CKD

INSTRUCTION MANUAL
FOR
High vacuum air-operated valve

AVB **3

- Before using this product, thoroughly read this instruction manual.
- In particular, read the safety precautions carefully.
- After reading this instruction manual, keep it in a safe place where all concerned personnel can refer to it immediately.

CKD Corporation

Rev.2

Safe Usage of Our Products

Our products are varieties of control valves such as solenoid valves, electric actuator valves and air operated valves and are designed to be used by people who have a basic knowledge of materials, fluids, piping, electricity and the like. We shall accept no responsibility for accidents caused by incorrect selection or usage of our products by people who have no knowledge of, or who have not undergone sufficient training with respect to these products.

The applications for which our customers put our products to use are many and varied and so therefore, it is not possible for us to provide details that cover all such applications.

Depending on the applications or the usage methods, there have been cases where it has not been possible to demonstrate the performance of products and accidents have occurred due to conditions such as the flow medium or piping. Accordingly, it is the customer's responsibility to decide how the product shall be used and to check the products' specifications in accordance with the customer's applications and the usage methods of the products.

While these products are equipped with various safety features, there may be accidents due to the customer's incorrect handling of the products.
To avoid such accidents, it is strongly advised that the instruction manual be thoroughly read and understood prior to using the product.

In addition to the handling precautions outlined in the main instructions manual, caution should also be exercised in regards to the following points.

⚠ Caution

- The coil sections of the solenoid valve and motorized valve, etc. , heat up when energized with electricity. Models with Class H specifications will become especially hot, and could cause burns if touched directly.

- There is a risk of electric shock if the electric wire connections (bare live parts) of the solenoid valve or motorized valve are touched. Always turn the power OFF before starting disassembly or inspection. Never touch the live sections with wet hands.

- When using steam and a control valve for high temperature control, the hot fluid could cause burns if it leaks out. Pipe the valve so that the hot fluid does not leak, and make sure that the hot fluid is not leaking from any section before starting use.

Thank you for purchasing the CKD air operated valve for high vacuum [AVB Series]. The AVB Series is an air operated valve developed with years of experience to Enable use in a variety of fields by many users.

CKD products are manufactured under strict quality control.

Please read this instruction manual to use the CKD product efficiency. Refer to the latest specification drawings and specifications for details on the inner structure, part lists and specifications.

—CONTENTS—

1. Safety Precautions

When designing and manufacturing devices using the CKD products, the manufacturer has an obligation to check that the safety of the device's mechanical mechanism, pneumatic control circuit or water control circuit, and the system operated by the electrical control that controls these circuits is secured.

It is important to appropriately select, use, handle and service the product to ensure that the CKD product is used safely.

Always observe the warnings and cautions to ensure the safety of the device.

Check that the safety of the device can be ensured, and manufacture a safe device.

⚠ WARNING

1. This product is designed and manufactured as a device and part for general industrial machines. This product must be handled by a well versed and skilled operated.

2. Use the product within the working range.

This product cannot be used outside the product's characteristic specifications. Never modify or additionally machine this product.

This product is intended for use in general industrial machines and parts. It is not intended for use outdoors, or under the following types of conditions or environments.

i. Use for special applications requiring safety including nuclear energy, railway, aircraft, ship, vehicle, medical devices, devices or applications coming into contact with beverages or foodstuffs, amusement devices, emergency cutoff circuits, press clutches, brake circuits or safety devices.

ii. Use for applications where human life or assets could be greatly affected, and special safety measures are required.

3. Always observe association standards and regulations, etc., related to the safety of device design and control, etc.

ISO 4414, JIS B 8370 (pneumatic system rules)
JFPS2008 (pneumatic cylinder selection and usage policy)
Occupational Safety and Sanitation Laws, and other safety rules,
association standards and regulations.

4. Never handle, pipe or remove the devices before confirming the safety.

i. Always inspect and service the machine and devices after confirming the safety of the entire system related to this product.

ii. Note that there may be hot sections or charged sections even when operation is stopped.

iii. When inspecting or servicing the device, always cut off the energy source (air supply or water supply), and cut off the power to the relevant facility. Discharge any compressed air from the system, and pay special attention to water leaks and electricity leaks.

iv. When starting or restarting a machine or device that incorporates pneumatic devices, make sure that the system safety, such as the popping out prevention measures, is secured.

5. Always observe the following warnings and cautions to prevent accidents.

■ **The safety precautions are ranked as "DANGER", "WARNING" and "CAUTION" in this section.**

DANGER: When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries, or when there is a high degree of emergency or urgency to a warning.

WARNING: When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries.

CAUTION: When a dangerous situation may occur if handling is mistaken leading to minor injuries or physical damage.

Note that some items described as "**CAUTION**" may lead to serious results depending on the situation.
In any case, important information that must be observed is explained.

Liability

1. CKD shall not be held liable for any business interruption, loss of profit, personal injury, delay costs, or any other ancillary or indirect loss, costs, or damage resulting from the use of or faults in the use of CKD products.
2. CKD shall not be held responsible for the following damage.
   i. Damage resulting from disaster or failure of CKD product due to fire from reasons not attributable to CKD, or by intentional or negligence of a third party or customer.
   ii. When a CKD product is assembled into customer equipment, damage that could have been avoided if customer equipment was provided with functions and structure, etc., generally accepted in the industry.
   iii. Damage resulting from use exceeding the scope of specifications provided in CKD catalogs or instruction manuals, etc., or from actions not following precautions for installation, adjustment, or maintenance, etc.,
   iv. Damage resulting from product modifications not approved by CKD or from faults due to combination with other software or other connected devices.

2. Warnings and Precautions for Use

2-1.Design and Selection

WARNING

Incorrect device selection and handling will result in product trouble and may cause trouble in the customer's system. Always make sure that this product's specifications and the customer's system are compatible.

i. Do not use for emergency shut-off valve.

This product is not designed as a valve to ensure safety such as an emergency shut-off valve. When using in that type of system, always provide other measures to accurately ensure safety. Incorrect device selection and handling will result in product trouble and may cause trouble in the customer's system. Always make sure that this product's specifications and the customer's system are compatible.

ii. Working fluid

This product is designed to control vacuum or inert gas. If other fluids (active gas, fluids, solids, etc.) are passed, the product's proper operation may be disrupted, or the performance could drop. Always check the compatibly of the wetted section material and working fluid before starting use. If the working fluid could solidify, make sure that there will be no problems in use before starting. If the working fluid could solidify, make sure that there will be no problems in use before starting. Avoid using fluids which will cause crystals to accumulate in the piping. Internal leaks could occur or the bellows could be damaged.

iii. Fluid quality

If dirt or foreign matter gets in the fluid, fluid could leak from the valve seat, and a satisfactory performance may not be attained. Take measures by providing a filter on the primary side, etc.

iv. Fluid temperature

Observe the fluid temperature given in the specifications. Using fluid exceeding the specifications could result in leaks or operation faults.

v. Ambient condition

- Confirm the compatibility of the product's configuration materials and ambient atmosphere before starting use.
- Observe the ambient temperature and ambient humidity given in the specifications. Use exceeding the specifications could result in leaks or operation faults.

vi. Selection

- When controlling the valve responsiveness, pay attention to the piping size, length and operation solenoid valve's flow rate characteristics.
- The inside of the cylinder and inside of the bellows are directly connected to the atmosphere. Make sure that the holes (two holes directly below operation port) connecting the inside of the bellows and the atmosphere are not plugged.

vii. Provide sufficient measures so that humans or objects are not adversely affected should this product fail.

