

BEIJING HUADE HYDRAULIC INDUSTRIAL GROUP CO.,LTD.	Proportional flow control valve 2-way version, Type 2FRE 6...RC			RC29188/9.2006
	Size 6	up to 21 MPa	up to 25 L/min	Replaces: RC29188/08.2000

**Features:**

- Valve with a pressure compensator for the pressure compensated control of a flow
- Actuation via a proportional solenoid
- 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)
- Flow control is possible in both directions by using a rectifier sandwich plate



**Functional , section , symbol**

The type 2FRE ...proportional flow control valves have a 2-way function. They can, from a 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 2FRE 6 B,**

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.

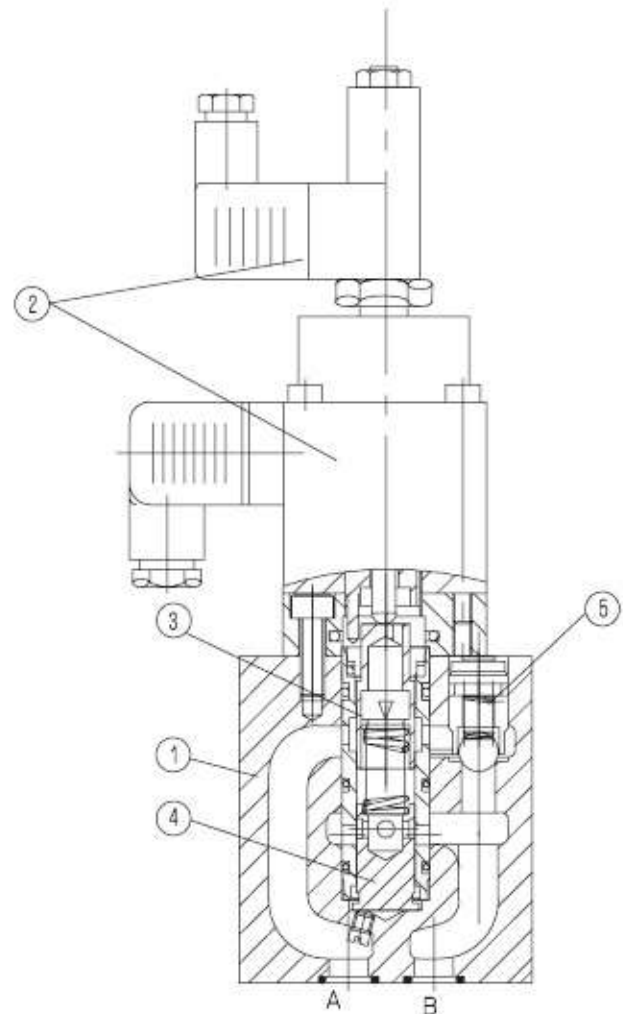
At a 0 % command value the measurement orifice is closed.

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.

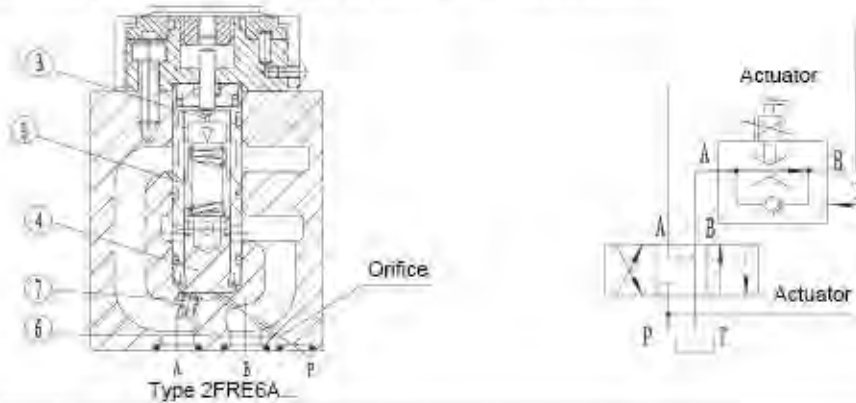
Via the check valve (5) a free flow is possible from B to A.



### Proportional flow control valve type 2FRE 6 A<sub>1</sub>

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

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.



### Ordering details

2FRE6	20	B		*
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With external closing of the pressure compensator = A  
Without external closing of the pressure compensator = B

Series 20 to 29 = 20  
(20 to 29: unchanged installation and connection dimensions)

Technology of Beijing Huade Hydraulic =B

Flow range A → B

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

Further details in clear text

No code= Mineral oil  
V= phosphate ester

R= with check valve  
M= without check valve

### Rectifier sandwich plate

Z4S6	10	B		*
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Rectifier sandwich plate  
Nominal size 6 = 6

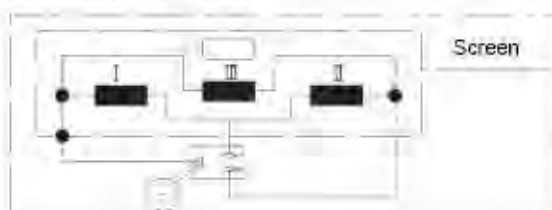
Further details in clear text

Electrical connections — Inductive position transducer

Technology of Beijing Huade Hydraulic =B

No code=Mineral oil  
V= Phosphate ester

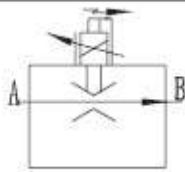
### Connections on loops



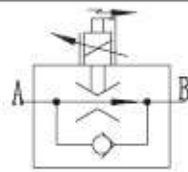
### Connections on plug-in connector



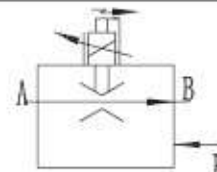
### Symbols, Proportional flow control valve (simplified, complete)



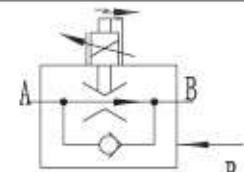
Type 2FRE6B-...M



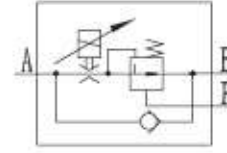
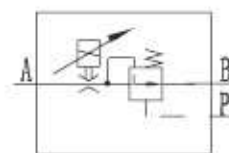
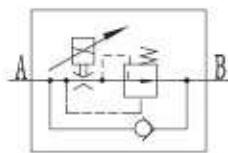
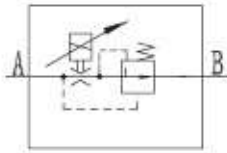
Type 2FRE6B-...R



