IAVB

Vacuum Pressure Control System

Overview

While maintaining the reliability of the conventional high vacuum valve, it has achieved pressure control that enables various processes.

Features

Slow exhaust control is possible
Realizes gradual exhaust at a constant rate

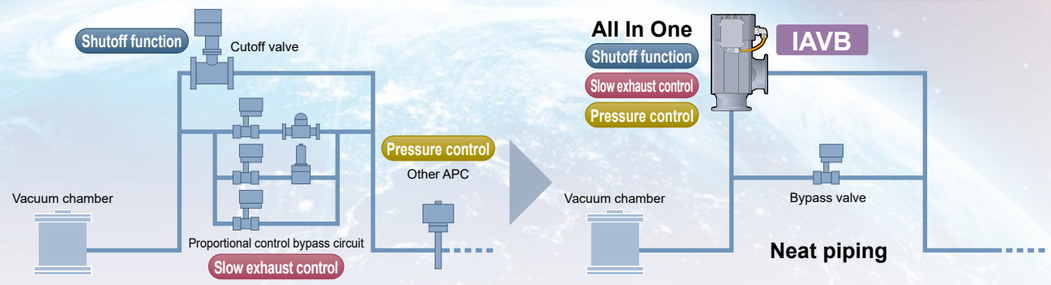
Pressure control is possible
Stable pressure control is possible with proportional control

Fully closed operation available
The poppet valve and O-ring sealant structure enables fully closed operation.

CONTENTS

The best solution for vacuum control

An all-in-one model that enables opening and closing operation, slow exhaust control, and pressure control with a single valve

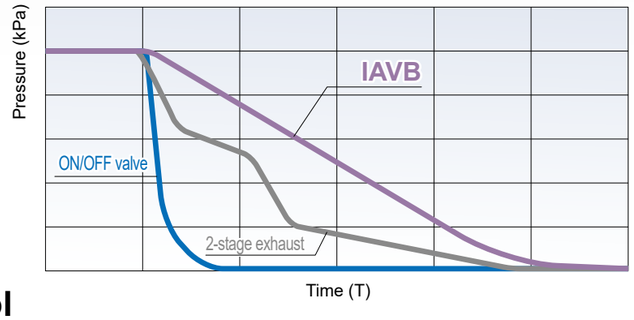


Contributes to the simplification of exhaust system layout

High precision slow exhaust control

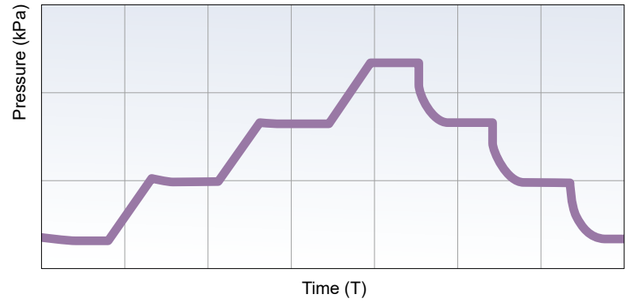
Compared with general ON/OFF vacuum valves and 2-stage exhaust vacuum valves, it enables high precision slow exhaust at an arbitrary rate.

* Slow Exhaust Rate (0.0133 to 2.666 kPa/s)



Stable pressure control

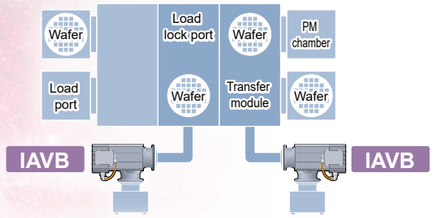
Stable pressure control is possible over a wide range of pressures from atmospheric pressure to vacuum. The desired pressure range is reached and pressure is maintained.



Application Examples

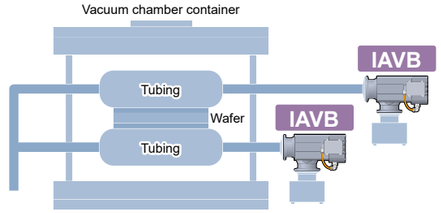
Wafer transport

While the wafer is being transported, the load lock port/transfer module is placed in a vacuum state to prevent contamination.



