Catalog No. DE303-03

NDV DIAPHRAGM VALVE

NIPPON DAIYA VALVE CO., LTD.

INTRODUCTION OF PRODUCTS

Weir Type Diaphragm Valve (Basic type: Type 400)

Manually Operated Diaphragm Valve: Type 400

Nominal Size(DN) : 15 – 300

Pneumatically Operated ON-OFF Diaphragm Valve: Type PO(PC, PN) 1400N

Nominal Size (DN):15–150
PO···Reverse Acting(Air to Open)
PC···Direct Acting(Air to Close)
PN···Double Acting

Pneumatically Operated ON-OFF Diaphragm Valve: Type HO(HC, HN) 1400N

Nominal Size (DN):100 – 300
HO···Reverse Acting(Air to Open)
HC···Direct Acting(Air to Close)
HN···Double Acting

●Large and high output type

Pneumatically Operated Flow Control Diaphragm Valve (1): Type 3400 [Rolling diaphragm type]

Nominal Size (DN):15–150
BO···Reverse Acting(Air to Open)
BC···Direct Acting(Air to Close)

Pneumatically Operated Flow Control Diaphragm Valve (2): Type HN3400N [Cylinder type]

Nominal Size (DN):150 – 300
HN···Double Acting

●Large and high output type

Electrically Operated Diaphragm Valve (1): Type MS4400

Nominal Size (DN): 25 – 300

Electrically Operated Diaphragm Valve (2): Type NR4400

Nominal Size (DN): 15 – 80

Photos in this catalog represent images of valves. Actual appearance may differ by specifications.

Straight Type Diaphragm Valve (Basic type: Type 500)

Manually Operated Diaphragm Valve: Type 500

Nominal Size (DN): 15 – 300

Pneumatically Operated ON-OFF Diaphragm Valve: Type PO(PN) 1500N

Nominal Size (DN): 15 –100
PO···Reverse Acting(Air to Open)
PN···Double Acting

Pneumatically Operated ON-OFF Diaphragm Valve: Type HOT (HN) 1500N

Nominal Size (DN): 125 – 300
HOT···Reverse Acting(Air to Open)
HN···Double Acting

●Large and high output type

Electrically Operated Diaphragm Valve (1): Type MS4500

Nominal Size (DN): 25 – 300

Electrically Operated Diaphragm Valve (2): Type NR4500

Nominal Size (DN): 15 – 50

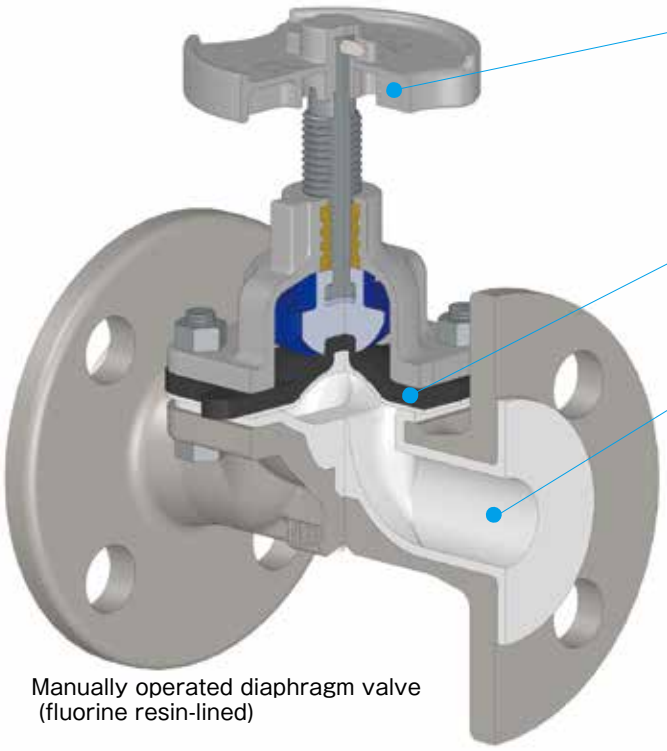
For the product specifications and details, contact our Sales Dept. or local representative.

OVERVIEW OF DIAPHRAGM VALVES

① Basic Structure and Mechanism of Diaphragm Valves

- Diaphragm valve generally refers to a valve having a diaphragm of rubber or other flexible material that opens or closes the fluid passage.
- The following diagram shows the basic structure of diaphragm valve that consists of three units, actuator, diaphragm and the body. The valve controls the liquid flow by pressing or depressing the diaphragm to or from the sealing surface on the inside of the body.
- Diaphragm valves are roughly categorized to two types; Weir type (Type 400) and Straight type (Type 500), but both types share the same basic structure.

Basic unit structure



Manually operated diaphragm valve (fluorine resin-lined)

Actuator

Mainly categorized into the manually operated type, pneumatically operated type, flow control type(*) and electrically operated type.

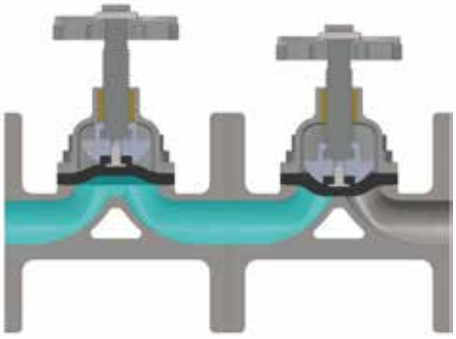
Diaphragm

Rubber, fluorine resin(*) and other material are available according to application(**).

Body

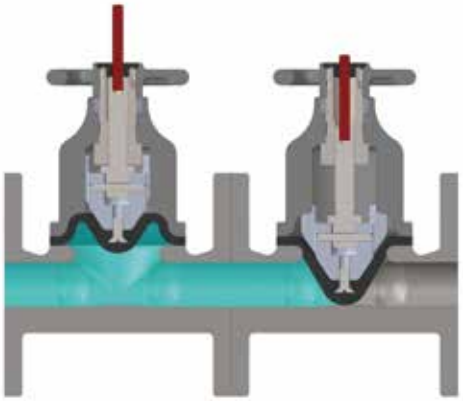
Metal with or without lining is available in rich selection for a body.
Connection method available includes welded type and screw type in addition to the flange type(**).
(*) For weir type diaphragm valve only.
(**) For details, see p.10 and p.15

Weir type diaphragm valve: Type 400



- Basic structure of diaphragm valve having a weir at the fluid passage. The diaphragm and weir of the body are tightly closed for airtightness to achieve high valve seat sealing performance.
- Rich selection is available for the main body and diaphragm material to apply to a wide scope of fluid.
- Used for : Chemical, environment and water treatment, iron and steel, shipbuilding, medical, food, semiconductor, power generation, etc.

Straight type diaphragm valve: Type 500

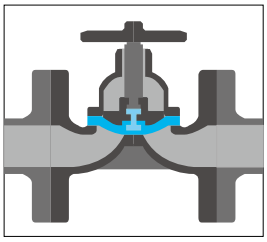


- The fluid passage is straight, which minimizes pressure drop and/or fluid accumulation.
- Applicable to viscose fluid, cellulose fluid, slurry, sledge and other fluids containing suspended solids.
- Used for : Water purifying plants, terminal treatment plant, etc.

② Features of Diaphragm Valves

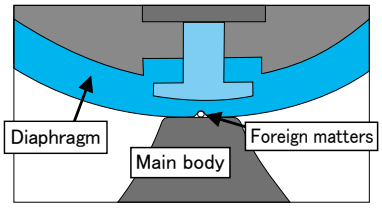
❶Superb airtightness

・Actuator is isolated by the diaphragm. This prevents fluid leakage to outside or contamination of fluid by outside air.



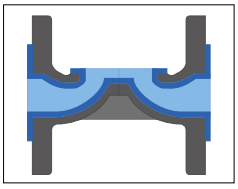
❷Zero leak from valve seat

・Controlled by flexible diaphragm, no fluid leaks from the valve seat.
・In the case of rubber diaphragm, complete closing is available, even if some foreign matters are bitten into diaphragm due to its flexibility.



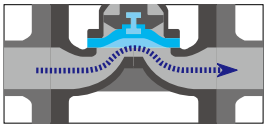
❸Superb corrosion and chemical resistance

・Simple body shape is suitable for the lining proess.
・Combination of rich selection of diaphragm material and various lining bodies such as rubber and fluorine resin allows manufacture of valves applicable to a wide span of fluid specifications, which is more efficient costwise than special alloy combination.



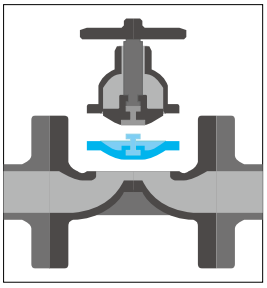
❹Good self-purifying performance

・Streamlined fluid passage without pockets provides self-purifying performance by minimizing fluid retention.



❺Superb maintainability

・Simple design of three parts. Actuator, Diaphragm and the Body makes it easy to disassemble/assemble the valve.
・Top entry structure adopted enables to change diaphragm by simply removing the nuts and bolts that joint the main body and the bonnet without disconnecting the valve from the piping.
・Each unit is interchangeable, enabling a system change with ease from manual to automatic operation.



❻Environment-friendly types

・Simple 3-unit construction of the Actuator, Diaphragm and the Body requires less number of parts than other valve types, saving consumable parts.

Environment-friendly type paint and lubricant free from hazardous heavy metal are used. (RoHS compliance)

Actuator for the pneumatically operated diaphragm valve is improved to have much higher durability, extending the replacement cycle for expendable parts.

Chloroprene diaphragm is lead-free.

Improved actuator for the pneumatically operated diaphragm valve has reduced air consumption. (Approx. 20% in average from the conventional products of ours.)

Solenoid valve to the pneumatically operated actuator can be installed directly without pneumatic piping, thus reducing material usage.

Type POM1400N

LIST OF DIAPHRAGM VALVES

Specifications			Weir type diaphragm valve (Type 400)										Straight type diaphragm valve (Type 500)				
			Manually operated type	Pneumatically operated type ON-OFF diaphragm valve					Pneumatically operated flow control diaphragm valve			Electrically operated type	Manually operated type	Pneumatically operated ON-OFF diaphragm valve			Electrically operated type
				①Type PO(PC, PN) 1400N			②Type HO(HO, HN) 1400N			①[Rolling diaphragm type]		②[Cylinder type]		①Type PO(PN) 1500N		②Type HO(HN) 1500N	
				Reverse Acting	Direct Acting	Double Acting	Reverse Acting	Direct Acting	Double Acting	Reverse Acting	Direct Acting	Double Acting		Reverse Acting	Double Acting	Reverse Acting	Double Acting	
Material (Base material)		Valve type / Material code	Type 400	Type PO1400N	Type PC1400N	Type PN1400N	Type HO1400N	Type HC1400N	Type HN1400N	Type BO3400	Type BC3400	Type HN3400N	Type 4400	Type 500	Type PO1500N	Type PN1500N	Type HOT1500N	Type HN1500N	Type 4500
Main body material and range of applicable nominal size (DN)	Gray cast iron	FC200	01	15-300	15-150			100-250	150	125-300	15-150		150-300	15-300	15-300	15-100		125-150	125-300	15-300
	Ductile cast iron	FCD-S	04	15-300	15-150			100-250	150	125-300	15-150		150-300	15-300	15-300	15-100		125-150	125-300	15-300
	Stainless steel	SCS13	07(2)/07	15-300	15-150			100-250	150	125-300	15-150		150-300	15-300	15-300	15-100		125-150	125-300	15-300
		SCS14	12(2)/12	15-300	15-150			100-250	150	125-300	15-150		150-300	15-300	15-300	15-100		125-150	125-300	15-300
		SCS16	13(2)/13	15-300	15-150			100-250	150	125-300	15-150		150-300	15-300	15-300	15-100		125-150	125-300	15-300
	Dissolved zinc plated	HDZ55(FC200)	71	15-300	15-150			100-200	150	125-300	15-150		150-300	15-300	15-300	15-100		125-150	125-300	15-300
	Hard natural rubber lined	(FC200)	30	15-300	15-150			100-250	150	125-300	15-150		150-300	15-300	15-300	15-100		125-150	125-300	15-300
	Soft natural rubber lined	(FC200)	33	15-300	15-150			100-250	150	125-300	15-150		150-300	15-300	15-300	15-100		125-150	125-300	15-300
	Chloroprene rubber lined	(FC200)	35	15-300	15-150			100-250	150	125-300	15-150		150-300	15-300	15-300	15-100		125-150	125-300	15-300
	Butyl rubber lined	(FC200)	36	15-300	1-150			100-250	150	125-300	15-150		150-300	15-300	15-300	15-100		125-150	125-300	15-300
	Polyethylene lined	(FC200)	50	20-200	20-150			100-200	150	125-200	20-150		150-200	20-200	–	–		–		–
	PFA lined	(FCD-S)	59(M)	15-250	15-150			100-250	150	125-250	15-150		150-250	15-250	–	–		–		–
		(SCS13)	59(2S)/59(S)	15-80	15-80			–	–	–	15-80		–	15-80	–	–		–		–
	ETFE lined	(FCD-S)	60	15-100	15-100			100	–	–	15-100		–	15-100	–	–		–		–
	Glass lined	(FCD-S)	40(04)	15-200	15-150			125-200	150	125-200	15-150		150-200	15-200	–	–		–		–
	Ceramic lined	(FCD-S)	80(04)	15-80	15-80			–	–	–	15-80		–	15-80	–	–		–		–
Diaphragm material and range of applicable nominal size (DN)	Natural rubber	NR+BR	NR	15-300	15-150			100-250	150	125-300	15-150		150-300	15-300	15-300	15-100		125-150	125-300	15-300
	Chloroprene rubber	CR	CR	15-300	15-150			100-250	150	125-300	15-150		150-300	15-300	15-300	15-100		125-150	125-300	15-300
	Butyl rubber	IIR	BG	15-300	15-150			100-250	150	125-300	15-150		150-300	15-300	15-300	15-100		125-150	125-300	15-300
	Nitrile rubber	NBR	AB	15-300	15-150			100-250	150	125-300	15-150		150-300	15-300	15-300	15-100		125-150	125-300	15-300
	EPDM	EPDM	EP	15-300	15-150			100-250	150	125-300	15-150		150-300	15-300	15-300	15-100		125-150	125-300	15-300
	NEW PTFE/EPDM	NEW PTFE/EPDM	TX/CE	15-100	15-100			100	–	–	15-100		–	15-100	–	–		–		–
	NEW PTFE/EPDM+α	NEW PTFE/EPDM+α	TX/CX	15-100	15-100			100	–	–	15-100		–	15-100	–	–		–		–
	PTFE/EPDM	PTFE/EPDM	TF/CE	125-250	125-150			125-250	150	125-250	125-150		150-250	125-250	–	–		–		–
	PTFE/EPDM+α	PTFE/EPDM+α	TF/CX	125-200	125-150			125-250	150	125-200	125-150		150-200	125-200	–	–		–		–

