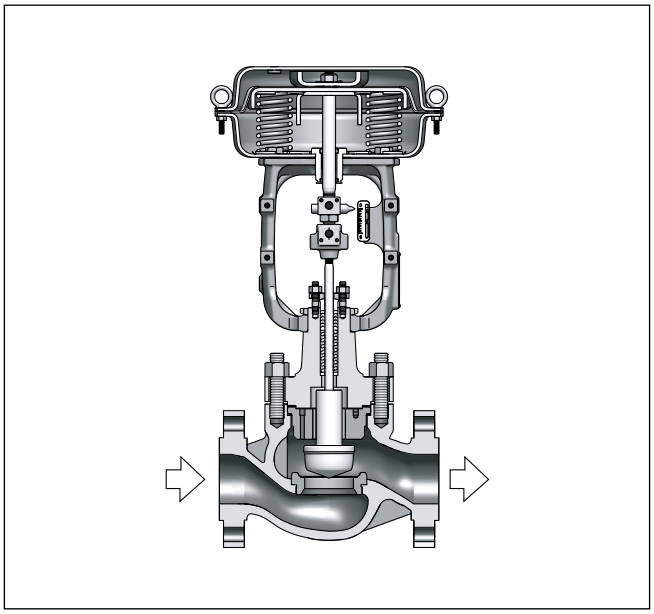
High Differential Pressure Top-Guided Single-Seated Control Valve

Model HTS _ _ _

OVERVIEW

Model HTS _ _ _ is a top-guided single-seated control valve that can be used for high differential pressure applications. The port area of the inner valve of this model is smaller than that of the standard model, so the amount of unbalanced axial thrust is small and the shutoff pressure is high. The compact valve body, having an S-shape flow path featuring low pressure loss, provides a large valve capacity, wide rangeability, and high-accuracy flow characteristics. The valve plug is held by a top guide with a large sliding area, so it has high vibration resistance and rigidity.
It has a high valve shutoff performance that complies with IEC and JIS standards. The compatible actuators are either a compact, high-output multi-spring diaphragm actuator that integrates simple mechanisms or a high-output piston cylinder actuator with or without a spring.
The HTS, featuring a small outer diameter and high performance, is widely applicable for reliable control in high- or low-temperature high-pressure process lines.
The HTS is compliant with the IEC 61508 functional safety standard and has acquired the SIL3 Capable certification from exida in the U.S.



Standard Specifications

Body

Type: Straight-through globe valve
Connection: Flanged end, welded end, threaded end

- Connection and pressure rating

Connection	Pressure rating	Standards compliance
FF	JIS 10K	JIS B2210-1984
	ANSI Class 125	ANSI B16.5-1981
	JPI Class 125	JPI-7S-15-1993
RF	JIS 10K, 16K, 20K, 30K, 40K	JIS B2210-1984
	ANSI Class 150, 300, 600	ANSI B16.5-1981
	JPI Class 150	JPI-7S-15-1993
RJ, LG	ANSI Class 150, 300, 600	ANSI B16.5-1981
	JPI Class 150, 300, 600	JPI-7S-15-1993
SW	Contact us.	–
BW		
Tongue and groove / Male and female	JIS 16K, 20K, 30K, 40K	JIS B2202-1984

- Nominal size:

  Flanged end: 1½, 2, 2½, 3, 4, 6, 8 inches
  SW (welded end): 1½, 2 inches
  BW (welded end): 1½, 2, 2½, 3, 4, 6, 8 inches
  Threaded end (Rc): 1½, 1 inches

- Material: For body and trim material combinations and operating temperature ranges, see Table 1.

- Bonnet:

Bonnet type	Temperature range	Note
Plain	−17 to +230 °C	
Extension type 1	−45 to −17 °C 230 to 566 °C	
Extension type 2	−100 to −45 °C	Integral-cast
	−196 to −100 °C	Welded
Bellows	−50 to +350 °C	See Figure 3. for details.

- Gland type: Bolted gland
- Grease

  Not required for: V- shaped PTFE packing, PTFE yarn packing
  Required for: Graphite packing

- Gaskets

  Shape: Flat, serrated
  Material: SUS316, SUS316L, etc. Determined by the material of the trim.

- Gland packing: See Table 1.
- Trim

  Valve plug: Single-seated contoured plug for high differential pressure and a metal seat

  - Equal percentage (%CH)
  - Linear (LCH)

- Material

  For body and trim material combinations and operating temperature ranges, see Table 3.

- Actuator: See Table 2 for specifications.
  - Actuator ambient temperature: –30 to +70 °C

Valve action

Direct action or reverse action

Optional accessories

Positioner, pressure regulator with air filter, handwheel, limit switch, solenoid valve, travel transmitter, booster relay, lock-up valve, etc.

Note: For the specifications of an optional item, see the specifications sheet and installation diagram for the item.

Actuator	Positioner		Handwheel	
	P/P	I/P	Top	Side
PSA1	VPE04-_ HTP-_ _	AVP2 _ _ AVP3 _ _ AVP7 _ _	Mounted	Mounted
HA2 - 4	HTP-_ _			
VA5	HTP-_ _			
PSA6R	HTP-_ _ VPP_ _ -_		–	
PSA7R	VPP_ _-_			
DAP560 DAP1000 DAP1500				Mounted (Hydraulic)

Additional specifications

- Special inspection

  Flow characteristics inspection, material certificate, non-destructive inspection, steam inspection, low-temperature inspection
- With drain plug
- Double gland
- With a steam jacket
- Oil/moisture removal treatment
- Copper-free specification
- Yoke material SCPH2 (standard for PSA1/6/7, DAP)
- Special air piping and SUS joint
- SUS304 for bolts and nuts exposed to the air
- Salt damage resistant
- Sand/dust prevention
- Tropical-area use specifications
- Cold-area use specifications
- Vacuum service

Compliant with functional safety standards (IEC 61508)

The HTS has acquired the SIL3 Capable certification from exida in the U.S. The certification is valid when the HTS is used in combination with a PSA, HA, or VA single-acting actuator.

Performance

- Rated Cv: See Table 3, Table 4, and Table 5.
- Flow characteristics: See Figure 2 and Figure 3.
- Inherent rangeability: 30:1
- Allowable differential pressure: See "Allowable differential pressure" (7 page).
- Valve seat leakage rate (% of rated Cv):
- Contoured plug

Valve seat leakage rate	Material	Standards compliance
Class IV (0.01 % or less)	Metal seat (CoCr-A hardfacing)	IEC 60534-4:2006 JIS B2005-4:2008
Class IV (0.001 % or less) (option)		
Class IV (0.00001 % or less)	Soft seat	IEC 60534-4:2006 JIS B2005-4:2008

- Hysteresis: 1 % FS max. (for PSA6R or PSA7R: 2 % FS max.)
  Note: With an Azbil positioner
- Linearity: 1 % FS max. (for PSA6R or PSA7R: 2 % FS max.)
  Note: With an Azbil positioner
- Face-to-face length: See Table 9 and Figure 9.
- Dimensions: See Table 10 and Figure 9.
- Weight: See Table 11.
- Actuator orientation: See Figure 10.
- Finish: Blue (Munsell 10B5/10) or silver are the standard colors. Other colors are also specifiable.

