NNOVATIVE valve

Direct acting proportional servo valve

RT6313E

Size: 6

Maximum pressure: 31.5 MPa

Rated flow: 5-40 L/min (△ P_N=7 MPa)

Features and Benefits

- High thrust permanent magnet linear force motor directly drives the spool;
- Dynamic response independent of system pressure;
- No pilot flow required, lower power consumption;
- Low hysteresis and high resolution for excellent repeatability;
- Standard spool position monitoring signal;
- Electrical gas zeroing;
- When the valve is de-energized, the spool is restored to the neutral position by the centering spring, so that the load is in a safe state;

The output flow rate of the valve is related to the input command electrical signal and the pressure drop at the throttle of the valve. For a given valve pressure drop, the output flow rate of the valve can be calculated by the following equation

$$Q = Q_N \sqrt{\frac{\Delta P}{\Delta P_N}}$$

Q— Actual flow，L/min

Q_N — Rated flow，L/min

Δp — the actual pressure drop of the valve, MPa

△P_N — the rated pressure drop of the valve, MPa

Working Principle

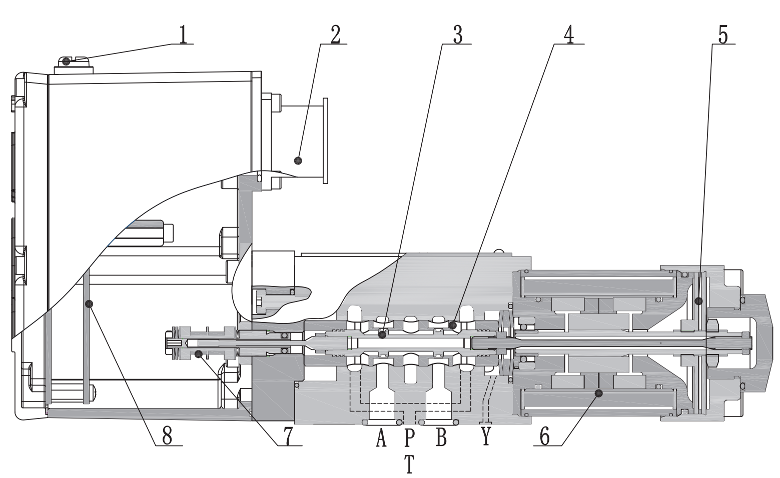
The servo achieves closed-loop control of the spool position by means of a built-in LVDT position sensor, a linear force motor and a built-in amplifier. When the servo valve is energized with a control signal corresponding to the desired spool position, the built-in amplifier converts it into a corresponding pulse width modulated signal (PWM) to drive the linear force motor. Under the excitation of the oscillator, the LVDT position sensor fixed to the spool generates an electrical signal proportional to the spool position, which is demodulated and compared with the input command signal. The spool position is proportional to the command signal.

Structure :

The valve consists of the following parts.

Permanent magnetic linear force motor: centering spring (5), force motor assembly (6)

Power stage: spool (3), sleeve (4), etc.



Working Principle

The working principle of permanent magnet linear force motor:

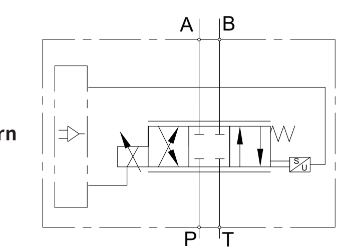
The linear force motor used in the RT6313E valve is a permanent magnet type differential motor (6). The permanent magnets provide some of the magnetic force for the force motor actuator, so the force motor requires less excitation current than the proportional solenoid. When the coil is not energized, the armature of the linear force motor is balanced in the neutral position by the magnetic field force in the left and right directions and the spring force in the center. When the coil is energized, the force on the armature is proportional to the displacement and the current of the coil.

The motor pushrod must overcome the large stiffness of the center spring force, the hydraulic force, and the friction caused by contaminants to drive the spool movement. The other solution is to work with the combination of proportional solenoid and reset spring, when the electromagnetic proportional solenoid to achieve the above two-way drive function requires two coils, but this will reduce the dynamic performance of the valve. Another option is to work with a combination of a proportional solenoid and a reset spring. When the solenoid is de-energized, the poppet will push the spool to reset and will experience a full open position of the valve, which may result in loss of load control.

