Controller for **IAVB**

RoHS

General specifications

Item		IAVB-CONT			
		IAVB217	IAVB317	IAVB417	IAVB517
Power supply voltage		24 VDC ± ±10% (stabilized power supply with ripple rate 1% or less)			
Current consumption		0.5 A or less (fuse capacity 1 A)			
Ambient temperature °C		10 to 40			
External input	No. of inputs	2 points			
	Input method	Dry contact input (photo coupler isolation)			
	Input capacity	24 VDC, 10 mA or less			
External output	No. of output points	2 points			
	Output method	NPN open collector output (photo coupler isolation)			
	Load capacity	30 VDC, 15 mA or less			
	Internal voltage drop	1.2 VDC or less			
Analog voltage input	Number of points	2 points			
	Type	0-10 VDC 0-5VDC (both input load 20 kΩ)			
Analog voltage output	Number of points	1 points			
	Output	0 to 10 VDC (connecting load 10 kΩ)			
Repeatability		Within ±1% F.S.			
Operation mode		Operation via serial connection or contact input and analog voltage (selection method)			
Communication method		RS-485			
Pressure control count		1ch			

Use a power source with sufficient margin against fuse capacity (current).

How to order

How to order controller individual model

IAVB-CONT

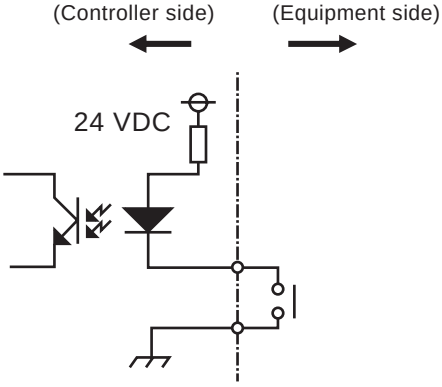
How to order valve cable individual model

IAVB-VCBL-03

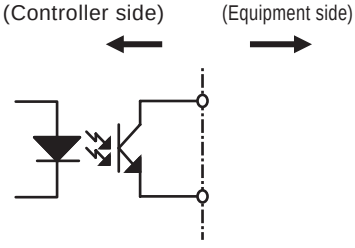
Cable length 3 m

Interface circuit

Dry contact input : Photo coupler input
When the contact is closed, about 5 mA flows.

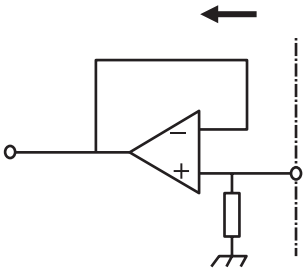


NPN open collector output: Photo coupler output
Load capacity 30 VDC, 15 mA or less
Internal voltage drop 1.2 VDC or less



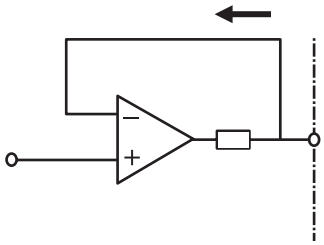
Analog voltage input: Follower input
Input load 20 kΩ

(Controller side) (Equipment side)



Analog voltage output: Follower output
Analog voltage output: Follower output

(Controller side) (Equipment side)



Connector terminal assignment of controller

1.MAIN (D-SUB 25pin male)

Pin No.	Signal name	Input/output	Remarks
1	Grounding terminal	Ground	Grounding
2	(NC)	-	(Connect nothing)
3	Power supply 24 VDC	Power supply input (+)	Power supply (+)
4	(NC)	-	(Connect nothing)
5	(NC)	-	(Connect nothing)
6	(port for CKD inspection)	-	(Connect nothing)
7	Press monitor output (0 to 10 V)	Analog output	0 to 10 V is equivalent to sensor 0 to 100%
8	Press command value input (0 to 5 V)	Analog input	0 to 5 V is equivalent to sensor 0 to 100%
9	Valve status output	NPN output	Photo coupler collector output 2
10	Alarm status output	NPN output	Photo coupler collector output 1
11	Valve operation input COM	Contact input (-) COM	Contact input (-) COM
12	Valve operation contact 2 input	Contact input (+)	Photo coupler cathode 2
13	AGND	Analog GND	Analog 0 V
14	(NC)	-	(Connect nothing)
15	(NC)	-	(Connect nothing)
16	Power supply GND	Power supply input (-)	Power supply (-)
17	(NC)	-	(Connect nothing)
18	AGND	Analog GND	Analog 0 V
19	(NC)	-	(Connect nothing)
20	AGND	Analog GND	Analog 0 V
21	AGND	Analog GND	Analog 0 V
22	(Spare)	(NPN output)	(Photo coupler collector output 3)
23	Status COM	Photo coupler emitter COM	Photo coupler emitter COM
24	Valve operation contact 1 input	Contact input (+)	Photo coupler cathode 1
25	(port for CKD inspection)	-	(Connect nothing)

2.PRESS (D-SUB 9pin female)

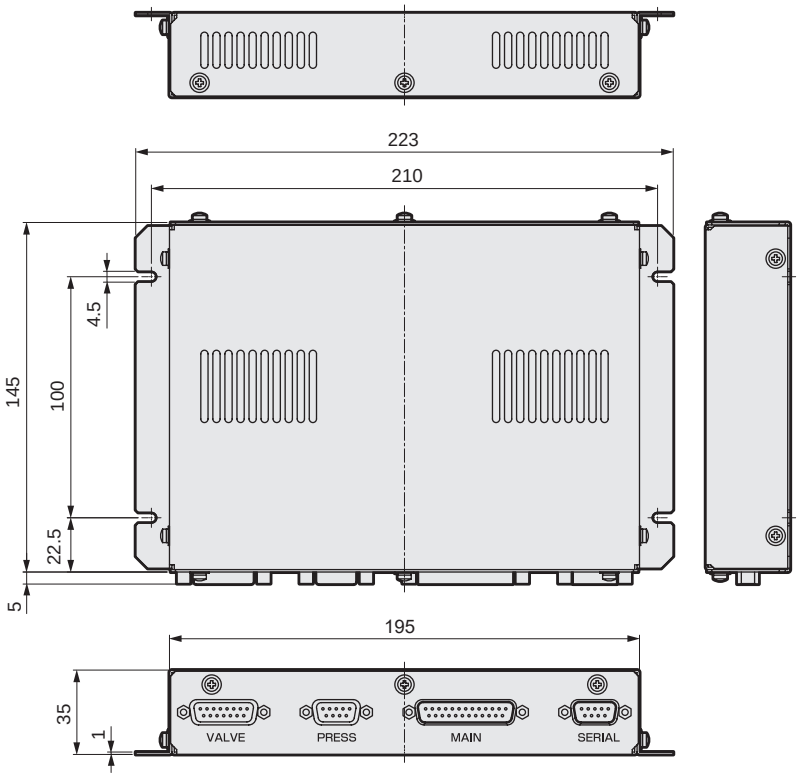
Pin No.	Signal name	Input/output	Remarks
1	(port for CKD inspection)	-	(Connect nothing)
2	(port for CKD inspection)	-	(Connect nothing)
3	Press input (0 to 10 V)	Analog input	Chamber pressure sensor
4	PRESS GND	Analog GND	Sensor signal GND
5 to 9	(NC)	-	(Connect nothing)

