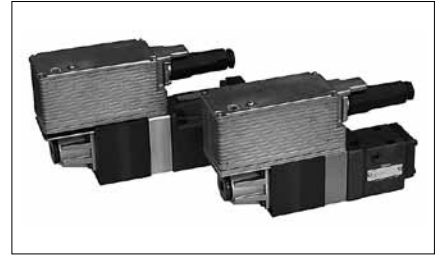


# OBE type Direct Operated Linear Servo Valves

On-board electronics (OBE) type direct operated linear servo valves are based on high speed linear servo valves (LSVG) and OBE type linear servo valves (LSVHG-\*EH), providing "high accuracy, easiness to use, and great usability".



● **High accuracy**

As is the case with the high speed linear servo valves, all of the OBE type direct operated linear servo valves have a low hysteresis of 0.1 % or less, realizing high accuracy. These valves allow the main unit to operate with much higher repeatability.

● **High response characteristics**

Compared to other equivalent models, these valves provide higher levels of step and frequency responses, which are typically used as measures of response characteristics; the step response is 3 ms (0 <=> 100 %)★, and the frequency response is 260 Hz/-3 dB (± 25 % amplitude)★.

[★ : Representative values for LSVG-03EH with the Y port (dry type)]

● **Easiness to use**

These valves can offer high accuracy for hydraulic control systems just with 24 V DC power supply and command signal input.

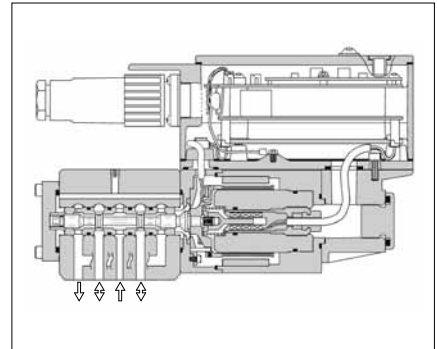
Six types of input signals in three input voltage/current ranges are available: 0 - ±10 V, 0 - ±10 mA, and 4 - 20 mA.

● **Great usability**

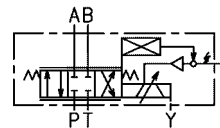
The small amplifier in the valves has a fault indicator lamp. This lamp indicates an error when valve failure causes any deviation between the spool position commanded by the signal and the actual spool position. It facilitates you to immediately troubleshoot the failure of the valves, if any.

● **Excellent contamination resistance**

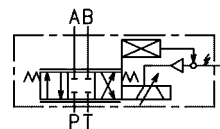
As is the case with the high speed linear servo valves, the OBE type direct operated linear servo valves have a simple pilot valve structure, exhibiting excellent contamination resistance. The permissible level of fluid contamination for these valves is up to NAS 1638 class 10.



**Graphic Symbols**



With Y Port (Dry Type)



Without Y Port (Wet Type)

■ **Model Number Designation**

F-	LSVG	-03	EH	-60	-W	A	-A	1	-10
Fluid Type	Series Number	Valve Size	Amp. Type	Rated Flow @ ΔP=7MPa	Drain Port and Permissible Back Pres.	Fail-safe Function	Input Signal/Spool Travel Monitoring	Connector Type	Design Number
F : Special Seals for Phosphate Ester Type Fluid (Omit if not required)	LSVG : Direct Operated Linear Servo Valves	01	EH : OBE Type	4: 4 L/min	None: With Y Port (Permissible Back Pres.: 0.05 MPa) (Dry Type)	A: P→A→B→T Position B: P→B→A→T Position C:Neutral	A: Voltage Signal ±10 V (P→B→A→T Flow with Input Signal (+))	1: 6 + PE Pole 2: 11 + PE Pole - With "Enable" Function - With "Valve Ready" Function - With "Alarm Output" Function	10
				10: 10 L/min			B: Current Signal 4 - 20 mA (P→B→A→T Flow with Current Signal 12 - 20 mA)		
		20: 20 L/min		W: Without Y Port★ (Wet Type)	C: Current Signal ±10 mA (P→B→A→T Flow with Input Signal (+))				
		40: 40 L/min			D: Voltage Signal ±10 V (P→A→B→T Flow with Input Signal (+))				
		03		60: 60 L/min			E: Current Signal 4 - 20 mA (P→A→B→T Flow with Current Signal 12 - 20 mA)		10
							F: Current Signal ±10 mA (P→A→B→T Flow with Input Signal (+))		1006 (Mounting bolt: M6)

★ For the wet type, water-glycol fluids cannot be used.

**Specifications** The values in parentheses in the specification table below are applicable to the models “LSVG-\*EH-\*-W\*.” (wet type).

Model Numbers		LSVG-01EH-4-*	LSVG-01EH-10-*	LSVG-01EH-20-*	LSVG-03EH-40-*	LSVG-03EH-60-*
Description						
Rated Flow at $\Delta P = 7 \text{ MPa}$ <sup>(1)</sup>	L/min	4	10	20	40	60
Max. Operating Pressure	MPa	35			35 <sup>(2)</sup>	
Proof Pres. at Return Port	MPa	21 (7)			35 <sup>(2)</sup> (7)	
Drain Port (Y Port) Permissible Back Pres. <sup>(3)</sup>	MPa	0.05 (No Y Port for Wet Type)				
Internal Leakage ( $P_s = 14 \text{ MPa}$ Max. Leakage Viscosity: $32 \text{ mm}^2/\text{s}$ )	L/min	0.4 or less	0.8 or less	1.2 or less	1.7 or less	
Hysteresis	%	0.1 or less				
Step Response (Typical) <sup>(4)</sup>	$P_2 = 14 \text{ MPa}$ ( $0 \leftrightarrow 100 \%$ )	3 (3.5)				4 (4.5)
Frequency Response ( $\pm 25 \%$ Amplitude) (Typical) <sup>(4)</sup>	Gain: -3 dB	240 (230)		260 (240)	250 (220)	
	Phase: -90°	300 (270)		310 (310)	260 (220)	
Vibration Proof	$\text{m/s}^2$	100				
Protection		IP 65				
Ambient Temperature	°C	0 - + 50				
Spool Stroke to Stops	mm	$\pm 0.5$				$\pm 0.75$
Polarity		See the description about I/O signal characteristics on page 23.				
Linear Motor Specification	Current	1.5 (Max. 3.2)				
	Coil Resistance	$\Omega$ 7 at 20 °C				
Approx. Mass	kg	4.3			5.2	
Electric Connection		6 + PE/11 + PE Connector				

Note: <sup>(1)</sup> Use the valves so that the relationship between the valve pressure difference and the flow rate, as specified below in “Range of Flow Control”, is met.

