



# Temperature Control Equipment Precautions 1

Be sure to read this before handling products.

For detailed precautions on each series, refer to the main text.

## Selection

### Warning

#### 1. Confirm the specifications.

Fully understand the applications, environment, fluids, and other operating conditions. Use this product within the specified range shown in the catalog. Using outside the specified range can cause injury, damage, or malfunction. When in doubt, please contact SMC beforehand.

#### 2. Secure the performance margin.

When you consider the product's cooling/heating performance or flow rate characteristics, allowances must be made because heat loss from the piping, pressure drops, etc., may occur.

## Operating Environment/Storage Environment

### Warning

#### 1. Observe the ambient temperature range.

The operating ambient temperature range must be within the specification range shown in the catalog.

Use caution because using beyond the range will lead to damage, breakage, or malfunction.

#### 2. Avoid using and storing in the following environments because it will lead to malfunction.

- In locations where water, water steam, salt water, and oil may splash on the product
- In locations where a large amount of particles are airborne
- In locations with an atmosphere of corrosive or explosive gases, solvents, or chemicals  
(This product is not explosion proof.)
- In locations which receive direct sunlight or radiated heat  
(Protect from direct sunlight to avoid the resin from deteriorating by ultraviolet rays or increasing the temperature.)
- In locations where temperature substantially changes
- In locations where there is a heat source nearby and the ventilation is poor  
(Insulate the heat source or ventilate well to avoid damages caused by the heat or temperature increase, such as softening.)
- In locations where condensation occurs
- In locations where strong magnetic noise occurs  
(In locations where strong electric fields, strong magnetic fields, and surge voltage occur)
- In locations where static electricity occurs, or conditions which make the product discharge static electricity
- In locations where high frequency occurs
- In locations where damage is likely to occur due to lightning
- In locations where impacts or vibrations occur
- In conditions where a massive force strong enough to deform the product is applied or the weight from a heavy object is applied
- In locations more than 1000 m in altitude (Excluding: storage, transportation)

## Fluid

### Warning

#### 1. Type of fluids

- The operating fluids must be used within the specified range shown in the catalog.  
Please consult with SMC when using the product with other fluids.
- Depending on the combination, foreign matter, chemical leakage, and catalysts may change the piping material and operating fluid qualities.
- When solid foreign objects may be mixed with a fluid, install a filter to remove them.

#### 2. Use clear water (including for diluting ethylene glycol aqueous solution) which meets the water quality standards mentioned below.

##### Facility Water Quality Standard

The Japan Refrigeration and Air Conditioning Industry Association  
JRA GL-02-1994 "Cooling water system – Circulation type – Circulating water"

|                | Item   | Unit    | Standard value          | Influence |                  |
|----------------|--|---------|-------------------------|-----------|------------------|
|                |  |         |                         | Corrosion | Scale generation |
| Standard item  | pH (at 25°C)                                       | —       | 6.0 to 8.0              | ○         | ○                |
|                | Electric conductivity (25°C)                       | [μS/cm] | 100*1 to 300*1          | ○         | ○                |
|                | Chloride ion (Cl <sup>-</sup> )                    | [mg/L]  | 50 or less              | ○         |                  |
|                | Sulfuric acid ion (SO <sub>4</sub> <sup>2-</sup> ) | [mg/L]  | 50 or less              | ○         |                  |
|                | Acid consumption amount (at pH4.8)                 | [mg/L]  | 50 or less              |           | ○                |
|                | Total hardness                                     | [mg/L]  | 70 or less              |           | ○                |
|                | Calcium hardness (CaCO <sub>3</sub> )              | [mg/L]  | 50 or less              |           | ○                |
| Reference item | Ionic state silica (SiO <sub>2</sub> )             | [mg/L]  | 30 or less              |           | ○                |
|                | Iron (Fe)  | [mg/L]  | 0.3 or less             | ○         | ○                |
|                | Copper (Cu)  | [mg/L]  | 0.1 or less             | ○         |                  |
|                | Sulfide ion (S <sub>2</sub> <sup>-</sup> )         | [mg/L]  | Should not be detected. | ○         |                  |
|                | Ammonium ion (NH <sub>4</sub> <sup>+</sup> )       | [mg/L]  | 0.1 or less             | ○         |                  |
|                | Residual chlorine (Cl)                             | [mg/L]  | 0.3 or less             | ○         |                  |
|                | Free carbon (CO <sub>2</sub> )                     | [mg/L]  | 4.0 or less             | ○         |                  |

\*1 In the case of [MΩ·cm], it will be 0.003 to 0.01.

