Oriental motor

HM-60085-5

5-Phase Stepping Motor and Driver Package

RK Ⅱ Series/ Motorized actuator equipped the RK Ⅱ Series

FLEX Built-in Controller Type

USER MANUAL

KCC-REM-OMC-066
KCC-REM-OMC-067

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.

1 Introduction

2 Installation and connection

3 Operation type and setting

4 Method of control via I/O

5 Method of control via Modbus RTU (RS-485 communication)

6 Method of control via industrial network

7 Operation using the OPX-2A

8 Inspection, troubleshooting and remedial actions

9 Appendix

1 Introduction

This part explains the composition of the operating manuals, the product overview, specifications and safety standards as well as the name and function of each part and others.

◆Table of contents

1 Introduction

■ Before use

Only qualified personnel should work with the product.
Use the product correctly after thoroughly reading the section "4 Safety precautions" on p.14.
The product described in this manual has been designed and manufactured for use in general industrial equipment.
Do not use for any other purpose. Oriental Motor Co., Ltd. is not responsible for any damage caused through failure to observe this warning.

■ How to use OPERATING MANUALS for product

OPERATING MANUALS for the **RK Ⅱ** Series FLEX Bulit-in Controller Type are listed below.
The USER MANUAL (this manual) does not come with the product.
Always keep the manual where it is readily available.

Type and description of OPERATING MANUAL	
Read these manuals first	
RK Ⅱ Series FLEX Bulit-in Controller Type • Instructions and Precautions for Safe Use Motor (supplied with the motor) • Motorized Actuator Edition (supplied with the actuator) • OPERATING MANUAL Driver (supplied with the driver)	These manuals explain precautions to use the product, as well as the installation and connection method.
RK Ⅱ Series FLEX Bulit-in Controller Type • USER MANUAL (this manual)	This manual explains the functions, installation/ connection method and data setting method as well as the operating method and others for the motor and driver. • Introduction • Installation and connection • Operation type and setting • Method of control via I/O • Method of control via Modbus RTU (RS-485 communication) • Method of control via industrial network • Operation using the **OPX-2A** • Inspection, troubleshooting and remedial actions • Appendix
Data setting software MEXE02 • OPERATING MANUAL	This manual explains how to set data using the accessory data setting software **MEXE02**.

memo This manual explains using screen examples of the **MEXE02** Ver.3.31.

Type and description of OPERATING MANUAL

Network converter

- CC-Link compatible **NETC01-CC** USER MANUAL
- CC-Link Ver.2 compatible **NETC02-CC** USER MANUAL
- MECHATROLINK-Ⅱ compatible **NETC01-M2** USER MANUAL
- MECHATROLINK-Ⅲ compatible **NETC01-M3** USER MANUAL
- EtherCAT compatible **NETC01-ECT** USER MANUAL

This manual explains the functions and installation/ connection method as well as the operating method for the network converter.

RKⅡ Series UL APPENDIX

- APPENDIX UL Standards and CSA Standards for **RK**Ⅱ Series (supplied with the product)

This appendix includes information required for certification of the UL Standards and CSA standards.

■ About terms and units

Terms and units to be used vary depending on a motor or motorized actuator. This manual explains by using the terms of the motor. When the motorized actuator is used, read this manual by replacing the terms.

	Motor	Motorized actuator
Term	Torque	Thrust force
	Moment of inertia	Mass
	Rotation	Movement
	CW direction	Forward direction
	CCW direction	Reverse direction
	Rotation speed	Speed
	Resolution	Minimum travel amount
Unit	N·m	N
	kHz/s	m/s^2

2 Overview of the product

This product is a motor and driver package product consisting of a 5-phase stepping motor and a driver with built-in controller function.
This product can be controlled via I/O, Modbus RTU (RS-485 communication) or industrial network communication using the network converter.
The operation data and parameters can be set using a data setting software **MEXE02** or accessory data setter **OPX-2A**, or via RS-485 communication.

■ Main features

- **Energy-saving**

  Motor and driver losses have been substantially reduced to achieve low heat generation and save energy.
  Since the motor and driver generate much less heat, they can now be operated for longer hours at high speed, which was not possible with conventional motors/drivers.

- **Closely installable compact, slim size driver**

  This compact size driver helps downsizing and space-saving for the control box and equipment.
  Since the drivers are available to install closely, the limited space can effectively be utilized.

- **Simple wiring**

  Screwless type connectors have adopted for connection of I/O signals.
  The motor can be connected with ease using the dedicated cable/connector assembly.

- **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.

- **Compatible with Modbus RTU (RS-485 communication)**

  You can set operation data and parameters or issue operation start/stop commands from the master controller.
  Up to 31 drivers can be connected to one master.

- **Low vibration**

  Adopting a high performance microstep driver, this product achieved a smooth drive operation with ultra low-vibration, even if the operation was at low speeds.

- **Automatic control of the electromagnetic brake (electromagnetic brake type only)**

  This driver controls the electromagnetic brake automatically. The control signal input or the troublesome ladder logic design can be saved.

- **Alarm and warning functions**

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

■ Accessories

The operation data and parameters can be set using a data setter **OPX-2A** (accessory), data setting software **MEXE02** or via RS-485 communication. Provide the **OPX-2A** or **MEXE02** as necessary.

- **OPX-2A**.....This product can be purchased separately.
- **MEXE02**.....The **MEXE02** can be downloaded from Oriental Motor Website Download Page. When the **MEXE02** is used, a communication cable for data setting software **CC05IF-USB** (accessory) is needed to connect a PC and driver. Be sure to purchase it.

■ Related products

The **RK Ⅱ** Series FLEX built-in controller type can be used via various network when connecting to a network converter.

Network converter	Supported network
NETC01-CC	CC-Link Ver.1.10
NETC02-CC	CC-Link Ver.2.00
NETC01-M2	MECHATROLINK-Ⅱ
NETC01-M3	MECHATROLINK-Ⅲ
NETC01-ECT	EtherCAT

■ Function list

Main functions

Return-to-home operation [Setting by parameters]	· **3-sensor mode** · **2-sensor mode** · **Position preset**
Motor operation [Setting by operation data and parameters]	· **Positioning operation** **Operation function**: Single-motion operation, Linked-motion operation, Linked-motion operation 2 + **Starting method**: Data number selecting operation, Direct positioning operation, Sequential positioning operation · **Continuous operation**
Other operations [Setting by parameters]	· **JOG operation**

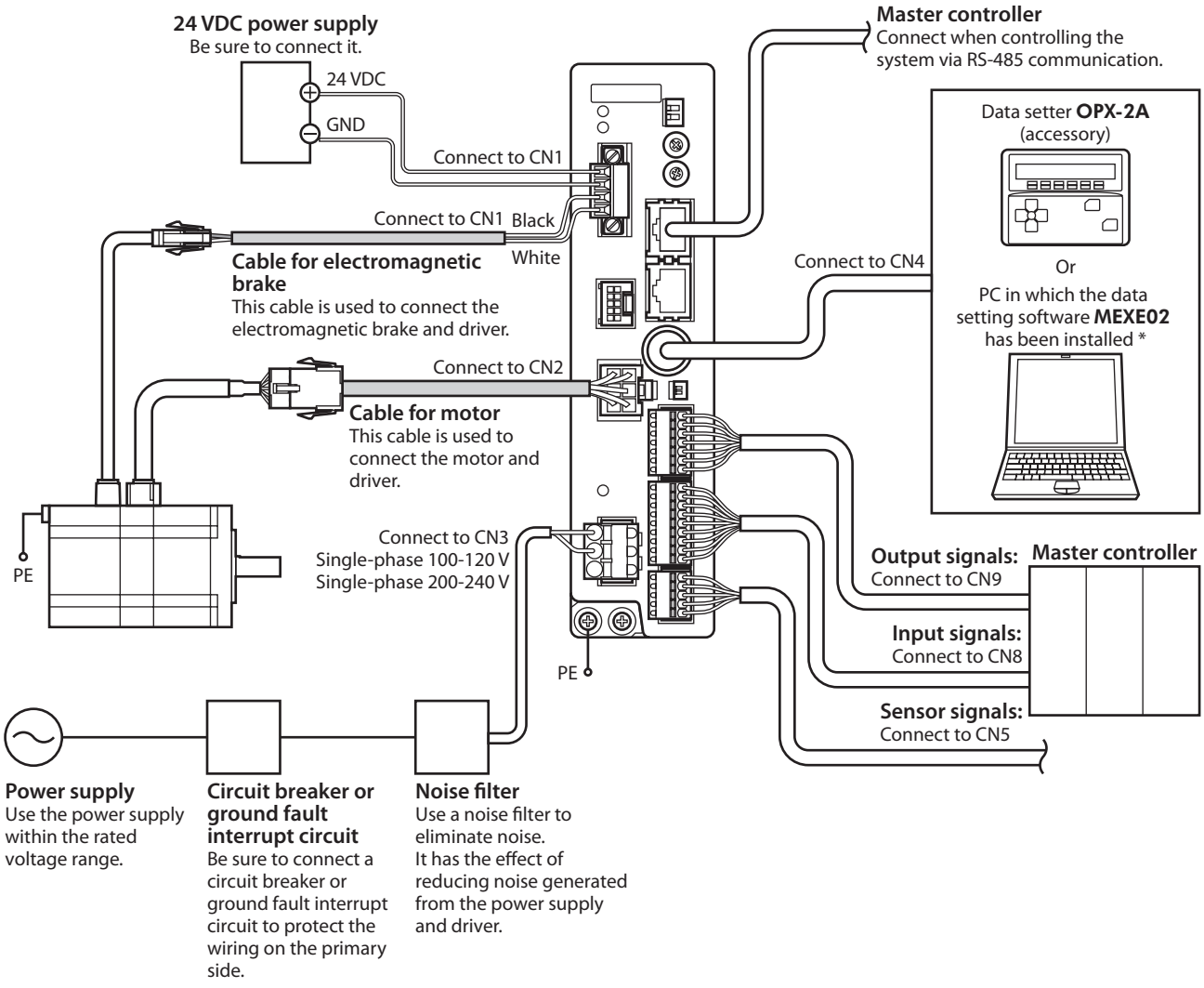
Support functions

[Setting by parameters]	· **Protective function** Alarm detection Warning detection · **I/O function** Input function selection Output function selection Input logic level setting · **Coordination setting** Resolution (Electronic gear) Wrap function Motor rotation direction · **Return-to-home function** Home position offset External sensor signal detection · **Stop operation** STOP input action Overtravel · **Motor function setting** Operating current Standstill current Speed filter Moving average filter · **Misstep detection function** Stepout detection action Stepout detection band Encoder resolution

External interface

Data setter	· **Monitor function** · **Data storing** · **Test function** Test operation Teaching I/O test · **Operation data setting** · **Download/Upload** · **Parameter setting** · **Data initialization**
RS-485 communication	· **Operation start** · **Parameter setting** · **Monitor function** · **Operation data setting** · **Maintenance function**

3 System configuration



* The customer must provide a PC. Use the accessory communication cable for the data setting software when connecting the PC and driver.

4 Safety precautions

The precautions described below are intended to prevent danger or injury to the user and other personnel through safe, correct use of the product. Use the product only after carefully reading and fully understanding these instructions.

Description of signs

⚠ 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.

Description of graphic symbols

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

⚠ Warning	
⃠	Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. This may cause fire, electric shock or injury.
	Do not transport, install the product, perform connections or inspections when the power is on. This may cause electric shock.
	Do not touch the driver while the power is on. This may cause fire or electric shock.
	The terminals on the driver's front panel marked with ⚠ ⚠ symbol indicate the presence of high voltage. Do not touch these terminals while the power is on. This may cause fire or electric shock.
	Do not use the brake mechanism of an electromagnetic brake motor as a deceleration/safety brake. This may cause injury or damage to the equipment.
	Do not forcibly bend, pull or pinch the cable. This may cause fire or electric shock.
	Do not turn the AWO input or FREE input to ON while the motor is operating. This may cause injury or damage to equipment.
	Do not touch the connection terminals on the driver immediately (within 10 minute) after the power is turned off. This may cause electric shock.
	Do not disassemble or modify the product. This may cause injury or damage to equipment.
❗	Assign qualified personnel the task of installing, wiring, operating/controlling, inspecting and troubleshooting the product. Failure to do so may result in fire, electric shock, injury or damage to equipment.
	If this product is used in an vertical application, be sure to provide a measure for the position retention of moving parts. Failure to do so may result in injury or damage to equipment.
	When the driver generates an alarm (any of the driver's protective functions is triggered), take measures to hold the moving part in place since the motor stops and loses its holding torque. Failure to do so may result in injury or damage to equipment.
	When the driver generates an alarm (any of the driver'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 and driver, leading to injury or damage to equipment.
	Install the product in an enclosure. Failure to do so may result in electric shock or injury.

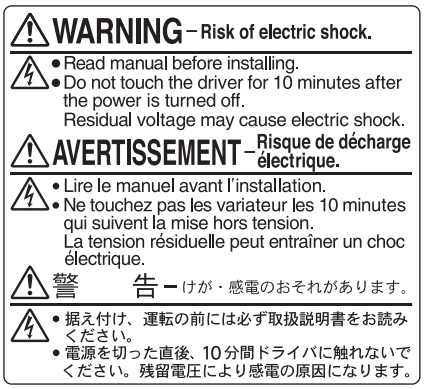
⚠ Warning	
	The motor and driver are designed with Class I equipment basic insulation. When installing the motor and driver, do not touch the product or be sure to ground them. Failure to do so may result in electric shock.
	Keep the driver's input-power voltage within the specified range. Failure to do so may result in fire or electric shock.
	Connect the cables securely according to the wiring diagram. Failure to do so may result in fire or electric shock.
	Turn off the driver power in the event of a power failure. Failure to do so may result in injury or damage to equipment.
	Before making wiring connections or carrying out checks, wait for the CHARGE LED to turn off and check the voltage with a tester, etc. Failure to do so may result in electric shock.

⚠ Caution	
	Do not use the product beyond its specifications. This may cause injury, electric shock or damage to equipment.
	Keep your fingers and objects out of the openings in the product. Failure to do so may result in fire, electric shock or injury.
	Do not touch the product during operation or immediately after stopping. This may cause a skin burn(s).
	Do not forcibly bend or pull the cable that was connected to the driver. Doing so may cause damage.
	Do not hold the motor output shaft or motor cable. This may cause injury.
	Keep the area around the product free of combustible materials. Failure to do so may result in fire or a skin burn(s).
	Leave nothing around the product that would obstruct ventilation. Failure to do so may result in damage to equipment.
	The data edit connector (CN4) and RS-485 communication connector (CN6/CN7) of the driver 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. This may cause the driver and these equipment to short, damaging both.
	Do not touch the rotating parts (output shaft etc.) during operation. This may cause injury.
	Do not touch the terminals while performing the insulation resistance test or dielectric strength test. This may cause electric shock.
	Provide a cover over the rotating parts (output shaft etc.). Failure to do so may result in injury.
	Use a motor and driver only in the specified combination. Failure to do so may result in fire.
	For the 24 VDC power supply, use a DC power supply with reinforced insulation on its primary and secondary sides. Failure to do so may result in electric shock.
	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 driver, turn all input signals to the driver to OFF. Failure to do so may result in injury or damage to equipment.
	Before moving the motor directly with the hands, confirm that the AWO input or FREE input turns ON. Failure to do so may result in injury.
	When an abnormal condition has occurred, immediately stop operation and turn off the driver power. Failure to do so may result in fire, electric shock or injury.

⚠ Caution	
❗	Use only an insulated screwdriver to adjust the driver's switches. Failure to do so may result in electric shock.
	To dispose of the motor and driver, disassemble it into parts and components as much as possible and dispose of individual parts/components as industrial waste.
	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

■ Warning information

A warning label with handling instructions is attached on the driver. Be sure to observe the instructions on the label when handling the driver.



Material: PET

5 Precautions for use

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

- **Always use the cable (supplied or accessory) to connect the motor and driver.**

  Be sure to use the cable (supplied or accessory) to connect the motor and driver.
  If a cable other than the supplied cable or accessory cable is used, the driver may generate a large amount of heat.
  In the following condition, an appropriate accessory cable must be purchased separately. Refer to p.276 for details.
  - If a flexible cable is to be used.
  - If a cable of 3 m (9.8 ft.) or longer is to be used.
  - If a motor and driver package without a cable was purchased.

- **Perform the insulation resistance test or dielectric strength test separately on the motor and the driver.**

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

- **Do not apply strong impact on the motor output shaft.**

  If you are using a motor with encoder, an optical encoder is housed in the motor. To prevent damage to the encoder, handle the motor with care and avoid strong impact to the motor output shaft when transporting the motor or installing the load.

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

  Operating the motor under an excessive radial load or axial load may damage the motor bearings (ball bearings). Be sure to operate the motor within the specified permissible limit of radial load and axial load. Refer to p.34 for details.

- **Motor case temperature**
  - The driver has an overheat protection function, but the motor has no such feature. The motor surface temperature may exceed 100 °C (212 °F) under certain conditions (ambient temperature, operating speed, duty cycle, etc.). To prevent the motor bearings (ball bearings) from reaching its usable life quickly, use the motor in conditions where the surface temperature will not exceed 100 °C (212 °F).
  - Use the geared type motor in a condition where the gear case temperature does not exceed 70 °C (158 °F), in order to prevent deterioration of grease and parts in the gear case.
  - In the case of a motor with an encoder, use it in a condition where the motor surface temperature will not exceed 85 °C (185 °F) in order to protect the encoder.

- **Holding torque at standstill**

  The motor holding torque is reduced by the current cutback function of the driver at motor standstill. When selecting a motor, check the holding torque at motor standstill in the specifications on the catalog.

- **Do not use the electromagnetic brake to reduce speed or as a safety brake.**

  Do not use the electromagnetic brake as a means to decelerate and stop the motor. The brake hub of the electromagnetic brake will wear significantly and the braking force will drop if used to stop the motor.
  The electromagnetic brake is a power-off activated type. This means that although it helps maintain the position of the load in the event of power outage, etc., this brake cannot securely hold the load in place. Accordingly, do not use the electromagnetic brake as a safety brake. To use the electromagnetic brake to hold the load in place, do so after the motor has stopped.

- **Preventing leakage current**

  Stray capacitance exists between the driver's current-carrying line and other current-carrying lines, the earth and the motor, respectively. A high-frequency current may leak out through such capacitance, having a detrimental effect on the surrounding equipment. The actual leakage current depends on the driver's switching frequency, the length of wiring between the driver and motor, and so on.
  When connecting an earth leakage breaker, use one of the following products offering resistance against high frequency current:
  Mitsubishi Electric Corporation: NV series
  Fuji Electric FA Components & Systems Co., Ltd.: EG and SG series

- **Preventing electrical noise**

  See "2-6 Noise measures" on p.43 for measures with regard to noise.

- **Saving data to the non-volatile memory**

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

- **Motor excitation at power ON**

  The motor is excited when the 24 VDC power and main power is on. If the motor is required to be in non-excitation status when turning on the power, assign the AWO input to the direct I/O or network I/O.

- **Note on connecting a power supply whose positive terminal is grounded**

  The data edit connector (CN4) and RS-485 communication connector (CN6/CN7) of the driver 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 driver and these equipment to short, damaging both. Use the data setter **OPX-2A** to set data, etc.

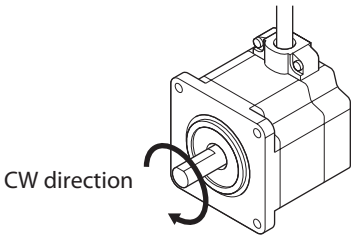
- **Grease of geared type motor**

  On rare occasions, a small amount of grease may ooze out from the geared type motor. If there is concern over possible environmental damage resulting from the leakage of grease, check for grease stains during regular inspections. Alternatively, install an oil pan or other device to prevent leakage from causing further damage. Oil leakage may lead to problems in the customer's equipment or products.

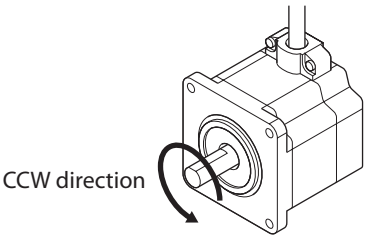
- **Rotation direction of the output shaft**

  The motor output shaft rotates in the figure below at the factory setting. The rotation direction can be changed with the parameter setting.

  • When setting the position (travel amount) to a positive value

  • When setting the position (travel amount) to a negative value

  For geared type, the relationship between the rotation direction of the motor shaft and that of the gear output shaft changes as follows, depending on the gear type and gear ratio. Check with the following table.

Type of gear	Gear ratio	Rotation direction (relative to the motor rotation direction)
TS geared	3.6, 7.2, 10	Same direction
	20, 30	Opposite direction
PS geared	All gear ratios	Same direction
Harmonic geared	All gear ratios	Opposite direction
FC geared	All gear ratios	Same direction

- **Peak torque of geared type motor**

  Always operate the geared type motor under a load not exceeding the peak torque. If the load exceeds the peak torque, the gear will be damaged.

6 General specifications

		Motor	Driver
Degree of protection		IP20	IP10
Operation environment	Ambient temperature	−10 to +50 °C (+14 to +122 °F) (non-freezing) Standard type with encoder: 0 to +50 °C (+32 to +122 °F) (non-freezing) Harmonic geared type: 0 to +40 °C (+32 to +104 °F) (non-freezing)	0 to +55 °C (+32 to 131 °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	−20 to +60 °C (−4 to +140 °F) (non-freezing)	−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	−20 to +60 °C (−4 to +140 °F) (non-freezing)	−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: • Case - Motor windings • Case - Electromagnetic brake windings	100 MΩ or more when 500 VDC megger is applied between the following places: • PE terminal - Power supply terminals • Signal I/O terminals - Power supply terminals
Dielectric strength		Sufficient to withstand the following for 1 minute • Case - Motor windings; 1.5 kVAC 50/60 Hz • Case - Electromagnetic brake windings; 1.5 kVAC 50/60 Hz	Sufficient to withstand the following for 1 minute: • PE terminal - Power supply terminals; 1.5 kVAC 50/60 Hz • Signal I/O terminals - Power supply terminals; 1.8 kVAC 50/60 Hz

* When installing a driver on a heat sink. [material: aluminium, 200×200×2 mm (7.87×7.87×0.08 in.) equivalent]

7 Regulations and standards

7-1 EU Directive

■ CE Marking

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

- **Low Voltage Directive**

Applicable Standards

Motor	EN 60034-1, EN 60034-5, EN 60664-1
Driver	EN 61800-5-1

Installation conditions (EN Standard)

Motor	Driver
To be incorporated in equipment. Overvoltage category: II Pollution degree: 2 Degree of protection: IP20 Protection against electric shock: Class I	To be incorporated in equipment. Overvoltage category: II Pollution degree: 2 Degree of protection: IP10 Protection against electric shock: Class I

- This product cannot be used with cables normally used for IT power distribution systems.
- Install the product within the enclosure in order to avoid contact with hands.
- Be sure to maintain a protective ground in case hands should make contact with the product. Be sure to connect the Protective Earth lead of the cable for motor to the Protective Earth Terminal on the driver, and ground the driver's Protective Earth Terminal.
- To protect against electric shock using an earth leakage breaker (RCD), connect a type B earth leakage breaker to the primary side of the driver.
- When using a circuit breaker (MCCB), use a unit conforming to the EN or IEC standard.
- Isolate the motor cable, power-supply cable and other drive cables from the signal cables (CN1, CN4 to CN9) by means of double insulation.
- The temperature of the driver's heat sink may exceed 90 °C (194 °F) depending on the driving conditions. Accordingly, take heed of the following items:
  · Do not touch the driver.
  · Do not use the driver near flammable objects.
  · Always conduct a trial operation to check the driver temperature.

- **EMC Directive**

This product is conducted EMC testing under the conditions specified in "Example of motor and driver installation and wiring" on p.46. The conformance of your mechanical equipment with the EMC Directive will vary depending on such factors as the configuration, wiring, and layout for other control system devices and electrical parts used with this product. It therefore must be verified through conducting EMC measures in a state where all parts including this product have been installed in the equipment.

Applicable Standards

EMI	EN 55011 Group 1 Class A EN 61000-6-4 EN 61800-3 EN 61000-3-2 EN 61000-3-3
EMS	EN 61000-6-2 EN 61800-3

This type of PDS is not intended to be used on a low-voltage public network which supplies domestic premises; radio frequency interference is expected if used on such a network.

7-2 Republic of Korea, Radio Waves Act

Seller and user shall be noticed that this equipment is suitable for electromagnetic equipments for office work (Class A) and it can be used outside home.
이 기기는 업무용 (A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며 , 가정외의 지역에서 사용하는 것을 목적으로 합니다 .

7-3 RoHS Directive

The products do not contain the substances exceeding the restriction values of RoHS Directive (2011/65/EU).

8 Preparation

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

8-1 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.
Verify the model number of the purchased product against the number shown on the package label.
Check the model number of the motor and driver against the number shown on the nameplate. Model names for motor and driver combinations are shown on p.23.

- Motor .....1 unit
- Driver .....1 unit
- Cable for motor .....1 pc.
  (When the product is supplied with a connection cable)
- Cable for electromagnetic brake .....1 pc.
  (When the product is a motor with an electromagnetic brake supplied with a connection cable)
- Cable for encoder .....1 pc.
  (When the product is a motor with an encoder supplied with a connection cable)
- CN1 connector (4 pins) .....1 pc.
- CN3 connector (3 pins) .....1 pc.
- CN5 connector (5 pins) .....1 pc.
- CN8 connector (9 pins) .....1 pc.
- CN9 connector (7 pins) .....1 pc.
- Parallel key .....1 pc.
  (Supplied with geared types; except for the **RKS543-TS**)
- Motor mounting screw (M4) .....4 pcs. (Supplied with **RKS564-TS**)
- Motor mounting screw (M8) .....4 pcs. (Supplied with **RKS596-TS**)
- Instructions and Precautions for Safe Use Motor .....1 copy
- OPERATING MANUAL Driver .....1 copy

8-2 How to identify the product model

RKS 5 6 4 A C D - HS 50 ■ - 3

- **3**: Number: Length of supplied connection cable (m)
  None: Without connection cable
- **■**: Gear output shaft direction of **FC** geared type
  LA: Gear output shaft faces to the left
  RA: Gear output shaft faces to the right
- **50**: Gear ratio
- **HS**: **TS**: **TS** geared type
  PS: **PS** geared type
  HS: Harmonic geared type
  FC: **FC**geared type
  Blank: Standard type
- **D**: Driver type **D**: Built-in Controller Type
- **C**: Power input **A**: Single-phase 100-120 V
  C: Single-phase 200-240 V
- **A**: Motor type **A**: Single shaft
  B: Double shaft
  M: With electromagnetic brake
  R: With encoder
- **4**: Motor case length
- **6**: Motor frame size **4**: 42 mm (1.65 in.)
  6: 60 mm (2.36 in.)
  9: 85 mm (3.35 in.) [90 mm (3.54 in) for geared types]
- **5**: 5-phase
- **RKS**: Series name **RK** Ⅱ Series

8-3 Combinations of motors and drivers

- ◆ indicates **A** (single-phase 100-120 V) or **C** (single-phase 200-240 V).
- When the connection cable is supplied, □ indicates the cable length (**-1**, **-2**, **-3**).

● **Standard type (single shaft)**

Model	Motor model	Driver model
RKS543A◆D□	PKE543AC	RKSD503-◆D
RKS544A◆D□	PKE544AC	
RKS545A◆D□	PKE545AC	
RKS564A◆D□	PKE564AC	RKSD507-◆D
RKS566A◆D□	PKE566AC	
RKS569A◆D□	PKE569AC	
RKS596A◆D□	PKE596AC	
RKS599A◆D□	PKE599AC	
RKS5913A◆D□	PKE5913AC	

● **Standard type (double shaft)**

Model	Motor model	Driver model
RKS543B◆D□	PKE543BC	RKSD503-◆D
RKS544B◆D□	PKE544BC	
RKS545B◆D□	PKE545BC	
RKS564B◆D□	PKE564BC	RKSD507-◆D
RKS566B◆D□	PKE566BC	
RKS569B◆D□	PKE569BC	
RKS596B◆D□	PKE596BC	
RKS599B◆D□	PKE599BC	
RKS5913B◆D□	PKE5913BC	

● **Standard type (with electromagnetic brake)**

Model	Motor model	Driver model
RKS543M◆D□	PKE543MC	RKSD503-◆D
RKS544M◆D□	PKE544MC	
RKS545M◆D□	PKE545MC	
RKS564M◆D□	PKE564MC	RKSD507-◆D
RKS566M◆D□	PKE566MC	
RKS569M◆D□	PKE569MC	
RKS596M◆D□	PKE596MC	
RKS599M◆D□	PKE599MC	
RKS5913M◆D□	PKE5913MC	

- **Standard type (with encoder)**

Model	Motor model	Driver model
RKS543R◆D2□	PKE543RC2	RKSD503-◆D
RKS544R◆D2□	PKE544RC2	
RKS545R◆D2□	PKE545RC2	
RKS564R◆D2□	PKE564RC2	RKSD507-◆D
RKS566R◆D2□	PKE566RC2	
RKS569R◆D2□	PKE569RC2	
RKS596R◆D2□	PKE596RC2	
RKS599R◆D2□	PKE599RC2	
RKS5913R◆D2□	PKE5913RC2	

- **TS geared type (single shaft)**

Model	Motor model	Driver model
RKS543A◆D-TS3.6□	PKE543AC-TS3.6	RKSD503-◆D
RKS543A◆D-TS7.2□	PKE543AC-TS7.2	
RKS543A◆D-TS10□	PKE543AC-TS10	
RKS543A◆D-TS20□	PKE543AC-TS20	
RKS543A◆D-TS30□	PKE543AC-TS30	
RKS564A◆D-TS3.6□	PKE564AC-TS3.6	RKSD507-◆D
RKS564A◆D-TS7.2□	PKE564AC-TS7.2	
RKS564A◆D-TS10□	PKE564AC-TS10	
RKS564A◆D-TS20□	PKE564AC-TS20	
RKS564A◆D-TS30□	PKE564AC-TS30	
RKS596A◆D-TS3.6□	PKE596AC-TS3.6	
RKS596A◆D-TS7.2□	PKE596AC-TS7.2	
RKS596A◆D-TS10□	PKE596AC-TS10	
RKS596A◆D-TS20□	PKE596AC-TS20	
RKS596A◆D-TS30□	PKE596AC-TS30	

- **TS geared type (double shaft)**

Model	Motor model	Driver model
RKS543B◆D-TS3.6□	PKE543BC-TS3.6	RKSD503-◆D
RKS543B◆D-TS7.2□	PKE543BC-TS7.2	
RKS543B◆D-TS10□	PKE543BC-TS10	
RKS543B◆D-TS20□	PKE543BC-TS20	
RKS543B◆D-TS30□	PKE543BC-TS30	
RKS564B◆D-TS3.6□	PKE564BC-TS3.6	RKSD507-◆D
RKS564B◆D-TS7.2□	PKE564BC-TS7.2	
RKS564B◆D-TS10□	PKE564BC-TS10	
RKS564B◆D-TS20□	PKE564BC-TS20	
RKS564B◆D-TS30□	PKE564BC-TS30	
RKS596B◆D-TS3.6□	PKE596BC-TS3.6	
RKS596B◆D-TS7.2□	PKE596BC-TS7.2	
RKS596B◆D-TS10□	PKE596BC-TS10	
RKS596B◆D-TS20□	PKE596BC-TS20	
RKS596B◆D-TS30□	PKE596BC-TS30	

- **TS geared type (with electromagnetic brake)**

Model	Motor model	Driver model
RKS543M◆D-TS3.6□	PKE543MC-TS3.6	RKSD503-◆D
RKS543M◆D-TS7.2□	PKE543MC-TS7.2	
RKS543M◆D-TS10□	PKE543MC-TS10	
RKS543M◆D-TS20□	PKE543MC-TS20	
RKS543M◆D-TS30□	PKE543MC-TS30	
RKS564M◆D-TS3.6□	PKE564MC-TS3.6	RKSD507-◆D
RKS564M◆D-TS7.2□	PKE564MC-TS7.2	
RKS564M◆D-TS10□	PKE564MC-TS10	
RKS564M◆D-TS20□	PKE564MC-TS20	
RKS564M◆D-TS30□	PKE564MC-TS30	
RKS596M◆D-TS3.6□	PKE596MC-TS3.6	
RKS596M◆D-TS7.2□	PKE596MC-TS7.2	
RKS596M◆D-TS10□	PKE596MC-TS10	
RKS596M◆D-TS20□	PKE596MC-TS20	
RKS596M◆D-TS30□	PKE596MC-TS30	

- **PS geared type (single shaft)**

Model	Motor model	Driver model
RKS545A◆D-PS5□	PKE545AC-PS5	RKSD503-◆D
RKS545A◆D-PS7.2□	PKE545AC-PS7.2	
RKS545A◆D-PS10□	PKE545AC-PS10	
RKS543A◆D-PS25□	PKE543AC-PS25	
RKS543A◆D-PS36□	PKE543AC-PS36	
RKS543A◆D-PS50□	PKE543AC-PS50	
RKS566A◆D-PS5□	PKE566AC-PS5	RKSD507-◆D
RKS566A◆D-PS7.2□	PKE566AC-PS7.2	
RKS566A◆D-PS10□	PKE566AC-PS10	
RKS564A◆D-PS25□	PKE564AC-PS25	
RKS564A◆D-PS36□	PKE564AC-PS36	
RKS564A◆D-PS50□	PKE564AC-PS50	
RKS599A◆D-PS5□	PKE599AC-PS5	
RKS599A◆D-PS7.2□	PKE599AC-PS7.2	
RKS599A◆D-PS10□	PKE599AC-PS10	
RKS596A◆D-PS25□	PKE596AC-PS25	
RKS596A◆D-PS36□	PKE596AC-PS36	
RKS596A◆D-PS50□	PKE596AC-PS50	

- **PS geared type (double shaft)**

Model	Motor model	Driver model
RKS545B◆D-PS5□	PKE545BC-PS5	RKSD503-◆D
RKS545B◆D-PS7.2□	PKE545BC-PS7.2	
RKS545B◆D-PS10□	PKE545BC-PS10	
RKS543B◆D-PS25□	PKE543BC-PS25	
RKS543B◆D-PS36□	PKE543BC-PS36	
RKS543B◆D-PS50□	PKE543BC-PS50	
RKS566B◆D-PS5□	PKE566BC-PS5	RKSD507-◆D
RKS566B◆D-PS7.2□	PKE566BC-PS7.2	
RKS566B◆D-PS10□	PKE566BC-PS10	
RKS564B◆D-PS25□	PKE564BC-PS25	
RKS564B◆D-PS36□	PKE564BC-PS36	
RKS564B◆D-PS50□	PKE564BC-PS50	
RKS599B◆D-PS5□	PKE599BC-PS5	
RKS599B◆D-PS7.2□	PKE599BC-PS7.2	
RKS599B◆D-PS10□	PKE599BC-PS10	
RKS596B◆D-PS25□	PKE596BC-PS25	
RKS596B◆D-PS36□	PKE596BC-PS36	
RKS596B◆D-PS50□	PKE596BC-PS50	

- **PS geared type (with electromagnetic brake)**

Model	Motor model	Driver model
RKS545M◆D-PS5□	PKE545MC-PS5	RKSD503-◆D
RKS545M◆D-PS7.2□	PKE545MC-PS7.2	
RKS545M◆D-PS10□	PKE545MC-PS10	
RKS543M◆D-PS25□	PKE543MC-PS25	
RKS543M◆D-PS36□	PKE543MC-PS36	
RKS543M◆D-PS50□	PKE543MC-PS50	
RKS566M◆D-PS5□	PKE566MC-PS5	RKSD507-◆D
RKS566M◆D-PS7.2□	PKE566MC-PS7.2	
RKS566M◆D-PS10□	PKE566MC-PS10	
RKS564M◆D-PS25□	PKE564MC-PS25	
RKS564M◆D-PS36□	PKE564MC-PS36	
RKS564M◆D-PS50□	PKE564MC-PS50	
RKS599M◆D-PS5□	PKE599MC-PS5	
RKS599M◆D-PS7.2□	PKE599MC-PS7.2	
RKS599M◆D-PS10□	PKE599MC-PS10	
RKS596M◆D-PS25□	PKE596MC-PS25	
RKS596M◆D-PS36□	PKE596MC-PS36	
RKS596M◆D-PS50□	PKE596MC-PS50	

- **Harmonic geared type (single shaft)**

Model	Motor model	Driver model
RKS543A◆D-HS50□	PKE543AC-HS50	RKSD503-◆D
RKS543A◆D-HS100□	PKE543AC-HS100	
RKS564A◆D-HS50□	PKE564AC-HS50	RKSD507-◆D
RKS564A◆D-HS100□	PKE564AC-HS100	
RKS596A◆D-HS50□	PKE596AC-HS50	
RKS596A◆D-HS100□	PKE596AC-HS100	

- **Harmonic geared type (double shaft)**

Model	Motor model	Driver model
RKS543B◆D-HS50□	PKE543BC-HS50	RKSD503-◆D
RKS543B◆D-HS100□	PKE543BC-HS100	
RKS564B◆D-HS50□	PKE564BC-HS50	RKSD507-◆D
RKS564B◆D-HS100□	PKE564BC-HS100	
RKS596B◆D-HS50□	PKE596BC-HS50	
RKS596B◆D-HS100□	PKE596BC-HS100	

- **Harmonic geared type (with electromagnetic brake)**

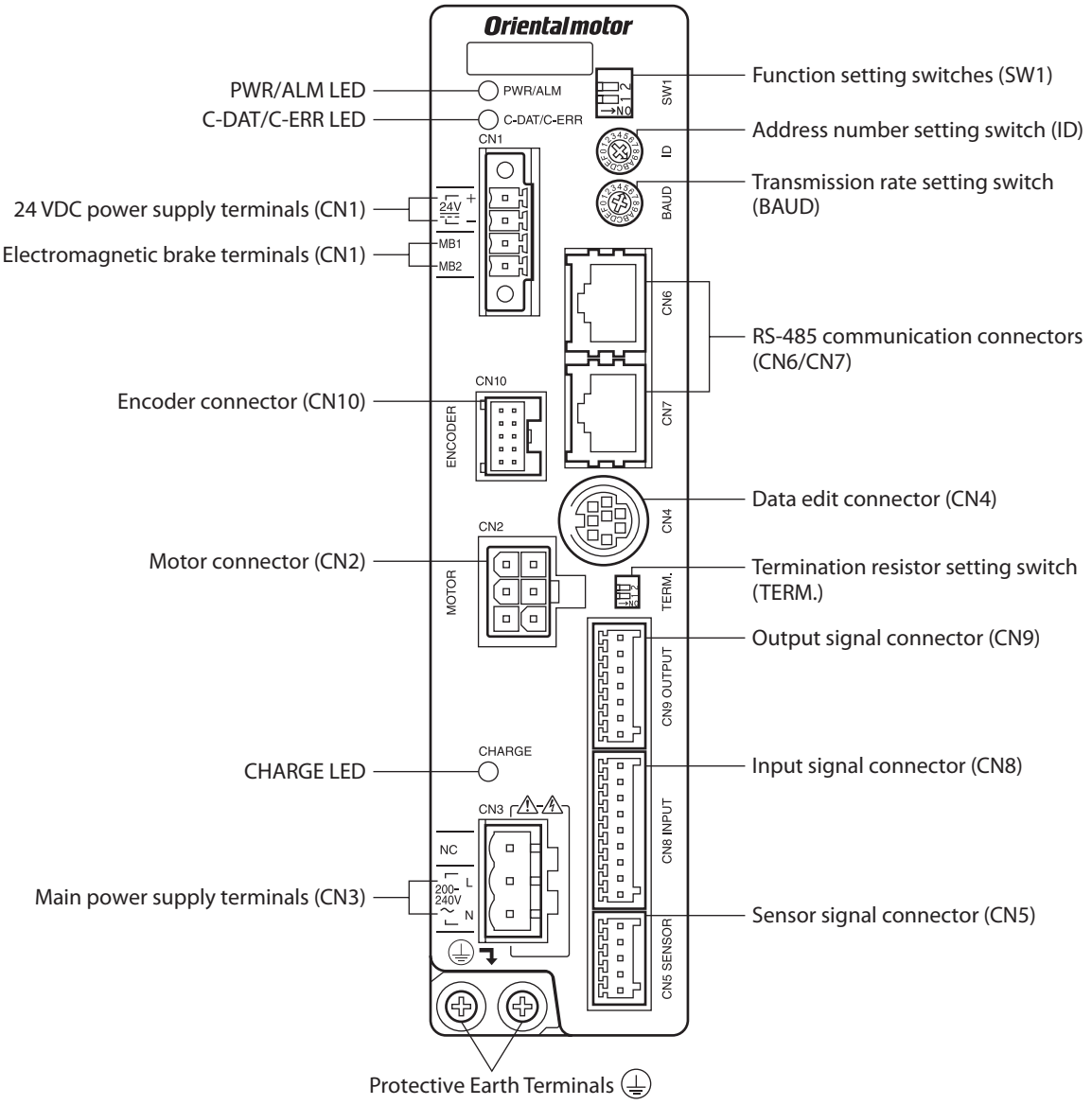
Model	Motor model	Driver model
RKS543M◆D-HS50□	PKE543MC-HS50	RKSD503-◆D
RKS543M◆D-HS100□	PKE543MC-HS100	
RKS564M◆D-HS50□	PKE564MC-HS50	RKSD507-◆D
RKS564M◆D-HS100□	PKE564MC-HS100	
RKS596M◆D-HS50□	PKE596MC-HS50	
RKS596M◆D-HS100□	PKE596MC-HS100	

- **FC geared type (single shaft)**

Model	Motor model	Driver model
RKS545A◆D-FC7.2LA□	PKE545AC-FC7.2LA	RKSD503-◆D
RKS545A◆D-FC7.2RA□	PKE545AC-FC7.2RA	
RKS545A◆D-FC10LA□	PKE545AC-FC10LA	
RKS545A◆D-FC10RA□	PKE545AC-FC10RA	
RKS545A◆D-FC20LA□	PKE545AC-FC20LA	
RKS545A◆D-FC20RA□	PKE545AC-FC20RA	
RKS545A◆D-FC30LA□	PKE545AC-FC30LA	
RKS545A◆D-FC30RA□	PKE545AC-FC30RA	
RKS566A◆D-FC7.2LA□	PKE566AC-FC7.2LA	RKSD507-◆D
RKS566A◆D-FC7.2RA□	PKE566AC-FC7.2RA	
RKS566A◆D-FC10LA□	PKE566AC-FC10LA	
RKS566A◆D-FC10RA□	PKE566AC-FC10RA	
RKS566A◆D-FC20LA□	PKE566AC-FC20LA	
RKS566A◆D-FC20RA□	PKE566AC-FC20RA	
RKS566A◆D-FC30LA□	PKE566AC-FC30LA	
RKS566A◆D-FC30RA□	PKE566AC-FC30RA	

8-4 Names and functions of parts

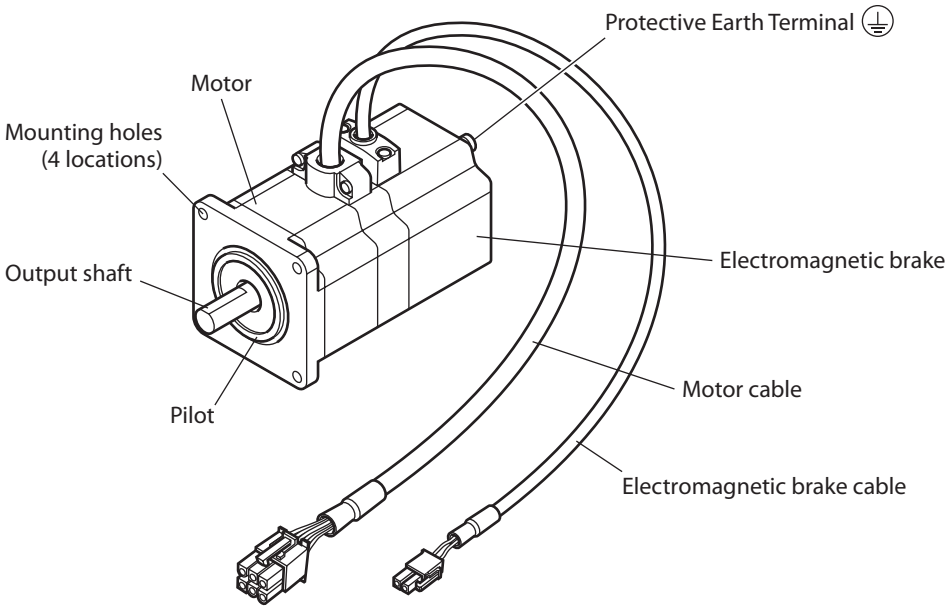
■ Driver (Example: RKSD507-CD)



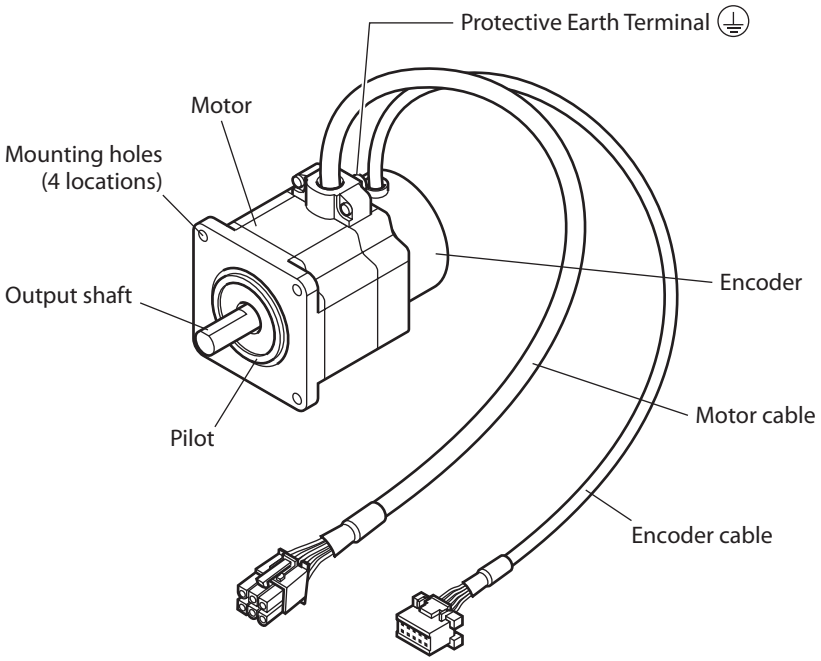
Type	Name	Description	Ref
LED	PWR/ALM LED	• PWR (Green): This LED is lit while the 24 VDC power is input. • ALM (Red): This LED will blink when an alarm generates. It is possible to check the generated alarm by counting the number of times the LED blinks.	p.267
	C-DAT/C-ERR LED	• C-DAT (Green): This LED will blink or illuminate steadily when the driver is communicating with the master station properly via RS-485 communication. • C-ERR (Red): This LED will illuminate when a RS-485 communication error occurs with he master station.	–
	CHARGE LED (Red)	This LED is lit while the main power is input. After the main power has been turned off, the LED will turn off once the residual voltage in the driver drops to a safe level.	–
Switch	Address number setting switch (ID)	Use this switch when controlling the system via RS-485 communication. Use this switch and SW1-No.1 of the function setting switch, to set the address number of RS-485 communication. Factory setting: 0	p.146 p.188
	Termination resistor setting switch (TERM.)	Use this switch when controlling the system via RS-485 communication. Set the termination resistor (120 Ω) of RS-485 communication. Factory setting: OFF	p.146 p.189
	Function setting switches (SW1)	Use these switches when controlling the system via RS-485 communication. • No.1: Using this switch and the address number setting switch (ID), set the address number of RS-485 communication. Factory setting: OFF • No.2: Set the protocol of RS-485 communication. Factory setting: OFF	p.145 p.188
	Transmission rate setting switch (BAUD)	Use this switch when controlling the system via RS-485 communication. Set the transmission rate of RS-485 communication. Factory setting: 7	p.146 p.189
Connector	Motor connector (CN2)	Connect the motor.	p.37
	Data edit connector (CN4)	Connect a PC in which the **MEXE02** has been installed, or the accessory **OPX-2A**.	p.42
	Sensor signal connector (CN5)	Connect the sensor.	p.37
	RS-485 communication connectors (CN6/CN7)	Connect the RS-485 communication cable.	p.43
	Input signal connector (CN8)	Connect the input signals.	p.37
	Output signal connector (CN9)	Connect the output signals.	
	Encoder connector (CN10)	Connect the encoder.	p.38
Terminal	24 VDC power input terminals (CN1-24V)	Connect the control power supply of the driver. +: +24 VDC power supply input –: Power supply GND	p.42
	Electromagnetic brake terminals (CN1-MB1/MB2)	Connect the lead wires from the electromagnetic brake. MB1: Electromagnetic brake – (Black) MB2: Electromagnetic brake + (White)	p.37
	Power supply input terminals (CN3)	Connect the main power supply. L: Live N: Neutral	
	Protective Earth Terminals ⏚	Used for grounding via a grounding cable of AWG16 (1.25 mm^2) or more.	p.42

■ Motor

- **Standard type with electromagnetic brake**



- **Standard type with encoder**



2 Installation and connection

This part explains the installation method of the product, the mounting method of a load and the connection method as well as I/O signals.

◆Table of contents

1 Installation

This chapter explains the installation location and installation methods of the motor and driver, along with load installation.

1-1 Location for installation

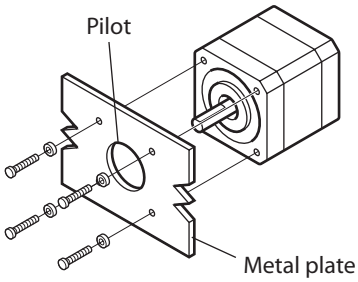
The motor and driver are designed and manufactured to be incorporated in equipment. Install them in a well-ventilated location that provides easy access for inspection.
The location must also satisfy the following conditions:

- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature
  Motor: –10 to +50 °C (+14 to +122 °F) (non-freezing)
  Motor with encoder: 0 to +50 °C (+32 to +122 °F) (non-freezing)
  Harmonic geared type: 0 to +40 °C (+32 to +104 °F) (non-freezing)
  Driver: 0 to +55 °C (+32 to +131 °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

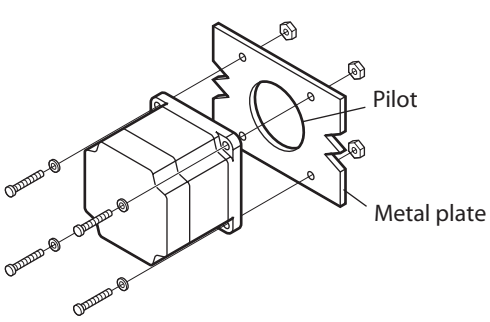
1-2 Installing the motor

The motor can be installed in any direction.
To allow for heat dissipation and prevent vibration, install the motor on a metal surface of sufficient strength.
For **RKS564-TS** and **RKS596-TS**, Install the motor using the supplied screws.

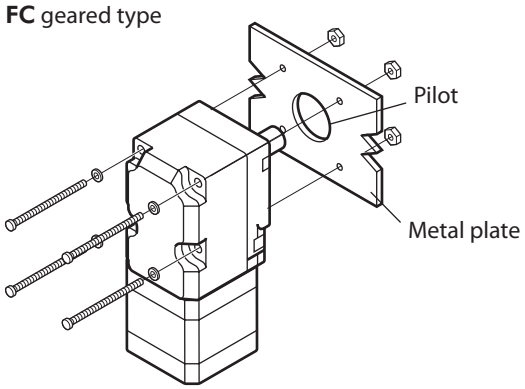
- **Installation method A**



- **Installation method B**



FC geared type



- **Screw size, tightening torque, installation method**

Type	Model	Nominal size	Tightening torque [N·m (oz-in)]	Effective depth of bolt [mm (in.)]	Installation method
Standard	**RKS54**	M3	1 (142)	4.5 (0.177)	A
	RKS56	M4	2 (280)	–	B
	RKS59	M6	3 (420)		
TS geared	**RKS54**	M4	2 (280)	8 (0.315)	A
	RKS56	M4	2 (280)	–	B
	RKS59	M8	4 (560)		
PS geared	**RKS54**	M4	2 (280)	8 (0.315)	A
	RKS56	M5	2.5 (350)	10 (0.394)	
	RKS59	M8	4 (560)	15 (0.591)	
FC geared	**RKS54**	M4	2 (280)	–	B
	RKS56	M5	2.5 (350)		
Harmonic geared	**RKS54**	M4	2 (280)	8 (0.315)	A
	RKS56	M5	2.5 (350)	10 (0.394)	
	RKS59	M8	4 (560)	–	B

1-3 Installing a load

When connecting a load to the motor, align the centers of the motor output shaft and load shaft.

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.
- Do not apply strong force using hammer or other tools when removing the parallel key. Doing so may damage the motor output shaft and bearings (ball bearings).
- If you are using a motor with encoder, an optical encoder is housed in the motor. To prevent damage to the encoder, handle the motor with care and avoid strong impact to the motor output shaft when transporting the motor or installing the load.

- **Using a coupling**

  Align the centers of the motor output shaft and load shaft in a straight line.

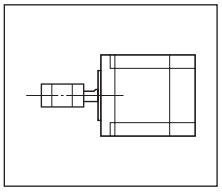
- **Using a belt drive**

  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.

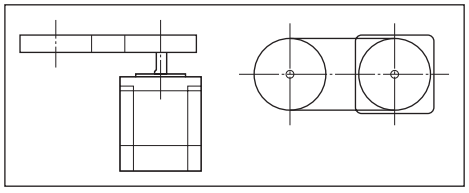
- **Using a gear drive**

  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.

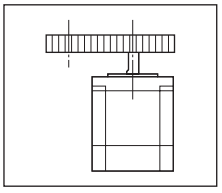
• Using a coupling



• Using a belt drive



• Using a gear drive

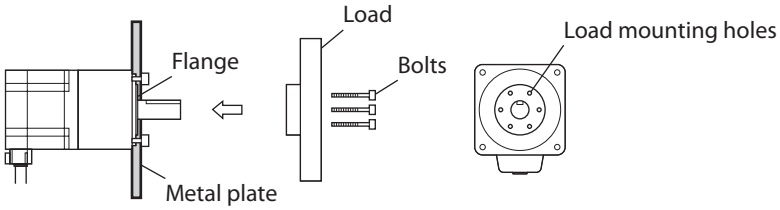


- **Using a parallel key (geared motor)**

  When connecting the load and gear output shaft with a key slot, secure the load using the key supplied with the gear output shaft after machining the key slot on the load.

- **Installing on the flange surface (Harmonic geared type)**

  With a Harmonic geared type (excluding PKE596), a load can be installed directly to the gear using the load mounting holes provided on the flange surface.



Model	Nominal size	Number of bolts	Tightening torque [N·m (oz-in)]	Effective depth of bolt [mm (in.)]
PKE543	M3	6	1.4 (198)	5 (0.2)
PKE564	M4	6	2.5 (350)	6 (0.24)

memo
- When installing a load on the flange surface, the load cannot be mounted using the key slot in the output shaft.
- Design an appropriate installation layout so that the load will not contact the metal plate or bolts used for installing the motor.

1-4 Permissible radial load and permissible axial load

The radial load and the axial load on the motor's output shaft must be kept under the permissible values listed below.

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

memo The permissible radial load and permissible axial load of the **PS** geared type represent the value that the service life of the gear part satisfies 20,000 hours when either of the radial load or axial load is applied to the gear output shaft.

Type	Motor model	Gear ratio	Permissible radial load [N (lb.)]					Permissible axial load [N (lb.)]
			Distance from the tip of motor output shaft					
			0 mm (0 in.)	5 mm (0.20 in.)	10 mm (0.39 in.)	15 mm (0.59 in.)	20 mm (0.79 in.)	
Standard	PKE54	–	35 (7.8)	44 (9.9)	58 (13)	85 (19.1)	–	15 (3.3)
	PKE56		90 (20)	100 (22)	130 (29)	180 (40)	270 (60)	30 (6.7)
	PKE59		260 (58)	290 (65)	340 (76)	390 (87)	480 (108)	60 (13.5)
TS geared	PKE54	3.6, 7.2, 10	20 (4.5)	30 (6.7)	40 (9)	50 (11.2)	–	15 (3.3)
		20, 30	40 (9)	50 (11.2)	60 (13.5)	70 (15.7)	–	
	PKE56	3.6, 7.2, 10	120 (27)	135 (30)	150 (33)	165 (37)	180 (40)	40 (9)
		20, 30	170 (38)	185 (41)	200 (45)	215 (48)	230 (51)	
	PKE59	3.6, 7.2, 10	300 (67)	325 (73)	350 (78)	375 (84)	400 (90)	150 (33)
		20, 30	400 (90)	450 (101)	500 (112)	550 (123)	600 (135)	
PS geared	PKE54	5	70 (15.7)	80 (18)	95 (21)	120 (27)	–	100 (22)
		7.2	80 (18)	90 (20)	110 (24)	140 (31)	–	
		10	85 (19.1)	100 (22)	120 (27)	150 (33)	–	
		25	120 (27)	140 (31)	170 (38)	210 (47)	–	
		36	130 (29)	160 (36)	190 (42)	240 (54)	–	
		50	150 (33)	170 (38)	210 (47)	260 (58)	–	

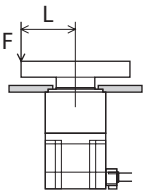
Type	Motor model	Gear ratio	Permissible radial load [N (lb.)]					Permissible axial load [N (lb.)]
			Distance from the tip of motor output shaft					
			0 mm (0 in.)	5 mm (0.20 in.)	10 mm (0.39 in.)	15 mm (0.59 in.)	20 mm (0.79 in.)	
PS geared	PKE56	5	170 (38)	200 (45)	230 (51)	270 (60)	320 (72)	200 (45)
		7.2	200 (45)	220 (49)	260 (58)	310 (69)	370 (83)	
		10	220 (49)	250 (56)	290 (65)	350 (78)	410 (92)	
		25	300 (67)	340 (76)	400 (90)	470 (105)	560 (126)	
		36	340 (76)	380 (85)	450 (101)	530 (119)	630 (141)	
		50	380 (85)	430 (96)	500 (112)	600 (135)	700 (157)	
	PKE59	5	380 (85)	420 (94)	470 (105)	540 (121)	630 (141)	600 (135)
		7.2	430 (96)	470 (105)	530 (119)	610 (137)	710 (159)	
		10	480 (108)	530 (119)	590 (132)	680 (153)	790 (177)	
		25	650 (146)	720 (162)	810 (182)	920 (200)	1070 (240)	
		36	730 (164)	810 (182)	910 (200)	1040 (230)	1210 (270)	
		50	820 (184)	910 (200)	1020 (220)	1160 (260)	1350 (300)	
FC geared	PKE54	All gear ratios	180 (40)	200 (45)	220 (49)	250 (56)	–	100 (22)
	PKE56		270 (60)	290 (65)	310 (69)	330 (74)	350 (78)	200 (45)
Harmonic geared	PKE54	All gear ratios	180 (40)	220 (49)	270 (60)	360 (81)	510 (114)	220 (49)
	PKE56		320 (72)	370 (83)	440 (99)	550 (123)	720 (162)	450 (101)
	PKE59		1090 (240)	1150 (250)	1230 (270)	1310 (290)	1410 (310)	1300 (290)

■ Permissible moment load of the Harmonic geared type

When installing an arm or table on the flange surface, calculate the moment load using the formula below if the flange surface receives any eccentric load. The moment load should not exceed the permissible value specified in the table.
L: Distance from the center of the output flange (m)
F: External force (N)

Moment load: M (N·m) = F × L

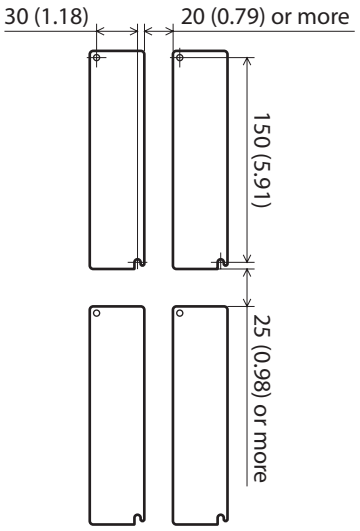
Motor model	Permissible moment load [N·m (oz-in)]
PKE543	5.6 (790)
PKE564	11.6 (1640)



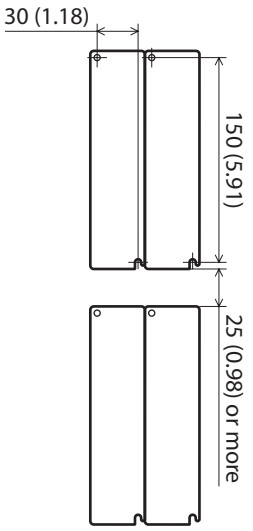
1-5 Installing the driver

The driver is designed so that heat is dissipated via air convection and conduction through the enclosure. Install the driver on a flat metal plate [material: aluminium, 200×200×2 mm (7.87×7.87×0.08 in.) equivalent] having excellent heat conductivity.
There must be a clearance of at least 25 mm (0.98 in.) in the horizontal and vertical directions, between the driver and enclosure or other equipment within the enclosure. When two or more drivers are to be installed side by side, provide 20 mm (0.79 in.) and 25 mm (0.98 in.) clearances in the horizontal and vertical directions, respectively.
When installing two or more drivers in parallel, it is possible to install them closely in the horizontal direction. In this case, use the drivers in conditions that an ambient temperature is 0 to +40 °C (+32 to +104 °F) and the standstill current is 50% or less.
When installing the driver in an enclosure, use two screws (M4, not supplied) to secure the driver through the mounting holes.

- When installing drivers while keeping clearances in the horizontal and vertical directions.



- When installing drivers closely in the horizontal direction.



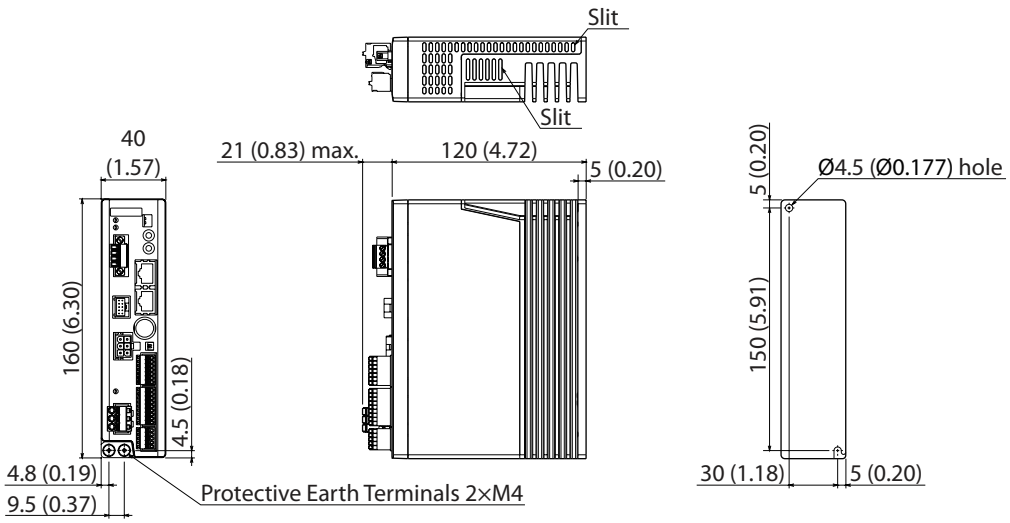
Unit: mm (in.)

memo

- Install the driver in an enclosure whose pollution degree is 2 or better environment, or whose degree of protection is IP54 minimum.
- Do not install any equipment that generates a large amount of heat or noise near the driver.
- Do not install the driver underneath the controller or other equipment vulnerable to heat.
- If the ambient temperature of the driver exceeds 55 °C (131 °F), improve the ventilation condition. Also, when the standstill current is set to 60%, use the driver in a condition that an ambient temperature does not exceed 50 °C (122 °F). See p.72 for the standstill current.
- Be sure to install the driver vertically (vertical position).

Dimension [Unit: mm (in.)]

Mass: 0.8 kg (1.76 lb.)



2 Connection

This chapter explains how to connect the motor, I/O signals and power supply to the driver, as well as grounding method. The installation and wiring methods in compliance with the EMC Directive are also explained.

2-1 Connection example

Note

- Have the connector plugged in securely. Insecure connections may cause malfunction or damage to the motor or driver.
- When cycle the power or plugging/unplugging the connector, turn off the power and wait for the CHARGE LED to turn off before doing so. Residual voltage may cause electric shock.
- Do not wire the power supply cable of the driver in the same cable duct with other power lines or motor cables. Doing so may cause malfunction due to noise.
- The lead wires of the "cable for electromagnetic brake" have polarities, so connect them in the correct polarities. If the lead wires are connected with their polarities reversed, the electromagnetic brake will not operate properly.

