

# High vacuum components



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High vacuum components

# Safety precautions

Always read this section before starting use.  
Refer to Intro 9 for the general cautions.

## Design and selection

### 1. Confirming specifications

#### ⚠ WARNING

- Incorrect selection and handling of devices may cause problems with this product and problems in the user's system. Confirm that the regulator specifications and the user's system are compatible before use.
- Confirm the compatibility of materials used for wetted area and the fluid used.
- Use the product within the fluid temperature and working pressure range in specifications.

### 2. Working media

#### ⚠ CAUTION

- This product is designed to control vacuum or inert gas. Using other fluids (active gas, liquids, solids, etc.) may disrupt the product's operation or performance could drop. Confirm the compatibility of materials used for wetted area and the fluid used. If the working fluid could solidify, check that no problems in use exist before starting.
- Avoid using fluids causing crystals to accumulate in piping.

### 3. Selection

#### ⚠ CAUTION

- When controlling the valve's responsiveness, check port size and length, as well as flow rate characteristics of the operation solenoid valve for control.
- The inside of the cylinder and the bellows are directly connected to the atmosphere. Make sure there is no blockages in the connection holes (2 holes just below the control port) connecting the bellows to the atmosphere.
- Use air piping and fittings suitable for working temperature.

## Installation and adjustment

### 1. Installation

#### ⚠ WARNING

- Incorrect installation and piping will cause product problems, may cause problems in the user's system, and may cause death or serious injury. The user is responsible for ensuring that the operator has read the instruction manual and fully understands the system.  
After installation, conduct an appropriate function test to confirm that the product is correctly installed.

#### ● High temperature specification

- Handle with care as the valve body will become hot due to the fluid temperature. Make sure that the valve body's temperature has cooled sufficiently before removing the valve.

#### ⚠ CAUTION

- This product is assembled in a clean room after precision cleaning.  
Open the clean pack in the package box in a clean environment immediately before installation.
- Pipe the valve so that excessive force is not applied to the flange. Fix heavy objects or mounted parts that vibrate so that the torque is not directly applied to the flange.

- Durability could drop if this product is used where there is continuous vibration. Pipe the product so that excessive vibration and impact are not applied.

#### ● High temperature specification

- When thermally insulating the valve, only insulate the body. If the cylinder is insulated, proper operation may not be maintainable. Therefore, please use caution.

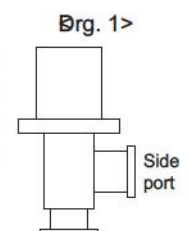
### 2. Direction when connecting piping (for some models)

#### ⚠ CAUTION

- The vacuum valve is basically designed so all ports can be used as connection ports to the vacuum pump. However, with some models (below), the port for connection to the vacuum pump is limited to one direction.

Table 1 Models with limited vacuum pump connection port

Model	Vacuum pump connection port
AVP712-50K	Bottom port (Refer to fig.1)
AVB812-80K	Bottom port (Refer to fig.1)
AVP812-80K	Bottom port (Refer to fig.1)
HVB612-12F-12B	A port
HVB712-15F-15B	A port



If connecting the models in the above table to a port that it is not designated to; problems such as defective sealing or malfunction may occur.



# High vacuum components

Individual precautions

## 3. Ensuring space

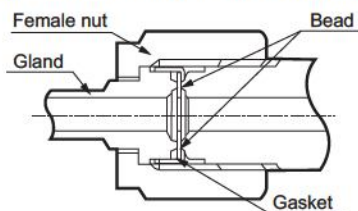
### CAUTION

- Ensure sufficient space for installation, removal, piping, and wiring work.
- Ensure sufficient space for maintenance and inspection.

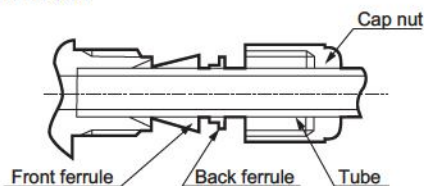
## 4. Piping

### CAUTION

- If dirt or burrs get on pipes or in the areas during piping, the valve seat or O-ring may be damaged; and cause leaks from the valve seat. Carefully remove any dirt or burrs before installing the valve.
  - Pipe the product so that the pipe tension, compression, and bending, etc., are not applied to the valve body.
  - Handle with care so that the vacuum flange seal surface is not damaged. AVB\*\*7, MBV\*17, EVB flange surfaces have a 0.1-0.2 mm step (concave shape) for seal surface protection.
  - Durability may decrease depending on the exhaust flow. Therefore, we recommend that you use the bellows side as the exhaust side (except for models with limited vacuum pump connection port). Please perform sufficient checks, as durability will vary depending on working conditions.
  - When work is completed, always carry out a leak inspection and confirm that there are no leaks.
  - Check that no dirt, scratches, or burrs get on the seal before tightening the fitting in the following procedures:
- (1) Tightening the fitting
- When the gasket material of JXR fitting is nickel or SUS316, screw in the nut manually until the gasket contacts the bead section, and then tighten another 1/8 turn using a tool. (Contact CKD if other materials are to be used.)



- Double barbed fitting  
Check that the front ferrule, back ferrule, and nut are properly attached, and then insert the tube until it contacts the back of the product. After tightening the nut manually, tighten another 1/4 turn with a tool.



- (2) After tightening the fitting, always carry out a leak inspection and confirm that there are no leaks.

## 5. Solenoid valve

### CAUTION

- High-temperature warning during energizing solenoid valve's coil
  - Coil section of solenoid valves (HVB/HVL) will generate heat when energized. Models using the H Class specification coil (some HVB models) become especially hot when energized. Beware of direct contact, it may cause burns.
- Precautions for wiring solenoid valve
  - (1) As a reference, use a lead wire with nominal cross-section area of 0.5 mm<sup>2</sup> or larger. Check that no excessive force is applied to leads.
  - (2) Use with in allowable voltage range. Use exceeding the allowable voltage range may cause malfunctions or coil damage.
  - (3) Provide an appropriate circuit breaker (such as a fuse) on the control circuit side to protect electrical equipment.
  - (4) Using a switching circuit that does not generate contact chattering improves solenoid valve durability.
  - (5) If the electric circuit is not susceptible to the solenoid surge, provide measures such as inserting a surge absorber parallel to the solenoid.

## 6. Air piping

### CAUTION

- Refer to the instruction manual and pipe connection ports correctly.
  - Failure to observe this could lead to operation faults.
- When connecting pipes, wrap sealing tape in the clockwise from threads starting 2 pitches inside from the end of piping threads.
  - If sealing tape protrudes from pipe threads, it could be cut when screwed in. This could cause the tape to enter and lead to faults.



- Tighten pipes with the appropriate torque.
  - Pipes must be connected with the appropriate torque to prevent air leakages and screw damage.
  - First tighten the screw by hand to prevent damage to screw threads, then use a tool.



[Reference value] Please refer to the instruction manual.

Connection screw	Tightening torque (N·m)
M5	1 to 1.5
Rc1/8	3 to 5
Rc1/4	6 to 8
Rc3/8	13 to 15

## During use and maintenance

### 1. Using this product

#### WARNING

- Always use this product within the specified range.

#### CAUTION

- Do not step on valves, etc., or place heavy objects on them.
- Do not over tighten the manual valve. Over tightening can cause damage to the valve.
- High temperature specification
- Screw hole on the surface of the body side is not for securing. Please do not use.
- When using the AVB\*47 adjusting nut, make sure the valve body has cooled sufficiently before adjusting.

### 2. Maintenance/inspection

#### WARNING

- Always carry out the work as specified in the instruction manual.
- Read instructions and precautions included with the product before use or maintenance.
- Make sure to remove the operating air and fluid before maintenance.

#### CAUTION

- Conduct the periodic inspections below to ensure optimal performance of the valve.
  - (1) Confirm that there are no leaks outside of the valve.
  - (2) Confirm that there are no leaks from the valve seat (internal leaks).
  - (3) Confirm that valve operation is smooth.
  - (4) Confirm that no pipes or valve screws are loose.
  - (5) Confirm that the O-ring is not worn or corroded.
- Be careful not to damage any parts when removing deposits.
- If damage is anticipated before designated durability, perform maintenance and inspections as soon as possible.
- Please use CKD's specified parts for maintenance parts. Refer to the structural drawing/repair parts/maintenance parts list.
- Please contact CKD or the nearest distributor regarding maintenance parts.

### 3. Solenoid valve

#### CAUTION

- Precaution regarding solenoid valve electric wiring connection electric shock
  - If electric wiring connection parts (bare live parts) of the solenoid valve (HVB/HVL) are touched, electric shock can occur.  
Always disconnect the power supply before starting disassembly inspection.  
Do not touch the live parts with wet hands.





# Safety precautions

## Proximity switch/T2H/T2V/T3H/T3V

Please make sure to read the safety precautions in "Pneumatic cylinder I" (No. CB-029SA) before use.

