# Safety Precautions

Be sure to read this section before use.
For general valve precautions, refer to Intro Page 59.



## Product-specific cautions: Direct acting 3-port valve 3QE / 3QB / 3QRA/B Series

## Design/selection

### 1. Common

**⚠WARNING**

■ Do not use this as a solenoid valve for emergency cutoff. If left pressurized for long periods, the starting response could be delayed.

■ The solenoid valve air leakage is greater than zero, so long-term pressure retention is not possible. For applications requiring pressure retention, design sufficient margins for container volume and holding time.

■ A mesh filter is built in the 2(A) port as standard to prevent foreign matter from being suctioned into the pipe, but it cannot remove fine dust particles. When using this in vacuum conditions, install a vacuum filter between the pad nozzle and the valve. (3QR Series)

■ Note the items below when mounting solenoid valves on non-CKD bases.

· Solenoid valve mounting pitch is 10.5 mm and over.
· Base material is aluminum.

As applications other than the above require consideration for heat dissipation, consult with CKD.

### 2. Surge suppressor

**⚠CAUTION**

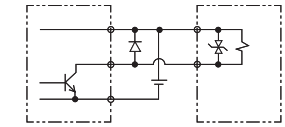
■ The surge suppressor included with the solenoid valve aims to protect the output contact for driving the solenoid valve. There is no significant protection for the other peripheral devices, and devices could be damaged or could malfunction due to a surge. As well, surges generated by other devices may be absorbed and cause damage such as burning. Note the following points.

● The surge suppressor functions to limit voltage surge in the solenoid valve, which can reach several hundred volts, to a low voltage level that the output contact can withstand. Depending on the output circuit used, this may be insufficient and could result in damage or malfunction. Check whether the surge suppressor can be used within the surge voltage limit of the solenoid valve in use, the output device's withstand pressure and circuit structure, and by the degree of return delay time. When necessary, provide other surge countermeasures. The 3Q Series solenoid valve with surge suppressor can also suppress the inverse voltage surge generated when the product is turned OFF to the level shown in the table below.

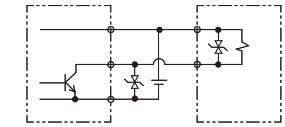
| Model | Specification voltage | Inverse voltage when OFF |
|---|---|---|
| 3QE, 3QR | 3 VDC | Approx. 6.2 V |
| | 5 VDC | Approx. 13 V |
| | 12 VDC | Approx. 27 V |
| | 24 VDC | Approx. 47 V |
| | When options "S", "E" or "H" are selected | Approx. 1 V |
| 3QB | 12, 24 VDC | Approx. 1 V |

● If the output unit is an NPN type, a surge voltage equaling the voltage shown in the table above plus the power supply voltage may be applied to the output transistor. Make sure to install a contact protection circuit or select option "S".

[Output transistor protection circuit: Installation example 1]




[Output transistor protection circuit: Installation example 2]

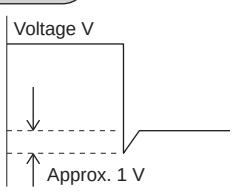



(3) If another device or solenoid valve is connected in parallel to the solenoid valves, the inverse voltage surge generated when the valve is turned OFF would apply to those devices. Even in the case of a solenoid valve with 24 VDC surge suppressor, the surge voltage may reach negative tens of volts for some models. This inverse voltage may cause damage or malfunction to other components connected in parallel. Avoid parallel connection of devices susceptible to inverse polarity voltages, e.g. LED indicator lamps.
When driving several solenoid valves in parallel, the surge from other solenoid valves may enter the surge suppressor of one solenoid valve, and it may burn depending on the current value.
When driving several solenoid valves with surge suppressors in parallel, surge current could concentrate at the surge suppressor with the lowest limit voltage and cause similar burning. Due to the variations in surge suppressor limit voltage that exist even among solenoid valves of the same model No., in the worst case the surge suppressor may burn out. Avoid driving several solenoid valves in parallel.

