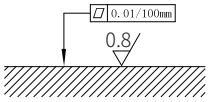
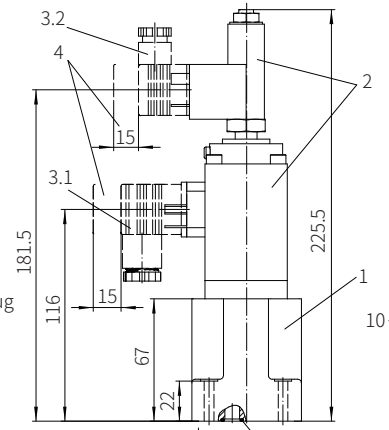
## Component size

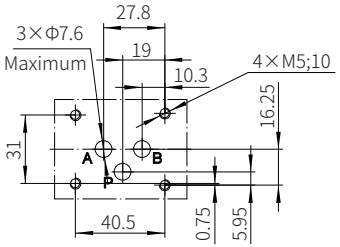
Size unit: mm

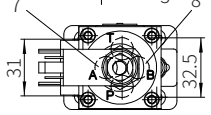


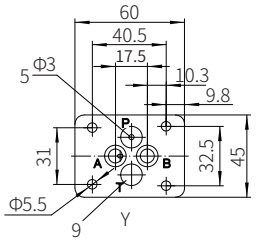

Required surface finishing of mating components

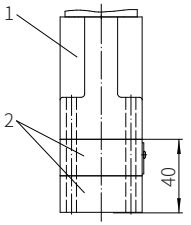


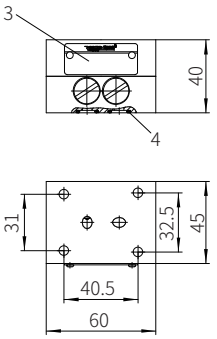

1 Valve body
2 Proportional solenoid with inductive position transducer
3 Connecting plug
4 Space required to remove the plug
5 Hole for model 2FRE6A...
6 O-ring 9.25x1.78
7 Port A
8 Port B
9 Blind hole
10 Name plate




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.





# 2-Way Proportional Flow Control Valve

**Model: 2FRE...4XJ**

- Size 10, 16
- Maximum working pressure 315bar
- Maximum working flow 160 L/min

## Contents



## Features

- With pressure compensation for the pressure compensated control a flow
- Operation by proportional solenoid
- With electrical position feedback of control throttler
- The position transducer coil is axially adjusted to make the zero position adjustment of the throttle port easy (electrical, hydraulic) without the need to adjust the electronics
- Minimum sample variation of valve 2FRE and proportional amplifiers

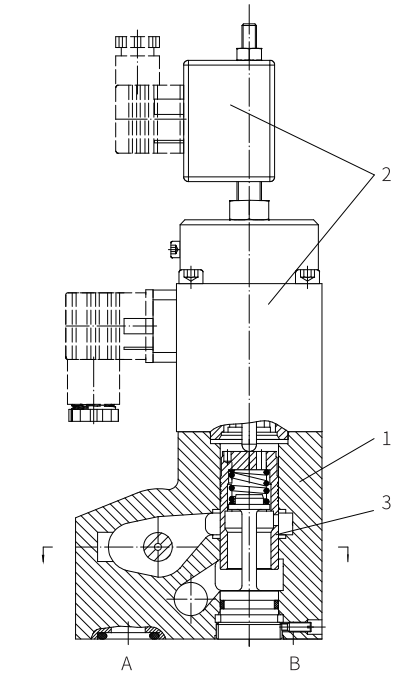
## Function description, sectional drawing

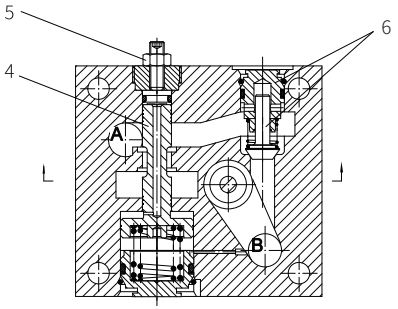
The 2FRE... proportional flow control valves have a 2-way function.They can control a corresponding flow with a large degree of compensation for pressure and temperature according to the provided electrical command value. The valve basically consists of valve body (1), proportional solenoid with inductive position transducer (2), measurement orifice (3), pressure compensator (4), stroke limiter (5) and optional check valve (6).

