

# Electric Small-Port Single Seated Control Valves

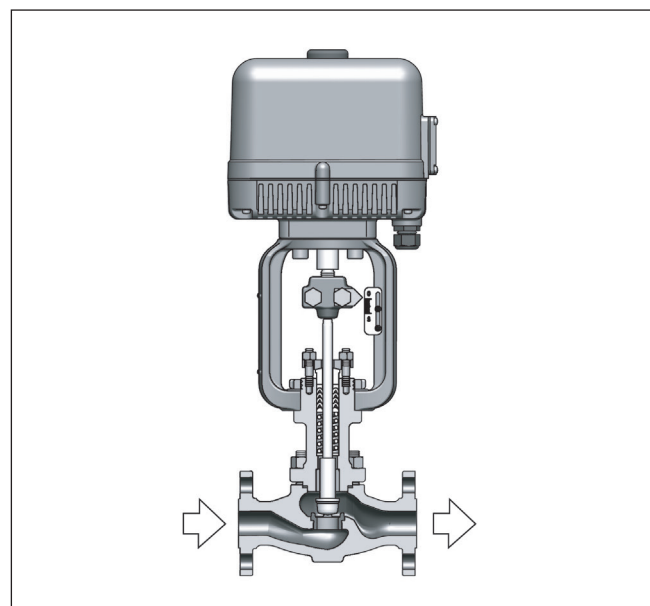
Model HLS\_ \_ \_

## OVERVIEW

Model HLS Small-Port Single Seated Control Valves are designed for heavy duty service. The compact valve body, having an S-shaped flow passage that features low pressure loss, allows a large flow capacity, rangeability, and high accuracy flow characteristics.

The valve plug are available in a wide range of Cv values. The flow shut-off performance complies with the ANSI Standards. The actuator section performs ON-OFF operation or proportional operation by directly receiving the signal of 4 to 20 mA DC or 1 to 5V DC from the electronic-type controller. The provided electric-type actuator offers high accuracy, compactness, and sturdy structure.

The model HLS Valves are widely applicable for reliable control of small flow in process lines.



## SPECIFICATIONS

### Body

#### Type

Straight-through, cast globe valve

#### Nominal size

1/2, 3/4, 1 inch

#### Pressure rating

- JIS 10K, 16K, 20K, 30K, 40K
- ANSI Class 150, 300, 600
- JPI Class 150, 300, 600

#### End connection

- Flanged end ;

Connection type	Pressure rating	Applicable standard
FF	JIS10K	JIS B2210-1984
RF	JIS10K, 16K, 20K, 30K, 40K	JIS B2210-1984
	ANSI Class 150, 300, 600	ANSI B16.5-1981
	JPI Class150, 300, 600	JPI-7S-15-1993
RJ, LG	ANSI Class 150, 300, 600	ANSI B16.5-1981
	JPI Class 150, 300, 600	JPI-7S-15-1993
Tongue and groove (groove) Male and female(female)	JIS16K, 20K, 30K, 40K	JIS B2202-1984

- Welded end ; SW, BW

### Material

For body/trim material combinations and operating temperature ranges, refer to Table 1.

### Bonnet style

Plain bonnet	-17 to 230 °C	
Extension bonnet Type 1	-45 to -17 °C and 230 to 566 °C	
Extension bonnet Type 2	-100 to -45 °C	Integral cast type
	-196 to -100 °C	Welded type
Bellows type	For operating temperature and pressure range, refer to Figure 2.	

Note) Take care not to exceed the operating temperature ranges specified for respective materials.

### Gland type

Bolted gland

### Packing / Grease

- Grease not provided ;  
When V shaped PTFE packing or PTFE yarn packing is used.
- Grease provided ;  
When graphite packing is used.

Note) PTFE: Polytetrafluoroethylene. Gasket

**Gasket****Type**

Flat type, serrated type

**Material**

Stainless steel (SUS316, SUS316L, SUS329J1), copper, aluminium, titanium, ASTM B574 (Hastelloy C-276 equivalent) or alloy 20

**Trim****Valve plug**

- Single seated contoured-type plug
  - <Metal seat>
  - (For flow characteristics, refer to Figure 1.)
  - Equal percentage (%CF)
  - Linear (LCF)
  - <Soft seat>
  - (For flow characteristics, refer to Figure 1.)
  - Equal percentage (%TF)
  - Linear (LTF)

*Note* 1. For operating temperature and maximum differential pressure range of soft-seat type, refer to Figure 3.

