



XL\*\*\*-OMH0004

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High Vacuum L Type Valve (with solenoid valve type)  
(Bellows Seal)

# Operation Manual

XLAV-\*\*-\*\*\*-Q

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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 specifications.

Keep this operation manual with care so that it can be used at any time.

Contents of this operation manual is subject to change without notice.

**SMC Corporation**

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# 1. Specifications

## 1-1 Main valve

Model	XLAV-16	XLAV-25	XLAV-40	XLAV-50	XLAV-63	XLAV-80	XLAV-100	XLAV-160
Valve type	Normal close (open by pressurization and with spring sealed by bellows)							
Fluid	Non-corrosive gas for aluminum alloy (A6063) and SUS304/316							
Operating temperature °C	5 to 50							
Operating Pressure Pa	Atmospheric pressure to $1 \times 10^{-6}$							
Note 1) Conductance l/s	5	14	45	80	160	200	300	800
Leakage Pa m <sup>3</sup> /s (FKM Seal)	Internal	$1.3 \times 10^{-10}$ at ordinary temperatures. excluding gas permeation						
	External	$1.3 \times 10^{-11}$ at ordinary temperatures. excluding gas permeation						
Flange type	KF(NW)				KF(NW), K(DN)			
Principle materials	Body: Aluminum alloy Bellows: Stainless Seal: FKM (Fluorine rubber),etc							
Pilot pressure MPa	0.4~0.7							
Pilot port size	M5				P: Rc 1/8, R: M5			
Service life (Million cycles)	2							1
Mass Kg	0.29	0.49	1.14	1.64	2.96	5.06	10.66	18.56

Note 1) Conductance is the same as that of an elbow with the same dimensions.

## 1-2 Pilot solenoid valve

Fluid	Air
Coil rated voltage V DC	24, 12
Allowable voltage fluctuation	±10%
Power consumption W	0.35 (with light: 0.4)
Surge voltage suppressor	Diode (non-polar style: Varistor)
Indicator light	LED
Manual override	Non-locking push type
Lubrication	Not required

## 2. How to order

XLAV - a b c - d e - f g h - X j k - Q

X: Option Symbol

**a:** Flange size 16,25,40,50,63,80,100,160

**b:** Flange type

Symbol	Type	Applicable flange size
Nil	KF	16,25,40,50,63,80,100,160
D	K	63,80,100,160

**c:** Installing position of solenoid valve

Symbol	With or without indicator/ Installing position
F	With/Left of flanged side
G	With/Back of flanged side
J	With/Right of flanged side
K	Without/Left of flanged side
L	Without/Back of flanged side
M	Without/Right of flanged side

**d:** Auto switch type

Nil	Without auto switch(Without built-in magnet)	
M9N(L)	D-M9N(L)	Solid state switches
M9P(L)	D-M9P(L)	
M9B(L)	D-M9B(L)	
A90(L)	D-A90(L)	Reed auto switches
A93(L)	D-A93(L)	
M9//	-	With built-in magnet

Note 1) XLA-16 Type ; M9\*,M9// only

**f:** Rated voltage

5	24VDC
6	12VDC

**g:** Electrical entry

G	Grommet (300mm of lead wire)
H	Grommet (600mm of lead wire)
L	Plug connector(L type), with lead wire
LN	Plug connector(L type), without lead wire
LO	Plug connector(L type), without connector
M	Plug connector(M type), with lead wire
MN	Plug connector(M type), without lead wire
MO	Plug connector(M type), without connector
WO	M8 connector, without connector assembly

**k:** Seal material change point & Leakage

Symbol	change point	Leakage <small>**Pa m<sup>3</sup>/s or less</small>	
		Internal	External
-	Nil	$1.3 \times 10^{-10}$ (FKM)	$1.3 \times 10^{-11}$ (FKM)
A	③,⑭	$1.3 \times 10^{-8}$	$1.3 \times 10^{-9}$
B	⑭	$1.3 \times 10^{-8}$	$1.3 \times 10^{-11}$ (FKM)
C	③	$1.3 \times 10^{-10}$ (FKM)	$1.3 \times 10^{-9}$

at ordinary temperatures. excluding gas permeation

③,⑭:Refer to the figure in item 3

**j:** Seal material

Symbol	Seal material	Compound no.
Nil	FKM	1349-80
N1	EPDM	2101-80
P1	BARREL PERFLUORO	70W
Q1	Kalrez	4079
R1	CHEMRAZ	SS592
R2		SS630
R3		SSE38
S1	VMQ	1232-70
T1	FKM for Plasma	3310-75

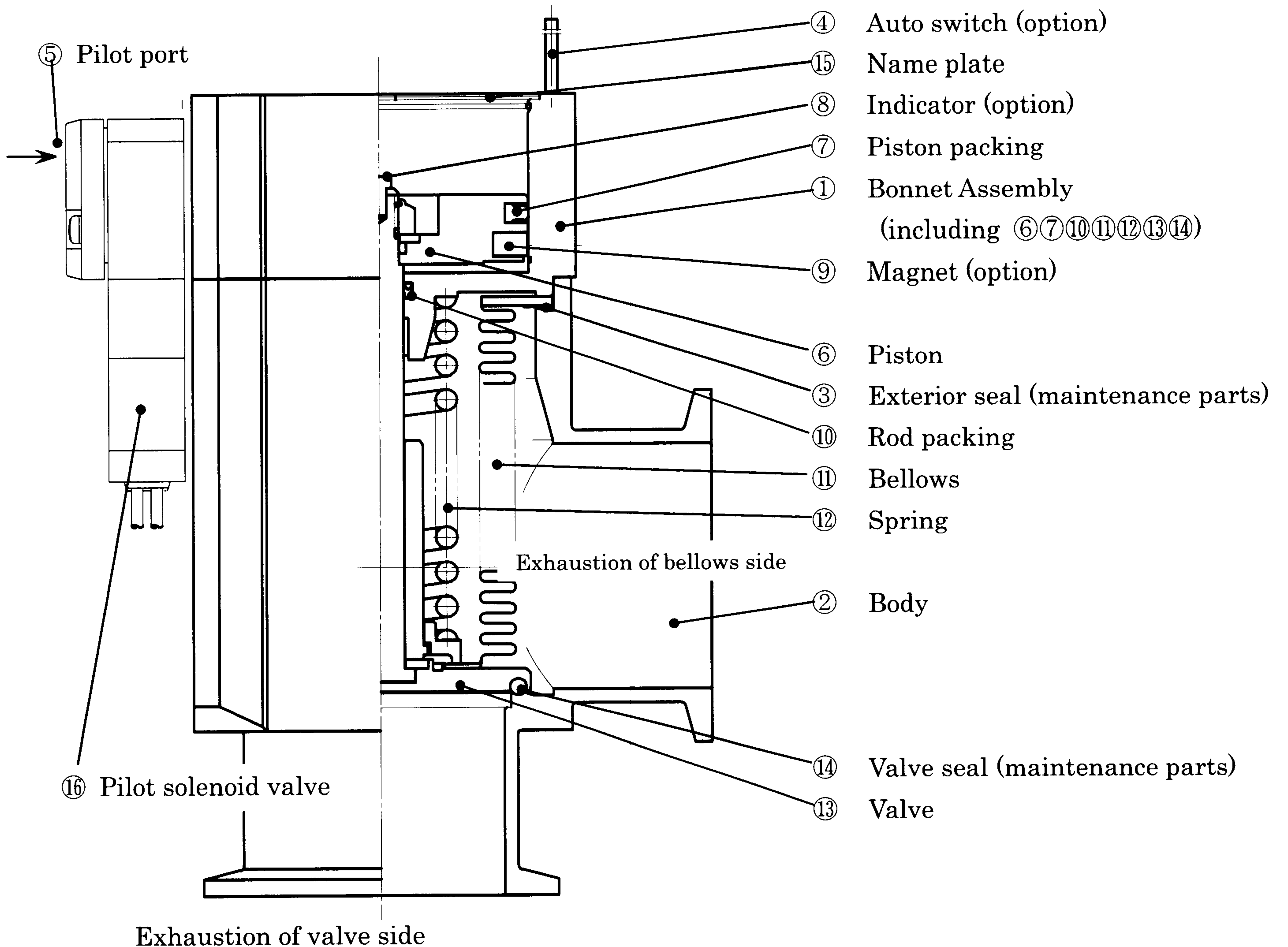
**e:** Switch quantity/Mounting position

Symbol	quantity	Mounting position
Nil	-	-
A	2pcs.	Valve open/closed
B	1pc.	Valve open
C	1pc.	Valve closed

**h:** Light & surge voltage suppressor

Nil	none
S	with surge voltage suppressor
Z	with light & surge voltage suppressor
R	with surge voltage suppressor (non-polar style)
U	with light & surge voltage suppressor (non-polar style)

### 3. Construction / Operation



#### Operation principal

By energizing pilot solenoid valve ⑯ with applying pressure to pilot port ⑤, piston ⑥ sealed by rod packing ⑩ and piston packing ⑦ can move against spring ⑫ to open valve ⑬.

By de-energizing pilot solenoid valve ⑯, the valve ⑬ is closed with spring force and sealed with valve seal ⑭.

#### <Option>

Following options are available in this product.

