INSTRUCTION MANUAL

Pendulum Valve
Model VFR-400/500

Read this instruction manual thoroughly before starting operations and keep this around so operators can review the contents anytime necessary.

Components Division
ULVAC, Inc.

Before Use of This Product

Thank you for choosing our product.
This manual describes about appropriate operating and maintenance procedures in order to use the product safely and at its optimal performance. This document includes important information to avoid potential risks. It is required to for you to read and thoroughly understand the specification, operating procedure, and maintenance methods specified here, before using the product.

- Personnel involved with the operation of this product should attend general safety training classes officially authorized in your country. Also, expertise, skills or qualifications are required regarding electricity, machine, cargo handling, and vacuum technologies.
- This manual is subject to change without notice, for the purpose of improvement and specification change of the product, and friendliness of the contents of this manual. Such modified version of this manual will be issues, indicating as such by revision numbers at the right top of the instruction manual front page.
- This manual should be kept handy so that you can read it later as required.
- In case you lost this manual, consult our customer service division or sales representative offices as soon as possible.
- It is prohibited to make a copy of any part or whole of this manual for any third party without consent of ULVAC.
- When transferring this product to any third party, please make sure to attach this manual to the product.
- Any modification done by you to the product and its consequences are out of our warranty coverage, and we are not liable for it.

For uncertain matters regarding the operation of this valve, please consult our local office or sales agent or Components Division.

For safe use of the product

- Repair of this product, and Maintenance works other than specified in this document are conducted by ULCAC. If any problem occurs, please contact our sales office or sales representatives that are printed at the end of this document.
- This product is designed in compliance with current laws and regulations of the time this manual is created. When, in future, basis of those laws and regulations are amended, we will not guarantee the product's compatibility.
- In case if the system on which this valve product will be installed does not comply with the same laws and regulations, or if this valve product itself is modified, performance and safety of such product might not be ensured.

  In such case, ULVAC shall not guarantee (not be liable for) the product's performance and safety.
- Personnel who have not attended the authorized general safety training classes (electrical safety, cargo safe handling, etc) conducted in countries where the valve is installed should never operate this valve. Operators should be trained for their assigned tasks.
- Please install and operate the product in accordance with safety rules and regulations (ex. Fire law, Electrical wiring law, etc) of the country where the product is used.
- All the hazardous energy sources (electricity, compressed air, etc) should be isolated from the product before installing and removing the product.
- Do not use the product under special environment or with exposure to special gases.

If considering using the product under these conditions, please contact us beforehand.

Safety Symbol Marks

Following three levels of safety symbol marks and accompanying messages are indicated in this instruction manual and on the valve warning labels for users to understand the hazardous levels and matters to be complied with, .
When you see these symbols, please follow the accompanying messages and take actions accordingly, in order to avoid potential risks.

 **Danger** : Impending hazardous condition that, if it cannot be avoided, could result in personnel death or serious injury.

 **Warning** : Hazardous conditions that, when not avoided, can result in personnel death or serious injury.

 **Caution** : Hazardous conditions that, when not avoided, might result in minor to moderate personnel injuries. It also includes condition that may lead only to property damage.

Safety Precautions

Procedures and prohibited actions to avoid hazards for each task item are described here.

Specifications

Warning

- This product is for use under vacuum condition. ULVAC will not be liable for any damages if the product is used for the purposes other than specified in this document or is used at a pressure of more than 1.2×10^5 Pa (absolute pressure).

Unpacking

Warning

- Handling of heavy objects should be done in accordance with general safety precautions.
- Removing of packaging materials should be done carefully – do not drop or apply heavy impacts.
- Care must be taken not to damage the surface of the valve seat. (It could cause valve leaks.)

Caution

- This product is clean surface treated to be compatible with high vacuum condition. To avoid contamination, do not touch the plate with bare hands. Wear clean gloves of nylon or polyethylene materials during work. It is also recommended not to touch the valve outer surfaces with bare hands and the same precautions as with working with the valve internal surfaces should be taken. If touched with bare hands, stains such as fingerprints could be baked out.

Caution

- If any faults are found, please contact our sales office within one week after the delivery.

Installation

Caution

Avoid installing and storing the valve in the following places.

- Where environmental temperature is out of the range of 10 to 80 ˚C
- Where environmental humidity is equal to or higher than 85 %, or where dew condensation occurs
- Where water splash occurs
- Where is dusty
- Where explosive or flammable gas exists
- Where corrosive gas exists
- Near heating source
- Where much vibration occurs
- Where exposed to salt air
- Where exposed to direct sunlight
- Where exposed to radiation
- Where strong magnetic field or electric field exists

Caution

- When performing bake out, high temperature lubricant (>120°C) should be applied to the mating surface of the bolts, in order to avoid galling that could make bolts seize up and will never can be removed. Also, care must be taken not to contaminate the vacuum side of the bolt with the applied lubricant.

Warning

- When using multiple valves, install the valves with their cylinders more than 40 mm apart one another. Lead switch might malfunction.

Warning

- Handling of heavy objects should be done in accordance with general safety precautions.
- Installation and assembly works should be done carefully – do not drop or apply heavy impacts.
- Care must be taken not to damage the surface of the valve seat. (It could cause valve leaks.))

Caution

- This product is clean surface treated to be compatible with high vacuum condition. Do not contaminate the valve internal surface (exposed to vacuum) by touching it with bare hands. Wear clean gloves of nylon or polyethylene materials during work. It is also recommended not to touch the valve outer surfaces with bare hands and the same precautions as with working with the valve internal surfaces should be taken. If touched with bare hands, stains such as fingerprints could be baked out.

Compressed Air Connection

Warning

- Maximum compressed air pressure supported by the product is 0.70 MPaG.
- Do not use the product with pressures over this value. It could result in breakage or malfunction of the valve. When operating the product at higher than 0.70 MPaG, insert a pressure regulator between the compressed air supply source and the cylinder. (0.60 MPaG recommended)
- If the compressed air contains chemicals, compound oil with organic solvents, sodium, or corrosive gases, do not use it since it could lead to the valve damage or malfunction.
- **When supplying the compressed air with the pendulum valve for the first time after the compressed air pipe is connected, make sure to introduce the air to "CLOSE side compressed air IN".** The pendulum valve is shipped with its CLOSE position. Therefore, if the compressed air is supplied to "OPEN side compressed air IN" for the first time, it would impair the rotation control, damaging it with abnormal rotation.

Caution

- Minimum compressed air pressure to be supplied with the product is 0.50 MPaG.
- Do not use the product at a pressure less than this value. It could adversely affect the timing synchronization of rotation and sealing operations, causing damage to the valve.

Caution

- Install the air filter with filtration level of 5 μm or lower.
- Compressed air with high concentration of moist or oil could cause the failures. Countermeasures such as after cooler, air dryer, or drain ejector should be implemented.

Connection of Lead Switch

Warning

- Use the valve at the specified voltage value. Operating the valve at voltages other than specified here could cause the equipments' malfunction, shock hazard, or fire. Load currents or temperatures outside the specification, or physical shocks could also cause the equipment breakage or malfunctions. Proper use of the equipment is recommended.

Caution

- Always connect the loads first, before powering ON the system. Powering ON the system with no loads connected will cause over current, instantaneously damaging the equipments.

Normal Operation

Warning

- Do not use the product under special environment or with exposure to special gases.
- If considering using the product under these conditions, please contact us beforehand.

Danger

- Do not put your hands or feet inside the valve.
- Pinch hazard such as death or serious injuries could occur. Under normal operation, do not put your hands or any other parts of your body into the valve.

Caution

- When opening the valving element (OPEN), the differential pressure at the valve plate should be at or less than 0.5kPa for both positive and negative pressures. Opening the valve with pressure more than the above value could cause damage to the valve.

Bake out

Caution

- Do not touch any parts of the valve during bake out.
- Also, even after the completion of bake-out, do not touch the valve until the valve is cooled to the room temperature.
- Temperature tolerance is 120°C. However, the tolerance of drive unit section should be at or less than 80°C.

Maintenance

Danger

- Do not put your hands or feet inside the valve.
- Pinch hazard such as death or serious injuries could occur. Please contact us when considering works other than specified here that require entrance of your body parts within the valve body.
- Parts and units more than 20kg are used. Comply with the specified maintenance procedure, and care must be taken not to fall or get entangled in the equipment.

Warning

- Should the valve have experienced special operating conditions or be exposed to special gases, check such type of environment or gases used to ensure safety of work environment before inspecting the valve.
- Should the product have experienced such special environment or be exposed to special gases, please always inform us before ordering inspection or repairing work. Please note that, depending on the conditions, we might not be able to undertake inspection or repair works. Never send back the valve to ULVAC without prior contact; otherwise, personal lives could be endangered.

Caution

- No one, other than the service personnel of ULVAC, is allowed to perform disassemble task other than what is specified in this document.
- If any disassembly work other than allowed in this document is done by you, the product's guarantee will terminate even before its expiry date.
- Please contact us if disassembly/assembly of the product other than the specified unit replacement is required.

