



Doc. No. GV* -OMG0005-A

High Vacuum Slit Valve Operation Manual

XGT221 - 32222 - * *

XGT221 - 46236 - * *

Thank you for your purchase of SMC's product.
Be sure to read this Operation Manual carefully and understand its content before operation of this product to keep safety of operator and this product. And, use drawing and other informative documents for your reference of construction and specification of this product. Further, ensure your operating environment satisfies requirements specified to the product.
Moreover, keep this Operation Manual available whenever necessary.

Accept that this Operation Manual is subject to change without notice in advance.

SMC Corporation

Safety instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by label of “Caution”, “Warning” or “Danger”. To ensure safety, be sure to observe ISO 4414^{*1)}, JIS B 8370^{*2)} and other safety practices.



Caution : Operator error could result in injury or equipment damage.



Warning : Operator error could result in serious injury or loss of life.



Danger : In extreme condition, there is a possible result of serious injury or loss of life.

* 1) ISO 4414 : Pneumatic fluid power- Recommendations for the application of equipment to transmission and control systems

* 2) JIS B 8370 : Generic rule for pneumatic system



Warning

① The compatibility of vacuum equipment is the responsibility of the person who designs the vacuum system or decides its specifications.

Since the products specified here are used in various operating conditions, their compatibility for the specific pneumatic system must be based on specifications or after the person who designs the vacuum system or its specifications analyzes and/or tests to meet your specific requirements. The initial performance and safety are assured under the responsibility of the person. And the information of the product should be updated via catalog and other sales promotional documents to grasp potential damage of the product exactly and compose your system with consideration of that.

② Only trained personnel should operate vacuum operated machinery and equipment.

Assembly, handling or repair of machinery/equipment which is operated at vacuum should be performed by trained and experienced operators.

③ Do not service machinery/equipment or attempt to remove component until safety is confirmed.

1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safe locked-out control positions.

2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for this equipment and exhaust all residual compressed air in the system.

3. Before machinery/equipment is restarted, take measures to prevent shooting-out of cylinder piston rod, etc.

④ Contact SMC if the product is to be used in any of the following conditions.

1. Conditions and environments beyond the given specifications

2. Use of fluid which may not have compatibility with material of equipment.

3. Use of fluid which is harmful to human body

⑤ If using fluid which is harmful to human body or transporting the product which has attachment of harmful material, be sure to perform treatment which eliminates harm.

