



# Operation Manual

PRODUCT NAME

*High Vacuum Slit Valve*

MODEL / Series / Product Number

XGT312-50336-\*\*

XGT313-50336-\*\*

**SMC Corporation**

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# SLIT VALVE

## Safety Instructions C

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution," "Warning" or "Danger." They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)\*1), and other safety regulations.

\*1) ISO 4414: Pneumatic fluid power -- General rules relating to systems.

ISO 4413: Hydraulic fluid power -- General rules relating to systems.

IEC 60204-1: Safety of machinery -- Electrical equipment of machines .(Part 1: General requirements)

ISO 10218: Manipulating industrial robots -Safety.

etc.



### Caution

**Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.



### Warning

**Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



### Danger

**Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

## Warning

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

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results.

The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product.

This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

### 2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly.

The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

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

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.

2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.

3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

### 4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.

3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.



# SLIT VALVE

## Safety Instructions C

### **Caution**

#### **The product is provided for use in manufacturing industries.**

The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary. If anything is unclear, contact your nearest sales branch.

### **Limited warranty and Disclaimer/Compliance Requirements**

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".

Read and accept them before using the product.

#### **Limited warranty and Disclaimer**

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.\*2)

Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.

This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

\*2) Vacuum pads are excluded from this 1 year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

#### **Compliance Requirements**

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction(WMD) or any other weapon is strictly prohibited.

2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulation of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

### **Caution**

#### **SMC products are not intended for use as instruments for legal metrology.**

Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.

Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

## 1. Specifications

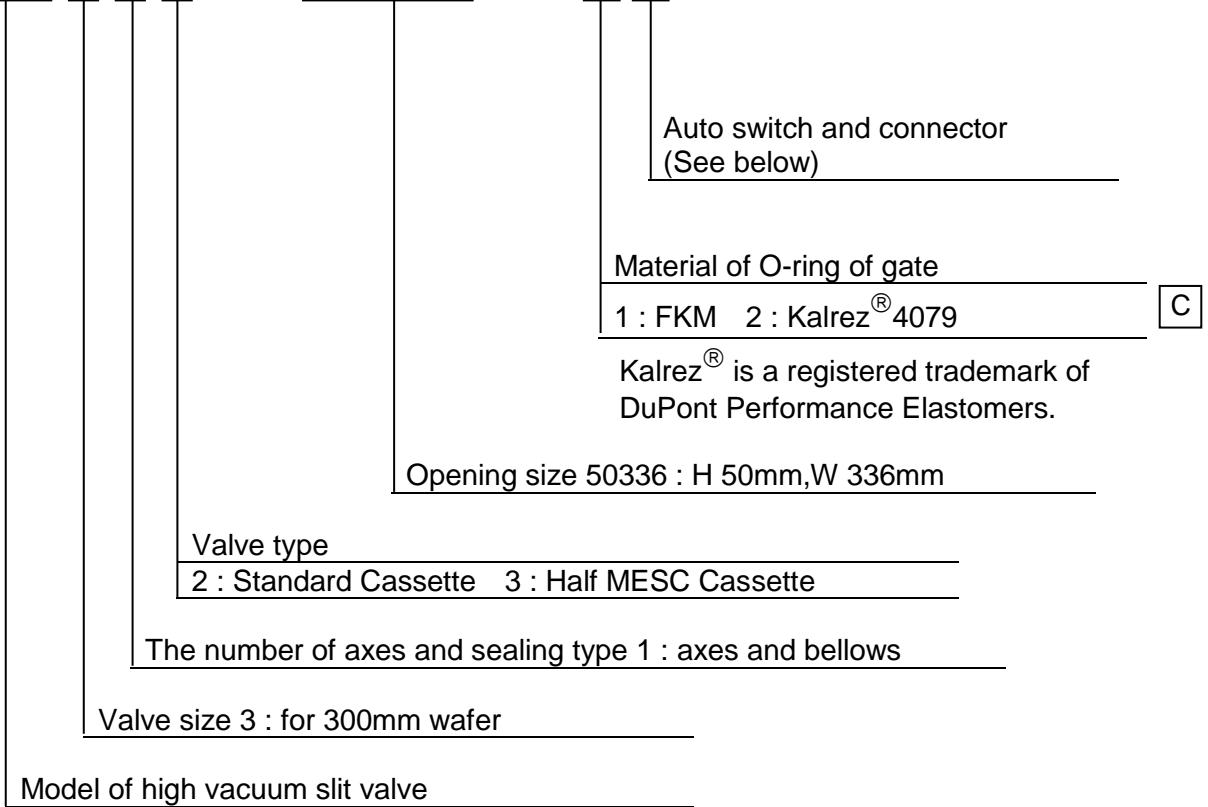
Opening angle		50mm×336mm		
Working pressure Pa		Atmospheric pressure to 10 <sup>-6</sup>		
Operating pressure MPa		0.45 to 0.6		
Internal leakage amount		O-ring material : FKM	6.5×10 <sup>-10</sup> Pa·m <sup>3</sup> /sec	
		O-ring material : Kalrez <sup>®</sup> 4079	6.5×10 <sup>-9</sup> Pa·m <sup>3</sup> /sec	C
Internal leakage amount (At negative pressure 0.1MPa or less)		O-ring material : FKM	6.5×10 <sup>-8</sup> Pa·m <sup>3</sup> /sec	
		O-ring material : Kalrez <sup>®</sup> 4079	6.5×10 <sup>-7</sup> Pa·m <sup>3</sup> /sec	C
External leakage amount		6.5×10 <sup>-11</sup> Pa·m <sup>3</sup> /sec		
Operating temperature °C		5 to 150 (for gate) 5 to 60 (for moving part)		
Operating fluid		Inertia vacuum		
Operating times s		0.6 to 1		*2
Position detection		Auto switch (D-A93)		
Main materials for vacuum part	Seal material	FKM		
	Material for mechanism	Bellows : AM350, Gate : A6063, Body : A5052P, Bonnet : A5052, Others : SUS304		B
Piping size		Rc1/8		
Exhaust direction		Universal		
Mounting direction		Vertical		
End lock mechanism		With end lock (No seal function at gate closed)		
Cylinder capacity l		0.2		
Mass kg		20		

\*1: At normal temperature · Gas penetration 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.

