Oriental motor

HM-9204-8

OPERATING MANUAL

World K Series Terminal Box Type

Induction Motors and Reversible Motors

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 personnel should work with the product. Use the product correctly after thoroughly reading the section "Safety precautions." In addition, be sure to observe the contents described in warning, caution, and note in this manual.
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.

Regulations and standards

■ UL Standards, CSA Standards, CCC System

This product is recognized by UL under the UL and CSA Standards, and also certified by CQC under the China Compulsory Certification (CCC) system.
The motor model name represents the model that conforms to the standards.

Applicable standards	Certification Body / File No.
UL 1004-1, UL 1004-3	UL /UL File No.E64197
CSA C22.2 No.100, CSA C22.2 No.77	
GB/T 12350	CQC

- Thermal Class: 130 (B)

● Standards for accessories

- Capacitor: UL File No.E83671 (CYWT2),
  VDE License Nos.112847 (capacitors with a rated voltage of 250 VAC,
  114747 (capacitors with a rated voltage of 450 VAC)
- Capacitor cap: UL File No.E56078 (YDTU2)

■ CE Marking

This product is affixed the CE Marking under the Low Voltage Directive.

● Low Voltage Directive

• Applications standards

EN 60034-1, EN 60034-5, EN 60664-1, EN 60950-1

• Installation conditions (For EN standard)

Overvoltage category Ⅱ, Pollution degree 2 (induction motor: pollution degree 3, except for the motor mounting surfase), Class Ⅰ equipment
When the machinery to which the motor is mounted requires overvoltage category Ⅲ and pollution degree 3 specifications, install the motor in a cabinet that comply with IP54 and connect to power supply via an isolation transformer.

• Motor temperature rise tests

Temperature rise tests required by the standards are conducted for the pinion shaft type motors in a state of attaching a gearhead.
For the 90 W reversible motors, the tests are conducted in a state of attaching a gearhead and heat radiation plate [heat radiation plate size: 200×200 mm (7.87×7.87 in.), thickness: 5 mm (0.20 in.), material: aluminum alloy].
The tests for the round shaft type motors are conducted in a state of attaching a heat radiation plate. The size, thickness and material of the heat radiation plates are as follows.

First number in motor name	Size [mm (in.)]	Thickness [mm (in.)]	Material
4	135×135 (5.31×5.31)	5 (0.20)	Aluminum alloy
5 (40 W)	165×165 (6.50×6.50)		
5 (60 W, 90 W Induction motors, 150 W)	200×200 (7.87×7.87)		
5 (90 W Reversible motors)		10 (0.39)	

■ Electrical Appliance and Material Safety Law

The three-phase round shaft motor type bears a (PS/E) mark.

■ RoHS Directive

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.
⚠CAUTION	Handling the product without observing the instructions that accompany a "CAUTION" symbol may result in injury or property damage.
Note	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.
- Turn off the power in the event the overheat protection device (thermal protector) is triggered. Failure to do so may result in injury or damage to equipment, since the motor will start abruptly when the overheat protection device (thermal protector) is automatically reset.
- 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 connection diagram in order to prevent fire and electric shock.
- Do not forcibly bend, pull or pinch the lead wires. 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.

⚠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, cooling fan) 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 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

- Dispose the product correctly in accordance with laws and regulations, or instructions of local governments.

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 piece (only for single-phase motors)
- Capacitor cap .....1 piece (only for single-phase motors)
- Operating manual .....1 copy (this document)

■ Checking the model name

Check the model number against the number indicated on the product.
The list above shows pinion shaft motors. For the round shaft motor, "**GN**" and "**GE**" in the model and motor model are replaced by "**A**".
Refer to p.3 for the connection diagram.

