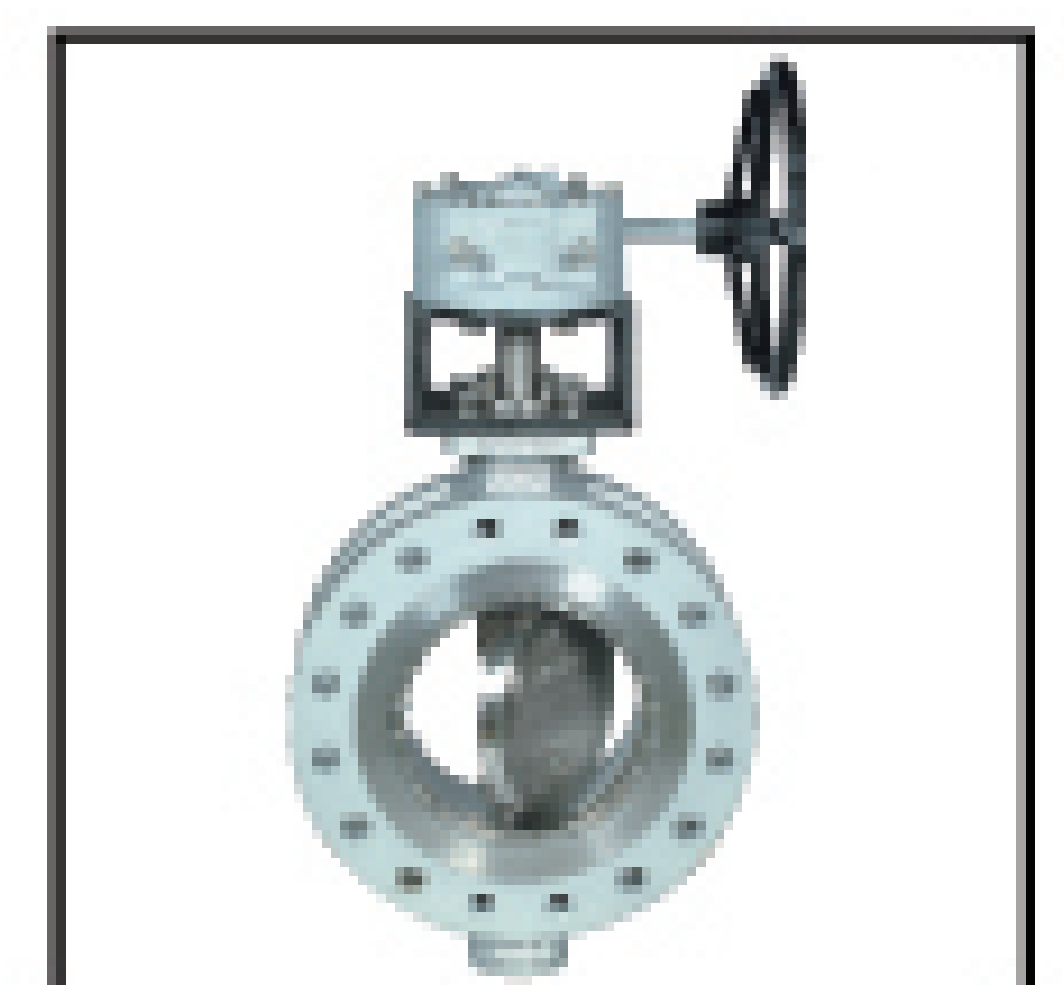
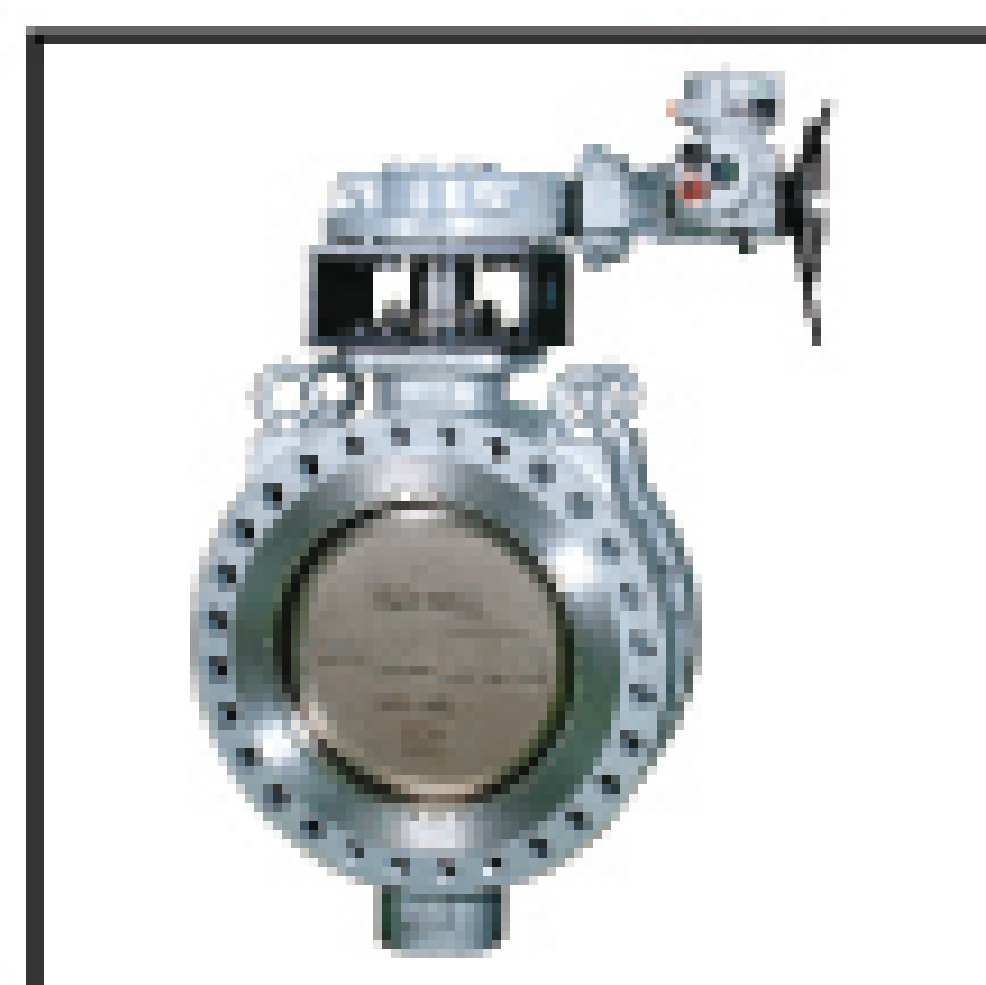
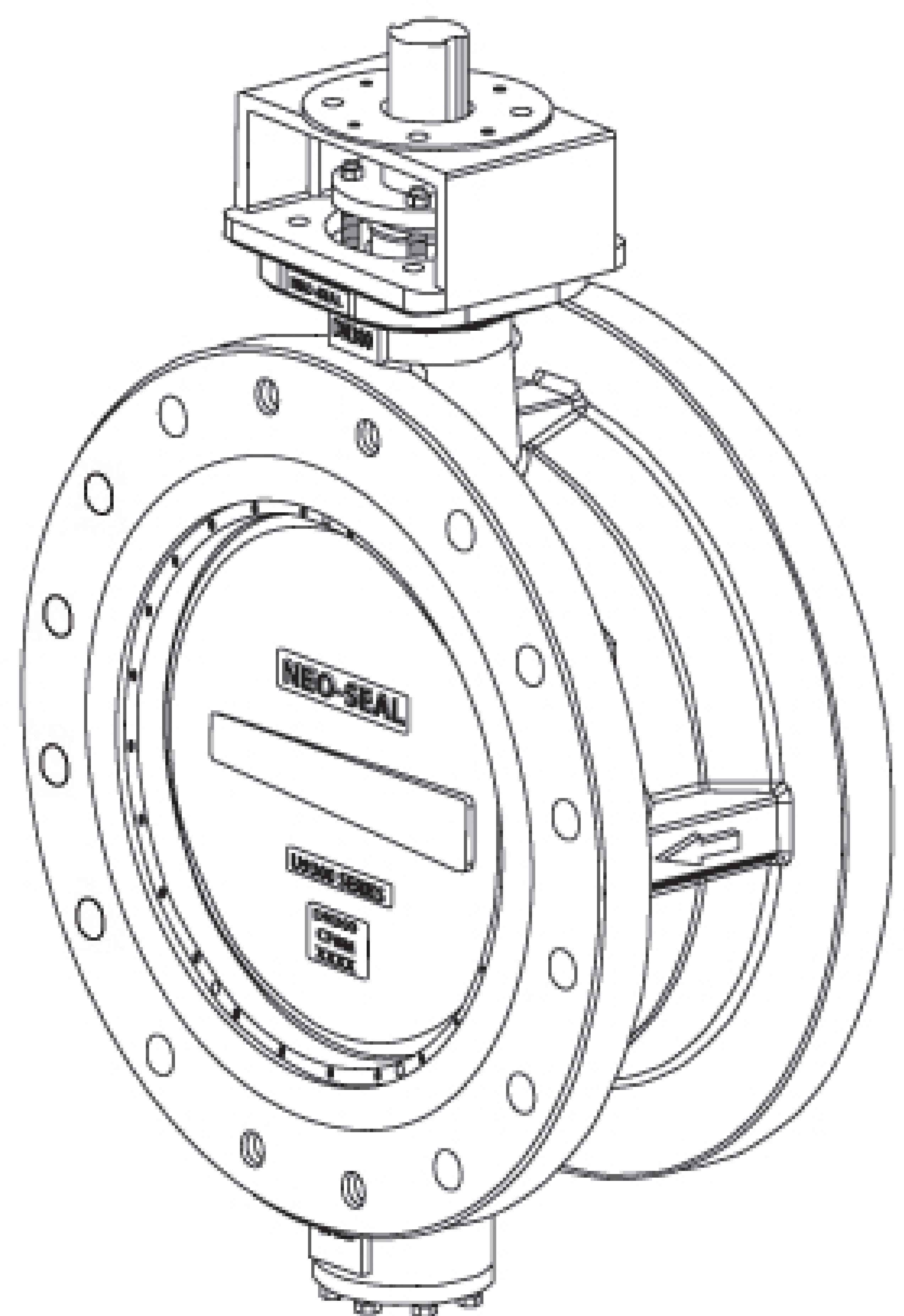


Installation, Operation and Maintenance

TOD MANUAL



Triple Offset Valves API / ISO 9001 Certified

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☒ **INTRODUCTION**

☐ **INSTALLATION**

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➤ **General Notes**

➤ **Packing Information**

➤ **Handling Information**

➤ **Storage Information**

➤ **Exploded View of Valve**

1. INTRODUCTION

1.1. General Notes

This manual is intended to give basic information to users. UNICOM shall not be liable for any damage or operating malfunctions occurring as a result of non-compliance with this installation, operation and maintenance manual. If modifications are made on valves without UNICOM's authorization, the safety of valves cannot be guaranteed. All valves are shop tested and sealed tightly prior to delivery.

