

RE 29 188/11.02

Replaces: 11.98

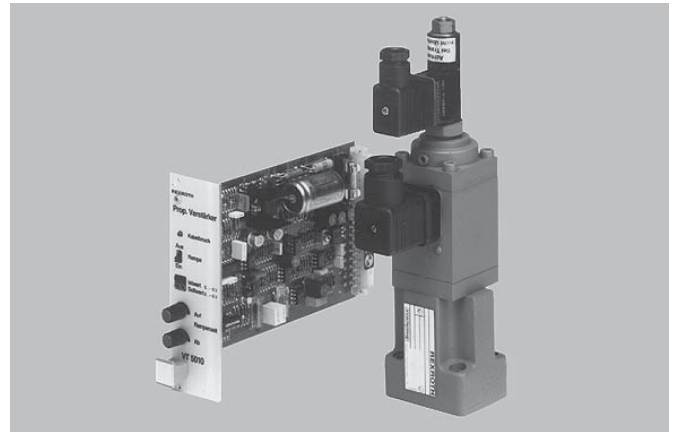
**Proportional flow control valve
of 2-way version
Type 2FRE 6...**

Nominal size 6

Series 2X

Maximum operating pressure 210 bar

Maximum flow 25 L/min



Type 2FRE 6 B-2X/K4 with plug-in connector and associated control electronics (separate order)

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Features

- Valve with a pressure compensator for the pressure compensated control of a flow
- Operation via a proportional solenoid
- For subplate mounting:
Porting pattern to DIN 24 340 Form A,
ISO 4401 and CETOP-RP 121 H
Subplates to catalogue sheet RE 45 052
(separate order), see page 10
- With electrical position feedback of the control orifice
- The position transducer coil can be axially moved making the zero point adjustment of the control orifice easy, without having to touch the electronics (electrical-hydraulic)
- Minimum sample variation of the valve and electrical amplifiers VT 5010 (analogue), VT-VRPD-1 (digital) and VT 11033 (modul) (separate order), see page 6
- Flow control is possible in both directions by using a rectifier sandwich plate



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Ordering details

Proportional flow control valve

2FRE		6	-2X/	K4	V	*
Nominal size 6		= 6				Further details in clear text
With external closing of the pressure compensator (suppression of start-up jump)		= A			V =	FKM seals, suitable for mineral oil (HL, HLP) to DIN 51 524
Without external closing of the pressure compensator		= B			R =	With check valve
Series 20 to 29 (20 to 29: unchanged installation and connection dimensions)		= 2X			M =	Without check valve
Flow range A → B						
Linear:						
	Up to 1 L/min	= 1L				
	Up to 2 L/min	= 2L				
	Up to 8 L/min	= 8L				
Progressive:						
	Up to 3 L/min	= 3Q				
	Up to 6 L/min	= 6Q				
	Up to 10 L/min	= 10Q				
	Up to 16 L/min	= 16Q				
	Up to 25 L/min	= 25Q				
Progressive with fast feed						
Fine control range up to 2 L/min		= 2QE				
				K4 =	With component plug to DIN 43 650-AM2 for proportional solenoid and GSA20 Manufacturer Hirschmann for the position transducer	
					Without plug-in connector Plug-in connector – separate order, see page 7	

Rectifier sandwich plate

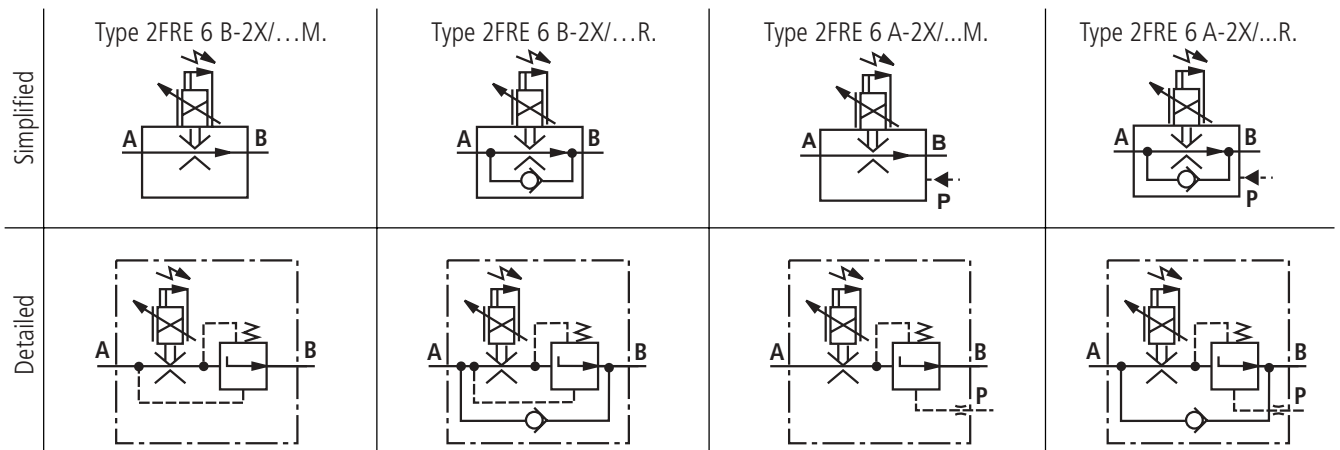
Z4S		6	-1X /	V	*	
Nominal size 6		= 6				Further details in clear text
Series 10 to 19 (10 to 19: unchanged installation and connection dimensions)		= 1X				
FKM seals, suitable for mineral oil (HL, HLP) to DIN 51 524				= V		

