

## OPERATING MANUAL

### World K Series Terminal Box Type 6 W Electromagnetic Brake Motors




#### Introduction

##### ■ Before use

Only qualified personnel should work with the product. Use the product correctly after thoroughly reading the section "Safety precautions."  
Should you require the inspection or repair of internal parts, contact the Oriental Motor office where you purchased the product. The product described in this manual has been designed and manufactured for use in general industrial machinery, and must not be used for any other purpose. Oriental Motor Co., Ltd. is not responsible for any damage caused through failure to observe this warning.

#### Safety precautions

The precautions described below are intended to prevent danger or injury to the user and other personnel through safe, correct use of the product. Use the product only after carefully reading and fully understanding these instructions.

 <b>WARNING</b>	Handling the product without observing the instructions that accompany a "WARNING" symbol may result in serious injury or death.
 <b>CAUTION</b>	Handling the product without observing the instructions that accompany a "CAUTION" symbol may result in injury or property damage.
 <b>Note</b>	The items under this heading contain important handling instructions that the user should observe to ensure safe use of the product.

#### **WARNING**

- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. Doing so may result in fire, electric shock or injury.
- Assign qualified personnel the task of installing, wiring, operating/controlling, inspecting and troubleshooting the product. Failure to do so may result in fire, electric shock or injury.
- Do not transport, install the product, perform connections or inspections when the power is on. Always turn the power off before carrying out these operations. Failure to do so may result in electric shock.
- Do not use the electromagnetic brake for stopping or for safety purposes. Using it for purposes other than holding the moving parts and motor in position may cause injury or damage to equipment.
- The motor is Class I equipment. Install the motor so as to avoid contact with hands, or ground it to prevent the risk of electric shock.
- Install the motor in an enclosure in order to prevent electric shock or injury.
- Keep the input power voltage within the specification to avoid fire and electric shock.
- Connect the cables securely according to the wiring diagram in order to prevent fire and electric shock.
- Do not forcibly bend, pull or pinch the lead wires (cables). Doing so may result in fire and electric shock.
- Be sure to insulate the connection terminal of the capacitor. Failure to do so may result in electric shock.
- Turn off the power in the event of a power failure, or the motor will suddenly start when the power is restored and may cause injury or damage to equipment.
- Do not touch the connection terminal of the capacitor immediately after the power is turned off (for a period of 30 seconds). The residual voltage may cause electric shock.
- Do not disassemble or modify the motor. This may cause electric shock or injury.

Thank you for purchasing an Oriental Motor product. This Operating Manual describes product handling procedures and safety precautions.

- Please read it thoroughly to ensure safe operation.
- Always keep the manual where it is readily available.

#### **CAUTION**

- Do not use the motor beyond its specifications, or electric shock, injury or damage to equipment may result.
- Do not touch the motor during operation or immediately after stopping. The surface is hot and may cause a burn.
- Do not hold the motor output shaft. This may cause injury.
- Keep the area around the motor free of combustible materials in order to prevent fire or a burn.
- To prevent the risk of damage to equipment, leave nothing around the motor that would obstruct ventilation.
- To prevent bodily injury, do not touch the rotating parts (output shaft) of the motor during operation.
- When an abnormality is noted, turn off the power immediately, or fire, electric shock or injury may occur.
- The motor's surface temperature may exceed 70 °C, even under normal operating conditions. If a motor is accessible during operation, post the warning label shown in the figure in a conspicuous position to prevent the risk of burns.
- Dispose the product correctly in accordance with laws and regulations, or instructions of local governments.



Warning label

#### Preparation

##### ■ Checking the product

Verify that the items listed below are included. Report any missing or damaged items to the branch or sales office from which you purchased the product.

- Motor ..... 1 unit
- Capacitor ..... 1 pc. (only for single-phase motors)
- Capacitor cap ..... 1 pc. (only for single-phase motors)
- Set of mounting bolts ..... 1 set (only for combination type)  
Mounting bolts, hexagonal nuts, washers: 4 pcs. each
- Instructions and Precautions for Safe Use ... 1 copy

##### ■ Checking the model name

Check the model number against the number indicated on the product.

