



# Operation Manual

PRODUCT NAME

High Vacuum L Type Valve

MODEL/ Series/ Product Number

XLA-2, XLC-2 Series  
Replacement of bellows assembly

**SMC Corporation**

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# 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.  
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.



# 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, 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.**

# 1. Product Specific Precautions



## Precautions

Please read this section before attempting replacement of the bellow assembly.

### Design



## Warning

#### •All models

1. The bellows is SUS316L, and other metal seal material is SUS304.
2. Standard seal material in the vacuum section is FKM. It is possible to change the material of the seal, but in this case, select the same material as previously installed before when replacing the bellow. When the vacuum seal material is changed at the same time as the bellows, please refer to "Table 4 Maintenance parts (P6) of Chapter 2 Preparation".

### Maintenance



## Warning

If the fluid or reaction product (deposit) may cause the valve to become unsafe, the valve should be disassembled, cleaned and re-assembled by an operator who has sufficient knowledge and experience (e.g. a specialist).



## Caution

1. When removing deposits from the valve, take care not to damage any part of the valve.
2. Refer to "Table 4 Maintenance parts (P6) and Fig.1 Product construction (P7) of Chapter 2 Preparation" for maintenance parts. Parts with the indication of "Maintenance part" can be replaced.
3. SMC specified parts should be used for service. Refer to the Construction / Maintenance parts table.

### Handling



## Caution

1. Handle the replacement parts with care, ensure to pay great attention to the bellows. If the bellow is damaged or deformed, the life in use of the part may be reduced significantly.
2. In high humidity environments, keep the valve packed until the time of installation.

### Warranty after disassembly and assembly



## Caution

1. We guarantee that the product does not have any defects in the components, materials or assembly.
2. Please read this manual thoroughly before disassembly and assembly. However, this operation manual does not guarantee the product, even after proper maintenance.

## 2. Preparation

### 2-1. Applicable part number

The replacement bellow assembly applies to the XLA (single acting with bellow seal) and XLC (double acting with bellow seal), and the applicable valve sizes are 16, 25, 40, 50, 63 and 80. The applicable product No. and bellow assembly part No. are described below.

Part No.: X L 1 A  – 2 – 1 0 1

**Table 1. Valve size**

Applicable product No.	Symbol
XLA/XLC-16*-2*	16
XLA/XLC-25*-2*	25
XLA/XLC-40*-2*	40
XLA/XLC-50*-2*	50
XLA/XLC-63*-2*	63
XLA/XLC-80*-2*	80

**Table 2. Seal material option**

Standard	Nil
Optional	Refer to Table 3

Note 1) Bellows assembly contains the valve seal 1.

Note 2) In cases where the material of the valve seal 1 is anything other than the standard (**FKM: Compound No. 1349-80**), add suffix symbol for the seal material (as shown below) to the end of the part number (In place of ). e.g.) XL1A16-2-101-XN1

Note 3) Bellows assembly does not contain other maintenance parts (Valve seal 2, Nut assembly, and external seal). Order separately if it is required. Please refer to Table 4. Maintenance parts list (P6).

**Table 3. Suffix symbol for seal materials**

Seal material	EPDM	Barrel Perfluoro®	Kalrez®	Chemraz®			VMQ	FKM for PLASMA
Combination No.	2101-80	70W	4079	SS592	SS630	SSE38	1232-70	3310-75
<b>Symbol</b>	<b>-XN1</b>	<b>-XP1</b>	<b>-XQ1</b>	<b>-XR1</b>	<b>-XR2</b>	<b>-XR3</b>	<b>-XS1</b>	<b>-XT1</b>

Note 1) Barrel Perfluoro® is a registered trademark of MATSUMURA OIL Co.,Ltd.

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

Chemraz® is a registered trademark of Greene, Tweed Technologies, Inc.