Preferred types

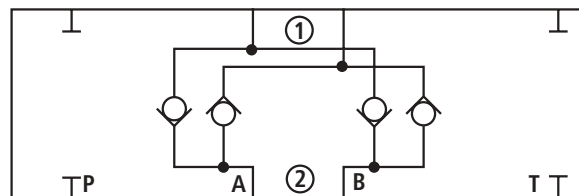
Material No.	Type
R900947600	2FRE 6 B-2X/1LK4RV
R900934070	2FRE 6 B-2X/8LK4RV
R900949563	2FRE 6 B-2X/10QK4RV
R900937871	2FRE 6 B-2X/25QK4RV
R900954501	2FRE 6 B-2X/2QEK4RV

Symbols

Proportional flow control valve (simplified, detailed)



Rectifier sandwich plate (① = component side, ② = subplate side)



Function, section

The type 2FRE 6... proportional flow control valves have a 2-way function. They can, from an applied electrical command value, regulate flow which is pressure and temperature compensated.

They basically comprise of the housing (1), proportional solenoid with inductive position transducer (2), measuring orifice (3), pressure compensator (4) as well as the optional check valve (5).

Proportional flow control valve type 2FRE 6 B-2X/.K4RV

(without external closing, with check valve)

The setting of the flow is determined (0 to 100 %) at the command value potentiometer. The applied command value adjusts, via the amplifier as well as the proportional solenoid, the measurement orifice (3). The position of the measurement orifice (3) is obtained by the inductive position transducer. Any deviations from the command value are compensated for by the feedback control.

The pressure compensator (4) holds the pressure drop at the measurement orifice (3) at a constant value. The flow is therefore load compensated.

The small temperature drift is achieved due to the design of the measurement orifice.

At a 0 % command value the measurement orifice is closed.

In the case of a loss of power or a cable break at the position transducer the measurement orifice closes.

From a 0 % command value a jump free start is possible. Via two ramps within the electrical amplifier, it is possible to delay the opening and closing of the measurement orifice.

Via the check valve (5) free-flow is possible from B to A.

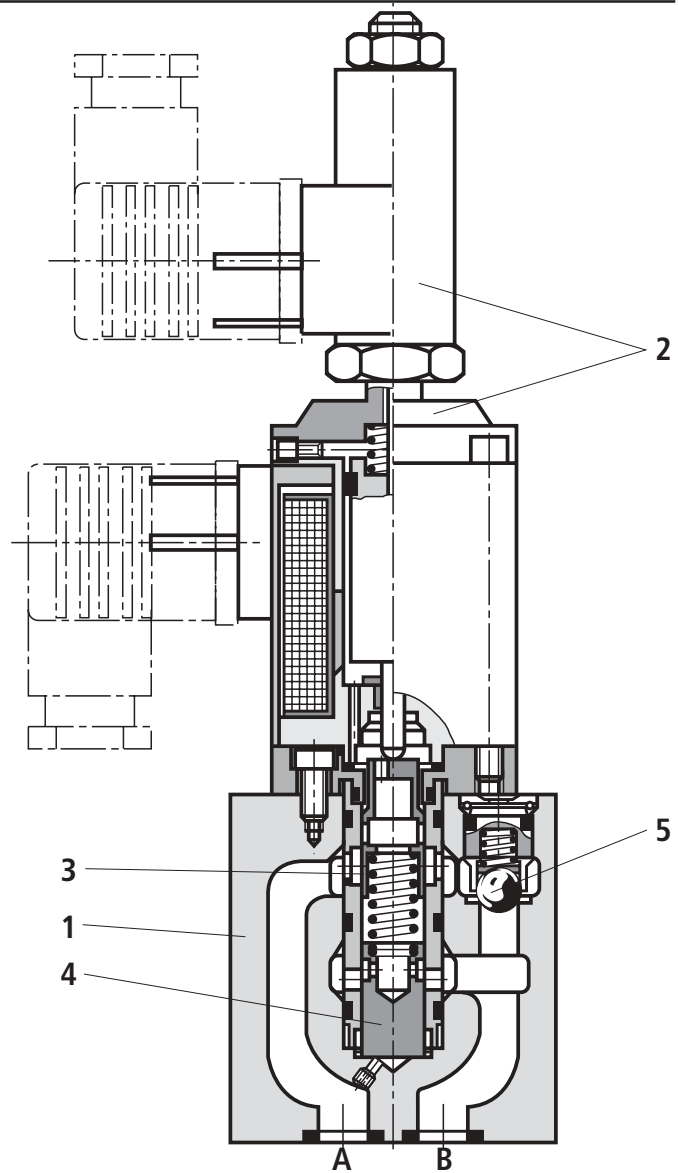
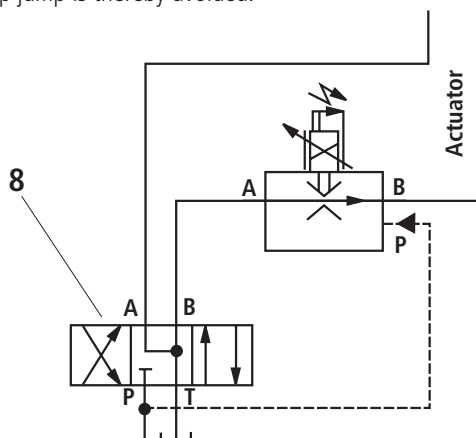
With an additional rectifier sandwich plate type Z4S 6... which is fitted under the proportional flow control valve, it is possible to control the flow too and from the actuator.