<sup>(2)</sup> For LSVG-03EH-\*-\*-\*1006 (mounting bolt: M6), the pressure should be 31.5 MPa.

<sup>(3)</sup> Back pressure at the drain port (Y) should be 0.05 MPa or less and not be a negative pressure.

<sup>(4)</sup> This value is measured for each valve; it may vary depending on the actual circuit/operation conditions.

## Attachment

### Mounting Bolts

Model Number	Mounting Bolt	Qty.	Bolt Tightening Torque
LSVG-01EH	Hex. Soc. Head Cap Screw : M5×55 L	4	6.0 - 8.0 Nm
LSVG-03EH-*10	Hex. Soc. Head Cap Screw : M8×65 L	4	30.8 - 37.7 Nm
LSVG-03EH-*1006	Hex. Soc. Head Cap Screw : M6×60 L	4	13.0 - 16.0 Nm

### Connector

Model Number	Connector	Qty.	Remarks
LSVG-*EH-*-*1	6 + PE Electrical Plug	1	Compatible with EN 175201 PART 804
LSVG-*EH-*-*2	11 + PE Electrical Plug	1	

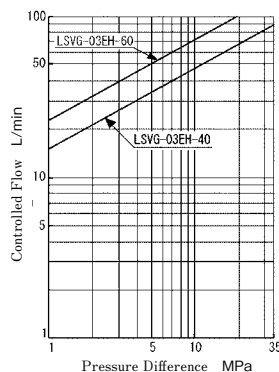
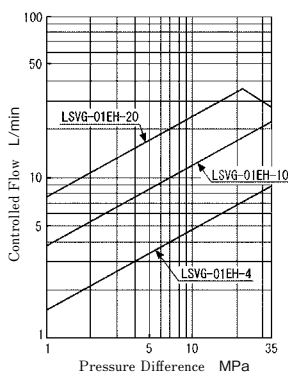
### Cable with Connector (Separately Available)

Model Number	Connector	Cable Model Number	Remarks
LSVG-*EH-*-*1	6 + PE Electrical Plug	LSVC-6PE-*10	* Cable Length 03 : 3 m 05 : 5 m 10 : 10 m
LSVG-*EH-*-*2	11 + PE Electrical Plug	LSVC-12PE-*10	

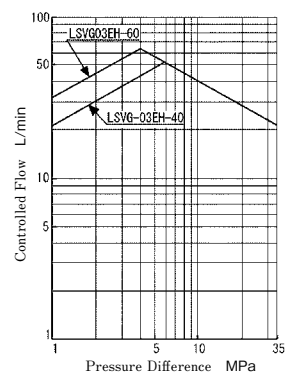
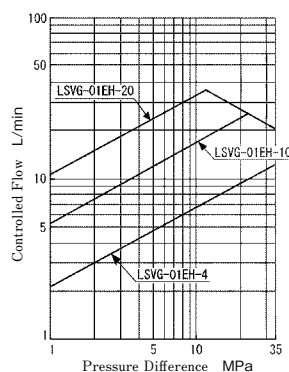
The cable with a connector is a cable assembly that includes the same connector as the one supplied with the valves.

## Range of Flow Control

### Control Method: 4-Way Valve

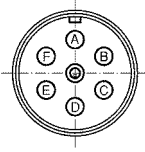


### Control Method: 3-Way Valve



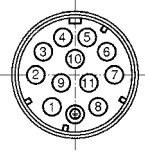
## Electrical Specifications

### 6 + PE Connector



Pin		Valve Model		
		LSVG-*EH-*-A1 LSVG-*EH-*-D1	LSVG-*EH-*-B1 LSVG-*EH-*-E1	LSVG-*EH-*-C1 LSVG-*EH-*-F1
Pin A	Power Supply	24 V DC (21.6 - 26.4 V DC Included Ripple), 100 VA or more		
Pin B		0 V		
Pin C	Signal Common	COM(0 V)		
Pin D	Input (+) (Differential) <sup>*1</sup>	0 - ±10 V Ri=100 kΩ	4 - 20 mA Ri=200 Ω	0 - ±10 mA Ri=200 Ω
Pin E	Input (-) (Differential) <sup>*1</sup>			
Pin F	Spool Travel Monitoring	0 - ±10 V Ri ≥ 10 kΩ	4 - 20 mA Ri = 100~500 Ω <sup>*2</sup>	0 - 10 mA Ri = 100~500 Ω <sup>*2</sup>
Pin	Protective Earth	-		

