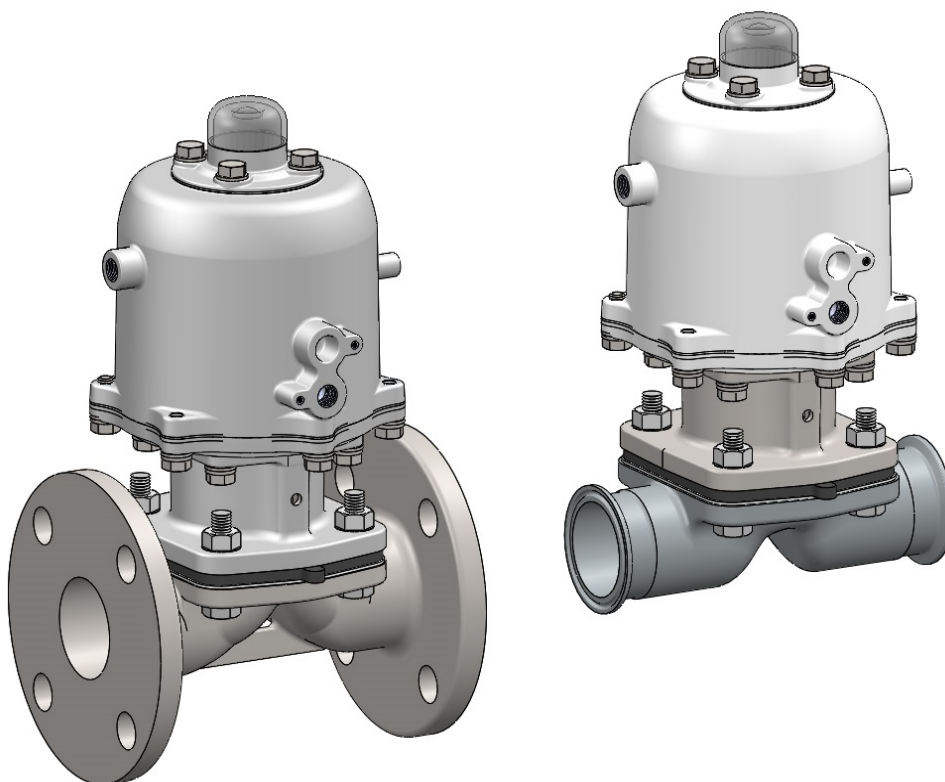


Instruction Manual  
for  
Pneumatically Operated On-Off Diaphragm Valve  
Pneumatically Operated On-Off Bioclean Valve

Application	Operation method	Nominal diameter	Type						
			Basic type	Dedicated limit witch	Opening adjustment mechanism	With yoke and opening indicator	With yoke and opening indicator +opening adjustment mechanism	With yoke and opening indicator + manual opening mechanism	With yoke and opening indicator +manual opening mechanism +opening adjustment mechanism
general purpose	Reverse acting	15/150	PO	POM	POT	POS	POST	POSH	POSL
	Direct acting		PC	PCM	PCT	PCS	PCST	—	—
	Double acting		PN	PNM	PNT	PNS	PNST	—	—
bioclean	Reverse acting	15/100	BPO	BPOM	BPOT	BPOS	BPOST	BPOSH	BPOSL
	Direct acting		BPC	BPCM	BPCT	BPCS	BPCST	—	—
	Double acting		BPN	BPNM	BPNT	BPNS	BPNST	—	—



Nippon Daiya Valve Co., Ltd.

## Preface

Thank you very much for choosing this Nippon Daiya Valve product. This instruction manual will be useful for first-time users and experienced users alike. First-time users will learn about the many features of this product, and experienced users will have a chance to review and learn more.

To ensure safe and proper operation of your product, please read this instruction manual thoroughly before beginning of use. Once you have read through the manual, keep it nearby for handy access whenever you have questions or need to troubleshoot a problem.

### Safety Advice

This advice will help you use your product safely and correctly. Adherence to these guidelines will eliminate all risks of property damage and all risks of injury to you and your coworkers.

The instructions in this manual are classified into four levels based on the risk of injury, damage, or operational failure—> “DANGER,” “WARNING,” “CAUTION,” and “Request.”

DANGER	Indicates the presence of high danger. If a DANGER warning is ignored, death, serious injury, or property damage may occur.
WARNING	Indicates an indirect risk of danger. Danger is not immediate, but it may arise depending on the situation. If a WARNING message is ignored, death, serious injury, or property damage may occur.
CAUTION	Indicates an indirect risk of danger, but it may arise depending on the situation. If a CAUTION warning is ignored, slight or intermediate injury may occur. Also, a risk of property damage may occur.
REQUEST	A recommendation on the proper use of the product, for the protection of the product itself. While no damage will result if a REQUEST message is ignored, proper use may extend the lifetime of the product.

### Liability waiver

Please understand that Nippon Daiya Valve bears no liability whatsoever for damages resulting from any failure to observe the instructions in this manual.

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1. Features of actuator

(1) Smooth operation and improved duration

Smooth operation has been facilitated due to installation of wear ring. No problems were found even after one million times of in-house endurance tests were conducted.

(2) Selection of economical actuator according to customer specifications

Two to three types of actuators are designed according to nominal diameters of main body. You can select an economical actuator for bioclean valves according to the working fluid pressure.

(3) Easy replacement of diaphragms

Use of stopper nuts prevents the spindle from jumping up, and the diaphragm can be easily replaced.

(4) Direct mounting of solenoid valve

With the mounting seat for the solenoid valve provided on the actuator, the solenoid valve can be directly mounted to the actuator. NAMUR standards are used as mounting dimensions for the solenoid valve.

(5) Direct mounting of attached mechanism such as dedicated limit switch, manual handle, etc.

Attached mechanism such as dedicated limit switch, opening adjustment device, manual handle, etc., can be directly mounted to both general purpose valves and bioclean valves just by removing the cap at the top.

(6) Light weight and compact

Compared to the conventional valves used for general industry (HO1400N type), the actuators are light weighted and compacted. Also, these actuators are lighter than those for bioclean valves (lightweight type).

## 2. Product specifications

### 2.1 Valve specifications

- (1) Applicable body and nominal diameter: Types 400: DN15~150
- (2) There are six types of actuator: 07N、09 N、12 N、16 N、20 N、25 N
- (3) Operation system: reverse acting type (PO, BPO), direct acting type (PC, BPC), double acting type (PN, BPN)
- (4) Operating pressure: 0.4 MPa for reverse acting type is also used for direct acting and double acting types. Set the operating pressure within the range of 0.4 (+0.1、-0) MPa. 0.3MPa is used as option.
- (5) Materials for bonnet and bolt & nut

Materials for bonnet and bolts&nuts to be used vary with body material and valve Type (general purpose/bioclean). Refer the table below

Valve Type	body	bonnet	bolt & nut
general purpose PO(C,N)	stainless steel	SCPH2 or FC200	SUS304
	other than above		SWCH
bioclean BPO(C,N)	stainless steel	SCS13A	SUS304
	other than above		

### (6) External appearance

Reverse acting, direct acting and double acting types have the same appearance.

Identified by the name plate or by the position mounting the exhaust pipe and the cap (connection of applied pressure) of the actual product

Type	Upper side	Lower side
(B)PO	Exhaust pipe	Cap
(B)PC	Cap	Exhaust pipe
(B)PN	Cap	Cap

painting color: silver (natural drying) for general purpose valves, and white (baking finish) for bioclean valves

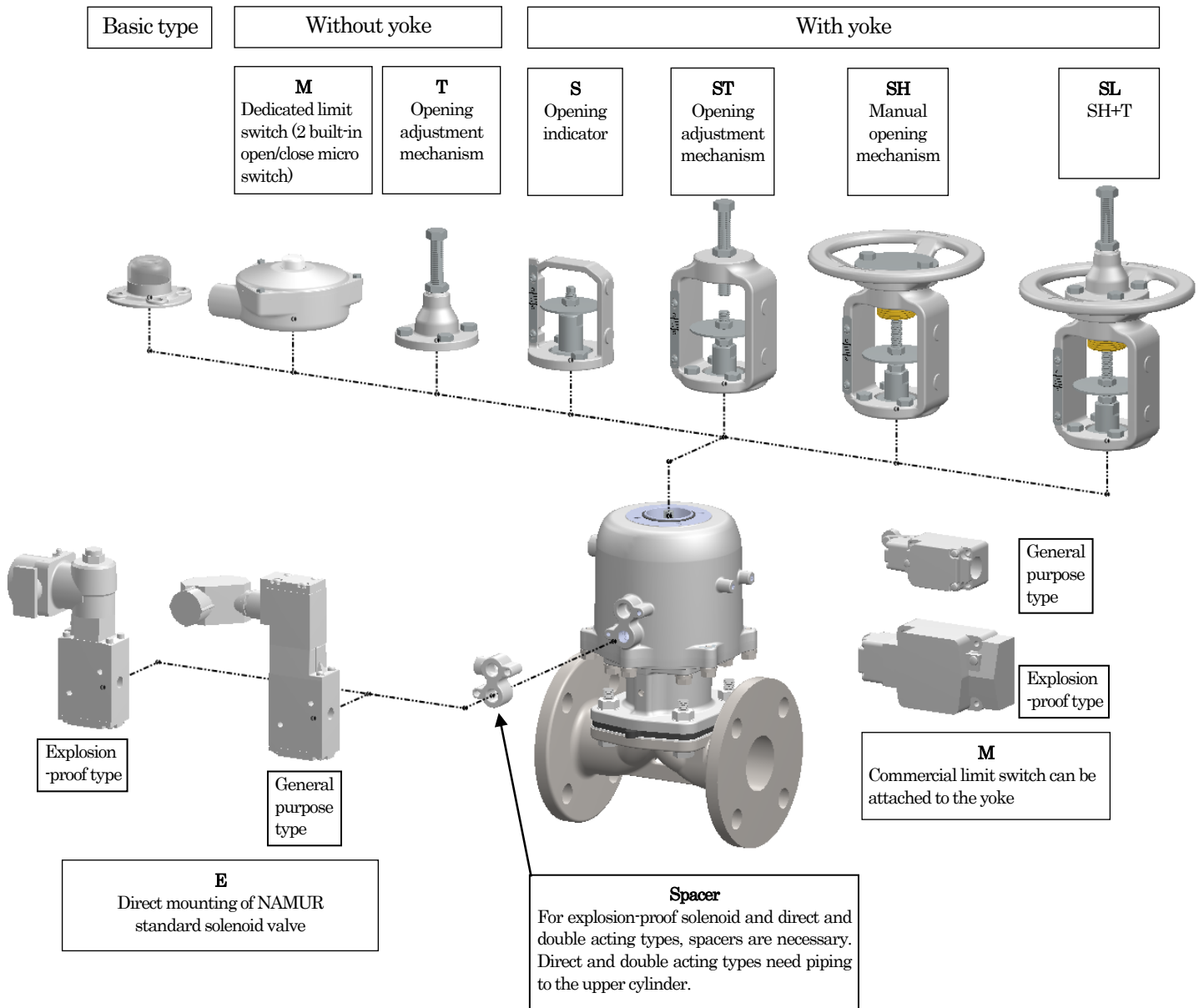
### (7) Name plate

Attach a seal name plate onto the actuator, showing product name, LP, OP, SER No, and TAG No. The product name is the same as in the delivery sheet.

(8) Accessories: limit switch

See attached document 7.

- M : dedicated limit switch, T : opening adjustment mechanism, S : valve opening indicator, ST : S+opening adjustment mechanism, SH : S+manual opening mechanism, SL : SH+T
- Mechanical devices are common to those with yoke and without yoke, which can be assembled later without detaching the actuator.



(9) Accessories

(a) Limit switch

- ① Dedicated limit switch is a direct mount type with a built-in micro switch.
- ② Commercial limit switch specified by the customer are delivered with yoke.

Our company's standard accessory

	For general purpose type	For explosion-proof type
Azbil Co., Ltd.	1 LS19-J	1 LX7001-J

- ③ When the attached mechanism is provided with the product, the dedicated limit switch cannot be installed. In this case, a commercial limit switch is mounted to the yoke.

(b) Solenoid valve

- ① NAMUR standard is adopted for the air intake of the cylinder. NAMUR standard solenoid valves can be directly mounted to any types irrespective of manufacturers.
- ② There are two solenoid valves: general purpose and explosion-proof types of CKD and SMC with NAMUR standard.

Manufacturer	Protective structure	Applicable actuator	Abbreviated code
CKD	General purpose type	PO	EC20
		PN	
		PC	
	Explosion-proof type	PO	EC30
		PN	
		PC	
SMC	General purpose type	PO	EV20
		PN	
		PC	
	Explosion-proof type	PO	EV30
		PN	
		PC	

(c) Filter regulator

The filter regulator is provided with bracket which enables vertical mount.

	General purpose type	Explosion-proof type
SMC	AW20	

(d) Pneumatic pressure piping

- ① Coated copper piping for pneumatic pressure are available.
- ② For correspondence to the other piping specified by the customer, contact our Sales Dept. or local representative.





(10) Selection table of actuator



Operation pressure:  $0.4 \begin{smallmatrix} +0.1 \\ -0 \end{smallmatrix}$  MPa

	Nominal diameter (DN)	Rubber diaphragm(*1)													PTFE diaphragm(*2)									
		Fluid pressure (MPa)													Fluid pressure (MPa)									
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
PO	15									07N								07N					09N	
	20				07N								09N						09N					
	25		07N							09N			12N		07N			09N					12N	
	40		09N							12N			16N						12N					
	50				12N								16N			12N							16N	
	65												16N						16N					20N
	80				20N						25N								20N					25N
	100		20N							25N						20N				25N				
	125			25N													25N							
150		20N							25N						25N									
PC	15									07N								07N				09N		
	20				07N								09N						09N					
	25			07N								09N	12N		07N			09N				12N		
	40		09N							12N			16N						12N					
	50				12N								16N			12N							16N	
	65												16N						16N					20N
	80				20N						25N								20N					25N
	100		20N							25N						20N				25N				
	125		20N							25N						25N								
150		25N													25N									
PN	15									07N								07N				09N		
	20									07N			09N						07N				09N	
	25				07N								09N						07N				09N	
	40		09N							12N			16N			09N				12N			16N	
	50				12N								16N						12N				16N	
	65												16N						16N					
	80				20N						25N								20N					25N
	100		20N							25N						20N				25N				
	125		20N							25N						20N				25N				
150		20N	25N												20N	25N								

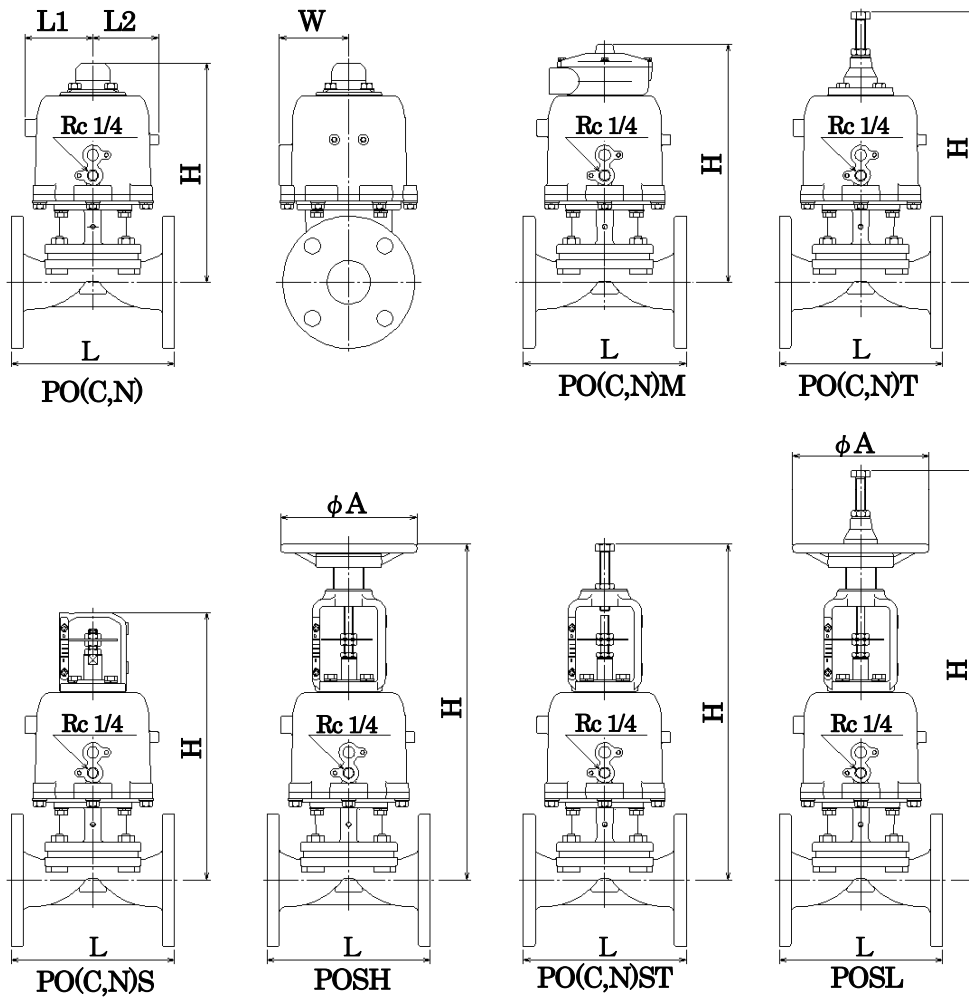
Operation pressure:  $0.3 \begin{smallmatrix} +0.1 \\ -0 \end{smallmatrix}$  MPa

	Nominal diameter (DN)	Rubber diaphragm(*1)													PTFE diaphragm(*2)									
		Fluid pressure (MPa)													Fluid pressure (MPa)									
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3	1.4	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
PO	15													093N										
	20				073N								093N						093N					
	25		073N										123N						093N				123N	
	40		093N										163N						123N				163N	
	50		123N										163N			123N				163N				
	65				163N								203N						163N				203N	
	80				203N								253N						203N				253N	
	100		203N										253N		203N				203N				253N	
PC	15									07N				09N										
	20				07N								09N											
	25			07N									12N		09N								12N	
	40		09N										16N			12N							16N	
	50				12N								16N			12N							16N	
	65												16N						16N					
	80				20N								25N						20N				25N	
	100		20N										25N			20N				25N				
PN	15									07N				09N										
	20									07N			09N						07N				09N	
	25				07N								12N						07N				12N	
	40		09N										16N			09N				12N			16N	
	50				12N								16N						12N				16N	
	65												16N						16N					
	80				20N								25N						20N				25N	
	100		20N										25N			20N				25N				

(\*1):  Maximum working pressure for other than glass lined and porcelain body.  
 Maximum working pressure for glass lined and porcelain body.

(\*2):  Maximum working pressure for other than hard-rubber lined, glass lined and porcelain body.  
 Maximum working pressure for hard-rubber lined, glass lined and porcelain body.

(11) Principal Dimensions



Nominal diameter DN	Face to face length L [mm]		Actuator code No.	Principal dimensions[mm]											
	Other than rubber lined resin	Rubber lined resin		H(for main body material code "01")								A	W	L1	L2
				PO PC PN	POM PCM PNM	POT PCT PNT	POS PCS PNS	POSH — —	POST PCST PNST	— — —	— — —				
15	102	107	07N	202	224	262	258	321	338	411	160	56	54	52	
			09N	224	246	284	280	343	360	433	160	64	62	59	
20	118	123	07N	198	220	258	254	319	334	409	160	56	54	52	
			09N	220	242	280	276	341	356	431	160	64	62	59	
25	127	132	07N	210	232	270	266	333	346	423	160	56	54	52	
			09N	232	254	292	288	355	368	445	160	64	62	59	
			12N	239	261	299	295	362	375	452	160	82	80	77	
40	159	165	09N	239	261	299	295	366	375	456	160	64	62	59	
			12N	246	268	306	302	373	382	463	160	82	80	77	
			16N	272	306	349	373	499	507	603	250	101	98	96	
50	191	197	12N	254	276	314	310	388	390	477	160	82	80	77	
			16N	280	315	357	381	514	515	617	250	101	98	96	
65	216	222	16N	297	357	374	398	535	532	639	250	101	98	96	
			20N	348	408	445	449	586	598	705	250	122	119	117	
80	254	260	20N	365	425	462	466	609	615	728	250	122	119	117	
			25N	404	463	523	516	683	681	822	400	147	143	143	
100	305	313	20N	382	441	479	483	636	632	755	250	122	119	117	
			25N	420	479	539	532	710	697	849	400	147	143	143	
125	356	364	20N	446	505	543	547	700	696	819	250	122	119	117	
			25N	484	543	603	596	774	761	913	400	147	143	143	
150	406	414	20N	468	527	565	569	722	718	841	250	122	119	117	
			25N	506	565	625	618	796	783	935	400	147	143	143	

Table of Peumatically operated ON-OFF Diaphragm Valve Mass

Unit:(approx. kg)

DN	Operation method	Basic type						Attached mechanism								
		PO		PC		PN		POM	POT	POS	POSH	POST	POSL			
	Bonnet	SCS13A without coating	SCPH2 with coating	SCS13A without coating	SCPH2 with coating	SCS13A without coating	SCPH2 with coating	PCM	PCT	PCS	PCST	PNM	PNT	PNS	PNST	PNST
	Body	Stainless steel Clamping connection	Hard rubber lined Flange connection	Stainless steel Clamping connection	Hard rubber lined Flange connection	Stainless steel Clamping connection	Hard rubber lined Flange connection	Mass of valve with attached mechanism = Mass of basic type valve + mass of attached mechanism								
	Actuator Code No.															
15	07N	1.7	3.1	1.6	3	1.5	2.9									
	09N	2.2	3.6	2.1	3.5	1.9	3.3									
20	07N	2.1	3.3	2	3.2	1.9	3.1									
	09N	2.6	3.8	2.5	3.7	2.3	3.5	+0.5	+0.4	+0.6	+2	+1.5	+2.5			
25	07N	2.3	4.6	2.2	4.5	2.1	4.4									
	09N	2.8	5.1	2.7	5	2.5	4.8									
40	12N	4.6	6.9	3.7	6	3.3	5.6									
	09N	3.9	7.2	3.8	7.1	3.6	6.9									
50	12N	5.7	9	4.8	8.1	4.4	7.7									
	16N	9.1	12.4	7.2	10.5	6.7	10	+1	+1.4	+1.5	+6.2	+4.3	+7.9			
65	12N	7.4	11.3	6.5	10.4	6.1	10	+0.5	+0.4	+0.6	+2	+1.5	+2.5			
	16N	10.8	14.7	8.9	12.8	8.4	12.3									
80	16N	12.5	18.5	10.6	16.6	10.1	16.1									
	20N	18.5	24.5	15.5	21.5	14	20									
100	20N	22.7	29.3	19.7	26.3	18.2	24.8									
	25N	36.1	42.7	24.4	31	22.9	29.5	+1	+2.6	+2.6	+11.8	+7.5	+15			
125	20N	29.9	37.5	26.9	34.5	25.4	33									
	25N	43.3	50.9	31.6	39.2	30.1	37.7									
150	20N	-	59.0	-	56.0	-	54.5									
	25N	-	77.0	-	65.5	-	64.0									
150	20N	-	74.5	-	71.5	-	70.0									
	25N	-	92.0	-	80.5	-	79.0									

※DN125/150 : FC200

## 2.2 Indication of product specifications by code No.

Example (1) : Example codes of general purpose valves

PO SL 1 4 30 ( ) N - CR - 050 - 12N - J 10KFF  
 ①      ②      ③      ④      ⑤      ⑥      ⑦      ⑧      ⑨      ⑩      ⑪

Example (2) : Example codes of bioclean valves

BPO M 1 4 14 ( ) N - TX/CE - 050 - 12 BN - ISSC  
 ①      ②      ③      ④      ⑤      ⑥      ⑦      ⑧      ⑨      ⑩      ⑪

If you designate a commercial limit switch, it will be supplied with yoke. As conventionally, please specify model No. for commercial limit switch as accessory

① Operation method

PO · BPO : Piston-operated reverse acting type (spring close, pressurize open)

PC · BPC : Piston-operated direct acting type (spring open, pressurize close)

PN · BPN : Piston-operated double acting type (pressurize open, pressurize close)

For application of bioclean valves, be sure to put "B" at the beginning

② Operation method to be continued (Optional other than basic type)

Enter the following codes after PO (C,N) · BPO (C,N)

Without yoke

With yoke

None : Basic type (equipped with an indicator showing full open state)

S : With yoke and opening indicator

M : (Two switches for Open/Close as standard)

SH : With yoke and opening indicator + manual opening mechanism

T : opening adjustment mechanism

ST : With yoke and opening indicator + opening adjustment mechanism

SL : With yoke and opening indicator + manual opening mechanism + opening adjustment mechanism

Commercial limit switch specified by the customer are delivered with yoke.

③ Operation classification

1 : On/Off operation valve

④ Valve type

4 : Type 400 (weir type)

⑤ Body materials

General purpose valve body : See catalog No.DE303.

Bioclean valve body : See catalog No.DE117.

⑥ Special valve body

Bioclean valve body : See catalog No.DE117.

⑦ Modification No.

⑧ Diaphragm material

General purpose valve body : See catalog No.DE303.

Bioclean valve body : See catalog No.DE117.

⑨ Nominal diameter

015~150 (unit: mm)



2.4 Air chamber capacity and air consumption

$$Q = V(10P+1)$$

Q : Air consumption ( ℓ )    P : Operation pressure (MPa)    V : Air chamber capacity ( ℓ )

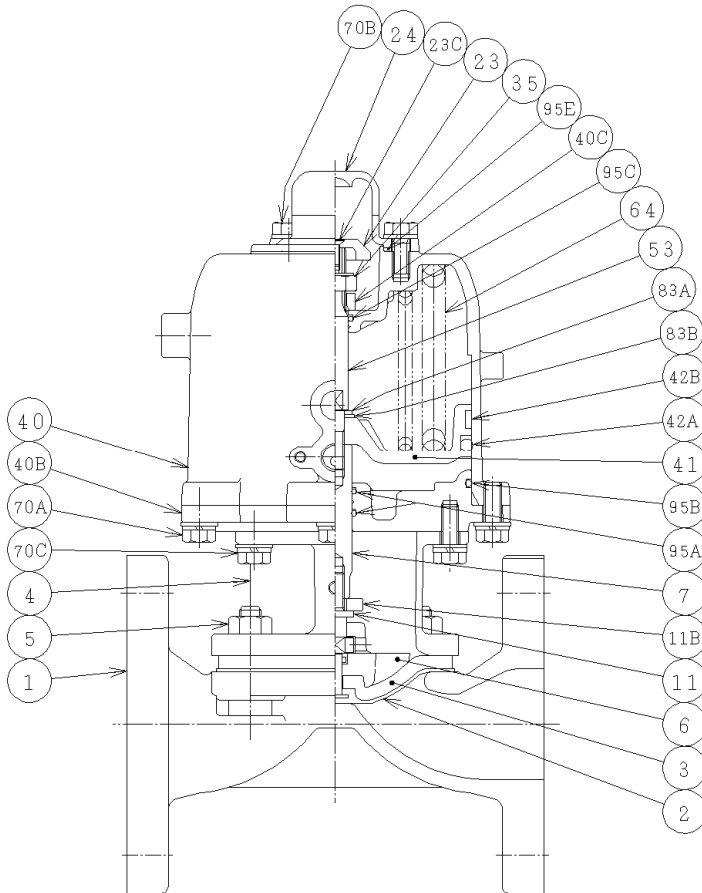
2.4 Air chamber capacity and air consumption

DN	Actuator Code No.	Air chamber capacity ( ℓ )			Air consumption ( ℓ )					
					Operation pressure : 0.4MPa			Operation pressure : 0.3MPa		
		Reverse acting (lower side)	Direct and double acting (upper side)	Double acting (lower chamber)	Reverse acting (lower side)	Direct and double acting (upper side)	Double acting (lower chamber)	Reverse acting (lower side)	Direct and double acting (upper side)	Double acting (lower chamber)
15	07N	0.12	0.08	0.19	0.60	0.40	0.95	0.48	0.32	0.76
	09N	0.22	0.23	0.29	1.10	1.15	1.45	0.88	0.92	1.16
20	07N	0.12	0.09	0.19	0.60	0.45	0.95	0.48	0.36	0.76
	09N	0.22	0.24	0.29	1.10	1.20	1.45	0.88	0.96	1.16
25	07N	0.12	0.1	0.19	0.60	0.50	0.95	0.48	0.40	0.76
	09N	0.22	0.26	0.29	1.10	1.30	1.45	0.88	1.04	1.16
	12N	0.49	0.53	0.69	2.45	2.65	3.45	1.96	2.12	2.76
40	09N	0.22	0.28	0.29	1.10	1.40	1.45	0.88	1.12	1.16
	12N	0.49	0.58	0.69	2.45	2.90	3.45	1.96	2.32	2.76
	16N	0.95	0.93	1.39	4.75	4.65	6.95	3.80	3.72	5.56
50	12N	0.49	0.65	0.69	2.45	3.25	3.45	1.96	2.60	2.76
	16N	0.95	1.05	1.39	4.75	5.25	6.95	3.80	4.20	5.56
65	16N	0.95	1.14	1.39	4.75	5.70	6.95	3.80	4.56	5.56
	20N	2.18	2.19	2.97	10.90	10.95	14.85	8.72	8.76	11.88
80	20N	2.18	2.38	2.97	10.90	11.90	14.85	8.72	9.52	11.88
	25N	3.08	4.23	5.49	15.40	21.15	27.45	12.32	16.92	21.96
100	20N	2.18	2.7	2.97	10.90	13.50	14.85	8.72	10.80	11.88
	25N	3.08	4.74	5.49	15.40	23.70	27.45	12.32	18.96	21.96
125	20N	2.18	2.7	2.97	10.90	13.50	14.85	-	-	-
	25N	3.08	4.74	5.49	15.40	23.70	27.45	-	-	-
150	20N	2.18	2.7	2.97	10.90	13.50	14.85	-	-	-
	25N	3.08	4.74	5.49	15.40	23.70	27.45	-	-	-

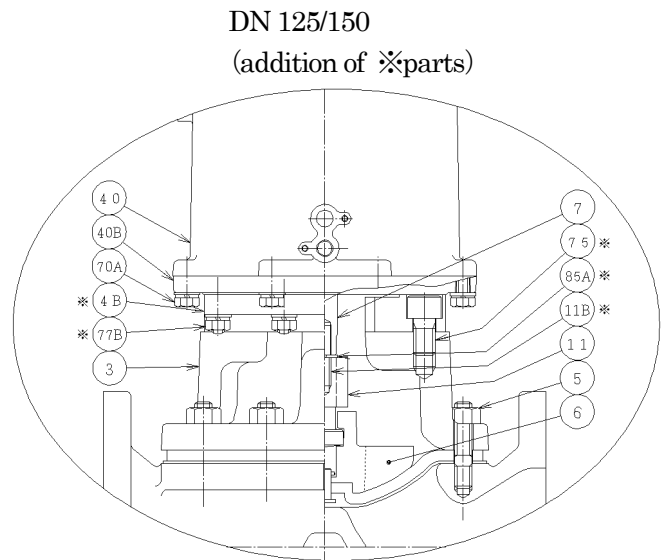
### 3. Structural drawing

#### 3.1 Basic type

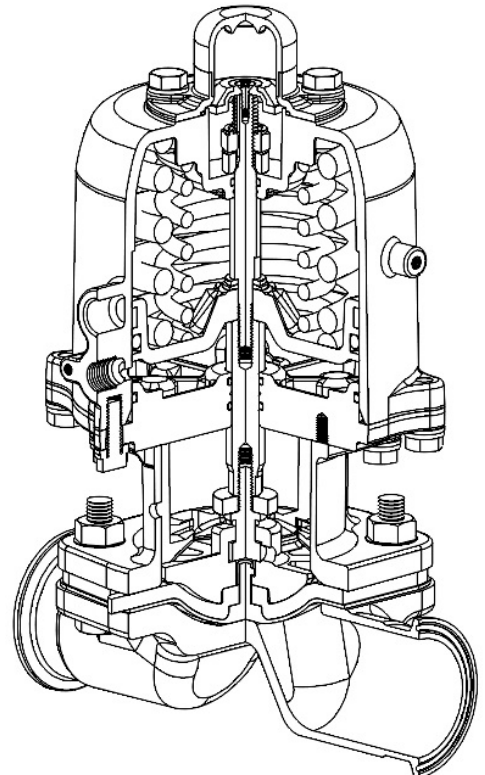
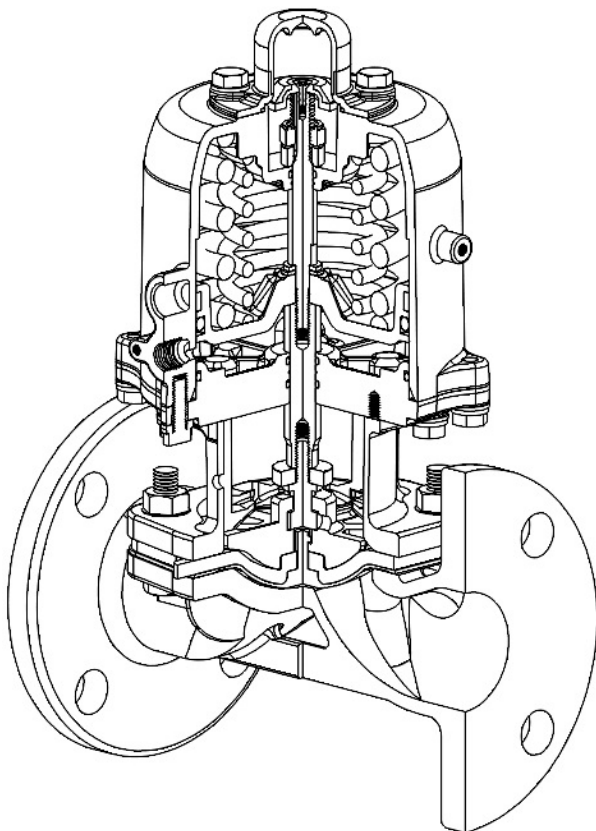
##### (1) Reverse acting type (Type PO1400N)



