

## 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

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

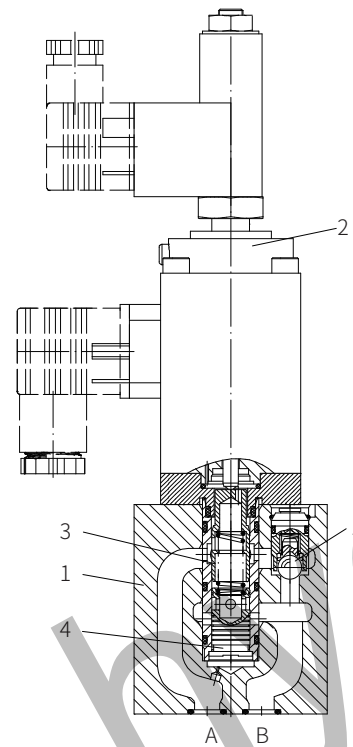
measured by the inductive position transducer. Any deviation from the command value compensated through feedback control. The pressure compensator(4) keeps the pressure drop at the measurement orifice (3) at a constant value at all times. Therefore, the flow is load compensated. The low temperature drift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

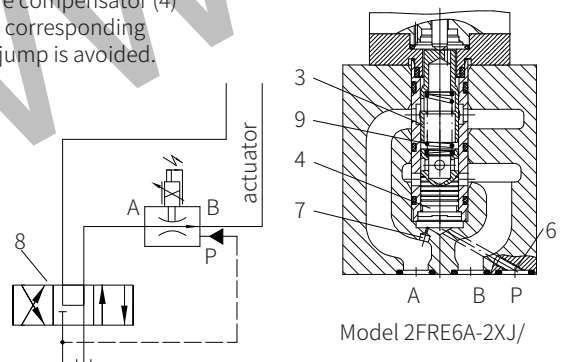
Proportional flow control valve model 2FRE6A-2XJ/ (with external closing, without check valve)

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/

Proportional flow control valve

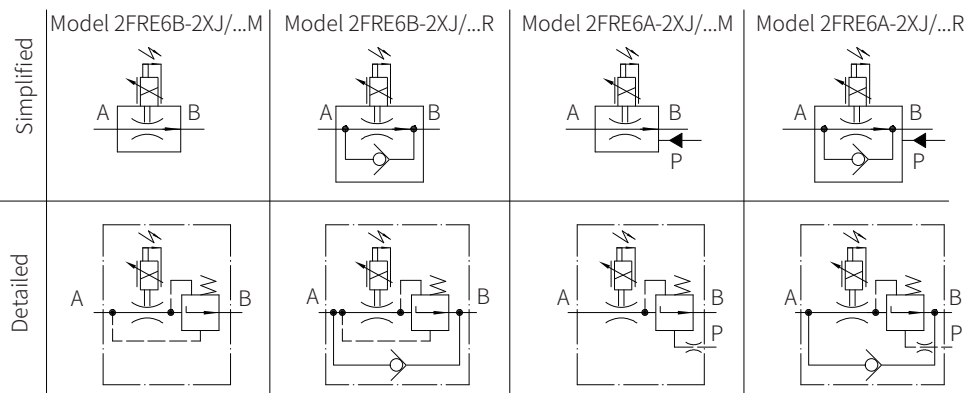
2FRE	E	6	-2X					*
without integrated electronics	=No code							more information in text
with integrated electronics	=E							sealing material
size 6	=6							No code= NBR seals
with external closing of the pressure compensator (suppression of the start-up jump)	=A							V= FKM seals
without external 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								K31= for model 2FREE6
to 6L/min								R= with check valve
to 10L/min								M= without check valve
to 16L/min								
to 25L/min								

Rectifier sandwich plate

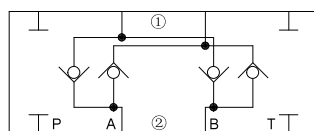
Z4S	6			*
size 6	=6			more information in text
20 to 29 series			=2X	sealing material
(20 to 29 series installation and connection size unchanged)				No code= NBR seals
				V= FKM seals
				(consult for other seals)

## Functional symbols

Proportional flow control valve (with integrated OBE)