2. For Rated Cv 0.01, 0.04 and 0.1, cage guide trim.

**Material**

For body/trim material combinations and operating temperature ranges, refer to Table 1.

*Note* For fluid conditions that require CoCr-A, refer to Figure 4.

**Actuator****Type**

Electric motor

**Action**

Direct or reverse action

**Control operation**

Proportional or two position operation

**Input signal****Proportional control**

Current input: 4 to 20 mA, 4 to 12 mA, 12 to 20 mA  
DC input: 1 to 5V DC, 1 to 3V DC, 3 to 5V DC

**On-Off control**

Power supply voltage, relay contact input

*Note*) Select the control valve operation mode during input signal "OFF" (At the selected position, the valve stops, or is fully open or closed)

**Power supply**

Single phase 100, 200, 24V AC ( $\pm 10\%$ , 50 / 60 Hz) or  
Single phase 110, 115, 120, 210, 215, 220, 230, 240V AC.

**Input resistance**

250  $\Omega$

**Power consumption**

100V AC powered : 50VA during operation, 1.5VA during non-operation

200V AC powered : 50VA during operation, 1.5VA during non-operation.

24V AC powered : 75VA during operation, 1.5VA during non-operation.

**Insulation resistance**

Between input terminal and housing

100 M $\Omega$  / 500V DC

Between power supply terminal and housing

100 M $\Omega$  / 500V DC

**Withstand voltage**

Between input terminal and housing

500V AC, 1 min.

Between power supply terminal and housing

1500V AC, 1 min.

**Housing material**

Aluminum diecast (ADC12)

**Housing**

Waterproof type (NEMA4, 4X, IEC529(1989)IP-65 equivalent)

**Motor**

Capacitor motor (Built-in continuous rating thermal switch Class E insulation)

**Feedback mechanism**

Conductive-plastic-type potentiometer (with backlash compensation mechanism)

**Electrical conduit connection**

G1/2 (2 positions)

**Protective device**

Built-in open/close limit switch (with motor burn-preventive thermal switch)

**Ambient temperature**

-5 to +55 °C

**Ambient humidity**

10 to 90 % RH

**Permissible vibration**

2 G / 100 Hz

**Output**

Analog feedback :

4 to 20 mA (For proportional control)

Contact feedback :

Open/Close 2 points, contact capacity 5A, 125V AC or more.

Resistance feedback :

With 135 Ω potentiometer (accuracy 135 Ω 10 %, linearity 1 %)

**Manual operation**

With multi-turn lever

**Hazardous chemical regulations**

Compliant with China RoHS

RoHS (EU) and CE marks available

**Additional specifications (by special order)**

- Special inspection  
Flow characteristics inspection, material inspection (Material certificate), non-destructive inspection, steam inspection, low-temperature inspection
- With drain plug
- Double gland
- Steam jacket
- Oil/water free treatment
- Stainless steel (SUS304) nuts and bolts for atmospheric exposure
- Yoke material (SCPH2)
- Sand-/dust preventive measure
- Vacuum service
- Explosion proof [Exd II BT4]

**Performance****Rated Cv value**

Refer to Table 3.

**Flow characteristics**

Refer to Figure 1.

**Inherent rangeability**

Refer to Table 3. (Rangeability 75:1 is available as option for Rated Cv larger than 1.0)

**Allowable differential pressure**

Refer to Table 9 and Table 10.

**Leakage specification**

- Contoured type plug  
IEC 60534-4:2006 or JIS B 2005-4:2008  
<Metal seat>  
Standard.....Class IV: Leakage less than 0.01 % of maximum valve capacity.
- Option.....Leakage less than 0.001 % of maximum valve capacity.
- <Soft seat>  
Class IV : Leakage less than 0.00001 % of maximum valve capacity

**Accuracy**

Within ± 2 % F.S.

