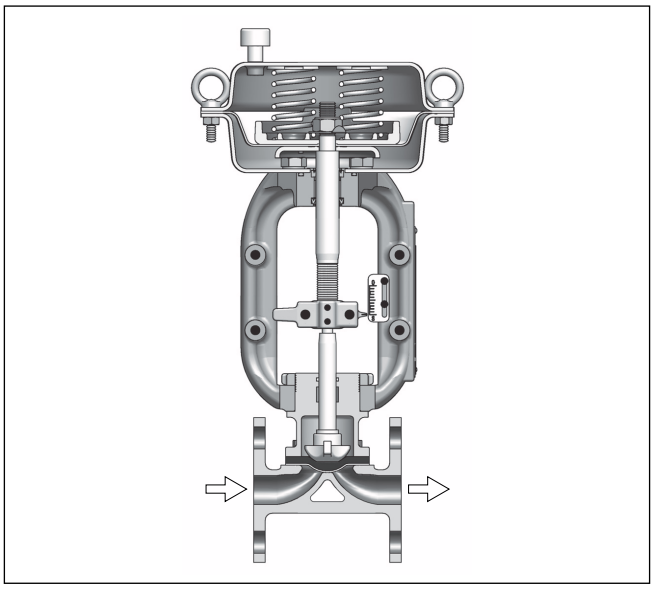
Weir Diaphragm Control Valves

Model VDD _ _ _

INTRODUCTION

Model VDD weir diaphragm control valves are designed for slurry or corrosive material handling service.
The valve body adopts a flow passage structure free from interrupted liquid trapping, which minimizes clogging by fluids containing solid substances. Abrasion- and corrosion- resistant linings can be applied to the valve interior.
The actuator integrated with simplest mechanisms utilizes a compact yet powerful diaphragm actuator loaded with multiple springs.
The model VDD valves are widely applicable for reliable control of low-pressure process lines for slurry and corrosive fluids.



SPECIFICATIONS

Body

Type
Weir diaphragm valve

Nominal size
1/2, 3/4, 1, 1-1/2, 2, 2-1/2, 3, 4 inches

Pressure rating
For operating temperature and pressure range, refer to Table 1, 3, 5, 6, 7 and 8.

End connection
JIS10K, ANSI150
(BS10-1962, UK standard, for flange thickness)

End connection

Connection method	Diaphragm material
FF	Hard natural rubber, chloroprene rubber, SCS13 (without lining)
RF	PTFE, ETFE

Material
For body / diaphragm combinations, refer to Table 1.

Bonnet
Plain bonnet (Non liquid-contacting, non pressurized vessel)
Bonnet material: FCD-S

Trim type
Diaphragm type

Flow characteristics
Inherent flow characteristics (approximately linear)

Stem material
SUS403

Actuator

Type
Single acting diaphragm actuator

Action
Direct or reverse action

Diaphragm
Refer to Table 1.

Spring range
Refer to Table 5 through Table 8.

Supply pressure
200, 270 kPa {2.0, 2.8 kgf/cm^2}
Note)Spring range and air supply pressure vary depending on nominal size.

Air connection
Rc1/4 or 1/4NPT internal thread

Ambient temperature
-30°C to +70°C

Valve action
Air-to-close (Direct action actuator is combined)
Air-to-open (Reverse action actuator is combined)

Standard accessory
Pneumatic or electric / pneumatic positioner *

Optional accessories
Pressure regulator with filter, hand wheel*, limit switch, solenoid valve, motion transmitter, booster relay, lock-up valve, and others.
Accessories with an asterisk mark (*) are selected from the following types depending on the actuators to be combined.

Actuator	Positioner		Hand wheel	
	P/P	I/P	Top	Side
PSA1	VPE/HTP	AVP	THM	SHM
HA2 to 4	HTP	AVP	THM	SHM

Additional specifications (by special order)
- Flow characteristics inspection
- Oil / water free treatment
- Copper-free treatment
- Stainless steel (SUS304) nuts and bolts for atmospheric exposure
- Special air piping and joints
- Vacuum service

Performance

Rated Cv value
Refer to Table 2.

Flow characteristics
Refer to Figure 1 and 2.