● Induction motors

Single-phase type (Connection diagram: ①)

Output power	Model	Motor model	Capacitor model
25 W	**4IK25GN-AW2TJ**	4IK25GN-AW2T	CH80CFAUL2
	4IK25GN-AW2TU		CH65CFAUL2
	4IK25GN-CW2TJ	4IK25GN-CW2T	CH20BFAUL
	4IK25GN-CW2TE		CH15BFAUL
40 W	**5IK40GN-AW2TJ**	5IK40GN-AW2T	CH110CFAUL2
	5IK40GN-AW2TU		CH90CFAUL2
	5IK40GN-CW2TJ	5IK40GN-CW2T	CH30BFAUL
	5IK40GN-CW2TE		CH23BFAUL
60 W	**5IK60GE-AW2TJ**	5IK60GE-AW2T	CH200CFAUL2
	5IK60GE-AW2TU		CH180CFAUL2
	5IK60GE-CW2TJ	5IK60GE-CW2T	CH50BFAUL
	5IK60GE-CW2TE		CH40BFAUL
90 W	**5IK90GE-AW2TJ**	5IK90GE-AW2T	CH280CFAUL2
	5IK90GE-AW2TU		CH200CFAUL2
	5IK90GE-CW2TJ	5IK90GE-CW2T	CH70BFAUL
	5IK90GE-CW2TE		CH60BFAUL

Three-phase type (Connection diagram: ②)

Output power	Model	Motor model
25 W	**4IK25GN-SW2T**	4IK25GN-SW2T
40 W	**5IK40GN-SW2T**	5IK40GN-SW2T
60 W	**5IK60GE-SW2T**	5IK60GE-SW2T
90 W	**5IK90GE-SW2T**	5IK90GE-SW2T
150 W	**5IK150A-TW2T**∗	5IK150A-TW2T

∗ Only for round shaft type.

● Reversible motors

Single-phase type (Connection diagram: ③)

Output power	Model	Motor model	Capacitor model
25 W	**4RK25GN-AW2TJ**	4RK25GN-AW2T	CH100CFAUL2
	4RK25GN-AW2TU		CH80CFAUL2
	4RK25GN-CW2TJ	4RK25GN-CW2T	CH30BFAUL
	4RK25GN-CW2TE		CH25BFAUL
40 W	**5RK40GN-AW2TJ**	5RK40GN-AW2T	CH160CFAUL2
	5RK40GN-AW2TU		CH120CFAUL2
	5RK40GN-CW2TJ	5RK40GN-CW2T	CH40BFAUL
	5RK40GN-CW2TE		CH35BFAUL
60 W	**5RK60GE-AW2TJ**	5RK60GE-AW2T	CH250CFAUL2
	5RK60GE-AW2TU		CH200CFAUL2
	5RK60GE-CW2TJ	5RK60GE-CW2T	CH60BFAUL
	5RK60GE-CW2TE		CH50BFAUL
90 W	**5RK90GE-AW2TJ**	5RK90GE-AW2T	CH350CFAUL2
	5RK90GE-AW2TU		CH300CFAUL2
	5RK90GE-CW2TJ	5RK90GE-CW2T	CH80BFAUL
	5RK90GE-CW3TE	5RK90GE-CW3T	CH70BFAUL

Installation

■ Location for installation

The motor is designed and manufactured for installation in equipment.
Install it in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

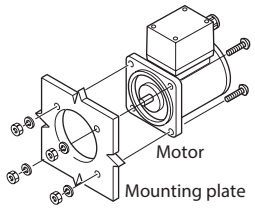
- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature
  −10 to +40 °C (+14 to +104 °F) (non-freezing)
  100 V/200 V : −10 to +50 °C (+14 to +122 °F) (non-freezing)
- Operating ambient humidity 85%, maximum (non-condensing)
- Area that is free from an explosive 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 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 (3300 ft.) or less above sea level

■ How to install the motor

● Round shaft type

Drill holes on the mounting plate and fix the motor on the plate using screws (not supplied). Do not leave a gap between the motor and mounting plate.

First number of motor model	Nominal diameter of screw	Tightening torque [N·m (lb-in)]
4	M5	2.5 (22)
5	M6	3.0 (26)

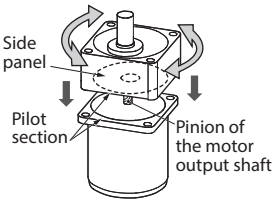


Note Do not insert the motor into the mounting hole at an angle or force it in, as this may scratch the flange pilot section and damage the motor.

