



## OPERATING MANUAL

### All-in-One 5-Phase Stepping Motor

### PKA Series



## Introduction

### ■ Before use

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 equipment. Do not use for any other purpose. For the motor 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.

### ■ Operating Manuals for the PKA Series

Operating manuals for the PKA Series are listed below. After reading the above manuals, keep them in a convenient place so that you can reference them at any time.

- PKA Series USER MANUAL (CD-ROM)  
This manual explains the function, installation and connection of the motor as well as operating method.
- PKA Series OPERATING MANUAL (this document)  
This manual explains safety precautions, connector pin assignments and others.

### ■ Hazardous substances

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

### ■ 한국전파법

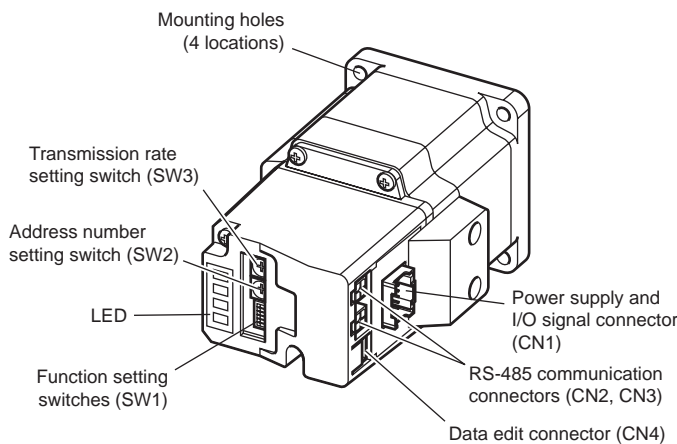
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### ■ Checking the product

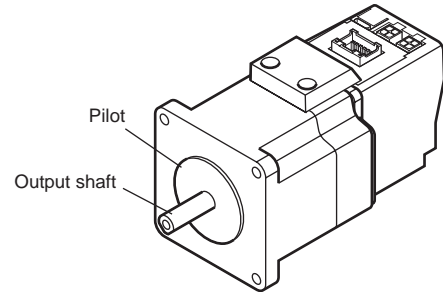
Verify that the items listed below are included. Report any missing or damaged items to the branch or sales office from which you purchased the product.

- Motor.....1 unit
- CN1 leadwire/connector assembly .....1 pc. [0.6 m (2 ft.), 12-pins]
- Connector cap .....2 pcs.
- OPERATING MANUAL (this document).....1 copy
- USER MANUAL (CD-ROM).....1 pc.

### ■ Names and functions of parts



Front side



Name	Description
PWR LED (Green)	This LED is lit while the power is input.
ALM LED (Red)	This LED will blink when an alarm generates. It is possible to check the generated alarm by counting the number of times the LED blinks.
DAT LED (Green)	This LED will blink or illuminate steadily when the driver is communicating with the master station properly via RS-485 communication.
ERR LED (Red)	This LED will illuminate when a RS-485 communication error occurs with the master station.
Function setting switches (SW1)	Use this switch when controlling the system via RS-485 communication. <ul style="list-style-type: none"> <li>• No.1, No.2: Set the termination resistor (120 Ω) of RS-485 communication. (Factory setting: OFF)</li> <li>• No.3: Using this switch and the address number setting switch (SW2), set the address number of RS-485 communication. (Factory setting: OFF)</li> <li>• No.4: Set the connection device of RS-485 communication. (Factory setting: OFF)</li> <li>• No.5, No.6: Not used. (Keep this switch in the OFF position.)</li> </ul>
Address number setting switch (SW2)	Use this switch when controlling the system via RS-485 communication. Use this switch and SW1-No.3 of the function setting switch, to set the address number of RS-485 communication. (Factory setting: 0)
Transmission rate setting switch (SW3)	Use this switch when controlling the system via RS-485 communication. Set the transmission rate of RS-485 communication (Factory setting: 7).
Power supply and I/O signal connector (CN1)	Connect the main power supply (+24 VDC) and I/O signals.
RS-485 communication connectors (CN2/CN3)	Connect the RS-485 communication cable.
Data edit connector (CN4)	Connect a PC in which the MEXE02 has been installed, or the OPX-2A (both are accessories).
Mounting holes (4 locations)	Secure the motor with screws using these mounting holes.

## Installation

### Location for installation

The motor has been designed and manufactured to be installed within another device. 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 0 to +50 °C (+32 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
- 1000 m (3300 ft.) or lower above sea level

### Installation method

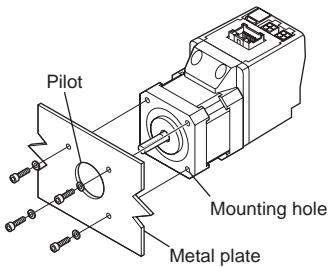
The motor can be installed in any direction.

Install the motor onto an appropriate flat metal plate having excellent vibration resistance and heat conductivity.