(4) The surge suppressor incorporated in the solenoid valve is likely to be short-circuited if it is damaged by overvoltage or overcurrent from other solenoid valves. Where there is a failed surge suppressor, if a large current flows when the output is ON, in the worst case scenario, the output circuit or solenoid valve could be damaged or ignited. Do not continue energizing in a state of failure. Additionally, to prevent large currents from continuing to flow, connect an overcurrent protection circuit to the power supply and drive circuit, or use a power supply with overcurrent protection.

### 3. Surgeless (3QE Series only)

· The surgeless type reduces the solenoid valve surge voltage to approx. 1 V with the built-in diode. In addition, there is no polarity.

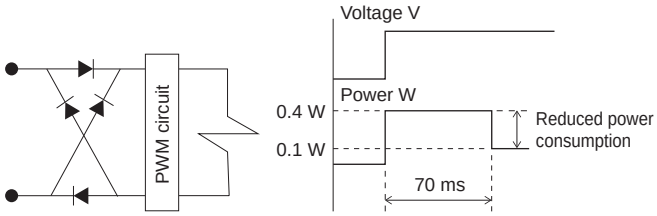


## 4. Low exoergic/energy circuit (3QE Series only)

· The low exoergic/energy saving type includes a PWM circuit in the solenoid valve, which is designed to reduce the current value when the coil is held with suction. Power consumption is reduced to 1/4 compared to standard products. In addition, there is no polarity.

[Specifications for low exoergic/energy type]

| Item | | Current A | Power consumption W |
|---|---|---|---|
| When starting | 12 VDC | 0.033 | 0.4 |
| | 24 VDC | 0.017 | 0.4 |
| When holding | 12 VDC | 0.01 | 0.1 |
| | 24 VDC | 0.005 | 0.1 |




### ⚠CAUTION

■ Do not use this valve in an environment where vibration and impact exceed the specified range. This may result in valve malfunction.

■ The energized state cannot be maintained if power is cut off instantaneously for 30 ms or less on the power source driving the solenoid valve. If any disturbance has caused up to 30 ms instantaneous power cut-off of the solenoid valve after being continuously energized, cut the power OFF for 50 ms or more before switching the solenoid valve ON again.

■ Do not use this product by gradually raising the voltage. The valve will not operate.

## 5. AC voltage specifications (3QE Series only)

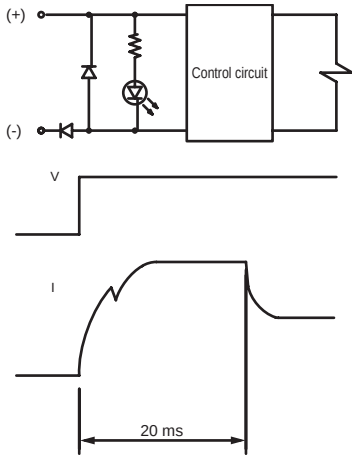
### ⚠CAUTION

■ The models with AC voltage specifications have a built-in full-wave rectifier circuit.
Depending on the type of SSR used to turn ON/OFF the solenoid valve, recovery failure of the valve may result.
Use caution when selecting SSRs. (Consulting the manufacturer of the relay or PLC is recommended.)

## 6. Large flow rate (3QRA/B Series only)

### ⚠CAUTION

· Never use in environments where the vibration or impact applied exceeds the specifications.This may result in valve malfunction.
The large flow rate includes a current control circuit, which is designed to reduce the current value when the coil is held with suction. Only plus common polarity is used.




## 7. Vacuum specifications

### ⚠CAUTION

Select 3QB or 3QR Series when using the unit with vacuum. 3QE Series cannot be used under vacuum conditions, including vacuum burst applications.

