

Brushless Motor and Driver Package

BLE Series

RS-485 communication type

USER MANUAL

Thank you for purchasing an Oriental Motor product.

This Operating Manual describes product handling procedures and safety precautions.

- Please read it thoroughly to ensure safe operation.
- Always keep the manual where it is readily available.

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1 Entry

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.

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1 Operating Manuals for the BLE Series

Operating manuals for the **BLE** Series FLEX RS-485 communication type are listed below.

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

| Applicable product | Type of operating manual | Model | Description of operating manual |
|--|---|----------|--|
| BLE Series FLEX RS-485 communication type | USER MANUAL (this manual) | HM-5140 | This manual explains the function, installation and connection of the motor and driver as well as operating method. |
| Data setter OPX-2A | OPERATING MANUAL | HP-5056 | This manual explains the functions and installation/connection method as well as data setting method and others for the accessory OPX-2A (sold separately). |
| Support software MEXE02 | OPERATING MANUAL | HM-60131 | This manual explains how to set data using the support software MEXE02 . |
| Network converter | CC-Link Ver.1.1 compatible NETC01-CC USER MANUAL | HM-60089 | This manual explains the functions, installation/connection method as well as the operating method and others for the network converter. |
| | CC-Link Ver.2 compatible NETC02-CC USER MANUAL | HM-60305 | |
| | MECHATROLINK-Ⅱ compatible NETC01-M2 USER MANUAL | HM-60091 | |
| | MECHATROLINK-Ⅲ compatible NETC01-M3 USER MANUAL | HM-60093 | |
| | EtherCAT compatible NETC01-ECT USER MANUAL | HM-60301 | |

2 Introduction

■ Before use

Only qualified personnel of electrical and mechanical engineering should work with the product.

Use the product correctly after thoroughly reading the section p.8 "3 Safety precautions." In addition, be sure to observe the contents described in warning, caution, and note in this manual.

The product described in this manual has been designed and manufactured to be incorporated 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.

■ Product overview

This is a motor and driver package product consisting of a compact, high-torque brushless motor and driver compatible with I/O control and RS-485 communication.

The operation data and parameters can be set using an accessory data setter **OPX-2A** (sold separately) or support software **MEXE02**, or via RS-485 communication.

■ Accessories

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

■ Related products

The **BLE** Series FLEX RS-485 communication type can be used via various network when connecting to a network converter.

| Network converter | Supported network |
|-------------------|--|
| NETC01-CC | CC-Link communication (Ver.1.1 compatible) |
| NETC02-CC | CC-Link communication (Ver.2 compatible) |
| NETC01-M2 | MECHATROLINK- II communication |
| NETC01-M3 | MECHATROLINK- III communication |
| NETC01-ECT | EtherCAT communication |




■ 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 and so on. |

3 Safety precautions

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

| | |
|--|--|
|  WARNING | Handling the product without observing the instructions that accompany a "WARNING" symbol may result in serious injury or death. |
|  CAUTION | Handling the product without observing the instructions that accompany a "CAUTION" symbol may result in injury or property damage. |
| Note | The items under this heading contain important handling instructions that the user should observe to ensure the safe use of the product. |
|  | The items under this heading contain related information and contents to gain a further understanding of the text in this manual. |

WARNING

- Do not use the product in a place exposed to explosive, flammable or corrosive gases or water splashes or near combustible materials. Doing so may result in fire, electric shock or injury.
- Only qualified and educated personnel should be allowed to perform installation, connection, operation and inspection/troubleshooting of the product. Handling by unqualified personnel may result in fire, electric shock, injury or equipment damage.
- Do not move, install, connect or inspect the product while the power is supplied. Perform these operations after turning off the power. Failure to observe these instructions may result in 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 to avoid the risk of fire or electric shock.
- Do not use a non-electromagnetic brake type motor in a vertical application. If the driver's protection function is activated, the motor will stop and the moving part of the equipment will drop, thereby causing injury or equipment damage.
- Do not use the brake mechanism of the electromagnetic brake motor as a safety brake. It is intended to hold the moving parts and motor position. Doing so may result in injury or damage to equipment.
- If the driver protective function has been activated, remove the cause and reset the protective function. Continuing to operate the equipment without removing the cause of problem will lead to a motor or driver malfunction, resulting in injury or equipment damage.
- Use a specified motor (gearhead) and driver combination. Failure to do so may result in fire, electric shock or equipment damage.
- The motor and driver are Class I equipment.
When installing the motor and driver, connect their Protective Earth Terminals. Failure to do so may result in electric shock.
- Install the motor and driver in an enclosure. Failure to do so may result in electric shock or injury.
- Securely connect the cables in accordance with the connection examples. Failure to do so may result in fire or electric shock.
- Do not forcibly bend, pull or pinch the cables. Doing so may result in fire or electric shock.
- Do not machine or modify the motor cable or connection cable. Doing so may result in electric shock or fire.
- Be sure to observe the specified cable sizes. Use of unspecified cable sizes may result in fire.
- Observe the specified screw tightening torque when connecting terminals to the terminal block. Failure to do so may result in electric shock or equipment damage.
- Always keep the power supply voltage of the driver within the specified range. Failure to do so may result in fire or electric shock.
- When using the electromagnetic brake motor, do not turn the MB-FREE input ON while a load is held in vertical direction. Otherwise, the holding power of the motor and electromagnetic brake will be lost, causing personal injury or damage to equipment.
- When using the electromagnetic brake motor in vertical drive (gravitational operation), be sure to operate after checking the load condition. If a load in excess of the rated torque is applied or the small torque limiting value is set using a **OPX-2A**, **MEXE02** or RS-485 communication, the load may fall. This may result in injury or damage to equipment.
- Always turn off the power before performing maintenance/inspection. Failure to do so may result in electric shock.
- Do not touch the motor or driver when measuring insulation resistance or performing a dielectric strength test. Accidental contact may result in electric shock.
- Do not touch the connection terminals on the driver immediately (until the CHARGE LED turns off) after the power is turned off. Residual voltage may cause electric shock.
- Regularly check the openings in the driver for accumulated dust. Accumulated dust may cause fire.
- Do not disassemble or modify the motor (gearhead) and driver. Doing so may result in electric shock, injury or equipment damage. Should you require inspection or repair of internal parts, please contact the Oriental Motor branch or sales office from which you purchased the product.

⚠ CAUTION

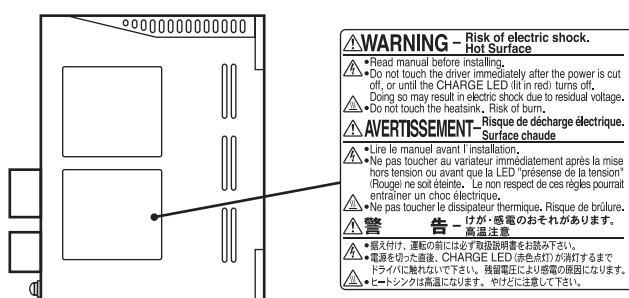
- Do not use the product in conditions exceeding the motor (gearhead) or driver specifications. Doing so may result in electric shock, fire, injury or equipment damage.
- Do not insert an object into the openings in the driver. Doing so may result in fire, electric shock or injury.
- Do not touch the motor (gearhead) or driver while operating or immediately after stopping. The surface of the motor (gearhead) or driver may be hot and cause a skin burn(s).
- Do not carry the product by holding the motor (gearhead) output shaft or any of the cables. Doing so may result in injury.
- Do not place around the motor and driver any object blocking the air flow. Doing so may result in equipment damage.
- Do not touch the motor output shaft (end of shaft or pinion) with bare hands. Doing so may result in injury.
- When assembling the motor (pinion shaft) with the gearhead, exercise caution not to pinch your fingers or other parts of your body between the motor and gearhead. Injury may result.
- Securely install the motor (gearhead) and driver to their respective mounting plates. Inappropriate installation may cause the motor/driver to detach and fall, resulting in injury or equipment damage.
- Provide a cover on the rotating part (output shaft) of the motor (gearhead). Failure to do so may result in injury.
- When installing the motor (gearhead) in the equipment, exercise caution not to pinch your fingers or other parts of your body between the equipment and motor or gearhead. Injury may result.
- Securely install the load on the motor output shaft. Inappropriate installation may result in injury.
- Be sure to ground the motor and driver to prevent them from being damaged by static electricity. Failure to do so may result in fire or damage to equipment.
- Use a 24 VDC 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.
- Immediately when trouble has occurred, stop running and turn off the driver power. Failure to do so may result in fire, electric shock or injury.
- Take safety measures in the event of a momentary voltage drop. This may cause the motor to stop, rotational torque, or rotation speed. Failure to do so may result in injury or damage to equipment.
- Do not touch the rotating part (output shaft) during operation. Doing so may result in injury.
- The motor surface temperature may exceed 70 °C (158 °F) even under normal operating conditions. If the operator is allowed to approach a running motor, attach a warning label as shown to the right in a conspicuous position. Failure to do so may result in skin burn(s).
- Use an insulated screwdriver to adjust the switches in the driver. Failure to do so may result in electric shock.



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.



4 Precautions for use

This chapter explains the restrictions and other items you should take heed of when using the **BLE** Series FLEX RS-485 communication type.

- **Connect protective devices to the power line**

Connect a circuit breaker or earth leakage breaker to the driver's power line to protect the primary circuit. If an earth leakage breaker is to be installed, use one incorporating high-frequency noise elimination measures. Refer to "Preventing leakage current" below for the selection of protective devices.

- **Use an electromagnetic brake type for an application involving vertical travel**

When the motor is used in an application involving vertical travel, use an electromagnetic brake type to hold the load in position.

- **Do not use a solid-state relay (SSR) to turn on/off the power**

A circuit that turns on/off the power via a solid-state relay (SSR) may damage the motor and driver.

- **Do not conduct the insulation resistance measurement or dielectric strength test with the motor and driver connected.**

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

- **Grease measures**

On rare occasions, grease may ooze out from the gearhead. 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. Grease leakage may lead to problems in the user's equipment or products.

- **Apply grease to the hollow output shaft of a hollow shaft flat gearhead**

When using a hollow shaft flat gearhead, apply grease (molybdenum disulfide grease, etc.) on the surface of the load shaft and inner walls of the hollow output shaft to prevent seizure.

- **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

- **Noise elimination measures**

Provide noise elimination measures to prevent a motor or driver malfunction caused by external noise.

For more effective elimination of noise, use a shielded I/O signal cable or attach ferrite cores if a non-shielded cable is used. Refer to "2.4 Conformity to the EMC" on p.156 for the noise elimination measures.

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

The data edit connector (CN3), I/O signal connectors (CN5/CN6) and RS-485 communication connectors (CN7/CN8) are not 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 these equipment and driver to short, damaging both.

- **The driver uses semiconductor elements, so be extremely careful when handling them**
Electrostatic discharge can damage the driver.

Be sure to ground the motor and driver to prevent them from being damaged by electric shock or static electricity.

- **Use a connection cable (supplied or sold separately) when extending the wiring distance between the motor and driver**

- **When using the motor in operation such as vertical drive (gravitational operation) or a large inertial load drive, use an accessory regeneration unit **EPRC-400P** (sold separately).**

The driver may be damaged if the regeneration energy generated during vertical drive (gravitational operation) or sudden starting/stopping of a large inertial load exceeds the allowable limit that can be absorbed by the driver.

The accessory regeneration unit **EPRC-400P** is designed to discharge the regenerated energy, thereby protecting the driver.

- Saving data to the non-volatile memory

Do not turn off the 24 VDC power supply while writing the data to the non-volatile memory, and also do not turn off within 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.

[illegible]

6 Preparation

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

6.1 Checking the product

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

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.14.

- Motor..... 1 unit (with a gearhead, only for combination type)
- Driver 1 unit
- Connection cable..... 1 piece (Only models with a supplied connection cable)
- CN5 connector (10 pins)..... 1 piece
- CN6 connector (8 pins)..... 1 piece
- External potentiometer..... 1 piece
- Signal cable for external potentiometer 1 piece [1 m (3.3 ft.)]
- Instructions and Precautions for Safe Use 1 copy

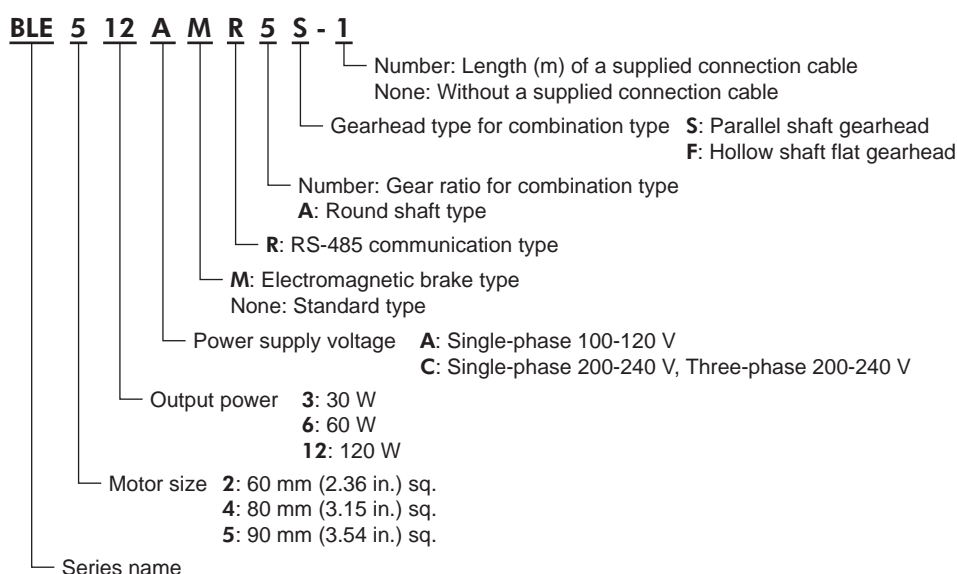
Accessories for combination type • parallel shaft gearhead

- Hexagonal socket head screw set..... 1 set
(Hexagonal socket head screw, flat washer, spring washer and nut, pieces each)
- Parallel key..... 1 piece

Accessories for combination type • hollow shaft flat gearhead

- Hexagonal socket head screw set..... 1 set
(Hexagonal socket head screw, flat washer, spring washer and nut, 4 pieces each)
- Safety cover 1 piece
- Safety cover mounting screw..... 2 pieces
- Parallel key..... 1 piece

6.2 How to identify the product model



6.3 Combination tables

- in the model names indicates a number representing the gear ratio.
- indicates a number representing the length of a connection cable.
- The combination types come with the motor and gearhead pre-assembled.

■ Standard type

| Motor type | Model | Motor model | Gearhead model | Driver model |
|---|--------------|-------------|----------------|--------------|
| Combination type • parallel shaft gearhead | BLE23AR□S-■ | BLEM23-GFS | GFS2G□ | BLED3AM-R |
| | BLE23CR□S-■ | | | BLED3CM-R |
| | BLE46AR□S-■ | BLEM46-GFS | GFS4G□ | BLED6AM-R |
| | BLE46CR□S-■ | | | BLED6CM-R |
| | BLE512AR□S-■ | BLEM512-GFS | GFS5G□ | BLED12AM-R |
| | BLE512CR□S-■ | | | BLED12CM-R |
| Combination type • hollow shaft flat gearhead | BLE23AR□F-■ | BLEM23-GFS | GFS2G□FR | BLED3AM-R |
| | BLE23CR□F-■ | | | BLED3CM-R |
| | BLE46AR□F-■ | BLEM46-GFS | GFS4G□FR | BLED6AM-R |
| | BLE46CR□F-■ | | | BLED6CM-R |
| | BLE512AR□F-■ | BLEM512-GFS | GFS5G□FR | BLED12AM-R |
| | BLE512CR□F-■ | | | BLED12CM-R |
| Round shaft type | BLE23ARA-■ | BLEM23-A | - | BLED3AM-R |
| | BLE23CRA-■ | | | BLED3CM-R |
| | BLE46ARA-■ | BLEM46-A | | BLED6AM-R |
| | BLE46CRA-■ | | | BLED6CM-R |
| | BLE512ARA-■ | BLEM512-A | | BLED12AM-R |
| | BLE512CRA-■ | | | BLED12CM-R |

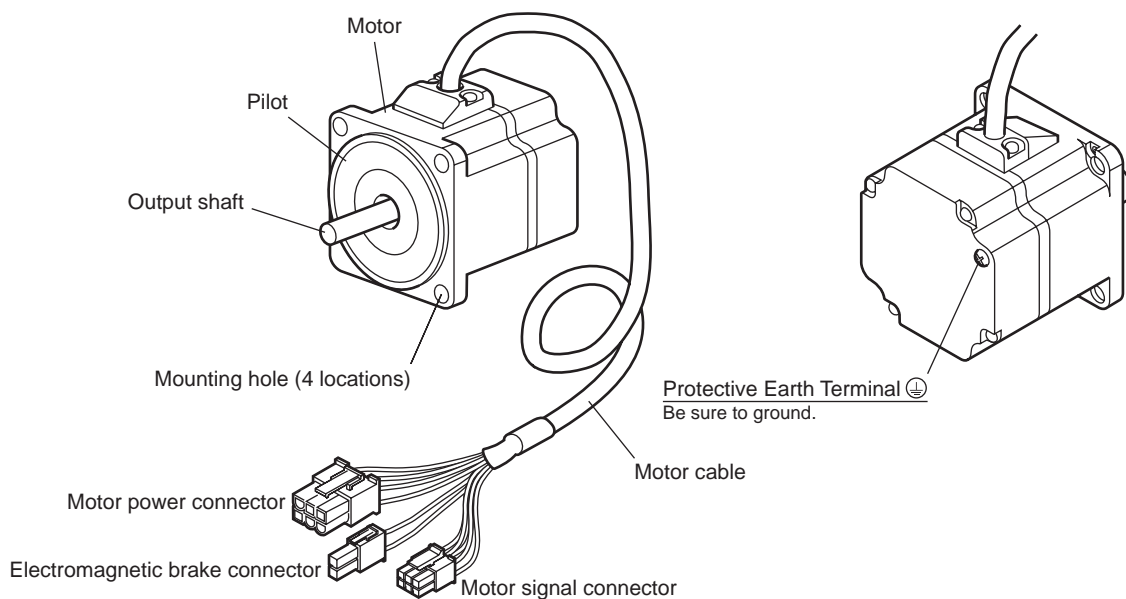
■ Electromagnetic brake type

| Motor type | Model | Motor model | Gearhead model | Driver model |
|---|---------------|---------------|----------------|--------------|
| Combination type • parallel shaft gearhead | BLE23AMR□S-■ | BLEM23M2-GFS | GFS2G□ | BLED3AM-R |
| | BLE23CMR□S-■ | | | BLED3CM-R |
| | BLE46AMR□S-■ | BLEM46M2-GFS | GFS4G□ | BLED6AM-R |
| | BLE46CMR□S-■ | | | BLED6CM-R |
| | BLE512AMR□S-■ | BLEM512M2-GFS | GFS5G□ | BLED12AM-R |
| | BLE512CMR□S-■ | | | BLED12CM-R |
| Combination type • hollow shaft flat gearhead | BLE23AMR□F-■ | BLEM23M2-GFS | GFS2G□FR | BLED3AM-R |
| | BLE23CMR□F-■ | | | BLED3CM-R |
| | BLE46AMR□F-■ | BLEM46M2-GFS | GFS4G□FR | BLED6AM-R |
| | BLE46CMR□F-■ | | | BLED6CM-R |
| | BLE512AMR□F-■ | BLEM512M2-GFS | GFS5G□FR | BLED12AM-R |
| | BLE512CMR□F-■ | | | BLED12CM-R |
| Round shaft type | BLE23AMRA-□ | BLEM23M2-A | - | BLED3AM-R |
| | BLE23CMRA-□ | | | BLED3CM-R |
| | BLE46AMRA-□ | BLEM46M2-A | | BLED6AM-R |
| | BLE46CMRA-□ | | | BLED6CM-R |
| | BLE512AMRA-□ | BLEM512M2-A | | BLED12AM-R |
| | BLE512CMRA-□ | | | BLED12CM-R |

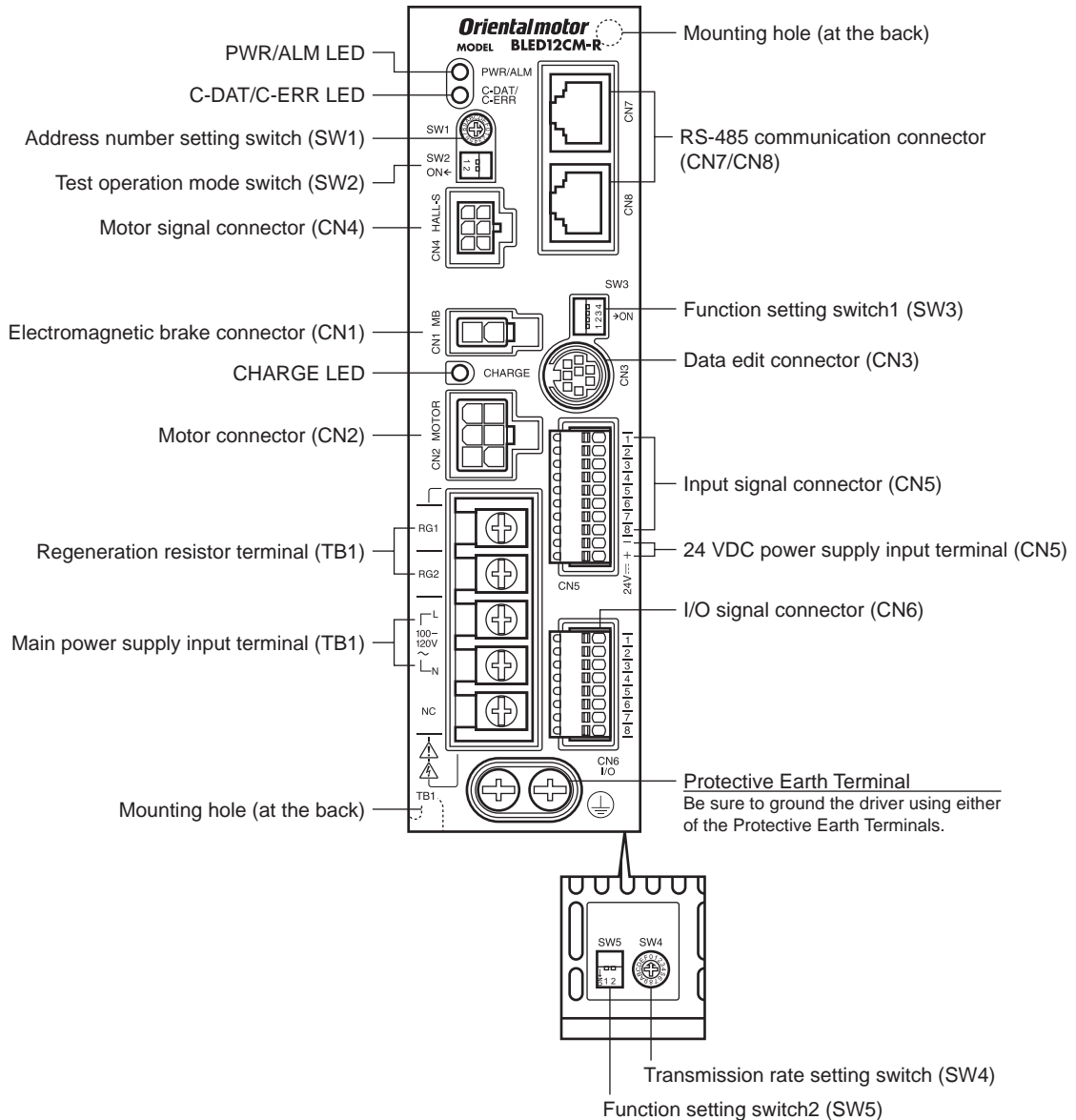
6.4 Names and functions of parts

■ Motor

Illustration shows the electromagnetic brake type.



■ Driver



| Name | Description | Ref. |
|-------------------------------------|--|------------------------|
| 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.143 |
| 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 the RS-485 communication error occurs with the 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. | p.81 p.113 p.125 |
| Address number setting switch (SW1) | Use this switch when controlling the system via RS-485 communication. Using this switch in combination with the SW5-No.1 of the function setting switch2, the address number of RS-485 communication can be set. Factory setting: 0 | |

| Name | Description | Ref. |
|--|---|------------------------|
| Test operation mode switch (SW2) | SW2-No.1: This switch is used to check the connection between the motor and driver before establishing a communication. When having connected properly, setting the SW2-No.1 to the ON side causes the motor to rotate at low speed in the forward direction. Factory setting: OFF | p.39 |
| | SW2-No.2: Not used. (Keep this switch OFF.) | |
| Function setting switch1 (SW3) | <ul style="list-style-type: none"> • SW3-No.1: Not used. (Keep this switch OFF.) • SW3-No.2: Not used. (Keep this switch OFF.) • SW3-No.3: This switch is used to select the power supply for I/O signals (use the built-in power supply or external power supply). To control the operation using relays and switches, set the SW3-No.3 to the ON side to select the built-in power supply. Factory setting: OFF • SW3-No.4: Use this switch when controlling the system via RS-485 communication. The termination resistor (120 Ω) of RS-485 communication can be set. Factory setting: OFF | – |
| Transmission rate setting switch (SW4) | Use this switch when controlling the system via RS-485 communication. The transmission rate of RS-485 communication can be set. Factory setting: 7 | p.81 p.113 p.125 |
| Function setting switch2 (SW5) | Use this switch when controlling the system via RS-485 communication. <ul style="list-style-type: none"> • SW5-No.1: Using this switch in combination with the address number setting switch (SW1), the address number of RS-485 communication can be set. Factory setting: OFF • SW5-No.2: The protocol of RS-485 communication can be set. Factory setting: OFF | |
| Electromagnetic brake connector (CN1) | Connects the electromagnetic brake connector. (Electromagnetic brake type only) | p.33 |
| Motor connector (CN2) | Connects the motor power connector. | |
| Data edit connector (CN3) | Connects a PC in which the MEXE02 has been installed, or the OPX-2A . | p.38 |
| Motor signal connector (CN4) | Connects the motor signal connector. | p.33 |
| Input signal connector (CN5) | Connects the input signals. | p.34 |
| 24 VCD power input terminals (CN5) | Connects the control power supply of the driver. +: +24 VDC power supply input –: Power supply GND [This is shared with the common wire of input signals (0 V)] | p.34 |
| I/O signal connector (CN6) | <ul style="list-style-type: none"> • Connects the external potentiometer (supplied) or external DC power supply. • Connects the output signals. | p.34 |
| RS-485 communication connectors (CN7/CN8) | Connects the RS-485 communication cable. | p.38 |
| Regeneration resistor terminal (TB1) | Connects an accessory regeneration unit EPRC-400P (sold separately). | p.39 |
| Main power supply input terminal (TB1) | Connects to the main power supply. <ul style="list-style-type: none"> • Single-phase 100-120 VAC L, N: Connects a single-phase 100-120 VAC power supply NC: Not used. • Single-phase 200-240 VAC L1, L2: Connects a single-phase 200-240 VAC power supply L3: Not used. • Three-phase 200-240 VAC L1, L2, L3: Connects a three-phase 200-240 VAC power supply | p.32 |
| Protective Earth Terminal | Ground this terminal using a grounding wire of AWG18 to 14 (0.75 to 2.0 mm ²). | |
| Mounting holes (two locations at the back) | These mounting holes are used to install the driver with screws (M4). | p.29 |

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.

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1 Installation

This chapter explains the installation location and installation methods of the motor and driver, as well as how to install a load and external potentiometer.

1.1 Installation location

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

- Inside an enclosure that is installed indoors (provide vent holes)
- Ambient temperature: 0 to +50 °C (+32 to +122 °F) (non-freezing)
- Ambient humidity: 85% or less (non-condensing)
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area free of excessive salt
- Area that is free of explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- Area not subject to splashing water (rain, water droplets), oil (oil droplets) or other liquids
- 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
- Altitude Up to 1000 m (3300 ft.) above sea level

1.2 Installation overview

This section explains an overview of how to install the motor and driver. Refer to each applicable section for details.

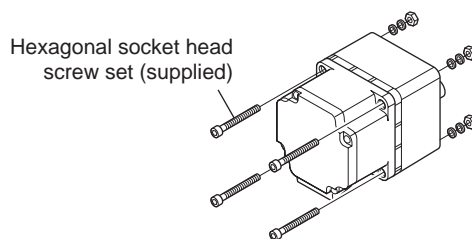
■ Installing the combination type • parallel shaft gearhead and round shaft type

Secure the motor using the hexagonal socket head screws through the four mounting holes. Tighten the nuts until no gaps remain between the motor and mounting plate.

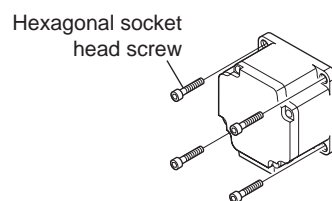
The combination type • parallel shaft gearheads come with a set of hexagonal socket head screws. Round shaft types do not come with hexagonal socket head screws. Hexagonal socket head screws must be provided by the user if round shaft types are used.

For machining dimension of the mounting plate or installing/removing method of the gearhead, see p.22 for the combination type • parallel shaft gearhead and p.23 for the round shaft type.

• Combination type • parallel shaft gearhead



• Round shaft type



Hexagonal socket head screw set (supplied with the combination type • parallel shaft gearhead)

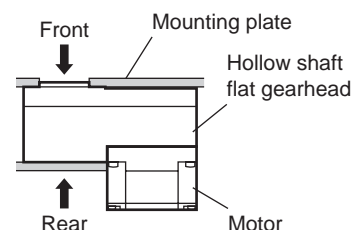
| Model | Nominal thread size | Tightening torque | Maximum applicable plate thickness * |
|---------------|---------------------|----------------------|--------------------------------------|
| BLE23 | M4 | 1.8 N·m (15.9 lb-in) | 5 mm (0.20 in.) |
| BLE46 | M6 | 6.4 N·m (56 lb-in) | 8 mm (0.31 in.) |
| BLE512 | M8 | 15.5 N·m (137 lb-in) | 12 mm (0.47 in.) |

* When the supplied hexagonal socket head screw set is used.

■ Installing the combination type • hollow shaft flat gearhead

A combination type • hollow shaft flat gearhead can be installed by using either its front or rear side as the mounting surface. Install the supplied hexagonal socket head screw set in the four mounting holes you drilled and tighten the nuts until no gaps remain between the motor and mounting plate. Also, attach the supplied safety cover to the hollow output shaft on the end opposite from the one where the load shaft is installed.

Refer to p.23 for the installation method and how to install/remove the gearhead.



Hexagonal socket head screw set (supplied)

| Model | Nominal thread size | Tightening torque | Maximum applicable plate thickness * |
|---------------|---------------------|----------------------|--------------------------------------|
| BLE23 | M5 | 3.8 N·m (33 lb-in) | 5 mm (0.20 in.) |
| BLE46 | M6 | 6.4 N·m (56 lb-in) | 8 mm (0.31 in.) |
| BLE512 | M8 | 15.5 N·m (137 lb-in) | 12 mm (0.47 in.) |

* When the supplied hexagonal socket head screw set is used.

■ Installing the driver

The driver can be installed in two different ways. Refer to p.29 for the specific installation methods.

- Use screws (M4: not supplied) to secure the driver through the mounting holes (two locations) provided at the back of the driver.
- Secure the driver on a DIN rail using the accessory DIN-rail mounting plate (sold separately).

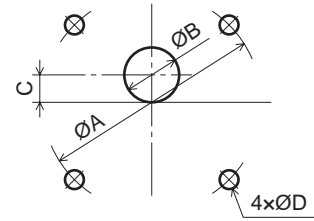
1.3 Installing the combination type • parallel shaft gearhead

■ Mounting hole dimensions [unit: mm (in.)]

| Model | ØA | ØB | C | ØD |
|---------------|------------|-----------|-----------|-------------|
| BLE23 | 70 (2.76) | 24 (0.94) | 10 (0.39) | 4.5 (0.177) |
| BLE46 | 94 (3.70) | 34 (1.34) | 13 (0.51) | 6.5 (0.256) |
| BLE512 | 104 (4.09) | 40 (1.57) | 18 (0.71) | 8.5 (0.335) |

ØB indicates the external dimensions of the product.

Drill holes with a minimum diameter of ØB + 1 mm (0.04 in.).

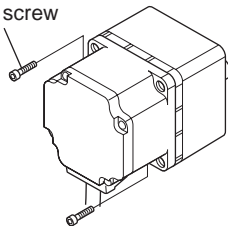


■ Removing/Installing the gearhead

To replace the gearhead or change the cable outlet direction, remove the screws assembling the gearhead. The gearhead can be removed and the motor cable position changed to a desired 90° direction.

1. Remove the hexagonal socket head screws (2 pieces) assembling the motor and gearhead and detach the motor from the gearhead.

Hexagonal socket head screw

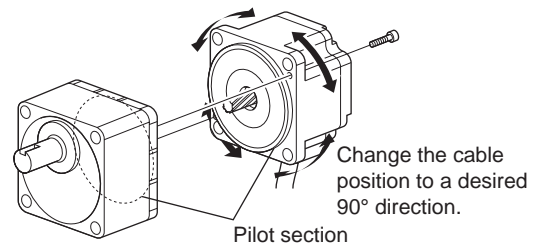


Assembly screws

| Model | Nominal thread size | Tightening torque |
|------------------------------|---------------------|---------------------|
| BLE23 BLE46 | M2.6 | 0.4 N·m (3.5 lb-in) |
| BLE512 | M3 | 0.6 N·m (5.3 lb-in) |

2. Using the pilot sections of the motor and gearhead as guides, install the gearhead to the motor and tighten the hexagonal socket head screws.

At this time, the motor cable position can be changed to a desired 90° direction. When installing the gearhead, slowly rotate it clockwise/counterclockwise to prevent the pinion of the motor output shaft from contacting the side panel or gear of the gearhead. Also confirm that no gaps remain between the motor flange surface and the end face of the gearhead's pilot section.



Note

- Do not forcibly assemble the motor and gearhead. Also, do not let metal objects or other foreign matters enter the gearhead. The pinion of the motor output shaft or gear may be damaged, resulting in noise or shorter service life.
- Do not allow dust to attach to the pilot sections of the motor and gearhead. Also, assemble the motor and gearhead carefully by not pinching the O-ring at the motor's pilot section. If the O-ring is crushed or severed, grease may leak from the gearhead.
- The hexagonal socket head screws assembling the motor and gearhead are used to attach the motor and gearhead temporarily. When installing the product, be sure to use the supplied hexagonal socket head screws (4 pieces).

1.4 Installing the round shaft type

■ Mounting plate size

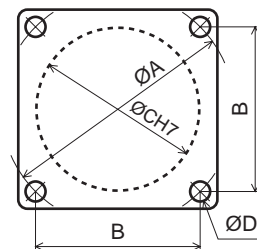
Install the motor to a mounting plate of the following size or larger, so that the motor case temperature will not exceed 90 °C (194 °F).

| Model | Size of mounting plate | Thickness | Material |
|---------------|------------------------------|-----------------|----------------|
| BLE23 | 115×115 mm (4.53×4.53 in.) * | 5 mm (0.20 in.) | Aluminum alloy |
| BLE46 | 135×135 mm (5.31×5.31 in.) | | |
| BLE512 | 165×165 mm (6.50×6.50 in.) | | |

* Electromagnetic brake type: 135×135 mm (5.31×5.31 in.)

■ Mounting hole dimensions [unit: mm (in.)]

| Model | ØA | B | ØCH7 | ØD |
|---------------|------------|---------------|---|-------------|
| BLE23 | 70 (2.76) | 49.5 (1.949) | $54^{+0.030}_0$ (2.1260 $^{+0.0012}_0$) | 4.5 (0.177) |
| BLE46 | 94 (3.70) | 66.47 (2.616) | $73^{+0.030}_0$ (2.8740 $^{+0.0012}_0$) | 6.5 (0.256) |
| BLE512 | 104 (4.09) | 73.54 (2.895) | $83^{+0.035}_0$ (3.2677 $^{+0.0014}_0$) | 8.5 (0.335) |



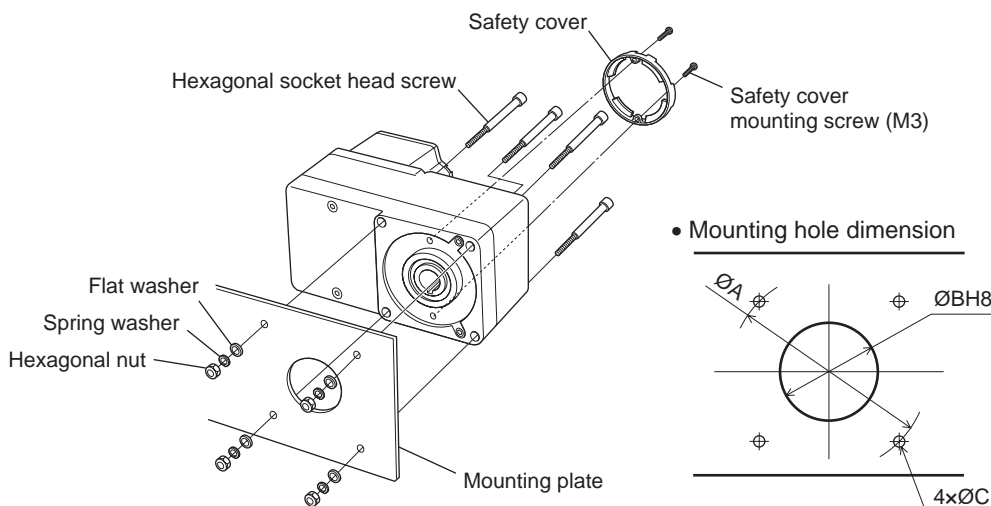
ØC indicates the pilot diameter on the flange.

Note Fit the boss on the gearhead mounting surface into a pilot receiving hole.

1.5 Installing the combination type • hollow shaft flat gearhead

■ Using the front side as the mounting surface

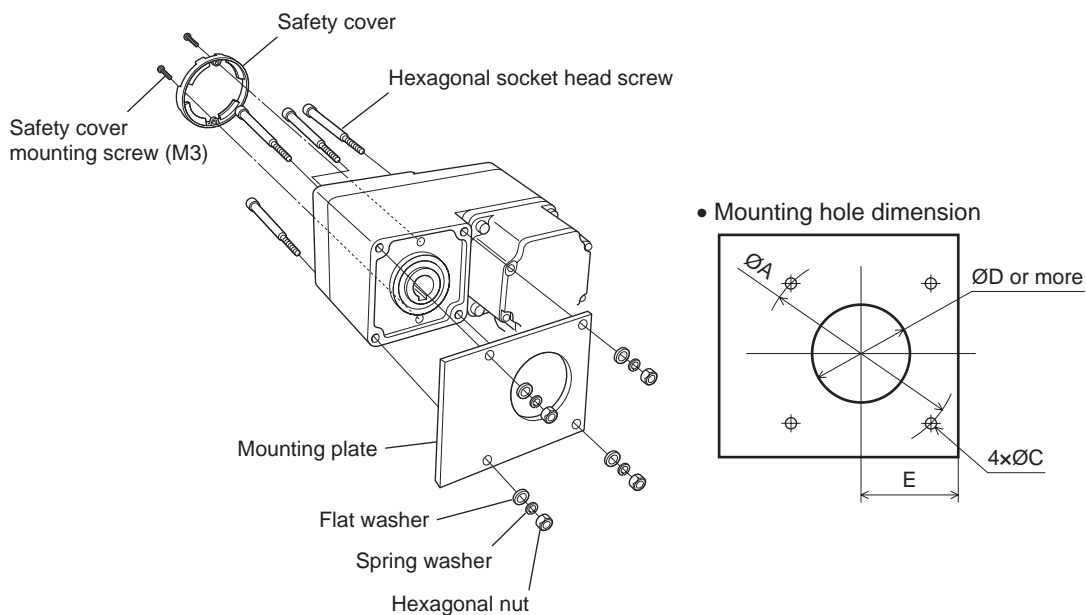
When the gearhead is installed by using its front side as the mounting surface, use the boss of the output shaft to align the center.



Mounting hole dimensions [unit: mm (in.)]

| Model | ØA | ØBH8 | ØC |
|---------------|------------|---|------------|
| BLE23 | 70 (2.76) | $34^{+0.039}_0$ (1.34 $^{+0.0015}_0$) | 5.5 (0.22) |
| BLE46 | 94 (3.70) | $38^{+0.039}_0$ (1.50 $^{+0.0015}_0$) | 6.5 (0.26) |
| BLE512 | 104 (4.09) | $50^{+0.039}_0$ (1.97 $^{+0.0015}_0$) | 8.5 (0.33) |

■ Using the rear side as the mounting surface



Mounting hole dimensions [unit: mm (in.)]

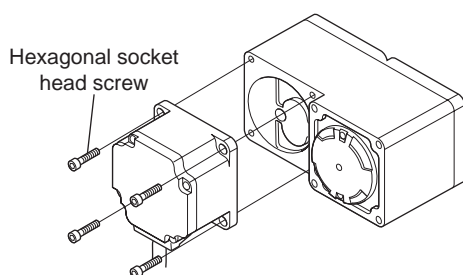
| Model | ØA | ØC | ØD | E |
|---------------|------------|------------|-----------|-----------|
| BLE23 | 70 (2.76) | 5.5 (0.22) | 25 (0.98) | 29 (1.14) |
| BLE46 | 94 (3.70) | 6.5 (0.26) | 30 (1.18) | 39 (1.54) |
| BLE512 | 104 (4.09) | 8.5 (0.33) | 35 (1.38) | 44 (1.73) |

Note When installing the gearhead by using its rear side as the mounting surface, prevent contact between the mounting plate and motor by keeping dimension E below the specified value.

■ Removing/Installing the gearhead

To replace the gearhead or change the cable outlet direction, remove the screws assembling the gearhead. The gearhead can be removed and the motor cable position changed to one of three 90° directions. Note that the motor cable cannot be positioned in the direction where the cable faces the gearhead output shaft.

1. Remove the hexagonal socket head screws (4 pieces) attaching the gearhead and motor and detach the motor from the gearhead.

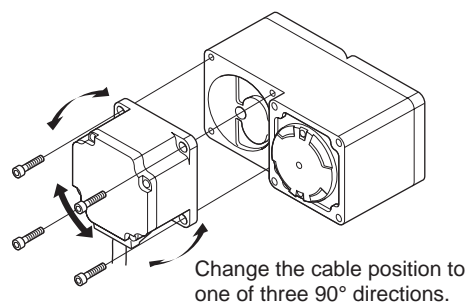


Assembly screws

| Model | Nominal thread size | Tightening torque |
|---------------|---------------------|----------------------|
| BLE23 | M4 | 1.8 N·m (15.9 lb-in) |
| BLE46 | M6 | 6.4 N·m (56 lb-in) |
| BLE512 | M8 | 15.5 N·m (137 lb-in) |

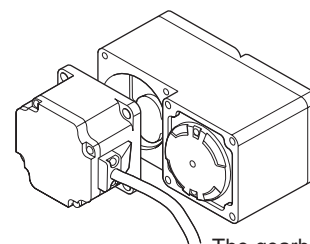
2. Using the pilot sections of the motor and gearhead as guides, install the motor to the gearhead and tighten the hexagonal socket head screws.

At this time, the motor cable position can be changed to one of three 90° directions. Install the motor carefully to prevent the pinion of the motor output shaft from contacting the casing or gear of the gearhead. Also confirm that no gaps remain between the motor flange surface and the end face of the gearhead's pilot section.



Note

- Do not forcibly assemble the motor and gearhead. Also, do not let metal objects or other foreign matters enter the gearhead. The pinion of the motor output shaft or gear may be damaged, resulting in noise or shorter service life.
- Do not allow dust to attach to the pilot sections of the motor and gearhead. Also, assemble the motor carefully by not pinching the O-ring at the motor's pilot section. If the O-ring is pinched, the coupling strength will drop and grease may leak from the gearhead.
- The motor cable position cannot be changed to the direction where the cable faces the gearhead output shaft, because the gearhead case will obstruct the cable.



The gearhead case will obstruct the cable.

1.6 Installing a load to the combination type • parallel gearhead or round shaft type

When installing a load on the motor (gearhead), align the center of the motor output shaft (gearhead output shaft) with the center of the load shaft.

Note

- When coupling the motor (gearhead) with a load, pay attention to centering, belt tension, parallelism of pulleys, etc. Also, firmly secure the tightening screws of the coupling or pulleys.
- When installing a load, do not damage the motor output shaft (gearhead output shaft) or bearing. Forcing in the load by driving it with a hammer, etc., may break the bearing. Do not apply any excessive force to the output shaft.
- Do not modify or machine the motor (gearhead) output shaft. The bearing may be damaged or motor (gearhead) may break.

■ Output shaft shape

- Combination type • parallel shaft gearhead

A key slot is provided on the output shaft of each combination type • parallel shaft gearhead. Form a key slot on the load side and secure the load using the supplied parallel key.

- Round shaft type

A flat section is provided on the motor output shaft of each round shaft type. Apply a double-point screw, etc., at the flat section to firmly secure the load and prevent it from spinning.

■ How to install a load

- Using a coupling

Align the centerline of the motor (gearhead) output shaft with the centerline of the load shaft.

- Using a belt

Adjust the motor (gearhead) output shaft to lie parallel with the load shaft and form right angles between the output shaft/load shaft and the line connecting the centers of both pulleys.

