



Safety Precautions

Be sure to read this section before use.

When designing and manufacturing equipment using CKD products, the manufacturer is obligated to ensure that the safety of the mechanism, pneumatic control circuit and/or water control circuit and the system that runs the electrical controls are secured.

It is important to select, use, handle and maintain CKD products appropriately to ensure their safe usage.

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.)

- ① 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.
- ② 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 the device design and control, etc. ISO4414, JIS B 8370 (Pneumatic 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.

- ① Inspect and service the machine and devices after confirming safety of the entire system related to this product.
- ② Note that there may be hot or charged sections even after operation is stopped.
- ③ 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 enough attention to possible water leakage and leakage of electricity.
- ④ When starting or restarting a machine or device that incorporates pneumatic components, make sure to secure system safety, such as pop-out prevention measures.

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

■ Precautions are ranked as “DANGER”, “WARNING”, and “CAUTION” in this section.

 **DANGER:** In the case where the product operation is mishandled and/or when the urgency of a dangerous situation is high, it may lead to fatalities or serious injuries.

 **WARNING:** A dangerous situation may occur if handling is mistaken, leading to fatal or serious injuries.

 **CAUTION:** A dangerous situation may occur if handling is mistaken, leading to minor injuries or property damage.

Note that some items indicated with “CAUTION” may lead to serious results depending on the conditions. All items contain 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.

Precautions for export

1 Security Trade Control

The products in this catalog and their related technologies may require approval before export or provision. For the sake of maintaining world peace and safety, there may be cases in which approval under the Foreign Exchange and Foreign Trade Control Law is required in advance, depending on the country to where the product or related technology is being exported or provided.

The scope of products and related technologies requiring approval are listed in the Export Trade Control Order Appendix Table 1 or Foreign Exchange Order Appendix Table.

The Export Trade Control Order Appendix Table 1 and Foreign Exchange Order Appendix Table contain the following two types of information.

- "List controls" specified for items 1 to 15
- "Catch-all controls" that do not indicate specifications by item, but restriction by application (Section 16)



An application for approval is received by the Security Export Licensing Division of the Ministry of Economy, Trade and Industry or local bureaus of the Ministry of Economy, Trade and Industry.

2 Products and related technologies in this catalog

The products and related technologies in this catalog are subject to the catch-all control of the Foreign Exchange and Foreign Trade Control Law.

When exporting or providing the products or related technologies in this catalog, ensure that they are not used for arms or weapons.

3 Contact

Contact your local CKD Sales Office for information on the Security Trade Control of products and related technologies in this catalog.



Safety precautions

Fluid Control Components: Warnings and Cautions

Be sure to read this section before use.

Design/selection

1. Safety design

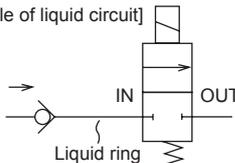
WARNING

- This product cannot be used as an emergency shutoff valve. The valves listed in this catalog are not designed as valves to ensure safety such as emergency shutoff valves. When using in such a system, always take separate measures that will ensure safety.
- Take measures to prevent physical harm or property damage in the event of failure of this product.

CAUTION

- Leakage current from other fluid control components
When using a PLC with a CR circuit to absorb the surge voltage generated from switching elements, etc., the leakage current could adversely affect the operation of the solenoid valve. Keep leakage current to less than the value given in the safety precautions for each product in this catalog or the value given for each product.
- Min. working pressure differential
Use the pilot valve at a pressure higher than the min. working pressure differential within the specifications listed in this catalog.
- Liquid ring
When liquid is to be passed, and a circuit of the liquid seal is formed, the pressure could rise due to changes in the temperature and operation may be disabled; some products may also suffer damage to parts. Prevent a liquid ring circuit by providing a relief valve in the system.

[Example of liquid circuit]



- Vibration
Install this product in a place not subject to vibration.

2. Working fluid

WARNING

■ Working fluids

- (1) Do not use any fluid other than the working fluids specified in the catalog.
- (2) Before starting use, check the compatibility between the product and working fluid with the working fluid check list (Intro Pages 39 to 47).
- (3) Depending on the water quality, the copper alloy body could corrode due to the degalvanizing phenomenon. This may lead to internal leakage. Carry out a periodic inspection every six months, and replace with a stainless steel body if any abnormalities are found.
- (4) Depending on the model, internal parts may wear when the valve operates. Caution is required because wear chips could enter the secondary side of the valve.
- (5) If rust must be avoided, select a component whose metal sections are not wetted.

