IN21764

Doc. no. XG*-OMW0069

Operation Manual

PRODUCT NAME

Parallel Seal Type Gate Valve

MODEL / SERIES / PRODUCT NUMBER

XGTP31*-50336-***

Thank you for purchasing SMC product. For appropriate operation of this product, please read this operation manual thoroughly to understand. Also, refer to the drawing, product information for structure and specification of this product. Confirm operating environment is within operating specifications.

SMC Corporation

CONTENTS

Gate Valve Safety Instructions

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 10218-1992: Manipulating industrial robots-Safety

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.

Safety Instructions

Caution

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

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.

Safety Instructions Be sure to read the " Handling precautions for SMC Products" (M-E03-3) and "Operation Manual" before use.

1. Specifications

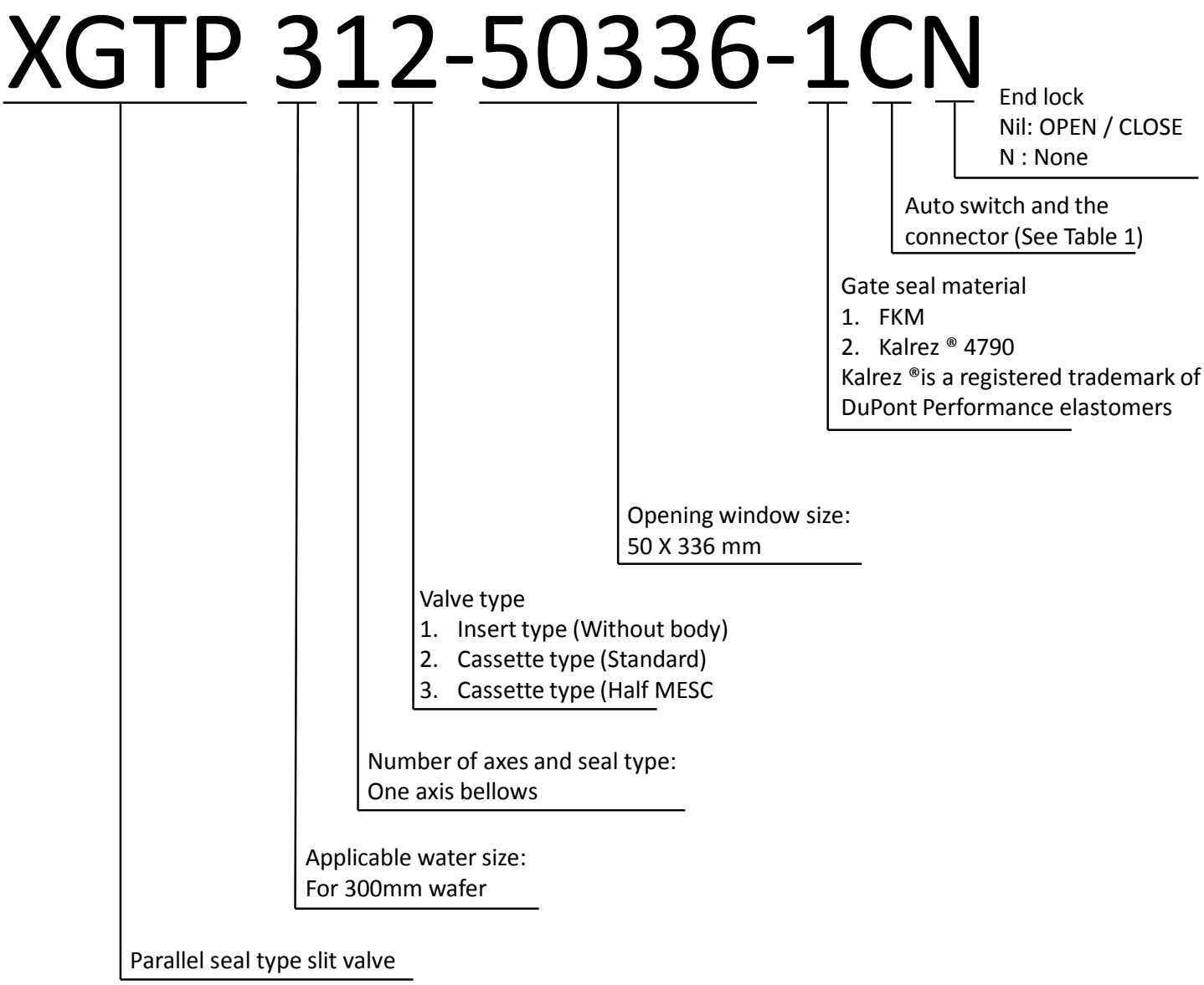
Opening size		50mm×336mm	
Operating pressure		Atmospheric pressure～10^{-6} Pa	
Pilot pressure		0.45～0.6 MPa	
Internal leakage *1		O-Ring Material : FKM	6.5×10^{-10} Pa･m^3/sec
		O-Ring Material : Kalrez □	6.5×10^{-9} Pa･m^3/sec
Internal leakage at Back pressure *1 〈Back pressure 0.1MPa(abs) or less〉		O-Ring Material : FKM	6.5×10^{-8} Pa･m^3/sec
		O-Ring Material : Kalrez □	6.5×10^{-7} Pa･m^3/sec
External Leakage*1		6.5×10^{-11} Pa･m3/sec	
Operating temperature		Gate Part：5～120℃(During bake-out：150℃) Actuator part：5～90℃ （Except Auto switch）	
Fluid		Inert gas	
Operating Time		1 sec or less *2	
Auto Switch		D-A93 （Operating temperature：20～60℃）	
Main material of vacuum part	Seal material	FKM	
	Mechanical parts	Bellows :AM350	
		Gate :A6063	
		Body :A5052	
		Bonnet :A6061	
		Gate Bolt :SUS316	
		Others :SUS304	
Piping size		Rc 1/8	
Exhaust direction		Free	
End-Lock (End lock type)		With lock mechanism in opened or FULL seal postion	
Cylinder Volume		.2 ℓ	
Mounting Direction		Vertical	
Mass		* Insert type : 10 kg	
		* Cassette type (Standard) : 14.5 kg	
		* Cassette type (Half MESC) :13.5 kg	

*1: At normal temperature. Gas permeation is not included.(SMC's inspection conditions)
*2: The period of time from gate open state to clamp after signals comes to solenoid valve and from gate clam

＜Conditions＞

- Pressure: 0.5MPa
- Pipe length:1m
- Gate Direction: Vertical Upper
- Without Speed Controller
- Solenoid Valve:SY5120-01
- Tube:TU0604

2. How to order



Symbol	Auto Switch	Connector
Nil	**-**	**-**
A	**D-A93 (2pcs)**	**Lead wire: 0.5m**
C		**Multiple connector (AMP)** • **C01630D00610012 made by AMP is recommended for the connector (female type).**
F		**D-sub connector** • **CDE-9SF05 made by HIROSE ELECTRIC CO., LTD** **is recommended for the connector (female type).**