### 11 + PE Connector



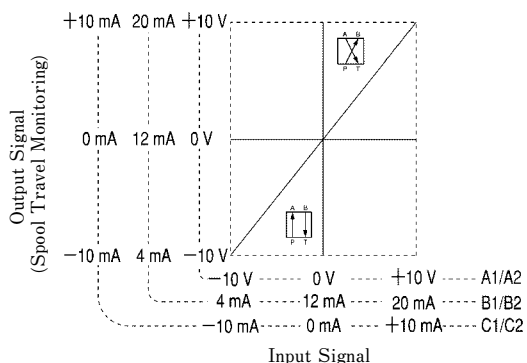
Pin		Valve Model		
		LSVG-*EH-*-A2 LSVG-*EH-*-D2	LSVG-*EH-*-B2 LSVG-*EH-*-E2	LSVG-*EH-*-C2 LSVG-*EH-*-F2
Pin 1	Power Supply	24 V DC (21.6 - 26.4 V DC Included Ripple), 100 VA or more		
Pin 2		0 V		
Pin 3	Enable (Servo ON) Input	Input Current = 3 - 5 mA at 4.8 - 28 V DC		
Pin 4	Input (+) (Differential) <sup>*1</sup>	0 - ±10 V Ri=100 kΩ	4 - 20 mA Ri=200 Ω	0 - ±10 mA Ri=200 Ω
Pin 5	Input (-) (Differential) <sup>*1</sup>			
Pin 6	Spool Travel Monitoring	0 - ±10 V Ri ≥ 10 kΩ	4 - 20 mA Ri = 100 - 500 Ω <sup>*2</sup>	0 - ±10 mA Ri = 100 - 500 Ω <sup>*2</sup>
Pin 7	Signal Common	COM (0 V)		
Pin 8	Valve Ready Output	Open Collector Output Voltage: Max. 30 V, Current: Max. 20 mA		
Pin 9	-	-		
Pin 10	-	-		
Pin 11	Alarm Output	Open Collector Output Voltage: Max. 30 V, Current: Max. 20 mA		
Pin	Protective Earth	-		

<sup>\*1</sup>. Differential input signals can be used only for the valves with the voltage signal specifications of ±10 V (LSVG-\*EH-\*-A\*/D\*).

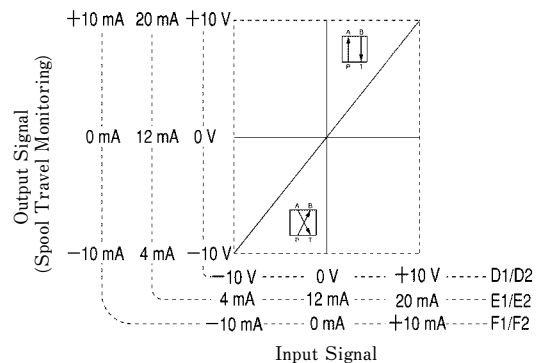
<sup>\*2</sup>. The recommended load resistance is 200 Ω.

