Oriental motor

HM-60063-2

All-in-One 5-Phase Stepping Motor

PKA Series

USER MANUAL

KCC-REM-OMC-061

Thank you for purchasing an Oriental Motor product.
This 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.

Table of contents

1 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

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.

⚠ Caution

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).

Warning label

- 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.

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.

2 Overview of the PKA Series

The **PKA** Series is a 5-phase stepping motor integrated with a control circuit.
The motor is compatible with I/O control and RS-485 communication.
The operation data and parameters can be set using an accessory data setter **OPX-2A** or data setting software **MEXE02** (both are sold separately), or via RS-485 communication.

■ Main features

- Three operating patterns

  You can perform positioning operation, return-to-home operation and continuous operation. Up to 64 operation data points can be set, and multi-point positioning is also possible.

- Low vibration and low noise

  The microstep drive control circuit implemented the smooth drive function achieves low-vibration and low-noise.

- Supports RS-485 communication (Modbus RTU)

  You can set operation data and parameters or issue operation start/stop commands from the master station.
  Up to 31 motors can be connected to one master.
  The RS-485 communication protocol is the Modbus protocol.

- Alarm and warning functions

  The motor provides alarms that are designed to protect the motor from overheating, poor connection, error in operation, etc. (protective functions), as well as warnings that are output before the corresponding alarms generate (warning functions).

■ Accessory

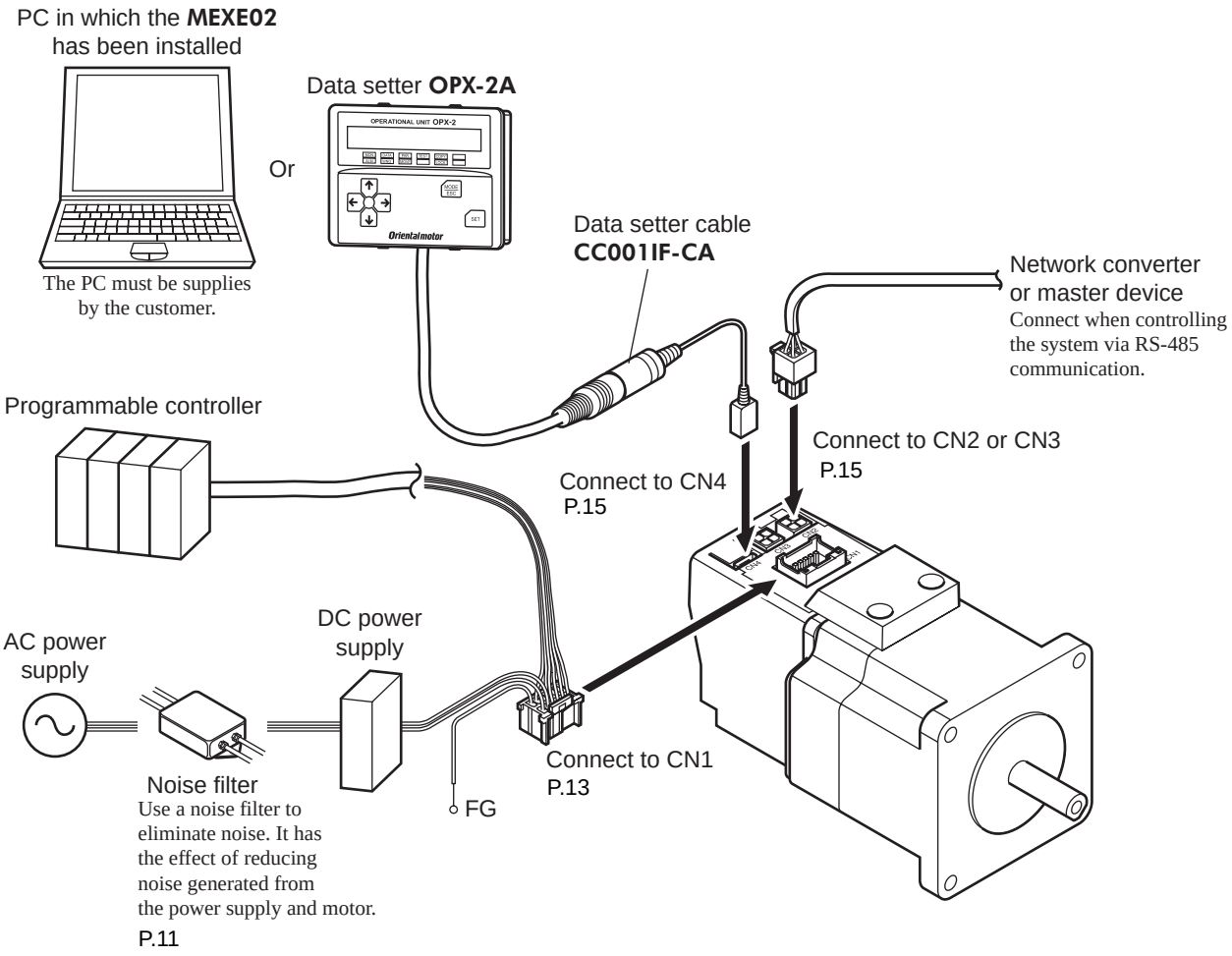
When controlling the motor using the I/O signals, an accessory **OPX-2A** or **MEXE02** is required. Set the data or parameters to operate the motor using the **OPX-2A** or **MEXE02**. Be sure to prepare either one when using I/O signals.

■ Related products

The AR Series DC power input built-in controller type can be used via various network when connecting to a network converter.

Network converter	Supported network
NETC01-CC	CC-Link communication
NETC01-M2	MECHATROLINK-Ⅱcommunication
NETC01-M3	MECHATROLINK-Ⅲcommunication

3 System configuration



4 Introduction

■ Before use

Only qualified personnel should work with the product.
Use the product correctly after thoroughly reading the section "1 Safety precautions" on. p.3.
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.

- **PKA** Series OPERATING MANUAL

  This manual explains safety precautions, connector pin assignments and others.

- **PKA** Series USER MANUAL (this document)

  This manual explains the function, installation and connection of the motor as well as operating method.

  After reading the above manuals, keep them in a convenient place so that you can reference them at any time.

■ CE Marking

Because the input power supply voltage of this product is 24 VDC, it is not subject to the Low Voltage Directive but install and connect this product as follows.

- This product is designed and manufactured to be installed within another device. Install the product in an enclosure.
- For the motor power supply, use a DC power supply with reinforced insulation on its primary and secondary sides.

- Installation conditions
  - Overvoltage category: I
  - Pollution degree: 2
  - Degree of protection: IP20

- EMC Directive

  This product has received EMC compliance under the conditions specified in “Example of installation and wiring” on p.12.
  Be sure to conduct EMC measures with the product assembled in your equipment by referring to “7.5 Installing and wiring in compliance with EMC Directive” p.11.

  Applicable Standards

EMI	Emission Tests Radiated Emission Test	EN 61000-6-4 EN 55011 group 1 class A
EMS	Immunity Tests Radiation Field Immunity Test Electrostatic Discharge Immunity Test Fast Transient/Burst Immunity Test Conductive Noise Immunity Test	EN 61000-6-2 IEC 61000-4-3 IEC 61000-4-2 IEC 61000-4-4 IEC 61000-4-6

■ Hazardous substances

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

■ 한국전파법

이 기기는 업무용(A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며,가정외의 지역에서 사용하는 것을 목적으로 합니다.

5 Precautions for use

This section covers limitations and requirements the user should consider when using the product.

- Do not apply an overhung load and thrust load in excess of the specified permissible limit

  Operating the motor under an excessive overhung load or thrust load may damage the motor bearings (ball bearings). Be sure to operate the motor within the specified permissible limit of overhung load and thrust load.
  Refer to p.11 for details.

- Motor surface temperature

  The motor surface temperature may exceed 75 °C (167 °F) under certain conditions (ambient temperature, operating speed, duty cycle, etc.). To prevent damage of the control circuit or deterioration of the motor bearings (ball bearings), use the motor in a condition where the motor surface temperature will not exceed 75 °C (167 °F).

- Maximum static torque at excitation

  When the motor stops, the maximum static torque at excitation of the motor will drop by about 50% by the current cutback function. When operating the motor, take account of the motor torque drop at the time of stopping.

- Preventing electrical noise

  See “7.5 Installing and wiring in compliance with EMC Directive” on p.11 for measures with regard to noise.

- Overvoltage alarm by regeneration energy

  The overvoltage alarm will generate depending on the operating condition. When an alarm is generated, review the operating conditions.
  If the motor becomes the overvoltage condition, the motor coil will be short-circuited in the control circuit and the holding torque will be generated (dynamic brake). When the voltage returns to normal, the dynamic brake will automatically be released.

- Saving data to the NV memory

  Do not turn off the power supply while writing the data to the NV memory and 5 seconds after the completion of writing the data. Doing so may abort writing the data and cause a EEPROM error alarm to generate.
  The NV memory can be rewritten approx. 100,000 times.

6 Preparation

This chapter explains the items you should check, as well as the name and function of each part.

6.1 Checking the product

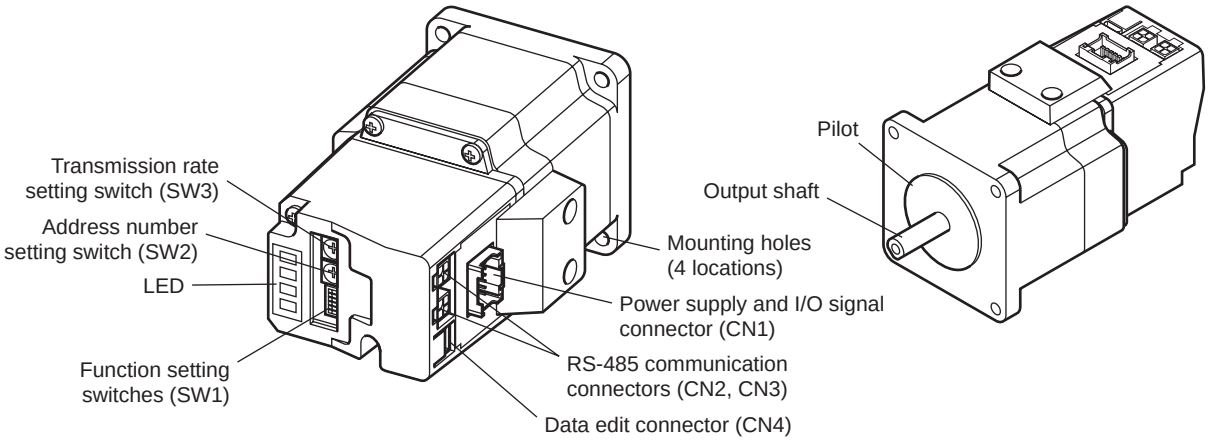
Verify that the items listed below are included. Report any missing or damaged items to the branch or sales office from which you purchased the product.

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

6.2 Product type

Model	**PKA544KD** [Frame size 42 mm (1.65 in.)]
	PKA566KD [Frame size 60 mm (2.36 in.)]

6.3 Names and functions of parts



Name		Function	Ref.
LED	PWR (Green)	This LED is lit while the power is input.	–
	ALM (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.	P.117
	DAT (Green)	This LED will blink or illuminate steadily when the driver is communicating with the master station properly via RS-485 communication.	–
	ERR (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. No.1, No.2: Set the termination resistor (120 Ω) of RS-485 communication. (Factory setting: OFF) No.3: Using this switch and the address number setting switch (SW2), set the address number of RS-485 communication. (Factory setting: OFF) No.4: Set the connection device of RS-485 communication. (Factory setting: OFF) No.5, No.6: Not used. (Keep this switch in the OFF position.)	P.68 P.93
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)	P.68 P.93
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).	P.68 P.93
Power supply and I/O signal connector (CN1)		Connect the main power supply (+24 VDC) and I/O signals.	P.13
RS-485 communication connectors (CN2/CN3)		Connect the RS-485 communication cable.	P.15
Data edit connector (CN4)		Connect a PC in which the **MEXE02** has been installed, or the **OPX-2A**.	P.15
Mounting holes (4 locations)		Secure the motor with screws using these mounting holes.	P.10

7 Installation

This chapter explains the installation location and installation methods of the motor, along with load installation. The installation and wiring methods in compliance with the EMC Directive are also explained.

7.1 Location for installation

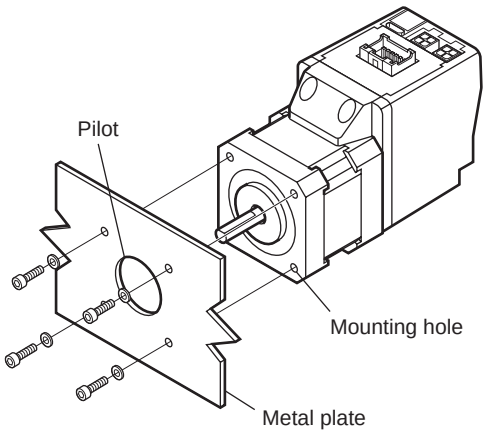
The motor has been designed and manufactured to be installed within another device. Install it in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

- 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

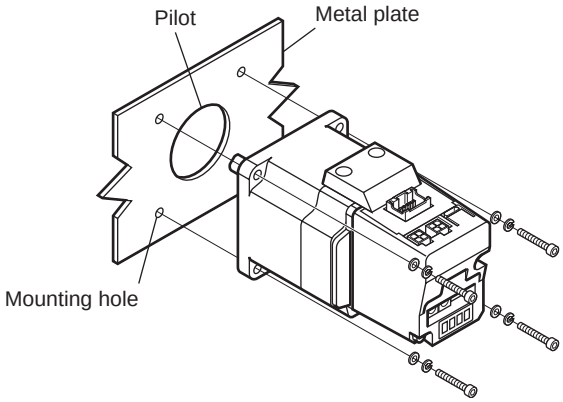
7.2 Installation method

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

7.3 Installing a load

When connecting a load to the motor, align the centers of the load shaft and motor output shaft. Also, keep the overhung load and thrust load under the permissible values.

Installation method	Description
Using a coupling	Align the centers of the motor output shaft and load shaft in a straight line.
Using a belt drive	Align the motor output shaft and load shaft in parallel with each other, and position both pulleys so that the line connecting their centers is at a right angle to the shafts.
Using a gear drive	Align the motor output shaft and gear shaft in parallel with each other, and let the gears mesh at the center of the tooth widths.

Note

- When coupling the load to the motor, pay attention to the centering of the shafts, belt tension, parallelism of the pulleys, and so on. Securely tighten the coupling and pulley set screws.
- Be careful not to damage the output shaft or bearings when installing a coupling or pulley to the motor output shaft.
- Do not modify or machine the motor output shaft. Doing so may damage the bearings and destroy the motor.

7.4 Permissible overhung load and permissible thrust load

The overhung load and the thrust load on the motor's output shaft must be kept under the permissible values listed on below. The permissible thrust loads are the motor's mass. The thrust load should not exceed the motor's mass.

Note Failure due to fatigue may occur when the motor bearings and output shaft are subject to repeated loading by an overhung or thrust load that is in excess of the permissible limit.

Model	Permissible overhung load [N (lb.)]					Permissible thrust load [N (lb.)]
	Distance from the tip of motor's output shaft					
	0 mm (0 in.)	5 mm (0.2 in.)	10 mm (0.39 in.)	15 mm (0.59 in.)	20 mm (0.79 in.)	
PKA544KD	20 (4.5)	25 (5.6)	34 (7.6)	52 (11.7)	−	0.3 (0.66)
PKA566KD	63 (14.1)	75 (16.8)	95 (21)	130 (29)	190 (42)	0.8 (1.76)

7.5 Installing and wiring in compliance with EMC Directive

Effective measures must be taken against the EMI that the motor may give to adjacent control-system equipment, as well as the EMS of the motor itself, in order to prevent a serious functional impediment in the machinery. The use of the following installation and wiring methods will enable the motor to be compliant with the EMC directive. Refer to "CE Marking" on p.7 for the applicable standards.
Oriental Motor conducts EMC measurements on its motors in accordance with "Example of installation and wiring" on p.12. The user is responsible for ensuring the machine's compliance with the EMC Directive, based on the installation and wiring explained below.

■ Power supply

This motor is a product of DC power supply input. Use a DC power supply (switching power supply etc.) that conforms to the EMC Directive.

■ Noise filter for power supply line

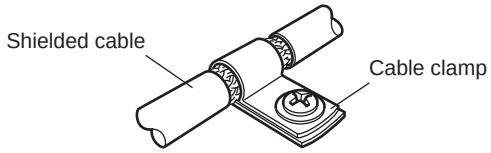
- Connect a noise filter in the DC power supply input to prevent the noise generated in the motor from propagating externally through the power supply line.
- When using a power supply transformer, be sure to connect a noise filter to the AC input side of the power supply transformer.
- For a noise filter, use MC1210 (TDK-Lambda Corporation) or equivalent product.
- Install the noise filter as close to the AC input terminal of DC power supply as possible. Use cable clamps and other means to secure the input cables (AWG18: 0.75 mm^2 or more) and output cables (AWG18: 0.75 mm^2 or more) firmly to the surface of the enclosure.
- Connect the ground terminal of the noise filter to the grounding point, using as thick and short a wire as possible.
- Do not place the input cable parallel with the output cable. Parallel placement will reduce noise filter effectiveness if the enclosure's internal noise is directly coupled to the power supply cable by means of stray capacitance.

■ How to ground

Install the motor to the grounded metal plate.
The cable used to ground the noise filter must be as thick and short as possible so that no potential difference is generated. Choose a large, thick and uniformly conductive surface for the grounding point.

■ Wiring the power supply cable and signal cable

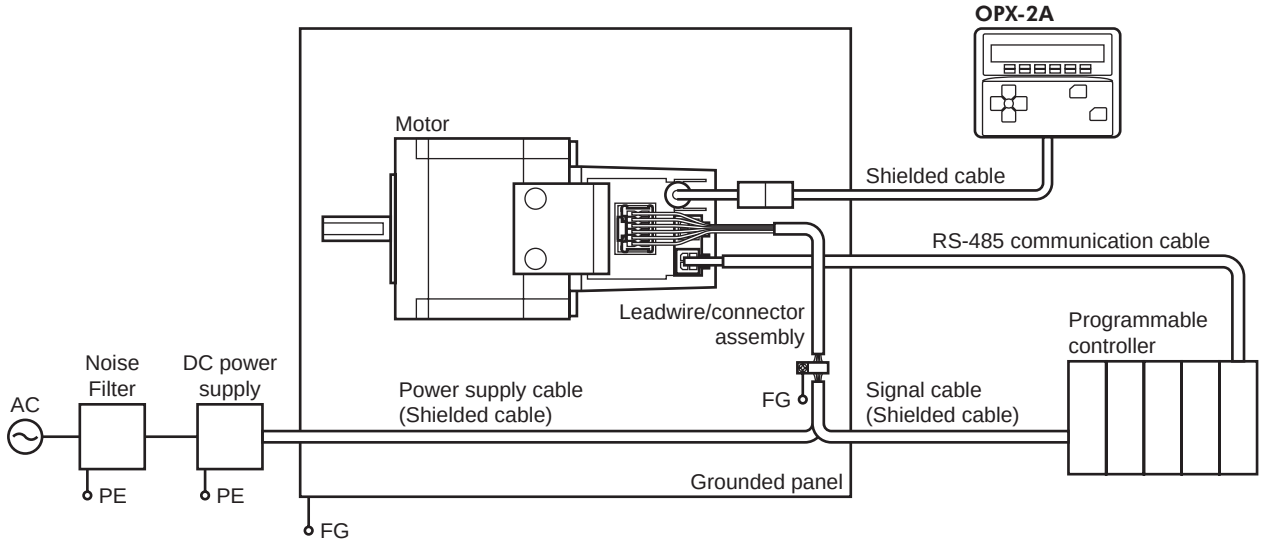
- Use a supplied leadwire/connector assembly for the power supply and I/O signals cable, and keep it as short as possible. When extending the lead wire, use a shielded cable of AWG22 (0.3 mm^2) or more.
- To ground a power supply cable, use a metal clamp or similar device that will maintain contact with the entire circumference of the cable. Attach a cable clamp to the end of the cable, and connect it as shown in the figure.



■ Notes about installation and wiring

- Connect the motor and other peripheral control equipment directly to the grounding point so as to prevent a potential difference from developing between grounds.
- When relays or electromagnetic switches are used together with the system, use noise filters and CR circuits to suppress surges generated by them.
- Keep cables as short as possible without coiling and bundling extra lengths.
- Place the input cable and output cable of a noise filter separately from each other.

■ Example of installation and wiring



■ Precautions about static electricity

Static electricity may cause the motor to malfunction or suffer damage. While the motor is receiving power, handle the motor with care and do not come near or touch the motor.
Always use an insulated screwdriver to adjust the motor's switches.

Note The motor uses parts that are sensitive to electrostatic charge. Before touching the motor, turn off the power to prevent electrostatic charge from generating. If an electrostatic charge is impressed on the motor, the motor may be damaged.

8 Connection

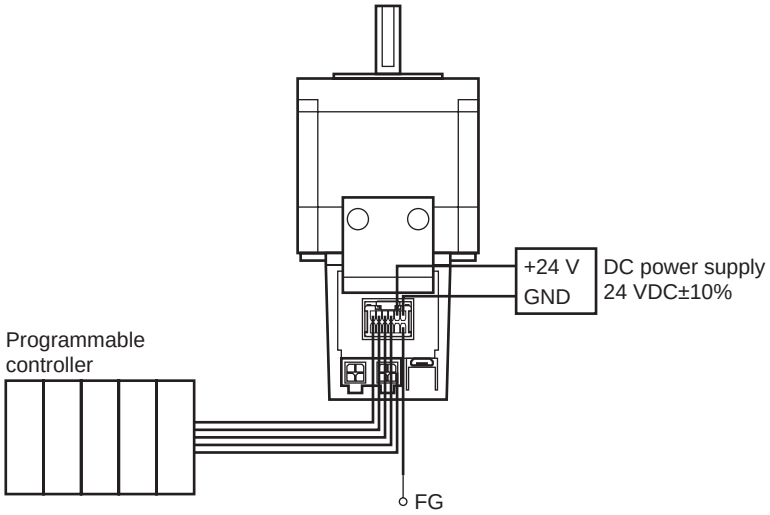
This chapter explains how to connect the power supply, I/O signals and others.

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.

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

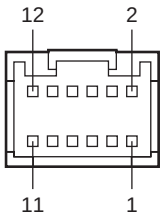
Connect the power supply and I/O signals to the motor using the supplied CN1 leadwire/connector assembly (12-pins).



■ 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 (initial value: +LS)
Blue	6	IN1	Control input 1 (initial value: −LS)
Purple	7	IN2	Control input 2 (initial value: HOMES)
Gray	8	IN3	Control input 3 (initial value: STOP)
White	9	OUT0+	Control output 0 (initial value: ALM)
Black	10	OUT0−	
Brown	11	OUT1+	Control output 1 (initial value: READY)
Red	12	OUT1−	

• Pin assignment



■ Connecting the power supply

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

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

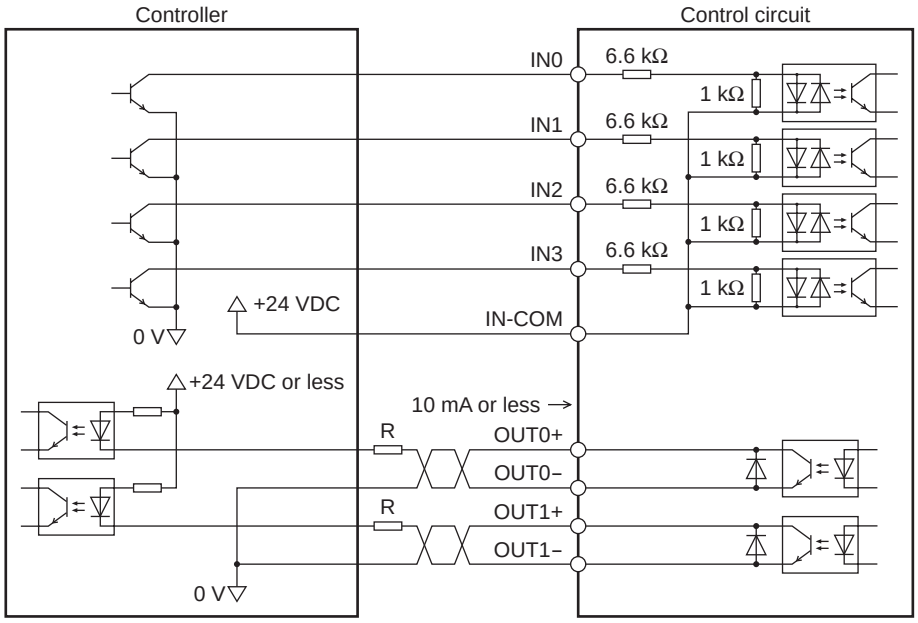
Ground the Frame Ground terminal (FG) of pin No.1 as necessary.
Ground using a wire of AWG24 to 16 (0.2 to 1.25 mm^2), and do not share the protective earth terminal with a welder or any other power equipment.

■ I/O signal connection example

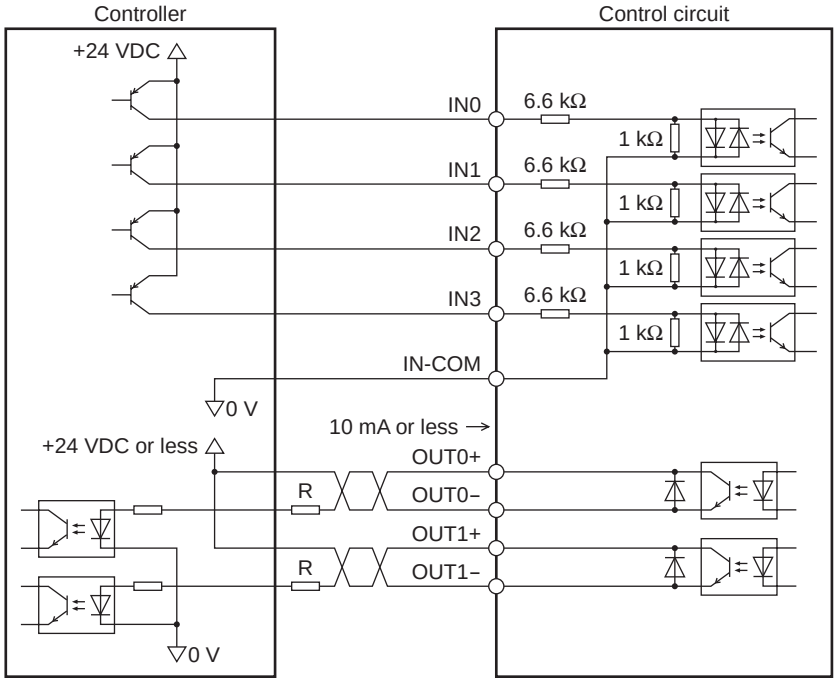
Note

- Keep the input signal to 24 VDC.
- Use output signals at 24 VDC 10 mA or less. If the output signal current exceeds 10 mA, connect external resistor R to keep the current to 10 mA or below.

- Connecting to a current sink output circuit (NPN specifications)

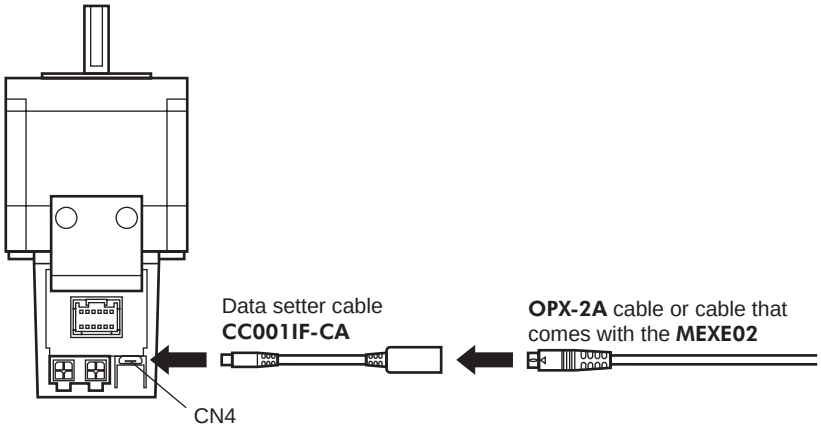


- Connecting to a current source output circuit (PNP specifications)



8.2 Connecting the data setter

Connect the motor to the **OPX-2A** or **MEXE02** using an accessory data setter cable (sold separately).

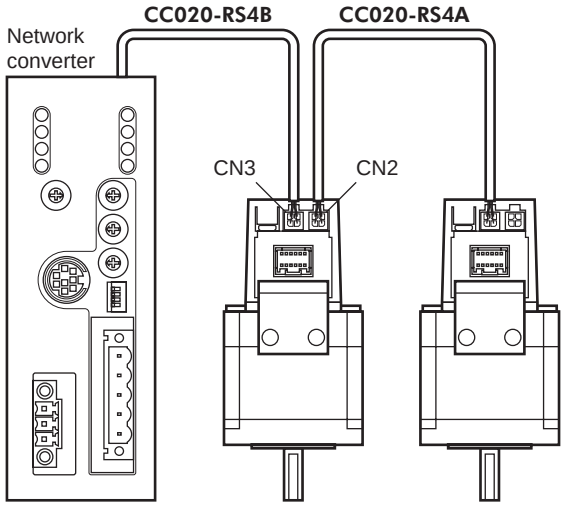


⚠ Caution

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.

8.3 Connecting the RS-485 communication cable

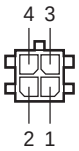
Connect this cable if you want to control your product via RS-485 communication or network converter. Connect the RS-485 communication cable to CN2 or CN3. You can use the vacant connectors to connect a different **PKA** Series. An accessory RS-485 communication cable is available (sold separately). Refer to p.125 for details.



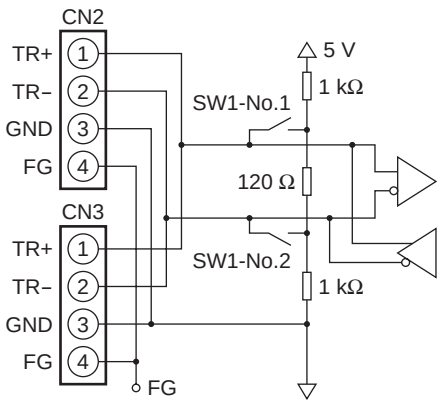
■ CN2/CN3 connector pin assignments

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

• Pin assign



• Internal circuit



9 Explanation of I/O signals

In this manual, I/O signals are described as follows.
- Direct I/O: I/O signals accessed via I/O signal connector (CN1)
- Network I/O: I/O signals accessed via RS-485 communication

Set the following parameters using the **OPX-2A**, **MEXE02** or RS-485 communication.

9.1 Assignment of direct I/O

■ Assignment to the input terminals

The input signals shown below can be assigned to the input terminals IN0 to IN3 of CN1 by setting parameters. For details on input signals, refer to p.24.

Signal name of direct I/O	Initial value
IN0	60: +LS
IN1	61: −LS
IN2	62: HOMES
IN3	18: STOP

Assignment No.	Signal name	Function
0	Not used	Set when the input terminal is not used.
1	FWD	Continuous operation in the positive direction.
2	RVS	Continuous operation in the negative direction.
3	HOME	Return-to-home operation.
4	START	Positioning operation.
5	SSTART	Sequential operation.
6	+JOG	JOG operation in the positive direction.
7	−JOG	JOG operation in the negative direction.
8	MS0	Direct positioning operation.
9	MS1	
10	MS2	
11	MS3	
12	MS4	
13	MS5	
16	FREE*	Motor excitation switching between excitation and non-excitation.
17	AWO	
18	STOP	Stop of the motor operation
24	ALM-RST	Reset of the current alarm
25	P-PRESET	Position preset.
27	HMI	Release of the function limitation of the **OPX-2A** or **MEXE02**.
32	R0	General signals. Use these signals when controlling the system via RS-485 communication.
33	R1	
34	R2	
35	R3	
36	R4	
37	R5	
38	R6	
39	R7	
40	R8	
41	R9	
42	R10	
43	R11	
44	R12	

* The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

Assignment No.	Signal name	Function
45	R13	General signals. Use these signals when controlling the system via RS-485 communication.
46	R14	
47	R15	
48	M0	Select the operation data No. using these six bits.
49	M1	
50	M2	
51	M3	
52	M4	
53	M5	
60	+LS	+ limit sensor
61	−LS	− limit sensor
62	HOMES	Home sensor
63	SLIT	Slit sensor

Related parameters

Parameter name	Description	Initial value
IN0 input function selection	Assigns the following input signals to IN0 to IN3 of the input terminals. (See table below)	60: +LS
IN1 input function selection		61: −LS
IN2 input function selection		62: HOMES
IN3 input function selection		18: STOP

0: Not used	8: MS0	18: STOP	36: R4	44: R12	52: M4
1: FWD	9: MS1	24: ALM-RST	37: R5	45: R13	53: M5
2: RVS	10: MS2	25: P-PRESET	38: R6	46: R14	60: +LS
3: HOME	11: MS3	27: HMI	39: R7	47: R15	61: −LS
4: START	12: MS4	32: R0	40: R8	48: M0	62: HOMES
5: SSTART	13: MS5	33: R1	41: R9	49: M1	63: SLIT
6: +JOG	16: FREE*	34: R2	42: R10	50: M2	
7: −JOG	17: AWO	35: R3	43: R11	51: M3	

* The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

Note

- Do not assign the same input signal to multiple input terminals. When the same input signal is assigned to multiple input terminals, the function will be executed if any of the terminals becomes active.
- If the HMI input is not assigned to the input terminal, the HMI input will always become ON (function limitation release). When assigning to both direct I/O and network I/O, the function will be executed when both of them are set to ON.

■ Changing the logic level setting of input signals

You can change the logic level setting for input terminals IN0 to IN3 using the parameter.

Related parameters

Parameter name	Description	Initial value
IN0 input logic level setting	Changes the logic level setting for input terminals IN0 to IN3. 0: Normally open 1: Normally closed	0: Normally open
IN1 input logic level setting		
IN2 input logic level setting		
IN3 input logic level setting		

■ Assignment to the output terminals

The output signals shown below can be assigned to the output terminals OUT0 and OUT1 of CN1 by setting parameters. For details on output signals, refer to p.28.

Signal name of direct I/O	Initial value
OUT0	65: ALM
OUT1	67: READY

Assignment No.	Signal name	Function
0	Not used	Set when the output terminal is not used.
1	FWD_R	Output in response to the FWD.
2	RVS_R	Output in response to the RVS.
3	HOME_R	Output in response to the HOME.
4	START_R	Output in response to the START.
5	SSTART_R	Output in response to the SSTART.
6	+JOG_R	Output in response to the +JOG.
7	−JOG_R	Output in response to the −JOG.
8	MS0_R	Output in response to the MS0.
9	MS1_R	Output in response to the MS1.
10	MS2_R	Output in response to the MS2.
11	MS3_R	Output in response to the MS3.
12	MS4_R	Output in response to the MS4.
13	MS5_R	Output in response to the MS5.
16	FREE_R	Output in response to the FREE.*
17	AWO_R	Output in response to the AWO.
18	STOP_R	Output in response to the STOP.
32	R0	Output the status of the general signal R0.
33	R1	Output the status of the general signal R1.
34	R2	Output the status of the general signal R2.
35	R3	Output the status of the general signal R3.
36	R4	Output the status of the general signal R4.
37	R5	Output the status of the general signal R5.
38	R6	Output the status of the general signal R6.
39	R7	Output the status of the general signal R7.
40	R8	Output the status of the general signal R8.
41	R9	Output the status of the general signal R9.
42	R10	Output the status of the general signal R10.
43	R11	Output the status of the general signal R11.
44	R12	Output the status of the general signal R12.
45	R13	Output the status of the general signal R13.
46	R14	Output the status of the general signal R14.
47	R15	Output the status of the general signal R15.
48	M0_R	Output in response to the M0.
49	M1_R	Output in response to the M1.
50	M2_R	Output in response to the M2.
51	M3_R	Output in response to the M3.
52	M4_R	Output in response to the M4.
53	M5_R	Output in response to the M5.
60	+LS_R	Output in response to the +LS.
61	−LS_R	Output in response to the −LS.
62	HOMES_R	Output in response to the HOMES.
63	SLIT_R	Output in response to the SLIT.
65	ALM	Output the alarm status (normally closed).
66	WNG	Output the warning status.
67	READY	Output when the motor is ready.
68	MOVE	Output when the motor operates.

* The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

Assignment No.	Signal name	Function
70	HOME-P	Output when the motor is in home position.
72	TIM	Output once every 7.2° rotation of the motor output shaft.
73	AREA1	Output when the motor is within the area 1.
74	AREA2	Output when the motor is within the area 2.
75	AREA3	Output when the motor is within the area 3.
80	S-BSY	Output when the motor is in internal processing state.

Related parameters

Parameter name	Description	Initial value
OUT0 output function selection	Assigns the following output signals to OUT0 and OUT1 of the output terminals. (See table below)	65: ALM
OUT1 output function selection		67: READY

0: Not used	9: MS1_R	33: R1	42: R10	51: M3_R	67: READY
1: FWD_R	10: MS2_R	34: R2	43: R11	52: M4_R	68: MOVE
2: RVS_R	11: MS3_R	35: R3	44: R12	53: M5_R	70: HOME-P
3: HOME_R	12: MS4_R	36: R4	45: R13	60: +LS_R	72: TIM
4: START_R	13: MS5_R	37: R5	46: R14	61: −LS_R	73: AREA1
5: SSTART_R	16: FREE_R	38: R6	47: R15	62: HOMES_R	74: AREA2
6: +JOG_R	17: AWO_R	39: R7	48: M0_R	63: SLIT_R	75: AREA3
7: −JOG_R	18: STOP_R	40: R8	49: M1_R	65: ALM	80: S-BSY
8: MS0_R	32: R0	41: R9	50: M2_R	66: WNG	

9.2 Assignment of network I/O

Assign the I/O function via RS-485 communication.

■ Assignment of input signals

The input signals shown below can be assigned to the NET-IN0 to NET-IN15 of the network I/O by setting parameters. See each command description for the assignment of the NET-IN0 to NET-IN15.

Assignment No.	Signal name	Function	Setting range
0	Not used	Set when the input terminal is not used.	–
1	FWD	Continuous operation in the positive direction.	0: Deceleration stop 1: Operation
2	RVS	Continuous operation in the negative direction.	
3	HOME	Return-to-home operation.	0: No operation 1: Start operation
4	START	Positioning operation.	
5	SSTART	Sequential operation.	
6	+JOG	JOG operation in the positive direction.	
7	−JOG	JOG operation in the negative direction.	
8	MS0	Direct positioning operation.	
9	MS1		
10	MS2		
11	MS3		
12	MS4		
13	MS5		
16	FREE*	Motor excitation switching between excitation and non-excitation.	0: Excitation 1: Non-excitation
17	AWO		
18	STOP	Stop of the motor operation	0: No operation 1: Stop operation
24	ALM-RST	Reset of the current alarm	0: No operation 1: Reset alarm
25	P-PRESET	Position preset.	0: No operation 1: Preset
27	HMI	Release of the function limitation of the **OPX-2A** or **MEXE02**	0: Function limitation 1: Function limitation release
32	R0	General signals. Use these signals when controlling the system via RS-485 communication.	0: OFF 1: ON
33	R1		
34	R2		
35	R3		
36	R4		
37	R5		
38	R6		
39	R7		
40	R8		
41	R9		
42	R10		
43	R11		
44	R12		
45	R13		
46	R14		
47	R15		
48	M0	Select the operation data No. using these six bits.	0 to 63: Operation data No.
49	M1		
50	M2		
51	M3		
52	M4		
53	M5		

* The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

Related parameters

Parameter name	Description	Initial value
NET-IN0 input function selection	Assigns the following input signals to NET-IN0 to NET-IN15. (See table below)	48: M0
NET-IN1 input function selection		49: M1
NET-IN2 input function selection		50: M2
NET-IN3 input function selection		4: START
NET-IN4 input function selection		3: HOME
NET-IN5 input function selection		18: STOP
NET-IN6 input function selection		0: Not used
NET-IN7 input function selection		17: AWO
NET-IN8 input function selection		8: MS0
NET-IN9 input function selection		9: MS1
NET-IN10 input function selection		10: MS2
NET-IN11 input function selection		5: SSTART
NET-IN12 input function selection		6: +JOG
NET-IN13 input function selection		7: −JOG
NET-IN14 input function selection		1: FWD
NET-IN15 input function selection		2: RVS

0: Not used	7: −JOG	16: FREE*	33: R1	40: R8	47: R15
1: FWD	8: MS0	17: AWO	34: R2	41: R9	48: M0
2: RVS	9: MS1	18: STOP	35: R3	42: R10	49: M1
3: HOME	10: MS2	24: ALM-RST	36: R4	43: R11	50: M2
4: START	11: MS3	25: P-PRESET	37: R5	44: R12	51: M3
5: SSTART	12: MS4	27: HMI	38: R6	45: R13	52: M4
6: +JOG	13: MS5	32: R0	39: R7	46: R14	53: M5

* The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

Note

- Do not assign the same input signal to multiple input terminals. When the same input signal is assigned to multiple input terminals, the function will be executed if any of the terminals becomes active.
- If the HMI input is not assigned to the input terminal, the HMI input will always become ON (function limitation release). When assigning to both direct I/O and network I/O, the function will be executed when both of them are set to ON.