· This table outlines the standard manufacturing range of the flanged type body.
· For other material and/or nominal size, contact our Sales Dept. or local representative.

2

PNEUMATICALLY OPERATED TYPE ON-OFF DIAPHRAGM VALVE

2-1. Pneumatically Operated ON-OFF Diaphragm Valve Actuator

① Features of actuator

② Actuator specifications

2-2. Weir Type Diaphragm Valve: Type PO(PC, PN)/HO(HC, HN) 1400N

① Actuator selection table

② Principal dimensions

2-3. Straight Type Diaphragm Valve: Type PO(PN)/HO(HN) 1500N

① Actuator selection table

② Principal dimensions

2-4. Reference Material

① Air chamber capacity and air consumption

② Accessories

2 1. Pneumatically Operated type ON-OFF Actuator

① Features of actuator

❶Smooth operation and sharp improvement of durability:

- Adoption of wear ring realizes smoother operation and improved durability.
- Adoption of stopper nut prevents the shortening of product life due to an excessive load to the diaphragm when the valve is closed, simultaneously eliminating the need for adjusting the working pressure on the direct and double acting types.

❷Lightweight and compact:

- The actuator is more lightweight and compact compared with our conventional products (Type HO1400N series).

❸Economical in actuator selection:

- Two to three types of actuator can be selected per nominal size. Selection of an optimum actuator for the working fluid is available.

❹Adoption of NAMUR connection standard*:

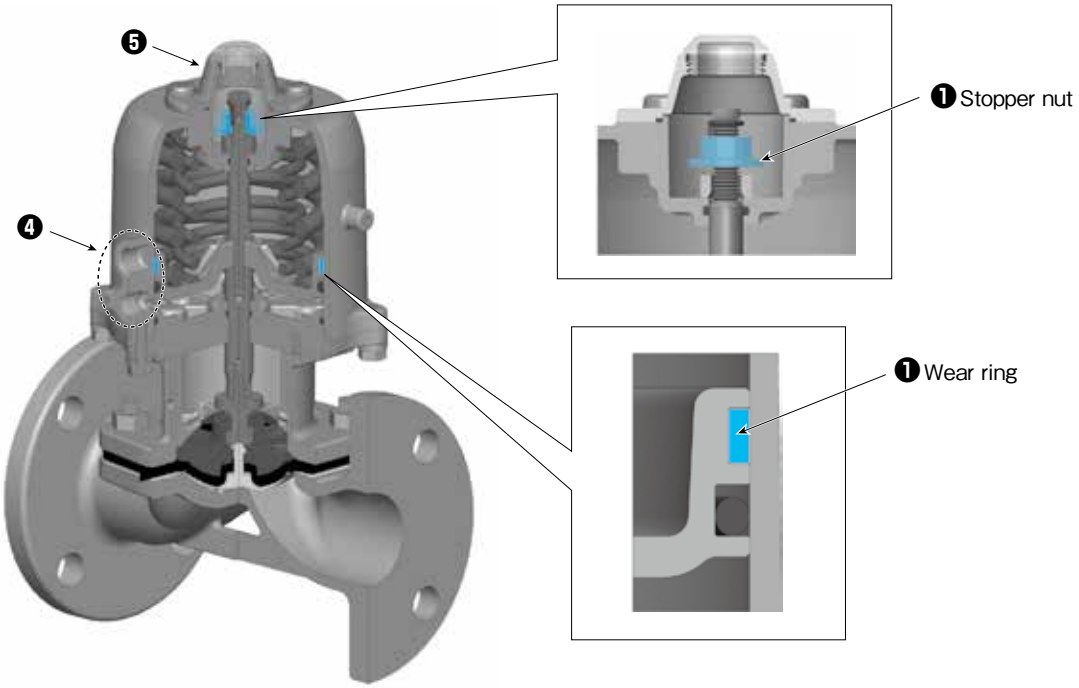
- Adoption of NAMUR dimensions to the solenoid valve mounting seat enables direct installation of the same standard solenoid valve without the mounting plate and pneumatic piping. (In the case of direct or double acting type, the pneumatic piping to the upper cylinder is required by using a spacer.)
  *VDI/VDE3845-2010

❺Rich selection of ancillary device (see the following page) is easy to install:

- Ancillary device includes manual operating device and opening limit device, etc.
- Ancillary device can be installed without disassembling the actuator by simply removing the cap on the top.
- Special compact limit switch box is expected to save space for the piping.

❻Air saving and use of environment-friendly paint :

- Compact actuator saves on air consumption.
- Environment-friendly paint is used.

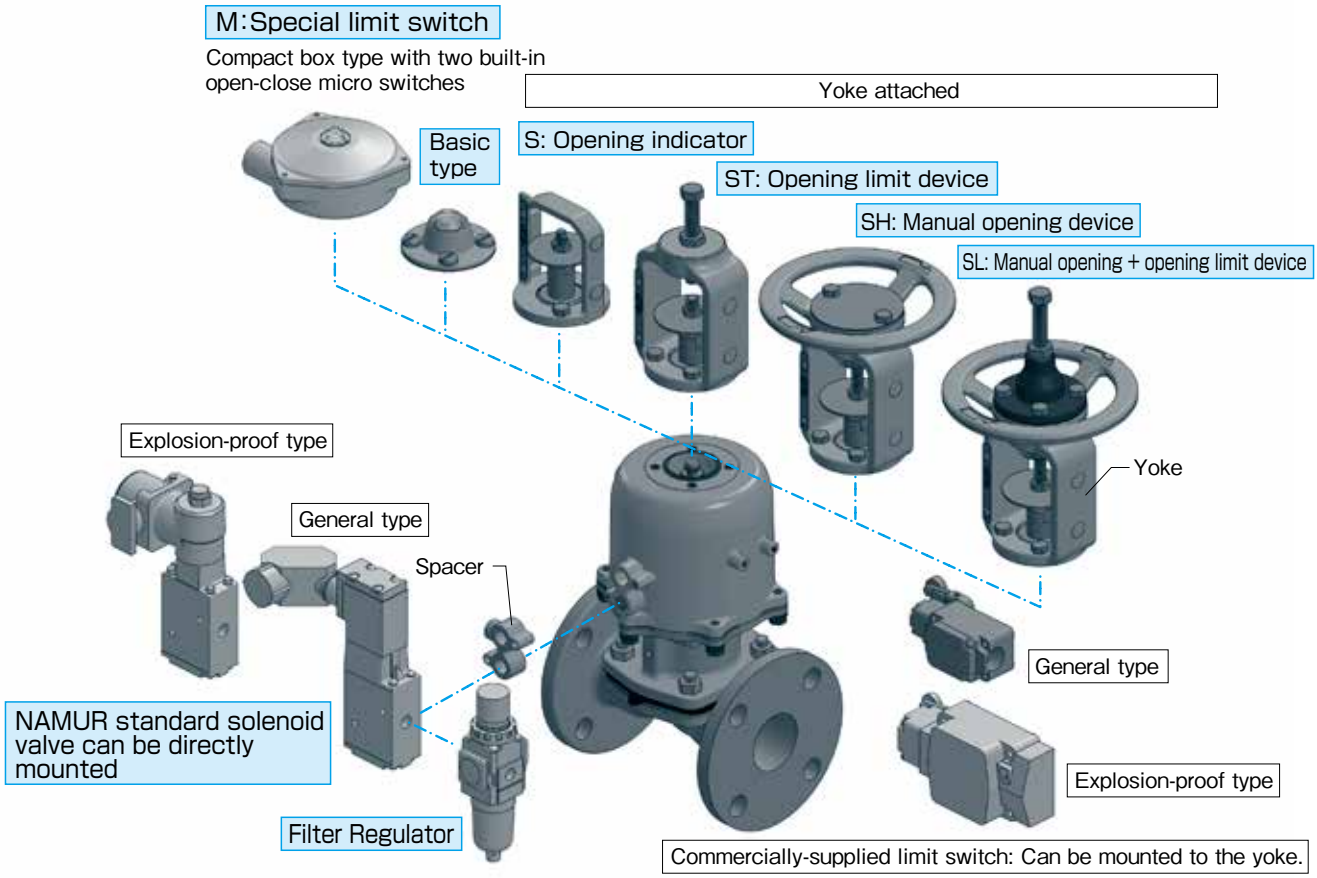


② Actuator specifications

●Standard specifications

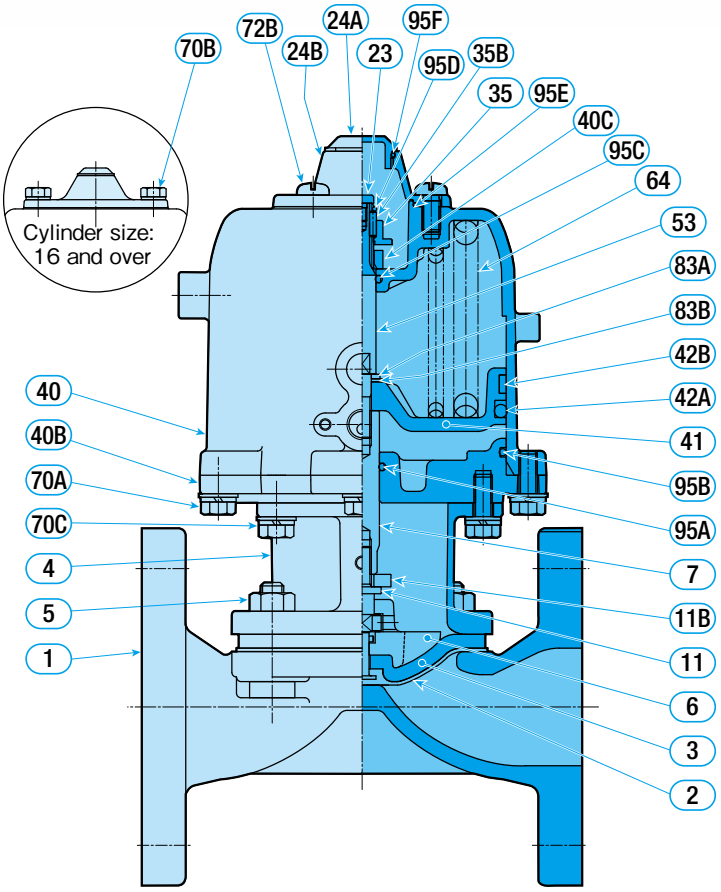
Operation	Reverse acting type (Air to Open/Spring to Close): Type PO1400N, Type PO1500N
	Direct acting type (Air to Close/Spring to Open) : Type PC1400N
	Double acting type (Air to Open/Air to Close) : Type PN1400N, Type 1500N
Actuator type	Piston Type (With wear ring)
Operating pressure	0.4 $^{+0.1}_{0}$ MPa, Optional: 0.3 $^{+0.1}_{0}$ MPa
Bonnet material	SCPH2···DN100 or under, Optional: SCS13
	FC200···DN125 or over, Optional: SCS13
Cylinder material	ADC12(Aluminum diecast), Optional: Cylinder base SCPH2
Standard exterior painting color	Silver (environment-friendly type)
Nameplate	Seal nameplate reading "Product name/LP/OP/SER No./TAG No." is attached on the exterior surface of the actuator.
Applicable nominal size range	DN15-150

Ancillary Devices



・Spacer: Required for the explosion-proof type solenoid valve, direct and/or double acting type. Pneumatic piping is required to the upper cylinder in the case of the direct and/or double acting type.
・Optional: Closing limit device, 2-stage open-close device.