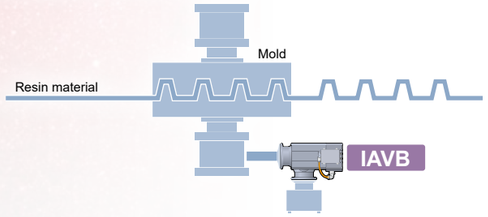
Wafer bonding

The wafer is laminated by expanding the tube in the vacuum chamber.



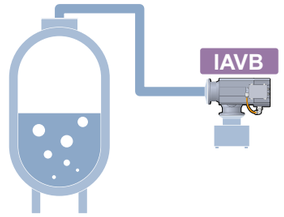
Resin sealed (mold)

The forming die is set in a vacuum state and the workpiece is filled with resin.

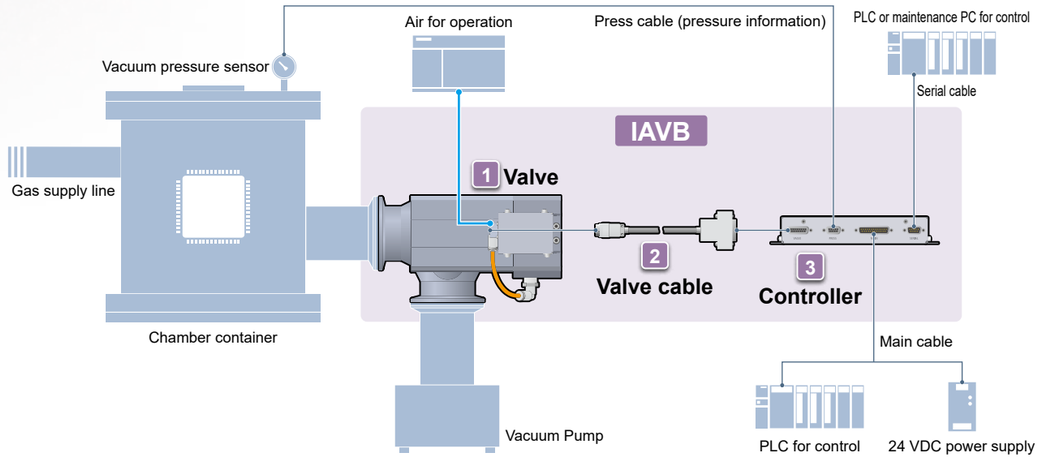


Vacuum deaeration

Removes dissolved gas by vacuuming liquid.



System configuration example (vacuum ON/OFF pressure control of vacuum related devices)



Lineup

Model No.	Connection			
	NW16	NW25	NW40	NW50
IAVB217	●			
IAVB317		●		
IAVB417			●	
IAVB517				●

Vacuum Pressure Control System

IAVB Series

●Molded bellows used ●Aluminum body

RoHS

Model No. Notation Method

IAVB 2 1 7 - 16K - 3

- IAVB: Model No.
- 2: ❶ Orifice Diameter
- 17
- 16K: ❷ Port Size
- 3: ❸ Pilot Port Position

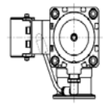
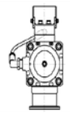
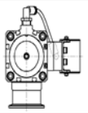
❶Orifice Diameter

Code	Content
2	ø17
3	ø24
4	ø39
5	ø48

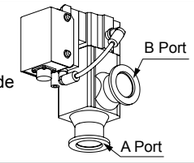
❷ Port Size

Code	Content
16K	NW16 only
25K	NW25 only
40K	NW40 only
50K	NW50 only

❸Pilot Port Position

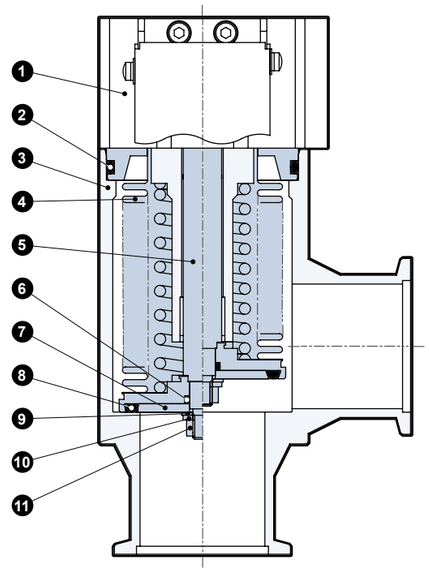
Code	Content
3	 Operating port positions are shown as 3 (standard), 1,2 with respect to the flange direction when viewed from the valve top.
1	
2	

