

Operation Manual

Weir Type Manually Operated Diaphragm Valve

Model : 400-125/350

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 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 result.
 WARNING	Indicates an indirect risk of danger. Danger is not immediate, but it may arise. If a WARNING message is ignored, death, serious injury, or property damage may occur.
 CAUTION	Indicate a risk of moderate danger. If a CAUTION warning is ignored, slight injury 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 the negligent use of this product or failure of observing the instructions in this manual.

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1. Product Specifications

Representing Product Specifications by Code Number

Example :

4 01 - NR - 125

① ② ③ ④

Description of code

① Valve type

4 0 0 : 400 type (weir type)

② Body material

0 1 : Gray cast iron FC200

0 4 : Ductile cast iron FCD-S

0 5 : Cast steel SCPH2

0 7 : Stainless steel SCS13

1 2 : Stainless steel SCS14

1 3 : Stainless steel SCS16

2 6 : Bronze casting CAC406

3 0 : Hard natural rubber lined (Base material : FC200)

3 3 : Soft natural rubber lined (Base material : FC200)

3 5 : Chloroprene rubber lined (Base material : FC200)

3 6 : Butyl rubber lined (Base material : FC200)

4 0 : Glass lined (Base material : FC200)

5 0 : Polyethylene lined (Base material : FC200)

5 9 : PFA lined (Base material : FCD-S)

6 1 (M) : New-PFA lined (Base material : FCD-S)

7 1 : Zinc plated (Base material : FC200)

③ Diaphragm material

NR : Natural rubber

CR : Chloroprene rubber

BG : Butyl rubber

AB : Nitrile rubber

EP : EPDM

UG : Polyurethane

HP : Hyperon

TF/CE : PTFE/EPDM

TF/CX : PTFE/EPDM

④ Valve nominal diameter

Shown in (mm).

