# Safety Precautions

Be sure to read this section before use.

When designing and manufacturing a device using CKD products, the manufacturer is obligated to check that device safety mechanism, pneumatic control circuit, or water control circuit and the system operated by electrical control that controls the devices is secured.
It is important to select, use, handle and maintain the product appropriately to ensure that the CKD product is used safely.
Observe warnings and precautions to ensure device safety.
Check that device safety is ensured, and manufacture a safe device.

## WARNING

**1** This product is designed and manufactured as a general industrial machine part.
It must be handled by an operator having sufficient knowledge and experience.

**2** Use this product in accordance with specifications.

This product must be used within its stated specifications. In addition, never modify or additionally machine this product.
This product is intended for use in general industrial machinery equipment or parts. It is not intended for use outdoors (except for products with outdoor specifications) or for use under the following conditions or environments.
(Note that this product can be used when CKD is consulted prior to its usage and the customer consents to CKD product specifications. The customer should provide safety measures to avoid danger in the event of problems.)

❶ Use for applications requiring safety, including nuclear energy, railways, aircraft, marine vessels, vehicles, medical devices, devices or applications in contact with beverages or foodstuffs, amusement devices, emergency cutoff circuits, press machines, brake circuits, or safety devices or applications.
❷ Use for applications where life or assets could be significantly affected, and special safety measures are required.

**3** Observe organization standards and regulations, etc., related to the safety of device design and control, etc.

ISO4414, JIS B 8370 (Pneumatics fluid power - General rules and safety requirements for systems and their components)
JFPS2008 (Principles for pneumatic cylinder selection and use)
Including the High Pressure Gas Safety Act, Industrial Safety and Health Act, other safety rules, organization standards and regulations, etc.

**4** Do not handle, pipe, or remove devices before confirming safety.

❶ Inspect and service the machine and devices after confirming safety of all systems related to this product.
❷ Note that there may be hot or charged sections even after operation is stopped.
❸ When inspecting or servicing the device, turn OFF the energy source (air supply or water supply), and turn OFF power to the facility.Discharge any compressed air from the system, and pay attention to possible water leakage and leakage of electricity.
❹ When starting or restarting a machine or device that incorporates pneumatic components, make sure that the system safety, such as pop-out prevention measures, is secured.

**5** Observe warnings and cautions in the following pages to prevent accidents.

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

| | |
|---|---|
| ⚠ DANGER: | When a dangerous situation may occur if handling is mistaken leading to fatal or serious injuries, and when there is a high degree of emergency to a warning. |
| ⚠ WARNING: | If handled incorrectly, a dangerous situation may occur, resulting in death or serious injury. |
| ⚠ CAUTION: | When a dangerous situation may occur if handling is mistaken leading to minor injuries or physical damage. |

Note that some items described as "CAUTION" may lead to serious results depending on the situation.
Every item provides important information and must be observed.

## Warranty

**1** Warranty period

The product specified herein is warranted for one (1) year from the date of delivery to the location specified by the customer.

**2** Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified above, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.
However, following failures are excluded from this warranty:

1) Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or the Instruction Manual.
2) Failure caused by use of the product exceeding its durability (cycles, distance, time, etc.) or caused by consumable parts.
3) Failure not caused by the product.
4) Failure caused by use not intended for the product.
5) Failure caused by modifications/alterations or repairs not carried out by CKD.
6) Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
7) Failure caused by acts of nature and disasters beyond control of CKD.

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.
Note: For details on the durability and consumable parts, contact your nearest CKD sales office.

**3** Compatibility check

The customer is responsible for confirming the compatibility of CKD products with the customer's systems, machines and equipment.

Pneumatic components

# Safety Precautions

Be sure to read this section before use.
Refer to "Pneumatic Valves (No.CB-023SA)" for general precautions on valves.

Product-specific cautions: Pilot operated explosion-proof 3, 5-port valve 4G*/M4G* EJ Series

## Design/selection

### ⚠ WARNING

- Usable in Class 1 and 2 danger zones (Zones 1 and 2) where there is combustible gas or steam. Cannot be used in Class 0 special danger zone.
- Explosion-proof performance is ExibIICT4Gb. Select models and perform installation in accordance with JIS.C.60079 "Factory Explosion-Proof Guidelines for Users JNIOSH-TR-NO.44 (2012)".
- Use in combination with a barrier. Valves cannot be used independently in dangerous zones.
- The 4GD/E*EJ Series has a certification range within Japan only.

