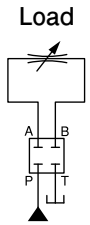
Valve Pressure Difference/Load Pressure Difference

This catalog uses two terms related to pressure differences: "valve pressure difference" (used for the range of flow control and no-load flow characteristics) and "load pressure difference" (used for load flow characteristics). The terms are described below.

Valve Pressure Difference



Suppose that, in the circuit shown on the right, the fluid flows from P to A and from B to T. In this case, the sum of the pressure differences between P and A and between B and T is the pressure difference of this valve. For this four-way valve, the valve pressure difference "ΔP" is:

Valve Pressure Difference = [(Pres. at P) - (Pres. at A)] + [(Pres. at B) - (Pres. at T)].

In relation to the flow rate, an increase in the flow through the valve with a constant valve opening leads to an increase in the valve pressure difference due to increased flow resistance at the control part.

Load Pressure Difference

In the circuit above, the absolute pressure difference between A and B is the load pressure difference.

Load Pressure Difference = | (Pres. at A) - (Pres. at B) |

If the resistance of piping, etc. is ignored, the difference between the supply pressure and the load pressure difference is the valve pressure difference of the linear servo valve. Therefore, a smaller load pressure difference means a larger valve pressure difference, allowing increasing the flow rate through the valve.

Flow Rate

In this catalog, the rated flow tolerance is ±10 %

The flow rate depends on the viscosity and specific gravity of each hydraulic fluid.

- Multiply each viscosity by the corresponding coefficient in the table below.

Viscosity mm^2/s	15	20	30	40	50	60	70	80	90	100
Coefficient	1.19	1.11	1.00	0.93	0.88	0.84	0.81	0.78	0.76	0.74

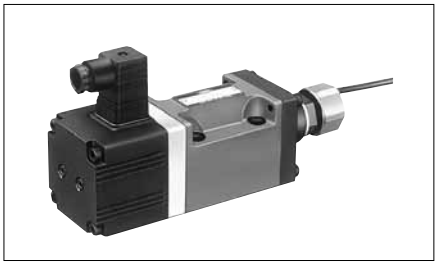
- Use the following formula to obtain the flow rate corresponding to a specific gravity. $Q' = Q\sqrt{(0.85/G')}$

- Use the following formula to obtain the relationship between the flow rate and the pressure for a servo valve.

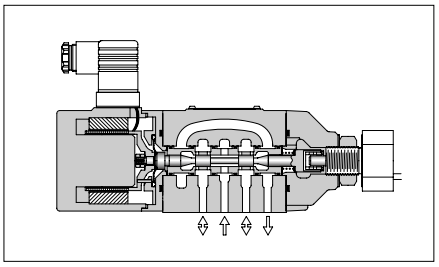
$$Q_X = Q_{rate}\sqrt{\frac{\Delta P_X}{7}}$$

where Q_X : Flow rate to be determined;
Q_{rate} : Rated flow rate (at ΔP = 7 MPa); and
ΔP_X: Valve pressure difference in the actual circuit.

Direct type High-Speed Linear Servo Valves



Direct type high speed linear servo valves use a compact and powerful linear motor as an actuator and have an extremely simple structure that connects the linear motor moving coil, the spool, and the position sensor in series.



●High accuracy

These valves have a low hysteresis of 0.1 % or less, achieving high accuracy. They allow the main unit to operate with much higher repeatability.

●High response characteristics

The valves provide significantly high levels of step and frequency responses, which are typically used as measures of response characteristics; the step response is 2 ms (0 <=> 100 %)★, and the frequency response is 450 Hz/-90° (±25 % amplitude)★. Thus, the valves ensure that the main unit can achieve unprecedented high response. (★: Representative values)

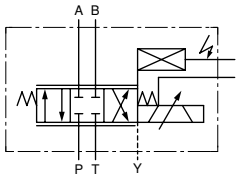
●Excellent vibration-proof characteristics

With a simple structure, the valves offer high vibration resistance.

●Excellent contamination resistance

The valves are also featured by excellent contamination resistance since they have a simple structure that directly connects the linear motor moving coil, the spool, and the position sensor. Compared to conventional servo valves for which the permissible contamination level is up to NAS 1638 class 7, the direct type linear servo valves can accept a contamination level of up to NAS 1638 class 10. These valves can contribute to greatly reducing the cost of fluid management.