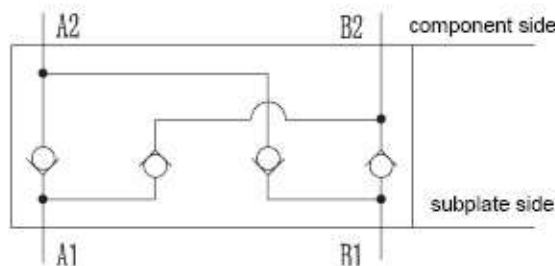
Type 2FRE6A-...M



Type 2FRE6A-...R



Rectifier sandwich plate:



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

#### Hydraulic

Max. permissible operating pressure, port A		21 (port A)						
Flow $q_v$ max. (L/min)	Type	2QE	3Q	6Q	10Q	16Q	25Q	
	to 10MPa	0.015	0.015	0.025	0.05	0.07	0.1	
	to 21MPa	0.025	0.025	0.025	0.05	0.07	0.1	
Flow $q_v$ min. (L/min)								
Max. leakage flow at command value 0% (L/min)	$\Delta P$ (A → B)							
(measured at $v = 36^{-6}$ × 10m <sup>3</sup> /s and $t=50^{\circ}\text{C}$ )	5MPa	0.004	0.004	0.004	0.006	0.007	0.01	
	10MPa	0.005	0.005	0.005	0.008	0.01	0.015	
	21MPa	0.007	0.007	0.007	0.012	0.015	0.022	
Minimum pressure differential	(MPa)	0.6 to 1						
$\Delta p$ free return flow (B → A)		see diagram on page 69						
Pressure flow relationship: inlet/outlet pressure		see diagram on page 69						
Flow stability		see diagram on page 69						
Hysteresis		< ± 1% $Q_{max}$						
Repeatability		< 1% $Q_{max}$						
Degree of contamination	( $\mu\text{m}$ )	≤ 20 (We recommend a filter with a minimum retention rate of 10)						
Pressure fluid		Mineral oil (for NBR seal), Phosphate ester (for FPM seal)						
Viscosity range	(mm <sup>2</sup> S)	2.8 to 360						
Pressure fluid temperature range	( $^{\circ}\text{C}$ )	-20 to +70						
Installation		optional						

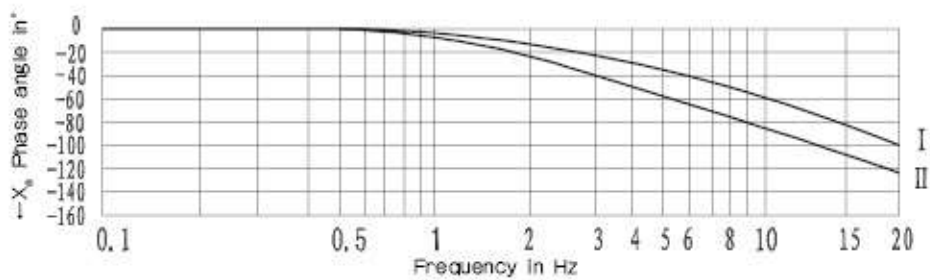
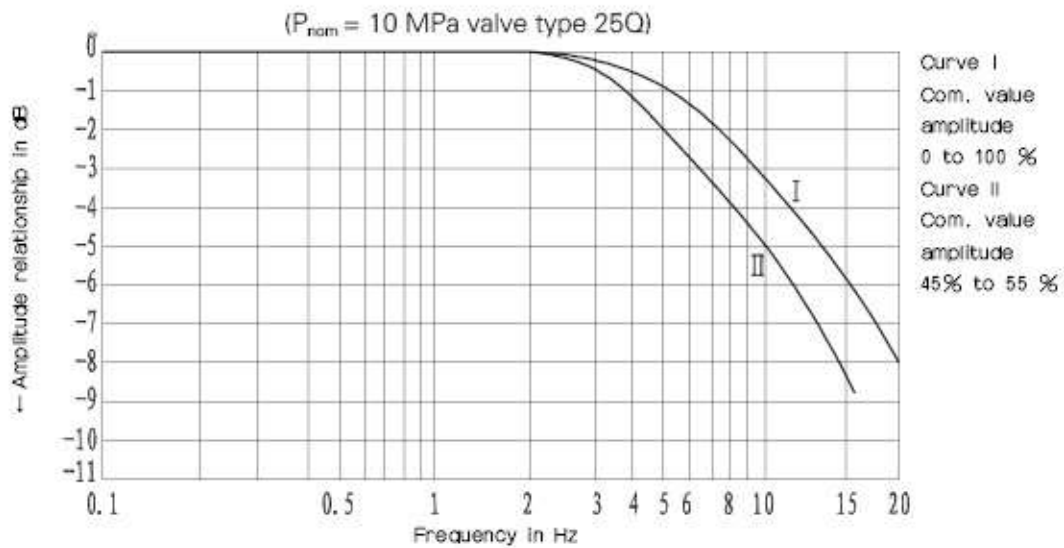
#### Electrical

Voltage type		DC
Coil resistance of solenoid	( $\Omega$ )	Cold value at 20 $^{\circ}\text{C}$ 5.4, Max. warm value 8.2
Coil resistance of transducer	( $\Omega$ )	at 20 $^{\circ}\text{C}$ I -56, II -56, III -112
Max. Power	(VA)	50
Inductivity	(mH)	6 to 8
Oscillator frequency	(KHz)	2.5
Surroundubgs temperature	( $^{\circ}\text{C}$ )	Max. 50
Amplifier		VT-5010S30 Demand of insulation IP65

**Characteristic curves (measured at  $v=36 \times 10^{-6} \text{m}^2/\text{S}$ ;  $t=50^\circ\text{C}$  )**

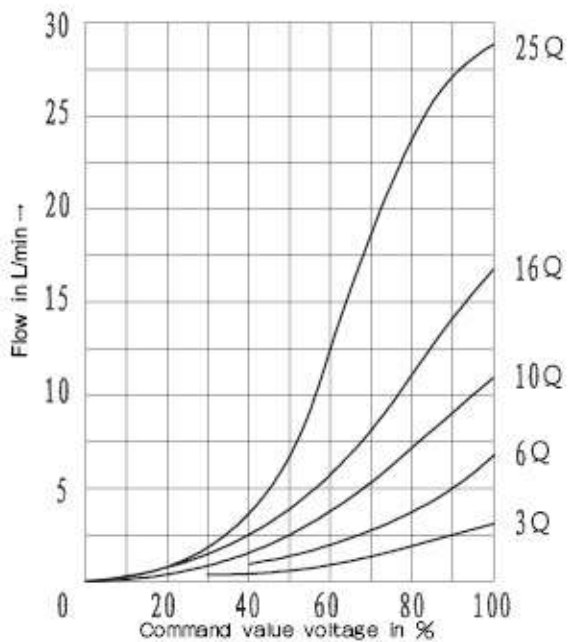
Frequency response characteristic curve

Input signals (%)	Qmin to Qmax Tu+Tg(ms)	Qmax to Qmin Tu+Tg(ms)
0-100	50	60
10-90	45	50
25-75	40	45