Table 1. Gland packing

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

Application	Gland packing type	Operating temperature Operating pressure
General (various chemicals, acids, alkalis, etc.)	PTFE fiber yarn packing with carbon fiber core (P4519)	−17 to +230 °C 10 MPa max.
General use and oil free & clean applications (various chemicals, acids, alkalis, etc.)	V-shaped pure PTFE molded packing	−196 to +230 °C 10 MPa max.
Vacuum service	V-shaped pure PTFE molded packing (direct + reversed)	−196 to +230 °C 10 MPa max.
Normal or low-temperature service (general purpose, various chemicals, acids, alkalis, LNG, He, etc.)	V-shaped pure PTFE molded packing + PTFE thread yarn packing (V-shaped pure PTFE + TK2006 or V7233)	−196 to +230 °C 10 MPa max.
High-temperature service	Expanded graphite molded packing + carbon fiber yarn packing*1 (P6610CH + P6528)	230 to 500 °C 43 MPa max.
	Expanded graphite molded packing + Carbon fiber reinforced expanded graphite packing*1 (P6610CH + M8590)	500 to 566 °C 43 MPa max.
VOC*2 exhaust regulation compliant, low emission specifications (ISO 15848-1 certified)	Live-loaded packing system Low-emission gland packing (*3)	*3

PTFE: Polytetrafluoroethylene
**1. With grease.*
**2. Volatile organic compound*
**3. For details, see the specifications sheet (document No. SS2-SSL100-0100).*

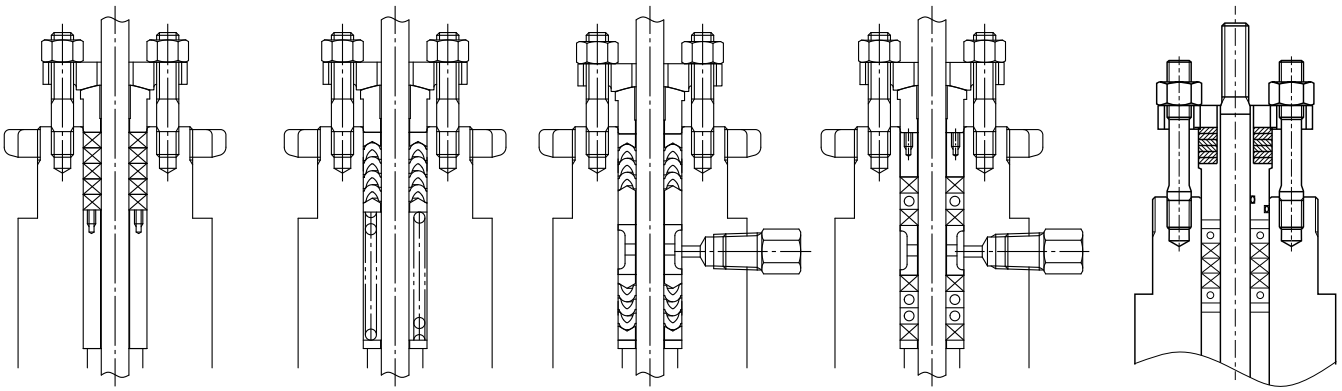


Figure 1. Gland packing structure

Table 2. Actuator specifications

Type	Action direction	Model No.	Diaphragm material	Spring range	Supply air pressure	Air supply connection
Spring type diaphragm actuator	Direct or reverse	PSA1 _ , HA_ _	Ethylene-propylene rubber with embedded cloth	20–98 kPa 80–240 kPa	140–390 kPa	Rc ¼ or ¼ NPT
		VA5_	Chloroprene rubber with embedded cloth		140–270 kPa	
Spring type piston cylinder actuator	Reverse	PSA6R	(No diaphragm used)	200–340 kPa or 200–390 kPa	400 kPa or 500 kPa	Rc ¼ or ¼ NPT Rc ⅜ or ⅜ NPT Rc ½ or ½ NPT
		PSA7R		200–270 kPa or 200–305 kPa	400 Pa	
Springless type piston cylinder actuator	Double-acting	DAP_ _ _		(No spring used)	290–490 kPa	

Table 3. Body and trim material combinations and operating temperature ranges (°C)

Trim material \ Body material		JIS	SCPH2	SCPH21	SCPH61	SCPL1	SCS11
		ASTM	A216WCB	A217WC6	A217C5	A352LCB	--
JIS	SUS304		−5 to +300	--	--	−45 to +300	--
JIS	SUS316		−5 to +300	--	--	−45 to +300	--
JIS	SUS304L		--	--	--	−45 to +300	--
JIS	SUS316L		−5 to +300	−5 to +300	--	−45 to +300	--
JIS	SUS440C		−5 to +425	−5 to +425	−5 to +425	--	--
JIS	SUS329J1		--	--	--	--	−50 to +300
JIS	SUS304, CoCr-A hardfacing		−5 to +425	−5 to +550	−5 to +566	−45 to +350	--
JIS	SUS304, overall CoCr-A hardfacing		−5 to +425	−5 to +550	−5 to +566	−45 to +350	--
JIS	SUS316, CoCr-A hardfacing		−5 to +425	−5 to +550	−5 to +566	−45 to +350	--
JIS	SUS316, overall CoCr-A hardfacing		−5 to +425	−5 to +550	−5 to +566	−45 to +350	--
JIS	SUS304L, CoCr-A hardfacing		--	--	--	−45 to +350	--
JIS	SUS316L, CoCr-A hardfacing		--	--	--	−45 to +350	--
JIS	SUS329J1, CoCr-A hardfacing		--	--	--	--	−50 to +550
JIS	SUS304, soft seat		−5 to +230	--	--	−45 to +230	--
JIS	SUS316, soft seat		−5 to +230	--	--	−45 to +230	--
JIS	SUS316L, soft seat		--	--	--	−45 to +230	--
JIS	SUS329J1, soft seat		--	--	--	--	−50 to +230

Trim material \ Body material		JIS	SCS13A	SCS14A	SCS16A	SCS19A
		ASTM	A351CF8	A351CF8M	A351CF3M	A351CF3
JIS	SUS304		−196 to +300	--	--	--
JIS	SUS316		−196 to +300	−196 to +300	--	--
JIS	SUS304L		−196 to +300	--	--	−196 to +300
JIS	SUS316L		−196 to +300	−196 to +300	−196 to +300	−196 to +300
JIS	SUS440C		--	--	--	--
JIS	SUS329J1		--	−196 to +300	--	--
JIS	SUS304, CoCr-A hardfacing		−196 to +550	--	--	--
JIS	SUS304, overall CoCr-A hardfacing		−196 to +550	--	--	--
JIS	SUS316, CoCr-A hardfacing		−196 to +550	−196 to +550	--	--
JIS	SUS316, overall CoCr-A hardfacing		−196 to +550	−196 to +550	--	--
JIS	SUS304L, CoCr-A hardfacing		−196 to +550	--	--	−196 to +450
JIS	SUS316L, CoCr-A hardfacing		−196 to +450	−196 to +450	−196 to +450	−196 to +450
JIS	SUS329J1, CoCr-A hardfacing		--	−196 to +550	--	--
JIS	SUS304, soft seat		−80 to +230	--	--	--
JIS	SUS316, soft seat		−80 to +230	−80 to +230	--	--
JIS	SUS316L, soft seat		−80 to +230	−80 to +230	−80 to +230	−80 to +230
JIS	SUS329J1, soft seat		--	−80 to +230	--	--

Trim material \ Body material		JIS	SCPH2	SCS13A	SCS14A	SCS16A
		ASTM	A216WCB	A351CF8	A351CF8M	A351CF3M
JIS	Titanium alloy		--	--	--	--
JIS	Titanium (overlaid nitriding)		--	--	--	--
JIS	ASTM B574 (Hastelloy C-276 equivalent)		--	--	--	--
JIS	Alloy 20		--	--	--	--
JIS	Nickel copper alloy		−5 to +300	−196 to +300	−196 to +300	−196 to +300

Trim material \ Body material		JIS	SCS19A	Titanium	ASTM CW-12MW	SCS23
		ASTM	A351CF3	--	(Hastelloy C equivalent)	--
JIS	Titanium alloy		--	−196 to +315	--	--
JIS	Titanium (overlaid nitriding)		--	−196 to +315	--	--
JIS	ASTM B574 (Hastelloy C-276 equivalent)		--	--	−196 to +450	--
JIS	Alloy 20		--	--	--	−196 to +300
JIS	Nickel copper alloy		−196 to +300	--	--	--

Note) 1. The standard combination of body and trim materials is circled with a bold frame.

