RE 28163
Edition: 2025-05
Replaces: 2015-07

2-way flow control valves

Type 2FRM

- Size 6
- Component series 3X
- Maximum operating pressure 350 bar
- Maximum flow 32 l/min

Features

- Porting pattern according to ISO 4401-03-02-0-05
- External closing of the pressure compensator, optional
- Check valve, optional
- 2 adjustment types, optional:
  - Rotary knob with scale
  - Lockable rotary knob with scale

Contents

Ordering code: 2-way flow control valve

01	02	03	04	05		06		07	08	09	*10*	11
2FRM	**6**			**6**	**–**	**3X**	**/**					*****

01	2-way flow control valve	**2FRM**
02	Size 6	**6**
03	With closing of the pressure compensator (suppression of the start-up jump)	**A**
	Without closing of the pressure compensator	**B** ◊

Adjustment type

04	Lockable rotary knob with scale [1]	**3** ◊
	Rotary knob with scale	**7**
05	Zero position of the marking at port P	**6**
06	Component series 30 ... 39 (30 ... 39: Unchanged installation and connection dimensions)	**3X**

Flow (A→B)

07	up to 0,2 l/min	**0,2Q**
	up to 0,6 l/min	**0,6Q**
	up to 1,5 l/min	**1,5Q**
	up to 3,0 l/min	**3Q**
	up to 6,0 l/min	**6Q**
	up to 10,0 l/min	**10Q**
	up to 16,0 l/min	**16Q**
	up to 25,0 l/min	**25Q**
	up to 32,0 l/min	**32Q**

Corrosion resistance

08	None	**no code** ◊
	Improved corrosion protection (240 h salt spray test according to EN ISO 9227); (version „7“ only)	**J3**
09	With check valve	**R** ◊
	Without check valve	**M**

Seal material (observe compatibility of seals with hydraulic fluid used, see page 7)

10	NBR seals	**no code** ◊
	FKM seals	**V**
11	Further details in the plain text	*****

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

☞ **Notice:** ◊ = Preferred type

Ordering code: Rectifier sandwich plate (only version „B“)

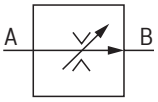
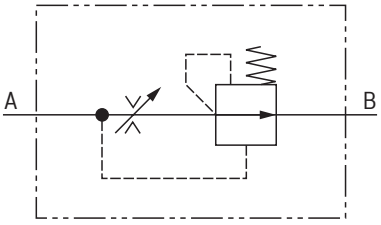
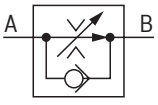
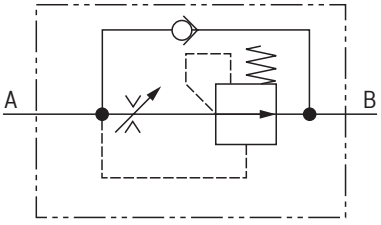
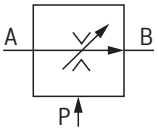
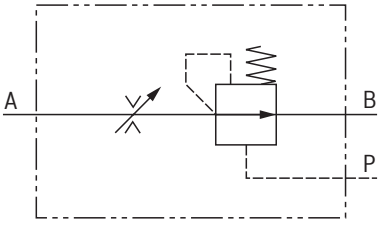
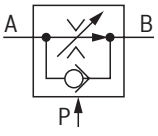
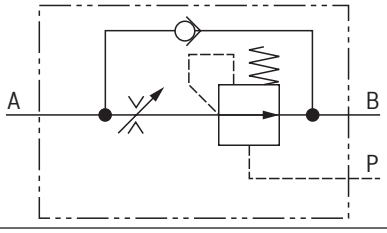
01	02		03		04	05
Z4S	**6**	**–**	**1X**	**/**		*****

01	Rectifier sandwich plate	**Z4S**
02	Size 6	**6**
03	Component series 10 ... 19 (10 ... 19: Unchanged installation and connection dimensions)	**1X**