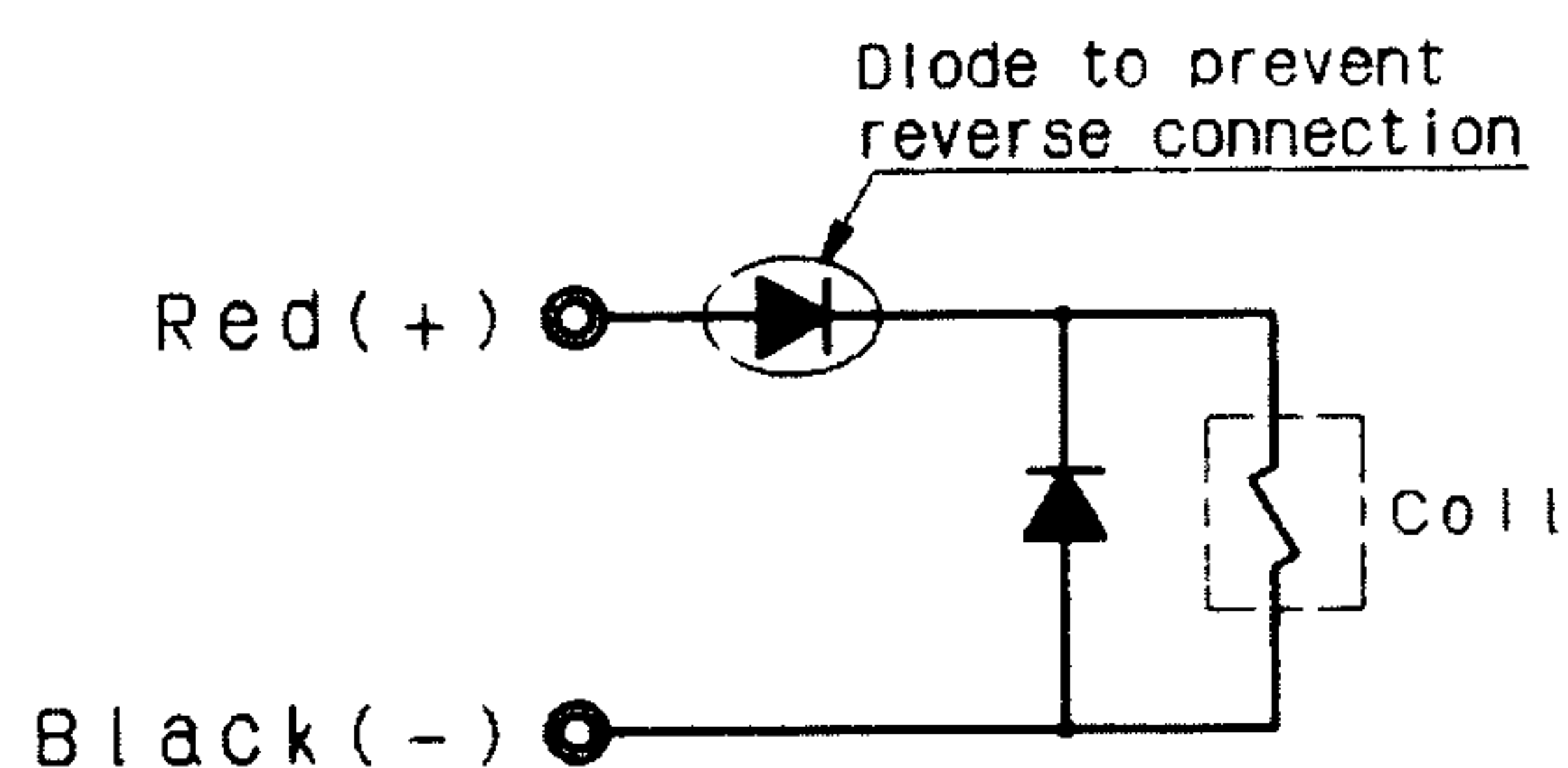
⑧Indicator : When valve is opened, orange indicator ⑧ comes out at the center of name plate ⑮ by approx. 1mm.

④Auto switch : The magnet ⑨ actuates the auto switch ④ detecting the position of the integrated valve ⑬ and piston ⑥. With 2 auto switches, the open and close positions are detected. And with 1 auto switch, either the open or close position is detected.

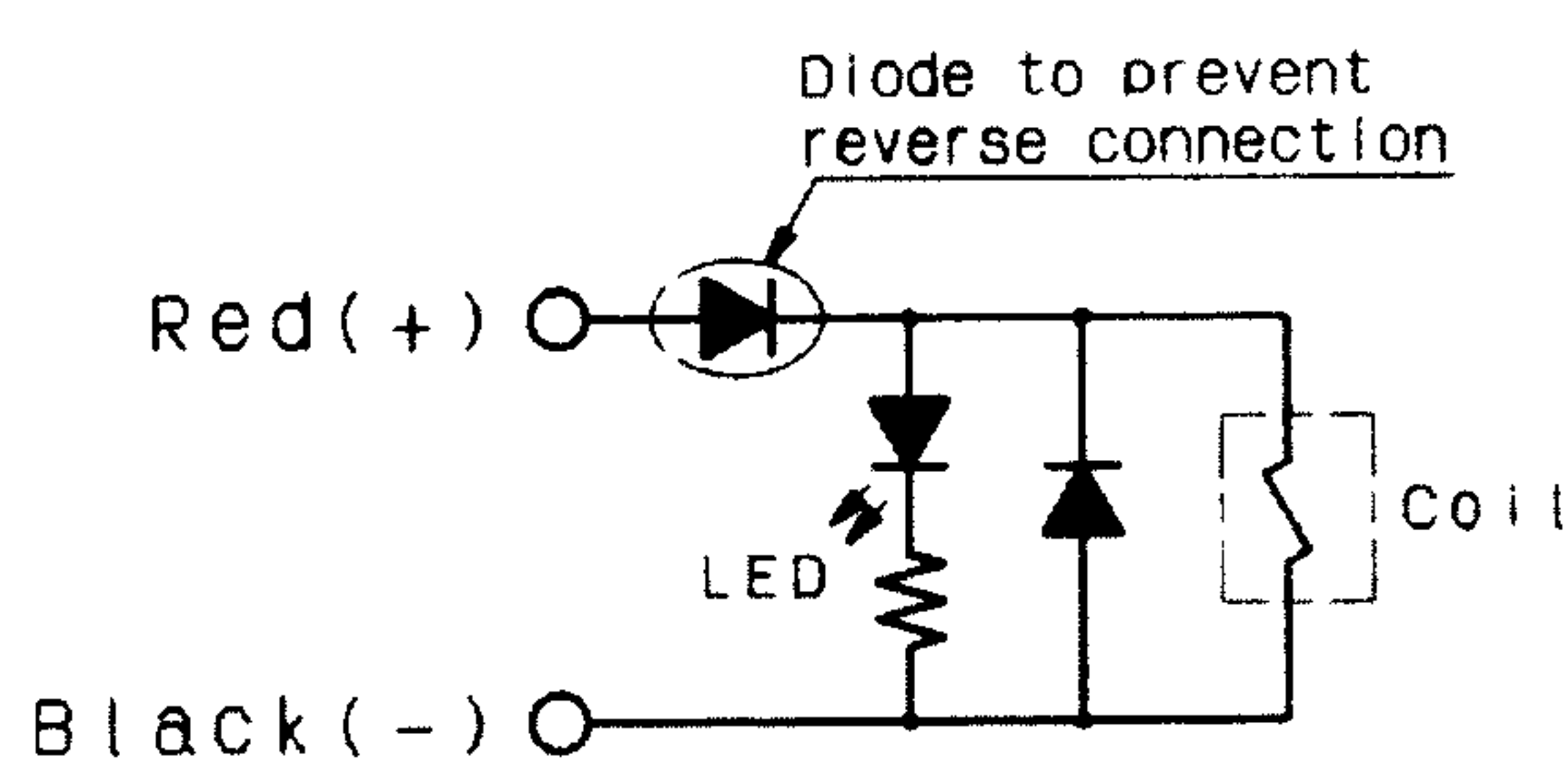
## 4. Operation of pilot solenoid valve

### 4-1 Circuit of light and surge voltage suppressor

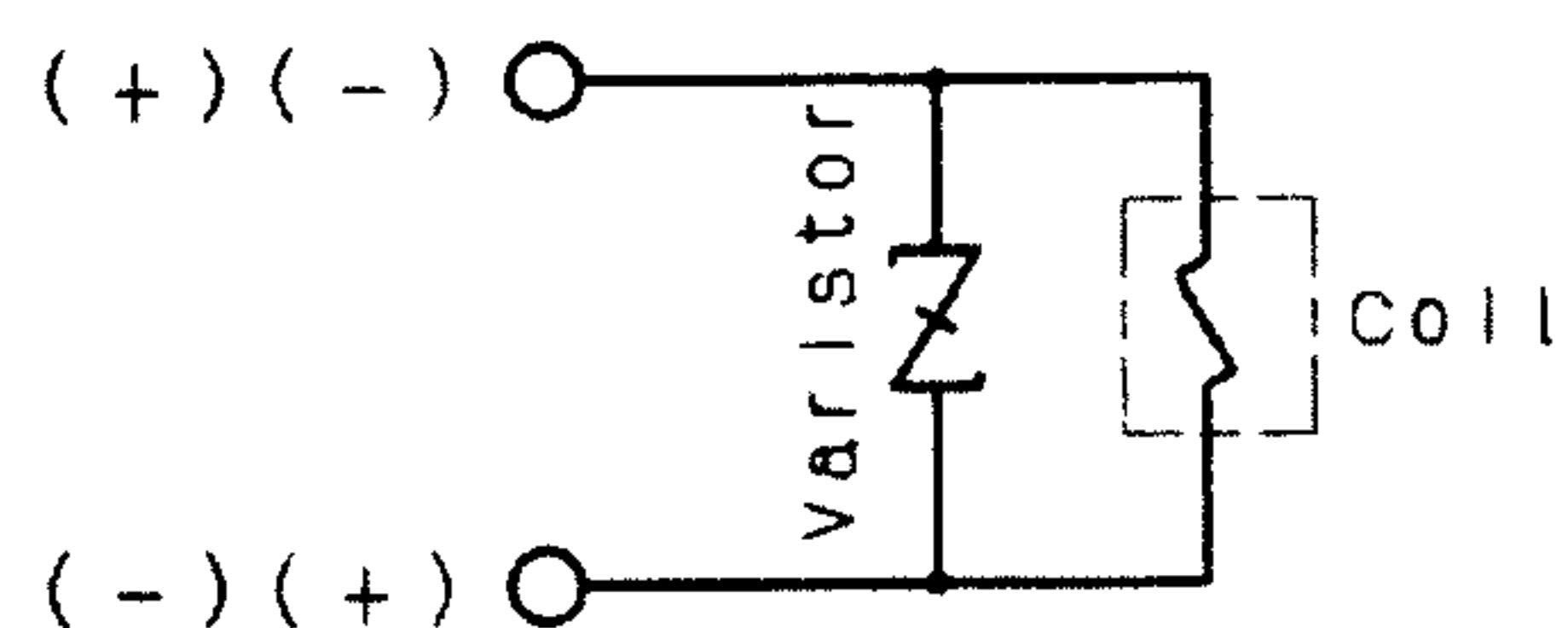
Standard style with polarity  
with surge voltage suppressor(S)