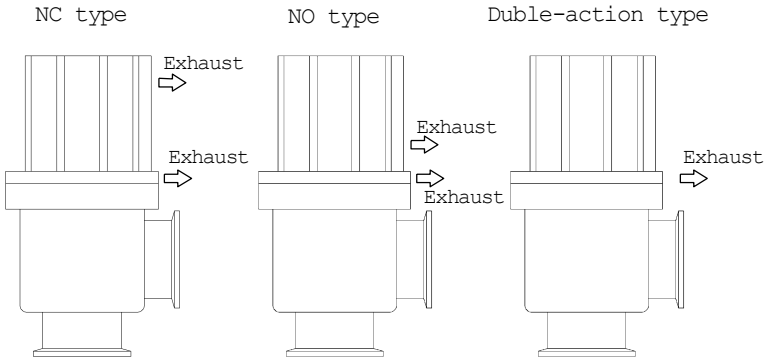
——————2-2.Installation and Adjustment——————

WARNING

Incorrect installation and piping result in product trouble, may cause trouble in the customer's system, and may result in death or serious injury. The customer is responsible for making sure that the system is operated by someone who understands the system and has read the instruction manual thoroughly. After installing the product, carry out an adequate function test and confirm that the installation state is correct.

CAUTION

- **This product is assembled in a clean room after precision cleaning. Always open the clean pack in the packaging box in a clean environment just before installation.**
- **The 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.**
- **This product has a structure which discharges air from the cylinder's exhaust port and bellows' bleed hole. Consult with CKD when the discharged air needs to be collected.**

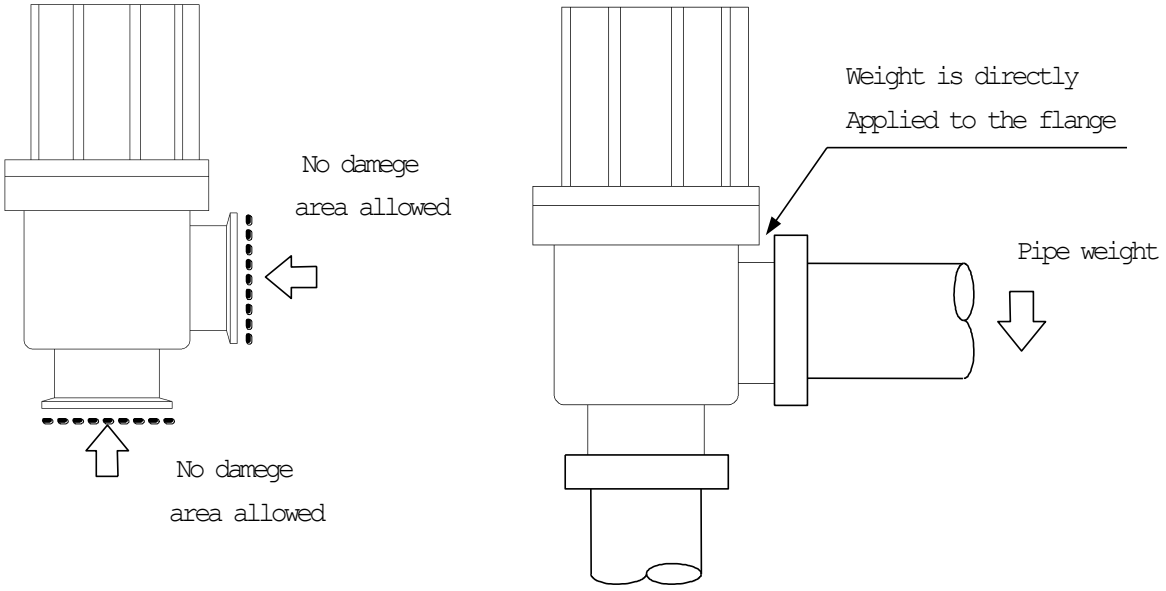


i. Securing space

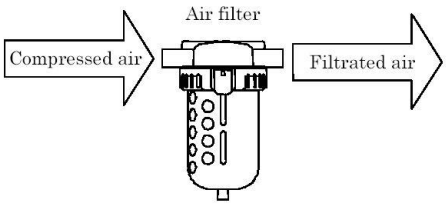
Secure enough space for installation, removal, piping and wiring work.

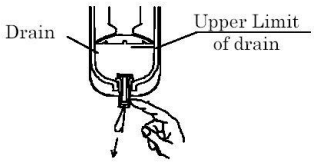
ii. Main piping

1. Dirt or burrs in the piping or during the piping work could damage the valve seat or O ring seal, and cause leaks. Always remove all dirt and burrs before installing the valve.
2. Pipe so that any tension, compression or bending, etc., caused by the pipe is not applied on the valve body.
3. Clean the vacuum flange's seal face and the center ring's O ring with ethanol, etc., before installing.
4. Handle this part carefully so that the seal face is not scratched, etc.
5. The durability could drop by the flow of exhaust, so the bellows side should be used as the exhaust side.
   The durability differs according to the working conditions, so check the situation carefully.
6. Always carry out a leak inspection after completing the piping work, and make sure that there are no leaks.

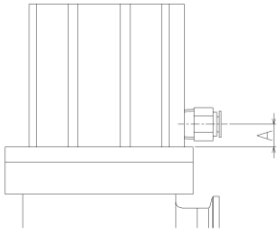


iii. Operation air





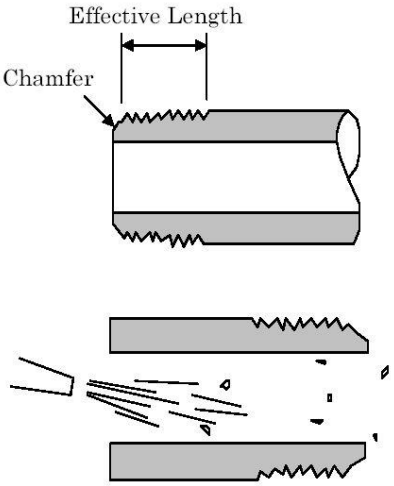
1. It is necessary to use dehumidified air that has been filtered from compressed air. Carefully select an adequate filter that has an adequate filtration rate (preferably 5μm or less), flow rate and its mounting location (as nearest to the directional control valve as possible).
2. Be sure to drain out the accumulation in the filter periodically.
3. Note that the intrusion of carbide for the compres substace) into the circuit causes malfunction of the solenoid valve and the cylinder. Be sure to carry out thorough inspection and maintenance of the compressor.
4. The usable joints are limited, so refer to the following table and select the correct joint.



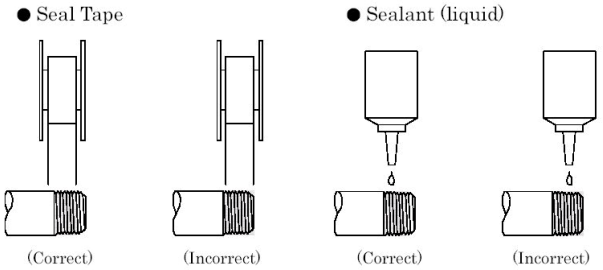
Model	Port Diameter	Port Dimension A[mm]	Available joints (CKD)	Joint unsuitable (CKD)
AVB5*3-25K	Rc1/8	8	GWS4～8-6 GWS4～8-6-S GWJS3～6-S GWL4～8-6 GWJL3～6-6 GWL4～8-6-T	GWS10-6 GWS10-6-S GWL10-6
AVB6*3-40K	Rc1/4	10.5	GWS4～10-8 GWS6～12-8-S GWL4～12-8 GWJL3～6-8 GWL4～10-8-T	GWS12-8 GWL12-8-T
AVB7*3-50K	Rc1/4	13	GWS4～12-8 GWS6～12-8-S GWL4～12-8 GWL4～12-8-T	---
AVB8*3-80K	Rc3/8	16	GWS6～16-10 GWS8～12-10-S GWL6～16-10 GWL6～12-10-T	---

iv. Air piping

1. Always use zinc plated pipes, nylon tubes, or rubber pipes for the piping located after the filter.
2. When controlling the valve responsiveness, pay attention to the piping size, length and operation solenoid valve's flow rate characteristics.
3. To remove the rust, foreign matter, and drain from the piping, install the filter as close to the air source as possible.
4. Strictly observe the specified effective screw thread of the gas piping. Additionally, 1/2 pitch from the end of the screw thread must be chamfered.