■ Assignment to the output terminals

The output signals shown below can be assigned to the NET-OUT0 to NET-OUT15 of the network I/O by setting parameters. See each command description for the assignment of the NET-OUT0 to NET-OUT15.

Assignment No.	Signal name	Function	Setting range
0	Not used	Set when the output terminal is not used.	−
1	FWD_R	Output in response to the FWD.	0: FWD=OFF 1: FWD=ON
2	RVS_R	Output in response to the RVS.	0: RVS=OFF 1: RVS=ON
3	HOME_R	Output in response to the HOME.	0: HOME=OFF 1: HOME=ON
4	START_R	Output in response to the START.	0: START=OFF 1: START=ON
5	SSTART_R	Output in response to the SSTART.	0: SSTART=OFF 1: SSTART=ON
6	+JOG_R	Output in response to the +JOG.	0: +JOG=OFF 1: +JOG=ON
7	−JOG_R	Output in response to the −JOG.	0: −JOG=OFF 1: −JOG=ON
8	MS0_R	Output in response to the MS0.	0: MS0=OFF 1: MS0=ON
9	MS1_R	Output in response to the MS1.	0: MS1=OFF 1: MS1=ON
10	MS2_R	Output in response to the MS2.	0: MS2=OFF 1: MS2=ON

Assignment No.	Signal name	Function	Setting range
11	MS3_R	Output in response to the MS3.	0: MS3=OFF 1: MS3=ON
12	MS4_R	Output in response to the MS4.	0: MS4=OFF 1: MS4=ON
13	MS5_R	Output in response to the MS5.	0: MS5=OFF 1: MS5=ON
16	FREE_R	Output in response to the FREE.*	0: FREE=OFF 1: FREE=ON
17	AWO_R	Output in response to the AWO.	0: AWO=OFF 1: AWO=ON
18	STOP_R	Output in response to the STOP.	0: STOP=OFF 1: STOP=ON
32	R0	Output the status of the general signal R0.	0: R0=OFF 1: R0=ON
33	R1	Output the status of the general signal R1.	0: R1=OFF 1: R1=ON
34	R2	Output the status of the general signal R2.	0: R2=OFF 1: R2=ON
35	R3	Output the status of the general signal R3.	0: R3=OFF 1: R3=ON
36	R4	Output the status of the general signal R4.	0: R4=OFF 1: R4=ON
37	R5	Output the status of the general signal R5.	0: R5=OFF 1: R5=ON
38	R6	Output the status of the general signal R6.	0: R6=OFF 1: R6=ON
39	R7	Output the status of the general signal R7.	0: R7=OFF 1: R7=ON
40	R8	Output the status of the general signal R8.	0: R8=OFF 1: R8=ON
41	R9	Output the status of the general signal R9.	0: R9=OFF 1: R9=ON
42	R10	Output the status of the general signal R10.	0: R10=OFF 1: R10=ON
43	R11	Output the status of the general signal R11.	0: R11=OFF 1: R11=ON
44	R12	Output the status of the general signal R12.	0: R12=OFF 1: R12=ON
45	R13	Output the status of the general signal R13.	0: R13=OFF 1: R13=ON
46	R14	Output the status of the general signal R14.	0: R14=OFF 1: R14=ON
47	R15	Output the status of the general signal R15.	0: R15=OFF 1: R15=ON
48	M0_R	Output in response to the M0 to M5	0 to 63: Operation data No.
49	M1_R		
50	M2_R		
51	M3_R		
52	M4_R		
53	M5_R		
60	+LS_R	Output in response to the +LS.	0: +LS=OFF 1: +LS=ON
61	−LS_R	Output in response to the −LS.	0: −LS=OFF 1: −LS=ON
62	HOMES_R	Output in response to the HOMES.	0: HOMES=OFF 1: HOMES=ON
63	SLIT_R	Output in response to the SLIT.	0: SLIT=OFF 1: SLIT=ON
65	ALM	Output the alarm status (normally closed).	0: Alarm not present 1: Alarm present
66	WNG	Output the warning status.	0: Warning not present 1: Warning present

∗ The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

Assignment No.	Signal name	Function	Setting range
67	READY	Output when the motor is ready.	0: Not ready 1: Ready
68	MOVE	Output when the motor operates.	0: Motor stopped 1: Motor operating
70	HOME-P	Output when the motor is in home position.	0: Not home position 1: Home position
72	TIM	Output once every 7.2° rotation of the motor output shaft.	0: TIM=OFF 1: TIM=ON
73	AREA1	Output when the motor is within the area 1.	0: Outside area 1: Inside area
74	AREA2	Output when the motor is within the area 2.	
75	AREA3	Output when the motor is within the area 3.	
80	S-BSY	Output when the motor is in internal processing state.	0: S-BSY=OFF 1: S-BSY=ON

Related parameters

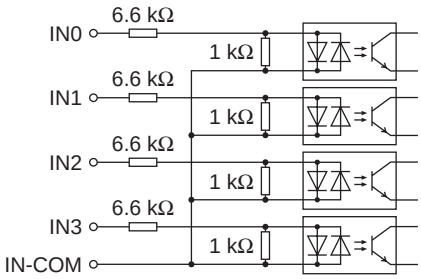
Parameter name	Description	Initial value
NET-OUT0 output function selection	Assigns the following output signals to NET-OUT0 to NET-OUT15. (See table below)	48: M0_R
NET-OUT1 output function selection		49: M1_R
NET-OUT2 output function selection		50: M2_R
NET-OUT3 output function selection		4: START_R
NET-OUT4 output function selection		70: HOME-P
NET-OUT5 output function selection		67: READY
NET-OUT6 output function selection		66: WNG
NET-OUT7 output function selection		65: ALM
NET-OUT8 output function selection		80: S-BSY
NET-OUT9 output function selection		73: AREA1
NET-OUT10 output function selection		74: AREA2
NET-OUT11 output function selection		75: AREA3
NET-OUT12 output function selection		72: TIM
NET-OUT13 output function selection		68: MOVE
NET-OUT14 output function selection		0: Not used
NET-OUT15 output function selection		0: Not used

0: Not used	9: MS1_R	33: R1	42: R10	51: M3_R	67: READY
1: FWD_R	10: MS2_R	34: R2	43: R11	52: M4_R	68: MOVE
2: RVS_R	11: MS3_R	35: R3	44: R12	53: M5_R	70: HOME-P
3: HOME_R	12: MS4_R	36: R4	45: R13	60: +LS_R	72: TIM
4: START_R	13: MS5_R	37: R5	46: R14	61: −LS_R	73: AREA1
5: SSTART_R	16: FREE_R	38: R6	47: R15	62: HOMES_R	74: AREA2
6: +JOG_R	17: AWO_R	39: R7	48: M0_R	63: SLIT_R	75: AREA3
7: −JOG_R	18: STOP_R	40: R8	49: M1_R	65: ALM	80: S-BSY
8: MS0_R	32: R0	41: R9	50: M2_R	66: WNG	

9.3 Input signals

The following input signals are photocoupler inputs. The signal state represents the "ON: Carrying current" or "OFF: Not carrying current" state of the internal photocoupler rather than the voltage level of the signal.

■ Internal circuit



■ M0 to M5 input

Select a desired operation data number for positioning operation or continuous operation based on the combination of ON/OFF states of the M0 to M5 inputs.

Operation data No.	M5	M4	M3	M2	M1	M0
0	OFF	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	OFF	**ON**
2	OFF	OFF	OFF	OFF	**ON**	OFF
3	OFF	OFF	OFF	OFF	**ON**	**ON**
4	OFF	OFF	OFF	**ON**	OFF	OFF
5	OFF	OFF	OFF	**ON**	OFF	**ON**
6	OFF	OFF	OFF	**ON**	**ON**	OFF
7	OFF	OFF	OFF	**ON**	**ON**	**ON**
8	OFF	OFF	**ON**	OFF	OFF	OFF
9	OFF	OFF	**ON**	OFF	OFF	**ON**
10	OFF	OFF	**ON**	OFF	**ON**	OFF
11	OFF	OFF	**ON**	OFF	**ON**	**ON**
12	OFF	OFF	**ON**	**ON**	OFF	OFF
13	OFF	OFF	**ON**	**ON**	OFF	**ON**
14	OFF	OFF	**ON**	**ON**	**ON**	OFF
15	OFF	OFF	**ON**	**ON**	**ON**	**ON**
16	OFF	**ON**	OFF	OFF	OFF	OFF
17	OFF	**ON**	OFF	OFF	OFF	**ON**
18	OFF	**ON**	OFF	OFF	**ON**	OFF
19	OFF	**ON**	OFF	OFF	**ON**	**ON**
20	OFF	**ON**	OFF	**ON**	OFF	OFF
21	OFF	**ON**	OFF	**ON**	OFF	**ON**
22	OFF	**ON**	OFF	**ON**	**ON**	OFF
23	OFF	**ON**	OFF	**ON**	**ON**	**ON**
24	OFF	**ON**	**ON**	OFF	OFF	OFF
25	OFF	**ON**	**ON**	OFF	OFF	**ON**
26	OFF	**ON**	**ON**	OFF	**ON**	OFF
27	OFF	**ON**	**ON**	OFF	**ON**	**ON**
28	OFF	**ON**	**ON**	**ON**	OFF	OFF
29	OFF	**ON**	**ON**	**ON**	OFF	**ON**
30	OFF	**ON**	**ON**	**ON**	**ON**	OFF
31	OFF	**ON**	**ON**	**ON**	**ON**	**ON**

Operation data No.	M5	M4	M3	M2	M1	M0
32	**ON**	OFF	OFF	OFF	OFF	OFF
33	**ON**	OFF	OFF	OFF	OFF	**ON**
34	**ON**	OFF	OFF	OFF	**ON**	OFF
35	**ON**	OFF	OFF	OFF	**ON**	**ON**
36	**ON**	OFF	OFF	**ON**	OFF	OFF
37	**ON**	OFF	OFF	**ON**	OFF	**ON**
38	**ON**	OFF	OFF	**ON**	**ON**	OFF
39	**ON**	OFF	OFF	**ON**	**ON**	**ON**
40	**ON**	OFF	**ON**	OFF	OFF	OFF
41	**ON**	OFF	**ON**	OFF	OFF	**ON**
42	**ON**	OFF	**ON**	OFF	**ON**	OFF
43	**ON**	OFF	**ON**	OFF	**ON**	**ON**
44	**ON**	OFF	**ON**	**ON**	OFF	OFF
45	**ON**	OFF	**ON**	**ON**	OFF	**ON**
46	**ON**	OFF	**ON**	**ON**	**ON**	OFF
47	**ON**	OFF	**ON**	**ON**	**ON**	**ON**
48	**ON**	**ON**	OFF	OFF	OFF	OFF
49	**ON**	**ON**	OFF	OFF	OFF	**ON**
50	**ON**	**ON**	OFF	OFF	**ON**	OFF
51	**ON**	**ON**	OFF	OFF	**ON**	**ON**
52	**ON**	**ON**	OFF	**ON**	OFF	OFF
53	**ON**	**ON**	OFF	**ON**	OFF	**ON**
54	**ON**	**ON**	OFF	**ON**	**ON**	OFF
55	**ON**	**ON**	OFF	**ON**	**ON**	**ON**
56	**ON**	**ON**	**ON**	OFF	OFF	OFF
57	**ON**	**ON**	**ON**	OFF	OFF	**ON**
58	**ON**	**ON**	**ON**	OFF	**ON**	OFF
59	**ON**	**ON**	**ON**	OFF	**ON**	**ON**
60	**ON**	**ON**	**ON**	**ON**	OFF	OFF
61	**ON**	**ON**	**ON**	**ON**	OFF	**ON**
62	**ON**	**ON**	**ON**	**ON**	**ON**	OFF
63	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**

■ START input

This signal starts the positioning operation.
Select the operation data No. and turn the START input to ON to start positioning operation.

Related parameters

Parameter name	Description	Setting range	Initial value
Return-to-home incomplete alarm	Sets the alarm signal status: When the positioning operation is started while the position origin has not been set, selects whether the alarm generates or not.	0: Disable 1: Enable	0

Note When the "return-to-home incomplete alarm" parameter is set to "enable", the return-to-home incomplete alarm will generate if the positioning operation is started while the position origin has not been set.

■ SSTART input

This signal starts the sequential operation.
Positioning operation based on the next data No. will be performed every time the SSTART input turns ON.
This function is useful when multiple positioning operations must be performed sequentially, because there is no need to repeatedly select each data No.
See p.35 for sequential operation.

Related parameters

Parameter name	Description	Setting range	Initial value
Return-to-home incomplete alarm	Sets the alarm signal status: When the positioning operation is started while the position origin has not been set, selects whether the alarm generates or not.	0: Disable 1: Enable	0

Note When the "return-to-home incomplete alarm" parameter is set to "enable", the return-to-home incomplete alarm will generate if the positioning operation is started while the position origin has not been set.

■ MS0 to MS5 input

This signal starts the direct positioning operation.
When any of the MS0 to MS5 inputs is turned ON, the positioning operation corresponding to the input data No. will be performed. Since the positioning operation is enabled by turning any of the MS0 to MS5 inputs ON, you can save the steps of selecting the operation data No.
See p.36 for direct positioning operation.

Related parameters

Parameter name	Description	Setting range	Initial value
Return-to-home incomplete alarm	Sets the alarm signal status: When the positioning operation is started while the position origin has not been set, selects whether the alarm generates or not.	0: Disable 1: Enable	0
MS0 operation data No. selection	Sets operation data No. corresponding to MS0 input.	Operation data No.0 to 63	0
MS1 operation data No. selection	Sets operation data No. corresponding to MS1 input.		1
MS2 operation data No. selection	Sets operation data No. corresponding to MS2 input.		2
MS3 operation data No. selection	Sets operation data No. corresponding to MS3 input.		3
MS4 operation data No. selection	Sets operation data No. corresponding to MS4 input.		4
MS5 operation data No. selection	Sets operation data No. corresponding to MS5 input.		5

Note When the "return-to-home incomplete alarm" parameter is set to "enable", the return-to-home incomplete alarm will generate if the positioning operation is started while the position origin has not been set.

■ HOME input

This signal starts the return-to-home operation.
Turn the HOME input ON to start return-to-home operation. When the return-to-home operation is completed and the motor stops, the HOME-P output turns ON.
See p.39 for return-to-home operation.

Related parameters

Parameter name	Description	Setting range	Initial value
Home-seeking mode	Sets the mode for return-to-home operation.	0: 2-sensor mode 1: 3-sensor mode	1
Operating speed for home-seeking	Sets the operating speed for return-to-home operation.	1 to 1,000,000 Hz	1000
Acceleration/deceleration rate for home-seeking	Sets the acceleration/deceleration rate or acceleration/deceleration time for return-to-home operation.	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s)	30000
Starting speed for home-seeking	Sets the starting speed for return-to-home operation.	1 to 1,000,000 Hz	100
Position offset for home-seeking	Sets the amount of offset from mechanical home.	−8,388,608 to 8,388,607 step	0
Starting direction for home-seeking	Sets the starting direction for home detection.	0: Negative direction 1: Positive direction	1
SLIT detection with home-seeking	Sets whether or not to concurrently use the SLIT input for return-to-home operation.	0: Disable 1: Enable	0
TIM signal detection with home-seeking	Sets whether or not to concurrently use the TIM signal for return-to-home operation.	0: Disable 1: Enable	0
Backward steps in 2sensor mode home-seeking	Set the travel amount after pulling out of the limit sensor in 2-sensor mode return-to-home operation.	1 to 32767 step	200

■ FWD input, RVS input

These signals start the continuous operation. Operation is performed based on the FWD or RVS input and the operating speed corresponding to the selected operation data No.
Turn the FWD signal to ON, to perform continuous operation in the positive direction.
Turn the RVS signal to ON, to perform continuous operation in the negative direction.
The motor operates continuously while the FWD or RVS input is ON. When the FWD or RVS input is turned OFF, the motor will decelerate to a stop. If the signal of the same direction is turned ON again during deceleration, the motor will accelerate and continue operating. If the FWD and RVS inputs are turned ON simultaneously, the motor will decelerate to a stop.
When the operation data No. is changed during continuous operation, the speed will change to the one specified for the new operation data No.
See p.36 for continuous operation.

■ +JOG input, −JOG input

These signals start the JOG operation. Turn the +JOG signal to ON, to perform JOG operation in the positive direction. Turn the -JOG signal to ON, to perform JOG operation in the negative direction.
See p.38 for JOG operation.

Related parameters

Parameter name	Description	Setting range	Initial value
JOG travel amount	Sets the travel amount for JOG operation.	1 to 8,388,607 step	1
JOG operating speed	Sets the operating speed for JOG operation.	1 to 1,000,000 Hz	1000
Acceleration/deceleration rate of JOG	Sets the acceleration/deceleration rate or acceleration/deceleration time for JOG operation.	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s)	30000
JOG starting speed	Sets the starting speed for JOG operation.	0 to 1,000,000 Hz	100

■ STOP input

When the STOP input turns ON, the motor will stop. When the STOP input turns ON while a positioning operation is being performed, the balance of the travel amount will be cleared. See p.42 for stop action.

Related parameters

Parameter name	Description	Setting range	Initial value
STOP input action	Sets how the motor should stop when a STOP input is turned ON.	0: Immediate stop 1: Deceleration stop 2: Immediate stop+current OFF 3: Deceleration stop+current OFF	1

■ AWO input

When the AWO input is turned ON, the motor current will be cut off. The motor will lose its holding torque, and the output shaft can be turned with manually.

Note Do not turn the AWO input ON when driving a vertical load. Since the motor loses its holding torque, the load may drop.

■ P-PRESET input

This is a signal for the command position preset. When the P-PRESET input is turned from OFF to ON, the command position is set as the value of the "preset position" parameter. (Effective at ON-edge)
However, the preset will not execute in the following conditions.

- When an alarm is present
- When the motor is operating

Related parameters

Parameter name	Description	Setting range	Initial value
Preset position	Sets the preset position.	−8,388,608 to 8,388,607 step	0

■ ALM-RST input

When an alarm generates, the ALM output will turn OFF and the motor will stop. When the ALM-RST input is turned from OFF to ON, the ALM output will turn ON and the alarm will be reset. (The alarm will be reset at the ON edge of the ALM-RST input.) Always reset an alarm after removing the cause of the alarm and after ensuring safety. Note that some alarms cannot be reset with the ALM-RST input. See p.117 for alarm descriptions.

■ HMI input

When the HMI input is turned ON, the function limitation of the **OPX-2A** or **MEXE02** will be released. When the HMI input is turned OFF, the function limitation will be imposed.

- I/O test
- Test operation
- Teaching
- Download the parameters
- Initialize the parameters

Note If the HMI input is not assigned to the input terminal, the HMI input will always become ON (function limitation release). When assigning to both direct I/O and network I/O, the function will be executed when both of them are set to ON.

■ +LS input, −LS input

These signals are input from the applicable limit sensors. The +LS input is for the +side sensor and the −LS input is for the −side sensor.
Return-to-home operation: Operates according to the return-to-home sequence when detecting +LS input or −LS input.
Any other operation: Detect the hardware overtravel and stop the motor. See p.42 for hardware overtravel.

Related parameters

Parameter name	Description	Setting range	Initial value
Hardware overtravel	Sets whether to enable or disable hardware overtravel detection using ±LS inputs.	0: Disable 1: Enable	1
Overtravel action	Sets the motor stop action to take place upon the occurrence of overtravel.	0: Immediate stop 1: Deceleration stop	0

■ HOMES input

This is an input signal from the HOME sensor. The mechanical home position is detected when using 3-sensor mode return-to-home operation. See p.39 for return-to-home operation.

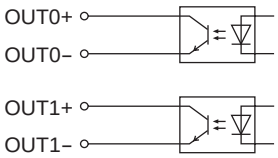
■ SLIT input

Connect when detecting the home position using a slit disk etc. When detecting the home, use of the SLIT input in addition to the HOMES will increase the accuracy of home detection.
See p.39 for return-to-home operation.

9.4 Output signals

The driver outputs signals in the photocoupler/open-collector output mode or line driver output mode. The signal state represents the "ON: Carrying current" or "OFF: Not carrying current" state of the internal photocoupler rather than the voltage level of the signal.

■ Internal output circuit



■ ALM output

When an alarm generates, the ALM output will turn OFF. At the same time, the ALM LED of the driver will blink and the motor current will be cut off and stop. The ALM output is normally closed.
See p.117 for alarm descriptions.

Related parameters

Parameter name	Description	Setting range	Initial value
Return-to-home incomplete alarm	Sets the alarm signal status: When the positioning operation is started while the position origin has not been set, selects whether the alarm generates or not.	0: Disable 1: Enable	0
Communication timeout	Sets the condition in which a communication timeout occurs in RS-485 communication.	0: Not monitored 0 to 10000 ms	0
Communication error alarm	Sets the condition in which a RS-485 communication error alarm generates. A communication error alarm generates after a RS-485 communication error has occurred by the number of times set here.	1 to 10 times	3

■ WNG output

When a warning generates, the WNG output turns ON. See p.120 for warning descriptions.

Related parameters

Parameter name	Description	Setting range	Initial value
Overheat warning	Sets the temperature at which a main circuit overheat warning generates.	40 to 80 °C (104 to 176 °F)	80
Overvoltage warning	Sets the voltage at which an overvoltage warning generates.	150 to 420 (1=0.1 V)	420
Undervoltage warning	Sets the voltage at which an undervoltage warning generates.		180

■ READY output

When the driver becomes ready, the READY output turns ON. Input operating commands after the READY output has turned ON. The READY output turns ON when all of the following conditions are satisfied.

- All inputs which start operation are OFF
- The FREE input is OFF*
- The AWO input is OFF
- The STOP input is OFF
- An alarm is not present.
- The motor is not operating.
- Test operation, downloading, initializing or teaching function was not performed using the **OPX-2A**.
- Test function, downloading or teaching function was not performed using the **MEXE02**.
- Configuration commands, all data initialization commands and batch NV memory read commands are not executed via RS-485 communication.

∗ The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

■ HOME-P output

The HOME-P output turns ON corresponding to the setting of the "HOME-P function selection" parameter.

- When "HOME-P function selection" parameter is set to "home output":

When the command position is in the home-position while the MOVE output is OFF, the HOME-P output will turn ON. However, the HOME-P output remains OFF when the position origin for the motor has not been set.

- When "HOME-P function selection" parameter is set to "return-to-home complete output":

Regardless of the command position, if the position origin for the motor is set, the HOME-P output will turn ON. Therefore, it turns ON after completing the return-to-home operation or preset. Once the HOME-P output turns ON, it will not turn OFF until the motor has moved from the position origin.
See p.43 for setting the position origin.

Related parameters

Parameter name	Description	Setting range	Initial value
HOME-P function selection	Selects the HOME-P output function.	0: Home output 1: Return-to-home complete output	0

■ MOVE output

The MOVE output turns ON while the motor is operating.

Related parameters

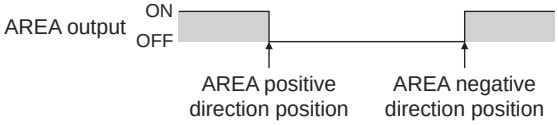
Parameter name	Description	Setting range	Initial value
Minimum ON time for MOVE output	Sets the minimum ON time for MOVE output.	0 to 255 ms	0

■ AREA1 output to AREA3 output

The AREA output turns ON when the motor is inside the area set by the parameters. It turns ON when the motor is inside the area even when the motor stops.

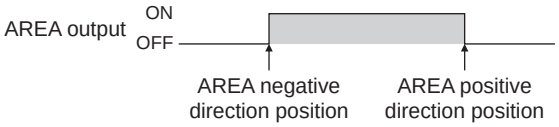
- When the "AREA positive direction position" parameter ≤ "AREA negative direction position" parameter

To turn the AREA output ON: Motor position ≤ AREA positive direction position, or AREA negative direction position ≤ Motor position



- When the "AREA positive direction position" parameter ≥ "AREA negative direction position" parameter

  To turn the AREA output ON: AREA negative direction position ≤ Motor position ≤ AREA positive direction position



- When the "AREA positive direction position" parameter = "AREA negative direction position" parameter

  To turn the AREA output ON: Motor position = AREA negative direction position = AREA positive direction position

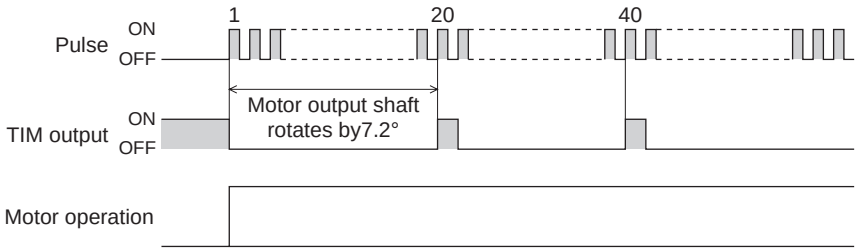
Note The motor position is the command position when turning the AREA1 to AREA3 output ON.

Related parameters

Parameter name	Description	Setting range	Initial value
AREA1 positive direction position	Sets the AREA1 positive direction position.	−8,388,608 to 8,388,607 step	0
AREA1 negative direction position	Sets the AREA1 negative direction position.		
AREA2 positive direction position	Sets the AREA2 positive direction position.		
AREA2 negative direction position	Sets the AREA2 negative direction position.		
AREA3 positive direction position	Sets the AREA3 positive direction position.		
AREA3 negative direction position	Sets the AREA3 negative direction position.		

■ TIM output

The TIM output will turn ON every time the motor output shaft rotates by 7.2°. If the command speed is faster than 500 Hz, TIM output will not be output correctly.



Note When the TIM output is used, set the resolution to be an integral multiple of 50.

■ S-BSY output

This output is turned ON when the motor is in internal processing state. The motor will be in internal processing state at the following condition.

- The maintenance command is in progress via RS-485 communication.

■ Response output

The response output is the output signal that shows the ON/OFF status corresponding to the input signals.
The following tables show the correspondence between the input signals and output signals.

Input signal	Output signal
FWD	FWD_R
RVS	RVS_R
HOME	HOME_R
START	START_R
SSTART	SSTART_R
+JOG	+JOG_R
−JOG	−JOG_R
MS0	MS0_R
MS1	MS1_R
MS2	MS2_R
MS3	MS3_R
MS4	MS4_R
MS5	MS5_R

Input signal	Output signal
FREE*	FREE_R
AWO	AWO_R
STOP	STOP_R
M0	M0_R
M1	M1_R
M2	M2_R
M3	M3_R
M4	M4_R
M5	M5_R
+LS	+LS_R
−LS	−LS_R
HOMES	HOMES_R
SLIT	SLIT_R

* The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

Note The response output is the output signal to return the status of the input signal. Therefore, the output signals corresponding to the input signals for motor operation (START_R output etc.) do not show the movement of the motor itself.

9.5 General signals (R0 to R15)

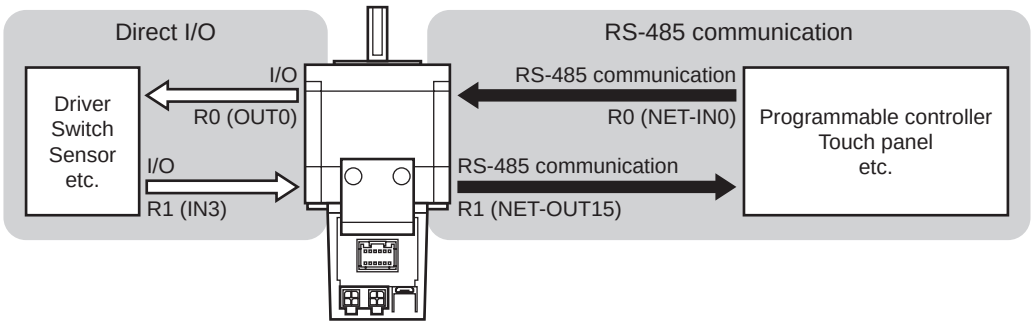
R0 to R15 are general signals that enable control via RS-485 communication.
Using R0 to R15, I/O signals for the external device can be controlled by the master device via the motor. Direct I/O of the driver can be used as an I/O unit.
See following example for setting of the general signals.

- When outputting the signals from the master device to the external device

Assign the general signal R0 to the OUT0 output and NET-IN0.
When setting the NET-IN0 to 1, the OUT0 output turns ON. When setting the NET-IN0 to 0, the OUT0 output turns OFF.

- When inputting the output of the external device to the master device

Assign the general signal R1 to the IN3 input and NET-OUT15.
When turning the IN3 input ON by the external device, the NET-OUT15 becomes 1. When turning the IN3 input OFF, the NET-OUT15 becomes 0.
The logic level of the IN3 input can be set using "IN3 logic level setting" parameter.



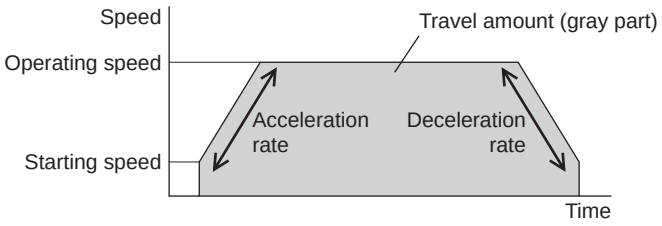
10 Operation

This chapter explains the types of operation and timing charts.

10.1 Operation types

■ Positioning operation

Positioning operation is an operation in which motor operating speed, position (distance) and other items are set as operation data and then executed. When the positioning operation is executed, the motor begins at the starting speed and accelerates until the operating speed is reached. Then, once the operating speed is reached, that speed is maintained. The motor decelerates when the stopping position approaches, and finally comes to a stop.



The acceleration/deceleration in the positioning operation can be set as follows using the "acceleration/deceleration type" parameter:

Separate: The acceleration/deceleration set under the applicable operation data No. will be followed.
The acceleration/deceleration in linked-motion operation corresponds to the acceleration/deceleration specified for the operation data No. with which the linked-motion operation is started.

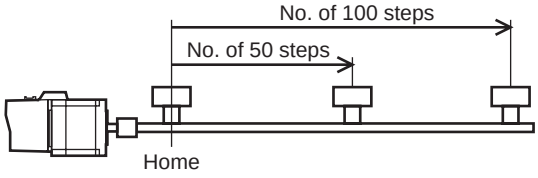
Common: The setting of the "common acceleration" and "common deceleration" parameter will be followed.

- Positioning modes

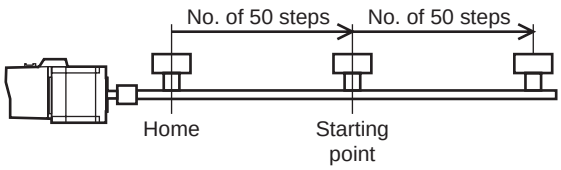
The following two operation modes are available:

- Absolute mode: The position (distance) from home is set [Absolute positioning].
- Incremental mode: Each motor destination becomes the starting point for the next movement. This mode is suitable when the same position (distance) is repeatedly used [Incremental positioning].

• Absolute mode



• Incremental mode



- Positioning pattern

Positioning operation can be performed in the following five patterns:

- Single-motion operation ..... A single operation data set is executed.
- Linked-motion operation ..... Multiple sets of operation data are linked to perform continuous positioning operation.
- Linked-motion operation 2 ..... Linked-motion operation is performed with the dwell time function. Dwell time refers to a wait time before the next positioning operation is performed. Operation data whose rotating direction is different can also be linked.
- Sequential operation ..... Positioning operation is performed to the next operation data No. every time a SSTART input signal is input.
- Direct positioning operation ..... When any of the MS0 to MS5 inputs is turned ON, the positioning operation corresponding to the input data No. will perform.

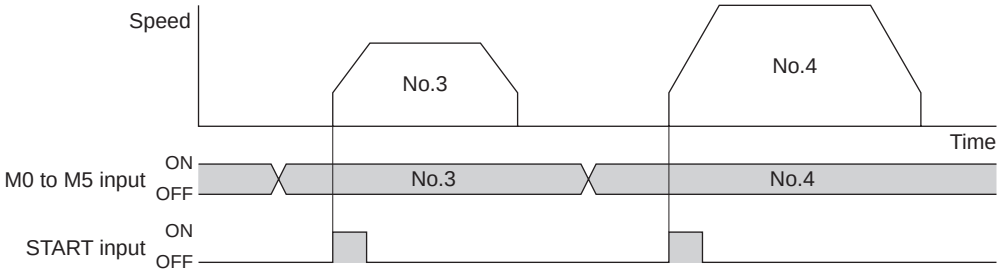
- Selecting the operation data No.

Select an operation data based on a combination of ON/OFF status of the M0 to M5 inputs.
See p.24 for selecting the operation data No.

Operation data No.	M5	M4	M3	M2	M1	M0
0	OFF	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	OFF	**ON**
2	OFF	OFF	OFF	OFF	**ON**	OFF
• • •	• • •	• • •	• • •	• • •	• • •	• • •
61	**ON**	**ON**	**ON**	**ON**	OFF	**ON**
62	**ON**	**ON**	**ON**	**ON**	**ON**	OFF
63	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**

- Single-motion operation

The positioning operation is performed only once using a single operation data set.
To perform single-motion operation, set "operating mode" to "single" using operation data.
Data Nos.3 and 4 shows the operation profile when motion profiles are set as "single".



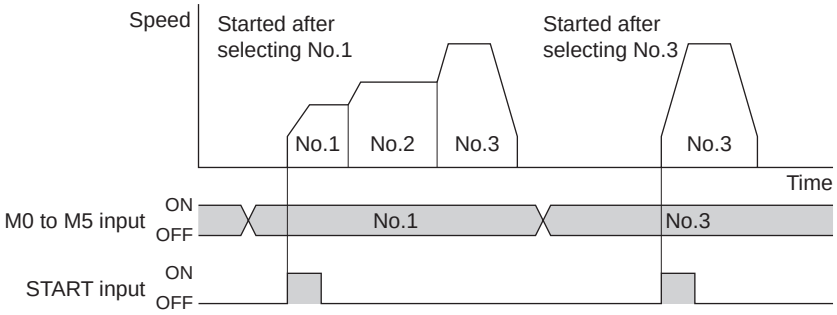
- Linked-motion operation

When setting the "operating mode" to "link", using operation data, positioning operation based on the next data number will be performed, without stopping the motor.
A maximum of 4 operation data can be linked.
If operation data includes data for which "single" is set, the motor will stop after the positioning with respect to the "single" operation data is completed.
Note that only operation data of the same direction can be linked.

Example of linked-motion operation

Data No.	Operating mode
1	Link
2	Link
3	Single

- If data No.1 is selected, positioning will be performed continuously for Nos.1 to 3.
- If data No.3 is selected, single-motion operation will be performed only for No.3.



Note

- Multiple operation data of different directions cannot be linked. An operation data error alarm will generate during operation.
- Up to four sets of operation data can be linked. When combining the linked-motion operation and the linked-motion operation 2, make sure the total number of linked operation data sets does not exceed four. When linked-motion operation is performed with five or more sets of operation data linked together, an operation data error alarm will generate upon start of operation.
- No.0 will not be linked even when "link" is set for data No. 63, because the operation pertaining to No. 63 will be processed independently.
- The acceleration/deceleration in linked-motion operation corresponds to the acceleration/deceleration specified for the operation data No. with which the linked-motion operation is started.

- Linked-motion operation 2

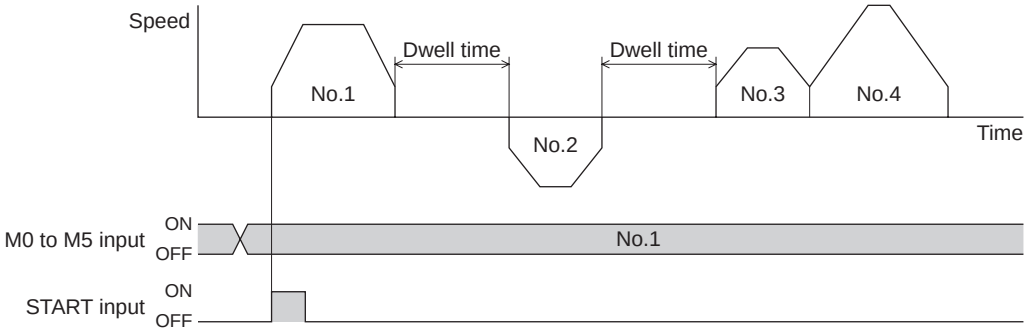
By setting the "operation mode" of operation data to "link2," an operation data whose rotating direction is different can be linked. In this case, the system stops for the dwell time after each positioning operation, and then performs operation according to the next operation data. If operation data includes data for which "single" is set, the motor will stop after the positioning with respect to the "single" operation data is completed.

Note

- Up to four sets of operation data can be linked. When combining the linked-motion operation and the linked-motion operation 2, make sure the total number of linked operation data sets does not exceed four. When linked-motion operation is performed with five or more sets of operation data linked together, an operation data error alarm will generate upon start of operation.
- No.0 will not be linked even when "link2" is set for data No. 63, because the operation pertaining to No. 63 will be processed independently.

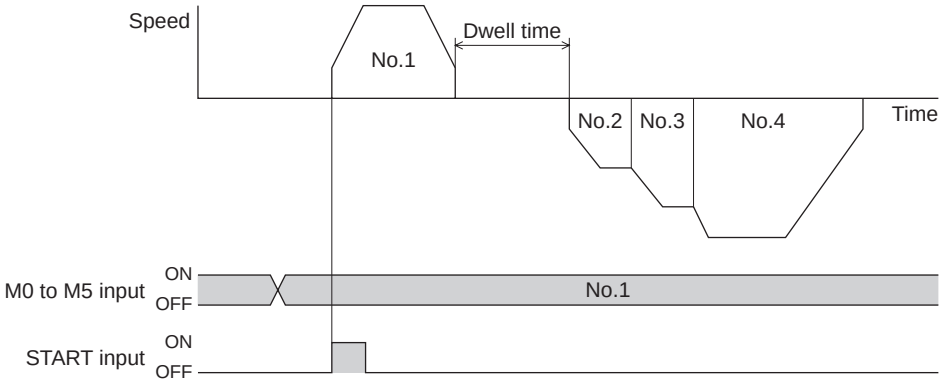
Example of linked-motion operation2

Data No.	Operating mode	Rotating direction	Dwell time
1	Link2	Positive	Set
2	Link2	Negative	Set
3	Link2	Positive	Not set
4	Single	Positive	N/A



When combining the linked-motion operation and the linked-motion operation 2

Data No.	Operating mode	Rotating direction	Dwell time
1	Link2	Positive	Set
2	Link	Negative	N/A
3	Link	Negative	N/A
4	Single	Negative	N/A



- Sequential operation

When the "sequential positioning" value of the operation data is set to "enable", positioning operation is performed for the next operation data No. every time the SSTART input turns ON. This function is useful when multiple positioning operations must be performed sequentially, because there is no need to select each data number.
When the "sequential positioning" of operation data is executed up to the data No. set to "disable", the operation returns to the original data No. that was selected before starting the sequential operation. And the sequential operation will start again.
If the starting point for the sequential operation is changed using the M0 to M5 inputs or the MS0 to MS5 inputs, multiple sequential operations can be set.

How to perform the sequential operation

1. Selects the data No.(n) for the starting point for the sequential positioning and perform the positioning operation by turning the START input ON.
2. Turn the SSTART input ON.
   Perform positioning operation based on data No.(n+1).
3. Turn the SSTART input ON again.
   Perform positioning operation based on data No.(n+2).
   The operation data No. that the sequential positioning is set to disable will not perform. The positioning operation will start again after returning to the operation data No.(n).

Note

- The operation data No.0 is set to the starting point when turning the power ON.
- The operation data No.0 is set to the starting point when the following operations are performed. And the current operation data No. is set to "−1".
  · When the motor power is turned ON again
  · When operations other than the positioning operation are performed (return-to home operation, continuous operation, etc.)
  · When an alarm is generated and reset
  · When the STOP input is turned ON
  · When the command turning the excitation OFF is input (when FREE* or AWO is turned ON)
  · When the P-PRESET is executed
  · When a configuration is executed
- When the operation function is set to "link" or "link2", set all of the linked operation data No. to the sequential positioning.

