



OPERATING MANUAL

KII Series Electromagnetic brake 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.
- Do not use the electromagnetic brake to hold on a load securely. If the electromagnetic brake is used as a safety brake, provide separate safety measures. Failure to do so may result in 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.
Motore zur Verwendung in Geräten der Schutzklasse I. Die Gehäuse der Motore sind mit einer Schraube und Zahnscheibe sicher mit dem geerdeten Gehäuse des Gerätes zu verbinden.
- 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 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 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 cable. 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.

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.



Warning label

- 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.

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	5IK100VJSMT2-GHR□	5IK100VHP-JSMT2
	5IK100VESMT2-GHR□	5IK100VHP-ESMT2
Solid shaft type	5IK100VJSM2-GAR□	5IK100VHP-JSMT2
	5IK100VESMT2-GAR□	5IK100VHP-ESMT2
	5IK100VJSM2-GAL□	5IK100VHP-JSMT2
	5IK100VESMT2-GAL□	5IK100VHP-ESMT2

• Cable type

Type	Model	Model name for standards *
Hollow shaft type	5IK100VJSM-GHR□	5IK100VHP-JSM
	5IK100VESM-GHR□	5IK100VHP-ESM
Solid shaft type	5IK100VJSM-GAR□	5IK100VHP-JSM
	5IK100VESM-GAR□	5IK100VHP-ESM
	5IK100VJSM-GAL□	5IK100VHP-JSM
	5IK100VESM-GAL□	5IK100VHP-ESM

* 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.

[Cable 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

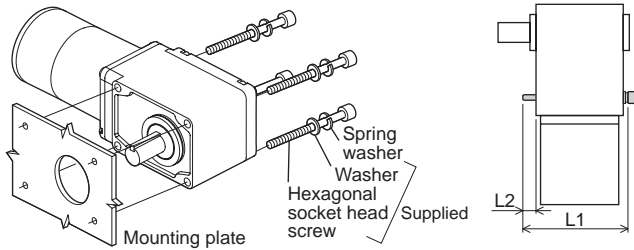
Note

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

Installation to equipment

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. 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	
5IK	M8	110 mm (4.33 in.)	8 mm (0.31 in.)	12 N·m (106 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.

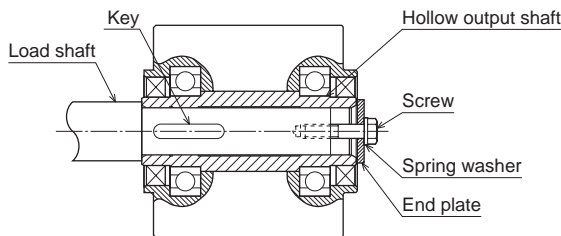
Installing a load to the hollow shaft type

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.

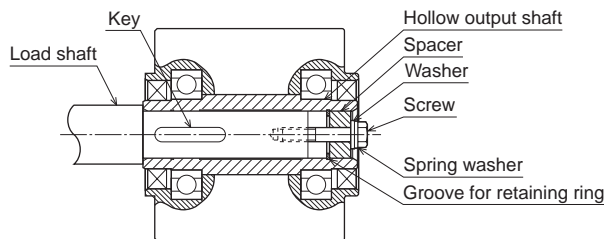
Model	Hollow shaft inside dimensions (H8)	Recommended load shaft dimensions (h7)
5IK	$\varnothing 25_{-0.033}^{+0.003}$ mm ($\varnothing 0.9843_{-0.0013}^{+0.0013}$ in.)	$\varnothing 25_{-0.021}^0$ mm ($\varnothing 0.9843_{-0.0008}^0$ in.)

Stepped load shaft

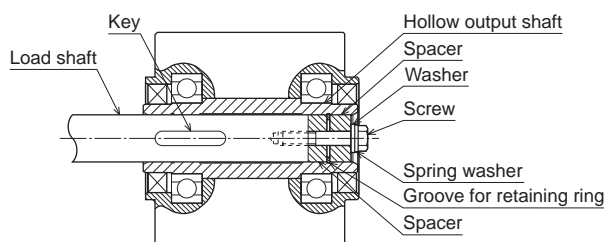
Mounting method using end plate



Mounting method using retaining ring



Non-stepped load shaft

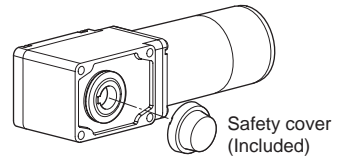


Note

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

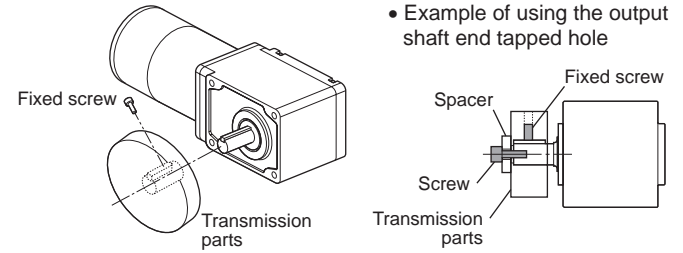
After installing the load, attach the safety cover. When removing the safety cover, insert a plastic stick with a flat tip to the cutout of the safety cover, and remove.