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1. Specifications

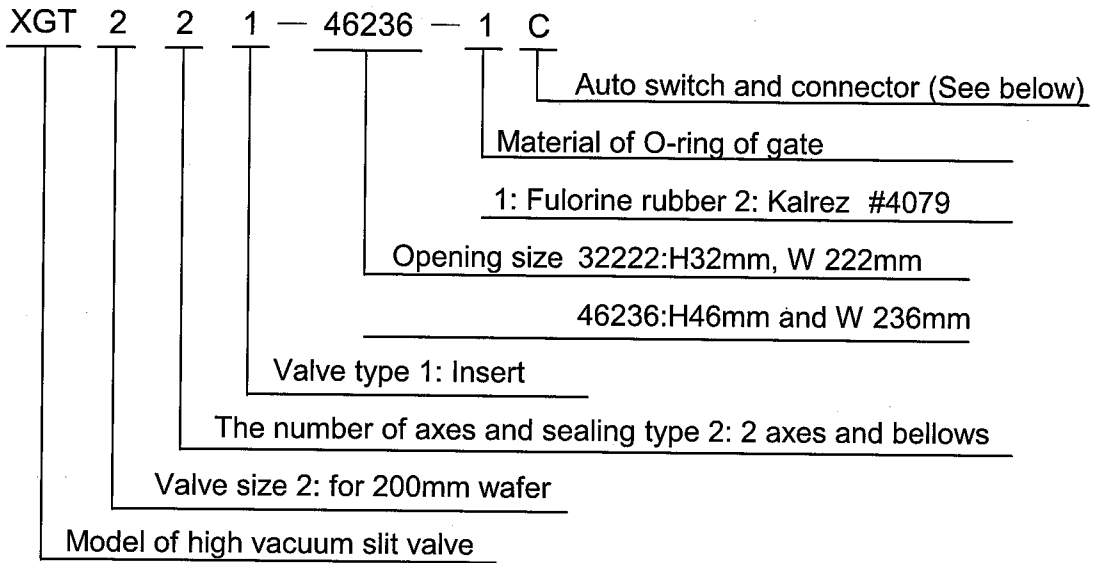
| | | |
|---|-------------------------------|--|
| Opening size | | 32mm×222mm (XGT221-32222-*) |
| | | 46mm×236mm (XGT221-46236-*) |
| Working pressure Pa | | Atmospheric pressure $\sim 10^{-6}$ |
| Operating pressure difference kPa | | 4 or less |
| Operating pressure MPa | | 0.4~0.6 |
| Service life(in million) | | 100 |
| Leakage Pa·m ³ /s(Torr·l/s) | Internal | 6.5×10^{-10} ^{*1)} |
| | Internal at negative pressure | 6.5×10^{-8} [In case of FKM at 0.1MPa (abs) or less negative pressure] 6.5×10^{-7} [In case of Kalrez at 0.1MPa (abs) or less negative pressure] ^{*1)} |
| | External | 6.5×10^{-11} ^{*1)} |
| Operating temperature °C | | 5~150(Only gate) 5~60(Actuating part) |
| Operating fluid | | Vacuum of inert gas |
| Operating time s ^{*2)} | | 1~0.6 ^{*2)} |
| Position detection | | Auto switch (D-A93) |
| Main materials for vacuum part | Seal | FKM |
| | Mechanism | SUS316L(Bellows), Gate(A6063), Other parts; SUS304 |
| Exhaust direction | | Normally positive pressure side (Negative pressure side for maintenance) |
| Pumping direction | | Vertical |
| Pressure piping | | M5×0.8 thread |
| End lock mechanism | | With end lock mechanism at open and close position ^{*3)} |
| Cylinder capacity L | | 0.12 |
| Weight N | | Approx. 80 |

* 1): At normal temperature. Gas permeation is not included.

* 2): The period of time from gate open state to clamp after signal comes to solenoid valve and from gate clamp state to gate open.

* 3): This mechanism doesn't provide seal for the gate at close position.

2. How to order



Auto switch and connector

| Symbol | Auto switch | Connector |
|--------|---|---|
| NIL | Not provided | Not provided |
| A | D-A93 (2 pcs in total, one for open and close) | Lead wire length: 0.5mm |
| C | | Multi connector (T3106 000: AMP) |
| F | | D-sub connector (CDE-9PF05: Hirose Electric Co. Ltd.) |