Warning

- When disassembling the parts during maintenance work, do it in accordance with the procedures described here and do not remove other parts not specified in this document.
- Spring and air cylinder are installed within the valving element, and special tools are required to disassemble them. If these parts are disassembled with tools other than specified, valve member may burst and cause personnel injury. The valve needs to be send back to ULVAC for disassembly. Do not do it yourself.
- When removing the drive unit from the fixing bolt (schematic view 1-16), OPEN the valve in accordance with the procedures described in this document, and release the valve to the atmosphere with no compressed air supplied to it. When the valve is in CLOSE state, even if the compressed air supply is disabled before releasing the valve to the atmosphere, residual pressure within the cylinder is still encapsulated by the action of the check valve. Under this condition, when the drive unit fixing bolt (structural drawing 1-16) is removed, the valve member may burst and cause personnel injury.

Warning

- When removing the valving element unit, always make sure to tighten the maintenance bolt in clockwise direction. If the bolt is not tightened in CW direction, the valving element will encapsulate itself when it is removed, causing injury of personnel and damage to properties.

Warning

- When removing the valving element unit, please make sure to turn ON the maintenance switch. If the unit is removed with the switch is OFF, compressed air will be released, making the O-ring burst out, causing injury of personnel and damage to the valve.

Caution

- After the valving element installation is completed, always make sure to turn OFF the maintenance switch before tightening the maintenance bolt in counter-clockwise direction. If the maintenance bolt is tightened by rotating it counter-clockwise with the maintenance switch ON, the valve will be damaged.

Troubleshooting

Caution

In case of an occurrence of valve failure or accident, preservation of the condition of the operating site as well as sending back the valve may be required, in order to investigate root cause of such events. We appreciate your cooperation.

- In case of an even of valve failure or accident, please contact us or local CS center. We might ask you to preserve the site if the event is a serious failure or an accident.
- In case of an event of valve failure or accident, we might ask you to report detailed information and your operating conditions.

Removal

Danger

- When removing the product, place it to CLOSE position before starting the task.
- Removing the valve with its OPEN position is highly dangerous, since the valving element position will be unstable and its center of gravity can easily be changed depending of the valve's orientation. It also could cause damage.
- Once set to CLOSE position, the valve will keep that position unless it is supplied with compressed air again.

Transport

Danger

- During transportation, please keep the valve at CLOSE position.
- Transporting the valve with its OPEN position is highly dangerous, since the valving element position will be unstable and its center of gravity can easily be changed depending of the valve's orientation. It also could cause damage.
- Once set to CLOSE position, the valve will keep its position unless it is supplied with compressed air again.

Caution

- The valve should be horizontally oriented (flange opening parallel with the ground) during transportation.
- If not in horizontal orientation, the valve could be damaged due to vibration during transportation.

Storage

Danger

- Please keep the valve at CLOSE position during storage.
- Storing the valve with its OPEN position is highly dangerous, since the valving element position will be unstable and its center of gravity can easily be changed depending of the valve's orientation. It also could cause damage.
- Once set to CLOSE position, the valve will keep its position unless it is supplied with compressed air again.

Caution

Avoid installing and storing the valve in the following places.

- Where environmental temperature is out of the range of 10 to 80 ˚C
- Where environmental humidity is equal to or higher than 85 %, or where dew condensation occurs
- Where water splash occurs
- Where is dusty
- Where explosive or flammable gas exists
- Where corrosive gas exists
- Near heating source
- Where much vibration occurs
- Where exposed to salt air
- Where exposed to direct sunlight
- Where exposed to radiation
- Where strong magnetic field or electric field exists

Disposal

Warning

- Before disposing the product, residual energy of spring and compressed air should be released. Please contact us before disposing the product.
- The valve must be disposed of according to the regulations of the local government.
- If the valve is covered with any substance harmful to human health (or if any harmful gas or substance is used in the valve), it must be disposed of by a professional waste disposal firm. Please note that disposal cost will be borne by the customer.

- "Contacts" is printed at the end of this document.
- Please make notes of **model No., drawing No. and Serial number** of the product, before consulting our sales offices or representatives.

Table of Contents

1. Specification

Warning

- This valve is the valve to be used in vacuum condition. ULVAC provides no guarantee to a usage not complying with the purpose of this valve, or a usage in pressure range higher than atmospheric pressure 1.2×10^5 Pa (absolute pressure).

1.1 Features

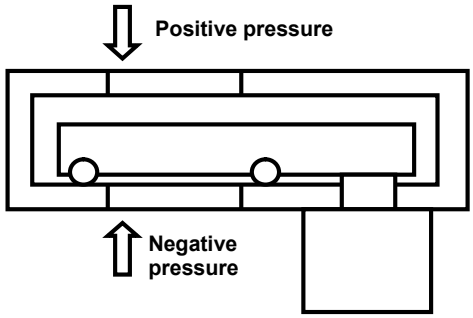
(1) This product is a compressed air driven pendulum vacuum valve.
(2) Its conductance at open position is high, and it optimizes the evacuation performance of the vacuum pump.
(3) Specially designed spring seal mechanism will zero the vibration inherent to mechanical lock operation.

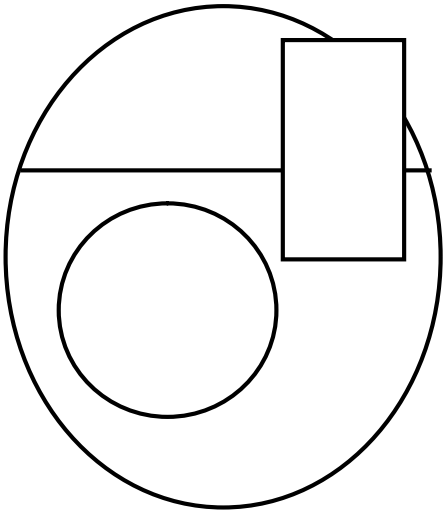
1.2 Selecting valving element seat surface orientation and installation position of drive unit (option)

(1) Orientation of the sealing surface of this valve can be selected. This makes it possible to select the valve seal's positive/negative pressure against the system at your option (see Fig 1-4).
(2) Installation location of the drive unit (cylinder section) outside the casing can be selected between front or back side. This ensures flexibility of the system layout (see Figure 1-4).
(3) Configuration of selectable seat surface orientation and installation position of the drive unit are optional.
(4) Relationship models and sides are as follows.

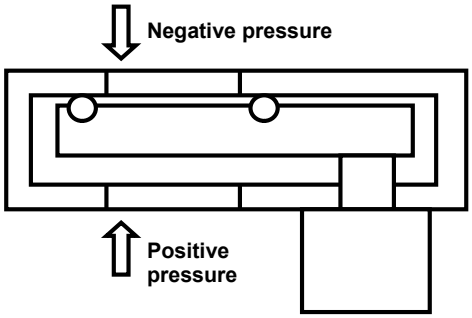
VFR－400－FF

- Seal side・・・F:Front／B:Back
- Drive unit side・・・F:Front／B:Back
- D/N・・・・・・・・・・・・400／500
- Series

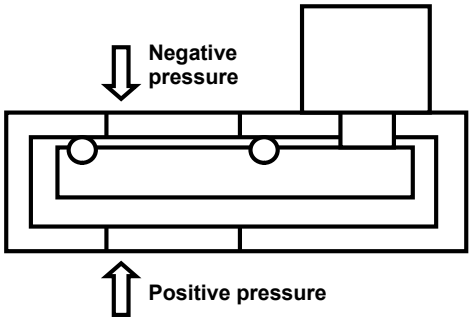




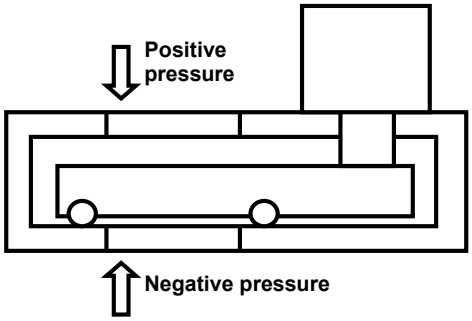
[Figure 1 Standard installation]
(Valving element sealing:Front side, Drive unit: Ffront side)



[Fig 2.Ooptional installation]
(Valving element sealing: Backside, Drive unit: Front side)