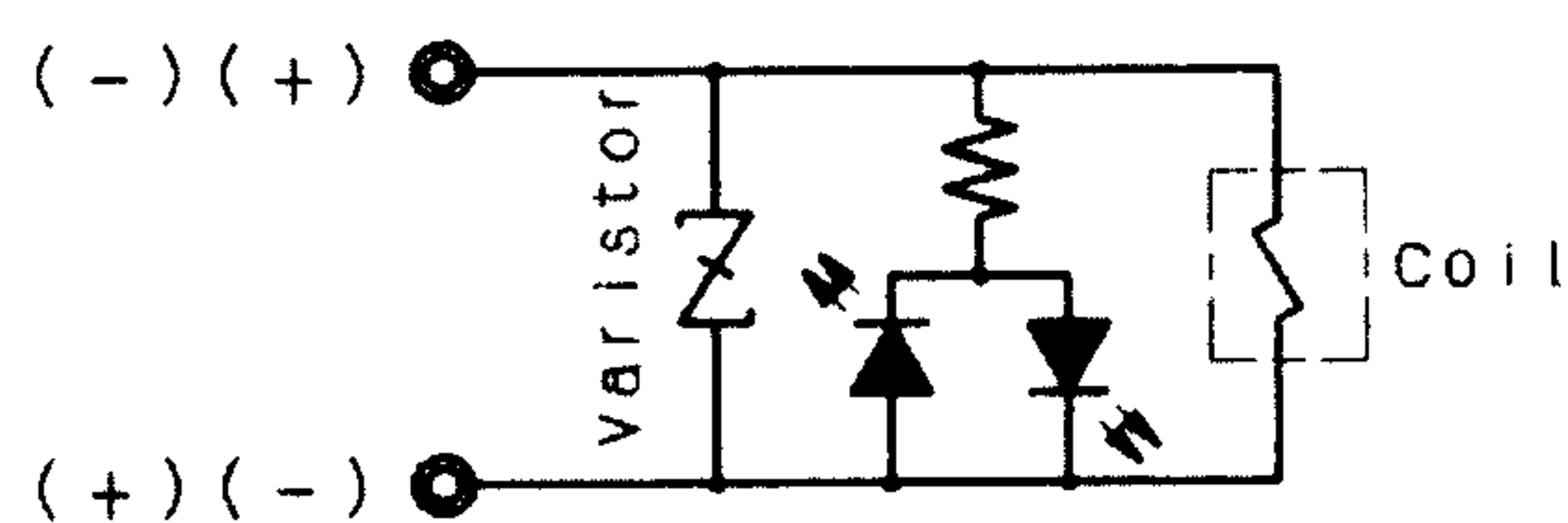
Indicator light and surge voltage suppressor(Z)



Non-polar style  
with surge voltage suppressor(R)

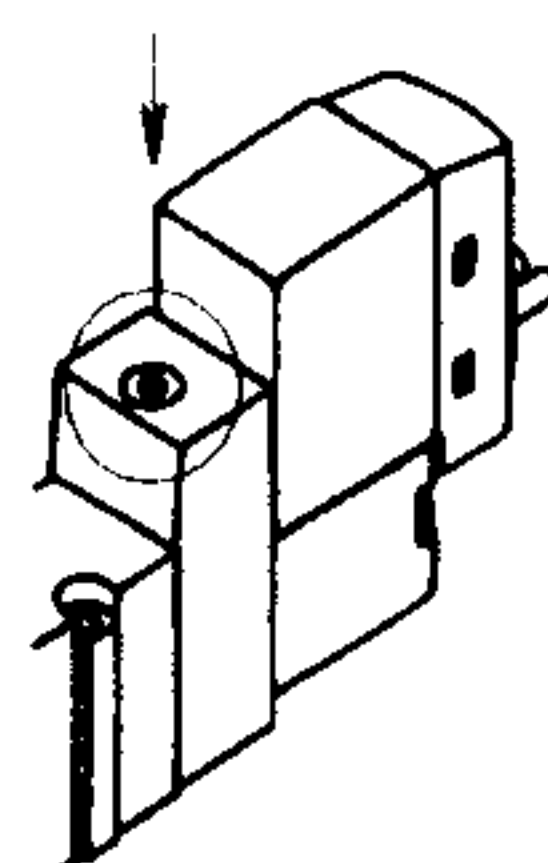


Indicator light and surge voltage suppressor(U)



### 4-3 Operation of manual override (Non-locking push type)

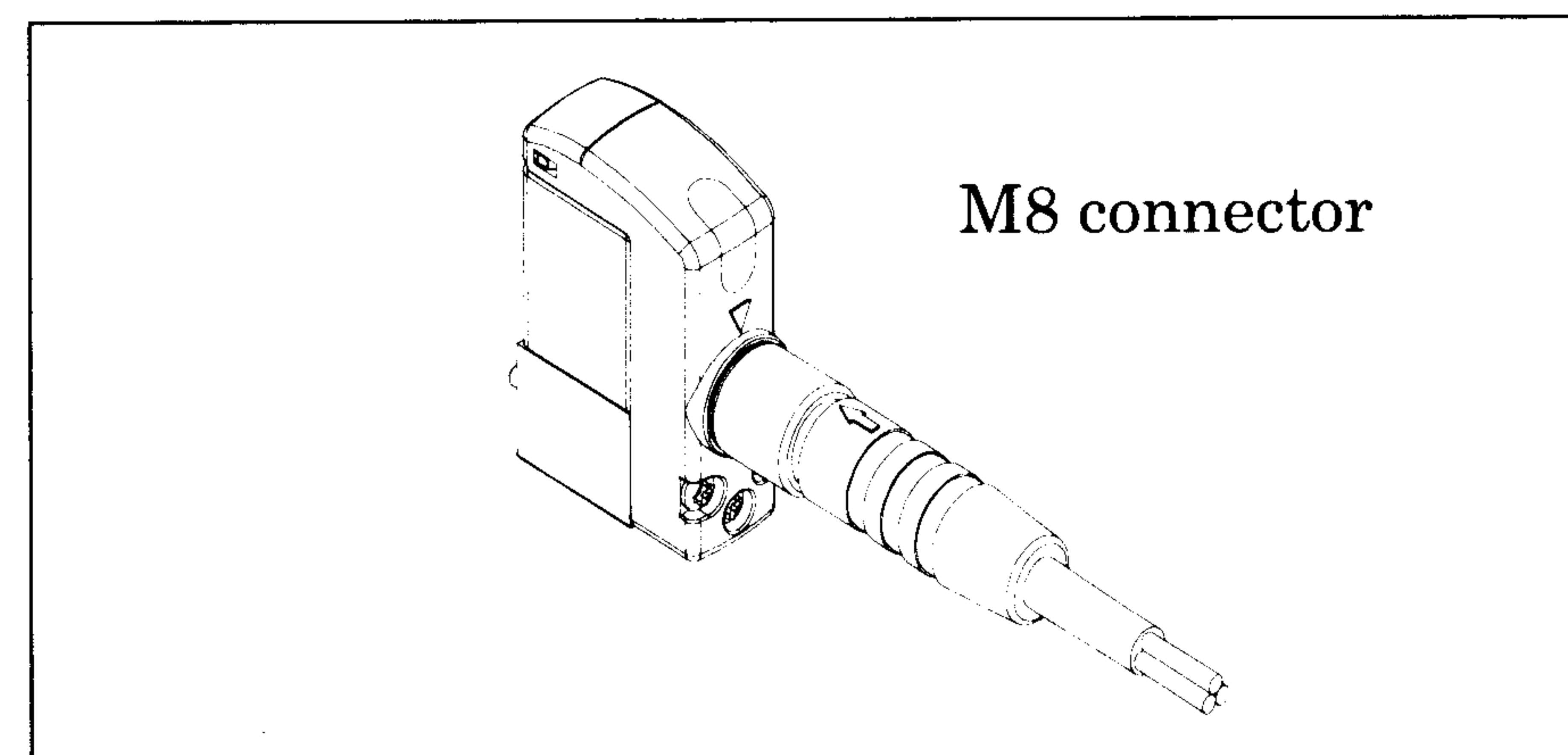
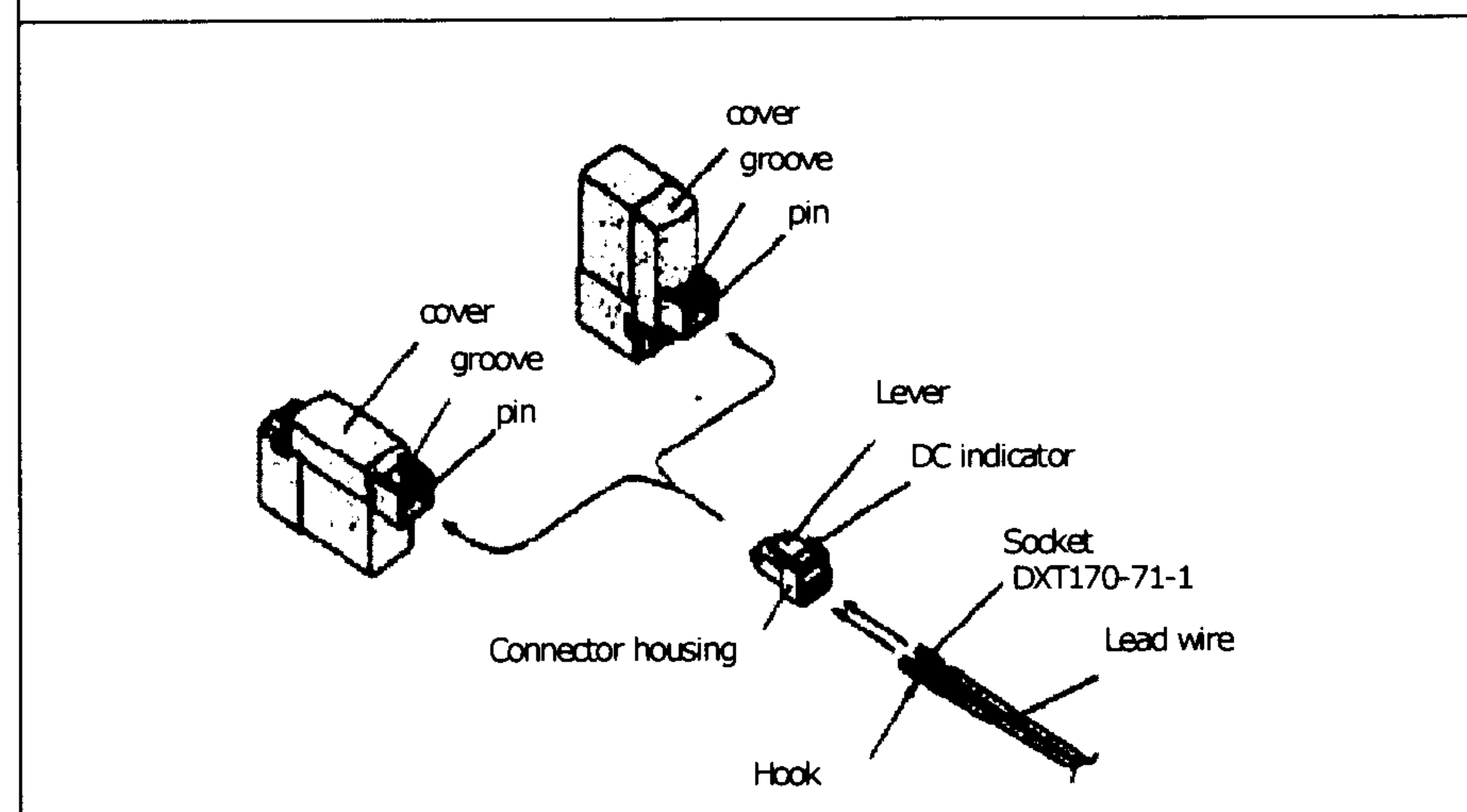
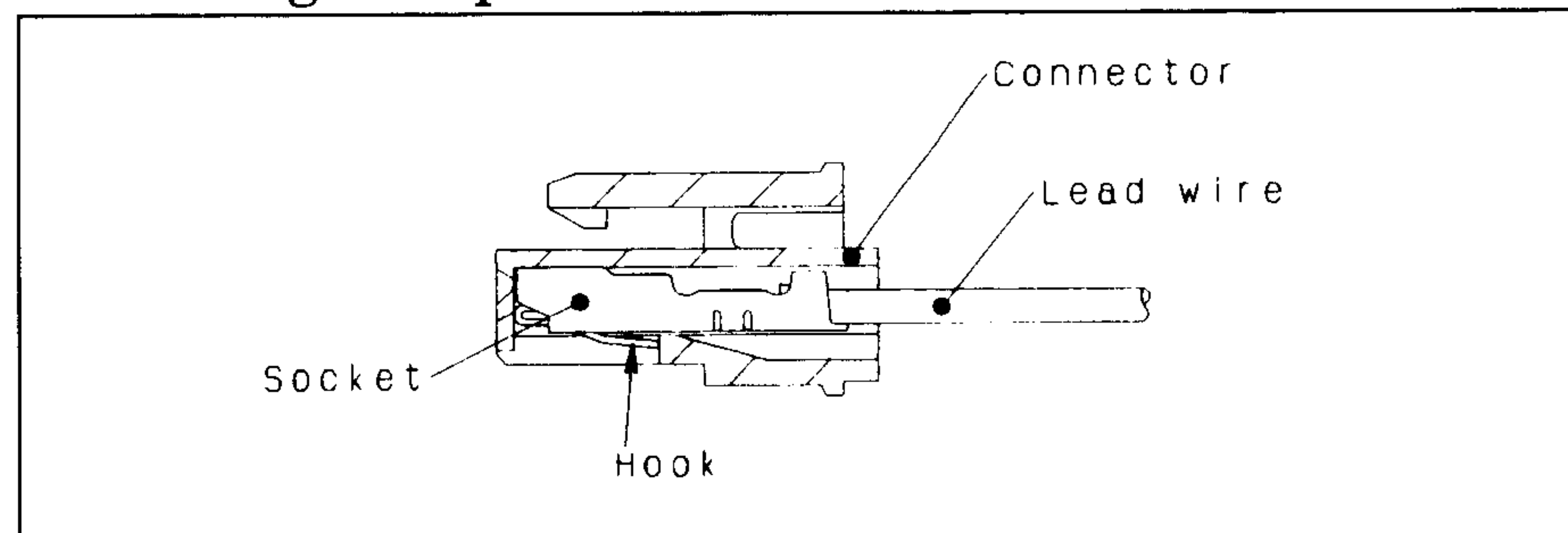
Press in the direction of the arrow