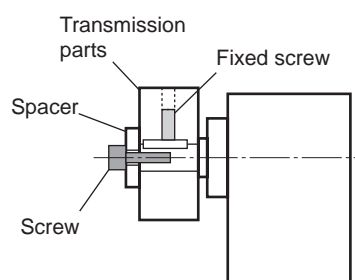
- Using a gear

Adjust the motor (gearhead) output shaft to lie parallel with the gear shaft and allow the output shaft to mesh correctly with the centers of the gear teeth.

- When using the output axis tip screw hole of a gearhead

Use a screw hole provided at the tip of the output shaft as an auxiliary means for preventing the transfer mechanism from disengaging. (GFS2G type have no output shaft tip screw hole.)

| Gearhead model name | Output shaft tip screw hole |
|---------------------|--------------------------------------|
| GFS4G | M5, Effective depth 10 mm (0.39 in.) |
| GFS5G | M6, Effective depth 12 mm (0.47 in.) |



1.7 Installing a load to the combination type • hollow shaft flat gearhead

If the motor is subject to a strong impact upon instantaneous stop or receives a large overhung load, use a stepped load shaft.

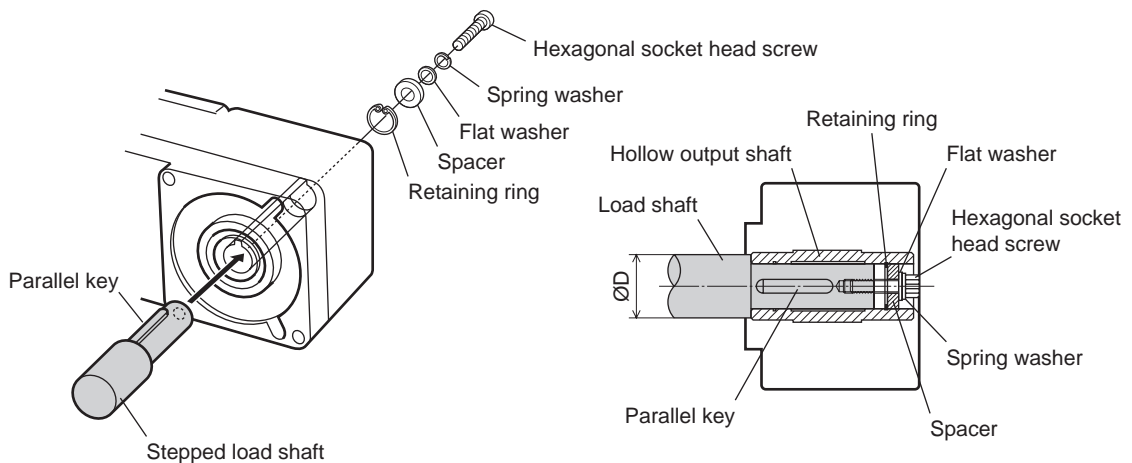
Note

- Apply grease (molybdenum disulfide grease, etc.) on the surface of the load shaft and inner walls of the hollow output shaft to prevent seizure.
- When installing a load, do not damage the hollow output shaft or bearing of the gearhead. Forcing in the load by driving it with a hammer, etc. may break the bearing. Do not apply any excessive force to the hollow output shaft.
- Do not modify or machine the hollow output shaft of the gearhead. Doing so may damage the bearings and destroy the gearhead.

■ Stepped load shaft

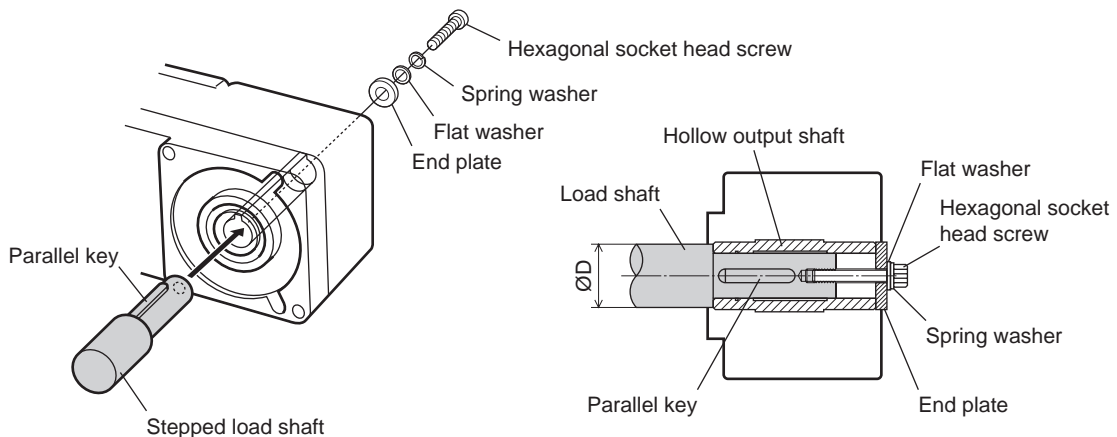
• Mounting method using retaining ring

Secure the retaining ring to the load shaft by tightening the hexagonal socket head screw over a spacer, flat washer and spring washer.



• Mounting method using end plate

Secure the end plate to the load shaft by tightening the hexagonal socket head screw over a flat washer and spring washer.



Note

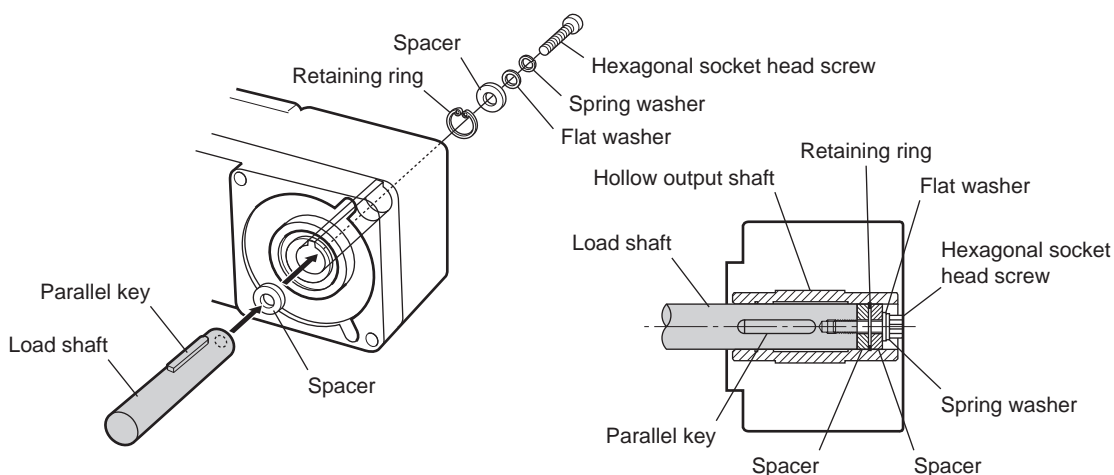
The safety cover (supplied) cannot be attached due to contact between the safety cover and hexagonal socket head screw. Take safety measures against rotating part.

• Recommended load shaft installation dimensions [Unit: mm (in.)]

| Model | Inner diameter of hollow shaft (H8) | Recommended diameter of load shaft (h7) | Nominal diameter of retaining ring | Applicable screw | Spacer thickness | Outer diameter of stepped shaft (ØD) |
|---------------|---|---|------------------------------------|------------------|------------------|--------------------------------------|
| BLE23 | $\varnothing 12^{+0.027}_0$ ($\varnothing 0.4724^{+0.0011}_0$) | $\varnothing 12^{-0.018}_0$ ($\varnothing 0.4724^{-0.0007}_0$) | $\varnothing 12$ (Ø0.47) | M4 | 3 (0.12) | 20 (0.79) |
| BLE46 | $\varnothing 15^{+0.027}_0$ ($\varnothing 0.5906^{+0.0011}_0$) | $\varnothing 15^{-0.018}_0$ ($\varnothing 0.5906^{-0.0007}_0$) | $\varnothing 15$ (Ø0.59) | M5 | 4 (0.16) | 25 (0.98) |
| BLE512 | $\varnothing 20^{+0.033}_0$ ($\varnothing 0.7874^{+0.0013}_0$) | $\varnothing 20^{-0.021}_0$ ($\varnothing 0.7874^{-0.0008}_0$) | $\varnothing 20$ (Ø0.79) | M6 | 5 (0.20) | 30 (1.18) |

■ Non-stepped load shaft

Install a spacer on the load shaft side and secure the retaining ring to the load shaft by tightening the hexagonal socket head screw over a spacer, flat washer and spring washer.



Recommended load shaft installation dimensions [Unit: mm (in.)]

| Model | Inner diameter of hollow shaft (H8) | Recommended diameter of load shaft (h7) | Nominal diameter of retaining ring | Applicable screw | Spacer thickness |
|---------------|---|---|------------------------------------|------------------|------------------|
| BLE23 | $\varnothing 12^{+0.027}_0$ ($\varnothing 0.4724^{+0.0011}_0$) | $\varnothing 12^{-0.018}_0$ ($\varnothing 0.4724^{-0.0007}_0$) | $\varnothing 12$ (Ø0.47) | M4 | 3 (0.12) |
| BLE46 | $\varnothing 15^{+0.027}_0$ ($\varnothing 0.5906^{+0.0011}_0$) | $\varnothing 15^{-0.018}_0$ ($\varnothing 0.5906^{-0.0007}_0$) | $\varnothing 15$ (Ø0.59) | M5 | 4 (0.16) |
| BLE512 | $\varnothing 20^{+0.033}_0$ ($\varnothing 0.7874^{+0.0013}_0$) | $\varnothing 20^{-0.021}_0$ ($\varnothing 0.7874^{-0.0008}_0$) | $\varnothing 20$ (Ø0.79) | M6 | 5 (0.20) |

1.8 Permissible radial load and permissible axial load

Make sure the radial load and axial load received by the motor (gearhead) output shaft will not exceed the allowable values shown in the table below.

Note If the radial load or axial load exceeds the specified allowable value, repeated load applications may cause the bearing or output shaft of the motor (gearhead) to undergo a fatigue failure.

■ Combination type • parallel shaft gearhead

| Model | Gear ratio | Distance from tip of gearhead output shaft and permissible radial load [N (lb.)] * | | Permissible axial load [N (lb.)] |
|---------------|------------|--|-----------------------|----------------------------------|
| | | 10 mm (0.39 in.) | 20 mm (0.79 in.) | |
| BLE23 | 5 | 100 (22) [90 (20)] | 150 (33) [110 (24)] | 40 (9) |
| | 10 to 20 | 150 (33) [130 (29)] | 200 (45) [170 (38)] | |
| | 30 to 200 | 200 (45) [180 (40)] | 300 (67) [230 (51)] | |
| BLE46 | 5 | 200 (45) [180 (40)] | 250 (56) [220 (49)] | 100 (22) |
| | 10 to 20 | 300 (67) [270 (60)] | 350 (78) [330 (74)] | |
| | 30 to 200 | 450 (101) [420 (94)] | 550 (123) [500 (112)] | |
| BLE512 | 5 | 300 (67) [230 (51)] | 400 (90) [300 (67)] | 150 (33) |
| | 10 to 20 | 400 (90) [370 (83)] | 500 (112) [430 (96)] | |
| | 30 to 200 | 500 (112) [450 (101)] | 650 (146) [550 (123)] | |

* The values assume a rated speed of 3000 r/min or below. The values in [] are based on a rated speed of 4000 r/min.

■ Combination type • hollow shaft flat gearhead

| Model | Gear ratio | Distance from gearhead mounting surface and permissible radial load [N (lb.)] * | | Permissible axial load [N (lb.)] |
|---------------|------------|---|-------------------------|----------------------------------|
| | | 10 mm (0.39 in.) | 20 mm (0.79 in.) | |
| BLE23 | 5, 10 | 450 (101) [410 (92)] | 370 (83) [330 (74)] | 200 (45) |
| | 15 to 200 | 500 (112) [460 (103)] | 400 (90) [370 (83)] | |
| BLE46 | 5, 10 | 800 (180) [730 (164)] | 660 (148) [600 (135)] | 400 (90) |
| | 15 to 200 | 1200 (270) [1100 (240)] | 1000 (220) [910 (200)] | |
| BLE512 | 5, 10 | 900 (200) [820 (184)] | 770 (173) [700 (157)] | 500 (112) |
| | 15, 20 | 1300 (290) [1200 (270)] | 1110 (240) [1020 (220)] | |
| | 30 to 200 | 1500 (330) [1400 (310)] | 1280 (280) [1200 (270)] | |

* The values assume a rated speed of 3000 r/min or below. The values in [] are based on a rated speed of 4000 r/min.

■ Round shaft type

| Model | Distance from tip of motor output shaft and permissible radial load [N (lb.)] | | Permissible axial load [N (lb.)] |
|---------------|---|------------------|--|
| | 10 mm (0.39 in.) | 20 mm (0.79 in.) | |
| BLE23 | 80 (18) | 100 (22) | Not to exceed one-half the motor's dead weight * |
| BLE46 | 110 (24) | 130 (29) | |
| BLE512 | 150 (33) | 170 (38) | |

* Minimize the axial load. If a thrust load must be applied, do not let it exceed one-half the motor's mass.

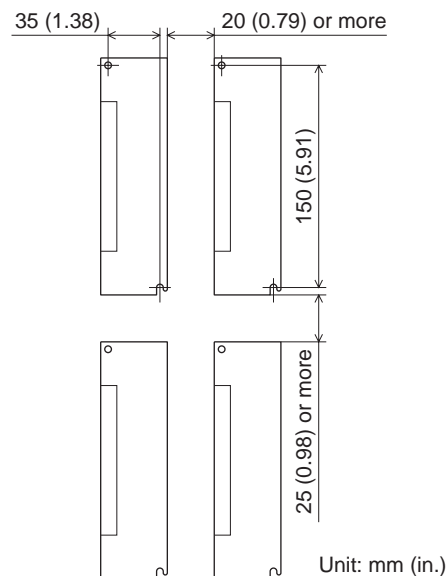
1.9 Installing the driver

The driver is designed so that heat is dissipated via air convection and conduction through the enclosure. Install the driver to a flat metal plate offering excellent vibration resistance.

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.

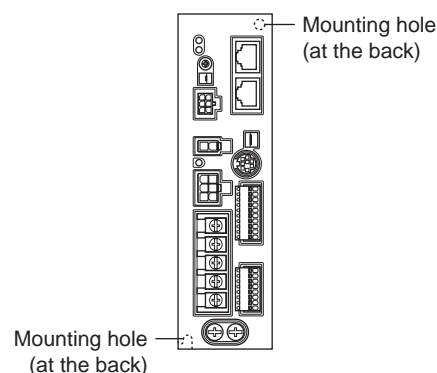
Note

- Install the driver in an enclosure whose degree of protection is IP54 minimum if the driver is used in an environment of pollution degree 3.
- Be sure to install the driver vertically (in vertical position) shown in the figure. Do not block the radiation openings.
- Do not install any equipment that generates a large amount of heat or noise near the driver.
- If the ambient temperature of the driver exceeds the upper limit of the operating ambient temperature, revise the ventilation condition or forcibly cool the area around the driver using a fan in order to keep within the operating ambient temperature.



■ Installing with screws

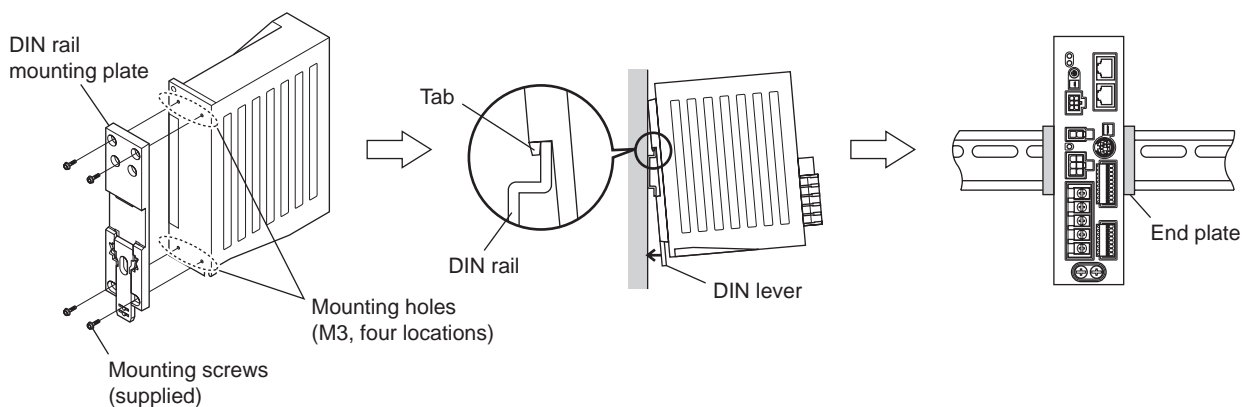
Install the driver vertically (in vertical position) and secure the driver through the mounting holes using two screws (M4: not supplied).



■ Mounting to DIN rail

When mounting the driver to a DIN rail, use a separately sold DIN rail mounting plate (model number: **PADP03**) and attach it to a 35 mm (1.38 in.) wide DIN rail.

1. Attach the DIN rail mounting plate to the back of the driver using the screws supplied with the plate.
Tightening torque: 0.3 to 0.4 N·m (2.6 to 3.5 lb-in)
2. Pull the DIN lever down, engage the upper tab of the DIN rail mounting plate over the DIN rail, and push the DIN lever until it locks in place.
3. Fix the driver with the end plate (not supplied).

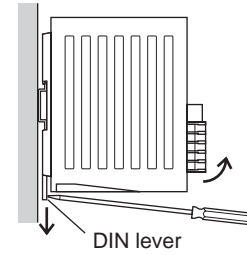


Note

- Do not use the mounting holes for the DIN rail mounting plate for any purpose other than securing the DIN rail mounting plate.
- Be sure to use the supplied screws when securing the DIN rail mounting plate. The use of screws that would penetrate 3 mm (0.12 in.) or more through the surface of the driver may cause damage to the driver.

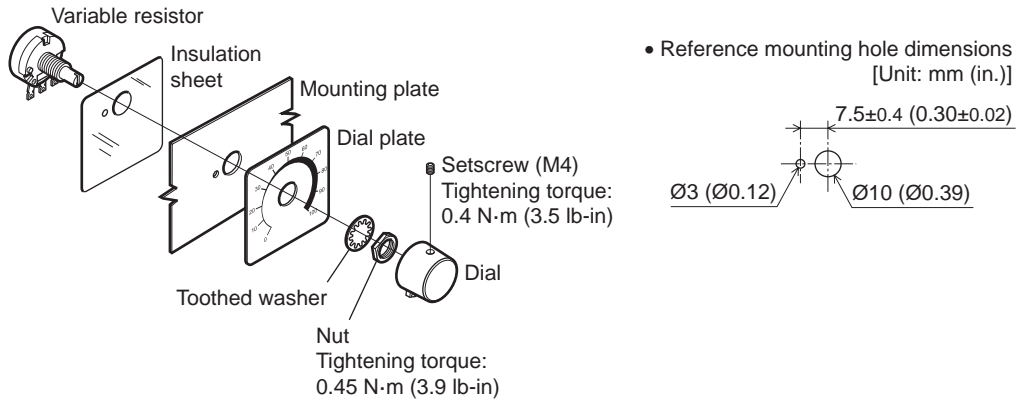
Removing from DIN rail

Pull the DIN lever down until it locks using a flat tip screwdriver, and lift the bottom of the driver to remove it from the rail.
Use force of about 10 to 20 N (2.2 to 4.5 lb.) to pull the DIN lever to lock it.
Excessive force may damage the DIN lever.



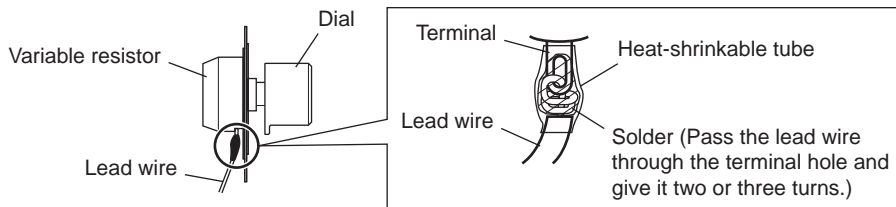
1.10 Installing the external potentiometer (supplied)

Install the external potentiometer as shown below.



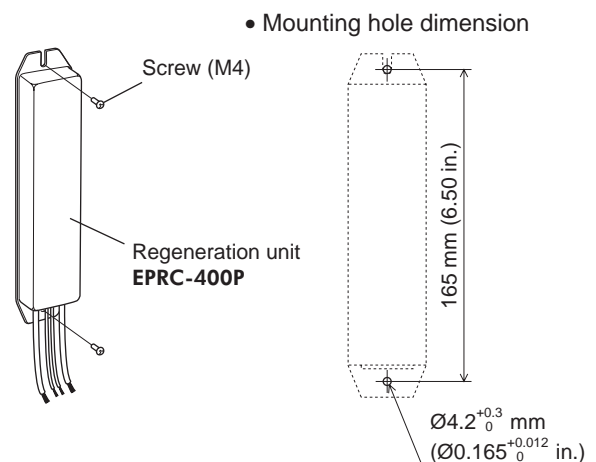
Soldering the variable resistor terminal and the lead wires

Cover a heat-shrinkable tube over the soldered part to insulate.
Soldering condition: 235 °C (455 °F), less than 5 sec.



1.11 Installing the regeneration unit (sold separately)

Install the regeneration unit **EPRC-400P** in a location where heat dissipation capacity equivalent to a level achieved with a heat sink [made of aluminum alloy, 350×350×3 mm (13.78×13.78×0.12 in.)] is ensured. Secure it on a smooth metal plate offering high heat conductivity, using two screws (M4, not supplied).

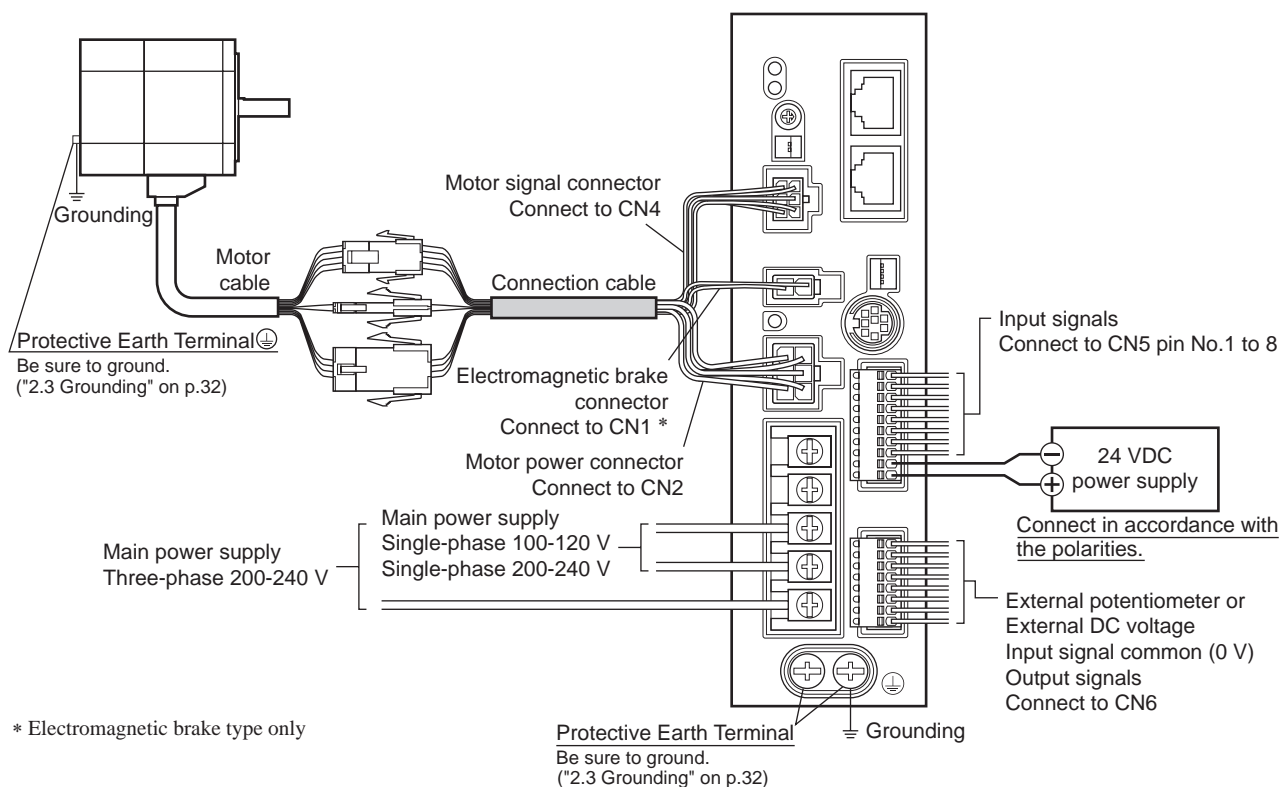


2 Connection

This chapter explains how to connect the driver and motor, I/O signals, and power supply, as well as the grounding method.

2.1 Connection example

The following figure is a connection example when an electromagnetic brake motor is used.



Note

- Have the connector plugged in securely. Insecure connections may cause malfunction or damage to the motor or driver.
- When connecting the 24 VDC power supply, check the indication of the driver case and pay attention to the polarity of the power supply. Reverse-polarity connection may cause damage to the driver.
- When unplugging the 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.
- When installing the motor to a moving part, use an accessory flexible cable (sold separately) offering excellent flexibility. For the flexible motor cable, refer to p.160.

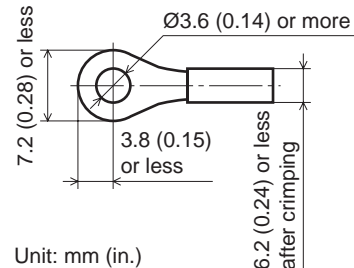
2.2 Connecting the power supply

Connect the power cable to the main power supply input terminals (TB1) on the driver.
The product does not come with a power cable. It must be supplied by the user.

| Power supply input | Connecting method |
|------------------------|--|
| Single-phase 100-120 V | Connect the live side to terminal L, and the neutral side to terminal N. |
| Single-phase 200-240 V | Connect the live side to terminal L1, and the neutral side to terminal L2. |
| Three-phase 200-240 V | Connect the R, S and T phase lines to the L1, L2 and L3 terminals, respectively. |

Power connection terminal and cable

- Applicable crimp terminal: Round crimp terminal with insulation cover
- Thread size of terminal: M3.5
- Tightening torque: 1.0 N·m (8.8 lb-in)
- Applicable lead wire: AWG18 to 14 (0.75 to 2.0 mm²)
- Conductive material: Use only copper wire.



■ Circuit breaker

Be sure to connect a circuit breaker to the power line of the driver to protect the primary circuit.

- Rated current of protective device: Single-phase input 10 A, three-phase input 5 A
- Circuit breaker: Mitsubishi Electric Corporation NF30

2.3 Grounding

Be sure to ground using the Protective Earth Terminal ⚡ of the motor and the Protective Earth Terminal ⚡ of the driver.

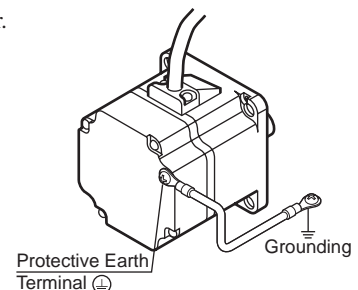
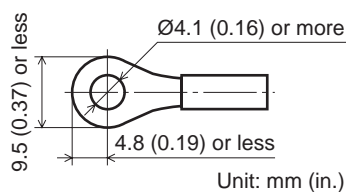
Note Be sure to ground the motor and driver. Failure to do so may result in electric shock or damage to the product. Static electricity may cause damage to the product if the Protective Earth Terminals are not grounded.

■ Motor

Connect the Protective Earth Terminal ⚡ on the motor to the ground near the motor.
Minimize the wiring length of the ground cable.

Ground terminal and cable

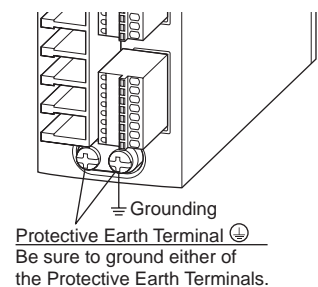
- Applicable crimp terminal: Round crimp terminal with insulation cover
- Thread size of terminal: M4
- Tightening torque: 0.8 to 1.0 N·m (7.0 to 8.8 lb-in)
- Applicable lead wire: AWG18 to 14 (0.75 to 2.0 mm²)



■ Driver

Either of the two Protective Earth Terminals can be used for grounding the driver.
The terminal that is not grounded can be used as a spare terminal. Use the spare terminal according to your specific need, such as connecting it to the motor in order to ground the motor. Do not share the Protective Earth Terminal with a welder or any other power equipment. When grounding the Protective Earth Terminal, secure the grounding point near the driver.

- Applicable crimp terminal: Round crimp terminal with insulation cover
- Thread size of terminal: M4
- Tightening torque: 1.2 N·m (10.6 lb-in)
- Applicable lead wire: AWG18 to 14 (0.75 to 2.0 mm²)



■ Precautions about static electricity

Static electricity may cause the driver to malfunction or suffer damaged.

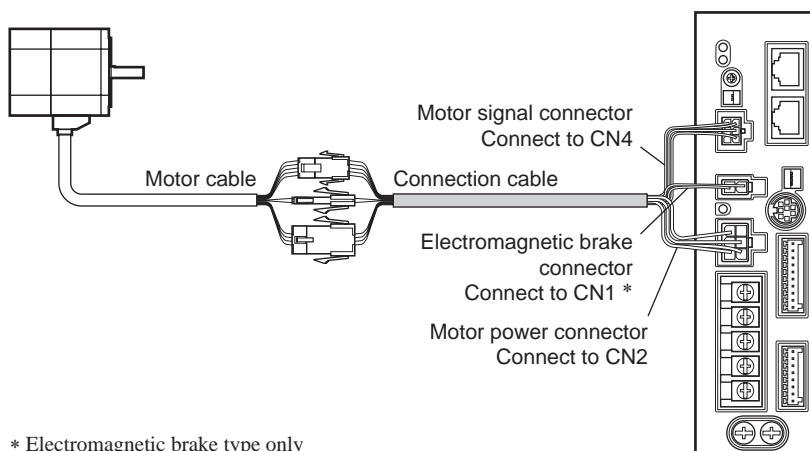
Be sure to ground the motor and driver to prevent them from being damaged by static electricity.

2.4 Connecting the motor and driver

Connect the motor power connector to the CN2, and the motor signal connector to the CN4 on the driver.

When using an electromagnetic brake type motor, also connect the electromagnetic brake connector to the CN1.

When extending the connection distance between the motor and driver, use the connection cable (supplied or sold separately).

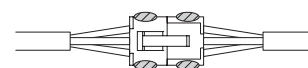


* Electromagnetic brake type only

Note Have the connector plugged in securely. Insecure connector connection may cause malfunction or damage to the motor or driver.

■ Notes about connector connection

Note When inserting connectors or pulling out connectors, be sure to do with holding the connector bodies. Doing with holding the cables may cause a connection failure.



○ Position to hold the connector

● When inserting the connector

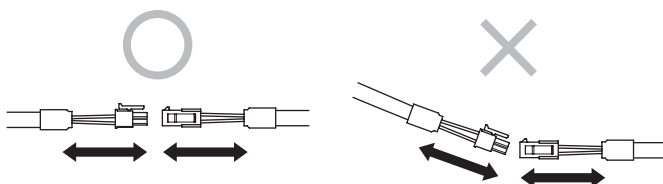
Hold the connector bodies, and insert in straight securely.

Inserting the connector in an inclined state may result in damage to terminals or a connection failure.

● When pulling out the connector

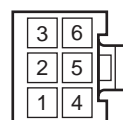
Pull out the connector in straight while releasing the lock part of the connector.

Pulling out the connector with holding the cable (lead wire) may result in damage to the connector.



● Pin assignment of motor power connector

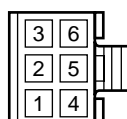
| Pin No. | Color | Lead size |
|---------|--------|-----------------------------|
| 1 | Blue | AWG18 |
| 2 | - | - |
| 3 | - | Drain (AWG24 or equivalent) |
| 4 | Purple | AWG18 |
| 5 | Gray | |
| 6 | - | - |



Housing: 5557-06R-210 (Molex)
Terminal: 5556T (Molex)

● Pin assignment of motor signal connector

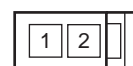
| Pin No. | Color | Lead size |
|---------|--------|-----------|
| 1 | - | - |
| 2 | Green | AWG26 |
| 3 | Yellow | |
| 4 | Brown | |
| 5 | Red | |
| 6 | Orange | - |



Housing: 43025-0600 (Molex)
or
794617-6 (TE Connectivity)
Terminal: 43030-0004 (Molex)

● Pin assignment of electromagnetic brake connector

| Pin No. | Color | Lead size |
|---------|-------|-----------|
| 1 | Black | AWG24 |
| 2 | White | |

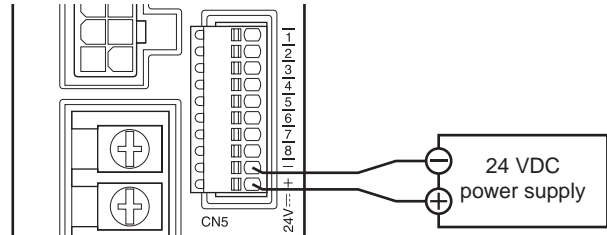


Housing: 5557-02R-210 (Molex)
Terminal: 5556T (Molex)

2.5 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 which voltage is 24 VDC -15% to $+20\%$ and current is 1 A or more, to the CN5.

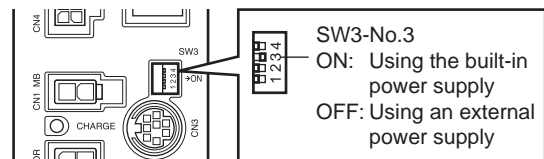


- Note**
- When connecting the 24 VDC power supply, check the indication of the driver case and pay attention to the polarity of the power supply. Reverse-polarity connection may cause damage to the driver.
 - When cycling the 24 VDC power, turn off the power and wait for the PWR/ALM LED to turn off.

2.6 Selecting the input signal power supply

Select the input signal power supply (built-in power supply or external power supply) to be used.

The driver comes with a built-in power supply. To control the operation using relays and switches, set the SW3-No.3 of the function setting switch1 to the ON side to select the built-in power supply.



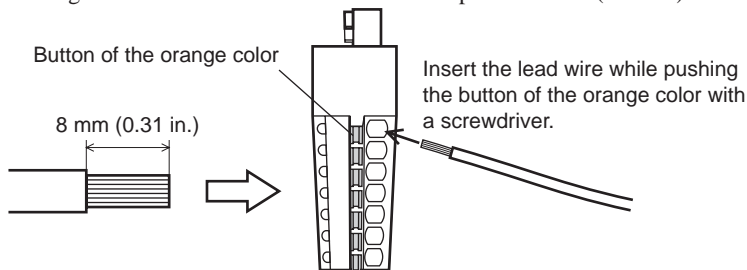
Factory setting: OFF (an external power supply is used)

- Note** The built-in power supply cannot be used with the source logic. If the source logic is used, do not turn the external voltage selector switch to the ON side.

2.7 Connecting the I/O signals

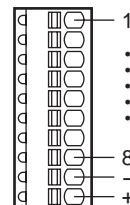
Connect the input signals to the CN5, and connect the analog external speed setting input signals and output signals to the CN6.

- Applicable lead wire: AWG26 to 20 (0.14 to 0.5 mm²)
- Length of the insulation cover which can be peeled: 8 mm (0.31 in.)



■ CN5 pin assignment

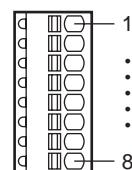
| Pin No | Name | Description * |
|--------|---------|--|
| 1 | IN0 | Input terminal 0 [FWD] |
| 2 | IN1 | Input terminal 1 [REV] |
| 3 | IN2 | Input terminal 2 [STOP-MODE] |
| 4 | IN3 | Input terminal 3 [M0] |
| 5 | IN4 | Input terminal 4 [ALARM-RESET] |
| 6 | IN5 | Input terminal 5 [MB-FREE] |
| 7 | IN6 | Input terminal 6 [TH] |
| 8 | IN-COM0 | Input signal common |
| - | - | Power supply GND/ Input signal common (0 V) |
| + | - | 24 VDC power supply |



* The signal in brackets [] is a function that is assigned at the time of shipment. The assignments can be changed using the **OPX-2A** or **MEXE02**, or via RS-485 communication.

■ CN6 pin assignment

| Pin No | Name | Description *2 |
|--------|---------|-------------------------------------|
| 1 | VH | Analog external speed setting input |
| 2 | VM | |
| 3 | VL *1 | |
| 4 | IN-COM1 | Input signal common (0 V) |
| 5 | OUT0+ | Output terminal 0 (+) [SPEED-OUT] |
| 6 | OUT0- | Output terminal 0 (-) [SPEED-OUT] |
| 7 | OUT1+ | Output terminal 1 (+) [ALARM-OUT1] |
| 8 | OUT1- | Output terminal 1 (-) [ALARM-OUT1] |

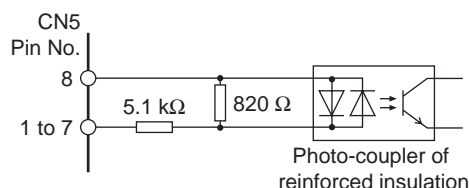


*1 The VL input is connected to IN-COM1 inside the driver.

*2 The signal in brackets [] is a function that is assigned at the time of shipment. The assignments can be changed using the **OPX-2A** or **MEXE02**, or via RS-485 communication.

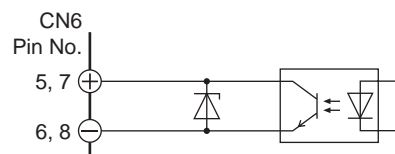
■ Input signal circuit

All input signals of the driver are photocoupler inputs.
When an external power supply is used: 24 VDC -15 to $+20\%$,
100 mA or more



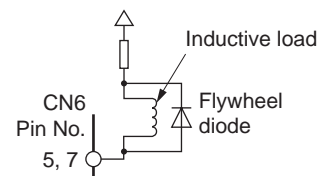
■ Output signal circuit

All output signals of the driver are photocoupler/open-collector outputs. The ON voltage of the output circuit is 1.6 VDC maximum.
When driving each element using the output signal circuit, give consideration to this ON voltage.
4.5 to 30 VDC, 40 mA or less (For the SPEED-OUT output, supply at least 5 mA of current.)



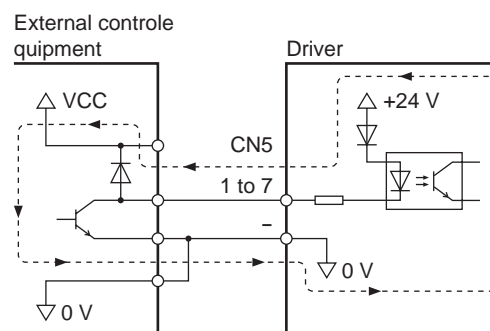
Note

- For output signals, be sure to connect a current-limiting resistor so that the current does not exceed 40 mA.
When using a programmable controller, check the resistance value inside the controller and connect a currentlimiting resistor as necessary.
- When connecting a relay (inductive load), etc., to detect alarm outputs, use a relay with built-in flywheel diode, or provide a fly-back voltage control measure based on diode, etc., for the inductive load.



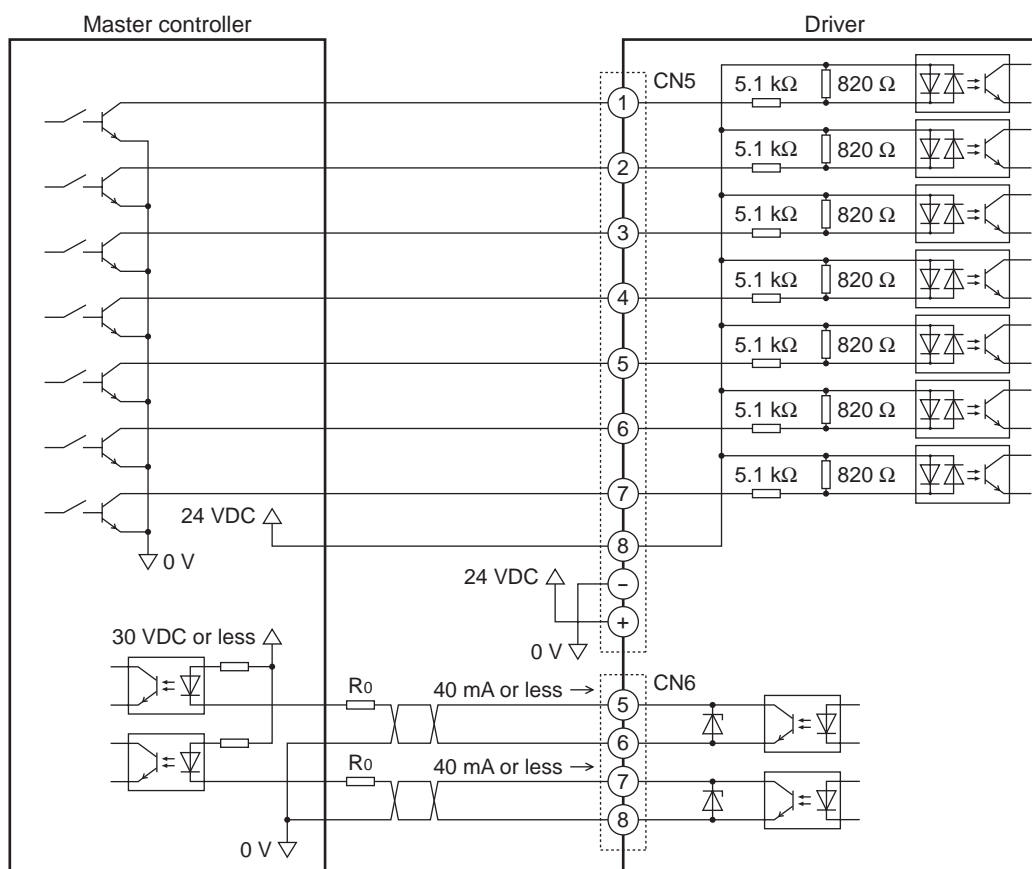
■ Using a controller with a built-in clamp diode

If a controller with a built-in clamp diode is used, a leakage path may form and cause the motor to operate even when the controller power is off, as long as the driver power is on. Since the power capacity of the controller is different from that of the driver, the motor may operate when the controller and driver powers are turned on or off simultaneously. When powering down, turn off the driver power first, followed by the controller power. When powering up, turn on the controller power first, followed by the driver power.



■ Connection example with I/O signal circuit

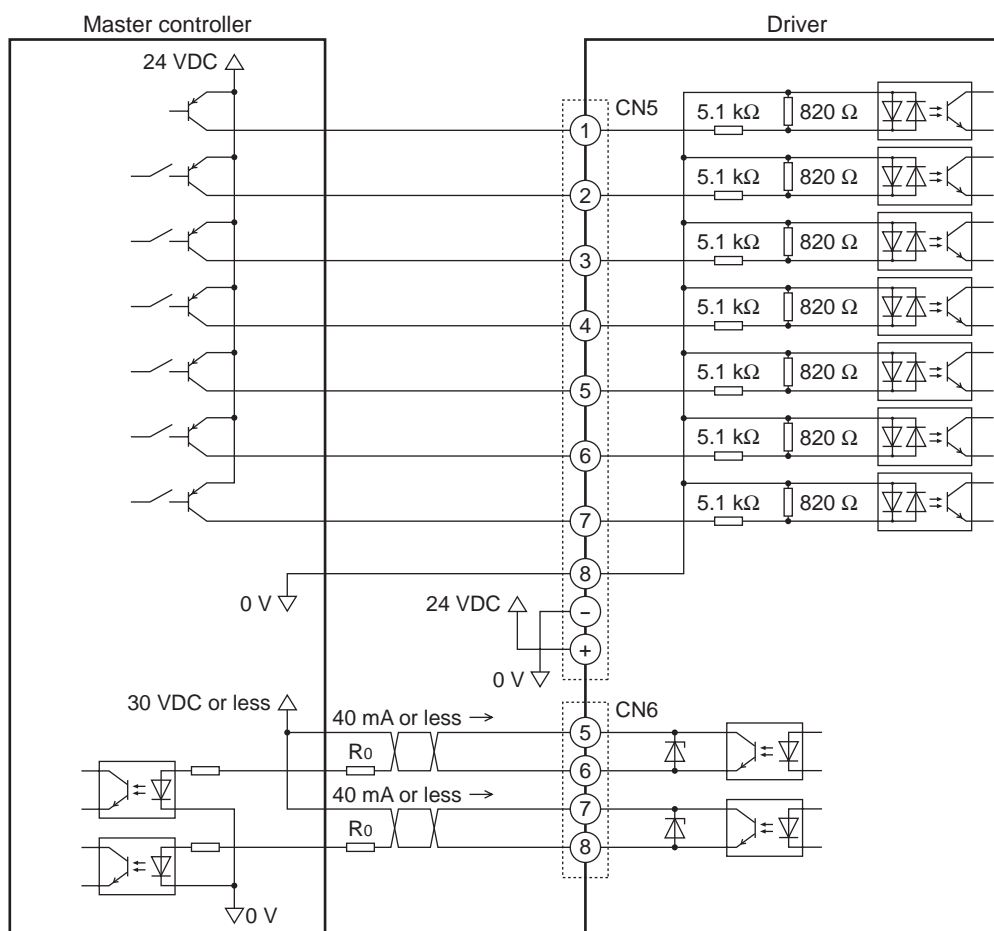
- Sink logic circuit



Note

- Keep the output signal to 30 VDC or less.
- For output signals, be sure to connect a current-limiting resistor R₀ so that the current does not exceed 40 mA.
When using a programmable controller, check the resistance value inside the controller and connect a currentlimiting resistor R₀ as necessary.