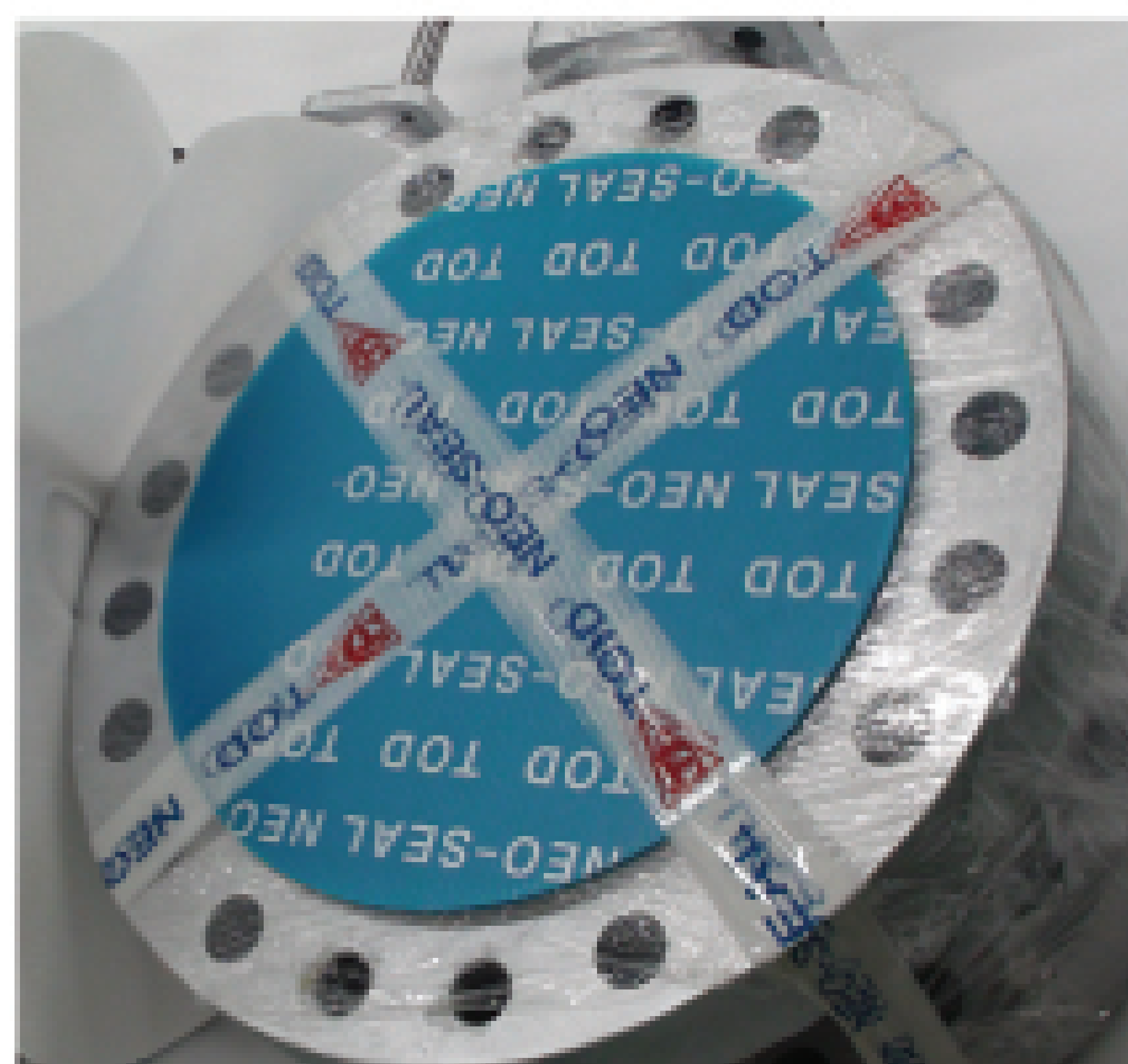
❖ Applicable Product Range ❖

- ✓ TOD Series Basic Configuration, Double Flanged Body Style, which can be installed between two flanges using stud and machine bolts.
- ✓ TOD Series Basic Configuration, Lug Body Style, which can be installed between two flanges using stud and machine bolts.
- ✓ TOD Series Basic Configuration, Wafer Body Style, which can be installed between two flanges using stud and machine bolts.
- ✓ TOD Series Basic Configuration, Butt-weld ends, which must be welded to the pipeline.

1.2. Packing Information

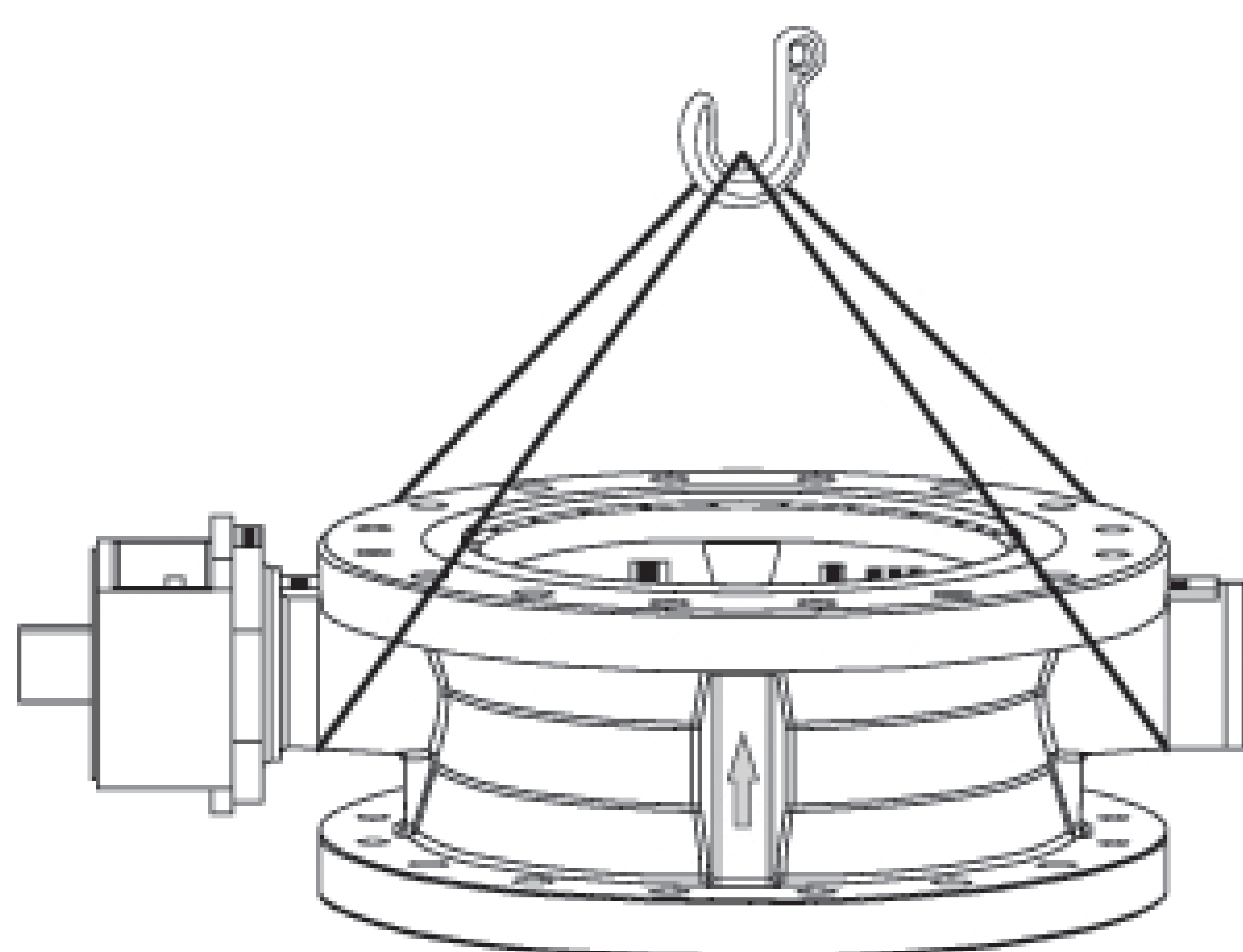
All valves are packed properly to protect the valve internal parts and flange faces that are subjected to possible damages during transportation and storage on site. Following precautions must be addressed for the inspector of the shipment.

- A** Valves are packed with the discs in the closed position. Valve internals and flange faces are protected with the application of anti-corrosion grease unless specified otherwise for cleaning valves.
- B** The flange faces are protected by either plastic or wooden boards to prevent scratches and the intrusion of foreign substances in the valve body.
- C** The end of the shaft is protected with a plastic tube for bare shaft valves.
- D** The wood materials used for overseas packing are fumigated in accordance with ISPM15 to prevent biological contamination during transportation and storage.



1.3. Handling Requirements

- A** Crates: Use appropriate equipment such as a fork lift truck using fork lift hitches.
- B** Cases: Center of gravity location must be measured to safely move the material and all local safety regulations must be followed.
- C** Valves: Use a fork lift and lifting ropes that are capable of withstanding the weight of the valve including a safety factor. The condition of equipment and tools, such as a fork lift and ropes, used must be checked before use. The weight balance must be used to prevent falling or moving during lifting and handling.



< Fig.1 A Schematic of looped cable around the valve body >



CAUTION

For valve handling and/or lifting, the lifting equipment (fasteners, hooks, etc.) must be sized and selected while taking into account the valve weight indicated in the packing list and/or delivery note. Lifting and handling must be made only by a qualified personnel. Fasteners must be protected by plastic covers in sharp corner areas. Caution must be taken during the handling when this equipment passes over the workers or over any other place. In all cases, the local safety regulations must be strictly respected.

1.4. Storage Information

In case that valves have to be stored before installation, the storage must take place in a controlled environment. Following guidelines shall be applied during storage.

- A** The valves have to be stored with the discs closed in a clean and dry storage environment.
- B** The valve faces must be protected with the supplied plastic or wooden materials with straps tightly secured to prevent damages.
- C** The controlled environment must be checked regularly to prevent the degradation of valve condition.