3. Construction and Operation
 3-1. Construction

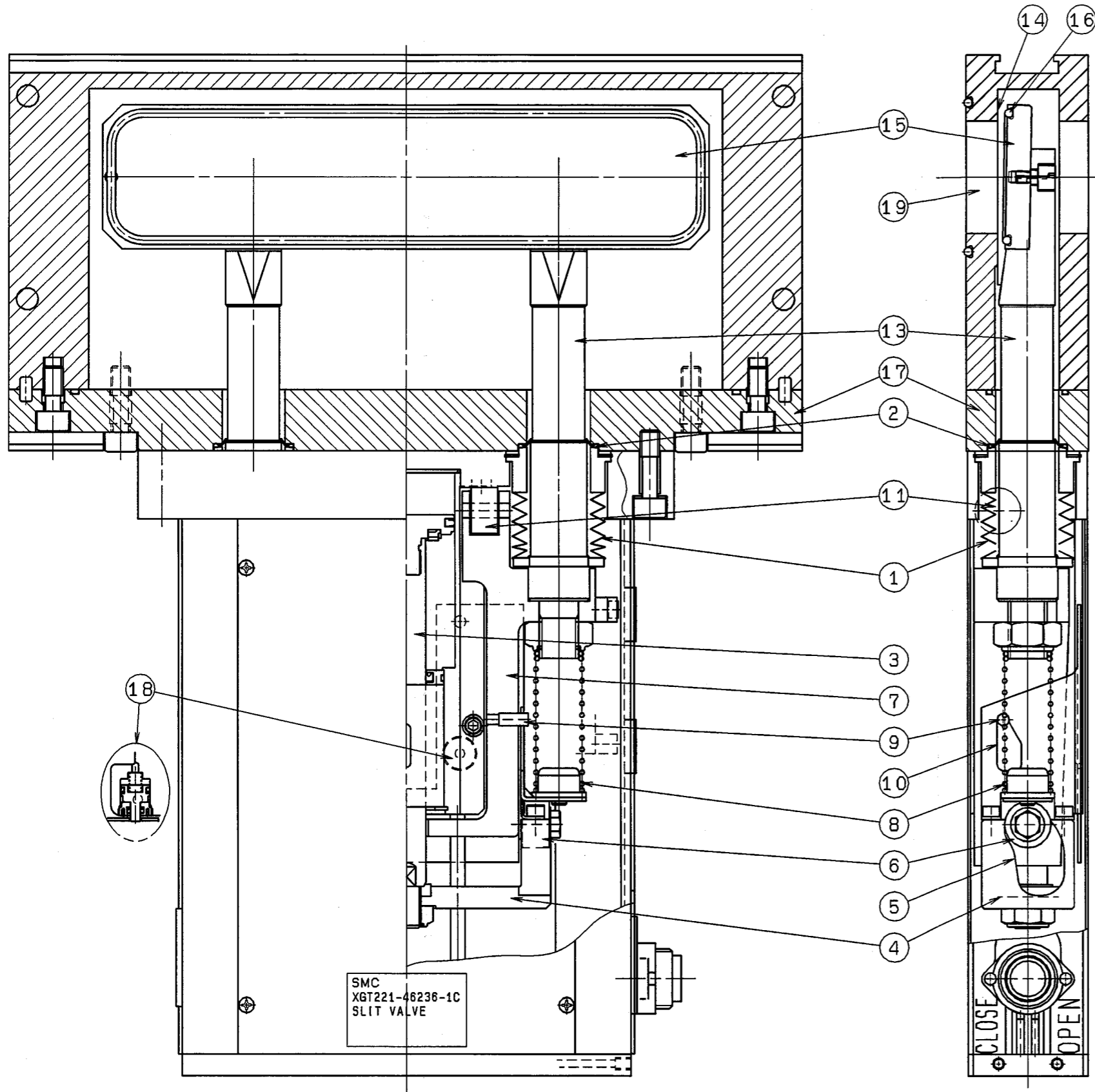


Fig. 1A

Fig. 1B

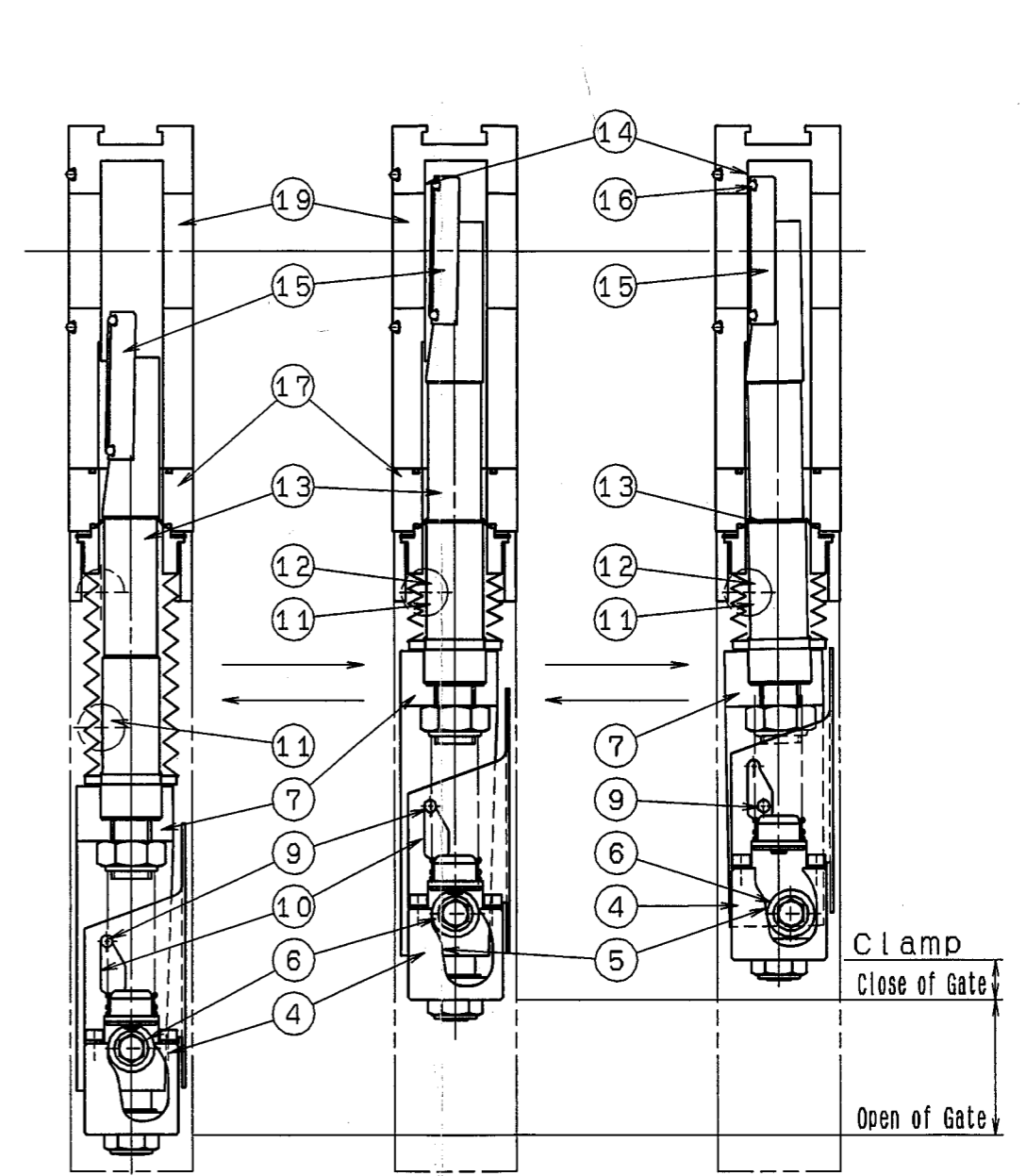
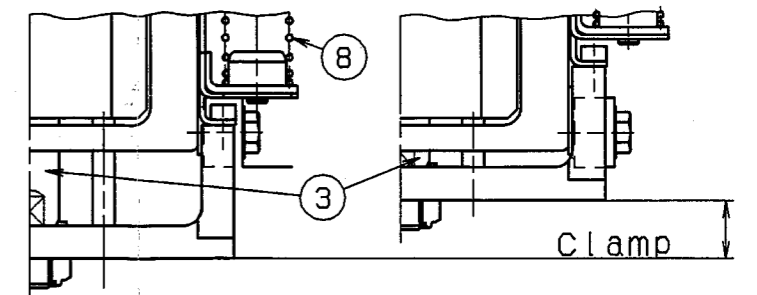


Fig. 2A

Fig. 2B

Fig. 2C



3-2 Operation

Figure 1A is a front view of slit valve. In this figure, the slit valve closes a slit ⑬ transferring workload and a gate ⑮ (a seal material ⑯) do not clamp (seal) a sealing face of a body ⑭.

Figure 2A shows a state which the slit valve opens and the body slit ⑬ is in open position, allowing transfer of workload.

Figure 2B shows the same state of Figure 1B. Figure 2C shows a state which the gate ⑮ clamps and the sealing face of the body ⑭ is sealed with a sealing material ⑯ of the gate ⑮.

3-2-1 Overall construction

For Figure 1A and Figure 1B, a piston rod ③ integrated with a piston and a roller block ④ are integrated. A force of spring ⑧ separates these parts and a shaft ⑬ integrated with a lever ⑦. On the other hand, a guide groove ⑩, a part of roller block ④ and a guide pin ⑨ integrated with the lever ⑦ are connected, the shaft ⑬ and the roller block ④ integrate and can achieve up/down movement even when they are influenced by the force of spring ⑧.