##### ● Combination type

Model*	Motor model	Capacitor model	Gearhead model*
<b>2RK6AMB-□S</b>	2RK6GN-AW2MB	CH45FAUL2	<b>2GN□S</b>
<b>2RK6FMB-□S</b>		CH35FAUL2	
<b>2RK6CMB-□S</b>	2RK6GN-CW2MB	CH10BFAUL	
<b>2RK6EMB-□S</b>		CH08BFAUL	
<b>2IK6SMB-□S</b>	2IK6GN-SW2MB	—	

\* The box (□) of the model will be filled with the numeral to represent the gear reduction ratio.

##### ● Pinion shaft type, round shaft type

Model*	Motor model	Capacitor model
<b>2RK6GN-AW2MBJ</b>	2RK6GN-AW2MB	CH45FAUL2
<b>2RK6GN-AW2MBU</b>		CH35FAUL2
<b>2RK6GN-CW2MBJ</b>	2RK6GN-CW2MB	CH10BFAUL
<b>2RK6GN-CW2MBE</b>		CH08BFAUL
<b>2IK6GN-SW2MB</b>	2IK6GN-SW2MB	—

\* The list above shows pinion shaft motors. For the round shaft motor, "GN" in the model and motor model are replaced by "A".

## Installation

### Location for installation

Install it in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature
  - 10 to +40 °C (+14 to +104 °F) (non-freezing)
  - 10 to +50 °C (+14 to +122 °F) for 100 V/200 V
- Operating ambient humidity 85% or less (non-condensing)
- Area that is free from an explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- Area not exposed to direct sun
- Area free of excessive amount dust, iron particles or the like
- Area not subject to splashing water (storms, water droplets), oil (oil droplets) or other liquids
- Area free of excessive salt
- Area not subject to continuous vibration or excessive shocks
- Area free of excessive electromagnetic noise (from welders, power machinery, etc.)
- Area free of radioactive materials, magnetic fields or vacuum
- 1000 m or less above sea level

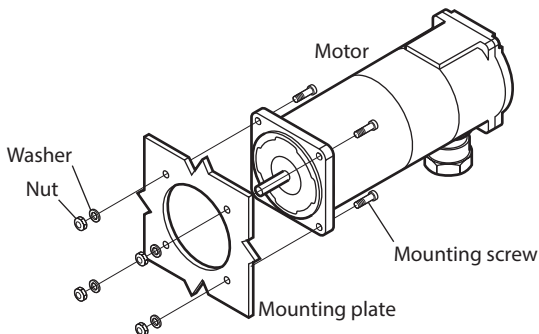
**Note** On rare occasions, grease may ooze out from the gearhead. If there is concern over possible environmental damage resulting from the leakage of grease, check for grease stains during regular inspections. Alternatively, install an oil pan or other device to prevent leakage from causing further damage. Grease leakage may lead to problems in the customer's equipment or products.

### Installing the motor

#### Round shaft type

Drill holes on the mounting plate and fix the motor on the plate using screws, nuts, and washers (not supplied). Be careful there is no gap between the motor installation surface and the bracket.

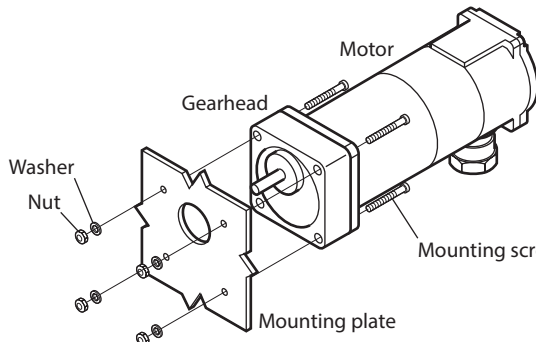
Nominal diameter of screw: M4



**Note** Do not insert the motor into the mounting hole at an angle or force it in, as this may scratch the flange pilot section and damage the motor.