### ⚠ CAUTION

■ Explosive gas and explosion-proof structure

The degree of explosive gas danger is classified according to the group and temperature class. 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 class must be indicated in this order on the electrical components of explosion-proof structures. These codes indicate which group and temperature class the electrical components have been manufactured for, and which gases can be used. For the example of explosion-proof solenoid valve of ExibIICT4Gb:

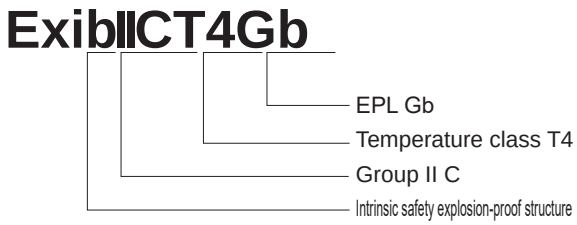



Table 2 indicates the classification of gases with a danger category of Group II C and temperature class T4 that are compatible with the product. Less dangerous gases are also listed that are guaranteed to be explosion-proof. Temperature class refers to the degree of ignition risk, and is classified into six classes according to the ignition point. It defines the maximum surface temperature of the device corresponding to each class (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. EPL represents the component protection level. Gb indicates a component with a high protection level that can be used in Class 1 danger zones.

Table 1

| Item | 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

| Temperature class / Group | T1 | T2 | T3 | T4 | T5 |
|---|---|---|---|---|---|
| II A | Acetone<br>Ammonia<br>Carbon monoxide<br>Ethane<br>Acetic acid<br>Ethyl acetate<br>Toluene<br>Propane<br>Benzene<br>Methanol<br>Methane | Ethanol<br>Isoamyl acetate<br>Butane<br>Acetic anhydride | Gasoline<br>Hexane | Acetaldehyde | |
| II B | | Ethylene<br>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 "dangerous zones". These zones are classified into Class 0 special danger zones, Class 1 danger zones and Class 2 danger zones 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.

● Special danger zone (Zone 0)(4GD/E*EJ 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 long periods above the lower limit for explosions.

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

● Class 1 special danger zone (Zone 1)

(1)Zones where explosive gas could accumulate to a dangerous concentration during operations such as the operation of the product take-out lid open/close / safety valve, etc.

(2)Zones where explosive gases are likely to accumulate to dangerous concentrations during repair or maintenance or due to leakage, etc.

● Class 2 special danger zone (Zone 2)

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

### 1. Prohibition of Disassembly and Modification

#### ⚠ WARNING

- Disassembly of pilot valves or barriers not only leads to the risk of decreased explosion-proof performances but may also cause accidents. Accordingly, customers are asked not to disassemble or modify their units.

### 2. Intrinsic safety explosion-proof circuit wiring

#### ⚠ WARNING

- The intrinsic safety explosion-proof circuit wiring should not be mixed with other circuitry, nor should it be installed so as to be affected by static induction or electromagnetic induction from other circuits.

Intrinsic safety-related components (safety retainer, barrier) and intrinsic safety components (4G EJ Series) must meet the explosion-proof specifications below, as well as the safety retention ratings and parameters.

| Intrinsic safety component | combination condition | Intrinsic safety related component |
|---|---|---|
| Explosion-proof structure and category: ia, ib, ic | ≤ | Explosion-proof structure and category: ia, ib, ic |
| Electrical Component group: IIA, IIB, IIC | ≤ | Electrical Component group: IIA, IIB, IIC |
| Ui:Intrinsic safety circuit allowable voltage (maximum addable voltage) | ≥ | Uo: Max. voltage (max. output voltage) |
| Ii:Intrinsic safety circuit allowable current (maximum addable current) | ≥ | Io: Max. current (max. output current) |
| Pi: Intrinsic safety circuit allowable power (max. input power) | ≥ | Po: Max. power (max. output power) |
| Ci+Cw<br>Ci: Intrinsic Component's internal capacitance<br>Cw: Intrinsic safety circuit wiring max. capacitance | ≤ | Co:Allowable capacitance<br>(maximum connectable capacitance) |
| Li+Lw<br>Li: Intrinsic Component's internal inductance<br>Lw: Intrinsic safety circuit wiring max. inductance | ≤ | Lo:Allowable inductance<br>(maximum connectable inductance) |