**Table 4. Maintenance parts list (Valve seal 1, 2 / External seal / Nut assembly)**

Description Part indication No.	Material	Valve size			
		16	25	40	50
Valve seal 1 (2)	Standard	B2401-V15V	B2401-V24V	B2401-P42V	AS568-227V
	Special	B2401-V15**	B2401-V24**	B2401-P42**	AS568-227**
Valve seal 2 (3)	Standard	B2401-P4V	B2401-P5V	B2401-P6V	B2401-P8V
	Special	B2401-P4**	B2401-P5**	B2401-P6**	B2401-P8**
External seal (4)	Standard	AS568-025V	AS568-030V	AS568-035V	AS568-039V
	Special	AS568-025**	AS568-030**	AS568-035**	AS568-039**
Nut assembly (9)	SUS304	XL1A16-10-1	XL1A25-10-1	XL1A40-10-1	XL1A50-10-1

Description Part indication No.	Material	Valve size	
		63	80
Valve seal 1 (2)	Standard	AS568-233V	B2401-V85V
	Special	AS568-233**	B2401-V85**
Valve seal 2 (3)	Standard	B2401-P8V	B2401-P10V
	Special	B2401-P8**	B2401-P10**
External seal (4)	Standard	AS568-043V	AS568-045V
	Special	AS568-043**	AS568-045**
Nut assembly (9)	SUS304	XL1A50-10-1	XL1A80-10-1

Note 1) Add the seal material symbol shown on page 3 at the end of the model number (in place of \*\*).  
This is not necessary for the standard seal material (**FKM: Compound No. 1349-80**).  
e.g.) AS568-025-XN1

## 2-2. Required jigs and tools

Please refer to Table 5. Tools and instruments and Table 6. Bolt and nut size for replacing the bellows assembly. Please refer to “3-2. Disassembly Procedure (XLA/XLC Bellows assembly) of Chapter 3 Replacement” for the tool size.

