



## OPERATING MANUAL

### KII Series Induction Motor Right angle geared type



### Introduction

#### ■ Before using the motor

Only qualified and educated 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 to be incorporated in general industrial equipment. Do not use for any other purpose. Oriental Motor Co., Ltd. is not responsible for any damage caused through failure to observe this warning.

#### ■ Standard and CE Marking

- This product is recognized by UL under the UL and CSA standards. Also, it conforms to the China Compulsory Certification System (CCC System).
- The motor is affixed the CE Marking under the Low Voltage Directive.

Refer to p.4 for details.

#### ■ Hazardous substances

The products do not contain the substances exceeding the restriction values of RoHS Directive (2011/65/EU).

### 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.



Handling the product without observing the instructions that accompany a "Warning" symbol may result in serious injury or death.

- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, or near combustibles. Doing so may result in fire, electric shock or injury.
- Only qualified and educated personnel should be allowed to perform installation, connection, operation and inspection/troubleshooting of the product. Handling by unqualified and uneducated personnel may result in fire, electric shock, injury or equipment damage.
- 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.
- 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.
- Keep the input power voltage within the specified range. Failure to do so may result in fire or electric shock.
- Securely connect the cables in accordance with the connection examples. Failure to do so may result in fire or electric shock.
- Do not forcibly bend, pull or pinch the lead wires (cable). Doing so may result in fire and electric shock.
- Turn off the power in the event of a power failure. Or the motor may suddenly start when the power is restored and may cause injury or damage to equipment.
- Do not disassemble or modify the motor. This may cause electric shock or injury.



Handling the product without observing the instructions that accompany a "Caution" symbol may result in injury or property damage.

- Do not use the motor and driver beyond its specifications. Doing so may result in electric shock, injury or damage to equipment.
- Do not touch the motor during operation or immediately after stopping. The surface is hot and may cause a skin burn(s).
- Do not lift the motor by holding the motor output shaft or motor lead wires. Doing so may result in injury.
- Keep the area around the motor free of combustible materials. Failure to do so may result in fire or a skin burn(s).
- Do not leave anything around the motor that would obstruct ventilation. Doing so may result in damage to equipment.
- The motor does not have a built-in overheat protection device. Provide an overload protection device externally.
- Do not touch the rotating part (output shaft) while operating the motor. Doing so may result in injury.
- When an abnormality is noted, turn off the power immediately. Failure to do so may result in fire, electrical shock or injury.
- The motor surface temperature may exceed 70 °C (158 °F) even under normal operating conditions. If the operator is allowed to approach the running motor, attach a warning label as shown in the figure in a conspicuous position. Failure to do so may result in a skin burn(s).
- To dispose of the motor, disassemble it into parts and components as much as possible and dispose of individual parts/components as industrial waste.



Warning label

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.

### 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.

- Geared motor ..... 1 unit
- Hexagonal socket head screw set..... 1 set
- Hexagonal socket head screws, washers, spring washers 4 pieces each
- Parallel key ..... 1 piece  
(Fixed to the output shaft for the solid shaft type)
- Safety cover..... 1 piece (only for hollow shaft type)
- OPERATING MANUAL..... 1 copy (this document)

#### ■ Checking the model name

Check the model number against the number indicated on the product. Enter the gear ratio in the box (□) within the model name.

- Terminal box type

Type	Model	Model name for standards *
Hollow shaft type	5IK100VJST2-GHR□	5IK100VHP-JST2
	5IK100VEST2-GHR□	5IK100VHP-EST2
	7IK200VJST2-GHR□	7IK200VHP-JST2
	7IK200VEST2-GHR□	7IK200VHP-EST2
	7IK200VEUT2-GHR□	7IK200VHP-EUT2
Solid shaft type	5IK100VJST2-GAR□	5IK100VHP-JST2
	5IK100VEST2-GAR□	5IK100VHP-EST2
	7IK200VJST2-GAR□	7IK200VHP-JST2
	7IK200VEST2-GAR□	7IK200VHP-EST2
	7IK200VEUT2-GAR□	7IK200VHP-EUT2
	5IK100VJST2-GAL□	5IK100VHP-JST2
	5IK100VEST2-GAL□	5IK100VHP-EST2
	7IK200VJST2-GAL□	7IK200VHP-JST2
	7IK200VEST2-GAL□	7IK200VHP-EST2
	7IK200VEUT2-GAL□	7IK200VHP-EUT2