● Pinion shaft type

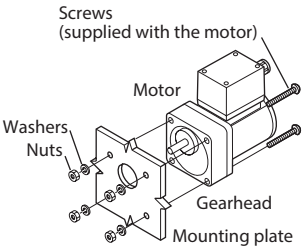
Assembling

Keep the pilot sections of the motor and gearhead in parallel, and assemble the gearhead with the motor while slowly rotating it clockwise/counterclockwise. At this time, note so that the pinion of the motor output shaft does not hit the side panel or gears of the gearhead strongly. Assemble the gearhead to the motor in a condition where the motor output shaft is in an upward direction.



Installing

Drill holes on the mounting plate and fix the motor and gearhead on the plate using screws supplied with the gearhead. Do not leave a gap between the motor and mounting plate.
Refer to the Oriental Motor Website for the screw specifications.



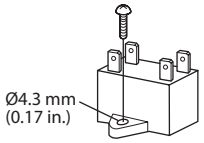
Note
- Use the gearhead with pinion shaft which is identical with one of motor.
- Do not forcibly assemble the motor and gearhead. Also, prevent metal objects or foreign substances from entering in the gearhead. The pinion of the motor output shaft or gear may be damaged, resulting in noise or shorter service life.

● Motor with cooling fan

When installing a motor with cooling fan onto a device, leave 10 mm (0.39 in.) or more behind the fan cover or open a ventilation hole so that the cooling inlet on the back of the motor cover is not blocked.

■ 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 fastening 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. Ground the motor using a Protective Earth Terminal.

■ 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. Refer to the Oriental Motor Website for details.

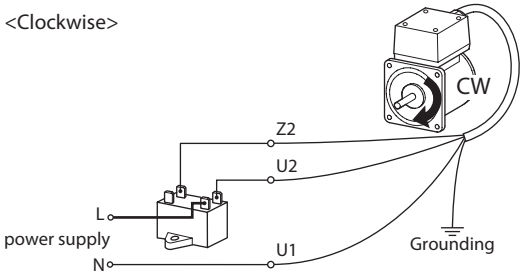
■ Connection diagram

Check the motor model name used before connecting.
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.
Z2, U2, U1, U, V, and W in the connection diagram indicate terminal codes inside the terminal box.

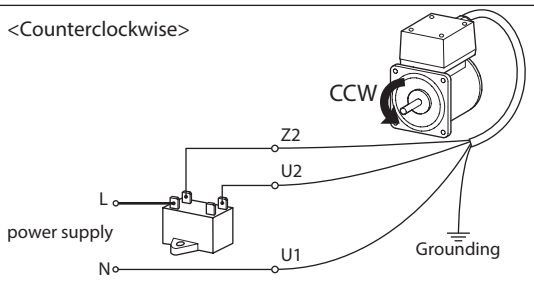
● Induction motors

Single-phase type (Connection diagram: ①)

<Clockwise>

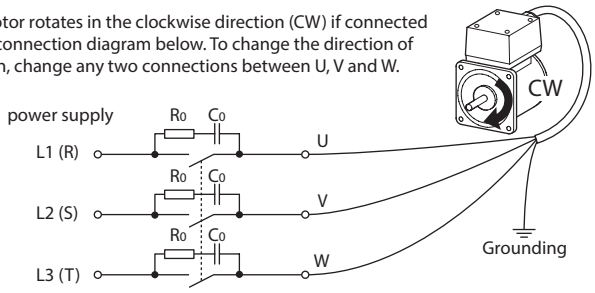


<Counterclockwise>



Three-phase type (Connection diagram: ②)

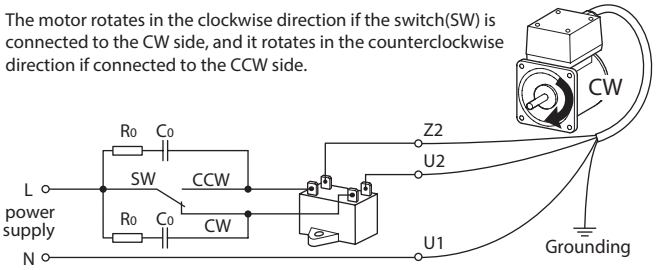
The motor rotates in the clockwise direction (CW) if connected as the connection diagram below. To change the direction of rotation, change any two connections between U, V and W.