2. Structure Drawings

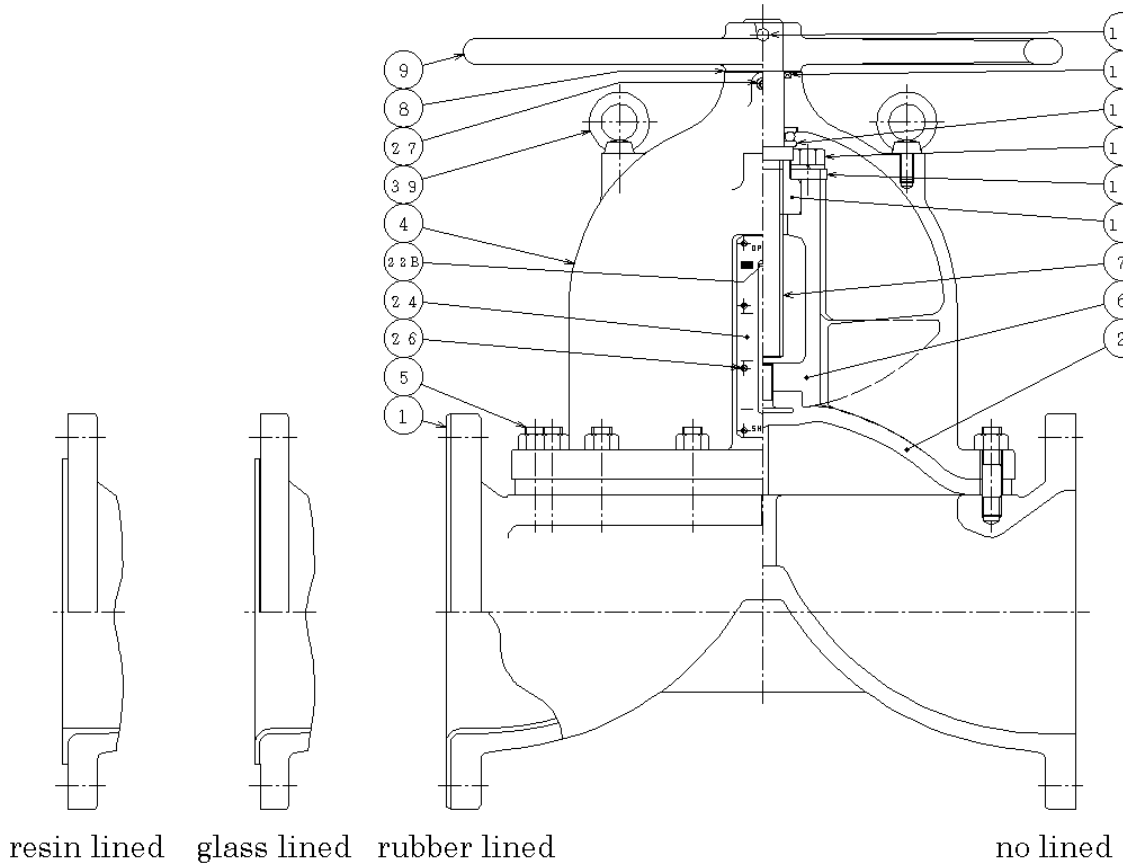
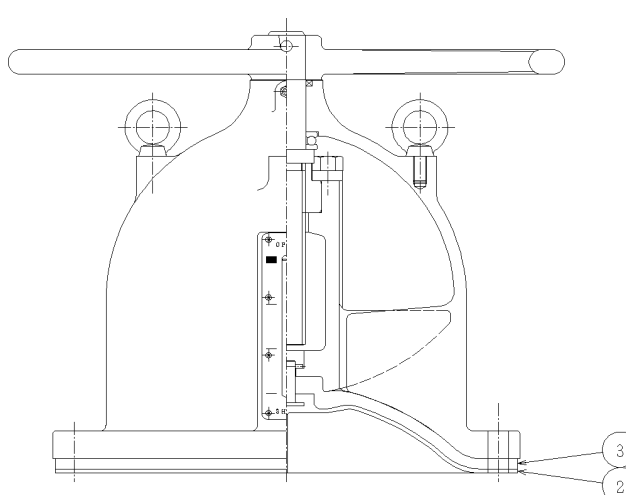
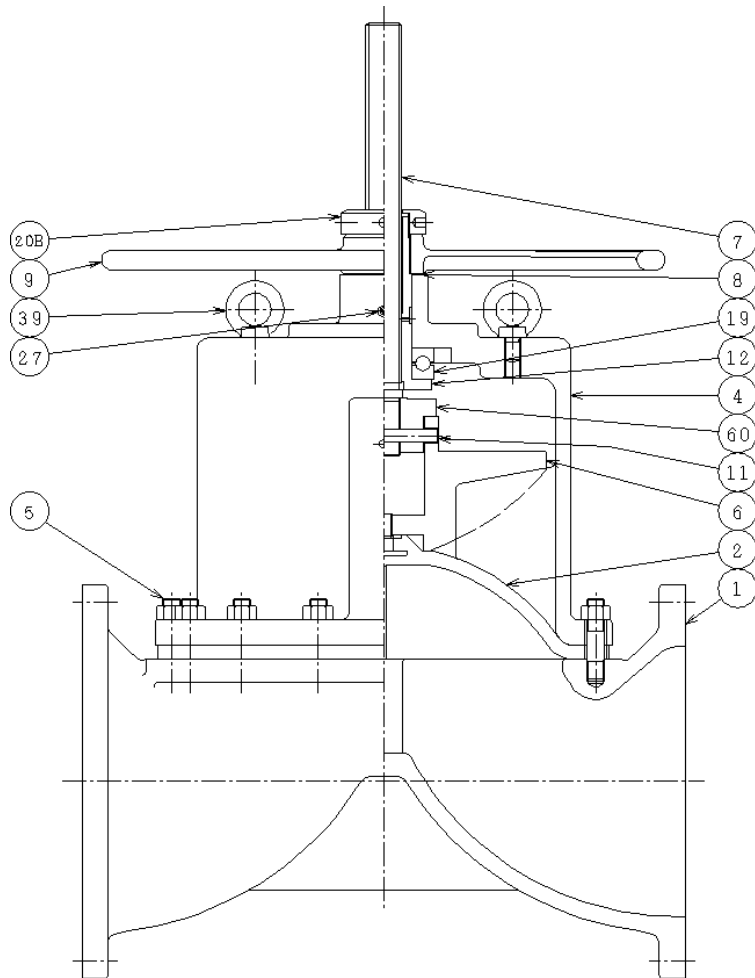