#### Combination type

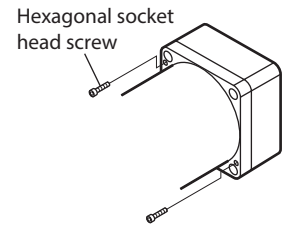
Drill holes on the mounting plate and fix the motor and gearhead on the plate using supplied screws (4 pcs.). Be careful there is no gap between the motor/gearhead assembly and the installation surface.



### Installing/removing the gearhead

The gearhead can be removed and the cable gland position changed to a desired 90° direction. The same procedure is followed when replacing the gearhead.

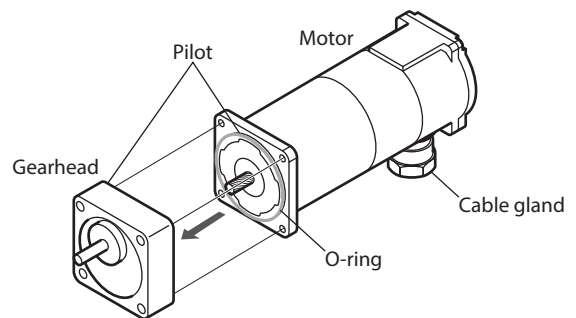
1. Remove the hexagonal socket head screws (2 pcs.) assembling the motor and gearhead and detach the motor from the gearhead.



2. Using the pilot sections of the motor and gearhead as guides, install the gearhead to the motor.

At this time, the cable gland position can be changed to a desired 90° direction. When installing the gearhead, slowly rotate it clockwise/ counterclockwise to prevent the pinion of the motor output shaft from contacting the side panel or gear of the gearhead.

This flange surface is constructed to hold a O-ring. If this O-ring comes out of the flange groove, reseal it correctly on the flange groove. Also confirm that no gaps remain between the motor flange surface and the end face of the gearhead's pilot section.



After assembling the motor with the gearhead, install the motor/gearhead assembly using mounting screws by referring to the explanation under "Combination type".

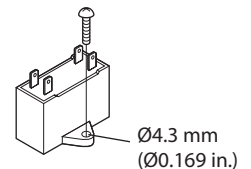
- Note**
- Do not forcibly assemble the motor and gearhead. Also, do not let metal objects or other foreign matters enter the gearhead. The pinion or gear of the motor output shaft may be damaged, resulting in noise or shorter service life.
  - Do not allow dust to attach to the pilot sections of the motor and gearhead. Grease may leak from inside the gearhead.
  - The hexagonal socket head screws used to assemble the motor and gearhead together only tentatively secure the two components. Always use the four supplied mounting screws when installing the motor/gearhead assembly.

### Pinion shaft type

Pinion shaft type motors are used with a gearhead assembled. Refer to figure above.

### Mounting the capacitor (only for single-phase motors)

Before mounting the provided capacitor, check that the capacitor's capacitance matches that stated on the motor's name plate. Mount the capacitor securely by using M4 screws (not provided).



- Note**
- Do not let the screw tightening torque exceed 1 N·m (8.8 lb-in) to prevent damage to the mounting foot.
  - Mount capacitor at least 10 cm (3.94 in.) away from the motor. If it is located closer, the life of the capacitor will be shortened.

## Connection

Insulate all the wire connections, such as the connection between the motor and the capacitor connection.

For safety's sake, install a breaker or fuse in the power line.

Ground the motor using a Protective Earth Terminal.

The rotation direction is as viewed from the side of the motor's output shaft. The motor rotates in a clockwise (CW) and counterclockwise (CCW) direction.

### Rotating direction of the gearhead output shaft

The rotating direction of the gearhead output shaft may be opposite that of the motor shaft, depending on the gear ratio. Before performing wiring, be sure to check the rotating direction of the gearhead output shaft to be used and determine the desired direction of motor rotation.