● Reversible motors

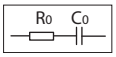
Single-phase type (Connection diagram: ③)

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



● For protection of contact (switch)

If the switch is used for starting/stopping the motor or switching the rotation direction, connect the CR circuit for surge suppression in order to protect the contacts.



R_0=5 to 200 Ω
C_0=0.1 to 0.2 µF 250 VAC

It is provided as an accessory (sold separately).
Model: **EPCR1201-2**

■ Lead Wire for Power Supply

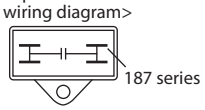
Use a lead wire of AWG20 (0.5 mm^2) or thicker.

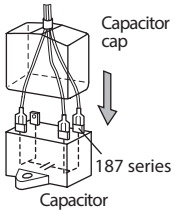
■ Capacitor connection (only for single-phase motors)

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>





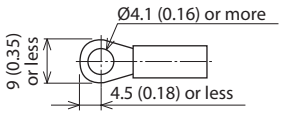
Note For lead wire connection, use one lead wire for each individual terminal.

■ Connecting Protective Earth Terminal

Ground the motor using the motor's Protective Earth Terminal ⏚.
On the three-phase round shaft motor type, refer to the following specifications.

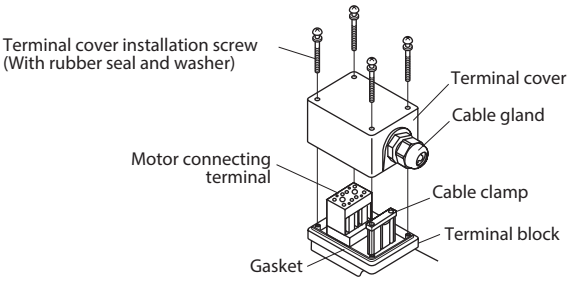
Applicable crimp terminal:
Insulated round crimp terminal
Terminal screw size: M4
Tightening torque:
1.0 to 1.3 N·m (8.8 to 11.5 lb-in)
Applicable minimum lead wire size:
AWG18 (0.75 mm^2) or thicker

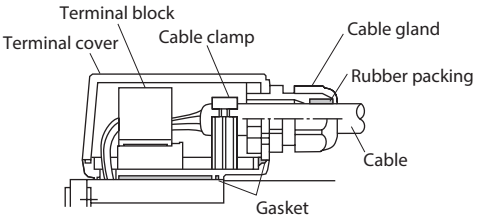
[Unit: mm (in.)]



Note Be sure to use the screw for grounding attached on the product.

■ Connection method to a terminal box





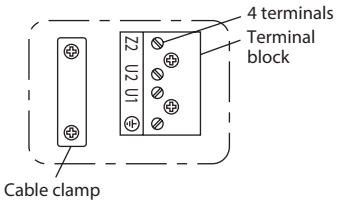
- Use a cable of the following specifications:
  Applicable cable diameter: Ø6 to 12 mm
  Applicable lead wire: AWG24 to 12 (0.2 to 3.5 mm^2)
  Stripping length: 8 mm (0.31 in.)
- When sealing the terminal cover, ensure that no scraps or particles get caught between the contact surfaces.
- The terminal cover screws are specifically designed for mounting the terminal cover. They are provided with a rubber seal and washer that keep the terminal box splashproof. In order to maintain a tight seal around the terminal box, use only the provided screws.
  Also, this terminal box is constructed to hold a gasket. If this gasket comes out of the box, please reseal it correctly on the box.
  Also refer to the tightening torque table to determine the appropriate tightening torque to use when fastening the terminal cover and cable gland.

Terminal cover	0.3 to 0.4 N·m (42 to 56 oz-in.)
Cable gland	2.5 to 3.8 N·m (350 to 530 oz-in.)
Cable clamp	0.2 to 0.3 N·m (28 to 42 oz-in.)
Terminal block	0.5 to 0.8 N·m (71 to 113 oz-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.