- Lead wire type

Type	Model	Model name for standards *
Hollow shaft type	5IK100VJS-GHR□	5IK100VHP-JS
	5IK100VES-GHR□	5IK100VHP-ES
Solid shaft type	5IK100VJS-GAR□	5IK100VHP-JS
	5IK100VES-GAR□	5IK100VHP-ES
	5IK100VJS-GAL□	5IK100VHP-JS
	5IK100VES-GAL□	5IK100VHP-ES

\* Model name that conforms to the UL Standards and CSA Standards

### Installation

#### ■ Location for installation

Install it in a well-ventilated location that provides easy access for inspection.

[ Common conditions ]

- Operating ambient temperature 0 to +40 °C (+32 to +104 °F) (non-freezing)
- Operating ambient humidity 85%, maximum (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 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
- Altitude Up to 1000 m (3300 ft.) above sea level

[ Terminal box type ]

- Indoors
- Not exposed to oil (oil droplets) or chemicals.
- The motor can be used in an environment that is splashed with water. Not available for use under high pressure jets of water or immersion in water.

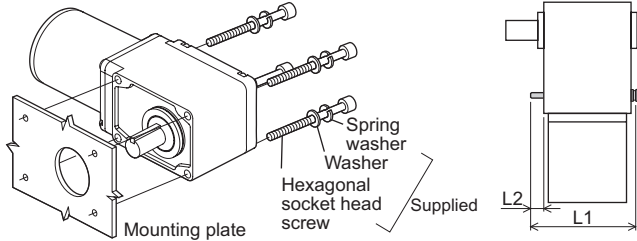
[ Lead wire type ]

- Inside an enclosure that is installed indoors (provide vent holes)
- Area not subject to splashing water (storms, water droplets), oil (oil droplets) or other liquids

**Note** On rare occasions, a small amount of grease may ooze out from the gearhead. If there is a concern over possible environmental damage resulting from the leakage of grease, provide an oil tray or similar oil catching mechanism in order not to cause a secondary damage. Oil leakage may lead to problems in the customer's equipment or products.

**How to install the motor**

Machine tapped holes on the mounting plate and fix the motor on the plate using set of mounting bolts (provided). The pilot section on the output shaft has been machined to  $\varnothing 58_{-0.046}^0$  mm (h8) [ $\varnothing 2.2835_{-0.0018}^0$  in.] for **5IK** and  $\varnothing 66_{-0.046}^0$  mm (h8) [ $\varnothing 2.5984_{-0.0018}^0$  in.] for **7IK**. Use this pilot section as a guide when aligning the output shaft.



The figure shows a solid shaft type.

Model	Hexagonal socket head screw Material: Stainless steel			Tightening torque
	Screw size	L1	L2	
<b>5IK</b>	M8	110 mm (4.33 in.)	8 mm (0.31 in.)	12 N·m (106 lb-in)
<b>7IK</b>	M10	135 mm (5.31 in.)	10.5 mm (0.41 in.)	24 N·m (210 lb-in)

\* When using the supplied hexagonal socket head screw set

**Note**

- When using the gearhead flange to mount the geared motor to equipment, proper alignment between the hollow shaft inside dimension and the load shaft is necessary. Keep the alignment tolerance within 0.02 mm (0.0008 in.). Insufficient alignment may result in damage to the gearhead internal bearings.
- Do not disassemble the gearhead from the motor.

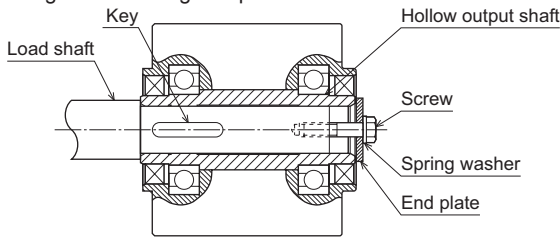
**Installing a load to the hollow shaft type**

Mounting method of the load varies depending on the load shaft conditions. See the following figures. The hollow output shaft inside dimension is processed to a tolerance of H8, and incorporates a key slot for load shaft attachment. A load shaft tolerance of h7 is recommended. Apply grease on the surface of the load shaft and inner walls of the hollow output shaft to prevent seizure.