5. Before starting the piping work, perform flushing of the piping (air blow) to remove foreign matter and cutting chips from the piping.
6. When wrapping the sealing tape while connecting the pipes, start wrapping the tape clockwise from a position within two threads from the end of the pipe's threads. If the sealing tape protrudes from the pipe threads, it could be cut when screwed in. This could cause the tape to enter and lead to faults.



7. Tighten the pipes joints with the correct torque.
   - The correct torque is set to prevent air leaks and thread damage.
   - To prevent damage to the threads, first tighten the joint by hand, and then use a tool.

2-3.Using the Product

WARNING

- Use this product within the specified range. Refer to the product's latest specifications and specification drawings for details on the specified range.

WARNING

- Do not use the valves, etc., as footing or place heavy objects on them.

————2-4.Precautions for using [Option] switch————

CAUTION

i. Common items

1. Magnetic environment

   Do not operate this product in a place where a strong magnetic field or large current (large magnet or spot welder, etc.) exists. If a valves with the switch is installed in parallel to this product or the magnetic substance moves near the valves with the switch, the mutual interference may occur and affect the detection accuracy.

2. Protection of lead cord

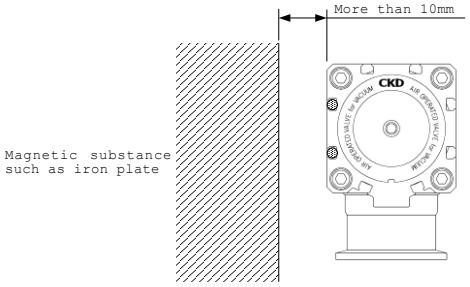
   Pay consideration to eliminate repeating bending stress or stretching of lead cord while laying the cord. To the moving portion, use such cord of flexibility as for building a robot.

3. Handling

   When the switch is installed on the valve, do not transport the valve by holding only the switch's lead wires.

4. Operating temperature

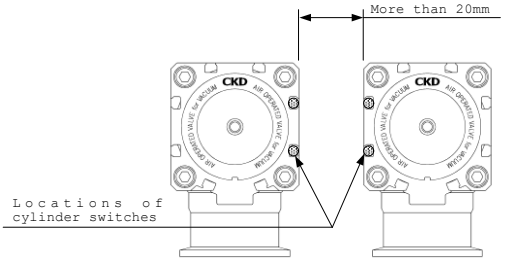
   Do not operate the product at a high temperature (60℃)Always avoid operation of the product in a hot place due to temperature characteristics of magnetic and electronics parts.



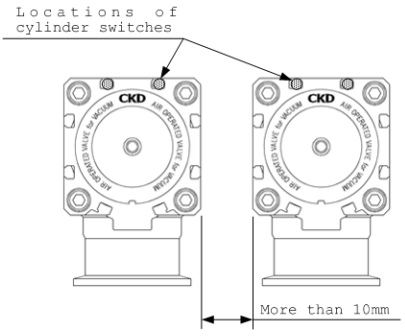
5. Impact

   Do not apply a large vibration or impact to the product when transporting the valves with the switch, or mounting or adjusting the switch.

6. Magnetic substance such as iron plate near by cylinder switch is apt to cause malfunction of cylinder switches. Keep it from cylinder surface at least10mm away (This is applicable for all bore sizes of tube).



7. It usually causes malfunction switches when plural valves with the switch are laid adjoining. Keep a space between each other as illustrated to right (This is applicable for all bore sizes of tube).



8. When adjusting the switch position, fix the switch at a position where the switch can detect each state with the valve at the completely opened state or closed state.

   After adjusting, confirm that the switch accurately detects the state.

ii. Solid state type switch (T2, T3)

1. Connection of lead wire

Comply with the color wiring specified on the illustrations. Be sure to turn the power off before starting connecting work.

An erroneous wiring or sort circuiting of load causes damage to not only switches, but also load side circuit. Wiring work without shutting electricity off may cause damage to the load side circuit

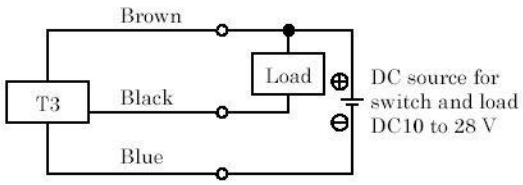


Fig.1 Fundamental circuit Example (1)
(In case the same source of power is used.)

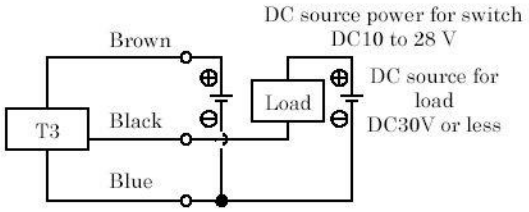


Fig.2 Fundamental circuit Example (2)
(In case individual sources of power are

2. Protection of output circuit

Install some protective circuit as illustrated in Fig. 3 when inducing type load (Relay or solenoid valve) are to be used because those types apt to generate surge current switch off.

Install some protective circuit as illustrated in Fig. 4 when capacitor type load (Capacitor type) are to be used, because these types apt to generate a dash current when turning the switch ON.

If the length of lead wire is more than 10m, install some protective circuit as illustrated in Fig. 5 or 6 (in case of model T2) and Fig 7 (in case of model T3).

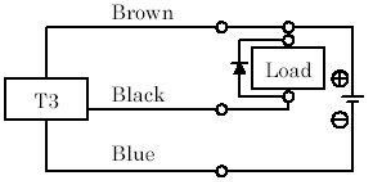
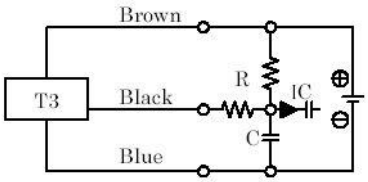


Fig.3 An example of using inducing load together with surge absorptive element (diode). (Hitachi Mfg. made diode V06C or equivalent is recommended.)



Flg.4 An example of using capacitor type load together with current regulating resister R.
Comply with the following formula to figure out required R.

$$\frac{V}{0.05} = R(\Omega)$$

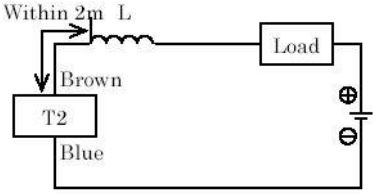


Fig.5 · Choke coil
L= a couple hundred μ H to a couple mH surpassing high frequency characteristic
· Install it near by a switch (within 2m).

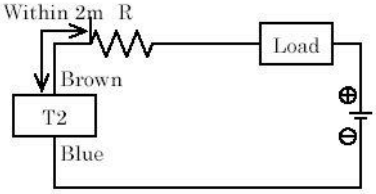


Fig.6 · Dash current restriction resister.
R= As much large resister as the load circuit can afford.
· Install it near by a switch (within 2m).

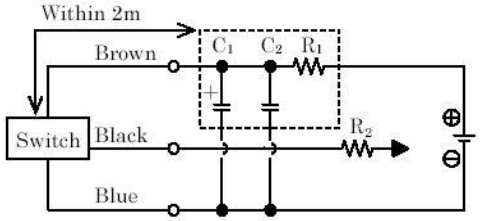


Fig7・Electric power noise absorptive circuit.
C_1=20 to 50 μF electrolytic capacitor
(withstanding 50V or more)
C_2=0.01 to 0.1 μF ceramic capacitor
R_1=20 to 30Ω

・Dash current restriction resister.
R_2=As much large resister as the load circuit can afford.
・Install it nearby the switch (Within 2m)

3. Connection to a programmable controller (Sequencer).

Type of connection varies depending upon the model of the programmable controller. Refer to the following Fig. 8 to 12 respectively.