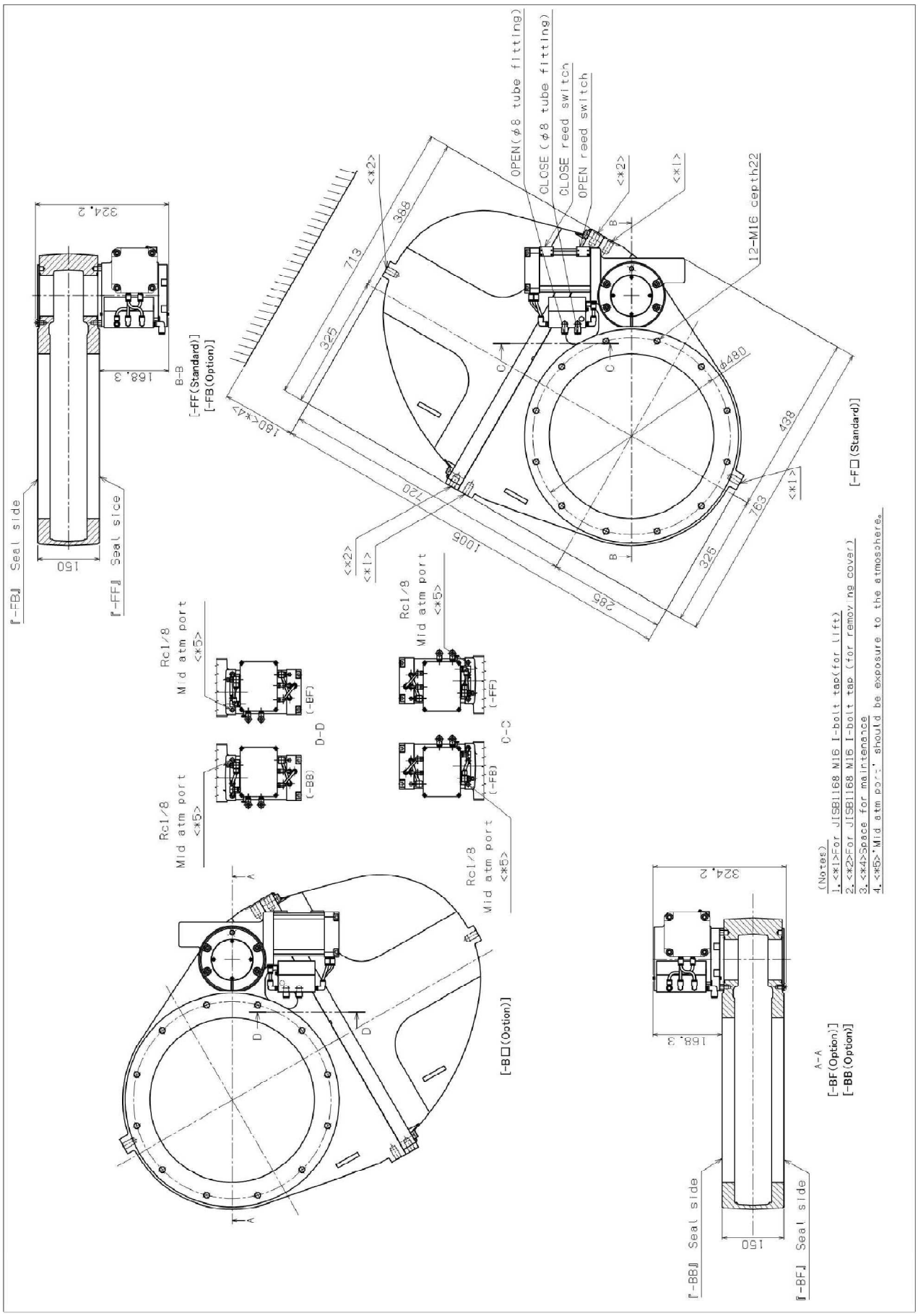


[Fig 3. Optional installation]
(Valving element sealing: Backside, Drive unit: Backside)

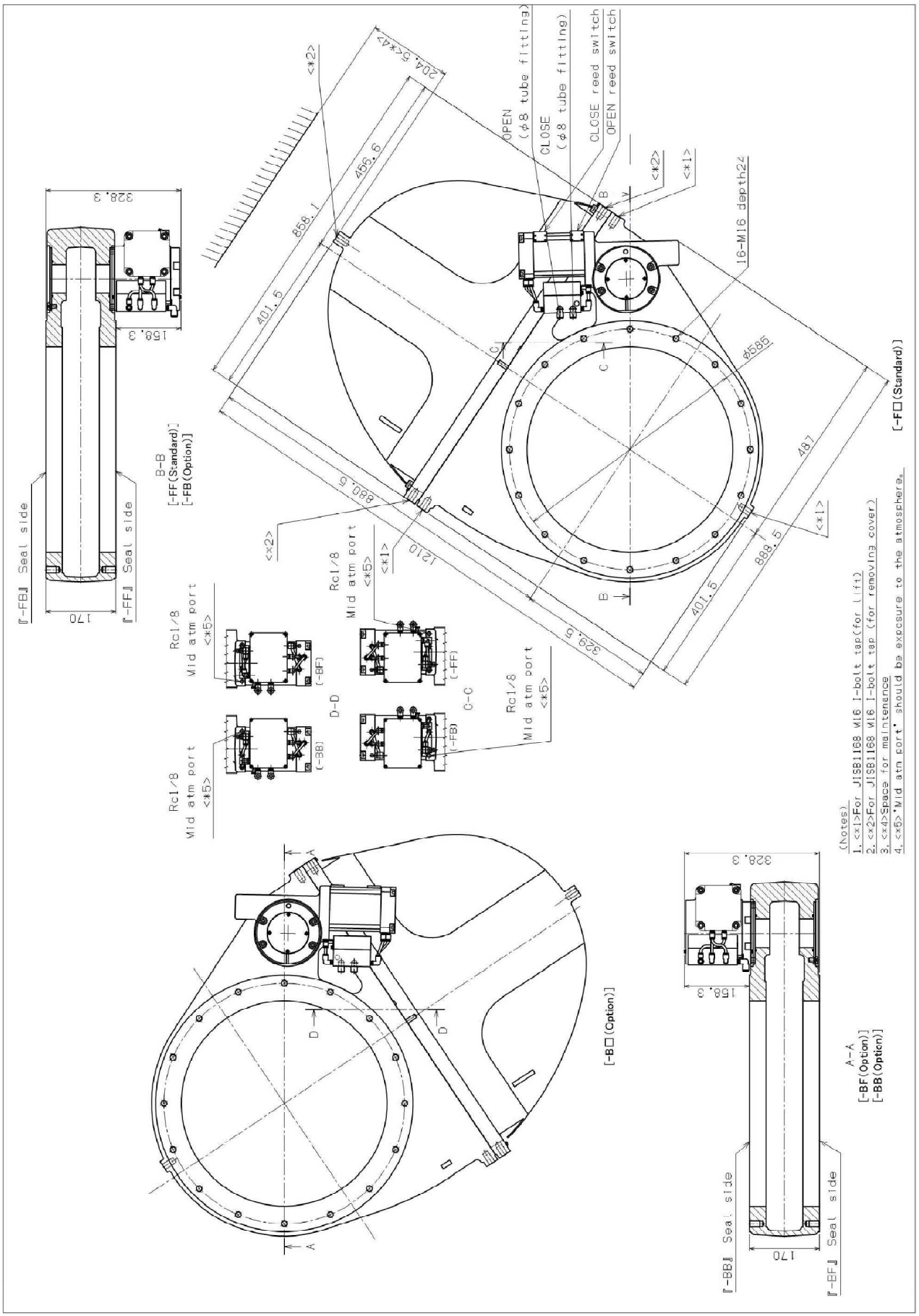


[Figure 4. Optional installation]
(Valving element sealing: Front side, Drive unit: Back side)

1.3 Drawing



[Fig 11 VFR-400 Drawing]



[Figure 12 VFR-500 Drawing]

1.4 Specification table

[Table 2 . List of Specifications]