## Design and selection

### WARNING

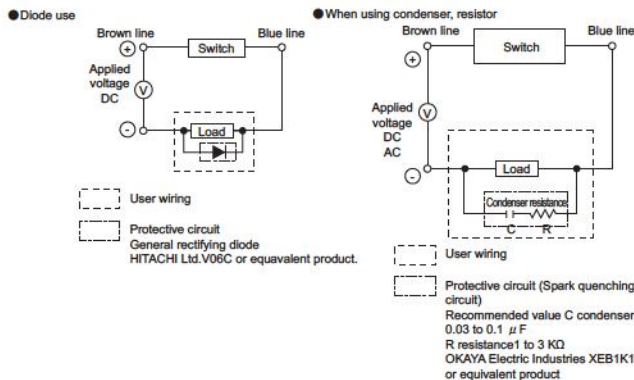
- Application, load current, voltage, temperature, impact, environment, etc., exceeding the specifications will result in damage or operation faults. Use the device as instructed in specifications.
- Do not use this product in flammable atmosphere. Switch doesn't have explosion proof structure. Never use in any atmosphere with explosive gas as it can lead to explosions.

### CAUTION

- Check when using for an interlock circuit.
 

When using the cylinder switch for an interlock signal, requiring high reliability, provide mechanical protection or use a double interlock, installing a switch (sensor) other than the cylinder switch as protection against faults. Execute inspection regularly to check that the normal operation is done.
- Check the contact capacity.
 

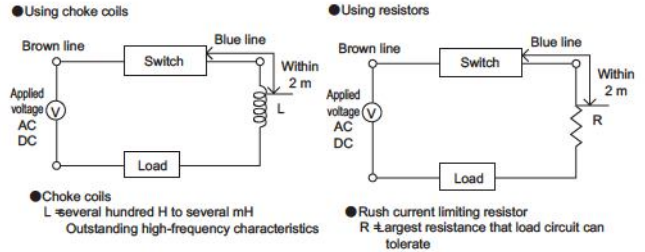
Do not use a load that exceeds the switch's maximum contact capacity. It can cause failure. The switch may not light if the load is less than the rated current value.
- Check the contact capacity.
  - Provide a protection circuit when connecting an inductive load (relay, solenoid valve), as surge voltage is generated when the switch is turned OFF.



- Provide a protection circuit when connecting a capacitive load (capacitor), because rush current will occur when the switch is turned ON.
- When the wiring length increases, wiring capacity is reached and rush current is generated. This can damage the switch or reduce its lifetime. Provide a contact protection circuit if the wiring length exceeds values in Table 1.

Switch	Voltage	Wire length
T	DC	50m
T	AC	10m

Table 1



Refer to supplement page 29 of the Pneumatic Cylinders catalog (CB-029SA) for contact protecting circuit specifications.

- Avoid using in an environment exposed to water.
  - Operation faults could occur due to insulation faults.
- Avoid use in environments containing oil or chemicals.
  - The switch could be adversely affected (insulation fault, malfunction caused by swelling of filled resin, hardening of lead sheath, etc.) if used in an environment containing oil, coolant, cleaning fluid, or chemicals. Contact with CKD about such an environment.
- Do not use in a high-impact environment.
 

When using the reed switch, an impact of 294 m/s<sup>2</sup> or more applied during use could output a signal for an instant (1 ms or less), or could turn it OFF. It may be necessary to use a proximity switch depending on the working environment. Contact with CKD.
- Do not use where surge is generated.

If there is a device (magnetic lifter, high-frequency induction furnace, motor, etc.) that generates a large surge near the valve with a proximity switch, circuit elements in the switch could deteriorate or be damaged. Take measures against the surge-generating source.

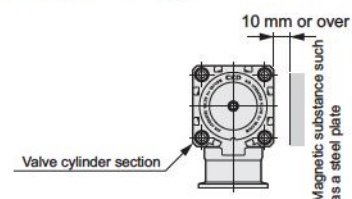
- Check the accumulation of iron chips and contact of magnetic material.

If a large amount of iron chips, such as cutting chips or welding spatter accumulate or if magnetic objects (material attracted to magnets) are present around the valve with switch, the magnetic force in the valve is lost, and the switch's operations may be inhibited.

- Note the proximity of valves. When using more than two valves with switches adjacently in parallel, observe the indicated allowable spacing.
- Switches could malfunction because of bidirectional magnetic interference.

### CAUTION

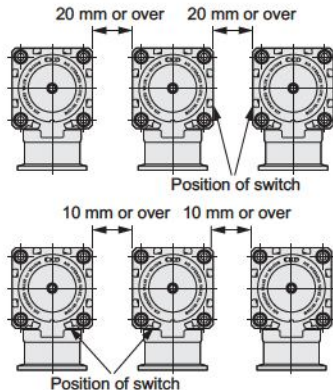
- Sources of magnetism such as steel plates near the switch could cause the valve to malfunction. Keep at least 10 mm away from the valve. (Same for all bore sizes)



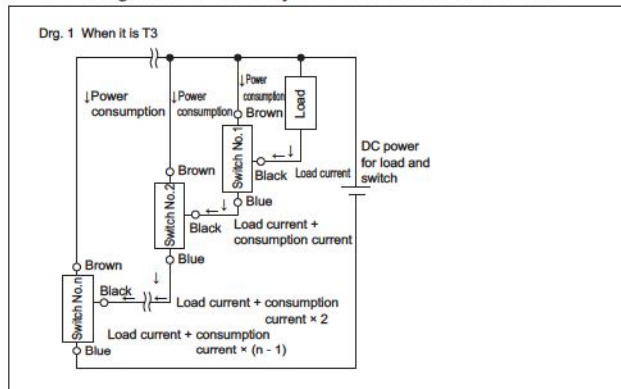


# High vacuum components

- If valves are adjacent, the switch could malfunction. Check that following distance is maintained between valve surfaces.  
(Same for all bore sizes)



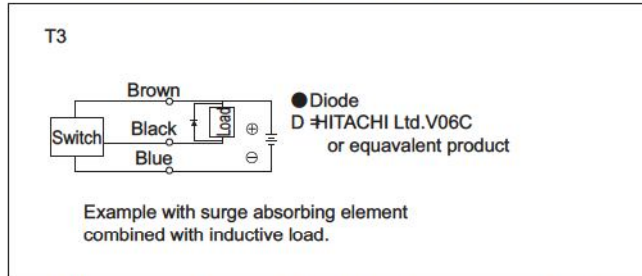
- Check the magnetic environment.
  - When installing valves with switches adjacently in parallel or if magnetic material moves near valves with switches, mutual interference may occur and affect detection accuracy.
- Check internal voltage drops caused by serial connections.
  - When connecting several 2-wire type switches in serial, the switch voltage drop is the total voltage drop of all connected switches. The voltage applied to the load is the voltage obtained by subtracting the voltage drop at switches from the power voltage. Check load specifications and determine the number of switches to be connected.
  - When connecting several 3-wire serial proximity switches, the switch's voltage drop is the total voltage drop of all connected switches, as with the 2-wire switch. The current that flows to the switch is the total of the connected switch's current consumption and load current, as shown below. Check load specifications and determine the number of switches to be connected so that the maximum switch load current is not exceeded.
  - The light turns ON only when all switches are ON.



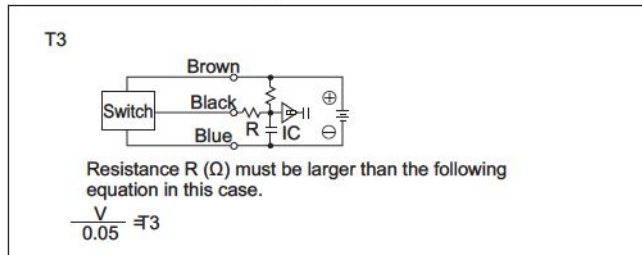
- Please use caution to ensure that no current leaks from parallel connections.
  - When connecting several 2-wire switches in parallel, note that leakage current increases in proportion to the number of connected units. Check load specifications and determine the number of switches to be connected. Note that switch light could dim or may not turn ON.
  - With the 2-wire proximity switch, when 1 switch is changing from ON to OFF status, voltage at both ends of the switch connected in parallel drops to the internal voltage drop value at switch ON and is less than the load voltage range and other switches will not turn ON. Check input specifications of the programmable controller, which is the connection load, before starting use.
  - The 3-wire proximity switch has an extremely small leakage current (10  $\mu$ A or less), so there is no problem to use under normal conditions.

- Output circuit protection

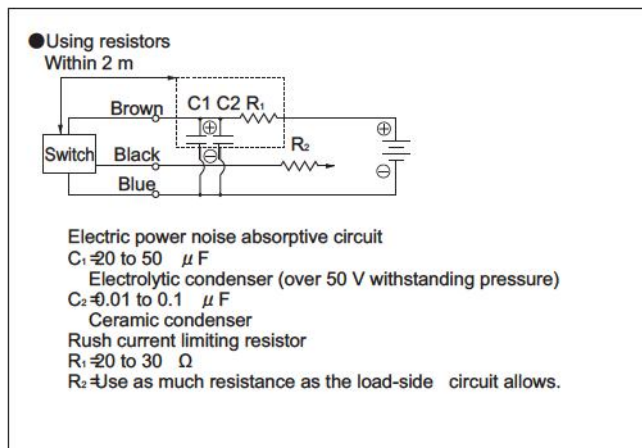
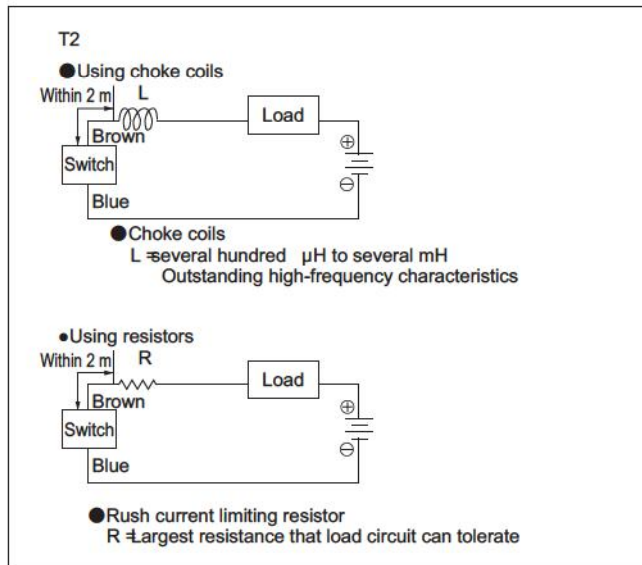
- When an inductive load (relay, solenoid valve) is connected, a surge voltage is generated when the switch is turned OFF. Provide the following protective circuit.



