Thank you for choosing KITZ products. For safe and trouble-free function and performance of the product, make sure to read and understand all items in this manual before handling the product. Keep this manual accessible to all valve operating personnel.
This manual applies to the manual operation of the KITZ cast steel and stainless steel pressure seal bonnet type gate, globe and check valves (flanged end, butt welding end and socket welding end).

SAFETY PRECAUTIONS

For the safe use of the product, read all of the safety precautions listed in this manual before handling the product.
The safety precautions in this manual are determined to ensure safe and proper use of the product and to prevent personal injury and property damage. This manual uses two terms, "Warning" and "Caution", according to the hazard level, to clearly indicate the extent and severity of the risk.

Both "Warning" and "Caution" indicate important safety instructions. Please be sure to follow them.

Indicates an imminently hazardous situation that, if not avoided, may result in serious injury or death.

Indicates a potentially hazardous situation that, if not avoided, may result in minor to moderate injuries or product damage.

NOTES TO USERS

"This manual is designed to show an appropriate usage of the products for transportation, storage, installation, operation and maintenance. Be sure to read through this manual before handling the products."

"This manual does not cover the whole scope of conceivable usage of the products for transportation, storage, installation, operation and maintenance. If technical assistance beyond the scope of this manual is required, contact KITZ Corporation or its distributor."

"The specifications have been determined with safety considerations. Do not use the products beyond the specifications."

"The illustrations given in this manual do not show all the details. If more detailed information is required, refer to the relevant approved drawings."

*Any information provided in this operation manual is subject to change without prior notice.*
1. The purpose of this operation manual is to instruct the operators about proper handling and maintenance of the valve.

2. Read this operation manual carefully before installing, disassembling/reassembling or operating valves. The illustrations in this operation manual only show the standard types of products.

3. This operation manual does not cover all the possible operating conditions and maintenance conditions of the products. Contact KITZ for any questions or details.

4. Follow the limitations specified in this operation manual and avoid any improper handling. Perform maintenance properly and take measures to prevent accidents.

5. Keep this operation manual in the place accessible by the valve operators. This operation manual is for use only. Please do not disclose any information in this manual without permission of KITZ.

6. When a product failure occurs or when repair is required, contact the valve distributor or KITZ sales office.
1. Structure and Function

1.1 Valve Type

1.1.1 Globe Valve

1.1.2 Gate Valve

1.1.3 Check Valve

1.2 Bonnet Type

Pressure Seal Bonnet

1.3 Stem Type

1.3.1 Outside Screw and Yoke, Rotating Stem Type

1.3.2 Outside Screw and Yoke, Non-Rotating Stem Type

1.4 Operation Method

1.4.1 Manually Operated Handwheel Type

1.4.2 Reduction Gear Type

1.4.3 Air Motor Type

1.4.4 Electric Motor Type

2. Installation

2.1 Precautions before Installation

2.2 Installation to Piping

2.3 Confirmation before Operation
1. Structure and Function

1.1 Valve Type

1.1.1 Globe Valve
Globe valves are used to shut off the fluid by blocking the valve port with the disc from the above. See Figure 1.1.1 for its structure.

1.1.2 Gate Valve
Gate valves are also called a sluice valve. The disc in the body moves up and down to control the flow from the pipe. Gate valves are usually used for large sizes because their fluid resistance and the operation force are lower compared with those of globe valves. See Figure 1.1.2 for its structure.

1.1.3 Check Valve
Check valves are also called a non-return valve and used to prevent backflow. A lift type is usually used for small sizes and a swing type is used for large sizes. See Figure 1.1.3 for its structure.
Figure 1.1.1 Globe Valve

KITZ CORPORATION
1.2 Bonnet Type
Pressure Seal Bonnet

A pressure seal bonnet type is suitable for high-pressure valves and large size valves. There are two types depending on the gasket type.

(1) Sealing is achieved by giving upward force generated by the internal pressure to the wedge-shaped gasket. See Figure 1.2 (With wedge-shaped metal gasket) for the structure.

(2) Sealing is achieved by giving upward force generated by the internal pressure to the ring-shaped graphite gasket (expanded graphite). See Figure 1.2 (With graphite gasket) for the structure.
Pressure Seal Bonnet Type

- with wedge-shaped metal gasket
- with graphite gasket

Figure 1.2 Bonnet Type
1.3 Stem Type

There are two types of stem.

1.3.1 Outside Screw and Yoke, Rotating Stem Type

The threaded portion of the stem is on the outside so that the stem does not contact with the fluid. The stem rotates when it moves up or down by handwheel operation. See Figure 1.3 for its structure.

1.3.2 Outside Screw and Yoke, Non-Rotating Stem Type

The threaded portion of the stem is on the outside so that the stem does not contact with the fluid. The stem does not rotate when it moves up or down by handwheel operation. See Figure 1.3 for its structure.

1.4 Operation Method

1.4.1 Manually Operated Handwheel Type

See Figure 1.4.1 for its structure.

1.4.2 Reduction Gear Type

This type is used to reduce the operation force. See Figure 1.4.2 for its structure.

1.4.3 Air Motor Type

An air motor is equipped to the reduction gear to reduce the operation force. See Figure 1.4.3 for its structure.

1.4.4 Electric Motor Type

Operation by an electric motor is suitable for automatic operation, remote operation and labor saving. See Figure 1.4.4 for its structure.
Outside Screw and Yoke, Rotating Stem Type

Outside Screw and Yoke, Non-Rotating Stem Type

Figure 1.3 Stem Type
2. Installation

2.1 Precautions before Installation

(1) Valves shall be stored in a dry and clean room at the appropriate temperature. Take measures to prevent dew condensation.

(2) When outdoor storage is unavoidable, place the valve on a rack at least 50 cm above the ground and protect the valve with a waterproof and sand prevention sheet.

(3) After unpacking the package of valve, check the valve for any damage.

(4) The protective equipment on the valve ends shall not be removed until just before the installation.

(5) After the protective equipment is removed from the valve, check the welding bevel for any damage.

2.2 Installation to Piping

(1) Check the marking indicated on the valve body such as cast letters, stamped marks and the specifications on the nameplate.

(2) Take appropriate measures if any special precautions are indicated on the tag plate.

(3) Install the valve properly according to the specified flow direction.

(4) Check the inside of the pipe and remove foreign objects if there is any.

(5) Installation of welding end type valve

a) Perform welding operation, pre-heat treatment and post-heat treatment with the valve partially open after the installation has been completed.

b) The area for welding, pre-heating and post-heating shall be limited to the minimum.

c) Perform welding and heat treatment procedures according to the specified procedures.
(6) Valve Mounting Direction

Valve mounting direction may affect the valve function. Install the valve as follows.

a. Globe valves and gate valve
Install the valve vertically in the horizontal piping. Upside down installation shall be avoided.

b. Swing type check valve
Install the valve vertically, with the valve cover on the upper side, in the horizontal piping. When the valve is installed in the vertical piping, the flow direction shall be upwards.

c. Electric motor device
Install the electric motor device horizontally with the switch cover on the upper side. Upside down installation shall be avoided.

(7) Maintenance and Operation Space

Ensure a space necessary for maintenance and operation as follows.

a. Approximately 1 meter in circumference and sufficient space in the vertical direction for lifting.

b. Passage accessible by at least two operators and a secure foothold.

c. Permanent or temporal foothold and hanging hook for chain block for a valve installed in a high place

(8) Thermal Insulation

a. Thermal insulation which may cause a trouble for disassembly of the valve shall be avoided.

b. Outer circumference of the gland packing box shall not be thermally insulated. Rise of packing temperature shall be avoided.
2.3 Confirmation before Operation

(1) If pipe flushing is not performed properly, foreign objects remaining in the pipeline may damage the valve. Flush the valve and the pipeline and close the valve completely. If any leakage is found, disassemble the valve and remove the foreign objects. Lapping is required if the disc is damaged.

(2) Check that there is no looseness in the bolts such as bonnet bolts and yoke bolts.

(3) For motor operated valves, check the wiring of the terminal box with the wiring diagram.

(4) For electric motor operated valves, turn on and turn off the open-close switch on the control panel. Manual operation can be performed after switching to the "manual operation".

(5) Motor operated valves can be installed without any adjustment because they are adjusted at the factory. However, after wiring is performed on the valve, manually open the valve to the half-open position and check the correct movement of the valve disc by pressing the valve open/close button.

(6) The valve closes when the handle is turned clockwise. Do not apply any excessive torque by using a tool when closing a valve.

(7) Some of the manually operated gate valves and reduction gear type gate valves have a stopper at the upper part of the stem in order to prevent biting of the disc.

(8) When the valve has a limit switch, check that the limit switch is properly wired.

(9) The operation position of the manually operated valve with a limit switch is adjusted before shipment. Confirm that the limit switch turns on and off correctly after wiring is performed.
**⚠️ Warning**

- Clockwise turning of the handwheel closes the valve and counterclockwise turning opens the valve. Do not turn the handwheel to the wrong direction.

- Do not replace or add any packing while the valve is pressurized.

- All of the bolts are right-handed screws. Bolts shall be turned clockwise for tightening.
1 Valve Operation

1.1 General Information

1.1.1 Lubrication

1.1.2 Gland Packing

1.1.3 Discharge of Residual Fluid

1.1.4 Back Seat

1.2 Valve Operation

1.2.1 Globe Valve

1.2.2 Gate Valve

1.2.3 Check Valve

2 Precautions for Operation

2.1 Retightening of Gland Packing

2.1.1 Appropriate Time for Retightening

2.1.2 Retightening Procedures

2.2 Retightening of Pressure Seal Gasket

2.2.1 Pressure Seal Gasket

2.2.2 Retightening

2.3 Precautions for Valve Operation

2.3.1 Globe Valve

2.3.2 Gate Valve

2.4 Precautions for Operation of Motor Operated Valve

2.5 Precautions for Operation of Air Motor Valve

3 Troubleshooting

3.1 Defective Phenomenon and Countermeasures

3.1.1 Defect of Valve

3.1.2 Defect of Electric Motor Device

3.1.3 Defect of Air Motor
1. Valve Operation

1.1 General Information

1.1.1 Lubrication

Lubricate the valve regularly for a smooth valve operation and prolonging the service life of the threaded portion, bearing and drive unit.

(1) Stem threaded portion

Remove any dust from the threaded portion of the stem before lubrication.

See Attachment 2 for lubrication procedures and the grease type to be applied.

(2) Reduction gear and Electric Motor Device

Grease is used for lubrication of the inside of the gear device.

Check the reduction gear regularly and replenish or replace the grease properly. See Attachment 3 for the procedures and the grease type.

(3) Air Motor

Inject the spindle oil #60 into the oiler attached to the air piping before or after using the air motor.
1.1.2 Gland Packing

(1) Use the gland packing equivalent to or greater than those shown in Table 1.1.2.

<table>
<thead>
<tr>
<th>Product No.</th>
<th>Material</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>P#6710</td>
<td>Combination</td>
<td></td>
</tr>
<tr>
<td>P#6610 or P#6616</td>
<td>Expanded graphite</td>
<td>Nippon Pillar Co.</td>
</tr>
</tbody>
</table>

See the valve assembly drawing or the packing list for the number of packing to be installed, dimensions and combinations.

(2) Packing may reduce the volume and tightening force during use, leading to leakage. Follow the instructions below.

(a) Retighten the packing with the specified torque before operation and after the temperature is raised.

(b) Overtightening shall be avoided. It will make the operation difficult or shorten the product life.

(c) Retighten the packing immediately when leakage is found. See 2.1 for retightening of packing.

1.1.3 Discharge of Residual Fluid

Discharge residual fluid from the pipe during the warm-up operation. Residual fluid may cause the following.

(1) Water hammer phenomenon
(2) Excessive pressure rise of gate valve
(3) Leakage from gasket section or valve seating section due to temperature gradient

1.1.4 Back seat

Back seat is provided to protect gland packing, but it is difficult to keep the sealing performance permanently.

It is very dangerous to replace the packing by using a function of the back seat. Do not replace the packing while the valve is being operated.
1.2 Operation of Valve

KITZ valves are closed by turning the handwheel clockwise and open by turning the handwheel counterclockwise. Open/Close direction is indicated on the handwheel.

1.2.1 Globe Valve

(1) Manually operated valves of small sizes have either a rotating stem or a non-rotating stem.

(2) Manually operated valves of large sizes have a non-rotating stem.

(3) Valves which require a high operating force have a hammer blow type handwheel.