■ Quality of fluid

Iron rust and debris in the fluid can cause operation faults or leaks and deteriorate product performance. Provide measures to remove foreign matter.

■ Fluid temperature

Use the product within the fluid temperature range.

3. Working environment

WARNING

- Only explosion-proof solenoid valves and air operated valves can be used in an explosive atmosphere. Select either an explosion-proof solenoid valve or air operated valve for use within an explosive atmosphere.
- When using with AC voltage, a thrumming noise may be heard depending on the working conditions. If the thrumming noise is a problem because of the working environment, select a coil with a diode or DC voltage.
- Do not use this product in a corrosive gas atmosphere or an atmosphere that could affect the component materials.
- Do not use this product near a heat generating source or in a location where it may be exposed to radiant heat.
- Use this product within the specified ambient temperature range.
- When using this product in a cold climate, take the necessary measures to prevent freezing. When wrapping insulation around the solenoid valve, etc., do not wrap around the coil section.
- Take appropriate safeguards according to the degree of protection listed in the catalog specifications. Consult with CKD when using outdoors.
- Take appropriate safeguards when using this product in places where oil or welding spatter, etc. could come in contact with it.

4. Securing of space

CAUTION

■ Securing maintenance space

Secure sufficient space for maintenance and inspection.



Safety precautions

Fluid Control Components: Warnings and Cautions

Be sure to read this section before use.

Caution

Mounting, installation and adjustment

1. Installation

⚠ CAUTION

- Be sure to read the instruction manual thoroughly before installing the product.
- In the case of models with solenoid valves, do not apply external force to the coil during installation.
- After installation, check for leaks from pipes, for proper wire connections and that the product is installed correctly.

2. Piping

⚠ CAUTION

- Observe the effective thread length for the piping threads.
Chamfer the end of the thread section by approx. a half-pitch.
- Before piping, flush the inside of the pipe with 0.3 MPa of air, and remove foreign matter such as dirt, metal chips, rust and sealing tape.
- If excessive sealant (sealing tape, gel-type sealant) is applied when piping, it could enter the product and cause malfunctions.
- When applying or wrapping sealant on the piping material, apply or wind it from the pipe end along the thread section, and leave 1.5 to 2 threads uncovered.
- Dirt or foreign matter in fluid could prevent the product from functioning correctly.
Install an 80 mesh or more filter for water flow, and a 5 μm or less filter for air flow.
- Make sure not to use the wrong supply port when connecting the pipes to the product.
- Install a by-pass circuit and use an elbow union for piping to simplify the maintenance and repair work.
- When controlling fluid in a tank, pipe at a level slightly above the bottom of the tank.
- When using steam for the working fluid, provide piping that prevents drainage from accumulating on the primary side of the solenoid valve. Otherwise, malfunction will occur.

- Refer to the table below for the piping tightening torque.

[When body is aluminum]

Piping nominal diameter	Recommended piping tightening torque (Nm)
Rc1/8	7 to 9
Rc1/4	12 to 14
Rc3/8	22 to 24
Rc1/2	28 to 30
Rc3/4	31 to 33
Rc1	36 to 38
Rc1 1/4	40 to 42
Rc1 1/2	48 to 50
Rc2	54 to 56

[When the body material is other than aluminum]

Piping nominal diameter	Recommended piping tightening torque (Nm)
Rc1/8	18 to 20
Rc1/4	23 to 25
Rc3/8	31 to 33
Rc1/2	41 to 43
Rc3/4	62 to 65
Rc1	83 to 86
Rc1 1/4	97 to 100
Rc1 1/2	104 to 108
Rc2	132 to 136
Rc2 1/2	146 to 150

Note: For NPT threads, values recommended for Rc threads with the same size apply.