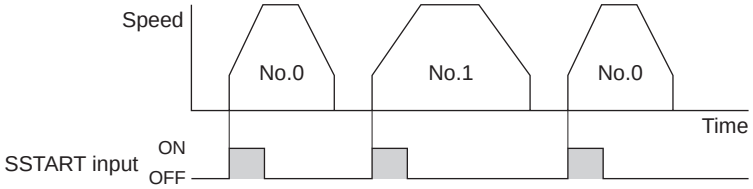
* The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

Example of sequential operation

Data No.	Operating mode	Sequential operation
0	Single	Set
1	Single	Set
2	Single	Not set
3	Single	Set
4	Link	Set
5	Single	Set
6	Single	Not set

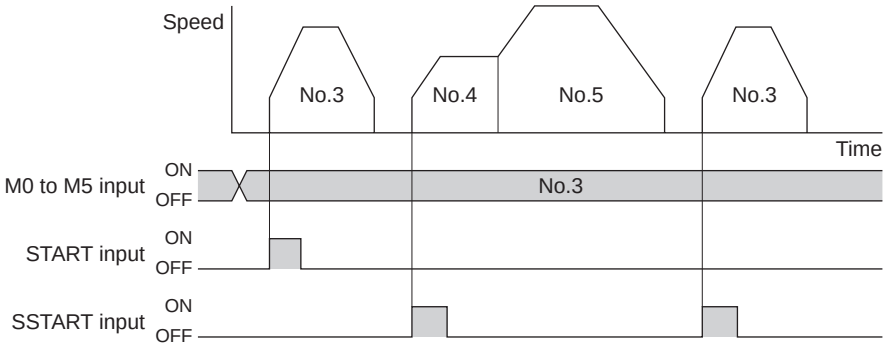
Perform sequential operation after power supply is turned on

When the SSTART input is turned ON after power supply is turned on, a positioning operation is performed based on data No.0. When a SSTART input is turned ON again, a positioning operation is performed based on data No.1. Then, when a SSTART input is turned ON again, the driver returns to No.0 and performs a positioning operation based on data No.0, since "sequential operation" is set to "disable" for data No.2.



When the sequential positioning operation is performed from data No.3 to 5.

When the START input is turned ON with No.3 selected, a positioning operation is performed based on data No.3. When the SSTART input is turned ON, positioning operations are performed based on data No.4 and 5. Then, when a SSTART input is turned ON again, the driver returns to No.3 and performs a positioning operation based on data No.3, since "sequential operation" is set to "disable" for data No.6.



- Direct positioning operation

When any of the MS0 to MS5 inputs is turned ON, the positioning operation corresponding to the input data No. will be performed. Since the positioning operation is enabled by turning any of the MS0 to MS5 inputs ON, you can save the step of selecting the operation data No.

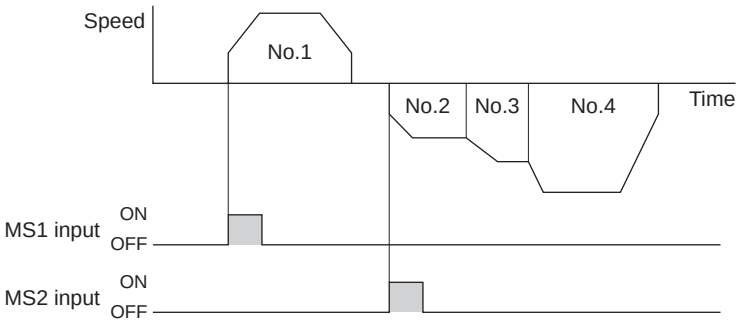
Example of direct positioning operation

• Operation data

Data No.	Operating mode	Rotating direction
1	Single	Positive
2	Link	Negative
3	Link	Negative
4	Single	Negative

• Parameter

Parameter name	Setting value
MS1 operation No. selection	1
MS2 operation No. selection	2



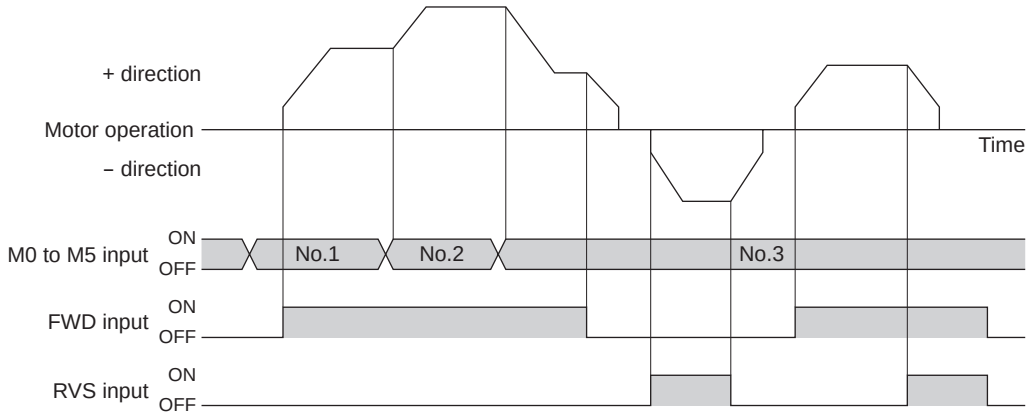
- Stop the positioning operation

When the STOP input is turned ON, the current positioning operation stops.
The stopping mode is determined by the setting of the "STOP input action" parameter.

■ Continuous operation

The motor operates continuously while the FWD or RVS input is ON.
Operation is performed based on the FWD or RVS input and the operating speed corresponding to the selected operation data No.
When the operation data No. is changed during continuous operation, the speed will change to the speed specified by the new operation data No.
When the FWD or RVS input is turned OFF, the motor will decelerate to a stop. If the signal of the same direction is turned ON again during deceleration, the motor will accelerate and continue operating.
If the FWD and RVS inputs are turned ON simultaneously, the motor will decelerate to a stop.

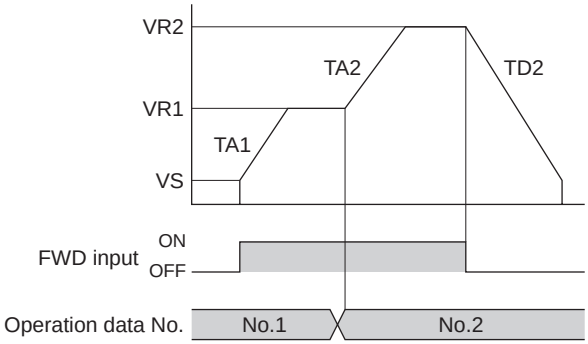
The acceleration/deceleration in the continuous operation can be set as follows using the "acceleration/deceleration type" parameter:
Separate: The acceleration/deceleration set under the applicable operation data No. will be followed.
Common: The setting of the "common acceleration" and "common deceleration" parameter will be followed.



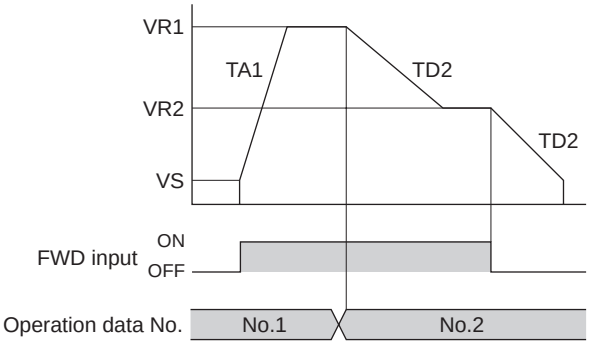
- Variable speed operation: When acceleration/deceleration is "separate"

Acceleration/deceleration unit: ms/kHz

When accelerating

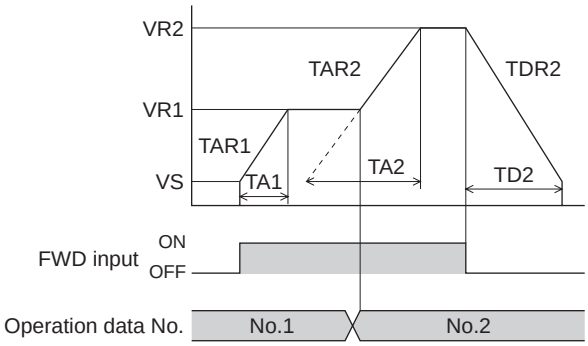


When decelerating

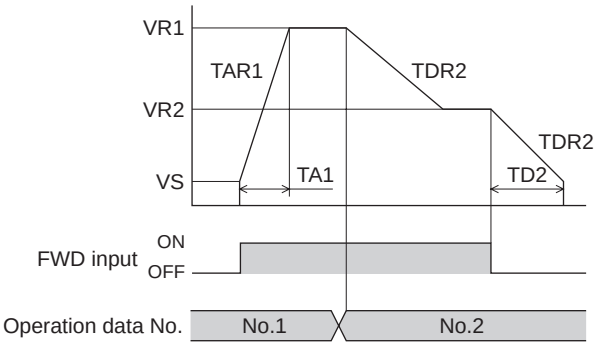


Acceleration/deceleration unit: s

When accelerating



When decelerating



- Explanation of labels

VS: Starting speed (Hz)
VR1: Operating speed of operation data No.1 (Hz)
VR2: Operating speed of operation data No.2 (Hz)
TA1: Acceleration of operation data No.1
TA2: Acceleration of operation data No.2
TD2: Deceleration of operation data No.2
TAR1: Acceleration rate of operation data No.1 (ms/kHz)
TAR2: Acceleration rate of operation data No.2 (ms/kHz)
TDR2: Deceleration rate of operation data No.2 (ms/kHz)

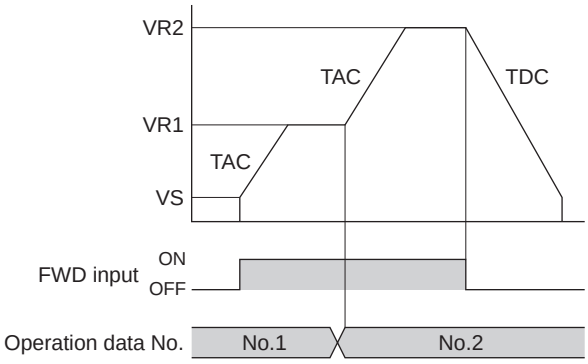
- Calculation method for acceleration/deceleration rate

TAR1 = (VR1 - VS)/ TA1
TAR2 = (VR2 - VS)/ TA2
TDR2 = (VR2 - VS)/ TD2

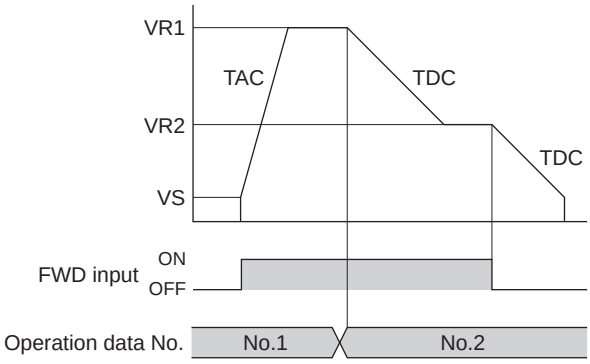
• Variable speed operation: When acceleration/deceleration is "common "

Acceleration/deceleration unit: ms/kHz

When accelerating

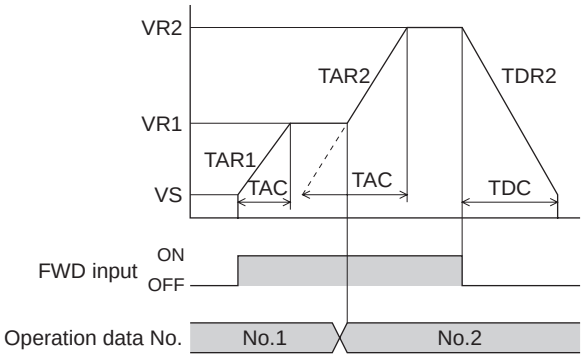


When decelerating

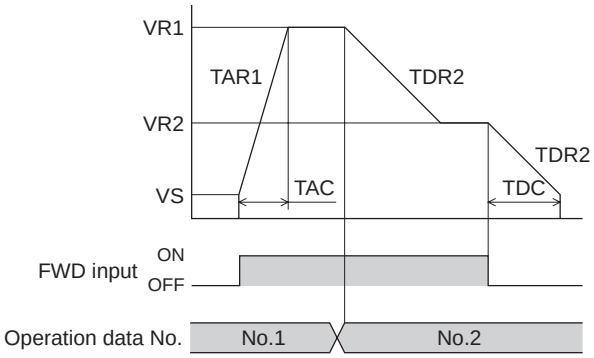


Acceleration/deceleration unit: s

When accelerating



When decelerating



• Explanation of labels

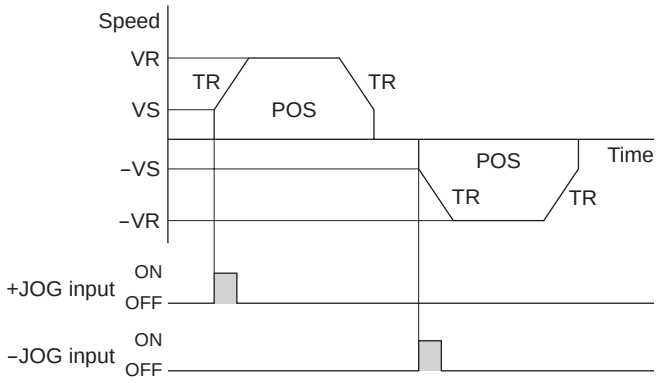
VS: Starting speed (Hz)
VR1: Operating speed of operation data No.1 (Hz)
VR2: Operating speed of operation data No.2 (Hz)
TAC: Common acceleration
TDC: Common deceleration
TAR1: Acceleration rate of operation data No.1 (ms/kHz)
TAR2: Acceleration rate of operation data No.2 (ms/kHz)
TDR1: Deceleration rate of operation data No.1 (ms/kHz)
TDR2: Deceleration rate of operation data No.2 (ms/kHz)

• Calculation method for acceleration/deceleration rate

TAR1 = (VR1 - VS)/ TAC
TAR2 = (VR2 - VS)/ TAC
TDR2 = (VR2 - VS)/ TDC

■ JOG operation

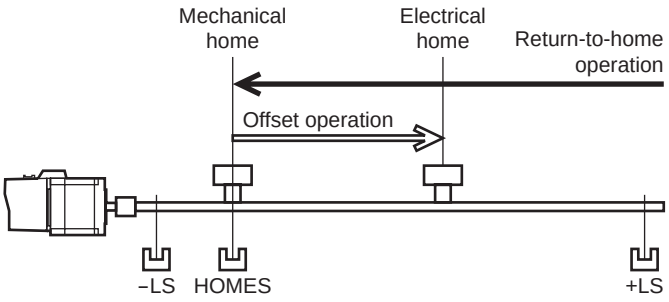
When the +JOG signal to ON, JOG operation is in the positive direction.
When the −JOG signal to ON, JOG operation is in the negative direction.



POS: JOG travel amount
VR: JOG operating speed
TR: JOG acceleration/deceleration rate
VS: JOG starting speed

■ Return-to-home operation

Return-to-home operation is an operation in which the reference point of positioning (mechanical home position) is detected automatically.
When a HOME is turned ON, a return-to-home operation is started in the preset direction.
When an offset from the mechanical home is set in the “position offset of home-seeking” parameter, the offset position becomes the home. This home is called the electrical home.
If the “position offset of home-seeking” parameter is “0,” the mechanical home and electrical home will become the same.

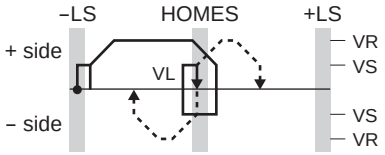
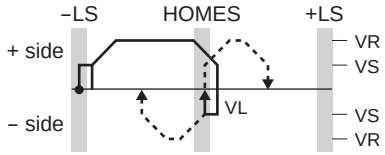
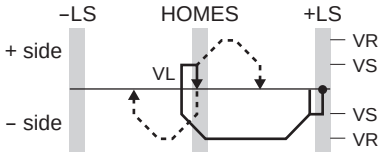
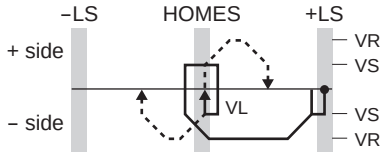
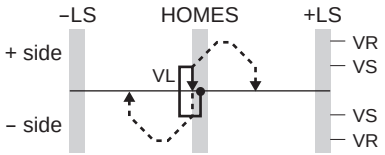
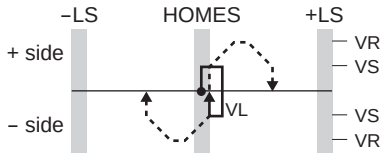
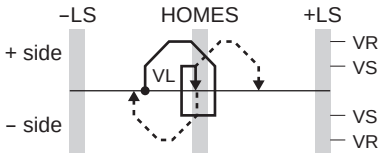
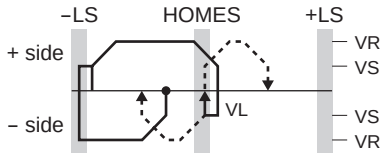
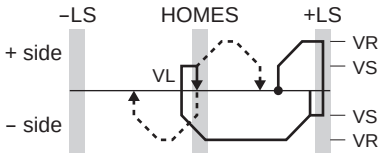
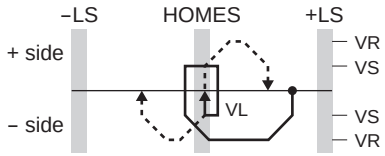


Two home detection modes are available: 3-sensor mode (high-speed operation) and 2-sensor mode (constant-speed operation). The desired mode can be set using the “home-seeking mode” parameter.
The operation pattern varies depending on the starting direction and position of home detection. In the 2-sensor mode, a rectangular pattern is performed.

Operation sequence of the 3-sensor mode

The home is detected using the three sensors; +LS, −LS and HOMES. The ON edge of HOMES defines the home.

- - - Broken line indicates a home offset move.

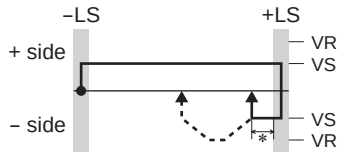
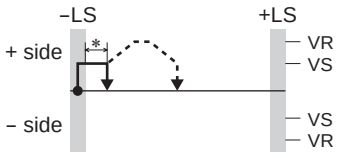
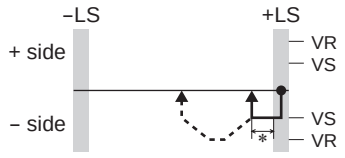
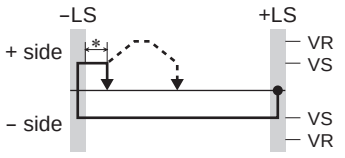
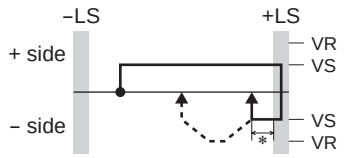
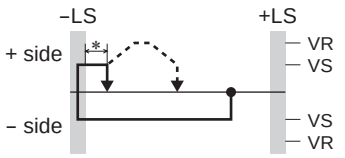
Starting position of return-to-home operation	Starting direction of return-to-home operation: Positive side	Starting direction of return-to-home operation: Negative side
−LS		
+LS		
HOMES		
Between HOMES and −LS		
Between HOMES and +LS		

VS: Starting speed of return-to-home
VR: Operating speed of return-to-home
VL: Last speed of return-to-home
When VS < 500 Hz: VS
When VS≧500 Hz: 500 Hz

Operation sequence of the 2-sensor mode

The home is detected using +LS and –LS. When the motor pulls off of the limit sensor and both +LS and –LS turn OFF, the applicable position will be used to define the home.

- - - Broken line indicates a home offset move.

Starting position of return-to-home operation	Starting direction of return-to-home operation: Positive side	Starting direction of return-to-home operation: Negative side
–LS		
+LS		
Between –LS and +LS		

VS: Starting speed of return-to-home
VR: Operating speed of return-to-home

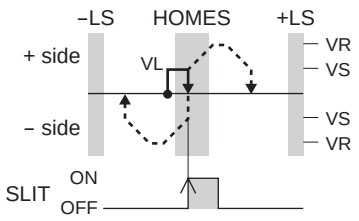
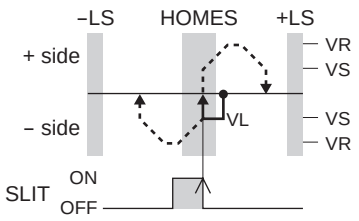
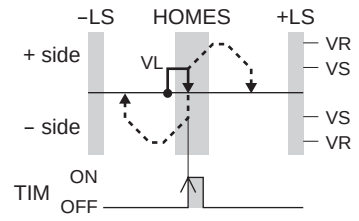
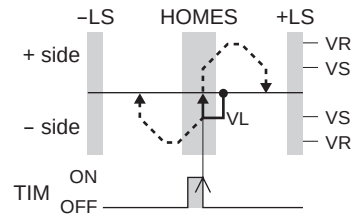
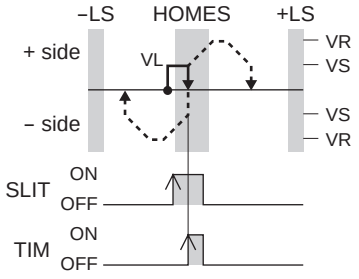
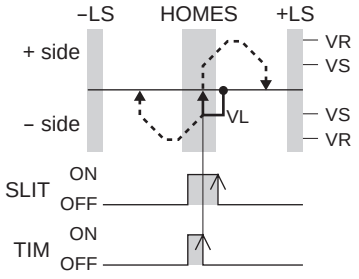
∗ After pulling out of the limit sensor, the motor moves only the value set in the "backward steps in 2sensor mode home-seeking" parameter. (Initial value: 200 step)

- When concurrently using the SLIT input and/or TIM signal for return-to-home operation

When detecting the home, use of the SLIT input and/or TIM signal will increase the accuracy of home detection. When concurrently using the SLIT input and TIM signal, adjust the home position so that the TIM signal can be detected while the SLIT input ON. When using the 3-sensor mode, adjust the home position so that all signals can be detected while the HOMES input ON.

Operation sequence for the last home-seeking of the 3-sensor mode

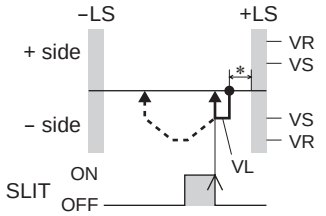
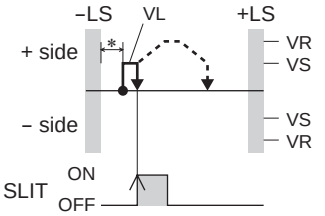
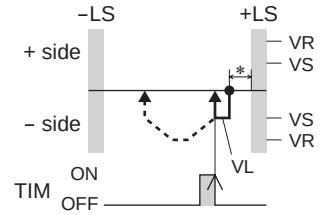
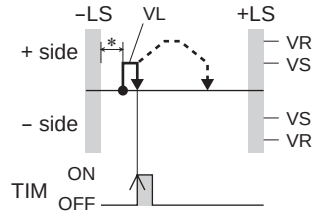
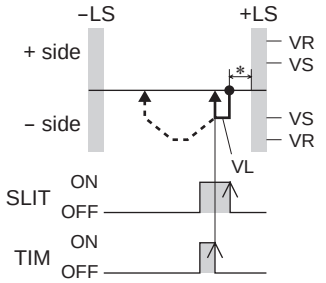
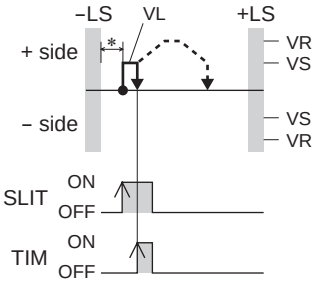
- - - Broken line indicates a home offset move.

Signal type	Starting direction of return-to-home operation: Positive side	Starting direction of return-to-home operation: Negative side
SLIT input		
TIM signal		
SLIT input and TIM signal		

VS: Starting speed of return-to-home
VR: Operating speed of return-to-home
VL: Last speed of return-to-home
When VS < 500 Hz: VS
When VS≧500 Hz: 500 Hz

Operation sequence for the last motion home-seeking of the 2-sensor mode

- - - Broken line indicates a home offset move.

Signal type	Starting direction of return-to-home operation: Positive side	Starting direction of return-to-home operation: Negative side
SLIT input		
TIM signal		
SLIT input and TIM signal		

VS: Starting speed of return-to-home
VR: Operating speed of return-to-home
VL: Last speed of return-to-home
When VS < 500 Hz: VS
When VS≧500 Hz: 500 Hz

∗ After pulling out of the limit sensor, the motor moves only the value set in the "backward steps in 2sensor mode home-seeking" parameter. (Initial value: 200 step)

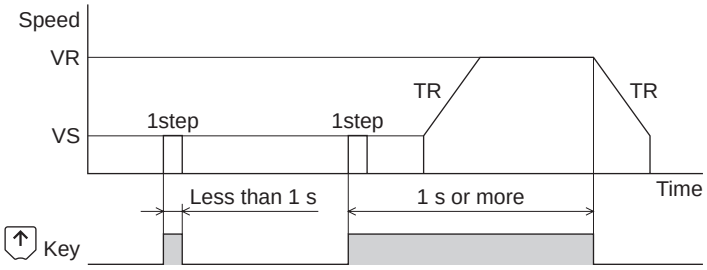
■ Test operation

Test operation is performed using the **OPX-2A** or **MEXE02**. JOG operation and teaching function can be performed.

- JOG operation

Connection condition or operation status for the motor can be checked using JOG operation. Refer to the operating manual for each product.

Example: When performing JOG operation with the **OPX-2A**



VS: JOG starting speed
VR: JOG operating speed
TR: Acceleration/deceleration rate of JOG

- Teaching

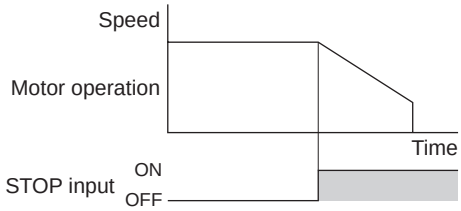
This is a function to move the motor using the **OPX-2A** or **MEXE02** and set the current position as the position (travel amount) of the operation data. When the position (travel amount) is set using teaching function, the "operation mode" will always be the absolute mode. The operating speed, acceleration/deceleration speed and starting speed of teaching function are same as those of JOG operation.

Note Perform teaching function when the position origin is set. See p.43 for setting the position origin.

■ Stop operation

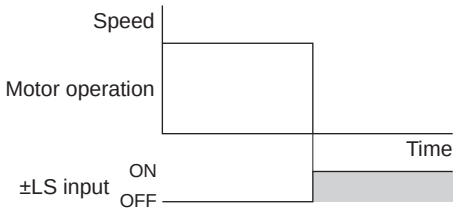
- STOP action

When the STOP input is turned ON or STOP is commanded via RS-485 communication while the motor is operating, the motor will stop. The stopping mode is determined by the setting of the “STOP input action” parameter.
For example, the operation when setting "STOP input action" parameter to "deceleration stop" is shown in the figure to the right.



- Hardware overtravel

Hardware overtravel is the function that limits the operation range by installing the limit sensor (±LS) at the upper and lower limit of the operation range.
If the "hardware overtravel" parameter is set to "enable", the motor can be stopped when detecting the limit sensor.
The stopping mode is determined by the setting of “overtravel action” parameter.
The operation example when setting the "overtravel action" parameter to "immediate stop" is shown in the figure to the right.

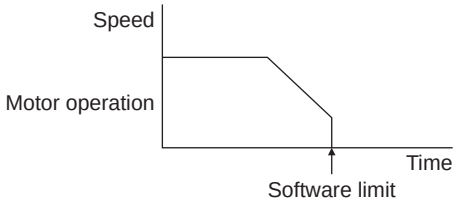


Related parameters

Parameter name	Description	Setting range	Initial value
Hardware overtravel	Sets whether to enable or disable hardware overtravel detection using ±LS inputs.	0: Disable 1: Enable	1
Overtravel action	Sets the motor action to take place upon the occurrence of overtravel.	0: Immediate stop 1: Deceleration stop	0

- Software overtravel

The software overtravel is a function that limits the range of movement via software settings.
If the "software overtravel" parameter is set to "enable", the motor can be stopped when exceeding the software limit.
The stopping mode is determined by the setting of “overtravel action” parameter.
The operation pattern shown on the right applies when an operation where a soft limit is to be exceeded is started.



Note

- Software overtravel will become effective after the position origin is set. See p.43 for setting the position origin.
- When the value of the software limit is changed while the motor is operating, the motor will stop based on the setting of “overtravel action” parameter.

Related parameters

Parameter name	Description	Setting range	Initial value
Software overtravel	Sets whether to enable or disable software overtravel detection using soft limits.	0: Disable 1: Enable	1
Positive software limit	Sets the value of soft limit in positive direction.	−8,388,608 to 8,388,607 step	8,388,607
Negative software limit	Sets the value of soft limit in negative direction.	−8,388,608 to 8,388,607 step	−8,388,608

- Escape from the limit sensor

It is possible to escape in the negative direction when detecting the positive direction limit, and possible to escape in the positive direction when detecting the negative direction limit.
The following operations can be used when escaping from the limit sensor.

Types of operation	Limit sensors (±LS)	Software limit
Positioning operation	Will not operate (unable to escape)	Allowed to operate (able to escape)
Continuous operation Return-to-home operation Test operation	Allowed to operate (able to escape)	

■ Position coordinate management

The motor manages the position information.

- Position origin for the driver

The position origin will be set whenever one of the following operations is executed:
- Return-to-home operation
- P-PRESET input is turned ON

The position origin will be undefined whenever one of the following operations is executed:
- The motor's power is cycled
- The motor current is removed
- The configuration command is performed

If the "return-to-home incomplete alarm" parameter is set to "enable", positioning operations can be prohibited while the position origin has not been set. The return-to-home incomplete alarm will generate if the START input, SSTART input or the MS0 to MS5 inputs are turned ON while the position origin has not been set. See p.117 for alarm.

Related parameters

Parameter name	Description	Setting range	Initial value
Return-to-home incomplete alarm	Sets the alarm signal status: When the positioning operation is started while the position origin has not been set, selects whether the alarm generates or not.	0: Disable 1: Enable	0

- Wrap function

The wrap function is a function that resets the command position to 0 whenever the command position exceeds the set value by the “wrap setting range” parameter.
The command position varies in a range of "0 to (wrap setting value−1)."

Related parameters

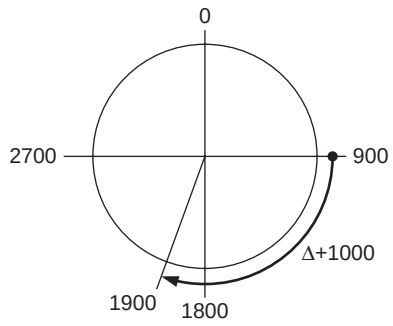
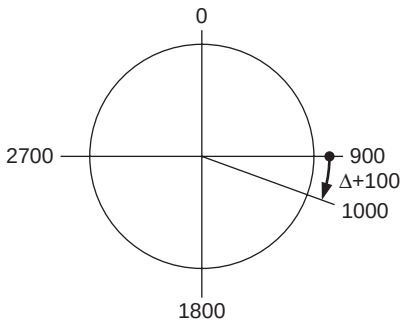
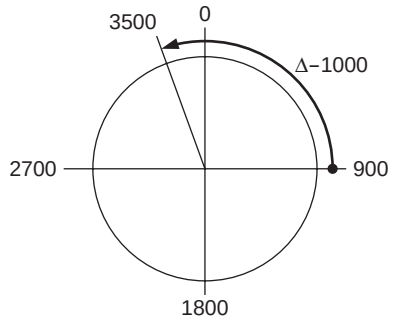
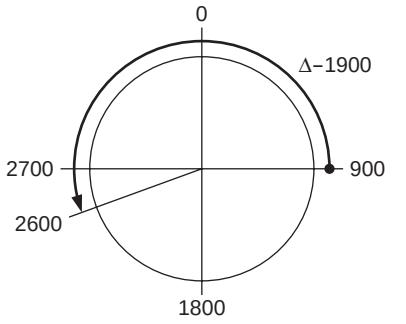
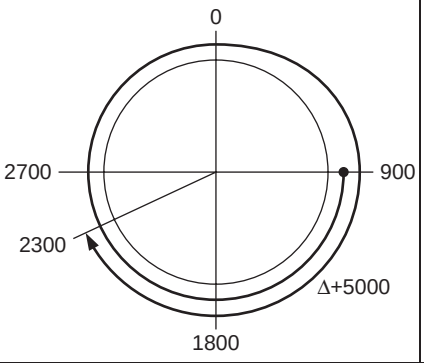
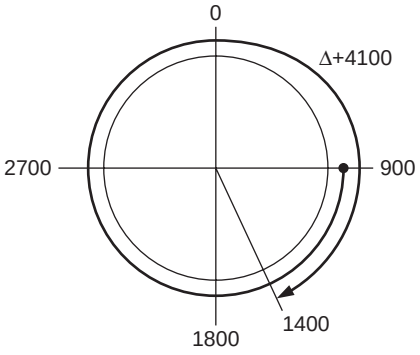
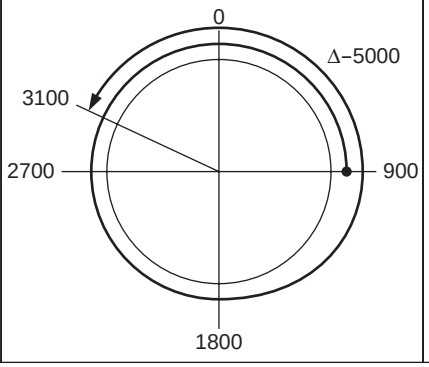
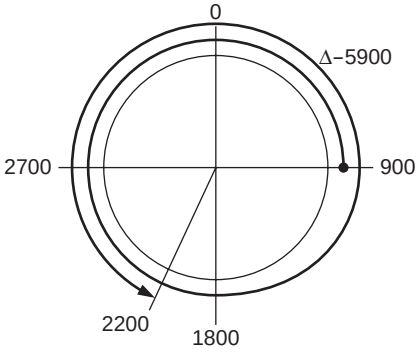
Parameter name	Description	Setting range	Initial value
Wrap setting	Sets enable/disable for the wrap function.	0: Disable 1: Enable	0
Wrap setting range	Sets the wrap setting range.	1 to 8,388,607 step	500

Note When setting the " wrap setting" parameter to "enable", the software overtravel will be disabled. (It is disabled even when setting the "software overtravel" parameter to "enable".)

Example for wrap function

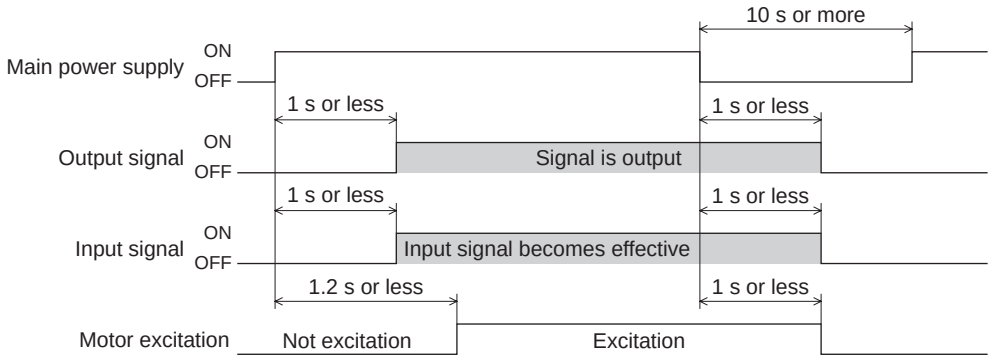
Example of operation when the positioning operation is performed in following conditions.

- Wrap setting range: 3600
- Resolution: 500 P/R (“Electronic gear A” parameter=1, “Electronic gear B” parameter=1)
- Command position: 900

Position	Operation mode: Incremental	Operation mode: Absolute
+1000		
−1000		
+5000		
−5000		

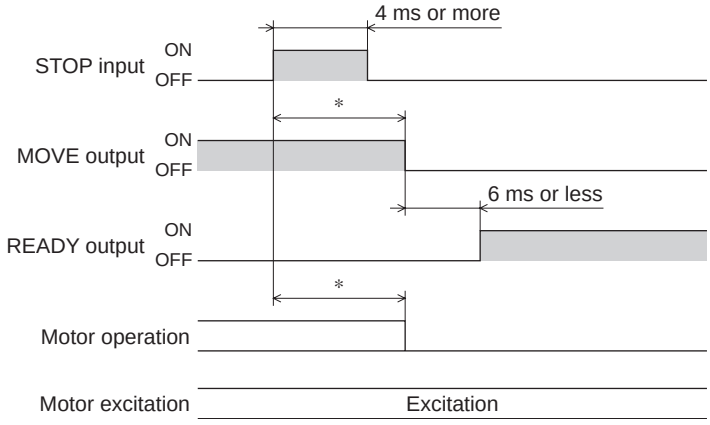
10.2 Timing charts

■ When the power supply is turned ON



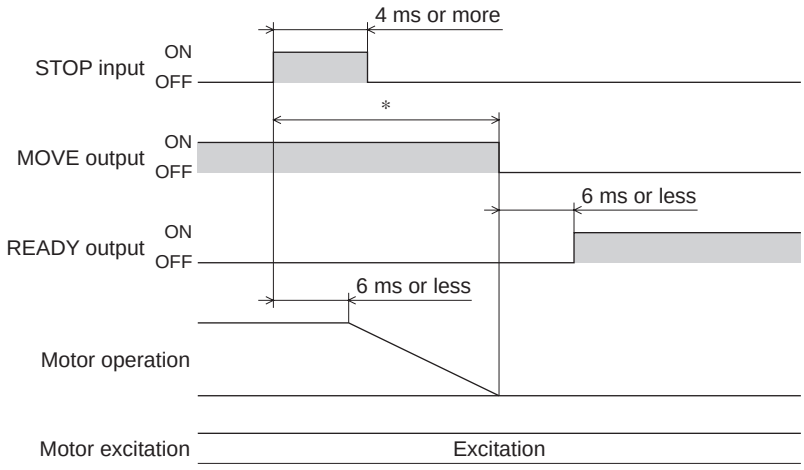
■ STOP input

- When the “STOP input action” parameter is immediate stop.



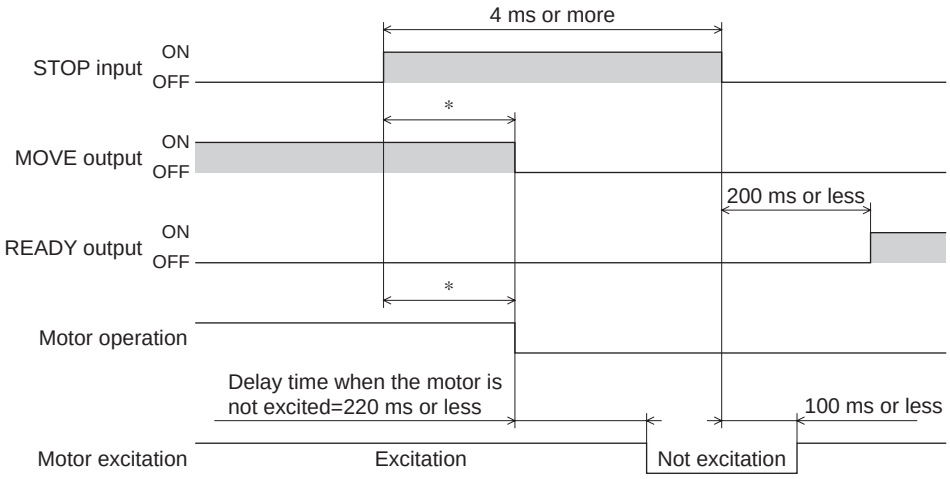
∗ The specific time varies depending on the load, operating speed, speed filter, moving average filter and other.

- When the “STOP input action” parameter is deceleration stop.



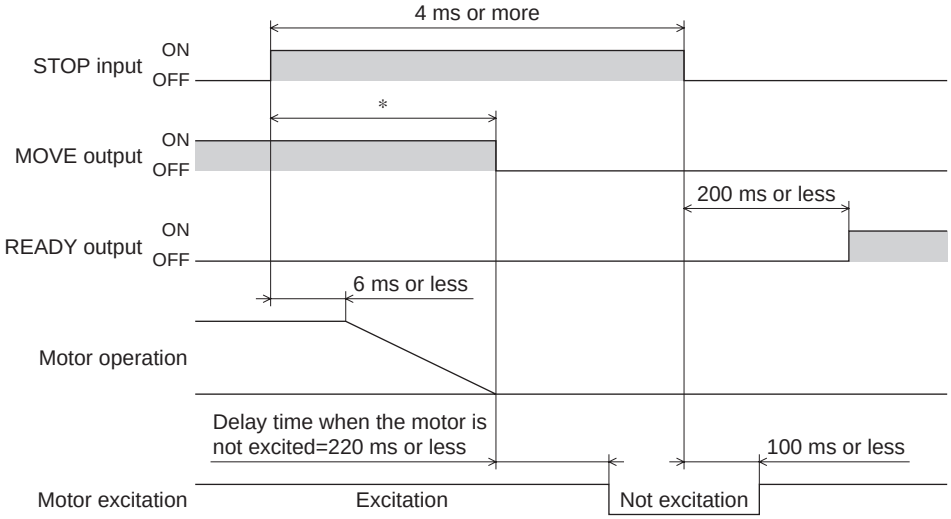
∗ The specific time varies depending on the load, operating speed, speed filter, moving average filter and other.