(4) Valves with reduction gear have a non-rotating stem.

(5) Motor operated valves have a non-rotating stem. Manual operation is available after setting the switch lever to "manual operation".

1.2.2 Gate Valve

(1) All of gate valves have a non-rising stem.

(2) Valves which require a high operating force are equipped with reduction gear.

(3) Manual operation of motor operated valve is available after setting the switch lever to "manual operation".

1.2.3 Check Valve

Swing type check valves are open depending on the flow volume and closed when backflow occurs.
2. Precautions for Operation

**Caution:**
- Retighten the gland packing (before starting the operation and after increasing the temperature and/or pressure).
- Do not overtighten the gland packing.
- Do not overtighten the valve seat.
- Gate valves shall be used either in the fully closed position or in the fully open position.
- Do not unnecessarily change the switch setting of motor operated valves.
- When the valve seat of a motor operated and position seated gate valve is retightened for a hydraulic test, put the valve back manually to the 0% valve opening position after the test.
- After the air motor is used, set the air-supply handle to "stop".

2.1 Retightening of Gland Packing

2.1.1 Appropriate Time for Retightening

1. **Before starting operation**
   Sealing performance of packing is decreased due to a long period of storage (stress relaxation). Decrease of temperature and/or pressure also lowers the valve sealing performance. Retighten the gland packing before valve operation.

2. **Hydraulic test of pipeline**
   When a hydraulic test is performed on the pipeline and leakage is found, retighten the gland packing immediately. If leakage is not solved, replacement of the packing is required.

3. **Increase of temperature/pressure**
   Reduction of surface pressure due to thermal reduction of packing may cause leakage. Immediately retighten the packing when any leakage is found. Retightening of the packing at this point is very effective to prevent leakage during operation. Retightening of other related valves at this stage is recommended.

4. **During operation**
   Regularly check any leakage. If leakage is found, immediately retighten the nuts for gland.
2.1.2 Retightening Procedures

(1) Gland bolt nuts shall be tightened alternately and evenly.

(2) Refer to Table 2.1.2-1 “Tightening Torque of Gland Bolts”.

(3) Use a torque wrench for tightening. When a torque wrench cannot be used, refer to Table 2.1.2-2 “Tightening Torque by Spanner”.

(4) Overtightening shall be avoided.

(5) Replacement or addition of packing is required if the gland is inserted too deeply and the packing tightening margin is reduced.

(6) Excessive pressure shall not be applied to the packing.

   a) Close the valve if the internal pressure can be reduced to the atmospheric pressure with the valve in the fully closed position and if there is no problem.

   b) If there is a problem and the valve cannot be closed, or if the internal pressure cannot be reduced to the atmospheric pressure when the valve is fully closed, use a back seat function and open the valve.

(7) When leakage does not stop even after retightening, additional retightening shall be very carefully carried out.

(8) Check for leakage after retightening the packing. If leakage still occurs after retightening, replace the packing.

See “W-3.1.1 for packing replacement procedures.”

[Warning]

- Addition or replacement of packing shall be performed when the internal pressure is reduced to the atmospheric pressure.
- It is very dangerous and therefore prohibited to add or replace packing by using a back seat function while the valve is being operated.
Table 2.1.2-1 Tightening Torque of Gland Bolts (1/6)

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Size (inch)</th>
<th>Gland Bolt Size</th>
<th>Tightening Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M10</td>
<td></td>
<td>7.9</td>
</tr>
<tr>
<td></td>
<td>M10</td>
<td></td>
<td>13.8</td>
</tr>
<tr>
<td></td>
<td>M12</td>
<td></td>
<td>17.7</td>
</tr>
<tr>
<td></td>
<td>M12</td>
<td></td>
<td>18.7</td>
</tr>
<tr>
<td></td>
<td>M12</td>
<td></td>
<td>21.6</td>
</tr>
<tr>
<td></td>
<td>M16</td>
<td></td>
<td>27.5</td>
</tr>
<tr>
<td></td>
<td>M16</td>
<td></td>
<td>39.3</td>
</tr>
<tr>
<td></td>
<td>M20</td>
<td></td>
<td>72.6</td>
</tr>
<tr>
<td></td>
<td>M20</td>
<td></td>
<td>82.4</td>
</tr>
<tr>
<td></td>
<td>M22</td>
<td></td>
<td>146</td>
</tr>
<tr>
<td></td>
<td>M24</td>
<td></td>
<td>178</td>
</tr>
<tr>
<td></td>
<td>M24</td>
<td></td>
<td>178</td>
</tr>
<tr>
<td></td>
<td>M24</td>
<td></td>
<td>198</td>
</tr>
<tr>
<td></td>
<td>M24</td>
<td></td>
<td>25.5</td>
</tr>
<tr>
<td></td>
<td>M12</td>
<td></td>
<td>10.7</td>
</tr>
<tr>
<td></td>
<td>M16</td>
<td></td>
<td>17.6</td>
</tr>
<tr>
<td></td>
<td>M16</td>
<td></td>
<td>22.5</td>
</tr>
<tr>
<td></td>
<td>M12</td>
<td></td>
<td>25.4</td>
</tr>
<tr>
<td></td>
<td>M16</td>
<td></td>
<td>28.4</td>
</tr>
<tr>
<td></td>
<td>M16</td>
<td></td>
<td>36.2</td>
</tr>
<tr>
<td></td>
<td>M20</td>
<td></td>
<td>52.9</td>
</tr>
<tr>
<td></td>
<td>M20</td>
<td></td>
<td>97.0</td>
</tr>
<tr>
<td></td>
<td>M20</td>
<td></td>
<td>- 110</td>
</tr>
<tr>
<td></td>
<td>M22</td>
<td></td>
<td>- 194</td>
</tr>
<tr>
<td></td>
<td>M24</td>
<td></td>
<td>- 237</td>
</tr>
<tr>
<td></td>
<td>M24</td>
<td></td>
<td>- 237</td>
</tr>
<tr>
<td></td>
<td>M24</td>
<td></td>
<td>- 262</td>
</tr>
<tr>
<td></td>
<td>M24</td>
<td></td>
<td>- 262</td>
</tr>
</tbody>
</table>

Note: The lower limit of the tightening torque in the table above is applied when the valve is still new and the friction coefficient of the nut contact surface is low. When bolts are retightened at site, apply the upper limit value, considering the possible formation of rust.
## Table 2.1.2-1 Tightening Torque of Gland Bolts (2/6)

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Class</th>
<th>Size (inch)</th>
<th>Gland bolt Size</th>
<th>Tightening Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1500</td>
<td>1/2 M16</td>
<td>37.3</td>
<td>49.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3/4 M16</td>
<td>37.3</td>
<td>49.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 M16</td>
<td>40.2</td>
<td>53.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 1/4 M20</td>
<td>57.9 - 77.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 1/2 M20</td>
<td>70.6</td>
<td>93.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 M22</td>
<td>106</td>
<td>141</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 1/2 M20</td>
<td>91.2 - 122</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 M22</td>
<td>119 - 158</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 M20</td>
<td>120 - 159</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 M22</td>
<td>151 - 201</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 M24</td>
<td>219 - 291</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 M24</td>
<td>288 - 382</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The lower limit of the tightening torque in the table above is applied when the valve is still new and the friction coefficient of the nut contact surface is low. When bolts are retightened at site, apply the upper limit value, considering the possible formation of rust.
Table 2.1.2-1 Tightening Torque of Gland Bolts (3/6)

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Class</th>
<th>Size</th>
<th>Gland Bolt Size</th>
<th>Tightening Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Globe Valve</td>
<td>2500</td>
<td>4</td>
<td>M22</td>
<td>142 - 191</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>M12</td>
<td>21.6 - 29.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 1/2</td>
<td>M12</td>
<td>22.8 - 30.4</td>
</tr>
<tr>
<td>Wedge Gate Valve</td>
<td>900</td>
<td>3</td>
<td>M12</td>
<td>32.8 - 43.7</td>
</tr>
</tbody>
</table>

Note: The lower limit of the tightening torque in the table above is applied when the valve is still new and the friction coefficient of the nut contact surface is low. When bolts are retightened at site, apply the upper limit value, considering the possible formation of rust.

Table 2.1.2-1 Tightening Torque of Gland Bolts (4/6)

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Class</th>
<th>Size</th>
<th>Gland Bolt Size</th>
<th>Tightening Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>M12</td>
<td>34.5 - 46.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>M16</td>
<td>65.8 - 87.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>M20</td>
<td>137 - 182</td>
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<tr>
<td></td>
<td></td>
<td>10</td>
<td>M20</td>
<td>143 - 191</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>M20</td>
<td>158 - 210</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14</td>
<td>M20</td>
<td>158 - 210</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16</td>
<td>M20</td>
<td>175 - 233</td>
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<td></td>
<td></td>
<td>18</td>
<td>M24</td>
<td>282 - 375</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>M24</td>
<td>282 - 375</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24</td>
<td>M30 (P3)</td>
<td>366 - 488</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 1/2</td>
<td>M12</td>
<td>24.6 - 32.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>M12</td>
<td>29.5 - 39.5</td>
</tr>
</tbody>
</table>

Note: The lower limit of the tightening torque in the table above is applied when the valve is still new and the friction coefficient of the nut contact surface is low. When bolts are retightened at site, apply the upper limit value, considering the possible formation of rust.
### Table 2.1.2-1 Tightening Torque of Gland Bolts (5/6)

<table>
<thead>
<tr>
<th>Valve Type Class</th>
<th>Size</th>
<th>Gland Bolt Size</th>
<th>Tightening Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wedge Gate Valve 1500</td>
<td>6 M16</td>
<td>69.4 - 92.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 M16</td>
<td>75.8 - 101</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 M16</td>
<td>88.3 - 117</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 M20</td>
<td>160 - 213</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14 M20</td>
<td>177 - 236</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16 M22</td>
<td>210 - 280</td>
<td></td>
</tr>
<tr>
<td></td>
<td>18 M24</td>
<td>322 - 429</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 M24</td>
<td>322 - 429</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24 M30</td>
<td>457 - 610</td>
<td></td>
</tr>
</tbody>
</table>

Note: The lower limit of the tightening torque in the table above is applied when the valve is still new and the friction coefficient of the nut contact surface is low. When bolts are retightened at site, apply the upper limit value, considering the possible formation of rust.
### Table 2.1.2-1 Tightening Torque of Gland Bolts (6/6)

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Class</th>
<th>Size</th>
<th>Gland Bolt Size</th>
<th>Tightening Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N-m</td>
</tr>
<tr>
<td>Wedge Gate Valve</td>
<td>2500</td>
<td>2</td>
<td>M16</td>
<td>35.3 - 47.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.5</td>
<td>M12</td>
<td>29.6 - 39.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>M12</td>
<td>35.5 - 47.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>M12</td>
<td>35.5 - 47.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>M16</td>
<td>75.8 - 101</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>M16</td>
<td>88.3 - 117</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>M20</td>
<td>160 - 213</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>M20</td>
<td>177 - 236</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14</td>
<td>M22</td>
<td>210 - 280</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16</td>
<td>M24</td>
<td>337 - 449</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18</td>
<td>M30 (P3)</td>
<td>470 - 627</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>M30 (P3)</td>
<td>470 - 627</td>
</tr>
</tbody>
</table>

*Note: The lower limit of the tightening torque in the table above is applied when the valve is still new and the friction coefficient of the nut contact surface is low. When bolts are retightened at site, apply the upper limit value, considering the possible formation of rust.*
### Table 2.1.2-2 Tightening Torque Applied by Spanner

<table>
<thead>
<tr>
<th>Bolt Size</th>
<th>Spanner Size (Width x Length)</th>
<th>Tightening Torque N·m (with one hand)</th>
<th>Operating Force N·m</th>
</tr>
</thead>
<tbody>
<tr>
<td>M16</td>
<td>24 x 220</td>
<td>75.6 - 107</td>
<td>123 - 152</td>
</tr>
<tr>
<td>M20</td>
<td>30 x 270</td>
<td>98.1 - 137</td>
<td>157 - 196</td>
</tr>
<tr>
<td>M22</td>
<td>32 x 285</td>
<td>108 - 152</td>
<td>173 - 215</td>
</tr>
<tr>
<td>M24</td>
<td>36 x 320</td>
<td>123 - 171</td>
<td>197 - 245</td>
</tr>
<tr>
<td>M30</td>
<td>46 x 400</td>
<td>157 - 220</td>
<td>250 - 313</td>
</tr>
<tr>
<td>M36</td>
<td>55 x 470</td>
<td>192 - 269</td>
<td>304 - 382</td>
</tr>
<tr>
<td>M42</td>
<td>65 x 550</td>
<td>226 - 313</td>
<td>363 - 451</td>
</tr>
</tbody>
</table>

**Note:**
1. Calculation Formula of Torque Value:

   \[
   \text{Torque} = \text{Operating force} \times \text{Distance from the point of a lever where force is applied to the bolt center}
   \]

2. JIS B4630 round type single head spanner is applied.

3. Some margins are given to the operating force which varies depending on the operating conditions.

4. When a spanner is pulled in a quick and repetitive motion using both hands, the upper tightening torque shall be applied.