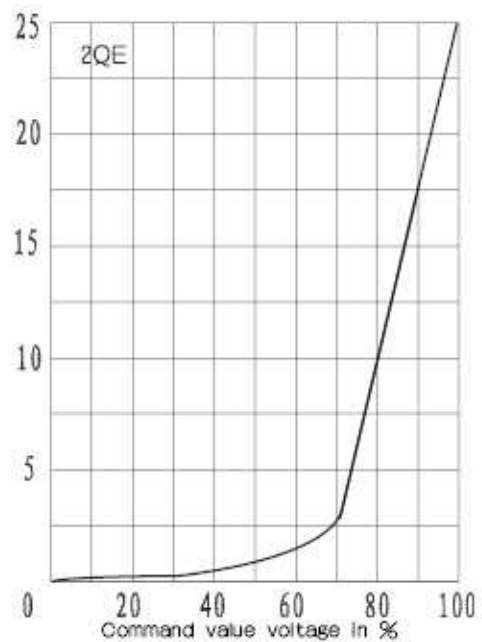


Relationship of the flow to the command value ( $P_{nom} = 50 \text{ MPa}$ )

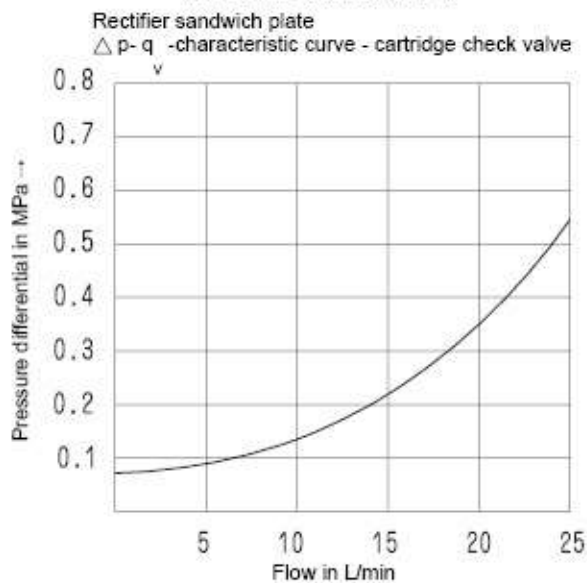
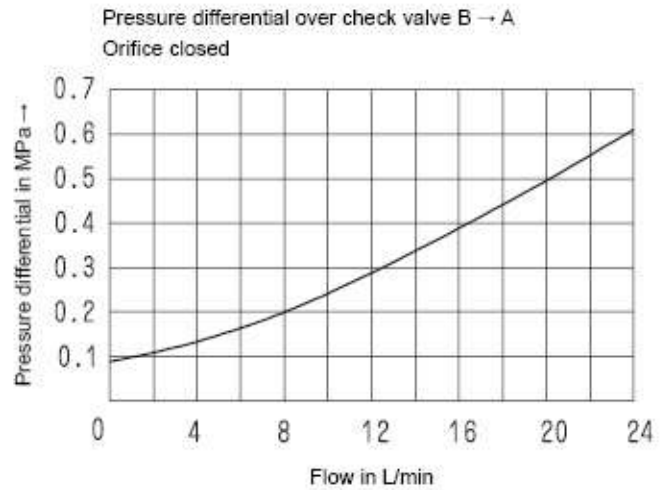
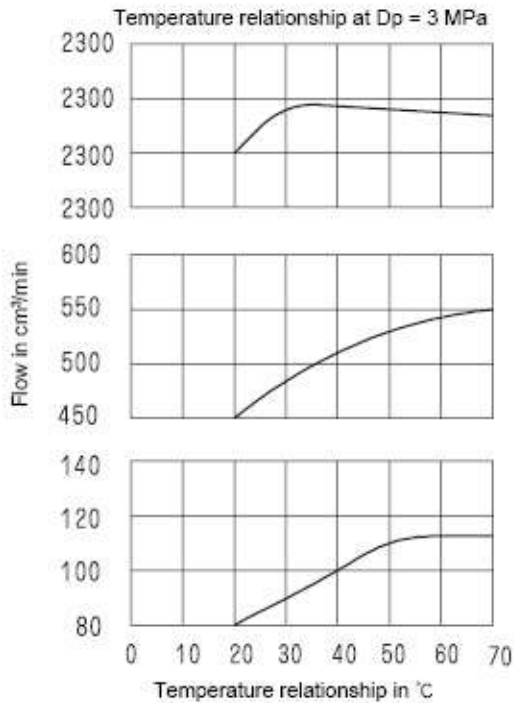
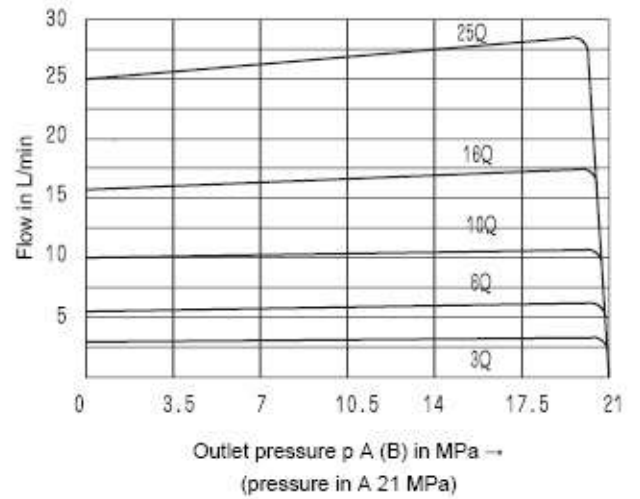
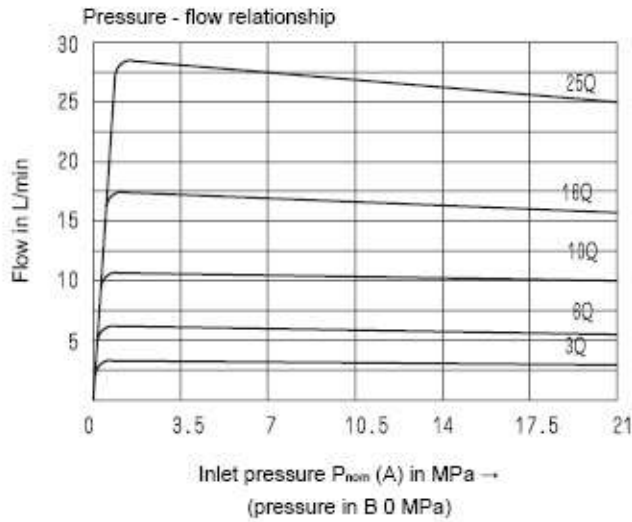
(flow control from A  $\rightarrow$  B)



