Fluid Control Components: Warnings and Cautions

Be sure to read this section before use.

Precautions for each model series and for individual products

Compliant with international standard guidelines Explosion-proof solenoid valve (2, 3-port)

Design/selection

⚠ WARNING

■ Usable in Class 1 and 2 danger zones where there is combustible gas or steam. Cannot be used in special danger zone.

■ Select models and perform installation in accordance with JIS.C.60079 “Factory Explosion-Proof Guidelines for Users JNIOSH-TR-NO.44 (2012)”.

⚠ CAUTION

■ Explosive gas and explosion-proof enclosure

The degree of explosive gas danger is classified according to the group and temperature grade. Gases with equivalent risk are grouped into one group, and explosion-proof structure standards are set for each group. Codes to indicate the type, group and temperature grade must be indicated in this order on the electrical components of explosion-proof structures. These codes indicate which group and temperature grade the electrical components have been manufactured for, and which gases can be used. For the example of explosion-proof solenoid valve of Exd II BT4:

Ex d IIB T4

- T4 → Temperature class T4
- IIB → Group II B
- d → Pressure and explosion proof structure

Table 2 indicates the classification of gases with a danger category of Group II B and Grade T4 temperature that are compatible with the product. Less dangerous gases are also listed that are guaranteed to be explosion-proof.

Temperature grade refers to the degree of ignition risk, and is classified into six grades according to the ignition point. It defines the maximum surface temperature of the device corresponding to each grade (Table 1).

Higher numbers indicate a higher risk that the gas will ignite at low igniting temperatures. Group refers to the risk of fire leaping to the exterior from small gaps. The level is classified into three grades according to the gap, and the codes shown in Table 1 are used. It can be said that this group expresses the classification by size of the explosive energy. Lower maximum safety clearance indicates more dangerous gases with higher explosive energy that can cause flames to pass through small gaps and leap to the exterior.

Table 1

Description	Code	Provision
Temperature class	T1	Max. surface temperature: 450°C
	T2	300°C
	T3	200°C
	T4	135°C
	T5	100°C
	T6	85°C
Group	II A	Max. safety clearance: 0.9 mm or more
	II B	Over 0.5 to less than 0.9
	II C	0.5 mm or less

Table 2

Temp class / Group	T1	T2	T3	T4	T5
II A	Acetone, Ammonia, Carbon monoxide, Ethane, Acetic acid, Ethyl acetate, Toluene, Propane, Benzene, Methanol, Methane	Ethanol, Isoamyl acetate, Butane, Acetic anhydride	Gasoline, Hexane	Acetaldehyde	
II B		Ethylene, Ethylene oxide		Ethyl ether	
II C	Hydrogen	Acetylene			Carbon disulfide

■ Dangerous zone

Situations where explosive gases and air mix at a high enough level to cause an explosion or fire are called “danger zones”. These zones are classified into Zones 0, 1 and 2 according to the time and frequency at which the dangerous atmosphere is reached. The explosion-proof structure that can be used is determined according to these classes.

● Zone 0 (explosion-proof general purpose valve EX Series cannot be used)

Zones where a dangerous atmosphere is or could be continuously generated, and where the concentration of explosive gas is maintained continuously or for a long time above the lower limit for explosions.

Example a: The open space above a flammable fluid inside a container or tank.
b: Inside a combustible gas container or tank.
c: Near flammable fluid in an open container.

● Zone 1

(1) Zones where explosive gas could accumulate to a dangerous concentration during operations such as the opening/closing of the lid for removing the product or operation of the safety valve, etc.
(2) Zones where explosive gases are likely to accumulate to dangerous concentrations during repair or maintenance or due to leakage, etc.

● Zone 2

(1) Zones where combustible gases or flammable fluids are regularly handled, but where the gases and fluids are sealed in a vessel or equipment, and where the gases and fluids could leak to dangerous concentrations only if the vessel or equipment breaks by accident or due to misoperation.

■ Explosion-proof test model

Explosion-proof certification has been obtained with the electromagnet.

The test model and product model No. of the electromagnet are as listed in the explosion-proof performance on page 372.

Design/selection

⚠ WARNING

1 Working fluids

(1) When using this valve for dry air or inert gas, the life can be shortened considerably due to wear.

(2) This valve cannot be used for maintaining vacuum. Consult with CKD when the vacuum needs to be maintained.

⚠ CAUTION

1 Continuous energizing

Use the NO pressurization when using the 3-port valve in a continuously energized state with the NO port pressurized. When continuously energizing the universal or NC pressurization, use a fluoro rubber seal.