2. How to order B

**XGT 3 1 2 - 50336 - 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 : 0.5m
C		Multi connector (C016 30C006 100 12 : AMP) <span style="border: 1px solid black; padding: 0 5px;">C</span>
F		D-sub connector (CDE-9PF05 : Hirose Electric Co. Ltd)

### 3. Construction / Operation

#### 3-1 Construction

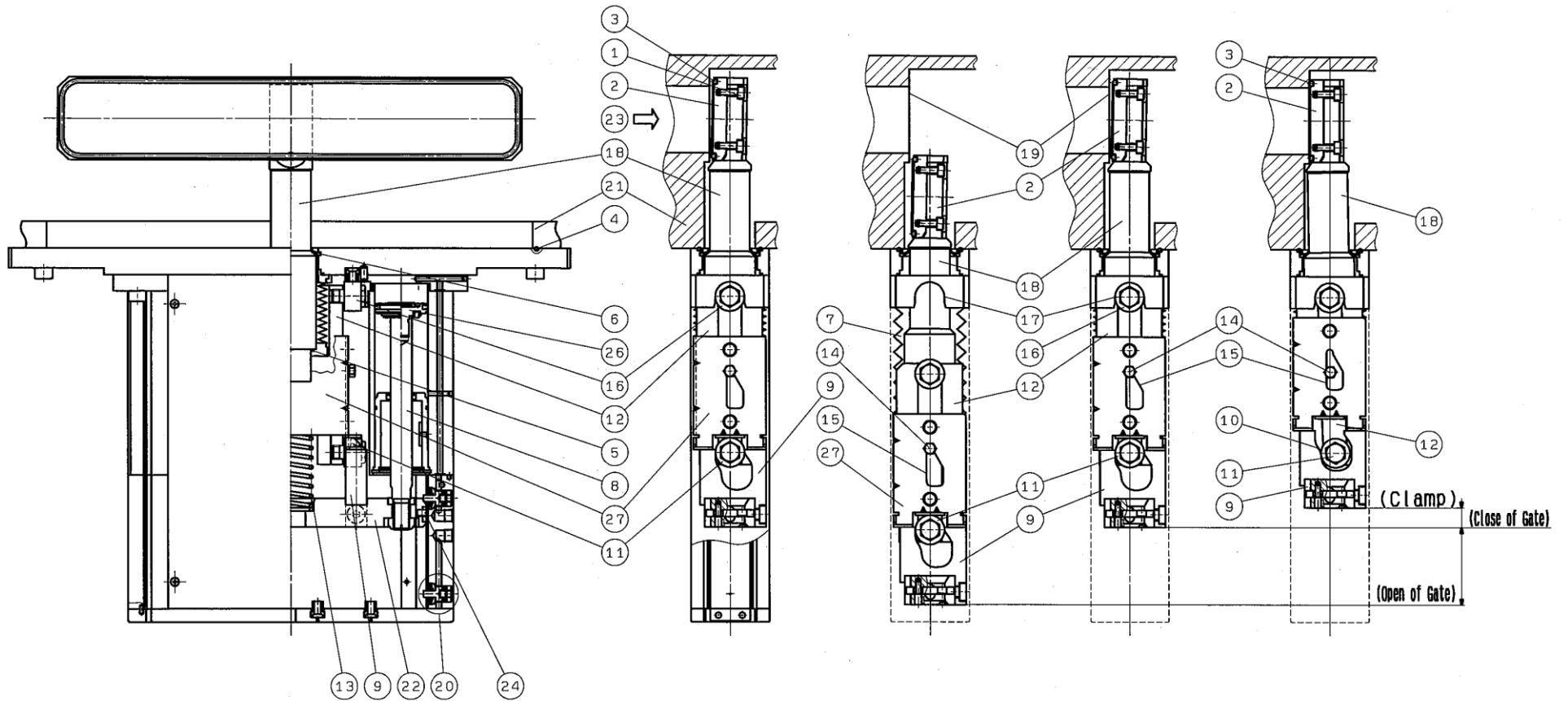


Fig. 1A

Fig. 1B

Fig. 2A: Open

Fig. 2B: Close

Fig. 2C: Clamp

### 3-2 Operation

Figure 1A and B are front view of a slit valve. In these figures, the slit valve closes an opening (slit) ② which transfers workload and a gate ② (seal material ③) does not clamp (seal) a seating face ⑱.

In Figure 2A, the slit valve opens and makes the slit ② able to transfer workload.

Figure 2B shows the condition same as Figure 1B and Figure 2C, that's, the gate ② clamps and seals the seating face ⑱ by the seal ③.

#### 3-2-1 Overall construction

In Figure 1A and 1B, a piston rod ⑧ integrated with a piston ⑫ and a roller block ⑨ are integrated and held to an actuating base ⑭. And a shaft ⑰ fixed to these components and a lever ⑬ are separated away by force of spring ⑬. On the other hand, since the lever is bound by a plate ⑮ fixed to the roller block ⑨, the shaft ⑰ and the roller block ⑨ can be moved up and down simultaneously by action of spring ⑬.

When the shaft ⑰ moves up and down, axial seal between a body ① and outside is realized by O-rings ⑤ and ⑥ and a bellows ⑦. And fixing seal between the bonnet ASSY and the body ① is realized by an O-ring ④.

#### 3-2-2 Closing gate (Figure 2A to Figure 2B)

The roller block ⑨ integrated with the piston rod ⑧ moves up when pressure is applied to "CLOSE" side of pressure piping (in other words, pressure is exhausted from "OPEN" side of pressure piping). On the other hand, although the lever ⑬, the shaft ⑰ and the gate ② continue to move up because the roller block ⑨ pushes the shaft ⑰ integrated with the lever ⑬ by force of spring ⑬, a roller bearing A ⑯ gets into an U-shaped fulcrum groove ⑰, stops and closes the slit ② of the body ①.

In Figure 2B, a cam groove ⑩ of the roller block ⑨ and a roller bearing B ⑪ guides the movement in lateral direction.

Further, the guide groove ⑮ of the plate ⑮ held to the roller block ⑨ and the guide pin ⑭ held to the lever ⑬ are also guiding the lateral movement.

On the other hand, the movement in vertical direction is fixed by constant distance between the lever ⑬ and the roller block ⑨. The distance is kept constant by the roller bearing B ⑪ and the plate ⑮, which are clamped by spring ⑬ after touching each other. These mechanism to guide and fix the movement makes the lever ⑬, the shaft ⑰ and the gate ② able to move up and down stably from the gate open position shown in Figure 2A to the gate close position shown in Figure 2B.