Standard Manufacturing Specification (Type PO1400N-TX)



Part No.	Name
1	Main body
2	Diaphragm
3	Cushion rubber
4	Bonnet
5	Bolt
	Nut
6	Compressor
7	Spindle
11	Compressor suspension
11B	Washer
23	Indicator
24A	Cap A
24B	Cap B
35	Stopper nut
35B	Pin
40	Cylinder
40B	Base
40C	Spacer
41	Piston
42A	O-ring

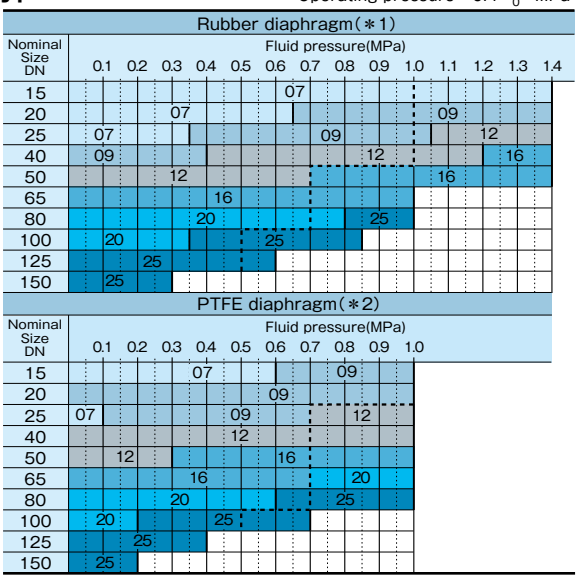
Part No.	Name
42B	Wear ring
53	Stem
64	Coil spring
70A	Hexagonal bolt
	Spring washer
	Plain washer
70B	Hexagonal bolt
	Plain washer
70C	Hexagonal bolt
	Spring washer
	Plain washer
72B	Slotted round head screw
83A	Washer
83B	Seal washer
95A	O-ring
95B	O-ring
95C	O-ring
95D	O-ring
95E	O-ring
95F	O-ring

2. Weir Type Diaphragm Valve: Type PO(PC,PN)/HO(HC,HN) 1400N

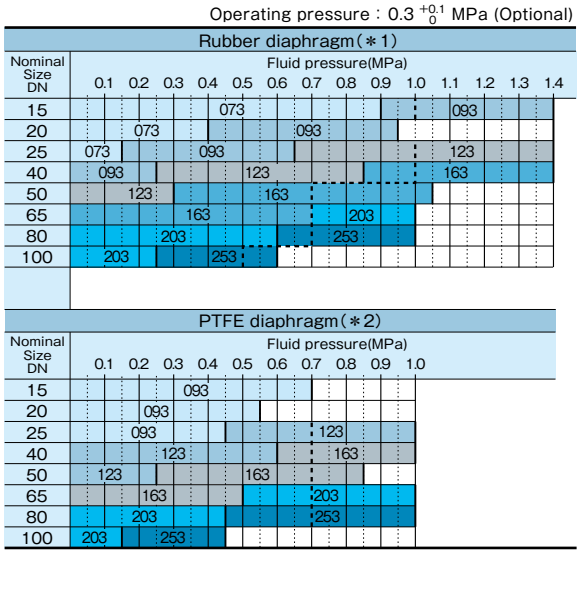
① Actuator selection table

●Reverse acting type: Type PO1400N

Operating pressure : 0.4 $^{+0.1}_{0}$ MPa

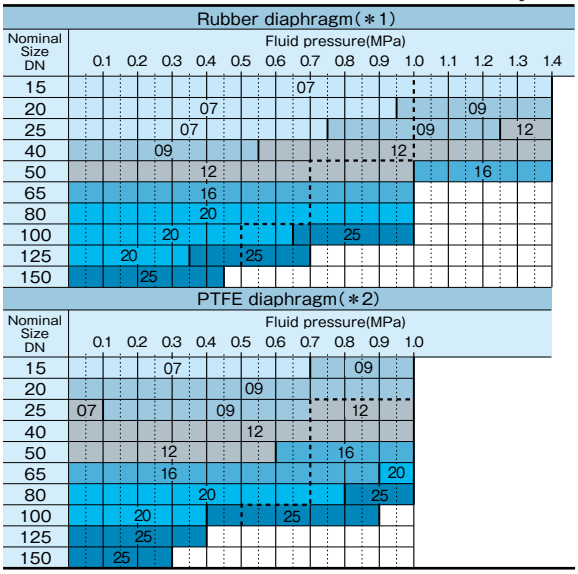


Operating pressure : 0.3 $^{+0.1}_{0}$ MPa (Optional)

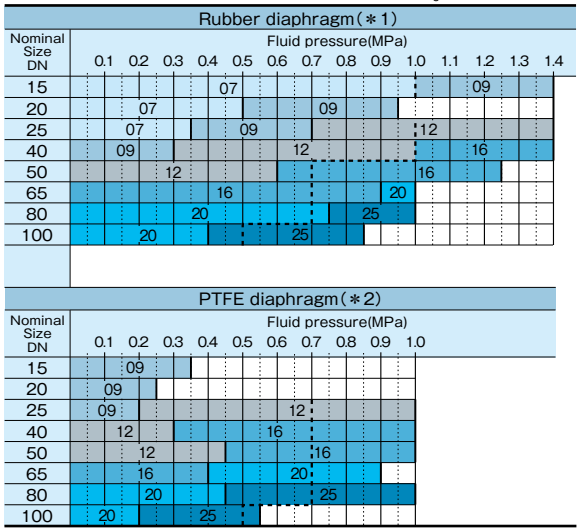


●Direct acting type: Type PC1400N

Operating pressure : 0.4 $^{+0.1}_{0}$ MPa

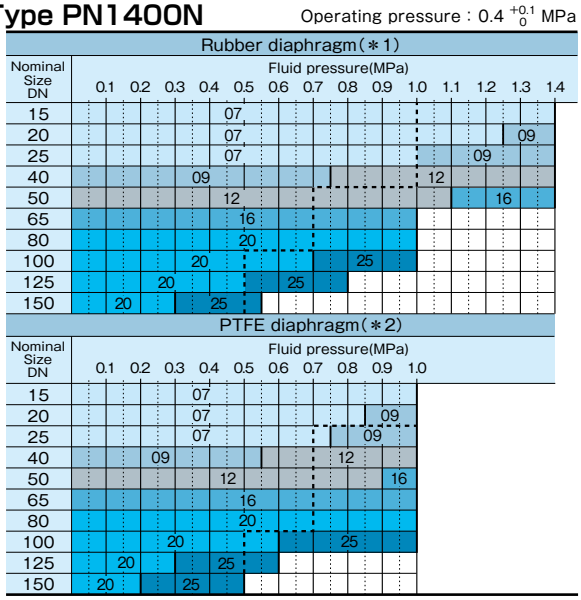


Operating pressure : 0.3 $^{+0.1}_{0}$ MPa (Optional)

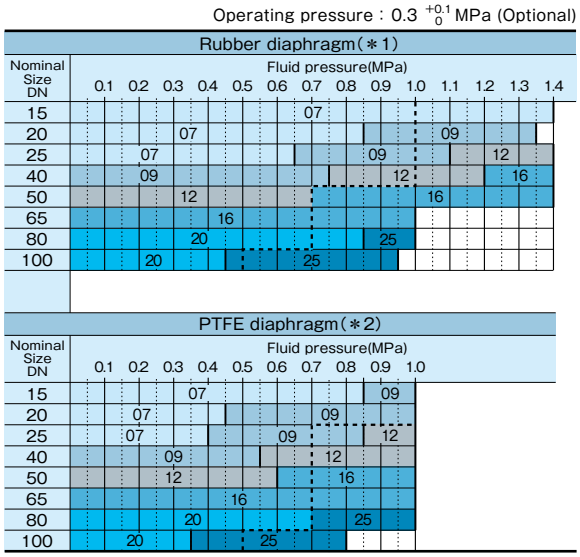


●Double acting type: Type PN1400N

Operating pressure : 0.4 $^{+0.1}_{0}$ MPa



Operating pressure : 0.3 $^{+0.1}_{0}$ MPa (Optional)



(＊1) : —— Max. allowable working pressure for other than the glass-lined and ceramic body
····· Max. allowable working pressure for the glass-lined and ceramic body
(＊2) : —— Max. allowable working pressure for other than the hard rubber-lined, glass-lined and ceramic body
····· Max. allowable working pressure for the hard rubber-lined, glass-lined and ceramic body

●Reverse acting type: Type HO1400N (For large bore and high output)

Working pressure : 0.4 $^{+0.1}_{0}$ MPa

Rubber diaphragm

Nominal Size DN	Actuator Code	Max. allowable working pressure for other than the glass-lined and ceramic body — Fluid pressure(MPa) 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
100	3147ABC	
125	3147ABC	
150	3147ABC	
	4048BC	
200	3147ABC	
	4048ABC	
250	4048ABC	

Nominal Size DN	Actuator Code	Max. allowable working pressure for the glass-lined and ceramic body — Fluid pressure(MPa) 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
125	3147AB	
150	3147ABC	
200	3147ABC	
	4048ABC	
250	4048ABC	

Working pressure : 0.4 $^{+0.1}_{0}$ MPa

PTFE diaphragm

Nominal Size DN	Actuator Code	Max. allowable working pressure for other than the hard rubber-lined, glass-lined and ceramic body — Fluid pressure(MPa) 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
100	3147ABC	
125	3147ABC	
150	3147ABC	
	4048BC	
200	3147ABC	
	4048ABC	
250	4048ABC	

Nominal Size DN	Actuator Code	Max. allowable working pressure for the hard rubber-lied, glass-lined and ceramic body — Fluid pressure(MPa) 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
125	3147ABC	
150	3147ABC	
200	3147ABC	
	4048ABC	
250	4048ABC	

●Direct acting type: Type HC1400 (For large bore and high output)

Working pressure: See MPa in the table below

Rubber diaphragm

Nominal Size DN	Actuator Code	Max. allowable working pressure for than the glass-lined and ceramic body — Fluid pressure(MPa) 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
150	3167	0.25 0.3 0.4

Nominal Size DN	Actuator Code	Max. allowable working pressure for the glass-lined and ceramic body — Fluid pressure(MPa) 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
150	3167	0.25 0.3

Working pressure: See MPa in the table below

PTFE diaphragm

Nominal Size DN	Actuator Code	Max. allowable working pressure for other than the hard rubber-lined, glass-lined and ceramic body — Fluid pressure(MPa) 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
150	3167	0.25 0.4

Nominal Size DN	Actuator Code	Max. allowable working pressure for the hard rubber-lied, glass-lined and ceramic body — Fluid pressure(MPa) 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
150	3167	0.25 0.4

●Double acting type: Type HN1400N (For large bore and high output)

Working pressure: See MPa in the table below

Rubber diaphragm

Nominal Size DN	Actuator Code	Max. allowable working pressure for other than the glass-lined and ceramic body — Fluid pressure(MPa) 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
125	31	0.2 0.25
150	31	0.2 0.25 0.3 0.4
200	31	0.25 0.3 0.4
	40	0.2 0.25 0.3 0.4
250	31	0.25 0.4
	40	0.2 0.25 0.3 0.4
300	31	0.4
	40	0.4

Nominal Size DN	Actuator Code	Max. allowable working pressure for the glass-lined and ceramic body — Fluid pressure(MPa) 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
125	31	0.2
150	31	0.2 0.25 0.3
200	31	0.25 0.3 0.4
	40	0.2 0.25 0.3
250	31	0.25 0.3
	40	0.2 0.25 0.3 0.4
300	31	0.4
	40	0.4

Working pressure: See MPa in the table below

PTFE diaphragm

Nominal Size DN	Actuator Code	Max. allowable working pressure for the hard rubber-lied, glass-lined and ceramic body — Fluid pressure(MPa) 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
125	31	0.2 0.25
150	31	0.25 0.3 0.4
200	31	0.3 0.4
	40	0.25 0.3 0.4
250	31	0.3 0.4
	40	0.25 0.3 0.4

Nominal Size DN	Actuator Code	Max. allowable working pressure for the hard rubber-lied, glass-lined and ceramic body — Fluid pressure(MPa) 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0
125	31	0.2
150	31	0.25 0.3
200	31	0.3 0.4
	40	0.25 0.3 0.4
250	31	0.3 0.4
	40	0.25 0.3 0.4