Graphic Symbols



■ Model Number Designation

F—	LSVG	—03	—40	—R	—10
Fluid Type	Series Number	Valve Size	Rated Flow @ ΔP = 7 MPa	Cable Departure Direction	Design Number
F： Special Seals for Phosphate Ester Type Fluid (Omit if not required)	**LSVG：** Direct Type High Speed Linear Servo Valves	**03**	**4：** 4 L/min **10：** 10 L/min **20：** 20 L/min **40：** 40 L/min **60：** 60 L/min	(Viewed from the linear motor side) **None：** Upper (Standard) **R：** Right **L：** Left	**10**

■ Exclusive Amplifiers

To ensure stable performance, it is recommended to use Yuken's AMLS series linear servo amplifiers.

Valve Model Number	Amplifier Model
LSVG-03-4/10/20/40	AMLS-A-D＊-＊-10
LSVG-03-60	AMLS-B-D＊-＊-10

■ Attachment

Mounting Bolt	Bolt Tightening Torque
Hex. Soc. Head Cap Screw: M8×65L…4 Pieces	30.8 - 37.7 Nm

Specifications

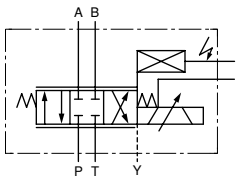
The specifications below are for use with a 48 V DC type exclusive amplifier; for use with a 24 V DC type amplifier, see the values in parentheses ( ).

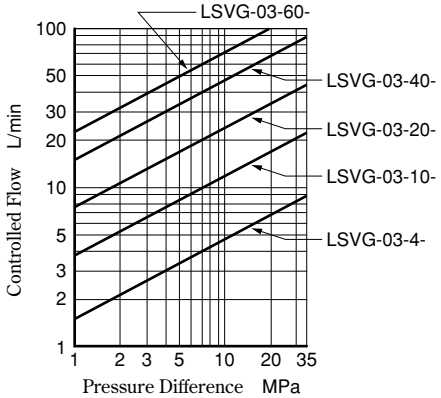
Description \ Model Numbers			LSVG-03-4/10/20/40	LSVG-03-60
Rated Flow @ ΔP = 7 MPa (1)		L/min	4, 10, 20, 40	60
Max. Operating Pressure		MPa	35	
Proof Pres. at Return Port		MPa	35	
Drain Port (Y Port) Permissible Back Pres. (2)		MPa	0.05	
Internal Leakage (PS = 14 MPa) (Viscosity: 32 mm^2/s)		L/min	1.7 or less	
Hysteresis		%	0.1 or less	
Step Response (0 <=> 100 %, Typical) (3)		ms	2 (3)	3 (4)
Frequency Response (±25 % Amplitude, Typical) (3)	Gain: -3 dB	Hz	350 (300)	330 (240)
	Phase: -90°	Hz	450 (370)	410 (330)
Vibration Proof (4)			Frequency: 10 - 60 Hz, Amplitude: 4 mm, Acceleration: 7.8 - 282 m/s^2 Frequency: 61 - 2000 Hz, Amplitude: 4 - 0.0038 mm, Acceleration: 294 m/s^2	
Protection			IP 64	
Ambient Temperature		℃	−15 - +60	
Spool Type			Neutral/Zero Lap	
Spool Stroke to Stops		mm	±0.5	±0.75
Polarity			See the description about I/O signal characteristics on page 18.	
Linear Motor Specification	Current	A	2 [Max. 6]	
	Coil Resistance	Ω	4.5 [at 20 ℃]	
Mass		kg	5	

Note: (1) 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.
(2) Back pressure at the drain port (Y) should be 0.05 MPa or less and not be a negative pressure.
(3) This value is measured for each valve; it may vary depending on the actual circuit.
(4) There are restrictions on the mounting position; refer to the instructions for details.