### I/O Signal Characteristics

· LSVG-\*EH-\*-A\*/B\*/C\*

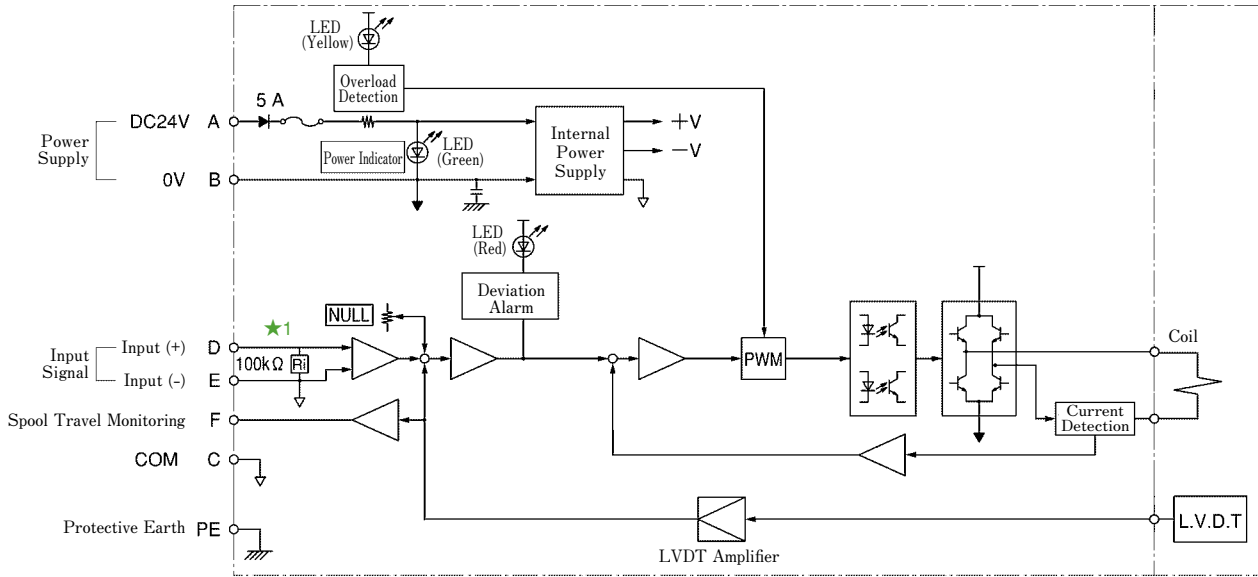


· LSVG-\*EH-\*-D\*/E\*/F\*

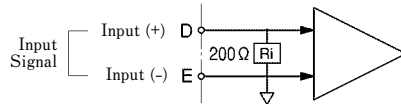


## ■ Block Diagram

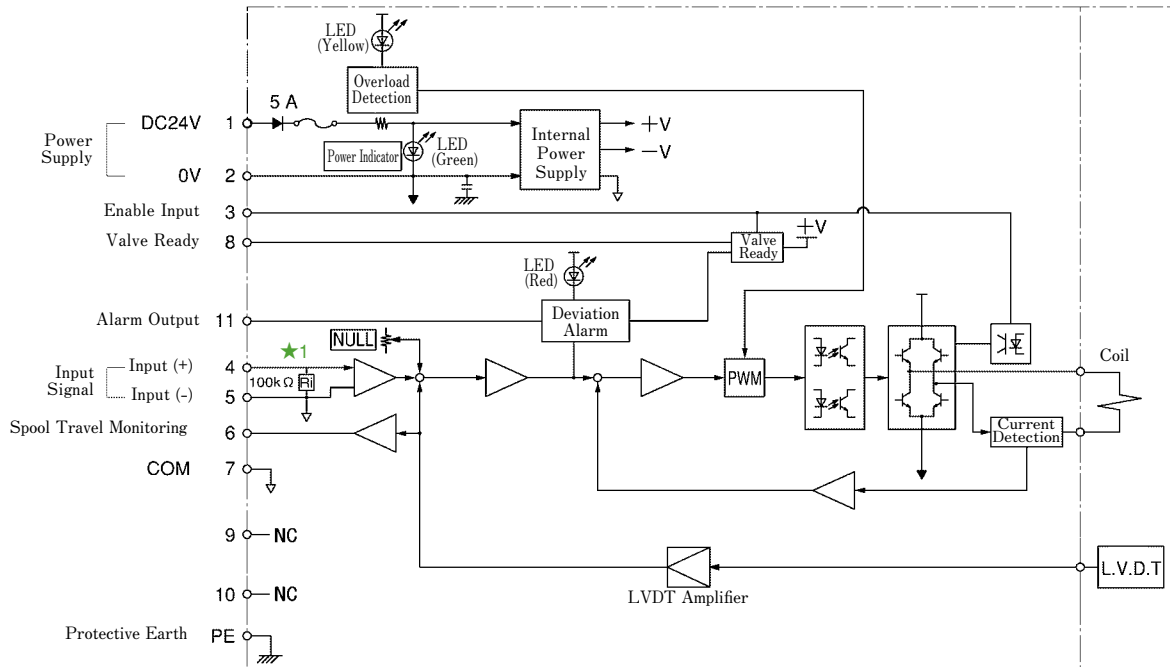
### ● LSVG-\*EH-\*-\* \*-A1/B1/C1/D1/E1/F1 (6 + PE Connector)



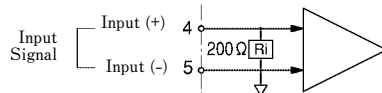
★1. The input stage for the models LSVG-\*EH-\*-\* \*-B1/C1/E1/F1 (current signal) is as follows.



### ● LSVG-\*EH-\*-\* \*-A2/B2/C2/D2/E2/F2 (11 + PE Connector)

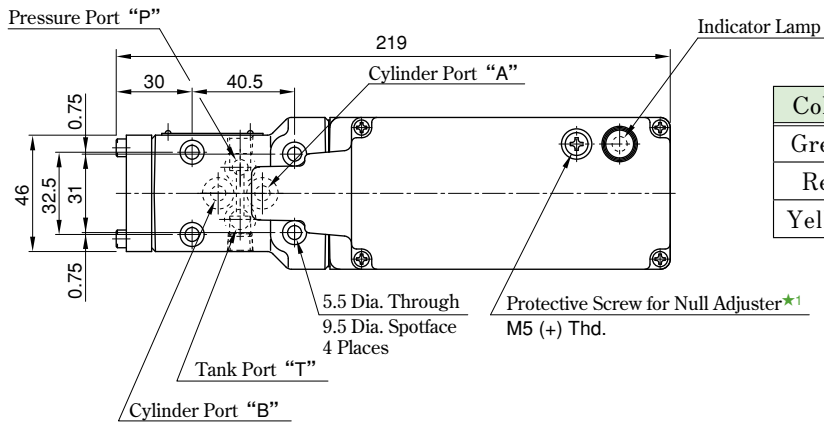


★1. The input stage for the models LSVG-\*EH-\*-\* \*-B2/C2/E2/F2 (current signal) is as follows.

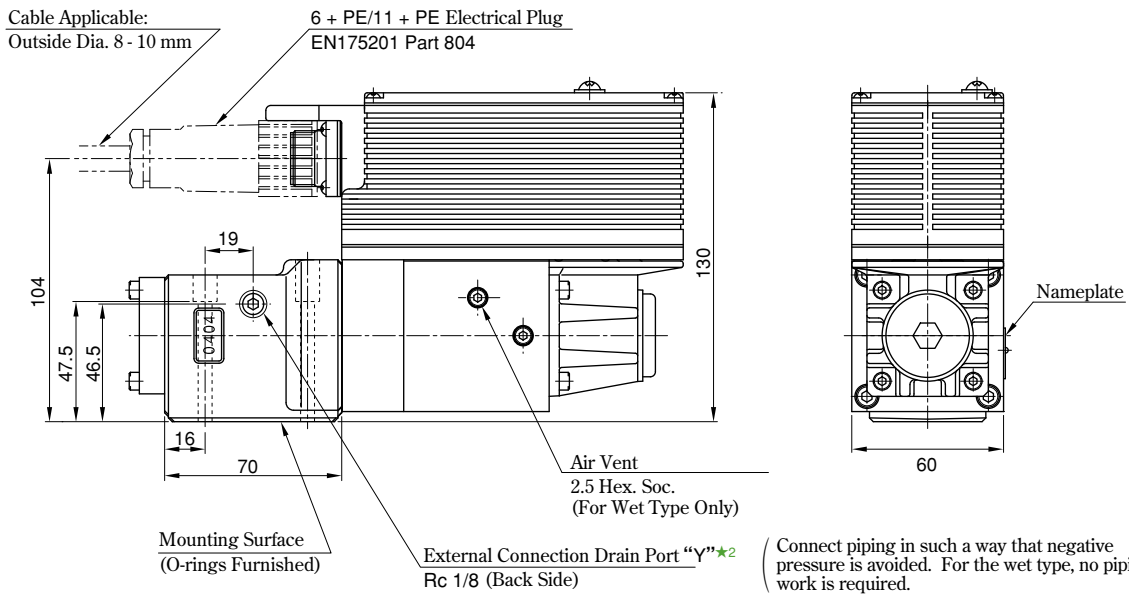


**LSVG-01EH**

Mounting Surface: Conforming to ISO 4401-03-02-0-94



Color	Indicator Lamp
Green	Power Supply
Red	Deviation Alarm
Yellow	Overload



(Connect piping in such a way that negative pressure is avoided. For the wet type, no piping work is required.)