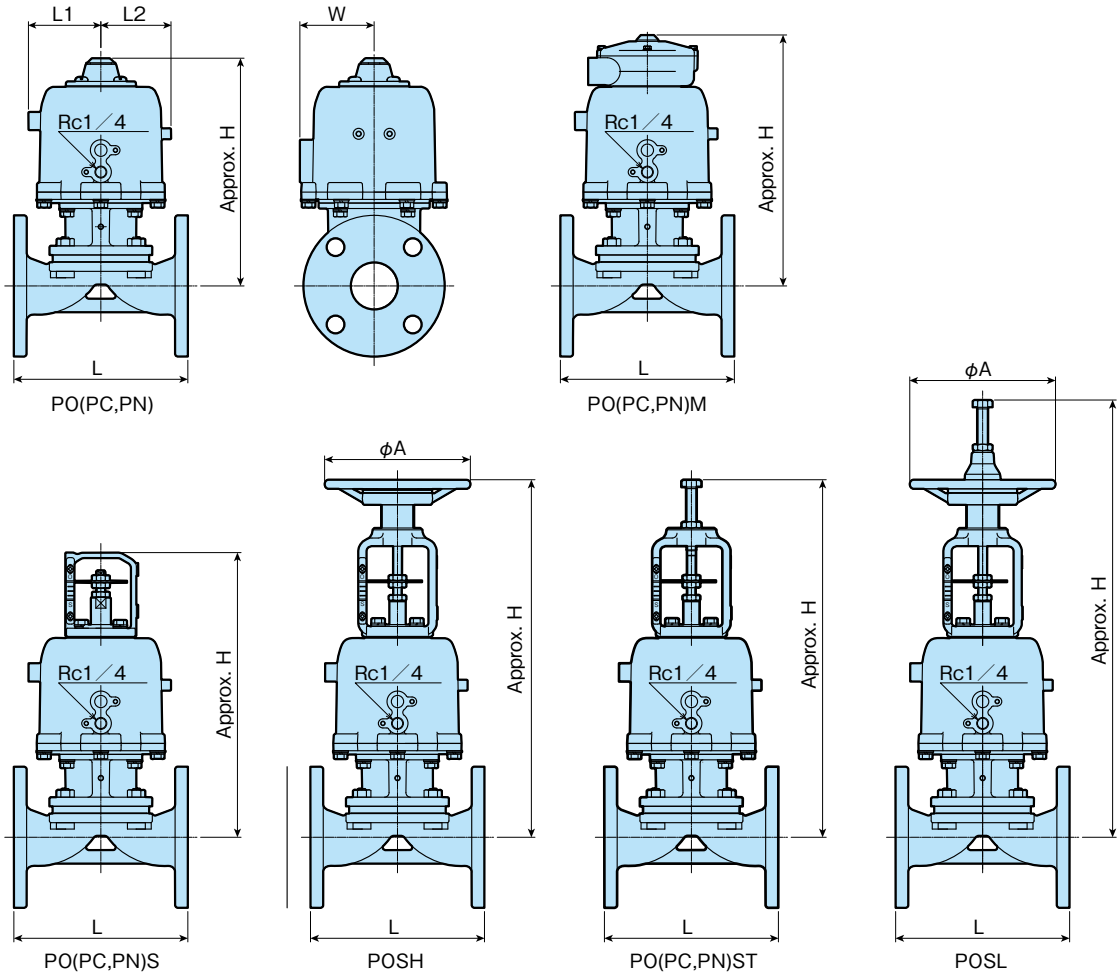
Remark : The stroke and Cv value are different between Type PO(PC,PN)1400N and Type HO(HC,HN)1400N, while choosing the same nominal size. For the details, contact our Sales Dept. or local representative.

Actuator selection table in this catalog represents the data when the secondary pressure is atmospheric with the valve fully closed. See 6. Reference Material for more detail.

2. Weir Type Diaphragm Valve: Type PO(PC, PN)/HO(HC, HN) 1400N

② Principal dimensions

●Type PO(PC, PN) 1400N Principal dimensions



Unit: mm

Nominal Size DN	Face-to-face length: L		Actuator Code	Principal dimensions									
				Approx. H						A	W	L1	L2
	Other than rubber-lined and resin-lined	Rubber-lined and resin lined		PO PC PN	POM PCM PNM	POS PCS PNS	POSH — —	POST PCST PNST	POSL — —				
15	102	107	07	196	221	258	321	338	411	160	56	54	52
			09	218	243	280	343	360	433	160	64	62	59
20	118	123	07	192	217	254	319	334	409	160	56	54	52
			09	214	239	276	341	356	431	160	64	62	59
			12	221	246	283	348	363	438	160	82	80	77
25	127	132	07	204	229	266	333	346	423	160	56	54	52
			09	226	251	288	355	368	445	160	64	62	59
			12	233	258	295	362	375	452	160	82	80	77
40	159	165	09	232	258	295	366	375	456	160	64	62	59
			12	239	265	302	373	382	463	160	82	80	77
			16	265	303	373	499	507	603	250	101	98	96
50	191	197	12	248	273	310	388	390	477	160	82	80	77
			16	274	312	381	514	515	617	250	101	98	96
65	216	222	16	291	354	398	535	532	639	250	101	98	96
			20	342	405	449	586	598	705	250	122	119	117
80	254	260	20	359	422	466	609	615	728	250	122	119	117
			25	397	460	516	683	681	822	400	147	143	143
100	305	313	20	375	438	483	636	632	755	250	122	119	117
			25	414	476	532	710	697	849	400	147	143	143
125	356	364	20	439	502	547	700	696	819	250	122	119	117
			25	478	540	596	774	761	913	400	147	143	143
150	406	414	20	461	524	569	722	718	841	250	122	119	117
			25	500	562	618	796	783	935	400	147	143	143

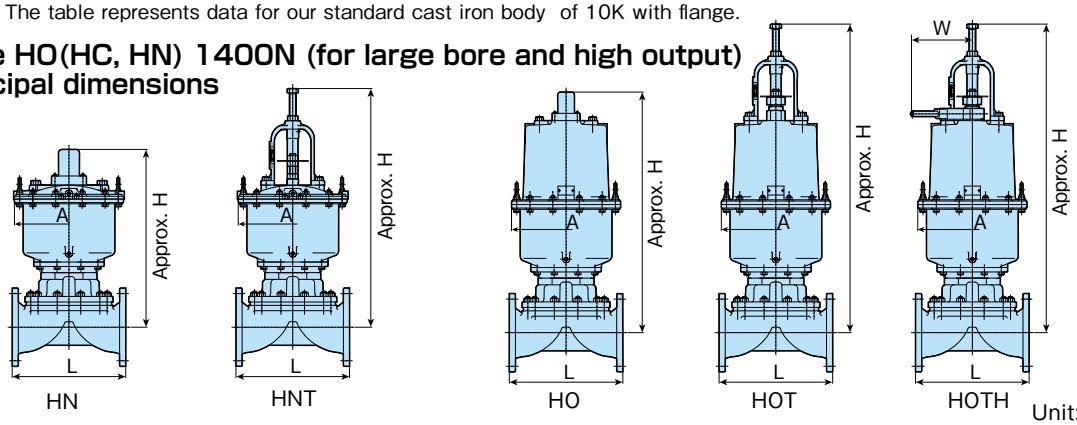
●Type PO(PC, PN) 1400N Mass table

Unit: approx. kg

Nominal Size DN	Operation / Actuator Code	Basic type PO	Basic type PC	Basic type PN	Additional mass for ancillary device POM PCM PNM	POS PCS PNS	POSH — —	POST PCST PNST	POSL — —
15	07	3.1	3	2.9					
	09	3.6	3.5	3.3					
20	07	3.3	3.2	3.1					
	09	3.8	3.7	3.5					
	12	5.6	4.7	4.3					
25	07	4.6	4.5	4.4					
	09	5.1	5	4.8					
	12	6.9	6	5.6					
40	09	7.2	7.1	6.9					
	12	9	8.1	7.7					
	16	12.4	10.5	10	+1	+1.5	+6.2	+4.3	+7.9
50	12	11.3	10.4	10	+0.5	+0.6	+2	+1.5	+2.5
	16	14.7	12.8	12.3					
65	16	18.5	16.6	16.1					
	20	24.5	21.5	20	+1	+1.5	+6.2	+4.3	+7.9
80	20	29.3	26.3	24.8					
	25	42.7	31	29.5	+1.3	+2.6	+11.8	+7.5	+15
100	20	37.5	34.5	33	+1	+1.5	+6.2	+4.3	+7.9
	25	50.9	39.2	37.7	+1.3	+2.6	+11.8	+7.5	+15
125	20	64	61	59	+2	+1.5	+6.2	+4.3	+7.9
	25	77	66	64	+2	+2.6	+11.8	+7.5	+15
150	20	82	79	78	+2	+1.5	+6.2	+4.3	+7.9
	25	95	84	82	+2	+2.6	+11.8	+7.5	+15

・The table represents data for our standard cast iron body of 10K with flange.

●Type HO(HC, HN) 1400N (for large bore and high output) principal dimensions



Unit: mm

	Nominal Size DN	Face-to-facelength; L: Other than rubber-lined and resin-lined	Face-to-facelength; L: Rubber-lined and resin-lined	Actuator Code	Principal dimensions: Approx. H HO	Approx. H HOT HOTH	A	W	Mass: approx. kg HO	HOT	HOTH	Air chamber capacity:l
Single acting type (HO)	125	356	364	3147AB	838	1062	396	238	146	157	159	13.2
				3147ABC	838	1062	396	238	159	171	173	13.2
				4048 C	922	1226	495	412	220	241	245	22.6
	150	406	414	3147AB	860	1084	396	238	162	174	176	13.2
				3147ABC	860	1084	396	238	175	187	189	13.2
				4048 C	944	1258	495	412	236	257	261	22.6
				4048 BC	944	1258	495	412	255	275	279	22.6
	200	521	529	3147ABC	952	1280	396	238	248	259	261	13.2
				4048 C	1036	1370	495	412	309	330	334	22.6
				4048ABC	1036	1370	495	412	332	353	357	22.6
	250	635	645	4048ABC	1107	1460	495	412	410	431	435	22.6

	Nominal Size DN	Face-to-facelength; L: Other than rubber-lined and resin-lined	Face-to-facelength; L: Rubber-lined and resin-lined	Actuator Code	Principal dimensions: Approx. H HN	Approx. H HNT	A	Mass: approx. kg HN	HNT	Air chamber capacity:l Lower chamber	Upper chamber
Double acting type (HN)	150	406	414	31	630	990	396	133	142	13.2	6.1
	200	521	529	31	720	1105	396	211	220	13.2	9.1
				40	790	1145	495	240	255	22.6	12.3
	250	635	645	31	790	1180	396	290	299	13.2	10.6
				40	860	1220	495	312	333	22.6	14.8
	300	749	759	31	826	1213	396	365	375	13.2	12.1
				40	903	1262	495	390	410	22.6	17.3

Remarks : 1.The air intake ports are Rc1/4.
2.Height of product represents cast iron body for other than rubber-lined and resin-lined, and hard rubber lining body for rubber-lined and resin-lined.
3.The mass of product is for cast iron body of 10K with flange.

2 3. Straight Type Diaphragm Valve: Type PO(PN)/HO(HN)1500N

① Actuator selection table

Reverse acting type: Type PO1500N

Working pressure : 0.4 $^{+0.1}_{0}$ MPa

Nominal Size DN	Actuator Code	Fluid pressure(MPa) 0.1	0.2	0.3	0.4	0.5	0.6	0.7
15/20	12B							
25/40	16BC							
50	20BC							
65	25BC							
80	25ABC							
100	25ABC							

Double acting type: Type PN1500N

MPa in the table below

Nominal Size DN	Actuator Code	0.1	0.2	0.3	0.4	0.5	0.6	0.7
15/20	09	0.25		0.3			0.35	
25/40	12		0.25		0.3		0.35	
50	16		0.2		0.25		0.3	0.35
65	20		0.2			0.25		0.3
80	20	0.25		0.25		0.3	0.35	0.4
100	25		0.2			0.25		0.3

Reverse acting type: Type HO1500N (for large bore and high output)

Working pressure : 0.4 $^{+0.1}_{0}$ MPa

Nominal Size DN	Actuator Code	Fluid pressure(MPa) 0.1	0.2	0.3	0.4	0.5	0.6	0.7
125	3147ABC							
	4048BC							
150	4048BC							

Double acting type: Type HN1500N (for large bore and high output)

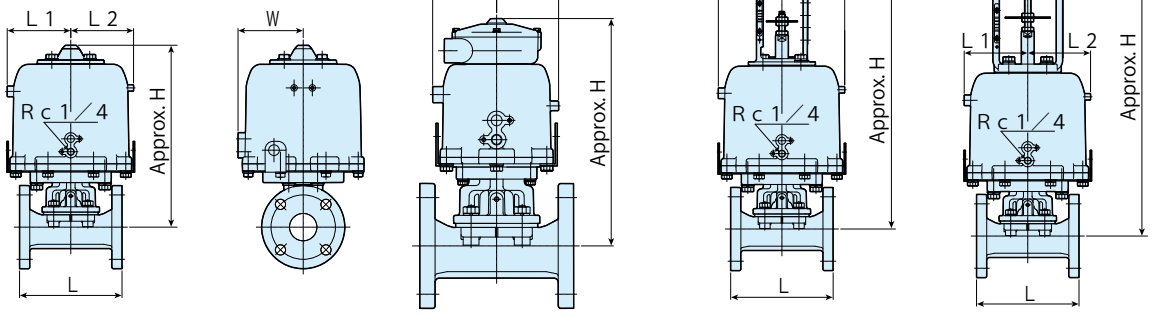
Working pressure : MPa in the table below

Nominal Size DN	Actuator Code	0.1	0.2	0.3	0.4	0.5	0.6	0.7
125	31		0.15		0.2		0.25	
150	31	0.2	0.25	0.3	0.35			
200	3512	0.25	0.3	0.35	0.4			
250	3513	0.25	0.3	0.35	0.4			
300	4014	0.25	0.3	0.35	0.4			

Actuator selection table in this catalog represents the data when the secondary pressure is atmospheric with the valve fully closed. See 6. Reference Material for more detail.