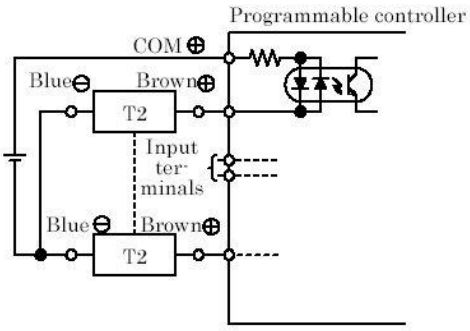


Fig.8 An example of T2 connection to source input type (an external power source)

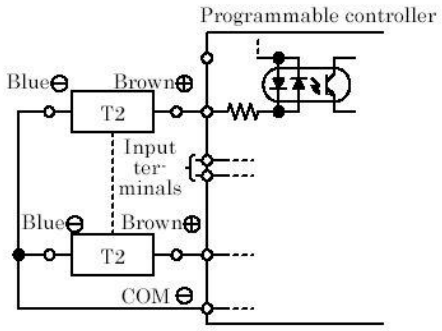


Fig.9 An example of T2 connection to source input type (an internal power source)

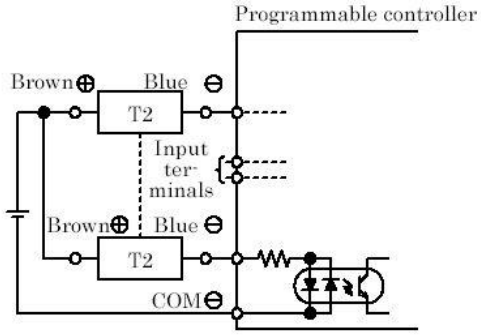


Fig.10 An example of T2 connection to source input type

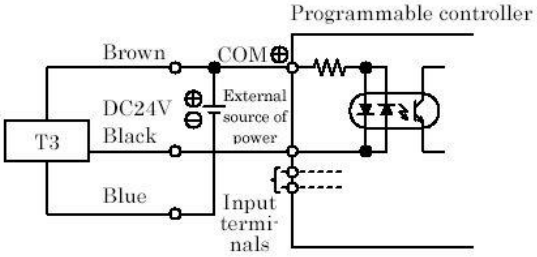


Fig.11 An example of T3 connection to source input type (an internal power source)

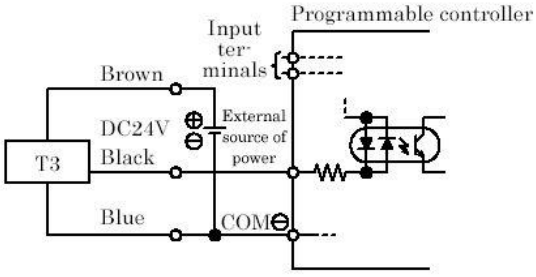


Fig.12 An example of T3 connection to source input type (an internal power source)

4. Parallel connection

The total voltage will decrease when the T2 switches connections have a leak. Therefore, confirm the input specifications for the programmable controllers, which are the connecting load. However, dimming or total failure of the lamp may exist. T3 switches hardly ever leak. When less than 10μA, then leakage may occur. Usually dimming and failure of the lamp do not occur.

iii. Reed switch type switch (T0, T5)

1. Connection of lead wire

Instead of connecting a cord to the power source directly, always connect to the load in series. In case of model T0 connection, pay the following precautions.

A) When using the switch for DC power supply, connect the brown and blue lines to the positive and negative sides, respectively. If these lines are connected reversible, the switch is activated, but the lamp is not lit.

B) When the switch is connected to an AC relay or a programmable controller input, the lamp on the switch is not lit if the half-wave rectification is performed in the connected circuit. If this occurs, reverse the polarities of the switch lead wire connection. The lamp may then be lit.

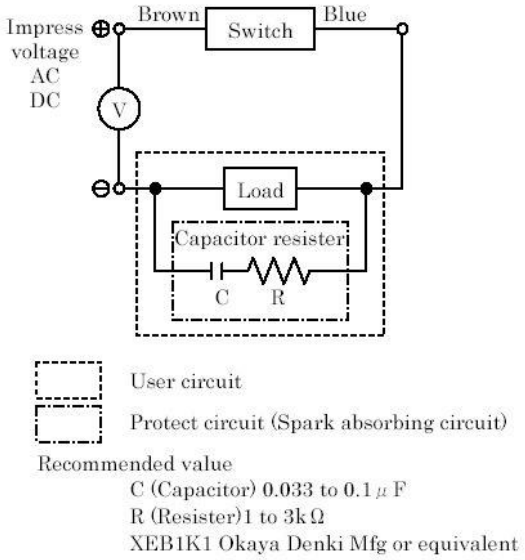
2. Contact protective measures

When an inductive load, such as relay is used or the wire length exceeds that stated in Table 1, always install a contact protective circuit.

Table 1

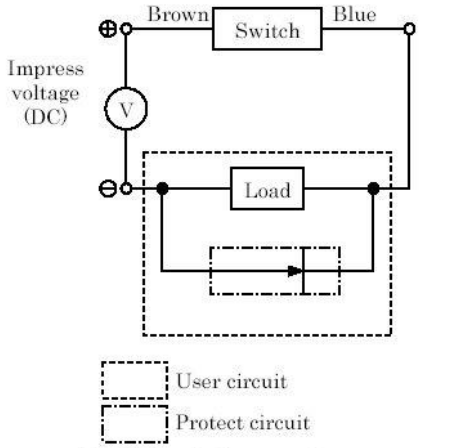
Electric power	Length of wire
DC	100m
AC	10m

A) Protective circuit when connecting an inductive load.



Recommended value
C (Capacitor) 0.033 to 0.1μF
R (Resister) 1 to 3kΩ
XEB1K1 Okaya Denki Mfg or equivalent

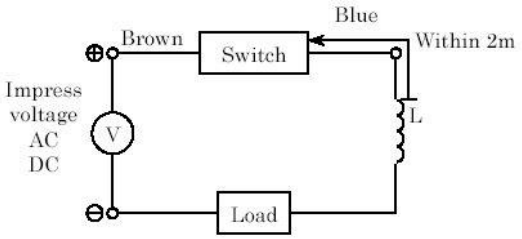
Fig.1 When capacitor resister is used.



Rectifying diode, general use
Hitachi Mfg. product V06C or equivalent

Fig.2 When diode is used.

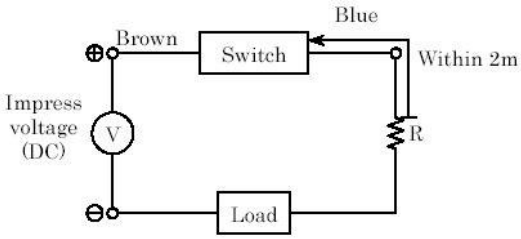
B) Protective circuit when the wire length exceeds that stated Table 1



・ Choke coil
L=a couple hundred μH to a couple mH surpassing high frequency characteristic

・ Install it near by a switch (within 2m).

Fig.3



・ Dash current restriction resister
R=As much large resister as the load circuit can afford.

・ Install it near by a switch (within 2m).

Fig.4

3. Capacity of contact points

Avoid using a load exceeding the max. capacity of contact points. On the other hand, in case of T0 model, switch lamp may not be lit sometimes when current is lower than rated current.

4. Relay

Always use the relays listed below.

