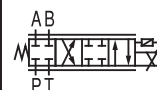
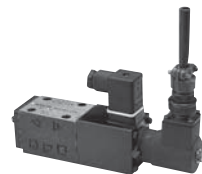


High-Response Proportional Flow Control Valve ESH-G01

2.6 to 13.2 gpm
4640 psi



Features

Frequency response equivalent to an electro-hydraulic servo valve. Direct spool by a high-output proportional solenoid. Differential transformer for accurate spool positioning with minor feedback.

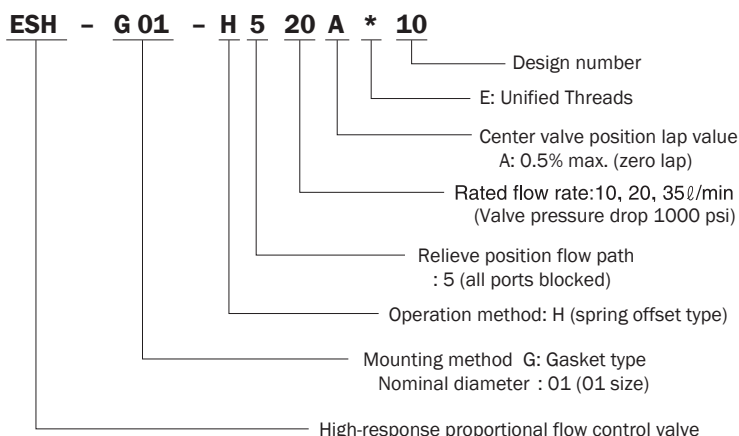
Recovery of all port block positions following amp power off or wiring disconnection (Failsafe Function). Steel spool and spring for long life.

Specifications

Model No.		ESH-G01-H510A-10	ESH-G01-H520A-10	ESH-G01-H540A-10
Item				
Maximum Operating Pressure P, A, B psi		4640		
T Port Allowable Back Pressure psi		362 max.		
Rated Flow Rate l/min (gpm) (Valve pressure drop 1000 psi)		10 (2.6)	20 (5.2)	40 (9.2)
Maximum Flow Rate gpm		5.8	9.2	13
Limit Valve Pressure Drop psi		4640	3045	2030
Hysteresis %		0.5 max.		
Step Response ms (0→100% Displacement)		16 max. (Note 1)		
Frequency Response Hz (90° Phase Delay ±10% Displacement)		At least 80 (Note 1)		
Center	Supply Pressure	0.5% max/FS (Δp=3625 psi)		
Drift	Fluid Temperature	1.5% max/FS (Δt=104°F)		
Filtration		Class NAS9 max.		
Operating Fluid Temperature Range °F (Recommended Fluid Temperature Range °F)		32 to 140° F (86 to 140° F)		
Water and Dust Resistance		IP53		
Weight lbs		5		

Note: 1. Step response is typical value for a supply pressure of 1000 psi and fluid temperature of 104° F (kinematic viscosity: 40 centistokes)