Specifications

Item		IAVB217	IAVB317	IAVB417	IAVB517
Applicable Fluid		Vacuum and inert gas			
Operating Pressure	Pa (abs)	$1.3x10^{-6}$ to $1x10^{5}$			
Max. Operating Pressure Differential	MPa	0.1			
Valve Seat Leakage	Pa·m³/s (He)	$1.3x10^{-10}$ or less			
External Leakage	Pa·m³/s (He)	$1.3x10^{-11}$ or less			
Proof Pressure	MPa	0.3 MPa			
Fluid temperature	°C	5 to 60			
Ambient Temperature	°C	5 to 45			
Orifice Diameter	mm	ø17	ø24	ø39	ø48
Conductance *1	L/s	5	13	43	74
Port Size		NW16	NW25	NW40	NW50
Weight	kg	0.6	0.8	1.6	2.4
Pilot pressure	MPa	0.45 to 0.55 MPa			
Mounting Orientation		Unrestricted			
Connection direction *2		Connect port A to chamber side and port B to vacuum pump side 			

*1: The conductance value is a theoretical calculated value in the molecular flow region and is not an actual measured value.
*2: Avoid reverse connection: while fully open and closed operation will be possible even with reverse connection, the vacuum pressure control will become unstable.
*3: Grease for vacuum is applied to the O-rings of outer seal parts.

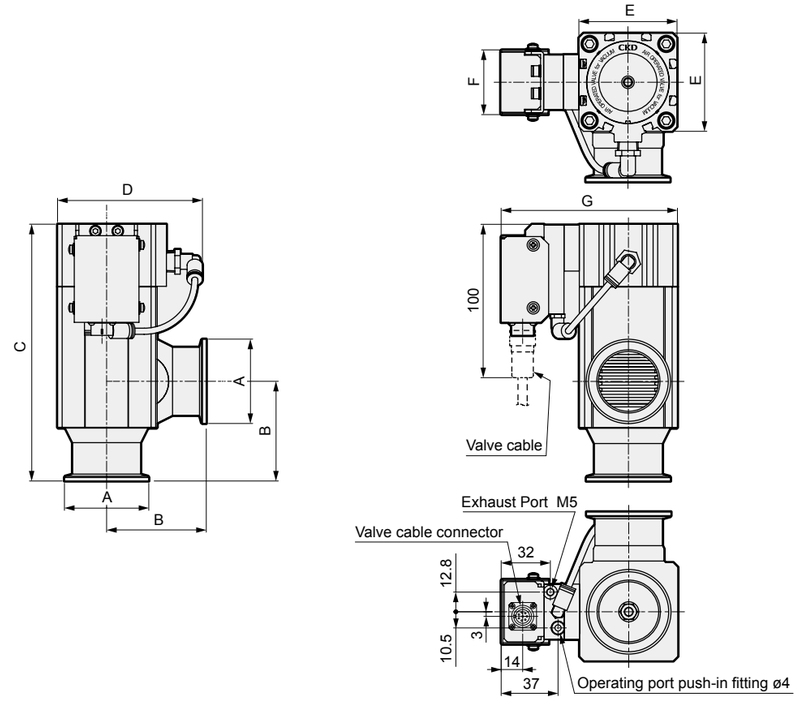
Internal Structure Diagram and Materials



Part No.	Part Name	Material
1	Cylinder (Built-in Magnet)	-
2	O-ring	FKM Note)
3	Body	A6063
4	Bellows	SUS316L
5	Rod	SUS316L
6	O-ring	FKM Note)
7	Valve Disc B	SUS316L
8	O-ring	FKM Note)
9	Flat Washer	SUS304
10	Spring Washer	SUS304
11	Hex Nut	SUS304

Note) Contact CKD for other O-ring material compatibility.