- Source logic circuit


Note

- Keep the output signal to 30 VDC or less.
- For output signals, be sure to connect a current-limiting resistor R_0 so that the current does not exceed 40 mA.
When using a programmable controller, check the resistance value inside the controller and connect a currentlimiting resistor R_0 as necessary.

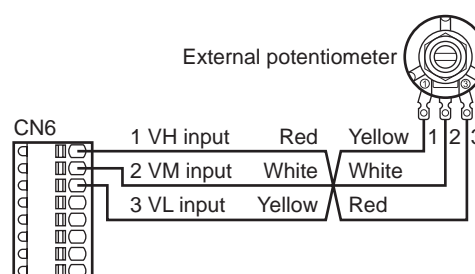
2.8 Connecting an external speed setter

The rotation speed can be set using an external potentiometer (supplied) or external DC voltage. Refer to p.66 for setting method.

- Using an external potentiometer

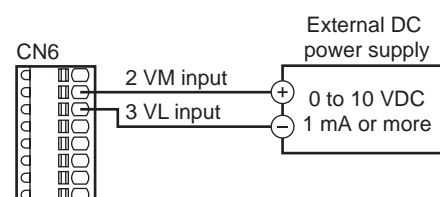
Connect the supplied external potentiometer to the pin Nos.1 to 3 of CN6 of the driver. Use the supplied signal wire for this connection.

Connect the shield wire of the signal wire to the VL input terminal. Make sure the shield wire does not contact other terminals.



- Using an external DC voltage

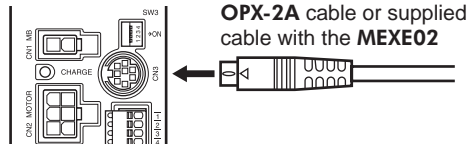
For the external voltage, use a DC power supply (0 to 10 VDC) with reinforced insulation on both the primary side and secondary side, and connect it to the pin Nos. 2 and 3 of CN6 of the driver. The input impedance between the VM input and VL input is approximately 30 kΩ. The VL input is connected to IN-COM1 inside the driver.


Note

Be sure to set the external DC voltage to 10 VDC or less. When connecting the external DC power supply, make sure the polarities are correct. If the polarities are reversed, the driver may be damaged.

2.9 Connecting the data setter

Connect **OPX-2A** cable or supplied cable with the **MEXE02** to CN3 on the driver.



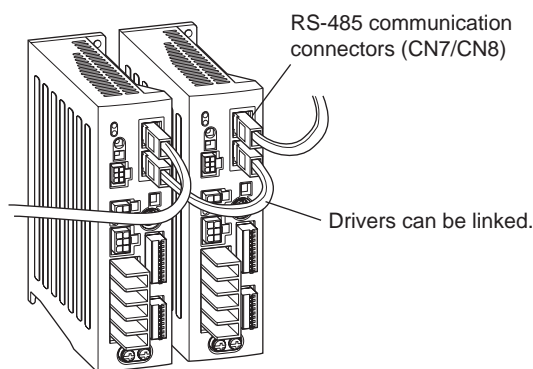
⚠ CAUTION

The data edit connector (CN3), I/O signal connectors (CN5/CN6) and RS-485 communication connectors (CN7/CN8) are not 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 these equipment and driver to short, damaging both.

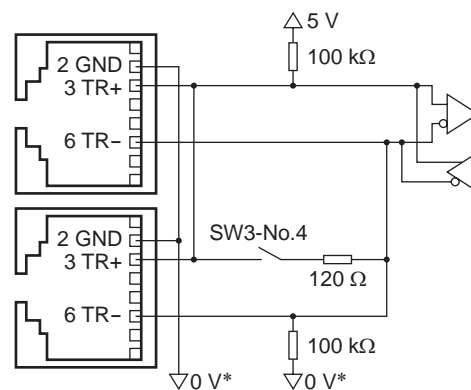
2.10 Connecting the RS-485 communication cable

Connect this cable when controlling the product via RS-485 communication. Connect the RS-485 communication cable to the CN7 or CN8 on the driver.

The vacant connector can be used to connect a different driver. A driver link cable is available as an accessory (sold separately). See p.160. A commercial LAN cable can be also used to link drivers.



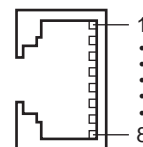
• Internal circuit



* The GND line is used in common with 24 VDC power supply input terminal (CN5).

CN7/CN8 pin assignment

| Pin No | 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. | |

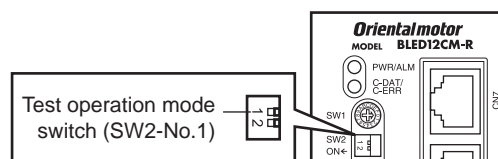


2.11 Test operation

Once a main power supply and 24 VDC power supply are connected, the connection status can be checked by driving the motor tentatively without setting the data.

1. Turn on the main power supply and 24 VDC power supply after completing the wiring.
2. Turn the test operation mode switch (SW2-No.1) ON.

3. Check that the motor rotates at low speed (100 r/min) in the forward direction.
If the motor did not rotate or malfunction could be seen, check the wiring after turning off the power.



(If the rotation direction has been changed by the **OPX-2A** or **MEXE02**, or via RS-485 communication, the motor rotates according to the setting.)

4. Turn the test operation mode switch OFF.
The motor stops.

Note If the FWD input or REV input is turned ON while the motor rotates in test operation, the motor will stop. (A warning or alarm signal is not output.) To reset this condition, turn all of test operation mode switch, FWD input and REV input OFF. The motor will be able to operate after turning all of them OFF.

2.12 Connecting the regeneration unit

If vertical drive (gravitational operation) such as elevator applications is performed or if sudden start-stop operation of a large inertial load is repeated frequently, connect the regeneration unit **EPRC-400P**.

Install the regeneration unit in a location where heat dissipation capacity equivalent to a level achieved with a heat sink [made of aluminum alloy, 350×350×3 mm (13.78×13.78×0.12 in.)] is ensured.

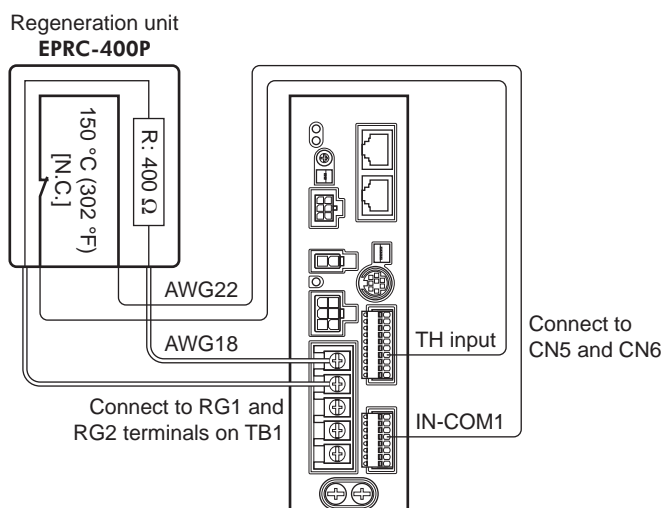
■ Connecting method

The wiring of the regeneration unit to the driver I/O terminals varies depending on the connecting methods.

Refer to p.41, 42, 43 for connecting method.

Connect the regeneration unit before turning on the main power and 24 VDC power. The regeneration unit does not perform its control function if connected after the main power and 24 VDC power has been turned on.

- Regenerative current flows through the two thick lead wires (AWG18: 0.75 mm²) of the regeneration unit. Connect them to the RG1 and RG2 terminals of the TB1. The applicable crimp terminal is the same as the one used to connect the power supply. Refer to p.32.
- The two thin lead wires (AWG22: 0.3 mm²) of the regeneration unit are thermostat outputs. Connect them to CN5 and CN6. Refer to p.34 for connecting method.



- Note**
- If the current consumption of the regeneration unit exceeds the allowable level, the thermostat will be triggered and a regeneration unit overheat alarm will generate. If a regeneration unit overheat alarm generates, turn off the power and check the content of the error.
 - If an external power supply is used for the power supply of input signals, turn on the external power supply before turning on the driver main power supply.

■ Regeneration unit specifications

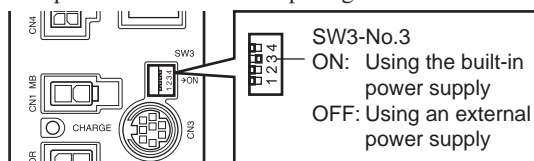
| | |
|-------------------------------------|--|
| Model | EPRC-400P |
| Continuous regenerative power | 100 W |
| Resistance | 400 Ω |
| Operating temperature of thermostat | Operation: Opens at 150 ± 7 °C (302 ± 45 °F) Reset: Closes at 145 ± 12 °C (293 ± 54 °F) (normally closed) |
| Electrical rating of thermostat | 120 VAC 4 A, 30 VDC 4 A (minimum current: 5 mA) |

2.13 Connection diagram (example)

Each connection diagram (example) is for the electromagnetic brake type. In the case of the standard type, there are no connection for the electromagnetic brake and no connection/input for the MB-FREE input signal.

To use the built-in power supply, set the SW3-No.3 of the function setting switch switch1 to the ON side.

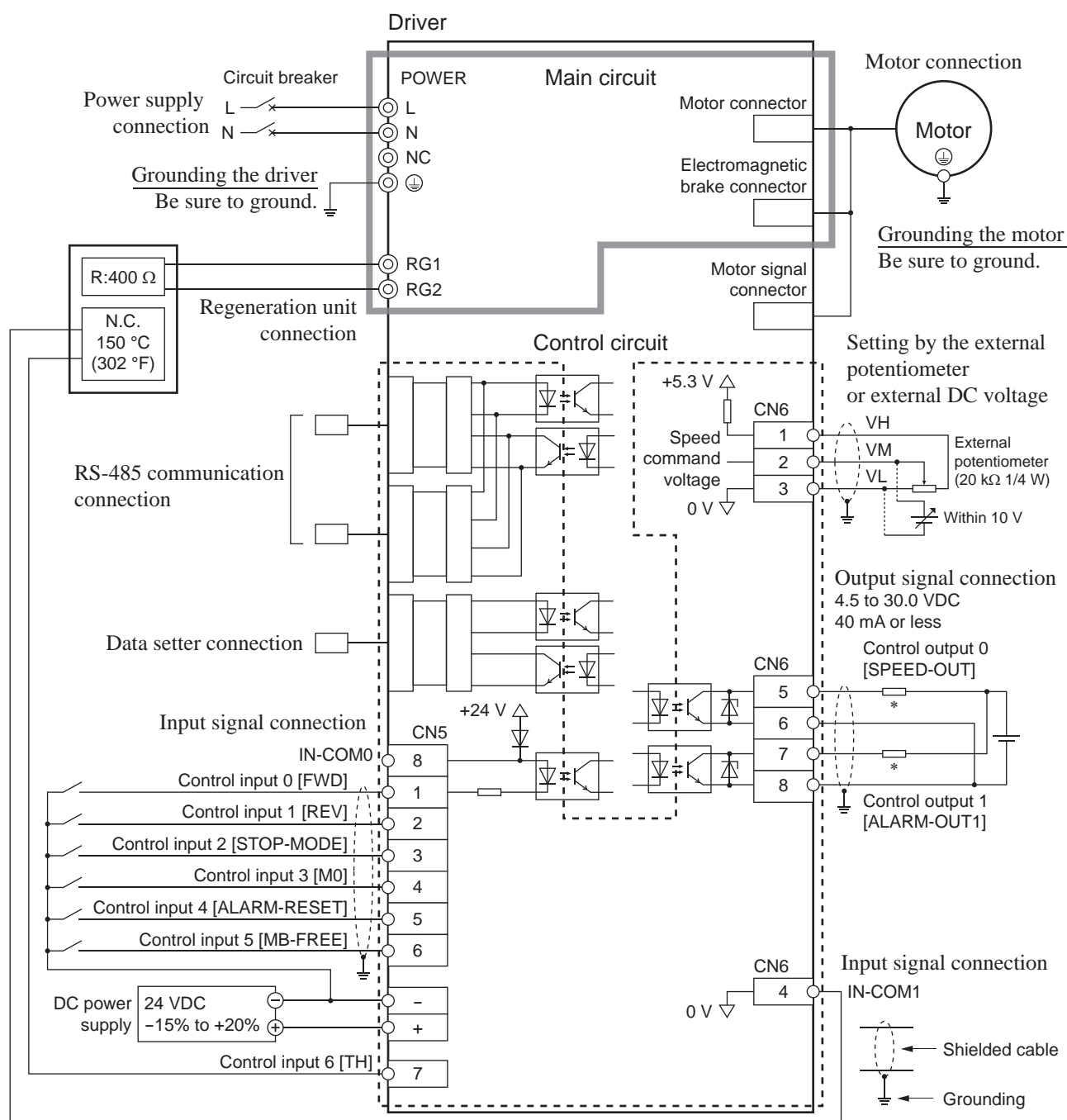
The factory setting is OFF (an external power supply is used). To use an external power supply, the factory setting need not be changed.



■ Sink logic

• Using the built-in power supply

This is a connection example that the power supply is single-phase 100-120 VAC, the rotation speed is set using an external potentiometer or external DC voltage, and the motor is operated with relays, switches and other contact switches. For the SPEED-OUT output, supply at least 5 mA of current.

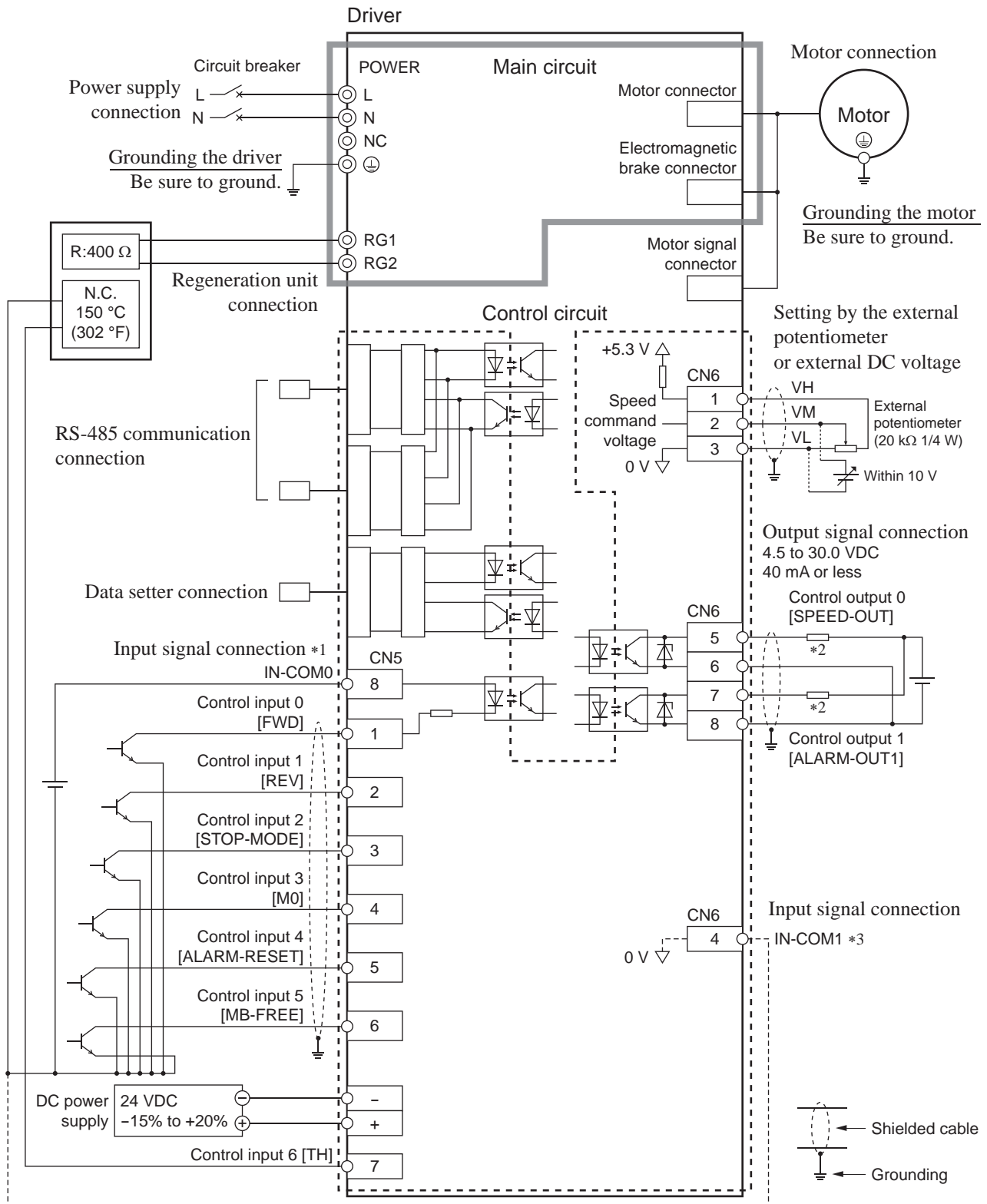


* Recommended resistance 24 VDC: 680 Ω to 4.7 kΩ (2 W) 5 VDC: 150 Ω to 1.0 kΩ (0.5 W)

Note Be sure to ground the motor and driver. Failure to do so may result in electric shock or damage to the product.
Static electricity may cause damage to the product if the Protective Earth Terminals are not grounded.

• Using an external power supply

This is a connection example that the power supply is single-phase 100-120 VAC, the rotation speed is set using an external potentiometer or external DC voltage, and the motor is operated with sequence connection of transistor type. For the SPEED-OUT output, supply at least 5 mA of current.



*1 Turn on the external power supply before turning on the driver main power supply.

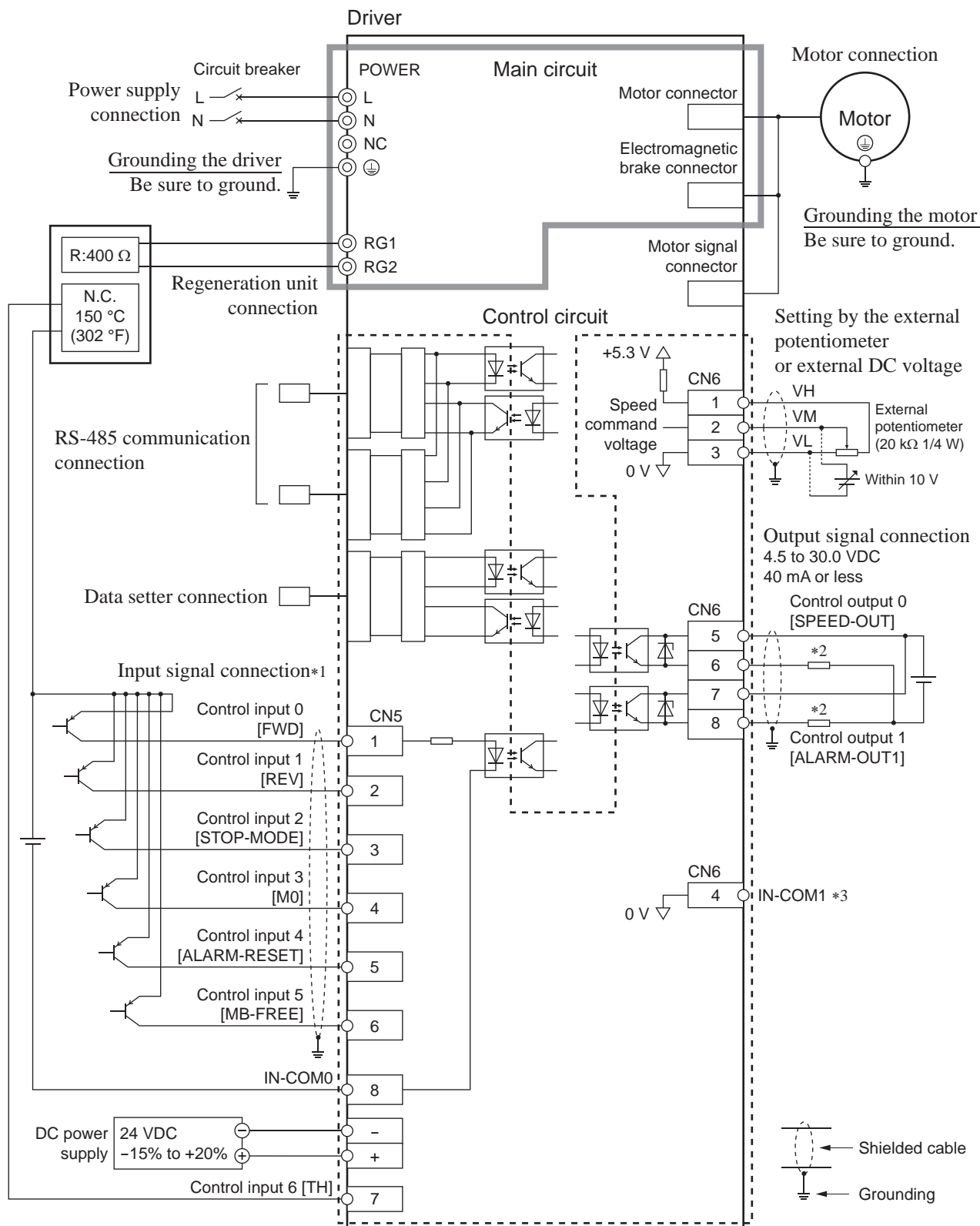
*2 Recommended resistance 24 VDC: 680 Ω to 4.7 k Ω (2 W) 5 VDC: 150 Ω to 1.0 k Ω (0.5 W)

*3 When connecting one of the lead wires of the thermostat output to the IN-COM1, connect it in common with a GND of the external power supply.

Note Be sure to ground the motor and driver. Failure to do so may result in electric shock or damage to the product. Static electricity may cause damage to the product if the Protective Earth Terminals are not grounded.

■ Source logic

This is a connection example that the power supply is single-phase 100-120 VAC, the rotation speed is set using an external potentiometer or external DC voltage, and the motor is operated with sequence connection of transistor type. For the SPEED-OUT output, supply at least 5 mA of current.



*1 Turn on the external power supply before turning on the driver main power supply.

*2 Recommended resistance 24 VDC: 680 Ω to 4.7 kΩ (2 W) 5 VDC: 150 Ω to 1.0 kΩ (0.5 W)

*3 When connecting one of the lead wires of the thermostat output to the IN-COM1, connect it in common with a GND of the external power supply.

Note Be sure to ground the motor and driver. Failure to do so may result in electric shock or damage to the product. Static electricity may cause damage to the product if the Protective Earth Terminals are not grounded.

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 (CN5) and I/O signal connector (CN6)
- Network I/O: I/O signals accessed via RS-485 communication

Set the following parameters using any of 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 IN6 of CN5 by setting parameters. For details on input signals, refer to p.50.

| Input terminal | Initial value | Input terminal | Initial value |
|----------------|---------------|----------------|-----------------|
| IN0 | 1: FWD | IN4 | 24: ALARM-RESET |
| IN1 | 2: REV | IN5 | 20: MB-FREE |
| IN2 | 19: STOP-MODE | IN6 | 22: TH |
| IN3 | 48: M0 | | |

| Assignment No. | Signal name | Function |
|----------------|-------------|---|
| 0 | Not used | Set when the input terminal is not used. |
| 1 | FWD | Rotate the motor in the forward direction. |
| 2 | REV | Rotate the motor in the reverse direction. |
| 19 | STOP-MODE | Select instantaneous stop or deceleration stop. |
| 20 | MB-FREE | Release the electromagnetic brake. |
| 21 | EXT-ERROR | Stop the motor (normally closed). |
| 22 | TH | |
| 24 | ALARM-RESET | Reset of the present alarm. |
| 27 | HMI | Release of the function limitation of the OPX-2A or MEXE02 (normally closed). |
| 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 | |
| 46 | R14 | |
| 47 | R15 | |
| 48 | M0 | Select the operation data No. using these four bits. |
| 49 | M1 | |
| 50 | M2 | |
| 51 | M3 | |
| 54 | TL | Disable the torque limiting. (normally closed). |

Related parameters

| Parameter name | Description | Initial value |
|---------------------|---|-----------------|
| IN0 function select | Assigns the input signals to the input terminal IN0 to IN6. See the table on the previous page for the assignment number and corresponding signal. | 1: FWD |
| IN1 function select | | 2: REV |
| IN2 function select | | 19: STOP-MODE |
| IN3 function select | | 48: M0 |
| IN4 function select | | 24: ALARM-RESET |
| IN5 function select | | 20: MB-FREE |
| IN6 function select | | 22: TH |

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 ALARM-RESET input will be executed when turning from ON to OFF.
- When the HMI input and TL input are not assigned to the input terminals, these inputs will be always set to ON. When assigning them to multiple terminals (including direct I/O and network I/O), the function will be executed when all terminals are set to ON.

■ Changing the logic level setting of input signals

You can change the logic level setting for input terminals IN0 to IN6 using the parameter.

Related parameters

| Parameter name | Description | Initial value |
|---------------------------|--|---------------|
| IN0 contact configuration | Changes the logic level setting for the input terminal IN0 to IN6. 0: Normally open 1: Normally closed | 0 |
| IN1 contact configuration | | |
| IN2 contact configuration | | |
| IN3 contact configuration | | |
| IN4 contact configuration | | |
| IN5 contact configuration | | |
| IN6 contact configuration | | |

■ Assignment to the output terminals

The output signals shown below can be assigned to the output terminals OUT0 and OUT1 of CN6 by setting parameters. For details on output signals, refer to p.52.

| Output terminal | Initial value |
|-----------------|----------------|
| OUT0 | 85: SPEED-OUT |
| OUT1 | 65: ALARM-OUT1 |

| 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 | REV_R | Output in response to the RVS input. |
| 19 | STOP-MODE_R | Output in response to the STOP-MODE input. |
| 20 | MB-FREE_R | Output in response to the MB-FREE input. |
| 27 | HMI_R | Output in response to the HMI input. |
| 32 | R0 | Output the status of the general signals 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 M3 inputs. |
| 49 | M1_R | |
| 50 | M2_R | |
| 51 | M3_R | |
| 54 | TL_R | Output in response to the TL input. |
| 65 | ALARM_OUT1 | Output the alarm status of the driver (normally closed). |
| 66 | WNG | Output the warning status of the driver. |
| 68 | MOVE | Output while the motor operates. |
| 71 | TLC | Output when the motor torque reaches the torque limiting value. |
| 77 | VA | Output when the motor speed reaches the setting value. |
| 80 | S-BSY | Output when the driver is in internal processing state. |
| 81 | ALARM-OUT2 | Output when the overload warning detection level is exceeded. Output when the overload alarm generates. (normally closed) |
| 82 | MPS | Output the ON-OFF state of the main power supply. |
| 84 | DIR | Output the rotation direction of motor shaft. |
| 85 | SPEED-OUT | 30 pulses are output with each revolution of the motor output shaft. |

Related parameters

| Parameter name | Description | Initial value |
|----------------------|---|----------------|
| OUT0 function select | Assigns the output signals to the output terminals OUT0 and OUT1. See the table above for the assignment number and corresponding signal. | 85: SPEED-OUT |
| OUT1 function select | | 65: ALARM-OUT1 |

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 network I/O by setting parameters. See each command description for the assignments 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 | Rotate the motor to FWD direction. | 0: Stop |
| 2 | REV | Rotate the motor to REV direction. | 1: Operation |
| 19 | STOP-MODE | Select instantaneous stop or deceleration stop. | 0: Instantaneous stop 1: Deceleration stop |
| 20 | MB-FREE | Release the electromagnetic brake. | 0: Electromagnetic brake hold 1: Electromagnetic brake release |
| 27 | HMI | Release of the function limitation of the OPX-2A or MEXE02 (normally closed). | 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 four bits. | 0: OFF 1: ON (Operation data No.0 to 15 can be selected.) |
| 49 | M1 | | |
| 50 | M2 | | |
| 51 | M3 | | |
| 54 | TL | Disable the torque limiting. (normally closed). | 0: Torque limiting disable 1: Torque limiting enable |

Related parameters

| Parameter name | Description | Initial value |
|--------------------------|---|---------------|
| NET-IN0 function select | Assigns the input signals to the NET-IN0 to NET-IN15. See the table on the previous page for the assignment number and corresponding signal. | 48: M0 |
| NET-IN1 function select | | 49: M1 |
| NET-IN2 function select | | 50: M2 |
| NET-IN3 function select | | 1: FWD |
| NET-IN4 function select | | 2: REV |
| NET-IN5 function select | | 19: STOP-MODE |
| NET-IN6 function select | | 20: MB-FREE |
| NET-IN7 function select | | 0: Not used |
| NET-IN8 function select | | |
| NET-IN9 function select | | |
| NET-IN10 function select | | |
| NET-IN11 function select | | |
| NET-IN12 function select | | |
| NET-IN13 function select | | |
| NET-IN14 function select | | |
| NET-IN15 function select | | |

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 and TL input are not assigned to the input terminals, these inputs will be always set to ON. When assigning them to multiple terminals (including direct I/O and network I/O), the function will be executed when all terminals 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 network I/O by setting parameters. See each command description for the assignments 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. | 0: OFF 1: ON |
| 1 | FWD_R | Output in response to the FWD input. | |
| 2 | RVS_R | Output in response to the RVS input. | |
| 19 | STOP-MODE_R | Output in response to the STOP-MODE input. | |
| 20 | MB-FREE_R | Output in response to the MB-FREE input. | |
| 27 | HMI_R | Output in response to the HMI input. | |
| 32 | R0 | Output the status of the general signals 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 M3 inputs. | |
| 49 | M1_R | | |
| 50 | M2_R | | |
| 51 | M3_R | | |
| 54 | TL_R | Output in response to the TL input. | |
| 65 | ALARM-OUT1 | Output the alarm status of the driver (normally closed). | 0: Alarm not present 1: Alarm present |
| 66 | WNG | Output the warning status of the driver. | 0: Warning not present 1: Warning present |
| 68 | MOVE | Output while the motor operates. | 0: Motor stopped 1: Motor operating |
| 71 | TLC | Output when the motor torque reaches the torque limiting value. | 0: No torque limiting 1: In torque limiting operation |
| 77 | VA | Output when the motor speed reaches the setting value. | 0: Speed not attained 1: Speed attainment |
| 80 | S-BSY | Output when the driver is in internal processing state. | 0: OFF 1: ON |
| 81 | ALARM-OUT2 | Output when the overload warning detection level is exceeded. Output when the overload alarm generates. (normally closed) | 0: Normal operation 1: In overload operation |
| 82 | MPS | Output the ON-OFF state of the main power supply. | 0: OFF 1: ON |
| 84 | DIR | Output the rotation direction of motor shaft. | 0: REV direction 1: FWD direction |

Related parameters

| Parameter name | Description | Initial value |
|---------------------------|---|-----------------|
| NET-OUT0 function select | Assigns the output signal to the NET-OUT0 to NET-OUT15. See the table on the previous page for the assignment number and corresponding signal. | 48: M0_R |
| NET-OUT1 function select | | 49: M1_R |
| NET-OUT2 function select | | 50: M2_R |
| NET-OUT3 function select | | 1: FWD_R |
| NET-OUT4 function select | | 2: REV_R |
| NET-OUT5 function select | | 19: STOP-MODE_R |
| NET-OUT6 function select | | 66: WNG |
| NET-OUT7 function select | | 65: ALARM-OUT1 |
| NET-OUT8 function select | | 80: S-BSY |
| NET-OUT9 function select | | 0: Not used |
| NET-OUT10 function select | | |
| NET-OUT11 function select | | |
| NET-OUT12 function select | | 81: ALARM-OUT2 |
| NET-OUT13 function select | | 68: MOVE |
| NET-OUT14 function select | | 77: VA |
| NET-OUT15 function select | | 71: TLC |

3.3 Input signals

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

■ FWD input and REV input

When the FWD input is turned ON, the motor rotates in the clockwise direction. When the FWD input is turned OFF, the motor stops.

When the REV input is turned ON, the motor rotates in the counterclockwise direction. When the REV input is turned OFF, the motor stops.

If both the FWD input and REV input are turned ON, the motor stops instantaneously.

■ STOP-MODE input

Select how the motor should stop when the FWD input or REV input is turned OFF.

When the STOP-MODE input is ON, the motor decelerates to a stop. When the STOP-MODE input is OFF, the motor stops instantaneously.

■ MB-FREE input

This input signal is used with electromagnetic brake types. Select how the electromagnetic brake would operate when the motor stops.

When the MB-FREE input is ON, the electromagnetic brake will be released.

When the MB-FREE input is OFF, the electromagnetic brake will actuate and hold the shaft in position.

Note The MB-FREE input is disabled while an alarm is present.

■ EXT-ERROR input

The EXT-ERROR input is normally closed.

Connect an error signal detected externally. When the error signal is input, the EXT-ERROR input will be turned OFF and the motor will be stopped.

When operating the motor, turn the EXT-ERROR input ON.

■ TH input

The TH input is normally closed.

When using the regeneration unit, connect the thermostat output of the regeneration unit.

■ ALARM-RESET input

When an alarm generates, the motor will stop. When the ALARM-RESET input is turned from ON to OFF, the alarm will be reset (The alarm will be reset at the OFF edge of the ALARM-RESET input). Always reset an alarm after removing the cause of the alarm and ensuring safety.

Note that some alarms cannot be reset with the ALARM-RESET input. See p.143 for alarm descriptions.

■ HMI input

The HMI input is normally closed.

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 be always set to ON.
When assigning it to multiple terminals (including direct I/O and network I/O), the function will be executed when all terminals are set to ON.

■ M0 to M3 inputs

Select a desired operation data number for multi-speed operation based on the combination of ON/OFF states of the M0 to M3 inputs.

Refer to p.73 for multi-speed operation.

| Operation data No. | M3 | M2 | M1 | M0 | Speed setting method |
|--------------------|-----|-----|-----|-----|--------------------------------|
| 0 | OFF | OFF | OFF | OFF | Analog setting/digital setting |
| 1 | OFF | OFF | OFF | ON | |
| 2 | OFF | OFF | ON | OFF | |
| 3 | OFF | OFF | ON | ON | |
| 4 | OFF | ON | OFF | OFF | |
| 5 | OFF | ON | OFF | ON | |
| 6 | OFF | ON | ON | OFF | |
| 7 | OFF | ON | ON | ON | |
| 8 | ON | OFF | OFF | OFF | |
| 9 | ON | OFF | OFF | ON | |
| 10 | ON | OFF | ON | OFF | |
| 11 | ON | OFF | ON | ON | |
| 12 | ON | ON | OFF | OFF | |
| 13 | ON | ON | OFF | ON | |
| 14 | ON | ON | ON | OFF | |
| 15 | ON | ON | ON | ON | |

■ TL input

The TL input is normally closed.

When the TL input is turned ON, the torque limiting is enabled.

When the TL input is turned OFF, the torque limiting becomes invalid.

Note

When the TL input is not assigned to the input terminal, this input will be always set to ON.
When assigning it to multiple terminals (including direct I/O and network I/O), the function will be executed when all terminals are set to ON.

3.4 Output signals

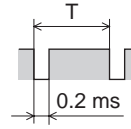
The signal state represents the "ON: Carrying current" or "OFF: Not carrying current" state of the internal photocoupler rather than the voltage level of the signal.

■ SPEED-OUT output

30 pulses are output with each revolution of the motor output shaft synchronously with the motor operation. The pulse width of output pulse signals is 0.2 ms. The rotation speed of the motor output shaft can be calculated using the SPEED-OUT output.

$$\text{SPEED-OUT output frequency (Hz)} = \frac{1}{T}$$

$$\text{Motor shaft speed (r/min)} = \frac{\text{SPEED-OUT output frequency}}{30} \times 60$$



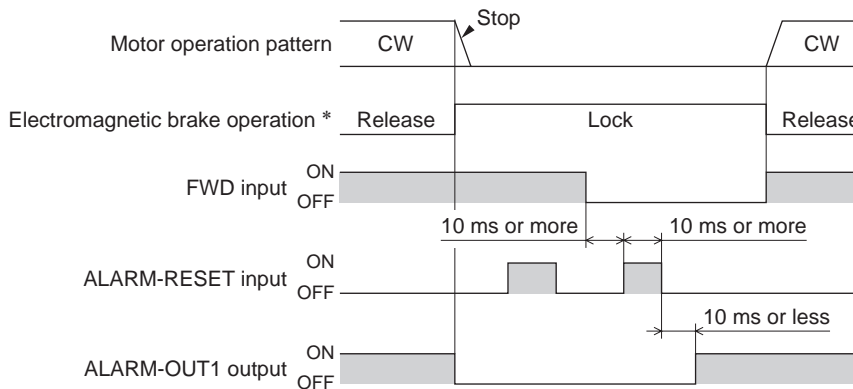
■ ALARM-OUT1 output

The ALARM-OUT1 input is normally closed.

When the driver's protective function actuates, the ALARM-OUT1 output turns OFF and the ALM LED blinks.

In the case of a standard type, the motor coasts to a stop. In the case of an electromagnetic brake type, on the other hand, the motor stops instantaneously, upon which the electromagnetic brake actuates and holds the shaft in position. To reset an alarm, turn both the FWD input and REV input OFF, and remove the cause of the alarm before turning the ALARM-RESET input ON (keep it ON for 10 ms or more). The ALARM-RESET input is disabled while the FWD input or REV input is ON.

If the alarm cannot be reset with the ALARM-RESET input, once turn off the power, wait for at least 30 sec, and turn on the power again.



* When the motor is an electromagnetic brake type, the electromagnetic brake is actuated to hold the shaft in position at the same time that an alarm generates. The setting, which the electromagnetic brake will actuate and hold the position after the motor coasts to a stop, can be selected using the **OPX-2A**, **MEXE02** or RS-485 communication.

■ MOVE output

The MOVE output turns ON while the motor is operating (while any of the input signal for operation is ON).

■ VA output

The VA output turns ON when the motor speed reaches the setting value.

■ ALARM-OUT2 output

The ALARM-OUT2 output is normally closed.

When the "overload warning enable" is set to enable, this signal will be turned OFF if the motor load torque exceeds the overload warning level.

Even if the "overload warning enable" is set to disable, this signal will be turned OFF if the overload alarm generates.

■ WNG output

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.

■ TLC output

The TLC output turns ON when the motor output torque reaches the limit value.

■ 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.

■ DIR output

The DIR output is the output signal that shows the rotation direction of motor output shaft.

The rotation direction shows the forward direction if this signal is ON, and the rotation direction shows the reverse direction if this signal is OFF.

■ 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 |
| REV | REV_R |
| STOP-MODE | STOP-MODE_R |
| MB-FREE | MB-FREE_R |
| HMI | HMI_R |

| Input signal | Output signal |
|--------------|---------------|
| M0 | M0_R |
| M1 | M1_R |
| M2 | M2_R |
| M3 | M3_R |
| TL | TL_R |

3.5 General signals (R0 to R15)

The R0 to R15 are general signals that enable control via RS-485 communication.

Using the R0 to R15 signals, 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

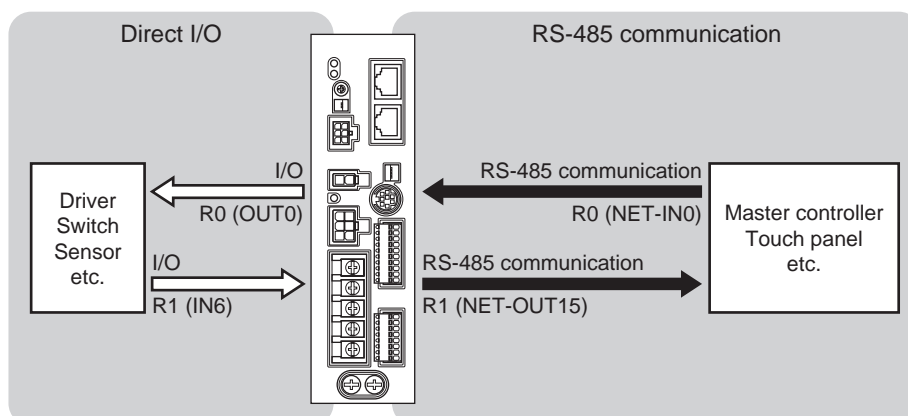
Assign the general signal R0 to the OUT0 output and NET-IN0.

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 IN6 input and NET-OUT15.

When turning the IN6 input ON by the external device, the NET-OUT15 becomes 1. When turning the IN6 input OFF, the NET-OUT15 becomes 0. The logic level of the IN6 input can be set using "IN6 contact configuration" parameter.



3 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**.

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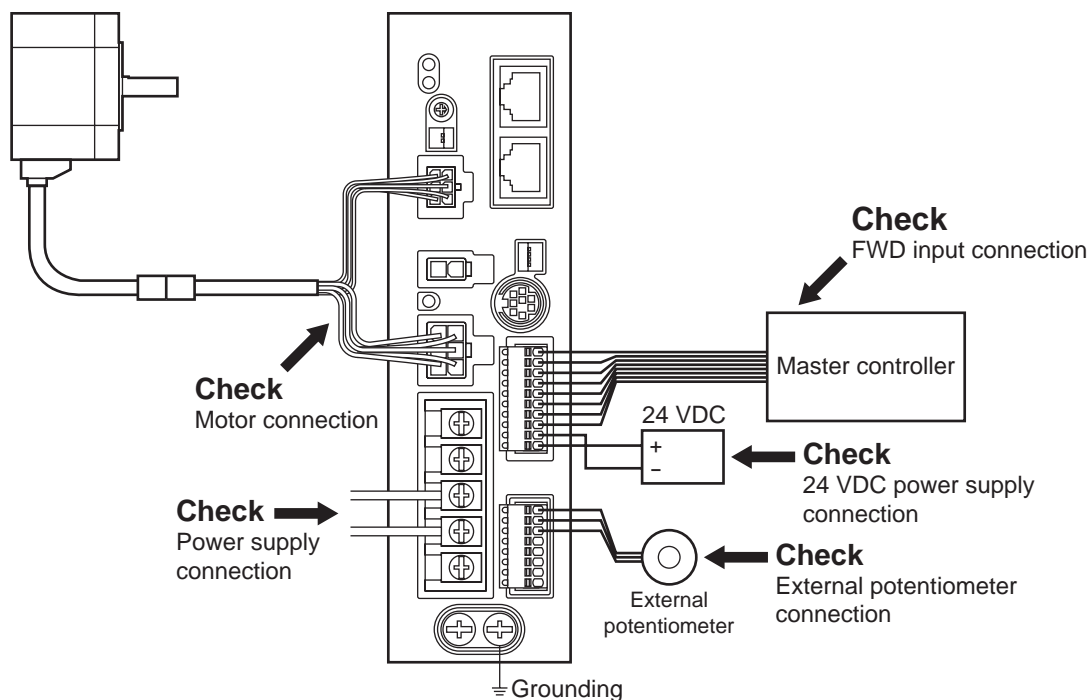
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1 Guidance

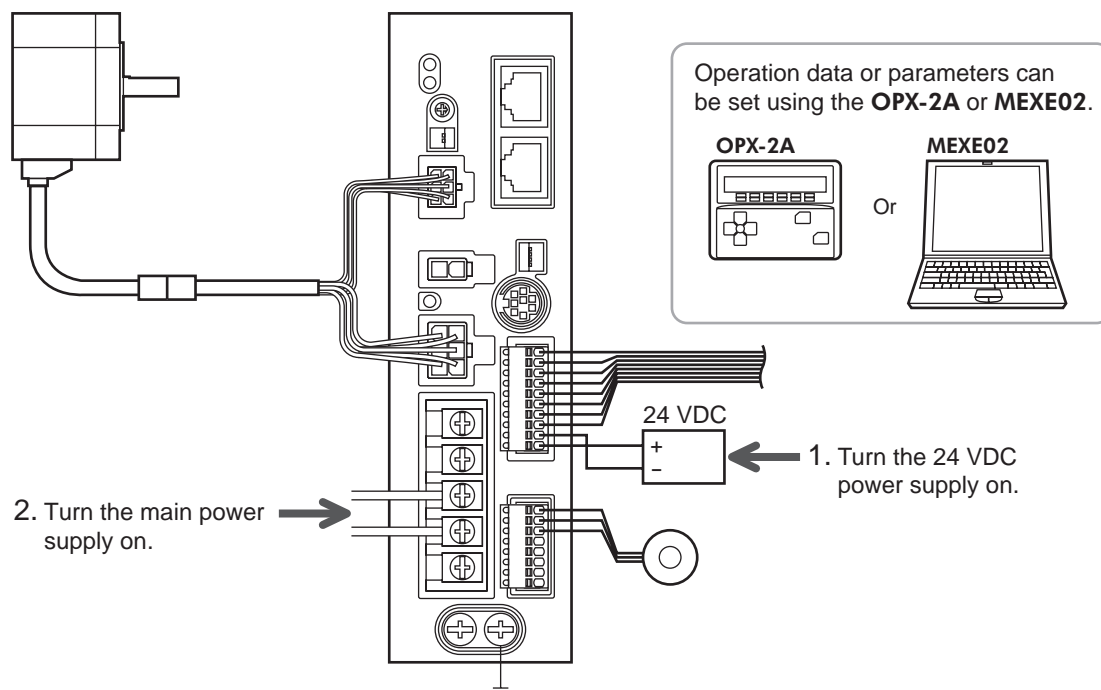
If you are new to the **BLE** Series FLEX RS-485 communication type, read this section to understand the operating methods along with the operation flow.