The length of the intrinsic safety circuit external wiring can be calculated using the method below, in accordance with the above connection conditions.
Wiring capacitance and inductance are Co≥Ci+Cw and Lo≥Li+Lw.
The allowable wiring length must be less than or equal to the value of either (Co-Ci)/Cc or (Lo-Li)/Lc, whichever is smaller.
Cc: Capacitance per unit length, Lc: Inductance per unit length

## 3. When using the product in combination with low friction cylinders

■ Malfunctions could occur because of the exhaust pressure. Contact CKD.

## 4. Degree of protection IP67 IP67

■ 4GD/E* The EJ Series supports IP67 as standard, and while it is protected from dust and water, note that it cannot be used immersed in water. Countermeasures such as a protective cover for the unit should also be taken if using in environments where it will be constantly exposed to dust or water.

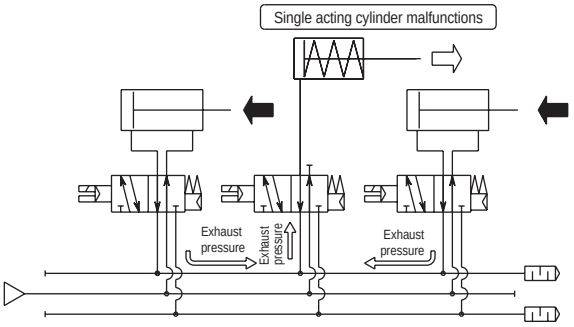
■ Barrier degree of protection is IP20.

## 5. Exhaust check valve

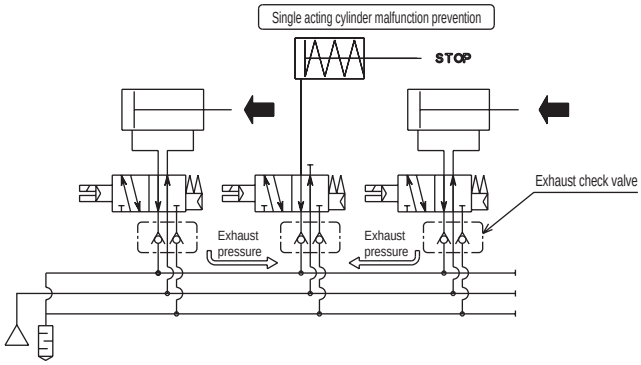
**CAUTION**:The exhaust check valve is a check valve. If the cylinder rod is manually operated directly without pressurization, the check valve opens and the air flow is shut off, preventing cylinder rod adjustment.

Generally, the double acting cylinder connected at the manifold to direct acting cylinders or ABR connection valves may malfunction when adversely affected by the exhaust pressure led in by operation of other cylinders. For the manifold of 4G Series, the "exhaust check valve" integrated to prevent this malfunction can be selected, except for all ports closed valves and PAB connection valves. However, with components that are affected by a small amount of leakage or pressure of low friction cylinders, etc., the functions may not operate properly. Moreover, 4G4 is not compatible with check valves.

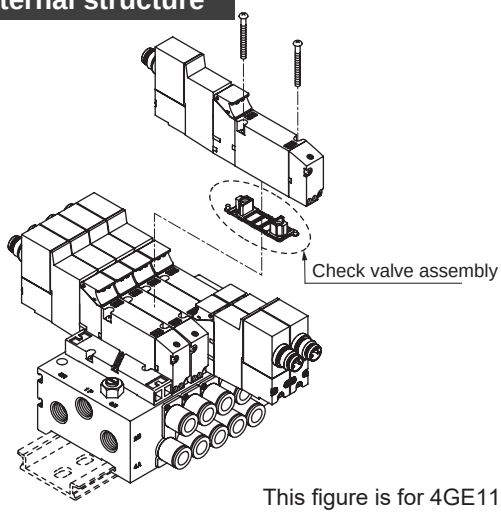
### Example of pneumatic pressure system that may malfunction




