SMC

Doc. No. GV＊－OMF0001－C

High Vacuum Slit Valve

Operation Manual

XGT222 - 32222 - ＊＊

XGT222 - 46236 - ＊＊

B **XGT223 - 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 exteme conditions, there is a possible result of serious injury or loss of life.

* 1) ISO 4414 : Pneumatic fluid power – General rules relating to systems. [C]
* 2) JIS B 8370 : Generic rule for pneumatics system

⚠ Warning

① **The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic 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 analysis and / or tests to meet your specific requirements.

② **Only trained personnel should operate pneumatically operated machinery and equipment.**
Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems 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 re-started, take measures to prevent shooting / out of cylinder piston rod etc. (Bleed air into the system gradually to create back-pressure.)

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 B

Opening size		32mm×222mm (XGT222-32222-＊＊)
		46mm×236mm (XGT222-46263-＊＊)
		46mm×236mm (XGT223-46263-＊＊)
Working pressure Pa		Atmospheric pressure ～10^{-6}
Operating pressure difference kPa		4 or less
Operating pressure MPa		0.45～0.6
Service life (in million)		200
Leakage Pa·m^3/s (Torr·l/s)	Internal	6.5×10^{-10} *1)
	Internal at negative pressure	6.5×10^{-8} *1) [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]
	External	6.5×10^{-11} *1)
Operating temperature ℃		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	Bellows (AM350), Gate (A6063), Body (A5052P), Bonnet (A5052), Other parts; SUS304
Exhaust direction		Free (Refer to internal leakage for reverse pressurization) C
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
Mass kgf		Approx. 12

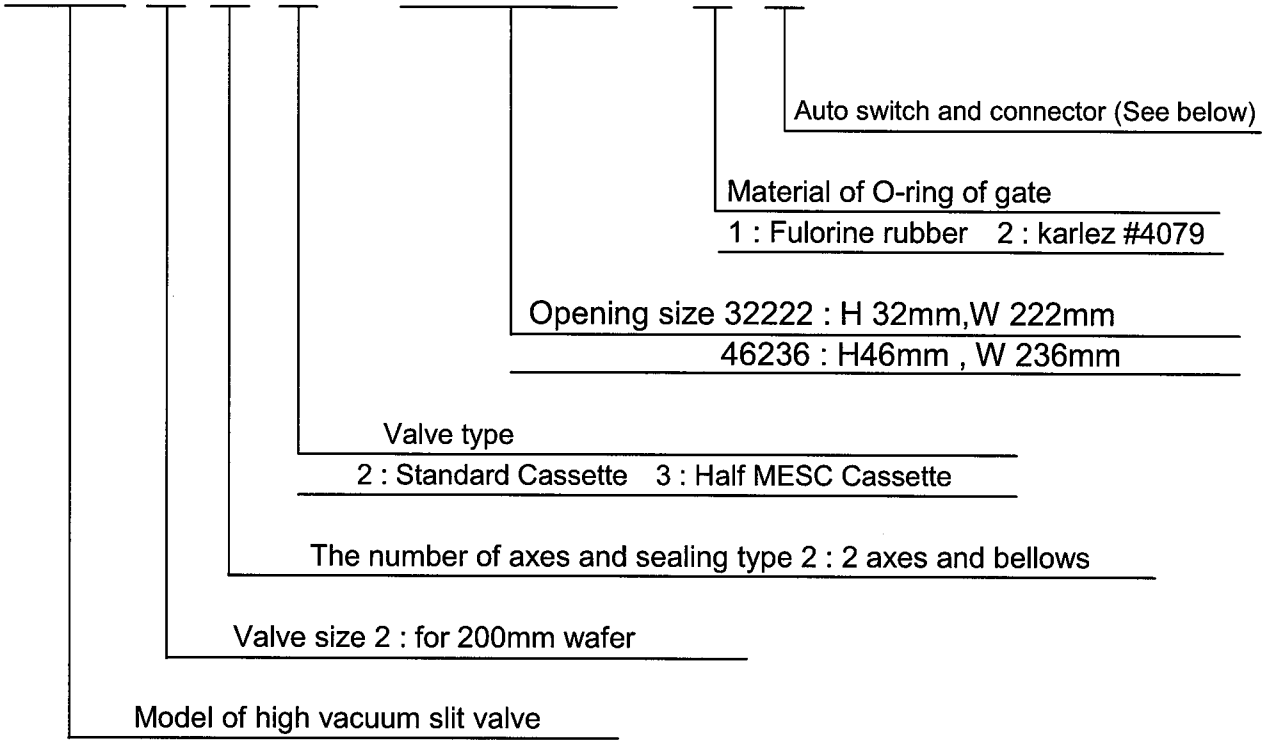
*1): At normal temperature. Gas permeation is not included.