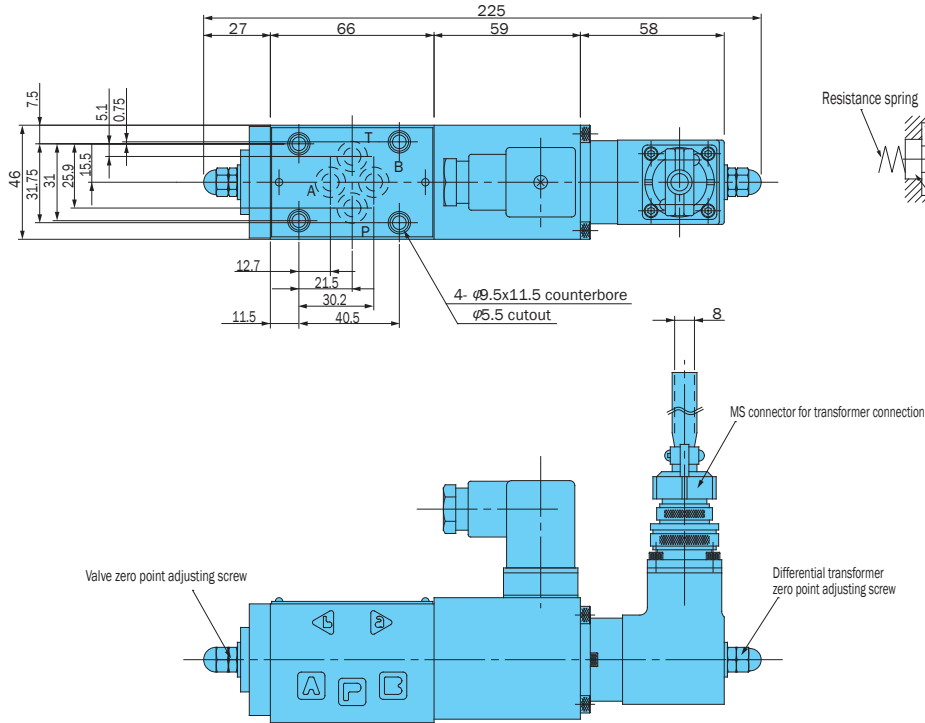
Understanding Model Numbers



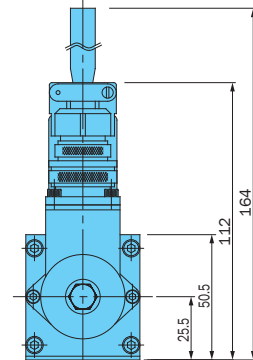
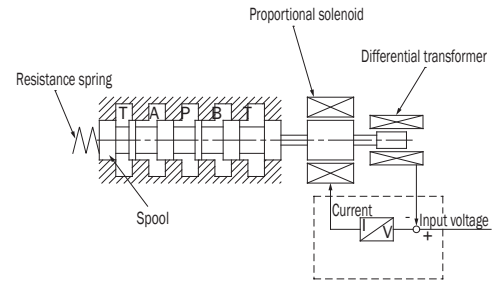
• Handling

- The amp and valve are adjusted to match at the factory, so be sure to use items that have the same MFG No.
- The differential transformer zero adjust screw and valve zero adjust screw are adjusted and fixed at the factory. Because of this, you should not touch the screws (sealed cap nuts).
- Install the valve so the spool axis line is horizontal.
- In the case of 3-port applications and for the direction that throughflow is most common, use of the following flow is recommended P→A→B→T. P→A limit differential pressure is greater than that of P→B.
- Be sure to perform sufficient flushing before a test run.
- Use steel piping for this valve and the main actuator, and keep piping as short as possible.
- There is no air bleeding.
- Mineral oil hydraulic operating fluid is standard. Use an R&O type and wear resistant type of ISO VG32, 46, or 68 or equivalent.
- Use an operating fluid that conforms to the both of the following.
Kinematic viscosity: 20 to 140 centistokes
Oil temperature: 86 to 140° F
- Filtration
Maintain hydraulic operating fluid contamination so it is at least NAS Class 9.
- Electrical wiring between the amp and valve should be no longer than 30 meters. For the solenoid valve use VCTF 2 mm², 2-conductor shielded wire, and for the differential transformer use VCTF 0.5 mm², 4-conductor shielded wire.
- After disassembling the valve, be sure to fill the inside of the guide with operating fluid before reassembling.
- Bundled Accessories (Valve Mounting Bolts)
(4) 10-24 x 1 3/4"
Tightening Torque: 3.5 to 5 ft lbs