2. ASTM specifications indicate materials equivalent to those designated by JIS.

Table 4. Cv and travel

Contoured plug for high differential pressure (standard: %CH, LCH, option: %TH, LTH)

Nominal size (inches)	1½			2			2½			3			4			6			8		
Port size (inches)	1	1¼	1½	1¼	1½	2	1½	2	2½	2	2½	3	2½	3	4	4	5	6	5	6	8
Rated Cv	10	17	24	17	24	44	24	44	68	44	68	99	68	99	175	175	275	360	275	360	640
Rated travel (mm)	25						38									50			75		

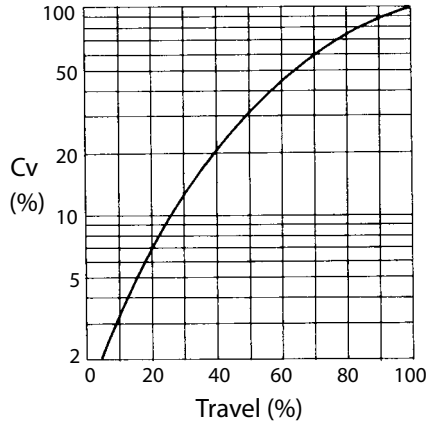


Figure 2-1. Equal percentage characteristics (%CH: metal seat)

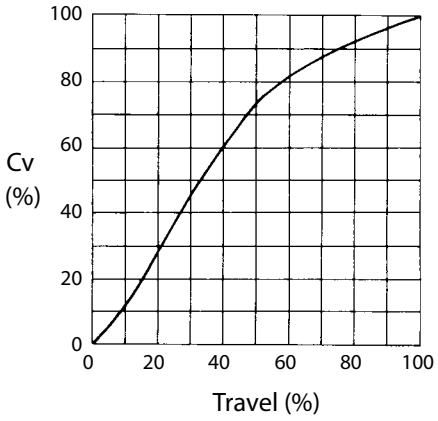


Figure 2-2. Linear characteristics (LCH: metal seat)

Figure 2. High differential pressure type

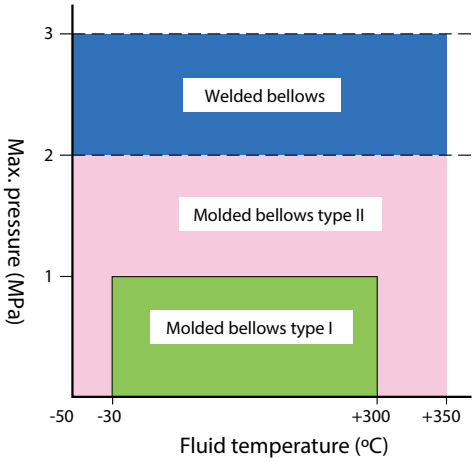


Figure 3. Bellows selection based on temperature and pressure ranges

Note: Select molded bellows type I, type II, or welded bellows according to the operating temperature and pressure. See SS2-BSL100-0100 for detailed specifications.

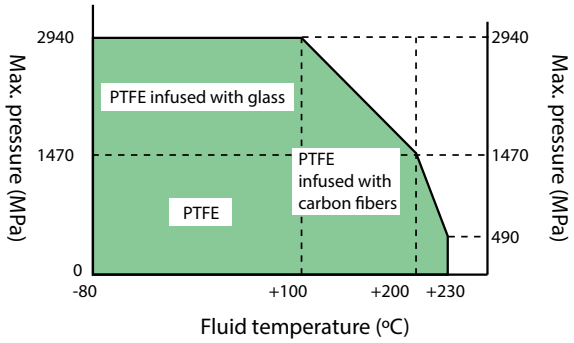


Figure 4. Operating temperature and maximum differential pressure range for soft seats

Note: Use a metal seat if erosion may occur or slurry may be produced due to saturated steam, hot water, etc.

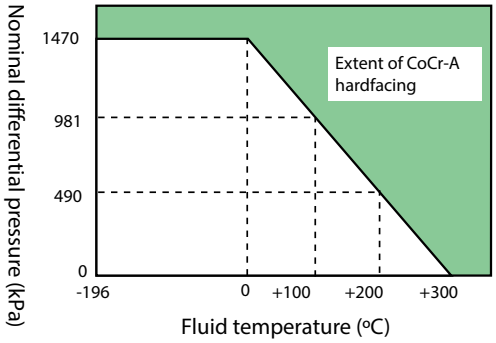


Figure 5. Temperature/nominal differential pressure ranges requiring CoCr-A

Note: For cavitation/flashing service, oil-free service, and in a case where retention of valve shutoff performance is required, CoCr-A is recommended regardless of the temperature and differential pressure. For water in cavitation/flashing service and hot water exceeding 100 °C, SUS440C is recommended.

Trim structure and main parts material combinations

Typical body/trim material combinations are shown below. For other combinations, please contact us.

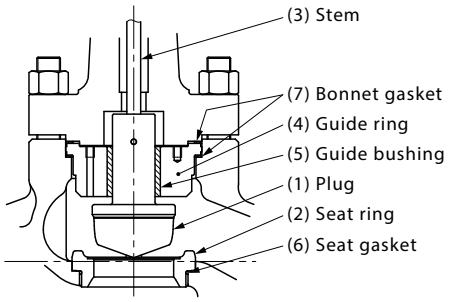


Figure 6. Trim structure (with guide bushing)

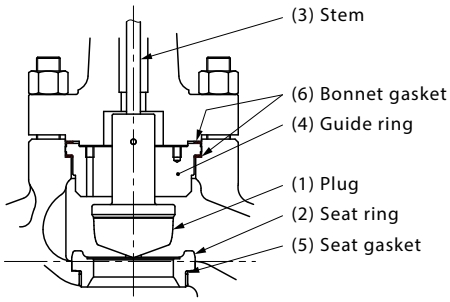


Figure 7. Trim structure (without guide bushing)

Table 5. Body material: carbon steel (SCPH2/A216WCB)

(1) Plug (2) Seat ring	SUS316 SUS304	SUS440C	SUS316, CoCr-A hardfacing SUS304, CoCr-A hardfacing SUS316, overall CoCr-A hardfacing SUS304, overall CoCr-A hardfacing		SUS316, soft seat SUS304, soft seat	
			General	Oil free	General	Oil free
(3) Stem	SUS316					
(4) Guide ring	S25C or SFVC2A		S25C, CoCr-A hardfacing or SFVC2A, CoCr-A hardfacing		S25C or SFVC2A	S25C, CoCr-A hardfacing or SFVC2A, CoCr-A hardfacing
(5) Guide bushing	SUS440C		None (integrated with guide ring)		SUS440C	None (integrated with guide ring)
(6) Seat gasket	None			SUS316 (PTFE coating)	None	SUS316 (PTFE coating)
(7) Bonnet gasket	SUS316			SUS316 (PTFE coating)	SUS316	SUS316 (PTFE coating)

Table 6. Body material: stainless steel (SCS13A/A351CF8)

(2) Seat ring	SUS316 SUS304	SUS316, CoCr-A hardfacing SUS304, CoCr-A hardfacing SUS316, overall CoCr-A hardfacing SUS304, overall CoCr-A hardfacing		SUS304, soft seat SUS316, soft seat	
	General	General	Oil free	General	Oil free
(3) Stem	SUS316				
(4) Guide ring	SUS304	SUS304, CoCr-A		SUS304	SUS304, CoCr-A
(5) Seat gasket	None		SUS316 (PTFE coating)	None	SUS316 (PTFE coating)
(6) Bonnet gasket	SUS316		SUS316 (PTFE coating)	SUS316	SUS316 (PTFE coating)