5. When tightening is carried out by two personnel, the tightening force is doubled.
2.2 Retightening of Pressure Seal Gasket

2.2.1 Pressure Seal Gasket

The gaskets shown below are used. The same or equivalent level of gasket shall be used.

- Wedge-shaped metal gaskets
  - P1502 (Nippon Pillar Co.)
  - Hardness: HB 90 or below (Indicated as a soft iron in the drawing)

- Graphite gasket
  - P6690-T (Nippon Pillar Co.)

See the valve assembly drawing or the packing list for the dimensions suitable for each valve size.

2.2.2 Retightening

1. Bolts may be loosened and leakage may occur when the pressure is increased after replacing the gaskets. Retighten the bolts after the pressure is increased.

2. When the valve operation is stopped, the bolts may be loosened. Retighten the bolts before increasing the pressure.

3. Maintenance of graphite gaskets are not required, but retighten them gently by hand if they are loosened after the pressure or the temperature is raised. (Never overtighten the bolts.)

4. See Table 2.2.2 (Tightening Torque for Bonnet Bolts) for the tightening torque to be applied. The lower limits shown in the table shall be usually applied.

5. Tighten the bolts evenly and alternately in a cross pattern as shown in Figure 2.2.2.

6. Replace the gaskets with the new one if the leakage does not stop after retightening.

7. Refer to Maintenance of Pressure Seal Gaskets for details.

### Table 2.2.2 Tightening Torque of Bonnet Bolts

<table>
<thead>
<tr>
<th>Bolt Size</th>
<th>Tightening Torque N-m</th>
</tr>
</thead>
<tbody>
<tr>
<td>M20</td>
<td>197 - 294</td>
</tr>
<tr>
<td>M22</td>
<td>255 - 382</td>
</tr>
<tr>
<td>M24</td>
<td>334 - 500</td>
</tr>
<tr>
<td>M30</td>
<td>667 - 1000</td>
</tr>
<tr>
<td>M36</td>
<td>1177 - 1765</td>
</tr>
</tbody>
</table>

### Fig. 2.2.2

Bolt Tightening Sequence
2.3. Precautions for Valve Operation

2.3.1 Globe Valve

(1) Excessive tightening using a supplementary valve handle tool shall be avoided.

(2) Foreign objects may be stuck in the valve seat and obstruct the valve closing operation. In this case, open the valve and blow off the foreign objects and then close the valve. If leakage occurs, disassemble the valve for inspection.

(3) Operate valves in the fully open position to protect the seat surface. Valve operation in the partially open position may damage the valve seat due to erosion, leading to leakage.

(4) When the stem has reached the back seat position, turn the handwheel back by a half turn to the closing direction.

(5) Fully open (100%) position of motor operated valves is the position before reaching the back seat position. If the stem has reached the back seat position, turn back the stem position where the valve position meter indicates the 100% open position.

(6) Fully closed position of motor operated valves is the position where a valve position meter indicates 0%. Excessive tightening shall be avoided.
2.3.2 Gate Valve

(1) Gate valves shall be used in the fully open position or in the fully closed position. If gate valves are used in the slightly or half-open position, vibration generated by a vortex flow in the back of the disc may damage the guide area and valve seat. Erosion of the valve seat may also occur.

(2) Overtightening of the handwheel using a valve handle tool shall be avoided.

(3) A stopper may be equipped to the valves equipped with reduction gear or to manually operated valves. The clearance between the stopper and the sleeve is adjusted between 1.5 mm and 2 mm in the fully closed position.

(4) Foreign objects may be stuck in the valve seat and obstruct the valve closing operation. In this case, open the valve and blow off the foreign objects and then close the valve. If leakage does not stop, disassemble the valve for inspection.

(5) When the temperature is raised with the valve in the fully closed position, the disc may bite into the valve seat due to thermal expansion of the stem and the valve cannot be open. For the gate valves used for steam piping, fully close the valve and then slightly turn the handwheel to the open direction to raise the stem approximately 1mm.

(6) When the stem of the manually operated valve has reached the back seat position in the fully open direction, turn back the handwheel by half turn to the closing direction. When a valve position meter is equipped to the valve, adjust the valve to the position where the valve position meter indicates "OPEN".

See Table 2.3.2 for the handwheel reverse rotation of the valves with reduction gear.

<table>
<thead>
<tr>
<th>Reduction Gear Type</th>
<th>Reduction Ratio</th>
<th>Return Amount (Turns)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA-1</td>
<td>4.11</td>
<td>2</td>
</tr>
<tr>
<td>BA-2</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>BA-3</td>
<td>9</td>
<td>4.5</td>
</tr>
<tr>
<td>BA-4</td>
<td>10</td>
<td>5.0</td>
</tr>
<tr>
<td>Combination of BA-4 and BA-1</td>
<td>10 ~ 4.11</td>
<td>20</td>
</tr>
<tr>
<td>Combination of BA-4 and BA-2</td>
<td>10 ~ 6</td>
<td>30</td>
</tr>
</tbody>
</table>

Kitz Corporation
2.4 Precautions for Operation of Motor Operated Valve

(1) Inching operation is not permitted.
(2) Do not change the setting of torque switch and geared limit switch unnecessarily.
(3) Do not use the switch lever during operation. It may give an impact to the valve, leading to a failure of the switching mechanism.
(4) Do not turn the handwheel excessively by using a valve handle tool.
(5) When the valve seat of the position seated gate valve is retightened during a hydraulic test, turn the handwheel back to the 0 % open position after the test. For the number of turning of the handwheel, see the nameplate.
(6) When the frequency of the valve open/close operation is very low, operate the valve taking care not to give a bad effect to other devices in the plant and check that the valve operates properly. Switching between the electric power operation and manual operation shall be also checked.

2.5 Precautions for Operation of Air Motor Valve

(1) Discharge residual fluid and foreign materials from the air piping connected to the air motor.
(2) Return the air supply lever to the "Stop" position after using the air motor.
(3) The open/close operation by air motor shall be limited only to or from the half open position. Fully open operation shall be performed using the handwheel.
(4) When the operation is stopped while closing or opening the valve, immediately turn off the air motor.
(5) Air to be supplied to air pipes shall be clean and dry.
(6) It is recommended to inject the #60 spindle oil into the oiler before and after the air motor is used.
(7) Do not apply any excessive force to the manually operated valve by using a valve handle tool to open or close the valve.
### 3. Troubleshooting

#### 3.1 Defective Phenomenon and Countermeasures

<table>
<thead>
<tr>
<th>Phenomenon</th>
<th>Cause</th>
<th>Countermeasures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Leakage</strong></td>
<td>from valve seat</td>
<td>Foreign materials, Erosion, Deterioration of seat material</td>
</tr>
<tr>
<td><strong>Leakage</strong></td>
<td>from packing</td>
<td>Improper maintenance, Lack of tightening, Deterioration of packing</td>
</tr>
<tr>
<td><strong>Leakage</strong></td>
<td>from pressure seal gasket</td>
<td>Lack of tightening, Scratch on the gasket or gasket contact surfaces</td>
</tr>
<tr>
<td></td>
<td>Excessive tightening of gland packing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Improper lubrication to the stem threaded portion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heavy manual operation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operation failure</strong></td>
<td>Galling of sliding parts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chattering</td>
<td>Check valve</td>
</tr>
</tbody>
</table>
### 3.1.2 Defect of Electric Motor Device

| Motor does not stop even if the torque switch is activated. | Reverse-phase operation  | Manually operate the valve to the half open position and correct the wiring. |
| Motor operation is not available. | Deformation of the tripper locking pin because of incorrect handling of the declutch lever. | Replace the locking pin. |
| Excessive pushing of the handwheel shaft during installation procedure. | Over tightening of the gland packing | Loosen the packing and retighten it with proper torque. |
| Excessive pushing of the handwheel shaft during installation procedure. | Inadequate lubrication of the stem threaded portion | Clean the stem threaded portion and apply recommended grease. |
| Heavy manual operation | Defect of the valve internal parts | Overhaul the valve. |
| Insulation failure | Intrusion of water (improper sealing of the wire inlet) | Detect the water leak point and repair it. Keep the motor, switches and the wire inlet dry. |
| Loosening of the set screws of the receiver and the gear shaft. | Failure of the power supply | Check the power supply with a tester. |
| Failure of remotely operated valve position meter | Burnout of the selsyn or potentiometer | Check the conversion resistance value (reference value). |
| Maladjustment or wear of the tripper (Clicking sound is heard) | Wear of the clutch lug | Disassemble the valve and replace the clutch. |
| Wear of the stem nut (The position meter is operable) | Valve is not activated while the motor is working. | Remove the spring cartridge cap and adjust the handle shaft position. |
| The stem is activated abruptly at the time of startup. | Inadequate tightening or loosening of the stem lock nut. | Remove the stem cover or plug and securely tighten the lock nut and crimp it with the valve slightly open (10%). |
3.1.3 Defect of Air Motor

Defect Cause
Countermeasures

No air supplied. Check the air supply system.

Decrease of air pressure Check the air pressure.

No activation of air motor Failure of the air motor. Overhaul the air motor.

Inadequate lubrication of the stem threaded portion Clean the stem threaded portion and apply grease.

Adhesion of foreign materials to the stem threaded portion or in the valve
If the valve cannot be open by manually operating the handwheel, overhaul the valve.

Operation stop of air motor during open and close operation
Defect of valve parts Overhaul the valve.
Warning

Check the following before disassembly:

1. Ensure the valve is designated for maintenance.
2. Verify the internal pressure has been reduced to atmospheric pressure.
3. Confirm the power supply is turned off.
4. Confirm the air supply is turned off.
Contents
1. Inspection
   1.1 Daily Inspection
   1.2 Periodic Inspection
      1.2.1 General Information
      1.2.2 Inspection of parts
2. Disassembly and Reassembly
   2.1 General Information
      2.1.1 Preparation before Disassembly
      2.1.2 Precautions for Disassembly
   2.2 Disassembly
      2.2.1 Typical Structure
      2.2.2 Other Types of Valves
   2.3 Maintenance
   2.4 Reassembly
3. Maintenance
   3.1 Replacement of Parts
      3.1.1 Packing
      3.1.2 Gasket
   3.2 Lapping of Valve Seat
      3.2.1 Tools for Lapping
      3.2.2 Method of Lapping
      3.2.3 Lapping Portion
      3.2.4 Inspection
      3.2.5 Cleaning
4. Long-Term Storage

4.1 Storage

4.1.1 Storage of Delivered Product (Packed and Unused Product)

4.1.2 Storage after Installation

4.2 Inspection during Storage

4.3 Inspection after Long-Term Storage

4.4 Inspection before Operation

5. Tool List

5.1 Tools for Disassembly and Reassembly

5.2 Tools for Measurement

5.3 Tools for Lapping
1. Inspection

1.1 Daily Inspection
Check the items shown below during operation. When any abnormality is found, take appropriate measures immediately.

(1) Leakage from the gland area
(2) Leakage from the gasket area
(3) Valve opening and closing operation
(4) Lubrication on the stem threaded portion
(5) Abnormal sound
(6) Abnormal vibration
(7) Oil leakage from the motor operated device

1.2 Periodic Inspection

1.2.1 General Inspection
Check the following at least every six month.

(1) Loosening of bolts and nuts
Bolts for the pressure seal gasket area may be loosened when the valve operation is stopped. Make sure to retighten the bolts before raising the pressure. However, graphite gaskets shall not be overtightened. Gently tighten them.

(2) Grease on stem threaded portion
Remove the plug or the stem cover from the top of the electric motor device of the motor operated valve and lubricate the stem threaded portion with an appropriate volume of the grease (see III-1.1.1).

(3) Grease on non-rotating type stem
Apply grease to the threaded portion of the stem and replenish the grease from the grease nipple by using a grease gun (see III-1.1.1).