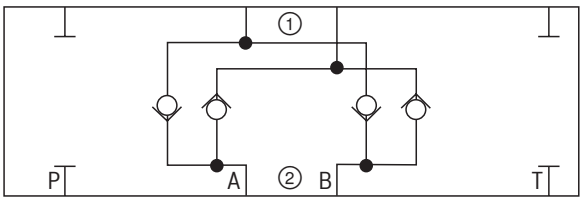
Seal material (observe compatibility of seals with hydraulic fluid used, see page 7)

04	NBR seals	**no code**
	FKM seals	**V**
05	Further details in the plain text	*****

Symbols: 2-way flow control valves

	Simplified	Detailed
Without check valve; **without** external closing Type 2FRM 6 B...M...		
With check valve; **without** external closing Type 2FRM 6 B...R...		
Without check valve; **with** external closing Type 2FRM 6 A...M...		
With check valve; **with** external closing Type 2FRM 6 A...R...		

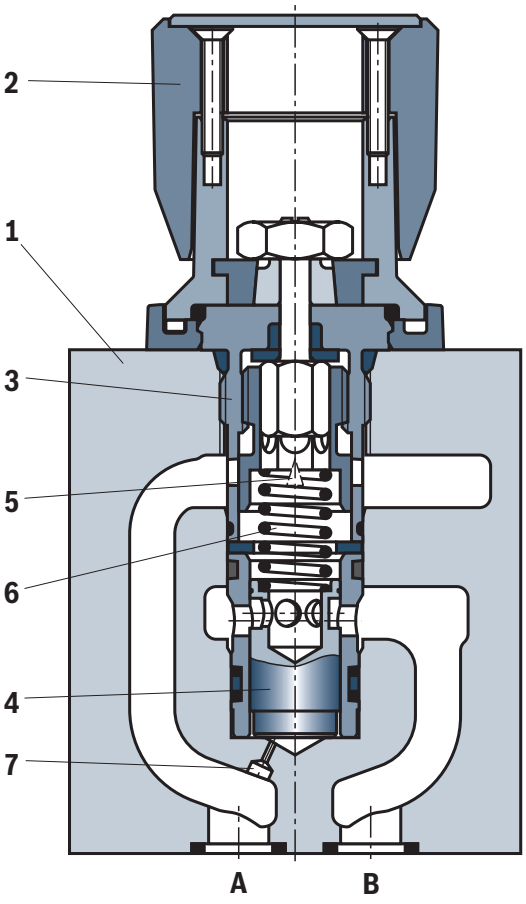
Symbol: Rectifier sandwich plate (① = component side, ② = plate side)



Function, section: Type 2FRM 6 **B**...

General
Flow control valves type 2FRM are 2-way flow control valves. They are used for maintaining a constant flow, independent of pressure and temperature.
The valves basically comprises a housing (1), a rotary knob (2), orifice bush (3), pressure compensator (4) and an optional check valve.

Version „B ... M“
(**without** external closing, **without** check valve)
The flow from channel A→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 acting in channel A applies a force to the pressure compensator (4) via nozzle (7).
The pressure compensator (4) moves into the controlled position until the forces balance. If 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/.M...

Function, section, circuit example: Type 2FRM 6 **A**...