Proportional flow control valve type 2FRE 6 A-2X/.K4MV

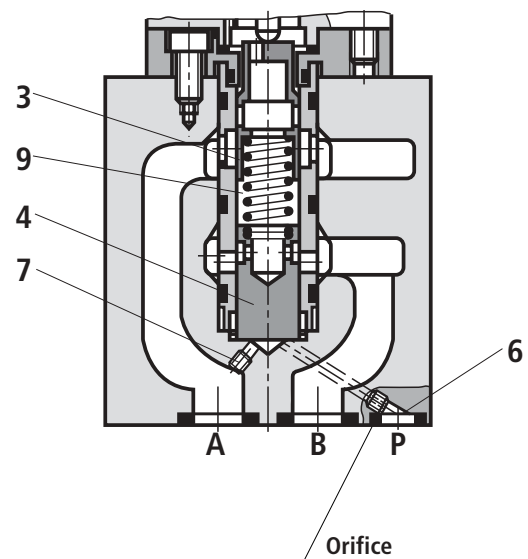
(with external closing, without check valve)

The function of this valve is in principle the same as valve type 2FRE 6 B-2X/.K4RV.

To suppress the start-up jump when the measurement orifice (3) (command value > 0 %) is open, there is provision for the pressure compensator (4) to be held closed via port P (6). The internal connection (7) between port A and the pressure compensator (4) is plugged. Via the external port P (6) the pressure in port P, before the directional valve (8) acts on the pressure compensator (4) and holds it against the spring force (9) in the closed position. If the directional valve (8) is switched over from P to B, then the pressure compensator (4) moves from the closed position into the regulating position and the start-up jump is thereby avoided.



Type 2FRE 6 B-2X/.K4RV



Type 2FRE 6 A-2X/.K4MV

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

General

Installation	Optional		
Storage temperature range	°C	- 20 to + 80	
Ambient temperature range	°C	- 20 to + 50	
Weight	Proportional flow control valve	kg	1.8
	Rectifier sandwich plate	kg	0.9

Hydraulic (measured with HLP46 and at $\vartheta_{oil} = 40^{\circ}\text{C} \pm 5^{\circ}\text{C}$)