- When a capacious load (capacitor) is connected, rush current is generated when the switch is turned ON. Provide the following protective circuit.



- Provide the following protective circuit if the lead wire length exceeds 10 m.





## Reed switch ETOH/ETOV

Please make sure to read the safety precautions in Pneumatic cylinder I" (No. CB-029SA) before use.

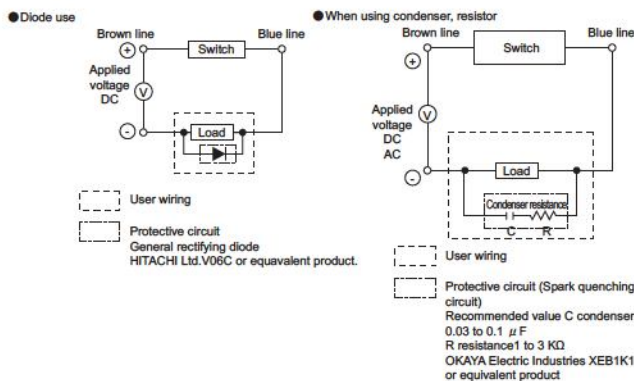
### Design and selection

#### ⚠ WARNING

- Application, load current, voltage, temperature, impact, environment, etc., exceeding the specifications will result in damage or operation faults. Use the device as instructed in specifications.
- Do not use this product in flammable atmosphere. Switch is not explosion proof structure. Never use in any atmosphere with explosive gas as it can lead to explosions.
- LED is used for the lamp. Visibility will slowly decline if used continuously under high temperature. Even if the LED turns off, the switch output will operate properly as it has a separate circuit structure system.

#### ⚠ CAUTION

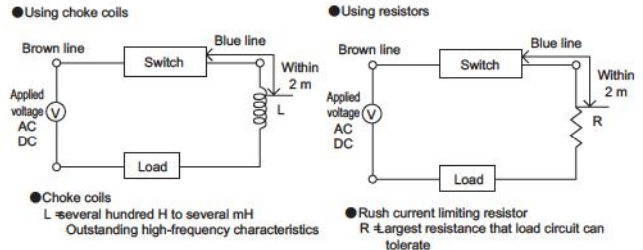
- Check the contact protection circuit.
  - Do not use a load that exceeds the switch's maximum contact capacity. It can cause failure. The switch may not light if the load is less than the rated current value.
- Check the contact protection circuit.
  - Provide the contact protection circuit when connecting an inductive load (relay, solenoid valve), as surge voltage is generated when the switch is turned OFF.



- Provide the contact protection circuit when connecting a capacious load (condenser), because rush current will be generated when the switch is turned ON.
- When the wiring length increases, wiring capacity is reached and rush current is generated. This can damage switch or reduce lifetime. Provide a contact protection circuit if the wiring length exceeds values in Table 1.

Switch	Voltage	Wire length
ET0	DC	50m
ET0	AC	10m

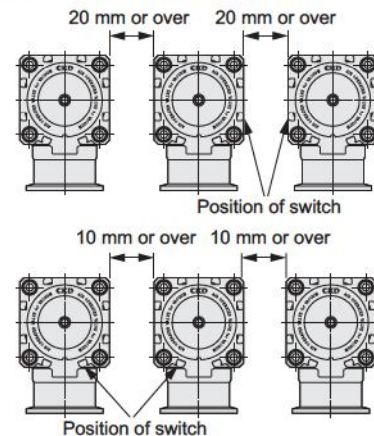
Table 1



Refer to supplement page 29 of the Pneumatic Cylinders catalog (CB-029S) for contact protecting circuit specifications.

- Check the magnetic environment.

- When installing valves with switches adjacently in parallel or if magnetic material moves near valves with switches, mutual interference may occur and affect detection accuracy.
- When adjoining switches other than ET0 types, usage in the below distances can cause malfunction. Accordingly, confirm its operation before use. (Same for all bore sizes)



- Check internal voltage drops caused by serial connections.

- When connecting several 2-wire type switches in serial, the switch voltage drop is the total voltage drop of all connected switches. The voltage applied to the load is the voltage obtained by subtracting the voltage drop at switches from the power voltage. Check load specifications and determine the number of switches to be connected.

- Please use caution against leaking current from parallel connections.

- When connecting several 2-wire switches in parallel, note that leakage current increases in proportion to the number of connected units. Check load specifications and determine the number of switches to be connected. Note that switch light could dim or may not turn ON.



## Installation and adjustment

### CAUTION

- Do not drop or bump the product
 

Do not drop, bump, or apply excessive impact (294 m/s<sup>2</sup> or more for reed switches, 980 m/s<sup>2</sup> or more for proximity switches). Even if the switch case does not break, switch components could break or malfunction.
  - Do not carry the valve by the switch's lead wire.
 

Do not carry the valve by the switch's lead wire because the wire could disconnect, and stress on the switch could damage switch components.
  - Do not wire with a power cable or high voltage cable.
 

Avoid wiring in parallel with or in the same conduit as a power cable or high voltage cable. Wire separately. Control circuit (including switch) can malfunction due to noise.
  - Do not short-circuit the load.
 

If turned ON while the load is short-circuited, an overcurrent will flow, and the switch will be damaged instantly.
  - Use caution with regards to lead wire connections.
 

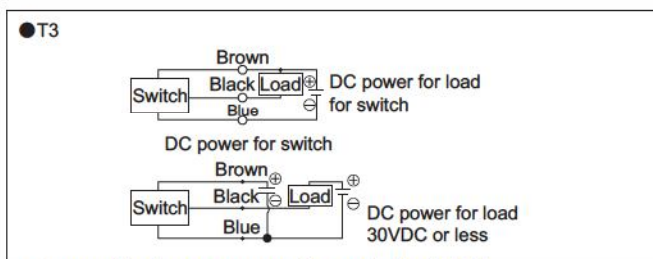
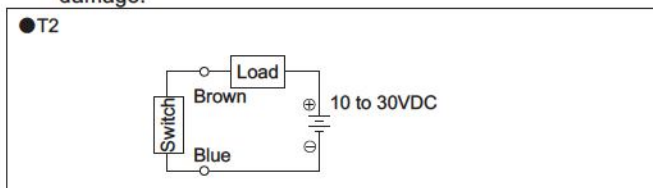
Turn OFF power to the device in the electric circuit to be connected before starting wiring. Conducting work with power ON could result in accidents from electric shock or unpredictable operation.
- Reed switch
 

Connect the switch's lead wire in parallel to the load instead of directly to power. For TO, use caution regarding "1," "2" below.

    - (1) When used for DC, connect so that the brown wire is on the plus (+) side and the blue wire on the negative (-) side.
 

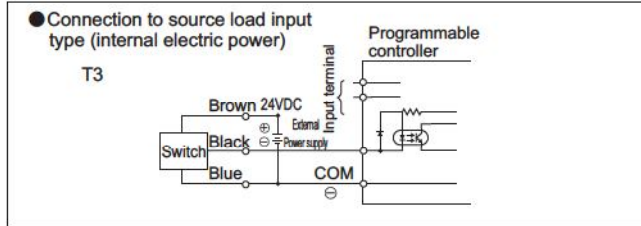
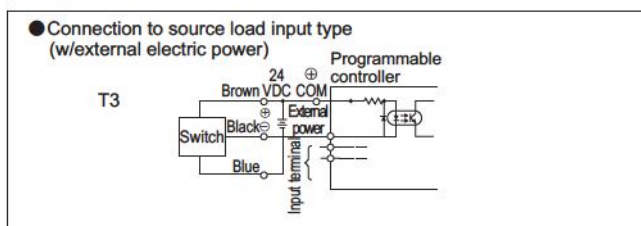
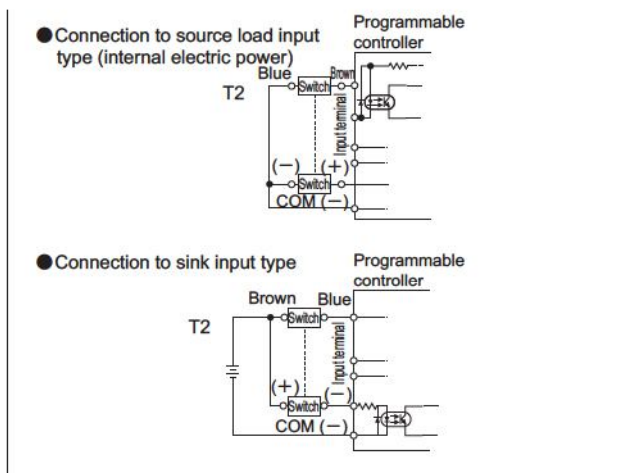
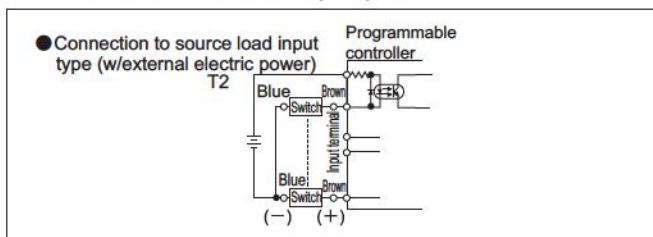
The switch will function when connected in reverse, but the light will not turn ON.
    - (2) When connected to an AC relay or programmable controller input, conducting half wave rectification with that circuit may prevent the switch light from turning ON. The light will light up when the switch lead's polarity is reversed.
  - Proximity switch
 

Connect the lead wires in the following diagram correctly according to color codes. Incorrect wiring could result in damage.