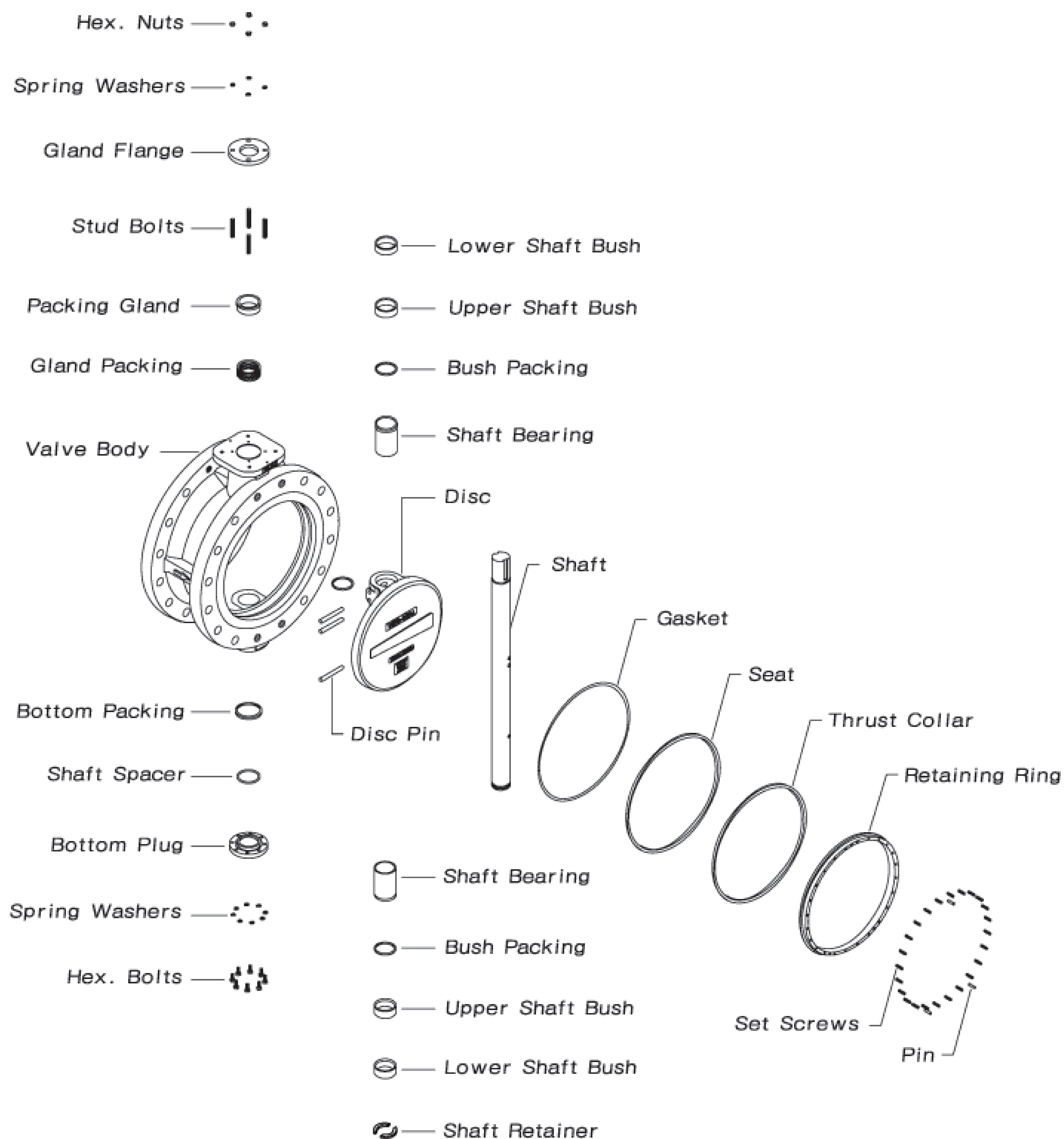
Note.

Storage in an open area for a limited period can be considered only in case the valves have appropriate packing (packed in cases lined with tarred paper, and contents well protected with varrier sacks).

INTRODUCTION

Installation, Operation and Maintenance

1.5. Exploded View of Valve



- ☐ INTRODUCTION
- ☒ **INSTALLATION**
- ☐ OPERATION
- ☐ MAINTENANCE
- ☐ DATA

- **Inspection Prior to Installation**
- **Valve Installation**
- **Valve Verification**
- **Alignment of Flanges**

2. INSTALLATION

2.1. Inspection Prior to Installation

Carry out a visual inspection of the sealing face of the flanges, the seal area and the general condition to see any damage that might happen in transit.

Inspection of Valve

- ✓ Ensure that any damage were occurred in transit.
- ✓ Ensure that the valve is clean and there is no other residue inside.
- ✓ Check the tightness of the hex. nuts/bolts at the gland flange and the bottom plug.
- ✓ Remove the protection cover of sealing face just before installation.
- ✓ Operate the valve prior to installation to check the functional condition of all mechanical components.
- ✓ Ensure that the valve is completely closed before further handling or installation.

Inspection of Pipeline

- ✓ Make sure the clearness of pipe flange and gasket surface.
- ✓ Remove materials such as a rust, residue and dirt which remain in the pipe or flanges.

2.2. Valve Installation

UNICOM recommends that the optimum valve installation is with the shaft in the vertical plane, after which it is preferable to have the shaft at an angle so as to minimize any problem associated with solid particles present in the fluid that otherwise could deposit in the lower bearing area.

Isolating applications

The best sealing performance will be maintained when pressure acts on the shaft side of the valve, which is recommended for a longer service life.

Control applications

Unless otherwise recommended by UNICOM, the valve should be installed with the disc in the closed position to ensure that the disc is not damaged during installation. Particular care should be taken with those valves equipped with 'fail-open' actuators.

For operation temperatures above 200 °C (392 °F) thermal insulation of the valve body is recommended.

If the valve has threaded tapped holes in the hub areas, UNICOM recommends to use hexagonal head bolts or shorter studs to connect the valve in this zone. The depth of the tapped holes in the bodies of all TOD valves is specified in the technical literature. Failure to use correct bolts/studs may result in damage to the valve.

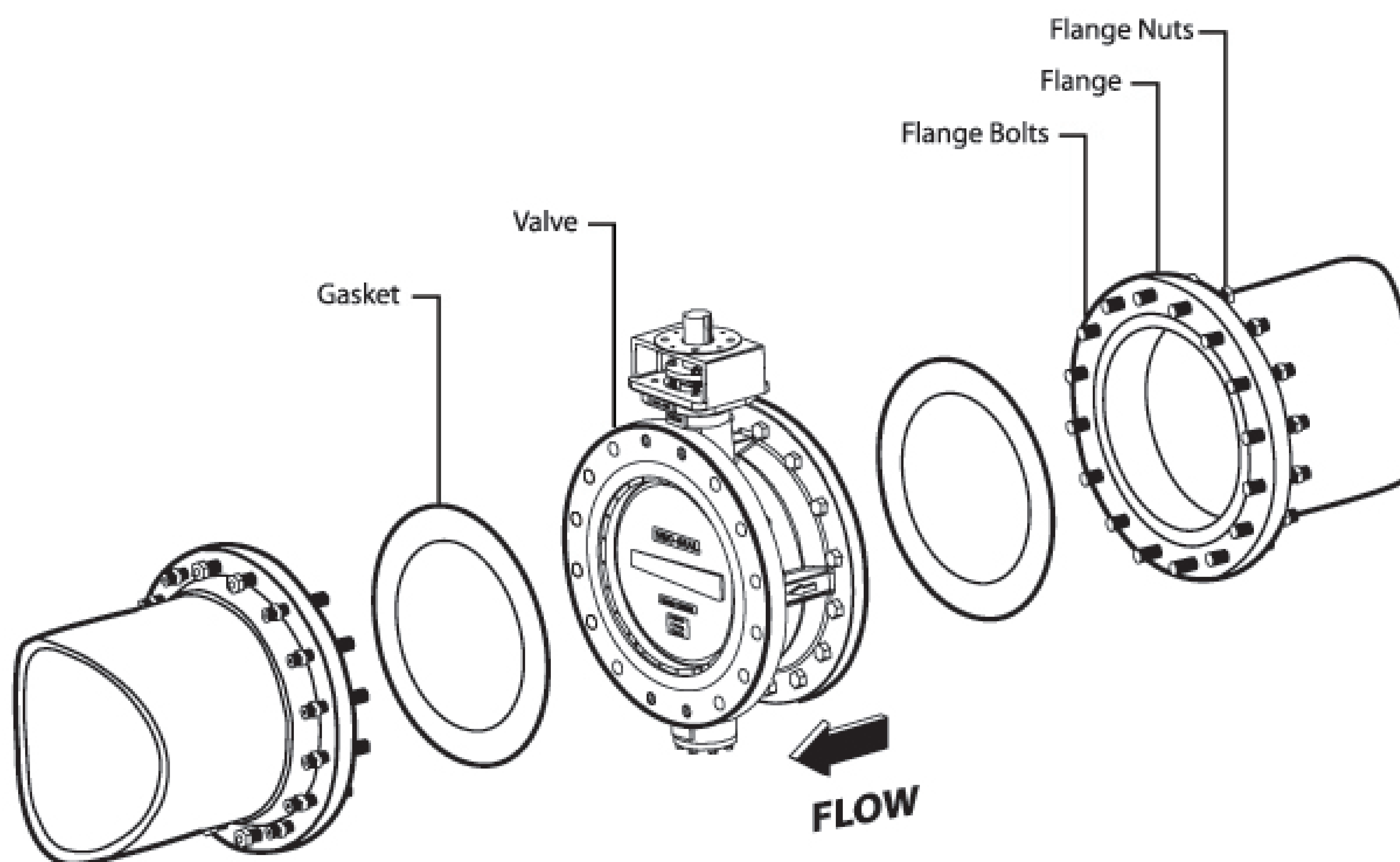
If the valve has welded ends, perfectly clean and degrease the ends to be welded (of both valve and pipe), using a cloth with acetone or similar product. Insert the valve correctly between the edges of the pipe to be welded, Carry out an initial accurate spot welding verifying the perfect alignment of the edge and axis of the valve. Carry out the welding of the edge proceeding in alternate way on both sides to reduce the tensions introduced by the welding. It is important to respect the interpass temperature which must not go above 150 °C (302 °F).

2.3. Valve Verification

- A** Tighten the packing just enough to prevent stem leakage. Over-tightening will decrease packing lift and increase operation torque.
- B** Check the operation of the valve by stroking it to “full open” and “full close”.
To verify the valve orientation, the disc position indicator mark on the shaft (during the normal open to close cycle) should rotate clockwise from a position in line with the pipe to a position parallel to the pipe flanges.

2.4. Alignment of Flanges

- ✓ Make sure that the preferred direction is indicated with an arrow marked on the valve body.
- ✓ As with all flange fittings, the connecting flanges must be aligned properly and the sealing faces must be parallel to each other.
- ✓ The gasket should be placed between sealing faces of valve and pipe flange.
- ✓ Clean sealing faces of valve and pipe flange from any residue and dirt.
- ✓ To prevent leakage, the flange bolts must be tightened evenly in turn from opposing ends.



< Fig.2 A schematic of installation between end connections >

The valve should preferably be installed in such a way that the shaft rests on the high pressure side when the valve is closed. This ensures optimum sealing properties.



CAUTION

Tightening the flange bolts too much must be avoided to prevent exceeding the gasket limits.

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- ☐ INTRODUCTION
- ☐ INSTALLATION
- ☒ **OPERATION**
- ☐ MAINTENANCE
- ☐ DATA

➔ **Operation**

3. OPERATION

TOD valve can be mounted with a manual gearbox, an electric actuator or a pneumatic actuator.