[When using a push-in fitting for pneumatic use]

Port thread	Recommended tightening torque values (Nm)
M3	0.3 to 0.6
M5	1 to 1.5
Rc1/8	3 to 5
Rc1/4	6 to 8
Rc3/8	13 to 15
Rc1/2	16 to 18
Rc3/4	19 to 40
Rc1	41 to 70

3. Wiring

⚠ CAUTION

- Use with the allowable voltage range. Usage outside the allowable voltage range may lead to malfunction or coil damage.
- Provide a circuit breaker, such as a fuse, on the control circuit to protect electrical equipment.
- If the electric circuit system is vulnerable to solenoid surge, use a solenoid with a surge suppressor (optional), or insert a surge absorber, etc., in parallel to the solenoid. (Note that this does not apply to the motorized ball valve series.)
- As a guide, use a wire with a nominal cross section of 0.5 mm² or more. Make sure that excessive force is not applied to the lead wire.
- When using an explosion-proof solenoid valve, follow the Recommended Practices for Explosion-protected Electrical Installations in General Industries when wiring.
- Use of a switching circuit which does not generate contact chattering will increase the durability of the solenoid valves and motor driven valves.

Use/maintenance

1. Maintenance and inspection

WARNING

- Do not touch coils or actuators with hands or body while the power is ON or immediately after it is turned OFF.
The solenoid valve coil and actuator will heat up when energized. Depending on the product, direct contact could cause burns and so use caution.
- Do not touch the electrical wiring connections (bare, live parts) with hands or body when they are energized. There is a risk of electric shock.
Touching electrical wiring connections while power is on may lead to electrical shock.
- Use this product under the max. working pressure and max. working pressure differential.
- To ensure ideal use, inspect the product every six months. This frequency varies with the frequency of use.

CAUTION

- Do not use valves as footing or place any heavy objects on top of the valves.
- If the product is continuously energized or not frequently used, periodically inspect it since malfunction may occur depending on the use condition.
- If the product has been out of use for one month or more, perform a test run before starting the actual operation.
- Carefully read the instruction manual before starting maintenance.
- Always turn the power OFF and release any fluids or pressure before starting maintenance.
- Pay attention to clogging of the strainer and filter.

2. Disassembly/assembly

CAUTION

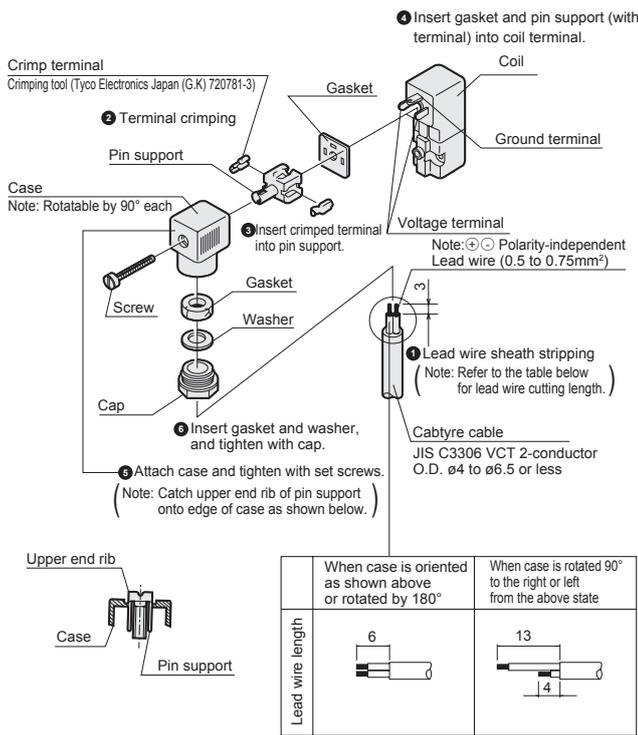
- When cleaning the product, use a low-polluting cleaning agent such as a neutral detergent. (Note that the rubber parts must be replaced. There is a risk of expansion.)
- When the product will not be used for one month or more after using water or hot water, completely remove any water or hot water left in the product. Water or hot water residue will cause rusting and may lead to malfunction or leaks.
If residual water cannot be eliminated, operate the valve several times a day and pass water through to ensure ideal use.
- Contact CKD with questions about repair parts, etc.