External Dimension Drawings



Model No.	A	B	C	D	E	F	G
IAVB217-16K	ø30 (NW16)	40	114	57	40	43	91
IAVB317-25K	ø40 (NW25)	50	127	71	45	43	96
IAVB417-40K	ø55 (NW40)	65	168	95	64	43	115
IAVB517-50K	ø75 (NW50)	70	186	108	77	43	128

IAVB Controllers

RoHS

Model No. Notation Method

●Controllers Discrete
IAVB-CONT

●Valve cable Discrete
IAVB-VCBL-03

Cable length 3 m

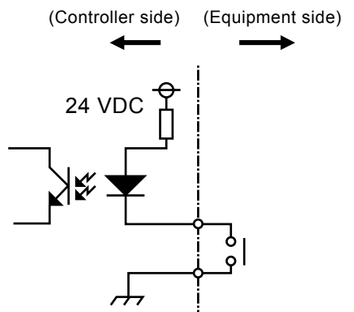
Specifications

Item			IAVB-CONT			
			IAVB217	IAVB317	IAVB417	IAVB517
Power Supply Voltage			DC24V ±10% (Stabilized power supply with ripple factor 1% or less)			
Current Consumption			0.5 A or less (fuse capacity 1 A)			
Ambient Temperature		°C	10 to 40			
External input		Number of input points	2 points			
		Input method	Dry contact input (photo coupler isolation)			
		Input capacity	24 VDC, 10 mA or less			
External output		Number 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			
		System	0 to 10 VDC, 0 to 5 VDC (both input load 20 kΩ)			
Analog voltage output		Number of points	1 point			
		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			

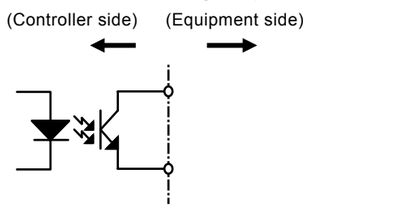
Note) Use a power source with sufficient margin against fuse capacity (current).

Interface circuit

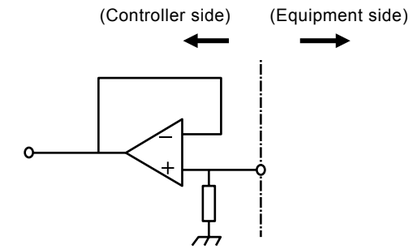
Dry contact input : Photo coupler input
When the contact is closed, about 5 mA flows.



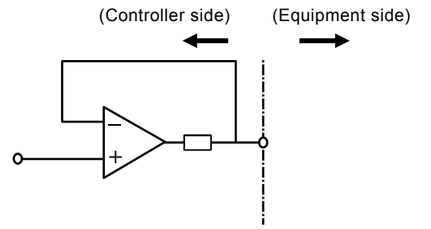
NPN open collector output: Photocoupler output
Load capacity 30 VDC, 15 mA or less
Internal voltage drop, 1.2 VDC or less



Analog voltage input: Follower input
Input load 20 kΩ



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



Connector terminal assignment of controller

1.MAIN (D-SUB 25pin male)

Pin number	Signal name	Input/Output	Remarks
1	Earth 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	Photocoupler collector output 2
10	Alarm status output	NPN Output	Photocoupler collector output 1
11	Valve operation input COM	Contact input (-) COM	Contact input (-) COM
12	Valve operation contact 2 input	Contact input (+)	Photocoupler 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	(Photocoupler collector output 3)
23	Status COM	Photocoupler emitter COM	Photocoupler emitter COM
24	Valve operation contact 1 input	Contact input (+)	Photocoupler cathode 1
25	(port for CKD inspection)	-	(Connect nothing)

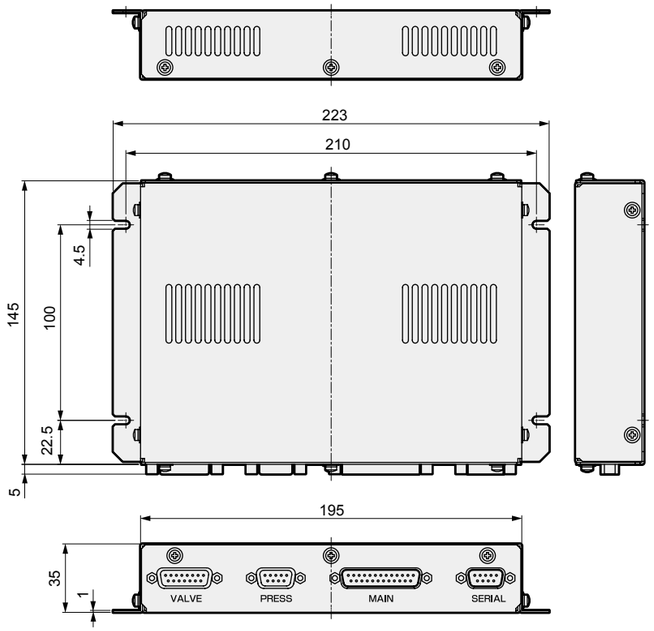
2.PRESS (D-SUB 9pin female)