- ★1. To adjust the null, remove the protective screw and turn the null trimmer. After adjustment, be sure to attach the protective screw.
- ★2. For the dry type, the external connection drain port "Y" on the tank port side is usually plugged. To use the port on the tank port side, remove the hexagon socket head plug (5 Hex.) from the drain port on the tank port side and plug the port on the pressure port side.

● O-rings for the Ports

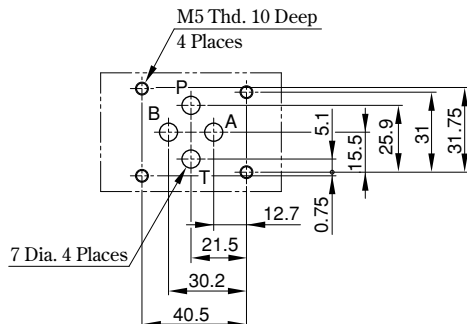
AS568-012 (NBR, Hs90): 4 pieces

O-rings made of fluorinated rubber are required to use phosphate ester type fluids.

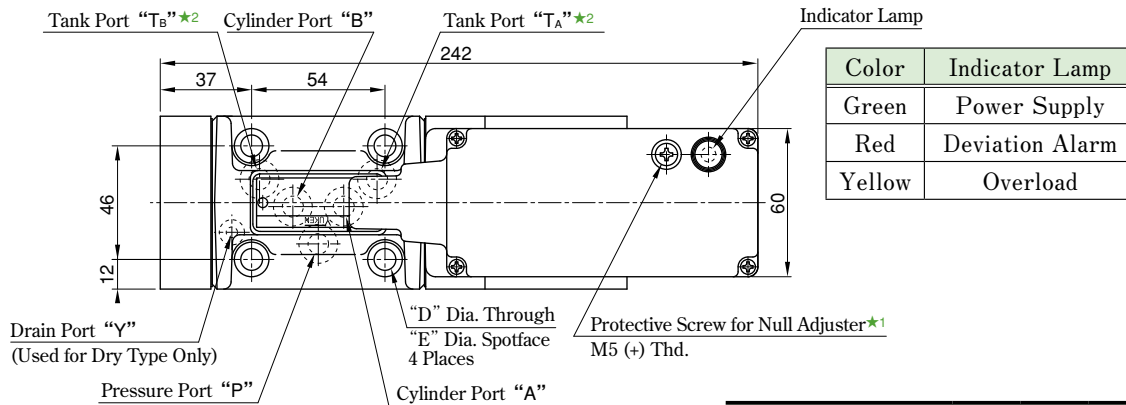
● Dimensions of Mounting Surface

Prepare a mounting surface shown below. Basically, the dimensions of the mounting surface conform to the ISO standard.

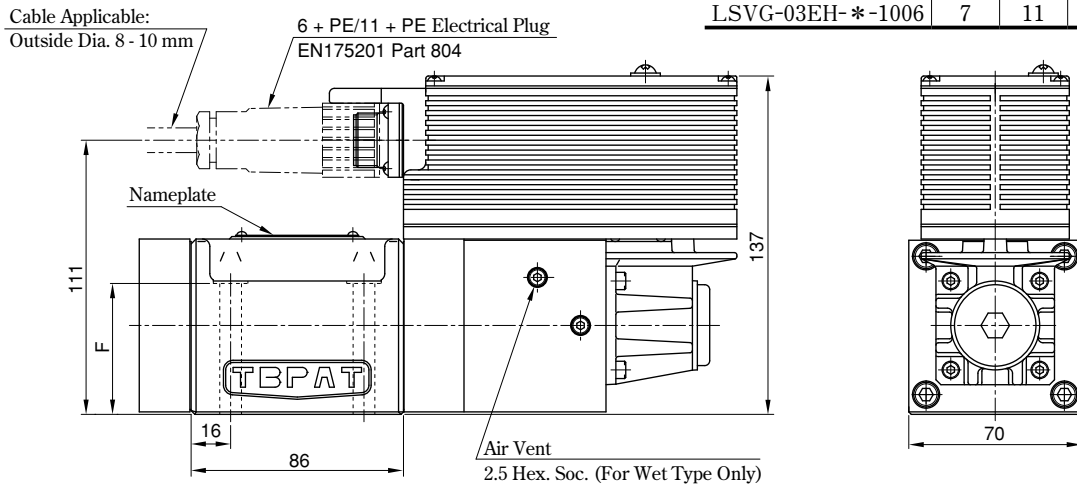
The mounting surface should have a good machined finish.



## LSVG-03EH



Model Number	D	E	F
LSVG-03EH- *-10	8.3	14	53
LSVG-03EH- *-1006	7	11	51



★1. To adjust the null, remove the protective screw and turn the null trimmer. After adjustment, be sure to attach the protective screw.

### ● O-rings for the Ports

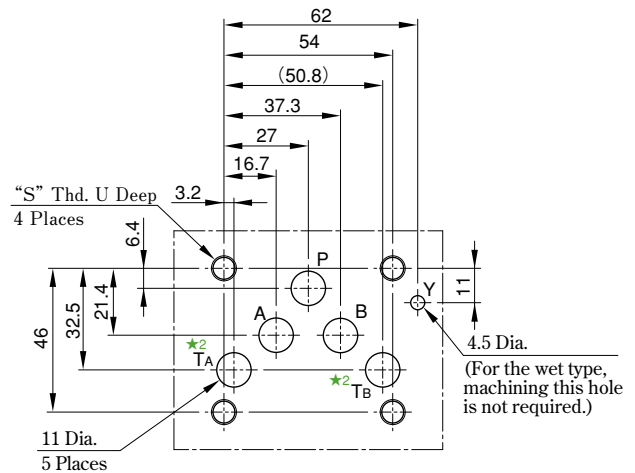
Port	O-ring Size	Qty.
P, A, B, T	AS568-014 (NBR, Hs90)	5
Y	JIS B2401-1B-P7	1

O-rings made of fluorinated rubber are required to use phosphate ester type fluids.

