

2-Way Proportional Flow Control Valve

Model: 2FRE6...2X



- ◆ Size 6
- ◆ Maximum working pressure 210bar
- ◆ Maximum working flow 25 L/min

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Features

- With pressure compensation for the pressure compensated control a flow
- Operation by proportional solenoid
- With electrical position feedback of control throttle
- The position transducer coil is axially adjusted to make the zero position adjustment of the throttle port easy (electrical, hydraulic)
- Flow control in both directions via rectifier sandwich plate

Function description, sectional drawing

The 2FRE6...proportional flow control valves have a 2-way function.They can control a corresponding flow independent of pressure and temperature according to the provided electrical command value. The valve basically consists of valve body (1), proportional solenoid with inductive position transducer (2), measurement orifice (3), pressure compensator (4), and optional check valve (5).

Proportional flow control valve model 2FRE6B-2XJ/ (without external closing, with check valve)

The setting of the flow (0 to 100%) is determined by the command value potentiometer. The applied command value adjusts the measurement orifice (3) via the amplifier and proportional

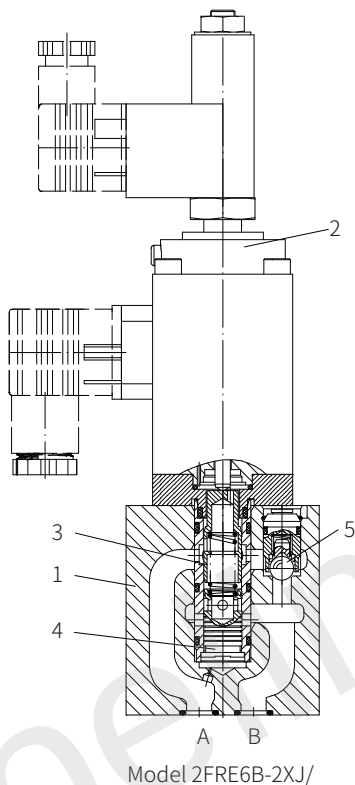
solenoid.The position of the measurement orifice (3) is measured by the inductive position transducer. Any deviation from the command value compensated through feedback control. The pressure compensator(4) keeps the pressure drop at the measurement orifice (3) at a constant value at all times. Therefore, the flow is load compensated. The low temperature drift is achieved due to the design of the measurement orifice.

With a command value of 0%, the measurement orifice is closed.In the case of a power failure or a cable break at the inductive position transducer, the measurement orifice closes. When the command value 0%, it is possible a start-up without overshoot. The opening and closing of the measurement orifice can delay via two ramps in the proportional amplifier. Via the check valve (6) a free flow from B to A is possible.By installing a rectifier sandwich plate Z4S6... under the proportional flow control valve, the flow from the actuator can be controlled in both directions.

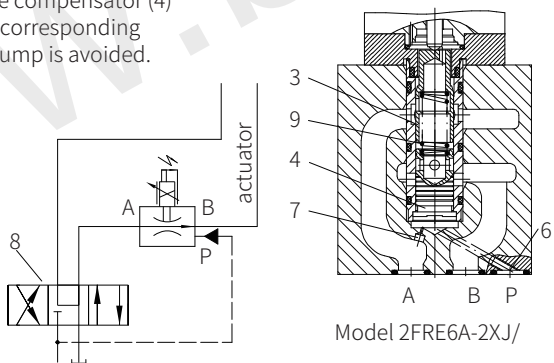
Proportional flow control valve model 2FRE6A-2XJ/ (with external closing, without check valve)

In principle, the function of this valve is similar with the valve 2FRE6B-2XJ/K4RV.

To suppress the start-up jump when the measurement orifice (3) (command value>0%) is open, a closing of the pressure compensator (4) is provided via port P (6). The internal connection between port A and the pressure compensator (4) is blocked. Via the external port P (6), the pressure in port P of the directional valve (8) acts on the pressure compensator (4) and keeps it in its closed position against the spring force (9).If the directional valve (8) is switched from P to B, the pressure compensator (4) moves from the closed position to the corresponding compensation position, thus start-up jump is avoided.