Connection to programmable controller(PLC)

- Connection differs with the type of programmable controller used. Connect based on input specifications.



- Set the switch to the center of the operation range.
 

Adjust the switch installation position so that the piston stops at the center of the operating range (range while power is ON). Operation may become unstable if set at the end of the operating range (near the ON, OFF borderline).
- Observe tightening torque when installing the switch.
 

If the tightening torque range is exceeded, the set screw, bracket, switch, etc., could be damaged. If installed with a tightening torque less than that designated, the switch installation position could deviate. Loosen the tightening screw (set screw), and move the switch along the switch groove. Tighten at the required position.

Tighten the switch fixing screw using a flat-tipped screwdriver 5 to 6 mm in grip diameter, 2.4 mm or less in end width, and 0.3 mm or less in thickness (precision screwdriver, or one for clocks) with a tightening torque of 0.1 to 0.2 N·m. Tighten ETOH and ETOV with a tightening torque of 0.5 to 0.7 N·m.
- Protection for lead wire
 

Lead wire's minimum curve radius shall be 9 mm or over (while secured). Use care when wiring so that there is no repeated bending stress or tension.
- Relay
 

Use the following or equivalent relays.

  - OMRON ..... MY type
  - Electric ..... HH5 type
  - Tokyo Electric Company ..... MPM type
  - MATSUSHITA ELECTRIC WORKS LTD. .. HC type



## During use and maintenance

### ⚠ WARNING

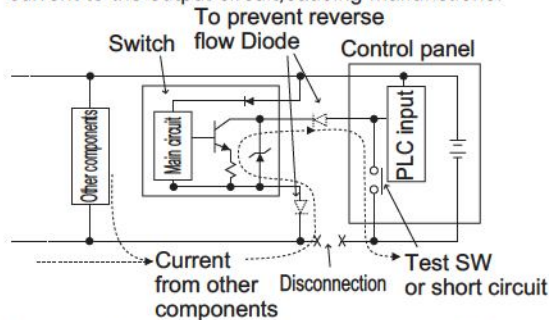
- Please do not use/apply over current.

If overcurrent flows to the cylinder switch because of a load short-circuit, etc., the switch will be damaged and could ignite. Install overcurrent protection circuits such as fuses in output wires and power supply wires as needed.

### ⚠ CAUTION

- Use caution regarding reverse electrical current caused by disconnection and wiring resistance.

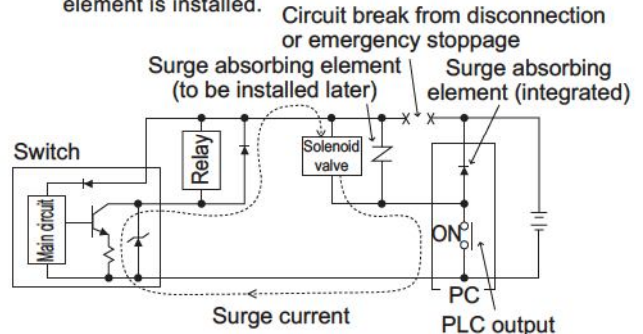
- When other components (including switches) are connected to the same power supply as the switch, short circuiting the output wire and power supply wire side or disconnecting the power supply wire side to check the control panels input unit operation can send reverse current to the output circuit; causing malfunctions.



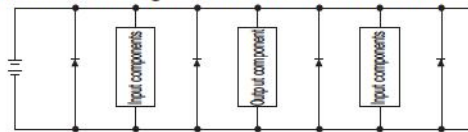
- To prevent malfunction from reverse currents, take countermeasures such as the following.
- (1) Avoid centralizing current at the power cable, especially a negative power cable, and use as thick a wire as possible.
  - (2) Limit components connected to the same power source as the switch.
  - (3) Prevent reverse current by inserting diode in a series on the switch output wire.
  - (4) Insert a diode serially with the switch power cable negative side to prevent reversal of current.

- Pay attention to leading of surge current

- When switch power is shared with an inductive load that generates a surge, such as a solenoid valve or relay, and the circuit is cut off while the inductive load is functioning, the surge current could enter the output circuit and cause damage depending on where the surge absorption element is installed.



- To prevent malfunction from surge current leading, take countermeasures such as those listed below.
- (1) Separate the power supply for the output system comprising the inductive load such as the solenoid valve and relay, and the input system such as the switch.
  - (2) If you cannot separate the power source, install a direct surge absorption element for all inductive loads. Note that the surge absorption element connected to the PLC, etc., protects only that device.
  - (3) Connect surge suppressors to the points as following to reduce damages when lines are disconnected.

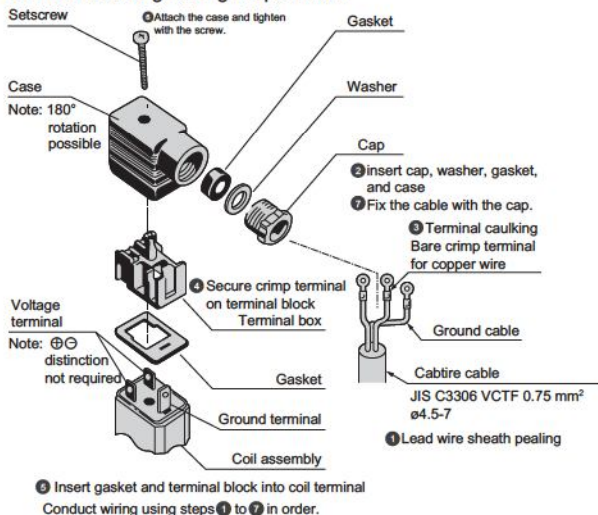


When devices are connected to a connector, the output circuit could be damaged by the above if the connector is disconnected while power is ON. Turn power OFF before connecting or disconnecting the connector.

## How to wire the terminal box

- DIN terminal box (Pg9), DIN terminal box w/lamp (Pg9)

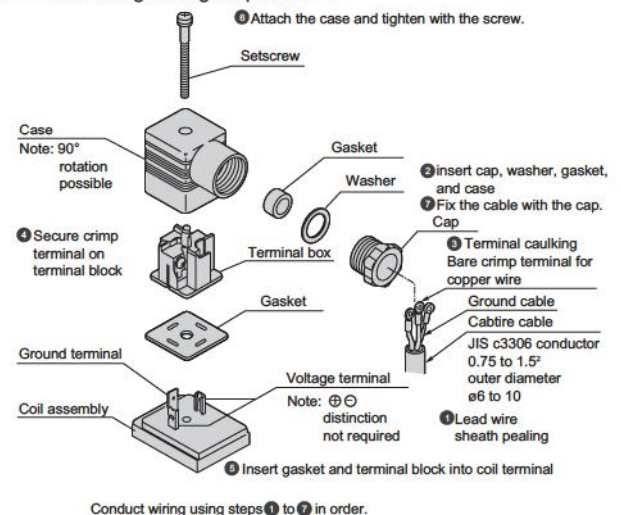
- (1) Use the following cable.
  - Cable outer diameter:  $\phi 4.5$  to  $\phi 7$  • Nominal section area:  $0.75 \text{ mm}^2$
- (2) Insert the crimp terminal for copper wires into the cable's lead wire, and crimp the terminal with the designated tool. M3 terminal screws are used with the terminal box.
- (3) Tighten screws with the following tightening torque.
  - Screw tightening torque  $0.5 \text{ Nm}$
  - Terminal screw tightening torque  $0.5 \text{ Nm}$



\* The orientation of the cable lead out port is changed by taking out the terminal box from the case, rotating it by 180°, then replacing the terminal box into the case.

- DIN terminal box (Pg11), DIN terminal box w/lamp (Pg11)

- (1) Use the following cable.
  - Cable outer diameter:  $\phi 6$  to  $\phi 10$  • Nominal section area:  $0.5$  to  $1.5 \text{ mm}^2$
- (2) Insert the crimp terminal for copper wires into the cable's lead wire, and crimp the terminal with the designated tool. M3 terminal screws are used with the terminal box.
- (3) Tighten screws with the following tightening torque.
  - Screw tightening torque  $0.5 \text{ Nm}$
  - Terminal screw tightening torque  $0.5 \text{ Nm}$



\* The orientation of the cable lead out port is changed by taking out the terminal box from the case, rotating it by 90°, then replacing the terminal box into the case.