(flow control from A  $\rightarrow$  B)

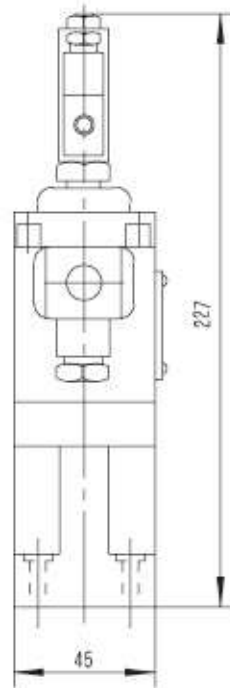
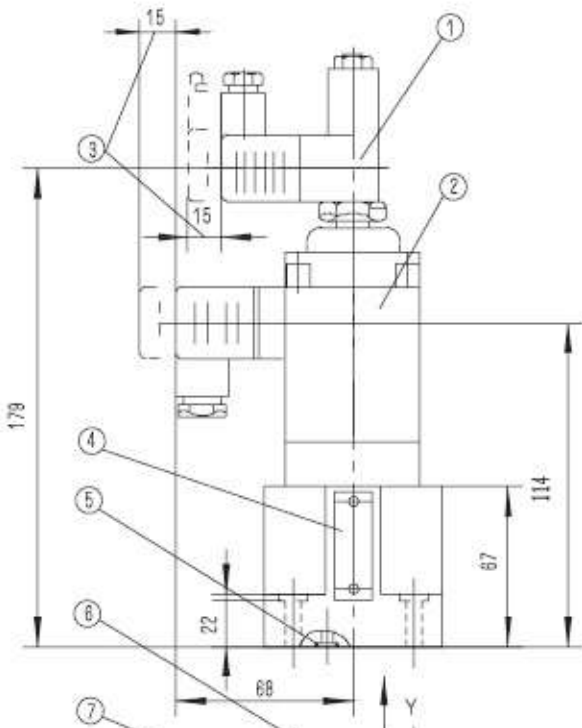


# Proportional flow control valve



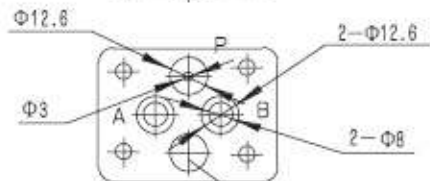
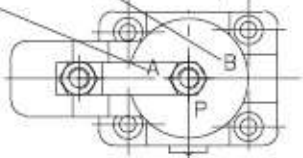
Unit dimensions:

(Dimensions in mm)



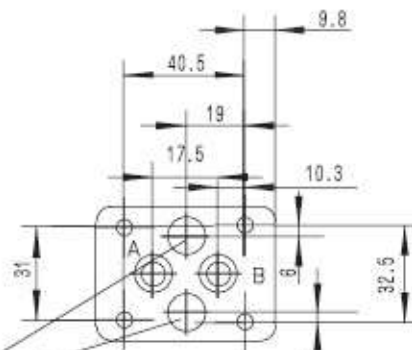
- 1 Inductive position transducer
- 2 Solenoid
- 3 Space required to remove plug-in connector
- 4 Nameplate
- 5 O-Ring 9.25 x 1.78 (for ports A, B, P, T and blind hole)
- 6 Port B
- 7 Port A

Subplates:  
 G 341/01 (G 1/4")  
 G 342/01 (G 3/8")  
 G 502/01 (G 1/2")  
 See page 80



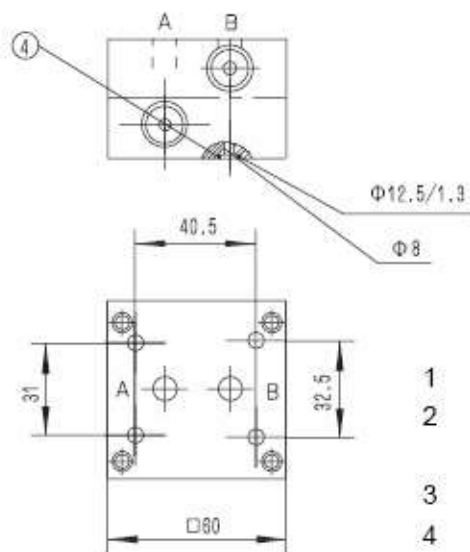
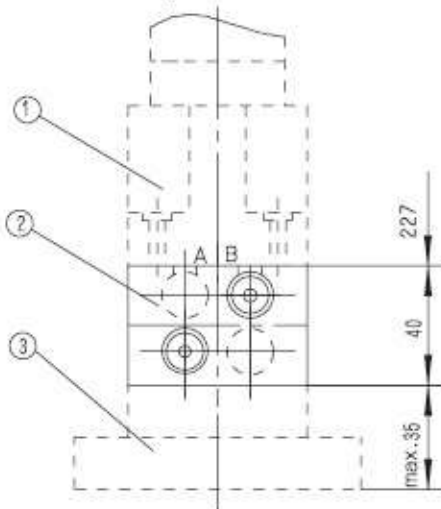
View "Y"  
 Type 2FRE6A...

Blind hole  
 $\Phi 12.6$



View "Y"  
 Type 2FRE6B...

