

High vacuum components



CONTENTS

▲ Safety precautions	102
Air operated valve for high vacuum	
AVB**7	NEW 116
AVB**3	128
AVB**3 Custom order	132
AVB**2	136
AVB**2 Custom order	142
AVP**2	144
Manual valve for high vacuum	
MVB*17	NEW 150
MVB*0	152
MVP*0	154
Electric vacuum valve	
EVB*17	NEW 156
High vacuum solenoid valve	
HVB212/312/412/512	166
HVB112	172
HVB41	174
HVB612/712	176
Vacuum delay solenoid valve	
HVL12/42	180



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.

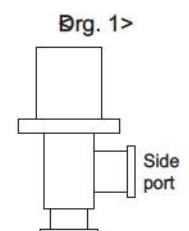
2. Direction when connecting piping (for some models)

⚠ 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

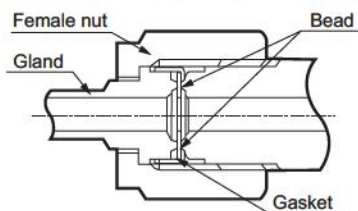
CAUTION

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

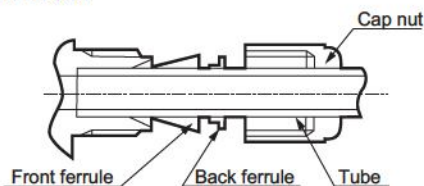
4. Piping

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 mm² 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.

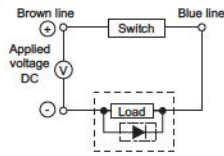
Check the contact capacity.

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.

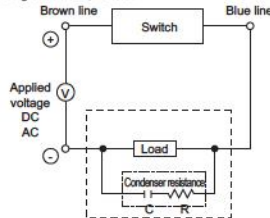
- Provide a protection circuit when connecting an inductive load (relay, solenoid valve), as surge voltage is generated when the switch is turned OFF.

Diode use



--- User wiring
 --- Protective circuit
 General rectifying diode
 HITACHI Ltd.V06C or equivalent product.

When using condenser, resistor



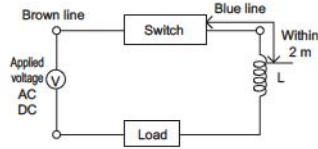
--- User wiring
 --- Protective circuit (Spark quenching circuit)
 Recommended value C condenser
 0.03 to 0.1 μ F
 R resistance 1 to 3 k Ω
 OKAYA Electric Industries XEB1K1 or equivalent product.

- 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 switch or reduce 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

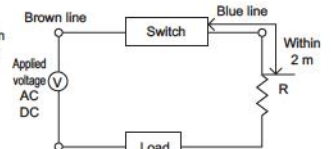
Table 1

Using choke coils



● Choke coils
 L several hundred H to several mH
 Outstanding high-frequency characteristics

Using resistors



● Rush current limiting resistor
 R largest resistance that load circuit can tolerate

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/s² 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.

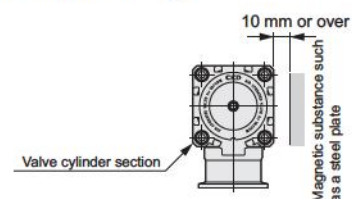
Check the accumulation of iron chips and contact of magnetic material.

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.

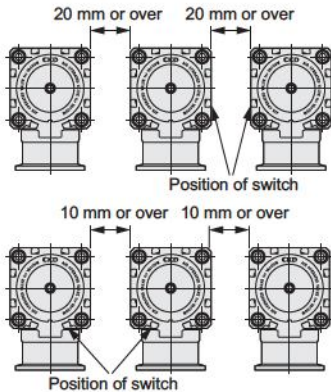
CAUTION

- 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)

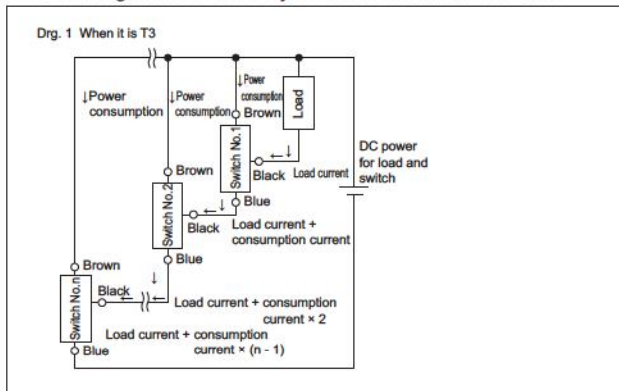


High vacuum components

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



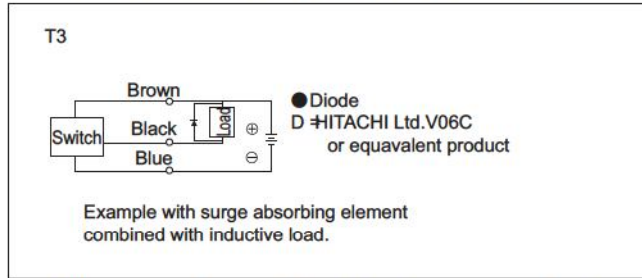
- Check the magnetic environment.
 - When installing valves with switches adjacently in parallel or if magnetic material moves near valves with switches, mutual interference may occur and affect detection accuracy.
- Check internal voltage drops caused by serial connections.
 - When connecting several 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.



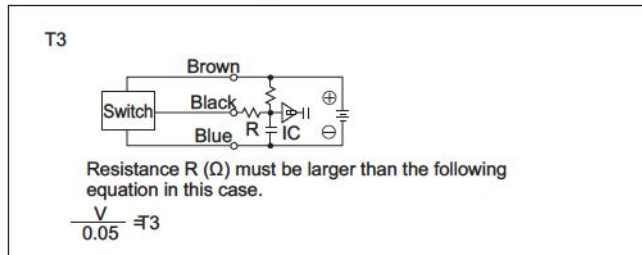
- Please use caution to ensure that no current leaks from parallel connections.
 - When connecting several 2-wire switches in parallel, note that leakage current increases in proportion to the number of connected units. Check load specifications and determine the number of switches to be connected. Note 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 μ A or less), so there is no problem to use under normal conditions.

- Output circuit protection

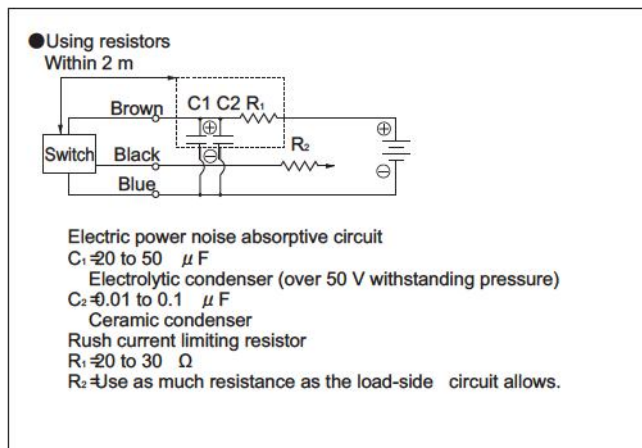
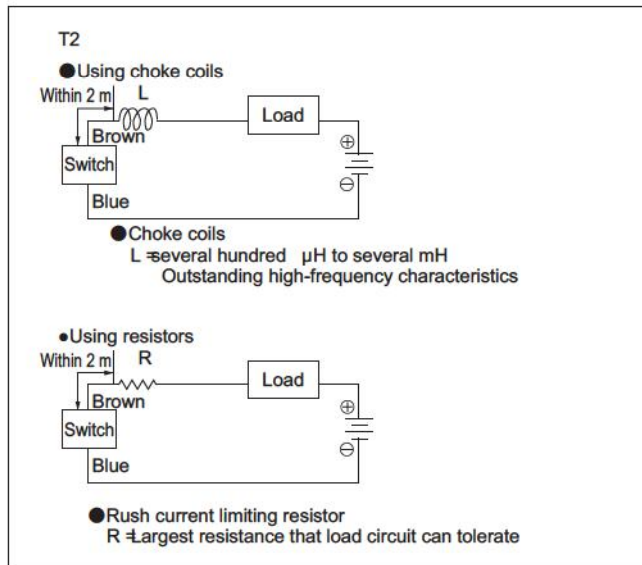
- When an inductive load (relay, solenoid valve) is connected, a surge voltage is generated when the switch is turned OFF. Provide the following protective circuit.



- 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.

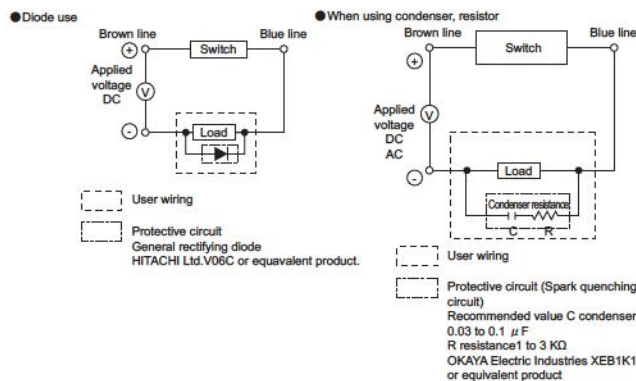
Design and selection

⚠ 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

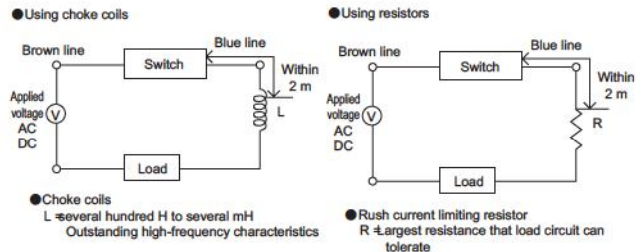
- Check the contact protection circuit.
 - Do not use a load that exceeds the switch's maximum contact capacity. It can cause failure. The switch may not light if the load is less than the rated current value.
- Check the contact protection circuit.
 - Provide the contact protection circuit when connecting 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

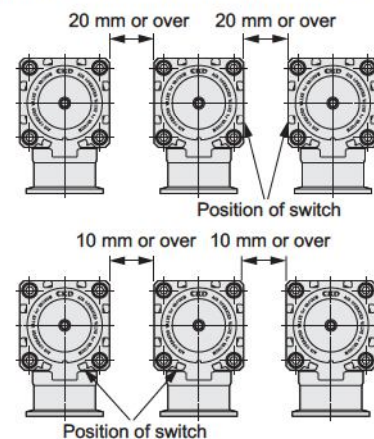
Table 1



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/s² or more for reed switches, 980 m/s² 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

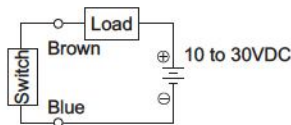
Connect the switch's lead wire in parallel to the load instead of directly to power. For TO, use caution regarding "1," "2" below.