*2): The period of time from gate open state to clamp after signals 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 B

XGT 2 2 2 – 46236 – 1 C



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

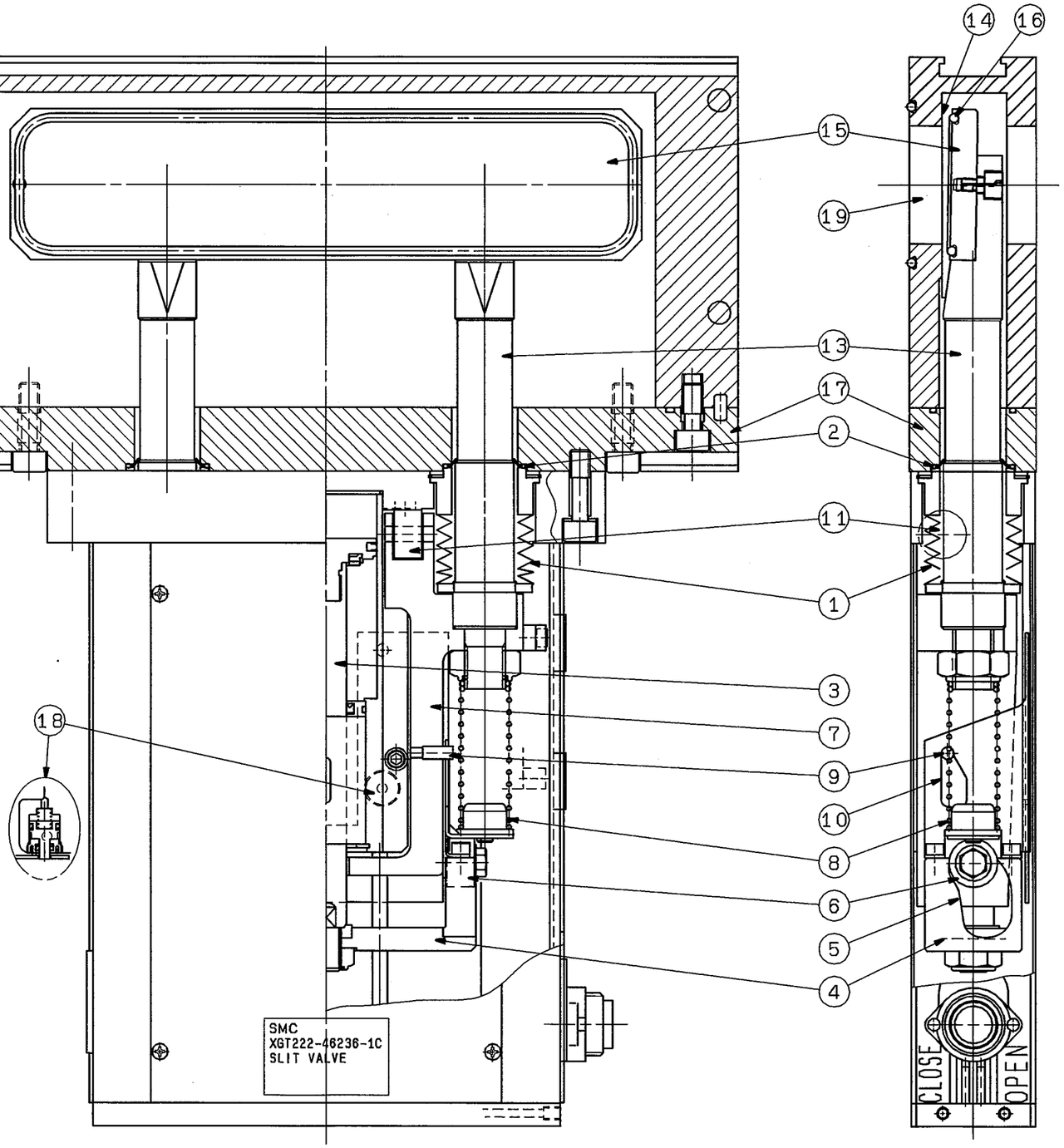


Fig.1A

Fig.1B

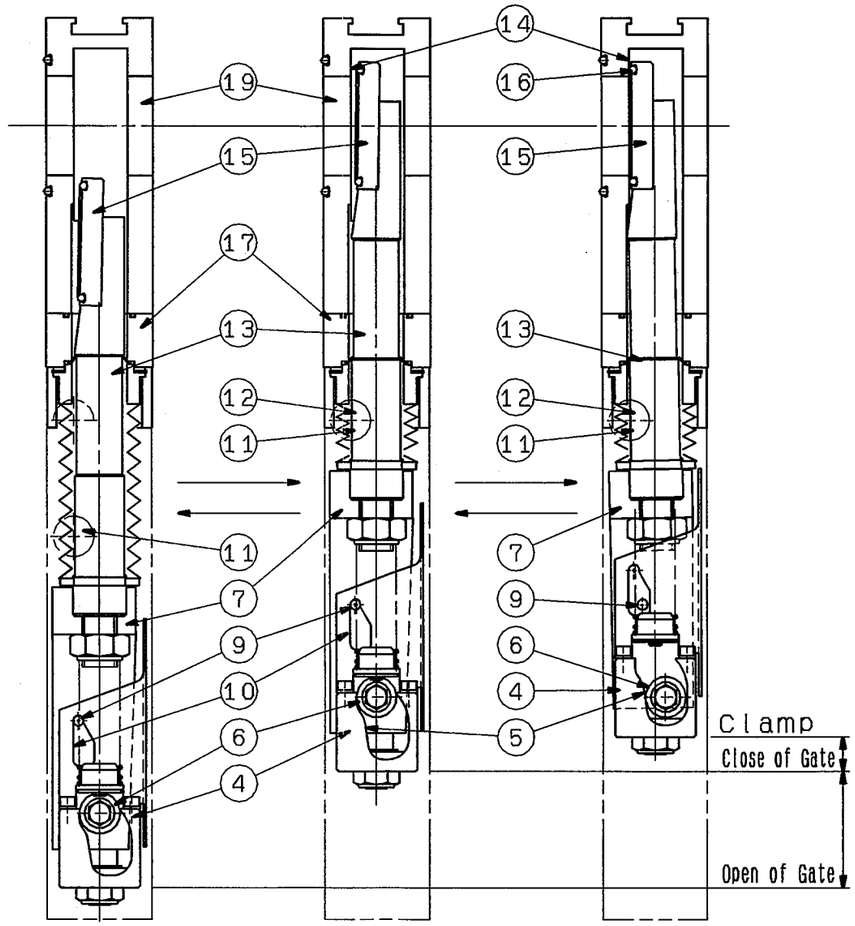


Fig.2A

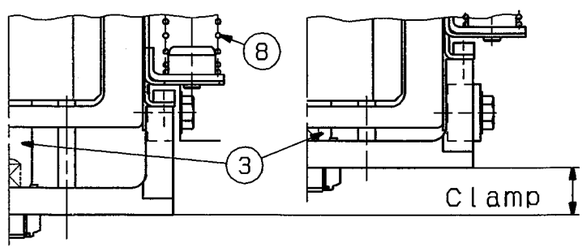


Fig.2B

Fig.2C

3-2 Operation

Figure 1A is a front view of slit valve. In this figure, the slit valve closes a slit ⑲ 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 ⑲ 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 champs 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 (Figure 2A to Figure 2B)

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 ⑲.