№	Item \ Model	VFR-400	VFR-500
1	Nominal diameter	400 mm	500 mm
2	Connection flange	VF400	VF500
3	Valve plate performance	Negative pressure	
4	Max. allowed differential pressure of valve seal (@positive pressure)	0.12 MPa	
5	Max. allowed differential pressure of valve seal (@negative pressure)	0.12 MPa	
6	Max allowed differential pressure @ OPEN position (@positive pressure)	0.5 kPa	
7	Max allowed differential pressure @ OPEN position (@negative pressure)	0.5 kPa	
8	Valve plate seal type	O-ring seal	
9	Shaft seal type	O-ring seal	
10	Seal operating mechanism	Direct-operated single cylinder mechanism, with internal valving elment	
11	Open Conductance	50000 L/s<Note 1>	90000 L/s<Note 1>
12	Vacuum air-tightness (external)	≦1.0×10^{-10} Pa • m^3/s<Note 2>	
13	Vacuum air-tightness (internal)	≦1.0×10^{-10} Pa • m^3/s<Note 2>	
14	Operating pressure range	1.0×10^{-5} Pa to 0.12 MPa (absolute pressure)	
15	Baking temperature tolerance (static)	≦ casing:120°C ≦ drive unit:80°C<Note 3>	
16	Operating ambient temperature	10 to 80°C	
17	Operating fluid temperature	10 to 80°C	
18	Heating & cooling rate	≦ 30°C/h	
19	Operating ambient atmosphere	Anti-corrosion gas	
20	Operating fluid	Anti-corrosion gas	
21	Cylinder compressed air pressure	0.50 to 0.70 MPaG	
22	Cylinder capacity	OPEN operation: 1.00 L CLOSE operation: 0.76 L	OPEN operation: 1.27 L CLOSE operation: 0.76 L
23	Diameter of compressed air supply tube	φ8 tube fitting <Note 4>	
24	Maintenance cycle	Every 100,000 cycles	
25	Warranted operation cycle	100,000 cycles <Note 5>	
26	Warranted period	1 year after delivery, 6 months after maintenance <Note 5>	
27	Open/Close operating speed	≦ 8s<Note 7>	≦ 12s<Note 7>
28	Operating orientation	Free	
29	Open/close sensor operating principle	Lead switch	
30	Open/close sensor contact capacity	≦ 100VDC, ≦ 0.5A, ≦ 10W<Note 6>	
31	Valve open/close position indication	None	
32	Materials of major parts	■ Casing: AC4CH-T6 ■ Valve plate: AC4CH-T6 ■ Other major vacuum parts: SUS304 ■ Atmosphere side major parts: AC4CH-T6,A5052,A6063	
33	Materials of sealing parts	■ Vacuum side: fluoro rubber ■ Atmosphere side: fluoro rubber, polyester	
34	Oils	Vacuum side: SUPER Z300 grease(ULVAC)	
35	Gross weight	98 kg	155 kg
36	Face-to-face dimension	150 mm	170 mm
37	Rinse treatment	Rinse with organic solvent	
38	Allowable external force in axial direction	7840 N	8820 N
39	Allowable bending moment onto the flange surface	980 N • m	1078 N • m
40	Option	■ Drive unit installation position can be changed ■ Valving elment sealing surface orientation can be changed	
41	Lifter	■ Casing: Tap hole for M16 eyebolt ■ Valving elment: Tap hole for M8 eyebolt	■ Casing: Tap hole for M16 eyebolt ■ Valving elment: Tap hole for M10 eyebolt
42	Compressed air system	■ OPEN: 1 ■ CLOSE: 1	
43	Behavior when compressed air stops	■ When closed: keep closed ■ When OPEN and during operation: keep FREE condition and rotation position not stable. However, when the valve reaches at CLOSE position, it will automatically be locked and be kept locked after that.	

<Note 1> Conductance value is calculated using molecular flow at 20°C in air.
<Note 2> Static air-tightness characteristics value (except during operation and immediately after an occurrence of differential pressure). Penetration via an O-ring is not included.
<Note 3> Do not open/close the valve during baking.
<Note 4> Refer to “Drawing” for the positions of the compressed air connecting ports.
<Note 5> Refer to “Warranty Condition”.
<Note 6> Condition for maintenance cycle specified is DC24V-40mA.
<Note 7> Operating ambient temperature of 20°C, with no baking histories.

2. Installation of the Product

2.1 Unpacking

Warning

- When transferring heavy units, follow the general safety rules.
- While unpacking, handle the valve with care, and be careful not to drop or give a strong shock.
- Be careful not to make a flaw on the valve seat surface. (a flaw causes leak).

Caution

- This product is clean surface treated to be compatible with high vacuum condition. To avoid contamination, do not touch the plate with bare hands. Wear clean gloves of nylon or polyethylene materials during work. It is also recommended not to touch the valve outer surfaces with bare hands and the same precautions as with working with the valve internal surfaces should be taken.If touched with bare hands, stains such as fingerprints could be baked out.

Caution

- If any faults are found, please contact our sales office within a week after the delivery.

At delivery, please check if the content of the package is in accordance with your order and it is not damaged during transportation.
At shipping, protective covers and packaging materials are used to protect the seat surface of the tie-in flange. Same type of protective materials should be used for storing and sending back the product for maintenance.
Three points of “eyebolt tap for lifting completed product” should be attached with “JIS B1168 M16 eyebolts” before lifting the system out of the crate using a crane.

2.2 Installation site environment

Caution

Avoid installing and storing the valve in the following places.

- Where environmental temperature is out of the range of 10 to 80 ˚C
- Where environmental humidity is equal to or higher than 85 %, or where dew condensation occurs
- Where water splash occurs
- Where is dusty
- Where explosive or flammable gas exists
- Where corrosive gas exists
- Near heating source
- Where much vibration occurs
- Where exposed to salt air
- Where exposed to direct sunlight
- Where exposed to radiation
- Where strong magnetic field or electric field exists

2.3 Installation

Caution

- When performing bake out, high temperature lubricant (>120°C) should be applied to the mating surface of the bolts, in order to avoid galling that could make bolts seize up and will never can be removed. Also, care must be taken not to contaminate the vacuum side of the bolt with the applied lubricant.

Warning

- When using multiple valves, install them with more than 40 mm apart one another. Lead switch might malfunction.

Warning

- When handling heavy units, follow the general safety rules.
- During installation and assembly works, handle the valve with care, and be careful not to drop or give a strong shock.
- Be careful not to make a flaw on the valve seat surface. (A leak may result.)

Caution

- This product is clean surface treated to be compatible with high vacuum condition. Do not contaminate the valve internal surface by touching it with bare hands. Wear clean gloves of nylon or polyethylene materials during work. It is also recommended not to touch the valve outer surfaces with bare hands and the same precautions as with the valve internal surfaces should be taken. If touched with bare hands, stains such as fingerprints could be baked out.

(4) Clean sealing surface and an O-ring of its mating flange.
(5) Use crane to move the pendulum valve to the installation site. During this operation, care must be taken to prevent making hummer or scratch marks on the sealing surface.
(6) Tighten the specified bolts in diagonal pairs to connect the flange.
(7) For the information about O-ring and bolt, refer to Table 3 below.

[Table 3 Flange connection: List of O-ring and bolt]

Valve Type	O-ring Type	Bolt Size	No. of Bolts (front+back)	Bolt Penetration Depth	Female Allowable Tightenig Axial Force	Allowable Tightening Torque<*1>
VFR-400	V430	M16	24	16 to 22 mm	22000N	76N • m
VFR-500	V530	M16	32	16 to 24 mm	22000N	76N • m

<*1> JISB1180 Attachment, Hexagonal Screw. Strength Class A2-50, Coefficient of screw thread = 0.13 (lubricated), Fitting surface Coefficient of Friction = 0.20 (non-lubricated), and Torque coefficient =0.22. Tighten bolts in accordance with actual conditions, as well as “female screw allowable tightening axial force” and allowable tightening torque of your bolts.

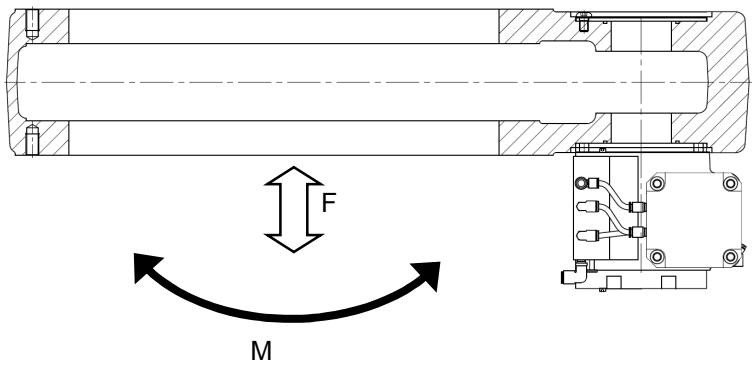
2.4 Allowable external forces to Flange parts

Valve flange receives external forces of system’s vacuum evacuation and pressurization, weight of other equipments, and baking. Tolerance values of external forces to the valve flange are listed in Table 4 below. Also, please refer to Figure 6.

[Table 4 Allowable external forces to flange] <*1>

Valve Type	F: Axialal allowable force (tention or press-in)	M: Allowable bending moment
VFR-400	7840N	980N • m
VFR-500	8820N	1078N • m

<*1> In a case when both “Axial external force” and “bending moment” are applied at the same time, above values are not applicable.



[Figure 6 Description of external forces]

2.5 Connecting Compressed Air

Warning

- This valve uses compressed air with the maximum pressure of 0.70 MPa.
- Do not use any pressure higher than this, or damage or malfunction may occur. When operating the product at higher than 0.70 MPaG, a pressure regulator must be inserted between the compressed air source and the cylinder to adjust the pressure. (recommended pressure: 0.60 MPaG)
- If the compressed air contains any kind of chemicals, compound oil with organic solvent, sodium, or corrosive gas, do not use such compressed air. Otherwise, the valve may be damaged or malfunction may occur.
- **When supplying the compressed air with the pendulum valve for the first time after the compressed air pipe is connected, make sure to introduce the air to "CLOSE side compressed air IN".** The pendulum valve is shipped with its CLOSE position. Therefore, if the compressed air is supplied to "OPEN side compressed air IN" for the first time, it would impair the rotation control, damaging it with abnormal rotation.
- **When stopping the supply of compressed air** ,Should carry out the supply stop operation at the **CLOSE state of valve. If you stop the compressed air supply in the open state, control does not act. and valve be damaged.**

Caution

- Minimum compressed air pressure to be supplied with the product is 0.50 MPaG.
- Do not use the product at a pressure less than this value. It could adversely affect the timing synchronization of rotation and sealing operations, causing damage to the valve.

