



Stepping Motor *α STEP*
**AR Series/
Motorized actuator equipped with AR Series**
AC power input/DC power input *FLEX*
Built-in controller type

USER MANUAL

- AC power input



- DC power input



Introduction

AC power input type

DC power input type

AC power input type/
DC power input type
Common

Operation type and
setting

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

Method of control via
industrial network

Appendix

Thank you for purchasing an Oriental Motor product.
This Manual describes product handling procedures and safety precautions.

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

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Specification Change of Driver

Some specifications have been changed in this product. There are differences in data setting range, etc. between the product after the change and before the change. For the driver before the specification change, contact your nearest Oriental Motor sales office.

This manual describes contents of the driver which is after the specification change.
When using the driver which is before the specification change, take note of the following points.

1. Some setting items have been changed

■ Push current

| Before the specification change | ➔ | After the specification change |
|---------------------------------|---|--------------------------------|
| 0 to 500 (1=0.1 %) | | 0 to 1,000 (1=0.1 %) |

■ NET-IN input function

The following input signals can be assigned in the product after the specification change.

- 24: ALM-RST
- 25: P-PRESET
- 26: P-CLR

■ Pay attention to the data update

- When the data is set using the support software **MEXE02**, use the **MEXE02** which software version is 3.00 or later

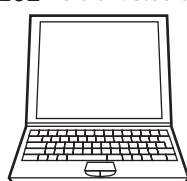
If the **MEXE02** is older version than 3.00, the value after the specification change can not be set.

- When the following data passing is performed, the most recent value will not be updated

- 1) When the **MEXE02** data which has set the value after the specification change is opened using the older **MEXE02** than the Version 3.00

If the data is opened by the older **MEXE02** than the Version 3.00, the data will be changed to the initial value.

MEXE02 Version. 3.00 or later

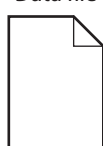


Latest value

Saves the data



Data file



Latest value

Opens the data



MEXE02 older than Version. 3.00



Initial value

- 2) When our data setter **OPX-2A** data which has set the value after the specification change is downloaded to the driver that is before the specification change

The value which is after the specification change will not be updated to the driver which is before the specification change, and the value presently set is kept.

Driver after specification change

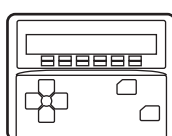


Latest value

Uploads the data



OPX-2A



Latest value

Downloads the data



Driver before specification change



Value before the change

2. The upper limit of the alarm output has been changed

The maximum speed for push-motion operation has been changed. If push-motion operation is started after setting higher speed than 30 r/min in the driver which is before the specification change, an operation data error alarm will generate.

■ Maximum speed for push-motion operation

| Before the specification change | ➔ | After the specification change |
|---------------------------------|---|--------------------------------|
| 30 r/min | | 500 r/min |



1 Introduction

This part explains the product overview and safety precautions in addition to the types and descriptions about operating manuals.

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1 Before use

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

Use the product correctly after thoroughly reading the section "3 Safety precautions" on p.13. 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.

■ Related operating manuals

For operating manuals not included with the product, contact your nearest Oriental Motor sales office or download from Oriental Motor Website Download Page.

| Operating manual name | Included or not included with product |
|----------------------------------------------------------------------------------------------------|---------------------------------------|
| AR Series OPERATING MANUAL Motor Edition | Included |
| AR Series/Motorized actuator equipped with AR Series OPERATING MANUAL Driver Edition | Included |
| AR Series/Motorized actuator equipped with AR Series USER MANUAL (this document) | Not included |
| APPENDIX UL Standards for AR Series | Included |

Read the following operating manuals in combination when using a motorized actuator.

| Operating manual name | Included or not included with product |
|---------------------------------------------|---------------------------------------|
| OPERATING MANUAL Actuator Edition | Included |
| Motorized actuator Function Setting Edition | Not included |

■ About terms and units

Terms and units to be used vary depending on a motor or motorized actuator. This manual explains by using the terms of the motor.

When the motorized actuator is used, read this manual by replacing the terms.

| | Motor | Motorized actuator |
|------|-------------------|-----------------------|
| Term | Torque | Thrust |
| | Moment of inertia | Mass |
| | Rotation | Movement |
| | CW direction | FWD direction |
| | CCW direction | RVS direction |
| | Rotation speed | Speed |
| | Resolution | Minimum travel amount |
| Unit | N·m | N |
| | kHz/s | m/s ² |

2 Overview of the product

The **AR** Series consists of a driver with built-in controller function and a motor with built-in rotor position detection sensor. This product can be controlled via I/O, Modbus (RTU), or industrial network communication using the network converter. Operation data and parameters can be set using any of our support software **MEXE02**, data setter **OPX-2A**, or RS-485 communication.

■ Main features

● Introducing closed loop control

The **AR** Series can continue its operation even upon encountering quick acceleration or an abrupt change in load. Monitoring the speed and amount of rotation while the motor is running, the **AR** Series performs the closed-loop control under overload and similar conditions to continue its operation at the maximum torque.

● Three operation types

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

● Compatible with Modbus RTU (RS-485 communication)

Operation data and parameters can be set from the host controller, and start and stop commands of operation can be executed as well. Up to 31 drivers can be connected to one master.

● Absolute-position backup system

When connecting our battery **BAT01B**, this product can be used in the absolute-position backup system. Positions will be retained in the event of a power outage or after turning off the driver power supply.

● Energy-saving

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

● Supporting sink output and source output

The driver supports both the current sink output circuit and the current source output circuit.

● Automatic control of the electromagnetic brake

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

● Alarm and warning functions

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

■ Accessories

Operation data and parameters can be set using any of the support software **MEXE02**, data setter **OPX-2A**, or RS-485 communication. Provide the **MEXE02** or **OPX-2A** as necessary.

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

■ Related products

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

| Network converter model | Supported network |
|-------------------------|-------------------|
| NETC01-CC | CC-Link Ver.1.1 |
| NETC02-CC | CC-Link Ver.2 |
| NETC01-ECT | EtherCAT |

| Network converter model | Supported network |
|-------------------------|-------------------|
| NETC01-M2 | MECHATROLINK-II |
| NETC01-M3 | MECHATROLINK-III |

■ Function list

Main functions

| | |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Return-to-home operation [Setting by parameters] | <ul style="list-style-type: none">● 2-sensor mode● 3-sensor mode● Push-mode● Data setting mode (Position preset) |
| Motor operation [Setting by operation data and parameters] | <div><div><ul style="list-style-type: none">● Positioning operation<div><div>Operation function</div><div>Single-motion operation Linked-motion operation Linked-motion operation 2 Push-motion</div></div><div>+</div><div><div>Starting method</div><div>Data number selecting operation Direct positioning operation Sequential positioning operation</div></div></div><ul style="list-style-type: none">● Continuous operation</div> |
| Other operations [Setting by parameters] | <ul style="list-style-type: none">● JOG operation● Automatic return operation |

Support functions

| | |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [Setting by parameters] | <ul style="list-style-type: none">● Protective function Alarm detection Warning detection● I/O function Input function selection Output function selection Input logic level setting● Coordination setting Resolution (Electronic gear) Wrap function Motor rotation direction● Return-to-home function Home position offset External sensor signal detection● Stop operation STOP input action Hardware overtravel Software overtravel● Motor function setting Operating current Standstill current Speed filter Moving average filter |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|




External interface

| | |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data setter | <ul style="list-style-type: none">● Monitor function● Operation data setting● Parameter setting● Data storing● Download/Upload● Data initialization● Test function Test operation Teaching I/O test |
| RS-485 communication | <ul style="list-style-type: none">● Operation start● Operation data setting● Parameter setting● Monitor function● Maintenance function |

3 Safety precautions

3-1 Safety precautions

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

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

WARNING

■ AC power input/DC power input common

General

- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. Doing so may result in fire, electric shock, or injury.
- Assign qualified personnel to the task of installing, wiring, operating/controlling, inspecting, and troubleshooting the product. Failure to do so may result in fire, electric shock, injury, or damage to equipment.
- Do not transport, install, connect or inspect the product while the power is supplied. Always turn the power off before carrying out these operations. Failure to do so may result in electric shock.
- Take measures to keep the moving part in position if the product is used in vertical operations such as elevating equipment. The motor loses holding torque when the power is shut off, allowing the moving parts to fall and possibly cause injury or damage to equipment.
- The brake mechanism of an electromagnetic brake motor is used for the purpose to hold the moving part and motor in position. Do not use it as a braking/safety brake. Doing so may result in injury or damage to the equipment.
- When an alarm is generated in the driver (any of the driver's protective functions is triggered), the motor will stop and lose its holding torque. Accordingly, provide measures to hold the moving part in place in the event of an alarm. Failure to do so may result in injury or damage to equipment.
- When an alarm is generated in the driver (any of the driver's protective functions is triggered), remove the cause before clearing the alarm. Continuing the operation without removing the cause of the problem may cause malfunction of the motor and driver, leading to injury or damage to equipment.

Installation

- Install the motor and driver inside an enclosure. Failure to do so may result in electric shock or injury.

Connection

- Always keep the power supply voltage of the driver within the specified range. Failure to do so may result in fire or electric shock.
- Connect the cables securely according to the wiring diagram. Failure to do so may result in fire or electric shock.
- Do not forcibly bend, pull, or pinch the connection cable. Doing so may result in fire or electric shock.
- Turn off the power to both the PC and driver before connecting your PC to the driver. Failure to do so may result in electric shock.

Operation

- Turn off the driver power supply in the event of a power failure. Otherwise, the motor may suddenly start when the power is restored, causing injury or damage to equipment.
- Do not remove the motor excitation during operation. Doing so may cause the motor to stop and lose the holding force, resulting in injury or damage to equipment.

Repair, disassembly, and modification

- Do not disassemble or modify the motor and driver. Doing so may result in electric shock or injury. Refer all such internal inspections and repairs to the Oriental Motor sales office from which you purchased the product.

■ AC power input**Installation**

- The motor and driver are Class I equipment. When installing the motor and driver, install them inside an enclosure so that they are out of the direct reach of users. Be sure to ground if users can touch them. Failure to do so may result in electric shock.

Maintenance and inspection

- Do not touch the connection terminal of the driver while the power is supplied. Turn off the power to check the CHARGE LED being turned off before starting connection or inspection. Residual voltage may cause electric shock.

■ DC power input**Installation**

- When installing the motor and driver, install them inside enclosures so that they are out of the direct reach of users. Be sure to ground if users can touch them. Failure to do so may result in electric shock.

Connection

- For the driver power supply, use a DC power supply with reinforced insulation on its primary and secondary sides. Failure to do so may result in electric shock.

**■ AC power input/DC power input common****General**

- Do not use the motor and driver beyond its specifications. Doing so may result in electric shock, injury, or damage to equipment.
- Keep your fingers and objects out of the openings in the motor and driver. Failure to do so may result in fire, electric shock, or injury.
- Do not touch the motor and driver during operation or immediately after stopping. The surface is hot, and this may cause a skin burn(s).
- Do not use other batteries than our battery **BAT01B**. Doing so may result in injury or damage to equipment.

Transportation

- Do not carry the motor by holding the motor output shaft or motor cable. Doing so may cause injury.

Installation

- Provide a cover over the rotating parts (output shaft) of the motor. Failure to do so may result in injury.
- Do not leave anything around the motor and driver that would obstruct ventilation. Doing so may result in damage to equipment.

Operation

- Use a motor and driver only in the specified combination. An incorrect combination may cause a fire.
- Provide an emergency stop device or emergency stop circuit external to the equipment so that the entire equipment will operate safely in the event of a system failure or malfunction. Failure to do so may result in injury.
- Before supplying power to the driver, turn all input signals to the driver to OFF. Otherwise, the motor may suddenly start when the power is turned on, leading to injury or damage to equipment.
- When moving the moving part manually, put the motor into a non-excitation state. Continuing the work while the motor is in an excitation state may result in injury.
- Do not touch the rotating part (output shaft) during operation. Doing so may cause injury.
- Immediately when a problem occurred, stop operation and turn off the driver power supply. Failure to do so may result in fire, electric shock, or injury.
- The motor surface temperature may exceed 70 °C (158 °F) even under normal operating conditions. If the operator is allowed to approach the motor in operation, affix a warning label shown in the figure on a conspicuous position. Failure to do so may result in skin burn(s).
- Use only an insulated slotted screwdriver to adjust the driver's switches. Failure to do so may result in electric shock.



Warning label

Maintenance and inspection

- Do not touch the terminals while conducting the insulation resistance measurement or dielectric strength test. Doing so may cause electric shock.

■ AC power input**Connection**

- The data edit connector (CN4) and RS-485 communication connectors (CN6/CN7) 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 driver and these equipment to short, damaging both.

Operation

- Use a 24 VDC power supply that has been given reinforced insulation between the primary side and secondary side. Failure to do so may cause electric shock.

■ DC power input**Connection**

- The power supply connector (CN1), data edit connector (CN3), and RS-485 communication connectors (CN6/CN7) 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 driver and these equipment to short, damaging both.
- When connecting, check the silk screen of the driver and pay attention to the polarity of the power supply. Reverse-polarity connection may cause damage to the driver. The power-supply circuit and the RS-485 communication circuit are not insulated. Therefore, when controlling multiple drivers via RS-485 communication, the reverse polarity of the power supply will cause a short circuit and may result in damage to the drivers.

Operation

- For the power supply to the electromagnetic brake, use a DC power supply with reinforced insulation on its primary and secondary sides. Failure to do so may result in electric shock.

3-2 Handling the battery

Be sure to observe the following instructions when using our battery **BAT01B**. Handling the battery without observing the instructions may cause the liquid leakage, heat generation and explosion, etc., which may result in injury or damage to equipment.

⚠ WARNING

- Do not heat the battery or throw it into a fire.
- Never short-circuit the battery or connect the positive and negative terminals in reverse.
- When carrying/storing the battery, do not place it together with metal necklaces, hairpins, coins, keys or other conductive objects. When storing the battery, store it away from direct sunlight in a place not subject to high temperature or high humidity.
- Do not disassemble or modify the battery.
- Do not apply solder directly to the battery.
- Use a dedicated driver to charge the battery.
- The battery has a vent structure for the release of internal gas. Do not apply a strong force to the battery, since it may cause this structure to deform.
- When installing the battery into the machine, never place it inside a sealed structure. The battery sometimes generates gas, which, if trapped, may cause a burst or an explosion due to ignition.
- The battery contains an alkali solution. If the alkali solution comes in contact with the skin or clothes, flush the area thoroughly with clean water. If the alkali solution gets into the eyes, do not rub. Flush the eyes thoroughly with clean water and seek immediate medical attention.
- Do not use the battery if there is leakage, discoloration, deformation or another abnormality.
- Do not immerse the battery in water or seawater, nor allow it to become wet. Doing so may cause the battery to generate heat or rust.
- Do not scratch the battery and battery cable. A scratched battery easily causes shorting, resulting in leakage, heat generation or bursting.
- The battery is connected to the primary circuit, so do not touch the battery while the power is on.
- Do not forcibly bend, pull, or pinch the cable. Also, do not bend and flex the cable repeatedly.
- Do not make a continuous vibration or excessive impact.

Note

- Always charge the battery connecting to the driver before use. For charging method, refer to p.46 (AC power input), p.76 (DC power input).
- Nickel-metal-hydride cell is used in this battery. Disposal of the used batteries is subject to each country's regulations on environmental control. Contact your nearest Oriental Motor sales office if you have any questions.



Ni-MH

3-3 Graphical symbols on the driver's front panel

| | |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | ⚠ WARNING This is the Protective Earth Terminal. Be sure to ground because improper grounding may result in electric shock. |
| | ⚠ WARNING A high voltage is applied to the motor connector (CN2) and the main power supply input terminal (CN3). Do not touch these terminals while the power is on. Doing so may result in fire or electric shock. (AC power input) |

3-4 Warning sign

A warning about handling precautions is described on the driver and battery. Be sure to observe the description contents when handling the driver or battery.

● **Driver (AC power input)**

Electrical hazard warning label

⚠ WARNING – Risk of electric shock.

- Read manual before installing. (Multiple rated)
- Do not touch the driver immediately after the power is cut off, or until the CHARGE LED (lit in red) turns off. Doing so may result in electric shock due to residual voltage.

⚠ AVERTISSEMENT – Risque de décharge électrique.

- Lire le manuel avant l'installation.
- Ne pas toucher au variateur immédiatement après la mise hors tension ou avant que la LED "présence de la tension" (Rouge) ne soit éteinte. Le non respect de ces règles pourrait entraîner un choc électrique.

⚠ 警告 — けが・感電のおそれがあります。

- 据え付け、運転の前には必ず取扱説明書をお読み下さい。
- 電源を切った直後、CHARGE LED (赤色点灯) が消灯するまでドライバに触れないで下さい。残留電圧により感電の原因になります。

Material: PET

● **Battery**

Electrical hazard warning label

⚠ 警告 — 感電のおそれがあります。 ⚠

⚠ バッテリーは一次回路に接続されています。**⚠**
通電中は触れないでください。

⚠ WARNING — Risk of electric shock. ⚠

⚠ The battery is connected to the primary AC power circuit. Do not touch the battery while the power is on. **⚠**

Material: Polypropylene

4 Precautions for use

This chapter covers restrictions and requirements the user should consider when using the product.

■ AC power input/DC power input common

- **Be sure to use our cable to connect the motor and the driver.**

Check the cable models on p.49 (AC power input), p.79 (DC power input).



Precautions for when the connection cable is used are described on p.19. Be sure to read before use.

- **When conducting the insulation resistance measurement or the dielectric strength test, be sure to separate the connection between 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.

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

Operating the motor under an excessive radial load or axial load may damage the motor bearings (ball bearings). Be sure to operate the motor within the specified permissible limit of radial load and axial load. For details, refer to p.32 (AC power input) or p.64 (DC power input).

- **Use the motor in conditions where the motor surface temperature does not exceed 100 °C (212 °F).**

The driver has an overheat protection function, but the motor has no such feature. The motor surface temperature may exceed 100 °C (212 °F) under certain conditions (ambient temperature, operating speed, duty cycle, etc.). To prevent the motor bearings (ball bearings) from reaching its usable life quickly, use the motor in conditions where the surface temperature does not exceed 100 °C (212 °F).

Use the geared motor in a condition where the gear case temperature does not exceed 70 °C (158 °F), in order to prevent deterioration of grease and parts in the gear case.

If the motor is to be operated continuously, install the motor in a location where heat dissipation capacity equivalent to a level achieved with a heat sink [made of aluminum, 250×250×6 mm (9.84×9.84×0.24 in.)] is ensured.

- **Holding torque at standstill**

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

- **Do not use the electromagnetic brake for braking or as a safety brake.**

Do not use the electromagnetic brake as a means to decelerate and stop the motor. The brake hub of the electromagnetic brake will wear significantly and the braking force will drop. Since the power off activated type electromagnetic brake is equipped, it helps maintain the position of the load when the power is cut off, but this brake cannot securely hold the load in place. Accordingly, do not use the electromagnetic brake as a safety brake. To use the electromagnetic brake to hold the load in place, do so after the motor has stopped.

- **Double shaft type motor**

Do not apply a load torque, radial load, or axial load to the output shaft on the opposite side of the motor output shaft.

