



OPERATING MANUAL

2-Phase Stepping Motor PKP Series

Introduction

■ Before using the motor

Only qualified personnel should work with the product.

Use the product correctly after thoroughly reading the section "Safety precautions".

The product described in this manual has been designed and manufactured for use in general industrial machinery, and must not be used for any other purpose. For the power supply use a DC power supply with reinforced insulation on its primary and secondary sides. Oriental Motor Co., Ltd. is not responsible for any damage caused through failure to observe this warning.

■ Hazardous substances

RoHS (Directive 2002/95/EC 27Jan.2003) compliant

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, locations subjected to splashing water, or near combustibles. Doing so may result in fire 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 or injury.
- Provide a means to hold moving parts in place for applications involving vertical travel. The motor loses holding torque when the power is shut off, allowing the moving parts to fall and possibly causing injury or damage to equipment.
- Install the motor in an enclosure in order to prevent injury.
- Keep the input-power voltage within the specified range to avoid fire.
- Connect the cables securely according to the wiring diagram in order to prevent fire.
- Do not forcibly bend or push the connector. Doing so may fire.
- Do not forcibly bend, pull or pinch the cable. Doing so may fire.
- For the power supply use a DC power supply with reinforced insulation on its primary and secondary sides. 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 disassemble or modify the motor. This may cause injury. Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product.

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, or 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 or motor cable. This may cause injury.
- Provide an emergency-stop device or emergency-stop circuit external to the equipment 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.

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.

- Conduct the insulation resistance measurement or withstand voltage test separately on the motor and the driver. Conducting the insulation resistance measurement or withstand voltage test with the motor and driver connected may result in injury or damage to equipment.
- To prevent bodily injury, do not touch the rotating parts (output shaft) of the motor during operation.
- Immediately when trouble has occurred, stop running and turn off the driver power. Failure to do so may result in fire or injury.
- To dispose of the motor, disassemble it into parts and components as much as possible and dispose of individual parts/components as industrial waste.

Checking the product

Open the package and confirm that all of the following items are available. To verify that the unit you've purchased is the correct one, check the model number shown on the nameplate. Should you find any item missing or damaged, contact the Oriental Motor sales office where you purchased the product.

- Motor 1 pc.
- Motor cable [0.6 m (2 ft.)] 1 pc. (PKP2□-L only)
- Encoder cable [0.6 m (2 ft.)] 1 pc. (PKP2□-L only)
* □ represents alphanumeric characters indicating the motor type.
- Operating manual (this manual)..... 1 copy

Installation

■ Location for installation

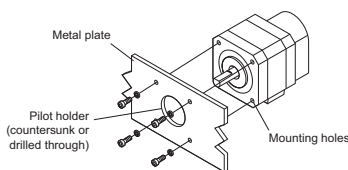
The motor is designed and manufactured for installation in equipment. Install it in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature
-10 °C to +50 °C (+14 °F to +122 °F) (non-freezing)
- Operating ambient humidity 85%, maximum (non-condensing)
- Area that is free from an explosive nature 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

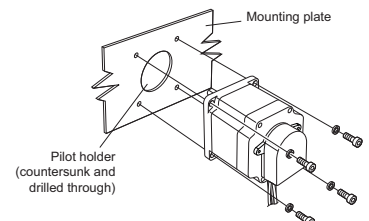
■ How to install the motor

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. Leave no gap between the motor and plate.

Installation method A



Installation method B



Motor type	Bolt size	Tightening torque [N·m (lb-in)]	Effective depth [mm (in.)]	Installation method
PKP22	M2.5 P0.45	0.5 (4.4)	2.5 (0.1)	A
PKP23 PKP24	M3 P0.5	1 (8.8)	4.5 (0.18)	
PKP26	M4	2 (17.7)	-	

■ Permissible overhung load and permissible thrust load

The overhung load on the motor's output shaft or gear output shaft must be kept within the permissible values listed below. The thrust load must not exceed the motor's mass.

Motor type	Permissible overhung load [N (lb.)]				
	Distance from the top of motor's output shaft [mm (in.)]				
	0 (0)	5 (0.2)	10 (0.39)	15 (0.59)	20 (0.79)
PKP22	25 (5.6)	34 (7.6)	52 (11.7)	-	-
PKP23 PKP24	20 (4.5)	25 (5.6)	34 (7.6)	52 (11.7)	-
PKP26	61 (13.7)	73 (16.4)	90 (20)	110 (24)	160 (36)
PKP26 □ A	49 (11)	60 (13.5)	79 (17.7)	110 (24)	-

* □ represents alphanumeric characters indicating the motor type.
Enter **A** (single shaft) or **B** (double shaft) in the box (■) within the model name.

■ Installing a load

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

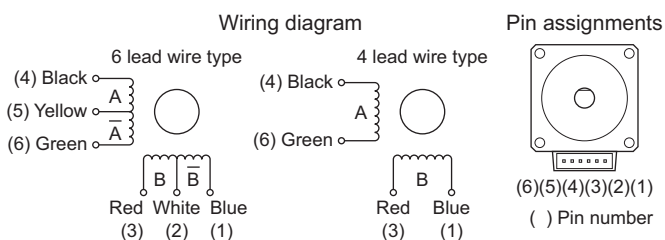
Connection

Note

- Secure the cable in place so that the connection won't be subjected to stress induced by a bent cable or the cable's own mass. The cable's radius of curvature should be as large as possible.
- When removing the connection cable for **PKP22**, **PKP23**, **PKP24** and **PKP26**, pull it out horizontally toward the output shaft.
- The connection cable for **PKP23**, **PKP24** and **PKP26** employs a connector with a lock. When removing this type of cable, release the connector lock first. Forcibly pulling out the cable without releasing the connector lock may damage the motor.