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
5IK	M6 Effective depth 12 mm (0.47 in.)



Example of using the output shaft end tapped hole

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

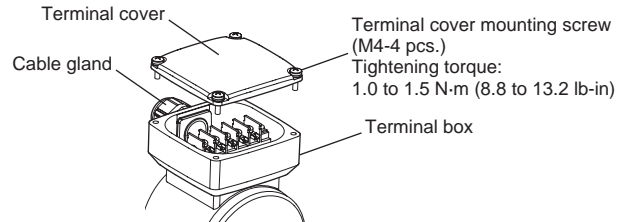
- Insulate the connecting part of the motor lead wires and power supply.
- Ground the motor using a Protective Earth Terminal.

Terminal box type

Connection method to a terminal box

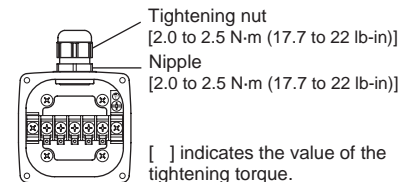
Connection procedure

- Loosen the terminal cover mounting screws, and remove the terminal cover from the terminal box.
- 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.
- Install the terminal cover on the terminal box.



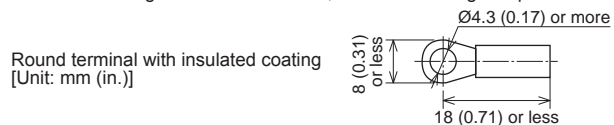
Insert the cable through the cable gland

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.



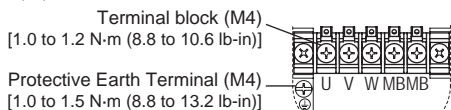
Connection method to a terminal block

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



- To ensure safety, ground the motor using the Protective Earth Terminal inside the terminal box.

- Layout of terminals
U, V, W and MB 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 mm²) 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.

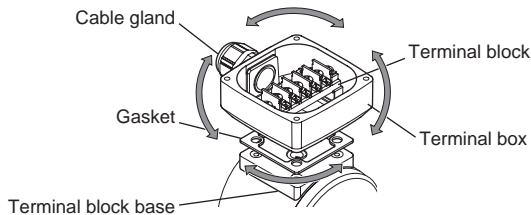
- Note**
- To make shielding function fully effective, use a cable of an appropriate diameter and observe the specified tightening torque of screws.
 - Secure the cable drawn from the motor terminal box so that it does not receive stress.

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 (M4-4 pcs.), and remove the terminal box from the terminal block base.
Terminal box mounting screw (M4-4 pcs.)
Tightening torque: 1.0 to 1.5 N·m (8.8 to 13.2 lb-in)
- 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.



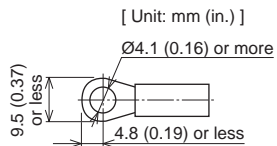
A gasket is installed between the terminal box and terminal block base. When installing the terminal box, be sure to install the gasket. Also be careful not to let any foreign object enter between the terminal box and terminal block base.

Cable type

Connecting Protective Earth Terminal

Ground the motor using the Protective Earth Terminal (PE) 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 mm²) or thicker

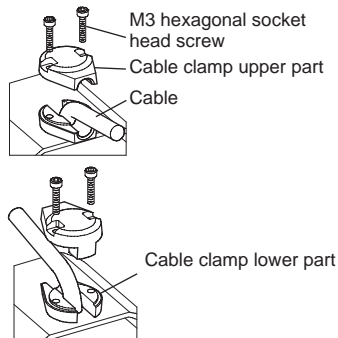


- Note** Do not use screws other than the Protective Earth Terminal screw attached on the product.

Changing direction of the cable outlet

The cable outlet at the time of shipment is set to the direction of the motor output shaft. The cable outlet direction can be made a 180-degree turn shown in the figure below.