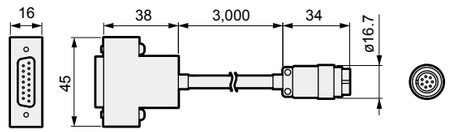
Pin number	Signal name	Input/Output	Remarks
1	(port for CKD inspection)	-	(Connect nothing)
2	(port for CKD inspection)	-	(Connect nothing)
3	Press input (0 to 10 V)	Analog Input	Chamber pressure sensor
4	PRESS GND	Analog GND	Sensor signal GND
5 to 9	(NC)	-	(Connect nothing)

3.SERIAL (D-SUB 9pin female)

Pin number	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)

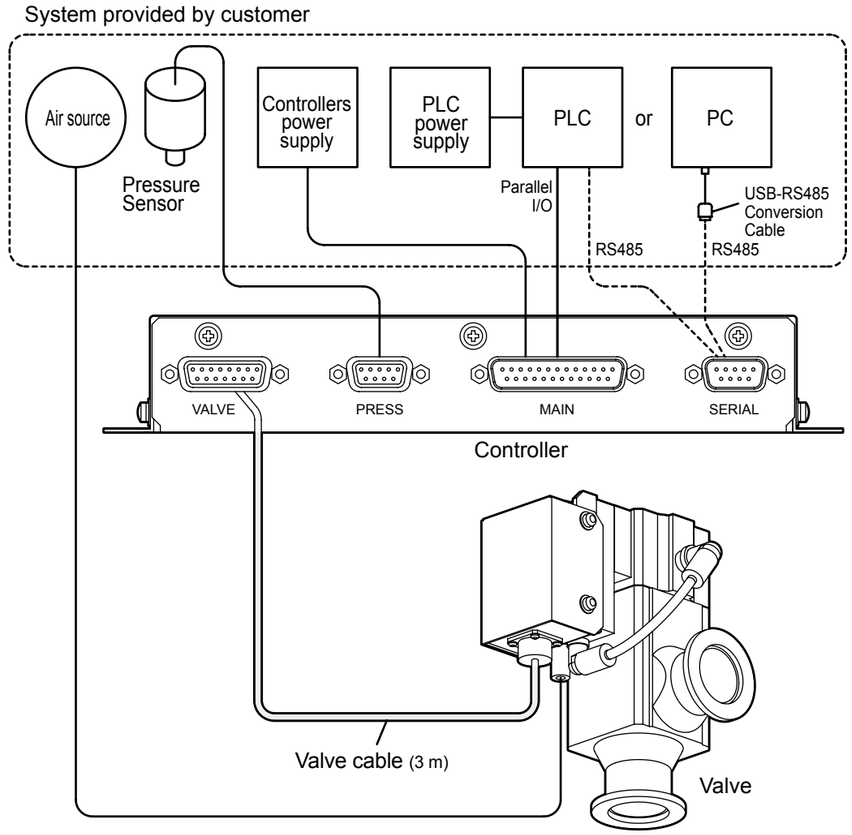
External Dimension Drawings





Valve cable

System configurations table



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

Parts Configuration

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.

Maintenance

Perform periodic inspection once or twice a year to ensure optimum use of the valve.

