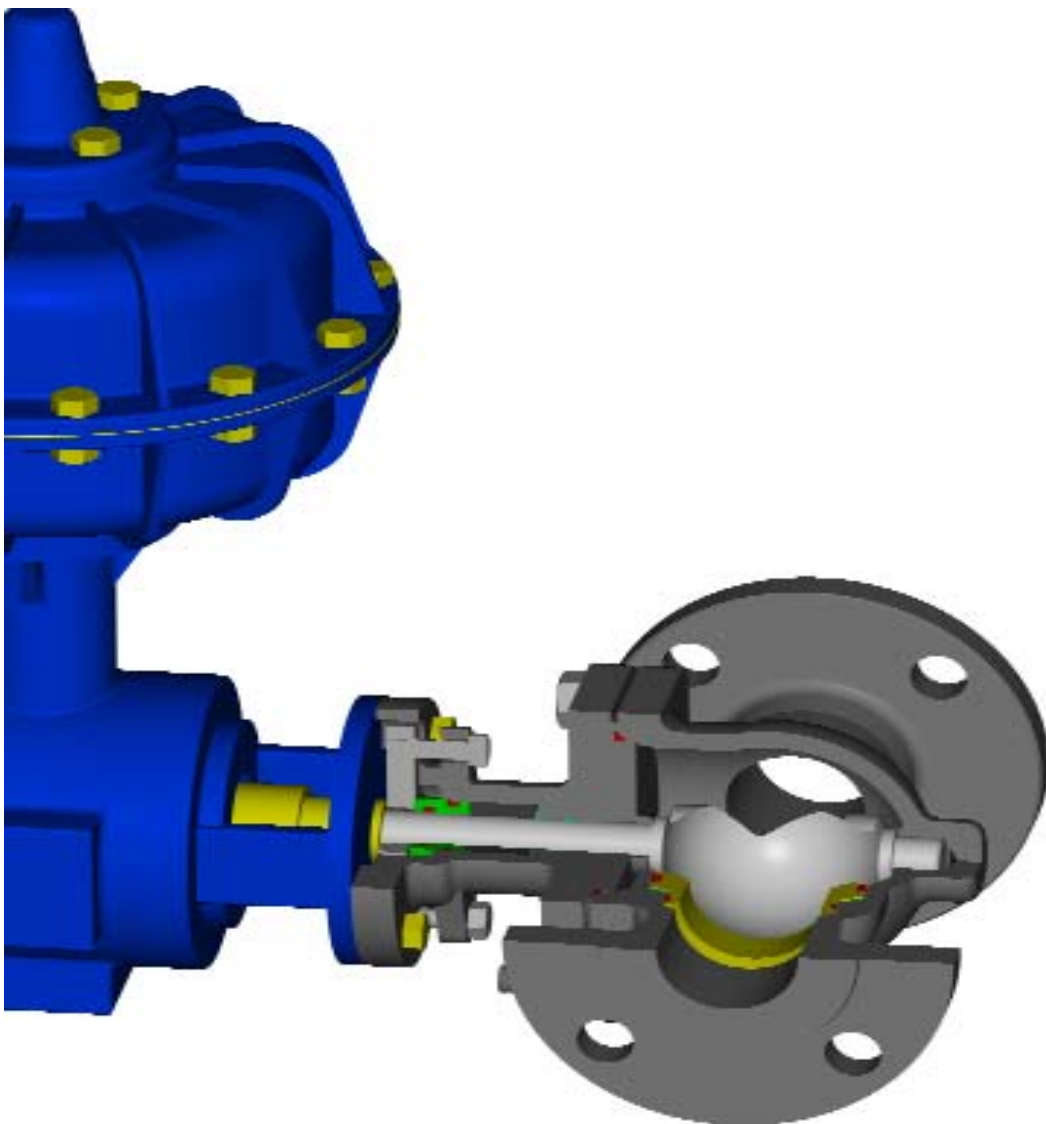


V-Notch Valve



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1. General

1.1 Introduction to Valves

- A) The V-notch valve has been designed for the requirements and applications of piping. As flow rate is effectively controlled, it has less cavitation, noise, corrosion, or vibration relatively.
- B) The most important feature of the V-notch valve is its body that has been manufactured in appropriate sizes to meet the requirements of piping. It consists of a V-ball that controls fluid, a body that includes a seat, and an actuator to adjust the valve trim.
- C) The V-notch valve is designed for easy maintenance.
- D) The V-notch valve trim boasts a long life span and has few faults. To use the valve to its full life span, you should install it correctly according to the manual and maintain it according to the prescribed procedures while using it.

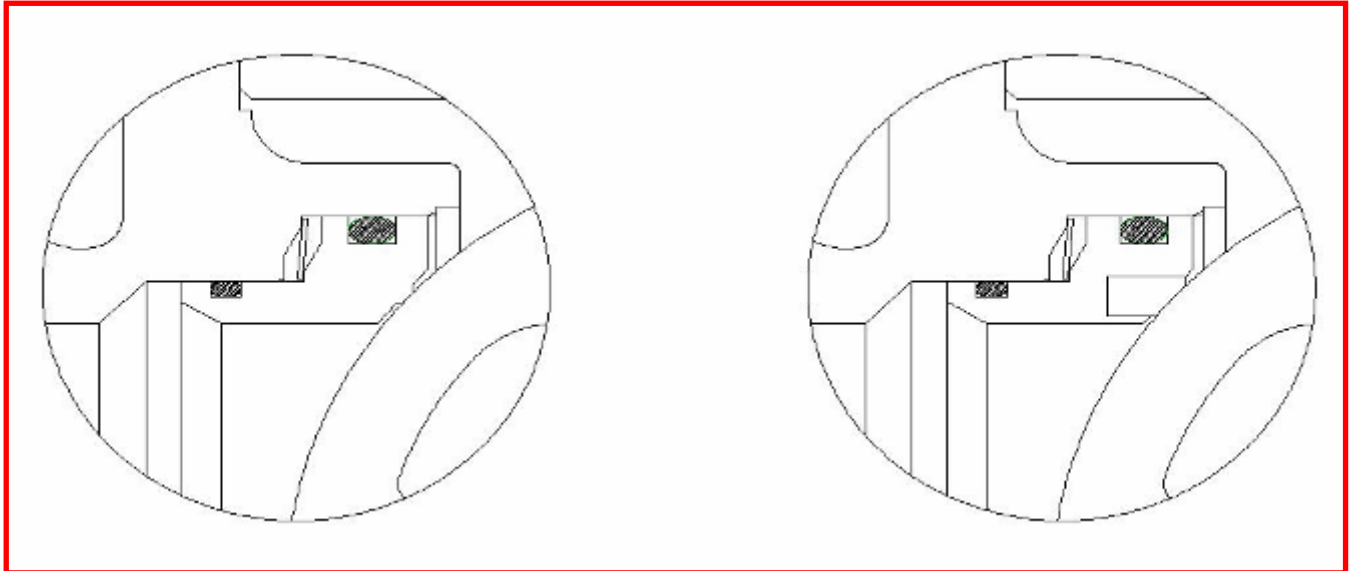
☀ Recommendations

Engineer who has professional assembly capabilities are required to maintain V-notch valves. Therefore, it is more economical to request repairs of the valves to their maker. As the valves repaired by their maker are thoroughly tested and warranted, you are recommended to entrust their maker with repairs.

To avoid possible injury to personnel or damage to valve parts, WARNING and CAUTION notes must be strictly followed. Modifying this product, substituting non-factory parts or using maintenance procedures other than outlined could drastically affect performance, be hazardous to personnel and equipment and may void existing warranties.

