Pneumatic components

Safety Precautions

Be sure to read this section before use.
Refer to this section for detailed precautions for individual series.

Design/selection

1. Checking the specifications

⚠ WARNING

■ Use the product in the range of conditions specified for the product.
The product in this catalog is designed for use only in a compressed air system. Use with pressure or temperature exceeding the specifications range may result in damage or operation faults. (Refer to specifications) Contact CKD when using fluids other than compressed air.

2. Safety design

⚠ WARNING

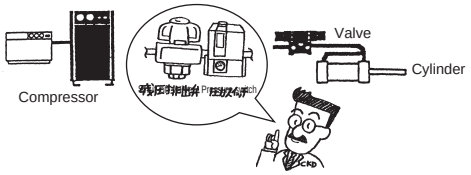
■ Understand the characteristics of compressed air before designing a pneumatic circuit.
- The same functions as the mechanical, hydraulic, and electrical methods cannot be anticipated if instantaneous stopping and holding are required during an emergency stop.
- Pop-out, air discharge, or leakage due to air compression and expansion may occur.
- The supply and exhaust of the valve must operate simultaneously.
When the supply is operated in advance, the actuator switching will be delayed.
When the exhaust is operated in advance, the actuator speed will be uncontrollable, causing the popping out phenomenon.

■ Make sure that the switching signals of the 2-position and 3-position double solenoids are never energized at the same time.

■ When using a 3-position all ports closed valve with a custom stroke, the properties of compressed air make it impossible to brake at an accurate position. In addition, as valves and cylinders, etc., are designed to allow small volumes of air leakage, pressure retention applications are not available, as they may cause the stop position to change or cause a pressure drop.

■ Pay attention to the electric circuit during emergency stop and to the cylinder operation during power outages.
- If the 2-position double solenoid is started and then switched, it will hold that status unless a reverse operation electrical signal is input.

■ Install a “pressure switch” and “shut-off valve” on the device’s compressed air supply side.
- The pressure switch will disable operation until the set pressure is reached. The shut-off valve releases compressed air into the pneumatic pressure circuit to prevent accidents caused by operation of pneumatic components under residual pressure.

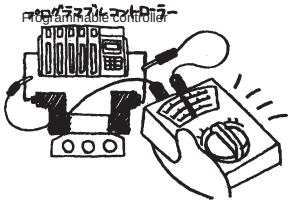


■ Do not constrict the air supply piping.
- A drop in pressure due to simultaneous operation of multiple stations may cause malfunctions.

■ Take measures to prevent physical harm or property damage in the event of failure of this product.

⚠ CAUTION

■ Check for leakage current to avoid malfunction caused by leakage current from other fluid control components.
- When using a programmable controller, leakage current may affect the solenoid valve and cause malfunction.
Note that the values that are affected by leakage current depend on the solenoid valve.



Using 100 VAC	3.0 mA or less (*1)
Using 200 VAC	1.5 mA or less
Using 12 VDC	1.5 mA or less (*2)
Using 24 VDC	1.8 mA or less (*2)

*1: 1.2 mA or less for the 4G Series.

■ Observe the following precautions when using nylon tubes or urethane tubes for piping material.
- Use flame-resistant tubes or metal steel pipes in an environment where spattering may occur.
- Use hydraulic hose when piping is for both hydraulic and pneumatic use.
- When using the standard push-in fitting on the spiral tube, fix the base of the tube with a hose clamp.
Rotation may occur, causing a reduction in holding force.
- Use a fastening fitting in a high-temperature atmosphere. The push-in fitting cannot be used.

3. Working environment

⚠ WARNING

■ Confirm before use that the product will withstand the working environment.
- This product cannot be used in an atmosphere containing corrosive gas, chemical liquids, solvents, water or steam. If water, oil, or metal chips (spatter or cutting chips, etc.) could come in contact with the product, provide appropriate protection.
- Consult with CKD if ozone is generated in the supplied air. (Ozone-proof products are available.)
- Products other than explosion-proof solenoid valves cannot be used in an atmosphere containing explosive gas.

■ Install the product where it will not be exposed to rain, water, direct sunlight, or high temperatures.
(The explosion-proof 4F ** OE series and outdoor 4F-W series are available for outdoor use.)

■ Do not use this product in a corrosive environment.
Use in such an environment could lead to damage or operation failure.

⚠ CAUTION

■ Use clean air.
- If compressed air contains chemicals, synthetic oils containing organic solvents, salt, or corrosive gas, do not use as it can cause damage and/or operation failure.