Table 7. Body material: stainless steel (SCS14A/A351CF8M)

(1) Plug (2) Seat ring	SUS316	SUS316, CoCr-A		SUS316, soft seat	
		General	Oil free	General	Oil free
(3) Stem	SUS316				
(4) Guide ring	SUS316	SUS316, CoCr-A		SUS316	SUS316, CoCr-A
(5) Seat gasket	None		SUS316 (PTFE coating)	None	SUS316 (PTFE coating)
(6) Bonnet gasket	SUS316		SUS316 (PTFE coating)	SUS316	SUS316 (PTFE coating)

Allowable differential pressure

Table 8-1. Contoured plug, metal seat (%CF, LCF, %C, LC): PTFE packing
Table 8-1-1. Valve with PSA, HA or VA actuator

• Direct action (air-to-close)

Actuator model	Supply air pressure (kPa)	Spring range (kPa)	Positioner	Differential pressure (kPa) for each port size (inches)									
				1	1¼	1½	2	2½	3	4	5	6	8
PSA1D	140	20–98	△	410	250	170	100	--	--	--	--	--	--
	160	20–98	○	2060	1270	860	520						
	390	80–240	○	3920	3800	2590	1550	--	--	--	--	--	--
				6190									
HA2D	140	20–98	△	800	490	340	200	120	90	50	--	--	--
	160	20–98	○	3920	2450	1680	1000	620	440	250	--	--	--
	390	80–240	○	3920	3920	3920	3000	1850	1330	750	--	--	--
				9810	7400	5020							
HA3D	140	20–98	△	1420	870	590	350	220	160	90	56	40	--
	160	20–98	○	3920	3920	2970	1770	1100	790	440	280	200	--
				7085	4350								
	390	80–240	○	3920	3920	3920	3920	3290	2370	1330	850	590	--
				9810	9810	8920	5320						
HA4D	140	20–98	△	2450	1500	1030	610	380	270	150	100	67	38
	160	20–98	○	3920	3920	3920	3070	1890	1360	770	490	340	190
				9810	7560	5130							
	390	80–240	○	3920	3920	3920	3920	3920	3920	2300	1470	1020	570
				9810	9810	9810	9200	5680	4090				
VA5D	140	20–98	△	--	--	1400	840	520	370	210	130	90	50
	160	20–98	○	--	--	3920	3570	2200	1590	890	570	400	220
						5980							

• Reverse action (air-to-open)

Actuator model	Supply air pressure (kPa)	Spring range (kPa)	Positioner	Differential pressure (kPa) for each port size (inches)									
				1	1¼	1½	2	2½	3	4	5	6	8
PSA1R	140	20–98	△	410	250	170	100	--	--	--	--	--	--
	270	80–240	○	2890	1770	1210	720						
HA2R	140	20–98	△	800	490	340	200	120	90	50	--	--	--
	270	80–240	○	3920	3430	2350	1400	860	620	350	--	--	--
				5600									
HA3R	140	20–98	△	1420	870	590	350	220	160	90	56	40	--
	270	80–240	○	3920	3920	3920	2480	1530	1100	620	400	280	--
				9810	6090	4160							
HA4R	140	20–98	△	2450	1500	1030	610	380	270	150	100	67	38
	270	80–240	○	3920	3920	3920	3920	2650	1910	1070	690	480	270
				9810	9810	7190	4290						
VA5R	140	20–98	○	--	--	1400	840	520	370	210	130	90	50
	270	80–240	○	--	--	3920	3920	3630	2610	1470	940	650	370
						9810	5860						
PSA6R	400*1	200–340	○	--	--	3920	3920	3920	3920	3370	--	--	--
						9810	9810	8330	5990				
	500*2	200–390	○	--	--	--	--	--	--	3370	2160	1500	--
	400*3	200–340	○	--	--	--	--	--	--	--	2160	1500	840
PSA7R	400*2	200–270	○	--	--	--	--	--	--	3920	3840	2670	--
										6000			
	400*3	200–305	○	--	--	--	--	--	--	--	3840	2670	1500

Note) 1. ○: A positioner is required. △: Can be operated with or without a positioner.

2. Make sure that the maximum allowable differential pressure does not exceed the maximum operating pressure specified by JIS B 2201-1984 or ANSI B 16.34-1981.

3. The figures in the upper cells are the nominal differential pressure and the figures in the lower cells are the allowable differential pressure when the valve is shut off.

*4. *1. For nominal size of 2½–4 inches. *2. For nominal size of 6 inches. *3. For nominal size of 8 inches.*

Table 8-1. Contoured plug, metal seat (%CF, LCF, %C, LC): PTFE packing
Table 8-1-2. Valve with DAP actuator

• Direct action, reverse action

Actuator model	Supply air pressure (kPa)	Positioner	Differential pressure (kPa) for each port size (inches)							
			1½	2	2½	3	4	5	6	8
DAP 560	290	○	3920	3920	3920	3920	2610	1670	1160	--
			9810	9810	6460	4650				
	390	○	3920	3920	3920	3920	3520	2250	1560	--
			9810	9810	8690	6250				
	490	○	3920	3920	3920	3920	3920	2830	1960	--
			9810	9810	9810	7860	4420			
DAP 1000	290	○	--	--	3920	3920	3920	2940	2040	1150
			--	--	9810	8170	4600			
	390	○	--	--	3920	3920	3920	3920	2720	1530
			--	--	9810	9810	6130			
	490	○	--	--	3920	3920	3920	3920	3410	1920
			--	--	9810	9810	7660	4900		
DAP 1500	290	○	--	--	--	--	3920	3920	3140	1770
			--	--	--	--	7070	4520		
	390	○	--	--	--	--	3920	3920	3920	2360
			--	--	--	--	9420	6030	4190	
	490	○	--	--	--	--	3920	3920	3920	2940
			--	--	--	--	9810	7540	5230	

Note) 1. If a backup system for pressure drop at the air source is used, the allowable differential pressure is determined by the nominal supply air pressure or the pressure set for the backup system (trip pressure), whichever is lower.

2. Make sure that the maximum allowable differential pressure does not exceed the maximum operating pressure specified by JIS B 2201-1984 or ANSI B 16.34-1981.

3. The figures in the upper cells are the nominal differential pressure and the figures in the lower cells are the allowable differential pressure when the valve is shut off.

Table 8-2. Contoured plug, metal seat (%CF, LCF, %C, LC): graphite packing P6610CH + P6528 (fluid temperature: 500 °C or less)
Table 8-2-1. Valve with PSA, HA or VA actuator

• Direct action (air-to-close)

Actuator	Supply air pressure (kPa)	Spring range (kPa)	Positioner	Differential pressure (kPa) for each port size (inches)									
				1	1¼	1½	2	2½	3	4	5	6	8
HA2D	390	80–240	○	3920	3920	3920	2520	1560	1120	630	--	--	--
				9810	6240	4230							
HA3D				3920	3920	3920	3920	2760	1990	1120	710	490	--
				9810	9810	7510	4480						
HA4D				3920	3920	3920	3920	3920	3520	1980	1260	880	500
				9810	9810	9810	7930	4890					
VA5D	270	40–200	○	--	--	3920	3570	2200	1590	890	570	400	220
						5980							

• Reverse action (air-to-open)

Actuator	Supply air pressure (kPa)	Spring Range (RANGR field) (kPa)	Positioner	Differential pressure (kPa) for each port size (inches)									
				1	1¼	1½	2	2½	3	4	5	6	8
HA2R	270	80–240	○	3920 4400	2710	1840	1100	670	480	270	--	--	--
HA3R	270	80–240	○	3920 7810	3920 4820	3270	1950	1200	860	480	310	210	--
HA4R	270	80–240	○	3920 9810	3920 8780	3920 5950	3550	2190	1580	880	560	390	220
VA5R	270	80–240	○	--	--	3920 7730	3920 4610	2850	2050	1150	730	510	290
PSA6R	400*1	200–340	○	--	--	3920 9810	3920 9810	3920 7770	3920 5590	3140	--	--	--
	500*2	200–390	○	--	--	--	--	--	--	3140	2010	1390	--
	400*3	200–340	○	--	--	--	--	--	--	--	2010	1390	790
PSA7R	400*2	200–270	○	 --	 --	 --	 --	 --	 --	3920 5160	3300	2290	--
	400*3	200–305	○	--	--	--	--	--	--	--	3300	2290	1290

Note) 1. ○: A positioner is required. △: Can be operated with or without a positioner.