Electric vacuum valve

# Safety precautions

Always read this section before starting use.

Refer to Intro page 9 for general precautions.

## Design and selection

### 1. Confirming specifications

#### **⚠ DANGER**

- Do not use where there are dangerous items such as ignitable items, inflammable items, and explosive items.  
It can cause ignition, flames, and explosion.
- This product has not been water-proofed. Make sure there is no water or oil contact. It can cause fire and failure.
- Make sure to use DC stabilized power supply for motor or motor control, and output circuit power supplies.  
Connecting directly to AC power supply can result in fire, rupture, damage, etc.

#### **⚠ WARNING**

- Incorrect selection and handling of devices may cause problems with this product and problems in the user's system. Confirm that the regulator specifications and the user's system are compatible before use.
- Design the safety circuit or device so that there is no damage to the device or injuries to people when the machine stops due abnormal conditions (such as emergency stoppage and power outage).
- Install indoors in an area with low humidity. Installing in areas where the rainwater can contact the product or with high humidity (85 humidity or more, areas with dew condensation) can lead to electricity leakage, fires, and similar accidents. Oil droplets and oil mist are also strictly prohibited.
- Use and store in condition without dew condensation while obeying usage and storage temperatures.  
It can cause emergency stoppage, service life decline, etc. Ventilate if heat builds up.
- Install in areas without direct sunlight, dust particles, heating elements, corrosive gas, explosive gas, flammable gas, and combustibles. Consideration has not been taken regarding chemical resistance.  
It can cause failure, explosion, or ignition.
- Use and store in areas without strong electromagnetic waves, ultraviolet rays, or radiation.  
It can cause malfunction or failure.

#### **⚠ CAUTION**

- When wiring, in order to avoid induction noise being applied; do not pipe or wire with areas where large electric currents or strong magnetic fields can occur, or with large type motor power lines of those other than this unit. Use caution regarding inverter power supply and wiring sections used in robots, etc. Install a frame ground for same power source and make sure to insert a filter into output sections.
- If this product's output section and inductive loads that can generate surges (such as solenoid valves and relays) use a common power source, surge current can lead into output sections; causing damage. Therefore, separate inductive load outputs and this product's output power. If you cannot separate the power source, connect a surge absorbing element to all inductive loads directly and use a parallel configuration.
- Do not disassemble the product.
- Cables cannot be used in applications with repeated bending.
- Secure cables so that they cannot be moved easily. When securing, do not bend cables in sharp angles.

### 2. Working media

#### **⚠ CAUTION**

- This product is designed to control vacuum or inert gas. Using other fluids (active gas, liquids, solids, etc.) may disrupt the product's operation or performance could drop. Confirm the compatibility of materials used for wetted area and the fluid used. If the working fluid could solidify, check that no problems in use exist before starting.
- Avoid using fluids causing crystals to accumulate in piping.



## Installation and adjustment

### 1. Installation

#### **⚠ DANGER**

- When installing the product, make sure to perform reliable holding and securing. Injuries can be caused by overturning, falling, abnormal operation, etc. of the product.

#### **⚠ WARNING**

- Incorrect installation and piping will cause product problems, may cause problems in the user's system, and may cause death or serious injury. The user is responsible for ensuring that the operator has read the instruction manual and fully understands the system. After installation, check to make sure it is properly installed.
- Overturning, vibration, and impact during transport is dangerous due to precision parts in the product.  
It can cause damage to parts.
- If placing at a temporary location, make sure it is horizontal.
- Do not get on top of packaging and do not place items on top of the product.
- Ambient temperature and ambient humidity during transport shall be -20-60°C and 35-85%, respectively. Make sure there is no dew condensation or freezing.  
It can cause product failure.
- Install the product on nonflammables. Installation directly or near flammable items can cause fire.
- Make sure to perform D class grounding construction (ground resistance 100Ω or less) for the product.  
Electricity leakage can cause electric shock, malfunctions, etc.
- Securely perform wiring of this product without incorrect wiring or loose connectors while following this catalog. Check wiring insulation. Contact with other circuits, ground fault, and defective terminal insulation can lead to overcurrent flowing into the product; causing damage. It can cause abnormal operation and fire.
- Make sure to perform safety checks of the area surrounding the instrument before turning on the product's power. Immediately turn off the power if the indicator light indicates abnormality upon turning on the power.  
Supplying the power carelessly can cause electric shock, injury, etc.

- Valves and controllers are adjusted during assembly for shipping. Always use valves and controllers with the same name plate display details as a set. Changing the grouping/pairing can cause abnormal operation.
- Always use the cable included for the cable between the valve and controller. Install so that there is no excess force applied or possibility of scratches. Do not modify the enclosed cable (change the length or material) because this could cause malfunction or faults.
- Make sure hands and body parts do not contact the product during operation or immediately after stoppage.  
There is risk of burn injuries.
- Do not place objects, or step on this product. It can cause falling accidents, overturning of the product, injury due to dropping, product damage, malfunction due to damage, etc.
- If power is shutdown (including shutdown due to failure), take sufficient countermeasures to protect workers and devices.  
It can lead to unforeseen accidents.

### 2. Ensuring space

#### **⚠ CAUTION**

- Ensure sufficient space for installation, removal, piping, and wiring work.
- Ensure sufficient space for maintenance and inspection.

### 3. Piping

#### **⚠ CAUTION**

- The inside of the bellows are directly connected to the atmosphere. Make sure there is no blockage in the connection hole (1 hole on the upper part of the body) connecting the inside of the bellows to the atmosphere.
- If foreign substance or burrs get on pipes or from areas in which piping is taking place, the valve seat or O-ring may be damaged; causing leakage. Carefully remove any dirt or burrs before installing the valve.
- Pipe the product so that the pipe tension, compression, and bending, etc., are not applied to the valve body.
- Clean the vacuum flange's seal face and the center ring's O ring with ethanol, etc., before installing.

- There is a 0.1 to 0.2 mm step (indentation) on the vacuum flange to protect the seal. Handle this part carefully so that the seal face is not scratched, etc.
- Durability could drop because of exhaust flow, so the bellows should be used as the exhaust side.  
Please perform sufficient checks, as durability will vary depending on working conditions.
- When piping work is completed, always carry out a leak inspection and confirm that there are no leaks.
- During transfer or installation, do not hold the cable section.  
It may cause injury or disconnection
- Do not pipe to areas with major vibration or impact.  
Major vibration or impact can cause malfunction. Especially, durability could drop if this product is used where there is continuous vibration. Pipe the product so that excessive vibration and impact are not applied.
- Do not operate product's movable sections forcibly by external force.  
Regenerative current may lead to malfunction or damage.
- When origin is returning, do not put external force on the valve. It may misrecognize the origin.
- Do not place strong magnetic fields such as rare earth magnets near the product's body. It may not be able to maintain expected accuracy.
- To prevent chattering malfunctions, the external I/F input area recognizes when the input signal status is 50 msec or more.
- This product is assembled in a clean room after precision cleaning.  
Open the clean pack in the package box in a clean environment immediately before installation.
- Pipe the valve so that excessive force is not applied to the flange. Fix heavy objects or mounted parts that vibrate so that torque is not directly applied to the flange.



## During use and maintenance

### 1. Using this product

#### **DANGER**

- Wiring and inspection shall be conducted by specialized engineers.
- Perform wiring of the product after piping.  
This could lead to electric shock.
- Do not work with wet hands.  
This could lead to electric shock.
- Conduct wiring and inspection after more than 5 minutes has exceeded since turning the power off and after checking the voltage with a tester, etc.  
It could lead to electric shock.
- Do not install/remove wiring or connector-type items while the power is on.  
There is danger of malfunction, failure, and electric shock.

#### **WARNING**

- Storage environment conforms to the installation environment, however, long-term storage for more than 1 month is not recommended. Please especially take measures to prevent dew condensation.

### 2. Maintenance/inspection

#### **WARNING**

- Always carry out the work regularly as specified in the instruction manual.
- Read instructions and precautions included with the product before use or maintenance.
- Always turn the power OFF and release any fluids before starting maintenance.

#### **CAUTION**

- Conduct the periodic inspections below to ensure optimal performance of the valve.
  - (1) Confirm that there are no leaks outside of the valve.
  - (2) Confirm that there are no leaks from the valve seat (internal leaks).
  - (3) Confirm that valve operation is smooth.
  - (4) Confirm that no pipes or valve screws are loose.
  - (5) Confirm that the O-ring is not worn or corroded.