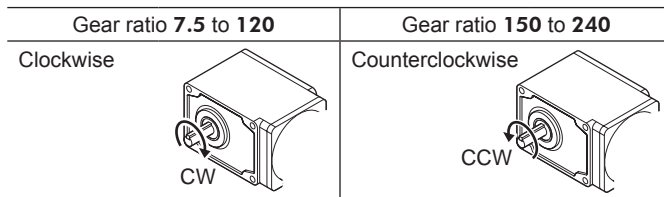
- Remove the upper part of cable clamp after unscrewing the screws that secured the cable clamp, and then turn the cable to the opposite side.
- Turn the lower part of cable clamp to a 180-degree direction.
- Install the upper part of cable clamp, and secure with the screws. Screw tightening torque: 0.5 to 0.7 N·m (71 to 99 oz-in)



Wiring diagram

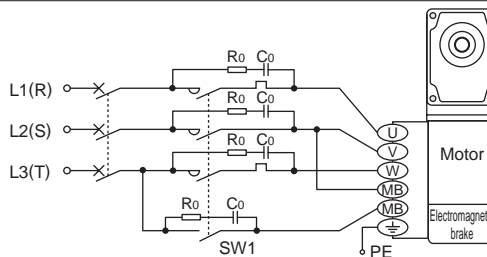
- Note** When the output shaft is locked or in the case of an overload state, use an electromagnetic switch in order to prevent the motor from burning out.

- 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.



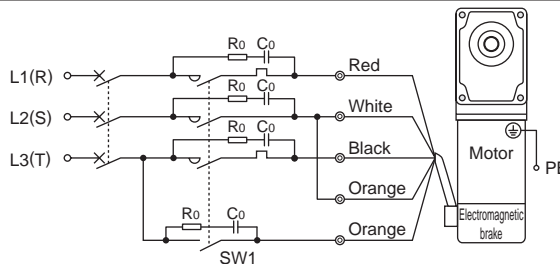
The figure represents the rotation direction viewed from the output shaft. The rotation in the clockwise direction represents "CW" and the rotation in the counterclockwise direction represents "CCW."

Wiring diagram: Terminal box type



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

Wiring diagram: Cable type

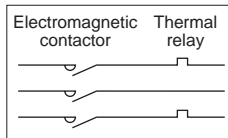


To change the direction of rotation, change any two connections between R, S and T.

[Contact capacity of the switch SW1]

250 VAC 5 A or more Inductive load (Switched simultaneously)

[Electromagnetic switch]



[Surge voltage measures]

Connect the CR circuit for surge suppression (—|—|—).
R₀=5 to 200 Ω
C₀=0.1 to 0.2 μF 250 WV
It is provided as an accessory (sold separately).

Operation

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

Starting and stopping

The SW1 is used for "operation/standstill" of the motor, and "operation/standstill" of the electromagnetic brake.

When the SW1 is turned ON, the electromagnetic brake is released, and the motor rotates.

When the SW1 is turned OFF, the electromagnetic brake activates, and the motor stops.

If the electromagnetic brake motor is used in vertical drive applications, the load may move downward. Check the position of the load prior to operation.

Other ways of operating

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 orange lead wires. The electromagnetic brake is released and the motor shaft can be rotated easily by hand.

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.]

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

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

[Mitsubishi Electric Corporation]

Model: MSO-T10 0.5A 200V AC200V

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.

When driving the inverter, use it at the setting frequency 80 Hz or lower.

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.
- Connect the lead wires of the electromagnetic brake to the primary side (commercial power supply) of the inverter.
Do not connect the secondary side (inverter output side).
- When stopping the motor by the electromagnetic brake, do so under conditions where the rotation speed is less than 1800 r/min.

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.	<ul style="list-style-type: none"> Check the power supply voltage. Connect the power supply and the motor correctly. If terminal blocks or crimp terminals are used, check them for poor connection.
Motor sometimes rotates and stops.	<ul style="list-style-type: none"> Keep the load at or below the allowable value. Check the voltage applied to the brake lead wires (MB, orange).
The motor rotates in the direction opposite to the specified direction.	<ul style="list-style-type: none"> The connection varies depending on the gear ratio of the gearhead. The rotation direction is as viewed from the output shaft end. Check the reference direction.
Motor temperature abnormally high. [Motor case temperature exceeds 90 °C (194 °F)]	<ul style="list-style-type: none"> Check the power supply voltage. Review the ventilation condition.

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*

Applicable standards	Certification Body / File No.
UL 1004-1	UL /
CSA C22.2 No.100	UL File No.E62327
GB 12350	CQC

- Thermal Class: 130 (B)

CE Marking*

Applicable 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
Cable 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: 200×200 mm (7.87×7.87 in.)
Thickness: 5 mm (0.20 in.) Material: Aluminum alloy

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