When operating, please make sure that there is no obstruction from adjacent piping components, such as elbows or swing check valves. When there is insufficient clearance for the rotating disc, please adjust the piping construction accordingly to allow required space.

For a manual gearbox, the OPEN/CLOSE indicator is adjusted after the pressure test from factory that there is no needs for additional adjustments. If the setting needs to be changed, please refer to the maintenance part of this I.O.M. for reference.

When opening/closing, please do not exert force on the handwheel over 360N. Such action may cause excessive stress to valve components including the gearbox.

For electric/pneumatic actuator, please note that the setting was performed in accordance with the valve/actuator datasheets.

For SIL required valves, please refer to the FMEDA reports in order to set a test interval to maintain the required SIL level.

When any unusual noise or malfunction is detected during operation, please do not proceed further and notify Unicom of exact symptom with relevant background information such as differential pressure, temperature, medium to shorten the Root-Cause-Analysis and Trouble Shooting period.



WARNING!

Additional torque input can damage the valve, gear and actuator seriously.

- ❑ INTRODUCTION
- ❑ INSTALLATION
- ❑ OPERATION
- ☑ **MAINTENANCE**
- ❑ DATA

- Seat Adjustment
- Seat Replacement
- Gear Box Separation
- Gear Box Mounting
- Gear Box Setting
- Gland Flange Adjustment
- Gland Packing Replacement
- Bottom Plug Adjustment
- Bottom Packing Replacement

4. MAINTENANCE

Maintenance works are recommended for safety and longer service life as below;

- ✓ Check the valve when abnormal sound is noticeable during operation.
- ✓ Ensure that tightness of each the hex. nuts/bolts at the gland flange and the bottom plug regularly.

After maintenance works, (If any suspected) Please call/send us.

Please be sure to get advice from trained personnel or an service engineer.



WARNING!

Before commencing maintenance works on pressurized valve components, complete occupational safety must be guaranteed.

Valve components must not be replaced while under pressure.

The valve must be approximately at ambient temperature before commencing maintenance works, otherwise there is a danger of injury upon contact.

4.1. Seat Adjustment

If leakage is detected, shut down the pipeline, completely close the disc of the valve and then separate the valve from the pipeline.

For Wafer and Lug type, a leakage can be rectified by retightening set screws.
(The set screws are tightened evenly one by one until a leakage has been stopped.)

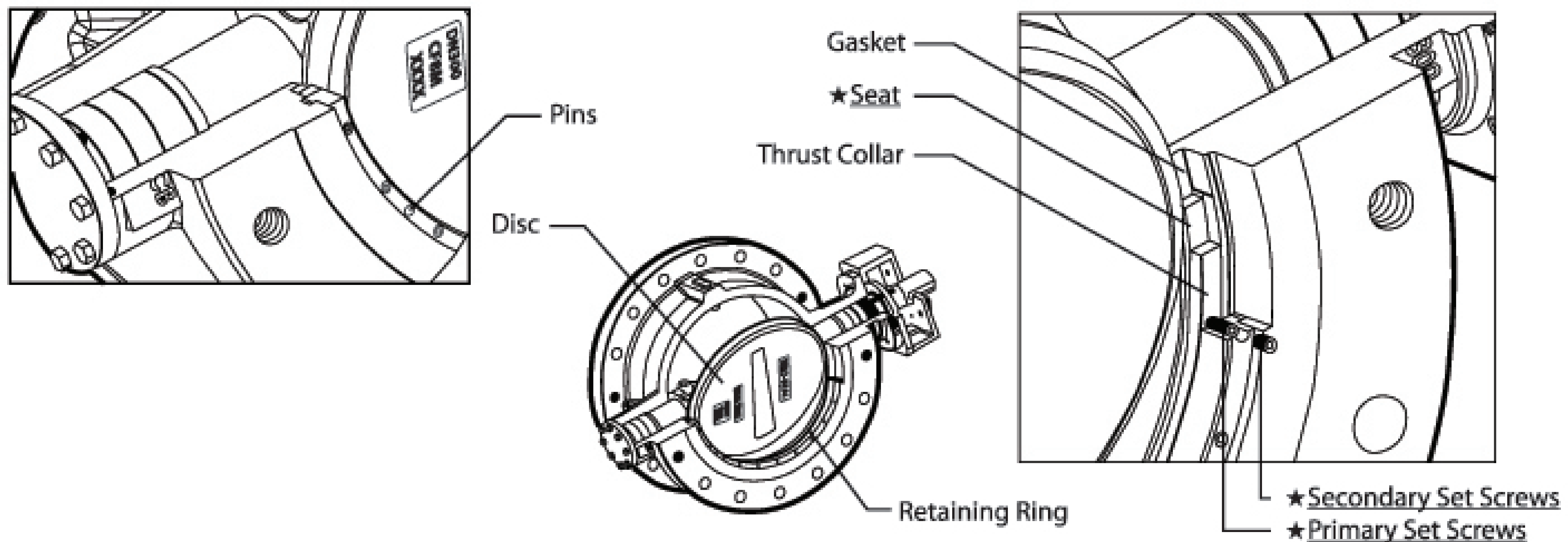
For Double Flanged type, a leakage can be rectified by retightening the primary set screws after loosening the secondary set screw out of the retaining ring.
(The set screws are tightened evenly one by one until a leakage has been stopped.)

The set screws must be tightened carefully while observing the torques stated in the section (5.3.) on "Torque for Retaining Ring Set Screws" for the maximum tightening moment.

If a leakage persists after the seat adjustment described above or the fluid can't be shut-off at full close position of disc, then seat-damage is suspected.

The seat must be replaced as described in the following section.(4.2.)

4.2. Seat Replacement



< Fig.3 A schematic of open condition of a disc to create working space >

- 1** Mark the location of each part of the retaining ring on the valve body.
- 2** Secondary and primary set screws can be loosened and then the parallel pins removed from the split joints of the retaining ring. Remove the split retaining ring.
(The set screws should be loosen evenly one by one to counter clockwise.)
- 3** After moving the disc into te open condition to create working space, the thrust collar, seat and gasket should be removed.
- 4** For assembly, Move the disc exactly into the closed condition and place the valve on a horizontal surface to avoid damaging the sealing face of the valve body flange.