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

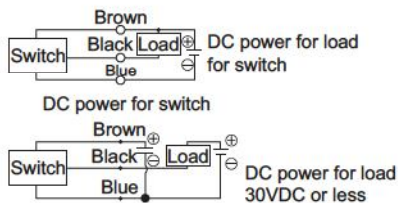
The switch will function when connected in reverse, but the light will not turn ON.
 - (2) When connected to an AC relay or programmable controller input, conducting half wave rectification with that circuit may prevent the switch light from turning ON. The light will light up when the switch lead's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

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

● T2



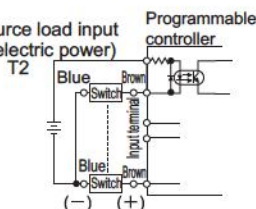
● T3



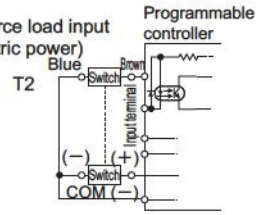
Connection to programmable controller(PLC)

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

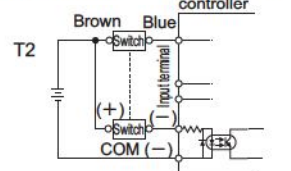
● Connection to source load input type (w/external electric power)



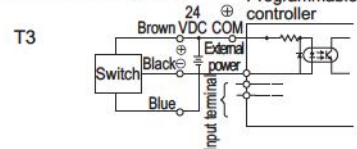
● Connection to source load input type (internal electric power)



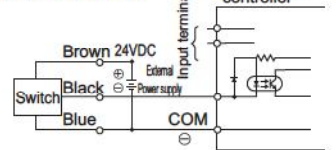
● Connection to sink input type



● Connection to source load input type (w/external electric power)



● Connection to source load input type (internal electric power)



- 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

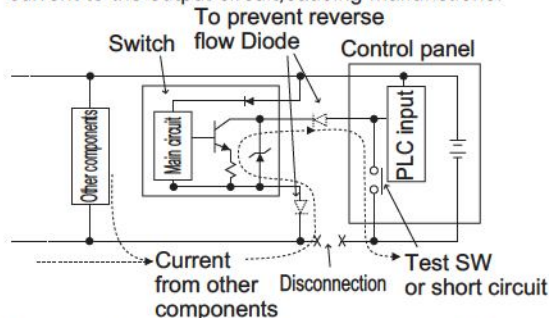
- Please do not use/apply over current.

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.

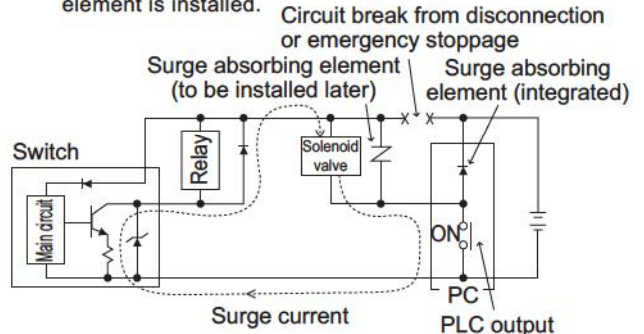
- When other components (including switches) are connected to the same power supply as the switch, short circuiting the output wire and power supply wire side or disconnecting the power supply wire side to check the control panels input unit operation can send reverse current to the output circuit; causing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



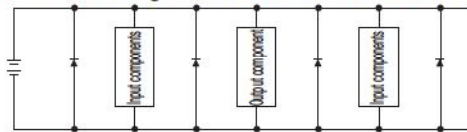
- To prevent malfunction from reverse currents, take countermeasures such as the following.
 - (1) Avoid centralizing current at the power cable, especially a negative power cable, and use as thick a wire as possible.
 - (2) Limit components connected to the same power source as the switch.
 - (3) Prevent 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.

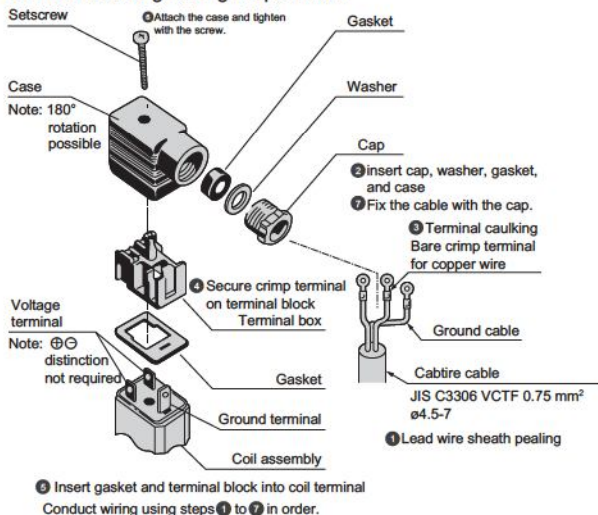


When devices are connected to a connector, the output circuit could be damaged by the above if the connector is disconnected while power is ON. Turn power OFF before connecting or disconnecting the connector.

How to wire the terminal box

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

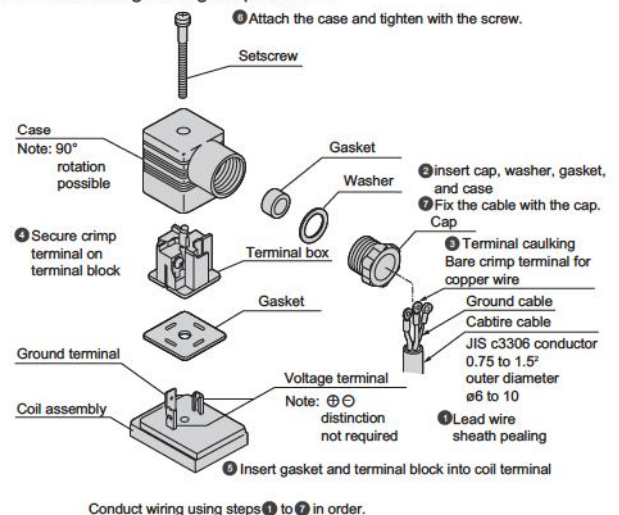
- (1) Use the following cable:
 - Cable outer diameter: $\phi 4.5$ to $\phi 7$ • Nominal section area: 0.75 mm^2
- (2) Insert the crimp terminal for copper wires into the cable's lead wire, and crimp the terminal with the designated tool. M3 terminal screws are used with the terminal box.
- (3) Tighten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

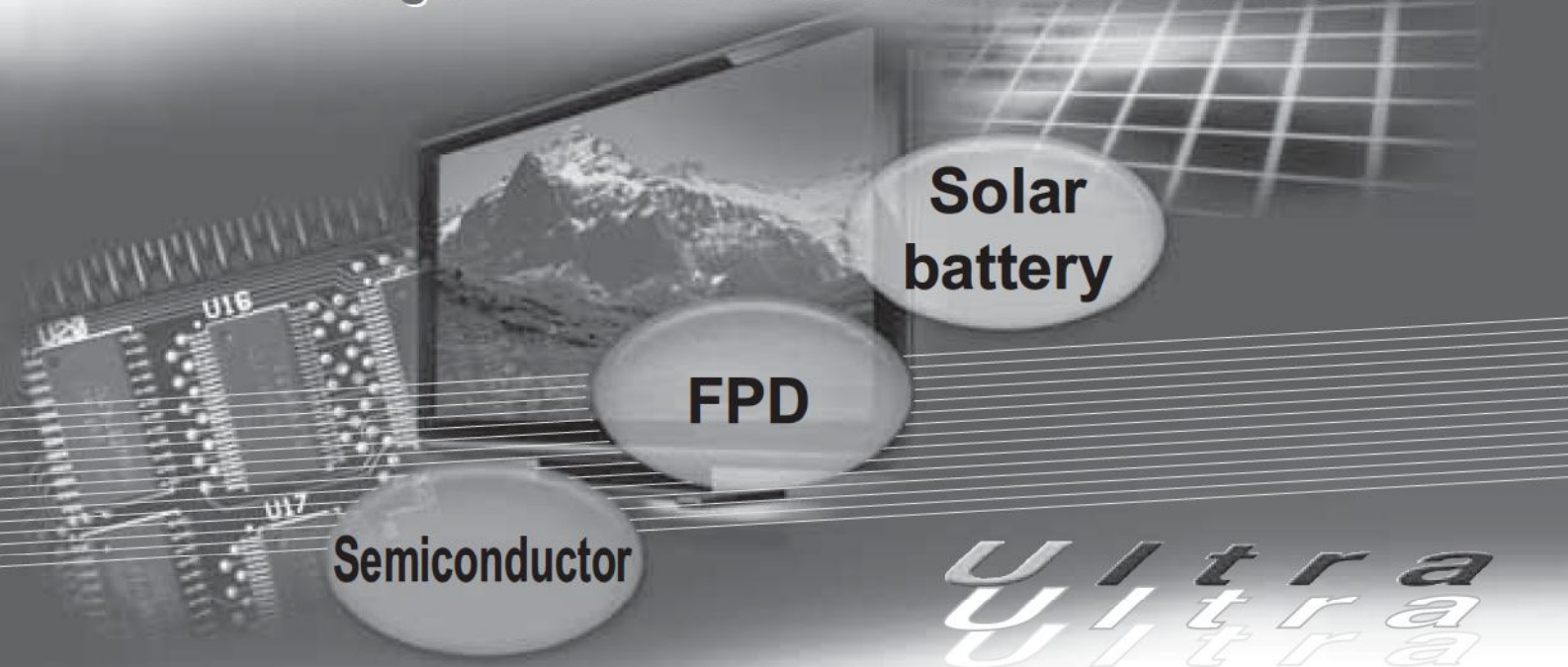
- Be careful not to damage any parts when removing deposits.
- If damage is anticipated before designated durability, perform maintenance and inspections as soon as possible.
- Product service life may decline from very small and repeated opening/closing of the valve. We recommend fully opening the valve 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!