How to connect terminal box

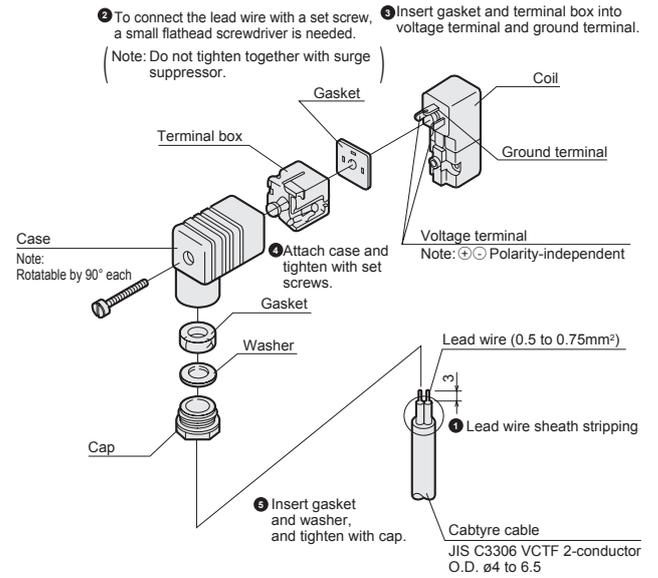
■ Compact terminal box (G1/4), compact terminal box with lamp (G1/4)

- ① Use the following cabtyre cable.
 - Cable O.D.: $\phi 4$ to $\phi 6.5$ · Nominal sectional area: 0.5 to 0.75 mm²
- ② Put the crimp terminal on the cabtyre cable's lead wire, and crimp the terminal with the designated tool.

(A crimp terminal is not required for a terminal box with lamp.)
- ③ Tighten the screws with the following tightening torque.
 - Set screw tightening torque: 0.3 N·m



Wire with steps ① to ③.
[For compact terminal box (G1/4)]



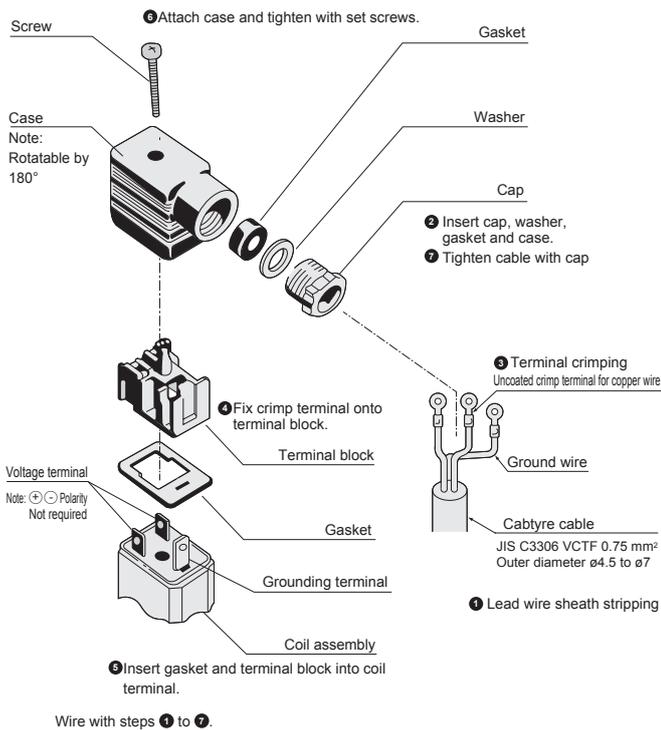
*The orientation of the cord can be changed by removing the terminal block from the case, rotating it by 90°, and then replacing the block into the case.

Wire with steps ① to ③.
[For compact terminal box with light (G1/4)]

How to connect terminal box

■ DIN terminal box (Pg9), DIN terminal box with lamp (Pg9)