In these figures, internal /external seal of a bonnet ⑰ during up/down movement of the shaft ⑬ is done by a metal bellows ① and external fixing seal of the slit valve with the bonnet ⑰ is done by a gasket ②.

3-2-2 Closing gate (Figure2A to Figure2B)

The roller block ④ integrated with the piston rod ③ moves upward when applying pressure to "close" side of pressure piping. On the other hand, although the lever ⑦, shaft ⑬ and gate ⑮ continue to move upward since the roller block ④ pushes the shaft ⑬ integrated with the lever ⑦ with the spring ⑧, a roller bearing A ⑪ fixed to the lever ⑦ gets into U-shaped fulcrum groove ⑫, stops and closes the body slit ⑬.

In Figure 2B, position is fixed by a cam groove ⑤ of the roller block ④ and a roller bearing B ⑥. Further, positions of the guide groove ⑩ of the roller block ④ and the guide pin ⑨ of the lever ⑦ are fixed and the lever ⑦, shaft ⑬ and gate ⑮ move upward without shaking right and left.

3-2-3 Clamping (Sealing) (Figure 2B to Figure 2C)

The roller bearing A ⑪ gets into fulcrum groove ⑫ and makes the lever ⑦, shaft ⑬ and gate ⑮ stop. On the other hand, as the piston rod ③ and the roller block ④ rise further, the roller bearing B ⑥ fixed to the lever ⑦ moves right along with the cam groove ⑤ of the roller block ④. Because of this, the shaft ⑬ and the gate ⑮ lean left around the roller bearing A ⑪ whose position is fixed with fulcrum groove ⑫ and the gate ⑮ clamps and is sealed.

The lever ⑦ whose top and bottom positions are fixed leans when restriction of the lever ⑦ is released when the roller block ④ and the guide groove ⑩ move upward and detach from the guide pin ⑨.

3-2-4 Clamp release (Figure 2C to Figure 2B)

Since the roller block ④ is moved downward by applying pressure to “open” side of pressure piping, the roller bearing B ⑥ moves left after the cam groove ⑤. Because of this, the shaft ⑬ and the gate ⑮ lean right around the roller bearing A ⑪ whose position is fixed with fulcrum groove ⑫ and the gate ⑮ clamp is released. When the roller block ④ moves downward, since the area from the roller bearing B ⑥ to the lever ⑦ is also pushed by the force of spring ⑧ on which downward force acts, the lever doesn't move downward and the gate ⑮ comes apart from the sealing face of the body ⑭ at right angles.

3-2-5 Opening valve (Figure 2B to Figure 2A)

After releasing clamp, the gate ⑮, shaft ⑬, lever ⑦ and roller block ④ move downward together. Then the gate ⑮ opens and the body slit ⑲ is released.

3-2-6 End lock (No Figure is provided.)

In the case of sudden loss of operating pressure (CDA) while the gate is in any of closed and opened position, the pin of end lock comes out, restricts the movement of the piston rod ③ and remain the position of the slit valve before the loss of operating pressure.

4. Precautions



Caution

4-1 Pressure piping

Perform plumbing for pressure after installing one-touch fitting or speed controller with M5 type thread to piping port (M5×0.8). The operating pressure can be checked on specification table.

4-2 Installation

Tighten the bolt for connection gradually and diagonally by constant torque to avoid application of uneven force to the bolts.

For the bolt to mount the body or the gate to the slit valve, tighten it by referential torque described in Table 1.

* For installation, pay attention not to damage the seating face of the body. Any damage on it may make leakage found out in leakage inspection after installation of the slit valve to the chamber.

Table 1 Tightening torque

| Hexagon socket head bolt | | M6 | M8 |
|--------------------------|--------|-------|-------|
| Tightening torque | Kgf·cm | 30~35 | 40~50 |
| | N·m | 3~3.5 | 4~5 |

4-3 End lock release

When unlocking the slit valve with no operating pressure applied, first apply pressure to operating port which can remain current open or close position, and then release end lock and switch the solenoid valve.