3.SERIAL (D-SUB 9pin male)

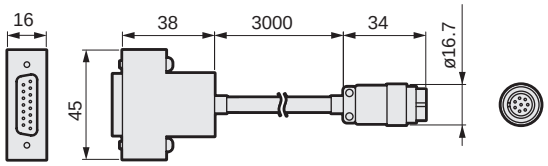
Pin No.	Signal name	Input/output	Remarks
1	NC	-	(Connect nothing)
2	NC	-	(Connect nothing)
3	TXD(+)/ RXD(+)	Transmission/reception (+)	Controller (+)↔ Host (+)
4	TXD(-)/ RXD(-)	Transmission/reception (-)	Controller (-)↔ Host (-)
5	SG	Signal ground	Serial power supply 0 V
6 to 9	(NC)	-	(Connect nothing)

Dimensions

●IAVB-CONT



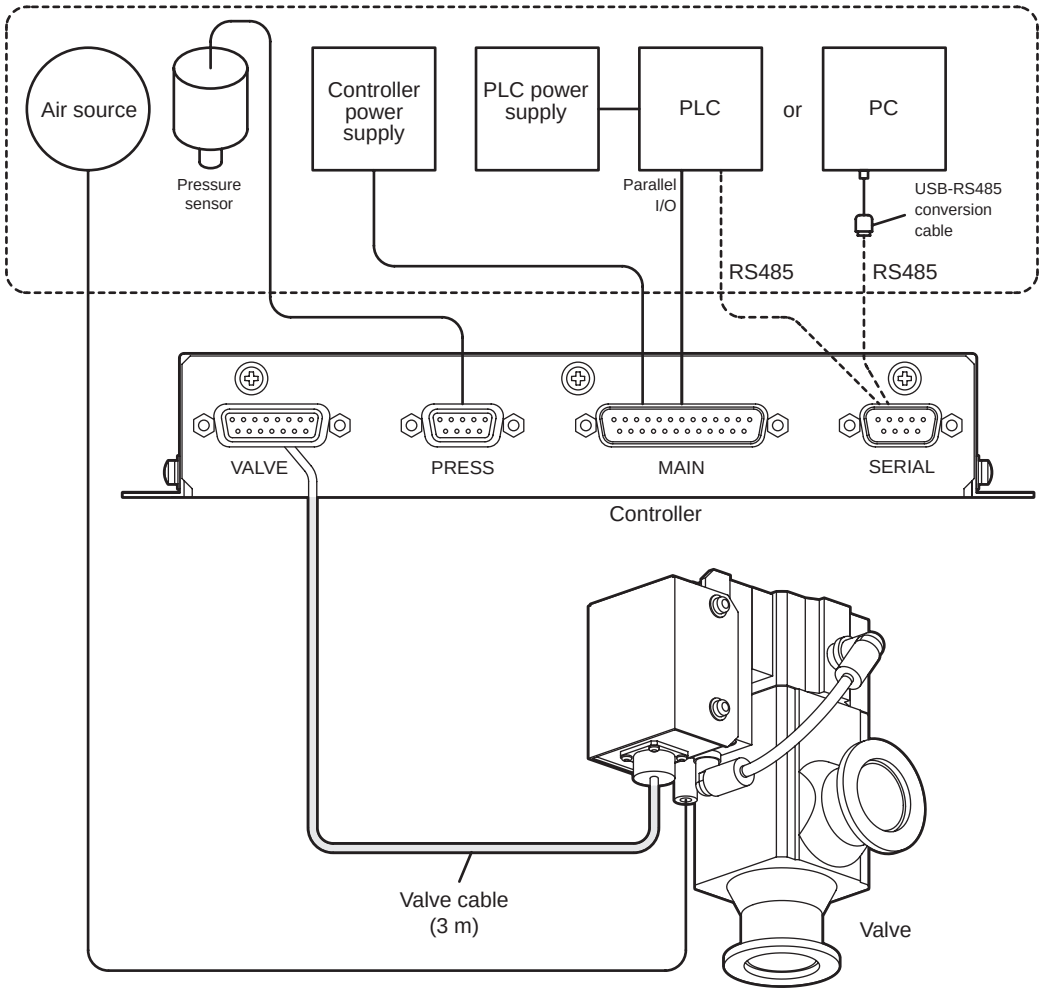
●IAVB-VCBL-03



Valve cable

System configurations table

System prepared by customer



- Capacitance manometer (0-10V output) is recommended for pressure sensor. (For other pressure sensors, consult with CKD.)
- When using a computer, prepare a USB-RS-485 conversion cable.

Configuration of product

Name	Quantity
Valve	1
Controller	1
Valve cable	1

This product is a system product intended for communication and control with the customer's PLC. The customer is responsible for confirming the compatibility of CKD products with the systems, machines and equipment used. When purchasing a controller, support freeware is included. This software is freeware intended to support rapid startup for customers. Its operation in customer computer environments is not guaranteed.

