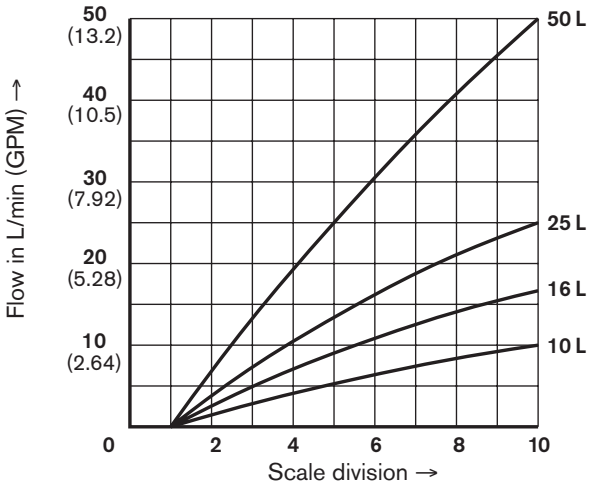
For the selection of filters see catalogue sheets RE 50070, RE 50076 and RE 50081.

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

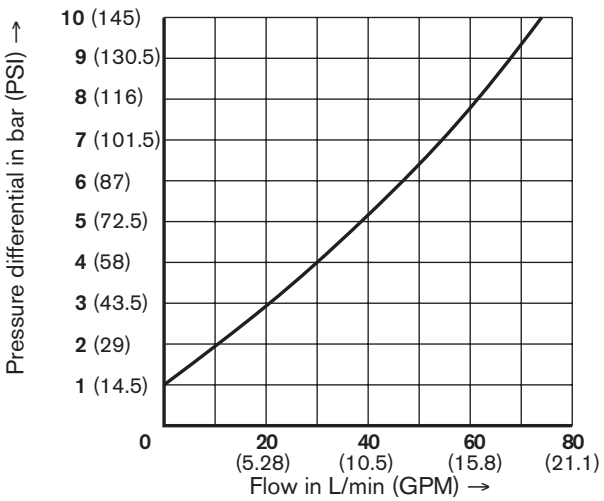
2-way flow control valves types 2FRM..., 2FRH... and 2FRW...								
		NS 10				NS 16		
Maximum flow	L/min (GPM)	10 (2.64)	16 (4.23)	25 (6.60)	50 (13.21)	60 (15.85)	100 (26.41)	160 (42.27)
Pressure differential with free-flow from B to A, qV dependent	bar (PSI)	2 (29.0)	2.5 (36.3)	3.5 (50.8)	6 (87.0)	2.8 (40.6)	4.3 (62.4)	7.3 (105.9)
Minimum pressure differential	bar (PSI)	3 to 7 (43 to101)				5 to 12 (72 to 174)		
Flow control • Temperature, stable, −20 to +80 °C (−4 to +176 °F)		± 2 % (qV max)				± 2 % (*q*V max)		
• Pressure, stable, up to Dp = 315 bar (4568 PSI)		± 2 % (qV max)				< ± 5 % (*q*V max)		
Maximum operating pressure, port A	bar (PSI)	315 (4600)						
2-way flow control valves types 2FRH... and 2FRW...								
Pilot volume for the max. adjustment range	cm^3 (in^3)	22 (1.34) at 300°						
Pilot pressure range	bar (PSI)	10 to 100 (145 to 1450) (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 (GPM)	10 (2.64)				See RE 23178		
Maximum operating pressure (directional valve)	bar (PSI)	Up to 315 (4600)				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 (GPM)	50 (13.2)				160 (42.27)		
Operating pressure, max.	bar (PSI)	315 (4600)						
Opening pressure	bar (PSI)	1.5 (22)						

Characteristic curves – measured with HLP46, ϑoil = 40 °C ±5 °C (104 °F ±41 °F)

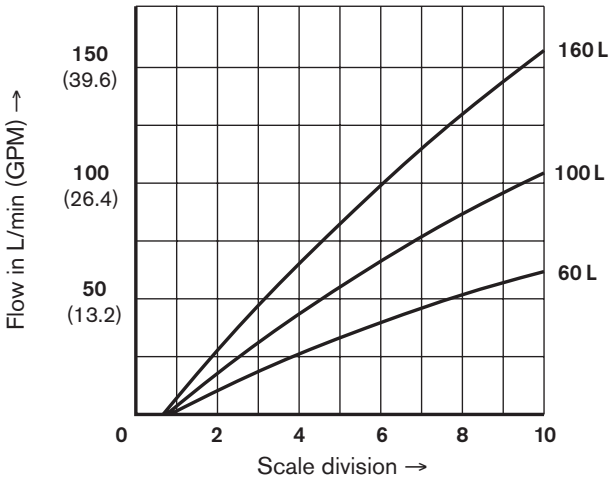
NS 10 – Flow control (A → B)



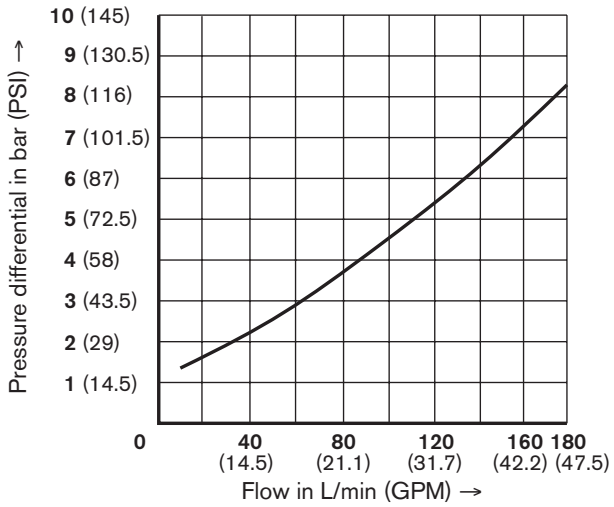
NS 10 – Free return flow (B → A)



NS 16 – Flow control (A → B)



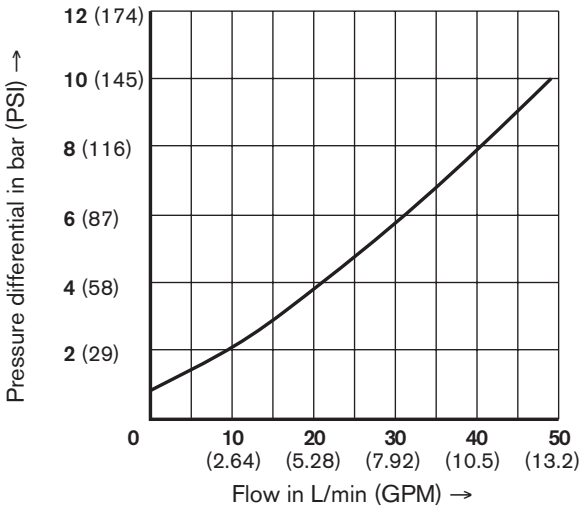
NS 16 – Free return flow (B → A)



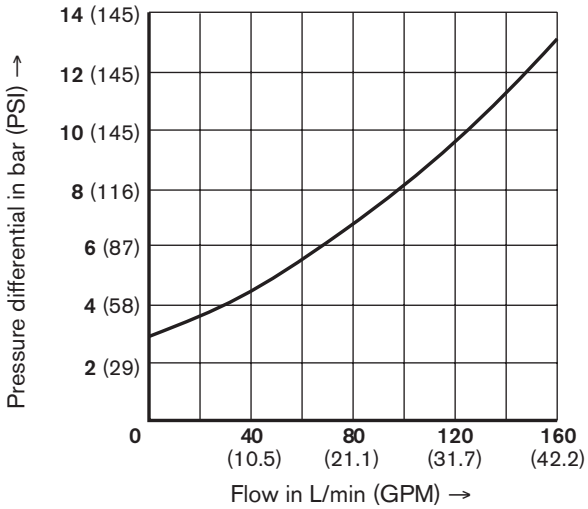
Characteristic curves: rectifier sandwich plate – measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C (104 °F ±41 °F)

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

NS 10

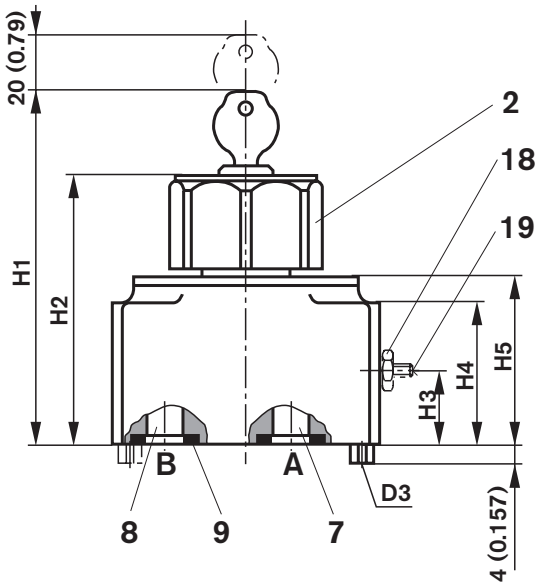


NS 16



Unit dimensions: 2-way flow control valve type 2FRM – dimensions in millimeters (inches)

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 (6.2 lb-in)
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:

	BSP	SAE Ports
Nominal size 10:	G 279 (G 1/2)	(SAE-8; 3/4“-16)
	G 280 (G 3/4)	(SAE-12; 1 1/16“-12)
Nominal size 16:	G 281 (G 1)	(SAE-16; 1 5/16“-12)
	G 282 (G 1 1/4)	(SAE-20; 5/8“-12)

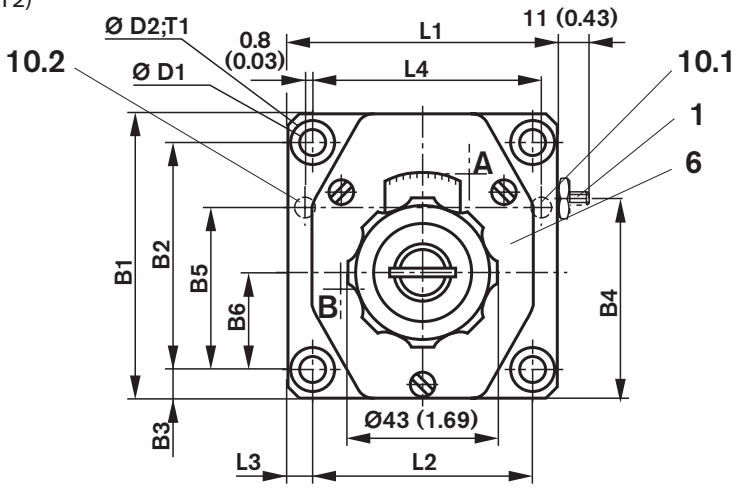
to catalogue sheet RE 45066 and

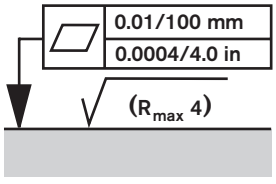
Valve fixing screws

Nominal size 10
M8 x 50 DIN 912-10.9 (5/16-18 UNC x 2”);
$M_A = 37$ Nm (27.3 lb-ft)

Nominal size 16
M10 x 80 DIN 912-10.9 (3/8-16 UNC x 3”);
$M_A = 75$ Nm (55.3 lb-ft)

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 (4)	82.5 (3.24)	9.5 (0.37)	68 (2.67)	58.7 (2.31)	35.5 (1.39)	9 (0.354)	15 (0.590)	6 (.24)	125 (4.92)	95 (3.74)	26 (1.02)	51 (2.0)	60 (2.3)	95 (3.74)	76 (2.99)	9.5 (0.37)	79.4 (3.12)	13 (0.52)
16	123.5 (4.86)	101.5 (3.99)	11 (0.43)	81.5 (3.2)	72.9 (2.87)	41.5 (1.63)	11 (0.434)	18 (0.708)	6 (.24)	147 (5.79)	117 (4.61)	34 (1.33)	72 (2.8)	82 (3.2)	123.5 (4.86)	101.5 (3.99)	11 (0.43)	102.4 (4.0)	12 (0.47)

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

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-energized = $q_{V\,min}$) 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

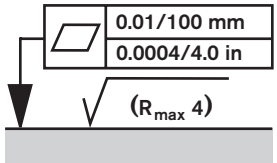
For subplates and valve fixing screws and valve connection dimensions see page 9.

1) Type 2FRH

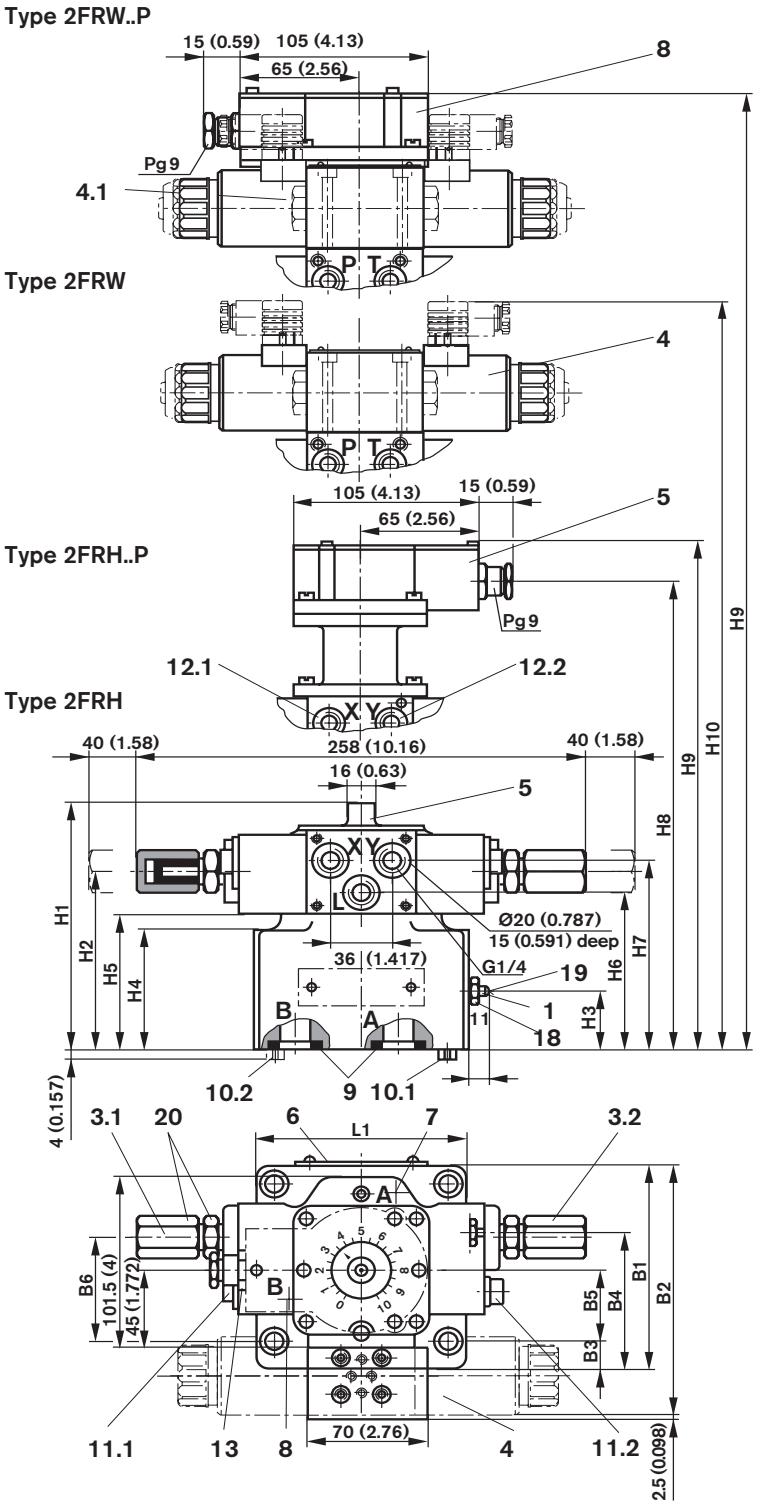
2) Type 2FRW

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

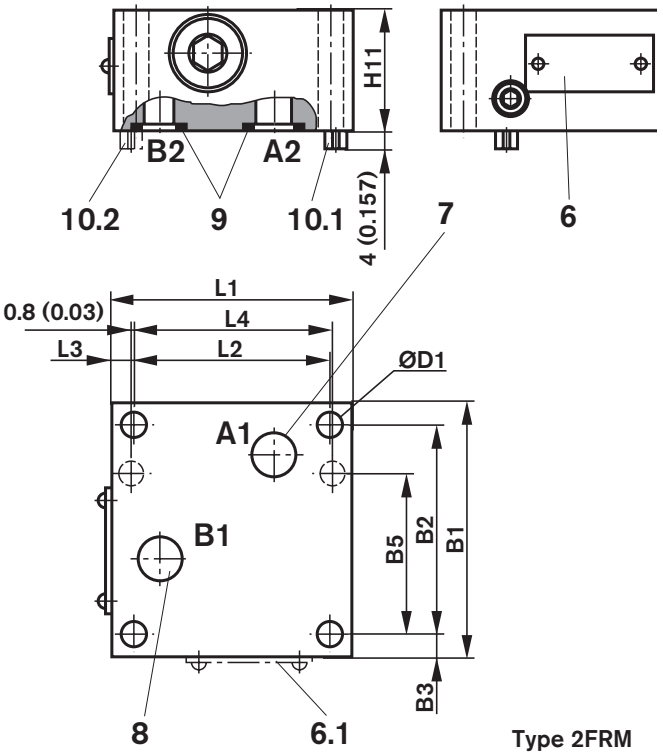


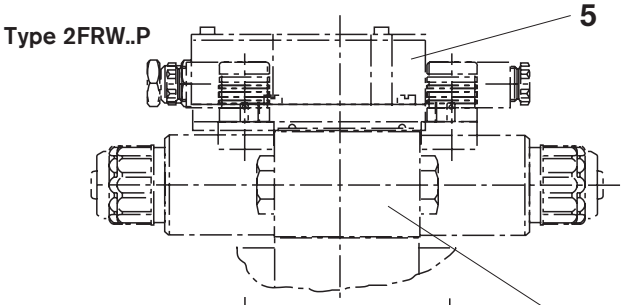
Required surface finish of the mating piece

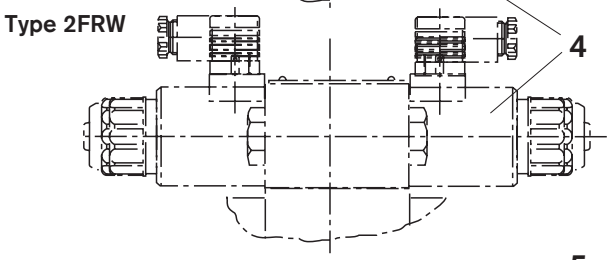


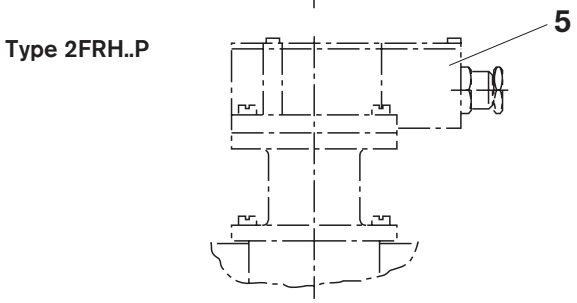
NS	B1	B2	B3	B4	B5	B6	H1	H2	H3	H4	H5	H6	H7[1]	H7[2]	H8	H9	H10[3]	H10[4]	L1
10	101.5 (4)	146 (5.74)	9.5 (0.37)	68 (2.67)	35.5 (1.38)	54.5 (2.14)	125.5 (4.94)	84 (3.3)	26 (1.02)	51 (2)	58 (2.2)	70 (2.7)	89 (3.5)	87 (3.4)	179 (7.0)	203 (7.99)	201 (7.91)	206 (8.11)	95 (3.74)
16	123.5 (4.86)	160.5 (6.3)	11 (0.43)	81.5 (3.2)	41.5 (1.63)	60.5 (2.38)	147.5 (5.81)	106 (4.17)	34 (1.33)	72 (2.8)	80 (3.1)	92 (3.6)	111 (4.37)	109 (4.29)	201 (7.9)	225 (8.86)	223 (8.7)	228 (8.98)	123.5 (0.47)

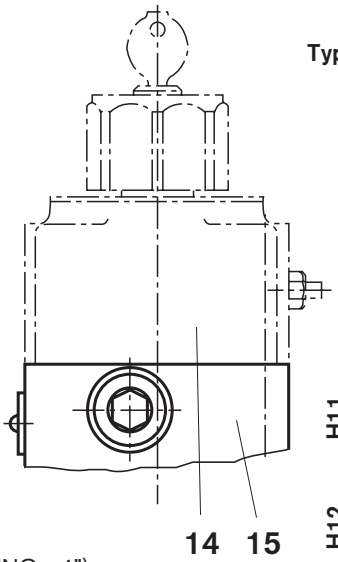
Unit dimensions: rectifier sandwich plate Z4S... – dimensions in mm (inches)

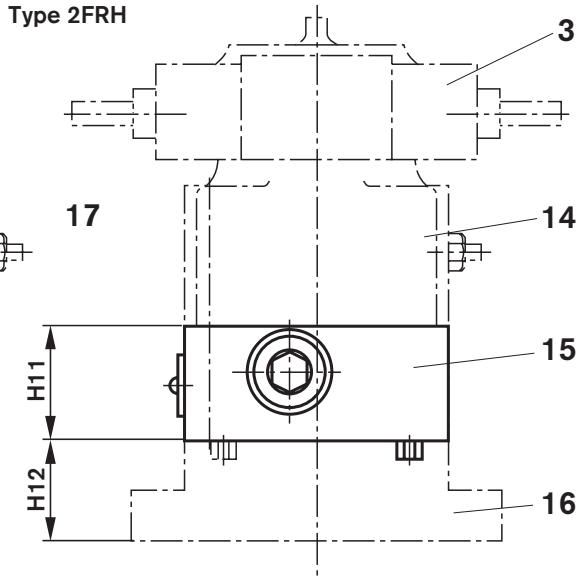




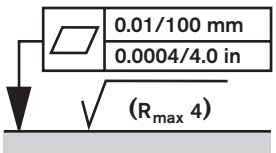








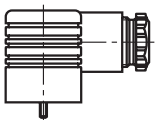
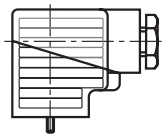
3 Rack and pinion actuator
4 Directional valve NS 6
5 Actual value potentiometer
6 Name plate (NS 10)
6.1 Name plate (NS 16)
7 Input "A"
8 Output "B"
9 Seal ring
10.1 Locating pin (NS 10 and 16)
10.2 Locating pin (NS 16)
14 2-way flow control valve
15 Rectifier sandwich plate
16 Subplates, see page 6
17 **Valve fixing screws**
Nominal size 10:
M8 x 100 DIN 912-10.9 (5/16-18 UNC x 4");
M_A = 37 Nm (27.3 lb-ft)
Nominal size 16:
M10 x 160 DIN 912-10.9 (3/8-16 UNC x 6-1/4");
M_A = 75 Nm (55.3 lb-ft)
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 (4)	82.5 (3.248)	9.5 (0.374)	58.7 (2.31)	9 (0.354)	50 (1.97)	30 (1.18)	95 (3.74)	76 (2.992)	9.5 (0.374)	79.4 (3.12)
16	123.5 (4.86)	101.5 (3.996)	11 (0.433)	72.9 (2.81)	11 (0.433)	85 (3.35)	40 (1.57)	123.5 (4.86)	101.5 (3.996)	11 (0.433)	102.4 (4.03)

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	**Color**	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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Rexroth
Bosch Group

2-way flow control valve

RE 28155/11.10 1/8
Replaces: 11.02

Type 2FRM

Sizes 6 and 10
Component series 1X
Maximum operating pressure 315 bar
Maximum flow 60 l/min

H5012

Overview of contents

Features

- Cartridge valve
- Adjustment element with internal hexagon
- With built-in check valve
- Low start-up jump

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

2FRM		K	2 – 1X /		R	V	*

2-way flow control valve

Size 6 **= 6**
Size 10 **= 10**

Cartridge valve **= K**

Adjustment element
Internal hexagon **= 2**

Series 10 to 19 **= 1X**
(10 to 19: unchanged installation and connection dimensions)

Further details in clear text

Seal material
V = FKM seals
(Other seals on request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

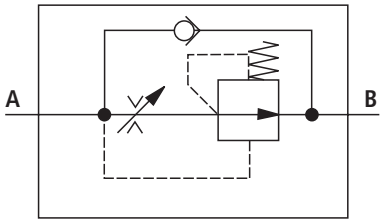
R = With check valve

Flow (A → B)
6Q = up to 6.0 l/min (size 6)
32Q = up to 32.0 l/min (size 6)
60Q = up to 60.0 l/min (size 10)

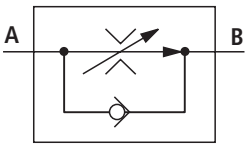
Preferred types and standard components can be found in the EPS (Standard Price List).

