Oriental motor

HM-60085-4

New 5-Phase Stepping Motor and Driver Package

RKⅡ Series FLEX

Built-in controller type

USER MANUAL

CE

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 munication)

6 Method of control via industrial network

7 Inspection, troubleshooting and remedial actions

8 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 "5 Safety precautions" on p.12.
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.

■ Hazardous substances

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

■ Notation rules

The following term is used in explanation of this manual.

Term	Description
Master controller	This is a generic name for a programmable controller, master module, pulse generator and so on.

2 Operating Manuals for the RKⅡ Series

Operating manuals for the **RK**Ⅱ Series FLEX built-in controller type are listed below.
After reading these manuals, keep them in a convenient place so that you can reference them at any time.

Applicable product	Type of operating manual	Description of operating manual
RKⅡ Series FLEX Built-in controller type	Instructions and Precautions for Safe Use Motor (Supplied with motor)	This manual explains precautions to use the motor, as well as the motor installation and others.
	Driver OPERATING MANUAL (Supplied with driver)	This manual explains the functions as well as the installation method and others for the driver.
	USER 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.
Data setting software **MEXE02**	OPERATING MANUAL	This manual explains how to set data using the accessory data setting software **MEXE02** (sold separately).
Data setter **OPX-2A**	OPERATING MANUAL	This manual explains the functions and installation/connection method as well as data setting method and others for the accessory **OPX-2A** (sold separately).
Network converter	CC-Link compatible **NETC01-CC** USER MANUAL	This manual explains the functions and installation/connection method as well as the operating method for the network converter.
	MECHATROLINK-Ⅱ compatible **NETC01-M2** USER MANUAL	
	MECHATROLINK-Ⅲ compatible **NETC01-M3** USER MANUAL	
	EtherCAT compatible **NETC01-ECT** OPERATING MANUAL	

3 Overview of the product

This product is a motor and driver package product consisting of a high-efficiency 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 an accessory data setter **OPX-2A** or data setting software **MEXE02** (sold separately), 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 an accessory data setter **OPX-2A** or data setting software **MEXE02**, or via RS-485 communication. Provide the **OPX-2A** or **MEXE02** as necessary.

■ 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 communication
NETC01-M2	MECHATROLINK-Ⅱ communication
NETC01-M3	MECHATROLINK-Ⅲ communication
NETC01-ECT	EtherCAT communication

■ Function list

Main functions

Return-to-home operation [Setting by parameters]	• **2-sensor mode** • **Position preset** • **3-sensor mode**
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**

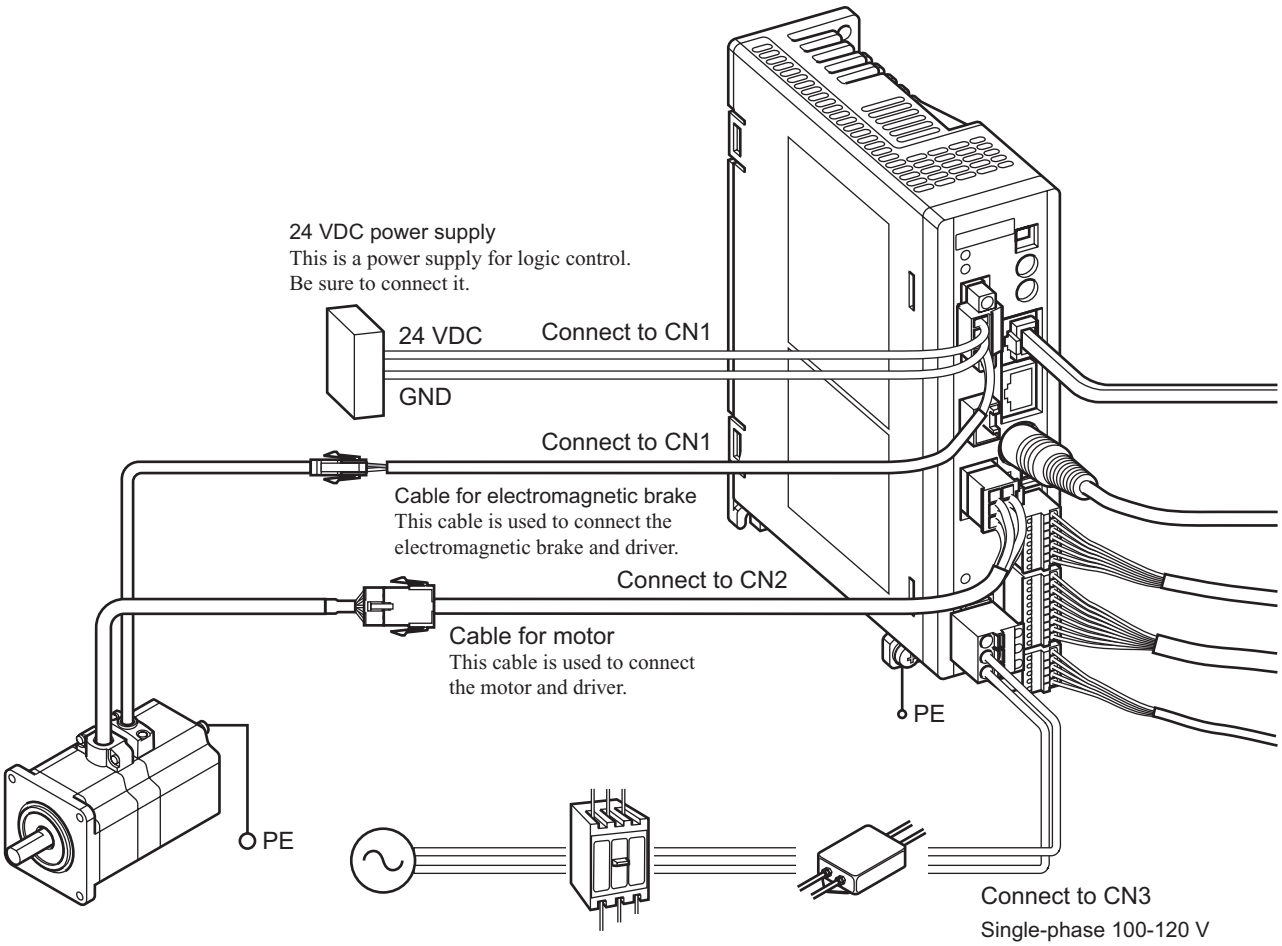
Support functions

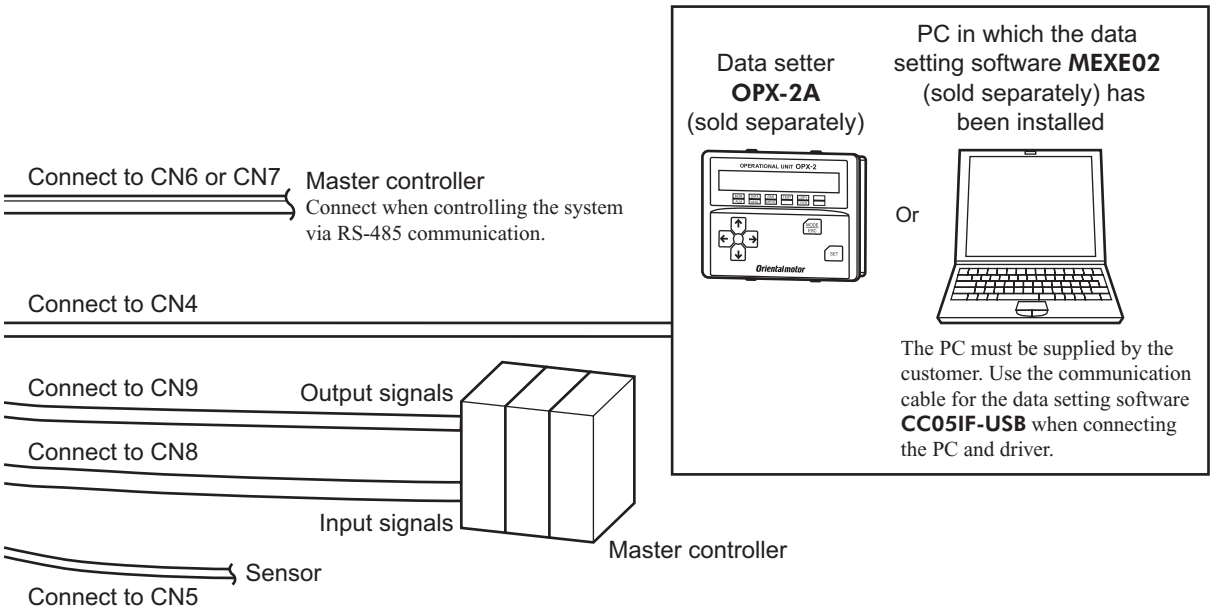
[Setting by parameters]	• **Protective function** Alarm detection Warning detection • **I/O function** Input function selection Output function selection Input logic level setting • **Coordination setting** Resolution (Electronic gear) Wrap function Motor rotation direction • **Return-to-home function** 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**

4 System configuration




Data setter
OPX-2A
(sold separately)
PC in which the data setting software MEXE02 (sold separately) has been installed
Or
The PC must be supplied by the customer. Use the communication cable for the data setting software CC05IF-USB when connecting the PC and driver.
Connect to CN6 or CN7
Master controller
Connect when controlling the system via RS-485 communication.
Connect to CN4
Connect to CN9
Output signals
Connect to CN8
Input signals
Master controller
Sensor
Connect to CN5

5 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.

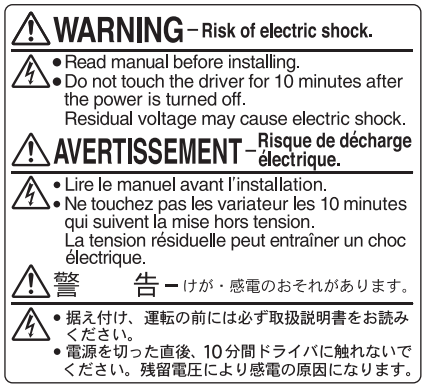
⚠ Warning	
	Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. This may cause fire, electric shock or injury.
	Do not transport, install the product, perform connections or inspections when the 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.
	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.

⚠ Warning	
❗	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.
	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

6 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 (sold separately) 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.200 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 an 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.28 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 for your application, consider the fact that the holding torque will be reduced at motor standstill.

- 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.36 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 a 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 gear output shaft

  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.

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

- Maximum torque of geared type motor

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

7 General specifications

		Motor	Driver
Degree of protection		IP20	IP10
Operation environment	Ambient temperature	• Standard type, **TS** geared type, **PS** geared type: −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: • FG 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: • FG 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]

8 CE Marking

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

■ Low Voltage Directives

- The product is a type with machinery incorporated, so it should be installed within an enclosure.
- This product cannot be used with cables normally used for IT equipment.
- 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.

• Applicable Standards

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

• Installation conditions (EN Standard)

Motor	Driver
Motor is to be used as a component within other equipment. Overvoltage category: Ⅱ Pollution degree: 2 Degree of protection: IP20 Protection against electric shock: Class Ⅰ	Driver is to be used as a component within other equipment. Overvoltage category: Ⅱ Pollution degree: 2 Degree of protection: IP10 Protection against electric shock: Class Ⅰ

■ EMC Directive

This product has received EMC compliance under the conditions specified in "Example of motor and driver installation and wiring" on p.38. Since the compliance of the final machinery with the EMC Directive will depend on such factors as the configuration, wiring, layout and risk involved in the control-system equipment and electrical parts, it therefore must be verified through EMC measures by the customer of the machinery.

Applicable Standards

EMI	EN 55011 Group1 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.

9 Preparation

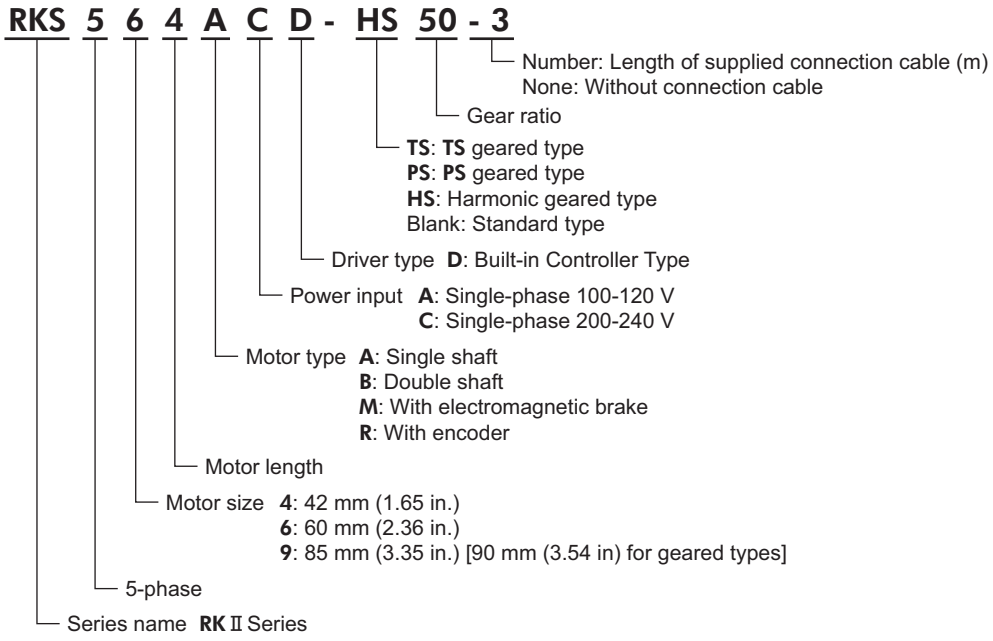
This chapter explains the items you should check, as well as the name and function of each part.

9.1 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.20.

- 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
- Driver OPERATING MANUAL .....1 copy
- USER MANUAL (CD-ROM) .....1 pc.

9.2 How to identify the product model



9.3 Combinations of motors and drivers

- □ indicates **A** (single shaft) or **B** (double shaft).
- ■ indicates **A** (single-phase 100-120 V) or **C** (single-phase 200-240 V).
- ● represents a number indicating the gear ratio.
- ○ indicates the cable length (**-1**, **-2**, **-3**) when the connection cable is supplied.

■ Standard type

Model	Motor model	Driver model
RKS543□■D○	PKE543□C	RKSD503-■D
RKS544□■D○	PKE544□C	
RKS545□■D○	PKE545□C	
RKS564□■D○	PKE564□C	RKSD507-■D
RKS566□■D○	PKE566□C	
RKS569□■D○	PKE569□C	
RKS596□■D○	PKE596□C	
RKS599□■D○	PKE599□C	
RKS5913□■D○	PKE5913□C	

■ 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

Model	Motor model	Driver model
RKS543□■D-TS●○	PKE543□C-TS●	RKSD503-■D
RKS564□■D-TS●○	PKE564□C-TS●	RKSD507-■D
RKS596□■D-TS●○	PKE596□C-TS●	

■ TS geared type with electromagnetic brake

Model	Motor model	Driver model
RKS543M■D-TS●○	PKE543MC-TS●	RKSD503-■D
RKS564M■D-TS●○	PKE564MC-TS●	RKSD507-■D
RKS596M■D-TS●○	PKE596MC-TS●	

■ PS geared type

Model	Motor model	Driver model
RKS543□■D-PS●○	PKE543□C-PS●	RKSD503-■D
RKS545□■D-PS●○	PKE545□C-PS●	
RKS564□■D-PS●○	PKE564□C-PS●	RKSD507-■D
RKS566□■D-PS●○	PKE566□C-PS●	
RKS596□■D-PS●○	PKE596□C-PS●	
RKS599□■D-PS●○	PKE599□C-PS●	

■ PS geared type with electromagnetic brake

Model	Motor model	Driver model
RKS543M■D-PS●○	PKE543MC-PS●	RKSD503-■D
RKS545M■D-PS●○	PKE545MC-PS●	
RKS564M■D-PS●○	PKE564MC-PS●	RKSD507-■D
RKS566M■D-PS●○	PKE566MC-PS●	
RKS596M■D-PS●○	PKE596MC-PS●	
RKS599M■D-PS●○	PKE599MC-PS●	

■ Harmonic geared type

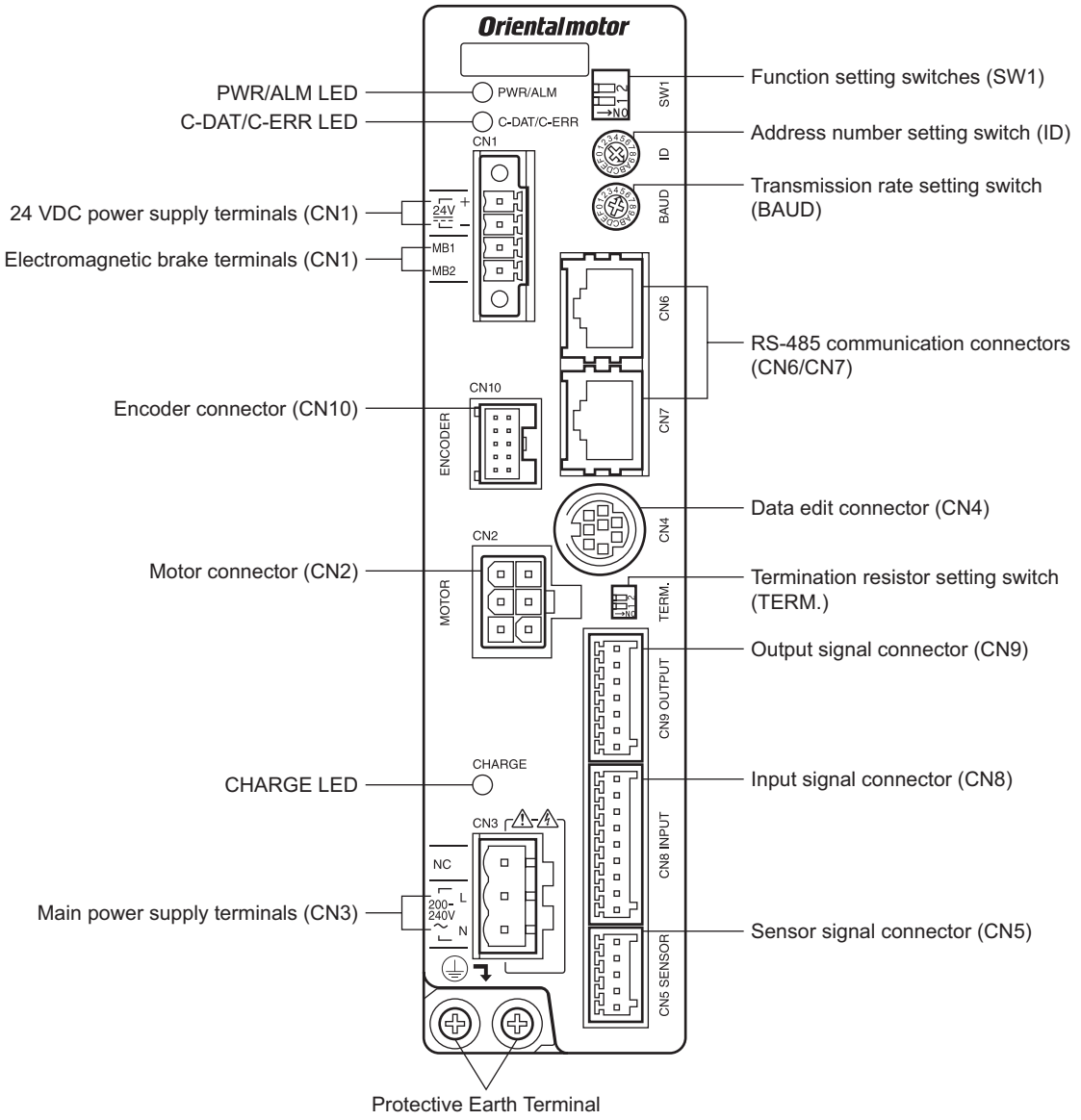
Model	Motor model	Driver model
RKS543□■D-HS50○	PKE543□C-HS50	RKSD503-■D
RKS543□■D-HS100○	PKE543□C-HS100	
RKS564□■D-HS50○	PKE564□C-HS50	RKSD507-■D
RKS564□■D-HS100○	PKE564□C-HS100	
RKS596□■D-HS50○	PKE596□C-HS50	
RKS596□■D-HS100○	PKE596□C-HS100	

■ 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	

9.4 Names and functions of parts

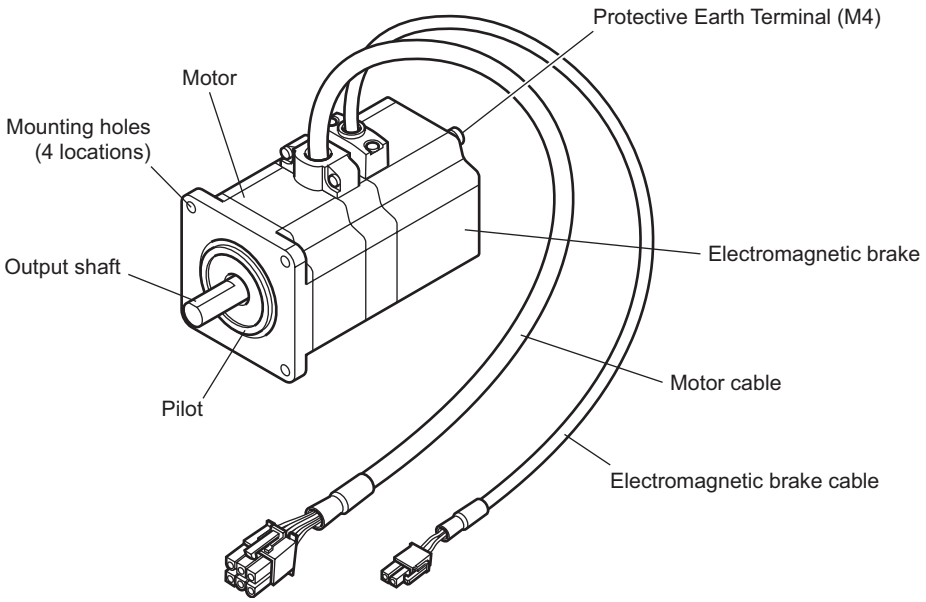
■ Driver (Example: RKSD507-CD)



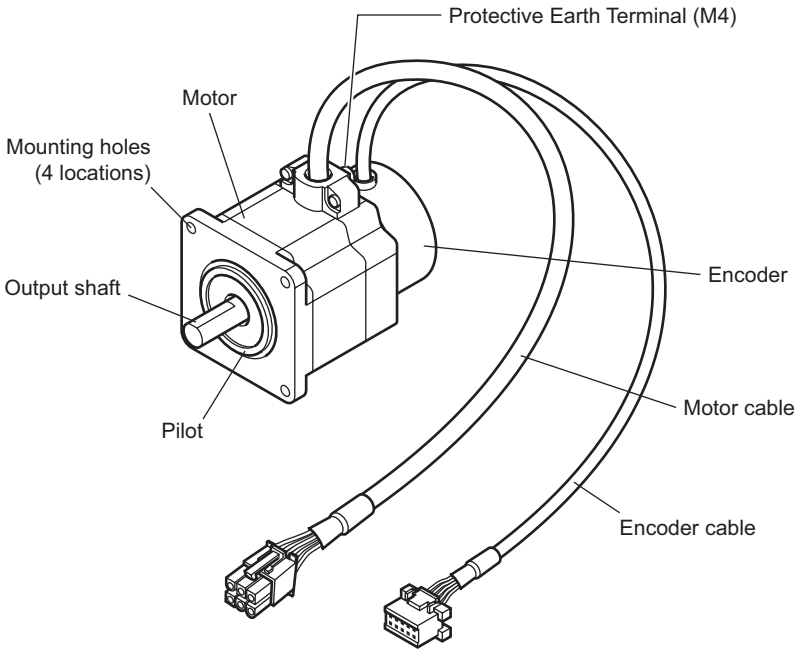
Type	Name	Description	Ref
LED	PWR/ALM LED	• PWR (Green): This LED is lit while the 24 VDC power is input. • ALM (Red): This LED will blink when an alarm generates. It is possible to check the generated alarm by counting the number of times the LED blinks.	p.191
	C-DAT/C-ERR LED	• C-DAT (Green): This 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.123 p.160 p.172
	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.124 p.160 p.172
	Function setting switch (SW1)	Use this switch 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.123 p.160 p.172
	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.124 p.160 p.172
Connector	Motor connector (CN2)	Connect the motor.	p.30
	Data edit connector (CN4)	Connect a PC in which the **MEXE02** has been installed, or the **OPX-2A**.	p.35
	Sensor signal connector (CN5)	Connect the sensor.	p.30
	RS-485 communication connectors (CN6/CN7)	Connect the RS-485 communication cable.	p.36
	Input signal connector (CN8)	Connect the input signals.	p.30
	Output signal connector (CN9)	Connect the output signals.	
	Encoder connector (CN10)	Connect the encoder.	p.31
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.35
	Electromagnetic brake terminals (CN1-MB1/MB2)	Connect the lead wires from the electromagnetic brake. MB1: Electromagnetic brake − (Black) MB2: Electromagnetic brake + (White)	p.30
	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.35

■ 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

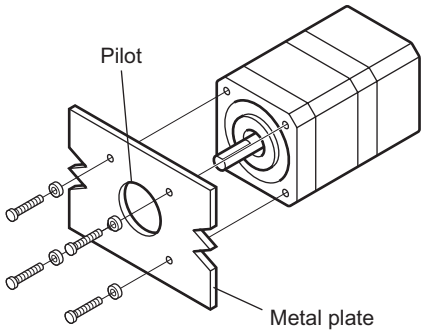
The motor and driver has been designed and manufactured to be installed within another device. Install them in a well-ventilated location that provides easy access for inspection.
The location must also satisfy the following conditions:

- 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

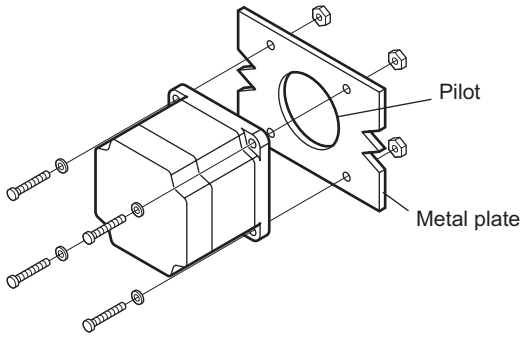
1.2 Installing the motor

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



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)	
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.
Flexible couplings are available as accessories.

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.

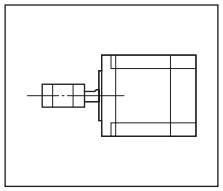
- Using a belt drive

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.

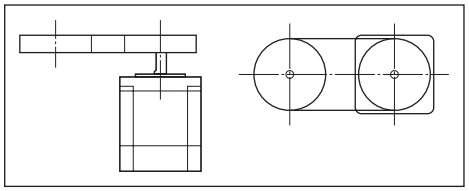
- Using a gear drive

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.

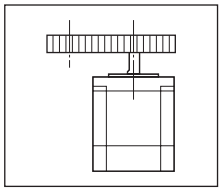
• Using a coupling



• Using a belt drive



• Using a gear drive

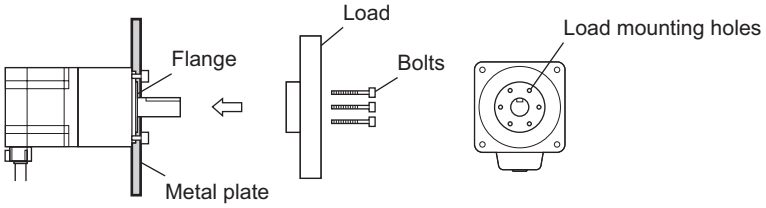


- Using a parallel key (geared motor)

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)

Note

- 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 an radial or axial load that is in excess of the permissible limit.

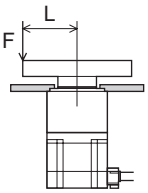
Type	Motor model	Gear ratio	Permissible radial load [N (lb.)]					Permissible axial load [N (lb.)] *
			Distance from the tip of motor output shaft					
			0 mm (0 in.)	5 mm (0.20 in.)	10 mm (0.39 in.)	15 mm (0.59 in.)	20 mm (0.79 in.)	
Standard	PKE543	—	35 (7.8)	44 (9.9)	58 (13)	85 (19.1)	–	2.5 (0.56) <3.9 (0.87)> {3.1 (0.69)}
	PKE544							3.1 (0.69) <4.5 (1.01)> {3.7 (0.83)}
	PKE545							3.7 (0.83) <5.1 (1.14)> {4.3 (0.96)}
	PKE564		90 (20)	100 (22)	130 (29)	180 (40)	270 (60)	6.9 (1.55) <9.8 (2.2)> {7.5 (1.68)}
	PKE566							8.8 (1.98) <11.8 (2.6)> {9.4 (2.1)}
	PKE569							13.7 (3) <16.7 (3.7)> {14.7 (3.3)}
	PKE596		260 (58)	290 (65)	340 (76)	390 (87)	480 (108)	18.6 (4.1) <26.5(5.9)> {19.6 (4.4)}
	PKE599							29.4 (6.6) <37.3 (8.3)> {30.4 (6.8)}
	PKE5913							40.2 (9) <48.1 (10.8)> {41.2 (9.2)}
TS geared	PKE543	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)	–	
	PKE564	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)	
	PKE596	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	PKE545	5, 7.2, 10	73 (16.4)	84 (18.9)	100 (22)	123 (27)	–	50 (11.2)
	PKE543	25, 36, 50	109 (24)	127 (28)	150 (33)	184 (41)	–	
	PKE566	5	200 (45)	220 (49)	250 (56)	280 (63)	320 (72)	100 (22)
		7.2, 10	250 (56)	270 (60)	300 (67)	340 (76)	390 (87)	
	PKE564	25, 36, 50	330 (74)	360 (81)	400 (90)	450 (101)	520 (117)	
	PKE599	5, 7.2, 10	480 (108)	540 (121)	600 (135)	680 (153)	790 (177)	300 (67)
	PKE596	25	850 (191)	940 (210)	1050 (230)	1190 (260)	1380 (310)	
		36	930 (200)	1030 (230)	1150 (250)	1310 (290)	1520 (340)	
		50	1050 (230)	1160 (260)	1300 (290)	1480 (330)	1710 (380)	
Harmonic geared	PKE543	50, 100	180 (40)	220 (49)	270 (60)	360 (81)	510 (114)	220 (49)
	PKE564		320 (72)	370 (83)	440 (99)	550 (123)	720 (162)	450 (101)
	PKE596		1090 (240)	1150 (250)	1230 (270)	1310 (290)	1410 (310)	1300 (290)

* The brackets < > indicate the value for the electromagnetic brake type.
The brackets { } indicate the value for the encoder type.

■ 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.
Moment load: M [N·m (oz-in)] = F × L

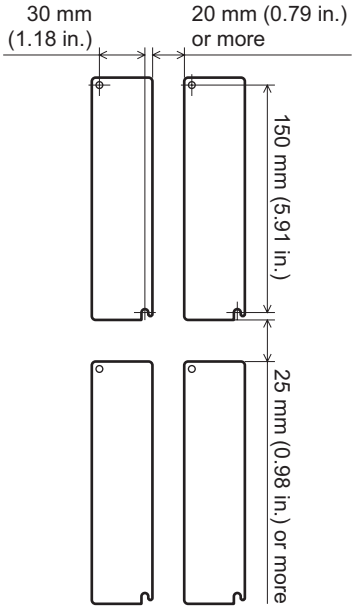
Motor model	Permissible moment load [N·m (oz-in)]
PKE543	5.6 (790)
PKE564	11.6 (1640)



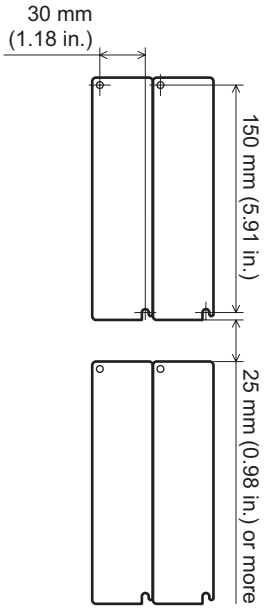
1.5 Installing the driver

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.



Note

- 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.61 for the standstill current.
- Be sure to install the driver vertically (vertical position).