(4) Grease inside electric motor device
Remove the plug and check the grease inside the electric motor device. Replenish or replace the grease as required (see ‡V-1.1.1).
1.2.2 Inspection of Parts

Visual inspection of the outer parts can be performed along with the daily inspection of the facility. For the internal parts, overhaul the valve periodically and inspect the parts for abnormality and deterioration. Inspection results shall be recorded in the inspection sheet in Attachment 1 and keep the inspection sheets in preparation for parts replacement or purchase.

(1) Major parts (valve body, bonnet/cover, disc, valve seat)

Check the valve for the following items by performing a visual inspection, liquid penetration test or dimension test and record the results in the inspection sheet. Re-evaluation of the valve structure may be required if damage by erosion and cavitation is serious.

a) Decrease in thickness of the flow passage section
b) Cracks
c) Erosion
d) Body/Bonnet and gasket contact surfaces
e) Internal surface of the packing box

(2) Sealing parts

Sealing parts are likely to deteriorate over time. Replace the sealing parts regularly in the time interval as shown below, or every time after the valve is disassembled.

a) Gasket
   1) Spiral wound gasket: 3 ~ 4 years
   2) Seal ring: 4 ~ 6 years
   3) Graphite gasket: See Table 1.2.2 "Durability of graphite Gasket"

b) Packing: 2 years

c) O ring
   1) Sliding section: 2 years
   2) Stationary section: 3 years

Table 1.2.2 "Durability of graphite Gasket"

<table>
<thead>
<tr>
<th>Gasket Type</th>
<th>Durability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spiral wound</td>
<td>3 ~ 4 years</td>
</tr>
<tr>
<td>Seal ring</td>
<td>4 ~ 6 years</td>
</tr>
<tr>
<td>Graphite</td>
<td>See Table 1.2.2</td>
</tr>
</tbody>
</table>

2 years

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Table 1.2.2 Durability of Graphite Gasket

<table>
<thead>
<tr>
<th>Fluid Temperature</th>
<th>Carbon steel</th>
<th>1Cr-0.5Mo Steel</th>
<th>2.5Cr-1Mo Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>427°C or below</td>
<td>Open/Close</td>
<td>Operation</td>
<td>Frequency</td>
</tr>
<tr>
<td>540°C or below</td>
<td>Shell Material</td>
<td>Number of Temperature Change (per year)</td>
<td>Stainless steel Frequent stop 6 years 3 years 2 years</td>
</tr>
<tr>
<td>593°C or below</td>
<td>High 450 or less 5 years 3 years 2 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Normal 200 or less 6 years 4 years 3 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Continuous operation Low 100 or less 7 years 5 years 4 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Valve Operation</td>
<td>Frequency</td>
<td>Stainless steel Frequent stop 6 years 3 years 2 years</td>
</tr>
<tr>
<td></td>
<td>Normal 200 or less 6 years 4 years 3 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Continuous operation Low 100 or less 7 years 5 years 4 years</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(3) Other parts (stem, sleeve, arm, spindle, bolt, nut, etc)
Check the parts for the following items by visual inspection or by measuring dimensions and record the results in the inspection sheet.

a. Corrosion
b. Burning/Chipping
c. Wear
d. Rust
e. Damage of screw thread
f. Bend

(4) Reduction gear
(5) Air motor
(6) Electric motor device
Refer to the operation manual of each product.
2. Disassembly and Reassembly

2.1 General Information

Valve performance may be deteriorated due to long-term use of the valve. Disassemble the valve for inspection and reassemble the valve after the inspection.

2.1.1 Preparation before Disassembly

Check the following before disassembly.

1. Work plan and safety measures (operation procedures, number of personnel, necessity of footing and lifting area)
2. Footing and lifting area
3. Tools for disassembly
4. Replacement parts
5. Confirmation of work procedures
6. No residual internal pressure
   Use a pressure gauge to make sure that there is no internal pressure remained in the valve. When an air vent valve or drain valve is installed, open the air vent valve or drain valve to release the pressure.
7. Power supply is turned off.
8. Air supply is turned off.
2.1.2 Precautions for Disassembly

(1) Put matchmarks on the matching parts before disassembling the valve.

(2) Open the valve (1/3 or more) before disassembling the valve.

(3) Take appropriate measures to prevent intrusion of foreign materials into the pipeline.

(4) Keep the small parts separately to prevent being mixed with other parts.

(5) Remove the gaskets carefully from the seat not to damage the gasket surfaces.

(6) Pay special attention not to damage the precision finished surfaces:
   a. Disc and stellite overlay surfaces on the valve seat
   b. Back seat section of the stem and sliding surfaces
   c. Inner surface of the guide of needle valve and periphery of disc
   d. Valve body and gasket insertion area on the bonnet/cover
   e. Internal surface of packing box
   f. Threaded surface of the stem

2.2 Disassembly

2.2.1 Typical Structure

A typical structure of a pressure seal bonnet type gate valve is shown in Figure 2.2.1.
Figure 2.2.1 Disassembly and Reassembly of Gate Valve

- Nut for gland bolt
- Washer for gland bolt
- Gland bolt
- Gland plate
- Gland
- Packing
- Bushing
- Bonnet nut
- Bonnet washer
- Bonnet bolt
- Bonnet clamp
- Split ring
- Spacer ring
- Gasket
- Bonnet
- Valve seat
- Body
- Speed reduction device
- Spring washer
- Bolt
- Yoke
- Stem
- Disc
- Valve seat

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2.2.2 Other Types of Valves
Follow the procedures of disassembly, reassembly and maintenance of each type of valves provided in the separately attached sheet.

2.3 Maintenance
Follow the procedures of disassembly, reassembly and maintenance of each type of valves provided in the separately attached sheet.

2.4 Reassembly
Follow the procedures of disassembly, reassembly and maintenance of each type of valves provided in the separately attached sheet.
3. Maintenance

3.1 Replacement of Parts

3.1.1 Packing

(1) Disassemble the stem and remove all the packing. Use a tool dedicated for removal of packing if removal of the stem is not easy. See the tool list in Section 5.

(2) Take care not to damage the stem and the internal surface of the packing box when removing packing.

(3) Clean the inner surface of the packing box and the sliding parts of the stem, and inspect them for any scratch or eccentricity. If any defect is found, repair it or replace with the new one.

(4) Use only the specified packing. (Check the packing with the drawing or packing list.)

(5) Use packing which has been individually molded.

(6) When non-cut packing is used, the packing shall be cut with a sharp cutter so that there is no uneven gap on the cut surface when each packing is installed. When the diameter of the packing is greater than the stem diameter, wind the packing around the rod of which diameter is equal to the stem and carefully cut the necessary length of packing.

(7) Carefully attach the packing to the stem avoiding the overlap of the both ends of the 45-degree bias cut surfaces of the packing.

(8) Install the packing properly so that the cut end of each packing is positioned at every 90 degrees around the stem.

(9) Carefully and evenly install each packing around the stem. Do not tighten all of the packing at one time.

(10) Tighten the bolts evenly and alternately.

(11) Packing tightening force may be lowered due to thermal reduction and passage of time. Retighten the packing as required.
3.1.2 Gasket

(1) Old gaskets may be stuck in the seat surface. Carefully peel off the gaskets taking care not to damage the seat surface.

(2) Remove the gasket carefully not to damage the gasket inserting section on the body and bonnet.

(3) Clean the seat surface and gasket contact surface after removing the gasket, and check them for any scratches.

(4) Use only the specified gasket in the approved drawing or the parts list.

(5) Install new gaskets correctly.

(6) Assemble the body and the bonnet by aligning the matchmarks.

(7) Tighten the bolts evenly and alternately.
3.2 Lapping of Valve Seat

3.2.1 Tools for Lapping

1. Lapping jig
2. Surface plate
3. Sandpaper #80, #120, #220, #400
4. Double-sided adhesive tape
5. Others
   - Cleaning solution, Waste cloth

[Preparation]

Stick double-sided adhesive tape to sandpaper and cut the sandpaper into approximately 25 mm strips.

3.2.2 Method of Lapping

Perform lapping with the #80 sandpaper at first, then #120, #220 and #400 in order.

1. Stick the sandpaper by equally spacing (approx. 50 mm) on the surface plate with a double-sided adhesive tape.
2. Do not apply any excessive force or rotate the precision surface plate for a long time. Otherwise the surface plate will become deformed or generate heat and the double-sided adhesive tape will come off. Lapping time shall be about three minutes when the #80 sandpaper is used, and 30 seconds when the #400 sandpaper is used.
3. Replace the sandpaper with the new one when the sandpaper is worn out.
4. Avoid sudden startup and stop when an air motor is used.
5. Remove the sandpaper from the surface plate after lapping is finished. Always keep the surface plate clean to prevent rust.
3.2.3 Lapping Portion

(1) Globe Valve, Needle Valve, Threaded Type Check Valve

a. Flat Seat

b. Conical Seat

![Fig. 3.2.3-1](image1) ![Fig. 3.2.3-2](image2)

![Fig. 3.2.3-3](image3) ![Fig. 3.2.3-4](image4)
(2) Gate Valve

a. Flange Bonnet

Fig. 3.2.3-5

b. Pressure seal bonnet

Fig. 3.2.3-6

Fig. 3.2.3-7

Fig. 3.2.3-8

Surface plate

Disc

Handle or Actuator

KITCH CORPORATION
(3) Swing Type Check Valve

a. Flanged Bonnet

Fig. 3.2.3-9

b. Pressure Seal Bonnet

Fig. 3.2.3-10

Fig. 3.2.3-11

Fig. 3.2.3-12

Handle or Actuator

Surface plate

Disc

Surface plate

Handle or Actuator

Surface plate

Disc
3.2.4 Inspection

Inspect the lapped surfaces as follows after lapping is finished.

Apply red lead primer thinly and evenly to the seat contact surface of the disc. Temporarily assemble the valve. Then, close the valve lightly and turn the valve back to the open direction. Check that the seat surface is stained evenly with the red lead primer.

3.2.5 Cleaning

Wipe off the red lead primer using cleaning solution and a waste cloth.
4. Long-Term Storage

4.1 Storage

4.1.1 Storage of Delivered Product (Packed and Unused Product)

Even though rust prevention treatment is applied to the valve ends of the inlet and outlet sides, inner and outer surfaces before shipment, a special care such as weather resistant measures is required when valves are stored for a long time.

1. Store valves indoors without putting them directly on the ground.
2. Keep the temperature of the storeroom properly to prevent dew condensation.
3. Put a desiccant such as silica gel in the valve.
4. Remove the packing from the valve to prevent pitting of the stem during storage.
5. Use a volatile rust preventive agent such as ZERUST for the electric motor device.

4.1.2 Storage after Installation

1. Take preventive measures against moisture and rust by charging nitrogen gas in the pipe.
2. Perform the specified wiring work to the electric motor device.
3. Take rust preventive measures for electrical contacts and terminals.
   a. Use of electric space heater
   b. Use of a volatile rust preventive agent such as ZERUST for the electric motor device.

4.2 Inspection during Storage

Regularly (at least every six months) inspect the valve and record the result and countermeasures in the report.

1. Rust formation
2. Measurement of insulation resistance of electric devices
3. Rotation and exposure conditions of electric motor device
4.3 Inspection after Long-Term Storage

After long-term storage, normal operation may not be carried out due to a problem such as rust formation in the sliding and/or rotating section. Overhaul the valve and take appropriate measures as shown below.

1. Replacement with new gasket and packing
2. Application of graphite compound to the threaded portion of bolts and nuts.
3. Application of grease to the threaded portion of the stem.
4. Inspection and maintenance of electrical devices for the items shown below:
   a. Rust
   b. Grease in the gear case
   c. Insulation resistance of electric devices
5. Confirmation of the marking on the valve body and the name plate before installation

4.4 Inspection before Operation

Conduct no-load operation and make sure that the valve operates properly.
### 5. Tool List

#### 5.1 Tools for Disassembly and Reassembly

Use a tool suitable for the valve size.