Symbols (detailed and simplified)

Detailed



Simplified



Function, section

Flow control valves type 2FRM . K are 2-way flow control valves suitable for fitting into manifold systems. They are used for maintaining a constant flow, independent of pressure and temperature.

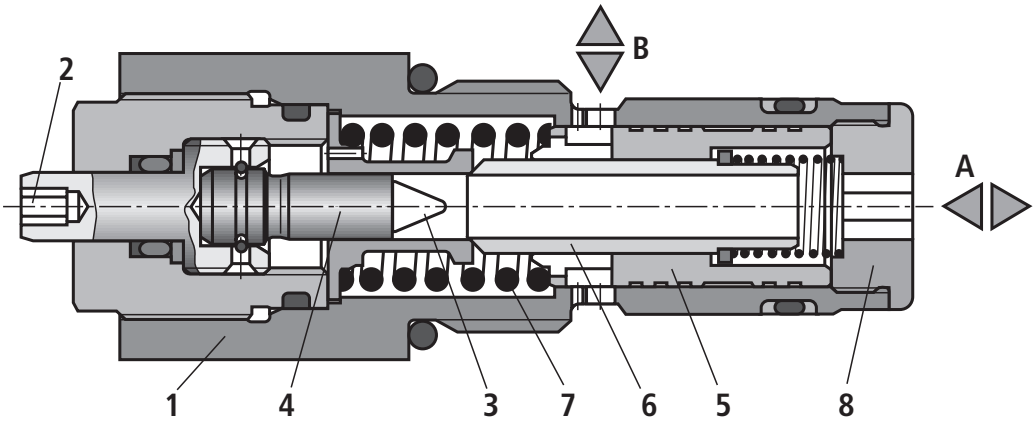
The valve basically consists of the housing (1), adjustment element (2), throttling area (3), throttle bolt (4), pressure compensator (5) and check valve (6).

Throttling of the flow from port A to port B occurs at the throttle area (3). The throttle cross-section is changed by turning the adjustment element (2). This takes place between the throttle area (3) and the throttle bolt (4).

In order to hold the flow constant, independent from the pressure, in port B a pressure compensator (5) is fitted downstream of the throttle area (3).

The pressure compensator (5) is pressed against the plug (8) by the compression spring (7) and so stays in the open position as long as there is no flow through the valve. When flow takes place through the valve the pressure, which is present in port A, applies a force onto the pressure compensator (5). The pressure compensator moves into the compensating position until the forces are balanced. If the pressure increases in port A, then the pressure compensator (5) moves towards its closed position until the forces are balanced. Due to this continuous compensating action a constant flow is obtained.

Free return flow from port B to port A is obtained via the check valve (6).



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

General

Size		NG6		NG10
Weight	kg	0.19		0.6
Installation		Optional		
Ambient temperature range	°C	–20 to +50		

Hydraulic

Maximum operating pressure – Port A		bar	315		210
Pressure differential Δp for free return flow B → A		bar	See characteristic curves on page 5		
Minimum pressure differential		bar	18		
Pressure stable up to Δp = 315 bar / 210 bar		%	±3 ($p_{V\,max}$)		
Flow	– $p_{V\,max}$	l/min	6.0	32	60
	– $p_{V\,min}$	cm^3/min	50	250	500
Pressure fluid			Mineral oil (HL, HLP) to DIN 51524; Fast bio-degradable pressure fluids to VDMA 24568 (also see data sheet 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic ester); Other pressure fluids on request		
Pressure fluid temperature range		°C	–20 to +80		
Viscosity range		mm^2/s	10 to 800		
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 20/18/15 [1)]		

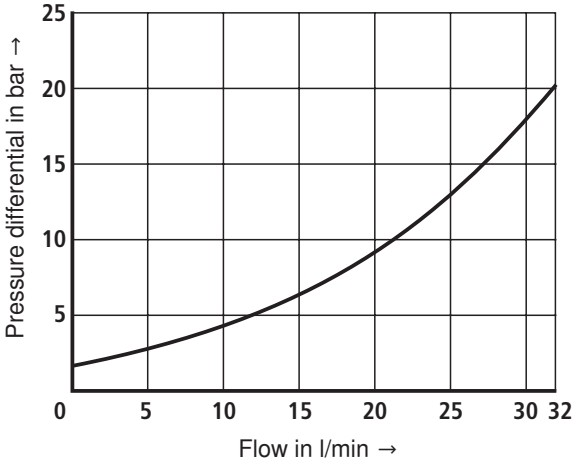
[1)] The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.

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

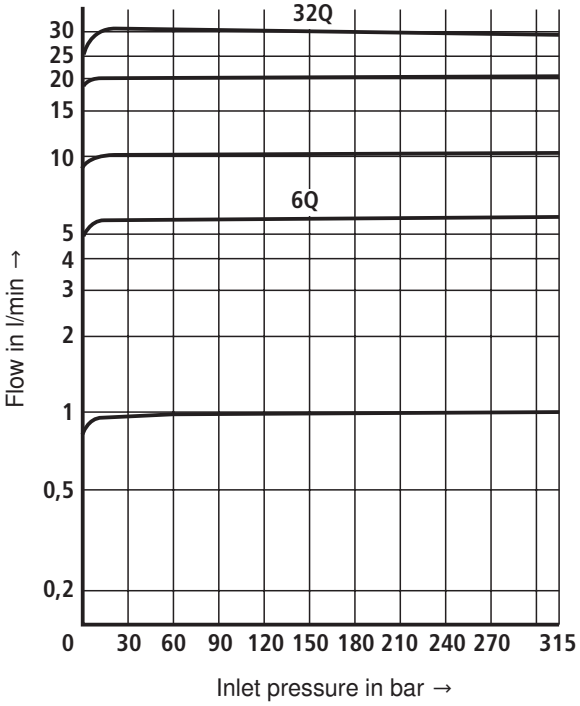
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C)

Size 6

Δp-q_V-characteristic curve via the check valve (B → A) Orifice closed

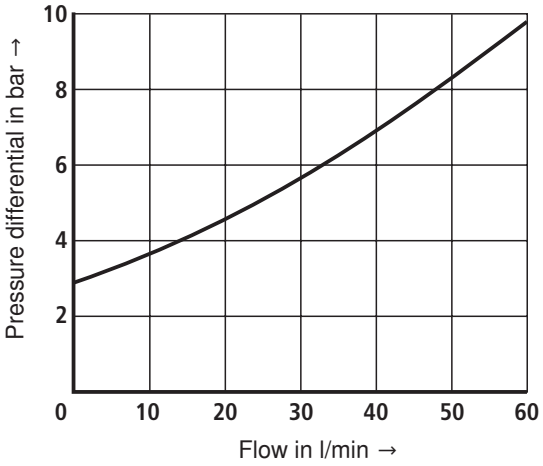


Flow q_V in relation to the inlet pressure p

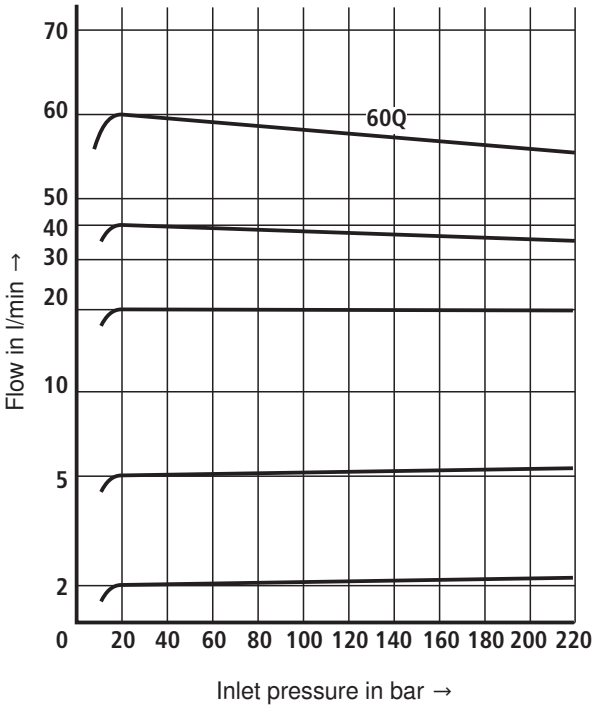


Size 10

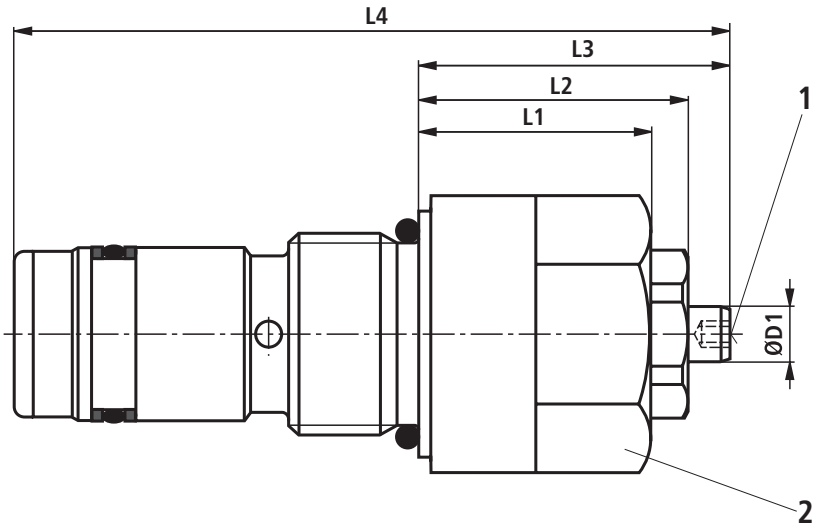
Δp-q_V-characteristic curve via the check valve (B → A) Orifice closed



Flow q_V in relation to the inlet pressure p



Dimensions (dimensions in mm)

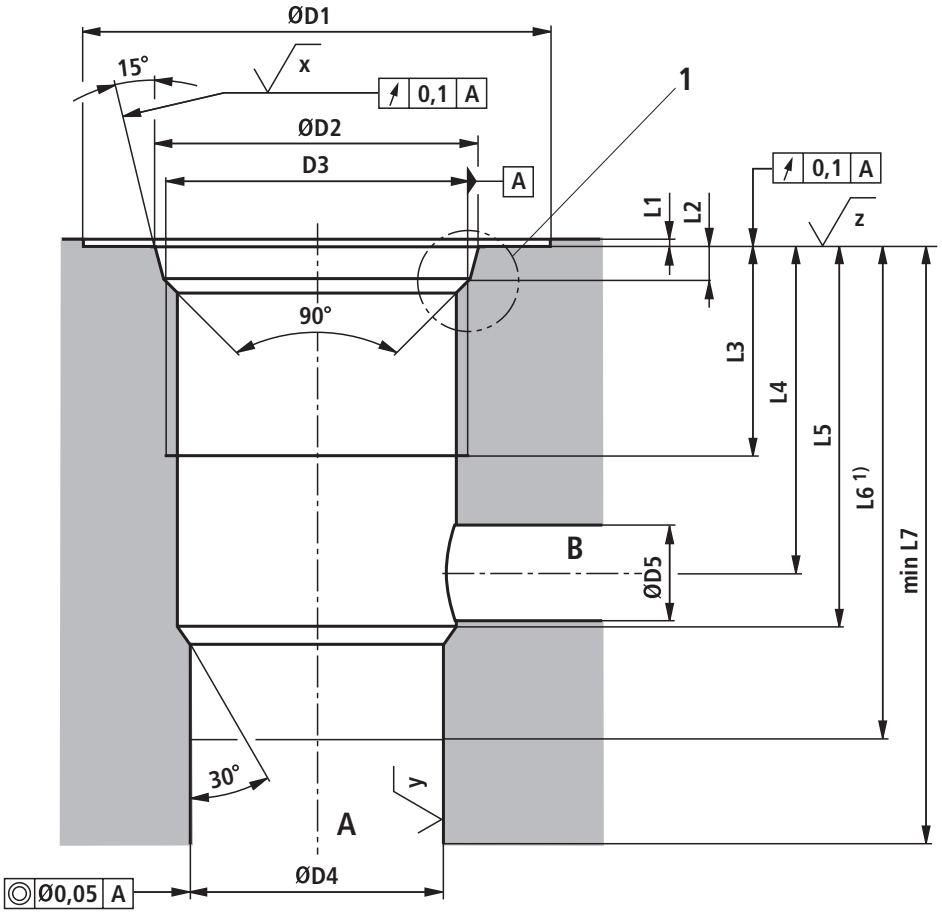


Size	L1	L2	L3	L4	ØD1
6	25	29	33,5	77	6
10	36	41	45,5	109	6

1 Internal hexagon 3A/F

2 – NG6: Hexagon 27A/F; M_A = 40 Nm
– NG10: Hexagon 41A/F; M_A = 120 Nm

Cavities to DIN ISO 7789 (dimensions in mm)



Size	L1	L2	L3	L4	L5	L6 [1)]	L7	ØD1	ØD2	D3	ØD4	ØD5
6	0,5	$2{,}4^{+0{,}4}$	17	24_{-4}	$28\pm0{,}1$	38,5	$45^{+0{,}2}$	34	$23{,}8\pm0{,}1$	M22 x 1,5	19H7	7
10	0,5	$3{,}1^{+0{,}4}$	23	32_{-4}	$39^{+0{,}4}$	55	65	46	$35{,}4\pm0{,}1$	M33 x 2	29H8	11

1 to DIN 3852-W

[1)] Depth of fit

Size 6

$\sqrt{x}$ = $\sqrt{Rmax\ 8}$

$\sqrt{y}$ = $\sqrt{Rz\ 8}$

$\sqrt{z}$ = $\sqrt{Rz\ 16}$

Size 10

$\sqrt{x}$ = $\sqrt{Rz\ 8}$

$\sqrt{y}$ = $\sqrt{Rz\ 8}$

$\sqrt{z}$ = $\sqrt{Rz\ 25}$

Notes

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Rexroth
Bosch Group

Twin throttle check valve

RE 27506/05.11 1/8
Replaces: 02.03

Type Z2FS

Size 6
Component series 4X
Maximum operating pressure 315 bar
Maximum flow 80 l/min

H5556

Table of contents

Features

- Sandwich plate valve
- Porting pattern according to DIN 24340 form A
- Porting pattern according to ISO 4401-03-02-0-05 (**with** locating hole)
- For the main or pilot flow limitation of 2 actuator ports
- 4 adjustment types:
  - Set screw with lock nut and protective cap
  - Lockable rotary knob with scale
  - Spindle with internal hexagon and scale
  - Rotary knob with scale
- For supply or discharge throttling

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z2FS	6		–4X/			*

Twin throttle check valve; sandwich plate design

Size 6 **= 6**

Throttle check valve side A and B **= –** [1]
Throttle check valve side A **= A**
Throttle check valve side B **= B**

Adjustment type
Setscrew with lock nut and protective cap **= 2**
Lockable rotary knob with scale **= 3** [2]
Spindle with internal hexagon and scale **= 5**
Rotary knob with scale **= 7**

4X = Component series 40 to 49 (40 to 49: unchanged installation and connection dimensions)

1Q = With fine adjustment
2Q = Standard design

Seal material
No code = NBR seals
V = FKM seals (other seals upon request)
Attention! Observe compatibility of seals with hydraulic fluid used!

No code = Without locating hole
/60 [3] **=** With locating hole

Further details in the plain text

[1] Identical adjustment types on the A and B side.

[2] H key with material no. **R900008158** is included in the delivery.

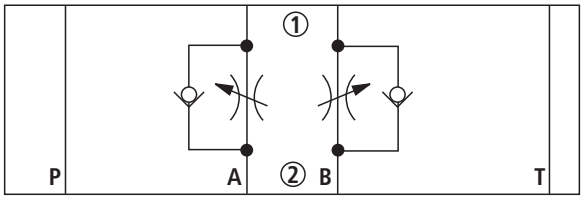
[3] Locating pin ISO 8752-3x8-St, material no. **R900005694** (separate order)

Standard types and standard units are contained in the EPS (standard price list).

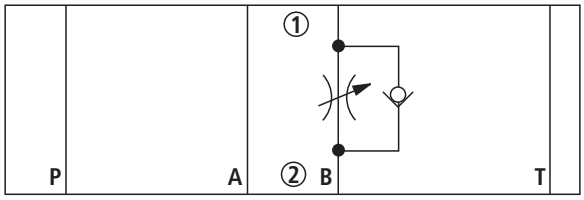
Symbols (① = component side, ② = plate side)

Supply throttling

Type Z2FS 6 –…

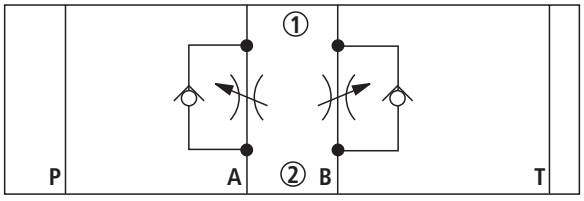


Type Z2FS 6 B…

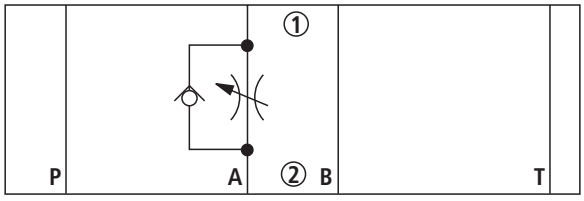


Discharge throttling

Type Z2FS 6 –…



Type Z2FS 6 A…



Function, section

The valve type Z2FS is a twin throttle check valve in sandwich plate design. It is used for the main or pilot flow limitation of one or two actuator ports.

Two throttle check valves aligned symmetrically to each other limit flows in one direction and allow free return flow in the opposite direction.

In the supply throttling, the hydraulic fluid reaches actuator A ② through channel ① via the throttling point (1) created by the valve seat (2) and the throttle spool (3). The throttle spool (3) can be axially adjusted by means of a setscrew (4) and thus allows for the setting of the throttling point (1).

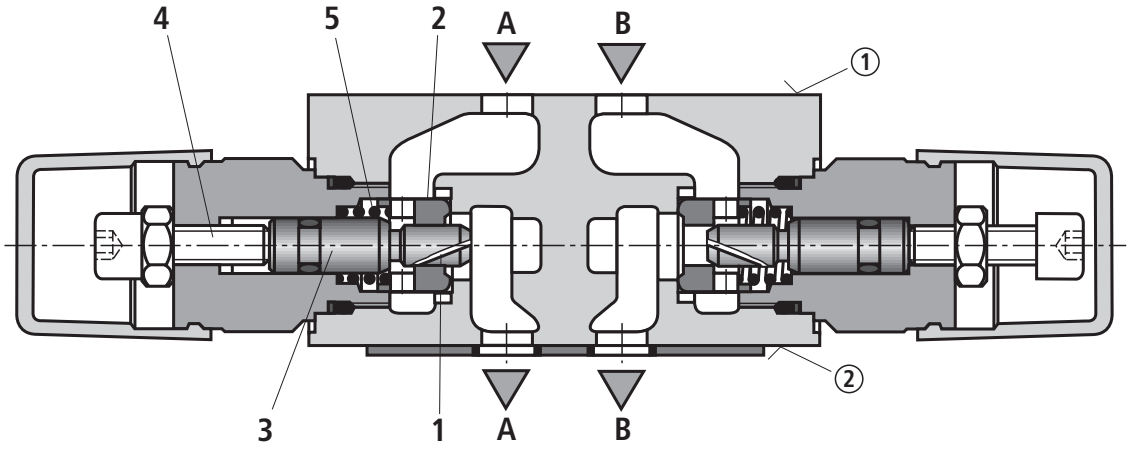
The hydraulic fluid flowing back from the actuator A② moves the valve seat (2) against the spring (5) in the direction of the throttle spool (3) and thus allows for the unhindered flow as check valve. Depending on the installation position, the throttling effect may be directly in the supply or in the discharge.

Main flow limitation (version "2Q")

For changing the velocity of an actuator (main flow limitation), the twin throttle check valve is installed between the directional valve and the subplate.

Pilot flow limitation (version "1Q")

With pilot operated directional valves, the twin throttle check valve can be used as switching time adjustment (pilot flow limitation). Then, it is installed between pilot control and main valve.



Type Z2FS 6 –2… (supply throttling)

① = component side
② = plate side

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

general

Weight	kg	Approx. 0.8
Installation position		Any
Ambient temperature range	°C	–20 to +80

hydraulic

Maximum operating pressure	bar	315
Maximum flow	l/min	80
Hydraulic fluid		See table below
Hydraulic fluid temperature range	°C	–20 to +80
Viscosity range	mm^2/s	10 to 800
Maximum permitted degree of contamination of the hydraulic fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1)]

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**
Mineral oils and related hydrocarbons		HL, HLP, HLPD	NBR, FKM	DIN 51524
Environmentally compatible	– Insoluble in water	HETG	NBR, FKM	ISO 15380
		HEES	FKM	
	– Soluble in water	HEPG	FKM	ISO 15380
Flame-resistant	– Water-free	HFDU, HFDR	FKM	ISO 12922
	– Water-containing	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, service life, maintenance intervals, etc.)!

