

## OPERATING MANUAL

### 5-Phase Stepping Motor PK Series

#### Introduction

##### ■ Before use

Only qualified personnel should work with the product. Use the product correctly after thoroughly reading the "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.




##### ■ 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.


##### Description of signs

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

##### Description of graphic symbols

	Indicates "prohibited" actions that must not be performed.
	Indicates "compulsory" actions that must be performed.


#### WARNING

	<ul style="list-style-type: none"> <li>Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. This may cause fire or injury.</li> <li>Do not forcibly bend, pull or pinch the motor lead wire or cable. This may cause fire.</li> <li>Do not disassemble or modify the product. This may cause injury.</li> </ul>
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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

	<ul style="list-style-type: none"> <li>Assign qualified personnel the task of installing, wiring, operating/controlling, inspecting and troubleshooting the product. Failure to do so may result in fire or injury.</li> <li>If this product is used in a vertical application, be sure to provide a measure for the position retention of moving parts. Failure to do so may result in injury or damage to equipment.</li> <li>Install the product in an enclosure. Failure to do so may result in injury.</li> <li>Connect the cables securely according to the wiring diagram. Failure to do so may result in fire.</li> <li>For the power supply, use a DC power supply with reinforced insulation on its primary and secondary sides. Failure to do so may cause electric shock.</li> </ul>
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#### CAUTION

	<ul style="list-style-type: none"> <li>Do not use the product beyond its specifications. This may cause injury or damage to equipment.</li> <li>Keep your fingers and objects out of the openings in the product. Failure to do so may result in fire or injury.</li> <li>Do not touch the product while operating or immediately after stopping. This may cause a skin burn(s).</li> <li>Do not carry the motor by holding the motor output shaft, lead wire or cable. Doing so may cause injury.</li> <li>Keep the area around the product free of combustible materials. Failure to do so may result in fire or a skin burn(s).</li> <li>Leave nothing around the product that would obstruct ventilation. Failure to do so may result in damage to equipment.</li> <li>Do not touch the rotating part (output shaft) while operating the motor. Doing so may result in injury.</li> </ul>
	<ul style="list-style-type: none"> <li>Provide a cover over the rotating part (output shaft) of the motor. Failure to do so may result in injury.</li> <li>Use a motor and driver only in the specified combination. Failure to do so may result in fire.</li> <li>Provide an emergency stop device or emergency stop circuit so that the entire equipment will operate safely in the event of a system failure or malfunction. Failure to do so may result in injury.</li> <li>When an abnormal condition has occurred, immediately stop operation and turn off the driver power. Failure to do so may result in fire or injury.</li> <li>To dispose of the product, disassemble it into parts and components as much as possible and dispose of individual parts/components as industrial waste.</li> </ul>

## Precautions for use

- Conduct the insulation resistance measurement and dielectric strength test in a condition where the connection between the motor and the driver are separated.

Conducting the insulation resistance test or dielectric strength test with the motor and driver connected may result in damage to the product.

- Do not apply a radial load and axial load in excess of the specified permissible limit

Operating the motor under an excessive radial load or axial load may damage the motor bearings (ball bearings). Be sure to operate the motor within the specified permissible limit of radial load and axial load.

- Use the motor in conditions where its surface temperature will not exceed 100 °C (212 °F).

The surface temperature on the motor case may exceed 100 °C (212 °F) depending on operating conditions such as ambient temperature, operating speed, duty cycle and others. To prevent the motor bearings (ball bearings) from reaching its usable life quickly, use the motor in conditions where the surface temperature will not exceed 100 °C (212 °F).

- Holding torque at standstill

The motor holding torque is reduced by the current cutback function of the driver at motor standstill. When operating the motor, take account of the motor torque drop at the time of stopping.

