2-Way Proportional Flow Control Valve

Model: 2FRE6...2X

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

Contents

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

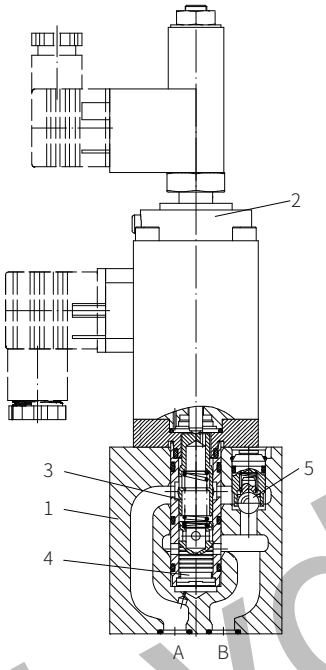
The 2FRE...proportional flow control valves have a 2-way function. They can control a corresponding flow independent of pressure and temperature according to the provided electrical command value. The valve basically consists of valve body (1), proportional solenoid with inductive position transducer (2), measurement orifice (3), pressure compensator (4), and optional check valve (6).

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 is 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 is 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 (5) 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.

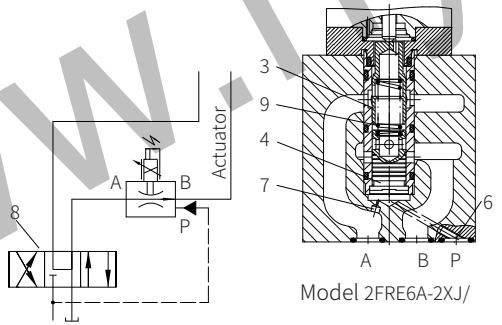


Model 2FRE6B-2XJ/

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 (7).



Model 2FRE6A-2XJ/

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.

Models and specifications

Proportional flow control valve

2FRE 6 – 2X / *

- size 6 =6
- with external closing of the pressure compensator (suppression of the start-up jump) =A
- without external closing of the pressure compensator =B
- 20 to 29 series =2X (20 to 29 series installation and connection size unchanged)
- rated flow A → B
  - to 3 L/min =3Q
  - to 6 L/min =6Q
  - to 10 L/min =10Q
  - to 16 L/min =16Q
  - to 25 L/min =25Q
- more information in text
- sealing material
  - No code= NBR seals
  - V= FKM seals
  - (consult for other seals)
- R= with check valve
- M= without check valve

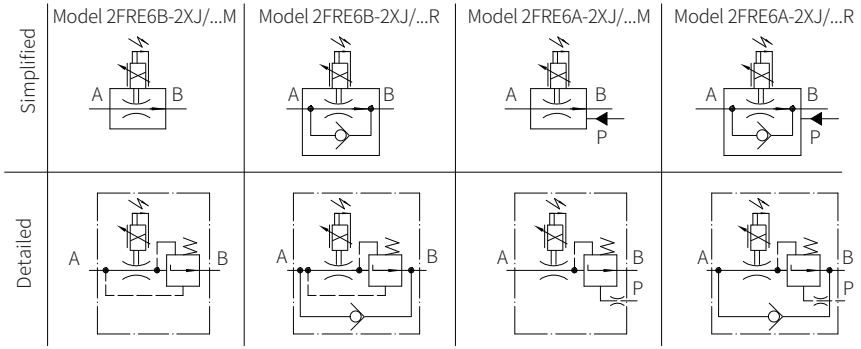
Rectifier sandwich plate

Z4S 6 – / *

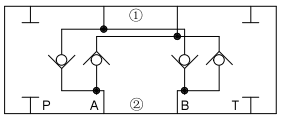
- size 6 =6
- 10 to 19 series =1X (10 to 19 series installation and connection size unchanged)
- more information in text
- sealing material
  - No code= NBR seals
  - V= FKM seals
  - (consult for other seals)

Functional symbols

Proportional flow control valve (simplified, detailed)



Rectifier sandwich plate
(①= Valve side, ②= Subplate side)



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, ϑ_{oil}=40°C ± 5°C)							
Maximum 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 100 bar	cm³/min	15	25	50	70	100
	to 210bar	cm³/min	25	25	50	70	100
Maximum leakage of flow when △p A →B with command value 0%	50 bar	cm³/min	4	4	6	7	10
	100 bar	cm³/min	5	5	8	10	15
	210 bar	cm³/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]				
Cleanliness of oil[3]			The maximum allowable pollution level of oil is ISO 4406 (C): 20/18/15				
Oil temperature range		°C	20 to +80				
Viscosity range		mm²/s	15 to 380				
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.