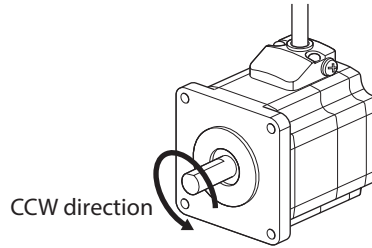
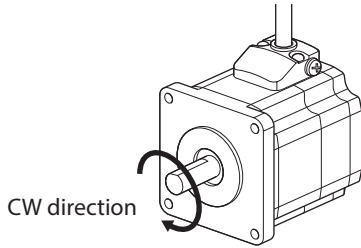
- **Preventing electrical noise**

For measures with regard to noise, refer to p.46 (AC power input) or p.76 (DC power input).

● Rotating direction of output shaft

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

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



The relationship between the rotating direction of the motor shaft and that of the gear output shaft changes as follows, depending on the gear type and gear ratio. Check with the table.

| Type of gear | Gear ratio | Rotating direction (relative to the motor rotating direction) |
|------------------------------------------------------------------------------------------------|-----------------|------------------------------------------------------------------|
| TH geared Motor frame size: 28 mm (1.10 in.) | 7.2, 10 | Opposite direction |
| | 20, 30 | Same direction |
| TH geared Motor frame size: 42 mm (1.65 in.) 60 mm (2.36 in.) 90 mm (3.54 in.) | 3.6, 7.2, 10 | Same direction |
| | 20, 30 | Opposite direction |
| FC geared, PS geared, PN geared | All gear ratios | Same direction |
| Harmonic geared | All gear ratios | Opposite direction |

● Peak torque of geared motor

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

● Do not perform push-motion operation with geared motors.

Doing so may result in damage to the motor or gear part.

● About grease of geared motor

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

● Saving data to the non-volatile memory

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

● Motor excitation at power ON

The motor is excited when the DC power supply and main power supply are on. If the motor is required to be in a non-excitation state when turning on the power, assign the C-ON input to direct I/O or remote I/O.

● Operation of multi-rotation for absolute-position backup system *

- Even if the present position is preset, the operation range of multi-rotation (−167,772 to +167,772 revolutions) is not changed because the driver stores the position from the home position.
- If the power is turned on again while the operation range of multi-rotation (−167,772 to +167,772 revolutions) is being exceeded, an alarm of the absolute position error generates. Reset the alarm of the absolute position error with either of the following methods.
 - Turn the P-CLR input from ON to OFF. (effective at the OFF edge of the P-CLR input).
 - Reset the absolute position error alarm using the **MEXE02**, **OPX-2A** or via RS-485 communication.

* Operation of multi-rotation refers to repeating continuous operation to the same direction or positioning operation.

■ AC power input

● 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 providing a leakage current breaker, use the following products, for example, which have high-frequency signal protection:
Mitsubishi Electric Corporation: NV series

● When an alarm of overvoltage protection is generated

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, an alarm of overvoltage protection may be detected. If an alarm of overvoltage protection is detected, adjust the driving condition or use our regeneration resistor **RGB100**.

● Note on connecting a power supply whose positive terminal is grounded

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

■ DC power input

● When an alarm of overvoltage protection is generated

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, an alarm of overvoltage protection may be detected. If the overvoltage protection alarm is detected, adjust the driving condition.

● Note on connecting a power supply whose positive terminal is grounded

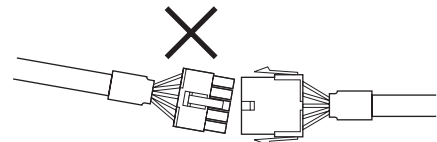
The power supply connector (CN1), data edit connector (CN3), and RS-485 communication connectors (CN6/CN7) are not insulated. When grounding the positive terminal of the power supply, do not connect any equipment (PC, etc.) whose negative terminal is grounded. Doing so may cause the driver and these equipment to short, damaging both. Use the **OPX-2A** to set data, etc.

■ Notes when the connection cable is used

Note the following points when our cable is used.

● When inserting the connector

Hold the connector main body, and insert it in straight securely. Inserting the connector in an inclined state may result in damage to terminals or a connection failure.

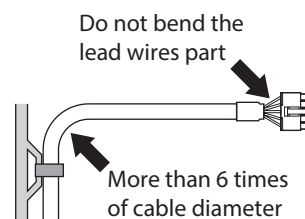


● When pulling out the connector

Pull out the connector in straight while releasing the lock part of the connector. Pulling out the connector with holding the cable may result in damage to the connector.

● Bending radius of cable

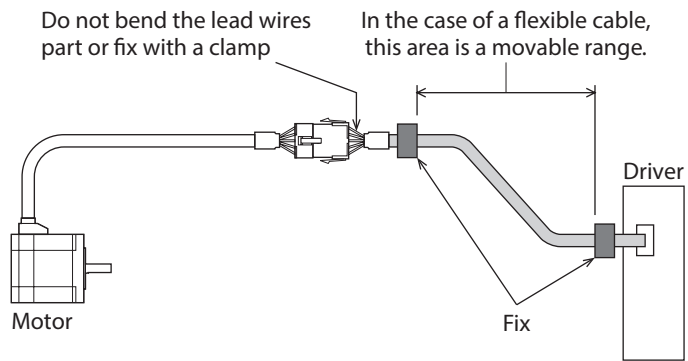
Use the cable in a state where the bending radius of the cable is more than six times of the cable diameter. Do not bend the lead wires part or fix it with a clamp. Doing so may cause damage to the connector.



- **How to fix the cable**

Fix the cable near the connector so that stress is not applied to the connector part.

Use a wide clamp or fix the connector at two places to prevent stress from being applied to the connector.



2 AC power input type

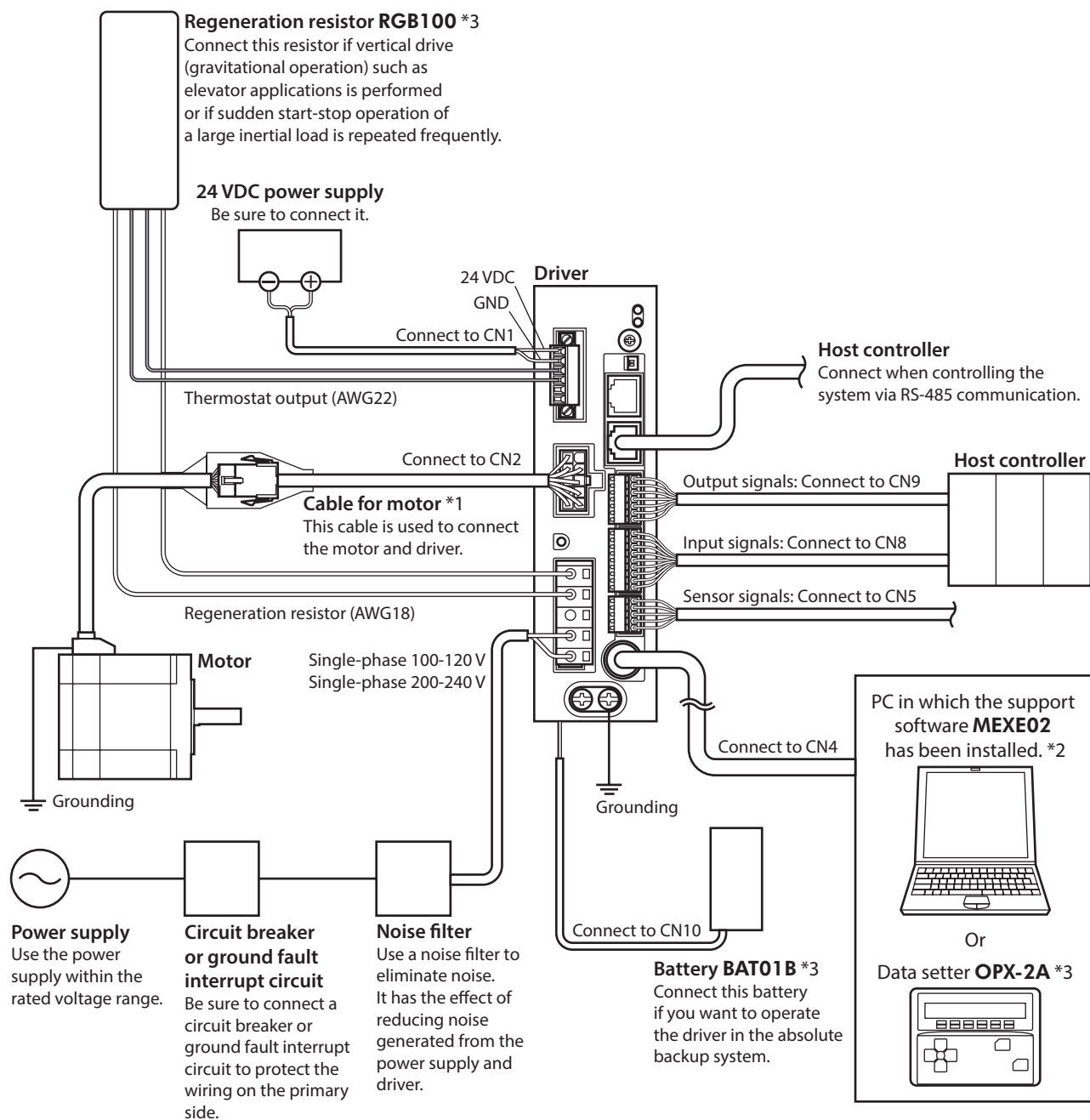
This part explains contents specific to the AR Series AC power input type.

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1 System configuration

2 AC power input type



*1 This cable is provided as our product. Purchase it separately.

*2 The PC must be supplied by the user. Use our communication cable for the support software **CC05IF-USB** when connecting the PC and driver.

*3 These products are provided as our accessories.

2 Preparation

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

2-1 Checking the product

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

● Motor

- Motor 1 unit
- Parallel key 1 pc. *1
- OPERATING MANUAL Motor Edition 1 copy
- APPENDIX UL Standards for **AR** Series 1 copy *2

*1 Included with geared types; except for the **ARM46-T** and **ARM66-T**.

*2 Included with products conform to the UL Standards.

● Driver

- Driver 1 unit
- CN1 connector (6 pins) 1 pc.
- CN3 connector (5 pins) 1 pc.
- CN5 connector (5 pins) 1 pc.
- CN8 connector (9 pins) 1 pc.
- CN9 connector (7 pins) 1 pc.
- Connector wiring lever (for CN3) 1 pc.
- OPERATING MANUAL Driver Edition 1 copy
- APPENDIX UL Standards for **AR** Series 1 copy

Included connector model

There are two types of CN3 connectors made by WAGO Corporation and Molex Incorporated. Either one of them is included with the product. Check the manufacturer name with the connector.

| Type | Model number (Manufacturer) |
|---------------|---------------------------------------------------|
| CN1 connector | MC1,5/6-STF-3,5 (PHOENIX CONTACT GmbH & Co. KG) |
| CN3 connector | 721-205 (WAGO Corporation) |
| | or 54928-0570 (Molex Incorporated) |
| CN5 connector | FK-MC0,5/5-ST-2,5 (PHOENIX CONTACT GmbH & Co. KG) |
| CN8 connector | FK-MC0,5/9-ST-2,5 (PHOENIX CONTACT GmbH & Co. KG) |
| CN9 connector | FK-MC0,5/7-ST-2,5 (PHOENIX CONTACT GmbH & Co. KG) |

2-2 How to identify the product model

Check the model number of the motor and driver against the number shown on the nameplate. Refer to p.26 for how to identify the nameplate.

■ Motor

● Standard type

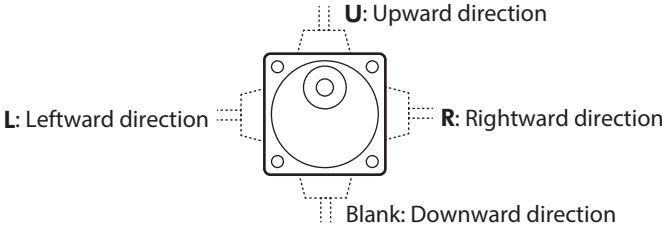
ARM 6 6 A 0 C
1 2 3 4 5 6

● Geared type (except for FC geared type)

ARM 6 6 A C - T 7.2 U
1 2 3 4 6 7 8 9

| | | |
|---|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Series name | ARM: AR Series motor |
| 2 | Motor frame size | 4: 42 mm (1.65 in.) 6: 60 mm (2.36 in.) 9: 85 mm (3.35 in.) [90 mm (3.54 in.) for geared type] |
| 3 | Motor length | |
| 4 | Motor type | A: Single shaft B: Double shaft M: With electromagnetic brake |
| 5 | Additional function | 0: Round shaft without shaft flat Blank: Round shaft with shaft flat on one side |
| 6 | Motor power supply input | C: AC power input type |
| 7 | Type of gear | T: TH geared PS: PS geared N: PN geared H: Harmonic geared Blank: Standard |
| 8 | Gear ratio | Indicates a number representing the gear ratio. Refer to the following table for the gear type and gear ratio. |
| 9 | Cable outlet direction * (TH geared type only) | U: Upward direction L: Leftward direction R: Rightward direction Blank: Downward direction |

* The cable outlet direction represents the one as viewed from the output shaft side in a state of placing it upward.



Type of gear ratio

| Type of gear | Gear ratio |
|------------------|-------------------------------------------------------------------------|
| TH geared | 3.6, 7.2, 10, 20, 30 |
| PS geared | 5, 7.2 (*), 10, 25, 36, 50 |
| PN geared | ARM46: 5, 7.2, 10 ARM66, ARM98: 5, 7.2, 10, 25, 36, 50 |
| Harmonic geared | 50, 100 |

* The model name is "7" for the gear ratio 7.2 of the **PS** geared type.

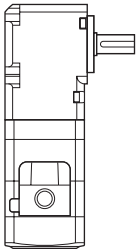
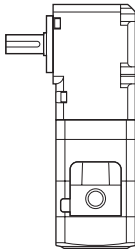
● FC geared type

ARM 6 6 A C - FC 7.2 L A
1 2 3 4 5 6 7 8 9

| | | |
|---|--------------------------|-----------------------------------------------------------------------------------|
| 1 | Series name | ARM: AR Series motor |
| 2 | Motor frame size | 4: 42 mm (1.65 in.) 6: 60 mm (2.36 in.) |
| 3 | Motor length | |
| 4 | Motor type | A: Single shaft |
| 5 | Motor power supply input | C: AC power input type |
| 6 | Type of gear | FC: FC geared |
| 7 | Gear ratio | 7.2, 10, 20, 30 |
| 8 | Output shaft direction * | L: L shaft (Leftward direction) R: R shaft (Rightward direction) |
| 9 | Output shaft type | A: Solid shaft |

* The direction of the gearhead output shaft represents that as the view from the motor cable outlet side.

L: L shaft (Leftward direction) **R:** R shaft (Rightward direction)



■ Driver

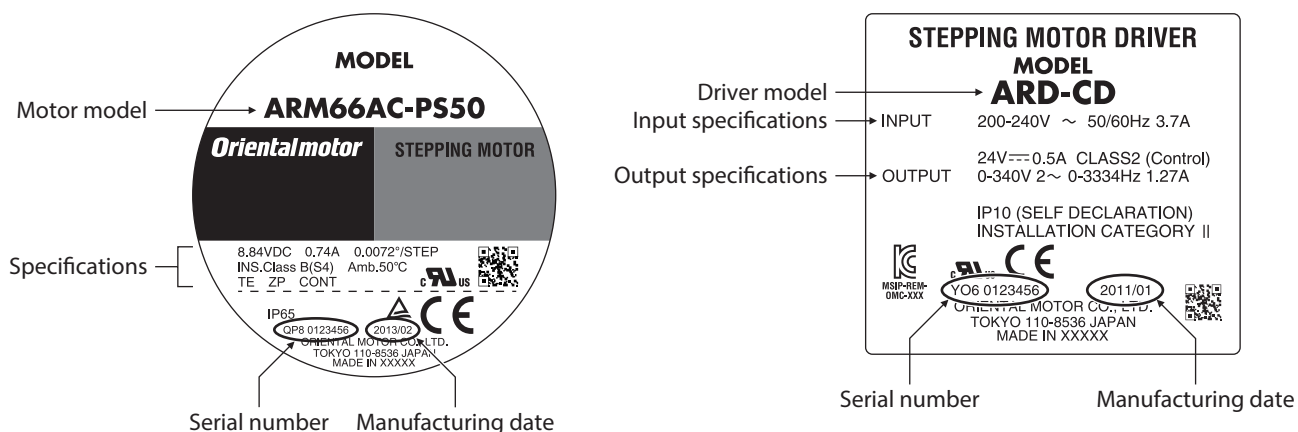
ARD - C D
1 2 3

| | | |
|---|--------------------|----------------------------------------------------------------------|
| 1 | Series name | ARD: AR Series driver |
| 2 | Power supply input | A: Single-phase 100-120 V C: Single-phase 200-240 V |
| 3 | Type | D: Built-in controller type |

2 AC power input type

2-3 Information about nameplate

The figure shows an example.



The position describing the information may vary depending on the product.