2. Make sure that the maximum allowable differential pressure does not exceed the maximum operating pressure specified by JIS B 2201-1984 or ANSI B 16.34-1981.

3. The figures in the upper cells are the nominal differential pressure and the figures in the lower cells are the allowable differential pressure when the valve is shut off.

*4. *1. For nominal size of 2½–4 inches. *2. For nominal size of 6 inches. *3. For nominal size of 8 inches.*

Table 8-2. Contoured plug, metal seat (%CF, LCF, %C, LC): graphite packing P6610CH + P6528 (fluid temperature: 500 °C or less)
Table 8-2-2. Valve with DAP actuator

• Direct action, reverse action

Actuator	Supply air pressure (kPa)	Positioner	Differential pressure (kPa) for each port size (inches)							
			1½	2	2½	3	4	5	6	8
DAP 560	290	○	3920 9810	3920 7730	3920 4770	3430	1930	1230	850	--
	390	○	3920 9810	3920 9810	3920 7040	3920 5070	2850	1820	1260	--
	490	○	3920 9810	3920 9810	3920 9320	3920 6710	3770	2410	1670	--
DAP 1000	290	○	--	--	3920 8090	3920 5830	3280	2090	1450	820
	390	○	--	--	3920 9810	3920 8600	3920 4840	3090	2150	1220
	490	○	--	--	3920 9810	3920 9810	3920 6400	3920 4090	2840	1610
DAP 1500	290	○	--	--	--	--	3920 5040	3220	2240	1270
	390	○	--	--	--	--	3920 7440	3920 4760	3300	1880
	490	○	--	--	--	--	3920 9810	3920 6290	3920 4370	2480

Note) 1. If a backup system for pressure drop at the air source is used, the allowable differential pressure is determined by the nominal supply air pressure or the pressure set for the backup system (trip pressure), whichever is lower.

2. Make sure that the maximum allowable differential pressure does not exceed the maximum operating pressure specified by JIS B 2201-1984 or ANSI B 16.34-1981.

3. The figures in the upper cells are the nominal differential pressure and the figures in the lower cells are the allowable differential pressure when the valve is shut off.

Table 8-3. Contoured plug, metal seat (%CF, LCF, %C, LC): graphite packing P6610CH + M8590 (fluid temperature: above 500 °C)
Table 8-3-1. Valve with PSA, HA or VA actuator

• Direct action (air-to-close)

Actuator	Supply air pressure (kPa)	Spring range (kPa)	Positioner	Differential pressure (kPa) for each port size (inches)									
				1	1¼	1½	2	2½	3	4	5	6	8
HA2D	390	80–240	○	3920 9810	3920 5840	3920 3960	2360	1460	1050	590	--	--	--
HA3D				3920 9810	3920 9810	3920 7020	3920 4190	2590	1860	1040	670	460	--
HA4D				3920 9810	3920 9810	3920 9810	3920 7520	3920 4640	3340	1880	1200	830	470
VA5D	270	40–200		--	--	3920 5150	3070	1900	1360	760	490	340	190

• Reverse action (air-to-open)

Actuator	Supply air pressure (kPa)	Spring range (kPa)	Positioner	Differential pressure (kPa) for each port size (inches)									
				1	1¼	1½	2	2½	3	4	5	6	8
HA2R	270	80–240	○	3920 3750	2310	1570	930	570	410	230	--	--	--
HA3R	270	80–240	○	3920 6650	3920 4100	2780	1660	1020	730	410	260	180	--
HA4R	270	80–240	○	3920 9810	3920 7770	3920 5270	3150	1940	1400	780	500	350	190
VA5R	270	80–240	○	--	--	3920 6580	3920 3930	2420	1740	980	620	430	240
PSA6R	400*1	200–340	○	--	--	3920 9810	3920 9810	3920 7410	3920 5330	3000	--	--	--
	500*2	200–390	○	--	--	--	--	--	--	3000	1920	1330	--
	400*3	200–340	○	--	--	--	--	--	--	--	1920	1330	750
PSA7R	400*2	200–270	○	--	--	--	--	--	--	4740	3030	2110	--
	400*3	200–305	○	--	--	--	--	--	--	--	3030	2110	1180

Note) 1. ○: A positioner is required. △: Can be operated with or without a positioner.

2. Make sure that the maximum allowable differential pressure does not exceed the maximum operating pressure specified by JIS B 2201-1984 or ANSI B 16.34-1981.

3. The figures in the upper cells are the nominal differential pressure and the figures in the lower cells are the allowable differential pressure when the valve is shut off.

*4. *1. For nominal size of 2½–4 inches. *2. For nominal size of 6 inches. *3. For nominal size of 8 inches.*

Table 8-3. Contoured plug, metal seat (%CF, LCF, %C, LC): graphite packing P6610CH + M8590 (fluid temperature: above 500 °C)
Table 8-3-2. Valve with DAP actuator

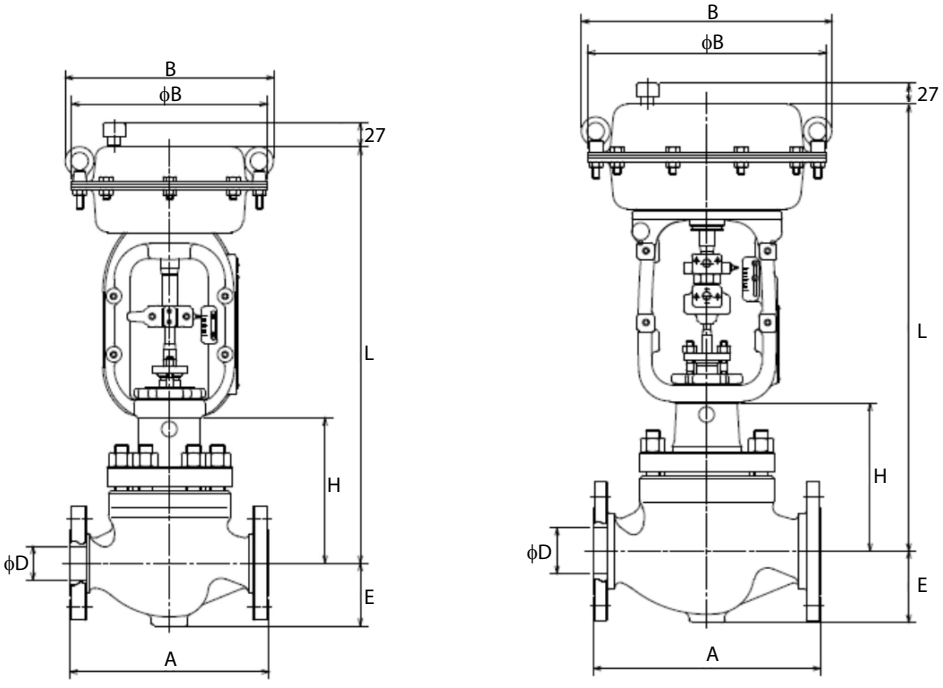
• Direct action, reverse action

Actuator	Supply air pressure (kPa)	Positioner	Differential pressure (kPa) for each port size (inches)							
			1½	2	2½	3	4	5	6	8
DAP 560	290	○	3920	3920	3920	3110	1740	1110	770	--
			9810	6990	4310					
	390	○	3920	3920	3920	3920	2670	1700	1180	--
			9810	9810	6590	4740				
	490	○	3920	3920	3920	3920	3590	2290	1590	--
			9810	9810	8860	6380				
DAP 1000	290	○	--	--	3920	3920	2960	1890	1310	750
					7320	5270				
	390	○	--	--	3920	3920	3920	2890	2010	1140
					9810	8050	4520			
	490	○	--	--	3920	3920	3920	3890	2700	1540
					9810	9810	6090			
DAP 1500	290	○	--	--	--	--	3920	2910	2020	1150
							4560			
	390	○	--	--	--	--	3920	3920	3090	1760
							6960	4450		
	490	○	--	--	--	--	3920	3920	3920	2360
							9360	5990	4160	

Note) 1. If a backup system for pressure drop at the air source is used, the allowable differential pressure is determined by the nominal supply air pressure or the pressure set for the backup system (trip pressure), whichever is lower.