Inherent rangeability
20 : 1

Allowable differential pressure
Refer to Table 5 through Table 8.

Leakage specification
IEC 60534-4:2006 or JIS B2005-4:2008
Class VI : Leakage less than 0.00001% of maximum valve capacity.

Hysteresis error
With positioner : Within 1% F.S. (2B to 4B)
Within 2% F.S. (1/2B to 1-1/2B)

Linearity
With positioner : ±1% F.S. (2B to 4B)
±3% F.S. (1/2B to 1-1/2B)
(VPE: Within ±3% F.S., AVP: Within ±2% F.S.)
Note)Parenthesized figures are applicable to Type PSA1.

Dimension
Refer to Figure 3, Figure 4, Table 9 and Table 10.

Weight
Refer to Table 10.

Actuator orientation
Refer to Figure 5.

Finish
Blue or silver, or other specified colors

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

Body / Diaphragm material	FC200	FC200	FCD-S	FCD-S	SCS13	SCS13
	Hard natural rubber	Chloroprene	PFA	ETFE	PFA	---
Natural rubber	0 to 80	---	---	---	---	---
Chloroprene	0 to 80	0 to 90	---	---	---	---
PTFE (Rubber EPDM)	---	---	0 to 140	0 to 130	0 to 140	-5 to +140
EPDM	0 to 120	0 to 90	---	---	---	-5 to +120

Note) EPDM: Ethylene propylene rubber
PFA : Perfluoro Alkoxy Resin

Table 2. Cv value and travel

Nominal size (in.)	Rated travel (mm)	Rated Cv value				
		FC200 / lining (Hard natural rubber, Chloroprene)	FCD-S / lining (PFA)	FCD-S / lining (ETFE)	SCS13 / lining (PFA)	SCS13 / Non lining
1/2	6	4.2	2.3	3	3	6
3/4	8	8.5	7.5	7	7	8.2
1	10	15	10	10	10	15.9
1-1/2	14	30	25	25	25	45
2	20	57	41	54	54	88
2-1/2	24	93	62	68	-	99
3	30	191	104	107	-	176
4	40	194	210	161	-	228

Selection of Actuator for model VDD

Select proper actuator for model VDD by following procedure.

1) Confirm both inlet and outlet pressure of the valve at full closure.
2) Calculate required shut-off pressure for actuator sizing referring to " Table 3 Required shut-off pressure calculation table".
3) Select proper actuator by using allowable differential pressure table and the calculated required shut-off pressure.

Table 3. Required shut-off pressure calculation table

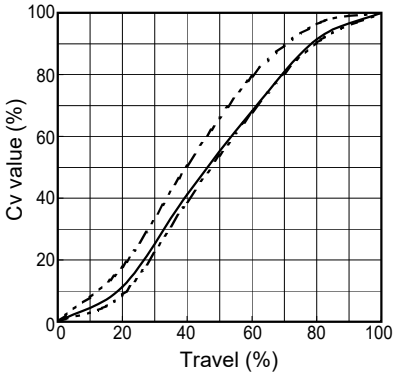
P2 \ P1	Valve-inlet pressure kPa {kgf/cm²}									
Valve-outlet pressure kPa {kgf/cm²}	98{1.0}	200{2.0}	270{2.7}	390{3.9}	490{4.9}	590{6.0}	690{7.0}	780{7.9}	880{8.9}	981{10.0}
0{0}	98{1.0}	200{2.0}	270{2.7}	390{3.9}	490{4.9}	590{6.0}	690{7.0}	780{7.9}	880{8.9}	981{10.0}
50{0.5}	150{1.5}	240{2.4}	340{3.4}	440{4.4}	540{5.5}	640{6.5}	740{7.5}	830{8.4}	930{9.4}	
98{1.0}	200{2.0}	270{2.7}	390{3.9}	490{4.9}	590{6.0}	690{7.0}	780{7.9}	880{8.9}	981{10.0}	
150{1.5}		340{3.4}	440{4.4}	540{5.5}	640{6.5}	740{7.5}	830{8.4}	930{9.4}	981{10.0}	
200{2.0}		340{3.4} 390{3.9}	440{4.4} 540{5.5}	540{5.5} 590{6.0}	640{6.5} 690{7.0}	740{7.5}	830{8.4}	930{9.4}		
240{2.4}			490{4.9}	590{6.0}	690{7.0}	780{7.9}	880{8.9}	981{10.0}		
270{2.7}			540{5.5}	640{6.5}	740{7.5}	830{8.4}	930{9.4}	981{10.0}		
340{3.4}				640{6.5}	740{7.5}	830{8.4}	930{9.4}			
390{3.9}				690{7.0}	780{7.9}	880{8.9}	981{10.0}			
440{4.4}					830{8.4}	930{9.4}				
490{4.9}					830{8.4}	930{9.4}				
540{5.5}						981{10.0}				
590{6.0}						981{10.0}				