Figure 1 DN125 ~ 300 (Rubber Diaphragm)



3 9	Eyebolt (DN200~300)
2 7	Grease Nipple (DN150~300)
2 6	Machine Screw
2 4	Indicator
2 2 B	Pointer
1 9	Thrust Ball Bearing
1 7	Felt Washer (DN125)
1 5	Bolt (DN150~300)
1 4	Compressor Plate (DN150~300)
1 3	Spindle Nut
1 0	Pin
9	Hand Wheel
8	Thrust Washer
7	Spindle
6	Compressor
5	Bolt & Nut
4	Bonnet
3	Rubber Backing
2	Diaphragm
1	Body
No.	Part Name

Figure 2 PTFE Diaphragm



6 0	Matching Piece
3 9	Eyebolt
2 7	Grease Nipple
2 0 B	Cap Nut
1 9	Thrust Ball Bearing
1 2	Sleeve
1 1	Compressor Pin
9	Hand Wheel
8	Thrust Washer
7	Spindle
6	Compressor
5	Bolt & Nut
4	Bonnet
2	Diaphragm
1	Body
No.	Part Name

Figure 3 DN350

3. Maximum Working Pressure and Test Pressure

Table 1

Unit : MPa

Diaphragm	Rubber Diaphragm		PTFE Diaphragm	
	Body material	Glass lined	Cast iron Ductile cast iron Cast steel Stainless steel Resin lined	Rubber lined Glass lined
Nominal diameter	Cast iron Ductile cast iron Cast steel Stainless steel Bronze casting Rubber lined Resin lined			
1 2 5	0.8 (1.0)	0.5 (0.6)	0.7 (0.8 5)	0.5 (0.6)
1 5 0				
2 0 0	0.7 (0.8 5)			
2 5 0	0.5 (0.6)	0.4 (0.5)	0.4 (0.5)	0.4 (0.5)
3 0 0	0.4 (0.5)			
3 5 0	0.3 5 (0.4)			

Note : Values in the table show the maximum working pressure and values in () show the shell test pressure and the seat leakage test pressure (hydraulic pressure).

The diaphragm valve cannot use the hydraulic test pressure indicated in JIS B2238, B 2239 and B 2240 as they are.

4. Reception, transportation and storage

4. 1 Reception and transportation



(1) Products are heavy goods.

When lifting these products, use a hoist machine compliant with the Industrial Health and Safety Law and transport them.

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) Always be sure to wear safety gear and safety protectors when working.

(3) Some diaphragm valves consist of materials such as glass lined, natural hard rubber lined, etc. , which are sensitive to the impact.

Please handle gently and carefully.

If anticorrosion lining materials which contact the fluid are to be damaged, metal of the base metal will be corroded causing the fluid to leak.

Contacting a certain kind of fluid can result in a risk of “Death, serious injury, blind”.

4. 2 Storage

(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.

① A place where rain drops come in

② A place with atmosphere with temperature of more than 60 degrees Celsius

③ A place with atmosphere with high humidity

④ 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) When handling the glass lined body or porcelain body, take enough care not to give impact upon them.

(7) Place the product on the rubber sheet, taking care not to scratch the connection flange surface of the valve body.

(8) To store the product after use, follow the steps described below.

① Thoroughly clean the inside of the valve and dry it sufficiently.

② Protect the connection flange surface of the valve body to prevent from being scratched.

③ Perform rust prevention treatment to the location where rust may occur.

5. Installation of the valve



(1) Products are heavy goods.

When attaching these products to piping, use a hoist machine compliant with the Industrial Health and Safety Law.

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) When attaching a valve to piping, never insert a hand 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 consist of materials such as glass lined, natural hard rubber lined, etc. , which are sensitive to the impact.

Please handle gently and carefully.

If anticorrosion lining materials which contact the fluid are to be damaged, metal of the base metal will be corroded causing the fluid to leak.

Contacting a certain kind of fluid can result in a risk of “Death, serious injury, blind”.



(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.”

Attaching the valve

(1) Remove the dust-tight seal covering the connection flange surface of the body and confirm that the inside is free of dirt or adhering foreign materials.

Also confirm the absence of dirt and foreign materials in the piping to be attached to the valve.

(2) The diaphragm valve can flow in either direction.