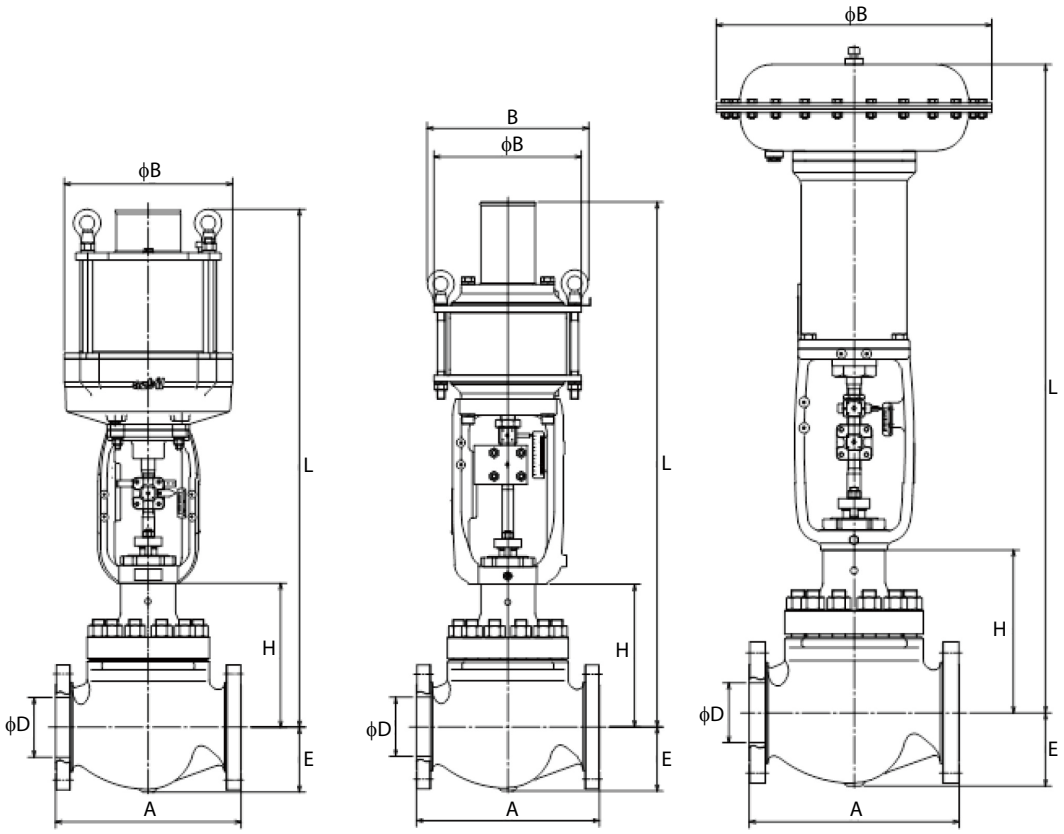
2. Make sure that the maximum allowable differential pressure does not exceed the maximum operating pressure specified by JIS B 2201-1984 or ANSI B 16.34-1981.

3. The figures in the upper cells are the nominal differential pressure and the figures in the lower cells are the allowable differential pressure when the valve is shut off.



With PSA1 actuator With HA actuator

Figure 8-1. HTS dimensions



With PSA6/7R actuator With DAP actuator With VA5 actuator

Figure 8-2. HTS dimensions

Table 9. Face-to-face length

Unit: mm

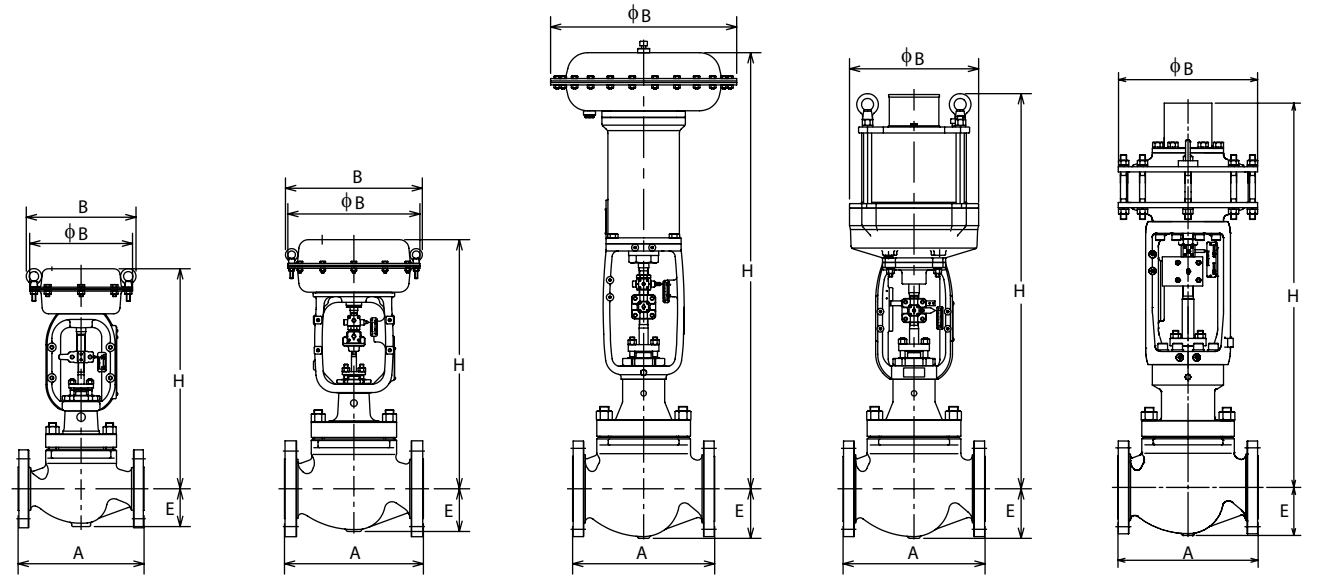
Nominal size (inches)	A							
	JIS 10K FF, RF ANSI 125FF JPI 125FF ANSI 150RF JPI 150RF*	JIS 16KRF	JIS 20KRF JIS 30KRF ANSI 300RF JPI 300RF*	JIS 40K FF, RF ANSI 600RF JPI 600RF*	JIS 16K Tongue and groove JIS 16K Male and female	JIS 20K Tongue and groove JIS 20K Male and female	JIS 30K Tongue and groove JIS 30K Male and female	JIS 40K Tongue and groove JIS 40K Male and female
1½	222	231	235	251	235	236	248	251
2	254	263	267	286	265	267	276	286
2½	276	288	292	311	290	292	303	311
3	298	313	317	337	310	317	326	337
4	352	364	368	394	360	368	379	394
6	451	465	473	508	475	473	486	508
8	543	560	568	610	570	568	580	610