- When the “STOP input action” parameter is immediate stop+current off.



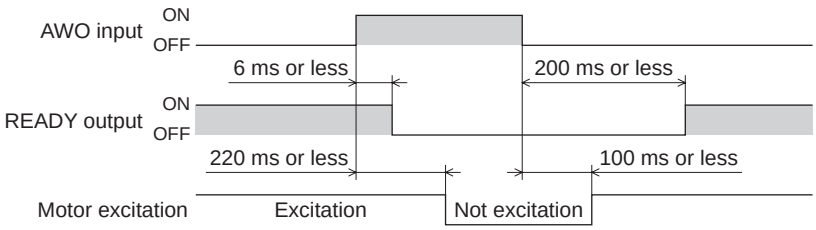
* The specific time varies depending on the load, operating speed, speed filter, moving average filter and other.

- When the “STOP input action” parameter is deceleration stop+current off.



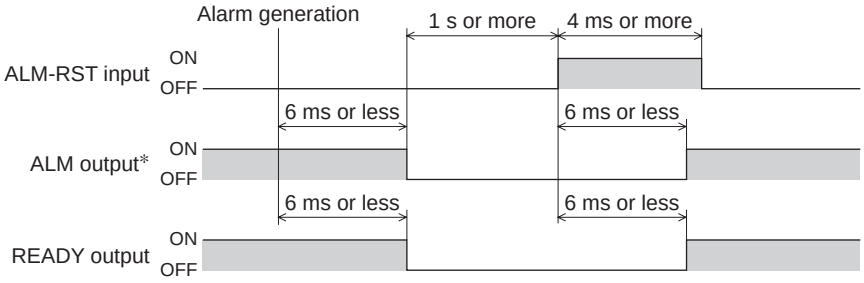
* The specific time varies depending on the load, operating speed, speed filter, moving average filter and other.

■ AWO input



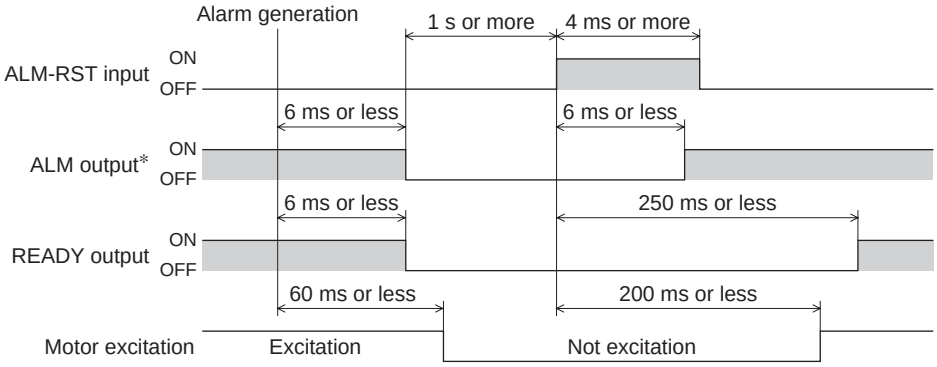
■ ALM-RST input

- When an alarm generates and the motor maintains excitation



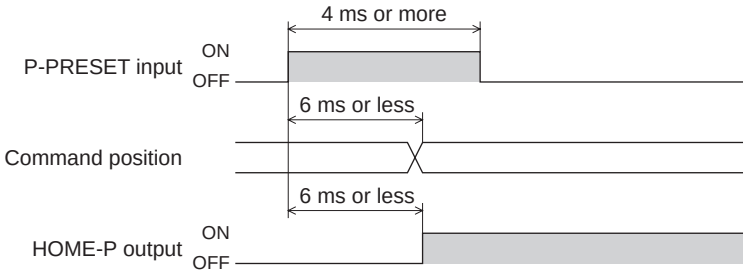
∗ ALM output is normally closed. It is ON during normal operation and it turns OFF when an alarm generates.

- When an alarm generates and the motor does not maintain excitation

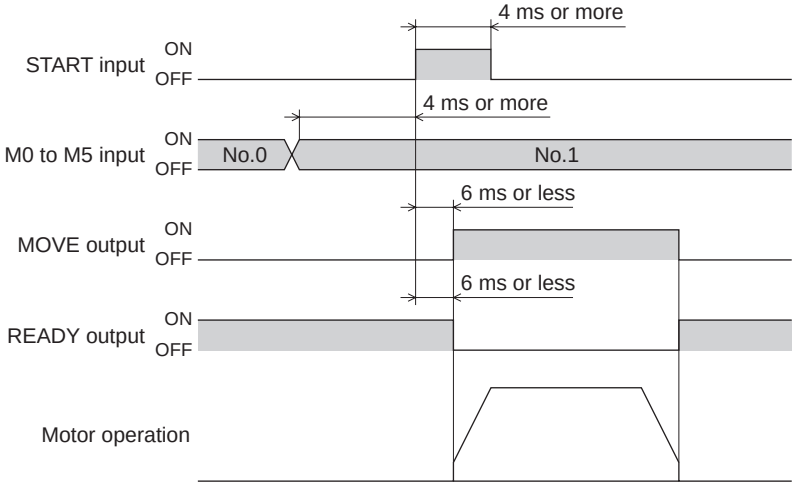


∗ ALM output is normally closed. It is ON during normal operation and it turns OFF when an alarm generates.

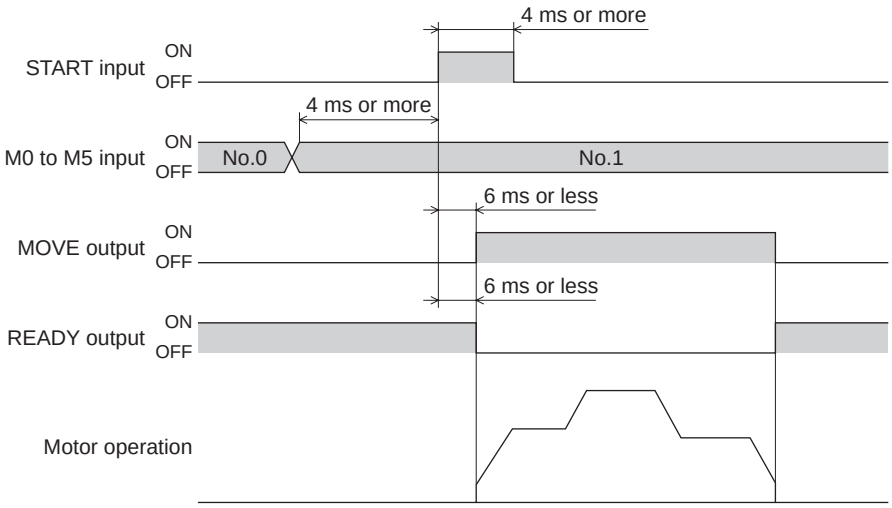
■ P-PRESET input



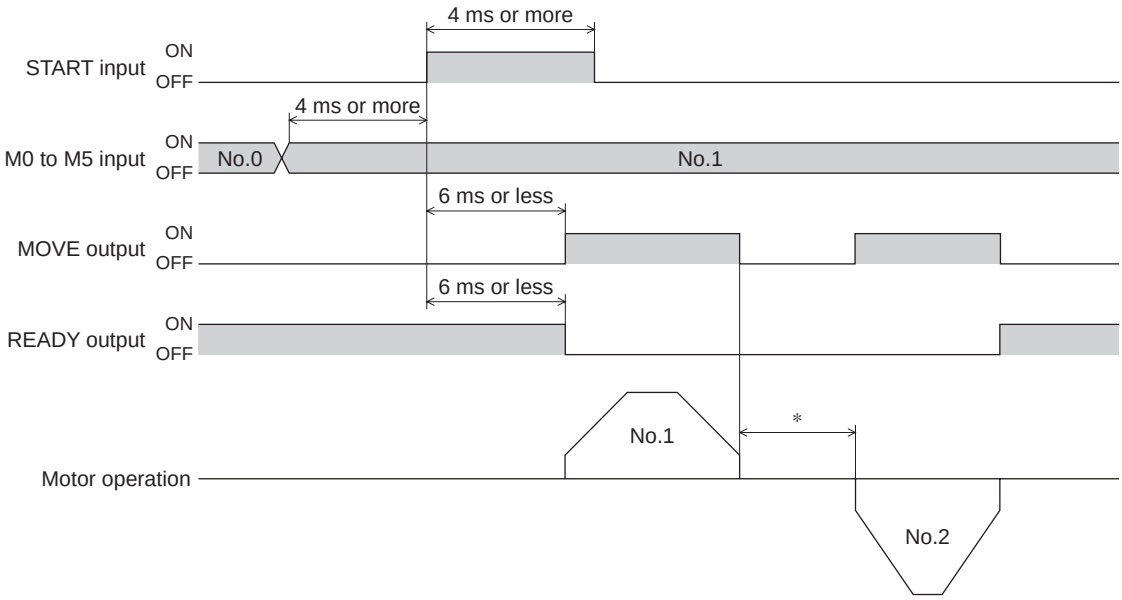
■ Single-motion operation (positioning operation)



■ Linked-motion operation (positioning operation)

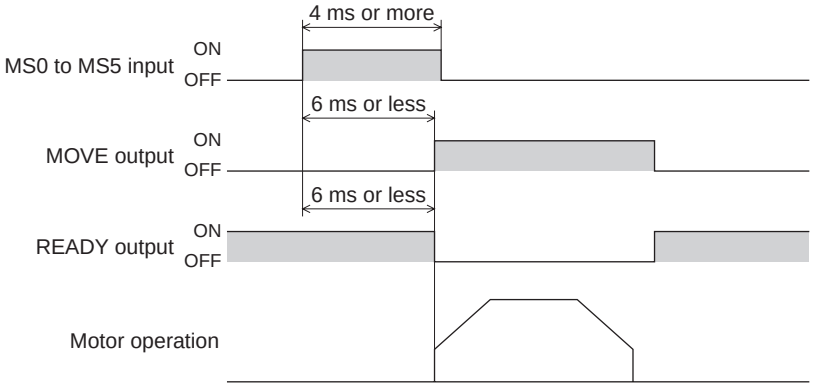


■ Linked-motion operation 2 (positioning operation)

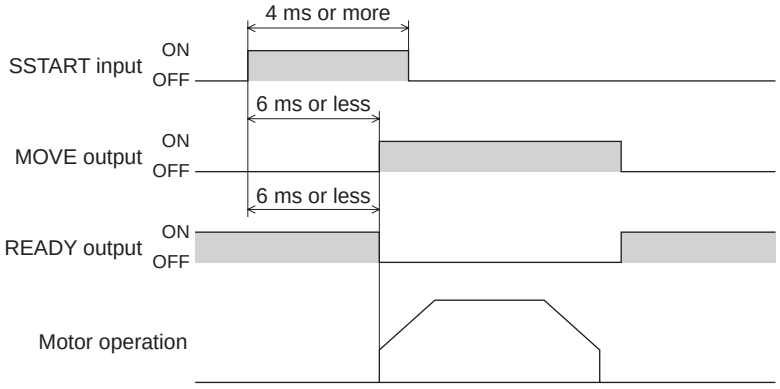


* This is the value of the dwell time to be set in operation data No.1.

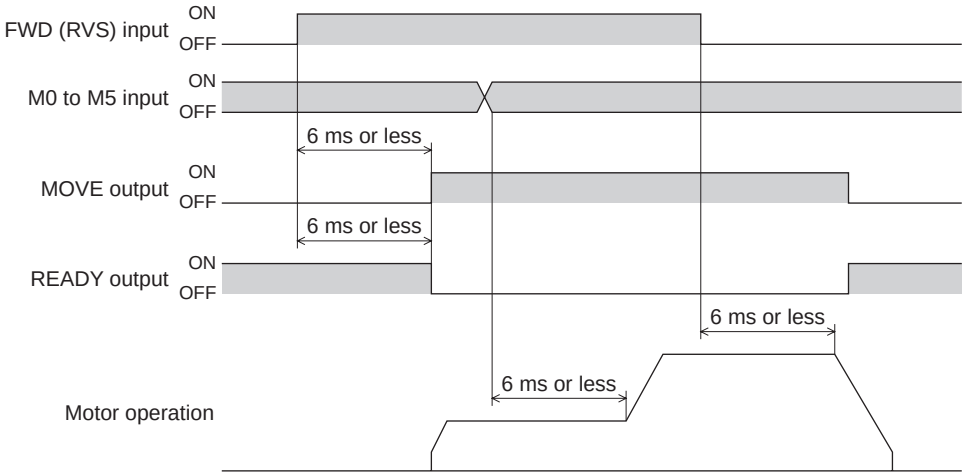
■ Direct positioning operation



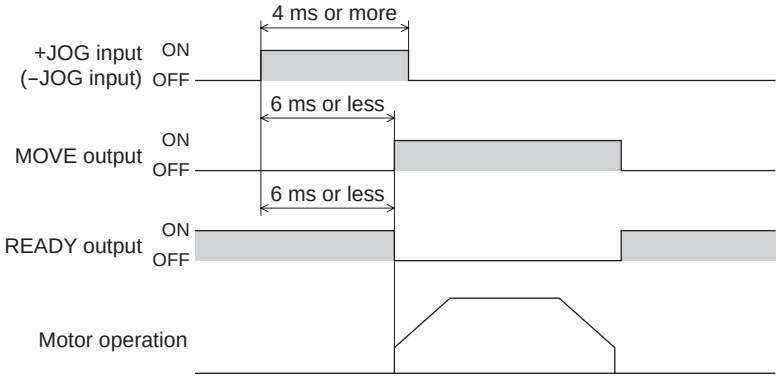
■ Sequential operation



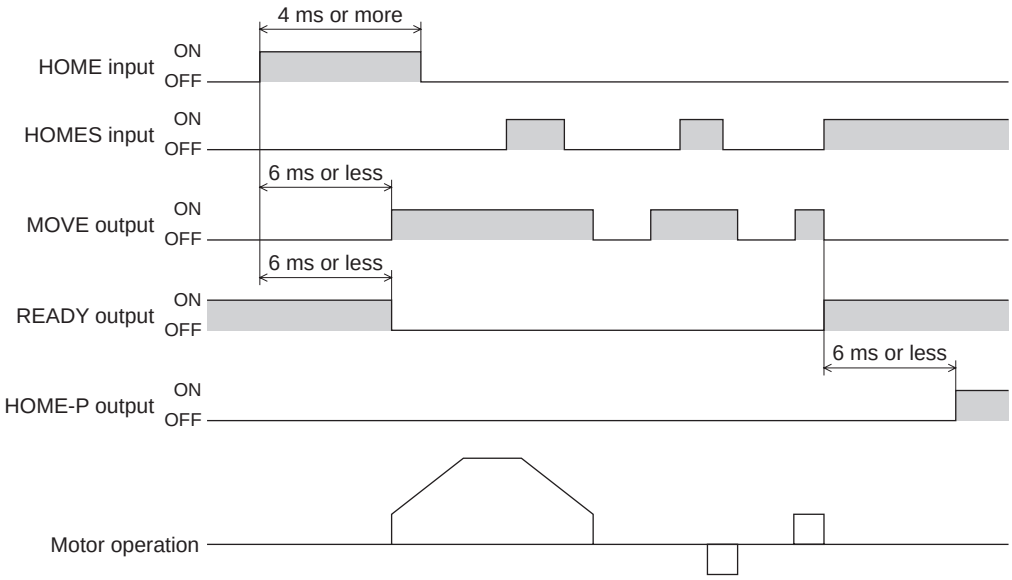
■ Continuous operation



■ JOG operation



■ Return-to-home operation



10.3 Operation data and parameters

The parameters required for motor operation are available in the following two types.

- Operation data
- User parameters

The parameters are saved in the RAM or NV memory. The data saved in the RAM will be erased once the power is turned off. On the other hand, the parameters saved in the NV memory will be retained even after the power supply is turned off.
When turning the motor power ON, the parameters saved in the NV memory will be sent to the RAM. Then, the recalculation and setup for the parameters are executed in the RAM.

When a parameter is changed, the timing to reflect the new value varies depending on the parameter. See the following four types.

- Effective immediately..... Executes the recalculation and setup immediately when writing the parameter.
- Effective after stopping the operation..... Executes the recalculation and setup after stopping the operation.
- Effective after executing the configuration..... Executes the recalculation and setup after executing the configuration.
- Effective after turning the power ON again..... Executes the recalculation and setup after turning the power ON again.

Note

- The parameters are written in the RAM when writing via RS-485 communication.
- The NV memory can be rewritten approx. 100,000 times.

■ Setting the operation data

Up to 64 operation data can be set (data Nos.0 to 63).

Name	Description	Setting range	Initial value	Effective[*1]
Position No.0 to Position No.63	Sets the position (distance) for positioning operation.	−8,388,608 to +8,388,607 step	0	B
Operating speed No.0 to Operating speed No.63	Sets the operating speed in positioning operation and continuous operation.	0 to 1,000,000 Hz	1000	
Operation mode No.0 to Operation mode No.63	Selects how to specify the position (travel amount) in positioning operation (absolute mode or incremental mode).	0: Incremental 1: Absolute	0	
Operation function No.0 to Operation function No.63	Sets perform positioning operation as single-motion or linked-motion operation.	0: Single-motion 1: Linked-motion 2: Linked-motion 2	0	
Acceleration No.0 to Acceleration No.63	Sets the acceleration rate or acceleration time in positioning operation and continuous operation.[*2]	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s)[*3]	30000	
Deceleration No.0 to Deceleration No.63	Sets the deceleration rate or deceleration time in positioning operation and continuous operation.[*2]			
Sequential positioning No.0 to Sequential positioning No.63	Sets enable or disable sequential positioning operation.	0: Disable 1: Enable	0	
Dwell time No.0 to Dwell time No.63	Sets the dwell time to be used in linked-motion operation 2.	0 to 50000 (1=0.001 s)	0	

∗1 Indicates the timing for the data to become effective. (B: Effective after stopping the operation)
∗2 This item is effective when the “acceleration/deceleration type” parameter is set to “separate”. If this parameter is set to “common”, the values of the “common acceleration” and “common deceleration” parameters will be used (initial value: separate).
∗3 Acceleration/deceleration rate (ms/kHz) or acceleration/deceleration time (s) can be selected using "acceleration/deceleration unit" parameter. (initial value: acceleration/deceleration rate).

■ Parameter list

The setting items for each parameter are as follows.

I/O (page 53)	• STOP input action • Hardware overtravel • Overtravel action • AREA1 positive direction position • AREA1 negative direction position • AREA2 positive direction position • AREA2 negative direction position • AREA3 positive direction position • AREA3 negative direction position	• Minimum ON time for MOVE output • MS0 operation No. selection • MS1 operation No. selection • MS2 operation No. selection • MS3 operation No. selection • MS4 operation No. selection • MS5 operation No. selection • HOME-P function selection
Motor (page 53)	• RUN current • STOP current • Speed filter	• Moving average time • Filter selection
Operation (page 55)	• Common acceleration • Common deceleration • Starting speed • JOG operating speed • Acceleration/deceleration rate of JOG	• JOG starting speed • Acceleration/deceleration type • Acceleration/deceleration unit • JOG travel amount
Return-to-home (page 56)	• Home-seeking mode • Operating speed of home-seeking • Acceleration/deceleration of home-seeking • Starting speed of home-seeking • Position offset of home-seeking	• Starting direction of home-seeking • SLIT detection with home-seeking • TIM signal detection with home-seeking • Backward steps in 2sensor mode home-seeking
Alarm/warning (page 56)	• Return-to-home incomplete alarm • Overheat warning	• Overvoltage warning • Undervoltage warning
Coordination (page 56)	• Electronic gear A • Electronic gear B • Motor rotation direction • Software overtravel	• Positive software limit • Negative software limit • Preset position • Wrap setting • Wrap setting range
Common (page 58)	• Data setter speed display • Data setter edit	
I/O function (page 58)	• IN0 to IN3 input function selection • IN0 to IN3 input logic level setting • OUT0, OUT1 output function selection	
I/O function [RS-485] (page 59)	• NET-IN0 to NET-IN15 input function selection • NET-OUT0 to NET-OUT15 output function selection	
Communication (page 60)	• Communication timeout • Communication error alarm • Communication parity	• Communication stop bit • Transmission waiting time

■ I/O parameter

Name	Description	Setting range	Initial value	Effective*
STOP input action	Sets how the motor should stop when a STOP input is turned ON.	0: Immediate stop 1: Deceleration stop 2: Immediate stop+Current OFF 3: Deceleration stop+Current OFF	1	A
Hardware overtravel	Sets whether to enable or disable hardware overtravel detection using ±LS inputs.	0: Disable 1: Enable	1	
Overtravel action	Sets the motor action to take place upon the occurrence of overtravel.	0: Immediate stop 1: Deceleration stop	0	
AREA1 positive direction position	Sets the position of AREA1 positive direction.	−8,388,608 to 8,388,607 step	0	
AREA1 negative direction position	Sets the position of AREA1 negative direction.			
AREA2 positive direction position	Sets the position of AREA2 positive direction.			
AREA2 negative direction position	Sets the position of AREA2 negative direction.			
AREA3 positive direction position	Sets the position of AREA3 positive direction.			
AREA3 negative direction position	Sets the position of AREA3 negative direction.			
Minimum ON time for MOVE output	Sets the minimum time during which the MOVE output remains ON.	0 to 255 ms	0	
MS0 operation No. selection	Sets the operation data No. corresponding to MS0 input.	0 to 63	0	B
MS1 operation No. selection	Sets the operation data No. corresponding to MS1 input.		1	
MS2 operation No. selection	Sets the operation data No. corresponding to MS2 input.		2	
MS3 operation No. selection	Sets the operation data No. corresponding to MS3 input.		3	
MS4 operation No. selection	Sets the operation data No. corresponding to MS4 input.		4	
MS5 operation No. selection	Sets the operation data No. corresponding to MS5 input.		5	
HOME-P function selection	Sets the timing to output the HOME-P output.	0: Home output 1: Return-to-home complete output	0	A

* Indicates the timing for the data to become effective. (A: Effective immediately, B: Effective after stopping the operation)

■ Motor parameter

Name	Description	Setting range	Initial value	Effective*
RUN current	Sets the motor operating current based on the rated current being 100%.	0 to 1000 (1=0.1%)	1000	A
STOP current	Sets the motor standstill current as a percentage of the rated current, based on the rated current being 100%.	0 to 500 (1=0.1%)	500	
Speed filter	Adjusts the motor response.	0 to 200 ms	1	B
Moving average time	Sets the time constant for the moving average filter.	0 to 200 ms	1	
Filter selection	Set either speed filter or moving average filter.	0: Speed filter 1: Moving average filter	0	C

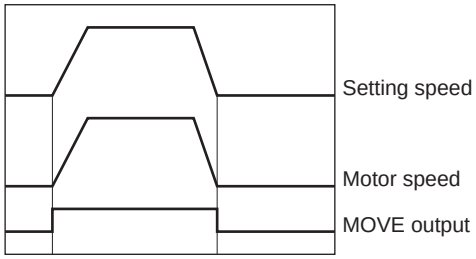
* Indicates the timing for the data to become effective. (A: Effective immediately, B: Effective after stopping the operation, C: Effective after executing the configuration)

Note The maximum driver operating current can be changed using the "RUN current" parameter. If the load is small and there is extra torque, setting the operating current lower may suppress the increases in motor temperature. Excessively low operating current may cause a problem in starting the motor or holding the load in position. Do not reduce the current any more than is necessary.

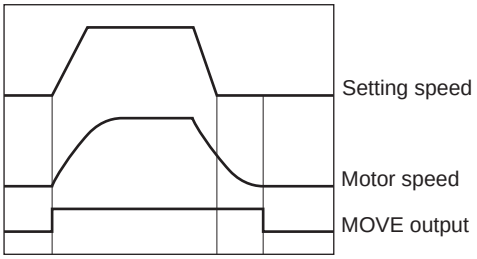
- Speed filter

When setting the "filter selection" parameter to "0: Speed filter," the speed filter will be effective. The motor response can be adjusted.
When setting a higher value for the speed filter, you can achieve lower vibration at low speed operation or smoother operation when starting/stopping of the motor. However, if this setting is too high, synchronization performance is decreased. When setting the value of the "speed filter" parameter to "0," this function will be invalid.
Set a suitable value based on the load or application.

When the "speed filter" parameter is set to 0 ms.

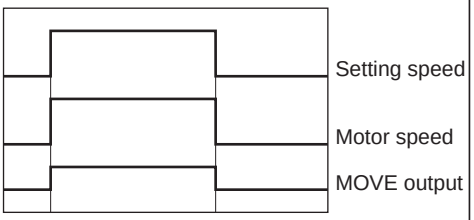
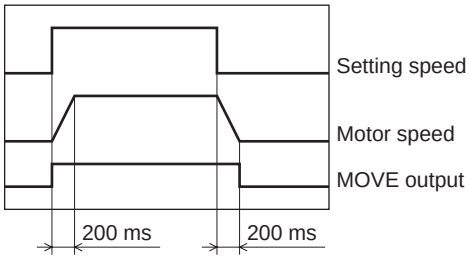
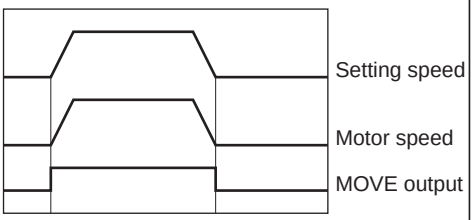
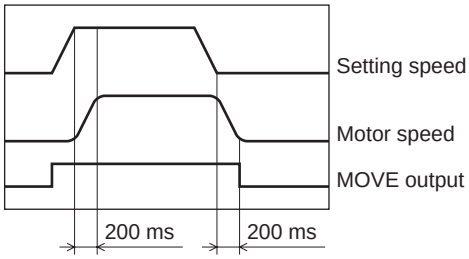


When the "speed filter" parameter is set to 200 ms.



- Moving average filter

When setting the "filter selection" parameter to "1: Moving average filter," the moving average filter will be effective. The motor response can be adjusted.
The positioning time can be shortened by suppressing the residual vibration for the positioning operation.
Optimum value for the "moving average time" parameter varies depending on the load or operation condition. When setting the value of the "moving average time" parameter to "0," this function will be invalid.
Set a suitable value based on the load or application.

	When the "moving average time" parameter is not used.	When the "moving average time" parameter is set to 200 ms.
Rectangular operation		
Trapezoidal operation		

■ Operation parameter

Name	Description	Setting range	Initial value	Effective *1
Common acceleration	Sets the common acceleration rate or common acceleration time in positioning operation and continuous operation.	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *2*3	30000	B
Common deceleration	Sets the common deceleration rate or common deceleration time in positioning operation and continuous operation.			
Starting speed	Sets the starting speed in positioning operation and continuous operation. The motor will operate at the starting speed if the operating speed is below the starting speed.	0 to 1,000,000 Hz	100	
JOG operating speed	Sets the operating speed for JOG operation.	1 to 1,000,000 Hz	1000	
Acceleration/deceleration rate of JOG	Sets the acceleration/deceleration rate or acceleration/deceleration time for JOG operation.	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *2*3	30000	
JOG starting speed	Sets the starting speed for JOG operation.	0 to 1,000,000 Hz	100	
Acceleration/deceleration type	Sets whether to use the common acceleration/ deceleration or the acceleration/deceleration specified for the operation data.	0: Common 1: Separate	1	
Acceleration/deceleration unit	Sets the acceleration/ deceleration unit.	0: ms/kHz 1: s	0	C
JOG travel amount	Sets the travel amount for JOG operation.	1 to 8,388,607 step	1	B

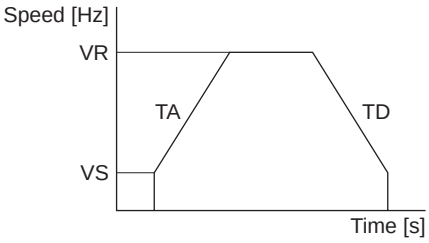
∗1 Indicates the timing for the data to become effective. (B: Effective after stopping the operation, C: Effective after executing the configuration)
∗2 This item is effective when the “acceleration/deceleration type” parameter is set to “common” (initial value: separate).
∗3 Acceleration/deceleration rate (ms/kHz) or acceleration/deceleration time (s) can be selected using "acceleration/deceleration unit" parameter. (initial value: acceleration/deceleration rate).

- Acceleration/deceleration rate and acceleration/deceleration time

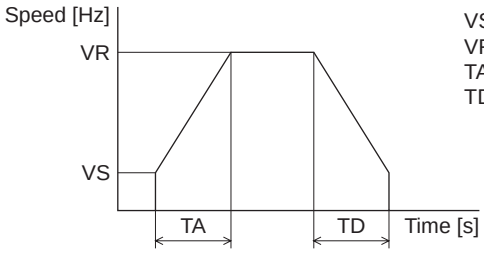
Acceleration/deceleration unit

Set the acceleration/deceleration unit using the "acceleration/deceleration unit" parameter.
Acceleration/deceleration rate (ms/kHz) or acceleration/deceleration time (s) can be set.

- Acceleration/deceleration unit: ms/kHz



- Acceleration/deceleration unit: s



Common setting and separate setting of the acceleration/deceleration

The acceleration/deceleration for positioning operation or continuous operation can be set as follows using the "acceleration/deceleration type" parameter:
Separate: The acceleration/deceleration set under the applicable operation data No. will be followed.
Common: The setting of the "common acceleration" and "common deceleration" parameter will be followed.

Note

- When performing linked operation, the acceleration/deceleration for the starting linked operation data No. is applied even when the "acceleration/deceleration type" parameter is set to "separate".
- See p.36 for the acceleration/deceleration when performing variable speed operation.

■ Return-to-home parameter

Name	Description	Setting range	Initial value	Effective *1
Home-seeking mode	Set the mode for return-to-home operation.	0: 2-sensor mode 1: 3-sensor mode	1	B
Operating speed of home-seeking	Sets the operating speed for return-to-home operation.	1 to 1,000,000 Hz	1000	
Acceleration/deceleration of home-seeking	Sets the acceleration/ deceleration rate or acceleration/deceleration time for return-to-home operation.	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *2	30000	
Starting speed of home-seeking	Sets the starting speed for return-to-home operation.	1 to 1,000,000 Hz	100	
Position offset of home-seeking	Sets the amount of offset from mechanical home.	−8,388,608 to 8,388,607 step	0	
Starting direction of home-seeking	Sets the starting direction for home detection.	0: Negative direction 1: Positive direction	1	
SLIT detection with home-seeking	Sets whether or not to concurrently use the SLIT input for return-to-home operation.	0: Disable 1: Enable	0	
TIM signal detection with home-seeking	Sets whether or not to concurrently use the TIM signal for return-to-home operation.			
Backward steps in 2sensor mode home-seeking	Set the travel amount after pulling out of the limit sensor in 2-sensor mode return-to-home operation.	1 to 32767 step	200	

∗1 Indicates the timing for the data to become effective. (B: Effective after stopping the operation)
∗2 Acceleration/deceleration rate (ms/kHz) or acceleration/deceleration time (s) can be selected using "acceleration/deceleration unit" parameter. (initial value: acceleration/deceleration rate).

■ Alarm/warning parameter

Name	Description	Setting range	Initial value	Effective *
Return-to-home incomplete alarm	Sets enable/disable for the return-to-home incomplete alarm.	0: Disable 1: Enable	0	C
Overheat warning	Sets the temperature at which a main circuit overheat warning generates.	40 to 80 °C (104 to 176 °F)	80	A
Overvoltage warning	Sets the voltage at which an overvoltage warning generates.	150 to 420 (1=0.1 V)	420	
Undervoltage warning	Sets the voltage at which an undervoltage warning generates.		180	

∗ Indicates the timing for the data to become effective. (A: Effective immediately, C: Effective after executing the configuration)

■ Coordination parameter

Name	Description	Setting range	Initial value	Effective *
Electronic gear A	Set the denominator of electric gear.	1 to 65535	1	C
Electronic gear B	Set the numerator of electric gear.			
Motor rotation direction	Sets the rotation direction of motor output shaft.	0: Positive direction=CCW 1: Positive direction=CW	1	
Software overtravel	Sets whether to enable or disable software overtravel detection using soft limits.	0: Disable 1: Enable	1	A
Positive software limit	Sets the value of soft limit in positive direction.	−8,388,608 to 8,388,607 step	8,388,607	
Negative software limit	Sets the value of soft limit in negative direction.		−8,388,608	
Preset position	Sets the preset position.		0	
Wrap setting	Sets enable/disable for the wrap function.	0: Disable 1: Enable	0	C
Wrap setting range	Sets the wrap setting range.	1 to 8,388,607 step	500	

∗ Indicates the timing for the data to become effective. (A: Effective immediately, C: Effective after executing the configuration)

- Resolution

When the "electronic gear A" and "electronic gear B" parameters are set, the resolution per one rotation of the motor output shaft can be set. Note that the calculated value must fall within the setting range specified below:
Resolution setting range: 500 to 125,000 P/R

$$\text{Resolution} = 500 \times \frac{\text{Electronic gear B}}{\text{Electronic gear A}}$$

Note

- If the value outside of the setting range is set, the "electronic gear setting error warning" will generate. If the power is cycled or the configuration is executed while the "electronic gear setting error warning" is present, an "electronic gear setting error alarm" will generate.
- When the TIM output is used, set the resolution to be an integral multiple of 50.

- Calculation of electronic gear A and B

Calculation of electronic gear A and B is explained with examples of a ball screw and rotary table.

Example: Ball screw

Ball screw lead : 10 mm (0.394 in.)
Minimum travel amount : 0.01 mm (0.000394 in.)
Gear ratio : 1 (No speed reduction mechanism between the motor and ball screw)

$$\text{Resolution} = 500 \times \frac{\text{Electronic gear B}}{\text{Electronic gear A}} = \frac{\text{Ball screw lead}}{\text{Minimum travel amount}} \times \text{Gear ratio}$$

$$\text{In this example: Resolution} = 500 \times \frac{\text{Electronic gear B}}{\text{Electronic gear A}} = \frac{10\ \text{mm}}{0.01\ \text{mm}} \times 1$$

$$\text{Result: } \frac{\text{Electronic gear B}}{\text{Electronic gear A}} = \frac{10}{5} = \frac{2}{1}$$

Therefore, the electronic gear A and B are 1 and 2 respectively, and the resolution will be 1000 P/R.

Example: Rotary table

Step angle per one rotation : 360°
Minimum step angle : 0.01°
Gear ratio : 7.2 [Using the geared motor (gear ratio 7.2:1)]

$$\text{Resolution} = 500 \times \frac{\text{Electronic gear B}}{\text{Electronic gear A}} = \frac{\text{Step angle per one rotation}}{\text{Minimum travel amount}} \times \text{Gear ratio}$$

$$\text{In this example: Resolution} = 500 \times \frac{\text{Electronic gear B}}{\text{Electronic gear A}} = \frac{360^\circ}{0.01^\circ} \times \frac{1}{7.2}$$

$$\text{Result: } \frac{\text{Electronic gear B}}{\text{Electronic gear A}} = \frac{360}{36} = \frac{10}{1}$$

Therefore, the electronic gear A and B are 1 and 10 respectively, and the resolution will be 5000 P/R.

■ Common parameter

Name	Description	Setting range	Initial value	Effective *
Data setter speed display	Sets the display method of the speed monitor for the **OPX-2A**.	0: Signed 1: Absolute value	0	A
Data setter edit	Sets whether it is possible to edit using the **OPX-2A**.	0: Disable 1: Enable	1	

* Indicates the timing for the data to become effective. (A: Effective immediately)

■ I/O function parameter

Name	Description	Setting range	Initial value	Effective *
IN0 input function selection	Sets the function of input terminals IN0 to IN3.	See table below.	60: +LS	C
IN1 input function selection			61: −LS	
IN2 input function selection			62: HOMES	
IN3 input function selection			18: STOP	
IN0 input logic level setting	Sets the IN0 to IN3 input logic.	0: Normally open 1: Normally closed	0	
IN1 input logic level setting				
IN2 input logic level setting				
IN3 input logic level setting				
OUT0 output function selection	Sets the function of output terminals OUT0 and OUT1.	See table below.	65: ALM	
OUT1 output function selection			67: READY	

* Indicates the timing for the data to become effective. (C: Effective after executing the configuration)

Setting range for IN input function selection

0: Not used	8: MS0	18: STOP	36: R4	44: R12	52: M4
1: FWD	9: MS1	24: ALM-RST	37: R5	45: R13	53: M5
2: RVS	10: MS2	25: P-PRESET	38: R6	46: R14	60: +LS
3: HOME	11: MS3	27: HMI	39: R7	47: R15	61: −LS
4: START	12: MS4	32: R0	40: R8	48: M0	62: HOMES
5: SSTART	13: MS5	33: R1	41: R9	49: M1	63: SLIT
6: +JOG	16: FREE*	34: R2	42: R10	50: M2	
7: −JOG	17: AWO	35: R3	43: R11	51: M3	

* The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

Setting range for OUT output function selection

0: Not used	8: MS0_R	32: R0	41: R9	50: M2_R	66: WNG
1: FWD_R	9: MS1_R	33: R1	42: R10	51: M3_R	67: READY
2: RVS_R	10: MS2_R	34: R2	43: R11	52: M4_R	68: MOVE
3: HOME_R	11: MS3_R	35: R3	44: R12	53: M5_R	70: HOME-P
4: START_R	12: MS4_R	36: R4	45: R13	60: +LS_R	72: TIM
5: SSTART_R	13: MS5_R	37: R5	46: R14	61: −LS_R	73: AREA1
6: +JOG_R	16: FREE_R	38: R6	47: R15	62: HOMES_R	74: AREA2
7: −JOG_R	17: AWO_R	39: R7	48: M0_R	63: SLIT_R	75: AREA3
	18: STOP_R	40: R8	49: M1_R	65: ALM	80: S-BSY

■ I/O function parameter [RS-485]

Name	Description	Setting range	Initial value	Effective *
NET-IN0 input function selection	Sets the function of NET-IN0 to NET-IN15.	See table below.	48: M0	C
NET-IN1 input function selection			49: M1	
NET-IN2 input function selection			50: M2	
NET-IN3 input function selection			4: START	
NET-IN4 input function selection			3: HOME	
NET-IN5 input function selection			18: STOP	
NET-IN6 input function selection			0: Not used	
NET-IN7 input function selection			17: AWO	
NET-IN8 input function selection			8: MS0	
NET-IN9 input function selection			9: MS1	
NET-IN10 input function selection			10: MS2	
NET-IN11 input function selection			5: SSTART	
NET-IN12 input function selection			6: +JOG	
NET-IN13 input function selection			7: −JOG	
NET-IN14 input function selection			1: FWD	
NET-IN15 input function selection			2: RVS	
NET-OUT0 output function selection	Sets the function of NET-OUT0 to NET-OUT15.	See table below.	48: M0_R	
NET-OUT1 output function selection			49: M1_R	
NET-OUT2 output function selection			50: M2_R	
NET-OUT3 output function selection			4: START_R	
NET-OUT4 output function selection			70: HOME-P	
NET-OUT5 output function selection			67: READY	
NET-OUT6 output function selection			66: WNG	
NET-OUT7 output function selection			65: ALM	
NET-OUT8 output function selection			80: S-BSY	
NET-OUT9 output function selection			73: AREA1	
NET-OUT10 output function selection			74: AREA2	
NET-OUT11 output function selection			75: AREA3	
NET-OUT12 output function selection			72: TIM	
NET-OUT13 output function selection			68: MOVE	
NET-OUT14 output function selection			0: Not used	
NET-OUT15 output function selection			0: Not used	

* Indicates the timing for the data to become effective. (C: Effective after executing the configuration)

Setting range for NET-IN input function selection

0: Not used	7: −JOG	16: FREE*	33: R1	40: R8	47: R15
1: FWD	8: MS0	17: AWO	34: R2	41: R9	48: M0
2: RVS	9: MS1	18: STOP	35: R3	42: R10	49: M1
3: HOME	10: MS2	24: ALM-RST	36: R4	43: R11	50: M2
4: START	11: MS3	25: P-PRESET	37: R5	44: R12	51: M3
5: SSTART	12: MS4	27: HMI	38: R6	45: R13	52: M4
6: +JOG	13: MS5	32: R0	39: R7	46: R14	53: M5

* The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

Setting range for NET-OUT output function selection

0: Not used	8: MS0_R	32: R0	41: R9	50: M2_R	66: WNG
1: FWD_R	9: MS1_R	33: R1	42: R10	51: M3_R	67: READY
2: RVS_R	10: MS2_R	34: R2	43: R11	52: M4_R	68: MOVE
3: HOME_R	11: MS3_R	35: R3	44: R12	53: M5_R	70: HOME-P
4: START_R	12: MS4_R	36: R4	45: R13	60: +LS_R	72: TIM
5: SSTART_R	13: MS5_R	37: R5	46: R14	61: −LS_R	73: AREA1
6: +JOG_R	16: FREE_R	38: R6	47: R15	62: HOMES_R	74: AREA2
7: −JOG_R	17: AWO_R	39: R7	48: M0_R	63: SLIT_R	75: AREA3
	18: STOP_R	40: R8	49: M1_R	65: ALM	80: S-BSY

■ Communication parameter

Name	Description	Setting range	Initial value	Effective *
Communication timeout	Sets the condition in which a communication timeout occurs in RS-485 communication.	0: Not monitored 0 to 10000 ms	0	A
Communication error alarm	Sets the condition in which a RS-485 communication error alarm generates. A communication error alarm generates after a RS-485 communication error has occurred by the number of times set here.	1 to 10 times	3	
Communication parity	Sets the parity of RS-485 communication.	0: None 1: Even number 2: Odd number	1	D
Communication stop bit	Sets the stop bit of RS-485 communication.	0: 1 bit 1: 2 bit	0	
Transmission waiting time	Sets the transmission waiting time of RS-485 communication.	0 to 10000 (1=0.1 ms)	100	

* Indicates the timing for the data to become effective. (A: Effective immediately, D: Effective after turning the power ON again)

11 Method of control via I/O

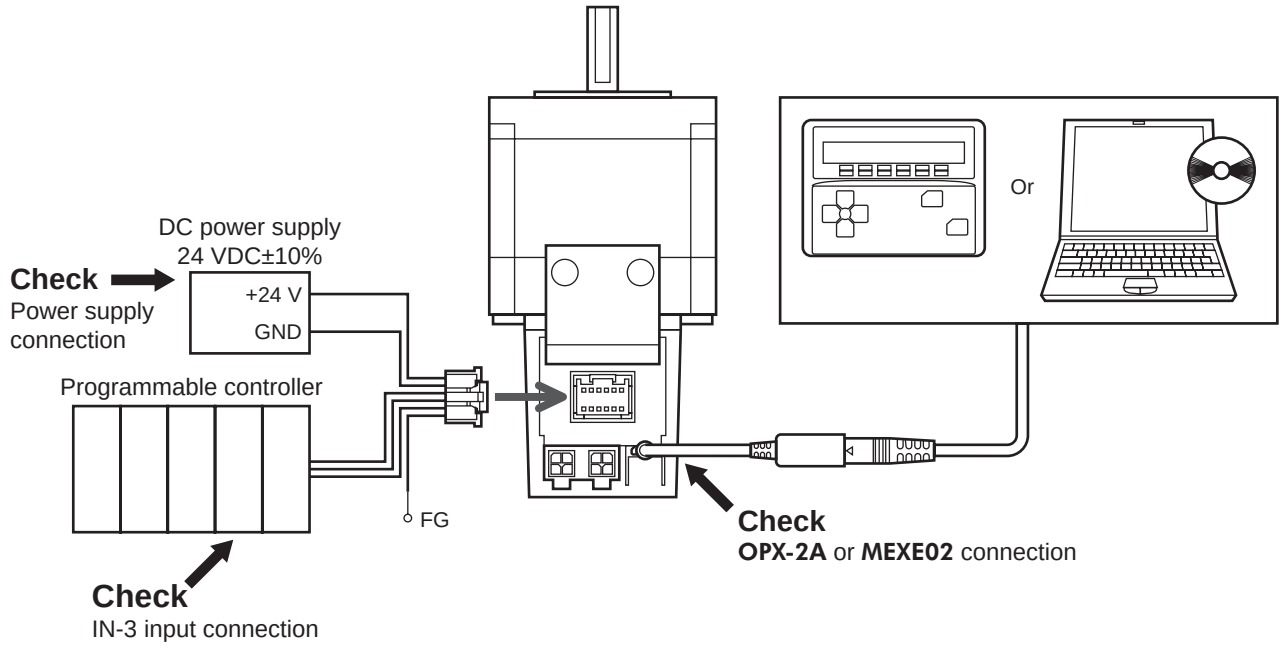
The following explains how to set operation data and parameters using an accessory **OPX-2A** or **MEXE02** (sold separately) or via RS-485 communication, and also explains how to control the operation with I/O.
See each operating manual for the detailed setting method of the **OPX-2A** or **MEXE02**.