- Be careful not to damage any parts when removing deposits.
- If damage is anticipated before designated durability, perform maintenance and inspections as soon as possible.
- Product service life may decline from very small and repeated opening/closing of the valve. We recommend fully opening the valve periodically.
- Shutdown the power immediately in case of product failure (abnormal heat, smoke, smell, sound, vibrations, etc.) It can cause product damage and fire due to continuous electrical current flow.
- When conducting maintenance, inspection, and repairs; always do so after turning off the power supply to this product. Use caution for surroundings to prevent a third person from accidentally turning on the power or operating.
- Comply with laws regarding waste disposal and cleaning when disposing of this product. Dispose of the product by subcontracting to waste treatment professionals, etc.
- When without power supply, this product's valve is structured to be closed by a spring (normal close). Before turning on the power, check to make sure that the leakage amount is a tolerable amount; then start operation.
- When the power is turned on, false recognition of closed valve may occur due to foreign matter being caught, etc. Before turning on the power, check to make sure that the leakage amount is a tolerable amount; then start operation. After turning ON the power, check to make sure opening malfunction does not occur by setting the degree of opening to the maximum.
- This product's integrated control board, a condenser is connected between the same circuit and metal body to prevent static electricity damage. Therefore, do not conduct withstanding voltage tests or insulation resistance tests on devices that have this product connected. Conducting such tests can damage this product. If necessary to conduct such tests for the device, please first remove/detach this product.

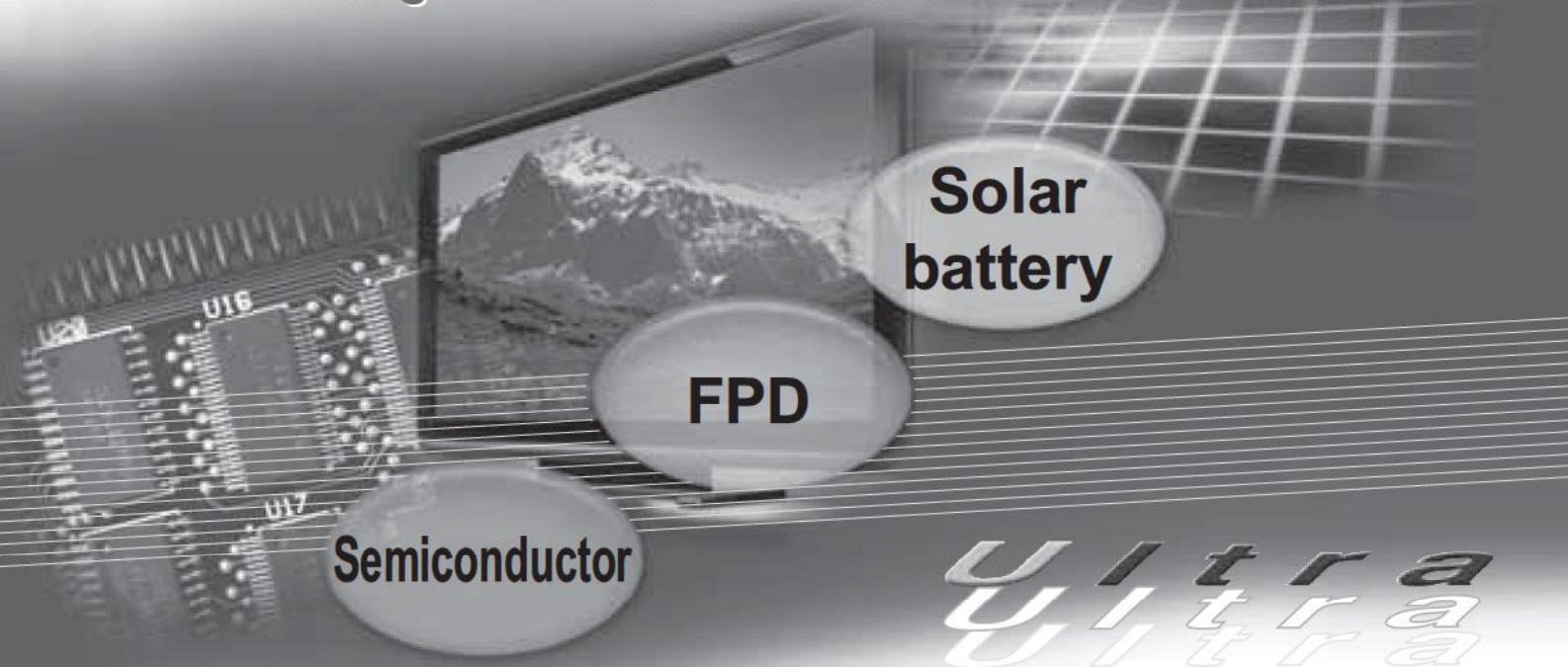


# Long service life, high durability.

Unprecedented drive life achieved through a special structure that employs CKD's original formed bellows.

Highly reliable and easy-to-use high vacuum control valve part 7 series.

**Double acting and manual models added to the series!**



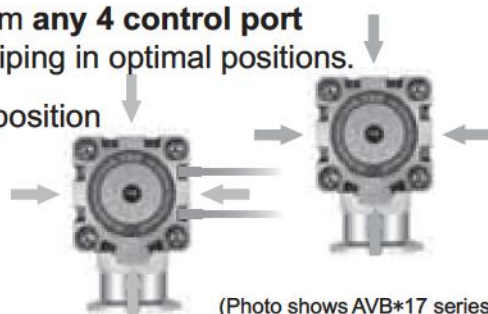
*Ultra*  
*Ultra*  
*Ultra*

## Increased positioning and piping flexibility

Option to choose from **any 4 control port positions** enables piping in optimal positions.

Miniature operating position detection **switches** can be installed in **all 4 positions**.

(Port size NW16 is 3-sided)



### ■ Ultra-fine concept

CKD's unique UF concept implements complete cleanliness in all critical areas for product development from design, evaluation, manufacturing methods, to manufacturing for total cleanliness control of products.

## Installation compatibility

Installation method is ISO21358 compliant.

## Visually check operation

Indicator provided as standard.



(Photo shows MVB\*17 series)

## Weight reduced with aluminum body

Significant weight reduction achieved compared to conventional stainless steel body.

## A wide variety of flange sizes

Model no.	Actuation	Connection							Indicator Standard equipment
		NW16	NW25	NW40	NW50	NW63	NW80	NW100	
AVB * 17	NC	●	●	●	●	●	●	●	●
AVB * 47	Two stage type	●	●	●	●	●	●	●	●
AVB * 37	Double acting	●	●	●	●	●	●	●	●
MVB * 17	Manual	●	●	●	●	●	●	●	●



Installation possible  
in any 4 directions

**Operation port**

**Light  
weight**  
with  
aluminum body



AVB\*17 series

Check operation  
with just one look

**Indicator**

Switches can be  
installed on all 4 sides

**Switch**

Reed/proximity switch (can be installed later)

**Uniquely formed bellows**



AVB\*47 series

AVB\*37 series

MVB\*17 series

*Fine  
Fine  
Fine*

Air operated valve  
for high vacuum

**New**

Manual valve  
for high vacuum

# AVB 7 Series

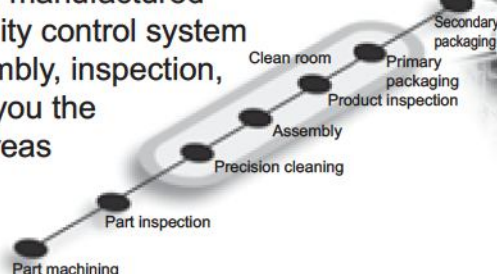
# MVB 7 Series

**RoHS** RoHS compliant

Substances harmful to the environment, including lead and hexavalent chrome, have been eliminated.

## Total cleanness control system

This product has been manufactured using a seamless quality control system from machining, assembly, inspection, to packaging. Giving you the highest quality in all areas including cleanness.







# Manual valve for high vacuum MVB\*17 Series

- Formed bellows aluminum body type



## Specifications

Descriptions	MVB217	MVB317	MVB417	MVB517
Working fluid	Vacuum and inert gas			
Working pressure range Pa (abs)	$1.3 \times 10^{-6}$ to $1 \times 10^5$			
Maximum working differential pressure MPa	0.1			
Valve seat leakage Pa·m <sup>3</sup> /s (He)	$1.3 \times 10^{-10}$ or less			
External leakage Pa·m <sup>3</sup> /s (He)	$1.3 \times 10^{-10}$ or less			
Withstanding pressure MPa	0.3			
Fluid temperature °C	5 to 60			
Ambient temperature °C	0 to 60 (no freezing)			
Orifice mm	ø17	ø24	ø39	ø48
Conductance Note 1 l/s	5	13	43	74
Connection	NW16	NW25	NW40	NW50
Operating torque Note 3 N·m	0.15 and over	0.25 and over	0.8 and over	1.5 and over
Handle rotations	5	7.5	12	15
Weight kg	0.4	0.6	1.4	2.3
JIS symbol				

Note 1: The conductance is the theoretical calculation value at the molecular flow range, and is not the actual measurement value.

Note 2: External O-ring uses grease for high vacuum.

Note 3: When turning the handle, the handle's torque will suddenly become light as it reaches full closure.

However, internal sealing is conducted by an internal spring. There is no problem with close-stop capability.

## How to order



Model no.