CAUTION

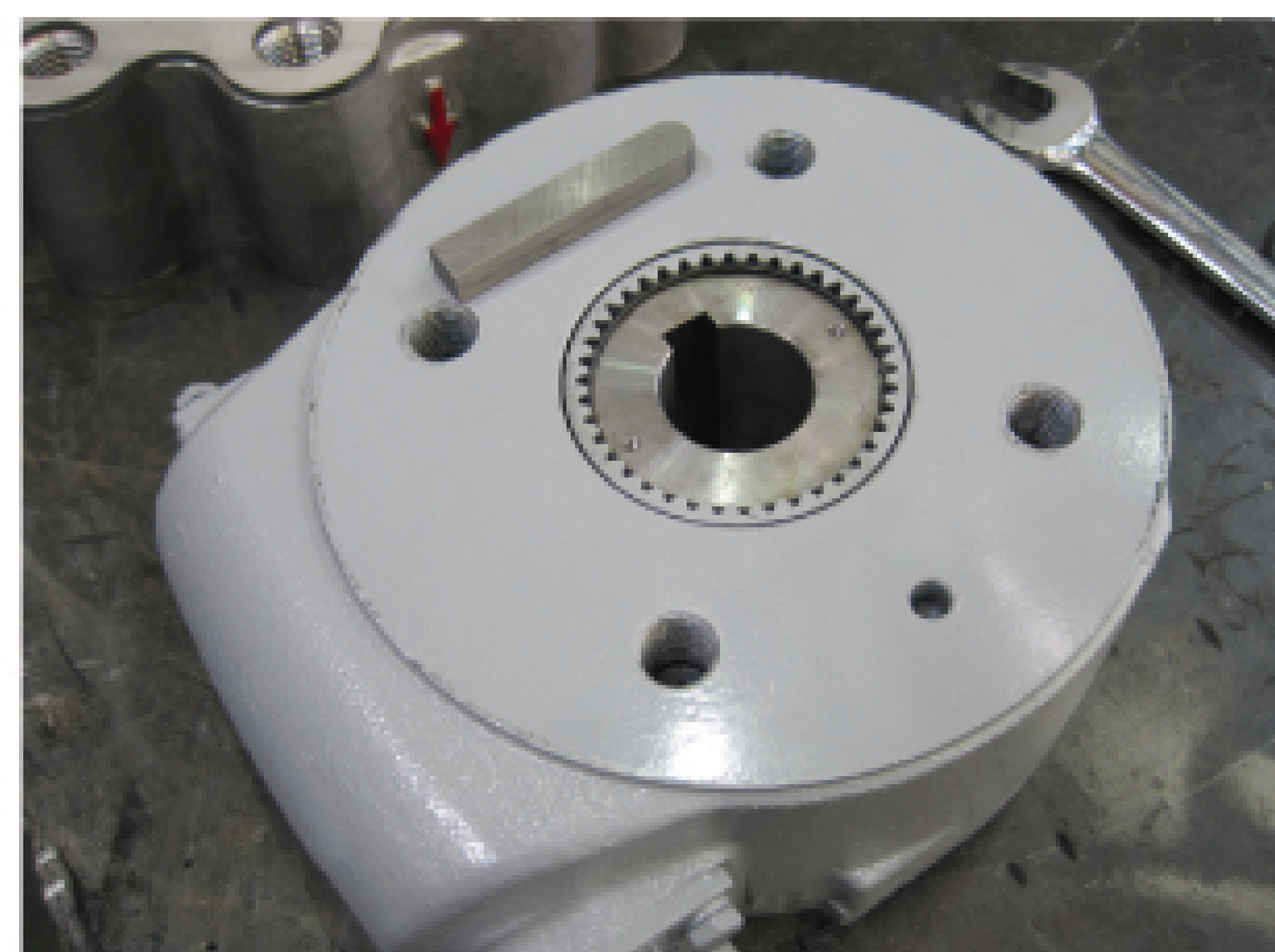
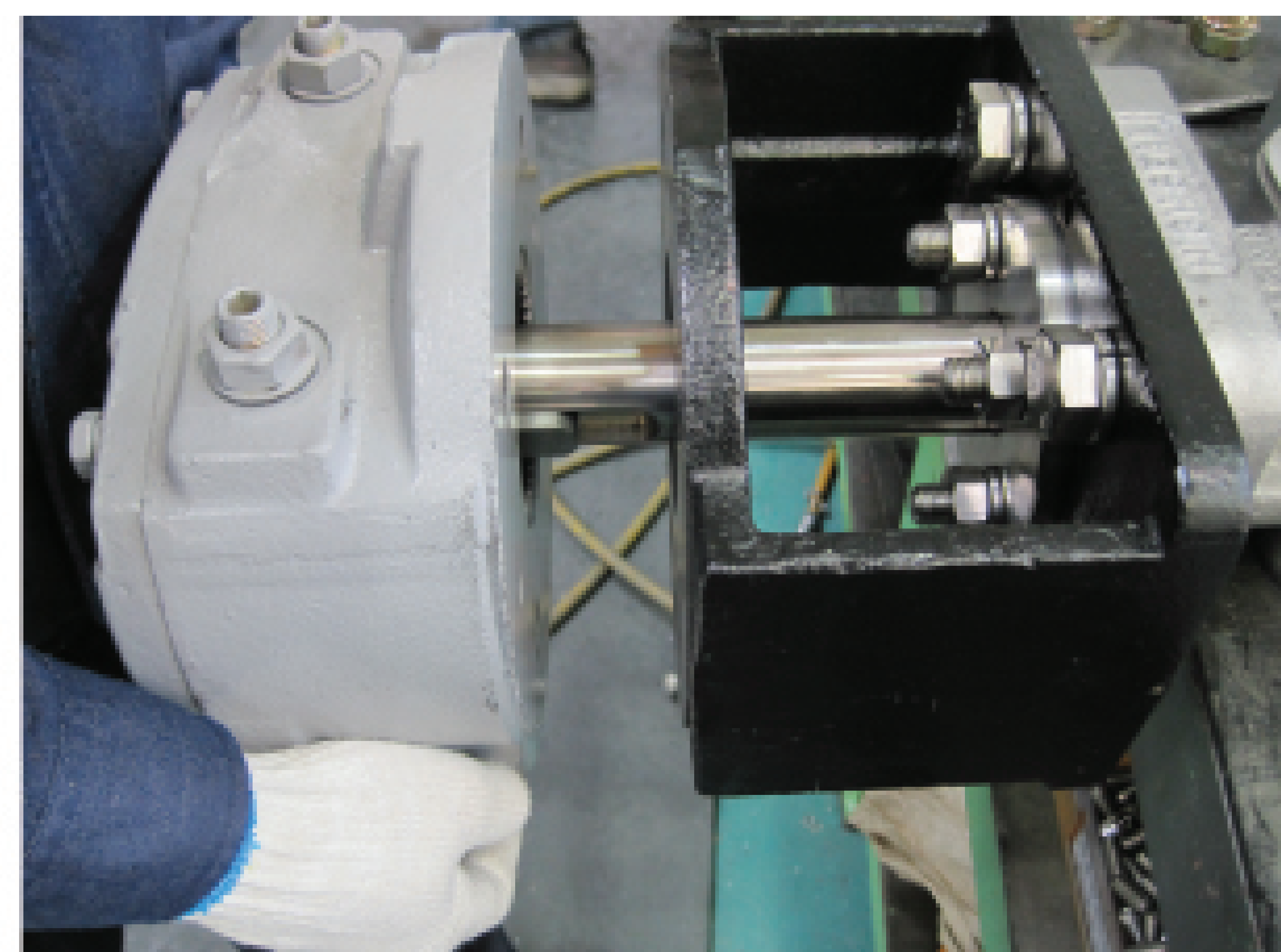
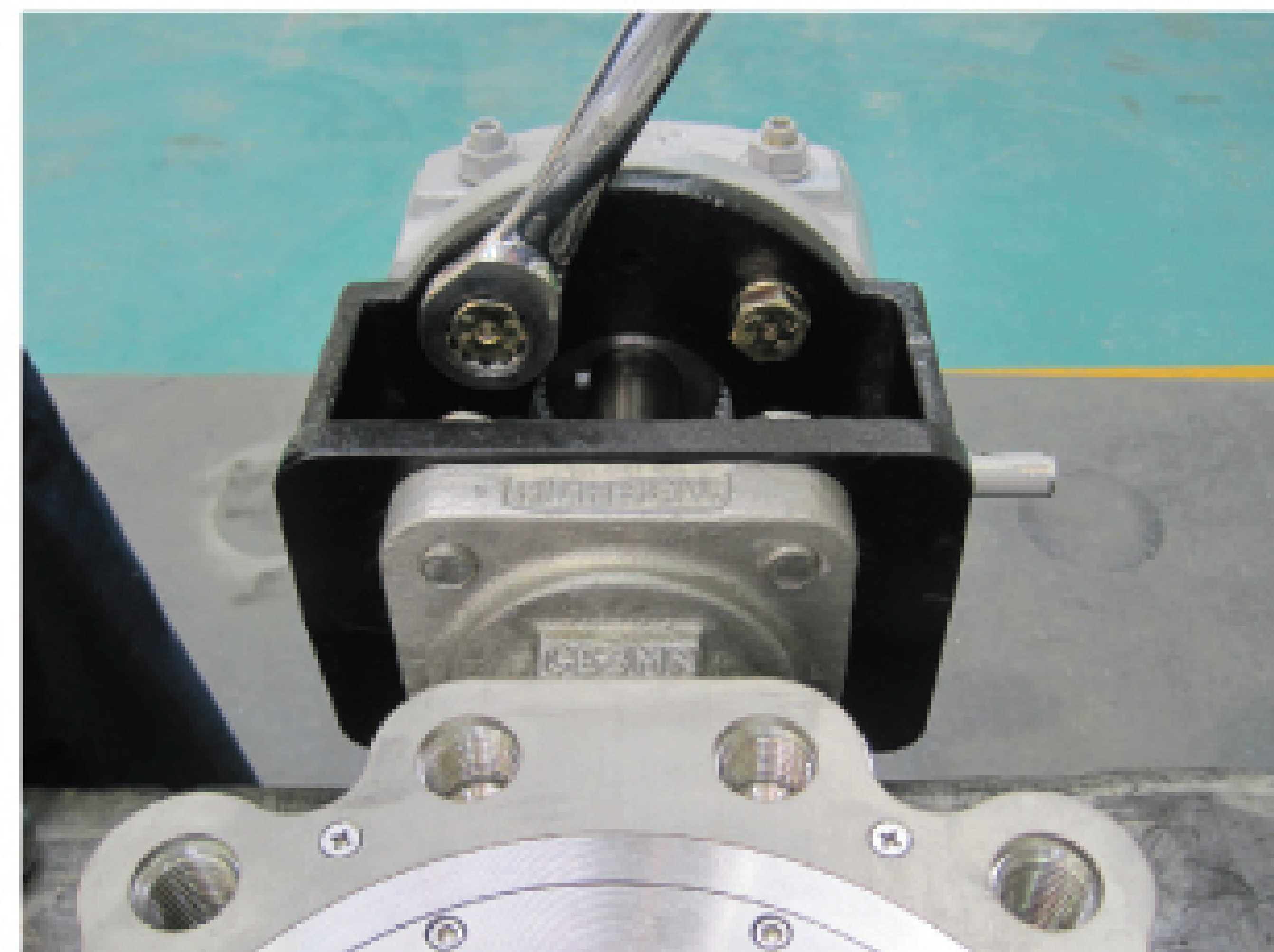
Clean the sealing area of the valve body, the retaining ring and the thrust collar.

- 5** Place the new gasket and seat.
(The inner corner taped part of the Seat should be put to lower direction.)
- 6** Place the thrust collar and then insert retaining ring.
(The retaining ring should be insert to marked the location of each part.)
- 7** Insert the pins and fasten the primary set screws.
(First, fasten set screws beside pin and the remainder are to be slightly pre-tightened evenly one by one to clockwise.)
- 8** Rotate the disc slightly by 10 degree to open and retighten the primary set screws and then close.
- 9** The set screws must be tightened carefully while observing the maximum torques described in the following section(5.3.), "Torque for Retaining Ring Set Screws"
- 10** Fastened the secondary set screws and then the secondary set screws are secured by the center punch works.

4.3. Gear Box Separation

To separate the gear from the valve, please take the following steps ;

- 1** Shut down the line on which the valve is installed.
- 2** Close the valve disc.
- 3** Pull out the position indicator bolt placed on the top of gear.
- 4** Separate the gear with a bracket from the valve.
You may leave the gear on the bracket.
- 5** After pulling out all bolts, which connect the bracket and the valve, take out the gear with bracket from the valve shaft.
- 6** Extract a Key from the Boss in the bottom of the gear.

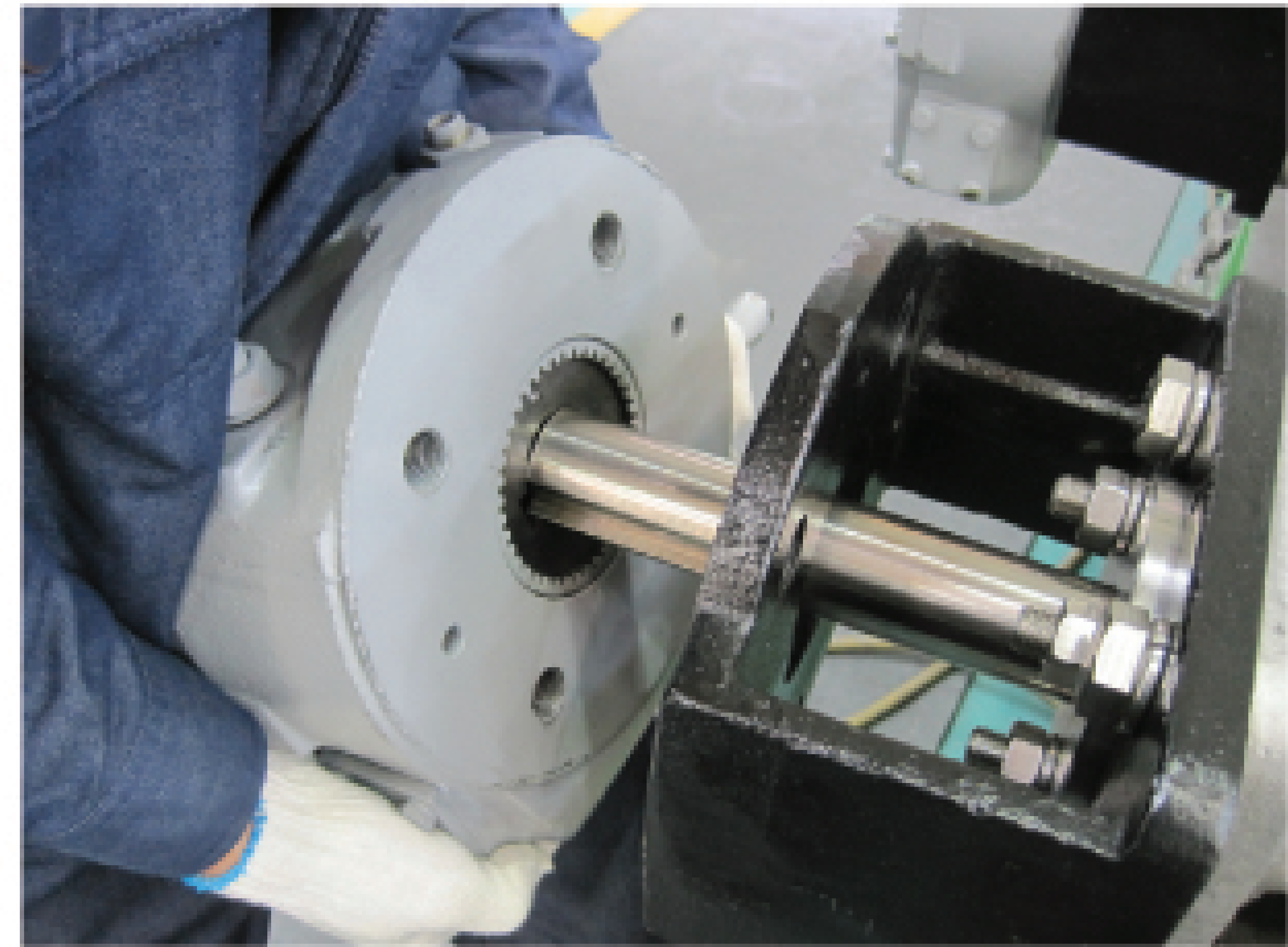


When separating a gear, please use a proper tool or equipment such as a chain-block to prevent any accident if the gearbox is too heavy to be handled by hands.