Omron Corporation ··· MY type

Fuji Electric Co., Ltd. ··· HH5 type

Matsushita Electric Works, Ltd ··· HC type

5. Serial connection

Total voltage loss, when connected T0 switches in series, equals to the sum of respective voltage loss of each switch.

The total voltage loss becomes equivalent to one T0 (approx. 2.4V) when connecting the combination of one T0 for actuation confirming and rest of T5 switches.

Lamp is lit only when all switches turn on.

6. Parallel connection

There is no restriction in parallel connection number of switches of these types.

Multi number connection of model T0 , sometimes, cause a dimmed lamp or complete lamp failure.

3. Maintenance and Inspection

――――――――――――――――3-1.Periodic Inspection――――――――――――――――

WARNING

i. Always follow the instructions given in the instruction manual.

ii. Always turn the power OFF and release the operation air, fluid and pressure before starting. Do not touch the live sections with wet hands. There is a risk of electric shock.

iii. Before replacing the valve, sufficiently purge out the residual gas in the valves and piping with inert gas, etc., so that devices and people in the area are not affected.

iv. Carefully remove all dirt and burrs before installing the valve.

v. After completing the work, always carry out a leak inspection and confirm that there are no leaks.

vi. Do not disassemble the product. The product warranty will be invalid once the product is disassembled.

vii. Periodic inspection
To ensure the product is used in the optimum state, carry out a periodic inspection (confirmation of operation, leak check, etc.) once or twice a year.

viii. Inspection items
- Leaks outside of the valve
- Leaks from the valve seat (internal leaks)
- Smooth valve operation
- Loosening of screws at pipe or valve
- O ring wear or corrosion

——— 3-2.Precautions for disassembly and reassembly ———

CAUTION

The AVB**3 structure makes it easy to disassemble and assemble the valve but does not necessarily guarantee the performance after reassembly. The performance of a product which has been disassembled and reassembled is not covered by the warranty.

If the valve must be disassembled, follow the procedures given in section 3-3 and 3-4. Failure to follow the disassembly procedures when disassembling or reassembling the contract may prevent the specified performance from being satisfied.

i. The product must be disassembled and reassembled by an operator having basic and general knowledge of machines (materials, fluids, piping, electricity, etc). The specified performance may not be satisfied if work is carried out by an inexperienced or untrained operator.
ii. Disassemble and reassemble the product in a clean room.
iii. Do not apply torsion, tension or compression strain on the bellows. The durability of the bellows could be affected, and the bellows performance may be lost.
iv. Do not touch the bellows with bare hands. The bellows durability could be affected by corrosion.
v. Do not make scratches or dents, etc., on the vacuum seal surface.
vi. Do not disassemble any section not explained in the Disassembly Procedures. Performing disassembly work not given in the procedures can be extremely hazardous.
vii. Tighten the screws with the specified torque when reassembling. Excessive or insufficient tightening could hamper the product performance.
viii. Carefully check the parts so that dirt, etc., is not stuck on the seal section when reassembling.
ix. Check the following performance after reassembly:
    - Leakage of fluids outside of the valve
    - Leaks from the valve seat (internal leaks)
    - Smooth valve movements
    - Loosening of piping section and valve screws
    - Wear and corrosion of O-ring
x. Use suitable tools for disassembly and reassembly. Tighten the screws with the specified torque when reassembling. Excessive or insufficient tightening could hamper the product performance.

A) Tools

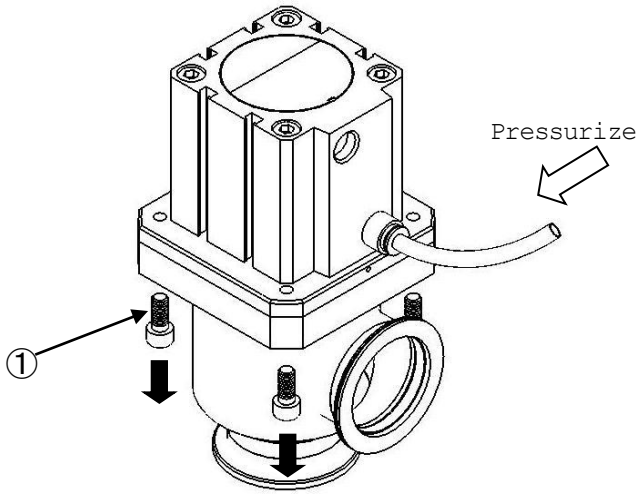
Hexagon wrench

Torque wrench (torque driver)

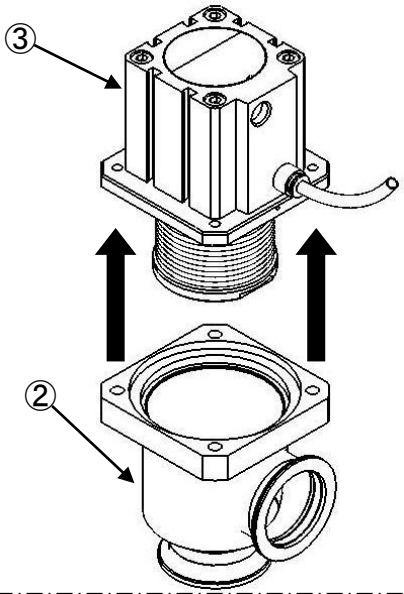
B) List of tool sizes and tightening torques

Model	Body-Cylinder		Bellows assy	
	Size	Tightening torque [N·m]	Size	Tightening torque [N·m]
AVB5*3	Round nominated 4	3.0	Round nominated 3	1.4
AVB6*3	Round nominated 5	5.0	Round nominated 5	1.8
AVB7*3	Round nominated 6	12.0	Round nominated 5	1.8
AVB8*3	Round nominated 6	12.0	Round nominated 6	2.2

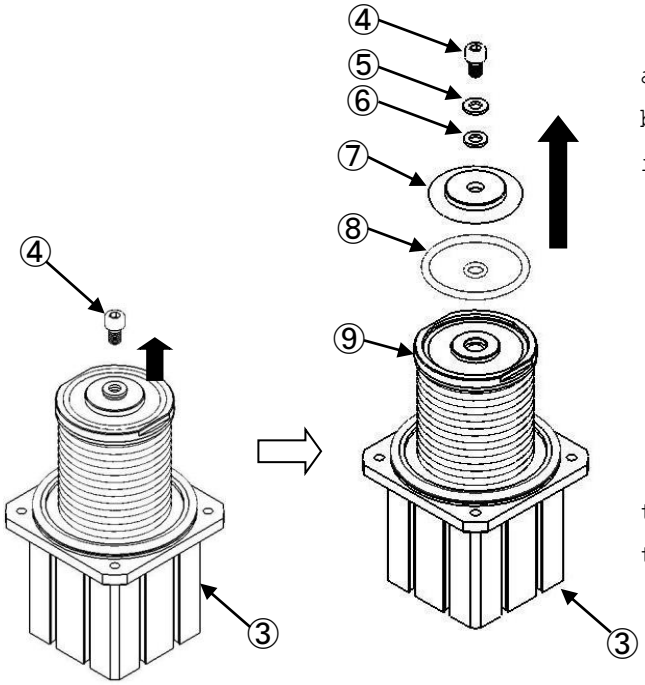
3-3. Disassembly procedures



Pressurize the valve open port, and open the valve. (Pressure: 0.4 to 0.6MPa, Only AVB*13)
Remove the four hexagon socket bolts (1).