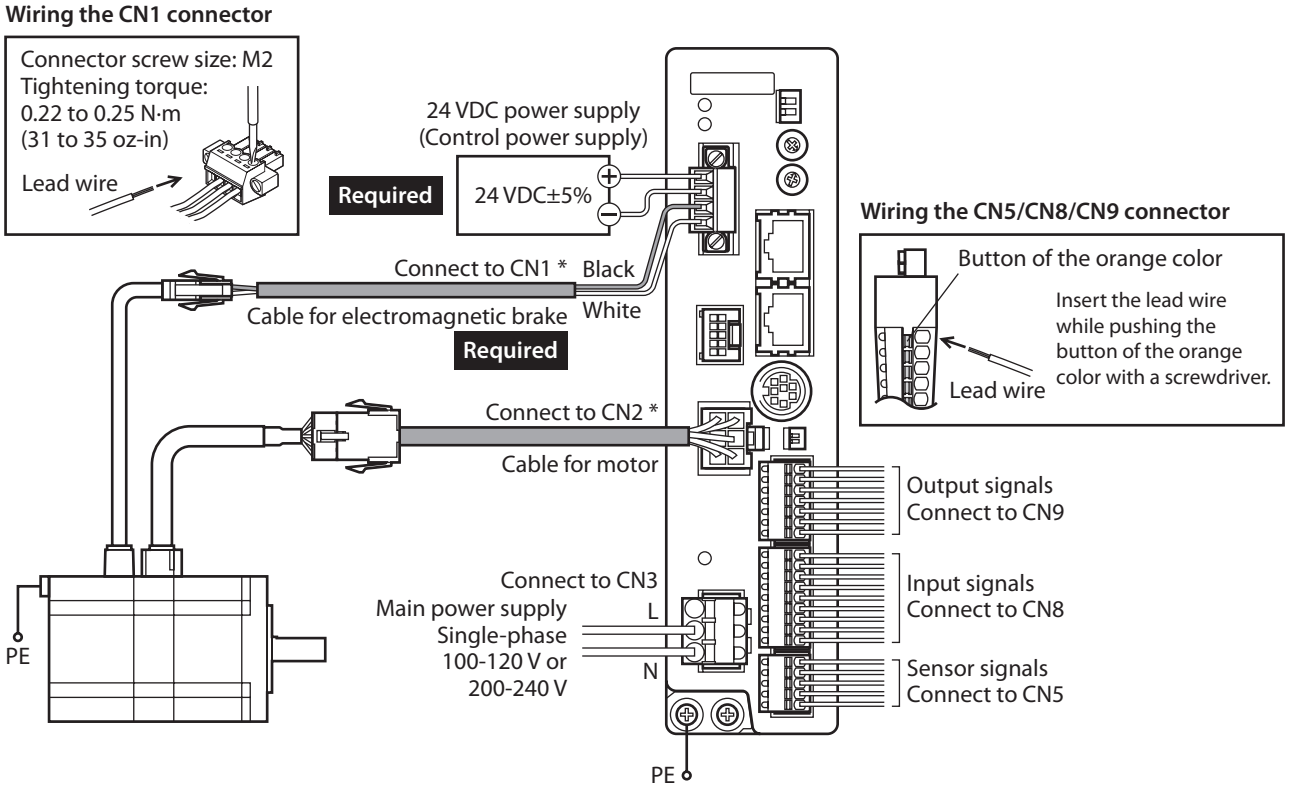
memo

- When unplugging the motor or encoder connector, do so while pressing the latches on the connector.
- If the distance between the motor and driver is extended to 15 m (49.2 ft.) or longer, use a power supply of 24 VDC±4%.
- When installing the motor to a moving part, use an accessory flexible cable offering excellent flexibility. For the flexible motor cable, refer to p.276.

■ Standard type with electromagnetic brake

See p.39 for connector pin assignments.

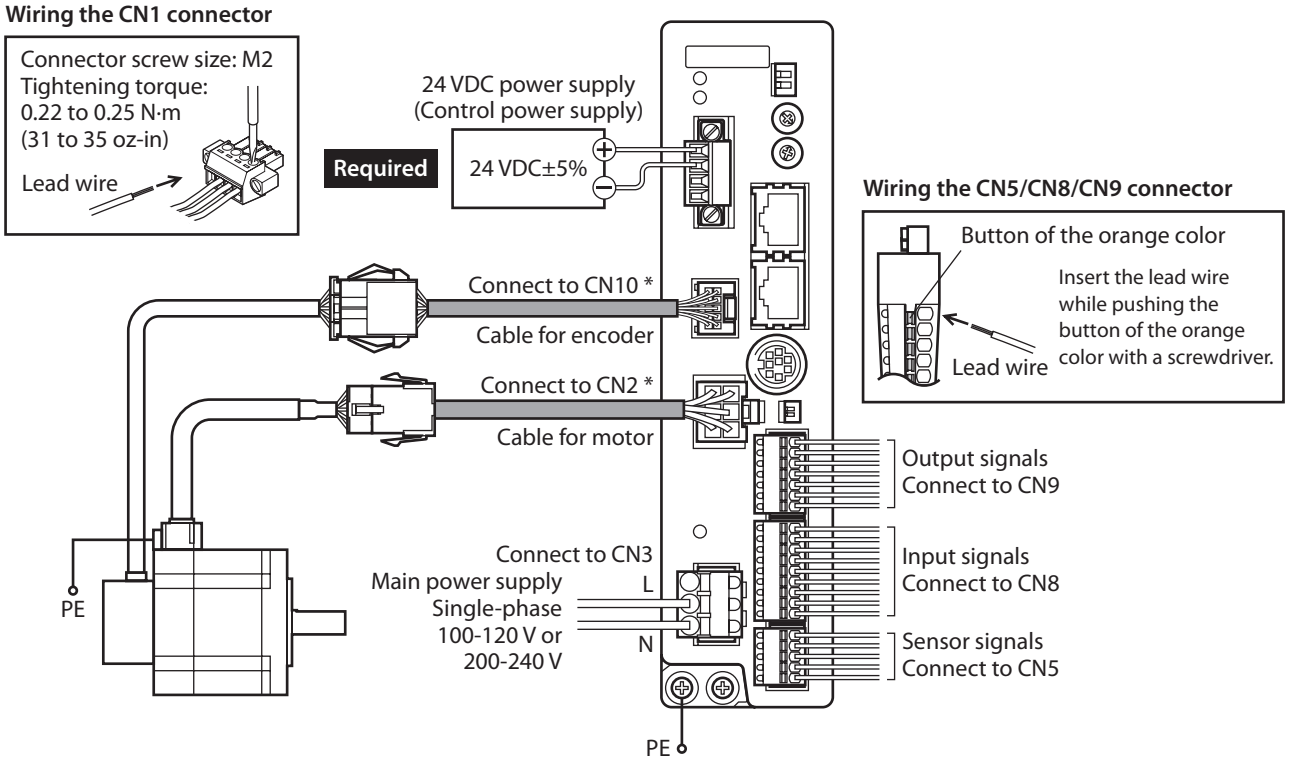
Wiring the CN1 connector



* Keep 20 m (65.6 ft.) or less for the wiring distance between the motor and driver.
Cables represented in gray color are supplied with the product or sold separately.

■ Standard type with encoder

See p.39 for connector pin assignments.



* Keep 20 m (65.6 ft.) or less for the wiring distance between the motor and driver.
Cables represented in gray color are supplied with the product or sold separately.

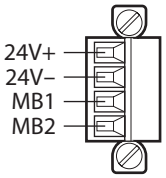
■ Main power supply current capacity

Model	Single-phase 100-120 V −15 to +10% 50/60 Hz	Single-phase 200-240 V −15 to +10% 50/60 Hz
RKS543	2.1 A or more	1.3 A or more
RKS544	1.9 A or more	1.2 A or more
RKS545	1.9 A or more	1.2 A or more
RKS564	4.0 A or more	2.4 A or more
RKS566	3.8 A or more	2.4 A or more
RKS569	4.0 A or more	2.5 A or more
RKS596	4.9 A or more	3.0 A or more
RKS599	3.5 A or more	2.2 A or more
RKS5913	3.5 A or more	2.2 A or more

■ Pin assignment list

● CN1

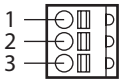
Display	Description
24V+	Connect the 24 VDC.
24V–	
MB1	Electromagnetic brake input –
MB2	Electromagnetic brake input +



- Applicable lead wire: AWG28 to 16 (0.08 to 1.25 mm^2)
- Length of the insulation cover which can be peeled: 7 mm (0.28 in.)

● CN3

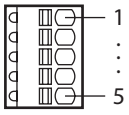
Pin No.	Display	Description
1	NC	Not used.
2	L	Connect the main power supply.
3	N	



- Applicable lead wire: AWG16 to 14 (1.25 to 2.0 mm^2)
- Length of the insulation cover which can be peeled: 10 mm (0.39 in.)

● CN5

Pin No.	Signal name	Description
1	+LS	Limit sensor input +
2	–LS	Limit sensor input –
3	HOMES	Mechanical home sensor input
4	SLIT	Slit sensor input
5	IN-COM2	Sensor common input

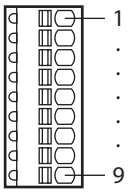


- Applicable lead wire: AWG26 to 20 (0.14 to 0.5 mm^2)
- Length of the insulation cover which can be peeled: 8 mm (0.32 in.)

● CN8

Pin No.	Signal name	Description *
1	IN0	Control input 0 [HOME]
2	IN1	Control input 1 [START]
3	IN2	Control input 2 [M0]
4	IN3	Control input 3 [M1]
5	IN4	Control input 4 [M2]
6	IN5	Control input 5 [FREE]
7	IN6	Control input 6 [STOP]
8	IN7	Control input 7 [ALM-RST]
9	IN-COM1	Input signal common

* [ ]: Initial value

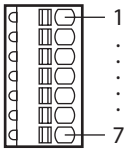


- Applicable lead wire: AWG26 to 20 (0.14 to 0.5 mm^2)
- Length of the insulation cover which can be peeled: 8 mm (0.32 in.)

● CN9

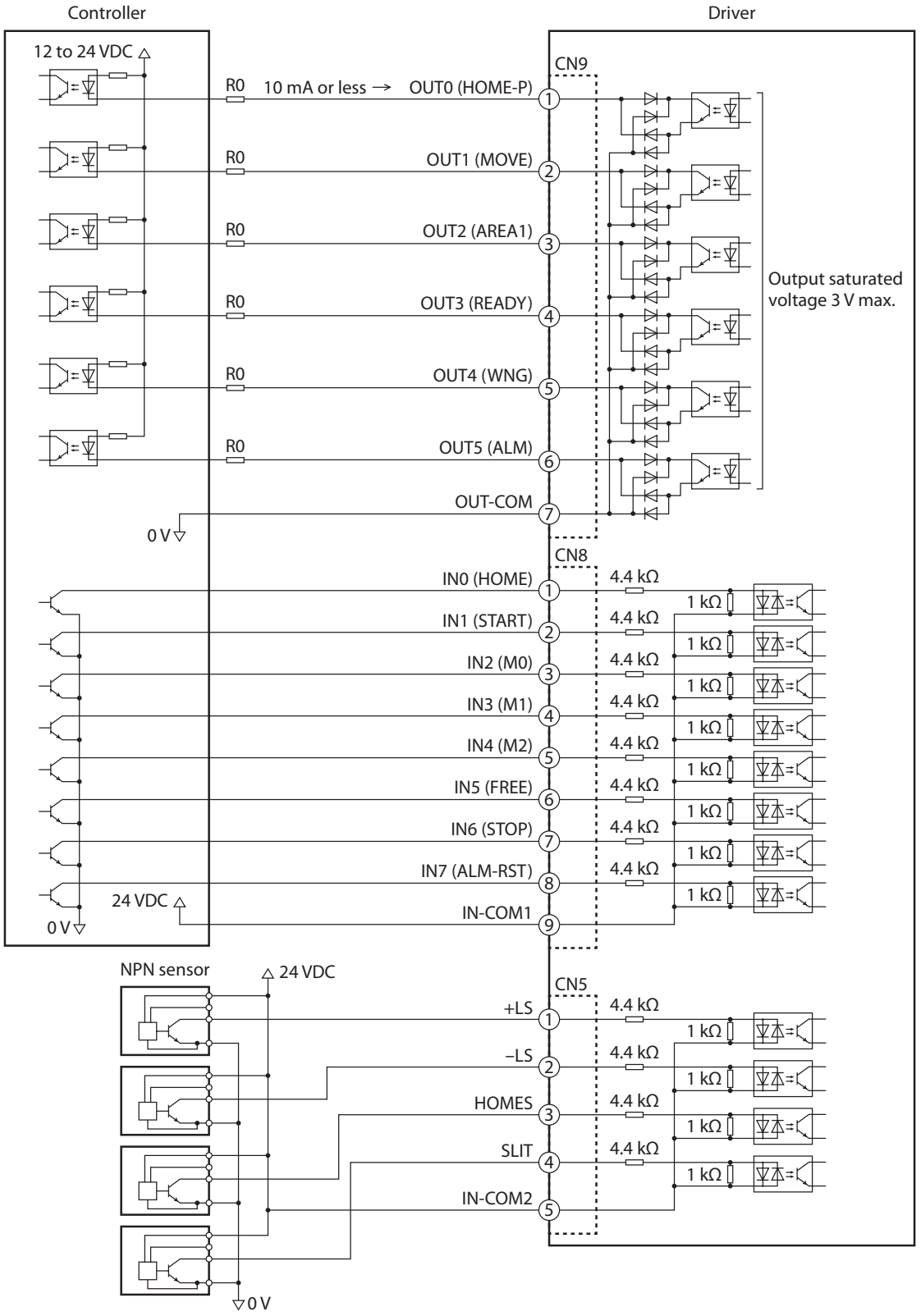
Pin No.	Signal name	Description *
1	OUT0	Control output 0 [HOME-P]
2	OUT1	Control output 1 [MOVE]
3	OUT2	Control output 2 [AREA1]
4	OUT3	Control output 3 [READY]
5	OUT4	Control output 4 [WNG]
6	OUT5	Control output 5 [ALM]
7	OUT-COM	Output signal common

* [ ]: Initial value



- Applicable lead wire: AWG26 to 20 (0.14 to 0.5 mm^2)
- Length of the insulation cover which can be peeled: 8 mm (0.32 in.)

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

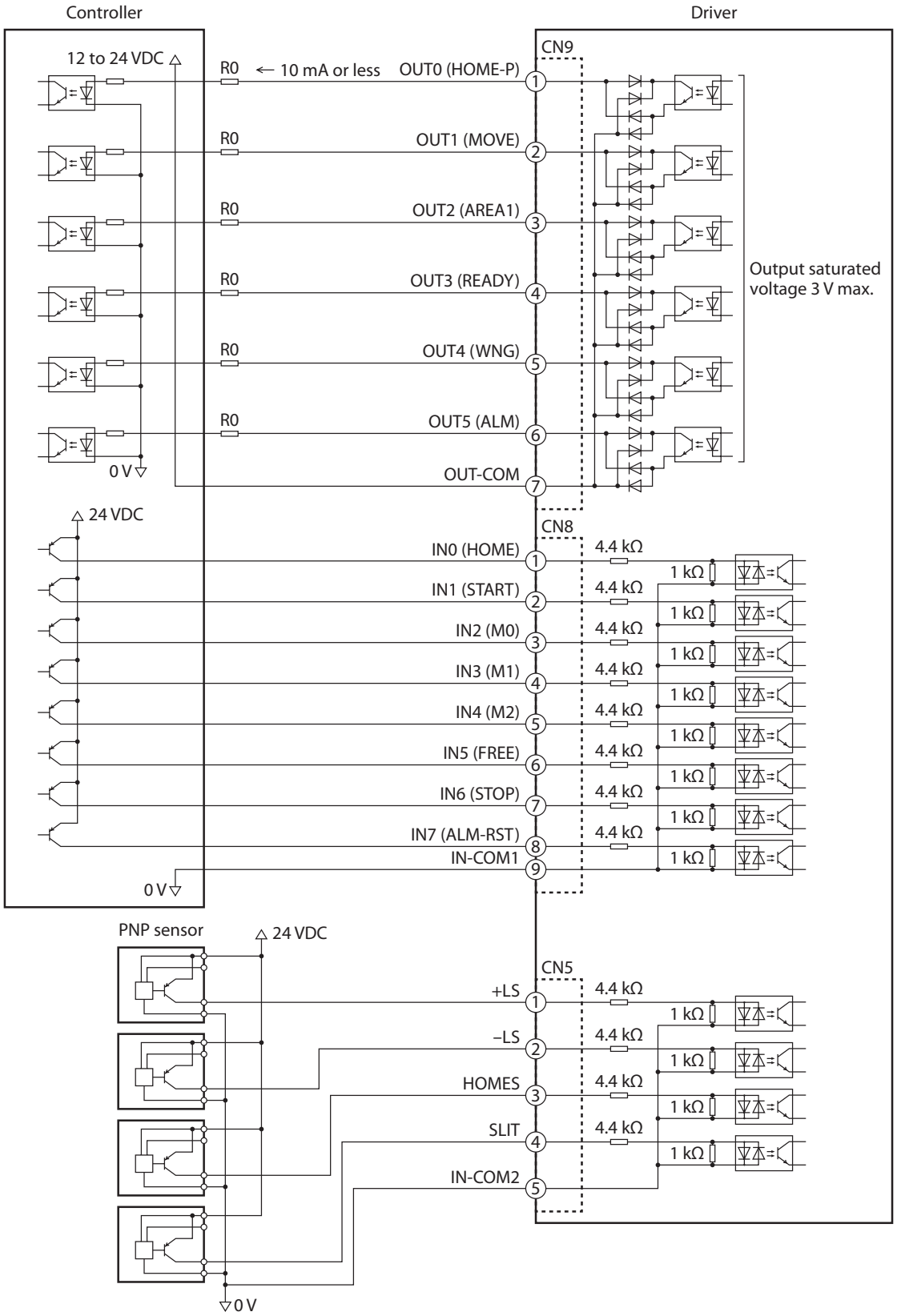


* ( ): Initial value

memo

- Use input signals at 24 VDC.
- Use output signals at 26.4 VDC 10 mA or less. If the current exceeds 10 mA, connect an external resistor R0.
- The saturated voltage of the output signal is 3 VDC maximum.

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



* ( ): Initial value

memo

- Use input signals at 24 VDC.
- Use output signals at 26.4 VDC 10 mA or less. If the current exceeds 10 mA, connect an external resistor R0.
- The saturated voltage of the output signal is 3 VDC maximum.

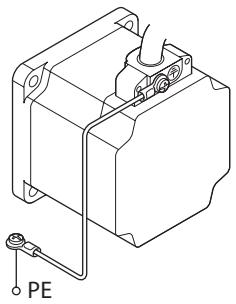
2-2 Grounding the motor and driver

■ Grounding the motor

Be sure to ground the Protective Earth Terminal of the motor.

- Grounding wire: AWG18 (0.75 mm^2) or more
- Screw size: M4
- Tightening torque: 1.2 N·m (170 oz-in)

When grounding, use a round terminal and secure it with a mounting screw with a washer. Ground wires and crimp terminals are not supplied.

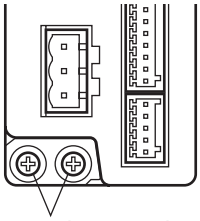


■ Grounding the driver

Be sure to ground the Protective Earth Terminal of the driver.

- Grounding wire: AWG16 to 14 (1.25 to 2.0 mm^2)
- Screw size: M4
- Tightening torque: 1.2 N·m (170 oz-in)

You can ground either of the two Protective Earth Terminals. The terminal that is not grounded is used as a service terminal. Use the service terminal according to your specific need, such as connecting it to the motor in order to ground the motor.
Do not share the grounding wire with a welder or any other power equipment.
When grounding the Protective Earth Terminal, use a round terminal and affix the grounding point near the driver.



Protective Earth Terminals
(Ground one of these terminals.)

2-3 Connecting the 24 VDC power supply

The 24 VDC power supply is for the control circuit of the driver. Be sure to connect the 24 VDC±5% power supply of the following capacity.

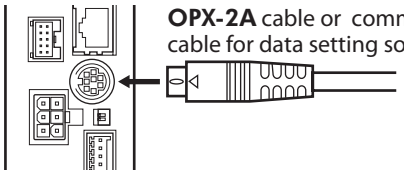
Model	Without electromagnetic brake	With electromagnetic brake
RKS54	0.2 A or more	0.3 A or more
RKS56		0.5 A or more
RKS59		0.7 A or more

memo

- If the distance between the motor and driver is extended to 15 m (49.2 ft.) or longer, use a power supply of 24 VDC±4%.
- When cycling the 24 VDC power supply, turn off the power and turn on the power again after waiting for 1 second or more.

2-4 Connecting the data setter

Connect **OPX-2A** cable or communication cable for data setting software to the data edit connector (CN4) on the driver.

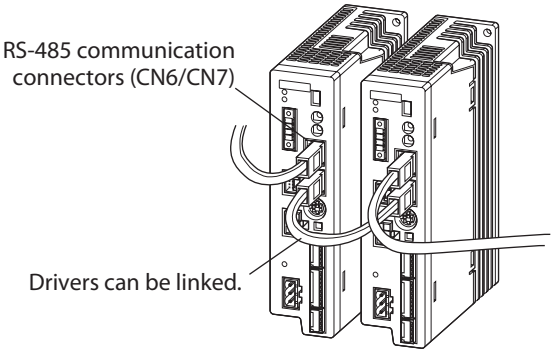


OPX-2A cable or communication cable for data setting software

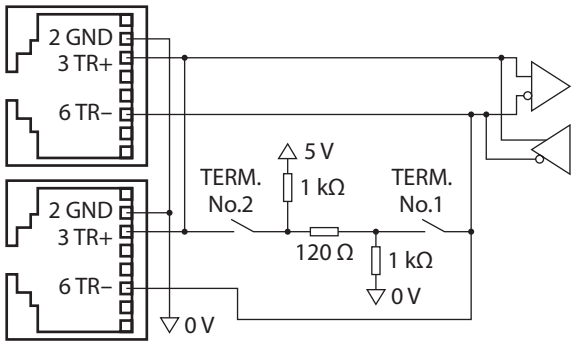
⚠ Caution The data edit connector (CN4) and RS-485 communication connector (CN6/CN7) of the driver are not electrically insulated. When grounding the positive terminal of the power supply, do not connect any equipment (PC, etc.) whose negative terminal is grounded. Doing so may cause the driver and these equipment to short, damaging both.

2-5 Connecting the RS-485 communication cable

Connect this cable if you want to control your product via RS-485 communication. Connect the RS-485 communication cable to CN6 or CN7 on the driver. You can use the vacant connectors to connect a different driver. A driver link cable is available as an accessory. See p.278. You can also use a commercial LAN cable (shielded straight cable) to link drivers.

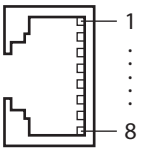


• Internal input circuit



CN6/CN7 pin assignments

Pin No.	Signal name	Description
1	N.C.	Not used
2	GND	GND
3	TR+	RS-485 communication signal (+)
4	N.C.	Not used
5	N.C.	
6	TR–	RS-485 communication signal (–)
7	N.C.	Not used
8	N.C.	



2-6 Noise measures

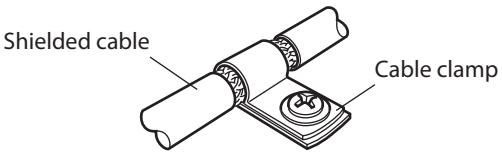
The electrical noise is of two types: One is a noise to invade into the driver from the outside and cause the driver malfunction, and the other is a noise to emit from the driver and cause peripheral equipments malfunction.
For the noise that is invaded from the outside, take measures to prevent the driver malfunction. It is needed to take adequate measures because signal lines are very likely to be affected by the noise.
For the noise that is emitted from the driver, take measures to suppress it.

■ Measures against electrical noise

There are the following three methods mainly to take measures against the electrical noise.

- **Noise suppression**
  - When relays or electromagnetic switches are used together with the system, use noise filters and CR circuits to suppress surges generated by them.
  - Use an accessory cable when extending a wiring distance between the motor and driver. This is effective in suppressing the electrical noise emitted from the motor.
  - Cover the driver by a metal plate such as aluminum. This is effective in shielding the electrical noise emitted from the driver.
- **Prevention of noise propagation**
  - Connect a noise filter in the power supply cable of driver.
  - Place the power lines, such as the motor and power supply cables, keeping a distance of 100 mm (3.94 in.) or more from the signal lines, and also do not bundle them or wire them in parallel. If the power cables and signal cables have to cross, cross them at a right angle.
  - Use a shielded cable of AWG16 (1.25 mm^2) or more for the power lines. Use a shielded cable of AWG26 to 20 (0.14 to 0.5 mm^2) for the signal cables.
  - Keep cables as short as possible without coiling and bundling extra lengths.

- When grounding PE terminals of multiple drivers to a grounding point, it becomes more effective to block the electrical noise since impedance on the grounding point is decreased. However, ground them so that a potential difference does not occur among the grounding points.
- To ground a shielded cable, use a metal cable clamp that will maintain contact with the entire circumference of the cable. Ground the cable clamp near the product.



● **Suppression of effect by noise propagation**

Loop the noise propagated cable around a ferrite core. Doing so will prevent the propagated noise invades into the driver or emits from the driver. The frequency band in which an effect by the ferrite core can be seen is generally 1 MHz or more. Check the frequency characteristics of the ferrite core used. To increase the effect of noise attenuation by the ferrite core, loop the cable a lot.

■ Noise suppression parts

● **Noise filter**

- Connect the following noise filter (or equivalent) to the power line. Doing so will prevent the propagated noise through the power line. Install the noise filter as close to the driver as possible.
  HF2010A-UPF (SOSHIN ELECTRIC CO.,LTD)
  FN2070-10-06 (Schaffner EMC)
- Use the AWG18 (0.75 mm^2) or thicker wire for the input and output cables of the noise filter, and secure firmly using a cable clamp etc. so that the cable does not come off the enclosure.
- Place the input cable as far apart as possible from the output cable, and do not wire the cables in parallel. If the input and output cable are placed at a close distance or if they are wired in parallel, the noise in the enclosure affects the power cable through stray capacitance, and the noise suppressing effect will reduce.
- Connect the ground terminal of the noise filter to the grounding point, using as thick and short a wire as possible.
- When connecting a noise filter in an enclosure, wire the input cable of the noise filter as short as possible. Wiring in long distance may reduce the noise suppressing effect.

● **Surge arrester**

A surge arrester is effective for reduction of the surge voltage of the lightning surge generated between the AC power line and earth or between AC power lines. Connect the following surge arrester.
LT-C12G801WS (SOSHIN ELECTRIC CO.,LTD)
R·A·V-781BWZ-4 (OKAYA ELECTRIC INDUSTRIES CO., LTD.).

Note When measuring dielectric strength of the equipment, be sure to remove the surge arrester, or the surge arrester may be damaged.

■ Noise suppression part (accessory)

Refer to p.278 for accessory.

● **Surge suppressor**

This product is effective to suppress the surge which occurs in a relay contact part. Connect it when using a relay or electromagnetic switch. CR circuit for surge suppression and CR circuit module are provided.

2-7 Conformity to the EMC Directive

Effective measures must be taken against the EMI that the motor and driver may give to adjacent control-system equipment, as well as the EMS of the motor and driver 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 and driver to be compliant with the EMC directive. Refer to p.20 for the applicable standards.
Oriental Motor conducts EMC measurements on its motors and drivers in accordance with "Example of motor and driver installation and wiring". The user is responsible for ensuring the machine's compliance with the EMC Directive, based on the installation and wiring explained below.

■ Connecting noise filter

In large electrically noisy environments, connect a noise filter. Refer to p.44 for details.

■ Connecting surge arrester

Refer to p.44.

■ Connecting the AC power line reactor

When inputting single-phase 240 V, insert a reactor (5 A, 5 mH) in the AC power line to ensure compliance with EN 61000-3-2.

■ Connecting the 24 VDC power supply

Use a DC power supply compliant with the EMC Directive. Use a shielded cable for wiring. Refer to "Prevention of noise propagation" on p.43 for wire the shielded cable.

■ Connecting the motor cable

Use an accessory cable when extending the wiring distance between the motor and driver

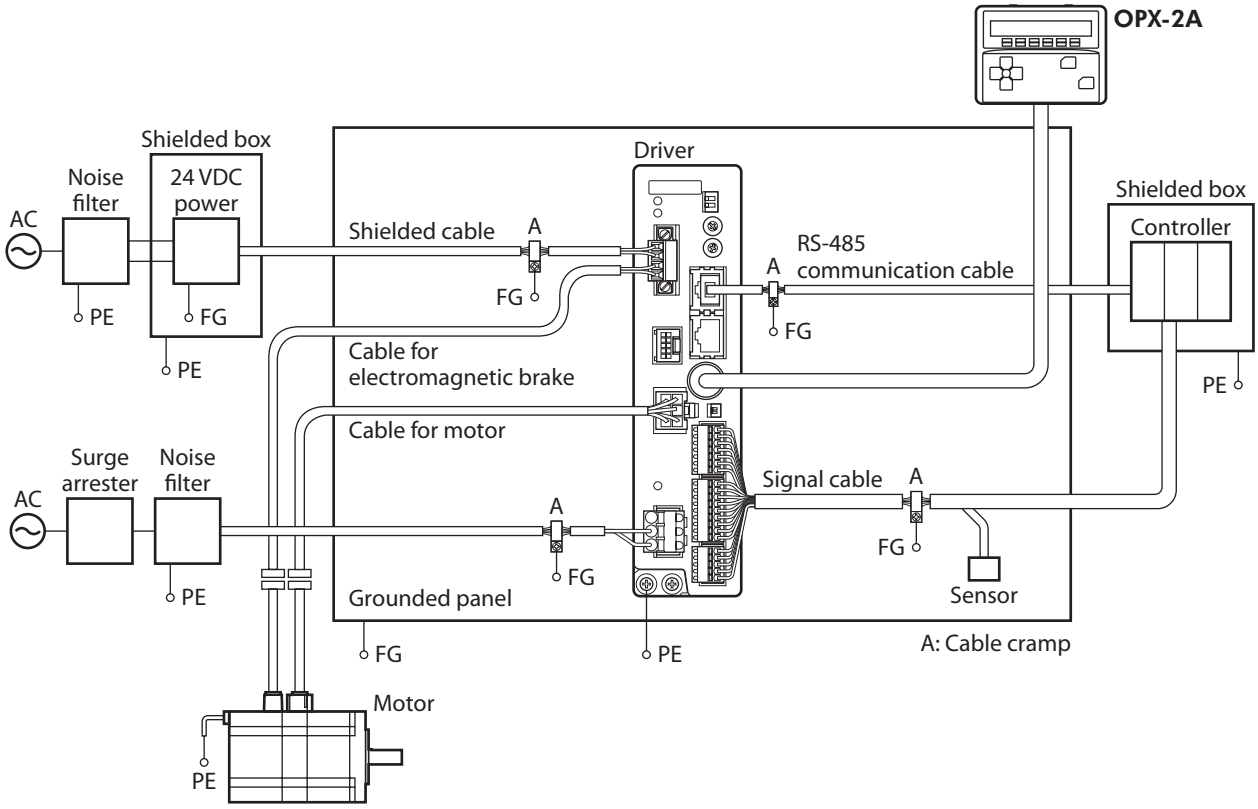
■ Connecting the signal cable

Refer to "Prevention of noise propagation" on p.43.

■ How to ground

- The cable used to ground the motor, driver and 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.
- Be sure to ground the Protective Earth Terminal of the motor and driver. Refer to p.42 for grounding method.

■ Example of motor and driver installation and wiring



Note The driver uses parts that are sensitive to electrostatic charge. Take measures against static electricity since static electricity may cause the driver to malfunction or suffer damage.

3 Explanation of I/O signals

In this manual, I/O signals are described as follows.
- Direct I/O: I/O signals accessed via input signal connector (CN8) and output signal connector (CN9)
- Network I/O: I/O signals accessed via RS-485 communication

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

3-1 Assignment of direct I/O

■ Assignment to the input terminals

The input signals shown below can be assigned to the input terminals IN0 to IN7 of CN8 by setting parameters.
For details on input signals, refer to p.55.

Direct I/O signal name	Initial value
IN0	3: HOME
IN1	4: START
IN2	48: M0
IN3	49: M1

Direct I/O signal name	Initial value
IN4	50: M2
IN5	16: FREE
IN6	18: STOP
IN7	24: ALM-RST

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 positioning 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	Stop the motor excitation and release the electromagnetic brake.
17	AWO	Motor excitation switching between excitation and non-excitation.
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	

Assignment No.	Signal name	Function
40	R8	General signals. Use these signals when controlling the system via RS-485 communication.
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.
49	M1	
50	M2	
51	M3	
52	M4	
53	M5	

Related parameters

MEXE02 tree view	Parameter name	Description	Initial value
I/O function [Input]	IN0 input function selection	Assigns the input signals shown below to IN0 to IN7 of the input terminals.	3: HOME
	IN1 input function selection		4: START
	IN2 input function selection		48: M0
	IN3 input function selection		49: M1
	IN4 input function selection		50: M2
	IN5 input function selection		16: FREE
	IN6 input function selection		18: STOP
	IN7 input function selection		24: ALM-RST

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

memo

- 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.
- The ALM-RST input and P-PRESET input will be executed when turning from OFF to ON.
- When the HMI input is not assigned to the input terminals, this input will always be set to ON. 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 IN7 using the parameter.

Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
I/O function [Input]	IN0 input logic level setting	Changes the logic level setting for the input terminal IN0 to IN7.	0: Normally open 1: Normally closed	0
	IN1 input logic level setting			
	IN2 input logic level setting			
	IN3 input logic level setting			
	IN4 input logic level setting			
	IN5 input logic level setting			
	IN6 input logic level setting			
	IN7 input logic level setting			

■ Assignment to the output terminals

The output signals shown below can be assigned to the output terminals OUT0 to OUT5 of CN9 by setting parameters.
For details on output signals, refer to p.60.

Direct I/O signal name	Initial value
OUT0	70: HOME-P
OUT1	68: MOVE
OUT2	73: AREA1

Direct I/O signal name	Initial value
OUT3	67: READY
OUT4	66: WNG
OUT5	65: ALM

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 input.
2	RVS_R	Output in response to the RVS input.
3	HOME_R	Output in response to the HOME input.
4	START_R	Output in response to the START input.
5	SSTART_R	Output in response to the SSTART input.
6	+JOG_R	Output in response to the +JOG input.
7	–JOG_R	Output in response to the –JOG input.
8	MS0_R	Output in response to the MS0 to MS5 input.
9	MS1_R	
10	MS2_R	
11	MS3_R	
12	MS4_R	
13	MS5_R	
16	FREE_R	Output in response to the FREE input.
17	AWO_R	Output in response to the AWO input.
18	STOP_R	Output in response to the STOP input.
32	R0	Output the status of the general signal R0 to R7.
33	R1	
34	R2	
35	R3	
36	R4	
37	R5	
38	R6	
39	R7	

Assignment No.	Signal name	Function
40	R8	Output the status of the general signal R8 to R15.
41	R9	
42	R10	
43	R11	
44	R12	
45	R13	
46	R14	
47	R15	
48	M0_R	Output in response to the M0 to M5 input.
49	M1_R	
50	M2_R	
51	M3_R	
52	M4_R	
53	M5_R	
60	+LS_R	Output in response to the +LS input.
61	−LS_R	Output in response to the −LS input.
62	HOMES_R	Output in response to the HOMES input.
63	SLIT_R	Output in response to the SLIT input.
65	ALM	Output the alarm status of the driver (normally closed).
66	WNG	Output the warning status of the driver.
67	READY	Output when the driver is ready.
68	MOVE	Output when the motor operates.
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 driver is in internal processing state.
82	MPS	Output the ON-OFF state of the main power supply.
83	STEPOUT	Output when the deviation error occurs.
84	O.H.	Output when the overheat warning generates.
85	ZSG	Output when the ENC-Z input signal is input from the encoder.
86	MBC	Output the electromagnetic brake status.

Related parameters

MEXE02 tree view	Parameter name	Description	Initial value
I/O function [Output]	OUT0 output function selection	Assigns the output signals shown next to OUT0 to OUT5 of the output terminals.	70: HOME-P
	OUT1 output function selection		68: MOVE
	OUT2 output function selection		73: AREA1
	OUT3 output function selection		67: READY
	OUT4 output function selection		66: WNG
	OUT5 output function selection		65: ALM

0: Not used	10: MS2_R	35: R3	45: R13	61: –LS_R	74: AREA2
1: FWD_R	11: MS3_R	36: R4	46: R14	62: HOMES_R	75: AREA3
2: RVS_R	12: MS4_R	37: R5	47: R15	63: SLIT_R	80: S-BSY
3: HOME_R	13: MS5_R	38: R6	48: M0_R	65: ALM	82: MPS
4: START_R	16: FREE_R	39: R7	49: M1_R	66: WNG	83: STEPOUT
5: SSTART_R	17: AWO_R	40: R8	50: M2_R	67: READY	84: O.H.
6: +JOG_R	18: STOP_R	41: R9	51: M3_R	68: MOVE	85: ZSG
7: –JOG_R	32: R0	42: R10	52: M4_R	70: HOME-P	86: MBC
8: MS0_R	33: R1	43: R11	53: M5_R	72: TIM	
9: MS1_R	34: R2	44: R12	60: +LS_R	73: AREA1	

3-2 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 positioning operation.	
6	+JOG	JOG operation in the positive direction.	
7	–JOG	JOG operation in the negative direction.	
8	MS0	Perform direct positioning operation of the operation data No. set by the I/O parameter.	
9	MS1		
10	MS2		
11	MS3		
12	MS4		
13	MS5		
16	FREE	Stop the motor excitation and release the electromagnetic brake.	0: No operation 1: Electromagnetic brake release + motor non-excitation
17	AWO	Motor excitation switching between excitation and non-excitation.	0: Motor non-excitation 1: Motor excitation
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: Execute
25	P-PRESET	Position 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		

Assignment No.	Signal name	Function	Setting range
39	R7	General signals. Use these signals when controlling the system via RS-485 communication.	0: OFF 1: ON
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. See p.56 for details on the combination.	0: OFF 1: ON (Operation data No.0 to 63 can be selected.)
49	M1		
50	M2		
51	M3		
52	M4		
53	M5		

Related parameters

MEXE02 tree view	Parameter name	Description	Initial value
I/O function [RS-485]	NET-IN0 input function selection	Assigns the input signals shown below to NET-IN0 to NET-IN15.	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		16: FREE
	NET-IN7 input function selection		24: ALM-RST
	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

memo

- 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.
- The ALM-RST input and P-PRESET input will be executed when turning from OFF to ON.
- When the HMI input is not assigned to the input terminals, this input will always be set to ON. 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	Data read
0	Not used	Set when the output terminal is not used.	–
1	FWD_R	Output in response to the FWD input.	0: OFF 1: ON
2	RVS_R	Output in response to the RVS input.	
3	HOME_R	Output in response to the HOME input.	
4	START_R	Output in response to the START input.	
5	SSTART_R	Output in response to the SSTART input.	
6	+JOG_R	Output in response to the +JOG input.	
7	–JOG_R	Output in response to the –JOG input.	
8	MS0_R	Output in response to the MS0 to MS5 input.	
9	MS1_R		
10	MS2_R		
11	MS3_R		
12	MS4_R		
13	MS5_R		
16	FREE_R	Output in response to the FREE input.	
17	AWO _R	Output in response to the AWO input.	
18	STOP_R	Output in response to the STOP input.	
32	R0	Output the status of the general signal R0 to R15.	
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_R	Output in response to the M0 to M5 inputs.	
49	M1_R		
50	M2_R		
51	M3_R		
52	M4_R		
53	M5_R		
60	+LS_R	Output in response to the +LS input.	
61	–LS_R	Output in response to the –LS input.	
62	HOMES_R	Output in response to the HOMES input.	
63	SLIT_R	Output in response to the SLIT input.	
65	ALM	Output the alarm of the driver (normally open).	0: Alarm not present 1: Alarm present

Assignment No.	Signal name	Function	Data read
66	WNG	Output the warning of the driver.	0: Warning not present 1: Warning present
67	READY	Output when the driver is ready.	0: Not ready 1: Ready for operation
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: OFF 1: 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 driver is in internal processing status.	0: OFF 1: ON
82	MPS	Output the ON-OFF state of the main power supply.	
83	STEPOUT	Output when the deviation error occurs.	0: No deviation error 1: During deviation error
84	O.H.	Output when the overheat warning generates.	0: No overheat warning 1: During overheat warning
85	ZSG	Output when the ENC-Z input signal is input from the encoder.	0: ENC-Z input not used 1: ENC-Z input used
86	MBC	Output the electromagnetic brake status.	0: Electromagnetic brake hold 1: Electromagnetic brake release

Related parameters

MEXE02 tree view	Parameter name	Description	Initial value
I/O function [RS-485]	NET-OUT0 output function selection	Assigns the output signals shown next to NET-OUT0 to NET-OUT15.	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		83: STEPOUT

0: Not used	10: MS2_R	35: R3	45: R13	61: –LS_R	74: AREA2
1: FWD_R	11: MS3_R	36: R4	46: R14	62: HOMES_R	75: AREA3
2: RVS_R	12: MS4_R	37: R5	47: R15	63: SLIT_R	80: S-BSY
3: HOME_R	13: MS5_R	38: R6	48: M0_R	65: ALM	82: MPS
4: START_R	16: FREE_R	39: R7	49: M1_R	66: WNG	83: STEPOUT
5: SSTART_R	17: AWO_R	40: R8	50: M2_R	67: READY	84: O.H.
6: +JOG_R	18: STOP_R	41: R9	51: M3_R	68: MOVE	85: ZSG
7: –JOG_R	32: R0	42: R10	52: M4_R	70: HOME-P	86: MBC
8: MS0_R	33: R1	43: R11	53: M5_R	72: TIM	
9: MS1_R	34: R2	44: R12	60: +LS_R	73: AREA1	

3-3 Input signals

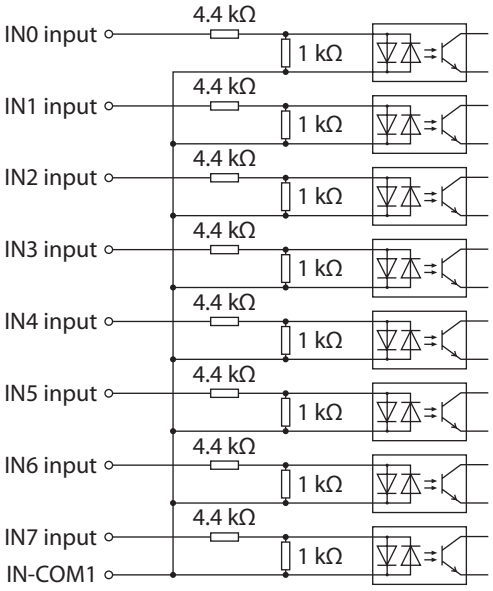
The input signals of the driver are photocoupler inputs.

- Direct I/O ..... I/O for normally open: "ON: Current-carrying", "OFF: Not current-carrying"
  I/O for normally closed: "ON: Not current-carrying", "OFF: Current-carrying"
- Network I/O ..... "ON: 1", "OFF: 0"

■ Order of priority for input signals

Each input signal has the order of priority and the order is as follows. When inputting multiple input signals simultaneously, the signal with a high priority is performed.
FREE > AWO > STOP > Operation signals (START, HOME, FWD etc.)

■ Internal input 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

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Alarm	Return-to-home incomplete alarm	When the positioning operation is started while the position origin has not been set, sets whether the alarm generates or not.	0: Disable 1: Enable	0

memo If positioning operation of the operating speed 0 Hz is performed, the abnormal operation data alarm generates.

■ SSTART input

This signal starts the sequential positioning operation (p.82).
Positioning operation based on the next operation 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 operation data No.

Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Alarm	Return-to-home incomplete alarm	When the positioning operation is started while the position origin has not been set, sets whether the alarm generates or not.	0: Disable 1: Enable	0

memo If positioning operation of the operating speed 0 Hz is performed, the abnormal operation data alarm generates.

■ MS0 to MS5 input

This signal starts the direct positioning operation (p.81).
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.

Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Alarm	Return-to-home incomplete alarm	When the positioning operation is started while the position origin has not been set, sets whether the alarm generates or not.	0: Disable 1: Enable	0
I/O	MS0 operation No. selection	Sets the operation data number corresponding to the MS0 to MS5 input.	Operation data No.0 to 63	0
	MS1 operation No. selection			1
	MS2 operation No. selection			2
	MS3 operation No. selection			3
	MS4 operation No. selection			4
	MS5 operation No. selection			5

memo If positioning operation of the operating speed 0 Hz is performed, the abnormal operation data alarm generates.

■ HOME input

This signal starts the return-to-home operation (p.88).
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.

Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Home operation	Home-seeking mode	Sets the mode for return-to-home operation.	0: 2-sensor mode 1: 3-sensor mode	1
	Operating speed of home-seeking	This is the operating speed for return-to-home operation.	1 to 1,000,000 Hz	1000
	Acceleration/ deceleration of home-seeking	This is 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 of home-seeking	This is the starting speed for return-to-home operation.	1 to 1,000,000 Hz	100
	Position offset of home-seeking	This is 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 (ZSG) output for return-to-home operation.	0: Disable 1: TIM signal enable 2: ZSG signal enable	
	Backward steps in 2-sensor mode home-seeking	Sets the travel amount after pulling out of the LS in 2-sensor mode return-to-home operation.	0 to 32767 step	200

■ FWD input, RVS input

These signals start the continuous operation (p.95).
Operation is performed based on the FWD or RVS input and the operating speed corresponding to the selected operation data No. Continuous operation is performed while turning the FWD input or RVS input ON.
When turning the FWD input ON, the motor rotates in the positive direction, and when turning the RVS input ON, the motor rotates in the negative direction.
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.

■ +JOG input, −JOG input

These signals start the JOG operation (p.100).
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.

Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Operation	JOG travel amount	This is the travel amount for JOG operation.	1 to 8,388,607 step	1
	JOG operating speed	This is the operating speed for JOG operation.	1 to 1,000,000 Hz	1000
	JOG acceleration/ deceleration rate	This is 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	This is 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.101 for stop action.

Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
I/O	STOP input action	Sets how to stop the motor when the STOP input has 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 and the motor will become non-excitation status. When an electromagnetic brake motor is used, the electromagnetic brake continues to hold the position.
When the AWO input is turned OFF, the motor will be excited.

■ FREE input

When the FREE 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 manually. When an electromagnetic brake motor is used, the electromagnetic brake will be released.

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

■ P-PRESET input

This signal is used to set the command position and feedback position to the preset position.
When the P-PRESET input is turned ON, the value in the "preset position" parameter will be overwritten by the command position and feedback position. (This signal will become effective when turning from OFF to ON)
Note that preset will not execute in the following conditions.

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

Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Coordinates	Preset position	Sets the preset position.	−8,388,608 to 8,388,607 step	0

■ ALM-RST input

When an alarm generates, the motor will stop. When the ALM-RST input is turned from OFF to ON, the alarm will be reset. (This signal will become effective when turning from OFF to ON.) 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.268 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.
The following functions will be limited to execute.

- I/O test
- Test operation
- Teaching
- Writing, downloading and initializing parameters

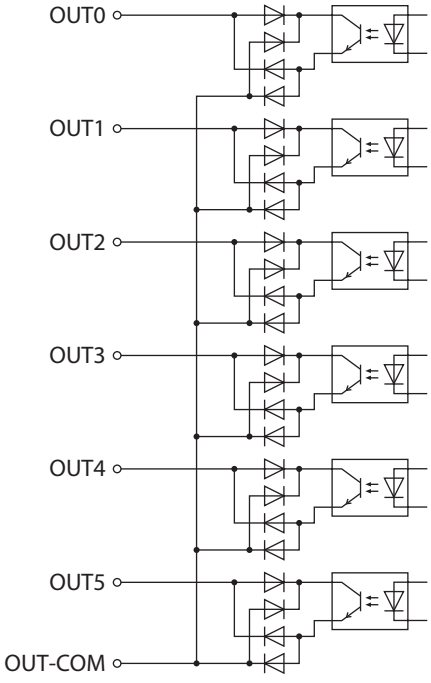
memo When the HMI input is not assigned to the input terminal, this input will always be set to ON. When assigning to both direct I/O and network I/O, the function will be executed when both of them are set to ON.

3-4 Output signals

The output signals of the driver are photocoupler/open-collector output.

- Direct I/O ..... I/O for normally open: "ON: Current-carrying", "OFF: Not current-carrying"
  I/O for normally closed: "ON: Not current-carrying", "OFF: Current-carrying"
- Network I/O ..... "ON: 1", "OFF: 0"

■ Internal output circuit



■ ALM output

See p.267 for alarm.

- **Direct I/O**

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 the motor will stop. The ALM output is normally closed.

- **Network I/O**

When an alarm generates, the ALM output will turn ON. At the same time, the ALM LED of the driver will blink and the motor current will be cut off and the motor will stop. The ALM output is normally open.

- **Related parameters**

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Alarm	Return-to-home incomplete alarm	When the positioning operation is started while the position origin has not been set, sets whether the alarm generates or not.	0: Disable 1: Enable	0
Communication	Communication timeout	Sets the condition in which the communication timeout occurs in RS-485 communication. When setting to zero (0), the driver does not monitor the condition in which the communication timeout occurs.	0 to 10000 ms	0
	Communication error alarm	Sets the condition in which the RS-485 communication error alarm generates. The communication error alarm generates after the RS-485 communication error has occurred by the number of times set here.	1 to 10 times	3
Coordinates	Stepout detection action	Sets how to operate when the deviation between the command position and encoder position reached the detection band for the loss of synchronism.	0: No operation (alarm/warning not present) 1: Warning 2: Alarm	0

■ WNG output

When a warning generates, the WNG output turns ON. See p.272 for warning.

Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Warning	Overheat warning	Sets the temperature at which a main circuit overheat warning generates.	40 to 85 °C (104 to 185 °F)	85
	Overvoltage warning	Sets the voltage at which an overvoltage warning generates. *	120 to 450 V	435
	Undervoltage warning	Sets the voltage at which an undervoltage warning generates. *	120 to 280 V	120
Coordinates	Stepout detection action	Sets how to operate when the deviation between the command position and encoder position reached the detection band for the loss of synchronism.	0: No operation (alarm/warning not present) 1: Warning 2: Alarm	0

* This is the driver internal voltage after smoothing the rectified current (pulsating current) by the capacitor. When converting the input voltage into the internal voltage, convert using the following formula.
Single-phase 100-120 V driver: Internal voltage = 2 × (√2 × Input voltage − 1)
Single-phase 200-240 V driver: Internal voltage = √2 × Input voltage − 1

■ READY output

When the driver becomes ready, the READY output turns ON. Input operating commands to the driver 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, AWO input and STOP input are 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 non-volatile memory read commands are not executed via RS-485 communication.

■ HOME-P output

The HOME-P output turns ON corresponding to the setting of the " HOME-P output function selection" parameter. See p.104 for setting the position origin.

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

When the command position of the driver 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 driver has not been set.

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

Regardless of the command position by the driver, if the position origin for the driver 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.

● **Related parameters**

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
I/O	HOME-P output function selection	Sets the timing to output the HOME-P output.	0: Home output 1: Return-to-home complete output	0

■ MOVE output

The MOVE output turns ON while the motor is operating.

Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
I/O	Minimum ON time for MOVE output	Sets the output time for the MOVE signal. If the motor operates more than the time set in this parameter, the MOVE output is turned ON.	0 to 255 ms	0

■ AREA1 to AREA3 output

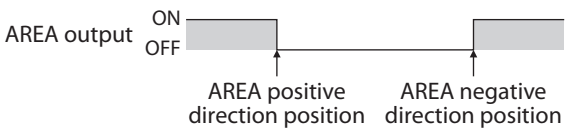
The AREA output turns ON when the motor is inside the area set by the parameters.
It turns ON when the motor is inside the area even when the motor stops.

- **Related parameters**

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
I/O	AREA1 positive direction position	This is the position of AREA1 to AREA3 positive direction.	−8,388,608 to 8,388,607 step	0
	AREA2 positive direction position			
	AREA3 positive direction position			
	AREA1 negative direction position	This is the position of AREA1 to AREA3 negative direction.		
	AREA2 negative direction position			
	AREA3 negative direction position			

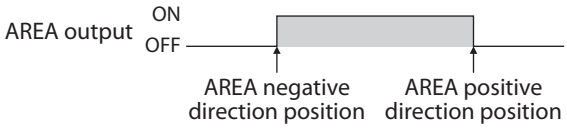
- **When the "AREA positive direction position" parameter < "AREA negative direction position" parameter**

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

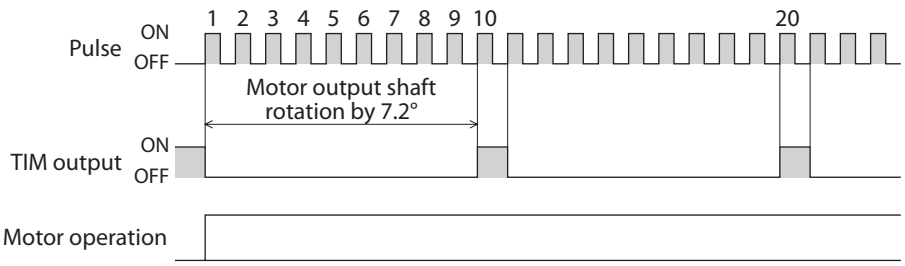
To turn the AREA output ON: Motor position = AREA negative direction position = AREA positive direction position

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

■ TIM output

This signal turns ON when the motor is at its excitation home. The present motor position will reset to the excitation home when turning on the driver power.
The TIM output will turn ON every time the motor moves by 7.2° from its excitation home in synchronization with the internal oscillation pulse.
If the "TIM signal detection with home-seeking" parameter is set to "TIM signal enable," when detecting the mechanical home in the equipment, the tolerance for the motor stop positions in a detection range of the home sensor can be reduced and the further accurate mechanical home can be detected.

Example of the TIM output when the motor resolution is 500 P/R



memo
- If the operating speed is faster than 500 Hz, TIM output will not be output correctly.
- When using the TIM output, set the position (travel amount) or resolution so that the motor output shaft stops at an integral multiple of 7.2°.

■ S-BSY output

The S-BSY output turns ON while internal processing of the driver is being executed.
In the following condition, the driver will be in an internal processing status.
- Issuing maintenance commands via RS-485 communication

■ MPS output

The MPS output turns ON when the driver main power is ON.

■ STEPOUT output

This signal becomes effective when an encoder is connected, and notifies the deviation error.
This signal will be output when the deviation between the feedback position and driver command position reaches the value set in the "stepout detection band" parameter.
If the STEPOUT output is to be used, set the "stepout detection" parameter to "enable".

Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Coordinates	Stepout detection	Sets whether to enable or disable the detection function for the loss of synchronism.	0: Disable 1: Enable	0
	Stepout detection band	Sets the detection condition for the loss of synchronism by the deviation (angle) between the command position and encoder position.	1 to 3600 (1=0.1°)	72
	Stepout detection action	Sets how to operate when the deviation between the command position and encoder position reached the detection band for the loss of synchronism.	0: Not operated 1: Warning 2: Alarm	0

■ O.H. output

If an overheat warning generates, the O.H. output turns ON. The O.H. output will automatically turn OFF upon recovery from the warning condition.

■ ZSG output

ZSG signal is used when an encoder is connected.
The ZSG output signal is output when the ENC-Z input signal is input to the driver from the encoder. Normally the ENC-Z input signal is input every time the motor output shaft turns one revolution.

memo
- The ZSG output signal will not be output correctly unless the ENC-Z input remains ON for at least 1 ms.
- The ZSG output delays behind motor movement by up to 3 ms. The output may be used to verify the stop position of the motor.

■ MBC output

When the electromagnetic brake is released, the MBC output turns ON.

■ 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

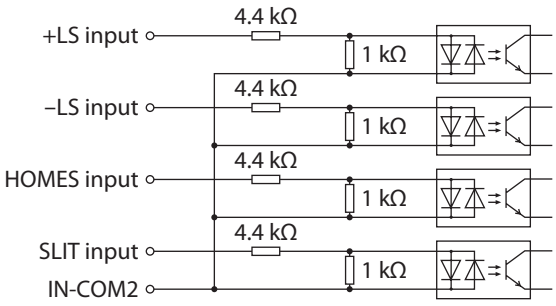
Input signal	Output signal
MS2	MS2_R
MS3	MS3_R
MS4	MS4_R
MS5	MS5_R
FREE	FREE_R
AWO	AWO_R
STOP	STOP_R
M0	M0_R
M1	M1_R

Input signal	Output signal
M2	M2_R
M3	M3_R
M4	M4_R
M5	M5_R
+LS	+LS_R
−LS	−LS_R
HOMES	HOMES_R
SLIT	SLIT_R

memo 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.

3-5 Sensor input

■ Internal input circuit



■ +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 .....When the +LS or −LS input is detected, perform the return-to-home operation according to the setting of the "home-seeking mode" parameter.
- Any other operation .....Detect the hardware overtravel and stop the motor. See p.102 for hardware overtravel.

Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
I/O	Hardware overtravel	Sets whether to enable or disable the hardware overtravel detection using ±LS inputs.	0: Disable 1: Enable	1
	Overtravel action	Sets how to stop the motor when the overtravel alarm has occurred.	0: Immediate stop 1: Deceleration stop	0
	±LS logic level	Sets the logic for ±LS input.	0: Normally open 1: Normally closed	0

■ HOMES input

The HOMES input is the input for the mechanical home sensor when setting the "home-seeking mode" operation parameter to the 3-sensor mode. See p.88 for return-to-home operation.

Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
I/O	HOMES logic level	Sets the logic for HOMES input.	0: Normally open 1: Normally closed	0

■ SLIT input

Connect the SLIT input when using the sensor equipped with a slit.
When detecting the home, use of the SLIT input in addition to the HOMES will increase the accuracy of home detection. See p.88 for return-to-home operation.

Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
I/O	SLIT logic level	Sets the logic for the SLIT input.	0: Normally open 1: Normally closed	0

3-6 General signals (R0 to R15)

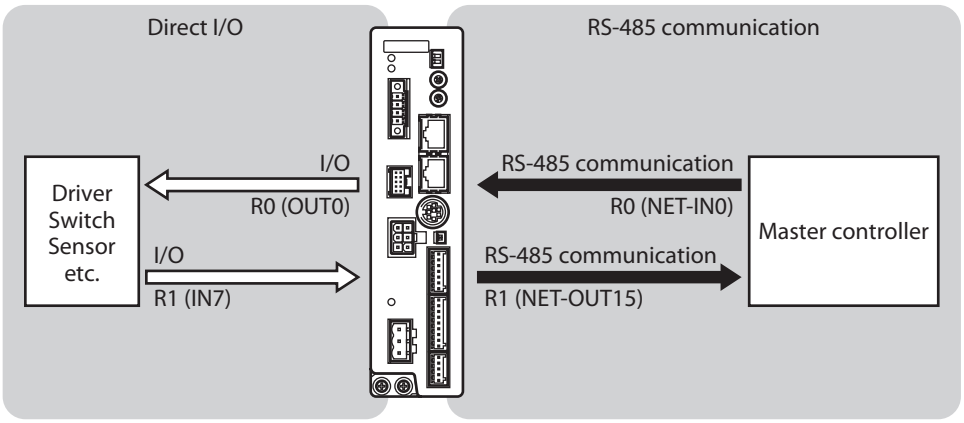
R0 to R15 are general signals that enable control via RS-485 communication.
Using R0 to R15, I/O signals for the external device can be controlled by the master device via the driver. The direct I/O of the driver can be used as an I/O unit.
See the following example for setting of the general signals.

- **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 IN7 input and NET-OUT15.
  When turning the IN7 input ON by the external device, the NET-OUT15 becomes 1. When turning the IN7 input OFF, the NET-OUT15 becomes 0. The logic level of the IN7 input can be set using "IN7 input logic level setting" parameter.



3 Operation type and setting

This part explains the operation functions and the details of parameters.

◆Table of contents

1 Guidance

If you are new to the **RK Ⅱ** Series, read this section to understand the operating methods along with the operation flow.
This chapter explains how to perform positioning operation using the **MEXE02**.

STEP1 Make preparations for operation

↓

STEP2 Setting operation data using the MEXE02

↓

STEP3 Operation of motor

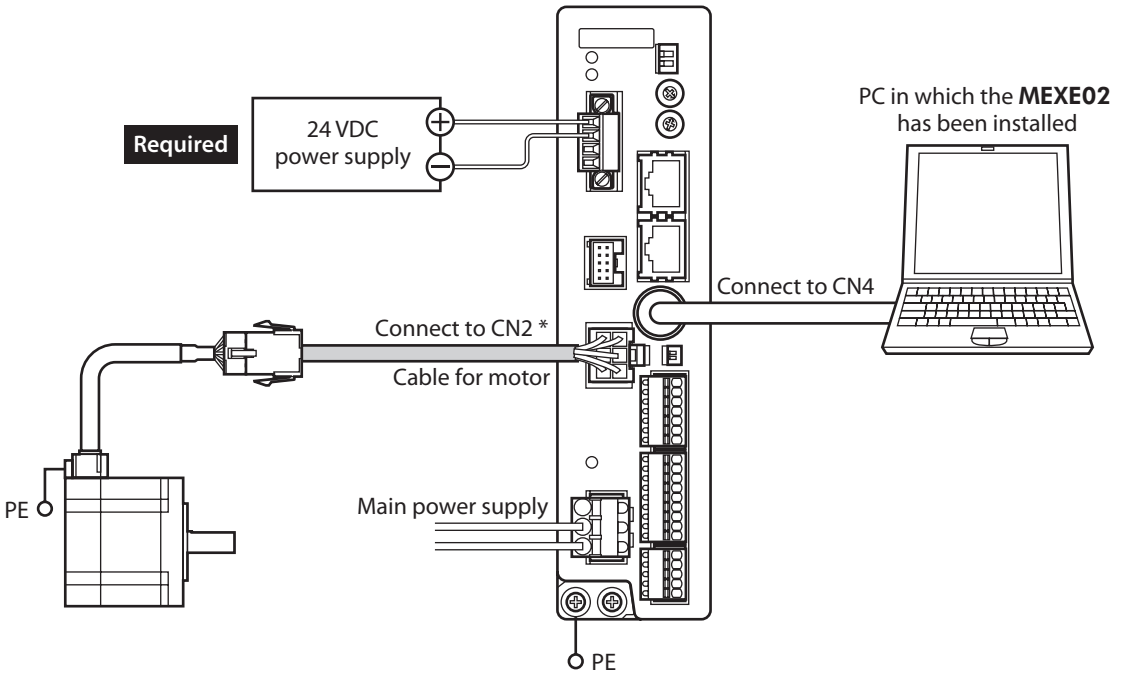
■ Check the factory setting

Setting item	Factory setting
Resolution	500 P/R (0.72 °/step)
Operating current	1000 (based on the rated current being 100%.)
Speed filter	1 ms
Home position	Motor position at power on

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

STEP 1 Make preparations for operation

1. Wire the driver by reference to the figure. Be sure to connect a 24 VDC power supply.

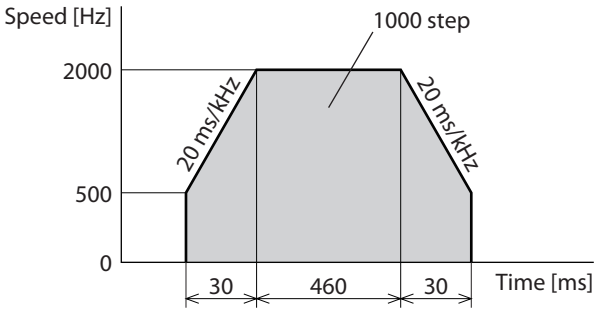


* Cables represented in gray color are supplied with the product or sold separately.

2. Start the **MEXE02** and turn on the power to the driver.
Refer to the "Data setting software **MEXE02** OPERATING MANUAL" for how to start or use the **MEXE02**.

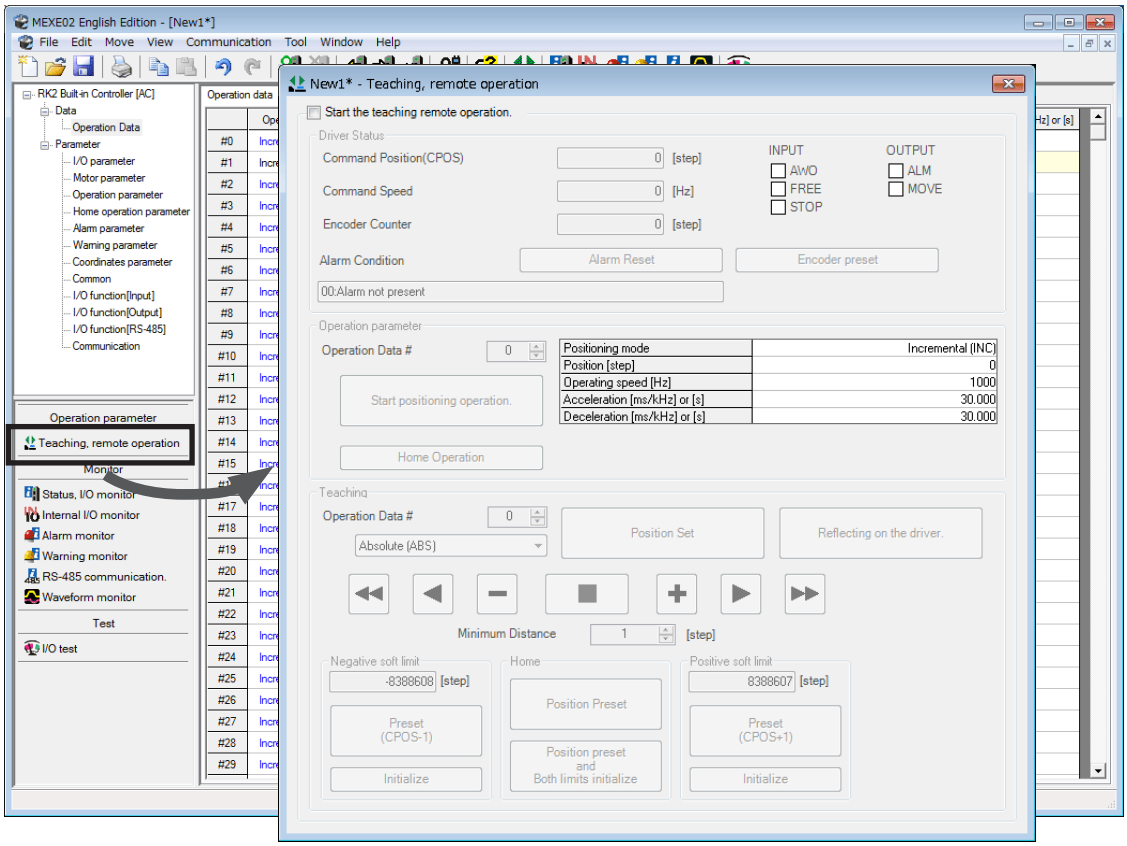
STEP 2 Set the operation data using the MEXE02

1. Using the **MEXE02**, set the operation data of No.1 as follows.

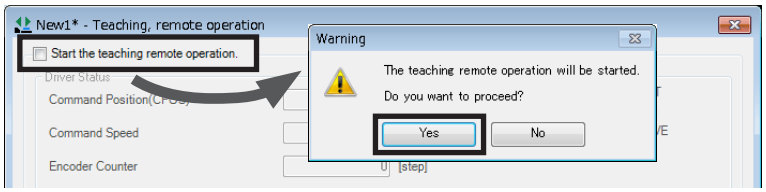


	Operation mode	Position [step]	Operating speed [Hz]	Operation function	Dwell time [s]	Sequential positioning	Acceleration [ms/kHz] or [s]	Deceleration [ms/kHz] or [s]
#0	Incremental (INC)	0	1000	Single-motion	0.000	Disable	30.000	30.000
#1	Incremental (INC)	1000	2000	Single-motion	0.000	Disable	20.000	20.000

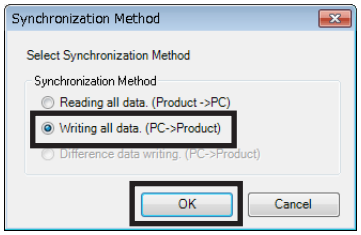
2. Click the [Teaching, remote operation] short-cut button in the left side of the screen.
The teaching/remote operation window appears.