Caution

- Install the air filter with filtration level of 5 μm or lower.
- Compressed air with high concentration of moist or oil could cause the system failures. Countermeasures such as after cooler, air dryer, or drain ejector should be implemented.

(1) Compressed air is used for valve open/close operations.
(2) Please refer to "compressed air IN" of "Drawings"
(3) Use clean compressed air. If the compressed air contains dust, moist, or oil, use filter and mist separator.
(4) Connect the cylinder to the system side compressed air solenoid valve using a tube. Connection of tubes should be done without supplying the compressed air yet. Do it under atmospheric pressure. Also, use tubes that withstand the pressure of .70 MPaG or more.
(5) When supplying the compressed air with the pendulum valve for the first time after the compressed air pipe is connected, make sure to introduce the air to "CLOSE side compressed air IN". The pendulum valve is shipped with its CLOSE position. Therefore, if the compressed air is supplied to "OPEN side compressed air IN" for the first time, it would impair the rotation control, damaging it with abnormal rotation.

2.6 Connection of Lead Switch

Warning

- Use the valve at the specified voltage value. Operating the valve at voltages other than specified here could cause the equipments' malfunction, shock hazard, or fire. Load currents or temperatures outside the specification, or physical shocks could also cause the equipment breakage or malfunctions. Proper use of the equipment is recommended.

Caution

- Always connect the loads first, before powering ON the system. Powering ON the system with no loads connected will cause over current, instantaneously damaging the equipments.

(1) General
Contact automatic switch is installed for detecting open/close operations. The switch finds piston position of the cylinder and can electrically detect open/close status of the valve plate.
(2) Electric connection of the lead switch
Refer to Table 5.

[Table 5 Specification of electric connection of lead switch]

Item	Description
No. of core wire	2
Polarity	None
Specificaiton of lead wire	UL1007 AWG24, length: 330mm
Specification of lead wire termination	Strip: 5mm, pre-soldering at leading end

3. Operation Method

3.1 Normal Operation

Warning

- Do not use this valve in special environment or with a special gas.
- If such operations are necessary, be sure to contact ULVAC before actually starting the operation.

Danger

- Do not put your hand, foot, or any part of your body into the valve.
- Otherwise, accident such as serious injury or death may occur due to caught-in. Under normal operation, do not put your hands or any other parts of your body in the valve.

Caution

- When opening the valving elment (OPEN), the differential pressure at the valve plate should be at or less than 0.5kPa for both positive and negative pressures. Opening the valve with pressure more than the above value could cause damage to the valve.

(1) Compressed air is used for valve open/close operations.
(2) Please refer to “compressed air IN” of “Drawings”
(3) According to “Compressed Air Connection”, make sure the compressed air is supplied to the CLOSE side (valve position at shipping).
(4) When the compressed air is supplied to the “OPEN side compressed air IN”, the valve plate will OPEN. Simultaneously, control “CLOSE side compressed air IN” to be released to the atmosphere.
(5) When the compressed air is supplied to the “CLOSE side compressed air IN”, the valve plate will CLOSE. Simultaneously, control “OPEN side compressed air IN” to be released to the atmosphere
(6) Operation time is pre-configured by the embedded speed control mechanism of the pendulum valve; it is not user-configurable. Do not remove, install, rotate, or perform any tasks on pipes, fittings, and screws on the drive unit, except those tasks specified in this “Operation Manual”. Abnormal behavior may cause damage to the system.

3.2 Operation under heated environment

Operating the heated valve could somewhat affect the performance of embedded speed controller of the pendulum valve, which might delay the operating time.
When using the heated valve, check its operating time under actual operation condition before using it.

3.3 Delay of Lead Switch

CLOSE side lead switch is activated when the moving operation of the valving elment to the CLOSE position is completed. After the valving elment movement is completed, the valve transitions to sealing operation; it takes a certain period of time to fully complete the sealing operation. The delay from the time when the lead switch is ON to the time opening operation is completed is listed in Table 6 below.

[Table 6 List of delay time of lead switch]

Valve Type	CLOSE delay time	OPEN delay time
VFR-400	≤ 4s	≤ 2s
VFR-500	≤ 6s	≤ 2s

3.4 Behavior when compressed air is low

This valve consists of two cylinders: cylinder for valving elment rotation and cylinder for v alving element sealing operation. Compressed air inputs (open x 1, close x 1) supplied from the system side is so controlled that the air can be supplied to these two cylinders at the defined timings through the control of embedded “sequence BOX”. “Sequence BOX” is a mechanical control system – it does not require power source or not affected by a power outage. Table 7 shows the valve behavior when the compressed air is low.

[Table 7 List of valve behaviors when compressed air is low]

Conditions immediately after the comp. air low	Behavior after the comp. air low event
Keep CLOSE state	Keep CLOSE state
During OPEN operation	Both valving elment closed position and rotation position are unstable. Care must be taken to this condition; it could lead to the mechanism damage.
Keep OPEN state	When kept FREE, rotation position unstable. However, when the valve reaches at CLOSE position, it will automatically be locked and be kept locked after that.
During CLOSE operation	

3.5 Bake-out

Caution

- Do not touch the valve during bake-out.
- Also, even after the completion of bake-out, do not touch the valve until the valve is cooled to the room temperature.
- Temperature tolerance is 120°C. However, the tolerance of drive unit section should be at or less than 80°C.

(1) Confirm that the pressure is 10^{-2} Pa or less. If the valve is baked out at a pressure higher than this value, sealing performance may be impaired or outgas may be increased due to the valve inside oxide.
(2) Thermal insulate the valve body with aluminum foil after wrapping the body with tape heater, etc.
(3) Temperature increase should be within the range of “Heating and cooling rate” of “Table 2 List of specifications”.
(4) Do not open/close during baking.
(5) After completion of bake-out, avoid rapid cooling of the valve as far as possible, and leave it until it is cooled down naturally, in order to keep temperature change within the range of “Heating and cooling rate” specified in "Table 2 List of Specifications.”
(6) After completion of bake-out, do not open or close the valve until every part of the valve is cooled down to room temperature.

4. Maintenance

Danger

- Do not put your hand, foot, or any part of your body into the valve.
- Otherwise, accident such as serious injury or death may occur because of caught-in.
- Please contact us when considering works other than specified here that require entrance of your body parts within the valve body.
- Parts and units more than 20kg are used. Comply with the specified maintenance procedure, and care must be taken not to fall or get entangled in the equipment.

Warning

- If the valve is used in a special environment or with a special gas, confirm the property of applied environment or gas and ensure the safety before starting maintenance work.
- In addition, be sure to inform us about such special environment or gas when requiring maintenance or repair. Please understand that there is a possibility we cannot accept maintenance or repair work.
  Never send back the valve to ULVAC without prior contact; otherwise, personal lives could be endangered.

Caution

- No one, other than the service personnel of ULVAC, is allowed to perform disassemble task other than what is specified in this document.
- If any disassembly work other than allowed in this document is done by you, the product’s guarantee will terminate even before its expiry date.
- Please contact us if disassembly/assembly of the product other than the specified unit replacement is required.

Maintenance works must be carried out in order to maintain the valve performance (including safety) and to continue planned productions.

4.1 Maintenance precautions

Please read and understand the following items about the maintenance work.

(1) Maintenance service is at your own cost.
(2) For the valve that has been found not maintained at the specified intervals, we may not meet your maintenance request, since such valve may have some unforeseeable defects.
(3) In order to verify whether the valve contains hazardous materials, our specified “Contamination Certificate” (see Attachment) should be filled out when ordering us maintenance work. Please note that, the document should be filled out for each hazardous material that might be contained in the valve.
(4) Please keep all the notes of required information such as operation time, operation period, and maintenance history of the product from the time of delivery, since such data is needed when deciding on what type of maintenance tasks are required.
(5) Maintenance period specified in this document is based on clean condition. If debris is found, more frequent maintenance is needed.
(6) “Contacts” is printed at the end of this document.
(7) Please make notes of **model No., drawing No. and Serial number** of the product, before consulting our sales offices or representatives.

4.2 Maintenance List

Table 8 and Table 9 show lists of exchangeable parts (units) and list of referenced parts for maintenance work.