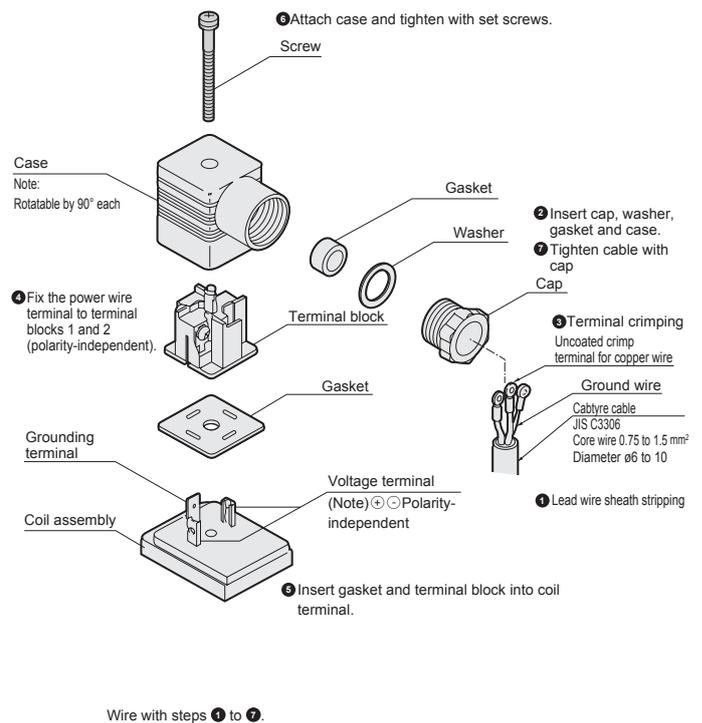
- (1) Use the following cabtyre cable.
 - Cable O.D.: $\phi 4.5$ to $\phi 7$ · Nominal sectional area: 0.75 mm^2
- (2) Put the crimp terminal for copper wire on the cabtyre cable's lead wire and crimp the terminal. The terminal box thread size is M3.
- (3) Tighten the screws with the following tightening torque.
 - Set screw tightening torque: $0.5 \text{ N}\cdot\text{m}$ · Terminal screw tightening torque: $0.5 \text{ N}\cdot\text{m}$



*The orientation of the cord can be changed by removing the terminal block from the case, rotating it by 180° , and then replacing the block into the case.

■ DIN terminal box (Pg11, G1/2), DIN terminal box with lamp (Pg11)

- (1) Use the following cabtyre cable.
 - Cable O.D.: $\phi 6$ to $\phi 10$ · Nominal sectional area: 0.5 to 1.5 mm^2
- (2) Put the crimp terminal for copper wire on the cabtyre cable's lead wire and crimp the terminal. The terminal box thread size is M3.
- (3) Tighten the screws with the following tightening torque.
 - Set screw tightening torque: $0.5 \text{ N}\cdot\text{m}$ · Terminal screw tightening torque: $0.5 \text{ N}\cdot\text{m}$

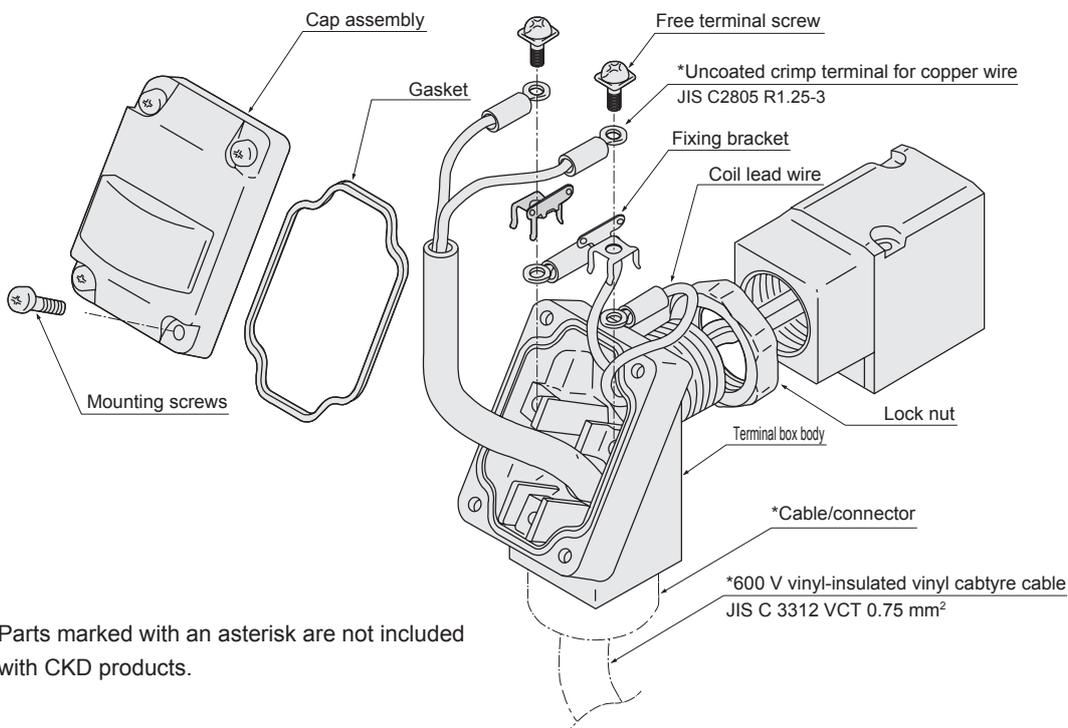


*The orientation of the cord can be changed by removing the terminal block from the case, rotating it by 90° , and then replacing the block into the case.