11.1 Guidance

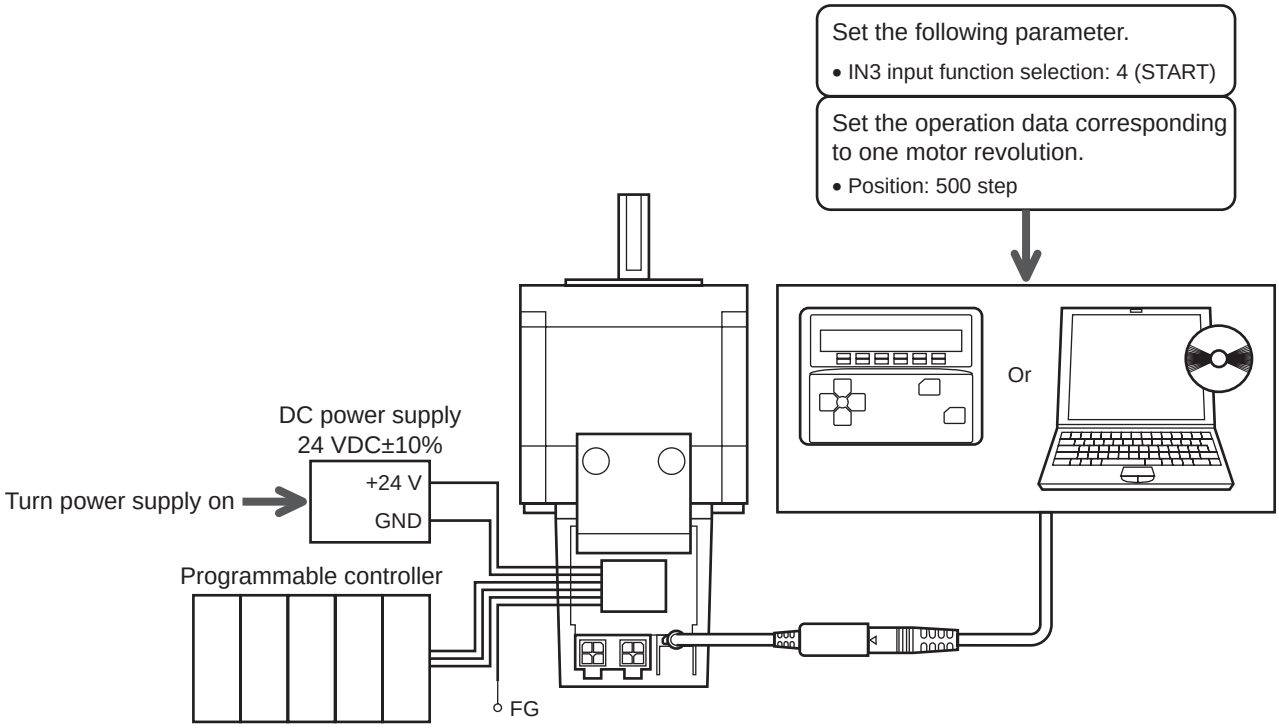
If you are new to the **PKA** Series, read this section to understand the operating methods along with the operation flow.

Note Before operating the motor, check the condition of the surrounding area to ensure safety.

STEP 1 Check the installation and connection



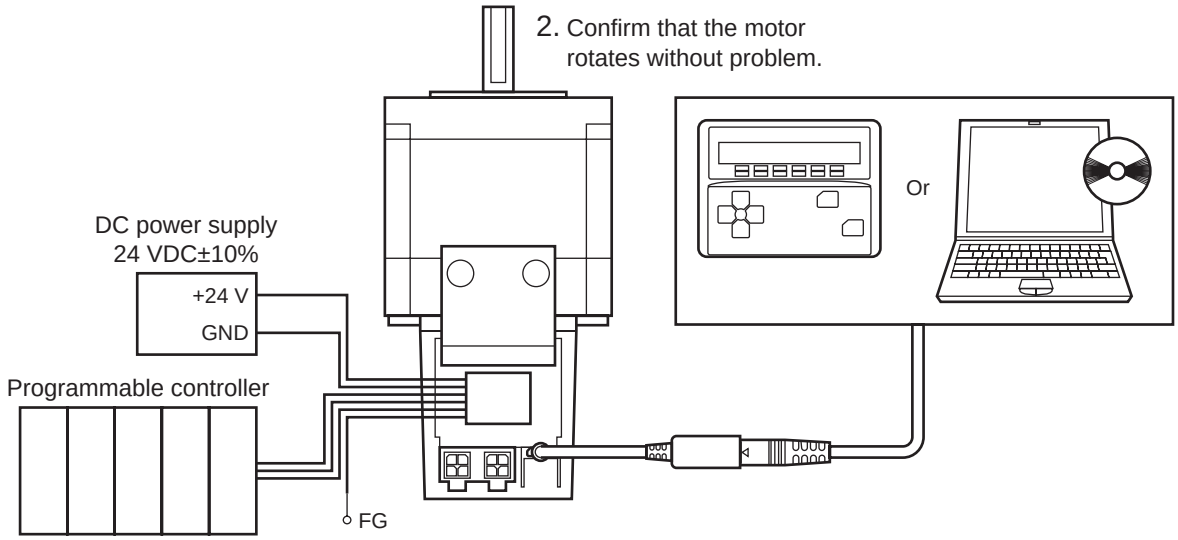
STEP 2 Turn on the power and set operation data and parameters.



STEP 3 Cycle the power

The “IN3 input function selection” parameter will be enabled after the power is cycled.

STEP 4 Operate the motor



1. Turn the START input ON.

STEP 5 Were you able to operate the motor properly?

How did it go? Were you able to operate the motor properly? If the motor does not function, check the following points:

- Is the STOP input OFF?
- Is any alarm present?
- Are the power supply connected securely?

For details on I/O signals, refer to p.16.

12 Method of control via Modbus protocol

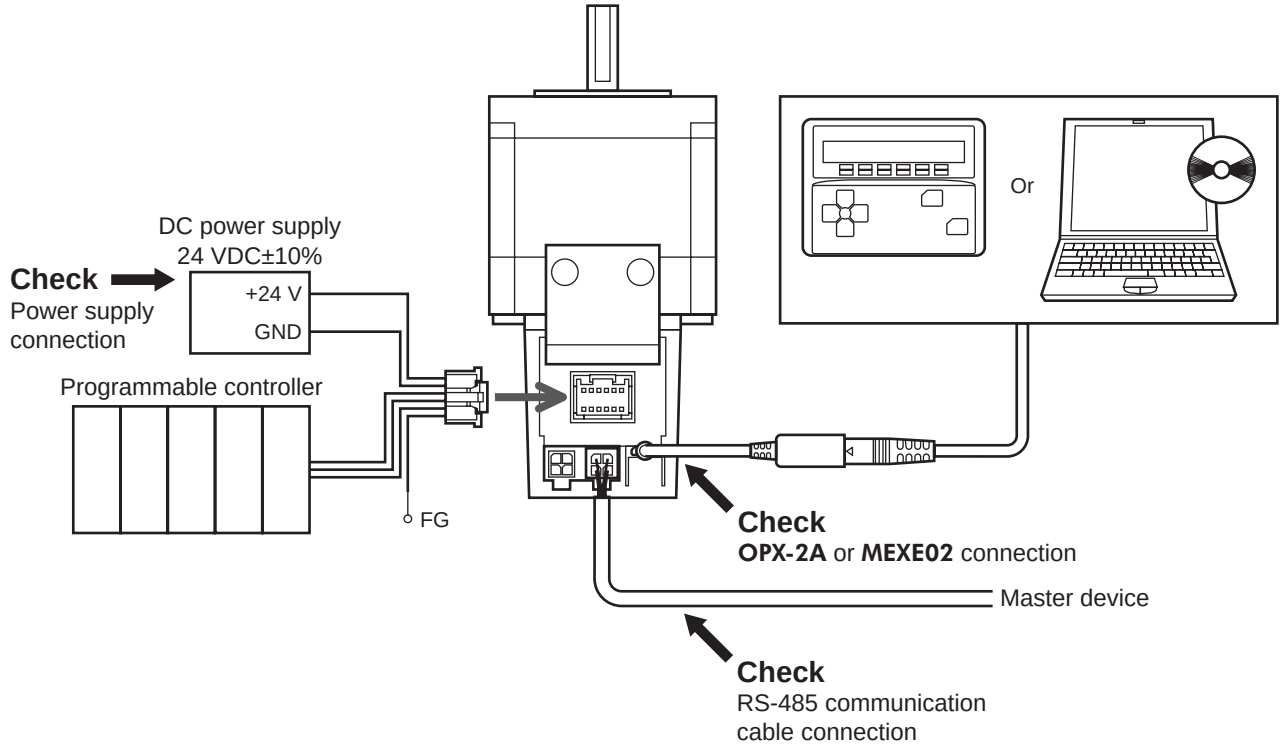
The following explains how to implement control from a programmable controller via RS-485 communication.
The protocol for the RS-485 communication is the Modbus protocol.
The Modbus protocol is simple and its specification is open to the public, so this protocol is used widely in industrial applications. Modbus communication is based on the single-master/multiple-slave method. Only the master can issue a query (command). Each slave executes the requested process and returns a response message.

12.1 Guidance

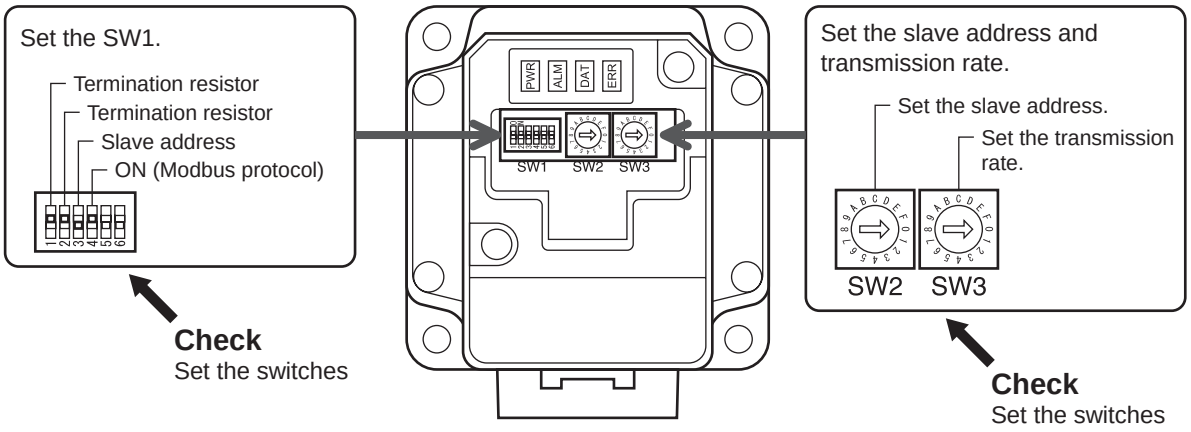
If you are new to the **PKA** Series, read this section to understand the operating methods along with the operation flow.

Note Before operating the motor, check the condition of the surrounding area to ensure safety.

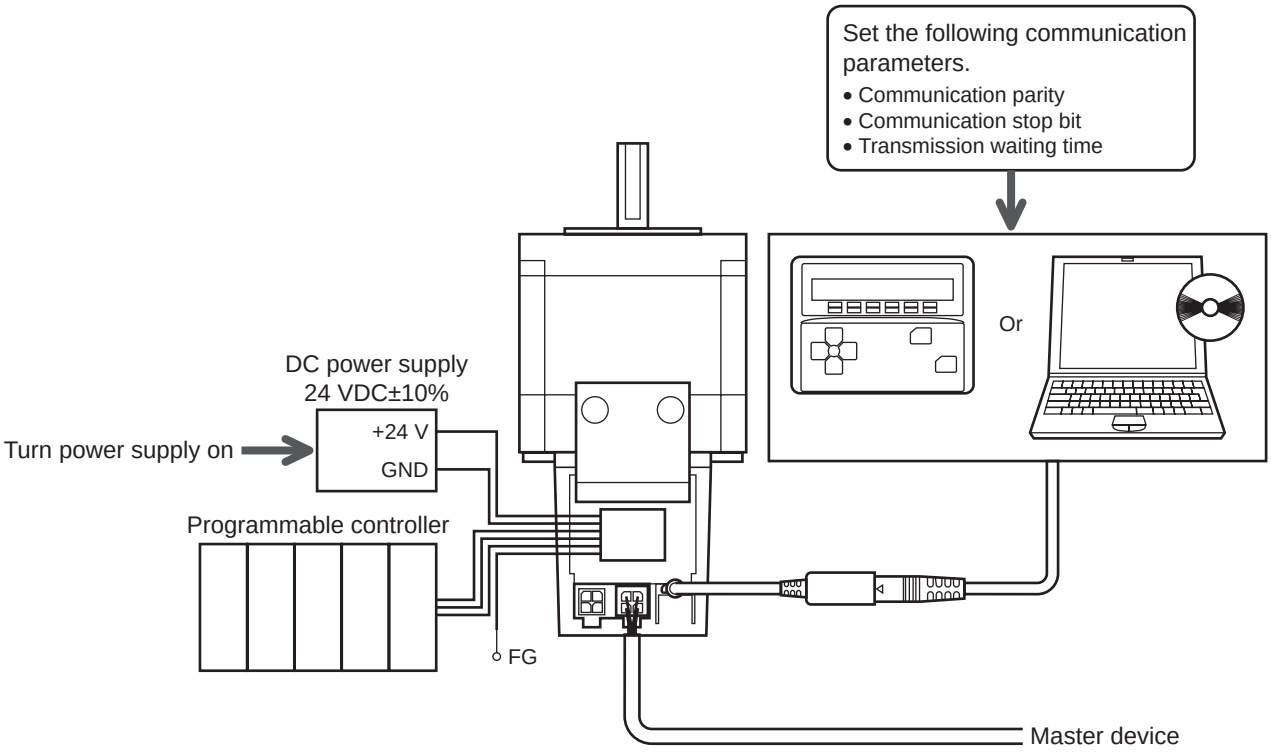
STEP 1 Check the installation and connection



STEP 2 Set the switches



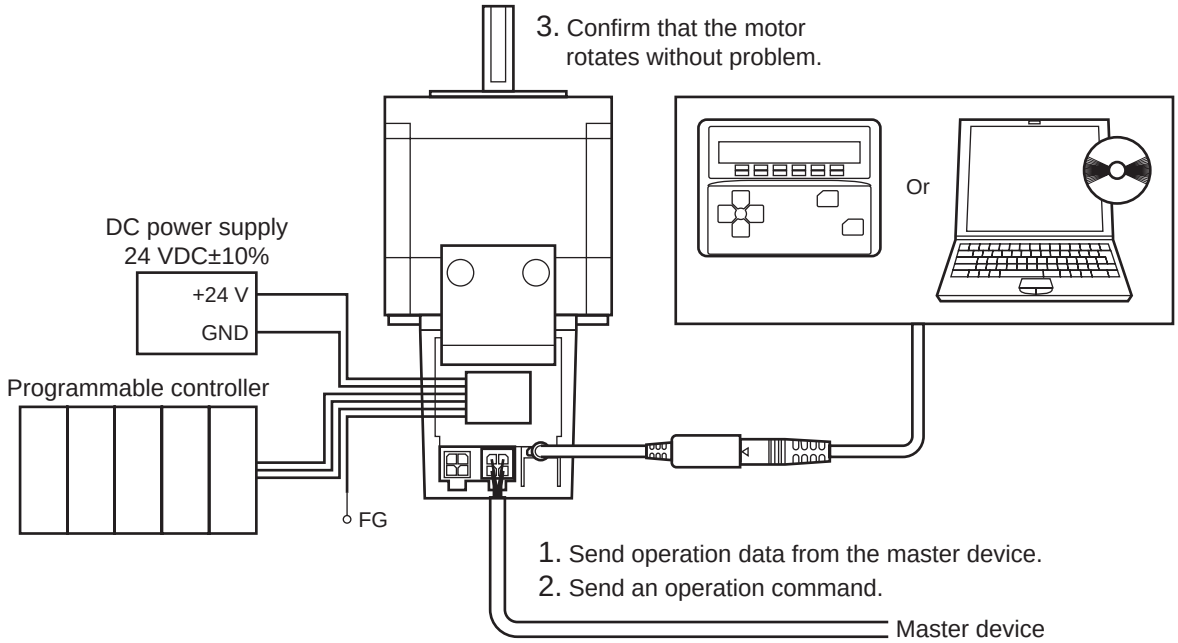
STEP 3 Turn on the power and set the parameters



STEP 4 Cycle the power

Communication parameters will be enabled after the power is cycled. If you have changed any of the communication parameters, be sure to cycle the power.

STEP 5 Operate the motor



STEP 6 Were you able to operate the motor properly?

How did it go? Were you able to operate the motor properly? If the motor does not function, check the following points:

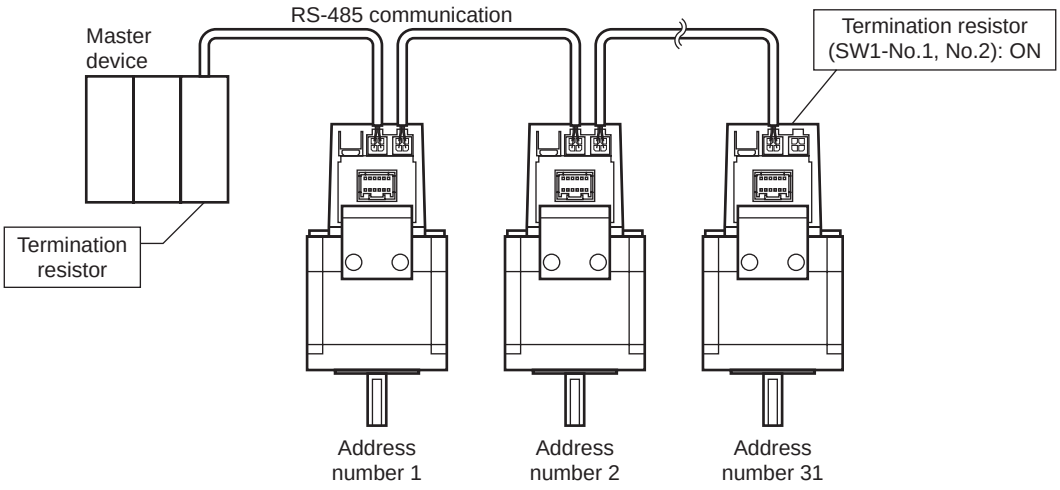
- Is any alarm present?
- Are the power supply and RS-485 communication cable connected securely?
- Are the slave address, transmission rate and termination resistor set correctly?
- Is the master device setting same as parameters of "communication parity", "communication stop bit" and "transmission waiting time"?
- Is the C-ERR LED lit?
- Is the C-DAT LED lit?

For more detailed settings and functions, refer to the following pages.

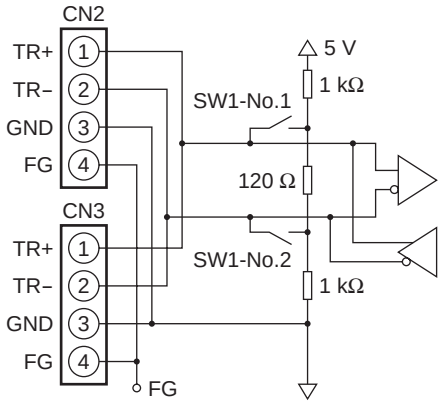
12.2 Communication specifications

Electrical characteristics	In conformance with EIA-485 Use a twisted pair cable (TIA/EIA-568B CAT5e or higher is recommended) and keep the total wiring distance including extension to 50 m (164 ft.) or less.
Transmission mode	Half duplex
Transmission rate	Selectable from 9600 bps, 19200 bps, 38400 bps, 57600 bps and 115,200 bps.
Physical layer	Asynchronous mode (data: 8 bits, stop bit: 1 bit/2 bits, parity: none/even number/odd number)
Protocol	Modbus RTU mode
Connection pattern	Up to 31 drivers can be connected to one programmable controller (master device).

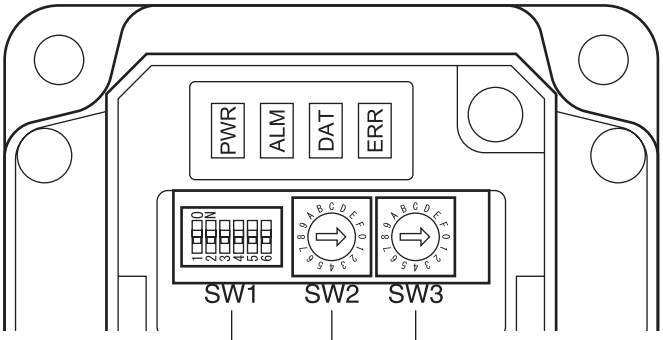
■ Connection example



Internal input circuit



12.3 Setting the switches



Function setting switch (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

Address number setting switch (SW2)

Transmission rate setting switch (SW3)

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)
OFF	0	Not used
	1	1
	2	2
	3	3
	4	4
	5	5
	6	6
	7	7
	8	8
	9	9
	A	10
	B	11
	C	12
	D	13
	E	14
	F	15

SW1-No.3	SW2	Address number (slave address)
ON	0	16
	1	17
	2	18
	3	19
	4	20
	5	21
	6	22
	7	23
	8	24
	9	25
	A	26
	B	27
	C	28
	D	29
	E	30
	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)

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.

SW3	Transmission rate
0	9600 bps
1	19200 bps
2	38400 bps
3	57600 bps
4	115,200 bps
5 to F	Not used

■ 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)

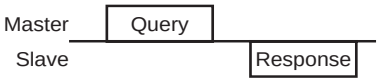
SW1-No.1, No.2	Termination resistor (120 Ω)
OFF	Disabled
ON	Enabled

12.4 Communication mode

Modbus protocol communication is based on the single-master/multiple-slave method. Under this protocol, messages are sent in one of two methods.

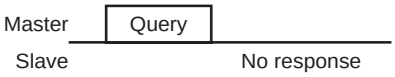
- Unicast mode

The master sends a command to only one slave. The slave executes the process and returns a response.

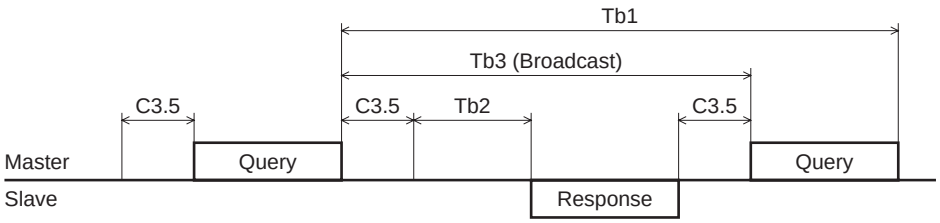


- Broadcast mode

If slave address 0 is specified on the master, the master can send a command to all slaves. Each slave executes the process, but does not return a response.



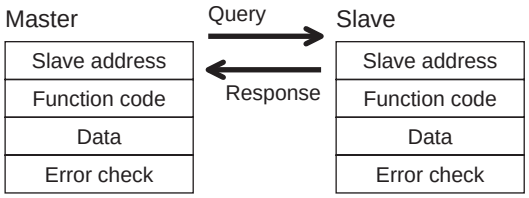
12.5 Communication timing



Character	Name	Description
Tb1	Communication timeout	Intervals between received messages are monitored. If no message could be received after the time set in the "communication timeout" parameter, a communication timeout alarm generates.
Tb2	Transmission waiting time	The time after the slave switches its communication line to the transmission mode upon receiving a query from the master, until it starts sending a response. Sets using the "transmission waiting time" parameter. The actual transmission waiting time corresponds to the silent interval (C3.5) + processing time + transmission waiting time (Tb2: 10 ms).
Tb3	Broadcasting interval	The time until the next query is sent in broadcasting. A time equivalent to or longer than the silent interval (C3.5) plus 5 ms is required.
C3.5	Silent interval	Be sure to provide a waiting time of 3.5 characters or more. If this waiting time is less than 3.5 characters long, the driver cannot respond. The silent interval should be 1.75 ms or more when the transmission rate is 19200 bps or more.

12.6 Message

The message format is shown below.



■ Query

The query message structure is shown below.

Slave address	Function code	Data	Error check
8 bits	8 bits	N×8 bits	16 bits

- Slave address

Specify the slave address (unicast mode).
If the slave address is set to 0, the master can send a query to all slaves (broadcast mode).

- Function code

The function codes and message lengths supported by the **PKA** Series are as follows.

Function code	Description	Broadcast
03h	Read from a holding register(s).	Impossible
06h	Write to a holding register.	Possible
08h	Perform diagnosis.	Impossible
10h	Write to multiple holding registers.	Possible

- Data

Set data associated with the selected function code. The specific data length varies depending on the function code.

- Error check

In the Modbus RTU mode, error checks are based on the CRC-16 method. The slave calculates a CRC-16 of each received message and compares the result against the error check value included in the message. If the calculated CRC-16 value matches the error check value, the slave determines that the message is normal.

CRC-16 calculation method

1. Calculate an exclusive-OR (XOR) value of the default value of FFFFh and slave address (8 bits).
2. Shift the result of step 1 to the right by 1 bit. Repeat this shift until the overflow bit becomes "1."
3. Upon obtaining "1" as the overflow bit, calculate an XOR of the result of step 2 and A001h.
4. Repeat steps 2 and 3 until a shift is performed eight times.
5. Calculate an XOR of the result of step 4 and function code (8 bits).
   Repeat steps 2 to 4 for all bytes.
   The final result gives the result of CRC-16 calculation.

■ Response

Slave-returned responses are classified into three types: normal response, no response, and exception response.
The response message structure is the same as the command message structure.

Slave address	Function code	Data	Error check
8 bits	8 bits	N×8 bits	16 bits

- Normal response

Upon receiving a query from the master, the slave executes the requested process and returns a response.

- No response

The slave may not return a response to a query sent by the master. This condition is referred to as "No response."
The causes of no response are explained below.

Transmission error

The slave discards the query and does not return a response if any of the following transmission errors is detected.

Cause of transmission error	Description
Framing error	Stop bit 0 was detected.
Parity error	A mismatch with the specified parity was detected.
Mismatched CRC	The calculated value of CRC-16 was found not matching the error check value.
Invalid message length	The message length exceeded 256 bytes.

Other than transmission error

A response may not be returned without any transmission error being detected.

Cause	Description
Broadcast	If the query was broadcast, the slave executes the requested process but does not return a response.
Mismatched slave address	The slave address in the query was found not matching the slave address of the motor.

- Exception response

An exception response is returned if the slave cannot execute the process requested by the query. Appended to this response is an exception code indicating why the process cannot be executed. The message structure of exception response is as follows.

Slave address	Function code	Exception code	Error check
8 bits	8 bits	8 bits	16 bits

Function code

The function code in the exception response is a sum of the function code in the query and 80h.
Example) query: 03h → Exception response: 83h

Example of exception response

Master

Slave address		01h
Function code		06h
Data	Register address (upper)	02h
	Register address (lower)	1Eh
	Value written (upper)	FFh
	Value written (lower)	FFh
Error check (lower)		E9h
Error check (upper)		C4h

Query →
← Response

Slave

Slave address		01h
Function code		86h
Data	Exception code	04h
Error check (lower)		02h
Error check (upper)		61h

Exception code

This code indicates why the process cannot be executed.

Exception code	Communication error code	Cause	Description
01h	88h	Invalid function	The process could not be executed because the function code was invalid. · The function code is not supported. · The sub-function code for diagnosis (08h) is other than 00h.
02h		Invalid data address	The process could not be executed because the data address was invalid. · The address is not supported (other than 0000h to 1FFFh). · Register address and number of registers are 2000h or more in total.
03h	8Ch	Invalid data	The process could not be executed because the data was invalid. · The number of registers is 0 or more than 17. · The number of bytes is other than twice the number of registers. · The data length is outside the specified range.
04h	89h 8Ah 8Ch 8Dh	Slave error	The process could not be executed because an error occurred at the slave. • User I/F communication in progress (89h) · Downloading, initializing or teaching function is in progress using the **OPX-2A** · Downloading or initialization is in progress using the **MEXE02** • NV memory processing in progress (8Ah) · Internal processing was in progress. (S-BSY is ON.) · An EEPROM error alarm was present. • Outside the parameter setting range (8Ch) The value write is outside the setting range. • Command execute disable (8Dh)

12.7 Function code

■ Reading from a holding register(s) (03h)

This function code is used to read a register (16 bits). Up to 16 successive registers (16×16 bits) can be read. Read the upper and lower data at the same time. If they are not read at the same time, the value may be invalid. If multiple holding registers are read, they are read in order of register addresses.

Example of read

Read operation data for positions Nos.1 and 2 of slave address 1.

Description	Register address	Value read	Corresponding decimal
Operation data position No.1 (upper)	0402h	0000h	10000
Operation data position No.1 (lower)	0403h	2710h	
Operation data position No.2 (upper)	0404h	FFFFh	−10000
Operation data position No.2 (lower)	0405h	D8F0h	

• Query

Field name		Data	Description
Slave address		01h	Slave address 1
Function code		03h	Reading from a holding register(s)
Data	Register address (upper)	04h	Register address to start reading from
	Register address (lower)	02h	
	Number of registers (upper)	00h	Number of registers to be read from the starting register address (4 registers=0004h)
	Number of registers (lower)	04h	
Error check (lower)		E4h	Calculation result of CRC-16
Error check (upper)		F9h	

• Response

Field name		Data	Description
Slave address		01h	Same as query
Function code		03h	Same as query
Data	Number of data bytes	08h	Twice the number of registers in the query
	Value read from register address (upper)	00h	Value read from register address 0402h
	Value read from register address (lower)	00h	
	Value read from register address+1 (upper)	27h	Value read from register address 0403h
	Value read from register address+1 (lower)	10h	
	Value read from register address+2 (upper)	FFh	Value read from register address 0404h
	Value read from register address+2 (lower)	FFh	
	Value read from register address+3 (upper)	D8h	Value read from register address 0405h
	Value read from register address+3 (lower)	F0h	
Error check (lower)		08h	Calculation result of CRC-16
Error check (upper)		A3h	

■ Writing to a holding register (06h)

This function code is used to write data to a specified register address.
However, since the result combining the upper and lower may be outside the data range, write the upper and lower at the same time using the "multiple holding registers (10h)."

Example of write

Write 80 (50h) as speed filter to slave address 2.

Description	Register address	Value write	Corresponding decimal
Speed filter	024Bh	50h	80

• Query

Field name		Data	Description
Slave address		02h	Slave address 2
Function code		06h	Writing to a holding register
Data	Register address (upper)	02h	Register address to be written
	Register address (lower)	4Bh	
	Value write (upper)	00h	Value written to the register address
	Value write (lower)	50h	
Error check (lower)		F8h	Calculation result of CRC-16
Error check (upper)		6Bh	

• Response

Field name		Data	Description
Slave address		02h	Same as query
Function code		06h	Same as query
Data	Register address (upper)	02h	Same as query
	Register address (lower)	4Bh	
	Value write (upper)	00h	Same as query
	Value write (lower)	50h	
Error check (lower)		F8h	Calculation result of CRC-16
Error check (upper)		6Bh	

■ Diagnosis (08h)

This function code is used to diagnose the communication between the master and slave. Arbitrary data is sent and the returned data is used to determine whether the communication is normal. 00h (reply to query) is the only sub-function supported by this function code.

Example of diagnosis

Send arbitrary data (1234h) to the slave 3.

- Query

Field name		Data	Description
Slave address		03h	Slave address 3
Function code		08h	Diagnosis
Data	Sub-function code (upper)	00h	Return the query data
	Sub-function code (lower)	00h	
	Data value (upper)	12h	Arbitrary data (1234h)
	Data value (lower)	34h	
Error check (lower)		ECh	Calculation result of CRC-16
Error check (upper)		9Eh	

- Response

Field name		Data	Description
Slave address		03h	Same as query
Function code		08h	Same as query
Data	Sub-function code (upper)	00h	Same as query
	Sub-function code (lower)	00h	
	Data value (upper)	12h	Same as query
	Data value (lower)	34h	
Error check (lower)		ECh	Calculation result of CRC-16
Error check (upper)		9Eh	

■ Writing to multiple holding registers (10h)

This function code is used to write data to multiple successive registers. Up to 16 registers can be written.
Write the data to the upper and lower at the same time. If not, an invalid value may be written.
Registers are written in order of register addresses. Note that even when an exception response is returned because some data is invalid as being outside the specified range, etc., other data may have been written properly.

Example of write

Set the following data as acceleration Nos.2 to 4 as part of operation data at slave address 4.

Description	Register address	Value written	Corresponding decimal
Operation data acceleration No.2 (upper)	0604h	0000h	10000
Operation data acceleration No.2 (lower)	0605h	2710h	
Operation data acceleration No.3 (upper)	0606h	0000h	20000
Operation data acceleration No.3 (lower)	0607h	4E20h	
Operation data acceleration No.4 (upper)	0608h	0007h	500,000
Operation data acceleration No.4 (lower)	0609h	A120h	

- Query

Field name		Data	Description
Slave address		04h	Slave address 4
Function code		10h	Writing to multiple holding registers
Data	Register address (upper)	06h	Register address to start writing from
	Register address (lower)	04h	
	Number of registers (upper)	00h	Number of registers to be written from the starting register address (6 registers=0006h)
	Number of registers (lower)	06h	
	Number of data bytes	0Ch	Twice the number of registers in the command
	Value written to register address (upper)	00h	Value written to register address 0604h
	Value written to register address (lower)	00h	
	Value written to register address+1 (upper)	27h	Value written to register address 0605h
	Value written to register address+1 (lower)	10h	
	Value written to register address+2 (upper)	00h	Value written to register address 0606h
	Value written to register address+2 (lower)	00h	
	Value written to register address+3 (upper)	4Eh	Value written to register address 0607h
	Value written to register address+3 (lower)	20h	
	Value written to register address+4 (upper)	00h	Value written to register address 0608h
	Value written to register address+4 (lower)	07h	
	Value written to register address+5 (upper)	A1h	Value written to register address 0609h
	Value written to register address+5 (lower)	20h	
Error check (lower)		1Dh	Calculation result of CRC-16
Error check (upper)		A9h	

- Response

Field name		Data	Description
Slave address		04h	Same as query
Function code		10h	Same as query
Data	Register address (upper)	06h	Same as query
	Register address (lower)	04h	
	Number of registers (upper)	00h	Same as query
	Number of registers (lower)	06h	
Error check (lower)		01h	Calculation result of CRC-16
Error check (upper)		17h	

12.8 Setting of RS-485 communication

Set parameters required RS-485 communication first.

- Parameters set with the **OPX-2A** or **MEXE02**

Set the following parameters using the **OPX-2A** or **MEXE02** since they cannot be set via RS-485 communication.

Parameter name	Setting range	Initial value	Description
Communication parity	0: None 1: Even number 2: Odd number	1	Sets the parity for RS-485 communication.
Communication stop bit	0: 1 bit 1: 2 bits	0	Sets the stop bit for RS-485 communication.
Transmission waiting time	0 to 10000 (×0.1 ms)	100	Sets the transmission waiting time for RS-485 communication.

- Parameters set with the **OPX-2A**, **MEXE02** or via RS-485 communication

Set the following parameters using the **OPX-2A**, **MEXE02** or via RS-485 communication.

Parameter name	Setting range	Initial value	Description
Communication timeout	0: Not monitored 0 to 10000 ms	0	Sets the condition in which a communication timeout occurs in RS-485 communication.
Communication error alarm	1 to 10 times	3	Sets the condition in which a RS-485 communication error alarm generates. A communication error alarm generates after a RS-485 communication error has occurred by the number of times set here.

12.9 Register address list

All data used by the motor is 32-bit wide. Since the register for the Modbus protocol is 16-bit wide, one data is described by two registers. Since the address assignment is big endian, the even number addresses become the upper and the odd number addresses become the lower.

■ Operation command

Commands related to motor operation. Operation commands are not saved in the NV memory.

Register address		WRITE/READ	Name	Description
Dec	Hex			
48	0030h	R/W	Group (upper)	Sets the address number for the group send.
49	0031h		Group (lower)	
124	007Ch	R/W	Driver input command (upper)	Sets the input command to the driver.
125	007Dh		Driver input command (lower)	
126	007Eh	R	Driver output command (upper)	Sets the output status of the driver.
127	007Fh		Driver output command (lower)	

- Group (0030h, 0031h)

  Multiple slaves are made into a group and a query is sent to all slaves in the group at once.
  When setting a group, write to the upper and lower at the same time using "writing to multiple holding registers (10h)." See p.90 for group details.

- Driver input command (007Ch, 007Dh)

  These are the motor input signals that can be accessed via RS-485 communication. See p.20 for each input signal.