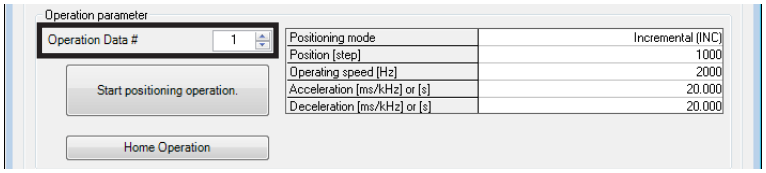
3. Click "Start the teaching remote operation.
   Since the pop-up window (Warning) is displayed, click [Yes].



4. Write the edited data to the driver.
   Click "Writing all data. (PC –> Product)," and click [OK]. The contents of the data No.1 will be written to the driver.

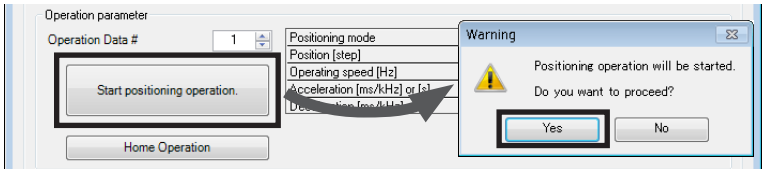


5. Select the operation data No.1.



STEP 3 Operate the motor

1. Click [Start positioning operation].
   Since the pop-up window (Warning) is displayed, click [Yes].
   The motor starts the positioning operation.



2. Check the command position has been 1000 on the **MEXE02**, and the motor output shaft has rotated by 1000 steps.
   If the motor is operated while the resolution remains the initial value, 1000 steps are equivalent to 2 revolutions of the motor output shaft.

3. To end the teaching/remote operation, unselect "Start the teaching remote operation."

The process has been completed.

2 Adjustment and setting

This chapter explains how to adjust/set the motor and driver functions. When a parameter is changed, the timing the new value becomes effective varies depending on the parameter. See p.107 for details.

2-1 Resolution

Set the resolution when using the motor in combination with a mechanism component such as a gear, actuator, or others.
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: 200 to 200,000 P/R

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

Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Coordinates	Electronic gear A	This is the denominator of electric gear.	1 to 65535	1
	Electronic gear B	This is the numerator of electric gear.		

memo
- 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 "electronic gear" parameters 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 (0.39 in.)
Minimum travel amount: 0.01 mm (0.000394 in.)
Gear ratio: 1 (No speed reduction mechanism between the motor and ball screw)

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

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

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

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)]

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

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

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

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

2-2 Operating current

The maximum driver operating current can be changed using the "RUN current" parameter. If the load is small and there is an ample allowance for torque, the motor temperature rise can be suppressed by setting a lower operating current.

Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Motor	RUN current	Sets the motor operating current based on the rated current being 100%.	0 to 1000 (1=0.1%)	1000

Note Excessively low operating current may cause a problem in starting the motor or holding the load in position. Do not lower the operating current more than necessary.

2-3 Standstill current

When the motor stops, the current cutback function will be actuated to lower the motor current to the standstill current. The standstill current is a value in which the set value of the "STOP current" is multiplied by the rated current (100%). The standstill current does not change even when the "RUN current" parameter has been changed.

Related parameters

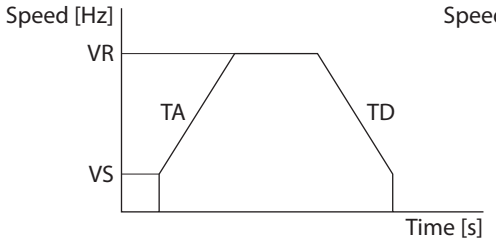
MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Motor	STOP current	Sets the motor standstill current based on the rated current being 100%.	0 to 600 (1=0.1%)	500

2-4 Acceleration/deceleration rate and acceleration/deceleration time

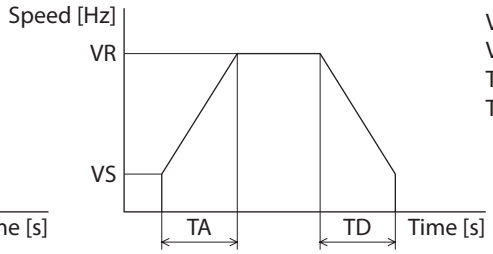
■ Acceleration/deceleration unit

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

• When setting with [ms/kHz]



• When setting with [s]



VS: Starting speed
VR: Operating speed
TA: Acceleration
TD: Deceleration

Related parameter

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Operation	Acceleration/deceleration unit	Sets the acceleration/deceleration rate or acceleration/deceleration time.	0: ms/kHz 1: s	0

■ 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.

memo
- 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.98 for the acceleration/deceleration when performing variable speed operation.

Related parameter

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Operation	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

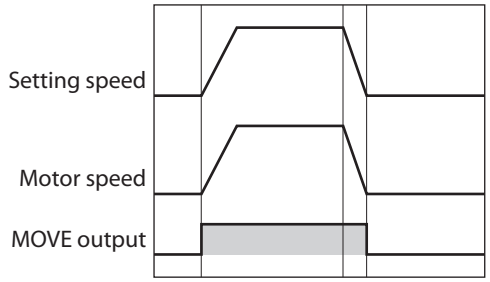
2-5 Speed filter

The motor response can be adjusted by setting the "speed filter" parameter when selecting the "speed filter" with the "filter selection" parameter.
When the speed filter level is raised, vibration can be suppressed during low-speed operation, and starting/stopping of the motor will become smooth. Note, however, that an excessively high filter level will result in lower synchronicity with commands. Set an appropriate value according to the specific load and purpose.

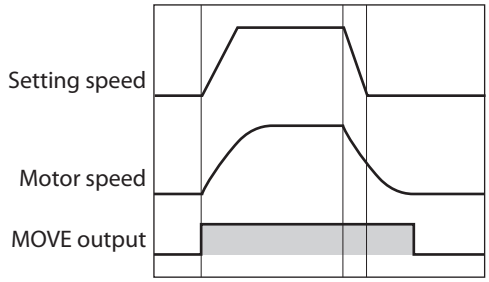
Related parameter

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Motor	Filter selection	Sets the filter function to adjust the motor response.	0: Speed filter 1: Moving average filter	0
	Speed filter	Adjusts the motor response.	0 to 200 ms	1

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



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



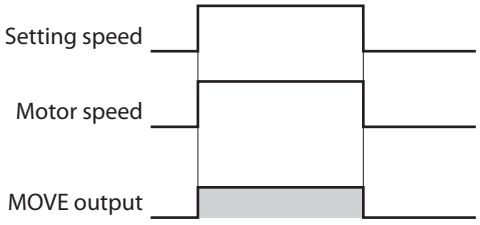
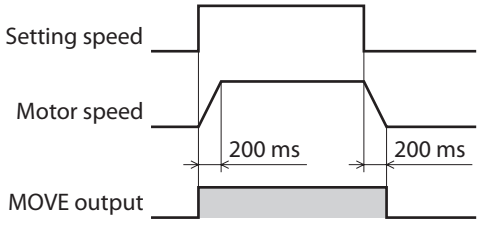
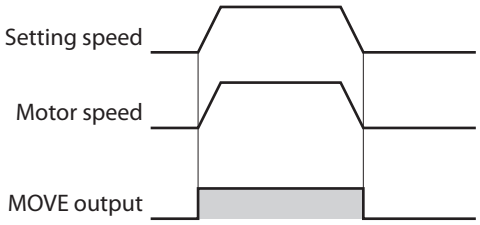
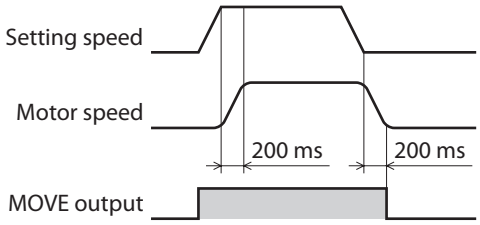
memo When setting the value of the "speed filter" parameter to "0," this function will be invalid.

2-6 Moving average filter

The motor response can be adjusted by setting the "moving average time" parameter when selecting the "moving average filter" with the "filter selection" parameter.
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.
Set a suitable value based on the load or application.

Related parameter

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Motor	Filter selection	Sets the filter function to adjust the motor response.	0: Speed filter 1: Moving average filter	0
	Moving average time	Sets the time constant for the moving average filter.	0 to 200 ms	1

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

2-7 When a motor with an encoder is used

This chapter explains the useful functions when an encoder is connected.

■ Position control

- The driver has an internal oscillating-pulse counter. The command position in the driver counter can be checked using the **OPX-2A**, **MEXE02** or RS-485 communication. The control range of the command position is −2,147,483,648 to 2,147,483,647.
- The command position will be cleared to 0 once the return-to-home operation ends successfully. If a preset is performed using the P-PRESET input, the command position will change to the value set in the "preset position" parameter.
- If an encoder is connected and the "stepout detection" parameter is set to "enable", the command position will be refreshed by the encoder counter value while the motor is not excited.

■ Encoder input

- You can read the 90° phase difference signal that is input from the encoder. The monitored value is of two types: One is the encoder counter value and the other is the feedback position.
- The encoder resolution is 500 P/R. The 90° phase difference signal is output four times while the motor rotates 0.72°. Therefore, the encoder counter value becomes "the command position×4" approximately.
- Executing the "preset encoder counter" changes the encoder counter value to the one set as the "encoder preset value".
- When an encoder is connected, the misstep detection function becomes available. Take note that the encoder input is counted even when the misstep detection function is not used.

memo
- The encoder counter value and feedback position may deviate from the actual motor position. Use them to check the position at which the motor stopped.
- Perform a counter clear or encoder counter preset while the motor is stopped.

■ Misstep detection function

This function becomes effective when an encoder is connected. Specifically, the deviation between the command position and encoder counter is monitored.
The sub-functions specified below become available when the "stepout detection" parameter is set to "enable".

● Deviation error detection

When the deviation reaches the value set in the "stepout detection band" parameter (initial value: 7.2°), a deviation error will be recognized.
If the base step angle of the motor is 0.72°, set the value of the "stepout detection band" parameter to 7.2°.
Deviation error detection will start after the motor has remained excited for 500 ms. This function is disabled during return to mechanical home operation.

Related parameter

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Coordinates	Stepout detection	Sets whether to enable or disable the detection function for the loss of synchronism.	0: Disable 1: Enable	0
	Stepout detection band	Sets the detection condition for the loss of synchronism by the deviation (angle) between the command position and encoder position.	1 to 3600 (1=0.1°)	72
	Encoder resolution	Sets the resolution of the connected encoder.	100 to 10000 P/R	500

memo When the misstep detection function is used, set the encoder resolution to an integral multiple of 50.

● Alarm/warning

You can cause an alarm or warning to be generated upon detection of a deviation error.
- Generate an excessive position deviation alarm: Set the "stepout detection action" parameter to "alarm".
- Generate an excessive position deviation warning: Set the "stepout detection action" parameter to "warning".
- Do not generate an alarm or warning: Set the "stepout detection action" parameter to "no operation".

Related parameter

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Coordinates	Stepout detection action	Sets how to operate when the deviation between the command position and encoder position reached the detection band for the loss of synchronism.	0: No operation 1: Warning 2: Alarm	0

● STEPOUT output

This signal notifies a deviation error. Assign the STEPOUT output to one of the OUT0 to OUT5 outputs.

● Command position update

The command position is corrected by the encoder counter while the motor is not excited. The command position will still be refreshed even when the motor output shaft is turned by an external force while the motor excitation is stopped.

● How to reset the deviation error

Perform one of the following operations to reset the deviation error:
- Stop the motor excitation.
- Perform return to mechanical home.
- Clear the counter.

When the "stepout detection action" parameter is set to "alarm"

When a deviation error is detected, an excessive position deviation alarm will generate. In this case, reset the alarm by following the procedure below:

1. Turn the ALM-RST input ON to reset the alarm.
2. Perform one of the above operations to reset the deviation error.

memo If an excessive position deviation alarm generates, turning the ALM-RST input ON alone will not reset the alarm. First reset the alarm by the ALM-RST input without fail, then reset the deviation error.

● Setting the encoder resolution

Even when the motor resolution and encoder resolution are not same, the deviation error can be detected if the encoder resolution is set. The encoder resolution is used to check the deviation error, and it does not affect the encoder counter value.

Related parameter

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Coordinates	Encoder resolution	Sets the resolution of the connected encoder.	100 to 10000 P/R	500

■ Monitor function

memo The encoder counter value and feedback position may deviate from the actual motor position. Use them to check the position at which the motor stopped.

● Monitor the encoder counter

The 90° phase difference signal that is input from the encoder can be read from the "encoder counter" using the **OPX-2A**, **MEXE02** or RS-485 communication. The read value becomes "the command position × 4" approximately.

● When changing the encoder counter value

Perform encoder counter preset using the **OPX-2A**, **MEXE02** or RS-485 communication.
The encoder counter value becomes the value in the "encoder preset value" parameter.

Related parameter

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Coordinates	Encoder preset value	Sets the preset value of the encoder.	–8,388,608 to 8,388,607 step	0

● Monitor the feedback position

The 90° phase difference signal that is input from the encoder can be read from the "feedback position" via RS-485 communication.
- The read value becomes almost the same value as the command position.
- If the wrap function is set to enable, the feedback position also becomes zero since the actual position returns to zero when the motor rotates one revolution. Therefore, the feedback position is read in a range of "0 to (wrap setting value–1)."
- Although the command position is reset to zero when return-to-home operation has been completed, the feedback position may not be reset to zero depending on the load or operation condition. At this time, if the position preset is performed, the command position can be matched with the feed back position.

● **When changing the feedback position**

When turning the P-PRESET input ON, the command position and feedback position becomes the value of the "preset position" parameter.

Related parameter

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Coordinates	Preset position	Sets the preset position.	–8,388,608 to 8,388,607 step	0
	Electronic gear A	This is the denominator of electric gear.	1 to 65535	1
	Electronic gear B	This is the numerator of electric gear.		
	Encoder resolution	Sets the resolution of the connected encoder.	100 to 10000 P/R	500

■ Z-phase output signal of encoder

When the ENC-Z signal from the encoder is input to the driver, the ZSG signal will be output from the driver. Usually, the ENC-Z signal is input whenever the motor output shaft rotates one revolution. When performing return-to-home operation, use of the HOMES input in addition to the ENC-Z signal will increase the accuracy of home detection.

Related parameter

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Home operation	TIM signal detection with home-seeking	Sets whether or not to concurrently use the TIM (ZSG) output for return-to-home operation.	0: Disable 1: TIM signal enable 2: ZSG signal enable *	0

* This signal is used when an encoder is connected.

3 Operation type and function list

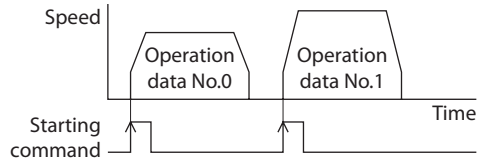
Operation

[Setting by operation data and parameters]

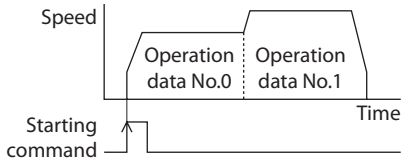
Positioning operation

Operating function

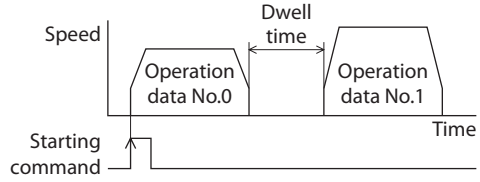
• Single-motion operation



• Linked-motion operation



• Linked-motion operation 2



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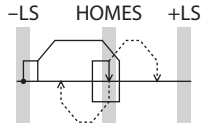
Starting method

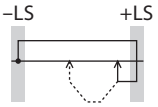
- Data number selecting operation
- Direct positioning operation
- Sequential positioning operation

Return-to-home operation

• 3-sensor mode



• 2-sensor mode

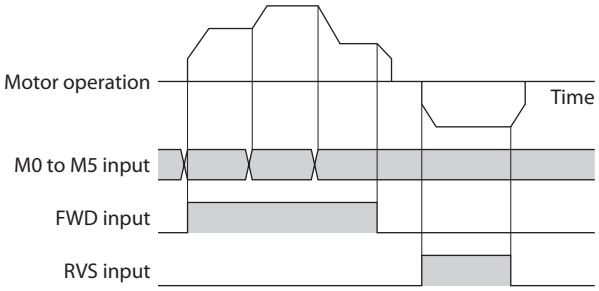


• Position preset

Other operations

• JOG operation

Continuous operation



Function

[Setting by parameters]

- **Stop operation**
  - STOP input action
  - Overtravel action
- **I/O function**
  - Input function
  - Input logic level
  - Output function
- **Protective function**
  - Alarm detection
  - Warning detection
- **Misstep detection function**
  - Stepout detection action
  - Stepout detection band
  - Encoder resolution
- **Return-to-home function**
  - Home position offset
  - External sensor signal detection
- **Coordination setting**
  - Resolution (Electronic gear)
  - Wrap function
  - Motor rotation direction
- **Motor function**
  - Operating current
  - Standstill current
  - Speed filter
  - Moving average filter

4 Positioning operation

Positioning operation is one in which motor operating speed, position (travel amount) 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 operation function can also be set in operation data. The operation function is how to operate consecutive operation data (example: operation data No.0, No.1, No.2).

4-1 Operation data

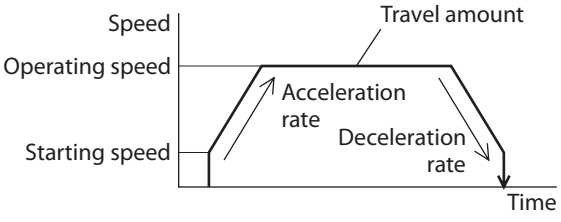
The following data are the operation data for positioning operation.
Up to 64 operation data can be set. (data Nos.0 to 63)

MEXE02 tree view	Name	Description	Setting range	Initial value
Operation data	Position	Sets the position (travel amount) for positioning operation.	−8,388,608 to +8,388,607 step	0
	Operating speed	This is the operating speed for positioning operation and continuous operation.	0 to 1,000,000 Hz	1000
	Acceleration	Sets the acceleration rate (or acceleration time) for positioning operation and continuous operation.	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s)	30000
	Deceleration	Sets the deceleration rate (or deceleration time) for positioning operation and continuous operation.		
	Operation mode	Sets the operation mode for positioning operation.	0: INC (incremental) 1: ABS (absolute)	0
	Operation function	This is used to set how to operate consecutive operation data.	0: Single-motion 1: Linked-motion 2: Linked-motion 2	0
	Dwell time	Sets the waiting time between the first operation data and second operation data in linked-motion operation 2.	0 to 50000 (1=0.001 s)	0
	Sequential positioning	Sets whether to enable or disable sequential positioning operation.	0: Disable 1: Enable	0

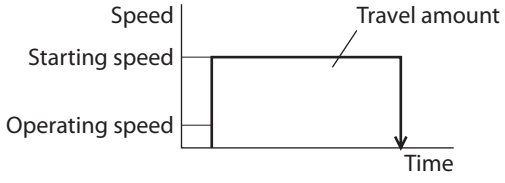
■ Position, operating speed, acceleration, deceleration

The acceleration/deceleration for positioning operation can be set as follows using the "acceleration/deceleration type" parameter:
Separate: The acceleration/deceleration rate set under the applicable operation data No. will be followed. (Each 64 data for acceleration and deceleration)
Common: The setting of the "common acceleration" and "common deceleration" parameter will be followed. (Each 1 data for acceleration and deceleration)

When the starting speed < operating speed



When the starting speed ≥ operating speed



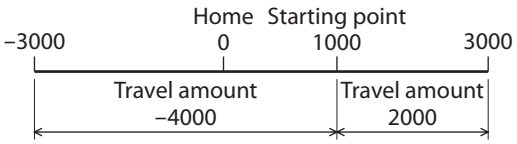
■ Operation mode

The following two operation modes are available:

- **Absolute (ABS) mode**

The position (distance) from home is set [Absolute positioning].

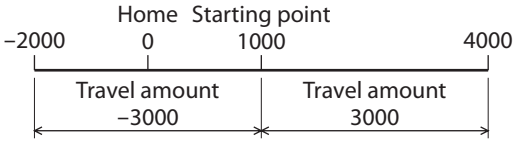
Example: When positioning operation is performed with setting the starting point to 1000 and setting the destination to +3000 and −3000



- **Incremental (INC) 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].

Example: When positioning operation is performed with setting the starting point to 1000 and setting the destination to +3000 and −3000



■ Operation function, dwell time

The following three operation functions are available:

Name	Description	Ref.
Single-motion	A single operation data set is executed.	p.84
Linked-motion	Multiple sets of operation data are linked to perform multi-variable speed operation	p.85
Linked-motion 2	Dwell time (stop waiting time) can be set between operation data. Operation data whose rotation direction is different can also be linked.	p.86

4-2 Starting method of positioning operation

The following three types are available in the starting method.

Name	Description
Data number selecting operation	When the START input is turned ON with selecting the operation data No. by a combination of the M0 to M5 inputs, the positioning operation will perform.
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.
Sequential positioning operation	Positioning operation is performed to the next operation data No. every time a SSTART input signal is input.

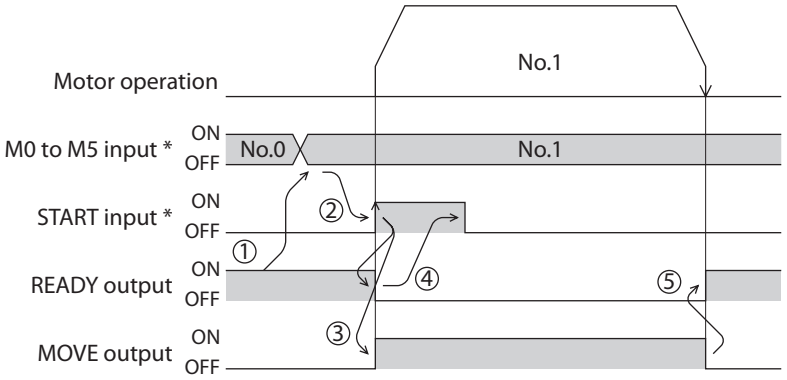
■ Data number selecting operation

Select an operation data based on a combination of ON/OFF status of the M0 to M5 inputs. See p.56 for details.

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**

● **Operating method**

1) Check the READY output is ON.
2) Select the operation data No. by a combination of the M0 to M5 inputs and turn the START input ON.
3) The motor starts positioning operation.
4) Check that the READY output has been turned OFF and turn the START input OFF.
5) When the positioning operation is completed, the READY output will be turned ON.



* In direct I/O, turn the START input ON after setting the M0 to M5 inputs. In network I/O, the operation will be performed even when turning the M0 to M5 inputs and the START input ON simultaneously.

■ Direct positioning operation

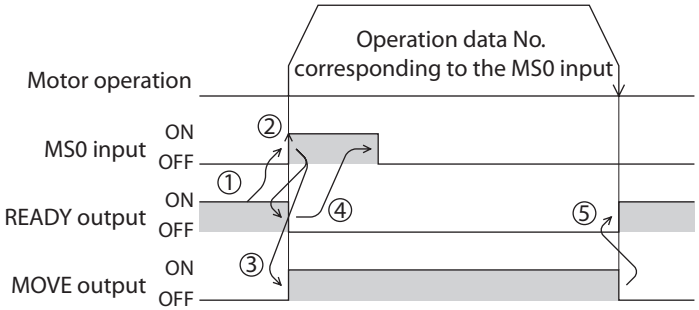
When any of the MS0 to MS5 inputs is turned ON, the positioning operation corresponding to the input data No. will perform. Since the positioning operation is enabled by turning any of the MS0 to MS5 inputs ON, you can save the step of selecting the operation data No.
The operation data assigning to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

● **Related parameters**

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
I/O	MS0 operation No. selection	Sets the operation data number corresponding to the MS0 to MS5 input.	0 to 63	0
	MS1 operation No. selection			1
	MS2 operation No. selection			2
	MS3 operation No. selection			3
	MS4 operation No. selection			4
	MS5 operation No. selection			5

● **Operating method**

1) Check the READY output is ON.
2) Turn the MS0 input ON.
3) The motor starts positioning operation.
4) Check that the READY output has been turned OFF and turn the MS0 input OFF.
5) When the positioning operation is completed, the READY output will be turned ON.



■ Sequential positioning operation

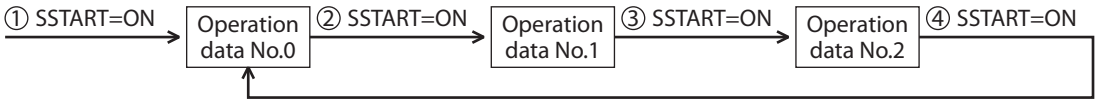
In sequential positioning operation, whenever turning the SSTART input ON, the positioning operation for the following operation data No. will be performed. This function is useful when multiple positioning operations must be performed sequentially, because there is no need to select each data number.
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 positioning operation. And the sequential positioning operation will start again.
If the starting point for the sequential positioning operation is changed using the M0 to M5 inputs or the MS0 to MS5 inputs, multiple sequential positioning operations can be set. It is convenient for setting a different operating pattern for each component or each process of works.

● When the operating pattern is one type

1) The positioning operation for the operation data No.0 is performed by turning the SSTART input ON.
2) After the operation 1) is completed, when turning the SSTART input ON again, the positioning operation for the operation data No.1 will be performed.
3) After the operation 2) is completed, when turning the SSTART input ON again, the positioning operation for the operation data No.2 will be performed.
4) After the operation 3) is completed, when turning the SSTART input ON again, the positioning operation will be performed by returning to the operation data No.0 because the sequential positioning for the operation data No.3 has been set to "disable."

• Setting example

Operation data	Sequential positioning
No.0	Enable
No.1	
No.2	
No.3	Disable

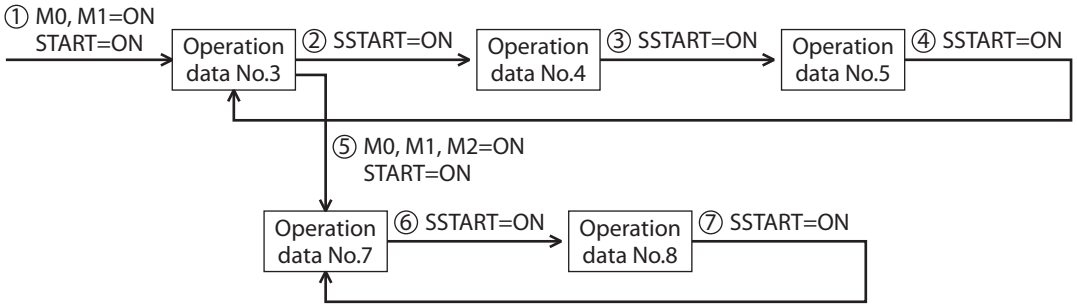


● When the operating patterns are multiple

1) After selecting the operation data No.3 that is the starting point for the sequential positioning operation, the positioning operation will be performed by turning the START input ON.
2) After the operation 1) is completed, when turning the SSTART input ON again, the positioning operation for the operation data No.4 will be performed.
3) After the operation 2) is completed, when turning the SSTART input ON again, the positioning operation for the operation data No.5 will be performed.
4) After the operation 3) is completed, when turning the SSTART input ON again, the positioning operation will be performed by returning to the operation data No.3 because the sequential positioning for the operation data No.6 has been set to "disable."
5) After the operation 4) is completed, the positioning operation is performed by selecting the operation No.7 and turning the START input ON.
The operation data No.7 becomes a starting point for a new sequential positioning operation.
6) After the operation 5) is completed, when turning the SSTART input ON again, the positioning operation for the operation data No.8 will be performed.
7) When turning the SSTART input ON again after the operation 6) is completed, the positioning operation will be performed by returning to the operation data No.7 because the sequential positioning for the operation data No.9 has been set to "disable."

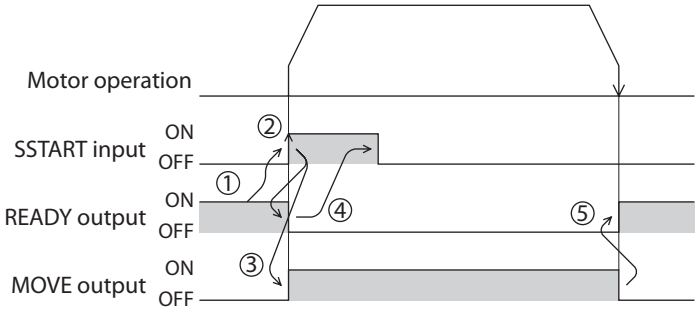
• Setting example

Operation data	Sequential positioning
No.3	Enable
No.4	
No.5	
No.6	Disable
No.7	Enable
No.8	
No.9	Disable



● Operating method

1) Check the READY output is ON.
2) Turn the SSTART input ON.
3) The motor starts positioning operation.
4) Check that the READY output has been turned OFF and turn the SSTART input OFF.
5) When the positioning operation is completed, the READY output will be turned ON.



● Key points about sequential positioning operation

When performing any of the following operations while sequential positioning operation is performed, the starting point for sequential positioning will be changed to the operation data No.0. And the current operation data No. is set to "−1".

- When the 24 VDC power supply is turned ON
- 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 to turn the motor excitation OFF, such as the FREE input or AWO input, was input
- When the P-PRESET is executed
- When a configuration is executed

memo Set "enable" the "sequential positioning" even when sequential positioning is performed by the operation data being set to "Linked-motion" or "Linked-motion 2" in the "operation function."

4-3 Operation function

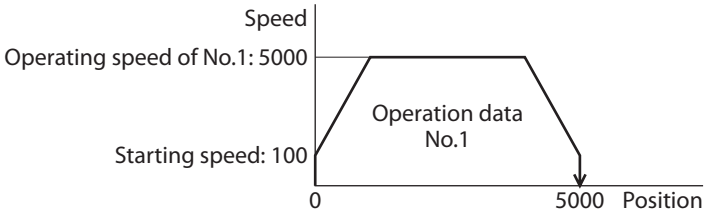
■ Single-motion

The positioning operation is performed only once using a single operation data set.

● Example of single-motion operation

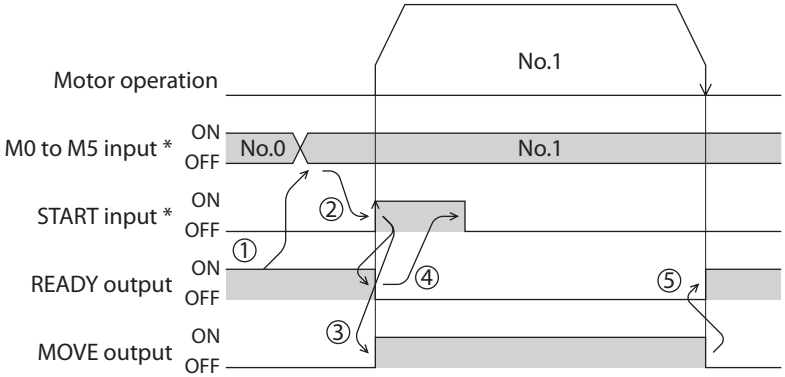
	Operation mode	Position [step]	Operating speed [Hz]	Operation function	Dwell time [s]	Sequential positioning	Acceleration [ms/kHz] or [s]	Deceleration [ms/kHz] or [s]
#0	Incremental (INC)	0	1000	Single-motion	0.000	Disable	30.000	30.000
#1	Incremental (INC)	5000	5000	Single-motion	0.000	Disable	30.000	30.000

Operation example



Operating method

1) Check the READY output is ON.
2) Select the operation data No.1 by turning the M0 input ON, and turn the START input ON.
3) The motor starts positioning operation of the operation data No.1.
4) Check that the READY output has been turned OFF and turn the START input OFF.
5) When the positioning operation is completed, the READY output will be turned ON.



* In direct I/O, turn the START input ON after setting the M0 to M5 inputs. In network I/O, the operation will be performed even when turning the M0 to M5 inputs and the START input ON simultaneously.

■ Linked-motion operation

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

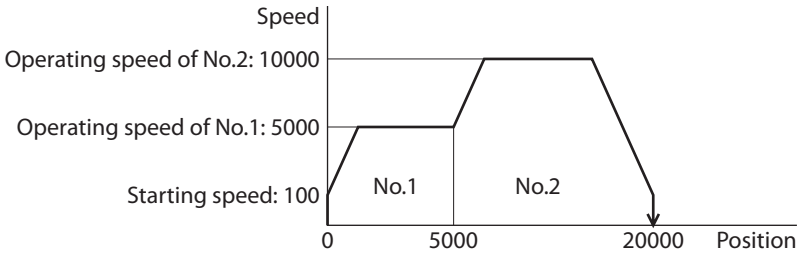
memo

- Multiple operation data of different directions cannot be linked. An abnormal operation data 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 operation2, 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 abnormal operation data alarm will generate upon start of operation.
- No.0 will not be linked even when "linked-motion" 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.

● Example of linked-motion operation

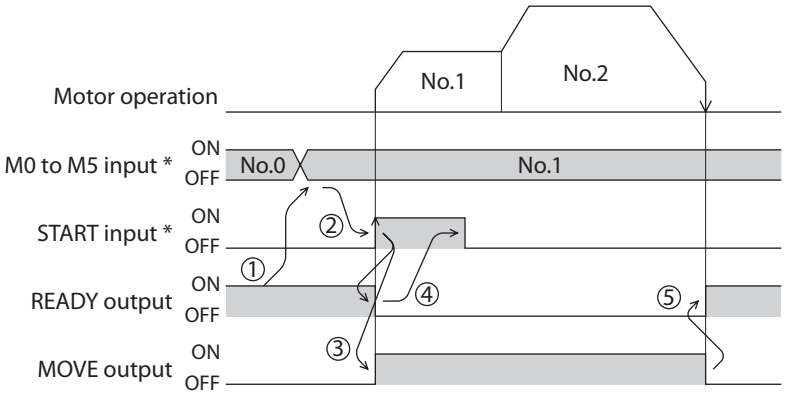
	Operation mode	Position [step]	Operating speed [Hz]	Operation function	Dwell time [s]	Sequential positioning	Acceleration [ms/kHz] or [s]	Deceleration [ms/kHz] or [s]
#0	Incremental (INC)	0	1000	Single-motion	0.000	Disable	30.000	30.000
#1	Incremental (INC)	5000	5000	Linked-motion	0.000	Disable	30.000	30.000
#2	Incremental (INC)	20000	10000	Single-motion	0.000	Disable	30.000	30.000

Operation example



Operating method

1) Check the READY output is ON.
2) Select the operation data No.1 by turning the M0 input ON and turn the START input ON.
3) The motor starts the positioning operation in which the operation data No.1 and No.2 are linked.
4) Check that the READY output has been turned OFF and turn the START input OFF.
5) When the positioning operation is completed, the READY output will be turned ON.



* In direct I/O, turn the START input ON after setting the M0 to M5 inputs. In network I/O, the operation will be performed even when turning the M0 to M5 inputs and the START input ON simultaneously.

■ Linked-motion operation2

By setting the "operation function" of operation data to "Linked-motion 2," an operation data whose rotation 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-motion" is set, the motor will stop after the positioning with respect to the "single" operation data is completed.

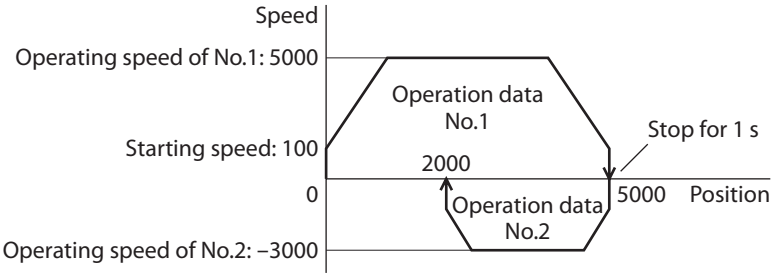
memo

- Up to four sets of operation data can be linked. When combining the linked-motion operation and the linked-motion operation2, 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 abnormal operation data alarm will generate upon start of operation.
- No.0 will not be linked even when "linked-motion 2" is set for data No.63, because the operation pertaining to No.63 will be processed independently.

● Example of linked-motion operation2

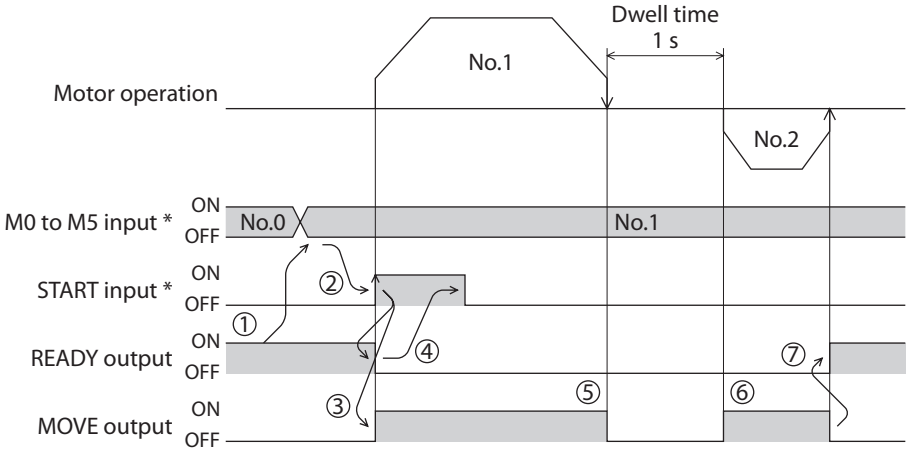
	Operation mode	Position [step]	Operating speed [Hz]	Operation function	Dwell time [s]	Sequential positioning	Acceleration [ms/kHz] or [s]	Deceleration [ms/kHz] or [s]
#0	Incremental (INC)	0	1000	Single-motion	0.000	Disable	30.000	30.000
#1	Incremental (INC)	5000	5000	Linked-motion 2	1.000	Disable	30.000	30.000
#2	Incremental (INC)	-3000	3000	Single-motion	0.000	Disable	30.000	30.000

Operation example



Operating method

1) Check the READY output is ON.
2) Select the operation data No.1 by turning the M0 input ON and turn the START input ON.
3) The motor starts the positioning operation for the operation data No.1.
4) Check that the READY output has been turned OFF and turn the START input OFF.
5) When the positioning operation 3) is completed, the MOVE output will be turned OFF.
6) When the dwell time has passed, the positioning operation for the operation data No.2 will automatically start. At the same time, the MOVE output will be turned ON.
7) When the positioning operation for the operation data No.2 is completed, the READY output will be turned ON.

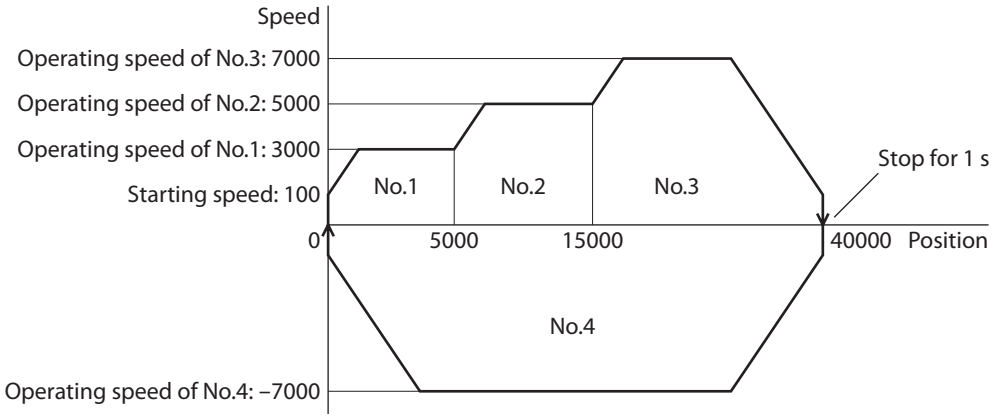


* In direct I/O, turn the START input ON after setting the M0 to M5 inputs. In network I/O, the operation will be performed even when turning the M0 to M5 inputs and the START input ON simultaneously.

- **Example of linked-motion operation2;**
  When combining the linked-motion operation and the linked-motion operation2

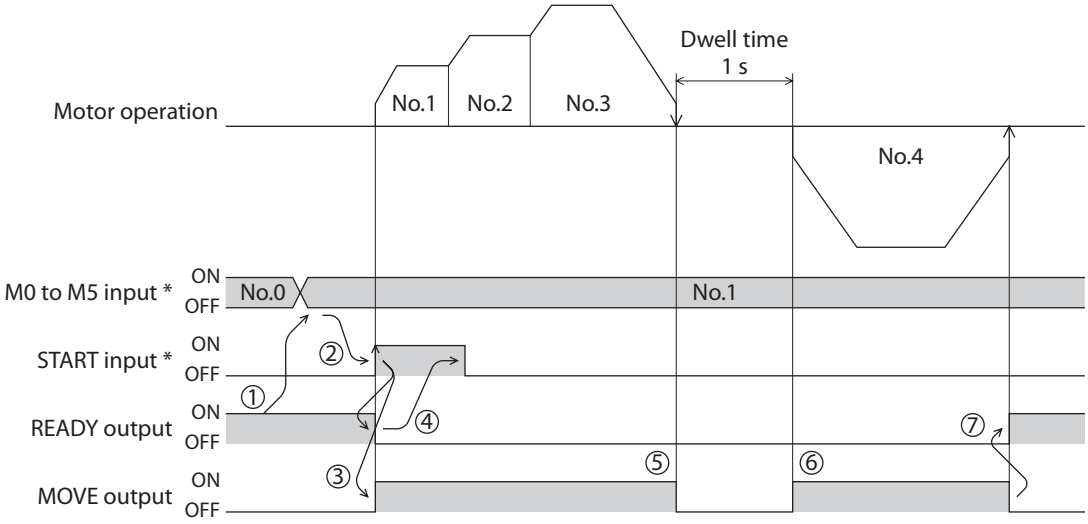
	Operation mode	Position [step]	Operating speed [Hz]	Operation function	Dwell time [s]	Sequential positioning	Acceleration [ms/kHz] or [s]	Deceleration [ms/kHz] or [s]
#0	Incremental (INC)	0	1000	Single-motion	0.000	Disable	30.000	30.000
#1	Incremental (INC)	5000	3000	Linked-motion	0.000	Disable	30.000	30.000
#2	Incremental (INC)	10000	5000	Linked-motion	0.000	Disable	30.000	30.000
#3	Incremental (INC)	25000	7000	Linked-motion 2	1.000	Disable	30.000	30.000
#4	Absolute (ABS)	0	7000	Single-motion	0.000	Disable	30.000	30.000

Operation example



Operating method

1) Check the READY output is ON.
2) Select the operation data No.1 by turning the M0 input ON and turn the START input ON.
3) The motor starts the positioning operation in which the operation data from No.1 to No.3 are linked.
4) Check that the READY output has been turned OFF and turn the START input OFF.
5) When the positioning operation 3) is completed, the MOVE output will be turned OFF.
6) When the dwell time has passed, the positioning operation for the operation data No.4 will automatically start. At the same time, the MOVE output will be turned ON.
7) When the positioning operation for the operation data No.4 is completed, the READY output will be turned ON.



* In direct I/O, turn the START input ON after setting the M0 to M5 inputs. In network I/O, the operation will be performed even when turning the M0 to M5 inputs and the START input ON simultaneously.

5 Return-to-home operation

5-1 About description of return-to-home operation

Return-to-home is an operation in which the reference point of positioning (mechanical home position) is detected automatically. Return-to-home operation is performed to return to the home position from the current position when the power supply is turned on or the positioning operation is completed.
Return-to-home operation can be performed in the following three modes:

Item	Description	Feature
3-sensor mode	The motor operates at the "operating speed of home-seeking." When the ON edge of the HOME sensor is detected, the motor will stop. The motor rotates in the reverse direction after stopping, and it will stop again when the ON edge of the HOME sensor is detected, then the position at which the motor stopped will become the home.	• 3 external sensors are needed * • Operating speed is high (Operating speed of return-to-home)
2-sensor mode	The motor operates at the "starting speed of home-seeking." When the limit sensor is detected, the motor will rotate in the reverse direction and pull out of the limit sensor. After pulling out of the sensor, the motor rotates to stop according to the set value in the "backward steps in 2-sensor mode home-seeking" parameter, then the position at which the motor stopped will become the home.	• 2 external sensors are needed • Operating speed is low (Starting speed of return-to-home)
Position preset	When executing the P-PRESET input at the position that the motor stops, the command position will be the value of the "preset position" parameter. The home position can be set to any position.	• No external sensor is needed • The home position can be set to any position.

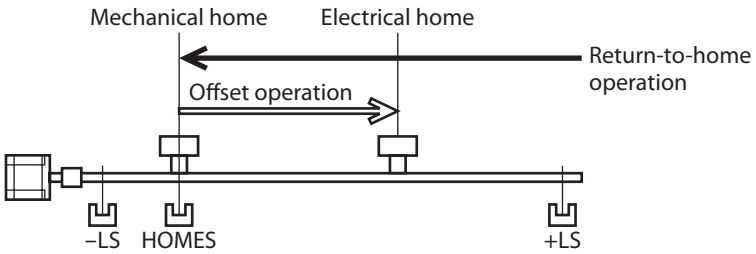
* In the case of a rotating mechanism, even when using one external sensor, the home position can be detected. Set to the 3-sensor mode, and connect the HOME sensor only.

■ Additional function

Item	2-sensor mode 3-sensor mode	Position preset	Related parameter
Home offset	Possible	Not possible	• Position offset of home-seeking
External sensor (signal) detection	Possible	Not possible	• SLIT detection with home-seeking • TIM signal detection with home-seeking
Command position after returning to home	The position becomes "0"	Any position	• Preset position

● Home offset

This is a function to perform positioning operation of the offset amount set by the parameter after return-to-home operation and to set the stop position to the home position. The position set by the home offset is called "electrical home" in distinction from the usual home position.
If the amount of offset from mechanical home is "0," the mechanical home and electrical home will become the same.



- **Detecting the external sensor (signal)**

  When detecting the home, use of the SLIT input and/or TIM (ZSG) signal will increase the accuracy of home detection.

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

- **Command position after returning to home**

  When executing the P-PRESET input at the position that the motor stops, the command position will be the value of the "preset position" parameter.

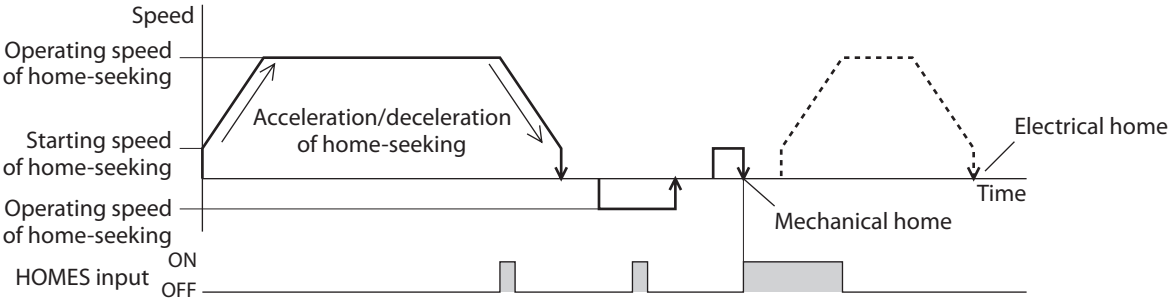
■ Parameters related to return-to-home operation

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Home operation	Home-seeking mode	Sets the mode for return-to-home operation.	0: 2-sensor mode 1: 3-sensor mode	1
	Operating speed of home-seeking	This is the operating speed for return-to-home operation.	1 to 1,000,000 Hz	1000
	Acceleration/ deceleration of home-seeking	This is 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 of home-seeking	This is the starting speed for return-to-home operation.	1 to 1,000,000 Hz	100
	Position offset of home-seeking	This is 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
	Backward steps in 2-sensor mode home-seeking	Sets the travel amount after pulling out of the LS in 2-sensor mode return-to-home operation.	0 to 32767 step	200
	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 (ZSG) output for return-to-home operation.	0: Disable 1: TIM signal enable 2: ZSG signal enable *	

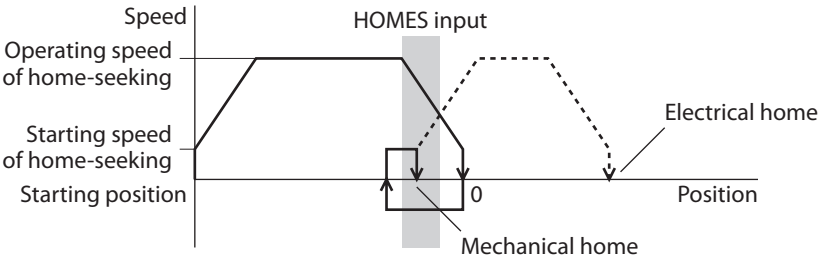
* This signal is used when an encoder is connected.

■ Operation example (when using 3-sensor mode)

● **Operating sequence in seeing a time axis**

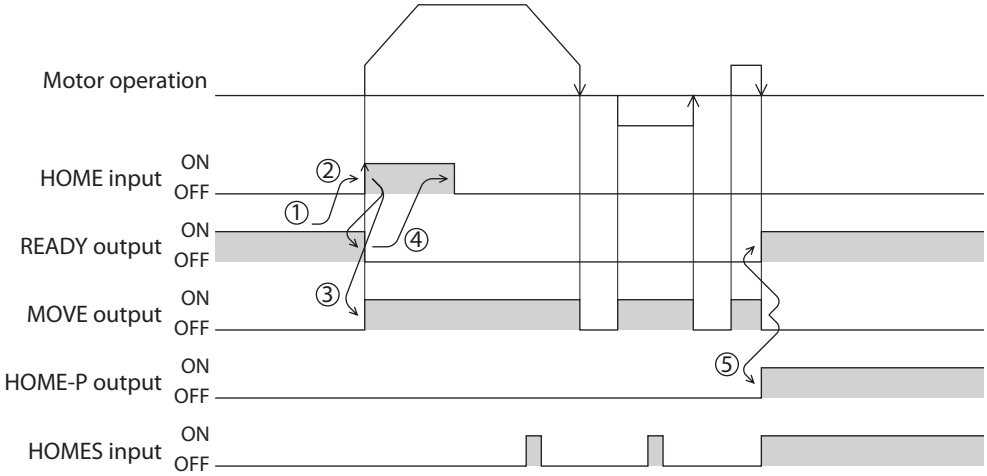


● **Operating sequence in seeing a travel amount**



■ Operating method

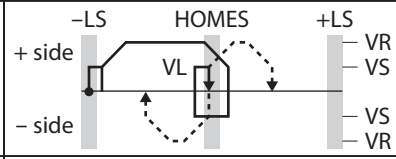
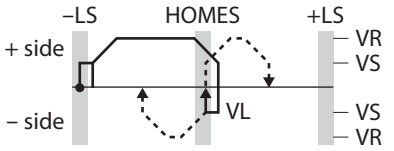
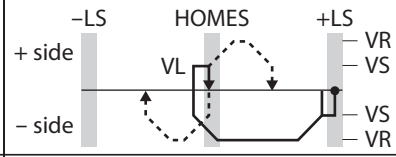
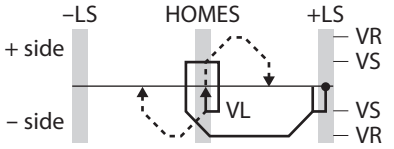
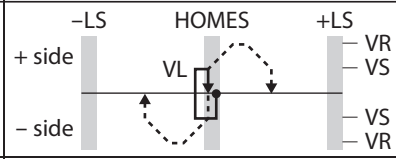
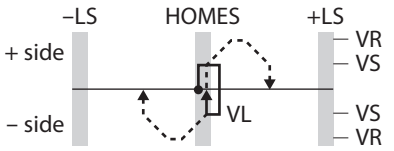
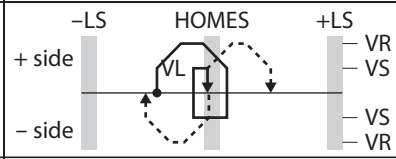
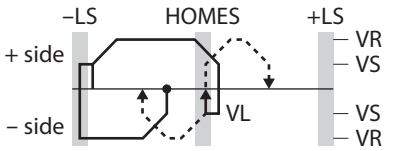
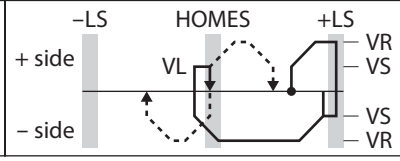
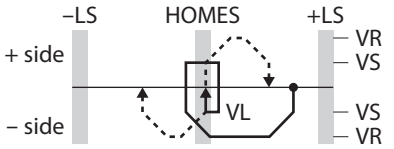
1) Check the READY output is ON.
2) Turn the HOME input ON.
3) Return-to-home operation will be started.
4) Check that the READY output has been turned OFF and turn the HOME input OFF.
5) When return-to-home operation is completed, the HOME-P output will be turned ON.



5-2 Operation sequence

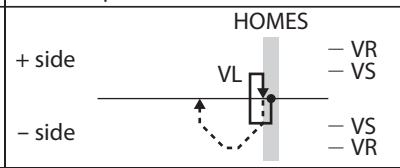
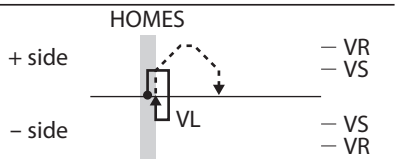
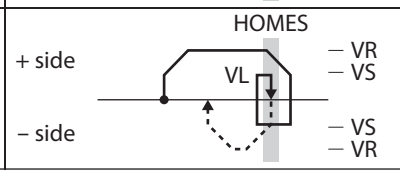
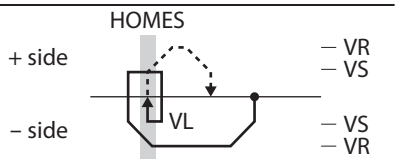
■ 3-sensor mode

- Explanation of labels
  VS: Starting speed of home-seeking
  VR: Operating speed of home-seeking
  VL: Last speed of return-to-home (When VS < 500 Hz: VS, When VS ≥ 500 Hz: 500 Hz)
  - - - 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		

● When using the HOME sensor only

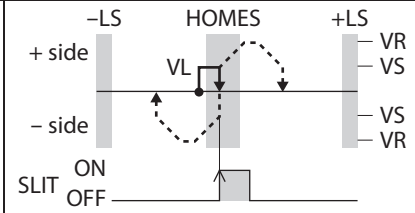
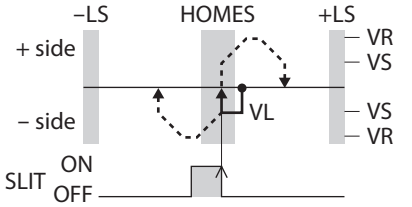
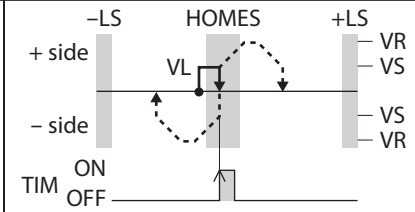
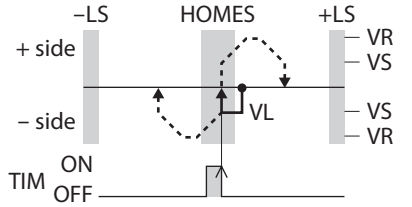
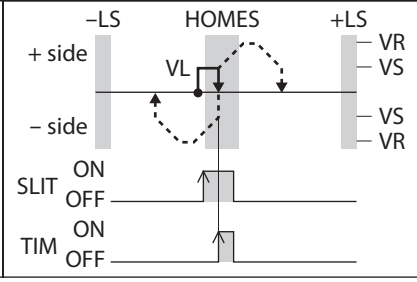
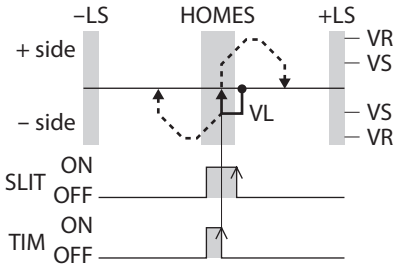
If the limit sensor is not used, such as a rotating mechanism or others, the operation sequence is as follows.

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
HOMES		
Other than HOMES		

Note After the HOME sensor was detected, a load (moving part) may decelerate to a stop beyond the HOME sensor depending on the setting value of the "Acceleration/deceleration of home-seeking" parameter. Since the load (moving part) may contact with the mechanical end if the distance between the mechanical end and the HOME sensor is close, take an enough distance between them.

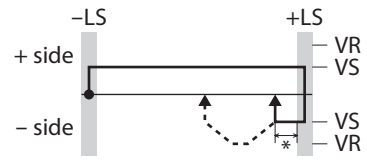
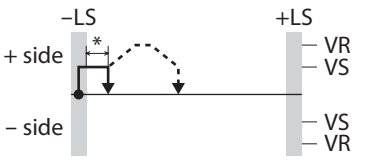
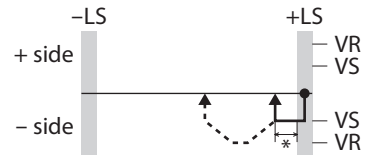
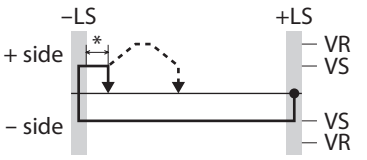
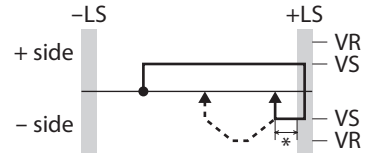
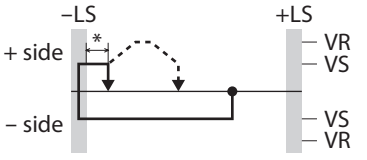
● **When concurrently using the external sensor (signal)**

After the OFF edge of the HOME sensor is detected, the operation will continue until the external sensor (signal) will be detected. If the external sensor (signal) is detected while the HOME sensor is ON, the return-to-home operation will complete.
When selecting "ZSG signal enable" in the "TIM signal detection with home-seeking" parameter, the TIM signal in the figure becomes the ZSG signal.

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		

■ 2-sensor mode

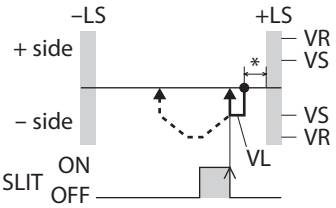
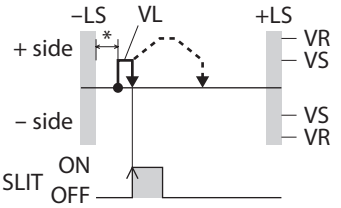
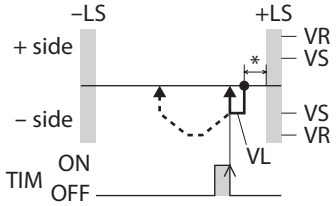
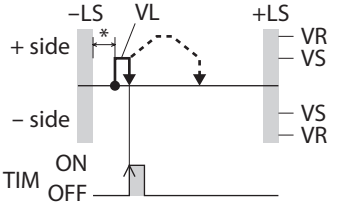
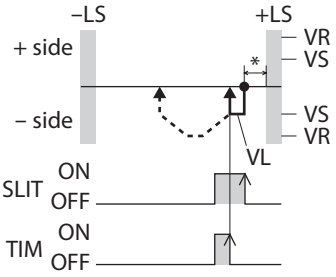
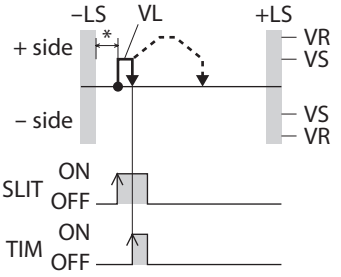
- Explanation of labels
  VS: Starting speed of home-seeking
  VR: Operating speed of home-seeking
  VL: Last speed of return-to-home (When VS < 500 Hz: VS, When VS ≥ 500 Hz: 500 Hz)
  - - - Broken line indicates a home offset move.

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		

* After pulling out of the limit sensor, the motor rotates according to the set value in the "backward steps in 2-sensor mode home-seeking" parameter.

- **When concurrently using the external sensor (signal)**

  When the limit sensor is detected, the motor will rotate in the reverse direction and pull out of the limit sensor. After pulling out of the limit sensor, the motor rotates to stop according to the set value in the "backward steps in 2-sensor mode home-seeking" parameter. Then, the motor operation will continue until the external sensor (signal) will be detected. When the external sensor (signal) is detected, return-to-home operation will complete.
  When selecting "ZSG signal enable" in the "TIM signal detection with home-seeking" parameter, the TIM signal in the figure becomes the ZSG signal.

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		

* After pulling out of the limit sensor, the motor rotates according to the set value in the "backward steps in 2-sensor mode home-seeking" parameter.

5-3 Position preset

When the P-PRESET input is turned ON, the command position is set as the value of the "preset position" parameter. However, the preset will not execute in the following conditions.

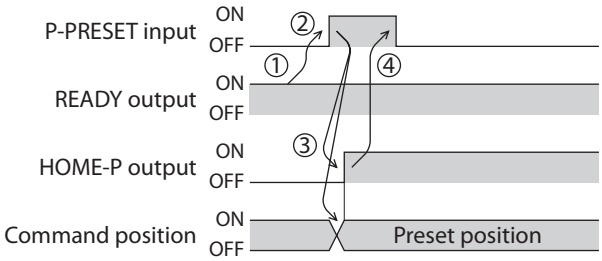
- When the motor is operating
- When an alarm is present

● Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Coordinates	Preset position	Sets the preset position.	−8,388,608 to 8,388,607 step	0

● Operating method

1) Check the READY output is ON.
2) Turn the P-PRESET input ON
3) When the driver internal processing is completed, the HOME-P output will be turned ON.
4) Check the HOME-P output has been turned ON, and then turn the P-PRESET input OFF.



6 Continuous operation

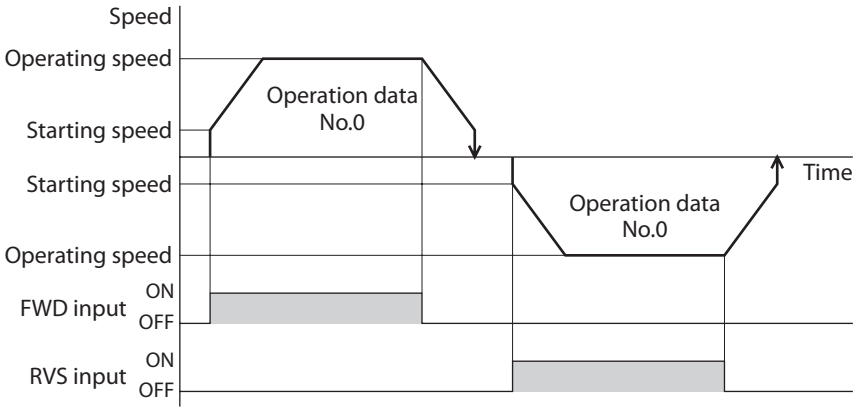
The motor operates continuously while the FWD or RVS input is ON.
Operation is performed based on the FWD or RVS input and the operating speed corresponding to the selected operation data No.
When the operation data No. is changed during continuous operation, the speed will change to the speed specified 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.

6-1 Operation data

Operation data for continuous operation are as follows.

MEXE02 tree view	Name	Description	Setting range	Initial value
Operation data	Operating speed	This is the operating speed for continuous operation.	0 to 1,000,000 Hz	1000
	Acceleration	Sets the acceleration rate (or acceleration time) for continuous operation. *	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s)	30000
	Deceleration	Sets the deceleration rate (or deceleration time) for continuous operation. *		

* The acceleration/deceleration for 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. (Each 64 data for acceleration and deceleration)
Common: The setting of the "common acceleration" and "common deceleration" parameter will be followed. (Each 1 data for acceleration and deceleration)



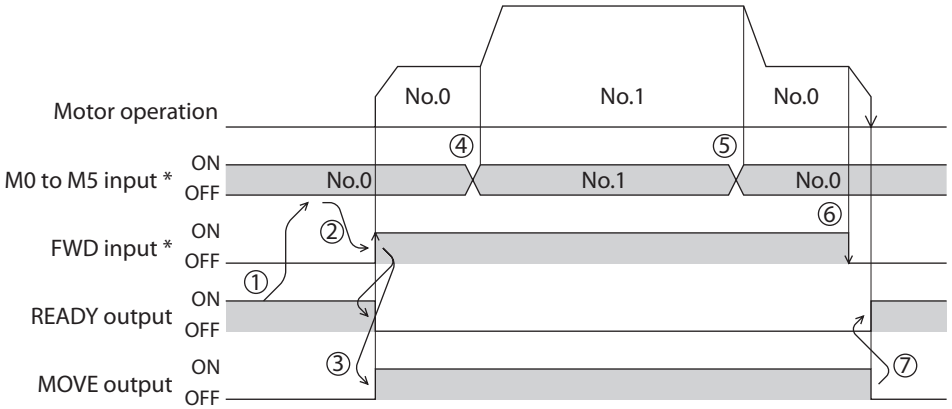
6-2 Starting method of continuous operation

When selecting the operation data No. and turning the FWD input or RVS input ON, continuous operation will be started.
Select an operation data based on a combination of ON/OFF status of the M0 to M5 inputs. See p.56 for details.