② Principal dimensions

Type PO(PN) 1500N principal dimensions



PO(PN) PO(PN)M PO(PN)S POSH

Unit: mm

	Nominal Size DN	Face-to-face length: L Other than rubber-lined	Face-to-face length: L Rubber-lined	Actuator Code	Principal dimensions Approx. H PO PN	Approx. H POM PNM	Approx. H POS PNS	Approx. H POSH	A	W	L1	L2
Single acting type (PO)	15	102	107	12B	228	253	290	357	160	82	80	77
	20	118	123	12B	228	253	290	357	160	82	80	77
	25	127	132	16BC	277	315	385	517	250	101	98	96
	40	159	165	16BC	277	315	385	517	250	101	98	96
	50	191	197	20BC	340	403	447	584	250	122	119	117
	65	216	222	25BC	405	468	524	702	400	147	143	143
	80	254	260	25ABC	426	489	545	723	400	147	143	143
	100	305	313	25ABC	427	490	546	724	400	147	143	143
Double acting type (PN)	15	102	107	09	221	246	283	—	—	64	62	59
	20	118	123	09	221	246	283	—	—	64	62	59
	25	127	132	12	251	277	314	—	—	82	80	77
	40	159	165	12	251	277	314	—	—	82	80	77
	50	191	197	16	288	351	396	—	—	101	98	96
	65	216	222	20	367	430	474	—	—	122	119	117
	80	254	260	20	388	451	495	—	—	122	119	117
	100	305	313	25	427	490	546	—	—	147	143	143

・H : Height of hard rubber lining

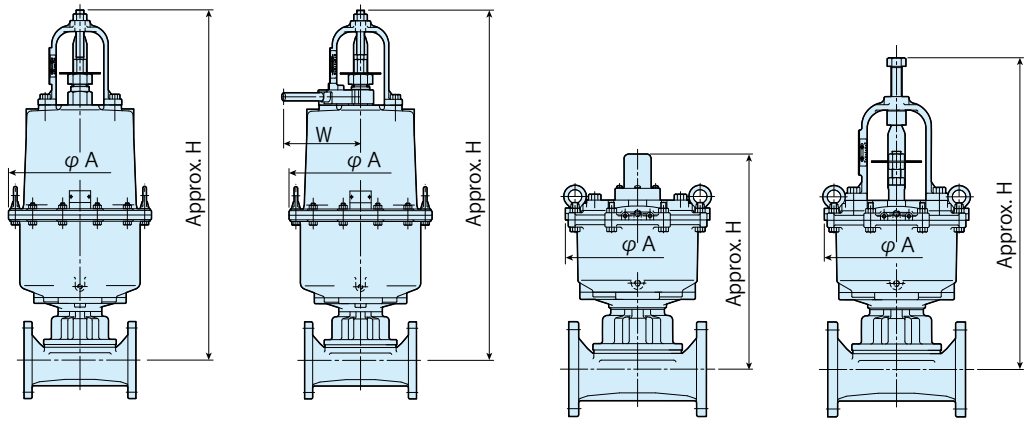
●Type PO(PN) 1500N table of mass

Unit : approx . kg

	DN	Actuator Code	Basic type	Added mass for ancillary device		
			PO PN	POS PNS	POM PNM	POSH
Single acting type (PO)	15	12BC	6.2	+0.6	+0.5	+2
	20	12BC	6.6	+0.6	+0.5	+2
	25	16BC	12.0	+1.5	+1	+6.2
	40	16BC	13.9	+1.5	+1	+6.2
	50	20BC	24.7	+1.5	+1	+6.2
	65	25BC	43.3	+2.6	+1	+11.8
	80	25ABC	48.2	+2.6	+1	+11.8
	100	25ABC	54.2	+2.6	+1	+11.8
Double acting type (PN)	15	09	4.1	+0.6	+0.5	—
	20	09	4.5	+0.6	+0.5	—
	25	12	7.0	+1.5	+1	—
	40	12	8.9	+1.5	+1	—
	50	16	16.3	+1.5	+1	—
	65	20	25.1	+2.6	+1	—
	80	20	30.0	+2.6	+1	—
	100	25	41.0	+2.6	+1	—

・The mass is for our standard cast iron body of 10K with flange.

●Type HO(HN) 1500N (for large bore and high output) principal dimensions



HOT　HOTH　HN　HNT

Unit : mm

	Nominal Size DN	Face-to-face length: L		Actuator Code	Principal dimensions			Mass: approx. kg		Air chamber capacity: l
		Other than rubber-lined	Rubber-lined		Approx. H HOT HOTH	A	W	HOT	HOTH	
Single acting type (HO)	125	356	364	3147BC	977	396	238	171	173	13.2
				4048BC	1133	495	412	241	245	22.6
	150	406	414	4048BC	1171	495	412	275	279	22.6

	Nominal Size DN	Face-to-face length: L		Actuator Code	Principal dimensions			Mass: approx. kg		Air chamber capacity: l	
		Other than rubber-lined	Rubber-lined		Approx. H HN	HNT	A	HN	HNT	Lower chamber	Upper chamber
Double acting type (HN)	125	356	364	31	629	879	396	117	126	12.4	8.3
	150	406	414	31	667	976	396	133	142	13.2	9.1
	200	521	529	3512	705	-	460	226	-	16.0	20.0
	250	635	645	3513	815	-	460	250	-	20.0	21.0
	300	749	759	4014	922	-	520	460	-	29.0	30.0

Remarks : 1.The air intake ports are Rc1/4 with exception that air intake ports of actuator 3512,3513 & 4014 is Rc3/8.
2.Height of product represents cast iron body for other than rubber-lined, and hard rubber lining body for rubber-lined.
3.DN200 to 300 are for the double acting Type HN1500. For further details. contact our Sales Dept. or local representative.

2 4. Reference Material

① Air chamber capacity and air consumption

Air chamber capacity: Type PO(PC/PN) 1400N / PO(PN) 1500N

	Actuator code	A : PO (Lower chamber)	B : PC (Upper chamber) C : PN (Upper chamber)	D : PN (Lower chamber)
Air chamber capacity: l	07	0.1	0.1	0.2
	09	0.2	0.3	0.3
	12/12BC	0.5	0.7	0.7
	16/16BC	1.0	1.1	1.4
	20/20BC	2.2	2.7	3.0
	25/25BC/25ABC	3.1	4.7	5.5

Air consumption

Cumulative air consumption needed for cylinder operation (one count per round of cylinder operation) can be calculated with the following equation.
[Equation for calculating the air consumption]
where; Q = Air consumption (Nl), P = Working pressure (MPa)
A - D = Air chamber capacity (l), N = Number of operation (1 operation = 1 round of operation)

- PO (Reverse acting type): Q=(1OP+1)A x N
- PC (Direct acting type): Q=(1OP+1)B x N
- PN (Double acting type): Q={(1OP+1) x (C+D)} x N

② Accessories

Limit switch

		Exclusive limit switch	Commercially-supplied limit switch	
Type		Rainproof type (IP67 comparable)	Rainproof type	Explosion-proof type (Ex de ⅡC T6)
Type No.		MDN	1LS19-J	1LX7001-J
Rated voltage	AC	5A-125、3A-250V	10A-125、250、480V	5A、250V
	DC	—	0.8A-125V 0.4A-250V	0.8A-125V 0.4A-250V
Connector		G1/2(JIS B 0202)	G1/2(JIS B 0202)	
Manufacturer		NDV	Azbil	

- Exclusive limit switch
  Special box with built-in micro switches is attached to the actuator. Compact in size and can be commonly applied to Types PO, PC, PN 1400N.
- Commercially-supplied limit switch
  Please designate rainproof type or explosion-proof type. Commercially-supplied limit switch will be installed with an opening indicator installed (to the yoke.) If a limit switch other than our standard switch is required, mounting parts will be specially designed.
  (In case of DN20 or less, only 1LS19-J is applicable. In case that other products are required, contact our Sales Dept. or local representative.)

Solenoid

Type	Rainproof type		Explosion-proof type		Rainproof type		Explosion-proof type	
Type No.	EC20	EC20R	EC30	EC30R	EV20	EV20R	EV30	EV30R
Actuator	PO、PN	PC	PO、PN	PC	PO、PN	PC	PO、PN	PC
Rated voltage	AC100V、110V、200V、220V、DC24V				AC100V、200V、DC24V		AC100V、110V、200V、220V、DC24V	
Connection bore	Rc1/4				Rc1/4			
Explosion-proof performance	—		d2G4		—		d2G4,Ex d ⅡB T4	
Connector	G1/2(JIS B 0202)				G1/2(JIS B 0202)			
Manufacturer	CKD				SMC			

Solenoid for NAMUR standard connection can be directly installed.

Filter Regulator

Type No.	AW20-02EH-CR-X2127
Connection bore	Rc1/4
Supply pressure	MAX:1.0MPa
Filtration granularity	5 μm
Manufacturer	SMC

Type PN1500N will be standard installed with a regulator (AR20K-02EH-X2156) on the closing side.

Accessories other than stated above can be installed as designated. For the details, contact our Sales Dept. or local representative.

5

INTRODUCTION OF RELATED PRODUCTS

5 INTRODUCTION OF RELATED PRODUCTS

① Gauge Valve type: Type 400G

- Liquid level inspection valve using the structure and features of weir type diaphragm valve.
- Main body made of lining material (hard natural rubber, glass, etc.) is corrosive liquid resistant.
- Applicable nominal size: DN20

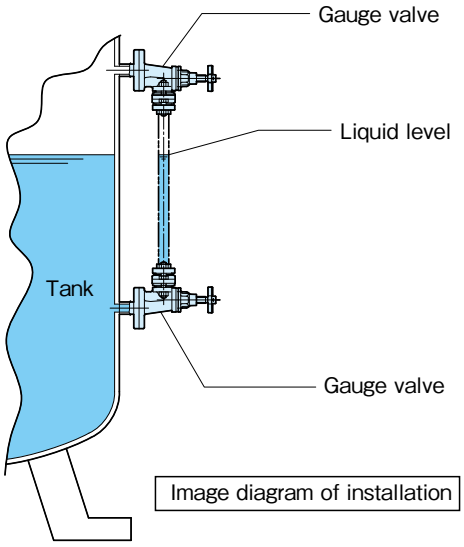


Image diagram of installation

② Rubber-lined Check Valve

- Check valve with rubber lining material is manufactured using technology for rubber lining processing.
- Sealing system for DN15 – 80 is a ball type valve body and DN100 and 150 a swing type valve body.
- This valve is exclusively for a vertical piping. (Swing type valve body is applicable to level installation as well.)

③ Bioclean Diaphragm Valve series

- Valves of optimal sanitary specifications are available for the production lines of pharmaceutical, cosmetic, food, semiconductor and other industries.
  Bioclean Diaphragm Valve series most utilize the advantages of diaphragm valve structure that “contaminates no fluid and provides superb self-purifying performance.”
- For more details, please refer to our Sanitary-related Valve Product Guide.

Order made system available to develop products meet customers' need;
Inquire us for other options for actuators, special shaped body, special material products, etc.