Note) 1) Where 2 conversion pressure values are shown, the upper one is for the rubber diaphram, and the lower one is for the PTFE diaphram conversion pressure.

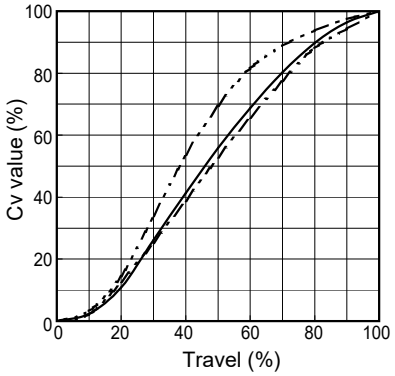
2) Rubber and PTFE diaphram conversion pressures have the same values, except for the values that are mentioned in Note 1.

Table 4. Flow characteristics reference No.

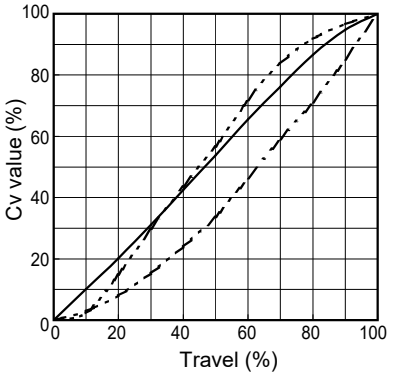
Diaphragm material \ Body	FC200	FCD-S	FCD-S	SCS13	SCS13
	Chloroprene	PFA	ETFE	PFA	Non lining
Natural rubber	(3)	—	—	—	(1)
Chloroprene	—	—	—	—	—
PTFE (Rubber EPDM)	—	(4)	(5)	(5)	(2)
EPDM	—	—	—	—	—