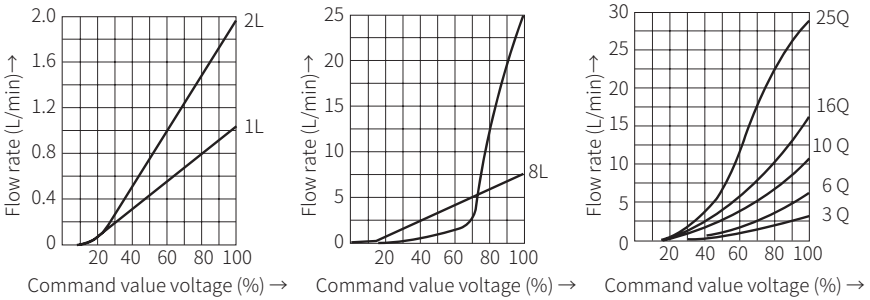
Electrical (proportional solenoid)			
Protection to DIN 40050			IP65 [2]
Voltage type			DC
Coil resistance	Cold value at 20°C	Ω	5.4
	Maximum warm value	Ω	8.2
Duty cycle			continuous
Maximum current per solenoid		A	1.5
Electrical connections			Plate connecter
			Connecting plug

Electrical (Inductive position transducer)				
Protection to DIN 40050			IP65	
Coil resistance (total resistance of the coils between....) at 20°C	Ω	1 and 2	2 and ⏚	1 and ⏚
		31.5	45.5	31.5
Electrical connections		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		

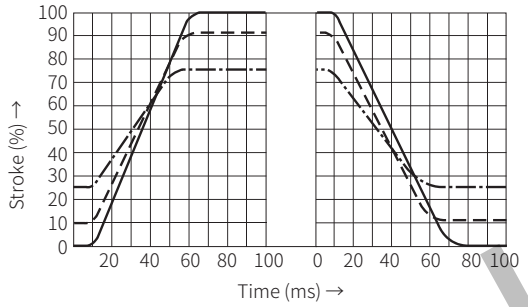
Characteristic curve

(Measured when using HLP46, ϑ_{oil}=40°C ± 5°C)

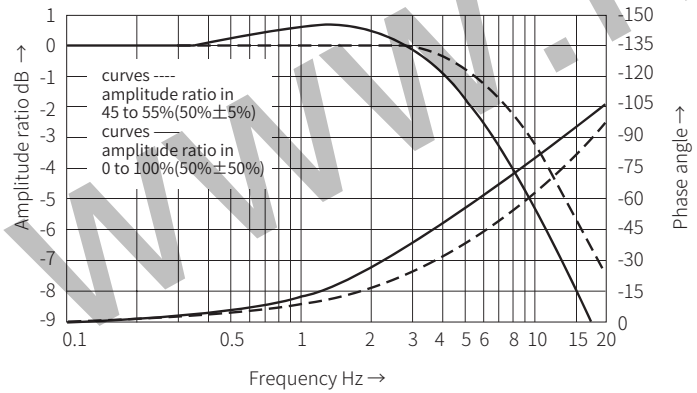
Command value voltage in relation to the flow
(Flow control of A → B); p_{nom}= 50bar



Dynamic response
Transition function with stepped command value modification; p_{nom}= 100 bar; type "25Q"