For DN125~300, attach them so as the indicator can be easily seen.

(3) Replacement of the diaphragm will be easier if installed vertically to the horizontal piping.

(4) For horizontal piping, to prevent the fluid from remaining inside the piping, the valve can be installed by tilting the valve.

Tilting angle varies with nominal sizes and body materials, so please check with us for the angle.

(5) Be sure to secure enough space for disassembly inspection.

The space must be wide enough to replace the diaphragm with the body attached to the piping.

Especially, secure the space wide enough to lift the bonnet.

(6) When installing the valve to the piping, be sure never to apply abnormal tensile compression or bending stress.

(7) When installing the valve, use a full-face gasket for the full-face seat flange type.

Especially, use soft rubber full-face gasket for the soft rubber lined body (natural soft rubber lined, chloroprene rubber lined, etc.).

- (8) When installing the valve to the piping, tighten the piping bolts diagonally in alternate steps in equal turning increments.
If only one piping bolt is tightened, leakage may occur from a connection flange surface and damage the lining.
- (9) For the bolts used when installing the valve to the piping, select the bolts with proper length whose end may not contact the bonnet. Use double-end studs if necessary.
- (10) When attaching the glass lined body, be sure to tighten one flange after securing the adjacent valve piping, and then the other flange.
- (11) For the valves to be connected by weld joint, carry out welding after removing a set of the bonnet including the diaphragm, and attach a set of the bonnet including the diaphragm after cooling.
- (12) Confirm that the tightening bolts and nuts of the body and diaphragm are fully tightened.
If any of them are loose, tighten them securely, according to torque listed in Table 2.
- (13) After installing the valve to the body, flush or flow out the piping with gas or liquid with the valve in the full open position to remove any foreign materials remaining inside.
Be sure to use the fluid, which does not corrode the body or diaphragm for cleansing.

6. Operation

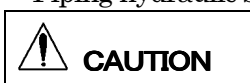


- (1) **The hand wheel diameter is designed to produce an optimum tightening thrust by a normal human power. Avoid the following actions.**
 - ① **Using an auxiliary handle on the hand wheel.**
 - ② **Operating the hand wheel by multiple people.**

If you take any of the above actions, the valve may be damaged.
Also, a risk of physical damage is high.
If the valve does not work with a designated hand wheel, disassemble it for inspection.
 - (2) **In case the fluid is incompressible liquid and the valves in the downstream and upstream of the valve to be operated are closed, do not operate the valve to be operated.**
The valve may be damaged due to pressure change caused by volume change of the fluid. Also, a risk of physical damage is high.
 - (3) **When retightening the hand wheel for closing, tighten it until it comes to between 15 degree and 20 degree from where closing resistance is felt and do not tighten further by force.**
Over tightening may shorten the lifetime of the diaphragm.
Special care should be taken for the high temperature fluid.
- (1) The valve is opened by turning the hand wheel to counterclockwise and closed by turning it to clockwise.
 - (2) If the handle torque sharply rises during closing operation, foreign matter can be caught in the weir (seat section). Fully open the valve to remove it and restart closing operation.

7. Piping hydraulic shell test

Piping hydraulic shell test pressures shall be in accordance with Table 1(Page 6).



The diaphragm valve cannot use the hydraulic test pressure indicated in JIS B2238, B2239 and B2240 as they are.
If tested with pressure exceeding the values in Table 1, external leakage may occur from between the body and the diaphragm.

8. 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.

8. 1 Daily Inspection

- (1) Is there any fluid leakage between the body (1) and the bonnet (4) and the connection area of the piping?
If leakage is found, tighten the bolt further after releasing fluid pressure.
- (2) Is there any fluid leakage from the crack or corrosion hole in the body (1)?
- (3) Is it possible to operate smoothly? (Hand wheel operation is heavier than usual, an allophone etc.)
- (4) Lubricate, apply grease
 - ① For DN125, lubricate onto the felt washer (17) from outside.
 - ② For DN150 and larger, apply grease from the grease nipple (27).
 - ③ In case of DN125~300, if the grease on the spindle thread part is deteriorated (evaporate, dry, emulsify etc.), disassemble, clean, and grease according to 9.4.

If you grease up spindle (7) threads as a first aid without disassembling, please follow the procedure below.