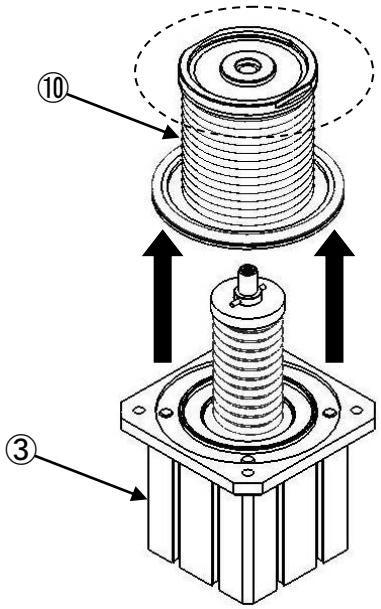
Pull the actuator assembly (3) out of the body (2). Release the pressure applied on the valve open port. (Only AVB*13)



Remove the hexagon socket bolt (4) from the actuator assembly (3). The following parts can be removed after the hexagon socket bolt (4) is removed.

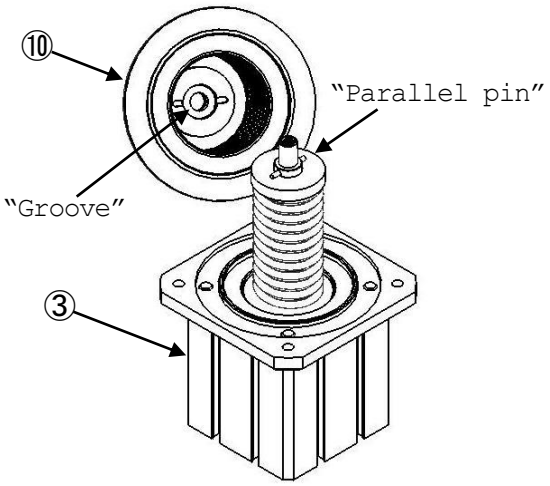
- Spring washer(5)
- Flat washer(6)
- Valve disk B(7)
- O ring(8)
- O ring(9)

When using the "NO type or double acting type", the valve close port must be pressurized and the valve closed during the work.

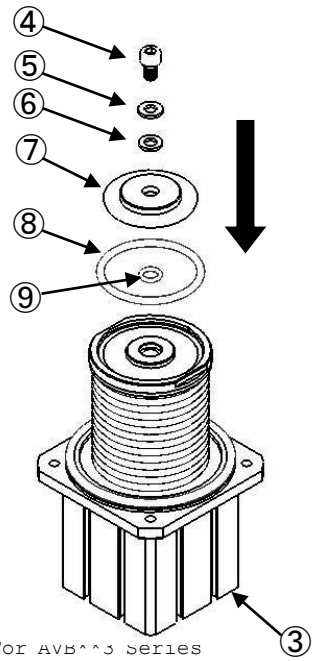


Hold the cylinder section on the actuator assembly (3), and pull the bellows assembly (10) from the rod. Hold the fitting (shown with the dotted line) on the bellows assembly (10). Do not hold the bellows section. Failure to observe this could affect the bellows performance, such as reduce the bellows durability.
With the NC type and NO type, the spring is pressed with a parallel pin, so the spring will not pop out. With the double-acting type, the parallel pin could drop off.
This completes the disassembly.
Replace the O ring, etc., at this time.
The size of the required O ring differs according to the port size. Check the specifications drawings for the correct size.

3-4. Reassembly procedures

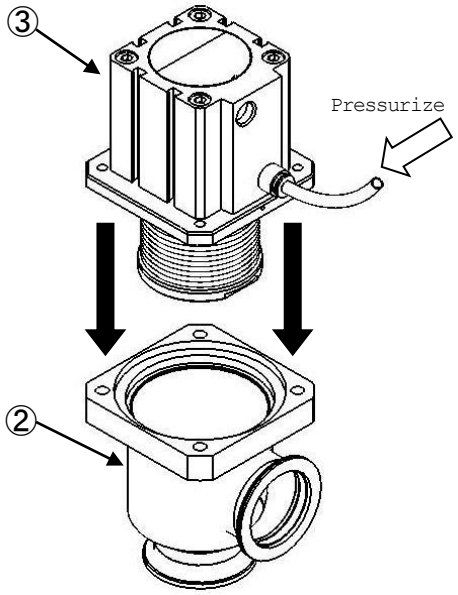


Insert the bellows assembly (10) into the actuator assembly (3). Align the "groove" on the inner side of the bellows assembly (1) with the "parallel pin" on the actuator assembly (3), and insert.
To confirm that the "parallel pin" is accurately set into the "groove", turn the bellows assembly (10) and make sure it does not turn.

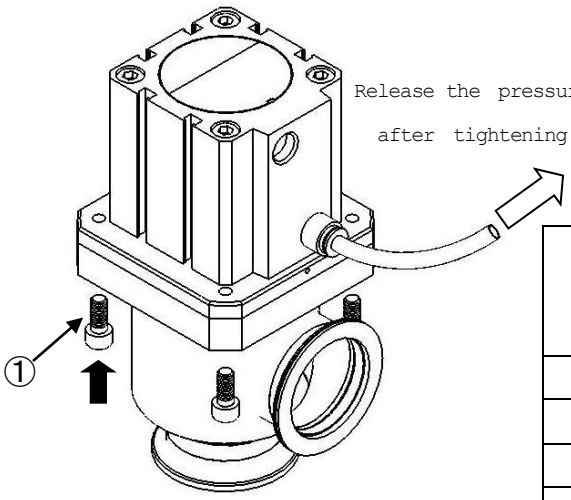


Follow the disassembly procedures in reverse and assembly parts (4) to (9). Hold the fitting instead of the bellows, and tighten the hexagon socket bolt (4). The hexagon socket bolt (4) must be tightened with the tightening torque matching each port size.

Model	Size	Tightening torque [N•m]
AVB5*3	Round nominated 4	1.4
AVB6*3	Round nominated 5	1.8
AVB7*3	Round nominated 5	1.8
AVB8*3	Round nominated 6	2.2



Pressurize the valve open port, and open the valve.
(Pressure: 0.4 to 0.6MPa, Only AVB*13)
Insert the actuator assembly (3) into the body (2).



Tighten the four hexagon socket bolts (1). The hexagon socket bolts (1) must be tightened with the tightening torque matching each port size.

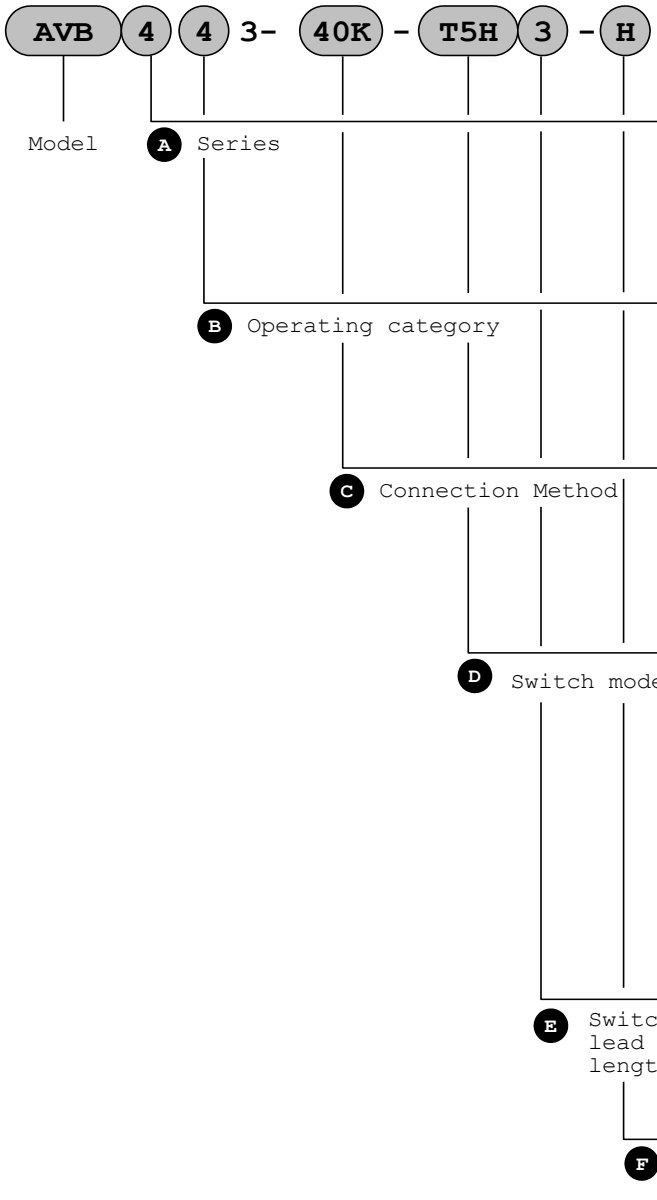
Model	Size	Tightening torque [N·m]
AVB5*3	Round nominated 4	3.0
AVB6*3	Round nominated 5	5.0
AVB7*3	Round nominated 6	12.0
AVB8*3	Round nominated 6	12.0

Release the pressure after tightening the hexagon socket bolt (1). This completes the reassembly.