3. Construction / Operation

Bonnet Assembly

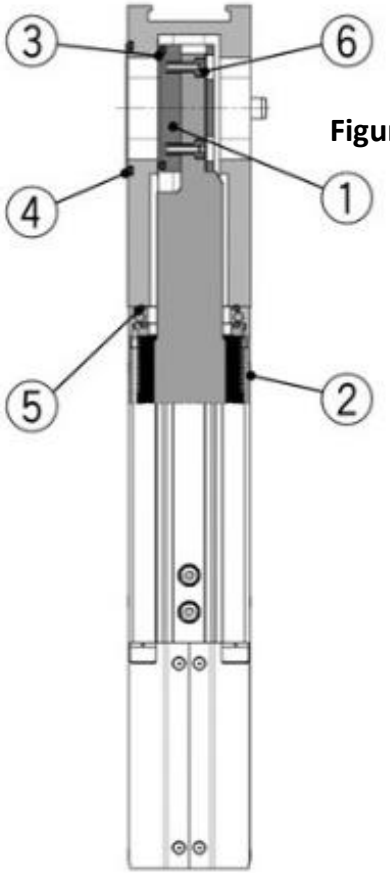


Figure 1

Component Parts

No.	Description	Material	Part number
1	**Gate**	A6063	XGTP300-2-1S
2	**Bellows**	AM350	XGTP300-20AS
3	**O-ring (Gate)**	FKM	XGT300-9-9S
		Kalrez® 4079	XGT300-9-11S
4	**O-ring** (Body opening side)	FKM	XGT300-9-10S
5	**O-ring** (Bonnet assembly)		XGT300-9-7S
6	**Fixing bolt**	Stainless steel 316	XGT300-2-5S (2 pcs.)

* Kalrez® is a registered trademark of E. I. du Pont de Nemours and Company or its affiliates.

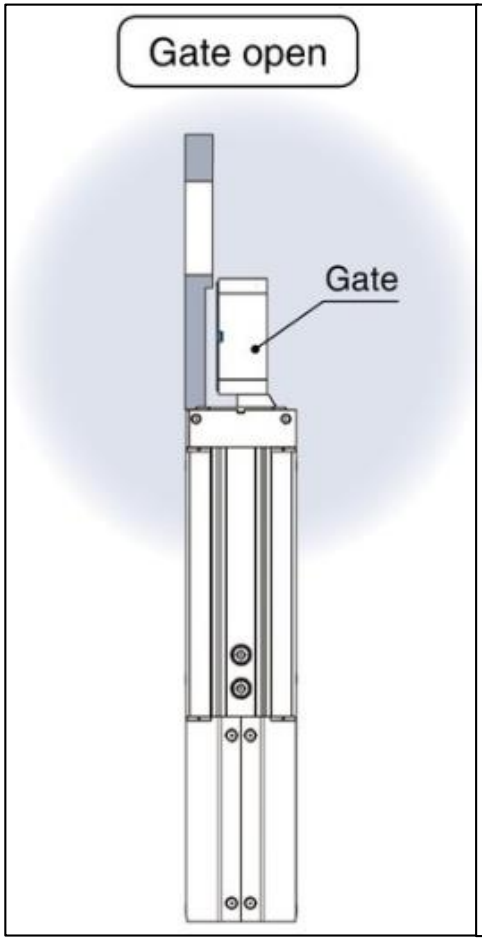


Figure 2A

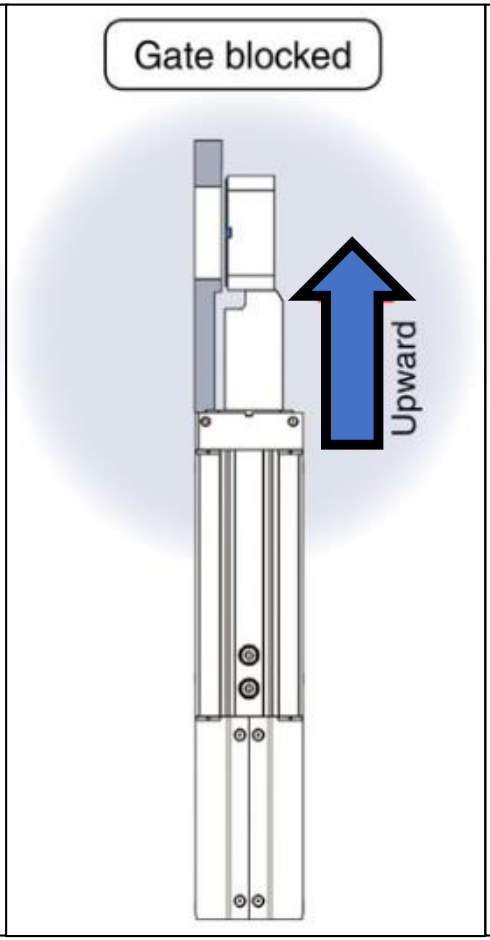


Figure 2B

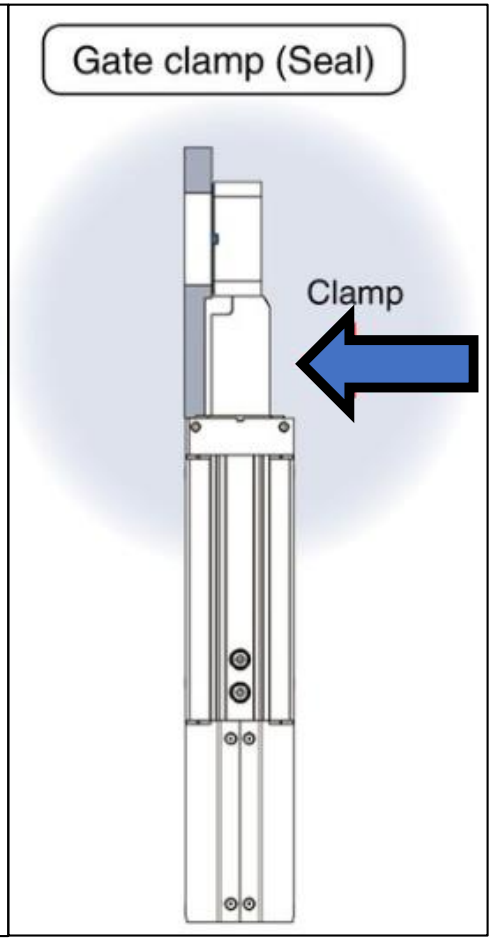


Figure 2C

3-1 Operation

Figures 1 and **2B** shows the valve in the **CLOSED** position

- As air pressure is applied to the ports, the gate will move towards the desired position. **(OPEN / CLOSE)**
- **Figure 2A** shows the valve in the **OPEN** position that would permit the transfer of product within the vacuum environment.
- **Figure 2B** shows the valve moving upward prior to sealing the gate seal.
- **Figure 2C** shows the valve in the **CLOSED** position that would permit processing the product by customer within vacuum environment.

3-2 Construction

Figures 1 illustrates the basic components that define the Gate valve.

- **1. Gate** mounts to the shaft and moves up and down to seal the Gate valve
- **2. Bellows** maintains vacuum in the Gate valve assembly while allowing for vertical motion of the shaft.
- **3. O-ring gate** is critical seal that contains process gas while sustain specific leak rate for vacuum.
- **4. O-ring Body** is critical seal that joins the Gate valve assembly to the customer system reactor/chamber.
- **5. O-ring Bonnet** assembly is critical seal that joins two Gate valve components while maintaining vacuum.
- **6. Fixing bolts** are specially deigned bolts that mount the gate to the shaft .