### 4-2 Insertion/Removal of Plug Connector

**Insertion** – Push the connector straight on the pins of the solenoid, making sure the lip of the lever securely “locks” into the groove of the solenoid cover.

**Removal** – Press the lever against the connector housing and pull it outward from the solenoid.



#### Connection:

When fitting a connector with lead wire, orientation has to be considered. Fit the connector so that the arrow on the connector aligns with the triangle on the valve. Please note that if it is forced into the valve without correct orientation, this might cause damage to the pins, etc.

When fitting the connector, please tighten it manually (0.4 to 0.6 Nm) because the use of a tool might cause damage.

#### Disconnection:

Unscrew the retaining ring.

Pull the connector away from the valve in a straight line.

## 5. Safety Instructions

Be sure to confirm the specifications and read following precautions before handling there valve.

### 5-1 Vacuum piping

- ① Before mounting, clean the surface of the flange seal and the O-ring with ethanol, etc.
- ② Be sure that the flange O-ring is compressed by 15% or more.
- ③ In high humidity environment, keep packaged condition just before piping.
- ④ Seal part on flange is protected, but for safety reason, handle not to damage the seal part.

### 5-2 Pilot pressure line piping

- ① Pilot pressure should be kept within the specified range. 0.4~0.7MPa is recommended.

### 5-3 Operating pressure and fluid

- ① Use within operating pressure range. It is impossible to pressurize from valve side.
- ② Materials of this valve are A6063 for body, SUS304 type for valve and bellows and fluorine rubber for vacuum sealant. Operating fluid shall have conformity with these materials.
- ③ For deposit of fluid, check periodically to remove the fluid or replace part.

### 5-4 Switch

- ① Make wire of switch have enough curvature and do not give excessive force to it.

### 5-5 Wiring / Connection

- ① When DC power is connected to a solenoid valve equipped with light and/or surge voltage suppressor, check for polarity indications.

For polarity indications:

- No diode to protect polarity

If polarity connection is wrong, the diode in the valve or switching device at control equipment or power supply may be damaged.

- With diode to protect polarity

If polarity connection is wrong, the valve does not switch.

- ② The M8 type connector satisfies IP65 (ingress protection structure) and has protection from dust and water jets (to BS EN 60529:1992).

However, please note that it cannot be used in water.

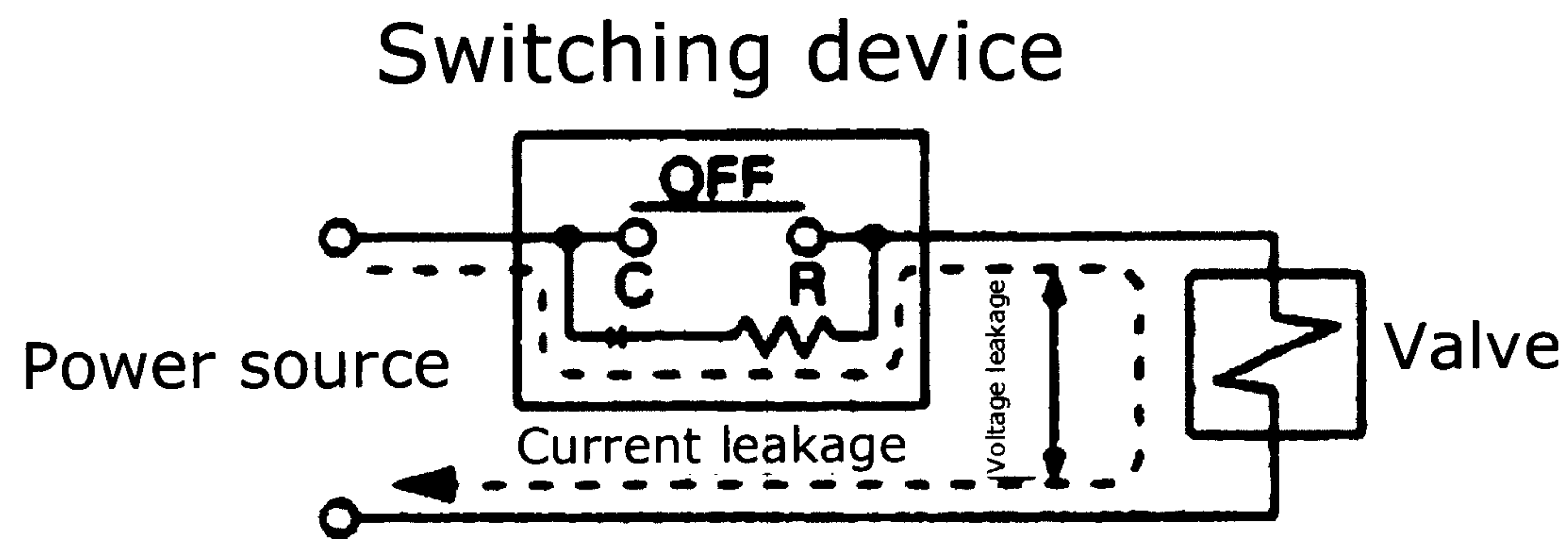
Please use an SMC connector with lead wire assembly or one for FA sensors conforming to IEC60947-5-2 (M8 3-pin screw-in type).

Please note that it will not be able to satisfy IP65 if a connector other than those mentioned above is used or it is not tightened sufficiently.

Please note that interference might occur if a connector with an outside diameter of over 10.5 mm is used for connection to a valve on manifold.

### 5-6 Energization

- ① Contact SMC when valve is to be continuously energized for a long period.
- ② When C-R device (surge voltage suppressor) is used for the protection of switching device, note that voltage leakage will be increased by passing voltage leakage through C-R device. Suppressor residual voltage leakage should be 3% or less of rated voltage. (Only DC coil)



- ③ If a surge protection circuit contains non-ordinary diodes such as Zener diodes or ZNRs, a residual voltage that is in proportion to the protective elements and the rated voltage will remain. Therefore, give consideration to surge voltage protection of the controller. In the case of diodes, the residual voltage is approximately 1V.

### 5-7 Maintenance

- ① Replace the bonnet assembly when the end of its service life is approached.
- ② If damage is suspected prior to the end of the service life, perform early maintenance.



## 6. Maintenance and replacement of part

### 6-1 Maintenance

It is possible to maintain without removing piping. And also possible to replace such as bonnet assembly by disconnecting hexagon socket head bolt (4 pcs.) on the top of bonnet assembly. When removing valve or exterior seals, take care do not damage the sealing surfaces. When installing the valve seal, be sure that the O-ring is not twisted. Please confirm the attached maintenance material.

### 6-2 Replacement of part

For replacement of part, refer to following table. (Refer to item 3 construction drawing.)

#### ① Bonnet Assembly

Seal material	Compound no.	without indicator	with indicator
FKM	1349-80	XLAV**-30-1	XLAV**A-30-1
EPDM	2101-80	XLAV**-30-1-XN1	XLAV**A-30-1-XN1
BARREL PERFLUORO	70W	XLAV**-30-1-XP1	XLAV**A-30-1-XP1
Kalrez	4079	XLAV**-30-1-XQ1	XLAV**A-30-1-XQ1
CHEMRAZ	SS592	XLAV**-30-1-XR1	XLAV**A-30-1-XR1
	SS630	XLAV**-30-1-XR2	XLAV**A-30-1-XR2
	SSE38	XLAV**-30-1-XR3	XLAV**A-30-1-XR3
VMQ	1232-70	XLAV**-30-1-XS1	XLAV**A-30-1-XS1
FKM for Plasma	3310-75	XLAV**-30-1-XT1	XLAV**A-30-1-XT1

Note:

The pilot solenoid valve ⑩ is not included in bonnet assembly.