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



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## 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 coils between...	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, $\rho_{oil} = 40^{\circ}\text{C} \pm 5^{\circ}\text{C}$ )					
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 $\text{cm}^3/\text{min}$	15	25	50	70	100
$q_{\max}$ to 210bar $\text{cm}^3/\text{min}$	25	25	50	70	100
Maximum leakage of flow 50bar $\text{cm}^3/\text{min}$	4	4	6	7	10
when $\Delta p A \rightarrow B$ with 100bar $\text{cm}^3/\text{min}$	5	5	8	10	15
command value 0% 210bar $\text{cm}^3/\text{min}$	7	7	12	15	22
Minimum pressure differential bar	6 to 10				
Pressure differential with free return flow B $\rightarrow$ A					
Pressure and flow of: input/output pressure	See characteristic curve				
Temperature dependence Temperature drift, hydraulic and electric					
Fluid	Mineral oil (HL, HLP) <sup>1)</sup> in accordance with DIN 51524; Fast living organisms degraded oil according to VDMA 24568; HETG (Rapeseed oil) <sup>1)</sup> ; HEPG (Polyethyleneglycol) <sup>2)</sup> ; HEES (Synthetic Fats) <sup>2)</sup>				
Oil temperature range °C	-20 to +80				
Viscosity range $\text{mm}^2/\text{s}$	15 to 380				
Cleanliness of oil <sup>3)</sup>	The maximum allowable pollution level of oil is ISO4406 Class 20/18/15				
Hysteresis %	$< \pm 1$ of $q_{v\max}$				
Repetition accuracy %	$< 1$ of $q_{v\max}$				
Manufacturing tolerance	$\leq \pm 3\%$ with command value 33% model 2FRE6... $\leq \pm 5\%$ 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.

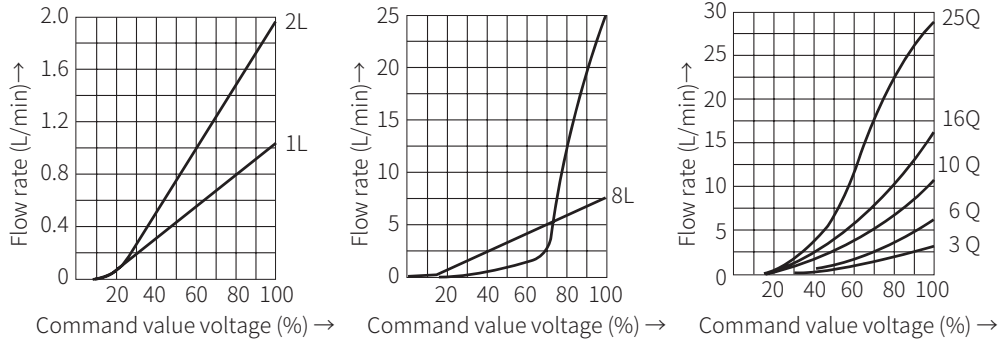
3) The oil must meet the cleanliness degree requested by the components in the hydraulic system. Effective oil filtration can prevent failure and increase the service life of the components.

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### Characteristic curve

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

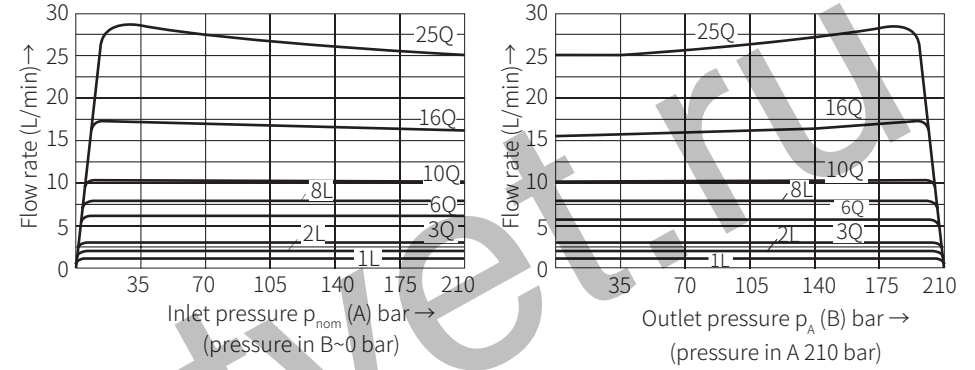
Command value voltage in relation to the flow  
(Flow control of A → B);  $p_{nom} = 50\text{bar}$



### Characteristic curve

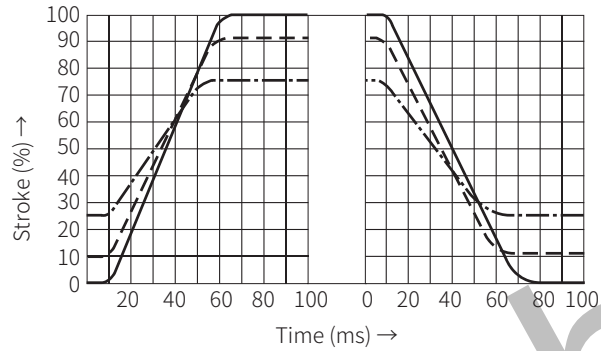
(Measured when using HLP46,  $\vartheta_{oil}=40^{\circ}\text{C} \pm 5^{\circ}\text{C}$ )