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 2C to Figure 2B)

After releasing clamps, 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 C

After installing One-touch fitting or speed controller with M5 type thread to piping port (M5 × 0.8), perform plumbing for pressure by holding the fitting lightly. Do not avoid excessive force to the fitting. For operation of the slit valve, use a 5-port valve. The use of other valves might operate an end lock improperly.

4-2. Installation C

Tighten the connect bolts diagonally with even torque so that not they are tightened only one side. To tighten bolts for mounting the bonnet Ass'y and the gate, see the maintenance procedure.

※Do not hurt the body seat during installation.

※Compression of the O ring of the mating side of the body shall be 0.7 to 0.9mm. Or, leakage is caused.

4-3 End lock release C

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

And at the time of shipment from the factory, a gate of the slit valve is set to close condition, and so the first supply of pressure need to be done to the port which closes the gate.

Ex: If the gate is in open condition, apply the pressure to a port which opens the gate, and switch the valve for operation after releasing the end lock.

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 lighting on.

⚠ Warning

(1) Do not get the hand in the body slit without care. If the slit valve starts moving in that condition, the gate may cut the finger.
(2) 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.
(3) Remove the pressure piping for operation and make cylinder have no pressure inside for maintenance.

⚠ Caution

4-7 Replacement of O-ring

Use the parts designated on "5. Replacement parts list" when replacing O-rings for a bonnet assembly, gate and body. Give sufficient cleaning to O-ring groove and mount O-ring in it so that it will not twist. Use a plastic specific tool so as not to damage sealing faces of the O-ring groove. After replacement, perform leak check.

⚠ Danger

4-8 Treatment of used product [C]

If retuning the slit valve 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 parts list B

XGT222-32222-** Special parts

Name		Order No.	Application	Remarks
Bonnet Ass'y		XGT0101-30-1AS	For XGT222-32222-* A C	—
Body Ass'y		XGT200-1-1-1AS	—	—
Bonnet		XGT200-1-2-1S	—	—
Gate Ass'y		XGT0101-2-1S	—	—
O-ring (of gate)	FKM	XGT200-9-13S	For XGT222-32222-1*	AS568-258V
	KALREZ® 4079	XGT200-9-14S	For XGT222-32222-2*	AS568-258
Auto switch Ass'y		XGT0101-50CS	For XGT222-32222-*C	—

XGT222-46236-** Special parts

Name		Order No.	Application	Remarks
Bonnet Ass'y		XGT0402-30-1AS	For XGT222-46236-* A C	—
Body Ass'y		XGT200-1-1-2AS	—	—
Bonnet		XGT200-1-2-1S	—	—
Gate Ass'y		XGT0402-2-1S	—	—
O-ring (of gate)	FKM	XGT200-9-7S	For XGT222-46236-1*	AS568-261V
	KALREZ® 4079	XGT200-9-9S	For XGT222-46236-2*	AS568-261
Auto switch Ass'y		XGT0402-50CS	For XGT222-46236-*C	—

XGT223-46236-** Special parts

Name		Order No.	Application	Remarks
Bonnet Ass'y		XGT0402-30-1AS	For XGT223-46236-* A C	—
Body Ass'y		XGT200-1-1-3AS	—	—
Bonnet		XGT200-1-2-3S	—	—
Gate Ass'y		XGT0402-2-1S	—	—
O-ring (of gate)	FKM	XGT200-9-7S	For XGT223-46236-1*	AS568-261V
	KALREZ® 4079	XGT200-9-9S	For XGT223-46236-2*	AS568-261
Auto switch Ass'y		XGT0402-50CS	For XGT223-46236-*C	—

Common exchange parts

Name	Order No.	Application	Remarks
O-ring (of Body) (FKM)	XGT200-9-12S	—	AS568-263V
O-ring (of Actuator)(FKM)	XGT200-9-11S	—	AS568-167V
Gasket with wiper	XGT0402-4-9S	Needing by 2 pieces	—
Fixed bolt	XGT0402-2-5S	Needing by 2 pieces	—