2-4 Combinations of motors and drivers

■ Standard type

| Single shaft | | Double shaft | | With electromagnetic brake | |
|--------------|------------------|--------------|------------------|----------------------------|------------------|
| Motor model | Driver model | Motor model | Driver model | Motor model | Driver model |
| ARM46AC | ARD-AD ARD-CD | ARM46BC | ARD-AD ARD-CD | ARM46MC | ARD-AD ARD-CD |
| ARM46A0C | | ARM46B0C | | ARM46M0C | |
| ARM66AC | | ARM66BC | | ARM66MC | |
| ARM66A0C | | ARM66B0C | | ARM66M0C | |
| ARM69AC | | ARM69BC | | ARM69MC | |
| ARM69A0C | | ARM69B0C | | ARM69M0C | |
| ARM98AC | | ARM98BC | | ARM98MC | |
| ARM98A0C | | ARM98B0C | | ARM98M0C | |
| ARM911AC | | ARM911BC | | | |
| ARM911A0C | | ARM911B0C | | | |

■ Geared type

- The box (●) in the model name indicates a number representing the gear ratio.
 - The box (◆) in the model name indicates **U** (upward direction), **L** (left direction), or **R** (right direction) representing the cable outlet direction.
- The box (◆) is blank when the cable outlet direction is downward.

| Type of gear | Single shaft | | With electromagnetic brake | |
|--------------|---------------|------------------|----------------------------|------------------|
| | Motor model | Driver model | Motor model | Driver model |
| TH geared | ARM46AC-T●◆ | ARD-AD ARD-CD | ARM46MC-T●◆ | ARD-AD ARD-CD |
| | ARM66AC-T●◆ | | ARM66MC-T●◆ | |
| | ARM98AC-T●◆ | | ARM98MC-T●◆ | |
| FC geared | ARM46AC-FC●LA | ARD-AD ARD-CD | — | — |
| | ARM46AC-FC●RA | | | |
| | ARM66AC-FC●LA | | | |
| | ARM66AC-FC●RA | | | |

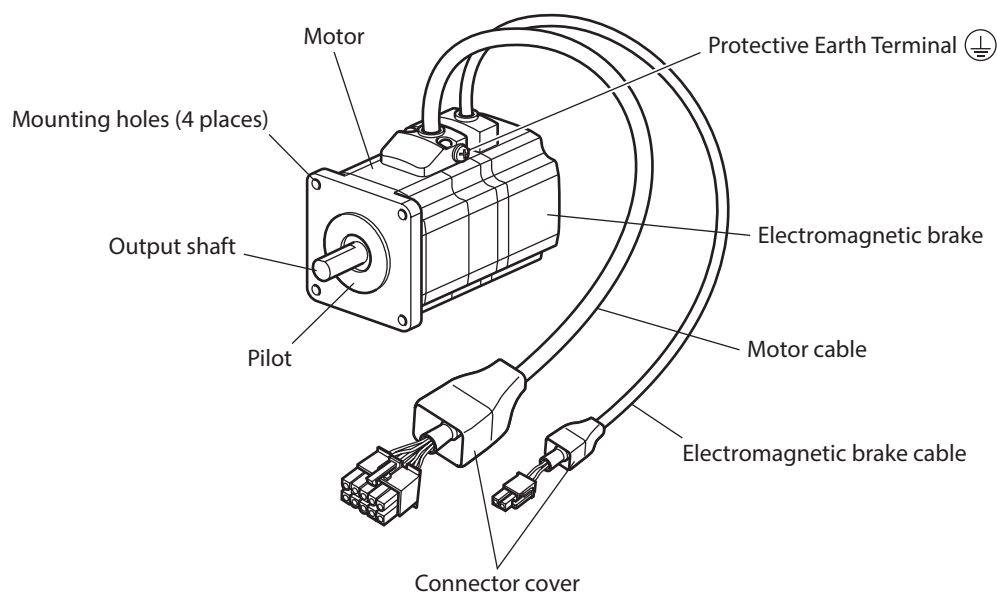
| Type of gear | Single shaft | | With electromagnetic brake | |
|-----------------|--------------|------------------|----------------------------|------------------|
| | Motor model | Driver model | Motor model | Driver model |
| PS geared | ARM46AC-PS● | ARD-AD ARD-CD | ARM46MC-PS● | ARD-AD ARD-CD |
| | ARM66AC-PS● | | ARM66MC-PS● | |
| | ARM98AC-PS● | | ARM98MC-PS● | |
| PN geared | ARM46AC-N● | ARD-AD ARD-CD | ARM46MC-N● | ARD-AD ARD-CD |
| | ARM66AC-N● | | ARM66MC-N● | |
| | ARM98AC-N● | | ARM98MC-N● | |
| Harmonic geared | ARM46AC-H● | ARD-AD ARD-CD | ARM46MC-H● | ARD-AD ARD-CD |
| | ARM66AC-H● | | ARM66MC-H● | |
| | ARM98AC-H● | | ARM98MC-H● | |

2-5 Input/output power ratings

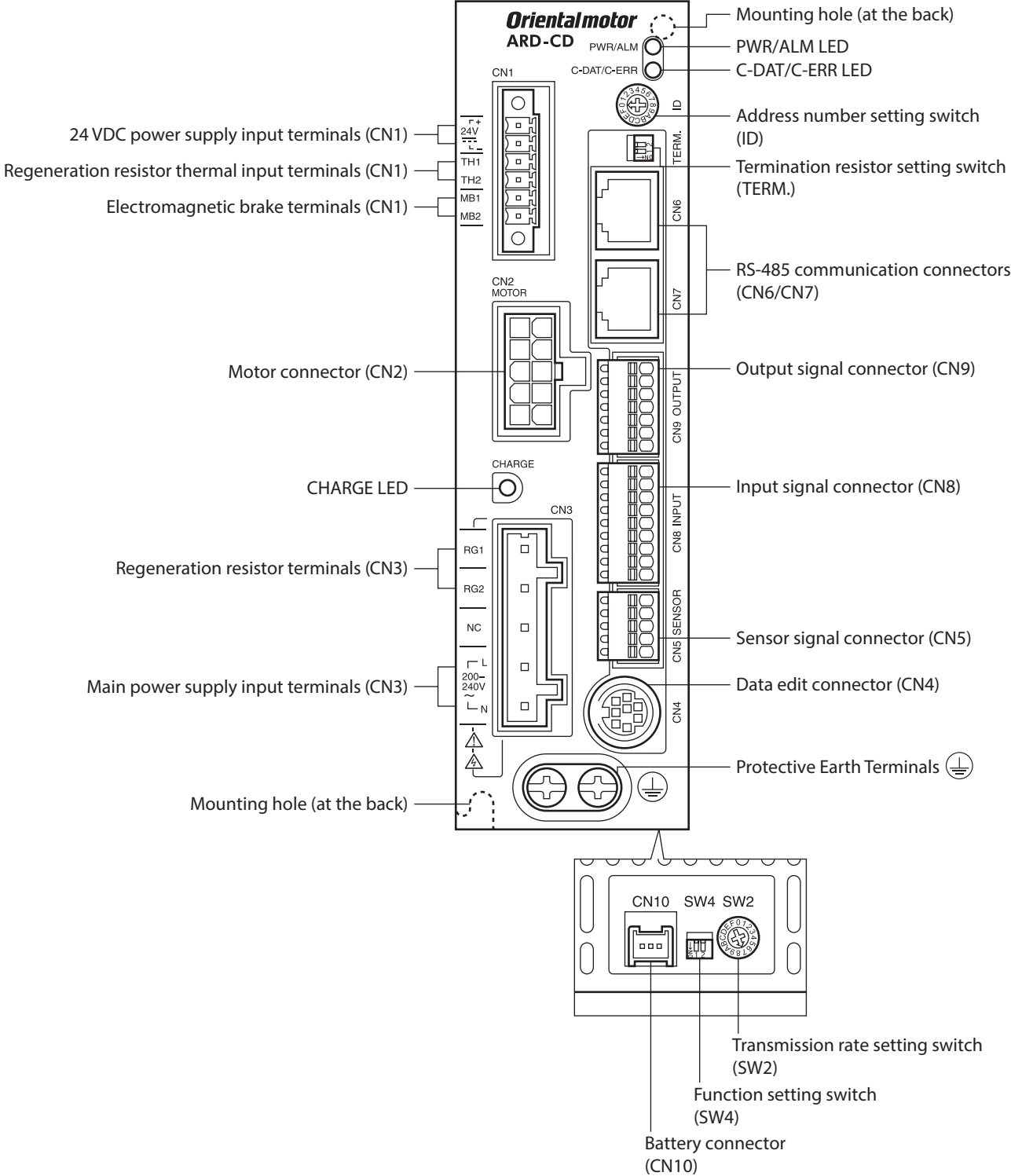
| Motor model | Driver model | Input | | | Output current per phase |
|-------------|--------------|---------------------------|-----------|---------|--------------------------|
| | | Voltage | Frequency | Current | |
| ARM46 | ARD-AD | Single-phase 100-120 V | 50/60 Hz | 2.4 A | 0.49 A |
| ARM66 | | | | 3.6 A | 0.74 A |
| ARM69 | | | | 4.9 A | 0.92 A |
| ARM98 | | | | 4.6 A | 1.13 A |
| ARM911 | | | | 5.9 A | 1.27 A |
| ARM46 | ARD-CD | Single-phase 200-240 V | | 1.5 A | 0.49 A |
| ARM66 | | | | 2.3 A | 0.74 A |
| ARM69 | | | | 3.0 A | 0.92 A |
| ARM98 | | | | 2.9 A | 1.13 A |
| ARM911 | | | | 3.7 A | 1.27 A |

2-6 Names and functions of parts

■ Motor (Example: ARM66MC)



■ Driver (Example: ARD-CD)



| Name | Description | Page |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| PWR/ALM LED | <ul style="list-style-type: none"> • PWR (Green) : This LED is lit while the 24 VDC power is input. • ALM (Red) : This LED will blink if an alarm generates (a protective function is triggered). It is possible to check the generated alarm by counting the number of times the LED blinks. | p.145 |
| C-DAT/C-ERR LED | <ul style="list-style-type: none"> • C-DAT (Green) : This LED blinks or is lit when the driver is communicating with the master controller properly via RS-485 communication. • C-ERR (Red) : This LED will be lit if a RS-485 communication error occurs with the master controller. | – |
| Address number setting switch (ID) | This switch is used when controlling the system via RS-485 communication. Sets the address number (slave address) of RS-485 communication using this switch and SW4-No.1 of the function setting switch. Factory setting: 0 | p.214 p.260 p.261 |
| Termination resistor setting switch (TERM.) | This switch is used when controlling the system via RS-485 communication. Sets the termination resistor (120 Ω) of RS-485 communication. Factory setting: OFF | |
| RS-485 communication connectors (CN6/CN7) | Connects the RS-485 communication cable. | p.45 |
| Output signal connector (CN9) | Connects the output signals. | p.42 |
| Input signal connector (CN8) | Connects the input signals. | |
| Sensor signal connector (CN5) | Connects the sensor signals. | |
| Data edit connector (CN4) | Connects a PC in which the MEXE02 has been installed, or the OPX-2A . | p.45 |
| Protective Earth Terminals | Ground using a wire of AWG16 to 14 (1.25 to 2.0 mm ²). | p.38 |
| 24 VDC power supply input terminals (CN1-24V) | Connects a power supply for control circuit of the driver. +: +24 VDC power supply input –: Power supply GND | p.40 |
| Regeneration resistor thermal input terminals (CN1-TH1/TH2) | Connects our regeneration resistor RGB100 . If no regeneration resistor is connected, short the TH1 and TH2 terminals. | |
| Electromagnetic brake terminals (CN1-MB1/MB2) | Connects the cable for electromagnetic brake. MB1: Electromagnetic brake – (black) MB2: Electromagnetic brake + (white) | |
| Motor connector (CN2) | Connects the motor. | p.37 |
| 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. | – |
| Regeneration resistor terminals (CN3-RG1/RG2) | Connects our regeneration resistor RGB100 . | p.41 |
| Main power supply input terminals (CN3-L/N) | Connects the main power supply. L: Live N: Neutral | p.39 |
| Mounting holes (2 places at the back) | These mounting holes are used to secure the driver with screws. | p.35 |
| Transmission rate setting switch (SW2) | This switch is used when controlling the system via RS-485 communication.. Sets the transmission rate of RS-485 communication. Factory setting: 7 | p.213 p.260 |
| Function setting switch (SW4) | This switch is used when controlling the system via RS-485 communication.. No.1: Sets the address number (slave address) using this switch and the address number setting switch (ID). Factory setting: OFF No.2: Sets the protocol of RS-485 communication. Factory setting: OFF | |
| Battery connector (CN10) | Connects our battery BAT01B . | p.46 |

3 Installation

This chapter explains how to install a regeneration resistor and a battery in addition to installation locations and installation methods for the motor and driver.

3-1 Location for installation

The motor and driver are designed and manufactured to be incorporated in an equipment. Install them in a well-ventilated location that provides easy access for inspection.

The location must also satisfy the following conditions:

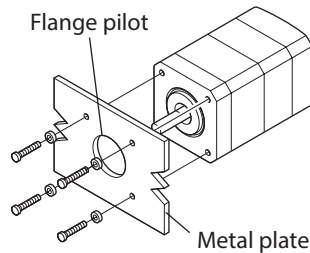
- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature
Motor: -10 to $+50$ °C ($+14$ to $+122$ °F) (non-freezing)
Harmonic geared type: 0 to $+40$ °C ($+32$ to $+104$ °F) (non-freezing)
Driver: 0 to $+55$ °C ($+32$ to $+131$ °F) (non-freezing)
- Operating ambient humidity 85 % or less (non-condensing)
- Area that is free of explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area not subject to splashing water (rain, water droplets), oil (oil droplets) or other liquids
- Area free of excessive salt
- Area not subject to continuous vibration or excessive shocks
- Area free of excessive electromagnetic noise (from welders, power machinery, etc.)
- Area free of radioactive materials, magnetic fields or vacuum
- 1,000 m (3,300 ft.) or lower above sea level

3-2 Installing the motor

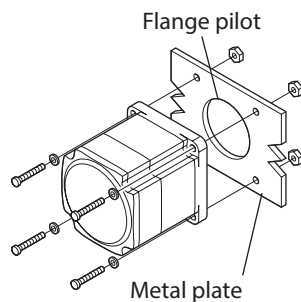
The motor can be installed in any direction.

To allow for heat dissipation and prevent vibration, install the motor on a metal surface of sufficient strength.

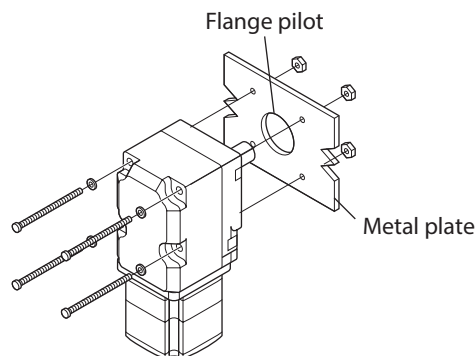
● Installation method A



● Installation method B



● Installation method B (FC geared type)



| Type | Frame size [mm (in.)] | Screw size | Tightening torque [N·m (oz-in)] | Effective depth of screw thread [mm (in.)] | Installation method |
|--------------------|--------------------------|------------|------------------------------------|-----------------------------------------------|------------------------|
| Standard | 42 (1.65) | M3 | 1 (142) | 4.5 (0.177) | A |
| | 60 (2.36) | M4 | 2 (280) | — | B |
| | 85 (3.35) | M6 | 3 (420) | | |
| TH geared | 42 (1.65) 60 (2.36) | M4 | 2 (280) | 8 (0.315) | A |
| | 90 (3.54) | M8 | 4 (560) | 15 (0.591) | |
| FC geared | 42 (1.65) | M4 | 2 (280) | — | B |
| | 60 (2.36) | M5 | 2.5 (350) | | |
| PS geared | 42 (1.65) | M4 | 2 (280) | 8 (0.315) | A |
| PN geared | 60 (2.36) | M5 | 2.5 (350) | 10 (0.394) | |
| Harmonic geared *1 | 90 (3.54) | M8 | 4 (560) | 15 (0.591) | |
| Harmonic geared *2 | 90 (3.54) | M8 | 4 (560) | — | B |

*1 **ARM46** and **ARM66** type only.

*2 **ARM98** type only.

3-3 Installing a load

When installing a load to the motor, align the centers of the motor output shaft and load shaft. Flexible couplings are also available in our products.

Note

- When coupling the load to the motor, pay attention to the centering of the shafts, belt tension, parallelism of the pulleys, and so on. Securely tighten the coupling and pulley set screws.
- Be careful not to damage the output shaft or bearings when installing a coupling or pulley to the motor output shaft.
- Do not modify or machine the motor output shaft. Doing so may damage the bearings (ball bearings) and destroy the motor.
- Do not apply strong force using hammer or other tools when removing the parallel key. Doing so may damage the motor output shaft and bearings (ball bearings).

● Using a coupling

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

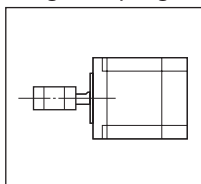
● Using a belt drive

Align the motor output shaft and load shaft in parallel with each other, and position both pulleys so that the line connecting their centers is at a right angle to the shafts.

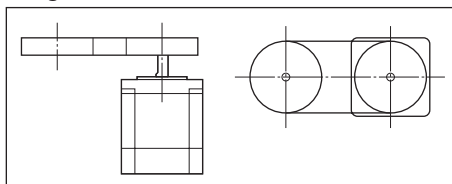
● Using a gear drive

Align the motor output shaft and gear shaft in parallel with each other, and let the gears mesh at the center of the tooth widths.

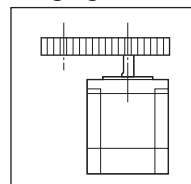
• Using a coupling



• Using a belt drive



• Using a gear drive



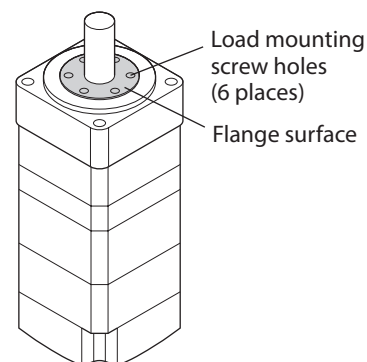
● Using a parallel key (geared motor)

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

● **Harmonic geared type; Installing the load on the flange surface**

With a Harmonic geared type (excluding **ARM98**), a load can be installed directly to the gear using the load mounting screw holes provided on the flange surface.

| Motor model | Screw size | Number of screw | Tightening torque [N·m (oz-in)] | Effective depth of screw thread [mm (in.)] |
|--------------|------------|-----------------|---------------------------------|--------------------------------------------|
| ARM46 | M3 | 6 | 1.4 (198) | 5 (0.197) |
| ARM66 | M4 | 6 | 2.5 (350) | 6 (0.236) |



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

3-4 Permissible radial load and permissible axial load



- If the radial load or axial load exceeds the specified allowable value, repeated load applications may cause the bearing (ball bearings) or output shaft of the motor to undergo a fatigue failure.
- With a double shaft type, do not apply load torque, radial load, or axial load to the output shaft on the opposite side of the motor output shaft.