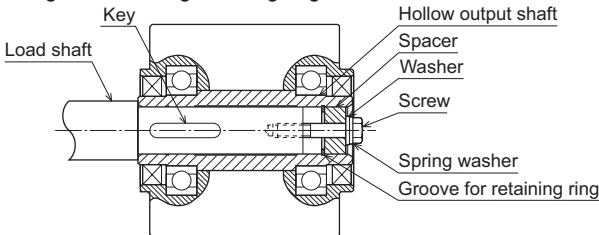
Model	Hollow shaft inside dimensions (H8)	Recommended load shaft dimensions (h7)
<b>5IK</b>	$\varnothing 25_{-0}^{+0.033}$ mm ( $\varnothing 0.9843_{-0}^{+0.0013}$ in.)	$\varnothing 25_{-0.021}^0$ mm ( $\varnothing 0.9843_{-0.0008}^0$ in.)
<b>7IK</b>	$\varnothing 30_{-0}^{+0.033}$ mm ( $\varnothing 1.1811_{-0}^{+0.0013}$ in.)	$\varnothing 30_{-0.021}^0$ mm ( $\varnothing 1.1811_{-0.0008}^0$ in.)

**Stepped load shaft**

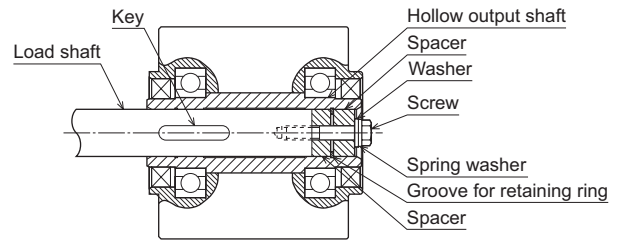
Mounting method using end plate



Mounting method using retaining ring



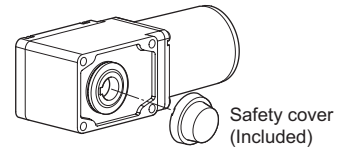
**Non-stepped load shaft**



**Note** Do not apply excessive or abrupt force to the hollow output shaft when inserting a load shaft into the hollow output shaft. Excessive or abrupt force may damage the gearhead internal bearings.

**Installing the safety cover**

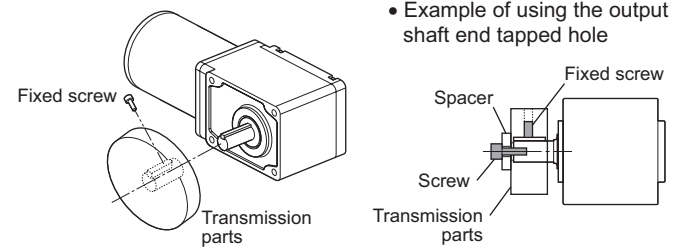
After installing the load, attach the safety cover. When removing the safety cover, insert a plastic stick with a flat tip to the cutout of the safety cover, and remove.



**Installing a load to the solid shaft type**

The shaft of the gearhead has been machined to an outer diameter tolerance of h7 and is provided with a key slot for connecting the transmission parts. When connecting the transmission parts, ensure that the shaft and parts have a clearance fit, and always fix the parallel key to the output shaft with a screw to prevent the parts from rattling or spinning. A screw hole is provided at the tip of the output shaft on solid shaft type. With solid shaft type, use this screw hole as an auxiliary means for preventing the transmission parts from coming off.

Model	Output shaft end tapped hole
<b>5IK</b>	M6 Effective depth 12 mm (0.47 in.)
<b>7IK</b>	M8 Effective depth 16 mm (0.63 in.)



**Note** Do not apply excessive force onto the output shaft of the gearhead using a hammer or other tools. Doing so may cause damage to the output shaft or bearings.

**Connection and operation**

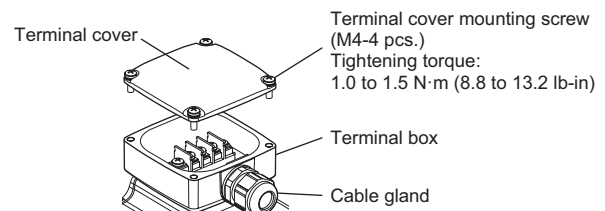
- Insulate the connecting part of the motor lead wires and power supply.
- Ground the motor using a Protective Earth Terminal.