Max. permissible operating pressure, port A		bar	Up to 210									
Flow	Type		1L	2L	8L	3Q	6Q	10Q	16Q	25Q	2QE	
	$q_{V\ max.}$	L/min	1	2	8	3	6	10	16	25	25	
	$q_{V\ min.}$	Up to 100 bar	cm ³ /min	25	25	50	15	25	50	70	100	15
		Up to 210 bar	cm ³ /min	25	25	50	25	25	50	70	100	25
Max. leakage flow at command value 0 % (measured at $v = 41\ \text{mm}^2/\text{s}$ and $\vartheta = 50^{\circ}\text{C}$)	$\Delta p\ A \rightarrow B$	50 bar	cm ³ /min	4	4	6	4	4	6	7	10	4
		100 bar	cm ³ /min	5	5	8	5	5	8	10	15	5
		210 bar	cm ³ /min	7	7	12	7	7	12	15	22	7
Minimum pressure differential		bar	6 to 10									
Δp free return flow B \rightarrow A			See diagram on page 9									
Pressure flow relationship: inlet/outlet pressure			See diagram on page 9									
Temperature relationship Temperature drift, hydraulic and electrical			See diagram on page 9									
Pressure fluid			Mineral oil (HL, HLP) to DIN 51 524 Other pressure fluids on request!									
Cleanliness class to ISO code			Maximum permissible degree of contamination of the pressure fluid is to ISO 4406 (C) class 20/18/15 ¹⁾									
Pressure fluid temperature range		°C	20 to + 80									
Viscosity range		mm ² /s	15 to 380									
Hysteresis		%	< ± 1 at $q_{V\ max}$									
Repeatability		%	< 1 at $q_{V\ max}$									
Sample spread	Valve 2FRE 6...	%	$\leq \pm 3\%$ for command value 33 % $\leq \pm 5\%$ for command value 100 %									
	Amplifier VT 5010	%	< 0.5									

Hydraulic, rectifier sandwich plate

Operating pressure	bar	Up to 210
Opening pressure	bar	0.7
Nominal flow	L/min	25

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.

Technical data (for applications outside these parameters, please consult us!)**Electrical, proportional solenoid**

Protection to DIN 40 050	IP 65 ²⁾		
Voltage type	DC		
Coil resistance	Cold value at 20 °C	Ω	5.4
	Max. warm value	Ω	8.2
Duty	Continuous		
Max. current per solenoid	A	1.5	
Electrical connection	With component plug to DIN 43 650-AM2		
	Plug-in connector to DIN 43 650-AF2/Pg11 ¹⁾		

Electrical, inductive position transducer

Protection to DIN 40 050	IP 65 ²⁾		
Coil resistance at 20 °C (also see page 6)	Total coil resistance between	1 and 2	2 and and 1
		31.5	45.5 \pm \pm 31.5
Electrical connection	With component plug GSA, manufacturer Hirschmann		
	Plug-in connector GM209N (Pg9), manufacturer Hirschmann ¹⁾		
Inductivity	mH	6 to 8	
Oscillator frequency	kHz	2.5	
Electrical position measuring system	Differential throttle		
Nominal stroke	mm	3.5	

Control electronics (separate order)

Associated amplifier in Eurocard format	Type VT 5010 to catalogue sheet RE 29 945
	Type VT-VRPD-1 to catalogue sheet RE 30 125
Associated amplifier module	Type VT 11033 to catalogue sheet RE 29 774

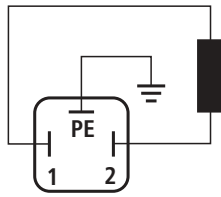
¹⁾ Separate order, see page 7

²⁾ Due to the occurring surface temperature of the solenoid coils, the European Standards EN563 and EN982 must be taken into account!