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

STEP 1 Check the installation and connection

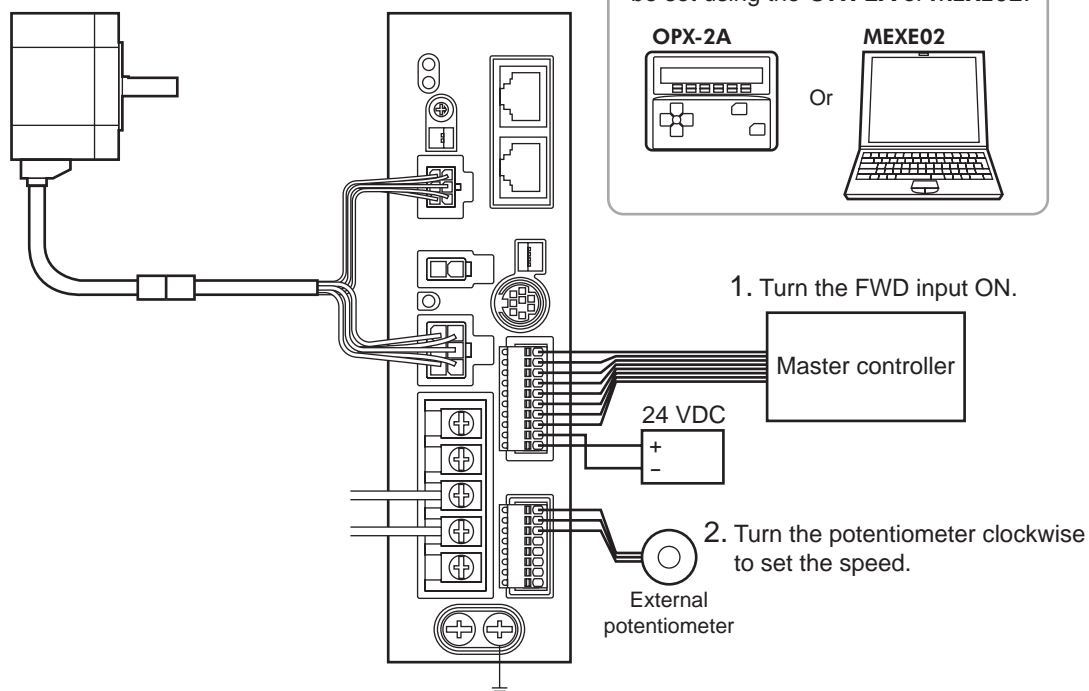


STEP 2 Turn on the power



STEP 3 Operate the motor

3. Confirm that the motor rotates without any 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?
- Is the external potentiometer connected securely?

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

2 Operation data and parameter

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

- Operation data
- User parameters

The parameters are saved in the RAM or 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 on the driver 24 VDC power supply, 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.

Parameters having set via RS-485 communication or industrial network are saved in the RAM. To save the parameters stored in the RAM to the non-volatile memory, execute the "batch NV memory write" of the maintenance command. The parameters set with the **MEXE02** will be saved in the non-volatile memory if "Data writing" is performed.

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

| | Update timing | Description |
|---|---|--|
| A | Effective immediately | Executes the recalculation and setup immediately when writing the parameter. |
| B | Effective after stopping the operation | Executes the recalculation and setup after stopping the operation. |
| C | Effective after executing configuration or effective after turning the power ON again | Executes the recalculation and setup after executing the configuration or turning the 24 VDC power ON again. |
| D | Effective after turning the power ON again | Executes the recalculation and setup after turning the 24 VDC power ON again. |

Note

- Parameters having written via RS-485 communication are written in the RAM. If you change the parameters that become effective after turning on the power again, be sure to save them in the non-volatile memory before turning off the power.
- The non-volatile memory can be rewritten approximately 100,000 times.

2.1 Operation data

The following data is required to operate a motor. Total 16 operation data (No.0 to No.15) can be set in this product. There are the following two setting methods.

- Analog setting for rotation speed: This is a method to set the rotation speed using the external potentiometer or external DC voltage.
- Digital setting for rotation speed: This is a method to set the rotation speed using any of the **OPX-2A**, **MEXE02** or RS-485 communication.

| Item | Description | Setting range | Initial value | Effective *1 |
|---|--|--|---------------|-----------------|
| Rotational speed No.0 to Rotational speed No.15 | Sets the rotation speed. | Analog setting: 100 to 4000 r/min Digital setting: 80 to 4000 r/min | 0 | A |
| Acceleration No.0 to Acceleration No.15 | Sets the time needed for the motor to reach the rotation speed. *2 | 0.2 to 15 s | 0.5 | |
| Deceleration No.0 to Deceleration No.15 | Sets the time needed for the motor to stop from the rotation speed. *3 | | | |
| Torque limit No.0 to Torque limit No.15 | Sets the motor torque. Sets the maximum torque based on the rated torque being 100%. | 0 to 200% | 200 | |

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

*2 The acceleration time when using the digital setting for rotation speed refers to the time needed for the motor to reach the set rotation speed.

The acceleration time when using the analog setting for rotation speed refers to the time needed for the motor to reach the rated rotation speed (3000 r/min).

*3 The deceleration time when using the digital setting for rotation speed refers to the time needed for the motor to stop from the set rotation speed.

The deceleration time when using the analog setting for rotation speed refers to the time needed for the motor to stop from the rated rotation speed (3000 r/min).

2.2 Parameter

■ Parameter list

| | |
|---|--|
| Function parameter (p.60) | <ul style="list-style-type: none"> • Reduction gear rate • Decimal place for reduction gear rate • Amplification speed rate • Conveyor reduction gear rate • Decimal place for conveyor reduction gear rate • Conveyor amplification speed rate • Velocity attainment width • Motor rotation direction |
| I/O function parameter (p.61) | <ul style="list-style-type: none"> • IN0 to IN6 function select • IN0 to IN6 contact configuration • OUT0 and OUT1 function select |
| I/O function parameter (RS-485) (p.62) | <ul style="list-style-type: none"> • NET-IN0 to NET-IN15 function select • NET-OUT0 to NET-OUT15 function select |
| Analog adjust parameter (p.63) | <ul style="list-style-type: none"> • Analog operating speed command gain • Analog operating speed command offset • Analog torque limit gain • Analog torque limit offset • Analog operating speed maximum value for external input • Analog torque limit maximum value external input |
| Alarm/warning parameter (p.63) | <ul style="list-style-type: none"> • Over load warning level • Over load warning enable |
| Utilities parameter (p.63) | <ul style="list-style-type: none"> • JOG operating speed • JOG operating torque • Display mode of the data setter speed • The data setter editing mode |
| Operation parameter (p.64) | <ul style="list-style-type: none"> • Data setter initial display • Analog input signal select • No operation at initial alarm enable • Magnetic brake function at alarm • Initial thermal input detection • Run mode select |
| Communication parameter (p.65) | <ul style="list-style-type: none"> • Communication time out • Communication error alarm • Communication parity • Communication stop bit • Communication transfer wait time |

■ Function parameter

| Name | Description | Setting range | Initial value | Effective * |
|--|--|---|---------------|-------------|
| Reduction gear rate | When entering the gear ratio of the gearhead, the rotation speed of the gearhead output shaft can be displayed. Set the decimal position for the setting value of the gear ratio by the "decimal place for reduction gear rate" parameter. | 100 to 9999 | 100 | A |
| Decimal place for reduction gear rate | | 0: 1 digit 1: 2 digit 2: 3 digit | 2 | |
| Amplification speed rate | Set the speed increasing ratio relative to the rotation speed of the motor output shaft. When setting the speed increasing ratio to 1, the speed reduction ratio will be effective. When setting the speed increasing ratio to other than 1, the speed increasing ratio will be effective. | 1 to 5 | 1 | |
| Conveyor reduction gear rate | When setting the conveyor speed reduction ratio, the transfer speed of the conveyor can be displayed. Set the decimal position for the setting value of the speed reduction ratio by the "decimal place for conveyor reduction gear rate" parameter. | 100 to 9999 | 100 | |
| Decimal place for conveyor reduction gear rate | | 0: 1 digit 1: 2 digit 2: 3 digit | 2 | |
| Conveyor amplification speed rate | Sets the conveyor speed-increasing ratio relative to the rotation speed of the motor output shaft. | 1 to 5 | 1 | |
| Velocity attainment width | Sets the band within which the rotation speed of the motor is deemed to have reached the set value. | 0 to 400 r/min | 200 | C |
| Motor rotation direction | Sets the motor direction to be applied when the FWD input is turned ON. | 0: + direction=CCW 1: + direction=CW | 1 | |

* Indicates the timing for the data to become effective.

(A: Effective immediately, C:Effective after executing configuration or effective after turning the power ON again)

• How to set the speed reduction ratio

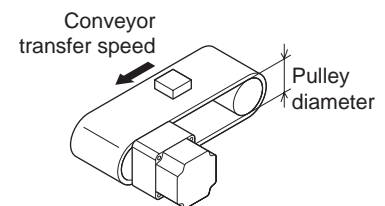
Set the speed reduction ratio as a combination of the "reduction gear rate" parameter and "decimal place for reduction gear rate" parameter. The relationships of speed reduction ratio and decimal position are explained by the combinations shown below.

| Actual speed reduction ratio | "Reduction gear rate" parameter | "Decimal place for reduction gear rate" parameter |
|------------------------------|---------------------------------|---|
| 1.00 to 9.99 | 100 to 999 | 2 |
| 10.0 to 99.9 | | 1 |
| 100 to 999 | | 0 |
| 10.00 to 99.99 | 1000 to 9999 | 2 |
| 100.0 to 999.9 | | 1 |
| 1000 to 9999 | | 0 |

• Display the conveyor transfer speed

To display the conveyor transfer speed, set the conveyor speed reduction ratio by using the formula below:

$$\text{Conveyor gear ratio} = \frac{1}{\text{Feed rate per motor revolution}} = \frac{\text{Gearhead gear ratio}}{\text{Pulley diameter [m]} \times \pi}$$



When the calculated conveyor speed reduction ratio is used, the conveyor transfer speed is converted as follows:

$$\text{Conveyor transfer speed [m/min]} = \frac{\text{Motor output shaft rotating speed [r/min]}}{\text{Conveyor gear ratio}}$$

Example: The pulley diameter is 0.1 m and gear ratio of the gear head is 20

$$\text{Conveyor gear ratio} = \frac{\text{Gearhead gear ratio}}{\text{Pulley diameter [m]} \times \pi} = \frac{20}{0.1[\text{m}] \times \pi} \doteq 63.7$$

From the conversion formula, the conveyor speed reduction ratio is calculated as 63.7 in this example. This means that the conveyor speed reduction ratio parameter is 637, while the conveyor speed reduction ratio decimal digit setting parameter is 1.

If the speed reduction decimal ratio is 63.7 and rotation speed of the motor is 1300 r/min, the conveyor transfer speed is converted as follows:

$$\text{Conveyor transfer speed [m/min]} = \frac{1300}{63.7} \doteq 20.4$$

Accordingly, “20.4” is shown.

■ I/O function parameter

| Name | Description | Setting range | Initial value | Effective * |
|---------------------------|---|-----------------------------------|-----------------|-------------|
| IN0 function select | Assigns the input signals to the input terminals IN0 to IN6. | See table next. | 1: FWD | B |
| IN1 function select | | | 2: REV | |
| IN2 function select | | | 19: STOP-MODE | |
| IN3 function select | | | 48: M0 | |
| IN4 function select | | | 24: ALARM-RESET | |
| IN5 function select | | | 20: MB-FREE | |
| IN6 function select | | | 22: TH | |
| IN0 contact configuration | Changes the logic level setting for the input terminals IN0 to IN6. | 0: Make (N.O.) 1: Brake (N.C.) | 0 | C |
| IN1 contact configuration | | | | |
| IN2 contact configuration | | | | |
| IN3 contact configuration | | | | |
| IN4 contact configuration | | | | |
| IN5 contact configuration | | | | |
| OUT0 function select | Assigns the output signals to the output terminals OUT0 and OUT1. | See table next. | 85: SPEED-OUT | A |
| OUT1 function select | | | 65: ALARM-OUT1 | |

* Indicates the timing for the data to become effective.

(A: Effective immediately, B: Effective after stopping the operation, C: Effective after executing configuration or effective after turning the power ON again)

• Setting range for IN input function selection

| | | | | |
|----------------|-----------------|--------|---------|---------|
| 0: No function | 22: TH | 35: R3 | 41: R9 | 47: R15 |
| 1: FWD | 24: ALARM-RESET | 36: R4 | 42: R10 | 48: M0 |
| 2: REV | 27: HMI | 37: R5 | 43: R11 | 49: M1 |
| 19: STOP-MODE | 32: R0 | 38: R6 | 44: R12 | 50: M2 |
| 20: MB-FREE | 33: R1 | 39: R7 | 45: R13 | 51: M3 |
| 21: EXT-ERROR | 34: R2 | 40: R8 | 46: R14 | 54: TL |

• Setting range for OUT output function selection

| | | | | |
|-----------------|--------|----------|----------------|----------------|
| 0: No function | 34: R2 | 42: R10 | 50: M2_R | 80: S-BSY |
| 1: FWD_R | 35: R3 | 43: R11 | 51: M3_R | 81: ALARM-OUT2 |
| 2: REV_R | 36: R4 | 44: R12 | 54: TL_R | 82: MPS |
| 19: STOP-MODE_R | 37: R5 | 45: R13 | 65: ALARM_OUT1 | 84: DIR |
| 20: MB-FREE_R | 38: R6 | 46: R14 | 66: WNG | 85: SPEED-OUT |
| 27: HMI_R | 39: R7 | 47: R15 | 68: MOVE | |
| 32: R0 | 40: R8 | 48: M0_R | 71: TLC | |
| 33: R1 | 41: R9 | 49: M1_R | 77: VA | |

■ I/O function parameter (RS-485)

| Name | Description | Setting range | Initial value | Effective * |
|---------------------------|--|-----------------|-----------------|----------------|
| NET-IN0 function select | Assigns the input signals to the NET-IN0 to NET-IN15. | See table next. | 48: M0 | C |
| NET-IN1 function select | | | 49: M1 | |
| NET-IN2 function select | | | 50: M2 | |
| NET-IN3 function select | | | 1: FWD | |
| NET-IN4 function select | | | 2: REV | |
| NET-IN5 function select | | | 19: STOP-MODE | |
| NET-IN6 function select | | | 20: MB-FREE | |
| NET-IN7 function select | | | 0: No function | |
| NET-IN8 function select | | | | |
| NET-IN9 function select | | | | |
| NET-IN10 function select | | | | |
| NET-IN11 function select | | | | |
| NET-IN12 function select | | | | |
| NET-IN13 function select | | | | |
| NET-IN14 function select | | | | |
| NET-IN15 function select | | | | |
| NET-OUT0 function select | Assigns the output signals to the NET-OUT0 to NET-OUT15. | See table next. | 48: M0_R | |
| NET-OUT1 function select | | | 49: M1_R | |
| NET-OUT2 function select | | | 50: M2_R | |
| NET-OUT3 function select | | | 1: FWD_R | |
| NET-OUT4 function select | | | 2: REV_R | |
| NET-OUT5 function select | | | 19: STOP-MODE_R | |
| NET-OUT6 function select | | | 66: WNG | |
| NET-OUT7 function select | | | 65: ALARM-OUT1 | |
| NET-OUT8 function select | | | 80: S-BSY | |
| NET-OUT9 function select | | | 0: No function | |
| NET-OUT10 function select | | | | |
| NET-OUT11 function select | | | 81: ALARM-OUT2 | |
| NET-OUT12 function select | | | 68: MOVE | |
| NET-OUT13 function select | | | 77: VA | |
| NET-OUT14 function select | | | 71: TLC | |
| NET-OUT15 function select | | | | |

* Indicates the timing for the data to become effective. (C: Effective after executing configuration or effective after turning the power ON again)

• Setting range for NET-IN input function selection

| | | | | |
|----------------|--------|---------|---------|--------|
| 0: No function | 32: R0 | 38: R6 | 44: R12 | 50: M2 |
| 1: FWD | 33: R1 | 39: R7 | 45: R13 | 51: M3 |
| 2: REV | 34: R2 | 40: R8 | 46: R14 | 54: TL |
| 19: STOP-MODE | 35: R3 | 41: R9 | 47: R15 | |
| 20: MB-FREE | 36: R4 | 42: R10 | 48: M0 | |
| 27: HMI | 37: R5 | 43: R11 | 49: M1 | |

• Setting range for NET-OUT output function selection

| | | | | |
|-----------------|--------|----------|----------------|----------------|
| 0: No function | 34: R2 | 42: R10 | 50: M2_R | 80: S-BSY |
| 1: FWD_R | 35: R3 | 43: R11 | 51: M3_R | 81: ALARM-OUT2 |
| 2: REV_R | 36: R4 | 44: R12 | 54: TL_R | 82: MPS |
| 19: STOP-MODE_R | 37: R5 | 45: R13 | 65: ALARM_OUT1 | 84: DIR |
| 20: MB-FREE_R | 38: R6 | 46: R14 | 66: WNG | |
| 27: HMI_R | 39: R7 | 47: R15 | 68: MOVE | |
| 32: R0 | 40: R8 | 48: M0_R | 71: TLC | |
| 33: R1 | 41: R9 | 49: M1_R | 77: VA | |

■ Analog adjust parameter

| Name | Description | Setting range | Initial value | Effective * |
|---|--|---------------------|---------------|-------------|
| Analog operating speed command gain | Sets the speed command per 1 VDC of input voltage. | 0 to 4000 r/min | 800 | A |
| Analog operating speed command offset | Sets the offset for speed command input. | -2000 to 2000 r/min | 0 | |
| Analog torque limit gain | Sets the torque limit per 1 VDC of input voltage. | 0 to 200% | 40 | |
| Analog torque limit offset | Sets the offset for torque limit input. | -50 to 50% | 0 | |
| Analog operating speed maximum value for external input | Sets the maximum value of rotation speed. | 0 to 4000 r/min | 4000 | |
| Analog torque limit maximum value external input | Sets the maximum value of torque limiting. | 0 to 200% | 200 | |

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

■ Alarm/warning parameter

| Name | Description | Setting range | Initial value | Effective * |
|--------------------------|---|-------------------------|---------------|-------------|
| Over load warning level | Sets the percentage to generate the overload warning against the motor load torque. | 50 to 100% | 100 | A |
| Over load warning enable | Sets whether to enable or disable overload warning function. | 0: Disable 1: Enable | 0 | |

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

■ Utilities parameter

| Name | Description | Setting range | Initial value | Effective * |
|---------------------------------------|---|--------------------------|---------------|-------------|
| JOG operating speed | Sets the rotation speed at JOG operation. | 0, or 80 to 1000 r/min | 300 | A |
| JOG operating torque | The torque in JOG operation can be limited. Sets the maximum torque based on the rated torque being 100%. | 0 to 200% | 200 | |
| Display mode of the data setter speed | Sets the display method of rotation speed in the monitor mode. If "0: Signed" is set, "-" will be displayed when rotating in the reverse direction. | 0: Signed 1: Absolute | 0 | |
| The data setter editing mode | Editing and clearing the operation data/parameters can be prohibited by locking operation of the OPX-2A . | 0: Disable 1: Enable | 1 | |

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

■ Operation parameter

| Name | Description | Setting range | Initial value | Effective * |
|--------------------------------------|--|---|---------------|-------------|
| Data setter initial display | Sets the initial screen to display on the OPX-2A when the driver power is turned on. | 0: Operating speed 1: Conveyor speed 2: Load factor 3: Operating number 4: Mon top view | 0 | C |
| Analog input signal select | Sets the setting method of operation data. See table next. | 0: Analog invalid 1: Analog speed 2: Analog torque | 1 | |
| No operation at initial alarm enable | Sets whether to enable or disable the "no operation at initial alarm enable." | 0: Disable 1: Enable | 0 | |
| Magnetic brake function at alarm | Set the actuated timing of the electromagnetic brake when an alarm is generated. When setting to 0, the electromagnetic brake will actuate and hold the position after the motor coasts to a stop. | 0: Lock after free stop 1: Lock immediately | 1 | |
| Initial thermal input detection | Switches whether to enable or disable the initial thermal input detection. When setting to "1: Enable," the regeneration unit overheat alarm will be generated if the 24 VDC power supply is input while the TH input is not assigned. | 0: Disable 1: Enable | 0 | |
| Run mode select | The motor excitation can be shut off so that the overvoltage alarm is not generated immediately when driving a large inertia. The time until the motor stops will be longer. | 0: PWM shut off mode enable 1: PWM shut off mode disable | 1 | |

* Indicates the timing for the data to become effective. (C:Effective after executing configuration or effective after turning the power ON again)

Note When the electromagnetic brake motor is operated in vertical direction, do not set the "run mode select" parameter to "0."

• Analog input signal selection parameter

Setting method of operation data can be changed using the "analog input signal select" parameter. Others except the following combinations are not available to set.

| Analog input signal selection parameter | Operation data No. | Rotational speed | Acceleration Deceleration | Torque limit |
|---|--------------------|------------------|------------------------------|----------------|
| 0 | 0 to 15 | Digital setting | | |
| 1 (Initial value) | 0 | Analog setting | Digital setting | |
| | 1 to 15 | Digital setting | | |
| 2 | 0 to 15 | Digital setting | | Analog setting |

Setting example

- When setting all operation data with digital setting: Set the analog input signal selection parameter to 0.
- When setting the only rotation speed of the operation data No.0 with analog setting: Set the analog input signal selection parameter to 1.

■ Communication parameter

| Name | Description | Setting range | Initial value | Effective * |
|----------------------------------|--|-----------------------------------|---------------|-------------|
| Communication time out | 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: No parity 1: Even 2: Odd | 1 | D |
| Communication stop bit | Sets the stop bit for RS-485 communication. | 0: 1 bit 1: 2 bit | 0 | |
| Communication transfer wait 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)

3 Method of control via I/O

This chapter explains the operations that can be performed with the **BLE** Series FLEX RS-485 communication type.

3.1 Operation data

The following data is required to operate a motor. Total 16 operation data (No.0 to No.15) can be set in this product. There are the following two setting methods.

- Analog setting for rotation speed: This is a method to set the rotation speed using the external potentiometer or external DC voltage.
- Digital setting for rotation speed: This is a method to set the rotation speed using any of the **OPX-2A**, **MEXE02** or RS-485 communication.

| Item | Description | Setting method | Setting range | Initial value |
|------------------|--|-----------------------------------|-------------------|---------------|
| Rotational speed | Sets the rotation speed. | Analog setting | 100 to 4000 r/min | 0 r/min |
| | | Digital setting | 80 to 4000 r/min | |
| Acceleration | Sets the time needed for the motor to reach the rotation speed. | Digital setting | 0.2 to 15 s | 0.5 s |
| Deceleration | Sets the time needed for the motor to stop from the rotation speed. | | | |
| Torque limit | Sets the motor torque. Sets the maximum torque based on the rated torque being 100%. | Digital setting Analog setting | 0 to 200% | 200% |

When using the digital setting for the rotation speed or torque limiting, enable the digital setting by setting the setting range of the following parameter to "0: Analog invalid."

| Parameter name | Description | Setting range | Initial value |
|----------------------------|---|--|---------------|
| Analog input signal select | Sets the setting method of operation data. Refer to p.64 for details. | 0: Analog invalid 1: Analog speed 2: Analog torque | 1 |

3.2 Setting the rotation speed

■ Analog setting

Set the rotation speed by the external potentiometer (supplied) or external DC voltage.

• Setting by the external potentiometer

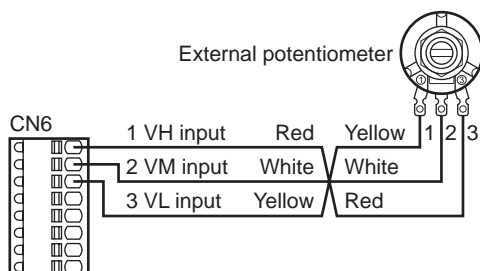
Connect the supplied external potentiometer to the pin Nos.1 to 3 of CN6 of the driver. Use the supplied signal wire for this connection.

Use the supplied signal wire for this connection.

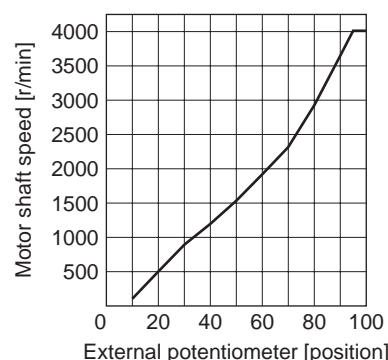
Connect the shield wire of the signal wire to the VL input terminal.

Make sure the shield wire does not contact other terminals.

Turning the external potentiometer in the clockwise direction makes the motor to rotate faster. Turning it in the counterclockwise direction makes the motor to rotate slower.



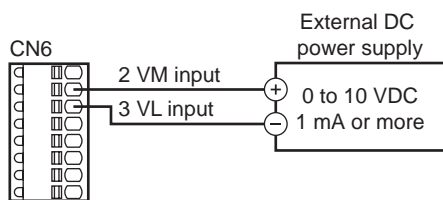
• Speed characteristics (representative values)



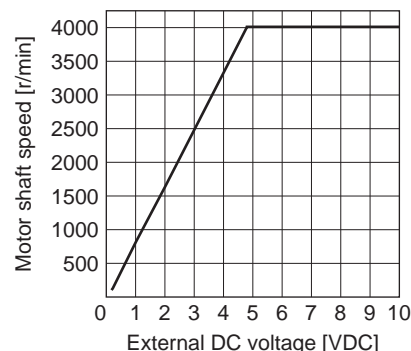
• Setting by the external DC voltage

For the external voltage, use a DC power supply (0 to 10 VDC) with reinforced insulation on both the primary side and secondary side, and connect it to the pin Nos. 2 and 3 of CN6 of the driver.

The input impedance between the VM input and VL input is approx. 30 k Ω . The VL input is connected to IN-COM1 inside the driver.



• Speed characteristics (representative values)

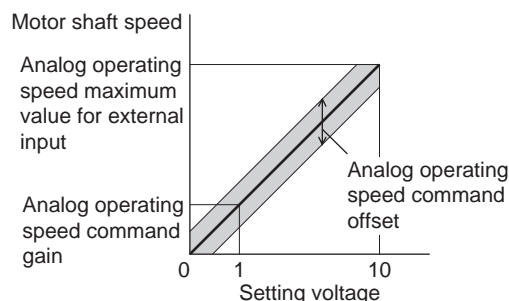


Note Be sure to set the external DC voltage to 10 VDC or lower. When connecting the external DC power supply, make sure the polarities are correct. If the polarities are reversed, the driver may be damaged.

Gain adjustment and offset adjustment for external DC voltage

When setting the rotation speed using the external DC voltage, the relationship between the voltage value and rotation speed can be changed by adjusting the gain or offset. Set the following parameters using any of the **OPX-2A**, **MEXE02** or via RS-485 communication.

Note The rotation speed corresponding to the voltage value varies depending on the products.

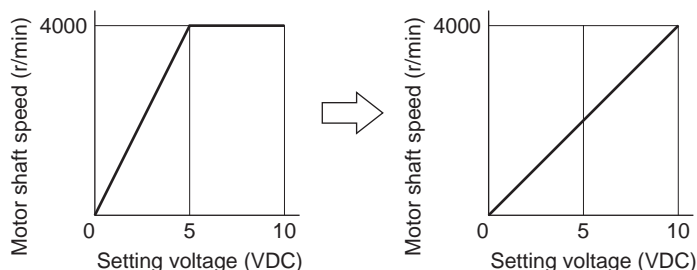


| Parameter name | Description | Setting range | Initial value |
|---|--|---------------------|---------------|
| Analog operating speed command gain | Sets the speed command per 1 VDC of input voltage. | 0 to 4000 r/min | 800 |
| Analog operating speed maximum value for external input | Sets the maximum value of rotation speed. | | 4000 |
| Analog operating speed command offset | Sets the offset for speed command input. | -2000 to 2000 r/min | 0 |

Setting example1:

When setting the rotation speed of the motor output shaft up to 4000 r/min (maximum rotation speed) using 0 to 10 VDC of the external DC voltage

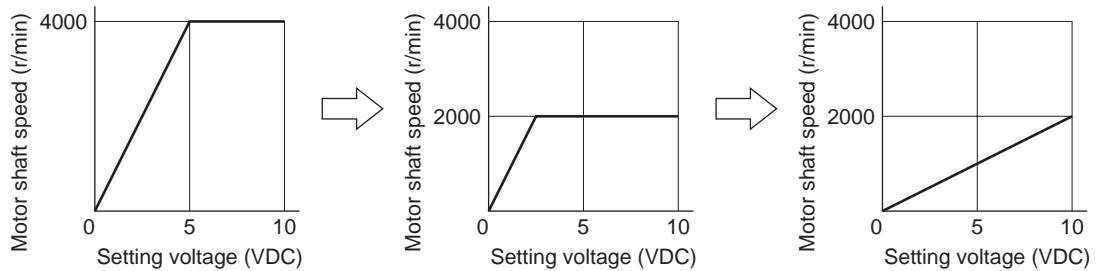
Set the "analog operating speed command gain" to 400.



Setting example2:

When setting the rotation speed of the motor output shaft up to 2000 r/min (maximum rotation speed) using 0 to 10 VDC of the external DC voltage

Set the "analog operating speed maximum value for external input" to 2000, and then set the "analog operating speed command gain" to 200.



■ Digital setting

- Using the **OPX-2A**: Refer to the **OPX-2A OPERATING MANUAL**.
- Using the **MEXE02**: Refer to the **MEXE02 OPERATING MANUAL**.
- Via RS-485 communication: Refer to "4 Method of control via Modbus RTU (RS-485 communication)" or "5 Method of control via industrial network"

3.3 Setting the acceleration time and deceleration time

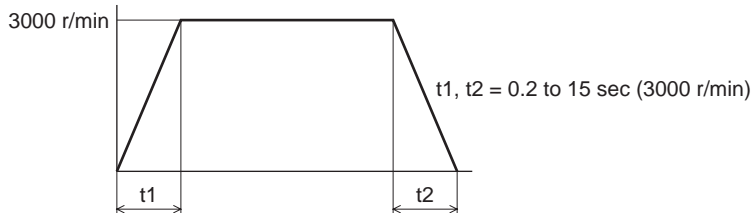
The meaning of the acceleration time/deceleration time varies depending on the setting method of the rotation speed.

■ When setting the rotation speed with analog setting

When using the analog setting, the motor is operated at the acceleration time and deceleration time set in the operating data No.0.

Acceleration time (t_1) refers to the time needed for the motor to reach the rated speed (3000 r/min) from the standstill status.

Deceleration time (t_2) refers to the time needed for the motor to stop from the rated speed (3000 r/min).



■ When setting the rotation speed with digital setting

When using the digital setting, the desired value for the acceleration time and deceleration time can be set to the operating data No.0 to No.15 respectively.

Acceleration time refers to the time needed for the motor to reach the setting speed from the standstill status.

Deceleration time refers to the time needed for the motor to stop from the setting speed.

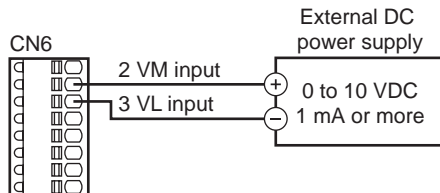
3.4 Setting the torque limiting

Set the torque limiting when restricting the motor output torque. The torque limiting can be set using either of the analog setting or digital setting. This section explains the analog setting by the external DC voltage.

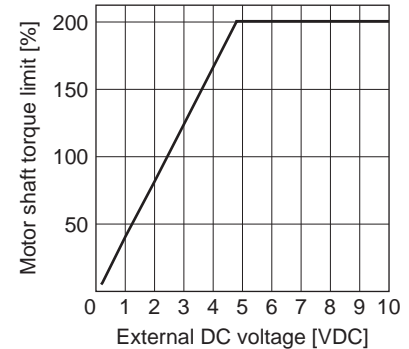
■ Setting by the external DC voltage

For the external voltage, use a DC power supply (0 to 10 VDC) with reinforced insulation on both the primary side and secondary side, and connect it to the pin Nos. 2 and 3 of CN6 of the driver.

The input impedance between the VM input and VL input is approx. 30 k Ω . The VL input is connected to IN-COM1 inside the driver.



- Torque limiting characteristics (representative values)

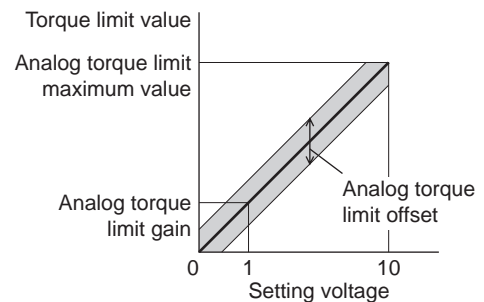


Note Be sure to set the external DC voltage to 10 VDC or lower. When connecting the external DC power supply, make sure the polarities are correct. If the polarities are reversed, the driver may be damaged.

Gain adjustment and offset adjustment for external DC voltage

When setting the torque limiting using the analog setting, the relationship between the voltage value and torque limiting value can be changed by adjusting the gain or offset.

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

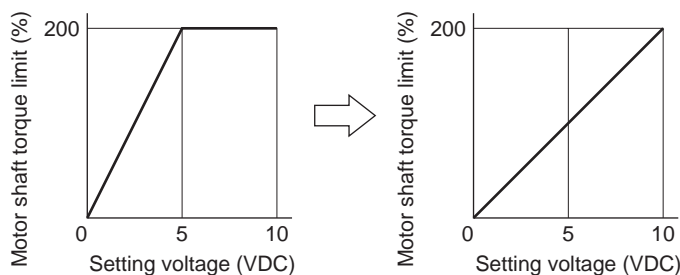


| Parameter name | Description | Setting range | Initial value |
|-----------------------------------|---|---------------|---------------|
| Analog torque limit gain | Sets the torque limit per 1 VDC of input voltage. | 0 to 200% | 40 |
| Analog torque limit maximum value | Sets the maximum value of torque limit. | | 200 |
| Analog torque limit offset | Sets the offset for torque limit input. | -50 to 50% | 0 |

Setting example

When adjusting the torque limiting value up to 200% using 0 to 10 VDC of the external DC voltage

Set the "analog torque limit gain" to 20.



3.5 Running/stopping the motor

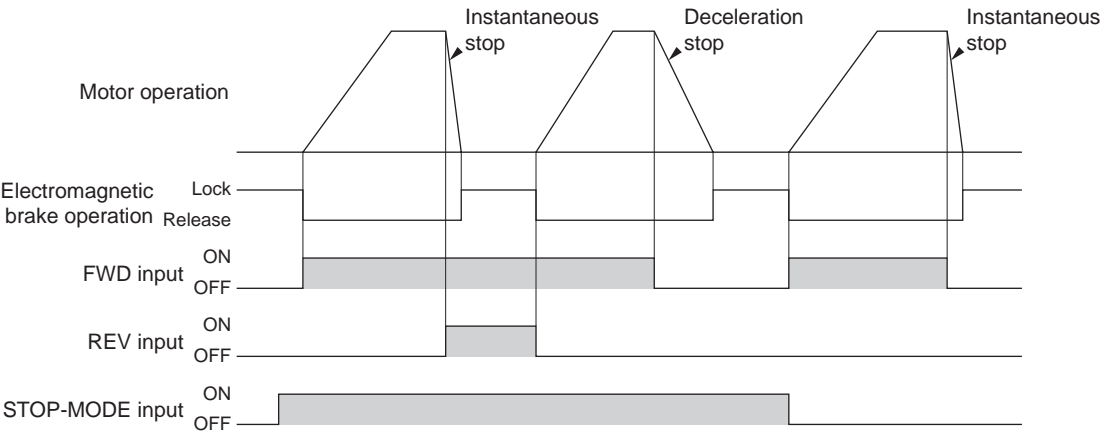
Run/stop the motor by inputting operation control signals.

■ Operation

When the FWD input is turned ON, the motor rotates in the clockwise direction. When the FWD input is turned OFF, the motor stops.

When the REV input is turned ON, the motor rotates in the counterclockwise direction. When the REV input is turned OFF, the motor stops.

If both the FWD input and REV input are turned ON, the motor stops instantaneously.



Note When using the motor in vertical drive (gravitational operation), although it depends on the load condition, if operation is performed with the setting below, the motor shaft may momentarily rotate in the reverse direction (about one-fourth revolution of the motor output shaft) at the time of starting/stopping the motor.

- When the set rotation speed is low
- When the acceleration time and deceleration time is long

■ Stop

If the STOP-MODE input is ON, the motor decelerates and stops. If the STOP-MODE input is OFF, the motor stops instantaneously.

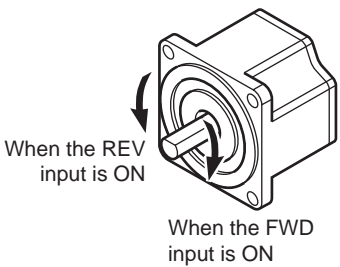
■ Rotation direction

The rotation direction of the motor output shaft represents the direction when viewed from the motor output shaft side.

• Combination type • parallel shaft gearhead

The rotation direction of the motor output shaft may vary from that of the gearhead output shaft depending on the gear ratio of the gearhead.

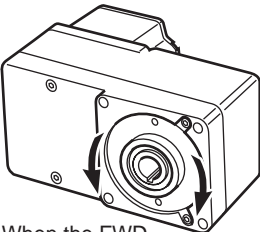
| Gear ratio | Rotating direction of gearhead output shaft |
|--------------------|---|
| 5, 10, 15, 20, 200 | Same as the motor output shaft |
| 30, 50, 100 | Opposite to the motor output shaft |



• Combination type • hollow shaft flat gearhead

For all gear ratios, the output shaft of the gearhead rotates in the opposite direction to that of the motor. The direction is different depending on whether the pre-assembled motor/gearhead is viewed from the front side or rear side.

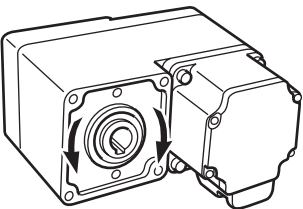
Viewed from Front



When the FWD input is ON

When the REV input is ON

Viewed from Rear

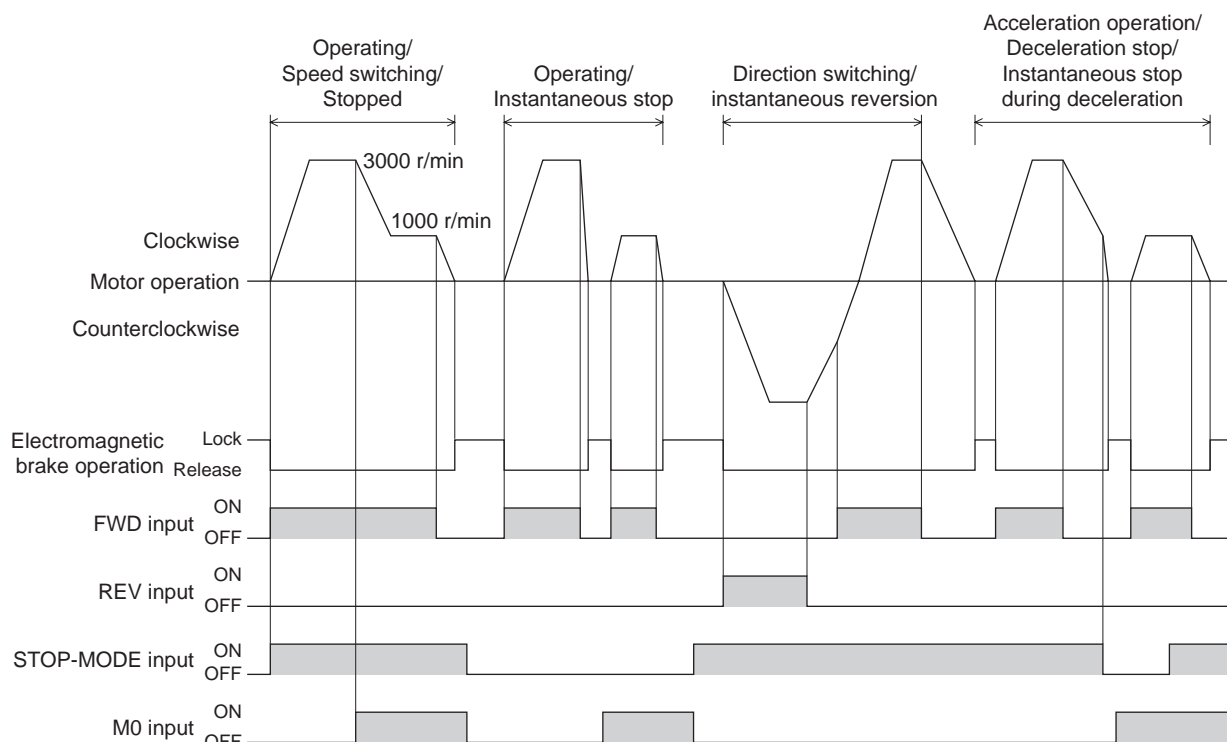


When the REV input is ON

When the FWD input is ON

3.6 Example of operation pattern

The charts below are an example of setting the external potentiometer to 3000 r/min and the rotation speed of the operation data No.1 to 1000 r/min, and switching the speed between these two levels.



- Note**
- Make sure each signal remains ON for at least 10 ms.
 - When switching the FWD input and REV input, provide an interval of at least 10 ms.

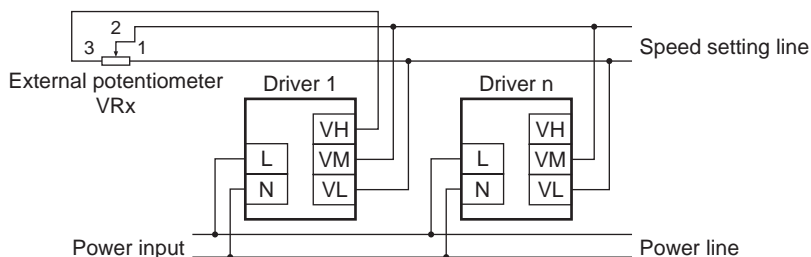
3.7 Multi-motor control

A single external potentiometer (external DC voltage) can be used to operate the same speed for multiple motors.

- The connection examples explained here assume a single-phase specification. In the case of a three-phase specification, connect the power line to a three-phase power supply.
- Connection of a motor and I/O signals is omitted in the figure.

■ Using an external potentiometer

Connect the drivers as shown below. When performing multi-motor control using the external potentiometer, the number of drivers should not exceed 20 units.



Resistance (VRx) when the number of drivers is n:

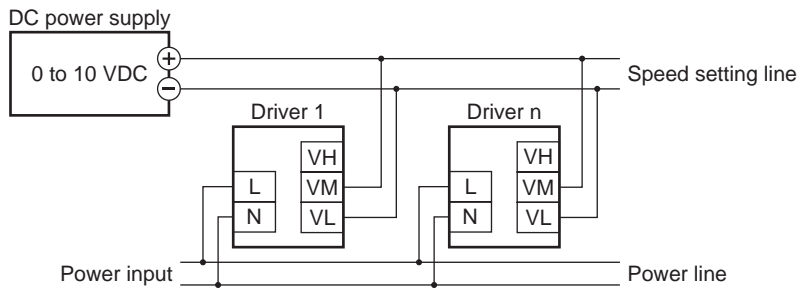
$$\text{Resistance (VRx)} = 20/n \text{ (k}\Omega\text{)}, n/4 \text{ (W)}$$

Example: If two drivers are used

$$\text{Resistance (VRx)} = 20/2 \text{ (k}\Omega\text{)}, 2/4 \text{ (W)}, \text{ resistance (VRx) is calculated as } 10 \text{ k}\Omega, 1/2 \text{ W.}$$

■ Using external DC voltage

Connect the drivers as shown below.



Current capacity (I) of external DC power supply when the number of drivers is n:

$$\text{Current capacity (I)} = 1 \times n \text{ (mA)}$$

Example: If two drivers are used

Current capacity (I) = 1×2 (mA), current capacity (I) is calculated as 2 mA or more.

■ How to adjust the speed difference

To adjust the speed difference among the first motor and the second and subsequent motors, change the parameter or connect a resistor to adjust.

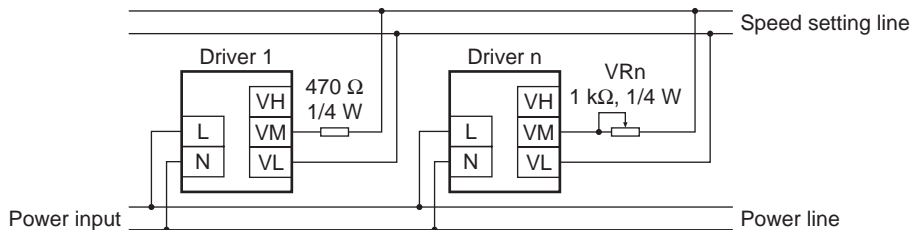
• Adjusting by the parameter

The speed difference can be adjusted by changing the "analog operating speed command gain" parameter and "analog operating speed command offset" parameter for the second and subsequent drivers. This section explains how to adjust by the "analog operating speed command offset" parameter. See p.67 for details.

- When the speed of the second motor is slower than that of the first motor:
Set the offset value to rotate faster (positive side) by the "analog operating speed command offset" parameter.
- When the speed of the second motor is faster than that of the first motor:
Set the offset value to rotate slower (negative side) by the "analog operating speed command offset" parameter.