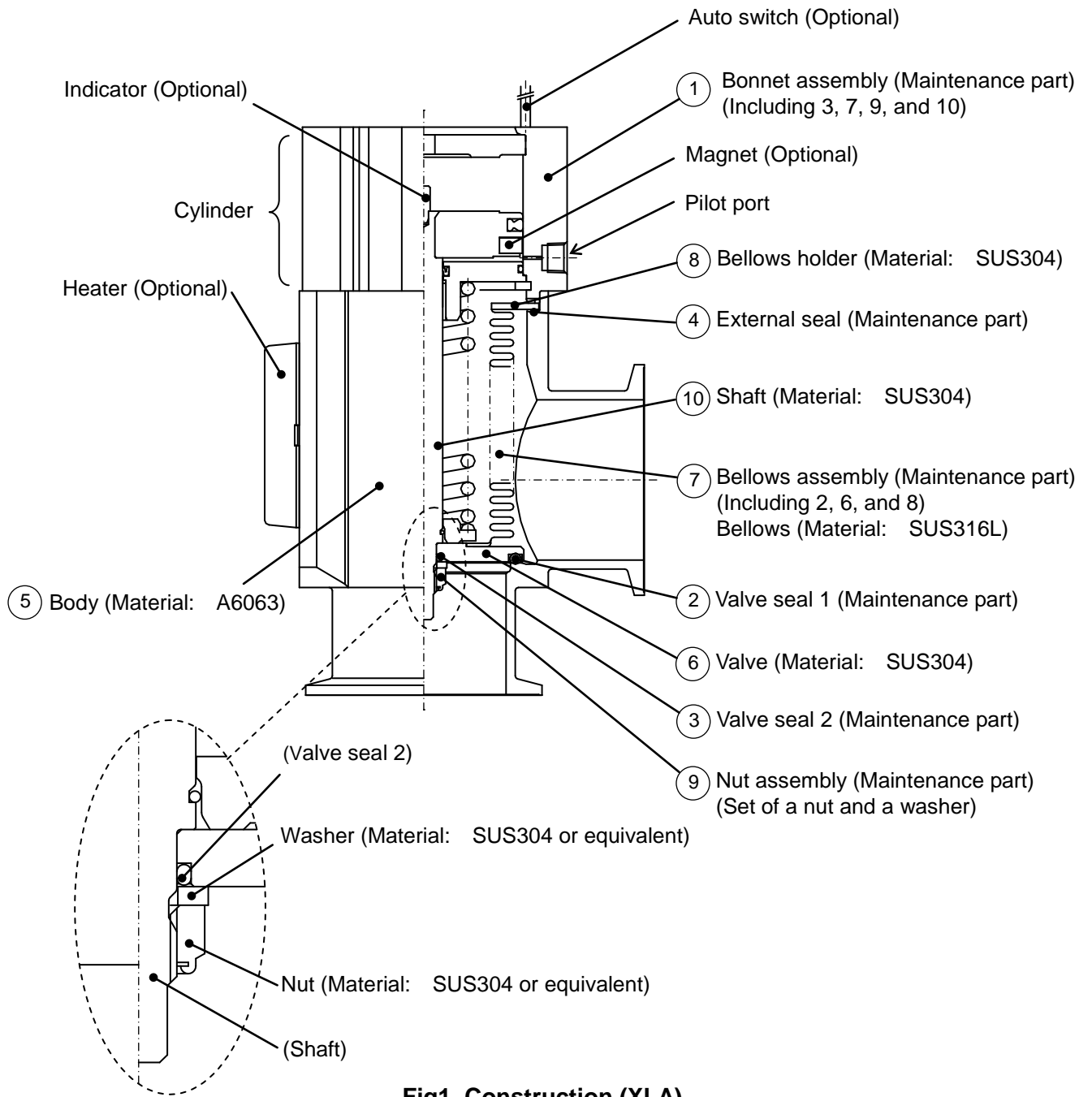
**Table 5. Tools and instruments**

Product name	Description
Dust-free gloves	Used during operation. It is recommended to replace gloves before disassembly and assembly takes place.
Cleaning agent	Ethanol, clean wiper.
Spanner or Adjustable wrench	The use of a ring spanner is prohibited. Refer to “Chapter 3 3-2. Step 2 (P9)” for size.
Torque wrench	Refer to “Chapter 3 3-3. Step 4 (P10)” for size and torque.
Tweezers or thin and pointed tool	Used for removing and mounting the O-ring. Refer to “Chapter 3 3-2. and 3-3 Step 3 (P9, 10)”.
Air facility for valve drive	For opening and closing the valve.

**Table 6. Bolt and Nut size**

Valve size	Bolt size	Nut size
16	M4	M4
25	M5	M5
40	M6	M6
50	M8	M8
63	M10	
80		M10

2-4. Construction



**Fig1. Construction (XLA)**



## 3. Replacement

### 3-1. Precautions

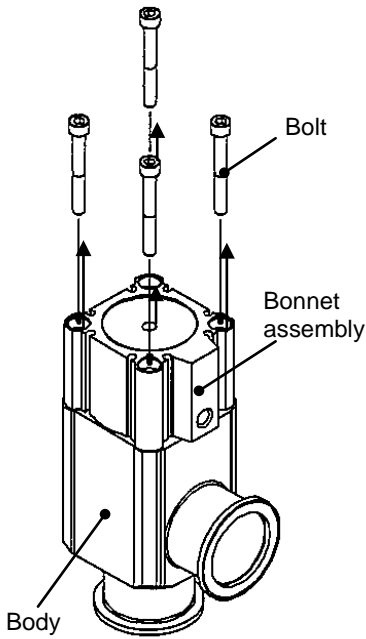
Be sure to adhere to the instructions given in “Chapter 1 Product Specific Precautions 1”, when disassembling the product for maintenance. Along with the precautions listed in “Chapter 1”, the user should comply with those listed below.

### Warning

- If it is expected that product materials may get stuck to the product, ensure safety is confirmed before handling. It is recommended that the user wear gloves and a mask.
- Pay attention to the handling of components in accordance with the procedures outlined, hereafter. Do not apply excessive force or impact. This may damage the product, as well as, decrease its performance and life expectancy.
- The cylinder portion of this product cannot be disassembled. When the cylinder portion or the bonnet assembly is damaged or is expected to have been damaged, replace the whole product or the bonnet assembly.
- Do not disassemble the parts that are not explained in this operation manual. This may decrease the performance and life expectancy of these parts. In addition, disassembly may cause danger.
- **Torque values specified in this manual must be followed.** Not adhering to these specifications, can result in damage to the product.