Installation Dimension Drawings

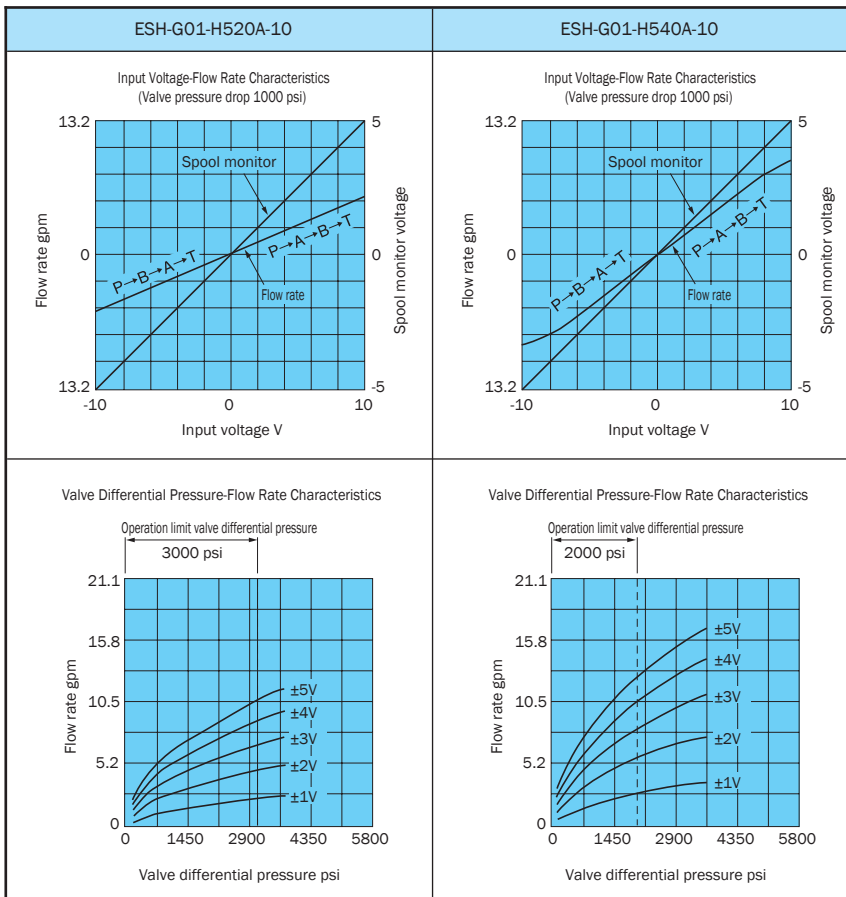


Operation Principle



The gasket mounting method conforms to ISO4401-AB-03-4-A.

Performance Curves



Note: $\pm 10V$ input amp factory default data.
Rotating the GAIN trimmer clockwise (rightward) increases the flow rate by up to 10%.

- Valve Pressure Drop and Rated Flow Rate

Valve Pressure Drop (ΔP_x)

$$= P_S - P_L - P_T$$

P_S : Valve supply pressure

P_L : Load pressure

P_T : T Port back pressure

The rated flow rate is the value when the above valve pressure drop is 1000 psi.

- Valve Pressure Drop and Control Flow Rate

The following is the maximum control flow rate when the size of the obtained valve pressure drop is ΔP_x ,

$$Q_x = Q_{\text{rate}} \times \sqrt{\frac{\Delta P_x}{7}}$$

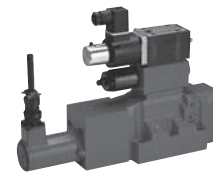
Qrate : Rated flow rate

$$\Delta P_x = P_S - P_L - P_T$$

- Calculation example
- When ESH-G01-H520A-10 is used under the following conditions:
 $P_S = 102 \text{ kgf/cm}^2$ (1450 psi)
 $P_L = 61 \text{ kgf/cm}^2$ (870 psi)
 $P_T = 10 \text{ kgf/cm}^2$ (145 psi)
 Maximum control flow rate Q_x is as shown below:

$$Q_x = Q_{\text{rate}} \times \sqrt{\frac{P_S - P_L - P_T}{7}}$$

$$= 20 \times \sqrt{\frac{10 - 6 - 1}{7}} = 13 \text{ l/min}$$



High-Response Proportional Flow Control Valve ESH-G03, 04, 06

21 to 158 gpm
4060 to 4640 psi

Features

- Main spool minor feedback for greatly increased hysteresis and repeatability.
- Response characteristics suitable to 20Hz and high precision acceleration control.
- Recovery of center position following amp power off or wiring disconnection (Failsafe Function).
- Single rod cylinder spool available for easy use.
- Built-in pilot pressure reducing valve for stable operation.

Specifications

Item		Model No.	ESH-G03-D*****-(*)-11	ESH-G04-D*****-(*)-11	ESH-G06-D*****-(*)-11
Maximum Operating Pressure psi	P,A,B Ports	External Pilot	4060	4640	4640
		Internal Pilot	3625	3625	3625
	T Port		3045	3045	3045
	Pp Port		3625	3625	3625
Minimum Pilot Pressure psi			217	217	217
Rated Flow Rate l/min (gpm) Rated stroke, P→A pressure drop, 145 psi			80 (21)	180 (47.5)	350 (92.5)
Maximum Flow Rate gpm			37	79.2	158
Pilot Pressure Reducing Valve Set Pressure psi			290	290	580
Hysteresis %			0.5 max.	0.5 max.	0.5 max.
Step Response ms (0 →100% displacement)			50(Note1)	50(Note1)	50(Note1)
Frequency Response Hz (±10% input, 90 ° phase delay)			20(Note1)	20(Note1)	20(Note1)
Pilot Flow Rate gpm			1	2.1	3.1
Y (DR1), L (DR2) allowable back pressure psi			29	29	29
Weight lbs			17.6	26.4	39.7