(a) General purpose valve  
(Example : PO1407(2)N-TX/CE-050-12N J10KFF)

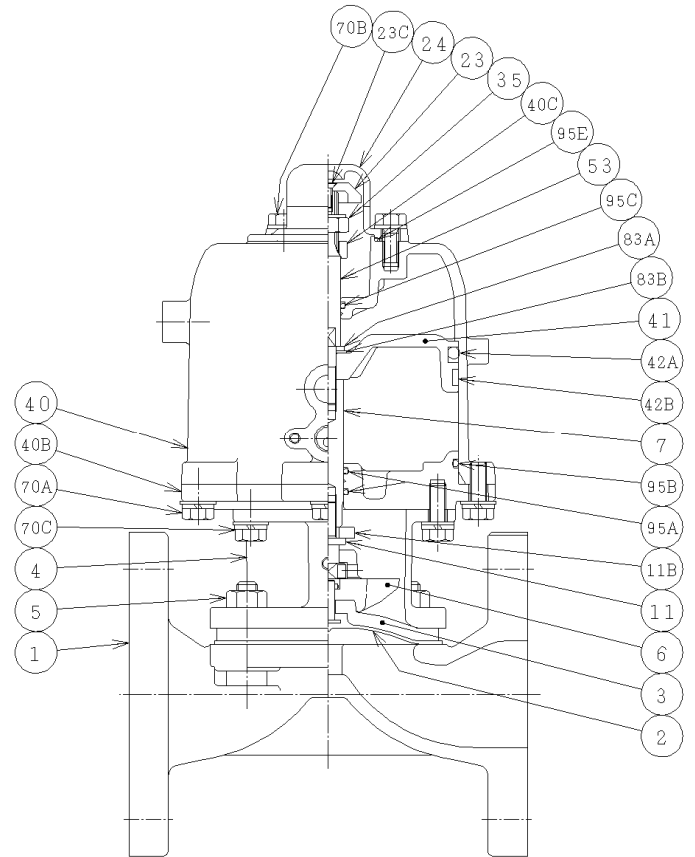
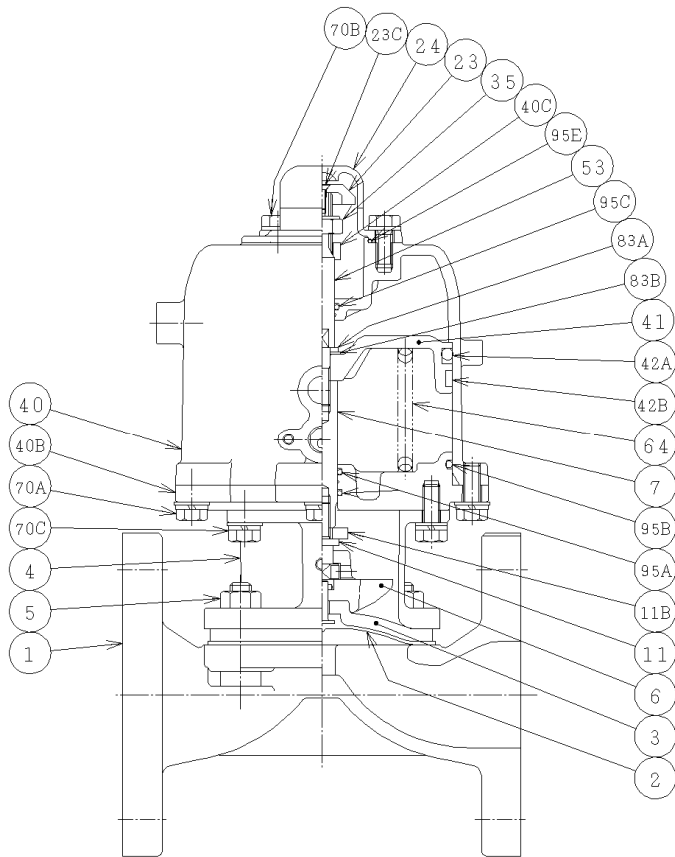


(b) Bioclean valve  
(Example : BPO1414N-TX/CE-050-12BN ISSC)

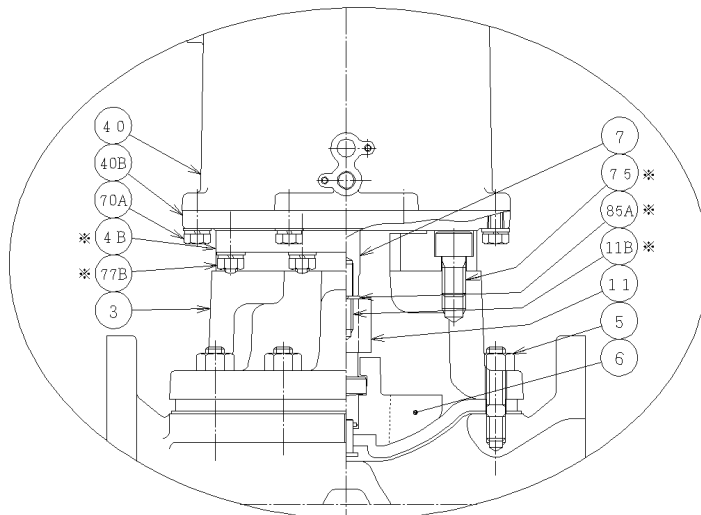


(2) Direct acting type (Type PC1400N)

(3) Double acting type (Type PN1400N)



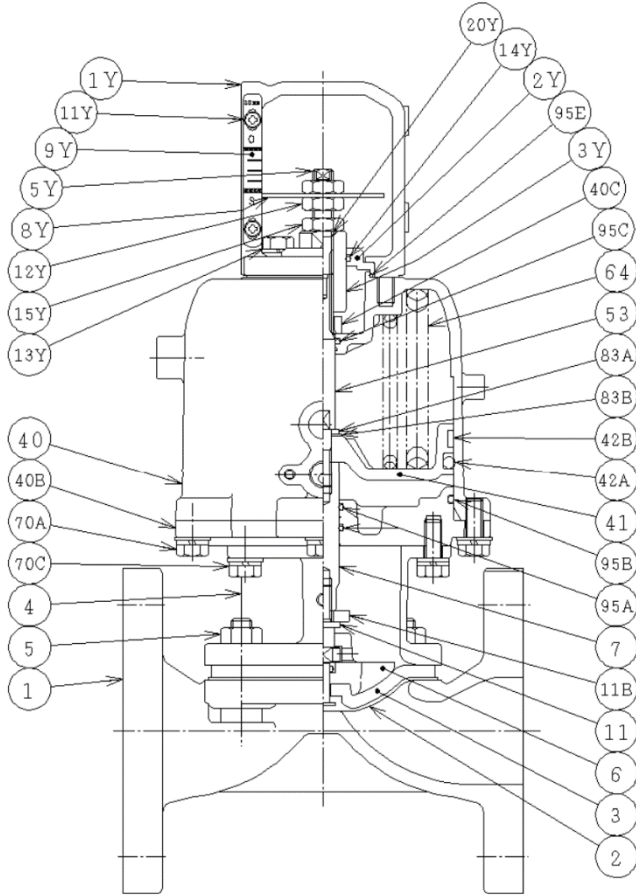
DN 125/150  
(addition of ※parts)



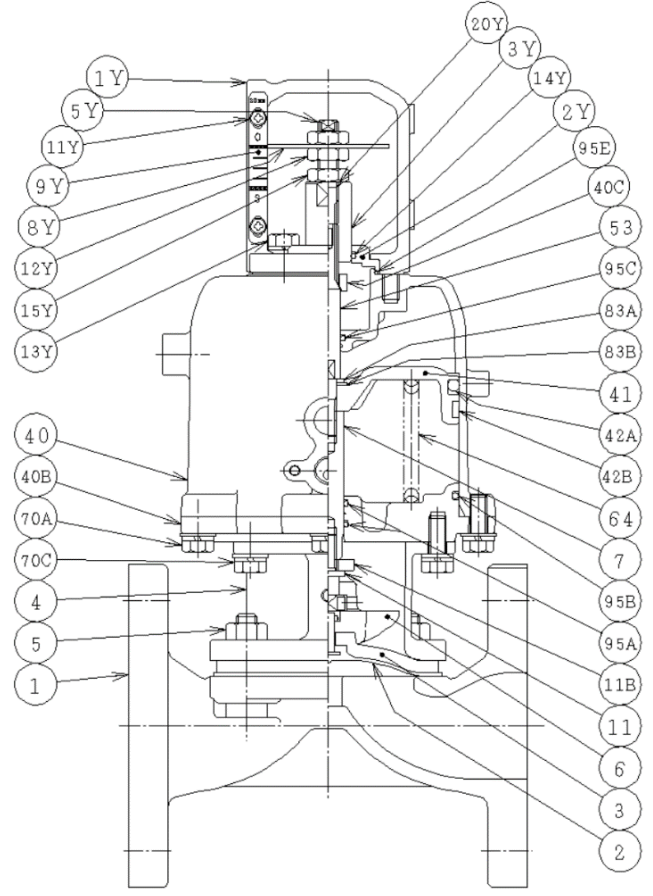


### 3.2 With yoke and opening indicator

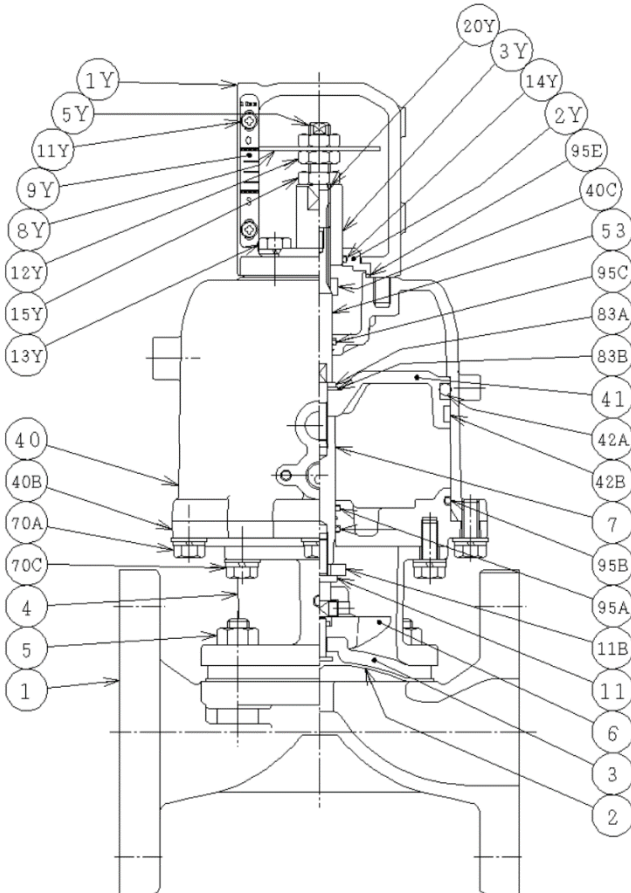
(1) Reverse acting type (Type POS1400N)



(2) Direct acting type (Type PCS1400N)

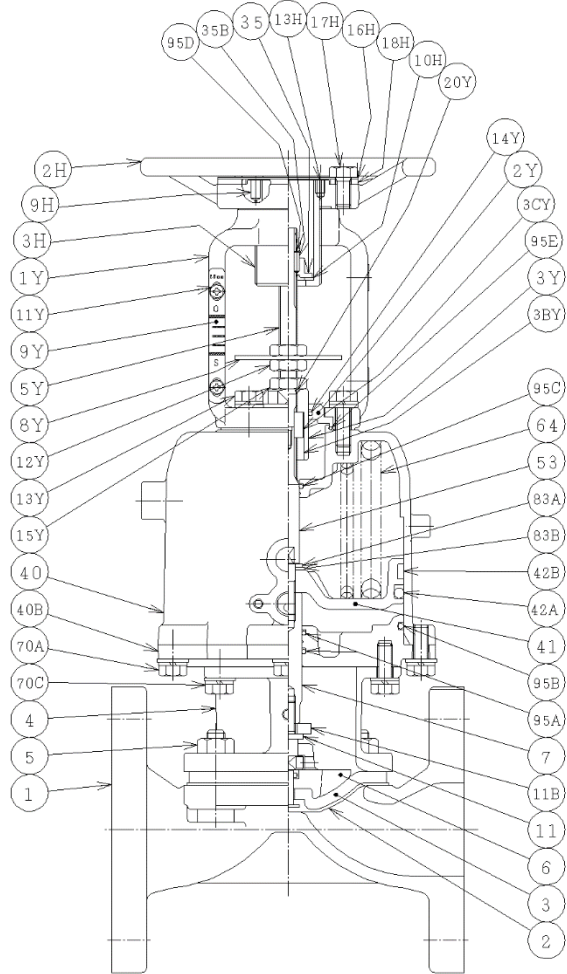


(3) Double acting type (Type PNS1400N)

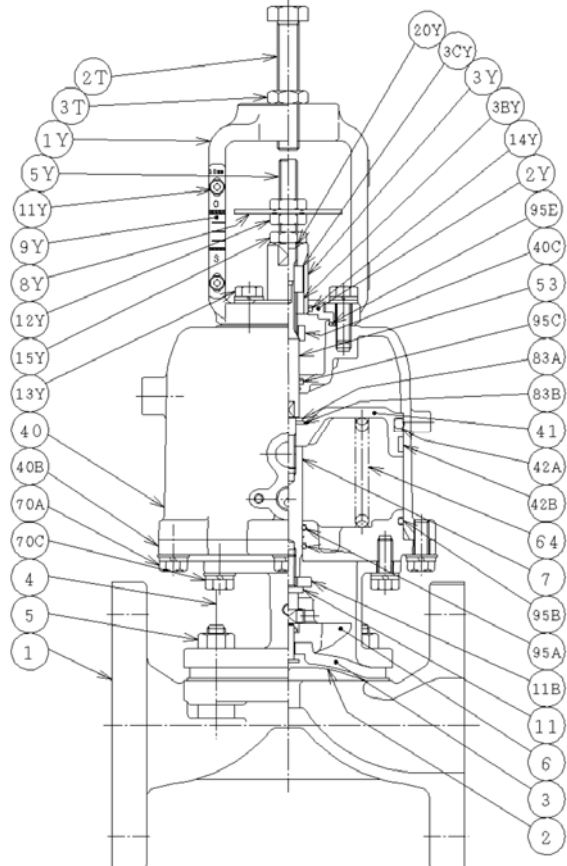


3.3 With yoke and opening indicator + manual opening mechanism

(1) Reverse acting type (Type POSH1400N)

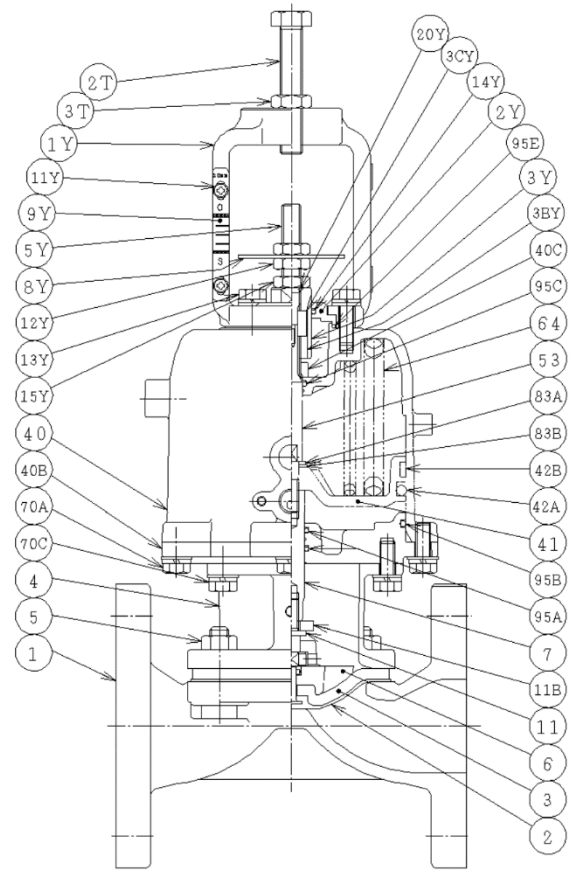


(2) Direct acting type (Type PCST1400N)

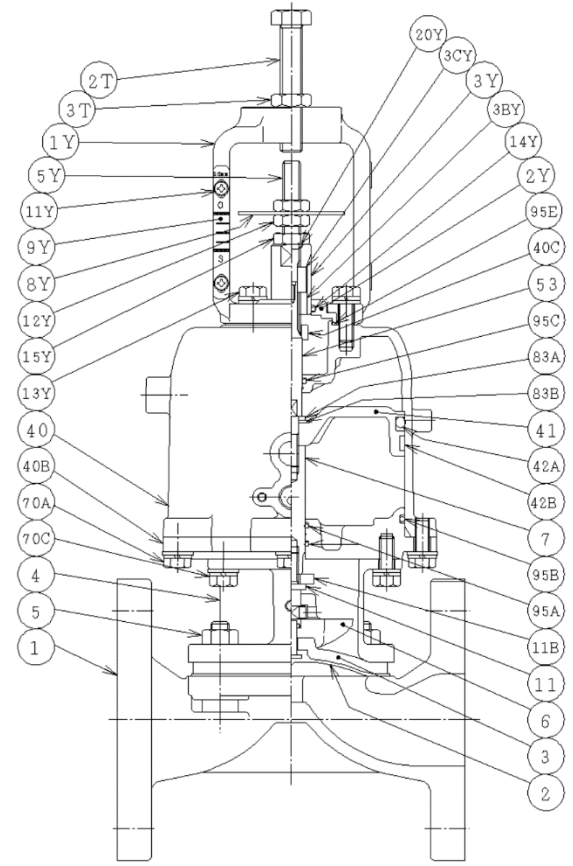


3.4 With yoke and opening indicator + opening adjustment mechanism

(1) Reverse acting type (Type POST1400N)

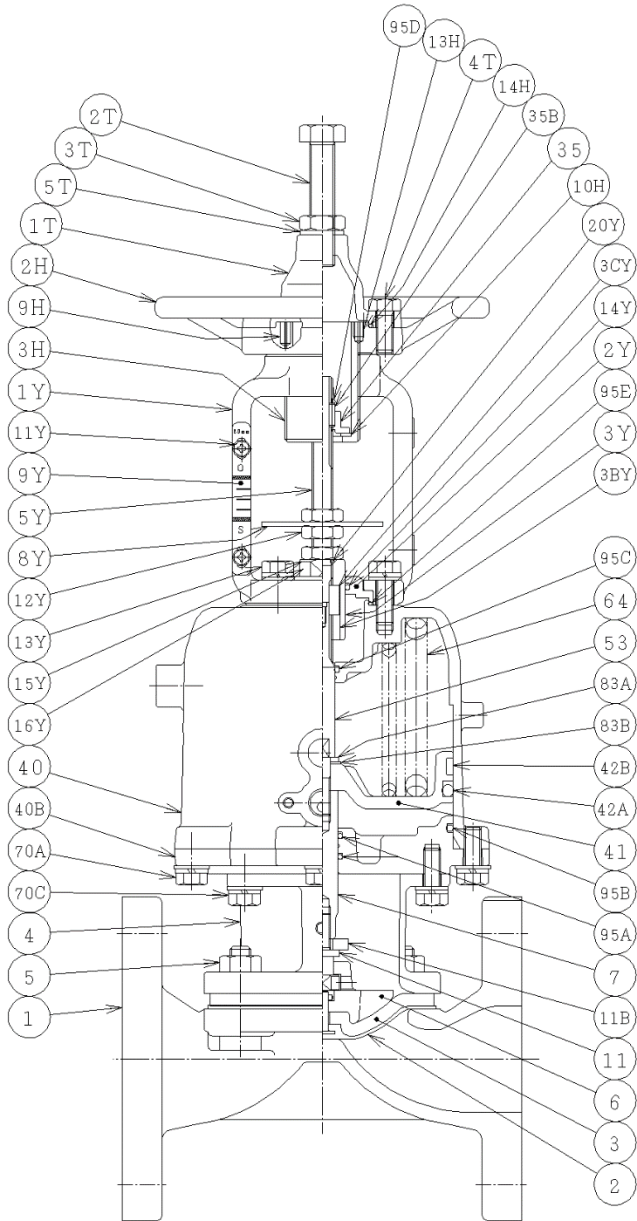


(3) Double acting type (Type PNST1400N)



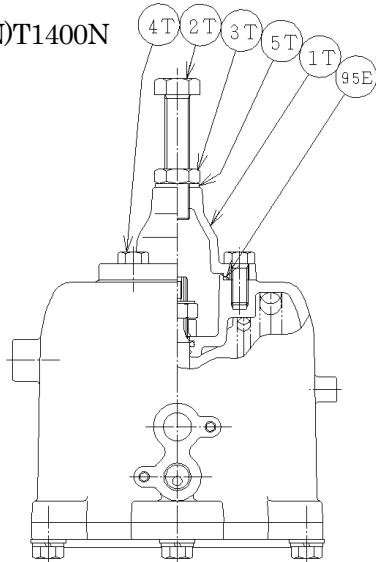
3.5 With yoke and opening indicator + manual opening mechanism + opening adjustment mechanism

(1) Reverse acting type (Type POSL1400N)



3.7 opening adjustment mechanism

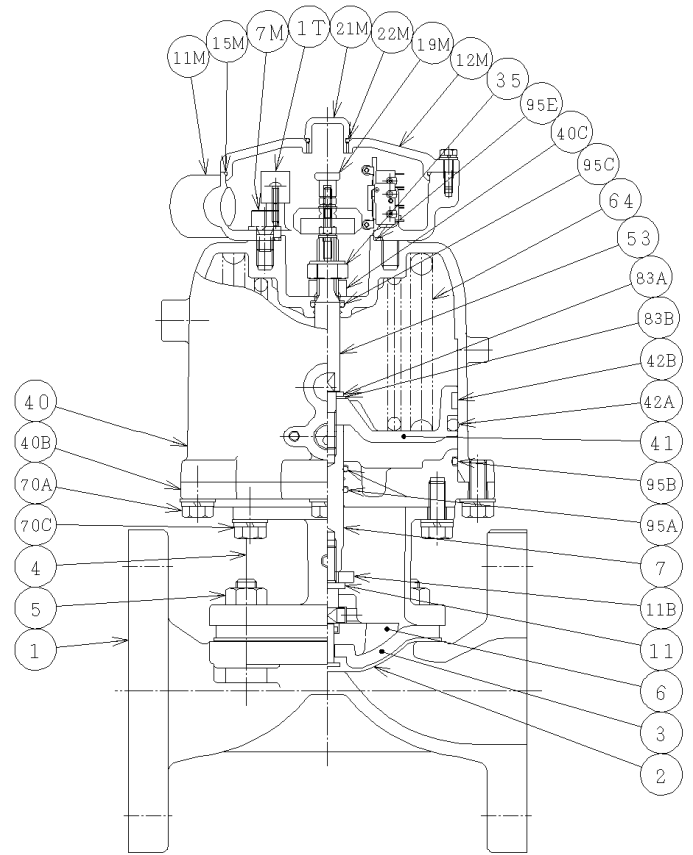
(1) Type PO(C,N)T1400N



3.6 With built-in limit switch

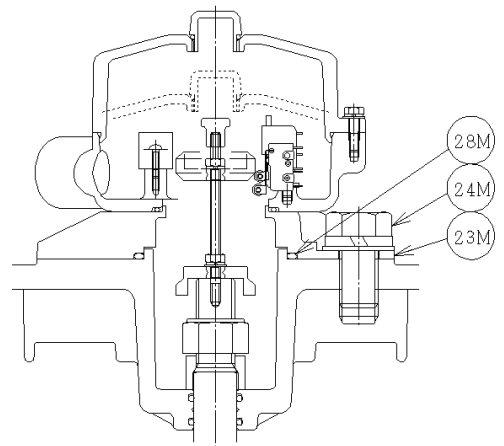
(1) Reverse (direct, double) acting type (Type

PO(C,N)M1400N)



Actuator code No. : 07N~12N

(The drawing shows the reverse acting type)

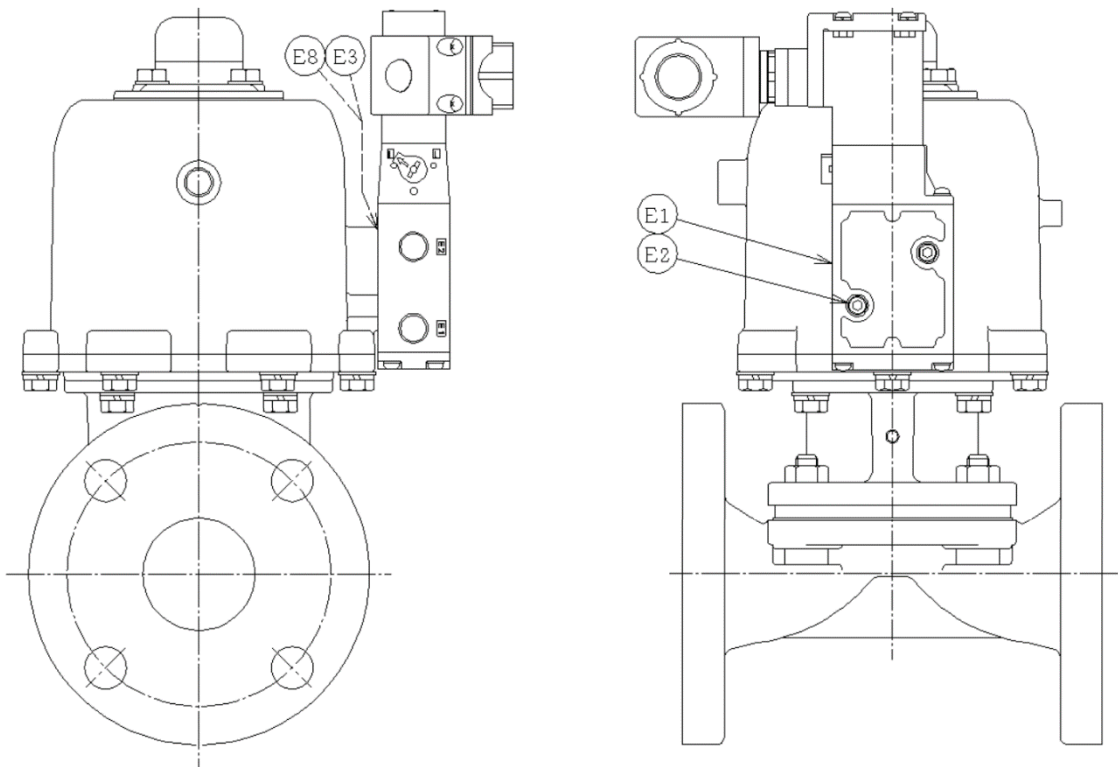


Combination using 23M spacer

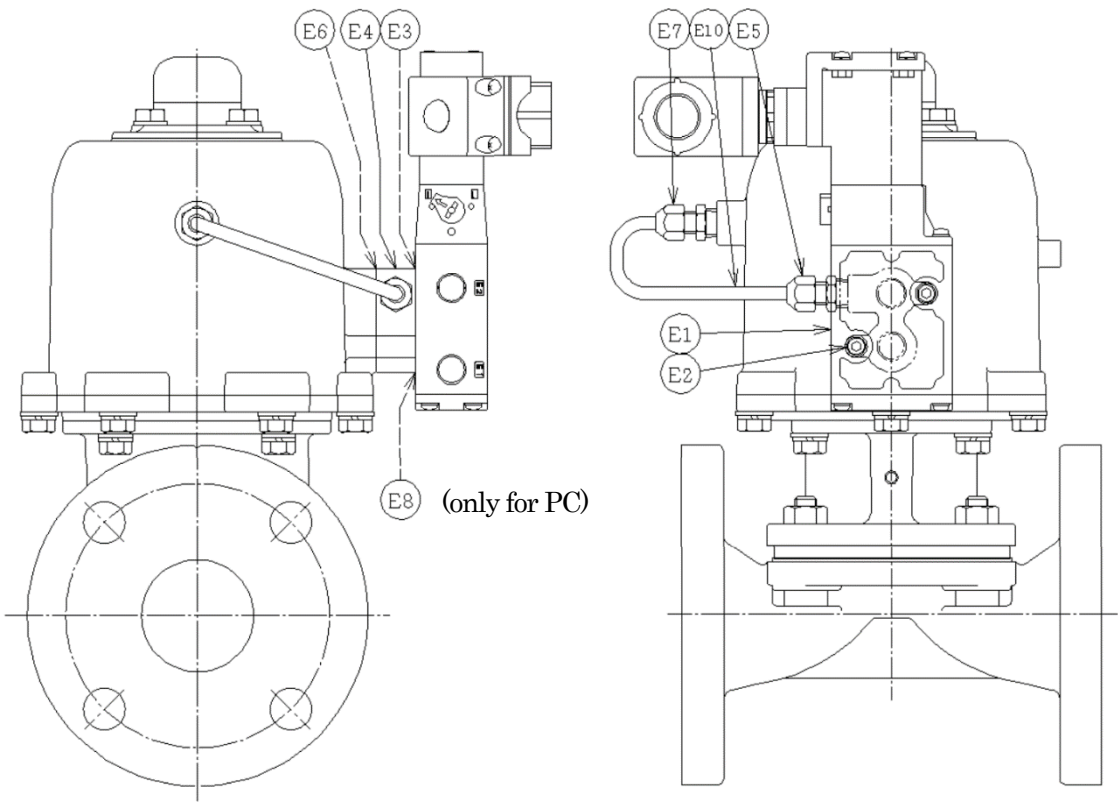
Actuator code No. : 16N~25N

3.8 With solenoid valve

(1) With solenoid valve to be directly mounted (Type POE1400N)



(2) With solenoid valve to be directly mounted (Type PC(N)E1400N)



For part Nos., part names, and locations where they are used, see 3. Structural Drawing (P15-20), 16. Part name list (P69-70), Attached Document (P71 ~ 76)(attached Drawings (disassembly drawing) (1-6)).

#### 4.Operation principle

##### 4.1 Reverse acting type (See 3.1(1) on page 15.)

The reverse acting type valve pushes down, by the force of the spring **64**, the piston **41**, spindle **7**, connector **11**, and compressor **6**, and is in a fully closed state at all times with the diaphragm **2** connected to the compressor **6** pushed against the main body **1**.

When specified air pressure for operation is applied to the lower chamber of the cylinder, the piston **41**, spindle **7**, connector **11**, and compressor **6** exceeds the force of the spring **64** and moves upward. Because the diaphragm **2** connected to the compressor **6** is pulled up, the valve becomes fully open.

Conversely, when air pressure for operation is discharged to the atmosphere, the valve pushes down, by the force of the spring **64**, the piston **41**, spindle **7**, connector **11**, and compressor **6**, and the diaphragm **2** connected to the compressor **6** is pushed against the main body **1**, and therefore, the valve becomes fully closed.

##### 4.2 Direct acting type (See 3.1(2) on page 16.)

The direct acting type valve, oppositely to the reverse acting type, is in a fully open state at all times by the force of the spring **64**.