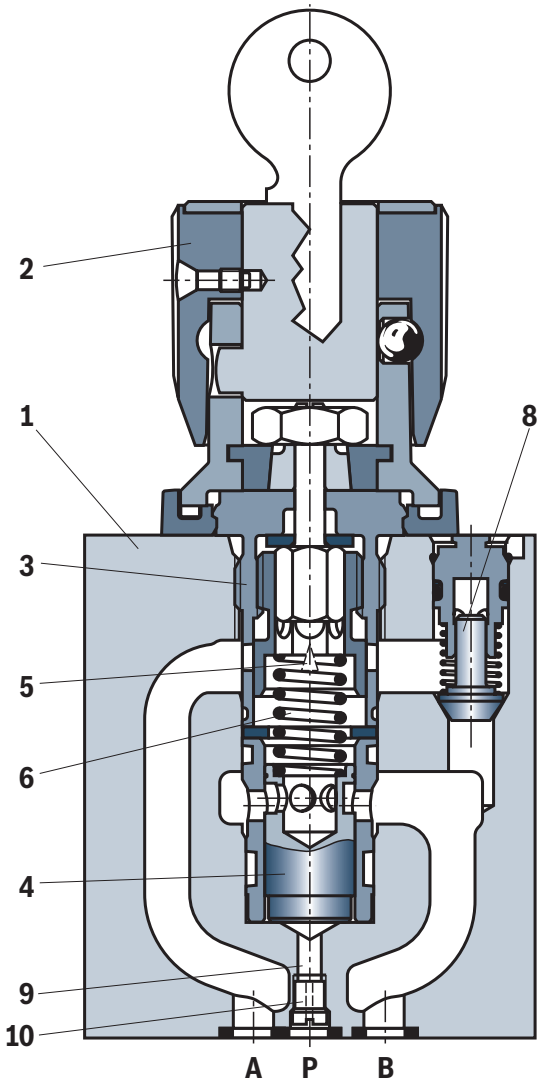
General

Flow control valves type 2FRM are 2-way flow control valve. They are used for maintaining a constant flow, independent of pressure and temperature.
The valves basically comprises a housing (1), a rotary knob (2), orifice bush (3), pressure compensator (4) and an optional check valve (8).

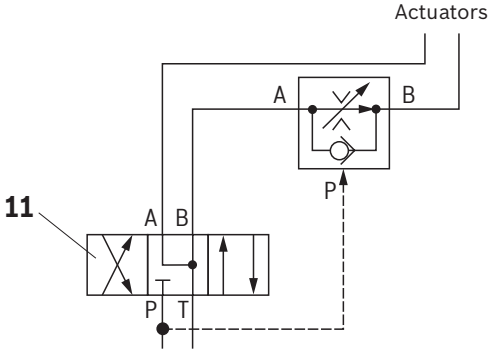
Version „A ... R“

(**with** external closing, **with** check valve)
In principle, the function of this valve corresponds to the function of version „B ... M“.
However, the flow control valve is provided with the possibility of an external closing of the pressure compensator (4) via channel P (9). The external pressure acting in channel P (9) via nozzle (10), holds the pressure compensator (4) in closed position against the compression spring (6). When the connected directional valve (11) is switched over to permit flow from P→B, control is achieved as with type „B“. Thus, a start-up jump is avoided.
This version can only be used for the supply control.
The free return flow from channel B→A is via the check valve (8).

☞ **Notice:**
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 A36-3X/..RV



Technical data: 2-way flow control valve
(For applications outside these values, please consult us!)

general		
Type of connection		Subplate mounting
Porting pattern		ISO 4401-03-02-0-05
Weight	kg	Approx. 1.3
Installation position		Any
Ambient temperature range	°C	–20 ... +80 (NBR seals) –15 ... +80 (FKM seals)

hydraulic										
Maximum operating pressure		bar	350							
Hydraulic fluid			See table page 7							
Hydraulic fluid temperature range		°C	–20 ... +80 (NBR seals) –15 ... +80 (FKM seals)							
Viscosity range		mm^2/s	10 ... 800							
Maximum admissible degree of contamination of the hydraulic fluid; cleanliness class according to ISO 4406 (c)			Class 20/18/15 [1]							
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 to 100 bar	cm^3/min	15	15	15	15	25	50	70	100	250
	▶ up to 350 bar	cm^3/min	25	25	25	25	25	50	70	100	250
Minimum pressure differential range		bar	6 ... 14							
Flow control (Pressure stable / Thermally stable) up to Δp = 350 bar		%	±2 (q_{Vmax})							

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

Technical data: 2-way flow control valve (For applications outside these values, please consult us!)