○: Factors that have an effect on corrosion or scale generation.

• Even if the water quality standards are met, complete prevention of corrosion is not guaranteed.

## Transportation/Transfer/Movement

### Warning

#### 1. Product transfer should be performed by a knowledgeable and experienced person.

In particular, transferring heavy objects is dangerous.

Use adequate caution to prevent products from falling and dropping accidents from occurring.

#### 2. Avoid transportation in the following environments because it will lead to breakage.

- In conditions where strong shock and vibrations occur
- In operating and storage environments other than those specified

#### 3. Caution when transferring a heavy object

This product is heavy. Use adequate caution to avoid injury when picking up and setting down the product, and falling and dropping accidents.

#### 4. Before moving this product, remove operating fluid and facility water from the inside of the product.



# Temperature Control Equipment Precautions 2

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## Mounting/Installation

### ⚠ Warning

1. **Installation should be performed by a knowledgeable and experienced person.**

In particular, the installation of heavy objects is dangerous. This product is heavy. Use adequate caution to prevent products from falling and dropping accidents from occurring.

### ⚠ Caution

1. **Provide space for ventilation and maintenance.**

Provide enough space for the ventilation requirement of each piece of equipment. Otherwise, a cooling malfunction or operation stoppage may occur. Also, provide enough space for maintenance and inspection.

2. **Confirm the mounting orientation.**

Mount and install horizontally.

## Piping

### ⚠ Warning

1. **For this product and future equipment, the design of the piping system should be performed by a knowledgeable and experienced person.**

2. **Work performed on the piping should be done by a knowledgeable and experienced person.**

If work performed on the piping is done by a less knowledgeable and inexperienced person, it will likely lead to operating fluid leakage, etc.

3. **Thoroughly read the operation manual.**

Read the operation manual completely before piping. Also, keep the manual where it can be referred to as necessary.

4. **Tighten threads with the proper tightening torque.**

When installing fittings, etc., follow the given torque levels below.

**Tightening Torque for Piping**

| Connection thread | Proper tightening torque (N·m) |
|-------------------|--------------------------------|
| M5                | 1.5 to 2                       |
| Rc 1/8            | 7 to 9                         |
| Rc 1/4            | 12 to 14                       |
| Rc 3/8            | 22 to 24                       |
| Rc 1/2            | 28 to 30                       |
| Rc 3/4            | 28 to 30                       |
| Rc 1              | 36 to 38                       |
| Rc 1 1/4          | 40 to 42                       |
| Rc 1 1/2          | 48 to 50                       |
| Rc 2              | 48 to 50                       |

5. **Check for fluid leakage.**

Confirm that the hose or tubing is not pulled out and that there is no leakage in the fitted parts.

## Piping

### ⚠ Caution

1. **Refer to the Fittings and Tubing Precautions (pages 52 to 56) for handling One-touch fittings.**

2. **Preparation before piping**

Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil, and other debris from inside the pipe.

3. **Use caution regarding the flowing direction of the fluid.**

When installing piping to a product, do not mistake the flow direction of the supply port, etc. Check the "IN" and "OUT" indications or other labels and the operation manual before connection.

4. **Winding of sealant tape**

When installing piping or fittings into a port, ensure that sealant material does not enter the port internally. When using sealant tape, leave 1.5 to 2 threads exposed on the end of the pipe/fitting.

5. **Take countermeasures against condensation.**

Depending on the operating conditions, condensation may occur in the piping. In such a case, take countermeasures such as installing insulation material, etc.



# Temperature Control Equipment Precautions 3

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## Electrical Wiring

### ⚠ Warning

#### 1. Electrical wiring should be performed by a knowledgeable and experienced person.

Power supply and wiring works should be implemented in accordance with the electric facilities technical standards and provisions and conducted correctly.