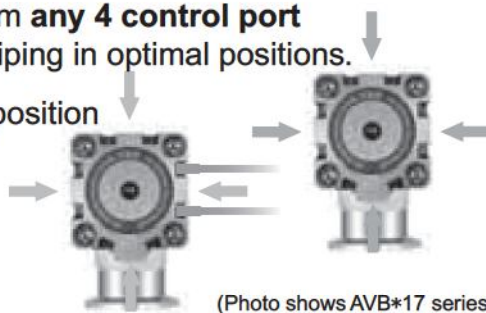
Ultra
Ultra
Ultra

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.

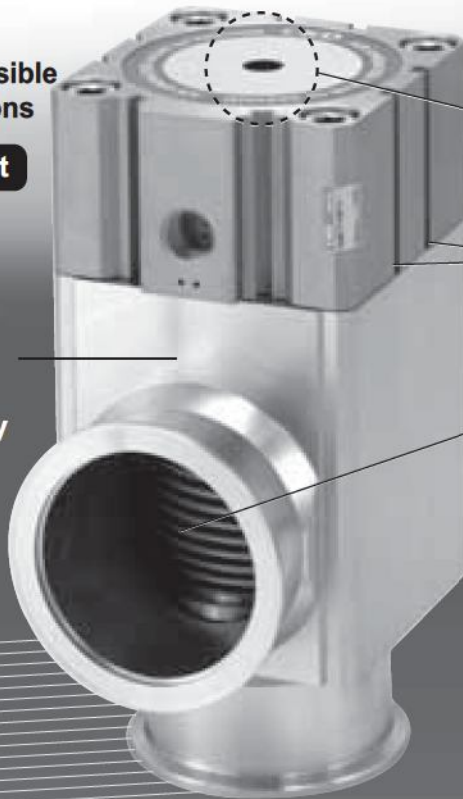
A wide variety of flange sizes

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

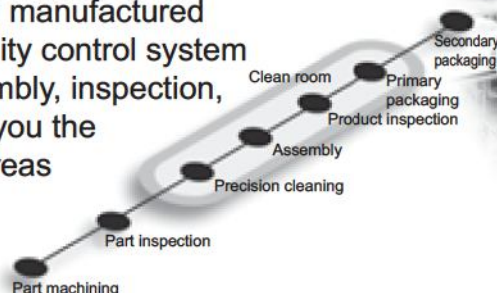
MVB 7 Series

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.





NC type air-operated valve for high vacuum

AVB*17 Series

- Formed bellows aluminum body type



Specifications

Descriptions	AVB217	AVB317	AVB417	AVB517	AVB617	AVB717
Working fluid	Vacuum and inert gas					
Working pressure range Pa (abs)	1.3×10^{-6} to 1×10^5					
Maximum working differential pressure MPa	0.1					
Valve seat leakage Pa·m ³ /s (He)	1.3×10^{-10} or less					
External leakage Pa·m ³ /s (He)	1.3×10^{-11} or less					
Withstanding pressure MPa	0.3					
Fluid temperature °C	5 to 60 (5 to 150) Note 1					
Ambient temperature °C	0 to 60 (no freezing)					
Orifice mm	ø17	ø24	ø39	ø48	ø68	ø80
Conductance Note 2 ℓ/s	5	13	43	74	166	242
Connection	NW16	NW25	NW40	NW50	NW63	NW80
Operating pressure MPa	0.4 to 0.6					
Weight kg	0.4	0.5	1.2	2.0	3.5	6.5
JIS symbol	 NC					

Note 1: Inside the parentheses "()" indicate high temperature specification types.

Note 2: The conductance is the theoretical calculation value at the molecular flow range, and is not the actual measurement value.

Switch specifications

Descriptions	Proximity switch		Reed switch		
	T2H/T2V	T3H/T3V	TOH/TOV	T5H/T5V	ETOH/ETOV
Applications	Programmable controller	Relay, programmable controller	Relay, programmable controller	Programmable controller, relay, IC circuit (w/o lamp), Serial connection	Relay, programmable controller
Power voltage	-	10 to 28 VDC	-	-	-
Load voltage/current	10 to 30VDC, 5 to 20 mA Note 4	30VDC or less, 100 mA or less	12/24VDC 5 to 50 mA 100VAC 7 to 20 mA	12/24VDC 50 mA or less 100VAC 20 mA or less	12/24VDC 5 to 50 mA 110VAC 7 to 20 mA
Power consumption	-	10 mA or less at 24VDC (ON)	-	-	-
Internal voltage drop	4 V or less	0.5 V or less	3 V or less	0 V	3 V or less
Light	LED (ON lighting)			-	LED (ON lighting)
Leakage current	1 mA or less	10 μA or less	0 mA	0 mA	0 mA
Lead wire length Note 3	Standard 1 m (oil-resistant vinyl cabtire cord 2-conductor 0.2 mm ²)	Standard 1 m (oil-resistant vinyl cabtire cord 3-conductor 0.2 mm ²)	Standard 1 m (oil resistant vinyl round code 2-conductor 0.2 mm ²)		Standard 1 m (heat-resistant fluorine insulation cabtire cord 2-conductor 0.5 mm ²)
Maximum impact	980 m/s ²		294 m/s ²		
Insulation resistance	20 M Ω and over when measured with a 500VDC megger				100 M Ω and over when measured with a 500VDC megger
Withstand voltage	No abnormal condition when 1000VAC applied for 1 min				
Ambient temperature range	-10 to +60°C				-10 to +150°C
Protective structure	IEC Standard IP67, JIS CO920 (water-tight type), oil-resistant				

Note 3: 3 m and 5 m lead wire lengths are also available.

Note 4: Above-mentioned load current's maximum value 20 mA is for 25°C.

The current will be lower than 20 mA if ambient temperature around the switch is higher than 25°C. (5-10mA at 60°C)

Note 5: For other safety precautions regarding switch usage, refer to pages 105 to 109.

How to order

AVB 4 17 - 40K - 4 - D T5H 3 - H

Model no.

A Series

Actuation
NC

B Connection

C Fluid temperature

D Operation port
position

E Switch installation
position
Note 1

F Switch model No.
Note 2

G Switch lead
wire length
Note 3

H Switch
quantity
Note 4

Note on model no. selection

Note 1: Only Series 2 (ø17 orifice) has 3-sided switch installation. Switch installation is possible on all surfaces excluding the control port side.

Not available for the models below

AVB217-16K-1-A**F****G****H**

AVB217-16K-2-B**F****G****H**

AVB217-16K-3-C**F****G****H**

AVB217-16K-4-D**F****G****H**

Note 2: **C** If fluid temperature is "HOM", select either ETOH or ETOV.

Note 3: **F** "3" and "5" are not available for switch model no. "ETOH", "ETOV".

Note 4: **F** "R" and "D" are not available for switch model no. "ETOH", "ETOV".

<Example of model number>

AVB417-40K-4-DT5H3-H

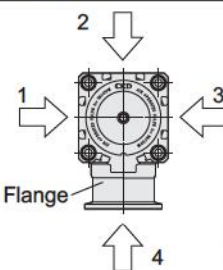
Model: AVB417 Air-operated valve for high vacuum (NC type)

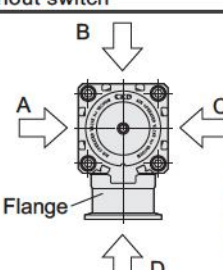
- A** Series : Orifice ø39
- B** Connection : NW40
- C** Fluid temperature : 5 to 60°C (magnet integrated)
- D** Operation port position : 4
- E** Switch installation position : D
- F** Switch model No. : T5H (Axial lead wire)
- G** Lead wire length : 3 m
- H** Switch quantity : Detect when valve is open

Symbol	Descriptions
A Series	
2	Orifice ø17
3	Orifice ø24
4	Orifice ø39
5	Orifice ø48
6	Orifice ø68
7	Orifice ø80 (Cannot be selected with high temperature spec)

B Connection		
16K	NW16	Available for AVB217 only
25K	NW25	Available for AVB317 only
40K	NW40	Available for AVB417 only
50K	NW50	Available for AVB517 only
63K	NW63	Available for AVB617 only
80K	NW80	Available for AVB717 only

C Fluid temperature	
Blank	5 to 60°C (magnet integrated)
HO	5 to 150°C (without magnet)
HOM	5 to 150°C (magnet integrated)