The setting of the flow rate (0 to 100%) is determined on the command value potentiometer. 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 be 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.








## Models and specifications

Proportional flow control valve

2FRE | – | 4X | J | B | | *

- size 10 =10
- size 16 =16
- 40 to 49 series =4X (40 to 49 series installation and connection size unchanged)
- Rekith =J
- B= pressure compensator, with stroke limiter
- sealing material: No code= NBR seals; V= FKM seals (consult for other seals)
- more information in text

| flow range A → B | | |
|---|---|---|
| size 10 | | size 16 |
| Linear | Increase by degrees | Linear |
| to 5L/min=5L<br>to 10L/min=10L<br>to 16L/min=16L<br>to 25L/min=25L<br>to 50L/min=50L<br>to 60L/min=60L | to 5L/min=5Q<br>to 10L/min=10Q<br>to 16L/min=16Q<br>to 25L/min=25Q | to 80L/min=80L<br>to 100L/min=100L<br>to 125L/min=125L<br>to 160L/min=160L |

Rectifier sandwich plate

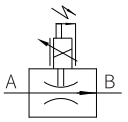
Z4S | – | 2X | | J | *

- size 10 =10
- size 16 =16
- 20 to 29 series =2X (20 to 29 series installation and connection size unchanged)
- Rekith =J
- sealing material: No code= NBR seals; V= FKM seals (consult for other seals)
- more information in text

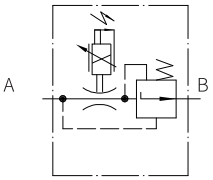
## Functional symbols

Proportional flow control valve

Simplified

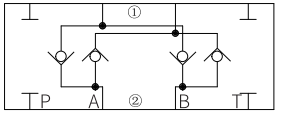



Detailed




Rectifier sandwich plate

(①= Valve side, ②= Subplate side)



## Technical parameters

| Overview | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | | | | 10 | | | | | 16 | | |
| Installation position | | | | Optional | | | | | | | |
| Storage temperature range | | °C | | -20 to +80 | | | | | | | |
| Environment temperature range | | °C | | -20 to +70 | | | | | | | |
| Weight | Proportional flow control valve | kg | | 6.1 | | | | | 8.5 | | |
| | Rectifier sandwich plate | kg | | 3.2 | | | | | 9.3 | | |
| **Hydraulic (Measured when using HLP46, $\vartheta_{oil}$=40°C ± 5°C)** | | | | | | | | | | | |
| Maximum working pressure | Port A | bar | | to 315 | | | | | | | |
| Flow $q_{v\,max.}$ | Size | NS | | 10 | | | | | 16 | | |
| | Linear | L/min | 10 | 16 | 25 | 50 | 60 | 80 | 100 | 125 | 160 |
| | Progressive with rapid speed | L/min | | 40 | | | | | - | | |
| Minimum pressure differential | | bar | | 3 to 8 | | | | | 6 to 10 | | |
| Pressure differential with free return flow B → A | | bar | | See characteristic curve | | | | | | | |
| Flow control temperature drift | | | | | | | | | | | |
| Hydraulic + electrical $\triangle q_v$/°C | | % | | 0.1 of $q_{v\,max.}$ | | | | | | | |
| Pressure compensator(to △p=315 bar) | | % | | ± 2 of $q_{v\,max.}$ | | | | | | | |
| 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 | | | | The maximum allowable pollution level of oil is ISO4406 class 20/18/15 (we recommend a filer with a minimum retention rate of 10) | | | | | | | |
| Hysteresis | | % | | < ±1 of $q_{v\,max}$ | | | | | | | |
| Repeatability | | % | | <1 of $q_{v\,max}$ | | | | | | | |
| Manufacturing tolerance | model 2FRE6... | % | | ⩽ ±2% with command value 33%<br>⩽ ±5% with command value 100% | | | | | | | |
| | amplifier RT-MRPD1-151-30-CN-A1/F1 | % | | < ±2 | | | | | | | |
| **Hydraulic – Rectifier sandwich plate** | | | | | | | | | | | |
| Working pressure | | bar | | to 315 | | | | | | | |
| Cracking pressure | | bar | | 15 | | | | | | | |
| Nominal flow | Size | NS | | 10 | | | | | 16 | | |
| | | L/min | | 60 | | | | | 160 | | |