**Terminal box type**

**Connection method to a terminal box**

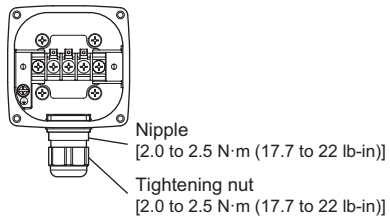
**Connection procedure**

1. Loosen the terminal cover mounting screws, and remove the terminal cover from the terminal box.
2. Insert the cable through the cable gland, and connect the lead wires to the terminal block. Connect the grounding lead wire to the Protective Earth Terminal.
3. Install the terminal cover on the terminal box.



### Insert the cable through the cable gland

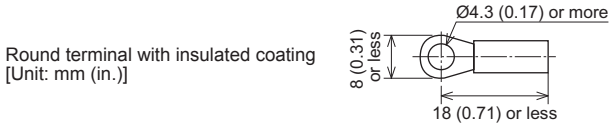
When inserting the cable through the cable gland, loosen the tightening nut. After connecting to the terminal block, turn the tightening nut to secure the cable.



[ ] indicates the value of the tightening torque.

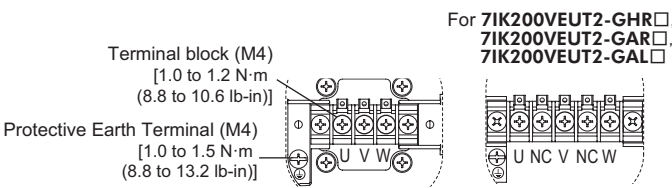
### Connection method to a terminal block

- When connecting to the terminal block, use the following crimp terminal.



Round terminal with insulated coating [Unit: mm (in.)]

- To ensure safety, ground the motor using the Protective Earth Terminal ⊕ inside the terminal box.
- Layout of terminals  
U, V and W are indicated on the side face of the terminal block.



[ ] indicates the value of the tightening torque.

- Use a cable of the following specifications.  
Applicable cable diameter:  $\varnothing 7$  to  $\varnothing 13$  mm ( $\varnothing 0.28$  to  $\varnothing 0.51$  in.)  
Applicable lead wire: AWG18 (0.75 mm<sup>2</sup>) or thicker  
Connection cables are available as accessories. Refer to the product catalog for details.
- Although the O-ring that is set to the matching surface of the terminal cover is a structure not to fall off easily, install it in the groove portion of the terminal cover securely if it fell off.

**Note**

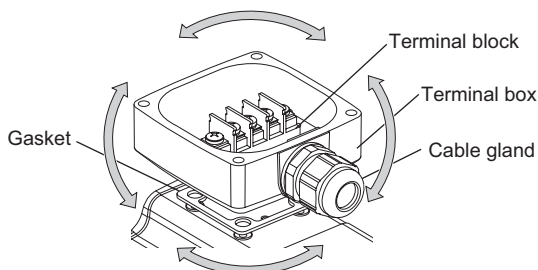
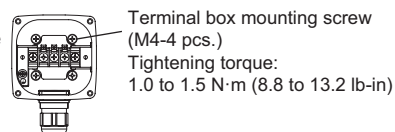
- To make shielding function fully effective, use a cable of an appropriate diameter and observe the specified tightening torque of screws.
- Secure the cable drawn from the motor terminal box so that it does not receive stress.

### Changing the cable outlet position

The cable outlet position can be changed to the left or right 90-degree direction, or the 180-degree direction by changing the mounting direction of the terminal box. When changing the mounting direction of the terminal box, specify the cable outlet position based on the equipment to be installed.

#### Change procedure

- Loosen the terminal cover mounting screws, and remove the terminal cover from the terminal box.
- Loosen the terminal box mounting screws, and remove the terminal box from the terminal block base.
- Change the cable outlet position of the terminal box from the mounting position at the time of shipment by turning the terminal box itself to the left or right 90-degree direction, or the 180-degree direction.



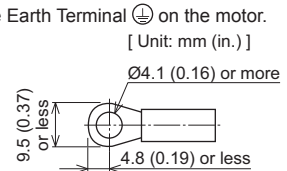
**Note**

- Be sure to use the gasket which has been put in the product at the time of shipment.
- Assemble not to enter any foreign object between the terminal box and terminal block base.