#### 2. Mounting a dedicated circuit breaker

As a countermeasure against current leakage, install a ground fault circuit interrupter (GFCI) in the main power supply.

#### 3. Check the power supply.

If this product is used with voltages other than those specified, it will likely lead to a fire or an electrical shock. Before wiring, confirm the voltage, volume, and frequency.

Confirm that the voltage fluctuation is within  $\pm 10\%$  of the specified value.

#### 4. Grounding

Be certain to ground (frame ground) with class D grounding (grounding resistance of 100  $\Omega$  or less).

This product can be grounded with the PE line of the power supply cable.

Also, do not use together with equipment that generates strong electrical magnetic noise or high-frequency noise.

#### 5. Wiring cable should be handled with care.

Do not bend, twist, or stretch the cord or cable.

#### 6. Wire with an applicable size cable and terminal.

In the event of attaching a power supply cable, use a cable and terminal size which is suitable for the electrical current of each product.

Forcibly mounting with an unsuitable size cable will likely result in a fire.

#### 7. Avoid wiring the signal line and power line in parallel.

Since there may be a possibility of malfunction from noise, avoid parallel wiring between the temperature sensor line, communication line, signal line of the alarm line, etc., and the power line and high voltage line. Also, do not place them in the same wiring tube.

## Facility Water Supply

### (Water-cooled refrigeration)

### ⚠ Warning

#### 1. Be certain to supply facility water.

1. Danger of no water operation, low water flow rate operation  
Do not operate under conditions where there is no facility water or where there is very little flow rate of water flowing.

In this kind of operation, facility water temperatures may become extremely high. There is a danger of the material of the hose softening and bursting when the piping supplying the facility water is connected with the hose.

2. Actions to be taken when an emergency stop occurs due to high temperatures

In case a stop occurs due to extremely high temperatures resulting from a decrease in the facility water flow rate, do not immediately flow facility water. There is a danger of the material of the hose softening and bursting when the piping supplying the facility water is connected with the hose.

First, let it cool down naturally by removing the cause of the flow rate reduction. Secondly, confirm that there is no leakage again.

### ⚠ Caution

#### 1. Facility water quality

1. Use facility water within the specified range.

When using a fluid other than facility water, please consult with SMC.

2. When it is likely that foreign matter may enter the fluid, install a filter (20 mesh or equivalent).

#### Facility Water Quality Standard

The Japan Refrigeration and Air Conditioning Industry Association

JRA GL-02-1994 "Cooling water system – Circulation type – Circulating water"

|                | Item   | Unit                        | Standard value                         | Influence |                  |
|----------------|--|-----------------------------|--|-----------|------------------|
|                |  |                             |  | Corrosion | Scale generation |
| Standard item  | pH (at 25°C)                                       | —                           | 6.5 to 8.2                             | ○         | ○                |
|                | Electric conductivity (25°C)                       | [ $\mu\text{S}/\text{cm}$ ] | 100 <sup>*1</sup> to 800 <sup>*1</sup> | ○         | ○                |
|                | Chloride ion (Cl <sup>-</sup> )                    | [mg/L]                      | 200 or less                            | ○         |                  |
|                | Sulfuric acid ion (SO <sub>4</sub> <sup>2-</sup> ) | [mg/L]                      | 200 or less                            | ○         |                  |
|                | Acid consumption amount (at pH4.8)                 | [mg/L]                      | 100 or less                            |           | ○                |
|                | Total hardness                                     | [mg/L]                      | 200 or less                            |           | ○                |
|                | Calcium hardness (CaCO <sub>3</sub> )              | [mg/L]                      | 150 or less                            |           | ○                |
| Reference item | Ionic state silica (SiO <sub>2</sub> )             | [mg/L]                      | 50 or less                             |           | ○                |
|                | Iron (Fe)  | [mg/L]                      | 1.0 or less                            | ○         | ○                |
|                | Copper (Cu)  | [mg/L]                      | 0.3 or less                            | ○         |                  |
|                | Sulfide ion (S <sub>2</sub> <sup>-</sup> )         | [mg/L]                      | Should not be detected.                | ○         |                  |
|                | Ammonium ion (NH <sub>4</sub> <sup>+</sup> )       | [mg/L]                      | 1.0 or less                            | ○         |                  |
|                | Residual chlorine (Cl)                             | [mg/L]                      | 0.3 or less                            | ○         |                  |
|                | Free carbon (CO <sub>2</sub> )                     | [mg/L]                      | 4.0 or less                            | ○         |                  |

\*1 In the case of [ $\text{M}\Omega\text{-cm}$ ], it will be 0.00125 to 0.01.