4.4. Gear Box Mounting

After changing the position of gear, please follow below instructions to mount the gear;

- 1** Please check the line pressure is still down.
- 2** Mount the gear on the shaft.



- 3** Place the gear where you want to place. And match the groove in the shaft and the groove in the Boss of the Gear, then insert the Key in the groove. This Key connects the Gear and the shaft.



- 4** See if the bracket drilled holes match with the top flange tapped holes of the valve. You may match those holes each other by rotating the gear hand wheel.
- 5** Screw the bracket to the top flange of the valve.
- 6** Match the position indicator with the disc position and fix the indicator.

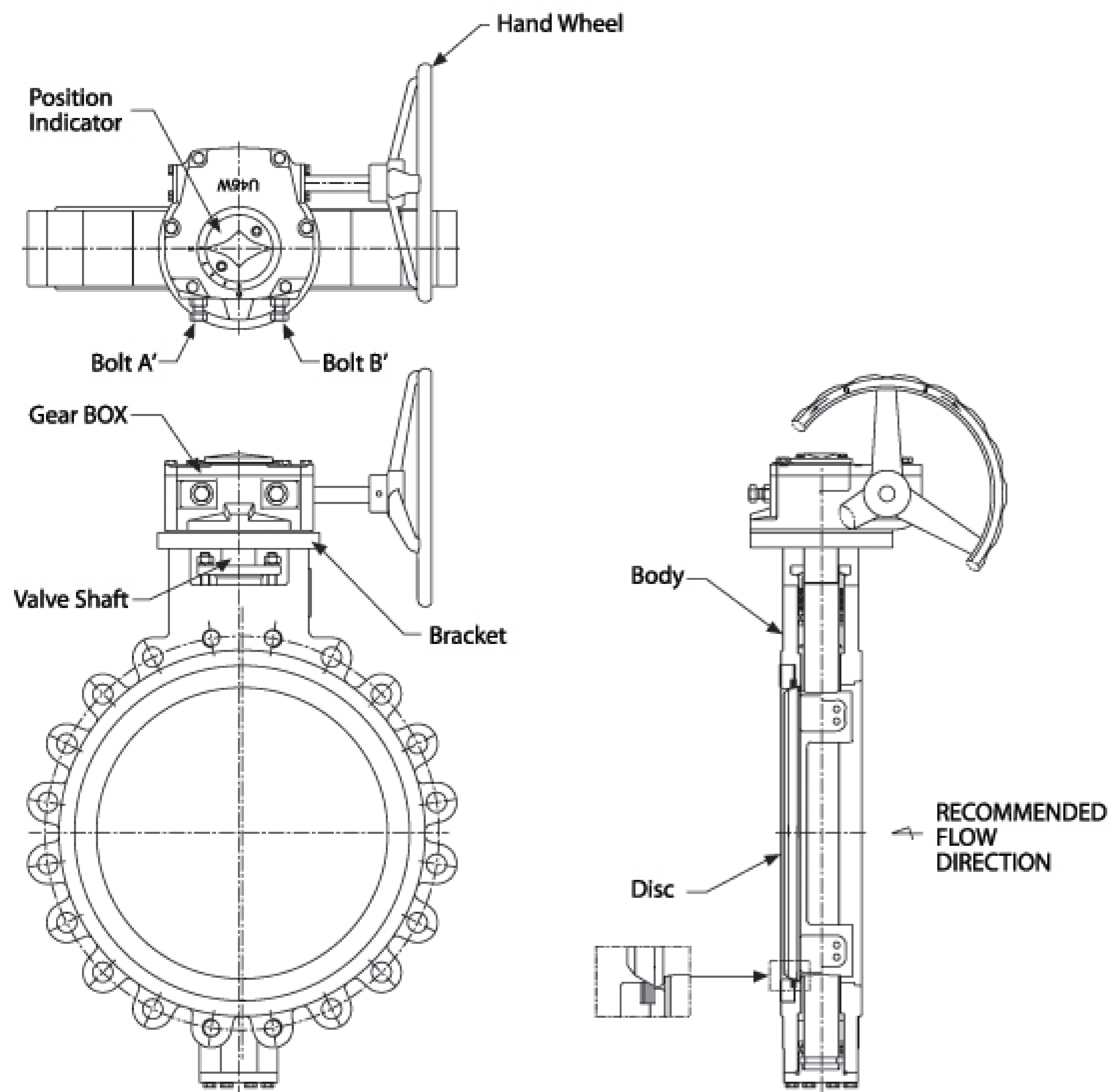


CAUTION

When bolting the bracket on the top flange, please use a new spring washer if the spring washer gets any damage.

4.5. Gear Box Setting

- 1 After mounting the gear, please rotate an 'bolt A' (see the picture) 3 ~ 5 turns CCW.

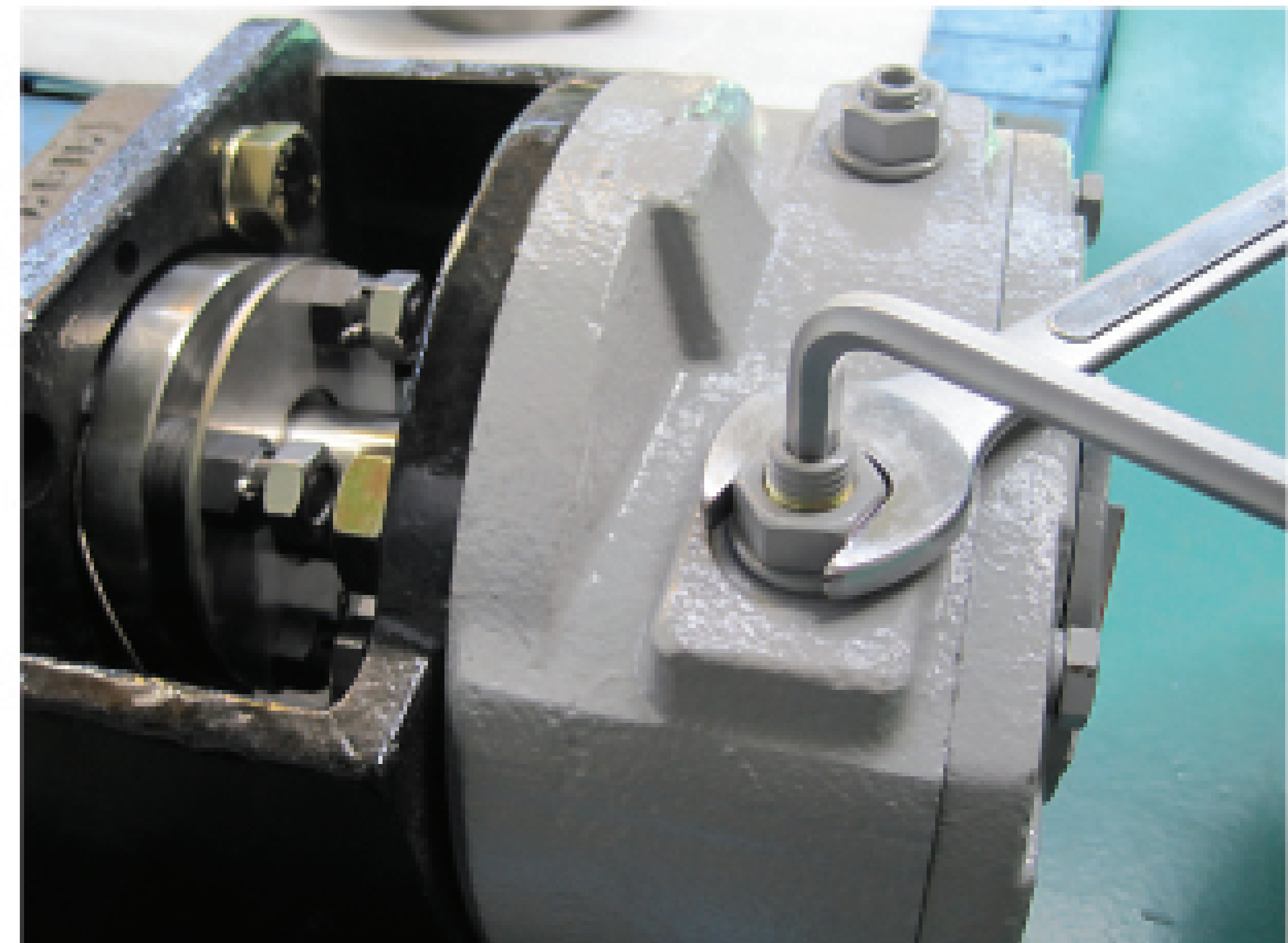


- 2 Close the disc until the disc contacts a disc stopper on the inner body by turning the gear hand wheel CW.