Related products	High vacuum components				Components for process gases						
	Safety precautions	Vacuum pressure control valves	Manual valve	Air operated valve	Safety precautions	Integrated gas supply system	Regulator	Other valves for process gas	High durability	AGD/OGD/ MGD-R Series	LGD Series

Vacuum pressure control valves

Safety Precautions

Be sure to read this section before use.
Refer to Intro Page 9 for general precautions.

Design / selection

1. Checking the specifications

DANGER

- Do not use in places where dangerous goods such as ignitable substances, inflammable substances or explosives are present. There is a possibility of ignition, combustion or explosion.

- This product is not waterproof. Ensure that the product is free of water droplets and oil droplets. Failure to do so may cause fire or malfunction.

- Be sure to use a DC stabilized power supply (24VDC±10%). Connecting directly to the AC power supply may cause fire, explosion, damage, etc.

WARNING

- Incorrect component selection and handling can cause problems not only in this product, but also to your system. Check the specifications of this product and the compliant with your system before use.

- If the machine stops in the event of a system failure such as emergency stop or power outage, equipment damage or injury occur. Design a safety circuit or device to prevent this.

- Install indoors with low humidity.
  There is a risk of electric leakage or fire accidents in places exposed to rainwater or where there is high humidity (humidity of 85% or more, condensation). Oil drops and oil mist are also strictly prohibited.

- Follow the use and storage temperature and use and store in a environment with no condensation.
  Failure to do so may cause abnormal stop or shorten the service life of the product. Ventilate in locations where heat may build up.

- Install in a location free from direct sunlight, dust, and corrosive gas/explosive gas/inflammable gas/ combustibles, and away from heat sources. Chemical resistance has not been taken into account.
  Failure to comply may lead to damage, explosion, or combustion.

- Use and store in locations free from strong electromagnetic waves, ultraviolet rays, or radiation.
  Otherwise, malfunction or damage may result.

CAUTION

- While wiring, ensure that inductive noise is not applied and that high-current or strong magnetic field locations or large motor power lines for other devices do not use the same piping and wiring (through multi-conductor cables, etc.). Also, pay attention to the inverter power supply and wiring section used for robots, etc. (same wiring and piping not possible). Apply the frame ground of this power supply and insert the filter to the output part.

- When surge-generating inductive loads or power supplies of product output and solenoid valve/relay, etc., are common, the surge current flows around the output part and may cause damage. Separate the inductive load output system from the output power supply of the product. If a separate power supply cannot be used, connect the surge absorption element directly to all inductive loads in parallel.

- Do not disassemble the products.

- Cable cannot be used for applications involving repeated bending.

- Fix the cable so that it does not easily move. Do not bend the cable at an acute angle when fixing.

2. Working fluids

CAUTION

- This product is designed for controlling vacuum or inert gas. If other fluids (active gas, liquids, solids, etc.) pass through, the product may fail to operate normally or may display decreased performance. Check the compatibility between the gas contact part materials and working fluid before use. If there is a risk of solidification of the working fluid, confirm that this poses no problems during use.

- Avoid using fluids that build up crystallization in the piping.

Mounting, installation and adjustment

1. Mounting

⚠DANGER

- When mounting the product, be sure to hold and fix it securely. If the product falls, is knocked over, or experiences malfunction, it may lead to injury.

⚠WARNING

- Incorrect mounting and piping will result in product trouble, may cause trouble in the user's system, and may result in death or serious injury. The user is responsible for making sure that the operator has read the instruction manual and fully comprehends the system. After mounting, confirm that the product is correctly mounted.
- Precision parts are built in, so laying the product on its side or applying vibration or impact during transportation are strictly prohibited.
  This may cause damage to the parts.
- For preliminary installation, place horizontally.
- Do not step onto the packaging or place objects on it.
- Avoid condensation, freezing, etc., and maintain ambient temperatures of -20 to 60°C and ambient humidity of 35 to 85% when transporting and carrying.
  Failure to do so may cause damage to the product.
- Mount the product on incombustible materials. Direct attachment or mounting to or near flammable materials may cause fire.
- Carefully wire the product while checking this catalog to prevent incorrect wiring and loose connectors. Check wiring insulation.
  Contact with other circuits, ground faults, and defective insulation between terminals may cause overcurrent to flow into the product, causing damage. This could lead to malfunction or fire.
- Before turning power ON to the Component, be sure to do a safety check around the product.
  Inadvertently supplying power can cause electric shock or injury.
- Be sure to use the attached cable between the valve and controller, and install it so that excessive force is not applied or damaged. Do not remodel the attached cable (change the length or material) as it may cause malfunction, failure or misoperation.
- Do not touch the product with hands or body during the operation or immediately after stopping.
  There is a risk of burns.
- Do not step onto the product or place objects on it.
  This may result in falling, knocking the product over, injury due to falling, product damage and/or malfunctions due therein, etc.
- When the power supply is cut off (including breakdown), take sufficient measures to protect workers and equipment.
  There is a risk of unexpected accidents.

2. Securing of space

⚠CAUTION

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

3. Piping

⚠CAUTION

- The bellows interior is directly connected to the atmosphere. Do not block the connecting hole between the bellows interior and the atmosphere (2 holes just under the operating port) in use.
- Foreign matter or burrs in the piping and piping work could damage the valve seat or O-ring seal and lead to leaks. Always remove dirt and burrs before installing the valve.
- Piping so that tension, compression, bending and other forces are not applied to the valve body from the piping.
- Clean the seal surface of the vacuum flange and the centering O-ring with ethanol before installing.

■Although the vacuum flange surface is provided with a 0.1 to 0.2mm level difference (concave shape) for seal surface protection, handle so as not to damage the seal surface.

■Durability may decrease due to exhaust flow, so we recommend use of the bellows side as the exhaust side. Durability varies depending on the conditions of use, so check thoroughly.

■After completing piping work, always carry out a leak test, and confirm that there are no leaks.

■When transporting or installing, do not hold the cable part.
This may lead to injury or disconnection.

■Do not lay piping in places where large vibration or impact is transmitted.
If large vibration or shock is transmitted, it could result in malfunction. Especially if vibration continues, durability may decrease. Perform piping so no excessive vibration or shock is applied.