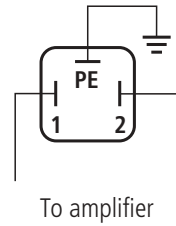
Electrical connections

Proportional solenoid

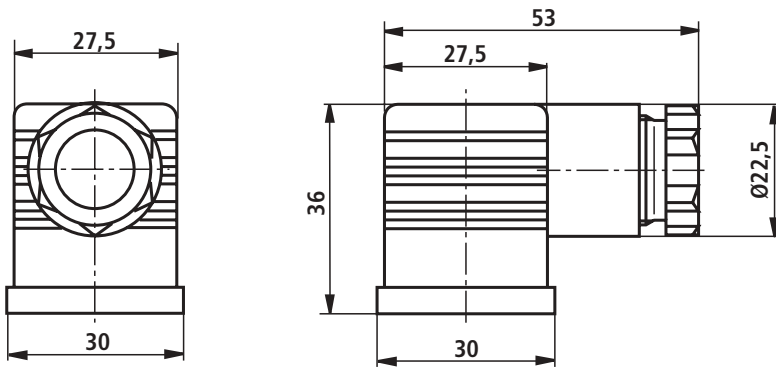
Connections on component plug



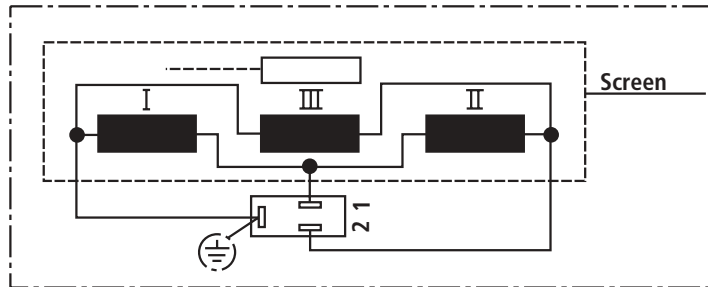
Connections on plug-in connector



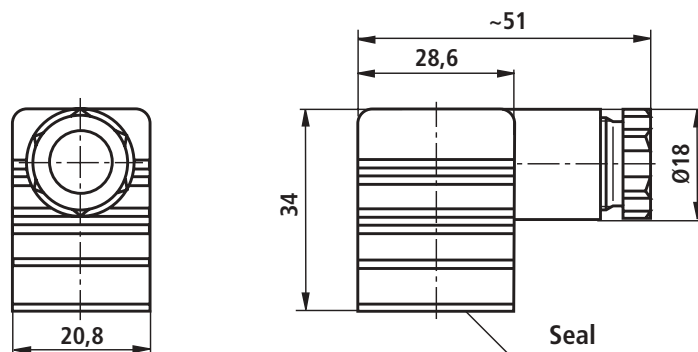
Plug-in connector to DIN 43 650-AF2/Pg11
Separate order under Material No. **R900074684**
(plastic version)



Inductive position transducer



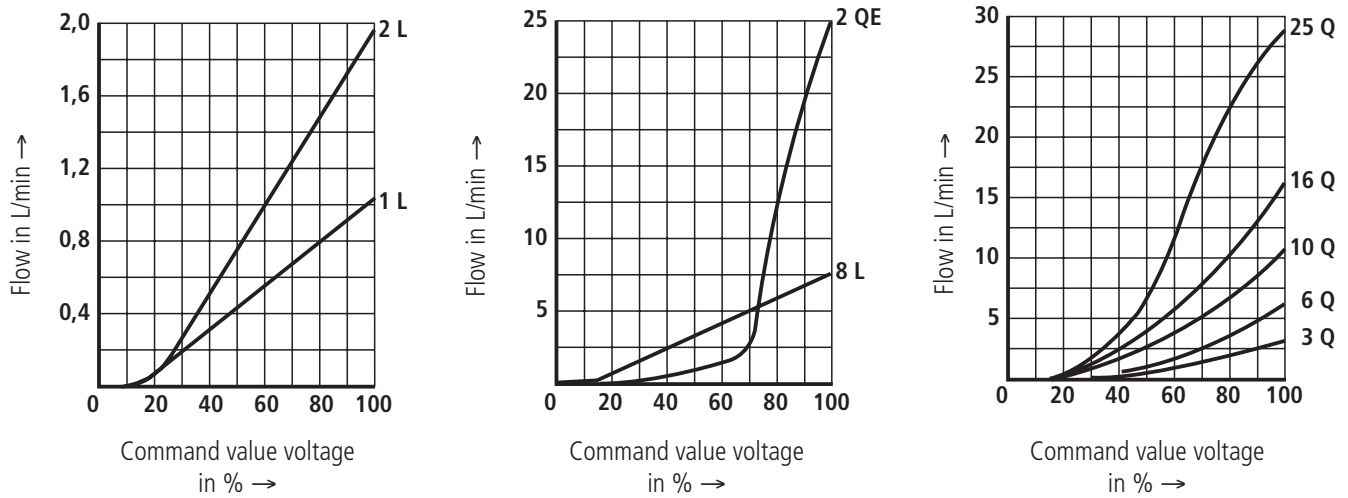
Plug-in connector GM209N (Pg9), manufacturer Hirschmann
Separate order under Material No. **R900013674**
(plastic version)



Characteristic curves (measured with HLP46 and with $\vartheta_{oil} = 40^{\circ}\text{C} \pm 5^{\circ}\text{C}$)

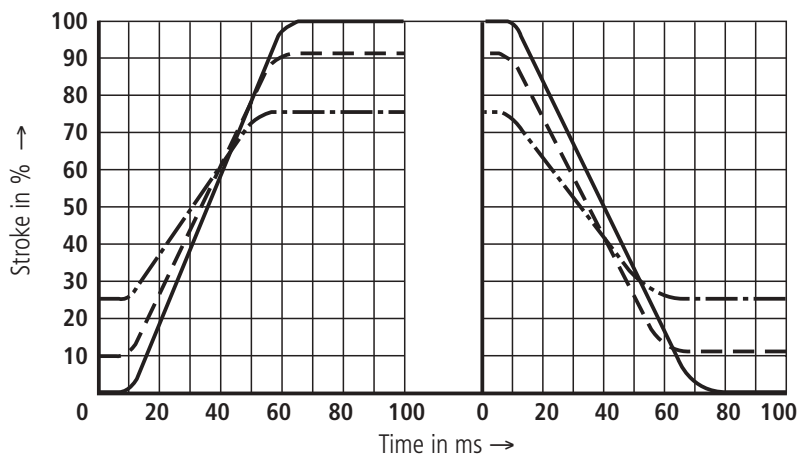
Relationship of the flow to the command value