4-4 Speed control

Be sure to control speed to open and close the gage in meter out condition. Otherwise, the slit valve may get in trouble such as life out in earlier period.

4-5 Exhaust piping

Pay attention no to give pressure from other solenoid valves to the slit valve. Such a pressure may cause improper operation of end lock of the gate.

4-6 Operation of valve

* Please confirm in regulated difference pressure it and do the opening and shutting operation when you open and shut the valve.

(1)Opened condition of gate

When the gate is fully opened, the indicator light of the auto switch at opening side is lighting on.

(2)Closed condition of gate

When the gate is fully closed, the indicator light of the auto switch at closing side is lightning on.



Warning

(1) Do not take off the side panel of actuating part except for maintenance.

Touch to the internal actuating parts while the slit valve is operating may result in injury.

(2)Remove the pressure piping for operation and make cylinder have no pressure inside for maintenance.

Maintenance with pressure piping installed may have pressure remain which can move the actuating part.



Caution

4-7 Replacement of O-ring

Use the parts designated by item 5 for replacement. Give sufficient cleaning to O-ring groove and mount it so that it will not twist. Please use a plastic specific tool device so as not to damage the sealing face in O-ring groove. After replacement, perform leak check.



Danger

4-8 Treatment of used product

If returning the product which has used fluid which is harmful to human body or have attachment of harmful material, be sure to clean and perform treatment which eliminates harm in advance.

5 Replacement of parts **A****XGT221-32222-** Special parts**

| Name | | Order No. | Application | Remarks |
|---------------------|--------------|----------------|---|------------|
| Bonnet Ass'y | | XGT0101-30-1AS | For XGT221-32222- * ^A _C | — |
| Gate Ass'y | | XGT0101-2-1S | — | — |
| O-ring (of gate) | FKM | XGT200-9-13S | For XGT221-32222-1* | AS568-258V |
| | KALREZ® 4079 | XGT200-9-14S | For XGT221-32222-2* | AS568-258 |
| Auto switch Ass'y | | XGT0101-50CS | For XGT221-32222- *C | — |

XGT221-46236- Special parts**

| Name | | Order No. | Application | Remarks |
|---------------------|--------------|----------------|---|------------|
| Bonnet Ass'y | | XGT0402-30-1AS | For XGT221-46236- * ^A _C | — |
| Gate Ass'y | | XGT0402-2-1S | — | — |
| O-ring (of gate) | FKM | XGT200-9-7S | For XGT221-46236-1* | AS568-261V |
| | KALREZ® 4079 | XGT200-9-9S | For XGT221-46236-2* | AS568-261 |
| Auto switch Ass'y | | XGT0402-50CS | For XGT221-46236- *C | — |

Common exchange parts

| Name | Order No. | Application | Remarks |
|-------------------|---------------|---|----------------|
| Gasket with wiper | XGT0402-4-9S | Needing by 2 pieces | — |
| Fixed bolt | XGT0402-2-5S | Needing by 2 pieces | — |
| Receptacle plug | XGT0402-4-12S | (Other party side of connector for XGT221-*****- *C) | T3105 000(AMP) |