Functional Symbols

RT6313E-···0···

Y-port internal oil return



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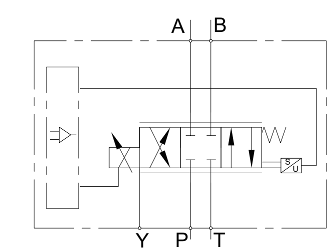
Y-port external oil return



Technical parameters

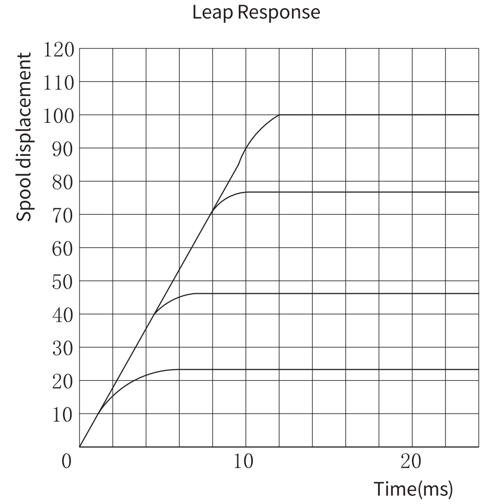
General Technical Data	
Operating pressure	port P、X、A、B: ≤ 315 bar(K)
	port R: ≤ 315 bar(K)
Storage temperature range	-20°C-80°C
Seal material	NBR、FPM
Working medium	Petroleum-based hydraulic oil in accordance with DIN 51524, or hydraulic oil viscosity of 5 - 400 mm^2/s at 38°C (preferably 15 - 45 mm^2/s) according to user needs
System filtration	High pressure filter without bypass and with alarm device shall be installed in the main oil circuit of the system. If possible, install the oil filter directly at the oil supply port of the servo valve
Recommended Fluid Cleanliness Grade	Regular use:ISO 4406＜15/12 Long-life use:ISO 4406＜14/11 (Oil cleanliness greatly affects the performance of the valve)
Filtration accuracy (Recommended Values)	Regular use:β_{10} ≥75（10μ Absolute value) Long-life use:β_6 ≥75(6μ Absolute value)
Installation requirement	Can be fixed in any position or installed with the system
Vibration resistance	30g, 3 axis
Weight (Including protection board)	2.5kg

Technical parameters

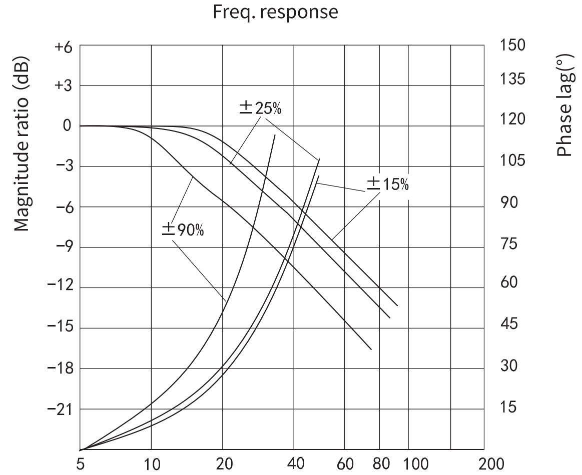
Static and dynamic data	
Model type	RT6313E
Leap Response	⩽12ms
Resolution ratio	⩽0.1%
hysteresis	<1%
Null shift (at △T=55°C)	1.5%
Rated flow	5/10/20/40/min
Maximum internal leakage	0.15/0.3/0.6/1.2L/min