When specified air pressure for operation is applied to the upper chamber of the cylinder, the piston **41**, spindle **7**, connector **11**, and compressor **6** exceeds the force of the spring **64** and moves downward. Because the diaphragm **2** connected to the compressor **6** is pushed against the main body **1**, the valve becomes fully closed.

Conversely, when air pressure for operation is discharged to the atmosphere, the piston **41**, spindle **7**, connector **11**, and compressor **6** move upward by the force of the spring **64**, and the diaphragm **2** connected to the compressor **6** is pulled up, and therefore, the valve becomes fully open.

##### 4.3 Double acting type (See 3.1(3) on page 16.)

The double acting type valve, unlike the reverse acting type and direct acting type, has no spring **64** and it is made fully open and fully closed by switching between pressurization and discharge of air pressure for operation to the upper and lower chambers of the cylinder.

When, with the piston **41** inside the cylinder as a boundary, air pressure for operation is applied to the upper chamber and air pressure in the lower chamber is discharged to the atmosphere, the piston **41** is pushed down and the diaphragm **2** is pushed against the main body **1**, and as a result, the valve becomes fully closed.

Conversely, when air pressure for operation is applied to the lower chamber and air pressure in the upper chamber is discharged to the atmosphere, the piston **41** is pushed up and the diaphragm **2** also goes up, and as a result, the valve becomes fully open.

## 5. Reception, Transportation and Storage

### 5.1 Reception and transportation

#### **WARNING**

- (1) Products with larger nominal diameters are classified as “heavy goods.” When unloading and transporting these products, use a proper hoist machine compliant with the Industrial Health and Safety Law. Furthermore, when products are lifted with hoist machines, cranes, etc., be sure never to operate machinery or place any part of your body under the lifted product (not even your hands or feet). Tumbling or falling products can result in “death and serious injury.”
- (2) A small-sized product contained in a corrugated cardboard package can be deteriorated in its package strength if it gets wet with water. Please take enough care when handling the wet corrugated cardboard. Tumbling or falling products can result in "physical damage".
- (3) Always be sure to wear safety gear and safety protectors when working.
- (4) Some diaphragm valves are made of materials susceptible to shock such as glass lining, hard natural rubber lining, etc. Please handle the product carefully and gently. In case the lining material with corrosion resistance is damaged that contacts the fluid, metal of base materials will be decomposed by the fluid and the fluid may leak. Also, contact with some types of fluid may result in the risk of death, serious injury or blindness.

### 5.2 Storage

#### 5.2.1 General purpose valves

- (1) It is recommended to keep the product in a package until piping work starts.
- (2) To store the product for a certain period, which has been unpacked, it is recommended to store it indoors to prevent it from rust.
- (3) Avoid the following places to store the products.
  - (a) A place where rain drops come in
  - (b) A place with atmosphere with temperature of more than 60 degrees Celsius
  - (c) A place with atmosphere with high humidity
  - (d) A place with dusty atmosphere
- (4) A dust-tight seal is provided on a connection flange surface of the product to prevent dust from coming into the inside of the valve body. Do not remove the dust-tight seal before piping even after the valve has been unpacked. If foreign material coming into the inside of the valve is caught between the diaphragm and seat, leakage may occur.
- (5) Also, when the valve is unpacked for the acceptance inspection, it is recommended to pack it again and store until the installation work starts.
- (6) Do not remove the plugs and covers on the pneumatic piping connection and conduit connection just before carrying out pneumatic piping and electrical wiring works.
- (7) Handle the glass lining body or ceramic body carefully so as not to give shock.
- (8) Place the product on the rubber sheet so that a connection flange surface of the valve body cannot be scratched.
- (9) To store the product after use, follow the steps described below.
  - (a) Thoroughly clean the inside of the valve and dry it sufficiently.
  - (b) Protect the connection flange surface of the valve body to prevent from being scratched.
  - (c) Perform rust prevention treatment to the location where rust may occur.
  - (d) Perform Waterproof treatment to the Pneumatic piping connection and conduit connection.

### 5.2.2 Bioclean valves

Special cautions for bioclean valves are described below. Other cautions are the same as for the general valves. See Section 5.2.1.

- (1) Some valve bodies and bonnets are applied with abrasive finishing on the surface. When handling the valves during transportation, take care not to impact and scratch the surface of the valve.
- (2) A dust-proof cap is fitted on the connection end and aperture section to prevent dust or dirt from coming in. Also, the valve is entirely covered with a dust-proof bag in order to keep the effect of cleaning treatment.

Keep the valve in the dust-proof bag with cap until starting piping even after it is unpacked.

<b>CAUTION</b>
----------------

If foreign matter inside the valve is caught between the valve and valve seat, operational failure will be caused and significantly deteriorate surface finishing and cleaning treatment.

## 6. Confirmation of specifications

The products are put with a seal name plate showing details in Table 1. Please confirm that the product delivered meets the specifications of the valve you ordered.

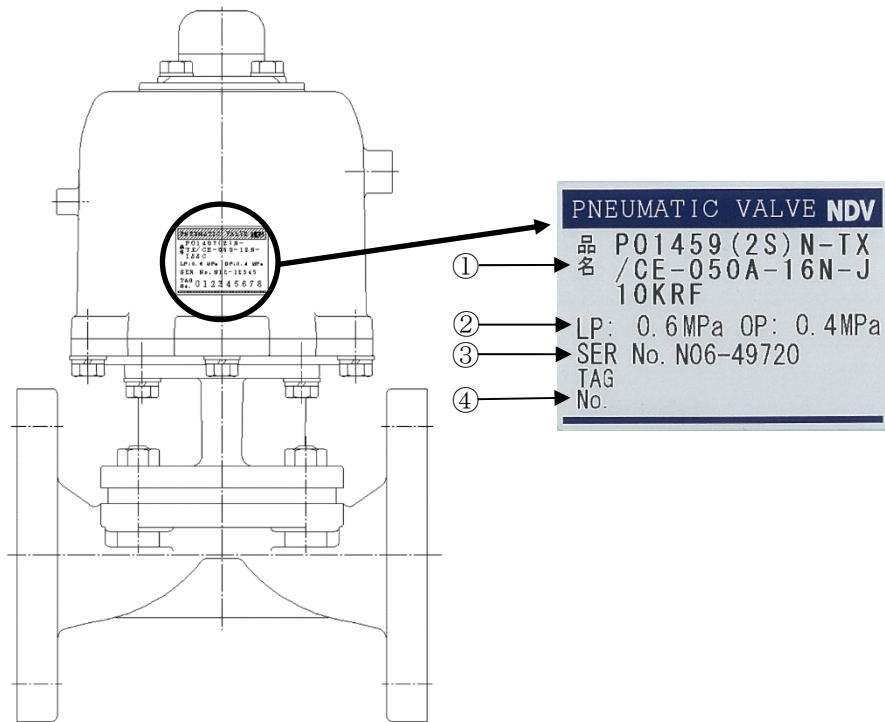


Table 1 Details in the seal name plate

No	Items	Description	Example
①	Product name	Product code	PO1459(2S)N-TX TXCX-050-16N-J10KRF
②	LP	Fluid pressure (MPa)	0.6 MPa
	OP	Operating pressure (MPa)	0.4 MPa
③	SER. No.	Manufacturer's serial No.	☆☆☆☆☆ N06- 4 9 7 2 0
④	TAG No.	User's valve No.	(Please assign)

Note: ☆☆☆☆☆ is shown in sequential numbers



## 7. Installation of valve

### WARNING

- (1) Products with larger nominal diameters are classified as “heavy goods.” When installing these products to piping, use a proper hoist machine compliant with the Industrial Health and Safety Law. Furthermore, when products are lifted with hoist machines, cranes, etc., be sure never to operate machinery or place any part of your body under the lifted product (not even your hands or feet). Tumbling or falling products can result in “death or serious injury.”
- (2) When attaching a valve to the piping, never insert a hands or foot into a connection flange surface of the valve and pipe. The risk of “physical damage” is high.
- (3) Always be sure to wear safety gear and safety protectors when working.
- (4) Some diaphragm valves are made of materials susceptible to shock such as glass lining, hard natural rubber lining, etc. Please handle the product carefully and gently. In case the lining material with corrosion resistance is damaged that contacts the fluid, metal of base materials will be decomposed by the fluid and the fluid may leak. Also, contact with some types of fluid may result in the risk of death, serious injury or blindness.

### CAUTION

- (1) Before starting work, please confirm that there are no safety hazards in the working environment.
- (2) When removing the product from the package and lifting it, use a standardized lifting device to safeguard against product damage.
- (3) During piping work, never drop the product or allow it to slip or tumble. Strong impacts due to tumbles and falls pose a risk of "damage or failure."

## 7.1 Attaching the valve

### 7.1.1 General purpose valves

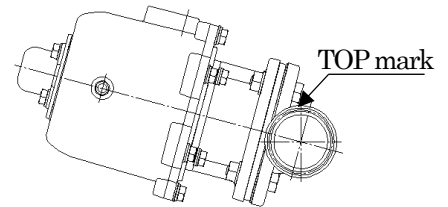
- (1) Remove the dust-tight seal covering the connection end of the body and confirm that the inside is free of dirt and adhering foreign materials. Also, confirm that the piping system to which the valve is attached is clean and free of foreign matter. If the flanges end were stuck with protection tape, remove it and wipe flanges with alcohol.
- (2) The diaphragm valve flows in either direction, so be sure to note the direction of the pneumatic piping, electric wiring, or valve open/close indication when attaching it to the piping. For the valve with manual operation mechanism, mount the diaphragm with care not to disturb handle operation.
- (3) The valve can be attached in any direction (vertically, horizontally, diagonally, etc.) but not inversely. Note that if the valve is installed vertically to the horizontal pipe, it will be easy to replace the diaphragm.
- (4) To completely remove the fluid inside the piping when carrying out horizontal piping, there is a method of attaching the valve by tilting the actuator. Inclination angles are different depending on the nominal diameters and materials of the main body. Please contact us for details.
- (5) To attach the valve slantingly, horizontally, or vertically to the piping, be sure to provide secure safety support.
- (6) Be sure to leave enough space for disassembly inspection. The space must be wide enough to replace the diaphragm with the valve body attached to the piping. The space must be wide enough to lift the actuator assembly

- (7) Pay attention to prevent foreign material, droplet, oil, etc., from coming in through the vent of bonnet and actuator.
- (8) Keep the ambient temperature of the valve within the range of  $-5^{\circ}\text{C}$  (but not to freeze) to  $60^{\circ}\text{C}$ . If the ambient temperature is too low or too high out of this range, diaphragms or o-rings may harden or deteriorate.
- (9) Never apply abnormal tensile compression or bending stress when attaching the valve to the piping.
- (10) Tighten the piping bolts over diagonal lines by turns evenly when attaching the valve to the piping. The connection flange surface may leak and cause lining to be damaged if piping bolts are unevenly tightened.
- (11) For valves to be connected with welding joint, perform welding after detaching the actuator assembly including diaphragm from the body and install the actuator assembly including diaphragm after cooling in normal temperature.
- (12) When attaching the valve, use the full-face gasket for flat face flange. Especially, use full-face gasket of soft rubber type for soft rubber lining body (soft natural rubber lining, chloroprene rubber lining, isobutylene-isoprene rubber lining).
- (13) 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 if 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.)
- (14) When attaching the glass lined body and ceramic body, be sure to fix the adjacent valves or piping and tighten one flange and then the other flange on the opposite side.
- (15) Confirm that clamping bolts and nuts of the body and diaphragm are securely tightened. If any are loose, tighten them securely according to tightening torque in "Table of Diaphragm Tightening Torque" (Table 3 on page 47).
- (16) Once the valve is attached to the piping, open the valve to the full-open position and flush out the piping with gas or liquid to remove any foreign materials remaining inside. Use the fluid for washing that does not cause the body and diaphragm to corrode.

### 7.1.2 Bioclean valves

Special cautions for bioclean valves are described below. For other cautions are common to those for general purpose valves, see 7.1.1.

- (1) Remove the dust-proof bag and dust-proof cap covering the connection end and aperture part and confirm that there is no foreign matter is adhered. Also confirm that the piping system is clean without foreign matter.
- (2) Confirm that the valve complies with the piping specification.
- (3) To remove the fluid thoroughly from the valve when attaching the valve to the horizontal piping, tilt the angle to the horizontal pipe with the “TOP” mark upside. (see the figure on the right.)



Sloping the piping will decrease drain and improve the self-drain effect.

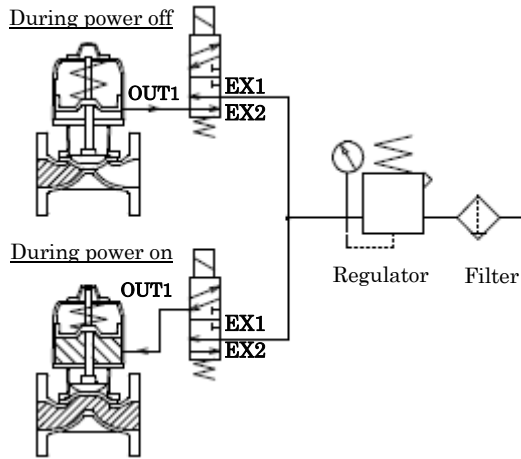
#### CAUTION

For valves of ferrule joint connection, rotary force will be exerted due to the actuator weight, loosen the clamp and rotate the valve, thereby hit the body and may lead to injury. Especially, since the valve inclined to minimum angle of liquid pool is easy to rotate, provide support to prevent rotation.

## 8. Pneumatic piping system diagram

The solenoid valve which our company installs as a standard is directly mounted on the Actuator. Therefore, connect air pressure for operation to the IN side of the solenoid valve. The general method of piping in this case is as follows.

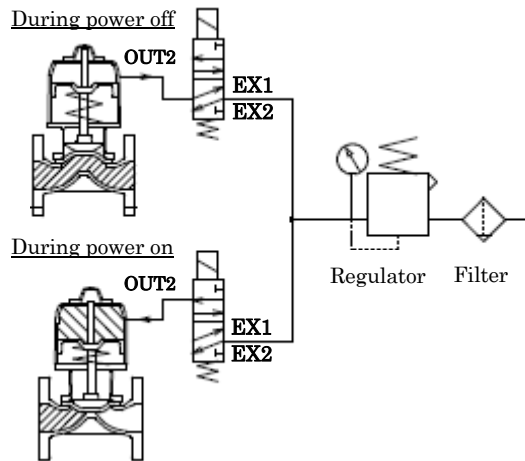
### (1) Reverse acting type



During power off: The valve is closed by discharging air pressure in the lower chamber of the cylinder.

During power on: The valve is opened by introducing air pressure into the lower chamber of the cylinder.

### (2) Direct acting type

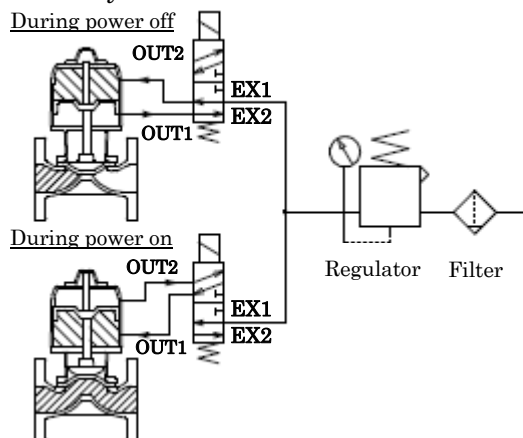


During power off: The valve is opened by discharging air pressure in the upper chamber of the cylinder.

During power on: The valve is closed by introducing air pressure into the upper chamber of the cylinder.

### (3) Double acting type

#### ① Normally closed state



#### ① Normally closed state

During power off : The valve is closed by discharging air pressure in the lower chamber of the cylinder and introducing air pressure into the upper chamber of the cylinder.

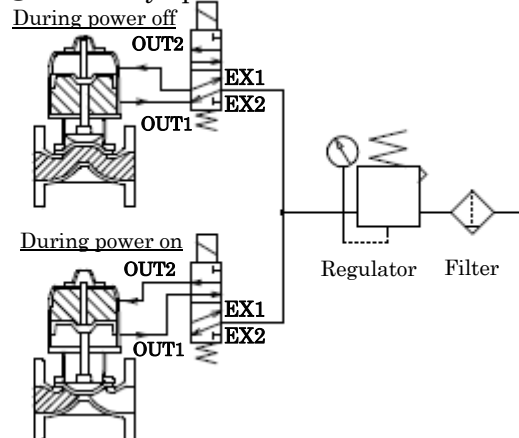
During power on : The valve is opened by introducing air pressure in the lower chamber of the cylinder and discharging air pressure in the upper chamber of the cylinder.

#### ② Normally open state

During power off : The valve is opened by introducing air pressure into the lower chamber of the cylinder and discharging air pressure in the upper chamber of the cylinder.

During power on : The valve is closed by discharging air pressure in the lower chamber of the cylinder and introducing air pressure into the upper chamber of the cylinder.

#### ② Normally open state



## 9. Operation

### 9.1 Operating air

#### WARNING

In case operating air pressure exceeding the specified range in Table 2 is applied inside the actuator during operation, the actuator may burst or destruct. This may lead to death, serious injury, or blindness due to scatters.

#### CAUTION

- (1) Use pure and dry supply air which has been filtered by an appropriate filter and dehumidified by an air dryer.
- (2) The operating air pressure should be 0.4MPa (+0.1, -0) not only for reverse acting type but also for direct acting type and double acting type. 0.3MPa is also supported as an option.

The upper and lower limits are within the specified pressure range shown in the table below.

Table 2 Specified operating air pressure

Type	Upper limit	Lower limit
Reverse acting type	0.5 MPa	Values indicated in the name plate
Direct acting type		
Double acting type		

- (3) The air piping joint to the pressure supply inlet should be tightened according to the torque in the table below after applying sealant onto the joint screw. Insufficient torque may cause air leakage, while excessive torque may damage the tapped hole.

Connecting screw	Optimum tightening torque (N · m)
Rc1/4	12~14

### 9.2 Operation

#### CAUTION

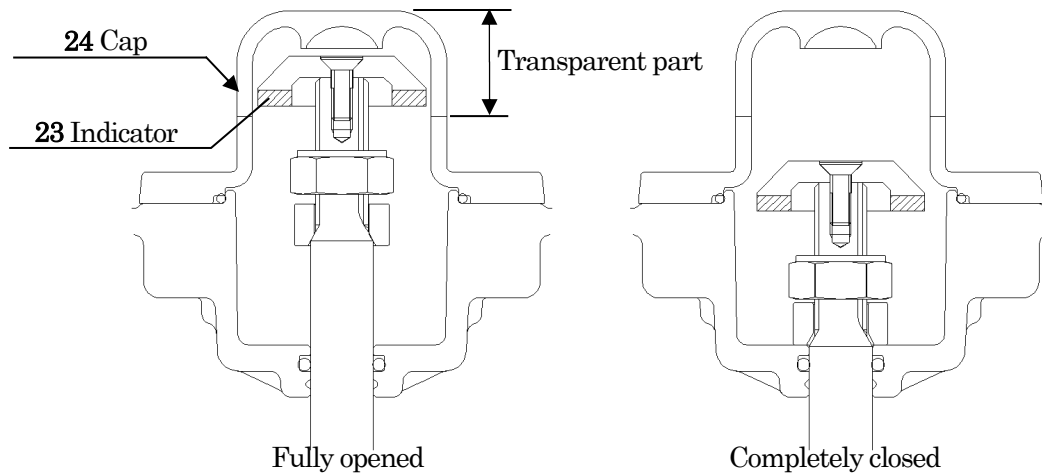
- (1) Pressure rise and drop due to operation under the closed state that both of the upstream and downstream valves are closed  
Since the diaphragm valve opens and closes along with movement of the diaphragm, internal volume changes. The pressure inside the closed pipe rises or reduces according to the diaphragm movement. This phenomenon may shorten the diaphragm service life, and when the diaphragm is insufficiently tightened, the fluid may leak out from the connection between the diaphragm and the body during pressure rise. Furthermore, there is a risk of sucking the external air during depressurizing. To avoid this, make sure that the pipe should not be closed.
- (1) Confirm that the connection direction of inlet and outlet of accessories such as solenoid valve, filter regulator, and speed controller is properly attached. Wrong connection will cause malfunction of the valve.
- (2) Confirm that the operation power of the solenoid valve complies with the voltage indicated on the name plate of the solenoid valve.  
With the incorrect voltage, the valve will not operate properly but also the coil will be damaged.
- (3) Confirm that the valve operates smoothly.
- (4) For the valve with manual operation mechanism, confirm that it functions reliably. For this mechanism, see 10.2. Do not 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.
- (5) Confirm that the limit switch functions properly. Since the limit switch is shipped after adjustment is made in the company, normally adjustment by the customer is not necessary. However, if the operation position deviates, make readjustment referring to Section 11.8 and 11.11.

## 10. Valve Mechanism

### 10.1 Open/close indication mechanism

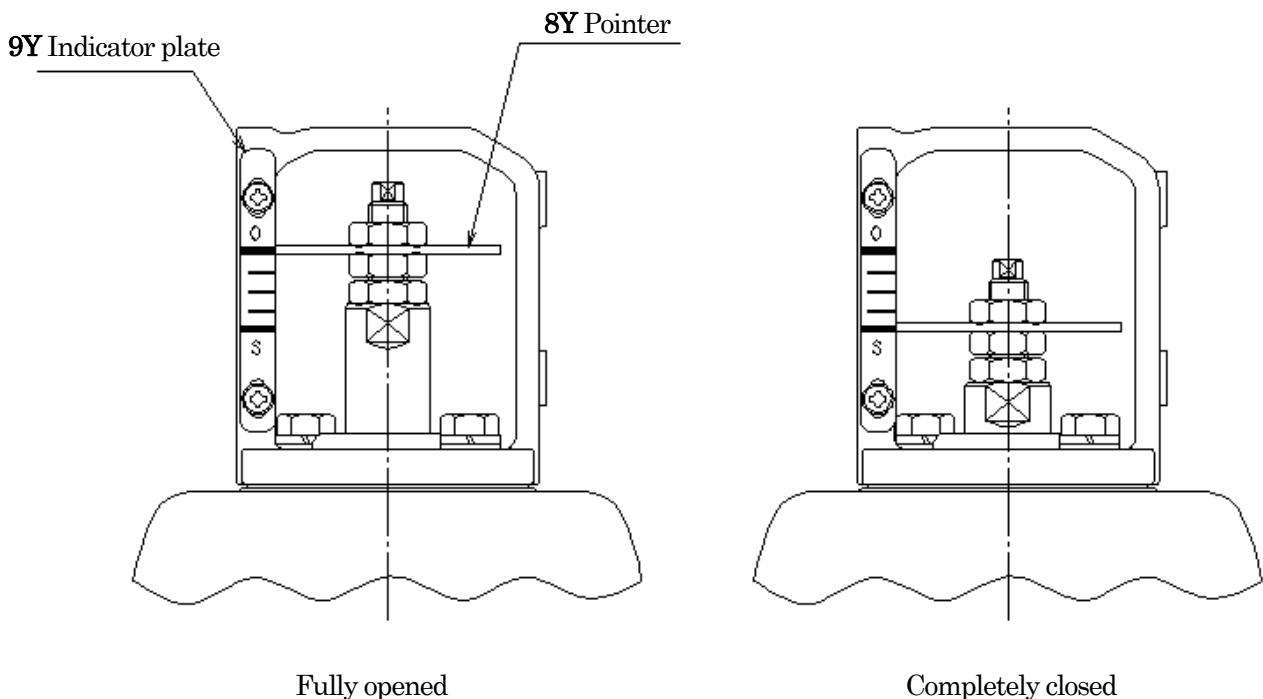
#### (1) Type PO, PC, PN1400 N

- ① The cap **24** is made of polycarbonate resin(with a transparent upper part) to show the valve open/close state at a glance.
- ② When the valve is fully opened, the red part on the outer circumference of the indicator **23** can be seen from the transparent part of the cap **24**.
- ③ During completely closed, the red part on the outer circumference of the indicator **23** is hidden by the cap **24** and becomes invisible.
- ④ Visibility is improved to easily determine open/close even in small stroke.



#### (2) Types PO(C,N)S, POSH, PO(C,N)ST, and POSL1400N

- ① When the valve is fully opened, the pointer **22B** rises to the scale line "O" of the indicator plate **9Y**, showing "full open" state.
- ② When the valve is completely closed, the pointer descends to the scale line "S", showing "completely closed" state.
- ③ The figure below shows Type PO (C,N)S1400N.



## 10.2 Manual opening mechanism (Option)

### (1) Applicable type : Types POSH and POSL1400N

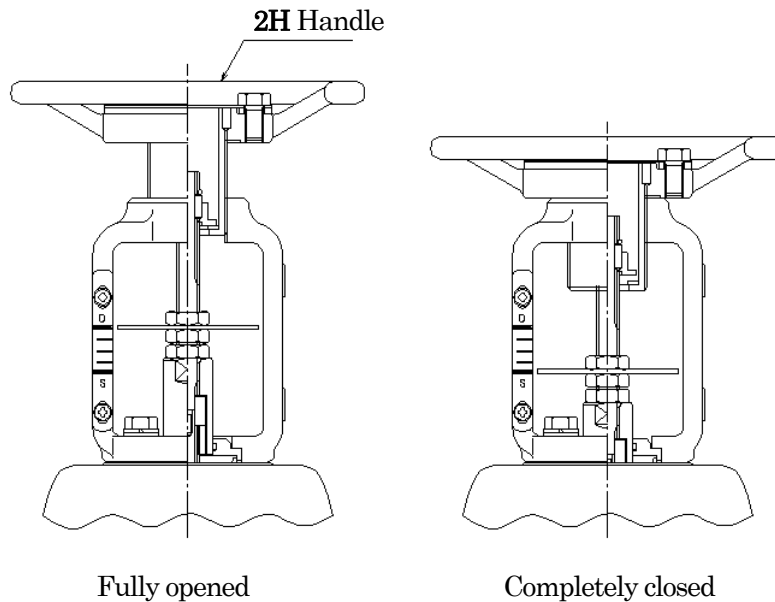
Type PC1400N (direct acting type) is not provided with manual opening mechanism as it is fully opened by the spring when discharging air in the cylinder lower chamber. Type PN1400N (double acting type) operates in the direction where the valve is opened due to the fluid pressure as the load to close the valve does not apply when discharging air in the cylinder lower chamber. Then, it is not provided with manual operation mechanism, either.

(2) Function: When the valve is closed by the spring, this mechanism is used to manually open the valve. It also has an open/close indication mechanism. For details of the open/close indicator mechanism, refer to Section 10.1 (2).

### (3) Opening operation

- ① When the valve is to be opened, the valve gradually opens by turning the handle **2H** counterclockwise.

The figure below shows Type PO1400N and the figure on the left shows a state where the valve is fully opened by the handle **2H**.



- ② The valve is opened while compressing the spring. To fully open the valve, 3~6 N·m operation force is required.

For Types PO1400N-20N and 25N, one person is capable of opening the valve up to 50~60%.

To fully open the valve, two persons are required to operate

### (4) Closing operation

To completely close the valve, turn the handle **2H** clockwise, thereby the valve is closed by the force of spring.

#### CAUTION

- (1) When closing the valve, confirm that the boss of the handle is completely in contact with the upper part of the cylinder or upper part of the yoke. If there is any gap, it will cause a valve seat leakage.
- (2) During operation, use the handle in a fully closed position.

#### WARNING

Never operate the handle when the valve is in operation. This may lead to a physical injury.

### 10.3.1 Opening adjustment mechanism (Option)

(1) Applicable type : Type PO(C,N)ST1400N

(2) Function : Limits the opening of the valve to adjust fluid amount

It also has an open/close indication mechanism. For details of the open/close indicator mechanism, refer to Section 10.1 (2).

(3) Opening adjustment operation

- ① The valve opening can be arbitrary limited (0~100%) by loosening the hexagon nut **3T** and turn the hexagonal bolt **2T**, after fully closing the valve. Approximately 5 mm clearance gap is provided between the hexagon bolt **3T** and the stem **53B** before shipment.
- ② The hexagon bolt **2T** cannot pull up the valve in the opening direction.

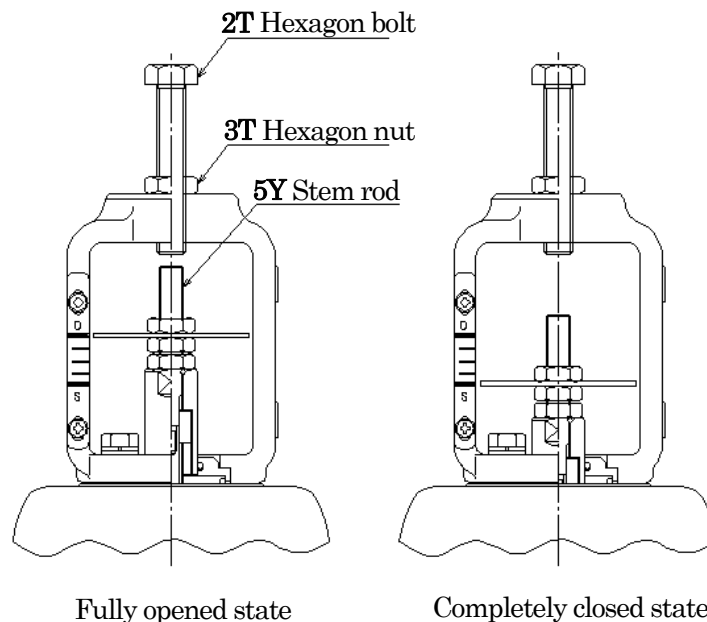
◇ The figure below shows Type POST1400N

#### **WARNING**

For the valve with yoke, never insert hands or fingers between the hexagon bolt **2T** and the stem rod **5Y** during operation. This may lead to a physical injury.

When limiting the opening, make sure that the valve is not opened

In case the opening is limited under full open state, the actuator may burst or destruct. This may lead to serious injury or blindness due to scatters.



### 10.3.2 Opening adjustment mechanism (Option : Without yoke)

(1) Applicable type : Type PO(C,N)T1400N

(2) Function : Limits the opening of the valve to adjust fluid amount.

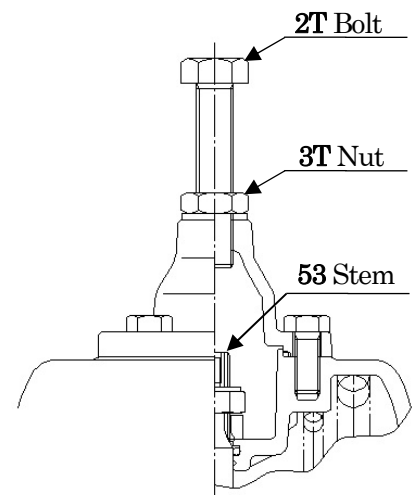
(3) Opening adjustment operation

- ① The valve opening can be arbitrary limited (0~100%) by loosening the hexagon nut **3T** and turn the hexagonal bolt **2T**, After fully closing the valve. Approximately 5 mm clearance gap is provided between the hexagon bolt **3T** and the stem **53** before shipment.
- ② With **2T** bolts, the valve cannot be pulled up in the opening direction.

#### **WARNING**

When limiting the opening, make sure that the valve is not opened

In case the opening is limited under full open state, the actuator may burst or destruct. This may lead to serious injury or blindness due to scatters.





#### 10.4 Manual opening mechanism + Opening adjustment mechanism (Option)

(1) Applicable type: POSL1400N type

(2) Function: The valve has both a mechanism which allows manual operation of the valve in the direction of opening when the valve is closed by the "spring" and a mechanism which limits the valve opening to adjust the flow rate.

The following figures show the POSL1400N type and the left figure shows a state in which it is fully opened by the handle **2H**.

It also has an open/close indication mechanism. For details of the open/close indicator mechanism, refer to Section 10.1 (2).

(3) Opening and closing operation: Refer to Section 10.2.