■Do not forcibly operate the movable parts of the product with external force.
This may lead to malfunction or damage due to regenerative current.

■When executing the auto-learning function, set the valve to its atmospheric pressure state. There is a possibility of misrecognition of the origin.

■Do not place objects that produce strong magnetic fields, such as rare earth magnets, near the product body. It may not be possible to maintain the original accuracy.

■This product is assembled in a cleanroom after precision cleaning treatment. Open the clean pack inside the packing box in a clean environment just before mounting.

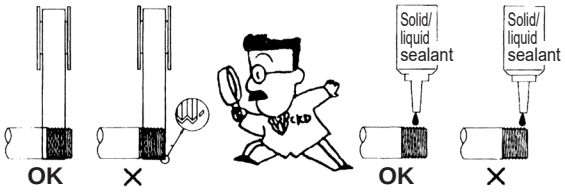
■Perform piping so no excessive force is applied to the flange. If heavy objects and mounted components vibrate, fix so that torque is not applied directly to the flange.

4. Air piping

⚠CAUTION

■When piping, refer to the instruction manual and make sure not to use the wrong connection port.
- This could cause improper operation.

■When connecting pipes, wrap sealing tape clockwise from the inside position to within 2 threads from the pipe end.
- If sealing tape protrudes from the pipe threads, it could be cut when screwing the bolts in. This could cause the tape to enter the components, causing breakdowns.



■Tighten pipes with the appropriate torque.
- The purpose is to prevent air leakage and damage to bolts.
- First tighten the bolts by hand to ensure that the threads are not damaged, then use a tool.

[Reference value]Refer to the instruction manual.

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

Use/maintenance

1. Before use

⚠DANGER

- Wiring work and inspection should be done by a specialized technician.
- Be sure to install the piping before wiring the product.
  It may lead to electric shock.
- Do not operate the unit with wet hands.
  It may lead to electric shock.
- When performing the wiring work and inspection, turn the power supply OFF and wait five minutes or more before checking the voltage with a tester or other equipment.
  It may lead to electric shock.
- Do not attach or detach wiring or connectors with the power supply ON.
  This may cause malfunction, failure, or electric shock.

⚠WARNING

- Though the storage environment conforms to the installation environment, it is not recommended to store for longer than 1 month. In particular, take measures to prevent condensation.

2. Maintenance and inspection

⚠WARNING

- Operate periodically according to the instruction manual.
- Read the instruction manual thoroughly and make sure you understand the content before performing maintenance.
- Always drain the fluid before performing maintenance.

⚠CAUTION

- Perform the following periodic inspection to ensure that the valve is achieving optimal functionality.
  (1)Inspection for leakage to the valve exterior
  (2)Inspection for leakage (internal leakage) from the valve seat
  (3)Confirmation that the valve operates smoothly
  (4)Inspection for looseness in the piping and valve threads
  (5)Inspection for abrasion or corrosion of the O-ring
- When removing deposits, do not damage any of the parts.
- If damage is expected before the specified duration, carry out maintenance and inspection earlier.
- If the product breakdowns (abnormal heat generation, smoke emission, unusual odor, noise, vibration, etc.), immediately shut OFF the power supply. It may cause damage to the product or lead to fire caused by the current flow.
- When performing maintenance, inspection and repair, stop the power supply to this product. Caution people in the vicinity that a third party should not turn ON the power inadvertently or operate the product.
- When disposing of the product, comply with laws pertaining to waste treatment and cleaning. Consign it to a specialized waste disposal company for processing.
- This product has a spring closing (Normally Closed) valve structure when no power is supplied. Before turning ON the power, make sure that the leakage amount is allowable and then begin operation.
- There is a possibility that the valve closed state may be misrecognized if foreign matter is caught at power ON. Before turning ON the power, make sure that the leakage amount is allowable and then begin operationplease.

Safety Precautions

Be sure to read this section before use.
Refer to Intro Page 9 for general precautions.

Design/selection

1. Checking the specifications

⚠ WARNING

- Incorrect Component selection and handling can cause problems not only in this product, but also to your system. Check the specifications of this product and the compliant with your system before use.
- Check the compatibility between the gas contact part materials and working fluid before use.
- Use within the specified fluid temperature and pressure range.

2. Working fluids

⚠ CAUTION

- This product is designed for controlling vacuum or inert gas. If other fluids (active gas, liquids, solids, etc.) pass through, the product can operate normallyor the performance may decrease sharply. Check the compatibility between the gas contact part materials and working fluid before use. When working fluidIf there is a risk of solidification, confirm that this poses no problems during use.
- Avoid using fluids that build up crystallization in the piping.

3. Selection

⚠ CAUTION

- When managing valve responsiveness, pay attention to piping size and length and the flow characteristics of the operation solenoid valve.
- The cylinder and bellows interior are directly connected to atmosphere. Do not block the connecting hole between the bellows interior and the atmosphere (2 holes just under the operation port) in use.
- Select air piping and fittings according to the working temperature.

Mounting, installation and adjustment

1. Mounting

⚠ WARNING

- Incorrect mounting and piping will result in product trouble, may cause trouble in the user's system, and may result in death or serious injury. The user is responsible for making sure that the operator has read the instruction manual and fully comprehends the system. After mounting, carry out an appropriate function test to confirm that the product is correctly mounted.

● High temperature specifications

- Since the valve body becomes hot in accordance with the fluid temperature, handle with care. When removing the valve, first confirm that the valve body temperature is sufficiently low.

⚠ CAUTION

- This product is assembled in a cleanroom after precision cleaning treatment.Open the clean pack inside the packing box in a clean environment just before mounting.
- Perform piping so no excessive force is applied to the flange. If heavy objects and mounted components vibrate, fix so that torque is not applied directly to the flange.
- If vibration continues, durability may decrease. Perform piping so no excessive vibration or shock is applied.

● High temperature specifications

- When insulating the valve, insulate only the body. Note that the product may not operate normally if the cylinder is insulated.