Check the following performance after reassembly:

- Leakage of fluids outside of the valve
- Leaks from the valve seat (internal leaks)
- Smooth valve movement
- Loosening of piping section and valve screws

4. How to Order



Symbol	Details
A Series	
5	Orifice φ24
6	Orifice φ40
7	Orifice φ50
8	Orifice φ80

B Connection Method	
1	NC type
2	NO type
3	Double-action type

C Connection Method		
25K	NW25	Available only for AVB5*3
40K	NW40	Available only for AVB6*3
50K	NW50	Available only for AVB7*3
80K	NW80	Available only for AVB8*3

D Switch model			
No symbol	No switch		
T0H	Lead wire Straight type	Reed type	2-wire type
T5H			
T0V	Lead wire L-shape type		
T5V			
T2H	Lead wire Straight type	Solid state type	3-wire type
T3H			2-wire type
T2V	Lead wire L-shape type		3-wire type
T3V			

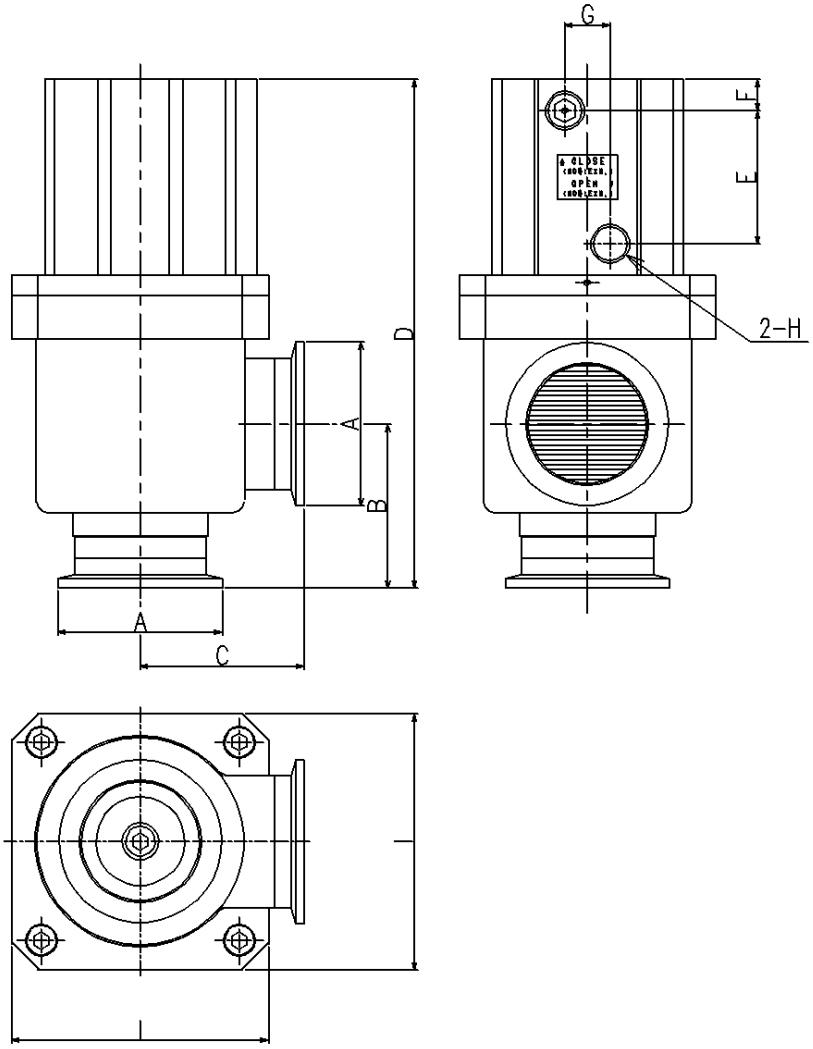
E Switch lead wire length	
No symbol	1m (standard)
3	3m
5	5m

F Number of switches	
H	Detect at valve open
R	Detect at valve close
D	Detect at valve open and close

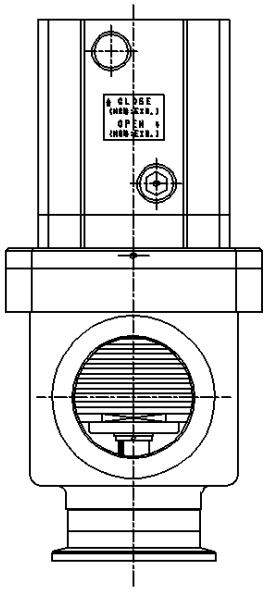
5. Dimensions

AVB**3-**k

● **NC type, Double-action type**



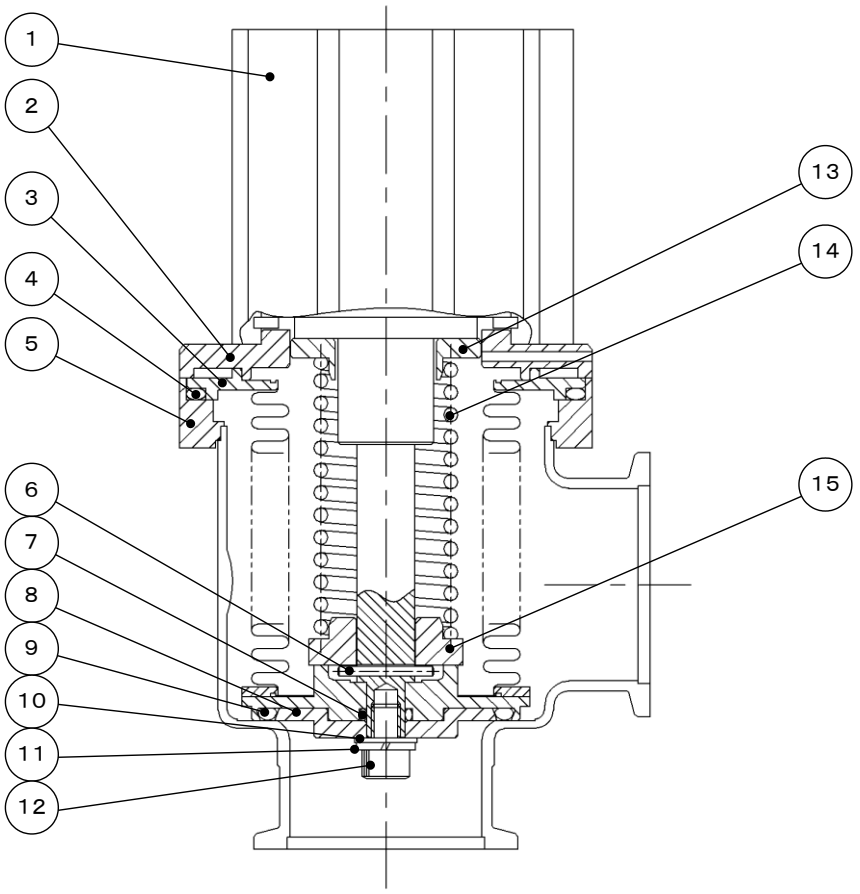
● **NO type**



MODEL	A	B	C	D	E	F	G	H	I
AVB 5*3	ϕ40 (NW25)	50	50	151.5 (162.5)	37	8	10	Rc1/8	77
AVB 6*3	ϕ55 (NW40)	55	55	170.5 (181.5)	44.5	10.5	15	Rc1/4	86
AVB 7*3	ϕ75 (NW50)	70	70	208	52	11	15	Rc1/4	112
AVB 8*3	ϕ114 (NW80)	90	105	258	64.5	13	15	Rc3/8	137