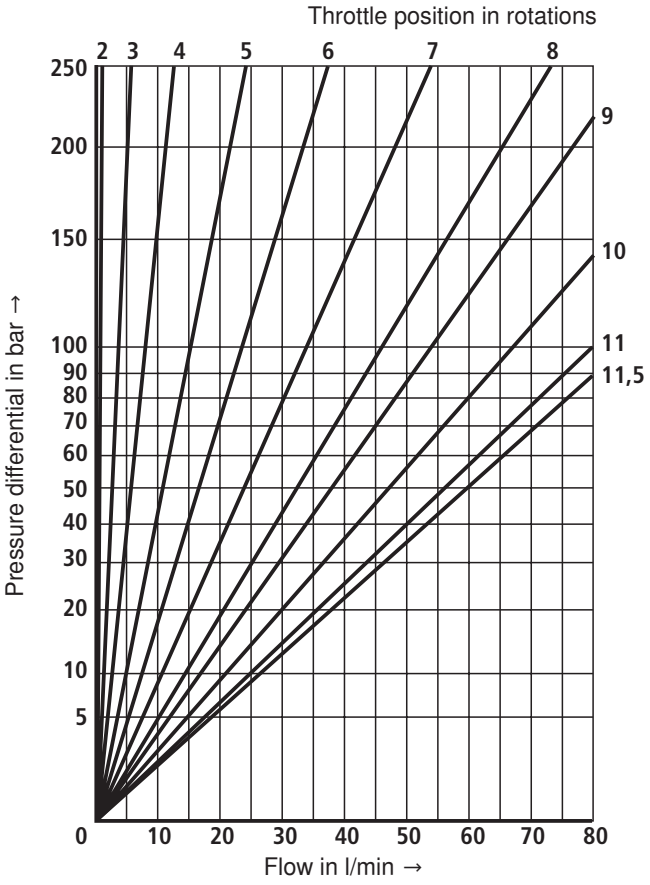
– **Flame-resistant – water-containing**:
  - Maximum operating pressure 210 bar
  - Maximum hydraulic fluid temperature 60 °C
  - Expected service life as compared to HLP hydraulic oil 30 % to 100 %

[1)] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the service life of the components.

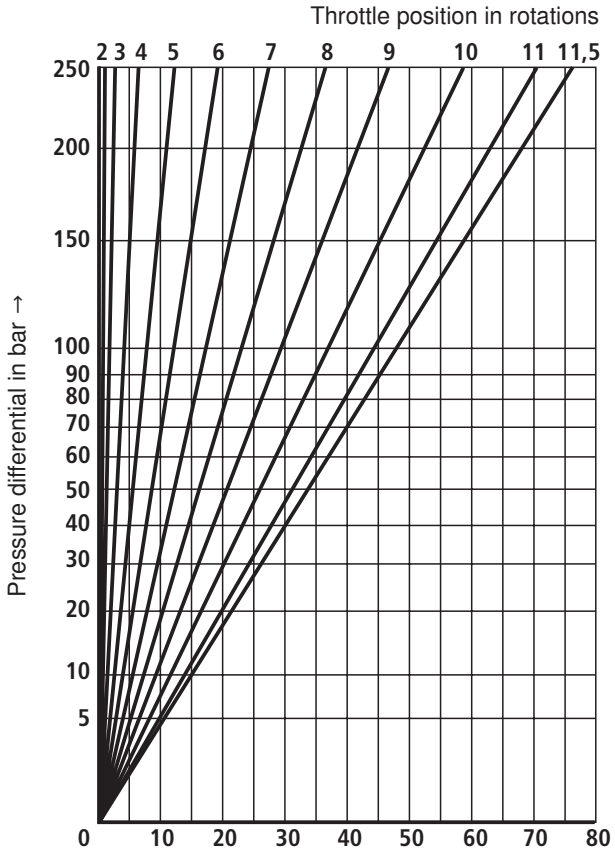
For the selection of the filters see www.boschrexroth.com/filter.

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

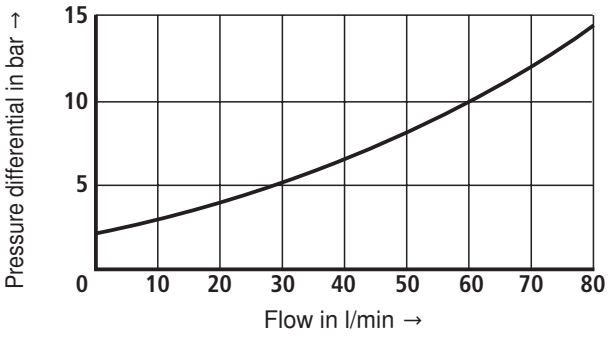
Δp-q_V characteristic curves (version "2Q")



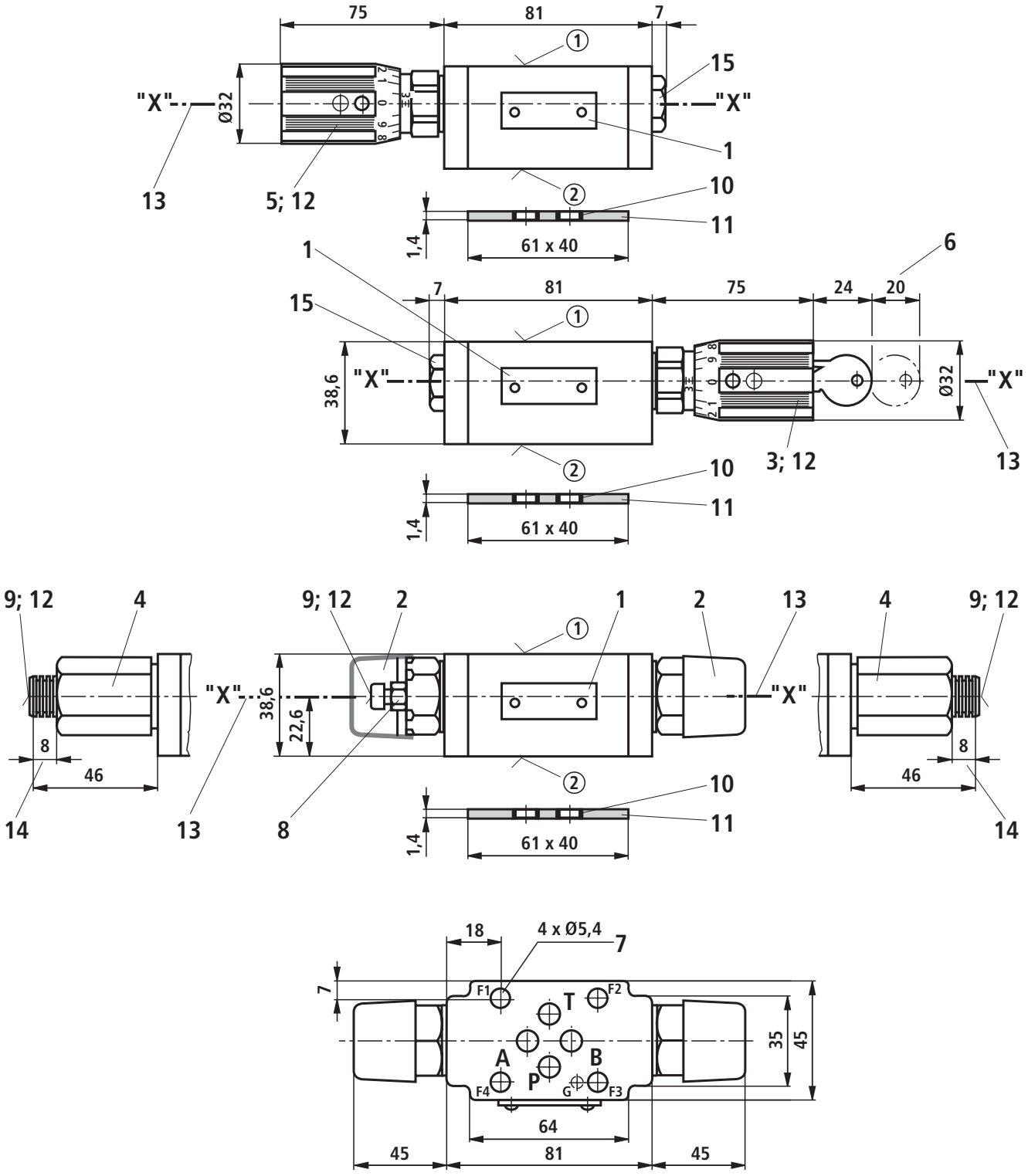
Δp-q_V characteristic curves (version "1Q")



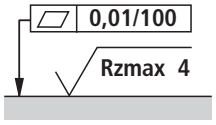
Δp-q_V characteristic curves
(via check valve; throttle closed)



Unit dimensions (dimensions in mm)



Item explanations and **valve mounting screws** see page 7.



Required surface quality of the valve mounting face

Unit dimensions

① Component side – porting pattern according to ISO 4401-03-02-0-05 (**with** locating hole Ø3 x 5 mm deep)

② Plate side – porting pattern according to DIN 24340 form A (**without** locating hole), or ISO 4401-03-02-0-05 (**with** locating hole for locating pin ISO 8752-3x8-St; version "/60")

1 Name plate
2 Adjustment type "2"
3 Adjustment type "3"
4 Adjustment type "5"
5 Adjustment type "7"
6 Space required to remove the key
7 Valve mounting bores
8 Lock nut SW10
9 Set screw/spindle for changing the flow cross-section (internal hexagon SW5)
10 Identical seal rings for ports A, B, P, and T
11 Seal ring plate
12 With all adjustment types:
Counterclockwise rotation = larger flow
Clockwise rotation = smaller flow
13 The unit is converted from supply to discharge throttling by rotating it around the "X"–"X" axis
14 Stroke
15 Plug screw SW22

Valve mounting screws (separate order)

4 hexagon socket head cap screws ISO 4762 - M5 - 10.9

☞ **Note!**

Length and tightening torque of the valve mounting screws must be calculated according to the components mounted under and over the sandwich plate valve.

Notes

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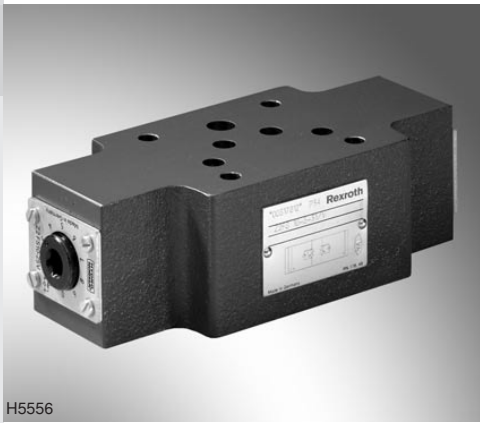
Rexroth
Bosch Group

Throttle check valve

RE 27518/10.07 1/8
Replaces: 02.03

Type Z2FS

Size 10
Component series 3X
Maximum operating pressure 315 bar *[4569 psi]*
Maximum flow 160 l/min *[42.3 US gpm]*



H5556

Table of contents

Features

- Sandwich plate valve
- Porting pattern to ISO 4401-05-04-0-05, NFPA T3.5.1 R2 and ANSI B93-7 D05
- For limiting the main or pilot oil flow of 2 actuator ports
- 3 adjustment elements:
  - Lockable rotary knob with scale
  - Spindle with hexagon socket and scale
  - Rotary knob with scale
- For meter-in and meter-out throttling

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z2FS	10		–3X/	V	*

Throttle check valve, sandwich plate design

Size 10 **= 10**

Throttle check valve, sides A and B **= –** [1]
Throttle check valve, side A **= A**
Throttle check valve, side B **= B**

Adjustment element
Lockable rotary knob with scale **= 3** [2]
Spindle with hexagon socket and scale **= 5**
Rotary knob with scale **= 7**

[1] Identical adjustment elements on sides A and B.

[2] H-key, Material no. **R900008158,** included in the scope of supply.

Standard types and components can be found in the EPS (standard price list).

Further details in clear text

Seal material
V = FKM seals (other seals on request)
⚠ Attention! Observe compatibility of seals with hydraulic fluid used!

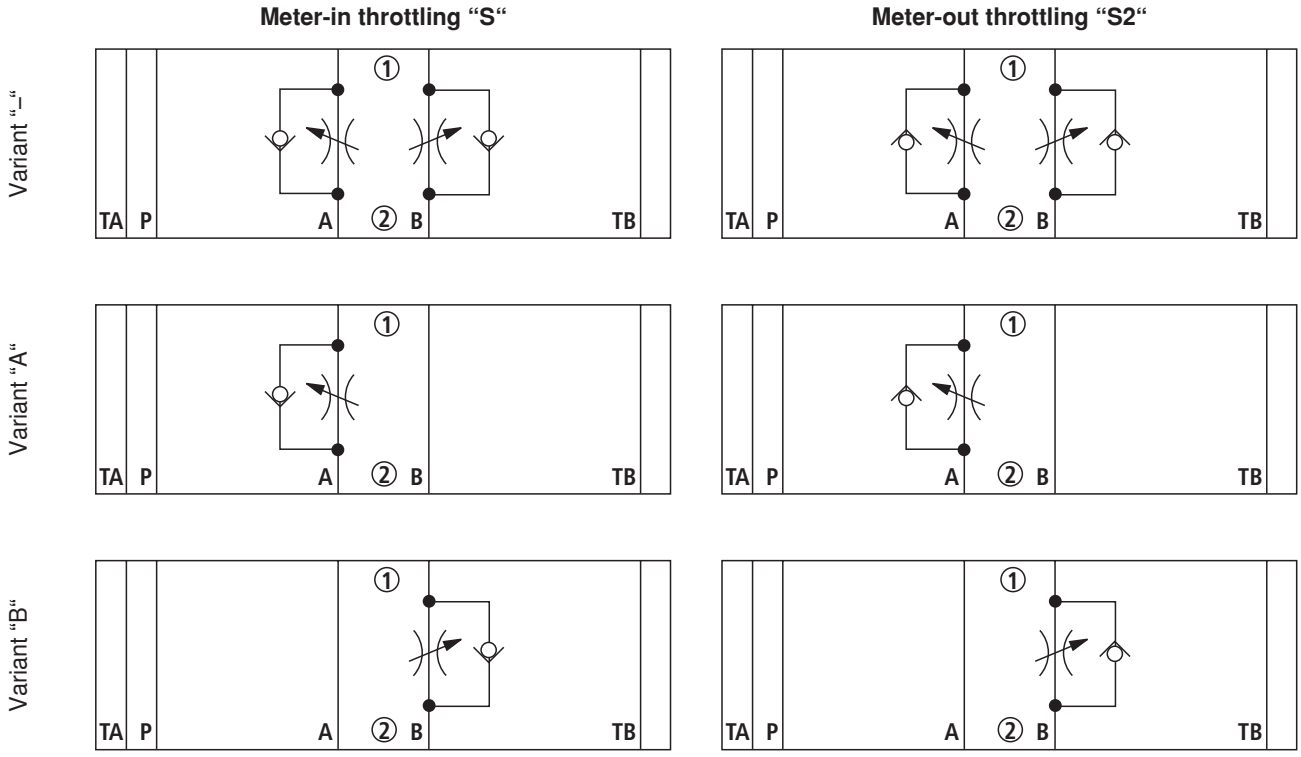
No code = With two throttle check valves, meter-in or meter-out throttling (valve can be rotated)

S = (…A.–3X/S) meter-in throttling on side A
(…B.–3X/S) meter-in throttling on side B

S2 = (…A.–3X/S2) meter-out throttling on side A
(…B.–3X/S2) meter-out throttling on side B

3X = Component series 30 to 39
(30 to 39: unchanged installation and connection dimensions)

Symbols (① = component side, ② = plate side)



Function, section

Valves of type Z2FS 10 are throttle check valves of sandwich plate design. They are used to limit the main or pilot oil flow of one or two actuator ports.

Two throttle check valves, which are arranged symmetrically to each other, limit flows in one direction and allow a free return flow in the opposite direction.

With meter-in throttling, hydraulic fluid flows through channel A1 via throttling point (1), which is formed by control land (2) and throttling spool (3.1), to actuator A2. Throttling spool (3.1) can be axially adjusted by means of spindle (4), thus allowing throttling point (1) to be adjusted.

At the same time, hydraulic fluid present in channel A1 flows through bore (5) to the opposite spool side (6). Together with the spring force, the pressure applied holds throttling spool (3.1) in the throttling position.

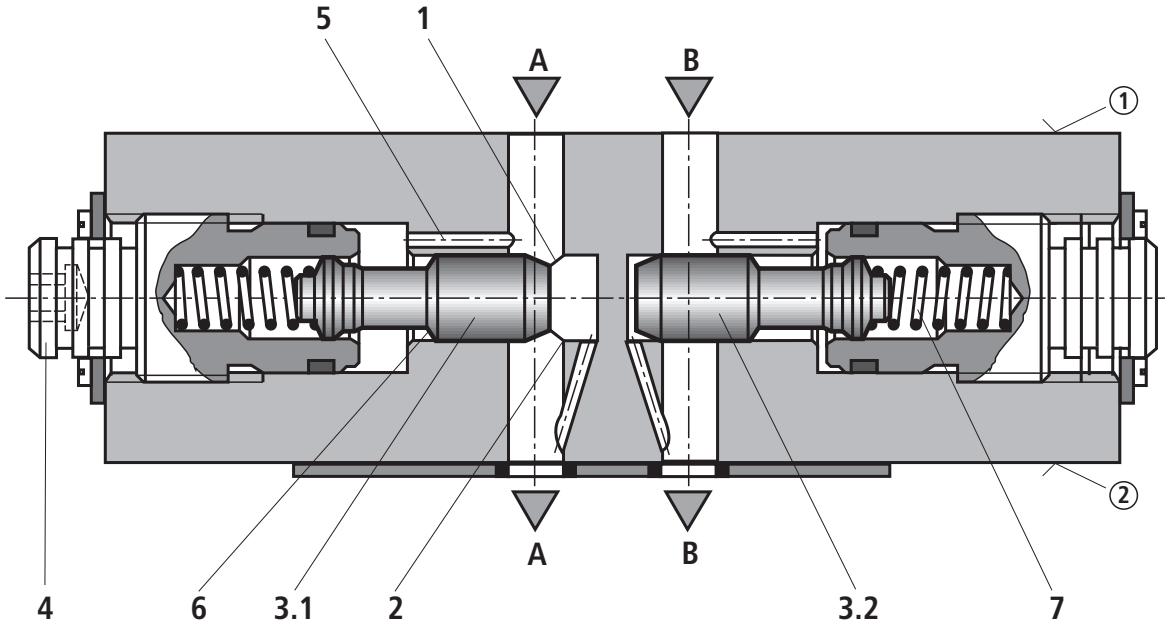
The hydraulic fluid returning from actuator B2 shifts throttling spool (3.2) against spring (7), thus allowing an unrestricted flow like with a check valve. Depending on the installation position, throttling can be effective in the supply or return line.

Main flow limitation

To change the velocity of an actuator (main flow limitation), the throttle check valve must be installed between the directional valve and the subplate.

Pilot oil flow limitation

In conjunction with pilot operated directional valves, the throttle check valve can be used for adjusting the actuating time (pilot oil flow limitation). In this case, it is installed between the pilot and the main valve.



Meter-in throttling

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

General

Weight	kg *[lbs]*	ca. 3.1 *[6.8]*
Installation position		Optional
Ambient temperature range	°C *[°F]*	–20 to +80 *[–4 to +176]*

Hydraulic

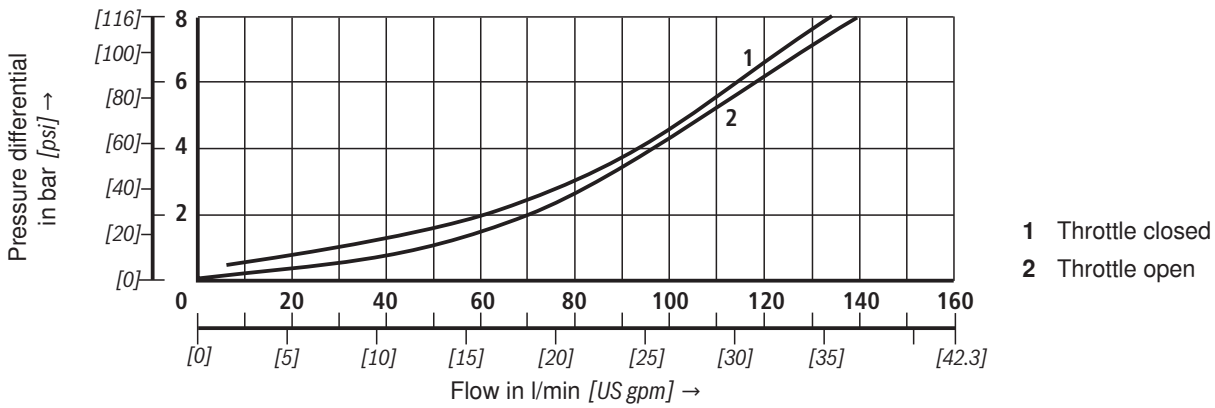
Maximum operating pressure	bar *[psi]*	315 *[4569]*
Maximum flow	l/min *[US gpm]*	160 *[42.2]*
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic esters); other hydraulic fluids on request
Hydraulic fluid temperature range	°C *[°F]*	–20 to +80 *[–4 to +176]*
Viscosity range	mm^2/s *[SUS]*	10 to 800 *[60 to 3710]*
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 [1)]

[1)] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

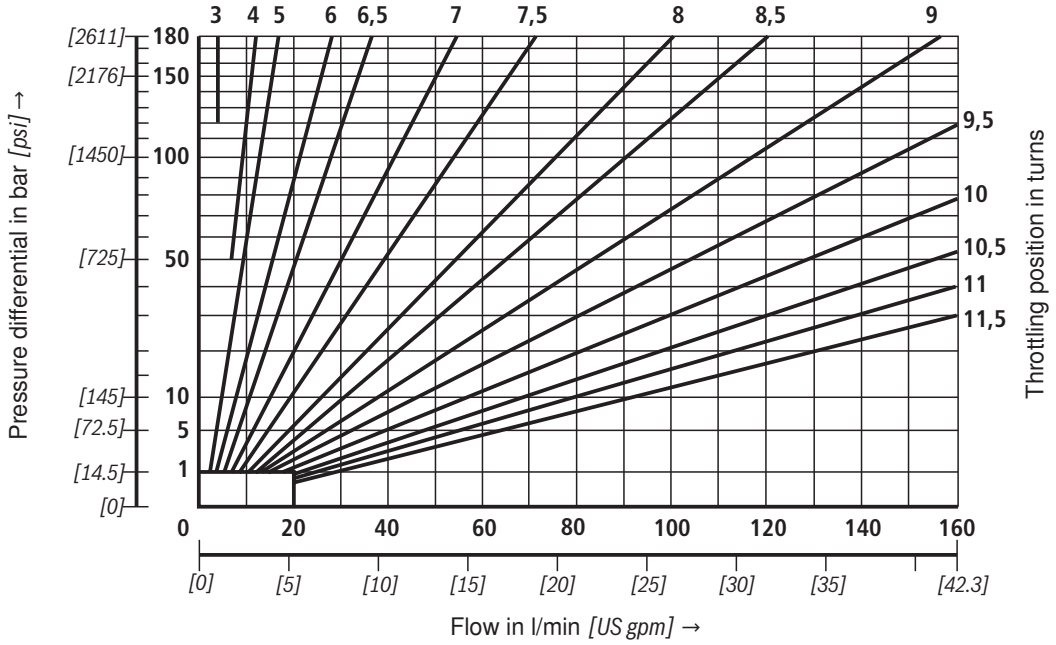
Characteristic curves (measured with HLP46, $\vartheta_{oil\ (\nu\ =\ 190\ SUS)}$ = 40 °C ± 5 °C *[104 °F ± 9 °F]*)

Δp-q_V characteristic curves (via check valve)