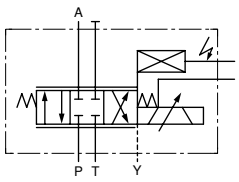
Range of Flow Control

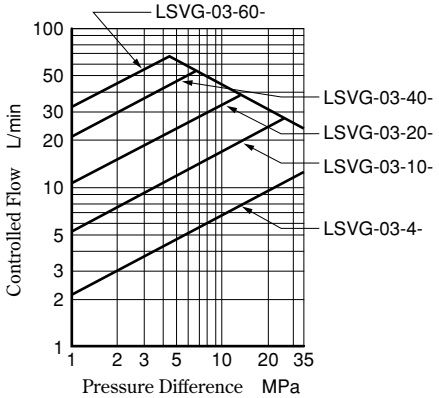
●Control Method: 4-Way Valve



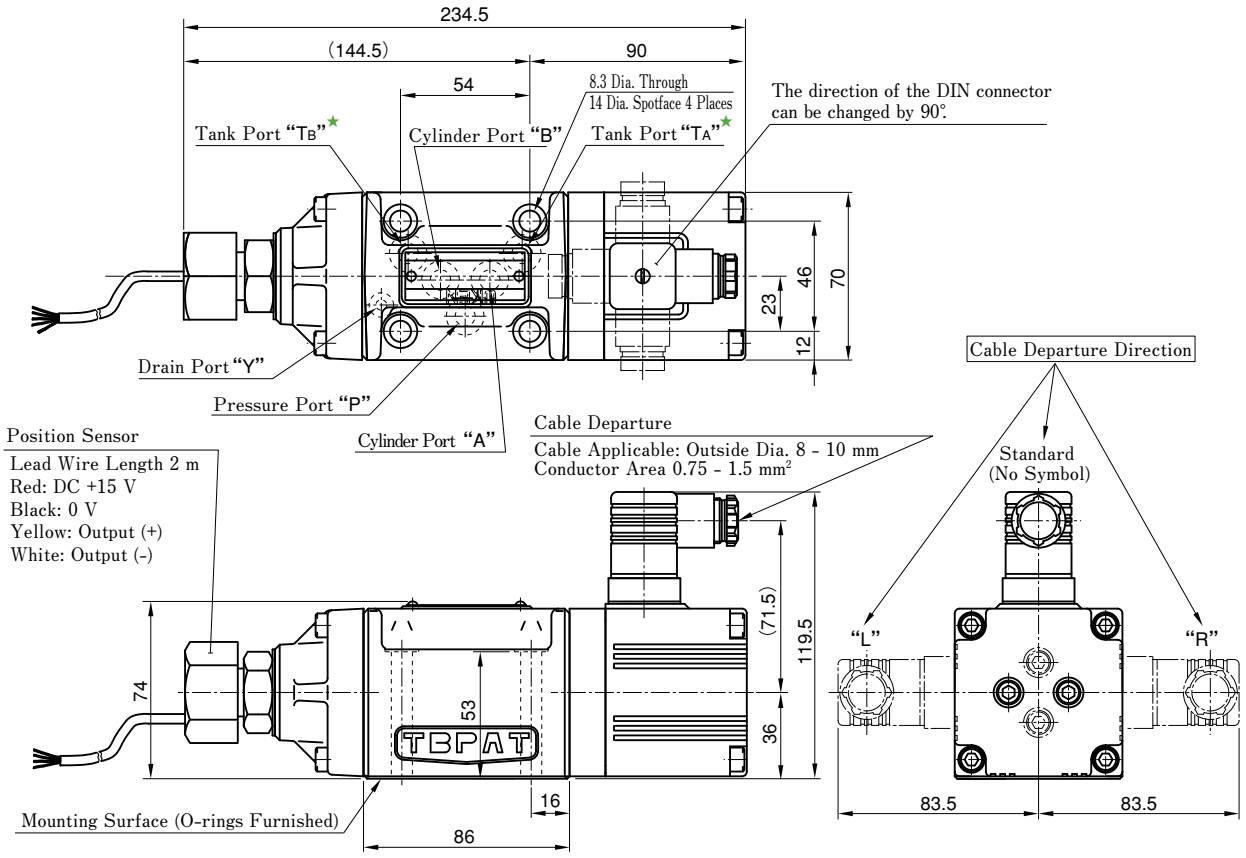


●Control Method: 3-Way Valve





LSVG-03



Note) Refer to the wiring diagram on page 20 for detailed connection between the DIN connector/position sensor and the amplifier.

● 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.

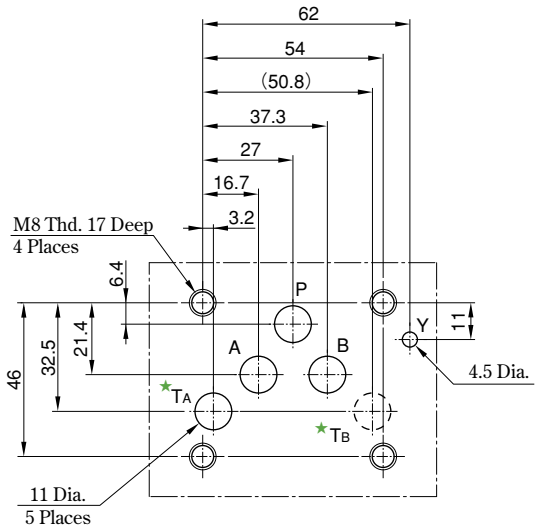
【Mounting Surface】

Prepare a mounting surface shown on the right. Basically, the dimensions of the mounting surface conform to the ISO standard, but the specifications for valve mounting screws are different as follows.