( ): Initial value

Address (Hex)		bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
007Ch	Upper	−	−	−	−	−	−	−	−
	Lower	−	−	−	−	−	−	−	−
007Dh	Upper	NET-IN15 (RVS)	NET-IN14 (FWD)	NET-IN13 (−JOG)	NET-IN12 (+JOG)	NET-IN11 (SSTART)	NET-IN10 (MS2)	NET-IN9 (MS1)	NET-IN8 (MS0)
	Lower	NET-IN7 (AWO)	NET-IN6 (Not used)	NET-IN5 (STOP)	NET-IN4 (HOME)	NET-IN3 (START)	NET-IN2 (M2)	NET-IN1 (M1)	NET-IN0 (M0)

- Driver output command (007Eh, 007Fh)

  These are the motor output signals that can be received via RS-485 communication. See p.21 for each output signal.

( ): Initial value

Address (Hex)		bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
007Eh	Upper	−	−	−	−	−	−	−	−
	Lower	−	−	−	−	−	−	−	−
007Fh	Upper	NET-OUT15 (Not used)	NET-OUT14 (Not used)	NET-OUT13 (MOVE)	NET-OUT12 (TIM)	NET-OUT11 (AREA3)	NET-OUT10 (AREA2)	NET-OUT9 (AREA1)	NET-OUT8 (S-BSY1)
	Lower	NET-OUT7 (ALM)	NET-OUT6 (WNG)	NET-OUT5 (READY)	NET-OUT4 (HOME-P)	NET-OUT3 (START_R)	NET-OUT2 (M2_R)	NET-OUT1 (M1_R)	NET-OUT0 (M0_R)

■ Maintenance command

These commands are used to reset alarms and warnings. They are also used to execute the batch processing for the NV memory. All commands can be read and written (READ/WRITE). Executes when writing from 0 to 1.

Register address		Name	Description	Setting range
Dec	Hex			
384	0180h	Reset alarm (upper)	Resets the alarms that are present. Some alarms cannot be reset with the “reset alarm.”	0, 1
385	0181h	Reset alarm (lower)		
388	0184h	Clear alarm records (upper)	Clears alarm records.	
389	0185h	Clear alarm records (lower)		
390	0186h	Clear warning records (upper)	Clears warning records.	
391	0187h	Clear warning records (lower)		
392	0188h	Clear communication error records (upper)	Clears the communication error records.	
393	0189h	Clear communication error records (lower)		
394	018Ah	P-PRESET execute (upper)	Presets the command position.	
395	018Bh	P-PRESET execute (lower)		
396	018Ch	Configuration (upper)	Executes the parameter recalculation and the setup.	
397	018Dh	Configuration (lower)		
398	018Eh	All data initialization (upper)	Resets the parameters saved in the NV memory to the initial settings.*	
399	018Fh	All data initialization (lower)		
400	0190h	Batch NV memory read (upper)	Reads the parameters saved in the NV memory, to the RAM. All operation data and parameters previously saved in the RAM are overwritten.	
401	0191h	Batch NV memory read (lower)		
402	0192h	Batch NV memory write (upper)	Writes the parameters saved in the RAM to the NV memory. The NV memory can be rewritten approx. 100,000 times.	
403	0193h	Batch NV memory write (lower)		

* Communication parity, communication stop bit and transmission waiting time are not initialized. Initialize them using the **OPX-2A** or **MEXE02**.

- Configuration (018Ch, 018Dh)

Configuration will be executed when all of the following conditions are satisfied:

- An alarm is not present.
- The motor is not operated.

Shows the motor status before and after executing the configuration.

Item	Configuration is ready to execute	Configuration is executing	Configuration is completed
PWR LED	Lit	Lit	Lit
ALM LED	OFF	OFF	Based on the motor condition.
Motor excitation	Excitation/no excitation	Excitation/no excitation*	
Output signals	Allowed	Indeterminable	Allowed
Input signals	Allowed	Not allowed	Allowed

* The motor excitation status while executing the configuration keeps the status that the configuration has started.

Note The correct monitor value may not return even when the monitor is executed via RS-485 communication while executing the configuration.

■ Monitor command

Monitor the command position, command speed, alarm and warning records, etc.
All commands can be read (READ).

Register address		Name	Description	Range
Dec	Hex			
128	0080h	Present alarm (upper)	Monitors the present alarm code.	00h to FFh
129	0081h	Present alarm (lower)		
130	0082h	Alarm record 1 (upper)	Monitors the alarm records 1 to 10.	
131	0083h	Alarm record 1 (lower)		
132	0084h	Alarm record 2 (upper)		
133	0085h	Alarm record 2 (lower)		
134	0086h	Alarm record 3 (upper)		
135	0087h	Alarm record 3 (lower)		
136	0088h	Alarm record 4 (upper)		
137	0089h	Alarm record 4 (lower)		
138	008Ah	Alarm record 5 (upper)		
139	008Bh	Alarm record 5 (lower)		
140	008Ch	Alarm record 6 (upper)		
141	008Dh	Alarm record 6 (lower)		
142	008Eh	Alarm record 7 (upper)		
143	008Fh	Alarm record 7 (lower)		
144	0090h	Alarm record 8 (upper)		
145	0091h	Alarm record 8 (lower)		
146	0092h	Alarm record 9 (upper)		
147	0093h	Alarm record 9 (lower)		
148	0094h	Alarm record 10 (upper)		
149	0095h	Alarm record 10 (lower)		
150	0096h	Present warning (upper)	Monitors the present warning code.	00h to FFh
151	0097h	Present warning (lower)		
152	0098h	Warning record 1 (upper)	Monitors the warning records 1 to 10.	
153	0099h	Warning record 1 (lower)		
154	009Ah	Warning record 2 (upper)		
155	009Bh	Warning record 2 (lower)		
156	009Ch	Warning record 3 (upper)		
157	009Dh	Warning record 3 (lower)		
158	009Eh	Warning record 4 (upper)		
159	009Fh	Warning record 4 (lower)		
160	00A0h	Warning record 5 (upper)		
161	00A1h	Warning record 5 (lower)		
162	00A2h	Warning record 6 (upper)		
163	00A3h	Warning record 6 (lower)		
164	00A4h	Warning record 7 (upper)		
165	00A5h	Warning record 7 (lower)		
166	00A6h	Warning record 8 (upper)		
167	00A7h	Warning record 8 (lower)		
168	00A8h	Warning record 9 (upper)		
169	00A9h	Warning record 9 (lower)		
170	00AAh	Warning record 10 (upper)		
171	00ABh	Warning record 10 (lower)		
172	00ACh	Communication error code (upper)	Monitors the last received communication error code.	
173	00ADh	Communication error code (lower)		

Register address		Name	Description	Range
Dec	Hex			
174	00AEh	Communication error code record 1 (upper)	Monitors the communication error records 1 to 10 that have occurred in the past.	00h to FFh
175	00AFh	Communication error code record 1 (lower)		
176	00B0h	Communication error code record 2 (upper)		
177	00B1h	Communication error code record 2 (lower)		
178	00B2h	Communication error code record 3 (upper)		
179	00B3h	Communication error code record 3 (lower)		
180	00B4h	Communication error code record 4 (upper)		
181	00B5h	Communication error code record 4 (lower)		
182	00B6h	Communication error code record 5 (upper)		
183	00B7h	Communication error code record 5 (lower)		
184	00B8h	Communication error code record 6 (upper)		
185	00B9h	Communication error code record 6 (lower)		
186	00BAh	Communication error code record 7 (upper)		
187	00BBh	Communication error code record 7 (lower)		
188	00BCh	Communication error code record 8 (upper)		
189	00BDh	Communication error code record 8 (lower)		
190	00BEh	Communication error code record 9 (upper)		
191	00BFh	Communication error code record 9 (lower)		
192	00C0h	Communication error code record 10 (upper)		
193	00C1h	Communication error code record 10 (lower)		
194	00C2h	Present selected data No. (upper)	Monitors the operation data No. currently selected.	0 to 63
195	00C3h	Present selected data No. (lower)		
196	00C4h	Present operation data No. (upper)	Monitors the operation data No. corresponding to the data used in the current positioning operation. This address is used in linked-motion operation and sequential operation. While the motor is stopped, the last used operation data number is indicated. "−1" is indicated until the positioning operation is performed after turning the power ON.	−1 to 63
197	00C5h	Present operation data No. (lower)		
198	00C6h	Command position (upper)	Monitors the command position.	−2,147,483,648 to 2,147,483,647 step
199	00C7h	Command position (lower)		
200	00C8h	Command speed (upper)	Monitors the current command speed. (r/min)	−9600 to +9600 r/min +: Forward −: Reverse 0: Stop
201	00C9h	Command speed (lower)		
202	00CAh	Command speed (upper)	Monitors the current command speed. (Hz)	−1,000,000 to +1,000,000 Hz
203	00CBh	Command speed (lower)		
210	00D2h	Remaining dwell time (upper)	Monitors how much of the dwell time used in the linked-motion operation 2 remains.	0 to 50000 ms
211	00D3h	Remaining dwell time (lower)		

Register address		Name	Description	Range
Dec	Hex			
212	00D4h	Direct I/O status (upper)	Monitors the each direct I/O signal.	See table next.
213	00D5h	Direct I/O status (lower)		

Direct I/O status (00D4h)

Register address (Hex)		bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
00D4h	Upper	−	−	−	−	−	−	−	−
	Lower	−	−	−	−	−	−	OUT1	OUT0
00D5h	Upper	−	−	−	−	−	−	IN3	IN2
	Lower	IN1	IN0	−	−	−	−	−	−

■ Parameter R/W command

Write or read parameters. All commands can be read and written (READ/WRITE).
The parameters required for motor operation are available in the following two types.

- Operation data
- User parameters

Parameters set via RS-485 communication are saved in the driver's RAM. The data saved in the RAM will be erased once the power is turned off. On the other hand, the parameters saved in the NV memory will be retained even after the power supply is turned off. See p.77 "Maintenance command" for writing the parameters saved in the RAM to the NV memory.
When turning the motor power ON, the parameters saved in the NV memory will be sent to the RAM. Then, the recalculation and setup for the parameters are executed in the RAM.

Note The NV memory can be rewritten approx. 100,000 times.

When a parameter is changed, the timing to reflect the new value varies depending on the parameter. See the following four types.

- Effective immediately..... Executes the recalculation and setup immediately when writing the parameter.
- Effective after stopping the operation..... Executes the recalculation and setup after stopping the operation.
- Effective after executing the configuration..... Executes the recalculation and setup after executing the configuration.
- Effective after turning the power ON again..... Executes the recalculation and setup after turning the power ON again.

• Operation data

Register address		Name	Description	Setting range	Initial value	Effective *1
Dec	Hex					
1024 1025 to 1150 1151	0400h 0401h to 047Eh 047Fh	Position No.0 (upper) Position No.0 (lower) to Position No.63 (upper) Position No.63 (lower)	Sets the position (distance) for positioning operation.	−8,388,608 to 8,388,607 step	0	B
1152 1153 to 1278 1279	0480h 0481h to 04FEh 04FFh	Operating speed No.0 (upper) Operating speed No.0 (lower) to Operating speed No.63 (upper) Operating speed No.63 (lower)	Sets the operating speed in positioning operation and continuous operation.	0 to 1,000,000 Hz	1000	
1280 1281 to 1406 1407	0500h 0501h to 057Eh 057Fh	Operation mode No.0 (upper) Operation mode No.0 (lower) to Operation mode No.63 (upper) Operation mode No.63 (lower)	Selects how to specify the position (travel amount) in positioning operation (absolute mode or incremental mode).	0: Incremental 1: Absolute	0	
1408 1409 to 1534 1535	0580h 0581h to 05FEh 05FFh	Operation function No.0 (upper) Operation function No.0 (lower) to Operation function No.63 (upper) Operation function No.63 (lower)	Sets perform positioning operation as single-motion or linked-motion operation.	0: Single-motion 1: Linked-motion 2: Linked-motion 2	0	
1536 1537 to 1662 1663	0600h 0601h to 067Eh 067Fh	Acceleration No.0 (upper) Acceleration No.0 (lower) to Acceleration No.63 (upper) Acceleration No.63 (lower)	Sets the acceleration rate or acceleration time in positioning operation and continuous operation. *2	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s)*3	30000	
1664 1665 to 1790 1791	0680h 0681h to 06FEh 06FFh	Deceleration No.0 (upper) Deceleration No.0 (lower) to Deceleration No.63 (upper) Deceleration No.63 (lower)	Sets the deceleration rate or deceleration time in positioning operation and continuous operation. *2			
1920 1921 to 2046 2047	0780h 0781h to 07FEh 07FFh	Sequential positioning No.0 (upper) Sequential positioning No.0 (lower) to Sequential positioning No.63 (upper) Sequential positioning No.63 (lower)	Sets enable or disable sequential positioning operation.	0: Disable 1: Enable	0	
2048 2049 to 2174 2175	0800h 0801h to 087Eh 087Fh	Dwell time No.0 (upper) Dwell time No.0 (lower) to Dwell time No.63 (upper) Dwell time No.63 (lower)	Sets the dwell time to be used in linked-motion operation 2.	0 to 50000 (1=0.001 s)	0	

∗1 Indicates the timing for the data to become effective. (B: Effective after stopping the operation)

∗2 This item is effective when the “acceleration/deceleration type” parameter is set to “separate”. If this parameter is set to “common”, the values of the “common acceleration” and “common deceleration” parameters will be used (initial value: separate).

∗3 Acceleration/deceleration rate (ms/kHz) or acceleration/deceleration time (s) can be selected using "acceleration/deceleration unit" parameter. (initial value: acceleration/deceleration rate).

• User parameters

Register address		Name	Description	Setting range	Initial value	Effective*
Dec	Hex					
512	0200h	STOP input action (upper)	Sets how the motor should stop when a STOP input is turned ON.	0: Immediate stop 1: Deceleration stop 2: Immediate stop+ Current off 3: Deceleration stop+ Current off	1	
513	0201h	STOP input action (lower)				
514	0202h	Hardware overtravel (upper)	Sets whether to enable or disable hardware overtravel detection using ±LS inputs.	0: Disable 1: Enable	1	
515	0203h	Hardware overtravel (lower)				
516	0204h	Overtravel action (upper)	Sets the motor action to take place upon the occurrence of overtravel.	0: Immediate stop 1: Deceleration stop	0	
517	0205h	Overtravel action (lower)				
522	020Ah	AREA1 positive direction position (upper)	Sets the position of AREA1 positive direction.	−8,388,608 to 8,388,607 step	0	A
523	020Bh	AREA1 positive direction position (lower)				
524	020Ch	AREA1 negative direction position (upper)	Sets the position of AREA1 negative direction.			
525	020Dh	AREA1 negative direction position (lower)				
526	020Eh	AREA2 positive direction position (upper)	Sets the position of AREA2 positive direction.			
527	020Fh	AREA2 positive direction position (lower)				
528	0210h	AREA2 negative direction position (upper)	Sets the position of AREA2 negative direction.			
529	0211h	AREA2 negative direction position (lower)				
530	0212h	AREA3 positive direction position (upper)	Sets the position of AREA3 positive direction.			
531	0213h	AREA3 positive direction position (lower)				
532	0214h	AREA3 negative direction position (upper)	Sets the position of AREA3 negative direction.			
533	0215h	AREA3 negative direction position (lower)				
534	0216h	Minimum ON time for MOVE output (upper)	Sets the minimum time during which the MOVE output remains ON.	0 to 255 ms	0	
535	0217h	Minimum ON time for MOVE output (lower)				
576	0240h	RUN current (upper)	Sets the motor operating current based on the rated current being 100%.	0 to 1000 (1=0.1%)	1000	
577	0241h	RUN current (lower)				
578	0242h	STOP current (upper)	Sets the motor standstill current as a percentage of the rated current, based on the rated current being 100%.	0 to 500 (1=0.1%)	500	
579	0243h	STOP current (lower)				
586	024Ah	Speed filter (upper)	Adjusts the motor response.	0 to 200 ms	1	B
587	024Bh	Speed filter (lower)				
588	024Ch	Moving average time (upper)	Sets the time constant for the moving average filter.	0 to 200 ms	1	
589	024Dh	Moving average time (lower)				
640	0280h	Common acceleration (upper)	Sets the common acceleration rate or common acceleration time in positioning operation and continuous operation.	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s)	30000	
641	0281h	Common acceleration (lower)				

* Indicates the timing for the data to become effective. (A: Effective immediately, B: Effective after stopping the operation)

Register address		Name	Description	Setting range	Initial value	Effective*
Dec	Hex					
642	0282h	Common deceleration (upper)	Sets the common deceleration rate or common deceleration time in positioning operation and continuous operation.	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s)	30000	B
643	0283h	Common deceleration (lower)				
644	0284h	Starting speed (upper)	Sets the starting speed in positioning operation and continuous operation. The motor will operate at the starting speed if the operating speed is below the starting speed.	0 to 1,000,000 Hz	100	
645	0285h	Starting speed (lower)				
646	0286h	JOG operating speed (upper)	Sets the operating speed for JOG operation.	1 to 1,000,000 Hz	1000	
647	0287h	JOG operating speed (lower)				
648	0288h	Acceleration/deceleration rate of JOG (upper)	Sets the acceleration/ deceleration rate or acceleration/deceleration time for JOG operation.	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s)	30000	
649	0289h	Acceleration/deceleration rate of JOG (lower)				
650	028Ah	JOG starting speed (upper)	Sets the starting speed for JOG operation.	0 to 1,000,000 Hz	100	
651	028Bh	JOG starting speed (lower)				
652	028Ch	Acceleration/deceleration type (upper)	Sets whether to use the common acceleration/ deceleration or the acceleration/deceleration specified for the operation data.	0: Common 1: Separate	1	
653	028Dh	Acceleration/deceleration type (lower)				
654	028Eh	Acceleration/deceleration unit (upper)	Sets the acceleration/ deceleration unit.	0: ms/kHz 1: s	0	C
655	028Fh	Acceleration/deceleration unit (lower)				
704	02C0h	Home-seeking mode (upper)	Set the mode for return-to-home operation.	0: 2-sensor mode 1: 3-sensor mode	1	B
705	02C1h	Home-seeking mode (lower)				
706	02C2h	Operating speed of home-seeking (upper)	Sets the operating speed for return-to-home operation.	1 to 1,000,000 Hz	1000	
707	02C3h	Operating speed of home-seeking (lower)				
708	02C4h	Acceleration/deceleration of home-seeking (upper)	Sets the acceleration/ deceleration rate or acceleration/deceleration time for return-to-home operation.	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s)	30000	
709	02C5h	Acceleration/deceleration of home-seeking (lower)				
710	02C6h	Starting speed of home-seeking (upper)	Sets the starting speed for return-to-home operation.	1 to 1,000,000 Hz	100	
711	02C7h	Starting speed of home-seeking (lower)				
712	02C8h	Position offset of home-seeking (upper)	Sets the amount of offset from mechanical home.	−8,388,608 to 8,388,607 step	0	
713	02C9h	Position offset of home-seeking (lower)				
714	02CAh	Starting direction of home-seeking (upper)	Sets the starting direction for home detection.	0: Negative direction 1: Positive direction	1	
715	02CBh	Starting direction of home-seeking (lower)				
716	02CCh	SLIT detection with home-seeking (upper)	Sets whether or not to concurrently use the SLIT input for return-to-home operation.	0: Disable 1: Enable	0	
717	02CDh	SLIT detection with home-seeking (lower)				

* Indicates the timing for the data to become effective. (B: Effective after stopping the operation, C: Effective after executing the configuration)

Register address		Name	Description	Setting range	Initial value	Effective*
Dec	Hex					
718	02CEh	TIM signal detection with home-seeking (upper)	Sets whether or not to concurrently use the TIM signal for return-to-home operation.	0: Disable 1: Enable	0	B
719	02CFh	TIM signal detection with home-seeking (lower)				
776	0308h	Return-to-home incomplete alarm (upper)	Sets enable/disable for the return-to-home incomplete alarm.		0	C
777	0309h	Return-to-home incomplete alarm (lower)				
832	0340h	Overheat warning (upper)	Sets the temperature at which a main circuit overheat warning generates.	40 to 80 °C (104 to 176 °F)	80	A
833	0341h	Overheat warning (lower)				
838	0346h	Overvoltage warning (upper)	Sets the voltage at which an overvoltage warning generates.	150 to 420 （1=0.1 V）	420	
839	0347h	Overvoltage warning (lower)				
840	0348h	Undervoltage warning (upper)	Sets the voltage at which an undervoltage warning generates.		180	
841	0349h	Undervoltage warning (lower)				
896	0380h	Electronic gear A (upper)	Set the denominator of electric gear.	1 to 65535	1	C
897	0381h	Electronic gear A (lower)				
898	0382h	Electronic gear B (upper)	Set the numerator of electric gear.		1	
899	0383h	Electronic gear B (lower)				
900	0384h	Motor rotation direction (upper)	Sets the rotation direction of motor output shaft.	0: Positive direction =CCW 1: Positive direction =CW	1	
901	0385h	Motor rotation direction (lower)				
902	0386h	Software overtravel (upper)	Sets whether to enable or disable software overtravel detection using soft limits.	0: Disable 1: Enable	1	A
903	0387h	Software overtravel (lower)				
904	0388h	Positive software limit (upper)	Sets the value of soft limit in positive direction.	−8,388,608 to 8,388,607 step	8,388,607	
905	0389h	Positive software limit (lower)				
906	038Ah	Negative software limit (upper)	Sets the value of soft limit in negative direction.		−8,388,608	
907	038Bh	Negative software limit (lower)				
908	038Ch	Preset position (upper)	Sets the preset position.		0	
909	038Dh	Preset position (lower)				
910	038Eh	Wrap setting (upper)	Sets enable/disable for the wrap function.	0: Disable 1: Enable	0	C
911	038Fh	Wrap setting (lower)				
912	0390h	Wrap setting range (upper)	Sets the wrap setting range.	1 to 8,388,607 step	500	
913	0391h	Wrap setting range (lower)				
960	03C0h	Data setter speed display (upper)	Sets the display method of the speed monitor for the **OPX-2A**.	0: Signed 1: Absolute value	0	A
961	03C1h	Data setter speed display (lower)				
962	03C2h	Data setter edit (upper)	Sets whether it is possible to edit using the **OPX-2A**.	0: Disable 1: Enable	1	
963	03C3h	Data setter edit (lower)				

* Indicates the timing for the data to become effective. (A: Effective immediately, B: Effective after stopping the operation, C: Effective after executing the configuration)

Register address		Name	Description	Setting range	Initial value	Effective*
Dec	Hex					
4096	1000h	MS0 operation No. selection (upper)	Sets the operation data No. corresponding to MS0 input.	0 to 63	0	B
4097	1001h	MS0 operation No. selection (lower)				
4098	1002h	MS1 operation No. selection (upper)	Sets the operation data No. corresponding to MS1 input.		1	
4099	1003h	MS1 operation No. selection (lower)				
4100	1004h	MS2 operation No. selection (upper)	Sets the operation data No. corresponding to MS2 input.		2	
4101	1005h	MS2 operation No. selection (lower)				
4102	1006h	MS3 operation No. selection (upper)	Sets the operation data No. corresponding to MS3 input.		3	
4103	1007h	MS3 operation No. selection (lower)				
4104	1008h	MS4 operation No. selection (upper)	Sets the operation data No. corresponding to MS4 input.		4	
4105	1009h	MS4 operation No. selection (lower)				
4106	100Ah	MS5 operation No. selection (upper)	Sets the operation data No. corresponding to MS5 input.		5	
4107	100Bh	MS5 operation No. selection (lower)				
4108	100Ch	HOME-P function selection (upper)	Sets the timing to output the HOME-P output.	0: Home output 1: Return-to-home complete output	0	A
4109	100Dh	HOME-P function selection (lower)				
4128	1020h	Filter selection (upper)	Set either speed filter or moving average filter.	0: Speed filter 1: Moving average filter	0	C
4129	1021h	Filter selection (lower)				
4168	1048h	JOG travel amount (upper)	Sets the travel amount for JOG operation.	1 to 8,388,607 step	1	B
4169	1049h	JOG travel amount (lower)				
4192	1060h	Backward steps in 2sensor mode home-seeking (upper)	Set the travel amount after pulling out of the limit sensor in 2-sensor mode return-to-home operation.	1 to 32767 step	200	
4193	1061h	Backward steps in 2sensor mode home-seeking (lower)				
4352	1100h	IN0 input function selection (upper)	Sets the function of input terminals IN0 to IN3.	See table on p.89.	60	C
4353	1101h	IN0 input function selection (lower)				
4354	1102h	IN1 input function selection (upper)			61	
4355	1103h	IN1 input function selection (lower)				
4356	1104h	IN2 input function selection (upper)			62	
4357	1105h	IN2 input function selection (lower)				
4358	1106h	IN3 input function selection (upper)			18	
4359	1107h	IN3 input function selection (lower)				

* Indicates the timing for the data to become effective. (A: Effective immediately, B: Effective after stopping the operation, C: Effective after executing the configuration)

Register address		Name	Description	Setting range	Initial value	Effective*
Dec	Hex					
4384	1120h	IN0 input logic level setting (upper)	Sets the IN0 to IN3 input logic.	0: Normally open 1: Normally closed	0	C
4385	1121h	IN0 input logic level setting (lower)				
4386	1122h	IN1 input logic level setting (upper)				
4387	1123h	IN1 input logic level setting (lower)				
4388	1124h	IN2 input logic level setting (upper)				
4389	1125h	IN2 input logic level setting (lower)				
4390	1126h	IN3 input logic level setting (upper)				
4391	1127h	IN3 input logic level setting (lower)				
4416	1140h	OUT0 output function selection (upper)	Sets the function of output terminals OUT0 and OUT1.	See table on p.89.	65	
4417	1141h	OUT0 output function selection (lower)				
4418	1142h	OUT1 output function selection (upper)			67	
4419	1143h	OUT1 output function selection (lower)				
4448	1160h	NET-IN0 input function selection (upper)	Sets the function of NET-IN0 to NET-IN8.	See table on p.89.	48	
4449	1161h	NET-IN0 input function selection (lower)				
4450	1162h	NET-IN1 input function selection (upper)			49	
4451	1163h	NET-IN1 input function selection (lower)				
4452	1164h	NET-IN2 input function selection (upper)			50	
4453	1165h	NET-IN2 input function selection (lower)				
4454	1166h	NET-IN3 input function selection (upper)			4	
4455	1167h	NET-IN3 input function selection (lower)				
4456	1168h	NET-IN4 input function selection (upper)			3	
4457	1169h	NET-IN4 input function selection (lower)				
4458	116Ah	NET-IN5 input function selection (upper)			18	
4459	116Bh	NET-IN5 input function selection (lower)				
4460	116Ch	NET-IN6 input function selection (upper)			0	
4461	116Dh	NET-IN6 input function selection (lower)				
4462	116Eh	NET-IN7 input function selection (upper)			17	
4463	116Fh	NET-IN7 input function selection (lower)				
4464	1170h	NET-IN8 input function selection (upper)			8	
4465	1171h	NET-IN8 input function selection (lower)				

* Indicates the timing for the data to become effective. (C: Effective after executing the configuration)

Register address		Name	Description	Setting range	Initial value	Effective*
Dec	Hex					
4466	1172h	NET-IN9 input function selection (upper)	Sets the function of NET-IN9 to NET-IN15.	See table on p.89.	9	C
4467	1173h	NET-IN9 input function selection (lower)				
4468	1174h	NET-IN10 input function selection (upper)			10	
4469	1175h	NET-IN10 input function selection (lower)				
4470	1176h	NET-IN11 input function selection (upper)			5	
4471	1177h	NET-IN11 input function selection (lower)				
4472	1178h	NET-IN12 input function selection (upper)			6	
4473	1179h	NET-IN12 input function selection (lower)				
4474	117Ah	NET-IN13 input function selection (upper)			7	
4475	117Bh	NET-IN13 input function selection (lower)				
4476	117Ch	NET-IN14 input function selection (upper)			1	
4477	117Dh	NET-IN14 input function selection (lower)				
4478	117Eh	NET-IN15 input function selection (upper)			2	
4479	117Fh	NET-IN15 input function selection (lower)				
4480	1180h	NET-OUT0 output function selection (upper)	Sets the function of NET-OUT0 to NET-OUT7.	See table on p.89.	48	
4481	1181h	NET-OUT0 output function selection (lower)				
4482	1182h	NET-OUT1 output function selection (upper)			49	
4483	1183h	NET-OUT1 output function selection (lower)				
4484	1184h	NET-OUT2 output function selection (upper)			50	
4485	1185h	NET-OUT2 output function selection (lower)				
4486	1186h	NET-OUT3 output function selection (upper)			4	
4487	1187h	NET-OUT3 output function selection (lower)				
4488	1188h	NET-OUT4 output function selection (upper)			70	
4489	1189h	NET-OUT4 output function selection (lower)				
4490	118Ah	NET-OUT5 output function selection (upper)			67	
4491	118Bh	NET-OUT5 output function selection (lower)				
4492	118Ch	NET-OUT6 output function selection (upper)			66	
4493	118Dh	NET-OUT6 output function selection (lower)				
4494	118Eh	NET-OUT7 output function selection (upper)			65	
4495	118Fh	NET-OUT7 output function selection (lower)				

* Indicates the timing for the data to become effective. (C: Effective after executing the configuration)

Register address		Name	Description	Setting range	Initial value	Effective*
Dec	Hex					
4496	1190h	NET-OUT8 output function selection (upper)	Sets the function of NET-OUT8 to NET-OUT15.	See table on p.89.	80	C
4497	1191h	NET-OUT8 output function selection (lower)				
4498	1192h	NET-OUT9 output function selection (upper)			73	
4499	1193h	NET-OUT9 output function selection (lower)				
4500	1194h	NET-OUT10 output function selection (upper)			74	
4501	1195h	NET-OUT10 output function selection (lower)				
4502	1196h	NET-OUT11 output function selection (upper)			75	
4503	1197h	NET-OUT11 output function selection (lower)				
4504	1198h	NET-OUT12 output function selection (upper)			72	
4505	1199h	NET-OUT12 output function selection (lower)				
4506	119Ah	NET-OUT13 output function selection (upper)			68	
4507	119Bh	NET-OUT13 output function selection (lower)				
4508	119Ch	NET-OUT14 output function selection (upper)			0	
4509	119Dh	NET-OUT14 output function selection (lower)				
4510	119Eh	NET-OUT15 output function selection (upper)			0	
4511	119Fh	NET-OUT15 output function selection (lower)				
4608	1200h	Communication timeout (upper)	Sets the condition in which a communication timeout occurs in RS-485 communication.	0: Not monitored 0 to 10000 ms	0	A
4609	1201h	Communication timeout (lower)				
4610	1202h	Communication error alarm (upper)	Sets the condition in which a RS-485 communication error alarm generates. A communication error alarm generates after a RS-485 communication error has occurred by the number of times set here.	1 to 10 times	3	
4611	1203h	Communication error alarm (lower)				

* Indicates the timing for the data to become effective. (A: Effective immediately, C: Effective after executing the configuration)

Setting range for IN input function selection

0: Not used	8: MS0	18: STOP	36: R4	44: R12	52: M4
1: FWD	9: MS1	24: ALM-RST	37: R5	45: R13	53: M5
2: RVS	10: MS2	25: P-PRESET	38: R6	46: R14	60: +LS
3: HOME	11: MS3	27: HMI	39: R7	47: R15	61: −LS
4: START	12: MS4	32: R0	40: R8	48: M0	62: HOMES
5: SSTART	13: MS5	33: R1	41: R9	49: M1	63: SLIT
6: +JOG	16: FREE*	34: R2	42: R10	50: M2	
7: −JOG	17: AWO	35: R3	43: R11	51: M3	

* The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

Setting range for OUT output function selection

0: Not used	8: MS0_R	32: R0	41: R9	50: M2_R	66: WNG
1: FWD_R	9: MS1_R	33: R1	42: R10	51: M3_R	67: READY
2: RVS_R	10: MS2_R	34: R2	43: R11	52: M4_R	68: MOVE
3: HOME_R	11: MS3_R	35: R3	44: R12	53: M5_R	70: HOME-P
4: START_R	12: MS4_R	36: R4	45: R13	60: +LS_R	72: TIM
5: SSTART_R	13: MS5_R	37: R5	46: R14	61: −LS_R	73: AREA1
6: +JOG_R	16: FREE_R	38: R6	47: R15	62: HOMES_R	74: AREA2
7: −JOG_R	17: AWO_R	39: R7	48: M0_R	63: SLIT_R	75: AREA3
	18: STOP_R	40: R8	49: M1_R	65: ALM	80: S-BSY

Setting range for NET-IN input function selection

0: Not used	7: −JOG	16: FREE	33: R1	40: R8	47: R15
1: FWD	8: MS0	17: AWO	34: R2	41: R9	48: M0
2: RVS	9: MS1	18: STOP	35: R3	42: R10	49: M1
3: HOME	10: MS2	24: ALM-RST	36: R4	43: R11	50: M2
4: START	11: MS3	25: P-PRESET	37: R5	44: R12	51: M3
5: SSTART	12: MS4	27: HMI	38: R6	45: R13	52: M4
6: +JOG	13: MS5	32: R0	39: R7	46: R14	53: M5

* The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

Setting range for NET-OUT output function selection

0: Not used	8: MS0_R	32: R0	41: R9	50: M2_R	66: WNG
1: FWD_R	9: MS1_R	33: R1	42: R10	51: M3_R	67: READY
2: RVS_R	10: MS2_R	34: R2	43: R11	52: M4_R	68: MOVE
3: HOME_R	11: MS3_R	35: R3	44: R12	53: M5_R	70: HOME-P
4: START_R	12: MS4_R	36: R4	45: R13	60: +LS_R	72: TIM
5: SSTART_R	13: MS5_R	37: R5	46: R14	61: −LS_R	73: AREA1
6: +JOG_R	16: FREE_R	38: R6	47: R15	62: HOMES_R	74: AREA2
7: −JOG_R	17: AWO_R	39: R7	48: M0_R	63: SLIT_R	75: AREA3
	18: STOP_R	40: R8	49: M1_R	65: ALM	80: S-BSY

12.10 Group send

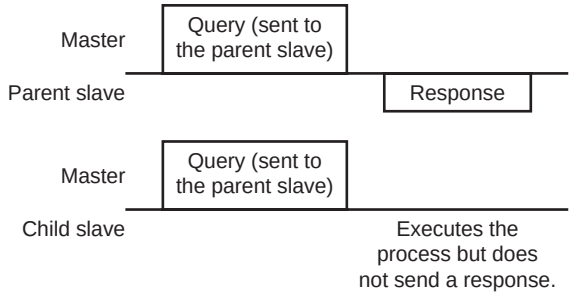
Multiple slaves are made into a group and a query is sent to all slaves in the group at once.

- Group composition

  A group consists of one parent slave and child slaves and only the parent slave returns a response.

- Group address

  To perform a group send, set a group address to the child slaves to be included in the group.
  The child slaves to which the group address has been set can receive a query sent to the parent slave.



- Parent slave

  No special setting is required on the parent slave to perform a group send. The address of the parent slave becomes the group address. When a query is sent to the parent slave from the master, the parent slave executes the requested process and then returns a response (same as with the unicast mode).

- Child slave

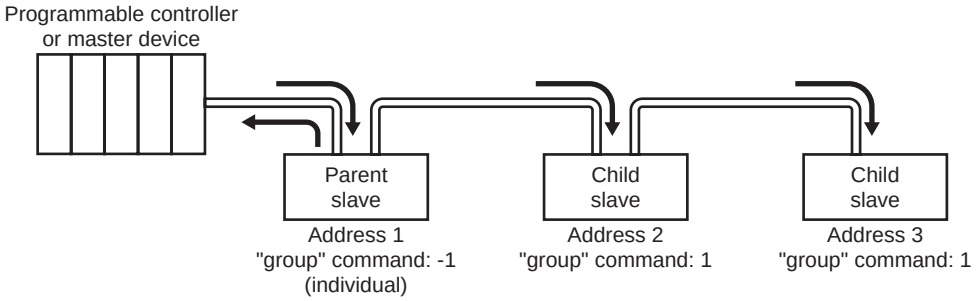
  Use a "group" command to set a group address to each child slave.
  Change the group in the unicast mode.

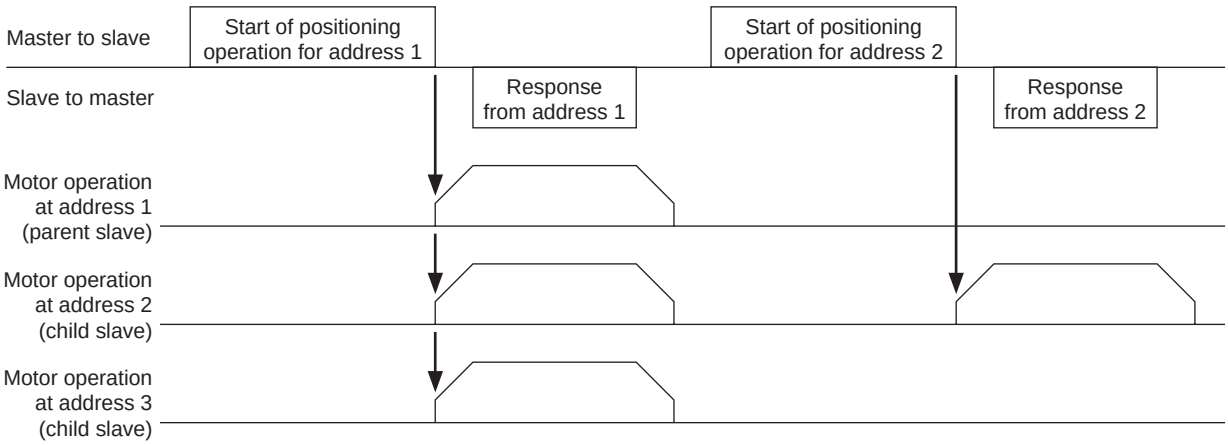
Register address		Name	Description	Setting range	Initial value
Dec	Hex				
48	0030h	Group (upper)	−1: No group specification (Group send is not performed) 1 to 31: Sets a group address.	−1 or 1 to 31	−1
49	0031h	Group (lower)			

Note Since the group setting is not saved in the NV memory even when the "batch NV memory write" executes, the group setting will be cleared when turning the motor power OFF.

- Function code to execute in a group send

Function code	Function
10h	Writing to multiple holding registers





12.11 Detection of communication errors

This function detects abnormalities that may occur during RS-485 communication. The abnormalities that can be detected include alarms, warnings and communication errors.

■ Communication errors

A communication error record will be saved in the RAM. You can check the communication errors using the "communication error record" command via RS-485 communication.

Note The communication error record will be cleared once the motor power is turned off.

Type of communication error	Error code	Cause
RS-485 communication error	84h	A transmission error was detected. See "Transmission error" on p.71.
Command not yet defined	88h	An exception response (exception code 01h, 02h) was detected. See p.71.
Execution disable due to user I/F communication in progress	89h	An exception response (exception code 04h) was detected. See p.71.
NV memory processing in progress	8Ah	
Outside setting range	8Ch	An exception response (exception code 03h, 04h) was detected. See p.71.
Command execute disable	8Dh	An exception response (exception code 04h) was detected. See p.71.

■ Alarms and warnings

When an alarm generates, the ALM output will turn OFF and the motor will stop. At the same time, the ALM LED will start blinking.
When a warning generates, the WNG output will turn ON. The motor will continue to operate. Once the cause of the warning is removed, the WNG output will turn OFF automatically.

Note You can also clear the warning records by turning off the motor power.

- Communication switch setting error

When setting the transmission rate setting switch (SW3) to positions 8 to F, the transmission rate setting switch error will occur.

- RS-485 communication error (84h)

The table below shows the relationship between alarms and warnings when an RS-485 communication error occurs.

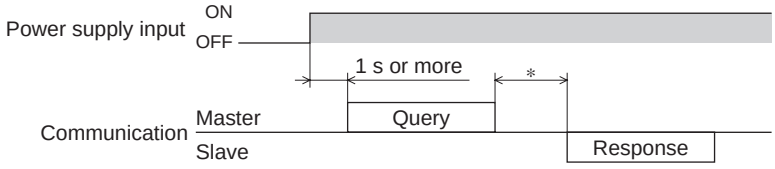
Description of error	Description
Warning	A warning generates when one RS-485 communication error (84h) has been detected. If normal reception occurs while the warning is present, the warning will be reset automatically.
Alarm	An alarm generates when a RS-485 communication error (84h) has been detected consecutively by the number of times set in the "communication error alarm" parameter.

- RS-485 communication timeout (85h)

If communication is not established with the master after an elapse of the time set by the "communication timeout" parameter, a RS-485 communication timeout alarm will generate.