3-3 Gate OPEN to CLOSE (Fig2A⇒ Fig2C)

- Pressurizing to “CLOSE" side port (exhausting “OPEN" side)
- Verify specified Mpa is maintained with operating range
- System design and peripheral components can impact precision Gate valve performance by altering target operating pressures.
- Fully completing OPEN / CLOSE cycles are imperative to prevent damaging the valve components such as the End Lock mechanism.
- Verify specified torques for proper assembly
- Verify fittings and tubing for kinks, twisting, damage, and long runs that might impact performance
- Handle precision Gate valve with care to prevent damage and scratches to prevent vacuum leaks
- Do not remove gate valve from reactor/chamber when the valve is in the closed position.

3-4 Gate CLOSE to OPEN (Fig.2C⇒ Fig.2A)

- Pressurizing to "OPEN" port side (exhausting "CLOSE" side)
- Verify specified Mpa is maintained with operating range
- System design and peripheral components can impact precision Gate valve performance by altering target operating pressures.
- Fully completing OPEN / CLOSE cycles are imperative to prevent damaging the valve components such as the End Lock mechanism.
- Verify specified torques for proper assembly
- Verify fittings and tubing for kinks, twisting, damage, and long runs that might impact performance
- Handle precision Gate valve with care to prevent damage and scratches to prevent vacuum leaks
- Do not remove gate valve from reactor/chamber when the valve is in the closed position.

3-5 End lock (in case with End Lock)

When the air pressure is suddenly lost during opening and closing of Gate valve, The End lock mechanism will engage**.** The valve maintains the location before the air is lost.

4. Precautions

Caution

4-1. Air piping

Hold the speed controller on the piping port **(Rc1/8)** lightly and connect the tube. Do not to apply excessive external force to the fittings. The end lock may not operate correctly without using the two position five port valve.

4-2. Installation

Tighten the bolts gradually and diagonally **(star pattern when possible)** by constant torque to avoid uneven force to the bolts. When installing the bonnet assembly and gate, refer to the maintenance procedure for tightening of the bolts.

- Utilize OPEN condition when Bonnet assembly is installed.
- Avoid scratching critical sealing surfaces during maintenance & installation
- The compression of the O-rings on the user's application should target 0.7 to 0.9mm.

Otherwise, improper compression could result in potential leak path.

- Always use proper torque for fasteners, fittings, bolts, etc.. Otherwise bolt and valve body thread engagement could create valve damage.

4-3. Disinstallation

OPEN valve prior to removal of Bonnet assembly during maintenance procedures. If Bonnet assembly is removed at **CLOSE** condition then Body's threads and critical sealing surfaces could be damaged.

4-4. End lock release

When unlocking the Gate valve that has previously lost air pressure during emergency shut off. First, apply pressure to the air port that was last energized. The cycle should be finished that was in motion. This completion of cycle that was not completed during pressure loss is critical to release end lock and switch the solenoid valve.

Example 1: The gate of the valve assembly is closed before shipment, so apply pressure to the closed position first.

Example 2: If the gate is opened, apply pressure to the "**open**" side of air piping, and switch the valve after releasing the end lock.

The type of Gate valve design can vary gate configuration during shipment. This is done to protect precision vacuum components throughout transport.

1. Insert type: Gate is OPEN so please supply the pressure to **OPEN** port first.

2. With Body type: Gate is CLOSED so supply the pressure to **CLOSE** port first.

Ignoring these concerns could lock the gate valve assembly, and potentially damaging components.

4-5. Speed control

Be sure to control speed to open and close the gage in **meter out** condition. Otherwise, the Gate valve life will be adversely affected. Improper use of speed controls can damage end-lock mechanism as well as shorten life time of valve.

4-6. Exhaust piping

Avoid system designs that combine additional solenoid valves to the Gate valve. The added exhaust pressures from other solenoid valves may cause improper operation of the end lock mechanism.

4-7. Operation of valve

1) Please confirm in regulated differential pressure of 4kPa and during the opening and shutting operation of the valve. **OPEN / CLOSE**

2) Incase the **Body (Chamber)** and **Gate** are heated and cooling gradually from High Temperature to Room temperature then please make **OPEN** condition. If it is cooling at **CLOSE** condition then Gate O -ring could become stuck and when operated to **OPEN** condition. This condition will pull out the O-ring

⚠ Warning

3) Maintain and monitor **specified** operating pressure range of Gate valve. System design can change over time providing **Over/Under** pressurization. The internal components could be damaged by improper pressure.

4) Do not put your hands near moving components or into the opening of the body without confirming safety. The closing forces will cause injury and bodily harm if the valve is operated.

5) Do not remove the Cover on the actuating part. The cover shields internal components while the Gate valve is operating prevent injury.

6) Remove the pneumatic tubing from valve operation and confirm cylinder has no pressure prior to maintenance. Be aware of your system design and latent energy stored to prevent accidental actuation. These steps will ensure that stored energy is removed. Additionally, pneumatic lines disconnected could create a potential hazard if energized.

⚠ Caution

4-8. Replacement of O-ring

Use the parts shown on “4. Replacement parts list” when replacing bonnet assembly, Gate and O-rings for a gate. Give sufficient cleaning to O-ring groove and mount O-ring in gland avoiding twisting. Use a plastic specific tool so as not to damage sealing surface of the O-ring groove. Refer to the maintenance manual for details. After replacement, confirm vacuum by leak inspection.

⚠ Warning

4-9. Return of Product

Vacuum products must be decontaminated prior to returning to SMC. The substances used in process application must be identified with certified removal of contaminants. The return authorization number will only be provided after the decontamination form has passed evaluation. The decontamination form is submitted by Product Return Request Sheet or Detoxification/Decontamination certificate to SMC and await return contact from SMC before returning the item to SMC. Please refer to International Chemical Safety Cards (ICSC) for a list of the harmful substances. If you have any questions, please contact your SMC sales representative.

5. Spare Parts List

For XGTP312-50336-***

Description	Orderable Part No.	Applicable Part No	Note
Body Assembly	XGT300-1-1AS	XGTP312-50336-***	-