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

The roller bearing A ⑩ gets into the fulcrum groove ⑪ and makes the lever ⑫, the shaft ⑬ and the gate ⑭ stop. On the other hand, as the piston rod ⑮ and the roller block ⑯ rise further overcoming force of spring ⑰, the roller bearing B ⑱ moves right along with the cam groove ⑲ of the roller block ⑯. Because of this, the shaft ⑬ and the gate ⑭ lean left around the roller bearing A ⑩ whose position is fixed by the fulcrum groove ⑪ and the gate ⑭ clamps an O-ring ⑳ to the seating face ㉑ for sealing. The lever ⑫ fixed in lateral and vertical position leans when the plate ㉒ moves up and makes the guide pin ㉓ of the lever ⑫ unengaged from the guide groove ㉔ of the plate ㉒. Because of this, the lateral position is made unfixed.

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

Since the roller block ⑯ is moved down when pressure is applied to “OPEN” side of pressure piping (in other words, pressure is exhausted from “CLOSE” side of pressure piping), the roller bearing B ⑱ moves left along with the cam groove ⑲. Because of this, the shaft ⑬ and the gate ⑭ lean right around the roller bearing A ⑩ whose position is fixed by the fulcrum groove ⑪, and the gate ⑭ stops clamping. At this time, the roller bearing B ⑱ held to the lever ⑫ and the plate ㉒ held to the roller block ⑯ come to touch each other and are fixed vertically by force of spring ⑰ and fixed laterally when the guide pin ㉓ held to the lever ⑫ is engaged into the guide groove ㉔ of the plate ㉒.

When the roller block ⑯ moves down, the lever ⑫ is given slight force to move down by the roller bearing B ⑱, but the force of spring ⑰ overcomes the force to move down and makes the gate ⑭ away perpendicularly from the seat plate ㉑.

### 3-2-5 Opening gate (Figure 2B to Figure 2A)

After the gate stops clamping (sealing), the gate ⑭, the shaft ⑬, the lever ⑫ and the roller block ⑯ move down simultaneously. And the gate ⑭ opens and makes the slit ㉕ of the body ㉖ able to transfer workload.

### 3-2-6 End lock (Not shown in Figure)

In the case of sudden loss of operating pressure while the gate ⑭ is in the opened or closed position, a pin ㉗ of end lock extends out and comes into an end lock groove ㉘ of the actuating base ㉙. Because of this, the movement of the piston rod ⑮ is restricted and the valve is held at the position before sudden loss of operating pressure. (The gate is not held sealed during clamping.)

## 4. Precautions



### Caution

#### 4-1. Pressure piping

After connecting one-touch fitting with Rc1/8 screw specification or speed controller (SPICON) to piping port (Rc1/8), connect the tube holding its fitting part lightly. Do not give excessive force to the fitting by connection. And the operation by air supply should be operated by 5 port 2 position valve.

Use of other valves may cause malfunction of the end lock.

#### 4-2. Installation

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Tighten the connect bolts diagonally with even torque so that not they are tightened only one side. To tighten bolts for mounting the bonnet ASSY 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

When unlocking valve with no operating pressure applied, first apply pressure to operating port which can remain the gate at open or close position as the gate is at the moment, and then release end lock and switch 5 port valve for operation.

Further, as slit valve is shipped with closed condition from factory, please apply pressure to the condition at first.

Ex; When the gate is in opened position, first apply pressure to the port which remains the gate in open position, release end lock and then switch 5 port valve for operation.

#### 4-4. Speed control

In case of control open / close speed with mounting speed controller on pipe connection port, please be sure to prepare speed controller for meter out.

If the speed controller is not for meter out, it may not only cause valve malfunction but also give bad effect for its life.

#### 4-5. Exhaust piping

Pay attention not to give pressure from other solenoid valves to the slit valve. Such a pressure may cause end lock to operate improperly.

#### 4-6. Operation of valve

B

※ 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**

(3) Please don't put your hands etc. into the slit on body carelessly.

When valve starts its operation, the gate may cut off fingers etc.

(4) Please don't remove the side plates on actuating part.

Touching moving part with hands during operation may cause injury.

(5) Please exhaust all pressure in cylinder with disconnecting air piping on operating part at valve maintenance.

#### **Warning**

#### 4-7. Replacement of O-ring

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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

If returning the product which has used a 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 A

### XGT312-50336-\*\*\* Special parts

Name	Order No.	Application	Remarks	B
Body ASSY	XGT300-1-1AS		—	

### XGT313-50336-\*\*\* Special parts

Name	Order No.	Application	Remarks	B
Body ASSY	XGT300-1-1-3AS		—	

### Common exchange parts

Name	Order No.	Application	Remarks	
Bonnet ASSY	XGT311-50336A1-1	For XGT31*-50336-*	C	
	XGT311-50336A1-1A	For XGT31*-50336-*A	C	
	XGT311-50336A1-1C	For XGT31*-50336-*C	C	
	XGT311-50336A1-1F	For XGT31*-50336-*F	C	
Gate ASSY	XGT300-2-1S		-	
Body O-ring (FKM)	XGT300-9-10S		AS568-273	
Gate O-ring	FKM	XGT300-9-9S	For XGT31*-50336-1*	AS568-271
	Kalrez <sup>®</sup> 4079	XGT300-9-11S	For XGT31*-50336-2*	AS568-271
Actuator O-ring (FKM)	XGT300-9-7S		AS568-177	
Wiper	XGT300-4-9S		-	
Fixed bolt	XGT300-2-5S		-	
Auto switch ASSY	Multiple connector	XGT300-50AS	For XGT31*-50336-*C	-
	D-sub connector	XGT300-50DS	For XGT31*-50336-*F	C

### Connected connector of Auto switch

Name	Order No.	Application	Remarks	B	C
Receptacle plug	XGT0402-9-12S	(For XGT31*-50336-*C)	C016 30D006 100 12 (AMP)		

## 6. Maintenance

Please refer to valve maintenance procedure in the attached documents.