• ○: Factors that have an effect on corrosion or scale generation.

• Even if the water quality standards are met, complete prevention of corrosion is not guaranteed.



# Temperature Control Equipment Precautions 4

Be sure to read this before handling products.

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## Operation

### Warning

#### 1. Handle and operate only after the safety of this product and the rest of the system is confirmed.

This product and incidental equipment should be operated by a knowledgeable and experienced person.

#### 2. Before operation, confirm the safety of mounting, installation, piping, and electric wiring conditions.

1. Confirm that the mounting and installation conditions are safe.
2. Confirm that the circulating fluid is filled and that the fluid level is within the display range.
3. Confirm whether the valve is open or closed and that the hose and resin tube are not twisted.  
It is dangerous when the valve in the piping is closed because circulating fluid and the facility water will not flow and fluid pressure will increase.
4. Confirm the flow direction of the fluid.  
Be certain that the flow direction of the fluid (Inlet/Outlet direction) is connected correctly.
5. Confirm that the electrical wiring condition is safe.  
Incorrect wiring will lead to malfunction or breakage of the product. Confirm that there are no errors in wiring before operation.
6. When using the product with a 3-phase power supply, confirm the connection.  
If the phase order is incorrect, the pump, etc. will run in reverse, or the phase-reversal relay will activate and the product will not operate.  
In this case, after cutting off the main power supply, reverse 2 of the 3 wires and connect them in the correct phase order.

#### 3. Do not remove the external panel during energization or operation.

If removed, there is a danger of electrical shock, burn, frostbite, or injury from rotating objects.

#### 4. Avoid operating with a low flow rate.

Avoid operating with a low flow rate because the temperature control may become unstable or it may shorten the service life of the pump.

#### 5. Confirm the safety of the product during operation.

During operation, if an emergency is detected, stop this product immediately and turn off the power supply breaker.

#### 6. When not used for long periods of time, confirm the safety once again prior to beginning its operation.

## Maintenance

### Warning

#### 1. Perform maintenance and inspection according to the procedures indicated in the operation manual.

If handled improperly, the malfunction or damage of machinery and equipment may occur.

#### 2. Maintenance work

Improper handling of compressed air is dangerous. Therefore, in addition to observing the product specifications, the replacement of elements and other maintenance activities should be performed by personnel having sufficient knowledge and experience pertaining to pneumatic equipment.

#### 3. Pre-maintenance inspection

Before removing this product, cut off the electric power, and be certain to shut off the supply pressure and exhaust the compressed air in the system. Proceed only after confirming that all pressure has been released to the atmosphere.

#### 4. Post-maintenance inspection

After installation or repair, reconnect compressed air and electricity and conduct appropriate inspections to confirm proper operation. If there is an audible air leakage, or if the equipment does not operate properly, stop operation and confirm that the equipment is installed correctly.

#### 5. Modification prohibited

Do not modify or reconstruct the unit.

#### 6. Stopping for long periods of time

When not using for long periods of time, remove the fluid (circulating fluid, facility water) and cut off the main power supply.

#### 7. Removal of product

Take the stop/inspection measures and confirm that there is no danger before the product is removed.  
In the event of removing the product, discharge the used fluid and clean the inside of the piping.  
When a dangerous fluid or polluted fluid is left inside, it is likely that the polluted area will become enlarged or an accident will occur.

#### 8. Disposal of product

When the product is disposed, it must be in compliance with the ordinance or rules of the local municipality.  
Ask for help from a professional industrial waste disposal company.  
In particular, in the case of a refrigerated type product, entrust a company to collect the refrigerant, etc.  
In such a case, the customer may be requested to submit a certificate showing the type of operating fluid and whether any quantity is left. These procedures are the responsibility of the customer.

#### 9. Preparation of a backup product

In order to keep the downtime of a system to a minimum, prepare a backup product when necessary.