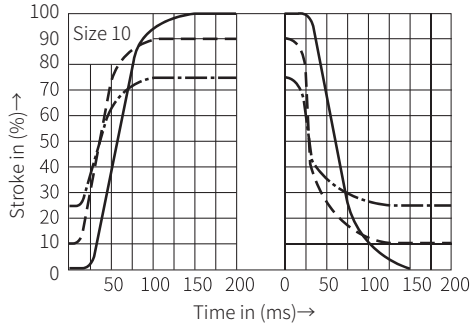
## Technical parameters

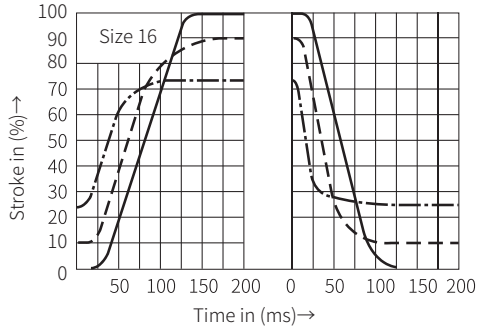
| Electrical (proportional solenoid) | | | | |
|---|---|---|---|---|
| Voltage type | | | DC | |
| Coil resistance | Cold value at 20°C | Ω | 10 | |
| | Maximum warm value | Ω | 13.9 | |
| Duty cycle | | % | 100 | |
| Maximum current per solenoid | | A | 1.51 | |
| Electrical connections | | | Component plug | |
| | | | Connecting plug | |
| Protection to DIN 40050 | | | IP65 | |
| **Electrical (Inductive position transducer)** | | | | |
| 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 | | | Component plug | |
| | | | Connecting plug | |
| Inductivity | | mH | 6 to 8 | |
| Oscillator frequency | | KHz | 2.5 | |
| Electrical position measurement system | | | Different throttle valves | |
| Nominal stroke | | mm | 4 | |
| Protection to DIN40050 | | | IP65 | |

## Characteristic curve

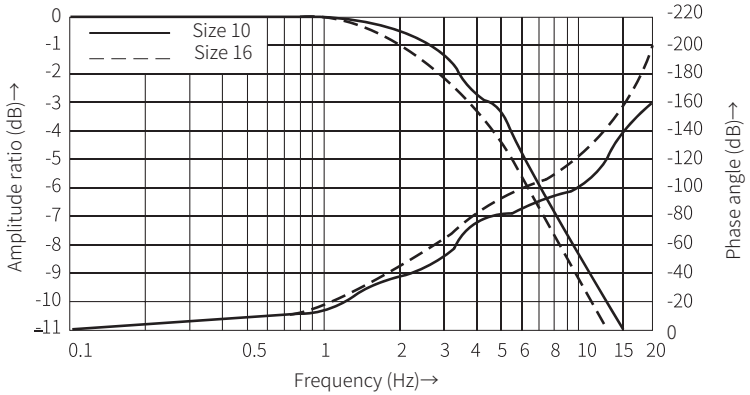
(Measured when using HLP46, $\vartheta_{oil}$=40°C ± 5°C,
Pnom = 50 bar, Amplitude 0 → >100 %; size 10 type 60L and size 16 type 160L)