[Table 8 VFR-400 Maintenance list]

No.	VFR-400			Maintenance, replacement period <*1>		Maintenance/ replacement method <*4,5>
	Replacement Part, section	Specification	pcs	Open ↔ Close Operation	Interv-al	
1-1	Valving elment unit	<*2>Weight: 25 kg	1	100,000 cycle	5 years	On site
1-2	Drive unit	<*2>Weight: 20 kg	1	500,000 cycle	5 years	On site
2-28	O-ring for valve plate	<*2>	1	<*6>		On site
1-6	O-ring for drive unit	<*2>	1	<*3>		On site
1-9	O-ring for cover	<*2>	1	<*3>		On site
2-20	O-ring for arm(small)	<*2>	2	<*3>		On site
2-21	O-ring for arm(large)	<*2>	1	<*3>		On site
1-4	Cover	Weight: 20 kg	1	Referenced part for maintenance		
7-1	Eyebolt for cover	JIS B 1168 M16	3	<*7>Referenced part for maintenance		
1-10	Bolt, M12 × 50, w/hexagonal hole	A2-70:Torque:65N • m	4	Referenced part for maintenance		
2-13	Maintenance bolt	width across flat, 3 hexagonal holes: Torque 2.4N • m(common for CCW/CW rotation)	2	Referenced part for maintenance		
5-16	Maintenance switch	Knurl, hand-rotated	1	Referenced part for maintenance		
4-51	Bolt, M4 × 12, w/hexagonal hole	A2-70: Torque 2.4N•m	4	Referenced part for maintenance		
4-15	Bearing lid	-	1	Referenced part for maintenance		
7-2	Eyebolt for valving elment	JIS B 1168 M8	4	<*7>Referenced part for maintenance		
1-17	Bolt, M10 × 220, w/hexagonal hole	10.9: Torque 80N • m	1	Referenced part for maintenance		
1-3	Main Body	-	1	Referenced part for maintenance		
1-12	Arm links	-	1	Referenced part for maintenance		
1-16	Bolt, M10 × 165, w/hexagonal hole	A2-70: Torque 39N•m	4	Referenced part for maintenance		
-	Vacuum sice grease	Super Z300(ULVAC)	-	Used for maintenance		

[Table 9 VFR-500 Maintenance List]

No.	VFR-500			Maintenance, replacement period <*1>		Maintenance/ replacement method <*4,5>
	Replacement Part, section	Specification	pcs	Open ↔ Close Operation	Interv-al	
1-1	Valving elment unit	<*2> Weight:: 39 kg	1	100,000 cycle	5 years	On site
1-2	Drive unit	<*2> Weight:: 20 kg	1	500,000 cycle	5 years	On site
2-28	O-ring for valve plate	<*2>	1	<*6>		On site
1-6	O-ring for drive unit	<*2>	1	<*3>		On site
1-9	O-ring for cover	<*2>	1	<*3>		On site
2-20	O-ring for arm(small)	<*2>	2	<*3>		On site
2-21	O-ring for arm(large)	<*2>	1	<*3>		On site
1-4	Cover	Weight: 40 kg	1	Referenced part for maintenance		
7-1	Eyebolt for cover	JIS B 1168 M16	3	<*7>Referenced part for maintenance		
1-10	Bolt, M12 × 50, w/hexagonal hole	A2-70: Torque 65N • m	4	Referenced part for maintenance		
2-13	Maintenance bolt	width across flat, 3 hexagonal holes: Torque 2.4N•m(common for CCW/CW rotation)	2	Referenced part for maintenance		
5-16	Maintenance switch	Knurl, hand-rotated	1	Referenced part for maintenance		
4-51	Bolt, M4 × 12, w/hexagonal hole	A2-70: Torque2.4N • m	4	Referenced part for maintenance		
4-15	Bearing lid	-	1	Referenced part for maintenance		
7-2	Eyebolt for valving elment	JIS B 1168 M10	4	<*7>Referenced part for maintenance		
1-17	Bolt, M10 × 220, w/hexagonal hole	10.9: Torque 80N • m	1	Referenced part for maintenance		
1-3	Main Body	-	1	Referenced part for maintenance		
1-12	Arm links	-	1	Referenced part for maintenance		
1-16	Bolt, M10 × 165, w/hexagonal hole	A2-70:Torque 39N•m	4	Referenced part for maintenance		
-	Vacuum sice grease	Super Z300(ULVAC)	-	Used for maintenance		

<*1> Open<->Close operation cycle or the Interval, whichever comes first.

<*2> In-house part. Please contact ULVAC.

<*3> If the parts is scratched by the decomposition work, please replace parts..

<*4> “send-back” means the valve should be sent back to ULVAC for parts replacement.

<*5> “on-site” means that ULVAC service person will replace the parts or units with the valve body assembled with the system.

<*6> If contamination from the process product or flaw is found, please replace parts, even before the maintenance interval elapses.

<*7> Lifting part for maintenance tasks, not included with the delivery items. Customer must supply the equipment.

4.3 Maintenance method

Warning

- When disassembling the parts during maintenance work, do it in accordance with the procedures described here, and do not disassemble the parts not specified in this document.
- Special tools are required to disassemble the parts including the spring and air cylinder of the valving elment. If these parts are disassembled with tools other than specified, valve member may burst and cause personnel injury. The valve needs to be sent back to ULVAC for disassembly. Do not do it yourself.
- When removing the drive unit from the fixing bolt (schematic view, No. 1-16), OPEN the valve in accordance with the procedures described in this document, and release the valve to the atmosphere with no compressed air supplied to it. When the valve is in CLOSE state, even if the compressed air supply is disabled and the valve is released to the atmosphere, pressure within the cylinder is still encapsulated by the action of the check valve. Under this condition, when the drive unit fixing bolt (structural drawing 1-16) is removed, the valve member may burst and cause personnel injury.

Warning

- When removing the valving elment unit, always make sure to tighten the maintenance bolt in clockwise direction. If the bolt is not tightened, the valving elment tries to seal itself when it is removed, causing injury of personnel and damage to the valve.

Warning

- When removing the valving elment unit, please make sure to turn ON the maintenance switch. If the unit is removed with the switch is OFF, compressed air will be released, making the O-ring burst out, causing injury of personnel and damage to the valve.

Caution

- Always make sure to turn OFF the maintenance switch before tightening the maintenance bolt in counter-clockwise direction after the valving elment unit is installed. If the maintenance bolt is tightened by rotating it counter-clockwise with the maintenance switch is ON, the valve will be damaged.

Please follow the procedures below to perform maintenance work, referring to Tables 8 to 9, and Figures 7 to 10.

4.3.1 Valving elment unit replacement procedure

(1) Control the pressures of the chambers on both side of the valve to the atmospheric pressure.
(2) OPEN the valve plate using normal operation procedure.
(3) Remove four “Number 1-10: bolt” while “Number 1-4: cover” is kept attached with “Number 7-1: eyebolt” (not supplied) . Since “Number 1-4: Cover” is a heavy object (refer to Table 8, 9), it should be lifted with a crane.
(4) Remove “Number 1-4: Cover”.
(5) Tighten two “Number 2-13: Maintenance bolt” by turning them CW direction.
(6) With “Number 5-16: Maintenance switch” pushing against the end, and turn it by 90 degrees in CW direction till it stops (Maintenance switch ON).
(7) Remove four “Number 4-51: Bolt”.
(8) Remove “Number 4-15: Bearing lid”.
(9) Remove one “Number 1-17: Bolt” while “Number 1-1: Valving elment” is kept attached with “Number 7-2: eyebolt” (not supplied) . Since “Number 1-1: Valve unit” is a heavy object (refer to Table 8, 9), it should be lifted with a crane.
(10) Remove “Number 1-1: Valve unit”.
(11) Clean seating surface and counter seating surface of “Number 1-3: Main body”.
(12) Prepare new “Number 1-1: Valving elment unit” and clean “Number 2-28: O-ring, valve plate”.
(13) Install “Number 1-1: Valving elment unit” with “Number 7-2 eyebold” (not supplied) by holding its weight using a crane, and insert them into the mating section of “Number 1-12: Arm links” until it stops.
(14) Tighten one “Number 1-17: Bolt”.
(15) Install “Number 4-15: Bearing lid”.
(16) Tighten four “Number 4-51: Bolt”.
(17) Remove “Number 7-2 eyebolt”.
(18) Turn “Number 5-16: Maintenance switch” in CCW approximately 90 degrees. Make sure that the maintenance switch is back at forward position by its spring force (Maintenance switch is OFF). Also, at this point, check the specified pressure of compressed air is supplied. Performing the following task without the compressed air supply could damage the system.
(19) Loosen two “Number 2-13: Maintenance bolt” by turning it in CCW, and keep turning the bolts until the end.
(20) Tighten four “Number 1-10: bolt” with “Number 1-4: cover” attached with “Number 7-1: eyebolt” (not supplied).
(21) CLOSE the valve plate using normal operation procedures.