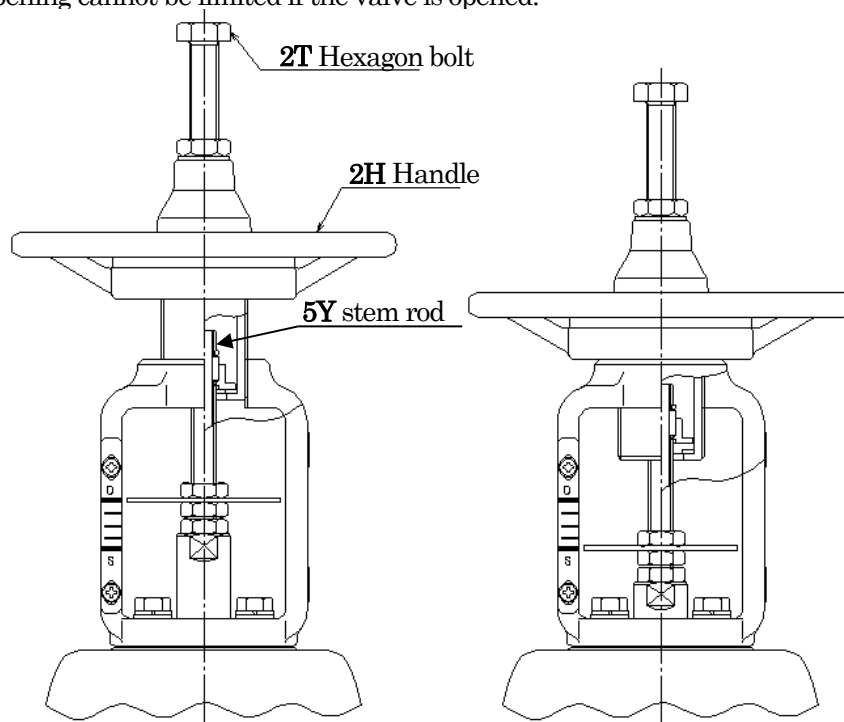
(4) Opening adjustment operation: Refer to Section 10.3.

#### CAUTION

① When performing opening operation, make sure that there is a clearance gap between the hexagon bolt **2T** and the top of stem rod **5Y**. Opening operation cannot be performed in a state in which the valve opening is limited.

Open the valve fully and tighten up the hexagon bolt **2T**, screwing it in until it contacts the stem rod **5Y**. Subsequently, a clearance gap can be provided by loosening the bolt by several turns.

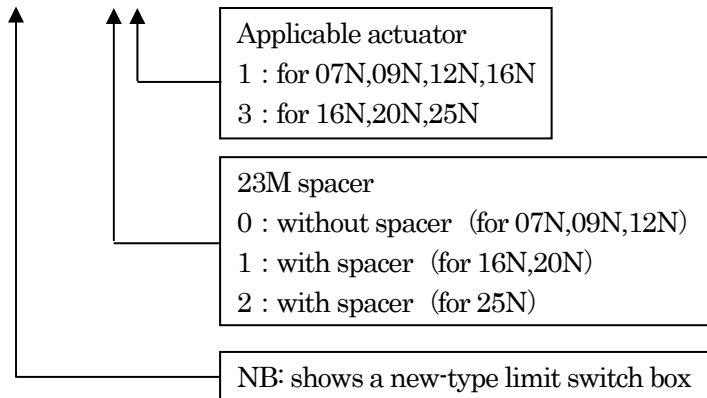
② When limiting the opening, make sure that the valve is not opened by the handle operation. The opening cannot be limited if the valve is opened.



## 11. Limit switch (Option)

### 11.1 Dedicated limit switch box for Type (B)PO(C,N) actuator, Product code

Example MD NB - 0 1



### 11.2 Combination by nominal diameter and actuator model No.

DN	Actuator model No. (B)PO(C,N)M14N-					
	07N	09N	12N	16N	20N	25N
15	MDNB-01					
20	MDNB-01					
25	MDNB-01					
40				MDNB-11		
50				MDNB-11		
65						
80						
100					MDNB-13	MDNB-23
125					MDNB-13	MDNB-23
150					MDNB-13	MDNB-23

### 11.3 Product specification

① Degrees of protection of switch box case

The switch box case is recognized as a spray-proof type after passing the test (in-house test) equivalent to IP 67 of JIS C0920-2003 "Degrees of protection provided by enclosures (IP Code)".

② Electrical rating of micro switch

Model No. : SS-5GL2

Rated voltage : AC 5A-125, 3A-250V

Manufacturer : OMRON

### 11.4 Production specification

(1) Main parts material

- Micro switch: OMRON (SS5GL2-F)
- Terminal block: PBT (polybutylene terephthalate, engineering thermoplastic)  
SATO PARTS make: ML-250SAXF4P
- Electric wire: JIS C3316KIV
- Switch case: aluminum die cast (ADC12)
- Switch case cover: aluminum die cast (ADC12)
- Switch cam: polyacetal (POM)
- Spacer: aluminum cast (AC2B)

(2) Coating color

White, baking finish for both general use and bio use

Priming coat : Power Bind (Nippon Paint, environmentally friendly one-pack quick-drying type epoxy resin)

Top coat : Super Rack Neo (Nippon Paint, environmentally friendly heat hardening acrylic resin)

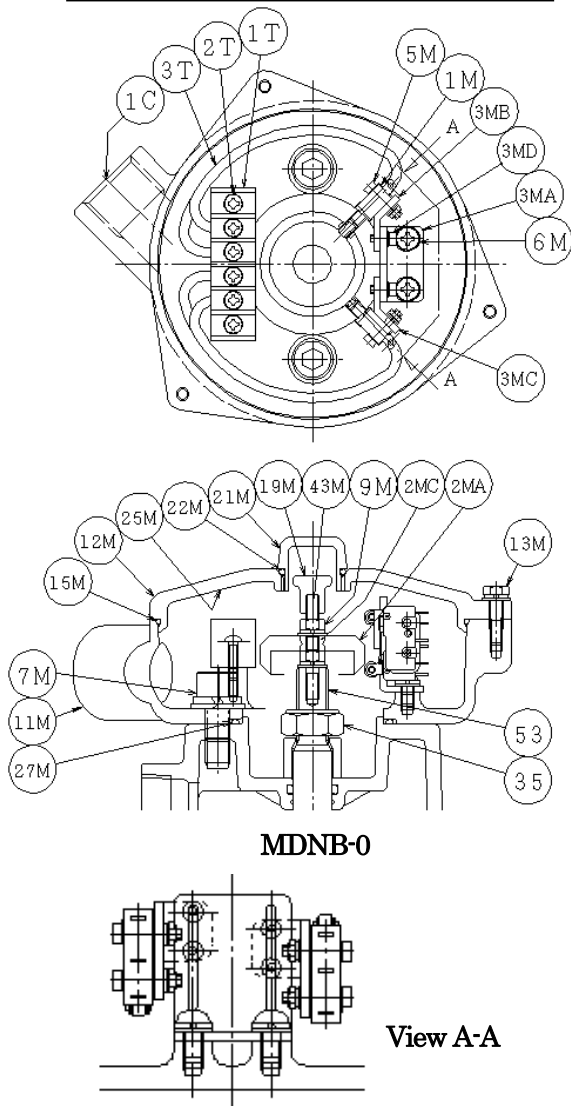
	Coating name	Coating frequency	Color	Film thickness	Drying method
Priming coat	Power Bind base coating (Manufacturer: Nippon paint) Epoxy resin	Once	White	20~35	Natural drying
Top coat	Super Rack110 (Manufacturer: Nippon paint) Heat-hardening acrylic resin	Once	White	30~32	Stove-drying (160°C×20 min)

11.5 Dedicated limit switch box (MDNB-XX), Structure

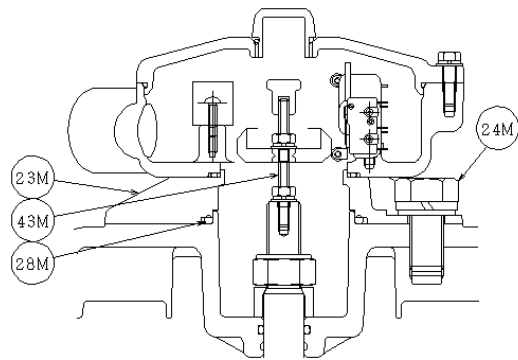
The dedicated limit switch is mounted directly on the top of actuator cylinder.

It is structured in such a manner that a micro switch is attached on where vertical movement of the valve stem caused by opening/closing of the valve can be directly detected, by adjusting the location of the switch vertical and forward/backward.

Dedicated limit switch box structure

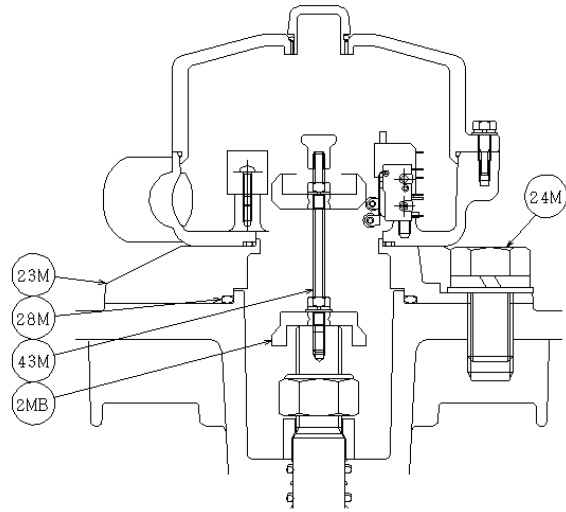


Part No.	Part name	Material	Quantity	Remarks
35	Stopper nut	SUS304	1	
53	Stem	SUS304	1	
1M	Micro switch		2	SS-5GL2-F(OMRON mede)
2MA	Switch cam	POM	1	Black
2MC	Insert nut	C3604BE	1	
3MA	Mounting plate A	SPCC	1	
3MB	Mounting plate B	SPCC	1	
3MC	Mounting plate C	SPCC	1	
3MD	Cap screw	SUS304	4	M2×6 with washer, spring WASHER
5M	Cap screw	SUS304	4	M2×12
5M	Hexagon nut	SUS304	4	M2 with washer, spring WASHER
6M	Machine screw	SS	2	M4×8 with washer, spring WASHER
7M	Cap screw	SUS304	2	M8×14 with washer, spring WASHER
9M	Hexagon nut	SUS304	2	M4 with washer, spring WASHER
11M	Switch case	ADC12	1	
12M	Cover	ADC12	1	
13M	Hexagon bolt	SUS304	3	M4×16 with washer, spring WASHER
15M	O-ring	NBR	1	AS568-044
19M	Indicator	Elastomer	1	
21M	Cap	PC	1	
22M	O-ring	NBR	1	AS568-018
25M	Circuit diagram	Teotron	1	
27M	Gasket	NBR	1	
43M	Hex socket set screw	SUS304	1	M4×30
1T	Terminal blocks	P.B.T.	1	ML-250S1AXF4P
2T	Machine screw	SUS304	2	M3×12
3T	Electroc wire		4	JIS C3316 KIV
1C	Cap		1	



MDNB-11

Part	Part name	Material	Quantity	Remarks
23M	Spacer	AC2B	1	
24M	Hexagon bolt	SUS304	2	M12×25
28M	O-ring	NBR	1	G50
43M	Hex socket set screw	SUS304	1	M4×50



MDNB-13,23

Part	Part name	Material	Quantity	Remarks
2MB	Switch cam B	POM	1	
23M	Spacer	AC2B	1	
24M	Hexagon bolt	SUS304	2	M16×30
28M	O-ring	NBR	1	G50
43M	Hex socket set screw	SUS304	1	M4×70

### 11.6 Operation mechanism of Dedicated limit switch box (MDNB-XX)

#### (a) Valve closing operation (MDNB-01,11,13,23)

- ① When the valve is closed, the stem **53** lowers, set screw **43M**, switch cam A **2MA**, and indicator **19M** linked to the stem, go down.
- ② Accordingly, the lower taper surface of the switch cam A **2MA** lowers the roller lever of the micro switch **1M**, and the limit switch on the closing side turns “ON”.

#### (b) Valve opening operation

##### (i) MDNB-01,11

- ① When the valve is opened, the stem **53** goes up, switch cam A **2MA**, and indicator **19M** linked to the stem go up.
- ② Accordingly, the upper taper surface of the switch cam A **2MA** pushes up the roller lever of the micro switch **1M**, and the limit switch on the opening side turns “ON”.

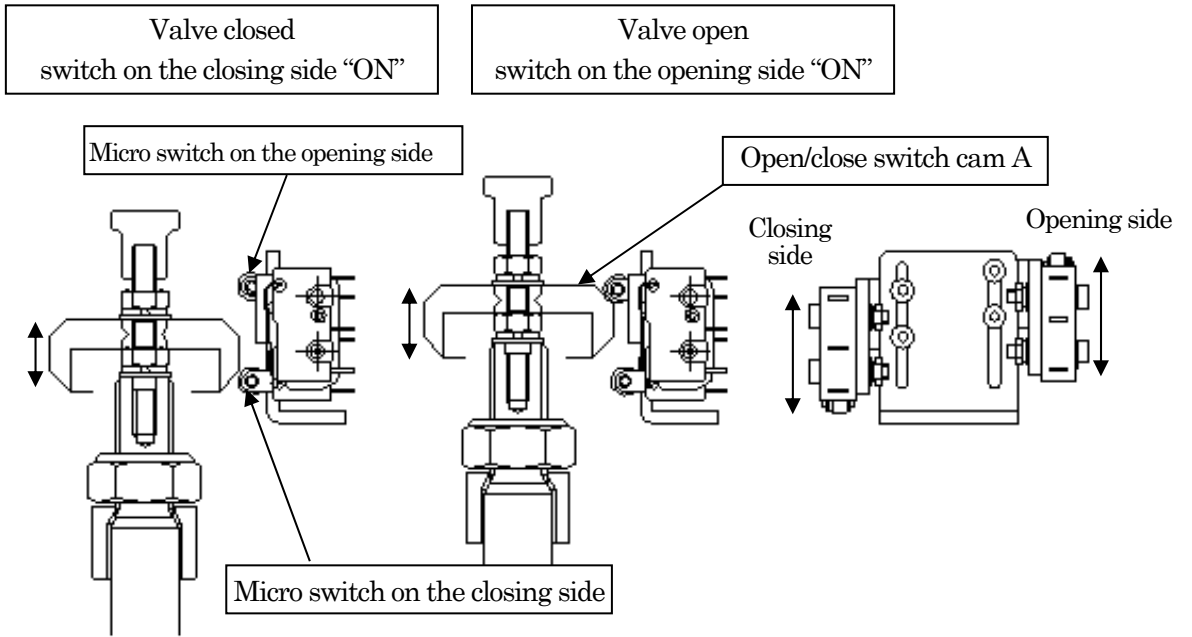
##### (ii) MDNB-13,23

- ① When the valve is opened, the stem **53** goes up, hex socket set screw **43M**, switch cam A **2MA**, switch cam B **2MB**, and indicator **19M** linked to the stem go up.
- ② Accordingly, the taper surface of the switch cam B **2MB** pushes up the roller lever of the micro switch, and the limit switch turns “ON”.

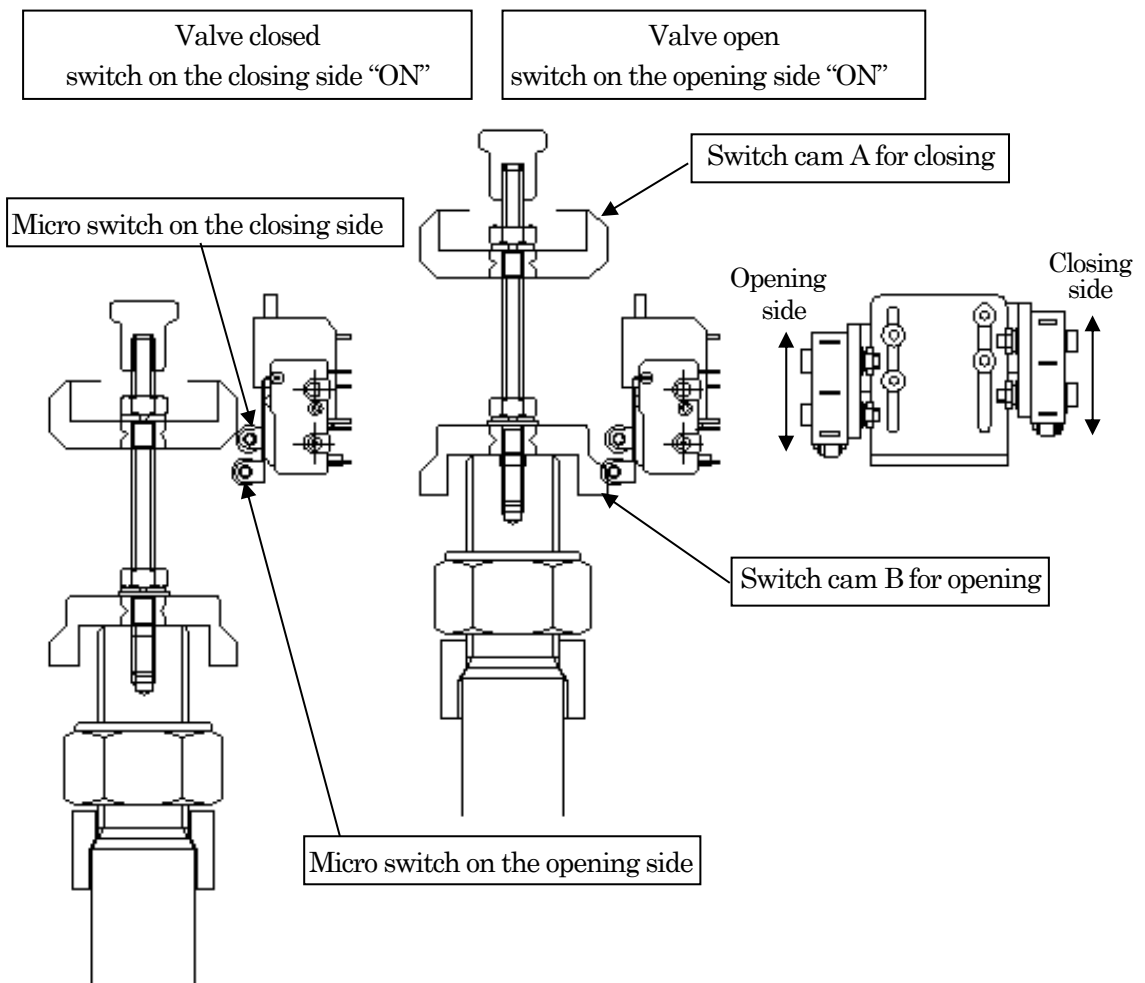
#### (c) When the valve is in the neutral position

- ① When the valve is in the middle of opening/closing operation, both limit switches, open /close side, are turned "OFF" due to self-returning mechanism of the micro switch **1M**.

- MDNB-01,11



- MDNB-13,23



## 11.7 Disassembly and assembly

MDNB model is an improved type of the MD model of limit switch box. When replacing the former dedicated limit switch box of type MD with a new MDNB, carry out disassembly in accordance with the following procedure.

### (1) Removal of old-type dedicated limit switch box

- ① Open the valve.
- ② Loosen the machine screw for drop prevention **13M**.
- ③ Remove the switch case cover **12M**.
- ④ Remove the wire connection on the terminal block. Be sure to confirm that the power is turned "OFF".
- ⑤ Remove the cap screws **7M** and copper washer **29M**.
- ⑥ Lift up the switch case **11M**, and then, while inclining it, pull out the closed position adjusting screw **10M** from the side of the stopper nut **35**.

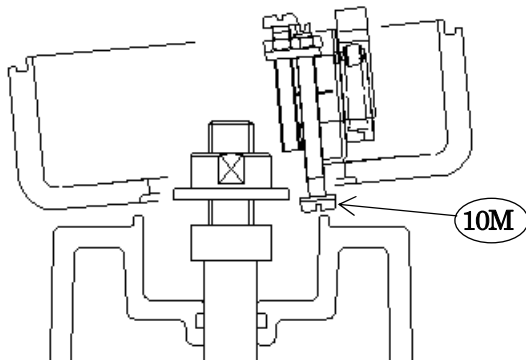
For the Actuator model No. 16 to 25, a collar is mounted in the concave portion of the cylinder. The collar **35M** has a cutout in one location, and therefore, pull out the closed position adjusting screw **10M** from this gap.

The spacer **23M** is commonly used for both new and former models, so the spacer is not necessary to be removed.

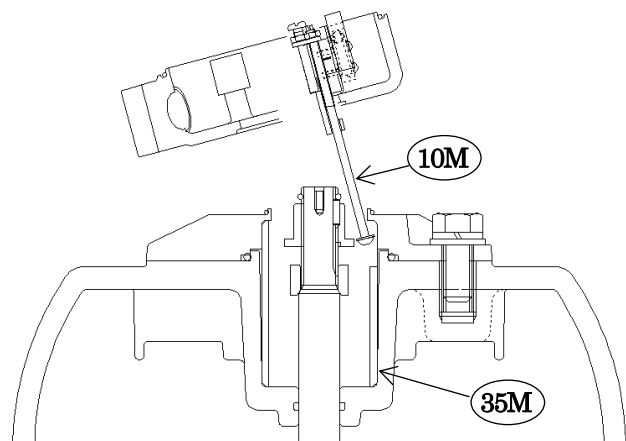
Similarly, the collar **35M** will not be needed any more, however, it has no effect on the valve operation. This part is not required to be removed, either.

### CAUTION

In a case where the valve is closed when the closed position adjusting screw is removed, there is a possibility that the limit switch may be damaged, and in addition, there is a danger of "damage to the body", such as fingers or hands. Therefore, keep the valve open.



Actuator Code No. : 07 to 12

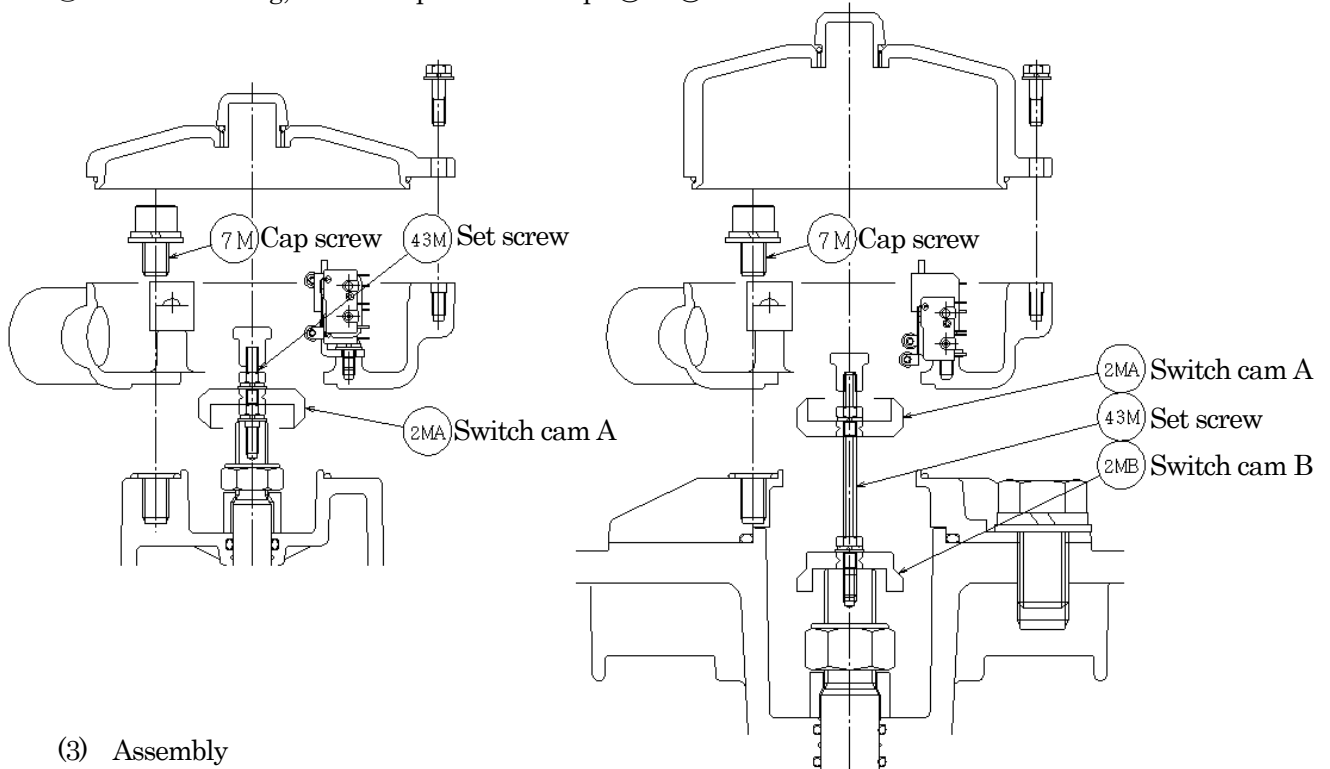


Actuator Code No. : 16 to 25

(2) Disassembly of MDNB-01/23

Disassembly or assembly can be performed only by removing or attaching the cap screws **7M** regardless of the valve is in open or closed position, since the switch cam A, B **2MA**, **2MB** and set screw **43M** are assembled to the stem and separated from the operating lever of the micro switch. (See the figures below)

- ① Loosen the bolt **13M**.
- ② Remove the switch case cover **12M**.
- ③ Remove the wire connection on the terminal block **1T**. Be sure to confirm that the power is turned "OFF". We recommend that at this time, a joint symbol, etc. be attached.
- ④ Remove the cap screw **7M**.
- ⑤ Make a new switch unit ready.
- ⑥ For assembling, follow the procedural steps ① to ⑥ in reverse order.

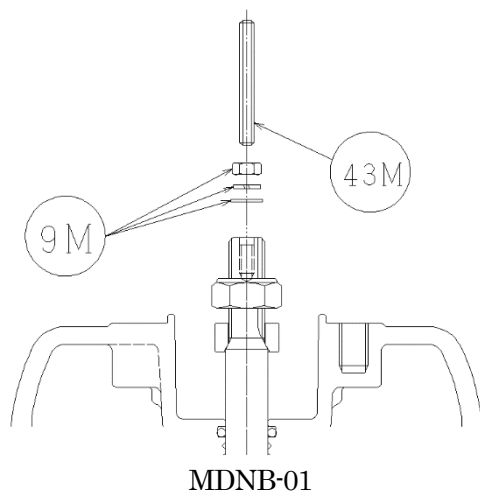


(3) Assembly

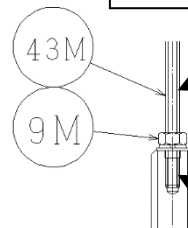
Use these guidance for (new) assembly, such as entire disassembly for inspection of actuator, or changing of the valve configuration from the standard one to limit switch box attached, after purchasing.

(a) Assembly of MDNB-01

- ① Mount the set screw **43M**, nut **9M**, spring washer and washer.



The set screw **43M** are thin (M4) and easy to bend, so be careful when handling them.



To prevent loosening, apply Loctite #262 before screwing the set screw **43M** into the stem.

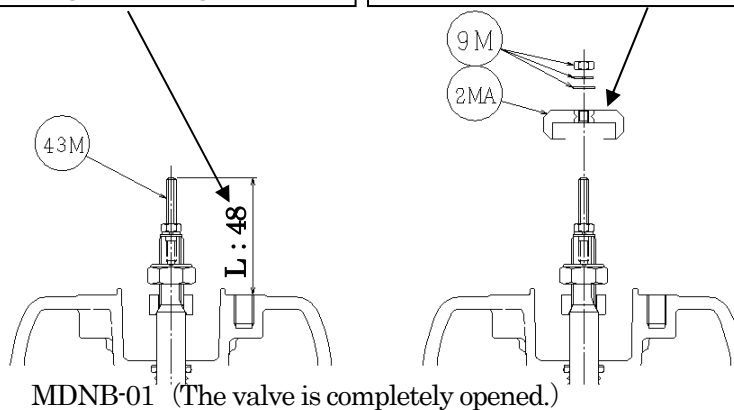
- ② The projected length of the hexagon socket set screw **43M** from the cylinder head portion (L: see figure below) should be adjusted appropriately.  
The projected length of the hexagon socket set screw **43M** from the stem, or the length of the set screw from the cylinder head while closing should not be used as a reference, because they vary depending on the variations of other parts' dimension or the valve stroke etc.
- ③ Apply "Loctite #262" to the end of the hexagon socket set screw **43M** and screw it into the stem.
- ④ Screw the set screw in as shown in the figure below. Be sure to keep the projected dimension (L: see figure below). When the hexagon socket set screw **43M** is tightened to the end and fixed, the indicator cap **19M** which serves as a mark during fully opening of the valve cannot be seen from a state in which the switch case cover **12M** is put on. The hexagon socket set screw **43M** is of the M4 type, which is thin and easy to bend, and therefore, exercise caution when the hexagon nut **9M** is tightened. (Refer to the figure below.)
- ⑤ The switch cam A **2MA** in MDNB-01 should be installed with the hexagon nut **9M**, spring washer, and plain washer after the projected dimension (L) is secured. The switch cam should be installed with the concave portion looking down. As for the fixing location, use the dimension H in "Indication List of H Dimension" (11.8.4 ①) as an approximation. (Refer to the figure below.)

**CAUTION**

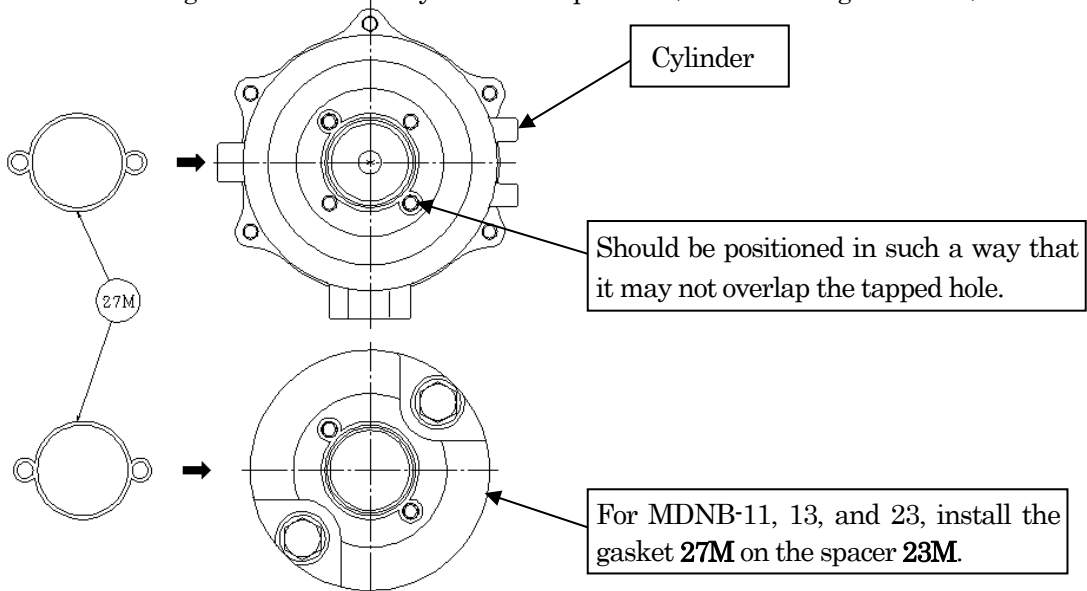
The direction of the switch cam A **2MA** differs depending on the model number. Caution should be exercised.

This is a projected dimension of the set screw **43M** when the valve is completely opened. Set the set screw by securing (L : see figure below).

Note that the direction of switch cam A **2MA** in MDNB-01 is different from that of MDNB-11, 13, and 23. (Install the switch cam A **2MA** with the concave portion downward.)



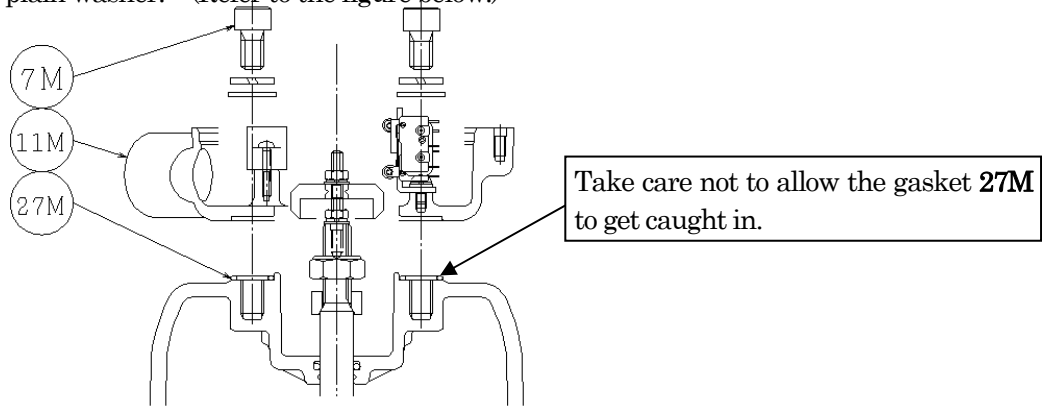
- ⑥ Fitting the gasket **27M**  
Install the gasket **27M** on the cylinder head portion. (Refer to the figure below.)