Rectifier sandwich plate



- 1 valve 2FRE6
- 2 Rectifier sandwich plate Z4S6
- 3 Subplates
- 4 O-ring 9.25 x 1.78

BEIJING HUADE HYDRAULIC INDUSTRIAL GROUP CO.,LTD.	Proportional flow control valve 2-way version, Type 2FRE 10, 16...			RC29190/9.2006
	Size 10, 16	up to 21 MPa	up to 160 L/min	Replaces: RC29190/08.2000

**Features:**

- Valve with a pressure compensator for pressure compensated control of a flow
- Actuation via a proportional solenoid
- 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 valve and electrical amplifier VT 5004 (separate order)



**Functional , section**

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

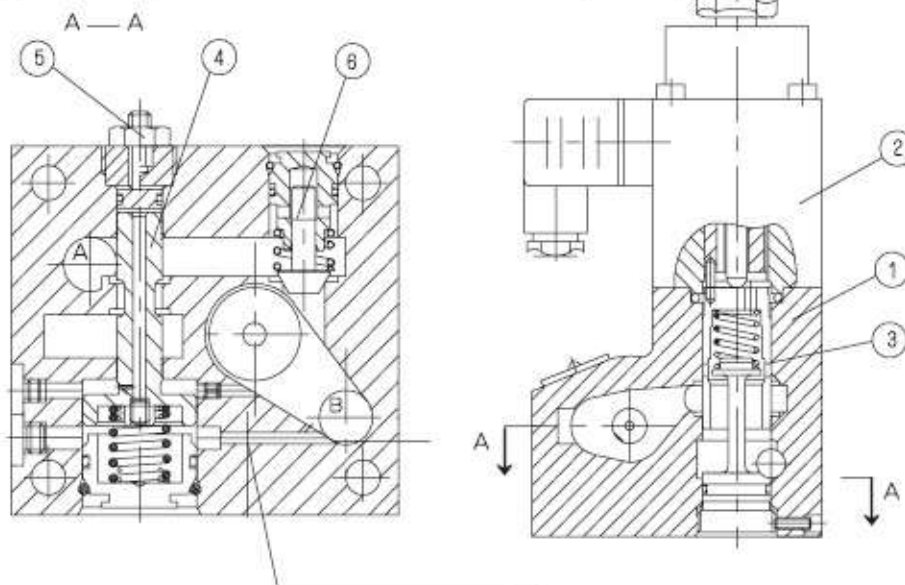
They basically comprise of the housing (1), proportional solenoid with inductive position transducer (2), measuring orifice (3), pressure compensator (4), stroke limiter (5), as well as an optional check valve (6).

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

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

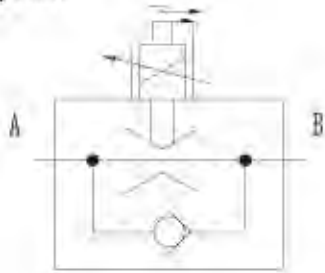
The small temperature drift is achieved due to the design of the measurement orifice. At a 0 % command value the measurement orifice is closed.

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 (6) free flow is possible from B to A.

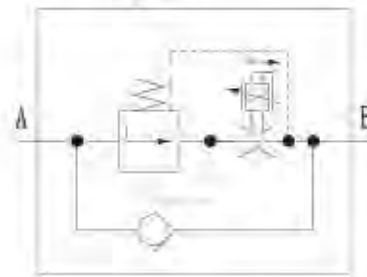


## Symbols,

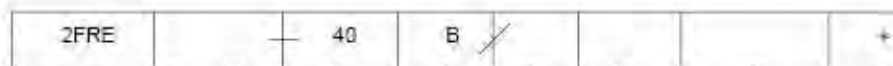
simplified



complete



## Ordering details



Nominal size 10 = 10  
Nominal size 16 = 16

Series 40 to 49 = 40  
(40 to 49: unchanged installation and connection dimensions)

Technology of Beijing Huade Hydraulic =B

Further details in clear text

No code = Mineral oil  
V = Phosphate ester

No code = Without pressure compensator stroke limiter

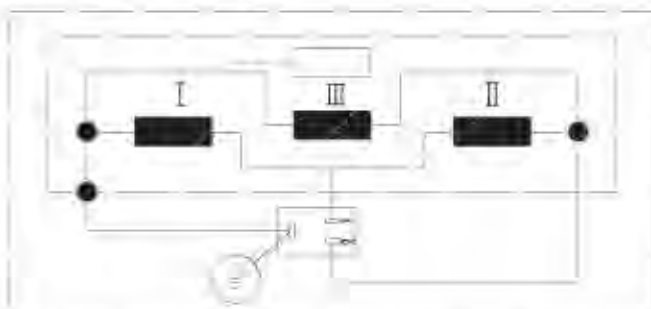
B = With pressure compensator stroke limiter

Flow control range A → B

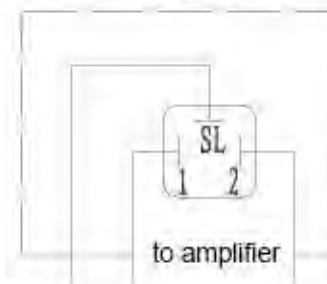
Nominal size 10		Nominal size 16	
Linear	Increase by degrees	Progressive with fast feed Linear (fine control range)	Linear
up to 5 L/min = 5L up to 10 L/min = 10L up to 16 L/min = 16L up to 25 L/min = 25L up to 50 L/min = 50L up to 60 L/min = 60L	up to 5 L/min=5 Q up to 10L/min=10Q up to 16L/min=16Q up to 25L/min=25Q	up to 2L/min=2QE up to 5L/min=5QE	up to 80 L/min = 80L up to 100 L/min = 100L up to 125 L/min = 125L up to 160 L/min = 160L

## Electrical connections ---- Inductive position transducer

Connections on loops



Connections on plug-in connector





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

**Hydraulic**

Operating pressure (MPa)		31.5									
Minimum pressure differential (MPa)		Size 10					Size 16				
		0.3~0.8					0.6~1				
$\Delta p$ free return flow B → A	Measurement orifice open(MPa)	0.1	0.12	0.15	0.2	0.3	0.35	0.16	0.19	0.24	0.31
	Measurement orifice closed(MPa)	0.17	0.2	0.25	0.3	0.5	0.6	0.3	0.35	0.45	0.6
Flow Q max. (L/min)		5	10	16	25	50	60	80	100	125	160
		40									
Flow Character	Temperature drift $\Delta Q/\Delta C$ (%) Hydraulic + electrical	0.1Q max									
	Pressure compensated up to $\Delta p = 31.5\text{MPa}$ (%)	$\pm 2Q_{\text{max}}$									
Degree of contamination ( $\mu\text{M}$ )		$< 20$ (We recommend a filter with a minimum retention rate of 10)									
Pressure fluid		Mineral oil(for NBR seal),Phosphate ester (for FPM seal)									
Viscosity range ( $\text{mm}^2/\text{s}$ )		2.8 to 380									
Pressure fluid temperature range ( $^{\circ}\text{C}$ )		-20 to +70									
Hysteresis (%)		$< \pm 1Q_{\text{max}}$									
Repeatability (%)		$< 1Q_{\text{max}}$									
Sample spread (%)		$< \pm 2$									
Installation		optional									
Weight (Kg)		6					8.3				