Auto Switch Connector (female)

Name	Order No.	Application	Remarks
Receptacle plug	XGT0402-9-12S	For XGT22∗-∗∗∗∗∗-∗C	T3105 000 (AMP)

C

6. Maintenance

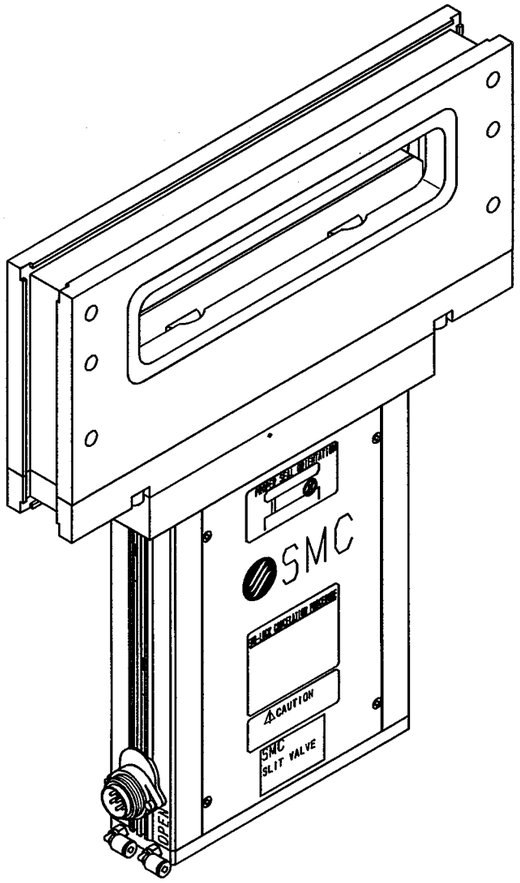
⚠ Warning

Refer to attachment "Procedure for maintenance".

7. Troubleshooting

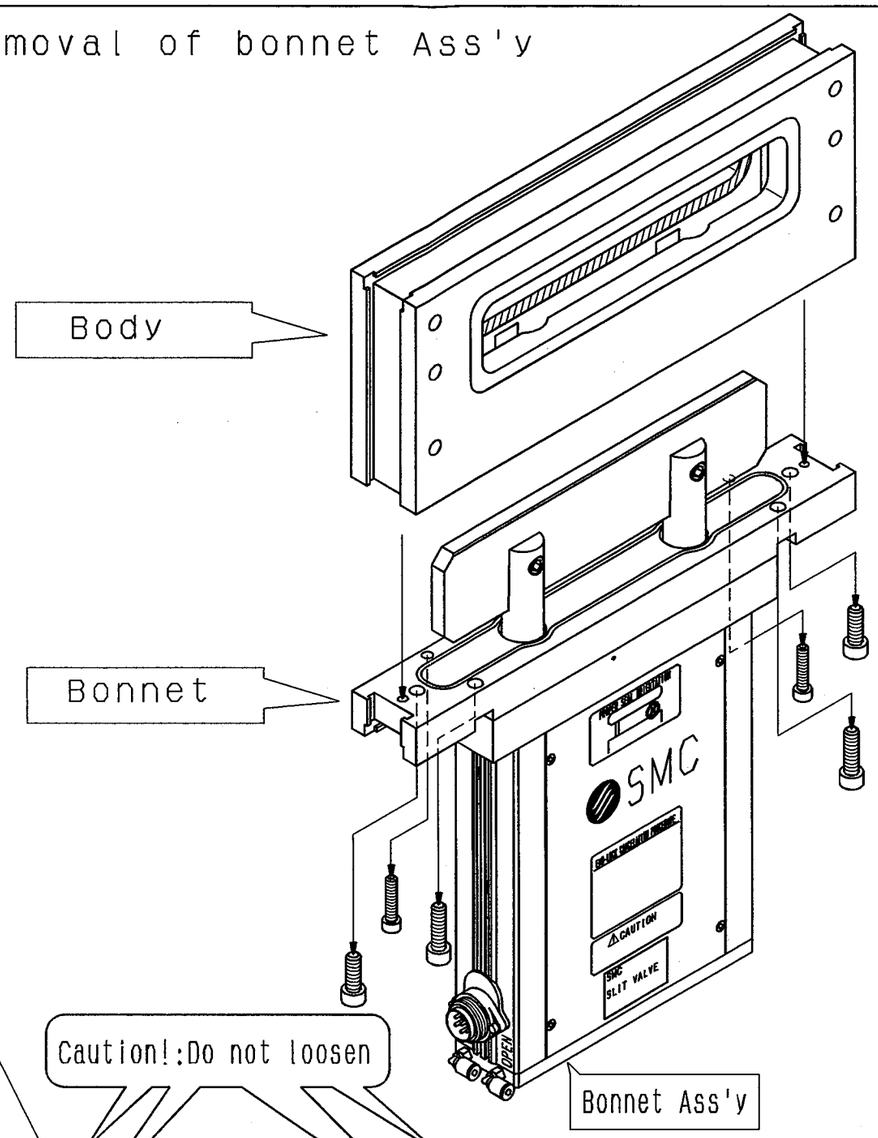
Trouble	Possible cause	Remedy	
Leak from gate	Too low actuating pressure	Increase air pressure to 0.45MPa at least	C
	Lowering of air pressure (Working of end lock)	Air leaks over specified value while end lock is working	
	Deterioration of O-ring by processing	Replace with new O-ring whose material is changed to have compatibility with processing	
	Flaw on sealing face of gate	Replace with new gate	
	Flaw on sealing 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 0.45MPa at least	C
	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 0.45MPa at least	C
	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	