• Part number of solenoid valve

for XLAV-16 ~ 50

SYJ319-\*\*\*-X54-Q

for XLAV-63 ~ 160

SYJ519-\*\*\*-X54-Q

(\*\*\*: refer to f, g and h in item 2)

\*\* : Flange size

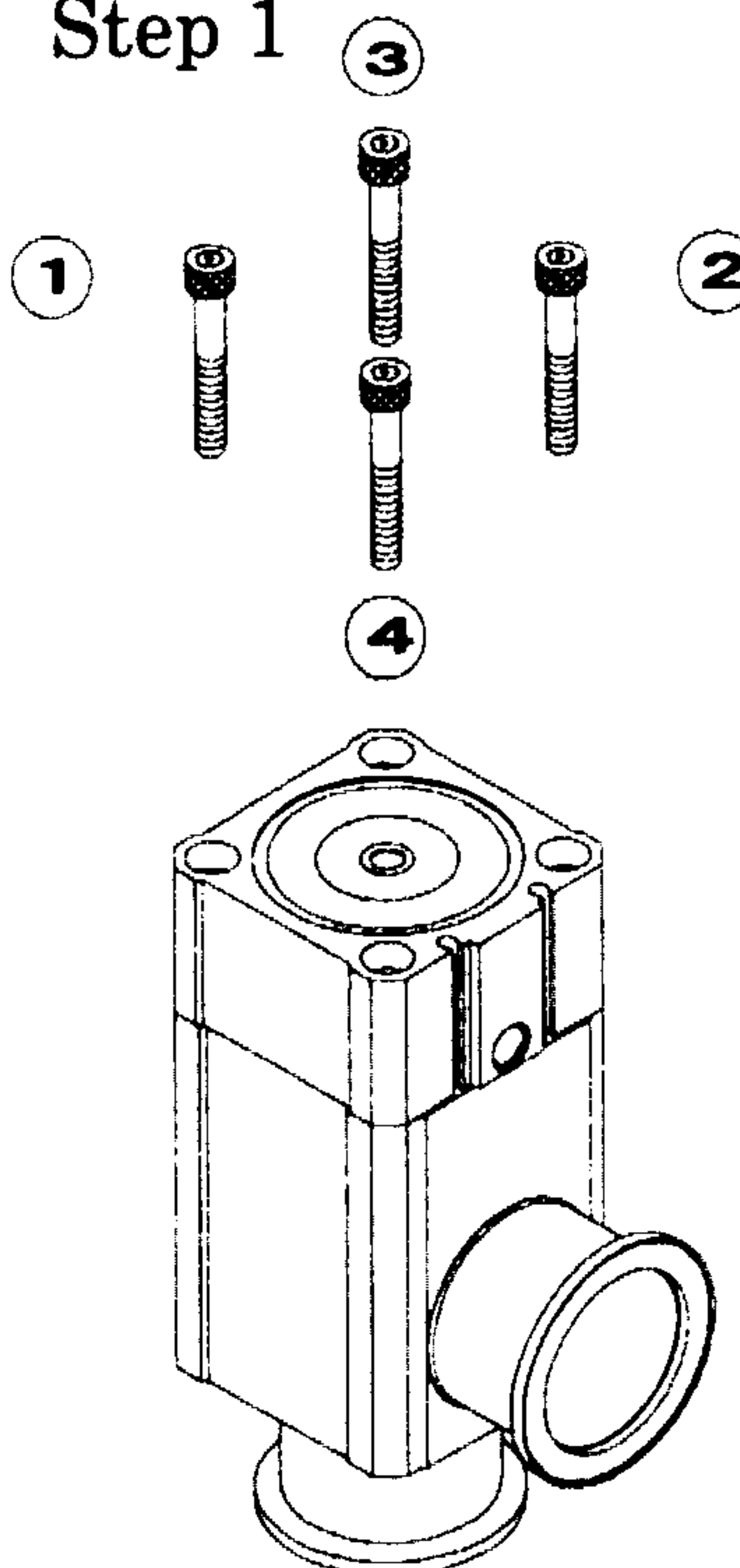
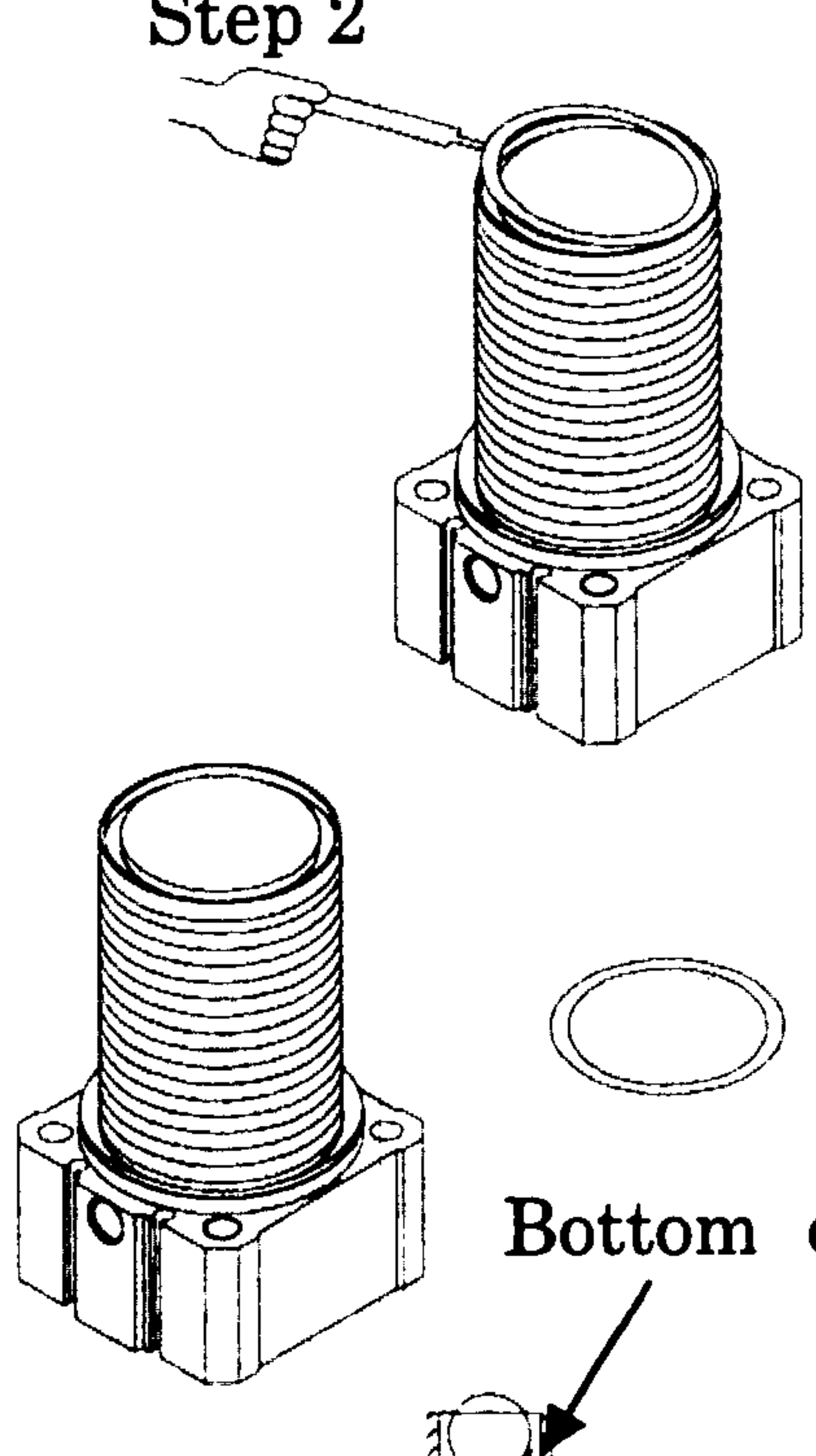
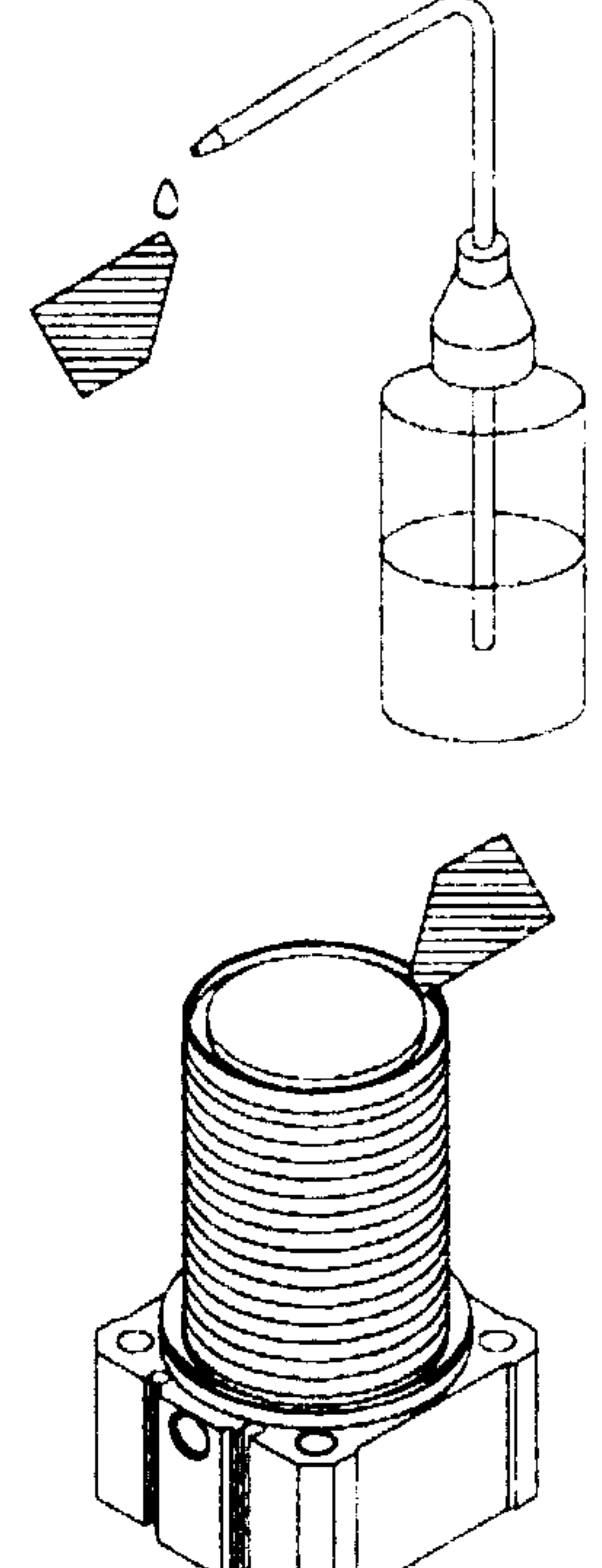
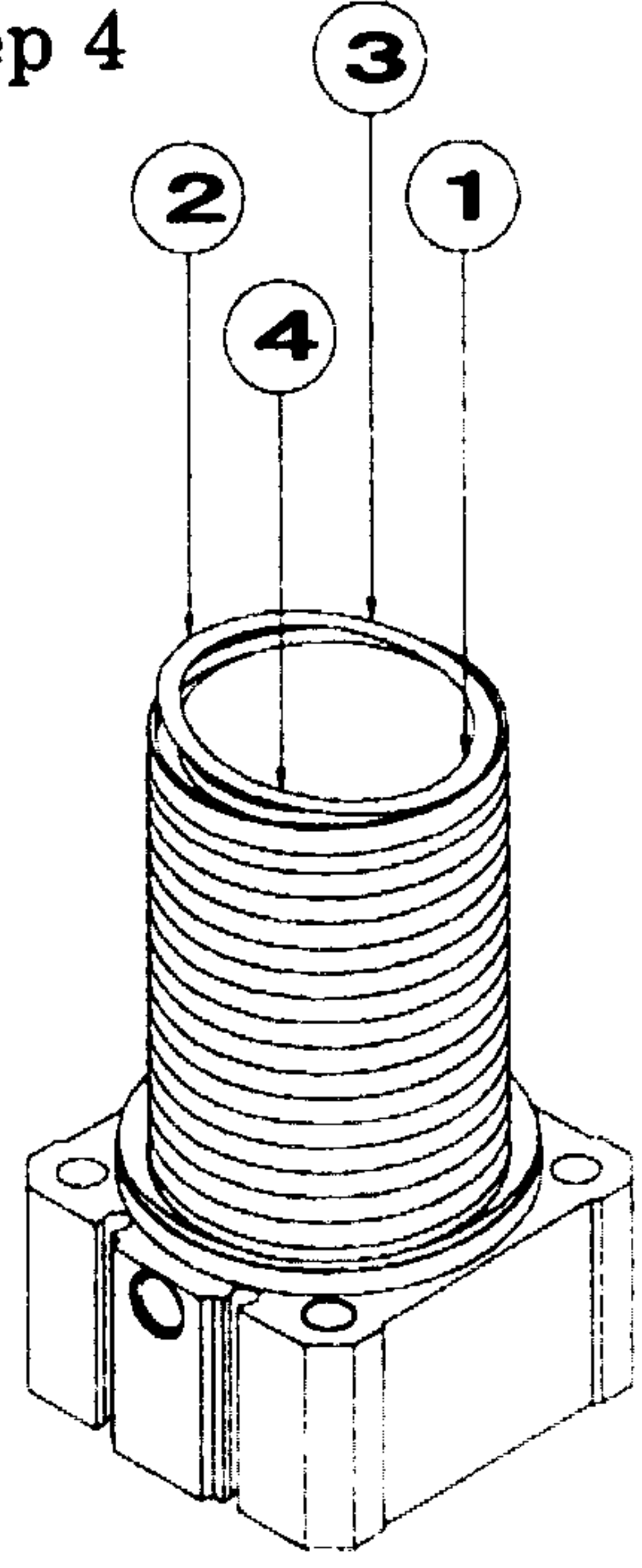
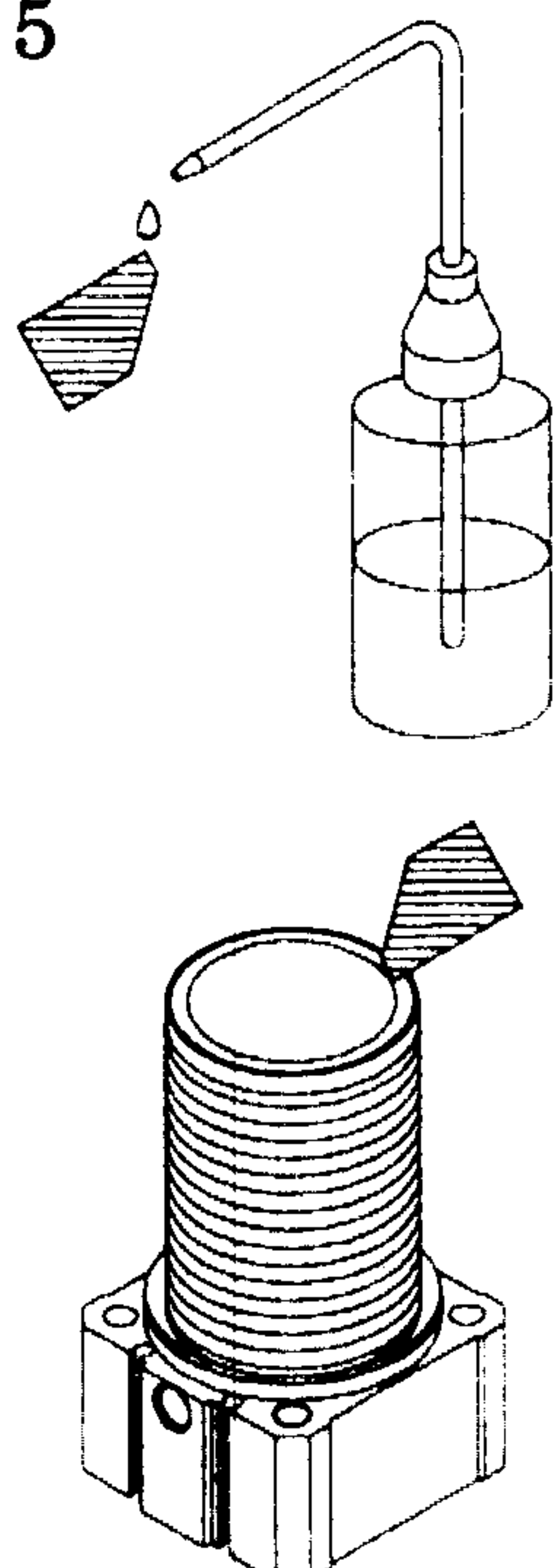
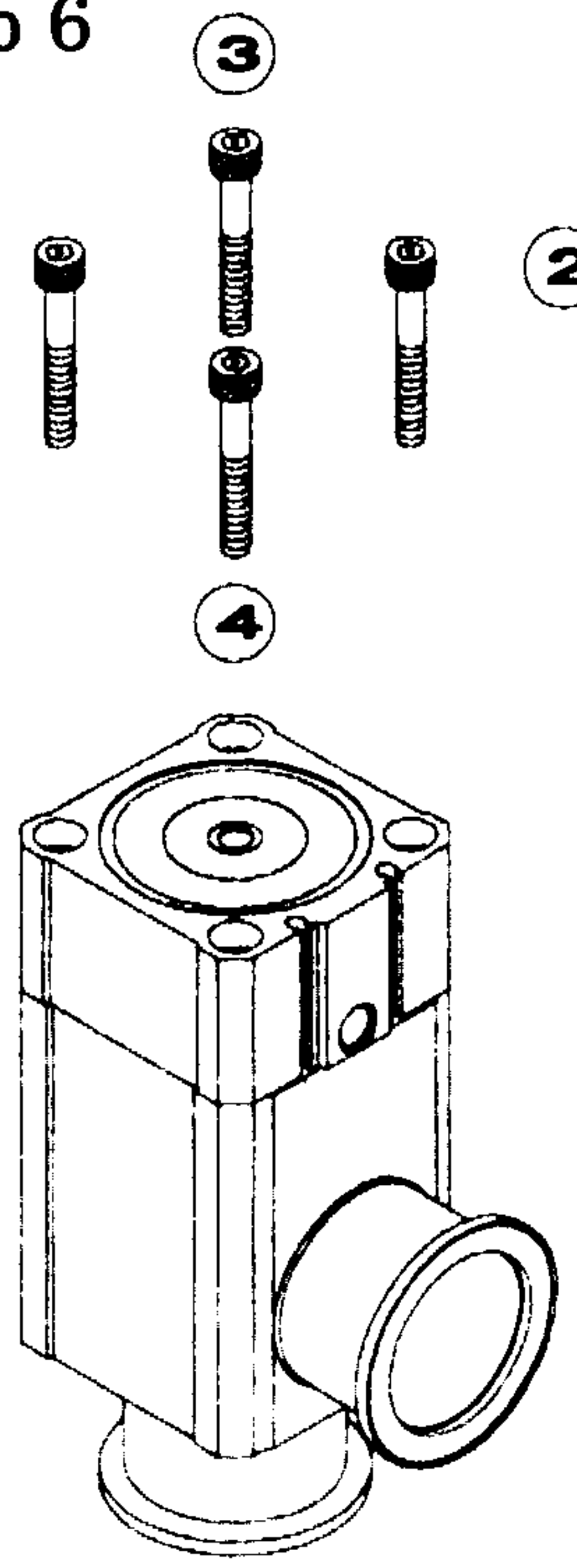
#### ④ Valve seal