**Electrica**

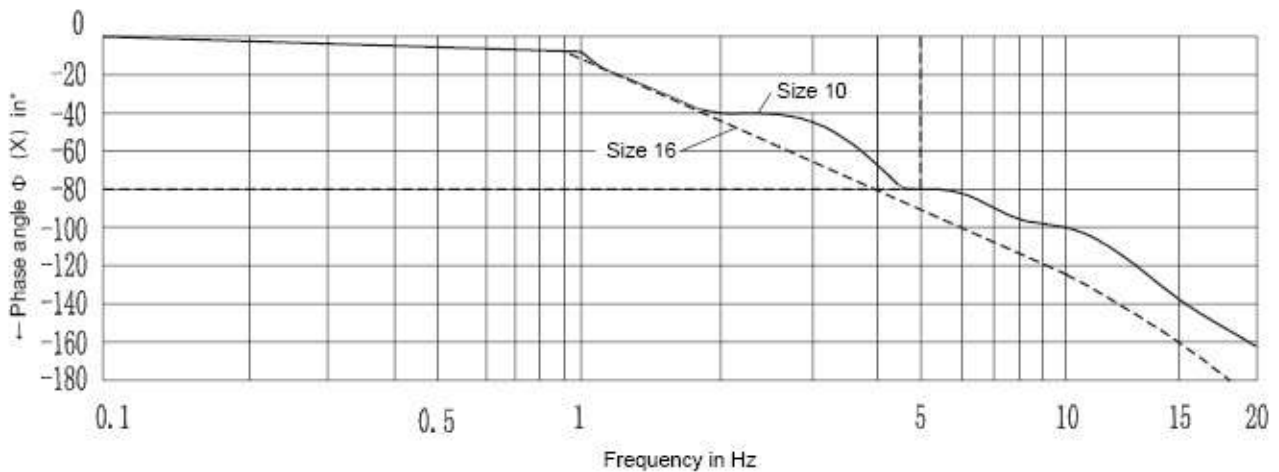
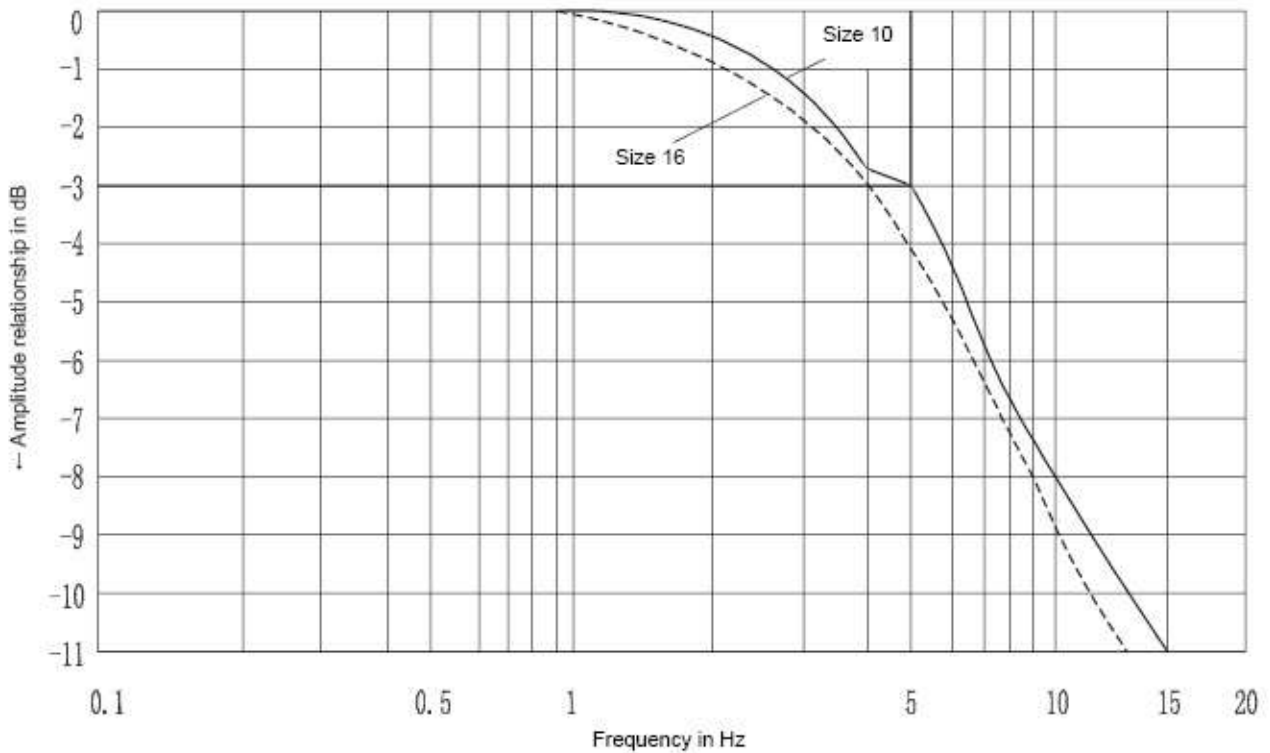
Voltage type		DC 24V
Coil resistancance ( $\Omega$ )	Cold value at 20 $^{\circ}\text{C}$ 10 , Max. warm value 13.9	
Operation state		Continuous
Max.fluid temperature ( $^{\circ}\text{C}$ )	+50	
Max. Power (VA)	50	
Coil resistance of transducer ( $\Omega$ )	at 20 $^{\circ}\text{C}$ I -56, II -56, III -112	
Inductivity (mH)	6 ~ 8	
Oscillator frequency (KHz)	2.5	
VT-5010S30 Demand of insulation IP65	IP65	
Amplifier (Supplied with valves)	VT-5004 S30	
Types of Electrical connections		see page 72

**Characteristic curves (measured at  $v = 36 \times 10^{-6} \text{m}^2/\text{S}$ ;  $t=50^\circ\text{C}$ )**

(measured at  $t = 50^\circ\text{C}$ ;  $P_{\text{nom}} = 5 \text{ MPa}$ ; amplitude 0 ~100 %; NS 10 / 60L ; NS 16 / 160L)