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**

- **Operating method**

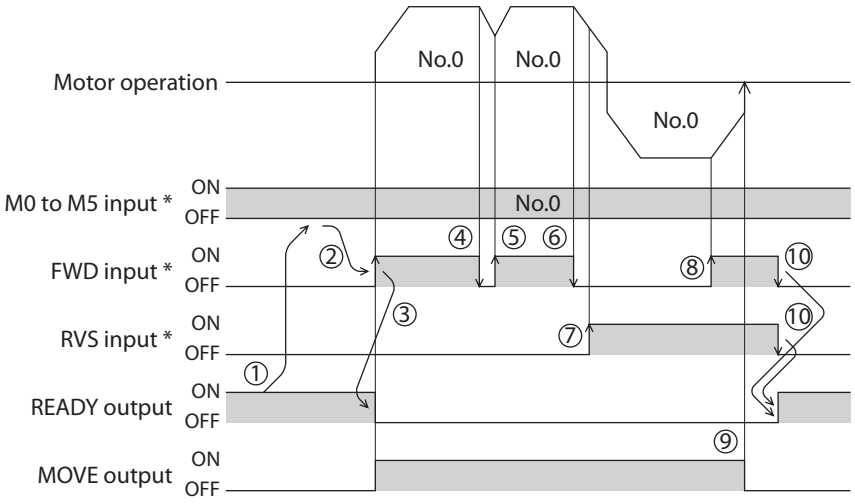
1) Check the READY output is ON.
2) Select the operation data No. by a combination of the M0 to M5 inputs and turn the FWD input ON.
3) The motor starts continuous operation. The READY output will be turned OFF.
4) Select the operation data No.1 by turning the M0 input ON. The motor accelerates to the operating speed of the operation data No.1.
5) Select the operation data No.0 by turning the M0 input OFF. The motor decelerates to the operating speed of the operation data No.0.
6) Turn the FWD input OFF.
7) The motor will decelerate to a stop and the READY output will be turned ON.



* In direct I/O, turn the FWD input or RVS input ON after setting the M0 to M5 inputs. In network I/O, the operation will be performed even when turning the M0 to M5 inputs and the FWD (RVS) input ON simultaneously.

- **Operating method; When combining the FWD input and RVS input**

1) Check the READY output is ON.
2) Select the operation data No. by a combination of the M0 to M5 inputs and turn the FWD input ON.
3) The motor starts continuous operation. The READY output will be turned OFF.
4) Turn the FWD input OFF. The motor will decelerate.
5) Turn the FWD input ON while the motor is decelerating. The motor accelerates again.
6) Turn the FWD input OFF. The motor will decelerate.
7) Turn the RVS input ON while the motor is decelerating. The motor will stop once, and start rotating in the reverse direction.
8) When turning the FWD input ON while the RVS input is ON, the motor will decelerate.
9) The motor will decelerate to a stop and the MOVE output will be turned OFF.
10) When turning both the FWD input and RVS input OFF, the READY output will be turned ON.



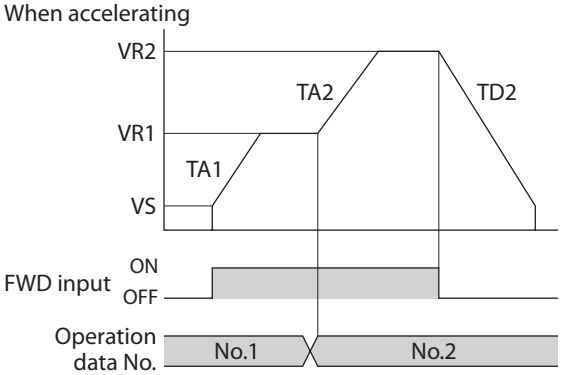
* In direct I/O, turn the FWD input or RVS input ON after setting the M0 to M5 inputs. In network I/O, the operation will be performed even when turning the M0 to M5 inputs and the FWD (RVS) input ON simultaneously.

6-3 Variable speed operation

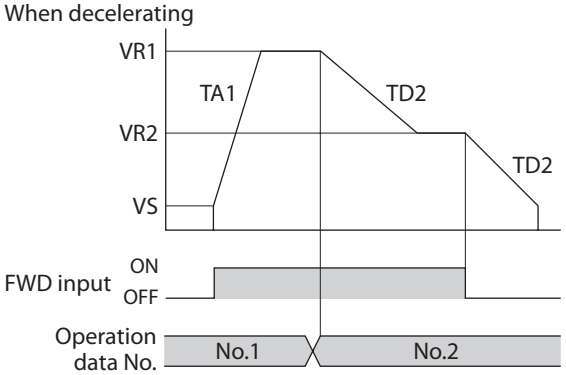
■ When acceleration/deceleration is "separate"

● Acceleration/deceleration unit: ms/kHz

When accelerating

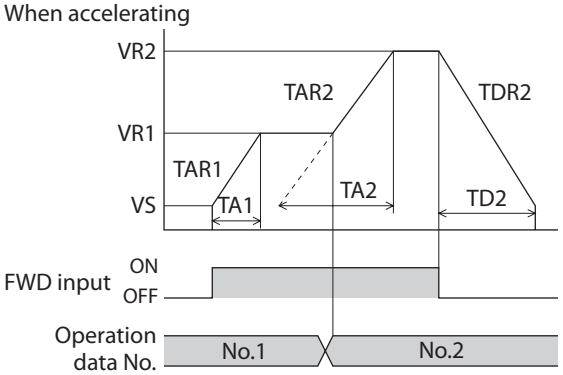


When decelerating

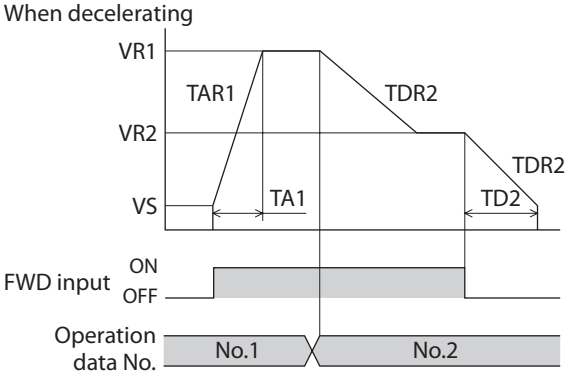


● Acceleration/deceleration unit: s

When accelerating



When decelerating



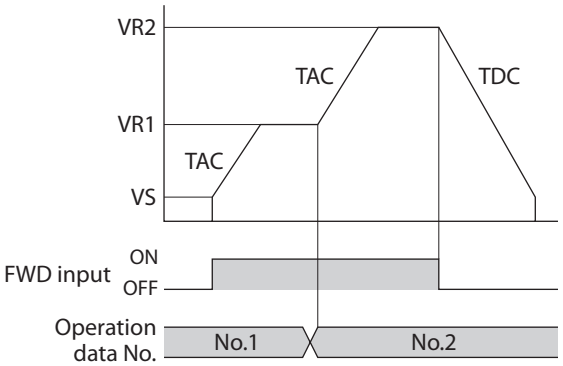
- Explanation of labels
  VS: Starting speed (Hz)
  VR1: Operating speed of operation data No.1 (Hz)
  VR2: Operating speed of operation data No.2 (Hz)
  TA1: Acceleration of operation data No.1
  TA2: Acceleration of operation data No.2
  TD2: Deceleration of operation data No.2
  TAR1: Acceleration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

- Calculation method for acceleration/deceleration rate
  TAR1 = (VR1 – VS)/ TA1
  TAR2 = (VR2 – VS)/ TA2
  TDR2 = (VR2 – VS)/ TD2

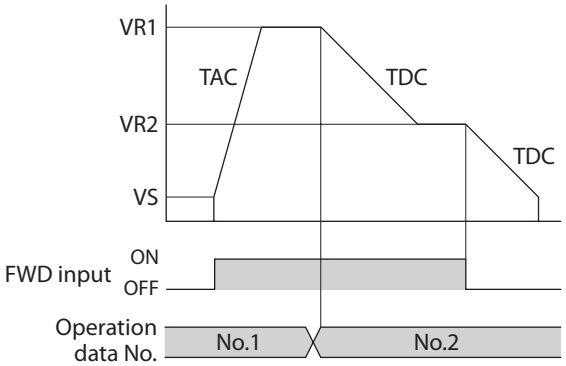
■ When acceleration/deceleration is "common"

● Acceleration/deceleration unit: ms/kHz

When accelerating

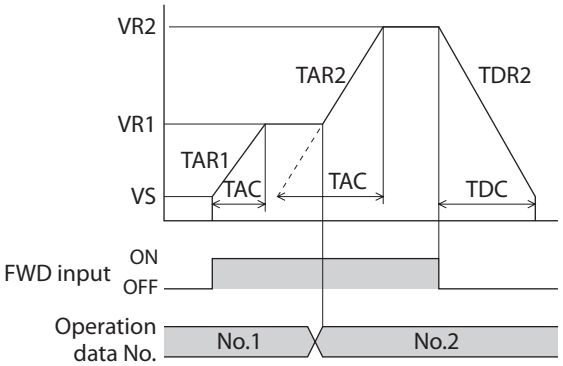


When decelerating

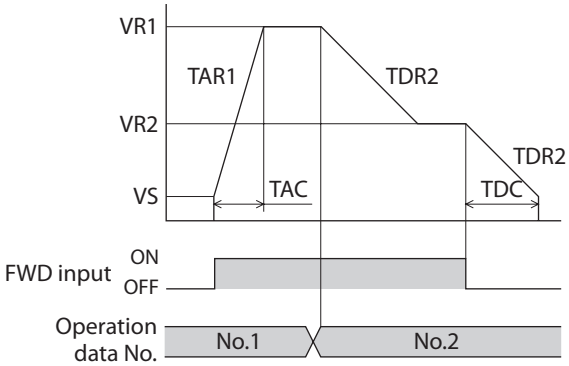


● Acceleration/deceleration unit: s

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 (Hz/s)
  TAR2: Acceleration rate of operation data No.2 (Hz/s)
  TDR1: Deceleration rate of operation data No.1 (Hz/s)
  TDR2: Deceleration rate of operation data No.2 (Hz/s)

- Calculation method for acceleration/deceleration rate
  TAR1 = (VR1 – VS)/ TAC
  TAR2 = (VR2 – VS)/ TAC
  TDR2 = (VR2 – VS)/ TDC

7 Other operation

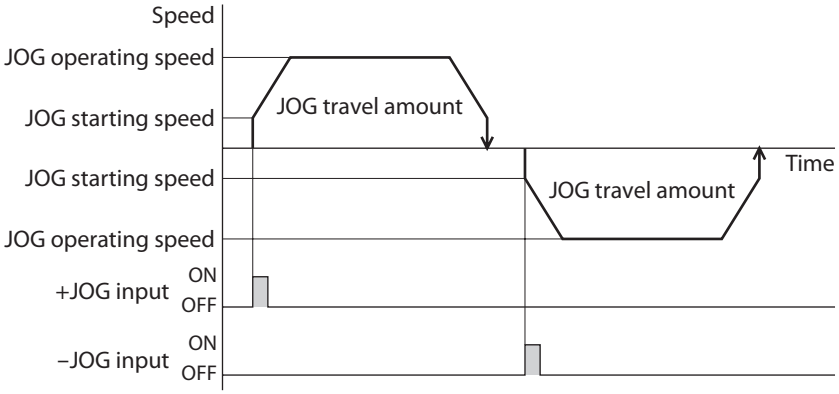
7-1 JOG operation

JOG operation is a function to perform positioning operation of the travel amount set in the "JOG travel amount" parameter.
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.
This function is convenient for fine adjustment of the position.

- **Related parameters**

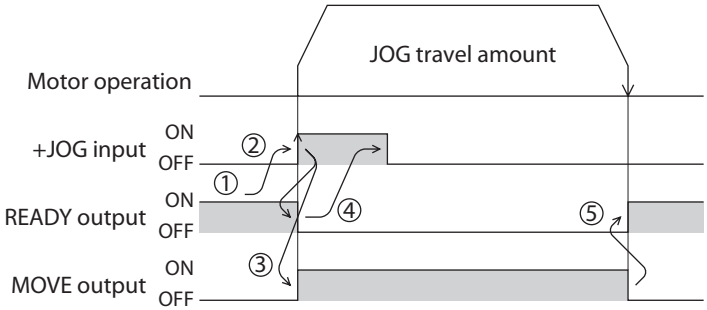
MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Operation	JOG travel amount	This is the travel amount for JOG operation.	1 to 8,388,607 step	1
	JOG operating speed	This is the operating speed for JOG operation.	1 to 1,000,000 Hz	1000
	JOG acceleration/ deceleration rate	This is 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	This is the starting speed for JOG operation.	0 to 1,000,000 Hz	100

- **Operation example**



- **Operating method**

1) Check the READY output is ON.
2) Turn the +JOG input ON.
3) The motor starts positioning operation.
4) Check the READY output has been turned OFF and turn the +JOG input OFF.
5) When the positioning operation is completed, the READY output will be turned ON.



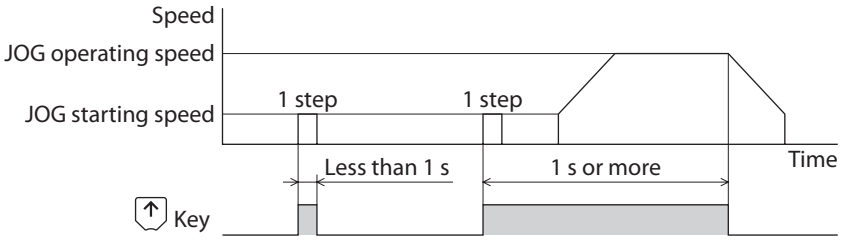
7-2 Test operation

Test operation is performed using the **OPX-2A** or **MEXE02**. JOG operation and teaching function can be performed. Refer to p.235 for details about the **OPX-2A**, and the "Data setting software **MEXE02** OPERATING MANUAL" for details about the **MEXE02**.

■ JOG operation

Connection condition or operation status for the motor and driver can be checked using JOG operation.

Example: When performing test operation with the OPX-2A



■ Teaching function

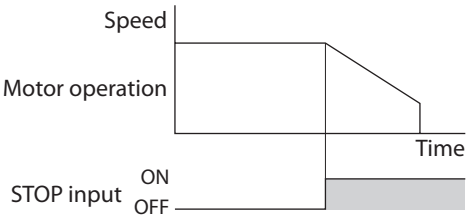
This is a function to move the motor using the **OPX-2A** or **MEXE02** and set the current position as the position (travel amount) of the operation data. When the position (travel amount) is set using teaching function, the "operation mode" will always be the absolute mode. The operating speed, acceleration/deceleration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

memo Perform teaching function when the position origin is set. See p.104 for setting the position origin.

7-3 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.



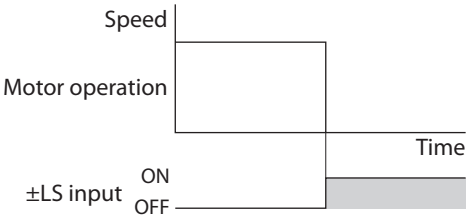
Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
I/O	STOP input action	Sets how to stop the motor when the STOP input has turned ON.	0: Immediate stop 1: Deceleration stop 2: Immediate stop + current OFF 3: Deceleration stop + current OFF	1

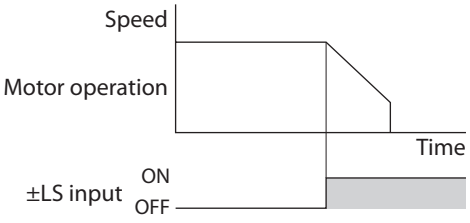
■ Hardware overtravel

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 examples are shown in the figure below.

• Immediate stop



• Deceleration stop



Related parameters

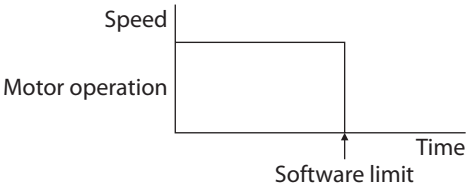
MEXE02 tree view	Parameter name	Description	Setting range	Initial value
I/O	Hardware overtravel	Sets whether to enable or disable the hardware overtravel detection using ±LS inputs.	0: Disable 1: Enable	1
	Overtravel action	Sets how to stop the motor when the overtravel alarm has occurred.	0: Immediate stop 1: Deceleration stop	0

Note When the "overtravel action" parameter is set to "deceleration stop," consider the distance to stop from the start of deceleration in order to avoid contact of a load with the mechanical end.

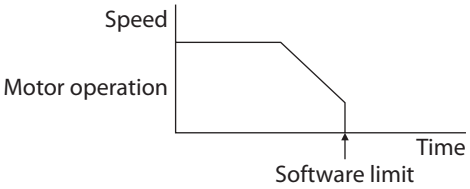
■ Software overtravel

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 examples are shown in the figure below when an operation where a software limit is to be exceeded is started.

• Immediate stop



• Deceleration stop



Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
I/O	Overtravel action	Sets how to stop the motor when the overtravel alarm has occurred.	0: Immediate stop 1: Deceleration stop	0
Coordinates	Software overtravel	Sets whether to enable or disable the software overtravel detection using the soft limits.	0: Disable 1: Enable	1
	Positive software limit	Sets the value of the software limit in positive direction.	–8,388,608 to 8,388,607 step	8,388,607
	Negative software limit	Sets the value of the software limit in negative direction.		–8,388,608

memo
- Software overtravel will become effective after the position origin is set. See p.104 for setting the position origin.
- When the value of the software limit is changed while the motor is operating, the motor will stop according to the setting of the "overtravel action" parameter.

■ 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 Test operation Return-to-home operation	Allowed to operate (able to escape)	

8 Coordinate management

8-1 Position coordinate management

The driver manages the motor position information.

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 not be set whenever one of the following operations is executed:
- When the 24 VDC power supply is turned ON
- When the motor becomes in non-excitation state while the "stepout detection" parameter is set to "disable."
- When a configuration is executed

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.267 for alarm.

Related parameters

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Alarm	Return-to-home incomplete alarm	When the positioning operation is started while the position origin has not been set, sets whether the alarm generates or not.	0: Disable 1: Enable	0

8-2 Wrap function

The wrap function is a function that resets the command position or multi-rotation data 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

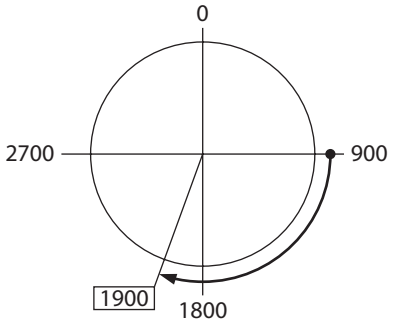
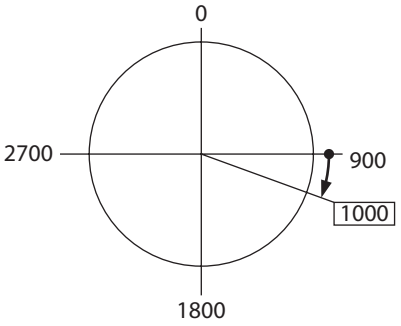
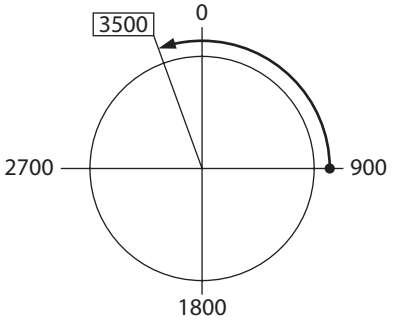
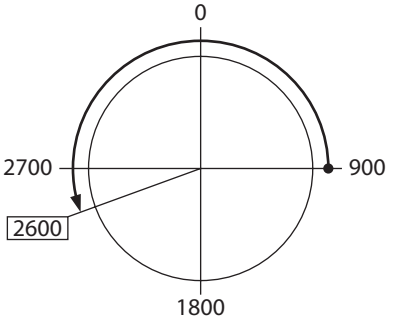
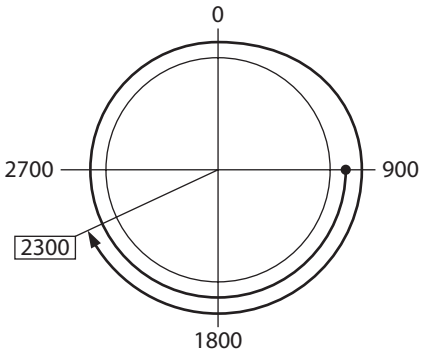
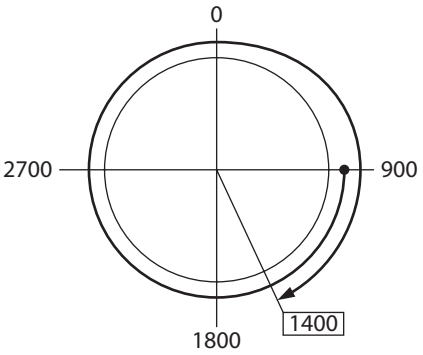
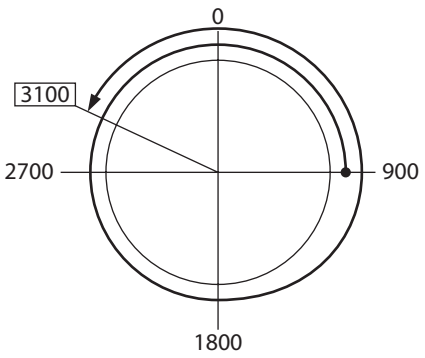
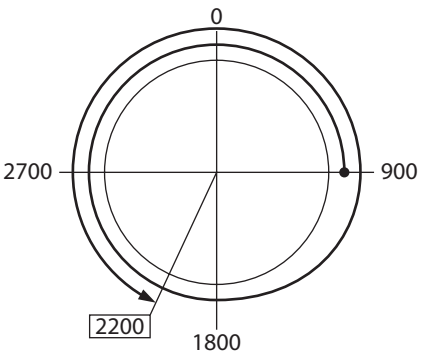
MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Coordinates	Wrap setting	Sets whether to enable or disable the wrap function.	0: Disable 1: Enable	0
	Wrap setting range	Wrap setting range.	1 to 8,388,607 step	500

memo 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 the following conditions.

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

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

9 Operation data

Up to 64 operation data can be set (data Nos.0 to 63).
If the data is changed, a recalculation and setup will be performed after the operation is stopped.

Name	Description	Setting range	Initial value
Position No.0 to Position No.63	Sets the position (travel amount) for positioning operation.	−8,388,608 to +8,388,607 step	0
Operating speed No.0 to Operating speed No.63	This is the operating speed for positioning operation and continuous operation.	0 to 1,000,000 Hz	1000
Operation mode No.0 to Operation mode No.63	Sets the operation mode for positioning operation.	0: Incremental (INC) 1: Absolute (ABS)	0
Operation function No.0 to Operation function No.63	This is used to set how to operate consecutive operation data.	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) for positioning operation and continuous operation. *1	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *2	30000
Deceleration No.0 to Deceleration No.63	Sets the deceleration rate (or deceleration time) for positioning operation and continuous operation. *1	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *2	30000
Sequential positioning No.0 to Sequential positioning No.63	Sets whether to enable or disable sequential positioning operation.	0: Disable 1: Enable	0
Dwell time No.0 to Dwell time No.63	Sets the waiting time between the first operation data and second operation data in linked-motion operation 2.	0 to 50000 (1=0.001 s)	0

*1 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).

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

10 Parameter

The parameters are saved in the RAM or non-volatile memory. The data saved in the RAM will be erased once the 24 VDC power supply is turned off. On the other hand, the parameters saved in the non-volatile memory will be retained even after the 24 VDC power supply is turned off.
When turning the 24 VDC power supply on, the parameters saved in the non-volatile memory will be sent to the RAM. Then, the recalculation and setup for the parameters are executed in the RAM.

The parameters are written in the RAM area when writing via the RS-485 communication or industrial network. When the parameters stored in the RAM is saved in the non-volatile memory, execute the "Batch NV memory write" command of the maintenance command.
The parameters having set in the **MEXE02** is saved in the non-volatile memory when the data writing is performed.

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

Update timing		Description
A	Effective immediately	Executes the recalculation and setup as soon as the parameter is written.
B	Effective after stopping the operation	Executes the recalculation and setup after stopping the operation.
C	Effective after executing the configuration or cycling the power	Executes the recalculation and setup after executing the configuration, or effective after cycling the 24 VDC power supply.
D	Effective after cycling the power	Executes the recalculation and setup after cycling the 24 VDC power supply again.

In this document, each update timing is represented in an alphabetical character.

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- The parameters are written in the RAM area when writing via the RS-485 communication or industrial network. Be sure to save in the non-volatile memory before turning off the power supply when changing the parameter that is required turning on the power again to update.
- The non-volatile memory can be rewritten approximately 100,000 times.

10-1 Parameter list

I/O parameter (p.109)	• STOP input action	• ±LS logic level
	• Hardware overtravel	• HOMES logic level
	• Overtravel action	• SLIT logic level
	• AREA1 positive direction position	• MS0 operation No. selection
	• AREA1 negative direction position	• MS1 operation No. selection
	• AREA2 positive direction position	• MS2 operation No. selection
	• AREA2 negative direction position	• MS3 operation No. selection
	• AREA3 positive direction position	• MS4 operation No. selection
	• AREA3 negative direction position	• MS5 operation No. selection
	• Minimum ON time for MOVE output	• HOME-P output function selection
Motor parameter (p.110)	• RUN current	• Moving average time
	• STOP current	• Filter selection
	• Speed filter	
Operation parameter (p.110)	• Common acceleration	• JOG starting speed
	• Common deceleration	• Acceleration/deceleration type
	• Starting speed	• Acceleration/deceleration unit
	• JOG operating speed	• JOG travel amount
	• JOG acceleration/deceleration rate	
Home operation parameter (p.111)	• Home-seeking mode	• Starting direction of home-seeking
	• Operating speed of home-seeking	• SLIT detection with home-seeking
	• Acceleration/deceleration of home-seeking	• TIM signal detection with home-seeking
	• Starting speed of home-seeking	• Backward steps in 2-sensor mode home-seeking
	• Position offset of home-seeking	
Alarm parameter (p.111)	• Return-to-home incomplete alarm	
Warning parameter (p.111)	• Overheat warning	
	• Overvoltage warning	
	• Undervoltage warning	
Coordinates parameter (p.112)	• Electronic gear A	• Wrap setting
	• Electronic gear B	• Wrap setting range
	• Motor rotation direction	• Encoder resolution
	• Software overtravel	• Encoder preset value
	• Positive software limit	• Stepout detection
	• Negative software limit	• Stepout detection band
	• Preset position	• Stepout detection action
Common parameter (p.112)	• Data setter speed display	
	• Data setter edit	
I/O function [Input] parameter (p.113)	• IN0 to IN7 input function selection	
	• IN0 to IN7 input logic level setting	
I/O function [Output] parameter (p.113)	• OUT0 to OUT5 output function selection	
I/O function [RS-485] parameter (p.114)	• NET-IN0 to NET-IN15 input function selection	
	• NET-OUT0 to NET-OUT15 output function selection	
Communication parameter (p.115)	• Communication timeout	• Communication stop bit
	• Communication error alarm	• Transmission waiting time
	• Communication parity	

10-2 I/O parameter

Parameter name	Description	Setting range	Initial value	Effective (p.107)
STOP input action	Sets how to stop the motor when the STOP input has 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 the hardware overtravel detection using ±LS inputs.	0: Disable 1: Enable	1	
Overtravel action	Sets how to stop the motor when the overtravel alarm has occurred.	0: Immediate stop 1: Deceleration stop	0	
AREA1 positive direction position	This is the position of AREA1 positive direction.	−8,388,608 to 8,388,607 step	0	
AREA1 negative direction position	This is the position of AREA1 negative direction.			
AREA2 positive direction position	This is the position of AREA2 positive direction.			
AREA2 negative direction position	This is the position of AREA2 negative direction.			
AREA3 positive direction position	This is the position of AREA3 positive direction.			
AREA3 negative direction position	This is the position of AREA3 negative direction.			
Minimum ON time for MOVE output	Sets the output time for the MOVE signal.	0 to 255 ms	0	
±LS logic level	Sets the logic for ±LS input.	0: Normally open 1: Normally closed	0	C
HOMES logic level	Sets the logic for HOMES input.		0	
SLIT logic level	Sets the logic for the SLIT input.		0	
MS0 operation No. selection	Sets the operation data number corresponding to the MS0 input.	0 to 63	0	B
MS1 operation No. selection	Sets the operation data number corresponding to the MS1 input.		1	
MS2 operation No. selection	Sets the operation data number corresponding to the MS2 input.		2	
MS3 operation No. selection	Sets the operation data number corresponding to the MS3 input.		3	
MS4 operation No. selection	Sets the operation data number corresponding to the MS4 input.		4	
MS5 operation No. selection	Sets the operation data number corresponding to the MS5 input.		5	
HOME-P output function selection	Sets the timing to output the HOME-P output.	0: Home output 1: Return-to-home complete output	0	A

10-3 Motor parameter

Parameter name	Description	Setting range	Initial value	Effective (p.107)
RUN current	Sets the motor operating current rate based on the rated current being 100%.	0 to 1000 (1=0.1%)	1000	A
STOP current	Sets the motor standstill current based on the rated current being 100%.	0 to 600 (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.			
Filter selection	Sets the filter function to adjust the motor response.	0: Speed filter 1: Moving average filter	0	C

10-4 Operation parameter

Parameter name	Description	Setting range	Initial value	Effective (p.107)
Common acceleration	This is the common acceleration rate (or common acceleration time) for positioning operation and continuous operation.	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *1 *2	30000	B
Common deceleration	This is the common deceleration rate (or common deceleration time) for positioning operation and continuous operation.			
Starting speed	This is the starting speed for 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	This is the operating speed for JOG operation.	1 to 1,000,000 Hz	1000	
JOG acceleration/ deceleration rate	This is 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	30000	
JOG starting speed	This is 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 rate or acceleration/deceleration time.	0: ms/kHz 1: s	0	C
JOG travel amount	This is the travel amount for JOG operation.	1 to 8,388,607 step	1	B

*1 This item is effective when the "acceleration/deceleration type" parameter is set to "common." (initial value: separate).

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

10-5 Home operation parameter

Parameter name	Description	Setting range	Initial value	Effective (p.107)
Home-seeking mode	Sets the mode for return-to-home operation.	0: 2-sensor mode 1: 3-sensor mode	1	B
Operating speed of home-seeking	This is the operating speed for return-to-home operation.	1 to 1,000,000 Hz	1000	
Acceleration/deceleration of home-seeking	This is 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) *1	30000	
Starting speed of home-seeking	This is the starting speed for return-to-home operation.	1 to 1,000,000 Hz	100	
Position offset of home-seeking	This is 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 (ZSG) output for return-to-home operation.	0: Disable 1: TIM signal enable 2: ZSG signal enable *2	0	
Backward steps in 2-sensor mode home-seeking	Sets the travel amount after pulling out of the LS in 2-sensor mode return-to-home operation.	0 to 32767 step	200	

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

*2 This signal is used when an encoder is connected.

10-6 Alarm parameter

Parameter name	Description	Setting range	Initial value	Effective (p.107)
Return-to-home incomplete alarm	When the positioning operation is started while the position origin has not been set, sets whether the alarm generates or not.	0: Disable 1: Enable	0	C

10-7 Warning parameter

Parameter name	Description	Setting range	Initial value	Effective (p.107)
Overheat warning	Sets the temperature at which a main circuit overheat warning generates.	40 to 85 °C (104 to 185 °F)	85	A
Overvoltage warning	Sets the voltage at which an overvoltage warning generates.	120 to 450 V	435	
Undervoltage warning	Sets the voltage at which an undervoltage warning generates.	120 to 280 V	120	

10-8 Coordinates parameter

Parameter name	Description	Setting range	Initial value	Effective (p.107)
Electronic gear A	This is the denominator of electric gear.	1 to 65535	1	C
Electronic gear B	This is the numerator of electric gear.			
Motor rotation direction	Sets the rotation direction of the motor output shaft.	0: Positive direction=CCW 1: Positive direction=CW	1	
Software overtravel	Sets whether to enable or disable the software overtravel detection using the soft limits.	0: Disable 1: Enable	1	A
Positive software limit	Sets the value of the software limit in positive direction.	−8,388,608 to 8,388,607 step	8,388,607	
Negative software limit	Sets the value of the software limit in negative direction.		−8,388,608	
Preset position	Sets the preset position.		0	
Wrap setting	Sets whether to enable or disable the wrap function.	0: Disable 1: Enable	0	C
Wrap setting range	Wrap setting range.	1 to 8,388,607 step	500	
Encoder resolution	Sets the resolution of the connected encoder.	100 to 10000 P/R	500	
Encoder preset value	Sets the preset value of the encoder.	−8,388,608 to 8,388,607 step	0	A
Stepout detection	Sets whether to enable or disable the detection function for the loss of synchronism.	0: Disable 1: Enable	0	C
Stepout detection band	Sets the detection condition for the loss of synchronism by the deviation (angle) between the command position and encoder position.	1 to 3600 (1=0.1°)	72	A
Stepout detection action	Sets how to operate when the deviation between the command position and encoder position reached the detection band for the loss of synchronism.	0: No operation 1: Warning 2: Alarm	0	

10-9 Common parameter

Parameter name	Description	Setting range	Initial value	Effective (p.107)
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 to enable to edit using the **OPX-2A**.	0: Disable 1: Enable	1	

10-10 I/O function [Input] parameter

Parameter name	Description	Setting range	Initial value	Effective (p.107)
IN0 input function selection	Assigns the input signal to the input terminal IN0 to IN7.	See table next.	3: HOME	C
IN1 input function selection			4: START	
IN2 input function selection			48: M0	
IN3 input function selection			49: M1	
IN4 input function selection			50: M2	
IN5 input function selection			16: FREE	
IN6 input function selection			18: STOP	
IN7 input function selection			24: ALM-RST	
IN0 input logic level setting	Changes the logic level setting for the input terminal IN0 to IN7.	0: Normally open 1: Normally closed	0	
IN1 input logic level setting				
IN2 input logic level setting				
IN3 input logic level setting				
IN4 input logic level setting				
IN5 input logic level setting				
IN6 input logic level setting				
IN7 input logic level setting				

- **Setting range for 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

10-11 I/O function [Output] parameter

Parameter name	Description	Setting range	Initial value	Effective (p.107)
OUT0 output function selection	Assigns the output signal to the output terminal OUT0 to OUT5.	See table next.	70: HOME-P	C
OUT1 output function selection			68: MOVE	
OUT2 output function selection			73: AREA1	
OUT3 output function selection			67: READY	
OUT4 output function selection			66: WNG	
OUT5 output function selection			65: ALM	

- **Setting range for OUT output function selection**

0: Not used	10: MS2_R	35: R3	45: R13	61: –LS_R	74: AREA2
1: FWD_R	11: MS3_R	36: R4	46: R14	62: HOMES_R	75: AREA3
2: RVS_R	12: MS4_R	37: R5	47: R15	63: SLIT_R	80: S-BSY
3: HOME_R	13: MS5_R	38: R6	48: M0_R	65: ALM	82: MPS
4: START_R	16: FREE_R	39: R7	49: M1_R	66: WNG	83: STEPOUT
5: SSTART_R	17: AWO_R	40: R8	50: M2_R	67: READY	84: OH
6: +JOG_R	18: STOP_R	41: R9	51: M3_R	68: MOVE	85: ZSG
7: –JOG_R	32: R0	42: R10	52: M4_R	70: HOME-P	86: MBC
8: MS0_R	33: R1	43: R11	53: M5_R	72: TIM	
9: MS1_R	34: R2	44: R12	60: +LS_R	73: AREA1	

10-12 I/O function [RS-485] parameter

Parameter name	Description	Setting range	Initial value	Effective (p.107)
NET-IN0 input function selection	Assigns the input signal to the NET-IN0 to NET-IN15.	See table next.	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			16: FREE	
NET-IN7 input function selection			24: ALM-RST	
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	Assigns the output signal to the NET-OUT0 to NET-OUT15.	See next page.	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			83: STEPOUT	

- **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

- **Setting range for NET-OUT output function selection**

0: Not used	10: MS2_R	35: R3	45: R13	61: –LS_R	74: AREA2
1: FWD_R	11: MS3_R	36: R4	46: R14	62: HOMES_R	75: AREA3
2: RVS_R	12: MS4_R	37: R5	47: R15	63: SLIT_R	80: S-BSY
3: HOME_R	13: MS5_R	38: R6	48: M0_R	65: ALM	82: MPS
4: START_R	16: FREE_R	39: R7	49: M1_R	66: WNG	83: STEPOUT
5: SSTART_R	17: AWO_R	40: R8	50: M2_R	67: READY	84: OH
6: +JOG_R	18: STOP_R	41: R9	51: M3_R	68: MOVE	85: ZSG
7: –JOG_R	32: R0	42: R10	52: M4_R	70: HOME-P	86: MBC
8: MS0_R	33: R1	43: R11	53: M5_R	72: TIM	
9: MS1_R	34: R2	44: R12	60: +LS_R	73: AREA1	

10-13 Communication parameter

Parameter name	Description	Setting range	Initial value	Effective (p.107)
Communication timeout	Sets the condition in which the communication timeout occurs in RS-485 communication. When setting to zero (0), the driver does not monitor the condition in which the communication timeout occurs.	0: Not monitored 1 to 10000 ms	0	A
Communication error alarm	Sets the condition in which the RS-485 communication error alarm generates. The communication error alarm generates after the RS-485 communication error has occurred by the number of times set here.	1 to 10 times	3	
Communication parity	Sets the parity for RS-485 communication.	0: None 1: Even number 2: Odd number	1	D
Communication stop bit	Sets the stop bit for RS-485 communication.	0: 1 bit 1: 2 bit	0	
Transmission waiting time	Sets the transmission waiting time for RS-485 communication.	0 to 10000 (1=0.1 ms)	100	

4 Method of control via I/O

This part explains when the operation is controlled via I/O after setting the operation data and parameters by the OPX-2A or MEXE02.

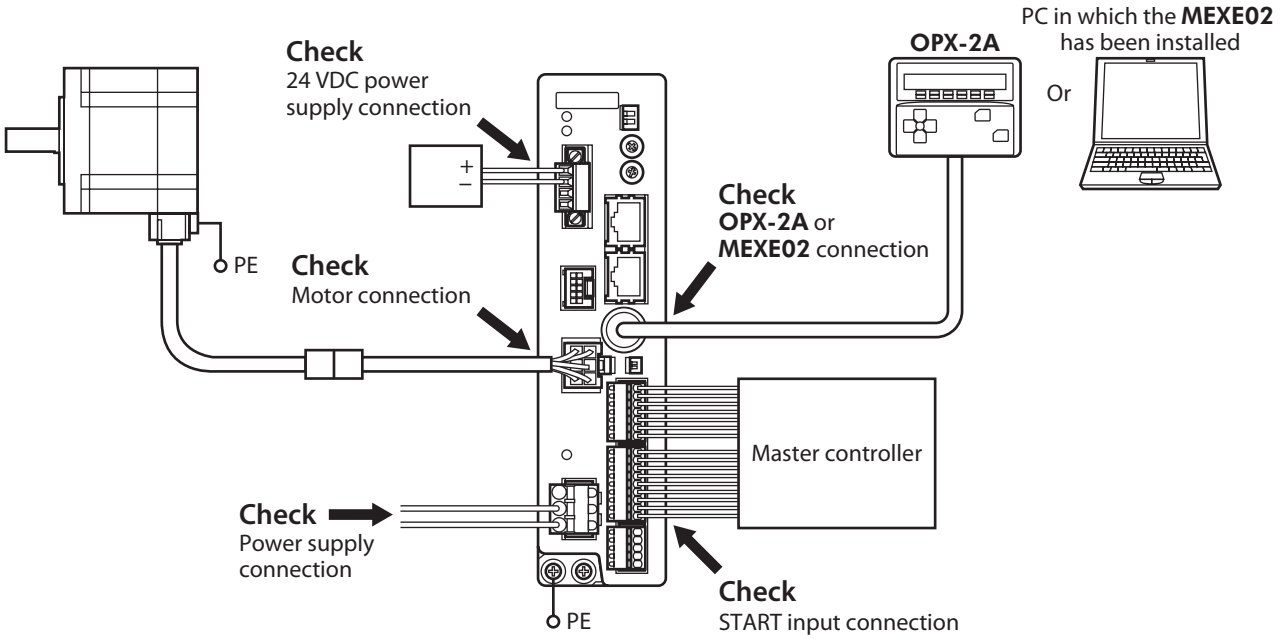
◆Table of contents

1 Guidance

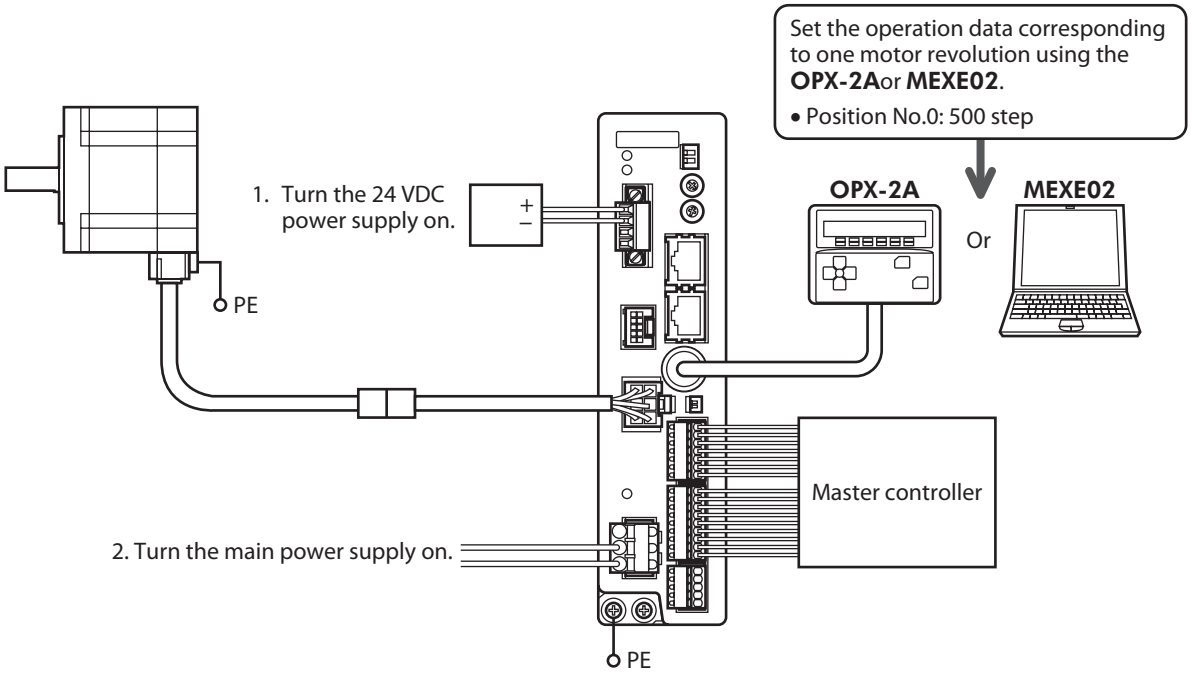
If you are new to the **RK Ⅱ** Series FLEX built-in controller type, read this section to understand the operating methods along with the operation flow.

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

STEP 1 Check the installation and connection

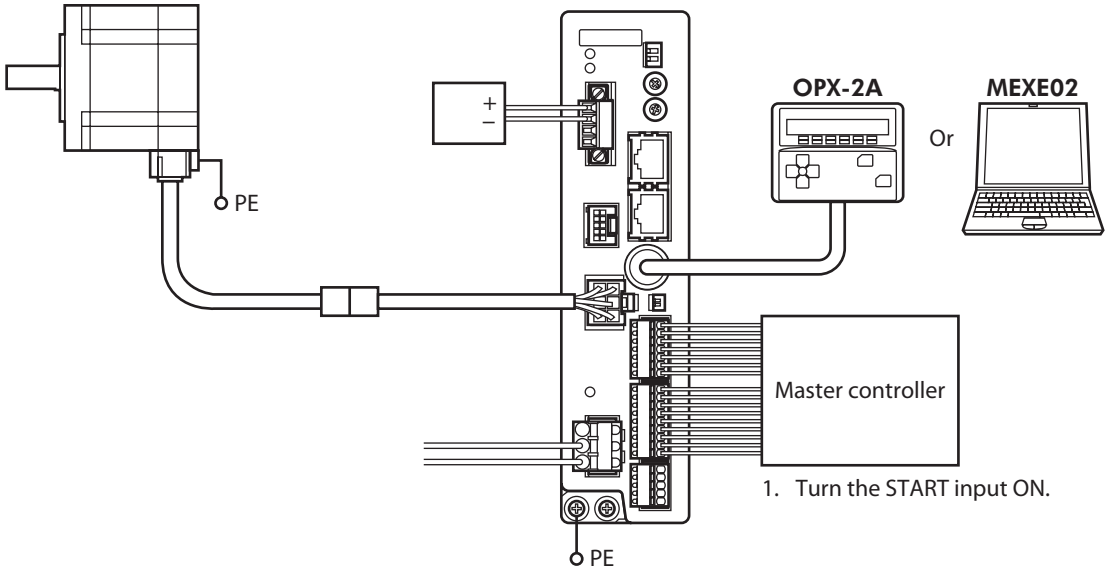


STEP 2 Turn on the power and set the operation data



STEP 3 Operate the motor

2. Confirm that the motor rotates without problem.



STEP 4 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 motor connected securely?

For more detailed settings and functions, refer to "3 Operation type and setting."

2 Operation data

Up to 64 operation data can be set (data Nos.0 to 63).
If the data is changed, a recalculation and setup will be performed after the operation is stopped.

Name	Setting range	Initial value
Position No.0 to Position No.63	–8,388,608 to +8,388,607 step	0
Operating speed No.0 to Operating speed No.63	0 to 1,000,000 Hz	1000
Operation mode No.0 to Operation mode No.63	0: Incremental (INC) 1: Absolute (ABS)	0
Operation function No.0 to Operation function No.63	0: Single-motion 1: Linked-motion 2: Linked-motion 2	0
Acceleration No.0 to Acceleration No.63	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *	30000
Deceleration No.0 to Deceleration No.63		
Sequential positioning No.0 to Sequential positioning No.63	0: Disable 1: Enable	0
Dwell time No.0 to Dwell time No.63	0 to 50000 (1=0.001 s)	0

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

3 Parameter

The parameters are saved in the RAM or non-volatile memory. The data saved in the RAM will be erased once the 24 VDC power supply is turned off. On the other hand, the parameters saved in the non-volatile memory will be retained even after the 24 VDC power supply is turned off.
When turning the 24 VDC power supply on, the parameters saved in the non-volatile memory will be sent to the RAM. Then, the recalculation and setup for the parameters are executed in the RAM.

The parameters are written in the RAM area when writing via the RS-485 communication or industrial network. When the parameters stored in the RAM is saved in the non-volatile memory, execute the "Batch NV memory write" command of the maintenance command.
The parameters having set in the **MEXE02** is saved in the non-volatile memory when the data writing is performed.

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

Update timing		Description
A	Effective immediately	Executes the recalculation and setup as soon as the parameter is written.
B	Effective after stopping the operation	Executes the recalculation and setup after stopping the operation.
C	Effective after executing the configuration or cycling the power	Executes the recalculation and setup after executing the configuration, or effective after cycling the 24 VDC power supply
D	Effective after cycling the power	Executes the recalculation and setup after cycling the 24 VDC power supply again.

In this document, each update timing is represented in an alphabetical character.

memo

- The parameters are written in the RAM area when writing via the RS-485 communication or industrial network. Be sure to save in the non-volatile memory before turning off the power supply when changing the parameter that is required turning on the power again to update.
- The non-volatile memory can be rewritten approximately 100,000 times.

3-1 Parameter list

I/O parameter (p.123)	• STOP input action	• ±LS logic level
	• Hardware overtravel	• HOMES logic level
	• Overtravel action	• SLIT logic level
	• AREA1 positive direction position	• MS0 operation No. selection
	• AREA1 negative direction position	• MS1 operation No. selection
	• AREA2 positive direction position	• MS2 operation No. selection
	• AREA2 negative direction position	• MS3 operation No. selection
	• AREA3 positive direction position	• MS4 operation No. selection
	• AREA3 negative direction position	• MS5 operation No. selection
	• Minimum ON time for MOVE output	• HOME-P output function selection
Motor parameter (p.123)	• RUN current	• Moving average time
	• STOP current	• Filter selection
	• Speed filter	
Operation parameters (p.124)	• Common acceleration	• JOG starting speed
	• Common deceleration	• Acceleration/deceleration type
	• Starting speed	• Acceleration/deceleration unit
	• JOG operating speed	• JOG travel amount
	• JOG acceleration/deceleration rate	
Home operation parameter (p.124)	• Home-seeking mode	• Starting direction of home-seeking
	• Operating speed of home-seeking	• SLIT detection with home-seeking
	• Acceleration/deceleration of home-seeking	• TIM signal detection with home-seeking
	• Starting speed of home-seeking	• Backward steps in 2-sensor mode home-seeking
	• Position offset of home-seeking	
Alarm parameter (p.125)	• Return-to-home incomplete alarm	
Warning parameter (p.125)	• Overheat warning	
	• Overvoltage warning	
	• Undervoltage warning	
Coordinates parameter (p.125)	• Electronic gear A	• Wrap setting
	• Electronic gear B	• Wrap setting range
	• Motor rotation direction	• Encoder resolution
	• Software overtravel	• Encoder preset value
	• Positive software limit	• Stepout detection
	• Negative software limit	• Stepout detection band
	• Preset position	• Stepout detection action
Common parameter (p.125)	• Data setter speed display	
	• Data setter edit	
I/O function [Input] parameter (p.126)	• IN0 to IN7 input function selection	
	• IN0 to IN7 input logic level setting	
I/O function [Output] parameter (p.126)	• OUT0 to OUT5 output function selection	
I/O function [RS-485] parameter (p.127)	• NET-IN0 to NET-IN15 input function selection	
	• NET-OUT0 to NET-OUT15 output function selection	
Communication parameter (p.128)	• Communication timeout	• Communication stop bit
	• Communication error alarm	• Transmission waiting time
	• Communication parity	

3-2 I/O parameter

Parameter name	Setting range	Initial value	Effective (p.121)
STOP input action	0: Immediate stop 1: Deceleration stop 2: Immediate stop & Current OFF 3: Deceleration stop &Current OFF	1	A
Hardware overtravel	0: Disable 1: Enable	1	
Overtravel action	0: Immediate stop 1: Deceleration stop	0	
AREA1 positive direction position	−8,388,608 to 8,388,607 step	0	
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	0 to 255 ms	0	
±LS logic level	0: Normally open 1: Normally closed	0	C
HOMES logic level			
SLIT logic level			
MS0 operation No. selection	0 to 63	0	B
MS1 operation No. selection		1	
MS2 operation No. selection		2	
MS3 operation No. selection		3	
MS4 operation No. selection		4	
MS5 operation No. selection		5	
HOME-P output function selection	0: Home output 1: Return-to-home complete output	0	A

3-3 Motor parameter

Parameter name	Setting range	Initial value	Effective (p.121)
RUN current	0 to 1000 (1=0.1%)	1000	A
STOP current	0 to 600 (1=0.1%)	500	
Speed filter	0 to 200 ms	1	B
Moving average time			
Filter selection	0: Speed filter 1: Moving average filter	0	C

3-4 Operation parameter

Parameter name	Setting range	Initial value	Effective (p.121)
Common acceleration	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *1 *2	30000	B
Common deceleration			
Starting speed	0 to 1,000,000 Hz	100	
JOG operating speed	1 to 1,000,000 Hz	1000	
JOG acceleration/deceleration rate	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *2	30000	
JOG starting speed	0 to 1,000,000 Hz	100	
Acceleration/deceleration type	0: Common 1: Separate	1	
Acceleration/deceleration unit	0: ms/kHz 1: s	0	C
JOG travel amount	1 to 8,388,607 step	1	B

*1 This item is effective when the "acceleration/deceleration type" parameter is set to "common." (initial value: separate).

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

3-5 Home operation parameter

Parameter name	Setting range	Initial value	Effective (p.121)
Home-seeking mode	0: 2-sensor mode 1: 3-sensor mode	1	B
Operating speed of home-seeking	1 to 1,000,000 Hz	1000	
Acceleration/deceleration of home-seeking	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *	30000	
Starting speed of home-seeking	1 to 1,000,000 Hz	100	
Position offset of home-seeking	–8,388,608 to 8,388,607 step	0	
Starting direction of home-seeking	0: Negative direction 1: Positive direction	1	
SLIT detection with home-seeking	0: Disable 1: Enable	0	
TIM signal detection with home-seeking	0: Disable 1: TIM signal enable 2: ZSG signal enable	0	
Backward steps in 2-sensor mode home-seeking	0 to 32767 step	200	

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

3-6 Alarm parameter

Parameter name	Setting range	Initial value	Effective (p.121)
Return-to-home incomplete alarm	0: Disable 1: Enable	0	C

3-7 Warning parameter

Parameter name	Setting range	Initial value	Effective (p.121)
Overheat warning	40 to 85 °C (104 to 185 °F)	85	A
Overvoltage warning	120 to 450 V	435	
Undervoltage warning	120 to 280 V	120	

3-8 Coordinates parameter

Parameter name	Setting range	Initial value	Effective (p.121)
Electronic gear A	1 to 65535	1	C
Electronic gear B			
Motor rotation direction	0: Positive direction=CCW 1: Positive direction=CW	1	
Software overtravel	0: Disable 1: Enable	1	A
Positive software limit	−8,388,608 to 8,388,607 step	8,388,607	
Negative software limit		−8,388,608	
Preset position		0	
Wrap setting	0: Disable 1: Enable	0	C
Wrap setting range	1 to 8,388,607 step	500	
Encoder resolution	100 to 10000 P/R	500	
Encoder preset value	−8,388,608 to 8,388,607 step	0	A
Stepout detection	0: Disable 1: Enable	0	C
Stepout detection band	1 to 3600 (1=0.1°)	72	A
Stepout detection action	0: No operation 1: Warning 2: Alarm	0	

3-9 Common parameter

Parameter name	Setting range	Initial value	Effective (p.121)
Data setter speed display	0: Signed 1: Absolute value	0	A
Data setter edit	0: Disable 1: Enable	1	

3-10 I/O function [Input] parameter

Parameter name	Setting range	Initial value	Effective (p.121)
IN0 input function selection	See table next.	3: HOME	C
IN1 input function selection		4: START	
IN2 input function selection		48: M0	
IN3 input function selection		49: M1	
IN4 input function selection		50: M2	
IN5 input function selection		16: FREE	
IN6 input function selection		18: STOP	
IN7 input function selection		24: ALM-RST	
IN0 input logic level setting	0: Normally open 1: Normally closed	0	
IN1 input logic level setting			
IN2 input logic level setting			
IN3 input logic level setting			
IN4 input logic level setting			
IN5 input logic level setting			
IN6 input logic level setting			
IN7 input logic level setting			

- **Setting range for 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

3-11 I/O function [Output] parameter

Parameter name	Setting range	Initial value	Effective (p.121)
OUT0 output function selection	See table next.	70: HOME-P	C
OUT1 output function selection		68: MOVE	
OUT2 output function selection		73: AREA1	
OUT3 output function selection		67: READY	
OUT4 output function selection		66: WNG	
OUT5 output function selection		65: ALM	

- **Setting range for OUT output function selection**

0: Not used	10: MS2_R	35: R3	45: R13	61: –LS_R	74: AREA2
1: FWD_R	11: MS3_R	36: R4	46: R14	62: HOMES_R	75: AREA3
2: RVS_R	12: MS4_R	37: R5	47: R15	63: SLIT_R	80: S-BSY
3: HOME_R	13: MS5_R	38: R6	48: M0_R	65: ALM	82: MPS
4: START_R	16: FREE_R	39: R7	49: M1_R	66: WNG	83: STEPOUT
5: SSTART_R	17: AWO_R	40: R8	50: M2_R	67: READY	84: OH
6: +JOG_R	18: STOP_R	41: R9	51: M3_R	68: MOVE	85: ZSG
7: –JOG_R	32: R0	42: R10	52: M4_R	70: HOME-P	86: MBC
8: MS0_R	33: R1	43: R11	53: M5_R	72: TIM	
9: MS1_R	34: R2	44: R12	60: +LS_R	73: AREA1	

3-12 I/O function [RS-485] parameter

Parameter name	Setting range	Initial value	Effective (p.121)
NET-IN0 input function selection	See table next.	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		16: FREE	
NET-IN7 input function selection		24: ALM-RST	
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	See next page.	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		83: STEPOUT	

- **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

- **Setting range for NET-OUT output function selection**

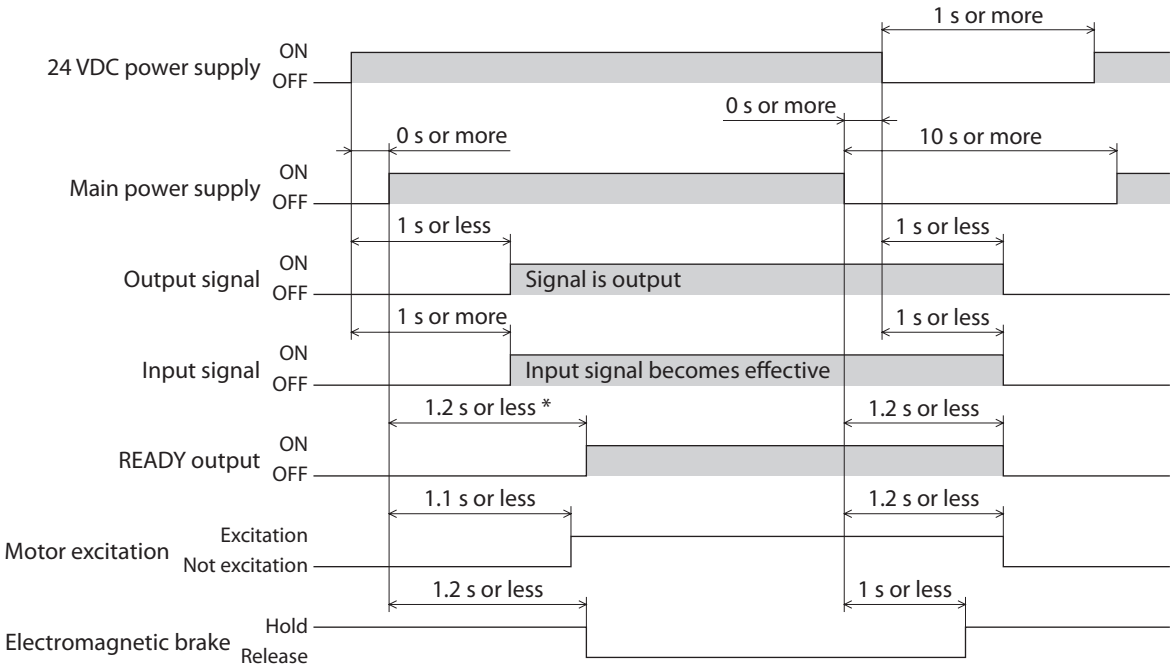
0: Not used	10: MS2_R	35: R3	45: R13	61: –LS_R	74: AREA2
1: FWD_R	11: MS3_R	36: R4	46: R14	62: HOMES_R	75: AREA3
2: RVS_R	12: MS4_R	37: R5	47: R15	63: SLIT_R	80: S-BSY
3: HOME_R	13: MS5_R	38: R6	48: M0_R	65: ALM	82: MPS
4: START_R	16: FREE_R	39: R7	49: M1_R	66: WNG	83: STEPOUT
5: SSTART_R	17: AWO_R	40: R8	50: M2_R	67: READY	84: OH
6: +JOG_R	18: STOP_R	41: R9	51: M3_R	68: MOVE	85: ZSG
7: –JOG_R	32: R0	42: R10	52: M4_R	70: HOME-P	86: MBC
8: MS0_R	33: R1	43: R11	53: M5_R	72: TIM	
9: MS1_R	34: R2	44: R12	60: +LS_R	73: AREA1	

3-13 Communication parameter

Parameter name	Setting range	Initial value	Effective (p.121)
Communication timeout	0: Not monitored 1 to 10000 ms	0	A
Communication error alarm	1 to 10 times	3	
Communication parity	0: None 1: Even number 2: Odd number	1	D
Communication stop bit	0: 1 bit 1: 2 bit	0	
Transmission waiting time	0 to 10000 (1=0.1 ms)	100	

4 Timing charts

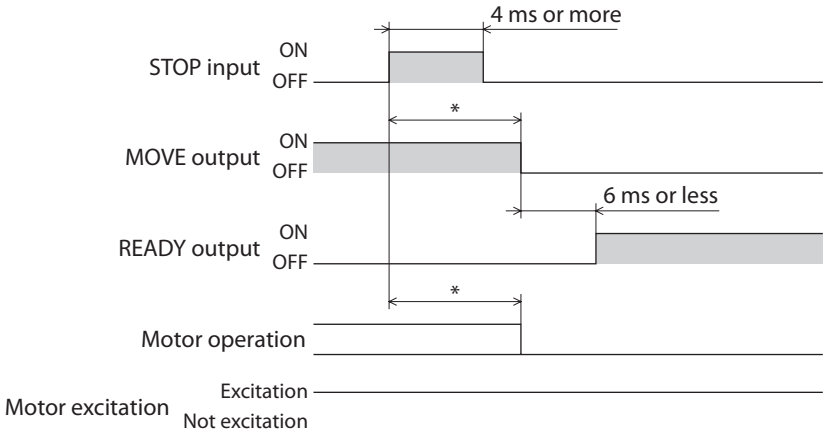
■ When the power supply is turned ON



* 2.2 sec or less for the electromagnetic brake type

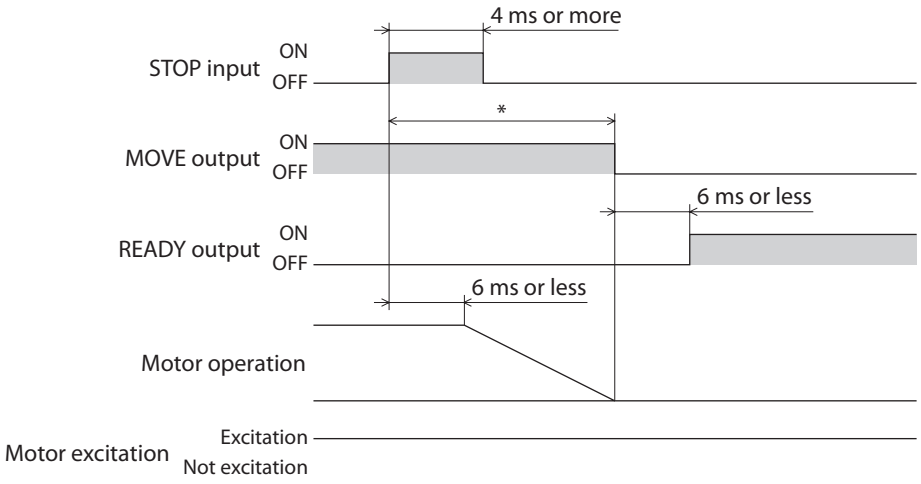
■ STOP input

- **When the "STOP input action" parameter is immediate stop.**



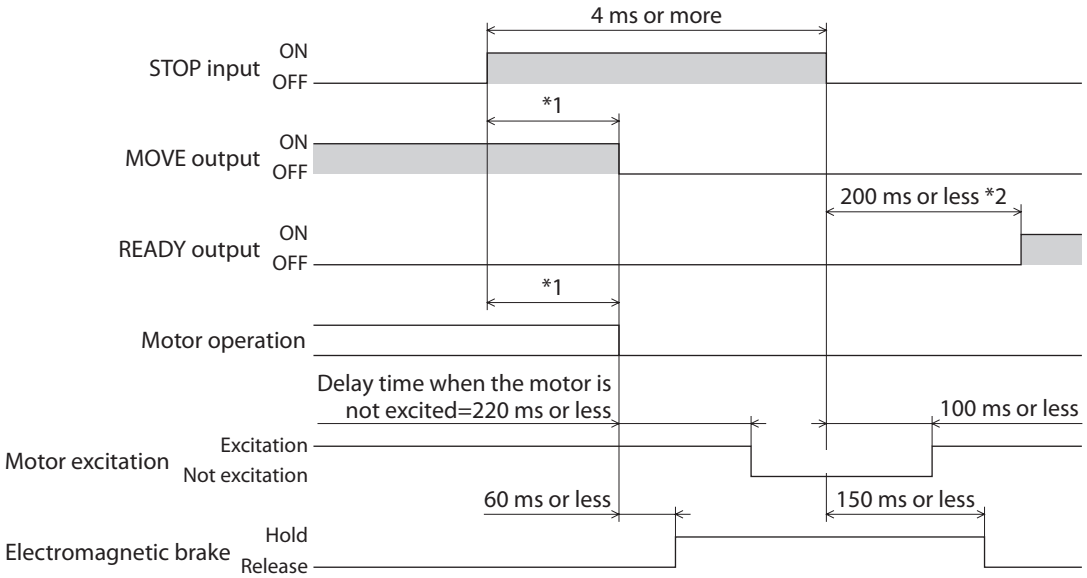
* The specific time varies depending on the operating speed, speed filter, moving average time and other.

- **When the "STOP input action" parameter is deceleration stop.**



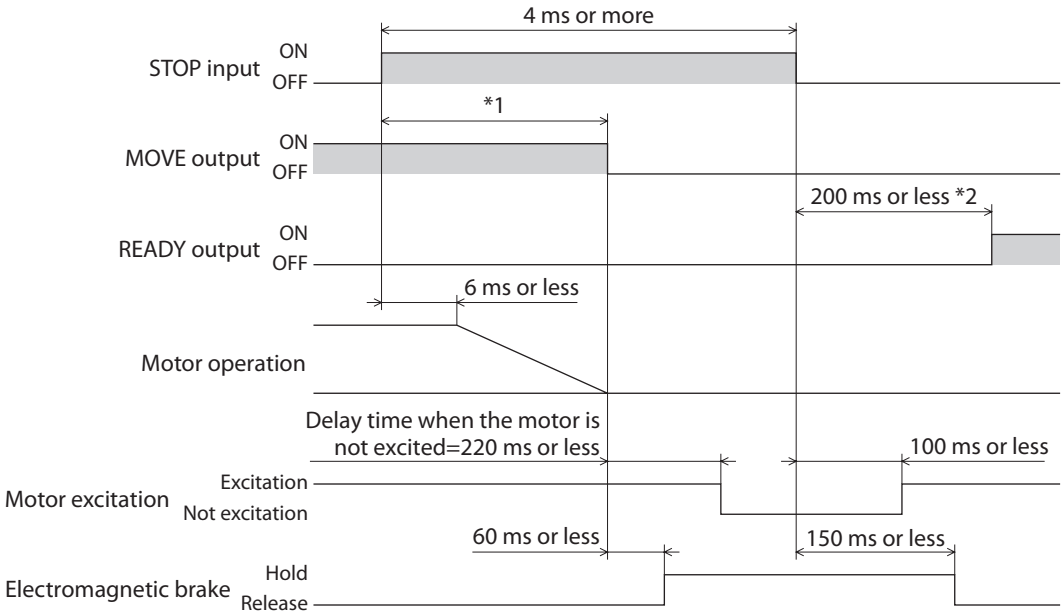
* The specific time varies depending on the operating speed, speed filter, moving average time and other.