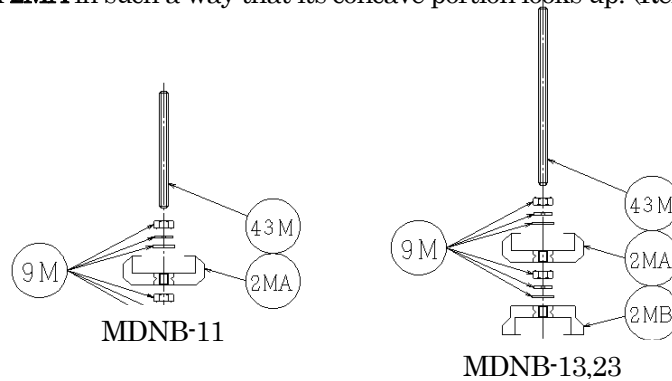
⑦ Fitting the switch case **11M**

Pass the switch case **11M** through **2MA** and set it on the cylinder. (In the case of MDNB-11, 13, and 23, set it on the spacer **23M**.) Fix it with the cap screw **7M**, spring washer, and plain washer. (Refer to the figure below.)



(b) Assembly of MDNB-11, 13, and 23

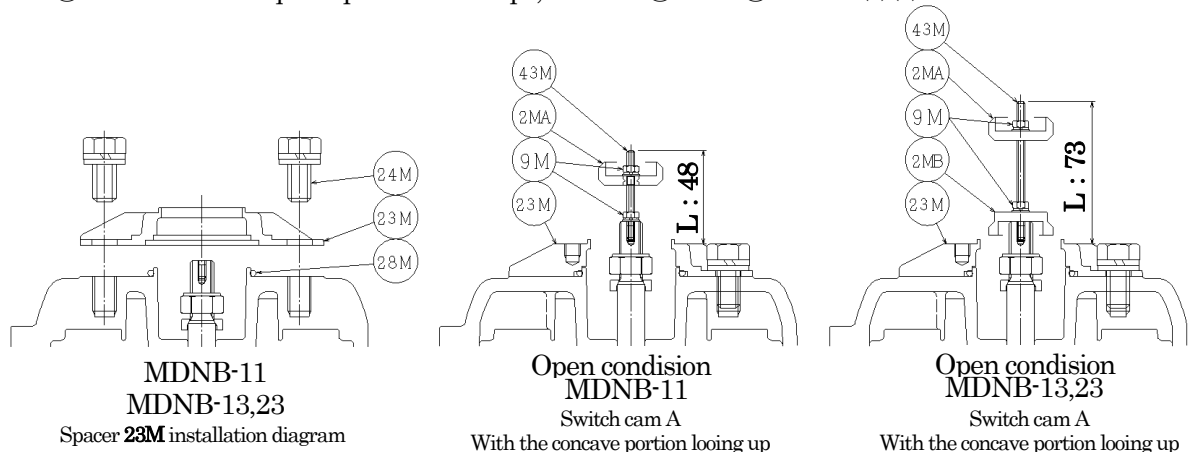
- ① Onto the set screw **43M**, screw in the hexagon nut **9M**, spring washer, plain washer, switch cam A **2MA**, hexagon nut **9M**, spring washer, and plain washer in order. For MDNB-13 and 23, screw the switch cam B **2MB** in addition to the above. At this time, set the switch cam A **2MA** in such a way that its concave portion looks up. (Refer to the figures below.)



**CAUTION**

Note that the direction is different from that of MDNB-01.

- ② Install the O-ring **28M** on the cylinder head portion.  
 ③ Fix the spacer **23M** with the hexagon bolt **24M**, spring washer, and plain washer. (Refer to the figures below.)  
 ④ Apply Loctite #262 to the set screw **43M** and screw it into the stem with the valve completely opened.  
 ⑤ Set the set screw **43M** at its projected length from the spacer **23M** head portion (L: see figure below). Then, fix the switch cam B **2MB** on the stem head portion with the hexagon nut **9M**, spring washer, and plain washer. As for the fixing position, use the dimension H in “Indication List of H Dimension” (11.8.4 ①) as an approximation. (Refer to the figures below.)  
 ⑥ For the subsequent procedural steps, refer to ⑥ and ⑦ in 11.7(3)(a) MDNB-01.



## 11.8 Method of adjustment

### 11.8.1 Adjustment of open position

#### (1) MDNB-01, 11

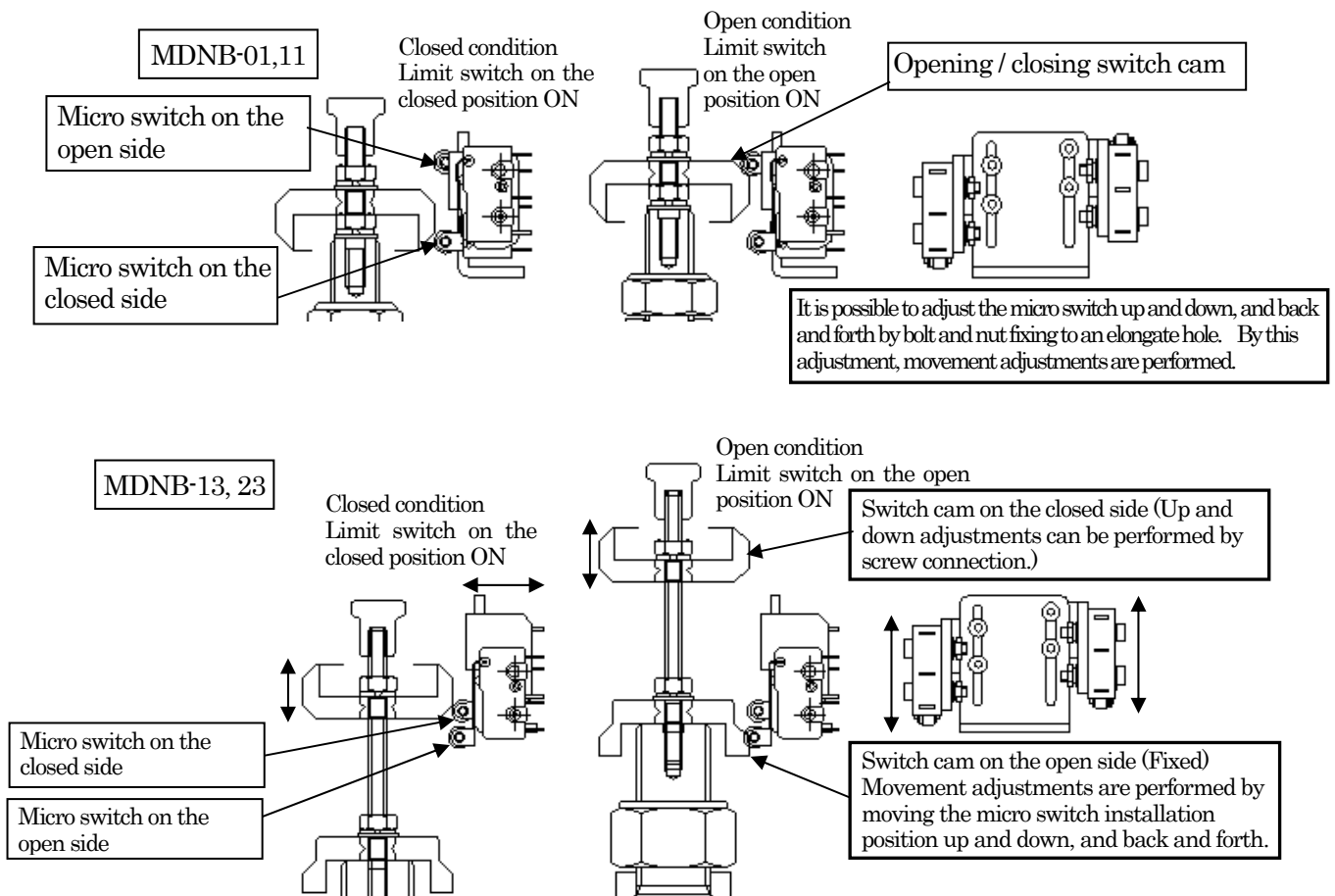
- ① Fully open the valve. The switch cam A **2MA** goes up to the open position.
- ② For the switch cam A **2MA** which has reached the fully opened position, adjust the micro switch on the open side, back and forth, and up and down to determine the detection position.
- ③ Fix the mounting plate B **3MB** and micro switch **1M** with the hexagon bolt **5M**, spring washer, and plain washer.
- ④ Fix the mounting plate A **3MA** and mounting plate B **3MB** with the hexagon bolt **5M**, spring washer, and plain washer.

#### (2) MDNB-13, 23

- ① Fully open the valve. The switch cam A **2MA** and switch cam B **2MB** go up to the open position.
- ② For the switch cam B **2MB** which has reached the fully opened position, adjust the micro switch on the open side, back and forth, and up and down to determine the detection position.
- ③ Fix the mounting plate B **3MB** and micro switch **1M** with the hexagon bolt **5M**, spring washer, and plain washer.
- ④ Fix the mounting plate A **3MA** and mounting plate B **3MB** with the hexagon bolt **5M**, spring washer, and plain washer.

### 11.8.2 Adjustment of closed position: MDNB-01~23

- ① Fully close the valve. The switch cam A **2MA** goes down to the closed position.
- ② For the switch cam A **2MA** which has reached the fully closed position, adjust the micro switch on the closed side, back and forth, and up and down to determine the detection position.
- ③ Fix the mounting plate C **3MC** and micro switch **1M** with the hexagon bolt **5M**, spring washer, and plain washer. In a case where the valve stroke is large in MDNB-13 and 23 (DN100, 125, and 150), fix the mounting plate C **3MC** and micro switch **1M** by keeping as large as possible the vertical distance to the mounting plate B **3MB** which is fixed on the open side. (to avoid micro switch on the **3MB** turned "on" when closed position)
- ④ Fix the mounting plate A **3MA** and mounting plate C **3MC** with the hexagon bolt **5M**, spring washer, and plain washer. (Refer to the figure below.)



### 11.8.3 Confirmation of operation

- ① Open and close the valve to make sure by means of operation noise, tester, opening and closing indication lamp, etc. that the limit switch operates without fail. In a case where the operation is unstable, re-adjustment should be made.

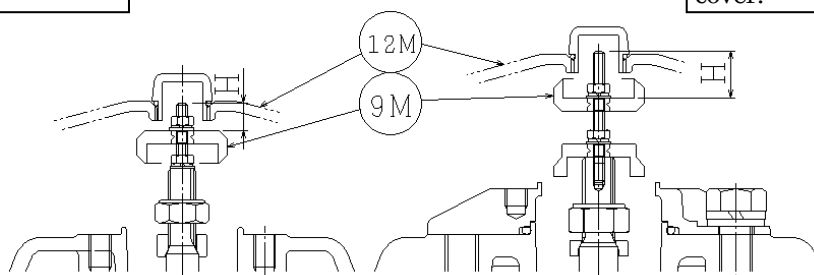
### 11.8.4 Fitting the switch case cover

#### CAUTION

- ① Before closing the switch case cover, make sure that there is no interference. If the adjusted position of the switch cam A **2MA** is too high, there is a possibility that the switch cam A **2MA** will interfere with the switch case cover **12M** when opening, thus causing the switch cam A **2MA** to be damaged. Please readjust the position of the switch cam A **2MA** largely from the installation height H from the set screw **43M** end, (Refer to the figure below) and follow the procedural steps 11.8.2 & 11.8.3 again.

MDNB-01, 11  
At H: 6 mm, it interferes with the 12M switch case cover.

MDNB-13, 23  
At H: 10 mm, it interferes with the 12M switch case cover.



List of approximate dimension H

Actuator model No.	Limit model No.	Nominal diameter [mm]	Dimension H [mm]
07N/12N	MDNB-01	15, 20, 25	14
		40, 50	10
16N	MDNB-11	40	23
		50	17
16N/20N	MDNB-13	65	29
		80	23
		100,125,150	15
25N	MDNB-23	80	23
		100,125,150	15

- ② Install the indicator cap **19M** on the hex socket set screw **43M**.
- ③ Install the O-ring **15M** on the switch case cover **12M**.
- ④ Fix the switch case cover **12M** with the hexagon bolt **13M**, spring washer, and plain washer.
- ⑤ Open and close the valve to make sure that there is no abnormality. In addition, open and close the valve with the switch case cover **12M** installed to confirm whether or not the switch cam A **2MA** interferes with the switch case cover **12M**, or whether or not the indicator cap **19M** is visible from the cap **21M**, etc.

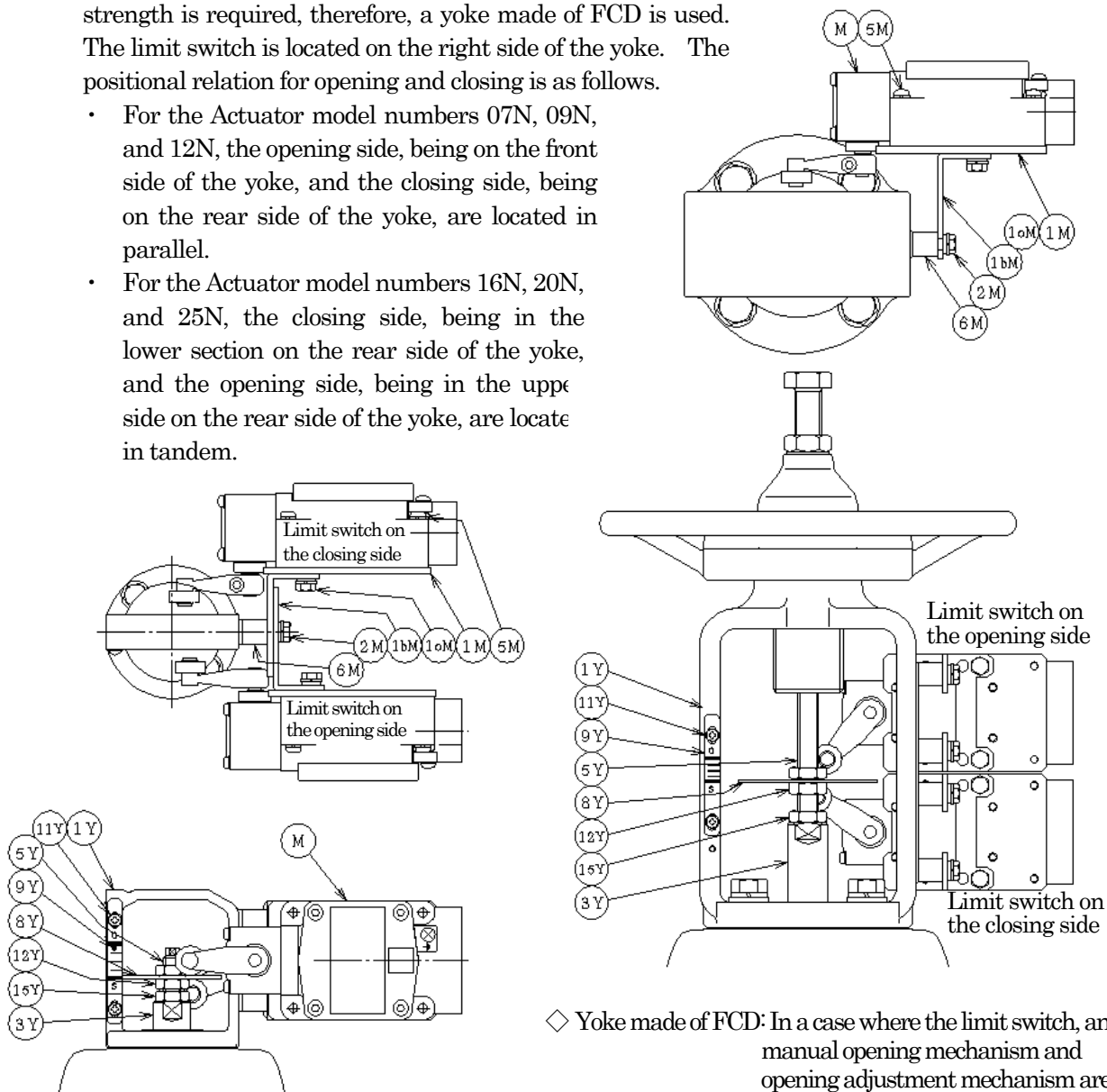
### 11.9 Commercial limit switch

- The commercial limit switch is mounted on the yoke (aluminum/FCD).
- In a case where only the limit switch is attached, the yoke is made of aluminum and is lightweight and compact.

In all Actuator model numbers, the limit switch is located on the right side of the yoke. The opening side, being on the front (forward) side of the yoke and the closing side, being on the rear side of the yoke, are located in parallel.

- In a case where the valve is equipped with a manual opening and closing mechanism and opening adjustment mechanism, strength is required, therefore, a yoke made of FCD is used. The limit switch is located on the right side of the yoke. The positional relation for opening and closing is as follows.

- For the Actuator model numbers 07N, 09N, and 12N, the opening side, being on the front side of the yoke, and the closing side, being on the rear side of the yoke, are located in parallel.
- For the Actuator model numbers 16N, 20N, and 25N, the closing side, being in the lower section on the rear side of the yoke, and the opening side, being in the upper section on the rear side of the yoke, are located in tandem.



◇ Yoke made of aluminum: In a case where only the limit switch is mounted

◇ Yoke made of FCD: In a case where the limit switch, and manual opening mechanism and opening adjustment mechanism are included

#### (a) Valve closing action

- ① When the valve is closed, the joint nut **3Y**, pointer **8Y**, and stem rod **5Y** go down.
- ② At this time, the lower surface of the pointer **8Y** pushes up the roller lever of the limit switch on the opening side and the switch is turned "ON".

#### (b) Valve opening action

- ① When the valve is open, the joint nut **3Y**, pointer **8Y**, and stem rod **5Y** go up.
- ② At this time, the upper surface of the pointer **8Y** pushes up the roller lever of the limit switch on the opening side and the switch is turned "ON".

## 11.10 Disassembly and assembly

### (1) Replacement of built-in switch unit in the dedicated limit switch

- ①. Open the valve.
- ②. Loosen the bolt **13M**.
- ③. Remove the cover **12M**.
- ④. Remove the wire connection on the terminal block. Be sure to confirm that the power is turned "OFF". We recommend that at this time, a joint symbol, etc. be attached.
- ⑤. Remove the cap screw **7M**.
- ⑥. Lift up the switch case **11M**, and remove it carefully while inclining it so that the roller lever of micro switch may not be caught on the switch cam **2MA,B**.
- ⑦. Remove the cross recessed head round machine screws **6M**, and then, remove the switch unit.
- ⑧. Make a new switch unit ready.
- ⑨. For assembling, follow the procedural steps ① to ⑦ in reverse order.

#### CAUTION

In a case where the valve is closed when the closed position adjustment screw is removed, the limit switch may be damaged and there may pose a danger of physical injury, such as fingers and hands. Therefore, keep the valve open.

### (2) Commercial limit switch

- ① Open the limit switch cover and remove the wire connection. Be sure to confirm that the power is turned "OFF". We recommend that at this time, a joint symbol, etc. be attached.
- ② Remove hexagon bolt **5M**.
- ③ Replace the limit switch with a new one.
- ④ For assembling, follow the procedural steps ① to ② in reverse order.

### (3) Confirmation of limit switch operation

The limit switches are shipped after they are adjusted to operate in a position where the valve is completely open and completely closed.

Normally, they require no adjustment. In a case where valve disassembly, etc. is carried out, however, make sure that the limit switch operates without fail. In a case where the operation position is displaced, re-adjust it.

## 11.11 Method of adjustment

In a case where the built-in switch unit is replaced and the commercial limit switch is replaced, adjust the operation of the limit switch in the following procedural steps.

### (1) Dedicated limit switch

Adjust the dedicated limit switch in accordance with the method of adjustment in Section 11.8.

### (2) Commercial limit switch

#### (a) Adjustment of closed position

- ① Set the valve in a closed position.
- ② Loosen the hexagon socket head bolt fixing the roller lever attached to the limit switch on the closed side.
- ③ The roller lever starts to rotate freely with the switch shaft of the limit switch as the center.
- ④ Insert a flat-blade screwdriver into a slit provided at the end of the switch shaft. Then, turn the screwdriver in the closing direction to a position where the limit switch starts to operate and the screwdriver gets in by 1 to 2 mm deep, and then, tighten the hexagon socket head bolt fixing the roller lever. At this time, set the roller lever in a condition where it is made to remain in contact with the pointer **8Y**.

(b) Adjustment of open position

- ① Set the valve in an open position.
- ② Loosen the hexagon socket head bolt fixing the roller lever attached to the limit switch on the open side.
- ③ The roller lever starts to rotate freely with the switch shaft of the limit switch as the center.
- ④ Insert a flat-blade screwdriver into a slit provided at the end of the switch shaft. Then, turn the screwdriver in the opening direction to a position where the limit switch starts to operate and the screwdriver gets in by 1 to 2 mm deep, and then, tighten the hexagon socket head bolt fixing the roller lever. At this time, set the roller lever in a condition where it is made to remain in contact with the pointer **8Y**.

(c) Confirmation of operation

Open and close the valve to make sure by means of operation noise, tester, opening and closing indication lamp, etc. that the limit switch operates without fail..

**CAUTION**

The operation range of the roller lever for the limit switch differs with the manufacturer and model number. But in a case where the roller lever is used with the angle of operation exceeded, the limit switch may be damaged.

11.12 Electric wire connection

**DANGER**

In a case where the valve is installed outdoors, be sure to avoid electric wire connection work in rainy weather at any cost. In addition, wire connection in the rain and electric wire connection work with wet hands cause an electric shock and could result in “death or physical injury to a person”. Electric wire connection work should be carried out after it is confirmed that electricity is not turned on.

(1) Wire connection and circuit diagram for dedicated limit switch

- ① Loosen the bolt **13M**.
- ② Remove the switch case cover **12M**.
- ③ The circuit diagram **25M** is applied to the back of the switch case cover **12M**.

The terminal block number is indicated in the side surface on the electric wire intake side of the terminal block. Carry out wire connection just as shown in the circuit diagram **25M**.

- ④ When wire connection is completed, install the switch case cover **12M**. Then, tighten the bolt **13M**.

After electric wire connection work is carried out, do not leave the switch case **11M** as it is while it is still open.

(2) Wire connection for commercial limit switch

Carry out wire connection after confirming the specifications based on the diagram submitted by the limit switch manufacturer.

(3) Treatment for conduit removal port

Carry out water entry prevention treatment for the conduit removal port.

Water entry prevention treatment includes adoption of a bell mouth and seal application by water-resistant putty, etc. Carry out water entry prevention treatment by adopting a method most suitable for piping specifications.

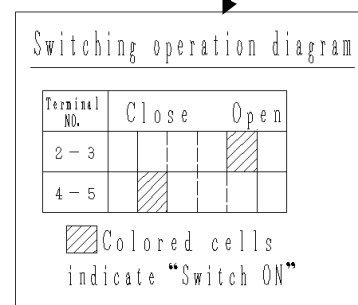
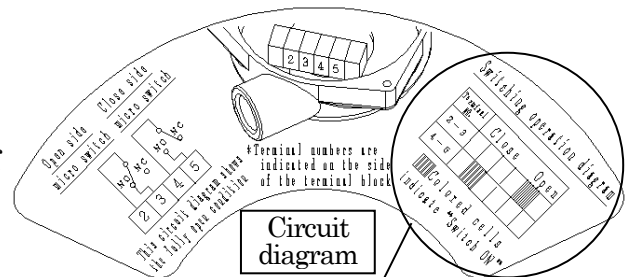


Diagram showing a completely closed condition of the valve (Reference diagram)

## 12. Maintenance and management

Maintenance and management is basically to keep the valve in a state that enables smooth operation without leakage from a pressure retaining part of the valve after starting operation. To attain this, it is necessary to monitor an everyday operation and continue to keep it.

Perform daily inspection and periodic inspection, referring to the following items:

### 12.1 Daily inspection

- (1) Is operation air pressure is normally supplied?
- (2) Can any abnormal sound be heard during operation, or does operation seem sluggish?
- (3) Is there air leakage from the pneumatic piping area?
- (4) If the drain remains in the filter, remove it periodically.
- (5) Is there any fluid leakage from the section between the body 1 and bonnet 4 and the connection of piping? If leakage is found, tighten the bolt further without applying fluid pressure.
- (6) Is there any air or fluid leakage from the exhaust outlet of the bonnet 4?  
If the sealability of the spindle deteriorates, leakage of operation pressure seems to have occurred.  
Also, if the diaphragm is damaged, the fluid will leak out from the vent of the bonnet.
- (7) Is there any leakage from the connecting area between the body connecting end and the piping?
- (8) If any abnormality occurs, see Section 14. "Troubleshooting".

### 12.2 Periodic inspection

- (1) Intervals of inspection  
Intervals of inspection vary with the conditions and frequency of use. It is recommended to perform inspection once every 6 through 12 months.
- (2) Check for tightening area between the body and diaphragm.  
Check that the bolts tightening the body and diaphragm are not loose periodically.  
If any of the bolts are loose, tighten it according to the torque value in Table 3.

Table 3 Tightening torque for diaphragm Unit : N·m

Nominal diameter DN		15	20	25	40	50	65	80	100	125	150
PTFE Diaphragm	Other than hard rubber lined body	3	4	6.5	12	20	35	60	30	50	50
	Hard rubber lined body	4	5.5	9	17	30	55	90	45	50	50
Rubber diaphragm		2	3	4	9	13	20	35	14	25	30

### (3) Inspection of flow passage section

- ① Check that there is any adhesion of foreign matter or adherence in the body.  
The foreign matter can be scrubbed with a hard cloth, or you can peel it off with anti-corrosive chemicals.
- ② Check for the state of corrosion of liquid-contacting section and the degree of wear.
- ③ Check the condition of lining surface of the body for presence or degree of swelling, crack or chipping.

(4) Inspection of diaphragm and replacement interval.

① Carefully check the liquid-contacting area and the rear side for degree of deterioration of the diaphragm appearance, and existence of crack or wear.

② It is recommended to replace the diaphragm once every 6 through 12 months for safety.

Note that service life of diaphragm depends on the conditions and frequency of use, frequency of disassembly for cleaning , or frequency of reassembly. We recommend that users determine the replacement interval.

(5) Inspection of actuator

① Decide appropriate inspection intervals considering conditions of ambient atmosphere and frequency of operation.

② Check the state of piston sliding surface inside the cylinder 40 for condition of the sliding surface and grease every two years. If grease is run out, apply it onto the part. We recommend using the “FUCHS Cassida Grease HDS2“ .

③ Note that adhesion of grease or oil to the rubber diaphragm may cause physical deterioration. To avoid this, take enough care.

④ Replace O-rings on the sliding part with new ones periodically.



### 13. Replacement of parts

#### WARNING

Completely remove the hazardous fluid or pressure from the piping. If you carry out replacement of parts under the state that there is a fluid remaining, the fluid can cause the risk of "physical damage or blindness".

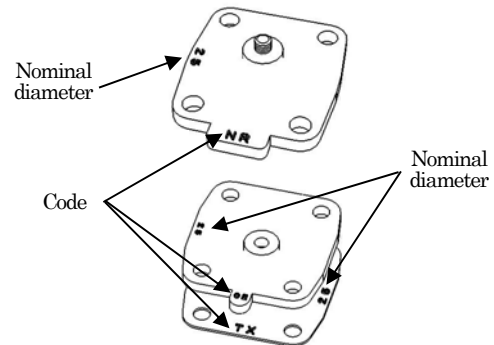
Before replacing the parts, remove the valve from the piping and make sure that there is no fluid remaining inside the valve.

#### 13.1 Procedure for replacing the diaphragm

##### (1) Preparation before replacement

- ① Prepare a new diaphragm of the same specification as of currently used. Confirm the specification of the diaphragm with the delivery specification or marking of the actual article. (See the table and figures below.)

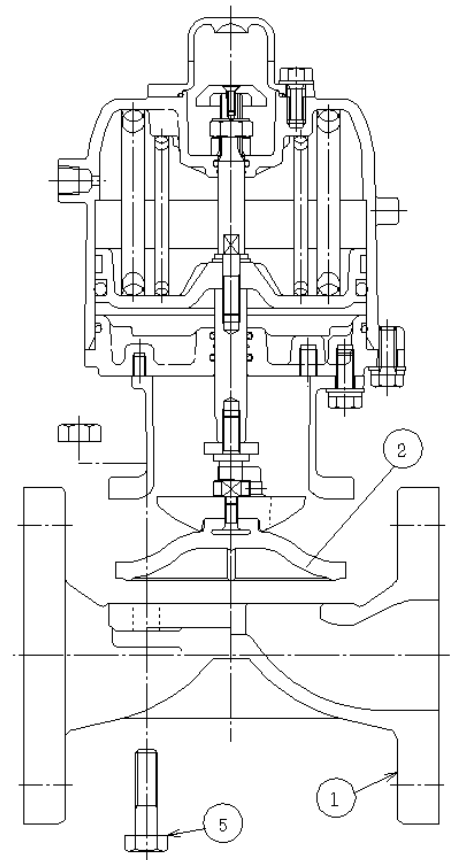
Code	Material
NR	Natural rubber
CR	Chloroprene rubber
BG	Butyl rubber
EP	EPDM
CE	EPDM
CX	EPDM+ $\alpha$
TF	PTFE
TX	NEW PTFE



- ② Prepare necessary tools, waste cloth, cleaning liquid, scraper and sand paper to remove adhesion from the body.
- ③ If there is any possibility of hazardous fluid remaining, in the piping, prepare protective jigs to prevent accidents.


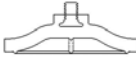





##### (2) Replacement of diaphragm

- ① Diaphragms can be replaced with the valve body connected to the piping.
- ② Be sure to mark a joint symbol on the section to be disassembled.
- ③ Replace the pneumatic piping with a temporary pneumatic piping which does not interrupt detachment /attachment of the actuator during disassembly.
- ④ Detaching the actuator from the body
  - The actuator can be detached from the body under closed state.  
Before disassembly, confirm again that no fluid or pressure remains inside the piping.  
With the valve fully opened, remove bolts and nuts tightening the body 1 and the bonnet 4.  
Refer to the table below for nominal size of tightening bolts and nuts for the diaphragm and nominal size of spanner.

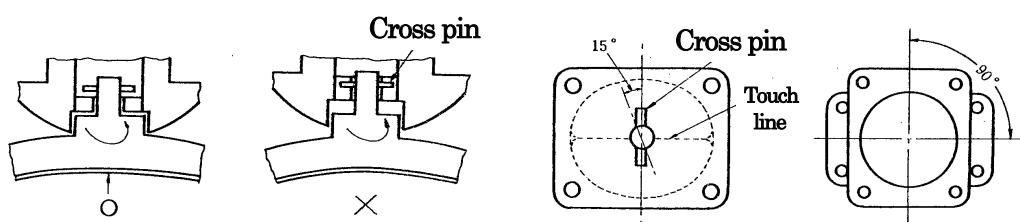
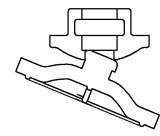


DN	15	20	25	40	50	65	80	100	125	150
Nominal size of bolt and nut	M6		M8	M10		M12	M16	M12	M16	
Nominal size of spanner	10		13	17		19	24	19	24	

- The actuator provided with a stopper has clearance gap to maintain sealability of the valve seat even if stress relaxation of the diaphragm has occurred. When the bolts and nuts **5** tightening the body **1** and bonnet **4** are loosened, the stopper works to prevent the compressor **6** from jumping up.
  - Disassembly work can be carried out more easily with the valve fully opened.
- ⑤ Take out the actuator from the body. If the diaphragm adheres to the body, slowly set the valve to full open or swing the actuator to pull upward. Avoid to open the body forcibly with a driver. This may scratch the body and make the valve inoperable.
  - ⑥ Clean the seal section of the body (weir and connecting area of the diaphragm) thoroughly with waste cloth. Remove the adhesion with scraper or sand paper taking care not to scratch the body.
  - ⑦ Fully open the actuator and remove the diaphragm from the compressor.
    - (i) For set-in type, pull it out by twisting it.
    - (ii) For screw-in type, turn it counterclockwise several times.
    - (iii) For bayonet type, lightly pull it by turning it right or left by  $90^\circ$ .
  - ⑧ Remove the dirt from the compressor and mount a new diaphragm.  
Connect the diaphragm and compressor according to the table below.