2 Suction sound

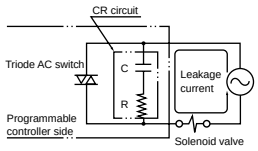
With the AC voltage specifications, a loud suction sound may be heard momentarily after energizing. To avoid a suction sound, select a coil with a diode or the DC voltage model. The suction sound volume will be reduced.

3 Fluid viscosity

The fluid viscosity must be 50 mm^2/s or less. Malfunctions could occur if the viscosity is higher than 50 mm^2/s.

4 Leakage current from other fluid control components

When operating the solenoid valve with a programmable controller, etc., check that the output leakage current from the programmable controller is within the following specifications. Failure to observe this could lead to malfunctions.



Voltage / Model No.	AC		AC diode		DC			
	100 V	200 V	100 V	200 V	12 V	24 V	48V	100 V
AB,AG,AP,AD ADK	6 mA or less	3 mA or less	2 mA or less	1 mA or less	2 mA or less	1 mA or less	0.5 mA or less	0.2 mA or less

Mounting, piping and wiring

⚠ CAUTION

1 Piping

(1) Always hold the socket with a wrench, etc., when piping the NO side of the 3-port valve.

(2) If the pipe vibrates when the solenoid valve is opened and closed, securely fix the piping.

(3) For steam fluids, steam generated from a boiler will contain a large amount of drainage. Always install a drain trap.

(4) When passing steam, the make-up water in the boiler will contain substances such as “calcium salt” and “magnesium salt”. As these substances will react with oxygen and carbon dioxide, and cause scales and sludge to form, always install a “water softener” and a filter for steam.

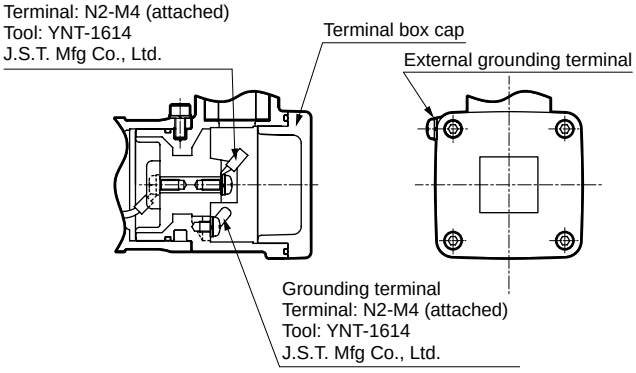
(5) When AP/AD/ADK and the regulator are directly coupled, the parts could mutually vibrate, causing resonance and chattering.

(6) If the piping cross-sectional area on the fluid inlet is reduced, the operation may become unstable due to differential pressure failure during valve operation. For the fluid inlet, use piping of a piping size that matches the port size of the valve. Do not use a needle valve.

2 Wiring

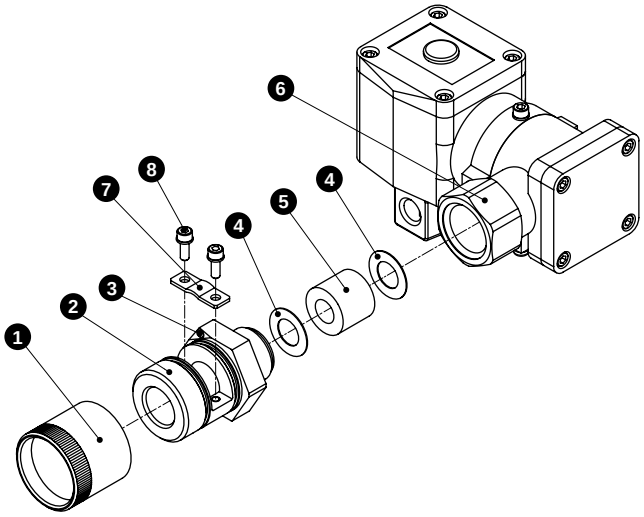
■ Wiring

- As a guide, use a wire with a nominal cross section of 1.04 to 2.63 mm^2 and the following allowable temperature.
  AB*EX4, AG4*EX4, AP**EX4, AD**EX4, ADK1*EX4 ..... Allowable temperatures 80°C or higher
  AB*EX2, AP**EX2 ..... Allowable temperatures 100°C or higher
  Make sure that excessive force is not applied to the lead wire.
- Install wiring in accordance with JIS explosion-proof guidelines.
- Remove the terminal box cap and install the wiring. Use the tools specified in the following diagram for crimping the crimp terminals upon wiring. After finishing wiring, securely tighten the terminal box cap.