Note: 1. Step response is typical value for a supply pressure of 1000 psi and fluid temperature of 104° F (kinematic viscosity: 40 centistokes)

Understanding Model Numbers

ESH - G 04 - D 5 180 S1 - (*) - 11

Design number

Auxiliary symbol

None: External pilot, external drain

E: External pilot, external drain

Contraction ratio

S1 (Normal)	P→A : B→T=1 : 1 P→B : A→T=1 : 1
S2 (Single rod/cylinder)	P→A : B→T=1 : 0.5 P→B : A→T=0.5 : 1

Rated flow rate (See the rated flow rate item in the specifications.)

Indicated through flow rate at rated stroke when pressure drop to P→A is ΔP= 145 psi

Through flow rate for P→A, A→T, B→T pressure drop at 145 psi is determined by contraction ratio.

Center valve position flow path

5		20% Center Position
6S		20% Center Position

Operation method D: Pressure center

Nominal diameter 03, 04, 06

Mounting method G: Gasket type

ESH: High response proportional flow valve

• Handling

1 Air Bleeding

In order to ensure stable control, loosen the air vent and bleed air from the valve before starting operation.

2 Y (DR1), L (DR2) Ports

Connect ports Y (DR1) and L (DR2) directly to the fluid tank so they are always supplied with operating fluid, in order to keep back pressure no greater than 29 psi.

3 L (DR2) Port

Since this valve is a pressure center type, G04 and G06 have an L (DR2) port. Be sure to connect this port directly to the fluid tank.

G03 has a Y (DR1) port only, and this is connected internally to L.

4 Valve Mounting Orientation

Install the valve so the spool axis line is horizontal.

5 Filtration

Maintain hydraulic operating fluid contamination so it is at least NAS Class 9.

6 The amp and valve are adjusted to match at the factory, so be sure to use items that have the same MFG No.

7 Oil-based operating fluid is standard. Use an R&O type and wear-resistant type of ISO VG32, 46, or 68 or equivalent.

8 Use an operating fluid that conforms to the both of the following.

Kinematic viscosity: 20 to 140 centistokes

Oil temperature: 86 to 140° F

9 Electrical wiring between the amp and valve should be no longer than 30 meters. For the solenoid valve use VCTF 2 mm2 2-conductor shielded wire, and for the differential transformer use VCTF 0.5 mm2 4-conductor shielded wire.

10 Bundled Accessories (Valve Mounting Bolts)

Model No.	Bolt Size	Q'ty	Tightening Torque ft lbs
ESH-G03	1/4-20 x 1 3/8"	4	7 to 9.5
ESH-G04	3/8-16 x 2"	4	33 to 40
	1/4-20 x 1 3/4"	2	7 to 9.5
ESH-G06	1/2-13 x 2 3/8"	6	44 to 51

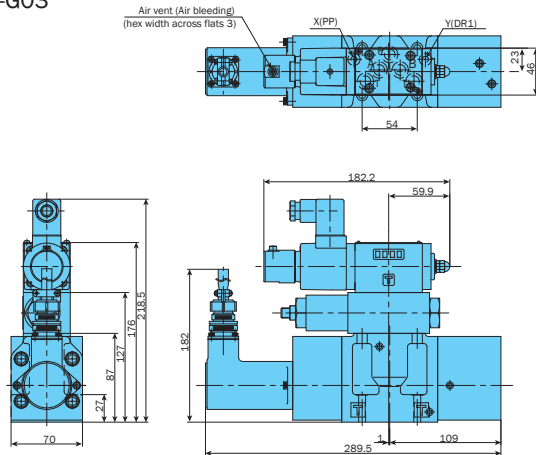
11 With G03 and G04, providing command in the range of 0 to +10V to the amp's RF input produces a flow of P→A→B→T. With G06, flow is P→B→A→T.

12 For G03 and G04, connect the ports and actuator to achieve a working of P→A→B→T. For G06, connect for a working of P→B→A→T.