Model 2FRE6B-2XJ/



Model 2FRE6A-2XJ/

Models and specifications

Proportional flow control valve

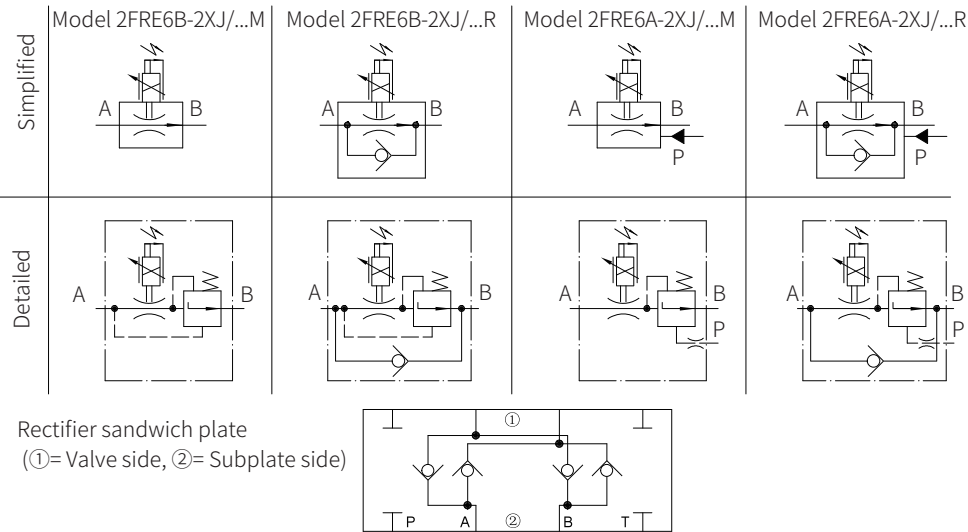
2FRE	E	6	-2X						*
without integrated electronics	=No code								more information in text
with integrated electronics	=E								sealing material
size 6	=6								No code= NBR seals
with external closing of the pressure compensator (suppression of the start-up jump)	=A								V= FKM seals
without external closing of the pressure compensator	=B								(consult for other seals)
20 to 29 series	=2X								Interface for electronics (only for model 2FREE6)
(20 to 29 series installation and connection size unchanged)									A1= command value ±10V
									F1= command value 4 to 20mA
									electrical connection
rated flow A → B									No code= for model 2FRE6: without plug
to 3L/min	=3Q								K31= for model 2FREE6
to 6L/min	=6Q								R= with check valve
to 10L/min	=10Q								M= without check valve
to 16L/min	=16Q								
to 25L/min	=25Q								

Rectifier sandwich plate

	Z4S	6			*	
size 6		=6				more information in text
20 to 29 series		=2X				sealing material
(20 to 29 series installation and connection size unchanged)					No code=	NBR seals
					V=	FKM seals
						(consult for other seals)

Functional symbols

Proportional flow control valve (with integrated OBE)



Technical parameters

Electrical (proportional solenoid)					
Protection to DIN 40050			IP65		
Voltage type			DC		
Coil resistance	Cold value at 20°C	Ω	5.4		
	Max. warm value	Ω	8.2		
Duty cycle			Continuous		
Maximum current per solenoid			A	1.5	
Electrical connections			Component plug		
			Connecting plug		
Electrical (Inductive position transducer)					
Protection to DIN 40050		bar	IP65		
Coil resistance	Cold value at 20°C	Ω	31.5	45.5	31.5
	Between.. and	Ω	1 and 2	2 and ≠	1 and ≠
Total resistance of the coilsbetween....			Plate connector GSA		
			Connecting plug GM209N		
Inductivity		mH	6 to 8		
Oscillator frequency		KHz	2.5		
Electrical position measurement system			Different throttle valves		
Nominal stroke		mm	3.5		