## 7. Troubleshooting

Condition	Assumed cause	Countermeasure
Gate Internal leakage	Operating pressure is low	Pressure should be 0.45MPa or more.
	Lowering of air pressure (Working of end lock)	Air leaks over specified value while end lock is working
	Flaws on gate seal	Replace gate
	Flaws on seal on chamber side	Polish or replace Body
	Deterioration of O-ring by processing	Replace with new O-ring whose material is changed to have compatibility with processing
	O-ring twisted	Remove and mount O-ring again
	Deflection of O-ring	Put deflected part into dovetail groove equally
	Deterioration of bonnet ASSY	Replace bonnet ASSY
External leakage	Breakage of bellows	Replace bellows
	O-ring deterioration caused by process	Replace it to the O-ring with appropriate material
	Flaws on seat surface	Polish seat surface
Gate doesn't close	Operation of end lock	See Precaution 4-3
	Operating pressure is low	It should be 0.45MPa or more
	Deterioration of bonnet ASSY	Replace bonnet ASSY
Gate doesn't open	Operation of end lock	See Precaution 4-3
	Operating pressure is low	It should be 0.45MPa or more
	Deterioration of bonnet ASSY	Replace bonnet ASSY
Switch doesn't operate	Incorrect position of switch	Adjust it to the appropriate position
	Operation failure of switch	Replace switch
Air leakage of bonnet ASSY	Looseness of connection	Replace bonnet ASSY
	Wearing of piston packing	Replace bonnet ASSY

B

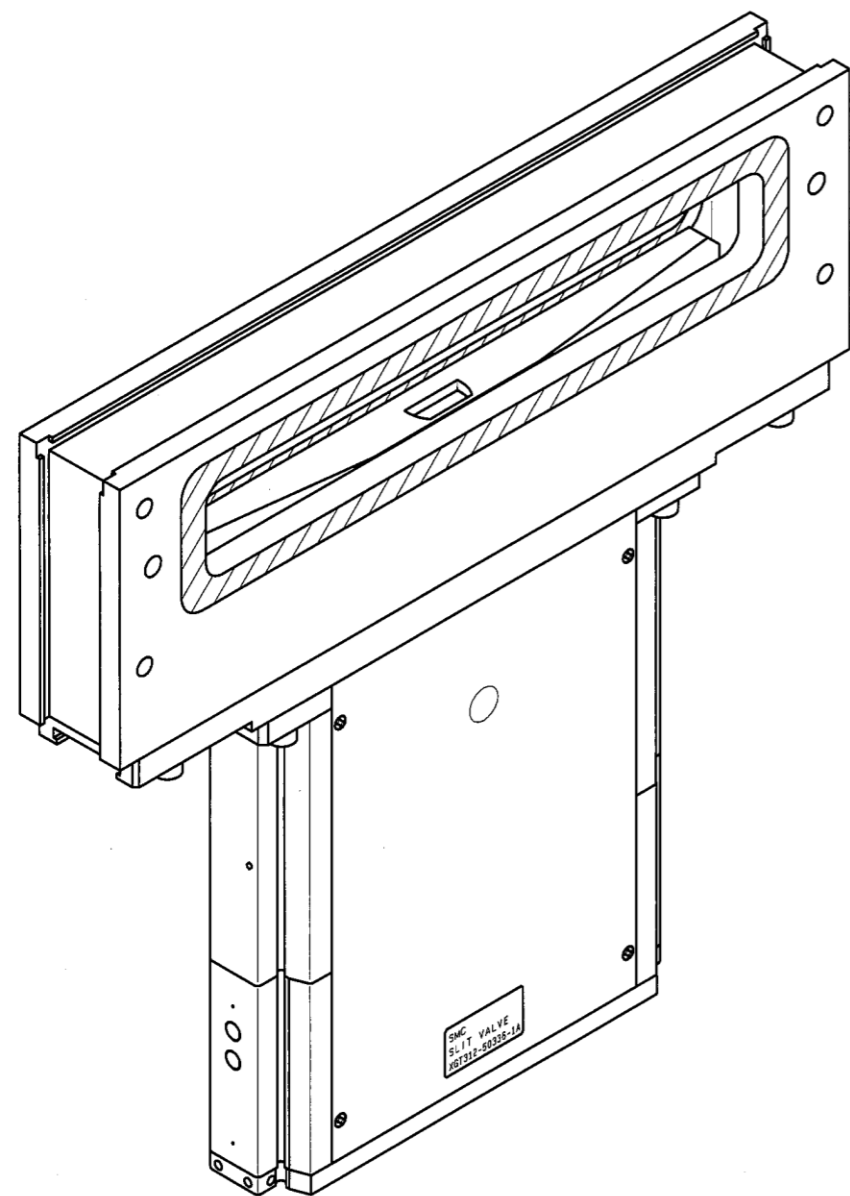
B

B

A Please contact to SMC, because the disassembly of it is necessary for the exchange of the bellows.