<table>
<thead>
<tr>
<th>Tool Name</th>
<th>Illustration</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanner</td>
<td><img src="image" alt="Spanner" /></td>
<td>JIS B4630</td>
</tr>
<tr>
<td>Adjustable wrench</td>
<td><img src="image" alt="Adjustable wrench" /></td>
<td>JIS B4604</td>
</tr>
<tr>
<td>Screwdriver</td>
<td><img src="image" alt="Screwdriver" /></td>
<td>JIS B4609</td>
</tr>
<tr>
<td>Cross point screwdriver</td>
<td><img src="image" alt="Cross point screwdriver" /></td>
<td>JIS B4633</td>
</tr>
<tr>
<td>Needle-nose pliers</td>
<td><img src="image" alt="Needle-nose pliers" /></td>
<td>JIS B4631</td>
</tr>
<tr>
<td>Torque wrench</td>
<td><img src="image" alt="Torque wrench" /></td>
<td>JIS B4650</td>
</tr>
<tr>
<td>Plastic hammer</td>
<td><img src="image" alt="Plastic hammer" /></td>
<td></td>
</tr>
<tr>
<td>Tool Name</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hanging bolt for disassembly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packing hook</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tool for back seat retaining ring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exclusive for Class 1500 to 4500 Size 1/2 to 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stop valves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graphite compound</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.2 Tools for Measurement

<table>
<thead>
<tr>
<th>Tool Name</th>
<th>Illustration</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring tape</td>
<td><img src="https://via.placeholder.com/150" alt="" /></td>
<td>JIS B4609</td>
</tr>
<tr>
<td>Caliper</td>
<td><img src="https://via.placeholder.com/150" alt="" /></td>
<td>JIS B7507</td>
</tr>
</tbody>
</table>
5.3 Tools for Lapping

<table>
<thead>
<tr>
<th>Tool Name</th>
<th>Illustration</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lapping jig</td>
<td><img src="image1.png" alt="Lapping jig" /></td>
<td></td>
</tr>
<tr>
<td>Surface plate</td>
<td><img src="image2.png" alt="Surface plate" /></td>
<td>for valve seat</td>
</tr>
<tr>
<td>Surface plate</td>
<td><img src="image3.png" alt="Surface plate" /></td>
<td>for disc</td>
</tr>
<tr>
<td>Sandpaper</td>
<td><img src="image4.png" alt="Sandpaper" /></td>
<td></td>
</tr>
<tr>
<td>Red lead primer</td>
<td><img src="image5.png" alt="Red lead primer" /></td>
<td></td>
</tr>
<tr>
<td>Cleaning solution</td>
<td><img src="image6.png" alt="Cleaning solution" /></td>
<td></td>
</tr>
<tr>
<td>Waste cloth</td>
<td><img src="image7.png" alt="Waste cloth" /></td>
<td></td>
</tr>
</tbody>
</table>
Contents of Attachment

1. Lubrication Procedures of Stem Threaded Portion
2. Lubrication of Drive Unit
3. Maintenance of Pressure Seal Type Gasket (Graphite Gasket)
4. Structure of Pressure Seal Bonnet and Disassembly, Reassembly and Maintenance Procedures
Lubrication Procedures of Stem Threaded Portion
Manually Operated Valve
Motor Operated Valve
Lubrication Procedures of Stem Threaded Portion

Copper alloy is used for female screws (sleeve or stem nut) which are engaged with the stem threaded portion and transmit the turning force. Threaded surfaces may be worn out by the rotating and sliding movement during operation, but lubrication to the threaded portions can slow the process of the wear. In order to prevent a sudden operation stop caused by wear of female screws, threaded portions need to be periodically lubricated. Since the wear of the stem nut threads of a frequently open or closed motor operated valve progresses rapidly, check the wear regularly. Apply or replace grease as required.

When wear of the stem nut is severe, the sliding section of the stem may be badly affected by wear debris and the wear will be rapidly progressed. Check the condition of the stem threaded portion carefully when grease is replenished or the valve is inspected.

<Reference>
See Attachment 2 "Lubrication of Drive Unit" for details of lubrication.

1. Grease Type

Use grease which has a heat-resistance, water-resistance, oxidation stability and mechanical stability with extreme pressure agent added. The grease below is a KITZ standard.

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOBILUX EP-2 Lithium</td>
<td>Exxon Mobil Co.</td>
</tr>
</tbody>
</table>

See Table 1 "List of Applicable Grease" for other applicable greases by different grease manufacturers.
### Table 1: List of Applicable Grease

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Product Name</th>
<th>Soap Base</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exxon Mobil</td>
<td>MOBILUX EP-2</td>
<td>Lithium</td>
<td>KITZ</td>
</tr>
<tr>
<td>Idemitsu Kosan</td>
<td>DAPHNE EPONEX EP-2</td>
<td>Lithium</td>
<td>EPNOC GREASE AP-2</td>
</tr>
<tr>
<td>JX Nippon Oil &amp; Energy</td>
<td>LISONIX GREASE EP-2</td>
<td>Lithium</td>
<td></td>
</tr>
<tr>
<td>Cosmo Oil</td>
<td>COSMO GREASE DYNAMAX EP-2</td>
<td>Lithium</td>
<td></td>
</tr>
<tr>
<td>Showa Shell</td>
<td>ALVANIA GREASE EP-2</td>
<td>Lithium</td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
1. The greases shown in Table 1 are extreme pressure greases with NLGI No. 2, equivalent to the JIS K2220 grease, #2 of class 1 for general purpose or high load.
2. For better adhesive property, the extreme pressure grease with NLGI No. 1 which is equivalent to the JIS K2220 grease, #1 of class 1, can be used instead of the greases in Table 1. However, grease shall be carefully chosen in consideration of the ambient temperature conditions in which the valve is applied. Liquidity of the grease is increased and the grease may flow out to the gland packing side of the stem when the ambient temperature is high.
3. Use of the extreme pressure grease with NLGI No. 2 which is equivalent to the JIS K2220 grease, #2 of class 1 for high load specification, is recommended when the valve (Class 1500 and over) is used for high pressure service or when the valve is installed in a place with high ambient temperature (40°C and over).
4. Combination use of greases with a different soap base does not affect the lubrication performance, but remove the old grease when grease is replenished or replaced.
2. Lubrication

2.1 Replenishment and Replacement Interval of Grease

See Table 2 for the replenishment and replacement interval of grease.

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Nominal Size</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30 or below</td>
<td>60 or below</td>
</tr>
<tr>
<td></td>
<td>5h or below</td>
<td>1 year/4 years</td>
</tr>
<tr>
<td></td>
<td>6h to 10h</td>
<td>2 years/4 years</td>
</tr>
<tr>
<td></td>
<td>150 to 900</td>
<td>2 years/4 years</td>
</tr>
<tr>
<td>Globe Valve</td>
<td>12h to 16h</td>
<td>1 year/2 years</td>
</tr>
<tr>
<td>Gate Valve</td>
<td>20h to 24h</td>
<td>1 year/2 years</td>
</tr>
<tr>
<td></td>
<td>1500 to 4500</td>
<td>1 year/2 years</td>
</tr>
</tbody>
</table>

Contact KITZ when the number of open/close operation is more than those shown in Table 2, or regulating operations other than on/off operation is applied.

Installation of an automatic lubrication device shall be considered for motor operated valves if the valve is critical to the whole system and if a rapid progress of wear of the stem nut threads is predicted.
2.2 Portion to be Lubricated and Method

(a) Rotating Type Stem
(b) Non-Rotating Type Stem
(c) Non-Rotating Type Stem (with thrust washer)
(d) With BA Reduction Gear
(e) With Electric Motor Device
(f) BA Reduction Gear with Secondary Reduction Gear
(g) Electric Motor Device with Secondary Reduction Gear

Figure 1 Section to be Lubricated and Method
2.2 Lubrication of Valve after Installation

(1) Grease may be deteriorated and hardened, or dust may be attached to the stem. Carefully remove them and clean the exposure area of the stem threaded portion. Check the stem threaded portion by referring to Table 5. If any damage is found on the stem, take appropriate measures as required.

(2) Apply grease to the stem threaded portion with a brush. Do not apply excessive amount of grease. See Table 3 for grease application amount.

<table>
<thead>
<tr>
<th>Stem Diameter (mm)</th>
<th>Grease Application Amount (gram) per 25 mm of Stem Threaded Portion</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 or below</td>
<td>0.5 to 10</td>
</tr>
<tr>
<td>22 to 28</td>
<td>0.8 to 1.6</td>
</tr>
<tr>
<td>30 to 36</td>
<td>1.2 to 2.3</td>
</tr>
<tr>
<td>38 to 44</td>
<td>1.8 to 3.5</td>
</tr>
<tr>
<td>46 to 60</td>
<td>2.9 to 5.8</td>
</tr>
<tr>
<td>62 to 80</td>
<td>4.2 to 8.3</td>
</tr>
<tr>
<td>82 to 120</td>
<td>6.7 to 14</td>
</tr>
</tbody>
</table>

(3) Use a grease gun if a grease nipple is equipped to the upper side of the yoke. Apply grease to the bearing area of the female thread by using a grease gun.

(4) Apply grease to the upper part of the stem nut as follows. See Table 4.1 through 4.8 for application amount and section for lubrication.

(a) Remove the plug or the stem cover.

(b) Make sure that there is no dust in the upper section of the stem nut. Remove the dust if there is any.

(c) Apply grease to the upper section of the stem nut.

(d) Attach the plug or the stem cover.

(5) Open and close the valve if possible.

(6) Wipe off the old grease from the bottom area (end of threads) of the stem threaded portion with a clean cloth.
2.4 Lubrication after Disassembly and during Reassembly

(1) Manually Operated Valve and Manually Operated Valve with Reduction Gear

(a) Clean the stem threads and female threads.
(b) Apply grease to the stem threaded portion and female threads.
(c) Assemble the valve.
(d) Wipe off the old grease from the bottom part of the stem with a clean cloth.

(2) Motor Operated Valve (including a motor operated valve with secondary reduction gear)

Refer to Table 4.1 through 4.8 for the application amount

(a) Remove the plug or the stem cover.
(b) Wipe off the old grease from the upper section of the stem nut. If any metal wear debris is found in the old grease, the stem nut threaded portion is worn.
(c) Clean the stem threaded portion and stem nut. Check the stem threaded portion for any damage. Take appropriate measures, such as replacement of the stem, as required.
(d) Apply grease to the stem threaded portion and stem nut.
(e) Install the electric motor device.
(f) Apply the specified amount of grease to the upper part of the stem nut.
(g) Attach the plug or the stem cover.
(h) Open and close the valve.
(i) Wipe off the old grease from the bottom area (chamfered area of the stem threaded portion) of the stem threaded portion with a clean cloth.

For lubrication of electric motor device and manually operated reduction gear, see Attachment gLubrication of Drive Unith.

Wear of stem nut for frequently and electrically operated valves

Progress of wear of the stem nuts used for frequently and electrically operated valves is faster when compared with the stem nuts for other types. Check the condition of wear at the time of periodic inspection and apply grease after wiping off the old grease.
### Table 4.1 Lubrication of Stem Threaded Portion

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Electrically Operated Valve Drive Unit LIMITORQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Type of Drive Unit</td>
<td>SMC-04</td>
</tr>
<tr>
<td>Standard Replenishment Amount of Grease</td>
<td>50g</td>
</tr>
<tr>
<td>Replacement Amount of Grease</td>
<td>50g</td>
</tr>
</tbody>
</table>

**Schematic View**

**Application Method**
- Grease gun

**Replacement of Grease**
- Every 1000 cycles or every 2 years, whichever is earlier
- Remove the plug or the stem cover and perform an inspection every six months. Or apply grease as required.

**Note**
1. Prevent dusts and foreign materials from adhering to the grease application area.
2. Wind seal tape around the threaded portion of the plug or the stem cover and sufficiently tighten the plug/stem cover.
3. Refer to Table 1 "List of Applicable Grease" and select an appropriate type of grease.
4. Apply grease to the shaded portion shown in the schematic view above.

**Diagram**

[Diagram showing stem cover, plug, lock nut, spacer, stem nut, and stem]
### Table 4.2 Lubrication of Stem Threaded Portion

<table>
<thead>
<tr>
<th>Drive Unit Type</th>
<th>SMB-0</th>
<th>SMB-1</th>
<th>SMB-2</th>
<th>SMB-3</th>
<th>SMB-4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard</strong></td>
<td>200g</td>
<td>300g</td>
<td>300g</td>
<td>700g</td>
<td>1300g</td>
</tr>
<tr>
<td><strong>Replacement</strong></td>
<td>200g</td>
<td>300g</td>
<td>300g</td>
<td>700g</td>
<td>1300g</td>
</tr>
</tbody>
</table>

**Note**
1. Prevent dusts and foreign materials from adhering to the grease application area.
2. Wind seal tape around the threaded portion of the plug or the stem cover and sufficiently tighten the plug/stem cover.
3. Refer to Table 1 - List of Applicable Grease and select an appropriate type of grease.
4. Apply grease to the shaded portion shown in the schematic view above.