D Operation port position	
4	 <p>Operation port positions are displayed (4, 1, 2, 3) as viewed from the valve's top surface.</p>
1	
2	
3	

E Switch installation position	
Blank	Without switch
D	 <p>Switch installation positions are displayed (D, A, B, C) as viewed from the valve's top surface.</p>
A	
B	
C	

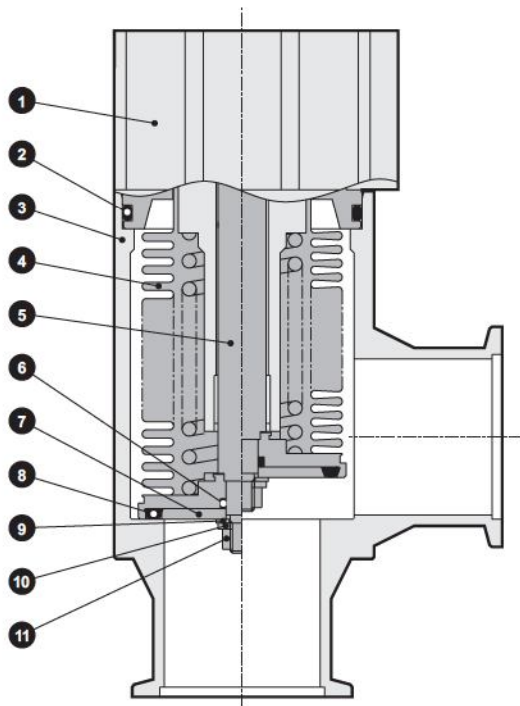
F Switch model No.			
Blank	Without switch		
T0H	Axial lead wire	Reed	2 wire
T5H			
T0V			
T5V	Radial lead wire	Proximity	3 wire
T2H	Axial lead wire		
T3H			
T2V	Radial lead wire		
T3V		Reed	2 wire
ETOH	Axial lead wire		
ETOV	Radial lead wire		

G Switch lead wire length	
Blank	1 m (standard)
3	3 m
5	5 m

H Switch quantity	
H	Detect when valve is open
R	Detect when valve is closed
D	Detect when valve is open/closed

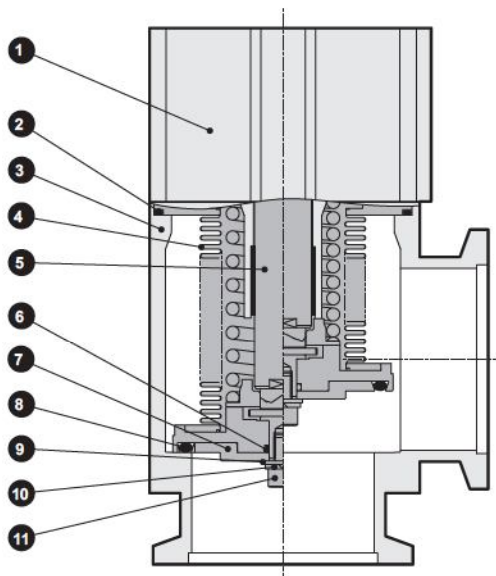
Internal structure and parts list (NC type)

● AVB217/AVB317/AVB417/AVB517/AVB617



No.	Part name	Material
1	Cylinder (magnet integrated)	
2	O ring	FKM
3	Body	A6063
4	Bellows	SUS316L
5	Rod	SUS316L
6	O ring	FKM
7	Valve disk B	SUS316L
8	O ring	FKM
9	Plain washer	SUS304
10	Spring washer	SUS304
11	Hexagon nut	SUS304

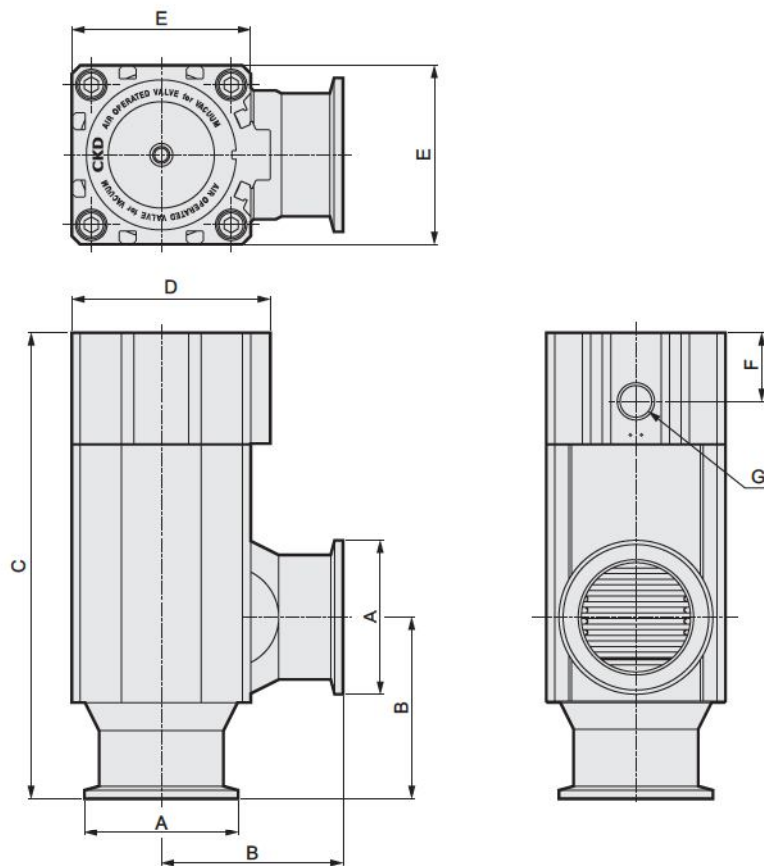
● AVB717



No.	Part name	Material
1	Cylinder (magnet integrated)	
2	O ring	FKM
3	Body	A6063
4	Bellows	ASL350
5	Rod	SUS304
6	O ring	FKM
7	Valve disk B	SUS316L
8	O ring	FKM
9	Plain washer	SUS304
10	Spring washer	SUS304
11	Hexagon socket bolt	SUS304

Dimensions (NC type)

- AVB217/AVB317/AVB417/AVB517/AVB617/AVB717



Model no.	A	B	C	D	E	F	G
AVB217	ø30 (NW16)	40	114	40	40	20	M5
AVB317	ø40 (NW25)	50	127	49.5	45	23	Rc1/8
AVB417	ø55 (NW40)	65	168	71	64	24.5	Rc1/4
AVB517	ø75 (NW50)	70	186	84	77	31	Rc1/4
AVB617	ø87 (NW63)	88	214	104	98	37	Rc1/4
AVB717	ø114 (NW80)	90	235	123.5	117	52.5	Rc1/4



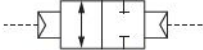
Air-operated valve for high vacuum (double-acting type)

AVB*37 Series

- Formed bellows aluminum body type



Specifications

Descriptions	AVB237	AVB337	AVB437	AVB537	AVB637	AVB737	AVB837
Working fluid	Vacuum and inert gas						
Working pressure range Pa (abs)	1.3×10^{-6} to 1×10^5						
Maximum working differential pressure MPa	0.1						
Valve seat leakage Pa·m ³ /s (He)	1.3×10^{-10} or less						
External leakage Pa·m ³ /s (He)	1.3×10^{-11} 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	ø68	ø80	ø100
Conductance Note 1 l/s	5	13	43	74	166	242	372
Connection	NW16	NW25	NW40	NW50	NW63	NW80	NW100
Operating pressure MPa	0.4 to 0.6						0.3 to 0.5
Weight kg	0.5	0.7	1.5	2.5	4.2	5.5	13
JIS symbol	 Double acting						

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

Switch specifications

Descriptions	Proximity switch		Reed switch	
	T2H/T2V	T3H/T3V	TOH/TOV	T5H/T5V
Applications	Programmable controller	Relay, programmable controller	Relay, programmable controller	Programmable controller, relay, IC circuit (w/o lamp), Serial connection
Power voltage	-	10 to 28VDC	-	-
Load voltage/current	10 to 30VDC, 5 to 20 mA Note 3	30 VDC or less, 100 mA or less	12/24VDC 5 to 50 mA 100VAC 7 to 20 mA	12/24VDC 50 mA or less 100VAC 20 mA or less
Power consumption	-	10 mA or less at 24VDC (ON)	-	-
Internal voltage drop	4 V or less	0.5 V or less	3 V or less	0 V
Light	LED (ON lighting)			-
Leakage current	1 mA or less	10 μA or less	0 mA	0 mA
Lead wire length Note 2	Standard 1 m (oil-resistant vinyl cable cord 2-conductor 0.2 mm ²)	Standard 1 m (oil-resistant vinyl cable cord 3-conductor 0.2 mm ²)	Standard 1 m (oil resistant vinyl round code 2-conductor 0.2 mm ²)	
Maximum impact	980 m/s ²		294 m/s ²	
Insulation resistance	20 M Ω and over when measured with a 500VDC megger			
Withstand voltage	No abnormal condition when 1000VAC applied for 1 min			
Ambient temperature range	-10 to +60°C			
Protective structure	IEC Standard IP67, JIS CO920 (water-tight type), oil-resistant			

Note 2: 3 m and 5 m lead wire lengths are also available.

Note 3: Above-mentioned load current's maximum value 20 mA is for 25°C.

The current will be lower than 20 mA if ambient temperature around the switch is higher than 25°C. (5-10 mA at 60°C)

Note 4: For other safety precautions regarding switch usage, refer to pages 105 to 109.

How to order

Model no. **AVB 4 37 - 40K - 4 - D T5H 3 - H**

A Series

Actuation
Double acting

B Connection

C Fluid temperature

D Operation port position

E Switch installation position
Note 1

F Switch model no.