- i. Turn the valve fully closed.
- ii. Loosen the machine screw (26) and remove the indicator (24).
- iii. Insert grease gun into 4 bonnet and apply grease directly to thread of spindle (7). At this time, please apply grease to the entire circumference of the screw part while gradually turning the handle in the opening direction.



Figure 4 An example of grease gun

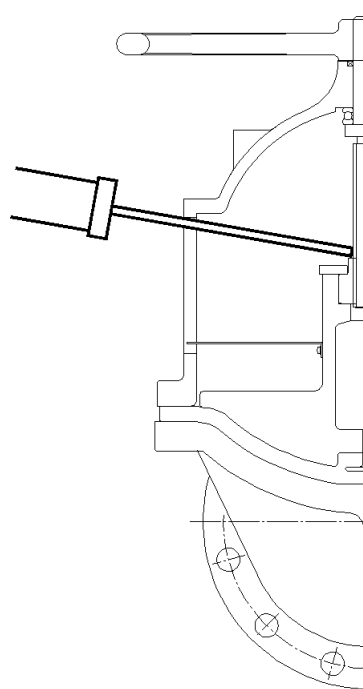


Figure 5 First aid using grease gun

- (5) If any abnormality occurs, refer to Chapter 10 "Troubleshooting".

8. 2 Periodic inspection

- (1) Intervals of inspection vary with the conditions and frequency of use.

Normally, perform the inspection once every 6 through 12 months.

- (2) Periodically check that the tightening bolts securing the body and diaphragm are not loose. If the bolts are loose, retighten them according to the torque value listed in Table 2. Retightening must be done especially for PTFE diaphragm.

Table 2 Tightening torque for diaphragm Unit: N·m

Nominal diameter	125	150	200	250	300	350
Rubber diaphragm	25	30	35	35	50	50
PTFE diaphragm	50	50	65	70	85	—

- (3) Inspection of flow passage section

- ① Check for any adhesion of foreign material or adherence in the main body.
- ② Check for the state of corrosion of liquid-contacting section and the degree of wear.
- ③ Check for the state of the lining surface of the body (existence and degree of swelling, crack, chipping, etc.).
- ④ For the diaphragm, carefully check the liquid-contacting surfaces and the rear side for the condition of appearance (degree of deterioration, existence of cracks and wear).

9. Replacement of Parts

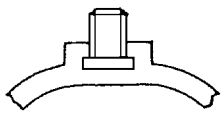


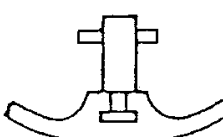


If you carry out replacement of parts when is fluid remaining, the fluid can cause a risk of “physical damage, blind”.

Before replacing the parts, make sure that there is no fluid, gas, or steam remaining inside the valve.

9. 1 Connecting method of the Diaphragm and its shape

Table 3

Diaphragm	Valve nominal diameter	Connecting method	Shape
Rubber diaphragm	125~300	 Screwed type	 Normal open type
	350		 Normal close type
PTFE diaphragm	125~300	 Bayonet type	

9. 2 Bolts and nuts fastening the Diaphragm

Table 4

Nominal diameter of valve	125	150	200	250	300	350
Nominal size of hexagon nut	M16			M18	M22	
Nominal size of spanner	24			27	32	

9. 3 Replacement procedures for the Diaphragm

The diaphragm can be replaced with the valve body connected to the piping.

(1) Remove the bolt and nut (5) securing the body (1) and the bonnet (4).

(2) Lift the bonnet out from the body.

If the diaphragm, the body and the bonnet stick each other, move the bonnet to left and right to loosen them.

If they still stick tightly, insert a minus driver, but take care not to damage the sealing surface of the body.

(3) Replacement of the diaphragm



WARNING

If the diaphragm (2) contacts acid or other poisonous chemicals, a risk of “death, serious injury, blind” is high due to the fluid.

Be sure to take appropriate prevention measures such as wearing rubber gloves when handling.

(a) Removing

Remove the diaphragm (2) from the compressor (6) as follows :

① For the screwed type, the diaphragm (2) can be removed by turning it counterclockwise twice.

② For the bayonet type, the diaphragm (2) can be removed by pulling it after turning it to clockwise or counterclockwise by 90 degree.