- **When the "STOP input action" parameter is current OFF after immediate stop.**



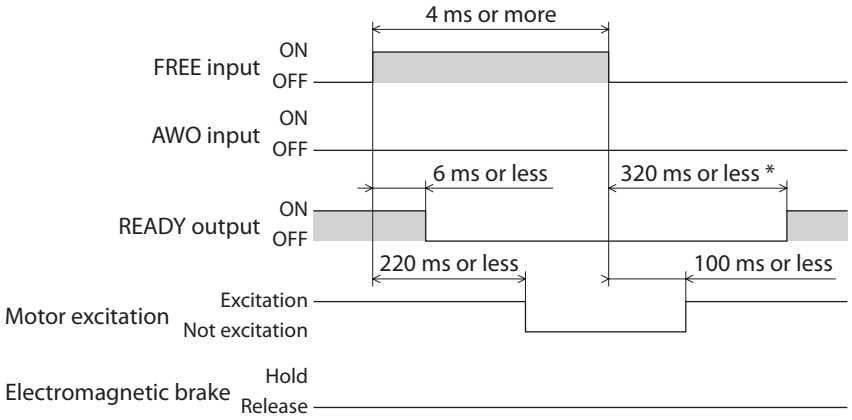
*1 The specific time varies depending on the operating speed, speed filter, moving average time and other.
*2 1.2 sec or less for the electromagnetic brake type

- **When the "STOP input action" parameter is current OFF after deceleration stop.**



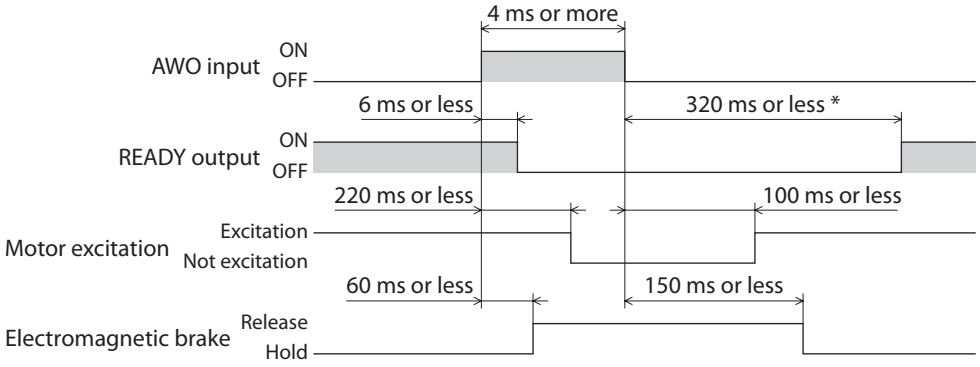
*1 The specific time varies depending on the operating speed, speed filter, moving average time and other.
*2 1.2 sec or less for the electromagnetic brake type

■ FREE input



* 1.2 sec or less for the electromagnetic brake type

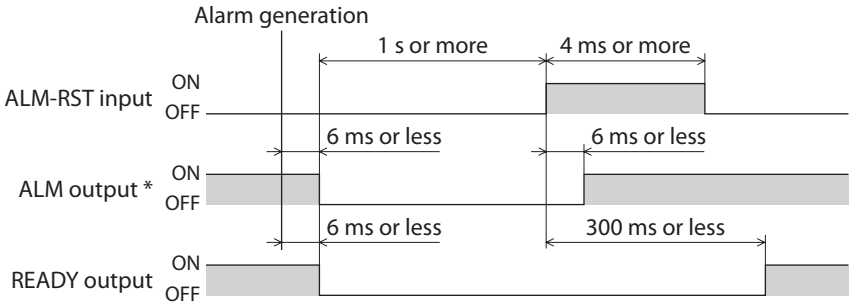
■ AWO input



* 1.2 sec or less for the electromagnetic brake type

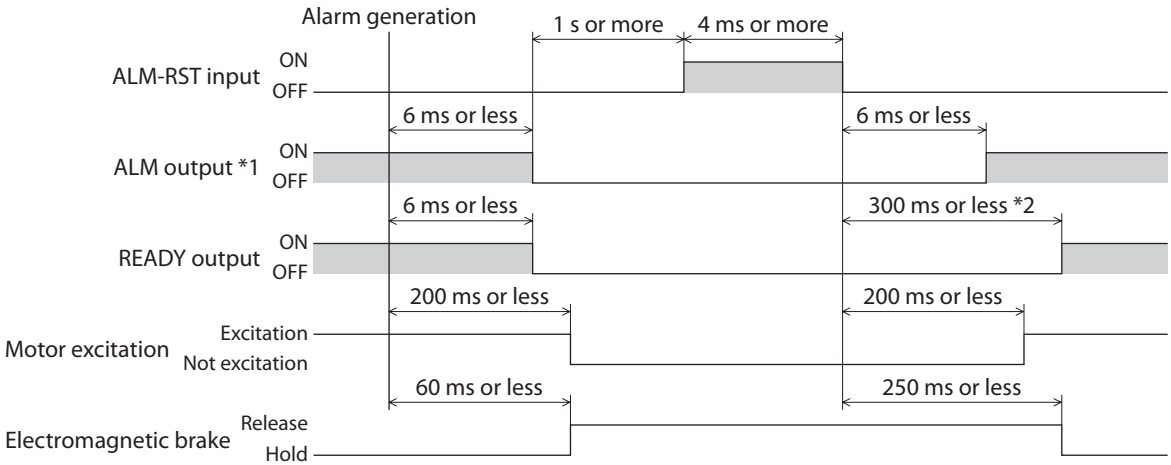
■ ALM-RST input

- **When an alarm generates and the motor maintains excitation**



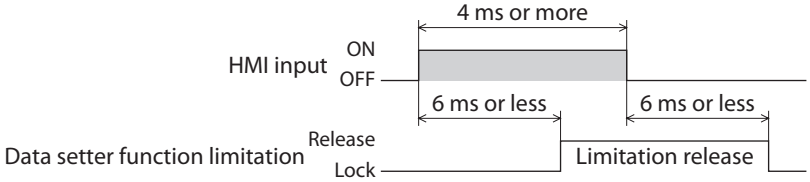
* ALM output is normally closed. It is ON during normal operation and it turns OFF when an alarm generates.

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

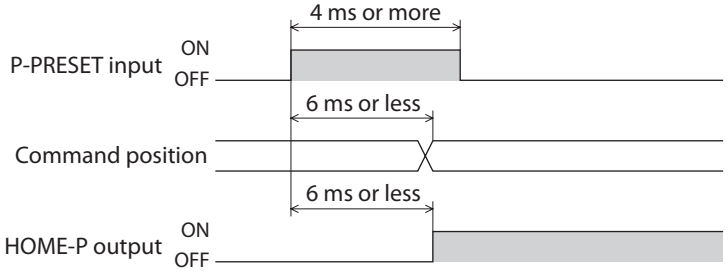


*1 ALM output is normally closed. It is ON during normal operation and it turns OFF when an alarm generates.
*2 1.3 sec or less for the electromagnetic brake type

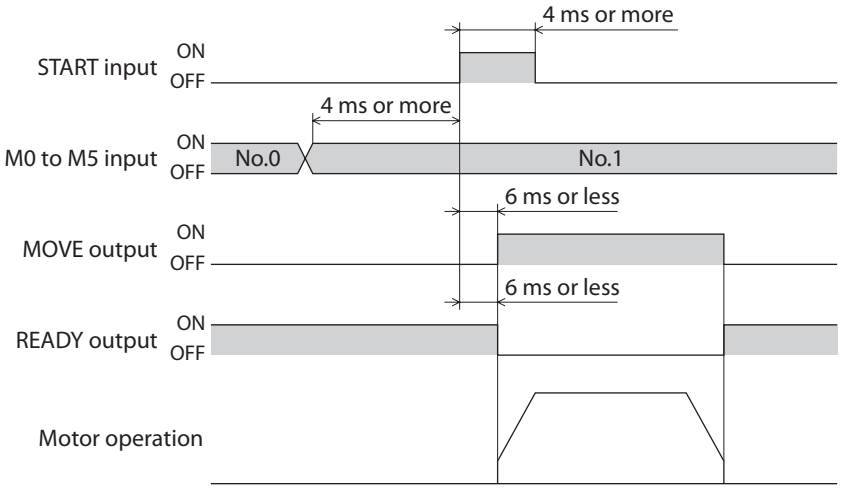
■ HMI input



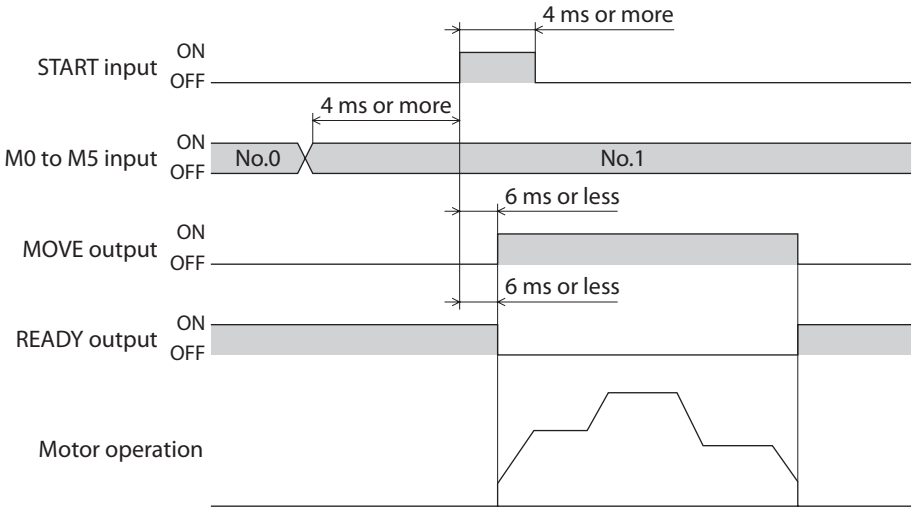
■ P-PRESET input



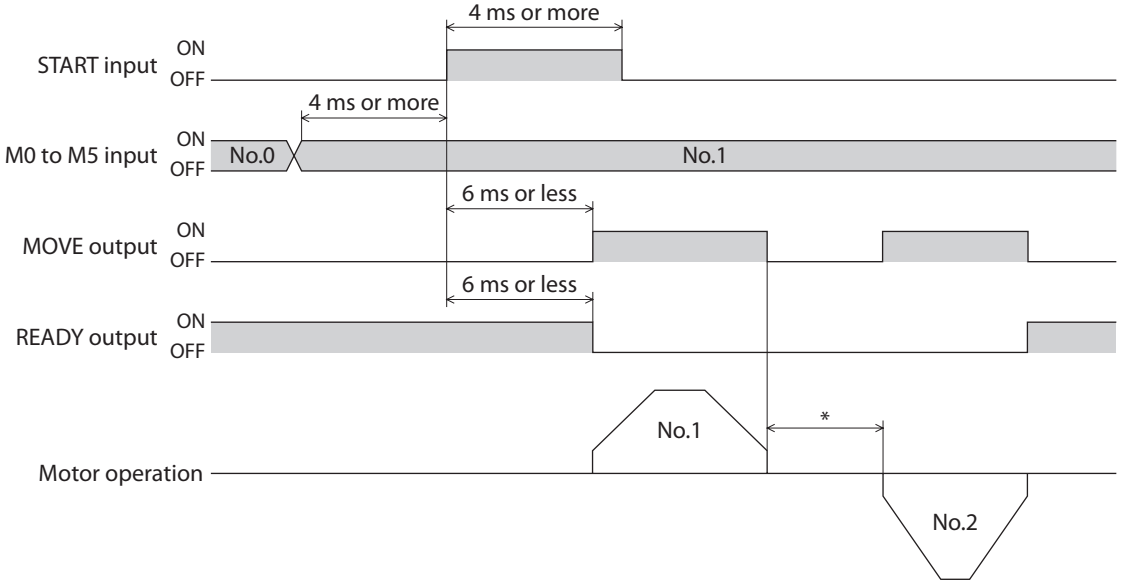
■ Single-motion operation (positioning operation)



■ Linked-motion operation (positioning operation)

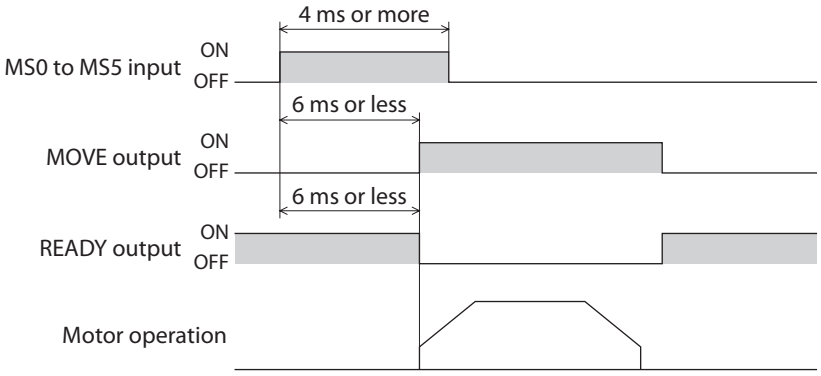


■ Linked-motion operation 2 (positioning operation)

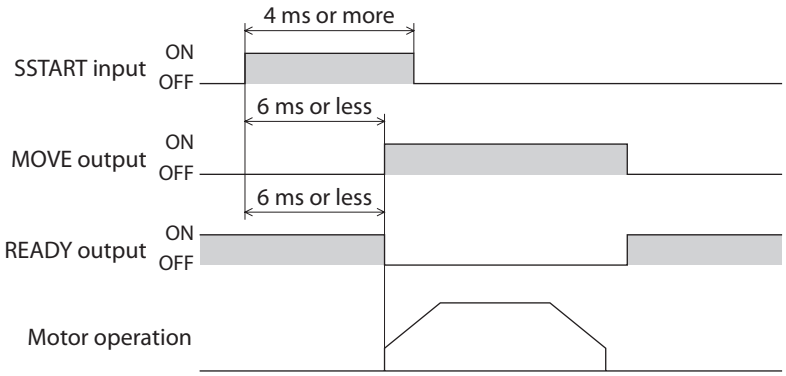


* This is the value of the dwell time to be set in operation data No.1.

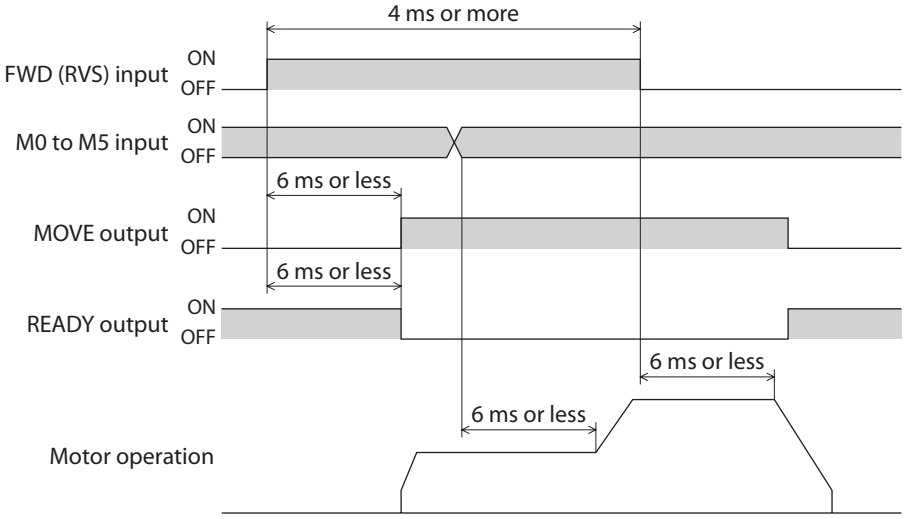
■ Direct positioning operation



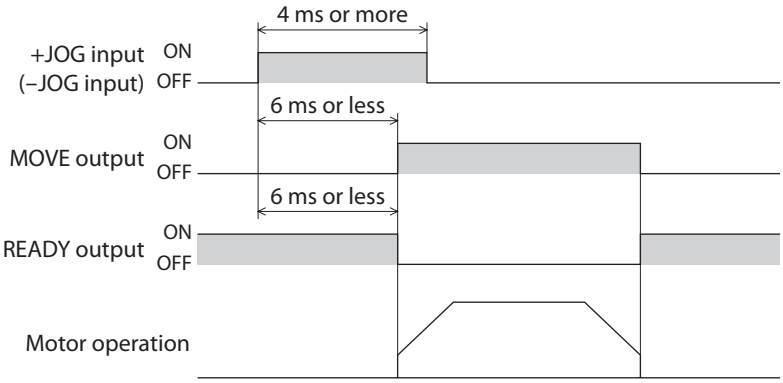
■ Sequential operation



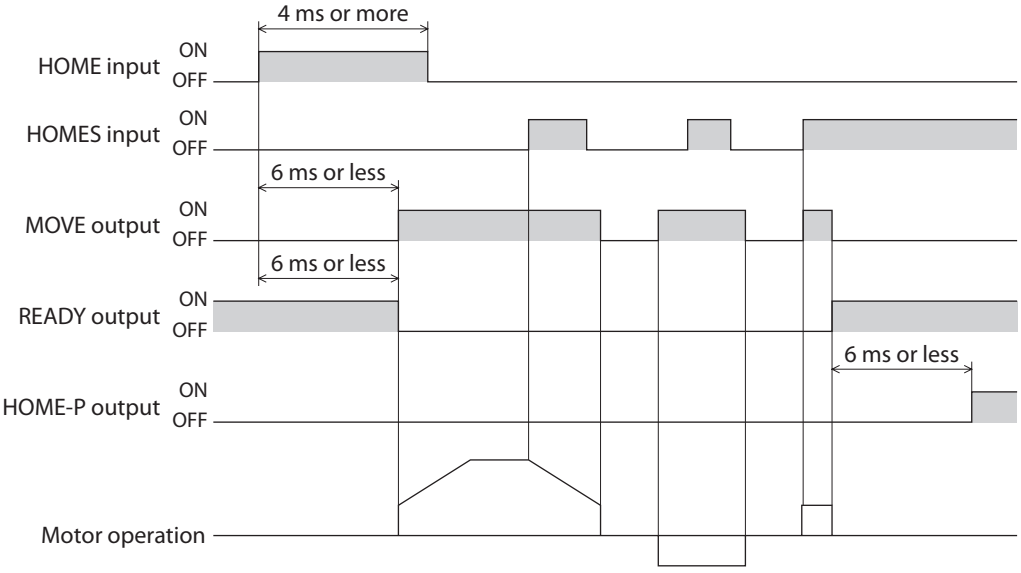
■ Continuous operation



■ JOG operation



■ Return-to-home operation



5 Method of control via Modbus RTU (RS-485 communication)

This part explains how to control from the master controller via RS-485 communication. The protocol for the RS-485 communication is the Modbus protocol.

◆Table of contents

1 Guidance

If you are new to the **RK Ⅱ** Series FLEX built-in controller type, read this section to understand the operating methods along with the operation flow.
This is an example how to operate the motor based on the operation data and parameters set to the driver by the master controller.

STEP1 Check the installation and connection

↓

STEP2 Set the switches

↓

STEP3 Turn on the power and check the communication parameters

↓

STEP4 Cycle the power

Communication parameters will be enabled after the power is cycled.

↓

STEP5 Operate the motor

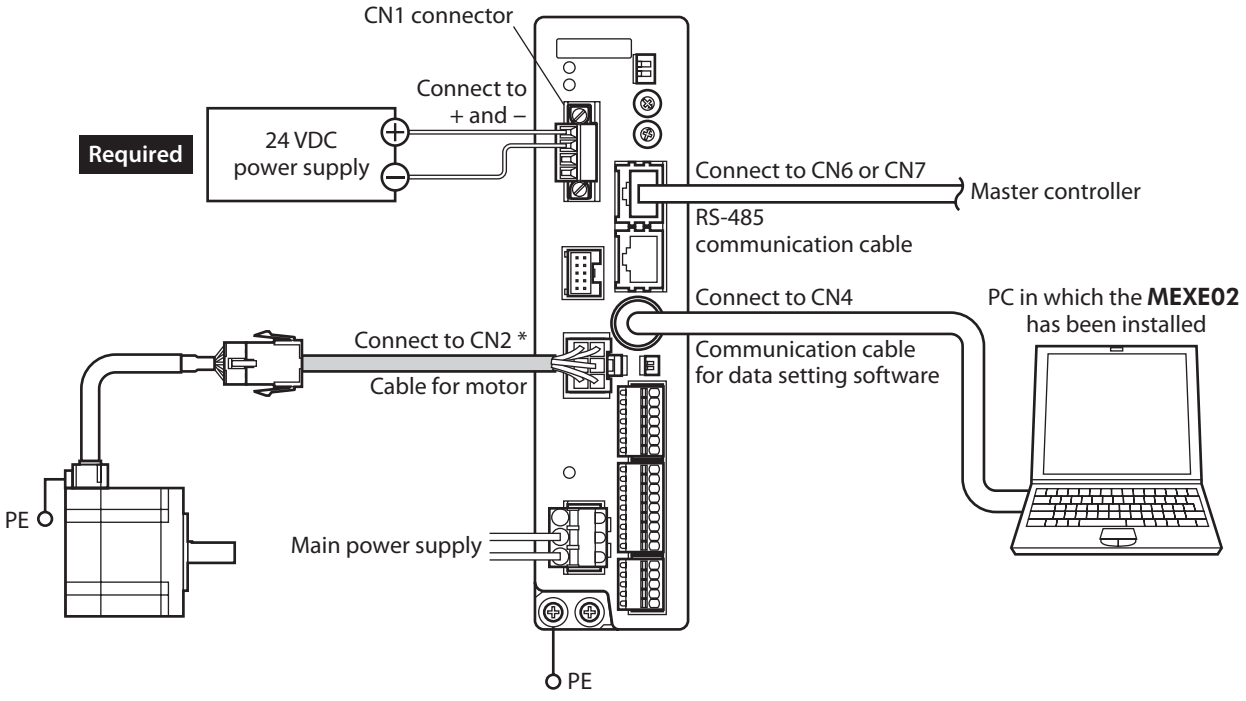
- **Operating condition**

Here, the motor is supposed to be operated under the following conditions.

- Number of connected driver: 1 unit
- Address number: 1
- Transmission rate: 115,200 bps
- Termination resistor: Enable

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

STEP 1 Check the installation and connection

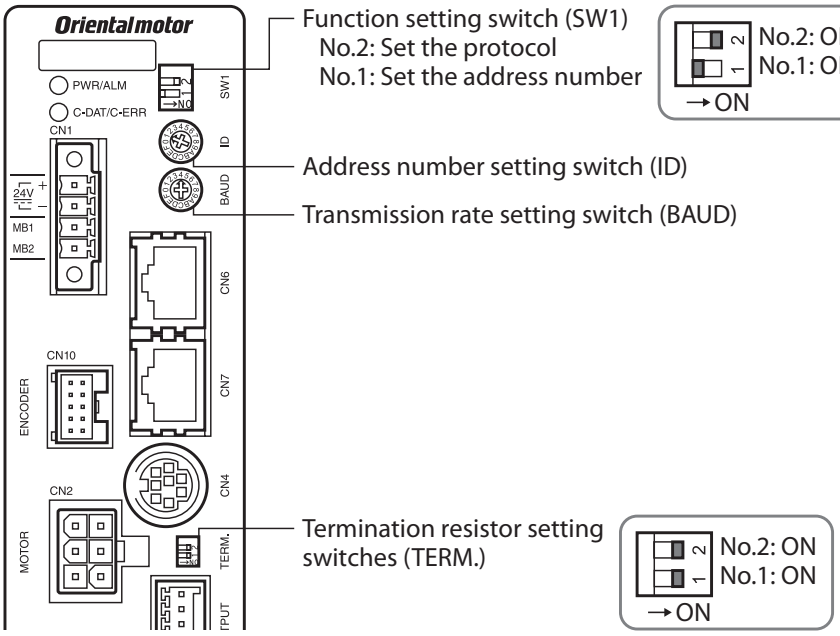


* Cables represented in gray color are supplied with the product or sold separately.

STEP 2 Set the switches

Set the following with the switches. The status becomes as shown in the following figures after setting.

Setting item	Switch	Factory setting
Protocol: Modbus protocol	SW1-No.2: ON	OFF
Address number: 1	SW1-No.1: OFF ID: 1	SW1-No.1: OFF ID: 0
Transmission rate: 115,200 bps	BAUD: 4	7
Termination resistor: ON	TERM.-Nos.1 and 2: ON	OFF



STEP 3 Turn on the power and set the communication parameters

Set the following communication parameters using the **MEXE02**.
If communication cannot be established, review the communication parameters of the driver.

MEXE02 tree view	Parameter name
Communication	• Communication parity [initial value: 1 (even number)]
	• Communication stop bit [initial value: 0 (1 bit)]
	• Transmission waiting time [initial value: 100 (10.0 ms)]

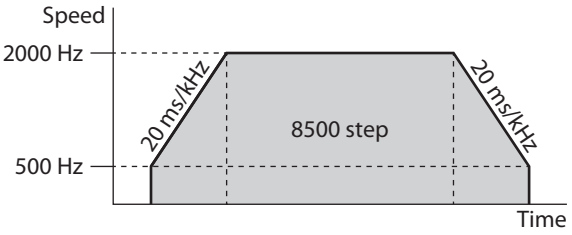
memo Set the transmission interval of frames sent from the master to be longer than the silent interval of the driver. When the transmission rate is 115,200 bps, the silent interval of the driver is 2.5 ms.

STEP 4 Cycle the power

The switches of the driver and the communication parameters are enabled after the power is cycled.

STEP 5 Send a message and operate the motor

As an example, here is a description how to execute the following positioning operation.



1. Send the following five queries and set the operation data.

• Operation type of the operation data No.0

Field name		Data	Description
Slave address		01h	Slave address 1
Function code		06h	Write to a holding register
Data	Register address (upper)	05h	Operation mode No.0 (0501h)
	Register address (lower)	01h	
	Write value (upper)	00h	Incremental (0000h)
	Write value (lower)	00h	
Error check (lower)		D8h	Calculation result of CRC-16
Error check (upper)		C6h	

• Position of the operation data No.0

Field name		Data	Description
Slave address		01h	Slave address 1
Function code		06h	Write to a holding register
Data	Register address (upper)	04h	Position No.0 (0401h)
	Register address (lower)	01h	
	Write value (upper)	21h	8500 step (2134h)
	Write value (lower)	34h	
Error check (lower)		C0h	Calculation result of CRC-16
Error check (upper)		BDh	

• Operating speed of the operation data No.0

Field name		Data	Description
Slave address		01h	Slave address 1
Function code		06h	Write to a holding register
Data	Register address (upper)	04h	Operating speed No.0 (0481h)
	Register address (lower)	81h	
	Write value (upper)	07h	2000 Hz (07D0h)
	Write value (lower)	D0h	
Error check (lower)		DBh	Calculation result of CRC-16
Error check (upper)		7Eh	

• Acceleration of the operation data No.0

Field name		Data	Description
Slave address		01h	Slave address 1
Function code		06h	Write to a holding register
Data	Register address (upper)	06h	Acceleration No.0 (0601h)
	Register address (lower)	01h	
	Write value (upper)	4Eh	20 ms/kHz (4E20h)
	Write value (lower)	20h	
Error check (lower)		ECh	Calculation result of CRC-16
Error check (upper)		FAh	

• Deceleration of the operation data No.0

Field name		Data	Description
Slave address		01h	Slave address 1
Function code		06h	Write to a holding register
Data	Register address (upper)	06h	Deceleration No.0 (0681h)
	Register address (lower)	81h	
	Write value (upper)	4Eh	20 ms/kHz (4E20h)
	Write value (lower)	20h	
Error check (lower)		EDh	Calculation result of CRC-16
Error check (upper)		12h	

2. Send the following two queries and execute operation.

• START input ON (operation data No.0 operation start)

Field name		Data	Description
Slave address		01h	Slave address 1
Function code		06h	Write to a holding register
Data	Register address (upper)	00h	Driver input command (007Dh)
	Register address (lower)	7Dh	
	Write value (upper)	00h	START ON (0008h)
	Write value (lower)	08h	
Error check (lower)		18h	Calculation result of CRC-16
Error check (upper)		14h	

• START input OFF

Field name		Data	Description
Slave address		01h	Slave address 1
Function code		06h	Write to a holding register
Data	Register address (upper)	00h	Driver input command (007Dh)
	Register address (lower)	7Dh	
	Write value (upper)	00h	START OFF (0000h)
	Write value (lower)	00h	
Error check (lower)		19h	Calculation result of CRC-16
Error check (upper)		D2h	

3. Confirm that the motor rotates without any problem.

STEP 6 Were you able to operate the motor properly?

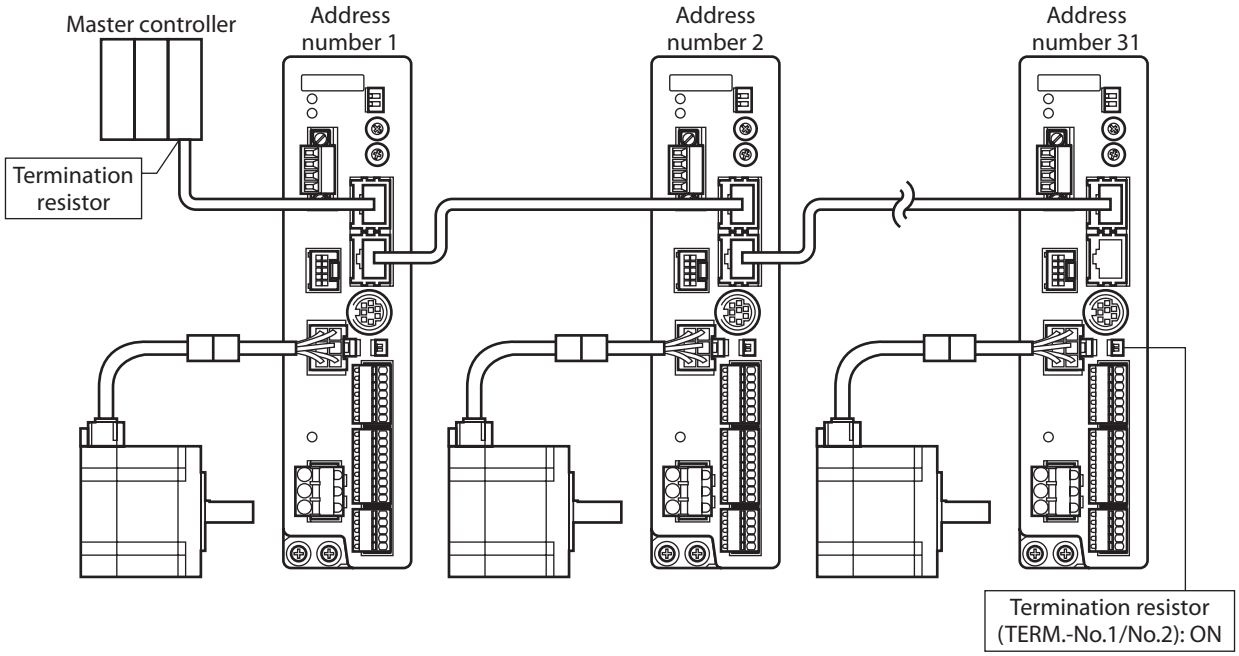
How did it go? Were you able to operate the motor properly? If the motor does not function, check the following points:

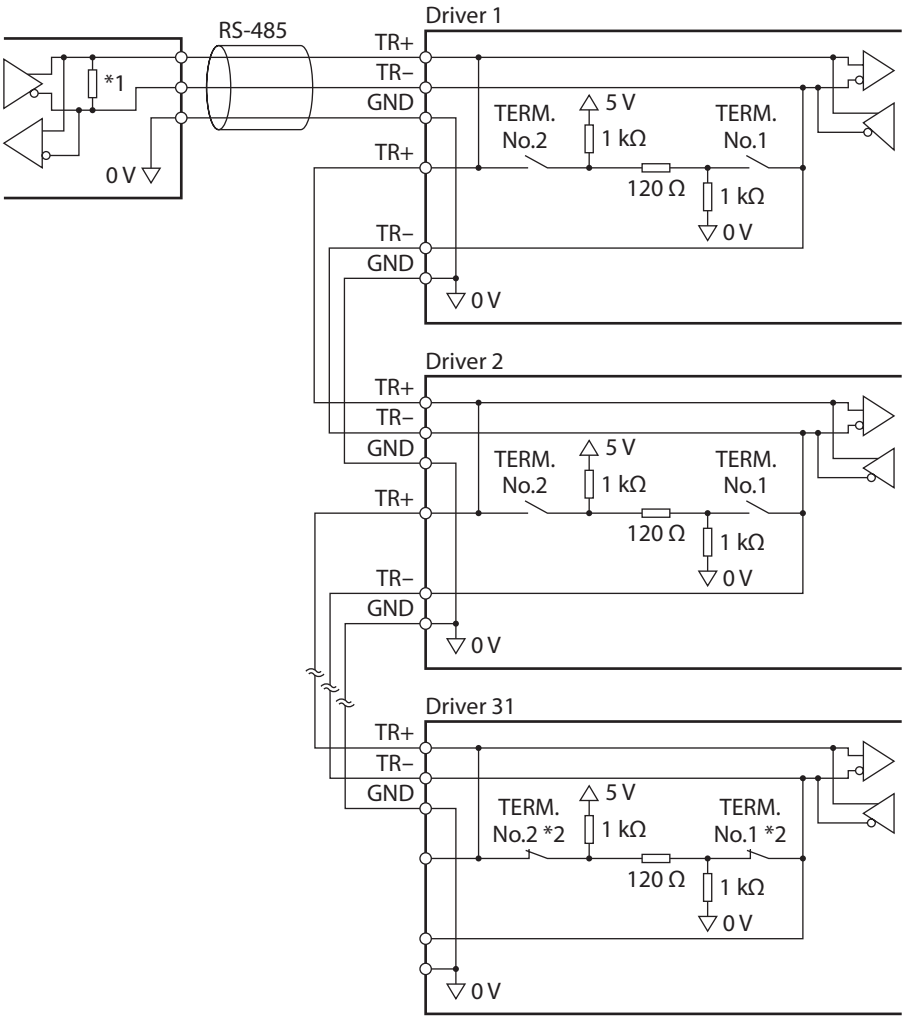
- Is any alarm present?
- Are the power supply, motor and RS-485 communication cable connected securely?
- Are the slave address, transmission rate and termination resistor set correctly?
- Is the C-DAT/C-ERR LED turned off? Or is it lit in red? (A communication error has occurred)

2 Communication specifications

Electrical characteristics	In conformance with EIA-485, straight cable Use a shielded 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.
Communication mode	Half duplex, Asynchronous mode (data: 8 bits, stop bit: 1 bit/2 bits, parity: none/even number/odd number)
Transmission rate	Selectable from 9600 bps, 19200 bps, 38400 bps, 57600 bps and 115,200 bps.
Protocol	Modbus RTU mode
Connection pattern	Up to 31 drivers can be connected to one master controller.

■ Connection example

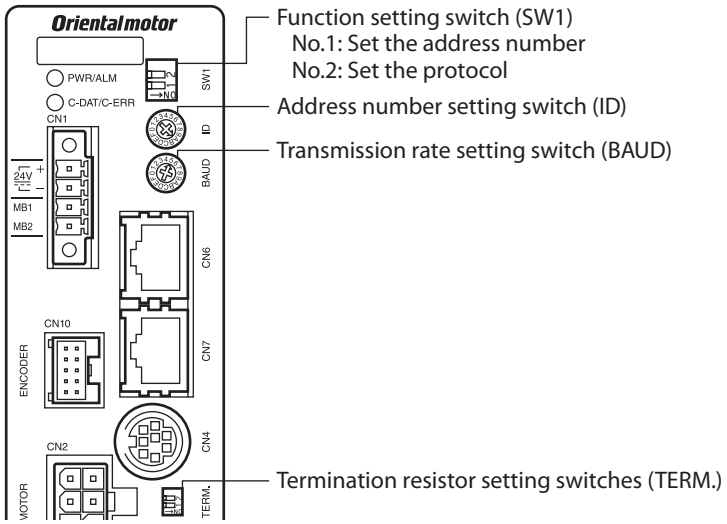




*1 Termination resistor 120 Ω

*2 Turn the termination resistor (TERM.-No.1 and No.2) to ON.

3 Setting the switches



memo Be sure to turn off the driver 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.

■ Protocol

Set the SW1-No.2 of the function setting switch to ON. The Modbus protocol is selected.

Factory setting OFF

SW1-No.2	Protocol
ON	Modbus RTU protocol
OFF	Connect to the network converter

■ Address number (slave address)

Set the address number (slave address) using the address number setting switch (ID) and SW1-No.1 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 ID: 0, SW1-No.1: OFF

ID	SW1-No.1	Address number (slave address)
0	OFF	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

ID	SW1-No.1	Address number (slave address)
0	ON	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 (BAUD).
The transmission rate to be set should be the same as the transmission rate of the master controller.

Factory setting 7

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

memo Do not set BAUD to positions 5 to F.

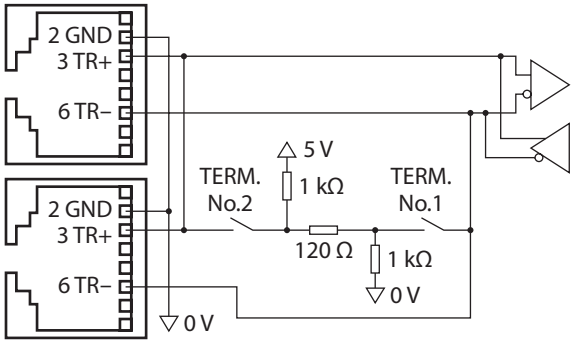
■ Termination resistor

Use a termination resistor for the driver located farthest away (position at end) from the master controller.
Turn the termination resistor setting switch (TERM.-No.1 and No.2) ON to set the termination resistor for RS-485 communication (120 Ω).

Factory setting No.1 and No.2: Both OFF (termination resistor disabled)

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

memo If only one of No.1 or No.2 is turned ON, a communication error may occur.



4 Setting the RS-485 communication

Set parameters required to use via RS-485 communication beforehand.
When a parameter is changed, the timing to reflect the new value varies depending on the parameter. Refer to p.165 for the update timing of each parameter.

■ 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.

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Communication	Communication parity	Sets the parity for RS-485 communication.	0: None 1: Even number 2: Odd number	1
	Communication stop bit	Sets the stop bit for RS-485 communication.	0: 1 bit 1: 2 bit	0
	Transmission waiting time	Sets the transmission waiting time for RS-485 communication.	0 to 10000 (1=0.1 ms)	100

■ 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.

MEXE02 tree view	Parameter name	Description	Setting range	Initial value
Communication	Communication timeout	Sets the condition in which the communication timeout occurs in RS-485 communication. When setting to zero (0), the driver does not monitor the condition in which the communication timeout occurs.	0 to 10000 ms	0
	Communication error alarm	Sets the condition in which the RS-485 communication error alarm generates. The communication error alarm generates after the RS-485 communication error has occurred by the number of times set here.	1 to 10	3

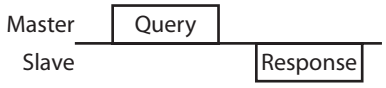
5 Communication mode and communication timing

5-1 Communication mode

Modbus protocol communication is based on the single-master/multiple-slave method.
Only the master can issue a query (command). Each slave executes the process requested by query and returns a response message.
The **RK Ⅱ** Series supports only the RTU mode as a transmission mode. It does not support the ASCII mode.
Under this protocol, messages are sent in one of two methods.

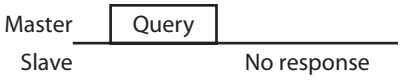
- **Unicast mode**

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



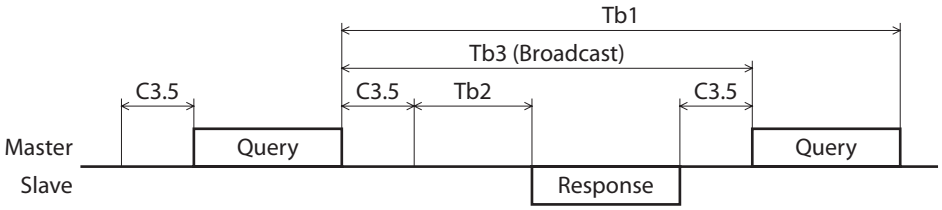
- **Broadcast mode**

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.



5-2 Communication timing

The communication time monitored by the driver and the communication timing of the master are as follows.



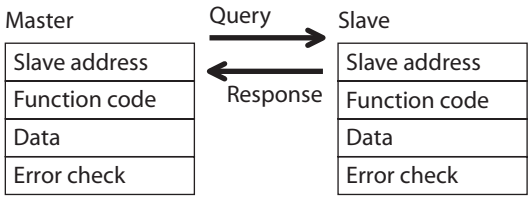
Character	Name	Description
Tb1	Communication timeout	Intervals between received messages are monitored. If no message could be received after the time set in the "communication timeout" parameter, a RS-485 communication timeout alarm generates.
Tb2	Transmission waiting time	The time after the slave switches 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) + transmission waiting time (Tb2).
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. See the following table for transmission waiting time.

Transmission waiting time of the "silent interval"

Transmission rate (bps)	Silent interval	Frame interval of master (reference)
9600	4 ms or more	5.0 ms or more
19200, 38400 57600, 115,200	2.5 ms or more	3.0 ms or more

6 Message

The message format is shown below.



6-1 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 **RK Ⅱ** Series FLEX built-in controller type are as follows.

Function code	Description	Message length		Broadcast
		Query	Response	
03h	Read from a holding register(s).	8	7 to 37	Impossible
06h	Write to a holding register.	8	8	Possible
08h	Perform diagnosis.	8	8	Impossible
10h	Write to multiple holding registers.	11 to 41	8	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.

- **Example of CRC-16 calculation**

The following table is a calculation example when setting the slave address of the first byte to 02h and setting the function code of the second byte to 07h.
The result of actual CRC-16 calculation is calculated including the data on and after the third byte.

Description	Result	Overflow digit
Default value in CRC register FFFFh	1111 1111 1111 1111	–
First byte 02h	0000 0000 0000 0010	–
XOR with default value FFFFh	1111 1111 1111 1101	–
First shift to right	0111 1111 1111 1110	1
XOR with A001h	1010 0000 0000 0001 1101 1111 1111 1111	–
Second shift to right	0110 1111 1111 1111	1
XOR with A001h	1010 0000 0000 0001 1100 1111 1111 1110	–
Third shift to right	0110 0111 1111 1111	0
Fourth shift to right	0011 0011 1111 1111	1
XOR with A001h	1010 0000 0000 0001 1001 0011 1111 1110	–
Fifth shift to right	0100 1001 1111 1111	0
Sixth shift to right	0010 0100 1111 1111	1
XOR with A001h	1010 0000 0000 0001 1000 0100 1111 1110	–
Seventh shift to right	0100 0010 0111 1111	0
Eighth shift to right	0010 0001 0011 1111	1
XOR with A001h	1010 0000 0000 0001 1000 0001 0011 1110	–
XOR with next byte 07h	0000 0000 0000 0111 1000 0001 0011 1001	–
First shift to right	0100 0000 1001 1100	1
XOR with A001h	1010 0000 0000 0001 1110 0000 1001 1101	–
Second shift to right	0111 0000 0100 1110	1
XOR with A001h	1010 0000 0000 0001 1101 0000 0100 1111	–
Third shift to right	0110 1000 0010 0111	1
XOR with A001h	1010 0000 0000 0001 1100 1000 0010 0110	–
Fourth shift to right	0110 0100 0001 0011	0
Fifth shift to right	0011 0010 0000 1001	1
XOR with A001h	1010 0000 0000 0001 1001 0010 0000 1000	–
Sixth shift to right	0100 1001 0000 0100	0
Seventh shift to right	0010 0100 1000 0010	0
Eighth shift to right	0001 0010 0100 0001	0
Result of CRC-16	0001 0010 0100 0001	–

6-2 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 corresponding to the function code.

■ 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 driver.

■ 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.

Function code in the query	Exception response
03h	83h
06h	86h
08h	88h
10h	90h

- **Example of exception response**

Master

Slave address		01h
Function code		10h
Data	Register address (upper)	02h
	Register address (lower)	42h
	Number of registers (upper)	00h
	Number of registers (lower)	02h
	Number of data bytes	04h
	Value written to register address (upper)	00h
	Value written to register address (lower)	00h
	Value written to register address+1 (upper)	03h
	Value written to register address+1 (lower)	20h
Error check (lower)		6Eh
Error check (upper)		0Eh

Query →

← Response

Slave

Slave address		01h
Function code		90h
Data	Exception code	04h
Error check (lower)		4Dh
Error check (upper)		C3h

- **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** • Non-volatile 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)

7 Function code

This chapter explains the function codes supported by the **RK Ⅱ** Series drivers.
Note that the function code cannot be executed if function codes other than those introduced here are sent.

7-1 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 holding registers
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	

7-2 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	

7-3 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 for diagnosis.

- **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	Same as query
Error check (upper)		9Eh	

7-4 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	

8 Register address list

All data used by the driver 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.

8-1 Operation commands

Commands related to motor operation. Operation commands are not saved in the non-volatile memory.

Register address		Name	Description	READ/ WRITE	Setting range
Dec	Hex				
48	0030h	Group (upper)	Sets the group address.	R/W	–1: No group specification (Group send is not performed) 1 to 31: Group address (Address number of parent slave)
49	0031h	Group (lower)			
124	007Ch	Driver input command (upper)	Sets the input command to the driver.	R/W	See next page.
125	007Dh	Driver input command (lower)			
126	007Eh	Driver output command (upper)	Read the output status of the driver.	R	See next page.
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. See p.174 for group details. The initial value is –1. When performing read or write for setting a group, set the upper and lower simultaneously.

Address (Hex)	Description of address *							
0030h	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
	[FFFFh]							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	[FFFFh]							

* [ ]: Initial value

Address (Hex)	Description of address *							
0031h	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
	1 to 31: Sets the address number for the group send. [FFFFh]							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	1 to 31: Sets the address number for the group send. [FFFFh]							

* [ ]: Initial value

■ Driver input command (007Ch/007Dh)

These are the driver input signals that can be accessed via RS-485 communication. See p.55 for each input signal.

Address (Hex)	Description of address							
007Ch	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
	–	–	–	–	–	–	–	–
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	–	–	–	–	–	–	–	–

Address (Hex)	Description of address *							
007Dh	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
	NET-IN15 [RVS]	NET-IN14 [FWD]	NET-IN13 [–JOG]	NET-IN12 [+JOG]	NET-IN11 [SSTART]	NET-IN10 [MS2]	NET-IN9 [MS1]	NET-IN8 [MS0]
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	NET-IN7 [ALM-RST]	NET-IN6 [FREE]	NET-IN5 [STOP]	NET-IN4 [HOME]	NET-IN3 [START]	NET-IN2 [M2]	NET-IN1 [M1]	NET-IN0 [M0]

* [ ]: Initial value

■ Driver output command (007Eh/007Fh)

These are the driver output signals that can be received via RS-485 communication. See p.60 for each output signal.

Address (Hex)	Description of address							
007Eh	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
	–	–	–	–	–	–	–	–
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	–	–	–	–	–	–	–	–

Address (Hex)	Description of address *							
007Fh	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
	NET-OUT15 [STEPOUT]	NET-OUT14 [Not used]	NET-OUT13 [MOVE]	NET-OUT12 [TIM]	NET-OUT11 [AREA3]	NET-OUT10 [AREA2]	NET-OUT9 [AREA1]	NET-OUT8 [S-BSY]
	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]

* [ ]: Initial value

8-2 Maintenance commands

These commands are used to reset alarms and warnings. They are also used to execute the batch processing for the non-volatile memory. All commands can be written (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 and feedback 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 operation data and parameters saved in the non-volatile memory, to their defaults.	
399	018Fh	All data initialization (lower)		
400	0190h	Batch NV memory read (upper)	Reads the parameters saved in the non-volatile 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 non-volatile memory. The non-volatile memory can be rewritten approximately 100,000 times.	
403	0193h	Batch NV memory write (lower)		
404	0194h	Encoder counter preset (upper)	Update the encoder counter to the value of the "encoder preset value" parameter.	
405	0195h	Encoder counter preset (lower)		

■ 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.
- The **OPX-2A** is in other modes than the test mode or copy mode.
- The **MEXE02** is in other status than downloading, I/O test, test operation or teaching function.

Shows the driver status before and after executing the configuration.

Item	Configuration is ready to execute	Configuration is executing	Configuration is completed
PWR LED	Lit	Lit	Based on the driver condition.
ALM LED	OFF	OFF	
Electromagnetic brake	Hold/release	Hold	
Motor excitation	Excitation/no excitation	No excitation	
Output signals	Allowed	Indeterminable	Allowed
Input signals		Not allowed	
Sensor input			
Command position	Based on the driver condition.	Indeterminable	0
Feedback position			0 *
Encoder counter			Continues the count before performing the configuration.

* This may not become zero (0) depending on the load or operation condition.

memo The correct monitor value may not return even when the monitor is executed while executing the configuration.

8-3 Monitor commands

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.	00h to FFh
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)		

Register address		Name	Description	Range
Dec	Hex			
152	0098h	Warning record 1 (upper)	Monitors the warning records.	00h to FFh
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.	00h to FFh
173	00ADh	Communication error code (lower)		
174	00AEh	Communication error code record 1 (upper)	Monitors the communication error records 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)		

Register address		Name	Description	Range
Dec	Hex			
186	00BAh	Communication error code record 7 (upper)	Monitors the communication error records that have occurred in the past.	00h to FFh
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)		
204	00CCh	Feedback position (upper)	Monitors the feedback position. The value that was applied the resolution having set by the electronic gears is shown. *	−2,147,483,648 to 2,147,483,647 step
205	00CDh	Feedback position (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)		
212	00D4h	Direct I/O and electromagnetic brake status (upper)	Monitors the each direct I/O signal and electromagnetic brake status.	See next table.
213	00D5h	Direct I/O and electromagnetic brake status (lower)		
256	0100h	Encoder counter (upper)	Monitors the encoder counter. *	−2,147,483,648 to 2,147,483,647 step
257	0101h	Encoder counter (lower)		

* When an encoder is equipped.

■ Direct I/O and electromagnetic brake status (00D4h/00D5h)

Address (Hex)		bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
00D4h	Upper	–	–	–	–	–	–	–	MB
	Lower	–	–	OUT5	OUT4	OUT3	OUT2	OUT1	OUT0
00D5h	Upper	–	–	–	–	SLIT	HOMES	–LS	+LS
	Lower	IN7	IN6	IN5	IN4	IN3	IN2	IN1	IN0

8-4 Parameter R/W commands

Write or read parameters. All commands can be read and written (READ/WRITE). For details on parameters, see p.107 and later.
When a parameter is changed, the timing to reflect the new value varies depending on the parameter. See the following four types.

Update timing		Description
A	Effective immediately	Executes the recalculation and setup as soon as the parameter is written.
B	Effective after stopping the operation	Executes the recalculation and setup after stopping the operation.
C	Effective after executing the configuration or cycling the power	Executes the recalculation and setup after executing the configuration, or effective after cycling the 24 VDC power supply
D	Effective after cycling the power	Executes the recalculation and setup after cycling the 24 VDC power supply again.

In this document, each update timing is represented in an alphabetical character.

■ Operation data

Register address		Name	Setting range	Initial value	Effective (p.165)
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)	−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)	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)	0: Incremental (INC) 1: Absolute (ABS)	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)	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)	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *1 *2	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)			
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)	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)	0 to 50000 (1=0.001 s)	0	

*1 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).

*2 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	Setting range	Initial value	Effective (p.165)
Dec	Hex				
512	0200h	STOP input action (upper)	0: Immediate stop 1: Deceleration stop 2: Immediate stop+current OFF 3: Deceleration stop+current OFF	1	A
513	0201h	STOP input action (lower)			
514	0202h	Hardware overtravel (upper)	0: Disable 1: Enable	1	
515	0203h	Hardware overtravel (lower)			
516	0204h	Overtravel action (upper)	0: Immediate stop 1: Deceleration stop	0	
517	0205h	Overtravel action (lower)			
522	020Ah	AREA1 positive direction position (upper)	−8,388,608 to 8,388,607 step	0	
523	020Bh	AREA1 positive direction position (lower)			
524	020Ch	AREA1 negative direction position (upper)			
525	020Dh	AREA1 negative direction position (lower)			
526	020Eh	AREA2 positive direction position (upper)			
527	020Fh	AREA2 positive direction position (lower)			
528	0210h	AREA2 negative direction position (upper)			
529	0211h	AREA2 negative direction position (lower)			
530	0212h	AREA3 positive direction position (upper)			
531	0213h	AREA3 positive direction position (lower)			
532	0214h	AREA3 negative direction position (upper)			
533	0215h	AREA3 negative direction position (lower)			
534	0216h	Minimum ON time for MOVE output (upper)	0 to 255 ms	0	
535	0217h	Minimum ON time for MOVE output (lower)			
536	0218h	±LS logic level (upper)	0: Normally open 1: Normally closed	0	C
537	0219h	±LS logic level (lower)			
538	021Ah	HOMES logic level (upper)			
539	021Bh	HOMES logic level (lower)			
540	021Ch	SLIT logic level (upper)			
541	021Dh	SLIT logic level (lower)			
4096	1000h	MS0 operation No. selection (upper)	0 to 63	0	B
4097	1001h	MS0 operation No. selection (lower)			
4098	1002h	MS1 operation No. selection (upper)		1	
4099	1003h	MS1 operation No. selection (lower)			
4100	1004h	MS2 operation No. selection (upper)		2	
4101	1005h	MS2 operation No. selection (lower)			
4102	1006h	MS3 operation No. selection (upper)		3	
4103	1007h	MS3 operation No. selection (lower)			
4104	1008h	MS4 operation No. selection (upper)		4	
4105	1009h	MS4 operation No. selection (lower)			
4106	100Ah	MS5 operation No. selection (upper)		5	
4107	100Bh	MS5 operation No. selection (lower)			
4108	100Ch	HOME-P output function selection (upper)	0: Home output 1: Return-to-home complete output	0	A
4109	100Dh	HOME-P output function selection (lower)			
576	0240h	RUN current (upper)	0 to 1000 (1=0.1%)	1000	
577	0241h	RUN current (lower)			

Register address		Name	Setting range	Initial value	Effective (p.165)
Dec	Hex				
578	0242h	STOP current (upper)	0 to 600 (1=0.1%)	500	A
579	0243h	STOP current (lower)			
586	024Ah	Speed filter (upper)	0 to 200 ms	1	B
587	024Bh	Speed filter (lower)			
588	024Ch	Moving average time (upper)			
589	024Dh	Moving average time (lower)			
4128	1020h	Filter selection (upper)	0: Speed filter 1: Moving average filter	0	C
4129	1021h	Filter selection (lower)			
640	0280h	Common acceleration (upper)	1 to 1,000,000 * (1=0.001 ms/kHz or 1=0.001 s)	30000	B
641	0281h	Common acceleration (lower)			
642	0282h	Common deceleration (upper)			
643	0283h	Common deceleration (lower)			
644	0284h	Starting speed (upper)	0 to 1,000,000 Hz	100	
645	0285h	Starting speed (lower)			
646	0286h	JOG operating speed (upper)	1 to 1,000,000 Hz	1000	
647	0287h	JOG operating speed (lower)			
648	0288h	JOG acceleration/deceleration rate (upper)	1 to 1,000,000 * (1=0.001 ms/kHz or 1=0.001 s)	30000	
649	0289h	JOG acceleration/deceleration rate (lower)			
650	028Ah	JOG starting speed (upper)	0 to 1,000,000 Hz	100	
651	028Bh	JOG starting speed (lower)			
652	028Ch	Acceleration/deceleration type (upper)	0: Common 1: Separate	1	
653	028Dh	Acceleration/deceleration type (lower)			
654	028Eh	Acceleration/deceleration unit (upper)	0: ms/kHz 1: s	0	C
655	028Fh	Acceleration/deceleration unit (lower)			
4168	1048h	JOG travel amount (upper)	1 to 8,388,607 step	1	B
4169	1049h	JOG travel amount (lower)			
704	02C0h	Home-seeking mode (upper)	0: 2-sensor mode 1: 3-sensor mode	1	
705	02C1h	Home-seeking mode (lower)			
706	02C2h	Operating speed of home-seeking (upper)	1 to 1,000,000 Hz	1000	
707	02C3h	Operating speed of home-seeking (lower)			
708	02C4h	Acceleration/deceleration of home-seeking (upper)	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)	1 to 1,000,000 Hz	100	
711	02C7h	Starting speed of home-seeking (lower)			
712	02C8h	Position offset of home-seeking (upper)	–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)	0: Negative direction 1: Positive direction	1	
715	02CBh	Starting direction of home-seeking (lower)			
716	02CCh	SLIT detection with home-seeking (upper)	0: Disable 1: Enable	0	
717	02CDh	SLIT detection with home-seeking (lower)			
718	02CEh	TIM signal detection with home-seeking (upper)	0: Disable 1: TIM signal enable 2: ZSG signal enable	0	
719	02CFh	TIM signal detection with home-seeking (lower)			

Register address		Name	Setting range	Initial value	Effective (p.165)
Dec	Hex				
4192	1060h	Backward steps in 2-sensor mode home-seeking (upper)	0 to 32767 step	200	B
4193	1061h	Backward steps in 2-sensor mode home-seeking (lower)			
776	0308h	Return-to-home incomplete alarm (upper)	0: Disable 1: Enable	0	C
777	0309h	Return-to-home incomplete alarm (lower)			
832	0340h	Overheat warning (upper)	40 to 85 °C (104 to 185 °F)	85	A
833	0341h	Overheat warning (lower)			
838	0346h	Overvoltage warning (upper)	120 to 450 V	435	
839	0347h	Overvoltage warning (lower)			
840	0348h	Undervoltage warning (upper)	120 to 280 V	120	
841	0349h	Undervoltage warning (lower)			
896	0380h	Electronic gear A (upper)	1 to 65535	1	C
897	0381h	Electronic gear A (lower)			
898	0382h	Electronic gear B (upper)			
899	0383h	Electronic gear B (lower)			
900	0384h	Motor rotation direction (upper)	0: Positive direction=CCW 1: Positive direction=CW	1	
901	0385h	Motor rotation direction (lower)			
902	0386h	Software overtravel (upper)	0: Disable 1: Enable	1	A
903	0387h	Software overtravel (lower)			
904	0388h	Positive software limit (upper)	–8,388,608 to 8,388,607 step	8,388,607	
905	0389h	Positive software limit (lower)			
906	038Ah	Negative software limit (upper)		–8,388,608	
907	038Bh	Negative software limit (lower)			
908	038Ch	Preset position (upper)		0	
909	038Dh	Preset position (lower)			
910	038Eh	Wrap setting (upper)	0: Disable 1: Enable	0	C
911	038Fh	Wrap setting (lower)			
912	0390h	Wrap setting range (upper)	1 to 8,388,607 step	500	
913	0391h	Wrap setting range (lower)			
4288	10C0h	Encoder resolution (upper)	100 to 10000 P/R	500	
4289	10C1h	Encoder resolution (lower)			
4290	10C2h	Encoder preset value (upper)	–8,388,608 to 8,388,607 step	0	A
4291	10C3h	Encoder preset value (lower)			
4292	10C4h	Stepout detection (upper)	0: Disable 1: Enable	0	C
4293	10C5h	Stepout detection (lower)			
4294	10C6h	Stepout detection band (upper)	1 to 3600 (1=0.1°)	72	A
4295	10C7h	Stepout detection band (lower)			
4296	10C8h	Stepout detection action (upper)	0: No operation 1: Warning 2: Alarm	0	
4297	10C9h	Stepout detection action (lower)			
960	03C0h	Data setter speed display (upper)	0: Signed 1: Absolute value	0	
961	03C1h	Data setter speed display (lower)			
962	03C2h	Data setter edit (upper)	0: Disable 1: Enable	1	
963	03C3h	Data setter edit (lower)			
4352	1100h	IN0 input function selection (upper)	See table on p.173.	3: HOME	C
4353	1101h	IN0 input function selection (lower)			

Register address		Name	Setting range	Initial value	Effective (p.165)
Dec	Hex				
4354	1102h	IN1 input function selection (upper)	See table on p.173.	4: START	C
4355	1103h	IN1 input function selection (lower)			
4356	1104h	IN2 input function selection (upper)		48: M0	
4357	1105h	IN2 input function selection (lower)			
4358	1106h	IN3 input function selection (upper)		49: M1	
4359	1107h	IN3 input function selection (lower)			
4360	1108h	IN4 input function selection (upper)		50: M2	
4361	1109h	IN4 input function selection (lower)			
4362	110Ah	IN5 input function selection (upper)		16: FREE	
4363	110Bh	IN5 input function selection (lower)			
4364	110Ch	IN6 input function selection (upper)		18: STOP	
4365	110Dh	IN6 input function selection (lower)			
4366	110Eh	IN7 input function selection (upper)		24: ALM-RST	
4367	110Fh	IN7 input function selection (lower)			
4384	1120h	IN0 input logic level setting (upper)	0: Normally open 1: Normally closed	0	
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)			
4392	1128h	IN4 input logic level setting (upper)			
4393	1129h	IN4 input logic level setting (lower)			
4394	112Ah	IN5 input logic level setting (upper)			
4395	112Bh	IN5 input logic level setting (lower)			
4396	112Ch	IN6 input logic level setting (upper)			
4397	112Dh	IN6 input logic level setting (lower)			
4398	112Eh	IN7 input logic level setting (upper)			
4399	112Fh	IN7 input logic level setting (lower)			
4416	1140h	OUT0 output function selection (upper)	See table on p.173.	70: HOME-P	
4417	1141h	OUT0 output function selection (lower)			
4418	1142h	OUT1 output function selection (upper)		68: MOVE	
4419	1143h	OUT1 output function selection (lower)			
4420	1144h	OUT2 output function selection (upper)		73: AREA1	
4421	1145h	OUT2 output function selection (lower)			
4422	1146h	OUT3 output function selection (upper)		67: READY	
4423	1147h	OUT3 output function selection (lower)			
4424	1148h	OUT4 output function selection (upper)		66: WNG	
4425	1149h	OUT4 output function selection (lower)			
4426	114Ah	OUT5 output function selection (upper)		65: ALM	
4427	114Bh	OUT5 output function selection (lower)			
4448	1160h	NET-IN0 input function selection (upper)	See table on p.173.	48: M0	
4449	1161h	NET-IN0 input function selection (lower)			
4450	1162h	NET-IN1 input function selection (upper)		49: M1	
4451	1163h	NET-IN1 input function selection (lower)			

Register address		Name	Setting range	Initial value	Effective (p.165)
Dec	Hex				
4452	1164h	NET-IN2 input function selection (upper)	See table on p.173.	50: M2	C
4453	1165h	NET-IN2 input function selection (lower)			
4454	1166h	NET-IN3 input function selection (upper)		4: START	
4455	1167h	NET-IN3 input function selection (lower)			
4456	1168h	NET-IN4 input function selection (upper)		3: HOME	
4457	1169h	NET-IN4 input function selection (lower)			
4458	116Ah	NET-IN5 input function selection (upper)		18: STOP	
4459	116Bh	NET-IN5 input function selection (lower)			
4460	116Ch	NET-IN6 input function selection (upper)		16: FREE	
4461	116Dh	NET-IN6 input function selection (lower)			
4462	116Eh	NET-IN7 input function selection (upper)		24: ALM-RST	
4463	116Fh	NET-IN7 input function selection (lower)			
4464	1170h	NET-IN8 input function selection (upper)		8: MS0	
4465	1171h	NET-IN8 input function selection (lower)			
4466	1172h	NET-IN9 input function selection (upper)		9: MS1	
4467	1173h	NET-IN9 input function selection (lower)			
4468	1174h	NET-IN10 input function selection (upper)		10: MS2	
4469	1175h	NET-IN10 input function selection (lower)			
4470	1176h	NET-IN11 input function selection (upper)		5: SSTART	
4471	1177h	NET-IN11 input function selection (lower)			
4472	1178h	NET-IN12 input function selection (upper)		6: +JOG	
4473	1179h	NET-IN12 input function selection (lower)			
4474	117Ah	NET-IN13 input function selection (upper)		7: –JOG	
4475	117Bh	NET-IN13 input function selection (lower)			
4476	117Ch	NET-IN14 input function selection (upper)		1: FWD	
4477	117Dh	NET-IN14 input function selection (lower)			
4478	117Eh	NET-IN15 input function selection (upper)		2: RVS	
4479	117Fh	NET-IN15 input function selection (lower)			
4480	1180h	NET-OUT0 output function selection (upper)	See table on p.173.	48: M0_R	
4481	1181h	NET-OUT0 output function selection (lower)			
4482	1182h	NET-OUT1 output function selection (upper)		49: M1_R	
4483	1183h	NET-OUT1 output function selection (lower)			
4484	1184h	NET-OUT2 output function selection (upper)		50: M2_R	
4485	1185h	NET-OUT2 output function selection (lower)			
4486	1186h	NET-OUT3 output function selection (upper)		4: START_R	
4487	1187h	NET-OUT3 output function selection (lower)			
4488	1188h	NET-OUT4 output function selection (upper)		70: HOME-P	
4489	1189h	NET-OUT4 output function selection (lower)			

Register address		Name	Setting range	Initial value	Effective (p.165)
Dec	Hex				
4490	118Ah	NET-OUT5 output function selection (upper)	See table on p.173.	67: READY	C
4491	118Bh	NET-OUT5 output function selection (lower)			
4492	118Ch	NET-OUT6 output function selection (upper)		66: WNG	
4493	118Dh	NET-OUT6 output function selection (lower)			
4494	118Eh	NET-OUT7 output function selection (upper)		65: ALM	
4495	118Fh	NET-OUT7 output function selection (lower)			
4496	1190h	NET-OUT8 output function selection (upper)		80: S-BSY	
4497	1191h	NET-OUT8 output function selection (lower)			
4498	1192h	NET-OUT9 output function selection (upper)		73: AREA1	
4499	1193h	NET-OUT9 output function selection (lower)			
4500	1194h	NET-OUT10 output function selection (upper)		74: AREA2	
4501	1195h	NET-OUT10 output function selection (lower)			
4502	1196h	NET-OUT11 output function selection (upper)		75: AREA3	
4503	1197h	NET-OUT11 output function selection (lower)			
4504	1198h	NET-OUT12 output function selection (upper)		72: TIM	
4505	1199h	NET-OUT12 output function selection (lower)			
4506	119Ah	NET-OUT13 output function selection (upper)		68: MOVE	
4507	119Bh	NET-OUT13 output function selection (lower)			
4508	119Ch	NET-OUT14 output function selection (upper)		0: Not used	
4509	119Dh	NET-OUT14 output function selection (lower)			
4510	119Eh	NET-OUT15 output function selection (upper)		83: STEPOUT	
4511	119Fh	NET-OUT15 output function selection (lower)			
4608	1200h	Communication timeout (upper)	0: Not monitored 1 to 10000 ms	0	A
4609	1201h	Communication timeout (lower)			
4610	1202h	Communication error alarm (upper)	1 to 10 times	3	
4611	1203h	Communication error alarm (lower)			

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

■ Setting range for function selection parameters

● IN input function selection parameter

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

● OUT output function selection parameter

0: Not used	10: MS2_R	35: R3	45: R13	61: –LS_R	74: AREA2
1: FWD_R	11: MS3_R	36: R4	46: R14	62: HOMES_R	75: AREA3
2: RVS_R	12: MS4_R	37: R5	47: R15	63: SLIT_R	80: S-BSY
3: HOME_R	13: MS5_R	38: R6	48: M0_R	65: ALM	82: MPS
4: START_R	16: FREE_R	39: R7	49: M1_R	66: WNG	83: STEPOUT
5: SSTART_R	17: AWO_R	40: R8	50: M2_R	67: READY	84: OH
6: +JOG_R	18: STOP_R	41: R9	51: M3_R	68: MOVE	85: ZSG
7: –JOG_R	32: R0	42: R10	52: M4_R	70: HOME-P	86: MBC
8: MS0_R	33: R1	43: R11	53: M5_R	72: TIM	
9: MS1_R	34: R2	44: R12	60: +LS_R	73: AREA1	

● NET-IN input function selection parameter

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

● NET-OUT output function selection parameter

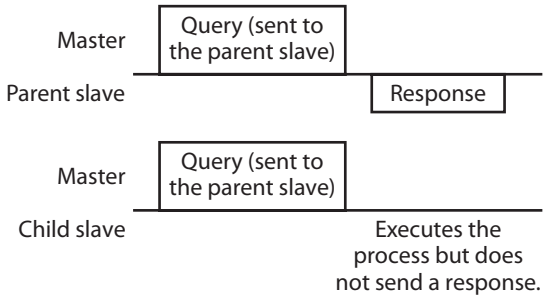
0: Not used	10: MS2_R	35: R3	45: R13	61: –LS_R	74: AREA2
1: FWD_R	11: MS3_R	36: R4	46: R14	62: HOMES_R	75: AREA3
2: RVS_R	12: MS4_R	37: R5	47: R15	63: SLIT_R	80: S-BSY
3: HOME_R	13: MS5_R	38: R6	48: M0_R	65: ALM	82: MPS
4: START_R	16: FREE_R	39: R7	49: M1_R	66: WNG	83: STEPOUT
5: SSTART_R	17: AWO_R	40: R8	50: M2_R	67: READY	84: OH
6: +JOG_R	18: STOP_R	41: R9	51: M3_R	68: MOVE	85: ZSG
7: –JOG_R	32: R0	42: R10	52: M4_R	70: HOME-P	86: MBC
8: MS0_R	33: R1	43: R11	53: M5_R	72: TIM	
9: MS1_R	34: R2	44: R12	60: +LS_R	73: AREA1	

9 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**

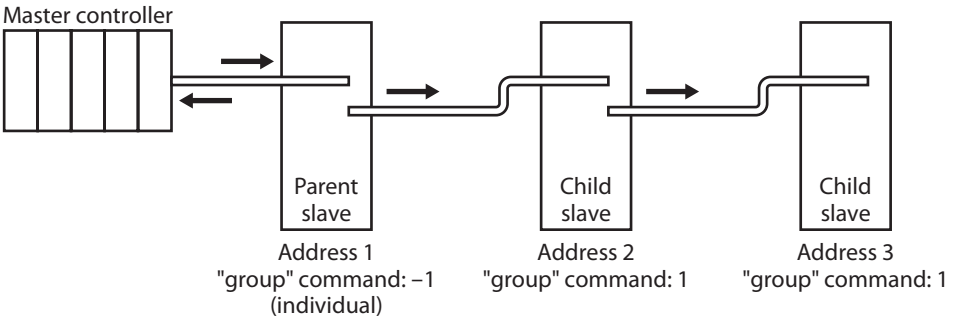
  Use a "group" command to set a group address to each child slave. Change the group in the unicast mode.
  When performing read or write for setting a group, set the upper and lower simultaneously.