4. Durability

⚠ WARNING

■ Decide on a method of lubricating pneumatic components, and provide correct maintenance.
- ● Is it a no-lubrication?
- ● Is it a lubrication?

Specify either of the above for control of lubricant.

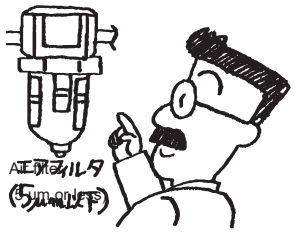
■ Ultra dry air is not suitable for pneumatic components.
- ● Ultra dry compressed air will shorten the life of pneumatic components. For use, be sure to use a solenoid valve for DC voltage drive.

■ Continuous energizing during use may accelerate degradation of the solenoid valve. Contact CKD when using the solenoid valve under such conditions.
- ● When using a product with continuous energization, be sure to use items with DC voltage specifications or fluoro rubber specifications.

5. Pneumatic source

⚠ CAUTION

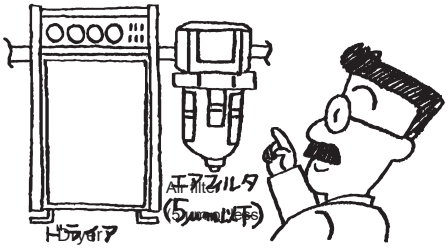
■ Install a pneumatic filter just before the pneumatic component in the circuit.



■ Do not supply anything other than compressed air.

■ Use clean compressed air that does not contain corrosive gases.

■ Use dry compressed air that does not cause moisture inside the piping.



- ● Moisture will occur if the temperature drops in the pneumatic piping or pneumatic components.
- ● Operation faults could occur if moisture enters the air flow path of pneumatic components and temporarily blocks passage.
- ● Moisture could cause rust, making the pneumatic components fail.
- ● The drain will flush the lubricant oil and cause a lubrication defect.

■ Use compressed air that does not contain oil oxides, tar, carbon, etc., from the air compressor.
- ● If oil oxides, tar, or carbon enter the pneumatic components and solidify, resistance at the sliding section will increase, leading to operation failure.
- ● If the supplied lubricant mixes with oil oxides, tar, carbon, etc., the sliding section of the pneumatic component could be worn down.

■ Use compressed air that does not contain solid foreign matter.
- ● Any solid foreign matter in the compressed air can enter the pneumatic components and cause wear or locking in the sliding parts.

6. Usage method

⚠ WARNING

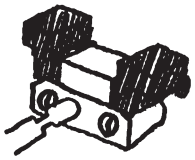
■ Do not narrow the exhaust port of the manifold valves.
- ● There may be cases where other cylinders are subject to unintended operation due to back pressure generated from the exhaust of the switching valve. In this case, individually install a manifold two-sided exhaust type or a single exhaust spacer equipped type with the valve causing the situation.

⚠ CAUTION

■ Make sure that the instantaneous energizing/manual override of the double solenoid 2 position valve is 0.1 seconds or more.
However, as the cylinder may malfunction due to secondary side load conditions, it is recommended that energizing/manual override is performed until the cylinder reaches the stroke end position.

■ For manual override of the push type, push the manual override straight.

■ Do not use the product with the air supply port throttled or released to atmospheric pressure.



Do not restrict the air supply port!

- ● With the internal pilot, the supply pressure may drop lower than the specified range and cause malfunctioning. In this case, use the external pilot.

■ Continuous energizing for long periods may accelerate degradation of the solenoid valve. Consult with CKD when energizing this device continuously. Furthermore, use caution under the following working conditions, as with continuous energization:
- When performing continuous energizing for a long period of time or when the energized time in a single day will be longer than the non-energized time

Install with an eye to heat dissipation.

■ With the internal pilot solenoid valve, turn the power on after applying the supply pressure.
The main valve may stop at an unintended position and prevent proper switching.

7. Securing of space

⚠ CAUTION

■ Secure sufficient space around the solenoid valve for installation, removal, wiring, and piping work.

8. Clearly indicated in the instruction manual

⚠ CAUTION

■ Indicate the maintenance conditions in the device's instruction manual.
- ● The product's performance may drop too low to maintain an appropriate safety level depending on usage conditions, working environment and maintenance status. With correct maintenance, the product functions can be used to the fullest.

Safety Precautions

Be sure to read this section before use.
Refer to this section for detailed precautions for Individual series.

Mounting, installation and adjustment

1. Installation

⚠WARNING

■ When mounting a valve, do not use a mounting method that relies on support from the piping.
- Mount and fix the valve body.