### Lead wire type

#### Connecting Protective Earth Terminal

Ground the motor using the Protective Earth Terminal ⊕ on the motor.  
Applicable crimp terminal:  
Insulated round crimp terminal  
Terminal screw size: M4  
Tightening torque:  
1.0 to 1.3 N·m (8.8 to 11.5 lb-in)  
Applicable lead wire:  
AWG18 (0.75 mm<sup>2</sup>) or thicker



**Note** Do not use screws other than the Protective Earth Terminal screw attached on the product.

### Wiring diagram

**Note** When the output shaft is locked or in the case of an overload state, use an electromagnetic switch in order to prevent the motor from burning out.

- See the p.4 for the electromagnetic switches.

- Check the gear ratio of the motor before connecting. The rotation direction of the output shaft may vary depending on the gear ratio. When connecting as the "Wiring diagram," the motor rotates in the direction as shown below.

100 W	Gear ratio: <b>7.5 to 120</b>	100 W	Gear ratio: <b>150 to 240</b>
200 W	Gear ratio: <b>15 to 60</b>	200 W	Gear ratio: <b>75 to 240</b>

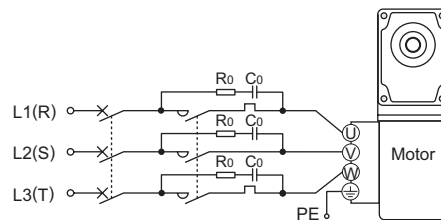
Clockwise

Counterclockwise

The figure represents the rotation direction viewed from the output shaft. The rotation in the clockwise direction represents "CW" and the rotation in the counterclockwise direction represents "CCW."

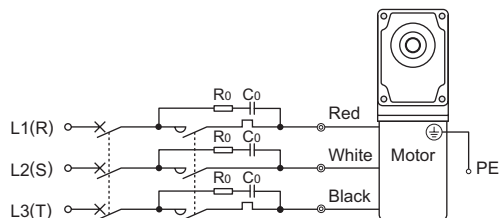
### Wiring diagram

#### Terminal box type



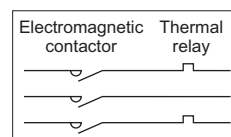
To change the direction of rotation, change any two connections between R, S and T.

#### Lead wire type



To change the direction of rotation, change any two connections between R, S and T.

#### [ Electromagnetic switch ]



#### [ Surge voltage measures ]

Connect the CR circuit for surge suppression (—|—|—).

- Motor rated voltage 200 to 230 VAC  
R<sub>0</sub>=5 to 200 Ω  
C<sub>0</sub>=0.1 to 0.2 μF 250 WV  
It is provided as an accessory (sold separately).

- Motor rated voltage 380 to 415 VAC  
R<sub>0</sub>=5 to 200 Ω  
C<sub>0</sub>=0.1 to 0.2 μF 450 WV

## ■ Operation

When the power is turned on, the motor rotates.

- Note**
- Make sure that the motor case temperature does not exceed 90 °C (194 °F) when operating 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.
  - When an ambient temperature is low, since the load torque may increase by the viscosity increment of the oil seal or grease, the motor starting may take a long time or the motor rotation speed may fall. However, if the operation is continued for a while, the oil seal or grease will be warmed up, and the motor can be driven at the normal rotation speed.

## Burnout protection for overload/locked-rotor state

- Note** When the output shaft is locked or in the case of an overload state, use an electromagnetic switch in order to prevent the motor from burning out. When connecting to an inverter, use the electronic thermal relay function of the inverter.

## ■ When connecting to the power supply

- Always connect an electromagnetic switch. Connect the electromagnetic switch according to the operating manual of the electromagnetic switch.
- Set the motor rated current for the thermal relay. The motor rated current is described on the motor nameplate.
- For electromagnetic switches, use the products as shown in the chart, or an equivalent.