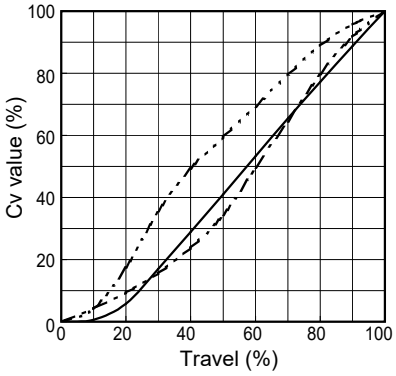
a. 1/2 inch



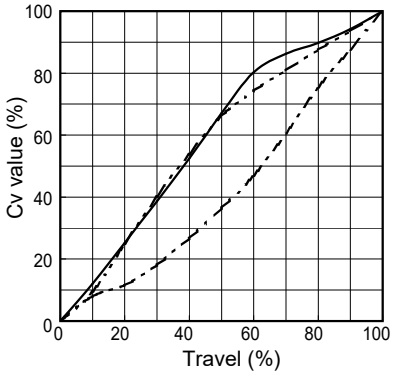
b. 3/4 inch



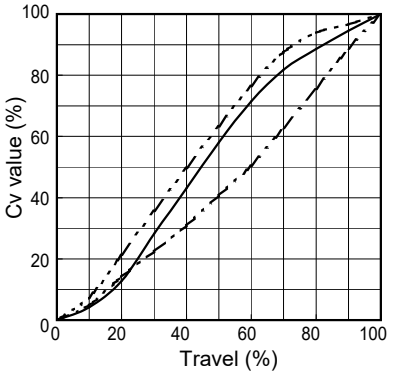
c. 1 inch



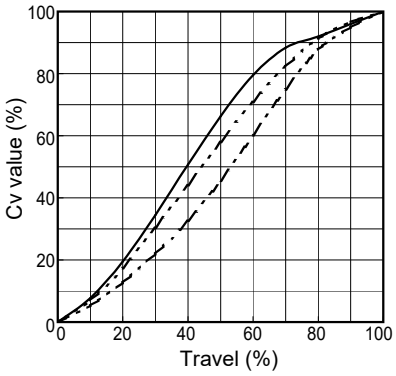
d. 1-1/2 inches



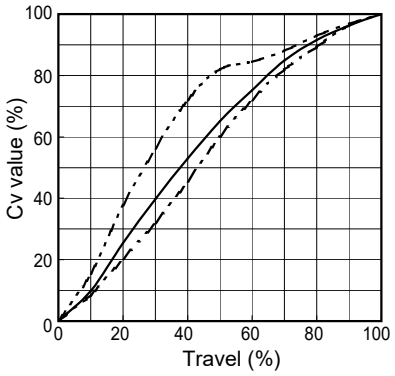
e. 2 inches



f. 2-1/2 inches



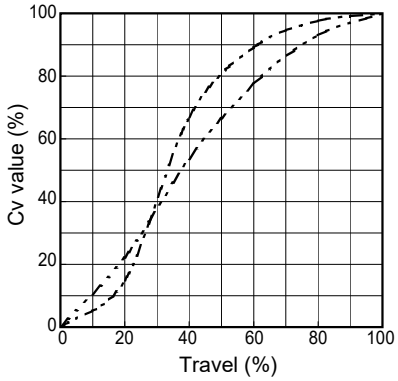
g. 3 inches



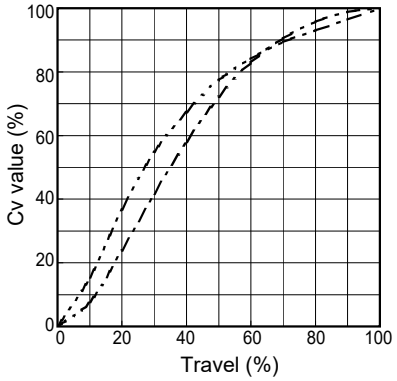
h. 4 inches

Line	Body/Lining	Diaphragm	Reference No.
———	SCS13/- (Non-lining)	EPDM	(1)
-·-·-·-	SCS13/- (Non-lining)	PTFE	(2)
-··-··-	FC200/Chloroprene	Natural rubber	(3)

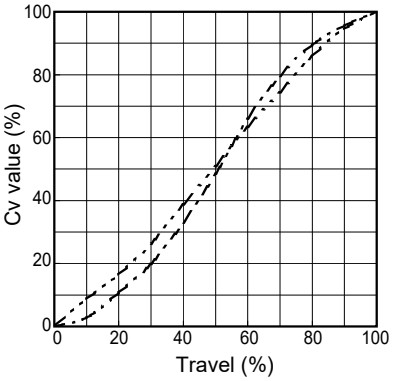
Figure 1. Flow characteristics : Non-lining or rubber-lining type