6

REFERENCE MATERIALS

① Flange dimensions:Basic dimensions and standard face-to-face dimensions for JIS 10K flange

② Special specifications: Nameplate, Painting, Photography and Witness inspection

③ How to read the product code number

④ Material selection table

⑤ Actuator selection table

6 REFERENCE MATERIALS

① Flange dimensions: Basic dimensions and standard face-to-face dimensions for JIS 10K flange

Unit: mm

Nominal Size DN	Outside Size D	Thickness t			Bolt hole			Bolt nomination	Raised face (RF)		Standard face-to-face dimension		
											Flange type		Screwed type
		FC	Other than FC	Rubber-lined, resin-lined	Diameter C of center circle	Quantity	Diameter h		g	f	Other than rubber-lined, resin-lined	Rubber-lined, resin-lined	
10	90	13	10	3	65	4	15	M12	46	1	102	107	—
15	95	13	10	3	70	4	15	M12	51	1	102	107	64
20	100	13	10	3	75	4	15	M12	56	1	118	123	93
25	125	13	10	3	90	4	19	M16	67	1	127	132	108
32	135	16	13	3	100	4	19	M16	76	2	159	165	—
40	140	16	13	3	105	4	19	M16	81	2	159	165	140
50	155	19	14	3	120	4	19	M16	96	2	191	197	165
65	175	19	14	3	140	4	19	M16	116	2	216	222	203
80	185	19	14	3	150	8	19	M16	126	2	254	260	254
100	210	22	17	4	175	8	19	M16	151	2	305	313	—
125	250	22	17	4	210	8	23	M20	182	2	356	364	—
150	280	22	17	4	240	8	23	M20	212	2	406	414	—
200	330	25	19	4	290	12	23	M20	262	2	521	529	—
250	400	25	19	5	355	12	25	M22	324	2	635	645	—
300	445	29	22	5	400	16	25	M22	368	3	749	759	—

Flange type

1. **Flange standard:**
   The above standard comply with JIS B2220 (steel pipe flange with nominal pressure of 10K). The flange thickness t shall comply with BS10 Part 2-TABLE D (British Standard Class D).
2. **The flange thickness t shall be classified as follows:**
   FC: Gray casting, ductile steel casting
   Other than FC: Steel casting, stainless steel casting, and bronze casting
3. **Packing face:**
   Standard face shall be flat face. The above table shall apply to stainless steel casting, particularly when raised face is specified. The standard of this company shall apply to ETFE-, PFA-, and glass-lined material for the main body that constitute a raised face from their manufacturing method.
4. **Other Standers:**
   We also manufacture flanges under other standards such as ANSI Class 125/150. Standards of Japan Water Works Association, DIN PN10/16. The thickness of flanges shall be all as per above-mentioned table.(Depending on body materials, either of ANSI Standard Class 125 or 150 is applied, but the both flange bolt hole pattern is same.)
5. **Face-to-face dimension:**
   Complies with ISO 5752.
6. **Bolt and nut:**
   Because of narrow space for the hexagon piping nut on the back of the flange of nominal size DN15 – 80, use of continuous-thread stud and hexagonal nut of JIS Standard (8-slit nut) is recommended.

② Special specifications: Nameplate, Painting, Photography and Witness inspection

1. **Nameplate:**
   Nameplates indicating the valve name and other special naming are available by option.
2. **Painting:**
   Standard painting shall be as follows:
   Manually operated valves: Rust resistant paint (Gray) without top coating
   Automatically operated valves (pneumatic and electric): Rust resistant paint and silver top paint
   For special coating, please specify details for separate estimate.
3. **Photography:**
   Photography is available by option.
4. **Witness inspection:**
   Witness inspection by inspection agency is option.

③ How to read the product code number

●Basic system for product code number

P	O	S	T	1	4	3	0	(04)	N *	–	EP	–	1	0	0	–	20	–	J10KFF
①		②		③	④	⑤		⑥			⑦		⑧				⑨		⑩
Operating system		Ancillary device		Operating section	Valve type	Material of main body		Special body/lining base material			Material of diaphragm		Nominal size				Actuator code		Connection standard

①Operating system

Manually operated valve	None	Standard handwheel type
	G	Gear operated type
	QL	Quick open-close type
Pneumatically operated valve	PO(HO)	ON-OFF valve, reverse acting type
	PC(HC)	ON-OFF valve, direct acting type
	PN(HN)	ON-OFF valve, double acting type
	BO	Rolling diaphragm type control valve, reverse acting type
	BC	Rolling diaphragm type control valve, direct acting type
Electrically operated valve	MRS	MS type actuator (Manufactured by Seibu Denki)
	M#S	
	NR#	NR type actuator (Manufactured by Nihon Koso)

②Ancillary device

None	Standard actuator
L	With the lock nut
S	With the opening indicator
M	With a limit switch/exclusive limit switch box
SH	With the manual opening device: for Types PO1400N(1500N)
ST	With the opening limit device: for Types PO(PC, PN)1400N(1500N)
SL	With the manual opening + opening limit device: for Types PO1400N(1500N)
T	With the opening limit device: for Types HO(HC, HN)1400N(1500N)
TH	With the manual opening + opening limit device: for Types HO1400N(1500N)
H	With the manual operated device: for Types BO(BC)3400

③Operating section

None	Manually operated valve
1	Pneumatically operated type ON-OFF valve
3	Pneumatically operated type flow control valve
4	Electrically operated valve

④Valve type

4	Weir type diaphragm valve: Type 400
5	Straight type diaphragm valve: Type 400

⑤Material of main body···See p10 and p15

⑥Special body/lining base material

None	Standard two-face body
L	Angle type
S,04 etc.	Lining base material:⑤Dependent on a main body material code

(Also depend on requested material and type.)

⑦Diaphragm material··· See p.11 and 15.

⑧Nominal size: (DN or A)
Compliant with ISO 6708 and JIS B 2001.

⑨Actuator code : Compliant with respective selection tables. (In the case of an electrically operated valve, our 8-digit code number will be given according to requested valve specifications.)

⑩Connection standard

J10KFF	JIS 10KFF
J10KRF	JIS 10KRF
A125FF	ANSI CL125FF
A150RF	ANSI CL150RF
PT	Tapered screw for the piping
JT	General TIG welded joint
SW	Insert welded type

(Other standard may be arranged as requested.)

*Improved product ID code (To be determined at the time of valve selection. Requires no selection by customer.)

None	First time
N	First improvement
NB	Second improvement
NC	Third improvement

[Notation example]

・Example for a manually operated valve

	S		4	0	1	( )	NB *	–	CR	–	0	2	5	–		–	J10KFF
①	②	③	④	⑤		⑥			⑦		⑧				⑨		⑩

Standard handwheel type: None
With the opening indicator
Manually operated valve: None
Weir type diaphragm valve
Main body: FC200
Base material : None
Diaphragm: Chloroprene
Nominal size: DN25
Actuator code : None
JIS 10KFF

・Example for a pneumatically operated ON-OFF valve

P	O	S	L	1	4	5	9	(M)	N *	–	TX/CE	–	0	5	0	–	16	–	J10KRF
①		②		③	④	⑤		⑥			⑦		⑧				⑨		⑩

With manual opening + opening limit device
Pneumatically operated ON-OFF diaphragm valve reverse acting type
Pneumatically operated ON-OFF diaphragm valve
Weir type diaphragm valve
Main body: PFA-lined
Base material: FCD-S
Diaphragm : NEW PTFE/EPDM
Nominal size : DN50
Actuator code : 16
JIS 10KRF

The above-mentioned product codes represent the standard system. A separate code number may be given to a product manufactured according to requested specifications. For any question on the detail of product coding, contact our Sales Dept. or local representative.

6 REFERENCE MATERIALS

④ Material Selection Table

This valve selection table outlines typical reference materials based on our tests and rich performance data.
(The following table represents excerpts of reference materials. For application under other fluid, concentration, temperature and other conditions than stated in the table, please contact our Sales Dept. or local representative.)

Material evaluation symbol
◎: Comprehensively recommended ○: Applicable △: Conditionally applicable ×: Inapplicable —: Applicability unknown

Fluid name	Concentration%	Temperature℃	Main body material code*1													Diaphragm material code*2					
			01	04	07	12	13	30	33	35	36	40	59	60	80	NR	CR	BG	EP	AB	TX
Sodium nitrite	60	20 to 60	△	△	○	○	○	◎	○	○	○	○	○	○	-	○	○	○	◎	○	○
		61 to 80	△	△	○	○	○	◎	△	△	△	○	○	○	-	○	○	△	◎	×	○
Sulfite solution	5	20 to 60	×	×	○	○	○	◎	△	○	△	○	○	○	-	○	◎	○	○	△	○
		61 to 80	×	×	○	○	○	◎	△	○	△	○	○	○	-	×	×	×	×	×	◎
Sodium sulfite	20 or under	20 to 60	×	×	○	○	○	◎	△	○	△	○	○	○	-	○	◎	○	○	△	○
		61 to 80	×	×	○	○	○	◎	△	○	△	○	○	○	-	○	○	△	◎	×	○
Ammonia water	28	20 to 50	○	○	○	○	○	◎	○	○	○	×	○	○	-	○	◎	○	○	-	○
Ethylene glycol	100	20 to 60	◎	○	○	○	○	○	○	○	○	○	○	○	○	○	◎	○	○	○	○
		61 to 80	◎	○	○	○	○	○	△	△	△	○	○	○	○	○	○	△	◎	△	○
		81 or over	○	◎	○	○	○	×	×	×	×	○	○	○	○	×	×	×	△	×	◎
Ammonium chloride	35	20 to 50	×	×	×	×	×	◎	○	○	○	○	○	○	-	○	◎	○	○	○	○
	55	60	×	×	×	×	×	◎	△	△	△	○	○	○	-	○	○	△	◎	×	○
	77	98	×	×	×	×	×	×	×	×	×	○	○	○	-	×	×	×	△	×	◎
Hydrochloric acid	5 or under	20 to 60	×	×	×	×	×	◎	○	○	○	○	○	○	-	◎	○	○	○	○	○
		61 to 80	×	×	×	×	×	◎	×	×	△	○	○	○	-	○	△	○	◎	△	○
		81 to 100	×	×	×	×	×	×	×	×	×	○	○	◎	-	×	×	×	△	×	◎
	6 to 20	20 to 60	×	×	×	×	×	◎	△	×	△	○	○	○	-	◎	○	○	○	○	○
		61 to 80	×	×	×	×	×	◎	×	×	×	○	○	○	-	△	△	△	○	△	◎
		81 to 100	×	×	×	×	×	×	×	×	×	○	◎	○	-	×	×	×	△	×	◎
	21 to 30	20 to 50	×	×	×	×	×	◎	×	×	△	○	○	○	-	○	○	○	◎	△	○
		51 to 70	×	×	×	×	×	◎	×	×	×	○	○	○	-	△	△	△	○	△	◎
		71 to 80	×	×	×	×	×	○	×	×	×	○	◎	○	-	×	×	×	×	×	◎
		81 to 90	×	×	×	×	×	×	×	×	×	○	◎	○	-	×	×	×	×	×	◎
	31 to 35	20 to 35	×	×	×	×	×	○	×	×	×	○	◎	○	-	△	×	○	○	×	◎
		36 to 60	×	×	×	×	×	○	×	×	×	○	◎	○	-	×	×	×	○	×	◎
		61 to 80	×	×	×	×	×	○	×	×	×	○	◎	○	-	×	×	×	×	×	◎
	36	20 to 35	×	×	×	×	×	○	×	×	×	○	○	◎	-	×	×	×	○	×	◎
		36 to 70	×	×	×	×	×	○	×	×	×	○	○	◎	-	×	×	×	×	×	◎
Fuming hydrochloric acid	37.2 or over	20 to 35	×	×	×	×	×	○	×	×	×	○	◎	○	-	×	×	×	×	×	◎
		36 to 60	×	×	×	×	×	△	×	×	×	○	◎	○	-	×	×	×	×	×	◎
Chlorine gas (wet)		20 to 35	×	×	×	×	×	△	×	×	×	○	◎	○	○	×	×	×	△	×	◎
		36 or over	×	×	×	×	×	×	×	×	×	○	◎	○	○	×	×	×	×	×	◎
Chlorine gas (dry)		20 to 35	×	△	△	△	△	△	×	×	×	○	○	◎	-	×	×	×	△	×	◎
		36 or over	×	△	△	△	△	×	×	×	×	○	○	◎	-	×	×	×	×	×	○
Sodium chlorate	20 or over	20 to 50	×	×	○	○	○	○	△	△	△	○	○	◎	-	△	△	△	○	-	◎
		51 or over	×	×	○	○	○	×	×	×	×	○	○	◎	-	×	×	×	×	-	◎
Chlorine water	0.3 or under	20 to 35	×	×	×	×	×	◎	×	×	×	○	○	○	○	×	×	×	○	×	◎
		36 or over	×	×	×	×	×	×	×	×	×	○	○	◎	○	×	×	×	×	×	◎
Seawater		20	×	×	×	×	×	◎	○	○	○	-	○	○	-	○	◎	○	○	-	○
Acetic acid	5 or under	20 to 50	×	×	○	○	○	◎	△	○	○	×	○	○	-	○	◎	○	△	△	○
		51 to 60	×	×	○	○	○	◎	△	△	×	×	○	○	-	○	○	○	△	×	◎
		61 to 80	×	×	○	○	○	×	×	×	×	×	○	◎	-	×	×	△	×	×	◎
	6 to 20	20 to 35	×	×	○	○	○	◎	×	○	×	×	○	○	-	×	○	◎	×	×	○
		36 to 50	×	×	○	○	○	◎	×	×	×	×	○	○	-	×	△	○	×	×	○
		51 to 80	×	×	○	○	○	×	×	×	×	×	○	◎	-	×	×	×	×	×	○
	21 to 40	20 to 35	×	×	○	○	○	◎	×	×	×	×	○	○	-	×	×	○	×	×	◎
		36 to 50	×	×	○	○	○	○	×	×	×	×	○	◎	-	×	×	○	×	×	◎
		51 to 80	×	×	○	○	○	×	×	×	×	×	○	◎	-	×	×	×	×	×	○
	41 to 60	20 to 35	×	×	○	○	○	○	×	×	×	×	◎	○	-	×	×	○	×	×	◎
		36 to 50	×	×	○	○	○	△	×	×	×	×	◎	○	-	×	×	×	×	×	◎
		51 to 80	×	×	○	○	○	×	×	×	×	×	◎	○	-	×	×	×	×	×	◎
	61 to 80	20 to 35	×	×	○	○	○	△	×	×	×	×	◎	○	-	×	×	×	×	×	◎
		36 to 50	×	×	○	○	○	×	×	×	×	×	◎	○	-	×	×	×	×	×	◎
		51 to 80	×	×	○	○	○	×	×	×	×	×	◎	○	-	×	×	×	×	×	◎
	96 to 100	20 to 35	×	×	○	○	○	×	×	×	×	×	◎	○	-	×	×	×	×	×	◎
		36 or over	×	×	○	○	○	×	×	×	×	×	◎	○	-	×	×	×	×	×	◎
Sodium hypochlorite	0.1 or under	20 to 35	×	×	×	×	×	◎	△	△	△	○	○	○	-	△	△	△	◎	△	○
		36 to 50	×	×	×	×	×	◎	×	×	×	○	○	○	-	×	×	△	○	×	◎
		51 to 60	×	×	×	×	×	◎	×	×	×	○	○	○	-	×	×	×	×	×	◎
	0.11 to 1.0	20 to 35	×	×	×	×	×	◎	△	△	△	○	○	○	-	△	△	△	◎	×	○
		36 to 50	×	×	×	×	×	○	×	×	×	○	○	◎	-	×	×	×	△	×	◎
		51 or over	×	×	×	×	×	×	×	×	×	○	○	◎	-	×	×	×	×	×	◎
	1.1 to 2.0	20 to 35	×	×	×	×	×	◎	×	×	△	○	○	○	-	×	△	△	◎	×	○
		36 to 50	×	×	×	×	×	○	×	×	×	○	○	◎	-	×	×	×	△	×	◎
		51 or over	×	×	×	×	×	×	×	×	×	○	○	◎	-	×	×	×	×	×	◎
	2.1 to 5.0	20 to 35	×	×	×	×	×	◎	×	×	△	○	○	○	-	×	×	△	◎	×	○
		36 to 50	×	×	×	×	×	○	×	×	×	○	○	◎	-	×	×	×	△	×	◎
		51 or over	×	×	×	×	×	×	×	×	×	○	○	◎	-	×	×	×	×	×	◎
	5.1 to 10	20 to 35	×	×	×	×	×	○	×	×	×	○	○	◎	-	×	×	×	○	×	◎
		36 or over	×	×	×	×	×	×	×	×	×	○	○	◎	-	×	×	×	×	×	◎
	11 to 13	20 to 35	×	×	×	×	×	△	×	×	×	○	○	◎	-	×	×	×	△	×	◎
		36 or over	×	×	×	×	×	×	×	×	×	○	◎	○	-	×	×	×	×	×	◎