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

| Type | Motor model | Gear ratio | Permissible radial load [N (lb.)] | | | | | Permissible axial load [N (lb.)] |
|-----------|-----------------|----------------|--------------------------------------------------------|----------|-----------|-----------|-----------|----------------------------------|
| | | | Distance from the tip of motor output shaft [mm (in.)] | | | | | |
| | | | 0 (0) | 5 (0.2) | 10 (0.39) | 15 (0.59) | 20 (0.79) | |
| Standard | ARM46 | — | 35 (7.8) | 44 (9.9) | 58 (13) | 85 (19.1) | — | 15 (3.3) |
| | ARM66 ARM69 | | 90 (20) | 100 (22) | 130 (29) | 180 (40) | 270 (60) | 30 (6.7) |
| | ARM98 ARM911 | | 260 (58) | 290 (65) | 340 (76) | 390 (87) | 480 (108) | 60 (13.5) |
| TH geared | ARM46 | All gear ratio | 10 (2.2) | 14 (3.1) | 20 (4.5) | 30 (6.7) | — | 15 (3.3) |
| | ARM66 | | 70 (15.7) | 80 (18) | 100 (22) | 120 (27) | 150 (33) | 40 (9) |
| | ARM98 | | 220 (49) | 250 (56) | 300 (67) | 350 (78) | 400 (90) | 100 (22) |
| FC geared | ARM46 | All gear ratio | 180 (40) | 200 (45) | 220 (49) | 250 (56) | — | 100 (22) |
| | ARM66 | | 270 (60) | 290 (65) | 310 (69) | 330 (74) | 350 (78) | 200 (45) |
| PS geared | ARM46 | 5 | 70 (15.7) | 80 (18) | 95 (21) | 120 (27) | — | 100 (22) |
| | | 7.2 | 80 (18) | 90 (20) | 110 (24) | 140 (31) | — | |
| | | 10 | 85 (19.1) | 100 (22) | 120 (27) | 150 (33) | — | |
| | | 25 | 120 (27) | 140 (31) | 170 (38) | 210 (47) | — | |
| | | 36 | 130 (29) | 160 (36) | 190 (42) | 240 (54) | — | |
| | | 50 | 150 (33) | 170 (38) | 210 (47) | 260 (58) | — | |

| Type | Motor model | Gear ratio | Permissible radial load [N (lb.)] | | | | | Permissible axial load [N (lb.)] |
|-----------------|-------------|----------------|--------------------------------------------------------|-------------|-------------|-------------|-------------|----------------------------------|
| | | | Distance from the tip of motor output shaft [mm (in.)] | | | | | |
| | | | 0 (0) | 5 (0.2) | 10 (0.39) | 15 (0.59) | 20 (0.79) | |
| PS geared | ARM66 | 5 | 170 (38) | 200 (45) | 230 (51) | 270 (60) | 320 (72) | 200 (45) |
| | | 7.2 | 200 (45) | 220 (49) | 260 (58) | 310 (69) | 370 (83) | |
| | | 10 | 220 (49) | 250 (56) | 290 (65) | 350 (78) | 410 (92) | |
| | | 25 | 300 (67) | 340 (76) | 400 (90) | 470 (105) | 560 (126) | |
| | | 36 | 340 (76) | 380 (85) | 450 (101) | 530 (119) | 630 (141) | |
| | | 50 | 380 (85) | 430 (96) | 500 (112) | 600 (135) | 700 (157) | |
| | ARM98 | 5 | 380 (85) | 420 (94) | 470 (105) | 540 (121) | 630 (141) | 600 (135) |
| | | 7.2 | 430 (96) | 470 (105) | 530 (119) | 610 (137) | 710 (159) | |
| | | 10 | 480 (108) | 530 (119) | 590 (132) | 680 (153) | 790 (177) | |
| | | 25 | 650 (146) | 720 (162) | 810 (182) | 920 (200) | 1,070 (240) | |
| | | 36 | 730 (164) | 810 (182) | 910 (200) | 1,040 (230) | 1,210 (270) | |
| | | 50 | 820 (184) | 910 (200) | 1,020 (220) | 1,160 (260) | 1,350 (300) | |
| PN geared | ARM46 | 5 | 80 (18) | 95 (21) | 120 (27) | 160 (36) | — | 100 (22) |
| | | 7.2 | 90 (20) | 110 (24) | 130 (29) | 180 (40) | — | |
| | | 10 | 100 (22) | 120 (27) | 150 (33) | 200 (45) | — | |
| | ARM66 | 5 | 240 (54) | 260 (58) | 280 (63) | 300 (67) | 330 (74) | 200 (45) |
| | | 7.2 | 270 (60) | 290 (65) | 310 (69) | 340 (76) | 370 (83) | |
| | | 10 | 300 (67) | 320 (72) | 350 (78) | 380 (85) | 410 (92) | |
| | | 25 | 410 (92) | 440 (99) | 470 (105) | 520 (117) | 560 (126) | |
| | | 36 | 360 (81) | 410 (92) | 480 (108) | 570 (128) | 640 (144) | |
| | | 50 | 360 (81) | 410 (92) | 480 (108) | 570 (128) | 700 (157) | |
| | ARM98 | 5 | 370 (83) | 390 (87) | 410 (92) | 430 (96) | 460 (103) | 600 (135) |
| | | 7.2 | 410 (92) | 440 (99) | 460 (103) | 490 (110) | 520 (117) | |
| | | 10 | 460 (103) | 490 (110) | 520 (117) | 550 (123) | 580 (130) | |
| | | 25 | 630 (141) | 660 (148) | 700 (157) | 740 (166) | 790 (177) | |
| | | 36 | 710 (159) | 750 (168) | 790 (177) | 840 (189) | 900 (200) | |
| | | 50 | 790 (177) | 840 (189) | 890 (200) | 940 (210) | 1,000 (220) | |
| Harmonic geared | ARM46 | All gear ratio | 180 (40) | 220 (49) | 270 (60) | 360 (81) | 510 (114) | 220 (49) |
| | ARM66 | | 320 (72) | 370 (83) | 440 (99) | 550 (123) | 720 (162) | 450 (101) |
| | ARM98 | | 1,090 (240) | 1,150 (250) | 1,230 (270) | 1,310 (290) | 1,410 (310) | 1,300 (290) |

■ **Permissible moment load of the Harmonic geared type**

If an eccentric load is applied on the flange surface when installing an arm or a table, do not exceed the permissible value shown in the table.

| Motor model | Permissible moment load (N·m) |
|--------------|-------------------------------|
| ARM46 | 5.6 |
| ARM66 | 11.6 |

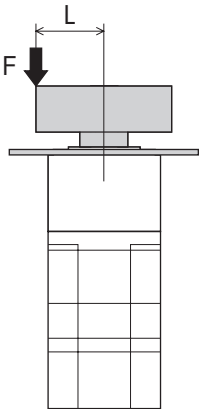
Calculate the moment load using the International System of Units (N, N·m).

- **Example 1; When an external force F is applied on the position of distance L from the center of the output flange**

L: Distance from the center of the output flange (m)

F: External force (N)

Moment load: $M \text{ (N·m)} = F \times L$



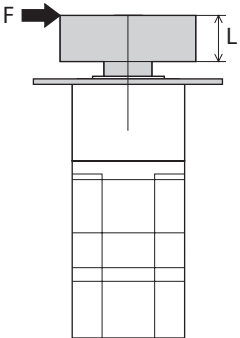
- **Example 2; When external forces F is applied on the position of distance L from the mounting face of the output flange**

L: Distance from the mounting face of the output flange (m)

F: External force (N)

Moment load: $M \text{ (N·m)} = F \times (L + \text{coefficient "a"})$

| Motor model | Coefficient "a" |
|--------------|-----------------|
| ARM46 | 0.009 |
| ARM66 | 0.0114 |

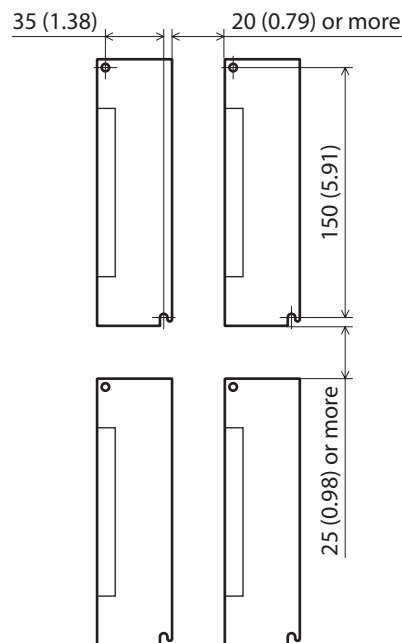


3-5 Installing the driver

The driver is designed so that heat is dissipated via air convection and conduction through the enclosure. Install the driver on a flat metal plate [material: aluminium, 200×200×2 mm (7.87×7.87×0.08 in.) equivalent] having excellent heat conductivity. When two or more drivers are to be installed side by side, provide 20 mm (0.79 in.) and 25 mm (0.98 in.) clearances in the horizontal and vertical directions, respectively. When installing the driver inside an enclosure, use two screws (M4, not included) to secure the driver through the mounting holes.



- Install the driver inside an enclosure whose pollution degree is 2 or better environment, or whose degree of protection is IP54 minimum.
- Do not install any equipment that generates a large amount of heat or noise near the driver.
- Do not install the driver underneath the controller or other equipment vulnerable to heat.
- If the ambient temperature of the driver exceeds 55 °C (131 °F), improve the ventilation condition.
- Be sure to install the driver vertically (vertical position).

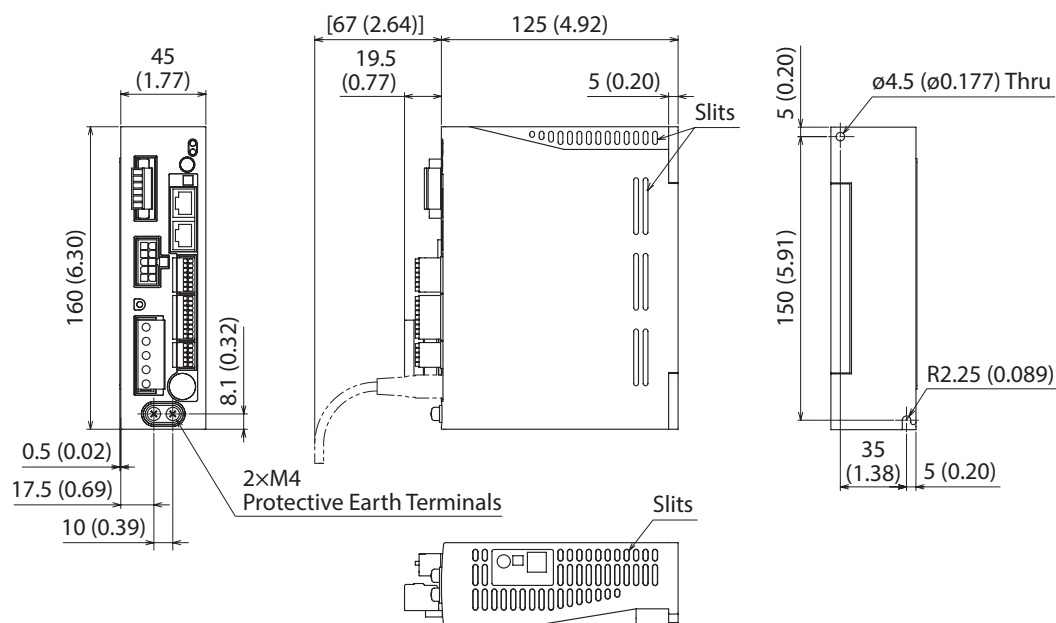


Unit: mm (in.)

2 AC power input type

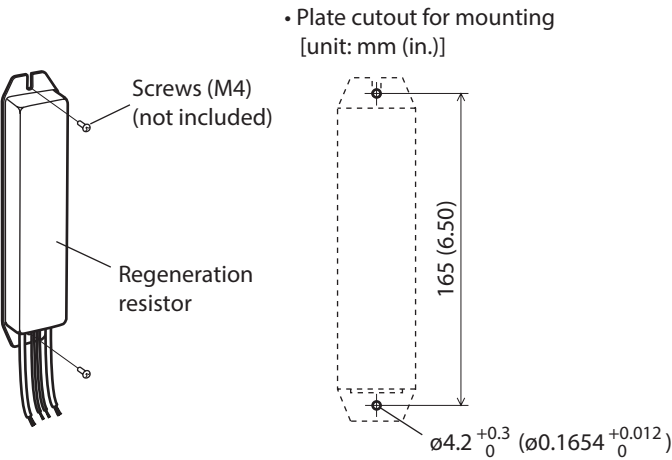
Dimension [unit: mm (in.)]

Mass: 0.75 kg (1.65 lb.)



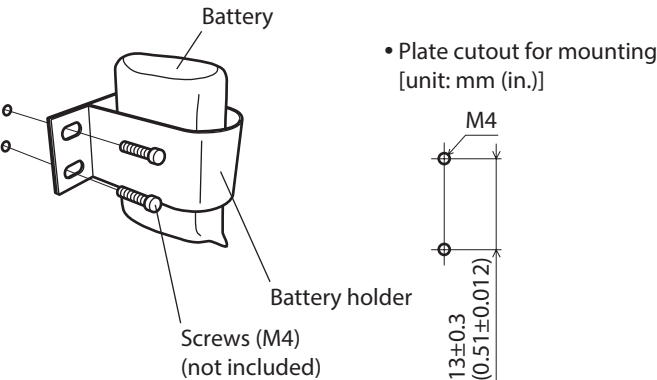
3-6 Installing the regeneration resistor

Install our regeneration resistor **RGB100** in a location where heat dissipation capacity equivalent to a level achieved with a heat sink [made of aluminum, 350×350×3 mm (13.78×13.78×0.12 in.)] is ensured.
Affix the regeneration resistor on a smooth metal plate offering high heat conductivity, using two screws (M4, not included).



3-7 Installing the battery

A battery and battery holder are included in our battery set **BAT01B**. Use the battery holder to secure the battery.



4 Connection

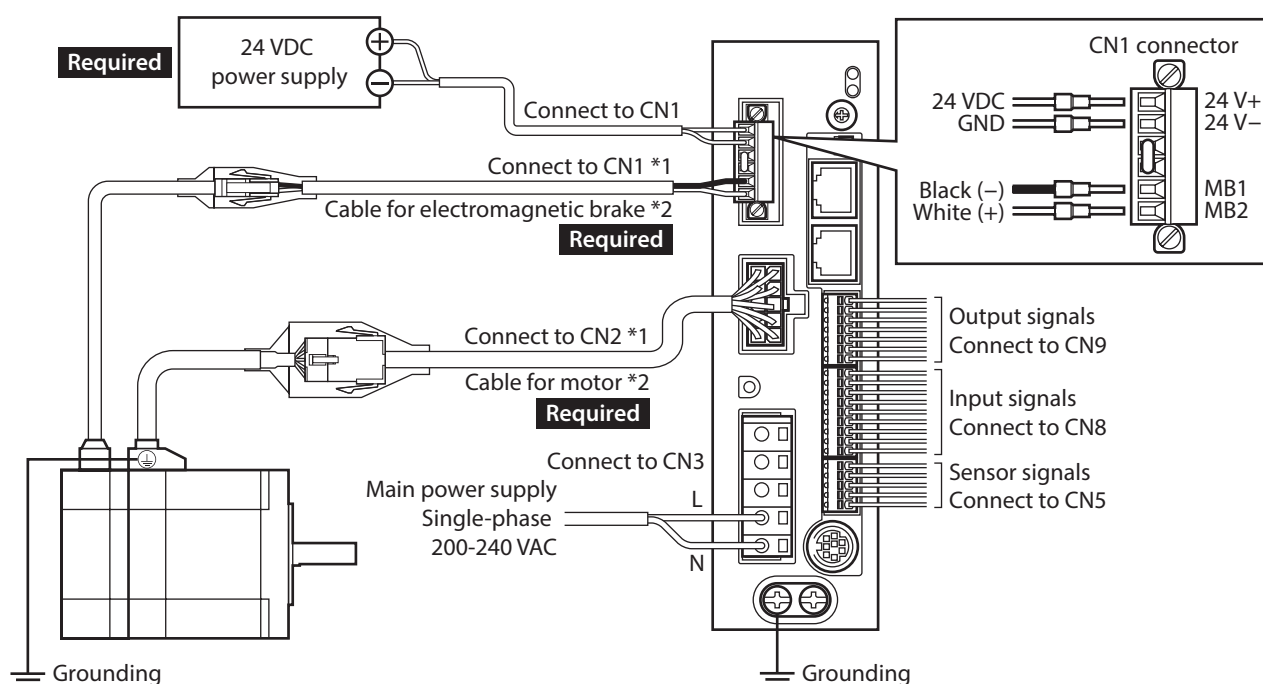
This chapter explains how to connect the motor, I/O signals and power supply to the driver, as well as grounding method. The installation and wiring methods in compliance with the EMC Directive as well as protection against noise are also explained.

⚠ WARNING

- For protection against electric shock, do not turn on the power supply until the wiring is completed.
- A high voltage is applied to the motor connector (CN2) and the main power supply input terminal (CN3). Do not touch these terminals while the power is on. Doing so may result in fire or electric shock.

4-1 Connection example

The figure shows models for the electromagnetic brake motor and single-phase 200 to 240 VAC input.



*1 Keep 30 m (98.4 ft.) or less for the wiring distance between the motor and driver.

*2 These cables are provided as our products. Purchase them separately.

Note

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

memo

- When disconnecting the connector, pull out while pressing the latches on the connector.
- When installing the motor on a moving part, use a flexible cable having excellent flex resistance. Refer to p.49 for the model name.

● Cable size and tightening torque

| Connector | Terminal symbol | Recommended cable size | Screw size | Tightening torque [N·m (oz-in)] |
|-----------|-----------------|-----------------------------------------------------------|------------|---------------------------------|
| CN1 | 24V+, 24V– | Stranded wire AWG28 to 16 (0.08 to 1.25 mm ²) | M2 | 0.22 to 0.25 (31 to 35) |
| | TH1, TH2 | Stranded wire AWG22 (0.3 mm ²) | | |
| | MB1, MB2 | Stranded wire AWG20 (0.5 mm ²) | | |
| CN3 | RG1, RG2 | Stranded wire AWG18 (0.75 mm ²) | – | – |
| | L, N | Stranded wire AWG16 to 14 (1.25 to 2.0 mm ²) | | |
| CN5 | – | Stranded wire AWG26 to 20 (0.14 to 0.5 mm ²) | – | – |
| CN8 | – | Stranded wire AWG26 to 20 (0.14 to 0.5 mm ²) | – | – |
| CN9 | – | Stranded wire AWG26 to 20 (0.14 to 0.5 mm ²) | – | – |

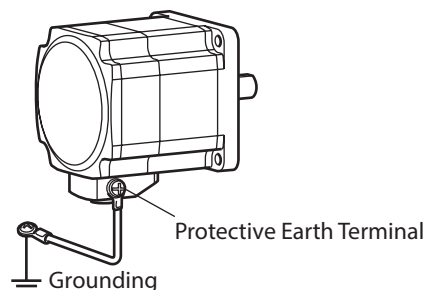
4-2 Grounding the motor and driver

■ Grounding the motor

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

- Grounding wire: AWG18 (0.75 mm²) or more
- Screw size: M4
- Tightening torque: 1.2 N·m (170 oz-in)

Use a round terminal when grounding, and secure it with a mounting screw with a washer. Ground wires and crimp terminals are not included.



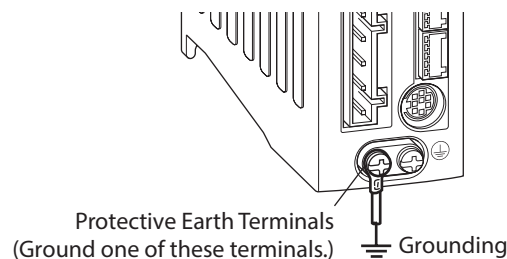
■ Grounding the driver

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

- Grounding wire: AWG16 to 14 (1.25 to 2.0 mm²)
- Screw size: M4
- Tightening torque: 1.2 N·m (170 oz-in)

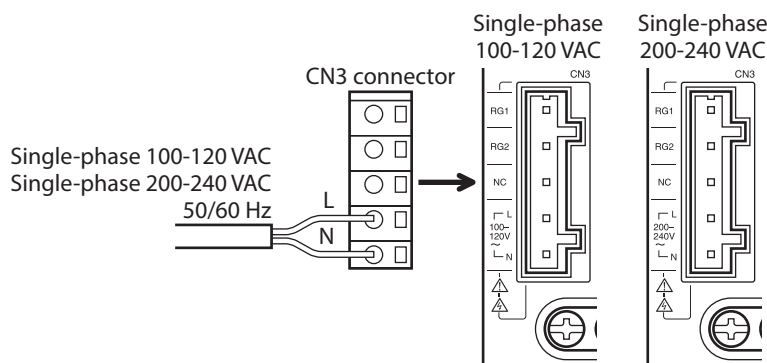
You can ground either of the two Protective Earth Terminals. The terminal that is not grounded is used as a service terminal. Use the service terminal according to your specific need, such as connecting it to the motor in order to ground the motor. Do not share the grounding wire with a welder or any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

When grounding the Protective Earth Terminal, use a round terminal and secure the grounding point near the driver.



4-3 Connecting the main power supply

Use the CN3 connector (5 pins) to connect the power supply cable (AWG16 to 14: 1.25 to 2.0 mm²) to the main power supply connector (CN3) on the driver.



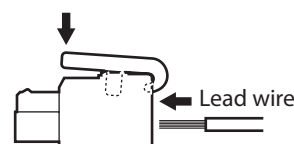
Note

- 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 cycling the power or connecting/disconnecting the connector, turn off the power and wait for the CHARGE LED to turn off. The residual voltage may cause electric shock.