**A** Series

**B** Connection

Symbol	Descriptions	
<b>A Series</b>		
2	Orifice ø17	
3	Orifice ø24	
4	Orifice ø39	
5	Orifice ø48	
<b>B Connection</b>		
16K	NW16	Available for MVB217 only
25K	NW25	Available for MVB317 only
40K	NW40	Available for MVB417 only
50K	NW50	Available for MVB517 only

<Example of model number>

### MVB417-40K

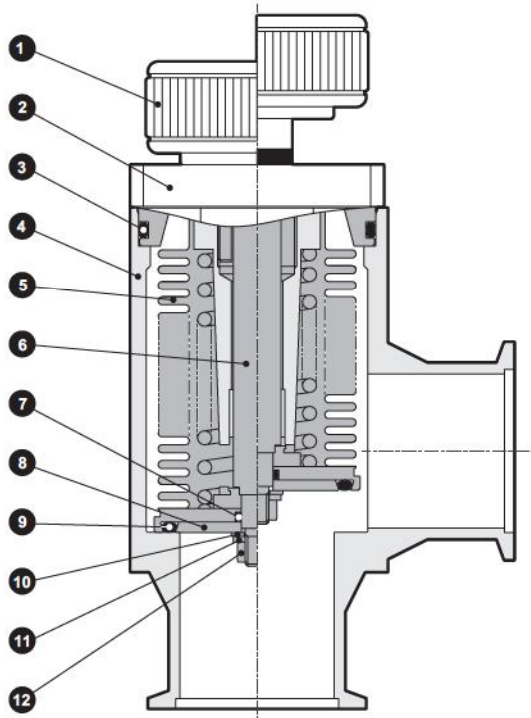
Model: MVB417 Manual valve for high vacuum

**A** Series : Orifice ø39

**B** Connection : NW40

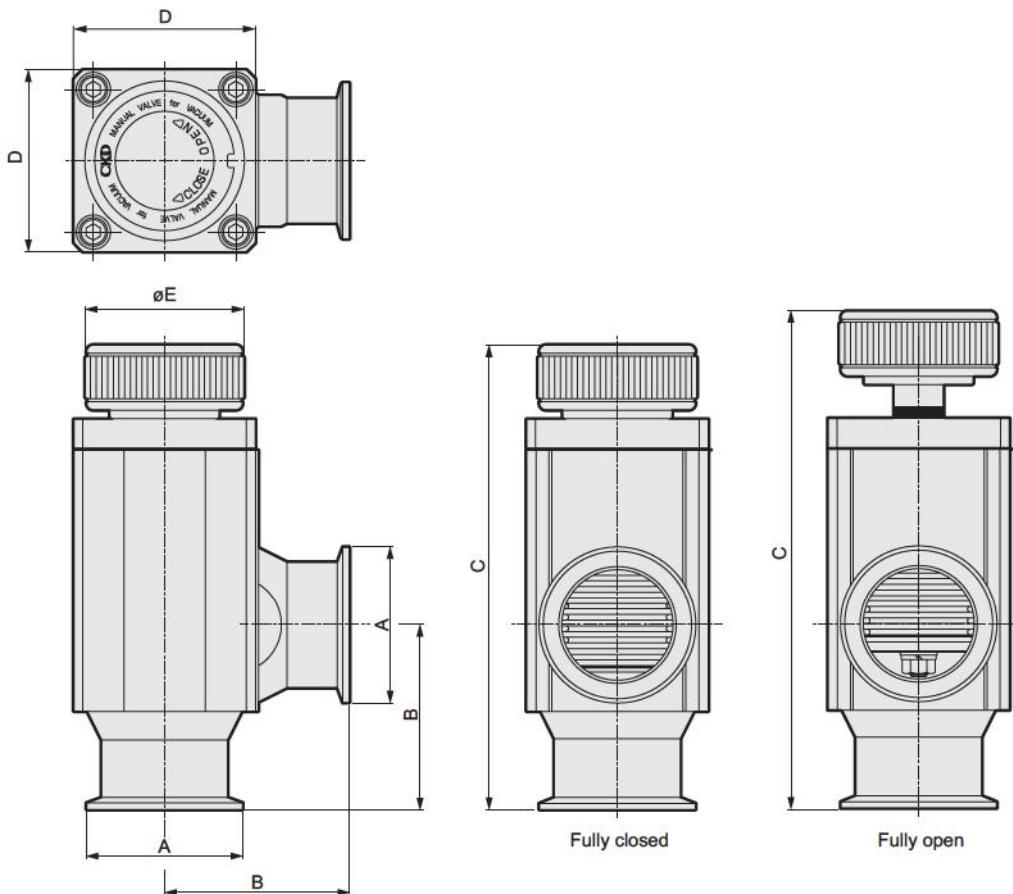


### Internal structure and parts list



No.	Part name	Material
1	Handle	SUS303 (16K/25K) A5056 (40K/50K)
2	Adaptor	A5056
3	O ring	FKM
4	Body	A6063
5	Bellows assembly	SUS316L
6	Rod	SUS316L
7	O ring	FKM
8	Valve disk B	SUS316L
9	O ring	FKM
10	Plain washer	SUS304
11	Spring washer	SUS304
12	Hexagon nut	SUS304

### Dimensions



Model no.	A	B	C		D	E
			Fully closed	Fully open		
MVB217	ø30 (NW16)	40	115	121	40	32
MVB317	ø40 (NW25)	50	127	134	45	38
MVB417	ø55 (NW40)	65	164	176	64	56
MVB517	ø75 (NW50)	70	178	193	77	69





Manual valve for high vacuum

# MVB<sup>5</sup><sub>6</sub><sub>7</sub>0 Series

- Formed bellows
- Handle type



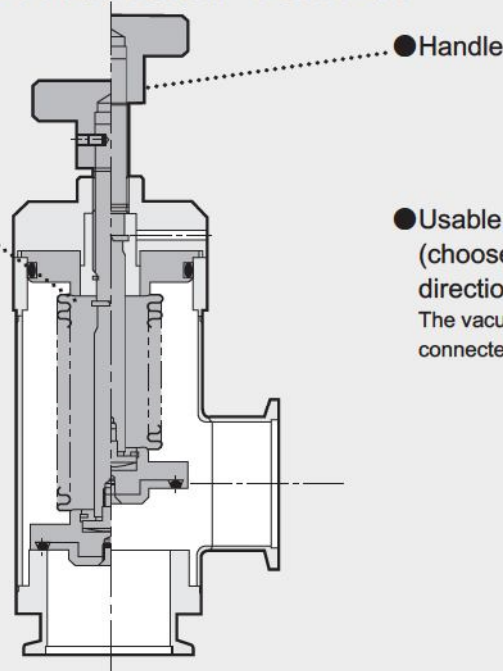
Custom order

Model no.	Actuation	Orifice	Model no.	Actuation	Orifice
MVB50	Manual	ø24	MVB70	Manual	ø50
MVB60	Manual	ø40			

## Air-operated valve (AVB\*\*2) performance is incorporated in the manual valve.

- Long-life formed bellows  
Special stainless steel material (ASL-350) provided.  
Outstanding corrosion resistance.

- Low dust generation  
Wetted areas (flow path) have no sliding parts that may generate particles.



- Usable with back pressure  
(choose any exhaust direction)  
The vacuum pump can be connected to either port.

### Specifications

Descriptions	MVB50	MVB60	MVB70
Working fluid	Vacuum and inert gas		
Working pressure range Pa (abs)	$1.3 \times 10^{-6}$ to $1 \times 10^5$		
Maximum working differential pressure MPa	0.1		
Valve seat leakage Pa·m <sup>3</sup> /s (He)	$1.3 \times 10^{-9}$ or less		
External leakage Pa·m <sup>3</sup> /s (He)	$1.3 \times 10^{-9}$ or less		
Withstanding pressure MPa	0.3		
Fluid temperature °C	5 to 60		
Ambient temperature °C	0 to 60 (no freezing)		
Orifice mm	ø24	ø40	ø50
Stroke length mm	15	20	22
Valve structure	Formed bellows		
Connection	NW25	NW40	NW50
Weight kg	1.4	2.4	3.2
JIS symbol			



### Safety precautions

Read page 9 in the introduction and the precautions on page 102 to 109 to ensure correct and safe use of this product.