■ Tightening the gland

1. Pass the cable through ❶ connector cap, ❷ gland, ❹ spacer, ❺ packing and ❹ spacer, and connect to ❻ terminal box.
2. Insert ❹ spacer, ❺ packing and ❹ spacer to ❻ terminal box, and screw ❷ gland into ❻ terminal box with 40 to 44 N·m of torque until the gap is eliminated.
3. Be sure to tighten ❸ low head hexagon socket set screws to prevent ❷ glands from loosening.
4. Tighten ❼ holder using ❽ low head hexagon socket bolt × 2 and spring washers × 2 with 1.9 to 2.0 N·m of torque to hold the cable.
5. Tighten ❶ connector cap until it comes in contact with ❷ gland.



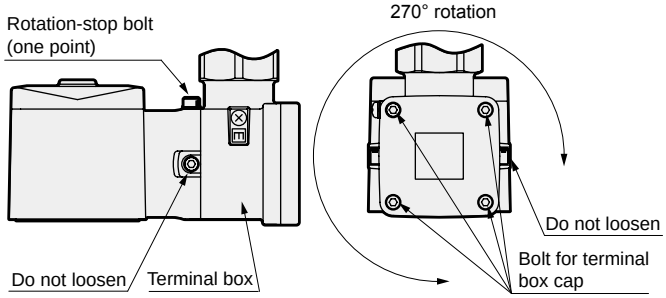
Make sure that the spacer does not catch on the terminal box thread part. The gland may be insufficiently tightened and disassembly may become impossible.

■ Be sure to replace used packings rather than reusing them.

■ Packing sizes are the four types shown below.

(1) ø7.5 to 9.5 *1, ø9.5 to 10.5, ø10.5 to 11.5, ø11.5 to 13.5
Be sure to use the cable diameter within the packing display value range. When the packing size and cable diameter do not match, the explosion-proof performance may be compromised.
*1 ø8.0 to ø9.5 for Korea-certified products AB41EX2, AP11EX2, and AP21EX2.

(2) Terminal box rotates 270°. The orientation can be changed by loosening the rotation-stop bolt. After wiring and setting the wiring direction, tighten the rotation-stop bolt with a torque of 0.6 to 0.8 N·m to fix the terminal box. If the rotation-stop bolt is loose, the terminal box could fall off during use. Furthermore, rotation of the terminal box may result in damage to the rotating unit or disconnection of an internal wire. When laying the electric wires, do not loosen any bolts other than the four terminal box cap bolts and rotation-stop bolt. The explosion-proof performance cannot be guaranteed.



(3) Include a fuse (1A) in the electrical circuit.

When using the product

⚠CAUTION

1 Instantaneous leakage

With the pilot operated or pilot kick 2-port valve, if the pressure is suddenly applied when the pump starts while the valve is closed, the valve may open for an instant causing fluid to leak. Caution is required during use.

2 Operation

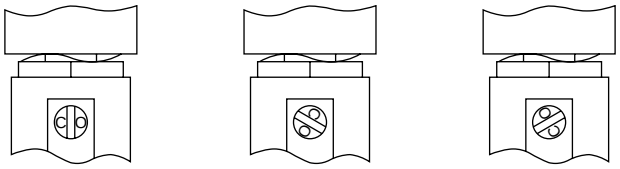
Do not apply back pressure. This could lead to malfunction.

3 Manual operation

When using a product with a manual override, follow the operations below:

Opening : Insert a flathead screwdriver into the slit on the manual adjustment shaft, and turn it approx. 120° to the right or left. The plunger will rise and the valve will open. (For the 3-port valve, the NC side valve seat will open and the NO side valve seat will close.)
The open state is held even when the screwdriver is removed.
Always return the valve to the original position after use.

Closing : From the open position, turn the manual adjustment shaft so that the slit is returned to the perpendicular position, which will lower the plunger and close the valve. (For the 3-port valve, the NC side valve seat will close and the NO side valve seat will open.) (Refer to the figure below)



Valve closed state | Valve open state | Valve open state

Maintenance

⚠CAUTION

1 Maintenance of coil case

Do not disassemble an explosion-proof solenoid valve used in an explosive hazard area, even when repair is necessary. Since the coil case section has a pressure and explosion-proof structure, if it must be disassembled for inspection, contact CKD.

To guarantee the performance of the explosion-proof valve, CKD requests that customers return the valves temporarily for repair at the CKD manufacturing plant.