### 4G Series pneumatic pressure system




### Internal structure

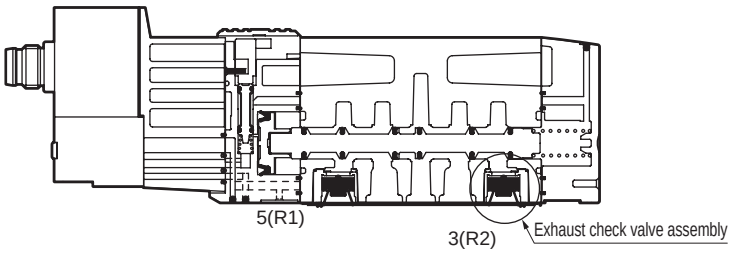



This figure is for 4GE119R

Standard specifications of check valve

| Model No. | Flow path switching | Option (H) selection |
|---|---|---|
| 3G D/E*669EJ | Two 3-port valves integrated NC/NC | Yes |
| 4G D/E*19EJ | 2 position single | Yes |
| 4G D/E*29EJ | 2-position double | Yes |
| 4G D/E*39EJ | 3-position all ports closed | No |
| 4G D/E*49EJ | 3-position ABR connection | Yes |
| 4G D/E*59EJ | 3-position PAB connection | No |

Note:Because 3-position all ports closed type and PAB connection type are not adversely affected by the exhaust pressure led in from other cylinders at the neutral position, installation of a check valve is not required.



# Mounting, installation and adjustment

## 1.Body piping (D) Discrete installation method

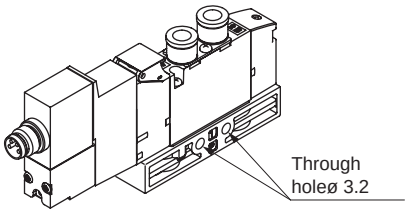
### ⚠CAUTION

■ When directly installing the manifold

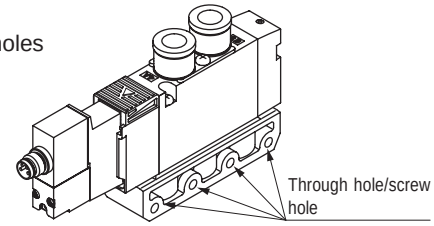
● The discrete body piping 4GD Series can be installed using the (a) through hole or (b) screw hole. When using the screw holes, be careful of the tightening torque.

Screw hole Tightening torque 0.7 to 1.2 N·m

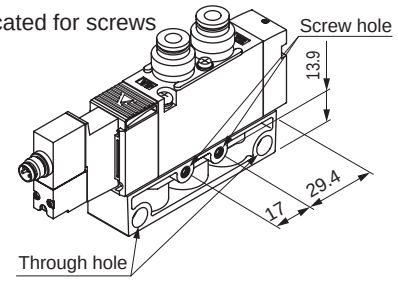
4GD1 Series
(a) 2 through holes



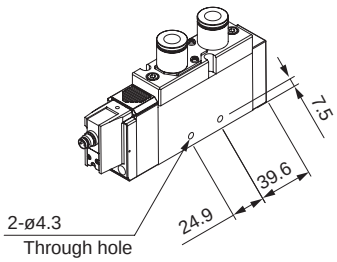

4 GD2 Series
(a) Through hole
(b) 4 common screw holes



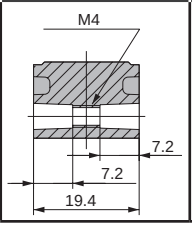
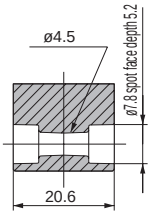
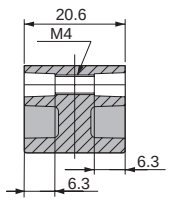