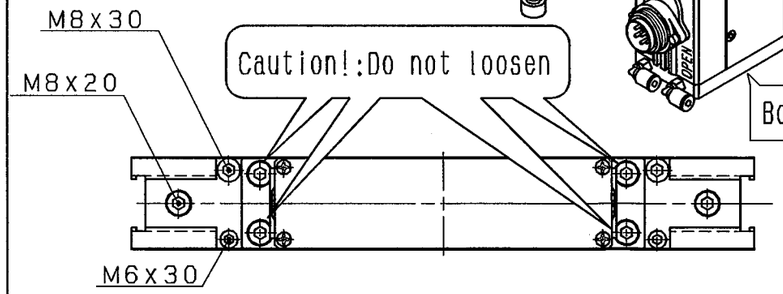
1 Preparation



Preparation for removal of bonnet Ass'y
As preparation for removal of the bonnet Ass'y,first of all,open the gate (move down the gate to lowest level).

2 Removal of bonnet Ass'y

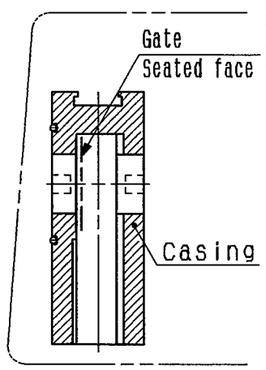




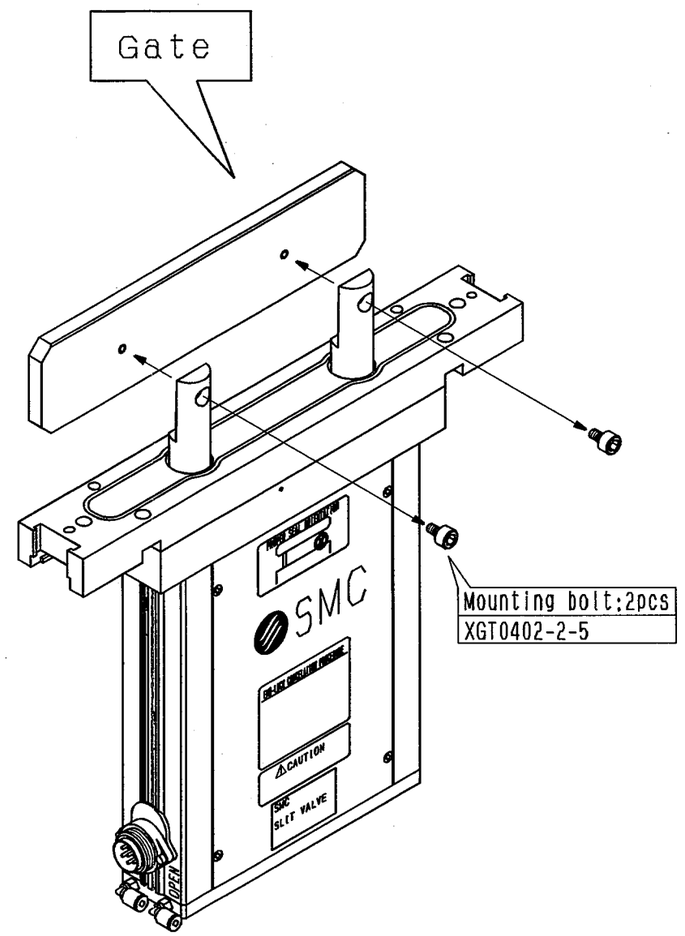
Removal of bonnet Ass'y
As shown above,remove six hexagon socket head bolts (two for each M6x30,M8x30 and M8x20) and remove the bonnet Ass'y.At this time,pay attention not to make the flaw on the face of the casing which is sealed by the gate.

C Tightening torque