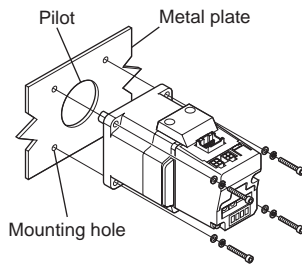
When installing the motor, secure it with four bolts (not supplied) through the four mounting holes provided. Do not leave a gap between the motor and metal plate.

Insert the pilot located on the motor's installation surface into the mounting plate's.

- Installation method A



- Installation method B



Model	Nominal size	Tightening torque [N·m (oz·in)]	Effective depth of bolt [mm (in.)]	Installation method
PKA544KD	M3	1 (142)	4.5 (0.177)	A
PKA566KD	M4	2 (280)	-	B

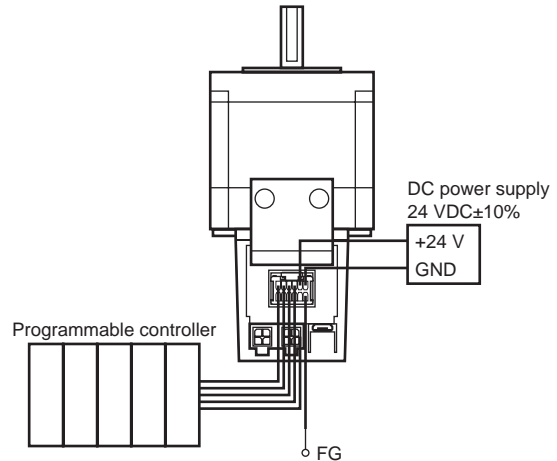
## Connection

### Note

- Ensure that the connector plugged in securely. Insecure connection may cause malfunction or damage to the motor.
- When unplugging the connector, do so while pressing the latches on the connector.
- When plugging/unplugging the connector, turn off the power and wait for the PWR LED to turn off before doing so.

### Connection of power supply and I/O signals, grounding motor

Connect the power supply and I/O signals to the motor using the supplied CN1 leadwire/connector assembly (12-pins).



### Connecting the power supply

Use a power supply that can supply the current capacity show in the table below.

Model	Input power supply voltage	Power supply current capacity
PKA544KD	24 VDC±10%	1.4 A or more
PKA566KD		2.5 A or more

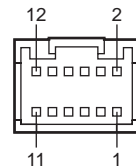
### Grounding method

Ground the Frame Ground terminal (FG) of pin No.1 as necessary.

Ground using a wire of AWG24 to 16 (0.2 to 1.25 mm<sup>2</sup>), and do not share the Protective Earth Terminal with a welder or any other power equipment.

### Pin assignments

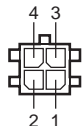
#### CN1 connector pin assignments



Lead wire color	Pin No.	Signal name	Description*
Yellow	1	FG	Frame Ground
Black/White	2	GND	Power supply GND
Orange	3	IN-COM	Input common
Red/White	4	+24 VDC	+24 VDC power supply input
Green	5	IN0	Control input 0 (+LS)
Blue	6	IN1	Control input 1 (-LS)
Purple	7	IN2	Control input 2 (HOMES)
Gray	8	IN3	Control input 3 (STOP)
White	9	OUT0+	Control output 0 (ALM)
Black	10	OUT0-	
Brown	11	OUT1+	Control output 1 (READY)
Red	12	OUT1-	

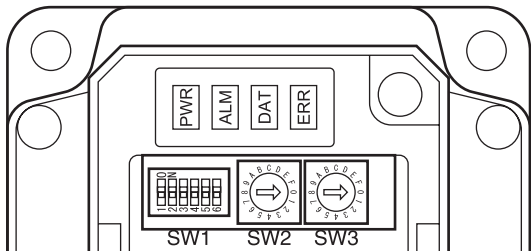
\* ( ): Initial value

• CN2/CN3 connector pin assignments



Pin No.	Signal name	Description
1	TR+	RS-485 communication signal (+)
2	TR-	RS-485 communication signal (-)
3	GND	GND
4	FG	Frame Ground

**Setting the switches**



Function setting switches (SW1)  
 No.1, No.2: Set the termination resistor  
 No.3: Set the address number  
 No.4: Set the connection device  
 No.5, No.6: Not used

Transmission rate setting switch (SW3)  
 Address number setting switch (SW2)

**Note** Be sure to turn off the motor power before setting the switches. If the switches are set while the power is still on, the new switch settings will not become effective until the motor power is cycled.