### ● Dimensions of Mounting Surface

Prepare a mounting surface shown on the right. Basically, the dimensions of the mounting surface conform to the ISO standard, but the specifications for the valve mounting screws and the drain port "Y" (for the dry type) are different as follows.

	ISO 4401-05-04-0-94	Mounting Surface for LSVG-03EH- *-10	Mounting Surface for LSVG-03EH- *-1006
Valve Mounting Screw	M6	M8	M6
Drain Port "Y" (For Dry Type)	Without "Y" Port	With "Y" Port	With "Y" Port



★2. There are two tank ports "T<sub>A</sub>" and "T<sub>B</sub>"; however, "T<sub>A</sub>" may be used alone.

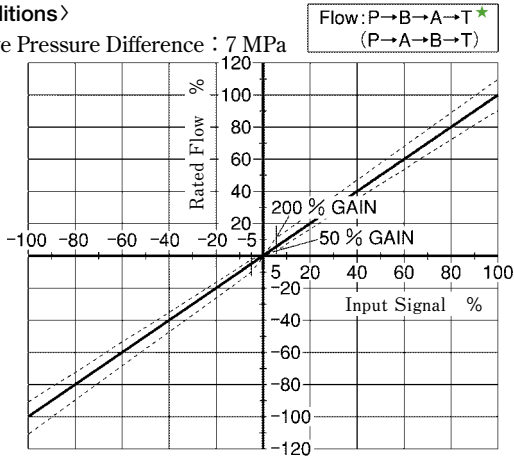
Model Number	S	U
LSVG-03EH- *-10	M8	17
LSVG-03EH- *-1006	M6	13

## Characteristics of LSVG-01EH-4/10/20 (Fluid Viscosity: 30 mm<sup>2</sup>/s)

### No-Load Flow Characteristics

<Conditions>

● Valve Pressure Difference : 7 MPa



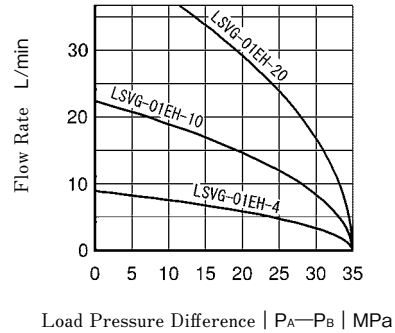
Flow: P→A→B→T★  
(P→B→A→T)

★ The flow outside of parentheses is achieved when the input signal type "A", "B", or "C" is selected. The flow in parentheses is achieved when "D", "E", or "F" is selected.

### Load Flow Characteristics

<Conditions> ● Input Signal : 100 %

Note) Tolerance for Load Flow : ±10 %

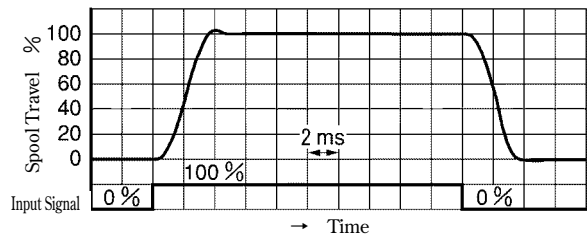
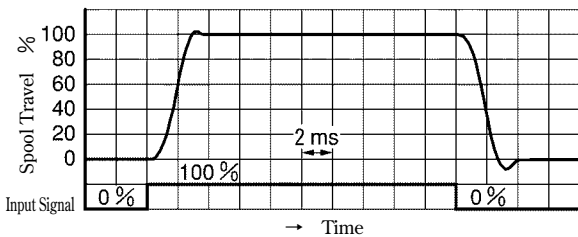


### Step Response

<Conditions> ● Input Amplitude : 0 ⇔ 100 % ● Supply Pressure : 14 MPa

● LSVG-01EH-4/10/20-\*\*-10 (Dry Type)

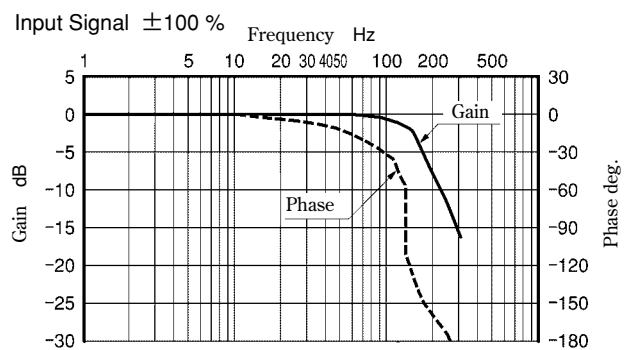
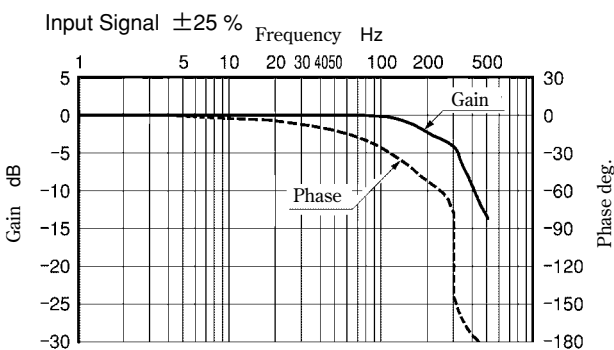
● LSVG-01EH-4/10/20-W\*\*-10 (Wet Type)