2. Securing of space

⚠ CAUTION

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

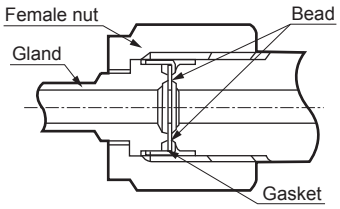
3. Piping

⚠ CAUTION

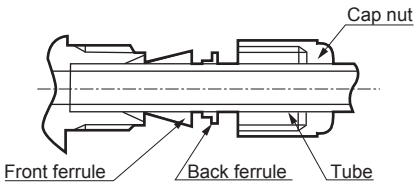
- foreign materials and burrs in the piping and piping work could damage the valve seat or O-ring seal and lead to leaks. Always remove dirt and burrs before installing the valve.
- When piping, do not apply tension, compression, bending or other forces to the valve body from the piping.
- Handle so as not to scratch the seal surface of the vacuum flange. The flange surface of AVB**7 and MVB*17 is provided with a 0.1 to 0.2mm level difference (concave shape) for seal surface protection.
- Durability may decrease due to exhaust flow, so we recommend use of the bellows side as the exhaust side except for models with limited vacuum pump connection ports.Durability varies depending on the conditions of use, so check thoroughly.
- After completing piping work, always carry out a leak test, and confirm that there are no leaks.
- Make sure that there is no foreign materials, scratches or burrs on the seal section before tightening the fitting with the following procedures.

(1) Fitting tightening method

- JXR fitting (when the gasket material is nickel/SUS316) Tighten the nut by hand until the gasket contacts the bead surface, and then tighten another 1/8 turn with a tool. (Consult with CKD for all other materials.)



- Double barbed fitting
  Confirm that the front ferrule, back ferrule and nuts are properly attached, and then insert the tube until it contacts the back of the body. Tighten the nuts as far as possible by hand, and then tighten 1 1/4 turn with a tool.

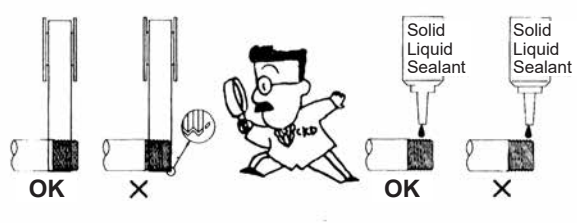


(2) After tightening the fitting, always carry out a leak test, and confirm that there are no leaks.

4. Air piping

⚠ CAUTION

- When piping, refer to the instruction manual and make sure not to use the wrong connection port.
  - This could cause improper operation.
- When connecting pipes, wrap sealing tape clockwise from the inside position to within 2 threads from the pipe end.
  - If sealing tape protrudes from the pipe threads, it could be cut when screwing the bolts in. This could cause the tape to enter the components, causing breakdowns.



- Tighten pipes with the appropriate torque.
  - The purpose is to prevent air leakage and damage to bolts.
  - First tighten the bolts by hand to ensure that the threads are not damaged, then use a tool.

[Reference value]Refer to the instruction manual.

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

Use/maintenance

1. Before use

⚠ WARNING

- Use this product within the specifications range.

⚠ CAUTION

- Do not use valves as footing or place any heavy objects on top of the valves.
- Take care not to tighten the manual valves too much. Excessive tightening may lead to valve damage.

● High temperature specifications

- The screw hole on the side of the body is not for fixing. Do not use.
- Adjust the adjustment nut of AVB*47 after confirming that the temperature of the valve body is sufficiently low.

2. Maintenance and inspection

⚠ WARNING

- Operate in accordance with the instruction manual.
- Read the instruction manual thoroughly and make sure you understand the content before performing maintenance.
- Always drain the operating air and fluid before performing maintenance.

⚠ CAUTION

- Perform the following periodic inspection to ensure that the valve is achieving optimal functionality.
  Inspection for leakage to the valve exterior
  Inspection for leakage (internal leakage) from the valve seat
  (3) Confirmation that the valve operates smoothly
  Inspection for looseness in the piping and valve threads
  Inspection for abrasion or corrosion of the O-ring
- When removing deposits, do not damage any of the parts.
- If damage is expected before the specified duration, carry out maintenance and inspection earlier.
- Use CKD specified parts for maintenance parts. Refer to Internal structure/Replacement parts/Maintenance parts list.
- For maintenance parts, contact CKD or a dealership.

Safety precautions

Proximity switch T2H/T2V/T3H/T3V

Always read the precautions described in "Pneumatic Cylinders I" (No. CB-029SA) before use.

Design/selection

WARNING

- Application, load current, voltage, temperature, impact, environment, etc., outside the specifications will result in damage or operation faults. Use the device as instructed in the specifications.
- Never use this product in an explosive gas atmosphere. The switch does not have an explosive-proof structure. Never use in an explosive gas atmosphere as explosions or fires could result.

CAUTION

- Take care when using this product for an interlock circuit.

  When using the switch for an interlock signal requiring high reliability, provide a double interlock by installing a mechanical protection function or a sensor other than a switch as a safeguard against failure. Regularly inspect and confirm that the interlock activates correctly.

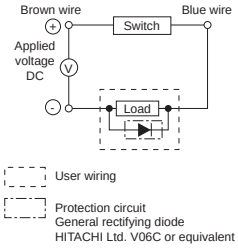
- Pay attention to the contact capacity.

  Do not use a load that exceeds the switch's max. contact capacity. This may lead to failure. The lamp may not come on if the current is less than the rated current.

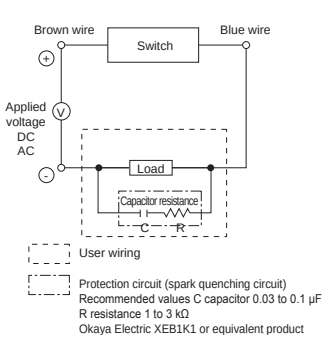
- Pay attention to the contact protection circuit.

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

● Diode used



● Capacitor and resistance used

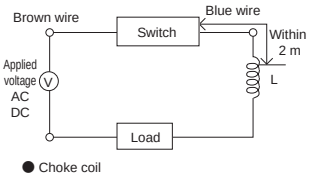


  - When a capacitance load (capacitor) is connected, starting current is generated when the switch is turned ON. Provide a contact protection circuit.
  - If the wiring increases, the wiring capacity will be reached and a rush current will occur, damaging the switch or shortening the service life. Provide a contact protection circuit if the wiring length exceeds Table 1.