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

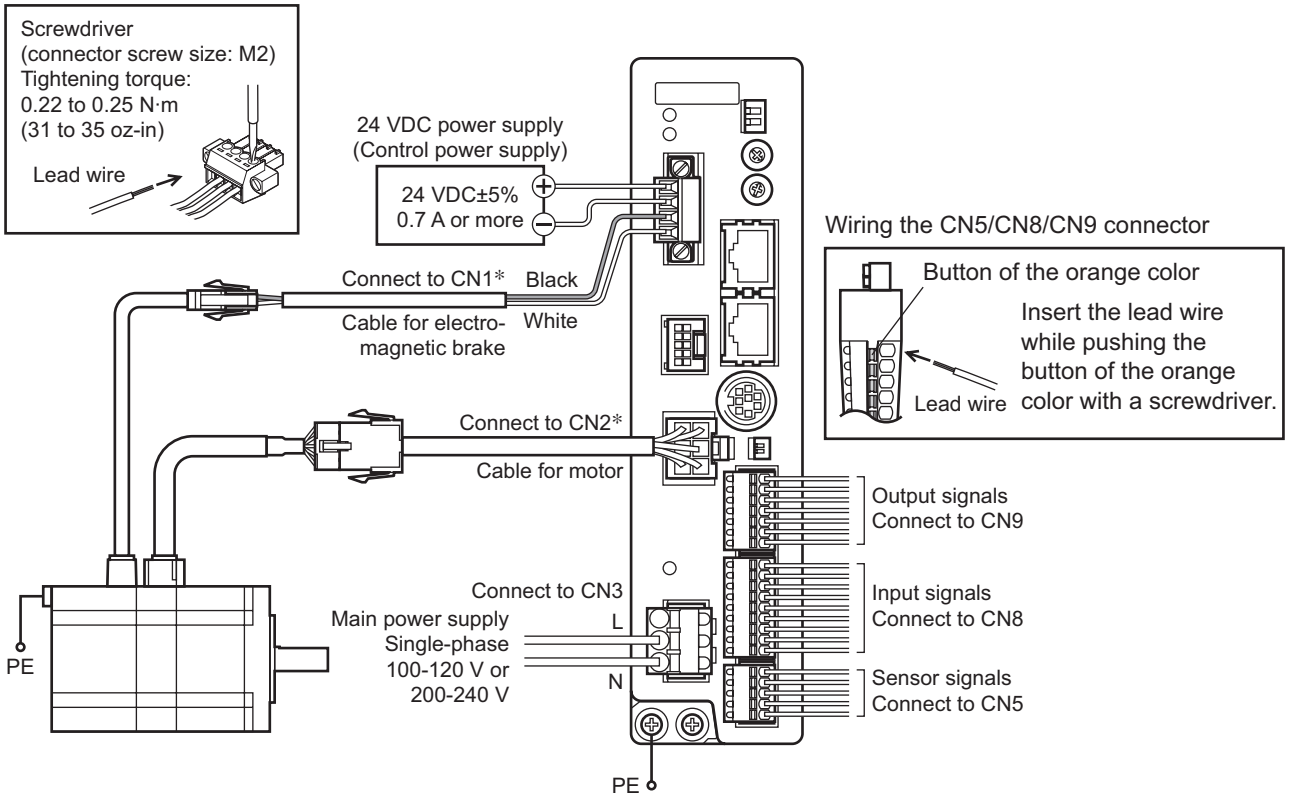
Note

- Have the connector plugged in securely. Insecure connections may cause malfunction or damage to the motor or driver.
- When unplugging the motor or encoder connector, do so while pressing the latches on the connector.
- 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.
- 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.200.

■ Standard type with electromagnetic brake

See p.32 for connector pin assignments.

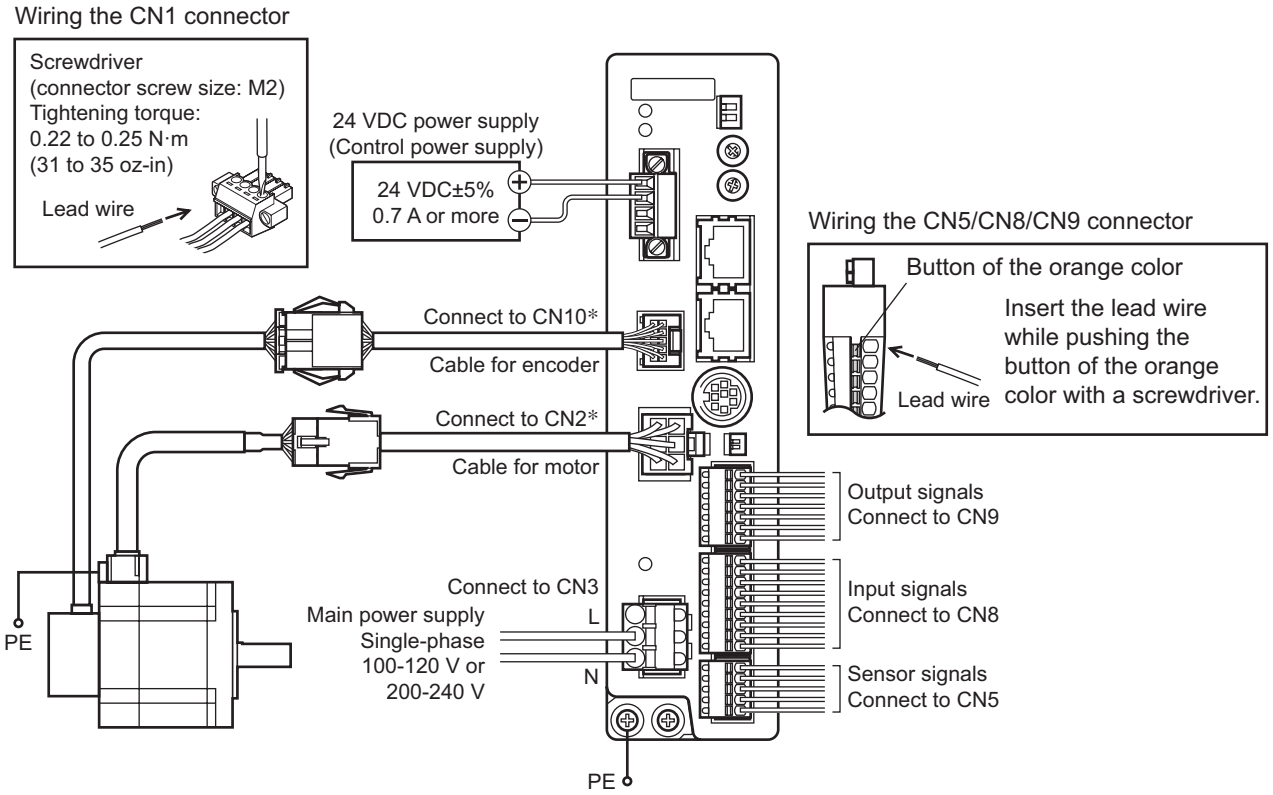
Wiring the CN1 connector



* Keep 20 m (65.6 ft.) or less for the wiring distance between the motor and driver.

■ Standard type with encoder

See p.32 for connector pin assignments.



* Keep 20 m (65.6 ft.) or less for the wiring distance between the motor and driver.

■ Power supply current capacity

- Single-phase 100-120 V

Model	Power supply current capacity
RKS543	2.1 A or more
RKS544	1.9 A or more
RKS545	1.9 A or more
RKS564	4.0 A or more
RKS566	3.8 A or more
RKS569	4.0 A or more
RKS596	4.9 A or more
RKS599	3.5 A or more
RKS5913	3.5 A or more

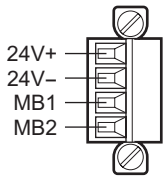
- Single-phase 200-240 V

Model	Power supply current capacity
RKS543	1.3 A or more
RKS544	1.2 A or more
RKS545	1.2 A or more
RKS564	2.4 A or more
RKS566	2.4 A or more
RKS569	2.5 A or more
RKS596	3.0 A or more
RKS599	2.2 A or more
RKS5913	2.2 A or more

■ Pin assignment list

- CN1

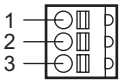
Display	Description
24V+	Connect the 24 VDC. 24 VDC±5% 0.7 A or more
24V−	
MB1	Electromagnetic brake −
MB2	Electromagnetic brake +



- 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

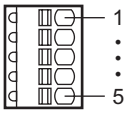
Pin No.	Display	Description
1	NC	Not used.
2	L	Connect the main power supply. • Single-phase 100-120 V −15 to +10% 50/60 Hz • Single-phase 200-240 V −15 to +10% 50/60 Hz
3	N	



- 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

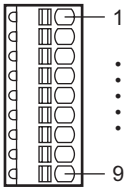


- Applicable lead wire: AWG26 to 20 (0.14 to 0.5 mm^2)
- Length of the insulation cover which can be peeled: 8 mm (0.32 in.)

- 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

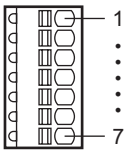


- Applicable lead wire: AWG26 to 20 (0.14 to 0.5 mm^2)
- Length of the insulation cover which can be peeled: 8 mm (0.32 in.)

- CN9

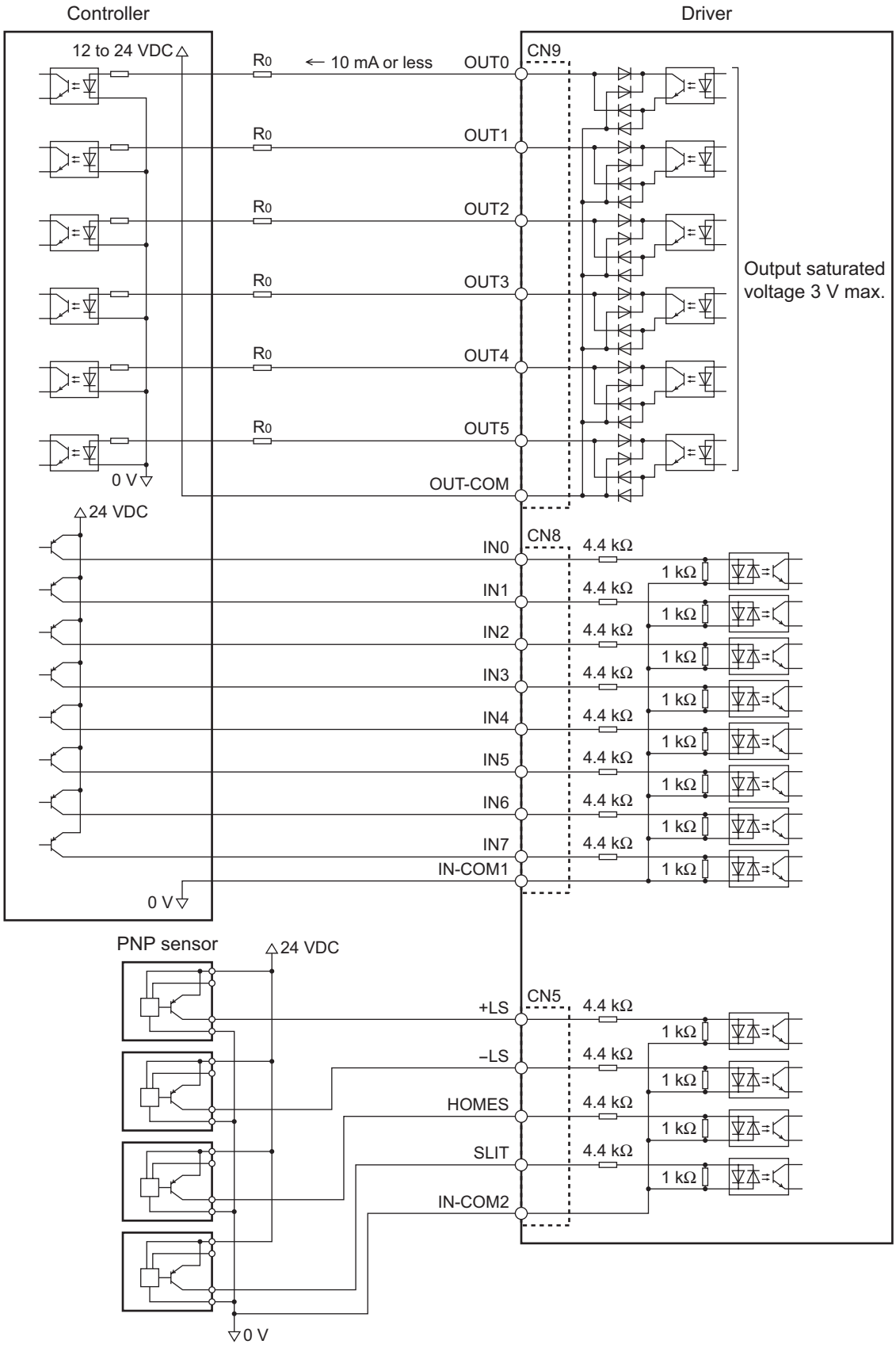
Pin No.	Signal name	Description *
1	OUT0	Control output 0 [HOME-P]
2	OUT1	Control output 1 [MOVE]
3	OUT2	Control output 2 [AREA1]
4	OUT3	Control output 3 [READY]
5	OUT4	Control output 4 [WNG]
6	OUT5	Control output 5 [ALM]
7	OUT-COM	Output signal common

* [ ]: 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.)

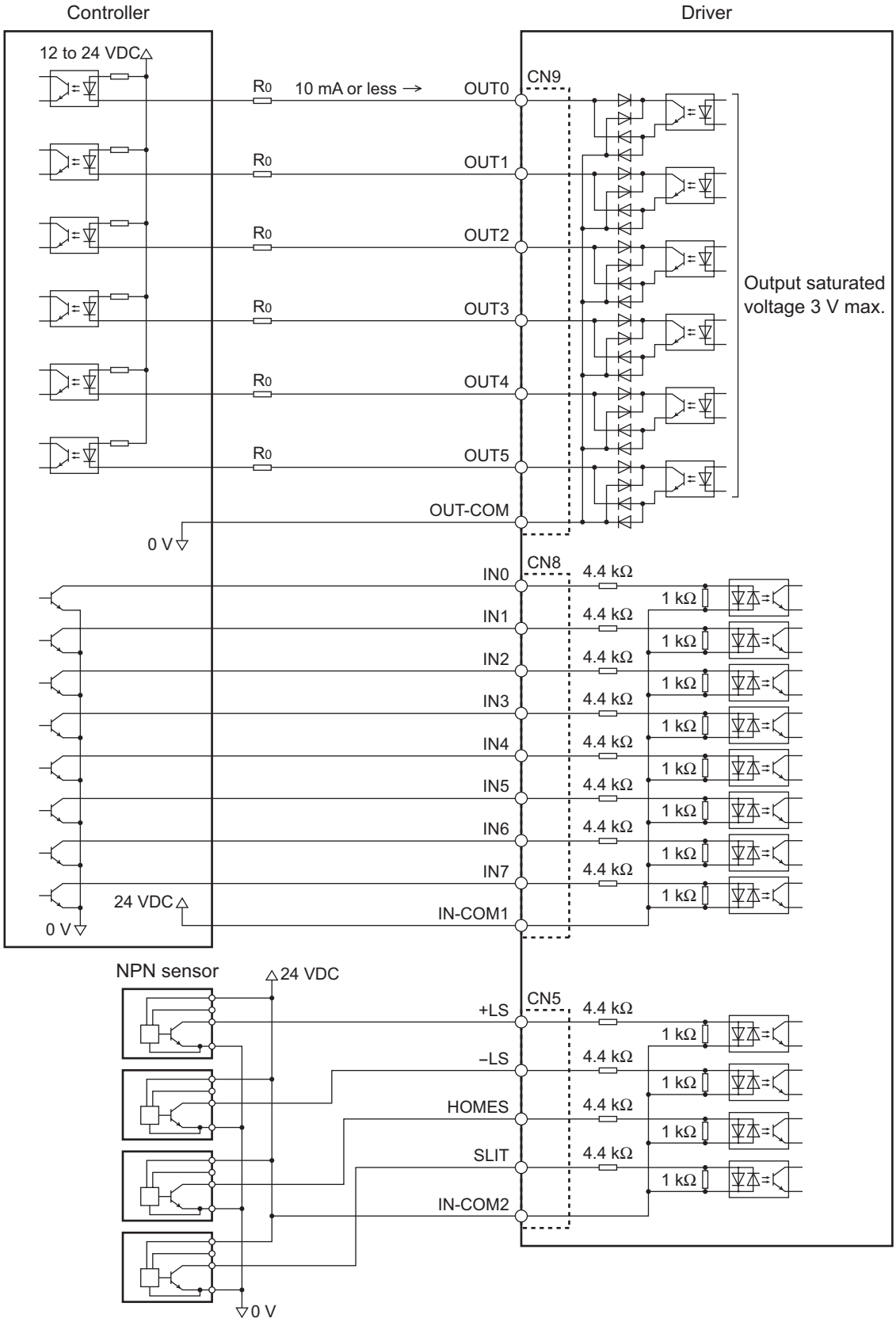
■ Connecting to a current source output circuit (PNP specifications)



Note

- 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 sink output circuit (NPN specifications)



Note

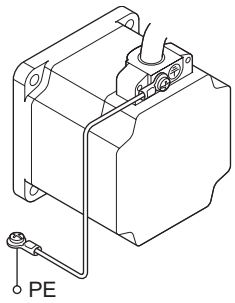
- Use input signals at 24 VDC.
- Use output signals at 26.4 VDC 10 mA or less. If the current exceeds 10 mA, connect an external resistor R0.
- The saturated voltage of the output signal is 3 VDC maximum.

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
Tightening torque: 1.2 N·m (170 oz-in)

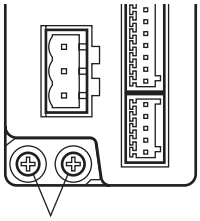
When grounding, use a round terminal and secure it with a mounting screw with a washer. Ground wires and crimp terminals are not supplied.



■ Grounding the driver

Be sure to ground the Protective Earth Terminal (screw size: M4) of the driver.
Grounding wire: AWG16 to 14 (1.25 to 2.0 mm^2)
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.



2.3 Connecting the 24 VDC power supply

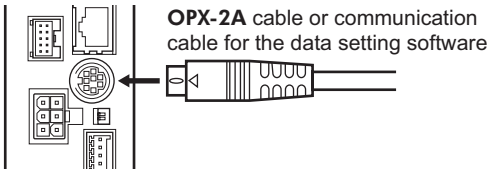
The 24 VDC power supply is for the control circuit of the driver.
Be sure to connect a power supply of 24 VDC±5%, 0.7 A or more.

Note

- 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 supplied cable with the **MEXE02** to the data edit connector (CN4) on the driver.

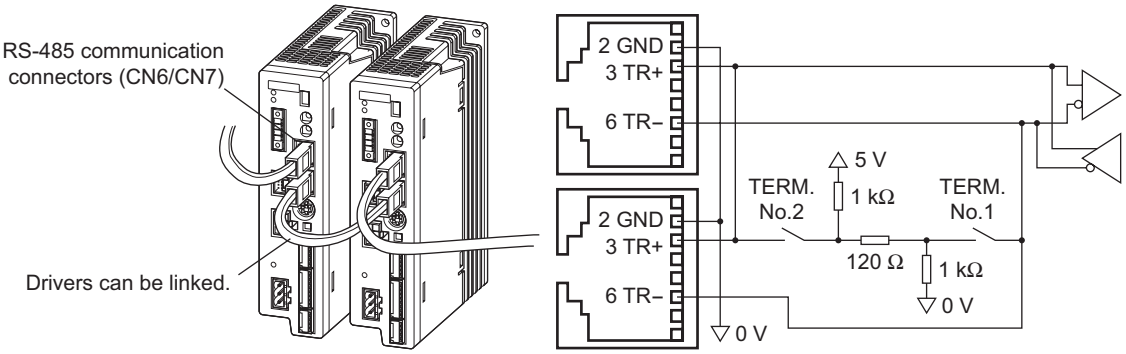


⚠ Caution

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.

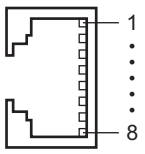
2.5 Connecting the RS-485 communication cable

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 (sold separately). See p.202. You can also use a commercial LAN cable to link drivers.



■ 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.	



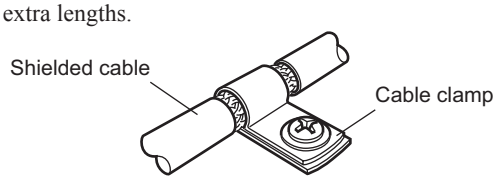
2.6 Noise measures

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 (sold separately) 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.
  - 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.



- 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.

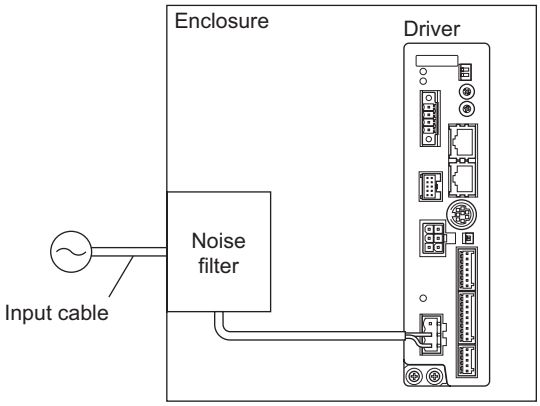
- Suppression of effect by noise propagation

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.

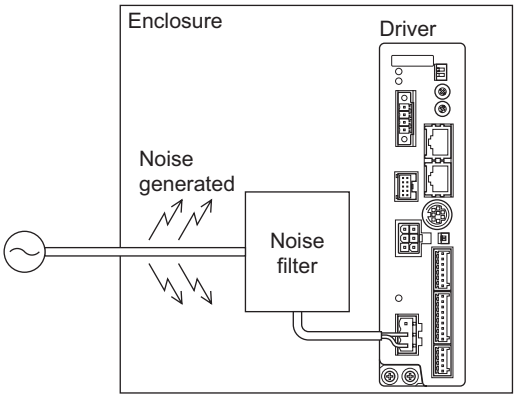
■ Noise suppression parts

- 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.

• Recommended wiring example



• Wiring example where the noise tends to generate



- 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 parts (accessories)

Accessories are sold separately. Refer to p.202 for details.

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 "8 CE Marking" on p.18 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

  Refer to p.37.

- Connecting surge arrester

  Refer to p.37.

- 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 page 36 for wire the shielded cable.

- Connecting the motor cable

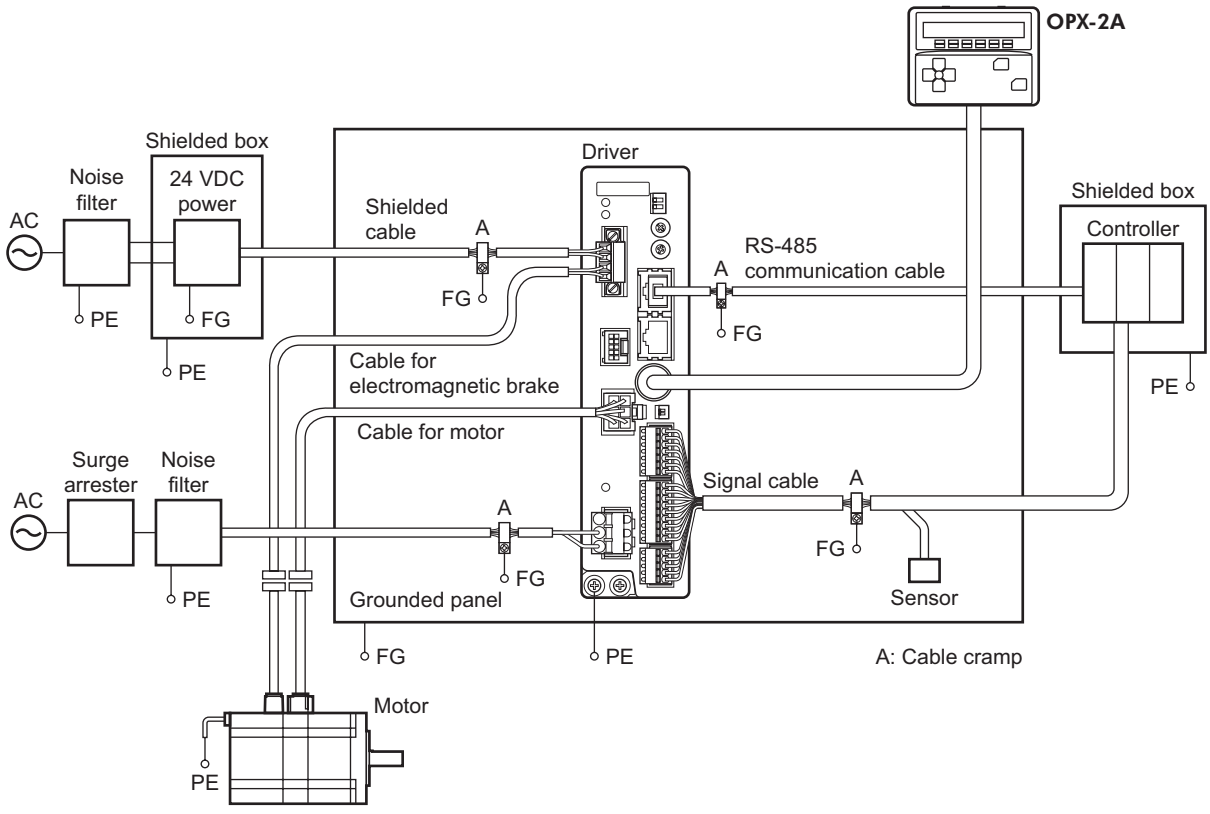
  Use an accessory cable (sold separately) when extending the wiring distance between the motor and driver

- Connecting the signal cable

  Refer to "Prevention of noise propagation" on p.36

- 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.35 for grounding method.

- Example of motor and driver installation and wiring



- Precautions about static electricity

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

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

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.48.

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	
40	R8	
41	R9	
42	R10	
43	R11	
44	R12	
45	R13	

Assignment No.	Signal name	Function
46	R14	General signals. Use these signals when controlling the system via RS-485 communication.
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

Parameter name	Description	Initial value
IN0 input function selection	Assigns the input signal to the input terminal IN0 to IN7.	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

Note

- Do not assign the same input signal to multiple input terminals. When the same input signal is assigned to multiple input terminals, the function will be executed if any of the terminals becomes active.
- 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

Parameter name	Description	Initial value
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.53.

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 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 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.

Assignment No.	Signal name	Function
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

Parameter name	Description	Initial value
OUT0 output function selection	Assigns the output signal to the output terminal OUT0 to OUT5.	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		
39	R7		
40	R8		
41	R9		
42	R10		
43	R11		
44	R12		
45	R13		
46	R14		
47	R15		
48	M0	Select the operation data No. using these six bits. See p.49 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

Parameter name	Description	Initial value
NET-IN0 input function selection	Assigns the input signal to the 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

Note

- Do not assign the same input signal to multiple input terminals. When the same input signal is assigned to multiple input terminals, the function will be executed if any of the terminals becomes active.
- 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
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
68	MOVE	Output when the motor operates.	0: Motor stopped 1: Motor operating

Assignment No.	Signal name	Function	Data read
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

Parameter name	Description	Initial value
NET-OUT0 output function selection	Assigns the output signal to the 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

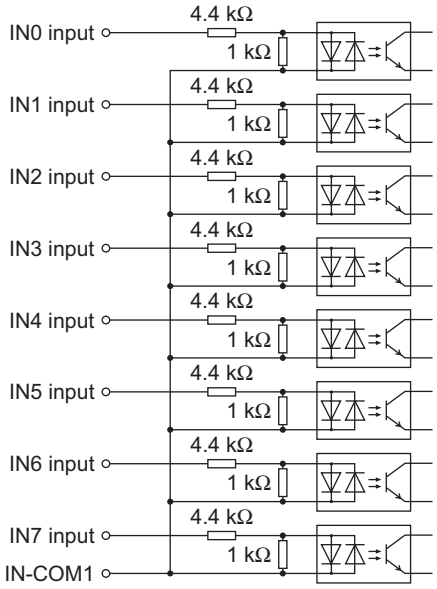
The input signals of the driver are photocoupler inputs.

- 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

Parameter name	Description	Setting range	Initial value
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

Note

- When the "return-to-home incomplete alarm" parameter is set to "enable", the return-to-home incomplete alarm will generate if the positioning operation is started while the position origin has not been set.
- 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.70).
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

Parameter name	Description	Setting range	Initial value
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

Note

- When the "return-to-home incomplete alarm" parameter is set to "enable", the return-to-home incomplete alarm will generate if the positioning operation is started while the position origin has not been set.
- 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.69).
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

Parameter name	Description	Setting range	Initial value
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
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

Note

- When the "return-to-home incomplete alarm" parameter is set to "enable", the return-to-home incomplete alarm will generate if the positioning operation is started while the position origin has not been set.
- 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.76).
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

Parameter name	Description	Setting range	Initial value
Home-seeking mode	Sets the mode for return-to-home operation.	0: 2-sensor mode 1: 3-sensor mode	1
Operating speed 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

Parameter name	Description	Setting range	Initial value
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.81).
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.84).
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

Parameter name	Description	Setting range	Initial value
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.86 for stop action.

Related parameters

Parameter name	Description	Setting range	Initial value
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

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

■ ALM-RST input

When an alarm generates, the 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.191 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

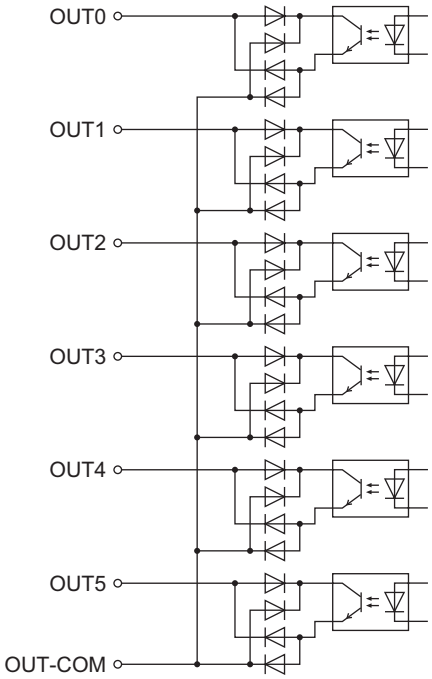
Note When the HMI input is not assigned to the input terminal, this input will always be set to ON. When assigning to both direct I/O and network I/O, the function will be executed when both of them are set to ON.

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.191 for alarm.

- Direct I/O

When an alarm generates, the ALM output will turn OFF. At the same time, the ALARM 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 ALARM 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

Parameter name	Description	Setting range	Initial value
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 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
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.195 for warning.

Related parameters

Parameter name	Description	Setting range	Initial value
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
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 × ($\sqrt{}$ 2 × Input voltage − 1)
Single-phase 200-240 V driver: Internal voltage = $\sqrt{}$ 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.87 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

Parameter name	Description	Setting range	Initial value
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

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

■ AREA1 to AREA3 output

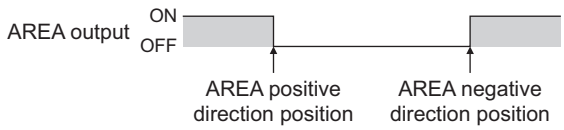
The AREA output turns ON when the motor is inside the area set by the parameters.
It turns ON when the motor is inside the area even when the motor stops.

- Related parameters

Parameter name	Description	Setting range	Initial value
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.		

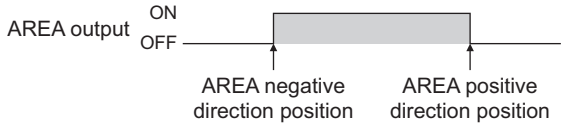
- When the "AREA positive direction position" parameter < "AREA negative direction position" parameter

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

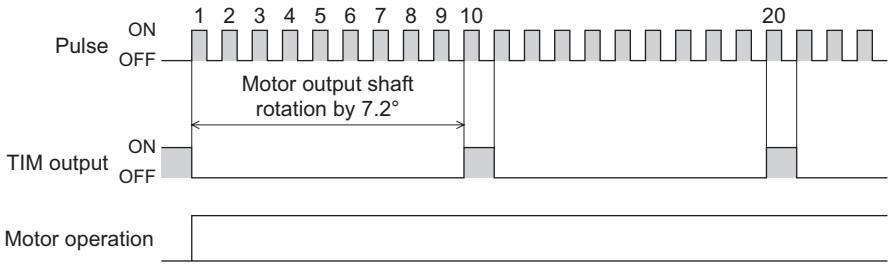
To turn the AREA output ON: Motor position = AREA negative direction position = AREA positive direction position

Note 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



Note
- 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

Parameter name	Description	Setting range	Initial value
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.

Note

- 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

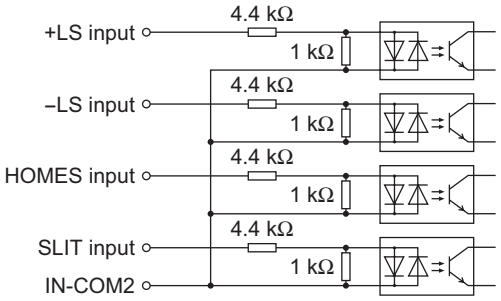
Input signal	Output signal
M2	M2_R
M3	M3_R
M4	M4_R
M5	M5_R
+LS	+LS_R
−LS	−LS_R
HOMES	HOMES_R
SLIT	SLIT_R

Note

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

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.86 for hardware overtravel.

Related parameters

Parameter name	Description	Setting range	Initial value
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.93 for return-to-home operation.

Related parameters

Parameter name	Description	Setting range	Initial value
HOMES logic level	Sets the logic for HOMES input.	0: Normally open 1: Normally closed	0

■ SLIT input

Connect the SLIT input when using motorized linear slides 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.93 for return-to-home operation.