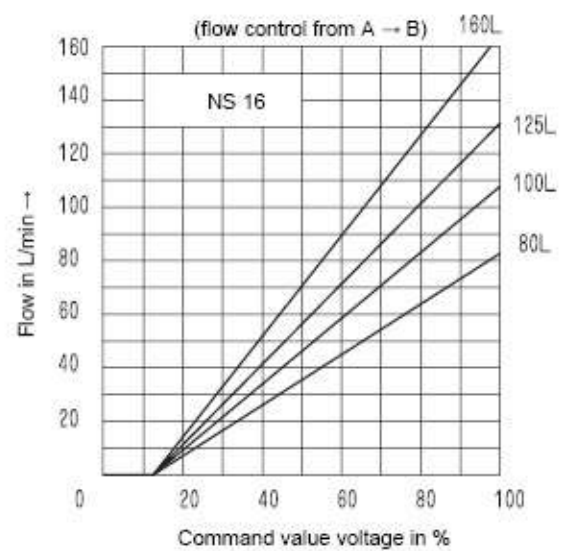
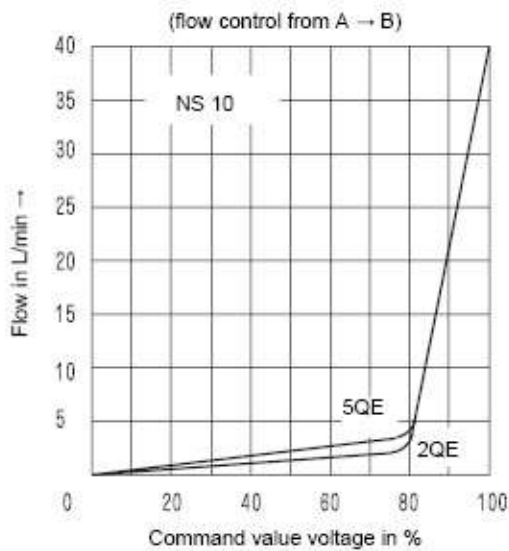
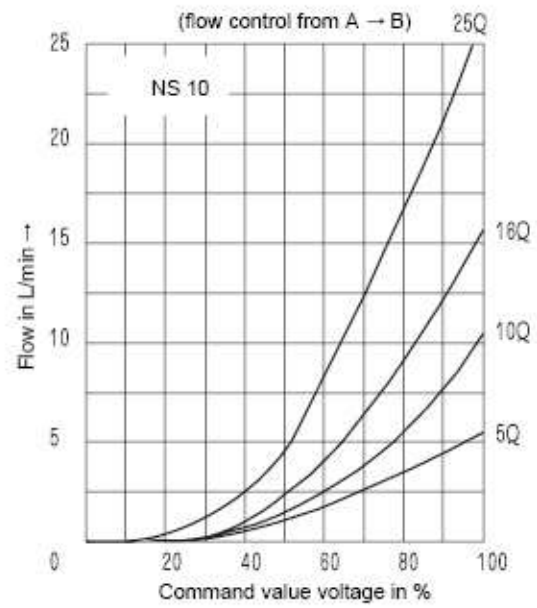
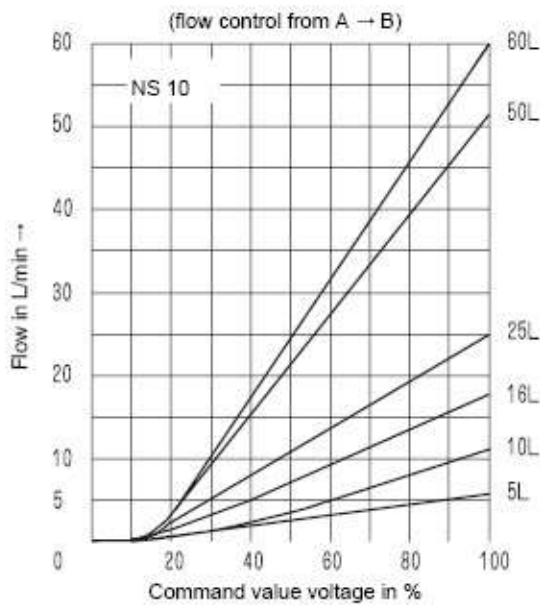
Transient function with a stepped form of command value change

Stroke	Time (from start to 100% amplitude)		Time (from start to Min. amplitude)	
	(ms)		(ms)	
%	NS 10	NS 16	NS 10	NS 16
0-100	100	110	80	110
10-90	90	100	85	100
25-75	85	95	80	95

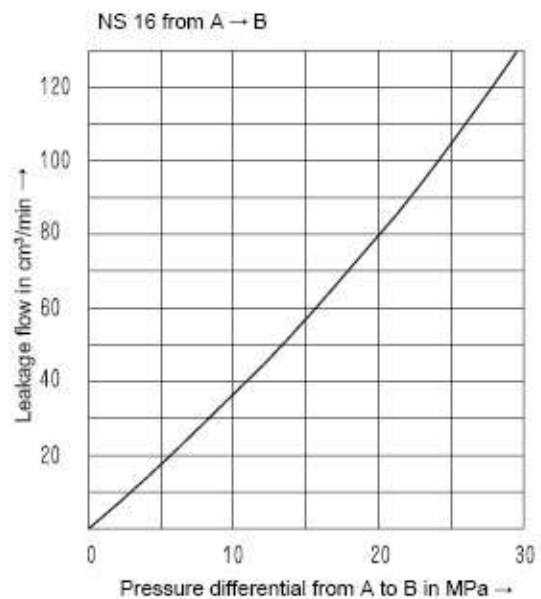
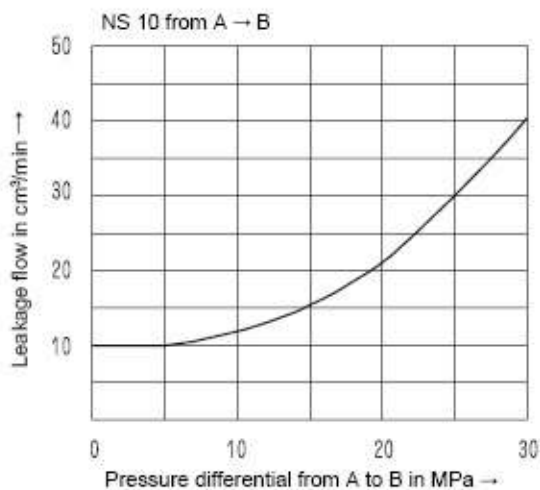


**Characteristic curves (measured at  $v = 36 \times 10^{-6} \text{m}^2/\text{S}$  ;  $t=50^\circ\text{C}$ )**

Relationship of the flow to the command value voltage (flow control from A → B)