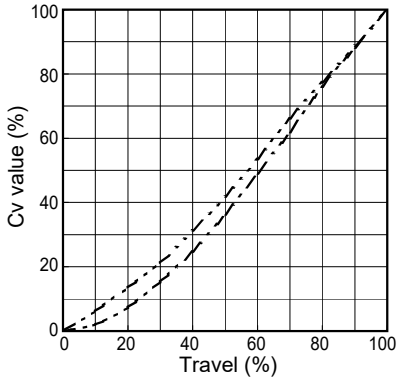
a. 1/2 inch



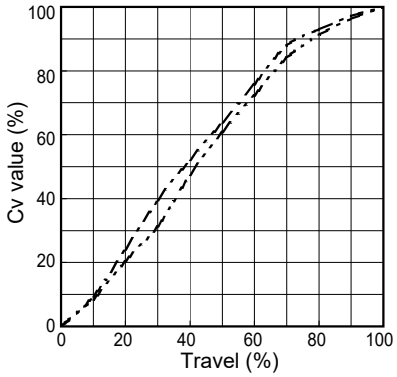
b. 3/4 inch



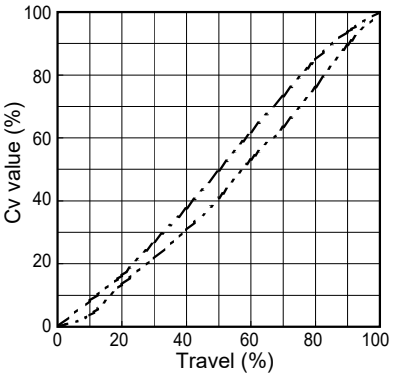
c. 1 inch



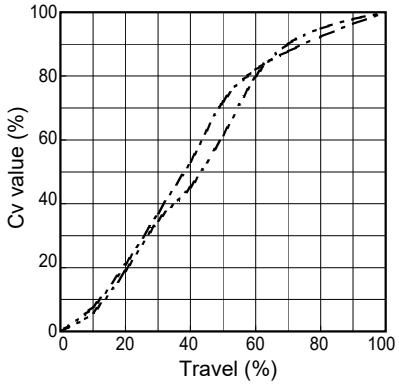
d. 1-1/2 inches



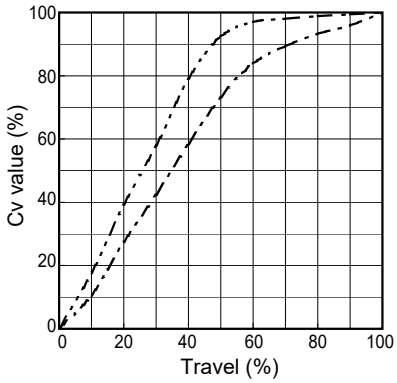
e. 2 inches



f. 2-1/2 inches



g. 3 inches



h. 4 inches

Line	Body/Lining	Diaphragm	Reference No.
-·-·-·-·-·-·-·-·-·-	FCD-S/PFA	PTFE	(4)
-··-··-··-··-··-··-	FCD-S/ETFE, SCS13/PFA	PTFE	(5)

Figure 2. Flow characteristics : PFA, and ETFE lining type

Maximum Allowable Shutoff Pressure Drops

Rubber diaphragm (natural rubber, chloroprene, EPDM)

Table 5. Air-to-close

Actuator model	Supply air pressure kPa {kgf/cm²}	Spring range kPa {kgf/cm²}	Positioner	Pressure drops (by nominal size inches) kPa {kgf/cm²}							
				1/2	3/4	1	1-1/2	2	2-1/2	3	4
PSA1D	200 {2.0}	20 to 53 {0.2 to 0.54}	✓	981 {10.0}	——	——	——	——	——	——	——
		20 to 64 {0.2 to 0.65}	✓	——	981 {10.0}	——	——	——	——	——	——
		20 to 74 {0.2 to 0.76}	✓	——	——	880 {9.0}	——	——	——	——	——
		20 to 96 {0.2 to 0.98}	✓	——	——	——	490 {5.0}	——	——	——	——
	270 {2.8}	20 to 74 {0.2 to 0.76}	✓	——	——	981 {10.0}	——	——	——	——	——
		20 to 96 {0.2 to 0.98}	✓	——	——	——	981 {10.0}	——	——	——	——
HA2D	200 {2.0}	20 to 82 {0.2 to 0.84}	✓	——	——	——	——	590 {6.0}	——	——	——
		20 to 95 {0.2 to 0.97}	✓	——	——	——	——	——	490 {5.0}	---	——
		20 to 81 {0.2 to 0.83}	✓	——	——	——	——	——	——	200 {2.0}	——
	270 {2.8}	20 to 82 {0.2 to 0.84}	✓	——	——	——	——	981 {10.0}	——	——	——
		20 to 95 {0.2 to 0.97}	✓	——	——	——	——	——	880 {9.0}	——	——
		20 to 81 {0.2 to 0.83}	✓	——	——	——	——	——	——	490 {5.0}	——
HA3D	200 {2.0}	20 to 81 {0.2 - 0.83}	✓	——	——	——	——	——	——	490 {5.0}	——
		20 to 102 {0.2 to 1.04}	✓	——	——	——	——	——	——	——	290 {3.0}
	270 {2.8}	20 to 81 {0.2 to 0.83}	✓	——	——	——	——	——	——	880 {9.0}	——
		20 to 102 {0.2 to 1.04}	✓	——	——	——	——	——	——	---	590 {6.0}
HA4D	200 {2.0}	20 to 102 {0.2 to 1.04}	✓	——	——	——	——	——	——	---	490 {5.0}
	270 {2.8}	20 to 102 {0.2 to 1.04}	✓	——	——	——	——	——	——	---	981 {10.0}