1.2 Valve Structure

A) There are largely two types of V-notch valve: soft seat and metal seat. <See FIG. 1-1, 1-2, 5-7>



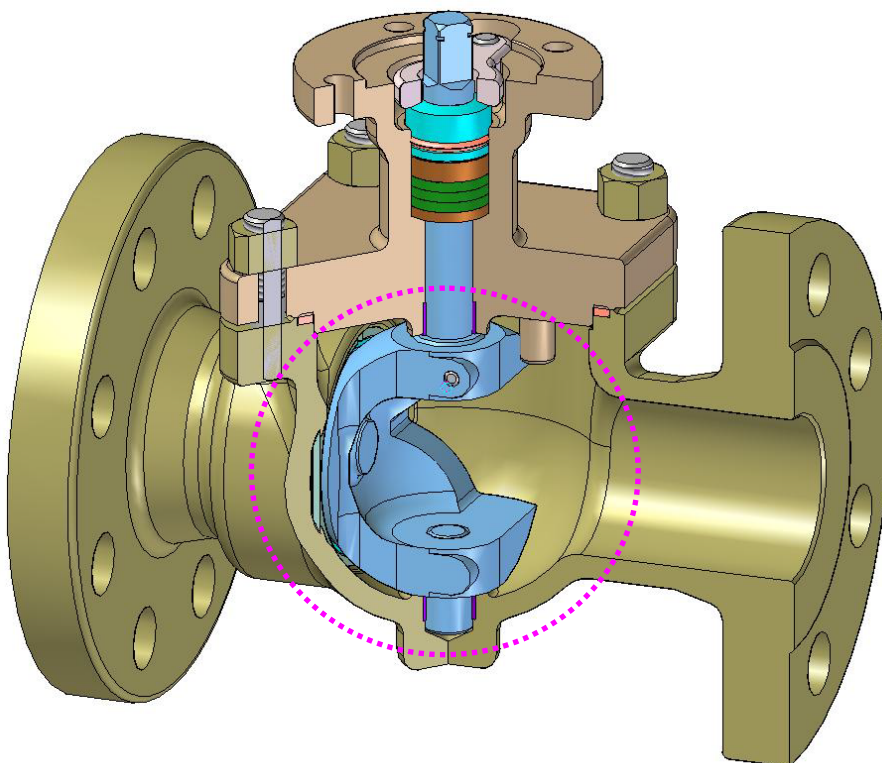
<FIG. 1-1> Metal Seat

<FIG. 1-2> Soft Seat

1.3 Features of Valve

A) As the V-notch valve has a V shape ball structure, it can be used for both control and on/off functions.

<See FIG. 1-3>



<FIG. 1-3> V-Notch Ball Shape

2. Storage

- A) Do not throw, drop, trip or drag V-notch valves when transporting it.
- B) Keep all parts of the V-notch valve in a well-ventilated place protected from fire, rain and wind.
Store the valve at a temperature between - 29°C (-20°F) and 48°C (120°F).
The storage area must be protected from flooding.
- C) Operate the elastomer (O-ring type) of pneumatic actuator at least once every six months to prevent their functional degeneration. Operate it to the full stroke even under general operation conditions at least three times a month.
- D) Do not remove the flange cap attached to the flange surface to prevent foreign substances from penetrating into the system until valves are installed on the line.

3. Installation

Like any other valves, the V-notch valve must be installed carefully at first according to the following cautions to use it for many years without malfunction.

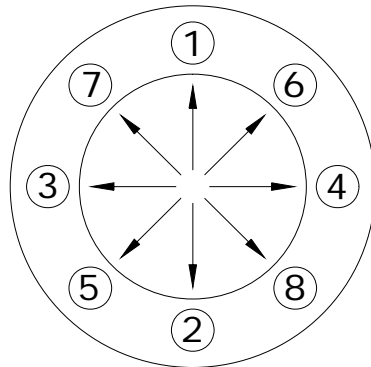
- A) Remove the flange cap and check whether there are any foreign substances in the body. If you find foreign substances, remove them before starting installation.
- B) As cast steel products are processed with rust preventive oil before shipping to prevent corrosion, remove the rust preventive oil from the pipes before installing them on the line.
- C) Blow off all foreign substances including welding chips in the pipes before starting installation.

- Warning -

To prevent damages to V-ball and seat, you must blow out (flashing) foreign substances such as weld beads, scales and chips from the pipeline according to the prescriptions before installing the V-notch valve.

- D) Install valves in the direction of arrow marked on the body.

E) When assembling the flange-type valve, you should use a specified gasket, and install it in parallel with the other flange. Also, you are recommended to fasten the bolts in several parts in a balanced manner sequentially in diagonal direction. <See FIG. 3-1>

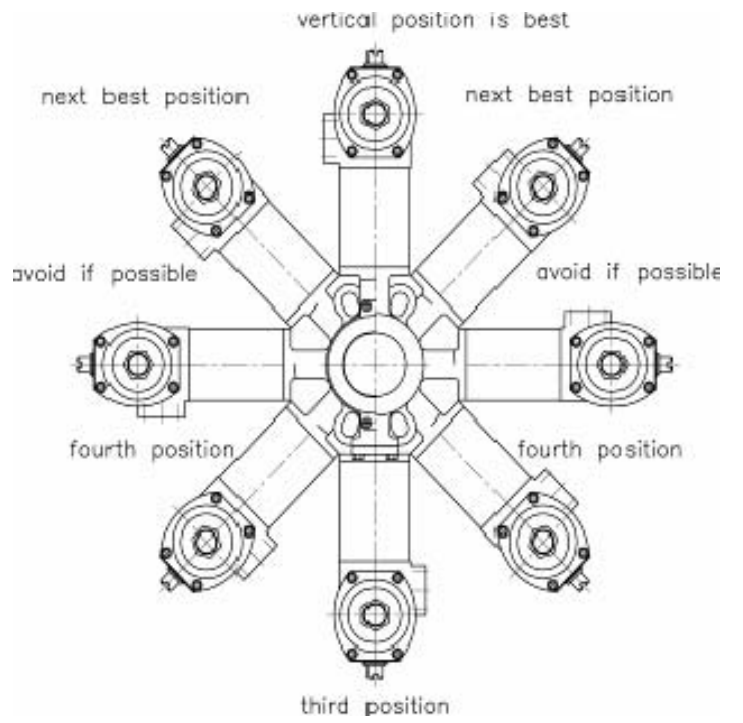
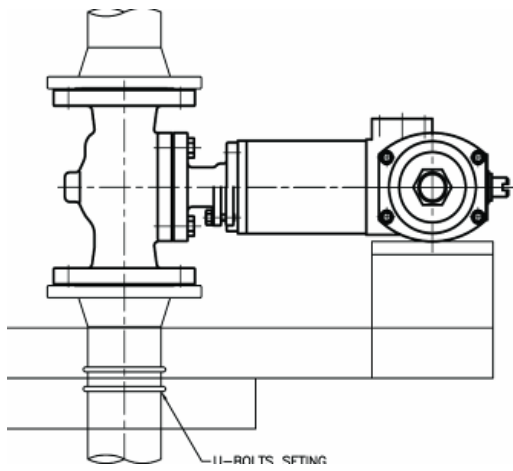


<FIG. 3-1> Procedure for Fastening Flange Bolts

F) Install the valve at right angle to the ground as much as possible. If this is impossible, attach a support to the valve before installing it. <See FIG. 3-2, 3-3>