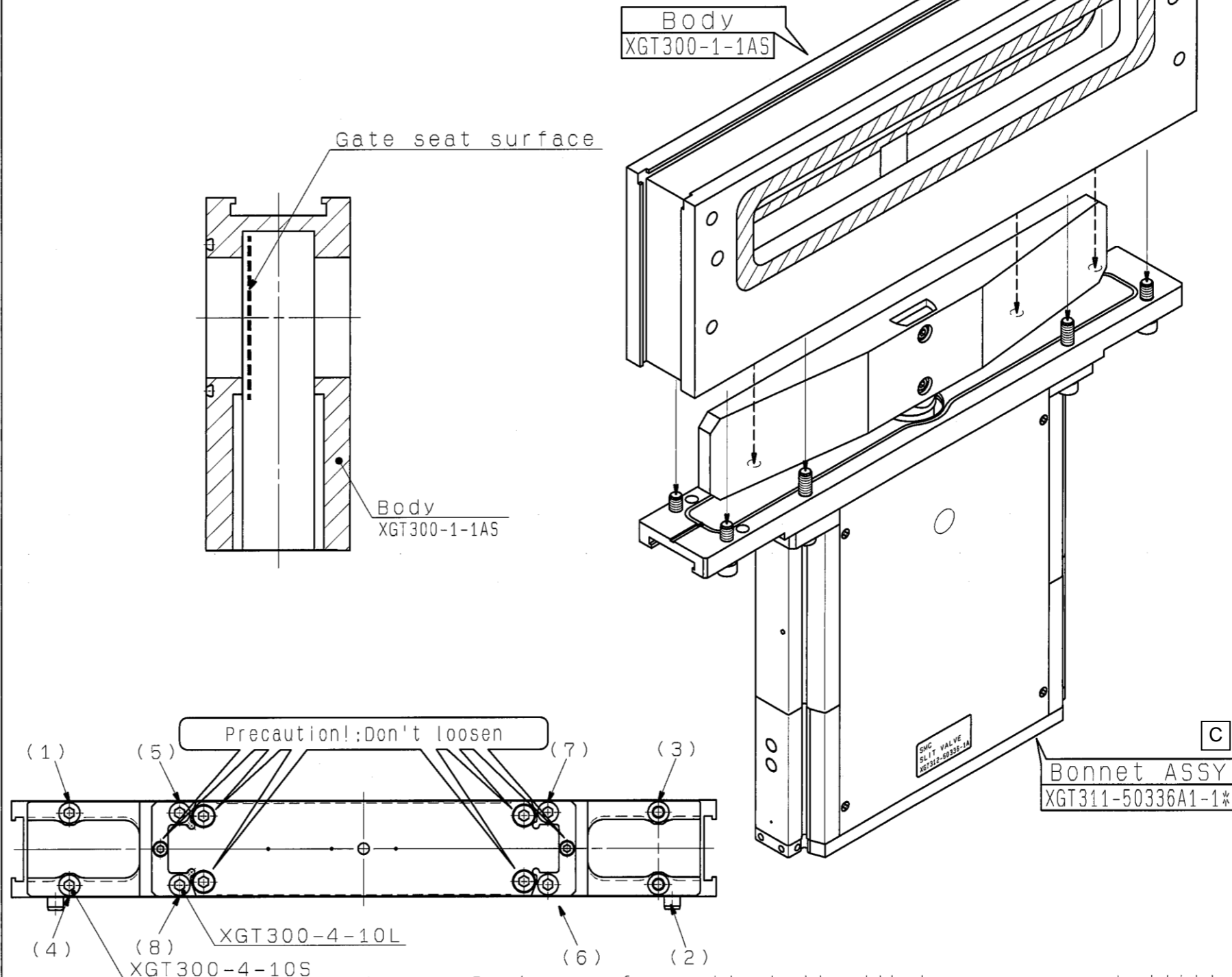
5. Maintenance procedure

1 Preparation



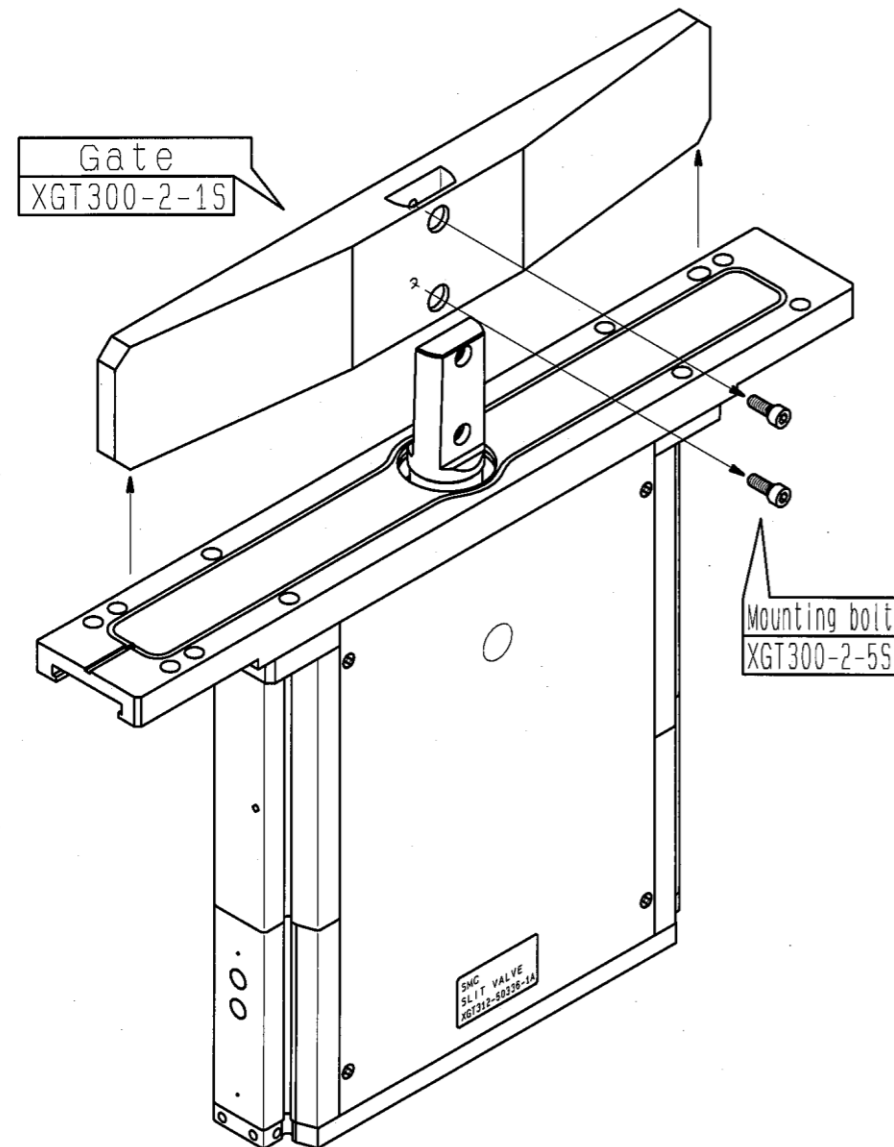
Open the gate of slit valve, stop the air supply to valve and exhaust residual pressure. Air supply after operation finished should be performed with manual system. In case that residual pressure left at removal or the system is not switched to manual at mounting, it is difficult to treat the accident urgently and may lead to physical injury.

2 Removal of bonnet ASSY



Loosen 8 pieces of cap tip bolt with hexagon wrench little by little following the order of (8)→(1). Since bolts are cap tip type, they have resistance at the first stage of loosening, however, they lose it suddenly after removed from body. After removing 8 pieces of cap tip bolt, remove ASSY. Please don't put any flaws on gate seat surface at this operation.