4.3.2 Drive unit replacement procedure

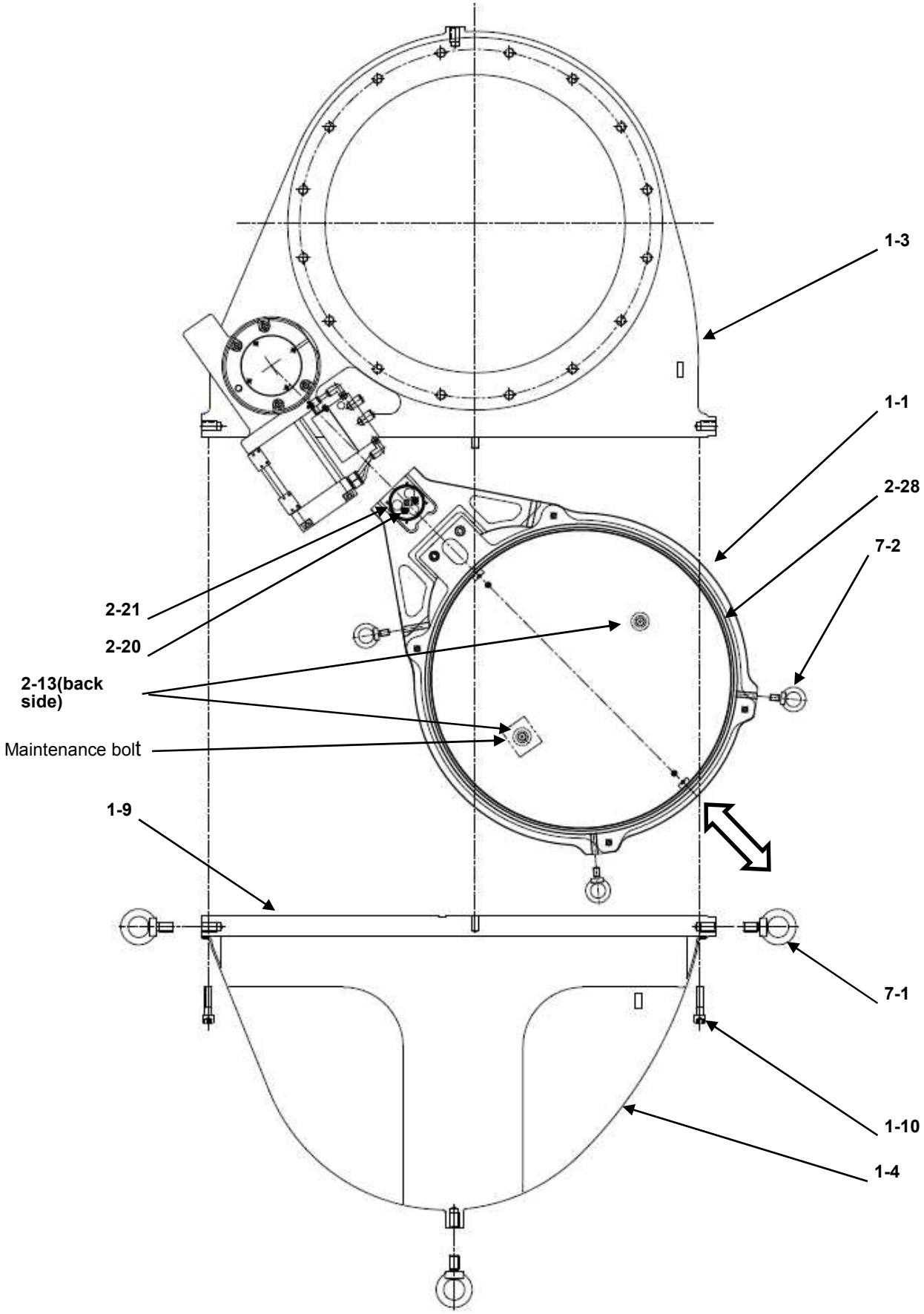
(1) According to “Valving elment unit replacement procedure”, remove “Number 1-1: Valving elment unit”.
(2) Making sure that compressed air is supplied to the OPEN side, shut off the compressed air supply. Then, remove the tube from the “OPEN side, and CLOSE side compressed air IN” to release the unit to the atmosphere.
(3) Remove four “Number 1-16: Bolt”. When removing the bolts, “Number 1-2: Drive unit” should be supported (refer to Table 8, 9 for its weight).
(4) Remove “Number 1-2: Drive unit”.
(5) Remove “Number 1-16: O-ring, Drive Unit” and clean it with the installation keyway before re-install them back.
(6) Prepare new “Number 1-2: Drive unit” and clean the sealing surface.
(7) Install a new “Number 1-2: Drive unit”.
(8) Tighten four “Number 1-16: Bolt”.
(9) Cut off the compressed air supply to the "valving element unit" by turning on "maintenance switch"
(10) Attach a tube at “OPEN side, and CLOSE side compressed air IN”.
(11) Restart the compressed air supply to “OPEN side compressed air IN”.

(12) Complete the process by installing “Number 1-1: Valving elment unit”, according to “Valving elment unit replacement procedure”.

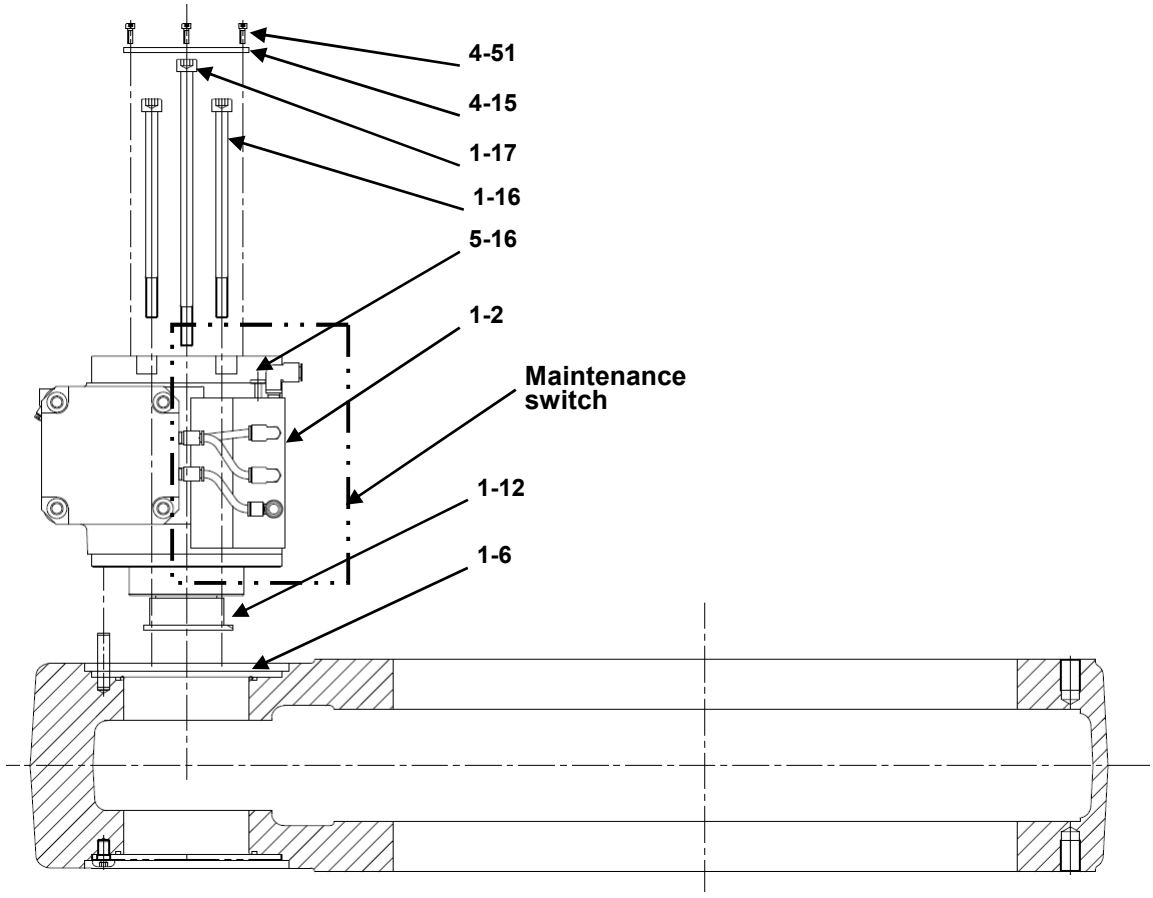
4.3.3 Common precautions during maintenance operation

(1) Bolt seat surface, on both bolt head and non-fastening part side, should be cleaned with alcohol before fastening the bolt.
(2) Apply SUPER Z300 grease on the bolt thread appropriately before fastening the bolt. However, when removing and re-fastening the built-in bolts within the assembly, grease is already applied; no additional grease is needed unless grease has burned out through the baking process.
(3) All the bolts and screws should be fastened in accordance with the specified torques listed in Tables 8 and 9.

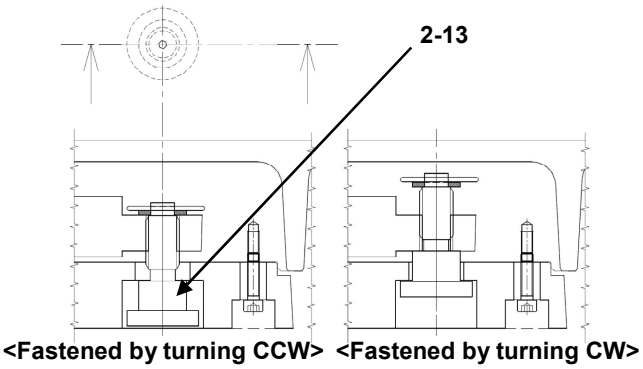
4.4 Schematic view



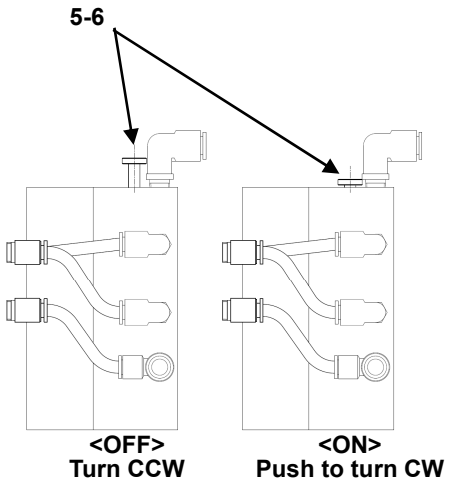
[Figure 7 Valving element unit]



[Figure 8 Drive unit]



[Figure 9 Maintenance bolt]



[Figure 10 Maintenance switch]

5. Troubleshooting

Caution

In case of an occurrence of valve failure or accident, preservation of the condition of the operating site and sending back the valve may be required, in order to investigate root cause of such events. We appreciate your cooperation.