	DN	Connection method	Diaphragm shapes, installation to compressor
Rubber diaphragm	15, 20	Set-in type 	Normal seat type Install as it is. 
	25~300	Screw-in type 	Reverse seat type Install as it is. 
	350~500		
PTFE diaphragm	8/10	Bayonet type 	Normal seat type Install as it is. 
	15, 20		Reverse seat type Install by reversing it. 
	25~300		

- (i) For set-in type, slightly wet the head of the diaphragm with water and screw in by hanging the rip end on the cavity of the compressor.
- (ii) For screw-in type, screw-in the boss top of the diaphragm until it contacts the bottom of the compressor slightly and align the bonnet with the bolt hole of diaphragm.
- (iii) For bayonet type, align the compressor cavity with the diaphragm pin, push the pin securely and turn it by  $90^\circ$ . If the pin is not sufficiently pushed, it rotates idly inside the PTFE and becomes inoperable. For the reverse seat type, it is easy to assemble after reversing the seat. Normally the pin intersects against the touch line by  $90^\circ$ , but deflection within  $90^\circ$  is within the normal range.



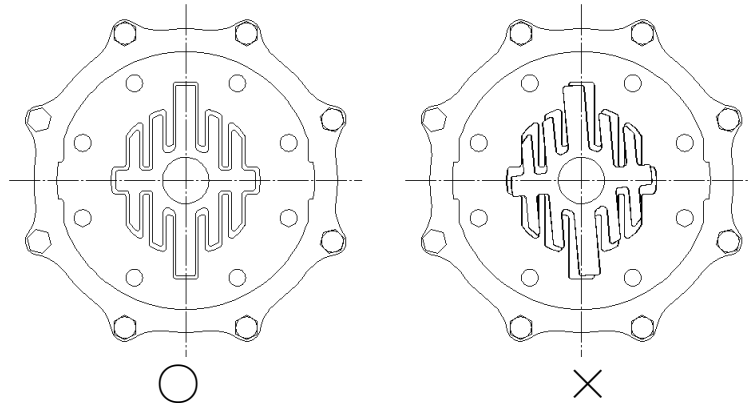
- ⑨ Keep opening of the valve according to the diaphragm shapes.  
Keep the reverse seat type diaphragm in closed state and the normal seat type diaphragm in full open state.

**CAUTION**

Be careful not to interfere with the compressor and bonnet when opening. If both parts are opened with interference, there is a risk of "damage or failure."

**WARNING**

Never insert hands or fingers compressor and the bonnet, or between the bonnet and the diaphragm when opening. This may lead to a physical injury.



- ⑩ Assembly of valve
- (i) Place the actuator mounted with diaphragm on the body and tighten bolts and nuts to the degree that the actuator slightly moves.
  - (ii) To center the valve seat, open and close the valve two or three times under the state ① and fully close it.
  - (iii) Lightly tighten the bolts and nuts over diagonal lines by turns with a spanner. When the actuator is fixed, open the valve by 10% or more and tighten all bolts and nuts evenly. The rubber diaphragm can be tightened by turns with a spanner, but for torque control, see 12.2 (3) "Table of diaphragm tightening torque".  
For the PTFE diaphragm, tighten bolts and nuts evenly according to torque values in 12.2 (3) "Table of diaphragm tightening torque". Sealability will improve by retightening 4 hours or more after tightening the bolts.

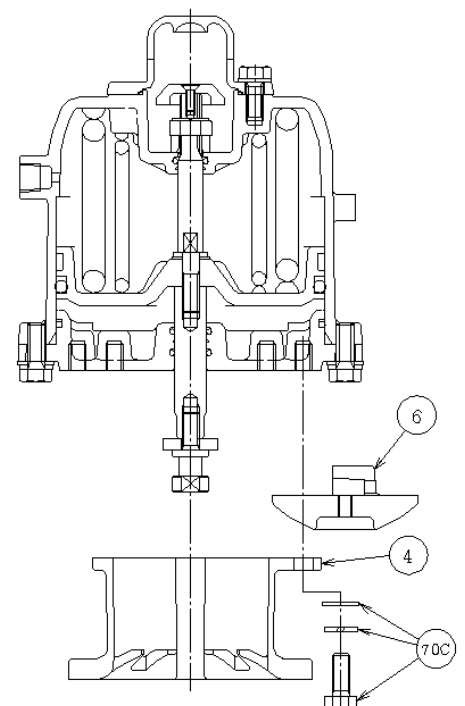
(3) Confirmation after replacing the diaphragm

After replacing the diaphragm, confirm outside leakage, sealability of valve seat and its action.

13.2 Procedure for replacing Compressor

Carry out the following work with the actuator disconnect from the body.

- ① Loosen the hexagon bolt **70C** and remove the Bonnet **4**.
- ② Replacing Compressor **6**.
- ③ Use steps ①~② in reverse for reassembly.



### 13.3 Procedure for replacing O-rings

Carry out the following work with the actuator disconnect from the body.

#### CAUTION

When replacing O-rings, clean the sliding surface and apply new grease uniformly. Apply grease onto O-rings.

#### (1) Disassembly of attached mechanism

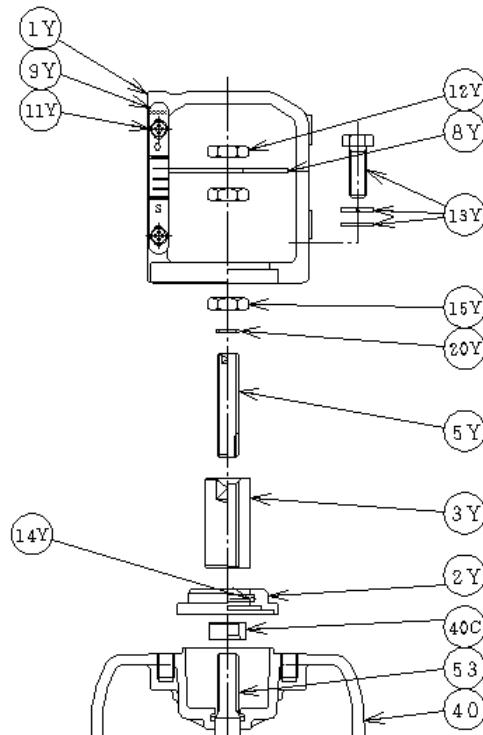
Remove the attached mechanism in advance if provided.

This procedure can be also used to replace O-rings mounted in the attached mechanism.

(a) With dedicated limit switch (M): See 11.7 “Disassembly and assembly” .

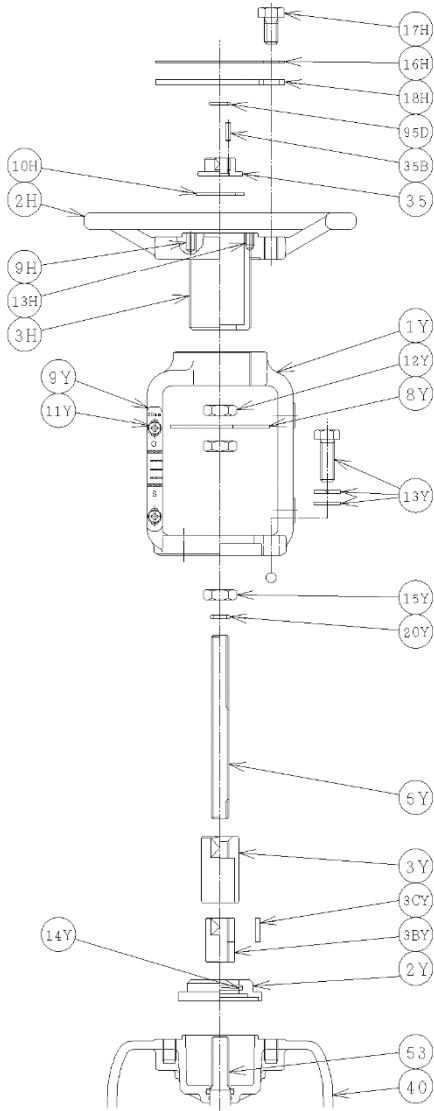
(b) With yoke (S,SM)

- ① Loosen the hexagon nut **12Y** and remove the pointer **8Y**.
- ② Loosen the hexagon bolt **13Y** and remove the yoke **1Y**.
- ③ Loosen the hexagon nut **15Y** and remove the O-ring **20Y**. If the O-ring **20Y** is hard to remove, loosen it together with the joint **3Y** and retighten it, thereby clearance gap is made enabling the O-ring to be easily removed.
- ④ Loosen the joint nut **3Y** and remove the stem rod **5Y**.
- ⑤ Remove yoke bush **2Y**.
- ⑥ Replace O-rings on respective sections.
- ⑦ Use steps ①~⑥ in reverse for reassembly.

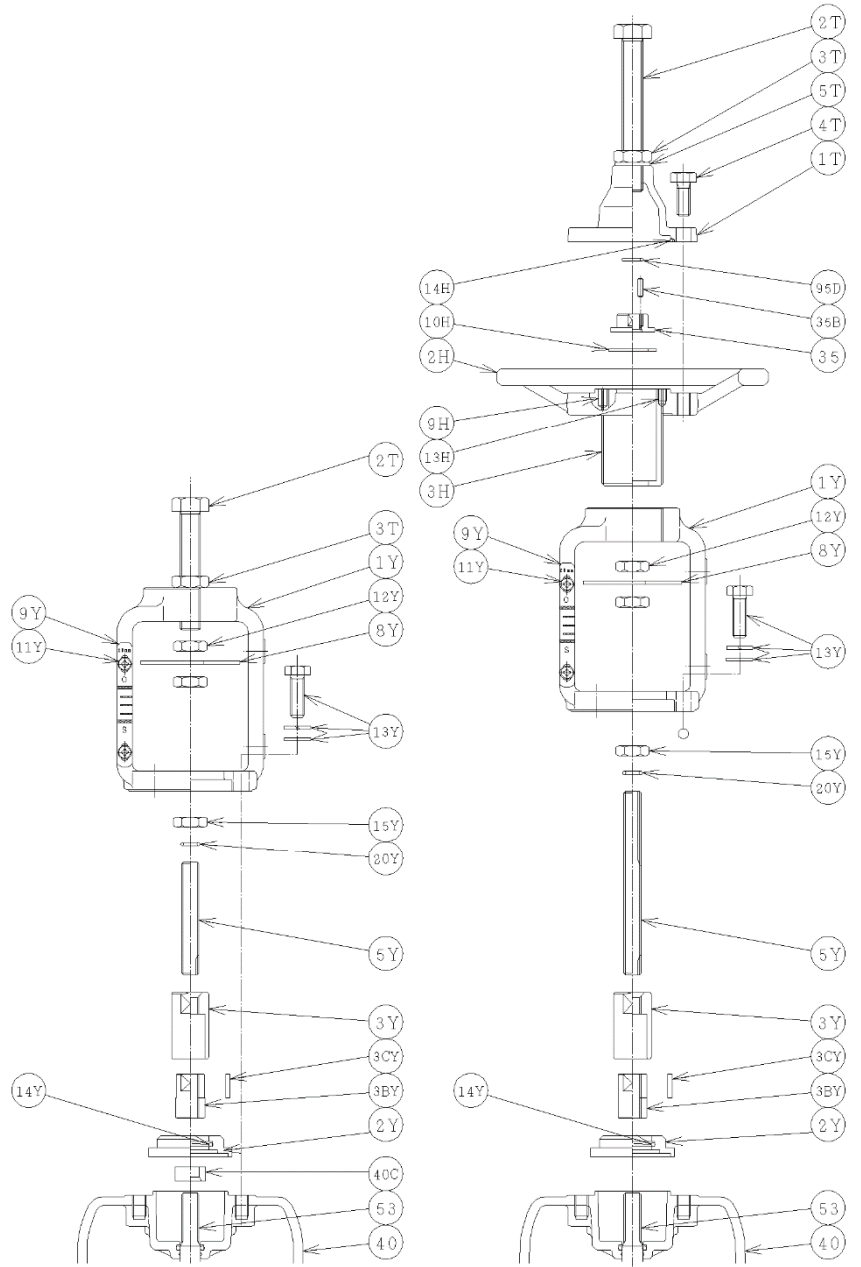


Type PO(C,N)S1400N

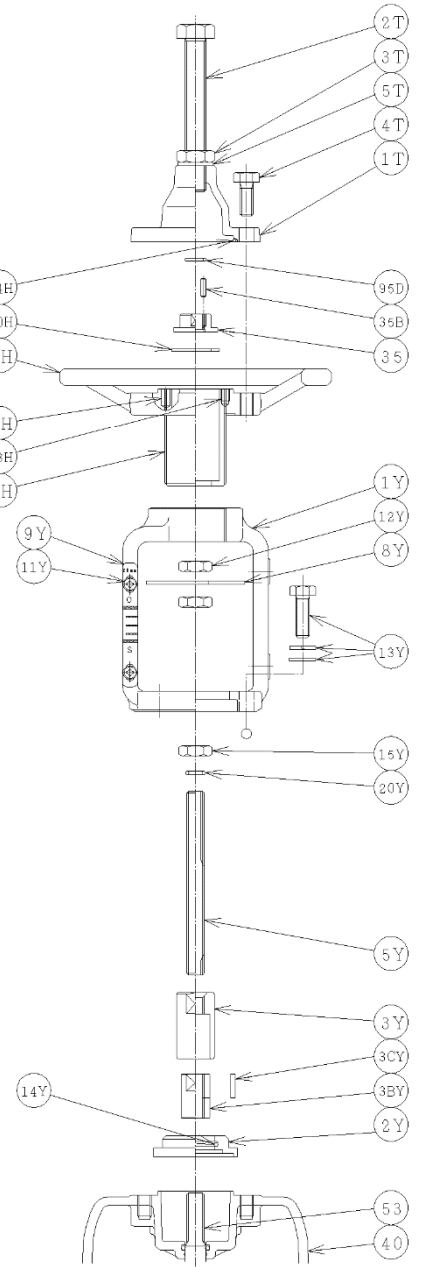
- (c) With yoke + manual opening mechanism (SH)
- ① Manual opening mechanical section
    - (i) Loosen hexagon socket bolt **17H** and remove handle cover **16H** and packing **18H**.
    - (ii) Remove O-ring **95D** and pull out pin **35B** with a magnetic driver.
    - (iii) Remove stopper nut **35** and thrust washer **10H**. (The stopper is in deep low position. If it is hard to turn, fully open the valve with pneumatic pressure. This will make it easier to turn the stopper nuts. Or use cylindrical jig with inside width across flats to improve workability.)
    - (iv) Turn the handle **2H**, **3H** counterclockwise to remove.
    - (v) Replace O-rings in respective sections.
    - (vi) Use disassembly steps (i)~(v) in reverse for reassembly.
  - ② Disassemble the yoke section.
    - (i) Loosen the hexagon nut **12Y** and remove the pointer **8Y**.
    - (ii) Loosen the hexagon bolt **13Y** and remove the yoke **1Y**.
    - (iii) Loosen the hexagon nut **15Y** and remove the O-ring **20Y**. If the O-ring **20Y** is hard to remove, loosen it together with the joint **3Y** and retighten it, thereby clearance gap is made enabling the O-ring to be easily removed.
    - (iv) Loosen and remove the joint nut **3Y**.
    - (v) The key **3CY** is inserted in the location where the groove of the stem **53** and stem rod **5Y** coincide with the slit of joint nut B **3BY**. Pull it out with a magnetic driver.
    - (vi) Remove the stem rod **5Y** and joint nut B **3BY**. Remove yoke bush A **2Y**.
    - (vii) Replace O-rings on respective sections.
    - (viii) Use steps (i) ~ (vi) in reverse for reassembly.
  - ③ Use disassembly steps ① and ② in reverse for reassembly.
- (d) With yoke + opening adjustment mechanism (ST)
- ① Disassemble the yoke section using the same steps for (c)② .
- (e) With yoke + manual opening mechanism+opening adjustment mechanism (SL)
- ① Manual opening mechanical+opening adjustment mechanical sections
    - (i) Loosen hexagon bolt **4T** and remove cover **1T** and O-ring **14H**.
    - (ii) Disassemble the manual opening mechanical section in the same steps (ii) ~ (v) as for (e) manual opening mechanism.
    - (iii) Replace O-rings of respective sections.
    - (iv) Use the disassemble steps (i), (ii) in reverse for reassembly.
  - ② Disassemble the yoke section using the same steps for (c)②.



Type POSH1400N



Type PO(C,N)ST1400N

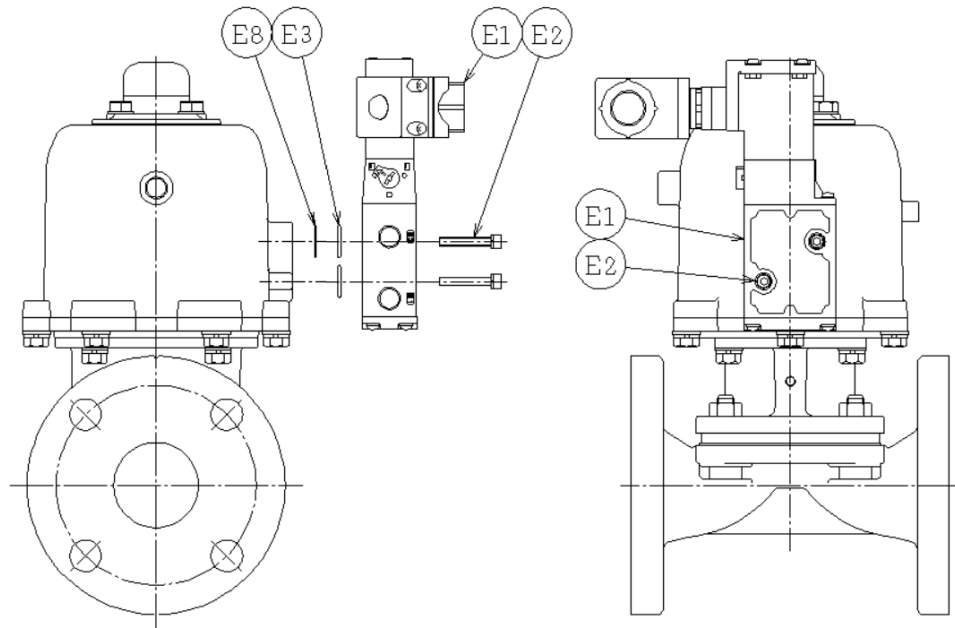


Type POSL1400N

(f) With solenoid valve (E)

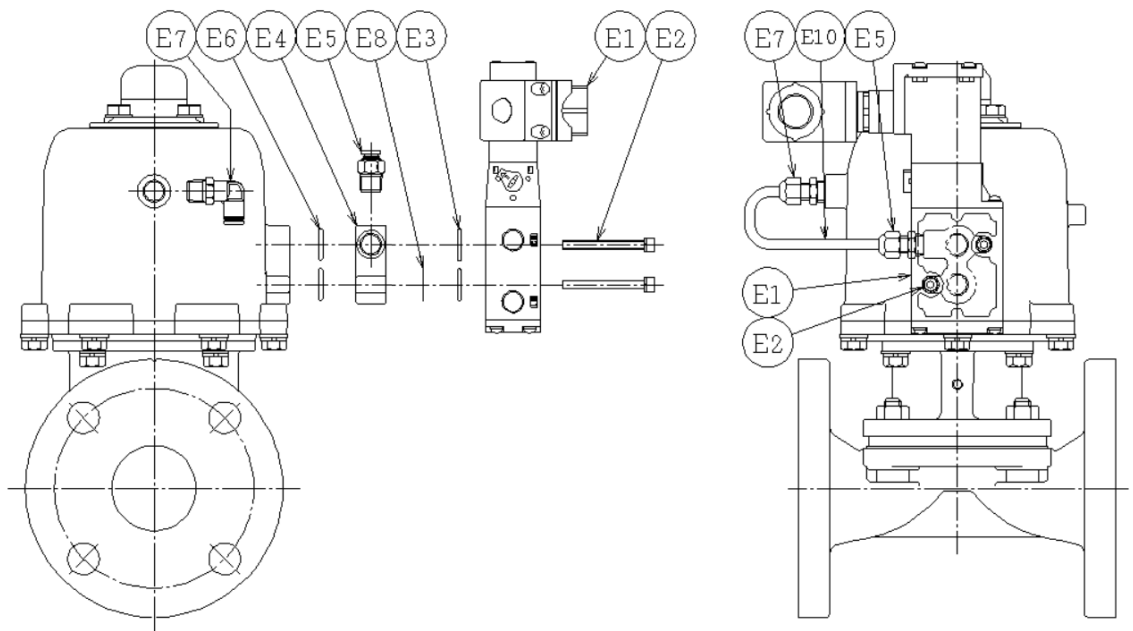
(i) Reverse acting type (Type POE1400N)

- ① Remove fixing bolts for solenoid valve **E2** and detach the solenoid valve **E1**.  
O-rings **E3** and the partition plate **E8** are easy to drop off. Make sure not to lose them.
- ② Use disassembly steps in reverse for reassembly.



(ii) Direct (double) acting type (Type PC(N)E1400N)

- ① Remove the pneumatic piping connecting the spacer **E4** and the upper chamber of cylinder.
- ② Loosen the fixing bolts for solenoid valve **E2** and remove the solenoid valve **E1**, spacer **E4**, O-rings **E3**, **E6** and the partition plate **E8** (installed on Type PCE1400N only).  
O-rings **E3** and partition plate **E8** are easy to drop out. Make sure not to lose it.
- ③ Use disassembly steps in reverse for reassembly.



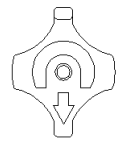
(2) Separation of actuator and main body, and removal of diaphragm

(a) Separation of actuator and main body, and removal of diaphragm

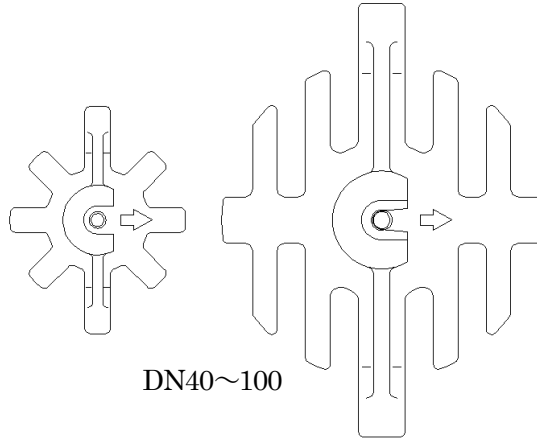
Use the same steps in 13.1 "Procedure for replacing diaphragm" for disassembly.

(b) Removal of bonnet and compressor

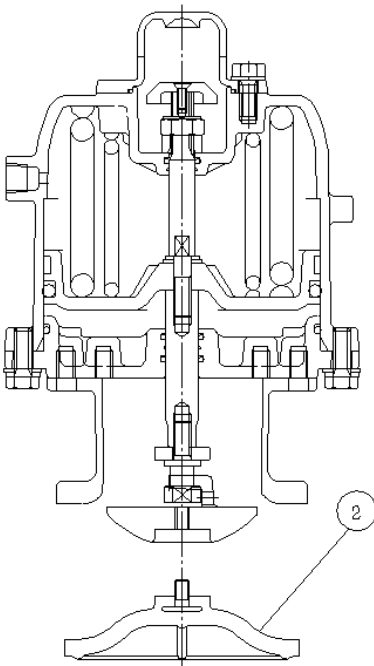
- ① Remove hexagon bolt 70C and detach the bonnet 4.
- ② Remove the compressor 6. The direction to remove is as shown in the figure below.
- ③ Remove the connector 11.



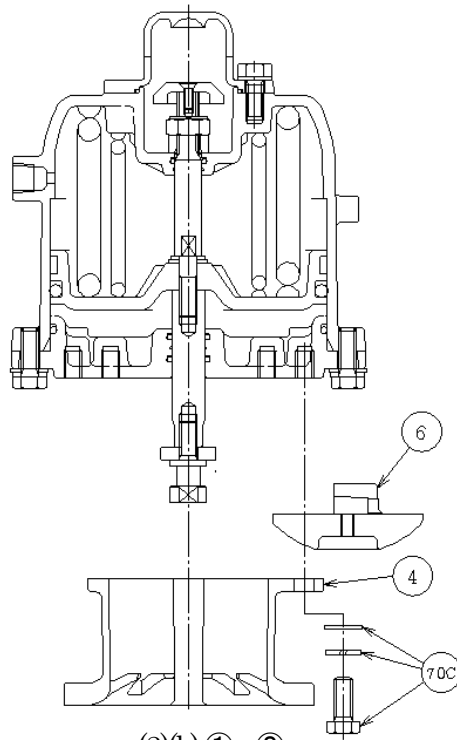
DN15~25



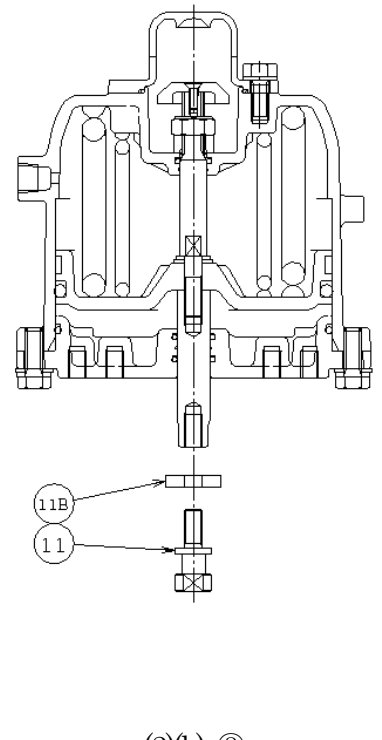
DN40~100



(2)(a)

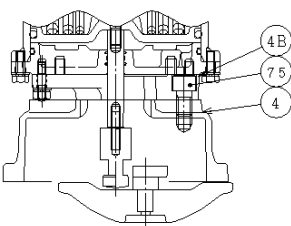


(2)(b) ①, ②

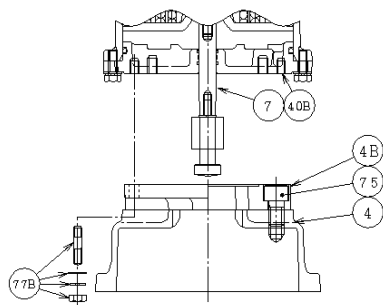


(2)(b) ③

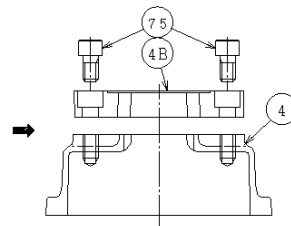
DN125/150



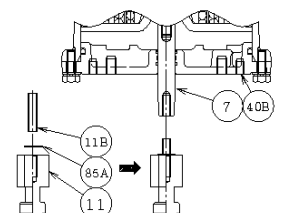
(2)(b)②



(2)(b)①



(2)(b)①



(2)(b)③



### (3) Disassembly of actuator

#### (a) Actuator of reverse acting type and direct acting type (Type PO(C)1400N)

#### DANGER

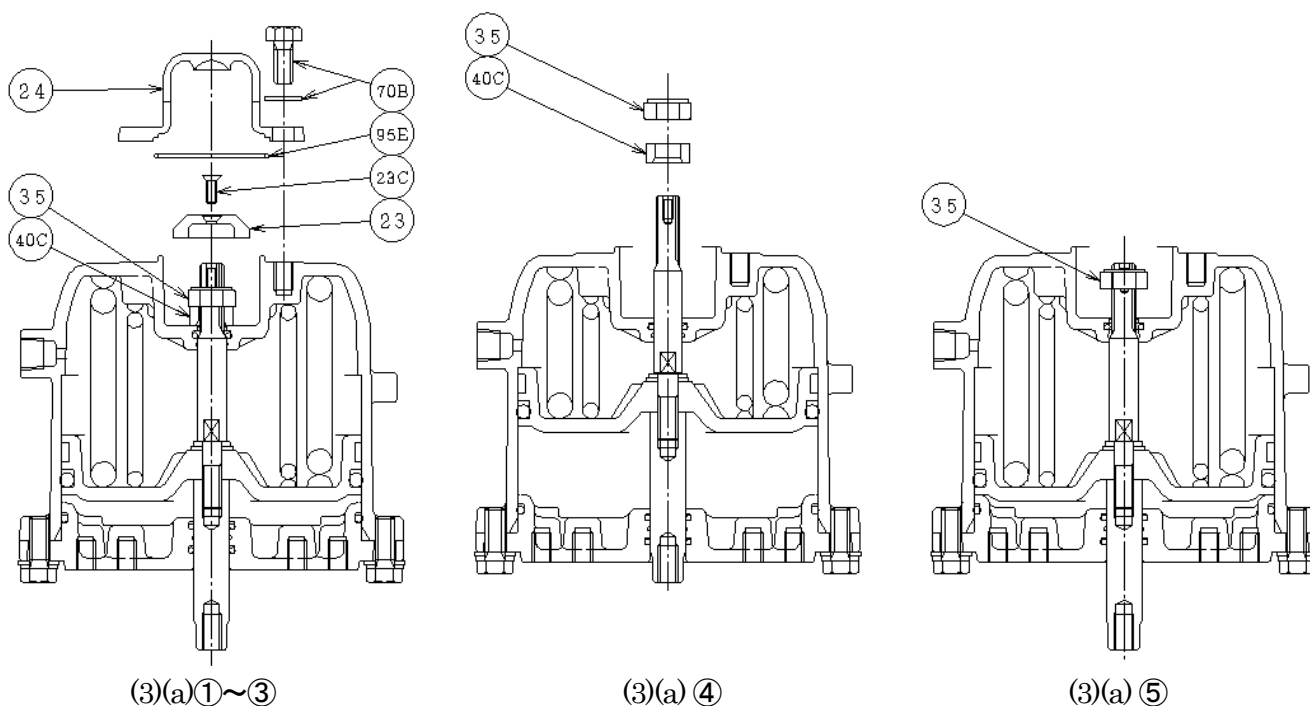
Working jigs are necessary for disassembling actuators of reverse acting type and direct acting type.

Without using working jigs, the cylinder **40** and the base **40B** abruptly separate due to reaction force of built-in spring. This may lead to "death or serious injury". If the working jigs are not available, please take advantage of our maintenance service.

- ① Loosen the bolt **70B** and remove caps **24** (for basic type)
- ② Loosen the cross recessed flat head screws **23C** to remove the indicator **23**.
- ③ Apply pneumatic pressure into the cylinder and remove the stopper **35** and spacer **40C**.  
(Pneumatic pressure is not required for the direct acting type because it is opened by spring **64**.)
- ④ Release pneumatic pressure and mount the stopper **35** to the stem **53** again.

#### CAUTION

(The piston **41** stops at the position hit against the base **40B** by spring **64**. The direct acting type is fully opened by spring **64**.) If hexagon bolts **70A** are all pulled out without mounting stopper nuts by mistake, cylinder **40** and base **40B** will abruptly separate due to reaction force of spring **64**. To avoid such danger, mount the stopper nut **35** again for safety.

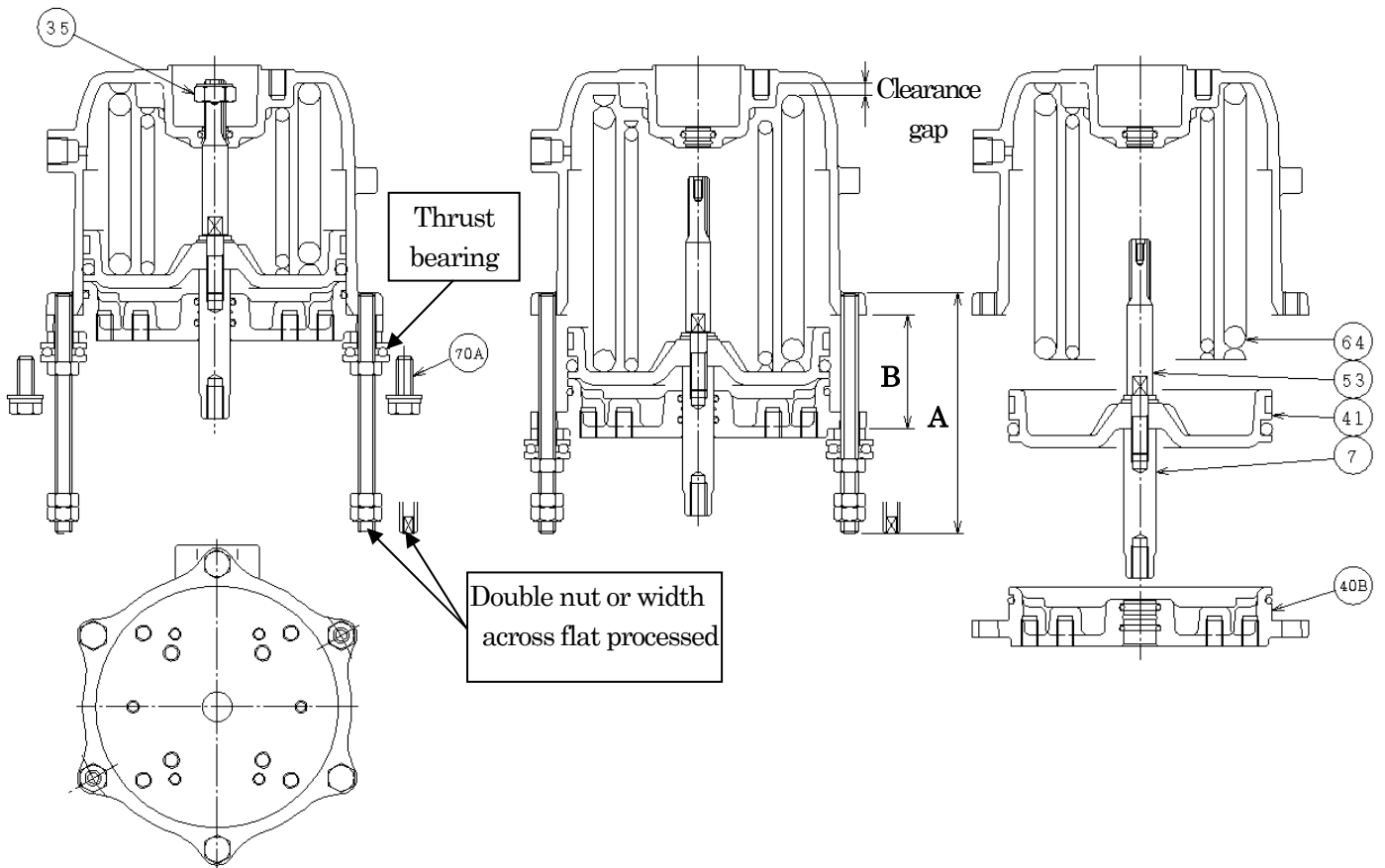


- ⑤ Pull out hexagon bolts **70A** diagonally only in 2 positions.
- ⑥ Screw-in the continuous thread studs into the diagonal positions of cylinder where hexagon bolts **70A** have been pulled out.