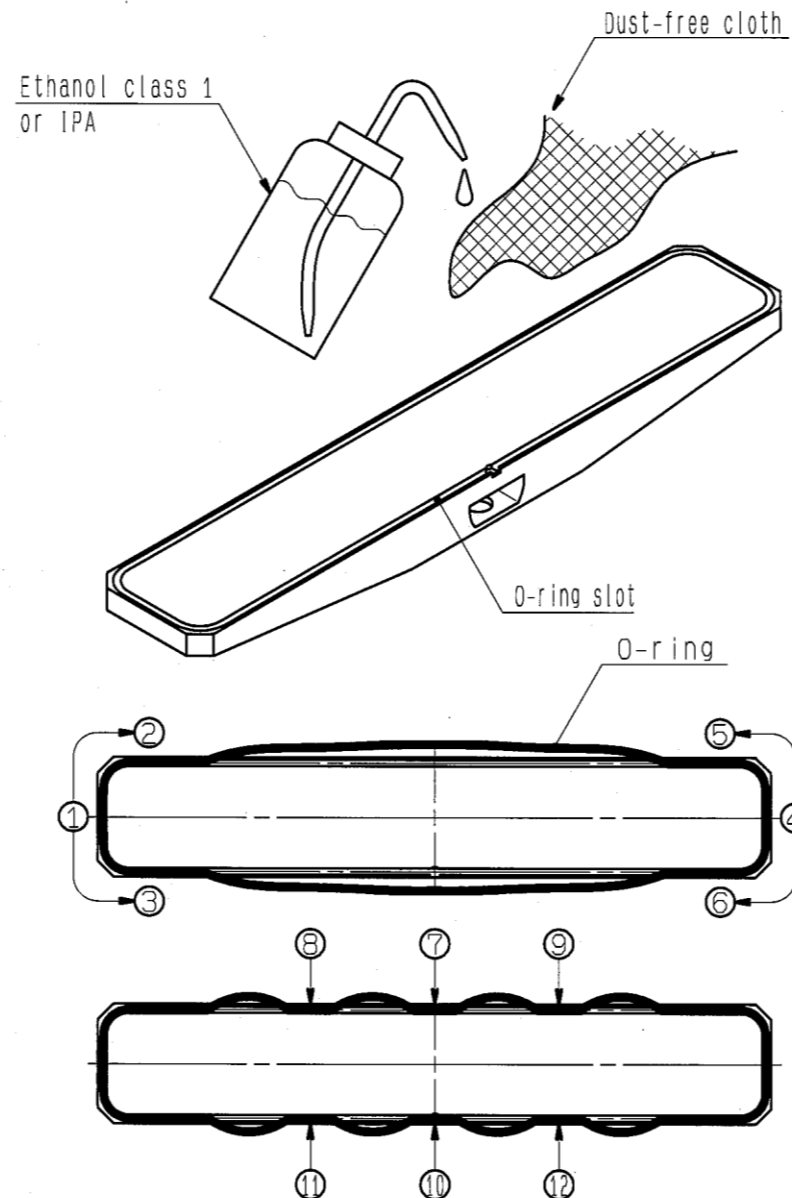
3 Removal of gate



Removal of gate

Remove 2 pieces of mounting bolt and remove gate. Please don't put any flaws on gate at this operation.

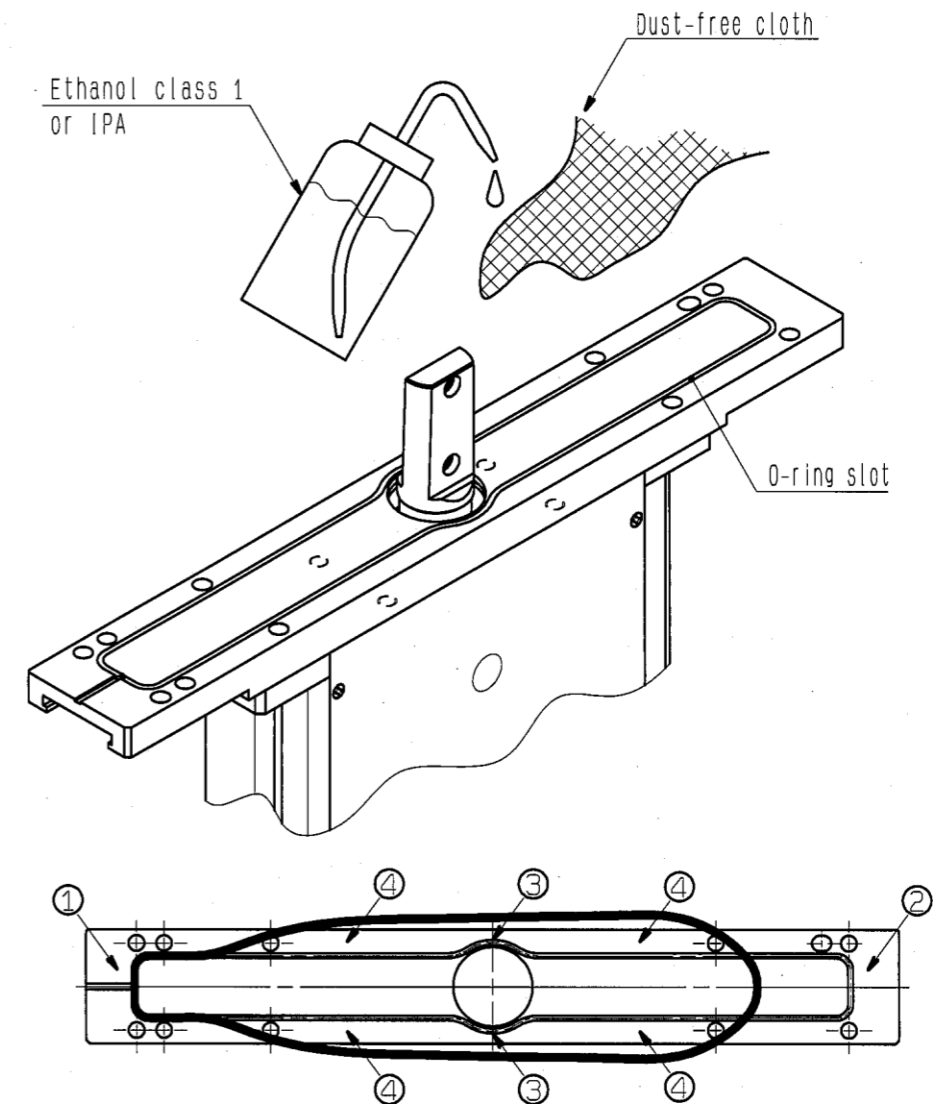
4 Replacement of gate O-ring



Replacement procedure of gate O-ring

1. Remove O-ring from gate, apply ethanol class 1 or IPA to the Dust-free cloth like shown above and wipe off dust and dirt etc. inside of O-ring slot.  
Pay attention not to put any flaws and gouges etc. on seat surface of O-ring at this operation.  
Note) Protect seat surface of O-ring slot from flaws and gouges by using plastic pin set at O-ring removal.
2. Wipe off dust and dirt etc. on new O-ring with ethanol class 1 or IPA.
3. Confirm no flaws, dust and dirt inside of O-ring slot of gate. Follow the mounting order shown above at mounting O-ring on gate.  
After ⑫, divide the un-mounted O-ring into small parts as much as possible and mount all of them.  
Note) Pay attention not to twist (when O-ring is twisted, parting line can be seen) and make wave on O-ring at mounting.