Transient function at stepped command value change




Frequency response characteristic curves



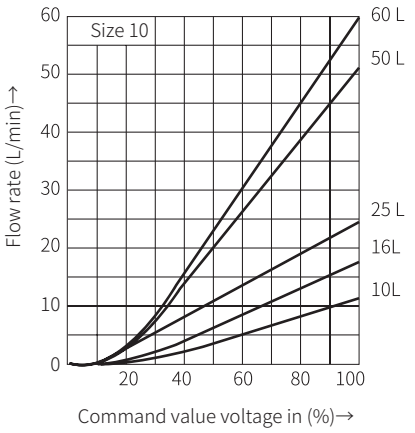


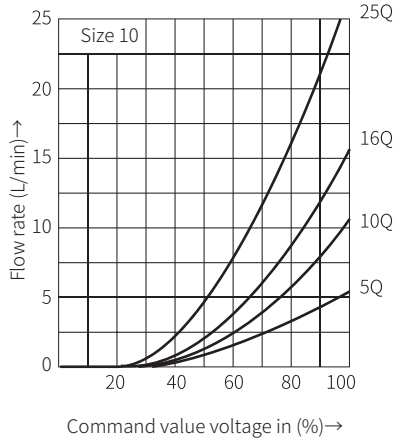


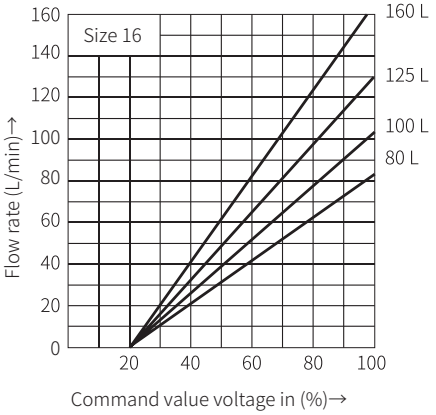

## Characteristic curve

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

Dependence of flow on command value voltage (flow control from A → B)



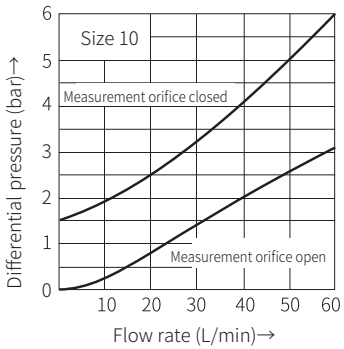



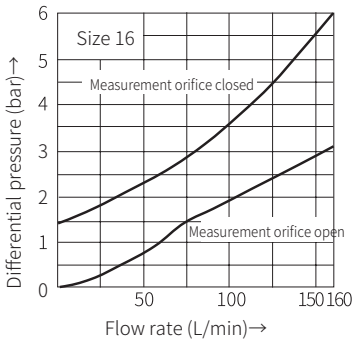



## Characteristic curve

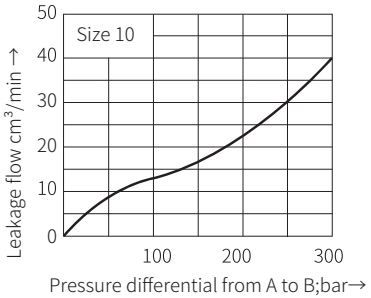
(Measured when using HLP46, $\vartheta_{oil}$=40°C ± 5°C)

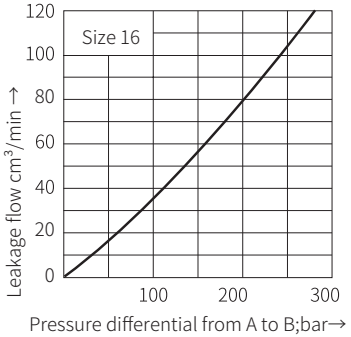
Pressure differential via check valve B → A