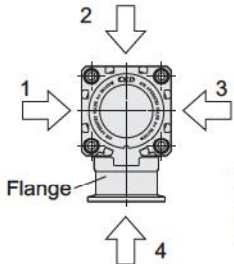
G Switch lead wire length

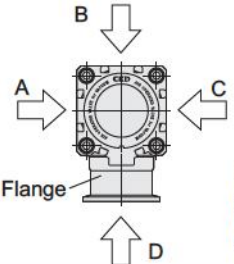
H Switch quantity

Symbol	Descriptions	
A Series		
2	Orifice $\phi 17$	
3	Orifice $\phi 24$	
4	Orifice $\phi 39$	
5	Orifice $\phi 48$	
6	Orifice $\phi 68$	
7	Orifice $\phi 68$	
8	Orifice $\phi 100$	

B Connection		
16K	NW16	Available for AVB237 only
25K	NW25	Available for AVB337 only
40K	NW40	Available for AVB437 only
50K	NW50	Available for AVB537 only
63K	NW63	Available for AVB637 only
80K	NW80	Available for AVB737 only
100K	NW100	Available for AVB837 only

C Fluid temperature	
Blank	5 to 60°C (magnet integrated)

D Operation port position	
4	 <p>Control port positions are displayed (4, 1, 2, 3) as viewed from the valve's top surface.</p>
1	
2	
3	

E Switch installation position	
Blank	Without switch
D	 <p>Switch installation positions are displayed (D, A, B, C) as viewed from the valve's top surface.</p>
A	
B	
C	

F Switch model no.			
Blank	Without switch		
T0H	Axial lead wire	Reed	2 wire
T5H			
T0V	Radial lead wire	Proximity	3 wire
T5V			
T2H	Axial lead wire	Proximity	2 wire
T3H	Axial lead wire		3 wire
T2V	Radial lead wire	Proximity	2 wire
T3V			Radial lead wire

G Switch lead wire length	
Blank	1 m (standard)
3	3 m
5	5 m

H Switch quantity	
H	Detect when valve is open
R	Detect when valve is closed
D	Detect when valve is open/closed

Note on model no. selection

Note 1: Only Series 2 ($\phi 17$ orifice) has 3-sided switch installation. Switch installation is possible on all surfaces excluding the control port side.

Not available for the models below
 AVB237-16K-1-A **F G H**
 AVB237-16K-2-B **F G H**
 AVB237-16K-3-C **F G H**
 AVB237-16K-4-D **F G H**

<Example of model number>

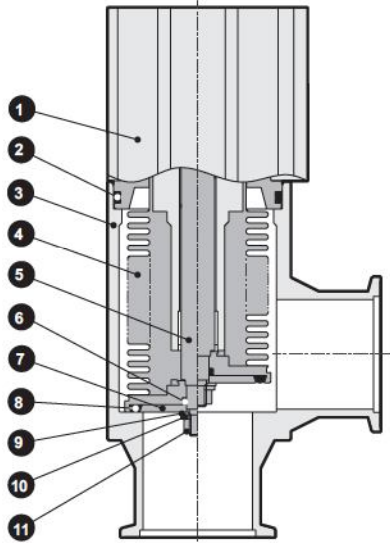
AVB437-40K-4-DT5H3-H

Model: AVB417 Air-operated valve for high vacuum (double-acting type)

- A Series** : Orifice $\phi 39$
- B Connection** : NW40
- C Fluid temperature** : 5 to 60°C (magnet integrated)
- D Control port position** : 4
- E Switch installation position** : D
- F Switch model no.** : T5H (Axial lead wire)
- G Lead wire length** : 3 m
- H Switch quantity** : Detect when valve is open

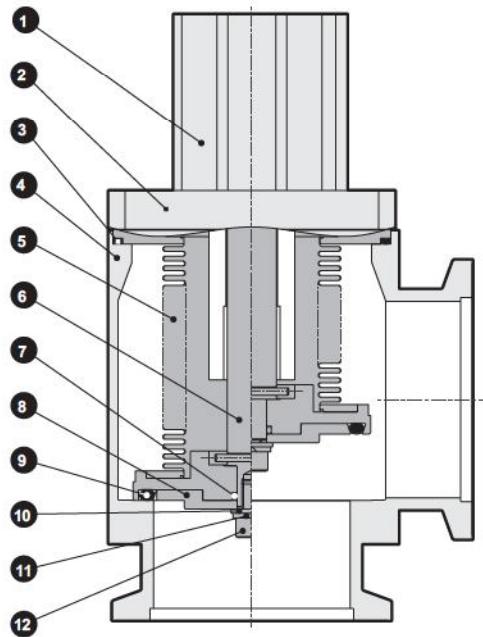
Internal structure and parts list (double-acting type)

● AVB237/AVB337/AVB437/AVB537/AVB637

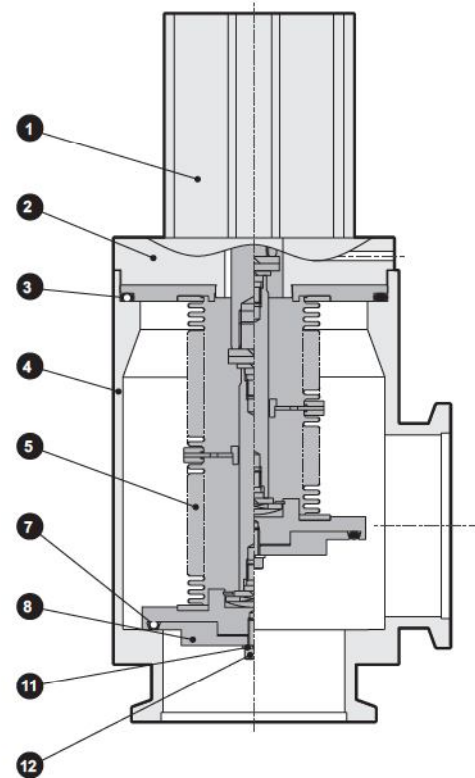


No.	Part name	Material
1	Cylinder (magnet integrated)	
2	O ring	FKM
3	Body	A6063
4	Bellows	SUS316L
5	Rod	SUS304
6	O ring	FKM
7	Valve disk B	SUS316L
8	O ring	FKM
9	Plain washer	SUS304
10	Spring washer	SUS304
11	Hexagon nut	SUS304

● AVB737



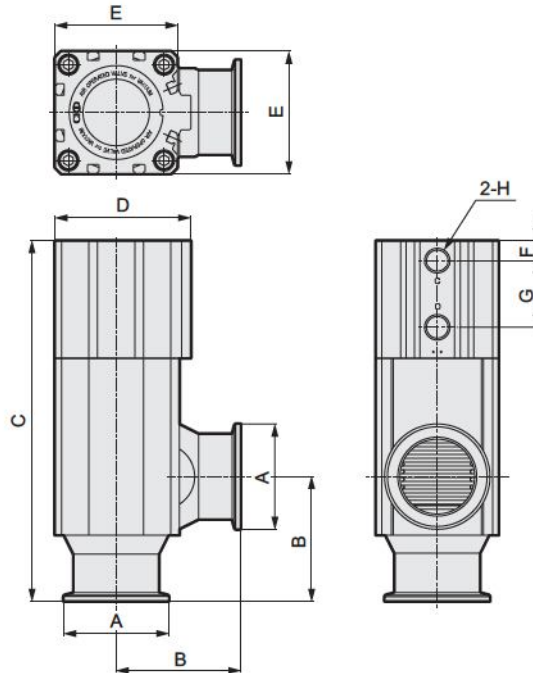
● AVB837



No.	Part name	Material	No.	Part name	Material
1	Cylinder (magnet integrated)		7	O ring	FKM
2	Cylinder adapter	AVB737: A5056 AVB837: A5052	8	Valve disk B	SUS316L
3	O ring	FKM	9	O ring	FKM
4	Body	A6063	10	Plain washer	SUS304
5	Bellows	ASL350	11	Spring washer	SUS304
6	Rod	SUS304	12	Hexagon socket bolt	SUS304

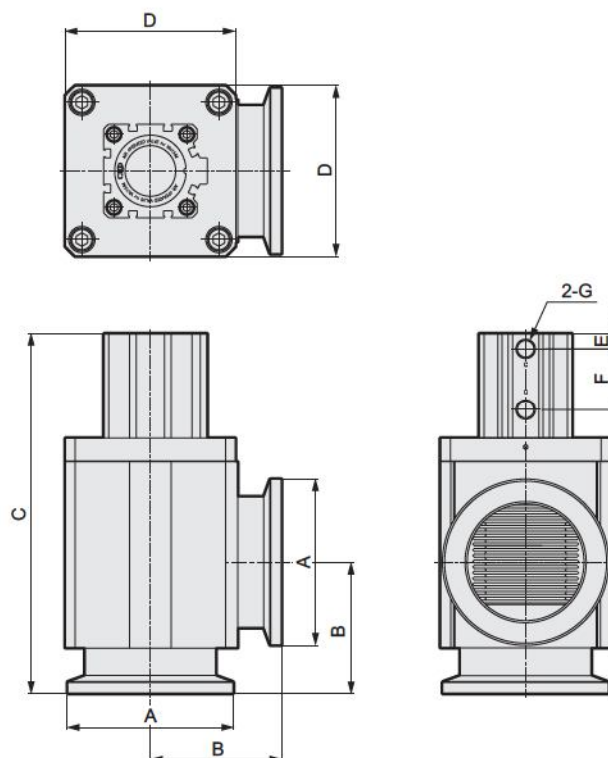
Dimensions (double-acting type)