Leakage flow from A → B



**Unit dimensions:**

**(Dimensions in mm)**

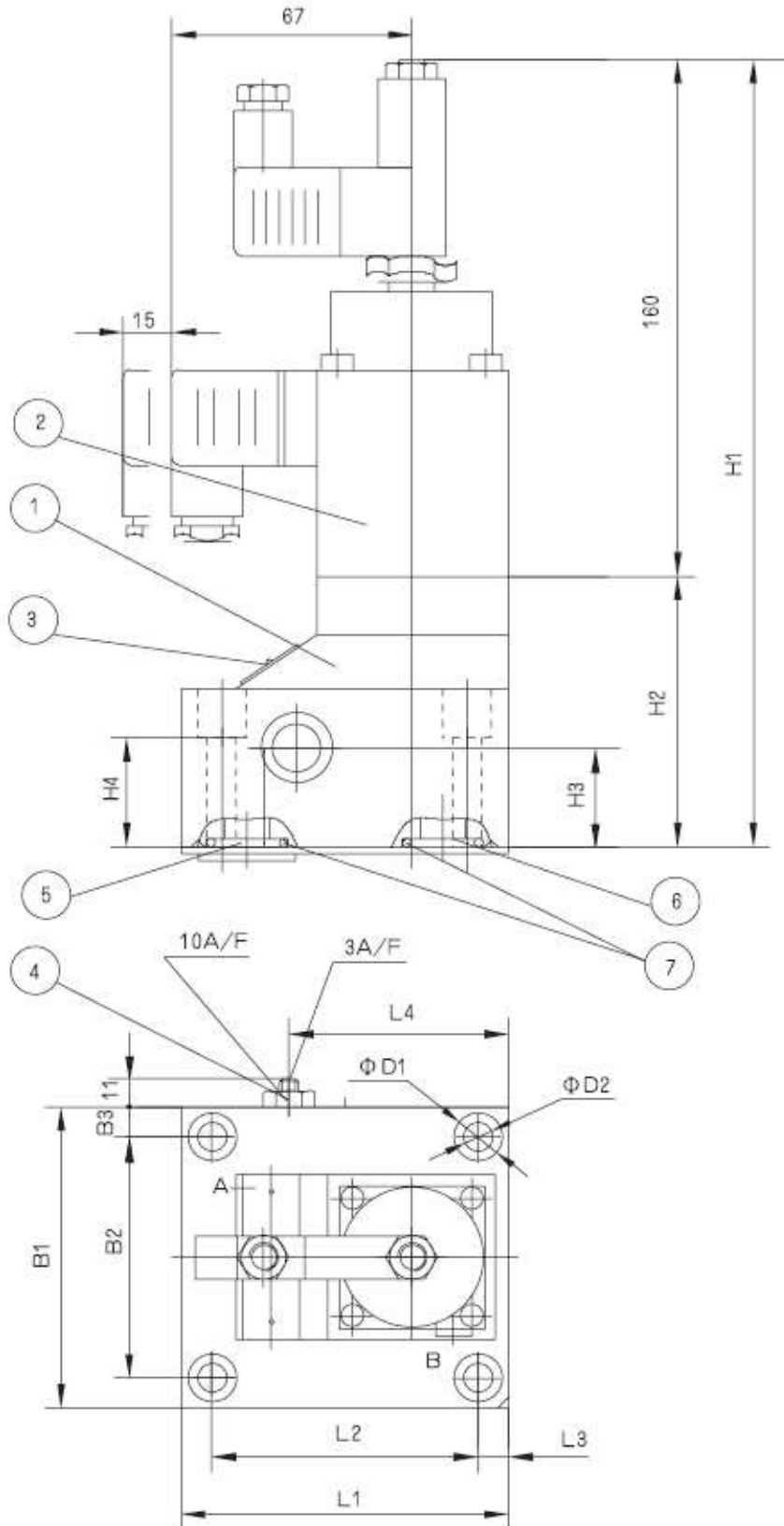
- 1 Valve housing
- 2 Proportional solenoid with inductive position transducer
- 3 Nameplate
- 4 Pressure compensator stroke limiter
- 5 Port A
- 6 Port B
- 7 O-Ring for ports A, B  
18.66 X 3.53(NS 10 )  
26.58 X 3.53(NS 16)

**Subplates :**

- NS 10: G279/01 (G 1/2") G280/01 (G 3/4")
- NS 16: G281/01 (G 1") G282/01 (G 1 1/4")
- See page 90

**Valve fixing screws**

- NS 10: 4 -M8 x 60-10.9  
(GB/T70.1-2000)
- NS 16: 4 -M10 x 70-10.9  
(GB/T70.1-2000)



NS	B1	B2	B3	$\phi D1$	$\phi D2$	H1	H2	H3	H4	L1	L2	L3	L4
10	95	76	9.5	15	9	245	85	38	48	102.5	82.5	10	68.5
16	123.5	101.5	11	18	11	255.5	95.5	31	51	123.5	101.5	11	81.5

**BEIJING HUADE  
HYDRAULIC INDUSTRIAL  
GROUP CO.,LTD.**

**Proportional Electro-Hydraulic Relief and Flow  
Control Valves, Type PQ10-20/140-125**

RC27500/9.2006

Size 10

up to 14 MPa

up to 125 L/min

**Features:**

- For subplate mounting
- Protected by high voltage
- Output flows scale by input elec-messages
- System Pressure could achieve the changes to scale

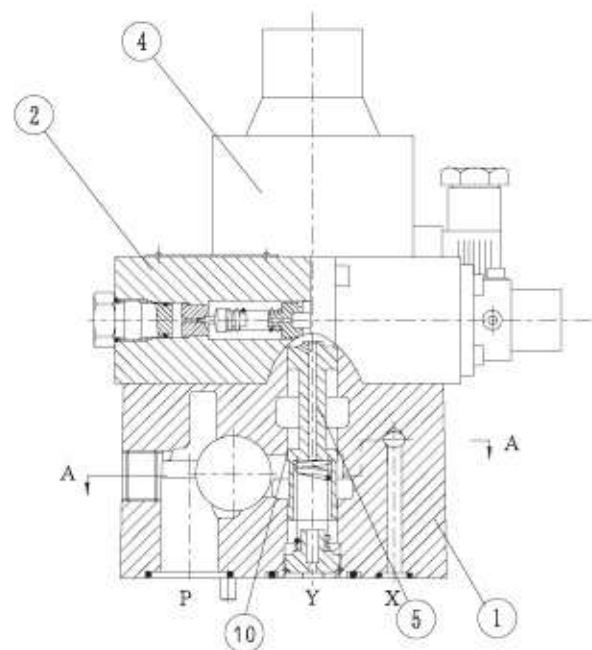


**Function, section;Symbol**

This pressure and flow control valve is an energy-saving valve that can adjust the pressure and flow of system proportional to electrical sign.

Since the valves controls the pump pressure by following the load pressure while keeping the differential pressure minimized, it serves as a low power-consumption energy-saving, meter-in, controlled flow control valve.

Further, since a temperature compensation function is incorporated, this valve provides consistent flow control without respect to the fluid temperature.



Symbol:

