

Smart-Port Single Seated Control Valves

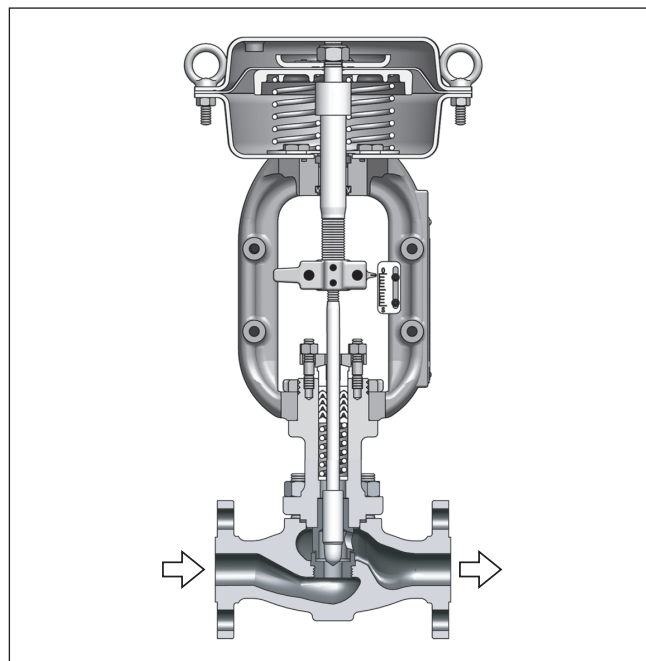
Model HLC_ _ _

OVERVIEW

Model HLC Small-Port Cage Guide Type Single Seated Control Valves are designed for high differential pressure Service where fluid normal differential pressure exceeds 2940 kPa {30 kgf/cm²} or for heavy-duty service where flashing/cavitation may occur. Further, they are ideal for preventing erosion from the valve body, because their guides are sturdy and the valve body is protected by a cage. The compact valve body, having an S-shaped flow passage that features low pressure loss, allows a large flow capacity and rangeability. The valve plugs are available in a wide range of Cv values. The flow shutoff performance complies with simplest mechanisms, utilizes a compact yet powerful diaphragm actuator loaded with multiple springs.

The model HLC Control Valves are widely applicable for reliable control of small flows in high- or low-temperature, high differential pressure process lines.

Model HLC is compliant to Functional Safety Standard (IEC61508).



SPECIFICATIONS

Body

Type

Straight-through, cast globe valve

Nominal size

1/2, 3/4, 1 inch

Pressure rating and End connection

Connection type	Pressure rating	Applicable standard
FF	JIS10K	JIS B2210-1984
	ANSI Class 125	ANSI B16.5-1981
	JPI Class 125	JPI-7S-15-1993
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)	JIS16K, 20K, 30K, 40K	JIS B2202-1984
Male and female(female)		

- Welded end: SW , BW

Materials

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

Bonnet

Plain bonnet	-17 to 230 °C	-
Extension bonnet Type 1	-45 to -17 °C 230 to 566 °C	-
Extension bonnet Type 2	-100 to -45 °C	Integral-cast type
	-196 to -100 °C	Welded type

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

Gland type

Bolted gland

Packing/Grease

- Grease not provided; V shaped PTFE packing, PTFE yarn packing
- Grease provided; Graphite packing

Note) PTFE:Polytetrafluoroethylene.

Gasket

Type: Flat type, serrated type

Material: Stainless steel (SUS316, SUS316L, SUS329J1), copper, aluminum

Trim**Valve plug**

- Single-seated, contoured type plug
- Metal seat Equal percentage (%CC)
 Linear (LCC)

Cage

Separated type cage

Materials

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

Actuator**Type**

Single-acting diaphragm actuator (Type PSA or HA)

Action

Direct or reverse action

Diaphragm

Cloth embedded ethylene propylene rubber

Spring range

20 to 98 kPa {0.2 to 1.0 kgf/cm²} or
80 to 240 kPa {0.8 to 2.4 kgf/cm²}

Supply pressure

120 to 390 kPa {1.2 to 4.0 kgf/cm²}

Note) Spring range and air supply pressure vary depending on permissible differential pressure.

Air connection

Rc1/4 or 1/4NPT internal thread

Ambient temperature

-30 to 70°C

Valve action

Air-to-close (Direct action actuator is combined.)

Air-to-open (Reverse action actuator is combined.)

Optional accessories

Positioner*, pressure regulator with filter, hand wheel*, limit switch, solenoid valve, motion transmitter, booster relay, lock-up valve, air lock relay, and others

Note) 1) For the optional items, refer to specification sheets and installation drawings of respective accessories.

2) Accessories with an asterisk mark (*) are selected from among the following types depending on the actuators to be combined.

3) Vinyl-coated copper pipes are normally used for air piping. If the ambient temperature may be -15 °C or lower or +60 °C or higher, stainless steel pipes are recommended.

Actuator	Positioner		Hand wheel	
	P/P	I/P	Top	Side
PSA1	VPE_ _ HTP_ _	AVP7_ _ _ AVP3_ _ _	Mounted	Mounted
HA2	HTP_ _	AVP2_ _ _		

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
- Oil/water free treatment
- Copper free treatment
- York material SCPH2 (Yoke material of PSA1 is SCPH2 as standard)
- Stainless steel (SUS304) atmosphere-exposed nuts and bolts
- Special air piping and joint
- Sand-/ dust-preventive measures
- Saline damage countermeasures
- Cold-area use specifications
- Tropical-area use specifications
- Vacuum service

Functional Safety Standard (IEC61508) conformity:

SIL3 capable - certified by exida Consulting LLC

Performance**Rated Cv value**

Refer to Table 2.

Flow characteristics

Refer to Figure 1 and Figure 2.

Inherent rangeability

Refer to Table 2.

(Optional: 75: 1 for values of rated Cv1.0 or more)

Allowable differential pressure

Refer to Table 7 and Table 12.

Leakage specifications

IEC 60534-4:2006 or JIS B 2005-4:2008

- Standard
Class IV: Leakage less than 0.01% of maximum valve capacity.
- Optional
Leakage less than 0.001% of maximum valve capacity.

Hysteresis error

Actuator Model	HA2	PSA1
Without positioner	±3% F.S.	±5% F.S.
With positioner	±1% F.S.	±1% F.S.

Linearity

Actuator Model	HA2	PSA1
Without positioner	±5% F.S.	±10% F.S.
With positioner	±1% F.S.	VPE: ±3%

Note) 1) When positioner is not provided, operating performance may vary depending on types of packings used.

Dimensions

Refer to Figure 6, Table 13 and Table 14.

Weight

Refer to Table 15, Table 16 and Table 17.

Actuator orientation

Refer to Figure 8.

Finish

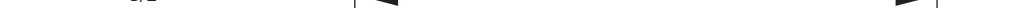
Blue or silver, or other specified colors.

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

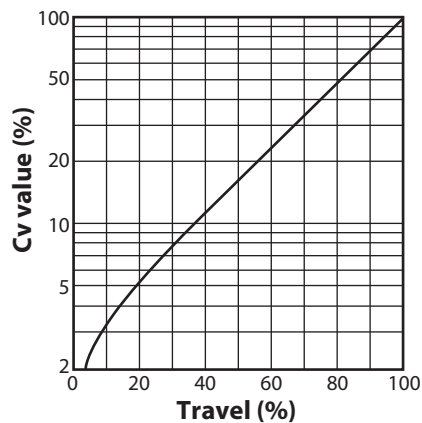
Body material		JIS	SCPH2	SCPH21	SCPH61	SCS11	SCS13A	SCS14A	SCS16A	SCS19A
Trim material		ASTM	A216WCB	A217WC6	A217C5		A351CF8	A351CF8M	A351CF3M	A351CF3
JIS	SUS440C		-5 to +425	-5 to +425	-5 to +425	-	-	-	-	-
JIS	SUS316 CoCr-A Seat or SCS14A CoCr-A Seat		-5 to +425	-5 to +550	-5 to +566	-	-196 to +550	-196 to +550	-	-
JIS	SUS316 CoCr-A face or SCS14A CoCr-A face		-5 to +425	-5 to +550	-5 to +566	-	-196 to +550	-196 to +550	-	-
JIS	SUS316L CoCr-A or SCS16A CoCr-A seat		-	-	-	-	-196 to +450	-196 to +450	-196 to +450	-196 to +450
JIS	SUS329J1 CoCr-A or SCS11 CoCr-A seat					-50 to +550	-	-196 to +550		

Note) 1) SUS440C is recommended for values for cavitation/flashing service of water or for superheated service of water higher than 100 °C.
2) When rated Cv value is 0.16 or lower CoCr-A faced valve plugs or SUS440C valve plugs are standard.

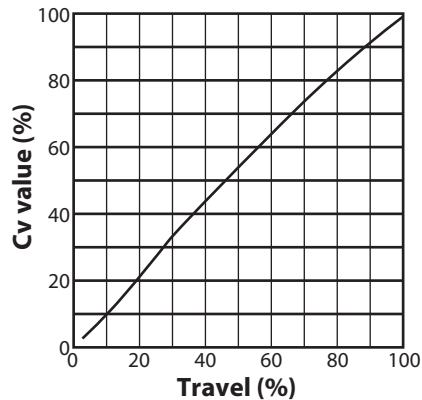
Table 2. Cv value travel

Plug type/ characteristics / Rated travel (mm) / Rated Cv				0.16	0.25	0.4	0.63	1.0	1.6	2.5	4.0
Contoured type	Metal seat	Equal percentage (%CC)	14.3 mm		✓	✓	✓	✓	✓	✓	✓
		Linear (LCC)		✓	✓	✓	✓	✓	✓	✓	✓
Inherent rangeability				20:1			30:1	50:1			
Nominal size (inch)		1/2									
		3/4, 1									

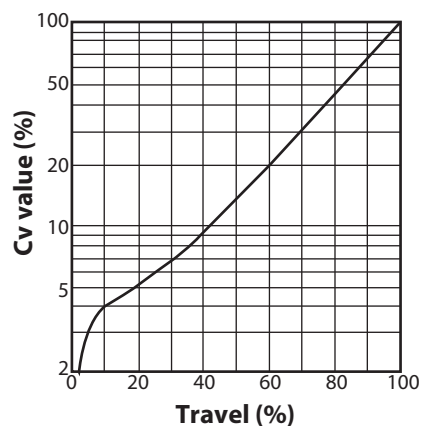
Note) 1) “✓” denotes production ranges.
2) Please select model # HLS for values of rated Cv0.01, 0.04, 0.1



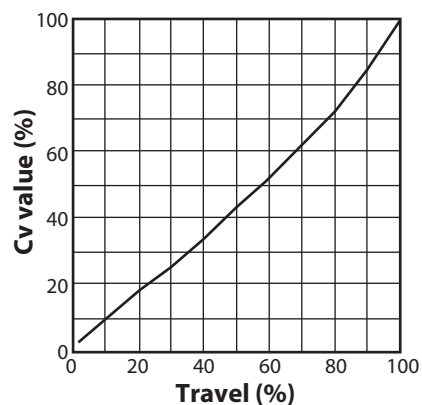
a. Equal percentage characteristics (%CC)



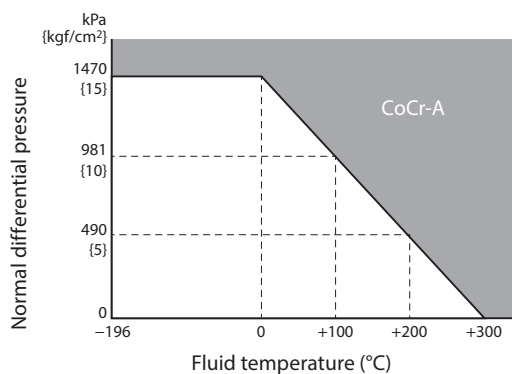
b. Linear characteristics (LCC)

Figure 1. Flow characteristics: Contoured type (Cv value: 0.4 to 4.0)

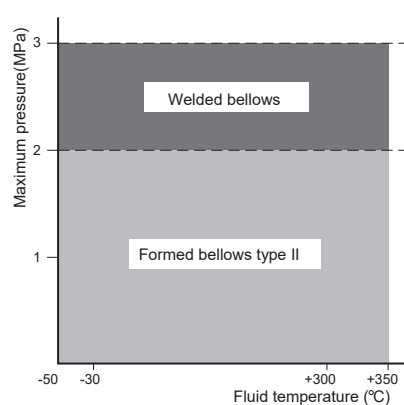
a. Equal percentage characteristics (%CC/Cv value: 0.25)



b. Linear characteristics (LCC)

Figure 2. Flow characteristics: Contoured type (Cv value: 0.01 to 0.25)**Figure 3. Temperature/normal differential pressure ranges requiring CoCr-A**

Note: For cavitation/flashing service or oil free service, CoCr-A is recommended regardless of temperature and differential pressure.

**Figure 4. 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.

Note) The above graphs indicate typical flow characteristics.

Table 3. Gland packing

According to your application, select appropriate type of gland packing from the following:

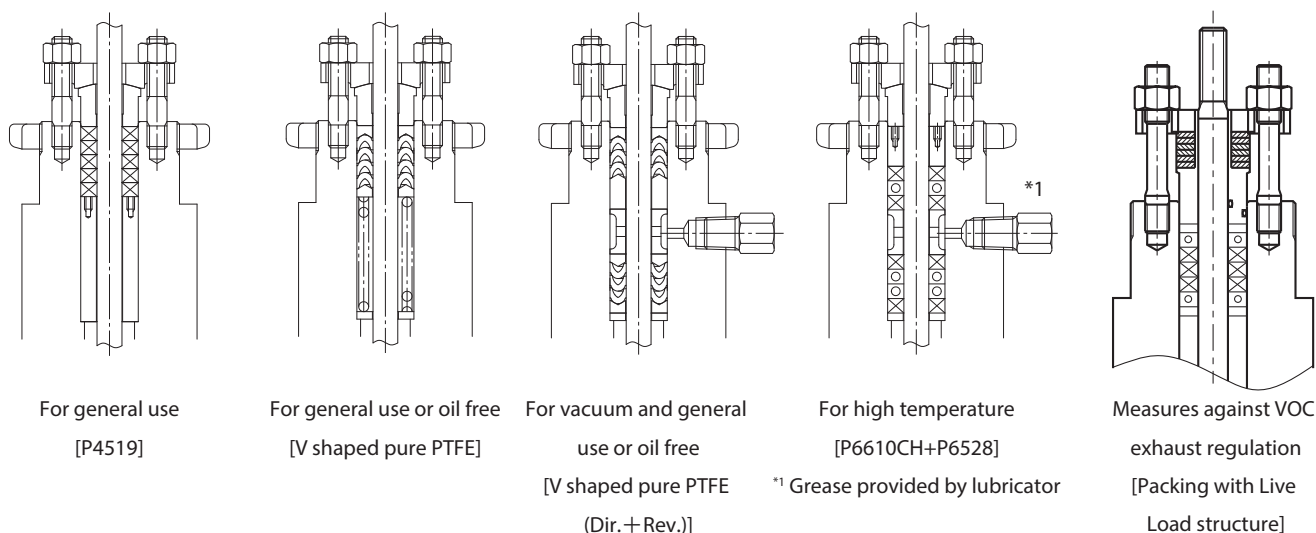
Application	Packing Type	Fluid temperature range
		Maximum working pressure
General use (Various chemical, acid and alkali)	PTFE fiber yarn packing with carbon fiber core packing [P4519]	-17 to +230 °C
		10MPa Max.
General use or oil free (Various chemical, acid and alkali)	V shaped pure PTFE packing [Pure PTFE]	-196 to + 230 °C
		10MPa Max.
Vacuum and General use or oil free (Various chemical, acid and alkali)	V shaped pure PTFE packing (Dir. + Rev.) [Pure PTFE (Dir. + Rev.)]	-196 to +230 °C
		10MPa Max.
Low or standard temperature (Various chemical, acid and alkali, LNG, etc.)	V shaped pure PTFE packing + PTFE fiber yarn packing or PTFE braided packing [Pure PTFE +PTFE fiber]	-196 to +230 °C
		10MPa Max.
High temperature	Expanded graphite packing + Expanded graphite yarn packing * ¹ [P6610CH+P6528]	+230 to +500 °C
		43MPa Max.
	Expanded graphite packing + Carbon fiber reinforced expanded graphite packing * ¹ [P6610CH+M8590]	+500 to +566 °C
Measures against VOC * ² exhaust regulation [ISO15848-1 compliant low emission packing system]	Packing with Live Load structure * ³	43MPa MAX.
		-17 to +350 °C
		15.5 MPa Max.

*1. Grease provided

It cannot be applied to PSA1 actuator (spring range 20 to 98 kPa).

*2. Volatile Organic Compound

*3. Refer to special spec sheet No.SS2-SSL100-0100 about detail of Low emission gland packing.

**Figure 5. Gland Packing structure**

Structural drawing of trim and body/trim material combinations

Following table shows typical body/trim material combinations.
Please contact us about materials that are not listed in this table.

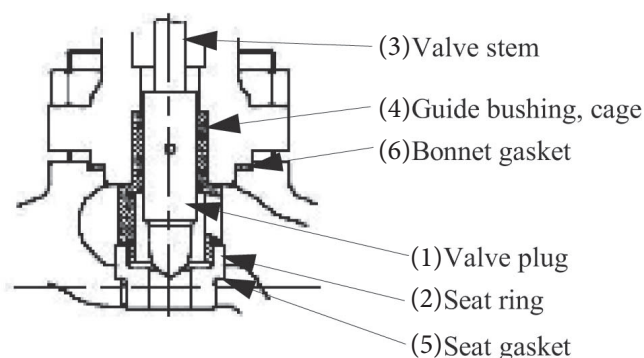


Figure 6. Structural drawing of trim

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

(1) Valve plug (2) Seat ring	SUS440C	SUS316 CoCr-A seat or SCS14A CoCr-A seat SUS316 CoCr-A face or SCS14A CoCr-A face	
	General	General	Oil-free
(3) Valve stem	SUS316		
(4) Guide bushing, cage	SUS440C	SUS316 and solid CoCr-A	
(5) Seat gasket	Without		SUS316 (PTFE coating)
(6) Bonnet gasket	SUS316		SUS316 (PTFE coating)

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

(1) Valve plug (2) Seat ring	SUS316 CoCr-A seat or SCS14A CoCr-A seat SUS316 CoCr-A face or SCS14A CoCr-A face		
	General		Oil-free
(3) Valve stem	SUS316		
(4) Guide bushing, cage	SUS316 and solid CoCr-A		
(5) Seat gasket	Without		SUS316(PTFE coating)
(6) Bonnet gasket	SUS316		SUS316(PTFE coating)

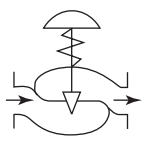
Table 6. The valve body material is stainless steel (SCS14A/A351CF8M)

(1) Valve plug (2) Seat ring	SUS316 CoCr-A seat or SCS14A CoCr-A seat SUS316 CoCr-A face or SCS14A CoCr-A face		
	General		Oil-free
(3) Valve stem	SUS316		
(4) Guide bushing, cage	SUS316 and solid CoCr-A		
(5) Seat gasket	Without		SUS316(PTFE coating)
(6) Bonnet gasket	SUS316		SUS316(PTFE coating)

Allowable differential pressure

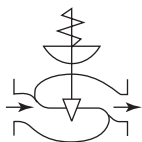
Contoured type metal seat (%CC LCC) : PTFE packing

Table 7. Air-to-close



Actuator Model	Supply pressure kPa{kgf/cm ² }	Spring range kPa{kgf/cm ² }	Differential pressure {by Cv value} kPa {kgf/cm ² }						
			Below 0.25	0.4	0.63	1.0	1.6	2.5	4.0
PDA1D	140 {1.4}	20 to 98 {0.2 to 1.0}	3920 {40.0}	3040 {31.0}	3040 {31.0}	1570 {16.0}	1570 {16.0}	981 {10.0}	981 {10.0}
			5490 {56.0}						
	160 {1.6}	20 to 98 {0.2 to 1.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}
			9810 {100}	9810 {100}	9810 {100}	8240 {84.0}	8240 {84.0}	5100 {52.0}	5100 {52.0}
	390 {4.0}	80 to 240 {0.8 to 2.4}	-	-	-	3920 {40.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}
						9810 {100}	9810 {100}	9810 {100}	9810 {100}
HA2D	140 {1.4}	20 to 98 {0.2 to 1.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}	3200 {32.6}	3200 {32.6}	1960 {20.0}	1960 {20.0}
			9810 {100}	62.0 {6080}	62.0 {6080}				
	160 {1.6}	20 to 98 {0.2 to 1.0}	-	3920 {40.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}
				9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}

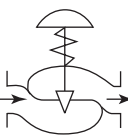
Table 8. Air-to-open



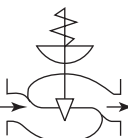
Actuator Model	Supply pressure kPa{kgf/cm ² }	Spring range kPa{kgf/cm ² }	Differential pressure {by Cv value} kPa {kgf/cm ² }						
			Below 0.25	0.4	0.63	1.0	1.6	2.5	4.0
PSA1R	140 {1.4}	20 to 98 {0.2 to 1.0}	3920 {40.0}	3040 {31.0}	3040 {31.0}	1570 {16.0}	1570 {16.0}	981 {10.0}	981 {10.0}
			5490 {56.0}						
	270 {2.7}	80 to 240 {0.8 to 2.4}	3920 {40.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}
			9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}	7060 {72.0}	7060 {72.0}
HA2R	140 {1.4}	20 to 98 {0.2 to 1.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}	3200 {32.6}	3200 {32.6}	1960 {20.0}	1960 {20.0}
			9810 {100}	6080 {62.0}	6080 {62.0}				
	270 {2.7}	80 to 240 {0.8 to 2.4}	-	3920 {40.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}	3920 {40.0}
				9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}

Note) 1) Take care not to cause the maximum permissible differential pressure to exceed the maximum operating pressure designated by ANSI B 16. 34-1981 or JIS B2201-1984.

2) The upper figures denote the operating permissible differential pressure. The lower denote permissible differential pressure at full closure.

Contoured type metal seat (%CC LCC) : Graphite packing (+230 to +500 °C)**Table 9. Air-to-close**


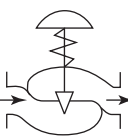
Actuator Model	Supply Pressure kPa{kgf/cm ² }	Spring range kPa{kgf/cm ² }	Differential pressure {by Cv value} kPa {kgf/cm ² }						
			Below 0.25	0.4	0.63	1.0	1.6	2.5	4.0
HA2D	390 {4.0}	80 to 240 {0.8 to 2.4}	3920* {40.0}	3920* {40.0}	3920* {40.0}	3920* {40.0}	3920* {40.0}	3920* {40.0}	3920* {40.0}
			9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}

Table 10. Air-to-open


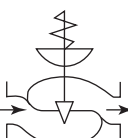
Actuator Model	Supply Pressure kPa{kgf/cm ² }	Spring range kPa{kgf/cm ² }	Differential pressure {by Cv value} kPa {kgf/cm ² }						
			Below 0.25	0.4	0.63	1.0	1.6	2.5	4.0
HA2R	270 {2.8}	80 to 240 {0.8 to 2.4}	3920* {40.0}	3920* {40.0}	3920* {40.0}	3920* {40.0}	3920* {40.0}	3920* {40.0}	3920* {40.0}
			9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}

Note) 1) Take care not to cause the maximum allowable differential pressure to exceed the maximum operating pressure designated by JIS B 2201-1984 or ANSI B 16.34-1981.

2) The upper figures denote the operating allowable differential pressure. The lower denote allowable differential pressure at full closure.

Contoured type metal seat (%CC LCC) : Graphite packing "P6610+M8590" (+500 to +560 °C)**Table 11. Air-to-close**


Actuator Model	Supply Pressure kPa{kgf/cm ² }	Spring range kPa{kgf/cm ² }	Differential pressure {by Cv value} kPa {kgf/cm ² }						
			Below 0.25	0.4	0.63	1.0	1.6	2.5	4.0
HA2D	390 {4.0}	80 to 240 {0.8 to 2.4}	3920* {40.0}	3920* {40.0}	3920* {40.0}	3920* {40.0}	3920* {40.0}	3920* {40.0}	3920* {40.0}
			9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}

Table 12. Air-to-open


Actuator Model	Supply Pressure kPa{kgf/cm ² }	Spring range kPa{kgf/cm ² }	Differential pressure {by Cv value} kPa {kgf/cm ² }						
			Below 0.25	0.4	0.63	1.0	1.6	2.5	4.0
HA2R	270 {2.8}	80 to 240 {0.8 to 2.4}	3920* {40.0}	3920* {40.0}	3920* {40.0}	3920* {40.0}	3920* {40.0}	3920* {40.0}	3920* {40.0}
			9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}	9810 {100}	9260 {94.4}

Note) 1) Take care not to cause the maximum allowable differential pressure to exceed the maximum operating pressure designated by JIS B 2201-1984 or ANSI B 16.34-1981.

2) The upper figures denote the operating allowable differential pressure. The lower denote allowable differential pressure at full closure.

DIMENSIONS

Table 13. Face-to-face dimensions

(Unit: mm)

Nominal size (inch)	A										
	JIS 10K FF,RF ANSI 125FF JPI 125FF ANSI 150RF JPI 150RF *	JIS 16KRF	JIS20KRF JIS30KRF ANSI300RF JPI300RF *	JIS40KRF ANSI600RF JPI600RF SW,BW *	ANSI150RJ JPI150RJ	ANSI300RJ JPI300RJ	ANSI 600RJ JPI600RJ	JIS20K Tongue and groove Male and female	JIS30K Tongue and groove Male and female	ANSI 300LG JP300LG	Screw- Type
1/2	184	190	194	206	-	206	206	198	208	203	125
3/4	184	190	194	206	-	206	206	198	208	203	125
1	184	193	197	210	197	210	210	198	212	206	125

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				Bellows bonnet	ϕ B	B	E
	Plain bonnet	Extension bonnet Type 1	Extension bonnet Type 2					
			Integral cast type	Welded type				
PSA1D, R	416	566	726	941	576	218	230	40
HA2D, R	450	600	760	975	608	267	281	40

Note) "H" dimensions are applicable when a hand wheel is not provided. When a top-mounted hand wheel actuator is used, add the dimensions of hand wheel specified on Specification Sheet (No.SS2-8213-0500).

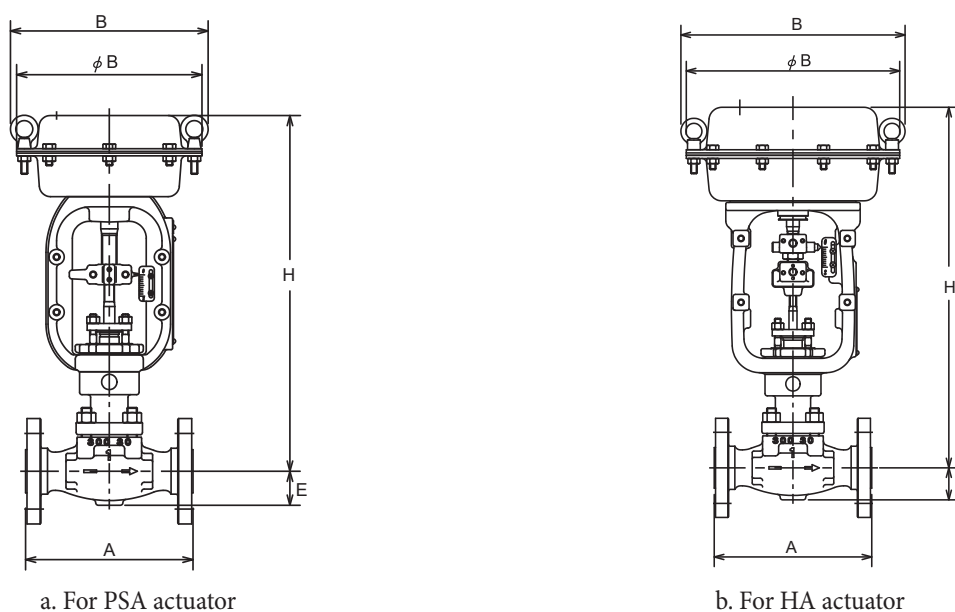


Figure 7. Face-to-face and external dimensions

Weight

Table 15. Screw-on type

(Unit: kg)

Nominal size (inch)	Actuator model	Weight			
		Plain bonnet	Extension bonnet Type 1	Extension bonnet Type 2	
				Integral cast type	Welded type
1/2, 3/4, 1	PSA1D,R	13	15	18	23
	HA2D,R	20	22	25	30

Table 16. Flanged type

(Unit: kg)

Nominal size (inch)	Actuator Model	Weight							
		JIS 10K, ANSI 125, 150, JPI 125, 150				JIS 16K, 20K, 30K, 40K, ANSI 300, 600, JPI 300, 600			
		Plain bonnet	Extension bonnet type	Extension bonnet Type 2		Plain bonnet	Extension bonnet Type 1	Extension bonnet Type 2	
				Integral-cast type	Welded type			Integral-cast type	Welded type
1/2	PSA1D,R	15	17	20	25	16	18	21	26
	HA2D,R	22	24	27	32	23	25	28	33
3/4	PSA1D,R	16	18	21	26	17	19	22	27
	HA2D,R	23	25	28	33	24	26	29	34
1	PSA1D,R	16	18	21	26	17	19	22	27
	HA2D,R	23	25	28	33	24	26	29	34

Table 17. Welded type

(Unit: kg)

Nominal size (inch)	Actuator Model	Weight			
		Plain bonnet	Extension bonnet Type 1	Extension bonnet Type 2	
				Integral cast type	Welded type
1/2, 3/4, 1 (SW)	PSA1D,R	14	16	19	24
	HA2D,R	21	23	26	31

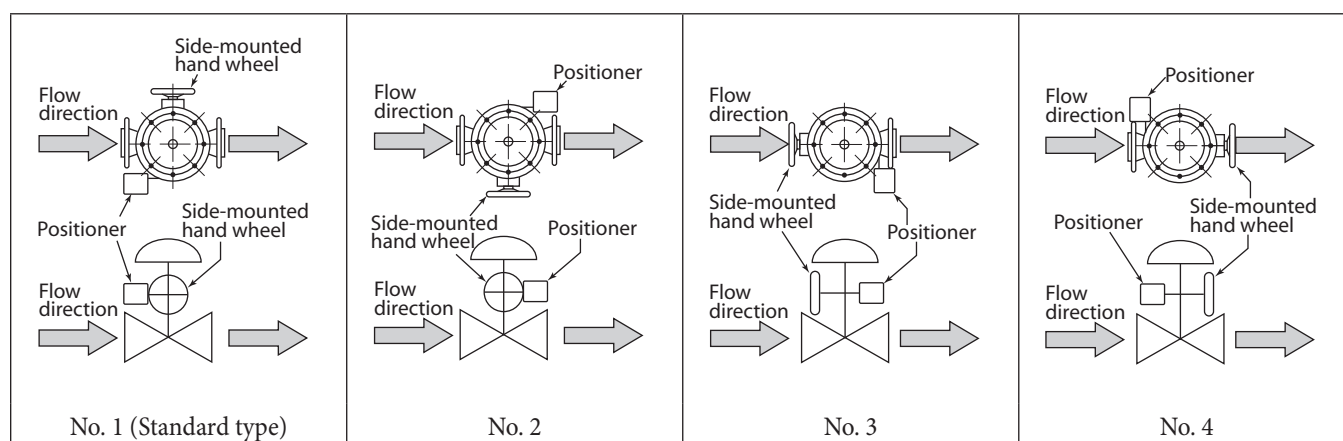


Figure 8. Actuator orientation

Note) Indicate by position number when installation other than the standard type is required.

Ordering information

When ordering, please specify;

- | | |
|--|---|
| 1) Model Number: HLC | 9) Accessories (pressure regulator with filter and etc.) |
| 2) Nominal size × Cv required | 10) Special requirement of oil/water free treatment, copper free treatment, etc. |
| 3) Type and rating of end connections | 11) Name of flow medium |
| 4) Body and trim material | 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, necessity of manual hand wheel, air pressure to diaphragm | 15) Viscosity of flow medium, inclusive or exclusive of slurry |
| 8) Valve action (direct or reverse) | |

Please read "Terms and Conditions" from the following URL before ordering and use.

<https://www.azbil.com/products/factory/order.html>

Specifications are subject to change without notice.



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