**Dead band**

Within 1 % F.S.

**Hysteresis error**

Within 2 % F.S.

**Linearity**

Within ± 2 % F.S.

**Operating time**

Rated travel 14.3 mm; 12 sec. (no-load, reference value)

**Dimensions**

Refer to Figure 6 and Table 13 and Table 14.

**Weight**

Refer to Table 15 and 16.

**Block diagram**

Refer to Figure 7.

**Terminal connection**

Refer to Figure 8.

**Finish**

Valve body and bonnet; Blue or silver.

Actuator; Silver

**Table 1. Body/trim material combinations and operating temperature ranges (°C)**

Body material / Trim material		JIS	SCPH2	SCPH21	SCPH61	SCPL1	SCS13A	SCS14A	SCS16A
		ASTM	A216WCB	A217WC6	A217C5	A352LCB	A351CF8	A351CF8M	A351CF3M
JIS	SUS316		-5 to +300	—	—	-45 to +300	-196 to +300	-196 to +300	—
JIS	SUS316L		-5 to +300	-5 to +300	—	-45 to +300	-196 to +300	-196 to +300	-196 to +300
JIS	SUS440C		-5 to +425	-5 to +425	-5 to 425	—	—	—	—
JIS	SUS329J1		—	—	—	—	—	-196 to +300	—
JIS	SUS316 CoCr-A		-5 to +425	-5 to +550	-5 to 566	-45 to +350	-196 to +550	-196 to +550	—
JIS	SUS316 CoCr-A face		-5 to +425	-5 to +550	-5 to 566	-45 to +350	-196 to +550	-196 to +550	—
JIS	SUS316L CoCr-A		—	—	—	-45 to +350	-196 to +450	-196 to +450	-196 to +450
JIS	SUS329J1 CoCr-A		—	—	—	—	—	-196 to +550	—
JIS	SUS316 Soft seat		-5 to +230	—	—	-45 to +230	-80 to +230	-80 to +230	—
JIS	SUS316L Soft seat		—	—	—	-45 to +230	-80 to +230	-80 to +230	-80 to +230
JIS	SUS329J1 Soft seat		—	—	—	—	—	-80 to +230	—

**Table 2.**

Body material / Trim material		JIS	SCPH2	SCS13A	SCS14A	SCS16A	Titanium	ASTM CW-12MW (Hastelloy C equivalent)	SCS23
		ASTM	A216WCB	A351CF8	A351CF8M	A351CF3M	-	-	-
JIS	Titanium with weld Nitride overlay		-	-	-	-	-196 to +315	-	-
JIS	Titanium		-	-	-	-	-196 to +315	-	-
JIS	ASTM CW-12MW (Hastelloy C-276 equivalent)		-	-	-	-	-	-196 to +450	-
JIS	Alloy 20		-	-	-	-	-	-	-196 to +300
JIS	Nickel-Copper Alloy		-5 to +300	-196 to +300	-196 to +300	-196 to +300	-	-	-

Note) 1. “” shows standard combination of valve body and trim materials.

**Table 3. Cv value and travel**

Plug type	characteristics	Rated travel (mm)	Rated Cv value													
			0.01	0.04	0.1	0.16	0.25	0.4	0.63	1.0	1.6	2.5	4.0	6.3	10	14
Contoured type	Metal seat	Equal percentage (%CF)				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Linear (LCF)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Soft seat	Equal percentage (%TF)					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Linear (LTF)				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Inherent rangeability			20:1	25:1	20:1		30:1	50:1								
End connection (inch)		1/2														
		3/4														
		1														

Note) “✓” denotes production range.