Characteristic Curve

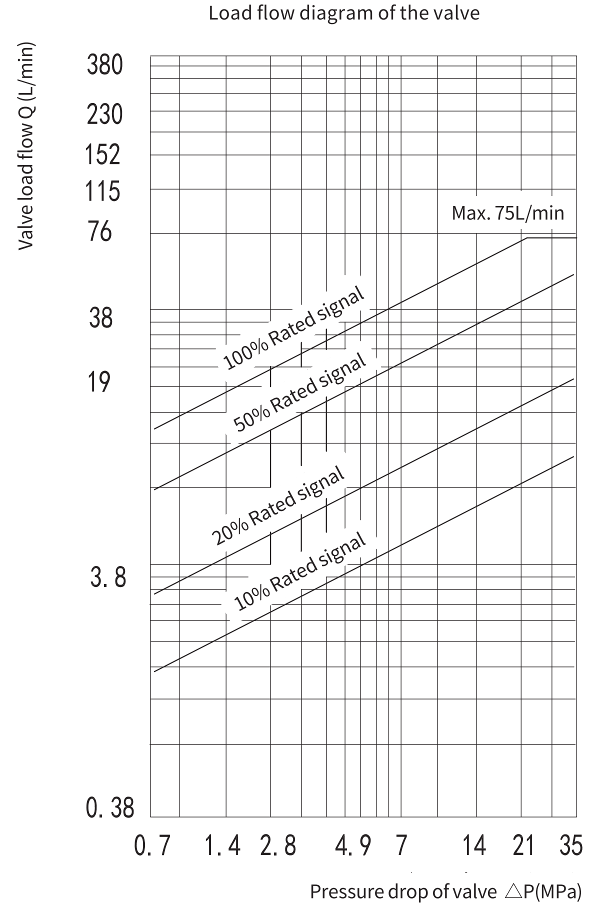
Leap Response



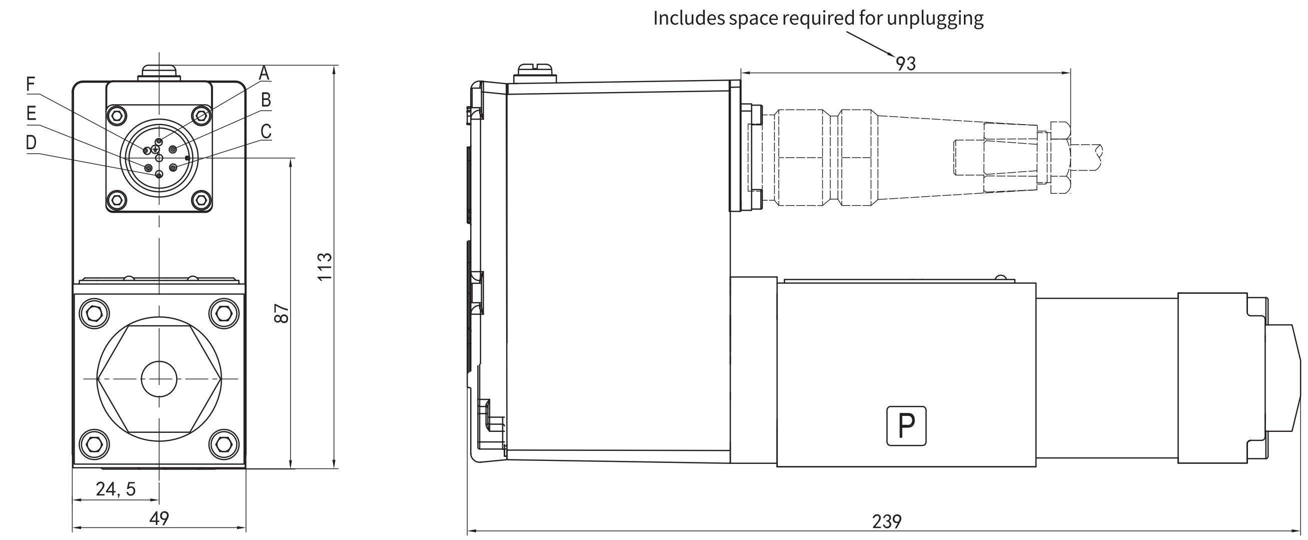
Freq. response



Load flow diagram of the valve



Dimension

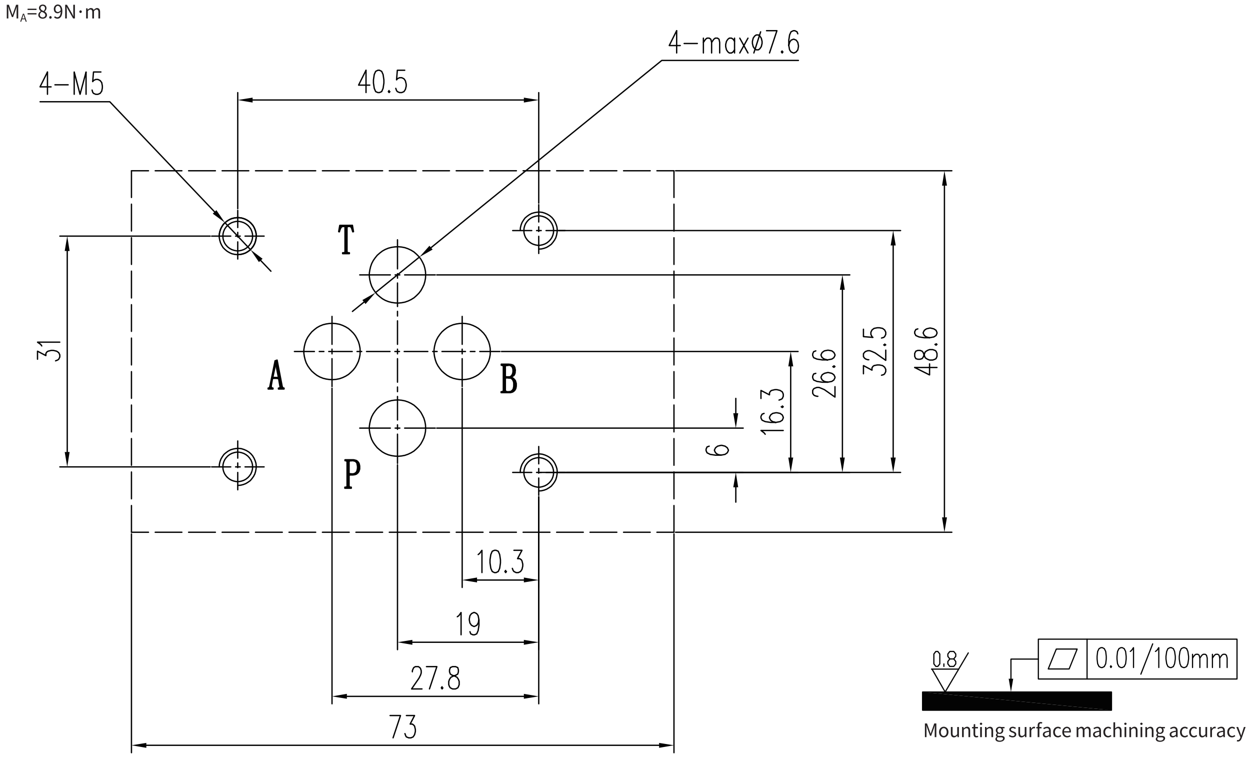


Installation Size

Conforms to ISO4410-03-03-094

Mounting screws: 4-M5x50-10.9 (GB/T70.1-2000)

M_A=8.9N·m



Electrical Characteristics

1. Supply voltage U:=+24 VDC (18~32 VDC)
Current consumption of RT6313E series is 1_{Amax}=1.2A
External fuse for valve 1.6A (delayed type)

2. Input Signal
2.1 Voltage command signal 0~±10V
Valve spool travel is proportional to (U_D-U_E)
(U_D-U_E) = +10V when the valve port is 100% fully open and port P communicates with port A and port T communicates with port B. For single-ended signals pin D or pin E can be connected to a reference potential (usually ground) depending on the desired flow direction.
2.2 Current command signal 0~±10mA (single-ended input)
Spool travel is proportional to I_D=-I_E
When the valve port is 100% fully open and the valve port P communicates with the valve port A and the valve port T communicates with the valve port B, I_{DB}=10mA. The current direction of D and E is opposite, so the D or E foot can be used according to the desired flow direction, and the unused foot is left hanging.
2.3 Current command signal 0~±10mA (differential input)
The spool travel is proportional to I_D=-I_E, the positive command input is connected to D, and the negative command input is connected to E.
When the valve port is 100% fully open and the valve port P communicates with the valve port A and the valve port T communicates with the valve port B, I_{DE}=10mA.
2.4 Current command signal +4~+20mA
Valve spool travel is proportional to (I_D-12mA)
When the valve port is 100% fully open and the valve port P communicates with the valve port A and the valve port T communicates with the valve port B, I_D = +20mA. when the valve port is fully open and the valve port P communicates with the valve port B and the valve port T communicates with the valve port A, I_D = +4mA.
Use pin D as signal input and pin E is left open.

3、Spool actual displacement monitoring output
I_F(+4⋯+20mA) corresponds to the actual displacement of the spool.
When the valve port is fully open and the valve port P communicates with the valve port A and the valve port T communicates with the valve port B, I_F=+20mA; When the valve port is fully open and the valve port P communicates with the valve port B and the valve port T communicates with the valve port A, I_F=+4Ma

4、All signal lines (including the external sensor connection) must use shielded cable. The shielded cable is connected to the power ground (0V) using the star grounding method, and connected to the shell of the socket (EMC)

5、EMC: meet the requirements of EN 55011/3.91 class B, and meet the standards of EN50081-1/01.92 and EN 50082-2/03.95 class A.