### 3-2. Disassembly Procedure (XLA/XLC Bellows assembly)

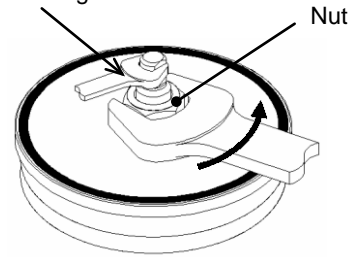
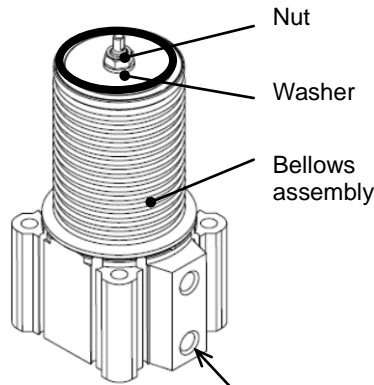
#### Step 1 Preparation



Remove the bonnet assembly from the body. Please refer to 3-4. Disassembly Procedure (XLA/XLC Body) for how to disassemble the product.

#### Step 2 Removal of nut

Apply a spanner to the width across the flats of the shaft to prevent it from rotating.



Width across flats of the shaft and the nut

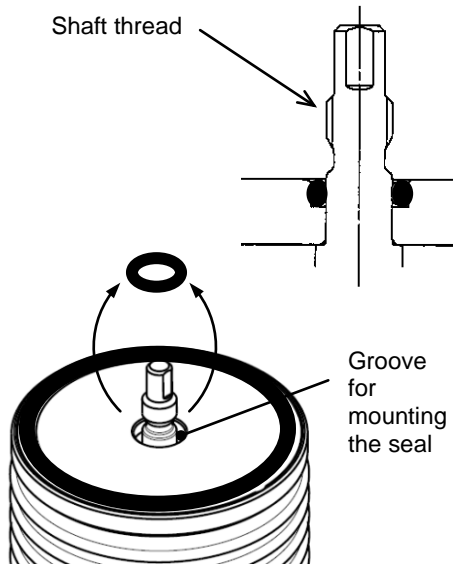
Valve size	Shaft	Nut
16	2.4mm	7mm
25	3mm	8mm
40	4mm	10mm
50	5mm	13mm
63		
80	6mm	17mm

[For XLA-\*]  
Air should not be applied.  
(Product may be damaged as a result.)

[For XLC-\*]  
Closed side pilot port  
Pressurize to 0.2 to 0.4 MPa.

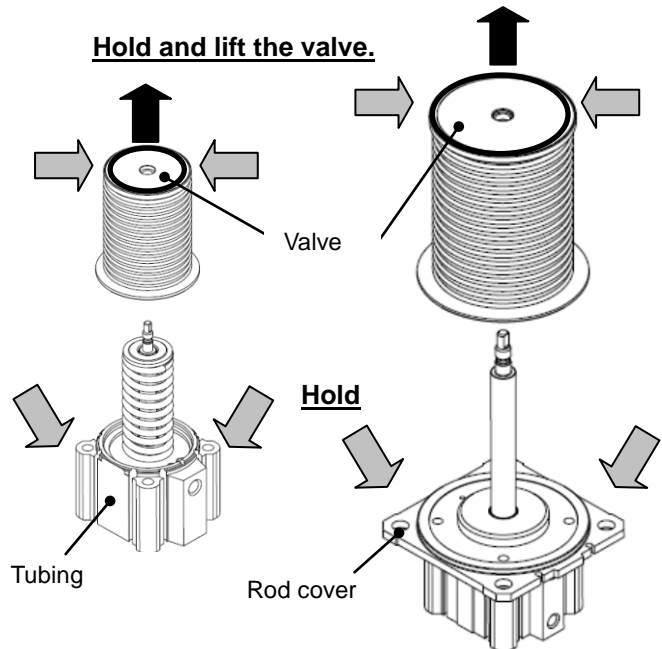
Apply a spanner to the width across the flats of the shaft of the bonnet assembly to hold the shaft, and remove the nut, washer.  
<When the nut and washer are re-assembled, please pay attention not to lose them. >  
(Note1) Only when disassembling the XLC, apply 0.2 to 0.4 MPa of pressure to the closed side pilot port. Do not apply pressure to the XLA during disassembly.