Related parameters

Parameter name	Description	Setting range	Initial value
SLIT logic level	Sets the logic for the SLIT input.	0: Normally open 1: Normally closed	0

3.6 General signals (R0 to R15)

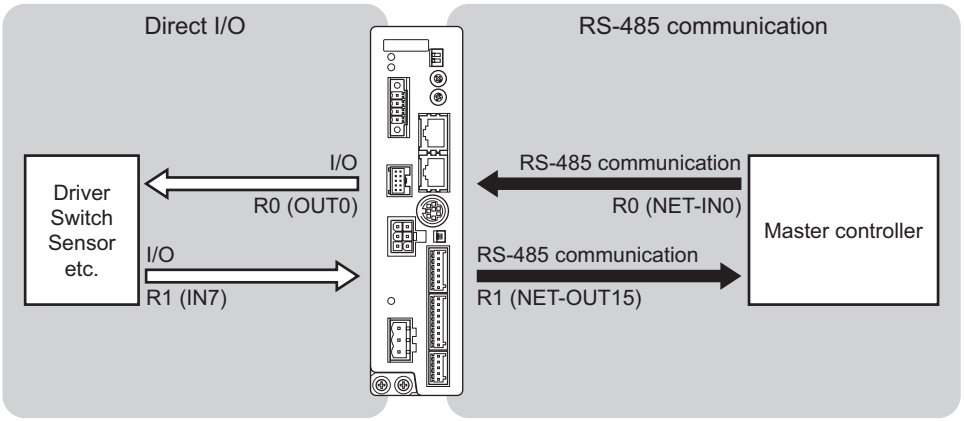
R0 to R15 are general signals that enable control via RS-485 communication.
Using R0 to R15, I/O signals for the external device can be controlled by the master device via the driver. The direct I/O of the driver can be used as an I/O unit.
See the following example for setting of the general signals.

- 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 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.90 for details.

1.1 Resolution

When the "electronic gear A" and "electronic gear B" parameters are set, the resolution per one rotation of the motor output shaft can be set. Note that the calculated value must fall within the setting range specified below:
Resolution setting range: 200 to 200,000 P/R

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

Related parameters

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

Note

- If the value outside of the setting range is set, the "electronic gear setting error warning" will generate. If the power is cycled or the configuration is executed while the "electronic gear setting error warning" is present, an "electronic gear setting error alarm" will generate.
- When the TIM output is used, set the “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)]

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

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

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

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

1.2 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

Parameter name	Description	Setting range	Initial value
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.

1.3 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

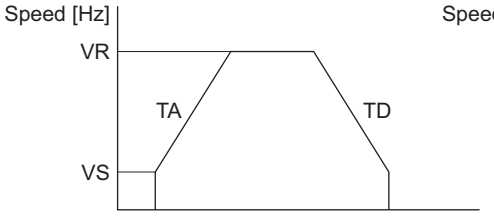
Parameter name	Description	Setting range	Initial value
STOP current	Sets the motor standstill current based on the rated current being 100%.	0 to 600 (1=0.1%)	500

1.4 Acceleration/deceleration rate and acceleration/deceleration time

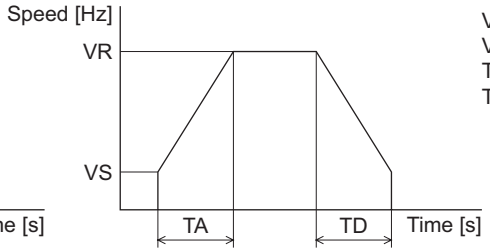
■ Acceleration/deceleration unit

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

Parameter name	Description	Setting range	Initial value
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.

Note
- When performing linked operation, the acceleration/deceleration for the starting linked operation data No. is applied even when the "acceleration/deceleration type" parameter is set to "separate".
- See p.83 for the acceleration/deceleration when performing variable speed operation.

Related parameter

Parameter name	Description	Setting range	Initial value
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

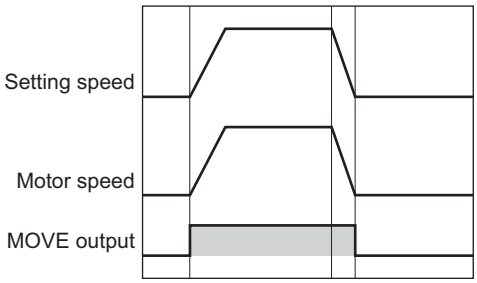
1.5 Speed filter

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.

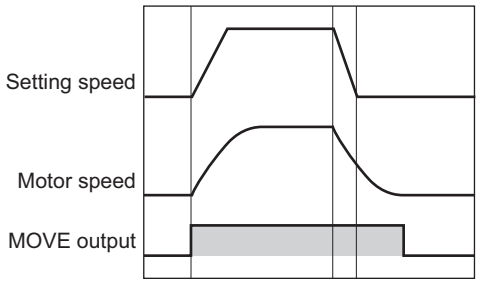
Related parameter

Parameter name	Description	Setting range	Initial value
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.



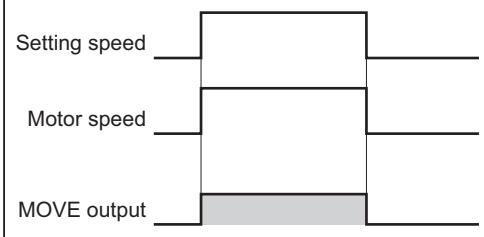
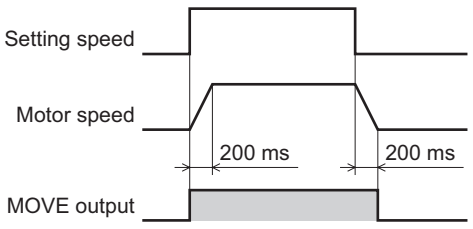
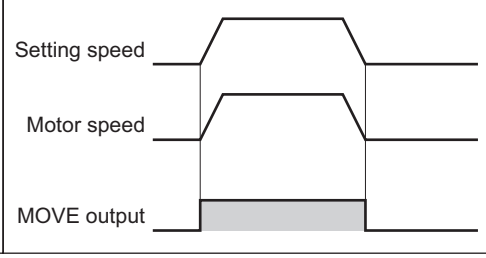
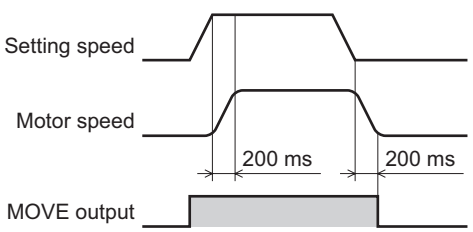
Note When setting the value of the "speed filter" parameter to "0," this function will be invalid.

1.6 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

Parameter name	Description	Setting range	Initial value
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		

1.7 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 counter 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.

Note
- 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

Parameter name	Description	Setting range	Initial value
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

Note 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

Parameter name	Description	Setting range	Initial value
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.

Note 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

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

■ Monitor function

Note 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

Parameter name	Description	Setting range	Initial value
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

Parameter name	Description	Setting range	Initial value
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

Parameter name	Description	Setting range	Initial value
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.

2 Operation

This chapter explains the types of operation and timing charts.

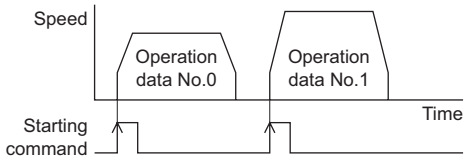
Operation

[Setting by operation data and parameters]

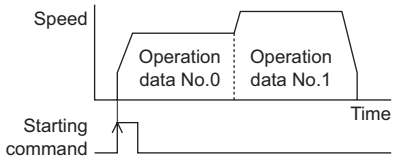
Positioning operation

Operating function

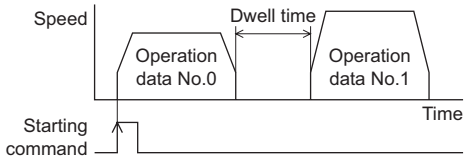
• Single-motion operation



• Linked-motion operation



• Linked-motion operation 2



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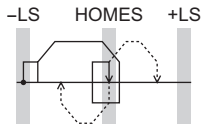
Starting method

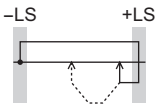
- Data number selecting operation
- Direct positioning operation
- Sequential positioning operation

Return-to-home operation

• 3-sensor mode



• 2-sensor mode

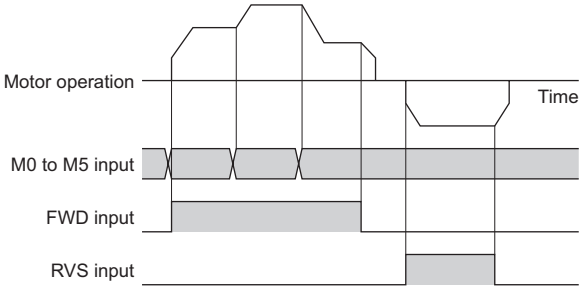


• Position preset

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

2.1 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).

■ Operation data

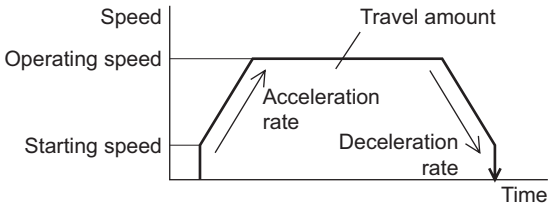
The following data are the operation data for positioning operation.

Name	Description	Setting range	Initial value
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: Incremental (INC) 1: Absolute (ABS)	0
Operation function	This is used to set how to operate consecutive operation data.	0: Single-motion 1: Linked-motion 2: Linked-motion2	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

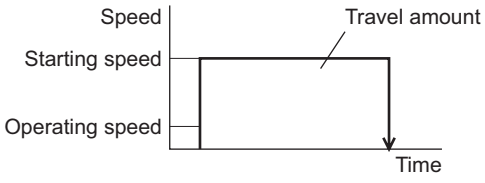
- Position, operating speed, acceleration, deceleration

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



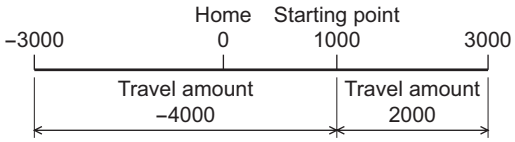
- Operation modes

The following two operation modes are available:

Absolute (ABS) mode

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

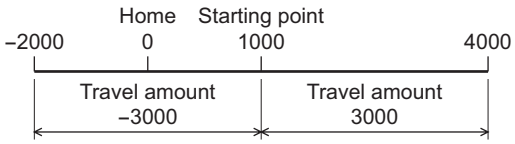
Example: When positioning operation is performed with setting the starting point to 1000 and setting the destination to +3000 and −3000



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.72
Linked-motion	Multiple sets of operation data are linked to perform multi-variable speed operation	p.73
Linked-motion2	Dwell time (stop waiting time) can be set between operation data. Operation data whose rotation direction is different can also be linked.	p.74

■ 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.

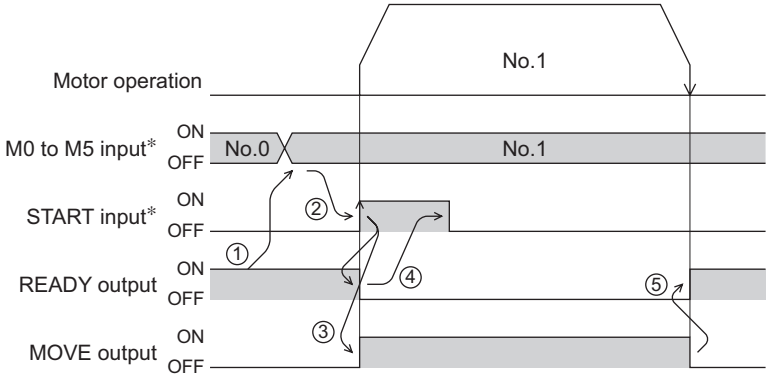
- Data number selecting operation

Select an operation data based on a combination of ON/OFF status of the M0 to M5 inputs. See p.49 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

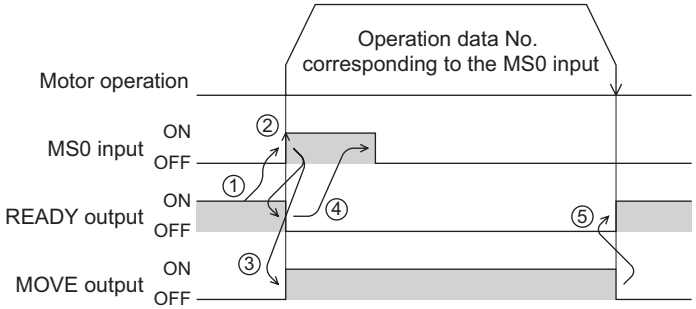
When any of the MS0 to MS5 inputs is turned ON, the positioning operation corresponding to the input data No. will perform. Since the positioning operation is enabled by turning any of the MS0 to MS5 inputs ON, you can save the step of selecting the operation data No.
The operation data assigning to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

Related parameters

Parameter name	Description	Setting range	Initial value
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

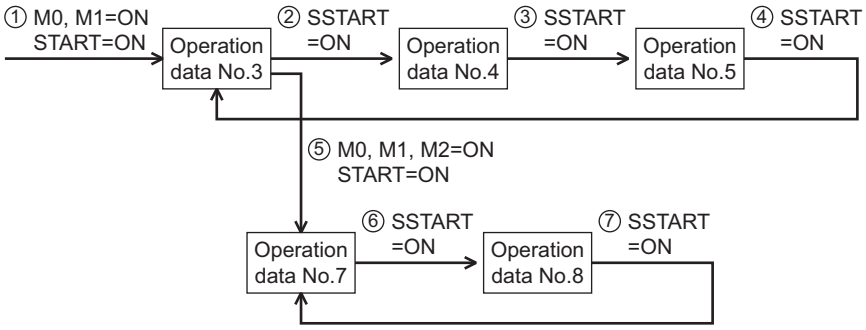
Operation data	Sequential positioning
No.0	Enable
No.1	
No.2	
No.3	Disable

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."

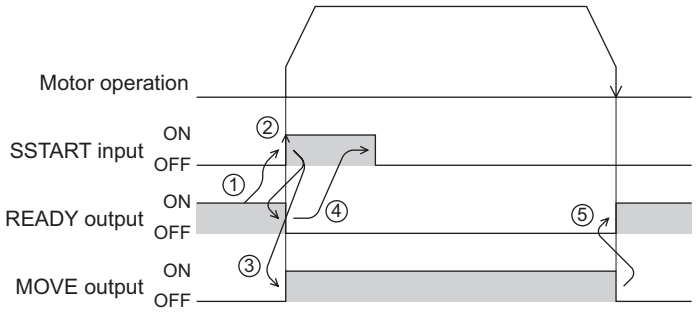
• Setting example

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

Note Set "enable" the "sequential positioning" even when sequential positioning is performed by the operation data being set to "Linked-motion" or "Linked-motion2" in the "operation function."

■ Operation function

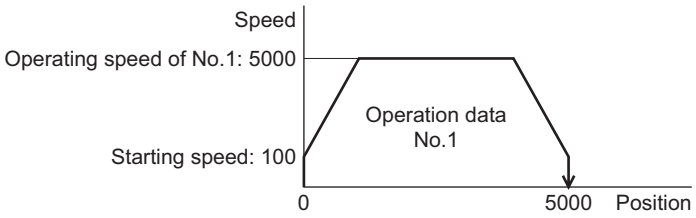
- Single-motion

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

Example of single-motion operation

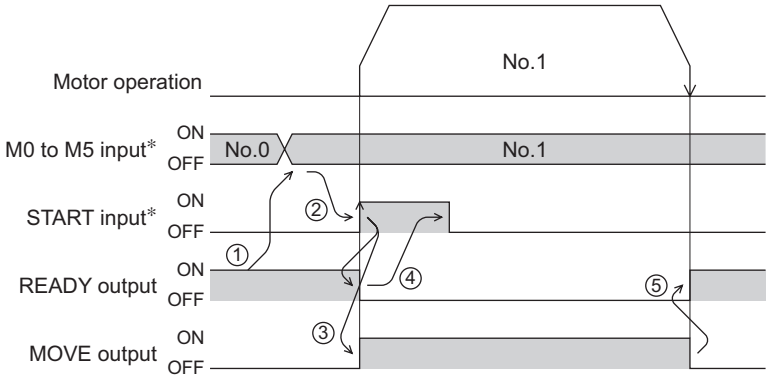
Operation data	Position	Operating speed	Acceleration	Deceleration	Operation mode	Operation function	Dwell time	Sequential positioning
No.1	5000	5000	30000	30000	INC	Single-motion	Not used	Not used

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.

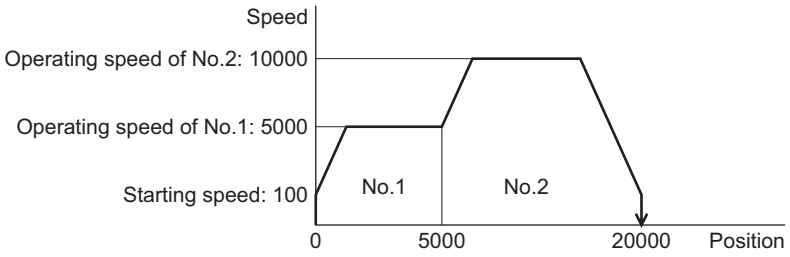
Note

- 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

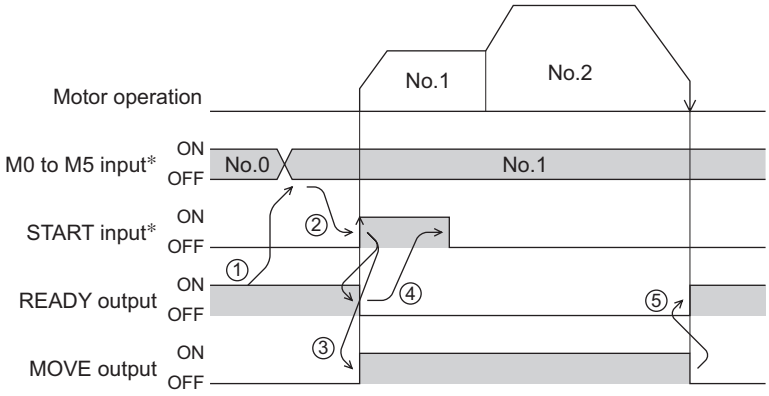
Operation data	Position	Operating speed	Acceleration	Deceleration	Operation mode	Operation function	Dwell time	Sequential positioning
No.1	5000	5000	30000	30000	INC	Linked-motion	Not used	Not used
No.2	20000	10000	Not used	Not used	INC	Single-motion	Not used	Not used

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-motion2," 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.

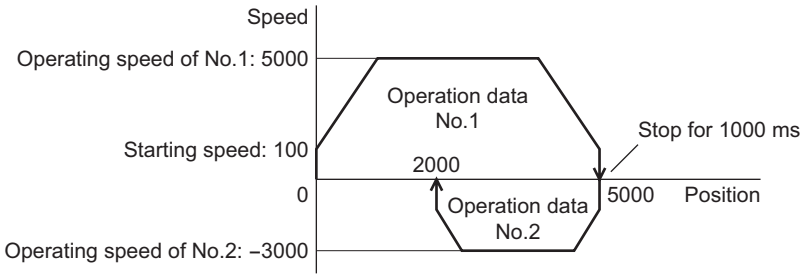
Note

- 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-motion2" is set for data No.63, because the operation pertaining to No.63 will be processed independently.

Example of linked-motion operation2

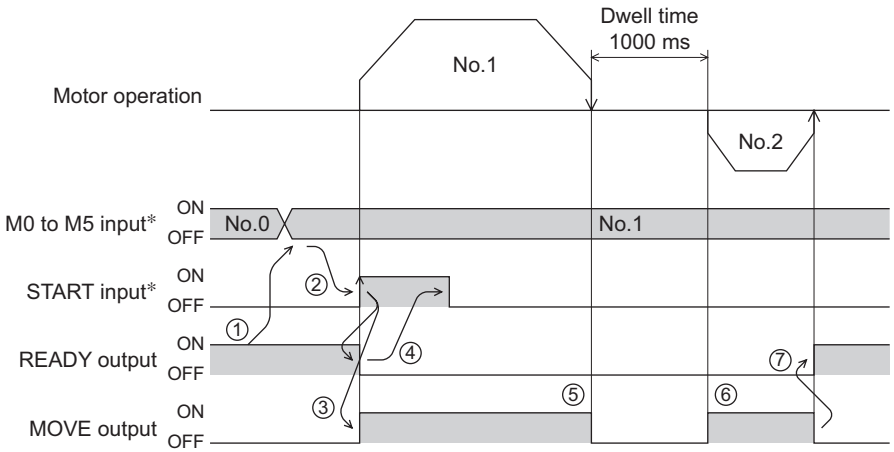
Operation data	Position	Operating speed	Acceleration	Deceleration	Operation mode	Operation function	Dwell time	Sequential positioning
No.1	5000	5000	30000	30000	INC	Linked-motion2	1000	Not used
No.2	−3000	3000	30000	30000	INC	Single-motion	0	Not used

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.

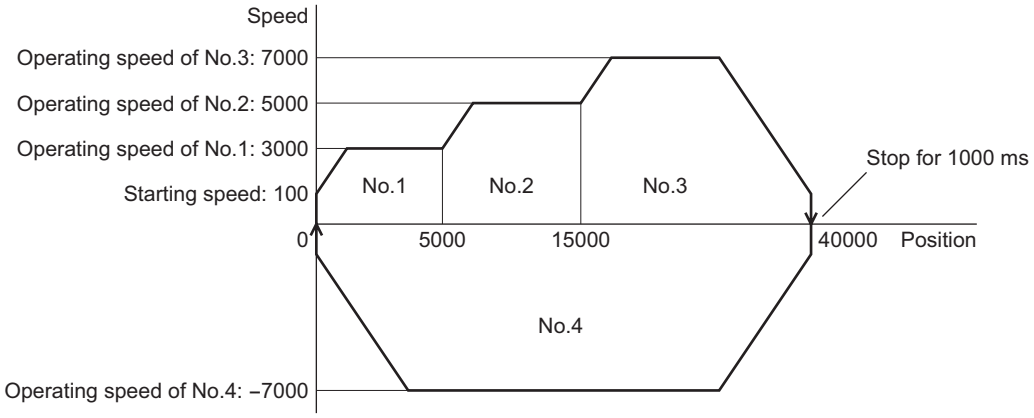


* In direct I/O, turn the START input ON after setting the M0 to M5 inputs. In network I/O, the operation will be performed even when turning the M0 to M5 inputs and the START input ON simultaneously.

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

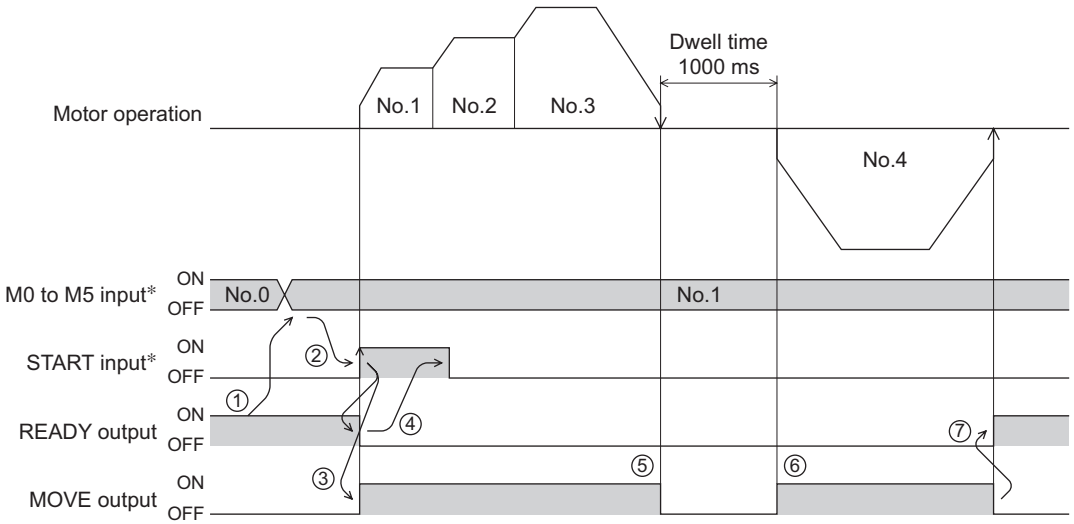
Operation data	Position	Operating speed	Acceleration	Deceleration	Operation mode	Operation function	Dwell time	Sequential positioning
No.1	5000	3000	30000	30000	INC	Linked-motion	Not used	Not used
No.2	10000	5000	Not used	Not used	INC	Linked-motion	Not used	Not used
No.3	25000	7000	Not used	Not used	INC	Linked-motion2	1000	Not used
No.4	0	7000	30000	30000	ABS	Single-motion	Not used	Not used

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.

2.2 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.

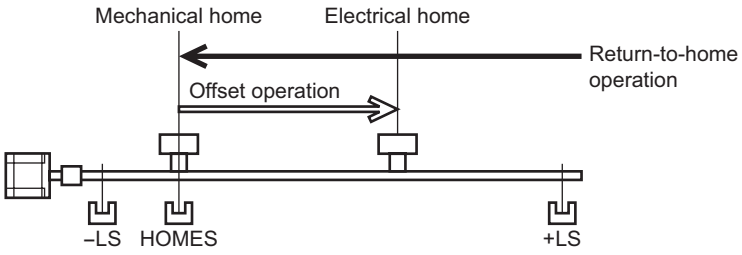
∗ In the case of a rotating mechanism, even when using one external sensor, the home position can be detected.

■ 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.

Note 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.

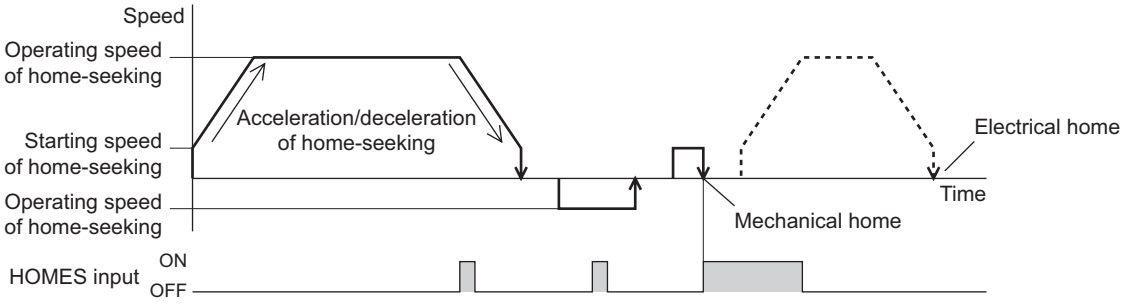
■ Parameters related to return-to-home operation

Parameter name	Description	Setting range	Initial value
Home-seeking mode	Sets the mode for return-to-home operation.	0: 2-sensor mode 1: 3-sensor mode	1
Operating speed 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 *	

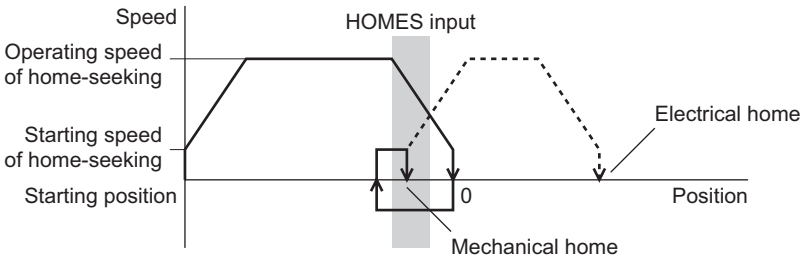
* This signal is used when an encoder is connected.

- Operation example (when using 3-sensor mode)

Operating sequence in seeing a time axis

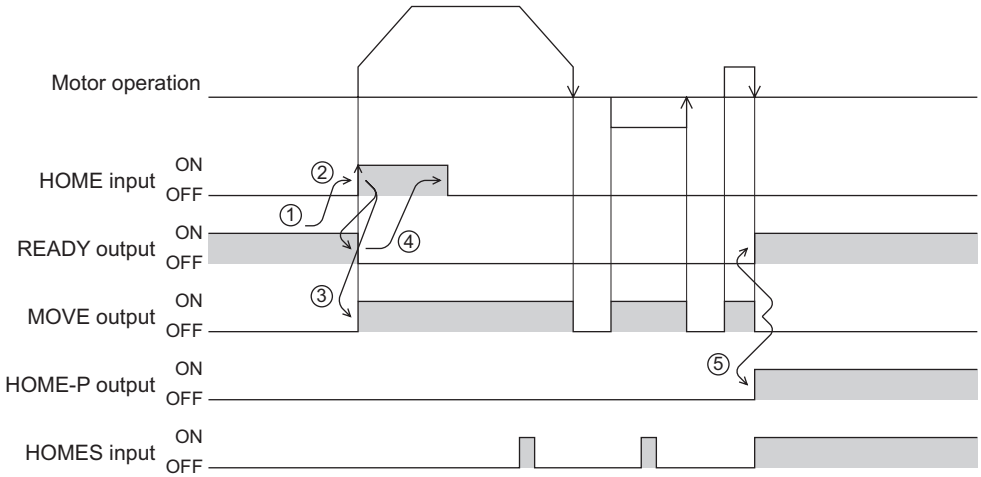


Operating sequence in seeing a travel amount



- Operating method

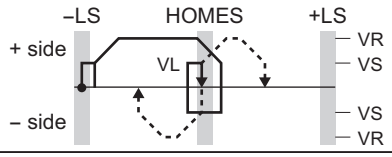
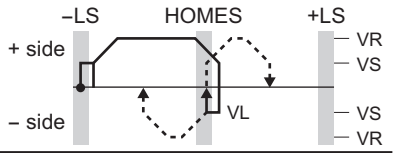
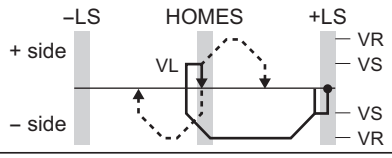
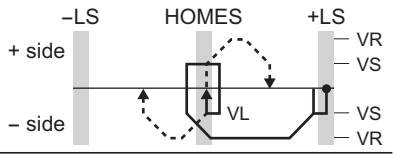
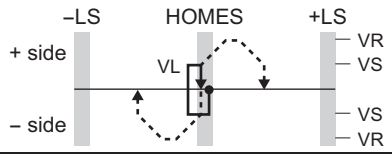
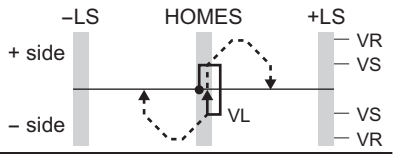
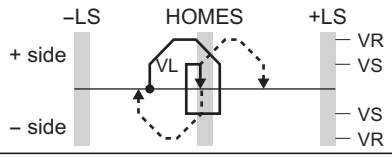
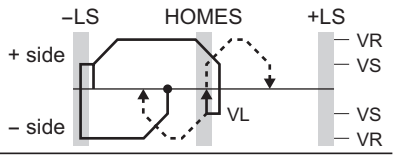
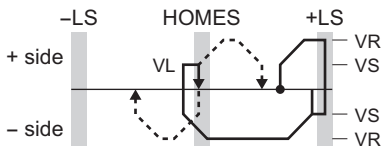
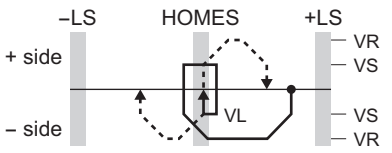
1）Check the READY output is ON.
2）Turn the HOME input ON.
3）Return-to-home operation will be started.
4）Check that the READY output has been turned OFF and turn the HOME input OFF.
5）When return-to-home operation is completed, the HOME-P output will be turned ON.