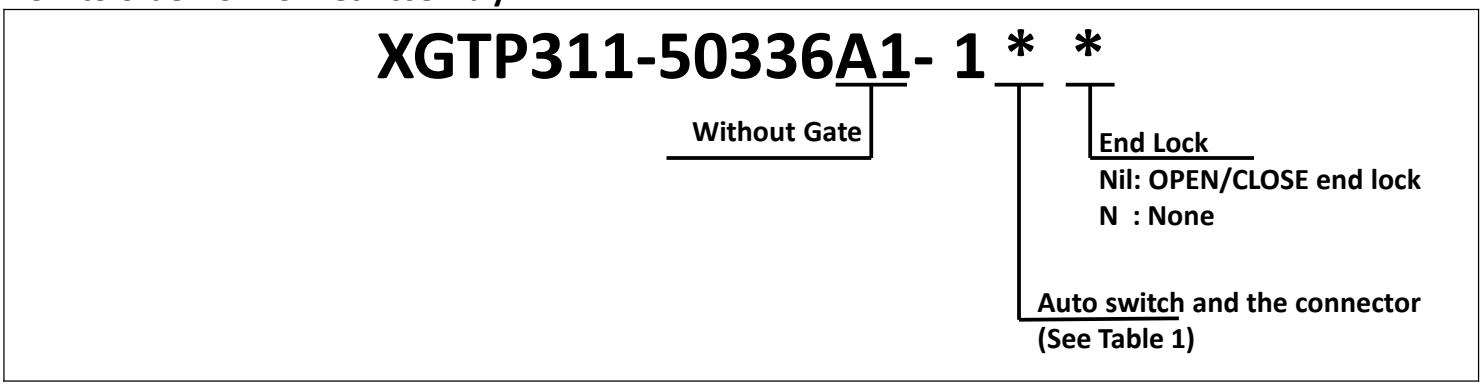
For XGTP313-50336-***

Description	Orderable Part No.	Applicable Part No	Note
Body Assembly	XGT300-1-1-3AS	XGTP313-50336-***	-

Common Spare Parts List

Description		Orderable Part No.	Applicable Part No	Note
Bonnet Assembly		XGTP311-50336A1-1*	XGTP31* -50336-1** or XGTP31*-50336-2**	-
		XGTP311-50336A1-1A*	XGTP31* -50336-* A*	-
		XGTP311-50336A1-1C*	XGTP31* -50336-* C*	-
		XGTP311-50336A1-1F*	XGTP31* -50336-* F*	-
Gate Assembly		XGTP300-2-1S	XGTP31* -50336-***	-
Bellows Assembly		XGTP300-20AS	XGTP31* -50336-***	-
O-Ring (Body opening side)	FKM	XGT300-9-10S	XGTP31* -50336-***	AS568-273
O-ring (Gate)	FKM	XGT300-9-9S	XGTP31* -50336-1**	AS568-271
	Kalrez 4079	XGT300-9-11S	XGTP31* -50336-2**	
O-Ring (Bonnet Assembly)	FKM	XGT300-9-7S	XGTP31* -50336-***	AS568-177
Gate Bolt		XGT300-2-5S	XGTP31* -50336-***	-

How to order for Bonnet Assembly



Connected connector of Auto switch (Female type)

Description	Orderable Part No.	Applicable Part No	Note
Straight plug	XGT0402-9-12S	For XGTP31* -50336-* C*	C016 30D006 100 12(AMP)

6. Maintenance

Warning
Please refer to the attached " Procedure for maintenance"

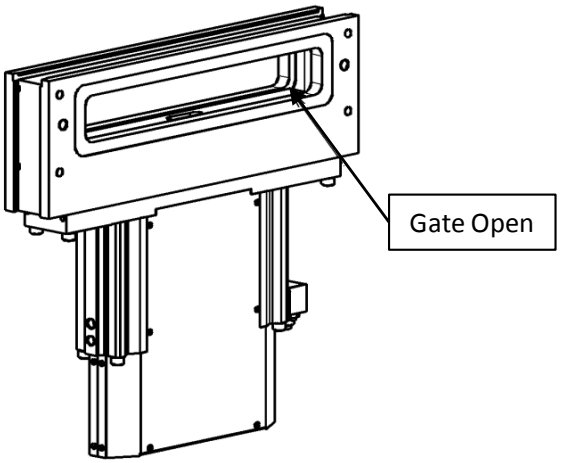
7.
Troubleshooting

Status	Possible Cause	Countermeasure
Gate Internal Leakage	Operating pressure is too low	Increase pressure to 0.45MPa or more
	Foreign materials on Seal surface	Cleaning the Seal Surface
	Scratches on the seal surface of Gate	Replace Gate
	Scratches on the seal surface of Body	Replace Body
	Deterioration of O-ring by process exposure	Replace with new O-ring whose material compatible with process environment
	Twist of O-ring	Re-install O-ring
	Come off of O-ring	Re-install O-ring
	Peeling off of O-ring	Replace O-ring
	Concave/Convex of end of O-ring	Place the convex part into the groove to make O-ring height the same
	Deterioration of Bonnet assembly	Replace Bonnet assembly
External Leakage	Damage of Bellow assembly	Replace Bellows assembly
	Deterioration of O-ring by processing	Replace with new O-ring whose material compatible with process environment
	Scratches on the seal surface	Polish of seal surface
Gate is not CLOSING	End lock operation lock	Please refer to 4-4
	Deterioration of Bonnet assembly	Increase pressure to 0.45MPa or more
	Deterioration of Bonnet assembly	Replace Bonnet assembly
Gate is not OPENING	End lock operation lock	Please refer to 4-4
	Operating pressure is too low	Increase pressure to 0.45MPa or more
	Deterioration of Bonnet assembly	Replace Bonnet assembly
Auto-switch not working	Displacement of Auto-switch	Adjust the location to detect range
	Failure of Auto-switch	Replace Auto-switch
	Operating pressure is too low	Increase pressure to 0.45MPa or more
Bonnet assembly air leakage	Loosening of connections	Replace Bonnet assembly
	Wear on piston seal	Replace Bonnet assembly

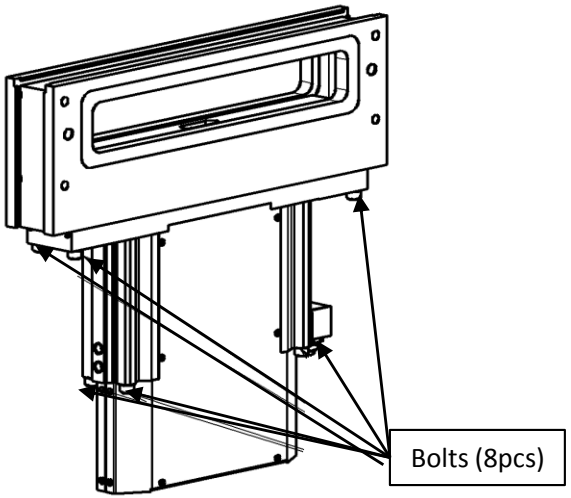
Appendix Procedure for maintenance

Step 1. Remove Body/Cassette

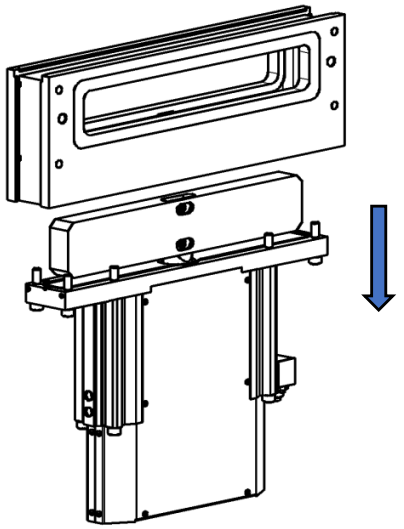
1) Pneumatically open gate valve



2) Loosen bolts at bonnet assembly (8pcs)