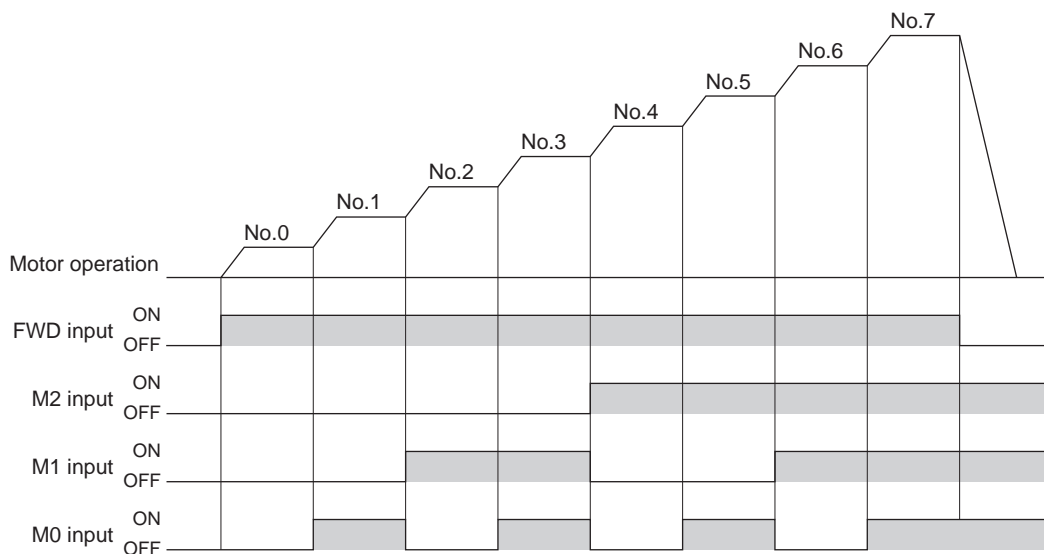
• Adjustment by a resistor

Connect a resistor of 470Ω , $1/4 \text{ W}$ to the terminal VM on the driver 1 and connect a variable resistor VRn of $1 \text{ k}\Omega$, $1/4 \text{ W}$ to the driver 2 and subsequent drivers.



3.8 Multi-speed operation

When assigning the M0 to M3 inputs to the CN5 input terminals, the variable-speed driving of the motor is possible using maximum 16 operation data. This section shows an example assigning the M0 to M2 inputs and performing multi-speed operation by using 8 operating data. See p.51 for the combination of the M0 to M3 inputs and how to select the operating data.



4 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.

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| 2 Communication specifications..... | 79 | 8.1 Operation commands..... | 93 |
| 3 Setting the switches | 81 | 8.2 Maintenance commands | 94 |
| 4 Setting the RS-485 communication.... | 83 | 8.3 Monitor commands..... | 95 |
| 5 Communication mode and communication timing | 84 | 8.4 Parameter R/W commands..... | 98 |
| 5.1 Communication mode | 84 | ■ Operation data | 98 |
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1 Guidance

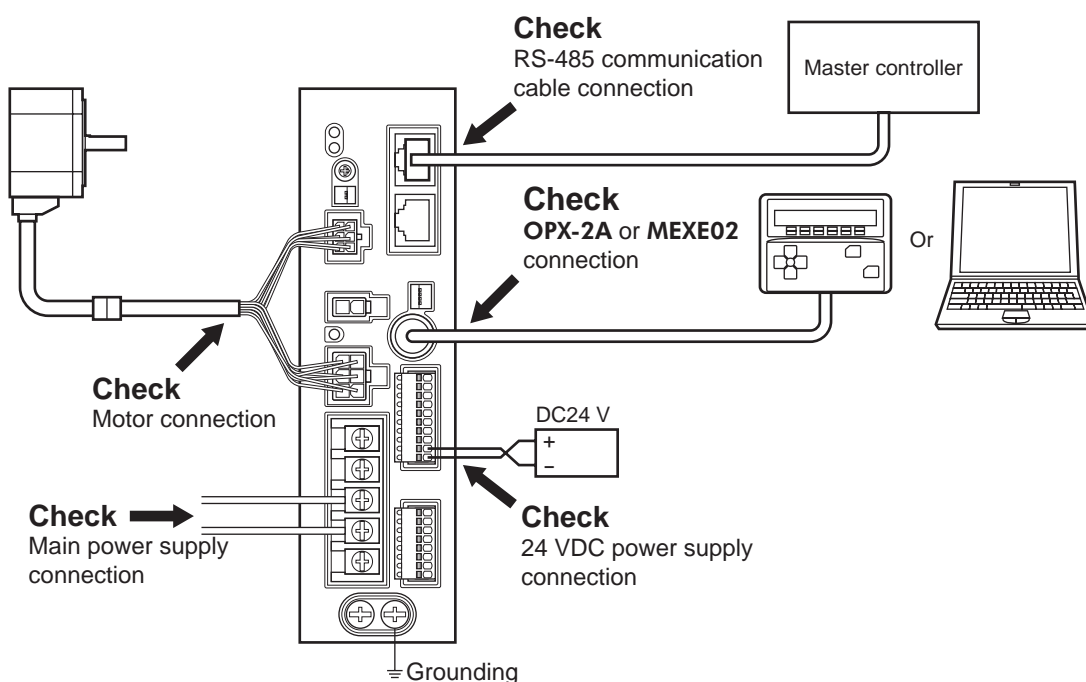
The Modbus protocol is simple and its specification is open to the public, so this protocol is used widely in industrial applications. Modbus communication is based on the single-master/multiple-slave method. Only the master can issue a query (command). Each slave executes the requested process and returns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

If you are new to the **BLE** Series **FLEX** RS-485 communication 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



■ Setting method of the operation data

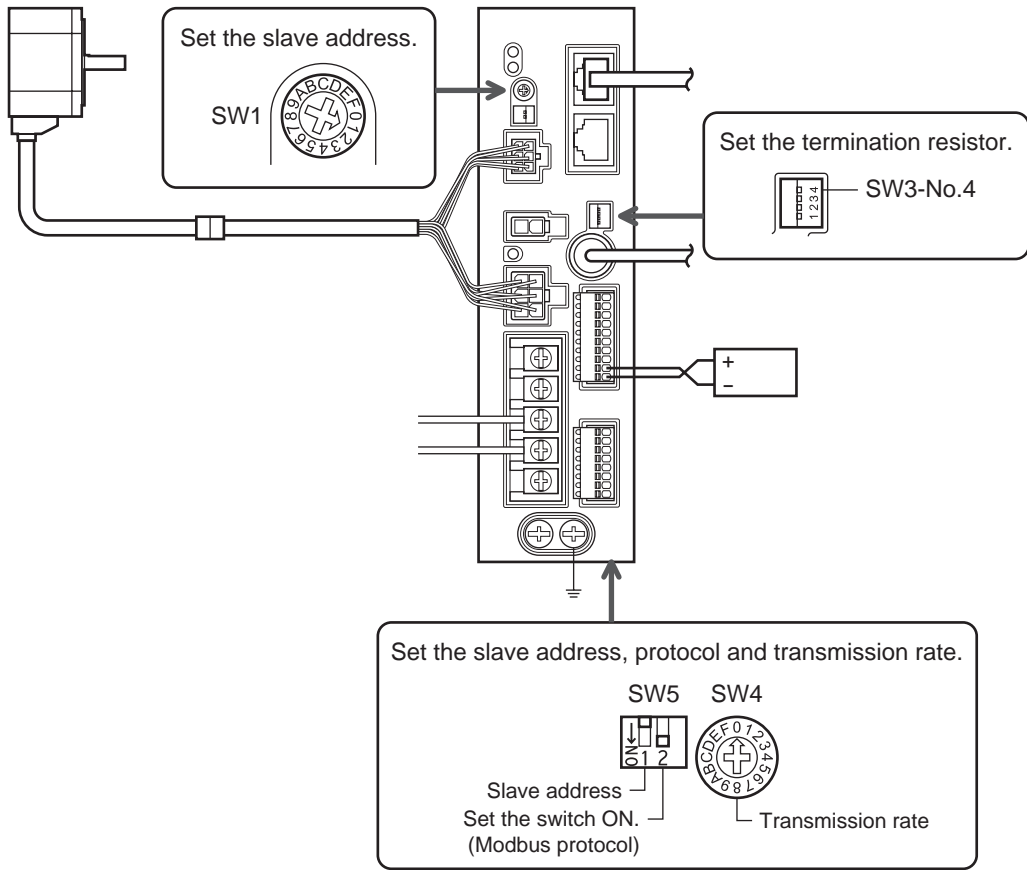
The analog setting, which permits the setting of the rotation speed with an external potentiometer or external DC voltage, is enabled at the time of shipment.

When controlling by a programmable controller via RS-485 communication, change the setting of the "Analog input signal selection" parameter to 0 (digital setting).

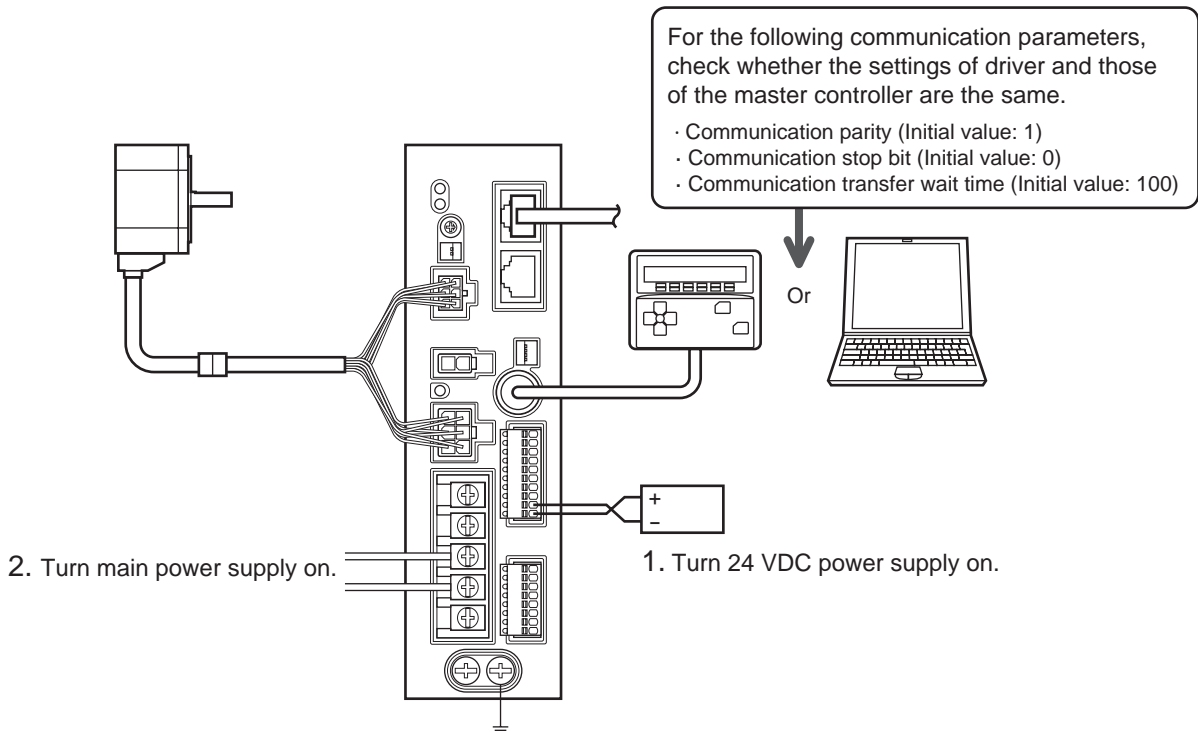
Refer to the table below for the parameter setting.

| "Analog input signal select" parameter | Operation data No. | Rotational speed | Acceleration Deceleration | Torque limit |
|--|--------------------|------------------|------------------------------|----------------|
| 0 | 0 to 15 | Digital setting | | |
| 1 (Initial value) | 0 | Analog setting | Digital setting | |
| | 1 to 15 | Digital setting | | |
| 2 | 0 to 15 | Digital setting | | Analog setting |

STEP 2 Set the switches



STEP 3 Turn on the power and check the parameters



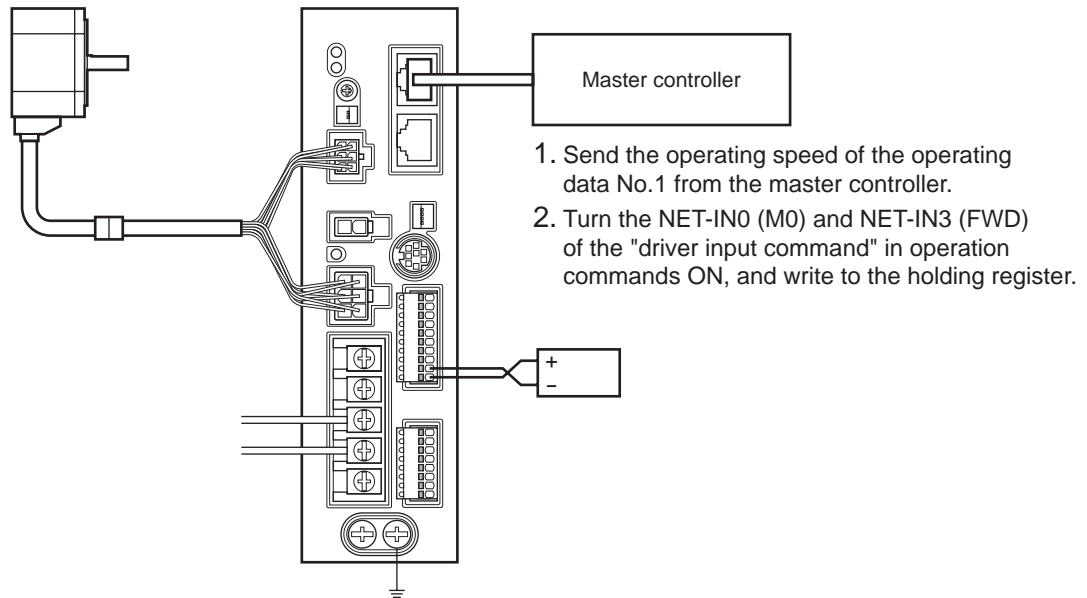
Check that the parameters of the driver and those of the master controller are the same.
Use the **OPX-2A** or **MEXE02** when changing the driver parameters.

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

3. Confirm that the motor rotates without any problem.



STEP 6 Were you able to operate the motor properly?

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

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

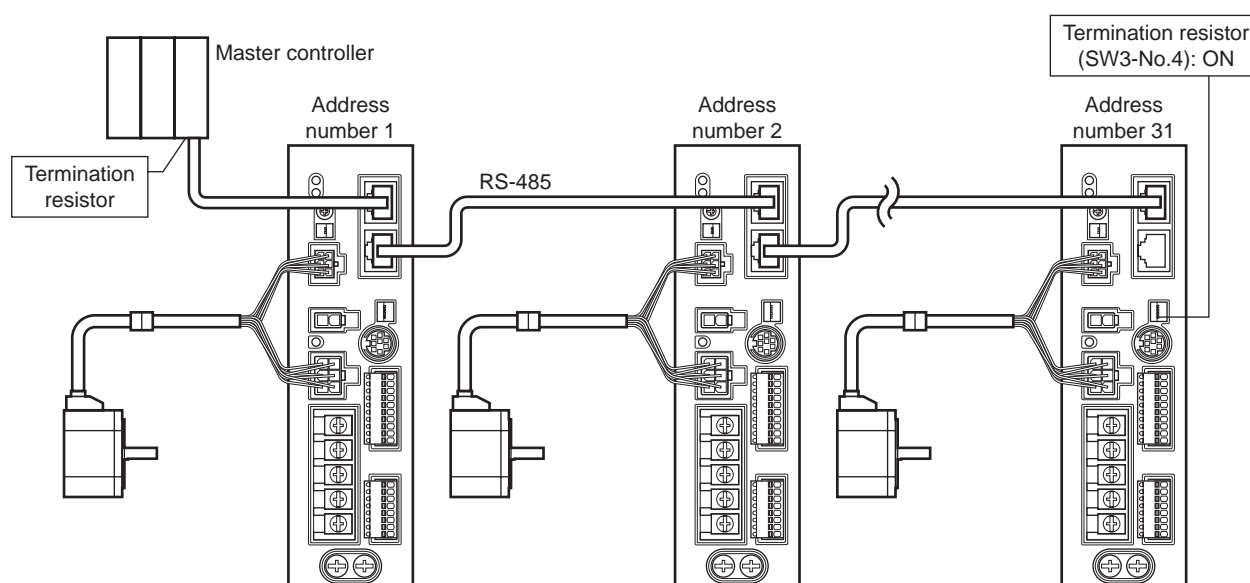
For more detailed settings and functions, refer to following pages.

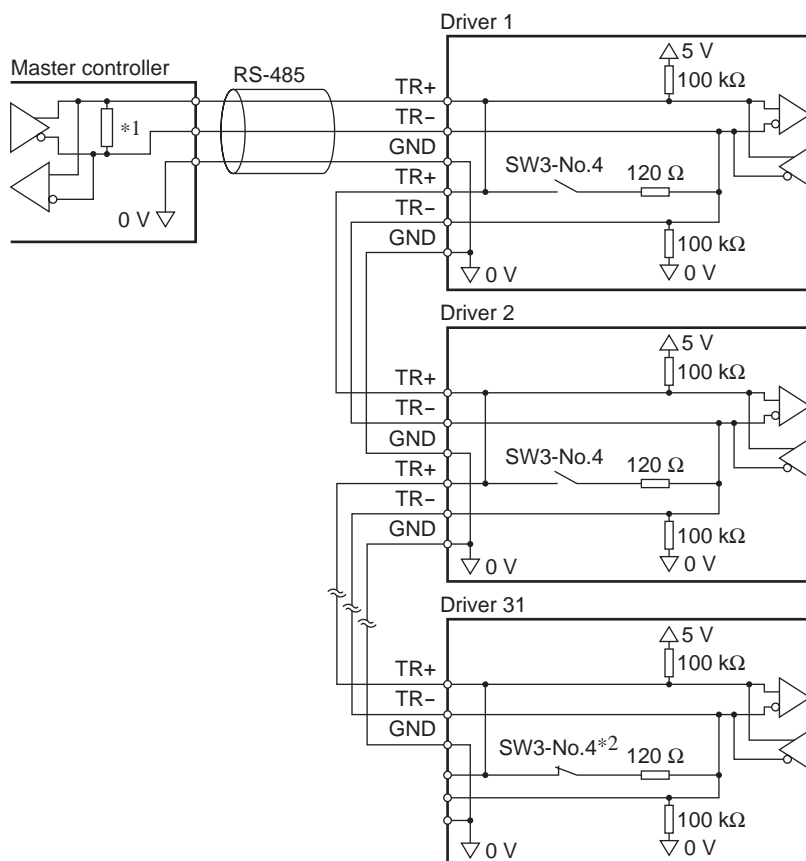
2 Communication specifications

| | |
|----------------------------|---|
| 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. * |
| Transmission mode | Half duplex |
| Transmission rate | Selectable from 9600 bps, 19200 bps, 38400 bps, 57600 bps and 115,200 bps. |
| Physical layer | Asynchronous mode (data: 8 bits, stop bit: 1 bit/2 bits, parity: none/even number/odd number) |
| Protocol | Modbus RTU mode |
| Connection pattern | Up to 31 drivers can be connected to one master controller. |

* If the motor cable or power supply cable generates an undesirable amount of noise depending on the wiring or configuration, shield the cable or install a ferrite core.

■ Connection example

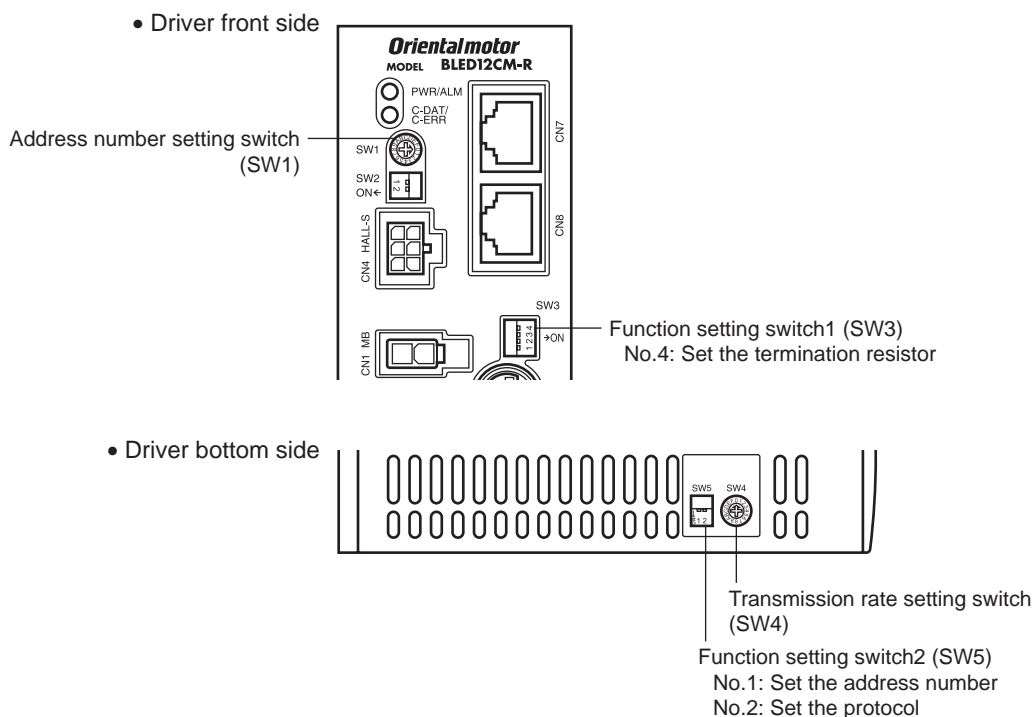




*1 Termination resistor 120 Ω

*2 Turn the termination resistor (SW3-No.4) 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 SW5-No.2 of the function setting switch2 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 (SW1) and SW5-No.1 of the function setting switch2. Make sure each address number (slave address) you set for each driver is unique. Address number (slave address) 0 is reserved for broadcasting, so do not use this address.

Factory setting SW1: 0, SW5-No.1: OFF (Address number 0)

| SW1 | SW5-No.1 | Address number (slave address) | SW1 | SW5-No.1 | Address number (slave address) |
|-----|----------|--------------------------------|-----|----------|--------------------------------|
| 0 | OFF | Not used | 0 | ON | 16 |
| 1 | | 1 | 1 | | 17 |
| 2 | | 2 | 2 | | 18 |
| 3 | | 3 | 3 | | 19 |
| 4 | | 4 | 4 | | 20 |
| 5 | | 5 | 5 | | 21 |
| 6 | | 6 | 6 | | 22 |
| 7 | | 7 | 7 | | 23 |
| 8 | | 8 | 8 | | 24 |
| 9 | | 9 | 9 | | 25 |
| A | | 10 | A | | 26 |
| B | | 11 | B | | 27 |
| C | | 12 | C | | 28 |
| D | | 13 | D | | 29 |
| E | | 14 | E | | 30 |
| F | | 15 | F | | 31 |

■ Transmission rate

Set the transmission rate using transmission rate setting switch (SW4).

The transmission rate to be set should be the same as the transmission rate of the master controller.

Factory setting 7

| SW4 | Transmission rate (bps) |
|--------|-------------------------|
| 0 | 9600 |
| 1 | 19200 |
| 2 | 38400 |
| 3 | 57600 |
| 4 | 115,200 |
| 5 | Not used |
| 6 | Not used |
| 7 | Network Converter |
| 8 to F | Not used |

Note Do not set the SW4 to positions 5, 6 and 8 to F.

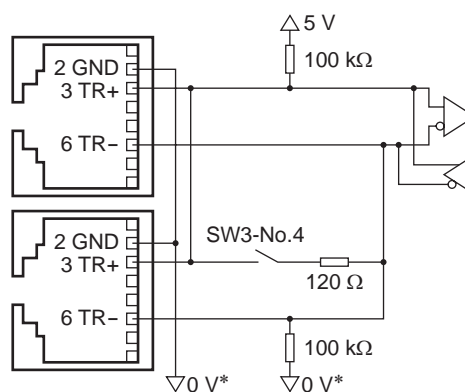
■ Termination resistor

Use a termination resistor for the driver located farthest away (positioned at the end) from the master controller.

Turn the SW3-No.4 of the function setting switch1 to ON to set the termination resistor for RS-485 communication (120 Ω).

Factory setting OFF (termination resistor disabled)

| SW3-No.4 | Termination resistor (120 Ω) |
|----------|--------------------------------------|
| OFF | Disabled |
| ON | Enabled |



* The GND line is used in common with 24 VDC power supply input terminal (CN5).

4 Setting the RS-485 communication

Set parameters required to use via RS-485 communication beforehand.

■ Parameters set with the OPX-2A or MEXE02

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

| Parameter name | Description | Setting range | Initial value |
|----------------------------------|--|-----------------------------------|---------------|
| Communication parity | Sets the parity for RS-485 communication. | 0: No parity 1: Even 2: Odd | 1 |
| Communication stop bit | Sets the stop bit for RS-485 communication. | 0: 1 bit 1: 2 bit | 0 |
| Communication transfer wait 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 any of the **OPX-2A**, **MEXE02** or RS-485 communication.

| Parameter name | Description | Setting range | Initial value |
|---------------------------|--|---------------|---------------|
| Communication time out | 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 |

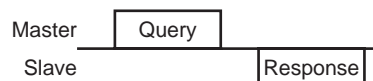
5 Communication mode and communication timing

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.

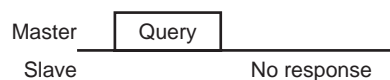
- **Unicast mode**

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

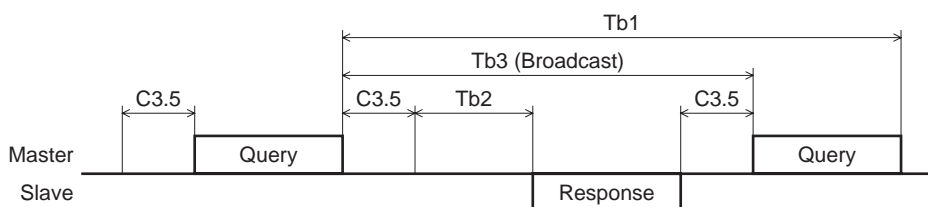


- **Broadcast mode**

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



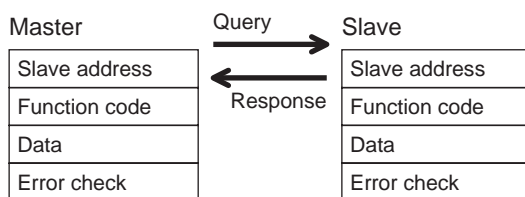
| Character | Name | Description |
|-----------|---------------------------|---|
| Tb1 | Communication timeout | Intervals between received messages are monitored. If no message could be received after the time set in the "communication time out" parameter, the RS-485 communication timeout alarm generates. |
| 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 "communication transfer wait time" parameter. The actual transmission waiting time corresponds to the silent interval (C3.5) + transmission waiting time (Tb2). |
| Tb3 | Broadcasting interval | The time until the next query is sent in broadcasting. A time equivalent to or longer than the silent interval (C3.5) plus 5 ms is required. |
| C3.5 | Silent interval | Be sure to provide a waiting time of 3.5 characters or more. If this waiting time is less than 3.5 characters long, the driver cannot respond. See the following table for transmission waiting time. |

Transmission waiting time of the "silent interval"

| Transmission rate (bps) | Transmission waiting time |
|------------------------------------|---------------------------|
| 9600 | 5.5 ms or more |
| 19200 38400 57600 115,200 | 3.5 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 **BLE** Series FLEX RS-485 communication 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.

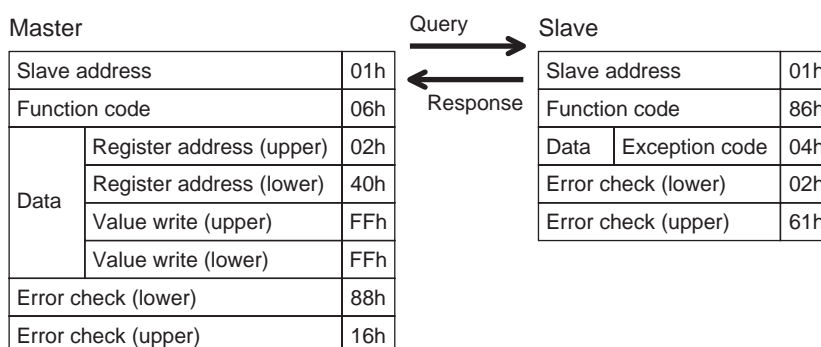
| Slave address | Function code | Exception code | Error check |
|---------------|---------------|----------------|-------------|
| 8 bits | 8 bits | 8 bits | 16 bits |

• 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



- 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. <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> • User I/F communication in progress (89h) <ul style="list-style-type: none"> · 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) <ul style="list-style-type: none"> · Internal processing is in progress. (S-BSY is ON.) • An EEPROM error alarm is present. • Outside the parameter setting range (8Ch) <ul style="list-style-type: none"> · 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 rotation speed Nos.0 and 1 of slave address 1.

| Description | Register address | Value read | Corresponding decimal |
|-----------------------------|------------------|------------|-----------------------|
| Rotation speed No.0 (upper) | 0480h | 0000h | 100 |
| Rotation speed No.0 (lower) | 0481h | 0064h | |
| Rotation speed No.1 (upper) | 0482h | 0000h | 4000 |
| Rotation speed No.1 (lower) | 0483h | 0FA0h | |

• 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 (lower) | 80h |
| | Number of registers (upper) | 00h |
| | Number of registers (lower) | 04h |
| Error check (lower) | 44h | Calculation result of CRC-16 |
| Error check (upper) | D1h | |

• Response

| Field name | Data | Description |
|---------------------|--|------------------------------|
| Slave address | 01h | Same as query |
| Function code | 03h | |
| Data | Number of data bytes | 08h |
| | Value read from register address (upper) | 00h |
| | Value read from register address (lower) | 00h |
| | Value read from register address+1 (upper) | 00h |
| | Value read from register address+1 (lower) | 64h |
| | Value read from register address+2 (upper) | 00h |
| | Value read from register address+2 (lower) | 00h |
| | Value read from register address+3 (upper) | 0Fh |
| | Value read from register address+3 (lower) | A0h |
| | Error check (lower) | E1h |
| Error check (upper) | 97h | Calculation result of CRC-16 |

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 50 (32h) as overload warning label (lower) to slave address 2.

| Description | Register address | Value write | Corresponding decimal |
|--------------------------------|------------------|-------------|-----------------------|
| Overload warning label (lower) | 10ABh | 32h | 50 |

• Query

| Field name | | Data | Description |
|---------------------|--------------------------|------|---------------------------------------|
| Slave address | | 02h | Slave address 2 |
| Function code | | 06h | Writing to a holding register |
| Data | Register address (upper) | 10h | Register address to be written |
| | Register address (lower) | ABh | |
| | Value write (upper) | 00h | Value written to the register address |
| | Value write (lower) | 32h | |
| Error check (lower) | | 7Dh | Calculation result of CRC-16 |
| Error check (upper) | | 0Ch | |

• Response

| Field name | | Data | Description |
|---------------------|--------------------------|------|------------------------------|
| Slave address | | 02h | Same as query |
| Function code | | 06h | |
| Data | Register address (upper) | 10h | |
| | Register address (lower) | ABh | |
| | Value write (upper) | 00h | |
| | Value write (lower) | 32h | |
| Error check (lower) | | 7Dh | Calculation result of CRC-16 |
| Error check (upper) | | 0Ch | |

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 time Nos.0 to 2 as part of operation data at slave address 4.

| Description | Register address | Value written | Corresponding decimal |
|---|------------------|---------------|-----------------------|
| Operation data acceleration time No.0 (upper) | 0600h | 0000h | 2 |
| Operation data acceleration time No.0 (lower) | 0601h | 0002h | |
| Operation data acceleration time No.1 (upper) | 0602h | 0000h | 50 |
| Operation data acceleration time No.1 (lower) | 0603h | 0032h | |
| Operation data acceleration time No.2 (upper) | 0604h | 0000h | 150 |
| Operation data acceleration time No.2 (lower) | 0605h | 0096h | |

• 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) | 00h | |
| | 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 (6 registers × 2 = 12 registers: 0Ch) |
| | Value written to register address (upper) | 00h | Value written to register address 0600h |
| | Value written to register address (lower) | 00h | |
| | Value written to register address+1 (upper) | 00h | Value written to register address 0601h |
| | Value written to register address+1 (lower) | 02h | |
| | Value written to register address+2 (upper) | 00h | Value written to register address 0602h |
| | Value written to register address+2 (lower) | 00h | |
| | Value written to register address+3 (upper) | 00h | Value written to register address 0603h |
| | Value written to register address+3 (lower) | 32h | |
| | Value written to register address+4 (upper) | 00h | Value written to register address 0604h |
| | Value written to register address+4 (lower) | 00h | |
| | Value written to register address+5 (upper) | 00h | Value written to register address 0605h |
| | Value written to register address+5 (lower) | 96h | |
| Error check (lower) | | 85h | Calculation result of CRC-16 |
| Error check (upper) | | 70h | |

• Response

| Field name | | Data | Description |
|---------------------|-----------------------------|------|------------------------------|
| Slave address | | 04h | Same as query |
| Function code | | 10h | |
| Data | Register address (upper) | 06h | |
| | Register address (lower) | 00h | |
| | Number of registers (upper) | 00h | |
| | Number of registers (lower) | 06h | |
| Error check (lower) | | 40h | Calculation result of CRC-16 |
| Error check (upper) | | D6h | |

8 Register address list

All data used by the driver is 32-bit wide. The register for the Modbus protocol is 16-bit wide, and 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

These are 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) | Reads 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.104 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.50 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 [Not used] | NET-IN14 [Not used] | NET-IN13 [Not used] | NET-IN12 [Not used] | NET-IN11 [Not used] | NET-IN10 [Not used] | NET-IN9 [Not used] | NET-IN8 [Not used] |
| | bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
| | NET-IN7 [Not used] | NET-IN6 [MB-FREE] | NET-IN5 [STOP-MODE] | NET-IN4 [REV] | NET-IN3 [FWD] | 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.52 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 [TLC] | NET-OUT14 [VA] | NET-OUT13 [MOVE] | NET-OUT12 [ALARM-OUT2] | NET-OUT11 [Not used] | NET-OUT10 [Not used] | NET-OUT9 [Not used] | NET-OUT8 [S-BSY] |
| | bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
| | NET-OUT7 [ALARM-OUT1] | NET-OUT6 [WNG] | NET-OUT5 [STOP-MODE_R] | NET-OUT4 [REV_R] | NET-OUT3 [FWD_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, and they are also used to execute the batch processing for the non-volatile memory. All commands can be written (WRITE). They are executed 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) | | |
| 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) | | |

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

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

Configuration (018Ch, 018Dh)

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

- An alarm is not present.
- The motor is not operated.
- The **OPX-2A** is in other modes than the test mode or copy mode.
- The **MEXE02** is in other status than downloading, I/O test, test operation or teaching function.

Shows the driver status before and after executing the configuration.

| Item | Configuration is ready to execute | Configuration is executing | Configuration is completed |
|-----------------------|-----------------------------------|----------------------------|--------------------------------|
| PWR LED | Lit | Lit | Based on the driver condition. |
| ALM LED | OFF | OFF | |
| Electromagnetic brake | Hold/release | Hold | |
| Output signals | Allowed | Indeterminable | Allowed |
| Input signals | | Not allowed | |

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

8.3 Monitor commands

These commands are used to monitor the command position, command speed, alarm and warning records, etc. All commands can be read (READ).

| Register address | | Name | Description | Range |
|------------------|-------|--------------------------|------------------------------------|------------|
| Dec | Hex | | | |
| 128 | 0080h | Present alarm (upper) | Monitors the present alarm code. | 00h to FFh |
| 129 | 0081h | Present alarm (lower) | | |
| 130 | 0082h | Alarm record 1 (upper) | Monitors the alarm records. | |
| 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. | |
| 153 | 0099h | Warning record 1 (lower) | | |
| 154 | 009Ah | Warning record 2 (upper) | | |
| 155 | 009Bh | Warning record 2 (lower) | | |
| 156 | 009Ch | Warning record 3 (upper) | | |
| 157 | 009Dh | Warning record 3 (lower) | | |
| 158 | 009Eh | Warning record 4 (upper) | | |
| 159 | 009Fh | Warning record 4 (lower) | | |

| Register address | | Name | Description | Range |
|------------------|-------|--|--|------------|
| Dec | Hex | | | |
| 160 | 00A0h | Warning record 5 (upper) | Monitors the warning records. | 00h to FFh |
| 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 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) | | |
| 192 | 00C0h | Communication error code record 10 (upper) | | |
| 193 | 00C1h | Communication error code record 10 (lower) | | |

| Register address | | Name | Description | Range |
|------------------|-------|---|--|---|
| Dec | Hex | | | |
| 196 | 00C4h | Present operation data No. (upper) | Monitors the operation data No. corresponding to the data used in the current operation. | 0 to 15 |
| 197 | 00C5h | Present operation data No. (lower) | | |
| 200 | 00C8h | Command speed (upper) | Monitors the command speed. | -4010 to +4010 r/min +: Forward -: Reverse 0: Stop |
| 201 | 00C9h | Command speed (lower) | | |
| 206 | 00CEh | Feedback speed (upper) | Monitors the feedback speed. | -5200 to +5200 r/min +: Forward -: Reverse 0: Stop |
| 207 | 00CFh | Feedback speed (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 | Operation speed (upper) | Monitors the feedback speed calculated by the "reduction gear rate" parameter or "amplification speed rate" parameter. | -20050 to +20050 r/min +: Forward -: Reverse 0: Stop |
| 257 | 0101h | Operation speed (lower) | | |
| 258 | 0102h | Operation speed decimal position (upper) | Monitors the decimal position in the operation speed. *1 | 0: No decimal point 1: 1 digit 2: 2 digit 3: 3 digit |
| 259 | 0103h | Operation speed decimal position (lower) | | |
| 260 | 0104h | Conveyor transfer speed (upper) | Monitors the feedback speed calculated by the "conveyor reduction gear rate" parameter or "conveyor amplification speed rate" parameter. | -20050 to +20050 r/min +: Forward -: Reverse 0: Stop |
| 261 | 0105h | Conveyor transfer speed (lower) | | |
| 262 | 0106h | Conveyor transfer speed decimal position (upper) | Monitors the decimal position in the conveyor transfer speed. *2 | 0: No decimal point 1: 1 digit 2: 2 digit 3: 3 digit |
| 263 | 0107h | Conveyor transfer speed decimal position (lower) | | |
| 264 | 0108h | Load factor (upper) | Monitors the torque that is output by the motor based on the rated torque being 100%. | 0 to 200% |
| 265 | 0109h | Load factor (lower) | | |
| 268 | 010Ch | External analog speed setting (upper) | Monitors the value of the analog speed setting. *3 | 0 to 4000 r/min |
| 269 | 010Dh | External analog speed setting (lower) | | |
| 272 | 0110h | External analog torque limit setting (upper) | Monitors the value of the analog torque limiting. *3 | 0 to 200% |
| 273 | 0111h | External analog torque limit setting (lower) | | |
| 278 | 0116h | External analog voltage setting (upper) | Monitors the value of the analog voltage setting. | 0 to 100 (1=0.1 V) |
| 279 | 0117h | External analog voltage setting (lower) | | |

*1 The decimal position is automatically changed based on the setting of the "reduction gear rate" parameter or "decimal place for reduction gear rate" parameter.

*2 The decimal position is automatically changed based on the setting of the "conveyor reduction gear rate" parameter or "decimal place for conveyor reduction gear rate" parameter.

*3 FFFFh is displayed when not selecting by the "analog input signal select" parameter.

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

| Address (Hex) | Description of address | | | | | | | |
|---------------|------------------------|-------|-------|-------|-------|-------|------|------|
| 00D4h | bit15 | bit14 | bit13 | bit12 | bit11 | bit10 | bit9 | bit8 |
| | – | – | – | – | – | – | MB | – |
| | bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
| | – | – | – | – | – | – | OUT1 | OUT2 |

| Address (Hex) | Description of address | | | | | | | |
|---------------|------------------------|-------|-------|-------|-------|-------|------|------|
| 00D5h | bit15 | bit14 | bit13 | bit12 | bit11 | bit10 | bit9 | bit8 |
| | – | – | – | – | – | – | – | – |
| | bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
| | – | IN6 | IN5 | IN4 | IN3 | IN2 | IN1 | IN0 |

8.4 Parameter R/W commands

These commands are used to write or read parameters. All commands can be read and written (READ/WRITE). When the operation data is changed, a recalculation and setup will be performed immediately and the changed value will be set. For details on parameters, see p.59 and later.