■ Operation sequence

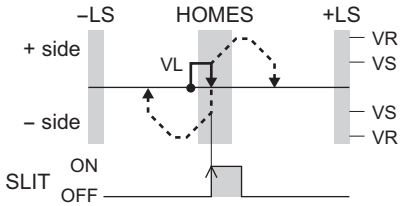
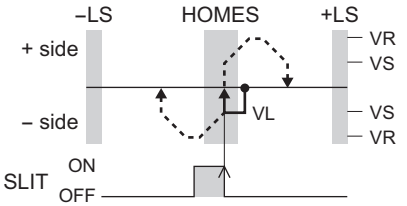
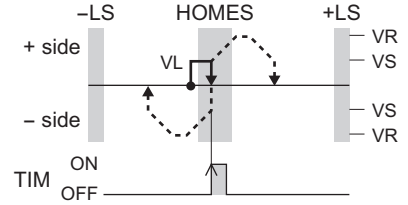
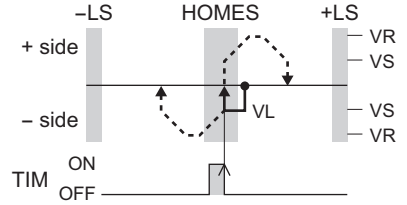
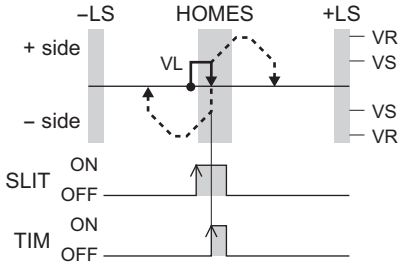
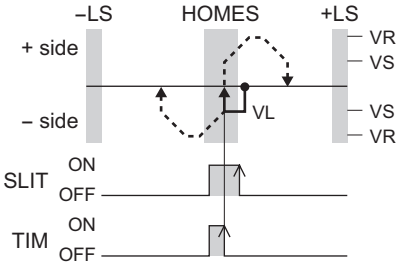
- 3-sensor mode

• 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		

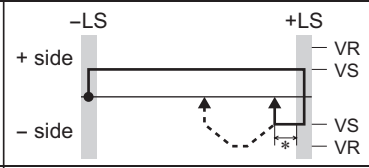
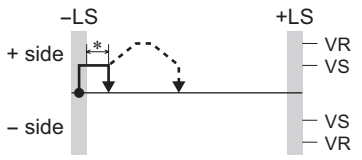
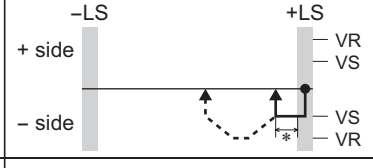
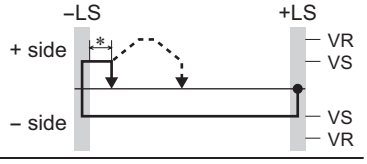
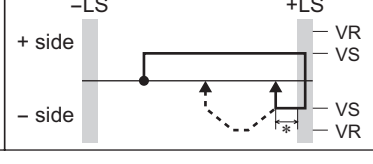
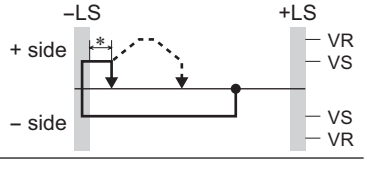
When concurrently using the external sensor (signal)

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

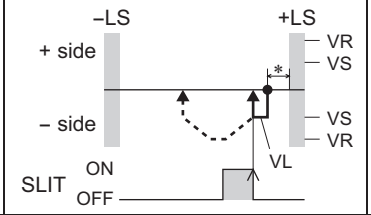
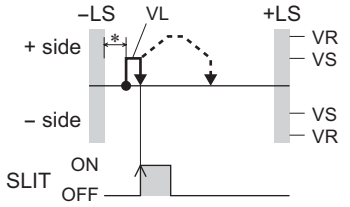
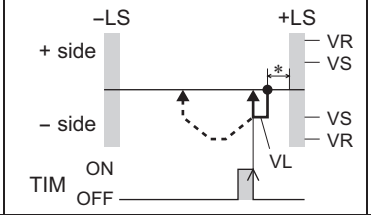
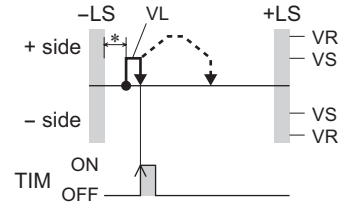
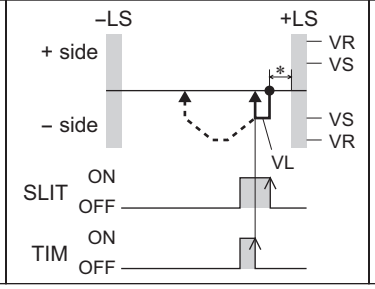
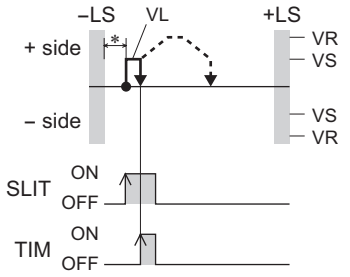
  - Explanation of labels
    VS: Starting speed of home-seeking
    VR: Operating speed of home-seeking
    VL: Last speed of return-to-home (When VS < 500 Hz: VS, When VS ≥ 500 Hz: 500 Hz)
    - - - Broken line indicates a home offset move.

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.

■ 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.

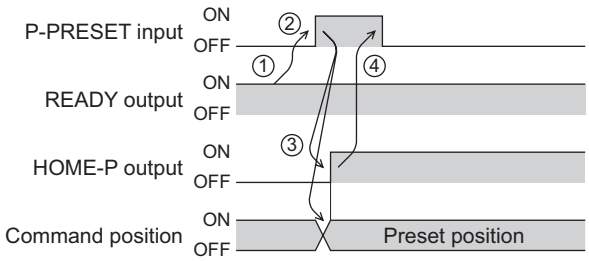
- When the motor is operating
- When an alarm is present

- Related parameters

Parameter name	Description	Setting range	Initial value
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.



2.3 Continuous operation

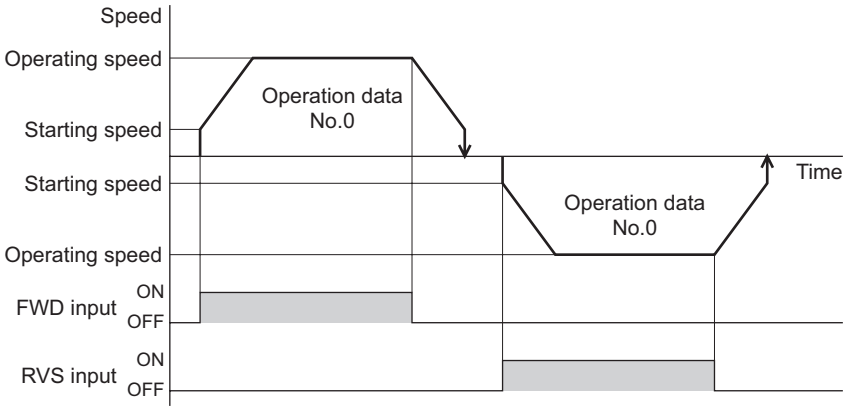
The motor operates continuously while the FWD or RVS input is ON.
Operation is performed based on the FWD or RVS input and the operating speed corresponding to the selected operation data No.
When the operation data No. is changed during continuous operation, the speed will change to the speed specified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

■ Operation data

Operation data for continuous operation are as follows.

Name	Description	Setting range	Initial value
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)



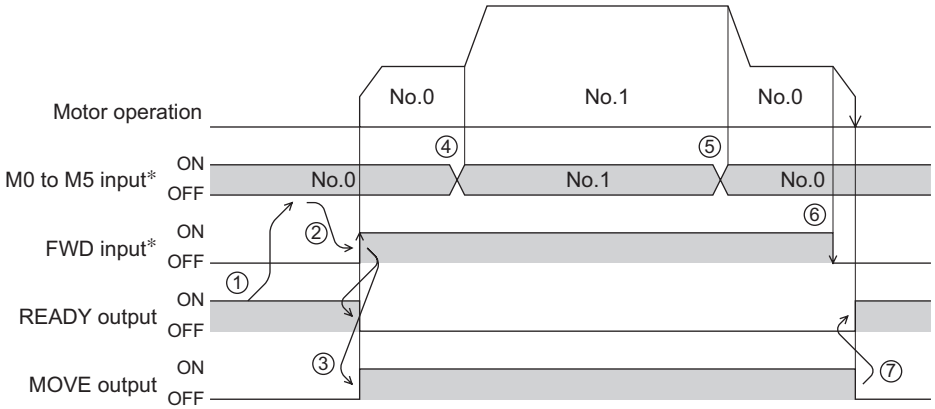
■ Starting method of continuous operation

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.49 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

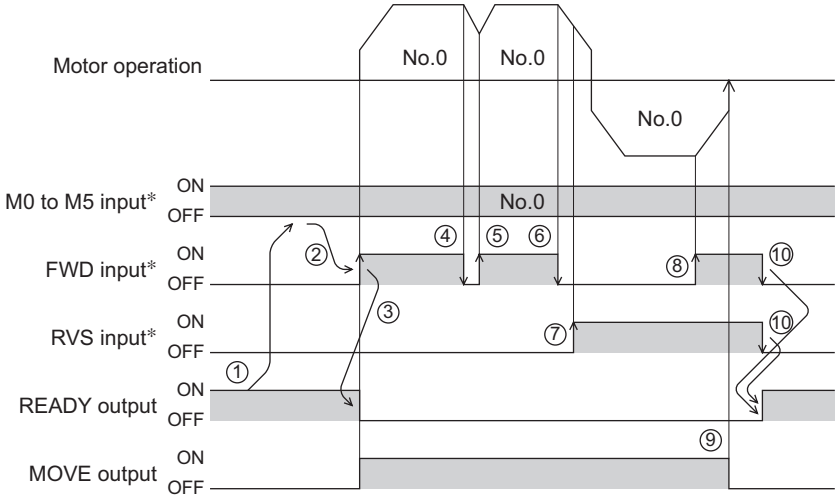
1）Check the READY output is ON.
2）Select the operation data No. by a combination of the M0 to M5 inputs and turn the FWD input ON.
3）The motor starts continuous operation. The READY output will be turned OFF.
4）Select the operation data No.1 by turning the M0 input ON. The motor accelerates to the operating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

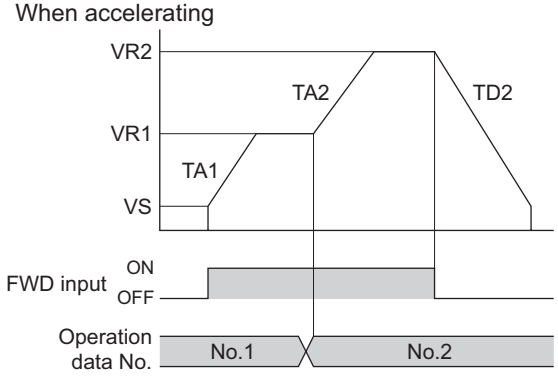


* In direct I/O, turn the FWD input or RVS input ON after setting the M0 to M5 inputs. In network I/O, the operation will be performed even when turning the M0 to M5 inputs and the FWD (RVS) input ON simultaneously.

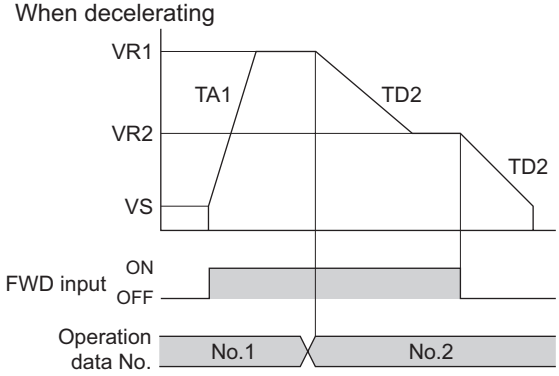
■ Variable speed operation

- When acceleration/deceleration is "separate"
  - Acceleration/deceleration unit: ms/kHz

When accelerating

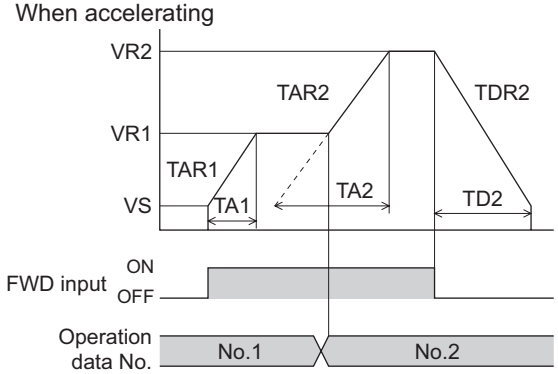


When decelerating

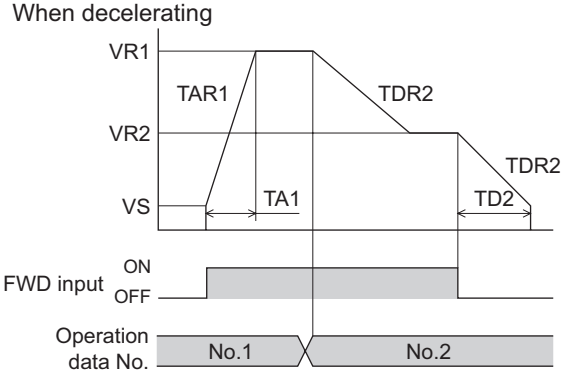


  - Acceleration/deceleration unit: s

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)

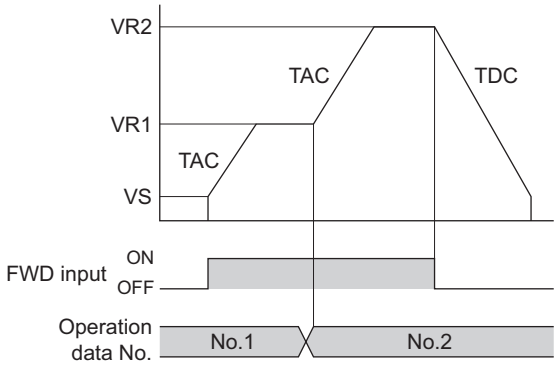
- Calculation method for acceleration/deceleration rate

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

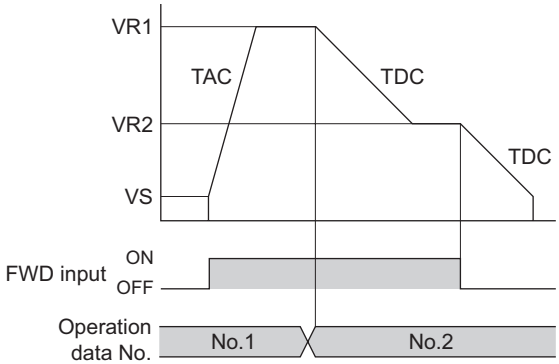
- When acceleration/deceleration is "common"

  - Acceleration/deceleration unit: ms/kHz

When accelerating

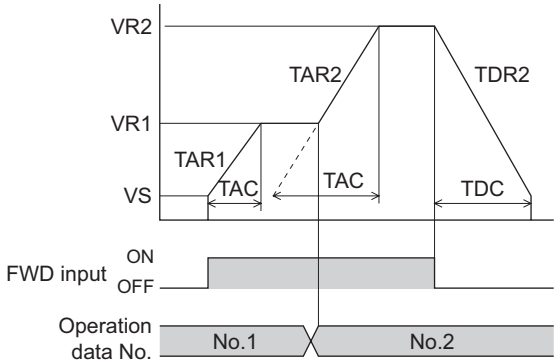


When decelerating

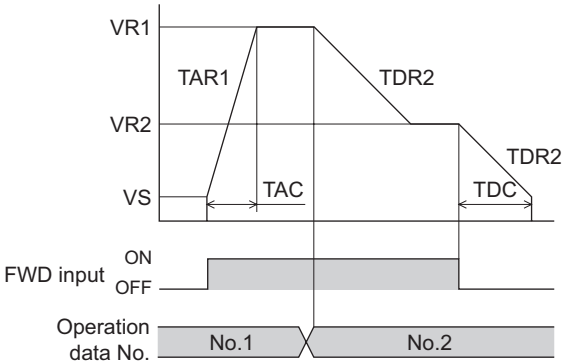


  - Acceleration/deceleration unit: s

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

2.4 Other operation

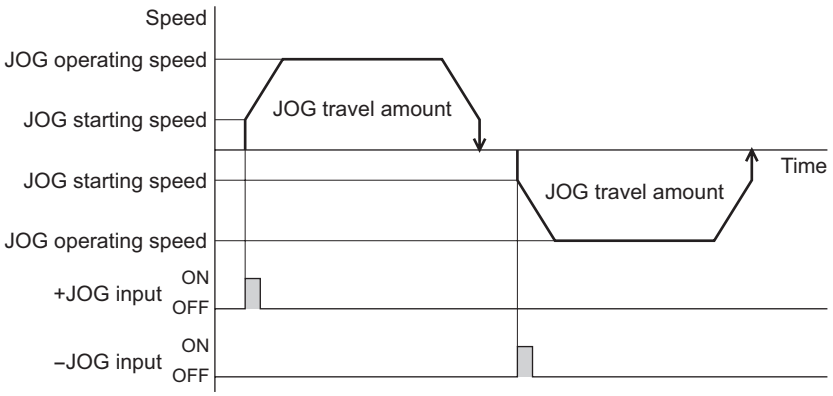
■ JOG operation

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

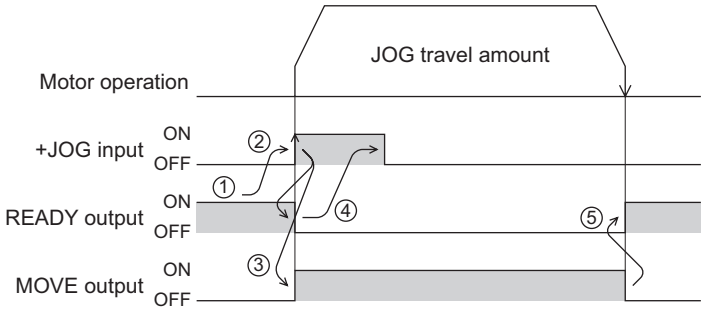
Parameter name	Description	Setting range	Initial value
JOG travel amount	This is the travel amount for JOG operation.	1 to 8,388,607 step	1
JOG operating speed	This is the operating speed for JOG operation.	1 to 1,000,000 Hz	1000
JOG acceleration/ deceleration rate	This is the acceleration/deceleration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



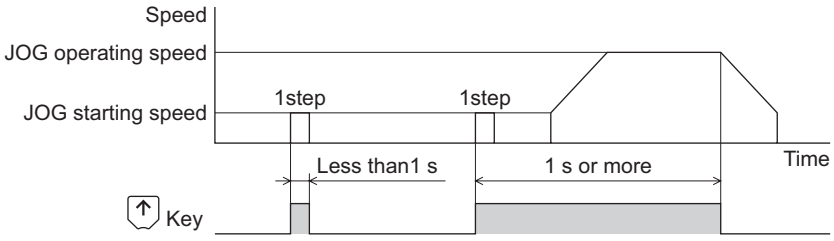
■ Test operation

Test operation is performed using the **OPX-2A** or **MEXE02**. JOG operation and teaching function can be performed. Refer to each operating manual for details.

- 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

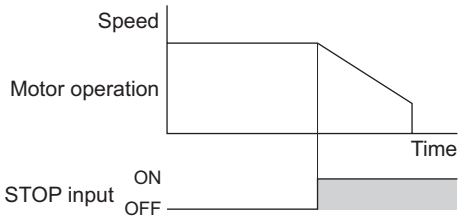
This is a function to move the motor using the **OPX-2A** or **MEXE02** and set the current position as the position (travel amount) of the operation data. When the position (travel amount) is set using teaching function, the "operation mode" will always be the absolute mode. The operating speed, acceleration/deceleration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

Note Perform teaching function when the position origin is set. See p.87 for setting the position origin.

■ Stop operation

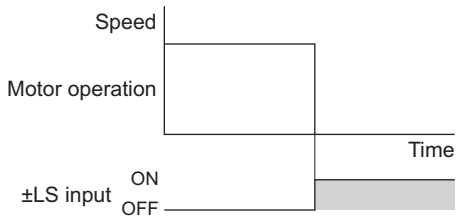
- STOP action

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



- Hardware overtravel

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

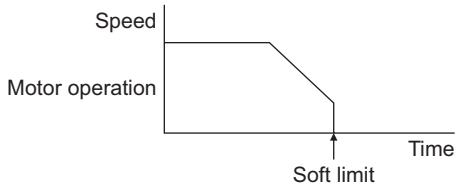


Related parameters

Parameter name	Description	Setting range	Initial value
Hardware overtravel	Sets whether to enable or disable 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

- 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 example shown on the right applies when an operation where a software limit is to be exceeded is started.



Note
- Software overtravel will become effective after the position origin is set. See p.87 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.

Related parameters

Parameter name	Description	Setting range	Initial value
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

- 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)	

■ 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.191 for alarm.

Related parameters

Parameter name	Description	Setting range	Initial value
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

■ 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

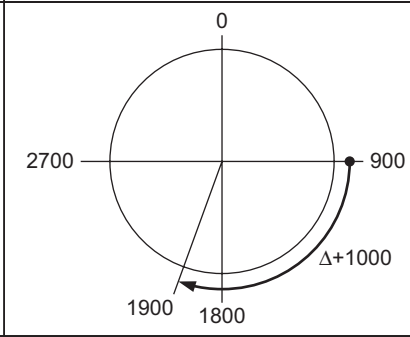
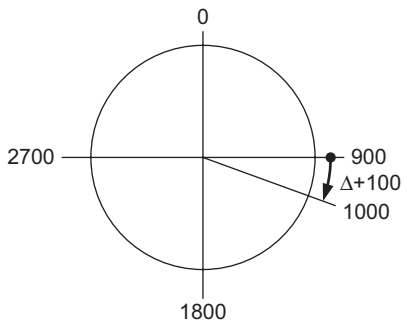
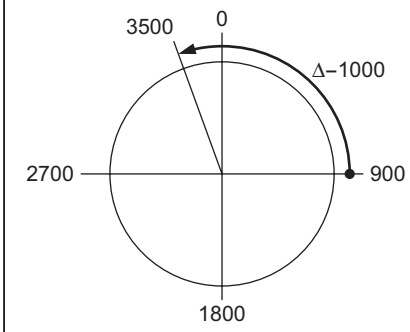
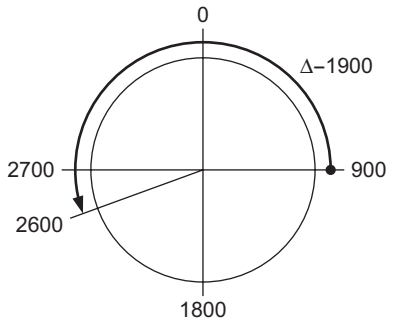
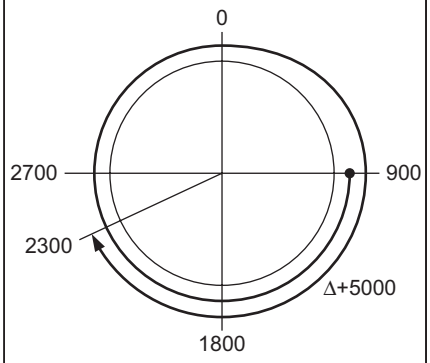
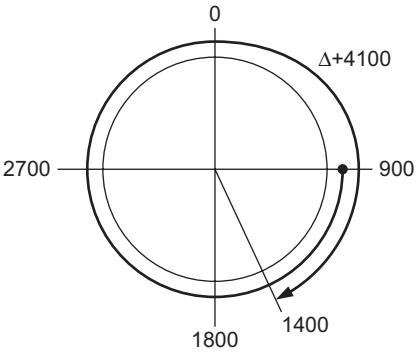
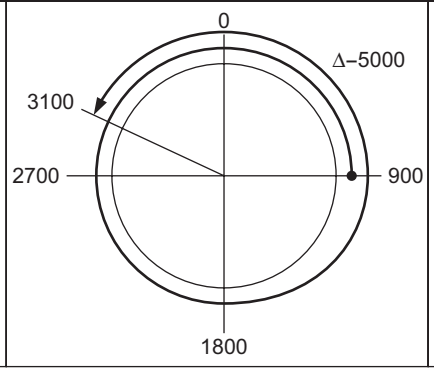
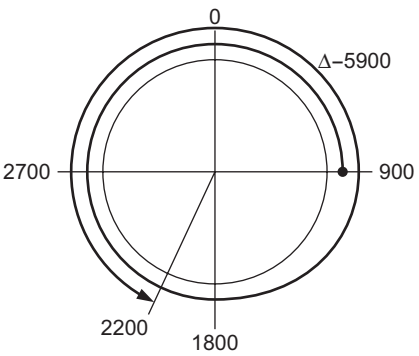
Parameter name	Description	Setting range	Initial value
Wrap setting	Sets whether to enable or disable the wrap function.	0: Disable 1: Enable	0
Wrap setting range	Wrap setting range.	1 to 8,388,607 step	500

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

Example for wrap function

Example of operation when the positioning operation is performed in 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		

3 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		
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).

4 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.

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

- Effective immediately.....Executes the recalculation and setup immediately when writing the parameter.
- Effective after stopping the operation.....Executes the recalculation and setup after stopping the operation.
- Effective after executing the configuration.....Executes the recalculation and setup after executing the configuration.
- Effective after turning the power ON again.....Executes the recalculation and setup after turning the 24 VDC power ON again.

Note

- The parameters are written in the RAM when writing via RS-485 communication.
- The non-volatile memory can be rewritten approximately 100,000 times.
- When the power is cycled, all parameters that was changed the setting will be effective.

4.1 Parameter list

I/O parameters (p.92)	• 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 parameters (p.92)	• RUN current	• Moving average time
	• STOP current	• Filter selection
	• Speed filter	
Operation parameters (p.93)	• 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	
Return-to-home parameters (p.93)	• 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/warning parameters (p.94)	• Return-to-home incomplete alarm	• Overvoltage warning
	• Overheat warning	• Undervoltage warning
Coordination parameters (p.94)	• 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 parameters (p.94)	• Data setter speed display	
	• Data setter edit	
I/O function parameters (p.95)	• IN0 to IN7 input function selection	
	• IN0 to IN7 input logic level setting	
	• OUT0 to OUT5 output function selection	
I/O function [RS-485] parameters (p.96)	• NET-IN0 to NET-IN15 input function selection	
	• NET-OUT0 to NET-OUT15 output function selection	
Communication parameters (p.97)	• Communication timeout	• Communication stop bit
	• Communication error alarm	• Transmission waiting time
	• Communication parity	

4.2 I/O parameter

Name	Description	Setting range	Initial value	Effective *
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.			
SLIT logic level	Sets the logic for the SLIT input.			
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

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

4.3 Motor parameter

Name	Description	Setting range	Initial value	Effective *
RUN current	Sets the motor operating current based on the rated current being 100%.	0 to 1000 (1=0.1%)	1000	A
STOP current	Sets the motor standstill current 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

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

4.4 Operation parameter

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

4.5 Return-to-home parameter

Name	Description	Setting range	Initial value	Effective ∗1
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) ∗2	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 ∗3		
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 Indicates the timing for the data to become effective. (B: Effective after stopping the operation)
*2 Acceleration/deceleration rate (ms/kHz) or acceleration/deceleration time (s) can be selected using "acceleration/deceleration unit" parameter. (initial value: acceleration/deceleration rate).
*3 This signal is used when an encoder is connected.

4.6 Alarm/warning parameter

Name	Description	Setting range	Initial value	Effective *
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
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	

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

4.7 Coordination parameter

Name	Description	Setting range	Initial value	Effective *
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	

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

4.8 Common parameter

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

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

4.9 I/O function parameter

Name	Description	Setting range	Initial value	Effective *
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				
OUT0 output function selection	Assigns the output signal to the output terminal OUT0 to OUT5.	See table next.	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	

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

- Setting range for IN input function selection

0: Not used	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	

4.10 I/O function [RS-485] parameter

Name	Description	Setting range	Initial value	Effective *
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 table next.	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	

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

- Setting range for NET-IN input function selection

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

- 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	

4.11 Communication parameter

Name	Description	Setting range	Initial value	Effective *
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	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	

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

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**.

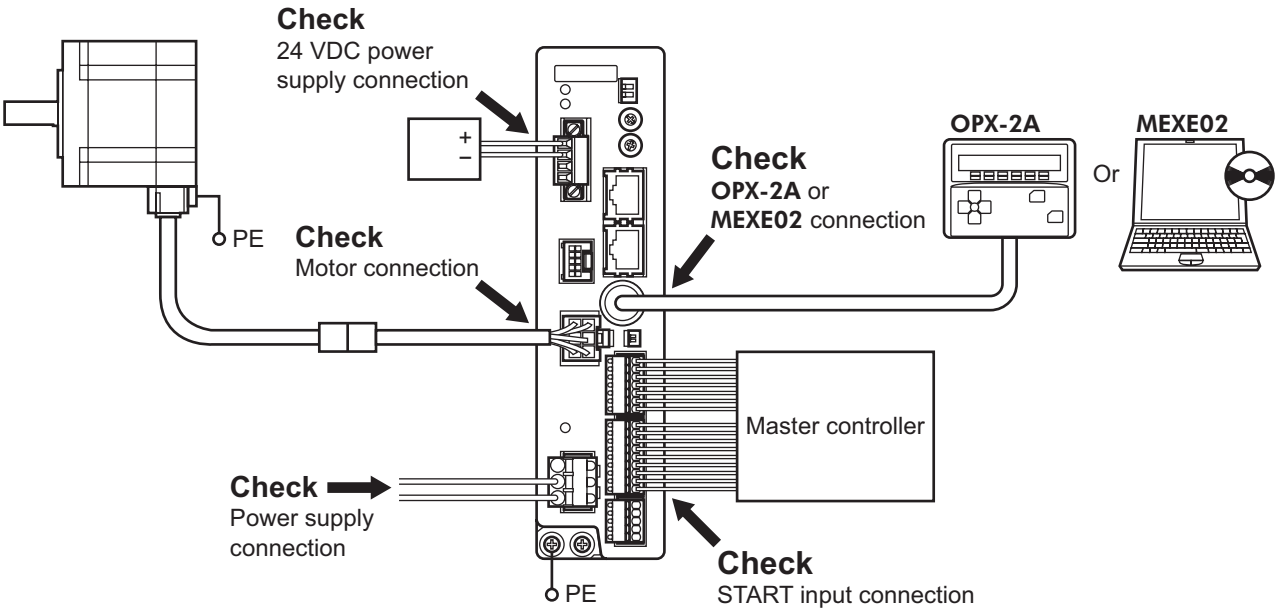
Table of contents

1 Guidance

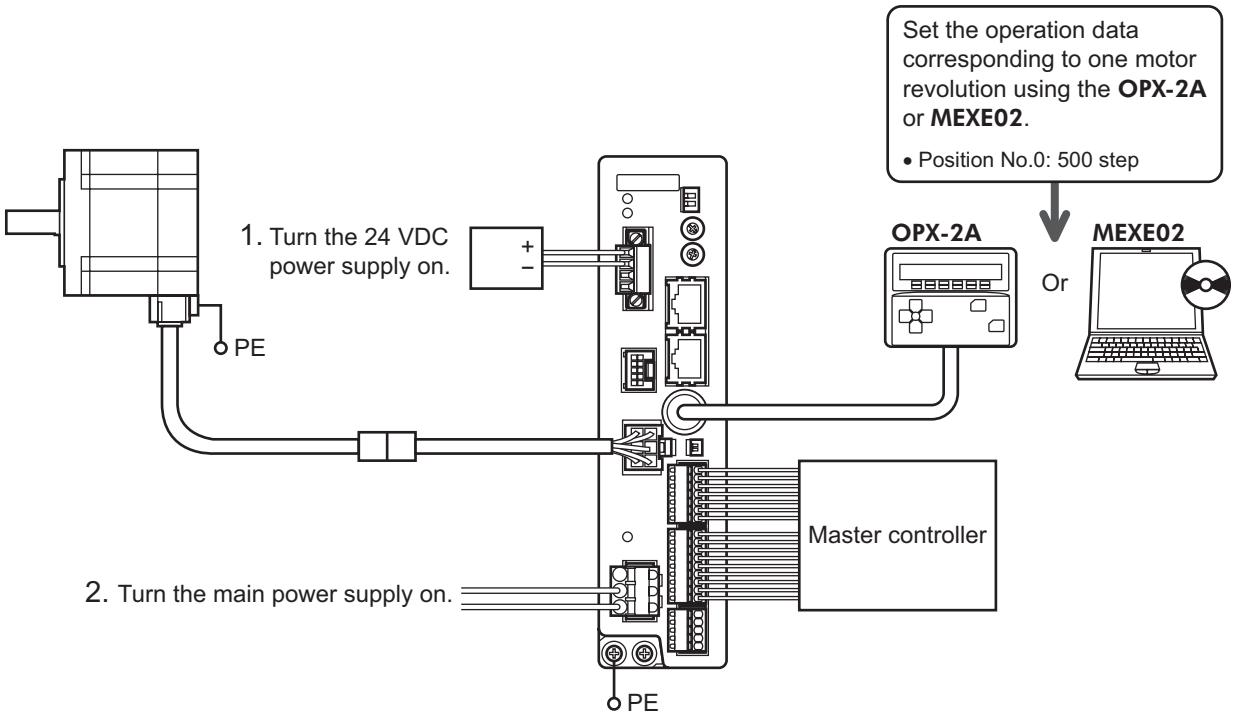
If you are new to the **RK Ⅱ** Series FLEX built-in controller type, read this section to understand the operating methods along with the operation flow.