6. Maintenance



Warning

6-1 Replacement of O-ring

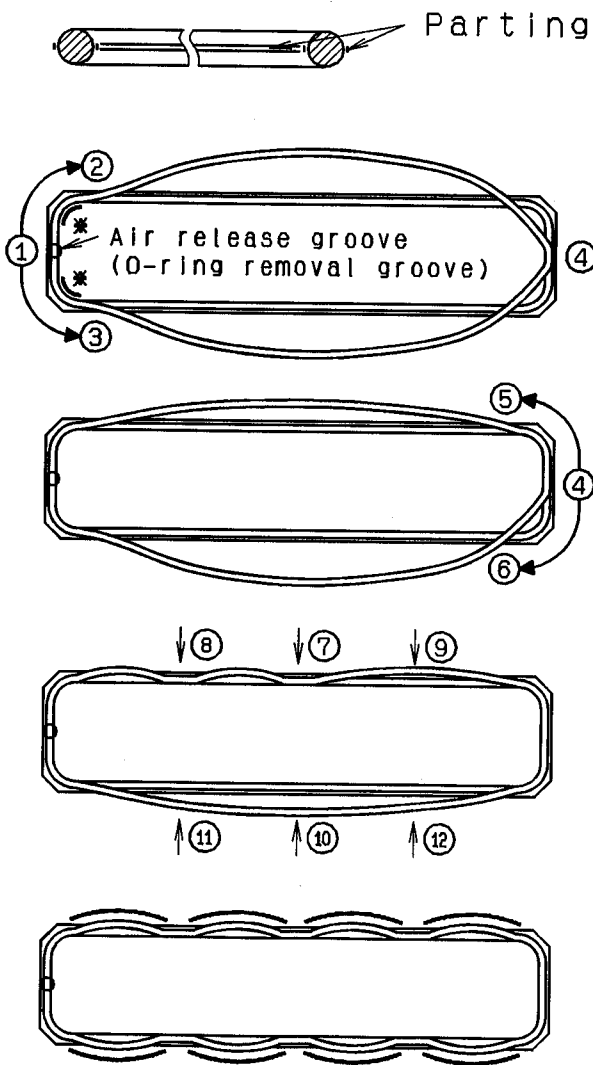
For replacement of O-ring used for gate, keep the following procedure.

6-1-1 Removal of O-ring

Insert plastic specific tool into air release groove on vent groove (O-ring removal groove) to remove O-ring.

6-1-2 Mount of O-ring

- (1) Wipe off attaching foreign materials with lint free wiper where ethanol is absorbed.
- (2) Do not make twist and wave on mounted O-ring.
- (3) Mount O-ring so that its parting line can be made horizontal.
- (4) Mounting order is as described below.



• Start mounting O-ring from air exhaust groove to the first both corners (the parts with number ① to ③ on the left illustration).

At the time, pay attention not to make twist on the O-ring of especially * mark of corners.

• Next, mount the O-ring to the center of opposite side (the part with number ④ on the left illustration).

• Then, keep mounting O-ring in direction ⑤ and ⑥ with care for twist on the corner.

• Then, mount O-ring to the center of longer side of the groove ⑦ and then to the part with number from ⑨ to ⑫ in order.

• Finally, make the rest part of O-ring flat indicated with the line by pushing into the groove.

Ensure that whole parts of O-ring are received by the groove completely not to make a wave on them.

Fig.6-1 Mounting of O-ring

7. Troubleshooting

| Trouble | Possible cause | Remedy |
|-------------------------------|--|---|
| Leak from gate | Too low actuating pressure | Increase air pressure to 0.4MPa at least |
| | Lowering of air pressure (Working of end lock) | Air leaks over specified value while end lock is working |
| | Deterioration of O-ring by processing | Replace with new O-ring whose material is changed to have compatibility with processing |
| | Flaw on sealing face of gate | Replace with new gate |
| | Flaw on seating face of chamber | Polish or replace with new seat |
| | Twist of O-ring | Remount O-ring |
| | Concave/Convex of end of O-ring | Push convex into dovetail groove and flatten O-ring |
| | Deterioration of bonnet Ass'y | Replace with new bonnet Ass'y |
| External leak | Damaged bellows | Replace with new bellows |
| | Deterioration of O-ring by processing | Replace with new O-ring whose material is changed to have compatibility with processing |
| | Flaw on seating face | Polish seating face |
| Gate is not close | End lock works | Refer to Precautions 4-3 |
| | Too low actuating pressure | Increase air pressure to 0.4MPa at least |
| | Deterioration of bonnet Ass'y | Replace with new bonnet Ass'y |
| Gate is not open | Working of end lock | Refer to Precautions 4-3 |
| | Too low actuating pressure | Increase air pressure to 0.4MPa at least |
| | Deterioration of bonnet Ass'y | Replace with new bonnet Ass'y |
| Switch doesn't work | Incorrect position of auto switch | Correct the position to become able to work |
| | Breakage of switch | Replace with new switch |
| Air leakage from bonnet Ass'y | Looseness of connected part | Replace with new bonnet Ass'y |
| | Wear of piston packing | Replace with new bonnet Ass'y |