Gearhead model*	Gear ratio	
	Same as the rotating direction of motor shaft	Opposite the rotating direction of motor shaft
2GN□S	3 to 18	25 to 36
	50 to 180	

\* The box (□) of the model will be filled with the numeral to represent the gear reduction ratio.

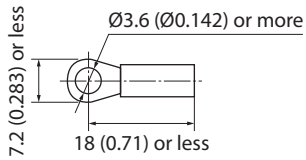
### Connection method to a terminal box

When connecting the cable (not supplied), use the following crimp terminal.

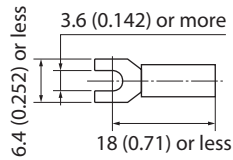
#### Applicable crimp terminal [unit: mm (in.)]

##### For terminal block

Insulated round terminal

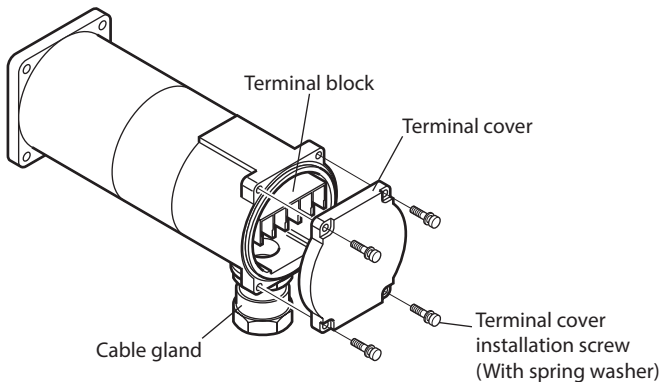
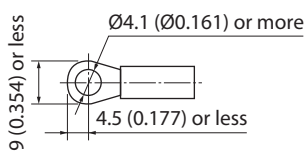


Insulated fork terminal

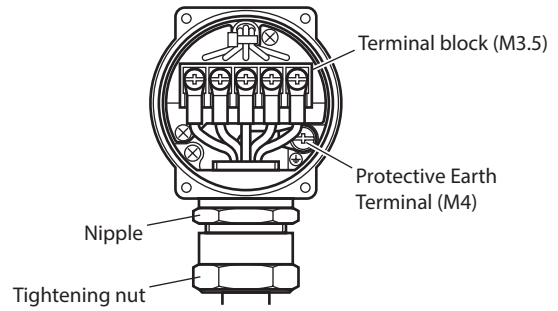


##### For Protective Earth Terminal

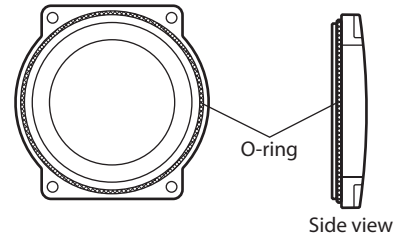
Insulated round terminal



### Layout of terminals



### Rear side of terminal cover



- To ensure safety, ground the motor using the ⊕ inside the terminal box.
- Use a cable of the following specifications:  
Applicable cable diameter: Ø12 to 16 mm (Ø0.47 to 0.63 in.)  
Applicable lead wire: AWG18 (0.75 mm<sup>2</sup>) or more
- When sealing the terminal cover, ensure that no scraps or particles get caught between the contact surfaces.
- This terminal cover is constructed to hold a O-ring. If this gasket comes out of the cover, please reseal it correctly on the cover.
- Refer to the tightening torque table to determine the appropriate tightening torque to use when fastening the terminal cover and cable gland. Loosening and then tightening the nut again may cause the nipple to become loose. In this case, securely tighten the nipple again to the applicable torque specified in the table below.

