Oriental motor

HM-9344-3

OPERATING MANUAL

KⅡS Series Electromagnetic brake motor

Three-phase 220/230 V type

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.

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 model name is the recognized product name.
- 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.

⚠Warning

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 of the motor as a safety brake. Take safety measures other than the electromagnetic brake. 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.
- 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.

⚠Caution

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.
- 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).

Warning label

- 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.

- Motor ..... 1 unit
  This product comes with the motor and its dedicated gearhead pre-assembled.
- Hexagonal socket head screw set..... 1 set
  Hexagonal socket head screws, washers, spring washers 4 pieces each, parallel key 1 piece
- 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

Model	Motor model	Gearhead model
5IK60VESMT2-□A	5IK60VGVH-ESMT2	5GVH□A
5IK100VESMT2-□A	5IK100VGVR-ESMT2	5GVR□A

- Cable type

Model	Motor model	Gearhead model
5IK60VESM-□A	5IK60VGVH-ESM	5GVH□A
5IK100VESM-□A	5IK100VGVR-ESM	5GVR□A

Installation

■ Location for installation

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

[Common conditions]

- Operating ambient temperature −10 to +40 °C (+14 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.

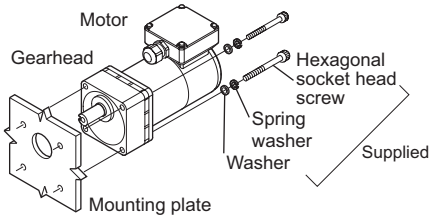
[Cable type]

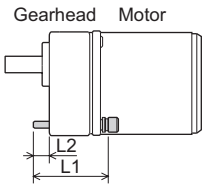
- Inside an enclosure that is installed indoors (provide vent holes)
- Area not subject to splashing water (storms, water droplets), oil (oil droplets) or other liquids

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

Secure the motor with hexagonal socket head screws (supplied) through the four mounting holes provided. Do not leave a gap between the motor and mounting plate.



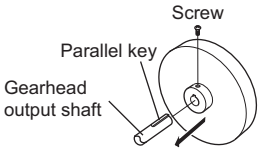


Hexagonal socket head screw set (supplied)

Gearhead model	Gear ratio	Hexagonal socket head screw Material: Stainless steel			Tightening torque
		Screw size	L1 [mm (in.)]	L2 [mm (in.)]	
5GVH□A	5 to 18	5/16-18UNC	69.9 (2.75)	14 (0.55)	12 N·m (106 lb-in)
	25 to 100		82.6 (3.25)	13 (0.51)	
	120 to 300		88.9 (3.5)	14 (0.55)	
5GVR□A	5 to 15		69.9 (2.75)	14 (0.55)	
	18 to 36		82.6 (3.25)	13 (0.51)	
	50 to 180		95.3 (3.75)	14 (0.55)	

■ Installing a load

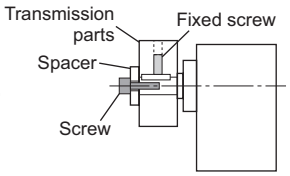
The gearhead shaft is provided with a key slot for connecting the transmission parts. When connecting the transmission parts, ensure that the shaft and parts have a clearance fit, and always fix the parallel key to the output shaft with a screw to prevent the parts from rattling or spinning.



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.

When using the output shaft end tapped hole of a gearhead

Use a tapped hole provided at the end of the output shaft as an auxiliary means for preventing the transfer mechanism from disengaging.
Output shaft end tapped hole: No.12-24 UNC, Effective depth 12 mm (0.47 in.)

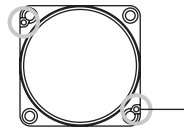


■ Removing/Installing the gearhead

• Removing the gearhead from the motor

Remove the gearhead by unscrewing the hexagonal socket head screws holding the gearhead to the motor (2 locations).

Illustration shows the view from motor case side.

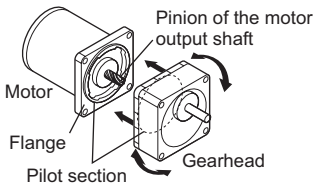


Hexagonal socket head screw
(2 locations)
Screw size: M3
Tightening torque: 0.6 N·m (5.3 lb-in)

• Installing a gearhead to a motor

Using the pilot sections of the motor and gearhead as guides, slowly rotate it clockwise/counterclockwise to prevent the pinion of the motor output shaft from contacting the side panel or gear of the gearhead.

Also confirm that no gaps remain between the motor and gearhead.
An O-ring is attached to the flange of the motor. Do not pinch the O-ring when assembling the motor and gearhead. Pinching the O-ring causes a grease leak from the gearhead.



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.

Connection

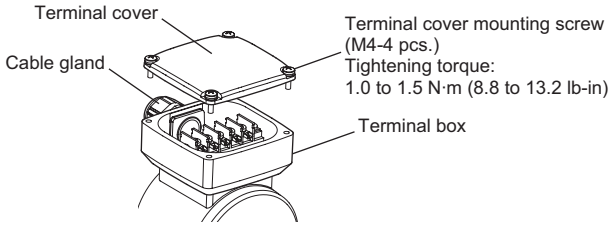
- Insulate the connecting part of the motor lead wires and power supply.
- Ground the motor using a Protective Earth Terminal.