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

STEP 1 Check the installation and connection

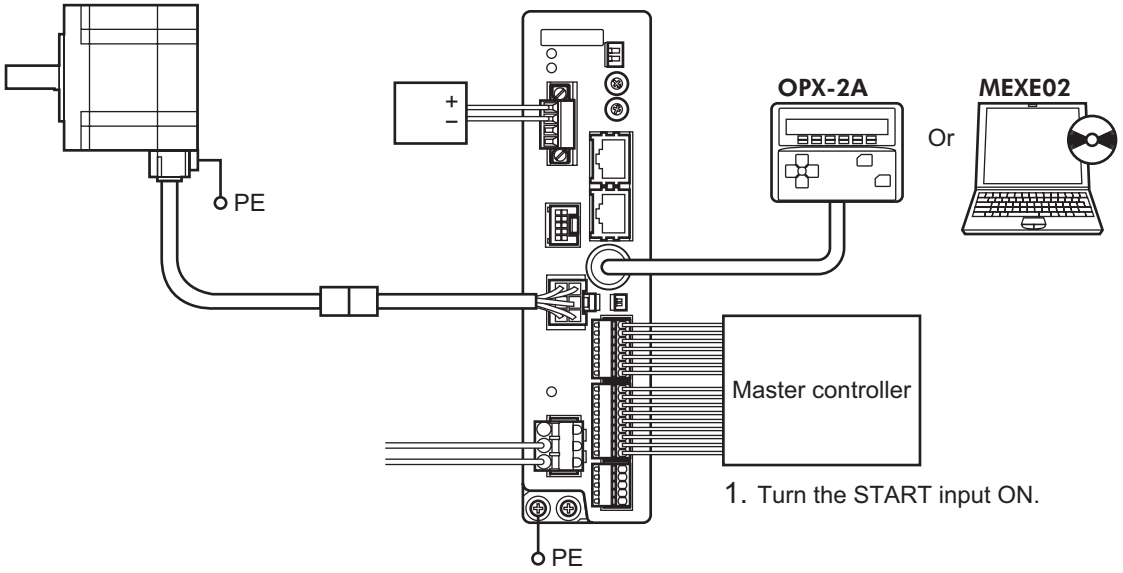


STEP 2 Turn on the power and set the operation data



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

3.1 Parameter list

I/O parameters (p.104)	• 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 parameters (p.104)	• RUN current	• Moving average time
	• STOP current	• Filter selection
	• Speed filter	
Operation parameters (p.105)	• 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	
Return-to-home parameters (p.105)	• 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/warning parameters (p.105)	• Return-to-home incomplete alarm	• Overvoltage warning
	• Overheat warning	• Undervoltage warning
Coordination parameters (p.106)	• 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 parameters (p.106)	• Data setter speed display	
	• Data setter edit	
I/O function parameters (p.107)	• IN0 to IN7 input function selection	
	• IN0 to IN7 input logic level setting	
	• OUT0 to OUT5 output function selection	
I/O function [RS-485] parameters (p.108)	• NET-IN0 to NET-IN15 input function selection	
	• NET-OUT0 to NET-OUT15 output function selection	
Communication parameters (p.109)	• Communication timeout	• Communication stop bit
	• Communication error alarm	• Transmission waiting time
	• Communication parity	

3.2 I/O parameter

Name	Setting range	Initial value	Effective *
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

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

3.3 Motor parameter

Name	Setting range	Initial value	Effective *
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

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

3.4 Operation parameter

Name	Setting range	Initial value	Effective ∗1
Common acceleration	1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) ∗2∗3	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) ∗3	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 Indicates the timing for the data to become effective. (B: Effective after stopping the operation, C: Effective after executing the configuration)
*2 This item is effective when the "acceleration/deceleration type" parameter is set to "separate." (initial value: separate).
*3 Acceleration/deceleration rate (ms/kHz) or acceleration/deceleration time (s) can be selected using "acceleration/deceleration unit" parameter. (initial value: acceleration/deceleration rate).

3.5 Return-to-home parameter

Name	Setting range	Initial value	Effective ∗1
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) ∗2	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 ∗3		
Backward steps in 2-sensor mode home-seeking	0 to 32767 step	200	

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

3.6 Alarm/warning parameter

Name	Setting range	Initial value	Effective ∗
Return-to-home incomplete alarm	0: Disable 1: Enable	0	C
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	

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

3.7 Coordination parameter

Name	Setting range	Initial value	Effective *
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	

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

3.8 Common parameter

Name	Setting range	Initial value	Effective *
Data setter speed display	0: Signed 1: Absolute value	0	A
Data setter edit	0: Disable 1: Enable	1	

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

3.9 I/O function parameter

Name	Setting range	Initial value	Effective *
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			
OUT0 output function selection	See table next.	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	

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

- Setting range for IN input function selection

0: Not used	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	

3.10 I/O function [RS-485] parameter

Name	Setting range	Initial value	Effective *
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 table next.	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	

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

- Setting range for NET-IN input function selection

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

- 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	

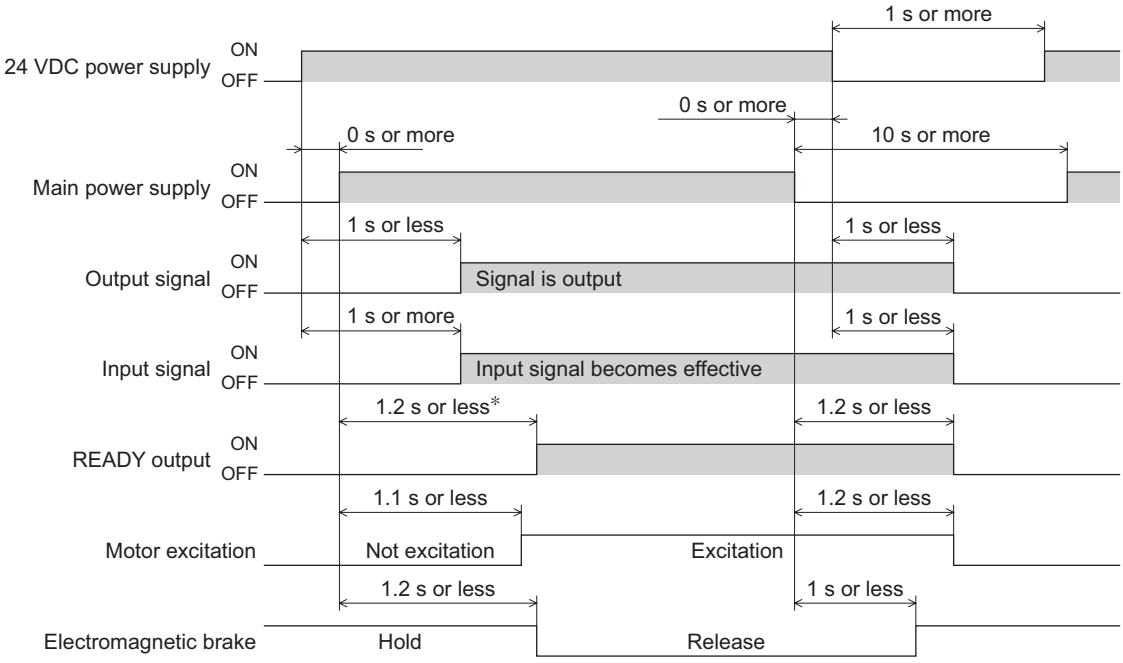
3.11 Communication parameter

Name	Setting range	Initial value	Effective *
Communication timeout	0 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	

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

4 Timing charts

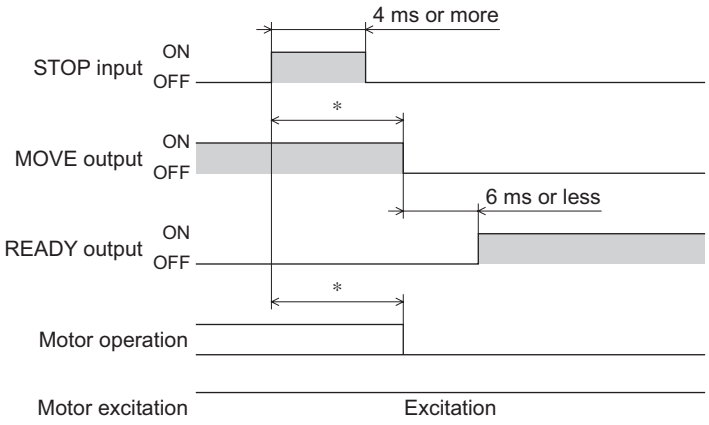
■ When the power supply is turned ON



* 2.2 sec or less for the electromagnetic brake type

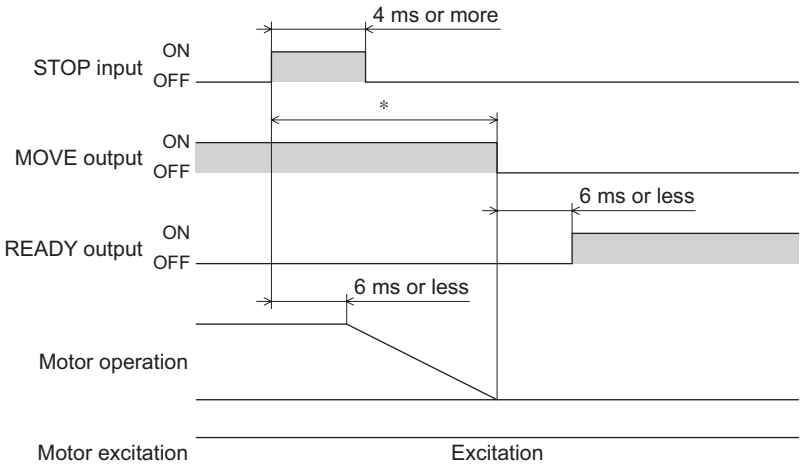
■ STOP input

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



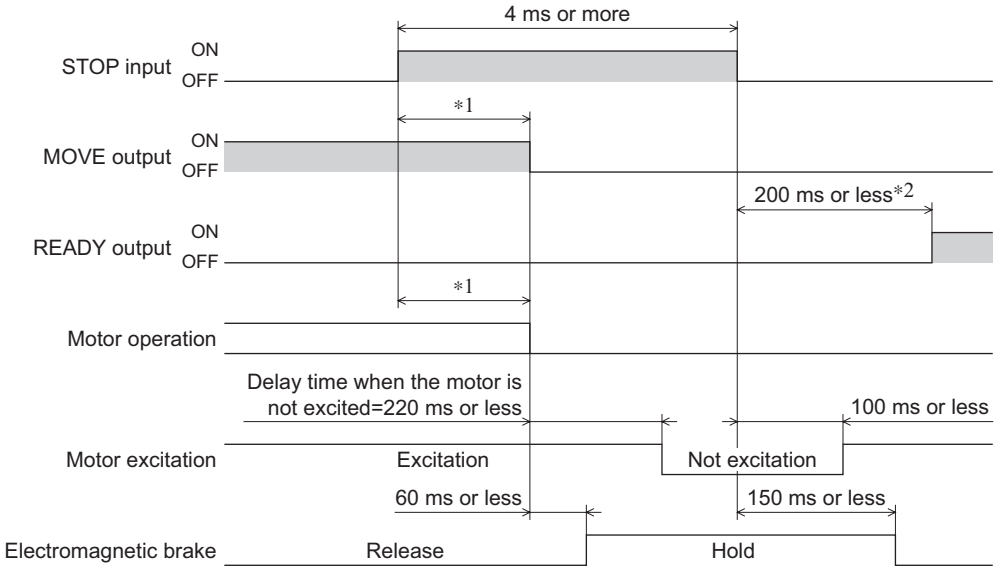
* The specific time varies depending on the operating speed, speed filter, moving average time and other.

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



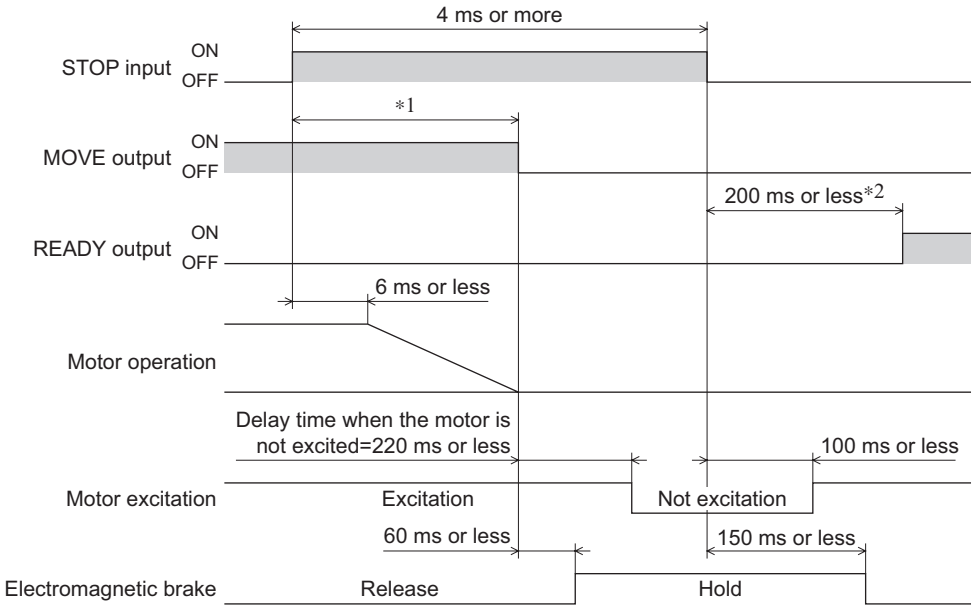
* The specific time varies depending on the operating speed, speed filter, moving average time and other.

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



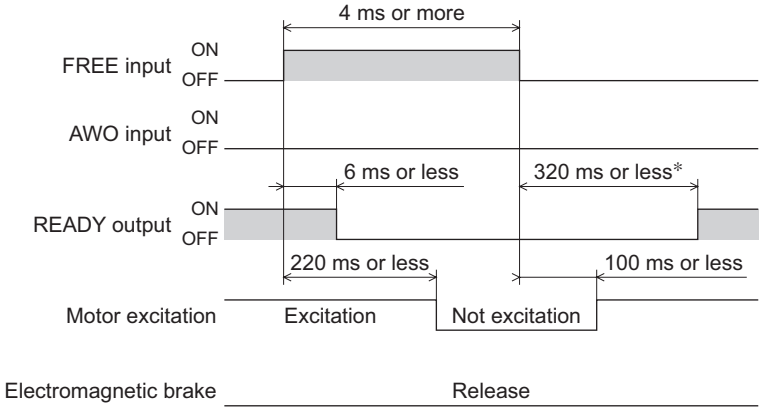
*1 The specific time varies depending on the operating speed, speed filter, moving average time and other.
*2 1.2 sec or less for the electromagnetic brake type

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



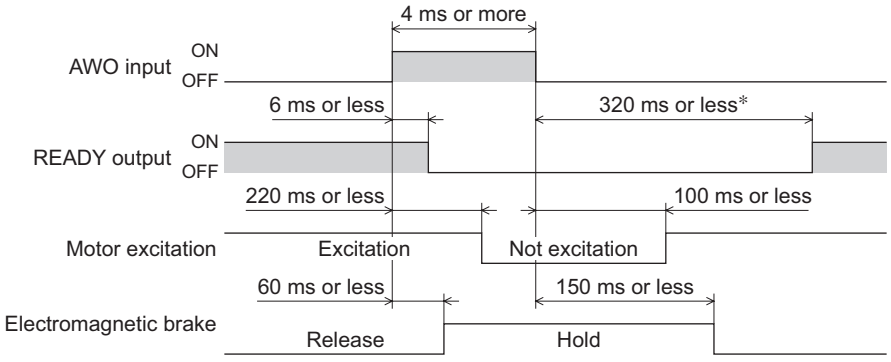
*1 The specific time varies depending on the operating speed, speed filter, moving average time and other.
*2 1.2 sec or less for the electromagnetic brake type

■ FREE input



* 1.2 sec or less for the electromagnetic brake type

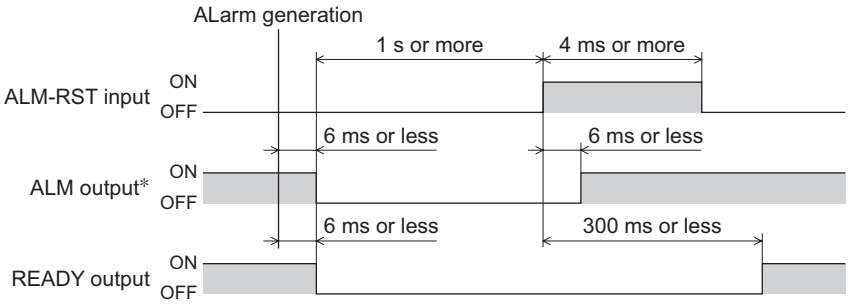
■ AWO input



* 1.2 sec or less for the electromagnetic brake type

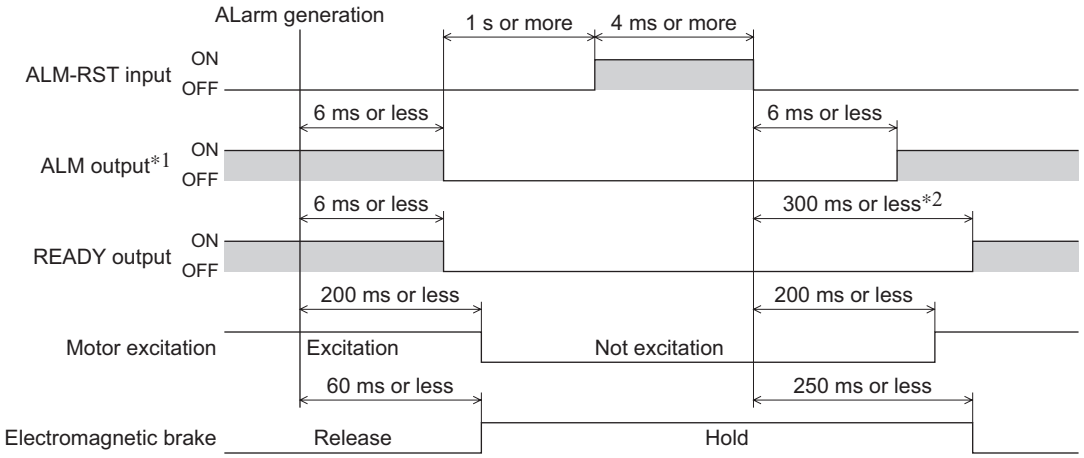
■ ALM-RST input

- When an alarm generates and the motor maintains excitation



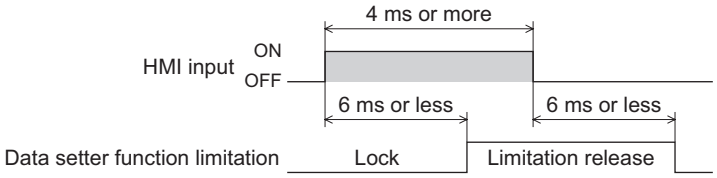
* ALM output is normally closed. It is ON during normal operation and it turns OFF when an alarm generates.

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

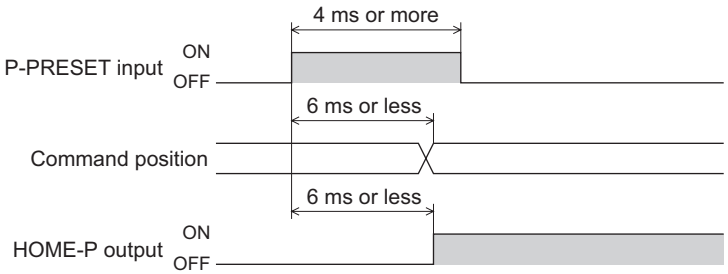


*1 ALM output is normally closed. It is ON during normal operation and it turns OFF when an alarm generates.
*2 1.3 sec or less for the electromagnetic brake type

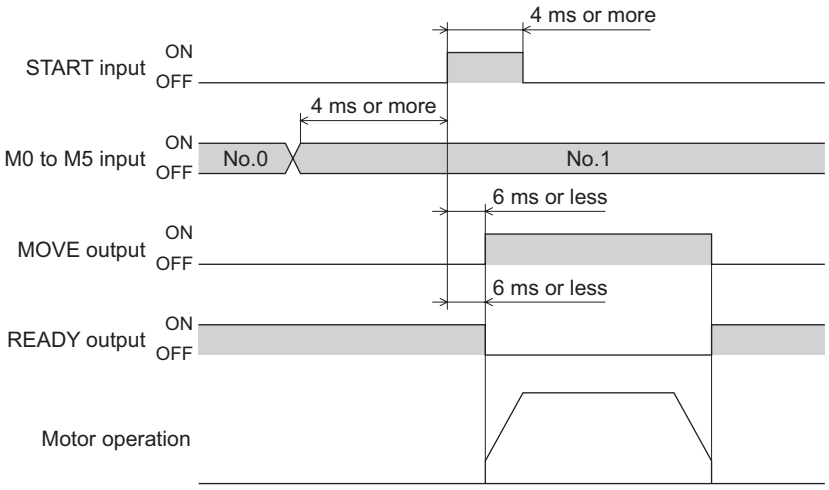
■ HMI input



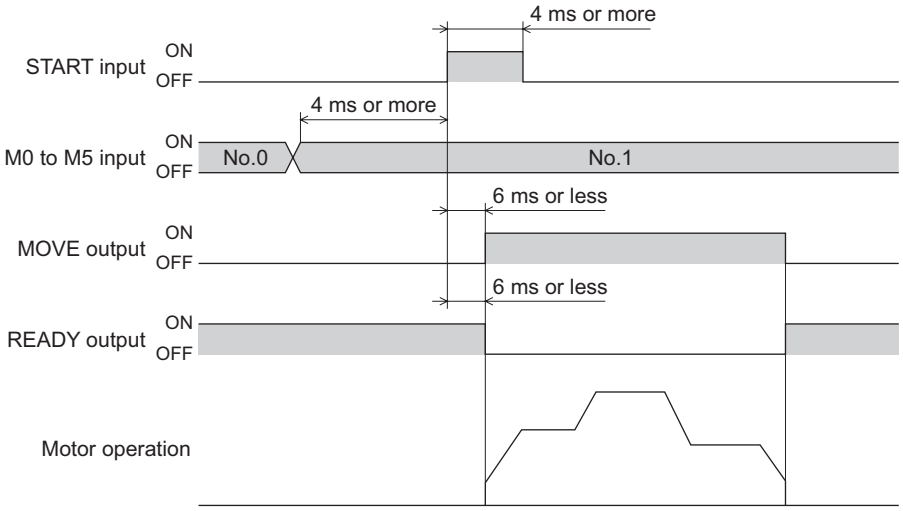
■ P-PRESET input



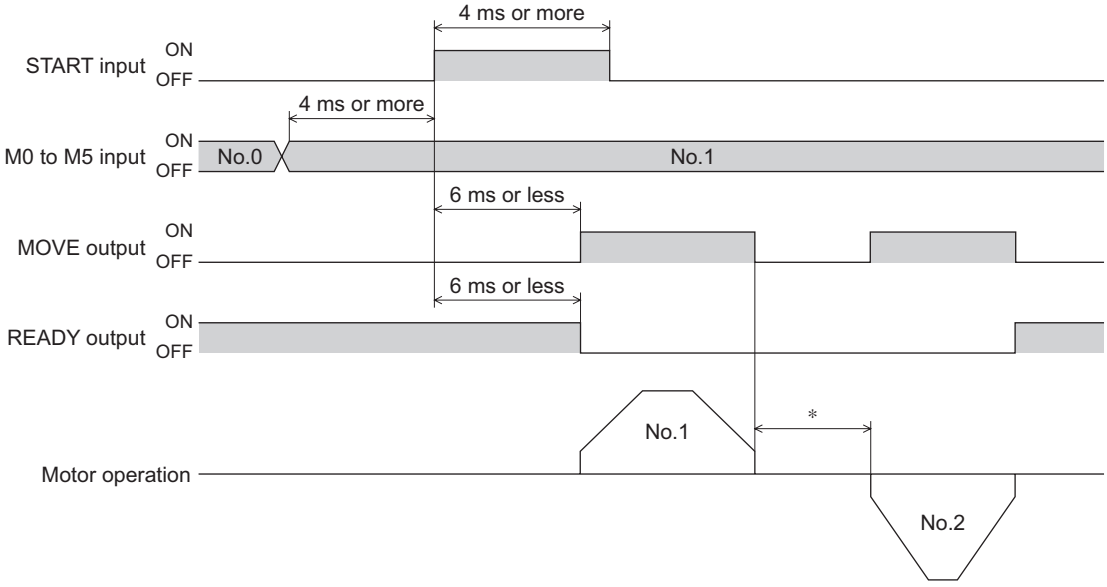
■ Single-motion operation (positioning operation)



■ Linked-motion operation (positioning operation)

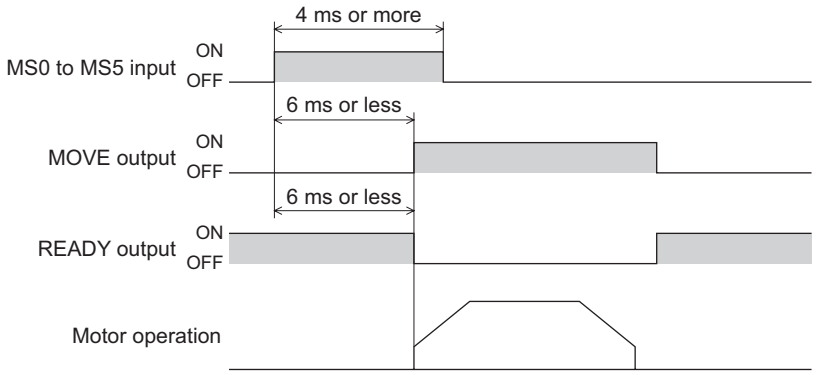


■ Linked-motion operation 2 (positioning operation)

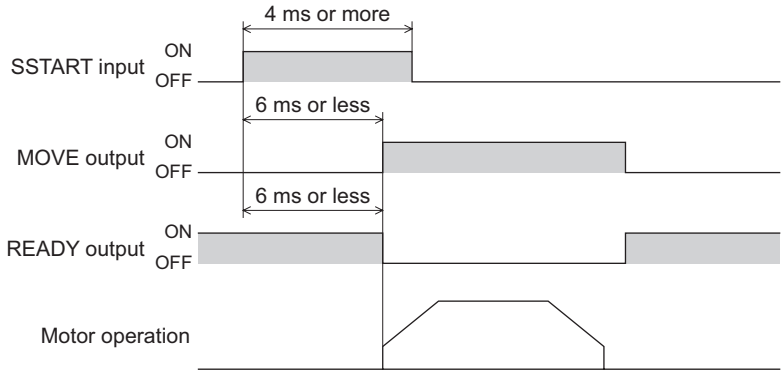


* This is the value of the dwell time to be set in operation data No.1.

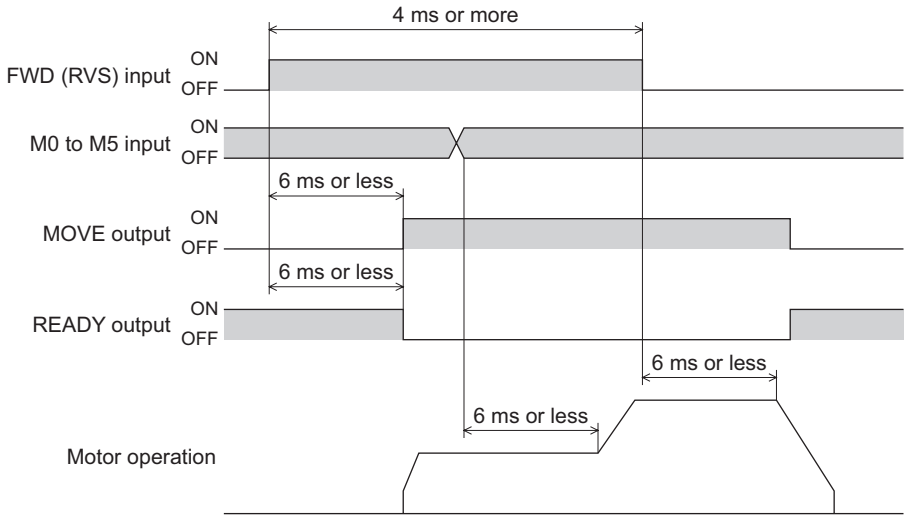
■ Direct positioning operation



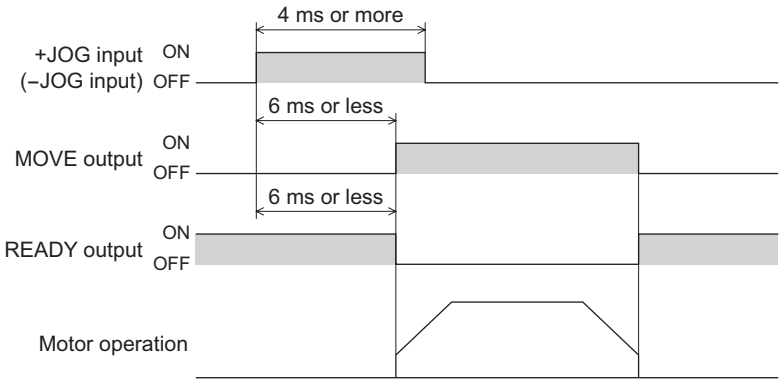
■ Sequential operation



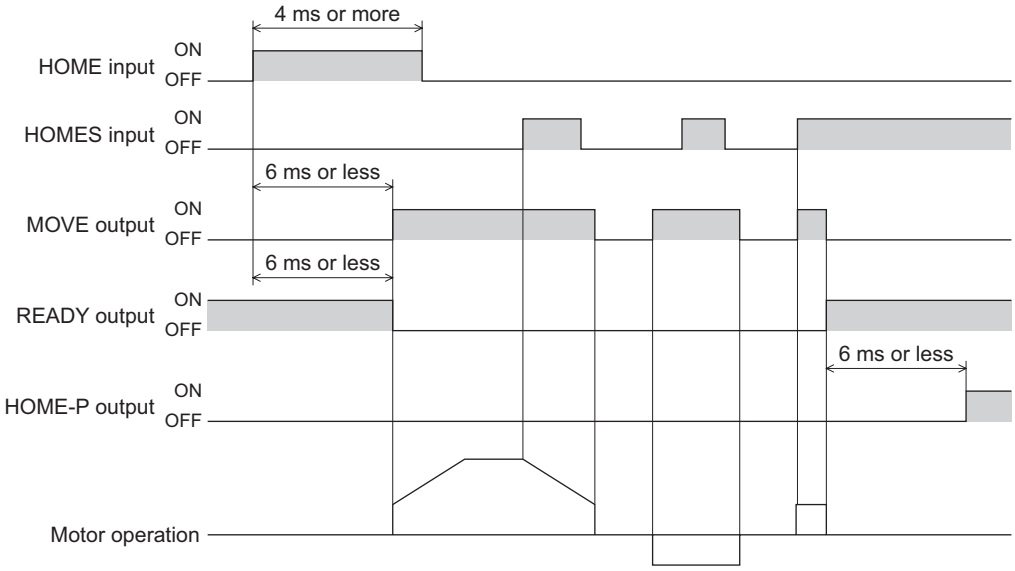
■ Continuous operation



■ 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.

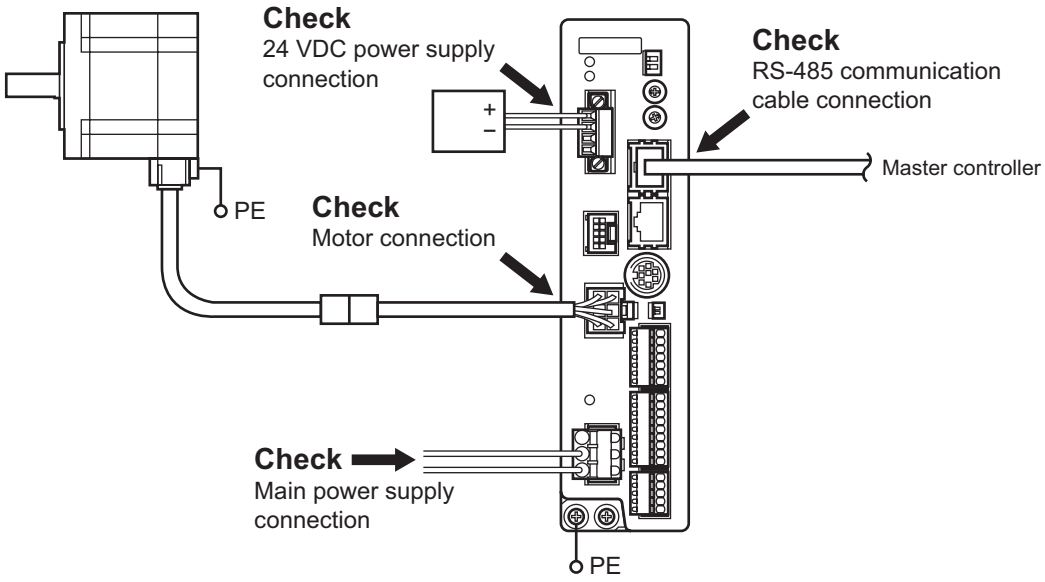
Table of contents

1 Guidance

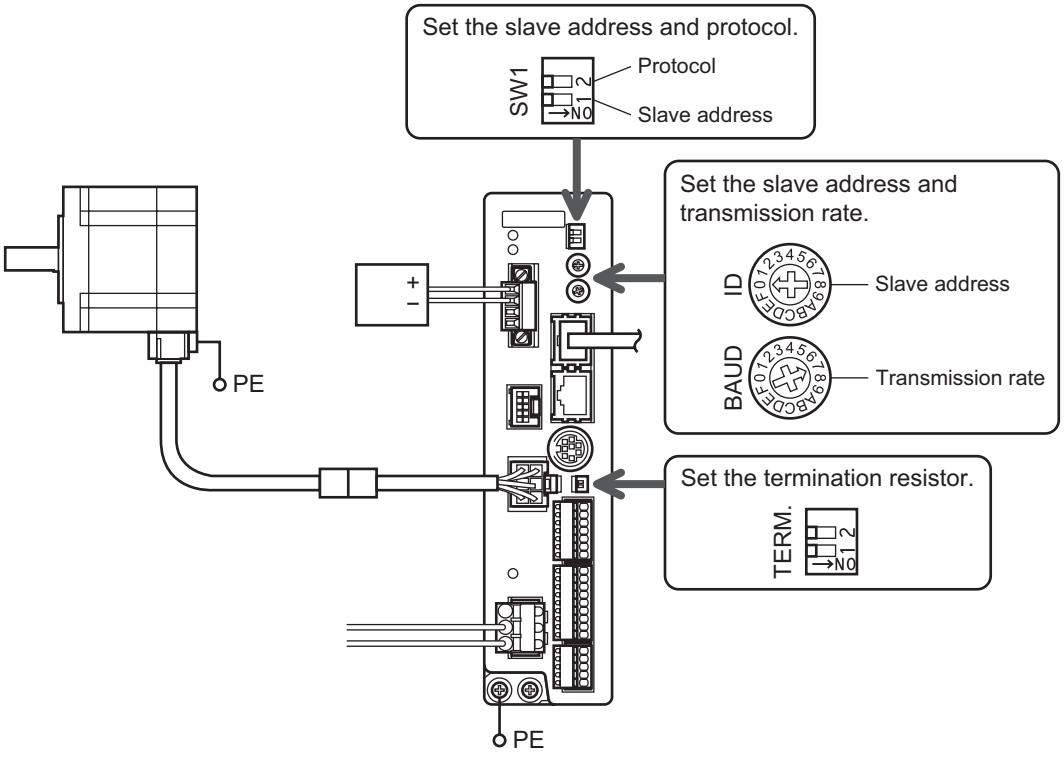
The Modbus protocol is simple and its specification is open to the public, so this protocol is used widely in industrial applications. Modbus communication is based on the single-master/multiple-slave method. Only the master can issue a query (command). Each slave executes the requested process and returns a response message.
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.