■ Wiring method

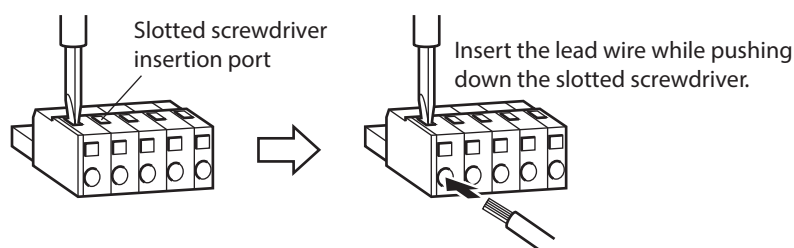
- Applicable lead wire: AWG16 to 14 (1.25 to 2.0 mm²)
- Stripping length of wire insulation : 8 to 9 mm (0.31 to 0.35 in.)

1. Insert the connector wiring lever.
2. Insert the lead wire while pushing down the connector wiring lever.



You can also connect the power supply cable using a slotted screwdriver.

Insert the lead wire while pushing the insertion port using a slotted screwdriver with a tip of 3.0 to 3.5 mm (0.12 to 0.14 in.) in width.



■ Power supply current capacity

The current capacity of the main power supply varies depending on the motor combined.

When motorized actuators are used, check while referring to the model name of the equipped motor.

In the case of the **DGII** Series, check the current capacity of a main power supply with the **DGII Series OPERATING MANUAL Actuator Edition**.

| Motor model | Single-phase 100-120 V -15 to +6 % 50/60 Hz | Single-phase 200-240 V -15 to +6 % 50/60 Hz |
|---------------|------------------------------------------------|------------------------------------------------|
| ARM46 | 2.4 A or more | 1.5 A or more |
| ARM66 | 3.6 A or more | 2.3 A or more |
| ARM69 | 4.9 A or more | 3.0 A or more |
| ARM98 | 4.6 A or more | 2.9 A or more |
| ARM911 | 5.9 A or more | 3.7 A or more |

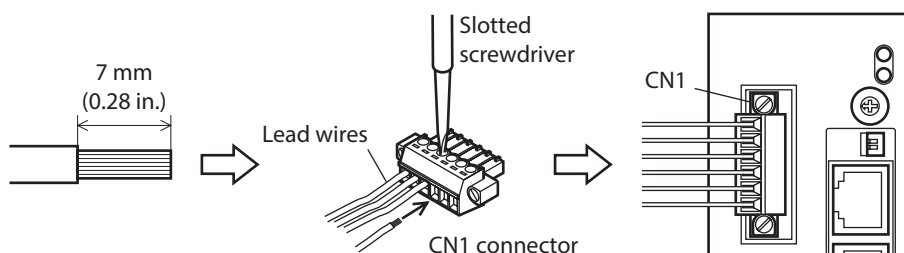
4-4 Connecting the 24 VDC power supply, regeneration resistor and electromagnetic brake

Use the CN1 connector (6 pins) to connect the 24 VDC power supply, regeneration resistor and electromagnetic brake. Connect the lead wire (AWG28 to 16: 0.08 to 1.25 mm²) to the connector while checking the pin numbers in below.

| Display | Description |
|---------|----------------------------------------------------------------------------------------------------|
| 24V+ | 24 VDC power supply input |
| 24V– | |
| TH1 | Regeneration resistor thermal input (If these pins are not used, short it using a jumper wire.) |
| TH2 | |
| MB1 | Electromagnetic brake – (Connect the black lead wire of the electromagnetic brake.) |
| MB2 | Electromagnetic brake + (Connect the white lead wire of the electromagnetic brake.) |

■ Connecting method

1. Strip the insulation cover of the lead wire by 7 mm (0.28 in.)
2. Insert each lead wire into the CN1 connector and tighten the screw with a slotted screwdriver.
Connector screw size: M2
Tightening torque: 0.22 to 0.25 N·m (31 to 35 oz-in)
3. Insert the CN1 connector into the CN1, and tighten the screw.
Connector screw size: M2.5
Tightening torque: 0.4 N·m (56 oz-in)



■ Connecting the 24 VDC power supply

Connect a 24 VDC power supply of the current capacity shown in the following table.

When motorized actuators are used, check while referring to the model name of the equipped motor.

In the case of the **DGII** Series, check the current capacity of a 24 VDC power supply with the **DGII Series OPERATING MANUAL Actuator Edition**.

The 24 VDC power supply is for the control circuit. Be sure to connect it.

| Motor model | Input power supply voltage | Power supply current capacity | |
|---------------|----------------------------|-------------------------------|----------------------------|
| | | Without electromagnetic brake | With electromagnetic brake |
| ARM46 | 24 VDC±5 % * | 0.25 A or more | 0.33 A or more |
| ARM66 | | | 0.5 A or more |
| ARM69 | | | |
| ARM98 | | | |
| ARM911 | | | – |

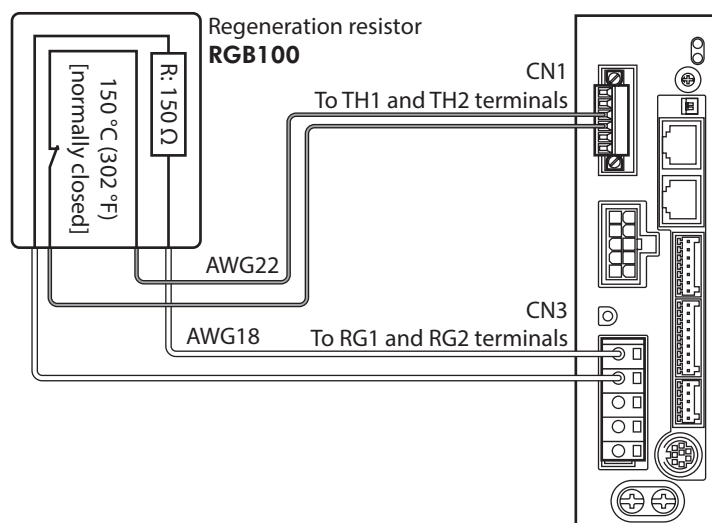
* If the distance between the motor and driver is extended to 20 to 30 m (65.6 to 98.4 ft.), use a power supply of 24 VDC±4 %.



When turning on the 24 VDC power supply again, turn off the 24VDC power supply and wait for at least 1 second before doing so.

■ Connecting the regeneration resistor

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 our regeneration resistor **RGB100**.



- The two thin lead wires (AWG22: 0.3 mm²) of the regeneration resistor are the thermostat outputs. Connect them to the TH1 and TH2 terminals using the CN1 connector.
- Regenerative current flows through the two thick lead wires (AWG18: 0.75 mm²) of the regeneration resistor. Connect them to the RG1 and RG2 terminals using the CN3 connector.



- Before connecting the regeneration resistor, be sure to remove the jumper wire from the CN1 connector.
- If the allowable power consumption of the regeneration resistor exceeds the allowable level, the thermostat will be triggered and an alarm of regeneration resistor overheat is generated. If an alarm of regeneration resistor overheat is generated, turn off the main power supply and check the content of the error.

Regeneration resistor specifications

| | |
|-------------------------------------|----------------------------------------------------------------------------------------------------------|
| Model | RGB100 |
| Allowable current consumption | Continuous regenerative power: 50 W * Instantaneous regenerative power: 600 W |
| Resistance | 150 Ω |
| Operating temperature of thermostat | Operation: Opens at 150±7 °C (302±12.6 °F) Reset: Closes at 145±12 °C (293±21.6 °F) (normally closed) |
| Electrical rating of thermostat | 120 VAC 4 A, 30 VDC 4 A (minimum current: 5 mA) |

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

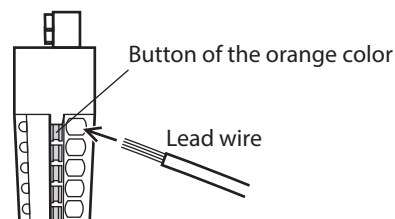
■ Connecting the electromagnetic brake

When the electromagnetic brake is connected, it can automatically be controlled by interlocking with the C-ON input or the FREE input. Refer to p.37 for connection method.

4-5 Connecting the I/O signals

■ Wiring method

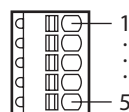
- Applicable lead wire: AWG26 to 20 (0.14 to 0.5 mm²)
 - Stripping length of wire insulation: 8 mm (0.32 in.)
1. Strip the insulation cover of the lead wire.
 2. Insert the lead wire while pushing the button of the orange color on the connector with a slotted screwdriver.
 3. After having inserted, release the button to secure the lead wire.



■ Pin assignment

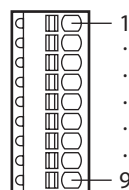
● Sensor signals (CN5)

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



● Input signals (CN8)

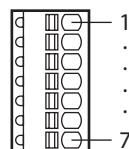
| Pin No. | Signal name | Description * |
|---------|-------------|---------------------------|
| 1 | IN0 | Control input 0 (HOME) |
| 2 | IN1 | Control input 1 (START) |
| 3 | IN2 | Control input 2 (M0) |
| 4 | IN3 | Control input 3 (M1) |
| 5 | IN4 | Control input 4 (M2) |
| 6 | IN5 | Control input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



* (): Initial value

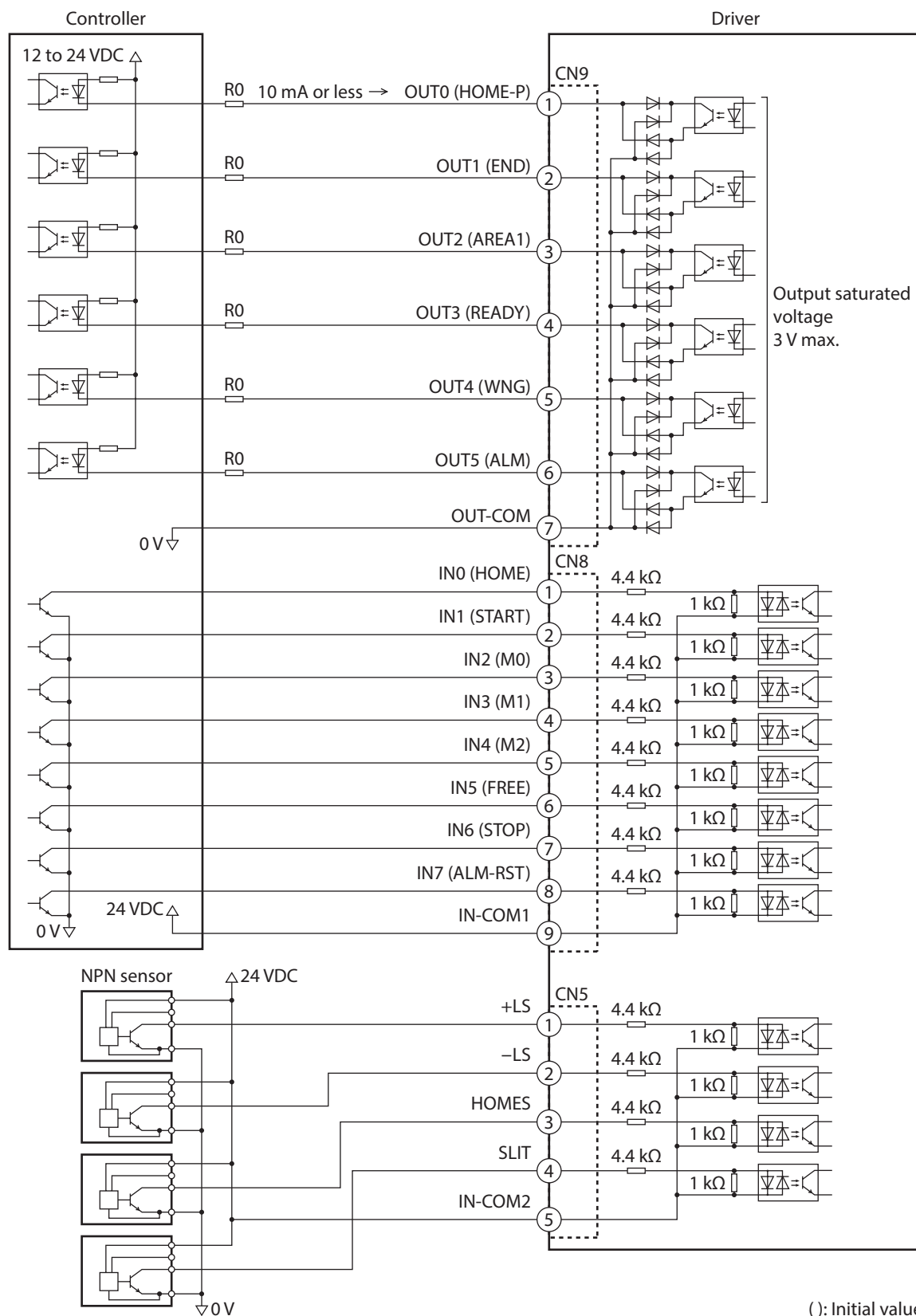
● Output signals (CN9)

| Pin No. | Signal name | Description * |
|---------|-------------|---------------------------|
| 1 | OUT0 | Control output 0 (HOME-P) |
| 2 | OUT1 | Control output 1 (END) |
| 3 | OUT2 | Control output 2 (AREA1) |
| 4 | OUT3 | Control output 3 (READY) |
| 5 | OUT4 | Control output 4 (WNG) |
| 6 | OUT5 | Control output 5 (ALM) |
| 7 | OUT-COM | Output signals common |



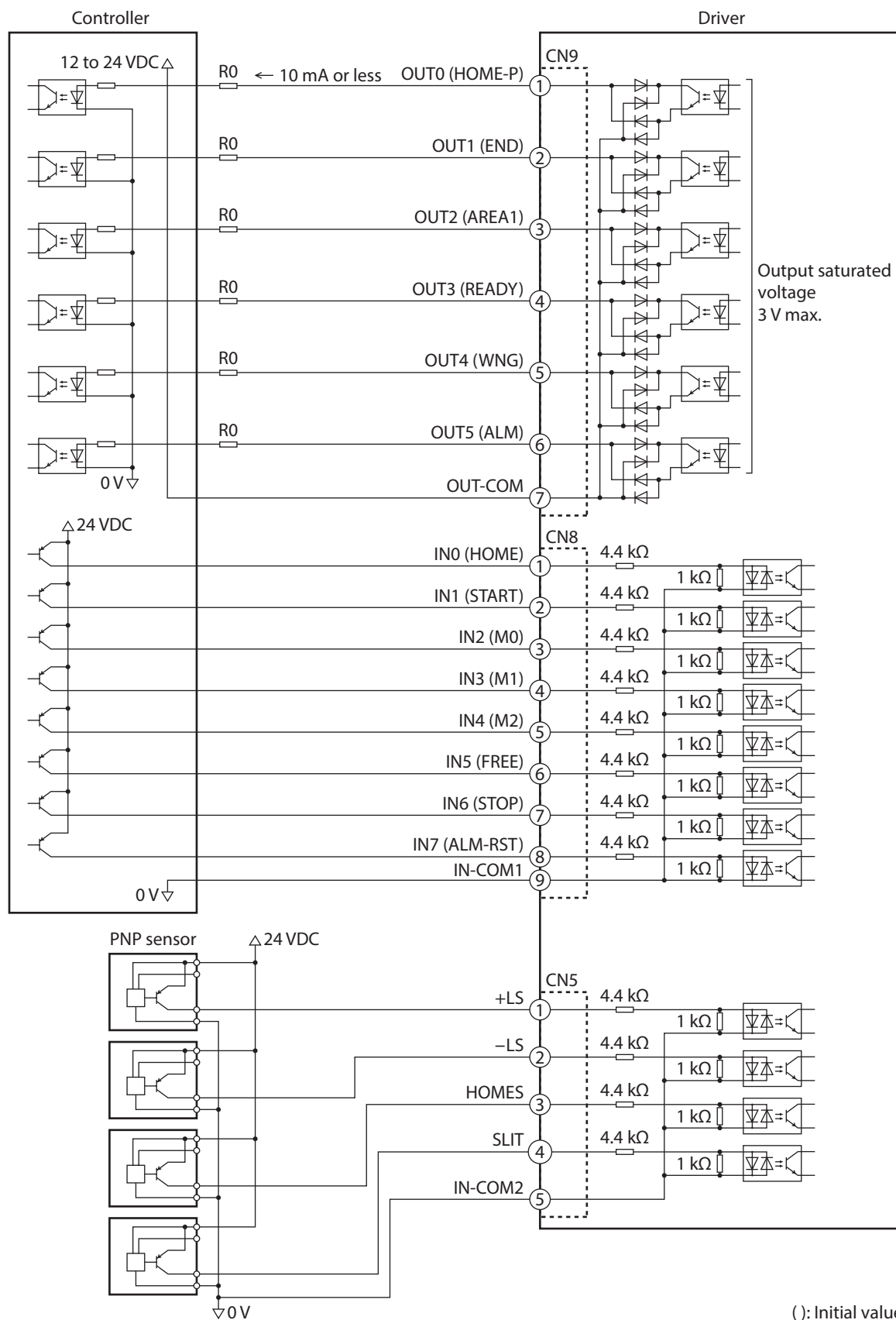
* (): Initial value

■ Connection example with a current sink output circuit (NPN specifications)



- Use input signals at 24 VDC.
- Use output signals at 12 to 24 VDC 10 mA or less. If the current exceeds 10 mA, connect an external resistor R0 so that the current becomes 10 mA or less.
- The saturated voltage of the output signal is 3 VDC maximum.

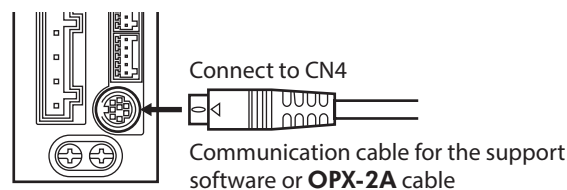
■ Connection example with a current source output circuit (PNP specifications)



- Use input signals at 24 VDC.
- Use output signals at 12 to 24 VDC 10 mA or less. If the current exceeds 10 mA, connect an external resistor R0 so that the current becomes 10 mA or less.
- The saturated voltage of the output signal is 3 VDC maximum.

4-6 Connecting the data setter

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

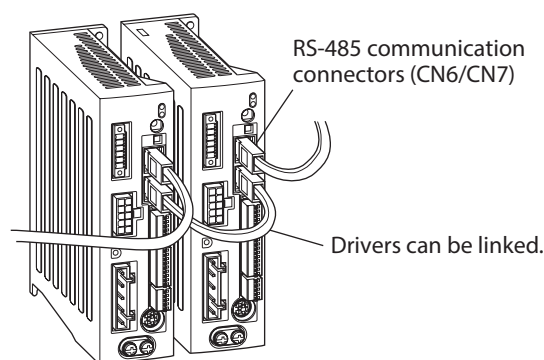


⚠ CAUTION

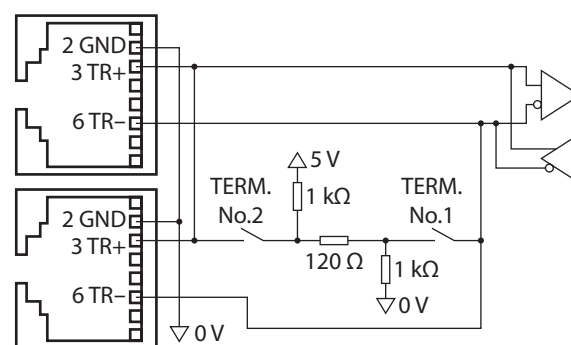
The data edit connector (CN4) and RS-485 communication connectors (CN6/CN7) of the driver are not insulated. When grounding the positive terminal of the power supply, do not connect any equipment (PC, etc.) whose negative terminal is grounded. Doing so may cause the driver and these equipment to short,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

4-7 Connecting the RS-485 communication cable

Connect this cable if you want to control your product via RS-485 communication. Connect the RS-485 communication cable to CN6 or CN7 on the driver. You can use the vacant connectors to connect a different driver. A driver link cable is also available in our products. Refer to p.51 for the model name. You can also use a commercial LAN cable (straight cable) to link drivers.