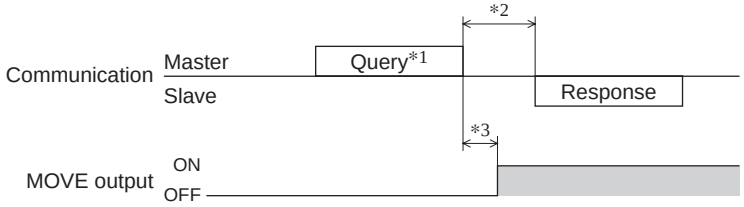
12.12 Timing charts

■ Communication start



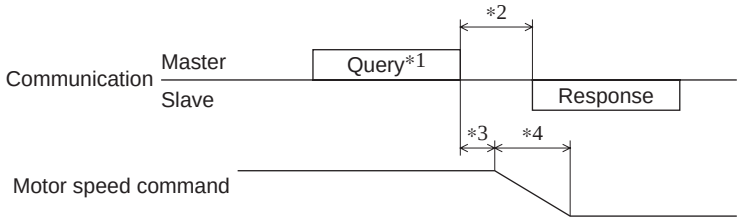
∗ Tb2 (transmission waiting time) + C3.5 (silent interval) + command processing time

■ Operation start



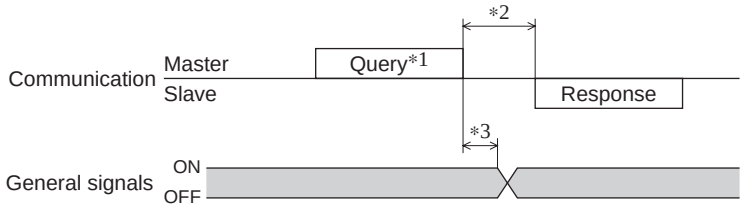
∗1 A message including a query to start operation via RS-485 communication.
∗2 Tb2 (transmission waiting time) + C3.5 (silent interval) + command processing time
∗3 C3.5 (silent interval) + 4 ms or less

■ Operation stop, speed change



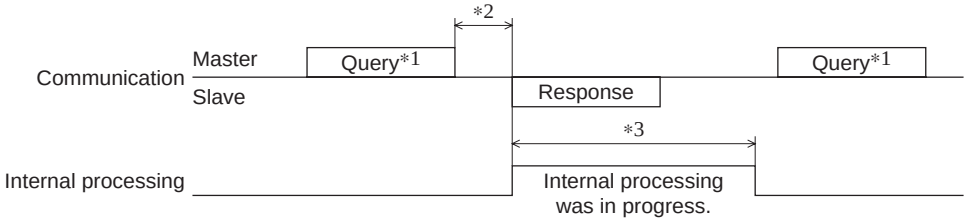
∗1 A message including a query to stop operation and another to change the speed via RS-485 communication.
∗2 Tb2 (transmission waiting time) + C3.5 (silent interval) + command processing time
∗3 C3.5 (silent interval) + command processing time
∗4 The deceleration method to be applied at the time of stopping varies according to the value set by the “STOP input action” parameter.

■ General signals



∗1 A message including a query for remote output via RS-485 communication.
∗2 Tb2 (transmission waiting time) + C3.5 (silent interval) + command processing time
∗3 C3.5 (silent interval) + 4 ms or less

■ Configuration



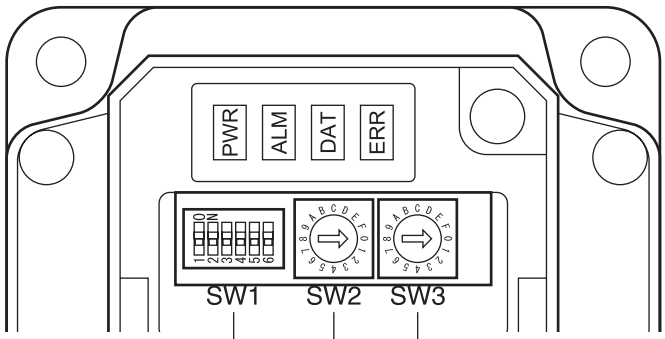
∗1 A message including a query for configuration via RS-485 communication.
∗2 Tb2 (transmission waiting time) + C3.5 (silent interval) + command processing time
∗3 C3.5 (silent interval) + 1 s or less

13 Method of control via Network converter

The following explains how to control the **PKA** Series with CC-Link communication or MECHATROLINK communication via the network converter.

13.1 Setting the PKA Series switches

When using the **PKA** Series in combination with the network converter, set the switches before use.



Function setting switch (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

Address number setting switch (SW2)

Transmission rate setting switch (SW3)

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 driver power is cycled.

■ Setting the connection device

Set the connection device of RS-485 communication using the function setting switch SW1-No.4. Turn this switch OFF when controlling via the network converter.

Factory setting 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.

Factory setting SW1-No.3: OFF, SW2: 0 (Address number 0)

SW1-No.3	SW2	Address number (slave address)
OFF	0	0
	1	1
	2	2
	3	3
	4	4
	5	5
	6	6
	7	7
	8	8
	9	9
	A	10
	B	11
	C	12
	D	13
	E	14
	F	15

SW1-No.3	SW2	Address number (slave address)
ON	0	16
	1	17
	2	18
	3	19
	4	20
	5	21
	6	22
	7	23
	8	24
	9	25
	A	26
	B	27
	C	28
	D	29
	E	30
	F	31

■ Transmission rate

Set the transmission rate to 625,000 bps using the transmission rate setting switch (SW3).
Factory setting 7 (625,000 bps)

■ 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

13.2 When using the motor with CC-Link communication

See the following explanation when using the **PKA** Series in combination with the network converter **NETC01-CC**, via CC-Link communication.

■ Guidance

If you are new to the **PKA** Series, read this section to understand the operating methods along with the operation flow.

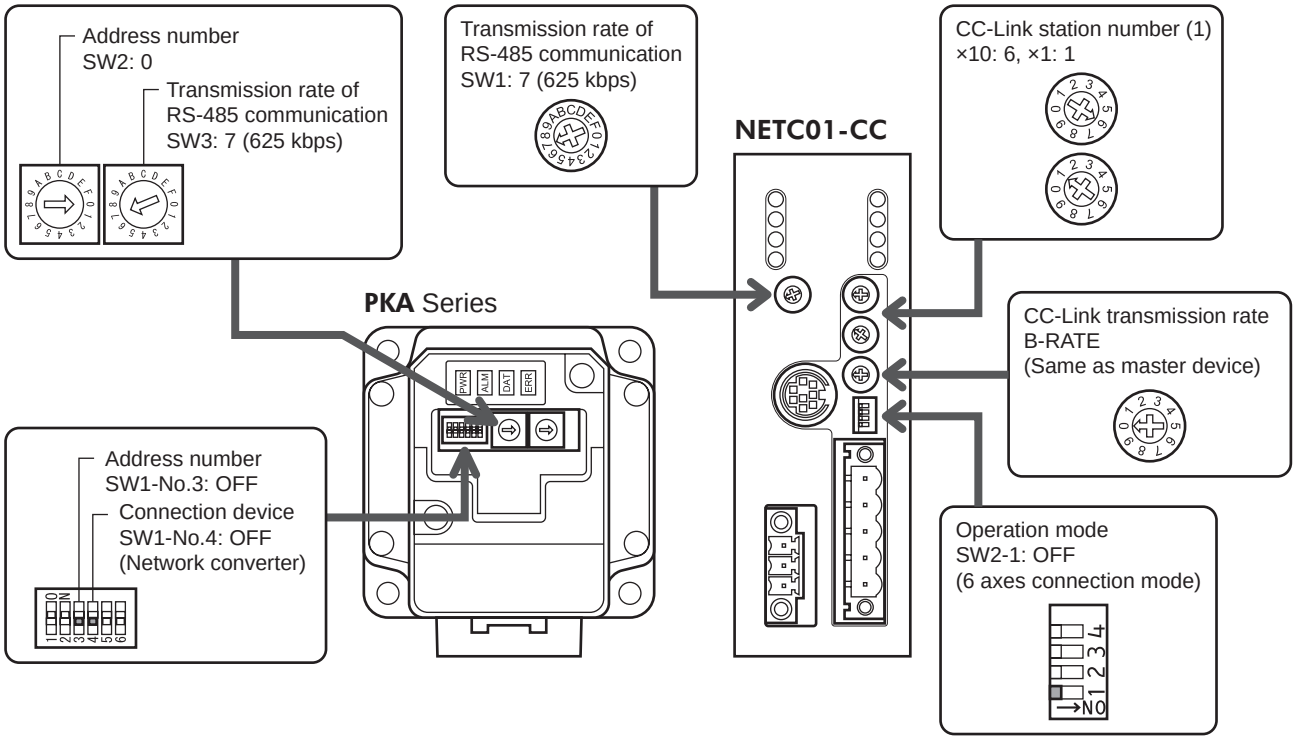
Note
- Before operating the motor, check the condition of the surrounding area to ensure safety.
- See the network converter **NETC01-CC** OPERATING MANUAL for how to set the parameter.

STEP 1 Set the transmission rate, station address and address number.

- Using the switches

Setting condition of **PKA** Series
- Address number of the **PKA** Series: 0
- RS-485 transmission rate: 625 kbps
- Connection device of RS-485 communication: Network converter

Setting condition of **NETC01-CC**
- CC-Link station number: 1
- RS-485 transmission rate: 625 kbps
- CC-Link transmission rate: Same as the master station
- Operation mode: 6 axes connection mode

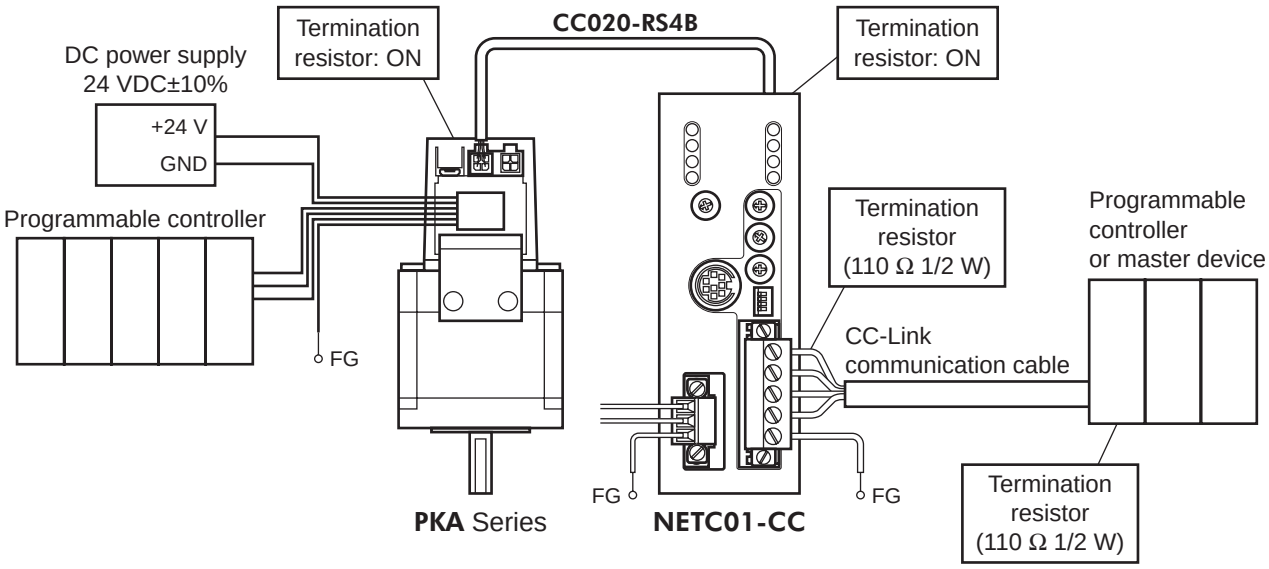


- Using the parameter

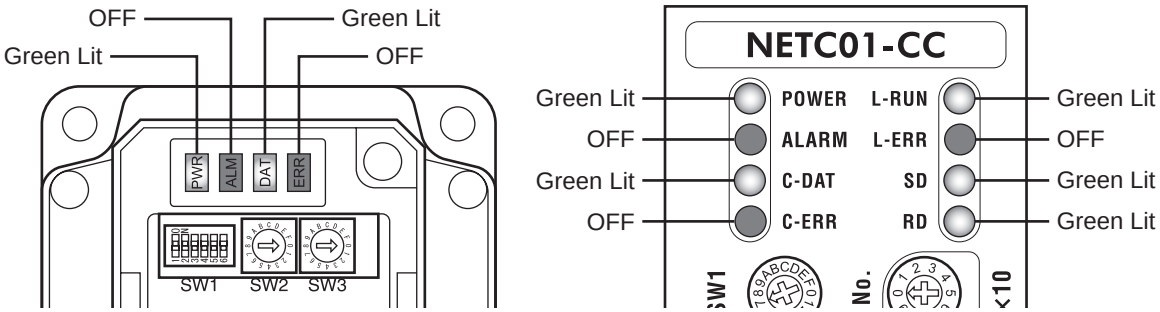
1. Set the "connection (address number 0) (1D80h)" parameter of the **NETC01-CC** to "1: Enable."
2. Execute the "batch NV memory write (3E85h)" of the **NETC01-CC**.
3. Cycle the **NETC01-CC** power.

Note "Connection" parameters will be enabled after the power is cycled.

STEP 2 Check the termination resistor



STEP 3 Turn on the power and check the setting



- When ERR (red) of the **PKA** Series or C-ERR (red) of the **NETC01-CC** is lit:
  Check the transmission rate or address number of RS-485 communication.
- When L-ERR (red) of the **NETC01-CC** is lit:
  Check the type of the CC-Link communication error.

STEP 4 Execute positioning operation via remote I/O of CC-Link communication.

1. Set the position (1200h) and operating speed (1240h) of the operation data No.0 of the **PKA** Series.
2. Execute positioning operation by turning the START of the CC-Link remote I/O address number 1 to ON.

RY (Master to **NETC01-CC**)		
Device No.	Signal name	Initial value
RY0	NET-IN0	M0
RY1	NET-IN1	M1
RY2	NET-IN2	M2
RY3	NET-IN3	START
RY4	NET-IN4	HOME
RY5	NET-IN5	STOP
RY6	NET-IN6	Not used
RY7	NET-IN7	AWO

RY (Master to **NETC01-CC**)		
Device No.	Signal name	Initial value
RY8	NET-IN8	MS0
RY9	NET-IN9	MS1
RYA	NET-IN10	MS2
RYB	NET-IN11	SSTART
RYC	NET-IN12	+JOG
RYD	NET-IN13	−JOG
RYE	NET-IN14	FWD
RYF	NET-IN15	RVS

STEP 5 Were you able to operate the motor properly?

How did it go? Were you able to operate the motor properly? If the motor does not function, check the following points:

- Is any alarm present in the **PKA** Series or **NETC01-CC**?
- Are the address number, transmission rate and termination resistor set correctly?
- Is the "connection" parameter of the **NETC01-CC** set correctly?
- Is the ERR LED of the **PKA** Series or the C-ERR LED of the **NETC01-CC** lit? (RS-485 communication error)
- Is the L-ERR LED of the **NETC01-CC** lit? (CC-Link communication error)
- Is the **PKA** Series motor excited? Or is the excitation setting correct?
- Are the **PKA** Series parameters set correctly?
- Is the STOP input of the **PKA** Series I/O turned ON?

For more detailed settings and functions, refer to the following pages.

■ Remote resistor list

Remote register is common to 6-axes connection mode and 12-axes connection mode.
"Monitor", "read and write of parameters" and "maintenance command" for the **PKA** Series or **NETC01-CC** are executed using remote register.

RWw (Master to **NETC01-CC**)		RWr (**NETC01-CC** to master)	
Address No.	Description	Address No.	Description
RWwn0	Command code of monitor 0	RWrn0	Data of monitor 0 (lower 16 bit)
RWwn1	Address number of monitor 0	RWrn1	Data of monitor 0 (upper 16 bit)
RWwn2	Command code of monitor 1	RWrn2	Data of monitor 1 (lower 16 bit)
RWwn3	Address number of monitor 1	RWrn3	Data of monitor 1 (upper 16 bit)
RWwn4	Command code of monitor 2	RWrn4	Data of monitor 2 (lower 16 bit)
RWwn5	Address number of monitor 2	RWrn5	Data of monitor 2 (upper 16 bit)
RWwn6	Command code of monitor 3	RWrn6	Data of monitor 3 (lower 16 bit)
RWwn7	Address number of monitor 3	RWrn7	Data of monitor 3 (upper 16 bit)
RWwn8	Command code of monitor 4	RWrn8	Data of monitor 4 (lower 16 bit)
RWwn9	Address number of monitor 4	RWrn9	Data of monitor 4 (upper 16 bit)
RWwnA	Command code of monitor 5	RWrnA	Data of monitor 5 (lower 16 bit)
RWwnB	Address number of monitor 5	RWrnB	Data of monitor 5 (upper 16 bit)
RWwnC	Command code	RWrnC	Command code response
RWwnD	Address number	RWrnD	Address number response
RWwnE	Data (lower)	RWrnE	Data (lower)
RWwnF	Data (upper)	RWrnF	Data (upper)

■ Assignment of remote I/O

Remote I/O assignments of the **PKA** Series are as follows.
"n" is an address assigned to the master station by the CC-Link station number setting.
See the network converter **NETC01-CC** OPERATING MANUAL for 6-axes or 12-axes mode.

• 6-axes connection mode

Command RY (Master to **NETC01-CC**)		Response RX (**NETC01-CC** to master)	
Device No.	Description	Device No.	Description
RYn7 to RYn0	Address number "0" remote I/O input	RXn7 to RXn0	Address number "0" remote I/O output
RYnF to RYn8		RXnF to RXn8	
RY (n+1) 7 to RY (n+1) 0	Address number "1" remote I/O input	RX (n+1) 7 to RX (n+1) 0	Address number "1" remote I/O output
RY (n+1) F to RY (n+1) 8		RX (n+1) F to RX (n+1) 8	
RY (n+2) 7 to RY (n+2) 0	Address number "2" remote I/O input	RX (n+2) 7 to RX (n+2) 0	Address number "2" remote I/O output
RY (n+2) F to RY (n+2) 8		RX (n+2) F to RX (n+2) 8	
RY (n+3) 7 to RY (n+3) 0	Address number "3" remote I/O input	RX (n+3) 7 to RX (n+3) 0	Address number "3" remote I/O output
RY (n+3) F to RY (n+3) 8		RX (n+3) F to RX (n+3) 8	
RY (n+4) 7 to RY (n+4) 0	Address number "4" remote I/O input	RX (n+4) 7 to RX (n+4) 0	Address number "4" remote I/O output
RY (n+4) F to RY (n+4) 8		RX (n+4) F to RX (n+4) 8	
RY (n+5) 7 to RY (n+5) 0	Address number "5" remote I/O input	RX (n+5) 7 to RX (n+5) 0	Address number "5" remote I/O output
RY (n+5) F to RY (n+5) 8		RX (n+5) F to RX (n+5) 8	
RY (n+6) 7 to RY (n+6) 0	Control input of **NETC01-CC** *	RX (n+6) 7 to RX (n+6) 0	Status output of **NETC01-CC** *
RY (n+6) F to RY (n+6) 8		RX (n+6) F to RX (n+6) 8	
RY (n+7) 7 to RY (n+7) 0	Control input of system area*	RX (n+7) 7 to RX (n+7) 0	Status output of system area*
RY (n+7) F to RY (n+7) 8		RX (n+7) F to RX (n+7) 8	

* See the network converter **NETC01-CC** OPERATING MANUAL for details.

• 12-axes connection mode

Command RY (Master to **NETC01-CC**)	
Device No.	Description
RYn7 to RYn0	Address number "0" remote I/O input
RYnF to RYn8	Address number "1" remote I/O input
RY (n+1) 7 to RY (n+1) 0	Address number "2" remote I/O input
RY (n+1) F to RY (n+1) 8	Address number "3" remote I/O input
RY (n+2) 7 to RY (n+2) 0	Address number "4" remote I/O input
RY (n+2) F to RY (n+2) 8	Address number "5" remote I/O input
RY (n+3) 7 to RY (n+3) 0	Address number "6" remote I/O input
RY (n+3) F to RY (n+3) 8	Address number "7" remote I/O input
RY (n+4) 7 to RY (n+4) 0	Address number "8" remote I/O input
RY (n+4) F to RY (n+4) 8	Address number "9" remote I/O input
RY (n+5) 7 to RY (n+5) 0	Address number "10" remote I/O input
RY (n+5) F to RY (n+5) 8	Address number "11" remote I/O input
RY (n+6) 7 to RY (n+6) 0	Control input of **NETC01-CC** *
RY (n+6) F to RY (n+6) 8	
RY (n+7) 7 to RY (n+7) 0	Control input of system area*
RY (n+7) F to RY (n+7) 8	

Response RX (**NETC01-CC** to master)	
Device No.	Description
RXn7 to RXn0	Address number "0" remote I/O output
RXnF to RXn8	Address number "1" remote I/O output
RX (n+1) 7 to RX (n+1) 0	Address number "2" remote I/O output
RX (n+1) F to RX (n+1) 8	Address number "3" remote I/O output
RX (n+2) 7 to RX (n+2) 0	Address number "4" remote I/O output
RX (n+2) F to RX (n+2) 8	Address number "5" remote I/O output
RX (n+3) 7 to RX (n+3) 0	Address number "6" remote I/O output
RX (n+3) F to RX (n+3) 8	Address number "7" remote I/O output
RX (n+4) 7 to RX (n+4) 0	Address number "8" remote I/O output
RX (n+4) F to RX (n+4) 8	Address number "9" remote I/O output
RX (n+5) 7 to RX (n+5) 0	Address number "10" remote I/O output
RX (n+5) F to RX (n+5) 8	Address number "11" remote I/O output
RX (n+6) 7 to RX (n+6) 0	Status output of **NETC01-CC** *
RX (n+6) F to RX (n+6) 8	
RX (n+7) 7 to RX (n+7) 0	Status output of system area*
RX (n+7) F to RX (n+7) 8	

* See the network converter **NETC01-CC** OPERATING MANUAL for details.

• Remote I/O input

• 6-axes connection mode ( ): Initial value

Device No.	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
RYn7 to RYn0	NET-IN7 (AWO)	NET-IN6 (Not used)	NET-IN5 (STOP)	NET-IN4 (HOME)	NET-IN3 (START)	NET-IN2 (M2)	NET-IN1 (M1)	NET-IN0 (M0)
RYnF to RYn8	NET-IN15 (RVS)	NET-IN14 (FWD)	NET-IN13 (−JOG)	NET-IN12 (+JOG)	NET-IN11 (SSTART)	NET-IN10 (MS2)	NET-IN9 (MS1)	NET-IN8 (MS0)

• 12-axes connection mode ( ): Initial value

Device No.	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
RYn7 to RYn0	NET-IN7 (AWO)	NET-IN6 (Not used)	NET-IN5 (STOP)	NET-IN4 (HOME)	NET-IN3 (START)	NET-IN2 (M2)	NET-IN1 (M1)	NET-IN0 (M0)

• Remote I/O output

• 6-axes connection mode ( ): Initial value

Device No.	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
RYn7 to RYn0	NET-OUT7 (ALM)	NET-OUT6 (WNG)	NET-OUT5 (READY)	NET-OUT4 (HOME-P)	NET-OUT3 (START_R)	NET-OUT2 (M2_R)	NET-OUT1 (M1_R)	NET-OUT0 (M0_R)
RYnF to RYn8	NET-OUT15 (Not used)	NET-OUT14 (Not used)	NET-OUT13 (MOVE)	NET-OUT12 (TIM)	NET-OUT11 (AREA3)	NET-OUT10 (AREA2)	NET-OUT9 (AREA1)	NET-OUT8 (S-BSY)

• 12-axes connection mode ( ): Initial value

Device No.	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
RYn7 to RYn0	NET-OUT7 (ALM)	NET-OUT6 (WNG)	NET-OUT5 (READY)	NET-OUT4 (HOME-P)	NET-OUT3 (START_R)	NET-OUT2 (M2_R)	NET-OUT1 (M1_R)	NET-OUT0 (M0_R)

13.3 When using the motor with MECHATROLINK communication

See the following explanation when using the **PKA** Series in combination with the network converter **NETC01-M2** or **NETC01-M3**, via MECHATROLINK communication.

■ Guidance

If you are new to the **PKA** Series, read this section to understand the operating methods along with the operation flow.

Note

- Before operating the motor, check the condition of the surrounding area to ensure safety.
- See the network converter **NETC01-M2/NETC01-M3** OPERATING MANUAL for how to set the parameter.

STEP 1 Set the transmission rate, station address and address number.

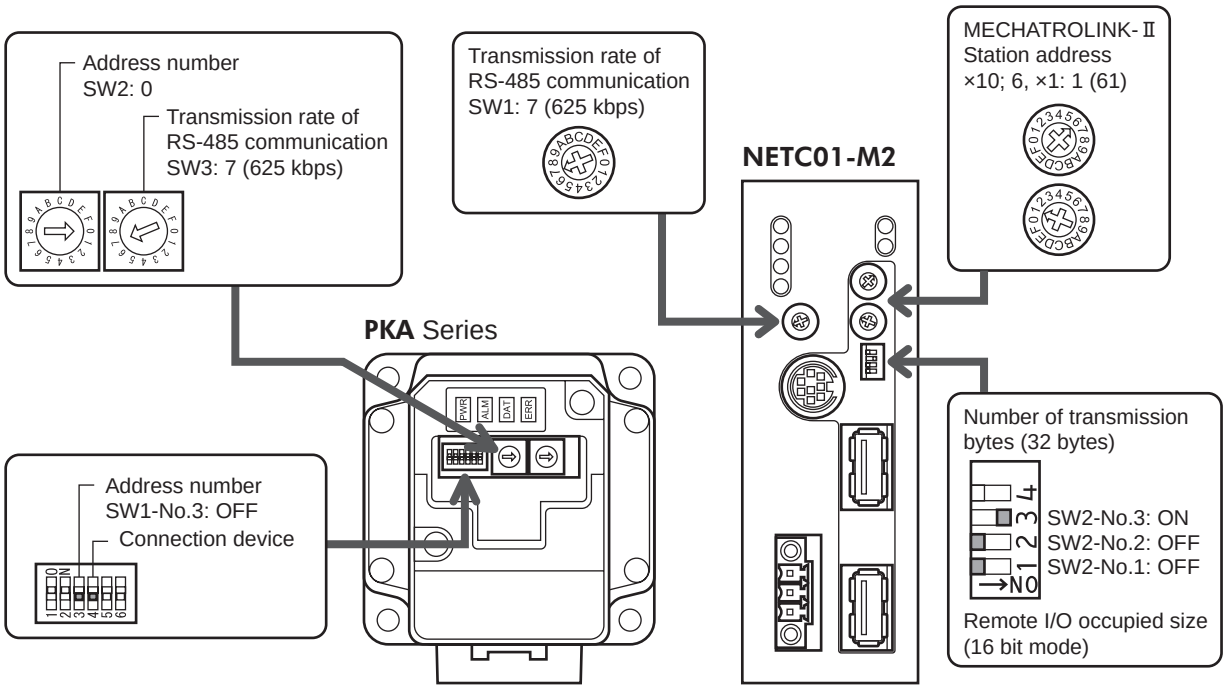
- Using the switches

Setting condition of **PKA** Series

- Address number of the **PKA** Series: 0
- RS-485 transmission rate: 625 kbps
- Connection device of RS-485 communication: Network converter

Setting condition of **NETC01-M2**

- MECHATROLINK-II station address: 61
- RS-485 transmission rate: 625 kbps
- Remote I/O occupied size: 16 bit mode
- Number of transmission bytes: 32 bytes



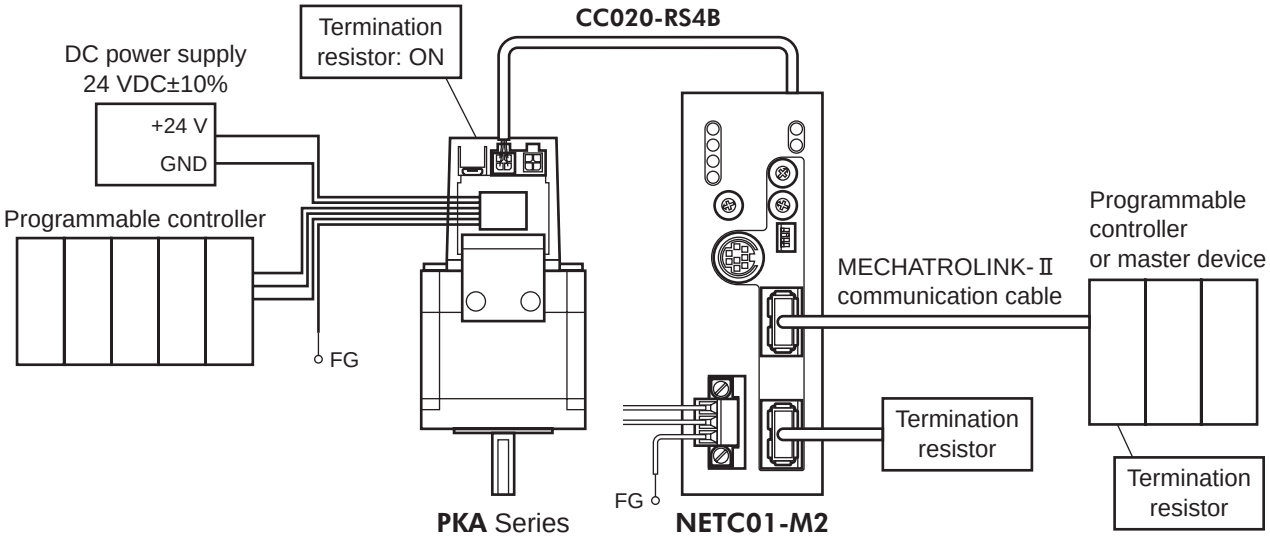
- Using the parameter

1. Set the "communication (address number 0) " parameter of the **NETC01-M2** to "1: Enable."
2. Cycle the **NETC01-M2** power.

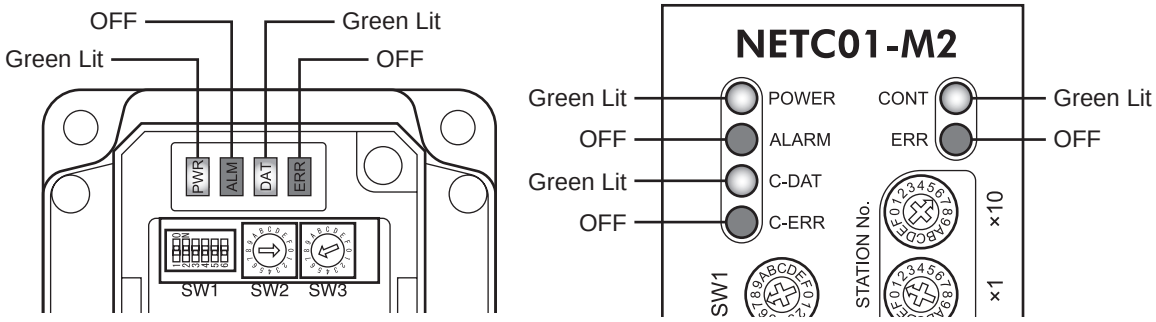
Note

- "Communication" parameters will be enabled after the power is cycled.
- When setting the parameters of the **NETC01-M2** or **NETC01-M3**, use an accessory **OPX-2A** or **MEXE02**.

STEP 2 Check the termination resistor



STEP 3 Turn on the power and check the setting



- When ERR (red) of the **PKA** Series or C-ERR (red) of the **NETC01-M2** is lit: Check the transmission rate or address number of RS-485 communication.
- When ERR (red) of the **NETC01-M2** is lit: Check the MECHATROLINK-Ⅱ communication error.

STEP 4 Positioning operation

Control the I/O signal of the **PKA** Series using the I/O command (DATA_RWA: 50h) of MECHATROLINK-II communication.

1. Set the position (1200h) and operating speed (1240h) of operation data No.0 of the **PKA** Series.
2. Execute positioning operation by turning the START of the address number 0 to ON.

( ): Initial value

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-IN7 (AWO)	NET-IN6 (Not used)	NET-IN5 (STOP)	NET-IN4 (HOME)	NET-IN3 (START)	NET-IN2 (M2)	NET-IN1 (M1)	NET-IN0 (M0)
NET-IN15 (RVS)	NET-IN14 (FWD)	NET-IN13 (−JOG)	NET-IN12 (+JOG)	NET-IN11 (SSTART)	NET-IN10 (MS2)	NET-IN9 (MS1)	NET-IN8 (MS0)

STEP 5 Were you able to operate the motor properly?

How did it go? Were you able to operate the motor properly? If the motor does not function, check the following points:

- Is any alarm present in the **PKA** Series or **NETC01-M2**?
- Are the address number, transmission rate and termination resistor set correctly?
- Is the "communication" parameter of the **NETC01-M2** set correctly?
- Is the ERR LED of the **PKA** Series or the C-ERR LED of the **NETC01-M2** lit? (RS-485 communication error)
- Is the ERR LED of the **NETC01-M2** lit? (MECHATROLINK-II/III communication error)
- Is the **PKA** Series motor excited? Or is the excitation setting correct?
- Is the **PKA** Series parameter set correctly?
- Is the STOP input of the **PKA** Series I/O turned ON?

For more detailed settings and functions, refer to the following pages.

■ I/O field map for the NETC01-M2

Update of remote I/O data (asynchronous) is executed by the “DATA_RWA” Command (50h). When the remote I/O occupied size is 16-bit mode and the number of transmission bytes is 32 bytes (initial setting), I/O field map will be as follows. See the network converter **NETC01-M2** OPERATING MANUAL for other I/O field map.

Byte	Part	Type	Command	Response
1	Header field	−	DATA_RWA (50h)	DATA_RWA (50h)
2		−	OPTION	ALARM
3		−		STATUS
4		−		
5	Data field	−	Reserved	Connection status
6		−		
7		Remote I/O	Address number "0" remote I/O input	Address number "0" remote I/O output
8				
9			Address number "1" remote I/O input	Address number "1" remote I/O output
10				
11			Address number "2" remote I/O input	Address number "2" remote I/O output
12				
13			Address number "3" remote I/O input	Address number "3" remote I/O output
14				
15			Address number "4" remote I/O input	Address number "4" remote I/O output
16				
17			Address number "5" remote I/O input	Address number "5" remote I/O output
18				
19			Address number "6" remote I/O input	Address number "6" remote I/O output
20				
21			Address number "7" remote I/O input	Address number "7" remote I/O output
22				
23		Remote resistor	Register address number	Register address number response
24				
25			Command code+TRIG	Command code response+ TRIG response+STATUS
26				
27			DATA	DATA response
28				
29				
30				
31		−	Reserved	Reserved

■ I/O field map for the NETC01-M3

Update of remote I/O data (asynchronous) is executed by “DATA_RWA” Command (20h). When the remote I/O occupied size is 16-bit mode and the number of transmission bytes is 32 bytes (initial setting), I/O field map will be as follows. See the network converter **NETC01-M3** OPERATING MANUAL for other I/O field map.

Byte	Type	Command	Response
0	−	DATA_RWA (20h)	DATA_RWA (20h)
1	−	WDT	RWDT
2	−	CMD_CTRL	CMD_STAT
3	−		
4	−	Reserved	Connection status
5	−		
6	Remote I/O	Address number "0" remote I/O input	Address number "0" remote I/O output
7			
8		Address number "1" remote I/O input	Address number "1" remote I/O output
9			
10		Address number "2" remote I/O input	Address number "2" remote I/O output
11			
12		Address number "3" remote I/O input	Address number "3" remote I/O output
13			
14		Address number "4" remote I/O input	Address number "4" remote I/O output
15			
16		Address number "5" remote I/O input	Address number "5" remote I/O output
17			
18		Address number "6" remote I/O input	Address number "6" remote I/O output
19			
20		Address number "7" remote I/O input	Address number "7" remote I/O output
21			
22	Remote resistor	Register address number	Register address number response
23			
24		Command code+TRIG	Command code response+ TRIG response+STATUS
25			
26		DATA	DATA response
27			
28			
29			
30	−	Reserved	Reserved
31	−		

■ Communication format

Communication format to the **PKA** Series and **NETC01-M2**/**NETC01-M3** are as follows.

- Remote I/O input

For details on remote I/O, refer to p.105.

• 16 bit mode ( ): Initial value

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-IN7 (AWO)	NET-IN6 (Not used)	NET-IN5 (STOP)	NET-IN4 (HOME)	NET-IN3 (START)	NET-IN2 (M2)	NET-IN1 (M1)	NET-IN0 (M0)
NET-IN15 (RVS)	NET-IN14 (FWD)	NET-IN13 (−JOG)	NET-IN12 (+JOG)	NET-IN11 (SSTART)	NET-IN10 (MS2)	NET-IN9 (MS1)	NET-IN8 (MS0)

• 8 bit mode ( ): Initial value

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-IN7 (AWO)	NET-IN6 (Not used)	NET-IN5 (STOP)	NET-IN4 (HOME)	NET-IN3 (START)	NET-IN2 (M2)	NET-IN1 (M1)	NET-IN0 (M0)

- Remote I/O output

• 16 bit mode ( ): Initial value

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-OUT7 (ALM)	NET-OUT6 (WNG)	NET-OUT5 (READY)	NET-OUT4 (HOME-P)	NET-OUT3 (START_R)	NET-OUT2 (M2_R)	NET-OUT1 (M1_R)	NET-OUT0 (M0_R)
NET-OUT15 (Not used)	NET-OUT14 (Not used)	NET-OUT13 (MOVE)	NET-OUT12 (TIM)	NET-OUT11 (AREA3)	NET-OUT10 (AREA2)	NET-OUT9 (AREA1)	NET-OUT8 (S-BSY)

• 8 bit mode ( ): Initial value

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-OUT7 (ALM)	NET-OUT6 (WNG)	NET-OUT5 (READY)	NET-OUT4 (HOME-P)	NET-OUT3 (START_R)	NET-OUT2 (M2_R)	NET-OUT1 (M1_R)	NET-OUT0 (M0_R)

- Remote Register Field

Command (**NETC01-M2/NETC01-M3** to **PKA** Series)

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
−	TRIG	Command code					
DATA							

Explanation of command

Name	Description	Setting range
Command code	The command sets the command code for “write and read of parameters,” “monitor” and “maintenance."	−
TRIG	This is the trigger for handshake to execute the command code. When turning the TRIG from 0 to 1, the command code and DATA will be executed.	0: No Motion 1: Execution
DATA	This is the data writing to the **PKA** Series (little endian)	−

Response (**PKA** Series to **NETC01-M2/NETC01-M3**)

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
STATUS	TRIG_R	Command code					
DATA_R							

Explanation of command

Name	Description	Setting range
Command code	The response returns the command code of the command.	−
TRIG_R	This is the trigger for handshake indicating the completion of the command code. When the command code is completed, the TRIG_R will be turned from 0 to 1.	0: Not processing 1: Execution completion
STATUS	This indicates the result that executed the command code.	0: Normal operation 1: Error
DATA_R	This is the data reading from the **PKA** Series (little endian)	−

13.4 Details of remote I/O

This is common to **NETC01-CC**, **NETC01-M2** and **NETC01-M3**.

■ Input signals to the PKA Series

The following input signals can be assigned to the NET-IN0 to NET-IN15 of remote I/O using the parameter.
See the following table for the assignments of the NET-IN0 to NET-IN15.
For details on parameter, refer to “I/O function parameter [RS-485]” on p.59

( ): Initial value

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-IN7 (AWO)	NET-IN6 (Not used)	NET-IN5 (STOP)	NET-IN4 (HOME)	NET-IN3 (START)	NET-IN2 (M2)	NET-IN1 (M1)	NET-IN0 (M0)
NET-IN15 (RVS)	NET-IN14 (FWD)	NET-IN13 (−JOG)	NET-IN12 (+JOG)	NET-IN11 (SSTART)	NET-IN10 (MS2)	NET-IN9 (MS1)	NET-IN8 (MS0)

Signal name	Function	Setting range
Not used	Set when the input terminal is not used.	−
FWD	Continuous operation in the positive direction.	0: Deceleration stop 1: Operation
RVS	Continuous operation in the negative direction.	
HOME	Return-to-home operation.	0: No operation 1: Start operation
START	Positioning operation.	
SSTART	Sequential operation.	
+JOG	JOG operation in the positive direction.	
−JOG	JOG operation in the negative direction.	
MS0 to MS5	Direct positioning operation.	
FREE*	Motor excitation switching between excitation and non-excitation.	0: Excitation 1: Non-excitation
AWO		
STOP	Stop of the motor.	0: No operation 1: Stop operation
ALM-RST	Reset of the current alarm.	1: Reset alarm
P-PRESET	Position preset.	1: Preset
HMI	Release of the function limitation of the **OPX-2A** or **MEXE02**.	0: Function limitation 1: Function limitation release
R0 to R15	General signals. Use these signals when controlling the system via RS-485 communication.	0: OFF 1: ON
M0 to M5	Select the operation data No. using these six bits.	0 to 63: Operation data No.

* The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

Note

- Do not assign the same input signal to multiple input terminals. When the same input signal is assigned to multiple input terminals, the function will be executed if any of the terminals becomes active.
- If the HMI input is not assigned to the input terminal, the HMI input will always become ON (function limitation release). When assigning to both direct I/O and network I/O, the function will be executed when both of them are set to ON.