- In case of an even of valve failure or accident, please contact us or local CS center. We might ask you to preserve the site if the event is a serious failure or an accident.
- In case of an event of valve failure or accident, we might ask you to report detailed information and your operating conditions.

[Table 10 Troubleshooting]

Problem	Cause	Attribution	Countermeasure
Leakage occurred through the valve plate (internal leak)	Not completely closed	Compressed air pressure is too weak.	Set supply pressure of the compressed air to the specified value.
		Pressure of OPEN side compressed air IN has not reached the atmospheric pressure.	Release the residual pressure of the exhaust side of the compressed air.
	Foreign object is stuck.	Foreign object has been mixed before. Or, the configuration of the evacuation system might have caused the entrance of foreign object.	Clean the valve plate packing and valve plate seal mating surface. If not fixable, send the parts back for inspection and repair. (remove the root cause of the entrance of foreign object.)
	Degradation or damage of the seat section (O-ring or seat surface)	Damage of the O-ring or seat surface by pinching of the foreign object	Replace the O-ring or repair the valve plate. (remove the root cause of the entrance of foreign object.)
		It had been heated at a highter temperature than allowed.	Replace the O-ring. Send it back to us for inspection and repair. (Conduct bake-out within the specified temperature range.)
		Degradation of the O-ring	Replace O-Rings Send it back to us for inspection and repair.
External leak	Leakage from the seat surface of the connecting flange	Bolts are tightened unequally or at the torque other than specified torque.	Re-tighten the connecting flange. If not repairable, remove the flange, inspect the seat surface, replace the O-ring, and then re-install the flange
		Tightening bolts are loose because of the repeated heat stress during bake-out.	
		Foreign object is pinched.	Remove the flange and inspect the seat surface. After removing the foreign object, replace the O-ring, and re-install the flange .
	Leakage from the embedded cylinder	Degraded O-ring of the ring cylinder.	Replace the O-ring.
	Leakage at the shaft seal section	Shortage of grease in the shaft seal section	Apply vacuum grease to the shaft or replenish vacuum grease to the grease nipple.
		Degradation of the O-ring in the shaft seal section	Replace the O-ring.
Valve cannot be opened/closed.	Compressed air is not supplied to the cylinder.	Compressed air is not supplied.	Supply the compressed air.
		Compressed air pressure is too weak.	Set supply pressure of the compressed air to the specified value.
		Electric power is not supplied to the solenoid valve.	Supply the power.
		When several valves are used, wiring or piping of solenoid valves is incorrect.	Check the wiring or piping
	Compressed air is supplied to the both sides of the cylinder.	Piping is incorrectly conducted.	Check the piping.
		Exhaustion side of the cylinder is not released to the air.	Release the exhaustion side of the cylinder to the air.
	Compressed air is leaking from the exhaustion side of the cylinder.	Because of the poor-quality compressed air, O-ring inside of the cylinder is degraded or damaged.	Send back to ULVAC for inspection and repair (Improve the compressed air quality)
		Cylinder section had been heated at a higher temperature than allowed before, and O-ring inside of the cylinder is degraded or damaged.	Send it back to us for inspection and repair. (Do not heat-up the cylinder section at a higher temperature than allowed)
	Problem of the valve internal drive parts	Problem of the valving element unit	Replace the valving element unit.
		Problem of the drive unit	Replace the drive unit

6. Removal

Danger

- When removing the product, place it to CLOSE position before starting the task.
- When it is removed with its OPEN position, the v alving element position will be unstable depending on its orientation, that is highly dangerous. It also could cause damage.
- Once set to CLOSE position, the valve will keep its position unless it is supplied with compressed air again.

7. Transport

Danger

- During transportation, please keep the valve at CLOSE position.
- When it is transported with its OPEN position, the v alving element position will be unstable depending on its orientation, that is highly dangerous. It also could cause damage.
- Once set to CLOSE position, the valve will keep its position unless it is supplied with compressed air again.

Caution

- The valve should be horizontally oriented (flange opening parallel with the ground surface) during transportation.
- If not in horizontal orientation, the valve could be damaged due to vibration during transportation.

During transport, protective covers should be applied in order to avoid damaging the flange seat surface.

8. Storage

Danger

- Please keep the valve at CLOSE position during storage
- When it is stored with its OPEN position, the va alving element position will be unstable depending on its orientation, which is highly dangerous. It also could cause damage.
- Once set to CLOSE position, the valve will keep its position unless it is supplied with compressed air again.

Caution

Avoid installing and storing the valve in the following places.

- Where environmental temperature is out of the range of 10 to 80 ˚C
- Where environmental humidity is equal to or higher than 85 %, or where dew condensation occurs
- Where water splash occurs
- Where is dusty
- Where explosive or flammable gas exists
- Where corrosive gas exists
- Near heating source
- Where much vibration occurs
- Where exposed to salt air
- Where exposed to direct sunlight
- Where exposed to radiation
- Where strong magnetic field or electric field exists

If you do not operate the valve for an extended period of time, store the valve according to the procedure below.

(1) Make sure the valve is CLOSED (valve should be closed at shipping and removing).
(2) Put protective cover on the tie-in flange.
(3) Put the valve in enclosures such as a clean vinyl bag, to protect it from dirts. Ideally, put dry N2 or desiccant and seal the bag.

9. Disposal

Warning

- Before disposing the product, residual energy of spring and compressed air should be released. Please contact us before disposing the product.
- Dispose the valve in accordance with local regulations.
- When any hazardous material toward human body (including a case that hazardous gas or material is used) remains in the system, dispose it by using the waste-disposal company. In addition, costs required for disposal will be borne by the customer.

10. Warranty Condition

Warranty of this product should be effective until the time when either the operation cycle or service year exceeds the values specified in item 1.4 of the “List of specifications”. However, above warranty period is only effective if you have performed all the maintenance tasks, observing the specified maintenance period. Please fully aware of such conditions about maintenance. Warranty period for Overhauling after the expiry of the warranty period is six months.

Should malfunction occurs during the above warranty period, ULVAC will be responsible for sending back, repair, and deliver the parts back to you at no cost. Note, however that, even within the warranty period, repairing of the valve is at your own cost for the following conditions.

(1) When the valve is operated in a way not described in this instruction manual
(2) When the valve is used in the environment, where flammable or corrosive gas generation is frequent; high-temperature, or high-humidity; where much vibration or radiation exists; or where other special condition exists
(3) When the valve is repaired or modified by any third person other than ULVAC
(4) In a case of natural disaster, eathquake, or fire
(5) Maintenance service is at your own cost. However, for the valve that has been found not maintained at the specified intervals, we may not meet your maintenance request, since such valve may have some unforeseeable defects.
(6) When our technician decides that the malfunction has been occurred due to the valve’s operating condition that does not comply with the operating condition specified for this valve.
(7) Consumable parts

Regarding any damage arising from the use or malfunction of our valve, we will compensate against such damage by the amount of up to; your original purchase cost of such product minus depreciation amount taken over the life of such product.

ULVAC

Form: A003S1268-03

ULVAC Components / Certificate of Decontamination

This is a certificate of decontamination for repair and inspection request of ULVAC Components. All material must be certified as decontaminated and this certificate must be submitted to your closest local ULVAC service center or sales office prior to shipment.
Please consult with your closest local ULVAC service center or sales office if our components are used with toxic gases or contaminated with reactive products or substances produced by reaction.

Product model:
Model:
Serial No.:
Application:
Repair/inspection requested _____
Trouble symptom _____
Other special note _____

Contaminant (Check an applicable box.)

☐ I guarantee that above returned item(s) is not contaminated with harmful substances.

☐ Above returned item(s) is contaminated with the following harmful substances.

	Name of contaminant (molecular formula)	Characteristics
1		
2		
3		
4		
5		

To: ULVAC, Inc
Attn: _____

Date: / / (YYYY/MM/DD)

Your company _____
Division _____
Contact _____
Phone _____
Fax _____
E-mail _____

Please pack returned item(s) carefully before shipment. Any accident occurred during transportation to us caused by contaminant is under your responsibility. It is also to be understood that ULVAC may decline to repair returned item(s) depending on the type of contaminant and degree of contamination, and return it to you.

To be filled in by ULVAC Request for MSDS: Yes/No	Received by	
ULVAC job No.		