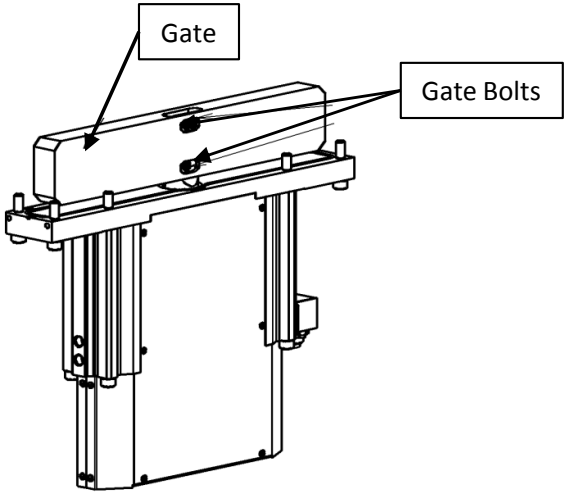


3) Remove bonnet assembly from body

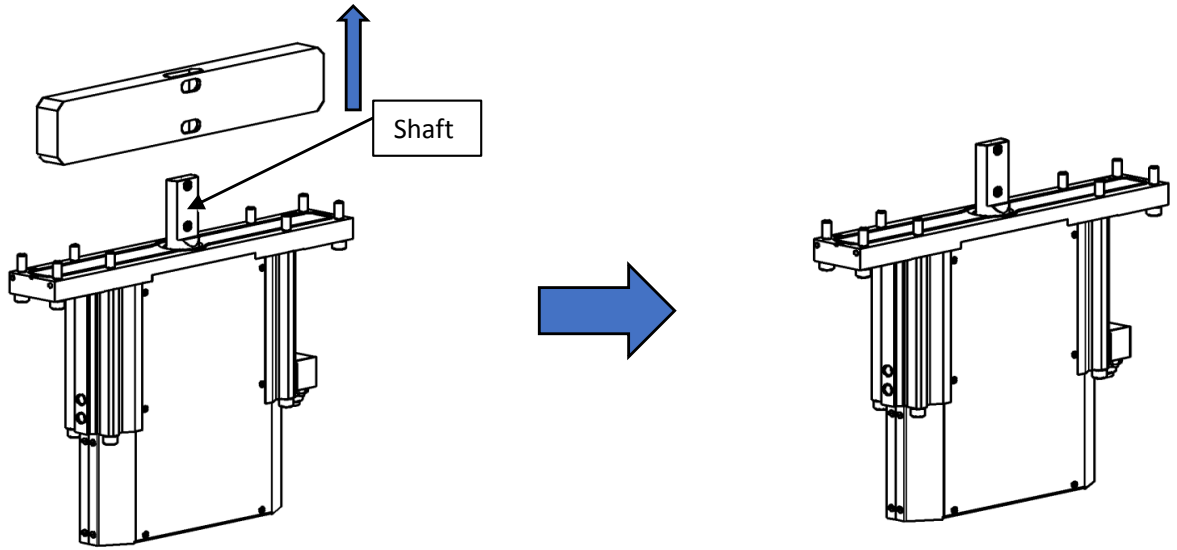


Step 2. Remove Gate

1) Remove gate bolts (2pcs)



2) Carefully remove gate from shaft



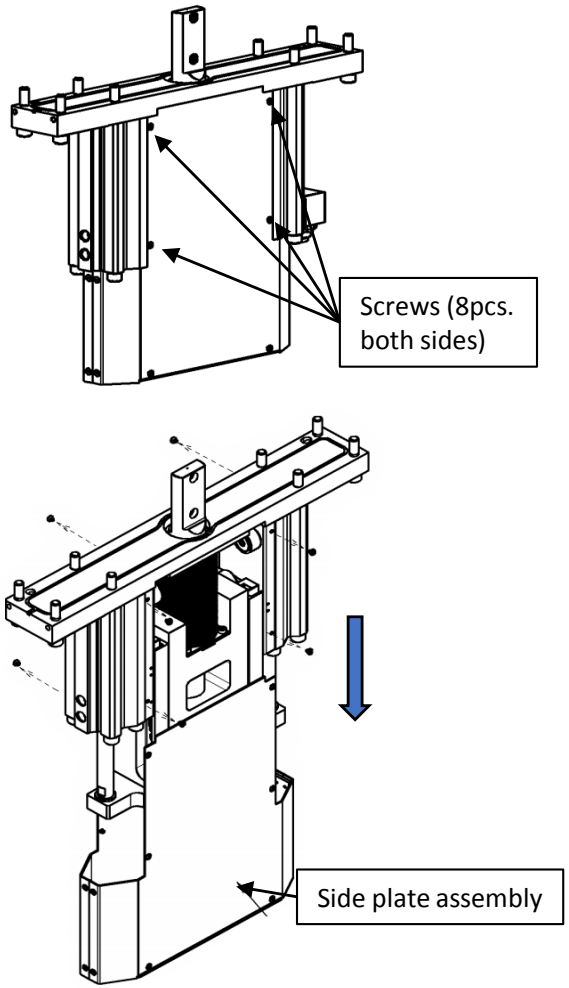
Step 3. Replace bellows assembly

Bellows replacement can only be performed after "1. Removal of body " and " Removal of gate"

1) Remove side plate assembly

Remove screws (8pcs) mounting the side plate assembly.

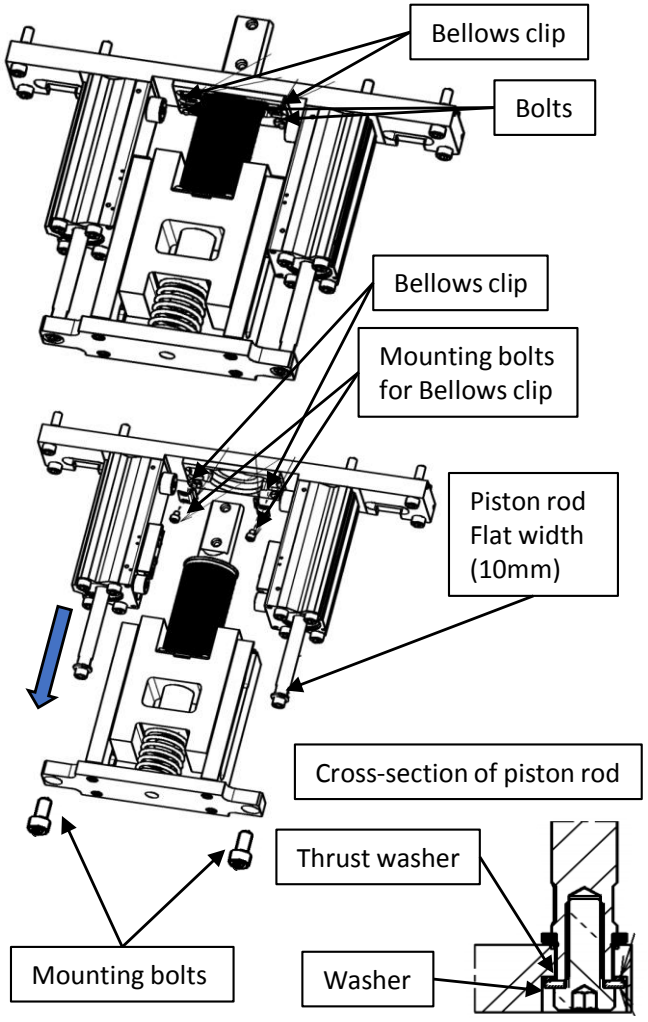
- Perform Step 1 & Step 2 prior to removing side plate assembly. (Body and gate)
- Remove all pneumatics lines prior to performing work.