**Schematic View**

![Schematic View](image-url)
### Table 4.3 Lubrication of Stem Threaded Portion

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Electrically Operated Valve Drive Unit LIMITORQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Type of Drive Unit</td>
<td>SB-000D</td>
</tr>
<tr>
<td>Standard Replacement Amount of Grease</td>
<td>70g</td>
</tr>
<tr>
<td>Replacement Amount of Grease</td>
<td>70g</td>
</tr>
</tbody>
</table>

**Application Method**
- Grease gun

**Replacement of Grease**
- Every 1000 cycles or every 2 years, whichever is earlier

**Replenishment of Grease**
- Remove the plug or the stem cover and perform an inspection every six months. Apply grease as required.

**Note**
1. Prevent dusts and foreign materials from adhering to the grease application area.
2. Wind seal tape around the threaded portion of the plug or the stem cover and sufficiently tighten the plug/stem cover.
3. Refer to Table 1 «List of Applicable Grease» and select an appropriate type of grease.
4. Apply grease to the shaded portion shown in the schematic view above.

---

![Schematic View](image-url)
### Table 4.4 Lubrication of Stem Threaded Portion

<table>
<thead>
<tr>
<th>Product Type of Drive Unit</th>
<th>LIMITORQUE SB-0</th>
<th>LIMITORQUE SB-0D</th>
<th>LIMITORQUE SB-1</th>
<th>LIMITORQUE SB-1D</th>
<th>LIMITORQUE SB-2</th>
<th>LIMITORQUE SB-2D</th>
<th>LIMITORQUE SB-3</th>
<th>LIMITORQUE SB-3D</th>
<th>LIMITORQUE SB-4</th>
<th>LIMITORQUE SB-4D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Replenishment Amount of Grease</td>
<td>200g</td>
<td>300g</td>
<td>300g</td>
<td>700g</td>
<td>1300g</td>
<td>200g</td>
<td>300g</td>
<td>300g</td>
<td>700g</td>
<td>1300g</td>
</tr>
<tr>
<td>Replacement Amount of Grease</td>
<td>200g</td>
<td>300g</td>
<td>300g</td>
<td>700g</td>
<td>1300g</td>
<td>200g</td>
<td>300g</td>
<td>300g</td>
<td>700g</td>
<td>1300g</td>
</tr>
</tbody>
</table>

**Application Method**
- Grease gun

**Replacement of Grease**
- Every 1000 cycles or every 2 years, whichever is earlier

**Replenishment of Grease**
- Remove the plug or the stem cover and perform an inspection every six months. Apply grease as required.

**Note**
1. Prevent dusts and foreign materials from adhering to the grease application area.
2. Wind seal tape around the threaded portion of the plug or the stem cover and sufficiently tighten the plug/stem cover.
3. Refer to Table 1 — List of Applicable Grease — and select an appropriate type of grease.
4. Apply grease to the shaded portion shown in the schematic view above.

![Schematic View](image-url)
Table 4.5 Lubrication of Stem Threaded Portion

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Electrically Operated Valve</th>
<th>Manually Operated Valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive Unit</td>
<td>LIMITORQUE</td>
<td></td>
</tr>
<tr>
<td>Product Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-4</td>
<td>1300g</td>
<td>1300g</td>
</tr>
<tr>
<td>Standard</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
1. Prevent dusts and foreign materials from adhering to the grease application area.
2. Wind seal tape around the threaded portion of the plug or the stem cover and sufficiently tighten the plug/stem cover.
3. Refer to Table 1 "List of Applicable Grease" and select an appropriate type of grease.
4. Apply grease to the shaded portion shown in the schematic view above.

**Schematic View**

Note: Applied when B-4, B-5 or B-6 is used with an electric motor device.
### Table 4.6 Lubrication of Stem Threaded Portion

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Electrically Operated Valve Drive Unit</th>
<th>Electric Actuator</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product Type of Drive Unit</strong></td>
<td>LTRM-01</td>
<td>LTMD-01</td>
</tr>
<tr>
<td><strong>Standard</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Replenishment Amount of Grease</strong></td>
<td>Appropriate amount of grease to apply to the entire threaded area or to put in the grease pocket</td>
<td></td>
</tr>
<tr>
<td><strong>Replacement Amount of Grease</strong></td>
<td>As appropriate</td>
<td></td>
</tr>
<tr>
<td><strong>Application Method</strong></td>
<td>Brush, spatula or hand</td>
<td></td>
</tr>
<tr>
<td><strong>Replacement of Grease</strong></td>
<td>Every 1000 cycles or every 2 years, whichever is earlier</td>
<td></td>
</tr>
<tr>
<td><strong>Replenishment of Grease</strong></td>
<td>Remove the plug or the stem cover and perform an inspection every six months. Apply grease as required.</td>
<td></td>
</tr>
</tbody>
</table>

**Note**
1. Prevent dusts and foreign materials from adhering to the grease application area.
2. Refer to Table 1 "List of Applicable Grease" and select an appropriate type of grease.
3. Apply grease to the shaded portion shown in the schematic view above.
### Table 4.7 Lubrication of Stem Threaded Portion

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Electrically Operated Valve Drive Unit</th>
<th>Electric Actuator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Type of Drive Unit</td>
<td>LTMD-05</td>
<td>LTMD-1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard</th>
<th>Replenishment Amount of Grease</th>
<th>Replacement Amount of Grease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Appropriate amount of grease to apply to the entire threaded area</td>
<td>As appropriate</td>
</tr>
</tbody>
</table>

**Application Method**
- Brush, Spatula or Hand

**Replacement**
- Every 1000 cycles or every 2 years, whichever is earlier

**Replenishment of Grease**
- Every six months. Apply grease as required.

**Note**
1. Prevent dusts and foreign materials from adhering to the grease application area.
2. Refer to Table 1 "List of Applicable Grease" and select an appropriate type of grease.
3. Apply grease to the shaded portion shown in the schematic view above.

### Schematic View
- Schematic diagram of the valve with labeled parts:
  - Stem nut
  - Drive sleeve
  - Stem cover
  - Stem
## Table 4.8 Lubrication of Stem Threaded Portion

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Electrically Operated Valve Drive Unit</th>
<th>LIMITORQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Type of Drive Unit</td>
<td>L120-10</td>
<td>L120-20</td>
</tr>
<tr>
<td>Standard Replenishment Amount of Grease</td>
<td>60g</td>
<td>220g</td>
</tr>
<tr>
<td>Replacement Amount of Grease</td>
<td>60g</td>
<td>220g</td>
</tr>
</tbody>
</table>

### Schematic View

- Check Points
  - Application Method: Grease gun
  - Replacement of Grease: Every 1000 cycles or every 2 years, whichever is earlier
  - Replenishment of Grease: Remove the plug or the stem cover and perform an inspection every six months. Apply grease as required.

### Note

1. Prevent dusts and foreign materials from adhering to the grease application area.
2. Wind seal tape around the threaded portion of the plug or the stem cover and sufficiently tighten the plug/stem cover.
3. Refer to Table 1 "List of Applicable Grease" and select an appropriate type of grease.
4. Apply grease to the shaded portion shown in the schematic view above.
### Table 4.9 Lubrication of Stem Threaded Portion

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Electrically Operated Valve Drive Unit LIMITORQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Type of Drive Unit</td>
<td>JX-05M</td>
</tr>
</tbody>
</table>

#### Standard

<table>
<thead>
<tr>
<th>Replenishment Amount of Grease</th>
<th>200g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacement Amount of Grease</td>
<td>200g</td>
</tr>
</tbody>
</table>

#### Application Method

- Lubrication at the time of disassembly
- Replacement of Grease 2000 hours of operation time or every 3 to 5 years, whichever is earlier
- Replenishment of Grease Unnecessary in general

#### Note

1. Prevent dusts and foreign materials from adhering to the grease application area.
2. Refer to Table 1 — List of Applicable Grease — and select an appropriate type of grease.
3. Apply grease to the shaded portion shown in the schematic view above.

![Schematic View](image-url)

#### Diagram

- Stem nut
- Drive sleeve
- Lock nut
- Stem
<table>
<thead>
<tr>
<th>Photograph</th>
<th>Description of Damage and Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photo 1</td>
<td>There are some small scratches on the sliding surface area where a thrust force is applied during valve closing operation. Damage on the threads is minimal. The stem can be used without repair.</td>
</tr>
<tr>
<td>Photo 2</td>
<td>There are some small scratches on the sliding surface area where a thrust force is applied during valve closing operation. The damage on the threads is minor. The stem can be used without repair. Check the progress of the damage during next periodic inspection.</td>
</tr>
<tr>
<td>Photo 3</td>
<td>There are some pitting damages on the external threads of the sliding surface area where a thrust force is applied during valve closing operation. The damage is a moderate level. If deteriorated condition is found in the next periodic inspection, replacement of the stem is recommended.</td>
</tr>
<tr>
<td>Photo 4</td>
<td>There are some abrasions and indentations on the sliding surface area, especially in the middle of the stem threaded portion, where a thrust force is applied during valve closing operation. The damage is deteriorated. Replacement of the stem is required at the next periodic inspection.</td>
</tr>
<tr>
<td>Photo 5</td>
<td>There is adhesion of wear debris, indentations, deformation (warpage to the outer diameter side) and abnormal abrasion on the sliding surface area, especially on the outer diameter shoulder in the middle of the stem threaded portion, where a thrust force is applied during valve closing operation. The photograph shows an advanced state of damage. Replacement of the stem at the earliest timing is required.</td>
</tr>
</tbody>
</table>
Lubrication of Drive Unit

**Applicable Product Type**

Nippon Gear Co., Ltd.

- Electric Motor Device: LIMITORQUE valve control
- SMC, SMB, SB, SB-D, L120, JX-05M

Manually Operated Reduction Gear: LIMITORQUE reduction gear
- BA, B

Seibu Electric & Machinery Co., Ltd.

- Electric Motor Device: Valve Control
- LTRH, LTRM, LTKD, LTMD
Lubrication of Drive Unit

A gear type drive unit is equipped to both of the electric motor device and the manually operated device. A drive unit is used for an automatic operation or labor-saving purpose, etc. In order to provide the best performance of the product for a long period, check the lubricating condition periodically and replenish or replace the grease as specified below.

1. Lubrication

1.1 Grease

(1) Use the extreme-pressure grease which has oxidation stability, mechanical stability, water/heat resistant property and rust-prevention characteristics.

Note: The greases shown above are recommended by the manufacturer of the drive unit. See Table 1 and Table 3 for other greases.

(2) Mixture of Grease

Use of grease mixed with a different soap base does not affect the lubrication performance. However, the old grease shall be removed as required when maintenance is performed.

1.2 Amount of Grease

See Table 2 and Table 4 for the amount of grease applied to the product which is installed in the upright position. When a drive unit is installed horizontally with the stem in the horizontal position against the pipe, fill the grease in the grease case of the drive unit until it is almost filled with the grease. The amount becomes about twice those shown in Table 2 and Table 4.

---

Fig. 1 Top View of Drive Unit

Fig. 2 Side View of Drive Unit
### Table 1: Grease List

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Product Name</th>
<th>Soap Base</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cosmo Oil Lubricants Co., Ltd</td>
<td>EP GEAR GREASE</td>
<td>Calcium Compound</td>
<td>Standard of the device manufacturer</td>
</tr>
<tr>
<td>Idemitsu Kosan Co., Ltd</td>
<td>DAPHNE EPONEX EP-0</td>
<td>Lithium</td>
<td></td>
</tr>
<tr>
<td>Cosmo Oil Lubricants Co., Ltd</td>
<td>COSMO GREASE</td>
<td>DYNAMAX EP-0</td>
<td>Lithium</td>
</tr>
<tr>
<td>JX Nippon Oil &amp; Energy</td>
<td>EPNOC GREASE</td>
<td>AP(N)0</td>
<td>Lithium</td>
</tr>
<tr>
<td>Showa Shell Sekiyu Co., Ltd</td>
<td>ALVANIA EP GREASE</td>
<td>RO</td>
<td>Lithium</td>
</tr>
</tbody>
</table>

**Note**

1. Extreme grease with NLGI consistency No.0 to 00
2. Equivalent to the JIS K2220 grease Grade 4, #0
3. Use of grease mixed with a different soap base does not affect the lubrication performance. However, old grease shall be removed as required when maintenance is performed.