● AVB237/AVB337/AVB437/AVB537/AVB637



Model no.	A	B	C	D	E	F	G	H
AVB237	ø30 (NW16)	40	132.5	40	40	6	32.5	M5
AVB337	ø40 (NW25)	50	144.5	49.5	45	8	32	Rc1/8
AVB437	ø55 (NW40)	65	188	71	64	10.5	35	Rc1/4
AVB537	ø75 (NW50)	70	213	84	77	11	47	Rc1/4
AVB637	ø87 (NW63)	88	245	104	98	13	55	Rc1/4

● AVB737/AVB837



Model no.	A	B	C	D	E	F	G
AVB737	ø114 (NW80)	90	247	117	10.5	42	Rc1/4
AVB837	ø134 (NW100)	108	390	154	13	94.5	Rc3/8



Air operated valve for high vacuum two stage type

AVB*47 Series

- Formed bellows aluminum body type



Specifications

Descriptions	AVB347	AVB447	AVB547	AVB647
Working fluid	Vacuum and inert gas			
Working pressure range Pa (abs)	1.3 × 10 ⁻⁶ to 1 × 10 ⁻⁵			
Maximum working differential pressure MPa	0.1			
Valve seat leakage Pa·m ³ /s (He)	1.3 × 10 ⁻¹⁰ or less			
External leakage Pa·m ³ /s (He)	1.3 × 10 ⁻¹¹ or less			
Withstanding pressure MPa	0.3			
Fluid temperature °C	5 to 60 (5 to 150)			Note 1
Ambient temperature °C	0 to 60 (no freezing)			
Orifice mm	ø24	ø39	ø48	ø68
Conductance Note 2 l/s	13	43	74	166
Connection	NW25	NW40	NW50	NW63
Main exhaust operating pressure MPa	0.4 to 0.6			
Soft exhaust operating pressure MPa	0.4 to 0.6			
Weight kg	0.7	1.6	2.6	4.4

Note 1: High temperature specification types are indicated in the parentheses "()".

Note 2: The conductance is the theoretical calculation value at the molecular flow range, and is not the actual measurement value.

Switch specifications

Descriptions	Proximity switch		Reed switch		
	T2H/T2V	T3H/T3V	TOH/TOV	T5H/T5V	ETOH/ETOV
Applications	Programmable controller	Relay, programmable controller	Relay, programmable controller	Programmable controller, relay, IC circuit (w/o lamp), Serial connection	Relay, programmable controller
Power voltage	-	10 to 28VDC	-	-	-
Load voltage/current	10 to 30VDC, 5 to 20 mA Note 4	30VDC or less, 100 mA or less	12/24VDC 5 to 50 mA 100VAC 7 to 20 mA	12/24VDC 50 mA or less 100VAC 20 mA or less	12/24VDC 5 to 50 mA 110VAC 7 to 20 mA
Power consumption	-	10 mA or less at 24VDC (ON)	-	-	-
Internal voltage drop	4 V or less	0.5 V or less	3 V or less	0 V	3 V or less
Light	LED (ON lighting)			-	LED (ON lighting)
Leakage current	1 mA or less	10 µA or less	0 mA	0 mA	0 mA
Lead wire length Note 3	Standard 1 m (oil-resistant vinyl cabtire cord 2-conductor 0.2mm ²)	Standard 1 m (oil-resistant vinyl cabtire cord 3-conductor 0.2mm ²)	Standard 1 m (oil resistant vinyl round code 2-conductor 0.2 mm ²)		Standard 1 m (heat-resistant fluorine insulation cabtire cord 2-conductor 0.5 mm ²)
Maximum impact	980 m/s ²		294 m/s ²		
Insulation resistance	20 M Ω and over when measured with a 500VDC megger				100 M Ω and over when measured with a 500VDC megger
Withstand voltage	No abnormal condition when 1000VAC applied for 1 min				
Ambient temperature range	-10 to +60°C				-10 to +150°C
Protective structure	IEC Standard IP67, JIS CO920 (water-tight type), oil-resistant				

Note 3: 3 m and 5 m lead wire lengths are also available.

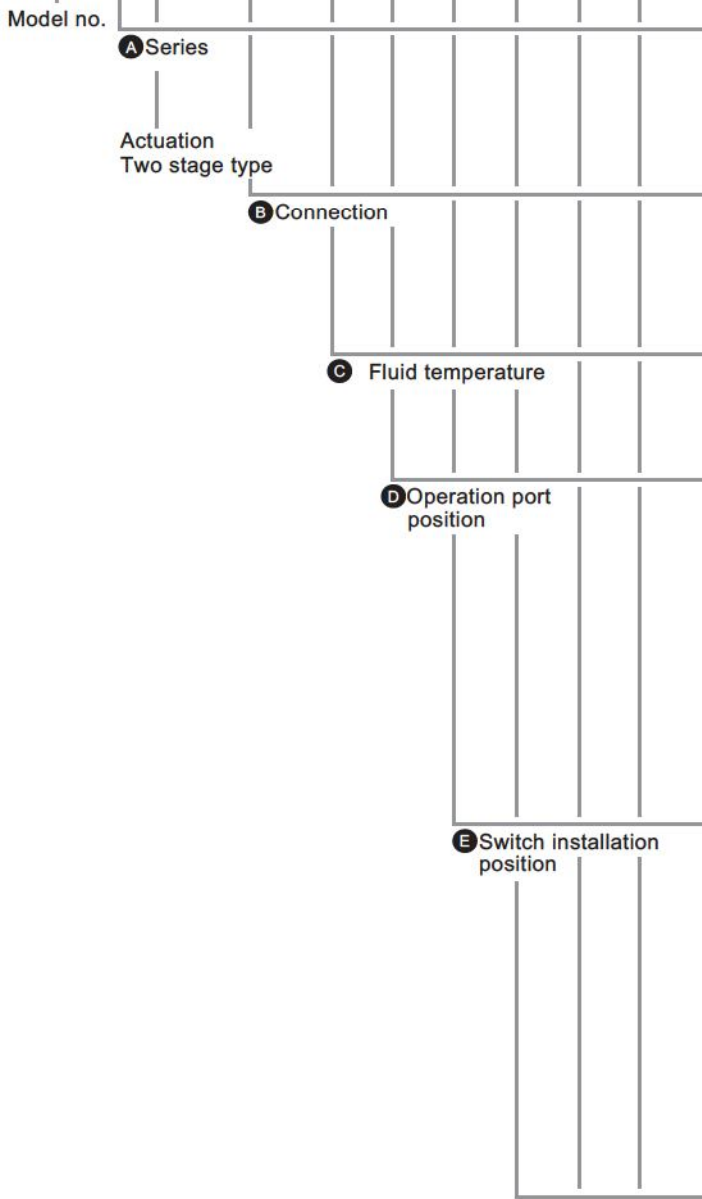
Note 4: Above-mentioned load current's maximum value 20 mA is for 25°C. The current will be lower than 20 mA if ambient temperature around the switch is higher than 25°C. (5-10 mA at 60°C)

Note 5: For other safety precautions regarding switch usage, refer to pages 105-109.

Note 6: Switch can be installed only on exhaust valve.

How to order

Model no. **AVB 4 47- 40K - 4 - D T5H 3 - H**



Symbol	Descriptions	
A Series		
3	Orifice $\phi 24$	
4	Orifice $\phi 39$	
5	Orifice $\phi 48$	
6	Orifice $\phi 68$	

B Connection		
25K	NW25	Available for AVB347 only
40K	NW40	Available for AVB447 only
50K	NW50	Available for AVB547 only
63K	NW63	Available for AVB647 only

C Fluid temperature	
Blank	5 to 60°C (magnet integrated)
HO	5 to 150°C (without magnet)
HOM	5 to 150°C (magnet integrated)

D Operation port position	
4	<p>Control port positions are displayed (4, 1, 2, 3) as viewed from the valve's top surface.</p>
1	
2	
3	

E Switch installation position	
Blank	Without switch
D	Can be installed only on main exhaust valve.
A	<p>Switch installation positions are displayed (D, A, B, C) as viewed from the valve's top surface.</p>
B	
C	

F Switch model no.			
Blank	Without switch		
T0H	Axial lead wire	Reed	2 wire
T5H	Axial lead wire		
T0V	Radial lead wire		
T5V	Radial lead wire	Proximity	3 wire
T2H	Axial lead wire		
T3H	Axial lead wire		
T2V	Radial lead wire		
T3V	Radial lead wire	Reed	2 wire
ETOH	Axial lead wire		
ETOV	Radial lead wire		

G Switch lead wire length	
Blank	1 m (standard)
3	3 m
5	5 m

H Switch quantity	
H	Detect when valve is open
R	Detect when valve is closed
D	Detect when valve is open/closed

Note on model no. selection

Note 1: **C**If fluid temperature is "HOM", select either ETOH or ETOV.

Note 2: **F**"3" and "5" are not available for switch model no. "ETOH", "ETOV".

Note 3: **F**"R" and "D" are not available for switch model no. "ETOH", "ETOV".