4 GD3 Series
(a) Through hole
(b) 2 places each, dedicated for screws




4 GD4 Series
(a) 2 through holes




Mounting hole shape

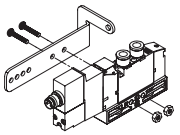
| | 4GD 2 | 4GD3 | |
|---|---|---|---|
| | (a) (b) Common use | (a) Through hole | (b) Screw hole |
| Sectional view of mounting hole |   |   |   |

■ When installing the manifold with mounting plate (P)

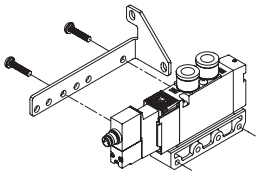
● Be careful of the mounting direction and orientation, as damage may result from incorrect mounting of body piping single mounting plate (P).

■ How to mount mounting plate (P)

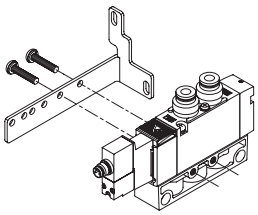
4GD1



4GD2



4GD3



Mounting plate (P) kit

| | Kit model No. | Set parts |
|---|---|---|
| 4GD1 | 4G1R-MOUNT-PLATE-KIT | Mounting plate, 2 mounting screws, 2 nuts |
| 4GD 2 | 4G2R-MOUNT-PLATE-KIT | Mounting plate, 2 mounting screws |
| 4GD3 | 4G3R-MOUNT-PLATE-KIT | Mounting plate, 2 mounting screws |

*Mounting plate is compatible only with single type. Moreover, 4G4 is not compatible.

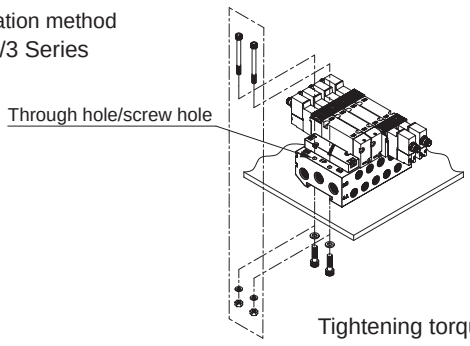
## 2 . How to install manifold (Metal base 4G$^{D}_{E}$Series)

### ⚠CAUTION

■ When directly installing the manifold

● For installation of the M4G2/3 Series, there are two methods of tightening the manifold with bolts: after passing it through the upper side of the manifold base and after tightening it with the bolts from the back side. When using a female thread as shown in the table below, check the thread depth, select a mounting bolt with 10 screw-in threads or more, and be careful with the tightening torque. The screw could be damaged if incorrectly installed.

Installation method
M4G2/3 Series

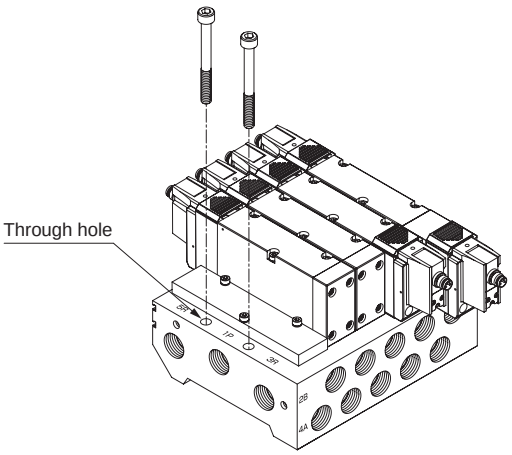



Tightening torque
1 to 1.5 N·m

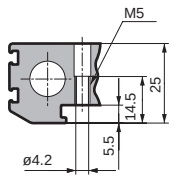
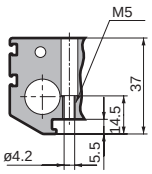
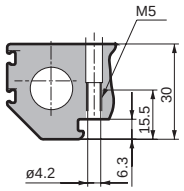
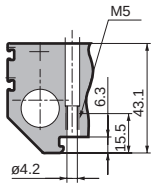
# Mounting, installation and adjustment

## M4G4 Series

- M4G$^{D}_{E}$For installation of Series 4, tighten the manifold with bolts after passing them through the upper side of the manifold base.