How to connect terminal box

■ T type terminal box (G1/2), T type terminal box with lamp (G1/2)

- (1) Use the following cabtyre cable.
 - Nominal sectional area: 0.75 mm²
- (2) Put the crimp terminal for copper wire on the cabtyre cable's lead wire and crimp the terminal. The terminal box thread size is M3.
- (3) Tighten the screws with the following tightening torque.
 - Mounting screw tightening torque: 0.5 N·m
 - Terminal screw tightening torque: 0.5 N·m



* Changing the orientation of T type terminal box

Use the following steps to change the orientation of the T type terminal box from the default state.

- (1) Hold the width across flats (25 width) of the T type terminal box with a tool (adjustable wrench, wrench, etc.), and loosen it by turning counterclockwise.
- (2) Loosen the lock nut.
- (3) Rotate the T type terminal box clockwise to approx. 15° before the required position.
- (4) Tighten the lock nut to the coil side by hand until it is lightly tightened.
- (5) Hold the width across flats of the T type terminal box with a tool, and rotate it (approx. 15°) to tighten it to the required position.

Note: When further tightening the terminal box to change the orientation from the default position, rotate it within 1/2 turn.

How to connect terminal box

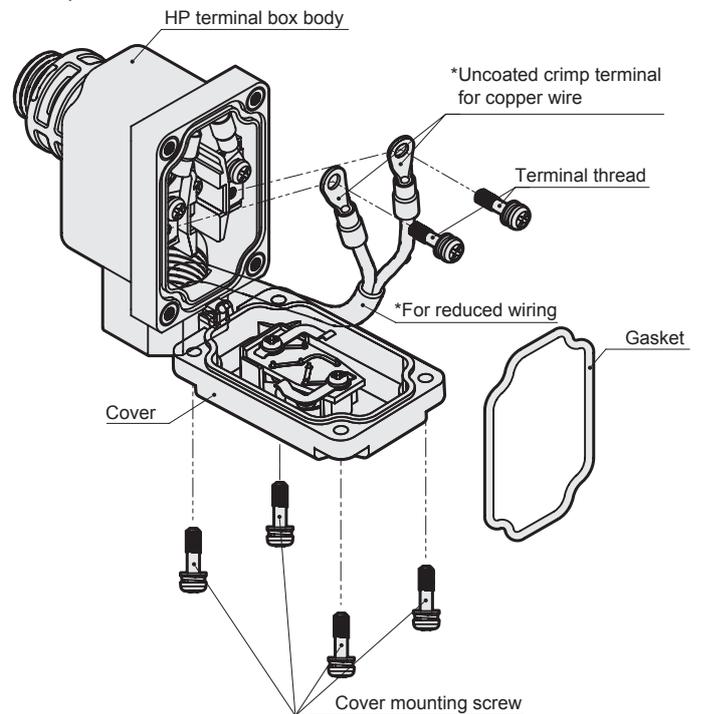
■ How to connect HP terminal box

(1) Put the crimp terminal for copper wire on the electric wire and crimp the terminal.

(2) The terminal screw size is M3.

Tighten the screws with the following tightening torque.

- Cover mounting screw tightening torque: 0.5 N·m
- Terminal screw tightening torque: 0.5 N·m



Parts marked with an asterisk are not included with CKD products.

(3) The wiring will be as follows according to the number of lead wires from the coil.

(i) For two lead wires

Wire to the A terminal and C terminal on the terminal board. Polarity-independent except in case of (ii)

(ii) For DC voltage terminal box with light and two lead wires

There is polarity, so wire the "⊖" pole to the terminal board's A terminal and the "⊕" pole to the C terminal.

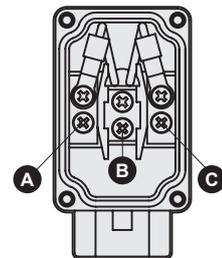
(iii) For three lead wires

The operating frequency

- For 50 Hz: A terminal and C terminal
- For 60 Hz: A terminal and B terminal

[Wiring diagram]

For two lead wires



For three lead wires