Note) ✓: Positioner is necessary.

Table 6. Air-to-open

Actuator model	Supply air pressure kPa {kgf/cm²}	Spring range kPa {kgf/cm²}	Positioner	Pressure drops (by nominal size inches) kPa {kgf/cm²}							
				1/2	3/4	1	1-1/2	2	2-1/2	3	4
PSA1R	270 {2.8}	80 to 144 {0.8 to 1.47}	✓	981 {10.0}	——	——	——	——	——	——	——
		80 to 170 {0.8 to 1.70}	✓	——	981 {10.0}	——	——	——	——	——	——
		80 to 188 {0.8 to 1.92}	✓	——	——	690 {7.0}	——	——	——	——	——
		80 to 232 {0.8 to 2.37}	✓	——	——	——	290 {3.0}	——	——	——	——
HA2R	270 {2.8}	80 to 188 {0.8 to 1.92}	✓	——	——	981 {10.0}	——	——	——	——	——
		80 to 232 {0.8 to 2.37}	✓	——	——	——	780 {8.0}	——	——	——	——
		80 to 204 {0.8 to 2.08}	✓	——	——	——	——	490 {5.0}	---	——	——
		80 to 229 {0.8 to 2.34}	✓	——	——	——	——	——	290 {3.0}	——	——
		80 to 202 {0.8 to 2.06}	✓	——	——	——	——	——	——	98 {1.0}	——
HA3R	270 {2.8}	80 to 204 {0.8 to 2.08}	✓	——	——	——	——	880 {9.0}	——	——	——
		80 to 229 {0.8 to 2.34}	✓	——	——	——	——	——	690 {7.0}	——	——
		80 to 202 {0.8 to 2.06}	✓	——	——	——	——	——	——	390 {4.0}	——
		80 to 243 {0.8 to 2.48}	✓	——	——	——	——	——	——	——	200 {2.0}
HA4R	270 {2.8}	80 to 202 {0.8 to 2.06}	✓	——	——	——	——	——	——	690 {7.0}	——
		80 to 243 {0.8 to 2.48}	✓	——	——	——	——	——	——	——	390 {4.0}

Note) ✓: Positioner is necessary.

PTFE diaphragm

Table 7. Air-to-close

Actuator model	Supply air pressure kPa {kgf/cm²}	Spring range kPa {kgf/cm²}	Positioner	Pressure drops (by nominal size inches) kPa {kgf/cm²}							
				1/2	3/4	1	1-1/2	2	2-1/2	3	4
PSA1D	200 {2.0}	20 to 53 {0.2 to 0.54}	✓	981 {10.0}	—	—	—	—	—	—	—
		20 to 64 {0.2 to 0.65}	✓	—	981 {10.0}	—	—	—	—	—	—
HA2D	200 {2.0}	20 to 74 {0.2 to 0.76}	✓	—	—	690 {7.0}	—	—	—	—	—
		20 to 96 {0.2 to 0.98}	✓	—	—	—	690 {7.0}	—	—	—	—
		20 to 82 {0.2 to 0.84}	✓	—	—	—	—	490 {5.0}	—	—	—
	270 {2.8}	20 to 74 {0.2 to 0.76}	✓	—	—	690 {7.0}	—	—	—	—	—
		20 to 96 {0.2 to 0.98}	✓	—	—	—	690 {7.0}	—	—	—	—
		20 to 82 {0.2 to 0.84}	✓	—	—	—	—	690 {7.0}	—	—	—
HA3D	200 {2.0}	20 to 95 {0.2 to 0.97}	✓	—	—	—	—	—	690 {7.0}	—	—
		20 to 81 {0.2 to 0.83}	✓	—	—	—	—	—	—	390 {4.0}	—
		20 to 102 {0.2 to 1.04}	✓	—	—	—	—	—	—	—	200 {2.0}
	270 {2.8}	20 to 95 {0.2 to 0.97}	✓	—	—	—	—	—	690 {7.0}	—	—
		20 to 81 {0.2 to 0.83}	✓	—	—	—	—	—	—	690 {7.0}	—
		20 to 102 {0.2 to 1.04}	✓	—	—	—	—	—	—	—	490 {5.0}
HA4D	200 {2.0}	20 to 102 {0.2 to 1.04}	✓	—	—	—	—	—	—	—	490 {5.0}
	270 {2.8}	20 to 102 {0.2 to 1.04}	✓	—	—	—	—	—	—	—	490* {5.0}