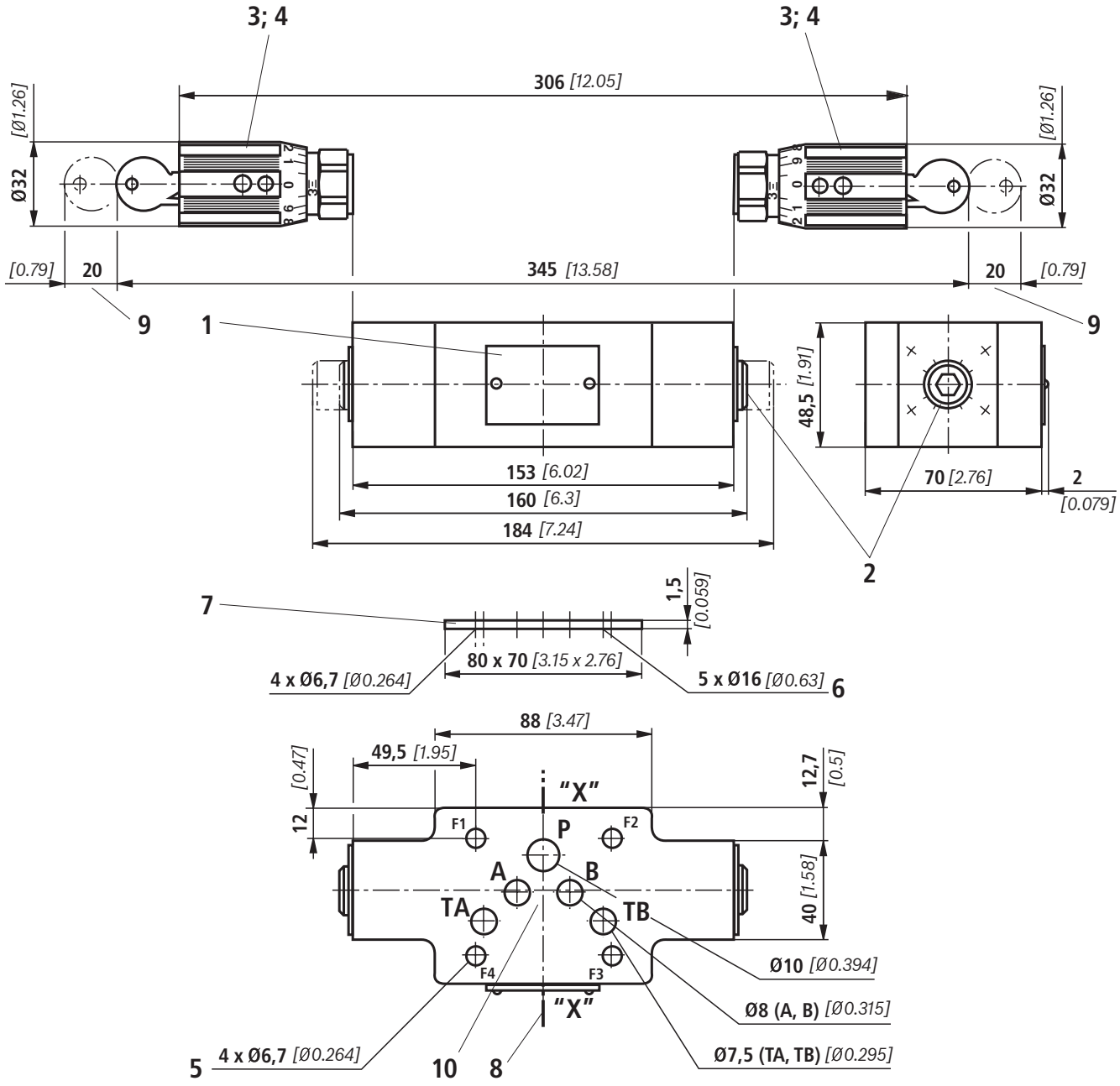


1 Throttle closed
2 Throttle open

Δp-q_V characteristic curves (constant throttling position)



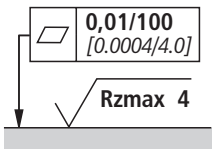
Unit dimensions: Variant "–" (dimensions in mm)



⚠ Attention!

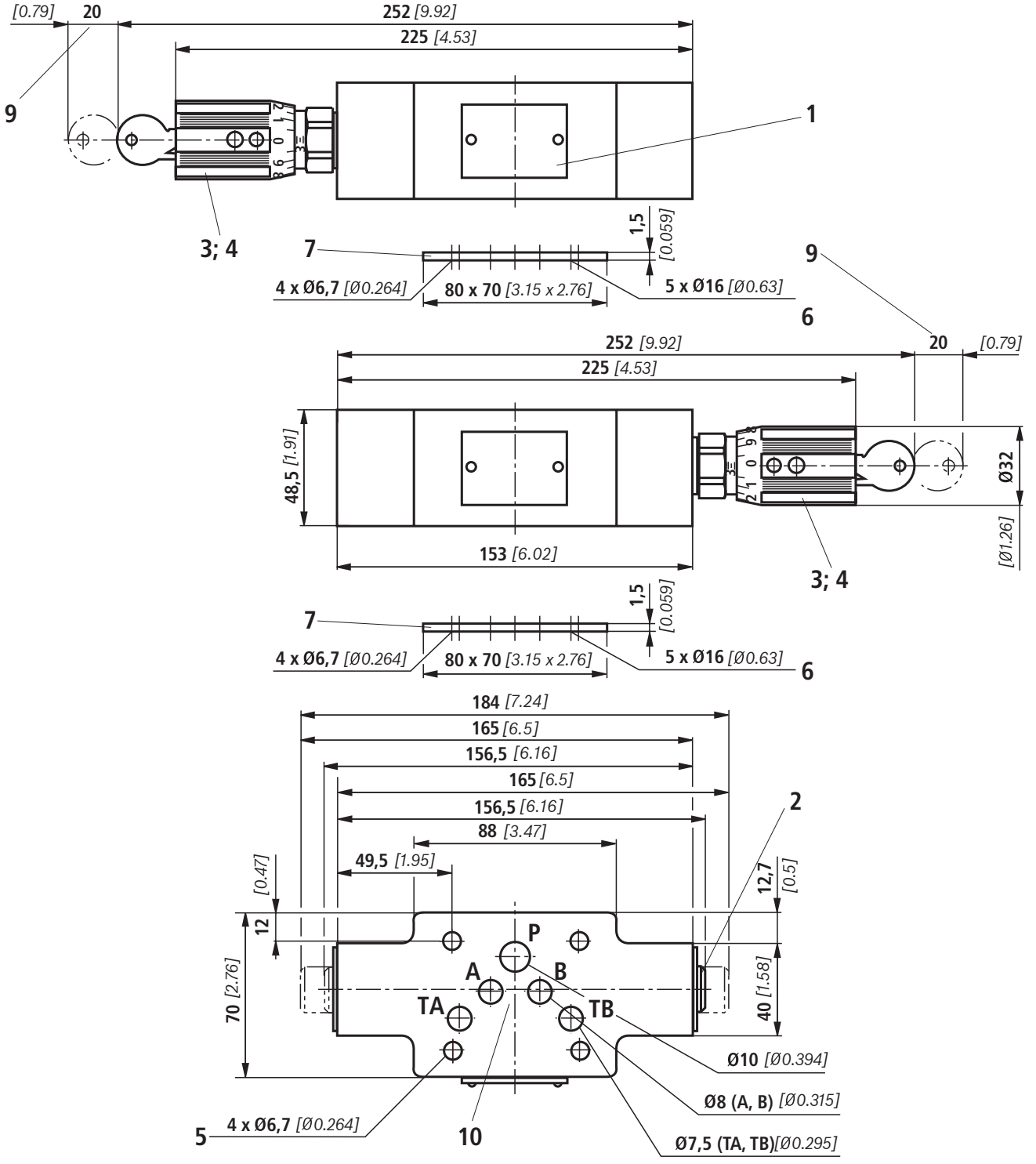
If bores are required for X- and Y-port (e.g. for pilot operated directional valve size 10) variant **SO30** must be selected!

For explanations of items and **valve mounting screws,** see page 8.



Required surface quality of the valve mounting face

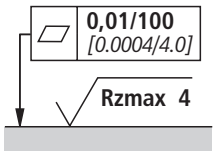
Unit dimensions: Variants “A“ and “B“ (dimensions in mm)



⚠ Attention!

If bores are required for X- and Y-port (e.g. for pilot operated directional valve size 10) variant **SO30** must be selected!

For explanations of items and **valve mounting screws,** see page 8.



Required surface quality of the valve mounting face

Unit dimensions

1 Nameplate

2 Adjustment element “5“
Spindle for adjusting the flow cross-section (hexagon socket 8 A/F)
- Turning counter-clockwise = larger flow
- Turning clockwise = smaller flow

3 Adjustment element “3“

4 Adjustment element “7“

5 4 through-bores for valve mounting

6 Identical seal rings for ports A, B, P, TA, TB

7 R-ring plate

8 To change over from meter-in to meter-out throttling, turn the device about the axis “X“–“X“ (only with variant “–“)

9 Space required to remove key

10 Porting pattern to ISO 4401-05-04-0-05, NFPA T3.5.1 R2 and ANSI B93-7 D05

Valve mounting screws (separate order)

4 hexagon socket head cap screws ISO 4762 - M6 - 10.9

4 hexagon socket head cap screws 1/4-20 UNC

☞ **Note!**

The length and tightening torque of the valve mounting screws must be calculated taking account of the components mounted above and below the sandwich plate valve.

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Rexroth
Bosch Group

Throttle check valve

RE 27526/04.08 1/8
Replaces: 11.02

Type Z2FS

Size 16
Component series 3X
Maximum operating pressure 350 bar *[5076 psi]*
Maximum flow 250 l/min *[66 US gpm]*


tb0221

Table of contents

Features

- Sandwich plate valve
- Porting pattern to ISO 4401-07-07-0-05 and NFPA T3.5.1 R2-D07
- For limiting the flow in 2 actuator ports
- Adjustment element: Spindle with hexagon socket
- For meter-in or meter-out throttling

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z2FS	16		8	–3X		*

Throttle check valve, sandwich plate design

Size 16 **= 16**

Throttle check valve Side A and B **= –**
Throttle check valve Side A **= A**
Throttle check valve Side B **= B**

Adjustment element
Spindle with hexagon socket **= 8**

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

Further details in clear text

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

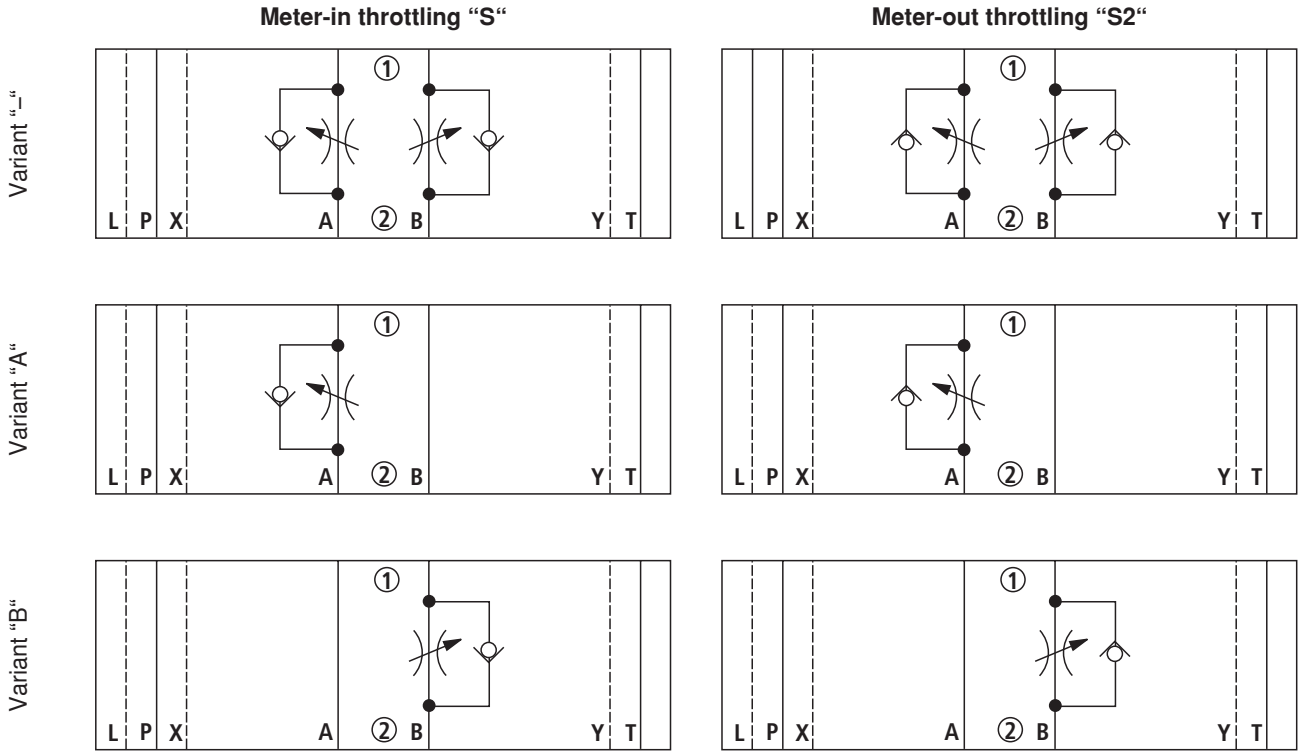
⚠ Attention!
Observe compatibility of seals with hydraulic fluid used

S = (…A8–3X/S) meter-in throttling on side A
(…B8–3X/S) meter-in throttling on side B
(…–8–3X/S) meter-in throttling on sides A and B

S2 = (…A8–3X/S2) meter-out throttling on side A
(…B8–3X/S2) meter-out throttling on side B
(…–8–3X/S2) meter-out throttling on sides A and B

Standard types and components are given in the EPS (standard price list).

Symbols (① = component side, ② = plate side)



Function, section

Valves of type Z2FS are throttle check valves of sandwich plate design. They are used to limit the flow in one or two actuator ports.

Two throttle check valves, which are arranged symmetrically to each other, limit flows (through adjustable throttle spools) in one direction and allow free return flow in the opposite direction.

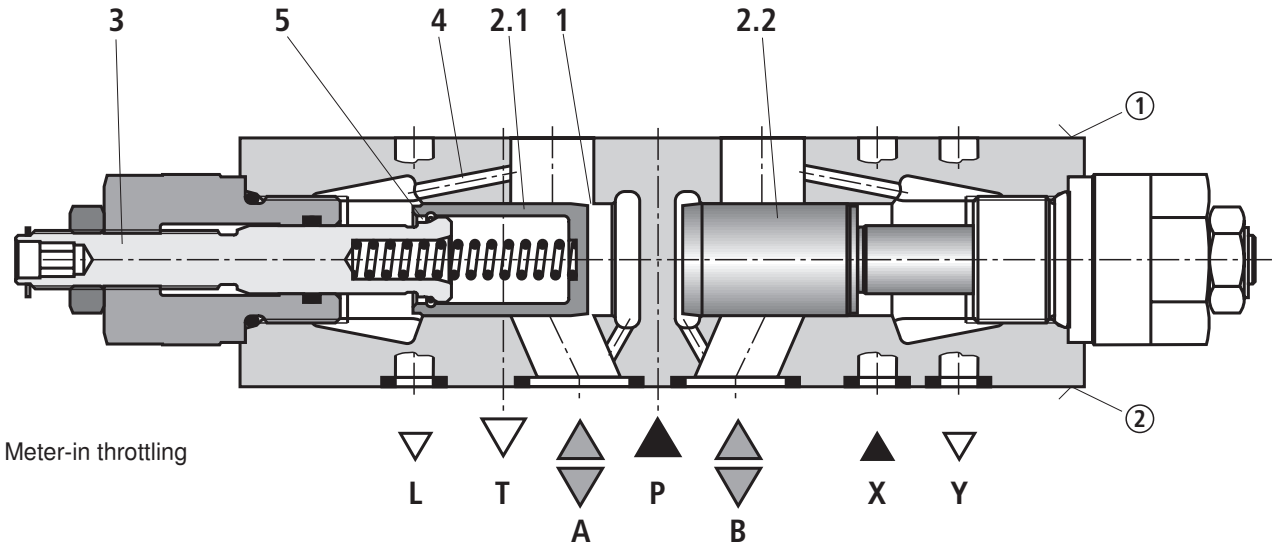
In the case of meter-in throttling the hydraulic fluid is fed through channel A1 via throttling point (1) to actuator A2. The throttle spool (2.1) can be axially adjusted by means of spindle (3), thus allowing throttling point (1) to be adjusted.

At the same time, the hydraulic fluid present in channel A1 gets via bore (4) to spool side (5). Together with the spring force, the applied pressure holds the throttle spool (2.1) in the throttling position.

The hydraulic fluid returning from actuator B2 shifts throttle spool (2.2). The valve then acts as check valve with free flow. Depending on the variant (“S“ or “S2“) throttling can be effective in the inflow or outflow.

Flow limitation

To change the velocity of an actuator, the throttle check valve is to be installed between the directional valve and the subplate.



Meter-in throttling

① = component side
② = plate side

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

General

Weight	kg *[lbs]*	ca. 4.7 *[10.4]*
Installation orientation		Optional
Ambient temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)

Hydraulic

Maximum operating pressure	bar *[psi]*	350 *[5076]*
Maximum flow	l/min *[US gpm]*	250 *[66]*
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids on request
Hydraulic fluid temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)
Viscosity range	mm^2/s *[SUS]*	2.8 to 380 *[13 to 1760]*
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 [3]

[1] Suitable for NBR and FKM seals

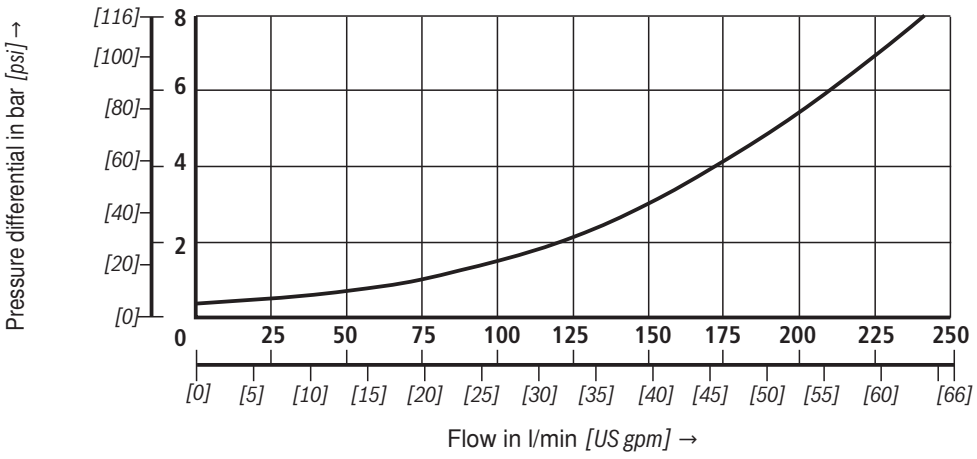
[2] Suitable only for FKM seals

[3] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

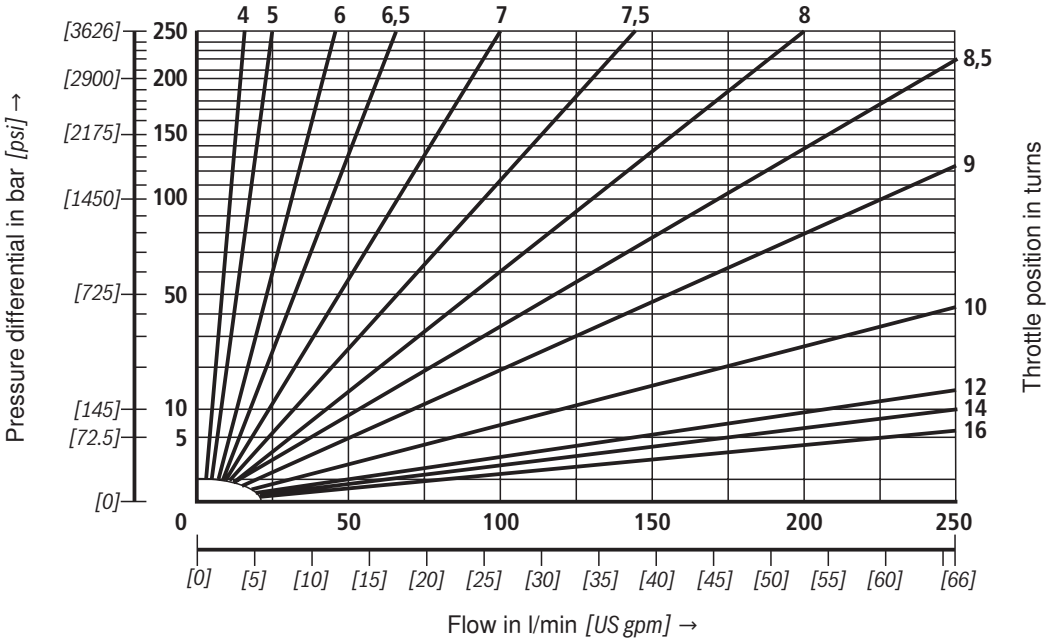
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Characteristic curves (measured with HLP46, $\vartheta_{oil\ (\nu\ =\ 190\ SUS)}$ = 40 °C ±5 °C *[104 °F ± 9 °F]*)

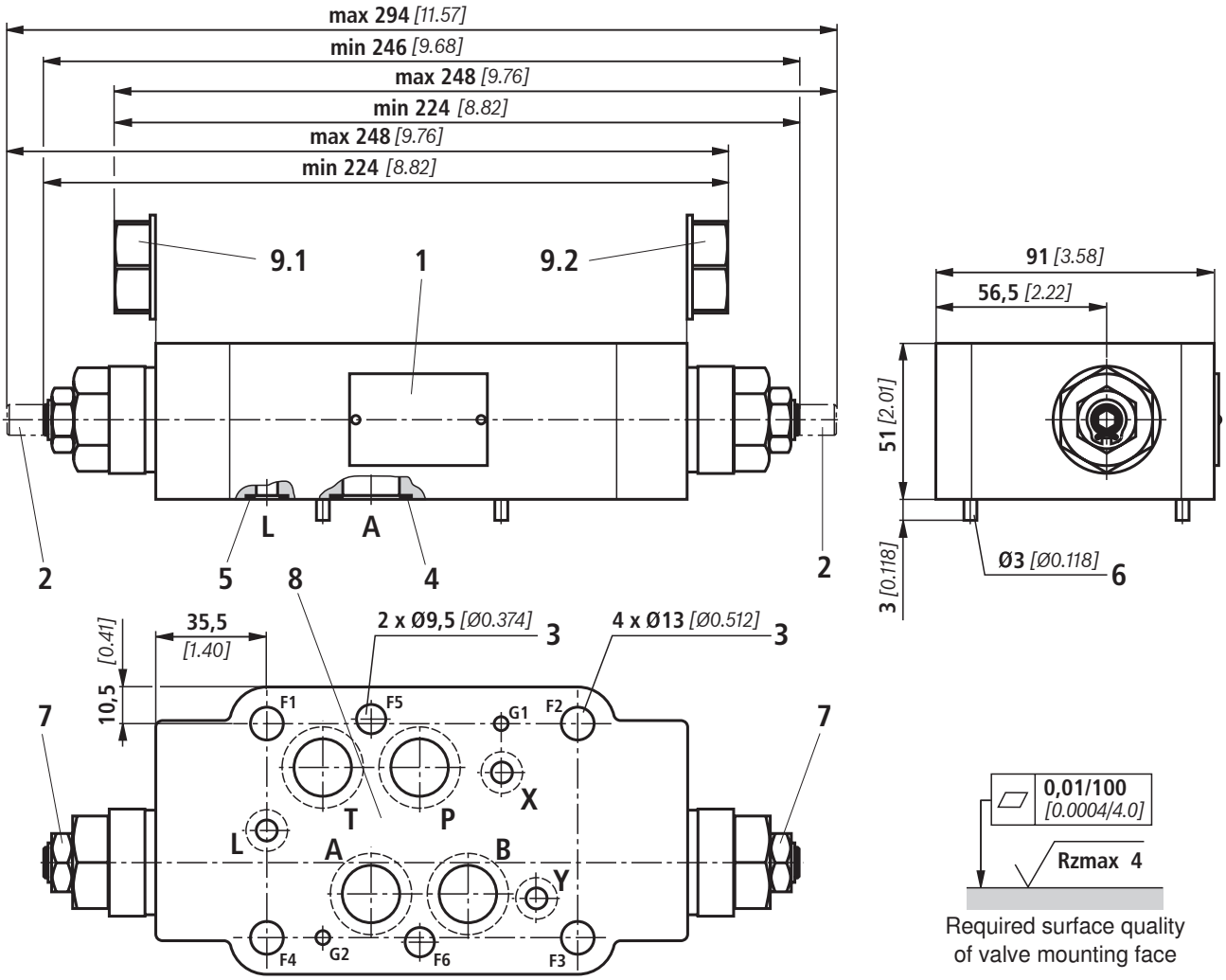
Δp-q_V characteristic curves (through check valve, with closed throttle)



Δp-q_V characteristic curves (throtlte position constant)



Unit dimensions (dimensions in mm *[inch]*)



Required surface quality of valve mounting face

1 Nameplate

2 Type of adjustment “8“
Spindle for adjusting the flow cross-section (hexagon socket 6 A/F)
- Turning counter-clockwise = larger flow
- Turning clockwise = smaller flow

3 Through-bores for valve mounting

4 Identical seal rings for ports A, B, P, T

5 Identical seal rings for ports X, Y, L

6 Locating pin (included in the sope of supply)

7 Hexagon 19 A/F, tightening torque M_T = 25 Nm *[18.4 ft-lbs]*

8 Porting pattern to ISO 4401-07-07-0-05 and NFPA T3.5.1 R2-D07

9.1 Plug screw on variant “B“

9.2 Plug screw on variant “A“

Valve mounting screws (separate order)

– Metric

4 hexagon socket head cap screws ISO 4762 - M10 - 10.9-flZn-240h-L

2 hexagon socket head cap screws ISO 4762 - M6 - 10.9-flZn-240h-L

– UNC

4 hexagon socket head cap screws 3/8-16 UNC

2 hexagon socket head cap screws 1/4-20 UNC

☞ **Note!**

The length and tightening torque of valve mounting screws must be calculated taking account of the components mounted above and below the sandwich plate valve.