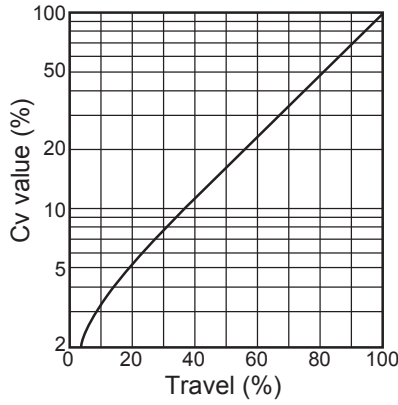


Figure 1-1. Equal percentage characteristics (%CF Metal seat)

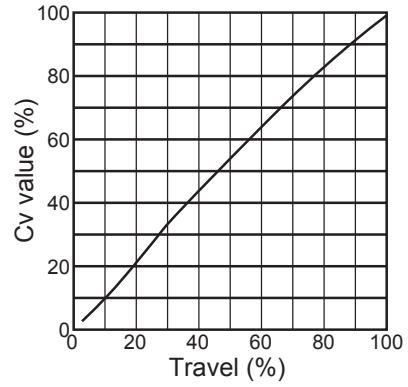


Figure 1-2. Linear characteristics (LCF Metal seat)

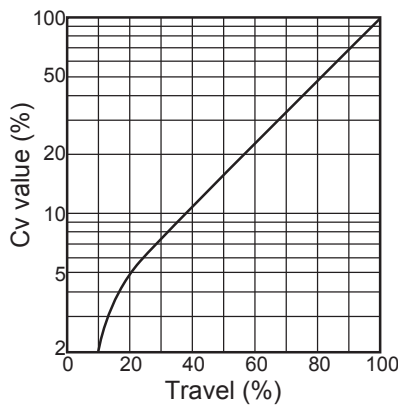


Figure 1-3. Equal percentage characteristics (%TF Soft seat)

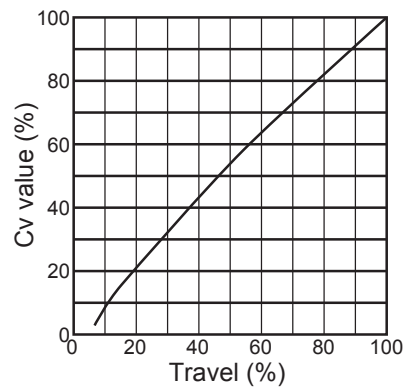


Figure 1-4. Linear characteristics (LTF Soft seat)

Figure 1. Flow characteristics

Note) The above graphs indicate typical flow characteristics

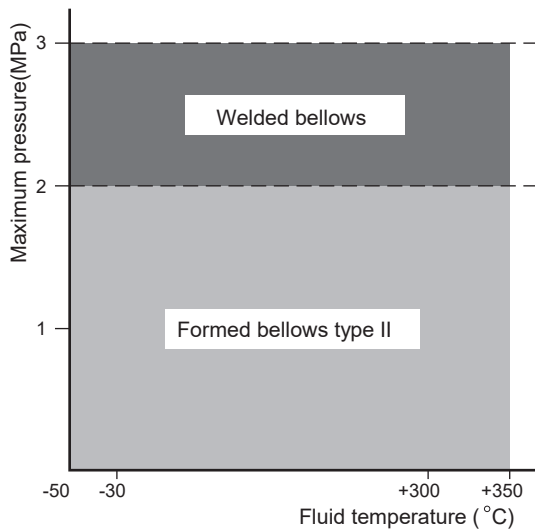


Figure 2. Bellows Type by Temperature and Pressure Ranges

Note) Bellows type are classified into Formed bellows type II and welded bellows by temperature and pressure ranges. Please refer to No. SS2-BSL100-0100 about detail of bellows specification.

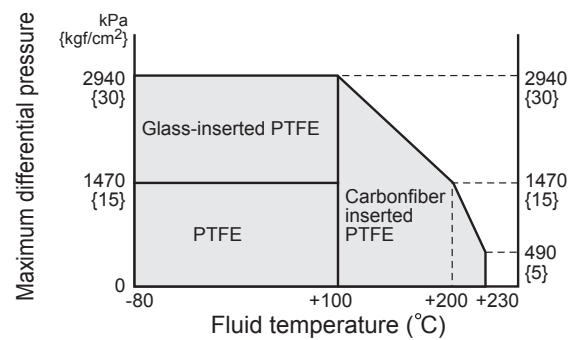
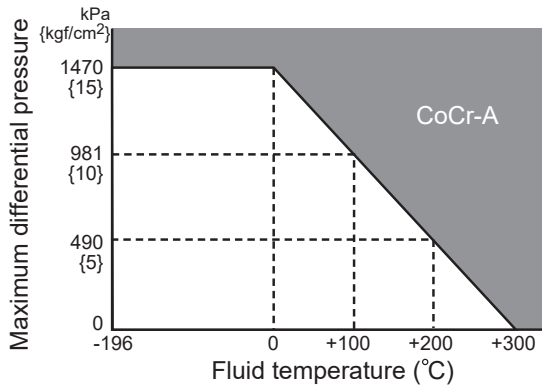