Leakage flow from A to B

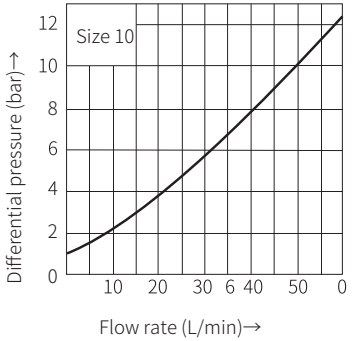


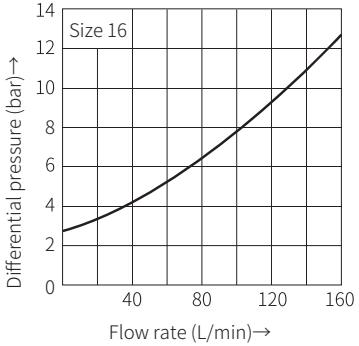




Rectifier sandwich plate

The pressure differential and flow relationship in two flow directions are the same

Flow from A → B (B → A)



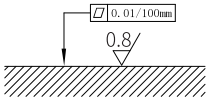







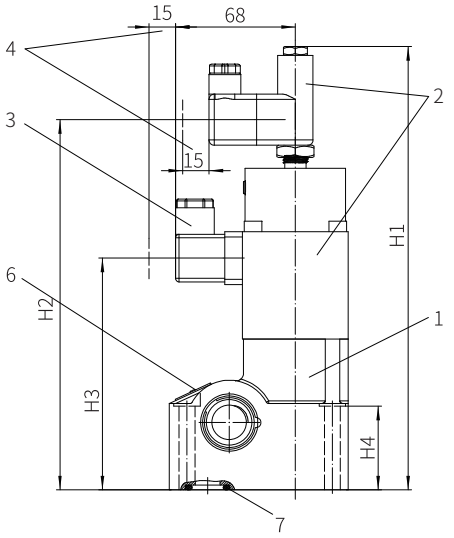

## Component size

Size unit: mm

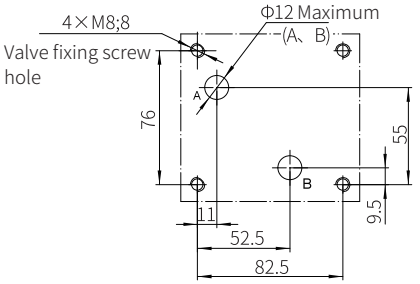


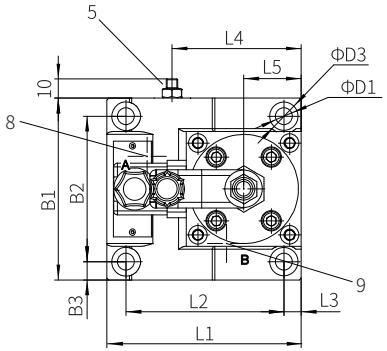

Required surface finishing of mating components

1 Valve body
2 Proportional solenoid with inductive position transducer
3 Connecting plug
4 Space required to remove the plug
5 Pressure compensator with stroke limiter
6 Name plate
7 O-ring
(NG10: 18.66x3.53; NG16: 26.58x3.53)
8 Port A
9 Port B

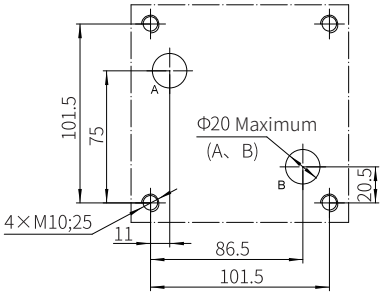



Mounting surface for size 10




Mounting surface for size 16




| Size | B1 | B2 | B3 | L1 | L2 | L3 | L4 |
|---|---|---|---|---|---|---|---|
| 10 | 76 | 9.5 | 101.5 | 82.5 | 9 | 6 | 7.5 |
| 16 | 123.5 | 101.5 | 11 | 23.5 | 101.5 | 11 | 81.5 |

| Size | L5 | H1 | H2 | H3 | H4 | D1 | D2 |
|---|---|---|---|---|---|---|---|
| 10 | 30 | 251.5 | 210 | 131.5 | 47.5 | 9 | 15 |
| 16 | 44 | 261.5 | 220 | 141.5 | 51 | 11 | 18 |