(flow control from A \rightarrow B); $p_{nom} = 50$ bar



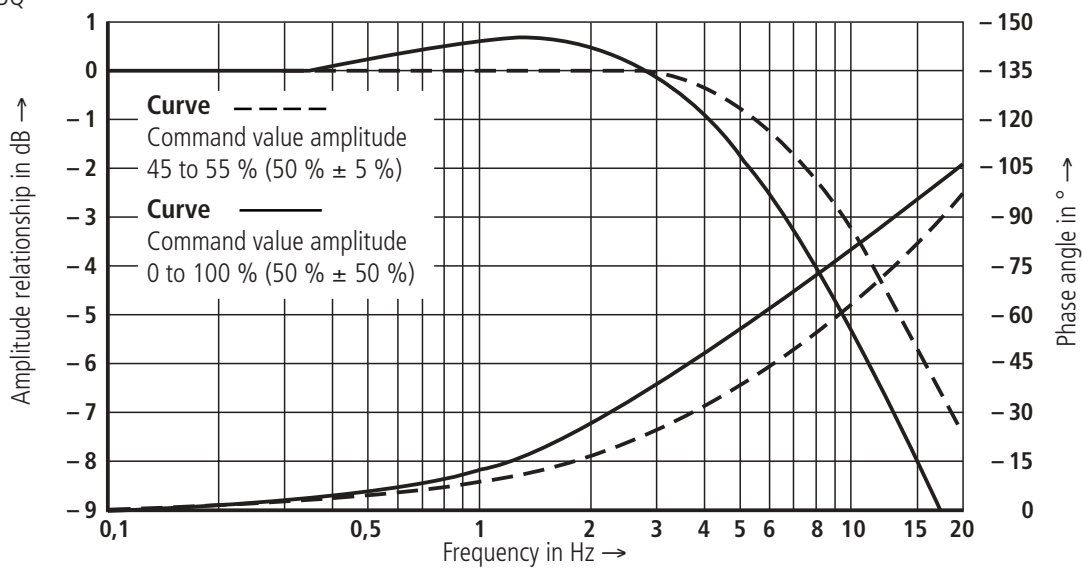
Transient function

With a stepped form of command value change; $p_{nom} = 100$ bar; valve type 25Q



Frequency response characteristic curves; $p_{nom} = 100$ bar;

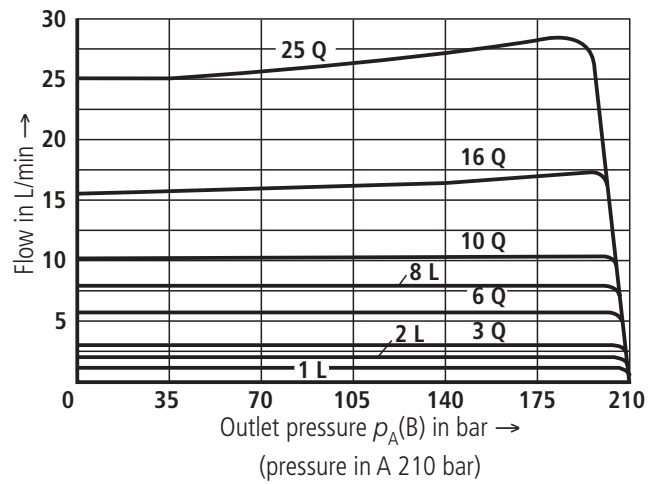
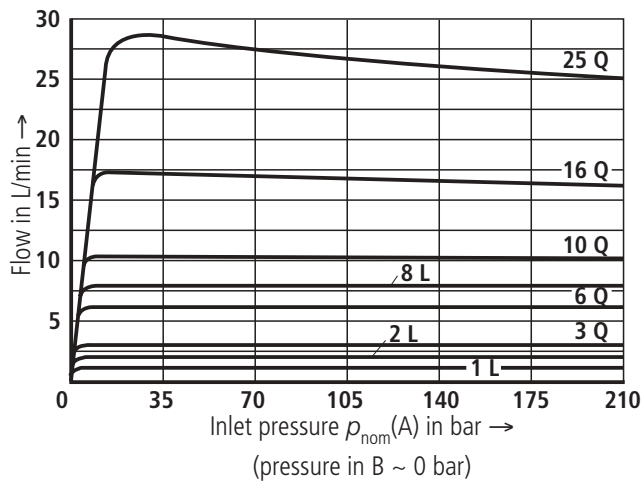
valve type 25Q