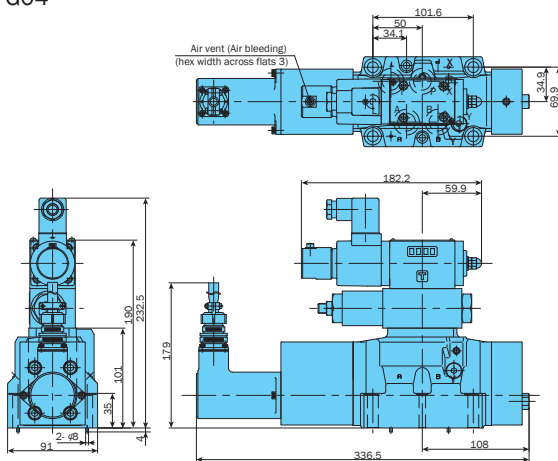
13 Contact your agent for a contraction ratio S2 with the G06 size.

Installation Dimension Drawings

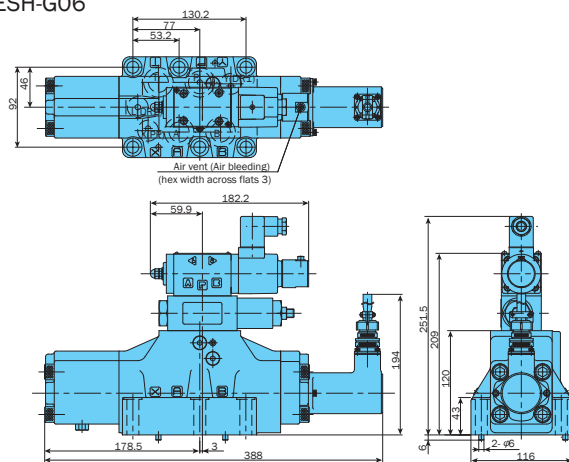
ESH-G03



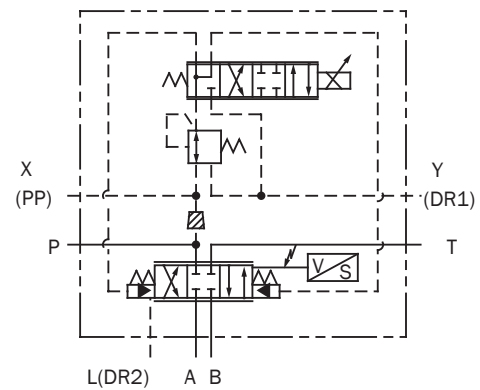
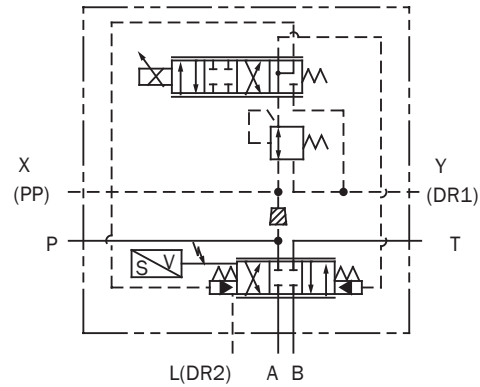
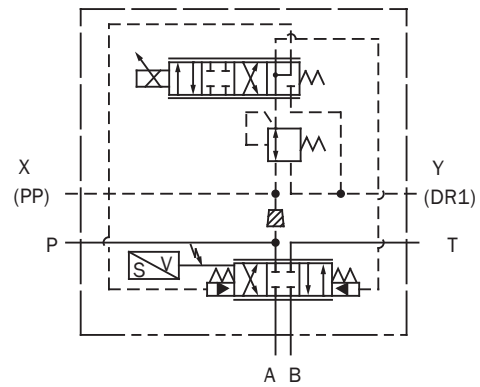
ESH-G04



ESH-G06



JIS Symbol



Note:
A stopper plug is needed for the  area if the pilot is external.

Gasket Surface Dimensions

For G03, see ESD-G03 gasket surface dimensions, and for G04 and G06, see DSS-G04, 06-**-20 gasket surface dimensions. Y (DR1) and L (DR2) are required. Gasket surface dimensions conform to the following.

G03: ISO 4401-03-02-0-94 (D05)

G04: ISO 4401-07-06-0-94 (D07)

G06: ISO 4401-08-07-0-94 (D08)