Notes

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Notes

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Rexroth
Bosch Group

Throttle check valve

RE 27536/05.08 1/8
Replaces: 04.02

Type Z2FS

Size 25
Component series 3X
Maximum operating pressure 350 bar *[5076 psi]*
Maximum flow 360 l/min *[95 US gpm]*


tb0222

Table of contents

Features

- Sandwich plate valve
- Porting pattern to ISO 4401-08-08-0-05 and NFPA T3.5.1 R2-D08
- For limiting the flow of 2 actuator ports
- Adjustment element: Spindle with hexagon socket
- For meter-in or meter-out throttling

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

Z2FS	22		8	–3X		*

Throttle check valve, sandwich plate design

Size 25 **= 22**

Throttle check valve, sides A and B **= –**
Throttle check valve, side A **= A**
Throttle check valve, side B **= B**

Adjustment element
Spindle with hexagon socket **= 8**

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

Further details in clear text

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

⚠ Attention!
Observe compatibility of seals with the hydraulic fluid used

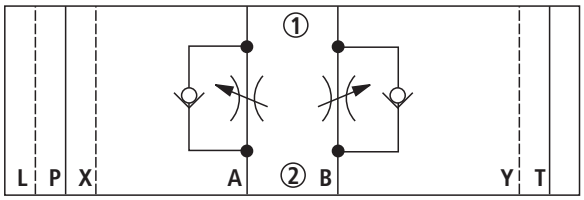
S = (…A8–3X/S) meter-in throttling on side A
(…B8–3X/S) meter-in throttling on side B
(…–8–3X/S) meter-in throttling on sides A and B

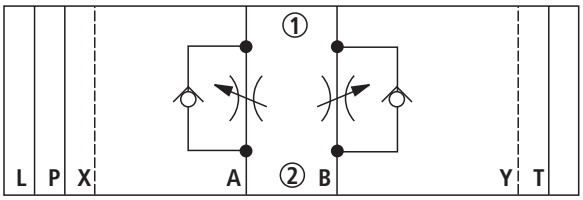
S2 = (…A8–3X/S2) meter-out throttling on side A
(…B8–3X/S2) meter-out throttling on side B
(…–8–3X/S2) meter-out throttling on sides A and B

Symbols (① = component side, ② = plate side)

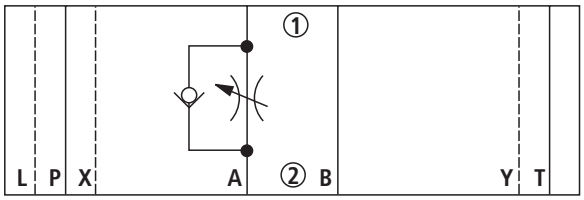
Meter-in throttling “S“ | **Meter-out throttling “S2“**

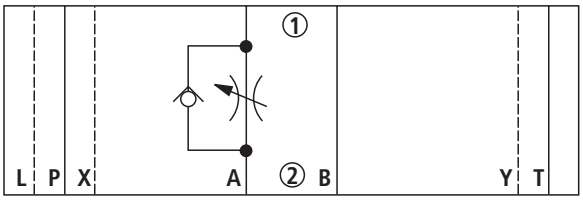
Variant “–“



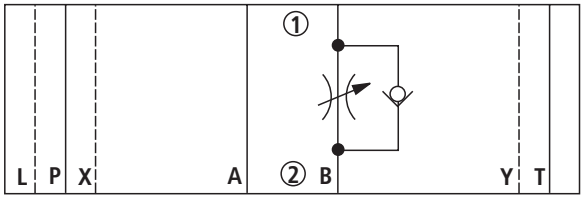


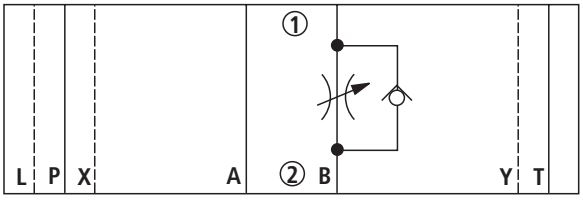
Variant “A“





Variant “B“





Function, section

Valves of type Z2FS are throttle check valves of sandwich plate design. They are used to limit the flow of one or two actuator ports.

Two throttle check valves, which are symmetrically arranged to each other, limit the flow (by means of adjustable throttle spools) in one direction and allow a free flow in the opposite direction.

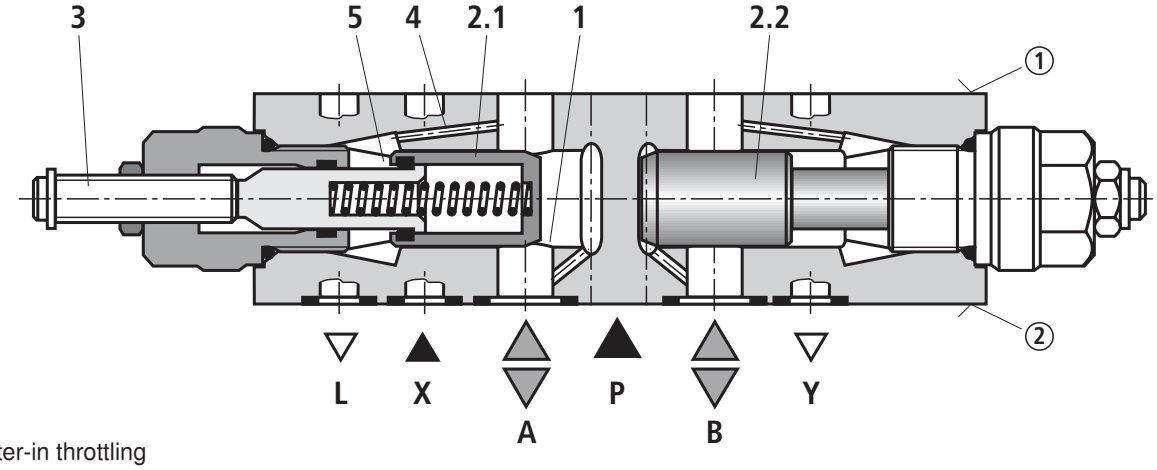
In the case of meter-in throttling the hydraulic fluid is fed through channel A1 via throttling point (1) to actuator A2. Throttle spool (2.1) can be axially adjusted by means of spindle (3), thus allowing throttling point (1) to be adjusted.

At the same time, the hydraulic fluid present in channel A1 is fed via bore (4) to spool side (5). In addition to the spring force, the applied pressure holds throttle spool (2.1) in the throttling position.

The hydraulic fluid returning from actuator B2 shifts throttle spool (2.2) and thus provides an unhindered flow as with a check valve. Depending on the variant (“S“ or “S2“) throttling can be effective on the supply or return side.

Flow limitation

To change the velocity of an actuator, the throttle check valve can be installed between the directional valve and the subplate.



Meter-in throttling

① = component side
② = plate side

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

General

Weight	kg *[lbs]*	ca. 8 *[17.6]*
Installation orientation		Optional
Ambient temperature range	°C *[°F]*	–30 to +50 *[–22 to +122]* (NBR seals) –20 to +50 *[–4 to +122]* (FKM seals)

Hydraulic

Maximum operating pressure	bar *[psi]*	350 *[5076]*
Maximum flow	l/min *[US gpm]*	360 *[95]*
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMT 24568 (see also RE 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids on request
Hydraulic fluid temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –20 to +80 *[–4 to +176]* (FKM seals)
Viscosity range	mm^2/s *[SUS]*	2.8 to 380 *[13 to 1760]*
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 [3]

[1] Suitable for NBR and FKM seals

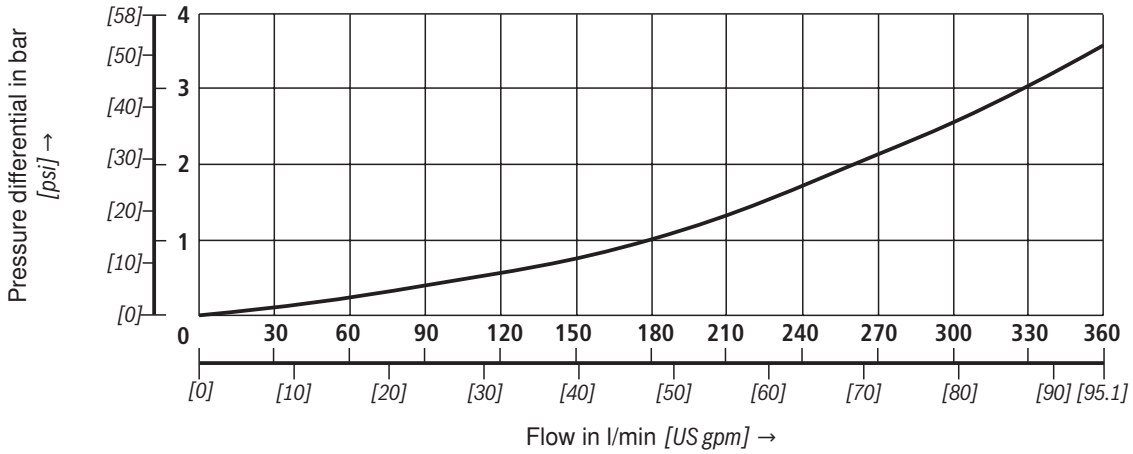
[2] Suitable for FKM seals only

[3] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

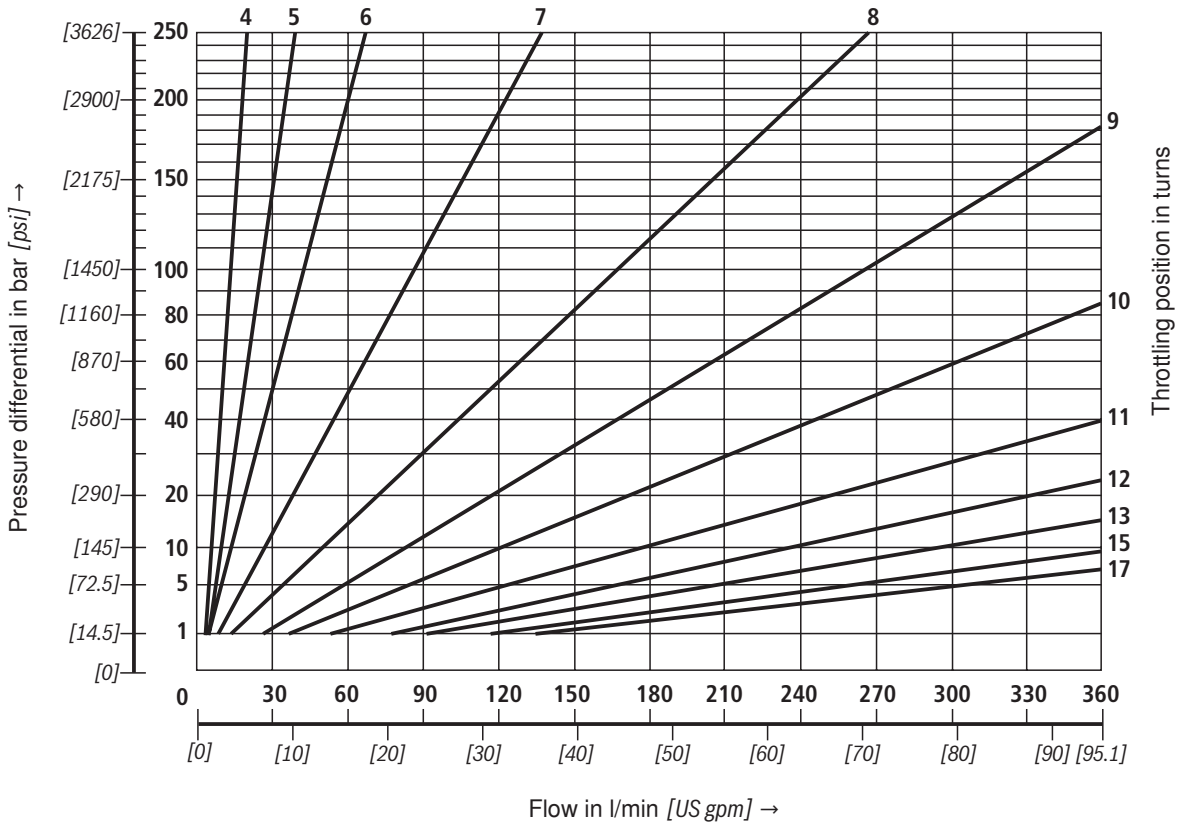
For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 and RE 50088.

Characteristic curves (measured with HLP46, $\vartheta_{oil\ (\nu\ =\ 190\ SUS)}$ = 40 °C ±5 °C *[104 °F ± 9 °F]*)

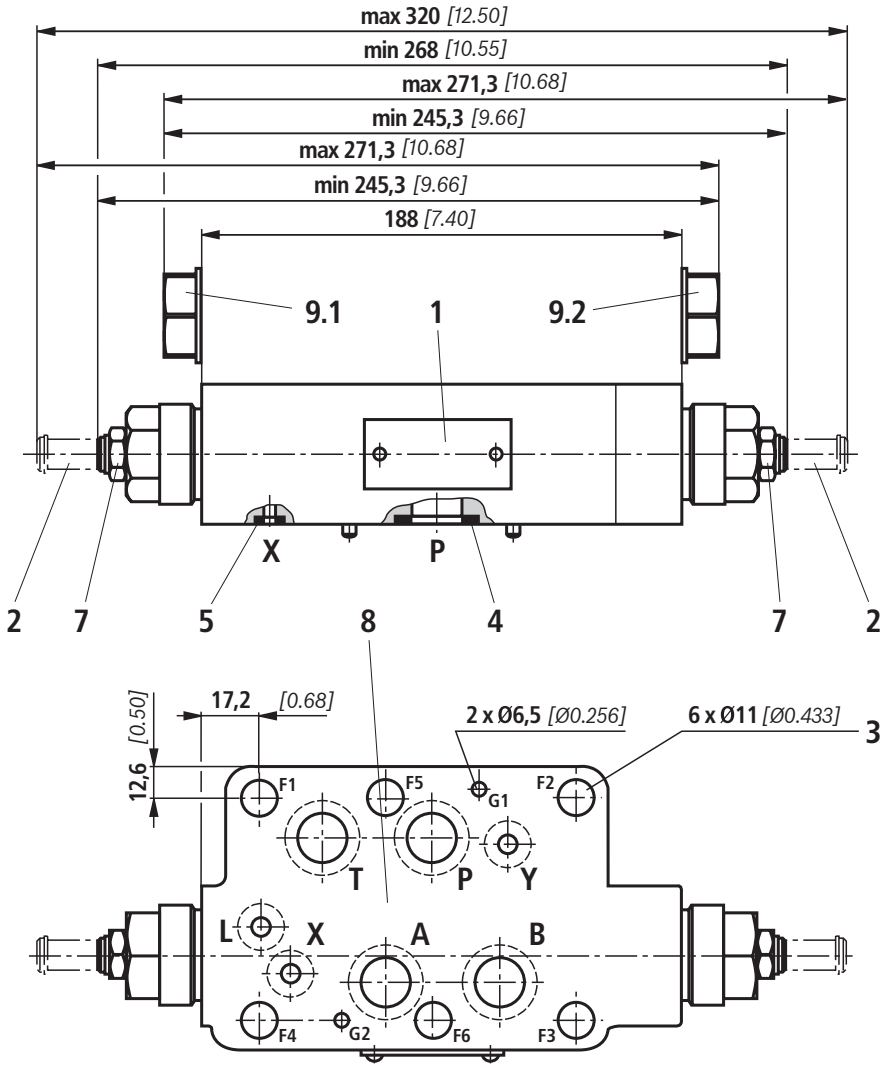
Δp-q_V characteristic curves (via check valve, with closed throttle)

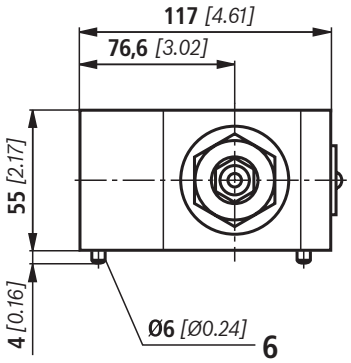


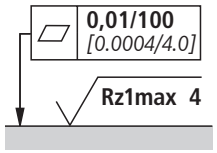
Δp-q_V characteristic curves (constant throttling position)



Unit dimensions (dimensions in mm *[inch]*)







Required surface quality of valve mounting face

1 Nameplate

2 Adjustment element “8“
Spindle for adjusting the flow cross-section (hexagon socket 6 A/F)
- Turning counter-clockwise = greater flow
- Turning clockwise = smaller flow

3 Through-bores for valve mounting

4 Identical seal rings for ports A, B, P, T

5 Identical seal rings for ports X, Y, L

6 Locating pin (included in the scope of supply)

7 Hexagon 22 A/F, tightening torque M_T = 25 Nm *[18.4 ft-lbs]*

8 Porting pattern to ISO 4401-08-08-0-05 and NFPA T3.5.1 R2-D08

9.1 Plug screw for variant “B“

9.2 Plug screw for variant “A“

Valve mounting screws (separate order)

– Metric
6 hexagon socket head cap screws
ISO 4762 - M12 - 10.9-flZn-240h-L

– UNC
6 hexagon socket head cap screws 5/8-11 UNC

☞ **Note!**

The length and tightening torque of valve mounting screws must be calculated taking account of the components mounted above and below the sandwich plate valve.

Notes

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Rexroth
Bosch Group

Double throttle check valve

RE 27510/05.06
Replaces: 11.02

Type Z2FSK 6

H4083_d

Size 6
Component series 1X
Maximum operating pressure 210 bar
Maximum flow 40 l/min

Table of contents

Features

- Sandwich plate valve
- Porting pattern to ISO 4401-03-02-0-05
- Type of adjustment:
  Hexagon socket head cap screw with locknut and protective cap
- For limiting the flow in 2 actuator ports
- For meter-in or meter-out throttling

Information on available spare parts:
www.boschrexroth.com/spc

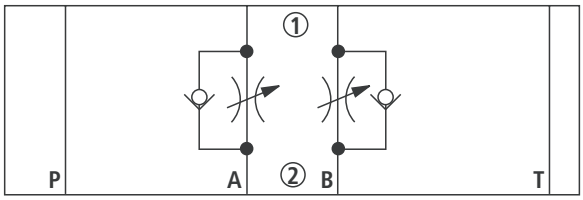
Ordering code, symbols (① = component side, ② = plate side)

Material no. R900564521

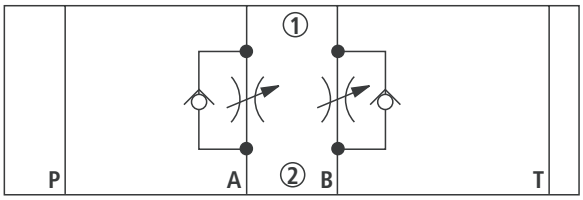
Type designation: Z2FSK 6-2-1X/2QV

Symbol

Meter-in throttle



Meter-out throttle



Function, section

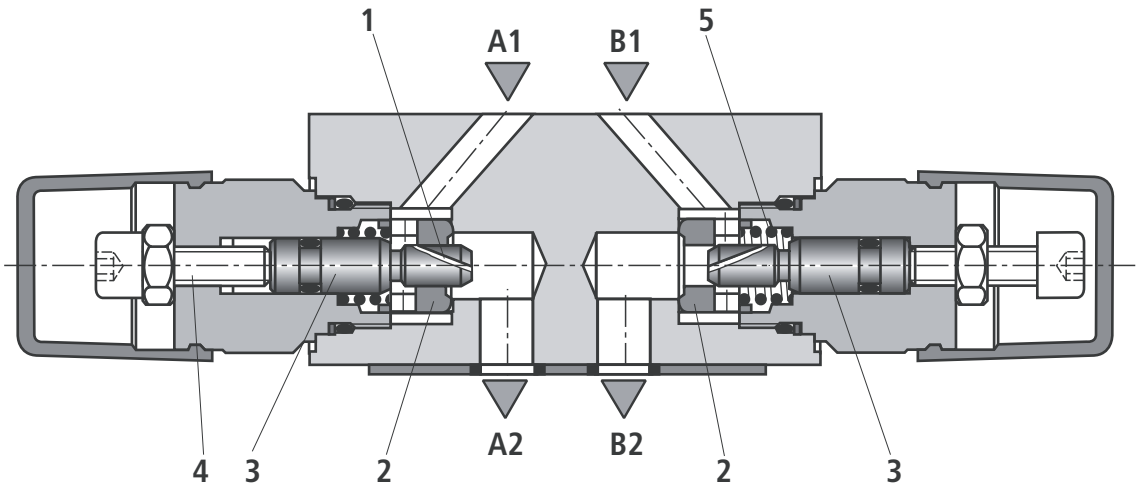
Valves of type Z2FSK 6 are double throttle check valves of sandwich plate design.