• **Setting the connection device**

Set the connection device of RS-485 communication using the function setting switch SW1-No.4. Set to ON when controlling via Modbus protocol.  
 Factory setting OFF (Network converter)

SW1-No.4	Connection device
ON	General purpose master device (Modbus protocol)
OFF	Network converter

• **Address number (slave address)**

Set the address number (slave address) using the address number setting switch (SW2) and SW1-No.3 of the function setting switch. Make sure each address number (slave address) you set for each driver is unique. Address number (slave address) 0 is reserved for broadcasting, so do not use this address.  
 Factory setting SW1-No.3: OFF, SW2: 0 (Address number 0)

SW1-No.3	SW2	Address number (slave address)	SW1-No.3	SW2	Address number (slave address)
OFF	0	Not used	ON	0	16
	1	1		1	17
	2	2		2	18
	3	3		3	19
	4	4		4	20
	5	5		5	21
	6	6		6	22
	7	7		7	23
	8	8		8	24
	9	9		9	25
	A	10		A	26
	B	11		B	27
	C	12		C	28
	D	13		D	29
	E	14		E	30
	F	15		F	31

• **Transmission rate**

Set the transmission rate using transmission rate setting switch (SW3). The transmission rate to be set should be the same as the transmission rate of the master device.  
 Factory setting 7 (625,000 bps)

SW3	Transmission rate (bps)
0	9600
1	19200
2	38400
3	57600

**Note** Do not set SW3 to positions 5 to F. The factory setting "7" is the transmission rate for when connecting to the network converter.

• **Termination resistor**

Use a termination resistor for the motor located farthest away (positioned at the end) from the programmable controller (master device).  
 Turn SW1-No.1 and No.2 of the function setting switch ON to set the termination resistor for RS-485 communication (120 Ω).  
 Factory setting No.1 and No.2: Both OFF (termination resistor disabled)

SW1- No.1, No.2	Termination resistor (120 Ω)
OFF	Disabled
ON	Enabled

**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.

**General**

- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. Failure to do 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, injury or damage to equipment.
- When the power is shut off or the motor does not maintain excitation, the motor will lose the holding torque. Take measures to keep the moving parts in position for vertical operations such as elevator applications. Failure to do so will cause the moving parts to fall and it may result in injury or damage to equipment.
- Depending on the type of the alarm (protective function), the motor may stop and lose its holding torque when the alarm generates. This may cause injury or damage to equipment.
- When the motor generates an alarm (any of the motor's protective functions is triggered), first remove the cause and then clear the protection function. Continuing the operation without removing the cause of the problem may cause malfunction of the motor, leading to injury or damage to equipment.

**Connection**

- Keep the motor's input-power voltage within the specified range to avoid fire.
- For the motor power supply, use a DC power supply with reinforced insulation on its primary and secondary sides. Failure to do so may cause electric shock.
- Connect the cables securely according to the wiring diagram in order to prevent fire.
- Do not forcibly bend, pull or pinch the cable or lead wire. Doing so may cause fire. Applying stress to the connection area of the connectors may cause damage to the product.

**Operation**

- 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 turn the motor excitation OFF while operating. The motor will stop its operation and lose the holding torque. This may cause injury or damage to equipment.
- Configure an interlock circuit in sequence program so that the system including the motor operates on the safe side when a RS-485 communication error generates.

## Repair, disassembly and modification

- Do not disassemble or modify the motor. Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product.



Handling the product without observing the instructions that accompany a "Caution" symbol may result in injury or property damage.

## General

- Do not use the motor beyond its specifications. Doing so may result in injury or damage to equipment.
- Keep your fingers and objects out of the openings in the motor. Failure to do so may result in fire or injury.
- Do not touch the motor during operation or immediately after stopping. The surface is hot and may cause a skin burn(s).

## Transportation

- Do not carry the motor by holding the motor output shaft or leadwire/connector assembly. Doing so may cause injury.

## Installation

- Install the motor in the enclosure in order to prevent injury.
- Keep the area around the motor free of combustible materials in order to prevent fire or a skin burn(s).
- Provide a cover over the rotating parts (output shaft) of the motor. Failure to do so may result in injury.

## Connection

- The connectors CN1, CN2, CN3 and CN4 of the motor are not electrically insulated. When grounding the positive terminal of the power supply, do not connect any equipment (PC, etc.) whose negative terminal is grounded. Doing so may cause the motor and these equipment to short, damaging both.
- When connecting, check the indication of the motor and be sure to observe the polarity of the power supply. Reverse-polarity connection may cause damage to the motor. The power-supply circuit and the RS-485 communication circuit are not electrically insulated. Therefore, when controlling multiple motors via RS-485 communication, the reverse polarity of the power supply will cause a short circuit and may result in damage to the motors.

## Operation

- 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.
- Before supplying power to the motor, turn all input signals to the motor OFF. Otherwise, the motor may start suddenly at power on and cause injury or damage to equipment.
- Set a suitable operation speed and acceleration/deceleration rate. Improper setting may cause loss of the motor synchronism and moving the load to an unexpected direction, which may result in injury or damage to equipment.
- Do not touch the rotating part (output shaft) during operation. Doing so may cause injury.
- When rotating the output shaft manually while the motor stops, cut off the motor current by turning off the power supply or motor excitation. Failure to do so may cause 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 below in a conspicuous position. Failure to do so may result in skin burn(s).
- Immediately when trouble has occurred, stop running and turn off the motor power. Failure to do so may result in fire or injury.
- Static electricity may cause the motor to malfunction or suffer damage. While the motor is receiving power, do not touch the motor. Always use an insulated screwdriver to adjust the motor's switches.



Warning label

## Disposal

- To dispose of the motor, disassemble it into parts and components as much as possible and dispose of individual parts/components as industrial waste.

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