Figure 3. Operating temperature and maximum differential pressure range of soft-seat type

Note) If there is any possibility to cause erosion due to saturated steam or superheated-water, use the metal sheet.



- Note) 1. When cavitation/flashing service, oil prohibitive service, or retention of valve-close performance is required, use of CoCr-A is recommended regardless of temperature or differential pressure.
2. 440C hardened stainless steel is recommended for valves for cavitation/flashing service of water or for superheated service of water of higher than 100 °C.
3. When rated Cv value is 0.16 or lower, faced valve plug or 440C hardened stainless steel valve plugs are standard.

Figure 4. Temperature / Normal differential pressure ranges requiring CoCr-A

**Structural drawing of trim and body/trim material combinations**

Following table shows typical body/trim material combinations.

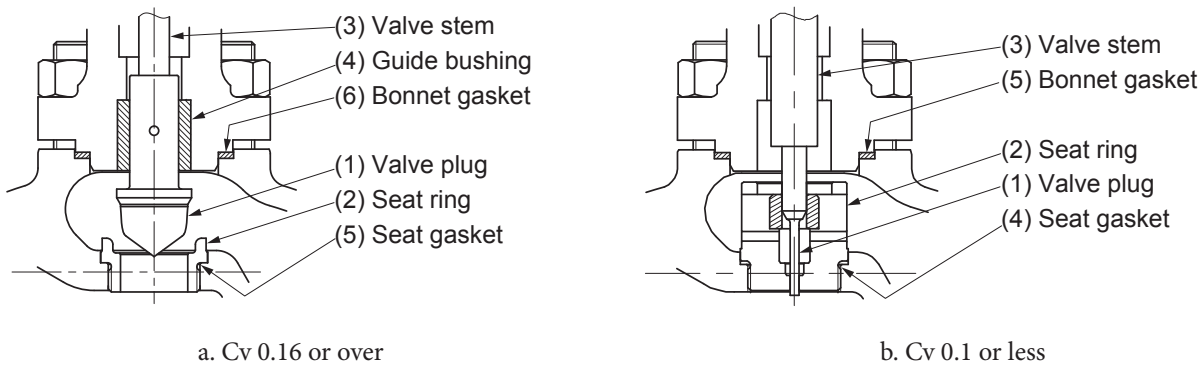


Figure 5. Structural drawing of trim

Table 4. The valve body material is carbon steel (SCPH2/A216WCB)

(1) Valve plug	SUS316	SUS440C	SUS316 CoCr-A SUS316 CoCr-A face		SUS316 soft seat	
(2) Seat ring	General	General	General	Oil-free	General	Oil-free
(3) Valve stem	SUS316					
(4) Guide bushing	SUS440C		SUS316 CoCr-A	Solid CoCr-A	SUS440C	Solid CoCr-A
(5) Seat gasket	Without (Design temperature: -17 to +230 °C)			SUS316 (PTFE coating)	Without	SUS316 (PTFE coating)
	SUS316 (Design temperature: above 230 °C)					
(6) Bonnet gasket	SUS316		SUS316 (PTFE coating)	SUS316	SUS316 (PTFE coating)	