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

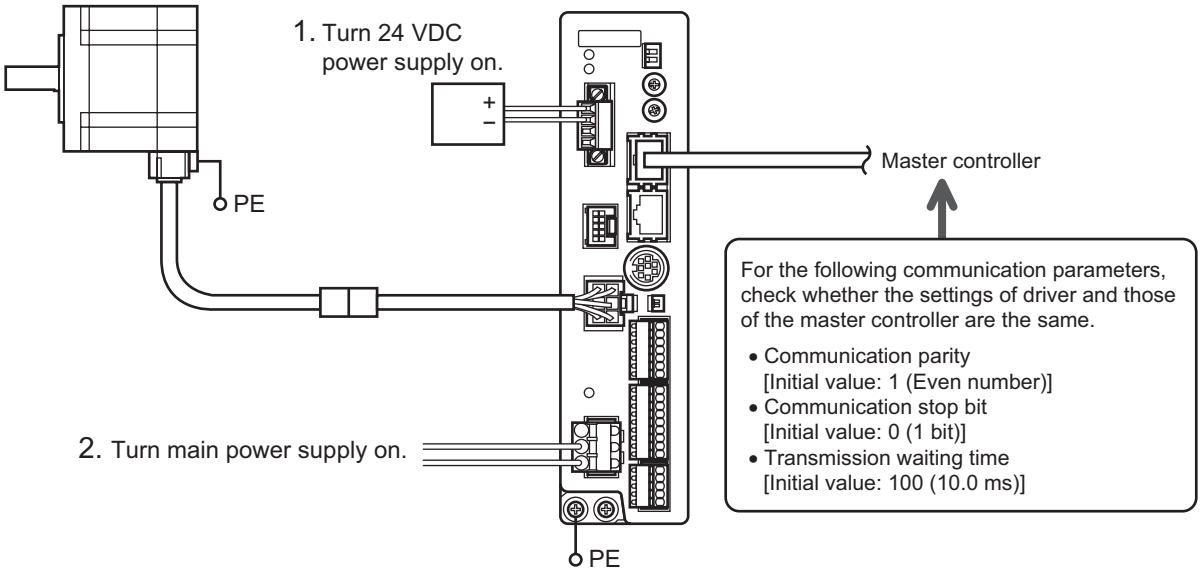
STEP 1 Check the installation and connection



STEP 2 Set the switches



STEP 3 Turn on the power and check the parameters

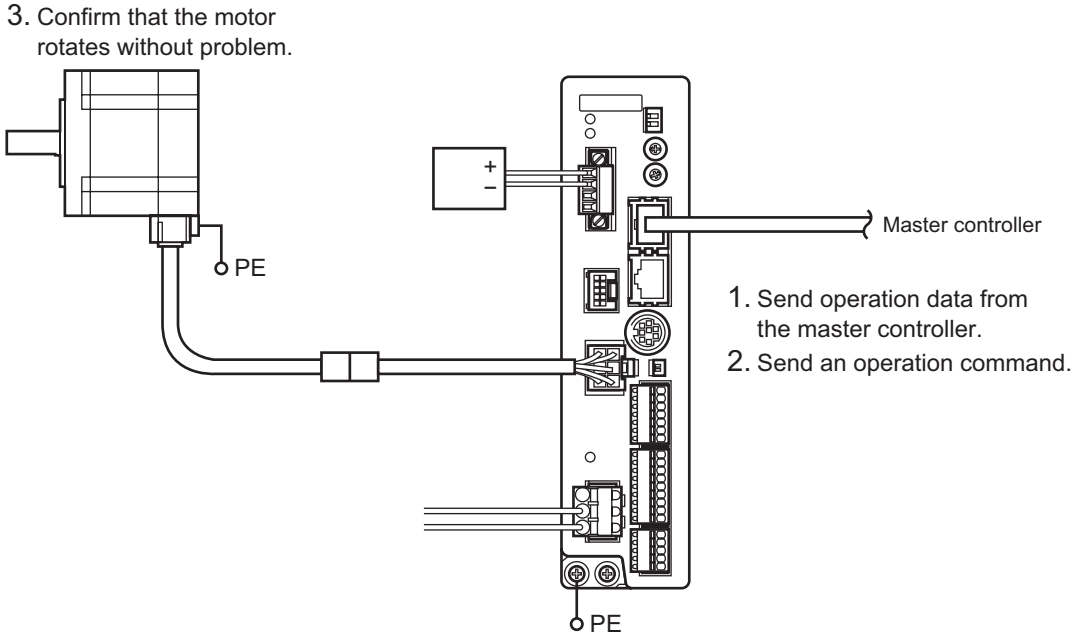


Check that the parameters of the driver and those of the master controller are the same.
Use the **OPX-2A** or **MEXE02** when changing the driver parameters.

STEP 4 Cycle the power

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

STEP 5 Operate the motor



STEP 6 Were you able to operate the motor properly?

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

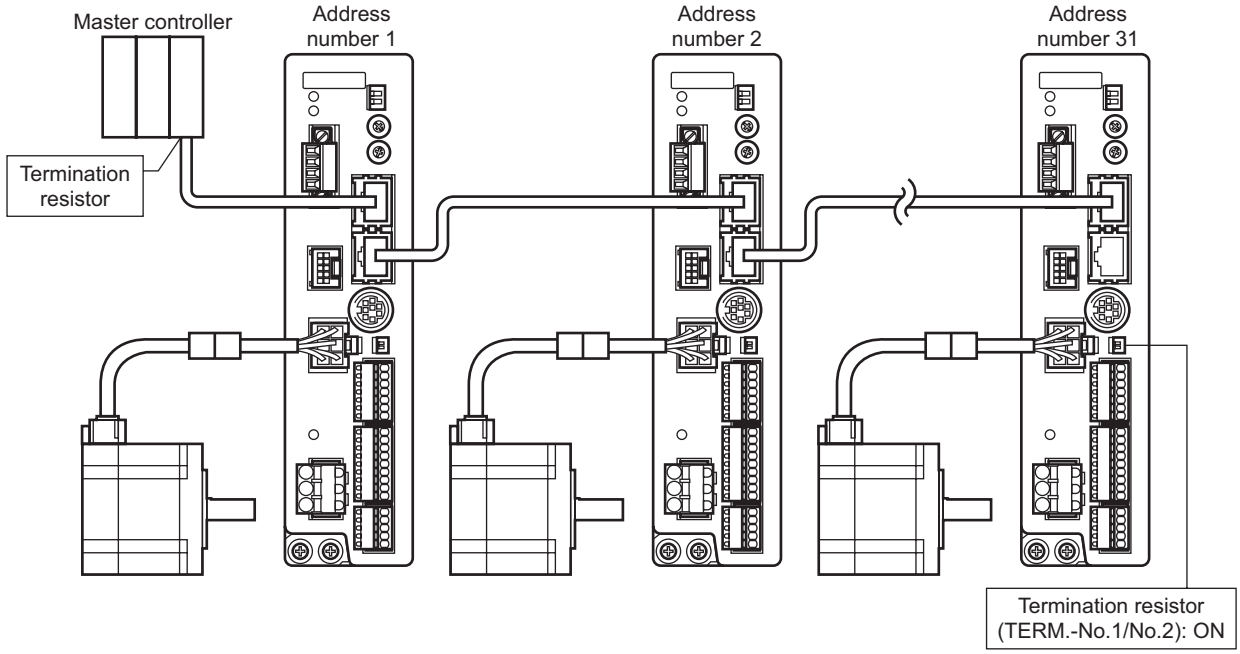
- Is any alarm present?
- Are the power supply, motor and RS-485 communication cable connected securely?
- Are the slave address, transmission rate and termination resistor set correctly?
- Is the C-ERR LED lit?
- Is the C-DAT LED lit or blinking?

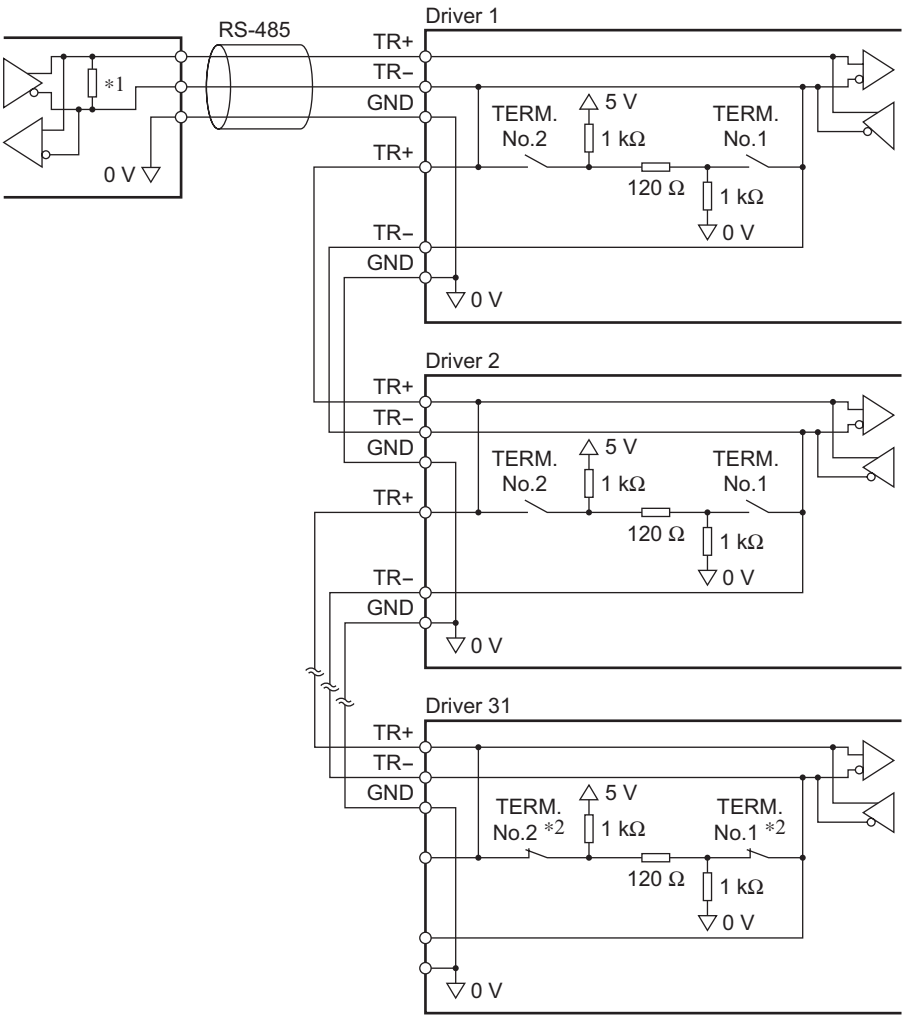
For more detailed settings and functions, refer to the “3 Operation type and setting” and following pages.

2 Communication specifications

Electrical characteristics	In conformance with EIA-485, straight cable Use a twisted pair cable (TIA/EIA-568B CAT5e or higher is recommended) and keep the total wiring distance including extension to 50 m (164 ft.) or less.
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.

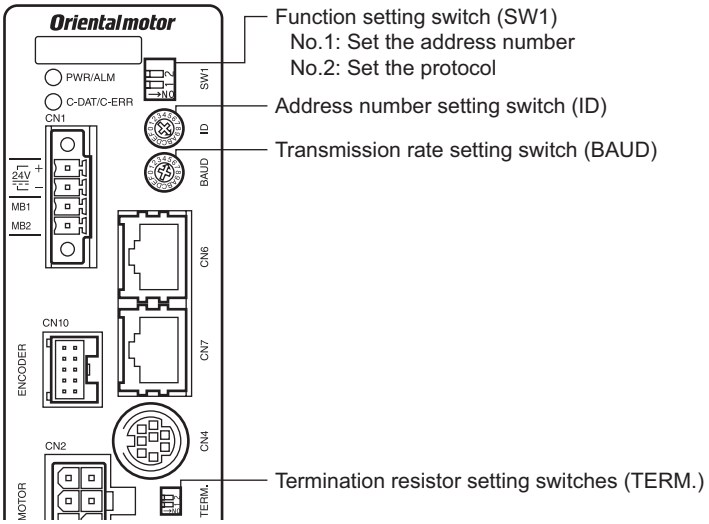
■ Connection example





*1 Termination resistor 120 Ω
*2 Turn the termination resistor (TERM.-No.1 and No.2) to ON.

3 Setting the switches



Note 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

■ 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

Note Do not set BAUD to positions 5 to F.

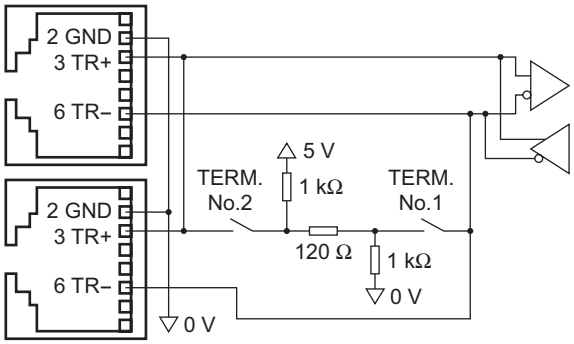
■ Termination resistor

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

Note 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.

■ Parameters set with the OPX-2A or MEXE02

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

Parameter name	Description	Setting range	Initial value
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.

Parameter name	Description	Setting range	Initial value
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

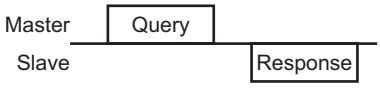
5 Communication mode and communication timing

5.1 Communication mode

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

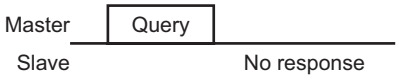
- Unicast mode

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

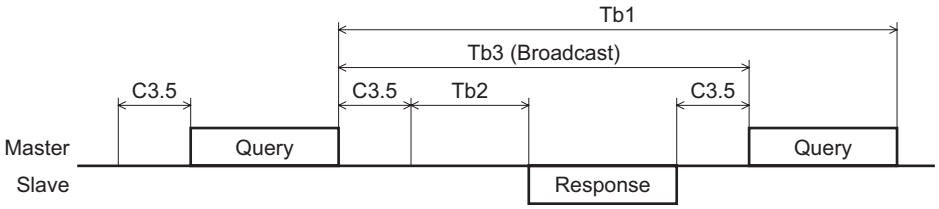


- Broadcast mode

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



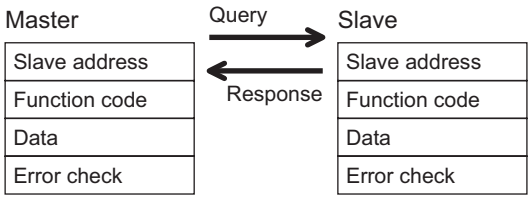
Character	Name	Description
Tb1	Communication timeout	Intervals between received messages are monitored. If no message could be received after the time set in the "communication timeout" parameter, a RS-485 communication timeout alarm generates.
Tb2	Transmission waiting time	The time after the slave switches 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) + processing time + 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)	Transmission waiting time
9600	4 ms or more
19200	2 ms or more
38400 57600 115,200	1.75 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 (slave address: 02h, function code: 07h)

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.

■ 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.
Example) query: 03h → Exception response: 83h
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

7.1 Reading from a holding register(s)

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

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	
Data	Register address (upper)	02h	
	Register address (lower)	4Bh	
	Value write (upper)	00h	
	Value write (lower)	50h	
Error check (lower)		F8h	Calculation result of CRC-16
Error check (upper)		6Bh	

7.3 Diagnosis

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.

- 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	
Data	Sub-function code (upper)	00h	
	Sub-function code (lower)	00h	
	Data value (upper)	12h	
	Data value (lower)	34h	
Error check (lower)		ECh	
Error check (upper)		9Eh	

7.4 Writing to multiple holding registers

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	
Data	Register address (upper)	06h	
	Register address (lower)	04h	
	Number of registers (upper)	00h	
	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 the following explanation.
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.149 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.48 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.53 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)

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
POWER 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.

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

8.3 Monitor commands

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

Register address		Name	Description	Range
Dec	Hex			
128	0080h	Present alarm (upper)	Monitors the present alarm code.	00h to FFh
129	0081h	Present alarm (lower)		
130	0082h	Alarm record 1 (upper)	Monitors the alarm records 1 to 10.	
131	0083h	Alarm record 1 (lower)		
132	0084h	Alarm record 2 (upper)		
133	0085h	Alarm record 2 (lower)		
134	0086h	Alarm record 3 (upper)		
135	0087h	Alarm record 3 (lower)		
136	0088h	Alarm record 4 (upper)		
137	0089h	Alarm record 4 (lower)		
138	008Ah	Alarm record 5 (upper)		
139	008Bh	Alarm record 5 (lower)		
140	008Ch	Alarm record 6 (upper)		
141	008Dh	Alarm record 6 (lower)		
142	008Eh	Alarm record 7 (upper)		
143	008Fh	Alarm record 7 (lower)		
144	0090h	Alarm record 8 (upper)		
145	0091h	Alarm record 8 (lower)		
146	0092h	Alarm record 9 (upper)		
147	0093h	Alarm record 9 (lower)		
148	0094h	Alarm record 10 (upper)		
149	0095h	Alarm record 10 (lower)		
150	0096h	Present warning (upper)	Monitors the present warning code.	
151	0097h	Present warning (lower)		
152	0098h	Warning record 1 (upper)	Monitors the warning records 1 to 10.	
153	0099h	Warning record 1 (lower)		

Register address		Name	Description	Range
Dec	Hex			
154	009Ah	Warning record 2 (upper)	Monitors the warning records 1 to 10.	00h to FFh
155	009Bh	Warning record 2 (lower)		
156	009Ch	Warning record 3 (upper)		
157	009Dh	Warning record 3 (lower)		
158	009Eh	Warning record 4 (upper)		
159	009Fh	Warning record 4 (lower)		
160	00A0h	Warning record 5 (upper)		
161	00A1h	Warning record 5 (lower)		
162	00A2h	Warning record 6 (upper)		
163	00A3h	Warning record 6 (lower)		
164	00A4h	Warning record 7 (upper)		
165	00A5h	Warning record 7 (lower)		
166	00A6h	Warning record 8 (upper)		
167	00A7h	Warning record 8 (lower)		
168	00A8h	Warning record 9 (upper)		
169	00A9h	Warning record 9 (lower)		
170	00AAh	Warning record 10 (upper)		
171	00ABh	Warning record 10 (lower)		
172	00ACh	Communication error code (upper)	Monitors the last received communication error code.	
173	00ADh	Communication error code (lower)		
174	00AEh	Communication error code record 1 (upper)	Monitors the communication error records 1 to 10 that have occurred in the past.	
175	00AFh	Communication error code record 1 (lower)		
176	00B0h	Communication error code record 2 (upper)		
177	00B1h	Communication error code record 2 (lower)		
178	00B2h	Communication error code record 3 (upper)		
179	00B3h	Communication error code record 3 (lower)		
180	00B4h	Communication error code record 4 (upper)		
181	00B5h	Communication error code record 4 (lower)		
182	00B6h	Communication error code record 5 (upper)		
183	00B7h	Communication error code record 5 (lower)		
184	00B8h	Communication error code record 6 (upper)		
185	00B9h	Communication error code record 6 (lower)		
186	00BAh	Communication error code record 7 (upper)		
187	00BBh	Communication error code record 7 (lower)		
188	00BCh	Communication error code record 8 (upper)		
189	00BDh	Communication error code record 8 (lower)		
190	00BEh	Communication error code record 9 (upper)		
191	00BFh	Communication error code record 9 (lower)		

Register address		Name	Description	Range
Dec	Hex			
192	00C0h	Communication error code record 10 (upper)	Monitors the communication error records 1 to 10 that have occurred in the past.	00h to FFh
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.	−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)		

■ 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.90 and later.

■ Operation data

Register address		Name	Setting range	Initial value	Effective *1
Dec	Hex				
1024 1025 to 1150 1151	0400h 0401h to 047Eh 047Fh	Position No.0 (upper) Position No.0 (lower) to Position No.63 (upper) Position No.63 (lower)	−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) *2*3	30000	
1664 1665 to 1790 1791	0680h 0681h to 06FEh 06FFh	Deceleration No.0 (upper) Deceleration No.0 (lower) to Deceleration No.63 (upper) Deceleration No.63 (lower)			
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 Indicates the timing for the data to become effective. (B: Effective after stopping the operation)

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

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

■ User parameters

Register address		Name	Setting range	Initial value	Effective *
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)			

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

Register address		Name	Setting range	Initial value	Effective *1
Dec	Hex				
4106	100Ah	MS5 operation No. selection (upper)	0 to 63	5	B
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)			
578	0242h	STOP current (upper)	0 to 600 (1=0.1%)	500	
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) *2	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) *2	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) *2	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)			

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

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

Register address		Name	Setting range	Initial value	Effective *
Dec	Hex				
712	02C8h	Position offset of home-seeking (upper)	−8,388,608 to 8,388,607 step	0	B
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)			
4192	1060h	Backward steps in 2-sensor mode home-seeking (upper)	0 to 32767 step	200	
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	A
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)			

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

Register address		Name	Setting range	Initial value	Effective *
Dec	Hex				
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.148.	3: HOME	C
4353	1101h	IN0 input function selection (lower)			
4354	1102h	IN1 input function selection (upper)		4: START	
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.148.	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)			

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

Register address		Name	Setting range	Initial value	Effective *
Dec	Hex				
4422	1146h	OUT3 output function selection (upper)	See table on p.148.	67: READY	C
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.148.	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)			
4452	1164h	NET-IN2 input function selection (upper)		50: M2	
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)			

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

Register address		Name	Setting range	Initial value	Effective *
Dec	Hex				
4470	1176h	NET-IN11 input function selection (upper)	See table on p.148.	5: SSTART	C
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.148.	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)			
4490	118Ah	NET-OUT5 output function selection (upper)		67: READY	
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)			

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

Register address		Name	Setting range	Initial value	Effective *
Dec	Hex				
4498	1192h	NET-OUT9 output function selection (upper)	See table on p.148.	73: AREA1	C
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 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)			

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

■ 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

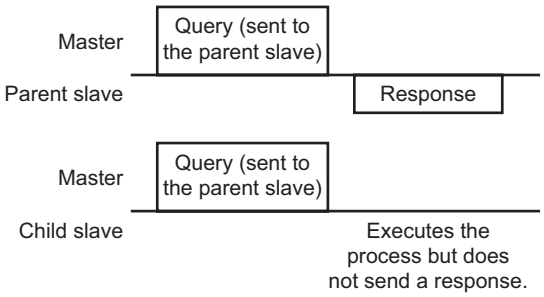
0: Not used	10: MS2_R	35: R3	45: R13	61: −LS_R	74: AREA2
1: FWD_R	11: MS3_R	36: R4	46: R14	62: HOMES_R	75: AREA3
2: RVS_R	12: MS4_R	37: R5	47: R15	63: SLIT_R	80: S-BSY
3: HOME_R	13: MS5_R	38: R6	48: M0_R	65: ALM	82: MPS
4: START_R	16: FREE_R	39: R7	49: M1_R	66: WNG	83: STEPOUT
5: SSTART_R	17: AWO_R	40: 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

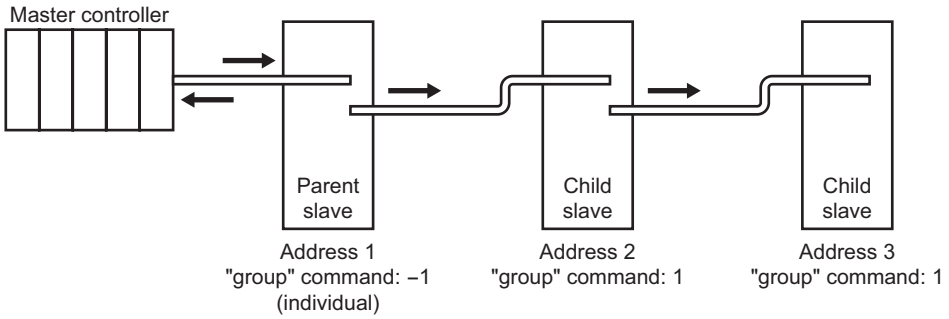
Use a "group" command to set a group address to each child slave. Change the group in the unicast mode.
When performing read or write for setting a group, set the upper and lower simultaneously.

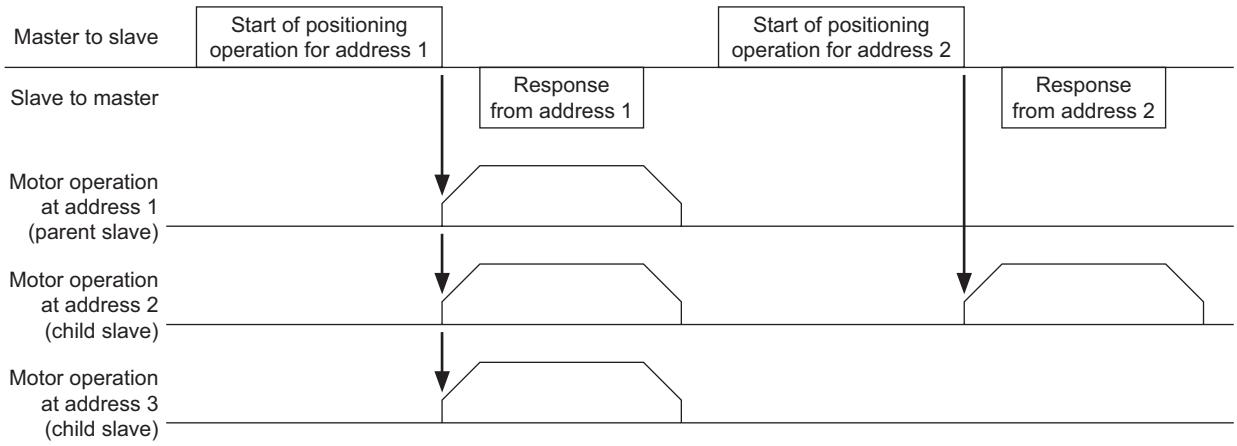
Resister address		Name	Description	READ/ WRITE	Setting range
Dec	Hex				
48	0030h	Group (upper)	Sets the group address.	R/W	−1: No group specification (Group send is not performed) 1 to 31: Group address (Address number of parent slave)
49	0031h	Group (lower)			

Note 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 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.

10.1 Communication errors

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

Note 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.129
Command not yet defined	88h	An exception response (exception code 01h, 02h) was detected. See p.129.
Execution disable due to user I/F communication in progress	89h	An exception response (exception code 04h) was detected. See p.129.
Non-volatile memory processing in progress	8Ah	
Outside setting range	8Ch	An exception response (exception code 03h, 04h) was detected. See p.129.
Command execute disable	8Dh	An exception response (exception code 04h) was detected. See p.129.

10.2 Alarms and warnings

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

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

■ Communication switch setting error (83h)

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

■ RS-485 communication error (84h)

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

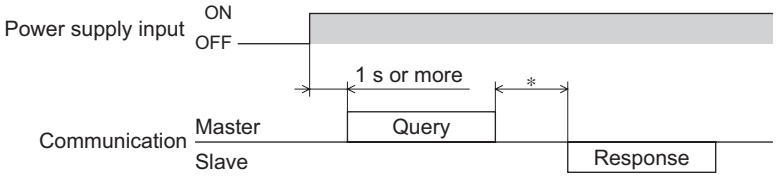
Description of error	Description
Warning	A warning generates when one RS-485 communication error (84h) has been detected. If normal reception occurs while the warning is present, the warning will be reset automatically.
Alarm	An alarm generates when a RS-485 communication error (84h) has been detected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

■ RS-485 communication timeout (85h)

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

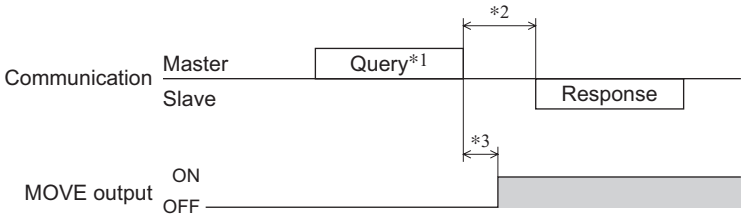
11 Timing charts

■ Communication start



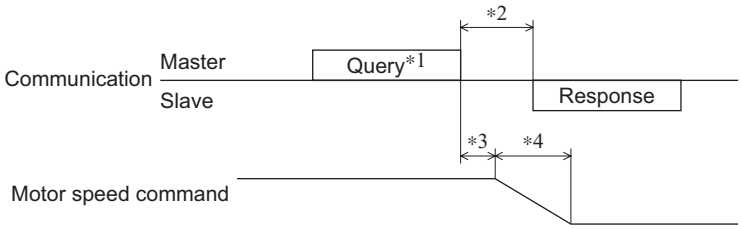
* Tb2 (transmission waiting time) + C3.5 (silent interval) + command processing time

■ Operation start



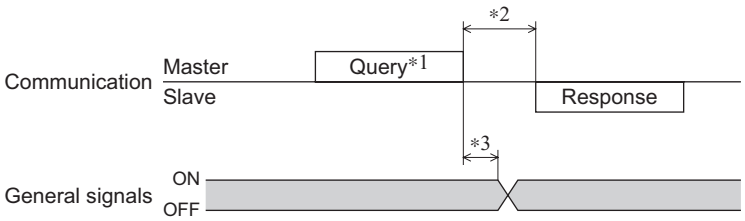
*1 A message including a query to start operation via RS-485 communication.
*2 Tb2 (transmission waiting time) + C3.5 (silent interval) + command processing time
*3 C3.5 (silent interval) + 4 ms or less

■ Operation stop, speed change



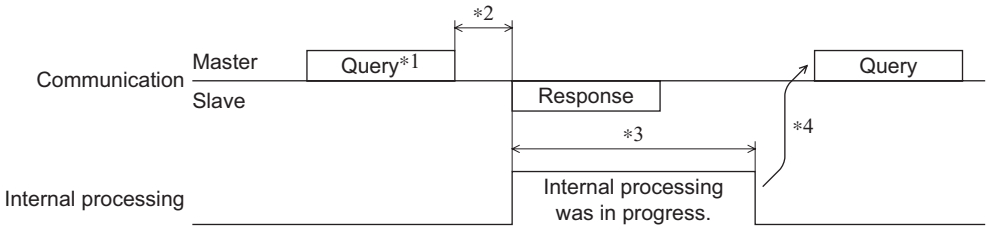
*1 A message including a query to stop operation and another to change the speed via RS-485 communication.
*2 Tb2 (transmission waiting time) + C3.5 (silent interval) + command processing time
*3 The specific time varies depending on the command speed.
*4 The deceleration method to be applied at the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

■ Configuration



*1 A message including a query for configuration via RS-485 communication.
*2 Tb2 (transmission waiting time) + C3.5 (silent interval) + command processing time
*3 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. This product can be controlled via CC-Link communication or MECHATROLINK communication in combination with a network converter (sold separately).