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

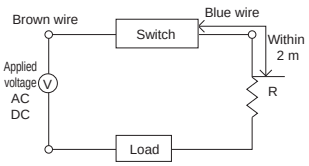
Table 1

● Choke coil used



● Choke coil
L = Several hundred μH to several mH
Item with outstanding high frequency characteristics

● Resistance used



● Rush current limiting resistor
R = Largest resistor tolerated by load circuit side

For specifications of contact protection circuits, refer to Pneumatic Cylinders I (Catalog No. CB-029SA).

- Avoid using in an environment constantly exposed to water.
  - Insulation failure can cause malfunctions.
- Avoid using this product in environments containing oil or chemicals.
  - The switch may be adversely affected (insulation failure, malfunction caused by swelling of the filled resin, hardening of lead wire sheath, etc.) if used in an environment containing oil, coolant, cleaning fluid, or chemicals. Consult with CKD.
- Do not use in a high-impact environment.

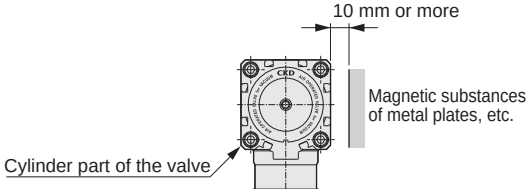
  For reed switch, if a strong impact (294m/s^2 or more) is applied while in use, a signal may appear momentarily (1 ms or less) or malfunction. It may be necessary to use a proximity switch depending on the working environment. Consult with CKD.
- Do not use this product in surge generating areas.

  If there are devices and components (solenoid lifters, high frequency induction furnace, motors, etc.) around the valve with proximity switch that generate a large surge, consider surge protection of the source as it may lead to deterioration or damage of the switch internal circuit element.
- Be careful of accumulation of iron powder and contact with magnetic substances.

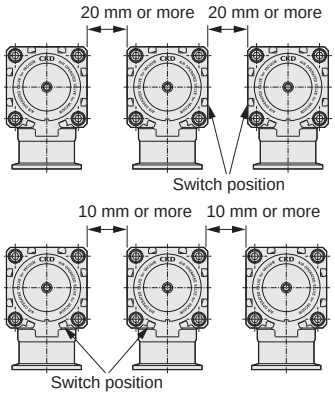
  If a large amount of iron chips such as cutting chips or welding spatter accumulate or if magnetic objects (material attracted to magnets) contact the valve with a valve switch, the valve will be demagnetized and valve switch operations may be inhibited.
  - Pay attention to the proximity of valves, etc. When installing more than one valve with switches in parallel, maintain sufficient distance according to the value shown.
  - Mutual magnetic interference may cause the switch to malfunction.

CAUTION

- The switch may malfunction if there is a magnetic substance such as a metal plate installed adjacently. Confirm that a distance of at least 10mm is allocated from the surface of the valves.
  (Same clearance for all bore sizes)



■ The switch may malfunction if valves are installed adjacently. Check that the following distance is allocated from the surface. (Same clearance for all bore sizes)



■ Pay attention to magnetic environments.

● When installing valves with switch nearby in parallel, or if a magnetic object is very close to the valve with switch, mutual interference may occur and adversely affect detection accuracy.

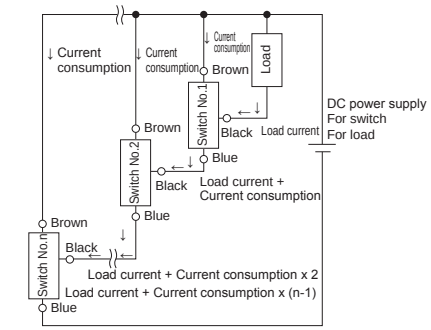
■ Be careful of the internal voltage drop caused by serial connection.

● When serially connecting several 2-wire switches, 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 supply voltage. Check load specifications and determine the number of switches.

● When connecting several 3-wire serial proximity switches, the switch voltage drop is the total voltage drop of all connected switches, as with the 2-wire switch. In addition, the current flowing to the switch is the sum of current consumption and load current of the switches connected as in the figure below. Check load specifications and determine the number of connections so as not to exceed the maximum load current of the switch.

● The lamp turns ON only when all switches are ON.

Fig. 1: For T3



■ Pay attention to the leakage current caused by the parallel connection.

● 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 connections. Note that switch lamp could dim or may not turn ON.

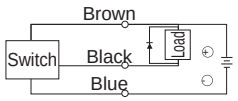
● With the 2-wire proximity switch, when 1 switch changes from ON to OFF status, voltage at both ends of the switch connected in parallel drops to the internal voltage drop value when the switch is ON and is less than the load voltage range, so other switches will not turn ON. Therefore, check the input specifications of the programmable controller that is the connected load before use.

● Since the leakage current value of the 3-wire proximity switch is very small (10 μA or less), it should not be a problem for normal use.

■ Output circuit protection

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

T3

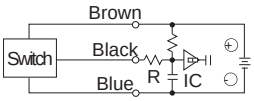


● Diode
D = HITACHI Ltd.
V06C or equivalent product

An example of using a surge absorbing element with inductive load.

● When a capacious load (capacitor) is connected, starting current is generated when the switch is turned ON. Provide the following protection circuit.

T3



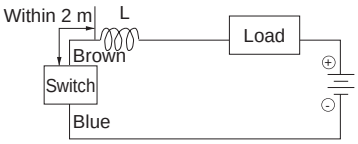
Resistance R (Ω) must be larger than the following equation in this case.

$$\frac{V}{0.05} = T3$$

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

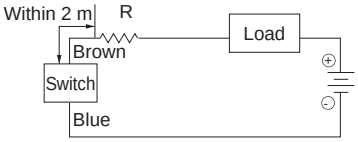
T2

● Choke coil used



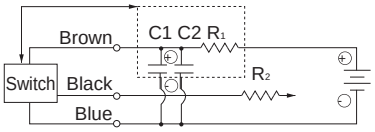
● Choke coil
L = Several hundred μH to several mH
Item with outstanding high frequency characteristics

● Resistance used



● Rush current limiting resistor
R = Largest resistor tolerated by load circuit side

● Resistance used
Within 2 m



Power supply noise absorptive circuit
C_1 = 20 to 50 μF
Electrolytic capacitor (Voltage resistance 50 V or more)
C_2 = 0.01 to 0.1 μF
Ceramic capacitor
Rush current limiting resistor
R_1 = 20 to 30 Ω
R_2 = Largest resistance tolerated by load circuit side used.