<Example of model number>

AVB447-40K-4-DT5H3-H

Model: AVB447 Air-operated valve for high vacuum (two stage type)

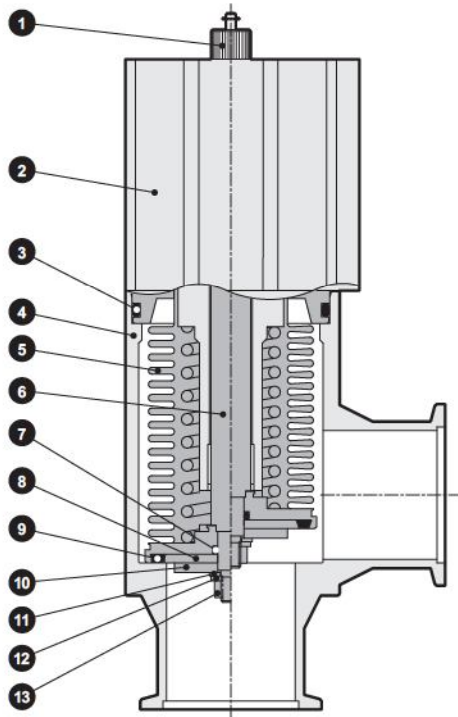
- A**Series : Orifice $\phi 39$
- B**Connection : NW40
- C**Fluid temperature : 5 to 60°C (magnet integrated)
- D**Control port position : 4
- E**Switch installation position : D
- F**Switch model no. : T5H (Axial lead wire)
- G**Lead wire length : 3 m
- H**Switch quantity : Detect when valve is open

F Switch model no.
Note 1

G Switch lead wire length
Note 2

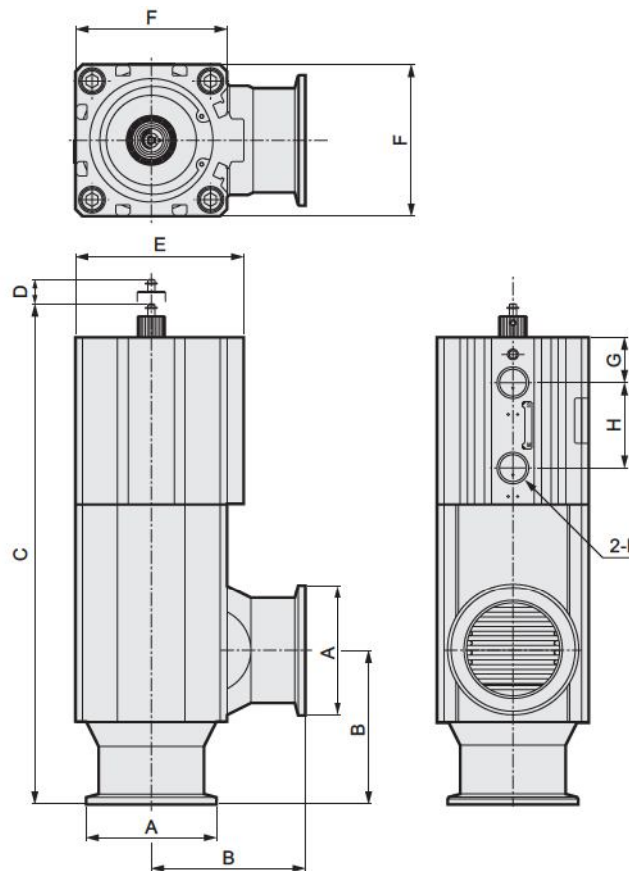
H Switch quantity
Note 3

Internal structure and parts list

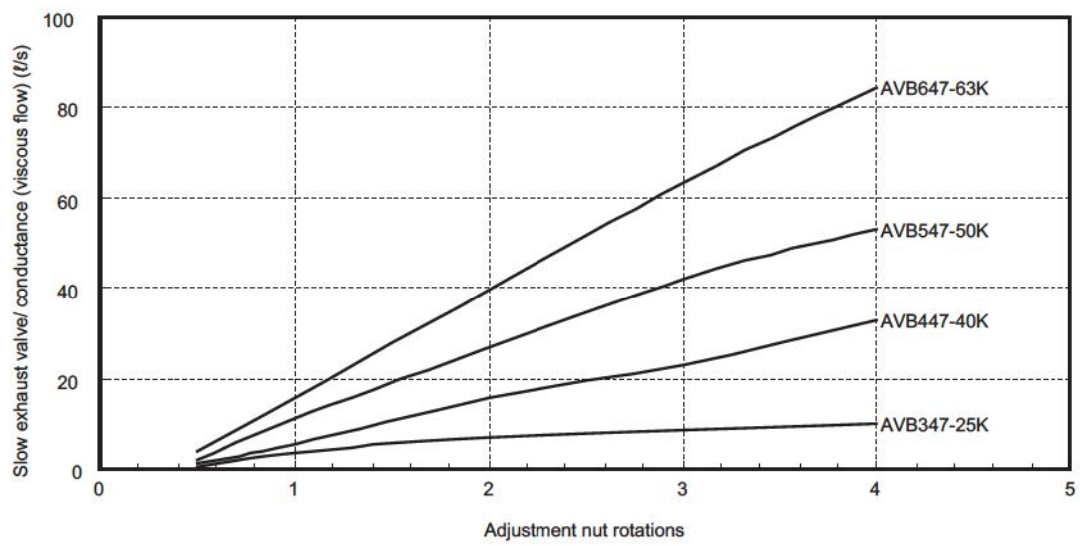


No.	Part name	Material
1	Adjustment nut	A5056
2	Cylinder (magnet integrated)	
3	O ring	FKM
4	Body	A6063
5	Bellows	SUS316L
6	Rod	SUS304
7	O ring	FKM
8	Valve disk B	SUS316L
9	O ring	FKM
10	Skirt	SUS304
11	Plain washer	SUS304
12	Spring washer	SUS304
13	Hexagon nut	SUS304

Dimensions



Model no.	A	B	C	D (Maximum)	E	F	G	H	I
AVB347	ø40 (NW25)	50	168	7.5	49.5	45	19	31	Rc1/8
AVB447	ø55 (NW40)	65	211	12	71	64	19	35	Rc1/4
AVB547	ø75 (NW50)	70	234	15	84	77	21.5	42.5	Rc1/4
AVB647	ø87 (NW63)	88	263	17	104	98	23.5	49	Rc1/4

Adjustment nut rotations x slow exhaust valve/conductance**MEMO**



Air operated valve for high vacuum

AVB^{5/6/7/8} *3 Series

- Formed bellows
- Stainless steel body compact type



Model no.	Actuation	Orifice	Model no.	Actuation	Orifice	Model no.	Actuation	Orifice
AVB513	NC	ø24	AVB523	NO	ø24	AVB533	Double acting	ø24
AVB613	NC	ø40	AVB623	NO	ø40	AVB633	Double acting	ø40
AVB713	NC	ø50	AVB723	NO	ø50	AVB733	Double acting	ø50
AVB813	NC	ø80	AVB823	NO	ø80	AVB833	Double acting	ø80

Now even more compact with improved maintainability.

- Overall height reduced by 25%

More compact and space-saving compared to AVB**2

- Long-life formed bellows

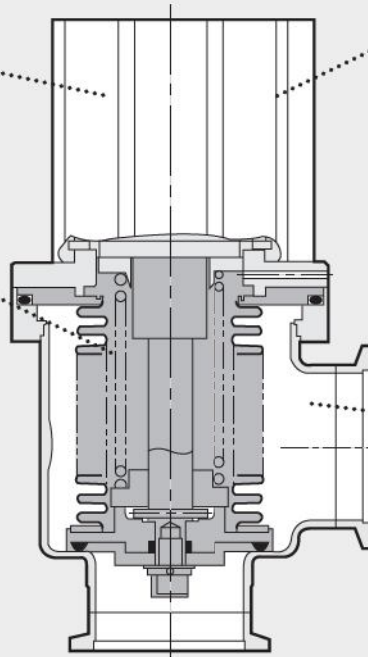
Special stainless steel material (ASL350) provided.

Durability: 1 million cycles (*1)

*1 Life when working media is inert gas within specified range, which does not contain solids such as reaction products.

- Usable with back pressure (choose any exhaust direction)

The vacuum pump can be connected to either port.



- Mountable miniature switch

Reed switch (reed/proximity) for checking operation can be connected. (can be installed later)

- No gas traps

Integrally molded blister provides a streamlined smooth flow path and smooth surface. There is no dead space where gas may get trapped.

- Low dust generation

Wetted areas (flow path) have no sliding sections that may generate particles.



Safety precautions

Always 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
- Proximity switch, reed switch

Contact CKD regarding these custom orders.

1. Different flange surface length
2. Different flange types
3. Valve heating
4. Different O-ring materials for wetted areas
5. Slow exhaust
6. Straight piping

Specifications



Descriptions	AVB5 ¹ / ₃	AVB6 ¹ / ₃	AVB7 ¹ / ₃	AVB8 ¹ / ₃	
Working fluid	Vacuum and inert gas				
Working pressure range Pa (abs)	1.3 × 10 ⁶ to 1 × 10 ⁵				
Maximum working differential pressure MPa	0.1				
Valve seat leakage Pam ³ /s (He)	1.3 × 10 ⁻⁹ or less				
External leakage Pam ³ /s (He)	1.3 × 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	ø80	
Stroke length mm	10	20	22	32	
Conductance Note 1 ℓ/s	13	52	80	242	
Connection	NW25	NW40	NW50	NW80	
Operating pressure MPa	0.4 to 0.6				
Weight kg	NC	1.1	1.9	3.6	7.9
	NO	1.1	1.9	3.5	7.8
	Double acting	1.0	1.6	3.2	7.3
JIS symbol					