2) Remove lever assembly

Remove bellows clips (2pcs) and mounting bolts (2pcs) and remove lever assembly.

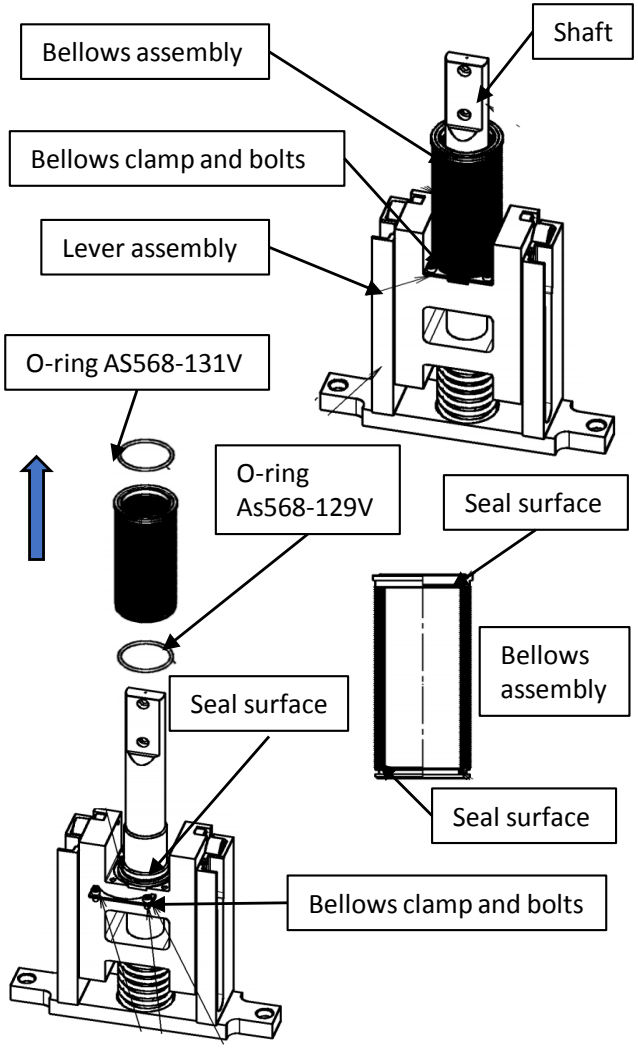
- Use wrench to hold piston rod stable to prevent rotation. (10mm)
- Maintain proper orientation of washer and thrust washer during disassembly.



3) Remove bellows assembly

Remove bellows clamps (2pcs) on Lever assembly.

- The bellows should be handled carefully, and cleaned with clean room grade wipes **(Alpha wiper: equivalent to Tex wipe)** and alcohol. **(ethanol 1 grade)**



Step 3. Replace bellows

Bellows replacement can only be performed after "1. Removal of body " and " Removal of gate"

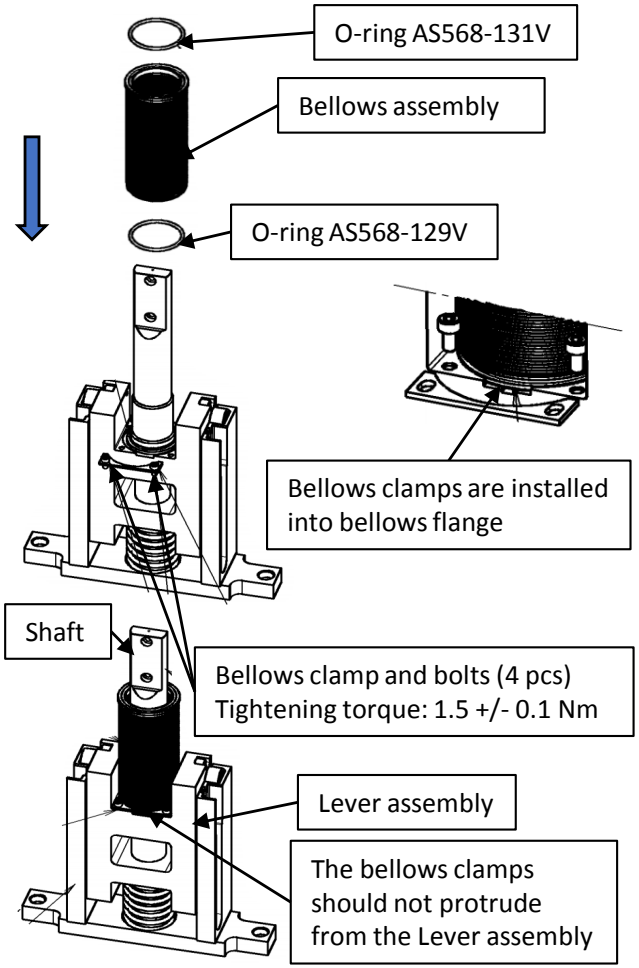
4) Install bellows assembly

Step 1) Wipe off the seal surface of bellows assembly and o-ring with clean room grade cloth and alcohol. (ethanol grade 1) Confirm no particulate

Step 2) Install bellows assembly and Lever assembly.

Step 3) Bellows clamps (2pcs) are installed to the groove with mounting bolts.

- The bellows clamp should not protrude from Lever
- Tighten 4pcs bolts gradually alternating sequence
  Tightening torque: 1.5+/- 0.1 Nm



5) Install Lever assembly

Step 1) Mounting Lever assembly

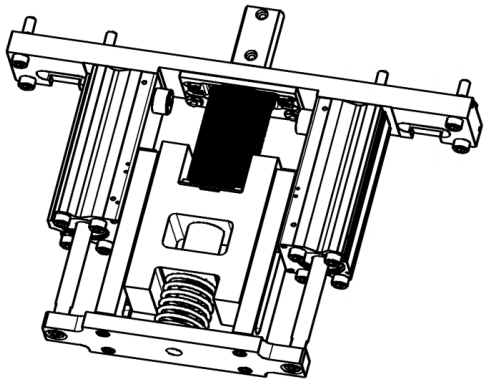
- Fit into Guide groove and Cam follower
- Ensure that Guide bushings are in place (4pcs)
- Piston rods must be extended to interface with counter bore
- Ensure orientation of washer and O-ring