(b) Confirmation

① Confirm that new diaphragm (2) conforms to its nominal diameter and kind of material.

② Check the new diaphragm (2) for any scratch.

(c) Installation

Install the new diaphragm (2) to the compressor (6) using the steps below.

① Screwed type (Figure 6)

Screw down the machine screw until the boss upper surface of the diaphragm (2) comes into contact with the dent of the compressor (6).

Then, return the diaphragm (2) by “ α° ” until hole “a” of the diaphragm (2) coincides with bonnet flange hole “a” .

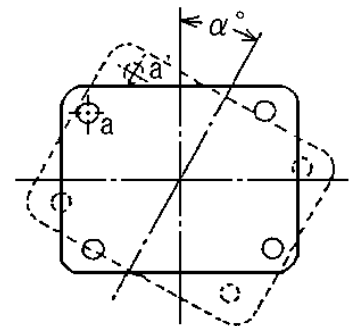


Figure 6

② Bayonet type (Figure 7)

Insert the cross pin into the groove of the compressor (6), and turn to clockwise while securely pressing the center of the diaphragm (2) with a finger



If the center is not pressed securely, the cross pin is caught in the groove of the compressor causing resistance. If the diaphragm is turned under this state, the cross pin idles.

This may cause the diaphragm (2) to be unusable.

Enough care should be taken to avoid this problem.

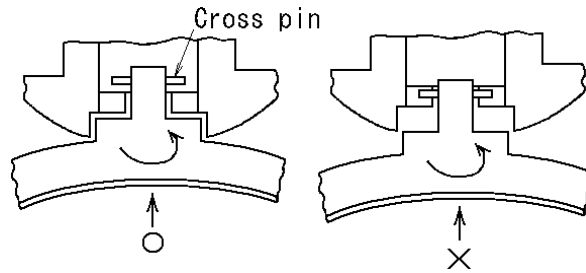


Figure 7

It is normal that the cross pin intersects the touchline by 90 degree, however, fluctuation within 15 degree is regarded normal (Figure 8).

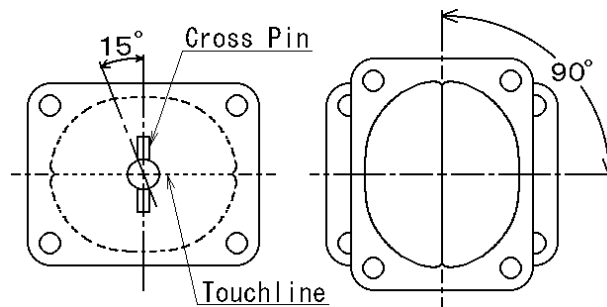


Figure 8



When installing the normal close type diaphragm, use the above-mentioned procedure after inserting it into the compressor groove with the diaphragm reversed as shown in Figure 9.



Figure 9

(4) Assembly

- ① Clean the weir and sealing surfaces of the body (1) with a cloth.
- ② After confirming that the diaphragm (2) has been properly installed onto the compressor (6), operate the hand wheel to set the valve to the open position.
- ③ Put the bonnet on the body (1), and temporarily tighten with the bolt and nut (5).
- ④ Open and close the valve several times for centering, then fully close the valve.
- ⑤ Tighten the bolt and nut (5) diagonally in alternate steps in equal turning increments while the valve closed, taking care that only one bolt may not be tightened. Confirming that the bonnet and the valve body are secured, open the valve more than 10% and tighten all the bolt and nut (5) evenly. In case of rubber diaphragm is to be used, tightening by hand are sufficient. If you need the tightening torque as a reference, the torque listed in Table 2 is to be used.

In case of PTFE diaphragm, tighten all the bolt and nut (5) evenly according to the torque listed in Table 2, and retighten with proper torque 4 hours or more after the first tightening to increase reliability of the seal between diaphragm and the valve body.



If there are scratches on the screw of the bolts and nuts due to repeated maintenance, specified tightening torque sometimes cannot be obtained even if tightened by the torque listed in Table 2.

Be sure to confirm that there is no leakage by conducting resistance test after replacing the diaphragm. If the leakage is to be found at the resistance test, retighten after releasing the fluid pressure.