Terminal cover (M3)	0.5 to 0.7 N·m (4.4 to 6.1 lb-in)
Cable gland (tightening nut)	4.8 to 12.0 N·m (42 to 106 lb-in)
Cable gland (nipple)	10 to 12 N·m (88 to 106 lb-in)
Protective Earth Terminal	1.0 to 1.3 N·m (8.8 to 11.5 lb-in)
Terminal block	0.8 to 1.0 N·m (7.0 to 8.8 lb-in)

#### Note

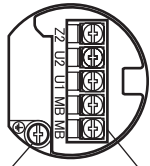
- To make shielding function fully effective, use a cable of an appropriate diameter.
- Securely affix the cable exposed outside the motor so that it does not receive stress.

## ■ Wiring diagram

Connect the motor according to the figure. The direction of motor rotation is as viewed from the side of the motor's output shaft. The motor rotates in a clockwise (CW) and counterclockwise (CCW) direction.

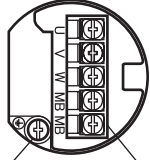
### ● Layout of terminals

Single-phase motor



Protective Earth Terminal Terminal block

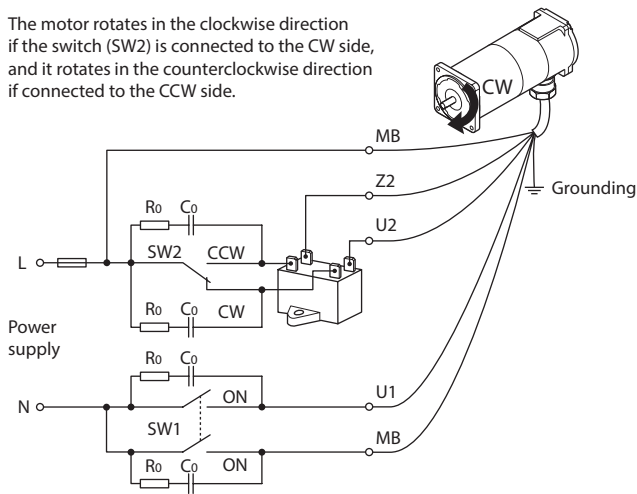
Three-phase motor



Protective Earth Terminal Terminal block

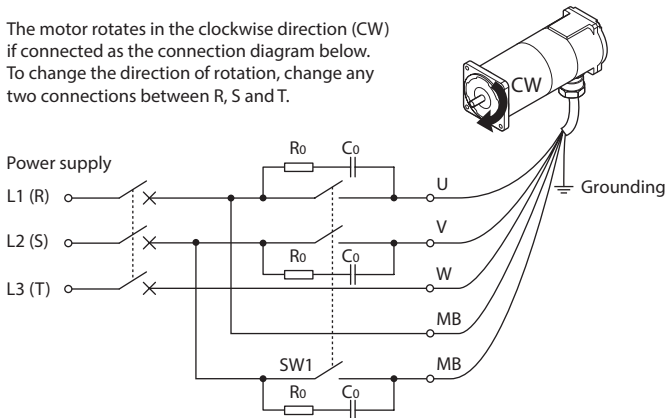
### ● Wiring the single-phase motor

The motor rotates in the clockwise direction if the switch (SW2) is connected to the CW side, and it rotates in the counterclockwise direction if connected to the CCW side.



### ● Wiring the three-phase motor

The motor rotates in the clockwise direction (CW) if connected as the connection diagram below. To change the direction of rotation, change any two connections between R, S and T.



Switch No.	Input specification			Note
	Single-phase 100 V/110 V/ 115 V input	Single-phase 200 V/220 V/ 230 V input	Three-phase 200 V/220 V/ 230 V input	
SW1	125 VAC 3 A or more Inductive load	250 VAC 1.5 A or more Inductive load	250 VAC 1.5 A or more Inductive load	Switched simultaneously
SW2			-	-

In order to protect the relay contacts, a CR circuit (—|—) must be connected. Refer to the wiring diagram.

$R_0=5$  to  $200 \Omega$

$C_0=0.1$  to  $0.2 \mu F$  250 WV

Peripheral equipment surge absorber is available (sold separately).