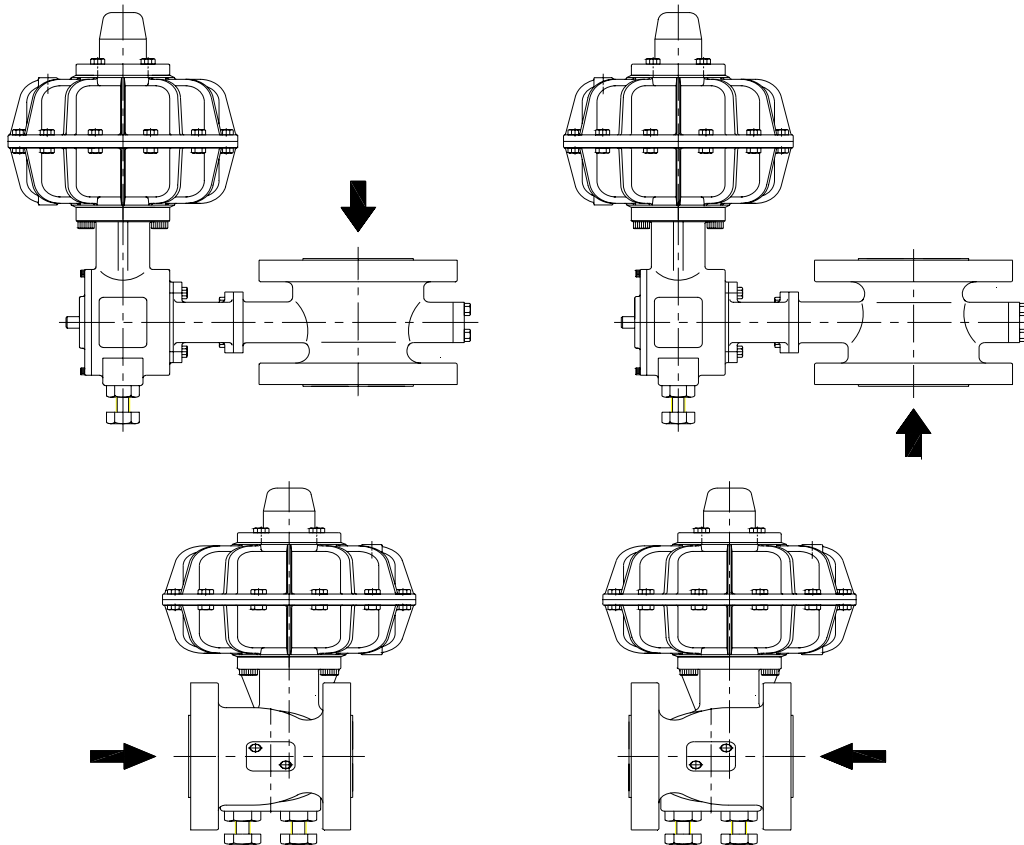
☀ Cautions

- ① Avoid horizontal piping if possible because it may adversely affect the function and performance of valves during operation.
- ② When moving V-notch valves, you should handle them carefully so that the components and air piping will not be damaged. Otherwise, the electronic and electric parts such as solenoid valve, positioner, and limit switch may get damaged or the valve track may change.
- ③ Be careful not to damage the surface of valve flange sealing.
- ④ Apply thermal insulation as needed, but do not apply thermal insulation to the cooling fin and extensions.

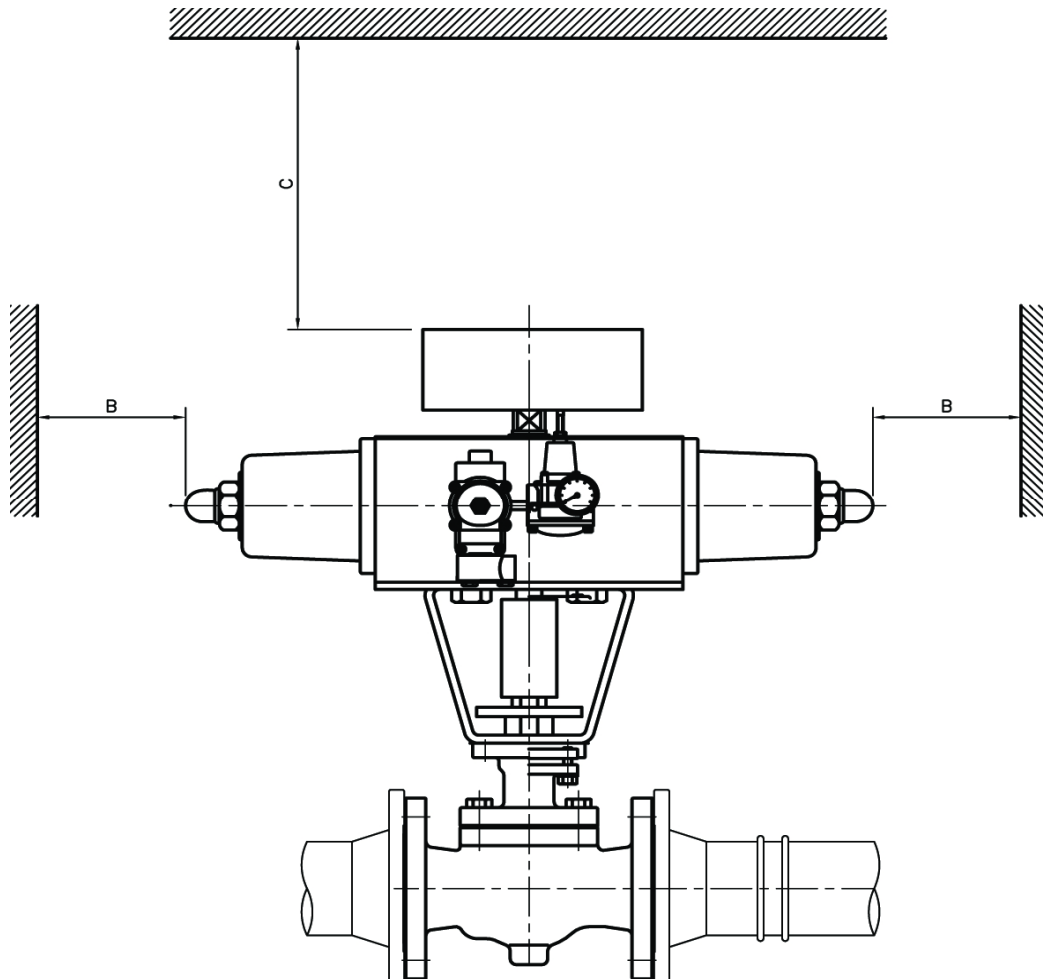


<FIG. 3-2> Installing Support

<FIG. 3-3> Installation Location of Actuator



G) A minimum space is required for maintenance of the valve installation area. <See FIG. 3-4> In addition, a space for manual operation is required if a manual hand wheel has been installed.



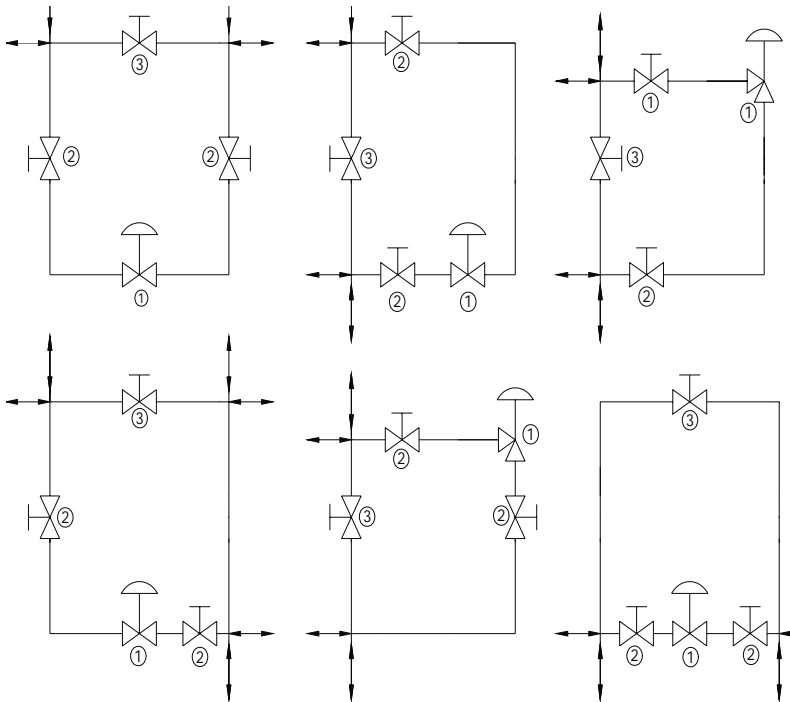
<FIG. 3-4> Space required for control valve installation

- ☞ B: Minimum distance from obstacles (Approx. 30 cm)
- C: Space for removing the actuator (Approx. 40 cm)