[Inspection Item]

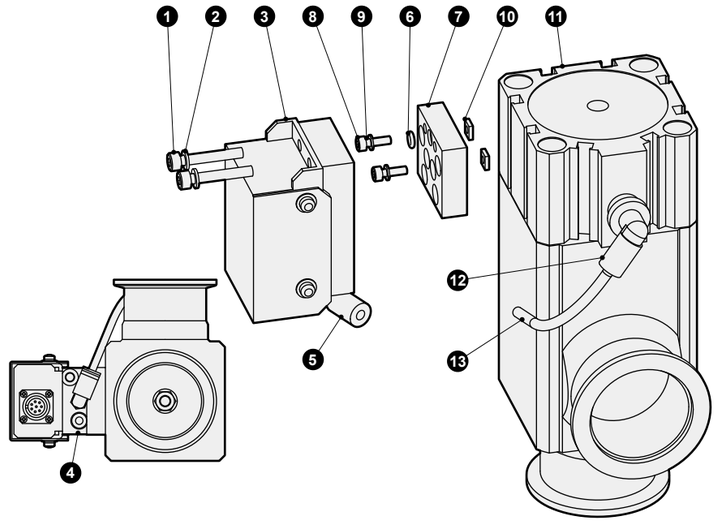
A: Leakage to the valve exterior (external leakage)

B: Valve seat leakage (internal leakage)

C: Valves should operate smoothly
(Check that the auto-learning completes normally)

D: Loosening of piping and valve screws

E: Packing wear and corrosion



Replacement parts list (maintenance parts)

Part No.	Item	Model No.
③④⑤⑥	Wiring section	IAVB-E
⑥⑪⑫⑬	Vacuum valve	IAVB□17-□□K-□-V

Since the valve replacement cycle differs depending on the working environment and conditions such as PID, periodic inspection is recommended. Consumable parts such as O-ring and wiring parts can be replaced by customers.

MEMO

Vacuum Pressure Control System

To Use This Product Safely

Be sure to read this before use.
For General Precautions refer to Intro 9.

Individual Precautions: Vacuum pressure control system IAVB Series

Design / Selection

1. Confirmation of Specifications

Danger

■Do not use in locations where hazardous materials such as ignitable, flammable, or explosive substances are present. There is a possibility of ignition, fire, or explosion.

■This product is not waterproof. Ensure that the product is free of water droplets and oil droplets. This can cause fire or failure.

■Be sure to use a DC stabilized power supply (24 VDC ±10%). Direct connection to an AC power supply can cause fire, bursting, damage, etc.

Warning

■Incorrect equipment selection and handling can cause problems not only in this product, but also to your system. Please be sure to confirm the specifications of this product and its compatibility with your system before use.

■Design a safety circuit or equipment so that damage to equipment, injury to persons, etc., does not occur when the machine stops in the event of a system failure such as emergency stop or power outage.

■Install indoors with low humidity.
In places exposed to rain or high humidity (over 85% RH, with condensation), there is a risk of electric leakage and fire. Oil drops and oil mist are also strictly prohibited.

■Use and store in accordance with the working/storage temperatures and where there is no condensation.
This can cause abnormal product stoppage or reduced service life. If heat accumulates, ventilate.

■Install in a location free from direct sunlight, dust, and corrosive gas/explosive gas/inflammable gas/combustibles, and away from heat sources. Additionally, chemical resistance has not been considered.
This can cause failure, explosion, or fire.

■Use and store in a location free from strong electromagnetic waves, ultraviolet rays, and radiation.
This can cause malfunction or failure.

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-core cables, etc.). Also, pay attention to the inverter power supply and wiring section used for robots, etc. (same wiring and piping not possible). Apply frame grounding for the same power supply and always insert a filter at the output section.

■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 surge absorbers directly in parallel with all inductive loads.

■ Do not disassemble the product.

■Cable cannot be used for applications involving repeated bending.

■Fix the cable so that it does not move easily. 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.

3. Mounting

Warning

■Use the supplied cable between the valve and the controller, and install so that excessive force is not applied and it is not scratched. Do not remodel the attached cable (change the length or material) as it may cause malfunction, failure or misoperation.

■When the power supply is cut off (including failures), take sufficient measures to protect workers and equipment.
There is a risk of unexpected accidents.

4. Securing Space

Caution

■Secure sufficient space for maintenance and inspection.

5. 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.

■When piping, do not apply tension, compression, bending or other forces to the valve body from the piping.

■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 bring objects such as rare earth magnets that emit powerful magnetic fields near the product body. It may not be possible to maintain the original accuracy.

■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.

For cautions about mounting, installation, adjustment, use, and maintenance, refer to CKD components Product Site (https://www.ckd.co.jp/kiki/jp/) → "Model No." Instruction Manuals