**Table 5. The valve body material is stainless steel (SCS13A/A351CF8)**

(1) Valve plug	SUS316	SUS316 CoCr-A SUS316 CoCr-A face		SUS316 soft seat	
(2) Seat ring	General	General	Oil-free	General	Oil-free
(3) Valve stem	SUS316				
(4) Guide bushing	SUS316	Solid CoCr-A		SUS316	Solid CoCr-A
(5) Seat gasket	Without (Design temperature: -17 to +230 °C)		SUS316 (PTFE coating)	Without (Design temperature: -17 to +230 °C)	SUS316 (PTFE coating)
	SUS316 (Design temperature: below -17 °C and above +230 °C)			SUS316 (Design temperature: below -17 °C)	
(6) Bonnet gasket	SUS316		SUS316 (PTFE coating)	SUS316	SUS316 (PTFE coating)

**Table 6. The valve body material is stainless steel (SCS14A/A351CF8M)**

(1) Valve plug	SUS316	SUS316 CoCr-A SUS316 CoCr-A face		SUS316 soft seat	
(2) Seat ring	General	General	Oil-free	General	Oil-free
(3) Valve stem	SUS316				
(4) Guide bushing	SUS316	Solid CoCr-A		SUS316	Solid CoCr-A
(5) Seat gasket	Without (Design temperature: -17 to +230 °C)		SUS316 (PTFE coating)	Without (Design temperature: -17 to +230 °C)	SUS316 (PTFE coating)
	SUS316 (Design temperature: below -17 °C and above +230 °C)			SUS316 (Design temperature: below -17 °C)	
(6) Bonnet gasket	SUS316		SUS316 (PTFE coating)	SUS316	SUS316 (PTFE coating)

**Cv 0.1 or less**

**Table 7. The valve body material is carbon steel (SCPH2/A216WCB)**

(1) Valve plug	SUS316 CoCr-A SUS316 CoCr-A face	
(2) Seat ring	General	Oil-free
(3) Valve stem	SUS316	
(4) Seat gasket	Without	SUS316 (PTFE coating)
(5) Bonnet gasket	SUS316	SUS316 (PTFE coating)

**Table 8. The valve body material is stainless steel (SCS13A/A351CF8 or SCS14A/A351CF8M)**

(1) Valve plug	SUS316 CoCr-A SUS316 CoCr-A face	
(2) Seat ring	General	Oil-free
(3) Valve stem	SUS316	
(4) Seat gasket	Without	SUS316 (PTFE coating)
(5) Bonnet gasket	SUS316	SUS316 (PTFE coating)

## Allowable differential pressure

**Table 9. Contoured type metal seat (%CF, LCF, %C, LC) : PTFE packing**

Actuator model	Differential pressure (by Cv value) kPa {kgf/cm <sup>2</sup> }									
	Below 0.25	0.4	0.63	1.0	1.6	2.5	4.0	6.3	10.0	14.0
EA2	9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}	5830 {59.5}	4350 {44.4}	2690 {27.4}

Note) Take care not to cause the maximum allowable differential pressure to exceed the maximum operating pressure designated by ANSI B16.34-1981 or JIS B2201-1984.

**Table 10. Contoured type soft seat (%TE, LTF, %T, LT) : PTFE packing**

Actuator model	Differential pressure (by Cv value) kPa {kgf/cm <sup>2</sup> }									
	Below 0.25	0.4	0.63	1.0	1.6	2.5	4.0	6.3	10.0	14.0
EA2	2940 {30.0}	2940 {30.0}	2940 {30.0}	2940 {30.0}	2940 {30.0}	2940 {30.0}	2940 {30.0}	2940 {30.0}	2940 {30.0}	1870 {19.1}

Note) Take care not to cause the maximum allowable differential pressure to exceed the maximum operating pressure designated by ANSI B16.34-1981 or JIS B2201-1984.

**Table 11. Contoured type metal seat (%CF, LCF, %C, LC) : Graphite packing “P6610CH+P6528” (+230 to +500 °C)**

Actuator model	Differential pressure (by Cv value) kPa {kgf/cm <sup>2</sup> }									
	Below 0.25	0.4	0.63	1.0	1.6	2.5	4.0	6.3	10.0	14.0
EA2	9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}	7540 {76.8}	7540 {76.8}	4090 {41.7}	3050 {31.1}	1880 {19.1}

Note) Take care not to cause the maximum allowable differential pressure to exceed the maximum operating pressure designated by ANSI B16.34-1981 or JIS B2201-1984.