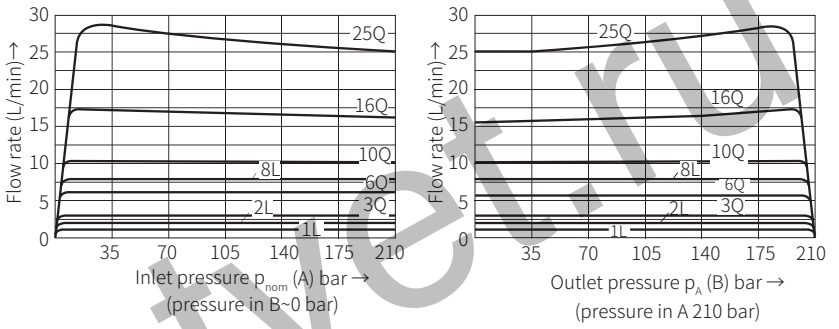
Frequency response characteristic curves; p_{nom} = 100 bar; type "25Q"



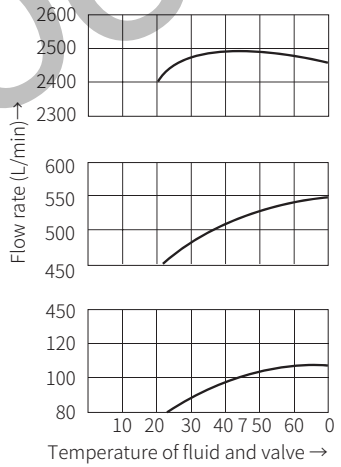
Characteristic curve

(Measured when using HLP46, ϑ_{oil}=40°C ± 5°C)

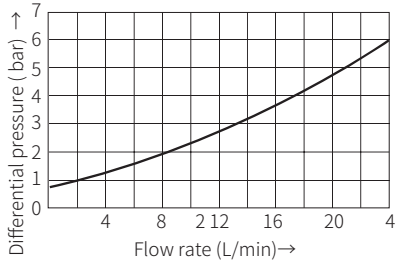
Proportional flow control valve
Pressure in relation to the flow rate



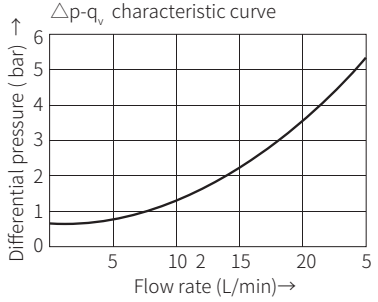
Temperature in relation to the flow rate
at △p= 30 bar

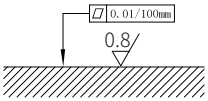


Pressure differential via check valve B → A
Throttle valve closed



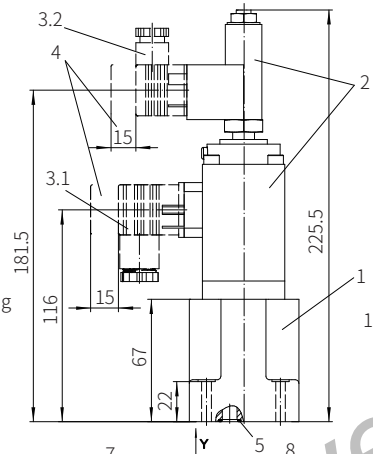
Rectifier sandwich plate
△p-q_v characteristic curve

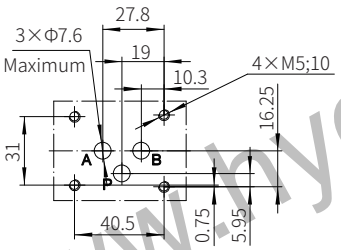


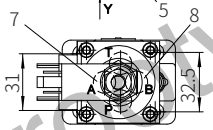


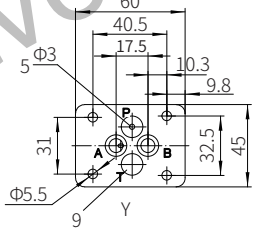
Required surface finishing of mating components

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

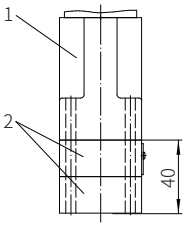


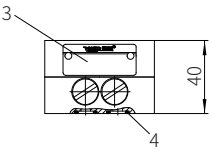


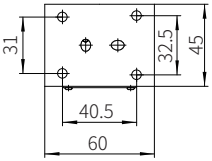




Rectifier sandwich plate Z4S6-1XJ/...
1 Flow control valve
2 Rectifier sandwich plate
3 Name plate
4 O-ring 9.25x1.78
(for port A, B)







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