■ Operation data

| Register address | | Name | Setting range | Initial value |
|------------------|-------|--------------------------------|------------------------|---------------|
| Dec | Hex | | | |
| 1152 | 0480h | Rotational speed No.0 (upper) | 0, or 80 to 4000 r/min | 0 |
| 1153 | 0481h | Rotational speed No.0 (lower) | | |
| to | to | to | | |
| 1182 | 049Eh | Rotational speed No.15 (upper) | | |
| 1183 | 049Fh | Rotational speed No.15 (lower) | | |
| 1536 | 0600h | Acceleration No.0 (upper) | 2 to 150 (1=0.1 s) | 5 |
| 1537 | 0601h | Acceleration No.0 (lower) | | |
| to | to | to | | |
| 1566 | 061Eh | Acceleration No.15 (upper) | | |
| 1567 | 061Fh | Acceleration No.15 (lower) | | |
| 1664 | 0680h | Deceleration No.0 (upper) | | |
| 1665 | 0681h | Deceleration No.0 (lower) | | |
| to | to | to | | |
| 1694 | 069Eh | Deceleration No.15 (upper) | | |
| 1695 | 069Fh | Deceleration No.15 (lower) | | |
| 1792 | 0700h | Torque limit No.0 (upper) | 0 to 200% | 200 |
| 1793 | 0701h | Torque limit No.0 (lower) | | |
| to | to | to | | |
| 1822 | 071Eh | Torque limit No.15 (upper) | | |
| 1823 | 071Fh | Torque limit No.15 (lower) | | |

■ User parameters

| Register address | | Name | Setting range | Initial value | Effective * |
|------------------|-------|--|---|---------------|-------------|
| Dec | Hex | | | | |
| 646 | 0286h | JOG operating speed (upper) | 0, or 80 to 1000 r/min | 300 | A |
| 647 | 0287h | JOG operating speed (lower) | | | |
| 900 | 0384h | Motor rotation direction (upper) | 0: + direction=CCW 1: + direction=CW | 1 | C |
| 901 | 0385h | Motor rotation direction (lower) | | | |
| 960 | 03C0h | Display mode of the data setter speed (upper) | 0: Signed 1: Absolute | 0 | A |
| 961 | 03C1h | Display mode of the data setter speed (lower) | | | |
| 962 | 03C2h | The data setter editing mode (upper) | 0: Disable 1: Enable | 1 | |
| 963 | 03C3h | The data setter editing mode (lower) | | | |
| 4140 | 102Ch | Run mode select (upper) | 0: PWM shut off mode enable 1: PWM shut off mode disable | 1 | C |
| 4141 | 102Dh | Run mode select (lower) | | | |
| 4162 | 1042h | JOG operation torque (upper) | 0 to 200% | 200 | A |
| 4163 | 1043h | JOG operation torque (lower) | | | |
| 4170 | 104Ah | Reduction gear rate (upper) | 100 to 9999 | 100 | |
| 4171 | 104Bh | Reduction gear rate (lower) | | | |
| 4172 | 104Ch | Decimal place for reduction gear rate (upper) | 0: 1 digit 1: 2 digit 2: 3 digit | 2 | |
| 4173 | 104Dh | Decimal place for reduction gear rate (lower) | | | |
| 4174 | 104Eh | Amplification speed rate (upper) | 1 to 5 | 1 | |
| 4175 | 104Fh | Amplification speed rate (lower) | | | |
| 4176 | 1050h | Conveyor reduction gear rate (upper) | 100 to 9999 | 100 | |
| 4177 | 1051h | Conveyor reduction gear rate (lower) | | | |
| 4178 | 1052h | Decimal place for conveyor reduction gear rate (upper) | 0: 1 digit 1: 2 digit 2: 3 digit | 2 | |
| 4179 | 1053h | Decimal place for conveyor reduction gear rate (lower) | | | |
| 4180 | 1054h | Conveyor amplification speed rate (upper) | 1 to 5 | 1 | |
| 4181 | 1055h | Conveyor amplification speed rate (lower) | | | |
| 4224 | 1080h | Magnetic brake function at alarm (upper) | 0: Lock after free stop 1: Lock immediately | 1 | C |
| 4225 | 1081h | Magnetic brake function at alarm (lower) | | | |
| 4226 | 1082h | No operation at initial alarm enable (upper) | 0: Disable 1: Enable | 0 | |
| 4227 | 1083h | No operation at initial alarm enable (lower) | | | |
| 4230 | 1086h | Initial thermal input detection (upper) | | 0 | |
| 4231 | 1087h | Initial thermal input detection (lower) | | | |
| 4258 | 10A2h | Over load warning enable (upper) | 50 to 100% | 0 | A |
| 4259 | 10A3h | Over load warning enable (lower) | | | |
| 4266 | 10AAh | Over load warning level (upper) | | 100 | |
| 4267 | 10ABh | Over load warning level (lower) | | | |
| 4320 | 10E0h | Data setter initial display (upper) | 0: Operating speed 1: Conveyor speed 2: Load factor 3: Operating number 4: Mon top view | 0 | C |
| 4321 | 10E1h | Data setter initial display (lower) | | | |

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

| Register address | | Name | Setting range | Initial value | Effective * |
|------------------|-------|------------------------------------|---|-----------------|-------------|
| Dec | Hex | | | | |
| 4322 | 10E2h | Analog input signal select (upper) | 0: Analog invalid 1: Analog speed 2: Analog torque (See p.102 for details) | 1 | C |
| 4323 | 10E3h | Analog input signal select (lower) | | | |
| 4430 | 114Eh | Velocity attainment width (upper) | 0 to 400 r/min | 200 | A |
| 4431 | 114Fh | Velocity attainment width (lower) | | | |
| 4352 | 1100h | IN0 function select (upper) | See table on p.102. | 1: FWD | B |
| 4353 | 1101h | IN0 function select (lower) | | 2: REV | |
| 4354 | 1102h | IN1 function select (upper) | | | |
| 4355 | 1103h | IN1 function select (lower) | | 19: STOP-MODE | |
| 4356 | 1104h | IN2 function select (upper) | | | |
| 4357 | 1105h | IN2 function select (lower) | | 48: M0 | |
| 4358 | 1106h | IN3 function select (upper) | | | |
| 4359 | 1107h | IN3 function select (lower) | | 24: ALARM-RESET | |
| 4360 | 1108h | IN4 function select (upper) | | | |
| 4361 | 1109h | IN4 function select (lower) | | 20: MB-FREE | |
| 4362 | 110Ah | IN5 function select (upper) | | | |
| 4363 | 110Bh | IN5 function select (lower) | | 22: TH | |
| 4364 | 110Ch | IN6 function select (upper) | | | |
| 4365 | 110Dh | IN6 function select (lower) | | | |
| 4384 | 1120h | IN0 contact configuration (upper) | 0: Make (N.O.) 1: Brake (N.C.) | 0 | C |
| 4385 | 1121h | IN0 contact configuration (lower) | | | |
| 4386 | 1122h | IN1 contact configuration (upper) | | | |
| 4387 | 1123h | IN1 contact configuration (lower) | | | |
| 4388 | 1124h | IN2 contact configuration (upper) | | | |
| 4389 | 1125h | IN2 contact configuration (lower) | | | |
| 4390 | 1126h | IN3 contact configuration (upper) | | | |
| 4391 | 1127h | IN3 contact configuration (lower) | | | |
| 4392 | 1128h | IN4 contact configuration (upper) | | | |
| 4393 | 1129h | IN4 contact configuration (lower) | | | |
| 4394 | 112Ah | IN5 contact configuration (upper) | | | |
| 4395 | 112Bh | IN5 contact configuration (lower) | | | |
| 4396 | 112Ch | IN6 contact configuration (upper) | | | |
| 4397 | 112Dh | IN6 contact configuration (lower) | | | |
| 4416 | 1140h | OUT0 function select (upper) | See table on p.102. | 85: SPEED-OUT | A |
| 4417 | 1141h | OUT0 function select (lower) | | 65: ALARM-OUT1 | |
| 4418 | 1142h | OUT1 function select (upper) | | | |
| 4419 | 1143h | OUT1 function select (lower) | | | |
| 4448 | 1160h | NET-IN0 function select (upper) | See table on p.102. | 48: M0 | C |
| 4449 | 1161h | NET-IN0 function select (lower) | | 49: M1 | |
| 4450 | 1162h | NET-IN1 function select (upper) | | 50: M2 | |
| 4451 | 1163h | NET-IN1 function select (lower) | | 1: FWD | |
| 4452 | 1164h | NET-IN2 function select (upper) | | | |
| 4453 | 1165h | NET-IN2 function select (lower) | | 2: REV | |
| 4454 | 1166h | NET-IN3 function select (upper) | | | |
| 4455 | 1167h | NET-IN3 function select (lower) | | 19: STOP-MODE | |
| 4456 | 1168h | NET-IN4 function select (upper) | | | |
| 4457 | 1169h | NET-IN4 function select (lower) | | 20: MB-FREE | |
| 4458 | 116Ah | NET-IN5 function select (upper) | | | |
| 4459 | 116Bh | NET-IN5 function select (lower) | | | |
| 4460 | 116Ch | NET-IN6 function select (upper) | | | |
| 4461 | 116Dh | NET-IN6 function select (lower) | | | |

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

| Register address | | Name | Setting range | Initial value | Effective * |
|------------------|-------|-----------------------------------|---------------------|-----------------|-------------|
| Dec | Hex | | | | |
| 4462 | 116Eh | NET-IN7 function select (upper) | See table on p.102. | 0: No function | C |
| 4463 | 116Fh | NET-IN7 function select (lower) | | | |
| 4464 | 1170h | NET-IN8 function select (upper) | | | |
| 4465 | 1171h | NET-IN8 function select (lower) | | | |
| 4466 | 1172h | NET-IN9 function select (upper) | | | |
| 4467 | 1173h | NET-IN9 function select (lower) | | | |
| 4468 | 1174h | NET-IN10 function select (upper) | | | |
| 4469 | 1175h | NET-IN10 function select (lower) | | | |
| 4470 | 1176h | NET-IN11 function select (upper) | | | |
| 4471 | 1177h | NET-IN11 function select (lower) | | | |
| 4472 | 1178h | NET-IN12 function select (upper) | | | |
| 4473 | 1179h | NET-IN12 function select (lower) | | | |
| 4474 | 117Ah | NET-IN13 function select (upper) | | | |
| 4475 | 117Bh | NET-IN13 function select (lower) | | | |
| 4476 | 117Ch | NET-IN14 function select (upper) | | | |
| 4477 | 117Dh | NET-IN14 function select (lower) | | | |
| 4478 | 117Eh | NET-IN15 function select (upper) | | | |
| 4479 | 117Fh | NET-IN15 function select (lower) | | | |
| 4480 | 1180h | NET-OUT0 function select (upper) | See table on p.102. | 48: M0_R | |
| 4481 | 1181h | NET-OUT0 function select (lower) | | 49: M1_R | |
| 4482 | 1182h | NET-OUT1 function select (upper) | | 50: M2_R | |
| 4483 | 1183h | NET-OUT1 function select (lower) | | 1: FWD_R | |
| 4484 | 1184h | NET-OUT2 function select (upper) | | 2: REV_R | |
| 4485 | 1185h | NET-OUT2 function select (lower) | | 19: STOP-MODE_R | |
| 4486 | 1186h | NET-OUT3 function select (upper) | | 66: WNG | |
| 4487 | 1187h | NET-OUT3 function select (lower) | | 65: ALARM-OUT1 | |
| 4488 | 1188h | NET-OUT4 function select (upper) | | 80: S-BSY | |
| 4489 | 1189h | NET-OUT4 function select (lower) | | 0: No function | |
| 4490 | 118Ah | NET-OUT5 function select (upper) | | 81: ALARM-OUT2 | |
| 4491 | 118Bh | NET-OUT5 function select (lower) | | 68: MOVE | |
| 4492 | 118Ch | NET-OUT6 function select (upper) | | 77: VA | |
| 4493 | 118Dh | NET-OUT6 function select (lower) | | 71: TLC | |
| 4494 | 118Eh | NET-OUT7 function select (upper) | | | |
| 4495 | 118Fh | NET-OUT7 function select (lower) | | | |
| 4496 | 1190h | NET-OUT8 function select (upper) | | | |
| 4497 | 1191h | NET-OUT8 function select (lower) | | | |
| 4498 | 1192h | NET-OUT9 function select (upper) | | | |
| 4499 | 1193h | NET-OUT9 function select (lower) | | | |
| 4500 | 1194h | NET-OUT10 function select (upper) | | | |
| 4501 | 1195h | NET-OUT10 function select (lower) | | | |
| 4502 | 1196h | NET-OUT11 function select (upper) | | | |
| 4503 | 1197h | NET-OUT11 function select (lower) | | | |
| 4504 | 1198h | NET-OUT12 function select (upper) | | | |
| 4505 | 1199h | NET-OUT12 function select (lower) | | | |
| 4506 | 119Ah | NET-OUT13 function select (upper) | | | |
| 4507 | 119Bh | NET-OUT13 function select (lower) | | | |
| 4508 | 119Ch | NET-OUT14 function select (upper) | | | |
| 4509 | 119Dh | NET-OUT14 function select (lower) | | | |
| 4510 | 119Eh | NET-OUT15 function select (upper) | | | |
| 4511 | 119Fh | NET-OUT15 function select (lower) | | | |

* Indicates the timing for the data to become effective. (C: Effective after executing configuration or effective after turning the power ON again)

| Register address | | Name | Setting range | Initial value | Effective * |
|------------------|-------|---|-----------------------------------|---------------|-------------|
| Dec | Hex | | | | |
| 4512 | 11A0h | Analog operating speed command gain (upper) | 0 to 4000 r/min | 800 | A |
| 4513 | 11A1h | Analog operating speed command gain (lower) | | | |
| 4514 | 11A2h | Analog operating speed command offset (upper) | -2000 to 2000 r/min | 0 | |
| 4515 | 11A3h | Analog operating speed command offset (lower) | | | |
| 4516 | 11A4h | Analog torque limit gain (upper) | 0 to 200% | 40 | |
| 4517 | 11A5h | Analog torque limit gain (lower) | | | |
| 4518 | 11A6h | Analog torque limit offset (upper) | -50 to 50% | 0 | |
| 4519 | 11A7h | Analog torque limit offset (lower) | | | |
| 4522 | 11AAh | Analog operating speed maximum value for external input (upper) | 0 to 4000 r/min | 4000 | |
| 4523 | 11ABh | Analog operating speed maximum value for external input (lower) | | | |
| 4526 | 11AEh | Analog torque limit maximum value external input (upper) | 0 to 200% | 200 | |
| 4527 | 11AFh | Analog torque limit maximum value external input (lower) | | | |
| 4608 | 1200h | Communication time out (upper) | 0: Not monitored 1 to 10000 ms | 0 | |
| 4609 | 1201h | Communication time out (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)

• "Analog input signal select" parameter

Setting method of operation data can be changed using the "analog input signal select" parameter.

Others except the following combinations are not available to set.

| "Analog input signal select" parameter | Operation data No. | Rotational speed | Acceleration Deceleration | Torque limit |
|--|--------------------|------------------|------------------------------|----------------|
| 0 | 0 to 15 | Digital setting | | |
| 1 (Initial value) | 0 | Analog setting | Digital setting | |
| | 1 to 15 | Digital setting | | |
| 2 | 0 ot 15 | Digital setting | | Analog setting |

Setting example

- When setting all operation data with digital setting: Set the "analog input signal select" parameter to "0."
- When setting only the rotation speed in the operation data No.0 using the analog setting: Set the "analog input signal select" parameter to "1."

• Setting items for I/O signal assignment

IN function select parameter

| | | | | |
|----------------|-----------------|--------|---------|---------|
| 0: No function | 22: TH | 35: R3 | 41: R9 | 47: R15 |
| 1: FWD | 24: ALARM-RESET | 36: R4 | 42: R10 | 48: M0 |
| 2: REV | 27: HMI | 37: R5 | 43: R11 | 49: M1 |
| 19: STOP-MODE | 32: R0 | 38: R6 | 44: R12 | 50: M2 |
| 20: MB-FREE | 33: R1 | 39: R7 | 45: R13 | 51: M3 |
| 21: EXT-ERROR | 34: R2 | 40: R8 | 46: R14 | 54: TL |

OUT function select parameter

| | | | | | |
|-----------------|--------|---------|----------|----------------|----------------|
| 0: No function | 32: R0 | 38: R6 | 44: R12 | 50: M2_R | 71: TLC |
| 1: FWD_R | 33: R1 | 39: R7 | 45: R13 | 51: M3_R | 77: VA |
| 2: REV_R | 34: R2 | 40: R8 | 46: R14 | 54: TL_R | 80: S-BSY |
| 19: STOP-MODE_R | 35: R3 | 41: R9 | 47: R15 | 65: ALARM-OUT1 | 81: ALARM-OUT2 |
| 20: MB-FREE_R | 36: R4 | 42: R10 | 48: M0_R | 66: WNG | 82: MPS |
| 27: HMI_R | 37: R5 | 43: R11 | 49: M1_R | 68: MOVE | 84: DIR |
| | | | | | 85: SPEED-OUT |

NET-IN function select parameter

| | | | | |
|----------------|--------|---------|---------|--------|
| 0: No function | 32: R0 | 38: R6 | 44: R12 | 50: M2 |
| 1: FWD | 33: R1 | 39: R7 | 45: R13 | 51: M3 |
| 2: REV | 34: R2 | 40: R8 | 46: R14 | 54: TL |
| 19: STOP-MODE | 35: R3 | 41: R9 | 47: R15 | |
| 20: MB-FREE | 36: R4 | 42: R10 | 48: M0 | |
| 27: HMI | 37: R5 | 43: R11 | 49: M1 | |

NET-OUT function select parameter

| | | | | | |
|-----------------|--------|---------|----------|----------------|----------------|
| 0: No function | 32: R0 | 38: R6 | 44: R12 | 50: M2_R | 71: TLC |
| 1: FWD_R | 33: R1 | 39: R7 | 45: R13 | 51: M3_R | 77: VA |
| 2: REV_R | 34: R2 | 40: R8 | 46: R14 | 54: TL_R | 80: S-BSY |
| 19: STOP-MODE_R | 35: R3 | 41: R9 | 47: R15 | 65: ALARM-OUT1 | 81: ALARM-OUT2 |
| 20: MB-FREE_R | 36: R4 | 42: R10 | 48: M0_R | 66: WNG | 82: MPS |
| 27: HMI_R | 37: R5 | 43: R11 | 49: M1_R | 68: MOVE | 84: DIR |

9 Group send

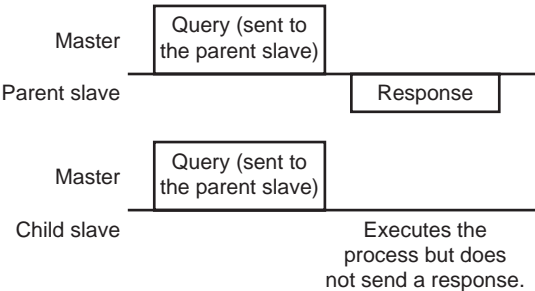
Multiple slaves are made into a group and a query is sent to all slaves in the group at once.

■ **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**

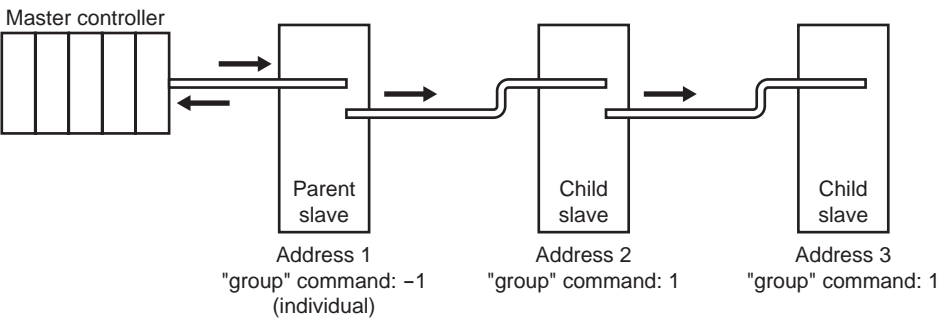
Use a "group" command to set a group address to each child slave. Change the group in the unicast mode.
When performing read or write for setting a group, set the upper and lower simultaneously.

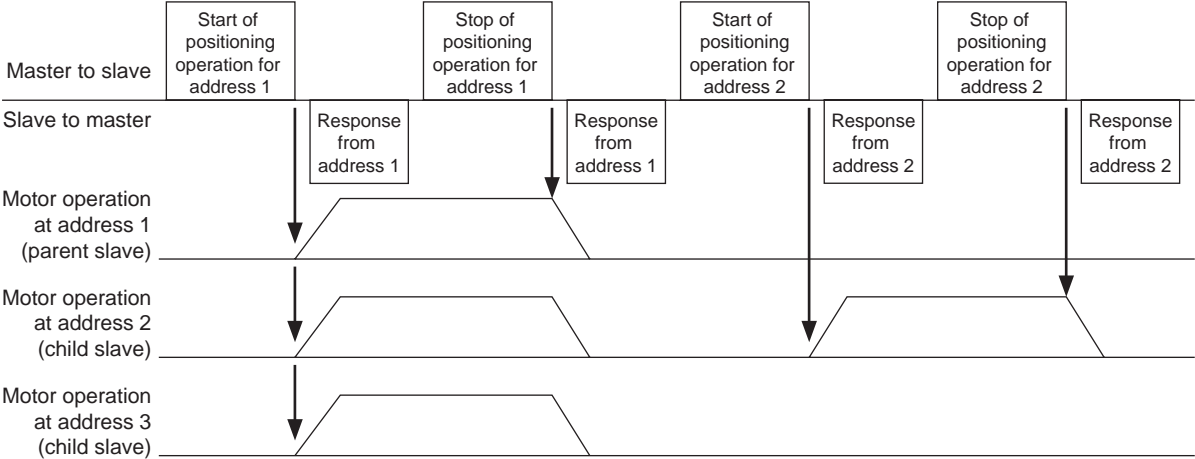
| Resister address | | Name | Description | READ/ WRITE | Setting range |
|------------------|-------|---------------|-------------------------|----------------|---|
| Dec | Hex | | | | |
| 48 | 0030h | Group (upper) | Sets the group address. | R/W | -1: No group specification (Group send is not performed) 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 |





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 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 | Ref. |
|---|------------|---|------|
| RS-485 communication error | 84h | A transmission error was detected. | p.87 |
| Command not yet defined | 88h | An exception response (exception code 01h, 02h) was detected. | |
| Execution disable due to user I/F communication in progress | 89h | An exception response (exception code 04h) was detected. | |
| Non-volatile memory processing in progress | 8Ah | | |
| Outside setting range | 8Ch | An exception response (exception code 03h, 04h) was detected. | |
| Command execute disable | 8Dh | An exception response (exception code 04h) was detected. | |

10.2 Alarms and warnings

When an alarm generates, the ALARM-OUT1 output will turn OFF and the motor will stop. At the same time, the ALM LED will start blinking.

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

Note | The warning records will be cleared by turning off the driver power.

■ Communication switch setting error (83h)

When setting the transmission rate setting switch (SW4) 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. |

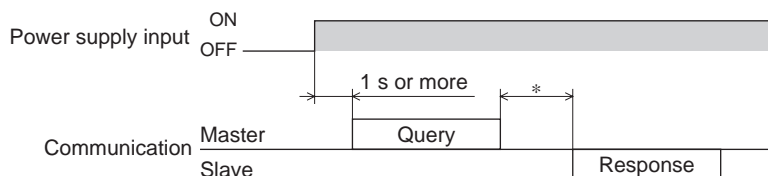
■ RS-485 communication timeout (85h)

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

11 Timing charts

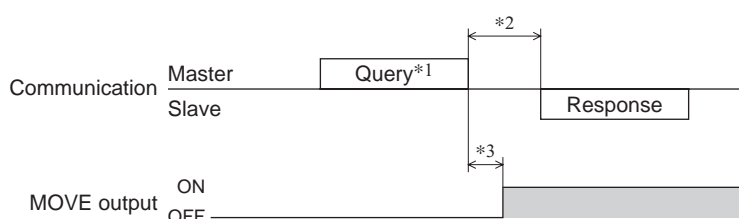
See p.84 "5.2 Communication timing" for codes in the timing chart.

■ Communication start



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

■ Operation start

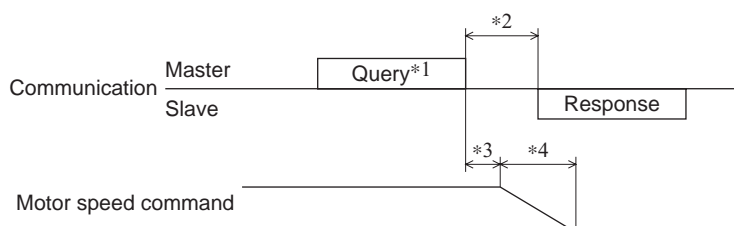


*1 A message including a query to start operation via RS-485 communication.

*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



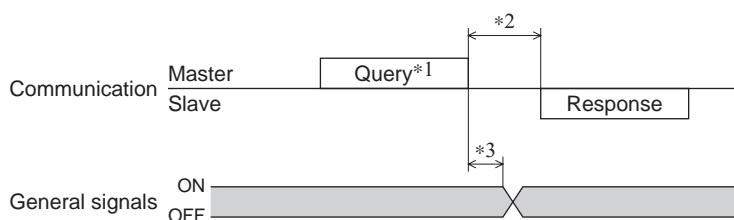
*1 A message including a query to stop operation and another to change the speed via RS-485 communication.

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

*3 The specific time varies depending on the command speed.

*4 It varies based on the stopping method selected by the STOP-MODE input.

■ General signals

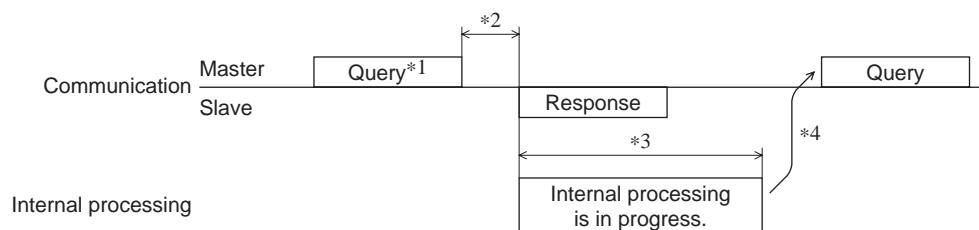


*1 A message including a query for remote output via RS-485 communication.

*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 has been completed.

5 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).

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1 Method of control via CC-Link communication

See the following explanation when using the **BLE** Series FLEX RS-485 communication type in combination with the network converter **NETC01-CC** via CC-Link communication. Refer to p.130 "3 Details of remote I/O" and p.132 "4 Command code list" for remote I/O and command code.

1.1 Guidance

If you are new to the **BLE** Series FLEX RS-485 communication 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.

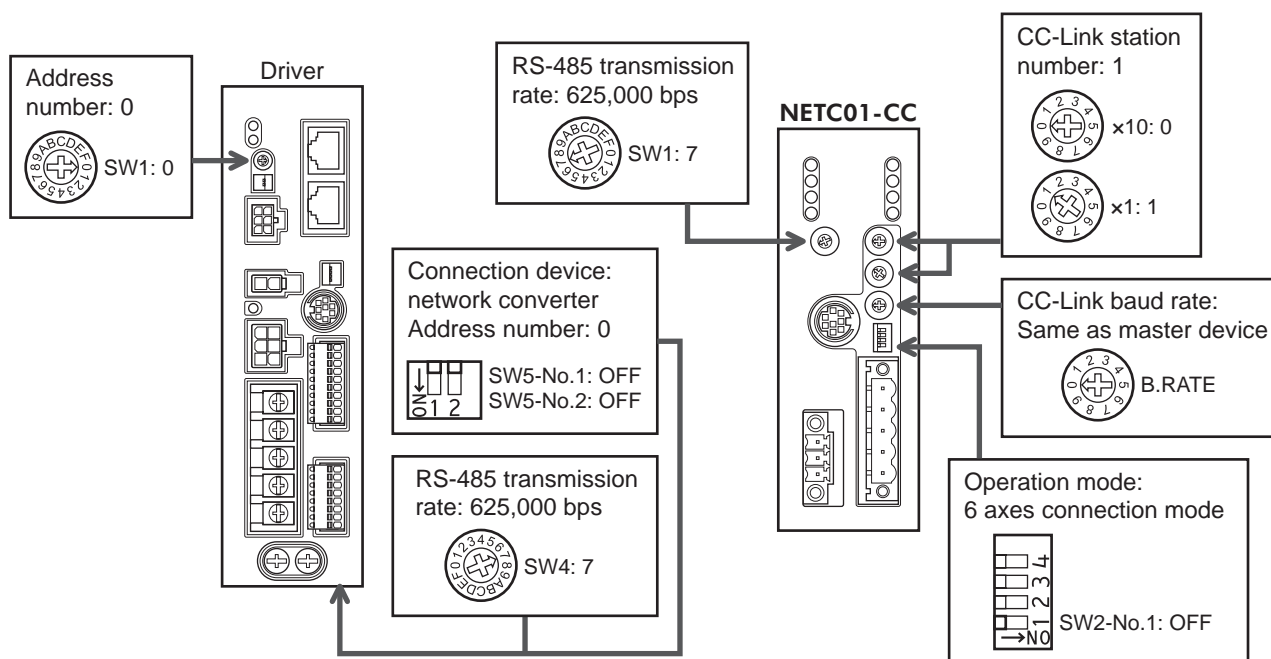
■ Using the switches

Setting condition of driver

- Address number of the driver: 0
- RS-485 transmission rate: 625,000 bps
- SW5-No.2 of the function setting switch2: OFF

Setting condition of **NETC01-CC**

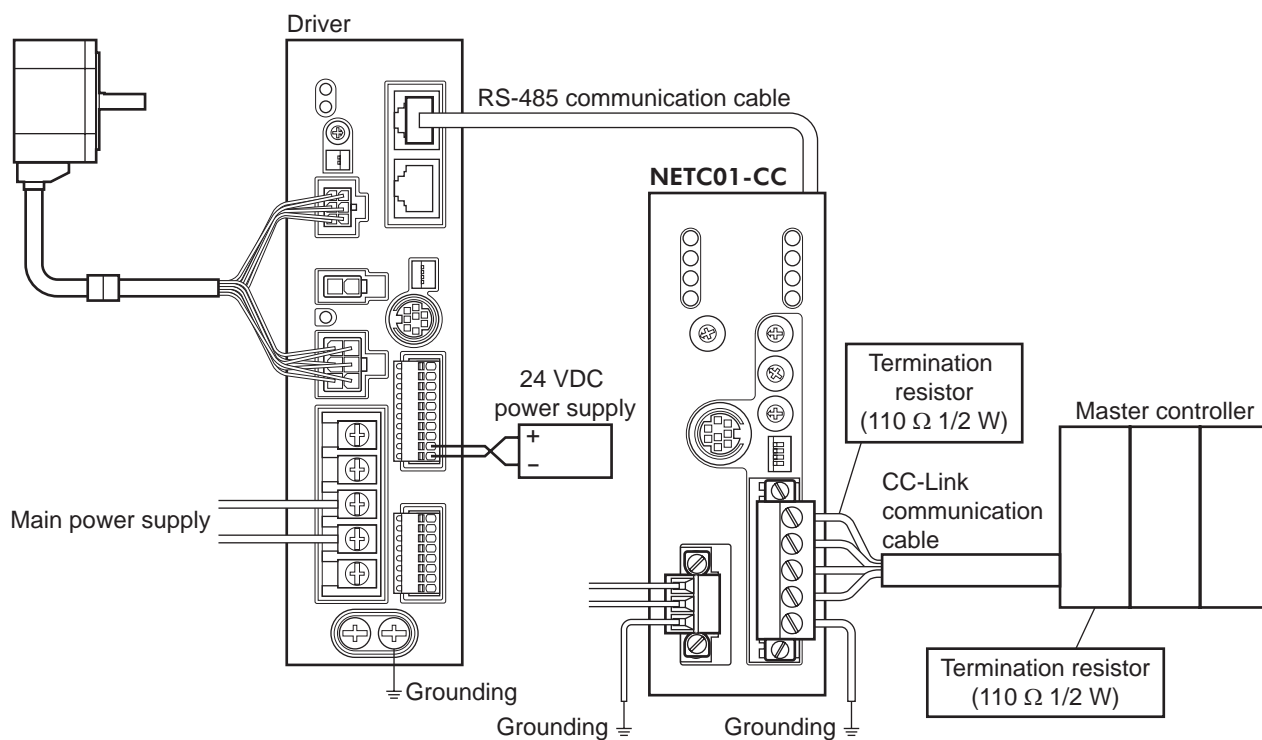
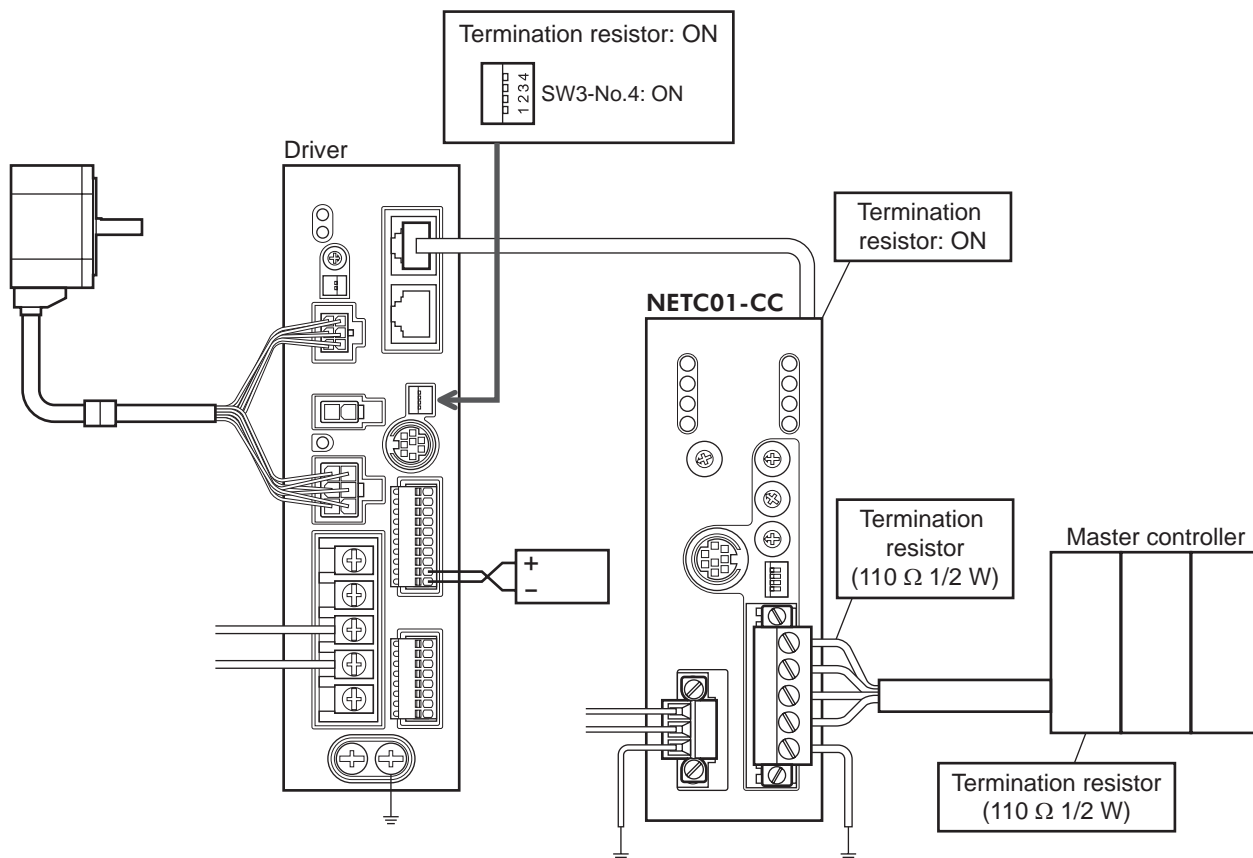
- CC-Link station number: 1
- RS-485 transmission rate: 625,000 bps
- CC-Link baud rate: Same as the master station
- Operation mode: 6 axes connection mode



■ Using the parameter

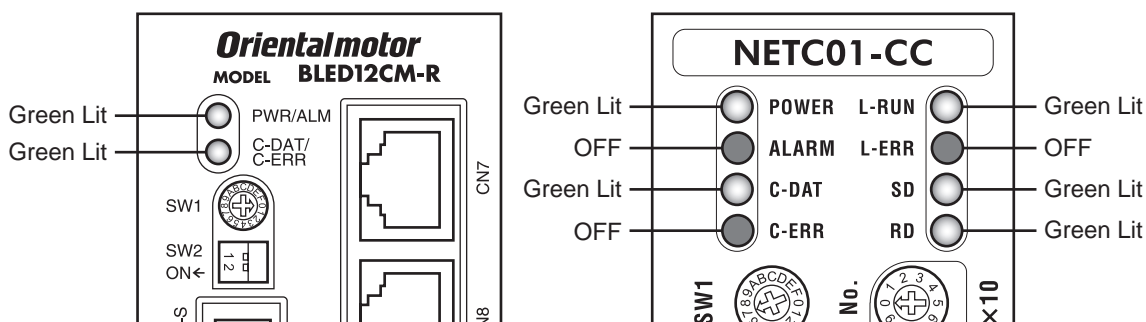
1. Set the "connection (address number 0) (1D80h)" parameter of the **NETC01-CC** to "Enable."
2. Execute the "batch NV memory write (3E85h)" of the **NETC01-CC**.
3. Cycle the **NETC01-CC** power.

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

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.

1. Set the rotation speed (1241h) for the operation data No.1 of the driver.
2. Perform continuous operation by turning ON the M0 and FWD of the address number 0 for remote I/O of CC-Link communication.

| RY (Master to NETC01-CC) | | | RY (Master to NETC01-CC) | | |
|----------------------------------|-------------|---------------|----------------------------------|-------------|---------------|
| Device No. | Signal name | Initial value | Device No. | Signal name | Initial value |
| RY0 | NET-IN0 | M0 | RY8 | NET-IN8 | Not used |
| RY1 | NET-IN1 | M1 | RY9 | NET-IN9 | |
| RY2 | NET-IN2 | M2 | RYA | NET-IN10 | |
| RY3 | NET-IN3 | FWD | RYB | NET-IN11 | |
| RY4 | NET-IN4 | REV | RYC | NET-IN12 | |
| RY5 | NET-IN5 | STOP-MODE | RYD | NET-IN13 | |
| RY6 | NET-IN6 | MB-FREE | RYE | NET-IN14 | |
| RY7 | NET-IN7 | Not used | RYF | NET-IN15 | |

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:

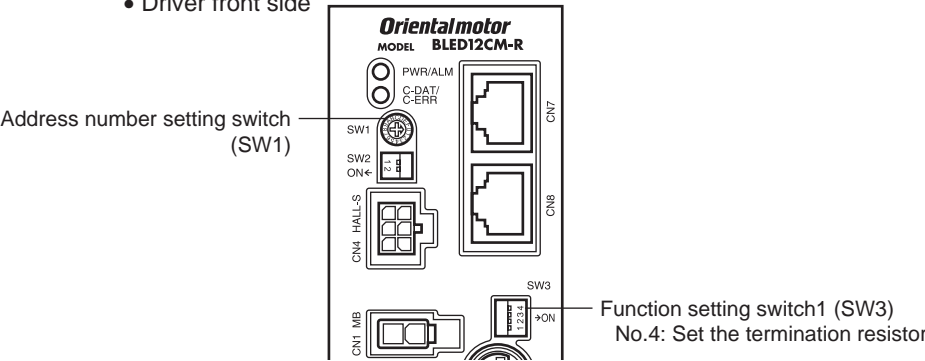
- Is any alarm present in the driver or **NETC01-CC**?
- Are the address number, transmission rate and termination resistor set correctly?
- Is the "connection" parameter of the **NETC01-CC** set correctly?
- Is the C-ERR LED lit? (RS-485 communication error)
- Is the L-ERR LED lit? (CC-Link communication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

For more detailed settings and functions, refer to next page and later, and the **NETC01-CC USER MANUAL**.

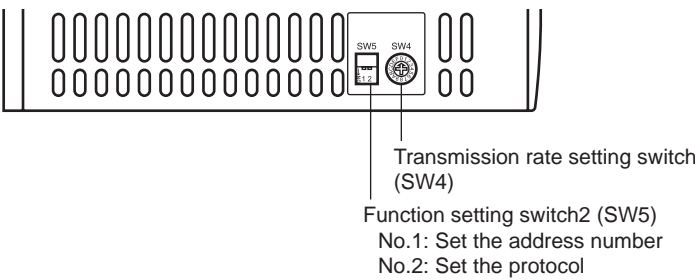
1.2 Setting the switches

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

• Driver front side



• Driver bottom side



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.

■ Setting the connection device

Set the connection device of RS-485 communication using the function setting switch2 SW5-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 (SW1) and SW5-No.1 of the function setting switch2. Make sure each address number (slave address) you set for each driver is unique.

Factory setting SW1: 0, SW5-No.1: OFF (Address number 0)

| Address number (slave address) | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|-----------------------------------|------------------------|---|---|---|---|---|-------------------------|---|---|---|----|----|
| SW1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B |
| SW5-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 (SW4).

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 SW3-No.4 of the function setting switch1 ON to set the termination resistor for RS-485 communication (120 Ω).

Factory setting OFF (termination resistor disabled)

| SW3-No.4 | Termination resistor (120 Ω) |
|----------|---|
| OFF | Disabled |
| ON | Enabled |

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

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.

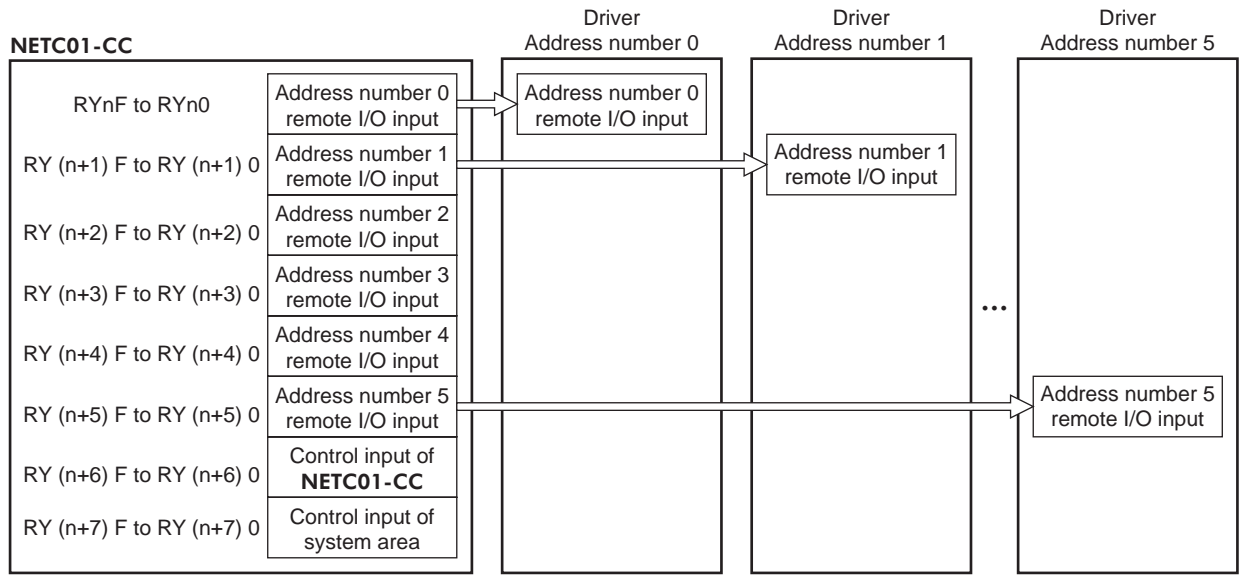
■ Assignment list of remote I/O

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

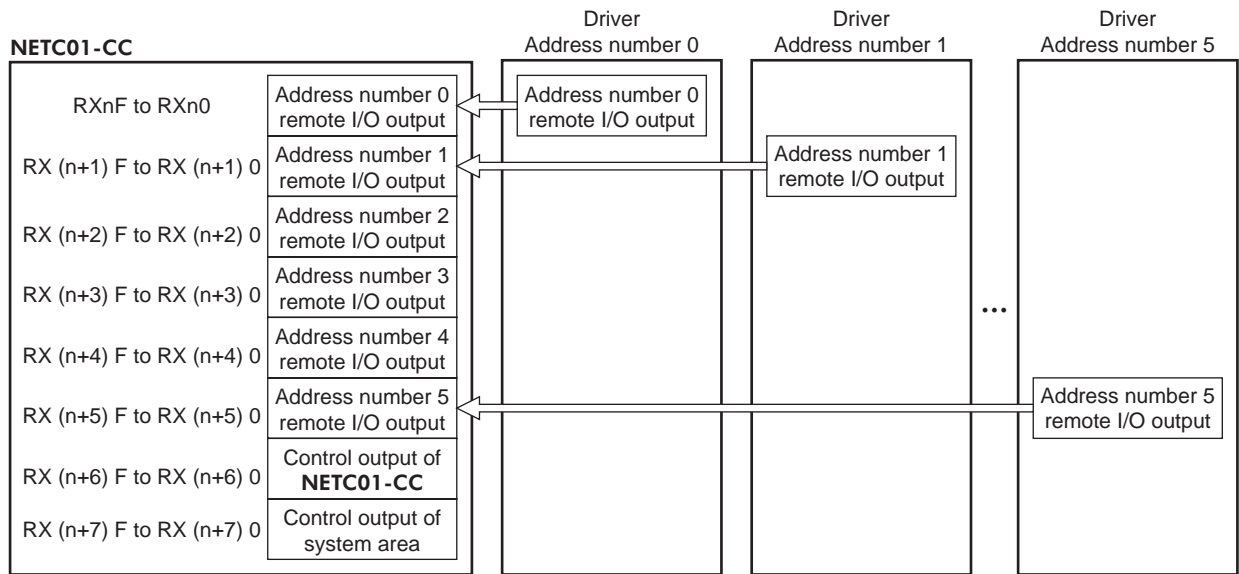
* See the network converter **NETC01-CC** USER MANUAL for details.

■ 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 | [FWD] * | RX(n)3 | NET-OUT3 | [FWD_R] * |
| | RY(n)4 | NET-IN4 | [REV] * | RX(n)4 | NET-OUT4 | [REV_R] * |
| | RY(n)5 | NET-IN5 | [STOP-MODE] * | RX(n)5 | NET-OUT5 | [STOP-MODE_R] * |
| | RY(n)6 | NET-IN6 | [MB-FREE] * | RX(n)6 | NET-OUT6 | [WNG] * |
| | RY(n)7 | NET-IN7 | [Not used] * | RX(n)7 | NET-OUT7 | [ALARM-OUT1] * |
| | RY(n)8 | NET-IN8 | | RX(n)8 | NET-OUT8 | [S-BSY] * |
| | RY(n)9 | NET-IN9 | | RX(n)9 | NET-OUT9 | [Not used] * |
| | RY(n)A | NET-IN10 | | RX(n)A | NET-OUT10 | |
| | RY(n)B | NET-IN11 | | RX(n)B | NET-OUT11 | [ALARM-OUT2] * |
| | RY(n)C | NET-IN12 | | RX(n)C | NET-OUT12 | |
| | RY(n)D | NET-IN13 | | RX(n)D | NET-OUT13 | [MOVE] * |
| | RY(n)E | NET-IN14 | | RX(n)E | NET-OUT14 | [VA] * |
| | RY(n)F | NET-IN15 | | RX(n)F | NET-OUT15 | [TLC] * |
| 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 | D-END | Command processing completion |
| | RY(n+6)C | D-REQ | Command execution request | RX(n+6)C | | |

| | Command RY (Master to NETC01-CC) | | | Response RX (NETC01-CC to master) | | |
|---|--|-------------|----------------|---|-------------|------------------------------------|
| | Device No. | Signal name | Description | Device No. | Signal name | Description |
| NETC01-CC control input/ status output | RY(n+6)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 |

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.