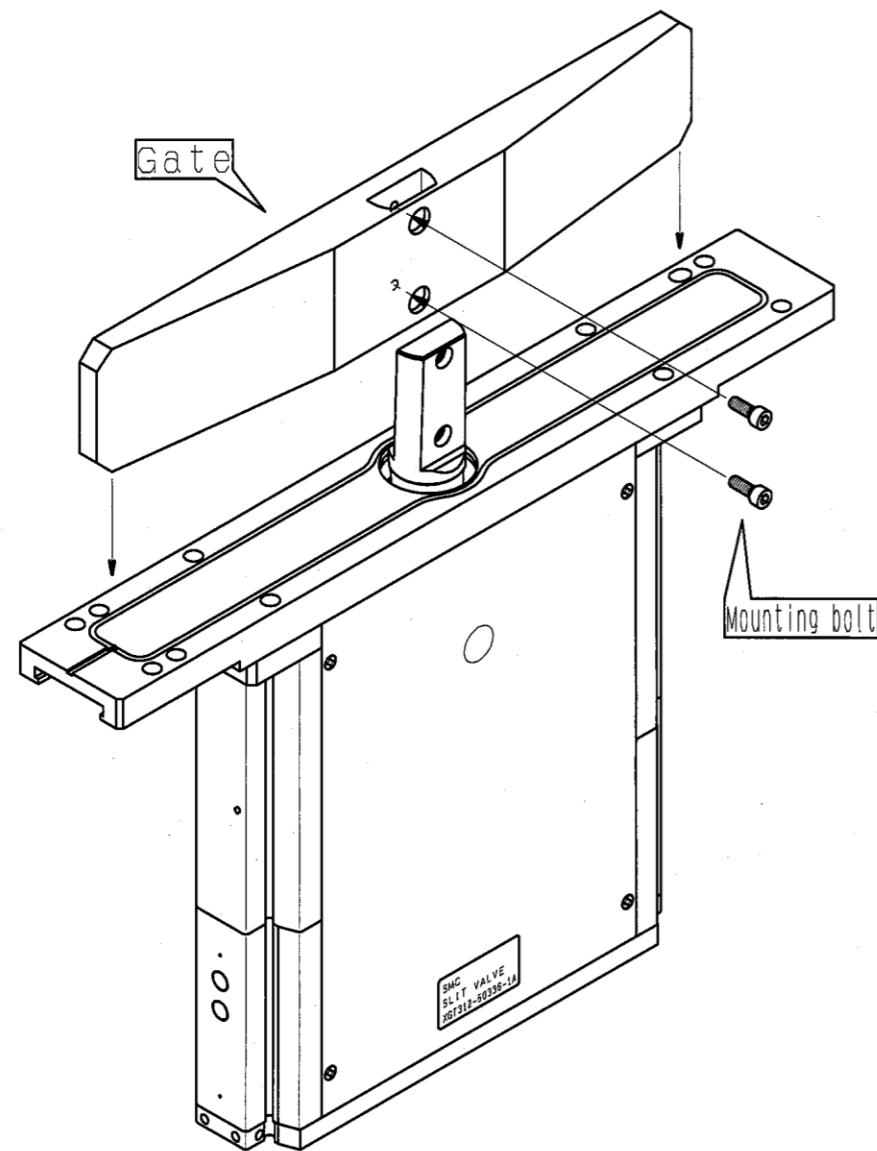
5 Replacement procedure of O-ring on bonnet