### Table 2: Amount of Grease

<table>
<thead>
<tr>
<th>Type</th>
<th>Product Type and Size</th>
<th>Amount of Grease (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Operated Drive Unit</td>
<td>L120-10</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>L120-20</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>L120-40</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>JX-05M</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>SMC-04</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>SMC-03</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>SMB-000</td>
<td>3.2</td>
</tr>
<tr>
<td></td>
<td>SMB-00</td>
<td>5.2</td>
</tr>
<tr>
<td></td>
<td>SMB-0</td>
<td>8.5</td>
</tr>
<tr>
<td></td>
<td>SMB-1</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td>SMB-2</td>
<td>22.0</td>
</tr>
<tr>
<td></td>
<td>SMB-3</td>
<td>32.0</td>
</tr>
<tr>
<td></td>
<td>SMB-4</td>
<td>56.0</td>
</tr>
<tr>
<td>Manually Operated Drive Unit</td>
<td>BA-0, 0P, 0S</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>BA-1, 1P, 1S</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>BA-2, 2P, 2S</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>BA-3, 3P, 3S</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>BA-4</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>B-4</td>
<td>12.0</td>
</tr>
<tr>
<td></td>
<td>B-5</td>
<td>25.0</td>
</tr>
</tbody>
</table>
Recommended Lithium Grease

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Product Name</th>
<th>Replenishment Amount of Grease (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nippon Grease Co., Ltd</td>
<td>NIGTIGHT LYW No. 0-N</td>
<td>LTRH: 1.0  LTRM: 1.0</td>
</tr>
<tr>
<td>Kyodo Yushi Co., Ltd</td>
<td>General purpose Grease No.0-S</td>
<td>LTRH: 10  LTRM: 10</td>
</tr>
<tr>
<td>Nippeco Co., Ltd</td>
<td>NIPPECO SVC No. 0</td>
<td>LTRH: 2.6  LTRM: 3.4</td>
</tr>
<tr>
<td>Cosmo Oil Lubricants Co., Ltd</td>
<td>COSMO GREASE DYNAMAX EP-0</td>
<td>LTRH: 7.5  LTRM: 12.5</td>
</tr>
<tr>
<td>Idemitsu Kosan Co., Ltd</td>
<td>DAPHNE EPONEX EP-0</td>
<td>LTRH: 10  LTRM: 15.5</td>
</tr>
<tr>
<td>Exxon Mobil Corp.</td>
<td>MOBILUX EP-0</td>
<td>LTRH: 20  LTRM: 22</td>
</tr>
<tr>
<td>Showa Shell Sekiyu Co., Ltd</td>
<td>ALVANIA EP GREASE R'O</td>
<td>LTRH: 45  LTRM: 45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LTRH: 20  LTRM: 28.5</td>
</tr>
</tbody>
</table>

Note
1. Extreme grease, NLGI consistency No.0 to 00
2. Equivalent to JIS K2220 Grease Grade 4, #0
3. Use of grease mixed with a different soap base does not affect the lubrication performance. However, old grease shall be removed as required when maintenance is performed.
2. Inspection, Replenishment and Replacement

2.1 Inspection

Appropriate amount of grease is filled in the product before shipment. Check the drive unit by referring to the following before operation.

1. Remove the plug from the plug hole for grease inspection or for replenishment. The location of the plug hole for oil inspection is different depending on the mounting position. Use the plug hole in the horizontal direction.

2. Insert a tool such as a screwdriver into the plug hole for inspection. Amount of grease: Replenishment is not necessary if the tool reaches the grease. When the tool does not reach the grease, replenish the grease.

3. Grease condition: If the grease adhered to the tool is dirty or abrasion powder is found, replace the grease.

4. After inspection, clean the plug hole. Wind seal tape around the plug and securely screw the plug into the plug hole.

2.2 Replenishment

Inspect the grease by removing the plug at least once a year and replenish an appropriate amount of grease as required.

2.3 Replacement

1. Grease for motor operated drive unit

Replace grease every 2000 operating hours or 3 to 5 years, whichever is earlier. When a secondary drive unit is used, treat it in the same way as the main drive unit.

2. Grease for manually operated drive unit

If any abnormality is not found during grease inspection, the device can be used without replacement of grease. If the device is used several times a day, replace the grease at the time of overhaul performed every 5 to 10 years. If the device is used more frequently, overhaul the device and replace the grease every 2 years.
(3) Motor
No replacement is required for the motor because a grease enclosure type bearing is used for the motor.

(4) Replacement of the entire amount of grease
Disassemble the drive unit and replace the grease. Do not remove the grease by using a chemical agent such as detergent oil.

2.4 Injection and Drain Method
(1) Use the designated plug holes for injection and drain of grease. See Figures 1 to 14 for the plug hole location of each device.
(2) Use a grease gun for injection.
(3) Use an appropriate container to collect drained grease.
(4) Clean the plug hole. Wire seal tape around the plug and screw the plug into the plug hole.
PT 1/4 plug (injection)
PT 3/4 plug (injection)
PT 1/8 plug
PT 3/4 plug (inspection)
PT 3/4 plug (drain)

Fig. 5 SMB-0, 1, 2

PT 3/4 plug (injection)
PT 1/8 plug
PT 3/4 plug (inspection)
PT 3/4 plug (drain)
(SMB-3 only)
PT 3/4 plug (drain)
(SMB-4 only)

Fig. 6 SMB-3, 4

PT 11/4 plug (injection)
PT 1/4 plug (injection)
PT 1/4 plug (drain)
PT 1/4 plug (injection)
PT 1/2 plug (inspection)

Fig. 7 SMB-5T
Fig. 10 SB 0, 1, 2, 3, 4

PT 3/4 plug (drain)
(SB-3 only)

PT 1/8 plug (injection)
PT 3/4 plug (injection)
PT 1/2 plug (injection)
PT 3/4 plug (injection)
PT 3/4 plug (inspection)
PT 3/4 plug (drain)

Fig. 11 SB-0D, 1D, 2D

PT 3/4 plug (injection)
(COMP. cover side)
PT 1/8 plug (injection)
PT 1/4 plug (injection SD-3D)
PT 1 plug (injection SD-4D)
PT 3/4 plug (injection)
PT 3/4 plug (drain)
(SB-3D only)
PT 3/4 plug (drain)
(SB-4D only)
PT 3/4 plug (inspection)

Fig. 12 SB-3D, 4D
Remove the gear cover (injection, drain)

Fig. 1 LTRH-01, LTRM-01

Remove the gear cover (injection, drain)

Fig. 2 LTKd-01, 02, LTMD-01, 02

Seibu Electric & Machinery Co., Ltd.

PT 3/4 plug (injection)

PT 3/4 plug (drain)

Fig. 3 LTKD-05, 1, 3, 5, LTMD-05, 1, 3, 5
Attachment 3

Maintenance of Graphite Gasket

For Pressure Seal Bonnet Type
1. Overview
Pressure seal type bonnet, which has high sealing performance by use of internal fluid pressure, is adopted to the valves described in this manual. The structure of pressure seal type bonnet is different from a flange type bonnet which is generally used for a low pressure range. A pressure seal bonnet type can be made compact in size and it can provide stable sealing performance in a high pressure and high temperature range. Two types of gasket can be used, graphite or metal. In this manual, maintenance of graphite gasket is provided.

2. Structure of Pressure Seal Bonnet
There are three types of structure depending on the valve size.
1) Bonnet bolt and nut type for large size valve (See Fig. 1-a and 1-b)
By tightening the bonnet bolt and nut, the bonnet is raised and the initial tightening force is applied to the gasket.
2) Bolt and nut type for small size valve (See Fig. 1-c)
By tightening the bolt and nut, the bonnet is raised and the initial tightening force is applied to the gasket.
3) Nut type for small size valve (See Fig. 1-d)
By tightening the nut, the bonnet is raised and the initial tightening force is applied to the gasket.

3. Care for Gasket Contact Surface
Irregularity on the gasket contact surfaces of the bonnet and valve body may cause leakage. Take care not to damage the gasket contact surfaces during maintenance work. Use of sandpaper to polish the surfaces focusing on a single point shall be avoided. When polishing is required, use the finest sandpaper and evenly polish the whole surface.

4. Allowable Clearance of Gasket Contact Surface
The maximum allowable clearance between the bonnet outer diameter and the inner diameter of the gasket contact surface of the valve body is 0.5 mm. If the clearance is over 0.5 mm, the sealing surface pressure is decreased leading to leakage.
Structure of Pressure Seal Type Bonnet

- Bonnet bolt and nut
- Stem
- Split ring
- Spacer ring
- Gasket
- Bonnet

- Body
- Bolt
- Nut
- Yoke
- Spacer ring
- Gasket
- Body

Fig. 1-a
Fig. 1-b
Fig. 1-c
Fig. 1-d
5. ベルトの締め付け

(1) ボルト締付けタイプ（図1-a、1-b、1-cを参照）

ボルトは初期密封圧を生成するために用いられます。初期密封圧が十分に作用すると、作業圧力が高くなると密封圧が増し、良好な密封性能を発揮します。

初期密封圧を確保するために、入場作業時にボルトの締め付けトルクをTable 1に示す通りに締め付けてください。

<table>
<thead>
<tr>
<th>ボルトサイズ</th>
<th>ボルトサイズ</th>
<th>締め付けトルク (N・m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M12</td>
<td></td>
<td>26.2 to 31.5</td>
</tr>
<tr>
<td>M16</td>
<td></td>
<td>65.7 to 78.4</td>
</tr>
<tr>
<td>M20</td>
<td></td>
<td>128 to 156</td>
</tr>
<tr>
<td>M22</td>
<td></td>
<td>177 to 215</td>
</tr>
<tr>
<td>M24</td>
<td></td>
<td>216 to 254</td>
</tr>
<tr>
<td>M30</td>
<td></td>
<td>432 to 519</td>
</tr>
<tr>
<td>M36</td>
<td></td>
<td>785 to 931</td>
</tr>
<tr>
<td>M42</td>
<td></td>
<td>1275 to 1470</td>
</tr>
</tbody>
</table>

（注）

(1) ボルトのサイズを確認し、Table 1に示す締め付けトルクを用いて締め付けてください。
(2) マイナスストリートを用いて締め付けてください。マイナスストリートが使えない場合は、同じレベルの締め付けトルクを用いて締め付けてください。
(3) ベルトの傾斜を確認した後、図の順にボルトを等間隔で締め付けてください。
When tightening the nuts, follow the procedure shown below. Use a hook spanner or a chain wrench for tightening. Put a dolly block on the nut and hit the nut four to five times with a hand hammer to tighten the nut clockwise.

6. Retightening of Gasket

6.1 Retightening of New Gasket

(a) Bolt Tightening Type (Fig. 1-a, 1-b and 1-c on page 32)

Bonnet bolts and nuts may be loosened due to the compression of the graphite gasket after a hydraulic test of the piping system or after the pressure or temperature is increased. Retighten the bolts with the proper tightening torque close to the upper limit shown in Table 2.

<table>
<thead>
<tr>
<th>Bolt Size</th>
<th>Retightening Torque</th>
<th>Tool for Tightening</th>
</tr>
</thead>
<tbody>
<tr>
<td>M16</td>
<td>21.6 to 32.3</td>
<td>Single ended spanner</td>
</tr>
<tr>
<td>M20</td>
<td>26.5 to 40.2</td>
<td>Closed wrench</td>
</tr>
<tr>
<td>M22</td>
<td>28.5 to 42.1</td>
<td>Box wrench</td>
</tr>
<tr>
<td>M24</td>
<td>31.4 to 47.0</td>
<td>Offset type special wrench</td>
</tr>
<tr>
<td>M30</td>
<td>39.3 to 58.8</td>
<td>Single ended spanner</td>
</tr>
<tr>
<td>M36</td>
<td>46.1 to 69.6</td>
<td>Closed wrench</td>
</tr>
<tr>
<td>M42</td>
<td>52.0 to 78.4</td>
<td>Box wrench</td>
</tr>
</tbody>
</table>
7. Others

(1) Bolt sizes of each valve shall be checked with the actual valve.