Nominal size (inches)	A						
	ANSI 150RJ JPI 150RJ	ANSI 300RJ JPI 300RJ	ANSI 600RJ JPI 600RJ	ANSI 300LG JPI 300LG	ANSI 600LG JPI 600LG	ANSI 150 JPI 150 (SW, BW)	ANSI 300, 600 JPI 300, 600 (SW, BW)
1½	235	248	251	244	248	251	251
2	267	283	289	276	283	286	286
2½	289	308	314	302	308	311	311
3	311	333	340	327	333	337	337
4	365	384	397	378	391	394	394
6	464	489	511	483	505	473	508
8	556	584	613	578	606	568	610

** The face-to-face length conforms to the following standards.*

IEC 60534-3-1: 2001 and JIS B 2005-3-1: 2005

IEC 60534-3-3: 2001 and JIS B 2005-3-3: 2005



With PSA1 actuator | With HA actuator | With VA5 actuator | With PSA6/7R actuator | With DAP actuator

Figure 9. Face-to-face length and dimensions

Table 10. Dimensions

Unit: mm

Nominal size (inches)	Actuator model	H					B	ϕB	E
		Plain bonnet	Extension bonnet type 1	Extension bonnet type 2		Bellows bonnet			
				Integral-cast	Welded				
1½	PSA1D, PSA1R	466	636	746	986	626	230	218	70
	HA2D, HA2R	500	665	780	1020	660	281	267	
	HA3D, HA3R	590	760	875	1140	810	363	350	
2	PSA1D, PSA1R	466	636	751	991	626	230	218	80
	HA2D, HA2R	500	670	785	1025	660	281	267	
	HA3D, HA3R	595	760	875	1140	810	363	350	
2½	HA2D, HA2R	575	745/755	880	1130	795	281	267	88
	HA3D, HA3R	630	800/810	930	1180	850	363	350	
	HA4D, HA4R	865	1035/1045	1165	1495	--	520	470	
	DAP560	1175	1325	--	--	--	--	380	
3	HA2D, HA2R	580	755/765	900	1135	800	281	267	98
	HA3D, HA3R	635	810/820	955	1190	855	363	350	
	HA4D, HA4R	870	1045/1055	1190	1505	--	520	470	
	DAP560	1190	1375	--	--	--	--	380	
4	HA2D, HA2R	610	810/820	915	1150	830	281	267	113
	HA3D, HA3R	660	860/870	1020	1205	880	363	350	
	HA4D, HA4R	890	1100/1110	1255	1520	--	520	470	
	VA5D	1300	1515	1710	1940	--	--	620	
	VA5R	1420	1635	1820	2050	--	--	620	
	PSA6R	1255	1470	1655	1885	--	--	476	
	DAP560	1185	1395	--	--	--	--	380	
	DAP1000	1215	1455	--	--	--	--	470	
6	HA3D, HA3R	785	1020/1045	1250	1385	1075	363	350	170
	HA4D, HA4R	955	1190/1215	1425	1570	1245	520	470	
	VA5D	1360	1620	1870	2000	--	--	620	
	VA5R	1480	1740	1980	2110	--	--	620	
	PSA6R	1315	1575	1815	1945	--	--	476	
	PSA7R	1745	2005	2245	2375	--	--	580	
	DAP560	1245	1515	--	--	--	--	380	
	DAP1000	1315	1545	--	--	--	--	470	
	DAP1500	1315	1560	--	--	--	--	570	
8	HA4D, HA4R	1090	1350	1580	1710	1340	520	470	220
	VA5D	1475	1740	2025	2155	1785	--	620	
	VA5R	1585	1850	2145	2275	--	--	620	
	PSA6R	1735	2000	2295	2425	--	--	476	
	PSA7R	2165	2430	2725	2855	--	--	580	
	DAP560	1465	1730	--	--	--	--	380	
	DAP1000	1440	1790	--	--	--	--	470	
	DAP1500	1485	1755	--	--	--	--	570	

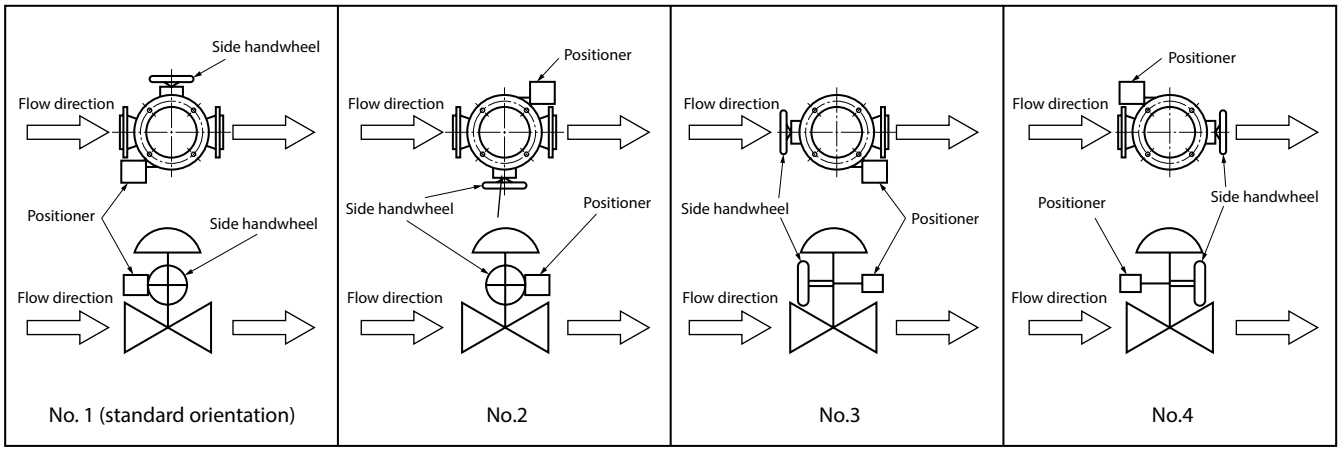
Note) 1. "H" is the dimension without a handwheel. If an HA or VA actuator with a top handwheel or a PSA6R actuator with a side handwheel is used, add the size of the handwheel that is shown in the specifications sheet for the actuator (HA: No. SS2-8213-0500, VA: No. SS2-8210-0100, PSA: No. SS2-PSA100-0100).

2. "H" of extension bonnet type 1 shown with a slash (/): The figure on the left is for JIS 10K and ANSI 150 and the figure on the right is for JIS 16K and ANSI 300 or more.