Model: **EPCR1201-2**

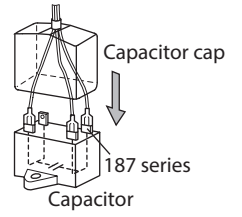
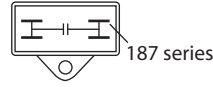
## ■ Capacitor connection (only for single-phase motors)

When crimp terminals are used, use the FASTON terminals 187 Series (TE Connectivity).

Use the supplied capacitor cap to insulate the capacitor terminal connection.

The capacitor has four terminals that are internally connected as shown in the figure.

<Capacitor internal wiring diagram>



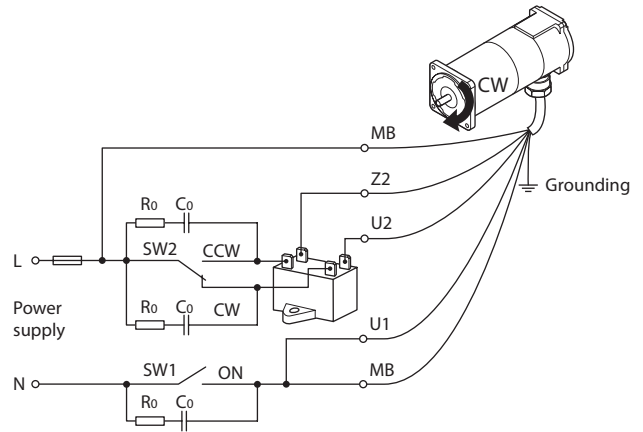
**Note** For lead wire connection, use one lead wire for each individual terminal.

### ■ Simplified connection

**Note** Wiring cannot be simplified for vertical drive applications or three-phase motors.

If the "RUN/STOP" operation of the motor and "RUN/STOP" operation of the electromagnetic brake are controlled via a single switch (contact), connect the lead wires as shown in the figure below.

Note that the motor's magnetic energy affects the electromagnetic brake windings, resulting in a longer braking time than that of the basic wiring by approximately 50 ms and thus increased overruns.



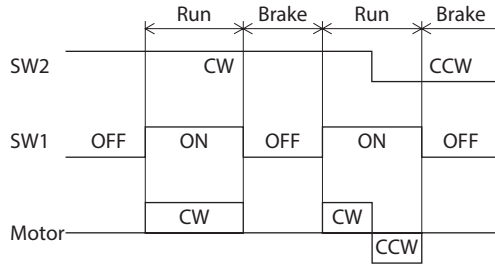
## Operation

### Note

- Make sure that the motor case temperature does not exceed 90 °C (194 °F) during operation of the motor. Operation exceeding case temperature 90 °C (194 °F) may significantly deteriorate the coils and ball bearings of the motor and shorten the motor's life span. Motor case temperature can be measured by fixing a thermometer on the motor surface. It can also be measured using thermo tape or a thermocouple.  
Thermal Class: 130 (B)
- Single-phase motors use a capacitor and keep it connected even after rotation of the motor has started.

### Timing chart of SW1 and SW2

This timing chart is case of the basic connection (shown in page 4).



### ■ RUN/STOP

SW1 operates motor and electromagnetic brake action. Motor will rotate when SW1 is switched simultaneously to ON (short circuit). When SW1 is switched simultaneously to OFF (open), the motor stops immediately by electromagnetic brake and holds the load.

### Note

When operating the electromagnetic brake, there may be a scraping noise because this braking system uses friction, but this is not a problem.

The load may move downward in vertical drive applications. Check the position of the load prior to operation.

### ■ Direction of rotation

#### ● Single-phase motor

To rotate the motor in a clockwise (CW) direction, switch SW2 to CW. To rotate it in a counter-clockwise (CCW) direction, switch SW2 to CCW.

#### ● Three-phase motor

When connected according to the connection diagram, the motor will operate in the clockwise direction (CW) as viewed from the motor's output shaft. To change the direction of rotation, change any two connections between R, S and T.

### ■ Other operation

#### ● Shortening the motor's starting time

If the electromagnetic brake is left release, the motor can be started much faster. Optimum timing for release of the brake is at least 10 ms before starting up the motor.