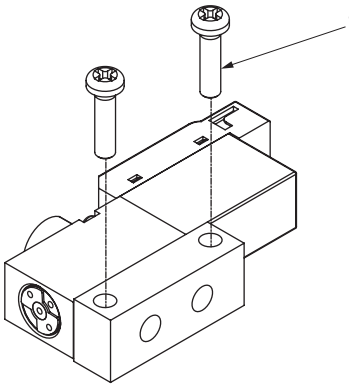
# Mounting, installation and adjustment

## How to install body piping (A) Discrete

### ⚠CAUTION

■ The body piping Discrete 3QRA Series can be installed using the through hole.

■ When installing the body piping type, it is not possible to fasten two or more stages together. If you need to use two or more layers for a contract, contact CKD for details.



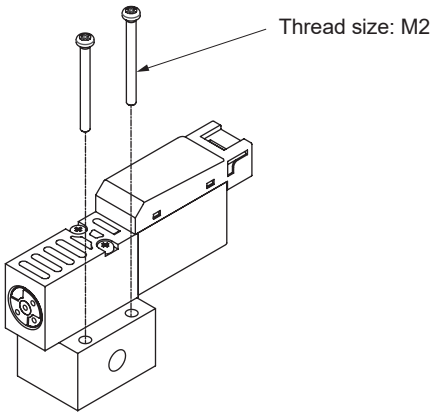

Tightening torque: 0.25 to 0.4 N·m

* Body piping is not available for 3QE and 3QB Series.

## How to install 3Q Series Discrete base/MF base

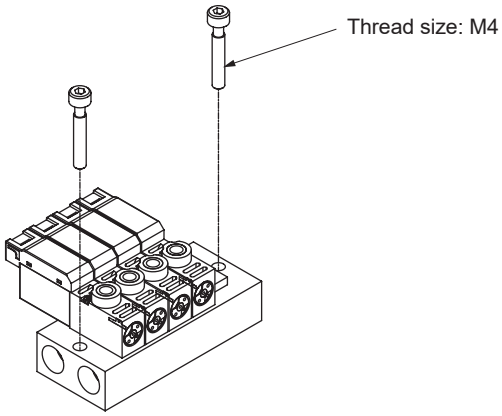
■Install using Discrete base and MF base through holes.

●3QRB Discrete base



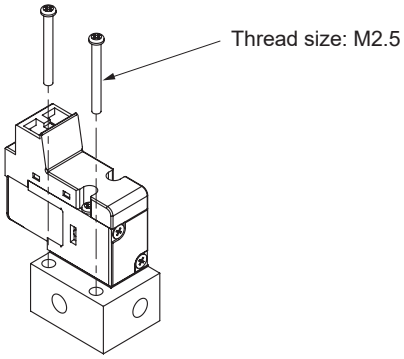

Tightening torque: 0.15 to 0.2 N·m

●3QRB Discrete base



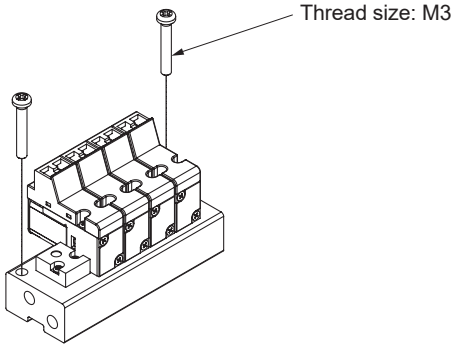

Tightening torque: 0.6 to 0.8 N·m

●3QE/B Discrete base




Tightening torque: 0.20 to 0.25 N·m

●3QE/B type MF base




Tightening torque: 0.25 to 0.4 N·m

# Use/maintenance

## 1. Common

### ⚠CAUTION

■ The coil may become hot due to ambient temperature or energizing time. Be sufficiently careful when touching the valve.

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

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

| Port thread | Tightening torque N·m |
|---|---|
| M5 | 1.0 to 1.5 |
| Rc1/8 | 3 to 5 |

■ Tighten the solenoid valve with an appropriate torque when mounting.