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

Switch specifications

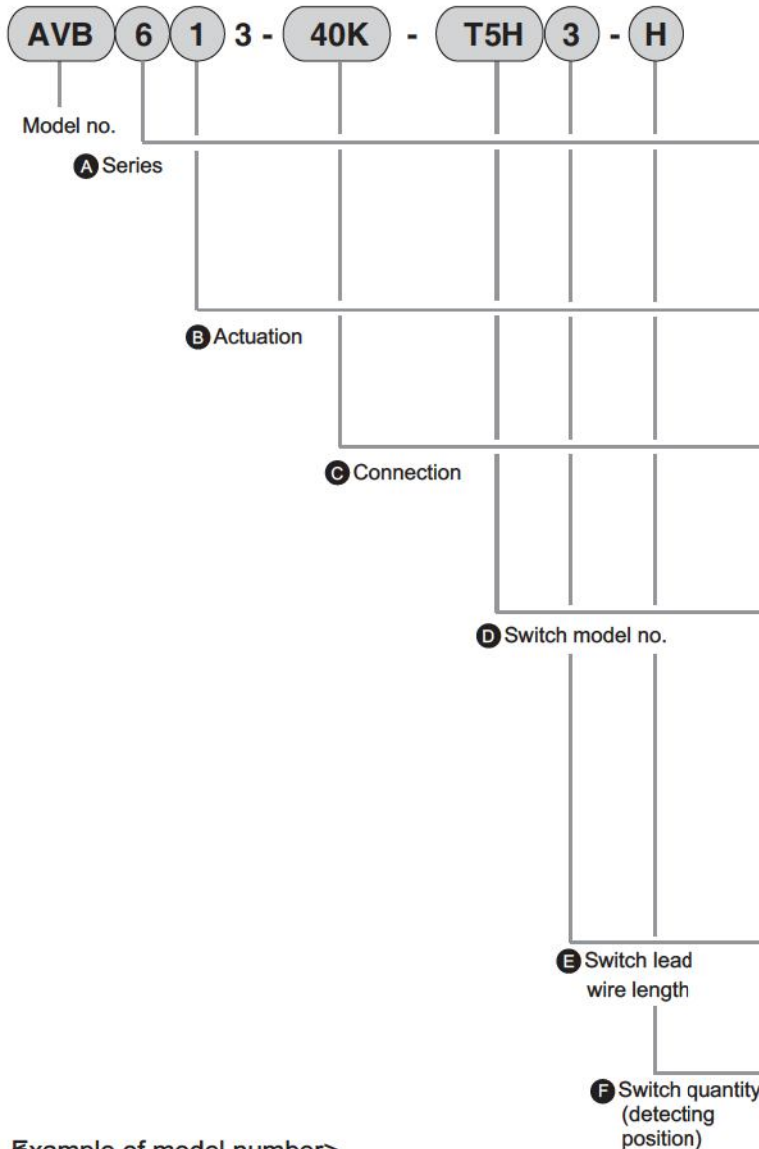
Descriptions	Proximity switch		Reed switch	
	T2H/T2V	T3H/T3V	TOH/TOV	T5H/T5V
Applications	Programmable controller	Relay, programmable controller	Relay, programmable controller	Programmable controller, relay, IC circuit (w/o lamp), Serial connection
Power voltage	—	DC10 to 28V	—	—
Load voltage/current	10 to 30VDC, 5 to 20 mA Note 3	30VDC or less, 100 mA or less	12/24VDC 5 to 50 mA 100VAC 7 to 20 mA	12/24VDC 50 mA or less 100VAC 20 mA or less
Power consumption	—	10 mA or less at 24VDC (ON)	—	—
Internal voltage drop	4 V or less	0.5 V or less	3 V or less	0 V
Light	LED (ON lighting)			—
Leakage current	1 mA or less	10 μA or less	0 mA	0 mA
Lead wire length Note 2	Standard 1 m (oil-resistant vinyl cabtire cord 2-conductor 0.2 mm ²)	Standard 1 m (oil-resistant vinyl cabtire cord 2-conductor 0.2 mm ²)	Standard 1 m (oil-resistant vinyl cabtire cord 2-conductor 0.2 mm ²)	
Maximum impact	980 m/s ²		294 m/s ²	
Insulation resistance	20 M Ω and over when measured with a 500VDC megger			
Withstand voltage	No abnormal condition when 1000VAC applied for 1 min			
Ambient temperature range	-10 to +60°C			
Protective structure	IEC standards IP67, JIS C0920 (water-tight type), oil resistance			

Note 2: 3 m and 5 m lead wire lengths are available.

Note 3: Above-mentioned load currents maximum value 20 mA is for 25 °C. The current will be lower than 20 mA if ambient temperature around the switch is higher than 25 °C. (5-10 mA at 60 °C)

Note 4: For other safety precautions regarding switch usage, refer to pages 105-109.

How to order



Symbol	Descriptions		
A Series			
5	Orifice ϕ 24		
6	Orifice ϕ 40		
7	Orifice ϕ 50		
8	Orifice ϕ 80		
B Actuation			
1	NC (normally closed)		
2	NO (normally open)		
3	Double acting		
C Connection			
25K	NW25	Only AVB5*3 is available	
40K	NW40	Only AVB6*3 is available	
50K	NW50	Only AVB7*3 is available	
80K	NW80	Only AVB8*3 is available	
D Switch model no.			
Blank	Without switch		
T0H	Axial lead wire	Reed	2 wire
T5H			
T0V	Radial lead wire	Proximity	
T5V			
T2H	Axial lead wire	Proximity	3 wire
T3H			
T2V	Radial lead wire	Proximity	2 wire
T3V			
T3V	Radial lead wire		
T3V	Radial lead wire		
T3V	Radial lead wire		
E Switch lead wire length			
Blank	1 m (standard)		
3	3 m		
5	5 m		
F Switch quantity			
H	Detect when valve is open		
R	Detect when valve is closed		
D	Detect when valve is open/closed		

Example of model number>

AVB613-40K-T5H3-H

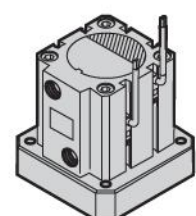
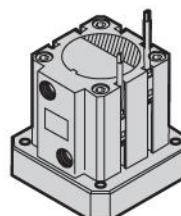
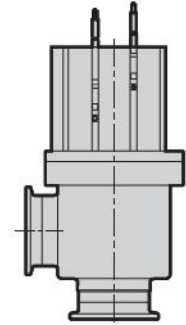
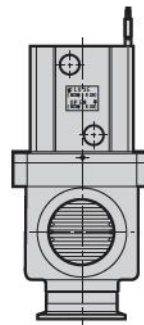
Model: AVP613 Air operated valve for high vacuum

- A** Series : Orifice ϕ 40
- B** Actuation : NC (normally closed)
- C** Connection : NW40
- D** Switch type : T5H (axial lead wire)
- E** Lead wire length : 3 m
- F** Switch quantity : Detect when valve is open

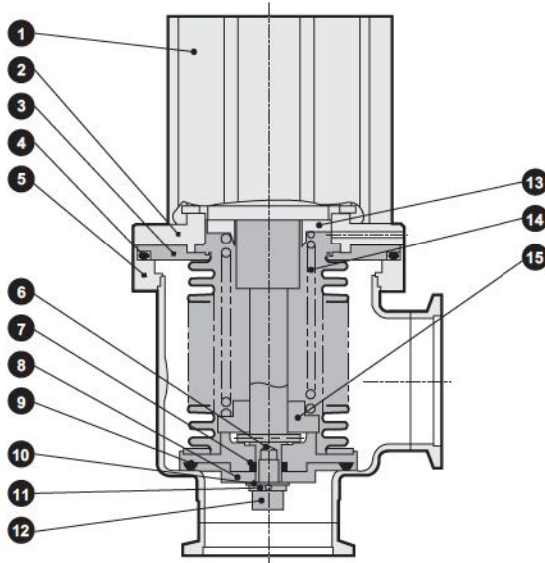
Appearance with switch installed

● T*H type
(Axial lead wire)

● T*V type
(Radial lead wire)



Internal structure and parts list



(Sectional view of NC)

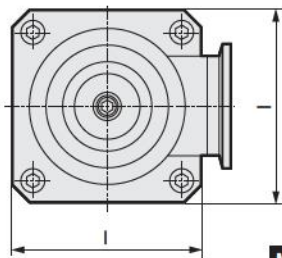
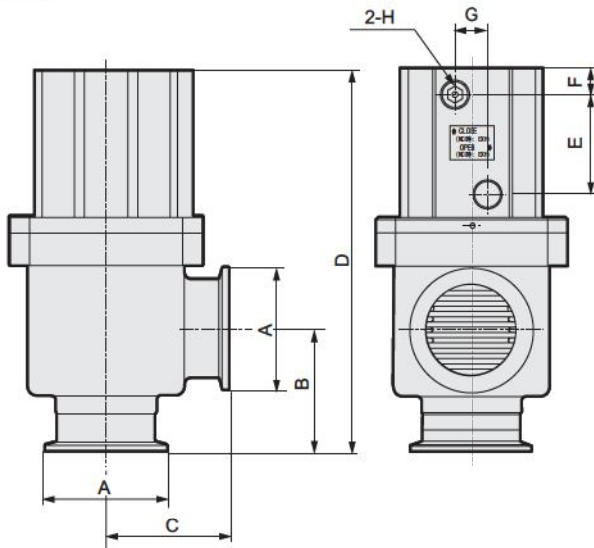
No.	Part name	Material
1	Super compact cylinder	
2	Cylinder adapter	A5056
3	Bellows assembly	ASL350/SUS316L
4	O ring	FKM
5	Body assembly	SUS316L
6	Parallel pin	SUS301
7	O ring	FKM
8	Valve disk B	SUS316L
9	O ring	FKM
10	Plain washer	SUS304
11	Spring washer	SUS304
12	Hexagon socket bolt	SUS304
13	Spring holder B	A5056
14	Spring	SWOSC-V (Electro position coating)
15	Spring holder A	A5056

Dimensions

Switch model No.
AVB3-*K-** (* * *)

● NC type Double acting

● NO



Dimensions in parentheses () under symbol D are for NO type.

Model no. / Symbol	A	B	C	D	E	F	G	H	I
AVB5*3	∅ 40 (NW25)	50	50	151.5 (162.5)	37	8	10	Rc1/8	77
AVB6*3	∅ 55 (NW40)	55	55	170.5 (181.5)	44.5	10.5	15	Rc1/4	86
AVB7*3	∅ 75 (NW50)	70	70	208	52	11	15	Rc1/4	112
AVB8*3	∅ 114 (NW80)	90	105	258	64.5	13	15	Rc3/8	137