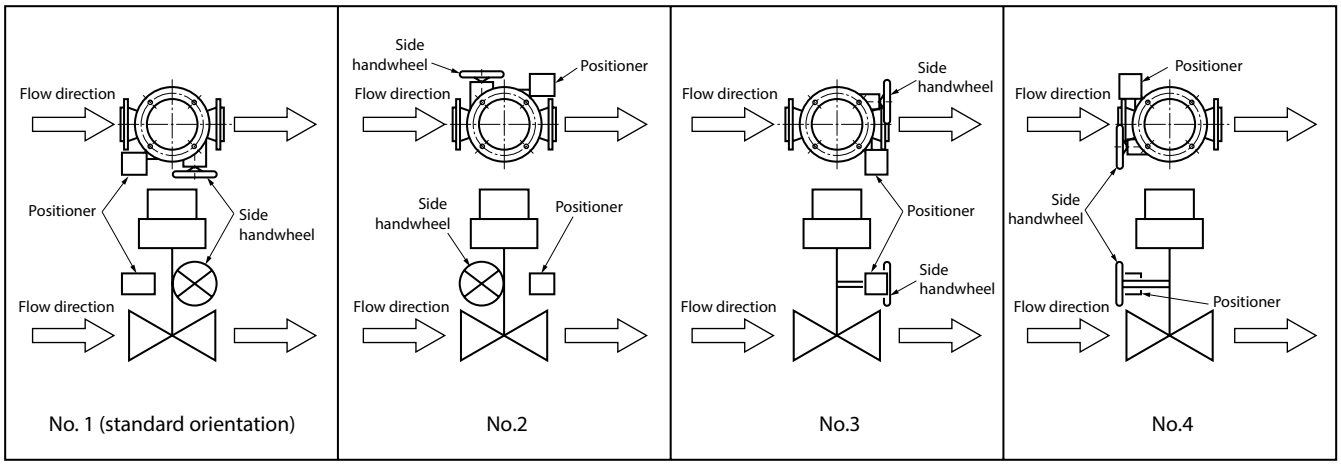
Table 11. Weight

Nominal size (inches)	Actuator model	Weight (flanged end)												Weight (welded end)			
		JIS 10K, ANSI 150, JPI 150				JIS 16K, JIS 20K, JIS 30K, ANSI 300, JPI 300				JIS 40K, ANSI 600, JPI 600				JIS 10K, JIS 16K, JIS 20K, JIS 30K, JIS 40K, ANSI 150, ANSI 300, ANSI 600 JPI 150, JPI 300, JPI 600			
		Plain	Extension type 1 Bellows	Extension type 2		Plain	Extension type 1 Bellows	Extension type 2		Plain	Extension type 1 Bellows	Extension type 2		Plain	Extension type 1 Bellows	Extension type 2	
				Integral-cast	Welded			Integral-cast	Welded			Integral-cast	Welded			Integral-cast	Welded
1½	PSA1D PSA1R	24	27	30	32	29	32	35	37	37	40	43	45	29	32	35	37
	HA2D HA2R	31	34	37	39	36	39	42	44	44	47	50	52	36	39	42	44
	HA3D HA3R	43	46	49	51	48	51	54	56	56	59	62	64	48	51	54	56
2	PSA1D PSA1R	30	33	36	38	35	38	41	43	40	43	46	48	35	38	41	43
	HA2D HA2R	37	40	43	45	42	45	48	50	47	50	53	55	42	45	48	50
	HA3D HA3R	49	52	55	57	54	57	60	62	59	62	65	67	54	57	60	62
2½	HA2D HA2R	43	47	51	53	48	52	56	58	65	69	73	75	48	52	56	58
	HA3D HA3R	55	59	63	65	60	64	68	70	77	81	85	87	60	64	68	70
	HA4D HA4R	86	90	94	96	91	95	99	101	108	112	116	118	91	95	99	101
	DAP560	188	192	--	--	193	197	--	--	210	214	--	--	193	197	--	--
3	HA2D HA2R	53	59	65	68	63	69	75	78	85	91	97	100	63	69	75	78
	HA3D HA3R	65	71	77	80	75	81	87	90	97	103	109	112	75	81	87	90
	HA4D HA4R	96	102	108	111	106	112	118	121	128	134	140	143	106	112	118	121
	DAP560	198	204	--	--	208	214	--	--	230	236	--	--	208	214	--	--
4	HA2D HA2R	63	73	78	81	78	88	93	96	113	123	128	131	75	85	90	93
	HA3D HA3R	75	85	90	93	90	100	105	108	125	135	140	143	87	97	102	105
	HA4D HA4R	106	116	121	124	121	131	136	139	156	166	171	174	118	128	133	136
	VA5D	208	218	223	226	223	233	238	241	258	268	273	276	220	230	235	238
	VA5R	233	243	248	251	248	258	263	266	283	293	298	301	245	255	260	263
	PSA6R	213	223	228	231	228	238	243	246	258	273	278	281	225	235	240	243
	DAP560	208	218	--	--	223	233	--	--	258	268	--	--	220	230	--	--
	DAP1000	248	258	--	--	263	273	--	--	298	308	--	--	260	270	--	--
6	HA3D HA3R	157	172	179	182	187	202	209	212	237	252	259	262	177	192	199	202
	HA4D HA4R	188	203	210	213	218	233	240	243	268	283	290	293	208	223	230	233
	VA5D	290	305	312	315	320	335	342	345	370	385	392	395	310	325	332	335
	VA5R	315	330	337	340	345	360	367	370	395	410	417	420	335	350	357	360
	PSA6R	295	310	317	320	325	340	347	350	375	390	397	400	315	330	337	340
	PSA7R	580	595	602	605	610	625	632	635	660	675	682	685	600	615	622	625
	DAP560	290	305	--	--	320	335	--	--	370	385	--	--	310	325	--	--
	DAP1000	330	345	--	--	360	375	--	--	410	425	--	--	350	365	--	--
	DAP1500	460	475	--	--	490	505	--	--	540	555	--	--	480	495	--	--
8	HA4D HA4R	268	288	298	303	318	338	348	353	438	458	468	473	308	328	338	343
	VA5D	370	390	400	405	420	440	450	455	540	560	570	575	410	430	440	445
	VA5R	395	415	425	430	445	465	475	480	565	585	595	600	435	455	465	470
	PSA6R	420	440	450	455	470	490	500	505	590	610	620	625	460	480	490	495
	PSA7R	705	725	735	740	755	775	785	790	875	895	905	910	745	765	775	780
	DAP560	370	390	--	--	420	440	--	--	540	560	--	--	410	430	--	--
	DAP1000	410	430	--	--	460	480	--	--	580	600	--	--	450	470	--	--
	DAP1500	540	560	--	--	590	610	--	--	710	730	--	--	580	600	--	--

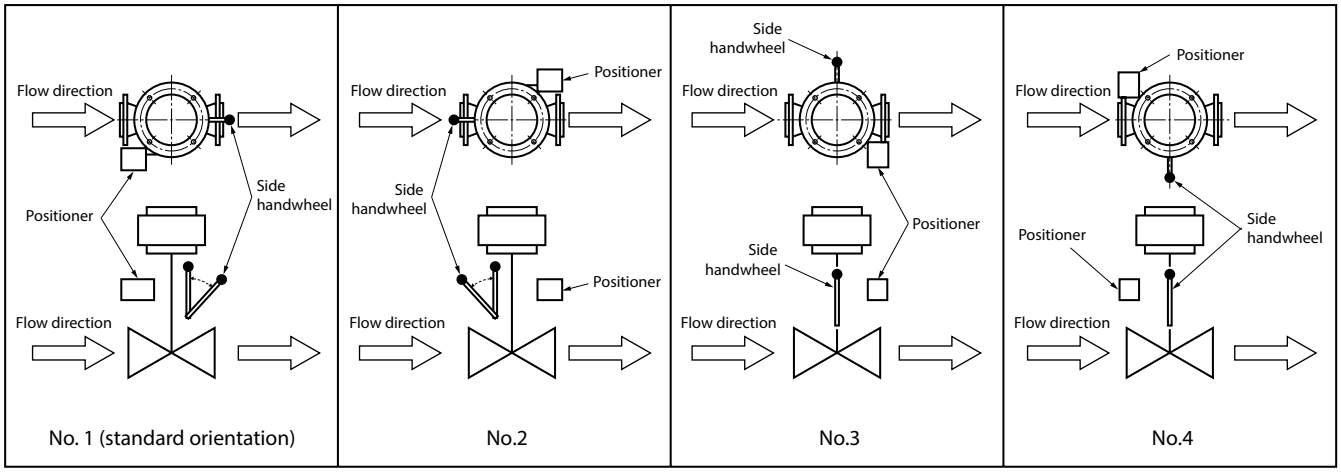
PSA1, HA, or VA actuator



PSA6R actuator



PSAR7 or DAP actuator



Note: If non-standard installation orientation is required, specify the orientation number.

Figure 10. Actuator orientation

MEMO

MEMO

MEMO

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