■ Terminal box type

● Connection method to a terminal box

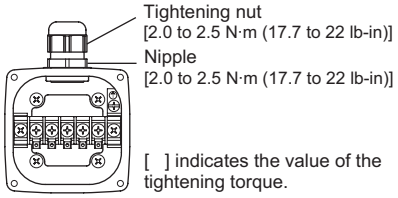
Connection procedure

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.

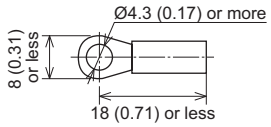


[ ] indicates the value of the tightening torque.

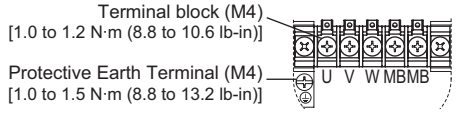
Connection method to a terminal block

- 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, 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: Ø7 to Ø13 mm (Ø0.28 to Ø0.51 in.)
  Applicable lead wire: AWG18 (0.75 mm^2) 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.

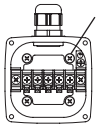
● Changing the cable outlet position

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

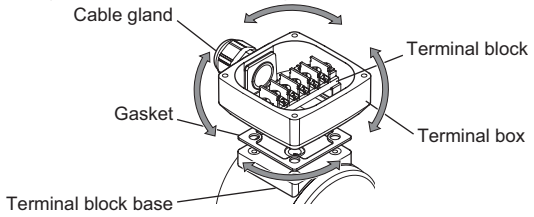
1. Loosen the terminal cover mounting screws, and remove the terminal cover from the terminal box.

2. Loosen the terminal box mounting screws, 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)

3. 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.

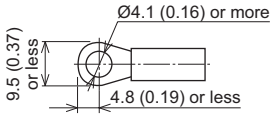
■ Cable type

• Connecting Protective Earth Terminal

Ground the motor using the Protective Earth Terminal ⏚ 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^2) or thicker

[Unit: mm (in.)]

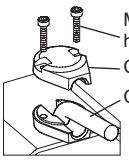


Note Do not use screws other than the Protective Earth Terminal screw attached on the product.

• Changing direction of the cable outlet

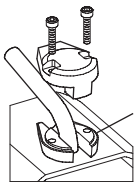
The cable outlet at the time of shipment is set to the direction of the motor output shaft. The cable outlet direction can be made a 180-degree turn shown in the figure below.

1. 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.



2. Turn the lower part of cable clamp to a 180-degree direction.

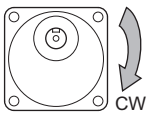
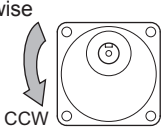
3. Install the upper part of cable clamp, and secure with the screws.
Screw tightening torque:
0.5 to 0.7 N·m (71 to 99 oz-in)



■ Wiring diagram

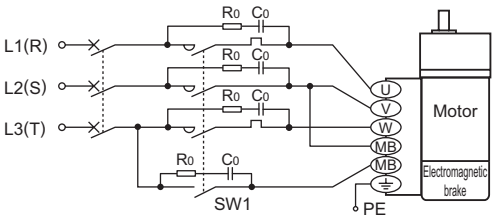
Note In order to prevent the motor from burning out for when the output shaft is locked or in the case of an overload state, use an electromagnetic switch.

- See the p.4 for the electromagnetic switches.
- Check the output power and gear ratio of the motor before connecting. The rotation direction of the output shaft varies depending on the gear ratio of the gearhead. When connecting as the "Wiring diagram," the motor rotates in the direction as shown below.

60 W	Gear ratio **5** to **18** **120** to **300**	60 W	Gear ratio **25** to **100**
100 W	Gear ratio **5** to **15** **75** to **180**	100 W	Gear ratio **18** to **60**
Clockwise 		Counterclockwise 	

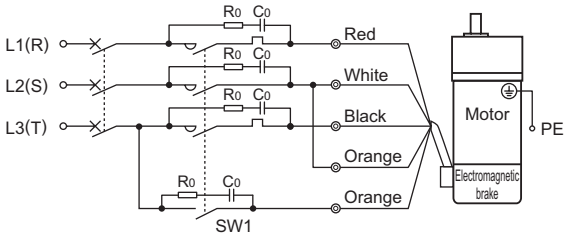
The figure represents the rotation direction viewed from the output shaft. The rotation in the clockwise direction represents "CW" and the rotation in the counterclockwise direction represents "CCW."

Wiring diagram: Terminal box type



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

Wiring diagram: Cable type

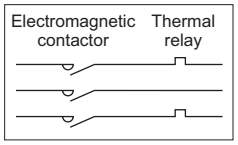


To change the direction of rotation, change any two connections between R, S and T.

[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 (-▭⊣⊢-).
R_0=5 to 200 Ω
C_0=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.

■ 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 In order to prevent the motor from burning out for when the output shaft is locked or in the case of an overload state, use an electromagnetic switch.
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 60 W Model: SC11AAN-□10TF
- For motor output power 100 W 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]

- For motor output power 60 W Model: MSO-T10 0.35A 200V AC200V
- For motor output power 100 W 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 120 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. Motor sometimes rotates and stops.	• 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. • 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.	• 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)]	• Check the power supply voltage. • Review the ventilation condition.
Noisy operation.	Check whether the combination of the motor and gearhead is correct. (Refer to p.1 for the combinations)

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 model name is the recognized product name.
- 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	
GB 12350	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
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

• Please contact your nearest Oriental Motor office for further information.

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