**Table 12. Metal seat (%VF, LTF, %V, LV) : Graphite packing “P6610CH+P8590” (+500 to +566 °C)**

Actuator model	Differential pressure (by Cv value) kPa {kgf/cm <sup>2</sup> }									
	Below 0.25	0.4	0.63	1.0	1.6	2.5	4.0	6.3	10.0	14.0
EA2	9810 {100}	9810 {100}	9810 {100}	9610 {97.9}	9610 {97.9}	5930 {60.4}	5930 {60.4}	3220 {32.8}	2400 {24.4}	1480 {15.0}

Note) Take care not to cause the maximum allowable differential pressure to exceed the maximum operating pressure designated by ANSI B16.34-1981 or JIS B2201-1984.



## DIMENSIONS

Table 13. Face-to-face dimensions

[Unit: mm]

		Nominal size (inch)	1/2	3/4	1	
A	JIS10K FF, RF	ANSI 150 RF	JPI 150 RF *	184	184	184
	JIS 16K RF			190	190	193
	JIS 20K RF	JIS 30K RF	ANSI 300 RF *	194	197	197
	JPI 300 RF					
	JIS 40K RF	ANSI 600 RF	JPI 600 RF SW, BW *	206	206	210
	ANSI 150 RJ	JPI 150 RJ		-	-	197
	ANSI 300 RJ	JPI 300 RJ		206	209	210
	ANSI 600 RJ	JPI 600 RJ		206	206	210
	JIS20K Tongue and groove, Male and female			198	198	198
	JIS30K Tongue and groove, Male and female			208	208	212
ANSI 300LG	JPI 300LG		203	203	206	

Note) \*: Face-to-face dimensions conform to following standards.  
 -IEC 60534-3-1:2001  
 -JIS B 2005-3-1:2005

Table 14. External dimensions

[Unit: mm]

Actuator Model	H					h	B	E	C	F
	Plain bonnet	Extension bonnet Type 1	Extension bonnet Type2		Bellows-type bonnet					
			Integral-cast type	Welded type						
EA2	490	640	800	1015	640	355	214	40	138	111

Note) "H" dimensions are applicable when a hand wheel is provided. When the hand wheel is not required, subtract the hand wheel dimensions ("T" dimensions)

## Weight

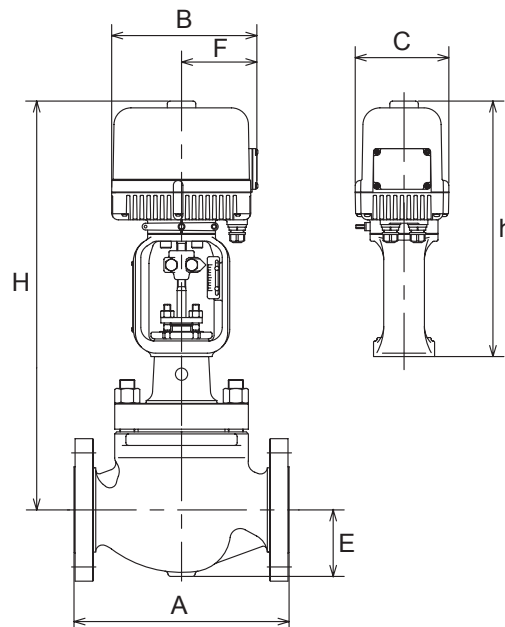


Figure 6. Face-to-face and external dimensions

Table 15. Flange type

[Unit: kg]

Nominal size (inch)		Actuator model	Weight				
			Plain bonnet	Extension bonnet Type 1	Extension bonnet Type2		Bellow type bonnet
					Integral-cast type	Welded type	
1/2	(SW)	EA2	17	19	22	27	22
3/4	(SW)	EA2	17	19	22	27	22
1	(SW)	EA2	17	19	22	27	22

Table 16. Welded type

[Unit: kg]