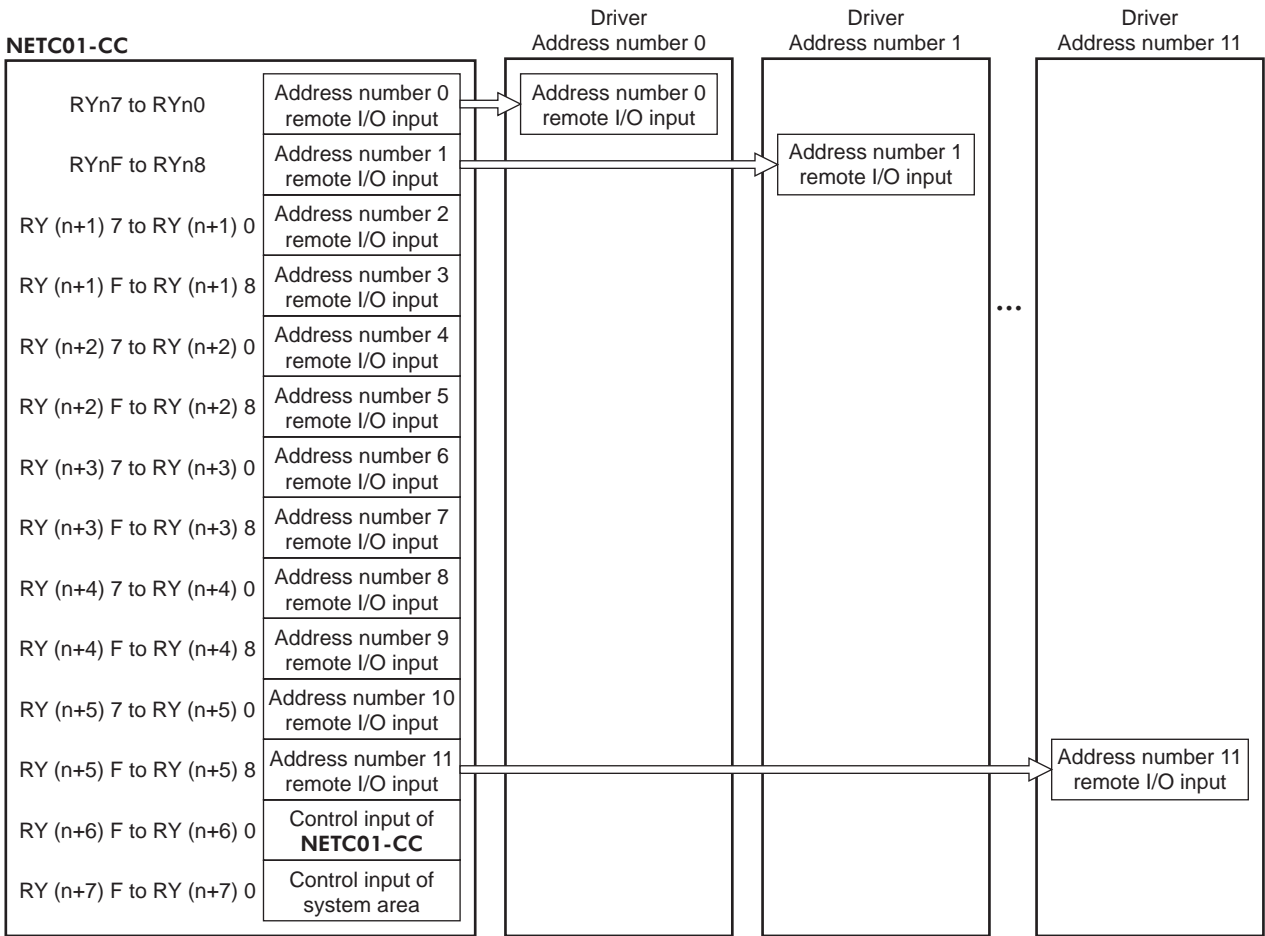
■ Assignment list of remote I/O

| Command RY (Master to NETC01-CC) | | Response RX (NETC01-CC to master) | |
|--|--------------------------------------|---|---------------------------------------|
| Device No. | Description | Device No. | Description |
| RYn7 to RYn0 | Address number "0" remote I/O input | RXn7 to RXn0 | Address number "0" remote I/O output |
| RYnF to RYn8 | Address number "1" remote I/O input | RXnF to RXn8 | Address number "1" remote I/O output |
| RY (n+1) 7 to RY (n+1) 0 | Address number "2" remote I/O input | RX (n+1) 7 to RX (n+1) 0 | Address number "2" remote I/O output |
| RY (n+1) F to RY (n+1) 8 | Address number "3" remote I/O input | RX (n+1) F to RX (n+1) 8 | Address number "3" remote I/O output |
| RY (n+2) 7 to RY (n+2) 0 | Address number "4" remote I/O input | RX (n+2) 7 to RX (n+2) 0 | Address number "4" remote I/O output |
| RY (n+2) F to RY (n+2) 8 | Address number "5" remote I/O input | RX (n+2) F to RX (n+2) 8 | Address number "5" remote I/O output |
| RY (n+3) 7 to RY (n+3) 0 | Address number "6" remote I/O input | RX (n+3) 7 to RX (n+3) 0 | Address number "6" remote I/O output |
| RY (n+3) F to RY (n+3) 8 | Address number "7" remote I/O input | RX (n+3) F to RX (n+3) 8 | Address number "7" remote I/O output |
| RY (n+4) 7 to RY (n+4) 0 | Address number "8" remote I/O input | RX (n+4) 7 to RX (n+4) 0 | Address number "8" remote I/O output |
| RY (n+4) F to RY (n+4) 8 | Address number "9" remote I/O input | RX (n+4) F to RX (n+4) 8 | Address number "9" remote I/O output |
| RY (n+5) 7 to RY (n+5) 0 | Address number "10" remote I/O input | RX (n+5) 7 to RX (n+5) 0 | Address number "10" remote I/O output |
| RY (n+5) F to RY (n+5) 8 | Address number "11" remote I/O input | RX (n+5) F to RX (n+5) 8 | Address number "11" remote I/O output |
| RY (n+6) 7 to RY (n+6) 0 | Control input of NETC01-CC * | RX (n+6) 7 to RX (n+6) 0 | Status output of NETC01-CC * |
| RY (n+6) F to RY (n+6) 8 | | RX (n+6) F to RX (n+6) 8 | |
| RY (n+7) 7 to RY (n+7) 0 | Control input of system area * | RX (n+7) 7 to RX (n+7) 0 | Status output of system area * |
| RY (n+7) F to RY (n+7) 8 | | RX (n+7) F to RX (n+7) 8 | |

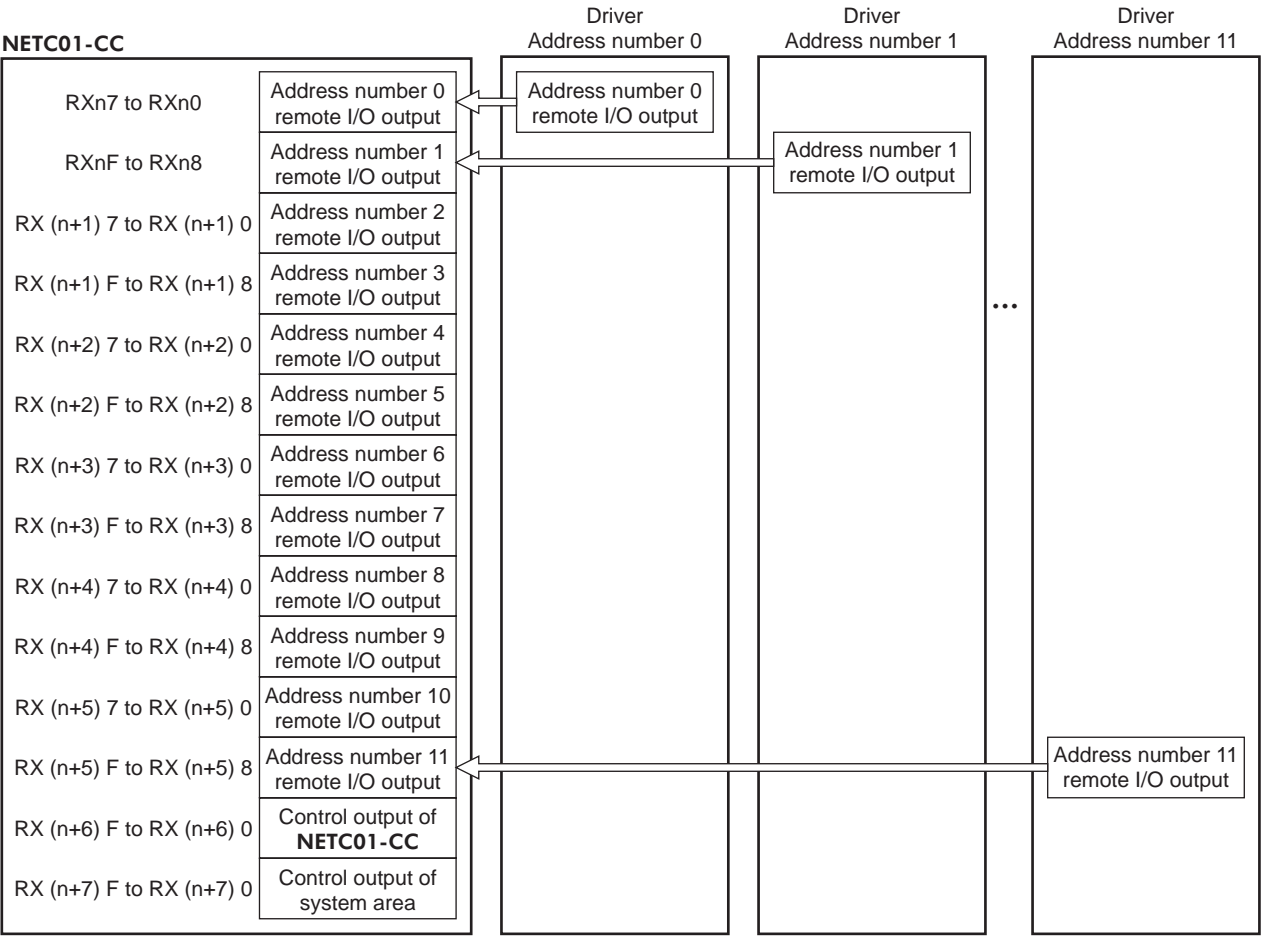
* See the network converter **NETC01-CC** USER MANUAL for details.

■ 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 | [FWD] * | RX(n)3 | NET-OUT3 | [FWD_R] * |
| | RY(n)4 | NET-IN4 | [REV] * | RX(n)4 | NET-OUT4 | [REV_R] * |
| | RY(n)5 | NET-IN5 | [STOP-MODE] * | RX(n)5 | NET-OUT5 | [STOP-MODE_R] * |
| | RY(n)6 | NET-IN6 | [MB-FREE] * | RX(n)6 | NET-OUT6 | [WNG] * |
| | RY(n)7 | NET-IN7 | [Not used] * | RX(n)7 | NET-OUT7 | [ALARM-OUT1] * |
| | RY(n)8 | NET-IN0 | | RX(n)8 | NET-OUT8 | [S-BSY] * |
| | RY(n)9 | NET-IN1 | | RX(n)9 | NET-OUT9 | [Not used] * |
| | RY(n)A | NET-IN2 | | RX(n)A | NET-OUT10 | |
| | RY(n)B | NET-IN3 | | RX(n)B | NET-OUT11 | [ALARM-OUT2] * |
| | RY(n)C | NET-IN4 | | RX(n)C | NET-OUT12 | |
| | RY(n)D | NET-IN5 | | RX(n)D | NET-OUT13 | [MOVE] * |
| | RY(n)E | NET-IN6 | | RX(n)E | NET-OUT14 | [VA] * |
| | RY(n)F | NET-IN7 | | RX(n)F | NET-OUT15 | [TLC] * |
| 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 | D-END | Command processing completion |
| | RY(n+6)C | D-REQ | Command execution request | RX(n+6)C | | |

| | 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 |

2 Method of control via MECHATROLINK communication

See the following explanation when using the **BLE** Series FLEX RS-485 communication type in combination with the network converter **NETC01-M2** or **NETC01-M3**, via MECHATROLINK communication.

Refer to p.130 "3 Details of remote I/O" and p.132 "4 Command code list" for remote I/O and command code.

2.1 Guidance

If you are new to the **BLE** Series FLEX RS-485 communication 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.

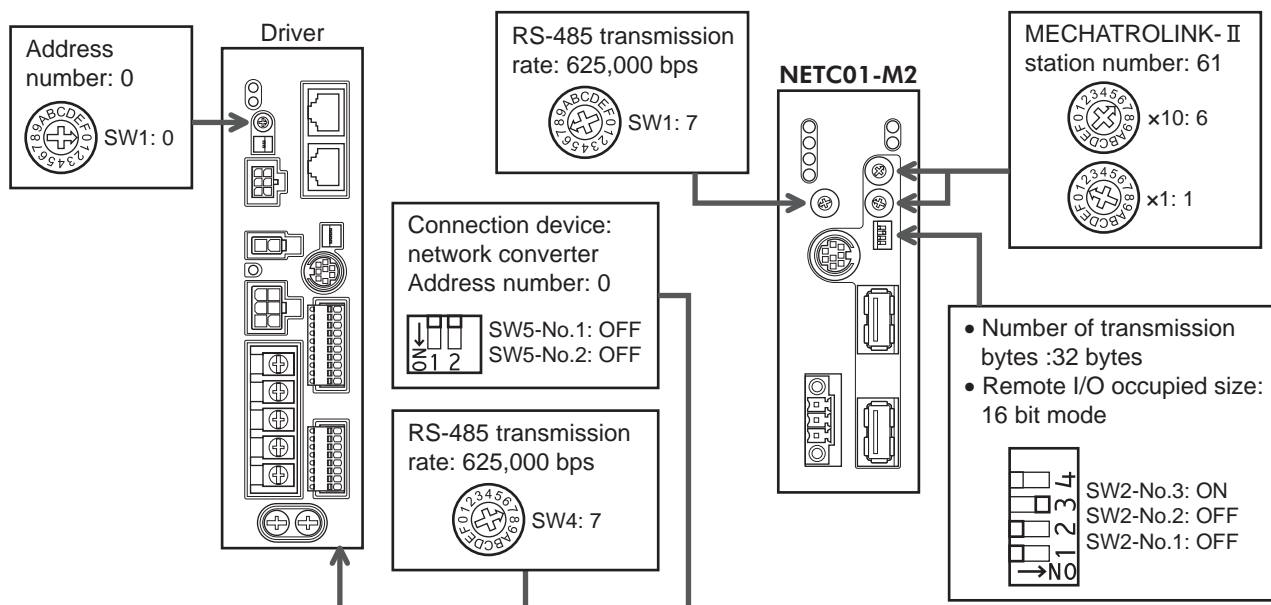
■ Using the switches

Setting condition of driver

- Address number of the driver: 0
- RS-485 transmission rate: 625,000 bps
- SW5-No.2 of the function setting switches: 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



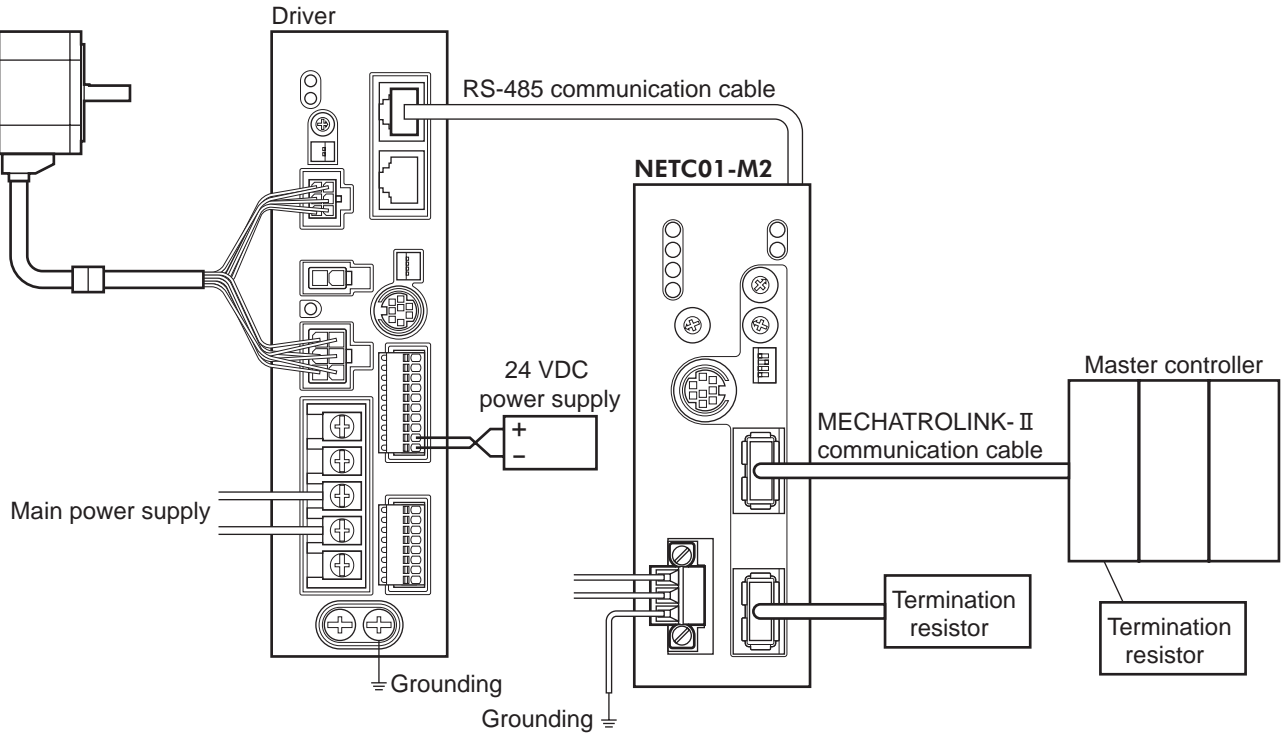
■ Using the parameter

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

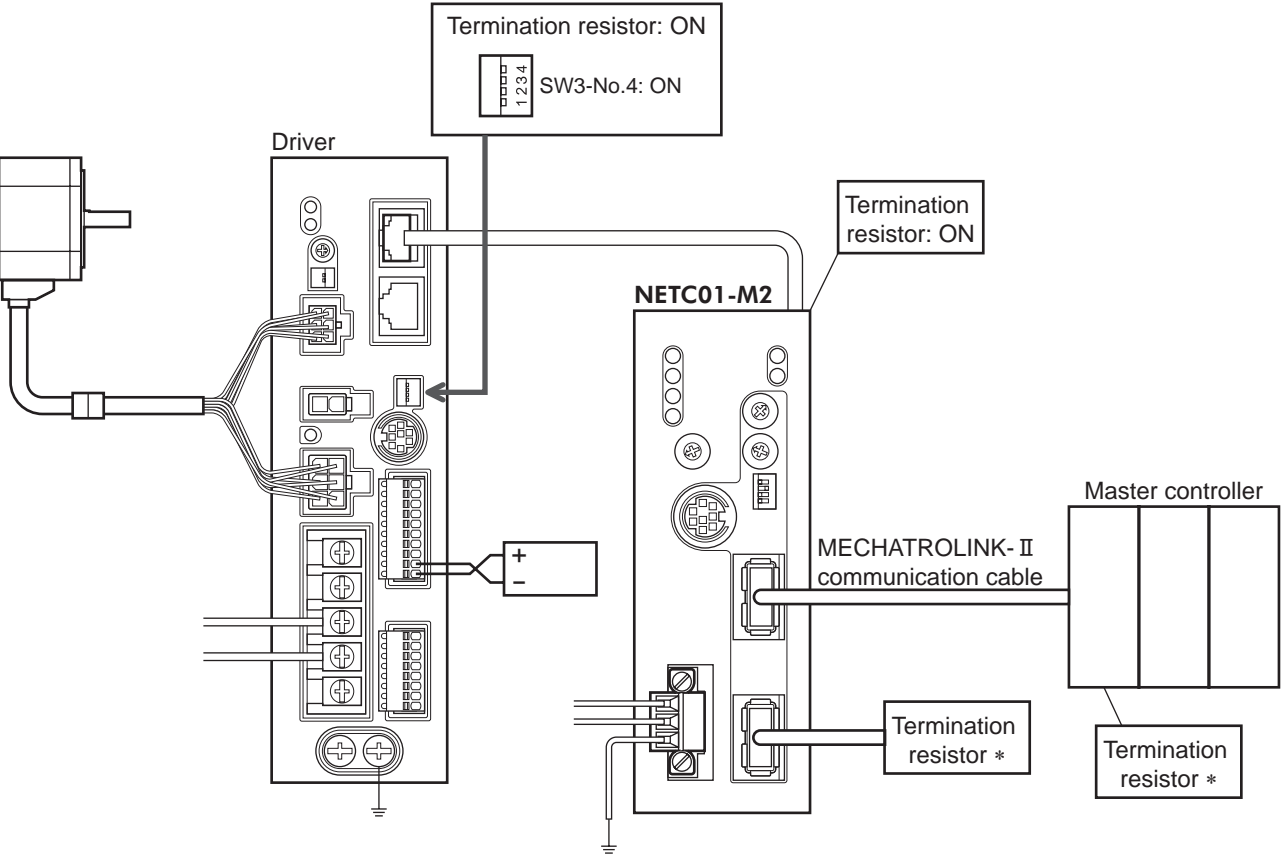
- "Communication" parameter will be enabled after the power is cycled.
- When setting the parameters of the **NETC01-M2**, use the **OPX-2A** or **MEXE02**.

STEP 2 Check the connection



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

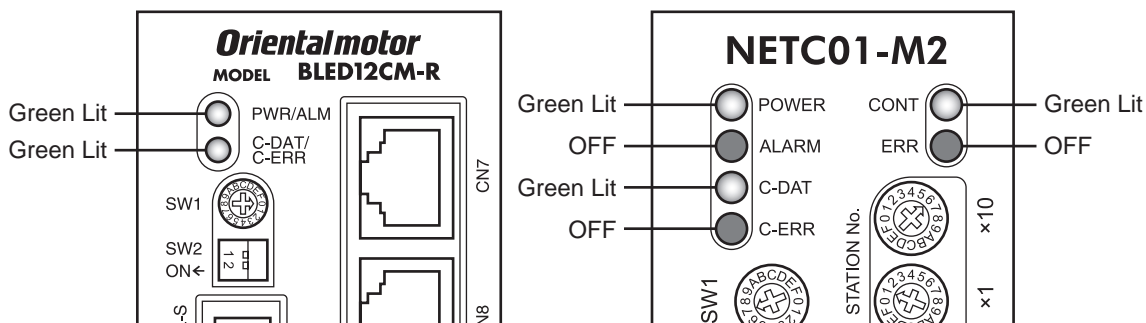
STEP 3 Check the termination resistor



* 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.

1. Set the rotation speed (1241h) for the operation data No.1 of the driver.
2. Perform continuous operation by turning ON the M0 and FWD of the address number 0.

| bit15 | bit14 | bit13 | bit12 | bit11 | bit10 | bit9 | bit8 |
|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|-----------------------|-----------------------|
| NET-IN15 [Not used] | NET-IN14 [Not used] | NET-IN13 [Not used] | NET-IN12 [Not used] | NET-IN11 [Not used] | NET-IN10 [Not used] | NET-IN9 [Not used] | NET-IN8 [Not used] |
| bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
| NET-IN7 [Not used] | NET-IN6 [MB-FREE] | NET-IN5 [STOP-MODE] | NET-IN4 [REV] | NET-IN3 [FWD] | 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:

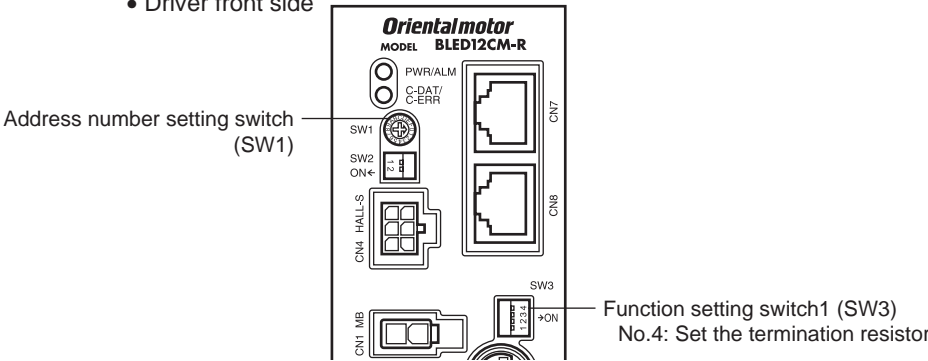
- Is any alarm present in the driver or **NETC01-M2**?
- Are the address number, transmission rate and termination resistor set correctly?
- Is the "connection" parameter of the **NETC01-M2** set correctly?
- Is the C-ERR LED lit? (RS-485 communication error)
- Is the ERR LED of the **NETC01-M2** lit?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

For more detailed settings and functions, refer to next page and later, and the **NETC01-M2** USER MANUAL.

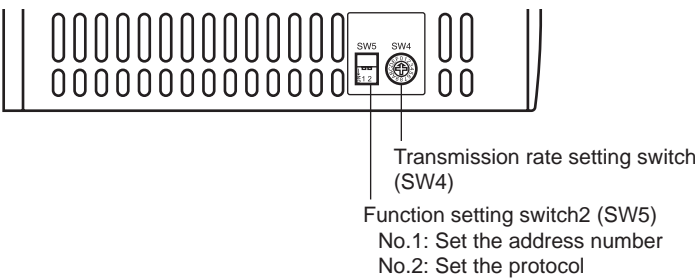
2.2 Setting the switches

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

• Driver front side



• Driver bottom side



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.

■ Setting the connection device

Set the connection device of RS-485 communication using the function setting switch2 SW5-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 (SW1) and SW5-No.1 of the function setting switch2. Make sure each address number (slave address) you set for each driver is unique.

Factory setting SW1: 0, SW5-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 |
|--------------------------------|------------------------|---|---|---|---|---|---|---|-------------------------|---|----|----|----|----|----|----|
| SW1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
| SW5-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 (SW4).

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 SW3-No.4 of the function setting switch1 ON to set the termination resistor for RS-485 communication (120 Ω).

Factory setting OFF (termination resistor disabled)

| SW3-No.4 | Termination resistor (120 Ω) |
|----------|------------------------------|
| OFF | Disabled |
| ON | Enabled |

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 | | Remote I/O | Address number "0" remote I/O input | Address number "0" remote I/O output |
| 7 | | | Address number "1" remote I/O input | Address number "1" remote I/O output |
| 8 | | | Address number "2" remote I/O input | Address number "2" remote I/O output |
| 9 | | | Address number "3" remote I/O input | Address number "3" remote I/O output |
| 10 | | | Address number "4" remote I/O input | Address number "4" remote I/O output |
| 11 | | | Address number "5" remote I/O input | Address number "5" remote I/O output |
| 12 | | | Address number "6" remote I/O input | Address number "6" remote I/O output |
| 13 | | | Address number "7" remote I/O input | Address number "7" remote I/O output |
| 14 | | Remote resistor | Register address number | Register address number response |
| 15 | | | Command code + TRIG | Command code response + TRIG response + STATUS |
| 16 | | | DATA | DATA response |
| 17 | | | | |
| 18 | | - | Reserved | Reserved |
| 19 | | Remote resistor | Register address number | Register address number response |
| 20 | | | Command code + TRIG | Command code response + TRIG response + STATUS |
| 21 | | | DATA | DATA response |
| 22 | | | | |
| 23 | | - | Reserved | Reserved |
| 24 | | Remote resistor | Register address number | Register address number response |
| 25 | | | Command code + TRIG | Command code response + TRIG response + STATUS |
| 26 | | | DATA | DATA response |
| 27 | | | | |
| 28 | | - | Reserved | Reserved |
| 29 | | Remote resistor | Register address number | Register address number response |
| 30 | | | Command code + TRIG | Command code response + TRIG response + STATUS |
| 31 | | | DATA | DATA response |
| 32 | | | | |

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.130.

• 8 axes connection mode [16 bit mode]

| bit15 | bit14 | bit13 | bit12 | bit11 | bit10 | bit9 | bit8 |
|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|-----------------------|-----------------------|
| NET-IN15 [Not used] | NET-IN14 [Not used] | NET-IN13 [Not used] | NET-IN12 [Not used] | NET-IN11 [Not used] | NET-IN10 [Not used] | NET-IN9 [Not used] | NET-IN8 [Not used] |
| bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
| NET-IN7 [Not used] | NET-IN6 [MB-FREE] | NET-IN5 [STOP-MODE] | NET-IN4 [REV] | NET-IN3 [FWD] | 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 [Not used] | NET-IN6 [MB-FREE] | NET-IN5 [STOP-MODE] | NET-IN4 [REV] | NET-IN3 [FWD] | 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 [TLC] | NET-OUT14 [VA] | NET-OUT13 [MOVE] | NET-OUT12 [ALARM- OUT2] | NET-OUT11 [Not used] | NET-OUT10 [Not used] | NET-OUT9 [Not used] | NET-OUT8 [S-BSY] |
| bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
| NET-OUT7 [ALARM- OUT1] | NET-OUT6 [WNG] | NET-OUT5 [STOP- MODE_R] | NET-OUT4 [REV_R] | NET-OUT3 [FWD_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 [ALARM- OUT1] | NET-OUT6 [WNG] | NET-OUT5 [STOP- MODE_R] | NET-OUT4 [REV_R] | NET-OUT3 [FWD_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]

| bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
|--------------|------|------|------|------|------|------|------|
| Command code | | | | | | | |
| - | TRIG | 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)**]

| | | | | | | | |
|--------------|--------|------|------|------|------|------|------|
| bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
| Command code | | | | | | | |
| STATUS | TRIG_R | | | | | | |
| 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 p.137 "I/O function parameter (RS-485)".

| | | | | | | | |
|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|-----------------------|-----------------------|
| bit15 | bit14 | bit13 | bit12 | bit11 | bit10 | bit9 | bit8 |
| NET-IN15 [Not used] | NET-IN14 [Not used] | NET-IN13 [Not used] | NET-IN12 [Not used] | NET-IN11 [Not used] | NET-IN10 [Not used] | NET-IN9 [Not used] | NET-IN8 [Not used] |
| bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
| NET-IN7 [Not used] | NET-IN6 [MB-FREE] | NET-IN5 [STOP-MODE] | NET-IN4 [REV] | NET-IN3 [FWD] | 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 | Rotate the motor in the forward direction. | 0: Stop 1: Operation |
| REV | Rotate the motor in the reverse direction. | |
| STOP-MODE | Select instantaneous stop or deceleration stop. | 0: Instantaneous stop 1: Deceleration stop |
| MB-FREE | Release the electromagnetic brake. | 0: Electromagnetic brake hold 1: Electromagnetic brake release |
| HMI | Release of the function limitation of the OPX-2A or MEXE02 (normally closed) | 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 M3 | Select the operation data No. using these four bits. | 0: OFF 1: ON (Operation data No.0 to 15 can be selected.) |
| TL | Disable the torque limiting. (normally closed). | 0: Torque limiting disabled 1: Torque limiting enabled |

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 and TL input are not assigned to the input terminals, these inputs will be always set to ON (1). When assigning them to multiple terminals (including direct I/O and network I/O), the function will be executed when all terminals 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 p.137 "I/O function parameter (RS-485)".

| bit15 | bit14 | bit13 | bit12 | bit11 | bit10 | bit9 | bit8 |
|------------------------------|-------------------|-------------------------------|-------------------------------|-------------------------|-------------------------|------------------------|---------------------|
| NET-OUT15 [TLC] | NET-OUT14 [VA] | NET-OUT13 [MOVE] | NET-OUT12 [ALARM- OUT2] | NET-OUT11 [Not used] | NET-OUT10 [Not used] | NET-OUT9 [Not used] | NET-OUT8 [S-BSY] |
| bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
| NET-OUT7 [ALARM- OUT1] | NET-OUT6 [WNG] | NET-OUT5 [STOP- MODE_R] | NET-OUT4 [REV_R] | NET-OUT3 [FWD_R] | NET-OUT2 [M2_R] | NET-OUT1 [M1_R] | NET-OUT0 [M0_R] |

* []: Initial value

| Signal name | Function | Data read |
|--------------|--|--|
| Not used | Set when the output terminal is not used. | – |
| FWD_R | Output in response to the FWD input. | 0: OFF 1: ON |
| REV_R | Output in response to the RVS input. | |
| STOP-MODE_R | Output in response to the STOP-MODE input. | |
| MB-FREE_R | Output in response to the MB-FREE input. | |
| HMI_R | Output in response to the HMI input. | |
| R0 to R15 | Output the status of the general signals R0 to R15. | |
| M0_R to M3_R | Output in response to the M0 to M3 inputs. | |
| TL_R | Output in response to the TL input | |
| ALARM_OUT1 | 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 |
| MOVE | Output when the motor operates. | 0: Motor stopped 1: Motor operating |
| TLC | Output when the motor torque reaches the limit value. | 0: No torque limiting 1: In torque limiting operation |
| VA | Output when the motor speed reaches the setting value. | 0: Speed not attained 1: Speed attainment |
| S-BSY | Output when the motor is in internal processing state. | 0: No internal processing 1: During internal processing |
| ALARM-OUT2 | Output when the overload warning detection level is exceeded. Output when an overload alarm generates. (normally closed) | 0: Normal operation 1: In overload operation |
| MPS | Output the ON-OFF state of the main power supply. | 0: Main power-OFF 1: Main power-ON |
| DIR | Output the motor rotation direction. | 0: REV direction 1: FWD direction |

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

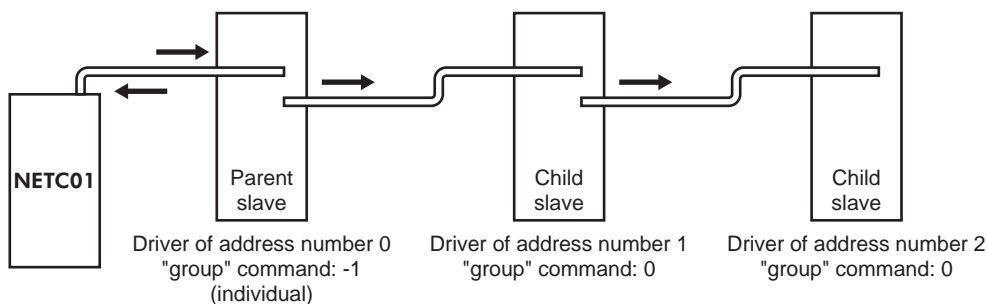
The group setting is not saved in the non-volatile memory even when the maintenance command "batch NV memory write" executes.

| 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: Individual |

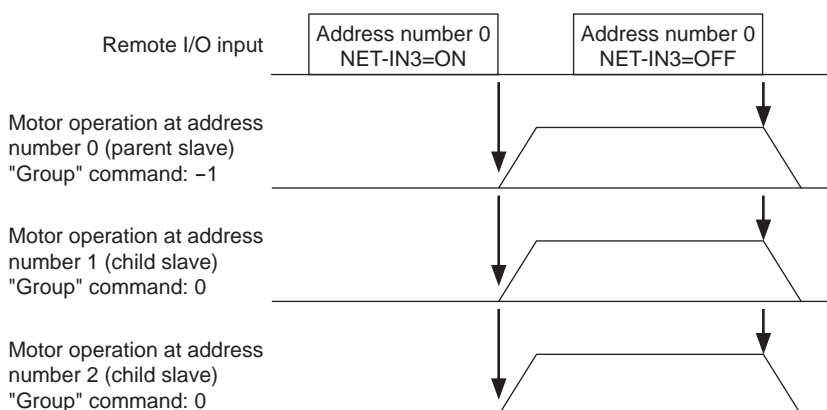
* Set in the 0 to 11 range when using the **NETC01-CC**, and set in the 0 to 15 range when using the **NETC01-M2** or **NETC01-M3**.

■ Example for setting of the group function

Set as follows when making a group by setting the 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 FWD 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." | 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. | |
| 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. | |
| 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. | |

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

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. |
| 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. |
| 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 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 | |
| 2062h | Present operation data No. | Monitors the operation data No. corresponding to the data used in the current operation. While the motor is stopped, the last used operation data number is indicated. |
| 2064h | Command speed | Monitors the command speed. |
| 2067h | Feedback speed | Monitors the feedback speed. |
| 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 | Operation speed | Monitors the feedback speed calculated by the "reduction gear rate" parameter or "amplification speed rate" parameter. (unit: r/min) |
| 2081h | Operation speed decimal position | Monitors the decimal position in the operation speed. *1 |
| 2082h | Conveyor transfer speed | Monitors the feedback speed calculated by the "conveyor reduction gear rate" parameter or "conveyor amplification speed rate" parameter. (unit: m/min) |
| 2083h | Conveyor transfer speed decimal position | Monitors the decimal position in the conveyor transfer speed. *2 |
| 2084h | Load factor | Monitors the torque that is output by the motor based on the rated torque being 100%. (unit: %) |
| 2086h | External analog speed setting | Monitors the speed setting value by the external potentiometer. (unit: r/min) *3 |

| Command code | Name | Description |
|--------------|--------------------------------------|--|
| 2088h | External analog torque limit setting | Monitors the torque limiting value by the external potentiometer. (unit: %) *3 |
| 208Bh | External analog voltage setting | Monitors the setting voltage by external voltage. (unit: 0.1 V) |

*1 The decimal position is automatically changed based on the setting of the "reduction gear rate" parameter or "decimal place for reduction gear rate" parameter.

*2 The decimal position is automatically changed based on the setting of the "conveyor reduction gear rate" parameter or "decimal place for conveyor reduction gear rate" parameter.

*3 FFFFh is displayed when not selecting by the "analog input signal select" parameter.

• Direct I/O and electromagnetic brake status (206Ah)

| Byte | bit7 | bit6 | bit5 | bit4 | bit3 | bit2 | bit1 | bit0 |
|------|------|------|------|------|------|------|------|------|
| 0 | – | IN6 | IN5 | IN4 | IN3 | IN2 | IN1 | IN0 |
| 1 | – | – | – | – | – | – | – | – |
| 2 | – | – | – | – | – | – | OUT1 | OUT2 |
| 3 | – | – | – | – | – | – | MB | – |

4.4 Operation data

Up to 16 operation data can be set (data Nos.0 to 15).

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 | | | |
| 0240h to 024Fh | 1240h to 124Fh | Rotational speed No.0 to Rotational speed No.15 | 0, or 80 to 4000 r/min | 0 |
| 0300h to 030Fh | 1300h to 130Fh | Acceleration No.0 to Acceleration No.15 | 2 to 150 (1=0.1 s) | 5 |
| 0340h to 034Fh | 1340h to 134Fh | Deceleration No.0 to Deceleration No.15 | | |
| 0380h to 038Fh | 1380h to 138Fh | Torque limit No.0 to Torque limit No.15 | 0 to 200% | 200 |

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 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 on the driver 24 VDC power supply, 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.

Parameters having set via RS-485 communication or industrial network are saved in the RAM. To save the parameters stored in the RAM to the non-volatile memory, execute the "batch NV memory write" of the maintenance command. The parameters set with the **MEXE02** will be saved in the non-volatile memory if "Data writing" is performed.

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

| Update timing | | Description |
|---------------|---|--|
| A | Effective immediately | Executes the recalculation and setup immediately when writing the parameter. |
| B | Effective after stopping the operation | Executes the recalculation and setup after stopping the operation. |
| C | Effective after executing configuration or effective after turning the power ON again | Executes the recalculation and setup after executing the configuration or turning the 24 VDC power ON again. |
| D | 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 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.

■ Function parameter

| Command code | | Description | Setting range | Initial value | Effective * |
|--------------|-------|--|---|---------------|----------------|
| Read | Write | | | | |
| 01C2h | 11C2h | Motor rotation direction | 0: + direction=CCW 1: + direction=CW | 1 | C |
| 0825h | 1825h | Reduction gear rate | 100 to 9999 | 100 | A |
| 0826h | 1826h | Decimal place for reduction gear rate | 0: 1 digit 1: 2 digit 2: 3 digit | 2 | |
| 0827h | 1827h | Amplification speed rate | 1 to 5 | 1 | |
| 0828h | 1828h | Conveyor reduction gear rate | 100 to 9999 | 100 | |
| 0829h | 1829h | Decimal place for conveyor reduction gear rate | 0: 1 digit 1: 2 digit 2: 3 digit | 2 | |
| 082Ah | 182Ah | Conveyor amplification speed rate | 1 to 5 | 1 | |
| 08A7h | 18A7h | Velocity attainment width | 0 to 400 r/min | 200 | |

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

■ I/O function parameter

| Command code | | Description | Setting range | Initial value | Effective * |
|--------------|-------|---------------------------|-----------------------------------|-----------------|----------------|
| Read | Write | | | | |
| 0880h | 1880h | IN0 function select | See table next. | 1: FWD | B |
| 0881h | 1881h | IN1 function select | | 2: REV | |
| 0882h | 1882h | IN2 function select | | 19: STOP-MODE | |
| 0883h | 1883h | IN3 function select | | 48: M0 | |
| 0884h | 1884h | IN4 function select | | 24: ALARM-RESET | |
| 0885h | 1885h | IN5 function select | | 20: MB-FREE | |
| 0886h | 1886h | IN6 function select | | 22: TH | |
| 0890h | 1890h | IN0 contact configuration | 0: Make (N.O.) 1: Brake (N.C.) | 0 | C |
| 0891h | 1891h | IN1 contact configuration | | | |
| 0892h | 1892h | IN2 contact configuration | | | |
| 0893h | 1893h | IN3 contact configuration | | | |
| 0894h | 1894h | IN4 contact configuration | | | |
| 0895h | 1895h | IN5 contact configuration | | | |
| 0896h | 1896h | IN6 contact configuration | | | |
| 08A0h | 18A0h | OUT0 function select | See table next. | 85: SPEED-OUT | A |
| 08A1h | 18A1h | OUT1 function select | | 65: ALARM-OUT1 | |

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

● Setting range for IN input function selection

| | | | | |
|----------------|-----------------|--------|---------|---------|
| 0: No function | 22: TH | 35: R3 | 41: R9 | 47: R15 |
| 1: FWD | 24: ALARM-RESET | 36: R4 | 42: R10 | 48: M0 |
| 2: REV | 27: HMI | 37: R5 | 43: R11 | 49: M1 |
| 19: STOP-MODE | 32: R0 | 38: R6 | 44: R12 | 50: M2 |
| 20: MB-FREE | 33: R1 | 39: R7 | 45: R13 | 51: M3 |
| 21: EXT-ERROR | 34: R2 | 40: R8 | 46: R14 | 54: TL |

● Setting range for OUT output function selection

| | | | | |
|-----------------|--------|----------|----------------|----------------|
| 0: No function | 34: R2 | 42: R10 | 50: M2_R | 80: S-BSY |
| 1: FWD_R | 35: R3 | 43: R11 | 51: M3_R | 81: ALARM-OUT2 |
| 2: REV_R | 36: R4 | 44: R12 | 54: TL_R | 82: MPS |
| 19: STOP-MODE_R | 37: R5 | 45: R13 | 65: ALARM-OUT1 | 84: DIR |
| 20: MB-FREE_R | 38: R6 | 46: R14 | 66: WNG | 85: SPEED-OUT |
| 27: HMI_R | 39: R7 | 47: R15 | 68: MOVE | |
| 32: R0 | 40: R8 | 48: M0_R | 71: TLC | |
| 33: R1 | 41: R9 | 49: M1_R | 77: VA | |

■ I/O function parameter (RS-485)

| Command code | | Description | Setting range | Initial value | Effective * |
|--------------|-------|---------------------------|-----------------|-----------------|----------------|
| Read | Write | | | | |
| 08B0h | 18B0h | NET-IN0 function select | See table next. | 48: M0 | C |
| 08B1h | 18B1h | NET-IN1 function select | | 49: M1 | |
| 08B2h | 18B2h | NET-IN2 function select | | 50: M2 | |
| 08B3h | 18B3h | NET-IN3 function select | | 1: FWD | |
| 08B4h | 18B4h | NET-IN4 function select | | 2: REV | |
| 08B5h | 18B5h | NET-IN5 function select | | 19: STOP-MODE | |
| 08B6h | 18B6h | NET-IN6 function select | | 20: MB-FREE | |
| 08B7h | 18B7h | NET-IN7 function select | | 0: No function | |
| 08B8h | 18B8h | NET-IN8 function select | | | |
| 08B9h | 18B9h | NET-IN9 function select | | | |
| 08BAh | 18BAh | NET-IN10 function select | | | |
| 08BBh | 18BBh | NET-IN11 function select | | | |
| 08BCh | 18BCh | NET-IN12 function select | | | |
| 08BDh | 18BDh | NET-IN13 function select | | | |
| 08BEh | 18BEh | NET-IN14 function select | | | |
| 08BFh | 18BFh | NET-IN15 function select | | | |
| 08C0h | 18C0h | NET-OUT0 function select | See table next. | 48: M0_R | |
| 08C1h | 18C1h | NET-OUT1 function select | | 49: M1_R | |
| 08C2h | 18C2h | NET-OUT2 function select | | 50: M2_R | |
| 08C3h | 18C3h | NET-OUT3 function select | | 1: FWD_R | |
| 08C4h | 18C4h | NET-OUT4 function select | | 2: REV_R | |
| 08C5h | 18C5h | NET-OUT5 function select | | 19: STOP-MODE_R | |
| 08C6h | 18C6h | NET-OUT6 function select | | 66: WNG | |
| 08C7h | 18C7h | NET-OUT7 function select | | 65: ALARM-OUT1 | |
| 08C8h | 18C8h | NET-OUT8 function select | | 80: S-BSY | |
| 08C9h | 18C9h | NET-OUT9 function select | | 0: No function | |
| 08CAh | 18CAh | NET-OUT10 function select | | | |
| 08CBh | 18CBh | NET-OUT11 function select | | 81: ALARM-OUT2 | |
| 08CCh | 18CCh | NET-OUT12 function select | | | |
| 08CDh | 18CDh | NET-OUT13 function select | | | |
| 08CEh | 18CEh | NET-OUT14 function select | | | |
| 08CFh | 18CFh | NET-OUT15 function select | | 71: TLC | |

* Indicates the timing for the data to become effective. (C: Effective after executing configuration or effective after turning the power ON again)

• Setting range for NET-IN input function selection

| | | | | |
|----------------|--------|---------|---------|--------|
| 0: No function | 32: R0 | 38: R6 | 44: R12 | 50: M2 |
| 1: FWD | 33: R1 | 39: R7 | 45: R13 | 51: M3 |
| 2: REV | 34: R2 | 40: R8 | 46: R14 | 54: TL |
| 19: STOP-MODE | 35: R3 | 41: R9 | 47: R15 | |
| 20: MB-FREE | 36: R4 | 42: R10 | 48: M0 | |
| 27: HMI | 37: R5 | 43: R11 | 49: M1 | |

• Setting range for NET-OUT output function selection

| | | | | |
|-----------------|--------|---------|----------------|----------------|
| 0: No function | 33: R1 | 40: R8 | 47: R15 | 66: WNG |
| 1: FWD_R | 34: R2 | 41: R9 | 48: M0_R | 68: MOVE |
| 2: REV_R | 35: R3 | 42: R10 | 49: M1_R | 71: TLC |
| 19: STOP-MODE_R | 36: R4 | 43: R11 | 50: M2_R | 77: VA |
| 20: MB-FREE_R | 37: R5 | 44: R12 | 51: M3_R | 80: S-BSY |
| 27: HMI_R | 38: R6 | 45: R13 | 54: TL_R | 81: ALARM-OUT2 |
| 32: R0 | 39: R7 | 46: R14 | 65: ALARM_OUT1 | 82: MPS |
| | | | | 84: DIR |

■ Analog adjust parameter

| Command code | | Description | Setting range | Initial value | Effective * |
|--------------|-------|---|---------------------|---------------|----------------|
| Read | Write | | | | |
| 08D0h | 18D0h | Analog operating speed command gain | 0 to 4000 r/min | 800 | A |
| 08D1h | 18D1h | Analog operating speed command offset | -2000 to 2000 r/min | 0 | |
| 08D2h | 18D2h | Analog torque limit gain | 0 to 200% | 40 | |
| 08D3h | 18D3h | Analog torque limit offset | -50 to 50% | 0 | |
| 08D5h | 18D5h | Analog operating speed maximum value for external input | 0 to 4000 r/min | 4000 | |
| 08D7h | 18D7h | Analog torque limit maximum value external input | 0 to 200% | 200 | |

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

■ Alarm/warning parameter

| Command code | | Description | Setting range | Initial value | Effective * |
|--------------|-------|--------------------------|-------------------------|---------------|----------------|
| Read | Write | | | | |
| 0851h | 1851h | Over load warning enable | 0: Disable 1: Enable | 0 | A |
| 0855h | 1855h | Over load warning level | 50 to 100% | 100 | |

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

■ Utilities parameter

| Command code | | Description | Setting range | Initial value | Effective * |
|--------------|-------|---------------------------------------|--------------------------|---------------|----------------|
| Read | Write | | | | |
| 0143h | 1143h | JOG operating speed | 0, or 80 to 1000 r/min | 300 | A |
| 01E0h | 11E0h | Display mode of the data setter speed | 0: Signed 1: Absolute | 0 | |
| 01E1h | 11E1h | The data setter editing mode | 0: Disable 1: Enable | 1 | |
| 0821h | 1821h | JOG operating torque | 0 to 200% | 200 | |

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

■ Operation parameter

| Command code | | Description | Setting range | Initial value | Effective * |
|--------------|-------|--------------------------------------|---|---------------|----------------|
| Read | Write | | | | |
| 0816h | 1816h | Run mode select | 0: PWM shut off mode enable 1: PWM shut off mode disable | 1 | C |
| 0840h | 1840h | Magnetic brake function at alarm | 0: Lock after free stop 1: Lock immediately | 1 | |
| 0841h | 1841h | No operation at initial alarm enable | 0: Disable 1: Enable | 0 | |
| 0843h | 1843h | Initial thermal input detection | | 0 | |
| 0870h | 1870h | Data setter initial display | 0: Operating speed 1: Conveyor speed 2: Load factor 3: Operating number 4: Mon top view | 0 | |
| 0871h | 1871h | Analog input signal select | 0: Analog invalid 1: Analog speed 2: Analog torque (See next page for details.) | 1 | |

* Indicates the timing for the data to become effective. (C: Effective after executing configuration or effective after turning the power ON again)

- "Analog input signal select" parameter

Setting method of operation data can be changed using the "analog input signal select" parameter.
Others except the following combinations are not available to set.

| "Analog input signal select" parameter | Operation data No. | Rotational speed | Acceleration Deceleration | Torque limit |
|--|--------------------|------------------|------------------------------|----------------|
| 0 | 0 to 15 | Digital setting | | |
| 1 (Initial value) | 0 | Analog setting | Digital setting | |
| | 1 to 15 | Digital setting | | |
| 2 | 0 to 15 | Digital setting | | Analog setting |

Setting example

- When setting all operation data with digital setting: Set the "analog input signal select" parameter to "0."
- When setting only the rotation speed in the operation data No.0 using the analog setting: Set the "analog input signal select" parameter to "1."