Note) 1) When material of the main body is SCS13, 690 kPa.
2) ✓: Positioner is necessary.

Table 8. Air-to-open

Actuator model	Supply air pressure kPa {kgf/cm²}	Spring range kPa {kgf/cm²}	Positioner	Pressure drops (by nominal size inches) kPa {kgf/cm²}							
				1/2	3/4	1	1-1/2	2	2-1/2	3	4
PSA1R	270 {2.8}	80 to 144 {0.8 to 1.47}	✓	981 {10.0}	—	—	—	—	—	—	—
		80 to 170 {0.8 to 1.70}	✓	—	780 {8.0}	—	—	—	—	—	—
		80 to 188 {0.8 to 1.92}	✓	—	—	490 {5.0}	—	—	—	—	—
		80 to 232 {0.8 to 2.37}	✓	—	—	—	200 {2.0}	—	—	—	—
HA2R	270 {2.8}	80 to 188 {0.8 to 1.92}	✓	—	—	690 {7.0}	—	—	—	—	—
		80 to 232 {0.8 to 2.37}	✓	—	—	—	690 {7.0}	—	—	—	—
		80 to 204 {0.8 to 2.08}	✓	—	—	—	—	290 {3.0}	—	—	—
		80 to 229 {0.8 to 2.34}	✓	—	—	—	—	—	200 {2.0}	—	—
		80 to 202 {0.8 to 2.06}	✓	—	—	—	—	—	—	98 {1.0}	—
HA3R	270 {2.8}	80 to 204 {0.8 to 2.08}	✓	—	—	—	—	690 {7.0}	—	—	—
		80 to 229 {0.8 to 2.34}	✓	—	—	—	—	—	590 {6.0}	—	—
		80 to 202 {0.8 to 2.06}	✓	—	—	—	—	—	—	200 {2.0}	—
		80 to 243 {0.8 to 2.48}	✓	—	—	—	—	—	—	—	98 {1.0}
HA4R	270 {2.8}	80 to 202 {0.8 to 2.06}	✓	—	—	—	—	—	—	690 {7.0}	—
		80 to 243 {0.8 to 2.48}	✓	—	—	—	—	—	—	—	290 {3.0}

Note) ✓: Positioner is necessary.

DIMENSIONS

Table 9. Face-to-face dimensions

[unit: mm]

Nominal size (in.)	A (mm)		
	FCD-S / Glass, SCS13	FC200 / Hard natural rubber, Chloroprene, FCD-S / PFA, ETFE	SCS13 / PFA
1/2	102	107	107
3/4	118	123	123
1	127	132	132
1-1/2	159	165	165
2	191	197	197
2-1/2	216	222	—
3	254	260	—
4	305	313	—