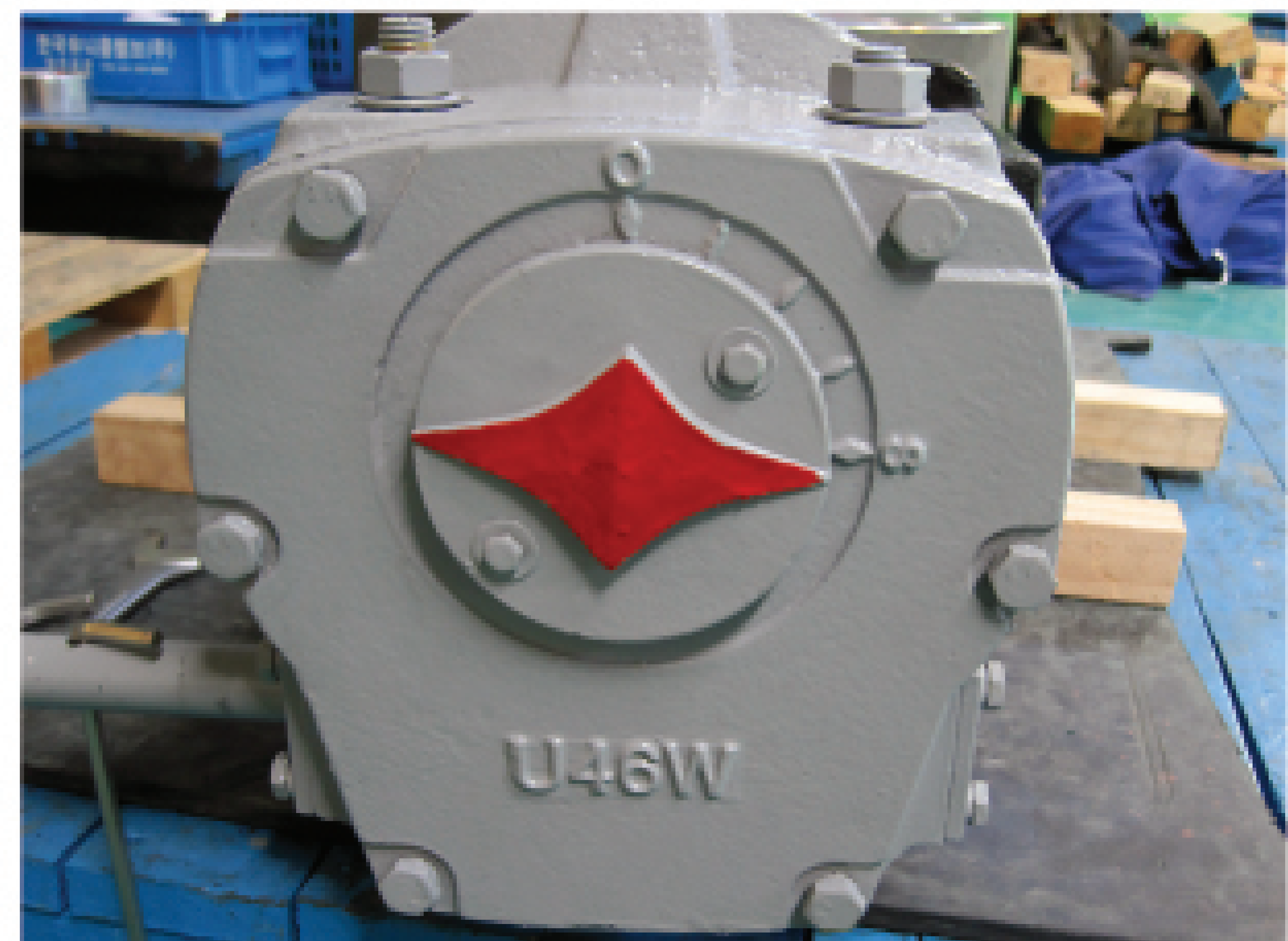
- 3 If the disc does not turn due to the disc stopper, please rotate the hand wheel slightly CW.

- 4** Rotate the 'bolt B' CW until the bolt does not turn any more as the adjust bolt meets the worm-gear of the gear. And then tighten the adjust nut by CW so that the adjust bolt does not back-out.



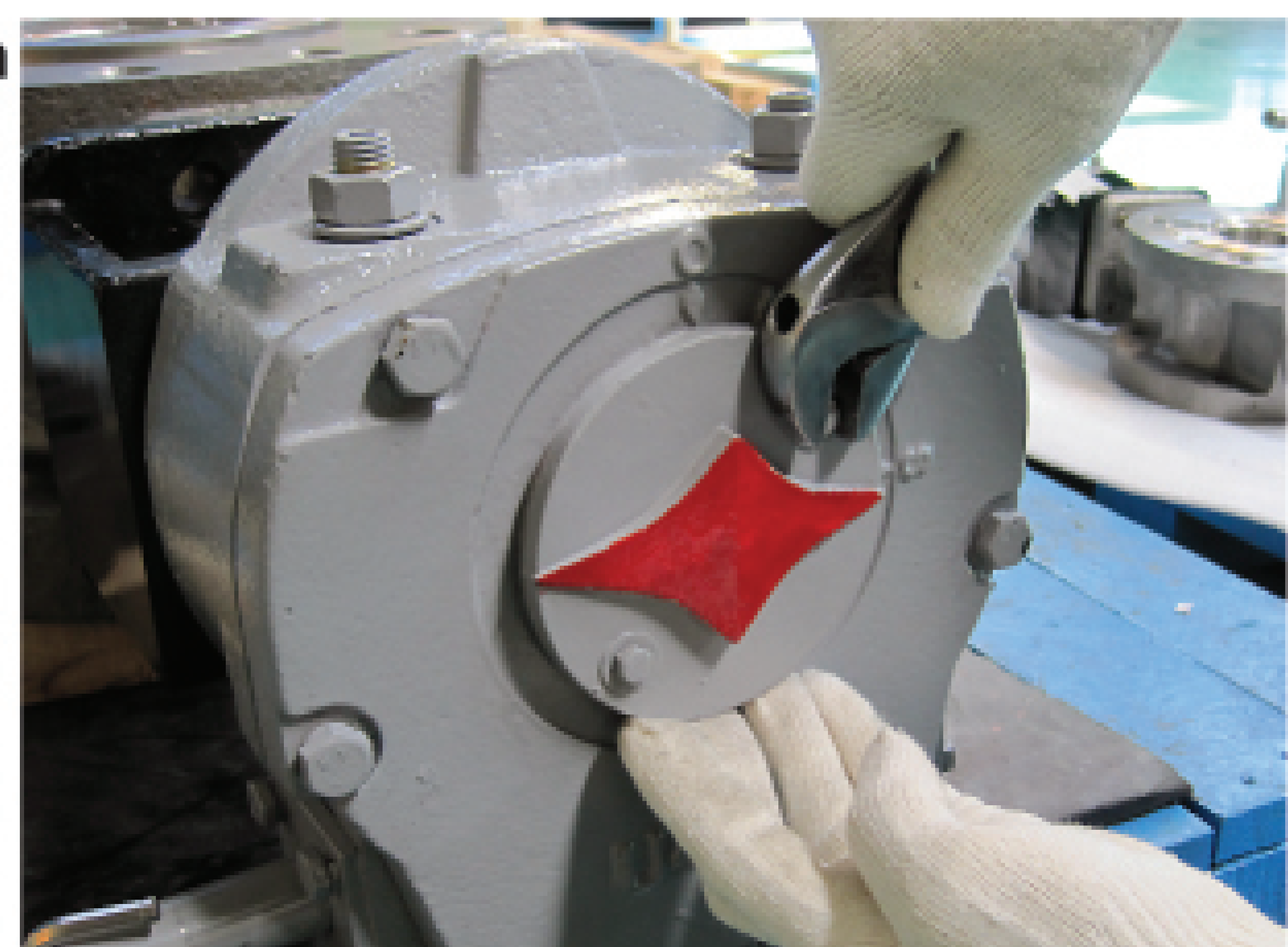
- 5** To see if the gear operates properly, open the disc by 30° and then close.

- 6** See if the center of the key groove in the gear boss perfectly matches with the close position of the position indicator.



- 7** If the key groove in the gear boss does not match with the close position of the position indicator, please repeat the step **1** ~ **6**.

- 8** Place and screw the position indicator of the gear at the right position.



- 9** Pressurize the line and check the sealing of the valve.



CAUTION

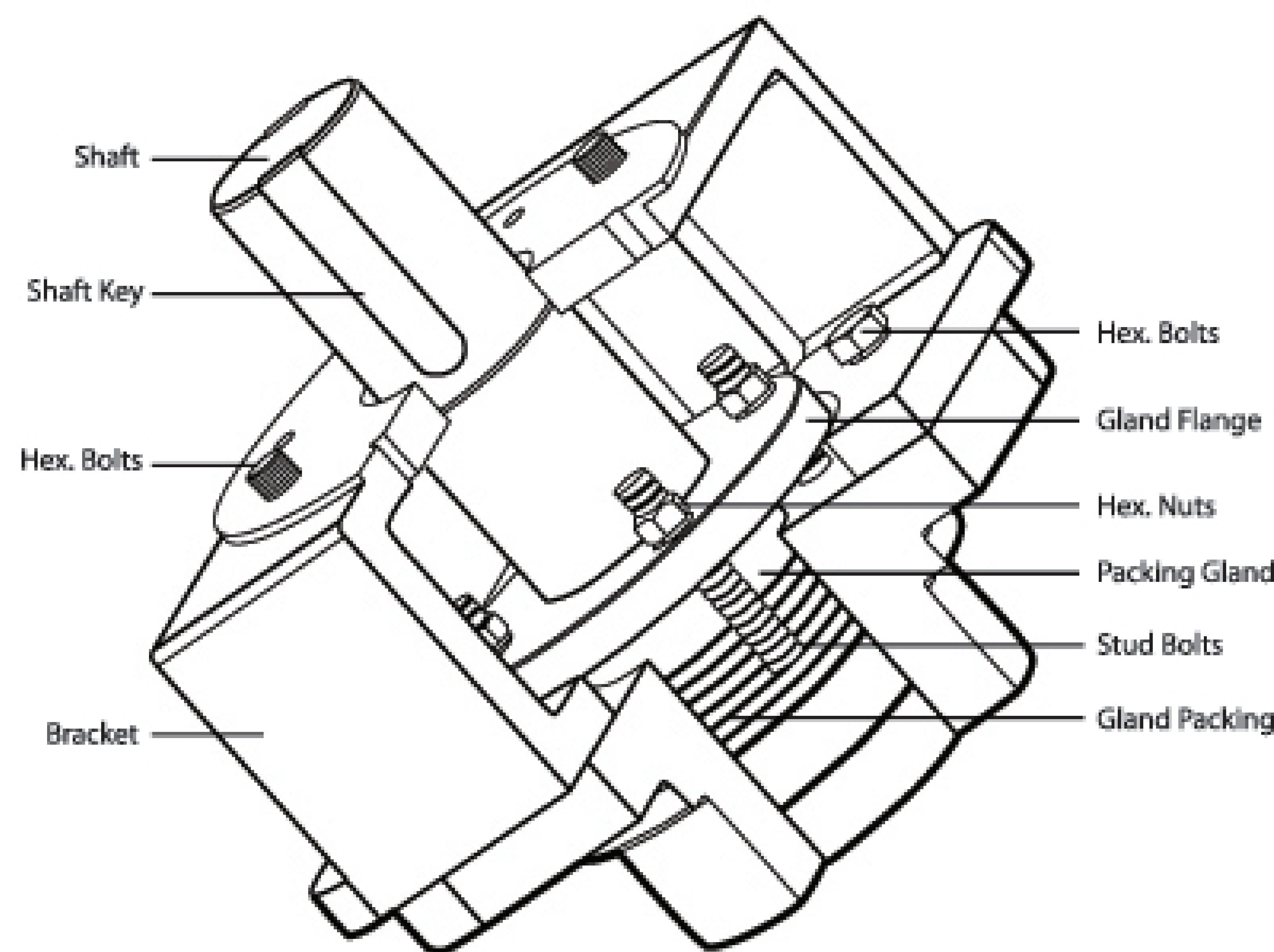
Too much force to the hand wheel might cause damage on the worm-gear of the gear operator.