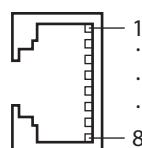


• Internal input circuit



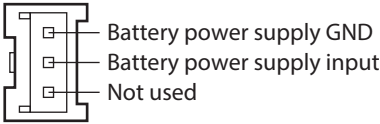
CN6/CN7 pin assignment

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



4-8 Connecting and charging the battery

Connect our battery **BAT01B** when using in the absolute-position backup system.
When the battery is connected to the battery connector (CN10) of the driver and the 24 VDC power is turned on, the battery will start charging. It takes approximately 32 hours to fully charge the battery [at an ambient temperature of 20 °C (68 °F)].
Refer to p.166 for setting method of the absolute-position backup system.



Battery specifications

| | |
|-----------------------|-------------------------------------------------------|
| Battery type | Sealed nickel-metal hydride battery |
| Nominal voltage | 2.4 V |
| Rated capacity | 1,900 mAh |
| Mass | 0.10 kg (3.5 oz) |
| Expected life | Approximately 4 years *1 |
| Charging time | 32 hours *1 |
| Data retention period | Approximately 360 hours (Approximately 15 days) *1 *2 |
| Ambient temperature | 0 to +40 °C (+32 to +104 °F) (non-freezing) |
| Ambient humidity | 45 to 85 % (non-condensing) |

*1 At an ambient temperature of 20 °C (68 °F)
*2 After the power is cut off with the battery fully charged.

4-9 Noise measures

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

Measures against electrical noise

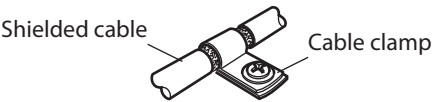
There are the following three methods mainly to take measures against the electrical noise.

Noise suppression

- When relays or electromagnetic switches are used together with the system, use noise filters and CR circuits to suppress surges generated by them.
- Use our connection cable or extension cable when extending a wiring distance between the motor and driver. Refer to p.49 for the model name.
- Cover the driver by a metal plate such as aluminum. This is effective in shielding the electrical noise emitted from the driver.

Prevention of noise propagation

- Connect a noise filter in the power supply cable of driver.
- Place the power lines, such as the motor and power supply cables, keeping a distance of 200 mm (7.87 in.) or more from the signal lines, and also do not bundle them or wire them in parallel. If the power cables and signal cables have to cross, cross them at a right angle.
- Use shielded twisted pair cables for power lines and signal lines.
- Keep cables as short as possible without coiling and bundling extra lengths.
- Grounding multiple points will increase effect to block electrical noise because impedance on the grounding points is decreased. However, ground them so that a potential difference does not occur among the grounding points. I/O signal cables that include a ground wire are provided in our product line. Refer to p.51 for the model name.
- To ground a shielded cable, use a metal cable clamp that will maintain contact with the entire circumference of the cable. Ground the cable clamp near the product.



● Suppression of effect by noise propagation

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

■ Noise suppression parts

● Noise filter

- Connect the following noise filter (or equivalent) to the power line. Doing so will prevent the propagated noise through the power line. Install the noise filter as close to the driver as possible.

| Manufacture | Model |
|---------------------------|--------------|
| SOSHIN ELECTRIC CO., LTD. | HF2010A-UPF |
| Schaffner EMC | FN2070-10-06 |

- Use the AWG18 (0.75 mm²) or thicker wire for the input and output cables of the noise filter, and secure firmly using a cable clamp etc. so that the cable does not come off the enclosure.
- Place the input cable as far apart as possible from the output cable, and do not wire the cables in parallel. If the input and output cable are placed at a close distance or if they are wired in parallel, the noise inside the enclosure affects the power cable through stray capacitance, and the noise suppressing effect will reduce.
- Connect the ground terminal of the noise filter to the grounding point, using as thick and short a wire as possible.
- When connecting a noise filter inside an enclosure, wire the input cable of the noise filter as short as possible. Wiring in long distance may reduce the noise suppressing effect.

● Surge arrester

A surge arrester is effective for reduction of the surge voltage of the lightning surge generated between the AC power line and earth or between AC power lines. Connect the following surge arrester.

R-A-V-781BWZ-4 (OKAYA ELECTRIC INDUSTRIES CO., LTD.)



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

■ Our noise suppression parts

Refer to p.51 for the model name.

● I/O signal cable

This cable is a shielded twisted pair cable for good noise immunity to connect the driver and controller. The ground wires useful to grounding are provided at both ends of the cable. The EMC measures are conducted using our I/O signal cable.

● Surge suppressor

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

4-10 Conformity to the EMC Directive

Effective measures must be taken against the EMI that the motor and driver may give to adjacent control-system equipment, as well as the EMS of the motor and driver itself, in order to prevent a serious functional impediment in the machinery. The use of the following installation and wiring methods will enable the motor and driver to be compliant with the EMC Directive. Refer to p.324 for the applicable standards.

Oriental Motor conducts EMC measurements on its motors and drivers in accordance with "Example of installation and wiring" on p.48.

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

● Connecting noise filter

In large electrically noisy environments, connect a noise filter. Refer to "Noise filter" in the above.

● Connecting surge arrester

Refer to "Surge arrester" in the above.

- **Connecting the 24 VDC power supply**

Use a 24 VDC power supply that conforms to the EMC Directive.

Use a shielded twisted pair cable for wiring. Refer to "Prevention of noise propagation" on p.46 for wiring method.

- **Connecting the motor cable**

Use our connection cable or extension cable when extending the wiring distance between the motor and driver. Refer to p.49 for the model name.

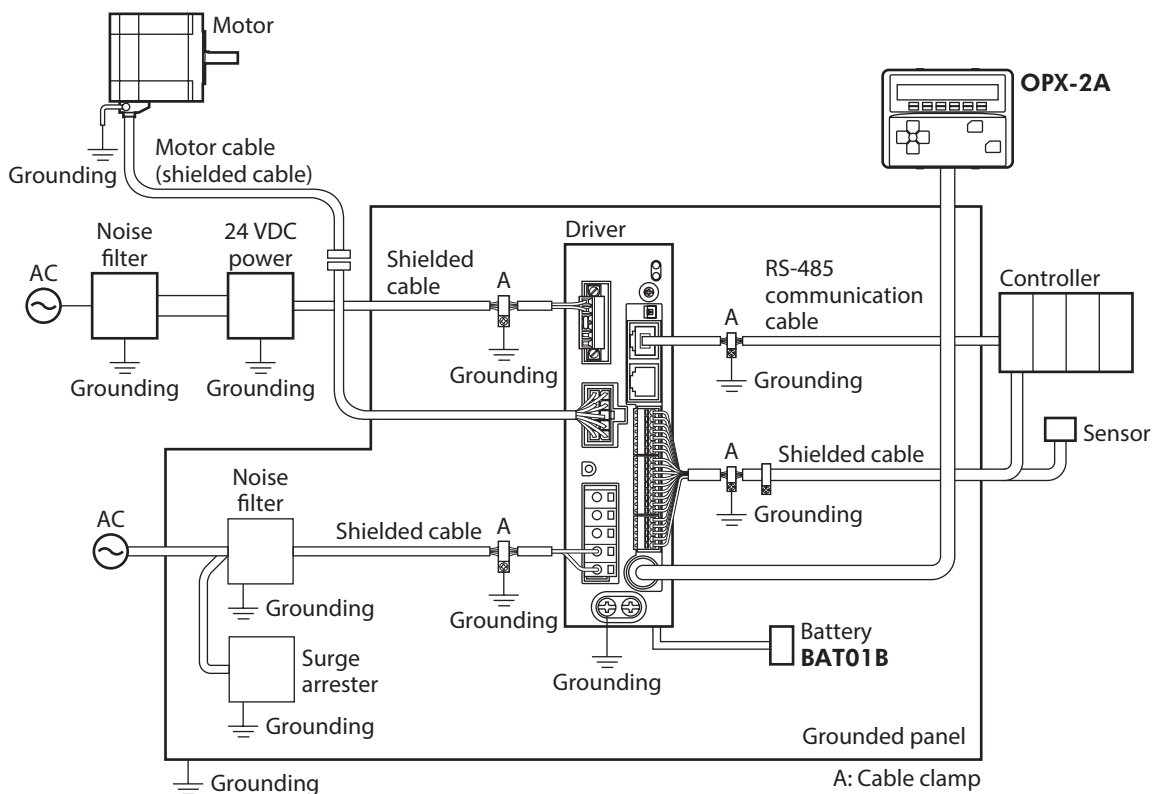
- **Connecting the signal cable**

Refer to "Prevention of noise propagation" on p.46.

- **How to ground**

- The cable used to ground the motor, driver and noise filter must be as thick and short as possible so that no potential difference is generated.
- Choose a large, thick and uniformly conductive surface for the grounding point.
- Be sure to ground the Protective Earth Terminal of the motor and driver. Refer to p.38 for grounding method.

- **Example of installation and wiring**



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

5 Cables

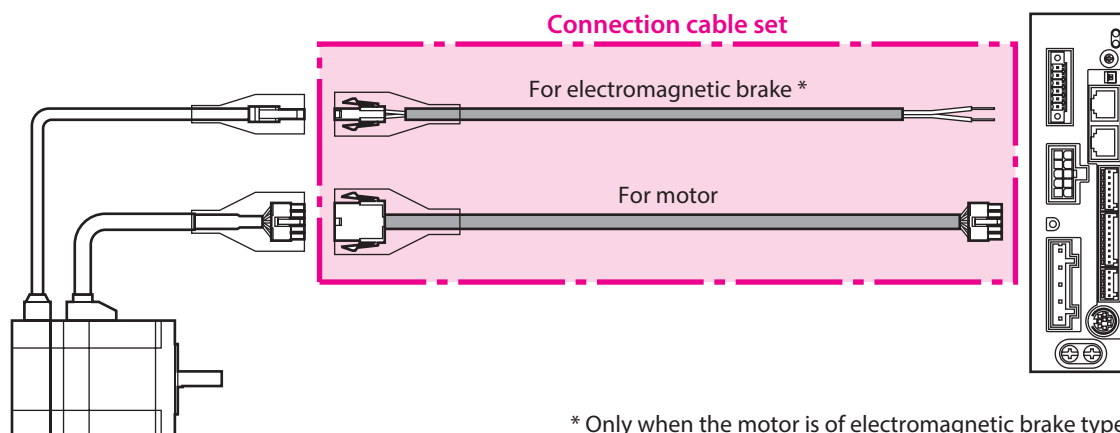


When installing the motor on a moving part, use a flexible cable having excellent flex resistance.

5-1 Connection cable set

Use when connecting a motor and a driver.

The cable set for electromagnetic brake motors consists of two cables, one for motor and the other for electromagnetic brake.



* Only when the motor is of electromagnetic brake type.

● Connection cable set model

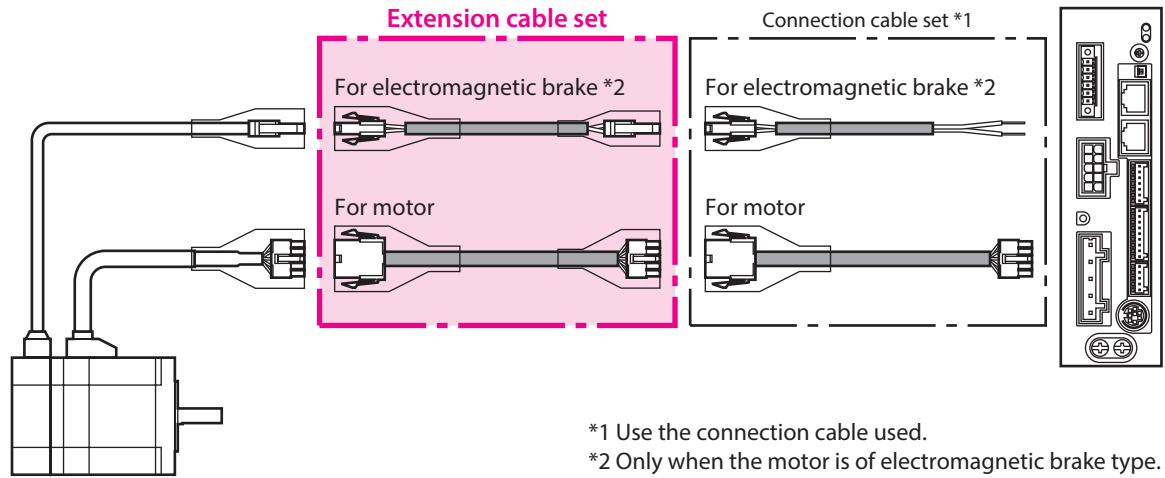
| Length [m (ft.)] | For standard type motor | For electromagnetic brake type motor |
|---------------------|----------------------------|-----------------------------------------|
| 0.5 (1.6) | CC005VAF | CC005VAFB |
| 1 (3.3) | CC010VAF | CC010VAFB |
| 1.5 (4.9) | CC015VAF | CC015VAFB |
| 2 (6.6) | CC020VAF | CC020VAFB |
| 2.5 (8.2) | CC025VAF | CC025VAFB |
| 3 (9.8) | CC030VAF | CC030VAFB |
| 4 (13.1) | CC040VAF | CC040VAFB |
| 5 (16.4) | CC050VAF | CC050VAFB |
| 7 (23) | CC070VAF | CC070VAFB |
| 10 (32.8) | CC100VAF | CC100VAFB |
| 15 (49.2) | CC150VAF | CC150VAFB |
| 20 (65.6) | CC200VAF | CC200VAFB |
| 30 (98.4) | CC300VAF | CC300VAFB |

● Flexible connection cable set model

| Length [m (ft.)] | For standard type motor | For electromagnetic brake type motor |
|---------------------|----------------------------|-----------------------------------------|
| 0.5 (1.6) | CC005VAR | CC005VARB |
| 1 (3.3) | CC010VAR | CC010VARB |
| 1.5 (4.9) | CC015VAR | CC015VARB |
| 2 (6.6) | CC020VAR | CC020VARB |
| 2.5 (8.2) | CC025VAR | CC025VARB |
| 3 (9.8) | CC030VAR | CC030VARB |
| 4 (13.1) | CC040VAR | CC040VARB |
| 5 (16.4) | CC050VAR | CC050VARB |
| 7 (23) | CC070VAR | CC070VARB |
| 10 (32.8) | CC100VAR | CC100VARB |
| 15 (49.2) | CC150VAR | CC150VARB |
| 20 (65.6) | CC200VAR | CC200VARB |
| 30 (98.4) | CC300VAR | CC300VARB |

5-2 Extension cable set

Use when extending the distance between a motor and a driver or when the length of the connection cable used is not enough. Extend the distance by connecting the extension cable to the connection cable. The cable set for electromagnetic brake motors consists of two cables, one for motor and the other for electromagnetic brake.



When extending the wiring length by connecting an extension cable to the connection cable, keep the total cable length to 30 m (98.4 ft.) or less.

● Extension cable set model

| Length [m (ft.)] | For standard type motor | For electromagnetic brake type motor |
|---------------------|----------------------------|-----------------------------------------|
| 0.5 (1.6) | CC005VAFT | CC005VAFBT |
| 1 (3.3) | CC010VAFT | CC010VAFBT |
| 1.5 (4.9) | CC015VAFT | CC015VAFBT |
| 2 (6.6) | CC020VAFT | CC020VAFBT |
| 2.5 (8.2) | CC025VAFT | CC025VAFBT |
| 3 (9.8) | CC030VAFT | CC030VAFBT |
| 4 (13.1) | CC040VAFT | CC040VAFBT |
| 5 (16.4) | CC050VAFT | CC050VAFBT |
| 7 (23) | CC070VAFT | CC070VAFBT |
| 10 (32.8) | CC100VAFT | CC100VAFBT |
| 15 (49.2) | CC150VAFT | CC150VAFBT |
| 20 (65.6) | CC200VAFT | CC200VAFBT |

● Flexible extension cable set model

| Length [m (ft.)] | For standard type motor | For electromagnetic brake type motor |
|---------------------|----------------------------|-----------------------------------------|
| 0.5 (1.6) | CC005VART | CC005VARBT |
| 1 (3.3) | CC010VART | CC010VARBT |
| 1.5 (4.9) | CC015VART | CC015VARBT |
| 2 (6.6) | CC020VART | CC020VARBT |
| 2.5 (8.2) | CC025VART | CC025VARBT |
| 3 (9.8) | CC030VART | CC030VARBT |
| 4 (13.1) | CC040VART | CC040VARBT |
| 5 (16.4) | CC050VART | CC050VARBT |
| 7 (23) | CC070VART | CC070VARBT |
| 10 (32.8) | CC100VART | CC100VARBT |
| 15 (49.2) | CC150VART | CC150VARBT |
| 20 (65.6) | CC200VART | CC200VARBT |

6 Accessories

6-1 Setting tool

■ Communication cable for the support software

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

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

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

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

■ Data setter

The data setter lets you set operation data and parameters for your **AR** Series with ease and also functions as a monitor.

Model: **OPX-2A**

6-2 Wiring support tool

■ RS-485 communication cable

You can link drivers using this cable connected to the RS-485 communication connectors (CN6, CN7).

Model: **CC002-RS4** [0.25 m (1 ft.)]

■ Regeneration resistor

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 resistor. Always connect the regeneration resistor if an overvoltage protection warning or alarm generates.

Model: **RGB100**

■ I/O signal cable

A shielded cable for driver control I/O signals offering excellent noise resistance. The ground wires useful to grounding are provided at both ends of the cable.

Select the cable suitable for the number of I/O signals connected.

General-purpose type

| Cable length [m (ft.)] | Number of lead wire | | | |
|---------------------------|---------------------|--------------------|--------------------|--------------------|
| | 6 pcs. | 10 pcs. | 12 pcs. | 16 pcs. |
| 0.5 (1.6) | CC06D005B-1 | CC10D005B-1 | CC12D005B-1 | CC16D005B-1 |
| 1 (3.3) | CC06D010B-1 | CC10D010B-1 | CC12D010B-1 | CC16D010B-1 |
| 1.5 (4.9) | CC06D015B-1 | CC10D015B-1 | CC12D015B-1 | CC16D015B-1 |
| 2 (6.6) | CC06D020B-1 | CC10D020B-1 | CC12D020B-1 | CC16D020B-1 |

■ CR circuit for surge suppression

This product is effective to suppress the surge which occurs in a relay contact part. Use it to protect the contacts of the relay or switch.

Model: **EPCR1201-2**

■ CR circuit module

This product is effective to suppress the surge which occurs in a relay contact part. Use this product to protect the contacts of the relay or switch.

Four pieces of CR circuit for surge suppression are mounted on the compact circuit, and this product can be installed to the DIN rail. This product can make the wiring easily and securely since it also supports terminal block connection.

Model: **VCS02**

6-3 Others

■ Battery set

This is a battery set (including a battery and battery holder) required in the absolute-position backup system.