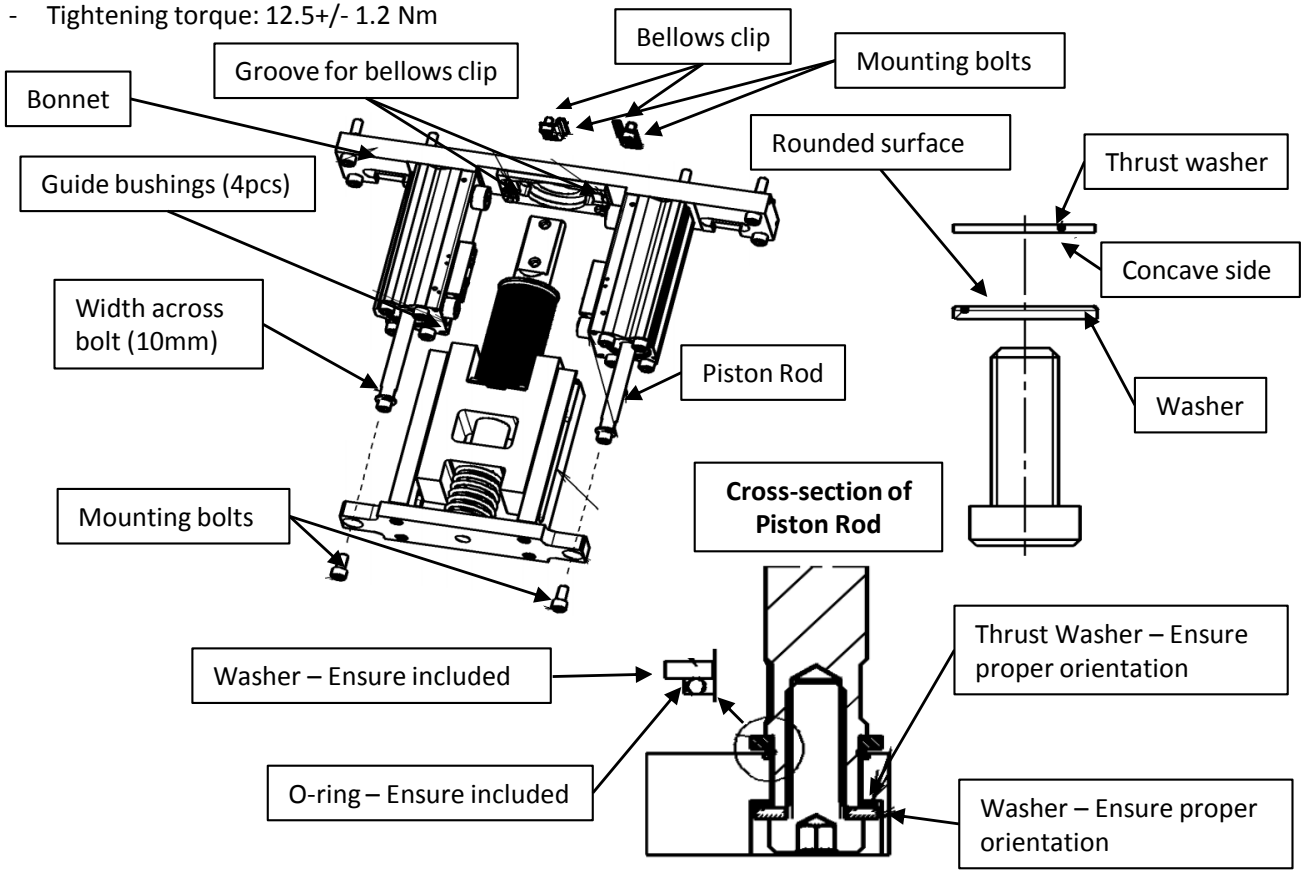
Step 2) Install Bellows clips

- Attach Bellows clips to Bellows assembly by mounting bolts
- Bellows is located in Bonnet assembly by mounting bolts
- Ensure that Bellows assembly is secured at collar
  Tightening torque: 3.0 +/- 0.3 Nm

Step 3) Attach Lever assembly to Piston rods

- Utilize wrench to secure width across Piston Rod (10mm) to not allow Piston rod rotation when tightened
- Tightening torque: 12.5+/- 1.2 Nm

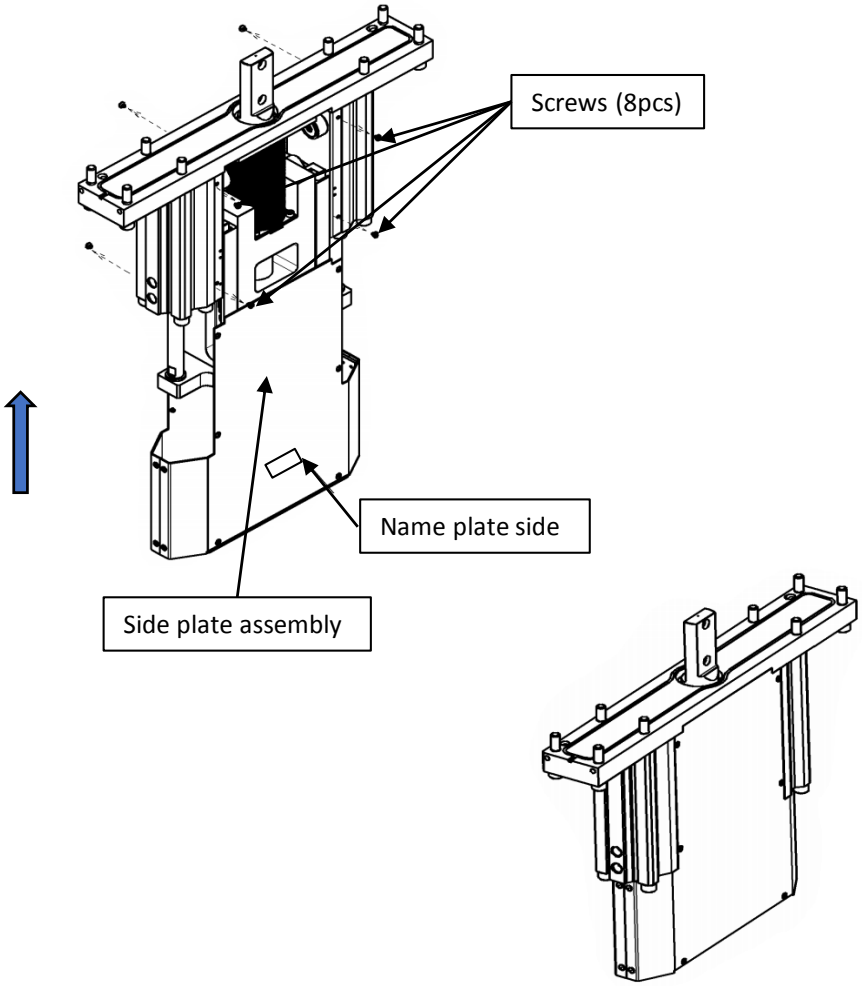




Step 4. Install side plate assembly

Install side plate assembly from the bottom side and tighten by screws. (8pcs)
Remove screws (8pcs) mounting the side plate assembly.

