**High-response proportional flow control valve**  
10 to 50ℓ/min  
32MPa

### 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

<table>
<thead>
<tr>
<th>Item</th>
<th>ESH-G01-H510A-10</th>
<th>ESH-G01-H520A-10</th>
<th>ESH-G01-H540A-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Operating Pressure P, A, B MPa(kgf/cm²)</td>
<td>32 (327)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T Port Allowable Back Pressure MPa(kgf/cm²)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated Flow Rate ℓ/min</td>
<td>10 (25.5) max.</td>
<td>20</td>
<td>35</td>
</tr>
<tr>
<td>(Valve pressure drop 7MPa(71kgf/cm²))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Flow Rate ℓ/min</td>
<td>22</td>
<td>35</td>
<td>50</td>
</tr>
<tr>
<td>Limit Valve Pressure Drop MPa(kgf/cm²)</td>
<td>32 (327)</td>
<td>21 (214)</td>
<td>14 (143)</td>
</tr>
<tr>
<td>Hysteresis %</td>
<td>0.5 max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step Response ms</td>
<td>16 max. (Note 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0→100% Displacement)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency Response Hz</td>
<td>At least 80 (Note 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(90° Phase Delay ±10% Displacement)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Center Drift Supply Pressure 0.5% max/FS (Δp=25MPa(255kgf/cm²))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil Temperature 1.5% max/FS (Δt=40°C)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filtration</td>
<td>Class NAS9 max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Oil Temperature °C</td>
<td>0 to 60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Recommended Oil Temperature Range °C)</td>
<td>(30 to 60)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water and Dust Resistance</td>
<td>IP53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight kg</td>
<td>2.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note** 1. Step response is typical value for a supply pressure of 7MPa (71kgf/cm²) and oil temperature of 40°C (kinematic viscosity: 40mm²/s).

### Explanation of model No.

ESH – G 01 – H 5 20 A – 10

- **Design number**
- Center valve position lap value A: 0.5% max. (zero lap)
- Rated flow rate : 10, 20, 35ℓ/min  
  (Value pressure drop 7 MPa (7kgf/cm²))
- Relieve position flow path : 5 (all ports blocked)
- Operation method: H (spring offset type)
- Mounting method G: Gasket type
- Nominal diameter : 01 (01 size)
- High-response proportional flow control valve

**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 140mm²/s
  - Oil temperature : 30 to 60°C
- 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)
  - M5 x 45, (four)
  - Tightening Torque : 5 to 7N·m(51 to 7kgf·cm)
### Electro-hydraulic control valve

**Electro-hydraulic control valve**

- **Input Voltage-Flow Rate Characteristics**
  - **Valve pressure drop 7 MPa** (71 kgf/cm²)

**Spool monitor voltage**

<table>
<thead>
<tr>
<th>Spool monitor</th>
<th>Flow rate ℓ/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>P B A T</td>
<td>0 10 20 30 40</td>
</tr>
<tr>
<td>P A B T</td>
<td>0 10 20 30 40</td>
</tr>
</tbody>
</table>

**Valve Differential Pressure-Flow Rate Characteristics**

**Operation limit valve differential pressure**

- **±1V**
- **±2V**
- **±3V**
- **±4V**
- **±5V**

**Valve differential pressure** (MPa)

<table>
<thead>
<tr>
<th>Flow rate ℓ/min</th>
<th>0 10 20 30 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>±1V</td>
<td>14 MPa (143 kgf/cm²)</td>
</tr>
<tr>
<td>±2V</td>
<td>10 MPa (102 kgf/cm²)</td>
</tr>
<tr>
<td>±3V</td>
<td>6 MPa (61 kgf/cm²)</td>
</tr>
<tr>
<td>±4V</td>
<td>2 MPa (20 kgf/cm²)</td>
</tr>
<tr>
<td>±5V</td>
<td>1 MPa (10 kgf/cm²)</td>
</tr>
</tbody>
</table>

**Calculation example**

When ESH-G01-H520A-10 is used under the following conditions:

- **P_s** = 10 MPa (102 kgf/cm²)
- **P_r** = 6 MPa (61 kgf/cm²)
- **P_T** = 1 MPa (10 kgf/cm²)

Maximum control flow rate **Q_x** is as shown below:

- **Q_x** = **Q_{rate}** × \( \frac{\Delta P}{7} \)

Where

- **Q_{rate}** : Rated flow rate
- **\Delta P** : Valve differential pressure

Max \( \Delta P = (P_S - P_T) = (10 - 1) = 9 \) MPa

\( \frac{9}{7} = 1.2857 \) MPa

\( Q_x = 20 \times 1.2857 = 25.714 \) ℓ/min

**Note:** ±10V input amp factory default data.

Rotating the GAIN trimmer clockwise (rightward) increases the flow rate by up to 10%.

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**Installation Dimension Drawings**

- **Gasket mounting method** conforms to ISO4401-03-02-0-05.

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**Operational Principle**

- **Valve Pressure Drop and Rated Flow Rate**
  - **Valve Pressure Drop** \( \Delta P_v \)
  - **P_s** : Valve supply pressure
  - **P_r** : Load pressure
  - **P_T** : T Port back pressure
  - The rated flow rate is the value when the above valve pressure drop is 7 MPa (71 kgf/cm²).

- **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

  \[ Q_x = Q_{rate} \times \frac{\Delta P}{7} \]

**Calculation example**

When ESH-G01-H520A-10 is used under the following conditions:

- **P_s** = 10 MPa (102 kgf/cm²)
- **P_r** = 6 MPa (61 kgf/cm²)
- **P_T** = 1 MPa (10 kgf/cm²)

Maximum control flow rate **Q_x** is as shown below:

\[ Q_x = Q_{rate} \times \frac{P_s - P_r - P_T}{7} \]

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