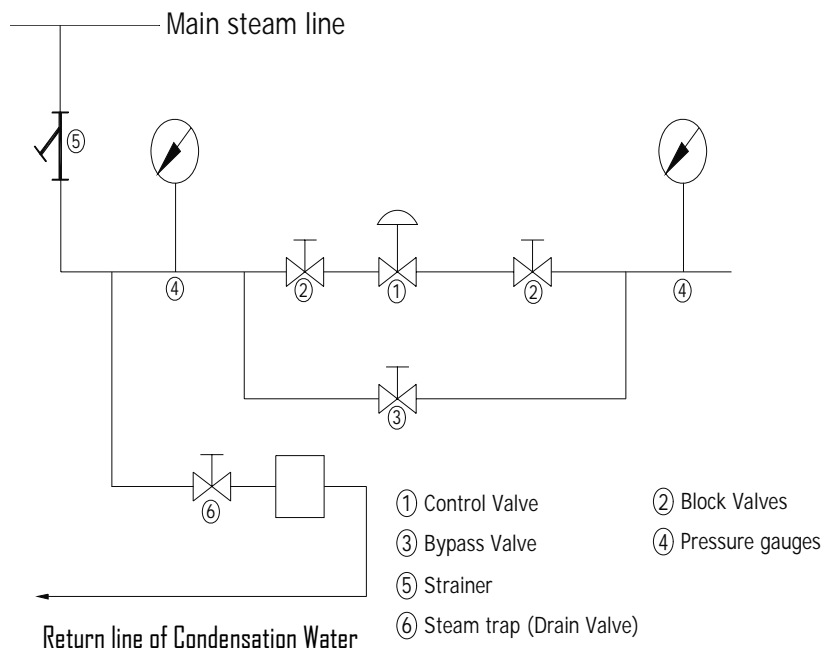
H) Install a bypass line for valve maintenance. <See FIG. 3-5>

*** Note**

When the control valve has a problem, you may have to close the block valve and open the bypass valve to control flow. Therefore, use a control valve that has the feature to control flow by opening the bypass valve. Moreover, it is ideal to choose the same flow characteristics and size as those of control valve. See the example of ideal control valve installation <FIG. 3-6>



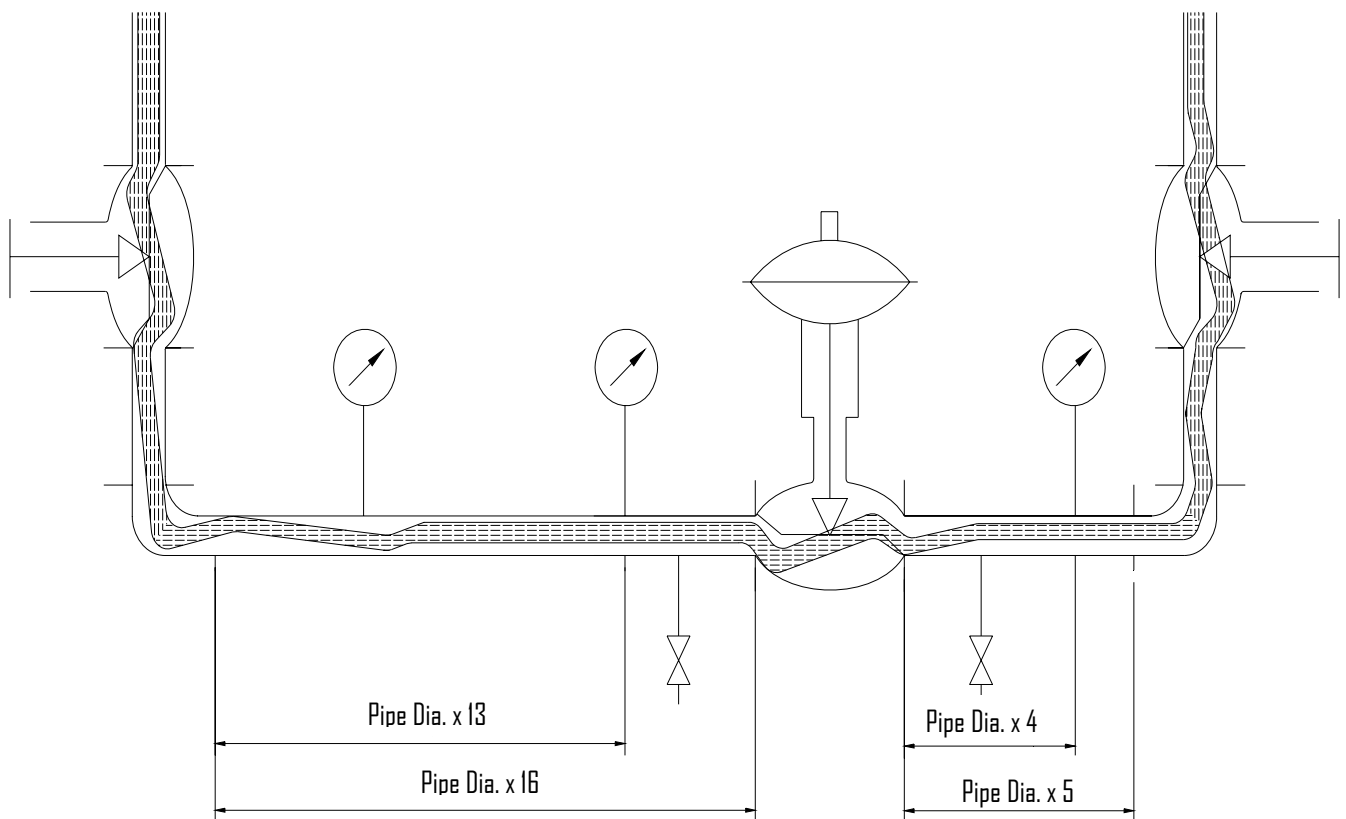
<FIG. 3-5> Example of Control Valve Installation



<FIG. 3-6> Example of Control Valve Installation Recommended by Komoto

☀ Note

To maintain a constant pressure at the entrance for all tracks of the valve, the straight pipe length at the valve entrance must be at least 10 to 20 times the pipe diameter. For the fluid to maintain the specified pressure after passing the valve and to prevent noise or vibration by turbulent flow, the straight pipe length at the valve exit must be at least 3 to 5 times the pipe diameter. Straight piping at the entrance and exit allows the preservation of accurate operation status by enabling accurate measurement of the pressure at the entrance and exit. <See FIG 3-7>



<FIG. 3-7> Minimum straight pipe length for valve performance and pressure measurement

4. Operation

4.1 Inspections before Operation

- ① Check whether there is any leak from all connections including the air pipe connections.
- ② To check whether there is any leak from gland packing and gaskets, apply a pressure to the pipeline. If any leak is detected, remove pressure from the pipeline and fasten the gland flange nut.
- ③ Check whether there are any loose nuts (clamps) at the valve stem and the spindle of the actuator.
- ④ Check whether there is any short circuit in the electric signal system.
- ⑤ Check whether the attached manual hand wheel is at the Neutral position.
- ⑥ Check whether the system operates accurately and flexibly according to the signals from the controller.
- ⑦ When raising the temperature or pressure, do it slowly. Never raise the temperature or pressure quickly.
- ⑧ Check whether the air pressure required for valve operation is accurately set (specified on the name plate).
 - i) Diaphragm Actuator: 4.0 kg/cm²
 - ii) Cylinder Actuator: 5.0 kg/cm²
- ⑨ Electrical devices such as positioner, limit S/W, solenoid V/V are attached to an control valve. Even if the manufacturer has adjusted them, the tubing may be bent or the valve stem's position becomes incorrect due to a shock during transportation or careless handling during assembly. Therefore, it is recommended to readjust the valve during the test run.

- Warning -

- ① Remove air pressure from the actuator before using the manual hand wheel. If you use the hand wheel without removing air pressure, it may not work normally and its weak part may get damaged by overstrain.
- ② If the manual hand wheel is not at the Neutral position during control operation, it may not work normally and its weak part may get damaged.
- ③ If you use a pressure higher than the specified pressure on the name plate, the rubber and O-rings of the actuator may be damaged and cause operation problems.

5. Maintenance and Repair

* Regular Inspection

Repair and inspect as described below. If any malfunction occurs, take appropriate measures according to the preventive maintenance procedures and troubleshooting in Chapter 6. Also, disassemble and inspect the system during the regular overhaul period, and replace parts if necessary.

* Recommendations

- ① The life span of the valve can increase if you replace parts according to their replacement cycles. Refer to the Part Replacement Cycle Sheet shown below.

Part Replacement Cycle Sheet		
Item Name	Replacement Cycle	Others
Packing	2 years	
Gasket	2 years	
O-ring		Replace after inspection according to the fluid conditions and used environment.
Seat Spring		Replace after inspection according to the fluid conditions and used environment.
V-ball		Replace after inspection according to the fluid conditions and used environment.
Seat Ring		Replace after inspection according to the fluid conditions and used environment.