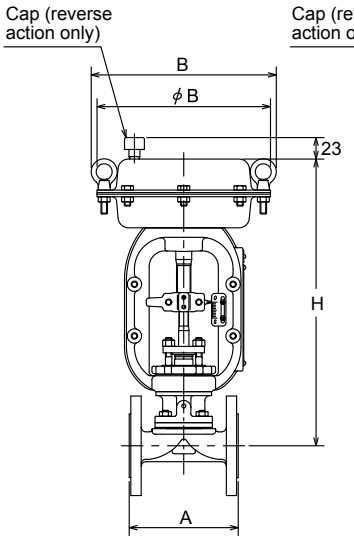


Figure 3. Flange end RF

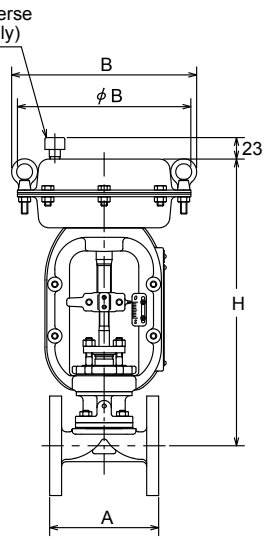


Figure 4. Flange end FF

Table 10. External dimensions and weight

Nominal size (in.)	Actuator model No.	External dimensions (mm)							Weight (kg)
		B	ϕ B	H					
				FC200 / Hard natural rubber, Chloroprene	FCD-S/ PFA	FCD-S/ ETFE	SCS13/ PFA	SCS13	
1/2	PSA1D, R	232	218	375	370	365	365	365	11
3/4	PSA1D, R	232	218	370	360	365	365	365	12
1	PSA1D, R	232	218	375	375	375	375	370	13
	HA2R	281	267	410	405	405	405	405	20
1-1/2	PSA1D, R	232	218	385	395	390	395	385	15
	HA2R	281	267	415	425	425	425	415	22
2	HA2D, R	281	267	430	440	440	440	430	25
	HA3R	363	350	555	565	565	565	555	46
2-1/2	HA2D, R	281	267	440	460	460	—	440	29
	HA3R	363	350	575	595	595	—	575	49
3	HA2D, R	281	267	480	500	500	—	480	37
	HA3D, R	363	350	535	555	555	—	530	52
	HA4R	520	470	785	805	805	—	780	94
4	HA3D, R	363	350	575	595	595	—	575	64
	HA4R	520	470	780	800	800	—	780	101

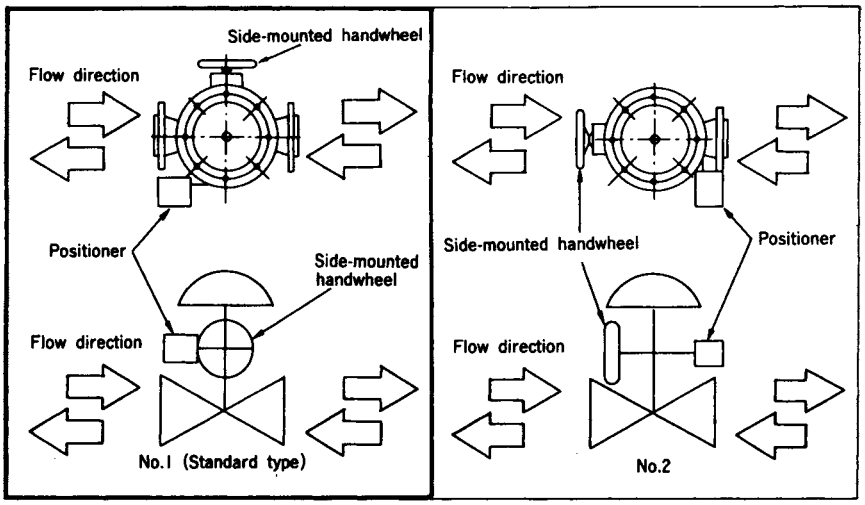


Figure 5. Actuator orientation

Note) Indicate position no. when installation other than the standard type is required.

Ordering information

When ordering, please specify:

1) Model number: VDD
2) Nominal size
3) Standard and type of end connections
4) Body and diaphragm material
5) Type of actuator, necessity of manual hand wheel, air supply pressure
6) Valve action (direct or reverse)
7) Accessories (pressure regulator with filter etc.)
8) Special requirement of degreasing, copper prohibitive treatment, etc.
9) Name of flow medium
10) Normal flow and maximum required flow
11) Pressure of flow medium, upstream and downstream pressure at maximum and minimum required flow
12) Temperature and specific gravity of flow medium
13) Viscosity of flow medium, inclusive or exclusive of slurry

Note

Note

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.

Azbil Corporation

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