■ PKP22, PKP23, PKP24, PKP26

PKP22, **PKP23**, **PKP24** and **PKP26** are connector type motor. Check the connector pin numbers, and connect them correctly.



The colors of lead wires shown apply to the supplied connection cable or optional connection cable. If you are using the connector set or when you are providing your own connector or lead wire, connect based on the pin numbers shown.

If the 4 lead wire type is used, pin number (2) and (5) are not required.

■ Applicable motor connectors and cables

Motor type	Housing Contact (Molex)	Lead wire	Crimping tool (Molex)
PKP22	51065-0600 50212-8100	AWG30 to 24 (0.05 to 0.2 mm ²) Insulation diameter: Ø1.4 mm (0.055 in.) or less Strip length: 1.3 to 1.8 mm (0.051 to 0.071 in.)	63819-0500
PKP23 PKP24	51103-0600 50351-8100	AWG28 to 22 (0.08 to 0.3 mm ²) Insulation diameter: Ø1.15 to 1.8 mm (0.045 to 0.071 in.) Strip length: 2.3 to 2.8 mm (0.091 to 0.11 in.)	63811-8100
PKP26	51067-0600 50217-9101	AWG24 to 18 (0.2 to 0.75 mm ²) Insulation diameter: Ø1.4 to 3 mm (0.055 to 0.118) Strip length: 3 to 3.5 mm (0.118 to 0.138 in.)	63811-8300

* Optional connection cable and connector set (sold separately) are available from Oriental Motor.

Encoder specifications

- Note**
- Use the encoder motor within the encoder motors' specifications.
 - The encoder specifications are designed to guarantee operation based on a response frequency of 60 kHz (PKP22) or 300 kHz (PKP23, PKP24 and PKP26). However, the encoder can be operated at a minimum response frequency of 60 kHz (PKP22) or 300 kHz (PKP23, PKP24 and PKP26).

The following characteristic values assume operation under the recommended operating conditions:

TTL type output encoders

Item	Value			
Encoder type	Incremental			
Resolution	200 P/R		400 P/R	
Number of Channels	2 (PKP□-R15)	3 (PKP□-R25)	2 (PKP□-R16)	3 (PKP□-R26)
Output type	A, B	A, B, Index	A, B	A, B, Index
Supplied voltage	5.0±10% V			
Supply current	PKP22: 21mA (typ.) PKP23: 27mA (typ.) PKP24: 27mA (typ.) PKP26: 27mA (typ.)			
Output Voltage	PKP22: Low: 0.4V @6mA, High: 2.4V @ -1mA PKP23: Low: 0.5V @8mA, High: 2.0V @ -8mA PKP24: Low: 0.5V @8mA, High: 2.0V @ -8mA PKP26: Low: 0.5V @8mA, High: 2.0V @ -8mA			
Output type	TTL			
Response frequency	PKP22: 60kHz(max) PKP23, PKP24, PKP26: 300 kHz (max)			

- Connector pin assignments for TTL output type encoder

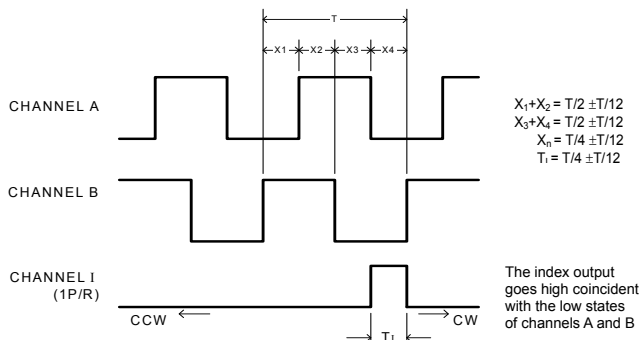
Motor Frame Size: 28mm (1.10 in.)

Pin Number	Lead Wire Color of Encoder Cable	2 channel
1	Red	+5VDC
2	Blue	Channel A
3	Black	GND
4	Yellow	Channel B

Motor Frame Size: 35mm (1.38 in.), 42mm (1.65 in.), 56.4mm (2.22 in.)

Pin Number	Lead Wire Color of Encoder Cable	2 channel	3 channel
1	Brown	GND	GND
2	Purple	N/A	Index
3	Blue	Channel A	Channel A
4	Orange	+5VDC	+5VDC
5	Yellow	Channel B	Channel B

TTL type output waveform



Applicable TTL type output encoder connectors and cables

Motor type	Housing Contact (Molex)	Lead wire	Crimping tool (Molex)
PKP22	51021-0400 50079-8100	AWG28 to 26 (0.08 to 0.12 mm ²) Insulation diameter: Ø0.67 to 1.00 mm (0.027 to 0.039 in.) Strip length: 1.40 to 1.91 mm (0.055 to 0.075 in.)	63819-0300
PKP23 PKP24 PKP26	50-57-9405 16-02-0104	AWG24 to 22 (0.2 to 0.33mm ²) Insulation diameter: Ø1.09 to 1.65 mm (0.043 to 0.065 in.) Strip length: 2.54 to 3.17 mm (0.1 to 0.125 in.)	63811-8700

* Optional connection cable and connector set (sold separately) are available from Oriental Motor.

Inspection

It is recommended that periodic inspections be 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 office.

- Check for any unusual noises in the motor's bearings (ball bearings) or other moving parts.
- Are there any loose connector connections, or any scratches or signs of stress in the motor cable?
- Are the motor's output shaft and load shaft out of alignment?

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

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