Proportional flow control valve  
Pressure in relation to the flow rate

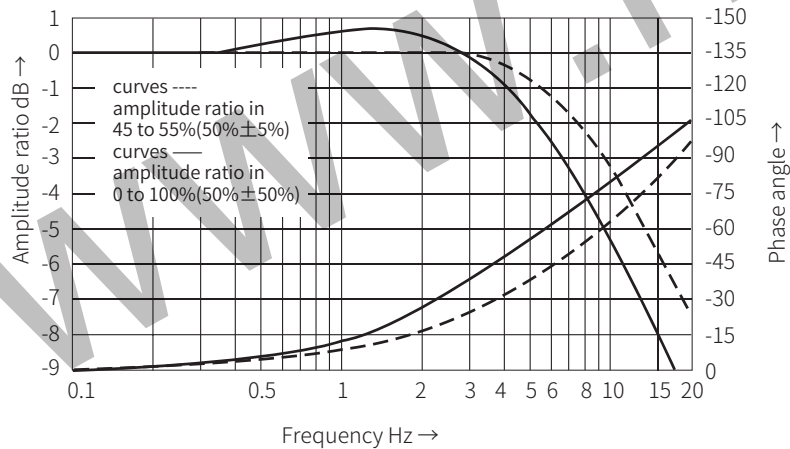


### Dynamic response

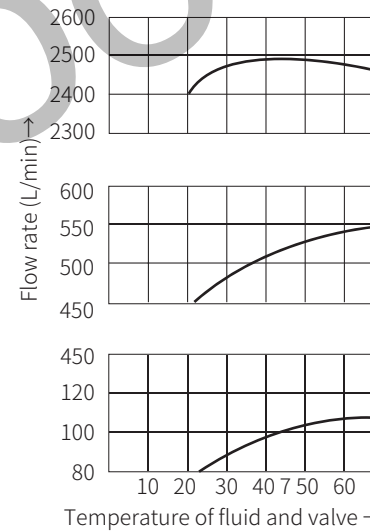
Transition function with stepped command value modification;  $p_{nom} = 100\text{bar}$ ; type "25Q"



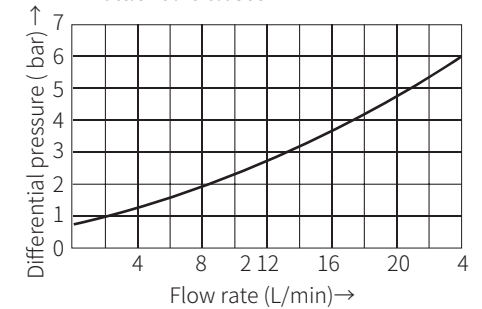
Frequency response characteristic curves;  $p_{nom} = 100\text{bar}$ ; type "25Q"



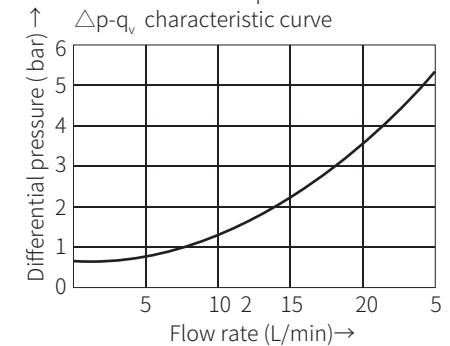
Temperature in relation to the flow rate  
at  $\Delta p = 30\text{bar}$