* Irregular Inspections

- A) Are there abnormal noise, vibration or hunting?
- B) Does the fluid leak from the valve?
- C) Are there any loose bolts and nuts?

5.1 General

- Warning -

1. To prevent human injuries and damages to control system, close the block valve, remove instrument air and signals from the valve and open the bypass valve to switch over the pressure from the line to the bypass. Then slowly unfasten the bolts from the pipe until the internal pressure of the body is completely released and remove the valve before disassembling the actuator.
2. 2. Keep hands, hair and clothing away from seat and port when operating valve. Failure to do so could cause serious injury.

- ♣ Prepare gland packing, gaskets (bonnet) and O-rings as required. (Do not reuse parts that have been used.)

5.2 Disassembly and Assembly of Valve Body and Actuator

※ Note

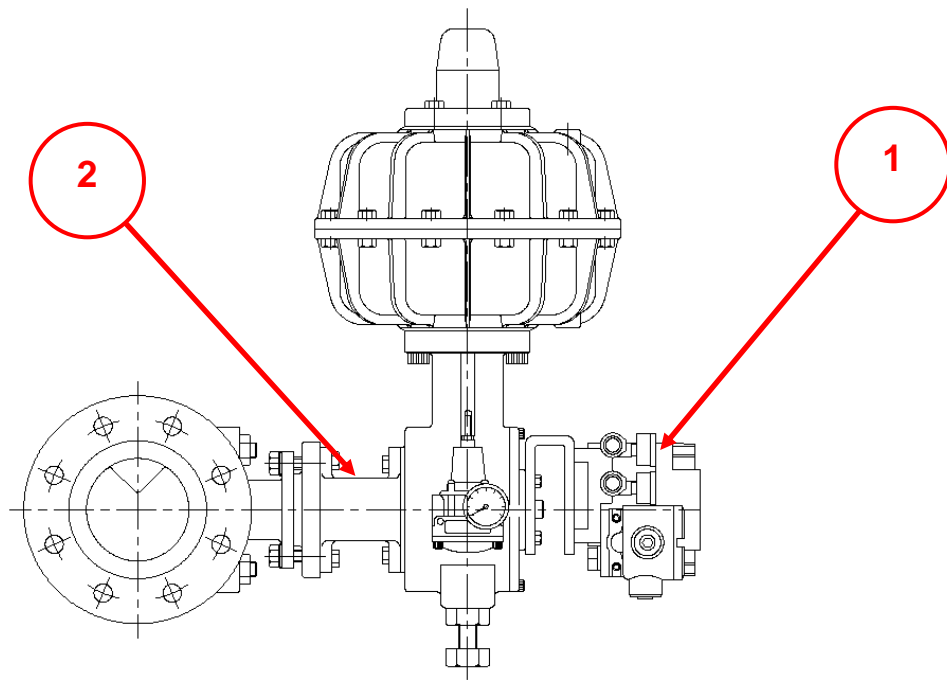
- Mark important parts to assemble them to their original position during assembly.

◆ Valve Disassembly Procedure <See FIG. 5-1>

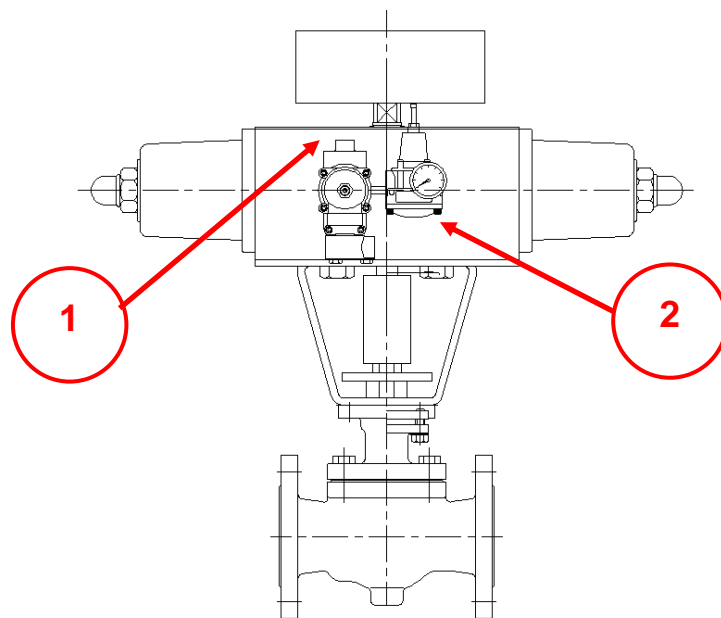
Disassemble in the sequence of Diaphragm Actuator Type and Cylinder Actuator Type ① → ②.

5.2.1 Disassembly

- ① Remove all accessories including positioner from actuator.
- ② Unfasten the yoke bolt and remove actuator and body.



◆ Diaphragm Actuator Type



◆ Cylinder Actuator Type

<FIG. 5-1> Disassembly Diagram for Actuator and Body

5.2.2 Assembly <See FIG. 5-1>

- ① Assemble in the reverse sequence of the disassembly.
- ② Reconnect accessories including positioner. Then perform calibration again.

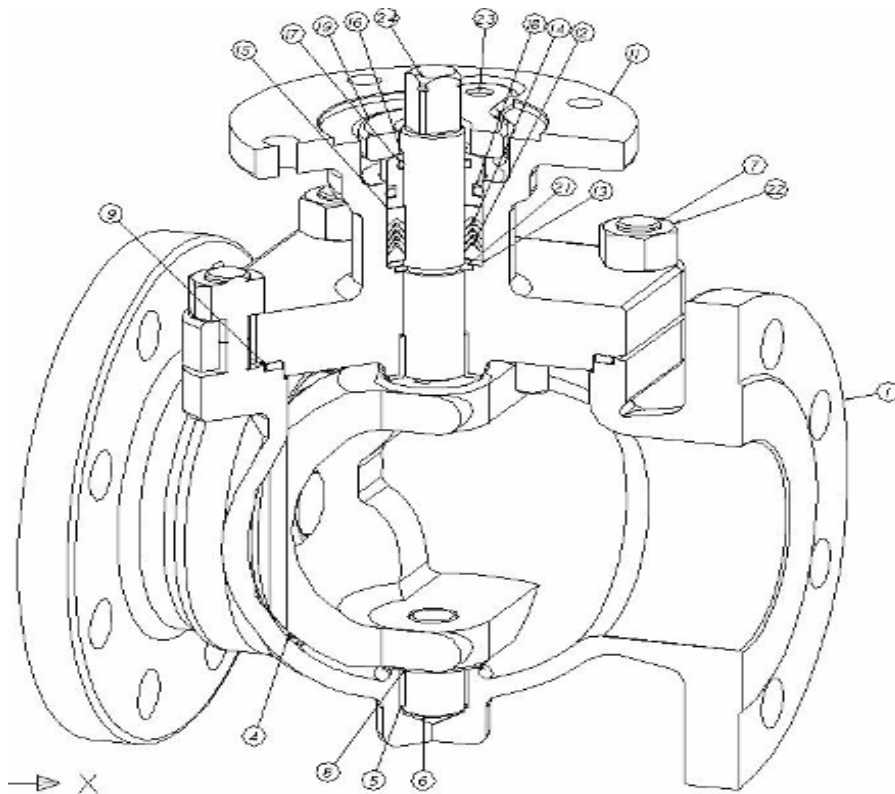
5.3 Disassembly and Assembly of Actuator

- ◆ Do not disassemble or assemble the actuator on your own at the site, but contact our technical department.

- Warning -

The components of a spring return type actuator are pressed down by a spring. Take general safety measures and disassemble correctly. Otherwise, injuries and damages may result.