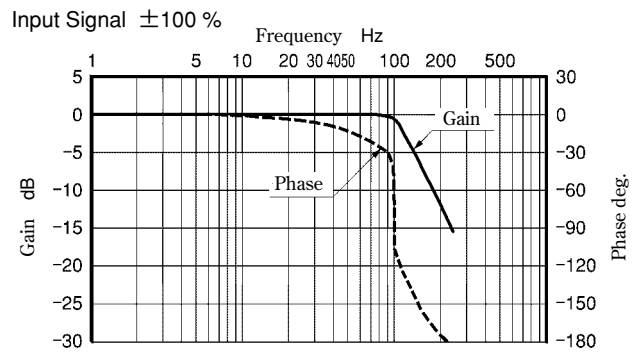
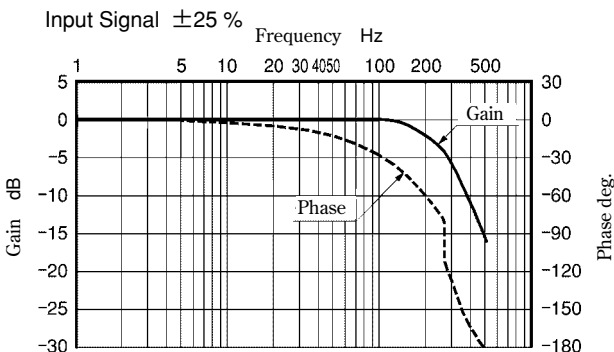
### Frequency Response

<Conditions> ● Hydraulic Circuit: Port A/B Closed ● Supply Pressure : 14 MPa

● LSVG-01EH-4/10/20-\*\*-10 (Dry Type)



● LSVG-01EH-4/10/20-W\*\*-10 (Wet Type)





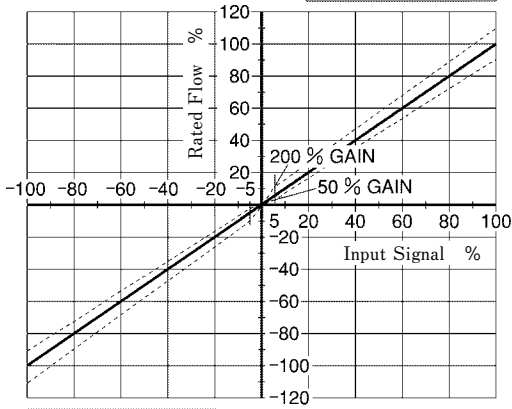
## Characteristics of LSVG-03EH-40/60 (Fluid Viscosity: 30 mm<sup>2</sup>/s)

### No-Load Flow Characteristics

<Conditions>

● Valve Pressure Difference : 7 MPa

Flow: P→B→A→T ★  
(P→A→B→T)



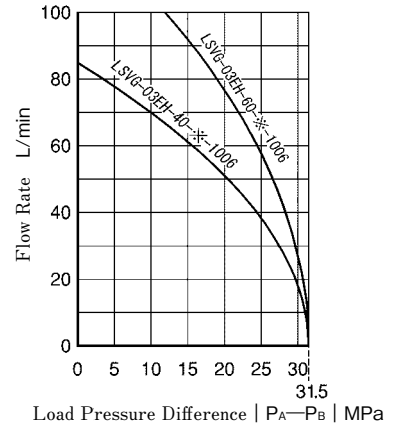
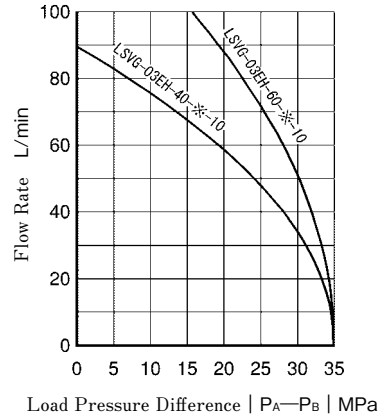
Flow: P→A→B→T ★  
(P→B→A→T)

★ The flow outside of parentheses is achieved when the input signal type "A", "B", or "C" is selected. The flow in parentheses is achieved when "D", "E", or "F" is selected.

### Load Flow Characteristics

<Conditions> ● Input Signal : 100 %

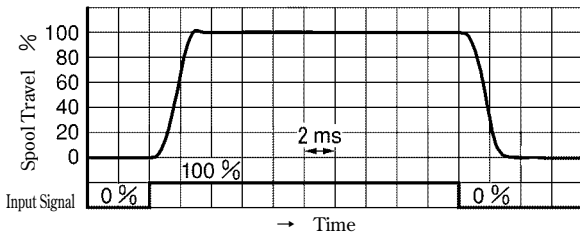
Note) Tolerance for Load Flow : ±10 %



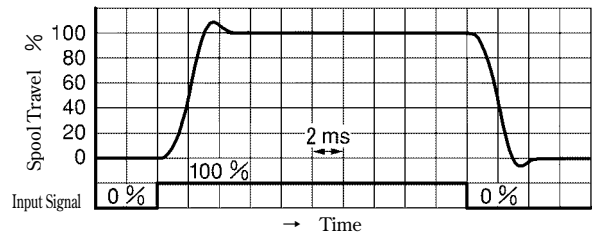
### Step Response

<Conditions> ● Input Amplitude : 0 ⇔ 100 % ● Supply Pressure : 14 MPa

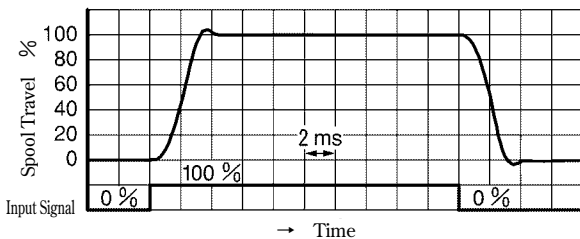
#### ● LSVG-03EH-40-\*-\*-10 (Dry Type)