Technical parameters

Overview								
Installation position		Optional						
Storage temperature range		°C	-20 to+80					
Environment temperature range		°C	-20 to+50					
Weight Proportional flow control valve		kg	1.8					
Rectifier sandwich plate		kg	0.9					
Hydraulic (Measured when using HLP46, $\vartheta_{oil}=40^{\circ}C \pm 5^{\circ}C$)								
Max working pressure Port A		bar	to 210					
Flow	type		3Q	6Q	10Q	16Q	25Q	
	$q_{v\ max}$	L/min	3	6	10	16	25	
	q_{max}	to 100bar	cm ³ /min	15	25	50	70	100
	q_{max}	to 210bar	cm ³ /min	25	25	50	70	100
Maximum leakage of flow 50bar		cm ³ /min	4	4	6	7	10	
when Δp A→B with		100bar	cm ³ /min	5	5	8	10	15
command value 0%		210bar	cm ³ /min	7	7	12	15	22
Minimum pressure differential		bar	6 to 10					
Pressure differential with free return flow B→A		See characteristic curve						
Pressure and flow of: input/output pressure								
Temperature dependence Temperature drift, hydraulic and electric								
Fluid		Mineral oil (HL, HLP) ¹⁾ in accordance with DIN 51524; Fast living organisms degraded oil according to VDMA 24568; HETG (Rapeseed oil) ¹⁾ ; HEPG(Polyethyleneglycol) ²⁾ ; HEES (Synthetic Fats) ²⁾						
Oil temperature range		°C	-20 to +80					
Viscosity range		mm ² /s	15 to 380					
Cleanliness of oil ³⁾		The maximum allowable pollution level of oil is ISO4406 Class 20/18/15						
Hysteresis		%	< ±1 of $q_{v\ max}$					
Repetition accuracy		%	<1 of $q_{v\ max}$					
Manufacturing tolerance model 2FRE6...		≤ ±3% with command value 33%						
		≤ ±5% with command value 100%						
RT-MRPD1-150-30-CN-A1/F1		%	<1					
Hydraulic – Rectifier sandwich plate								
Working pressure		bar	to 210					
Cracking pressure		bar	0.7					
Nominal flow rate		L/min	25					

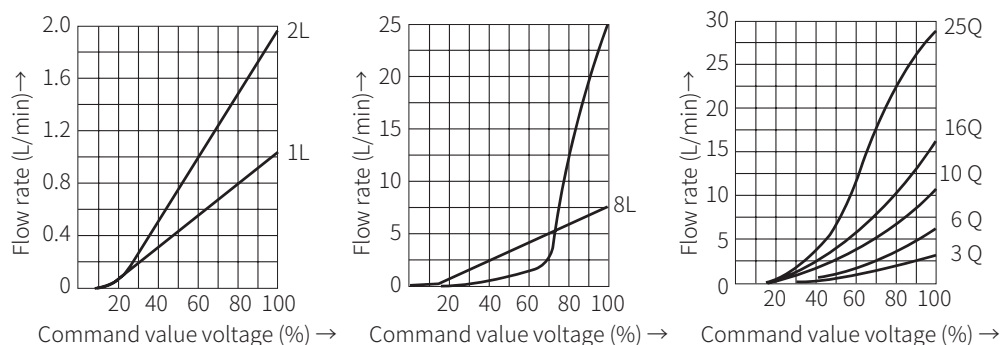
1) For NBR seal and FKM seal.
2) Only for FKM seal.
3) The oil must meet the cleanliness degree requested by the components in the hydraulic system. Effective oil filtration can prevent failure and increase the service life of the components.