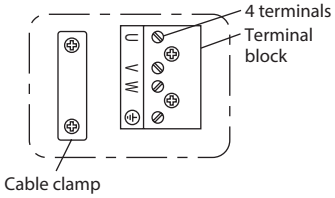
● Layout of terminals

Single-phase type

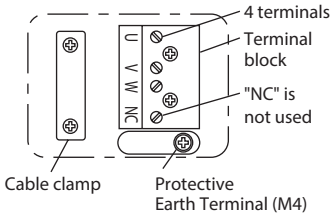


Three-phase type

• Pinion shaft type



• Round shaft type



Operation

The motor rotates when the power supply is turned on.
For protection against electric shock, do not turn on the power supply until the wiring is complete.

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.
- To change rotation direction of the single-phase induction motor, wait until the motor completely stops. Otherwise its direction may not change or may take much time to change.
- Do not perform an operation switching the motor rotation direction instantaneously with three-phase motors. Doing so may cause damage to the motor and gearhead.
- Single-phase motors use a capacitor and keep it connected even after rotation of the motor has started.

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

This motor is equipped with the feature listed below to prevent the motor from burning out as a result of abnormal heating which may be caused by misapplication.

■ Thermal protection

"TP" is stamped on the motor nameplate. The motor has an "auto reset" type thermal protector built into its motor coil. When the motor reaches a predetermined temperature, the internal thermal protector is activated and the motor is stopped. Always turn the power off before performing inspections.

Thermal protector activation range:

Power is turned off at 130±5 °C (266±9 °F)
Power is turned back on at 82±15 °C (180±27 °F)

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.	• Check the power supply voltage. • Connect the power supply and the motor correctly. • With a single-phase motor, connect the supplied capacitor correctly. • If terminal blocks or crimp terminals are used, check them for poor connection. • Keep the load at or below the allowable value.
Motor sometimes rotates and stops.	• Connect the power supply and the motor correctly. • With a single-phase motor, connect the supplied capacitor correctly. • If terminal blocks or crimp terminals are used, check them for poor connection.
The motor rotates in the direction opposite to the specified direction.	• Connect correctly by referring to "Connection diagram." • With a single-phase motor, connect the supplied capacitor correctly. • 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. Refer to the Oriental Motor Website for details. • The rotating direction is indicated as viewed from the motor output shaft. Check the reference direction.
Motor temperature abnormally high [Motor case temperature exceeds 90 °C (194 °F)]	• Check the power supply voltage. • With a single-phase motor, connect the supplied capacitor correctly. • Review the ventilation condition.
Noisy operation	• Assemble the motor and gearhead correctly. • Assemble a gearhead of the same pinion type as the motor.

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

ORIENTAL MOTOR U.S.A. CORP.
Technical Support Tel:800-468-3982
8:30am EST to 5:00pm PST (M-F)
www.orientalmotor.com

ORIENTAL MOTOR (EUROPA) GmbH
Schiessstraße 44, 40549 Düsseldorf, Germany
Technical Support Tel:00 800/22 55 66 22
www.orientalmotor.de

ORIENTAL MOTOR (UK) LTD.
Unit 5 Faraday Office Park, Rankine Road, Basingstoke, Hampshire RG24 8QB UK
Tel:+44-1256347090
www.oriental-motor.co.uk

ORIENTAL MOTOR (FRANCE) SARL
Tel:+33-1 47 86 97 50
www.orientalmotor.fr

ORIENTAL MOTOR ITALIA s.r.l.
Tel:+39-02-93906347
www.orientalmotor.it

ORIENTAL MOTOR CO., LTD.
4-8-1Higashiueno,Taito-ku,Tokyo 110-8536 Japan
Tel:+81-3-6744-0361
www.orientalmotor.co.jp

ORIENTAL MOTOR ASIA PACIFIC PTE. LTD.
Singapore
Tel:1800-842-0280
www.orientalmotor.com.sg

ORIENTAL MOTOR (MALAYSIA) SDN. BHD.
Tel:1800-806-161
www.orientalmotor.com.my

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