■ After mounting, do not clean or paint with water or solvent.
- Otherwise some resin parts may be damaged.
- Paint could plug the pilot exhaust port and result in malfunctions.

■ Do not narrow the exhaust port to a smaller one than the bore size of the piping connection port.
(The pilot exhaust port is also included as an exhaust port)
- Either attach a silencer or install a solenoid valve so that the exhaust port is facing downwards.
  An inhale effect may be generated at the exhaust port due to valving element operations and cause the intake of foreign matter near the exhaust port.
  If the exhaust port is facing upwards, foreign matter may fall into it.
- The actuator will not operate correctly if the exhaust air is not discharged smoothly. With the manifold, the exhaust air may prevent the correct operation of other solenoid valves.

■ Do not block the pilot exhaust port (PR port).
- Pilot pressure will not be discharged and will fail to operate.

■ Remove the valve packaging and dust-proof seal of the piping port just before starting piping.
- Removing the dust-proof seal of the piping port before the piping work starts could allow foreign matter to enter the valve from the piping port and cause failure or misoperation.

■ Check that tubing is not worn or damaged.
- Tubing could collapse, rupture, or become dislocated.

2. Pre-operation confirmation

⚠CAUTION

■ When supplying compressed air after connecting pipes, do not suddenly apply high pressure.
- The pipe connection could dislocate, causing the pipe tube to fly out, leading to accidents.
- Caution: If compressed air is supplied too slowly, sealing pressure may not be generated depending on the internal sealing mechanism of the solenoid valve and may cause air leakage.

■ As air leakage may occur when compressed air is supplied with the two 3-port valves integrated (differential pressure return) without piping to the output port, be sure to supply the compressed air after piping the output port.

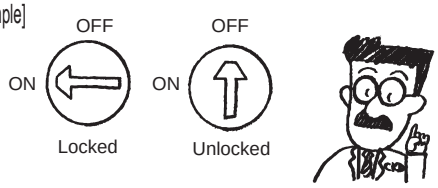
■ Before supplying compressed air after connecting pipes, check that there are no air leaks at any pipe connections.
- Apply a leakage detection agent to pipe connections with a brush and check for air leaks.

3. Adjustment

⚠WARNING

■ When the manual operation device of the solenoid valve has been operated, always be sure to operate the device after reset to the origin (default position).
Be sure to check that the non-locking has automatically returned or that the locking is in a state where the lock is released (OFF state).

[Example]



Note: As this varies depending on the model, refer to the pages of each model for operation methods.

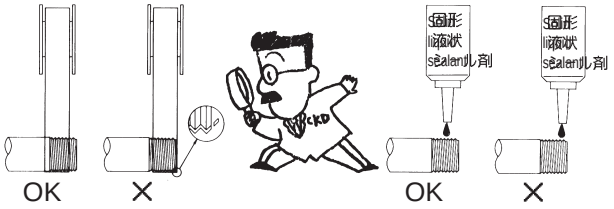
- The solenoid valve will operate as soon as the pneumatic source power is turned ON, which is hazardous.
- When the manual override device is used for operation at the operating position, abnormal operation is a risk.

4. Piping

⚠CAUTION

■When connecting pipes, wrap sealing tape in the opposite direction from the threading, from the inside position to within 2 mm 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 solenoid valve, causing failures.

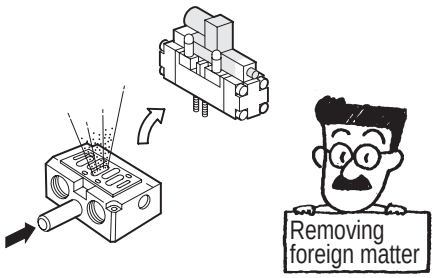


■Open the package in a cleanroom.

● The product is packaged in a cleanroom using antistatic sheet and packed in a packaging box. When installing in the cleanroom, take the product out of the box outside the cleanroom and open the package in the cleanroom.

■Always flush just before piping pneumatic components.

● Any foreign matter that has entered during piping must be removed so it does not enter the pneumatic components.



■Use appropriate torque to tighten the pipes when connecting them.

● The purpose is to prevent air leakage and damage to bolts. irst tighten the bolts by hand to ensure that the threads are not damaged, then use a tool.

Port thread	Tightening torque N·m
M3	0.3 to 0.6
M5	1.0 to 1.5
Rc 1/8	3 to 5
Rc 1/4	6 to 8

■ When piping to the product
Properly connect pipes by confirming the piping port position with the display, etc., on the product. Incorrect piping may cause irregular operation of the actuator.