Reed switch ET0H/ET0V

Always read the precautions described in "Pneumatic Cylinders I" (No. CB-029SA) before use.

Design/selection

⚠ WARNING

■Application, load current, voltage, temperature, impact, environment, etc., outside the specifications will result in damage or operation faults. Use the device as instructed in the specifications.

■Never use this product in an explosive gas atmosphere. The switch does not have an explosive-proof structure. Never use in an explosive gas atmosphere as explosions or fires could result.

■The lamps used are LEDs. Visibility will gradually decrease with continuous use under high temperatures. As the LED lamp circuit is separated from the switch output circuit, the switch output works normally even if the LED lamp goes out.

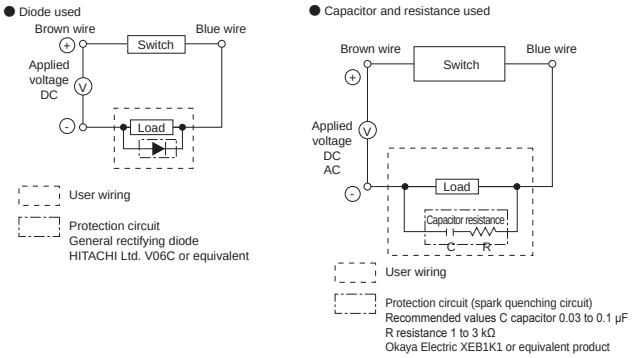
⚠ CAUTION

■Pay attention to the contact capacity.

Do not use a load that exceeds the switch's max. contact capacity. This may lead to failure. The lamp may not come on if the current is less than the rated current.

■Pay attention to the contact protection circuit.

● When an inductive load (relay or solenoid valve) is connected, a surge voltage is generated when the switch is turned OFF. Provide a contact protection circuit.

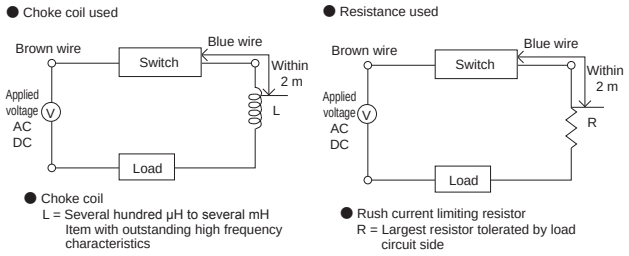


● When a capacitance load (capacitor) is connected, starting current is generated when the switch is turned ON. Provide a contact protection circuit.

● If the wiring increases, the wiring capacity will be reached and a rush current will occur, damaging the switch or shortening the service life. Provide a contact protection circuit if the wiring length exceeds Table 1.

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

Table 1

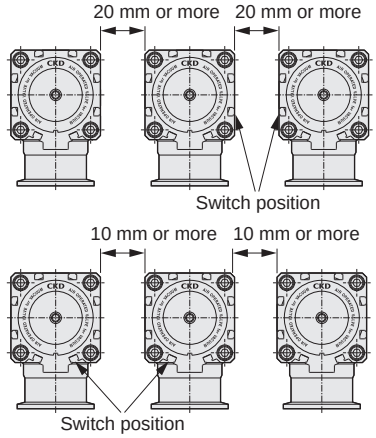


For specifications of contact protection circuits, refer to Pneumatic Cylinders I (Catalog No. CB-029S).

■Pay attention to magnetic environments.

● When installing valves with switch nearby in parallel, or if a magnetic object is very close to the valve with switch, mutual interference may occur and adversely affect detection accuracy.

● If adjacent to a switch other than ET0, it may malfunction at the following distance. Therefore, check the operation before use. (Same clearance for all bore sizes)



▪Be careful of the internal voltage drop caused by serial connection.

● When serially connecting several 2-wire switches, 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 supply voltage. Check load specifications and determine the number of switches.

▪Pay attention to the leakage current caused by the parallel connection.

● 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 connections. Note that switch lamp could dim or may not turn ON.

Mounting, installation and adjustment

⚠ CAUTION

■ Do not drop or apply impact.

DDo not drop, bump, or apply excessive impact (294m/s^2 or more for reed switches, 980m/s2 or more for proximity switches). Even if the switch case is not damaged, switch components could break or malfunction.

■ Do not carry the valve by the switch's lead wire.

Never do this: it not only causes disconnection of lead wires, but since stress is applied to the internal switch, it may also damage the switch's internal element.

■ Do not wire together with power lines or high voltage lines.

Avoid the use of parallel wiring or wiring in the same conduit as that of power lines or high voltage lines. Wire separately. The control circuit containing the switch could malfunction due to noise.

■ Do not short-circuit the load.

If turned ON in a state of load short-circuit, excess current will flow and the switch will be instantly damaged.

■ Pay attention to the lead wire connection.

Turn OFF power to the device in the electric circuit to be connected before starting wiring. If operated while the power is turned ON, it may cause accidents due to electric shock or unpredicted operation.

● Reed switch

Do not connect the switch lead wire directly to the power supply. Connect the load serially. Pay attention to the following (1), (2) for TO.

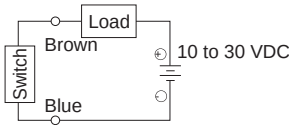
(1)When used for DC, connect the brown wire on the positive (+) side and the blue wire on the negative (-) side. The switch will function when connected in reverse, but the lamp will not turn ON.

(2)When connected to an AC relay or programmable controller input, conducting half wave rectification with that circuit may prevent the switch lamp from turning ON. The lamp will come ON when the switch lead's polarity is reversed.