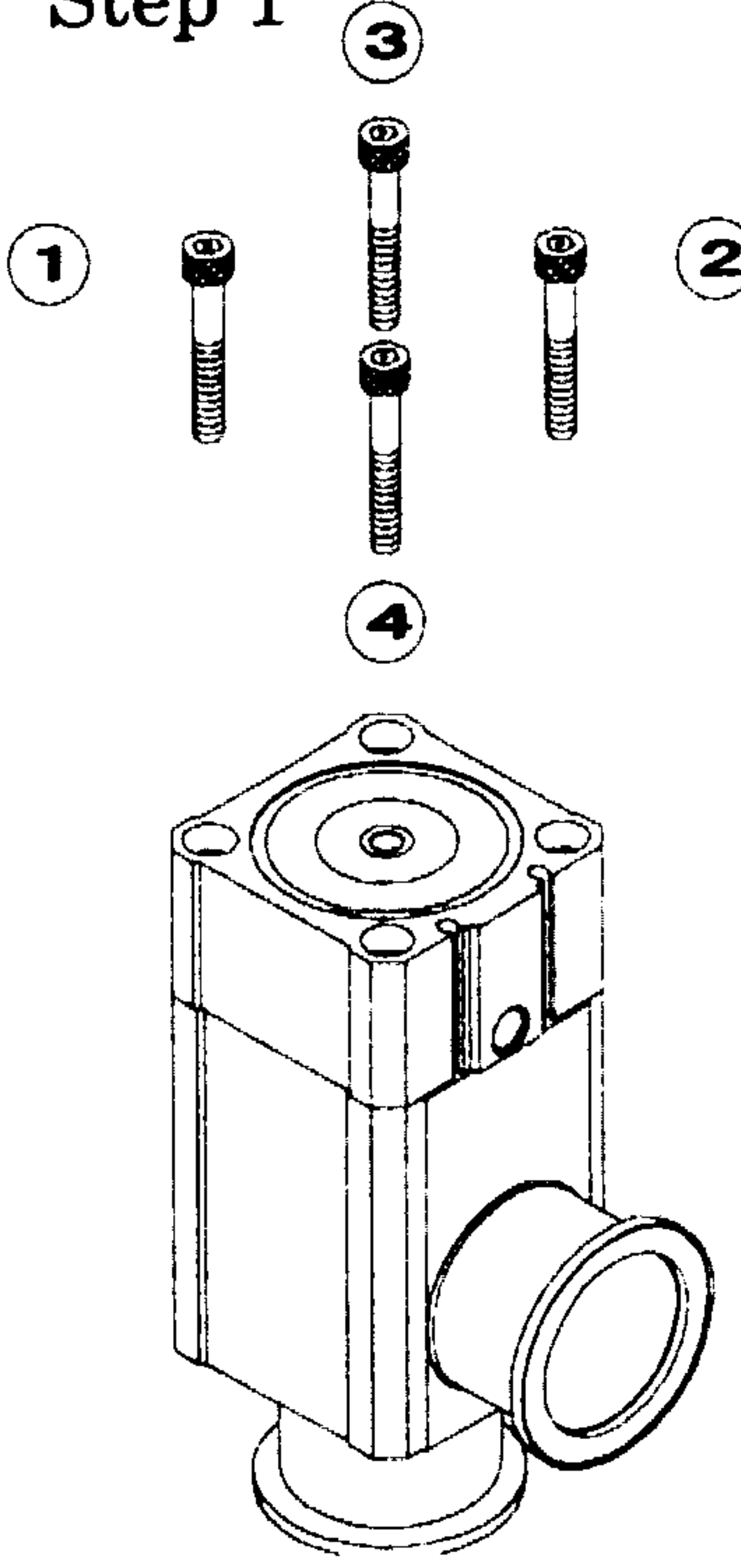
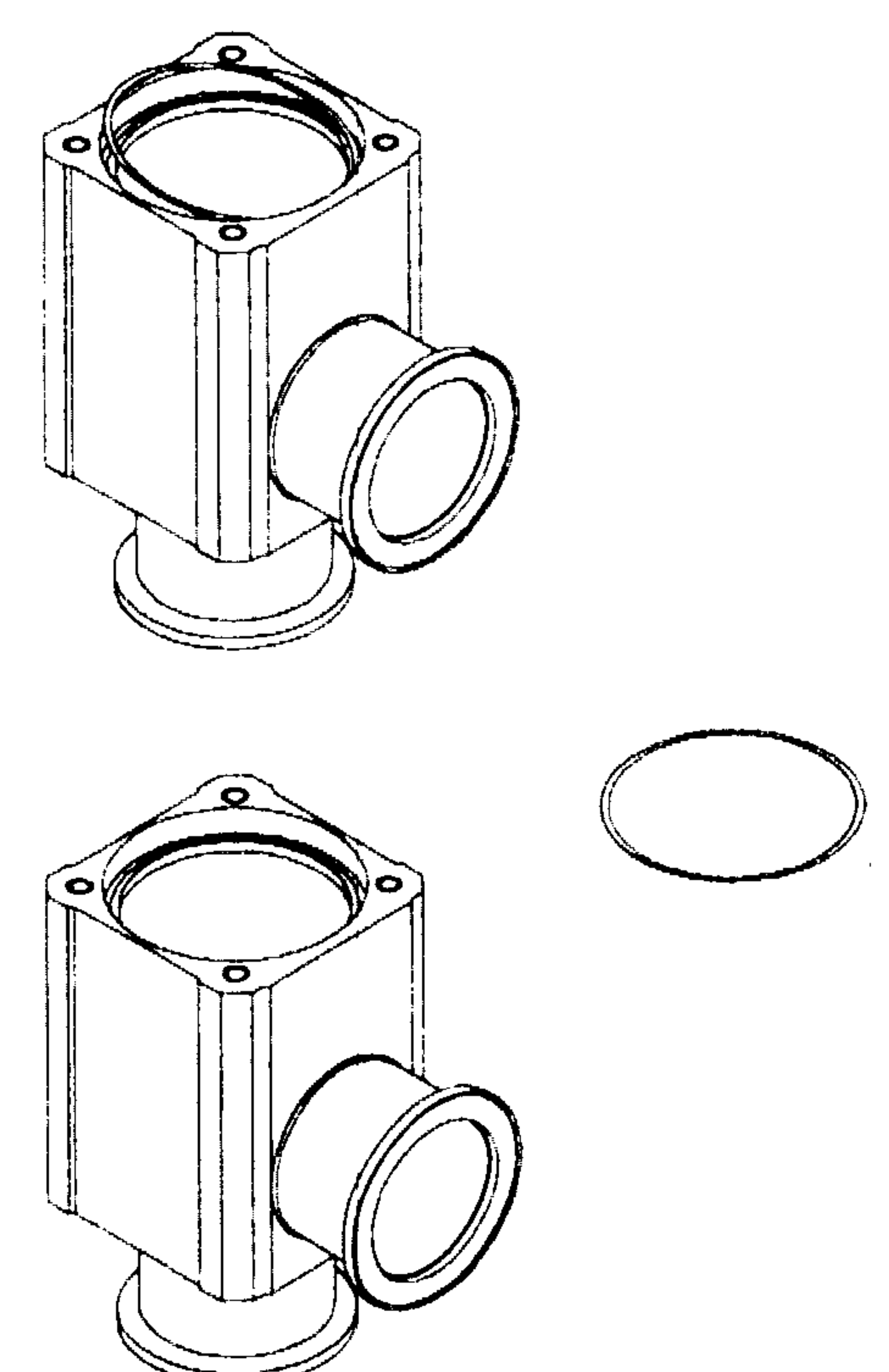
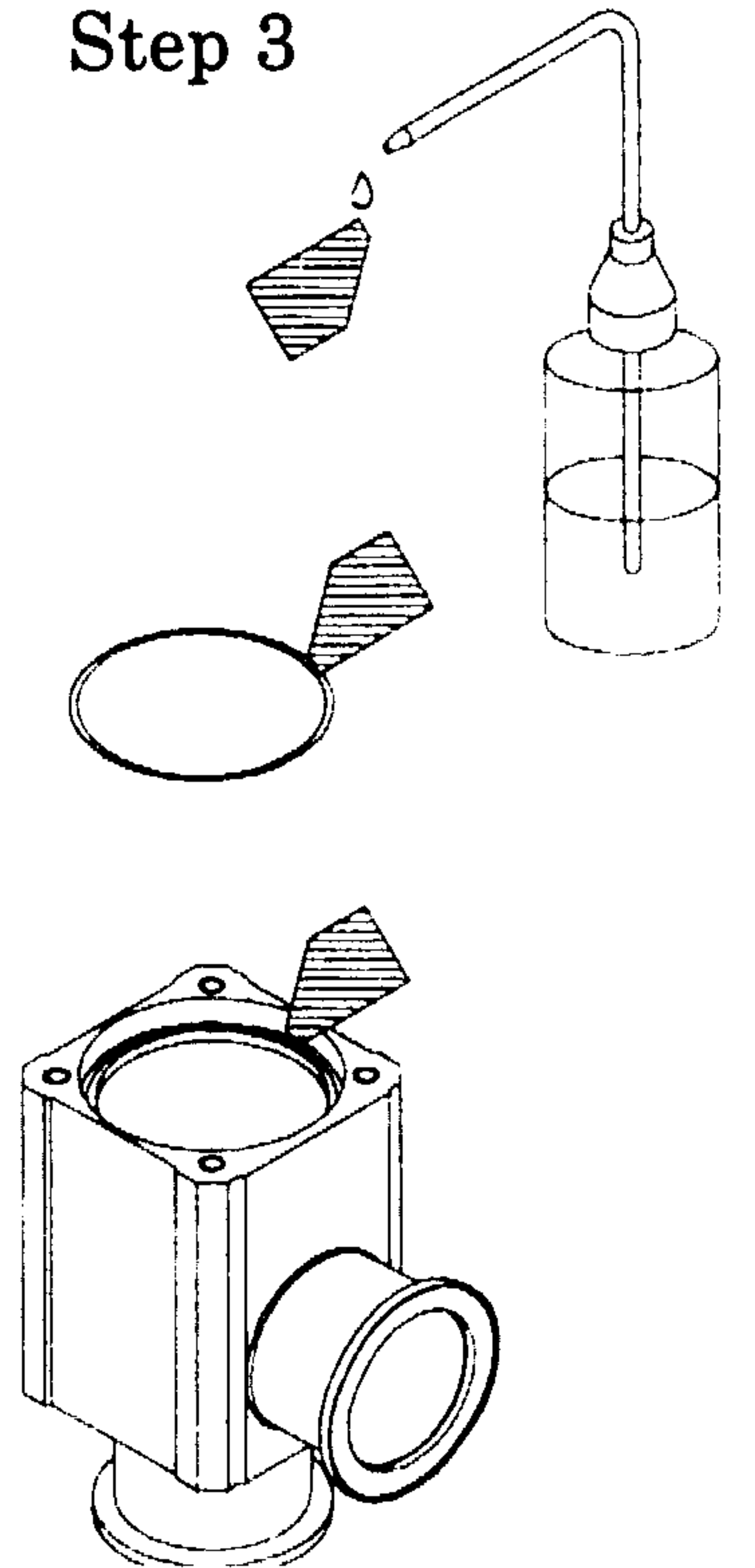
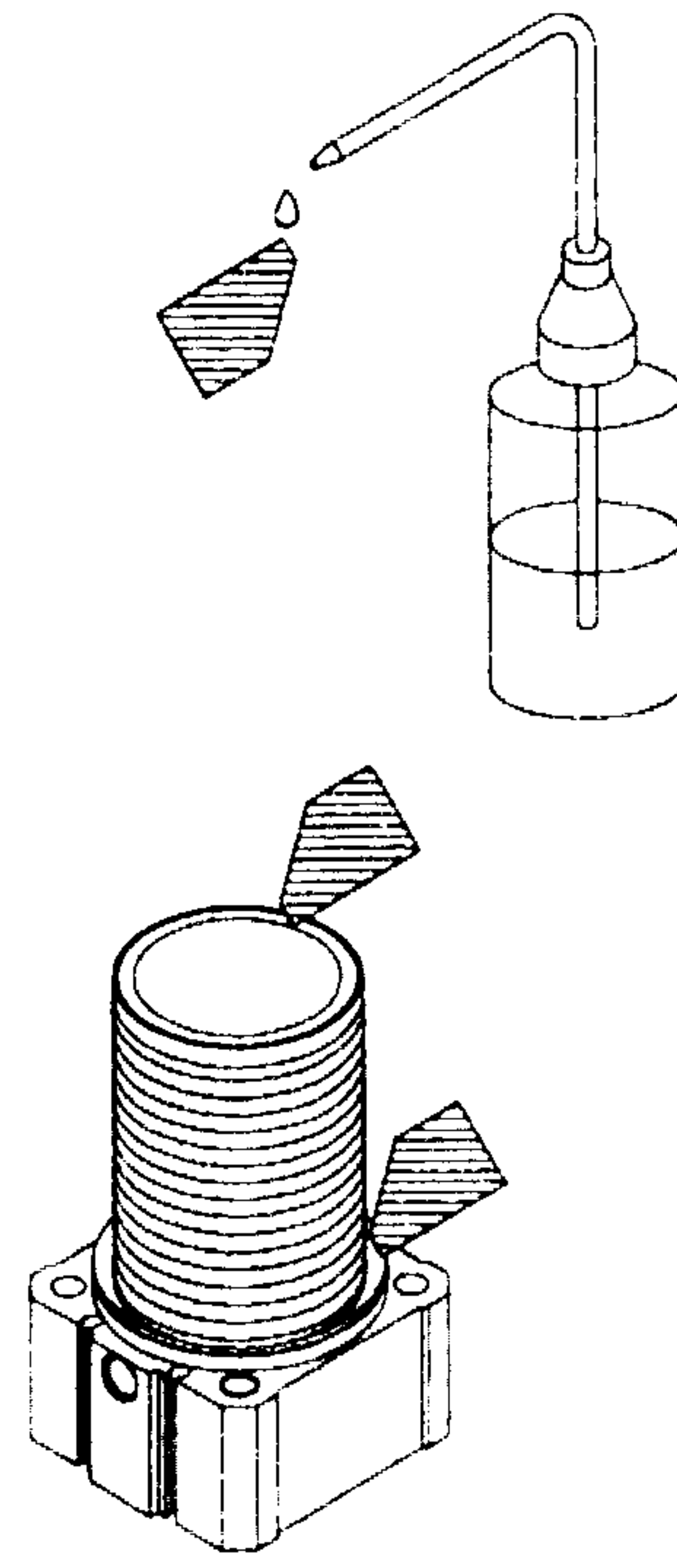
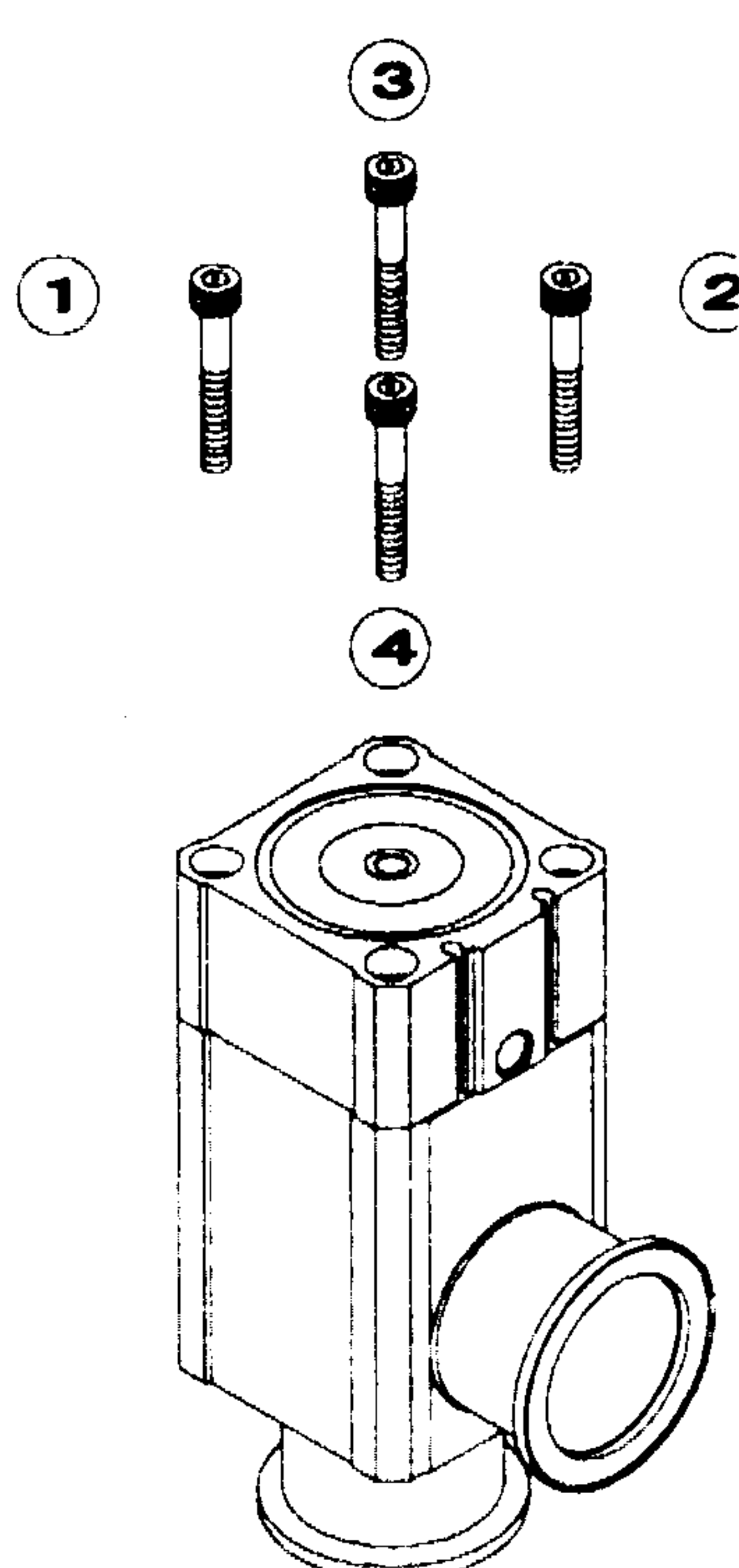
Seal material	Compound no.	XLAV-16 *: B2401	XLAV-25 *: B2401	XLAV-40 *: B2401	XLAV-50 *: AS568	XLAV-63 *: AS568	XLAV-80 *: B2401	XLAV-100 *: AS568	XLAV-160 *: B2401
FKM	1349-80	*-V15V	*-V24V	*-P42V	*-227V	*-233V	*-V85V	*-349V	*-G155V
EPDM	2101-80	*-V15-XN1	*-V24-XN1	*-P42-XN1	*-227-XN1	*-233-XN1	*-V85-XN1	*-349-XN1	*-G155-XN1
BARREL PERFLUORO	70W	*-V15-XP1	*-V24-XP1	*-P42-XP1	*-227-XP1	*-233-XP1	*-V85-XP1	*-349-XP1	*-G155-XP1
Kalrez	4079	*-V15-XQ1	*-V24-XQ1	*-P42-XQ1	*-227-XQ1	*-233-XQ1	*-V85-XQ1	*-349-XQ1	*-G155-XQ1
CHEMRAZ	SS592	*-V15-XR1	*-V24-XR1	*-P42-XR1	*-227-XR1	*-233-XR1	*-V85-XR1	*-349-XR1	*-G155-XR1
	SS630	*-V15-XR2	*-V24-XR2	*-P42-XR2	*-227-XR2	*-233-XR2	*-V85-XR2	*-349-XR2	*-G155-XR2
	SSE38	*-V15-XR3	*-V24-XR3	*-P42-XR3	*-227-XR3	*-233-XR3	*-V85-XR3	*-349-XR3	*-G155-XR3
VMQ	1232-70	*-V15-XS1	*-V24-XS1	*-P42-XS1	*-227-XS1	*-233-XS1	*-V85-XS1	*-349-XS1	*-G155-XS1
FKM for Plasma	3310-75	*-V15-XT1	*-V24-XT1	*-P42-XT1	*-227-XT1	*-233-XT1	*-V85-XT1	*-349-XT1	*-G155-XT1