Consult us for valves available with M6 mounting screws.

	ISO 4401-05-04-0-94	Mounting Surface for LSVG-03
Valve Mounting Screw	M6	M8

The mounting surface should have a good machined finish.



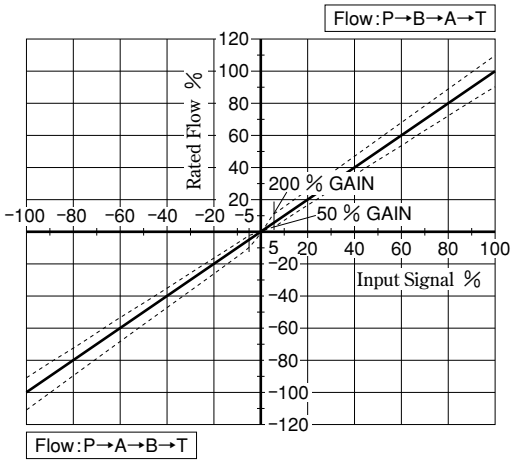
★There are two tank ports "TA" and "TB" ; however, "TA" may be used alone.

Characteristics of LSVG-03-4/10/20/40/60 (Fluid Viscosity: 30 mm²/s)

No-Load Flow Characteristics

〈Conditions〉

●Valve Pressure Difference : 7 MPa

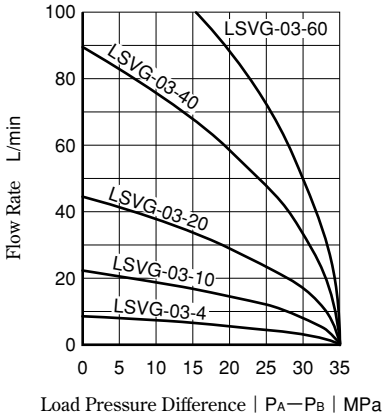


Load Flow Characteristics

〈Conditions〉

●Input Signal : 100 %

Note) Tolerance for Load Flow : ±10 %



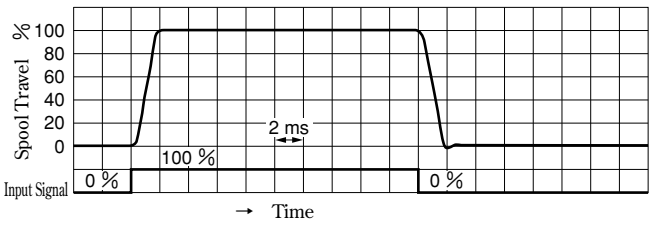
Step Response

〈Conditions〉

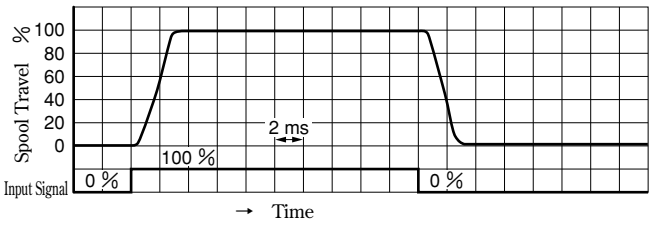
●Input Amplitude : 0 ⇔100 %　●Supply Pressure : 14 MPa

●LSVG-03-4/10/20/40-10

Amplifier : AMLS-A-D48-＊-10 (Power Supply: 48 V DC)

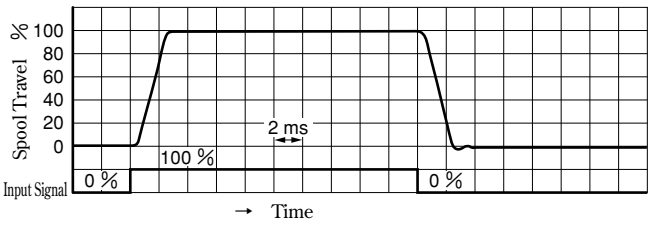


Amplifier : AMLS-A-D24-※-10 (Power Supply: 24 V DC)



●LSVG-03-60-10

Amplifier : AMLS-B-D48-＊-10 (Power Supply: 48 V DC)



Amplifier : AMLS-B-D24-※-10 (Power Supply: 24 V DC)