- Working media
- Installation
- Direction when connecting piping

### Internal structure and parts list

### How to order

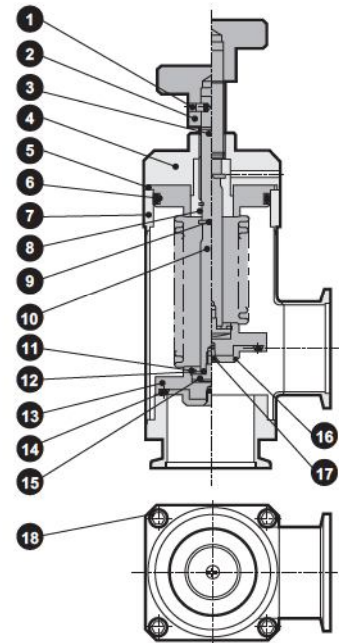
MVB 5 0 - 25K

Manual

A Series

B Connection

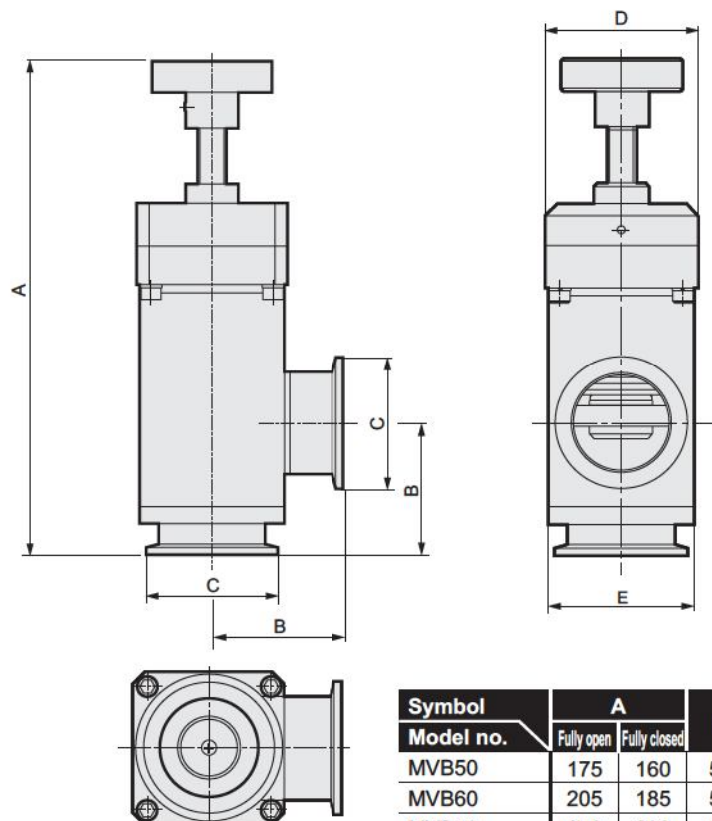
Symbol	Descriptions
<b>A Series</b>	
5	Orifice $\phi$ 24
6	Orifice $\phi$ 40
7	Orifice $\phi$ 50
<b>B Connection</b>	
25K	25A (Only MVB50 is available)
40K	40A (Only MVB60 is available)
50K	50A (Only MVB70 is available)



No.	Part name	Material	No.	Part name	Material
1	Hexagon socket set screw	SUS304	10	Rod	SUS316
2	Handle		11	Spring washer	SUS304
3	Manual rod	SUS303	12	C type snap ring	SUS304
4	Adaptor	A2017	13	Valve disk A	SUS316
5	Bellows assembly	ASL350, SUS316	14	O ring	FKM
6	O ring	FKM	15	Rod piece	SUS304
7	Body assembly	SUS304	16	Valve disk B	SUS316
8	E snap ring	SUS304	17	Flat headed cross cut screw	SUS304
9	Spring washer	SUS304	18	Cross headed bolt	SUS304

### Dimensions

#### MVB\*0



Symbol Model no.	A		B	C	D	E
	Fully open	Fully closed				
MVB50	175	160	50	$\phi$ 40 (NW25)	63	$\phi$ 48.6
MVB60	205	185	55	$\phi$ 55 (NW40)	63	$\phi$ 60.5
MVB70	252	230	70	$\phi$ 75 (NW50)	78	$\phi$ 79





Manual valve for high vacuum

# MVP<sup>5</sup><sub>6</sub><sub>7</sub> 0 Series

- Double O-ring seal type
- Handle type

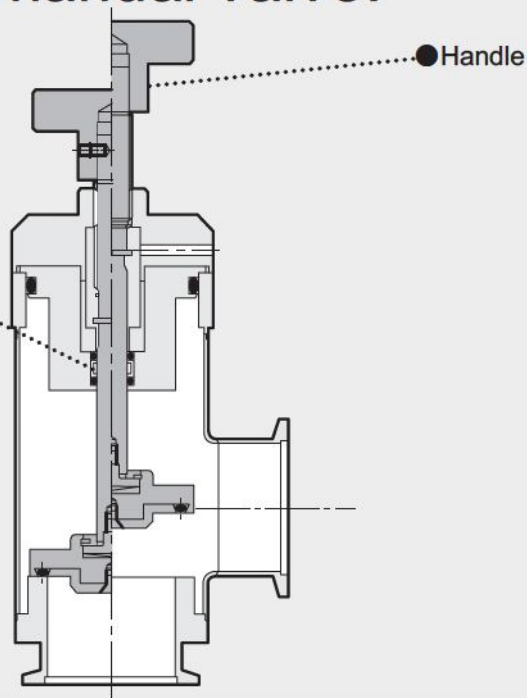


Custom order

Model no.	Actuation	Orifice	Model no.	Actuation	Orifice
MVP50	Manual	ø24	MVP70	Manual	ø50
MVP60	Manual	ø40			

Air-operated valve (AVB\*\*2) performance is incorporated in the manual valve.

- Long-life, high sealing  
Outstanding lifespan and external sealing are attained due to double O-ring seal and grease container.
- Usable with back pressure  
(choose any exhaust direction)  
The vacuum pump can be connected to either port.



## Specifications

Descriptions	MVP50	MVP60	MVP70
Working fluid	Vacuum and inert gas		
Working pressure range Pa (abs)	$1.3 \times 10^{-6}$ to $2 \times 10^5$		
Maximum working differential pressure MPa	0.2		
Valve seat leakage Pa·m <sup>3</sup> /s (He)	$1.3 \times 10^{-9}$ or less		
External leakage Pa·m <sup>3</sup> /s (He)	$1.3 \times 10^{-9}$ or less		
Withstanding pressure MPa	0.3		
Fluid temperature °C	5 to 60		
Ambient temperature °C	0 to 60 (no freezing)		
Orifice mm	ø24	ø40	ø50
Stroke length mm	15	20	22
Valve structure	O-ring shaft seal		
Connection	NW25	NW40	NW50
Overall height inside parentheses ( )/mm for when the valve is open	160 (175)	185 (205)	230 (252)
Distance between surfaces mm	50	55	70
Weight kg	1.4	2.5	3.7
JIS symbol			



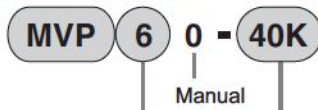
## Safety precautions

Read page 9 in the introduction and the precautions on page 102 to 109 to ensure correct and safe use of this product.

- Working media
- Installation
- Direction when connecting piping

### Internal structure and parts list

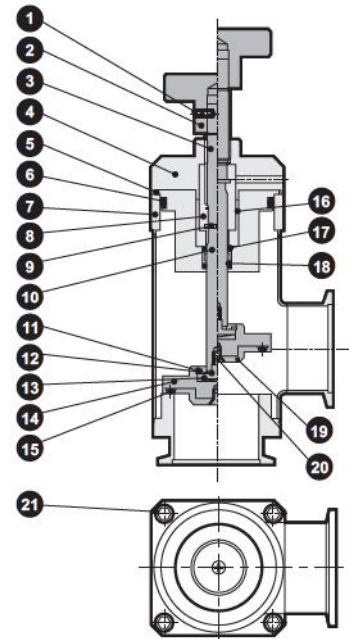
### How to order



A Performance class

B Connection

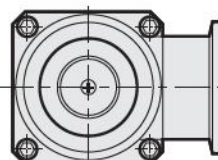
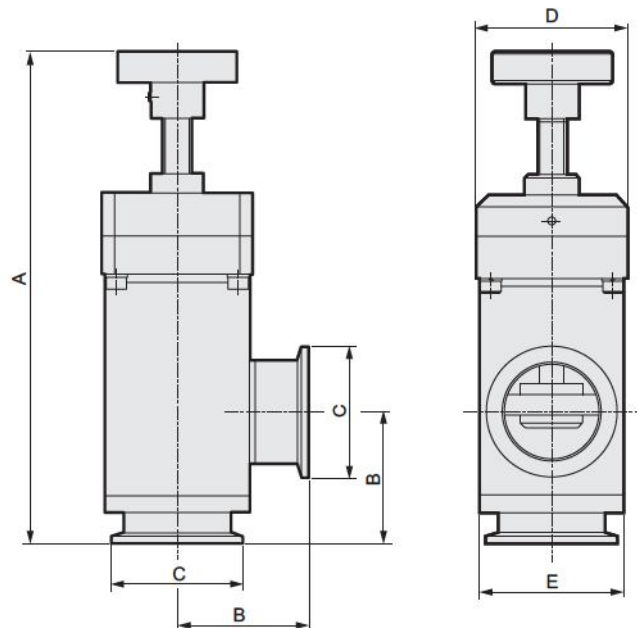
Symbol	Descriptions
<b>A Performance class</b>	
5	Orifice $\phi 24$
6	Orifice $\phi 40$
7	Orifice $\phi 50$
<b>B Connection</b>	
25K	25A Available for MVP50 only
40K	40A Available for MVP60 only
50K	50A Available for MVP70 only



No.	Part name	Material	No.	Part name	Material
1	Hexagon socket set screw	SUS304	12	C type snap ring	SUS304
2	Handle	SUS304	13	Rod piece	SUS304
3	Manual rod	SUS303	14	Valve disk A	SUS316
4	Adaptor	A2017	15	O ring	FKM
5	O ring holder	SUS316	16	O ring holder	A5056
6	O ring	FKM	17	O ring	FKM
7	Body assembly		18	Grease shield	SUS304
8	E snap ring	SUS304	19	Valve disk B	SUS316
9	Spring washer	SUS304	20	Flat headed cross cut screw	SUS304
11	Valve rod	SUS316	21	Cross headed bolt	SUS304
11	Spring washer	SUS304			

### Dimensions

#### MVP\*0



Symbol	A		B	C	D	E
	Fully open	Fully closed				
MVP50	175	160	50	$\phi 40$ (NW25)	63	$\phi 48.6$
MVP60	205	185	55	$\phi 55$ (NW40)	63	$\phi 60.5$
MVP70	252	230	70	$\phi 75$ (NW50)	78	$\phi 79$