Characteristic curve

(Measured when using HLP46, $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$)

Command value voltage in relation to the flow

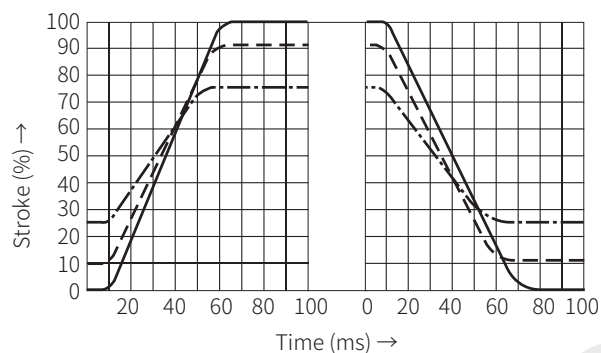
(Flow control of A $\rightarrow$ B); $p_{nom}=50\text{bar}$



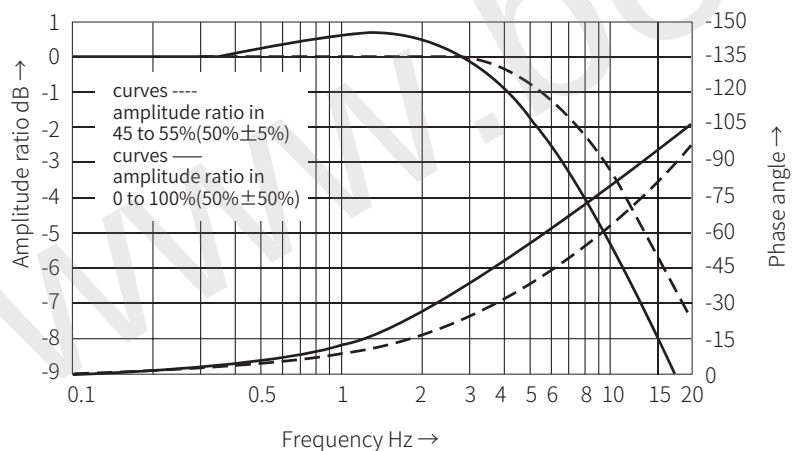
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Dynamic response

Transition function with stepped command value modification; $p_{nom}=100\text{bar}$; type "25Q"



Frequency response characteristic curves; $p_{nom}=100\text{bar}$; type "25Q"

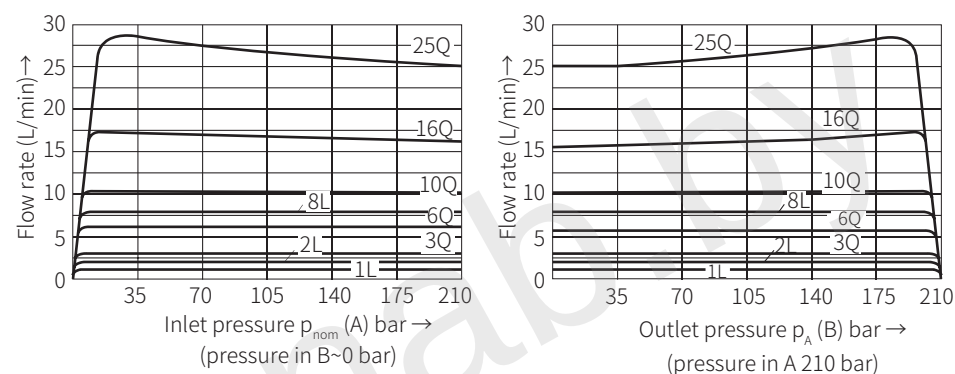


Characteristic curve

(Measured when using HLP46, $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$)