■Connect piping so that connections are not dislocated by equipment movement, vibration, or tension.

● Control of actuator speed will be disabled if piping on the exhaust side of the pneumatic circuit is disengaged.
● When using the chuck holding mechanism, the chuck may be released, creating a hazardous state.
● Cut the push-in fitting tube at right angles with a dedicated tool.
● Confirm that the tube has been inserted properly, and make sure that there is no tension during use. The tube could be dislocated or damaged if there is any tension.

■Make sure that there is no torsion, tension or moment load applied to the fitting or the tube.

■Use the designated tube.

● Particularly in the case of super-flexible urethane tubes, attach insert sleeves for use.

■Securely insert the tube to the tube end, and make sure that the tube cannot be pulled off.

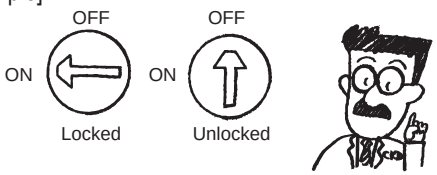
■Cut the tube with a dedicated cutter and always at a right angle.

Use/maintenance

1. Maintenance and inspection

⚠WARNING

■ When the manual operation device of the valve has been operated, always be sure to operate the device after reset to the origin (default position).
Be sure to check that the non-locking has automatically returned or that the locking is in a state where the lock is released (OFF state).
[Example]



Note: As this varies depending on the model, refer to the pages of each model for operation methods.

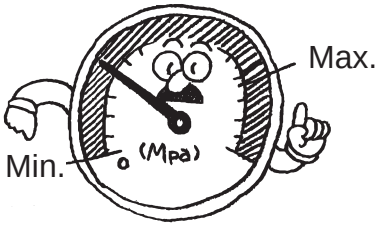
- The solenoid valve will operate as soon as the power is turned ON, which is hazardous.
- When the manual override device is used for operation at the operating position, abnormal operation is a risk.

■ Conduct daily inspections and regular inspections to ensure that maintenance control is done correctly.

- If maintenance is not correctly managed, the product's functions could deteriorate markedly and lead to a shortened service life, faults and accidents.

1. Pressure management of supplied compressed air pressure

- Is the set pressure supplied? Does the pressure gauge indicate the set pressure while the equipment is operating?



2. Control of pneumatics filter

- Is the drain correctly discharged?
  Is the bowl or element clean enough to use?

3. Control of compressed air leaks from piping connections

- Is the state of the connection, especially at movable sections, normal?

4. Valve operational status control

- Are operations delayed? Is exhaust normal?

5. Control of pneumatic actuator operation

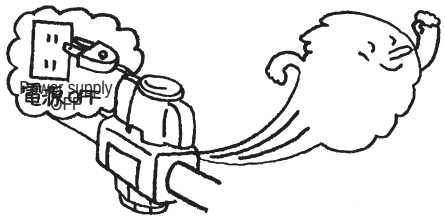
- Is operation smooth? Is the end stop state normal?
  Is coupling with the load normal?

2. Removal

⚠WARNING

■ Before conducting maintenance, turn the power OFF, stop the supply of compressed air and make sure that there is no residual pressure.

- Observe the conditions to ensure safety.



3. Disassembly/Assembly

⚠WARNING

■ Read the relevant product's instruction manual thoroughly and fully familiarize yourself with the task before disassembling or assembling the solenoid valve.

- Personnel must be fully familiar with solenoid valve structure and operational principles and safety requirements.
- Pneumatic Pressure Skill Test Class 2 or higher level is required.

Reduced wiring valve / product-specific cautions (MN4E/M(N)4G$^{A}_{B}$ Series)

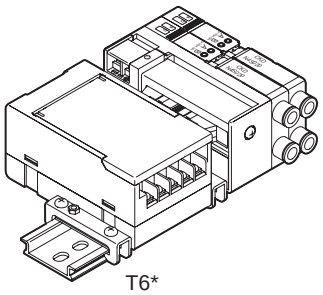
⚠ CAUTION

Install the wiring while sufficiently checking the polarity, voltage, and terminal numbers.

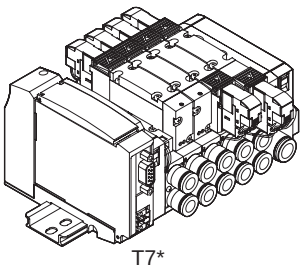
- Voltage drop may occur due to simultaneous energizing or cable length.
  Confirm that the voltage drop for the solenoid is within 10% of the rated voltage.