Model: **BAT01B**

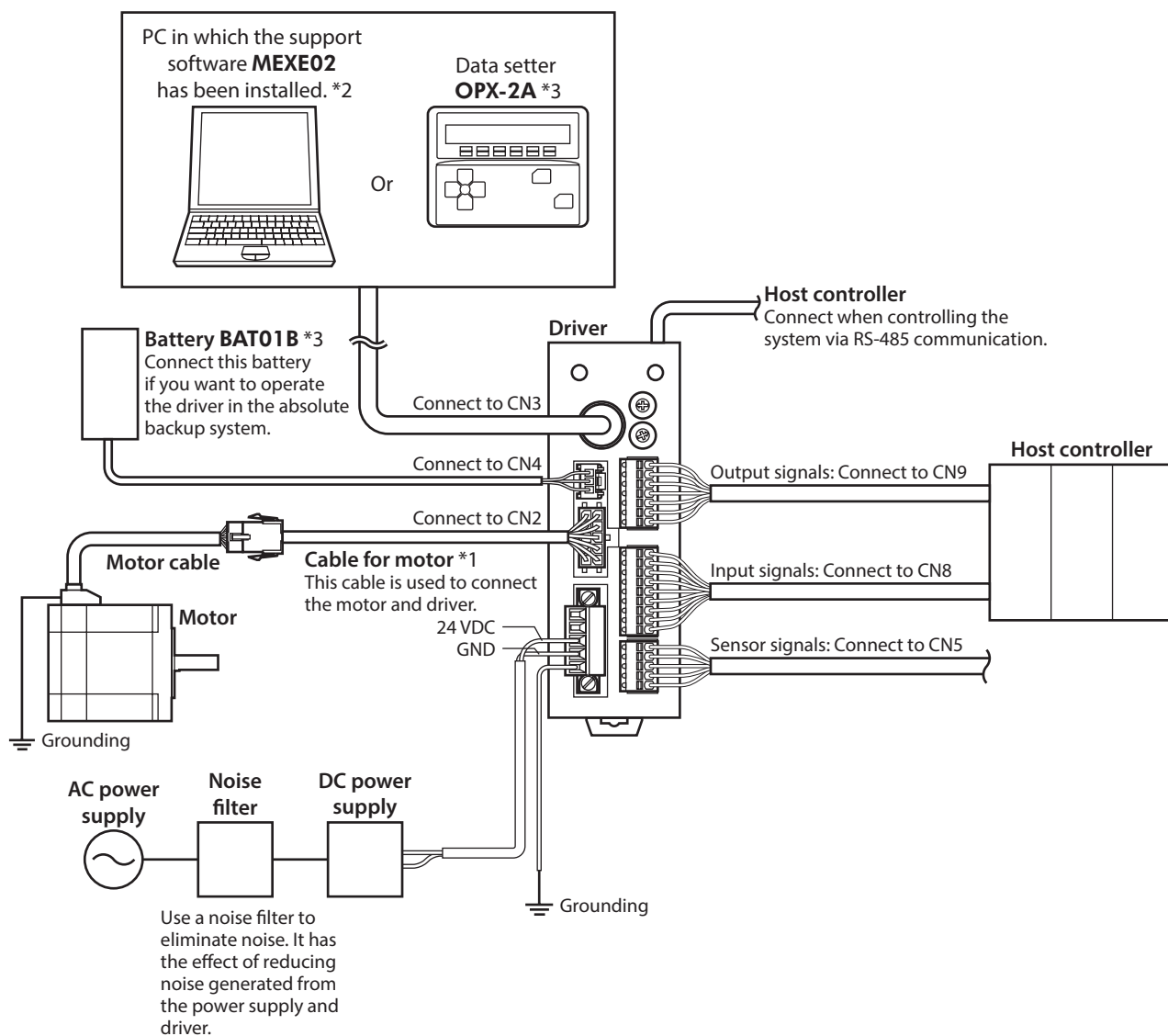
3 DC power input type

This part explains contents specific to the AR Series DC power input type.

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1 System configuration



*1 This cable is provided as our product. When the length of the motor cable is not enough, purchase it separately.

*2 The PC must be supplied by the user. Use our communication cable for the support software **CC051F-USB** when connecting the PC and driver.

*3 These products are provided as our accessories.

2 Preparation

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

2-1 Checking the product

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

● Motor

- Motor 1 unit
- Parallel key 1 pc. *1
- Varistor 1 pc. *2
- OPERATING MANUAL Motor Edition 1 copy
- APPENDIX UL Standards for **AR** Series 1 copy *3

*1 Included with geared types. However, the following geared types are excluded.

TH geared: **ARM24-T**, **ARM46-T**, and **ARM66-T**

PS geared: **ARM24-PS**

PN geared: **ARM24-N**

Harmonic geared: **ARM24-H**

*2 Included with the electromagnetic brake motor.

*3 Included with products conform to the UL Standards.

● Driver

- Driver 1 unit
- CN1 connector (5 pins) 1 pc.
- CN5 connector (5 pins) 1 pc.
- CN8 connector (9 pins) 1 pc.
- CN9 connector (7 pins) 1 pc.
- OPERATING MANUAL Driver Edition 1 copy
- APPENDIX UL Standards for **AR** Series 1 copy

Included connector model

| Type | Model number (Manufacturer) |
|---------------|---------------------------------------------------|
| CN1 connector | MC1,5/5-STF-3,5 (PHOENIX CONTACT GmbH & Co. KG) |
| CN5 connector | FK-MC0,5/5-ST-2,5 (PHOENIX CONTACT GmbH & Co. KG) |
| CN8 connector | FK-MC0,5/9-ST-2,5 (PHOENIX CONTACT GmbH & Co. KG) |
| CN9 connector | FK-MC0,5/7-ST-2,5 (PHOENIX CONTACT GmbH & Co. KG) |

2-2

How to identify the product model

Check the model number of the motor and driver against the number shown on the nameplate. Refer to p.57 for how to identify the nameplate.

Motor

Standard type

ARM24SA0K

1234567

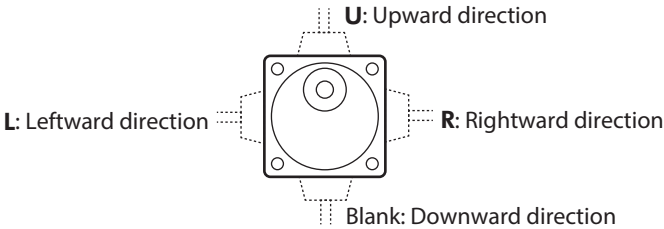
Geared type

ARM46SAK-T7.2U

1234578910

| | | |
|----|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Series name | ARM: AR Series motor |
| 2 | Motor frame size | 1: 20 mm (0.79 in.) 2: 28 mm (1.10 in.) [30 mm (1.18 in.) for Harmonic geared type] 4: 42 mm (1.65 in.) 6: 60 mm (2.36 in.) 9: 85 mm (3.35 in.) [90 mm (3.54 in.) for geared type] |
| 3 | Motor length | |
| 4 | Motor identification | S: Without connector cover for cable Blank: With connector cover for cable |
| 5 | Motor type | A: Single shaft B: Double shaft M: With electromagnetic brake |
| 6 | Additional function | O: Round shaft without shaft flat Blank: Round shaft with shaft flat on one side |
| 7 | Motor power supply input | K: DC power input type |
| 8 | Type of gear | T: TH geared PS: PS geared N: PN geared H: Harmonic geared Blank: Standard |
| 9 | Gear ratio | Indicates a number representing the gear ratio. Refer to p.57 for the gear type and gear ratio. |
| 10 | Cable outlet direction * (TH geared type only) | U: Upward direction L: Leftward direction R: Rightward direction Blank: Downward direction |

* The cable outlet direction represents the one as viewed from the output shaft side in a state of placing it upward.



Type of gear ratio

| Type of gear | Gear ratio |
|------------------|------------------------------------------------------------------------------------------|
| TH geared | ARM24 : 7.2, 10, 20, 30 ARM46, ARM66, ARM98 : 3.6, 7.2, 10, 20, 30 |
| PS geared | ARM24 : 5, 7.2 (*), 10 ARM46, ARM66, ARM98 : 5, 7.2 (*), 10, 25, 36, 50 |
| PN geared | ARM24, ARM46 : 5, 7.2, 10 ARM66, ARM98 : 5, 7.2, 10, 25, 36, 50 |
| Harmonic geared | 50, 100 |

* The model name is "7" for the gear ratio 7.2 of the **PS** geared type.

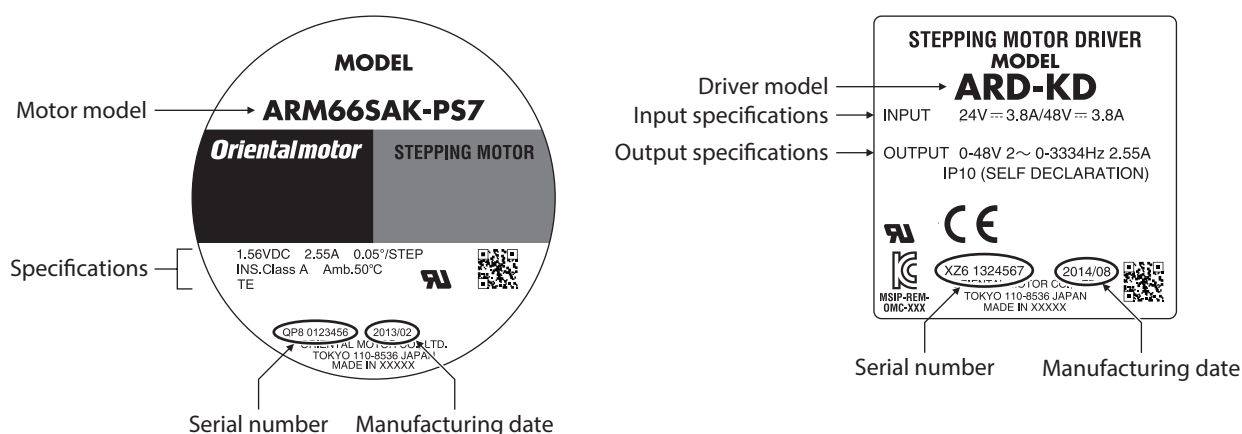
■ Driver

ARD - **K** **D**
1 2 3

| | | |
|---|--------------------|-------------------------------------|
| 1 | Series name | ARD: AR Series driver |
| 2 | Power supply input | K : 24 VDC/48 VDC |
| 3 | Type | D : Built-in controller type |

2-3 Information about nameplate

The figure shows an example.



The position describing the information may vary depending on the product.

2-4 Combinations of motors and drivers

■ Standard type

| Single shaft | | Double shaft | | With electromagnetic brake | |
|--------------|--------------|--------------|--------------|----------------------------|--------------|
| Motor model | Driver model | Motor model | Driver model | Motor model | Driver model |
| ARM14SAK | ARD-KD | ARM14SBK | ARD-KD | ARM24SMK | ARD-KD |
| ARM14SA0K | | ARM14SB0K | | ARM24SM0K | |
| ARM15SAK | | ARM15SBK | | ARM26SMK | |
| ARM15SA0K | | ARM15SB0K | | ARM26SM0K | |
| ARM24SAK | | ARM24SBK | | ARM46SMK | |
| ARM24SA0K | | ARM24SB0K | | ARM46SM0K | |
| ARM26SAK | | ARM26SBK | | ARM46MK | |
| ARM26SA0K | | ARM26SB0K | | ARM66SMK | |
| ARM46SAK | | ARM46SBK | | ARM66SM0K | |
| ARM46SA0K | | ARM46SB0K | | ARM66MK | |
| ARM46AK | | ARM46BK | | ARM69SMK | |
| ARM66SAK | | ARM66SBK | | ARM69SM0K | |
| ARM66SA0K | | ARM66SB0K | | ARM69MK | |
| ARM66AK | | ARM66BK | | ARM98SMK | |
| ARM69SAK | | ARM69SBK | | ARM98SM0K | |
| ARM69SA0K | | ARM69SB0K | | ARM98MK | |
| ARM69AK | | ARM69BK | | | |
| ARM98SAK | | ARM98SBK | | | |
| ARM98SA0K | | ARM98SB0K | | | |
| ARM98AK | | ARM98BK | | | |

■ Geared type

- The box (●) in the model name indicates a number representing the gear ratio.
 - The box (◆) in the model name indicates **U** (upward direction), **L** (left direction), or **R** (right direction) representing the cable outlet direction.
- The box (◆) is blank when the cable outlet direction is downward.

| Type of gear | Single shaft | | With electromagnetic brake | |
|--------------|--------------|--------------|----------------------------|--------------|
| | Motor model | Driver model | Motor model | Driver model |
| TH geared | ARM24SAK-T● | ARD-KD | ARM24SMK-T● | ARD-KD |
| | ARM46SAK-T◆ | | ARM46SMK-T◆ | |
| | ARM46AK-T◆ | | ARM46MK-T◆ | |
| | ARM66SAK-T◆ | | ARM66SMK-T◆ | |
| | ARM66AK-T◆ | | ARM66MK-T◆ | |
| | ARM98SAK-T◆ | | ARM98SMK-T◆ | |
| | ARM98AK-T◆ | | ARM98MK-T◆ | |
| PS geared | ARM24SAK-PS● | ARD-KD | — | — |
| | ARM46SAK-PS● | | ARM46SMK-PS● | ARD-KD |
| | ARM46AK-PS● | | ARM46MK-PS● | |
| | ARM66SAK-PS● | | ARM66SMK-PS● | |
| | ARM66AK-PS● | | ARM66MK-PS● | |
| | ARM98SAK-PS● | | ARM98SMK-PS● | |
| | ARM98AK-PS● | | ARM98MK-PS● | |

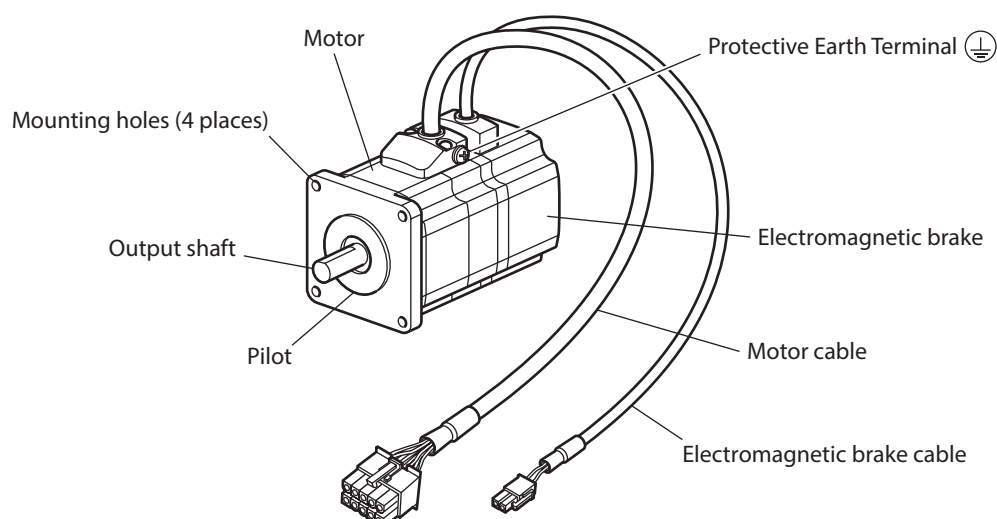
| Type of gear | Single shaft | | With electromagnetic brake | |
|-----------------|--------------|--------------|----------------------------|--------------|
| | Motor model | Driver model | Motor model | Driver model |
| PN geared | ARM24SAK-N● | ARD-KD | — | — |
| | ARM46SAK-N● | | ARM46SMK-N● | ARD-KD |
| | ARM46AK-N● | | ARM46MK-N● | |
| | ARM66SAK-N● | | ARM66SMK-N● | |
| | ARM66AK-N● | | ARM66MK-N● | |
| | ARM98SAK-N● | | ARM98SMK-N● | |
| | ARM98AK-N● | | ARM98MK-N● | |
| Harmonic geared | ARM24SAK-H● | ARD-KD | ARM24SMK-H● | ARD-KD |
| | ARM46SAK-H● | | ARM46SMK-H● | |
| | ARM46AK-H● | | ARM46MK-H● | |
| | ARM66SAK-H● | | ARM66SMK-H● | |
| | ARM66AK-H● | | ARM66MK-H● | |
| | ARM98SAK-H● | | ARM98SMK-H● | |
| | ARM98AK-H● | | ARM98MK-H● | |

2-5 Input/output power ratings

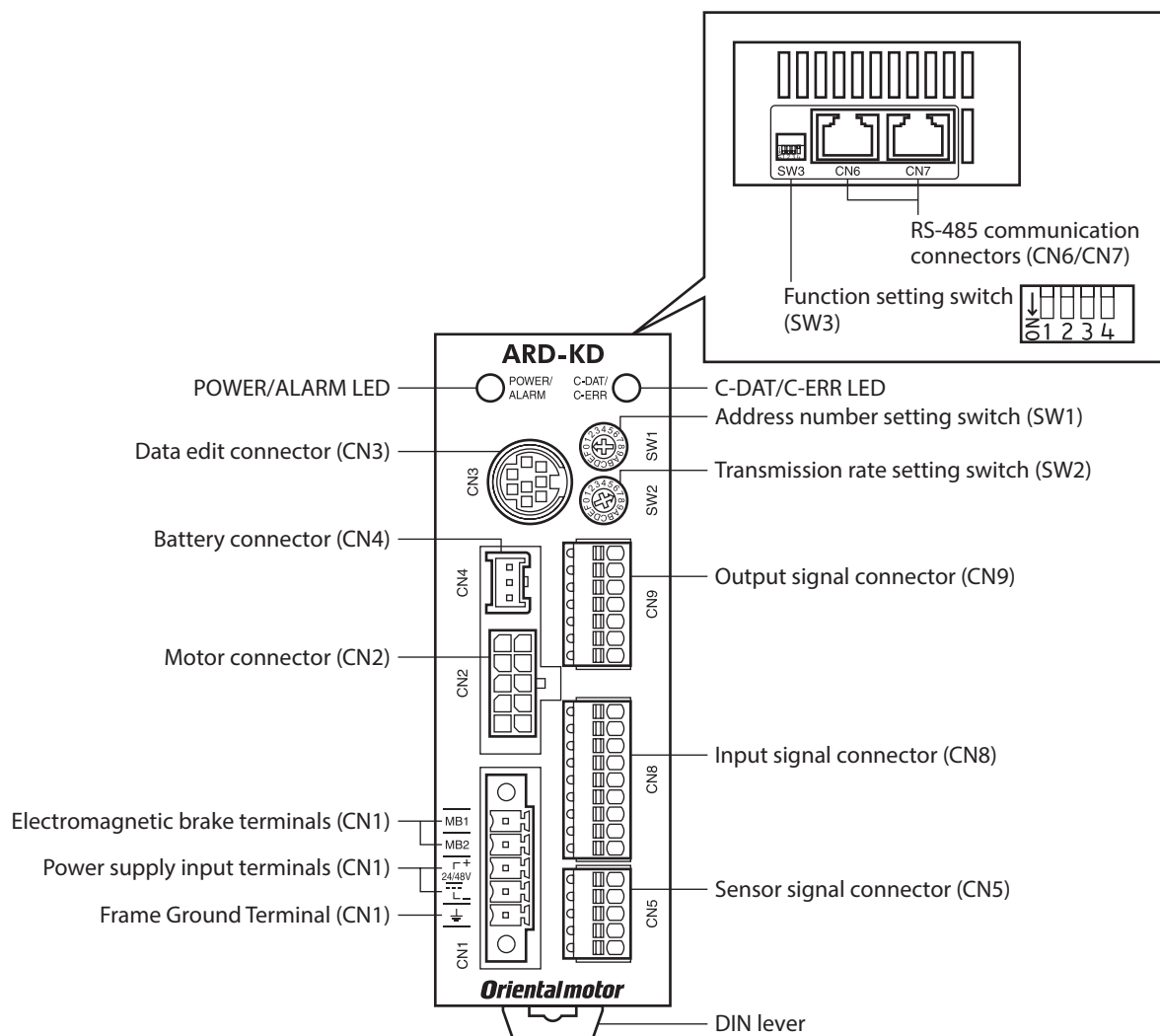
| Motor model | Driver model | Input | | Output current per phase |
|----------------|--------------|------------------|---------|--------------------------|
| | | Voltage | Current | |
| ARM14 | ARD-KD | 24 VDC | 0.4 A | 0.43 A |
| ARM15 | | | 0.5 A | 0.52 A |
| ARM24 ARM26 | | | 1.3 A | 0.88 A |
| ARM46 | | 24 VDC 48 VDC | 1.8 A | 1.48 A |
| ARM66 | | | 3.8 A | 2.55 A |
| ARM69 | | | 3.7 A | |
| ARM98 | | | 3.1 A | |