■ Communication parameter

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

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

6 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 Maintenance and inspection

1.1 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.

Note

- Conduct the insulation resistance measurement or dielectric strength test separately on the motor and the driver. Conducting the insulation resistance measurement or dielectric strength test with the motor and driver connected may result in damage to the product.
- The driver uses semiconductor elements. Handle the driver with care since static electricity may damage semiconductor elements. Static electricity may damage the driver.

■ During inspection

- The motor/gearhead mounting screws are not loose.
- Check for any unusual noises in the motor bearings (ball bearings) or other moving parts.
- The bearing (ball bearing) and gear meshing parts of the gearhead are not generating noise.
- The motor/gearhead output shaft is not misaligned with the load shaft.
- Are there any scratches, signs of stress or loose driver connections in the cable?
- Are the openings in the driver blocked?
- The driver mounting screws and power connection terminal screws are not loose.
- Are there any strange smells or appearances within the driver?

1.2 Warranty

Check on the Oriental Motor Website for the product warranty.

1.3 Disposal

Dispose the product correctly in accordance with laws and regulations, or instructions of local governments.

2 Alarms, warnings and communication errors

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).

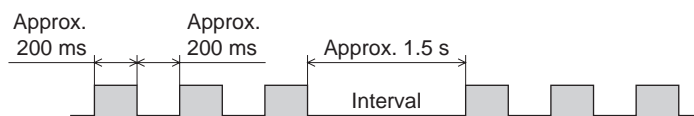
Communication error will generate when the process requested by the master could not be executed.

2.1 Alarms

When an alarm generates, the ALARM-OUT1 output will turn OFF and the motor will stop. At the same time, the PWR/ALM LED will start blinking.

The present alarm can be checked by counting the number of times the PWR/ALM LED blinks. The alarm can be also checked using any of the **OPX-2A**, **MEXE02** or RS-485 communication.

Example: Sensor error 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.52 for the timing chart.

- Turn the ALARM-RESET input to ON and then OFF. (This signal will become effective when turning from ON to OFF.)
- Perform an alarm reset using RS-485 communication.
- Perform an alarm reset using the **OPX-2A** or **MEXE02**.
- Cycle the power.

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

■ Alarm 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 LED blinks | Alarm type | Cause | Remedial action | Reset using the ALARM-RESET input |
|------|-------------------|------------------------------------|--|--|-----------------------------------|
| 30h | 2 | Overload | A load exceeding the rated torque was applied to the motor for 5 seconds or more. | <ul style="list-style-type: none">Decrease the load.Review the operation pattern settings such as the acceleration/ deceleration time. | Possible |
| 28h | 3 | Sensor error | The motor sensor signal line experienced an open circuit during operation, or the signal connector came off. | Check the connection between the driver and motor. | |
| 42h | | Initial sensor error | The motor sensor signal line broke or signal connector came off before the main power supply was turned on. | | |
| 22h | 4 | Overvoltage | <ul style="list-style-type: none">The main power-supply voltage became higher than the rated voltage by approx. 20%.A load exceeding the allowable gravitational capacity of the motor is driven or sudden starting/stopping of a large inertial load is performed. | <ul style="list-style-type: none">Check the main power supply voltage.If this alarm occurs during operation, reduce the load or increase the acceleration/ deceleration time.Use a regeneration unit. | |
| 25h | 5 | Undervoltage | The main power-supply voltage became lower than the rated voltage by approx. 40% | <ul style="list-style-type: none">Check the main power supply voltage.Check the wiring of the power supply cable. | |
| 31h | 6 | Overspeed | The rotation speed of the motor output shaft exceeded approx. 4800 r/min | <ul style="list-style-type: none">Decrease the load.Review the operation pattern settings such as the acceleration/ deceleration time. | |
| 20h | 7 | Overcurrent | Excessive current has flown through the driver due to ground fault, etc. | Check the wiring between the driver and motor for damage, and then cycled the power. | Not possible |
| 41h | 8 | EEPROM error | <ul style="list-style-type: none">Stored data was damaged.Data became no longer writable or readable. | Initialize the parameters if the OPX-2A or MEXE02 is used. If the alarm does not reset even after the power has been cycled, contact your nearest office. | |
| 51h | 9 | Overheated regeneration unit | <ul style="list-style-type: none">Overheating of the regeneration unit was detected.Lead wires of the thermostat output of the regeneration unit broke during operation. | <ul style="list-style-type: none">The power consumption of the regeneration unit exceeds the permissible level. Review the load condition and operating conditions.Check the connection of the regeneration unit. | Possible |
| 6Eh | 10 | External stop *1 | The EXT-ERROR input turned OFF. | Check the EXT-ERROR input. | |
| 46h | 11 | Initial operation inhibition *2 | The 24 VDC power supply was cycled when the FWD input or REV input was ON. | Turn the FWD input and REV input OFF, and then cycle the 24 VDC power supply. | |
| 81h | 12 | 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. | Not possible |
| 83h | | Communication switch setting error | Transmission rate setting switch (SW4) was out-of-specification. | Check the transmission rate setting switch (SW4). | |
| 84h | | RS-485 communication error | The number of consecutive RS-485 communication errors reached the set value of the "communication error alarm" parameter. | <ul style="list-style-type: none">Check the connection between the master controller and driver.Check the setting of RS-485 communication. | Possible |

*1 It generates when assigning the EXT-ERROR to the IN0 to IN6 inputs.

*2 It generates when setting the "no operation at initial alarm enable" parameter to "Enable."

| Code | No. of LED blinks | Alarm type | Cause | Remedial action | Reset using the ALARM-RESET input |
|------|-------------------|------------------------------|---|--|-----------------------------------|
| 85h | 12 | RS-485 communication timeout | The time set in the "communication time out" parameter has elapsed, and yet the communication could not be established with the master controller. | Check the connection between the master controller and driver. | Possible |
| 8Eh | | Network converter error | An alarm was generated in the network converter. | Check the alarm code of the network converter. | |
| 23h | 13 | Main power off | <ul style="list-style-type: none"> The main power supply was shut off while operating. Although the 24 VDC power supply has been turned on, the operation command was input while the main power supply was shut off. | <ul style="list-style-type: none"> Check the connections between the driver and power supply. Check the power supply cable wiring. | |
| 2Dh | 14 | Main circuit output error * | The motor drive wire broke or motor power connector came off. | Check the connection between the driver and motor. | |

* This alarm does not generate when the torque limiting value is set to less than 200% .

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 list

| Code | Warning type | Cause | Remedial action |
|------|----------------------------|---|--|
| 30h | Overload * | The load torque of the motor exceeded the overload warning level. | <ul style="list-style-type: none"> Decrease the load. Review the operation pattern settings such as the acceleration/ deceleration time. |
| 6Ch | Operation error | <ul style="list-style-type: none"> When moving from the test mode to other mode using the OPX-2A or MEXE02, the FWD input or REV input was turned ON. When changing the assignment of the input terminal using any of the OPX-2A, MEXE02 or RS-485 communication, the assigned terminal was ON. | Turn the input signals OFF. |
| 84h | RS-485 communication error | The RS-485 communication error was detected. | <ul style="list-style-type: none"> Check the connection between the master controller and driver. Check the setting of RS-485 communication. |

* The detection level can be changed using the **MEXE02** or **OPX-2A**.

■ 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.

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 list

| Code | Communication error type | Cause | Remedial action |
|------|---|--|--|
| 84h | RS-485 communication error | One of the following errors was detected. · Framing error · BCC error | <ul style="list-style-type: none"> • 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. | <ul style="list-style-type: none"> • Check the setting value for the command. • Check the flame configuration. |
| 89h | Execution disable due to user I/F communication in progress | The command requested by the master could not be executed because the OPX-2A or MEXE02 was communicating with the driver. | Wait until the processing for the OPX-2A or MEXE02 will be completed. |
| 8Ah | Non-volatile memory processing in progress | The command could not be executed because the driver was performing the non-volatile memory processing. · Internal processing was in progress. (S-BSY is ON.) · An EEPROM error alarm was present. | <ul style="list-style-type: none"> • Wait until the internal processing will be completed. • When the EEPROM error was generated, initialize all parameters using any of the OPX-2A, MEXE02 or 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. |

■ 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 RS-485 communication monitor of the **MEXE02**.

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

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 does not operate. | The power supply is not connected correctly. | Check the connection of the power supply. |
| | Both the FWD input and REV input are OFF. | Turn ON either the FWD input or REV input one at a time. |
| | Both the FWD input and REV input are ON. | |
| | The ALM LED (red) is blinking. | An alarm generated due to a protective function being triggered. Refer to p.143 to reset the alarm. |
| | Electromagnetic brake is not released. (electromagnetic brake motor only) | Turn ON the MB-FREE input. |
| The motor rotates in the direction opposite to the specified direction. | The FWD input and REV input are connected wrongly or otherwise not connected correctly. | Check the connection of the FWD input and REV input. The motor rotates in the clockwise direction when the FWD input is ON, and in the counterclockwise direction when the REV input is ON. |
| | The combination type • parallel shaft gearhead is using a gear with a gear ratio of 30, 50 or 100. | When the gear ratio of the combination type • parallel shaft gearhead is 30, 50 or 100, the rotation direction of the gear output shaft is opposite the rotation direction of the motor output shaft. Accordingly, reverse the FWD input and REV input operations. |
| | A combination type • hollow shaft flat gearhead is used. | <ul style="list-style-type: none"> With a combination type • hollow shaft flat gearhead, the rotation direction of the gear output shaft is opposite the rotation direction of the motor output shaft. Accordingly, reverse the FWD input and REV input operations. Is the gearhead viewed in the correct direction? With a combination type • hollow shaft flat gearhead, the rotation direction of the gearhead changes according to the direction in which the gearhead is viewed. |
| <ul style="list-style-type: none"> Motor operation is unstable. Motor vibration is too great. | The motor (gearhead) output shaft is not misaligned with the load shaft. | Check the coupling condition of the motor (gearhead) output shaft and load shaft. |
| | Effect of noise. | Check the operation only with the motor, driver and other external equipment required for operation. If an effect of noise has been confirmed, implement the following countermeasures: <ul style="list-style-type: none"> Move the motor and driver farther away from noise generation sources. Review the wiring. Change the signal cables to a shielded type. Install ferrite cores. |
| The motor doesn't stop instantaneously. | The STOP-MODE input is ON. | To cause the motor to stop instantaneously, turn OFF the STOP-MODE input. |
| | The inertial load is large. | Reduce the load inertia or connect the accessory regeneration unit (sold separately). |
| The electromagnetic brake does not hold. | The MB-FREE input is ON. | Turn OFF the MB-FREE input. |

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.

7 Reference

This part explains the standards and CE Marking.

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1 Specifications

The value in a state where the gearhead is not combined is described in each specification for the "rated torque," "maximum instantaneous torque," "rated rotation speed" and "speed control range."

- □ in the model names indicates a number representing the gear ratio.
- ■ indicates a number representing the length of a connection cable.

1.1 Specifications

■ Standard type

| | | | | | |
|---------------------------------|---|---|---|-----------------------------|---|
| Model | Combination type • parallel shaft gearhead | BLE23AR□S■ | BLE23CR□S■ | BLE46AR□S■ | BLE46CR□S■ |
| | Combination type • hollow shaft flat gearhead | BLE23AR□F■ | BLE23CR□F■ | BLE46AR□F■ | BLE46CR□F■ |
| | Round shaft type | BLE23ARA■ | BLE23CRA■ | BLE46ARA■ | BLE46CRA■ |
| Rated output power (Continuous) | | 30 W | | 60 W | |
| Power supply input | Rated voltage | Single-phase 100-120 VAC | Single-phase 200-240 VAC Three-phase 200-240 VAC | Single-phase 100-120 VAC | Single-phase 200-240 VAC Three-phase 200-240 VAC |
| | Permissible voltage range | -15 to +10% | | | |
| | Rated frequency | 50/60 Hz | | | |
| | Permissible frequency range | ±5% | | | |
| | Rated input current | 1.3 A | Single-phase: 0.8 A Three-phase: 0.45 A | 2.0 A | Single-phase: 1.2 A Three-phase: 0.7 A |
| | Maximum input current | 3.5 A | Single-phase: 2.1 A Three-phase: 1.2 A | 4.5 A | Single-phase: 2.6 A Three-phase: 1.5 A |
| Control Power Supply | Voltage | 24 VDC | | | |
| | Permissible Voltage Range | -15 to +20% | | | |
| Rated torque | | 0.1 N·m (14.2 oz-in) | | 0.2 N·m (28 oz-in) | |
| Maximum instantaneous torque*1 | | 0.2 N·m (28 oz-in) | | 0.4 N·m (56 oz-in) | |
| Rated rotation speed | | 3000 r/min | | | |
| Speed control range | | 100 to 4000 r/min (Analog setting) 80 to 4000 r/min (Setting in 1 r/min increments during digital setting)*2 | | | |

*1 The maximum instantaneous torque can be used for up to approximately 5 seconds.

*2 These specifications apply when the RS-485 communication is used with either the **OPX-2A** or **MEXE02**.

| | | | |
|---------------------------------|---|---|---|
| Model | Combination type • parallel shaft gearhead | BLE512AR□S■ | BLE512CR□S■ |
| | Combination type • hollow shaft flat gearhead | BLE512AR□F■ | BLE512CR□F■ |
| | Round shaft type | BLE512ARA■ | BLE512CRA■ |
| Rated output power (Continuous) | | 120 W | |
| Power supply input | Rated voltage | Single-phase 100-120 VAC | Single-phase 200-240 VAC Three-phase 200-240 VAC |
| | Permissible voltage range | -15 to +10% | |
| | Rated frequency | 50/60 Hz | |
| | Permissible frequency range | ±5% | |
| | Rated input current | 3.3 A | Single-phase: 2.0 A Three-phase: 1.2 A |
| Control Power Supply | Maximum input current | 8.2 A | Single-phase: 4.4 A Three-phase: 2.5 A |
| | Voltage | 24 VDC | |
| Rated torque | Permissible Voltage Range | -15 to +20% | |
| | | 0.4 N·m (56 oz-in) | |
| Maximum instantaneous torque*1 | | 0.8 N·m (113 oz-in) | |
| Rated rotation speed | | 3000 r/min | |
| Speed control range | | 100 to 4000 r/min (Analog setting) 80 to 4000 r/min (Setting in 1 r/min increments during digital setting)*2 | |

*1 The maximum instantaneous torque can be used for up to approximately 5 seconds.

*2 These specifications apply when the RS-485 communication is used with either the **OPX-2A** or **MEXE02**.

■ Electromagnetic brake type

| | | | | | |
|---------------------------------|---|---|---|-----------------------------|---|
| Model | Combination type • parallel shaft gearhead | BLE23AMR□S■ | BLE23CMR□S■ | BLE46AMR□S■ | BLE46CMR□S■ |
| | Combination type • hollow shaft flat gearhead | BLE23AMR□F■ | BLE23CMR□F■ | BLE46AMR□F■ | BLE46CMR□F■ |
| | Round shaft type | BLE23AMRA■ | BLE23CMRA■ | BLE46AMRA■ | BLE46CMRA■ |
| Rated output power (Continuous) | | 30 W | | 60 W | |
| Power supply input | Rated voltage | Single-phase 100-120 VAC | Single-phase 200-240 VAC Three-phase 200-240 VAC | Single-phase 100-120 VAC | Single-phase 200-240 VAC Three-phase 200-240 VAC |
| | Permissible voltage range | -15 to +10% | | | |
| | Rated frequency | 50/60 Hz | | | |
| | Permissible frequency range | ±5% | | | |
| | Rated input current | 1.3 A | Single-phase: 0.8 A Three-phase: 0.45 A | 2.0 A | Single-phase: 1.2 A Three-phase: 0.7 A |
| | Maximum input current | 3.5 A | Single-phase: 2.1 A Three-phase: 1.2 A | 4.5 A | Single-phase: 2.6 A Three-phase: 1.5 A |
| Control Power Supply | Voltage | 24 VDC | | | |
| | Permissible Voltage Range | -15 to +20% | | | |
| Rated torque | | 0.1 N·m (14.2 oz-in) | | 0.2 N·m (28 oz-in) | |
| Maximum instantaneous torque*1 | | 0.2 N·m (28 oz-in) | | 0.4 N·m (56 oz-in) | |
| Rated rotation speed | | 3000 r/min | | | |
| Speed control range | | 100 to 4000 r/min (Analog setting) 80 to 4000 r/min (Setting in 1 r/min increments during digital setting)*2 | | | |
| Electromagnetic Brake*3 | Brake Type | Power off activated type, automatically controlled by the driver | | | |
| | Static Friction Torque | 0.1 N·m (14.2 oz-in) | | 0.2 N·m (28 oz-in) | |

*1 The maximum instantaneous torque can be used for up to approximately 5 seconds.

*2 These specifications apply when the RS-485 communication is used with either the **OPX-2A** or **MEXE02**.

*3 Do not start or stop the motor by turning the power supply ON/OFF, as this will cause the electromagnetic brake to wear abnormally.

| | | | |
|---------------------------------|---|---|---|
| Model | Combination type • parallel shaft gearhead | BLE512AMR□S■ | BLE512CMR□S■ |
| | Combination type • hollow shaft flat gearhead | BLE512AMR□F■ | BLE512CMR□F■ |
| | Round shaft type | BLE512AMRA■ | BLE512CMRA■ |
| Rated output power (Continuous) | | 120 W | |
| Power supply input | Rated voltage | Single-phase 100-120 VAC | Single-phase 200-240 VAC Three-phase 200-240 VAC |
| | Permissible voltage range | -15 to +10% | |
| | Rated frequency | 50/60 Hz | |
| | Permissible frequency range | ±5% | |
| | Rated input current | 3.3 A | Single-phase: 2.0 A Three-phase: 1.2 A |
| Control Power Supply | Maximum input current | 8.2 A | Single-phase: 4.4 A Three-phase: 2.5 A |
| | Voltage | 24 VDC | |
| Electromagnetic Brake*3 | Permissible Voltage Range | -15 to +20% | |
| | Brake Type | Power off activated type, automatically controlled by the driver | |
| Rated torque | | 0.4 N·m (56 oz-in) | |
| Maximum instantaneous torque*1 | | 0.8 N·m (113 oz-in) | |
| Rated rotation speed | | 3000 r/min | |
| Speed control range | | 100 to 4000 r/min (Analog setting) 80 to 4000 r/min (Setting in 1 r/min increments during digital setting)*2 | |
| Electromagnetic Brake*3 | Static Friction Torque | 0.4 N·m (56 oz-in) | |

*1 The maximum instantaneous torque can be used for up to approximately 5 seconds.

*2 These specifications apply when the RS-485 communication is used with either the **OPX-2A** or **MEXE02**.

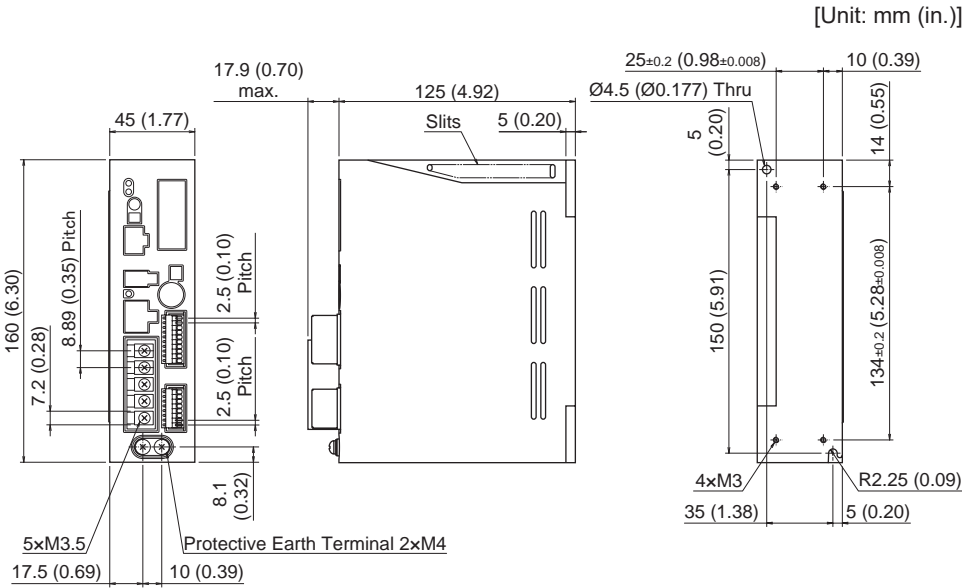
*3 Do not start or stop the motor by turning the power supply ON/OFF, as this will cause the electromagnetic brake to wear abnormally.

1.2 General specifications

| Item | | Motor | Driver |
|---|------------------------|---|--------|
| Operating environment | Ambient temperature | 0 to +50 °C [+32 to +122 °F] (non-freezing) | |
| | Ambient 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. Cannot be used in radioactive materials, magnetic field, vacuum or other special environment. | |
| | Vibration | Not subject to continuous vibrations or excessive impact. In conformance with JIS C 60068-2-6 "Sine-wave vibration test method" Frequency range: 10 to 55 Hz Pulsating amplitude: 0.15 mm (0.006 in.) Sweep direction: 3 directions (X, Y, Z) Number of sweeps: 20 times | |
| Storage environment Shipping environment | Ambient temperature | -25 to +70 °C [-13 to +158 °F] (non-freezing) | |
| | Ambient humidity | 85% or less (non-condensing) | |
| | Altitude | Up to 3000 m (10000 ft.) above sea level | |
| Degree of protection | | IP65 (Excluding the mounting surface of the round shaft type and connectors) | IP20 |

1.3 Dimension

Mass: 0.7 kg (1.54 lb.)



2 Regulations and standards

2.1 UL Standards and CSA Standards

This product is recognized by UL under the UL and CSA Standards.

2.2 CE Marking

This product is affixed with the marks under the following directives.

■ Low Voltage Directive

Installation conditions

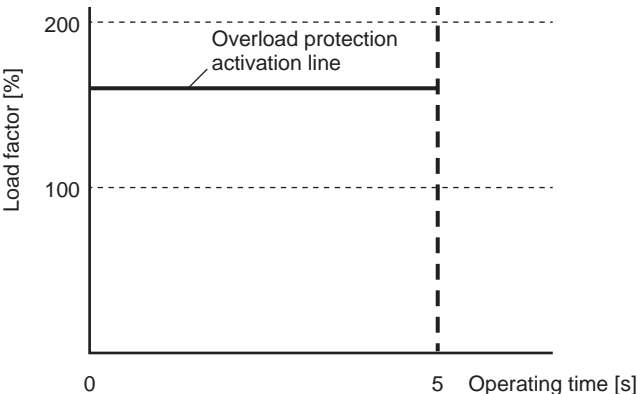
| | Motor | Driver |
|-----------------------------------|-------------------|--------|
| Overvoltage category | III *1 | II |
| Pollution degree | 3 | 2 |
| Degree of protection | IP65 *2 | IP20 |
| Protection against electric shock | Class I equipment | |

*1 Overvoltage category II when EN 60950-1 is applicable.

*2 Excluding the mounting surface of the round shaft type and the connector part.

- This product cannot be used in IT power distribution systems.
- Isolate power cables such as the connection cable, power supply cable and other drive cables from the signal cable (CN3, CN5 to CN8) by means of double insulation.
- Use a circuit breaker conforming to EN or IEC Standards.
- The driver is not provided with the motor overtemperature protection specified in EN Standards.
- The driver is provided with the electronic motor overload protection specified in EN Standards.

Overload protection characteristics



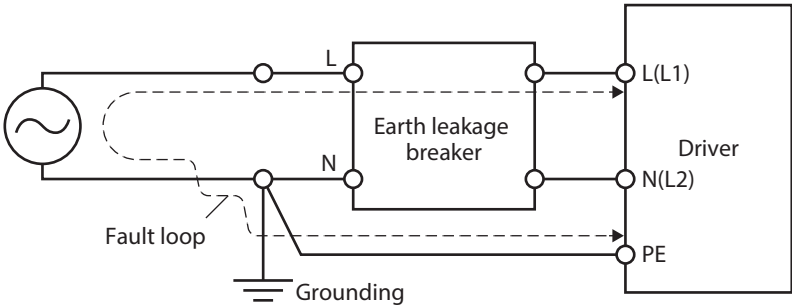
The driver is provided with the electronic motor overload protection, but is not provided with the thermal retention function and the speed sensitive function.

- The driver is not provided with the ground fault protection. Wire the product in accordance with “Wiring example having considered ground fault protection.” Also observe the followings.
 - Earth leakage breaker: Rated current 15 A, rated sensitivity current 30 mA
 - When connecting to a power supply of Overvoltage category III, use an insulation transformer to ground its secondary side (N for single-phase, Neutral point for three-phase).
 - Fault loop impedance: Equal to or less than the value in table

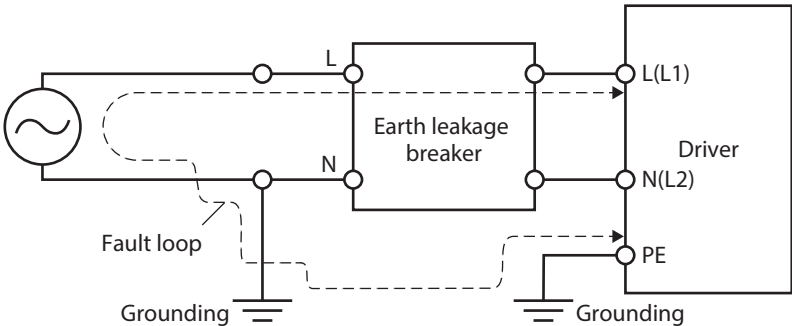
| Driver power supply specifications | Fault loop impedance |
|--|----------------------|
| Single-phase 100-120 V | 500 Ω |
| Single-phase 200-240 V | |
| Three-phase 200-240 VAC (Delta connection) | 1000 Ω |
| Three-phase 200-240 VAC (Star connection) | 577 Ω |

- Wiring example having considered ground fault protection
Single-phase 100-120 V, Single-phase 200-240 VAC

- TN power distribution systems

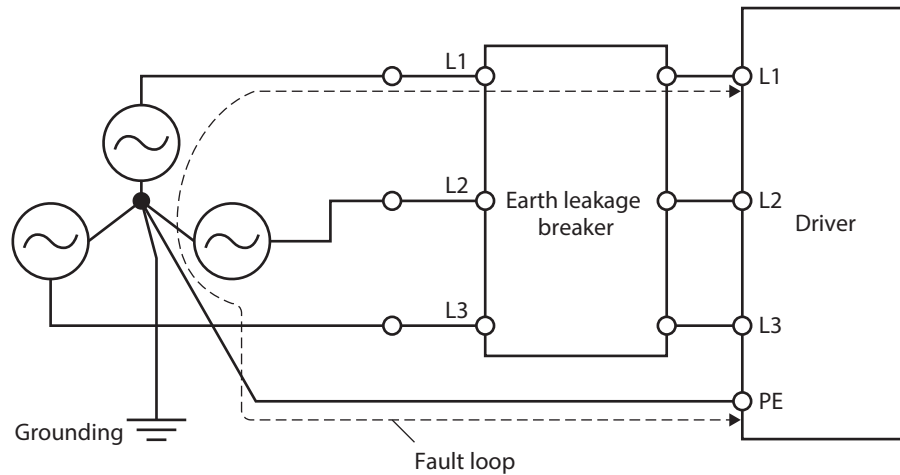


- TT power distribution systems

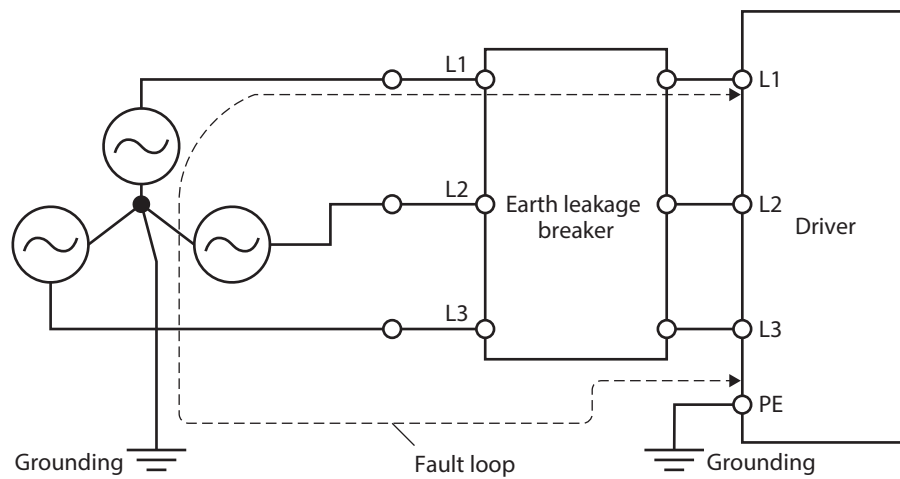


Three-phase 200-240 V

- TN power distribution systems



- TT power distribution systems



■ EMC Directive

Refer to "2.4 Conformity to the EMC" for details about conformity.

2.3 RoHS Directive

This product does not contain the substances exceeding the restriction values.

2.4 Conformity to the EMC

Effective measures must be taken against the EMI that the motor and driver may give to adjacent controlsystem 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.

Oriental Motor conducts EMC testing on its motors and driver in accordance with "Example of motor and driver installation and wiring" on p.157.

The user is responsible for ensuring the machine's compliance with the EMC, based on the installation and wiring explained below.

CAUTION

This equipment is not intended for use in residential environments nor for use on a lowvoltage public network supplied in residential premises, and it may not provide adequate protection to radio reception interference in such environments.

■ Connecting a mains filter

Install a mains filter in the power line in order to prevent the noise generated within the driver from propagating outside via the AC input line. For mains filters, use the product as shown below, or an equivalent.

| Manufacturer | Single-phase 100-120 V Single-phase 200-240 V | Three-phase 200-240 V |
|-------------------------|--|--------------------------|
| SOSHIN ELECTRIC CO.,LTD | HF2010A-UPF | HF3010C-SZA, NFU3010C-Z1 |
| Schaffner EMC | FN2070-10-06 | FN3025HP-10-71 |

- Overvoltage category II applies to the mains filter.
- Install the mains filter as close to the driver as possible.
- Use cable clamps and other means to secure the input and output cables firmly to the surface of the enclosure.
- Connect the ground terminal of the mains filter to the grounding point, using as thick and short a wire as possible.
- Do not place the AC input cable (AWG18 to 14: 0.75 to 2.0 mm²) parallel with the mains-filter output cable (AWG18 to 14: 0.75 to 2.0 mm²). Parallel placement will reduce mains filter effectiveness if the enclosure's internal noise is directly coupled to the power supply cable by means of stray capacitance.

■ Connecting the external power supply

Use an external power supply conforming to the EMC. Use a shielded cable for wiring and wire/ground the external power supply over the shortest possible distance. Refer to "Wiring the power supply cable" for how to ground the shielded cable.

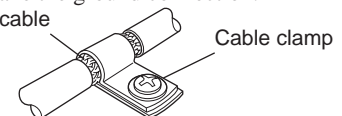
■ Grounding procedure

The cable used to ground the motor, driver, mains filter and power supply cable (shielded cable) must be as thick and short to the grounding point as possible so that no potential difference is generated. Choose a large, thick and uniformly conductive surface for the grounding point. Refer to the p.32 for the recommended grounding method.

■ Wiring the power supply cable

Use a shielded cable of AWG18 to 14 (0.75 to 2.0 mm²) in diameter for the driver power supply cable and keep it as short as possible. Strip a part of the shielded cable and ground the stripped part using a metal cable clamp that contacts the stripped cable around its entire circumference, or use a drain wire to make the ground connection.

When grounding the shielded cable, connect both ends (mains filter side and power supply side) to earth to prevent a potential difference from generating in the shielded cable.

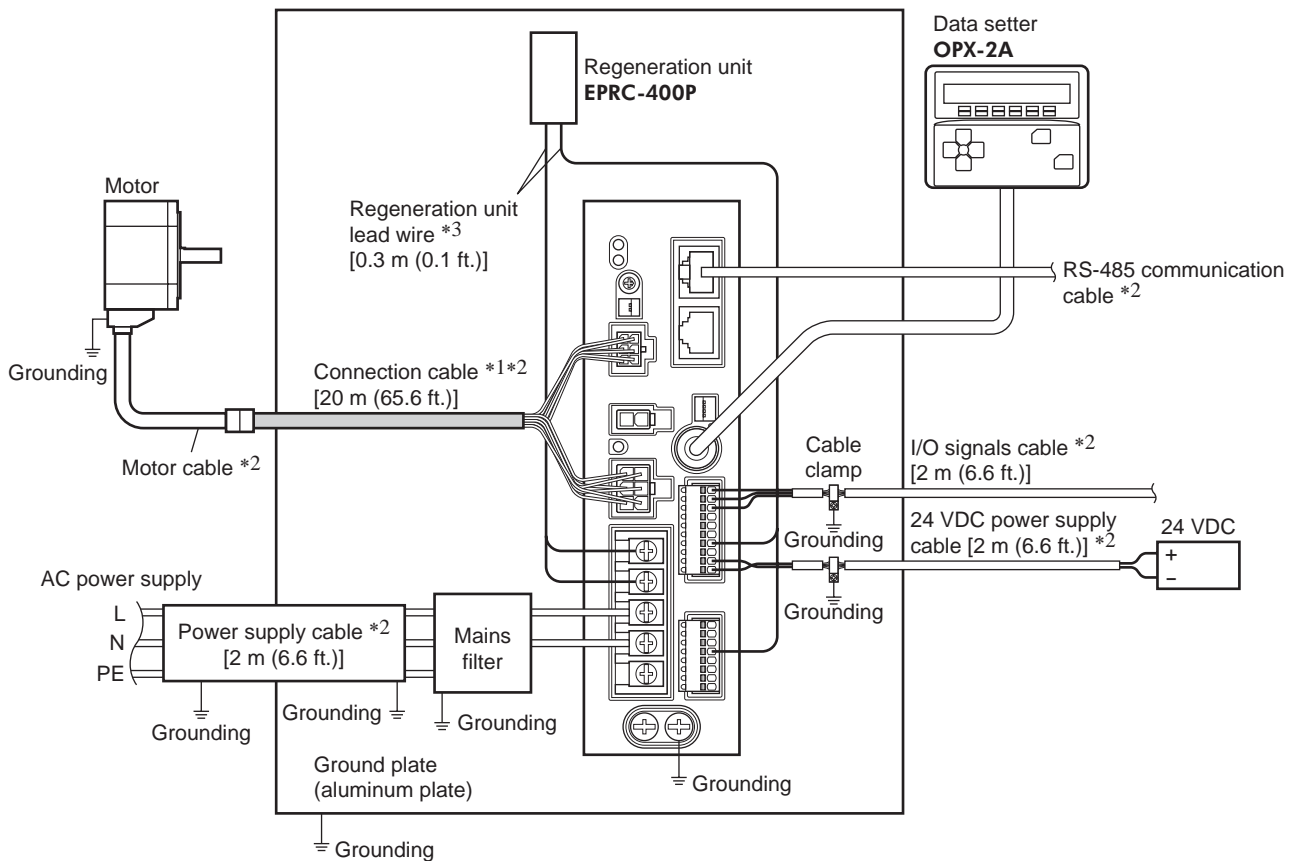


■ Notes about installation and wiring

- Connect the motor/driver and other peripheral control equipment directly to the grounding point so as to prevent a potential difference from developing between grounds.
- When relays or electromagnetic switches are used together with the system, use mains filters and CR circuits to suppress surges generated by them.
- Keep cables as short as possible without coiling and bundling extra lengths.
- Wire the power lines such as the motor cable and power cable away from the signal cables by providing a minimum clearance of 100 mm (3.94 in.) between them. If they must cross, do so at a right angle. Place the AC input cable and output cable of a mains filter separately from each other.
- Use a connection cable (supplied or sold separately) when extending the wiring distance between the motor and driver. The EMC measures are conducted using the Oriental Motor connection cable.

■ Example of motor and driver installation and wiring

Illustration shows the standard type.



*1 Performance has been evaluated based on connection cable lengths of up to 20 m (65.6 ft.). You can connect up to three connection cables.

*2 Shielded cable

*3 Unshielded cable

■ Precautions about static electricity

Static electricity may cause the driver to malfunction or become damaged. Do not come close to or touch the driver while the power is on except when operating the switch of the front of driver.

To change the settings of driver switches, be sure to use an insulated screwdriver.

8 Appendix

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

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1 Accessories (sold separately)

■ Connection cable

This cable is used to extend the wiring distance between the driver and motor. Connection can be extended to a maximum of 20.4 m (66.9 ft.). Flexible connection cables are also available. You can connect up to three connection cables.

• Standard type

• Connection cable

| Length [m (ft.)] | Model |
|------------------|----------------|
| 1 (3.3) | CC01BLE |
| 2 (6.6) | CC02BLE |
| 3 (9.8) | CC03BLE |
| 5 (16.4) | CC05BLE |
| 7 (23.0) | CC07BLE |
| 10 (32.8) | CC10BLE |
| 15 (49.2) | CC15BLE |
| 20 (65.6) | CC20BLE |

• Flexible connection cable

| Length [m (ft.)] | Model |
|------------------|-----------------|
| 1 (3.3) | CC01BLER |
| 2 (6.6) | CC02BLER |
| 3 (9.8) | CC03BLER |
| 5 (16.4) | CC05BLER |
| 7 (23.0) | CC07BLER |
| 10 (32.8) | CC10BLER |
| 15 (49.2) | CC15BLER |
| 20 (65.6) | CC20BLER |

• Electromagnetic brake type

• Connection cable

| Length [m (ft.)] | Model |
|------------------|-----------------|
| 1 (3.3) | CC01BLEM |
| 2 (6.6) | CC02BLEM |
| 3 (9.8) | CC03BLEM |
| 5 (16.4) | CC05BLEM |
| 7 (23.0) | CC07BLEM |
| 10 (32.8) | CC10BLEM |
| 15 (49.2) | CC15BLEM |
| 20 (65.6) | CC20BLEM |

• Flexible connection cable

| Length [m (ft.)] | Model |
|------------------|-----------------|
| 1 (3.3) | CC01BLEM |
| 2 (6.6) | CC02BLEM |
| 3 (9.8) | CC03BLEM |
| 5 (16.4) | CC05BLEM |
| 7 (23.0) | CC07BLEM |
| 10 (32.8) | CC10BLEM |
| 15 (49.2) | CC15BLEM |
| 20 (65.6) | CC20BLEM |

■ Data setter

The data setter lets you set data and parameters for your **BLE** Series FLEX RS-485 communication type with ease and also functions as a monitor.

Model: **OPX-2A**

■ Communication cable for the support software

Be sure to purchase the communication cable for the support software when connecting a driver to the PC in which the **MEXE02** has been installed.

This is a set of a PC interface cable and USB cable. The cable is connected to the USB port on the PC.

Model: **CC05IF-USB** [5 m (16.4 ft.)]

The **MEXE02** can be downloaded from Oriental Motor Web site Download Page.

■ RS-485 communication cable

You can link drivers using this cable connected to the RS-485 communication connectors (CN7, CN8).

Model: **CC002-RS4** [0.25 m (0.8 ft.)]

■ DIN rail mounting plate

When mounting the driver to a DIN rail, use a DIN rail mounting plate.

Use a DIN rail 35 mm (1.38 in.) wide.

Model: **PADP03**

■ Regeneration unit

If vertical drive (gravitational operation) such as elevator applications is performed or if sudden start-stop operation of a large inertial load is repeated frequently, connect the regeneration unit **EPRC-400P**.

Model: **EPRC-400P**

2 Related products (sold separately)

■ Network converter

NETC01-CC (CC-Link Ver.1.1 compatible)

NETC02-CC (CC-Link Ver.2 compatible)

NETC01-M2 (MECHATROLINK-Ⅱ compatible)

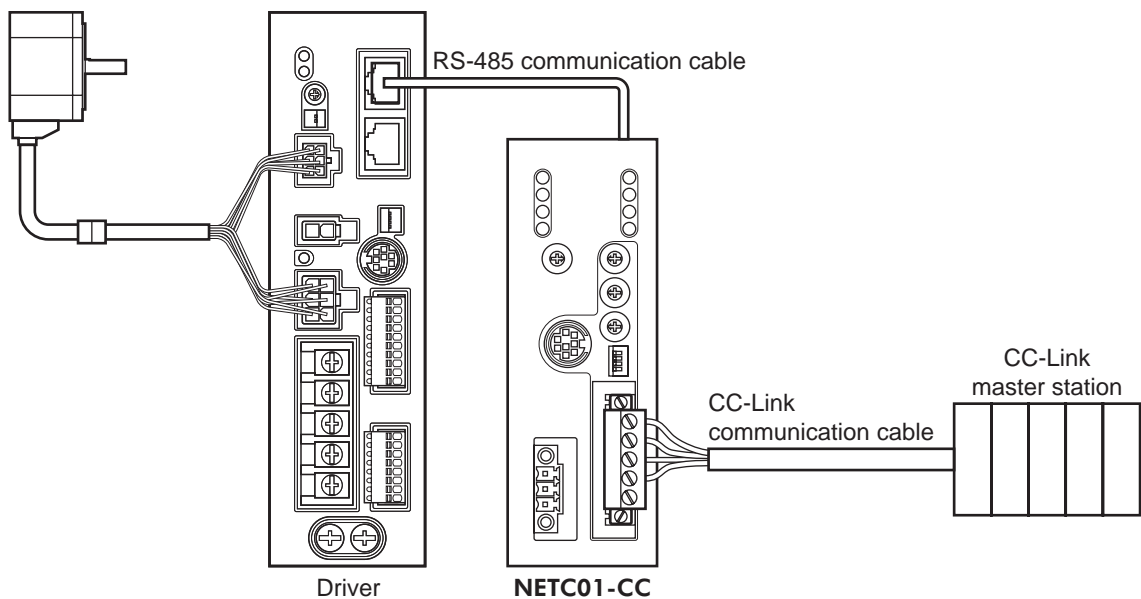
NETC01-M3 (MECHATROLINK-Ⅲ compatible)

NETC01-ECT (EtherCAT compatible)

When the **BLE** Series FLEX RS-485 communication type is used in a CC-Link system or MECHATROLINK system, EtherCAT system while connecting the driver via the network converter, the converted data from the each communication protocol to the RS-485 communication protocol can be sent to the driver.

Alarms and other data output from the driver, which normally conform to the RS-485 communication protocol, can also be converted to each communication protocol and sent to the master station accordingly.

Example: Connecting to the network converter **NETC01-CC**



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