Hydraulic fluid		Classification	Suitable sealing materials	Standards	Data sheet
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM	DIN 51524	90220
Bio-degradable	▶ Insoluble in water	HETG	FKM	ISO 15380	90221
		HEES	FKM		
	▶ Soluble in water	HEPG	FKM	ISO 15380	
Flame-resistant	▶ Water-free	HFDU (glycol base)	FKM	ISO 12922	90222
		HFDU (ester base))	FKM		
		HFDR	FKM		
	▶ Containing water	HFC (Fuchs: Hydrotherm 46M, Renosafe 500; Petrofer: Ultra Safe 620; Houghton: Safe 620; Union: Carbide HP5046)	NBR	ISO 12922	90223

☞ **Important information on hydraulic fluids:**

- For further information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us.
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The ignition temperature of the hydraulic fluid used must be 50 K higher than the maximum surface temperature.
- **Bio-degradable and flame-resistant – containing water:** If components with galvanic zinc coating (e.g., version „J3“ or „J5“) or parts containing zinc are used, small amounts of dissolved zinc may get into the hydraulic system and cause accelerated aging of the hydraulic fluid. Zinc soap may form as a chemical reaction product, which may clog filters, nozzles and solenoid valves – particularly in connection with local heat input.
- **Flame-resistant – containing water**: Due to increased cavitation tendency with HFC hydraulic fluids, the life cycle of the component may be reduced by up to 30% as compared to the use with mineral oil HLP. In order to reduce the cavitation effect, it is recommended - if possible specific to the installation - to back up the return flow pressure in ports¬T to approx. 20% of the pressure differential at the component.

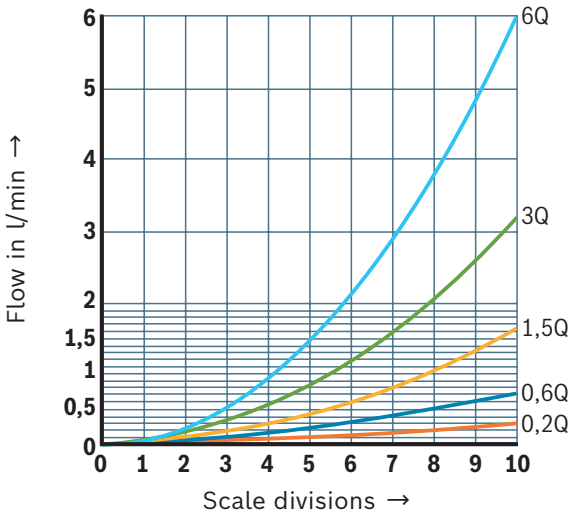
Technical data: Rectifier sandwich plate (For applications outside these values, please consult us!)

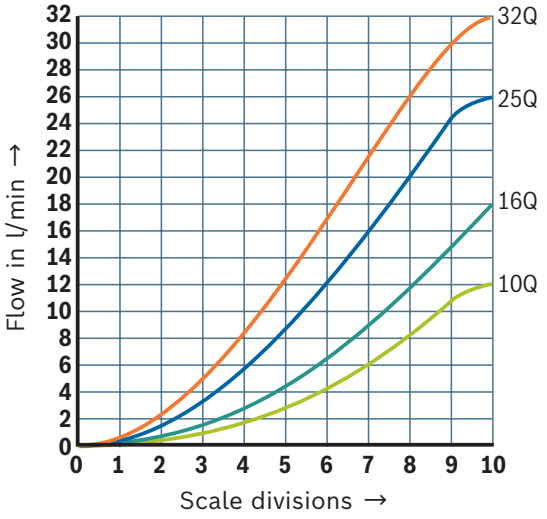
general		
Weight	kg	ca. 0,9

hydraulic		
Maximum operating pressure	bar	210
Cracking pressure	bar	0,7
Maximum flow	l/min	32