9.4 Disassembly and assembly procedures for the bonnet

9.4.1 DN125 ~ 300 (Refer to Figure 10)

- (1) Tap out the pin (10) from the spindle (7) using a pin punch and a hammer.
- (2) Remove the hand wheel (9) and the thrust washer (8) from the spindle (7).
- (3) Pull out a set of the compressor (6) and the spindle (7) from the bonnet (4).
- (4) For DN125, remove the felt washer (17).
- (5) Remove the thrust Ball bearing (19) from the spindle (7).
- (6) Turn the spindle (7) counterclockwise and pull out from the spindle nut (13).
- (7) For DN150 ~ 300, loosen the bolt (15) and remove them.
- (8) For DN125, pull out the spindle nut (13) sideward. For DN150 ~ 300, remove the compressor plate (14) and the spindle nut (13).
- (9) Wipe the parts with a soft cloth, and clean them.
- (10) When the parts are damaged due to corrosion or wear, replace them new ones.
- (11) For DN125, replace the felt washer (17).

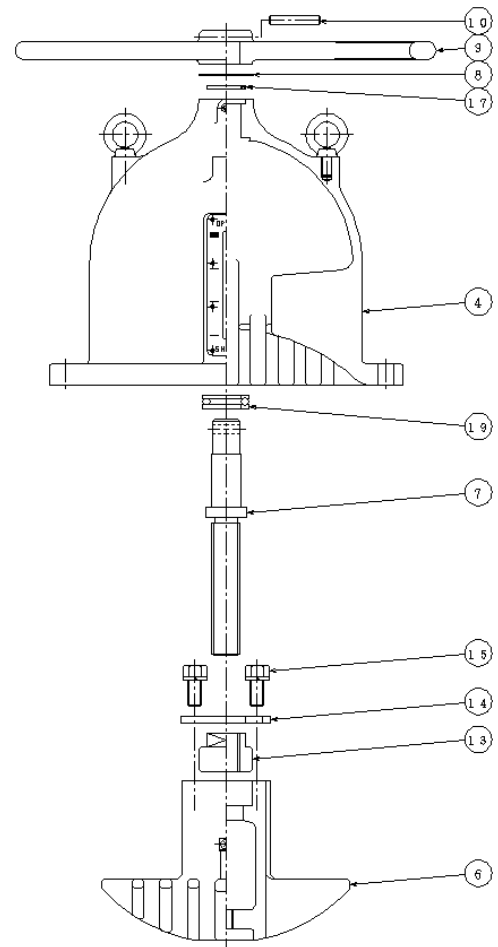


Figure 10

- (12) Apply proper amount of grease to the following locations.
 - ① Apply proper amount of grease to the screw and the sliding part of the **spindle (7)**.
 - ② Apply proper amount of grease to the **thrust ball bearing (19)**.
 - ③ Apply proper amount of grease to the **thrust washer (8)**.
- (13) For reassembling, use the steps (1) ~ (8) in reverse.

9.4.1 DN350 (Refer to Figure 11)

- (1) Pull out a set of the **compressor (6)** and the **spindle (7)** from the **sleeve (12)** by turning the **hand wheel (9)** clockwise.
- (2) Insert the round bar of $\phi 12$ into the **cap nut (20)**, loosen the **cap nut (12)** by turning counterclockwise, and remove it.
- (3) The brim of the sleeve (12) is provided with width across flats of 100 mm wide. Hold it not to rotate by placing a monkey spanner on it. **The sleeve (12) can fall down by removing the hand wheel (9).** Securely support the sleeve (12) to prevent dropping.
- (4) Turn the **hand wheel (9)** counterclockwise and remove from the sleeve (12).
- (5) Remove the **thrust washer (8)** from the sleeve (12).
- (6) Pull out the **sleeve (12)** from the **bonnet (4)**.
- (7) Remove the **thrust ball bearing (19)** from the sleeve (12).
- (8) When replacing any of the **compressor (6)**, the **spindle (7)**, the **compressor pin (11)** or the **matching piece (60)**, disassemble according to the procedures below.
 - ① Tap out the **compressor pin (11)** from the **matching piece (60)** using a pin punch and a hammer.
 - ② Remove the **spindle (7)** and the **matching piece (60)** from the **compressor (6)**.
 - ③ Turn the **spindle (7)** counterclockwise and pull out from the **matching piece (60)**.
- (9) Wipe the parts with a soft cloth, and clean them.
- (10) When the parts are damaged due to corrosion or wear, replace them new ones.
- (11) Apply proper amount of grease to the following locations.
 - ① Apply proper amount of grease to the screw part of the **spindle (7)** [excluding connection screw with the **matching piece (60)**].
 - ② Apply proper amount of grease inner and outer circumferences of the **sleeve (12)** [excluding connection thread with the **cap nut (20B)**].
 - ③ Apply proper amount of grease to the **thrust ball bearing (19)**
 - ④ Apply proper amount of grease to the **thrust washer (8)**
- (12) For reassembling, use the steps (1) ~ (8) in reverse.