Mounting hole shape (sectional view)

| | Standard manifold | |
|---|---|---|
| | M4GD (body piping) | M4GE (Base piping) |
| M4G2 |  |  |
| M4G3 |  |  |



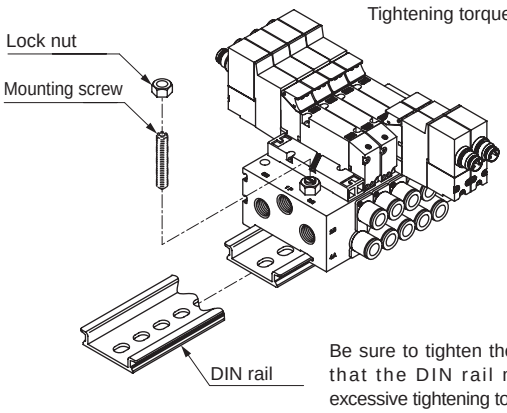
## ■When installing the manifold with DIN rail

M 4 G 1, 2, 3

- The manifold of the direct mounting specification can be changed to that of the DIN rail mounting specifications. Note that inappropriate mounting may result in falling off and damage of the manifold. If the manifold weighs more than 1 kg, or when using in an environment with vibration or impact, fix the DIN rail onto the surface at 50 to 100 mm intervals, and confirm that there is no problem with installation before starting operation. Use the individual specifications to calculate the weight.
  (CAUTION: Only the M4GE1 (page 53) is provided with a dedicated base for the direct mount type or DIN rail mount type. As for the mounting type, direct mount cannot be changed to DIN rail mounting, but the DIN rail mounting type can be direct mounted.
  The upper limit of station No. for DIN rail mounting is 16.

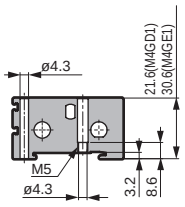
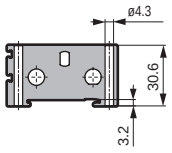
## ■How to mount DIN rail

- Only the M4GE1 Series is provided with a dedicated base for the direct mount type or DIN rail mount type. As for the mounting type, direct mount cannot be changed to DIN rail mounting, but the DIN rail mounting type can be direct mounted.)



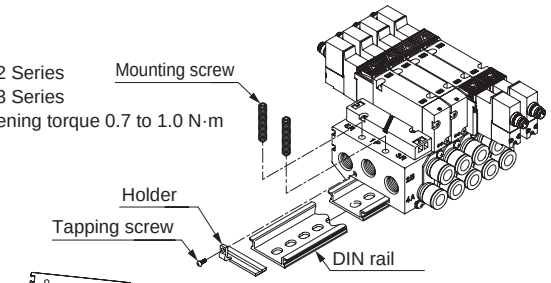

Be sure to tighten the lock nut. Note that the DIN rail may deform if excessive tightening torque is applied.

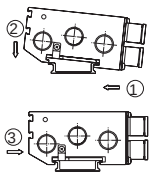
Mounting hole shape (sectional view)

| M4GD1 M4GE1 (DIN rail mount) | M4GE1 (Direct mount) |
|---|---|
|  |  |



M4G2 Series
M4G3 Series
Tightening torque 0.7 to 1.0 N·m




1. Holder mounting
   (Secure with bolts to prevent falling off)
2. Mounting screw temporarily fastened
3. ①② engauge the jaws with the DIN rail in order from .
4. ③push in the direction that
5. Tighten the mounting screws.

## DIN rail kit

| | Model No. | Description |
|---|---|---|
| M4G1 | 4GA1R-BAA length -D | DIN rail, 2 mounting screws, 2 lock nuts |
| | 4GB1R-BAA length -D | |
| M4G2 | 4GA2R-BAA length -D | DIN rail/2 holdersTapping screw 2, mounting screw 4 |
| | 4GB2R-BAA length -D | |
| M4G3 | 4GA3R-BAA length -D | |
| | 4GB3R-BAA length -D | |

Specify the length "0" when the DIN rail is not required.