- Confirm that the counter bore on Shaft and Name place are facing the same direction.
- Install side plate assembly to mounting surface of valve
- Tightening torque: 0.63Nm



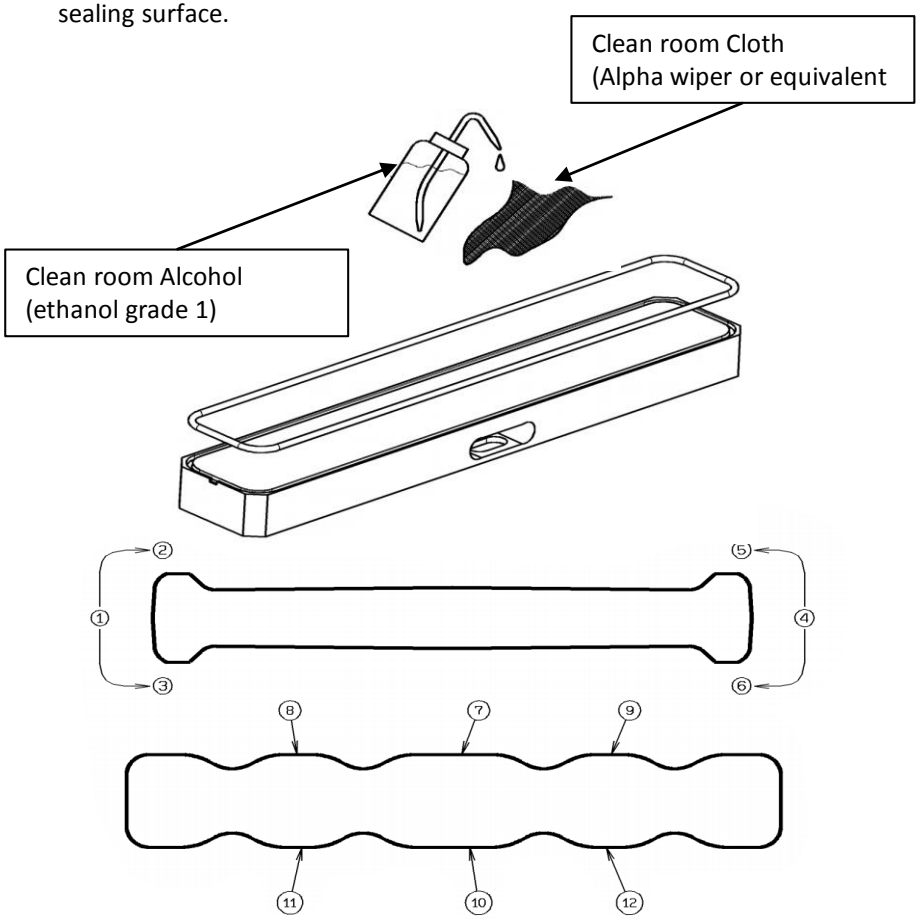
Step 5. Replace Gate O-ring

Procedure for replacing Gate O-ring

1. Remove O-ring from Gate and wipe off the dust, dirt, etc.. Additionally clean O-ring groove with clean room grade alcohol and wipes. (ethanol grade 1) (Alpha wiper equivalent)

Careful handling is critical to prevent scratches and dents to seal surface of O-ring groove. Note: When removing O-ring use resin O-ring pick or resin tweezers to avoid scratching the seal surfaces.

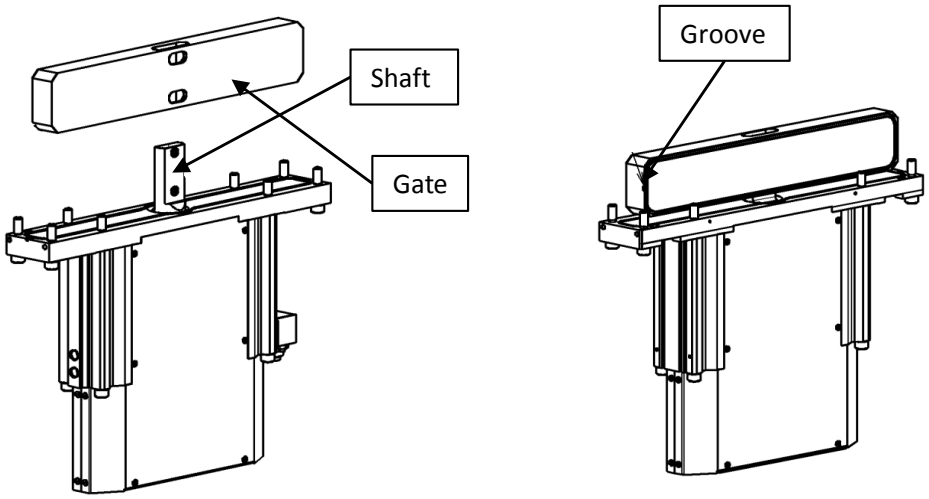
2. Clean new O-ring with alcohol (ethanol grade 1) to remove particulate
3. Examine valve, sealing surface, and O-ring groove for scratches or damage. Reference sequence below when installing new O-ring. It is critical to install slowly with precision to avoid twisting and O-ring parting line interfering with sealing surface.



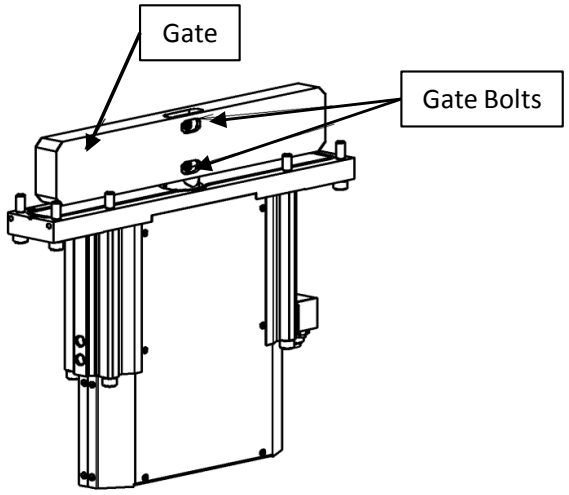
Step 6. Install Gate

1) Mounting Gate to Shaft

- **Confirm proper orientation of gate when installing on shaft.**
- **(Reference groove for Gate O-ring)**



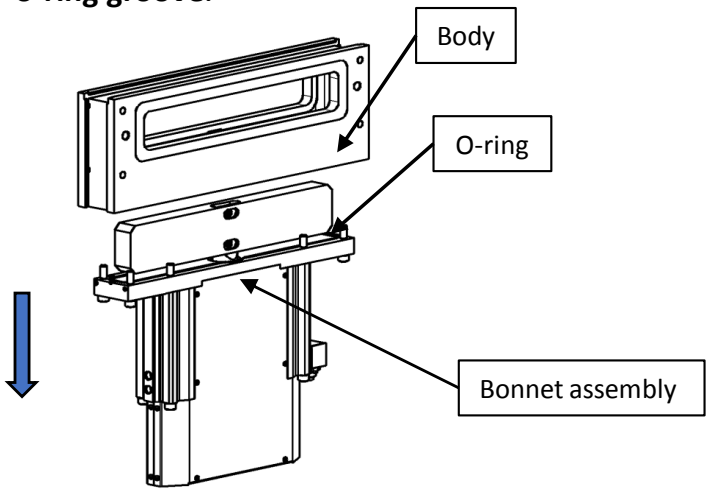
2) Attach Gate by Gate mounting bolts (2pcs)
Tightening torque: 3.6 +/- 0.3 Nm



Step 7. Install Body

1) Wipe off O-ring between Body and Bonnet assembly then install Bonnet assembly to Body.

- **Critical to verify that the o-ring has remained seated within the o-ring groove.**



2) Tighten Bolts (8pcs)
Tightening torque: 17.5 +/- 2 Nm