(1) Serial transmission (with T6* and T7*)

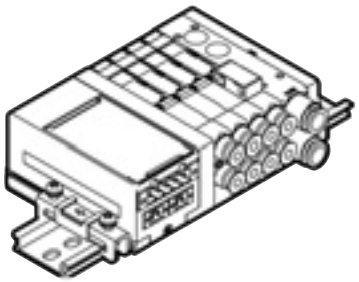
- These models are dedicated for use with a working voltage of 24 VDC.
- If operation may be affected by noise, wire the power supply independently for each manifold solenoid valve when possible.
- Keep the power supply cable as short as possible.
- Do not share power with an inverter or components causing motor noise, etc.
- Do not lay the power wire, signal wire, and other power cables in parallel.
- The slave units are dedicated for each manufacturer. There is no compatibility.
- For how to wire the slave unit, follow the instructions provided from the PLC manufacturer. The terminal numbers of the slave unit are displayed on the attachment side of the slave unit.
- For information regarding the PLC, please contact the corresponding PLC manufacturer.
- When installing a manifold solenoid valve vertically, install the slave unit at the top end.



T6*



T7*
(4G Series)



T7*
(MN4E Series)

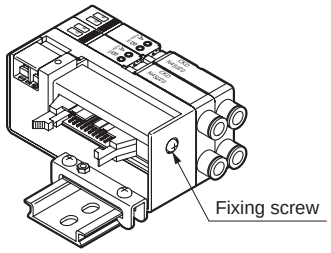
(2) Connector (T50)

- As it is necessary to match the signal arrangement of the PLC output unit with the signal arrangement on the valve side, direct connections with a PLC are currently limited. Establish connections with wiring connection examples (MN4E series: page 404, M4G$^{A}_{B}$/MN4G Series: page 735) as a reference. For the cables, use dedicated cables^{A} for each PLC manufacturer.
- These models are dedicated for use with a working voltage of 12 and 24 VDC.
- When connecting the T50, T50A type to a general output unit, use the + terminal (20, 10) of the 20P connector as the + side common, and use the NPN transistor output open collector type for the drive circuit. Contact CKD when using the PNP transistor output.
- Do not connect this solenoid valve to the input unit as major faults could occur in this device and in peripherals. Connect this solenoid valve to the output unit.
  Although common connectors are employed with the input units and output units of the relay terminal series by OMRON and Panasonic Electric Works Co., Ltd., the pin arrangement and polarity of the power supply are different. The pin arrangement of the T50 type of this solenoid valve is the same pin arrangement as the above output unit.

⚠ CAUTION

■ Install so that no force is applied to the connector section. The fixing screws may loosen if force is applied to the connector section.

- The connector rotates upwards and sideways. Further fasten the fixing screws after installation of the solenoid valve can fix the connectors.
- Make sure that the tightening torque of the fixing screws is 0.3 to 0.36 N·m.



Reduced wiring valve / product-specific cautions (MN4E / M(N)4G$^{A}_{B}$ Series)

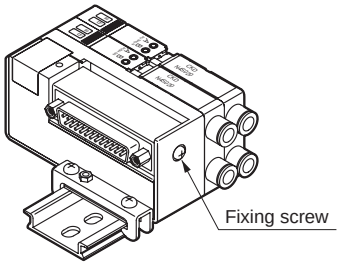
⚠ CAUTION

(3) Connector (T30, T31, T51, T52, T53, TM*)

- These models are dedicated for use with a working voltage of 12 and 24 VDC.

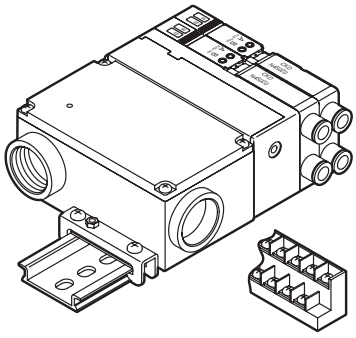
⚠ CAUTION

- Install so that no force is applied to the connector section. The fixing screws may loosen if force is applied to the connector section.
  - The connector rotates upwards and sideways. Further fasten the fixing screws after installation of the solenoid valve can fix the connectors.
  - Make sure that the tightening torque of the fixing screws is 0.3 to 0.36 N·m.

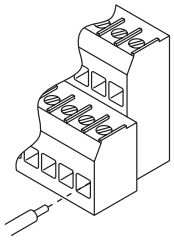


(4) Terminal block (T10, 11)

- Install the terminal block in a location that is out of reach or place a cover on the unit.



T10 terminal appearance



T11 terminal appearance