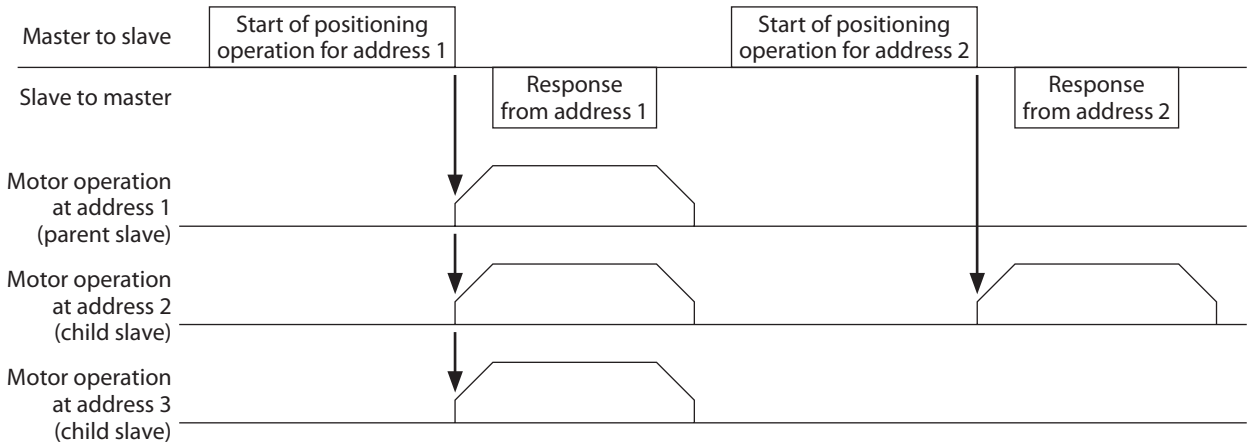
Resister address		Name	Description	READ/ WRITE	Setting range
Dec	Hex				
48	0030h	Group (upper)	Sets the group address.	R/W	–1: No group specification (Group send is not performed) 1 to 31: Group address (Address number of parent slave)
49	0031h	Group (lower)			

memo Since the group setting is not saved in the non-volatile memory even when the "batch NV memory write" executes, the group setting will be cleared when turning the driver power OFF.

■ Function code to execute in a group send

Function code	Function
10h	Writing to multiple holding registers




Master to slave
Start of positioning operation for address 1
Start of positioning operation for address 2
Slave to master
Response from address 1
Response from address 2
Motor operation at address 1 (parent slave)
Motor operation at address 2 (child slave)
Motor operation at address 3 (child slave)

10 Example for setting of the operation

10-1 Positioning operation

As an example, here is a description how to execute the following positioning operation. For details of positioning operatin, refer to p.79.
This section explains data writing using the function code "10h," and remote I/O writing using the function code "06h."

- **Setting example**
  - Slave address: 1
  - Position (travel amount): 1000 step
  - Operating speed: 5000 Hz
- **Operating procedure**

1. Send the following query to set the position (travel amount) of the operation data No.0 to 1000 steps

Query

Field name		Data	Description
Slave address		01h	Slave address
Function code		10h	Write to multiple holding registers
Data	Register address (upper)	04h	Register address to start writing from =Position No.0 (0400h)
	Register address (lower)	00h	
	Number of registers (upper)	00h	Number of registers to be written
	Number of registers (lower)	02h	
	Number of data bytes	04h	Twice the number of registers in the query
	Value written to register address (upper)	00h	Value written to register address =1000 step (0000 03E8h)
	Value written to register address (lower)	00h	
	Value written to register address+1 (upper)	03h	
	Value written to register address+1 (lower)	E8h	
Error check (lower)		C1h	Calculation result of CRC-16
Error check (upper)		D1h	

Response

Field name		Data	Description
Slave address		01h	Same as query
Function code		10h	
Data	Register address (upper)	04h	
	Register address (lower)	00h	
	Number of registers (upper)	00h	
	Number of registers (lower)	02h	
Error check (lower)		40h	Calculation result of CRC-16
Error check (upper)		F8h	

2. Send the following query to set the operating speed of the operation data No.0 to 5000 Hz.

Query

Field name		Data	Description
Slave address		01h	Slave address
Function code		10h	Write to multiple holding registers
Data	Register address (upper)	04h	Register address to start writing from =Operating speed No.0 (0480h)
	Register address (lower)	80h	
	Number of registers (upper)	00h	Number of registers to be written
	Number of registers (lower)	02h	
	Number of data bytes	04h	Twice the number of registers in the query
	Value written to register address (upper)	00h	Value written to register address =5000 Hz (0000 1388h)
	Value written to register address (lower)	00h	
	Value written to register address+1 (upper)	13h	
	Value written to register address+1 (lower)	88h	
Error check (lower)		C4h	Calculation result of CRC-16
Error check (upper)		59h	

Response

Field name		Data	Description
Slave address		01h	Same as query
Function code		10h	
Data	Register address (upper)	04h	
	Register address (lower)	80h	
	Number of registers (upper)	00h	
	Number of registers (lower)	02h	
Error check (lower)		41h	Calculation result of CRC-16
Error check (upper)		10h	

3. Send the following query to turn START ON.
   Positioning operation is started.

Query

Field name		Data	Description
Slave address		01h	Slave address
Function code		06h	Write to a holding register
Data	Register address (upper)	00h	Register address to be written =Driver input command (007Dh)
	Register address (lower)	7Dh	
	Value write (upper)	00h	Value written to register address =START ON (0008h)
	Value write (lower)	08h	
Error check (lower)		18h	Calculation result of CRC-16
Error check (upper)		14h	

Response

Field name		Data	Description
Slave address		01h	Same as query
Function code		06h	
Data	Register address (upper)	00h	
	Register address (lower)	7Dh	
	Value write (upper)	00h	
	Value write (lower)	08h	
Error check (lower)		18h	Calculation result of CRC-16
Error check (upper)		14h	

4. When positioning operation is started, send the following query to turn START OFF again.

Query

Field name		Data	Description
Slave address		01h	Slave address
Function code		06h	Writing to a holding register
Data	Register address (upper)	00h	Register address to be written =Driver input command (007Dh)
	Register address (lower)	7Dh	
	Value write (upper)	00h	Value written to register address =START OFF (0000h)
	Value write (lower)	00h	
Error check (lower)		19h	Calculation result of CRC-16
Error check (upper)		D2h	

Response

Field name		Data	Description
Slave address		01h	Same as query
Function code		06h	
Data	Register address (upper)	00h	
	Register address (lower)	7Dh	
	Value write (upper)	00h	
	Value write (lower)	00h	
Error check (lower)		19h	Calculation result of CRC-16
Error check (upper)		D2h	

10-2 Continuous operation

As an example, here is a description how to execute the following continuous operation. For details of continuous operatin, refer to p.95.
This section explains data writing using the function code "10h," and remote I/O writing using the function code "06h."

- **Setting example**
  - Slave address : 1
  - Rotation direction: Forward (FWD)
  - Operating speed: 5000 Hz
- **Operating procedure**

1. Send the following query to set the operating speed of the operation data No.0 to 5000 Hz.

Query

Field name		Data	Description
Slave address		01h	Slave address
Function code		10h	Write to multiple holding registers
Data	Register address (upper)	04h	Register address to start writing from =Operating speed No.0 (0480h)
	Register address (lower)	80h	
	Number of registers (upper)	00h	Number of registers to be written
	Number of registers (lower)	02h	
	Number of data bytes	04h	Twice the number of registers in the query
	Value written to register address (upper)	00h	Value written to register address =5000 Hz (0000 1388h)
	Value written to register address (lower)	00h	
	Value written to register address+1 (upper)	13h	
	Value written to register address+1 (lower)	88h	
Error check (lower)		C4h	Calculation result of CRC-16
Error check (upper)		59h	

Response

Field name		Data	Description
Slave address		01h	Same as query
Function code		10h	
Data	Register address (upper)	04h	
	Register address (lower)	80h	
	Number of registers (upper)	00h	
	Number of registers (lower)	02h	
Error check (lower)		41h	Calculation result of CRC-16
Error check (upper)		10h	

2. Send the following query to turn FWD ON.
   Continuous operation is started.

Query

Field name		Data	Description
Slave address		01h	Slave address
Function code		06h	Write to a holding register
Data	Register address (upper)	00h	Register address to be written =Driver input command (007Dh)
	Register address (lower)	7Dh	
	Value write (upper)	40h	Value written to register address =FWD ON (4000h)
	Value write (lower)	00h	
Error check (lower)		28h	Calculation result of CRC-16
Error check (upper)		12h	

Response

Field name		Data	Description
Slave address		01h	Same as query
Function code		06h	
Data	Register address (upper)	00h	
	Register address (lower)	7Dh	
	Value write (upper)	40h	
	Value write (lower)	00h	
Error check (lower)		28h	Calculation result of CRC-16
Error check (upper)		12h	

3. To stop continuous operation, send the following query to turn FWD OFF again.
   The motor decelerates to a stop.

Query

Field name		Data	Description
Slave address		01h	Slave address
Function code		06h	Write to a holding register
Data	Register address (upper)	00h	Register address to be written =Driver input command (007Dh)
	Register address (lower)	7Dh	
	Value write (upper)	00h	Value written to register address =FWD OFF (0000h)
	Value write (lower)	00h	
Error check (lower)		19h	Calculation result of CRC-16
Error check (upper)		D2h	

Response

Field name		Data	Description
Slave address		01h	Same as query
Function code		06h	
Data	Register address (upper)	00h	
	Register address (lower)	7Dh	
	Value write (upper)	00h	
	Value write (lower)	00h	
Error check (lower)		19h	Calculation result of CRC-16
Error check (upper)		D2h	

10-3 Return-to-home operation

As an example, here is a description how to execute the following return-to-home operation. For details of return-to-home operatin, refer to p.88.

- **Setting example**
  - Slave address : 1
  - Operation condition : Default
- **Operating procedure**

1. Send the following query to turn HOME ON.
   Return-to-home operation is started.

Query

Field name		Data	Description
Slave address		01h	Slave address
Function code		06h	Write to a holding register
Data	Register address (upper)	00h	Register address to be written =Driver input command (007Dh)
	Register address (lower)	7Dh	
	Value write (upper)	00h	Value written to register address =HOME ON (0010h)
	Value write (lower)	10h	
Error check (lower)		18h	Calculation result of CRC-16
Error check (upper)		1Eh	

Response

Field name		Data	Description
Slave address		01h	Same as query
Function code		06h	
Data	Register address (upper)	00h	
	Register address (lower)	7Dh	
	Value write (upper)	00h	
	Value write (lower)	10h	
Error check (lower)		18h	Calculation result of CRC-16
Error check (upper)		1Eh	

2. When return-to-home operation is started, send the following query to turn HOME OFF again.

Query

Field name		Data	Description
Slave address		01h	Slave address
Function code		06h	Write to a holding register
Data	Register address (upper)	00h	Register address to be written =Driver input command (007Dh)
	Register address (lower)	7Dh	
	Value write (upper)	00h	Value written to register address =HOME OFF (0000h)
	Value write (lower)	00h	
Error check (lower)		19h	Calculation result of CRC-16
Error check (upper)		D2h	

Response

Field name		Data	Description
Slave address		01h	Same as query
Function code		06h	
Data	Register address (upper)	00h	
	Register address (lower)	7Dh	
	Value write (upper)	00h	
	Value write (lower)	00h	
Error check (lower)		19h	Calculation result of CRC-16
Error check (upper)		D2h	

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.

11-1 Communication errors

A communication error record will be saved in the RAM. You can check the communication errors using the **MEXE02** or "communication error record" command via RS-485 communication.

memo The communication error record will be cleared once the driver 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.152
Command not yet defined	88h	An exception response (exception code 01h, 02h) was detected. See p.152.
Execution disable due to user I/F communication in progress	89h	An exception response (exception code 04h) was detected. See p.152.
Non-volatile memory processing in progress	8Ah	
Outside setting range	8Ch	An exception response (exception code 03h, 04h) was detected. See p.152.
Command execute disable	8Dh	An exception response (exception code 04h) was detected. See p.152.

11-2 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.

memo You can also clear the warning records by turning off the driver power.

■ Communication switch setting error (83h)

When setting the transmission rate setting switch (BAUD) to positions 5 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.

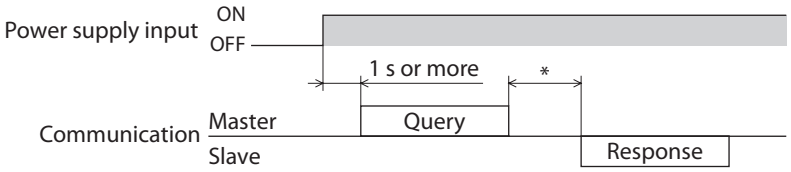
Description of error	Description
Warning	A warning generates when one RS-485 communication error (84h) has been detected. If normal reception occurs while the warning is present, the warning will be reset automatically.
Alarm	An alarm generates when a RS-485 communication error (84h) has been detected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

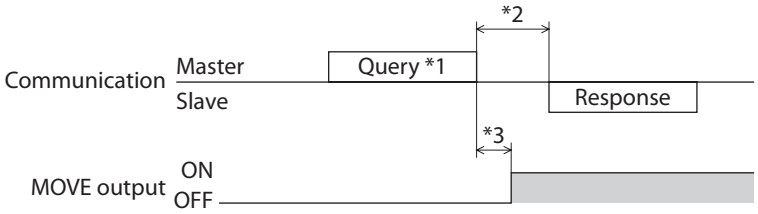
12 Timing charts

■ Communication start



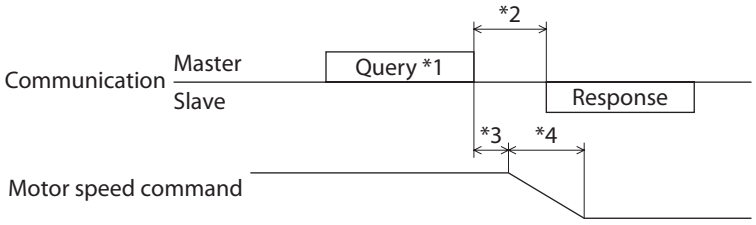
* Tb2 (transmission waiting time) + C3.5 (silent interval)

■ Operation start



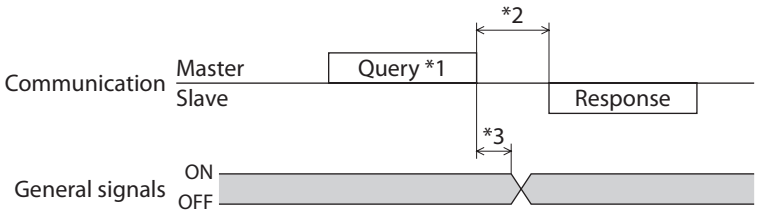
*1 A message including a query to start operation via RS-485 communication.
*2 Tb2 (transmission waiting time) + C3.5 (silent interval)
*3 C3.5 (silent interval) + 4 ms or less

■ Operation stop, speed change



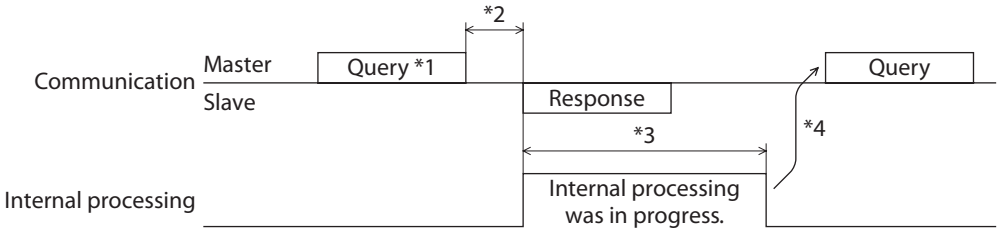
*1 A message including a query to stop operation and another to change the speed via RS-485 communication.
*2 Tb2 (transmission waiting time) + C3.5 (silent interval)
*3 The specific time varies depending on the command speed.
*4 The deceleration method to be applied at the time of stopping varies according 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)
*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)
*3 Internal processing time + 1 s or less
*4 Execute a query after the driver internal processing is completed.

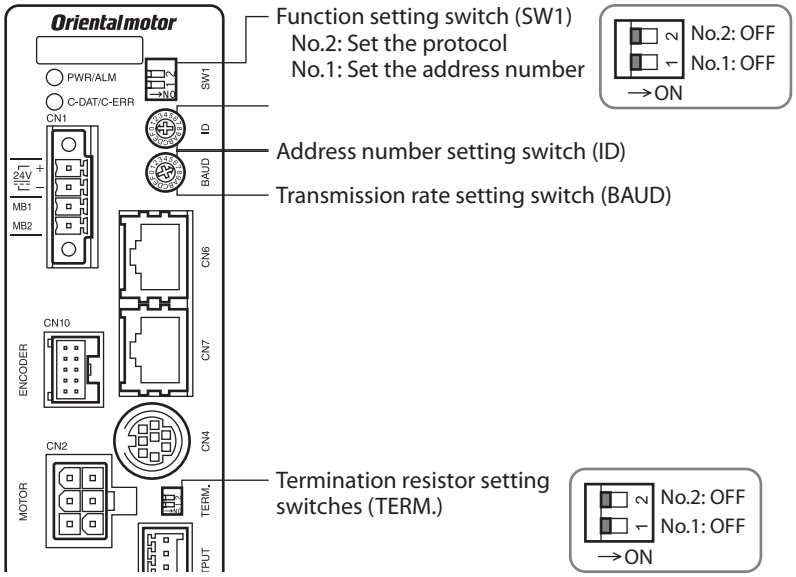
6 Method of control via industrial network

This part explains how to control via industrial network using the network converter (sold separately).

◆Table of contents

1 Setting the switches

The following figure shows the status of factory setting.



memo 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.

1-1 Protocol

Set the SW1-No.2 of the function setting switch to OFF. The network converter is selected.

Factory setting OFF

SW1-No.2	Protocol
ON	Modbus RTU protocol
OFF	Connect to the network converter

1-2 Address number (slave address)

Set the address number (slave address) using the address number setting switch (ID) and SW1-No.1 of the function setting switch. Make sure each address number (slave address) you set for each driver is unique.

Factory setting ID: 0, SW1-No.1: OFF (Address number 0)

■ CC-Link communication

Up to 12 units can be connected.

Address number (slave address)	0	1	2	3	4	5	6	7	8	9	10	11
ID	0	1	2	3	4	5	6	7	8	9	A	B
SW1-No.1	OFF											
Connection mode	6 axes connection mode						12 axes connection mode					

■ MECHATROLINK communication

Up to 16 units can be connected.

Address number (slave address)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
ID	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
SW1-No.1	OFF															
Connection mode	8 axes connection mode								16 axes connection mode							

1-3 Transmission rate

Set the transmission rate to 625,000 bps using the transmission rate setting switch (BAUD).

Factory setting 7 (625,000 bps)

1-4 Termination resistor

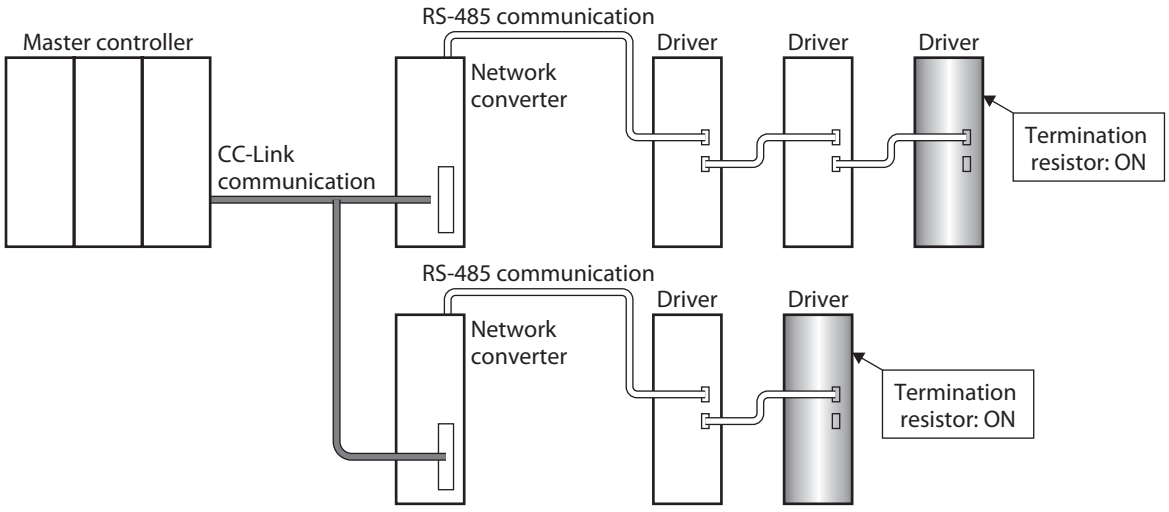
Use a termination resistor for the driver located farthest away (positioned at the end) from the network converter. Turn the termination resistor setting switch (TERM.-No.1 and No.2) ON to set the termination resistor for RS-485 communication (120 Ω).

Factory setting No.1 and No.2: Both OFF (termination resistor disabled)

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

memo If only one of No.1 or No.2 is turned ON, a communication error may occur.

For example, in the case of the following system, the termination resistor should be set to two drivers.



2 Method of control via CC-Link communication

2-1 Guidance

If you are new to the **RK Ⅱ** Series FLEX built-in controller type, read this section to understand the operating methods along with the operation flow.
This section explains how to control via CC-Link communication in combination with the network converter **NETC01-CC**.

STEP1 Installation and connection

↓

STEP2 Setting of network converter

↓

STEP3 Setting of driver

↓

STEP4 Cycle the power and check the LED — Parameters will be enabled after the power is cycled.

↓

STEP5 Operate the motor

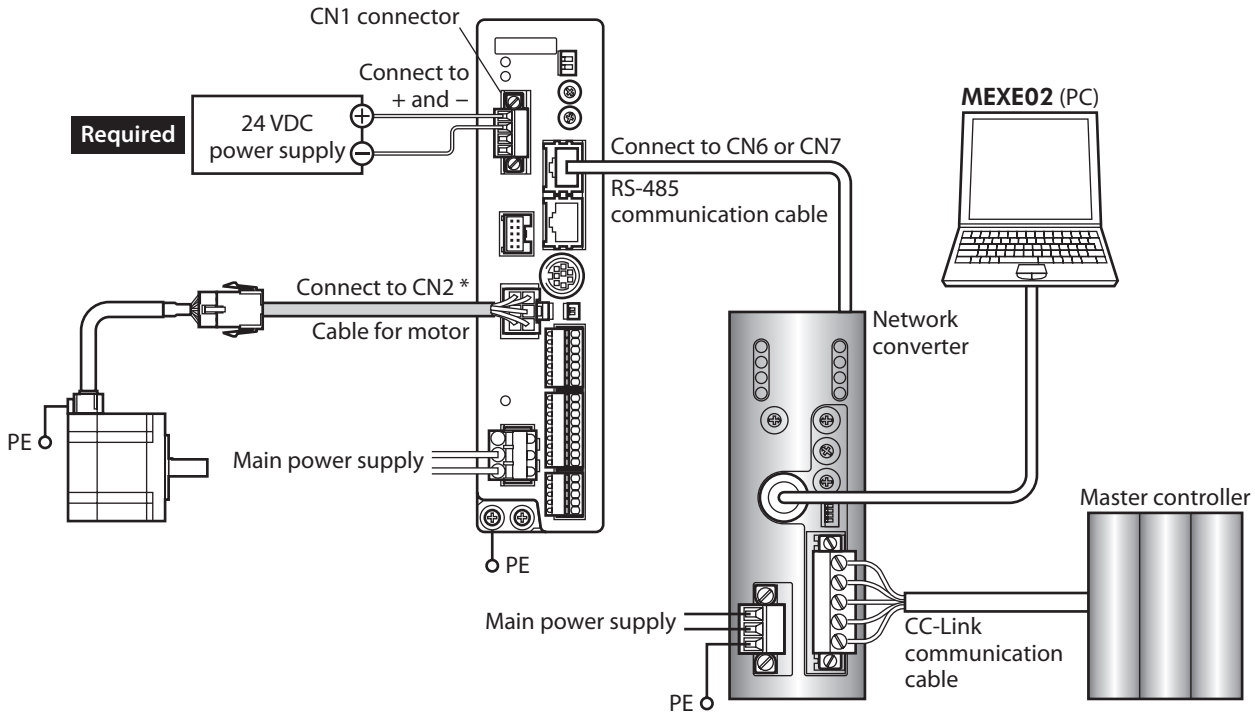
- **Operating condition**

Here, the motor is supposed to be operated under the following conditions.

- Number of connected driver: 1 unit
- Address number: 0
- Termination resistor: Set

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

STEP 1 Check the installation and connection

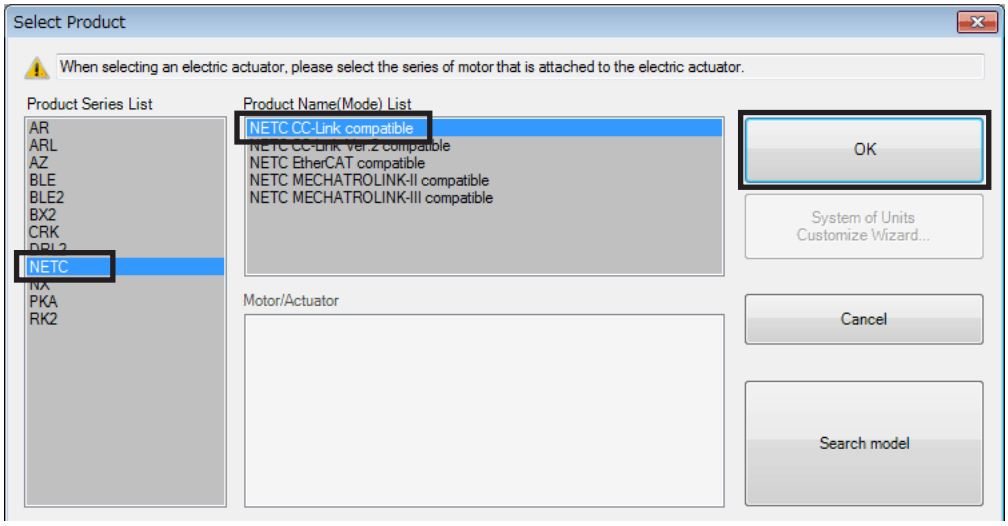


* Cables represented in gray color are supplied with the product or sold separately.

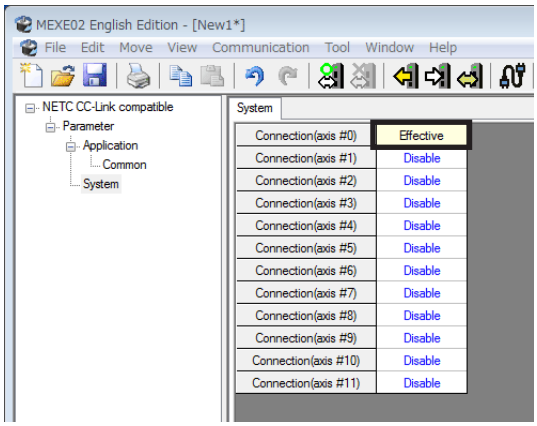
STEP 2 Set the parameters and switches of the network converter

■ Setting of parameters

1. Start the **MEXE02** and select the network converter.



2. Set the "Connection (axis #)" parameter of the driver connected to the network converter to "1: effective" using the **MEXE02**.



MEXE02 tree view	Parameter name	Description	Setting range	Initial value
System	Connection (axis #0) to Connection (axis #11)	Enables the address number of the driver connected to the network converter.	0: Disable 1: Effective	0

memo
- When multiple drivers are connected, set connection parameters as many as the drivers.
- "Connection (axis #)" parameters will be enabled after the power is cycled.
- Parameters can also be set via CC-Link communication.

■ Setting of switches

Set the following with the switches of the network converter. For the termination resistor, select "ON" (with termination resistor).

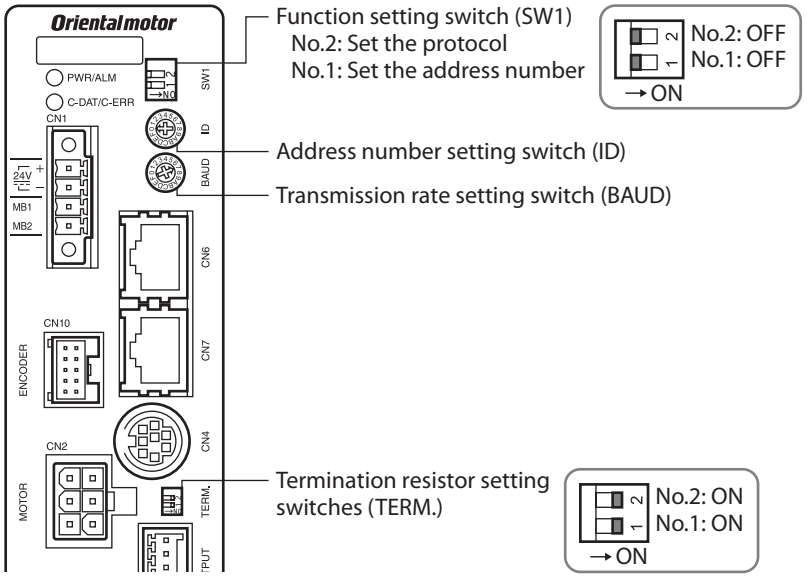
- CC-Link station number
- RS-485 transmission rate
- CC-Link baud rate
- Operation mode
- Termination resistor

memo For the setting method of the network converter, refer to the separate **NETC01-CC** USER MANUAL.

STEP 3 Set the switches of the driver

Set the following with the switches of the driver. For the protocol, select "OFF" (network converter).
The status becomes as shown in the following figures after setting.

Setting item	Switch	Factory setting
• Protocol: Network converter	SW1-No.2: OFF	OFF
• Address number: 0	SW1-No.1: OFF ID: 0	SW1-No.1: OFF ID: 0
• Termination resistor: ON	TERM.-Nos.1 and 2: ON	OFF
• Transmission rate: 625,000 bps	BAUD: 7	7

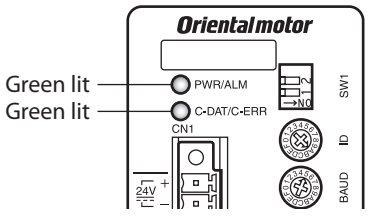


memo For the address number, set the one with the "Connection (axis #)" parameter of the network converter set to "1: effective."

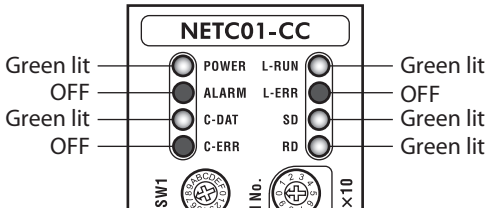
STEP 4 Cycle the power and check the LED

Check that the LED of the driver and network converter are as shown in the figure.

■ Driver



■ Network converter



- **When C-DAT/C-ERR LED of the driver or C-ERR LED (red) of the network converter is lit: Check the transmission rate or address number of RS-485 communication.**
- **When L-ERR (red) of the network converter is lit: Check the type of the CC-Link communication error.**

STEP 5 Perform continuous operation via remote I/O of CC-Link communication

Turn FWD of the address number 0 ON with the remote I/O of CC-Link communication. Continuous operation is started.
Initial values of the remote I/O are as follows.

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	FREE
RY7	NET-IN7	ALM-RST

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 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 in the driver or network converter?
- Are the power supply, motor, and RS-485 communication cable connected securely?
- Are the protocol, address number and termination resistor set correctly?
- Is the "connection (axis #)" parameter of the network converter set correctly?
- Is the C-DAT/C-ERR LED turned off? Or is it lit in red? (An communication error has occurred)
- Is the operation data set correctly?
- Is the motor excited? Or is the excitation setting correct?
- Are the driver parameters set correctly?
- Is the STOP input of the driver I/O turned ON?

2-2 Basic operation procedure

This section explains the execution methods of positioning operation and monitor function as a basic operation procedure.
As an example, here is an introduction of a procedure to control via CC-Link communication using the **NETC01-CC**.

■ Positioning operation

As an example, here is a description how to execute the following positioning operation.

- **Setting example**
  - Address number (slave address): 0
  - Operation data No.3
  - Position (travel amount): 3000 step
- **Operating procedure**

1. Send the following remote register to set the position (travel amount) of the operation data No.3 to 3000 steps.

Remote register of NETC01-CC

RWw (Master to **NETC01-CC**)	
Address No.	Description
RWwn0	Command code of monitor 0
RWwn1	Address number of monitor 0
RWwn2	Command code of monitor 1
RWwn3	Address number of monitor 1
RWwn4	Command code of monitor 2
RWwn5	Address number of monitor 2
RWwn6	Command code of monitor 3
RWwn7	Address number of monitor 3
RWwn8	Command code of monitor 4
RWwn9	Address number of monitor 4
RWwnA	Command code of monitor 5
RWwnB	Address number of monitor 5
RWwnC	Command code
RWwnD	Address number
RWwnE	Data (lower)
RWwnF	Data (upper)

Input example	Description
1203h *	Write to the position of operation data No.3
0	Address number 0
0BB8h	Position (travel smount) 3000 step

* From the list of p.226, we can see that the command code (WRITE) of "Position No.0" is 1200h. Here, the position is set to the operation data No.3, so the command code (WRITE) is 1200 + 3 = 1203h.

2. Send the following remote I/O to turn the command execution request "D-REQ" ON.
   The data set in the remote register is written.
   When the data writing is completed, the D-END is turned ON. (response)

Remote I/O of NETC01-CC

	Command RY (Master to **NETC01-CC**)		
	Device No.	Signal name	Description
NETC01-CC Control input/status output	RY(n+6)C	D-REQ	Command execution request

3. Check the D-END is turned ON, send the following remote I/O to turn the D-REQ OFF again.

Remote I/O of NETC01-CC

	Command RY (Master to **NETC01-CC**)		
	Device No.	Signal name	Description
NETC01-CC Control input/status output	RY(n+6)C	D-REQ	Command execution request

memo

- Be sure to turn D-REQ OFF again after turning it ON.
- When the data is written with the D-REQ, the data is saved in the RAM. If the data is saved in the non-volatile memory, execute the "Batch NV memory write" of the maintenance command.

4. Send the following remote I/O and turn M0 and M1 of the address number 0 and START ON.
   Positioning operation is started. If the motor rotates for 3000 steps, the positioning operation was successful.

Remote I/O of NETC01-CC (initial value)

	Command RY (Master to **NETC01-CC**)		
	Device No.	Signal name	Description
Address number "0"	RY(n)0	NET-IN0	M0
	RY(n)1	NET-IN1	M1
	RY(n)2	NET-IN2	M2
	RY(n)3	NET-IN3	START
	RY(n)4	NET-IN4	HOME
	RY(n)5	NET-IN5	STOP
	RY(n)6	NET-IN6	FREE
	RY(n)7	NET-IN7	ALM-RST
	RY(n)8	NET-IN8	MS0
	RY(n)9	NET-IN9	MS1
	RY(n)A	NET-IN10	MS2
	RY(n)B	NET-IN11	SSTART
	RY(n)C	NET-IN12	+JOG
	RY(n)D	NET-IN13	−JOG
	RY(n)E	NET-IN14	FWD
	RY(n)F	NET-IN15	RVS

■ Monitor function

In CC-Link communication, six types of data can be monitored at the same time.

● Setting example

- Address number (slave address): 0
- Monitor item: Present alarm

● Operating procedure

1. Send the following remote register to monitor the present alarm of the address number 0.

Remote register of NETC01-CC

RWw (Master to **NETC01-CC**)	
Address No.	Description
RWwn0	Command code of monitor 0
RWwn1	Address number of monitor 0
RWwn2	Command code of monitor 1
RWwn3	Address number of monitor 1
RWwn4	Command code of monitor 2
RWwn5	Address number of monitor 2
RWwn6	Command code of monitor 3
RWwn7	Address number of monitor 3
RWwn8	Command code of monitor 4
RWwn9	Address number of monitor 4
RWwnA	Command code of monitor 5
RWwnB	Address number of monitor 5
RWwnC	Command code
RWwnD	Address number
RWwnE	Data (lower)
RWwnF	Data (upper)

Input example	Description
2040h	Monitor present alarm
0	Address number 0

2. Send the following remote I/O to turn the monitor request 0 "M-REQ0" ON.

Remote I/O of NETC01-CC

	Command RY (Master to **NETC01-CC**)		
	Device No.	Signal name	Description
NETC01-CC Control input/status output	RY(n+6)C	M-REQ0	Monitor request 0

The monitor of the present alarm of the address number 0 is started. Monitoring of the present alarm is continued while M-REQ0 is ON.
The read value is reflected to the response area of the remote register.

Remote register of NETC01-CC

RWr (**NETC01-CC** to master)	
Address No.	Description
RWrn0	Data of monitor 0 (lower 16 bit)
RWrn1	Data of monitor 0 (upper 16 bit)
RWrn2	Data of monitor 1 (lower 16 bit)
RWrn3	Data of monitor 1 (upper 16 bit)
RWrn4	Data of monitor 2 (lower 16 bit)
RWrn5	Data of monitor 2 (upper 16 bit)
RWrn6	Data of monitor 3 (lower 16 bit)
RWrn7	Data of monitor 3 (upper 16 bit)
RWrn8	Data of monitor 4 (lower 16 bit)
RWrn9	Data of monitor 4 (upper 16 bit)
RWrnA	Data of monitor 5 (lower 16 bit)
RWrnB	Data of monitor 5 (upper 16 bit)
RWrnC	Command code response
RWrnD	Address number response
RWrnE	Data (lower)
RWrnF	Data (upper)

Output example	Description
70h	Reading-out alarm (example: operation data error)

3. To end the monitor, send the following remote I/O to turn the M-REQ0 OFF again.

Remote I/O of NETC01-CC

	Command RY (Master to **NETC01-CC**)		
	Device No.	Signal name	Description
NETC01-CC Control input/status output	RY(n+6)C	M-REQ0	Monitor request 0

2-3 Remote register list of NETC01-CC

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 driver or **NETC01-CC** are executed using remote register. "n" is an address assigned to the master station by the CC-Link station number setting.

RWw (Master to **NETC01-CC**)	
Address No.	Description
RWwn0	Command code of monitor 0
RWwn1	Address number of monitor 0
RWwn2	Command code of monitor 1
RWwn3	Address number of monitor 1
RWwn4	Command code of monitor 2
RWwn5	Address number of monitor 2
RWwn6	Command code of monitor 3
RWwn7	Address number of monitor 3
RWwn8	Command code of monitor 4
RWwn9	Address number of monitor 4
RWwnA	Command code of monitor 5
RWwnB	Address number of monitor 5
RWwnC	Command code
RWwnD	Address number
RWwnE	Data (lower)
RWwnF	Data (upper)

RWr (**NETC01-CC** to master)	
Address No.	Description
RWrn0	Data of monitor 0 (lower 16 bit)
RWrn1	Data of monitor 0 (upper 16 bit)
RWrn2	Data of monitor 1 (lower 16 bit)
RWrn3	Data of monitor 1 (upper 16 bit)
RWrn4	Data of monitor 2 (lower 16 bit)
RWrn5	Data of monitor 2 (upper 16 bit)
RWrn6	Data of monitor 3 (lower 16 bit)
RWrn7	Data of monitor 3 (upper 16 bit)
RWrn8	Data of monitor 4 (lower 16 bit)
RWrn9	Data of monitor 4 (upper 16 bit)
RWrnA	Data of monitor 5 (lower 16 bit)
RWrnB	Data of monitor 5 (upper 16 bit)
RWrnC	Command code response
RWrnD	Address number response
RWrnE	Data (lower)
RWrnF	Data (upper)

2-4 Assignment for remote I/O of 6-axes connection mode

Remote I/O assignments of the driver are as follows. "n" is an address assigned to the master station by the CC-Link station number setting. See the **NETC01-CC** USER MANUAL for 6-axes connection mode.

■ Assignment list of remote I/O

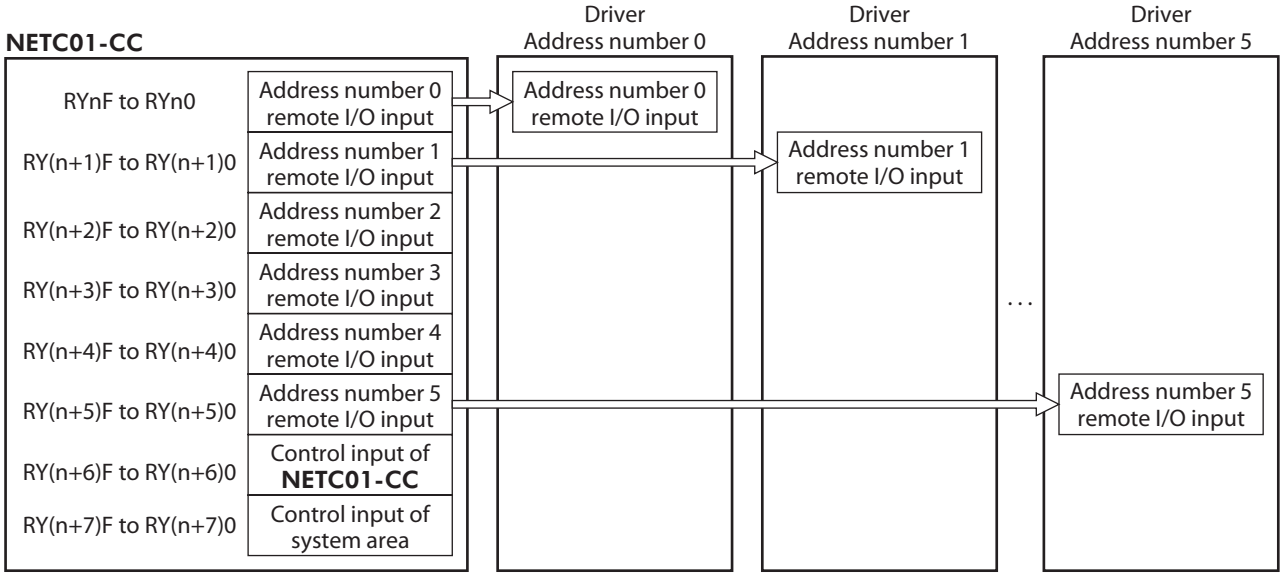
Details of remote I/O assignment ⇨ p.201

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

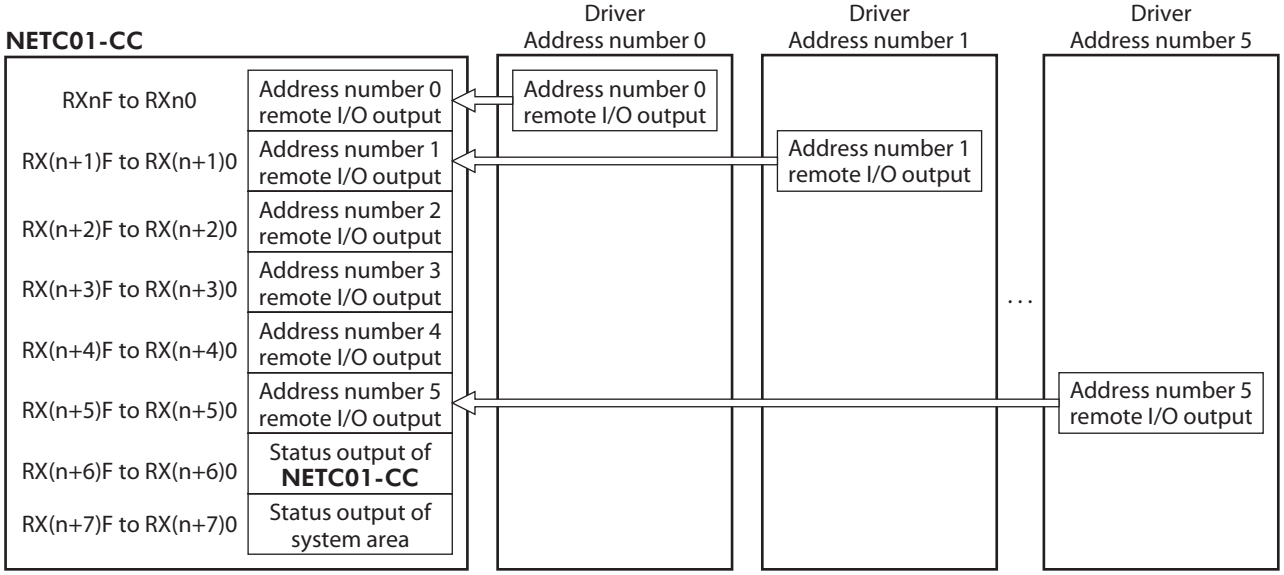
Response RX (**NETC01-CC** to master)	
Device No.	Description
RXn7 to RXn0	Address number "0" remote I/O output
RXnF to RXn8	
RX(n+1)7 to RX(n+1)0	Address number "1" remote I/O output
RX(n+1)F to RX(n+1)8	
RX(n+2)7 to RX(n+2)0	Address number "2" remote I/O output
RX(n+2)F to RX(n+2)8	
RX(n+3)7 to RX(n+3)0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

■ Input/output of remote I/O

- **Remote I/O input**



- **Remote I/O output**



■ Details of remote I/O assignment

[ ]: Initial value

	Command RY (Master to **NETC01-CC**)			Response RX (**NETC01-CC** to master)		
	Device No.	Signal name	Description	Device No.	Signal name	Description
Address number "0"	RY(n)0	NET-IN0	[M0]	RX(n)0	NET-OUT0	[M0_R]
	RY(n)1	NET-IN1	[M1]	RX(n)1	NET-OUT1	[M1_R]
	RY(n)2	NET-IN2	[M2]	RX(n)2	NET-OUT2	[M2_R]
	RY(n)3	NET-IN3	[START]	RX(n)3	NET-OUT3	[START_R]
	RY(n)4	NET-IN4	[HOME]	RX(n)4	NET-OUT4	[HOME-P]
	RY(n)5	NET-IN5	[STOP]	RX(n)5	NET-OUT5	[READY]
	RY(n)6	NET-IN6	[FREE]	RX(n)6	NET-OUT6	[WNG]
	RY(n)7	NET-IN7	[ALM-RST]	RX(n)7	NET-OUT7	[ALM]
	RY(n)8	NET-IN8	[MS0]	RX(n)8	NET-OUT8	[S-BSY]
	RY(n)9	NET-IN9	[MS1]	RX(n)9	NET-OUT9	[AREA1]
	RY(n)A	NET-IN10	[MS2]	RX(n)A	NET-OUT10	[AREA2]
	RY(n)B	NET-IN11	[SSTART]	RX(n)B	NET-OUT11	[AREA3]
	RY(n)C	NET-IN12	[+JOG]	RX(n)C	NET-OUT12	[TIM]
	RY(n)D	NET-IN13	[–JOG]	RX(n)D	NET-OUT13	[MOVE]
	RY(n)E	NET-IN14	[FWD]	RX(n)E	NET-OUT14	[Not used]
	RY(n)F	NET-IN15	[RVS]	RX(n)F	NET-OUT15	[STEPOUT]
Address number "1"	RY(n+1)0 to RY(n+1)F	NET-IN0 to NET-IN15	Same as Address number "0"	RX(n+1)0 to RX(n+1)F	NET-OUT0 to NET-OUT15	Same as Address number "0"
Address number "2"	RY(n+2)0 to RY(n+2)F	NET-IN0 to NET-IN15	Same as Address number "0"	RX(n+2)0 to RX(n+2)F	NET-OUT0 to NET-OUT15	Same as Address number "0"
Address number "3"	RY(n+3)0 to RY(n+3)F	NET-IN0 to NET-IN15	Same as Address number "0"	RX(n+3)0 to RX(n+3)F	NET-OUT0 to NET-OUT15	Same as Address number "0"
Address number "4"	RY(n+4)0 to RY(n+4)F	NET-IN0 to NET-IN15	Same as Address number "0"	RX(n+4)0 to RX(n+4)F	NET-OUT0 to NET-OUT15	Same as Address number "0"
Address number "5"	RY(n+5)0 to RY(n+5)F	NET-IN0 to NET-IN15	Same as Address number "0"	RX(n+5)0 to RX(n+5)F	NET-OUT0 to NET-OUT15	Same as Address number "0"
NETC01-CC control input/ status output	RY(n+6)0	M-REQ0	Monitor request 0	RX(n+6)0	M-DAT0	During execution of monitor 0
	RY(n+6)1	M-REQ1	Monitor request 1	RX(n+6)1	M-DAT1	During execution of monitor 1
	RY(n+6)2	M-REQ2	Monitor request 2	RX(n+6)2	M-DAT2	During execution of monitor 2
	RY(n+6)3	M-REQ3	Monitor request 3	RX(n+6)3	M-DAT3	During execution of monitor 3
	RY(n+6)4	M-REQ4	Monitor request 4	RX(n+6)4	M-DAT4	During execution of monitor 4
	RY(n+6)5	M-REQ5	Monitor request 5	RX(n+6)5	M-DAT5	During execution of monitor 5
	RY(n+6)6	–	–	RX(n+6)6	WNG	Warning
	RY(n+6)7	ALM-RST	Reset alarm	RX(n+6)7	ALM	Alarm
	RY(n+6)8	–	–	RX(n+6)8	C-SUC	During execution of RS-485 communication
	RY(n+6)9			RX(n+6)9	–	–

	Command RY (Master to **NETC01-CC**)		
	Device No.	Signal name	Description
NETC01-CC control input/ status output	RY(n+6)A	–	–
	RY(n+6)B		
	RY(n+6)C	D-REQ	Command execution request
	RY(n+6)D	–	–
	RY(n+6)E		
	RY(n+6)F		
System area control input/ status output	RY(n+7)0 to RY(n+7)F	–	Cannot be used

Response RX (**NETC01-CC** to master)		
Device No.	Signal name	Description
RX(n+6)A	–	–
RX(n+6)B		
RX(n+6)C	D-END	Command processing completion
RX(n+6)D	R-ERR	Register error
RX(n+6)E	S-BSY	During system processing
RX(n+6)F	–	–
RX(n+7)0 to RX(n+7)A	–	Cannot be used
RX(n+7)B	CRD	Remote station communication ready
RX(n+7)C to RX(n+7)F	–	Cannot be used

2-5 Assignment for remote I/O of 12-axes connection mode

Remote I/O assignments of the driver are as follows. "n" is an address assigned to the master station by the CC-Link station number setting. See the **NETC01-CC** USER MANUAL for 12 axes connection mode.

■ Assignment list of remote I/O

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

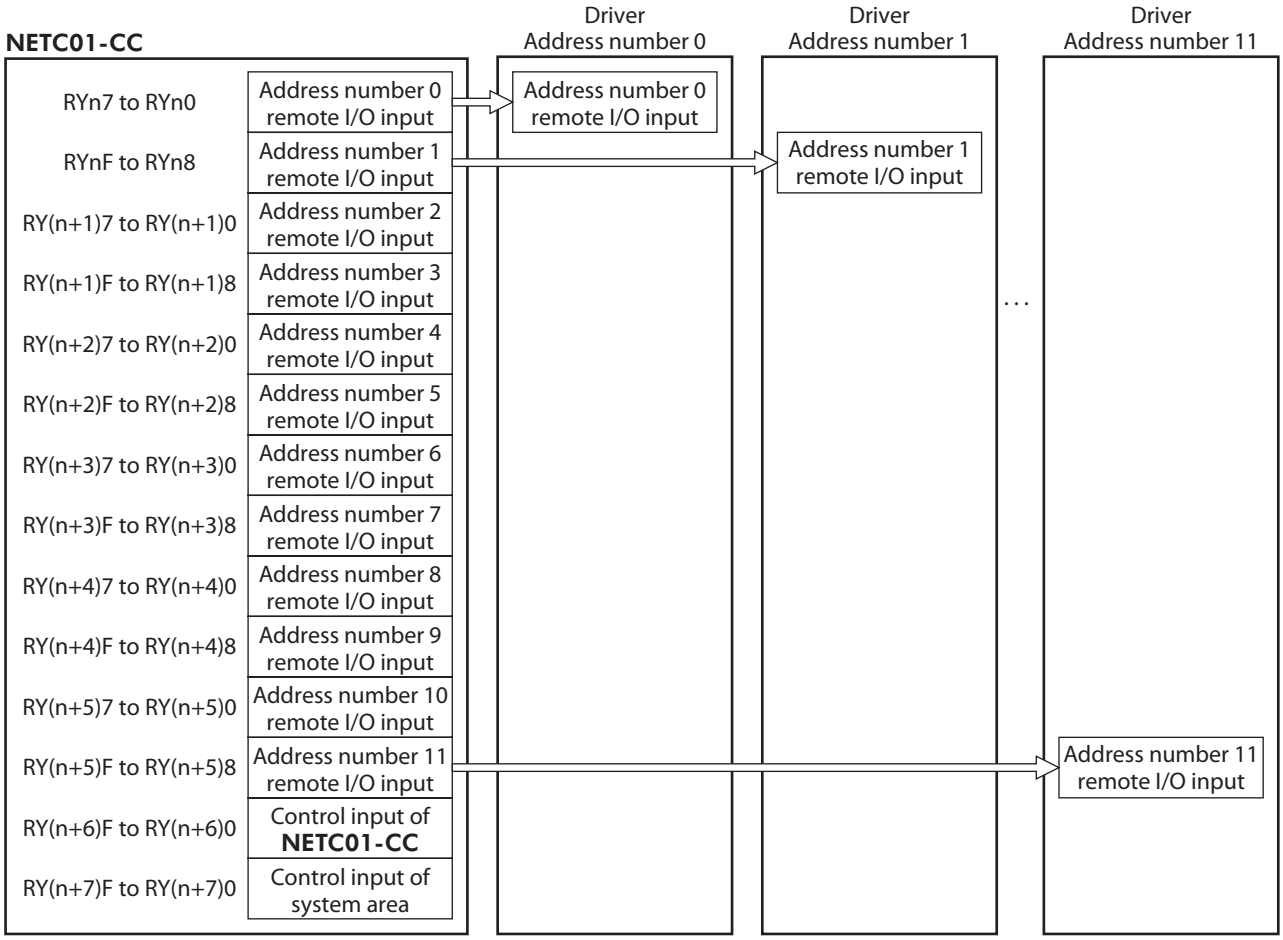
Response RX(**NETC01-CC** to master)	
Device No.	Description
RXn7 to RXn0	Address number "0" remote I/O output
RXnF to RXn8	Address number "1" remote I/O output
RX(n+1)7 to RX(n+1)0	Address number "2" remote I/O output
RX(n+1)F to RX(n+1)8	Address number "3" remote I/O output
RX(n+2)7 to RX(n+2)0	Address 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

Command RY(Master to **NETC01-CC**)	
Device No.	Description
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	

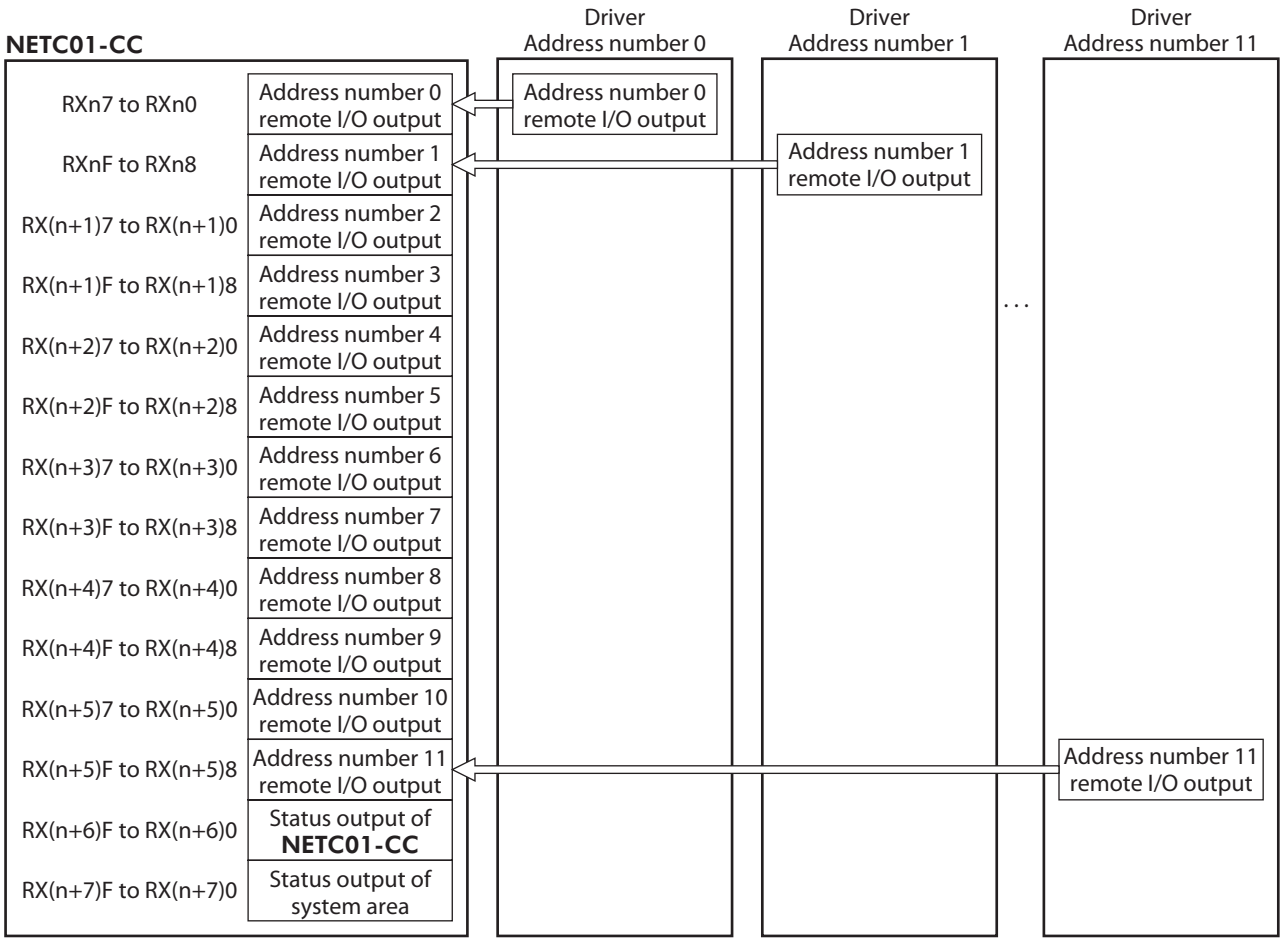
Response RX(**NETC01-CC** to master)	
Device No.	Description
RX(n+6)7 to RX(n+6)0	Status output of **NETC01-CC**
RX(n+6)F to RX(n+6)8	
RX(n+7)7 to RX(n+7)0	Status output of system area
RX(n+7)F to RX(n+7)8	

■ Input/output of remote I/O

- **Remote I/O input**



- **Remote I/O output**



■ Details of remote I/O assignment

[ ]: Initial value

	Command RY(Master to **NETC01-CC**)			Response RX(**NETC01-CC** to master)		
	Device No.	Signal name	Description	Device No.	Signal name	Description
Address number "0"	RY(n)0	NET-IN0	[M0]	RX(n)0	NET-OUT0	[M0_R]
	RY(n)1	NET-IN1	[M1]	RX(n)1	NET-OUT1	[M1_R]
	RY(n)2	NET-IN2	[M2]	RX(n)2	NET-OUT2	[M2_R]
	RY(n)3	NET-IN3	[START]	RX(n)3	NET-OUT3	[START_R]
	RY(n)4	NET-IN4	[HOME]	RX(n)4	NET-OUT4	[HOME-P]
	RY(n)5	NET-IN5	[STOP]	RX(n)5	NET-OUT5	[READY]
	RY(n)6	NET-IN6	[FREE]	RX(n)6	NET-OUT6	[WNG]
	RY(n)7	NET-IN7	[ALM-RST]	RX(n)7	NET-OUT7	[ALM]
Address number "1"	RY(n)8	NET-IN0	[M0]	RX(n)8	NET-OUT0	[M0_R]
	RY(n)9	NET-IN1	[M1]	RX(n)9	NET-OUT1	[M1_R]
	RY(n)A	NET-IN2	[M2]	RX(n)A	NET-OUT2	[M2_R]
	RY(n)B	NET-IN3	[START]	RX(n)B	NET-OUT3	[START_R]
	RY(n)C	NET-IN4	[HOME]	RX(n)C	NET-OUT4	[HOME-P]
	RY(n)D	NET-IN5	[STOP]	RX(n)D	NET-OUT5	[READY]
	RY(n)E	NET-IN6	[FREE]	RX(n)E	NET-OUT6	[WNG]
	RY(n)F	NET-IN7	[ALM-RST]	RX(n)F	NET-OUT7	[ALM]
Address number "2"	RY(n+1)0 to RY(n+1)7	NET-IN0 to NET-IN7	Same as Address number "0"	RX(n+1)0 to RX(n+1)7	NET-OUT0 to NET-OUT7	Same as Address number "0"
Address number "3"	RY(n+1)8 to RY(n+1)F	NET-IN0 to NET-IN7	Same as Address number "1"	RX(n+1)8 to RX(n+1)F	NET-OUT0 to NET-OUT7	Same as Address number "1"
Address number "4"	RY(n+2)0 to RY(n+2)7	NET-IN0 to NET-IN7	Same as Address number "0"	RX(n+2)0 to RX(n+2)7	NET-OUT0 to NET-OUT7	Same as Address number "0"
Address number "5"	RY(n+2)8 to RY(n+2)F	NET-IN0 to NET-IN7	Same as Address number "1"	RX(n+2)8 to RX(n+2)F	NET-OUT0 to NET-OUT7	Same as Address number "1"
Address number "6"	RY(n+3)0 to RY(n+3)7	NET-IN0 to NET-IN7	Same as Address number "0"	RX(n+3)0 to RX(n+3)7	NET-OUT0 to NET-OUT7	Same as Address number "0"
Address number "7"	RY(n+3)8 to RY(n+3)F	NET-IN0 to NET-IN7	Same as Address number "1"	RX(n+3)8 to RX(n+3)F	NET-OUT0 to NET-OUT7	Same as Address number "1"
Address number "8"	RY(n+4)0 to RY(n+4)7	NET-IN0 to NET-IN7	Same as Address number "0"	RX(n+4)0 to RX(n+4)7	NET-OUT0 to NET-OUT7	Same as Address number "0"
Address number "9"	RY(n+4)8 to RY(n+4)F	NET-IN0 to NET-IN7	Same as Address number "1"	RX(n+4)8 to RX(n+4)F	NET-OUT0 to NET-OUT7	Same as Address number "1"
Address number "10"	RY(n+5)0 to RY(n+5)7	NET-IN0 to NET-IN7	Same as Address number "0"	RX(n+5)0 to RX(n+5)7	NET-OUT0 to NET-OUT7	Same as Address number "0"
Address number "11"	RY(n+5)8 to RY(n+5)F	NET-IN0 to NET-IN7	Same as Address number "1"	RX(n+5)8 to RX(n+5)F	NET-OUT0 to NET-OUT7	Same as Address number "1"

	Command RY(Master to **NETC01-CC**)			Response RX(**NETC01-CC** to master)		
	Device No.	Signal name	Description	Device No.	Signal name	Description
NETC01-CC control input/ status output	RY(n+6)0	M-REQ0	Monitor request 0	RX(n+6)0	M-DAT0	During execution of monitor 0
	RY(n+6)1	M-REQ1	Monitor request 1	RX(n+6)1	M-DAT1	During execution of monitor 1
	RY(n+6)2	M-REQ2	Monitor request 2	RX(n+6)2	M-DAT2	During execution of monitor 2
	RY(n+6)3	M-REQ3	Monitor request 3	RX(n+6)3	M-DAT3	During execution of monitor 3
	RY(n+6)4	M-REQ4	Monitor request 4	RX(n+6)4	M-DAT4	During execution of monitor 4
	RY(n+6)5	M-REQ5	Monitor request 5	RX(n+6)5	M-DAT5	During execution of monitor 5
	RY(n+6)6	–	–	RX(n+6)6	WNG	Warning
	RY(n+6)7	ALM-RST	Reset alarm	RX(n+6)7	ALM	Alarm
	RY(n+6)8	–	–	RX(n+6)8	C-SUC	During execution of RS-485 communication
	RY(n+6)9			RX(n+6)9	–	–
	RY(n+6)A			RX(n+6)A		
	RY(n+6)B			RX(n+6)B		
	RY(n+6)C	D-REQ	Command execution request	RX(n+6)C	D-END	Command processing completion
	RY(n+6)D	–	–	RX(n+6)D	R-ERR	Register error
	RY(n+6)E	–	–	RX(n+6)E	S-BSY	During system processing
	RY(n+6)F			RX(n+6)F	–	–
System area control input/ status output	RY(n+7)0 to RY(n+7)F	–	Cannot be used	RX(n+7)0 to RX(n+7)A	–	Cannot be used
				RX(n+7)B	CRD	Remote station communication ready
				RX(n+7)C to RX(n+7)F	–	Cannot be used

3 Method of control via MECHATROLINK communication

3-1 Guidance

If you are new to the **RK Ⅱ** Series FLEX built-in controller type, read this section to understand the operating methods along with the operation flow.
This section explains how to control via MECHATROLINK-II communication in combination with the network converter **NETC01-M2**.