Material evaluation symbol
◎: Comprehensively recommended ○: Applicable △: Conditionally applicable × : Inapplicable —: Applicability unknown

Fluid name	Concentration%	Temperature℃	Main body material code*1													Diaphragm material code*2					
			01	04	07	12	13	30	33	35	36	40	59	60	80	NR	CR	BG	EP	AB	TX
Nitric acid	0.5 or under	20 to 35	×	×	○	○	○	◎	○	○	○	○	○	○	-	○	○	○	◎	○	○
		36 to 50	×	×	○	○	○	◎	△	△	○	○	○	○	-	○	○	○	◎	△	○
		51 to 80	×	×	◎	○	○	×	×	×	×	○	○	○	-	×	×	×	○	×	◎
		81 or over	×	×	◎	○	○	×	×	×	×	○	○	○	-	×	×	×	×	×	◎
	0.6 to 10	20 to 35	×	×	○	○	○	◎	×	×	△	○	○	○	-	△	△	△	◎	×	○
		36 to 50	×	×	○	○	○	○	×	×	×	○	○	○	-	×	×	×	◎	×	◎
		51 or over	×	×	◎	○	○	×	×	×	×	○	○	△	-	×	×	×	×	×	◎
	11 to 20	20 to 35	×	×	◎	○	○	△	×	×	×	○	○	○	-	×	×	×	○	×	◎
		36 to 50	×	×	◎	○	○	×	×	×	×	○	○	○	-	×	×	×	○	×	◎
		51 or over	×	×	◎	○	○	×	×	×	×	○	○	○	-	×	×	×	×	×	◎
	21 to 70	20 to 60	×	×	◎	○	○	×	×	×	×	○	○	○	-	×	×	×	×	×	◎
		61 or over	×	×	△	△	△	×	×	×	×	○	◎	△	-	×	×	×	×	×	◎
Sodium hydroxide (caustic soda)	5 or under	20 to 50	○	○	○	○	○	◎	○	○	○	×	○	○	×	◎	○	○	○	○	○
		51 to 80	○	○	○	○	○	◎	×	○	○	×	○	○	×	○	○	△	◎	△	○
		81 to 100	○	○	○	○	○	×	×	×	△	×	◎	○	×	×	×	×	△	×	◎
	6 to 10	20 to 50	○	○	○	○	○	◎	○	○	○	×	○	○	×	◎	○	○	○	○	○
		51 to 80	○	○	○	○	○	◎	×	○	○	×	○	○	×	○	○	△	◎	△	○
		81 to 100	○	○	○	○	○	×	×	×	△	×	◎	○	×	×	×	×	△	×	◎
	11 to 20	20 to 50	○	○	○	○	○	◎	○	○	○	×	○	○	×	◎	○	○	○	○	○
		51 to 80	○	○	○	○	○	◎	×	○	○	×	○	○	×	○	○	△	◎	△	○
		81 to 100	○	○	○	○	○	×	×	×	△	×	◎	○	×	×	×	×	△	×	◎
	21 to 40	20 to 50	○	○	○	○	○	◎	○	○	○	×	○	○	×	◎	○	○	○	○	○
		51 to 80	△	△	○	○	○	◎	×	○	○	×	○	○	×	△	△	△	◎	△	○
		81 to 100	△	△	△	△	△	×	×	×	△	×	◎	○	×	×	×	×	△	×	◎
	41 to 50	20 to 50	△	△	○	○	○	◎	○	○	○	×	○	○	×	◎	○	○	○	○	○
		51 to 80	△	△	△	△	△	◎	×	○	○	×	○	○	×	△	△	△	○	△	◎
		81 to 100	△	△	△	△	△	×	×	×	△	×	◎	○	×	×	×	×	△	×	◎
	51 to 60	20 to 50	△	△	○	○	○	◎	○	○	○	×	○	○	×	◎	△	△	○	×	○
		51 to 80	×	×	△	△	△	◎	×	○	○	×	○	○	×	×	×	×	○	×	◎
		81 to 100	×	×	×	×	×	×	×	×	×	×	◎	○	×	×	×	×	×	×	◎
Phthalic acid (alcoholic solution)	10 or under	20 to 60	△	△	○	○	○	△	×	×	×	○	◎	○	-	×	×	×	△	-	◎
Hydrofluoric acid	1 or under	20 to 60	×	×	×	×	×	×	×	×	×	×	○	◎	-	×	×	×	×	×	◎
		61 to 80	×	×	×	×	×	×	×	×	×	×	○	◎	-	×	×	×	×	×	◎
	2 to 5	20 to 60	×	×	×	×	×	×	×	×	×	×	○	◎	-	×	×	×	×	×	◎
		61 to 80	×	×	×	×	×	×	×	×	×	×	○	◎	-	×	×	×	×	×	◎
	6 to 9	20 to 60	×	×	×	×	×	×	×	×	×	×	○	◎	-	×	×	×	×	×	◎
		61 to 80	×	×	×	×	×	×	×	×	×	×	○	◎	-	×	×	×	×	×	◎
	10 to 30	20 to 60	×	×	×	×	×	×	×	×	×	×	○	◎	-	×	×	×	×	×	◎
		61 or over	×	×	×	×	×	×	×	×	×	×	◎	○	-	×	×	×	×	×	◎
	30 or under	20~100	×	×	×	×	×	×	×	×	×	×	◎	○	-	×	×	×	×	×	◎
Polyaluminum chloride		20 to 80	△	△	○	○	○	◎	○	○	○	○	○	○	-	◎	○	○	○	-	○
Sulfuric acid	20 or under	20 to 60	×	×	×	×	×	◎	○	○	○	○	○	○	-	○	◎	○	○	×	○
		61 to 70	×	×	×	×	×	◎	△	△	△	○	○	○	-	○	○	△	◎	×	○
		71 to 90	×	×	×	×	×	×	×	×	×	○	◎	○	-	×	×	×	×	×	◎
	21 to 50	20 to 60	×	×	×	×	×	◎	○	○	○	○	○	○	-	○	○	○	○	×	◎
		61 to 70	×	×	×	×	×	○	×	△	△	○	○	◎	-	△	○	△	○	×	◎
		71 to 90	×	×	×	×	×	×	×	×	×	○	◎	○	-	×	×	×	×	×	◎
	51 to 80	20 to 70	×	×	×	×	×	×	×	×	×	○	○	◎	-	×	×	×	×	×	◎
		71 to 90	×	×	×	×	×	×	×	×	×	○	◎	○	-	×	×	×	×	×	◎
	81 to 97	20 to 90	×	×	×	×	×	×	×	×	×	○	◎	○	-	×	×	×	×	×	◎
	98 or over	20 to 35	◎	○	○	○	○	×	×	×	×	○	○	○	-	×	×	×	×	×	◎
		36 or over	△	△	△	△	△	×	×	×	×	○	◎	○	-	×	×	×	×	×	◎
Fuming sulfuric acid		20	○	○	○	○	○	×	×	×	×	○	◎	○	-	×	×	×	×	○	◎
Phosphoric acid	40 or under	20~40	×	×	×	×	×	○	◎	○	○	○	○	○	-	◎	○	○	○	○	○
		41~60	×	×	×	×	×	◎	○	○	△	○	○	○	-	◎	○	○	○	△	○
		61~80	×	×	×	×	×	◎	×	×	×	○	○	◎	-	△	△	△	◎	△	○
	41 to 65	20~40	×	×	×	×	×	○	◎	○	○	○	○	○	-	◎	○	○	○	△	○
		41 to 60	×	×	×	×	×	◎	○	○	△	○	○	○	-	◎	○	○	○	△	○
		61 to 80	×	×	×	×	×	○	×	×	×	○	○	◎	-	△	△	△	◎	△	○
	66 to 85	20 to 40	×	×	×	×	×	○	◎	○	○	○	○	○	-	◎	○	○	○	△	○
		41 to 60	×	×	×	×	×	◎	○	○	△	○	○	○	-	◎	○	○	○	△	○
		61 to 80	×	×	×	×	×	○	×	×	×	○	○	◎	-	△	△	△	○	×	◎
	86 to 100	20 to 40	×	×	×	×	×	◎	○	△	○	○	○	○	-	◎	○	○	○	△	○
		41 to 60	×	×	×	×	×	◎	△	△	△	○	○	○	-	◎	△	○	○	△	○
		61 to 80	×	×	×	×	×	○	×	×	×	○	◎	○	-	△	×	×	△	×	◎

*1 : See p.10 and 15. *2 : See p.11 and 15.

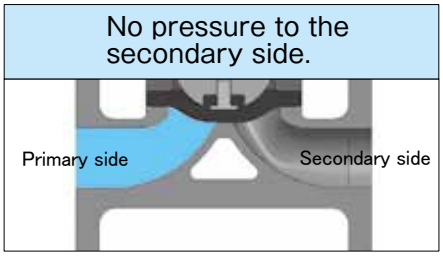
[Note]

- This table is applicable only for the diaphragm valve materials used by our company. The data is not applicable to composite chemical solution. For specific chemicals, contact our Sales Dept. or local representative.
- Rubber-lined bodies are not applicable to by-product hydrochloric acid (hydrochloric acid obtained as a by-product in the manufacturing process of chloromethane, chloroform, vinyl chloride, trichloroethylene and chlorobenzene). Bodies with ETFE or PFA lining are recommended.

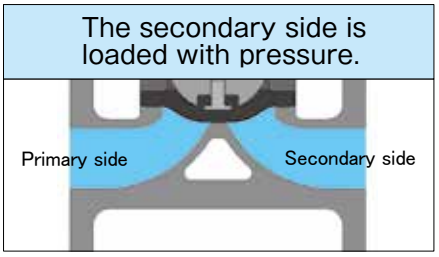
6 REFERENCE MATERIALS

⑤ Actuator Selection Table

Fluid pressure stated in the actuator selection table in this catalog represents the pressure to the primary side when no pressure is applied to the secondary side (atmospheric pressure). If the secondary side is loaded with the pressure when the valve is closed, a greater output may be required. In such a case, please contact our Business Dept.