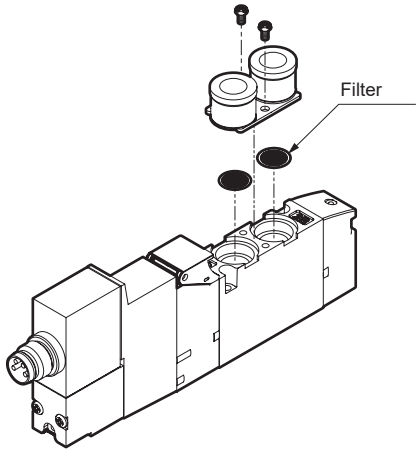
Set the DIN rail length with reference to the current manifold dimensions.

## Mounting, installation and adjustment

### 3 . Port filter

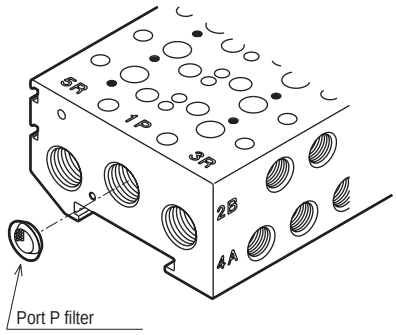
**⚠CAUTION**

■The port filter prevents the entry of foreign matter, and prevents problems from occurring in the valve. As this does not improve the quality of the compressed air, read Warnings and Precautions on the Intro pages of "Pneumatic Valves (No. CB-023SA)," then mount, install, and adjust accordingly. Do not detach or press down the port filter forcibly. The filter could deform, causing problems. If contaminants and foreign matter are found on the filter surface, blow them off lightly with air, or remove them with tweezers, etc.




Example of A/B port filter option combination

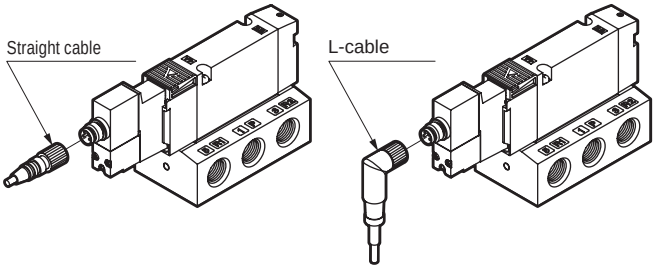
M4G Series




Port P filter (standard) example of embedding

### 4. M8 connector cable

M8 connector tightening torque is 0.38 to 0.42N·m. The degree of protection (IP67) will not be upheld if not tightened to the appropriate torque.



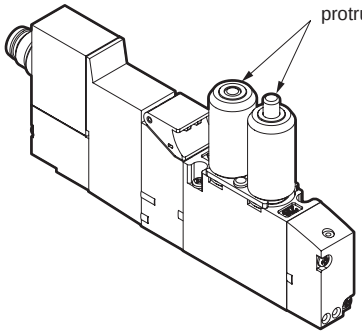

Straight cable L-cable

Wire the attached M8 connector cable as below.
- black: 12 V
- blue: 0 V
- brown and white: Not used.

Be careful as the solenoid has polarity.

### 5 . Indicator option

Make sure that there is no dust, etc., accumulated on the protruding part of the indicator. Snagging foreign matter may lead to malfunction or accidents.



# Use/maintenance

## 1. Continuous energizing

### ⚠CAUTION

■ If a valve is used in a continuously energized state for long periods, the valve performance may deteriorate more quickly. Furthermore, use caution under the following working conditions likewise.

- When the energized time exceeds non-energized time in intermittent operation
- When one energizing session exceeds 30min in intermittent energizing

Give sufficient consideration to heat dissipation when installing the product.

## 2 . Manual override

### ⚠WARNING

■ The 4G Series is an internal pilot solenoid valve. If air is not supplied to port P, the main valve will not be switched even if the manual override is operated.

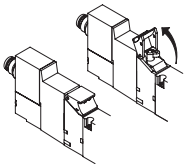
■ A manual protection cover is provided as standard. The manual protective cover is closed when the valve is shipped to protect it, which cannot be seen when delivered. Open the protective cover and operate the manual override. Note that the protective cover will not close unless the locking manual override is released.