5.4 Disassembly and Assembly of Body



No.	Name of Parts	Drawing No.	Material	QTY	Reference
1	Body	W0150720	WCB	1	
2	Disc Spring	W0150720	SUS 304	2	
3	O-Ring	W0100020	SILICON	1	
4	Metal Seat Ring	W0150720	SUS304/251 6+STL	1	
5	Dr Flange Bolt	W0100020	BC5	2	
6	Bottom Stem	W0150720	SUS 304	1	
7	Stud Bolt	W0100020	9H87	6	
8	V-Bolt	W0150720	SUS304/251 6+STL	1	
9	Bottom Gasket	W0150720	SUS304-G01 WHITE	1	
10	O-Ring	W0100020	SILICON	1	
11	Bottom	W0150720	WCB	1	
12	V-Packing (Bottom)	W0150720	P/44360	1	
13	Packing Ring	W0150720	SUS 304	1	
14	V-Packing (Middle)	W0150720	P/44360	4	
15	V-Packing (Top)	W0150720	P/44360	1	
16	Clad Follower	W0150720	SUS304	1	
17	O-Ring	W0100020	NBR	1	
18	O-Ring	W0100020	NBR	1	
19	Clad Flange	W0150720	SUS 304	1	
20	Key	W0100020	SUS 304	1	
21	Stop Ring	W0150720	SUS 304	1	
22	HEX Nut	W0100020	SUS 304	4	
23	Hex Head Bolt	W0100020	SUS 304	2	
24	Drive Stem	W0150720	SUS 304	1	
25	Coiled Disc Spring	W0150720	SUS 304	2	

<FIG. 5-4> Valve Assembly Diagram

5.4.1 Disassembly <See FIG. 5-4, 5-7>

- ① As described in Section 5, Clause 5.2, remove the actuator from the valve while taking care not to damage accessories and pipes by the valve body components.
- ② Unfasten the hexagonal nut (22) from the bonnet (11).
- ③ Remove the bonnet (11) from the body by sliding it to the direction of the seat ring.
- ④ Remove plug components and valve gaskets from the body.
- ⑤ Remove packing from the bonnet using hook.
- ⑥ Clean each part and check them for any damage. Prepare available parts for future repair.

- Warning -

1. To replace packing, remove packing while taking care not to damage the internal surface of the packing box.
2. Do not over tighten packing. This can cause excessive packing wear and high shaft friction, which may impede shaft rotation.
3. Take special care not to damage the splined end of the stem during disassembly.

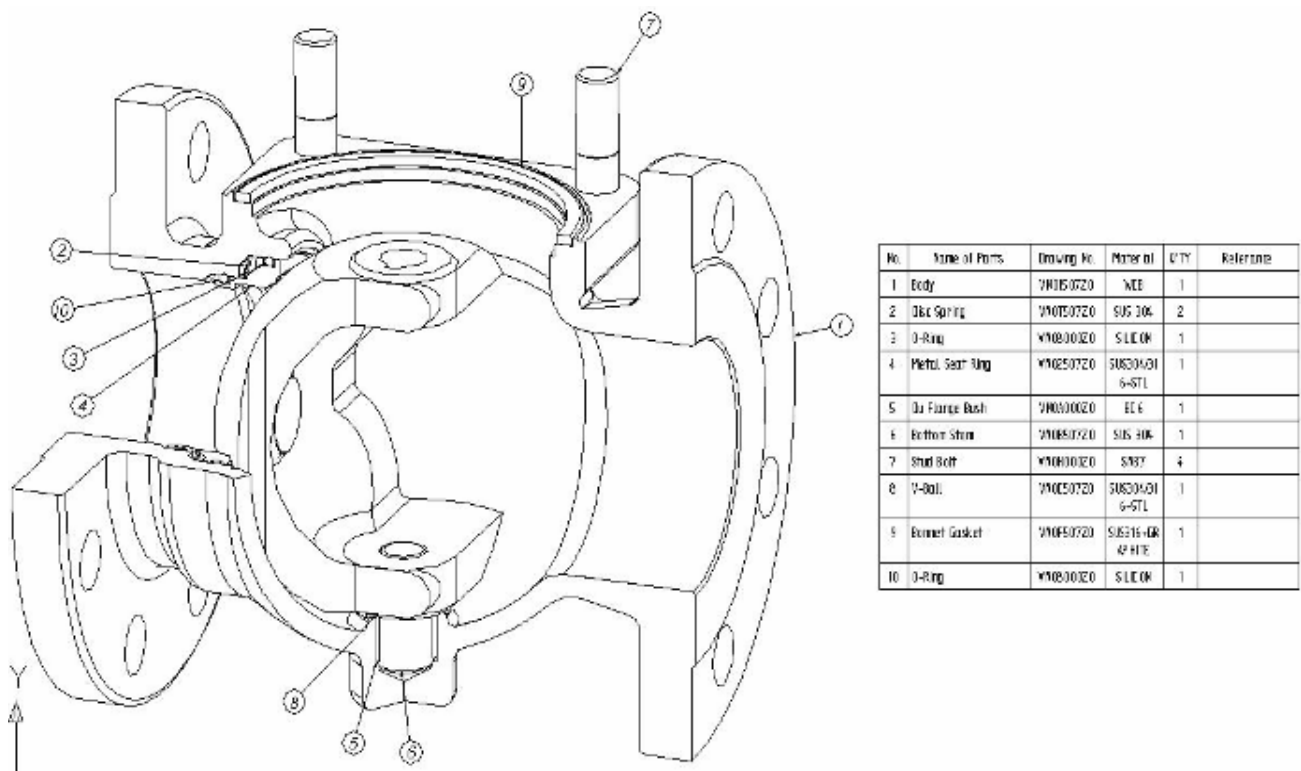
• Inspection after Disassembly

- i) Are there any damages to the seat ring contact surface, V-balls, seat, or stem?
- ii) Are there any damages to the body sealing surface?
- iii) Are there any damages to the gasket and gland packing?

5.4.2 Assembly

※ Recommendations

Always inspect and replace worn-out parts before starting reassembly. You are recommended to always replace soft products such as gland packing and gasket before reassembling.



<FIG. 5-5> Body Assembly Diagram

◆ Body Assembly Procedure <See FIG. 5-5, 5-7>

* Check the cleanness of the body and the conditions of the V-ball and the seat of the seat ring before starting assembly.

- 1) Insert the Du flange bush to the body bottom.
- 2) Connect the bottom stem to the Du flange bush.
- 3) Apply grease to the exterior of the seat ring.
- 4) Connect the disc spring.
- 5) Connect the O-ring (3) and (10).

* Caution: Take care not to make scars on the surface of O-rings.

- 6) Connect the seat ring to the body.
- * Caution: You should use a jig for assembly.

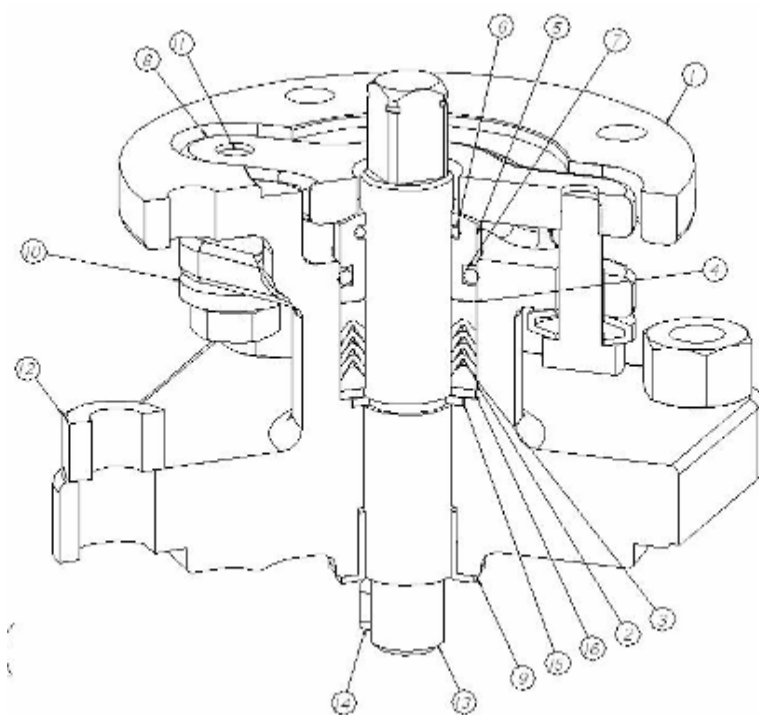
- 7) Apply grease to the surface of the V-ball.

- 8) Connect the V-ball.