They are used for limiting the flow in two actuator ports.

Two symmetrically arranged throttle check valves limit the flow in one direction and allow free flow in the reverse direction.

In the case of meter-in throttling, the hydraulic fluid is fed through channel A1 via throttling point (1), which is formed by valve seat (2) and throttling spool (3), to actuator A2. Throttling spool (3) can be axially adjusted by means of set screw (4) and therefore allows throttling point (1) to be adjusted.

The hydraulic fluid returning from actuator B2 shifts valve seat (2) against spring (5) towards throttling spool (3) and thus allows a free flow of the fluid. Depending on the installation orientation, the throttling effect can be implemented for the supply or the return flow.



Type Z2FSK 6-2-X/2QV
(meter-in throttle)

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

General

Weight	kg	approx. 0.5
Installation orientation		Optional
Ambient and storage temperature range	°C	–20 to +80 (FKM seals)

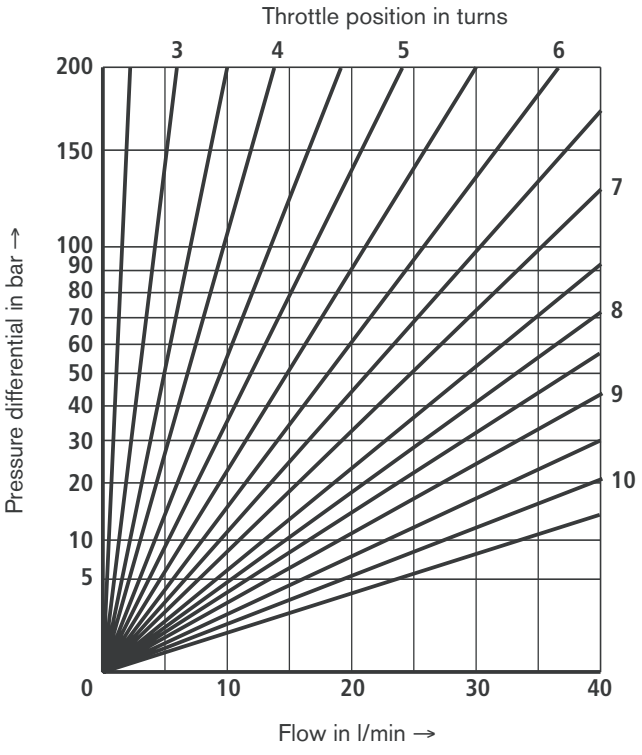
Hydraulic

Maximum operating pressure	bar	210
Maximum flow	l/min	40
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic esters); other hydraulic fluids on enquiry
Hydraulic fluid temperature range	°C	–20 to +80 (FKM seals)
Viscosity range	mm^2/s	10 to 800
Max. permissible degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 [1]

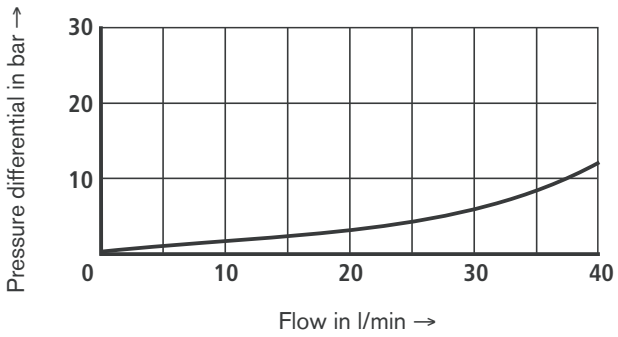
[1] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components. For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

Characteristic curves (measured at $\nu = 41 mm^2$, $\vartheta_{oil} = 40$ °C ±5 °C)

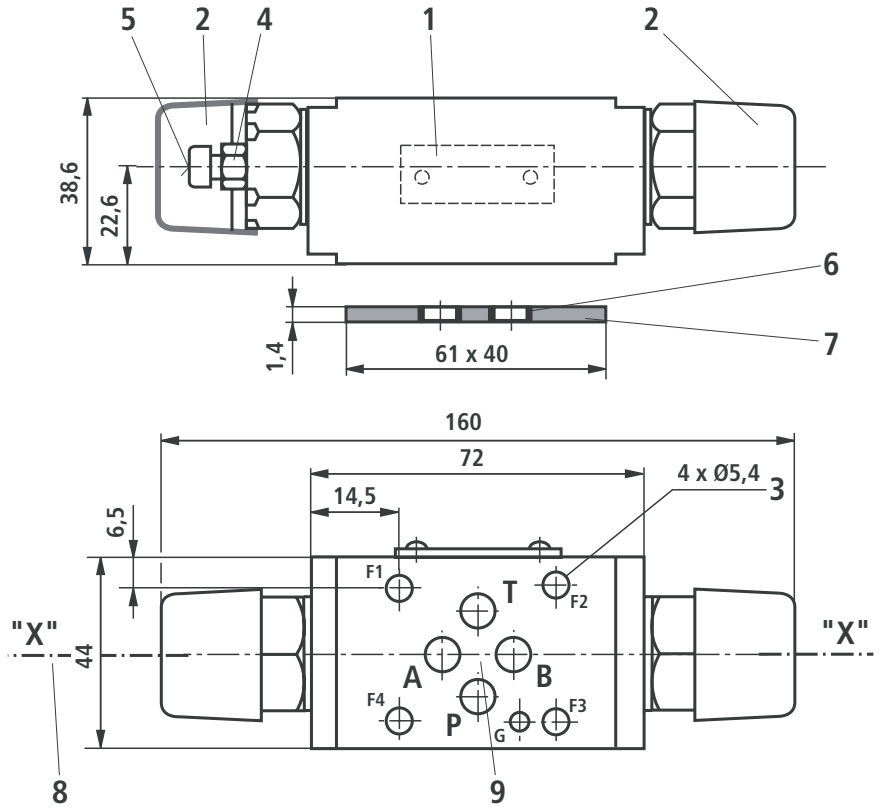
Δp-q_v characteristic curves

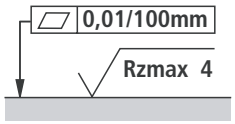


Δp-q_v characteristic curves (throttle closed)



Unit dimensions (nominal dimensions in mm)





Required surface quality of the valve mounting face

1 Nameplate

2 Adjustment element (hexagon socket head cap screw with locknut and protective cap)

3 Valve mounting bores

4 Locknut A/F 10

5 Setscrew for changing the flow cross-section (hexagon A/F 5)

6 Identical seal rings for ports A, B, P, T

7 R-ring plate

8 The meter-in throttle can be converted into a meter-out throttle by turning the component around the axis "X"–"X"

9 Porting pattern to ISO 4401-03-02-0-05 (**with** locating bore Ø3 for locating pin ISO 8752-3x8-St, Material no. **R900005694**, separate order)

Valve fixing screws (separate order)

4 socket head cap screws ISO 4762 – M5 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14

☞ **Note!**

The length of the fixing screws of the sandwich plate valve (screw-in depth ≥ 10 mm) must be selected to suit the components installed above and below the double throttle check valve. The type of screw and the tightening torque must be adapted to the individual requirements.
Please inquire screws of the required length from Bosch Rexroth.

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Rexroth
Bosch Group

Double throttle check valve

RE 27510/05.06
Replaces: 11.02

Type Z2FSK 6

H4083_d

Size 6
Component series 1X
Maximum operating pressure 210 bar
Maximum flow 40 l/min

Table of contents

Features

- Sandwich plate valve
- Porting pattern to ISO 4401-03-02-0-05
- Type of adjustment:
  Hexagon socket head cap screw with locknut and protective cap
- For limiting the flow in 2 actuator ports
- For meter-in or meter-out throttling

Information on available spare parts:
www.boschrexroth.com/spc

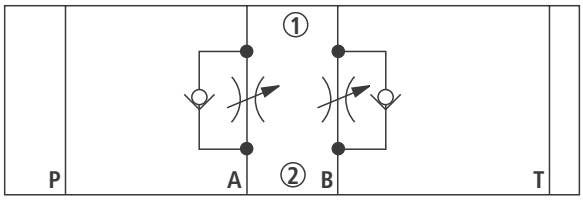
Ordering code, symbols (① = component side, ② = plate side)

Material no. R900564521

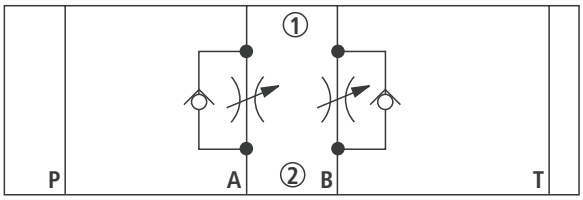
Type designation: Z2FSK 6-2-1X/2QV

Symbol

Meter-in throttle



Meter-out throttle



Function, section

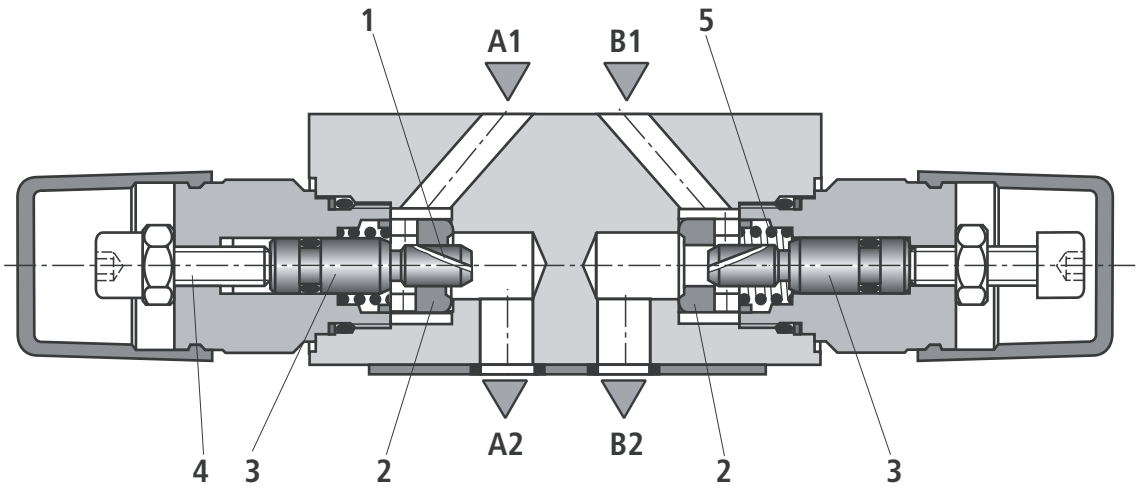
Valves of type Z2FSK 6 are double throttle check valves of sandwich plate design.

They are used for limiting the flow in two actuator ports.

Two symmetrically arranged throttle check valves limit the flow in one direction and allow free flow in the reverse direction.

In the case of meter-in throttling, the hydraulic fluid is fed through channel A1 via throttling point (1), which is formed by valve seat (2) and throttling spool (3), to actuator A2. Throttling spool (3) can be axially adjusted by means of set screw (4) and therefore allows throttling point (1) to be adjusted.

The hydraulic fluid returning from actuator B2 shifts valve seat (2) against spring (5) towards throttling spool (3) and thus allows a free flow of the fluid. Depending on the installation orientation, the throttling effect can be implemented for the supply or the return flow.



Type Z2FSK 6-2-X/2QV
(meter-in throttle)

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

General

Weight	kg	approx. 0.5
Installation orientation		Optional
Ambient and storage temperature range	°C	–20 to +80 (FKM seals)

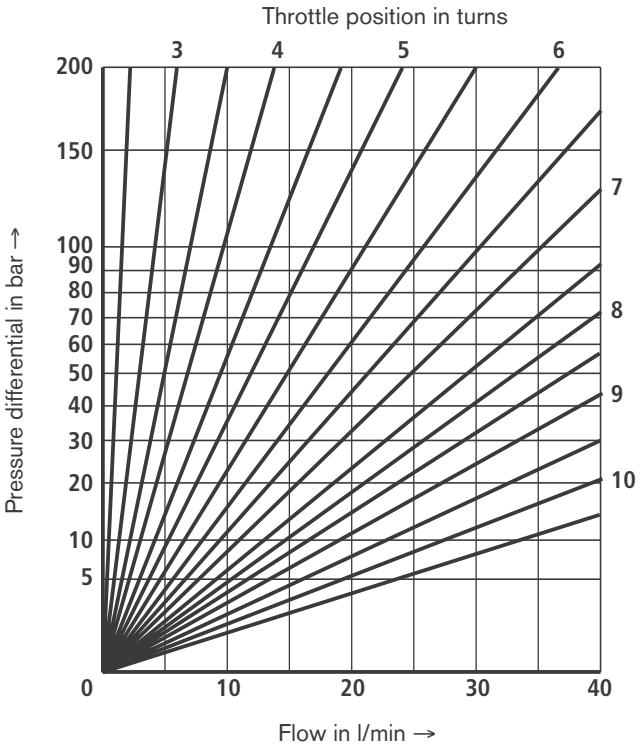
Hydraulic

Maximum operating pressure	bar	210
Maximum flow	l/min	40
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524; fast bio-degradable hydraulic fluids to VDMA 24568 (see also RE 90221); HETG (rape seed oil); HEPG (polyglycols); HEES (synthetic esters); other hydraulic fluids on enquiry
Hydraulic fluid temperature range	°C	–20 to +80 (FKM seals)
Viscosity range	mm^2/s	10 to 800
Max. permissible degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 [1]

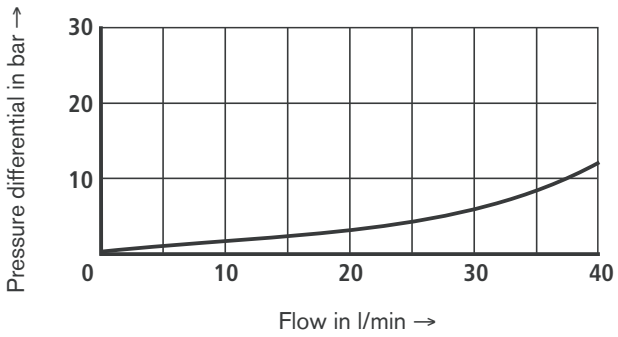
[1] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components. For the selection of filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086 and RE 50088.

Characteristic curves (measured at $\nu = 41 mm^2$, $\vartheta_{oil} = 40$ °C ±5 °C)

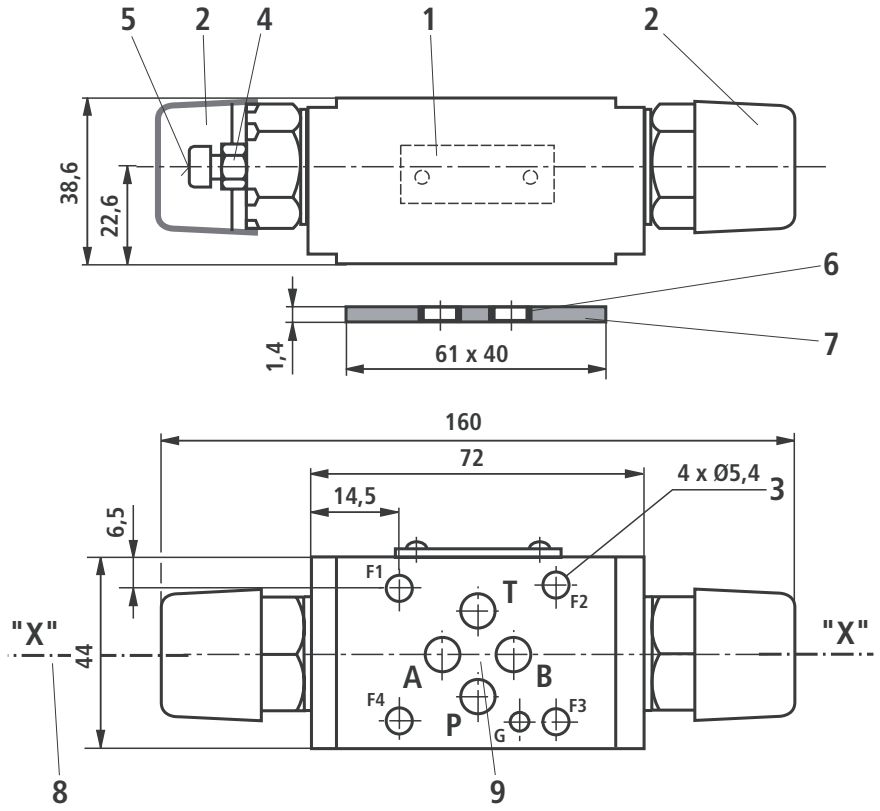
Δp-q_v characteristic curves

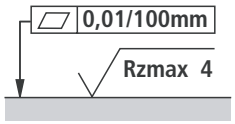


Δp-q_v characteristic curves (throttle closed)



Unit dimensions (nominal dimensions in mm)





Required surface quality of the valve mounting face

1 Nameplate

2 Adjustment element (hexagon socket head cap screw with locknut and protective cap)

3 Valve mounting bores

4 Locknut A/F 10

5 Setscrew for changing the flow cross-section (hexagon A/F 5)

6 Identical seal rings for ports A, B, P, T

7 R-ring plate

8 The meter-in throttle can be converted into a meter-out throttle by turning the component around the axis "X"–"X"

9 Porting pattern to ISO 4401-03-02-0-05 (**with** locating bore Ø3 for locating pin ISO 8752-3x8-St, Material no. **R900005694**, separate order)

Valve fixing screws (separate order)

4 socket head cap screws ISO 4762 – M5 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14

☞ **Note!**

The length of the fixing screws of the sandwich plate valve (screw-in depth ≥ 10 mm) must be selected to suit the components installed above and below the double throttle check valve. The type of screw and the tightening torque must be adapted to the individual requirements.
Please inquire screws of the required length from Bosch Rexroth.

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Rexroth
Bosch Group

Throttle and throttle check valve

RE 27219/01.09 1/6
Replaces: 03.06

Types MG and MK


K3564-1

Size 6 to 30
Component series 1X
Maximum operating pressure 315 bar
Maximum flow 400 l/min

Table of contents

Features

- Suitable for direct in-line installation
- Pressure and viscosity-dependent

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

		G	1X/		*

Throttle valve **= MG**
Throttle check valve **= MK**

Size 6 **= 6**
Size 8 **= 8**
Size 10 **= 10**
Size 15 **= 15**
Size 20 **= 20**
Size 25 **= 25**
Size 30 **= 30**

For threaded connection **= G**

1X = Component series 10 to 19
(10 to 19: unchanged installation and connection dimensions)

No code = NBR seals
V = FKM seals
(other seals upon request)
Attention!
Observe compatibility of seals with hydraulic fluid used!

Further details in the clear text

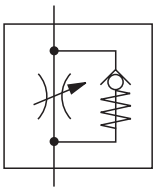
Seal material

Standard types and components are contained in the EPS (standard price list).

Symbols

Type MG

Type MK



Function, section

The valve types MG and MK are pressure- and viscosity-dependent throttle and throttle check valves.

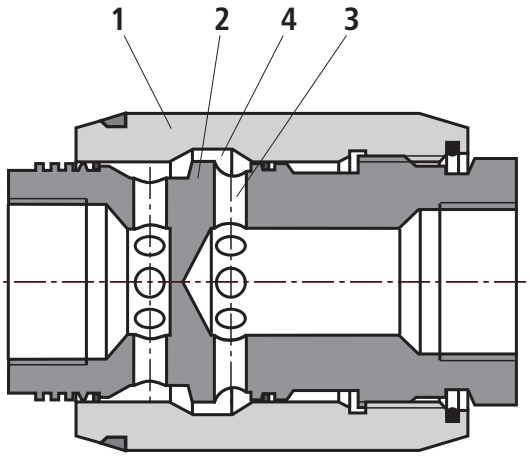
Type MG (throttle valve)

Throttling occurrs in both flow directions. The pressure fluid reaches the throttling point (4) via the lateral bores (3). The throttling point is formed between the housing (2) and the adjustable sleeve (1). By rotating the sleeve (1), the cross-section of the throttling point (4) can be changed infinitely.

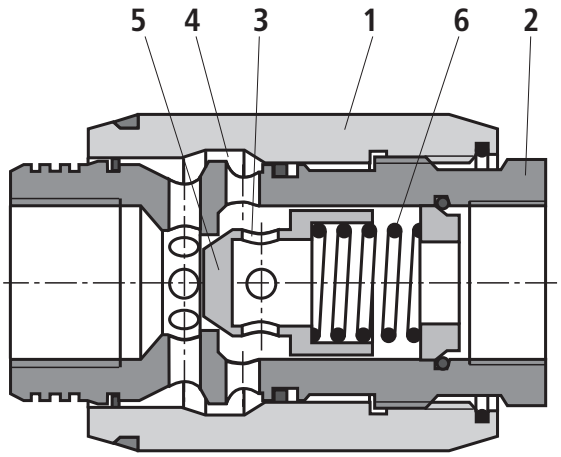
Type MK (throttle check valve)

When fluid flows through the valve in throttling direction, spring (6) and the pressure fluid press the poppet (5) onto the seat , thus blocking the connection. The pressure fluid uses the lateral bores (3) to reach the throttling point (4), which is formed between the housing (2) and the adjustable sleeve (1).

In the opposite direction, the pressure acts on the front face of the poppet (5), lifts the same from the seat, and allows the fluid to flow The pressure fluid flows through the valve without being throttled. At the same time, a part of the pressure fluid flows through the annular gap, which results in the desired self cleaning effect.



Throttle valve type MG



Throttle check valve type MK

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

general

Size		6	8	10	15	20	25	30
Weight	kg	0.3	0.4	0.7	1.1	1.9	3.2	4.1
Installation position		Any						
Ambient temperature range	°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)						

hydraulic

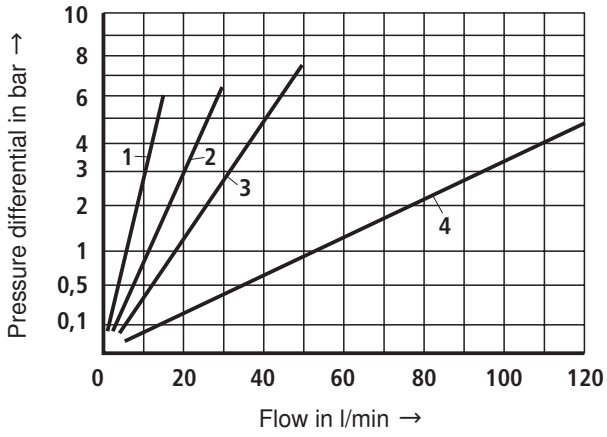
Maximum operating pressure	bar	315
Cracking pressure (type MK)	bar	0.5
Maximum volume flow	L/min	See characteristic curves page 5
Pressure fluid		Mineral oil (HL, HLP) according to DIN51524, other hydraulic fluids upon request
Pressure fluid temperature range	°C	–30 to +80 (NBR seals) –20 to +80 (FKM seals)
Viscosity range	mm^2/s	10 to 800
Maximum permitted degree of contamination of the pressure fluid - cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1)]

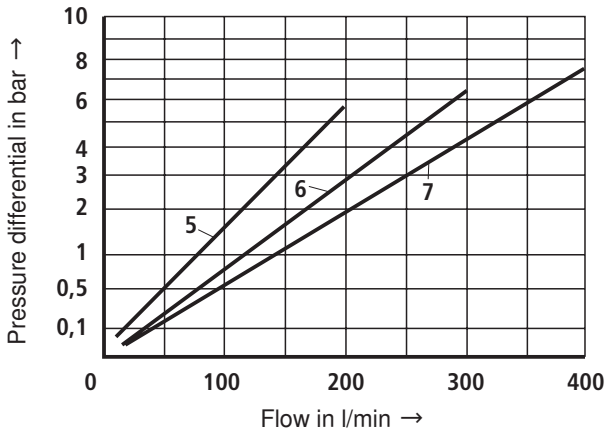
[1)] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Efficient filtration prevents malfunctions and at the same time prolongs the service life of components.