## General specifications

Degree of protection	IP20	
Operation environment	Ambient temperature	-10 to +50 °C (+14 to +122 °F) (non-freezing)
	Humidity	85% or less (non-condensing)
	Surrounding atmosphere	No corrosive gas, dust, water or oil
Insulation resistance	100 MΩ or more when 500 VDC megger is applied between the case and motor windings.	
Dielectric strength	Sufficient to withstand the following conditions applied between the case and motor windings for 1 minute: <ul style="list-style-type: none"> <li>• <b>PK51</b>: 0.5 kVAC 50/60 Hz</li> <li>• <b>PK59</b>: 1.5 kVAC 50/60 Hz</li> </ul>	

## 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
- OPERATING MANUAL ..... 1 copy (this manual)

### ■ How to identify the product model

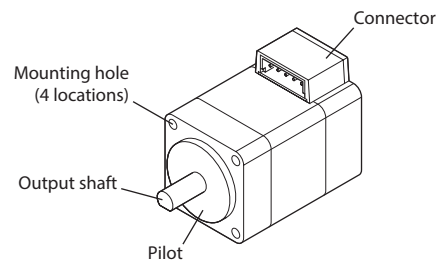
**PK 5 1 3 P A**  
1 2 3 4 5 8

**PK 5 9 6 H N A W**  
1 2 3 4 6 7 8 9

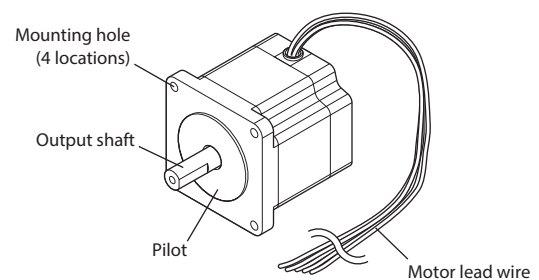
1	Series	<b>PK</b> : PK Series
2		<b>5</b> : 5-phase
3	Motor frame size	<b>1</b> : 20 mm (0.79 in.) <b>9</b> : 85 mm (3.35 in.)
4	Motor length	
5	Motor classification	
6	Motor specification	None: Standard type <b>H</b> : High-speed type
7	Number of lead wire	<b>N</b> : 5 pcs.
8	Shaft type	<b>A</b> : Single shaft <b>B</b> : Double shaft
9	Cable identification	None: Connector type <b>W</b> : Lead wire type

### ■ Names of parts

#### ● PK51



#### ● PK59



## Installation

### Location for installation

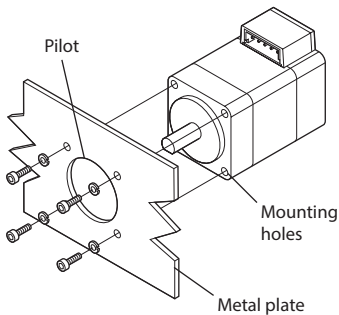
The motor has been designed and manufactured to be incorporated in equipment. Install it in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature: -10 to +50 °C (+14 to +122 °F) (non-freezing)
- Operating ambient humidity 85% or less (non-condensing)
- Area that is free of explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area not subject to splashing water (rain, 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

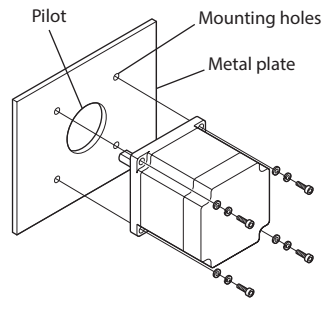
### Installation method

The motor can be installed in any direction. Install the motor onto an appropriate flat metal plate having excellent vibration resistance and heat conductivity. When installing the motor, secure it with four bolts (not supplied) through the four mounting holes provided. Do not leave a gap between the motor and metal plate.

#### Installation method 1



#### Installation method 2



Model	Nominal size	Tightening torque [N·m (lb·in.)]	Effective depth of bolt [mm (in.)]	Installation method
PK51	M2	0.25 (2.2)	2.5 (0.1)	1
PK59	M5	3 (26.6)	—	2

### Installing a load

When connecting a load to the motor, align the centers of the motor output shaft and load shaft. Be careful not to damage the output shaft or bearings when installing a coupling or pulley to the motor output shaft.