#### ③ Exterior seal

Seal material	Compound no.	XLAV-16 *: AS568	XLAV-25 *: AS568	XLAV-40 *: AS568	XLAV-50 *: AS568	XLAV-63 *: AS568	XLAV-80 *: AS568	XLAV-100 *: AS568	XLAV-160 *: AS568
FKM	1349-80	*-025V	*-030V	*-035V	*-039V	*-043V	*-045V	*-050V	*-167V
EPDM	2101-80	*-025-XN1	*-030-XN1	*-035-XN1	*-039-XN1	*-043-XN1	*-045-XN1	*-050-XN1	*-167-XN1
BARREL PERFLUORO	70W	*-025-XP1	*-030-XP1	*-035-XP1	*-039-XP1	*-043-XP1	*-045-XP1	*-050-XP1	*-167-XP1
Kalrez	4079	*-025-XQ1	*-030-XQ1	*-035-XQ1	*-039-XQ1	*-043-XQ1	*-045-XQ1	*-050-XQ1	*-167-XQ1
CHEMRAZ	SS592	*-025-XR1	*-030-XR1	*-035-XR1	*-039-XR1	*-043-XR1	*-045-XR1	*-050-XR1	*-167-XR1
	SS630	*-025-XR2	*-030-XR2	*-035-XR2	*-039-XR2	*-043-XR2	*-045-XR2	*-050-XR2	*-167-XR2
	SSE38	*-025-XR3	*-030-XR3	*-035-XR3	*-039-XR3	*-043-XR3	*-045-XR3	*-050-XR3	*-167-XR3
VMQ	1232-70	*-025-XS1	*-030-XS1	*-035-XS1	*-039-XS1	*-043-XS1	*-045-XS1	*-050-XS1	*-167-XS1
FKM for Plasma	3310-75	*-025-XT1	*-030-XT1	*-035-XT1	*-039-XT1	*-043-XT1	*-045-XT1	*-050-XT1	*-167-XT1

6-3 Replacement procedure

Valve Seal (O-ring) replacement procedure			Date
Dept.	1	Model	No.
High Vacuum Angle Valve		XL*****-TDF0002	
<p><b>Step 1</b></p>  <p>Supply 0.4MPa of pressure to the port and loosen bolts in numerical order. Pressure supply is not necessary for XLC, XLG.</p>	<p><b>Step 2</b></p>  <p>Remove O-ring from the gas release groove with a tool which height is the same as the groove depth. (Mind not to damage O-ring groove)</p>	<p><b>Step 3</b></p>  <p>Apply ethanol to clean paper to wipe off the dust in O-ring groove. (Ensure no fiber nor dust are found)</p>	
<p><b>Step 4</b></p>  <p>Apply ethanol to clean paper to wipe off dust on O-ring surface, and place the ring to O-ring groove. Press O-ring in numerical order in above drawing (press diagonally) to mount O-ring into the groove. (Put on gloves which generate no particle)</p>	<p><b>Step 5</b></p>  <p>Apply ethanol to clean paper to wipe off dust on O-ring surface.</p>	<p><b>Step 6</b></p>  <p>Supply 0.4MPa of pressure to the port to tighten bolts in numerical order in above drawing. First, hand-tighten them evenly until just before O-ring is squeezed. Then, tighten them altogether. Pressure supply is not necessary to XLC, XLG.</p>	

Exterior Seal (O-ring) replacement procedure				Date	
Dept.	1	Model	High Vacuum Angle Valve	No.	XL*****-TDF0003
<p><b>Step 1</b></p>  <p>Supply 0.4Mpa of pressure to the port and loosen bolts in numerical order. Pressure supply is not necessary for XLC, XLG.</p>		<p><b>Step 2</b></p>  <p>Remove O-ring from the body. (Mind not to damage O-ring groove)</p>		<p><b>Step 3</b></p>  <p>Apply ethanol to clean paper to wipe off the dust on O-ring surface and the body mount surface. Then, mount O-ring.</p>	
<p><b>Step 4</b></p>  <p>Apply ethanol to clean paper to wipe off dust on O-ring surface and bellows holder surface.</p>		<p><b>Step 5</b></p>  <p>Supply 0.4MPa of pressure to the port to tighten bolt in numerical order in above drawing. First, hand-tighten them evenly until just before O-ring is squeezed. Then, tighten them altogether. Pressure supply is not necessary to XLC, XLG.</p>			