For the selection of the filters, see data sheets RE 50070, RE 50076, RE 50081, RE 50086, RE 50087 und RE 50088.

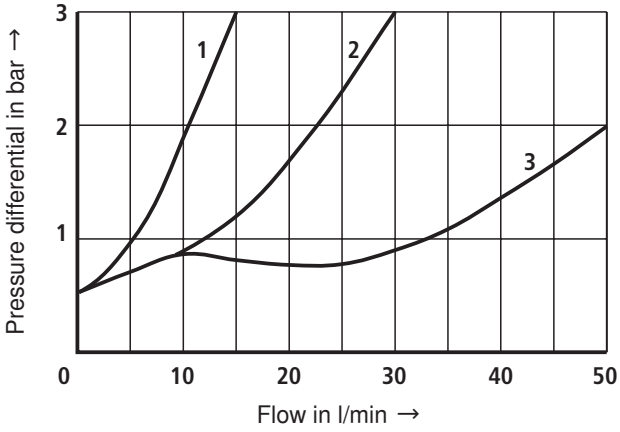
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C)

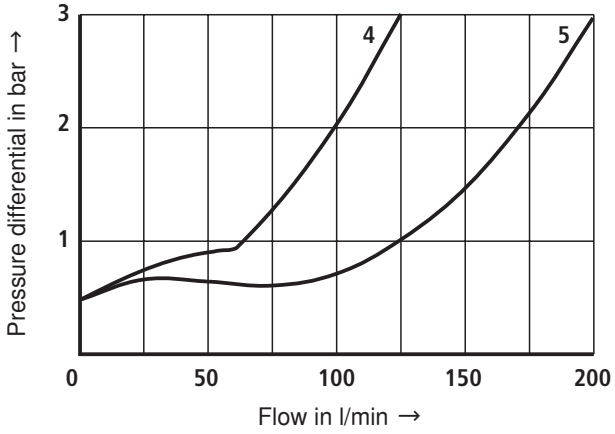
Δp-q_V characteristic curves with open throttle (types MK and MG)

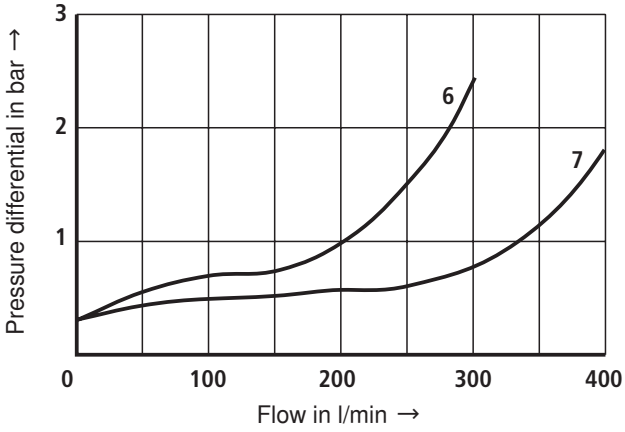




Δp-q_V characteristic curves with open check valve and closed throttle (type MK)

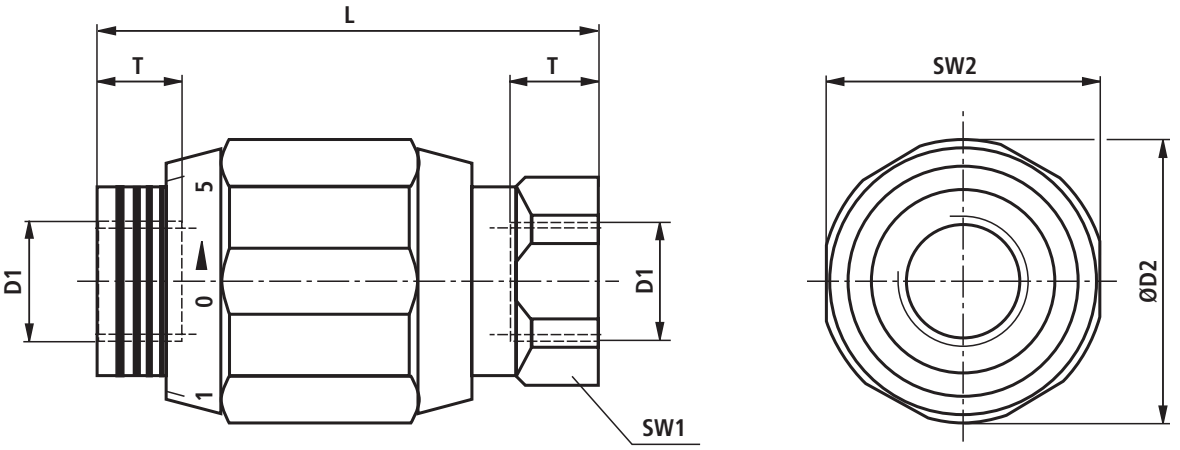






1 NG6
2 NG8
3 NG10
4 NG15
5 NG20
6 NG25
7 NG30

Unit dimensions (dimensions in mm)



Size	D1	ØD2	L	SW1	SW2	T
6	G1/4	34	65	22	32	12
8	G3/8	38	65	24	36	12
10	G1/2	48	80	30	46	14
15	G3/4	58	100	41	55	16
20	G1	72	110	46	70	18
25	G1 1/4	87	130	55	85	20
30	G1 1/2	93	150	60	90	22

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Notes

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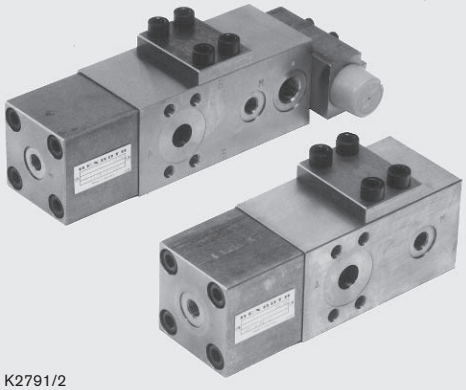
Rexroth
Bosch Group

Check-Q-meter

RE 27 551/06.03 **1**/10
Replaces: 09.97

Type FD



K2791/2

Nominal size 12...32
Series 2X
Max. Operating pressure 350 bar
Max. Flow 560 L/min

Overview of contents

Features

- For installation in manifolds (cartridge valve),
- With SAE flanged ports,
- For subplate mounting,
  porting pattern to DIN 24 340, form D,
  ISO 5781 and CETOP–RP 121 H,
  subplates to catalogue sheet RE 45 062
  (separate order),
- Use subplate version when valve panel mounting.

Functions

- Pilot operated check valve, leak-free,
- The check-Q-meter controls the returning flow q_{V2} in relation to the flow being directed into the opposite side of the actuater q_{V1}. With cylinders the area tratio ($q_{V2} = q_{V1} \cdot \varphi$) has to be taken into account,
- By-pass valve, free-flow in opposite direction,
- Optional built-on secondary pressure relief valve (only for valve with flange connections).

Ordering details

FD			2X /		V	*

Nominal size 12 **= 12**
Nominal size 16 **= 16**
Nominal size 25 **= 25**
Nominal size 32 **= 32**

For manifold mounting (cartridge valve) **= KA**
For sub-plate mounting **without** secondary DBV **= PA**
For SAE flange connections **without** secondary DBV **= FA**
For SAE flange connections **with** secondary DBV **= FB**

Series 20 to 29 **= 2X**
(20 to 29: unchanged installation and connection dimensions)

B00 = **Without** orifice
B03 = Orifice Ø 0.30 mm (sizes 12 and 16)
B04 = Orifice Ø 0.40 mm (size 25)
B06 = Orifice Ø 0.60 mm (size 32)
(other orifice diameters on request)

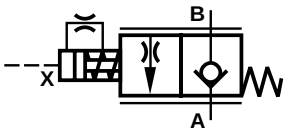
Pressure range of the secondary pressure relief valve
Valve with SAE flange connections
(**only** for version "FB")
200 = Pressure setting up to 200 bar
300 = Pressure setting up to 300 bar
400 = Pressure setting up to 400 bar

V = FKM seals, suitable for mineral oil to DIN 51 524 (HL, HLP) and phosphate ester (HFD-R)

Further details in clear text

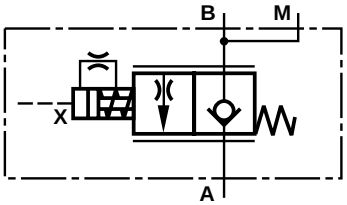
Symbols

Without secondary pressure relief valve



Valve type:

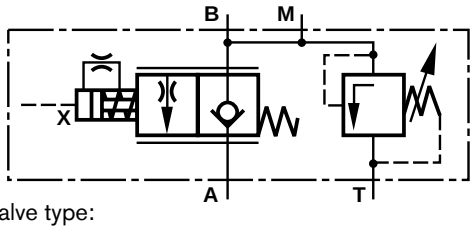
FD 12 KA 2X/B03..
FD 16 KA 2X/B03..
FD 25 KA 2X/B04..
FD 32 KA 2X/B06..



Valve type:

FD 12 PA 2X/B03.. FD 12 FA 2X/B03..
FD 16 PA 2X/B03.. FD 16 FA 2X/B03..
FD 25 PA 2X/B04.. FD 25 FA 2X/B04..
FD 32 PA 2X/B06.. FD 32 FA 2X/B06..

With secondary pressure relief valve



Valve type:

FD 12 FB 2X/.B03..
FD 16 FB 2X/.B03..
FD 25 FB 2X/.B04..
FD 32 FB 2X/.B06..

Functional description, section

Check-Q-meters are used in hydraulic systems to influence the speeds of hydraulic motors and cylinders independent of the load (prevents running away). In addition there is an isolator function for pipe burst safety.

The check-Q-meter comprises basically of the housing (1), main poppet (2), pilot part (3), pilot spool (4), damping spool (5) and pilot damping (6).

Lifting the load

With free-flow from A to B the main spool (2) is opened. If the load pressure fails (e.g. pipe break between the directional valve and port A) then the main spool (2) immediately closes. This function is achieved by the connection of the load side (7) with chamber (8).

Lowering the load (circuit examples)

The direction of flow is from B to A. Port A is connected to tank via the directional valve. The piston rod side of the cylinder has a flow applied which corresponds to the working conditions. The relationship between the control pressure at port X and the load pressure at port B = 1 : 20.

When the control pressure is reached the pre-opening of the main spool takes place. Via the control spool (4) the pilot stage (3) is lifted off its seat and chamber (8) is de-compressed via this drilling and port A to tank. At the same time the load pressure in port B is no longer applied to chamber (8), this is due to the longitudinal movement of the pilot stage (3) within the main spool. The main poppet (2) is thereby unloaded. The reverse side of the control spool (4) at the main poppet (2), lies against the collar of the damping spool (5).

The pressure required at port X to open B to A is now only influenced by the spring in chamber (9). The pressure required to begin opening the connection B to A is 20 bar; to fully open the connection 50 bar is required.

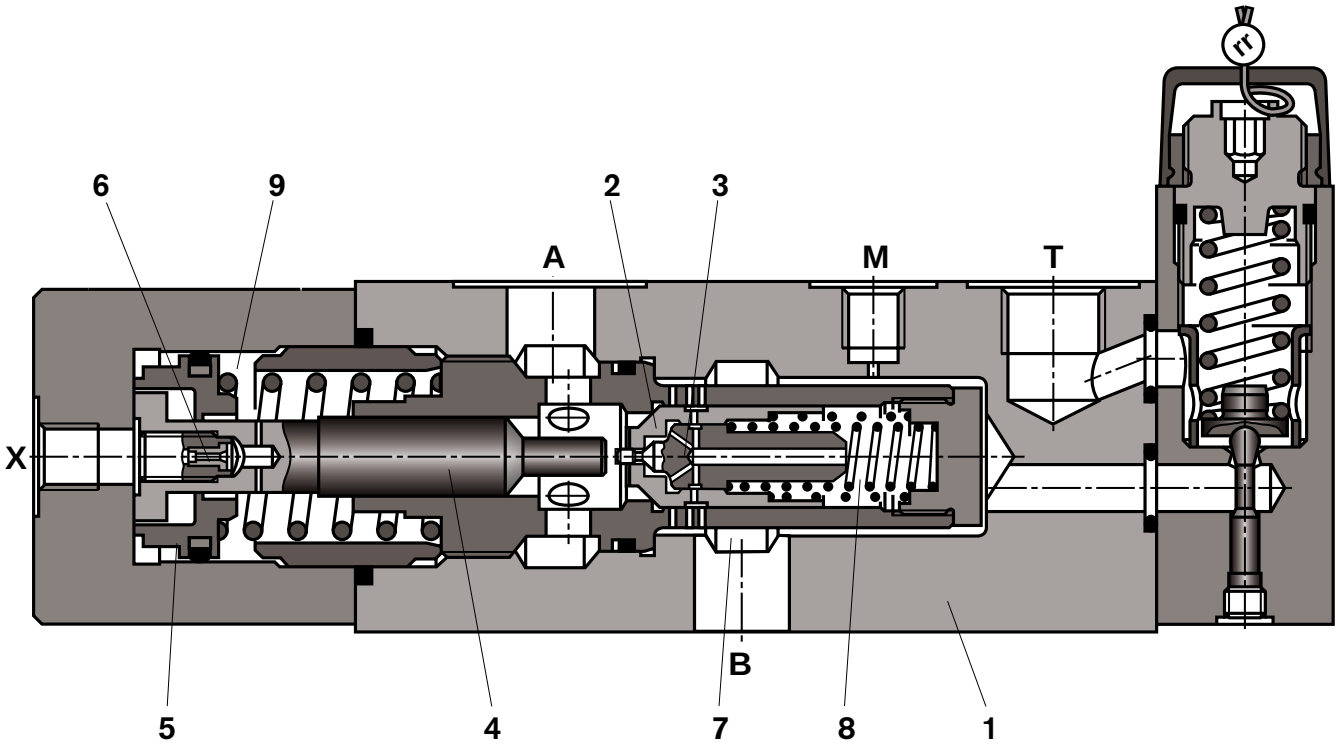
The opening cross-section for flow control increases progressively. It is created by the successive opeining of radial drillings in the bush and the main poppet (2) land.

The relationship between the control pressure, cracking pressure and differential pressure determines the flow to the actuator via the connection of B to A. Thus uncontrolled running away of the actuator is prevented.

The controlled lowering procedure is not affected even if there is a pipe burst between the directional valve and port A.

Guidelines for influencing the opening and closing times of the check-Q-meter.

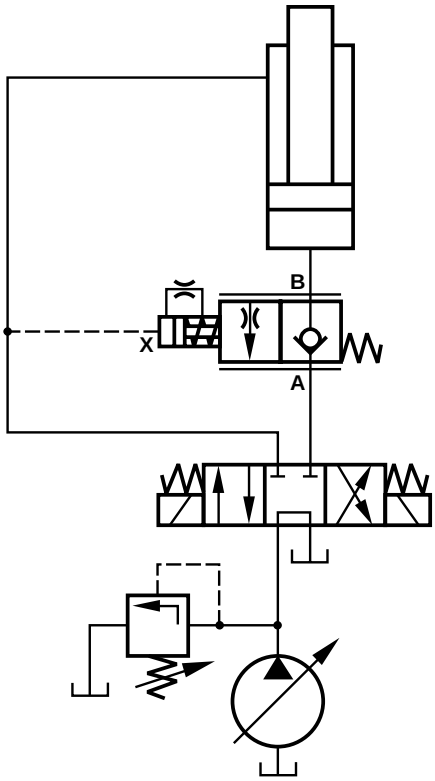
- Throttling of the opening sequence is via orifice (6) in the control spool (4) and both sides of the damping spool (5). The orifice (6) is protected by sieves.
- The closing movement of the check-Q-meter is virtually un-throttled.
- When being used in conjunction with cylinders the control line to port X can be fitted with a throttle check valve (meter-out control) to influence the closing sequence.
- When being used in conjunction with motors a throttle check valve should not be fitted in the control line to port X. In this case it is recommended that the control times of the directional valve are influenced.



Circuit examples

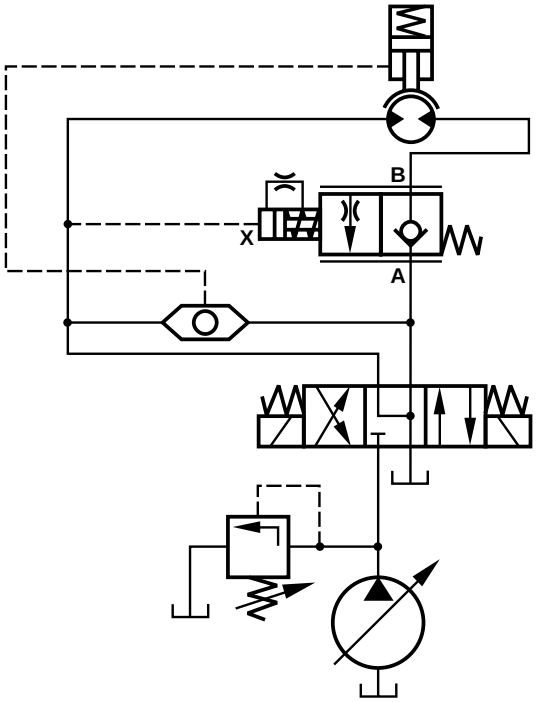
Differential cylinder

On safety grounds, a closed centre directional valve should always be used!



Hydraulic motor

So that the holding brake can operate both of the direction all valve ports have to be connected to port T in the de-energised position. If the brake is externally unloaded then it is possible to use a closed centre directional valve in the de-energised condition.

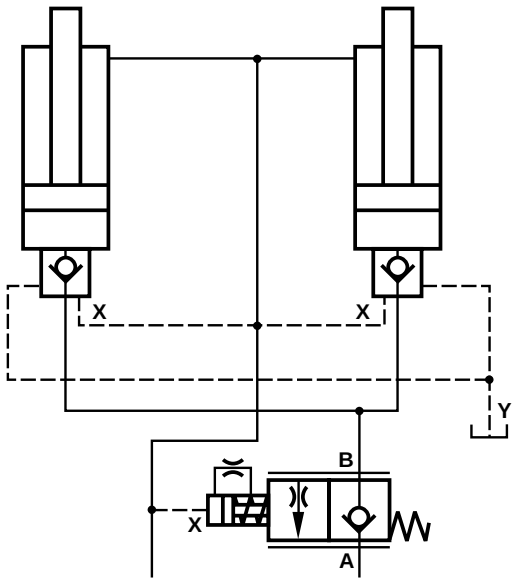


Note:

Two check-Q-meters cannot be used to control two cylinders which are forced mechanically to move together, as synchronisation and the same pressure cannot be guaranteed in each cylinder.

Therefore, the cylinders have to be equipped with two pilot operated check valves, type SL. The check-Q-meter is fitted in a common line.

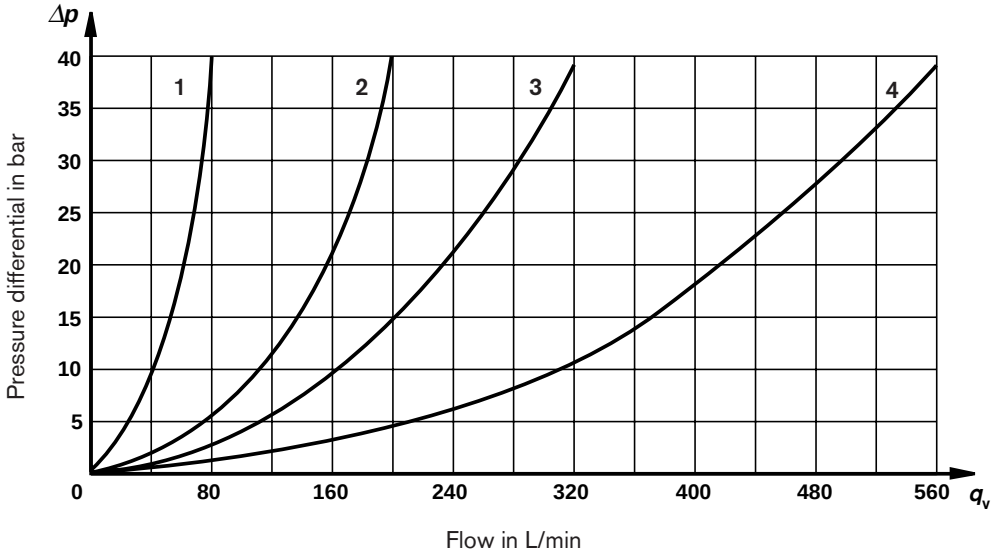
In this case, the load pressure must not exceed 200 bar!



Technical Data (For application outside these parameters, please consult us!)