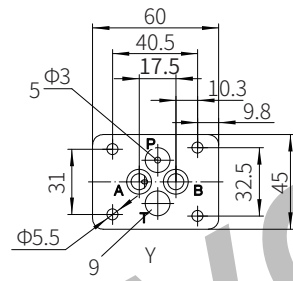
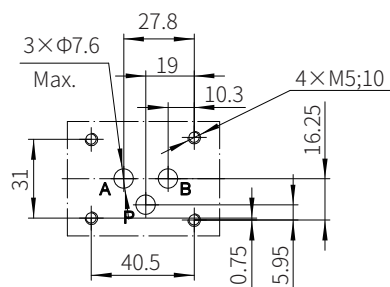
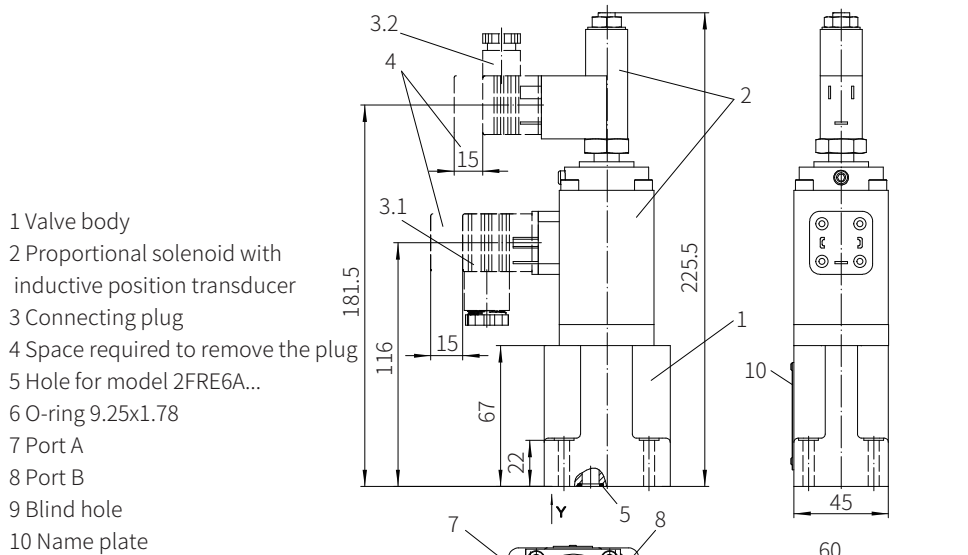


Pressure differential via check valve B → A  
Throttle valve closed



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



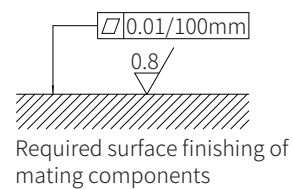
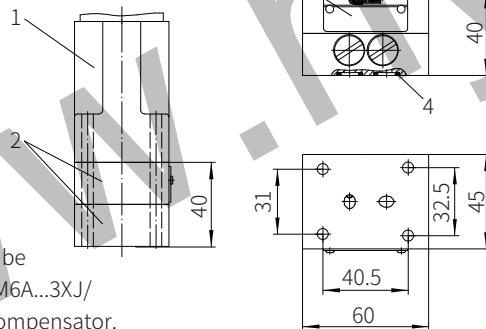


Rectifier sandwich plate Z4S6-1XJ/...

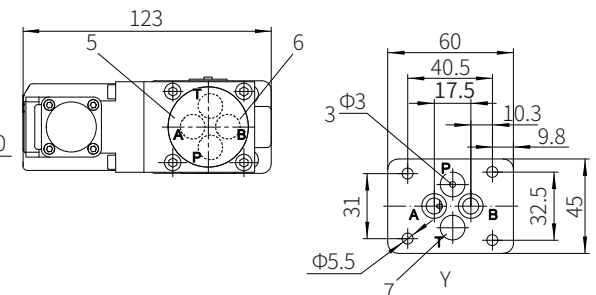
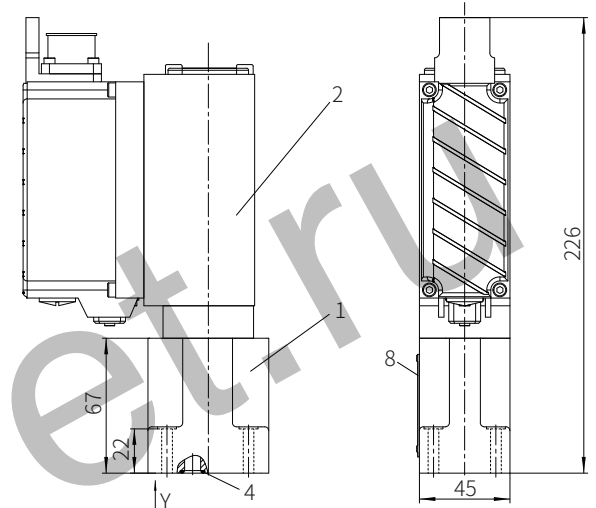
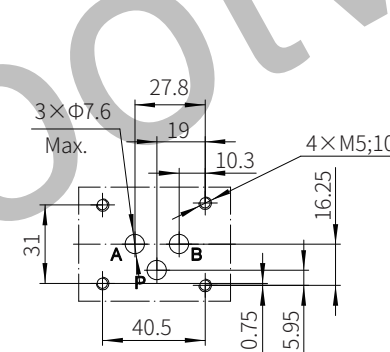
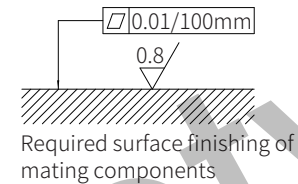
- 1 Flow control valve  
2 Rectifier sandwich plate  
3 Name plate  
4 O-ring 9.25x1.78  
(for port A, B)

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.