* Caution: Take care not to make scars on the surface of V-ball during assembly.

- 9) Connect the stud bolt.

- 10) Connect the gasket.



No.	Name of Parts	Drawing No.	Material	QTY	Reference
1	Bonnet	VN05C7ZD	WTR	1	
2	V-Packing (Bottom)	VN05C7ZD	PW4360	1	
3	V-Packing (Middle)	VN05D770	PW4360	4	
4	V-Packing (Top)	VN05C7ZD	PW4360	1	
5	Island Follower	VN05C7ZD	SUS 304	1	
6	O-Ring	VN06C0ZD	NBR	1	
7	O-Ring	VN06C0ZD	NBR	1	
8	Blank Flange	VN05C7ZD	SUS 304	1	
9	Du Flange Bush	VN05C0ZD	ET6	1	
10	Coiled Disc Spring	VN05D770	SUS 304	2	
11	Hex Head Bolt	VN05D0ZD	SUS 304	2	
12	HDK Nut	VN05C0ZD	SUS 304	4	
13	Drive Stem	VN05D770	SUS 304	1	
14	Key	VN05C0ZD	SUS 304	1	
15	Stop Ring	VN05D770	SUS 304	1	
16	Packing Ring	VN05C7ZD	SUS 304	1	

<FIG. 5-6> Bonnet Assembly Diagram

◆ Bonnet Assembly Procedure <See FIG. 5-6>

* Always check cleanness and the condition of packing before assembly.

- 1) Insert the Du flange bush.
- 2) Connect the stopper ring to the groove at the center of the stem.

- Warning -

Make sure that the stopper ring is assembled. Check it 2 to 3 times after assembling the bonnet as it plays the role of a stopper when pressurizing after valve assembly.

- 3) Assemble the stem connected with the stopper ring to the bonnet.
- 4) Assemble the packing ring.
- 5) Insert packing.
- 6) Apply grease to the gland follower O-ring.
- 7) Connect the O-ring to the gland follower.

* Caution: Take care not to make scars on the surface of O-rings.

- 8) Connect the gland flange and fasten bolts or stud bolts.

- 9) Make sure that the stopper ring has been assembled properly.

* Caution: Using a rubber hammer, strike the top and bottom surfaces of the stem.

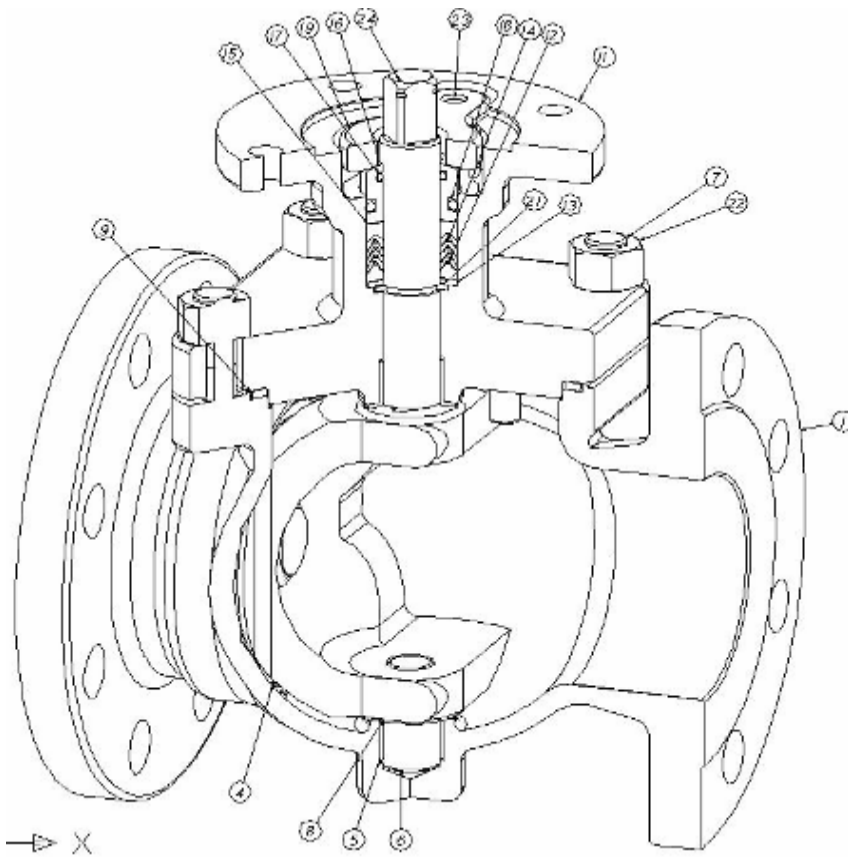
* Danger: Make sure that the stopper ring is assembled.

- Warning -

Take special care when assembling it as it plays the role of safety device like the stopper ring.

- 10) Connect the key to the key groove at the bottom of the stem.

* Caution: Assemble the key by interference fit so that it would not come out.



No.	Name of Parts	Drawing No.	Material	QTY	Reference
1	Body	WJ150720	WCB	1	
2 ¹	Disc Spring	WJ150720	SUS 304	2	
3	O-ring	WJ1000120	SILCON	1	
4	Metal Seal Ring	WJ150720	SUS304/316LSTI	1	
5	Wa Flange Bush	WJ1000120	AL6	2	
6	Bottom Stem	WJ150720	SUS 304	1	
7	Stud Bolt	WJ1000120	SHB7	4	
8	V-Ball	WJ150720	SUS304/316LSTI	1	
9	Bonnet Gasket	WJ150720	SUS316-LR PH1E	1	
10	O-ring	WJ1000120	SILCON	1	
11	Bonnet	WJ150720	WCB	1	
12	V-Packing (Bottom)	WJ150720	P404360	1	
13	Packing Ring	WJ150720	SUS 304	1	
14	V-Packing (Middle)	WJ150720	P404360	4	
15	V-Packing (Top)	WJ150720	P404360	1	
16	Lead Follows	WJ150720	SUS304	1	
17	O-ring	WJ1000120	NBR	1	
18	O-ring	WJ1000120	NBR	1	
19	Gland Flange	WJ150720	SUS 304	1	
20 ¹	Key	WJ1000120	SUS 304	1	
21	Stop Ring	WJ150720	SUS 304	1	
22	HEX Nut	WJ1000120	SUS 304	4	
23	Hex Head Bolt	WJ1000120	SUS 304	2	
24	Drive Stem	WJ150720	SUS 304	1	
25 ¹	Coiled Disc Spring	WJ150720	SUS 304	2	

<FIG. 5-7> Assembly Diagram

◆ Valve Assembly Procedure <See FIG. 5-7, 5-8>

* Always check cleanness and the condition of packing before assembly.

- 1) Make sure that the V-ball is in the closed direction on the first assembled body.
- 2) Check the positions of the stopper and key at the bottom of the bonnet.

* Make sure that the key will not come out.

- 3) Connect the key on the stem to the key groove on the V-ball.

* Check the position of the stopper on the bonnet.

* Make sure that the bonnet gasket has been assembled properly.

- 4) Connect the projected part of the bonnet to the groove on the body by pushing the bonnet to the direction of the seat ring.