4.6. Gland Flange Adjustment

If a leakage is noted around the gland flange, it can be rectified by the hex. nuts of gland flange. The fastenings are to be tightened evenly in turn from opposing ends by quarter turns until the gland packing is tight.

The hex. nuts must be tightened carefully while referring to the section(5.1.) on "Torque for Stud Bolts" for the maximum tightening moment.

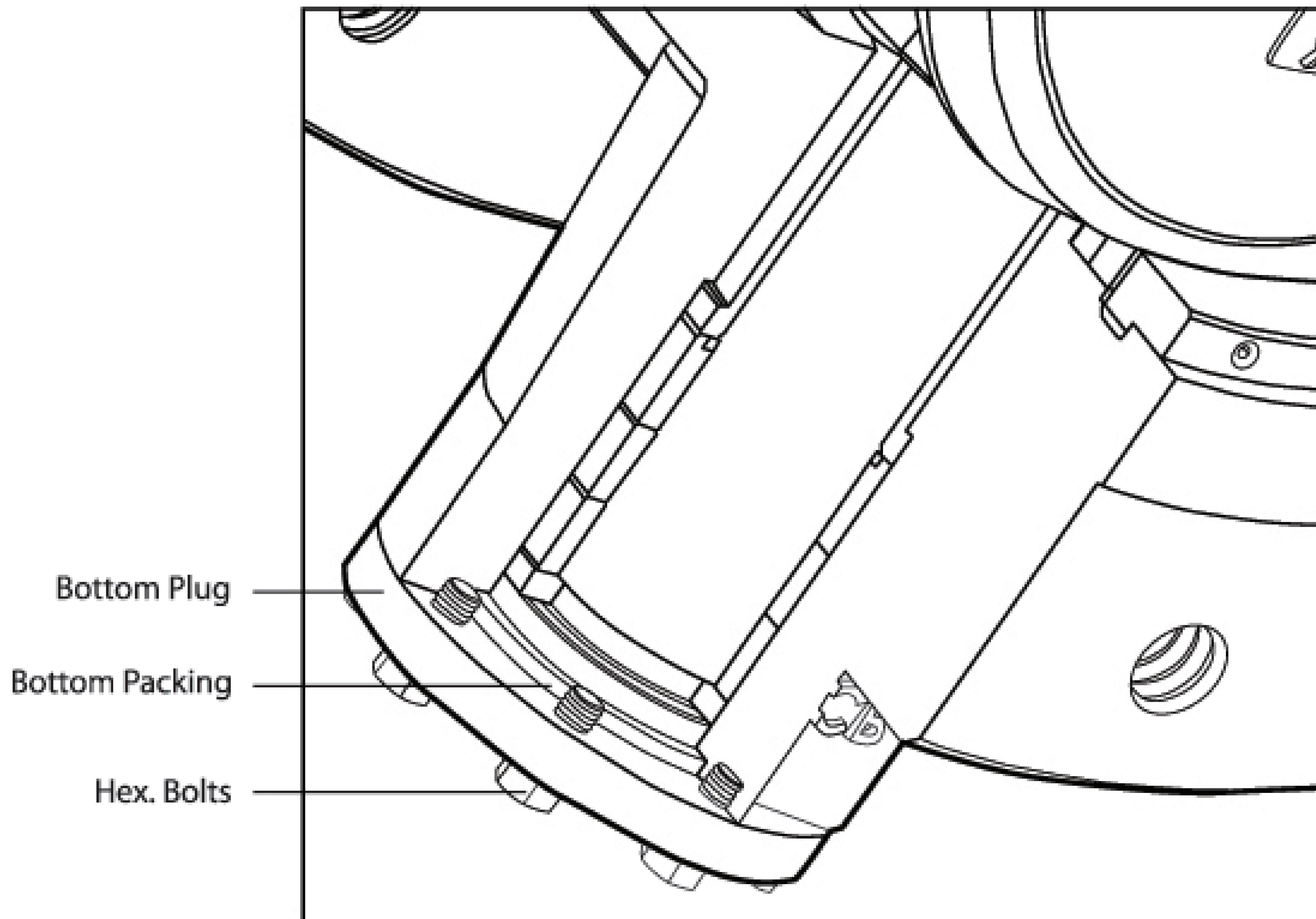
If leakage persists after the maintenance measures described above, the gland packing must be replaced as described in the following section(4.7.)



< Fig.4 The cross-section view of assembled gland packing >

4.7. Gland Packing Replacement

- 1** Loosen the hex. bolts. Now slide the gear or the actuator from the shaft.
- 2** Remove the parallel key(s).
- 3** After loosening the hex. bolts of the bracket, the bracket can be pulled out.
- 4** Loosen the hex. nuts and then the gland flange can be removed. Now pull out the packing gland.
- 5** The gland packings are then be carefully pulled out in a way not to damage the shaft or the bore by using a packing extractor such as the corkscrew, awl and/or gimlet etc.
- 6** If the sealing faces show grooves or sharp scratches, they should be smoothed out with a fine abrasive cloth. The gland packing area is to be cleaned thoroughly.
- 7** Insert the new gland packing provided by UNICOM.
(Each gland packing being pressed individually into the packing space using packing gland and gland flange.
- 8** After insert the packing gland and the gland flange, tighten the hex. nuts.
(The hex. nuts must be tightened carefully while observing the torques in the section(5.1.) on "Torque for Stud Bolts" for the maximum tightening moment.)
- 9** All removed parts can then be reassembled in a reverse order and the gland packing can be checked using the setting measurement described in the section(4.6.) "Gland Flange Adjustment"



< Fig.5 The cross-section view of assembled bottom packing >

4.8. Bottom Plug Adjustment

If leakage is detected around the bottom plug, it can be cured by retightening the hex. bolts. The fastenings are to be tightened in turn from opposing ends by quarter turns until the packing is tight. Refer to the section(5.2.) on "Torque for Hex. Bolts" for the maximum tightening moment.

If leakage persists after the maintenance measures described above, the bottom packing must be replaced as described in the following section(4.9.).

4.9. Bottom Packing Replacement

- 1** Loosen the hex. bolts and then remove the bottom plug.
- 2** The bottom packing should be carefully pulled out by using a packing extractor such as the corkscrew, awl and gimlet etc.
(Please be careful not to scratch and damage the wall of bottom plug. If the sealing faces show grooves or sharp scratches, they should be smoothed out with a fine abrasive cloth. The bottom packing area is to be cleaned thoroughly.)
- 3** Put a new bottom packing provided by UNICOM into the bottom plug.
- 4** After inserting the bottom plug, tighten the hex. bolts. (The hex. bolts must be tightened carefully while observing the torques in the section(5.2.) on "Torque for Hex. Bolts" for the maximum tightening moment.)

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- ☐ INTRODUCTION
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- Torque for Stud Bolts
- Torque for Hex. Bolts
- Torque for Retaining
Ring Set Screws
- Torque for Other Bolts

5.1. Torque for Stud Bolts

Valve Size(DN)	Thread	Material	N.m	in.lb(f)
80-100	M 8	A193 Gr.B8	5	45
125-200	M 10	A193 Gr.B8	7	60
250-300	M 10	A193 Gr.B8	14	125
350-450	M 14	A193 Gr.B8	30	265
500-750	M 16	A193 Gr.B8	50	445
800-850	M 16	A193 Gr.B8	80	710
900-1100	M 20	A193 Gr.B8	140	1240
1150-1200	M 20	A193 Gr.B8	170	1505

5.2. Torque for Hex. Bolts

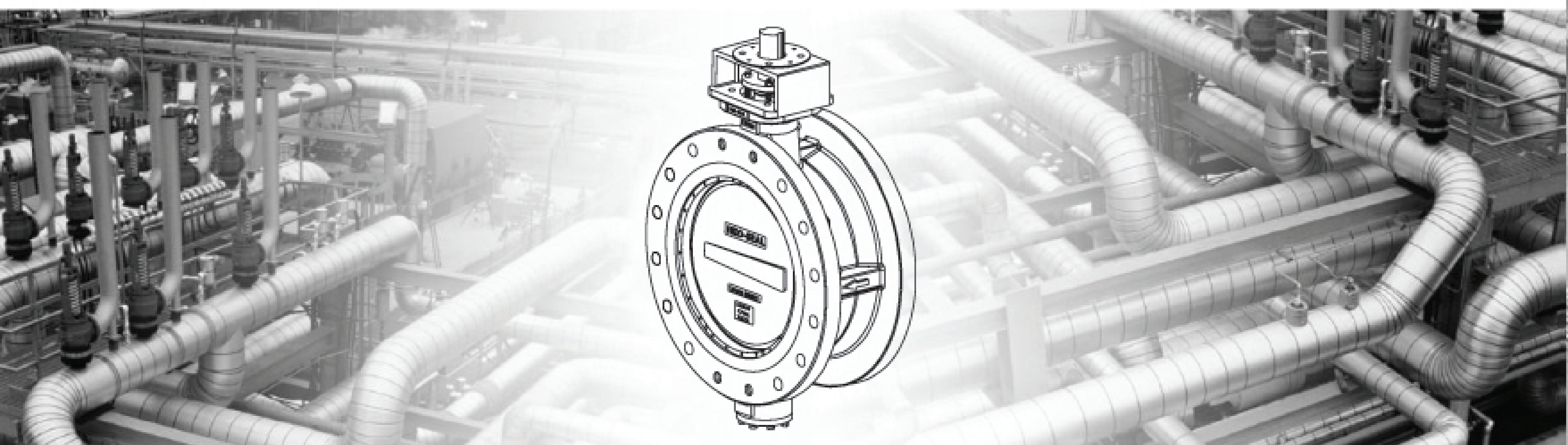
Thread	Material	N.m	in.lb(f)
M 8	A193 Gr.B8	14	125
M 10	A193 Gr.B8	28	250
M 12	A193 Gr.B8	50	445
M 16	A193 Gr.B8	130	1150
M 20	A193 Gr.B8	240	2125

5.3. Torque for Retaining Ring Set Screws

Thread	N.m	in.lb(f)
M 8	7.5	67
M 10	15	135
M 12	26	230
M 16	62	550

5.4. Torque for Other Bolts

Thread	Material	N.m	in.lb(f)
M 8	A193 Gr.B8	15	135
M 10	A193 Gr.B8	30	265
M 12	A193 Gr.B8	50	445
M 16	A193 Gr.B8	130	1150
M 20	A193 Gr.B8	300	2655
M 24	A193 Gr.B8	460	4070
M 27	A193 Gr.B8	640	5665
M 30	A193 Gr.B8	900	7965



Triple Offset Valves API / ISO 9001 Certified



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