(2) Replace the gasket with the new one when the valve is disassembled. It takes about a month to manufacture graphite gaskets. Disassembly of valves and a replacement of gaskets shall be planned well in advance.
Structure of Pressure Seal Bonnet

Disassembly, Reassembly and Maintenance Procedures
Disassembly and Reassembly
Pressure Class 1500 to 2500
Globe Valve
Nominal Size 2 1/2" to 4"

Disassembly
1. Slightly open the valve and loosen the gland.
2. Remove the stopper bolt and stopper.
3. Loosen the tightening bolts and turn the yoke several times counterclockwise to loosen the yoke.
4. Turn the handwheel counterclockwise and let the stem reach the back seat position. Raise the stem so that the gasket contacts with the lower end of the yoke.
5. Turn the yoke counterclockwise and remove the stem, bonnet and the assembled parts around the yoke from the body, taking care not to damage the gasket fitting section.
6. In order to remove the stem, remove the handwheel and pull the stem downward while turning the stem clockwise.
7. When removing the disc from the stem, remove the spot weld and loosen the disc stopper.
8. In order to loosen the threads easily, apply grease to the threaded portions.

Handwheel
Yoke bushing
Yoke
Gland
Bonnet tightening nut
Yoke lock plate
Gasket
Body
Stem
Bolt
Gland plate
Gland packing
Bonnet tightening bolt
Bonnet
Back seat
Spot weld
Disc
Disc stopper
Stopper bolt
Inspection

Check each part of the valve, especially, paying attention to the damage on the following parts.

1. Seat surface
2. Gasket contact surface
3. Sliding surface of the stem and the gland packing
4. Back seat

Maintenance

1. Carefully clean each matching parts.
2. Use the gland packing and gasket specified in the drawing or the packing list.
3. Follow the separately provided maintenance instructions for lapping of valve seat.
4. Apply graphite compound to the threaded portions of the yoke, bonnet and bolt, and the washer contact surface of the bonnet to prevent galling and seizure.

Reassembly

Reassemble the valve by installing the parts in the reverse order of the disassembly procedure.

Pay attention to the following.

1. Take care not to damage the seat surface and not to let foreign materials get into the valve body.
2. Gland packing can be replenished easier after the valve is reassembled. See the maintenance manual for details.
3. Install the disc, stem and bonnet to the body.
4. Reassemble the yoke, washer, bonnet tightening nut, gland and gland plate. The yoke shall be screwed until it contacts with the gasket.
5. Fit the gasket in the correct position, being careful not damage it.
6. Properly tighten the bolts to secure the gasket.
7. In order to secure the gasket, retighten the tightening bolts when the pressure is increased after assembly.
8. Apply grease to the threaded portion of the stem.
Disassembly and Reassembly
Pressure Class 900 to 2500
Globe Valve
Nominal Size 5" and over
Pressure Seal Bonnet Type
Product Type SCJSPSY

Disassembly
1. Open the valve slightly.
2. Remove the yoke clamp. Tighten the gland packing and lock the stem.
3. Turn the handwheel clockwise and detach the yoke from the body and hang it with a wire rope.
4. Loosen the bonnet tightening bolt.
5. Lightly hit the upper part of the bonnet ring counterclockwise to loosen it. When the bonnet tightening bolt is tightened, the bonnet and the gasket are lifted by the loosened amount of the bonnet ring. Loosen the bonnet ring until the gasket comes off from the fitting section of the body.
6. Remove the bonnet tightening nut and then remove the bonnet ring from the body.
7. Take out the assembly of the yoke, disc, bonnet and yoke, etc. from the body, being careful not to damage the gasket contact surface of the valve body.
8. Remove the eyebolt and eyebolt clamp.
9. Remove the stem lock bolt and embedded type key. Pull down the stem while turning the handwheel clockwise.

- Remove the handwheel to inspect the thrust ball bearing.
- Apply grease to the threaded portion of the bolt and nut so that the screw can be easily loosened.
Inspection

Check each part of the valve, especially, paying attention to the damage on the following parts.

1. Seat surface
2. Gasket contact surface
3. Sliding surface of the stem and the gland packing
4. Back seat

Maintenance

1. Carefully clean each matching parts.
2. Use the gland packing and gasket specified in the drawing or the packing list for replacement.
3. Follow the separately provided maintenance instructions for lapping of valve seat.
4. Apply graphite compound to the threaded portions of the yoke, bonnet and bolt, and the washer contact surface on the bonnet to prevent galling and seizure.

Reassembly

Reassemble the valve by installing the parts in the reverse order of the disassembly procedure.

Pay attention to the following.

1. Take care not to damage the seat surface and not to let foreign materials get into the valve body.
2. Gland packing can be replenished easier after valve is reassembled. See the maintenance manual for details.
3. Install the disc, stem and bonnet to the body.
4. Fit the gasket in the right position, being careful not damage it.
5. Screw in the bonnet ring until it contacts with the gasket.
6. Securely tighten the tightening bolt.
7. Put the yoke, yoke clamp and eyebolt, etc. back to their original position.
8. Install the embedded type key to the stem and set the stem with the bolt and the stopper.
9. In order to secure the gasket, retighten the tightening bolts when the pressure is increased after assembly.
10. Apply grease to the threaded portion of the sleeve and to the grease nipple with a grease gun.
Disassembly and Reassembly
Pressure Class 900 to 2500
Swing Type Check Valve
Nominal Size 21/2" to 5" (Class 900 to 1500)
21/2" to 6" (Class 2500)
Pressure Seal Bonnet Type Product Type. SCOSPSY

Disassembly
Screws of this valve are right-hand screws.
1. Loosen the cover nut and turn back the cover ring two to three turns.
2. The cover and the gasket are lifted by the loosened amount of cover ring when the cover nut is tightened.
3. Remove the cover nut and take the cover ring out from the body.
4. The valve internal can be inspected by removing the cover, spacer ring and gasket.
5. Remove the spindle nut and the gland flange and then the spindle to remove the disc.
6. Scrape off the welded part and loosen the nut to remove the disc from the arm.

Inspection
Check each part of the valve paying attention to the damage on the following parts.
1. Seat surface
2. Gasket contact surface
3. Sliding surface of the spindle and the bush
Swing check valves are open and closed according to the flow rate. Inspect the disc carefully because the valve function may be greatly influenced by the resistance on the disc.
Maintenance

1. Carefully clean each matching parts.
2. Use the gland packing and gasket specified in the drawing or the packing list for replacement.
3. Follow the separately provided maintenance instructions for lapping of valve seat.
4. Apply graphite compound to the threaded portions such as nuts to prevent galling and seizure.

Reassembly

Reassemble the valve by installing the parts in the reverse order of the disassembly procedure.

Pay attention to the following.
1. Take care not to damage the seat surface and not to let foreign materials get into the valve body.
2. Perform welding on the nut after assembling the disc and the arm.
3. Install the cushion plate and the cover in the body.
4. Fit the gasket in the right position, being careful not damage it.
5. Screw in the cover ring until it contacts with the gasket.
6. Securely tighten the cover nut.
7. In order to secure the gasket, retighten the cover nuts when the pressure is increased after assembly.
Disassembly and Reassembly

Pressure Class 900 to 2500

Swing Type Check Valve

Nominal Size 6\(\frac{1}{2}\) and over (Class 900 to 1500)
8\(\frac{1}{2}\) and over (2500)

Pressure Seal Bonnet Type Product Type SCOSPSY

Disassembly

Screws of this valve are right-hand screws.

1. Loosen the cover nuts (do not remove them).
2. Lightly hit the upper part of the cover ring counterclockwise to loosen it. When the cover nuts are tightened, the cover and the gasket are lifted by the loosened amount of the cover ring. Turn and loosen the cover ring until the gasket comes off from the body.
3. Remove all of the nuts of the cover bolts and take the cover ring out from the body.
4. Inside of the valve can be inspected by removing the cover, spacer ring and gasket.
5. Remove the spindle nut and gland. And remove the tightening bolt, spacer ring, gasket and spindle to take the disc out.
6. In order to remove the disc from the arm, scrape off the welded part and loosen the nut.
Inspection

Check each part of the valve, especially paying attention to the damage on the following parts.

1. Seat surface
2. Gasket contact surface
3. Sliding surface of the spindle and the bush

Swing check valves are open and closed according to the flow rate. The valve function may be greatly influenced by the resistance on the disc.

Maintenance

1. Carefully clean each matching parts.
2. Use the gasket specified in the drawing or the packing list for replacement.
3. Follow the separately provided maintenance instructions for lapping of valve seat.
4. Apply graphite compound to the threaded portions, such as a cover bolt and nut, to prevent galling and seizure.

Reassembly

Reassemble the valve by installing the parts in the reverse order of the disassembly procedure.

Assemble each part carefully.

1. Take care not to damage the seat surface and not to let foreign materials get into the valve body.
2. Perform welding on the nut after assembling the disc and the arm.
3. Install the cushion plate and the cover in the body.
4. Fit the gasket in the right position, being careful not damage it.
5. Screw in the cover ring until it contacts with the gasket.
6. Securely tighten the cover nuts evenly.
7. In order to secure the gasket, retighten the cover nuts when the pressure is increased after assembly.
Disassembly

1. Slightly open the valve.
2. Remove the yoke bolt.
3. Turn the handle clockwise until the stem screw and the sleeve come off. Hang the handwheel with a wire rope and remove the yoke.
4. Remove the gland bolt, nut, gland and packing in order.
5. Loosen the bonnet bolt and remove the bonnet retainer and take out the split pin washer.
6. Lightly hit the upper side of the split ring with an air cushion hammer and remove the split pin.
7. Take the cover out from the body holding the stem. Pull out the stem slowly taking care not to damage the stem with the packing ring in the stuffing box.
8. Lift up the stem. The disc can be pulled out with the stem.
9. In order to inspect the thrust ball bearing, scrape off the spot weld on the yoke nut and loosen the yoke nut. The sleeve and the thrust ball bearing can be removed at the same time.
10. In order to unscrew easily, apply grease to the threaded portions such as bolts and nuts.

Inspection

1. Carefully clean each matching parts.
2. Use the gland packing and gasket specified in the drawing or the packing list for replacement.
3. Follow the maintenance procedures for lapping of valve seat.
4. Apply graphite compound to the threaded portions of the yoke, bonnet and eyebolt, and the washer contact surfaces on the bonnet to prevent galling and seizure.

Diagram:

[Diagram of gate valve disassembly and reassembly process]
Maintenance

1. Carefully clean each matching parts.
2. Use the gasket specified in the drawing or the packing list for replacement.
3. Follow the maintenance procedures for lapping of valve seat.
4. Apply graphite compound to the threaded portions, such as abonnet and bolt, to prevent galling and seizure.

Reassembly

Reassemble the valve by installing the parts in the reverse order of the disassembly procedure.

1. Take care not to damage the seat surface and not to let foreign materials get into the valve body.
2. Gland packing can be replenished easier after valve is reassembled. See the maintenance manual for details.
3. Install the disc, stem and cover in the body. Check the matchmarks on the body and the disc before installing them.
4. Fit the gasket properly taking care not to give any damage.
5. To the horizontally installed valve, install split rings as shown below.
6. Install the yoke and the peripheral parts.
7. Make sure to lightly retighten the nut because the nut is loosened when the bonnet is pushed by the self-restraining action of the internal pressure of pipe pressure or operation pressure.
8. Apply grease to the threaded portion of the sleeve and supply grease through the grease nipple using a grease gun.
Gate Valve with Reduction Gear

The valve is mainly consisted with valve, reduction gear and joining section. Handle the valve in the same way as a manually operated valve.

Disassembly and reassembly of the valve and reduction gear is shown in this section. For details of reduction gear, see its appropriate operation manual.

Removal of Reduction Gear

1. Slightly open the valve and loosen the gland flange.
2. Loosen the stem cover on the top of the reduction gear and remove the stem cover.
3. Loosen the bolt and remove the bolt.
4. Remove the indicator from the stem.
5. Loosen and remove the hexagon bolt.
6. Turn the handwheel clockwise while lifting the handwheel clockwise.

The reduction gear can be removed from the valve.

Reinstallation of Reduction Gear

Reinstallation of the reduction gear can be done by installing the parts in the reverse order of the above procedure. Assemble each part carefully.

1. Align the center of the reduction gear stem nut and the center of the valve stem.
2. Gently engage the threaded portion of the stem nut and the stem threaded portion.
3. Turn the handwheel counterclockwise to install the reduction gear to the valve.
4. Make sure that there is no clearance between the mounting surface of the reduction gear and the yoke and screw in the hexagon bolt.
5. Slightly open the valve and securely tighten the hexagon bolt.