[ Fuji Electric FA Components & Systems Co., Ltd. ]

- For motor output power 100 W, rated voltage 200 to 230 VAC  
Model: SC11AAN-□10TH
- For motor output power 200 W, rated voltage 200 to 230 VAC  
Model: SC11AAN-□10TK
- For motor output power 200 W, rated voltage 380 to 415 VAC  
Model: SC11AAN-□10TH

(□: Coil code)

Coil code	50 Hz	60 Hz
2	200 V	200-220 V
M	200-220 V	220-240 V
P	220-240 V	240-260 V
S	346-380 V	380-420 V
4	380-400 V	400-440 V
T	415-440 V	440-480 V

Use the product which satisfies the motor rated voltage by selecting the coil code.

[ Mitsubishi Electric Corporation ]

- For motor output power 100 W, rated voltage 200 to 230 VAC  
Model: MSO-T10 0.5A 200V AC200V
- For motor output power 200 W, rated voltage 200 to 230 VAC  
Model: MSO-T10 0.9A 200V AC200V
- For motor output power 200 W, rated voltage 380 to 415 VAC  
Model: MSO-T10 0.5A 400V AC400V

## ■ When connecting to the inverter

Be sure to set the electronic thermal relay according to the operating manual of the inverter. Unless the electronic thermal relay is set, a burnout may result.

## When using the motor with an inverter

When the motor is used with connecting an inverter, perform the following settings to the inverter.  
About the setting frequency for when operating the motor, use at 80 Hz or less for the model **5IK** type (100 W) and at 100 Hz or less for the model **7IK** type (200 W).

## ■ Setting for motor

Electronic thermal relay function	Set the rated current listed on the motor nameplate based on the base frequency and the voltage applied to the motor.
Applicable motor setting	Constant-torque motor or inverter motor
Motor capacity	Motor rated output power If the setting value in the inverter does not exist, set the closest value.
Number of motor poles	4 poles

## ■ Notes about when using the motor with an inverter

The inverter which input voltage exceeds 240 VAC cannot be used.  
The insulation of the motor winding may deteriorate, causing damage to the motor.

## Time rating

Continuous operation is possible (continuous rating).

## 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. Motor sometimes rotates and stops.	<ul style="list-style-type: none"> <li>• Check the power supply voltage.</li> <li>• Connect the power supply and the motor 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> </ul>
The motor rotates in the direction opposite to the specified direction.	<ul style="list-style-type: none"> <li>• The connection varies depending on the gear ratio of the gearhead.</li> <li>• The rotation direction is as viewed from the output shaft end. 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>• Review the ventilation condition.</li> </ul>

## Standard and CE Marking

- This product is recognized by UL under the UL and CSA standards. Also, it conforms to the China Compulsory Certification System (CCC System).
- The motor is affixed the CE Marking under the Low Voltage Directive.

## ■ UL Standards\*, CSA Standards\*, CCC System\*

Applications standards	Certification Body / File No.
UL 1004-1	UL / UL File No.E62327
CSA C22.2 No.100	
GB12350	CQC

- Thermal Class: 130 (B)

## ■ CE Marking\*

- Applications standards  
EN 60034-1, EN 60034-5, EN 60664-1

- Installation conditions (For EN standard)

Terminal box type: Overvoltage category II, Pollution degree 3, Class I equipment  
Lead wire type: Overvoltage category II, Pollution degree 2, Class I equipment  
When the machinery to which the motor is mounted requires overvoltage category III specifications, install the motor in a cabinet that connect to power supply via an isolation transformer.

\*Temperature rise tests required by the above standards are performed in a state that has been attached a heat radiation plate instead of a gearhead.

The size and material for the heat radiation plates are as follows.

[Size] **5IK**: 200×200 mm (7.87×7.87 in.)

**7IK**: 230×230 mm (9.06×9.06 in.)

[Thickness] 5 mm (0.20 in.) [Material] Aluminum alloy

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ORIENTAL MOTOR U.S.A. CORP.  
Technical Support Tel:(800)468-3982  
8:30 A.M. to 5:00 P.M., P.S.T. (M-F)  
7:30 A.M. to 5:00 P.M., C.S.T. (M-F)  
www.orientalmotor.com  
ORIENTAL MOTOR DO BRASIL LTDA.  
Tel:+55-11-3266-6018  
www.orientalmotor.com.br  
ORIENTAL MOTOR (EUROPA) GmbH  
Schiessstraße 74, 40549 Düsseldorf, Germany  
Technical Support Tel:00 800/22 55 66 22  
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