#### ● Releasing electromagnetic brake

If you wish to release the brake while the motor is stopped, apply voltage between only the two brake terminals (MB). The electromagnetic brake is released and the motor shaft can be free.

## Time rating

### ● Induction motors

Induction motors have a continuous rating.

### ● Reversible motors

Reversible motors have a 30 minutes rating. ("30 min" is indicated on the nameplate.)

## Locked rotor burnout protection

The motor is equipped a function of overheat protection for when the motor output shaft is locked.

### ■ Impedance protection

"ZP" is stamped on the motor nameplate. The motor has higher coil impedance. When the motor goes into locked rotor condition due to a malfunction, coil impedance rises, suppressing input power to the motor and protecting the motor coil from burnout.

## Troubleshooting

When the motor cannot be operated correctly, refer to the contents provided in this section and take appropriate action. If the problem persists, contact your nearest office.

Phenomena	Check items
Motor does not rotate or rotates slowly.	<ul style="list-style-type: none"> <li>• Check the power supply voltage.</li> <li>• Connect the power supply and the motor correctly.</li> <li>• With a single-phase motor, connect the supplied capacitor correctly.</li> <li>• If terminal blocks or crimp terminals are used, check them for poor connection.</li> <li>• Keep the load at or below the allowable value.</li> <li>• Check the voltage applied to the brake terminal (MB).</li> </ul>
Motor sometimes rotates and stops.	<ul style="list-style-type: none"> <li>• Connect the power supply and the motor correctly.</li> <li>• With a single-phase motor, connect the supplied capacitor correctly.</li> <li>• If terminal blocks or crimp terminals are used, check them for poor connection.</li> </ul>
The motor rotates in the direction opposite to the specified direction.	<ul style="list-style-type: none"> <li>• Connect correctly by referring to wiring diagram.</li> <li>• With a single-phase motor, connect the supplied capacitor correctly.</li> <li>• The rotating direction of the motor output shaft may be different from that of the gearhead output shaft depending on the gear ratio of the gearhead. See "Rotating direction of the gearhead output shaft" on page 3.</li> <li>• The rotating direction is indicated as viewed from the motor output shaft. Check the reference direction.</li> </ul>
Motor temperature abnormally high [Motor case temperature exceeds 90 °C (194 °F)]	<ul style="list-style-type: none"> <li>• Check the power supply voltage.</li> <li>• With a single-phase motor, connect the supplied capacitor correctly.</li> <li>• Review the ventilation condition.</li> </ul>
Noisy operation	<ul style="list-style-type: none"> <li>• To replace the gearhead, assemble the motor and gearhead correctly by referring to the operating manual for the gearhead.</li> <li>• Assemble a gearhead of the same pinion type as the motor.</li> </ul>



## Regulations and standards

### ■ UL Standards, CSA Standards

This product is recognized by UL under the UL and CSA Standards.

### ■ CE Marking

This product is affixed with the marks under the following directives.

#### ● Low Voltage Directive

#### Installation conditions

Overvoltage category II , Pollution degree 3 (excluding the motor installation surface of pinion shaft type and round shaft type), Class I equipment (for EN standards)

When the machinery to which the motor is mounted requires overvoltage category III , connect to power supply via an isolation transformer.

### ■ Electrical appliance and material safety law

The three-phase round shaft motor type bears a (PS) mark. Measurement of noise power and noise terminal voltage, as required by the electrical appliance and material safety law is conducted with a mains filter connected. For the mains filter, use the following product or equivalent.

Manufacturer	Three-phase 200-230 V
Schaffner EMC	FN3025HP-10-71
SOSHIN ELECTRIC CO.,LTD	HF3010C-SZA

### ■ RoHS Directive

This product does not contain the substances exceeding the restriction values.

### ■ China Compulsory Certification System (CCC System)

This product is affixed with the CCC Mark under the China Compulsory Certification System.

It is also certified by the China Quality Certification Center (CQC).

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