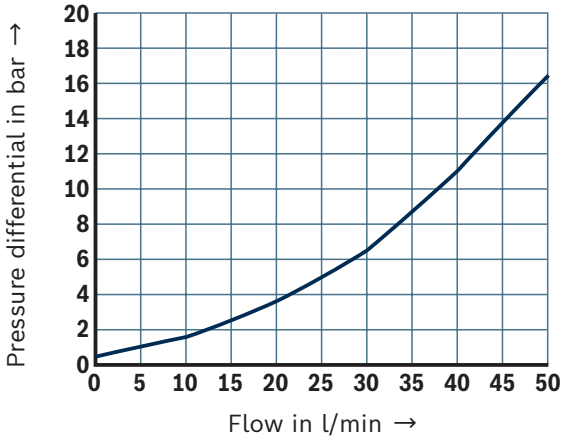
Characteristic curves
(measured with HLP46, $\vartheta_{Öl}$ = 40±5 °C)

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

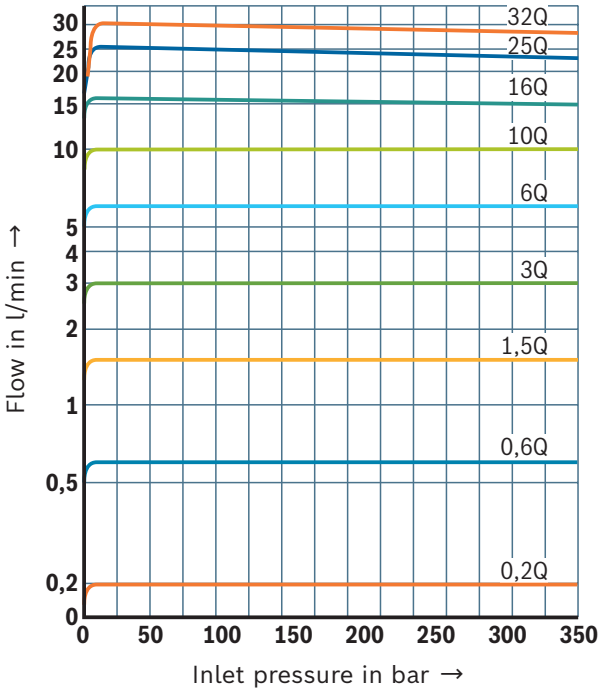




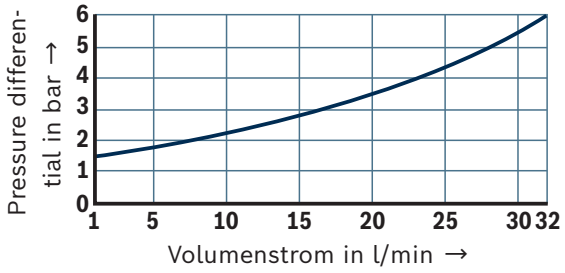
***Δp-q*$_V$ characteristic curves** via check valve B→A; (orife closed)