Replacement procedure of O-ring on bonnet

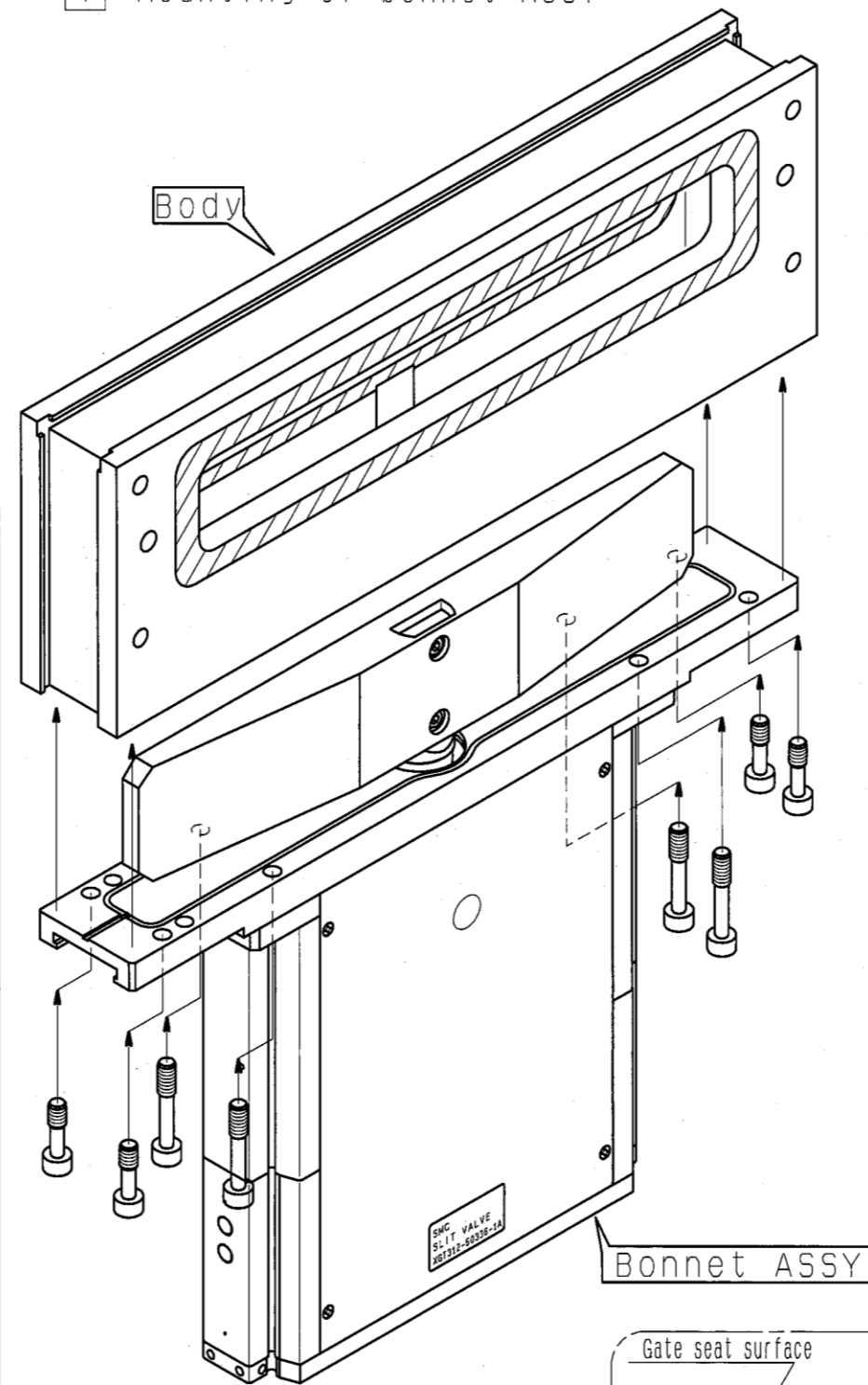
1. Remove O-ring from bonnet, apply ethanol class 1 or IPA to the Dust-free cloth shown above and wipe off dust and dirt etc. inside of O-ring slot.  
Pay attention not to put any flaws and gouges etc. on seat surface of O-ring at this operation.  
Note) Protect seat surface of O-ring slot from flaws and gouges by using plastic pin set at O-ring removal.
2. Wipe off dust and dirt etc. on new O-ring with ethanol class 1 or IPA.
3. Confirm no flaws, dust and dirt inside of O-ring slot of gate. Follow the mounting order shown above at mounting O-ring on gate.  
At mounting O-ring on bonnet, hold O-ring following the order stated above to mount the upper and lower part equally.  
In addition, pay attention not to twist (when O-ring is twisted, parting line can be seen) and make wave on O-ring at mounting.

6 Mounting of gate

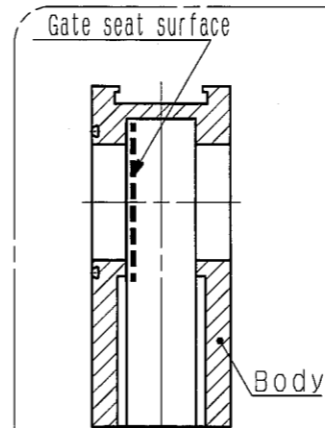


Mounting of gate  
 Mount gate with 2 pieces of mounting bolt (Tightening torque: 3.4N·m).  
 Pay attention not to put any flaws on gate at this operation.

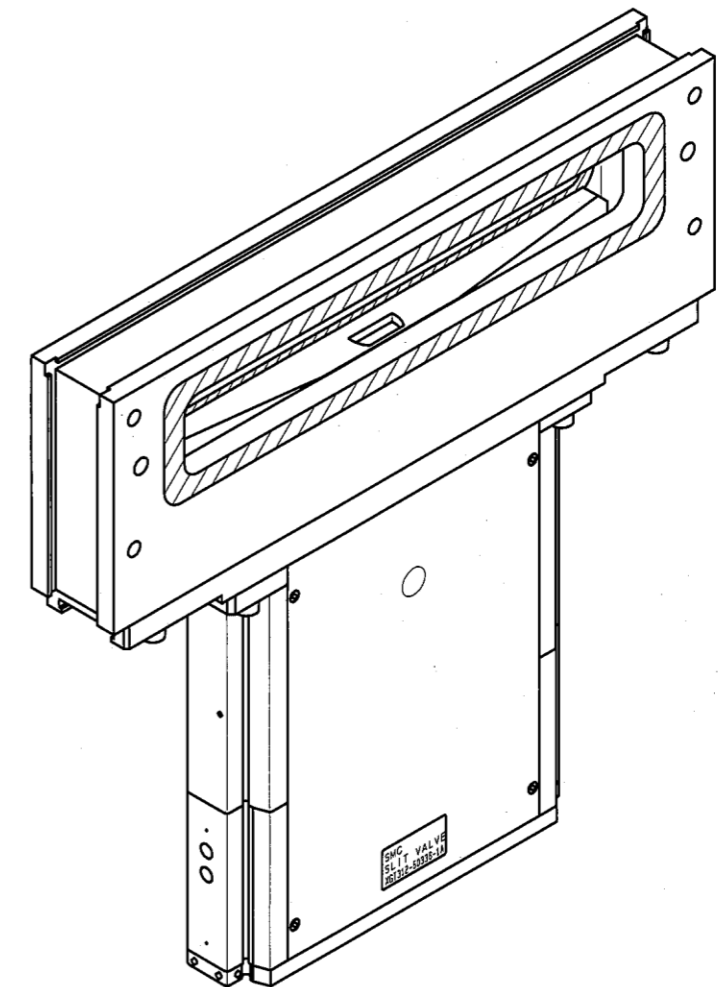
7 Mounting of bonnet ASSY



Mounting of bonnet ASSY  
 At mounting slit valve, tighten 8 pieces of cap tip bolt temporarily following the opposite order of valve removing [(1)→(2), (3)→(4), (5)→(6), (7)→(8)] with approx. 6N·m torque using hexagon wrench.  
 After temporary tightening, tighten them perfectly following the same order with 12±2N·m torque.  
 Note) At mounting it on body, confirm the position of positioning pins to mount it with proper direction.



8 Maintenance completed





Revision history	
C version : Change of connector and bonnet ASSY part number.	November 2021

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.

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