Nominal size (inch)	Actuator model	Weight									
		JIS 10K, ANSI 150, JPI 125, 150					JIS 16K, 20K, 30K, 40K, ANSI 300, 600, JPI 300, 600				
		Plain bonnet	Extension Type 1 Bellows type	Extension bonnet Type 2		Bellows-type bonnet	Plain bonnet	Extension bonnet Type 1	Extension bonnet Type 2		Bellows-type bonnet
				Integral cast type	Welded type				Integral cast type	Welded type	
1/2	EA2	18	20	23	28	21	19	21	24	29	22
3/4	EA2	18	20	23	28	21	19	21	24	29	22
1	EA2	18	20	23	28	21	19	21	24	29	22

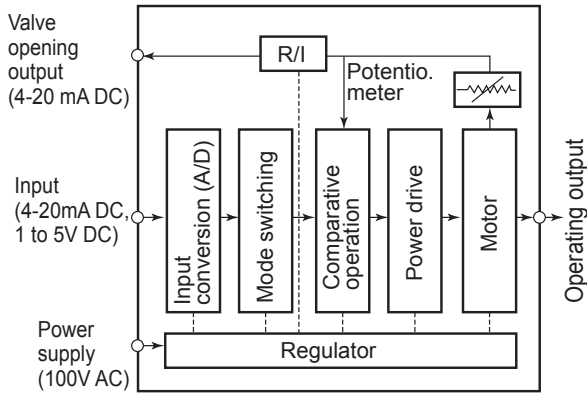


Figure 7. Operating principle of block diagram

**- Input conversion block:**

Receives gate opening command signals of 1-5V DC under high impedance (4-20 mA DC signals are converted to voltage signals by a resistor of 250 Ω connected to the input terminal) and converts to the level convenient for internal processing.

**- Mode switching block:**

Monitors gate opening command signals, judges signal “OFF”, and generates drive signals according to the preset mode.

**- Comparative operation block:**

Effects comparative operation between output axis rotating angle signals (potentiometer) and signals converted by the input conversion block.

**- Power drive block:**

Issues direct/reverse rotation command output to the motor depending on comparative judgment signals received from the comparative operation block.

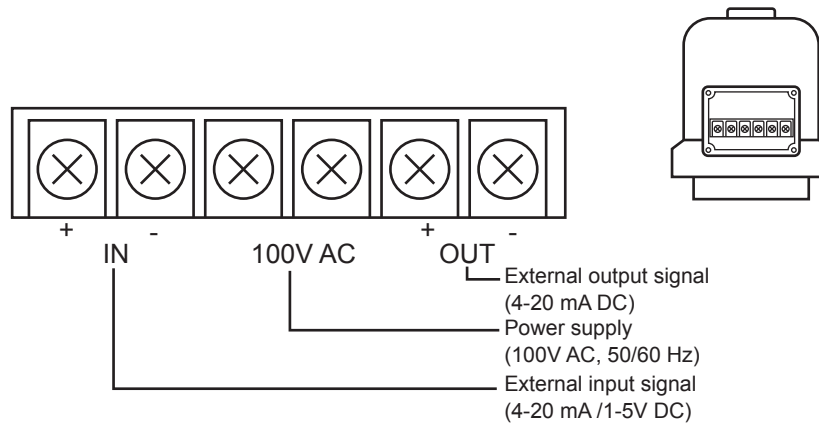


Figure 8. Terminal connection

## Ordering Information

When ordering, please specify;

- |  |   |
|--|---|
| 1) Model Number: HLS   | 9) Accessories (limit switch.)  |
| 2) Nominal size × Cv required  | 10) Special requirement of oil-free treatment and etc.  |
| 3) Type and rating of end connections                                      | 11) Name of flow medium   |
| 4) Body and trim material, necessity of hardening                          | 12) Normal flow and maximum required flow   |
| 5) Type of bonnet  | 13) Pressure of flow medium, upstream and downstream pressure at maximum and minimum, required flow |
| 6) Valve and plug characteristics  | 14) Temperature and specific gravity of flow medium   |
| 7) Type of actuator  | 15) Viscosity of flow medium, inclusive or exclusive of slurry                                      |
| 8) Valve action (direct or reverse), mode signal during input signal "OFF" |   |

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