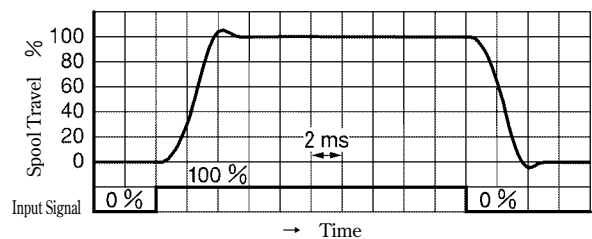
#### ● LSVG-03EH-40-W-\*-\*-10 (Wet Type)



#### ● LSVG-03EH-60-\*-\*-10 (Dry Type)



#### ● LSVG-03EH-60-W-\*-\*-10 (Wet Type)

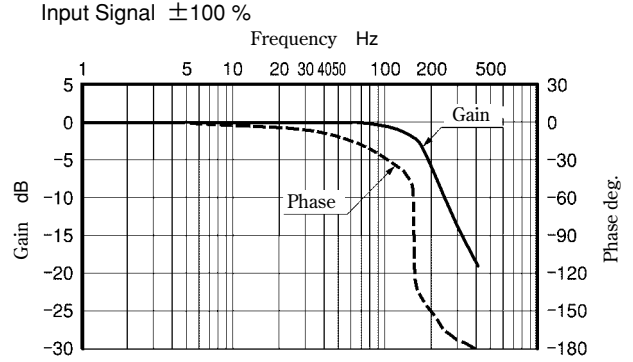
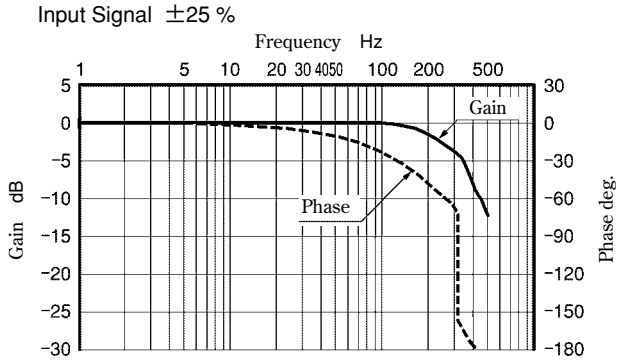




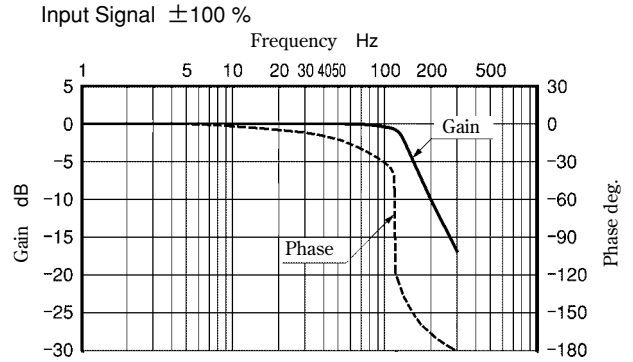
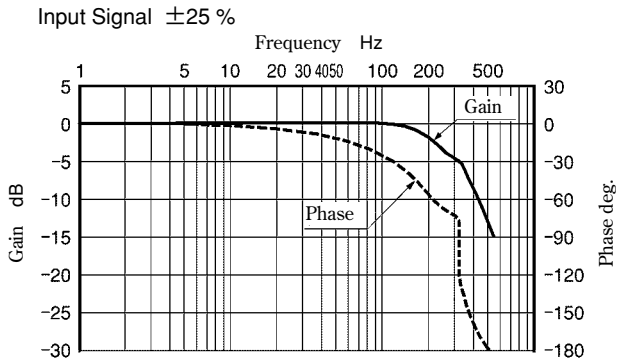
**Frequency Response**

<Conditions> ● Hydraulic Circuit: Port A/B Closed ● Supply Pressure : 14 MPa

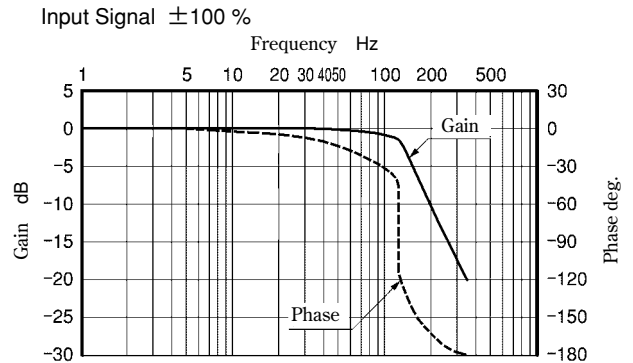
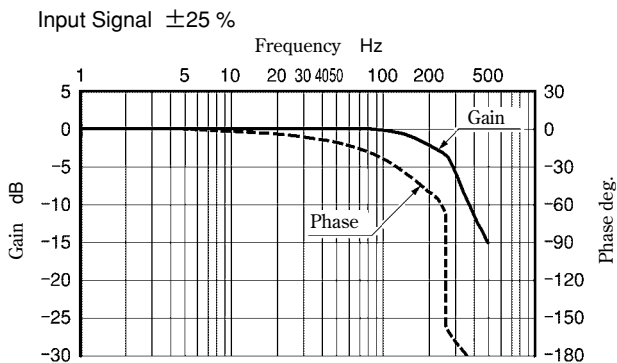
● LSVG-03EH-40-\*\*-\*\*-10 (Dry Type)



● LSVG-03EH-40-W\*\*-\*\*-10 (Wet Type)



● LSVG-03EH-60-\*\*-\*\*-10 (Dry Type)



● LSVG-03EH-60-W\*\*-\*\*-10 (Wet Type)