### Permissible radial load and permissible axial load

The radial load and axial load on the motor output shaft must be kept the permissible values listed in the table below.

Model	Permissible radial load [N (lb.)]					Permissible axial load [N (lb.)]
	Distance from the tip of motor output shaft					
	0 mm (0 in.)	5 mm (0.20 in.)	10 mm (0.39 in.)	15 mm (0.59 in.)	20 mm (0.79 in.)	
PK51	12 (2.7)	15 (3.3)	—	—	—	3 (0.67)
PK59	260 (58)	290 (65)	340 (76)	390 (87)	480 (108)	60 (13.5)

## Connection

### Connector type motor

Connect while checking the connector pin numbers. The parentheses ( ) in the wiring diagram are colors of the accessory connection cable. When you use an accessory connector set or provide a connector and lead wires by yourself, connect in accordance with the pin numbers in the wiring diagram.

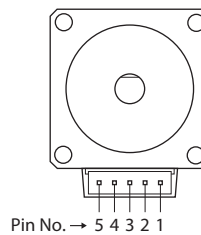


- Secure the cable at the connection part to prevent the connection part from receiving stress due to the flexing of the cable or the cable's own mass. Make the radius of curvature for the cable as large as possible.
- The connection cable uses a connector with a lock mechanism. When removing the cable, release the connector lock first. Forcibly pulling out the connector without releasing the connector lock may damage the motor and connector.

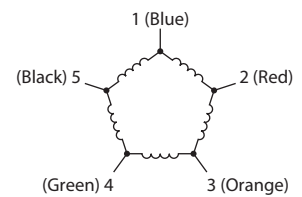


Remove the connection cable in the direction of the output shaft horizontally.

#### Pin assignment



#### Wiring diagram



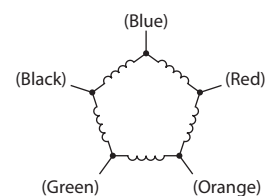
### Applicable connector/lead wire

Model	Type	Model
PK51	Connector housing	51065-0500 (Molex)
	Contact	50212-8100 (Molex)
	Designated crimping tool	57176-5000 (Molex)
	Applicable lead wire	AWG26 to 24 (0.14 to 0.2 mm <sup>2</sup> ) Outer sheath diameter: ø1.4 mm (ø0.055 in.) or less Length of the insulation cover which can be peeled: 1.3 to 1.8 mm (0.051 to 0.071 in.)

### Lead wire type motor

Connect the motor according to the wiring diagram. The parentheses ( ) in the wiring diagram are colors of the motor lead wires.

#### Wiring diagram



## Inspection and maintenance

### ■ Inspection

It is recommended that periodic inspections are conducted for the items listed below after each operation of the motor. If an abnormal condition is noted, discontinue any use and contact your nearest Oriental Motor sales office.

### ● During inspection

- Are any of motor mounting screws loose?
- Are there any abnormal noises in the motor bearings (ball bearings) or other moving parts?
- Are there any scratches, signs of stress in the motor lead wires?
- Are there any loose connections on the connector or driver?
- Are the motor's output shaft and load shaft out of alignment?

### ■ Warranty

Check on the Oriental Motor Website for the product warranty.

### ■ Disposal

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

## Specifications

Check on the Oriental Motor Website for the product specifications.

- Unauthorized reproduction or copying of all or part of this manual is prohibited.
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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)

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

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

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

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

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

ORIENTAL MOTOR ASIA PACIFIC PTE. LTD.  
Singapore  
Tel:1800-842-0280

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Tel:0800-060708

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Tel:400-820-6516

INA ORIENTAL MOTOR CO., LTD.  
Korea  
Tel:080-777-2042