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

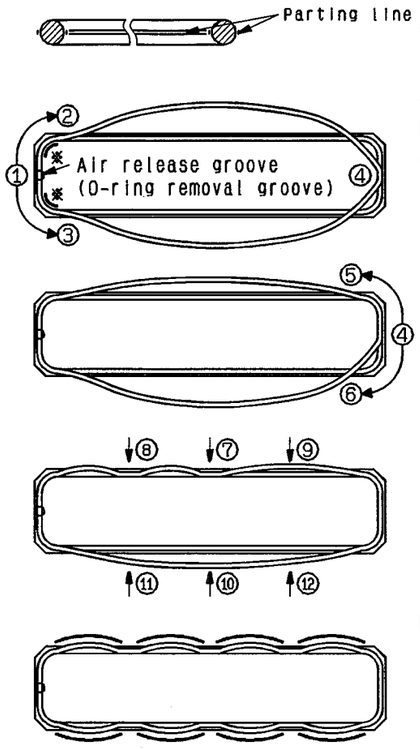


3 Removel of gate



Removal of gate
Remove two bolts(XGT0402-2-5)and remove the gate.At this time,pay attention not to make the flaw on the gate.

4 Replacement of O-ring



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

·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.

Table O-ring applicable to replacement

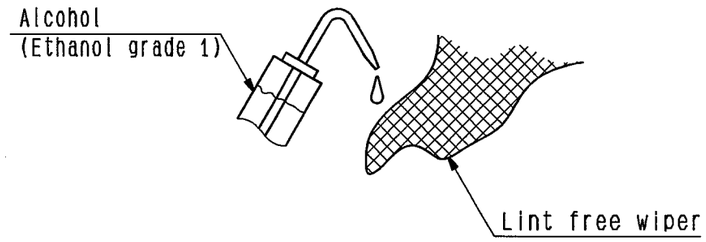
Part No. of used model	O-ring size	O-ring material
XGT22*-32222-1*	AS568-258	FKM
XGT22*-32222-2*		Kalrez 4079
XGT22*-46236-1*	AS568-261	FKM
XGT22*-46236-2*		Kalrez 4079