Operating pressure, ports A, X	bar	up to 350
port B	bar	up to 420
Pilot pressure, port X (flow control range)	bar	min. 20 to 50, max. 350
Cracking pressure, A to B	bar	2
Setting pressure for secondary pressure relief valve	bar	up to 400
Flow	L/min	80 (size 12), 200 (size 16), 320 (size 25), 560 (size 32)
Area ratio of the pre-opening		$\frac{\text{poppet seat area}}{\text{area of pilot spool}} = \frac{1}{20}$
Pressure fluid		mineral oil to DIN 51524 (HL,HLP); phosphate ester (HFD-R)
Pressure fluid temperature range	°C	– 20 to + 80
Viscosity range	mm^2/s	10 to 800
Degree of contamination (maximum permissible		ISO 4406 (C) class 20/18/15

Characteristic curves (measured at $\nu = 41\ mm^2$ and $\vartheta = 50\ °C$)

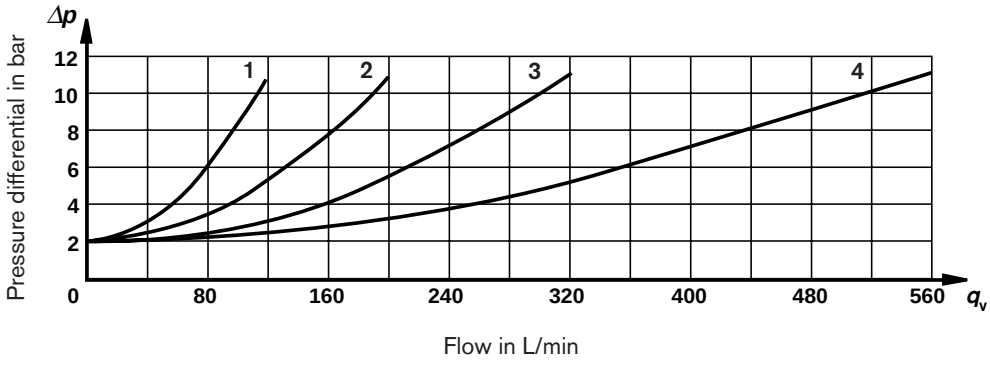


Pressure differential Δp in relation to flow q_v, measured at throttle position:

Throttle fully open ($p_x = 50$ bar)

B to A

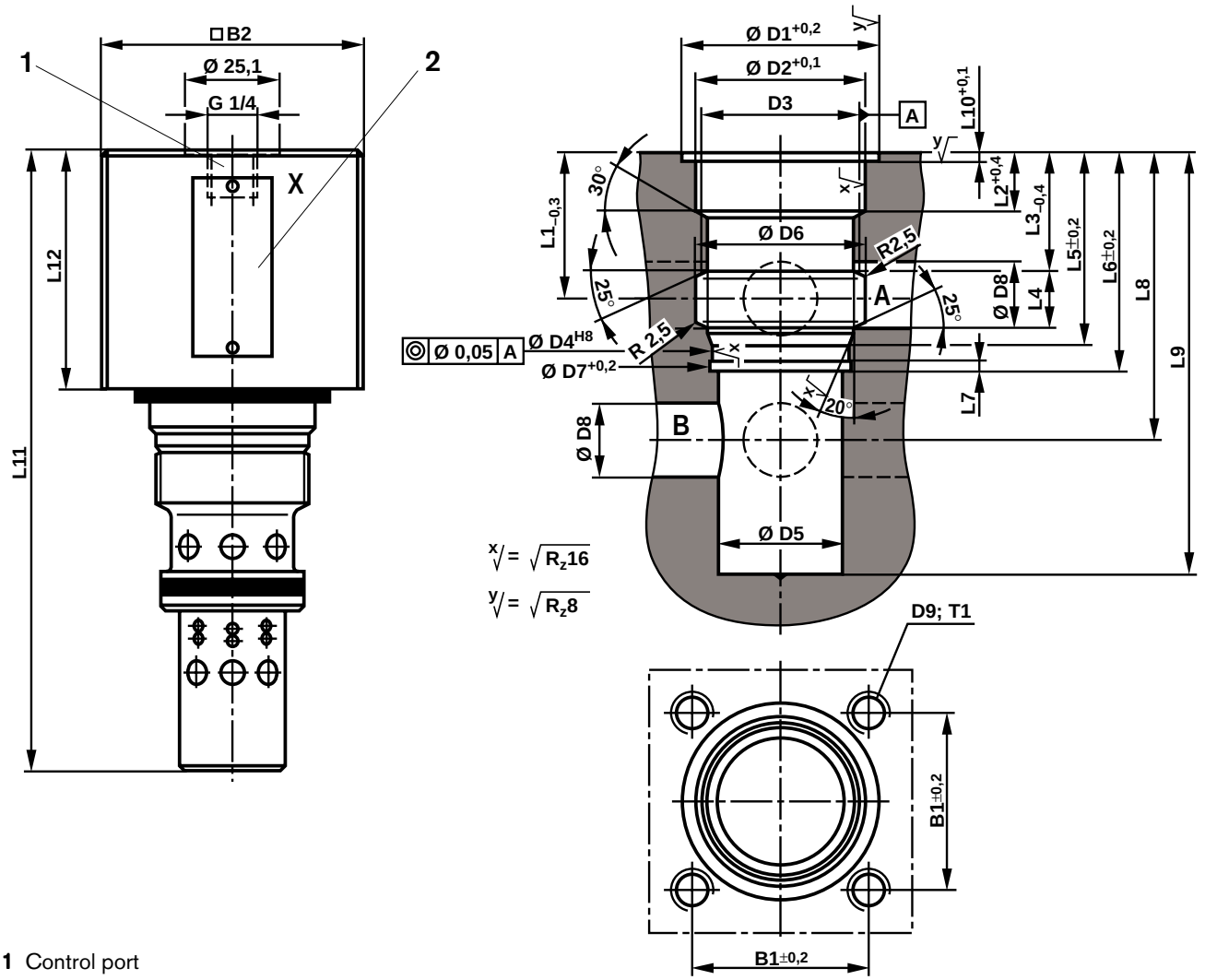
1 = size 12
2 = size 16
3 = size 25
4 = size 32



Pressure differential Δp in in relation to flow q_v, measured over the check valve

A to B

Unit dimensions: valve for assembly into manifolds (cartridge valve) (Dimensions in mm)



1 Control port

2 Name plate

Tightening torque M_A of cartridge valve:

for size 12: 65 Nm size 25: 110 Nm
size 16: 65 Nm size 32: 270 Nm

Ports A and B can be optionally arranged about the circumference.

Attention!

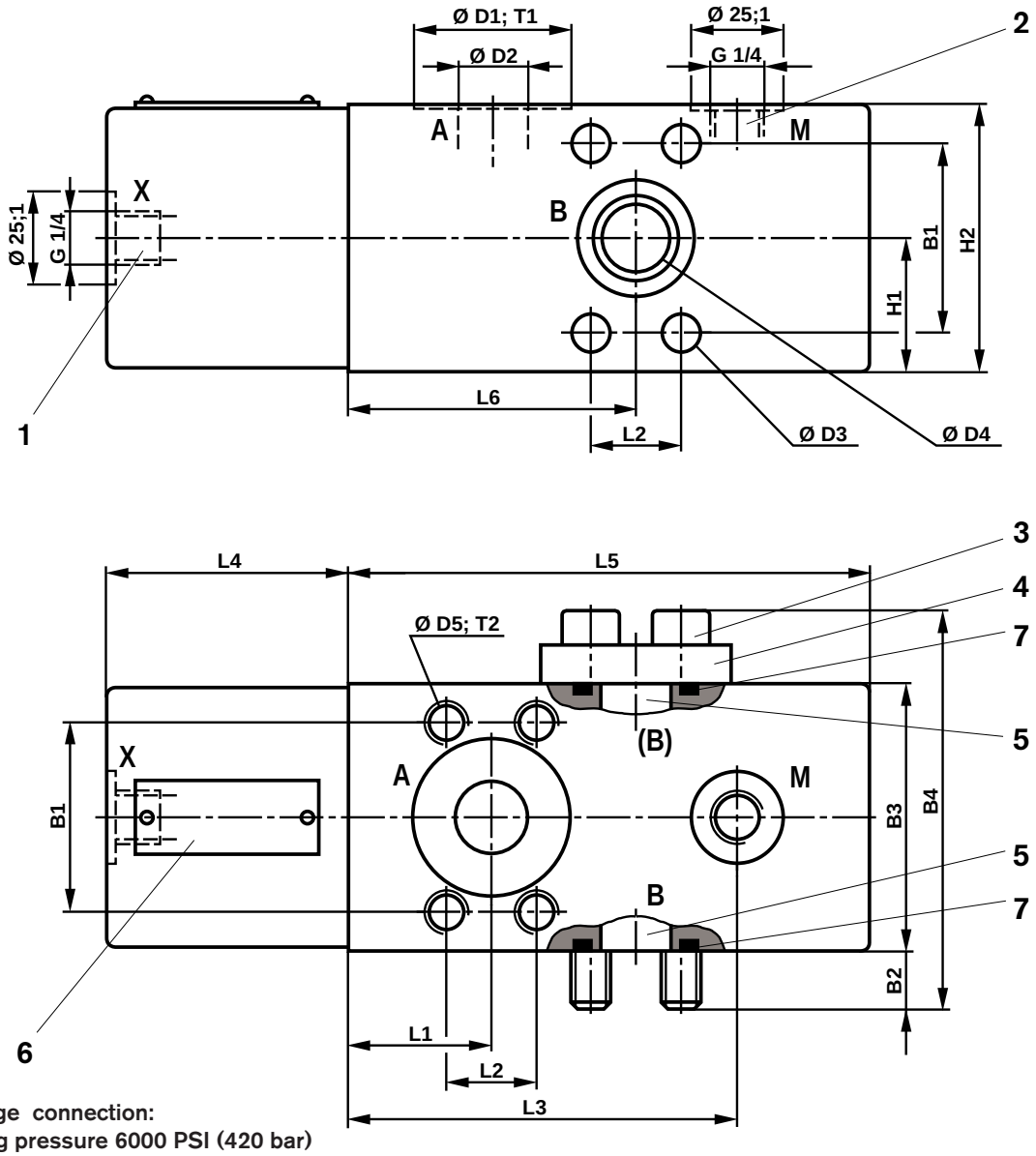
The valve fixing holes must not be damaged.

Pipe threads "G" to ISO 228/1

Type	B1	B2	D1	D2	D3	D4	D5	D6	D7	D8	D9	T1	L1	L2	L3	L4	L5	L6
FD 12 KA 2X/...	48	70	54	46	M42x2	38	34	46	38,6	16	M10	16	39	16	32	15,5	50,5	60
FD 16 KA 2X/...	48	70	54	46	M42x2	38	34	46	38,6	16	M10	16	39	16	32	15,5	50,6	60
FD 25 KA 2X/...	56	80	60	54	M52x2	48	40	60	48,6	25	M12	19	50	19	39	22	65	80
FD 32 KA 2X/...	66	95	72	65	M64x2	58	52	74	58,6	30	M16	23	52	19	40	25	71	85

Type	L7	L8	L9	L10	L11	L12	Valve fixing screws/tightening torque	M_A in Nm	Weight
FD 12 KA 2X/...	3	78	128	2,3	191	65	4 off M10 x 70 DIN 912-10.9	69	2,8 kg
FD 16 KA 2X/...	3	78	128	2,3	191	65	4 off M10 x 70 DIN 912-10.9	69	2,8 kg
FD 25 KA 2X/...	4	105	182	2,3	253	75	4 off M12 x 80 DIN 912-10.9	120	5,6 kg
FD 32 KA 2X/...	4	105	198	2,3	289	94	4 off M16 x 100 DIN 912-10.9	295	7,5 kg

Unit dimensions: for SAE flange connections, without secondary pressure relief valve (Dimensions in mm)



SAE flange connection:
Operating pressure 6000 PSI (420 bar)

Flange mounting screws and blanking flange are included within the scope of supply.

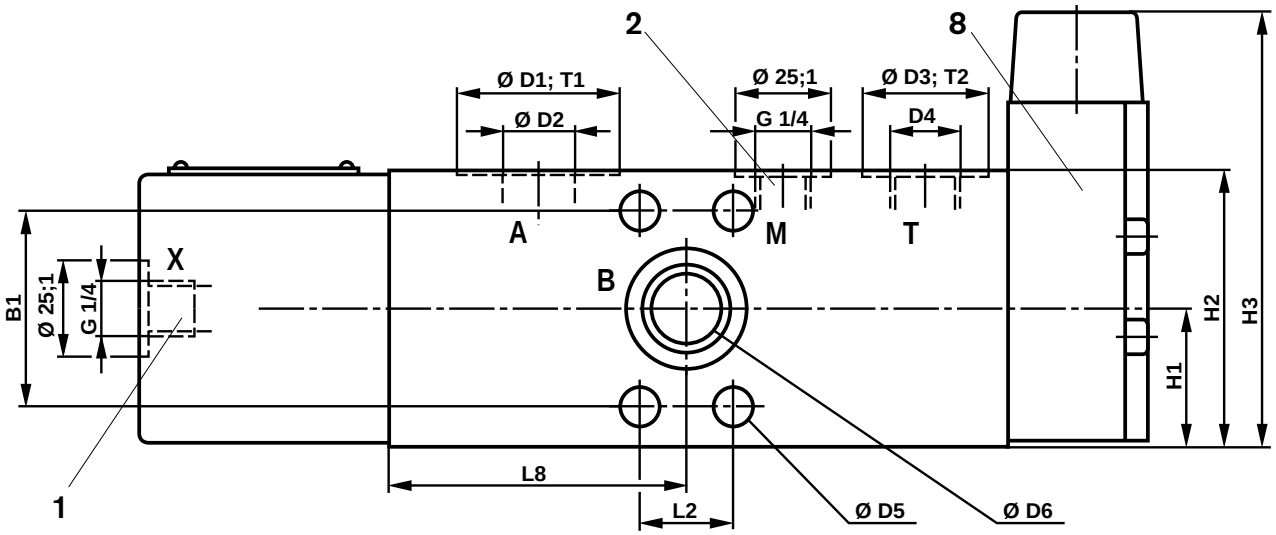
1 Control port
2 Measuring port
3 Flange fixing screws
4 Blanking flange
5 Optional port B
6 Name plate
7 O-ring

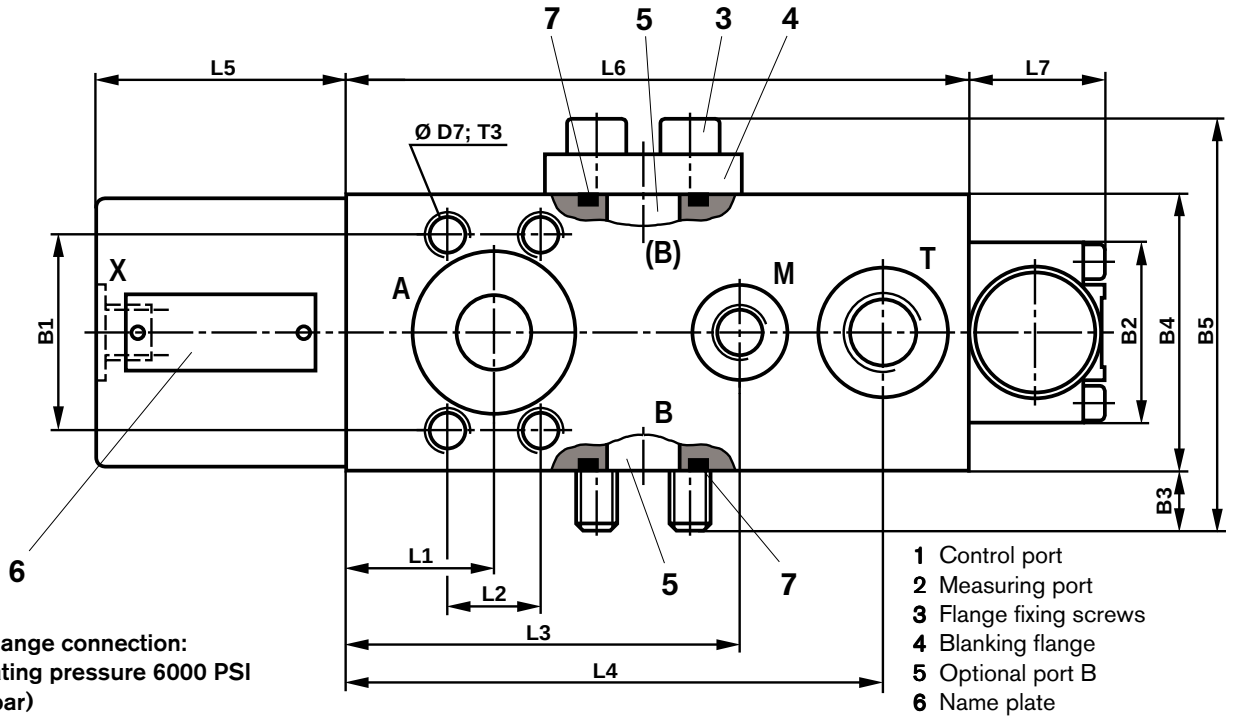
Pipe thread "G" to ISO 228/1

Type	B1	B2	B3	B4	D1	D2	D3	D4	D5	H1	H2
FD 12 FA 2X/...	50,8	16,5	72	110	43	18	10,5	18	M10	36	72
FD 16 FA 2X/...	50,8	16,5	72	110	43	18	10,5	18	M10	36	72
FD 25 FA 2X/...	57,2	14,5	90	132	50	25	13,5	25	M12	45	90
FD 32 FA 2X/...	66,7	20	105	154	56	30	15	30	M14	50	105

Type	L1	L2	L3	L4	L5	L6	T1	T2	Weight	O-ring (7)
FD 12 FA 2X/...	39	23,8	105	65	140	78	0,1	15	7 kg	25 x 3,5
FD 16 FA 2X/...	39	23,8	105	65	140	78	0,1	15	7 kg	25 x 3,5
FD 25 FA 2X/...	50	27,8	148	75	200	105	0,1	18	16 kg	32,92 x 3,53
FD 32 FA 2X/...	52	31,6	155	94	215	115	0,1	21	21 kg	37,7 x 3,53

Unit dimensions: for SAE flange connections, with secondary pressure relief valve (Dimensions in mm)





SAE flange connection:
Operating pressure 6000 PSI (420 bar)

Flange mounting screws and blanking flange are included within the scope of supply.

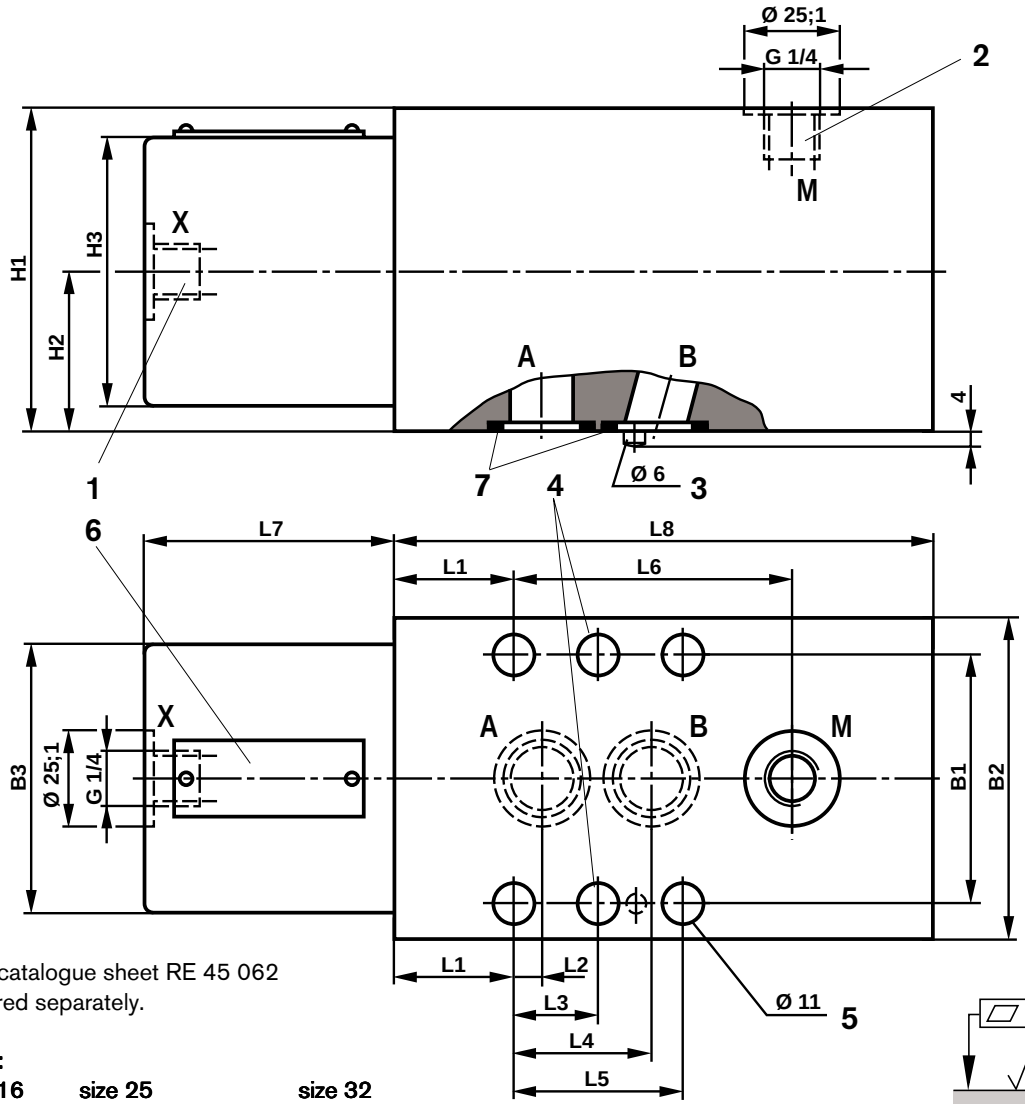
1 Control port
2 Measuring port
3 Flange fixing screws
4 Blanking flange
5 Optional port B
6 Name plate
7 O-ring
8 Secondary pressure relief valve

Pipe threads "G" to ISO 228/1

Type	B1	B2	B3	B4	B5	D1	D2	D3	D4	D5	D6	D7	H1	H2
FD 12 FB 2X/...	50,8	47	16,5	72	110	43	18	34	G 1/2	10,5	18	M10	36	72
FD 16 FB 2X/...	50,8	47	16,5	72	110	43	18	34	G 1/2	10,5	18	M10	36	72
FD 25 FB 2X/...	57,2	80	14,5	90	132	50	25	42	G 3/4	13,5	25	M12	45	90
FD 32 FB 2X/...	66,7	80	20	105	154	56	30	42	G 3/4	15	30	M14	50	105

Type	H3	L1	L2	L3	L4	L5	L6	L7	L8	T1	T2	T3	Weight	O-ring (7)
FD 12 FB 2X/...	118	39	23,8	105	141,5	65	162	38	78	0,1	1	15	9 kg	25 x 3,5
FD 16 FB 2X/...	118	39	23,8	105	141,5	65	162	38	78	0,1	1	15	9 kg	25 x 3,5
FD 25 FB 2X/...	145	50	27,8	148	198	75	225	50	105	0,1	1	18	18 kg	32,92 x 3,53
FD 32 FB 2X/...	145	52	31,6	155	215	94	240	50	115	0,1	1	21	24 kg	37,7 x 3,53

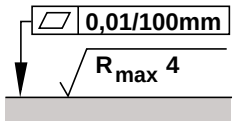
Unit dimensions: for subplate mounting (Dimensions in mm)



Subplates to catalogue sheet RE 45 062 must be ordered separately.

Subplates for:

sizes 12 and 16	size 25	size 32
G 460/01 (G 3/8)	G 412/01 (G 3/4)	G 414/01 (G 1 1/4)
G 461/01 (G 1/2)	G 413/01 (G 1)	G 415/01 (G 1 1/2)



Required surface finish of mating piece

Note!
Only use a sub-plate mounting valve for panel mounting!

1 Control port
2 Measuring port
3 Locating pin
4 Not for sizes 12,16 and 25
5 4 valve fixing holes for sizes 12, 16 and 25.
6 valve fixing holes for size 32
6 Name plate

Pipe threads “G” to ISO 228/1

Type	B1	B2	B3	H1	H2	H3	L1	L2	L3	L4	L5	L6
FD 12 PA 2X/...	66,7	85	70	85	42,5	70	31,8	7,2	–	35,8	42,9	73,2
FD 16 PA 2X/...	66,7	85	70	85	42,5	70	31,8	7,2	–	35,8	42,9	73,2
FD 25 PA 2X/...	79,4	100	80	100	50	80	38,9	11,1	–	49,2	60,3	109,1
FD 32 PA 2X/...	96,8	120	95	120	60	95	35,3	16,7	42,1	67,5	84,2	119,7

Type	L7	L8	Valve fixing screws/tightening torque	M_A in Nm	Weight	O-ring (7)
FD 12 PA 2X/...	65	140	4 off M10 x 100 DIN 912-10.9	75	9 kg	21,3 x 2,4
FD 16 PA 2X/...	65	140	4 off M10 x 100 DIN 912-10.9	75	9 kg	21,3 x 2,4
FD 25 PA 2X/...	75	200	4 off M10 x 120 DIN 912-10.9	75	18 kg	29,82 x 2,62
FD 32 PA 2X/...	94	215	6 off M10 x 140 DIN 912-10.9	75	24 kg	38 x 3

Notes

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