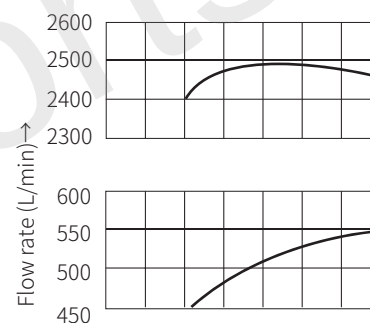
Proportional flow control valve

Pressure in relation to the flow rate

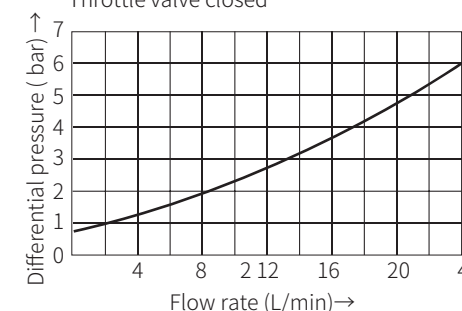


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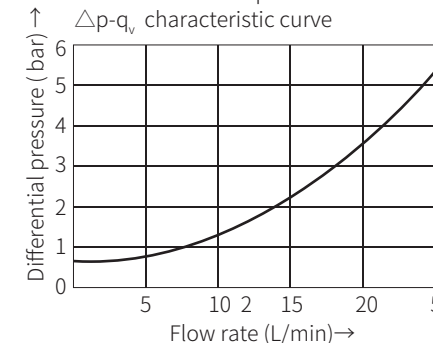
Temperature in relation to the flow rate at $\Delta p=30\text{bar}$



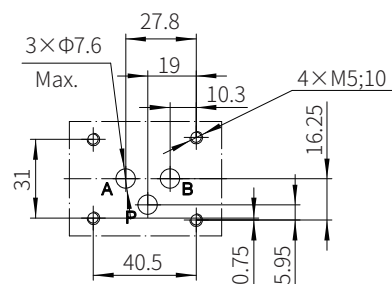
Pressure differential via check valve B $\rightarrow$ A Throttle valve closed



Rectifier sandwich plate $\Delta p-q_v$ characteristic curve



- 1 Valve body
- 2 Proportional solenoid with inductive position transducer
- 3 Connecting plug
- 4 Space required to remove the plug
- 5 Hole for model 2FRE6A...
- 6 O-ring 9.25x1.78
- 7 Port A
- 8 Port B
- 9 Blind hole
- 10 Name plate

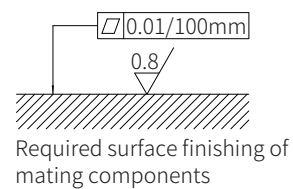
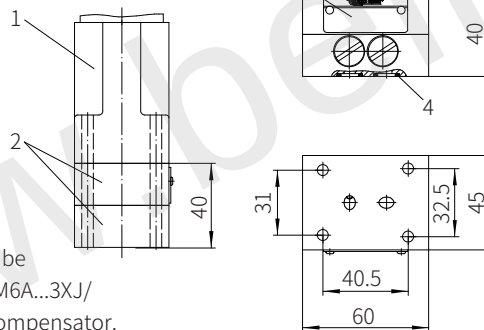


Rectifier sandwich plate Z4S6-1XJ/...

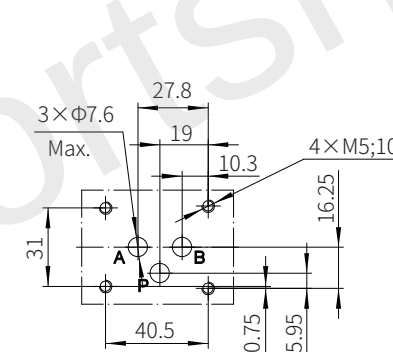
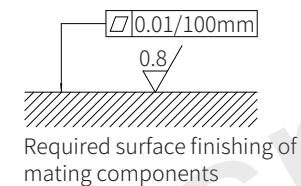
- 1 Flow control valve
- 2 Rectifier sandwich plate
- 3 Name plate
- 4 O-ring 9.25x1.78 (for port A, B)

Note:

Rectifier sandwich plate Z4S6-1XJ/ cannot be connected with the flow control valve 2FRM6A...3XJ/ with external connection of the pressure compensator.



- 1 Valve body
- 2 Proportional solenoid with inductive position transducer
- 3 Hole for model 2FRE6A...
- 4 O-ring 9.25x1.78
- 5 Port A
- 6 Port B
- 7 Blind hole
- 8 Name plate



Rectifier sandwich plate Z4S6-1XJ/...

- 1 Flow control valve
- 2 Rectifier sandwich plate
- 3 Name plate
- 4 O-ring 9.25x1.78 (for port A, B)

Note:

Rectifier sandwich plate Z4S6-1XJ/ cannot be connected with the flow control valve 2FRM6A...3XJ / with external connection of the pressure compensator.