· Excessive tightening may lead to damage.
· Use a #0 screwdriver.

| Model No. | Tightening torque N·m |
|---|---|
| 3QRA/B | 0.12 ±0.02 |
| 3QE/3QB | 0.15 ±0.02 |

## 2. Continuous energizing

### ⚠CAUTION

■ When using in a continuously energized state for long periods, use the low exoergic/energy type. (3QE Series)

■ When using the AC voltage type in a continuously energized state, the temperature of the coil's outer surface will be high. It may cause burns. Do not touch it when it is energized. (3QE Series)

■ Long energized time causes performance deterioration of the solenoid valve.
Note the following points for the standard flow rate in particular. (3QRA/B Series)

· The energized time should be no longer than the de-energized time for intermittent energizing.
· One energizing cycle should be 5 minutes or less.
· Set so that the temperature around the solenoid valve does not exceed the max. working temperature.

■ If a valve other than the low exoergic/energy type 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 30 minutes in intermittent operation

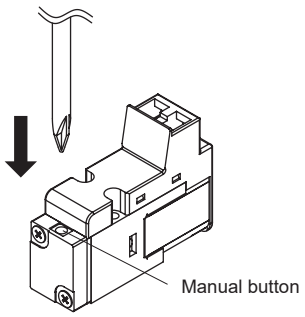
Give sufficient consideration to heat dissipation when installing the product.

## 3. Manual override

### ⚠CAUTION

■ 3QE Series

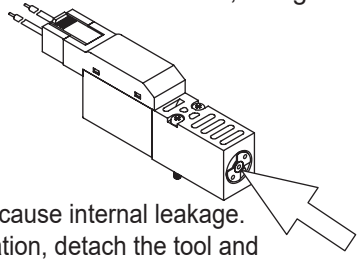
· How to operate manual override of non-locking
Push the manual button vertically with a thin-tipped tool.
· Locking manual override
Rotate the manual button in the direction of the arrow using a flathead screwdriver.
After completing manual operation, rotate the manual button to return it to its original position.



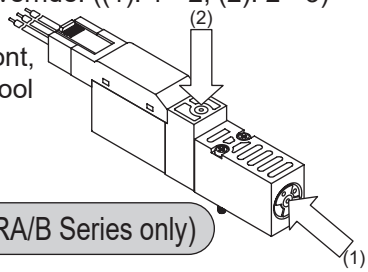
Non-locking manual override　Locking manual override

Precautions
Do not operate with excessive force. The solenoid valve could be damaged.
Forgetting to reset the locking manual override may lead to malfunction. Be sure to release the manual override after completing operation.

■ 3QRA/3QRB Series
[2-position single (self-reset)]
Pressing the manual override can switch the main valve to the solenoid position when energized.
Press the manual override from the front, using a thin-tipped tool such as a precision screwdriver.
Pushing diagonally at this point may result in incomplete position switching and cause internal leakage.
To obtain normal operation, detach the tool and press it again from the front.



[2-position single (self-hold)]
The flow path can be switched by pressing (1) and (2) on the manual override. ((1): 1→2, (2): 2→3)
Press the manual override from the front, using a thin-tipped tool such as a precision screwdriver.




## 4. Self-hold type (3QRA/B Series only)

### ⚠CAUTION

● Precautions when energizing

· Limit continuous energizing to within 30 seconds.
· Limit energization ratio to 50% or less.
· Min. time of excitation should be 50 ms or longer.
· Do not energize black and white lead wires simultaneously.
Solenoid valves will not operate if they are simultaneously energized. The state before energizing will be maintained (display lamps on both sides light).
Note that the valve will be activated from that state if both sides are not turned OFF simultaneously.

● Malfunction may occur if a magnet comes close to the solenoid valve.
Install at least 10 cm away from magnets.

● The holding position may change during installation and transport due to impact exceeding the specifications.
Before use, verify the position manually or electrically.