■ Manual override is used for both non-locking and locking. The lock is applied by pressing down and turning the manual override. For locking, be sure to press down and turn. If manual override is turned without being pressed down, it could be damaged or air could leak.

■ Opening and closing the manual protection cover

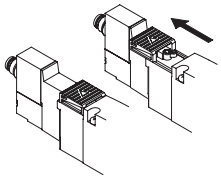
Do not excessively force the manual protection cover when opening and closing it. Excessive external force can cause breakdown. (Below 5 N)

4G1 Series



Rotary

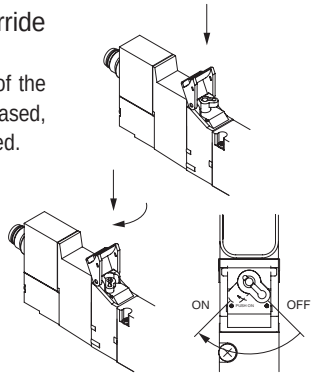
4G2 to 4 Series



Sliding

■ How to operate manual override

- Push non-locking operation
  Push straight in the direction of the arrow until it stops. When released, the manual operation is released.
- Push locking operation
  Push and hold the button and turn it 90° in the direction of the arrow. The function is not canceled even when the button is released.




■ When conducting manual operations, make sure that there are no people near the operating cylinder.

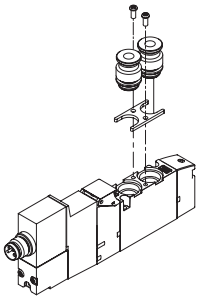
## 3 . How to replace the cartridge fitting

### ⚠CAUTION

■ Check procedures before changing the push-in fitting size. If installed incorrectly, or if the tightening of the mounting screw is insufficient, air leakage could occur.

■ Body piping (D)

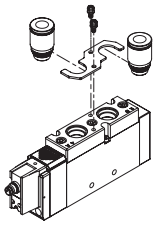
4G1, 2, 3



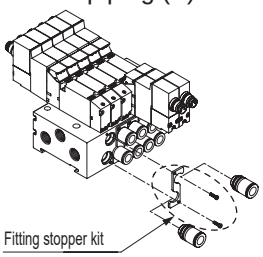
①Remove the mounting screw.
②Pull out the stopper plate and fitting together.
③ Align the groove of the replacement fitting with the stopper plate and assemble them temporarily.
④Assemble the stopper plate with the fitting, and tighten the mounting screw. Pull on the fitting to confirm that it is properly installed.

| | Size | Tightening Torque (N·m) |
|---|---|---|
| 4G1 | M1.7 | 0.18 to 0.22 |
| 4G2 | M2.5 | 0.25 to 0.30 |
| 4G3 | M3 | 0.6 to 0.7 |
| 4G4 | M3 | 0.6 to 0.7 |

4G4



■ Base piping (E)




①Remove the mounting screw.
②Pull out the stopper plate and fitting together.
③ Align the groove of the replacement fitting with the stopper plate and assemble them temporarily.
④Assemble the stopper plate with the fitting, and tighten the mounting screw. Pull on the fitting to confirm that it is properly installed.

**Model No. of cartridge push-in fitting**

| Model | Part name | Model No. |
|---|---|---|
| 4G1 | ø1.8 straight | 4G1R-JOINT-C18 |
| | ø4 straight | 4G1R-JOINT-C4 |
| | ø6 straight | 4G1R-JOINT-C6 |
| | Plug cartridge | 4G1R-JOINT-CPG |
| 4G2 | ø4 straight | 4G2R-JOINT-C4 |
| | ø6 straight | 4G2R-JOINT-C6 |
| | ø8 straight | 4G2R-JOINT-C8 |
| | Plug cartridge | 4G2R-JOINT-CPG |
| 4G3 | ø6 straight | 4G3R-JOINT-C6 |
| | ø8 straight | 4G3R-JOINT-C8 |
| | ø10 straight | 4G3R-JOINT-C10 |
| | Plug cartridge | 4G3R-JOINT-CPG |
| 4G4 | ø8 straight | 4G4-JOINT-C8 |
| | ø10 straight | 4G4-JOINT-C10 |
| | ø12 straight | 4G4-JOINT-C12 |