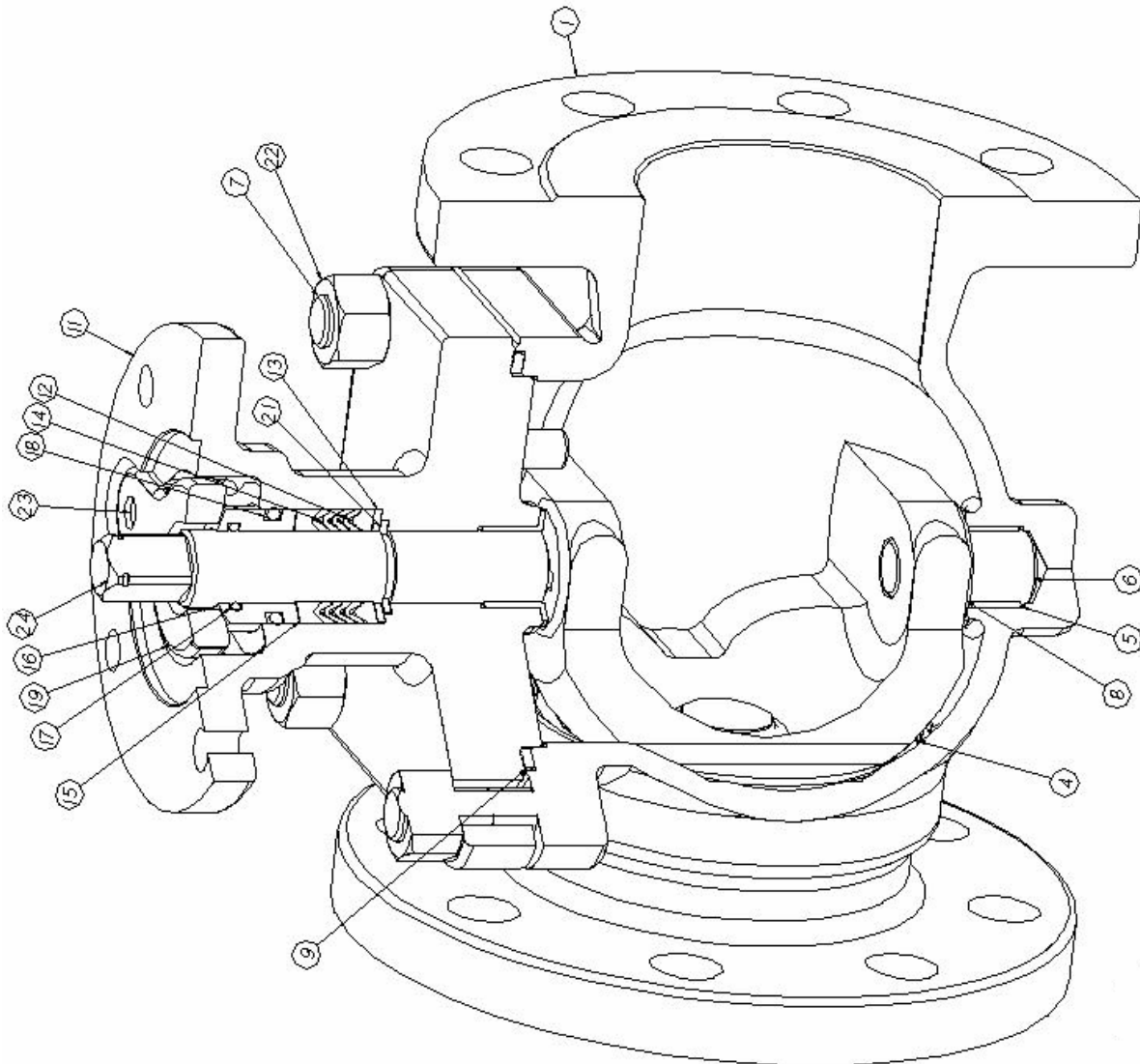
* Be careful not to damage the bonnet gasket.

- 5) Fix the bonnet by fastening a nut into the stud bolt.

Cautions for Testing

- Keep the valve closed during the test.
- Let the stem face upward, and never look down on the stem.
- For products that have passed the test in closed condition, remove pressure and open the valve.
- Slowly apply pressure in open condition.
 - * Danger: Let the stem face upward, and never look down on the stem.
- Apply pressure up to the test pressure, and check the bonnet connections for leak.
- Rotate the stem using the handle.
 - * Caution: Make sure that the stopper works properly in full open and closed conditions.

No.	Name of Parts	Drawing No.	Material	QTY	Reference
1	Body	WNU150720	WDB	1	
2	Disc Spring	WNU150720	SUS 304	2	
3	O-Ring	WNU800020	SILCON	1	
4	Metal Seat-Ring	WNU250720	SUS304/316+STL	1	
5	Oil Flange Bush	WNUA00020	BC6	2	
6	Bottom Stem	WNU850720	SUS 304	1	
7	Stud Bolt	WNUH00020	SM67	4	
8	Y-Ball	WNU150720	SUS304/316+STL	1	
9	Bonnet Gasket	WNUF50720	SUS316+BR/AFHTE	1	
10	O-Ring	WNU800020	SILCON	1	
11	Bonnet	WNU150720	WDB	1	
12	Y-Packing Bottom	WNU150720	P/442360	1	
13	Packing Ring	WNU850720	SUS 304	1	
14	Y-Packing Middle	WNU150720	P/442360	4	
15	Y-Packing Top	WNU150720	P/442360	1	
16	Gland Follower	WNU850720	SUS304	1	
17	O-Ring	WNU800020	MBR	1	
18	O-Ring	WNU800020	MBR	1	
19	Gland Flange	WNU150720	SUS 304	1	
20	Key	WNU000020	SUS 304	1	
21	Stop Ring	WNU150720	SUS 304	1	
22	HEX Nut	WNU000020	SUS 304	4	
23	Hex Head Bolt	WNUJ00020	SUS 304	2	
24	Drive Stem	WNU150720	SUS 304	1	
25	Coned Disc Spring	WNUF50720	SUS 304	2	



<FIG. 5-8> Parts List

6. Preventive Maintenance and Troubleshooting

* Note

Replace parts after inspection by referring to the Part Replacement Cycle Sheet in Section 5. For other parts, replace them to prevent damages to other devices when they show a wearing sign.

6.1 Troubleshooting

Table 6-1 shows some remedies to general problems that may occur at the site while using V-notch valves. For more serious problems, transport the system to the factory.

Table 6-1

Problem	Solution
Leak from Stem Packing	<ol style="list-style-type: none"> 1. Fasten the packing flange. Check for leaking. 2. If you suspect any damage to the stem, go to item no.3 Otherwise, replace packing after taking all safety precautions at the site. 3. Disassemble the valve. Visually inspect the stem. Check whether the plug components are damaged, and replace them if necessary. Also, replace the gland packing.
Excessive internal leak when the valve is closed (Seat)	<ol style="list-style-type: none"> 1. Check the air pressure supplied to the valve. 2. If you suspect any damage to V-ball or seat, go to item no.3 3. Disassemble the valve. Visually check V-ball and seat for damages. Replace them if any damage is found.
The stroke time is delayed.	<ol style="list-style-type: none"> 1. Check the air pressure supplied to the valve. 2. Check the pressure of the filter regulator. 3. Check the adjustment of accessories such as booster solenoid.
Leak from Bonnet	<ol style="list-style-type: none"> 1. Remove line pressure and fasten the bonnet. 2. Disassemble the valve and check the bonnet gasket.

Problem	Solution
V-ball does not move.	<ol style="list-style-type: none"> 1. Check the air pressure supplied to the valve and then check the condition of the filter regulator. 2. Check the operations of accessories such as solenoid valve and air operated valve. 3. Disassemble the valve and check whether there are any foreign substances in V-ball and seat. 4. Check the design temperature and actual line temperature. 5. Remove the actuator and try to operate the actuator only.
The valve does not respond to input signals.	<ol style="list-style-type: none"> 1. Check the air pressure supplied to the valve. 2. Check the voltage of the solenoid valve. 3. Apply a proper air pressure to the actuator to see whether it works properly or leaks. (If it leaks, fasten the cylinder cover bolts.) 4. Check whether the feedback lever of the positioner is loose.
The valve flow is low.	<ol style="list-style-type: none"> 1. Check pressure at the entrance and exit of the valve. 2. Visually check whether the valve responds to signals. 3. Check whether the valve operates with the maximum stroke.

7. Others

7.1 Procedure for Switching Action <Reverse Action ↔ Direct Action>

- Perform this procedure after the disassembly of valve body and actuator by referring to the procedure described in section 5.2.

◆ Diaphragm Actuator Type

Change the position of V-ball to the desired action, assemble the actuator in reverse direction, and install the positioner and accessories. Then perform a calibration again.

◆ Cylinder Actuator Type

Change the position of V-ball to the desired action, replace the actuator with the one of the desired action, and install the positioner and accessories. Then perform a calibration again.

※ Note

1. The rotation direction of the V-notch ball is predefined.

The cylinder actuator is classified into reverse and direct types.

- ▶ Reverse type: Rotates clockwise.
- ▶ Direct type: Rotates counter clockwise.

2. The diaphragm actuator is for both reverse and direct.