#### Step 3 Removal of valve seal 2



Remove valve seal 2 from the groove of the valve. <When re-assembling valve seal 2, please be careful not to damage the shaft thread. >

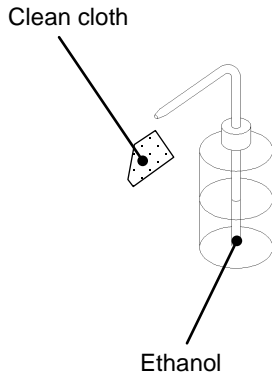
#### Step 3 Removal of bellows assembly



Hold the rod cover (tube) and remove the bellows assembly whilst holding the valve. <Be sure to hold the valve when removing the bellows assembly. Pay great attention not to damage the bellows during the removal process, otherwise, the bellows might be damaged. >

### 3-3. Assembly Procedure (XLA/XLC Bellows assembly)

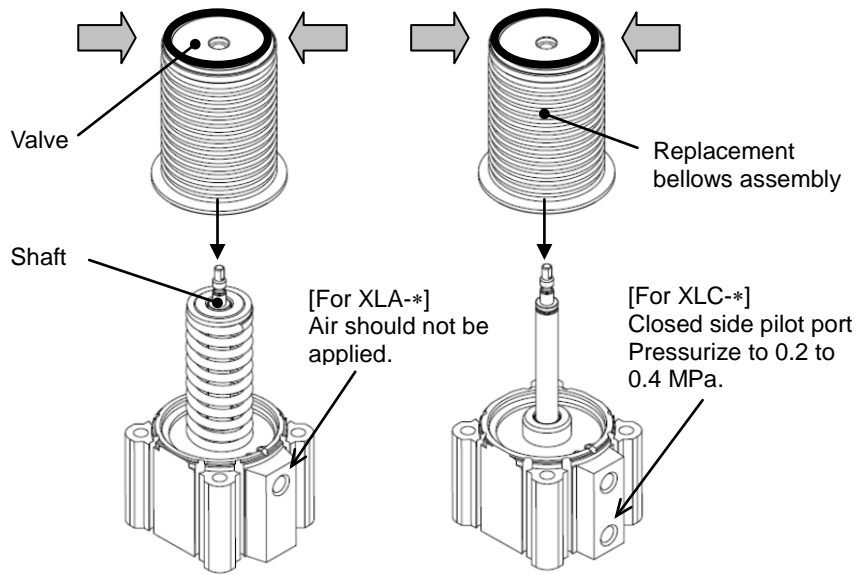
#### Step 1 Preparation



Assemble parts eliminating any dust or debris. Wipe off dust with a clean cloth soaked with ethanol. Blow parts with clean air if necessary. (Ensure there are no fibers or dust.)

#### Step 2 Reassembly of bellows assembly

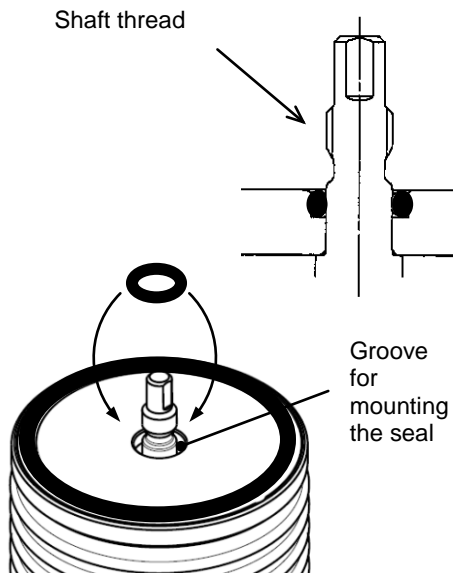
**Be sure to hold the valve.**



Insert the bellows assembly onto the shaft. Insert the bellows assembly until the valve is stopped completely. **Do not hold the bellows. Be sure to only hold the valve during reassembly.** Pay great attention to mounting the bellows assembly. Otherwise, the bellows might be damaged. >

(Note1) Only when disassembling the XLC, apply a 0.2 to 0.4 MPa of pressure to the closed side pilot port. Do not apply pressure to the XLA during disassembly.