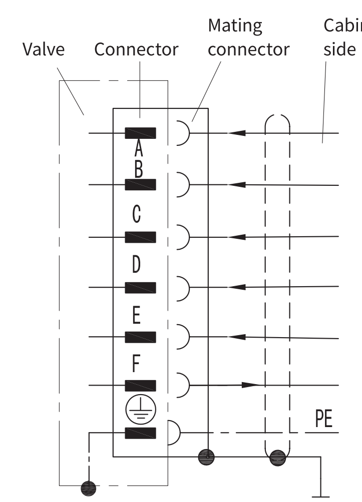
6. Protection grounding cable cross-sectional area 0.65mm²

7. When making electrical connections, effective measurements must be made to ensure that local ground potential changes do not cause excessive ground currents.

8、Protection level: in accordance with EN60529P standard, with matching plug protection level IP65 level.

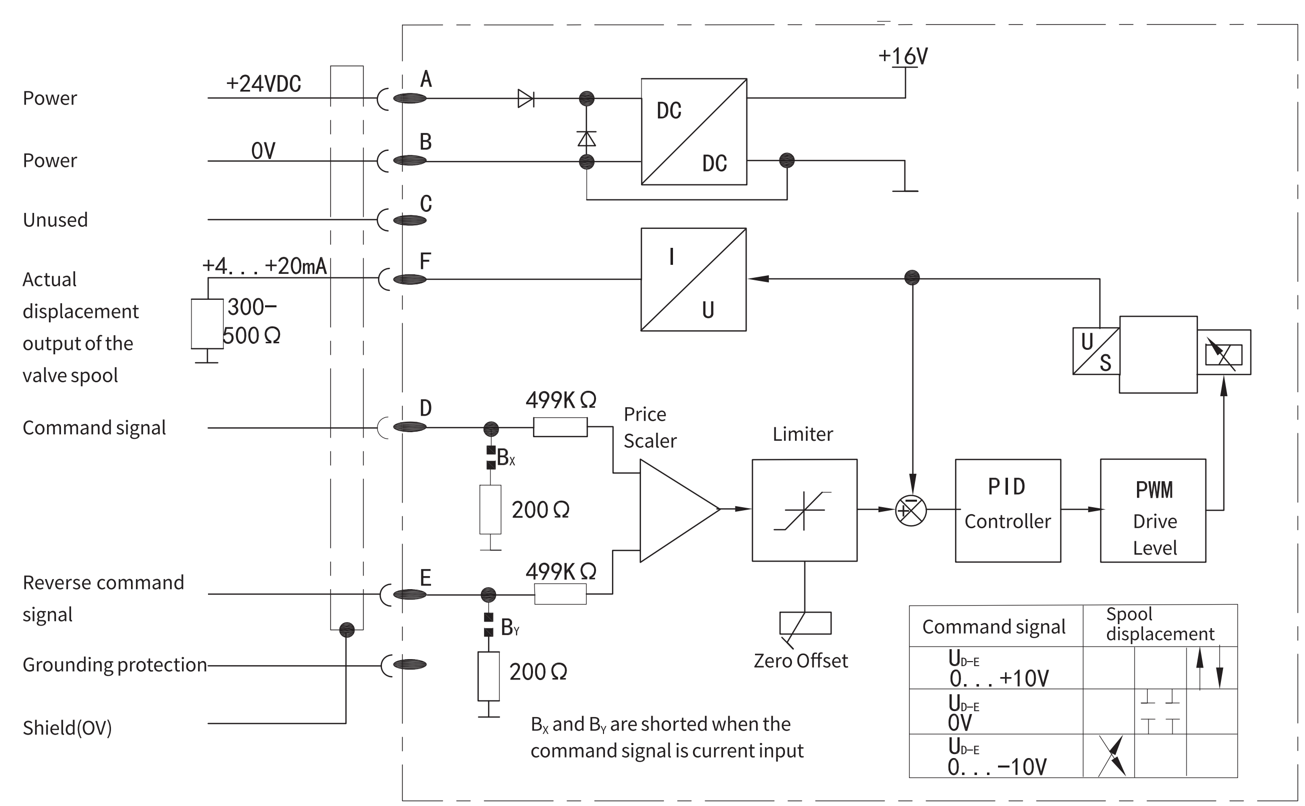
Socket wiring diagram

connector according to DIN 43563, to be ordered separately



Pin	Pin Function	Signal Type			
		M	X	P	U
		±10v	±10mA, Differential Inputs	±10mA, Single Ended to Ground	4-20mA
A	Power	Usupply=24VDC (18 to 32VDC), Reference GND			
B	GND	Power/ Signal Ground			
C	Not used	Not used			
D	Command signal +	U_{IN}=U_{DE} R_{IN}=10KΩ	I_{IN}=I_{DE} R_{IN}=200Ω	I_{IN}=I_{DB} R_{IN}=200Ω	U_{IN}=I_{DB} R_{IN}=200KΩ I_{MAX}=±
E	Command signal -	Reference D Pin	Reference D Pin	I_{IN}=I_{EB} R_{IN}=200Ω	No catch
F	Spool actual displacement output	I_{out}=4 to 20 mA,For reference GND, load resistance R_L=300-500			
G	Grounding Protection	Short connection to housing			

Block Diagram



Order Model Description

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RT	Model

Servo Valve Model	
63	Direct-acting servo valve

Mounting surface standard	
1	Mounting dimensions in accordance with ISO 4401

Latus rectum	
3	Latus rectum is 6mm

Feedback Type	
E	With built-in amplifier

Design code	
	Design Serial Number

Maximum working pressure	
K	31.5MPa

Flow(at △pN=7Mpa)	
5	5L/min
10	10L/min
20	20L/min
40	40L/min

Main valve spool function	
S	Standard
P	Positive covering
N	Negative covering
T	Special,customized to customer requirements

Power stage spool position in case of no signal or no oil supply	
F	P→ B or A→T(Minimum opening is 10% of the full opening)
D	P→ A or B→T(Minimum opening is 10% of the full opening)
M	Median
X	Other forms are available upon requst

Y port	
0	Plugged by bolt, PtMax≤5MPa
1	Open, PtMAX＞5MPa

O-ring material	
N	Buna-N
V	Fluoroelastomer

Electrical sockets	
6	6＋PE

Command signal		
Input signal		Output signal
M	±10 VDC	+4-20mA
X	±10mA,Differential inputs	+4-20mA
P	±10 mA Single-ended input	+4-20mA
U	4-20mA	+4-20mA

Power supply	
2	±24VDC(18-32VDC)

Servo Proportional Valve
RT6615E
RT6617E
RT6619E

RT6615E

Maximum pressure: 35 MPa

Rated flow: 20-200 L/min (△ P_N=7 MPa)

RT6617E

Maximum pressure: 35 MPa

Rated flow: 120-250 L/min (△ P_N=1 MPa)