Nominal length of continuous thread studs to prepare is as follows:

Actuator code No.		07N	09N	12N	16N	20N	25N	
Nominal length of screw		M5	M6	M8		M10	M12	
Length	A	100	100	120		180	300	
Dimension	B	Reverse acting	23	39	63	101	123	254
	B	Direct acting	66	73	63	62	146	125

- ⑦ Screw nuts into the continuous thread stud and tighten base **40B** temporarily.  
It is helpful to install washer, thrust bearing or the like for disassembly.  
To prevent galling, grease the continuous thread studs and nuts as required.
- ⑧ Fix the end of continuous thread stud with double nuts ( two nuts).  
If the end of the continuous thread stud is processed with width across flat, double nuts are not necessary.
- ⑨ Remove stopper nuts **35**.
- ⑩ Remove all other hexagon bolts **70A**. When doing this, remove the metal hanger.
- ⑪ Fix the double nuts with a spanner so that the continuous thread stud may not loose, and loosen temporarily tightened 2 nuts evenly until spring **64** gets free to make clearance gap.



(3)(a) ⑥~⑩

(3)(a) ⑪~⑫

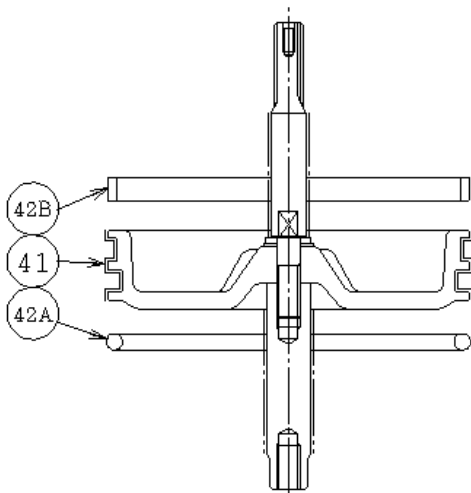
(3)(a) ⑬~⑮

- ⑫ Remove continuous thread studs and detach the base **40B**.
- ⑬ Take out the unit consisting of spindle **7**, piston **41** and stem **53**.  
(For direct acting type , take out spring **64**.)

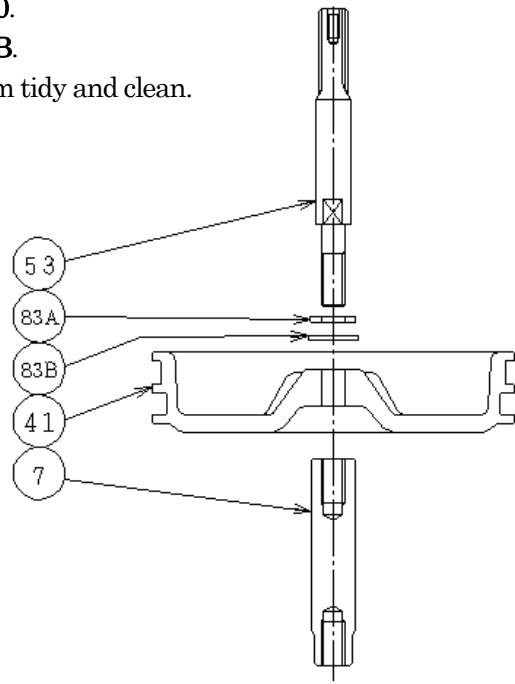
**WARNING**

Never take out the piston by applying pneumatic pressure into the upper side of the cylinder.  
This is very dangerous and may lead to “death or serious injury”.

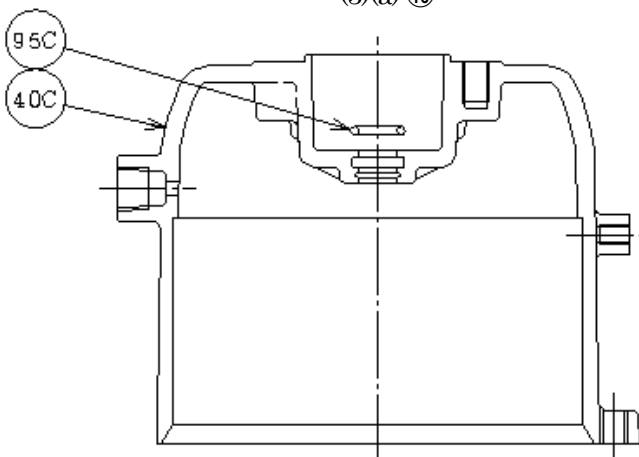
- ⑭ Take out spring **64**.  
(Take out the unit consisting of spindle **7**, piston **41**, and stem **53** for direct acting type.)
- ⑮ Remove O-ring **42A** and wear ring **42B** from the piston **41**.
- ⑯ Disassemble the unit consisting of spindle **7**, piston **41** and stem **53**.  
Hang a spanner on the width across flat stem rod **53** and spindle **7**, and turn the spanner counterclockwise to remove the stem rod. Some force is required to loosen them because the thread is tightened with Loctite No.262 applied to .
- ⑰ Remove seal washer **83B** from the stem rod **53**.
- ⑱ Remove O-ring **95C** from the cylinder **40**.
- ⑲ Remove O-ring **95A,B** from the base **40B**.
- ⑳ Clean and service the parts to keep them tidy and clean.



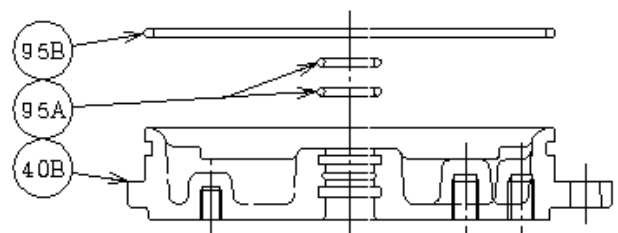
(3)(a) ⑯



(3)(a) ⑰



(3)(a) ⑱



(3)(a) ⑲

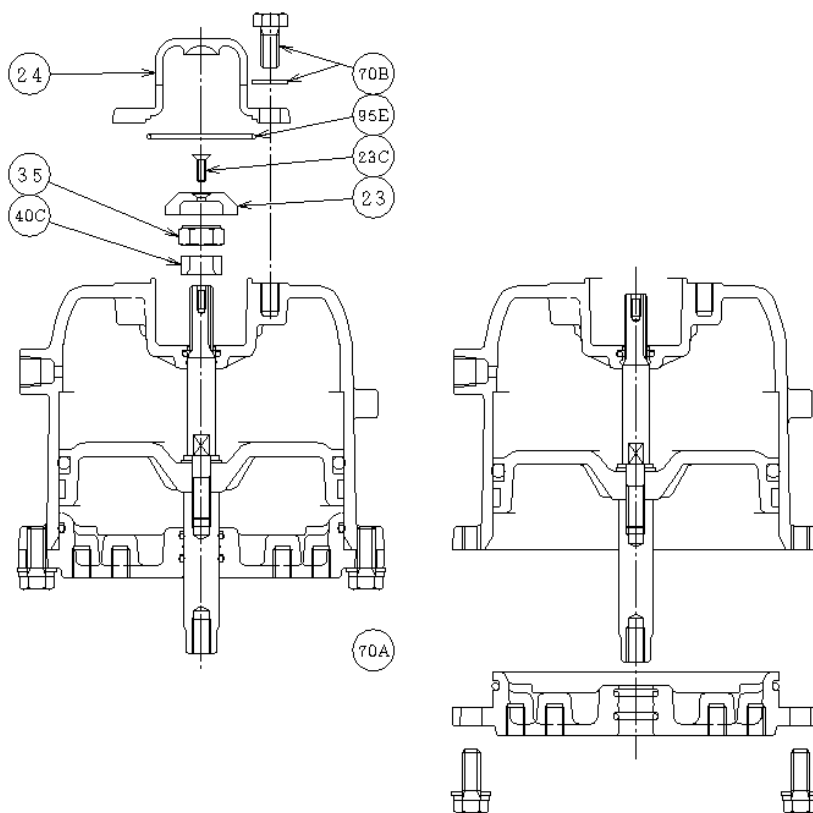
(b) Double acting type actuator (Type PN1400N)

Working jigs are not required as the double acting type actuator has no spring.

- ① Loosen the bolt **70B** and remove caps **24** (for basic type)
- ② Loosen the cross recessed flat head screws **23C** to remove the indicator **23**.
- ③ Loosen the stopper **35**, remove the stopper **35** and spacer **40C**.
- ④ Remove hexagon bolts **70A**. At this time, remove a metal hanger.
- ⑤ Remove the unit consisting of spindle **7**, piston **41**, and stem **53**.
- ⑥ For the subsequent steps, use the same step (3) (a) ⑮~⑳ for disassembly.
- ⑦ Clean and service the parts to keep them tidy and clean.

**WARNING**

Never take out the piston by applying pneumatic pressure into the upper side of the cylinder. This is very dangerous and may lead to "death or serious injury".



(3) (b) ①~③

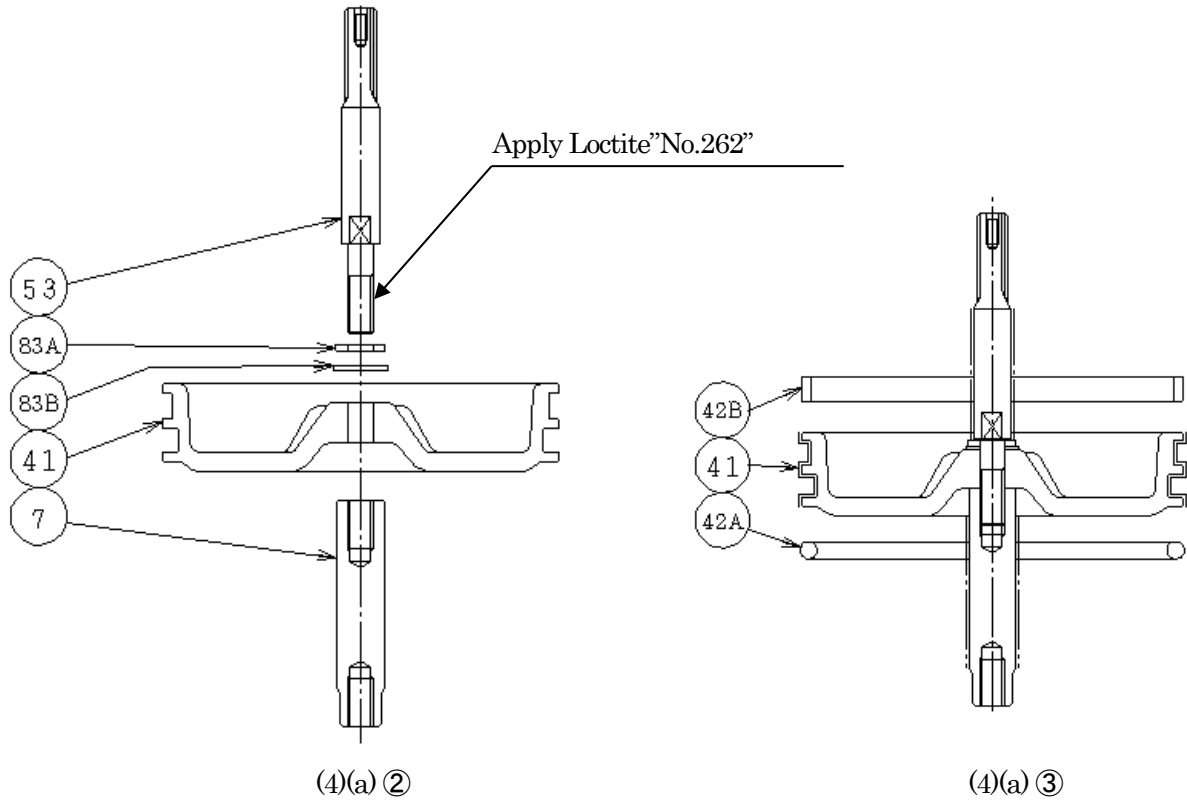
(3) (b) ④

(4) Assembly of actuator

(a) Reverse (direct, double) acting actuator (Type PO(C,N)1400N)

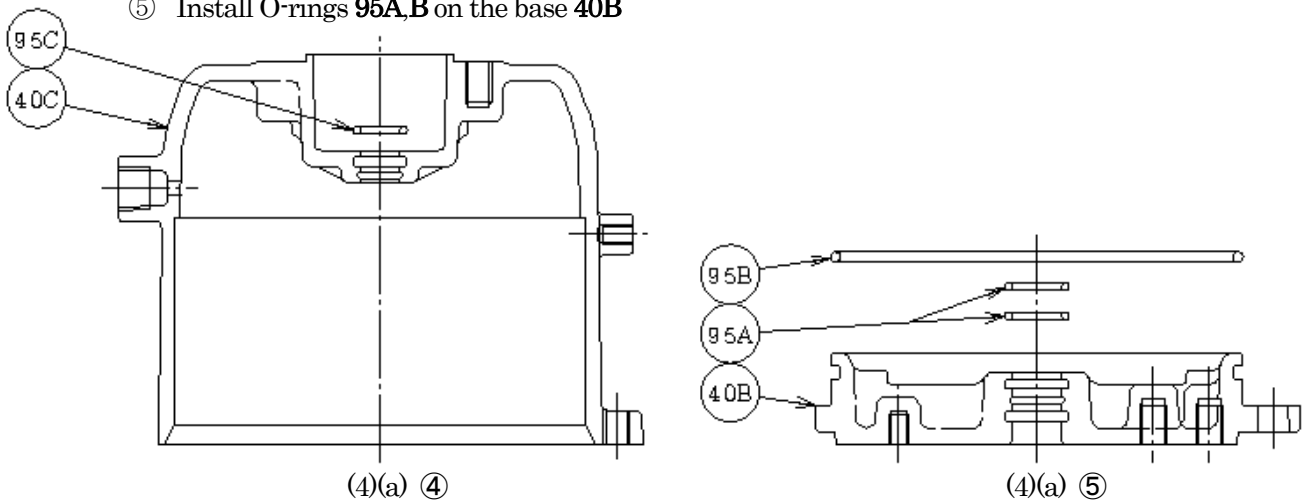
See “Applicable O-ring List” for nominal diameter of O-rings to be used.

- ① Apply grease uniformly onto the sliding surface and the part to install O-rings.
- ② Fit the washer **83A** and seal washer **83B** and piston **41** on the stem rod **53**, apply Loctite “No.262”, and screw in spindle **7**. Turn clockwise and securely tighten the rod with a spanner hanging on the width across flat.
- ③ Install O-ring **42A** and **41**wear ring **42B** on the piston.



④ Install O-ring **95C** on the cylinder **40**.

⑤ Install O-rings **95A,B** on the base **40B**



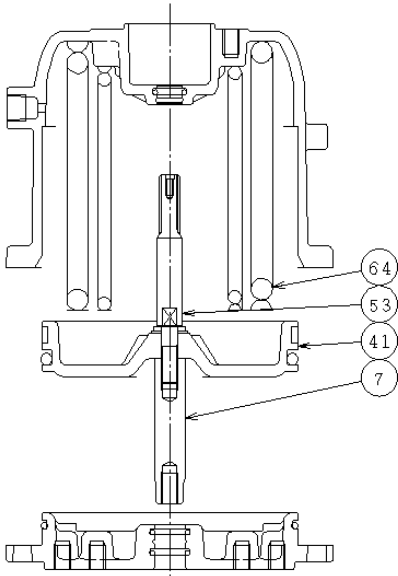
⑥ Set spring **64** in the cylinder **40**, and then set unit of spindle **7**, piston **41**, and stem **53**.

➤ For direct acting type, first set the piston unit and then set spring **64**.

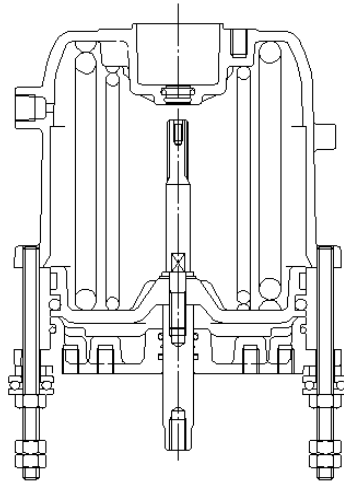
➤ Since the double acting type has no spring, just set the piston unit.

⑦ Set base **40B**. Pay attention to the direction to set the base **40B**. (See the figures below.)

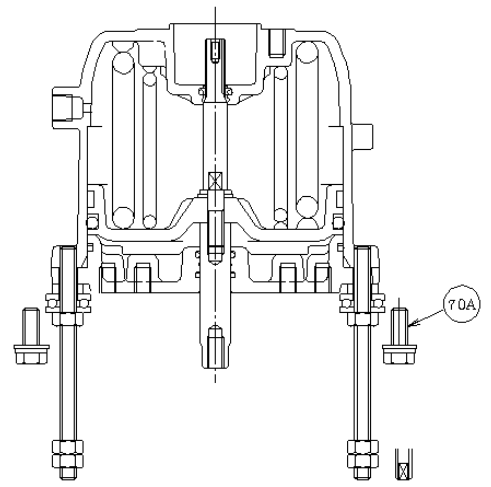
- ⑧ Screw nuts into 2 continuous thread studs, insert the bolt into the bolt hole of the base **40B** and screw in the screw hole of the cylinder **40**. (For double-acting type, go to ⑪)
- ⑨ Tighten the nuts evenly while fixing the double nuts (or width across flat) of the end of the continuous thread stud with a spanner. (For double-acting type, go to ⑪)



(4)(a) ⑥, ⑦

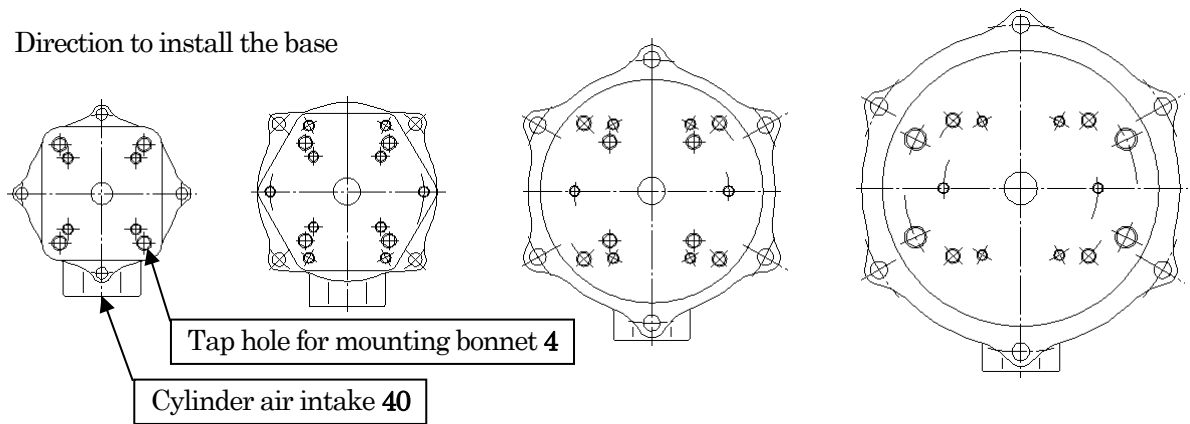


(4)(a) ⑧



(4)(a) ⑨

◇ Direction to install the base

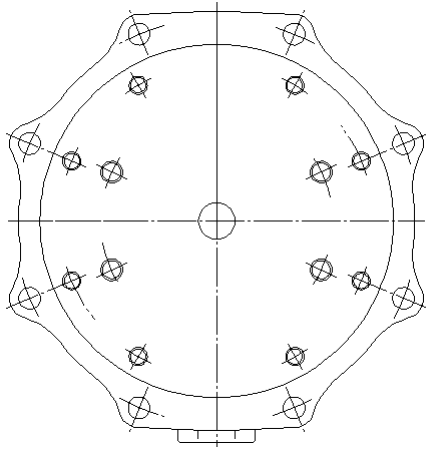


PO(C,N)1400N-07N

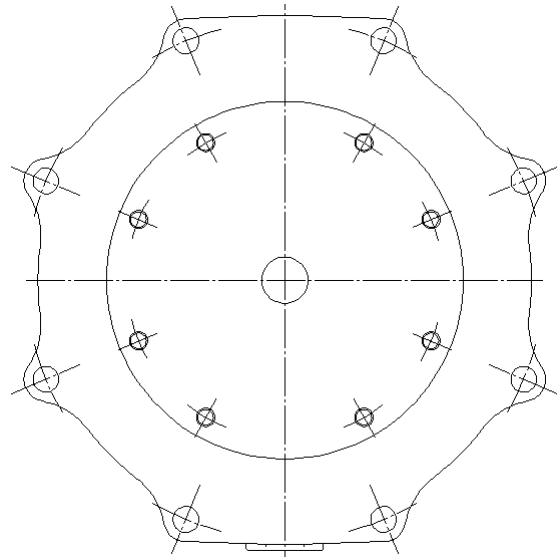
PO(C,N)1400N-09N

PO(C,N)1400N-12N

PO(C,N)1400N-16N



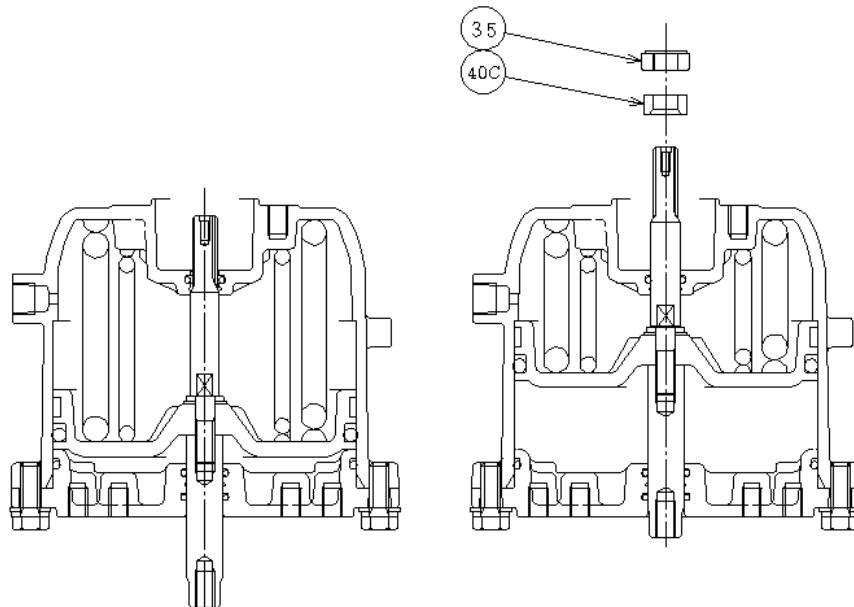
PO(C,N)1400N-20N



PO(C,N)1400N-25N

Shows direction to mount base **40B** to air intake of the cylinder **40**.  
 Align the direction of tap hole for mounting bonnet **4** with the position in the figure.  
 Possible to mount the base by turning it by 180°. For actuator size 12N and 16N, mounting by turning the base by 90° is impossible. This is possible with other size actuators but note that the direction changes by 90°

- ⑩ When the flange of base **40B** comes close to the cylinder flange, insert hexagon bolt **70A** into other bolt holes and tighten. (For double-acting type, go to ⑪)
- ⑪ Remove the continuous thread stud and mount hexagon bolt **70A**. At this time, mount a metal hanger.
- ⑫ Apply pneumatic pressure into the cylinder and screw the stopper nut **35** with spacer **40C**. (Since the direct acting type is opened by spring **64**, pneumatic pressure is not required.)
- ⑬ Adjust the stopper nut **35** and mount the cap after assembling the valve.



(4)(a)⑩,⑪

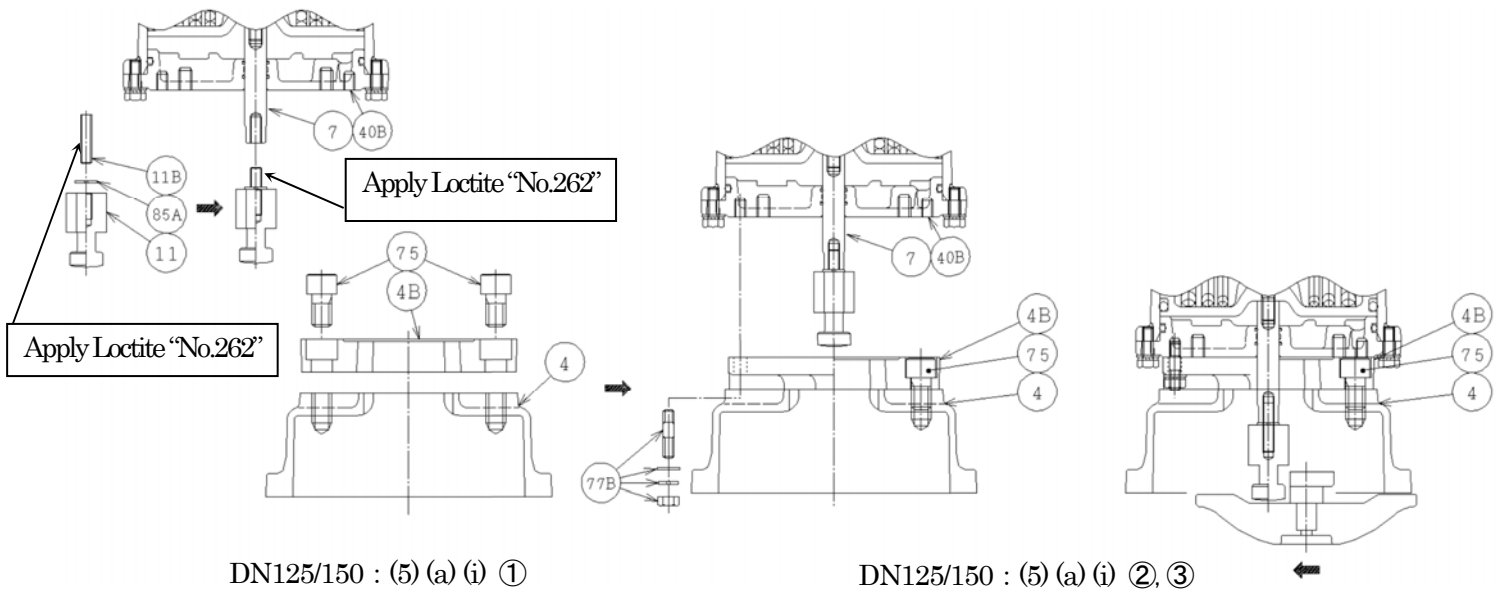
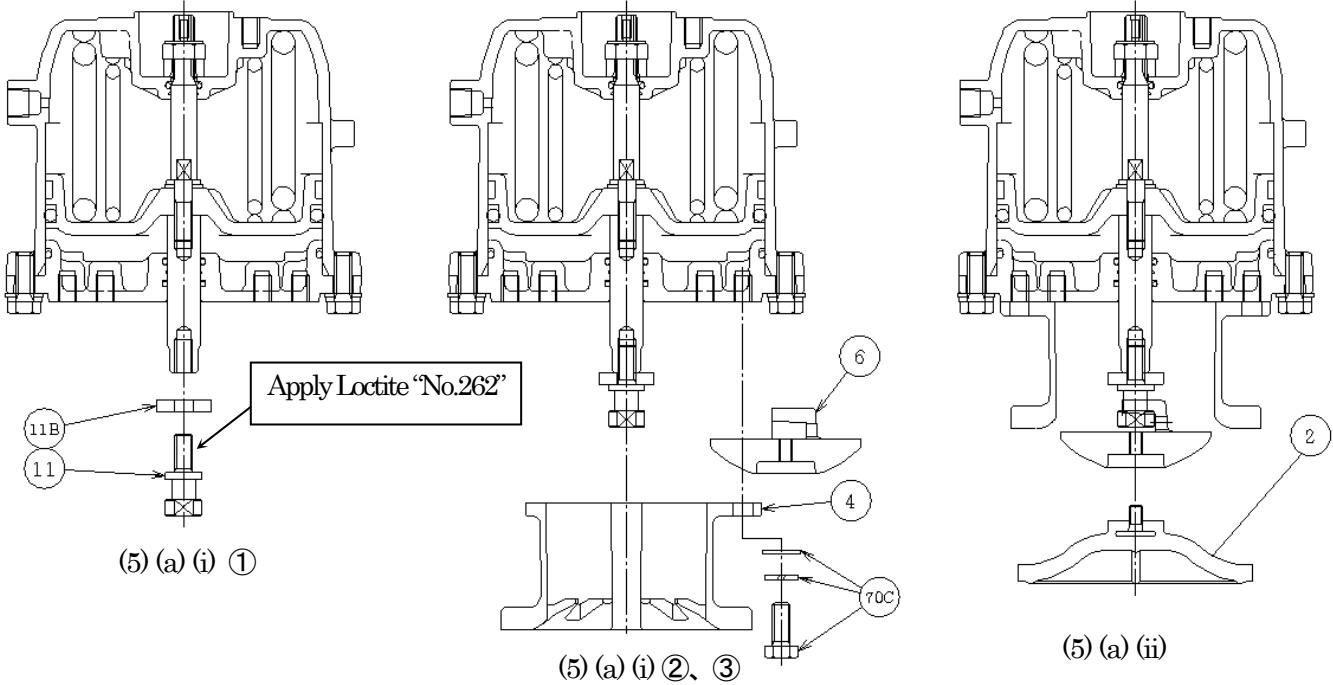
(4)(a)⑫

(5) Assembly of valve

(a) Reverse (direct, double) acting actuator (Type PO(C,N)1400N)

(i) Mounting of bonnet and compressor

- ① Apply Loctite “No.262” onto the connector thread and screw in spindle 7.
- ② Mount the compressor.
- ③ Mount the bonnet 4 to the base 40B with hexagon bolt 70C.



(ii) Mounting of diaphragm

Mount the diaphragm according to 13.1 Procedure for replacing diaphragm.