■ Output signals from the PKA Series

The following output signals can be assigned to the NET-OUT0 to NET-OUT15 of remote I/O using the parameter.
See the following table for the assignments of the NET-OUT0 to NET-OUT15.
For details on parameter, refer to “I/O function parameter [RS-485]” on p.59

( ): Initial value

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-OUT7 (ALM)	NET-OUT6 (WNG)	NET-OUT5 (READY)	NET-OUT4 (HOME-P)	NET-OUT3 (START_R)	NET-OUT2 (M2_R)	NET-OUT1 (M1_R)	NET-OUT0 (M0_R)
NET-OUT15 (Not used)	NET-OUT14 (Not used)	NET-OUT13 (MOVE)	NET-OUT12 (TIM)	NET-OUT11 (AREA3)	NET-OUT10 (AREA2)	NET-OUT9 (AREA1)	NET-OUT8 (S-BSY)

Signal name	Function	Setting range
Not used	Set when the output terminal is not used.	−
FWD_R	Output in response to the FWD.	0: FWD=OFF 1: FWD=ON
RVS_R	Output in response to the RVS.	0: RVS=OFF 1: RVS=ON
HOME_R	Output in response to the HOME.	0: HOME=OFF 1: HOME=ON
START_R	Output in response to the START	0: START=OFF 1: START=ON
SSTART_R	Output in response to the SSTART.	0: SSTART=OFF 1: SSTART=ON
+JOG_R	Output in response to the +JOG.	0: +JOG=OFF 1: +JOG=ON
−JOG_R	Output in response to the −JOG.	0: −JOG=OFF 1: −JOG=ON
MS0_R	Output in response to the MS0.	0: MS0=OFF 1: MS0=ON
MS1_R	Output in response to the MS1.	0: MS1=OFF 1: MS1=ON
MS2_R	Output in response to the MS2.	0: MS2=OFF 1: MS2=ON
MS3_R	Output in response to the MS3.	0: MS3=OFF 1: MS3=ON
MS4_R	Output in response to the MS4.	0: MS4=OFF 1: MS4=ON
MS5_R	Output in response to the MS5.	0: MS5=OFF 1: MS5=ON
FREE_R	Output in response to the FREE.*	0: FREE=OFF 1: FREE=ON
AWO_R	Output in response to the AWO.	0: AWO=OFF 1: AWO=ON
STOP_R	Output in response to the STOP.	0: STOP=OFF 1: STOP=ON
R0	Output the status of the general signal R0.	0: R0=OFF 1: R0=ON
R1	Output the status of the general signal R1.	0: R1=OFF 1: R1=ON
R2	Output the status of the general signal R2.	0: R2=OFF 1: R2=ON
R3	Output the status of the general signal R3.	0: R3=OFF 1: R3=ON
R4	Output the status of the general signal R4.	0: R4=OFF 1: R4=ON
R5	Output the status of the general signal R5.	0: R5=OFF 1: R5=ON
R6	Output the status of the general signal R6.	0: R6=OFF 1: R6=ON

* The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

Signal name	Function	Setting range
R7	Output the status of the general signal R7.	0: R7=OFF 1: R7=ON
R8	Output the status of the general signal R8.	0: R8=OFF 1: R8=ON
R9	Output the status of the general signal R9.	0: R9=OFF 1: R9=ON
R10	Output the status of the general signal R10.	0: R10=OFF 1: R10=ON
R11	Output the status of the general signal R11.	0: R11=OFF 1: R11=ON
R12	Output the status of the general signal R12.	0: R12=OFF 1: R12=ON
R13	Output the status of the general signal R13.	0: R13=OFF 1: R13=ON
R14	Output the status of the general signal R14.	0: R14=OFF 1: R14=ON
R15	Output the status of the general signal R15.	0: R15=OFF 1: R15=ON
M0_R to M5_R	Output in response to the M0 to M5	0: OFF 1: ON
+LS_R	Output in response to the +LS.	0: +LS=OFF 1: +LS=ON
−LS_R	Output in response to the −LS.	0: −LS=OFF 1: −LS=ON
HOMES_R	Output in response to the HOMES.	0: HOMES=OFF 1: HOMES=ON
SLIT_R	Output in response to the SLIT.	0: SLIT=OFF 1: SLIT=ON
ALM	Output the alarm status (normally open).	0: Alarm not present 1: Alarm present
WNG	Output the warning status.	0: Warning not present 1: Warning present
READY	Output when the motor is ready.	0: Not ready 1: Ready
MOVE	Output when the motor operates.	0: Motor stopped 1: Motor operating
HOME-P	Output when the motor is in home position.	0: Not home position 1: Home position
TIM	Output once every 7.2° rotation of the motor output shaft.	0: TIM=OFF 1: TIM=ON
AREA1	Output when the motor is within the area 1.	0: Outside area 1: Inside area
AREA2	Output when the motor is within the area 2.	
AREA3	Output when the motor is within the area 3.	
S-BSY	Output when the motor is in internal processing state.	0: S-BSY=OFF 1: S-BSY=ON

13.5 Command code list

This is common to **NETC01-CC**, **NETC01-M2** and **NETC01-M3**.

■ Group function

The **PKA** Series has a group function. Multiple slaves are made into a group and a operation command is sent to all slaves in the group at once.

- Group composition

A group consists of one parent slave and child slaves.

- Group address

To perform a group send, set a group address to the child slaves to be included in the group.
The child slaves to which the group address has been set can receive a command sent to the parent slave.
The operation command will be sent to the child slaves in the same group by sending it to the parent slave.

Parent slave

No special setting is required on the parent slave to perform a group send. The address of the parent slave becomes the group address.

Child slave

Use a "group" (1018h) to set a group address to each child slave.

Note Only remote I/O input can execute the group function. Read from commands and parameters or write to commands and parameters cannot be executed.

- Group setting

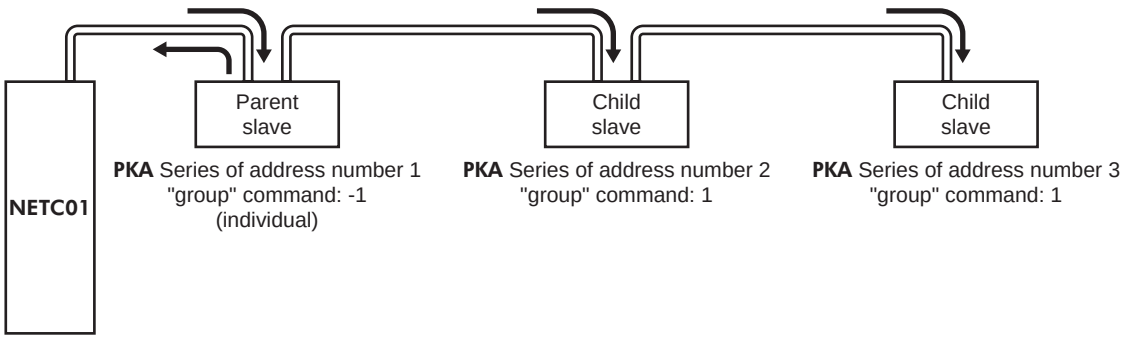
The group setting is not saved in the NV memory even when the maintenance command "batch NV memory write" executes.

Command code		Description	Setting range	Initial value
Read	Write			
0018h	1018h	Group	Set the group. −1: Individual (No group setting) 0 to 31: Set the group. *	−1: Individual

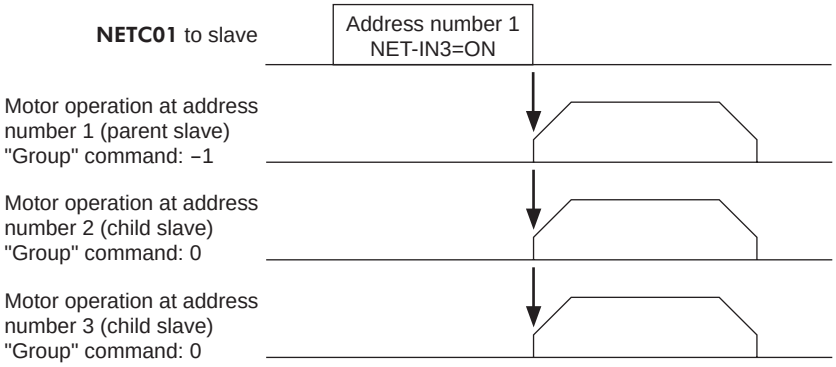
* Set in the 0 to 11 range when using the **NETC01-CC**, and set in the 0 to 15 range when using the **NETC01-M2** or **NETC01-M3**.

- Example for setting of the group function

Set as follows when making a group by setting the **PKA** Series of address number 1 to the parent slave and by setting the **PKA** Series of address number 2 and 3 to the child slaves.



This is a timing chart for when assigning the START signal to NET-IN3 (remote I/O) of the **PKA** Series in the group.



Note When inputting a command to the parent slave with remote I/O, the motors of the parent slave and child slaves will operate. The motors will not operate if the command is input to the child slaves.

■ Maintenance command

These commands are used to reset alarms and warnings. They are also used to execute the batch processing for the NV memory. All commands can be read and written (READ/WRITE). Executes when writing from 0 to 1.

Command code	Name	Description	Setting range
30C0h	Reset alarm	Resets the alarms that are present. Some alarms cannot be reset with the “reset alarm.”	1: Execute
30C2h	Clear alarm records	Clears alarm records.	
30C3h	Clear warning records	Clears warning records.	
30C4h	Clear communication error records	Clears the communication error records.	
30C5h	P-PRESET execute	Presets the command position.	
30C6h	Configuration	Executes the parameter recalculation and the setup.	
30C7h	All data initialization	Resets the parameters saved in the NV memory to the initial settings.	
30C8h	Batch NV memory read	Reads the parameters saved in the NV memory, to the RAM. All operation data and parameters previously saved in the RAM are overwritten.	
30C9h	Batch NV memory write	Writes the parameters saved in the RAM to the NV memory.	

Note The NV memory can be rewritten approx. 100,000 times.

■ Monitor command

Monitor the command position, command speed, alarm and warning records, etc.
All commands can be read (READ).

Command code	Name	Description	Range
2040h	Present alarm	Monitors the present alarm code.	00h to FFh
2041h	Alarm record 1	Monitors the alarm records 1 to 10.	
2042h	Alarm record 2		
2043h	Alarm record 3		
2044h	Alarm record 4		
2045h	Alarm record 5		
2046h	Alarm record 6		
2047h	Alarm record 7		
2048h	Alarm record 8		
2049h	Alarm record 9		
204Ah	Alarm record 10		
204Bh	Present warning	Monitors the present warning code.	
204Ch	Warning record 1	Monitors the warning records 1 to 10.	
204Dh	Warning record 2		
204Eh	Warning record 3		
204Fh	Warning record 4		
2050h	Warning record 5		
2051h	Warning record 6		
2052h	Warning record 7		
2053h	Warning record 8		
2054h	Warning record 9		
2055h	Warning record 10		
2057h	Communication error code record 1	Monitors the communication error records 1 to 10 that have occurred in the past.	
2058h	Communication error code record 2		
2059h	Communication error code record 3		
205Ah	Communication error code record 4		
205Bh	Communication error code record 5		
205Ch	Communication error code record 6		
205Dh	Communication error code record 7		
205Eh	Communication error code record 8		
205Fh	Communication error code record 9		
2060h	Communication error code record 10		
2061h	Present selected data No.	Monitors the operation data No. currently selected.	0 to 63
2062h	Present operation data No.	Monitors the operation data No. corresponding to the data used in the current positioning operation. This address is used in linked-motion operation and sequential operation. While the motor is stopped, the last used operation data number is indicated. "−1" is indicated until the positioning operation is performed after turning the power ON.	−1 to 63
2063h	Command position	Monitors the command position.	−2,147,483,648 to 2,147,483,647 step
2064h	Command speed (r/min)	Monitors the current command speed.	−9600 to +9600 r/min +: Forward −: Reverse 0: Stop
2065h	Command speed (Hz)		−1,000,000 to 1,000,000 Hz
2069h	Remaining dwell time	Monitors how much of the dwell time used in the linked-motion operation 2 remains.	0 to 50000 ms
206Ah	Direct I/O status	Monitors the each direct I/O signal.	See table next.

Direct I/O status (206Ah)

Byte	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0	IN1	IN0	−	−	−	−	−	−
1	−	−	−	−	−	−	IN3	IN2
2	−	−	−	−	−	−	OUT1	OUT0
3	−	−	−	−	−	−	−	−

■ Operation data

The parameters required for motor operation are available in the following two types.

- Operation data
- User parameters

The parameters are saved in the RAM or NV memory. The data saved in the RAM will be erased once the power is turned off. On the other hand, the parameters saved in the NV memory will be retained even after the power supply is turned off.
When turning the **PKA** Series power ON, the parameters saved in the NV memory will be sent to the RAM. Then, the recalculation and setup for the parameters are executed in the RAM.

When a parameter is changed, the timing to reflect the new value varies depending on the parameter. See the following four types.

- Effective immediately..... Executes the recalculation and setup immediately when writing the parameter.
- Effective after stopping the operation..... Executes the recalculation and setup after stopping the operation.
- Effective after executing the configuration..... Executes the recalculation and setup after executing the configuration.
- Effective after turning the power ON again..... Executes the recalculation and setup after turning the power ON again.

Note

- The parameters are written in the RAM area when writing via the **NETC01-CC**, **NETC01-M2** or **NETC01-M3**.
- When saving data to the NV memory, execute "batch NV memory write" of the maintenance command.
- The NV memory can be rewritten approx. 100,000 times.

Command code		Name	Setting range	Initial value	Effective*1
Read	Write				
0200h to 023Fh	1200h to 123Fh	Position No.0 to Position No.63	−8,388,608 to 8,388,607 step	0	B
0240h to 027Fh	1240h to 127Fh	Operating speed No.0 to Operating speed No.63	0 to 1,000,000 Hz	1000	
0280h to 02BFh	1280h to 12BFh	Operation mode No.0 to Operation mode No.63	0: Incremental 1: Absolute	0	
02C0h to 02FFh	12C0h to 12FFh	Operation function No.0 to Operation function No.63	0: Single-motion 1: Linked-motion 2: Linked-motion 2	0	
0300h to 033Fh	1300h to 133Fh	Acceleration No.0 to Acceleration No.63	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *2*3	30000	
0340h to 037Fh	1340h to 137Fh	Deceleration No.0 to Deceleration No.63			
03C0h to 03FFh	13C0h to 13FFh	Sequential positioning No.0 to Sequential positioning No.63	0: Disable 1: Enable	0	
0400h to 043Fh	1400h to 143Fh	Dwell time No.0 to Dwell time No.63	0 to 50000 (1=0.001 s)	0	

∗1 Indicates the timing for the data to become effective. (B: Effective after stopping the operation)

∗2 This item is effective when the “acceleration/deceleration type” parameter is set to “separate”. If this parameter is set to “common”, the values of the “common acceleration” and “common deceleration” parameters will be used (initial value: separate).

∗3 Acceleration/deceleration rate (ms/kHz) or acceleration/deceleration time (s) can be selected using "acceleration/deceleration unit" parameter. (initial value: acceleration/deceleration rate).

■ User parameter

- I/O

Command code		Name	Setting range	Initial value	Effective *
Read	Write				
0100h	1100h	STOP input action	0: Immediate stop 1: Deceleration stop 2: Immediate stop+Current OFF 3: Deceleration stop+Current OFF	1	A
0101h	1101h	Hardware overtravel	0: Disable 1: Enable	1	
0102h	1102h	Overtravel action	0: Immediate stop 1: Deceleration stop	0	
0105h	1105h	AREA1 positive direction position	−8,388,608 to 8,388,607 step	0	
0106h	1106h	AREA1 negative direction position			
0107h	1107h	AREA2 positive direction position			
0108h	1108h	AREA2 negative direction position			
0109h	1109h	AREA3 positive direction position			
010Ah	110Ah	AREA3 negative direction position			
010Bh	110Bh	Minimum ON time for MOVE output	0 to 255 ms	0	
0800h	1800h	MS0 operation No. selection	0 to 63	0	B
0801h	1801h	MS1 operation No. selection		1	
0802h	1802h	MS2 operation No. selection		2	
0803h	1803h	MS3 operation No. selection		3	
0804h	1804h	MS4 operation No. selection		4	
0805h	1805h	MS5 operation No. selection		5	
0806h	1806h	HOME-P function selection	0: Home output 1: Return-to-home complete output	0	A

* Indicates the timing for the data to become effective. (A: Effective immediately, B: Effective after stopping the operation)

- Motor

Command code		Name	Setting range	Initial value	Effective *
Read	Write				
0120h	1120h	RUN current	0 to 1000 (1=0.1%)	1000	A
0121h	1121h	STOP current	0 to 500 (1=0.1%)	500	
0125h	1125h	Speed filter	0 to 200 ms	1	B
0126h	1126h	Moving average time	1 to 200 ms	1	
0810h	1810h	Filter selection	0: Speed filter 1: Moving average filter	0	C

* Indicates the timing for the data to become effective. (A: Effective immediately, B: Effective after stopping the operation, C: Effective after executing the configuration

- Operation

Command code		Name	Setting range	Initial value	Effective*1
Read	Write				
0140h	1140h	Common acceleration	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *2*3	30000	B
0141h	1141h	Common deceleration			
0142h	1142h	Starting speed	0 to 1,000,000 Hz	100	
0143h	1143h	JOG operating speed	1 to 1,000,000 Hz	1000	
0144h	1144h	Acceleration/deceleration rate of JOG	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *2*3	30000	
0145h	1145h	JOG starting speed	0 to 1,000,000 Hz	100	
0146h	1146h	Acceleration/deceleration type	0: Common 1: Separate	1	
0147h	1147h	Acceleration/deceleration unit	0: ms/kHz 1: s	0	C
0824h	1824h	JOG travel amount	1 to 8,388,607 step	1	B

*1 Indicates the timing for the data to become effective. (B: Effective after stopping the operation, C: Effective after executing the configuration)
*2 This item is effective when the “acceleration/deceleration type” parameter is set to “common” (initial value: separate).
*3 Acceleration/deceleration rate (ms/kHz) or acceleration/deceleration time (s) can be selected using "acceleration/deceleration unit" parameter. (initial value: acceleration/deceleration rate).

- Return-to-home

Command code		Name	Setting range	Initial value	Effective*1
Read	Write				
0160h	1160h	Home-seeking mode	0: 2-sensor mode 1: 3-sensor mode	1	B
0161h	1161h	Operating speed of home-seeking	1 to 1,000,000 Hz	1000	
0162h	1162h	Acceleration/deceleration of home-seeking	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *2	30000	
0163h	1163h	Starting speed of home-seeking	1 to 1,000,000 Hz	100	
0164h	1164h	Position offset of home-seeking	−8,388,608 to 8,388,607 step	0	
0165h	1165h	Starting direction of home-seeking	0: Negative direction 1: Positive direction	1	
0166h	1166h	SLIT detection with home-seeking	0: Disable 1: Enable	0	
0167h	1167h	TIM signal detection with home-seeking			
0830h	1830h	Backward steps in 2sensor mode home-seeking	1 to 32767 step	200	

*1 Indicates the timing for the data to become effective. (B: Effective after stopping the operation)
*2 Acceleration/deceleration rate (ms/kHz) or acceleration/deceleration time (s) can be selected using "acceleration/deceleration unit" parameter. (initial value: acceleration/deceleration rate).

- Alarm/warning

Command code		Name	Setting range	Initial value	Effective *
Read	Write				
0184h	1184h	Return-to-home incomplete alarm	0: Disable 1: Enable	0	C
01A0h	11A0h	Overheat warning	40 to 80 °C (104 to 176 °F)	80	A
01A3h	11A3h	Overvoltage warning	150 to 420（1=0.1 V）	420	
01A4h	11A4h	Undervoltage warning		180	

* Indicates the timing for the data to become effective. (A: Effective immediately, C: Effective after executing the configuration)

- Coordination

Command code		Name	Setting range	Initial value	Effective *
Read	Write				
01C0h	11C0h	Electronic gear A	1 to 65535	1	C
01C1h	11C1h	Electronic gear B			
01C2h	11C2h	Motor rotation direction	0: Positive direction=CCW 1: Positive direction=CW	1	
01C3h	11C3h	Software overtravel	0: Disable 1: Enable	1	A
01C4h	11C4h	Positive software limit	−8,388,608 to 8,388,607 step	8,388,607	
01C5h	11C5h	Negative software limit		−8,388,608	
01C6h	11C6h	Preset position		0	
01C7h	11C7h	Wrap setting	0: Disable 1: Enable	0	C
01C8h	11C8h	Wrap setting range	1 to 8,388,607 step	500	

* Indicates the timing for the data to become effective. (A: Effective immediately, C: Effective after executing the configuration)

- Common

Command code		Name	Setting range	Initial value	Effective *
Read	Write				
01E0h	11E0h	Data setter speed display	0: Signed 1: Absolute value	0	A
01E1h	11E1h	Data setter edit	0: Disable 1: Enable	1	

* Indicates the timing for the data to become effective. (A: Effective immediately)

- I/O function

Command code		Name	Setting range	Initial value	Effective *
Read	Write				
0880h	1880h	IN0 input function selection	See table next.	60	C
0881h	1881h	IN1 input function selection		61	
0882h	1882h	IN2 input function selection		62	
0883h	1883h	IN3 input function selection		18	
0890h	1890h	IN0 input logic level setting	0: Normally open 1: Normally closed	0	
0891h	1891h	IN1 input logic level setting			
0892h	1892h	IN2 input logic level setting			
0893h	1893h	IN3 input logic level setting			
08A0h	18A0h	OUT0 output function selection	See table next.	65	
08A1h	18A1h	OUT1 output function selection		67	

* Indicates the timing for the data to become effective. (C: Effective after executing the configuration)

Setting range for IN input function selection

0: Not used	8: MS0	18: STOP	36: R4	44: R12	52: M4
1: FWD	9: MS1	24: ALM-RST	37: R5	45: R13	53: M5
2: RVS	10: MS2	25: P-PRESET	38: R6	46: R14	60: +LS
3: HOME	11: MS3	27: HMI	39: R7	47: R15	61: −LS
4: START	12: MS4	32: R0	40: R8	48: M0	62: HOMES
5: SSTART	13: MS5	33: R1	41: R9	49: M1	63: SLIT
6: +JOG	16: FREE*	34: R2	42: R10	50: M2	
7: −JOG	17: AWO	35: R3	43: R11	51: M3	

* The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

Setting range for OUT output function selection

0: Not used	8: MS0_R	32: R0	41: R9	50: M2_R	66: WNG
1: FWD_R	9: MS1_R	33: R1	42: R10	51: M3_R	67: READY
2: RVS_R	10: MS2_R	34: R2	43: R11	52: M4_R	68: MOVE
3: HOME_R	11: MS3_R	35: R3	44: R12	53: M5_R	70: HOME-P
4: START_R	12: MS4_R	36: R4	45: R13	60: +LS_R	72: TIM
5: SSTART_R	13: MS5_R	37: R5	46: R14	61: −LS_R	73: AREA1
6: +JOG_R	16: FREE_R	38: R6	47: R15	62: HOMES_R	74: AREA2
7: −JOG_R	17: AWO_R	39: R7	48: M0_R	63: SLIT_R	75: AREA3
	18: STOP_R	40: R8	49: M1_R	65: ALM	80: S-BSY

- I/O function [RS-485]

Command code		Name	Setting range	Initial value	Effective *
Read	Write				
08B0h	18B0h	NET-IN0 input function selection	See table below.	48	C
08B1h	18B1h	NET-IN1 input function selection		49	
08B2h	18B2h	NET-IN2 input function selection		50	
08B3h	18B3h	NET-IN3 input function selection		4	
08B4h	18B4h	NET-IN4 input function selection		3	
08B5h	18B5h	NET-IN5 input function selection		18	
08B6h	18B6h	NET-IN6 input function selection		0	
08B7h	18B7h	NET-IN7 input function selection		17	
08B8h	18B8h	NET-IN8 input function selection		8	
08B9h	18B9h	NET-IN9 input function selection		9	
08BAh	18BAh	NET-IN10 input function selection		10	
08BBh	18BBh	NET-IN11 input function selection		5	
08BCh	18BCh	NET-IN12 input function selection		6	
08BDh	18BDh	NET-IN13 input function selection		7	
08BEh	18BEh	NET-IN14 input function selection		1	
08BFh	18BFh	NET-IN15 input function selection		2	
08C0h	18C0h	NET-OUT0 output function selection	See table below.	48	
08C1h	18C1h	NET-OUT1 output function selection		49	
08C2h	18C2h	NET-OUT2 output function selection		50	
08C3h	18C3h	NET-OUT3 output function selection		4	
08C4h	18C4h	NET-OUT4 output function selection		70	
08C5h	18C5h	NET-OUT5 output function selection		67	
08C6h	18C6h	NET-OUT6 output function selection		66	
08C7h	18C7h	NET-OUT7 output function selection		65	
08C8h	18C8h	NET-OUT8 output function selection		80	
08C9h	18C9h	NET-OUT9 output function selection		73	
08CAh	18CAh	NET-OUT10 output function selection		74	
08CBh	18CBh	NET-OUT11 output function selection		75	
08CCh	18CCh	NET-OUT12 output function selection		72	
08CDh	18CDh	NET-OUT13 output function selection		68	
08CEh	18CEh	NET-OUT14 output function selection		0	
08CFh	18CFh	NET-OUT15 output function selection		0	

* Indicates the timing for the data to become effective. (C: Effective after executing the configuration)

Setting range for NET-IN input function selection

0: Not used	7: −JOG	16: FREE*	33: R1	40: R8	47: R15
1: FWD	8: MS0	17: AWO	34: R2	41: R9	48: M0
2: RVS	9: MS1	18: STOP	35: R3	42: R10	49: M1
3: HOME	10: MS2	24: ALM-RST	36: R4	43: R11	50: M2
4: START	11: MS3	25: P-PRESET	37: R5	44: R12	51: M3
5: SSTART	12: MS4	27: HMI	38: R6	45: R13	52: M4
6: +JOG	13: MS5	32: R0	39: R7	46: R14	53: M5

* The FREE input is a function that is used for an electromagnetic brake type motor. Do not use the FREE input since there is no electromagnetic brake type in the **PKA** Series.

Setting range for NET-OUT output function selection

0: Not used	8: MS0_R	32: R0	41: R9	50: M2_R	66: WNG
1: FWD_R	9: MS1_R	33: R1	42: R10	51: M3_R	67: READY
2: RVS_R	10: MS2_R	34: R2	43: R11	52: M4_R	68: MOVE
3: HOME_R	11: MS3_R	35: R3	44: R12	53: M5_R	70: HOME-P
4: START_R	12: MS4_R	36: R4	45: R13	60: +LS_R	72: TIM
5: SSTART_R	13: MS5_R	37: R5	46: R14	61: −LS_R	73: AREA1
6: +JOG_R	16: FREE_R	38: R6	47: R15	62: HOMES_R	74: AREA2
7: −JOG_R	17: AWO_R	39: R7	48: M0_R	63: SLIT_R	75: AREA3
	18: STOP_R	40: R8	49: M1_R	65: ALM	80: S-BSY

- Communication

Command code		Name	Setting range	Initial value	Effective *
Read	Write				
0900h	1900h	Communication timeout	0: Not monitored 1 to 10000 ms	0	A
0901h	1901h	Communication error alarm	1 to 10 times	3	

* Indicates the timing for the data to become effective. (A: Effective immediately)

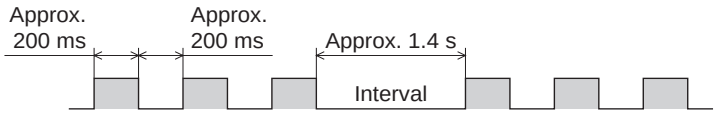
14 Alarms and warnings

The motor provides alarms that are designed to protect the motor from overheating, poor connection, error in operation, etc. (protective functions), as well as warnings that are output before the corresponding alarms generate (warning functions).

14.1 Alarms

When an alarm generates, the ALM output will turn OFF and the motor will stop. At the same time, the ALARM LED will start blinking. The present alarm can be checked by counting the number of times the ALARM LED blinks, or using the **OPX-2A**, **MEXE02** or RS-485 communication.

Example: Overvoltage alarm (number of blinks: 3)



■ Alarm reset

Before resetting an alarm, always remove the cause of the alarm and ensure safety, and perform one of the reset operations specified below. Refer to p.47 for the timing chart.

- Turn the ALM-RST input to OFF and then ON. (The alarm will be reset at the ON edge of the input.)
- Perform an alarm reset using RS-485 communication.
- Perform an alarm reset using the **OPX-2A** or **MEXE02**.
- Cycle the power.

Note Some alarms cannot be reset with the ALM-RST input, **OPX-2A**, **MEXE02** or RS-485 communication. Check the following table to identify which alarms meet this condition. To reset these alarms, cycle the power.

■ Alarm list

* When an alarm generates, the motor operates as follows.
  Excitation off: When an alarm generates, the motor current will be cut off and the motor will lose its holding torque.
  Excitation on: Even when an alarm generates, the motor current will not be cut off and the motor position will be held.

Code	No. of ALM LED blinks	Alarm type	Cause	Remedial action	Reset operation	Motor excitation *
21h	2	Main circuit overheat	The internal temperature of the control circuit has reached about 80 °C (176 °F).	Review the ventilation condition in the enclosure.	• ALM-RST input • RS-485 communication • **OPX-2A** • **MEXE02** • Cycle the power	Off
22h	3	Overvoltage	• A voltage exceeding the specification value was applied. • A large inertial load was stopped abruptly or vertical operation was performed	• Check the input voltage of the power supply. • If this alarm generates during operation, reduce the load or increase the acceleration/ deceleration.		
25h		Undervoltage	The main power was cut off momentarily or the voltage became low.	Check the input voltage of the main power supply.		
34h	2	Command pulse error	The command pulse frequency exceeded the specified value.	Lower the command pulse frequency to the rate at which no alarm is output.		
41h	9	EEPROM error	The stored data was damaged.	Initialize the all parameters.	Cycle the power	
4Ah	7	Return-to-home incomplete	The positioning operation was started when the position origin has not been set.	Perform the position preset or return-to-home operation.	• ALM-RST input • RS-485 communication • **OPX-2A** • **MEXE02** • Cycle the power	On
60h		±LS both sides active	Both the +LS and −LS signals were detected when “hardware overtravel” parameter was enabled.	Check the sensor logic.		
61h		Reverse limit sensor connection	The LS opposite to the operating direction has detected during a return-to-home operation in 2-sensor mode or 3-sensor mode.	Check the ±LS wiring.		
62h	7	Home seeking error	Return-to-home operation did not complete normally.	• An unanticipated load may have been applied during the return-to-home operation. Check the load. • If the installation positions of ±LS and HOMES are close to one another, the return-to-home sequence may not end properly, depending on the starting direction of return-to-home operation. Review the sensor installation positions and the starting direction of return-to-home operation. • Return-to-home operation may have been performed in a condition where both +LS and −LS were detected. Check the sensor logic.		

Code	No. of ALM LED blinks	Alarm type	Cause	Remedial action	Reset operation	Motor excitation *
63h	7	No HOMES	The HOMES is not detected at a position between +LS and −LS during return-to-home operation in 3-sensor mode.	Install a HOMES between +LS and −LS.	• ALM-RST input • RS-485 communication • **OPX-2A** • **MEXE02** • Cycle the power	On
64h		TIM, SLIT signal error	None of the SLIT input or TIM output could be detected during return-to-home operation.	• Adjust the connection condition of the motor output shaft and load as well as the HOMES position so that at least one of the SLIT input or TIM output will turn ON while HOMES is ON. • If the SLIT input or TIM output are not used with HOMES, set the “TIM signal detection with home-seeking” parameter and “SLIT detection with home-seeking” parameter to “disable.”		
66h		Hardware overtravel	A +LS or −LS signal was detected when “hardware overtravel” parameter was enabled.	Pull out from the limit sensor via continuous operation or return-to-home operation.		
67h		Software overtravel	A software limit was reached when “software overtravel” parameter was enabled.	In single-motion operation, check to see if the position exceeds the softlimit. In linked-motion operation, check to see if the result of linked position exceeds the softlimit.		
6Ah		Home seeking offset error	A limit sensor signal was detected during offset movement as part of return-to-home operation.	Check the offset value.		
70h		Invalid operation data	• Data of different directions may be linked in linked-motion operation. • Five or more data may be linked. • Positioning operation of the operating speed 0 r/min was performed.	Check the operation data.		
71h		Electronic gear setting error	The resolution set by the "electronic gear" parameter was outside of the specification.	Set the electronic gear correctly, and then cycle the power.	Cycle the power	Off
81h		Network bus error	When the motor operates, the host system for the network converter shows a disconnected status.	Check the host system connector or cable.	• ALM-RST input • RS-485 communication • **OPX-2A** • **MEXE02** • Cycle the power	On
83h		Communication switch setting error	Transmission rate setting switch (SW3) was out-of-specification.	Check the transmission rate setting switch (SW3)	Cycle the power	Off

Code	No. of ALM LED blinks	Alarm type	Cause	Remedial action	Reset operation	Motor excitation *
84h	7	RS-485 communication error	The number of consecutive RS-485 communication errors reached the value set in the “communication error alarm” parameter.	• Check the connection between the host system and motor. • Check the setting of RS-485 communication.	• ALM-RST input • RS-485 communication • **OPX-2A** • **MEXE02** • Cycle the power	On
85h		RS-485 communication timeout	The time set in the “communication timeout” parameter has elapsed, and yet the communication could not be established with the host system.	Check the connection between the host system and motor.		
8Eh		Network converter error	The network converter generated an alarm.	Check the alarm code of the network converter.		
F0h	Lit	CPU error	CPU malfunctioned.	Cycle the power.	Cycle the power	Off

■ Alarm records

Up to 10 generated alarms are saved in the NV memory in order of the latest to oldest.
Alarm records saved in the NV memory can be read and cleared when performing any of the following.

- Get the alarm records by the monitor command via RS-485 communication.
- Clear the alarm records by the maintenance command via RS-485 communication.
- Get and reset the alarm records using the **OPX-2A** or **MEXE02**.

14.2 Warnings

When a warning generates, the WNG output will turn ON. The motor will continue to operate.
Once the cause of the warning is removed, the WNG output will turn OFF automatically.

■ Warning list

Code	Warning type	Cause	Remedial action
21h	Main circuit overheat	The internal temperature of the control circuit has exceeded the set value of the "overheat warning" parameter.	Review the ventilation condition in the enclosure.
22h	Overvoltage	• The voltage of the power supply exceeded the value set in the parameter for overvoltage warning. • A large inertial load was stopped abruptly or vertical operation was performed	• Check the input voltage of the power supply. • If this alarm generates during operation, decrease the load or increase the acceleration/deceleration rate.
25h	Undervoltage	• The power supply voltage dropped from the value set in the parameter for undervoltage warning. • The main power was cut off momentarily or the voltage became low.	Check the input voltage of the power supply.
71h	Electronic gear setting error	The resolution set in the “electronic gear” parameter is outside the specified range.	Set the electronic gear correctly, and then cycle the power.
84h	RS-485 communication error	A RS-485 communication error was detected.	• Check the connection between the host system and motor. • Check the setting of RS-485 communication.

■ Warning records

Up to 10 generated warnings are saved in the RAM in order of the latest to oldest.
Warning records saved in the RAM can be read or cleared when performing any of the following.

- Get the warning records by the monitor command via RS-485 communication.
- Clear the warning records by the maintenance command via RS-485 communication.
- Get and reset the warning records using the **OPX-2A** or **MEXE02**.

Note You can also clear the warning records by turning off the motor power.

14.3 Communication errors

Up to 10 communication errors are saved in the RAM in order of the latest to the oldest and you can check via RS-485 communication.

■ Communication error list

Code	Communication error type	Cause	Remedial action
84h	RS-485 communication error	One of the following errors was detected. · Framing error · BCC error	• Check the connection between the host system and motor. • Check the setting of RS-485 communication.
88h	Command not yet defined	The command requested by the master could not be executed because of being undefined.	• Check the setting value for the command. • Check the flame configuration.
89h	Execution disable due to user I/F communication in progress	The command requested by the master could not be executed since the **OPX-2A** or **MEXE02** was communicating with the driver.	Wait until the processing for the **OPX-2A** or **MEXE02** will be completed.
8Ah	Execution disable due to NV memory processing in progress	The command could not be executed because the driver was processing the NV memory. · Internal processing was in progress. (S-BSY is ON.) · An EEPROM error alarm was present.	• Wait until the internal processing will complete. • When the EEPROM error was generated, initialize the parameter via RS-485 communication.
8Ch	Outside setting range	The setting data requested by the master could not be executed due to outside the range.	Check the setting data.
8Dh	Command execute disable	When the command could not be executed, it tried to do it.	Check the motor status.

■ Communication error records

Up to 10 communication errors are saved in the RAM in order of the latest to oldest.
Communication error records saved in the RAM can be read or cleared when performing any of the following.

- Get the communication error records by the monitor command via RS-485 communication.
- Clear the communication error records by the maintenance command via RS-485 communication.
- Get and reset the communication error records using the **OPX-2A** or **MEXE02**.

Note You can also clear the communication records by turning off the motor power.

15 Troubleshooting and remedial actions

During motor operation, the motor or driver may fail to function properly due to an improper speed setting or wiring. 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 Oriental Motor sales office.

Phenomenon	Possible cause	Remedial action
• The motor is not excited. • The motor output shaft can be moved by hand.	Connection error in the power supply.	Check the connections between the motor and power supply.
	The motor current is set wrong.	Return the “RUN current” or “STOP current” parameter to its initial setting and check the motor operation. If the operating current is too low, the motor torque will also be too low and operation will be unstable.
	The AWO input is turned ON.	Turn the AWO input OFF and confirm that the motor will be excited.
The motor does not operate.	The STOP input is turned ON.	Turn the STOP input OFF.
	The position (distance) is not set in the operation data while positioning operation.	Check the operation data.
	The FWD input and RVS input are turned ON simultaneously in the continuous operation.	Turn either FWD input or RVS input ON.
The motor rotates in the direction opposite to the specified direction.	The “rotation direction” parameter is set wrong.	Check the setting of the “rotation direction” parameter.
Motor operation is unstable.	Connection error in the power supply.	Check the connections between the motor and power supply.
	The “RUN current” or “STOP current” parameter is too low.	Return the “RUN current” or “STOP current” parameter to its initial setting and check the motor operation. If the operating current is too low, the motor torque will also be too low and operation will be unstable.
Motor vibration is too great.	The centers of the motor’s output shaft and load shaft are not aligned.	Check the connection condition of the motor output shaft and load shaft.
	Motor is resonating.	If the vibration decreases when the operating speed is changed, it means the motor is resonating. Change the operating speed setting.
	Load is too small.	Lower the operating current using the “RUN current” parameter. Vibration will increase if the motor’s output torque is too large for the load.
There is holding torque even if motor excitation is turned off.	Effect of dynamic brake.	If the motor becomes the overvoltage condition, the motor coil will be short-circuited in the control circuit and the holding torque will be generated (dynamic brake). Return to the normal voltage to release the dynamic brake.

Note

- Check the alarm message when the alarm generates.
- I/O signals can be monitored using the **OPX-2A**, **MEXE02** or via RS-485 communication. Use to check the wiring condition of the I/O signals.

16 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 Oriental Motor sales office.

■ During inspection

- Are any of the motor mounting screws loose?
- Are there any abnormal noises in the motor bearings (ball bearings) or other moving parts.?
- Are the motor output shaft and load shaft out of alignment?

Note The motor uses semiconductor elements. Handle the motor with care since static electricity may damage semiconductor elements. Static electricity may damage the motor.

17 General specifications

Degree of protection		IP20
Operation environment	Ambient temperature	0 to +50 °C [+32 to +122 °F] (non-freezing)
	Humidity	85% or less (non-condensing)
	Altitude	Up to 1000 m (3300 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil
Storage environment	Ambient temperature	−25 to +70 °C [−13 to +158 °F] (non-freezing)
	Humidity	85% or less (non-condensing)
	Altitude	Up to 3000 m (10000 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil
Shipping environment	Ambient temperature	−25 to +70 °C [−13 to +158 °F] (non-freezing)
	Humidity	85% or less (non-condensing)
	Altitude	Up to 3000 m (10000 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil
Insulation resistance		100 MΩ or more when 500 VDC megger is applied between the following places: · Between FG terminal and power supply terminal
Dielectric strength		Applied 500 VAC 50/60 Hz for 1 minute, leak current 10 mA or less ·Between FG terminal and power supply terminal

18 Accessories (sold separately)

■ Data setter

The data setter lets you set data and parameters for your **PKA** Series with ease and also functions as a monitor.
Model: **OPX-2A**

■ Data setting software

The data setting software lets you set parameters for your **PKA** Series and monitor its operating condition using a PC. The software comes with a PC interface cable [5 m (16.4 ft.)]. The cable is connected to the USB port on the PC.
Model: **MEXE02**

■ Data setter cable

This is a cable to connect the **OPX-2A** or **MEXE02** to the **PKA** Series.
Model: **CC001IF-CA**

■ RS-485 communication cable

- This is a cable to link motors.
  Model: **CC020-RS4A** [2 m (6.6 ft.)]
- This is a cable to connect the motor and network converter.
  Model: **CC020-RS4B** [2 m (6.6 ft.)]

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