RT6619E

Maximum pressure: 35 MPa

Rated flow: 250-550 L/min (△ P_N=1 MPa)

Features and Benefits

- High flow acceptance efficiency (more than 90% of the pilot stage flow is utilized), resulting in lower energy consumption
- High dynamic response of the valve due to the high undamped natural frequency of the jet pipe pilot stage
- Reliable performance, high pressure recovery capability of the jet pilot stage (more than 80% of the pressure recovery capability when the rated signal is input), thus providing a larger driving force to the power stage spool and improving spool position accuracy
- The minimum control pressure of the pilot stage is only 25 bar, so it has the advantage that it can be used for low-pressure systems such as turbine control.
- The high frequency response of this series of valves and the good position accuracy of the power stage slide valve can improve the static performance of the control system.
- The pilot stage control oil can be controlled and discharged externally by X and Y port selection due to the large flow rate valve body flow path design.
- The main spool has a reduced driving area and has the following advantages:
 High dynamic response with small pilot stage flow rate, which also enables fast spool movement
- Position electrical feedback with LVDT
- For fail-safe type proportional valves, the slide valve can be reliably secured in a safe position by spring, seating valve, or cutting off external oil pressure.
- The RT661 series has two-stage and three-stage configurations, and the power-stage slide valve is driven by a single-stage or two-stage pilot servo valve. The two-stage RT661 series valves are mainly used in small signal requirements with The two-stage RT661 series valves are mainly used in systems requiring high resolution and high dynamic response at small signals, while the three-stage valves are suitable for applications requiring high dynamic response at larger command signals.

The output flow rate of the valve is related to the input command electrical signal and the pressure drop at the throttle of the valve. For a given valve pressure drop, the output flow rate of the valve can be calculated by the following equation

$$Q = Q_N \sqrt{\frac{\Delta P}{\Delta P_N}}$$

Q— Actual flow，L/min

Q_N— Rated flow，L/min

Δp — the actual pressure drop of the valve, MPa

△P_N— the rated pressure drop of the valve, MPa