Characteristic curves (measured with HLP46 and with $\vartheta_{oil} = 40^{\circ}\text{C} \pm 5^{\circ}\text{C}$)

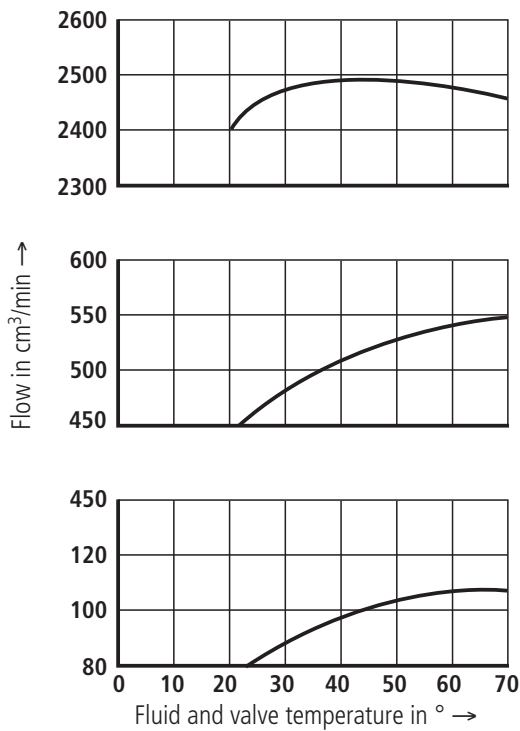
Proportional flow control valve

Pressure-flow relationship



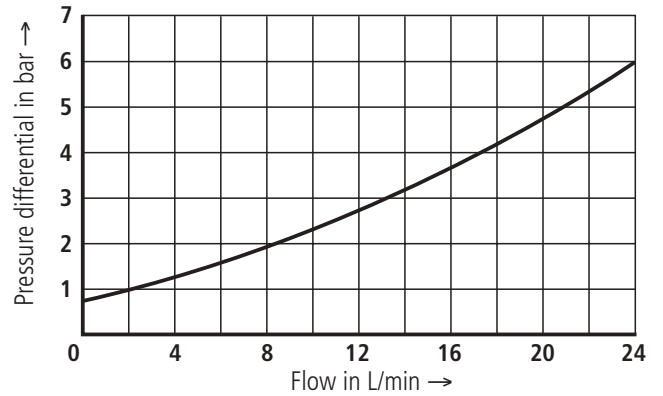
Temperature relationship

At $\Delta p = 30$ bar



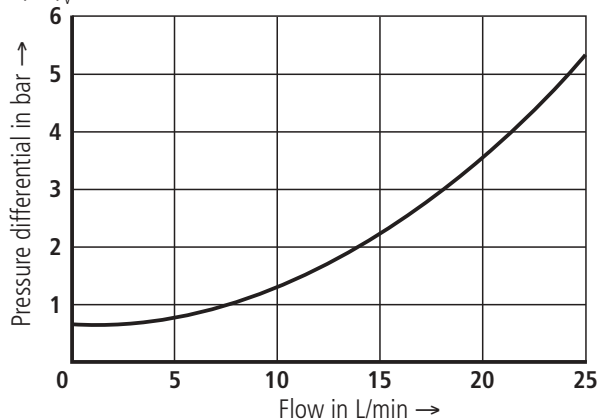
Pressure differential over the check valve B → A

Orifice closed



Rectifier sandwich plate

Δp - q_V -characteristic curve



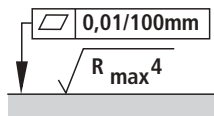
Unit dimensions (dimensions in mm)

- 1 Valve housing
- 2 Proportional solenoid with inductive position transducer
- 3.1 Plug-in connector to DIN 43 650-AF2/Pg11, separate order, see page 7
- 3.2 Plug-in connector GM209 (Pg9), manufacturer Hirschmann; separate order, see page 7
- 4 Space required to remove the plug-in connector
- 5 Valve fixing screws (separate order)
 - Without rectifier sandwich plate
M5 x 30 DIN 912-10.9; $M_A = 8.9$ Nm
 - With rectifier sandwich plate
M5 x 70 DIN 912-10.9; $M_A = 8.9$ Nm
- 6 R-ring 9.81 x 1.50 x 1.78 (ports A, B, P and blind hole)
- 7 Port A
- 8 Port B
- 9 Blind hole $\varnothing 12.6$
- 10 Name plate