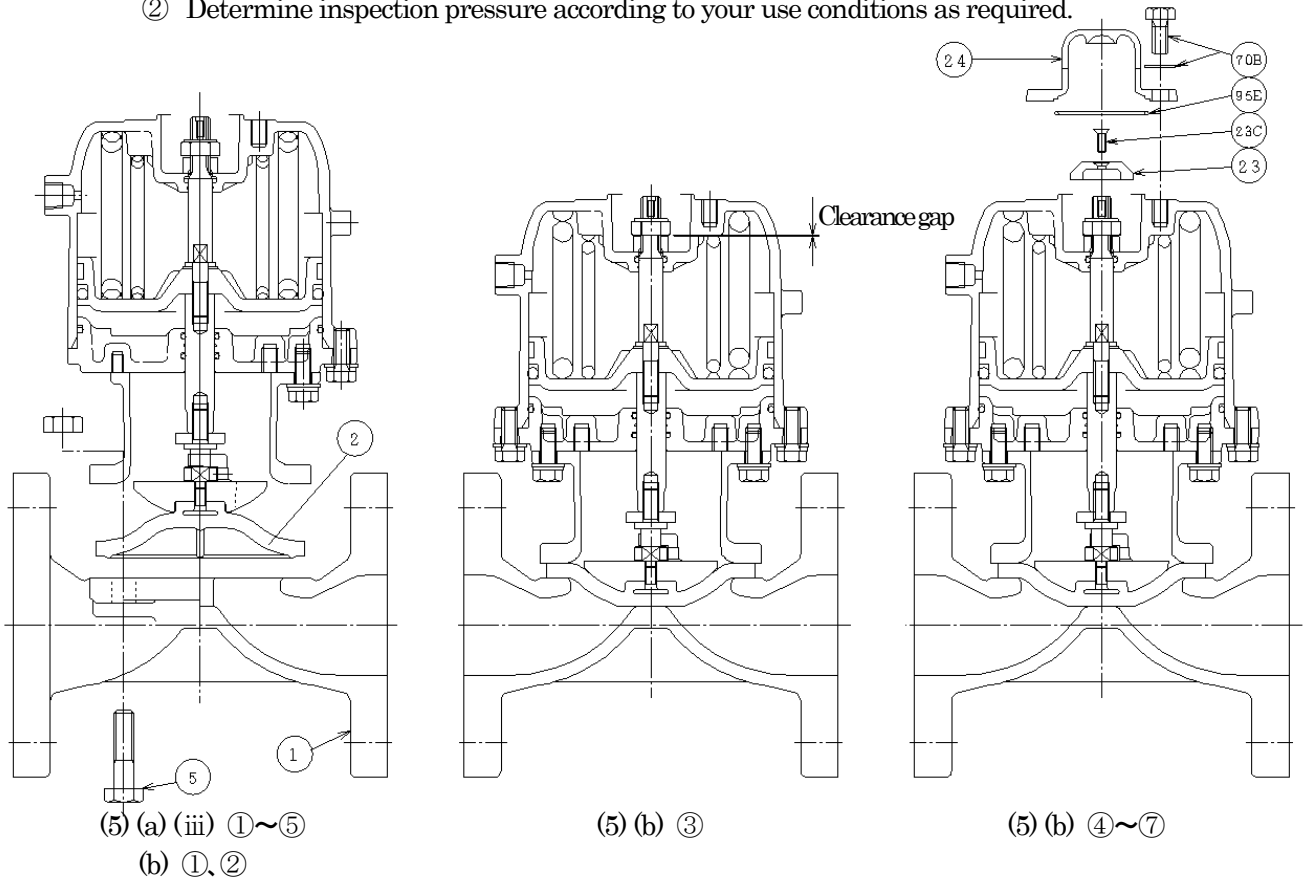
(iii) Assembly of body

Assemble the body according to 13.1 Procedure for replacing diaphragm. Confirmation after r assembling valve.



(iv) Confirmation after assembling valve

- ① Confirm existence of external leakage, sealability of washer and operation.
- ② Determine inspection pressure according to your use conditions as required.



(b) Procedure for setting stopper nut

- ① Fully close the valve.
- ② Insert the spacer **40C** to the stem **53** and screw in stopper nut **35**.
- ③ Setting of clearance gap of stopper nut **35**
  - Screw in stopper nut **35** once all the way, and put it back to make a specified clearance gap.
  - See the table below for number of return revolution of stopper nut.

DN	Nominal diameter of actuator					
	07N	09N	12N	16N	20N	25N
15	0.5 (0.7)	0.5 (0.7)				
20	0.5 (0.7)	0.5 (0.7)				
25	0.5 (0.7)	0.5 (0.7)	0.5 (0.7)			
40		0.5 (0.7)	0.5 (0.7)	0.5 (0.9)		
50			0.5 (0.7)	0.5 (0.9)		
65				0.5 (0.9)	0.5 (0.9)	
80					0.5 (0.9)	0.5 (1)
100					0.5 (0.9)	0.5 (1)
125					0.5 (0.9)	0.5 (1)
150					0.5 (0.9)	0.5 (1)

Values in ( ) show clearance values(mm) corresponding to number of return revolution of stopper nut.

- ④ Fix the indicator **23** to the stem by the the cross recessed flat head screws **23C**.
- ⑤ Install caps **24** with bolt **70B**.

(6) List of consumables

(a) Diaphragm tightening bolts and nuts

DN	15	20	25	40	50	65	80	100	125	150
Nominal size of hexagon bolt	M6		M8	M10		M12	M16	M12	M16	
Nominal size of spanner	10		13	17		19	24	19	24	

(b) Connector width across flat dimension

DN	15	20	25	40	50	65	80	100	125	150
Width across flat	14					19			32	

(c) Wear ring dimensions and seal washer nominal size

Actuator code No.		07N	09N	12N	16N	20N	25N
42B wear ring	Outer diameter	φ75	φ90	φ125	φ160	φ200	φ250
	Thickness	3	3	3	3	3	3
	Width	6	8	8	8	20	20
83B seal washer		DS-1-8	DS-1-8	DS-1-8	DS-1-12	DS-1-12	DS-1-16
5T seal washer		SM-12			SM-16		SM-20

(d) O-Ring nominal diameter

Application	Part No.	Nominal diameter of actuator					
		07N	09N	12N	16N	20N	25N
Type PO(C,N) 1400N	42A	P65	P80	P115	P150	P185	P235
	95A	P12		P15	P18	P20	P22
	95B	G70	G85	G120	P150	G190	G240
	95C	P12			P14		P18
	95D	P09			P11		P14
	95E	S045			G50		G60
	95F	AS568-022					
Dedicated limit switch	15M	AS568-044					
	22M	AS568-018					
	27M	AS568-031					
	28M	—			G50	G50	G60
With yoke	14Y	P08			P10		P12
	20Y	P22			P24		P28
With handle	14H	S045			G50		G60
With Solenoid valve	E3	φ16×2					
	E6						

## (e) Width across flat dimensions of bolts and parts

Application	Part No.	Part name	Nominal size of actuator						
			07N	09N	12N	16N	20N	25N	
Type PO(C,N) 1400N	7	Spindle	9		11	15	17		
	23	Indicator	10						
	24A	Cap A	30						
	35	Stopper nut	17			19		24	
		(only for POSH(SL))	17					21	
	53	Stem	10			13		17	
	70A	Hexagon bolt	8	10	13	13	17	19	
	70B	Hexagon bolt	—			19		24	
	70C	Hexagon bolt	D N	10					
			15						
			20						
			25	13			19		
			40	10					
			50	13					
65			19						
80			17						
100									
77B	125	17							
	150								
Dedicated limit switch	7M	Cap screw	6						
	9M	Hexagon nut	7						
With opening adjustment mechanism	2T	Hexagon bolt	19			24		30	
	3T	Hexagon nut	19			24		30	
	4T	Hexagon bolt	13			19		24	
With handle	13H	Hexagon socket Set screws	2.5			3			
	17H	Hexagon bolt	13			19		24	
With yoke	12Y	Hexagon nut	17			19		24	
	13Y	Hexagon bolt	13			19		24	
	15Y	Hexagon nut	17			19		24	

#### 14. Troubleshooting

Refer to the list below to solve problems such as external fluid leakage, valve operation, etc.

Failure		Causes	Countermeasures
Leakage from the main body		When there is leakage from the body, following problems may be possible. ① A hole developed in the main body due to corrosion. ② Crack occurred in the body due to piping stress. ③ Leakage from the body has caused weld cracking.	Replace the main body.
Leakage from the connecting area of the main body	Piping connecting area	Bolts are loose. Gasket is mismatching	Retighten bolts Replace the gasket.
	Connecting area of main body and diaphragm	Leakage between diaphragm and body Bolts and nuts are tightened insufficiently or one-sidedly.	Retighten bolts and nuts evenly with appropriate torque
Leakage from bonnet and liquid contacting area of diaphragm		Diaphragm is damaged.	Replace the diaphragm.
		Diaphragm is corroded.	Select and replace the diaphragm.
Leakage from the bonnet outlet		Diaphragm is broken.	Replace the diaphragm.
Leakage from the seat		Foreign matter is caught.	Remove the foreign matter.
		Increase of fluid pressure	Set to appropriate fluid pressure.
		Wear of body	Check and replace the body.
		Stress relaxation of diaphragm	Adjust the stopper. Replace the diaphragm.
Operation pressure is not set to specified value.		Insufficient capacity of compressor	Change the capacity Install volume tank.
		Leakage from piping to actuator	Check pneumatic piping and repair.
		Clogging inside pneumatic piping	Check and remove foreign matter.
The solenoid valve is turned on but does not actuate.		Galling of spindle	Disassemble and repair or replace
		Mistaken selection of actuator	Select again.
		Galling of sliding surface of cylinder	Disassemble and repair or replace
		Wear of O-ring	Disassemble and repair.
		Nonconforming voltage	Set to specified voltage. Check whether coil is burnt or not.
		Leakage from pneumatic piping	Check and repair
		Mixing of foreign matter in accessories	Check and remove foreign matter
		Incorrect direction to install accessories	Check and change the direction
		Coil burnt due to overcurrent	Check and replace the coil.
Operation has become sluggish.		Wear of O-ring	Disassemble and replace

#### WARNING

Disassembly and inspection involve risks unlike the operation. Pay special attention to the following points. Or for safety, please ask service personnel of valve manufacturers for inspection.

- (1) For work on solenoid valves or the like, the risk of electric shock may occur. Be sure to turn off the power and confirm that the power is off before starting inspection.
- (2) For disassembly of the actuator incorporating spring, there is a danger because the reaction force of spring works. Take enough care when disassembling the spring unit.

#### 15. Disposal

##### CAUTION

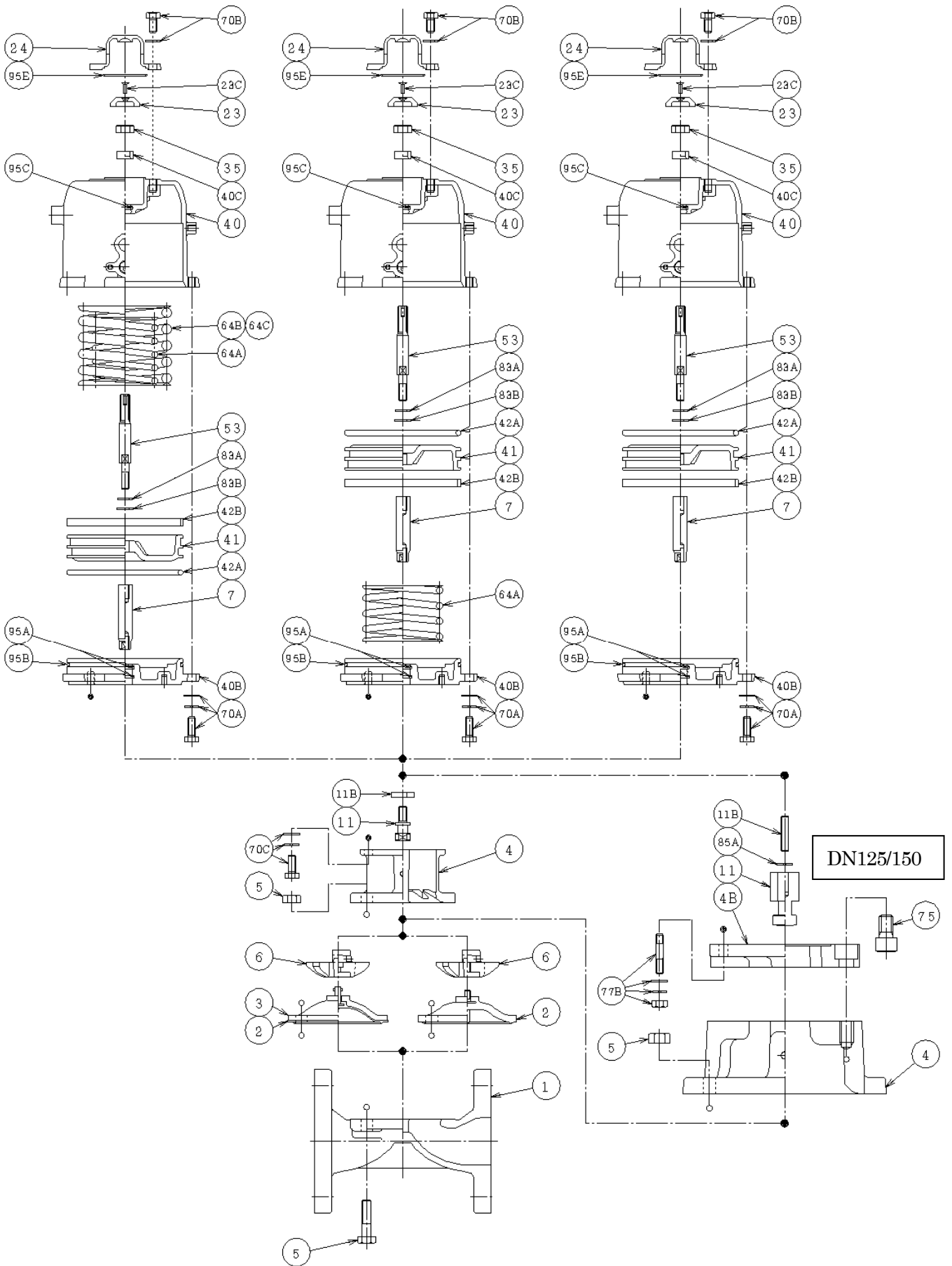
Used parts produced from maintenance of valves should be adequately disposed of as industrial waste.

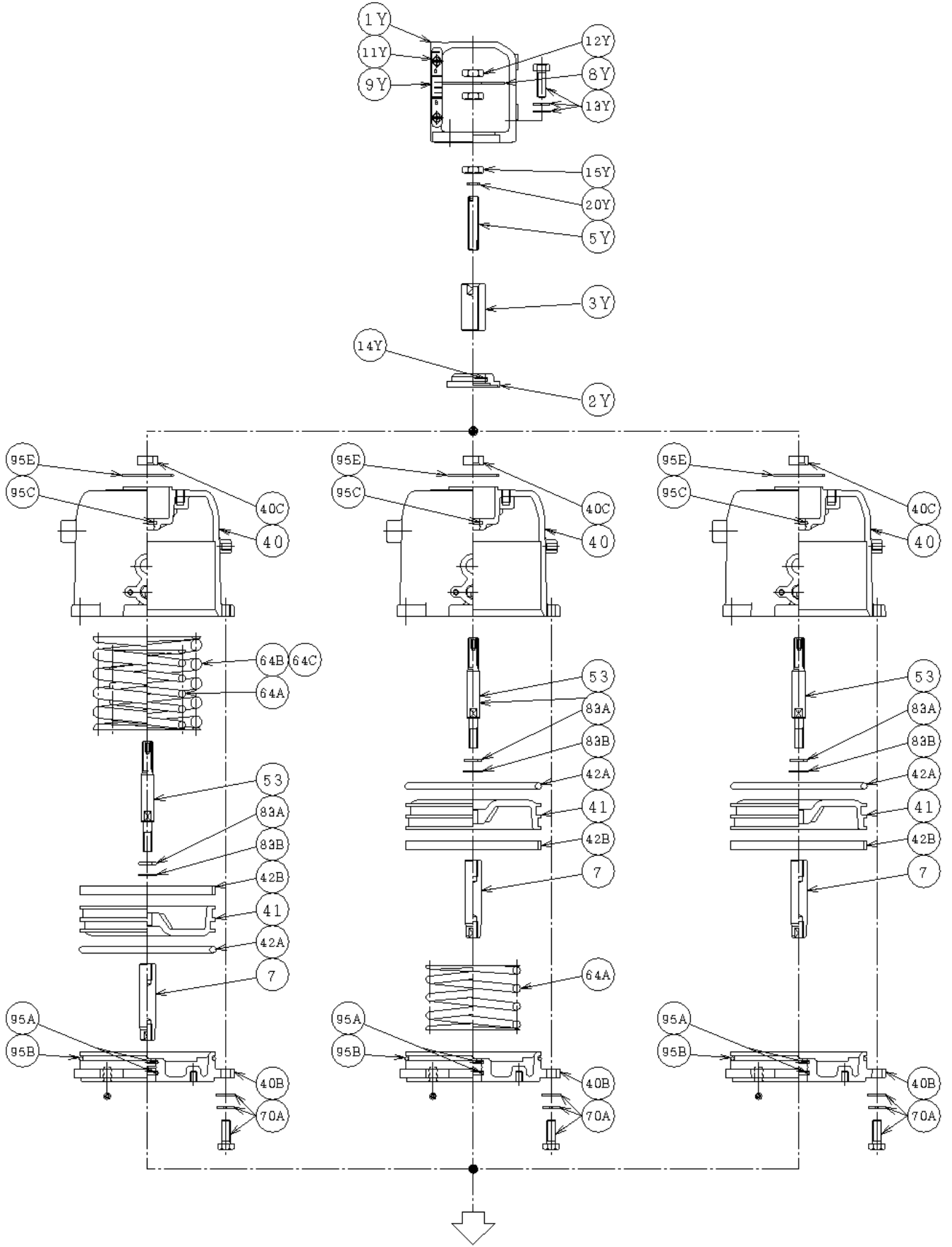
Inadequate disposal or burning of waste will cause environmental pollution.

Basic type (PO(C,N)1400N)			With dedicated limit switch (M)		
No.	Part name	Materials	No.	Part name	Materials
1	Body	—	1M	Micro switch	—
2	Diaphragm	—	2MA~B	Switch cam	POM
3	Rubber backing	—	3MA~C	Mounting plate	SPCC
4	Bonnet	SCS13A SCPH2	3MD	Cap screw	SUS304
			5M	Cap screw, nut	SUS304
5	Bolt and nut	SUS304 SWCH	6M	Machine screw	SUS304
			7M	Cap screw	SUS304
6	Compressor	—	9M	Hexagon nut	SUS304
7	Spindle	SUS304	11M	Switch case	ADC12
11	Connector	SUS304 S20C	12M	Cover	ADC12
11B	Washer	SUS304	13M	Hexagon bolt	SUS304
	Set screw	SCM435			
23	Indicator	PP	15M	O-ring	NBR
23C	cross recessed flat head screw	SUS304	19M	Indicator	Elastomer
24	Cap	PC	21M	Cap	PC
35	Stopper nut	S45C	22M	O-ring	NBR
40	Cylinder	ADC12	23M	Spacer	AC2B
40B	Base	ADC12	24M	Hexagon bolt	SUS304
40C	Spacer	SUS304	25M	Circuit diagram	Tetoron
41	Piston	ADC12	27M	Gasket	NBR
42A	O-ring	NBR	28M	O-ring	NBR
42B	Wear ring	POM	43M	Set screw	SUS304
53	Stem	SUS304	1T	Terminal blocks	P.B.T.
64A ~C	Spring	SWOSC-B SUP6	2T	Machine screw	SUS304
			3T	Electroc wire	
70A	Hexagon bolt	SUS304	1C	Cap	
70A	Spring washer	SUS304			
70A	Plain washer	SUS304			
70B	Hexagon bolt	SUS304			
70B	Plain washer	SUS304			
70C	Hexagon bolt	SUS304			
70C	Spring washer	SUS304			
70C	Plain washer	SUS304			
75	Cap screw	SCM435			
77B	Nut	SWCH			
77B	Bolt	SWCH			
83A	Washer	SUS304			
83B	Seal washer	SS+NBR			
85A	Spring washer	SWRH			
95A~ F	O-ring	NBR			

With handle opening mechanism (H)			With yoke (Y)		
No.	Part name	Material	No.	Part name	Material
2H	Handle A	AC2B	1Y	Yoke	FCD400
3H	Handle B	C3604BE			AC2B
9H	Spring pin	SUS420J2	2Y	Yoke bush	SUS304
10H	Thrust washer	SPCC+PTFE	3Y	Joint nut	SUS304
13H	Hex socket set screw	SUS304	3BY	Joint nut B	SUS304
14H	O-ring	NBR	3CY	Key	SUS304
16H	Handle cover	SUS304	5Y	Stem rod	SUS304
17H	Hexagon bolt	SUS304	8Y	Pointer	SUS304
18H	Packing	Nylon	9Y	Indicator plate	SUS304
35	Stopper	SUS304	11Y	Machine screw	SUS304
35B	Pin	SUS430	12Y	Hexagon nut	SUS304
			13Y	Hexagon bolt	SUS304
			13Y	Spring washer	SUS304
			13Y	Plain washer	SUS304
			14Y	O-ring	NBR
			15Y	Hexagon nut	SUS304
			20Y	O-ring	NBR

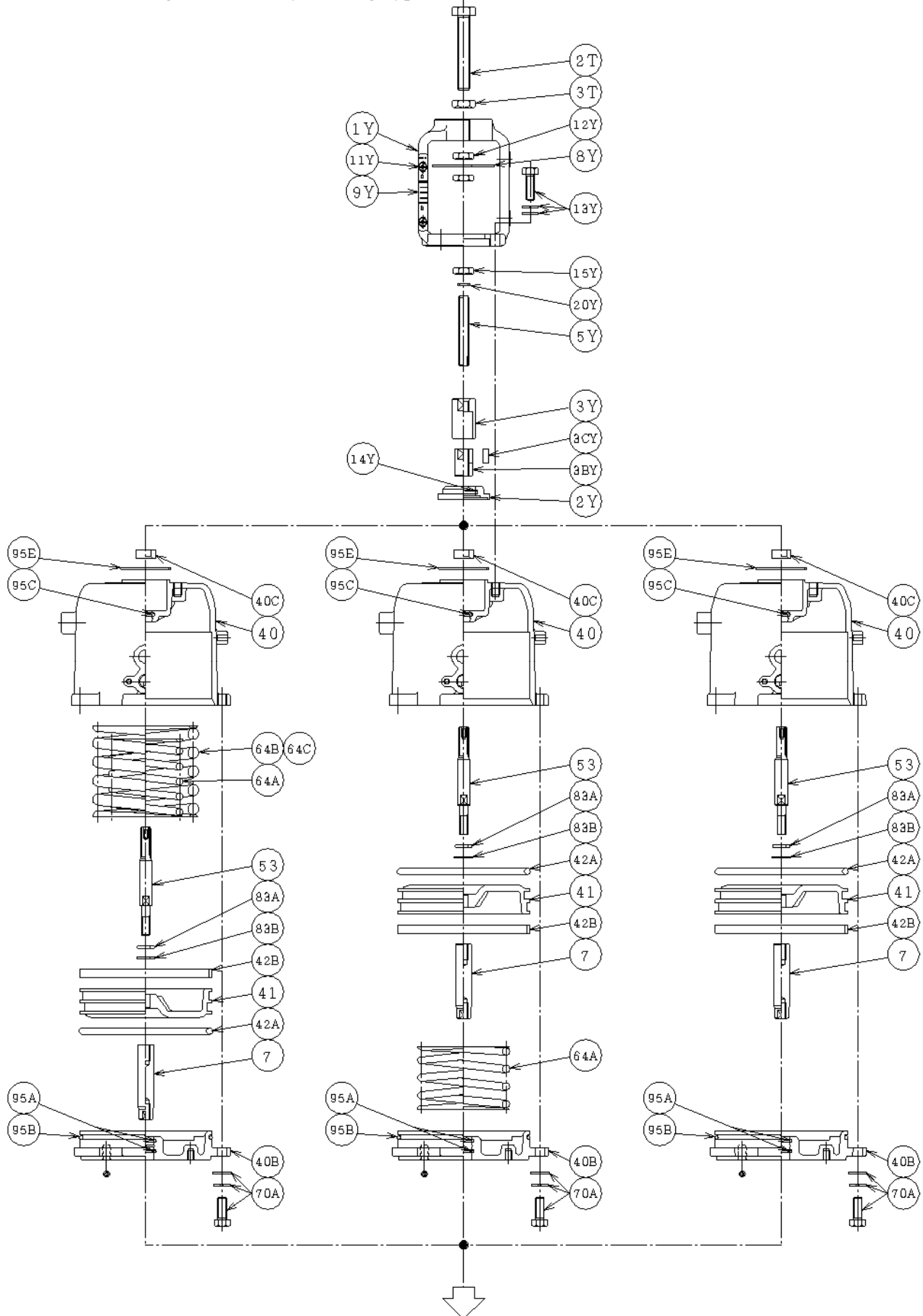
With solenoid valve (E)			With opening adjustment mechanism (T)		
No.	Part name	Material	No.	Part name	Material
E1	Solenoid valve	—	1T	Cover	FCD400
E2	Machine screw	SUS304	2T	Hexagon bolt	SUS304
E3	O-ring	NBR	3T	Hexagon nut	SUS304
E4	Spacer	SCS13	4T	Hexagon bolt	SUS304
E5	Pipe joint	C3604 or C3771	5T	Seal washer	SUS+NBR
E6	O-ring	NBR			
E7	Pipe joint	C3604 or C3771			
E8	Partition plate	SUS304			
E9	Plug	SUS304			
E10	Coated copper piping				



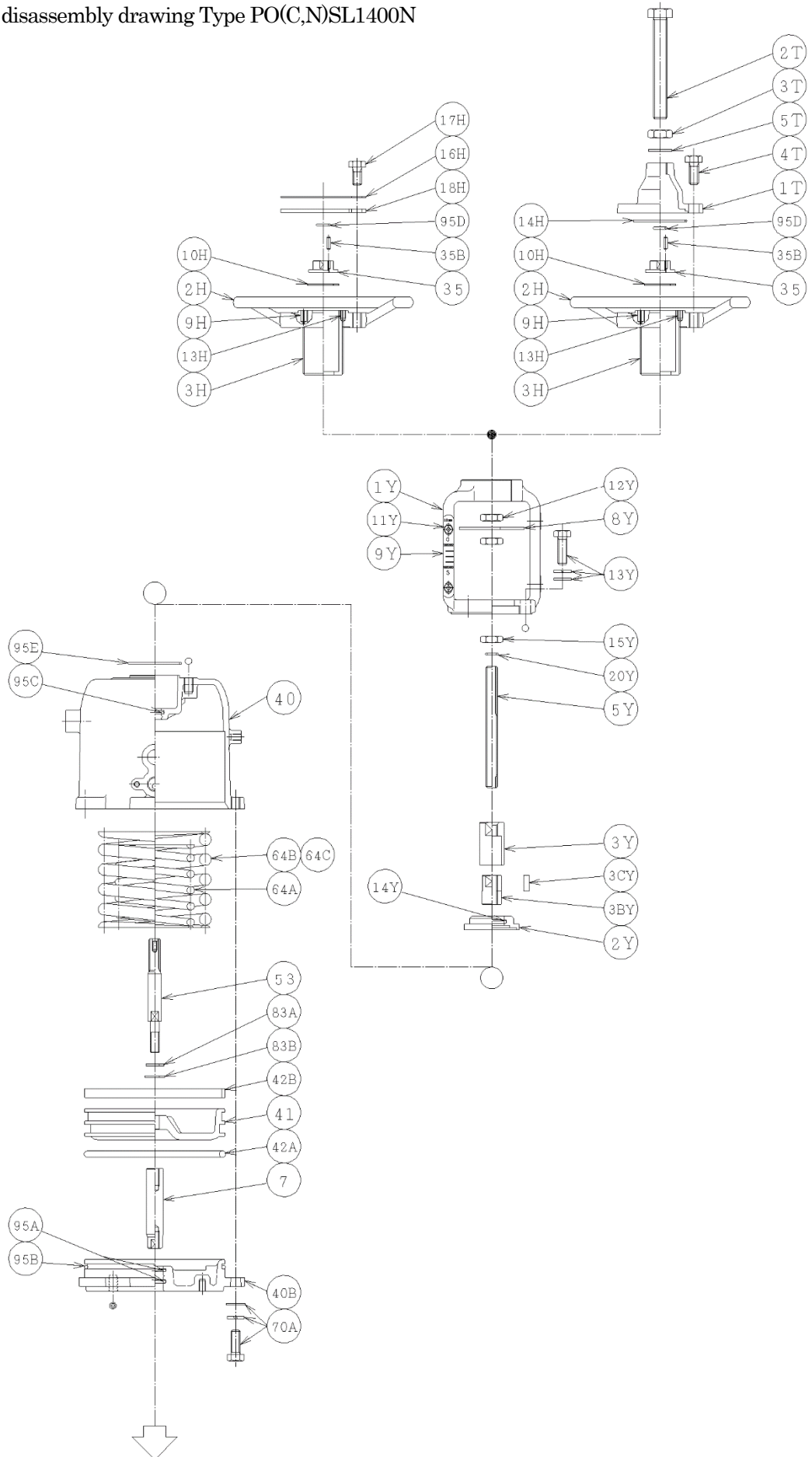


**Please watch disassembly drawing Type PO(C,N)1400N views**

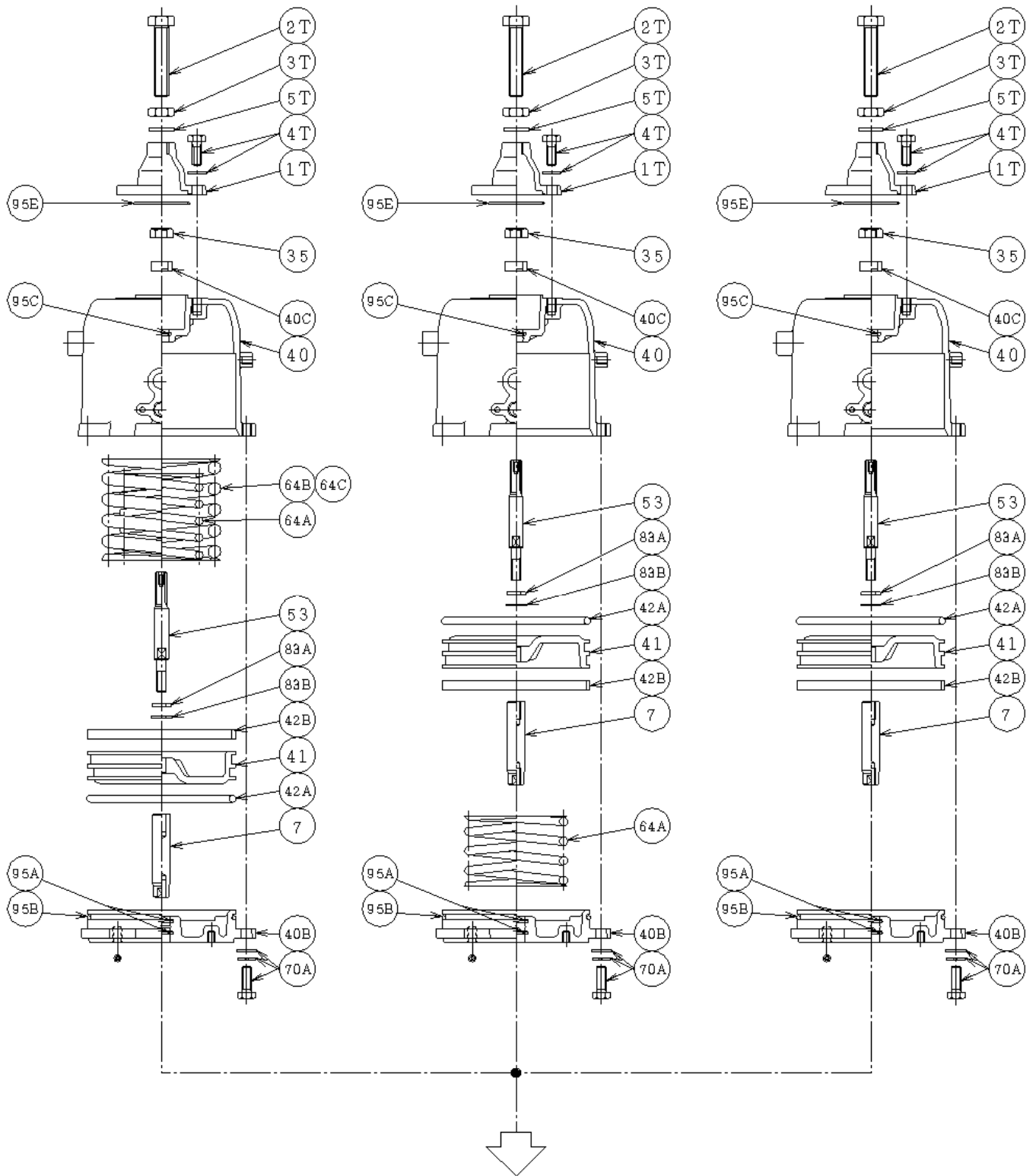




**Please watch disassembly drawing Type PO(C,N)1400N views**



Please watch disassembly drawing Type PO(C,N)1400N views



**Please watch disassembly drawing Type PO(C,N)1400N views**