#### Step 3 Reassembly of valve seal 2

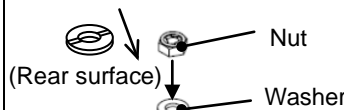


Securely mount the valve seal 2 into the seal mounting groove with caution not to damage the seal.

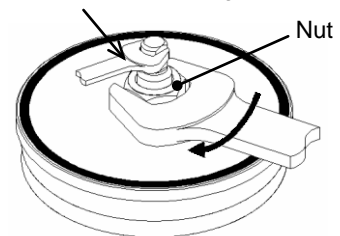
<Pay attention not to damage valve seal 2 by the shaft thread. >

#### Step 4 Reassembly of nut

Note) For XL\*-16/25, mount the washer in the orientation that the groove of the washer faces to the valve seal 2.



Apply a spanner to the width across the flats of the shaft to prevent it from rotating.



Width across flats of the shaft and the nut, Tightening torque of nut (N·m)

Valve size	Shaft	Nut	Tightening torque
16	2.4mm	7mm	0.9
25	3mm	8mm	1.5
40	4mm	10mm	2.5
50	5mm	13mm	6.3
63			
80	6mm	17mm	14

Mount the washer, nut and hold the shaft at the width across the flats with a spanner, and tighten the nut with another spanner.

<When tightening the nut, pay attention not to make contact with valve seal 1 (internal seal) and risk damaging it. >

Secure the nut using the torque specified in the table. Be sure to tighten the nut to the torque specified in the table as torques other than that specified may cause a loose nut or damage to the valve. When reassembly is complete, mount the body in reference to Step 2 Preparation 1 to Step 4 Body assembly of 3-4. Disassembly Procedure (XLA/XLC Body).

### 3-4. Disassembly Procedure (XLA/XLC Body) (Reference)

#### Step 1 Reassembly of body

Bolt size, Tool		
Valve size	Bolt size	Hex wrench
16	M4	3
25	M5	4
40	M6	5
50	M8	6
63	M10	8
80		

[For XLA-\*]  
Pilot port  
0.4 MPa

[For XLC-\*]  
Air should not be  
applied.

XLA-16 to 80  
XLC-16, 25, 40 XLC-50, 63, 80

Loosen the bolts in numerical order to disassemble the body and the bonnet assembly. When it is difficult to remove the bonnet assembly due to adhesion of the external seal, pull the bonnet assembly straight up slowly without twisting the bonnet.  
 (Note 1) For XLA, assemble the body while applying a 0.4 MPa(G) of pressure to the pilot port. Remove the pneumatic pressure after disassembly. (No air pressure should be applied for the XLC.)  
 (Note 2) For XLC-50, 63 and 80, be careful with the location of the bolts to be removed. (Those mounted on the outermost side should be removed.)

#### Step 2 Preparation1

Wipe off any dust from the surface of the mounting surface of the external seal on the body, then place the external seal in the mounting position on the body. Please refer to Step 1 Preparation of 3-3. Assembly Procedure (XLA/XLC Bellows assembly).

#### Step 3 Preparation2

Wipe off any dust from the surface of the valve seal 1 and the bellows holder.

#### Step 4 Body assembly

Bolt size, Tool, Tightening torque of bolt (N·m)			
valve size	Bolt size	Hex wrench	Tightening torque
16	M3	3	0.7
25	M5	4	1.5
40	M6	5	2.5
50	M8	6	6.1
63	M10	8	15
80			

[For XLA-\*]  
Pilot port  
0.4 MPa

[For XLC-\*]  
Air should not be  
applied.

XLA-16 to 80, XLC-16, 25, 40 XLC-50, 63, 80

Tighten the bolts in numerical order to re-assemble the body with the bonnet assembly. Manually tighten screws until the external seal is compressed. Perform final torquing of the bolts in the same numerical order (diagonally).  
 (Note 1) For XLA, assemble the body while applying a 0.4 MPa(G) of pressure to the pilot port.

Revision history
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1st printing: VZ

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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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