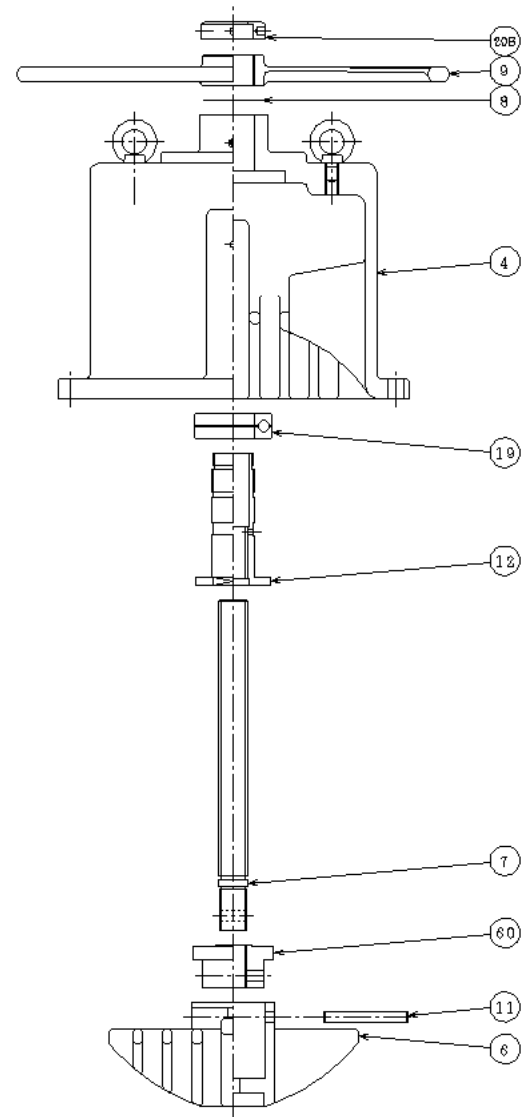


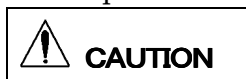
Figure 11

1 0. Troubleshooting

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

Failure		Causes	Countermeasures
Leakage from the body.		When leakage is found, following problems can exist : ① Hole in the body due to corrosion. ② Crack on the body due to stress. ③ Weld cracking caused due to leakage from the welded portion.	Replace the body.
Leakage from the connecting area of the body.	Piping connecting area.	The bolt is loose. Unsuitable gasket.	Retighten the bolt. Replace the gasket.
	Connecting area of the body and the diaphragm.	Bolts and nuts are not securely tightened or unevenly tightened..	Retighten the bolts and nuts with appropriate torque. Adjustment of unbalanced tightened bolts and nuts.
Leakage from the connecting area of the bonnet and the diaphragm.		Diaphragm is damaged.	Replace the diaphragm.
Leakage from the seat.		Foreign material is caught.	Remove foreign material.
		Fluid pressure is high.	Adjust the pressure.
		Wear of the body.	Check and replace.
		Diaphragm is damaged.	Replace the diaphragm.
During closing and opening operation, the torque of the hand wheel is too high or the hand wheel does not move.		Grease is run out of the screw of the spindle, the spindle nut and the sleeve.	Apply proper amount of grease to the screw of the spindle, the spindle nut and the sleeve.
		Galling of the screw of the spindle, the spindle nut and the sleeve.	Correction of the screw. If the thread cannot be corrected, replace the spindle, the spindle nut and the sleeve.

1 1. Disposal



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

In adequate disposal or burning of waste will cause environmental pollution.