Table of contents

1 Method of control via CC-Link communication

See the following explanation when using the **RK Ⅱ** Series FLEX built-in controller type in combination with the network converter **NETC01-CC** via CC-Link communication. Refer to "3 Details of remote I/O" on p.177 and "4 Command code list" on p.179 for remote I/O and command code.

1.1 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.
- See the network converter **NETC01-CC** USER MANUAL for how to set the parameter.

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

■ Using the parameter

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

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

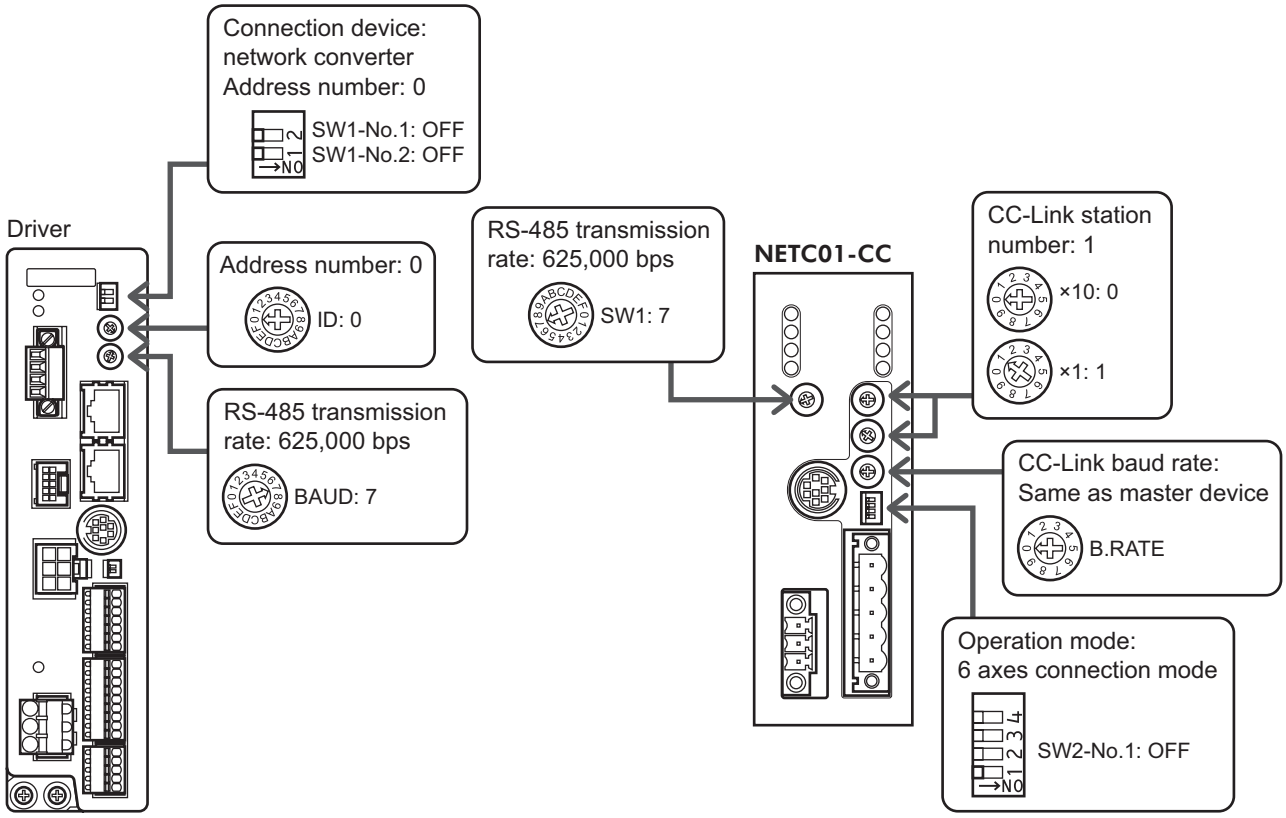
■ Using the switches

Setting condition of driver

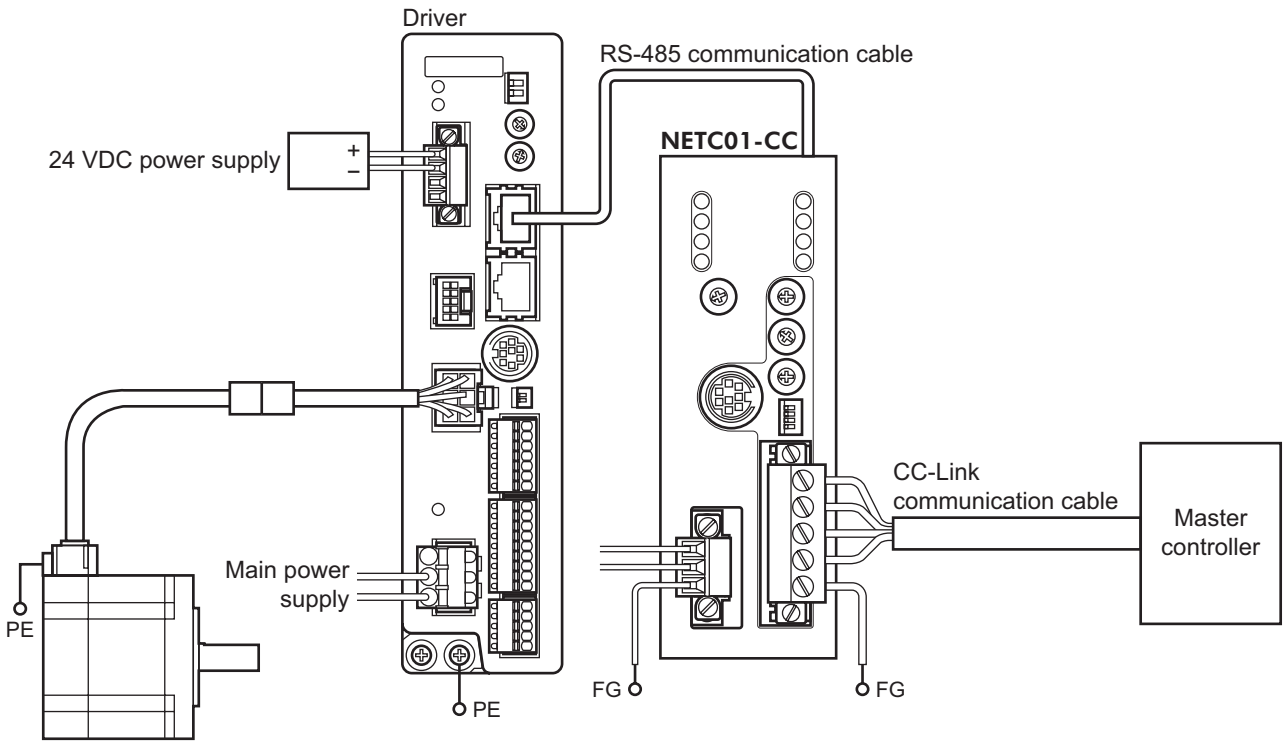
- Address number of the driver: 0
- RS-485 transmission rate: 625,000 bps
- SW1-No.2 of the function setting switch: OFF

Setting condition of **NETC01-CC**

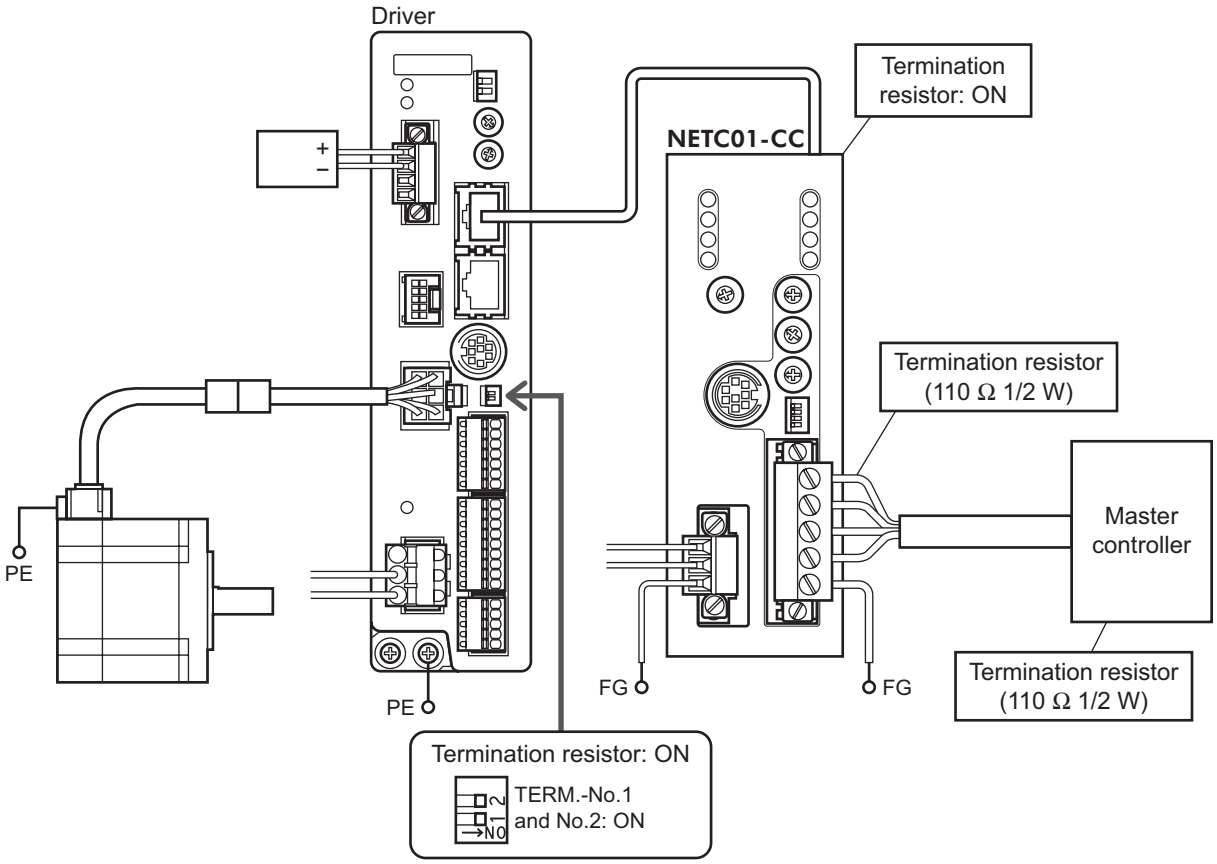
- CC-Link station number: 1
- RS-485 transmission rate: 625,000 bps
- CC-Link baud rate: Same as the master station
- Operation mode: 6 axes connection mode



STEP 2 Check the connection

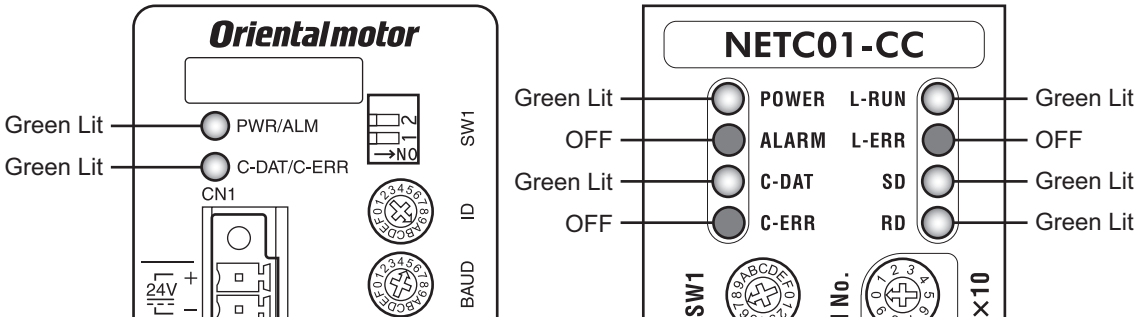


STEP 3 Check the termination resistor



STEP 4 Turn on the power and check the setting

Check that the LED condition has become as shown in the figures.



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

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

Perform continuous operation by turning ON the FWD of the address number 0 for remote I/O of CC-Link communication.

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?

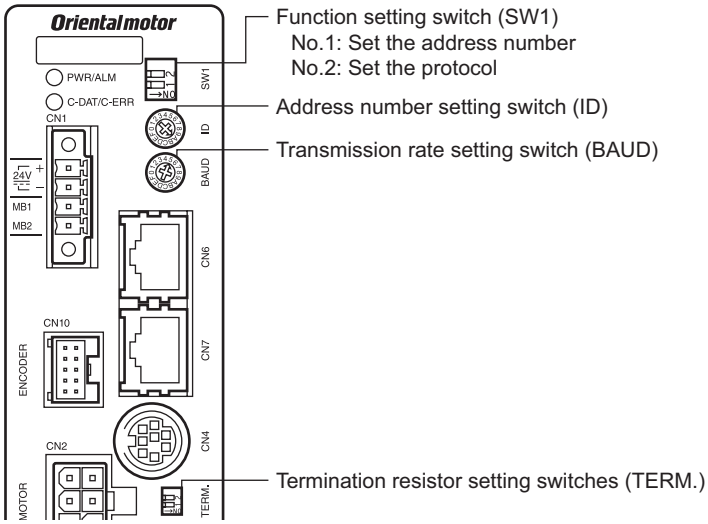
How did it go? Were you able to operate the motor properly? If the motor does not function, check the following points:

- Is any alarm present in the driver or **NETC01-CC**?
- Are the address number, transmission rate and termination resistor set correctly?
- Is the "connection" parameter of the **NETC01-CC** set correctly?
- Is the C-ERR LED lit? (RS-485 communication error)
- Is the L-ERR LED lit? (CC-Link communication error)
- 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?

For more detailed settings and functions, refer to "3 Operation type and setting," as well as next page and later, and the **NETC01-CC** USER MANUAL.

1.2 Setting the switches

When using the driver in combination with the network converter, set the switches before use.



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

■ Setting the connection device

Set the connection device of RS-485 communication using the function setting switch SW1-No.2.
Turn this switch OFF when controlling via the network converter.

Factory setting OFF (Network converter)

■ Address number (slave address)

Set the address number (slave address) using the address number setting switch (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)

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					

■ Transmission rate

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

Factory setting 7 (625,000 bps)

■ 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

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

1.3 Remote register list

Remote register is common to 6-axes connection mode and 12-axes connection mode.
"Monitor", "read and write of parameters" and "maintenance command" for the 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)

1.4 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 network converter **NETC01-CC** USER MANUAL for 6-axes.

■ Assignment list of remote I/O

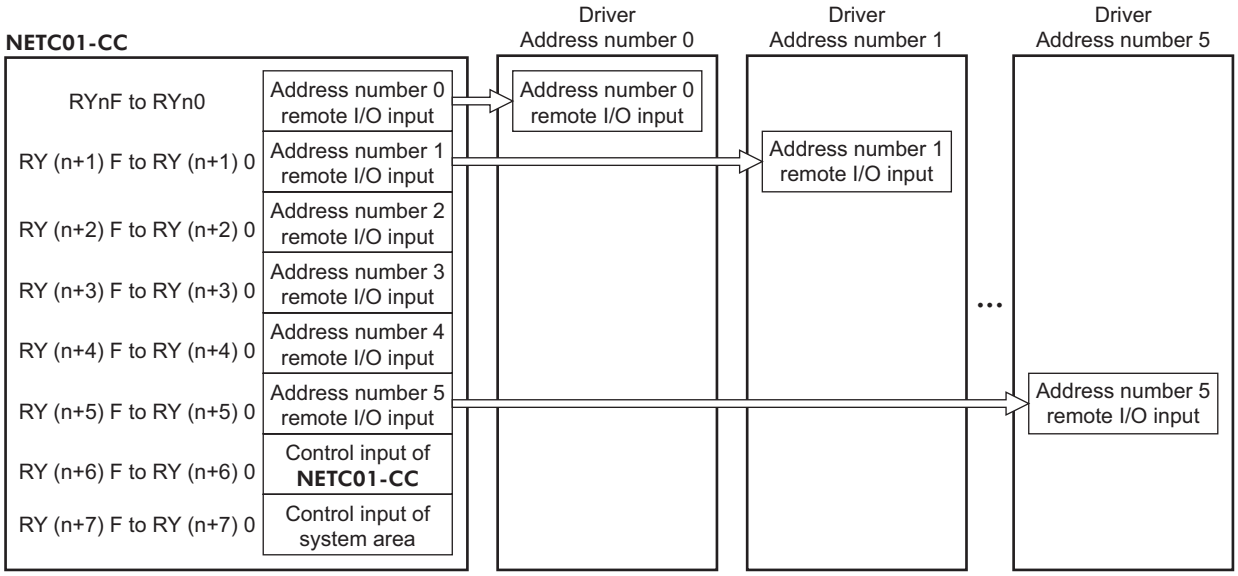
Command RY (Master to **NETC01-CC**)	
Device No.	Description
RYn7 to RYn0	Address number "0" remote I/O input
RYnF to RYn8	
RY (n+1) 7 to RY (n+1) 0	Address number "1" remote I/O input
RY (n+1) F to RY (n+1) 8	
RY (n+2) 7 to RY (n+2) 0	Address number "2" remote I/O input
RY (n+2) F to RY (n+2) 8	
RY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

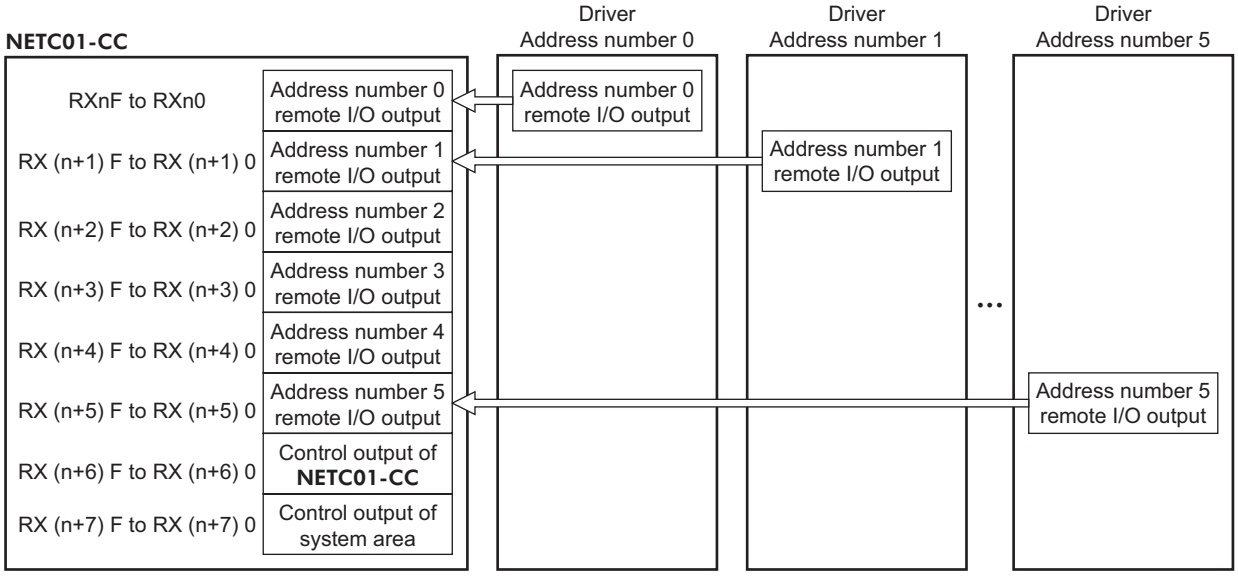
* See the network converter **NETC01-CC** USER MANUAL for details.

■ 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	–	–
	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

	Command RY (Master to **NETC01-CC**)		
	Device No.	Signal name	Description
NETC01-CC control input/ status output	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) 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

1.5 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 network converter **NETC01-CC** USER MANUAL for 12-axes.

■ Assignment list of remote I/O

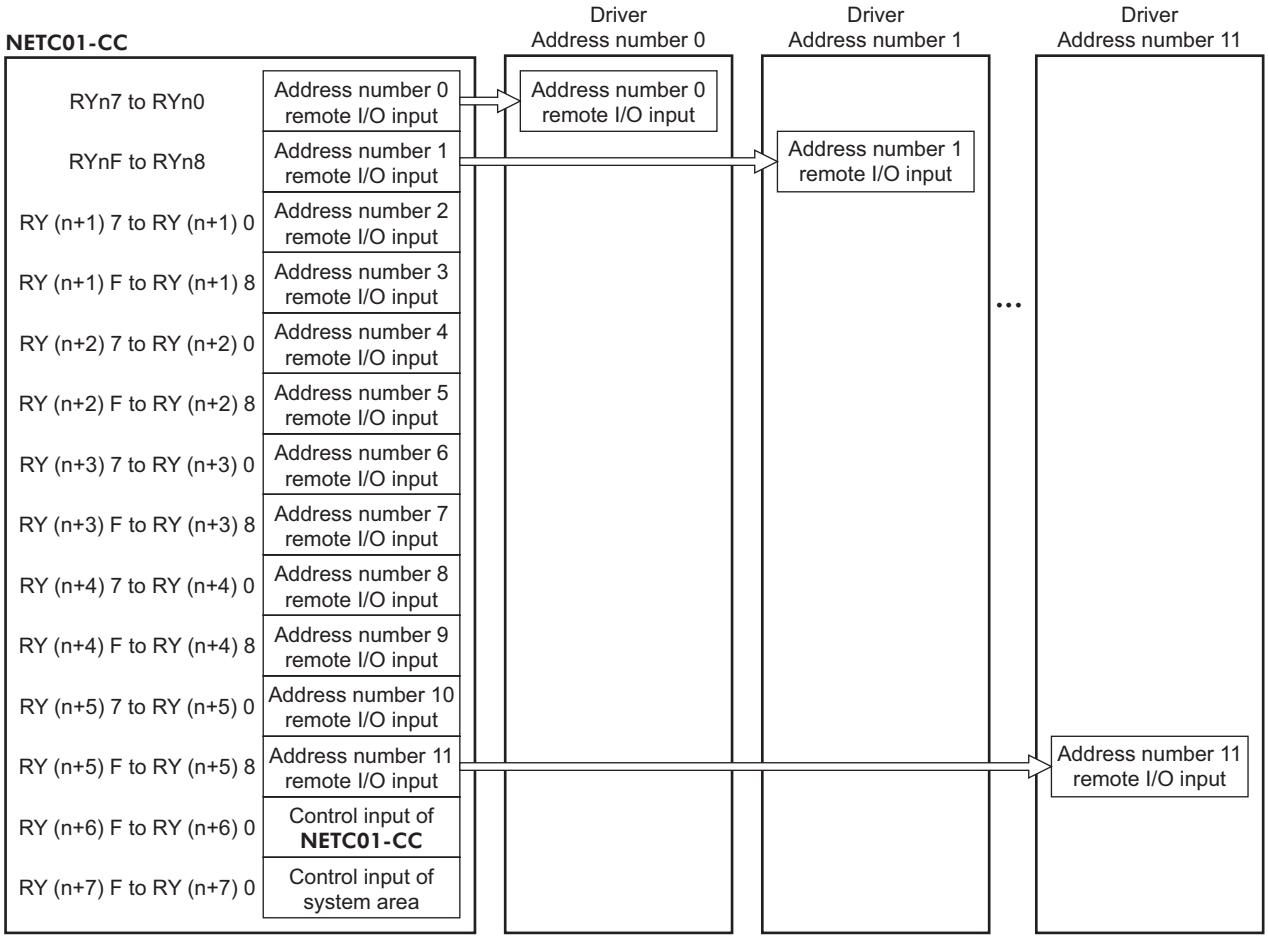
Command RY (Master to **NETC01-CC**)	
Device No.	Description
RYn7 to RYn0	Address number "0" remote I/O input
RYnF to RYn8	Address number "1" remote I/O input
RY (n+1) 7 to RY (n+1) 0	Address number "2" remote I/O input
RY (n+1) F to RY (n+1) 8	Address number "3" remote I/O input
RY (n+2) 7 to RY (n+2)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

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

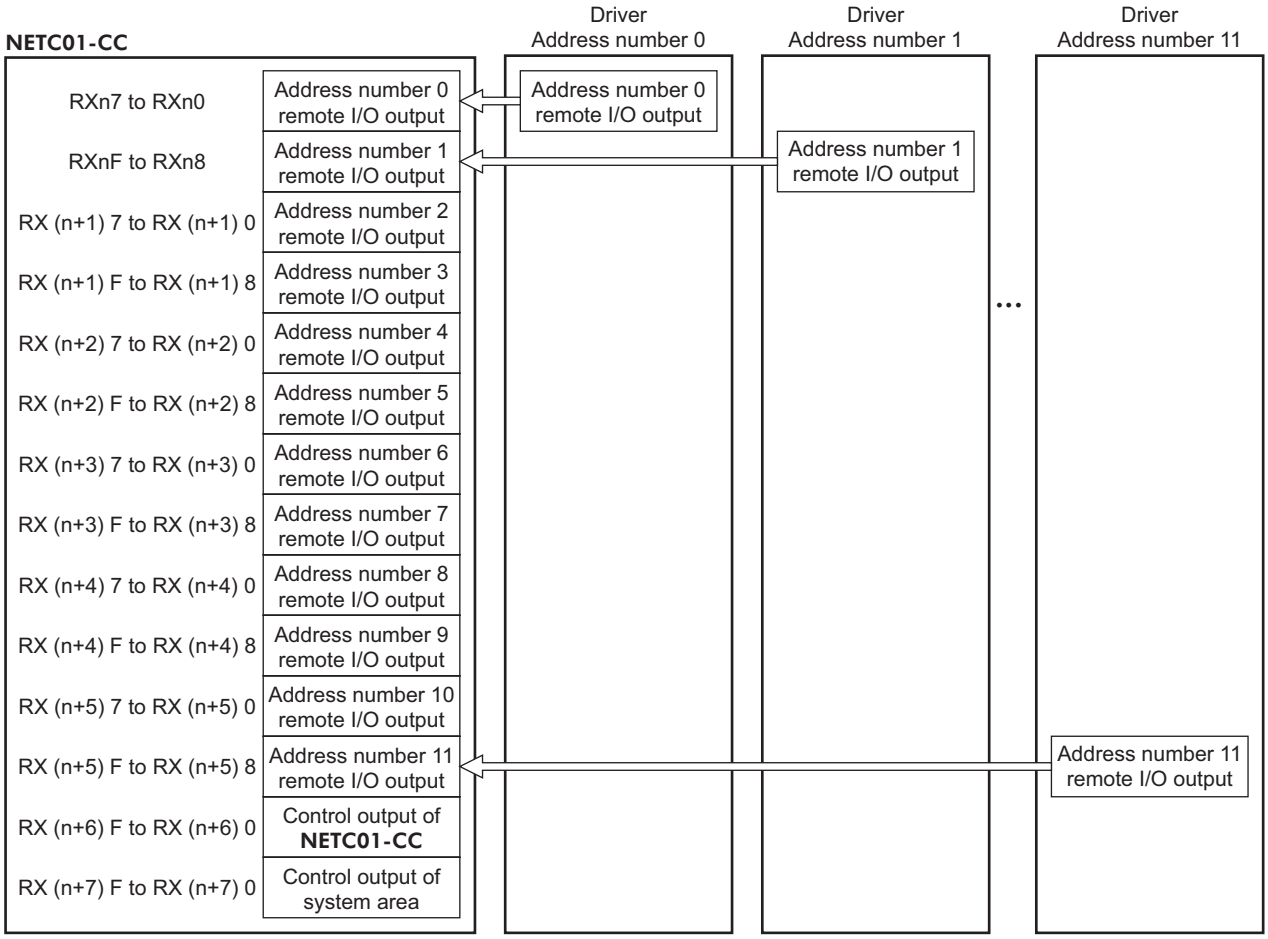
* See the network converter **NETC01-CC** USER MANUAL for details.

■ 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"

	Command RY (Master to **NETC01-CC**)			Response RX (**NETC01-CC** to master)		
	Device No.	Signal name	Description	Device No.	Signal name	Description
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"
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

2 Method of control via MECHATROLINK communication

See the following explanation when using the **RK Ⅱ** Series FLEX built-in controller type in combination with the network converter **NETC01-M2** or **NETC01-M3**, via MECHATROLINK communication.
Refer to "3 Details of remote I/O" on p.177 and "4 Command code list" on p.179 for remote I/O and command code.

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 the operation method in combination with the **NETC01-M2** as an example.

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

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

■ Using the parameter

1. Set the "communication (address number 0) " parameter of the **NETC01-M2** to " Enable" using the **OPX-2A** or **MEXE02**.
2. Cycle the **NETC01-M2** power.

Note
- “Communication” parameters will be enabled after the power is cycled.
- When setting the parameters of the **NETC01-M2**, use the **OPX-2A** or **MEXE02**.