STEP1 Installation and connection

↓

STEP2 Setting of network converter

↓

STEP3 Setting of driver

↓

STEP4 Cycle the power and check the LED — Parameters will be enabled after the power is cycled.

↓

STEP5 Operate the motor

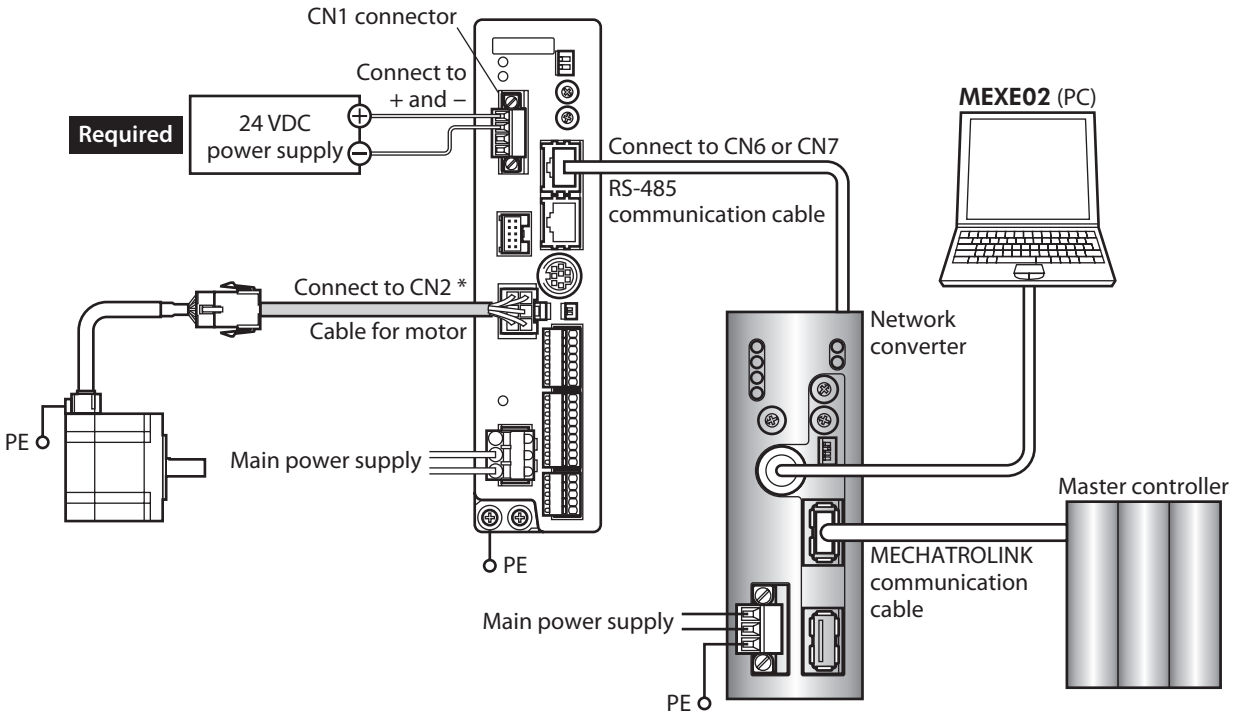
- **Operating condition**

Here, the motor is supposed to be operated under the following conditions.

- Number of connected driver: 1 unit
- Address number: 0
- Termination resistor: Set

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

STEP 1 Check the installation and connection

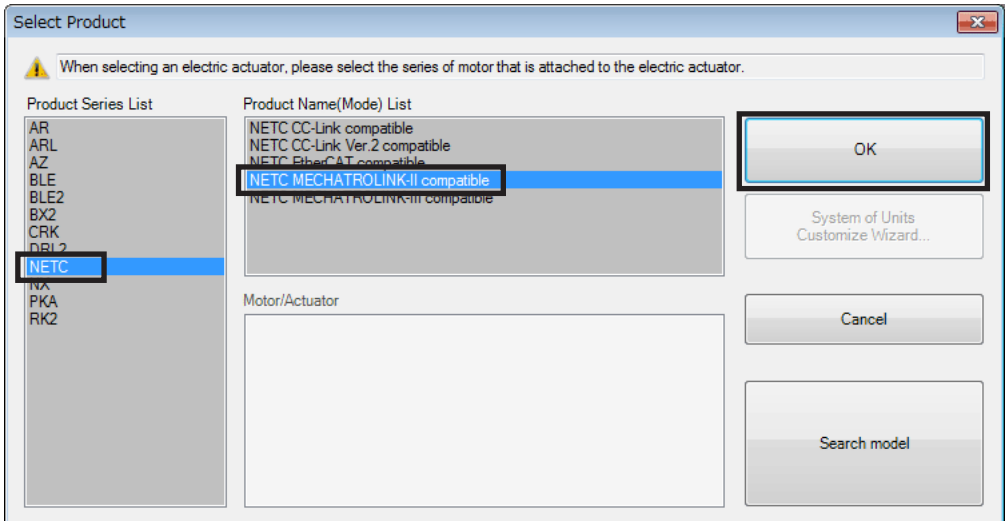


* Cables represented in gray color are supplied with the product or sold separately.

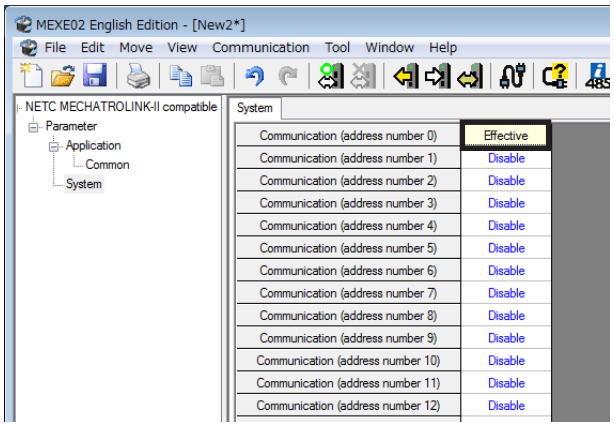
STEP 2 Set the parameters and switches of the network converter

■ Setting of parameters

1. Start the **MEXE02** and select the network converter.



2. Set the "Communication (address number)" parameter of the driver connected to the network converter to "effective" using the **MEXE02**.



MEXE02 tree view	Parameter name	Description	Setting range	Initial value
System	Communication (address number 0) to Communication (address number 15)	Enables the address number of the driver connected to the network converter.	Disable Effective	Disable

memo
- Since parameters of the network converter cannot be set via MECHATROLINK communication, set them by using the **MEXE02**.
- When multiple drivers are connected, set communication parameters as many as the drivers.
- "Communication (address number)" parameters will be enabled after the power is cycled.

■ Setting of switches

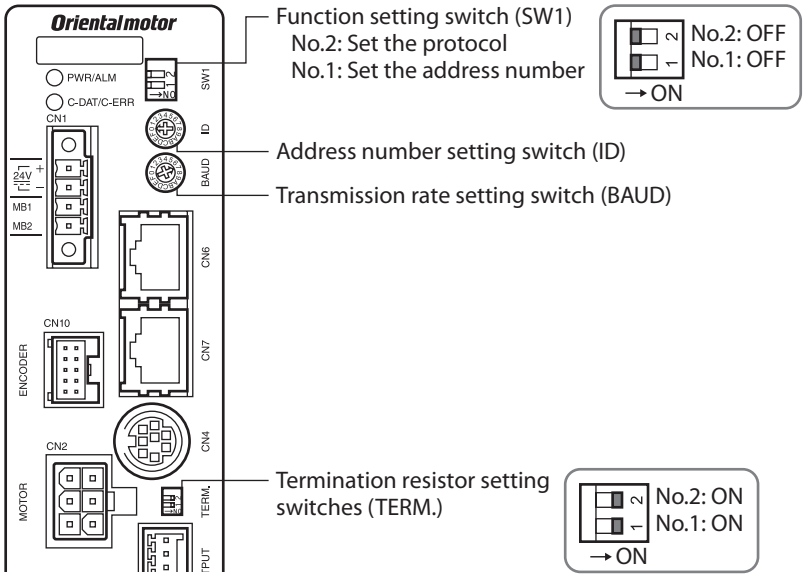
Set the following with the switches of the network converter.
- MECHATROLINK-II station address
- RS-485 transmission rate
- Remote I/O occupied size
- Number of transmission bytes

memo For the setting method of the network converter, refer to the separate **NETC01-M2** USER MANUAL.

STEP 3 Set the switches of the driver

Set the following with the switches of the driver. For the protocol, select "OFF" (network converter).
The status becomes as shown in the following figures after setting.

Setting item	Switch	Factory setting
• Protocol: Network converter	SW1-No.2: OFF	OFF
• Address number: 0	SW1-No.1: OFF ID: 0	SW1-No.1: OFF ID: 0
• Termination resistor: ON	TERM.-Nos.1 and 2: ON	OFF
• Transmission rate: 625,000 bps	BAUD: 7	7

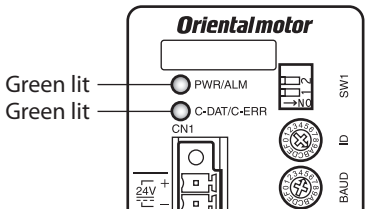


memo For the address number, select the one with the "Communication (address number)" parameter of the network converter set to "effective."

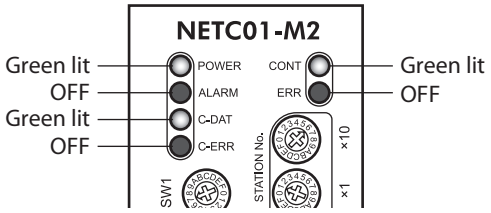
STEP 4 Cycle the power and check the LED

Check that the LED of the driver and network converter are as shown in the figure.

■ Driver



■ Network converter



- **When C-DAT/C-ERR LED of the driver or C-ERR LED (red) of the network converter is lit: Check the transmission rate or address number of RS-485 communication.**
- **When ERR (red) of the network converter is lit: Check the type of the MECHATROLINK communication error.**

STEP 5 Perform continuous operation via remote I/O of MECHATROLINK communication

Turn FWD of the address number 0 ON with the I/O command of MECHATROLINK communication. Continuous operation is started.
Initial values of the I/O commands are as follows.

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
NET-IN15 [RVS]	NET-IN14 [FWD]	NET-IN13 [–JOG]	NET-IN12 [+JOG]	NET-IN11 [SSTART]	NET-IN10 [MS2]	NET-IN9 [MS1]	NET-IN8 [MS0]
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-IN7 [ALM-RST]	NET-IN6 [FREE]	NET-IN5 [STOP]	NET-IN4 [HOME]	NET-IN3 [START]	NET-IN2 [M2]	NET-IN1 [M1]	NET-IN0 [M0]

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 in the driver or network converter?
- Are the power supply, motor, and RS-485 communication cable connected securely?
- Are the protocol, address number and termination resistor set correctly?
- Is the "communication (address number)" parameter of the network converter set correctly?
- Is the C-DAT/C-ERR LED turned off? Or is it lit in red? (An communication error has occurred)
- Is the operation data set correctly?
- Is the motor excited? Or is the excitation setting correct?
- Are the driver parameters set correctly?
- Is the STOP input of the driver I/O turned ON?

3-2 Basic operation procedure

This section explains the execution methods of positioning operation and monitor function as a basic operation procedure.
As an example, here is an introduction of a procedure to control via MECHATROLINK-II communication using the **NETC01-M2**.

■ Positioning operation

As an example, here is a description how to execute the following positioning operation.

● Setting example

- Address number (slave address): 0
- Operation data No.1
- Position (travel amount): 5000 step

● Operating procedure

1. Send the following remote register to set the position (travel amount) of the operation data No.1 to 5000 steps.
   The data set in the remote register is written.
   When the data writing is completed, the TRIG_R is turned ON.

Remote register of NETC01-M2

Byte	Part	Type	Command
23	Data field	Remote register	Register address number
24			
25			Command code + TRIG
26			
27			DATA
28			
29			
30			

→

Input example	Description
0	Address number 0
1201h + 4000h = 5201h *	Value to be written to the position of operation data No.1 + TRIG
1388h	Position (travel amount) 5000 step

* From the list of p.226, we can see that the command code (WRITE) of "Position No.1" is 1201h. Since the command code and the command execute request (TRIG) are written with the same command in MECHATROLINK communication, write "5201h" with the code (4000h) of TRIG added.

2. Check that TRIG_R is turned ON, then send the following remote register and turn TRIG OFF again.

Remote register of NETC01-M2

Byte	Part	Type	Command
25	Data field	Remote register	Command code + TRIG
26			

→

Input example	Description
0	Turn TRIG OFF

memo

- Be sure to turn TRIG OFF again after turning it ON.
- When the data is written with the command execute request TRIG, the data is saved in the RAM. If the data is saved in the non-volatile memory, execute the "Batch NV memory write" of the maintenance command.

3. Send the following remote I/O and turn M0 of the address number 0 and START ON.
   Positioning operation is started. If the motor rotates for 5000 steps, the positioning operation was successful.

Remote I/O of NETC01-M2

Byte	Part	Type	Command
7	Data field	Remote I/O	Address number "0" remote I/O input
8			

→

Input example	Description
9h	Turn M0 and START ON

Communication format (initial value) of remote I/O input

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
NET-IN15 [RVS]	NET-IN14 [FWD]	NET-IN13 [–JOG]	NET-IN12 [+JOG]	NET-IN11 [SSTART]	NET-IN10 [MS2]	NET-IN9 [MS1]	NET-IN8 [MS0]
bit7	**bit6**	**bit5**	**bit4**	**bit3**	**bit2**	**bit1**	**bit0**
NET-IN7 [ALM-RST]	NET-IN6 [FREE]	NET-IN5 [STOP]	NET-IN4 [HOME]	NET-IN3 [START]	NET-IN2 [M2]	NET-IN1 [M1]	NET-IN0 [M0]

■ Monitor function

- **Setting example**
  - Address number (slave address): 0
  - Monitor item: Present alarm
- **Operating procedure**

1. Send the following remote register to monitor the present alarm of the address number 0.
   Monitoring of the present alarm of the address number 0 is started.

Remote register of NETC01-M2

Byte	Part	Type	Command
23	Data field	Remote register	Register address number
24			
25			Command code + TRIG
26			
27			DATA
28			
29			
30			

→

Input example	Description
0	Address number 0
2040h + 4000h = 6040h *	Monitor present alarm + TRIG

* From the list of "5-3 Monitor command" on p.224, we can see that the command code (WRITE) of "present alarm" is 2040h. Since the command code and the command execute request (TRIG) are written with the same command in MECHATROLINK communication, write "6040h" with the code (4000h) of TRIG added.

Monitoring of the present alarm is continued while TRIG is ON.
The read value is reflected to the response area of the remote register.

Remote register of NETC01-M2

Byte	Part	Type	Command
23	Data field	Remote register	Register address number response
24			
25			Command code response + TRIG response + STATUS
26			
27			DATA response
28			
29			
30			

→

Output example	Description
0	Address number 0
6040h	Monitor present alarm
70h	Reading-out alarm (example: operation data error)

2. To end the monitor, send the following remote I/O to turn the TRIG OFF again.

Remote register of NETC01-M2

Byte	Part	Type	Command
25	Data field	Remote register	Command code + TRIG
26			

→

Input example	Description
0	Turn TRIG OFF

memo In MECHATROLINK-II communication, only one type of data can be monitored for one driver because of the performance of the network converter. To monitor drivers with multiple axes, change the address number before executing monitoring.

3-3 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 value), I/O field map will be as follows. See the **NETC01-M2** USER 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

3-4 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 value), I/O field map will be as follows. See the **NETC01-M3** USER 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	–		

3-5 Communication format

Communication formats to the driver and network converter are as follows.

■ Remote I/O input

For details on remote I/O ⇨ p.219

- **8 axes connection mode [16 bit mode]**

[ ]: Initial value

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
NET-IN15 [RVS]	NET-IN14 [FWD]	NET-IN13 [–JOG]	NET-IN12 [+JOG]	NET-IN11 [SSTART]	NET-IN10 [MS2]	NET-IN9 [MS1]	NET-IN8 [MS0]
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-IN7 [ALM-RST]	NET-IN6 [FREE]	NET-IN5 [STOP]	NET-IN4 [HOME]	NET-IN3 [START]	NET-IN2 [M2]	NET-IN1 [M1]	NET-IN0 [M0]

- **16 axes connection mode [8 bit mode]**

[ ]: Initial value

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-IN7 [ALM-RST]	NET-IN6 [FREE]	NET-IN5 [STOP]	NET-IN4 [HOME]	NET-IN3 [START]	NET-IN2 [M2]	NET-IN1 [M1]	NET-IN0 [M0]

■ Remote I/O output

For details on remote I/O ⇨ p.219

- **8 axes connection mode [16 bit mode]**

[ ]: Initial value

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
NET-OUT15 [STEPOUT]	NET-OUT14 [Not used]	NET-OUT13 [MOVE]	NET-OUT12 [TIM]	NET-OUT11 [AREA3]	NET-OUT10 [AREA2]	NET-OUT9 [AREA1]	NET-OUT8 [S-BSY]
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]

- **16 axes connection mode [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 input

- **Command [NETC01-M2 (NETC01-M3) to driver]**

The blanks are for command codes.

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
–	TRIG						
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0

- **Explanation**

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

■ Remote register output

- **Response [Driver to NETC01-M2 (NETC01-M3)]**

The blanks are for command codes.

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
STATUS	TRIG_R						
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0

- **Explanation**

Name	Description	Setting range
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

4 Details of remote I/O

This is common to all network converters.

4-1 Input signals to the driver

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. [ ]: Initial value
For details on parameter, refer to "5-5 User parameters" on p.227.

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
NET-IN15 [RVS]	NET-IN14 [FWD]	NET-IN13 [–JOG]	NET-IN12 [+JOG]	NET-IN11 [SSTART]	NET-IN10 [MS2]	NET-IN9 [MS1]	NET-IN8 [MS0]
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-IN7 [ALM-RST]	NET-IN6 [FREE]	NET-IN5 [STOP]	NET-IN4 [HOME]	NET-IN3 [START]	NET-IN2 [M2]	NET-IN1 [M1]	NET-IN0 [M0]

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 positioning operation.	
+JOG	JOG operation in the positive direction.	
–JOG	JOG operation in the negative direction.	
MS0 to MS5	Perform direct positioning operation of the operation data No. set by the I/O parameter.	
FREE	Stop the motor excitation and release the electromagnetic brake.	0: No operation 1: Electromagnetic brake release + motor non-excitation
AWO	Motor excitation switching between excitation and non-excitation.	0: Excitation 1: Non-excitation
STOP	Stop the motor	0: No operation 1: Stop operation
ALM-RST	Reset of the current alarm.	0: No operation 1: Execute
P-PRESET	Position 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. See p.56 for details on the combination.	0: OFF 1: ON (Operation data No.0 to 63 can be selected.)

memo

- 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.
- When the HMI input is not assigned to the input terminal, this input will always be set to ON (1). When assigning to both direct I/O and network I/O, the function will be executed when both of them are set to ON (1).

4-2 Output signals from the driver

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. [ ]: Initial value
For details on parameter, refer to "5-5 User parameters" on p.227.

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
NET-OUT15 [STEPOUT]	NET-OUT14 [Not used]	NET-OUT13 [MOVE]	NET-OUT12 [TIM]	NET-OUT11 [AREA3]	NET-OUT10 [AREA2]	NET-OUT9 [AREA1]	NET-OUT8 [S-BSY]
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]

Signal name	Function	Setting range
Not used	Set when the output terminal is not used.	–
FWD_R	Output in response to the FWD.	0: OFF 1: ON
RVS_R	Output in response to the RVS.	
HOME_R	Output in response to the HOME.	
START_R	Output in response to the START	
SSTART_R	Output in response to the SSTART.	
+JOG_R	Output in response to the +JOG.	
–JOG_R	Output in response to the –JOG.	
MS0_R to MS5_R	Output in response to the MS0 to MS5.	
FREE_R	Output in response to the FREE.	
AWO_R	Output in response to the AWO.	
STOP_R	Output in response to the STOP.	
R0 to R15	Output the status of the general signal R0 to R15.	
M0_R to M5_R	Output in response to the M0 to M5.	
+LS_R	Output in response to the +LS.	
–LS_R	Output in response to the –LS.	
HOMES_R	Output in response to the HOMES.	
SLIT_R	Output in response to the SLIT.	
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 driver is ready.	0: Not ready 1: Ready for operation
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: OFF 1: ON
AREA1 to AREA3	Output when the motor is within the area.	0: Outside area 1: Inside area
S-BSY	Output when the motor is in internal processing state.	0: No internal processing 1: During internal processing
MPS	Output the ON-OFF state of the main power supply.	0: Main power-OFF 1: Main power-ON
STEPOUT	Output when the deviation error occurs.	0: No deviation error 1: During deviation error
OH	Output when the overheat warning generates.	0: No overheat warning 1: During overheat warning

Signal name	Function	Setting range
ZSG	Output when the ENC-Z input signal is input from the encoder.	0: ENC-Z input not used 1: ENC-Z input used
MBC	Output the electromagnetic brake status.	0: Electromagnetic brake hold 1: Electromagnetic brake release

5 Command code list

This is common to all network converters.

5-1 Group function

The driver 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.

memo 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

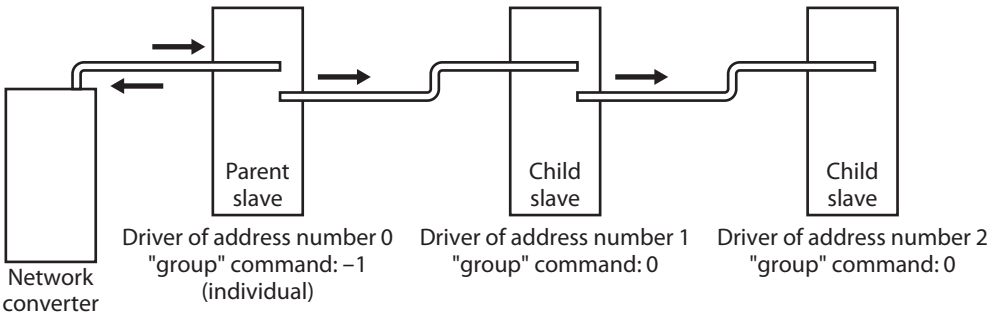
The group setting is not saved in the non-volatile memory even when the maintenance command "batch NV memory write" executes.

Command code		Name	Description	Setting range	Initial value
Read	Write				
24 (0018h)	4120 (1018h)	Group	Set the group.	–1: Individual (No group setting) 0 to 15: Set the group address. (Address number of parent slave) *	–1

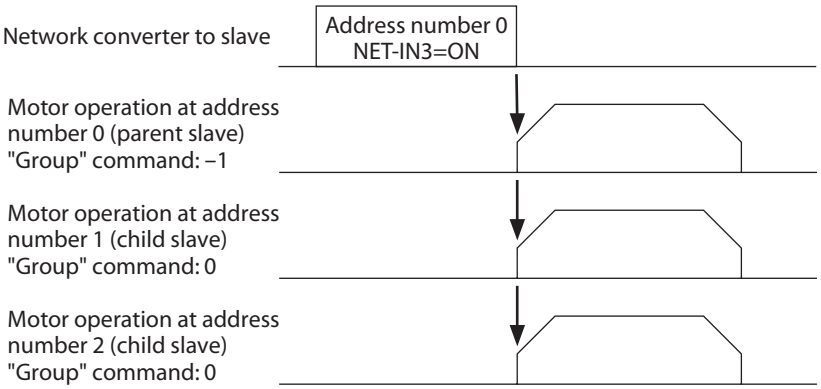
* Set in the 0 to 11 range when using the **NETC01-CC**, and set in the 0 to 15 range when using other network converter.

■ Example for setting of the group function

Set as follows when making a group by setting the driver of address number 0 to the parent slave and by setting the driver of address number 1 and 2 to the child slaves.



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



memo 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.

5-2 Maintenance command

These commands are used to clear the alarm records and warning records. They are also used to execute the batch processing for the non-volatile memory.

Command code	Name	Description	Setting range
12480 (30C0h)	Reset alarm	Resets the alarms that are present. Some alarms cannot be reset with the "reset alarm."	0: No operation 1: Execute
12482 (30C2h)	Clear alarm records	Clears alarm records.	
12483 (30C3h)	Clear warning records	Clears warning records.	
12484 (30C4h)	Clear communication error records	Clears the communication error records.	
12485 (30C5h)	P-PRESET execute	Presets the command position and feedback position.	
12486 (30C6h)	Configuration	Executes the parameter recalculation and the setup.	
12487 (30C7h)	All data initialization	Resets the parameters saved in the non-volatile memory to the initial value. Note that "communication parity", "communication stop bit" and "transmission waiting time" parameters are not initialized.	
12488 (30C8h)	Batch NV memory read	Reads the parameters saved in the non-volatile memory, to the RAM. All operation data and parameters previously saved in the RAM are overwritten.	
12489 (30C9h)	Batch NV memory write	Writes the parameters saved in the RAM to the non-volatile memory.	
12490 (30CAh)	Encoder counter preset	Update the encoder counter to the value of the "encoder preset value" parameter.	

memo The non-volatile memory can be rewritten approximately 100,000 times.

5-3 Monitor command

These commands are used to monitor the driver condition.

Command code	Name	Description
8256 (2040h)	Present alarm	Monitors the present alarm code.
8257 (2041h)	Alarm record 1	Monitors the alarm records.
8258 (2042h)	Alarm record 2	
8259 (2043h)	Alarm record 3	
8260 (2044h)	Alarm record 4	
8261 (2045h)	Alarm record 5	
8262 (2046h)	Alarm record 6	
8263 (2047h)	Alarm record 7	
8264 (2048h)	Alarm record 8	
8265 (2049h)	Alarm record 9	
8266 (204Ah)	Alarm record 10	
8267 (204Bh)	Present warning	Monitors the present warning code.
8268 (204Ch)	Warning record 1	Monitors the warning records.
8269 (204Dh)	Warning record 2	
8270 (204Eh)	Warning record 3	
8271 (204Fh)	Warning record 4	
8272 (2050h)	Warning record 5	
8273 (2051h)	Warning record 6	
8274 (2052h)	Warning record 7	
8275 (2053h)	Warning record 8	
8276 (2054h)	Warning record 9	
8277 (2055h)	Warning record 10	
8278 (2056h)	Present communication error code	Monitors the last received communication error code.
8279 (2057h)	Communication error code record 1	Monitors the communication error records that have occurred in the past.
8280 (2058h)	Communication error code record 2	
8281 (2059h)	Communication error code record 3	
8282 (205Ah)	Communication error code record 4	

Command code	Name	Description
8283 (205Bh)	Communication error code record 5	Monitors the communication error records that have occurred in the past.
8284 (205Ch)	Communication error code record 6	
8285 (205Dh)	Communication error code record 7	
8286 (205Eh)	Communication error code record 8	
8287 (205Fh)	Communication error code record 9	
8288 (2060h)	Communication error code record 10	
8289 (2061h)	Present selected data No.	Monitors the operation data No. currently selected.
8290 (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 positioning operation. While the motor is stopped, the last used operation data number is indicated. "-1" is shown until positioning operation is performed after turning on the power.
8291 (2063h)	Command position	Monitors the command position.
8292 (2064h)	Command speed (r/min)	Monitors the command speed. (r/min)
8293 (2065h)	Command speed (Hz)	Monitors the command speed. (Hz)
8294 (2066h)	Feedback position *	Monitors the feedback position.
8297 (2069h)	Remaining dwell time	Monitors how much of the dwell time used in the linked-motion operation 2 remains.
8298 (206Ah)	Direct I/O and electromagnetic brake status	Monitors the each direct I/O signal and electromagnetic brake status. See the following table for details.
8320 (2080h)	Encoder counter *	Monitors the encoder counter.

* When an encoder is equipped.

Direct I/O and electromagnetic brake status [8298 (206Ah)]

Byte	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0	IN7	IN6	IN5	IN4	IN3	IN2	IN1	IN0
1	–	–	–	–	SLIT	HOMES	–LS	+LS
2	–	–	OUT5	OUT4	OUT3	OUT2	OUT1	OUT0
3	–	–	–	–	–	–	–	MB

5-4 Operation data

Up to 64 operation data can be set (data Nos.0 to 63).
When the operation data is changed, a recalculation and setup will be performed after the operation is stopped and the changed value will be set.

Command code		Name	Setting range	Initial value
Read	Write			
512 (0200h) to 575 (023Fh)	4608 (1200h) to 4671 (123Fh)	Position No.0 to Position No.63	−8,388,608 to +8,388,607 step	0
576 (0240h) to 639 (027Fh)	4672 (1240h) to 4735 (127Fh)	Operating speed No.0 to Operating speed No.63	0 to 1,000,000 Hz	1000
640 (0280h) to 703 (02BFh)	4736 (1280h) to 4799 (12BFh)	Operation mode No.0 to Operation mode No.63	0: Incremental (INC) 1: Absolute (ABS)	0
704 (02C0h) to 767 (02FFh)	4800 (12C0h) to 4863 (12FFh)	Operation function No.0 to Operation function No.63	0: Single-motion 1: Linked-motion 2: Linked-motion2	0
768 (0300h) to 831 (033Fh)	4864 (1300h) to 4927 (133Fh)	Acceleration No.0 to Acceleration No.63	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *1 *2	30000
832 (0340h) to 895 (037Fh)	4928 (1340h) to 4991 (137Fh)	Deceleration No.0 to Deceleration No.63		
960 (03C0h) to 1023 (03FFh)	5056 (13C0h) to 5119 (13FFh)	Sequential positioning No.0 to Sequential positioning No.63	0: Disable 1: Enable	0
1024 (0400h) to 1087 (043Fh)	5120 (1400h) to 5183 (143Fh)	Dwell time No.0 to Dwell time No.63	0 to 50000 (1=0.001 s)	0

*1 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).

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

5-5 User parameters

The parameters are saved in the RAM or non-volatile memory. The data saved in the RAM will be erased once the 24 VDC power supply is turned off. On the other hand, the parameters saved in the non-volatile memory will be retained even after the 24 VDC power supply is turned off.
When turning the driver power ON, the parameters saved in the non-volatile memory will be sent to the RAM. Then, the recalculation and setup for the parameters are executed in the RAM.

The parameters are written in the RAM area when writing via industrial network.
When the parameters stored in the RAM is saved in the non-volatile memory, execute the "Batch NV memory write" command of the maintenance command.
The parameters having set in the **MEXE02** is saved in the non-volatile memory when the data writing is performed.

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

Update timing		Description
A	Effective immediately	Executes the recalculation and setup as soon as the parameter is written.
B	Effective after stopping the operation	Executes the recalculation and setup after stopping the operation.
C	Effective after executing the configuration or cycling the power	Executes the recalculation and setup after executing the configuration, or effective after cycling the 24 VDC power supply
D	Effective after cycling the power	Executes the recalculation and setup after cycling the 24 VDC power supply again.

In this document, each update timing is represented in an alphabetical character.

memo

- The parameters are written in the RAM area when writing via industrial network. Be sure to save in the non-volatile memory before turning off the power supply when changing the parameter that is required turning on the power again to update.
- The non-volatile memory can be rewritten approximately 100,000 times.

■ I/O parameter

Command code		Name	Setting range	Initial value	Effective (p.227)
Read	Write				
256 (0100h)	4352 (1100h)	STOP input action	0: Immediate stop 1: Deceleration stop 2: Immediate stop + current OFF 3: Deceleration stop + current OFF	1	A
257 (0101h)	4353 (1101h)	Hardware overtravel	0: Disable 1: Enable	1	
258 (0102h)	4354 (1102h)	Overtravel action	0: Immediate stop 1: Deceleration stop	0	
261 (0105h)	4357 (1105h)	AREA1 positive direction position	−8,388,608 to 8,388,607 step	0	
262 (0106h)	4358 (1106h)	AREA1 negative direction position			
263 (0107h)	4359 (1107h)	AREA2 positive direction position			
264 (0108h)	4360 (1108h)	AREA2 negative direction position			
265 (0109h)	4361 (1109h)	AREA3 positive direction position			
266 (010Ah)	4362 (110Ah)	AREA3 negative direction position			
267 (010Bh)	4363 (110Bh)	Minimum ON time for MOVE output	0 to 255 ms	0	
268 (010Ch)	4364 (110Ch)	±LS logic level	0: Normally open 1: Normally closed	0	C
269 (010Dh)	4365 (110Dh)	HOMES logic level		0	
270 (010Eh)	4366 (110Eh)	SLIT logic level		0	
2048 (0800h)	6144 (1800h)	MS0 operation No. selection	0 to 63	0	B
2049 (0801h)	6145 (1801h)	MS1 operation No. selection		1	
2050 (0802h)	6146 (1802h)	MS2 operation No. selection		2	
2051 (0803h)	6147 (1803h)	MS3 operation No. selection		3	
2052 (0804h)	6148 (1804h)	MS4 operation No. selection		4	
2053 (0805h)	6149 (1805h)	MS5 operation No. selection		5	
2054 (0806h)	6150 (1806h)	HOME-P output function selection	0: Home output 1: Return-to-home complete output	0	A

■ Motor parameter

Command code		Name	Setting range	Initial value	Effective (p.227)
Read	Write				
288 (0120h)	4384 (1120h)	RUN current	0 to 1000 (1=0.1%)	1000	A
289 (0121h)	4385 (1121h)	STOP current	0 to 600 (1=0.1%)	500	
293 (0125h)	4389 (1125h)	Speed filter	0 to 200 ms	1	B
294 (0126h)	4390 (1126h)	Moving average time			
2064 (0810h)	6160 (1810h)	Filter selection	0: Speed filter 1: Moving average filter	0	C

■ Operation parameter

Command code		Name	Setting range	Initial value	Effective (p.227)
Read	Write				
320 (0140h)	4416 (1140h)	Common acceleration	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *1 *2	30000	B
321 (0141h)	4417 (1141h)	Common deceleration			
322 (0142h)	4418 (1142h)	Starting speed	0 to 1,000,000 Hz	100	
323 (0143h)	4419 (1143h)	JOG operating speed	1 to 1,000,000 Hz	1000	
324 (0144h)	4420 (1144h)	JOG acceleration/ deceleration rate	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *2	30000	
325 (0145h)	4421 (1145h)	JOG starting speed	0 to 1,000,000 Hz	100	
326 (0146h)	4422 (1146h)	Acceleration/deceleration type	0: Common 1: Separate	1	
327 (0147h)	4423 (1147h)	Acceleration/deceleration unit	0: ms/kHz 1: sec	0	C
2084 (0824h)	6180 (1824h)	JOG travel amount	1 to 8,388,607 step	1	B

*1 This item is effective when the "acceleration/deceleration type" parameter is set to "common." (initial value: separate).

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

■ Home operation parameter

Command code		Name	Setting range	Initial value	Effective (p.227)
Read	Write				
352 (0160h)	4448 (1160h)	Home-seeking mode	0: 2-sensor mode 1: 3-sensor mode	1	B
353 (0161h)	4449 (1161h)	Operating speed of home-seeking	1 to 1,000,000 Hz	1000	
354 (0162h)	4450 (1162h)	Acceleration/deceleration of home-seeking	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *	30000	
355 (0163h)	4451 (1163h)	Starting speed of home-seeking	1 to 1,000,000 Hz	100	
356 (0164h)	4452 (1164h)	Position offset of home-seeking	−8,388,608 to 8,388,607 step	0	
357 (0165h)	4453 (1165h)	Starting direction of home-seeking	0: Negative direction 1: Positive direction	1	
358 (0166h)	4454 (1166h)	SLIT detection with home-seeking	0: Disable 1: Enable	0	
359 (0167h)	4455 (1167h)	TIM signal detection with home-seeking	0: Disable 1: TIM signal enable 2: ZSG signal enable		
2096 (0830h)	6192 (1830h)	Backward steps in 2-sensor mode home-seeking	0 to 32767 step	200	

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

■ Alarm parameter

Command code		Name	Setting range	Initial value	Effective (p.227)
Read	Write				
388 (0184h)	4484 (1184h)	Return-to-home incomplete alarm	0: Disable 1: Enable	0	C

■ Warning parameter

Command code		Name	Setting range	Initial value	Effective (p.227)
Read	Write				
416 (01A0h)	4512 (11A0h)	Overheat warning	40 to 85 °C (104 to 185 °F)	85	A
419 (01A3h)	4515 (11A3h)	Overvoltage warning	120 to 450 V	435	
420 (01A4h)	4516 (11A4h)	Undervoltage warning	120 to 280 V	120	

■ Coordinates parameter

Command code		Name	Setting range	Initial value	Effective (p.227)
Read	Write				
448 (01C0h)	4544 (11C0h)	Electronic gear A	1 to 65535	1	C
449 (01C1h)	4545 (11C1h)	Electronic gear B			
450 (01C2h)	4546 (11C2h)	Motor rotation direction	0: Positive direction=CCW 1: Positive direction=CW	1	
451 (01C3h)	4547 (11C3h)	Software overtravel	0: Disable 1: Enable	1	A
452 (01C4h)	4548 (11C4h)	Positive software limit	−8,388,608 to 8,388,607 step	8,388,607	
453 (01C5h)	4549 (11C5h)	Negative software limit		−8,388,608	
454 (01C6h)	4550 (11C6h)	Preset position		0	
455 (01C7h)	4551 (11C7h)	Wrap setting	0: Disable 1: Enable	0	C
456 (01C8h)	4552 (11C8h)	Wrap setting range	1 to 8,388,607 step	500	
2144 (0860h)	6240 (1860h)	Encoder resolution	100 to 10000 P/R	500	
2145 (0861h)	6241 (1861h)	Encoder preset value	−8,388,608 to 8,388,607 step	0	A
2146 (0862h)	6242 (1862h)	Stepout detection	0: Disable 1: Enable	0	C
2147 (0863h)	6243 (1863h)	Stepout detection band	1 to 3600 (1=0.1°)	72	A
2148 (0864h)	6244 (1864h)	Stepout detection action	0: No operation 1: Warning 2: Alarm	0	

■ Common parameter

Command code		Name	Setting range	Initial value	Effective (p.227)
Read	Write				
480 (01E0h)	4576 (11E0h)	Data setter speed display	0: Signed 1: Absolute value	0	A
481 (01E1h)	4577 (11E1h)	Data setter edit	0: Disable 1: Enable	1	

■ Communication parameter

Command code		Name	Setting range	Initial value	Effective (p.227)
Read	Write				
2304 (0900h)	6400 (1900h)	Communication timeout	0: Not monitored 1 to 10000 ms	0	A
2305 (0901h)	6401 (1901h)	Communication error alarm	1 to 10 times	3	

■ I/O function parameter

Command code		Name	Setting range	Initial value	Effective (p.227)
Read	Write				
2176 (0880h)	6272 (1880h)	IN0 input function selection	Refer to the table on p.233.	3: HOME	C
2177 (0881h)	6273 (1881h)	IN1 input function selection		4: START	
2178 (0882h)	6274 (1882h)	IN2 input function selection		48: M0	
2179 (0883h)	6275 (1883h)	IN3 input function selection		49: M1	
2180 (0884h)	6276 (1884h)	IN4 input function selection		50: M2	
2181 (0885h)	6277 (1885h)	IN5 input function selection		16: FREE	
2182 (0886h)	6278 (1886h)	IN6 input function selection		18: STOP	
2183 (0887h)	6279 (1887h)	IN7 input function selection		24: ALM-RST	
2192 (0890h)	6288 (1890h)	IN0 input logic level setting	0: Normally open 1: Normally closed	0	
2193 (0891h)	6289 (1891h)	IN1 input logic level setting			
2194 (0892h)	6290 (1892h)	IN2 input logic level setting			
2195 (0893h)	6291 (1893h)	IN3 input logic level setting			
2196 (0894h)	6292 (1894h)	IN4 input logic level setting			
2197 (0895h)	6293 (1895h)	IN5 input logic level setting			
2198 (0896h)	6294 (1896h)	IN6 input logic level setting			
2199 (0897h)	6295 (1897h)	IN7 input logic level setting			
2208 (08A0h)	6304 (18A0h)	OUT0 output function selection	Refer to the table on p.233.	70: HOME-P	
2209 (08A1h)	6305 (18A1h)	OUT1 output function selection		68: MOVE	
2210 (08A2h)	6306 (18A2h)	OUT2 output function selection		73: AREA1	
2211 (08A3h)	6307 (18A3h)	OUT3 output function selection		67: READY	
2212 (08A4h)	6308 (18A4h)	OUT4 output function selection		66: WNG	
2213 (08A5h)	6309 (18A5h)	OUT5 output function selection		65: ALM	

● **Setting range for 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

● **Setting range for OUT output function selection**

0: Not used	10: MS2_R	35: R3	45: R13	61: –LS_R	74: AREA2
1: FWD_R	11: MS3_R	36: R4	46: R14	62: HOMES_R	75: AREA3
2: RVS_R	12: MS4_R	37: R5	47: R15	63: SLIT_R	80: S-BSY
3: HOME_R	13: MS5_R	38: R6	48: M0_R	65: ALM	82: MPS
4: START_R	16: FREE_R	39: R7	49: M1_R	66: WNG	83: STEPOUT
5: SSTART_R	17: AWO_R	40: R8	50: M2_R	67: READY	84: OH
6: +JOG_R	18: STOP_R	41: R9	51: M3_R	68: MOVE	85: ZSG
7: –JOG_R	32: R0	42: R10	52: M4_R	70: HOME-P	86: MBC
8: MS0_R	33: R1	43: R11	53: M5_R	72: TIM	
9: MS1_R	34: R2	44: R12	60: +LS_R	73: AREA1	

■ I/O function [RS-485] parameter

Command code		Name	Setting range	Initial value	Effective (p.227)
Read	Write				
2224 (08B0h)	6320 (18B0h)	NET-IN0 input function selection	Refer to the table on p.234.	48: M0	C
2225 (08B1h)	6321 (18B1h)	NET-IN1 input function selection		49: M1	
2226 (08B2h)	6322 (18B2h)	NET-IN2 input function selection		50: M2	
2227 (08B3h)	6323 (18B3h)	NET-IN3 input function selection		4: START	
2228 (08B4h)	6324 (18B4h)	NET-IN4 input function selection		3: HOME	
2229 (08B5h)	6325 (18B5h)	NET-IN5 input function selection		18: STOP	
2230 (08B6h)	6326 (18B6h)	NET-IN6 input function selection		16: FREE	
2231 (08B7h)	6327 (18B7h)	NET-IN7 input function selection		24: ALM-RST	
2232 (08B8h)	6328 (18B8h)	NET-IN8 input function selection		8: MS0	
2233 (08B9h)	6329 (18B9h)	NET-IN9 input function selection		9: MS1	
2234 (08BAh)	6330 (18BAh)	NET-IN10 input function selection		10: MS2	
2235 (08BBh)	6331 (18BBh)	NET-IN11 input function selection		5: SSTART	
2236 (08BCh)	6332 (18BCh)	NET-IN12 input function selection		6: +JOG	
2237 (08BDh)	6333 (18BDh)	NET-IN13 input function selection		7: –JOG	
2238 (08BEh)	6334 (18BEh)	NET-IN14 input function selection		1: FWD	
2239 (08BFh)	6335 (18BFh)	NET-IN15 input function selection		2: RVS	

Command code		Name	Setting range	Initial value	Effective (p.227)
Read	Write				
2240 (08C0h)	6336 (18C0h)	NET-OUT0 output function selection	Refer to table below.	48: M0_R	C
2241 (08C1h)	6337 (18C1h)	NET-OUT1 output function selection		49: M1_R	
2242 (08C2h)	6338 (18C2h)	NET-OUT2 output function selection		50: M2_R	
2243 (08C3h)	6339 (18C3h)	NET-OUT3 output function selection		4: START_R	
2244 (08C4h)	6340 (18C4h)	NET-OUT4 output function selection		70: HOME-P	
2245 (08C5h)	6341 (18C5h)	NET-OUT5 output function selection		67: READY	
2246 (08C6h)	6342 (18C6h)	NET-OUT6 output function selection		66: WNG	
2247 (08C7h)	6343 (18C7h)	NET-OUT7 output function selection		65: ALM	
2248 (08C8h)	6344 (18C8h)	NET-OUT8 output function selection		80: S-BSY	
2249 (08C9h)	6345 (18C9h)	NET-OUT9 output function selection		73: AREA1	
2250 (08CAh)	6346 (18CAh)	NET-OUT10 output function selection		74: AREA2	
2251 (08CBh)	6347 (18CBh)	NET-OUT11 output function selection		75: AREA3	
2252 (08CCh)	6348 (18CCh)	NET-OUT12 output function selection		72: TIM	
2253 (08CDh)	6349 (18CDh)	NET-OUT13 output function selection		68: MOVE	
2254 (08CEh)	6350 (18CEh)	NET-OUT14 output function selection		0: Not used	
2255 (08CFh)	6351 (18CFh)	NET-OUT15 output function selection		83: STEPOUT	

- **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

- **Setting range for NET-OUT output function selection**

0: Not used	10: MS2_R	35: R3	45: R13	61: –LS_R	74: AREA2
1: FWD_R	11: MS3_R	36: R4	46: R14	62: HOMES_R	75: AREA3
2: RVS_R	12: MS4_R	37: R5	47: R15	63: SLIT_R	80: S-BSY
3: HOME_R	13: MS5_R	38: R6	48: M0_R	65: ALM	82: MPS
4: START_R	16: FREE_R	39: R7	49: M1_R	66: WNG	83: STEPOUT
5: SSTART_R	17: AWO_R	40: R8	50: M2_R	67: READY	84: OH
6: +JOG_R	18: STOP_R	41: R9	51: M3_R	68: MOVE	85: ZSG
7: –JOG_R	32: R0	42: R10	52: M4_R	70: HOME-P	86: MBC
8: MS0_R	33: R1	43: R11	53: M5_R	72: TIM	
9: MS1_R	34: R2	44: R12	60: +LS_R	73: AREA1	

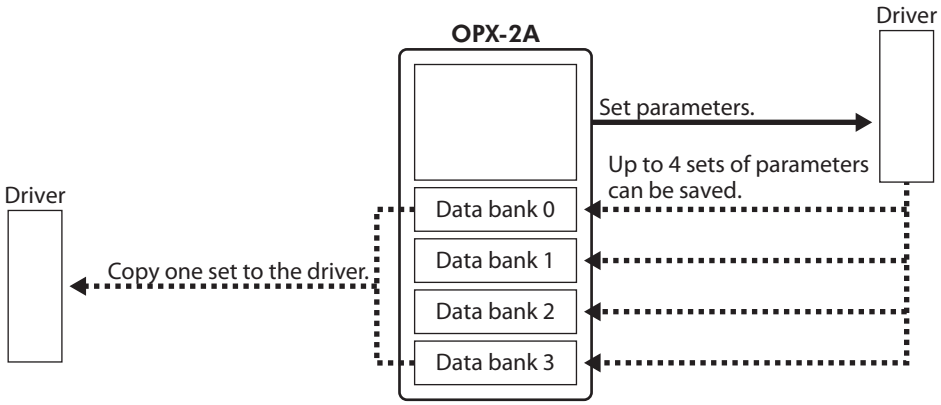
7 Operation using the OPX-2A

This chapter explains the overview and operation using the OPX-2A.

◆Table of contents

1 Overview of the OPX-2A

The **OPX-2A** is a data setter that lets you set parameters and monitor the communication time.
In addition, the **OPX-2A** can be used to save the data of driver. There are four destinations (data banks) to save data.

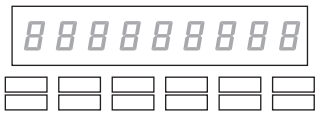


The **OPX-2A** can be used for the following purposes:

- Set parameters for the driver.
- Monitor the communication time and status.
- Check and clear the alarm records.
- The parameters set in the driver can be saved to the **OPX-2A**.
- The parameters saved in the **OPX-2A** can be copied to another driver connected to the **OPX-2A**.

■ Notation

In this manual, keys are denoted by symbols, such as【MODE/ESC】【SET】【↑】【↓】【←】【→】.
In figures, a simplified illustration of the display and LED indicators is used, as shown below.

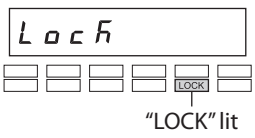


■ Edit lock function

Enable the edit lock function if you want to prevent parameters from being edited or cleared.
Parameters cannot be changed or deleted while the edit lock function is enabled.

● Setting the edit lock function

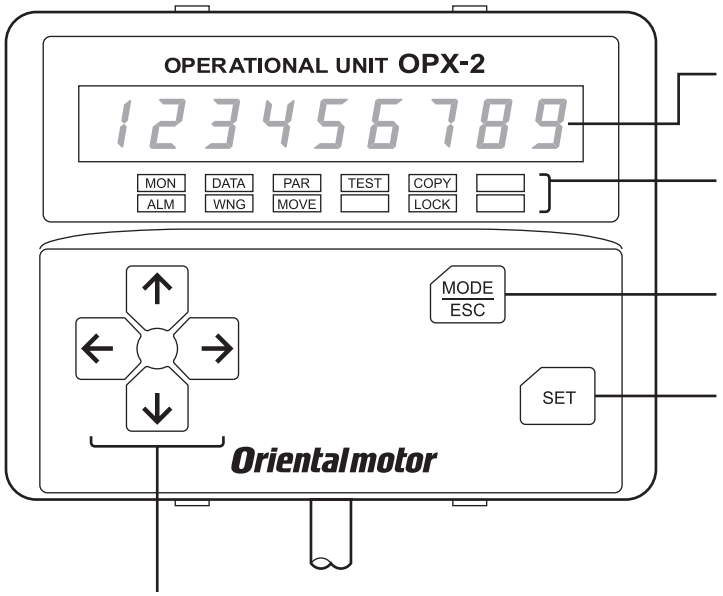
In the top screen of each operation mode, press the【MODE/ESC】key for at least 5 seconds.
The display will show "LocK" and the edit lock function will be enabled.
The "LOCK" LED in the LED indicator area will also be lit.



● Canceling the edit lock function

Again in the top screen of each operation mode, press the【MODE/ESC】key for at least 5 seconds.
The display will show "UnLocK" and the edit lock function will be cancelled.
The "LOCK" LED in the LED indicator area will turn off.

1-1 Names and functions of parts



Display
This area shows the motor position, operation data, parameters, alarms, etc.

LED indicators
These LED indicators are used to indicate the operation mode of the **OPX-2A** and the driver status.

Use this button to change the operation mode or move to the upper level.

Use this button to select data, change the displayed item or move to the lowerlevel.

Use these buttons to change the selected item or set data and parameters.

Use these buttons to increase or decrease the value or change the selected item.

Use these buttons to navigate through each data or parameter to a desired digit.

1-2 How to read the display

The display consists of 7-segment LEDs. (The number "5" and alphabet "S" are the same.)

• Numbers

1	2	3	4	5	6	7	8	9	0

• Alphabets

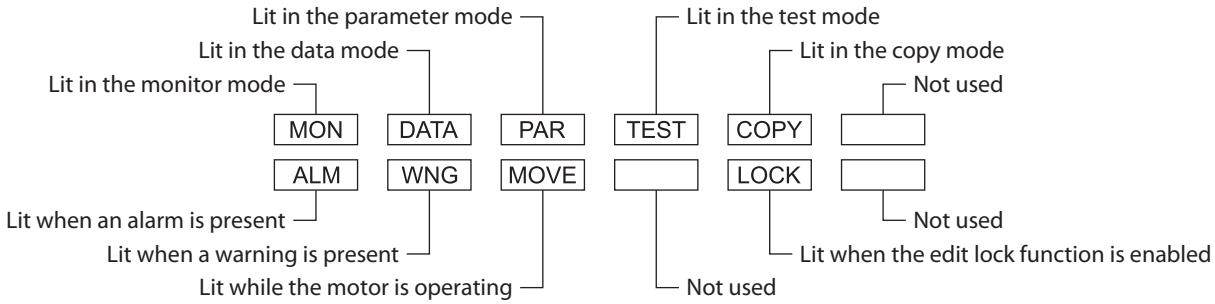
A	B	C	D	E	F	G	H	I	J	K	L
M	N	O	P	Q	R	S	T	U	V	W	Y

• Signs

+	−

■ How to read the LED indicators

When the operation mode is changed or an alarm or warning generates, a corresponding LED will be lit.
While the motor is operating or the edit lock function is enabled, the condition is also indicated by the illumination of a corresponding LED.



1-3 OPX-2A error display

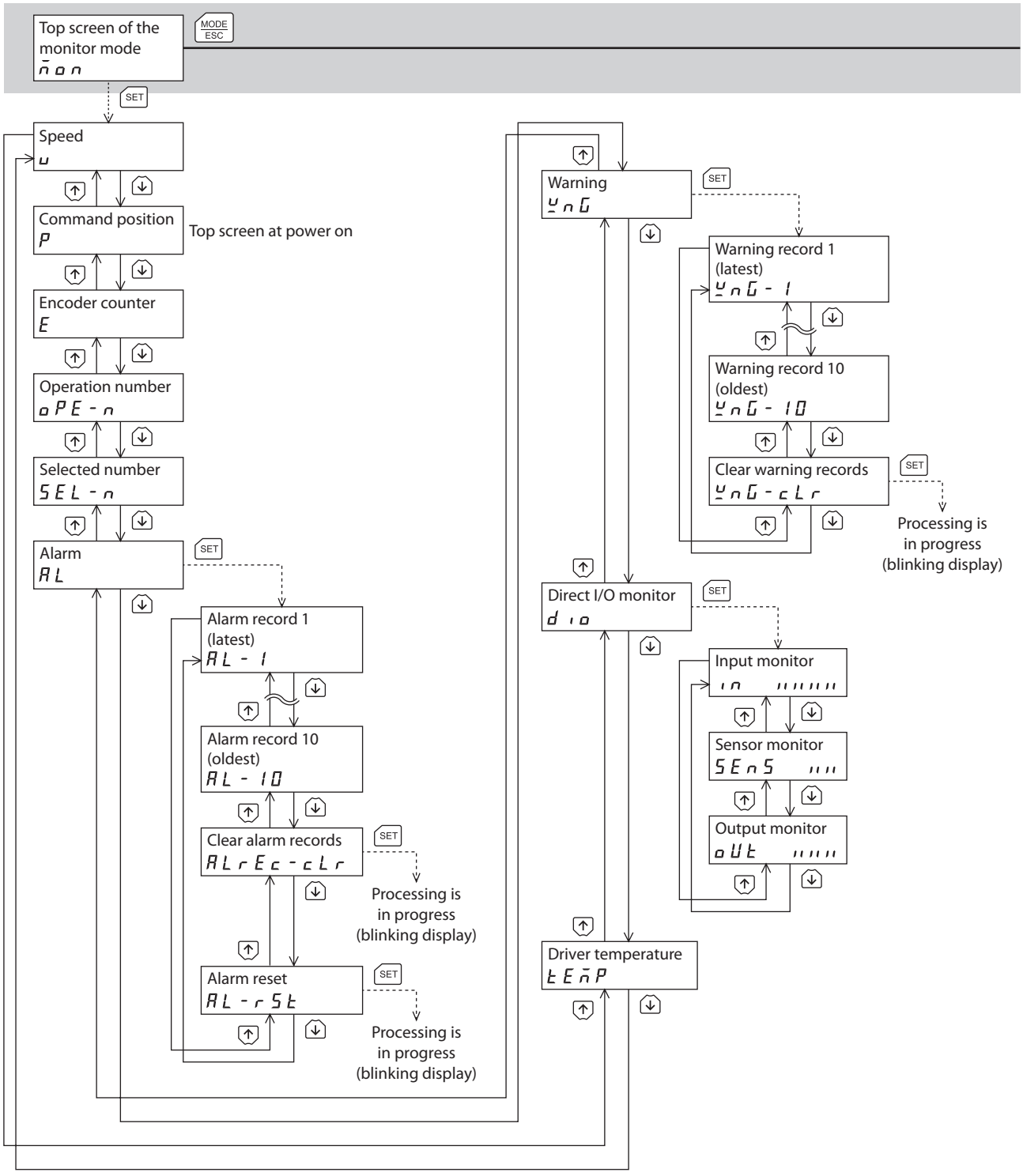
Errors displayed on the **OPX-2A** are explained.

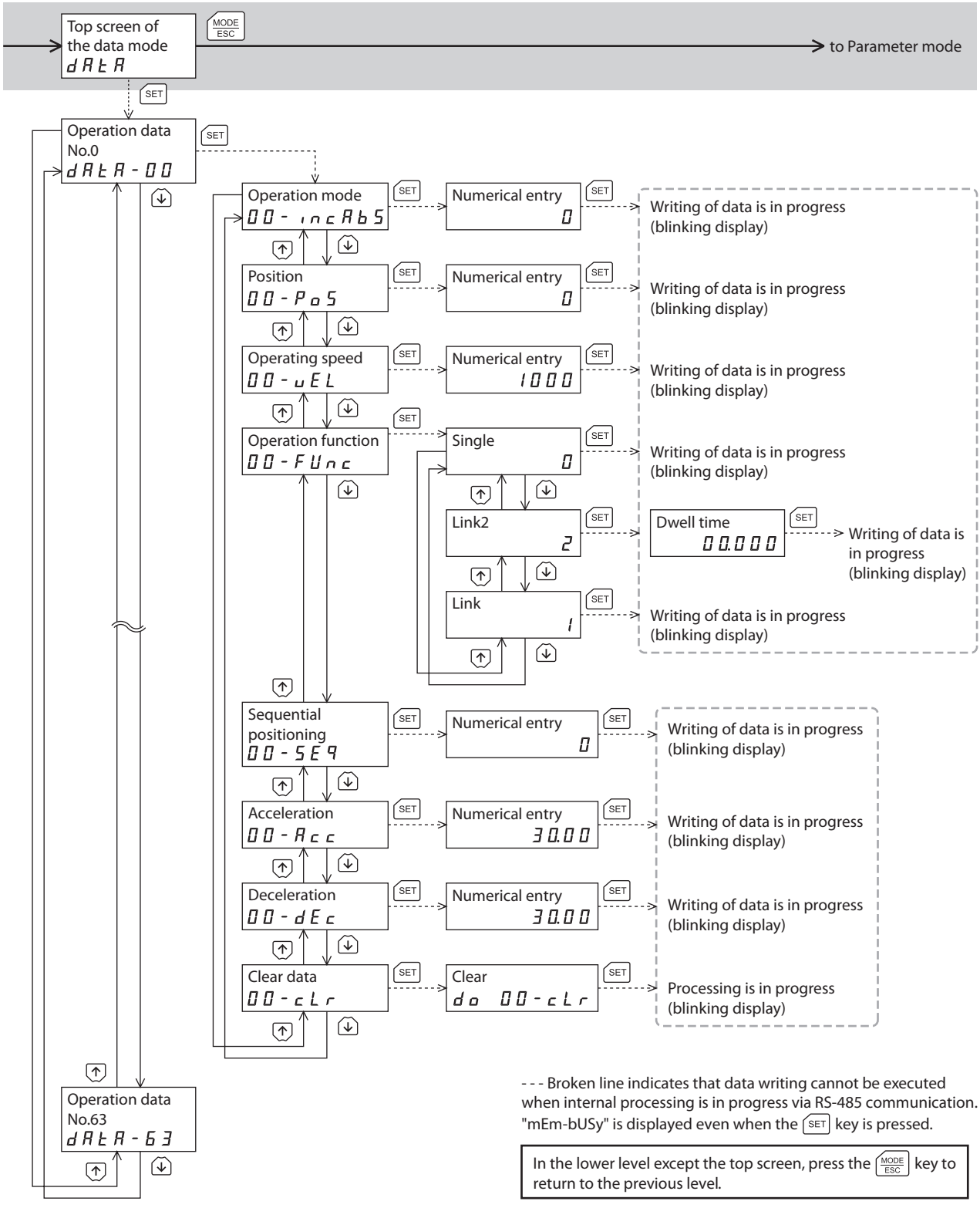
Error display	Meaning	Action
t inEoUt 1.1	A communication error occurred between the **OPX-2A** and driver.	• Check if the **OPX-2A** is connected securely. • Check if the **OPX-2A** cable is disconnected or damaged. • The **OPX-2A** or the communication part of the driver may have damaged. Contact your nearest Oriental Motor sales office.

2 Screen transitions

memo

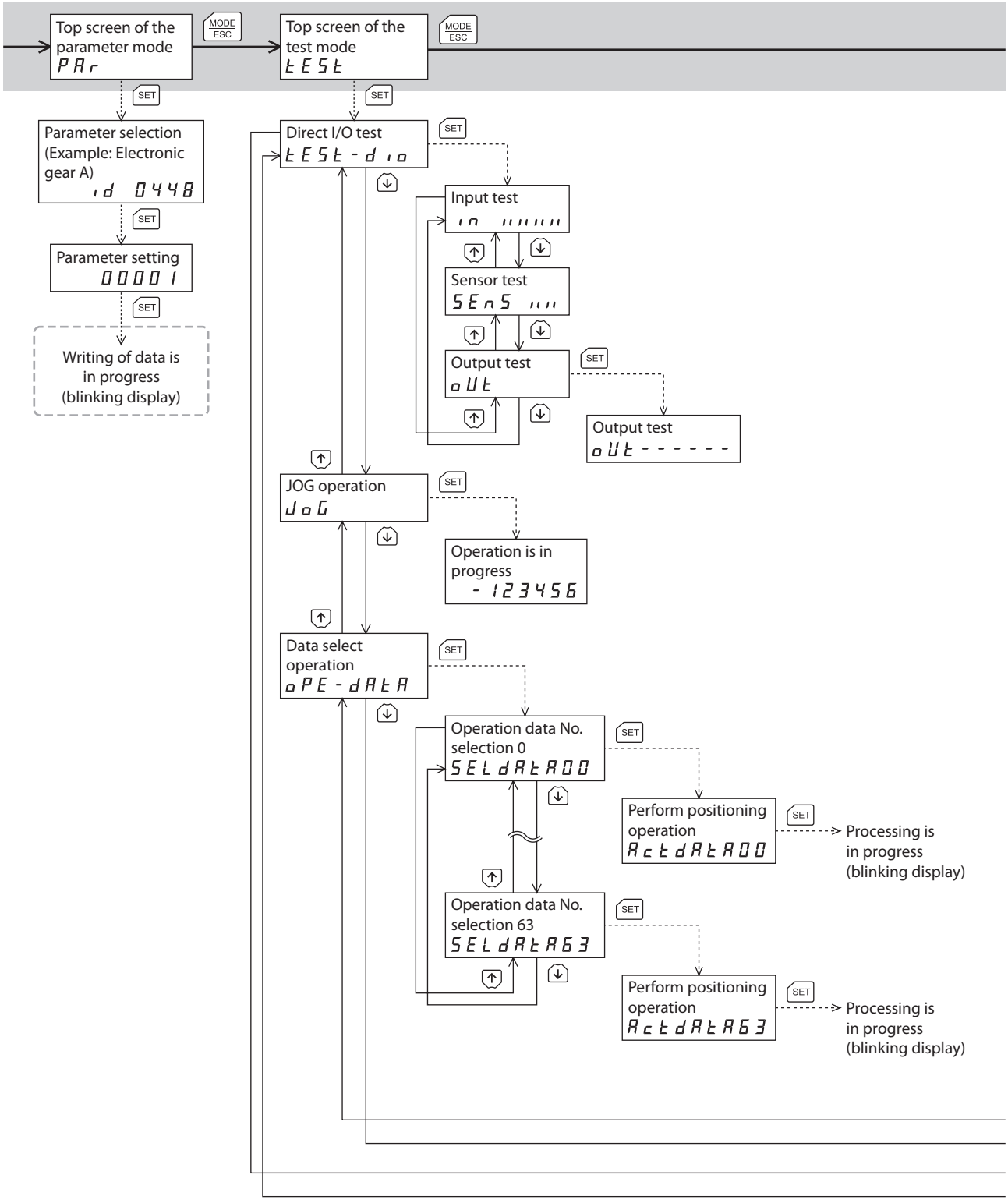
- The following limitations are present while the edit lock function is enabled.
  – Data mode, parameter mode: Although they are displayed on the screen, they are unable to operate.
  – Clearing the alarm and warning records, clear data, position preset, encoder counter preset, teaching, copy mode: They are not displayed on the screen.
- When the HMI input is OFF, you can operate all functions of the monitor mode, uploading and verification of the copy mode, and viewing of the parameter mode.