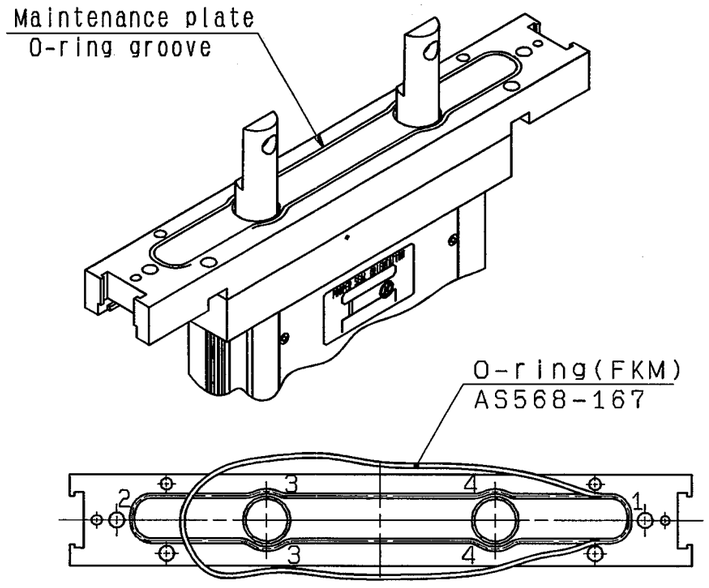
Procedure for replacement of O-ring

1.Removal of gate
Insert plastic specific tool into the air release groove on vent groove(O-ring removal groove) to remove the O-ring with no damage on the seating face.

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 above.

5 Replacement of O-ring of maintenance place

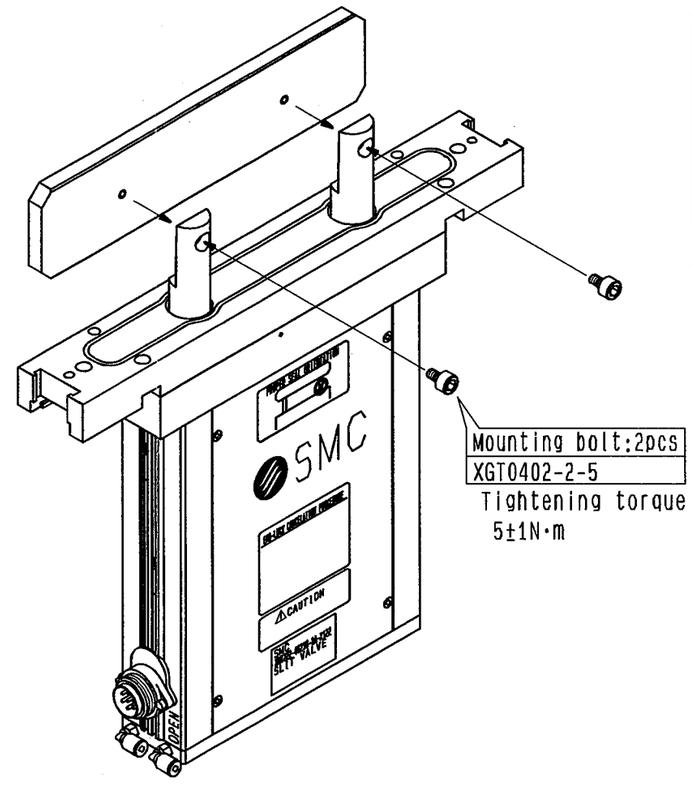




Procedure for replacement of O-ring of maintenance

1.Remove the O-ring from maintenance plate and wipe off any dust and dirt attached to O-ring groove with the cloth (lint free wiper) where alcohol (ethanol grade 1) is absorbed.
Note) In order to ensure no damage is cause on the seating face of the O-ring groove by removal of the O-ring,recommend use of tool such as plastic tweezers etc.
2.Wipe off the dust and dirt attached to new O-ring with cloth where alcohol (ethanol grade 1) is absorbed.
3.Confirm no flaw and no attachment of dust and dirt are made in the O-ring groove of maintenance plate and start mounting the new O-ring to the gate.
For mounting of new O-ring,keep the numeric order shown above so that same length of the O-ring is given to upper and lower part of the O-ring.
Any twist and wave on mounted O-ring is not allowable.If the twist is made on the O-ring, a parting line of the O-ring is seen.

6 Mounting of gate



Mounting of gate
Mount the gate by tightening two bolts(XGT0402-2-5).At this time, keep tightening torque of 5±1N·m.