Use the selection table in this catalog.



Contact us as correction is required.

7

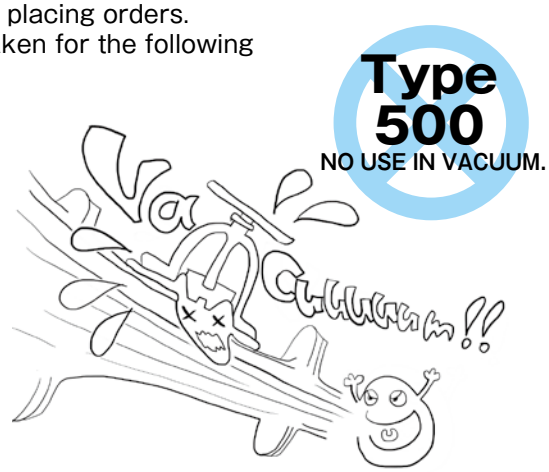
SAFETY INSTRUCTIONS

7 SAFETY INSTRUCTIONS

1 Cautions for selecting the valve

①Products described in this catalog have respective range of application specified according to the official standards and our own standard. Customers are requested to check on your conditions for usage (fluid, pressure, temperature, etc.) before selecting an optimum product.
②Select the material for the main body (lining), diaphragm, bonnet, compressor, base and other depending on the fluid you are to handle. As to the materials for the main body (lining) and diaphragm, please refer to the material selection table in the catalog or contact us. Please note that certain types and sizes of bonnet, compressor, base, etc. are standard manufactured using aluminum alloy. Optionally these products are also manufactured using steel material (FC200, SCS13, etc). When handling some liquid that erodes aluminum alloy, using steel material is recommended for the sake of safety. Please discuss this matter when placing orders.
③When using Type 500 (Straight type), care should be taken for the following matters due to valve characteristics:

(1)Avoid using it in a vacuum environment.
(2)Avoid controlling it or using it with the opening set to intermediate level.
(3)Avoid using it for handling a fluid of 70℃ or over continuously with the valve fully open.
(4)Avoid using it with the valve fully closed at a discharge side of a pump for example where high pressure or pulsation is momentarily loaded.
(5)Avoid using it for an abrasive fluid with the valve almost fully closed.



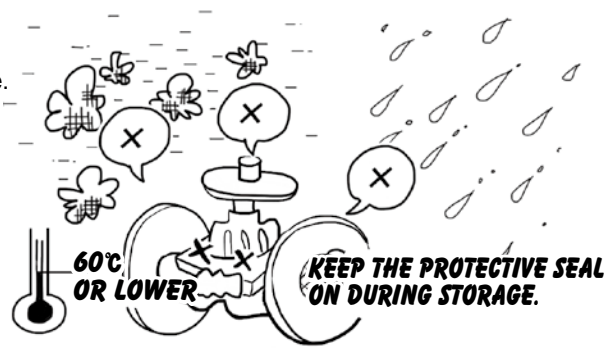
2 Cautions at Receiving and during Delivery

① Upon receipt of valves, check that the product and quantity are as ordered. Also check if the package and packing are undamaged.
② Certain items weigh heavy. When unloading or delivering the product, mind the safety by using an appropriate hoisting machines, etc. in conformity to Occupational Safety and Health Act or equivalent law. Never enter directly below a hoisted product package or operate the hoist from under the raised package.
③ If wetted, cardboard boxes may lose packing strength. In such a case, handle them with utmost care.
④ When handling a main body with the lining of hard rubber or glass lining or ceramic body, handle carefully and protect it from a strong impact or the lining may be damaged.

3 Cautions for Storage

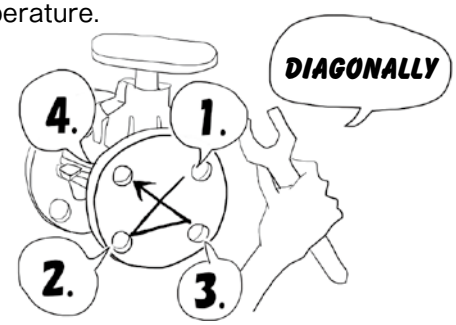
① Users are recommended to keep the product in packed state until starting installation to the piping.
② When storing the valve in unpacked condition for a period of time, always keep the protective seal (a cap) on to the face of the flange for piping.
③ To prevent the valve from rust or rubber and plastic material from degradation, store the valve in the following conditions:

(1)Keep away from the rainwater.
(2)Keep away from direct sunlight.
(3)Keep it at the ambient temperature of 60℃ or lower.
(4)Keep away from high humidity and dusty atmosphere.



4 Cautions for Installation to the Piping

① Remove the protective seal (a cap) from the connecting flange face of the main body. Check the inside of the valve for any contamination or attachment of foreign matters. Also check the piping system to connect the valve to for cleanliness and any foreign matters. Apply a gas blowing or liquid flushing as may be needed. Foreign matters inside the valve if any may cause leakage when caught between the valve base of the main body and the diaphragm.
② Provide a space around the valve necessary for overhauling. Such a space should allow to replace the diaphragm with the main body remaining connected to the piping. Particularly, when hoisting the bonnet, necessary space must be provided for the hoisting operation.
③ When installing the valve to the piping, prevent it from receiving abnormal tension, compression or bending stress.
④ In the case of a flat face flange, use a gasket that fully covers the flange face. If a soft rubber-lined body is covered with a gasket that fails to cover the flange face completely, the lining may be damaged or leakage may occur.
⑤ Use rubber gasket to the rubber-lined main body.
⑥ For connection to the piping, use the bolts of a length that makes no contact with the bonnet flange or use continuous thread studs and adjust the length of the protruding head of the stud. Tightening the bolt in contact with the bonnet flange may cause external leakage or damage the bonnet, causing the valve failure.
Particular care is required to the contact of the bonnet flange with the piping bolt when installing a valve of DN15 to 80 to the piping.
Users are recommended to use a double-end stud for the piping bolt and the nut of Style 1 (JIS B 1181), Class 1 or 2 (JIS B 1181 Attachment 1). Make adjustment to prevent contact between the bonnet flange and the piping bolts.
Adjustment position should read a position where the end face of the bolt is flush with the end face of the nut. (Select a bolt so that the fit length of the thread will be definitely at least 80% or higher of the height of the nut.)
⑦ When installing the valve to the piping, tighten individual bolts alternately and diagonally under identical torque. Unevenly clamped bolts may cause leakage from the connecting flange face.
⑧ Products with the air vent port (manually operated valve of DN125 and over, pneumatically operated valve and electrically operated valve) should be protected from the entry of rainwater, etc. through the port.
⑨ When connecting the valve with welded joint, always remove the bonnet including the diaphragm from the main body before welding. Reinstall the bonnet and all including the diaphragm after the temperature of the welded portions reaches the normal temperature.
⑩ Care should be given to the following points for wiring:
(1)Before closing the switch cover, make sure that the gasket is perfectly applied and the mating face is cleaned. Close the switch cover by tightening the mounting bolts steadily.
(2)Outlet port for the outside lead wire should be made rainwater-proof.
(3)Always keep the switch cover closed.
(4)Positively never carry on outdoor wiring work in the rain.
(5)After making wire connection, always check operation.



5 Cautions for Machine Operation

① Opening/closing the valve with part of an operator's body or wear carelessly in contact with the moving parts inside or outside of the valve may lead to a serious injuries. Never touch the inside or moving parts of the valve.
② When opening/closing the valve, don't operate the handwheel by hooking an auxiliary pipe or wrench on it. Or an excessive load will be applied to the valve component possibly to damage it.
③ When operating the handwheel to close the valve, stop the closing operation at maximum 15 to 20 degrees after sensing the valve resistance to the closing motion.
Excessive tightening may cause a shorter diaphragm life. Particular care is required when handling a fluid in high temperature.
④ If the handwheel operation is felt heavier in the middle of a valve closing operation, certain foreign matters might have been caught with the valve seat. In such a case, open the valve once, let the fluid flow through, and check if the foreign matters are washed away, then start the closing operation again.
⑤ If ambient temperature or fluid temperature changes greatly while the fluid is sealed inside the piping, thermal expansion of the fluid causes the pressure to change, possibly leading to external leakage or damaged diaphragm.

7 SAFETY INSTRUCTIONS

In addition, if the valve is operated to open/close while the valves before and after the diaphragm valve are closed and the inside fully filled with the fluid, the same phenomenon may occur, for which care should be taken.

⑥ If the fluid fully inside the valve is frozen, the valve may be freeze-fractured. For application in an environment where freezing may likely happen, take anti-freeze measures by providing the piping with thermal insulation or if the valve is not in use, to extract liquid from inside the valve, etc.

⑦ Rubber is used for the material of diaphragm. The nuts that clamp the diaphragm may be loosened due to vibration during transportation or stress relaxation after a long period of operation. In such a case, render the diaphragm unloaded by nullifying the fluid pressure, then apply prescribed torque to tighten the nuts to the required level.

6 Cautions for the Actuators of Pneumatically, Electrically Operated Valve

① Protective sealing (cap) is provided to the air intake port and the electric wiring connection port. Don't remove the sealing (cap) until the connection joint is installed.

② Actuators are shipped factory-adjusted. Don't disassemble and reassemble them. If any adjustment is required, please contact us.

③ Dehumidify the air and filter it clean before leading to the valve for application.

④ For the operating pressure and power supply, see the nameplate or the specifications of delivered product.

⑤ Protect the products with the air vent port against the entry of rainwater.

7 Cautions for Disassembly and Assembly

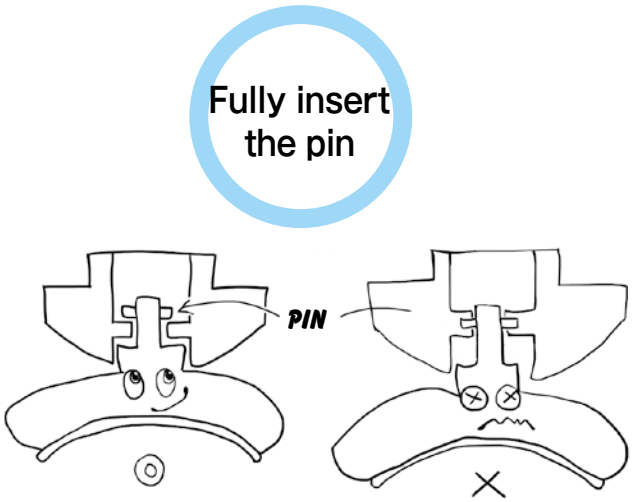
This is general information. Do not disassemble before you read necessary manual in details.

① When removing or disassembling the valve, ensure the following matters or you may be risking a serious hazard:

(1)The object valve should have been separated from other piping.
(2)The fluid pressure and temperature inside the piping and the valve should be atmospheric and normal.
(3)There remains no residual fluid inside the piping, and no fluid leakage occurs when the mounting bolts and nuts are loosened.

② Provide maintenance work for the diaphragm and actuator periodically.

(1)Rubber diaphragm is screwed in. When mounting to the compressor, apply appropriate pressure to screw it in. Slightly bring it back from where it stopped to align the bolt hole positions.
(2)PTFE diaphragm is of a bayonet type. To install to the compressor, push the center of a diaphragm firmly with fingertips. Ensure that the pin has fully entered the compressor before turning it 90 degrees clockwise or counterclockwise.
In the case of a reverse seat type diaphragm, turn it over before installation. Turning the diaphragm before the pin fully enters the compressor may damage the pin.
(3)When reassembling to the valve, run centering, and tighten the bolts and nuts evenly by applying prescribed torque.
(4)For detailed maintenance instructions, see the instruction manual or contact our Sales Dept. or local representative.



● The ISO 9001･14001 certificate was awarded

ISO 9001 99QR･167
ISO 14001 08ER･701

⚠ CAUTION

Specifications and performance figures of products contained in this catalog are based on the design calculations, in-house tests, actual records of product application, and the official standards and specifications. They are presented as the user guide on the use of product concerned under general service conditions. Users intending to use the product under a special condition are required to receive engineering advice from this company in advance or to make their own studies and evaluation to verify performance on their own responsibility. This company shall not be liable for any damages, material or human, that may arise without following this procedure. Inasmuch as full care was taken in editing this catalog, users are kindly requested to make contact with this company for any questions or discrepancies found. This catalog is subject to change without notice for the purpose of correcting error, supplementing or improving insufficient content, updating the content to the improved product performance, design change, discontinuation of product and other reasons. Revised version automatically invalidates catalogs issued prior to the current version. Check the version with our Sales Dept. or local representative before you place orders.

⚠ WARNING ⚠ CAUTION

There are some instructions for use of diaphragm valve because of a constructional characteristic. When valve is delivered, the leaflet related to instruction on Safety is bundled. Please read this instruction thoroughly before beginning of use and handling to use your product safely and stably for a prolonged life.

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