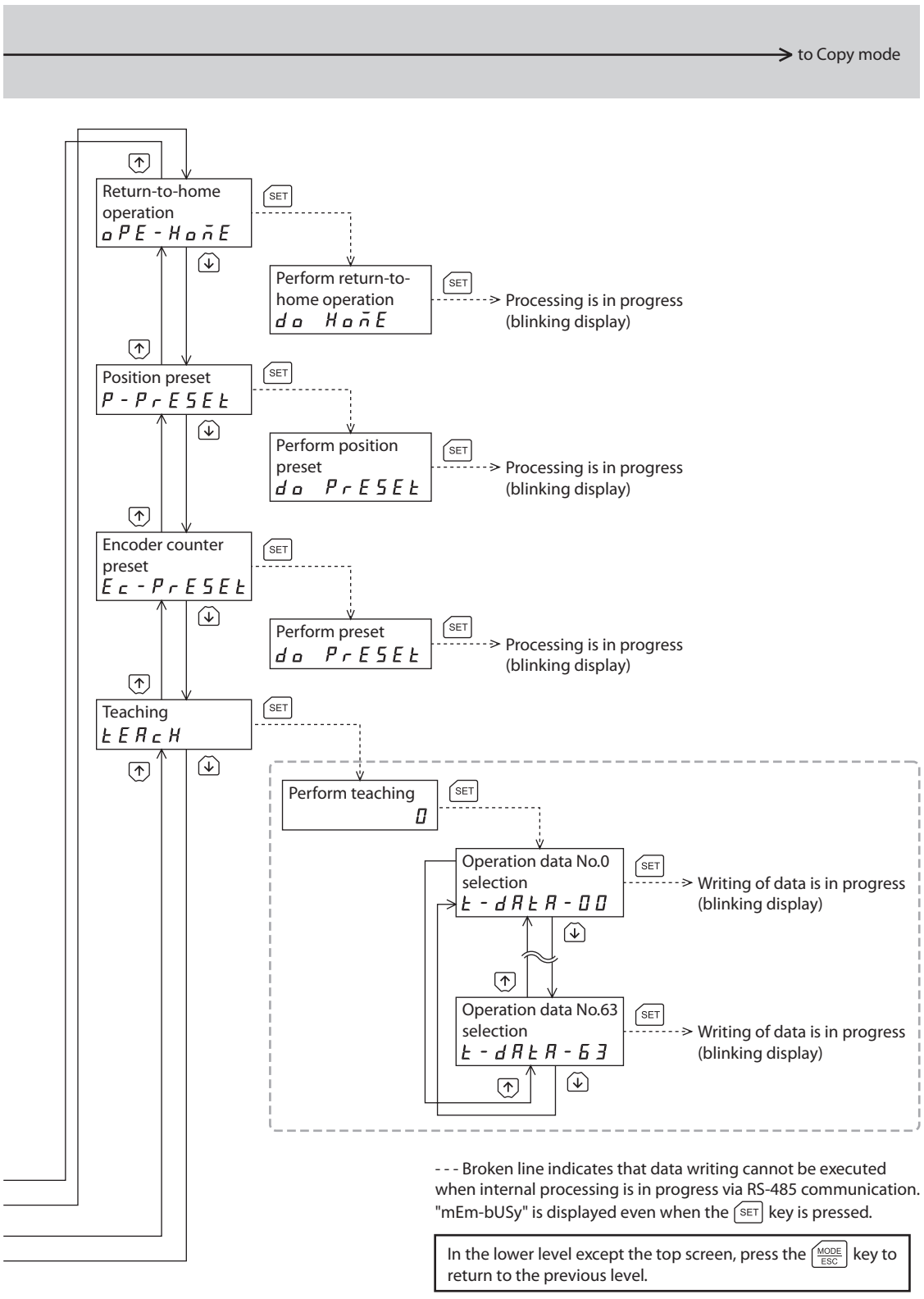




- - - Broken line indicates that data writing cannot be executed when internal processing is in progress via RS-485 communication. "mEm-bUSy" is displayed even when the SET key is pressed.

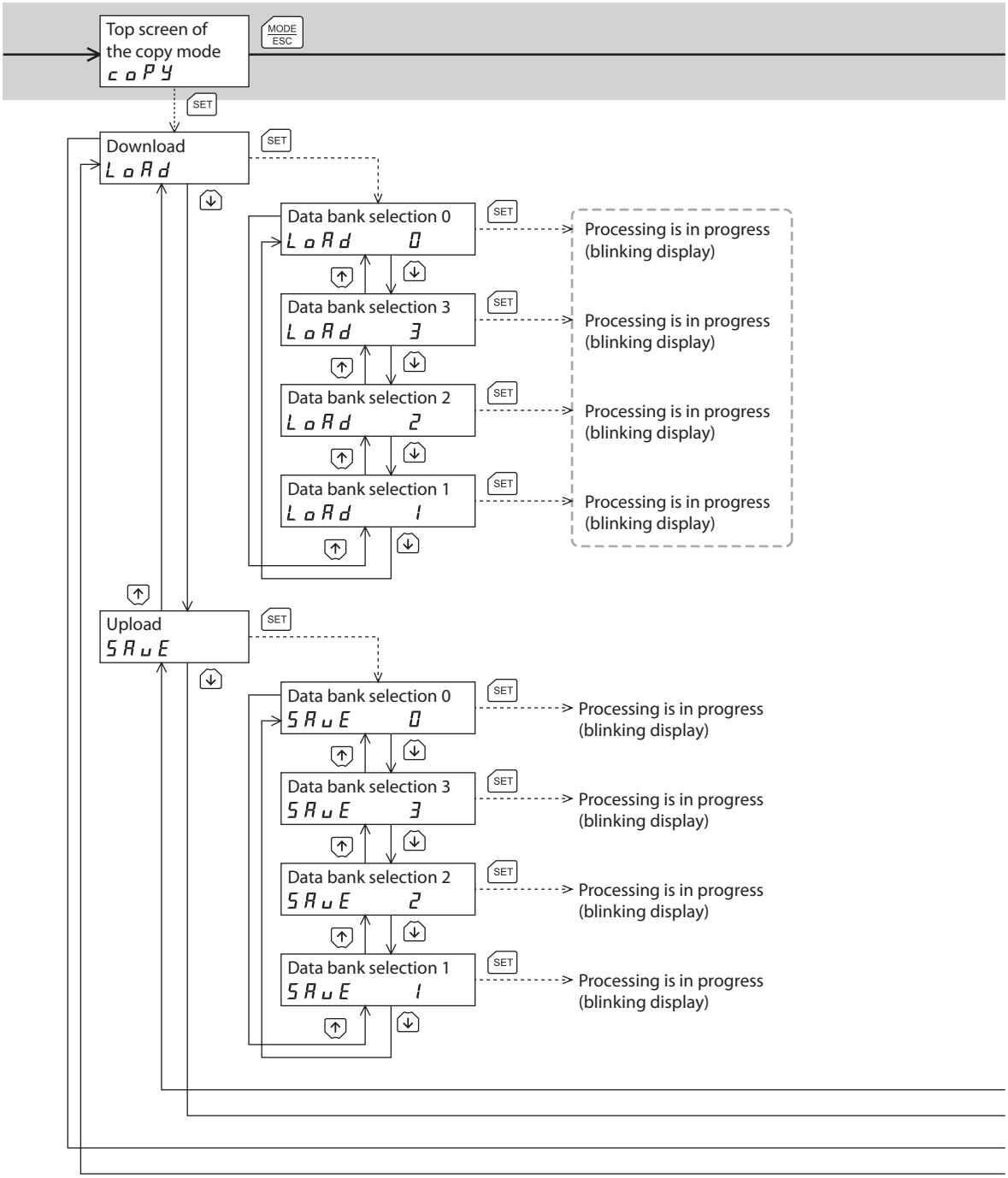
In the lower level except the top screen, press the MODE ESC key to return to the previous level.

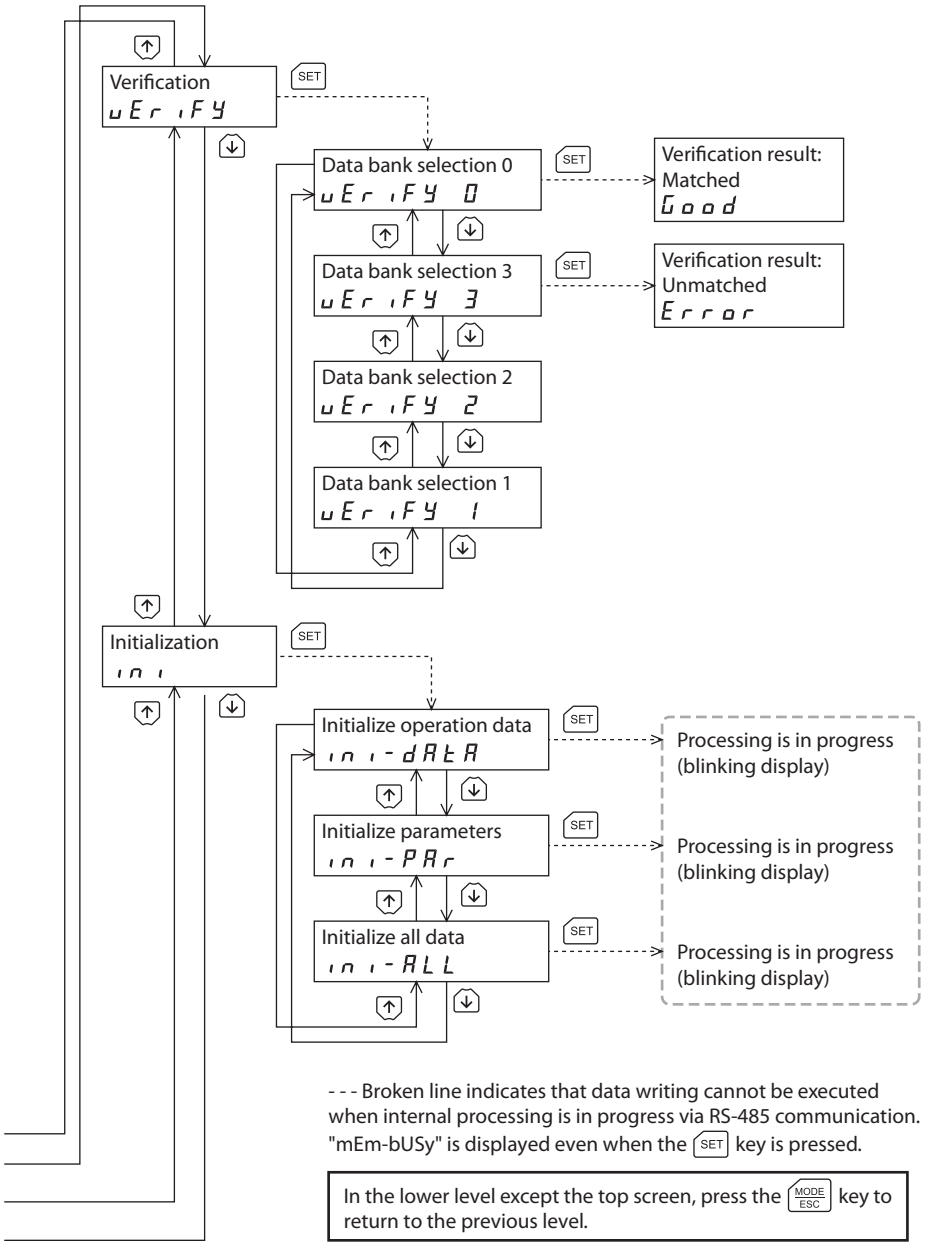

Top screen of the parameter mode
PAr
MODE ESC
Top screen of the test mode
tESt
MODE ESC
SET
Parameter selection (Example: Electronic gear A)
id 0448
Parameter setting
00001
Writing of data is in progress (blinking display)
Direct I/O test
tESt-dio
Input test
in
Sensor test
SEnS
Output test
oUt
Output test
oUt------
JOG operation
JoG
Operation is in progress
-123456
Data select operation
oPE-dAtA
Operation data No. selection 0
SELdAtA00
Perform positioning operation
ActdAtA00
Processing is in progress (blinking display)
Operation data No. selection 63
SELdAtA63
Perform positioning operation
ActdAtA63
Processing is in progress (blinking display)



- - - Broken line indicates that data writing cannot be executed when internal processing is in progress via RS-485 communication. "mEm-bUSy" is displayed even when the SET key is pressed.

In the lower level except the top screen, press the MODE/ESC key to return to the previous level.


Top screen of the copy mode
coPY
MODE ESC
SET
Download
LoAd
Data bank selection 0
LoAd 0
Data bank selection 3
LoAd 3
Data bank selection 2
LoAd 2
Data bank selection 1
LoAd 1
Processing is in progress (blinking display)
Upload
SAuE
Data bank selection 0
SAuE 0
Data bank selection 3
SAuE 3
Data bank selection 2
SAuE 2
Data bank selection 1
SAuE 1



- - - Broken line indicates that data writing cannot be executed when internal processing is in progress via RS-485 communication. "mEm-bUSy" is displayed even when the SET key is pressed.

In the lower level except the top screen, press the MODE ESC key to return to the previous level.

3 Monitor mode

3-1 Overview of the monitor mode

- **Monitoring the operating status**

  You can monitor the motor speed, command position, encoder counter, operation data number corresponding to the current operation, operation data number currently selected, and internal temperature of the driver in real time.

- **Checking the alarms/warnings, clearing alarm/warning records, and resetting alarms**
  - If an alarm or warning generates, a corresponding alarm code or warning code will be displayed. You can check the code to identify the details of the alarm/warning.
  - Up to ten most recent alarms/warnings can be displayed, starting from the latest one. You can also clear alarm/warning records.
  - You can reset the alarms currently present.

- **Checking the I/O signals**

  You can check the ON/OFF status of each I/O signal of the driver.

3-2 Monitor items

■ Motor speed

You can check the motor speed (unit: Hz).
While the motor is rotating in the CCW direction, "–" is shown in front of the displayed value. If the speed is indicated by an absolute value, no sign is shown to indicate the rotating direction.
You can select the value display format using the "data setter speed display" parameter.

■ Command position

You can check the command position of the motor with reference to the home position.
If a resolution is set, an appropriate value based on the resolution is shown as steps.

■ Encoder count

When an encoder is equipped, you can check the encoder counter value.

■ Operation number

You can check the operation data number corresponding to the data used in the current positioning operation.

■ Selected number

You can check the operation data number currently selected.

■ Alarm

When an alarm generates, a corresponding alarm code will be displayed. You can also reset alarms or check and clear alarm records. For details of alarm, refer to p.267.

Note Do not turn off the driver power while an alarm is being reset or alarm records are being cleared (=while the display is blinking). Doing so may damage the data.

memo Some alarms cannot be reset on the **OPX-2A**. Check with the "Alarm list" on p.268. To reset these alarms, you must cycle the driver power.

■ Warning

When a warning generates, a corresponding warning code will be displayed. You can also check or clear warning records. For details of warning, refer to p.272.

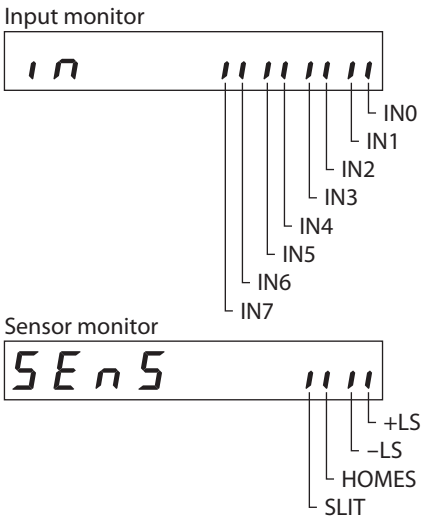
Note Do not turn off the driver power while warning records are being cleared (=while the display is blinking). Doing so may damage the data.

memo You can also clear the warning records by turning off the driver power.

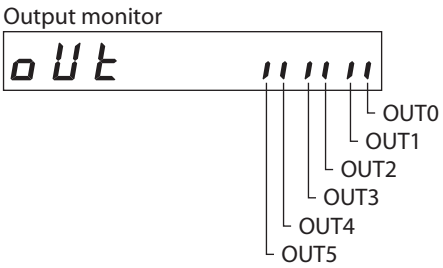
■ Direct I/O monitor

You can check the ON/OFF status of each I/O signal of the driver.
Each digit on the 7-segment LED display corresponds to a signal. The LED is lit when the signal is ON, and it is unlit when the signal is OFF.

• Input signals



• Output signals



■ Driver temperature

You can check the internal temperature of the driver.

Example: When the internal temperature of the driver is 40 °C (104 °F)

4 Data mode

Up to 64 sets of motor operation data can be set. Once set, the operation data is stored in the driver. The data will not be lost even after the **OPX-2A** is disconnected from the driver.

Note Operation data has significant bearing on motor operation. Before setting any operation data, make sure you fully understand the content of the operation data.

memo
- If operations are limited by the edit lock function or HMI input, operation data cannot be edited.
- Operation data can also be set by selecting the ID with the parameter mode.
- If the value you have input is outside the setting range, "Error" will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.
- If【SET】key is pressed while executing the internal processing via RS-485 communication, "mEm-bUSy" may be displayed. Check "2 Screen transitions" on p.240 when "mEm-bUSy" is displayed. Be sure to wait until all internal processing is completed, before pressing the【SET】key.

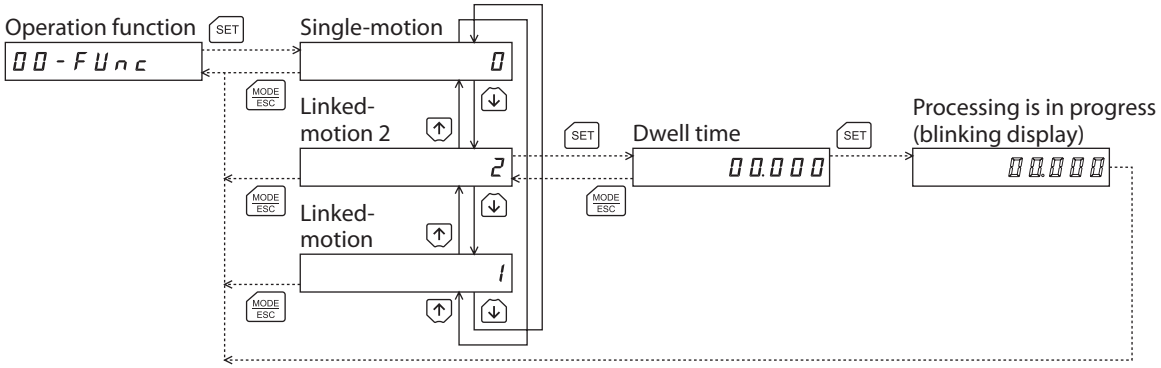
4-1 Setting items

Setting item	Description	Setting range	Initial value
Operation mode	Selects how to specify the position (travel amount) in positioning operation (absolute mode or incremental mode).	Inc: Incremental mode AbS: Absolute mode	Inc
Position	Sets the position (distance) for positioning operation.	−8,388,608 to +8,388,607 step	0
Operating speed	Sets the operating speed in positioning operation and continuous operation.	0 to 1,000,000 Hz	1000
Operation function	Sets perform positioning operation as single-motion or linked-motion operation.	0: Single-motion 1: Linked-motion 2: Linked-motion 2	0
Sequential positioning	Sets enable or disable sequential positioning operation.	0: Disable 1: Enable	0
Acceleration	Sets the acceleration rate or time in positioning operation and continuous operation. *	0.001 to 1000.000 ms/kHz or 0.001 to 1000.000 s	30.000
Deceleration	Sets the deceleration rate or time in positioning operation and continuous operation. *		
Dwell time	Sets the dwell time to be used in linked-motion operation 2.	0.000 to 50.000 s	0.000

* 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.

■ How to set the dwell time

When displaying the "2: linked-motion 2" on the "operation function" and pressing the【SET】key, the screen to set the dwell time is displayed. Input the dwell time using the【↑】【↓】【←】【→】keys and press the【SET】key.

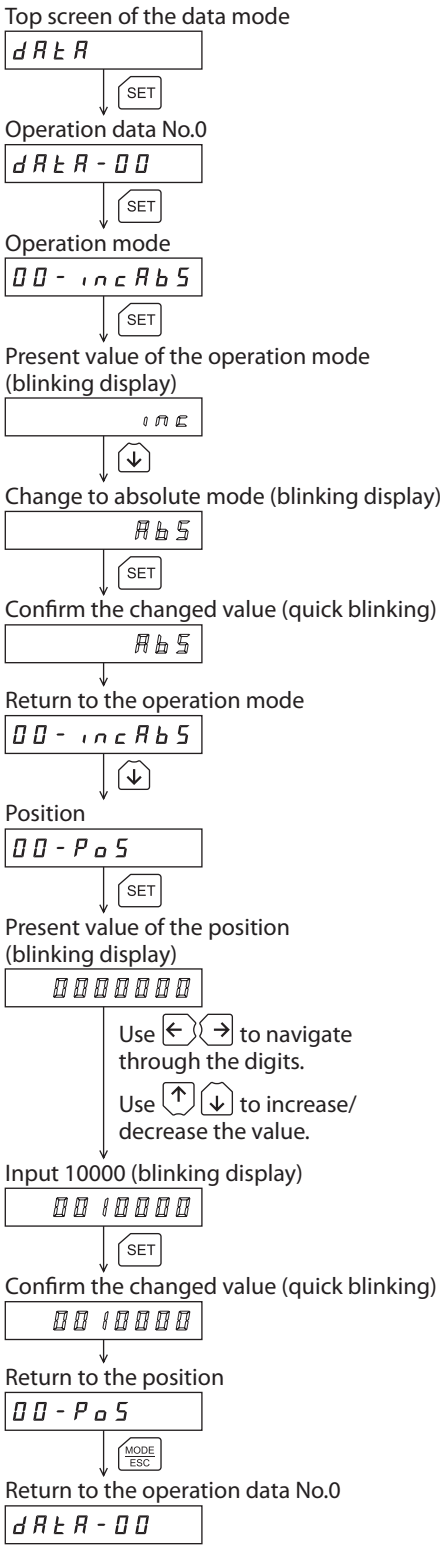


4-2 Setting example

This section explains how to change the operation mode and position of the operation data No.0.

- Operation mode: Changes from incremental mode to absolute mode.
- Position: Changes from 0 step to 10000 steps.

1. Use the【MODE/ESC】key to select the data mode.
   The "DATA" LED is lit.
2. Press the【SET】key on the top screen of the data mode.
   The display changes to the operation data No.0 screen.
3. Press the【SET】key.
   The display changes to the operation mode screen.
4. Press the【SET】key again.
   The present set value of the operation mode is displayed with blinking.
5. Press the【↓】key once to select "AbS."
6. Press the【SET】key.
   The blinking speed of the input value becomes quickly and the value is set.
   The display returns to the operation mode screen.
7. Press the【↓】key.
   The display changes to the position screen.
8. Press the【SET】key.
   The present set value of the position is displayed with blinking.
9. Use the【↑】【↓】【←】【→】keys to select "10000".
   The selected digit is displayed with blinking.
10. Press the【SET】key.
    The blinking speed of the input value becomes quickly and the value is set.
    The display returns to the position screen.
11. Press the【MODE/ESC】key.
    The display returns to the operation data No.0 screen.



4-3 Initialization of the selected operation data

All of the set value for the selected operation data number can be reverted to the initial values. Perform "clear data" of the data mode. For the operation, check the screen transitions of the data mode on p.241.

4-4 Initialization of all operation data

All of the operation data saved in the driver can be reverted to the initial values. Perform "Initialize operation data" of the copy mode. For the operation, check the screen transitions of the copy mode on p.244.

5 Parameter mode

You can set parameters relating to motor operation and control. These parameters are saved in the non-volatile memory of the driver.

Note Parameters have significant bearing on motor operation. Before setting any parameter, make sure you fully understand the content of the parameter.

memo
- If operations are limited by the edit lock function or HMI input, parameters cannot be edited.
- If the value you have input is outside the setting range, "Error" will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.
- If【SET】key is pressed while executing the internal processing via RS-485 communication, "mEm-bUSy" may be displayed. Check "2 Screen transitions" on p.240 when "mEm-bUSy" is displayed. Be sure to wait until all internal processing is completed, before pressing the【SET】key.
- If a non-existent parameter ID is entered, "id-Err" will be displayed for 1 second. Check the ID and enter the correct one.

■ Timing for the setting value to become effective

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

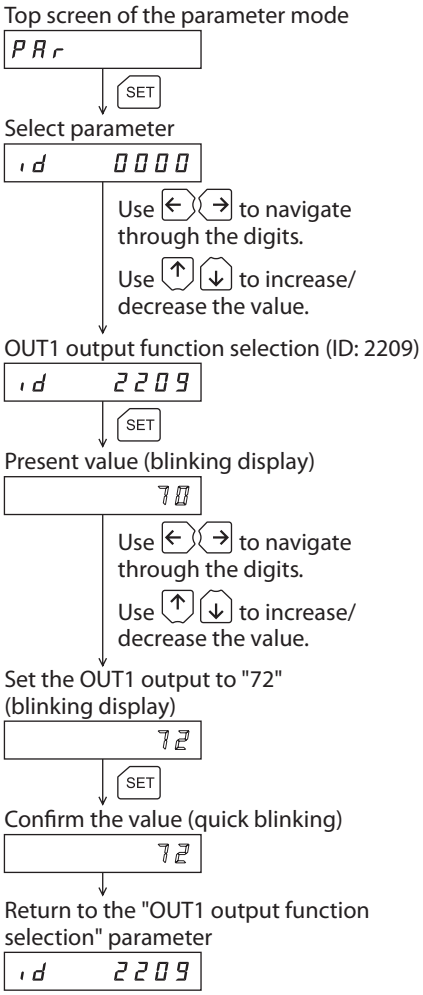
Update timing		Description
A	Effective immediately	Executes the recalculation and setup immediately when writing the parameter.
B	Effective after stopping the operation	Executes the recalculation and setup after stopping the operation.
C	Effective after cycling the power	Executes the recalculation and setup after cycling the 24 VDC power.

In this document, each update timing is represented in an alphabetical character.

5-1 Setting example

This section explains how to assign the TIM output to the OUT1 output.

1. Use the【MODE/ESC】key to select the parameter mode.
   The "PAR" LED is lit.
2. Press the【SET】key on the top screen of the parameter mode.
3. Use the【↑】【↓】【←】【→】keys to enter [ID: 2209] in the "OUT1 output function selection" parameter.
4. Press the【SET】key.
   The present set value of the OUT1 output is displayed with blinking.
5. Use the【↑】【↓】【←】【→】keys to enter "72".
   "72" indicates the TIM output.
6. Press the【SET】key.
   The blinking speed of the input value becomes quickly and the value is set.
   The display returns to the OUT1 signal mode selection parameter screen.



5-2 Parameter list

There is an unique ID in each parameter. With the **OPX-2A**, set the parameter selecting the ID.

■ Operation data

Operation data can also be set by selecting the data mode.

ID	Parameter name	Setting range	Initial value	Effective (p.252)
640 to 703	Operation mode No.0 to Operation mode No.63	Inc: Incremental mode AbS: Absolute mode	Inc	B
512 to 575	Position No.0 to Position No.63	−8,388,608 to +8,388,607 step	0	
576 to 639	Operating speed No.0 to Operating speed No.63	0 to 1,000,000 Hz	1000	
704 to 767	Operation function No.0 to Operation function No.63	0: Single-motion 1: Linked-motion 2: Linked-motion 2	0	
960 to 1023	Sequential positioning No.0 to Sequential positioning No.63	0: Disable 1: Enable	0	
768 to 831	Acceleration No.0 to Acceleration No.63	0.001 to 1000.000 ms/kHz or 0.001 to 1000.000 s *	30.000	
832 to 895	Deceleration No.0 to Deceleration No.63			
1024 to 1087	Dwell time No.0 to Dwell time No.63	0.000 to 50.000 s	0.000	

* 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.

■ Parameters

ID	Parameter name	Setting range	Initial value	Effective (p.252)
256	STOP input action	0: Immediate stop 1: Deceleration stop 2: Immediate stop & Current OFF 3: Deceleration stop & Current OFF	1	A
257	Hardware overtravel	0: Disable 1: Enable	1	
258	Overtravel action	0: Immediate stop 1: Deceleration stop	0	
261	AREA1 positive direction position	−8,388,608 to 8,388,607 step	0	
262	AREA1 negative direction position			
263	AREA2 positive direction position			
264	AREA2 negative direction position			
265	AREA3 positive direction position			
266	AREA3 negative direction position			
267	Minimum ON time for MOVE output	0 to 255 ms	0	
268	±LS logic level	0: Normally open 1: Normally closed	0	C
269	HOMES logic level			
270	SLIT logic level			
288	RUN current	0.0 to 100.0%	100.0	A
289	STOP current	0.0 to 60.0%	50.0	
293	Speed filter	0 to 200 ms	1	B
294	Moving average time		1	
320	Common acceleration	0.001 to 1000.000 ms/kHz or 0.001 to 1000.000 s	30.000	
321	Common deceleration			
322	Starting speed	0 to 1,000,000 Hz	100	
323	JOG operating speed	1 to 1,000,000 Hz	1000	
324	JOG acceleration/deceleration rate	0.001 to 1000.000 ms/kHz or 0.001 to 1000.000 s	30.000	
325	JOG starting speed	0 to 1,000,000 Hz	100	
326	Acceleration/deceleration type	0: Common 1: Separate	1	
327	Acceleration/deceleration unit	0: ms/kHz 1: s	0	C
352	Home-seeking mode	0: 2-sensor mode 1: 3-sensor mode	1	B
353	Operating speed of home-seeking	1 to 1,000,000 Hz	1000	
354	Acceleration/deceleration of home-seeking	0.001 to 1000.000 ms/kHz or 0.001 to 1000.000 s	30.000	
355	Starting speed of home-seeking	1 to 1,000,000 Hz	100	
356	Position offset of home-seeking	−8,388,608 to 8,388,607 step	0	
357	Starting direction of home-seeking	0: Negative direction 1: Positive direction	1	B
358	SLIT detection with home-seeking	0: Disable 1: Enable	0	
359	TIM signal detection with home-seeking	0: Disable 1: TIM signal enable 2: ZSG signal enable	0	
388	Return-to-home incomplete alarm	0: Disable 1: Enable	0	C

ID	Parameter name	Setting range	Initial value	Effective (p.252)
416	Overheat warning	40 to 85 °C (104 to 185 °F)	85	A
419	Overvoltage warning	120 to 450 V	435	
420	Undervoltage warning	120 to 280 V	120	
448	Electronic gear A	1 to 65535	1	C
449	Electronic gear B			
450	Motor rotation direction	0: Positive direction=CCW 1: Positive direction=CW	1	
451	Software overtravel	0: Disable 1: Enable	1	A
452	Positive software limit	−8,388,608 to 8,388,607 step	8,388,607	
453	Negative software limit		−8,388,608	
454	Preset position		0	
455	Wrap setting	0: Disable 1: Enable	0	C
456	Wrap setting range	1 to 8,388,607 step	500	
480	Data setter speed display	0: Signed 1: Absolute value	0	A
481	Data setter edit	0: Disable 1: Enable	1	
2048	MS0 operation No. selection	0 to 63	0	B
2049	MS1 operation No. selection		1	
2050	MS2 operation No. selection		2	
2051	MS3 operation No. selection		3	
2052	MS4 operation No. selection		4	
2053	MS5 operation No. selection		5	
2054	HOME-P output function selection	0: Home output 1: Return-to-home complete output	0	A
2064	Filter selection	0: Speed filter 1: Moving average filter	0	C
2084	JOG travel amount	1 to 8,388,607 step	1	B
2096	Backward steps in 2-sensor mode home-seeking	0 to 32767 step	200	
2144	Encoder resolution	100 to 10000 P/R	500	C
2145	Encoder preset value	−8,388,608 to 8,388,607 step	0	A
2146	Stepout detection	0: Disable 1: Enable	0	C
2147	Stepout detection band	0.1 to 360.0°	7.2	A
2148	Stepout detection action	0: No operation 1: Warning 2: Alarm	0	
2176	IN0 input function selection	See table on p.258.	3	C
2177	IN1 input function selection		4	
2178	IN2 input function selection		48	
2179	IN3 input function selection		49	
2180	IN4 input function selection		50	
2181	IN5 input function selection		16	
2182	IN6 input function selection		18	
2183	IN7 input function selection		24	

ID	Parameter name	Setting range	Initial value	Effective (p.252)
2192	IN0 input logic level setting	0: Normally open 1: Normally closed	0	C
2193	IN1 input logic level setting			
2194	IN2 input logic level setting			
2195	IN3 input logic level setting			
2196	IN4 input logic level setting			
2197	IN5 input logic level setting			
2198	IN6 input logic level setting			
2199	IN7 input logic level setting			
2208	OUT0 output function selection	See table on p.258.	70	
2209	OUT1 output function selection		68	
2210	OUT2 output function selection		73	
2211	OUT3 output function selection		67	
2212	OUT4 output function selection		66	
2213	OUT5 output function selection		65	
2224	NET-IN0 input function selection	See table on p.258.	48	
2225	NET-IN1 input function selection		49	
2226	NET-IN2 input function selection		50	
2227	NET-IN3 input function selection		4	
2228	NET-IN4 input function selection		3	
2229	NET-IN5 input function selection		18	
2230	NET-IN6 input function selection		16	
2231	NET-IN7 input function selection		24	
2232	NET-IN8 input function selection		8	
2233	NET-IN9 input function selection		9	
2234	NET-IN10 input function selection		10	
2235	NET-IN11 input function selection		5	
2236	NET-IN12 input function selection		6	
2237	NET-IN13 input function selection		7	
2238	NET-IN14 input function selection		1	
2239	NET-IN15 input function selection		2	
2240	NET-OUT0 output function selection	See table on p.258.	48	
2241	NET-OUT1 output function selection		49	
2242	NET-OUT2 output function selection		50	
2243	NET-OUT3 output function selection		4	
2244	NET-OUT4 output function selection		70	
2245	NET-OUT5 output function selection		67	
2246	NET-OUT6 output function selection		66	
2247	NET-OUT7 output function selection		65	
2248	NET-OUT8 output function selection		80	
2249	NET-OUT9 output function selection		73	
2250	NET-OUT10 output function selection		74	
2251	NET-OUT11 output function selection		75	
2252	NET-OUT12 output function selection		72	
2253	NET-OUT13 output function selection		68	
2254	NET-OUT14 output function selection		0	
2255	NET-OUT15 output function selection		83	

ID	Parameter name	Setting range	Initial value	Effective (p.252)
2304	Communication timeout	0: Not monitored 1 to 10000 ms	0	A
2305	Communication error alarm	1 to 10 times	3	
2563	Communication parity	0: None 1: Even number 2: Odd number	1	C
2564	Communication stop bit	0: 1 bit 1: 2 bit	0	
2565	Transmission waiting time	0.0 to 1000.0 ms	10.0	

■ Setting range of function selection parameters

● IN input function selection parameters

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

● OUT output function selection parameters

0: Not used	10: MS2_R	35: R3	45: R13	61: –LS_R	74: AREA2
1: FWD_R	11: MS3_R	36: R4	46: R14	62: HOMES_R	75: AREA3
2: RVS_R	12: MS4_R	37: R5	47: R15	63: SLIT_R	80: S-BSY
3: HOME_R	13: MS5_R	38: R6	48: M0_R	65: ALM	82: MPS
4: START_R	16: FREE_R	39: R7	49: M1_R	66: WNG	83: STEPOUT
5: SSTART_R	17: AWO_R	40: R8	50: M2_R	67: READY	84: O.H.
6: +JOG_R	18: STOP_R	41: R9	51: M3_R	68: MOVE	85: ZSG
7: –JOG_R	32: R0	42: R10	52: M4_R	70: HOME-P	86: MBC
8: MS0_R	33: R1	43: R11	53: M5_R	72: TIM	
9: MS1_R	34: R2	44: R12	60: +LS_R	73: AREA1	

● NET-IN input function selection parameters

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

● NET-OUT output function selection parameters

0: Not used	10: MS2_R	35: R3	45: R13	61: –LS_R	74: AREA2
1: FWD_R	11: MS3_R	36: R4	46: R14	62: HOMES_R	75: AREA3
2: RVS_R	12: MS4_R	37: R5	47: R15	63: SLIT_R	80: S-BSY
3: HOME_R	13: MS5_R	38: R6	48: M0_R	65: ALM	82: MPS
4: START_R	16: FREE_R	39: R7	49: M1_R	66: WNG	83: STEPOUT
5: SSTART_R	17: AWO_R	40: R8	50: M2_R	67: READY	84: O.H.
6: +JOG_R	18: STOP_R	41: R9	51: M3_R	68: MOVE	85: ZSG
7: –JOG_R	32: R0	42: R10	52: M4_R	70: HOME-P	86: MBC
8: MS0_R	33: R1	43: R11	53: M5_R	72: TIM	
9: MS1_R	34: R2	44: R12	60: +LS_R	73: AREA1	

5-3 Initializing parameters

You can revert parameters saved in the driver to their initial values. Perform "Initialize operation data" of the copy mode. For the operation, check the screen transitions of the copy mode on p.244.

6 Test mode

6-1 Overview of the test mode

- **Direct I/O test**

  You can check the ON/OFF status of each input signal of the driver. You can also switch the ON/OFF status of each output signal on the **OPX-2A**. There is also a direct I/O test function with which you can check the connection status of the driver.

- **JOG operation**

  You can operate the motor using the keys on the **OPX-2A**.

- **Data select operation**

  You can perform the positioning operation.

- **Return-to-home operation**

  You can perform the return-to-home operation.

- **Position preset**

  You can set the preset value as the command position.

- **Encoder counter preset**

  You can set the preset value as the encoder counter value.

- **Teaching**

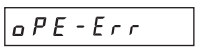
  You can operate the motor using the keys on the **OPX-2A** and reflect the attained position in the operation data.

memo

- Stop the motor operation before changing to the test mode.
- When you move from the top screen of the test mode to a lower level, the following inputs will be disabled.
  START, SSTART, HOME, ±JOG, FWD, RVS and MS0 to MS5.
- In the direct I/O test, if the screen moves to the lower level, all of I/O signals and operation will be disabled.
- If the【SET】key is pressed while executing the internal processing via RS-485 communication, "mEm-bUSy" may be displayed. Check "2 Screen transitions" on p.240 when "mEm-bUSy" is displayed. Be sure to wait until all internal processing is completed, before pressing the【SET】key.
- If "Error" is displayed when data select operation, return-to-home operation, position preset, encoder counter preset or teaching function is performed, check whether an alarm generates.
- When the HMI input is OFF, test mode cannot be executed.

■ What happens when the【SET】key is pressed while the motor is operating

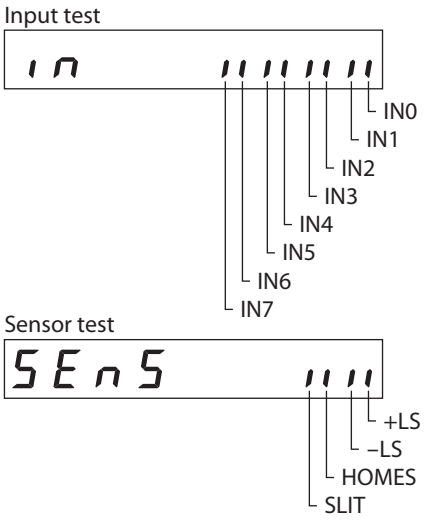
While the motor is operating, you cannot move to any lower level from the top screen of the test mode. Pressing the【SET】key will generate an error, and "oPE-Err" will be shown. Be sure to stop the motor operation before pressing the【SET】key.



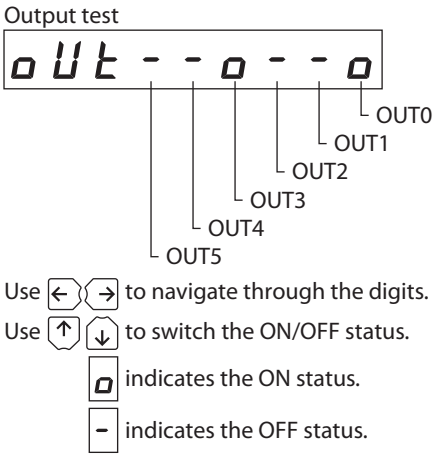
6-2 Direct I/O test

When checking the connection condition of the driver, perform the direct I/O test.
Each digit on the 7-segment LED display corresponds to a signal.
The LED is lit when the input signal is ON, and it is unlit when the input signal is OFF.
Use the【↑】【↓】keys to switch the ON-OFF state of the output signal. "o" is displayed when the signal is ON, while "-" is displayed when the signal is OFF.

• Input signals



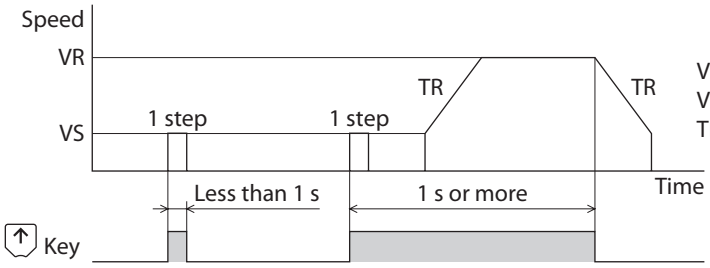
• Output signals



6-3 JOG operation

You can operate the motor using the keys on the **OPX-2A**.
Pressing the【↑】key once causes the motor to rotate one step in the positive direction. Pressing and holding the key causes the motor to rotate continuously in the positive direction.
Pressing the【↓】key once causes the motor to rotate one step in the negative direction. Pressing and holding the key causes the motor to rotate continuously in the negative direction.

The operating speed corresponds to the value set in the "JOG operating speed" parameter.
Take note that when the value set in the "JOG starting speed" parameter is greater than the value set in the "JOG operating speed" parameter, the JOG starting speed will become effective.



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

Note During operation, the motor rotates at the specified operating speed while each applicable key is pressed. Before commencing the operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situations.

6-4 Data select operation

Select a desired operation data number and then press the【SET】key, and positioning operation will be performed.

Note During operation, the motor rotates at the specified operating speed. Before commencing the operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situations.

6-5 Return-to-home operation

You can perform a return-to-home operation.
The operating speed corresponds to the value set in the "operating speed of home-seeking" parameter.

Note During operation, the motor rotates at the specified operating speed. Before commencing the operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situations.

6-6 Presetting the position

In this operation, the command position is preset by rewriting the value in the "preset position" parameter.

memo If operations are limited by the edit lock function, the preset function cannot be performed.

6-7 Presetting the encoder counter

In this operation, the encoder counter is preset by rewriting the value in the "encoder preset value" parameter.

memo If operations are limited by the edit lock function, the preset function cannot be performed.

6-8 Teaching

You can operate the motor using the keys on the **OPX-2A** and reflect the attained position in the operation data.
The absolute mode will be automatically selected as the operation mode of any position data set by teaching.
The operating speed, acceleration/deceleration rate and starting speed of teaching are the same as the corresponding settings applicable to JOG operation.

Note During operation, the motor rotates at the specified operating speed. Before commencing the operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situations.

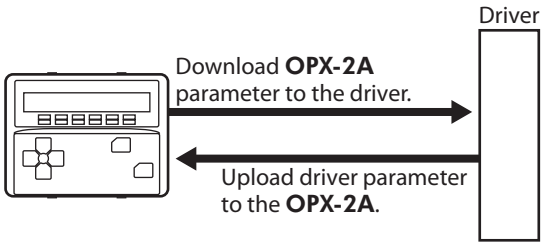
memo If operations are limited by the edit lock function, the teaching cannot be performed.

7 Copy mode

7-1 Overview of the copy mode

- **Download**

  Copy parameters saved in the **OPX-2A** to the driver.
  If a download error occurs, a code indicating the nature of the error will blink on the display. Download will not be performed and the display will return to the top screen of download. Refer to "7-2 Error of the copy mode" to display the error.



- **Upload**

  Copy parameters saved in the driver to the **OPX-2A**.

- **Verification**

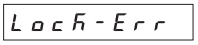
  Verify parameters in the **OPX-2A** against the corresponding data in the driver.
  If the verification finds that the two sets of parameters match, "Good" will be shown. If the two do not match, "Error" will be shown.
  If a verification error occurs, a code indicating the nature of the error will blink on the display. Verification will not be performed and the display will return to the top screen of verification. Refer to "7-2 Error of the copy mode" to display the error.

- **Initializing driver parameter**

  Revert parameters saved in the driver to their initial values.

■ What happens when the【SET】key is pressed while the edit lock is enabled

While the edit lock is enabled, you cannot move to any lower level from the top screen of the copy mode. Pressing the【SET】key will generate an error, and "LocK-Err" will be shown. Be sure to cancel the edit lock before pressing the【SET】key. Refer to p.236 for the procedure to cancel the edit lock.



7-2 Error of the copy mode

If an error occurs in download or verification, the error code will blink on the display.
The processing will not be executed and the display will return to the top screen of each processing.

Blinking display	Description	Action
Prod-Err	There is a discrepancy between the product series of the driver and the data being processed.	• Check the product series of the driver. • Check the data bank number on the **OPX-2A**.
HEAd-Err bcc-Err	An error occurred while processing the data.	Execute the processing again. If the same error occurs, the parameters saved in the **OPX-2A** may have damaged. Upload the applicable parameters and set the **OPX-2A** data again.
no-dAtA	The specified data bank number does not contain parameters.	Check the data bank number.

Note Do not turn off the driver power while processing is in progress (=while the display is blinking). Doing so may damage the parameters.

memo When a parameter has been changed, the new parameter will become effective after the power is cycled. When parameters were changed by downloading, cycle the driver power.

8 Inspection, troubleshooting and remedial actions

This part explains the periodical inspection methods as well as confirmation items and remedial actions when problems have happened.

◆Table of contents

1 Inspection

It is recommended that periodic inspections for the items listed below are conducted 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?
- Check for any unusual noises in the motor bearings (ball bearings) or other moving parts.
- Are there any scratches, signs of stress or loose driver connections in the motor cable?
- Are the motor output shaft and load shaft out of alignment?
- Are the openings in the driver blocked?
- Are any of the mounting screws or connection parts of the driver loose?
- Is there attachment of dust, etc., on the driver?
- Are there any strange smells or appearances within the driver?

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

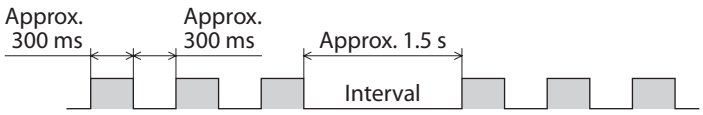
2 Alarms and warnings

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

2-1 Alarms

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. The present alarm can be checked by counting the number of times the ALM 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.132 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 24 VDC power.

memo

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 24 VDC power.

■ Alarm records

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

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

■ Alarm list

Code	No. of ALM LED blinks	Alarm type	Cause
10h	4	Excessive position deviation	When the "stepout detection action" parameter is set to "alarm" the position deviation between the encoder position and command position reached the set value of the "stepout detection band" parameter.
20h	5	Overcurrent	The motor, cable and driver output circuit were short-circuited.
21h	2	Main circuit overheat	The internal temperature of the driver reached 85 °C (185 °F).
22h	3	Overvoltage	• A voltage exceeding the specification value was applied. • A large inertial load was stopped abruptly or vertical operation was performed.
23h		Main power off	The motor was started when the main power supply had been cut off.
25h		Undervoltage	The main power was cut off momentarily or the voltage became insufficient.
2Ch	5	Electrolytic capacitor error	The electrolytic capacitor on the main circuit was damaged.
34h	2	Command pulse frequency error	The command pulse frequency exceeded the specification value.
41h	9	EEPROM error	The stored data was damaged.
4Ah	7	Return-to-home incomplete	When the "return-to-home incomplete alarm" parameter is set to "enable" return-to-home operation was started while the position origin has not been set.
60h		±LS both sides active	When the "hardware overtravel" parameter is set to "enable" both +LS and −LS have been detected.
61h		Reverse limit sensor connection	The LS opposite to the operating direction has been detected while performing return-to-home operation in 2-sensor mode or 3-sensor mode.
62h		Home seeking error	Return-to-home operation did not complete normally.
63h		No HOMES	The HOMES was not detected at a position between +LS and −LS while performing return-to-home operation in 3-sensor mode.
64h		TIM, ZSG, SLIT signal error	None of the TIM output, ZSG output, or SLIT input could be detected while performing return-to-home operation.
66h		Hardware overtravel	When the "hardware overtravel" parameter is set to "enable" +LS or −LS has been detected.
67h		Software overtravel	When the "software overtravel" parameter is set to "enable" the motor position reached the set value of the software limit.
6Ah		Home seeking offset error	When performing offset movement as part of return-to-home operation, +LS or −LS has been detected.

Remedial action	Reset operations	Motor excitation *1
• Reduce the load or increase the acceleration/deceleration. • Check the setting of the "stepout detection band" parameter.	• Turn the ALM-RST input from OFF (0) to ON (1). • Perform an alarm reset. *2	Excitation ON
Turn off the power and turn on the power again after checking that the motor, cable and driver output circuit are not short-circuited.	Cycle the power.	Excitation OFF
Review the ventilation condition in the enclosure.	• Turn the ALM-RST input from OFF (0) to ON (1). • Perform an alarm reset.	
• Check whether the power supply voltage is within the allowable range of the specification. • If the alarm is generated while operating, reduce the load or increase the acceleration/deceleration.	Cycle the power.	
Check if the main power supply has been input normally.	• Turn the ALM-RST input from OFF (0) to ON (1). • Perform an alarm reset.	
Check whether the power supply voltage is within the allowable range of the specification.		
Contact your nearest Oriental Motor sales office.	Cycle the power.	
Check the command pulse frequency.	• Turn the ALM-RST input from OFF (0) to ON (1). • Perform an alarm reset.	
Initialize all parameters.	Cycle the power.	
Perform the position preset or return-to-home operation.	• Turn the ALM-RST input from OFF (0) to ON (1). • Perform an alarm reset.	Excitation ON
Check the sensor logic and the setting of the "±LS logic level" parameter.		
Check the connection of ±LS.		
• Check the load. • Review the sensor installation positions and the starting direction of motor operation. • Check the sensor logic and the setting of the "±LS logic level" parameter.		
Install a HOME sensor in the position between +side sensor and −side sensor.		
• When each signal is used with the HOMES, adjust the connection condition of the motor output shaft and load as well as the HOME sensor position so that the each signal will turn ON while the HOMES is ON. • When each signal is not used with the HOMES, set the "TIM signal detection with home-seeking" parameter or "SLIT detection with home-seeking" parameter to "disable."		
Escape from the limit sensor by performing continuous operation or return-to-home operation.		
• In single-motion operation, check to see if the position data of the motor exceeds the softlimit value. • In linked-motion operation, check to see if the position data of the motor after linked-motion operation exceeds the softlimit value.		
Check the offset value.		

Code	No. of ALM LED blinks	Alarm type	Cause
70h	7	Abnormal operation data	• Five or more operation data was linked. • Data of different directions was linked in linked-motion operation. • Positioning operation of the operating speed 0 r/min was performed.
71h		Electronic gear setting error	The resolution set by the "electronic gear" parameter was outside the specification.
81h		Network bus error	When the motor operates, the master controller for the network converter shows a disconnection status.
83h		Communication switch setting error	Transmission rate setting switch (BAUD) was out-of-specification.
84h		RS-485 communication error	The number of consecutive RS-485 communication errors reached the set value of the "communication error alarm" parameter.
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 master controller.
8Eh		Network converter error	An alarm was generated in the network converter.
F0h	Lit	CPU error	CPU malfunctioned.

*1 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. The electromagnetic brake will automatically actuate and hold the position when using the electromagnetic brake motor.
Excitation ON: Even when an alarm generates, the motor current will not be cut off and the motor position will be held.

*2 If an excessive position deviation alarm generates, turning the ALM-RST input ON alone will not reset the alarm. Before recovering from the deviation error, be sure to reset the alarm by the ALM-RST input first. Check p.76 for how to recover from the deviation error.

Remedial action	Reset operations	Motor excitation *1
Check the operation data.	• Turn the ALM-RST input from OFF (0) to ON (1). • Perform an alarm reset.	Excitation ON
Set the electronic gear correctly, and then cycle the power.	Cycle the power.	Excitation OFF
Check the connector or cable of the master controller.	• Turn the ALM-RST input from OFF (0) to ON (1). • Perform an alarm reset.	Excitation ON
Check the transmission rate setting switch (BAUD).	Cycle the power.	Excitation OFF
• Check the connection between the master controller and driver. • Check the setting of RS-485 communication.	• Turn the ALM-RST input from OFF (0) to ON (1). • Perform an alarm reset.	Excitation ON
Check the connection between the master controller and driver.		
Check the alarm code of the network converter.		
Cycle the power.	–	–

2-2 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 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.

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

memo You can also clear the warning records by turning off the 24 VDC power.

■ Warning list

Code	Warning type	Cause	Remedial action
10h	Excessive position deviation	When the "stepout detection action" parameter is set to "warning" the position deviation between the encoder position and command position reached the set value of the "stepout detection band" parameter.	• Reduce the load or increase the acceleration/deceleration. • Check the setting of the "stepout detection band" parameter.
21h	Main circuit overheat	The driver internal temperature reached the set value of the "overheat warning" parameter.	Review the ventilation condition in the enclosure.
22h	Overvoltage	• The power supply voltage exceeded the set value of the "overvoltage warning" parameter. • A large inertial load was stopped abruptly or vertical operation was performed.	• Check whether the power supply voltage is within the allowable range of the specification. • If the alarm is generated while operating, reduce the load or increase the acceleration/deceleration.
25h	Undervoltage	• The power supply voltage fell below the set value of the "undervoltage warning" parameter. • The main power was cut off momentarily or the voltage became insufficient.	Check whether the power supply voltage is within the allowable range of the specification.
71h	Electronic gear setting error	The resolution set by the "electronic gear" parameter was outside the specification.	Set the "electronic gear" parameter correctly so that the resolution is in a range of the specification.
84h	RS-485 communication error	The RS-485 communication error was detected.	• Check the connection between the master controller and driver. • Check the setting of RS-485 communication.

2-3 Communication errors

Up to 10 communication errors are saved in the RAM in order of the latest to the oldest and you can check using the **MEXE02** or via RS-485 communication.

■ 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.

- Read 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.
- Read and clear the communication error records by the status monitor of the **MEXE02**.

memo You can also clear the communication records by turning off the 24 VDC power.

■ 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 master controller and driver. • 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 because the **OPX-2A** or **MEXE02** was communicating with the driver.	Wait until the processing for the **OPX-2A** or **MEXE02** will be completed.
8Ah	Non-volatile memory processing in progress	The command could not be executed because the driver was performing the non-volatile memory processing. · Internal processing was in progress. (S-BSY is ON.) · An EEPROM error alarm was present.	• Wait until the internal processing will be completed. • When the EEPROM error was generated, initialize all parameters using the **OPX-2A**, **MEXE02** or 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 is unable to execute, it was tried to execute.	Check the driver status.

3 Troubleshooting and remedial actions

During motor operation, the motor or driver may fail to function properly due to an improper 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.	The AWO input is turned ON.	Turn the AWO input OFF and confirm that the motor will be excited.
	The FREE input is turned ON.	Turn the FREE input OFF.
The motor does not operate.	An electromagnetic brake motor is used and the electromagnetic brake is in the holding state.	Check the connections between electromagnetic brake and driver.
	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 "motor rotation direction" parameter is set wrong.	Check the "motor rotation direction" parameter.
The gear output shaft rotates in the direction opposite to the motor.	A gear that rotates in the direction opposite to the motor shaft is used.	• With **TS** geared motors, the gear output shaft rotates in the direction opposite to the motor when the gear ratio is 20 or 30. • With Harmonic geared motors, the gear output shaft always rotates in the direction opposite to the motor.
Motor operation is unstable.	Connection error in the motor or power supply.	Check the connections between the driver, 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 value and check. 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.	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.
The electromagnetic brake does not release.	The power is not supplied to the electromagnetic brake.	Check the connection of the electromagnetic brake.

memo

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

9 Appendix

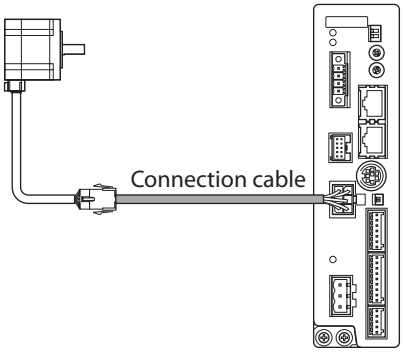
◆Table of contents

1 Accessories

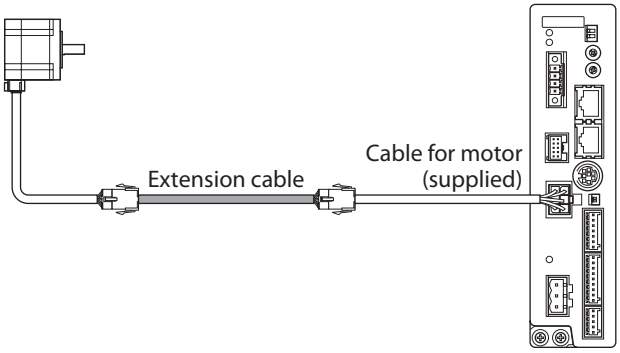
■ Motor cable

The **RK Ⅱ** Series has models supplied with a "cable for motor" to connect the motor and driver, and also it has models without a "cable for motor."
If the distance between the motor and the driver is extended furthermore, use a connection cable set or an extension cable set since the length of the supplied cable is not enough.
The cable set for electromagnetic brake motor consists of two cables, one for motor and the other for electromagnetic brake.
The cable set for encoder motor consists of two cables, one for motor and the other for encoder.
When installing the motor on a moving part, use a flexible cable offering excellent flexibility.

- Extending the wiring length using a connection cable set;
  Do not use the supplied cable.



- Extending the wiring length using an extension cable set;
  Connect an extension cable to the supplied cable.



memo When extending the wiring length by connecting an extension cable to the supplied cable, keep the total cable length to 20 m (65.6 ft.) or less.

● Connection cable set

The cable set for electromagnetic brake motor consists of two cables, one for motor and the other for electromagnetic brake.
The cable set for encoder motor consists of two cables, one for motor and the other for encoder.

• Connection cable set
For standard motor

Model	Length [m (ft.)]
CC010VPF	1 (3.3)
CC020VPF	2 (6.6)
CC030VPF	3 (9.8)
CC050VPF	5 (16.4)
CC070VPF	7 (23.0)
CC100VPF	10 (32.8)
CC150VPF	15 (49.2)
CC200VPF	20 (65.6)

• Connection cable set
For electromagnetic brake motor

Model	Length [m (ft.)]
CC010VPFB	1 (3.3)
CC020VPFB	2 (6.6)
CC030VPFB	3 (9.8)
CC050VPFB	5 (16.4)
CC070VPFB	7 (23.0)
CC100VPFB	10 (32.8)
CC150VPFB	15 (49.2)
CC200VPFB	20 (65.6)

• Connection cable set
For encoder motor

Model	Length [m (ft.)]
CC010VPFE	1 (3.3)
CC020VPFE	2 (6.6)
CC030VPFE	3 (9.8)
CC050VPFE	5 (16.4)
CC070VPFE	7 (23.0)
CC100VPFE	10 (32.8)
CC150VPFE	15 (49.2)
CC200VPFE	20 (65.6)

• Flexible connection cable set
For standard motor

Model	Length [m (ft.)]
CC010VPR	1 (3.3)
CC020VPR	2 (6.6)
CC030VPR	3 (9.8)
CC050VPR	5 (16.4)
CC070VPR	7 (23.0)
CC100VPR	10 (32.8)
CC150VPR	15 (49.2)
CC200VPR	20 (65.6)

• Flexible connection cable set
For electromagnetic brake motor

Model	Length [m (ft.)]
CC010VPRB	1 (3.3)
CC020VPRB	2 (6.6)
CC030VPRB	3 (9.8)
CC050VPRB	5 (16.4)
CC070VPRB	7 (23.0)
CC100VPRB	10 (32.8)
CC150VPRB	15 (49.2)
CC200VPRB	20 (65.6)

• Flexible connection cable set
For encoder motor

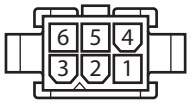
Model	Length [m (ft.)]
CC010VPRE	1 (3.3)
CC020VPRE	2 (6.6)
CC030VPRE	3 (9.8)
CC050VPRE	5 (16.4)
CC070VPRE	7 (23.0)
CC100VPRE	10 (32.8)
CC150VPRE	15 (49.2)
CC200VPRE	20 (65.6)

Connector pin assignments of connection cable

• Pin assignment of "cable for motor"

Pin No.	Color	Lead size
1	Black	AWG22 (0.3 mm^2)
2	Red	
3	Yellow	
4	Blue	
5	Orange	
6	Green	

• Motor side



Model: 5559-06P-210 (Molex)

• Driver side

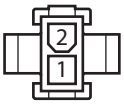
Mode: 5557-06P-210 (Molex)

• Pin assignment of "cable for electromagnetic brake"

Pin No.	Color	Lead size
1	White	AWG20 (0.5 mm^2) *
2	Black	

* AWG21 (0.5 mm^2) for flexible cable

• Motor side

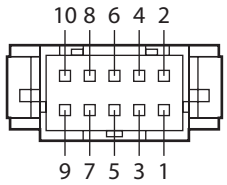


Model: 5559-02P-210 (Molex)

• Pin assignment of "cable for encoder"

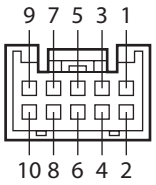
Pin No.	Color	Lead size
1	Red	AWG26 (0.14 mm^2)
2	Pink	
3	Green	
4	Blue	
5	Yellow	
6	Orange	
7	White	AWG22 (0.3 mm^2)
8	Black	
9	–	–
10	Drain wire	AWG25 (0.16 mm^2)

• Motor side



Model: XADR-10V
(J.S.T. Mfg Co., Ltd.)

• Driver side



Model: PUDP-10V-K
(J.S.T. Mfg Co., Ltd.)

● Extension cable set

The cable set for electromagnetic brake motor consists of two cables, one for motor and the other for electromagnetic brake.
The cable set for encoder motor consists of two cables, one for motor and the other for encoder.

• Extension cable set
For standard motor

Model	Length [m (ft.)]
CC010VPF	1 (3.3)
CC020VPF	2 (6.6)
CC030VPF	3 (9.8)
CC050VPF	5 (16.4)
CC070VPF	7 (23.0)
CC100VPF	10 (32.8)
CC150VPF	15 (49.2)

• Extension cable set
For electromagnetic brake motor

Model	Length [m (ft.)]
CC010VPFBT	1 (3.3)
CC020VPFBT	2 (6.6)
CC030VPFBT	3 (9.8)
CC050VPFBT	5 (16.4)
CC070VPFBT	7 (23.0)
CC100VPFBT	10 (32.8)
CC150VPFBT	15 (49.2)

• Extension cable set
For encoder motor

Model	Length [m (ft.)]
CC010VPFET	1 (3.3)
CC020VPFET	2 (6.6)
CC030VPFET	3 (9.8)
CC050VPFET	5 (16.4)
CC070VPFET	7 (23.0)
CC100VPFET	10 (32.8)
CC150VPFET	15 (49.2)

• Flexible extension cable set
For standard motor

Model	Length [m (ft.)]
CC010VPR	1 (3.3)
CC020VPR	2 (6.6)
CC030VPR	3 (9.8)
CC050VPR	5 (16.4)
CC070VPR	7 (23.0)
CC100VPR	10 (32.8)
CC150VPR	15 (49.2)

• Flexible extension cable set
For electromagnetic brake motor

Model	Length [m (ft.)]
CC010VPRBT	1 (3.3)
CC020VPRBT	2 (6.6)
CC030VPRBT	3 (9.8)
CC050VPRBT	5 (16.4)
CC070VPRBT	7 (23.0)
CC100VPRBT	10 (32.8)
CC150VPRBT	15 (49.2)

• Flexible extension cable set
For encoder motor

Model	Length [m (ft.)]
CC010VPRET	1 (3.3)
CC020VPRET	2 (6.6)
CC030VPRET	3 (9.8)
CC050VPRET	5 (16.4)
CC070VPRET	7 (23.0)
CC100VPRET	10 (32.8)
CC150VPRET	15 (49.2)

■ Data setter

The data setter lets you set data and parameters for your **RK Ⅱ** Series FLEX built-in controller type with ease and also functions as a monitor.

Model: **OPX-2A**

■ Communication cable for the data setting software

Be sure to purchase the communication cable for the data setting software when connecting a driver to the PC in which the data setting software **MEXE02** has been installed.
This is a set of a PC interface cable and USB cable. The cable is connected to the USB port on the PC.

Model: **CC05IF-USB** [5 m (16.4 ft.)]

The **MEXE02** can be downloaded from Oriental Motor Website Download Page. Also, the **MEXE02** is provided in the form of a storage medium. For details, check out our web site or contact your nearest Oriental Motor sales office.

■ RS-485 communication cable

You can link drivers using this cable connected to the RS-485 communication connectors (CN6, CN7).

Model: **CC002-RS4** [0.25 m (0.8 ft.)]

■ CR circuit for surge suppression

This product is effective to suppress the serge which occurs in a relay contact part. Use it to protect the contacts of the relay or switch.

Model: **EPCR1201-2**

■ CR circuit module

This product is effective to suppress the surge which occurs in a relay contact part. Use this product to protect the contacts of the relay or switch.
4 pieces of CR circuit for surge suppression are mounted on the compact circuit, and this product can be installed to the DIN rail. This product can make the wiring easily and securely since it also supports terminal block connection.

Model: **VCS02**

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