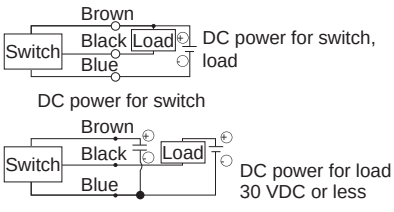
● Proximity switch

Correctly connect the lead wires based on the color coding in the figure below. Incorrect wiring could result in damage.

●T2

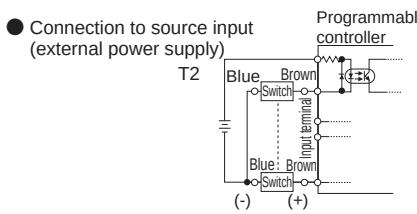


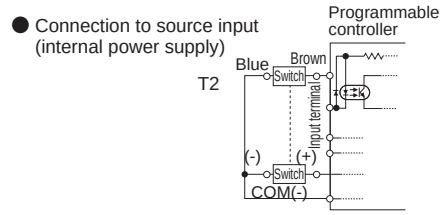
●T3

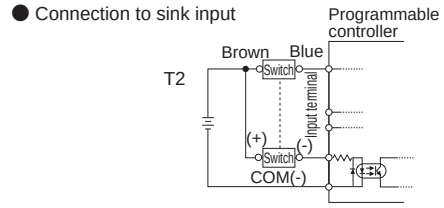


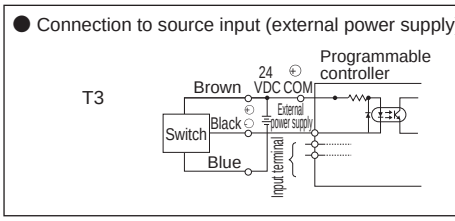
(Connection to programmable controller (PLC))

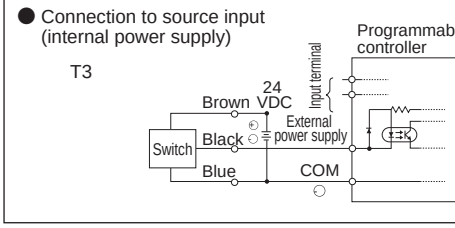
● Connection direction differs depending on the type of programmable controller. Connect based on input specifications.











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

Adjust the mounting position of the switch so that the piston stops at the center of the operating range (ON range). If set at the end of the operating range (near the boundary line of ON, OFF), operation may become unstable.

■ Observe tightening torque when installing the switch.

If the tightening torque range is exceeded, the mounting screw, mounting bracket, switch, etc., could be damaged. In addition, if tightening the set screw with a torque less than the min. tightening torque, the switch mounting position could be displaced. Loosen fixing screw (set screw) and switch groove, and tighten at the specified position. To tighten the switch fixing screw, a flathead screwdriver with a grip diameter of 5 to 6mm, a shape of the end of which is 2.4mm or less and a thickness of 0.3mm or less (watchscrew) with a tightening torque of 0.1 to 0.2N·m. Tighten ETOH/ETOV with a tightening torque of 0.5 to 0.7.

■ Lead wire protection

The lead wire's min. bending radius is 9 mm and over (when fixed). Pay attention to wiring so repeated bending and tensile strain are not applied to the lead wire.

■ Relay

Use the following or equivalent relays.

○ OMRON MY
○ Fuji Electric Co., Ltd. HH5
○ Tokyo Denki MPM
○ Panasonic HC type

Use/maintenance

WARNING

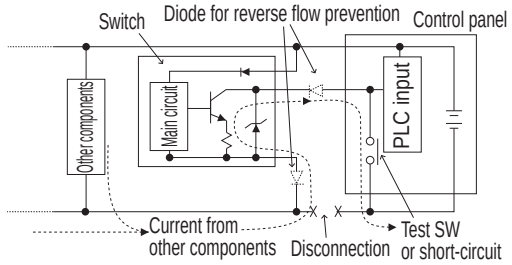
■ Do not apply overcurrent.

If overcurrent flows to the switch due to a load short-circuit, etc., the switch will be damaged with a risk of ignition. Provide an overcurrent protection circuit, such as a fuse, for the output wire and power cable as needed.

CAUTION

■ Pay attention to reverse currents caused by disconnected wires and wiring resistance.

● When other Components, including switches, are connected to the same power supply as the switch, and the output cable and power cable's minus side are short-circuited or the power supply's minus side is disconnected to check operation of the input unit from the control panel, reverse current could flow to the switch's output circuit and cause damage.



● Take the following measures to prevent damage caused by reverse current:

(1) Avoid centralizing current at the power cable, especially a negative power cable, and use as thick a cable as possible.

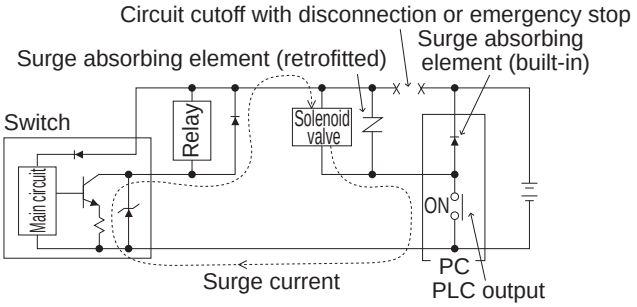
(2) Limit the number of components connected to the same power supply as the switch.

(3) Insert a diode in serial with the switch's output cable to prevent reversal of current.

(4) Insert a diode in serial with the switch's power cable negative side to prevent reversal of current.

■ Pay attention to surge current flow-around.

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

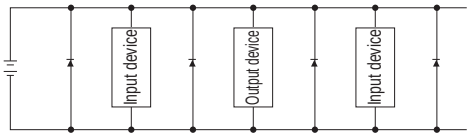


● Take the measures below to prevent damage from sneak surge current.

(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 a separate power supply cannot be used, directly install a surge absorption element for all inductive loads. Consider that the surge absorption element connected to the PLC, etc., protects only the individual device.

(3) Connect a surge absorption element to places on the power wiring shown in the figure below, as a measure against disconnections in unspecified areas.



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.