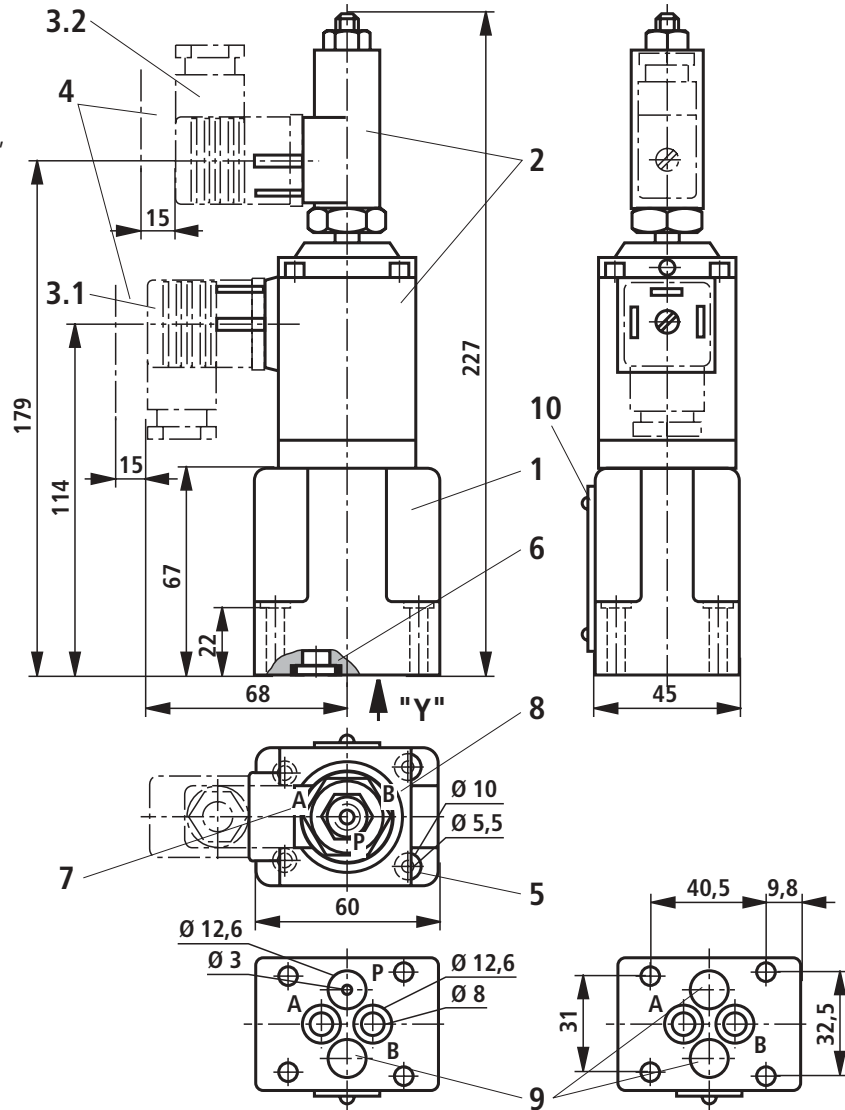
Subplates

- G 341/01 (G 1/4)
- G 342/01 (G 3/8)
- G 502/01 (G 1/2)

to catalogue sheet RE 45 052 (separate order)



Required surface finish of the mating piece



View "Y"

Type 2FRE 6 A...

View "Y"

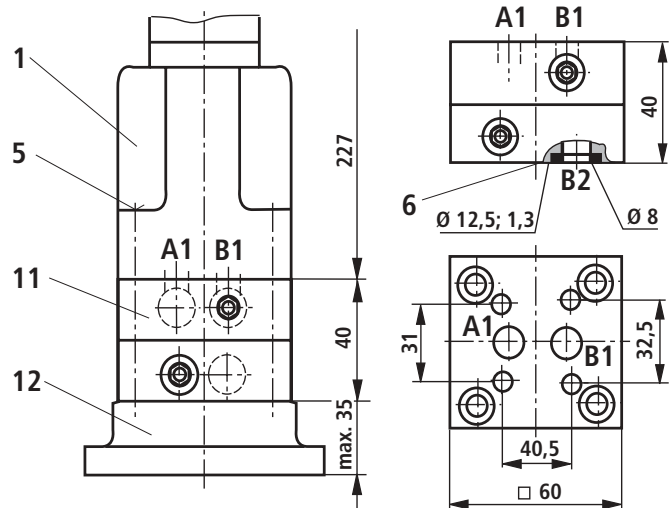
Type 2FRE 6 B...

Rectifier sandwich plate

- 1 Valve housing
- 5 Valve fixing screws (separate order) see above
- 6 R-ring 9.81 x 1.50 x 1.78 (ports A, B)
- 11 Rectifier sandwich plate
- 12 Subplates (separate order) see above

⚠ Attention!

Rectifier sandwich plate type Z4S 6-1X/V can **not** be used in conjunction with a proportional flow control valve type 2FRE 6 A-2X/... (with external closing of the pressure compensator).



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