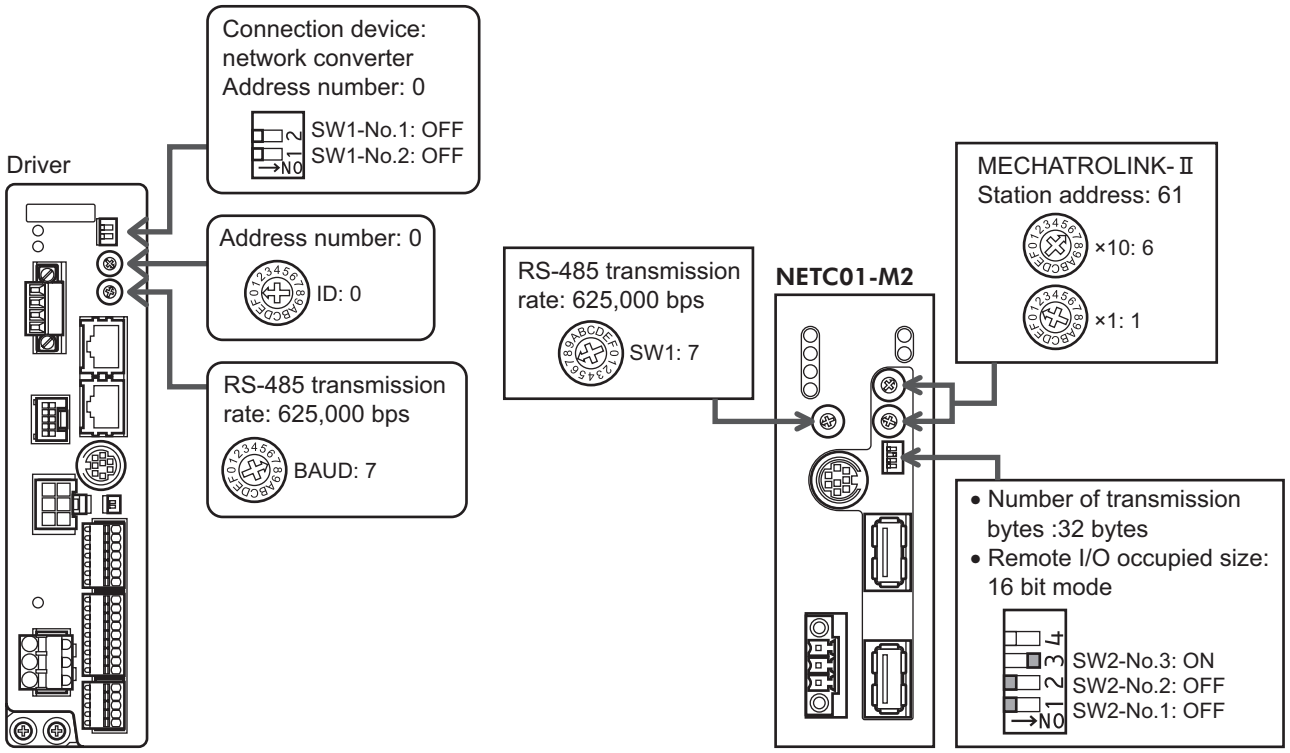
■ Using the switches

Setting condition of driver

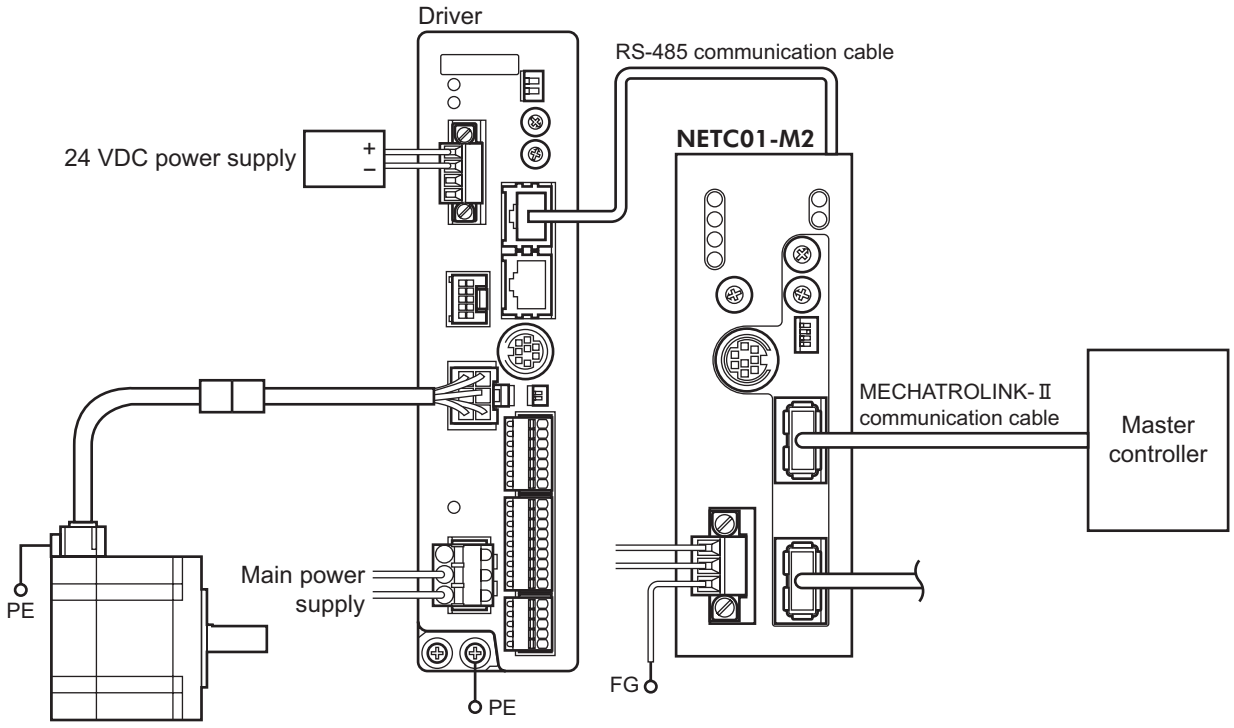
- Address number of the driver: 0
- RS-485 transmission rate: 625,000 bps
- SW1-No.2 of the function setting switch: OFF

Setting condition of **NETC01-M2**

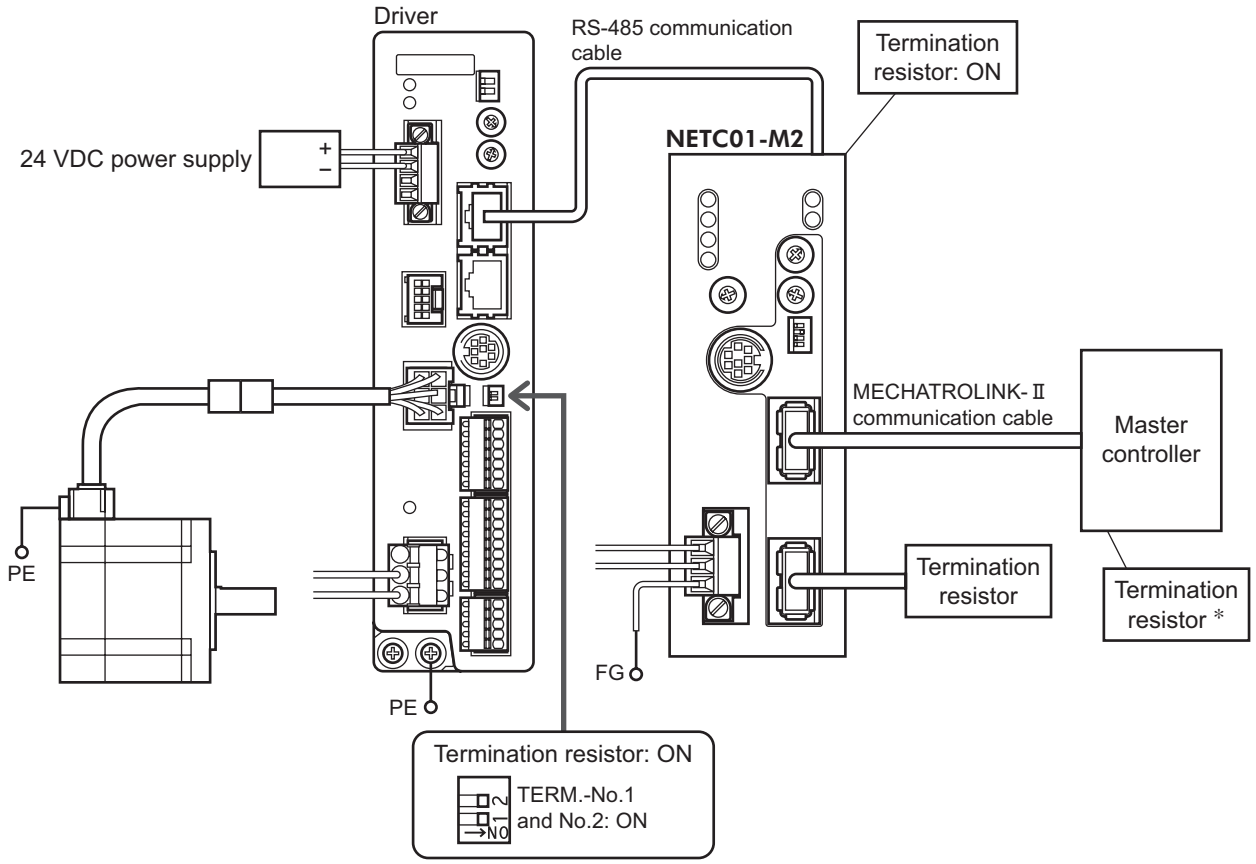
- MECHATROLINK-Ⅱ station address: 61
- RS-485 transmission rate: 625,000 bps
- Remote I/O occupied size: 16 bit mode
- Number of transmission bytes: 32 bytes



STEP 2 Check the connection



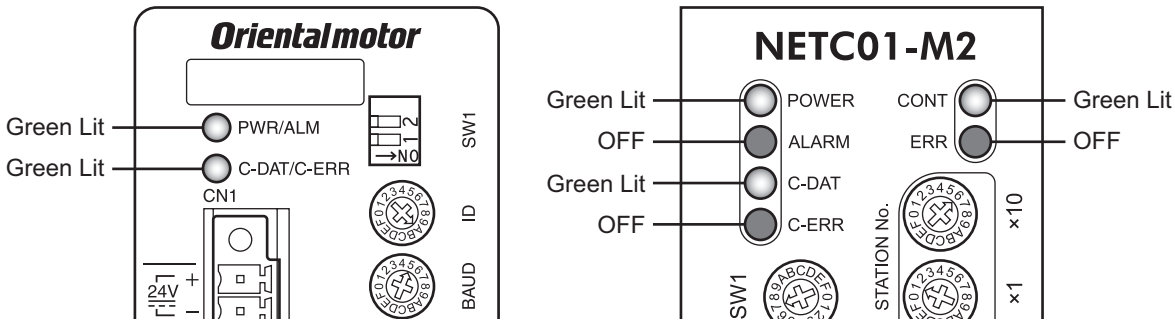
STEP 3 Check the termination resistor



* It is not necessary for the **NETC01-M3**.

STEP 4 Turn on the power and check the setting

Check that the LED condition has become as shown in the figures.



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

STEP 5 Continuous operation

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

Perform continuous operation by turning ON the FWD of the address number 0.

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

STEP 6 Were you able to operate the motor properly?

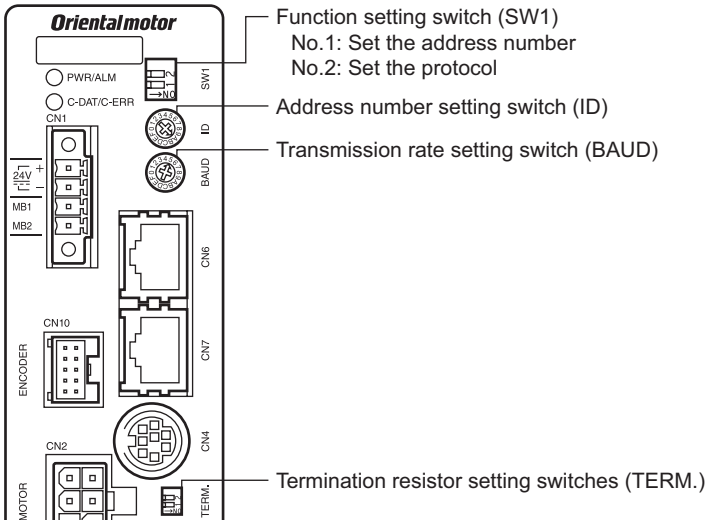
How did it go? Were you able to operate the motor properly? If the motor does not function, check the following points:

- Is any alarm present in the driver or **NETC01-M2**?
- Are the address number, transmission rate and termination resistor set correctly?
- Is the "connection" parameter of the **NETC01-M2** set correctly?
- Is the C-ERR LED lit? (RS-485 communication error)
- Is the ERR LED of the **NETC01-M2** lit? (MECHATROLINK-II/III communication error)
- 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?

For more detailed settings and functions, refer to "3 Operation type and setting," as well as next page and later, and the **NETC01-M2** USER MANUAL.

2.2 Setting the switches

When using the driver in combination with the network converter, set the switches before use.



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

■ Setting the connection device

Set the connection device of RS-485 communication using the function setting switch SW1-No.2.
Turn this switch OFF when controlling via the network converter.

Factory setting OFF (Network converter)

■ Address number (slave address)

Set the address number (slave address) using the address number setting switch (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)

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							

■ Transmission rate

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

Factory setting 7 (625,000 bps)

■ 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

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

2.3 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 network converter **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

2.4 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 network converter **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			

2.5 Communication format

Communication formats to the driver and **NETC01-M2** (**NETC01-M3**) are as follows.

■ Remote I/O input

For details on remote I/O, refer to p.177

- 8 axes connection mode [16 bit mode]

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

- 16 axes connection mode [8 bit mode]

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

■ Remote I/O output

- 8 axes connection mode [16 bit mode]

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

- 16 axes connection mode [8 bit mode]

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

■ Remote register input

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

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

- Explanation of command

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

■ Remote register output

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

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

- Explanation of command

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

3 Details of remote I/O

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

3.1 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.
For details on parameter, refer to "4.5 User parameters" on p.183.

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

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.49 for details on the combination.	0: OFF 1: ON (Operation data No.0 to 63 can be selected.)

Note

- Do not assign the same input signal to multiple input terminals. When the same input signal is assigned to multiple input terminals, the function will be executed if any of the terminals becomes active.
- 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).

3.2 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.
For details on parameter, refer to "4.5 User parameters" on p.183.

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

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
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
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

4 Command code list

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

4.1 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.

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

■ Group setting

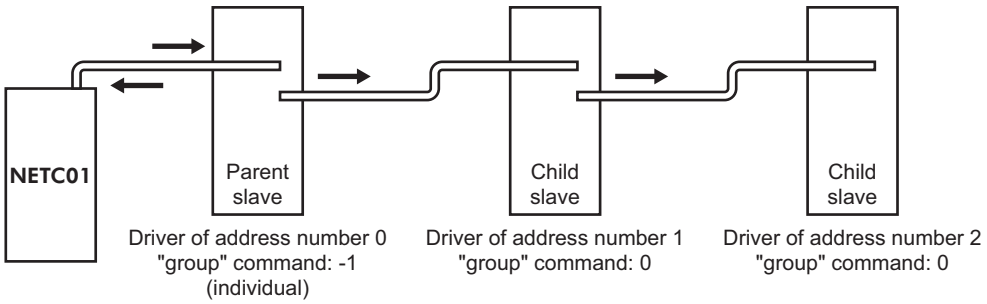
The group setting is not saved in the non-volatile memory even when the maintenance command "batch NV memory write" executes.

Command code		Description	Setting range	Initial value
Read	Write			
0018h	1018h	Group	Set the group. −1: Individual (No group setting) 0 to 15: Set the group address. (Address number of parent slave) *	−1

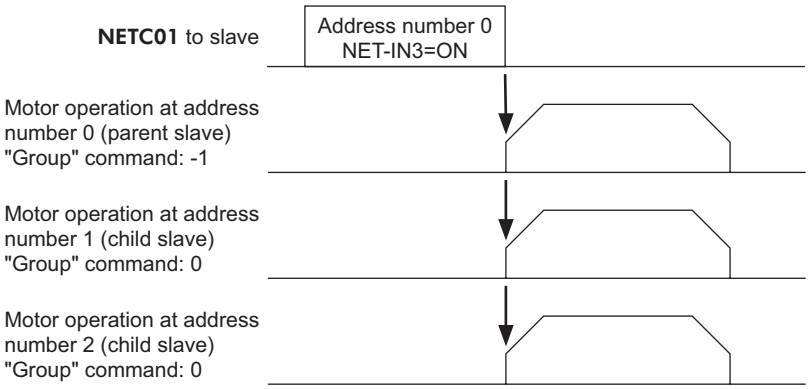
* Set in the 0 to 11 range when using the **NETC01-CC**, and set in the 0 to 15 range when using the **NETC01-M2** or **NETC01-M3**.

■ 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.



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

4.2 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
30C0h	Reset alarm	Resets the alarms that are present. Some alarms cannot be reset with the “reset alarm.”	0: No operation 1: Execute
30C2h	Clear alarm records	Clears alarm records.	
30C3h	Clear warning records	Clears warning records.	
30C4h	Clear communication error records	Clears the communication error records.	
30C5h	P-PRESET execute	Presets the command position and feedback position.	
30C6h	Configuration	Executes the parameter recalculation and the setup.	
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.	
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.	
30C9h	Batch NV memory write	Writes the parameters saved in the RAM to the non-volatile memory.	
30CAh	Encoder counter preset	Update the encoder counter to the value of the "encoder counter preset position" parameter.	

Note The non-volatile memory can be rewritten approximately 100,000 times.

4.3 Monitor command

These commands are used to monitor the driver condition.

Command code	Name	Description
2040h	Present alarm	Monitors the present alarm code.
2041h	Alarm record 1	Monitors the alarm records 1 to 10.
2042h	Alarm record 2	
2043h	Alarm record 3	
2044h	Alarm record 4	
2045h	Alarm record 5	
2046h	Alarm record 6	
2047h	Alarm record 7	
2048h	Alarm record 8	
2049h	Alarm record 9	
204Ah	Alarm record 10	
204Bh	Present warning	Monitors the present warning code.
204Ch	Warning record 1	Monitors the warning records 1 to 10.
204Dh	Warning record 2	
204Eh	Warning record 3	
204Fh	Warning record 4	
2050h	Warning record 5	
2051h	Warning record 6	
2052h	Warning record 7	
2053h	Warning record 8	
2054h	Warning record 9	
2055h	Warning record 10	
2056h	Present communication error code	Monitors the last received communication error code.
2057h	Communication error code record 1	Monitors the communication error records 1 to 10 that have occurred in the past.
2058h	Communication error code record 2	
2059h	Communication error code record 3	
205Ah	Communication error code record 4	
205Bh	Communication error code record 5	
205Ch	Communication error code record 6	
205Dh	Communication error code record 7	
205Eh	Communication error code record 8	
205Fh	Communication error code record 9	
2060h	Communication error code record 10	
2061h	Present selected data No.	Monitors the operation data No. currently selected.
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.
2063h	Command position	Monitors the command position.
2064h	Command speed	Monitors the command speed. (r/min)
2065h	Command speed	Monitors the command speed. (Hz)
2066h	Feedback position	Monitors the feedback position.
2069h	Remaining dwell time	Monitors how much of the dwell time used in the linked-motion operation 2 remains.
206Ah	Direct I/O and electromagnetic brake status	Monitors the each direct I/O signal and electromagnetic brake status. See the following table for the assignments.
2080h	Encoder counter	Monitors the encoder counter.

■ Direct I/O and electromagnetic brake status (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

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

*5 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).

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

4.5 User parameters

The parameters are saved in the RAM or non-volatile memory. The data saved in the RAM will be erased once the power is turned off. On the other hand, the parameters saved in the non-volatile memory will be retained even after the 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.

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

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

Note

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

■ I/O parameter

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

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

■ Motor parameter

Command code		Description	Setting range	Initial value	Effective *
Read	Write				
0120h	1120h	RUN current	0 to 1000 (1=0.1%)	1000	A
0121h	1121h	STOP current	0 to 600 (1=0.1%)	500	
0125h	1125h	Speed filter	0 to 200 ms	1	B
0126h	1126h	Moving average time			
0810h	1810h	Filter selection	0: Speed filter 1: Moving average filter	0	C

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

■ Operation parameter

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

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

■ Return-to-home parameter

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

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

■ Alarm/warning parameter

Command code		Description	Setting range	Initial value	Effective *
Read	Write				
0184h	1184h	Return-to-home incomplete alarm	0: Disable 1: Enable	0	C
01A0h	11A0h	Overheat warning	40 to 85 °C (104 to 185 °F)	85	A
01A3h	11A3h	Overvoltage warning	120 to 450 V	435	
01A4h	11A4h	Undervoltage warning	120 to 280 V	120	

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

■ Coordination parameter

Command code		Description	Setting range	Initial value	Effective *
Read	Write				
01C0h	11C0h	Electronic gear A	1 to 65535	1	C
01C1h	11C1h	Electronic gear B			
01C2h	11C2h	Motor rotation direction	0: Positive direction=CCW 1: Positive direction=CW	1	
01C3h	11C3h	Software overtravel	0: Disable 1: Enable	1	A
01C4h	11C4h	Positive software limit	−8,388,608 to 8,388,607 step	8,388,607	
01C5h	11C5h	Negative software limit		−8,388,608	
01C6h	11C6h	Preset position		0	
01C7h	11C7h	Wrap setting	0: Disable 1: Enable	0	C
01C8h	11C8h	Wrap setting range	1 to 8,388,607 step	500	
0860h	1860h	Encoder resolution	100 to 10000 P/R	500	
0861h	1861h	Encoder preset value	−8,388,608 to 8,388,607 step	0	A
0862h	1862h	Stepout detection	0: Disable 1: Enable	0	C
0863h	1863h	Stepout detection band	1 to 3600 (1=0.1°)	72	A
0864h	1864h	Stepout detection action	0: No operation 1: Warning 2: Alarm	0	

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

■ Common parameter

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

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

■ Communication parameter

Command code		Description	Setting range	Initial value	Effective *
Read	Write				
0900h	1900h	Communication timeout	0 to 10000 ms	0	A
0901h	1901h	Communication error alarm	1 to 10	3	

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

■ I/O function parameter

Command code		Description	Setting range	Initial value	Effective *
Read	Write				
0880h	1880h	IN0 input function selection	See table next.	3: HOME	C
0881h	1881h	IN1 input function selection		4: START	
0882h	1882h	IN2 input function selection		48: M0	
0883h	1883h	IN3 input function selection		49: M1	
0884h	1884h	IN4 input function selection		50: M2	
0885h	1885h	IN5 input function selection		16: FREE	
0886h	1886h	IN6 input function selection		18: STOP	
0887h	1887h	IN7 input function selection		24: ALM-RST	
0890h	1890h	IN0 input logic level setting	0: Normally open 1: Normally closed	0	
0891h	1891h	IN1 input logic level setting			
0892h	1892h	IN2 input logic level setting			
0893h	1893h	IN3 input logic level setting			
0894h	1894h	IN4 input logic level setting			
0895h	1895h	IN5 input logic level setting			
0896h	1896h	IN6 input logic level setting			
0897h	1897h	IN7 input logic level setting			
08A0h	18A0h	OUT0 output function selection	See table next.	70: HOME-P	
08A1h	18A1h	OUT1 output function selection		68: MOVE	
08A2h	18A2h	OUT2 output function selection		73: AREA1	
08A3h	18A3h	OUT3 output function selection		67: READY	
08A4h	18A4h	OUT4 output function selection		66: WNG	
08A5h	18A5h	OUT5 output function selection		65: ALM	

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

- Setting range for IN input function selection

0: Not used	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		Description	Setting range	Initial value	Effective *
Read	Write				
08B0h	18B0h	NET-IN0 input function selection	See table next.	48: M0	C
08B1h	18B1h	NET-IN1 input function selection		49: M1	
08B2h	18B2h	NET-IN2 input function selection		50: M2	
08B3h	18B3h	NET-IN3 input function selection		4: START	
08B4h	18B4h	NET-IN4 input function selection		3: HOME	
08B5h	18B5h	NET-IN5 input function selection		18: STOP	
08B6h	18B6h	NET-IN6 input function selection		16: FREE	
08B7h	18B7h	NET-IN7 input function selection		24: ALM-RST	
08B8h	18B8h	NET-IN8 input function selection		8: MS0	
08B9h	18B9h	NET-IN9 input function selection		9: MS1	
08BAh	18BAh	NET-IN10 input function selection		10: MS2	
08BBh	18BBh	NET-IN11 input function selection		5: SSTART	
08BCh	18BCh	NET-IN12 input function selection		6: +JOG	
08BDh	18BDh	NET-IN13 input function selection		7: − JOG	
08BEh	18BEh	NET-IN14 input function selection		1: FWD	
08BFh	18BFh	NET-IN15 input function selection		2: RVS	
08C0h	18C0h	NET-OUT0 output function selection	See table next.	48: M0_R	
08C1h	18C1h	NET-OUT1 output function selection		49: M1_R	
08C2h	18C2h	NET-OUT2 output function selection		50: M2_R	
08C3h	18C3h	NET-OUT3 output function selection		4: START_R	
08C4h	18C4h	NET-OUT4 output function selection		70: HOME-P	
08C5h	18C5h	NET-OUT5 output function selection		67: READY	
08C6h	18C6h	NET-OUT6 output function selection		66: WNG	
08C7h	18C7h	NET-OUT7 output function selection		65: ALM	
08C8h	18C8h	NET-OUT8 output function selection		80: S-BSY	
08C9h	18C9h	NET-OUT9 output function selection		73: AREA1	
08CAh	18CAh	NET-OUT10 output function selection		74: AREA2	
08CBh	18CBh	NET-OUT11 output function selection		75: AREA3	
08CCh	18CCh	NET-OUT12 output function selection		72: TIM	
08CDh	18CDh	NET-OUT13 output function selection		68: MOVE	
08CEh	18CEh	NET-OUT14 output function selection		0: Not used	
08CFh	18CFh	NET-OUT15 output function selection		83: STEPOUT	

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

- Setting range for NET-IN input function selection

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

- 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 Inspection, troubleshooting and remedial actions

This part explains the periodical inspection methods as well as confirmation items and remedial actions when problems have happened.

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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.

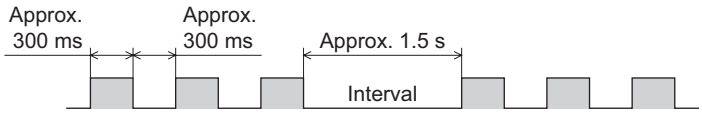
2 Alarms and warnings

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 ALARM LED will start blinking. The present alarm can be checked by counting the number of times the ALARM LED blinks, or using the **OPX-2A**, **MEXE02** or RS-485 communication.

Example: Overvoltage alarm (number of blinks: 3)



■ Alarm reset

Before resetting an alarm, always remove the cause of the alarm and ensure safety, and perform one of the reset operations specified below. Refer to p.113 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.

Note Some alarms cannot be reset with the ALM-RST input, **OPX-2A**, **MEXE02** or RS-485 communication. Check the following table to identify which alarms meet this condition. To reset these alarms, cycle the 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 ALARM LED blinks	Alarm type	Cause	Remedial action	Reset using the ALM-RST input	Motor excitation *
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.	• Reduce the load or increase the acceleration/deceleration time. • Check the setting of the "stepout detection band" parameter.	Possible	On
20h	5	Overcurrent	The motor, cable and driver output circuit were short-circuited.	Turn off the power and turn on the power again after checking that the motor, cable and driver output circuit are not short-circuited.	Not possible	Off
21h	2	Main circuit overheat	The internal temperature of the driver reached 85 °C (185 °F).	Review the ventilation condition in the enclosure.	Possible	
22h	3	Overvoltage	• A voltage exceeding the specification value was applied. • 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 time.	Not possible	
23h		Main power off	The motor was started when the main power supply had been cut off.	Check if the main power supply has been input normally.	Possible	
25h		Undervoltage	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.		
2Ch	5	Electrolytic capacitor error	The electrolytic capacitor on the main circuit was damaged.	Contact your nearest Oriental Motor sales office.	Not possible	
34h	2	Command pulse frequency error	The command pulse frequency exceeded the specification value.	Check the command pulse frequency.	Possible	
41h	9	EEPROM error	The stored data was damaged.	Initialize all parameters.	Not possible	
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.	Perform the position preset or return-to-home operation.	Possible	On
60h		±LS both sides active	When the "hardware overtravel" parameter is set to "enable" both +LS and −LS have been detected.	Check the sensor logic and the setting of the "±LS logic level" parameter.		
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.	Check the connection of ±LS.		

* 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.

Code	No. of ALARM LED blinks	Alarm type	Cause	Remedial action	Reset using the ALM-RST input	Motor excitation *
62h	7	Home seeking error	Return-to-home operation did not complete normally.	• 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.	Possible	On
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.	Install a HOME sensor in the position between +side sensor and −side sensor.		
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.	• 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."		
66h		Hardware overtravel	When the "hardware overtravel" parameter is set to "enable" +LS or −LS has been detected.	Escape from the limit sensor by performing continuous operation or return-to-home operation.		
67h		Software overtravel	When the "software overtravel" parameter is set to "enable" the motor position reached the set value of the software limit.	• 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.		
6Ah		Home seeking offset error	When performing offset movement as part of return-to-home operation, +LS or −LS has been detected.	Check the offset value.		
70h		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.	Check the operation data.		
71h		Electronic gear setting error	The resolution set by the "electronic gear" parameter was outside the specification.	Set the electronic gear correctly, and then cycle the power.	Not possible	Off

* 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.

Code	No. of ALARM LED blinks	Alarm type	Cause	Remedial action	Reset using the ALM-RST input	Motor excitation *
81h	7	Network bus error	When the motor operates, the master controller for the network converter shows a disconnection status.	Check the connector or cable of the master controller.	Possible	On
83h		Communication switch setting error	Transmission rate setting switch (BAUD) was out-of-specification.	Check the transmission rate setting switch (BAUD).	Not possible	Off
84h		RS-485 communication error	The number of consecutive RS-485 communication errors reached the set value of the "communication error alarm" parameter.	• Check the connection between the master controller and driver. • Check the setting of RS-485 communication.	Possible	On
85h		RS-485 communication timeout	The time set in the "communication timeout" parameter has elapsed, and yet the communication could not be established with the master controller.	Check the connection between the master controller and driver.		
8Eh		Network converter error	An alarm was generated in the network converter.	Check the alarm code of the network converter.		
F0h	Lit	CPU error	CPU malfunctioned.	Cycle the power.	−	−

* 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.

2.2 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 reset the warning records using the **OPX-2A** or **MEXE02**.

Note You can also clear the warning records by turning off the driver 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 time. • 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 time.
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.
- Clear the communication error records by the status monitor of the **MEXE02**.

Note 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	NV 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 speed setting or wiring. When the motor cannot be operated correctly, refer to the contents provided in this section and take appropriate action. If the problem persists, contact your nearest Oriental Motor sales office.

Phenomenon	Possible cause	Remedial action
• The motor is not excited. • The motor output shaft can be moved by hand.	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.

Note

- 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.

8 Appendix

This part explains accessories (sold separately) that are used in combination with the products.

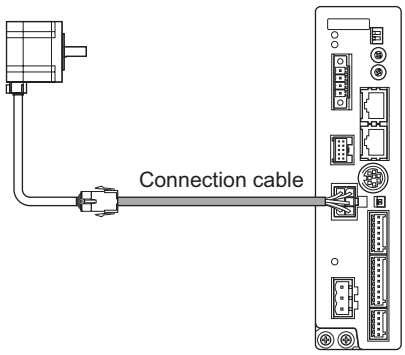
Table of contents

1 Accessories (sold separately)

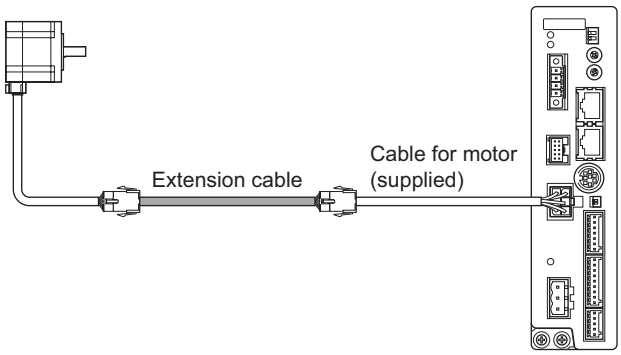
■ Motor cable

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 driver is extended more than 3 m (9.8 ft.) when using the model with a "cable for motor," use the connection cable set. In the case of the model without a "cable for motor," use an 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.
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.



Note 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.

For standard motor

	• Connection cable set	• Flexible connection cable set
Length [m (ft.)]	Model	Model
1 (3.3)	**CC010VPF**	**CC010VPR**
2 (6.6)	**CC020VPF**	**CC020VPR**
3 (9.8)	**CC030VPF**	**CC030VPR**
5 (16.4)	**CC050VPF**	**CC050VPR**
7 (23.0)	**CC070VPF**	**CC070VPR**
10 (32.8)	**CC100VPF**	**CC100VPR**
15 (49.2)	**CC150VPF**	**CC150VPR**
20 (65.6)	**CC200VPF**	**CC200VPR**

For electromagnetic brake motor

	• Connection cable set	• Flexible connection cable set
Length [m (ft.)]	Model	Model
1 (3.3)	**CC010VPFB**	**CC010VPRB**
2 (6.6)	**CC020VPFB**	**CC020VPRB**
3 (9.8)	**CC030VPFB**	**CC030VPRB**
5 (16.4)	**CC050VPFB**	**CC050VPRB**
7 (23.0)	**CC070VPFB**	**CC070VPRB**
10 (32.8)	**CC100VPFB**	**CC100VPRB**
15 (49.2)	**CC150VPFB**	**CC150VPRB**
20 (65.6)	**CC200VPFB**	**CC200VPRB**

For encoder motor

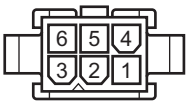
	• Connection cable set	• Flexible connection cable set
Length [m (ft.)]	Model	Model
1 (3.3)	**CC010VPFE**	**CC010VPRE**
2 (6.6)	**CC020VPFE**	**CC020VPRE**
3 (9.8)	**CC030VPFE**	**CC030VPRE**
5 (16.4)	**CC050VPFE**	**CC050VPRE**
7 (23.0)	**CC070VPFE**	**CC070VPRE**
10 (32.8)	**CC100VPFE**	**CC100VPRE**
15 (49.2)	**CC150VPFE**	**CC150VPRE**
20 (65.6)	**CC200VPFE**	**CC200VPRE**

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

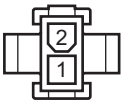
Mode: 5557-06P-210 (Molex)

• 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

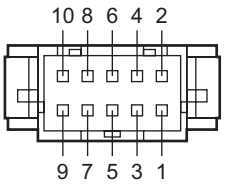


Model: 5559-02P-210 (Molex)

• Pin assignment of "cable for encoder"

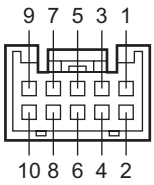
Pin No.	Color	Lead size
1	Red	AWG26 (0.14 mm^2)
2	Pink	
3	Green	
4	Blue	
5	Yellow	
6	Orange	
7	White	AWG22 (0.3 mm^2)
8	Black	
9	–	–
10	Drain wire	AWG25 (0.16 mm^2)

• 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.

For standard motor

	• Connection cable set	• Flexible connection cable set
Length [m (ft.)]	Model	Model
1 (3.3)	**CC010VPF**	**CC010VPR**
2 (6.6)	**CC020VPF**	**CC020VPR**
3 (9.8)	**CC030VPF**	**CC030VPR**
5 (16.4)	**CC050VPF**	**CC050VPR**
7 (23.0)	**CC070VPF**	**CC070VPR**
10 (32.8)	**CC100VPF**	**CC100VPR**
15 (49.2)	**CC150VPF**	**CC150VPR**

For electromagnetic brake motor

	• Connection cable set	• Flexible connection cable set
Length [m (ft.)]	Model	Model
1 (3.3)	**CC010VPFBT**	**CC010VPRBT**
2 (6.6)	**CC020VPFBT**	**CC020VPRBT**
3 (9.8)	**CC030VPFBT**	**CC030VPRBT**
5 (16.4)	**CC050VPFBT**	**CC050VPRBT**
7 (23.0)	**CC070VPFBT**	**CC070VPRBT**
10 (32.8)	**CC100VPFBT**	**CC100VPRBT**
15 (49.2)	**CC150VPFBT**	**CC150VPRBT**

For encoder motor

	• Connection cable set	• Flexible connection cable set
Length [m (ft.)]	Model	Model
1 (3.3)	**CC010VPFET**	**CC010VPRET**
2 (6.6)	**CC020VPFET**	**CC020VPRET**
3 (9.8)	**CC030VPFET**	**CC030VPRET**
5 (16.4)	**CC050VPFET**	**CC050VPRET**
7 (23.0)	**CC070VPFET**	**CC070VPRET**
10 (32.8)	**CC100VPFET**	**CC100VPRET**
15 (49.2)	**CC150VPFET**	**CC150VPRET**

■ 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**

■ Data setting software

The data setting software lets you set parameters for your **RK Ⅱ** Series FLEX built-in controller type and monitor its operating condition using a PC.
The software comes with a PC interface cable [5 m (16.4 ft.)]. The cable is connected to the USB port on the PC.

Model: **MEXE02**

■ 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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