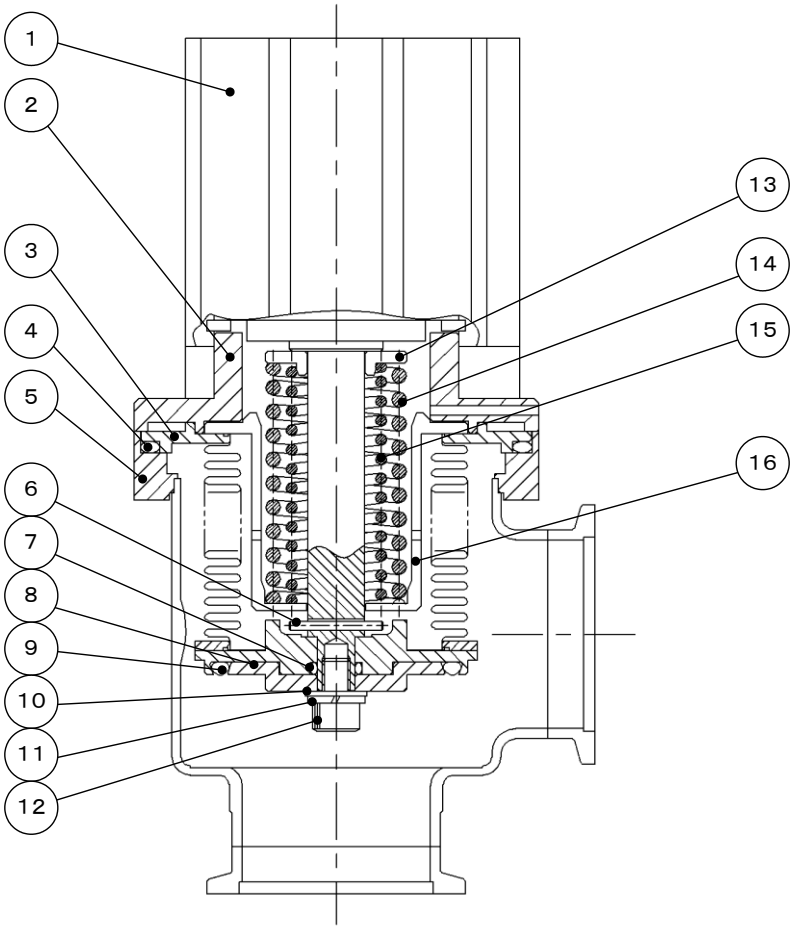
6. Internal Structure

AVB*13-**k [NC type]



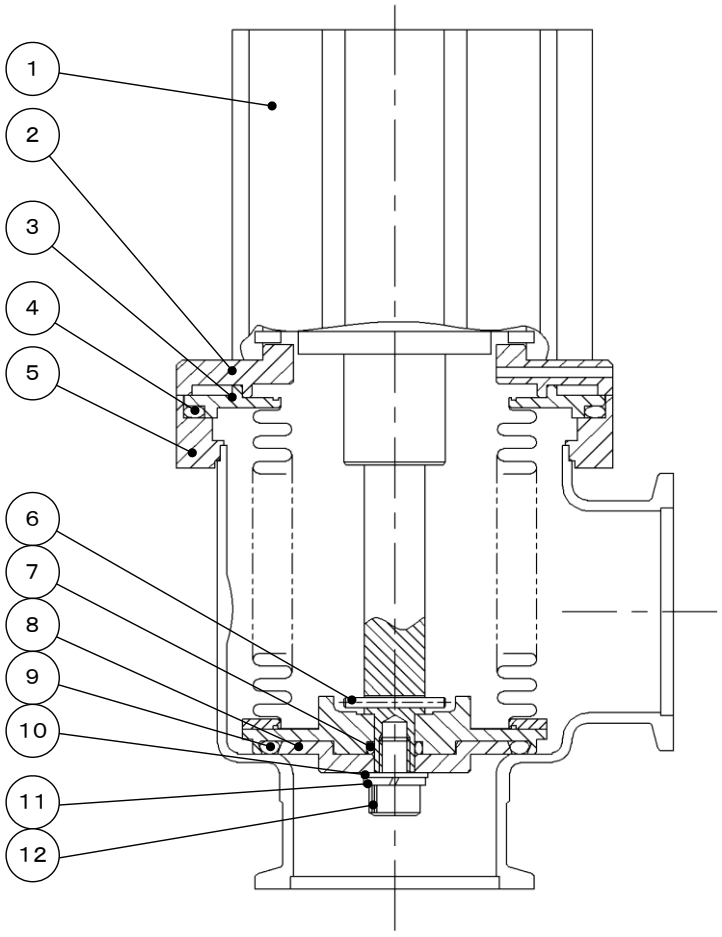
Part No.	Part name	Marerial	Qty.	Remarks
1	Actuator assembly	---	1	
2	Cylinder Adapter	A5056	1	
3	Bellows assembly	ASL350/SUS316L	1	
4	O ring	FKM	1	
5	Body	SUS316L	1	
6	Parallel pin	SUS301	1	
7	O ring	FKM	1	
8	Valve disk B	SUS316L	1	
9	O ring	FKM	1	
10	Flat washer	SUS304	1	
11	Spring washer	SUS304	1	
12	Hexagon socket bolt	SUS304	1	
13	Spring retainer B	A55056	1	
14	Spring	SWOSC-V	1	Electrodesposition coating
15	Spring retainer A	A5056	1	

AVB*23-**k [NO type]



Part No.	Part name	Marerial	Qty.	Remarks
1	Actuator assembly	---	1	
2	Cylinder Adapter	A5056	1	
3	Bellows assembly	ASL305/SUS316L	1	
4	O ring	FKM	1	
5	Body	SUS316L	1	
6	Parallel pin	SUS301	1	
7	O ring	FKM	1	
8	Valve disk B	SUS316L	1	
9	O ring	FKM	1	
10	Flat washer	SUS304	1	
11	Spring washer	SUS304	1	
12	Hexagon socket bolt	SUS304	1	
13	Spring retainer B	C3604	1	
14	Spring B	SWOSC-V	1	Electrodesposition coating
15	Spring A	SWOSC-V	1	Electrodesposition coating
16	Spring retainer A	C33604	1	

AVB*33-**k [Double-action type]



Part No.	Part name	Marerial	Qty.	Remarks
1	Actuator assembly	---	1	
2	Cylinder Adapter	A5056	1	
3	Bellows assembly	ASL350/SUS316L	1	
4	O ring	FKM	1	
5	Body	SUS316L	1	
6	Parallel pin	SUS301	1	
7	O ring	FKM	1	
8	Valve disk B	SUS316L	1	
9	O ring	FKM	1	
10	Flat washer	SUS304	1	
11	Spring washer	SUS304	1	
12	Hexagon socket bolt	SUS304	1	