***p*$_E$-*q*$_V$ characteristic curves**

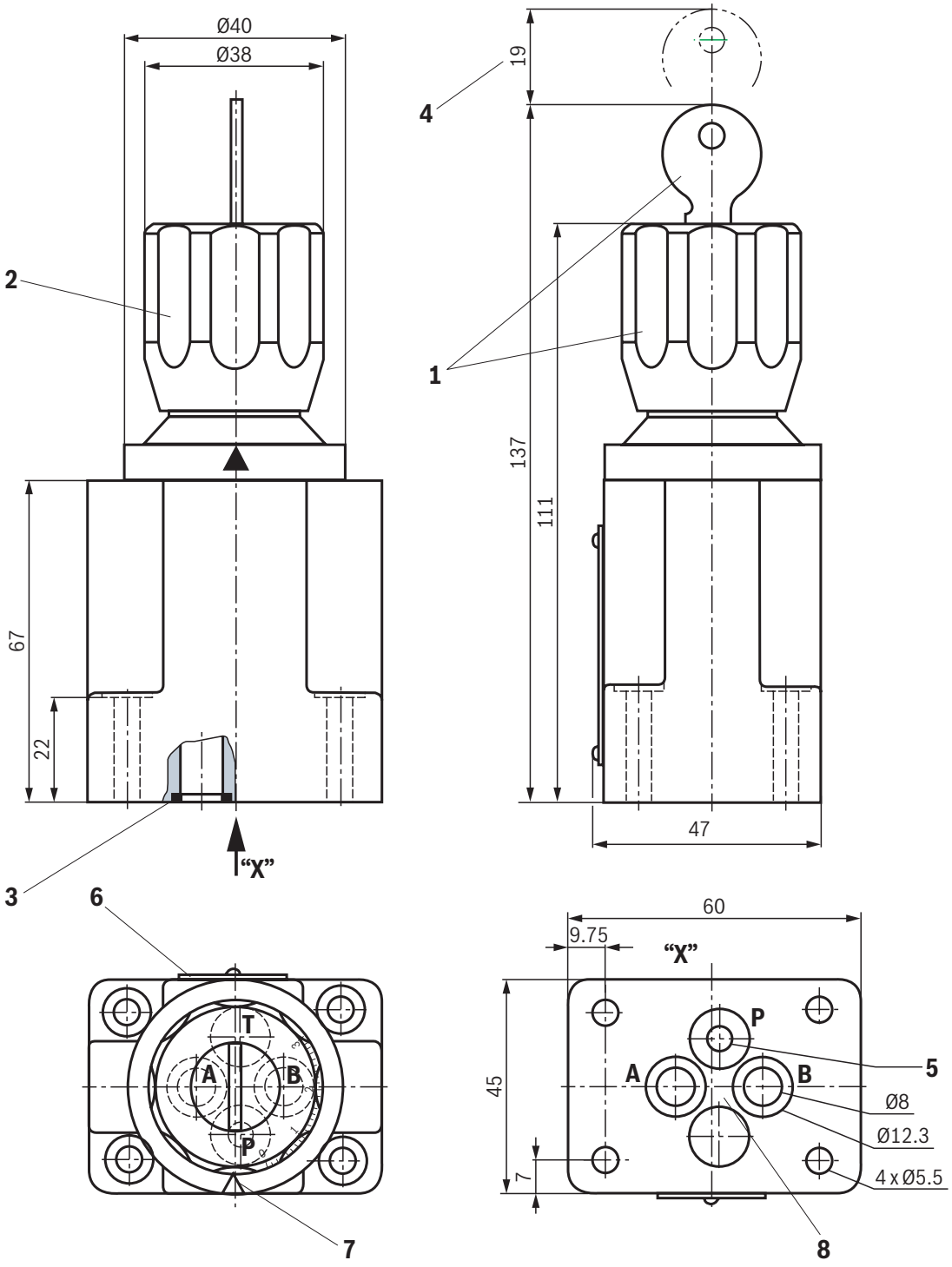


***Δp-q*$_V$ characteristic curves**
Rectifier sandwich plate

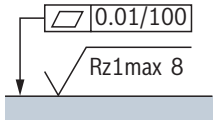


☞ **Notice:**
Typical characteristic curves which are subject to tolerance variations.

Dimensions: Subplate mounting – version „A“ and „B“ (dimensions in mm)



Item explanations, subplates und **valve mounting screws** see page 10.



Required surface quality of the valve contact surface

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

Dimensions

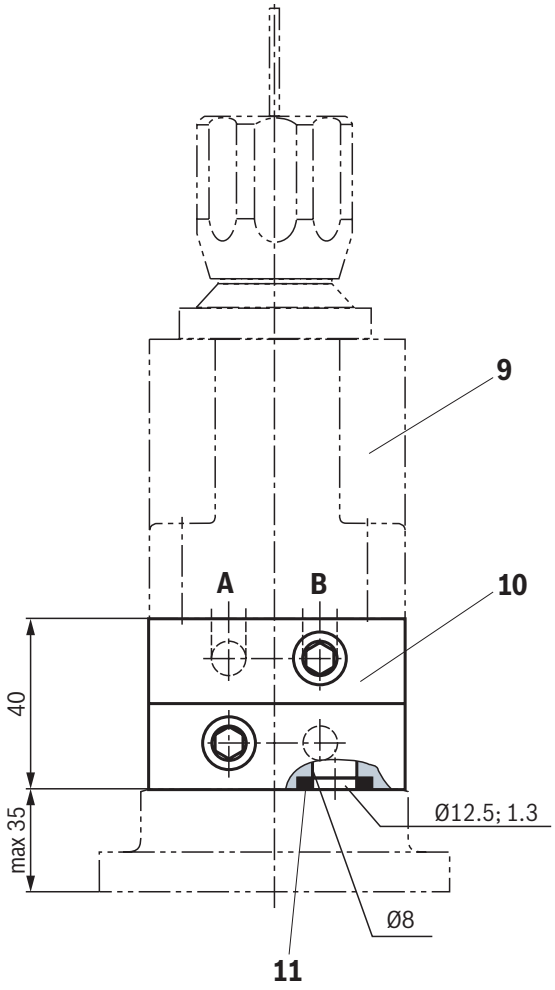
1 Adjustment type „3“ (lockable rotary knob with scale)
2 Adjustment type „7“ (rotary knob with scale)
3 Identical seal rings for ports A, B, P, and T
4 Space required to remove the key
5 Ø3 bore in version „B“ not bored (without external closing)
6 Name plate
7 Position of the marking at port P
8 Porting pattern according to ISO 4401-03-02-0-05

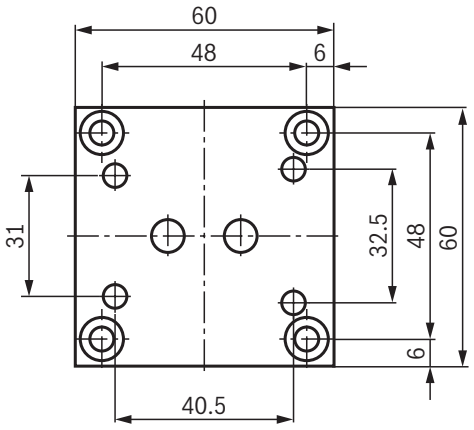
Valve mounting screws (separate order)

	Quantity	Hexagon socket head cap screws	Material number
Without rectifier sandwich plate	4	**ISO 4762 - M5 x 30 - 10.9-flZn-240h-L** Friction coefficient μ_{total} = 0,09 ... 0,14; Tightening torque M_A = 7 Nm ±10 %	**R913000316**
With rectifier sandwich plate	4	**ISO 4762 - M5 x 70 - 10.9-flZn-240h-L** Friction coefficient μ_{total} = 0,09 ... 0,14; Tightening torque M_A = 7 Nm ±10 %	**R913000325**

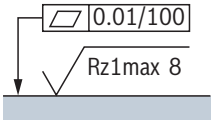
Subplates (separate order) with porting pattern according to ISO 4401-03-02-0-05 see data sheet 45100

Dimensions: Rectifier sandwich plate „Z4S 6“ (dimensions in mm)





9 2-way flow control valve
10 Rectifier sandwich plate
11 Seal ring



Required surface quality of the valve contact surface

Subplates and **valve mounting screws** see page 10.

☞ **Notices:**
- The rectifier sandwich plate „Z4S 6“ can only be used in connection with the flow control valve „2FRM 6 **B** ...“ (without closing of the pressure compensator).
- The dimensions are nominal dimensions which are subject to tolerances.

Further information

▶ Subplates	Data sheet 45100
▶ Hydraulic fluids on mineral oil basis	Data sheet 90220
▶ Environmentally compatible hydraulic fluids	Data sheet 90221
▶ Flame-resistant, water-free hydraulic fluids	Data sheet 90222
▶ Flame-resistant hydraulic fluids – containing water (HFAE, HFAS, HFB, HFC)	Data sheet 90223
▶ Hydraulic valves for industrial applications	Operating instructions 07600-B
▶ Information on available spare parts	www.boschrexroth.com/spc

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