2-6 Names and functions of parts

■ Motor (Example: ARM66SMK)



■ Driver



| Name | Description | Page |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| POWER LED (Green) | This LED is lit while the power is input. | — |
| ALARM LED (Red) | This LED will blink if an alarm generates (a protective function is triggered). It is possible to check the generated alarm by counting the number of times the LED blinks. | p.145 |
| C-DAT LED (Green) | This LED blinks or is lit when the driver is communicating with the master controller properly via RS-485 communication. | — |
| C-ERR LED (Red) | This LED will be lit if a RS-485 communication error occurs with the master controller. | — |
| Address number setting switch (SW1) | This switch is used when controlling the system via RS-485 communication. Sets the address number (slave address) of RS-485 communication using this switch and SW3-No.1 of the function setting switch. Factory setting: 0 | p.215 p.216 p.262 |
| Transmission rate setting switch (SW2) | This switch is used when controlling the system via RS-485 communication. Sets the transmission rate of RS-485 communication. Factory setting: 7 | |

| Name | Description | Page |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Function setting switch (SW3) | <p>This switch is used when controlling the system via RS-485 communication.</p> <p>No.1: Sets the address number (slave address) using this switch and the address number setting switch (SW1). Factory setting: OFF</p> <p>No.2: Sets the protocol of RS-485 communication. Factory setting: OFF</p> <p>No.3: Not used.</p> <p>No.4: Sets the termination resistor (120 Ω) of RS-485 communication. Factory setting: OFF</p> | p.215 p.262 |
| Electromagnetic brake terminals (CN1-MB1/MB2) | <p>Connects the cable for electromagnetic brake.</p> <p>MB1: Electromagnetic brake – (black)</p> <p>MB2: Electromagnetic brake + (white)</p> | p.71 |
| Power supply input terminals (CN1) | <p>Connects the driver power supply.</p> <p>+: +24 VDC/48 VDC power supply input</p> <p>–: Power supply GND</p> | |
| Frame Ground Terminal (CN1) | Ground using a wire of AWG24 to 16 (0.2 to 1.25 mm ²). | p.70 |
| Motor connector (CN2) | Connects the motor. | p.69 |
| Data edit connector (CN3) | Connects a PC in which the MEXE02 has been installed, or the OPX-2A . | p.75 |
| Battery connector (CN4) | Connects our battery BAT01B . | p.76 |
| Sensor signal connector (CN5) | Connects the sensor signals. | p.72 |
| RS-485 communication connectors (CN6/CN7) | Connects the RS-485 communication cable. | p.75 |
| Input signal connector (CN8) | Connects the input signals. | p.72 |
| Output signal connector (CN9) | Connects the output signals. | |

3 Installation

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

3-1 Location for installation

The motor and driver are designed and manufactured to be incorporated in an equipment. Install them in a well-ventilated location that provides easy access for inspection.

The location must also satisfy the following conditions:

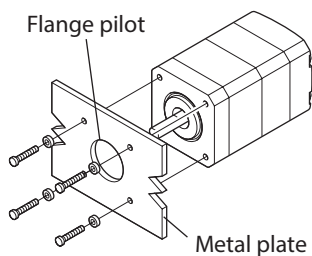
- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature
Motor: -10 to $+50$ °C ($+14$ to $+122$ °F) (non-freezing)
Harmonic geared type: 0 to $+40$ °C ($+32$ to $+104$ °F) (non-freezing)
Driver: 0 to $+50$ °C ($+32$ to $+122$ °F) (non-freezing)
- Operating ambient humidity 85 % or less (non-condensing)
- Area that is free of explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area not subject to splashing water (rain, water droplets), oil (oil droplets) or other liquids
- Area free of excessive salt
- Area not subject to continuous vibration or excessive shocks
- Area free of excessive electromagnetic noise (from welders, power machinery, etc.)
- Area free of radioactive materials, magnetic fields or vacuum
- 1,000 m (3,300 ft.) or lower above sea level

3-2 Installing the motor

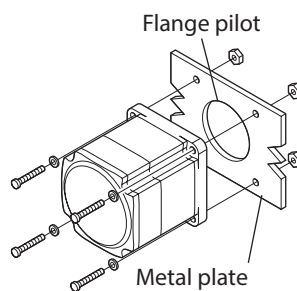
The motor can be installed in any direction.

To allow for heat dissipation and prevent vibration, install the motor on a metal surface of sufficient strength.

● Installation method A



● Installation method B



| Type | Frame size [mm (in.)] | Screw size | Tightening torque [N·m (oz-in)] | Effective depth of screw thread [mm (in.)] | Installation method |
|-----------|--------------------------|---------------|------------------------------------|-----------------------------------------------|------------------------|
| Standard | 20 (0.79) | M2 | 0.25 (35) | 2.5 (0.098) | A |
| | 28 (1.10) | M2.5 | 0.5 (71) | 2.5 (0.098) | |
| | 42 (1.65) | M3 | 1 (142) | 4.5 (0.177) | |
| | 60 (2.36) | M4 | 2 (280) | — | B |
| | 85 (3.35) | M6 | 3 (420) | | |
| TH geared | 28 (1.10) | M2.5 | 0.5 (71) | 4 (0.157) | A |
| | 42 (1.65) | M4 | 2 (280) | 8 (0.315) | |
| | 60 (2.36) | | | | |
| | 90 (3.54) | M8 | 4 (560) | 15 (0.591) | |

| Type | Frame size [mm (in.)] | Screw size | Tightening torque [N·m (oz-in)] | Effective depth of screw thread [mm (in.)] | Installation method |
|------------------------------------------------------------|--------------------------|---------------|------------------------------------|-----------------------------------------------|------------------------|
| PS geared PN geared Harmonic geared *1 | 28 (1.10) 30 (1.18) | M3 | 1 (142) | 6 (0.236) | A |
| | 42 (1.65) | M4 | 2 (280) | 8 (0.315) | |
| | 60 (2.36) | M5 | 2.5 (350) | 10 (0.394) | |
| | 90 (3.54) | M8 | 4 (560) | 15 (0.591) | |
| Harmonic geared *2 | 90 (3.54) | M8 | 4 (560) | — | B |

*1 **ARM24**, **ARM46** and **ARM66** type only.

*2 **ARM98** type only.

3-3 Installing a load

When connecting a load to the motor, align the centers of the motor output shaft and load shaft. Flexible couplings are also available in our products.

Note

- When coupling the load to the motor, pay attention to the centering of the shafts, belt tension, parallelism of the pulleys, and so on. Securely tighten the coupling and pulley set screws.
- Be careful not to damage the output shaft or bearings when installing a coupling or pulley to the motor output shaft.
- Do not modify or machine the motor output shaft. Doing so may damage the bearings and destroy the motor.
- Do not apply strong force using hammer or other tools when removing the parallel key. Doing so may damage the motor output shaft and bearings (ball bearings).

● Using a coupling

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

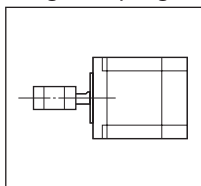
● Using a belt drive

Align the motor output shaft and load shaft in parallel with each other, and position both pulleys so that the line connecting their centers is at a right angle to the shafts.

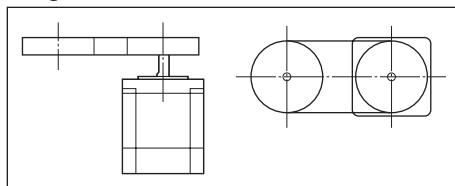
● Using a gear drive

Align the motor output shaft and gear shaft in parallel with each other, and let the gears mesh at the center of the tooth widths.

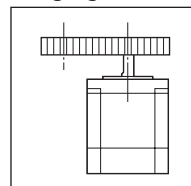
• Using a coupling



• Using a belt drive



• Using a gear drive

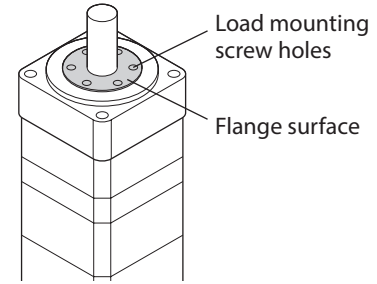


● Using a parallel key (geared motor)

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

● Harmonic geared type; Installing the load on the flange surface

With a Harmonic geared type (excluding **ARM98**), a load can be installed directly to the gear using the load mounting screw holes provided on the flange surface.



| Motor model | Screw size | Number of screw | Tightening torque [N·m (oz-in)] | Effective depth of screw thread [mm (in.)] |
|--------------|------------|-----------------|---------------------------------|--------------------------------------------|
| ARM24 | M3 | 4 | 1.4 (198) | 4 (0.157) |
| ARM46 | M3 | 6 | 1.4 (198) | 5 (0.197) |
| ARM66 | M4 | 6 | 2.5 (350) | 6 (0.236) |



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

3-4 Permissible radial load and permissible axial load



- If the radial load or axial load exceeds the specified allowable value, repeated load applications may cause the bearing (ball bearings) or output shaft of the motor to undergo a fatigue failure.
- With a double shaft type, do not apply load torque, radial load or axial load to the output shaft on the opposite side of the motor output shaft.



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

| Type | Motor model | Gear ratio | Permissible radial load [N (lb.)] | | | | | Permissible axial load [N (lb.)] |
|------------------|------------------------------|----------------|--------------------------------------------------------|-----------|-----------|-----------|-----------|----------------------------------|
| | | | Distance from the tip of motor output shaft [mm (in.)] | | | | | |
| | | | 0 (0) | 5 (0.2) | 10 (0.39) | 15 (0.59) | 20 (0.79) | |
| Standard | ARM14 ARM15 | — | 12 (2.7) | 15 (3.3) | — | — | — | 3 (0.67) |
| | ARM24 ARM26 | | 25 (5.6) | 34 (7.6) | 52 (11.7) | — | — | 5 (1.12) |
| | ARM46 | | 35 (7.8) | 44 (9.9) | 58 (13) | 85 (19.1) | — | 15 (3.3) |
| | ARM66 ARM69 | | 90 (20) | 100 (22) | 130 (29) | 180 (40) | 270 (60) | 30 (6.7) |
| | ARM98 | | 260 (58) | 290 (65) | 340 (76) | 390 (87) | 480 (108) | 60 (13.5) |
| TH geared | ARM24 | All gear ratio | 15 (3.3) | 17 (3.8) | 20 (4.5) | 23 (5.1) | — | 10 (2.2) |
| | ARM46 | | 10 (2.2) | 14 (3.1) | 20 (4.5) | 30 (6.7) | — | 15 (3.3) |
| | ARM66 | | 70 (15.7) | 80 (18) | 100 (22) | 120 (27) | 150 (33) | 40 (9) |
| | ARM98 | | 220 (49) | 250 (56) | 300 (67) | 350 (78) | 400 (90) | 100 (22) |
| PS geared | ARM24 | All gear ratio | 45 (10.1) | 60 (13.5) | 80 (18) | 100 (22) | — | 40 (9) |
| | ARM46 | 5 | 70 (15.7) | 80 (18) | 95 (21) | 120 (27) | — | 100 (22) |
| | | 7.2 | 80 (18) | 90 (20) | 110 (24) | 140 (31) | — | |
| | | 10 | 85 (19.1) | 100 (22) | 120 (27) | 150 (33) | — | |
| | | 25 | 120 (27) | 140 (31) | 170 (38) | 210 (47) | — | |
| | | 36 | 130 (29) | 160 (36) | 190 (42) | 240 (54) | — | |
| | | 50 | 150 (33) | 170 (38) | 210 (47) | 260 (58) | — | |

| Type | Motor model | Gear ratio | Permissible radial load [N (lb.)] | | | | | Permissible axial load [N (lb.)] |
|-----------------|-------------|----------------|--------------------------------------------------------|-------------|-------------|-------------|-------------|----------------------------------|
| | | | Distance from the tip of motor output shaft [mm (in.)] | | | | | |
| | | | 0 (0) | 5 (0.2) | 10 (0.39) | 15 (0.59) | 20 (0.79) | |
| PS geared | ARM66 | 5 | 170 (38) | 200 (45) | 230 (51) | 270 (60) | 320 (72) | 200 (45) |
| | | 7.2 | 200 (45) | 220 (49) | 260 (58) | 310 (69) | 370 (83) | |
| | | 10 | 220 (49) | 250 (56) | 290 (65) | 350 (78) | 410 (92) | |
| | | 25 | 300 (67) | 340 (76) | 400 (90) | 470 (105) | 560 (126) | |
| | | 36 | 340 (76) | 380 (85) | 450 (101) | 530 (119) | 630 (141) | |
| | | 50 | 380 (85) | 430 (96) | 500 (112) | 600 (135) | 700 (157) | |
| | ARM98 | 5 | 380 (85) | 420 (94) | 470 (105) | 540 (121) | 630 (141) | 600 (135) |
| | | 7.2 | 430 (96) | 470 (105) | 530 (119) | 610 (137) | 710 (159) | |
| | | 10 | 480 (108) | 530 (119) | 590 (132) | 680 (153) | 790 (177) | |
| | | 25 | 650 (146) | 720 (162) | 810 (182) | 920 (200) | 1,070 (240) | |
| | | 36 | 730 (164) | 810 (182) | 910 (200) | 1,040 (230) | 1,210 (270) | |
| | | 50 | 820 (184) | 910 (200) | 1,020 (220) | 1,160 (260) | 1,350 (300) | |
| PN geared | ARM24 | All gear ratio | 45 (10.1) | 60 (13.5) | 80 (18) | 100 (22) | – | 40 (9) |
| | ARM46 | 5 | 80 (18) | 95 (21) | 120 (27) | 160 (36) | – | 100 (22) |
| | | 7.2 | 90 (20) | 110 (24) | 130 (29) | 180 (40) | – | |
| | | 10 | 100 (22) | 120 (27) | 150 (33) | 200 (45) | – | |
| | ARM66 | 5 | 240 (54) | 260 (58) | 280 (63) | 300 (67) | 330 (74) | 200 (45) |
| | | 7.2 | 270 (60) | 290 (65) | 310 (69) | 340 (76) | 370 (83) | |
| | | 10 | 300 (67) | 320 (72) | 350 (78) | 380 (85) | 410 (92) | |
| | | 25 | 410 (92) | 440 (99) | 470 (105) | 520 (117) | 560 (126) | |
| | | 36 | 360 (81) | 410 (92) | 480 (108) | 570 (128) | 640 (144) | |
| | | 50 | 360 (81) | 410 (92) | 480 (108) | 570 (128) | 700 (157) | |
| | ARM98 | 5 | 370 (83) | 390 (87) | 410 (92) | 430 (96) | 460 (103) | 600 (135) |
| | | 7.2 | 410 (92) | 440 (99) | 460 (103) | 490 (110) | 520 (117) | |
| | | 10 | 460 (103) | 490 (110) | 520 (117) | 550 (123) | 580 (130) | |
| | | 25 | 630 (141) | 660 (148) | 700 (157) | 740 (166) | 790 (177) | |
| | | 36 | 710 (159) | 750 (168) | 790 (177) | 840 (189) | 900 (200) | |
| | | 50 | 790 (177) | 840 (189) | 890 (200) | 940 (210) | 1,000 (220) | |
| Harmonic geared | ARM24 | All gear ratio | 100 (22) | 135 (30) | 175 (39) | 250 (56) | – | 140 (31) |
| | ARM46 | | 180 (40) | 220 (49) | 270 (60) | 360 (81) | 510 (114) | 220 (49) |
| | ARM66 | | 320 (72) | 370 (83) | 440 (99) | 550 (123) | 720 (162) | 450 (101) |
| | ARM98 | | 1,090 (240) | 1,150 (250) | 1,230 (270) | 1,310 (290) | 1,410 (310) | 1,300 (290) |

■ **Permissible moment load of the Harmonic geared type**

If an eccentric load is applied on the flange surface when installing an arm or a table, do not exceed the permissible value shown in the table.

| Motor model | Permissible moment load (N·m) |
|--------------|-------------------------------|
| ARM24 | 2.9 |
| ARM46 | 5.6 |
| ARM66 | 11.6 |

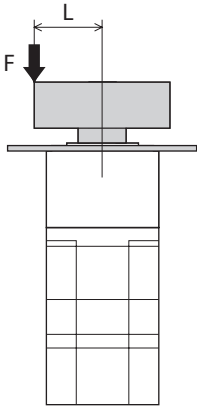
Calculate the moment load using the International System of Units (N, N·m).

- **Example 1; When an external force F is applied on the position of distance L from the center of the output flange**

L: Distance from the center of the output flange (m)

F: External force (N)

Moment load: $M \text{ (N·m)} = F \times L$



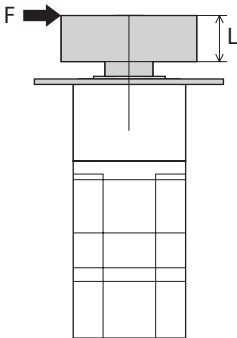
- **Example 2; When external forces F is applied on the position of distance L from the mounting face of the output flange**

L: Distance from the mounting face of the output flange (m)

F: External force (N)

Moment load: $M \text{ (N·m)} = F \times (L + \text{coefficient "a"})$

| Motor model | coefficient "a" |
|--------------|-----------------|
| ARM24 | 0.0073 |
| ARM46 | 0.009 |
| ARM66 | 0.0114 |



3-5 Installing the driver

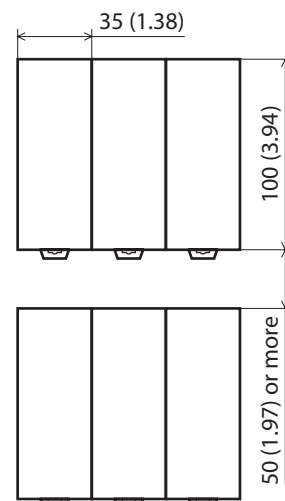
Mount the driver to a 35 mm (1.38 in.) width DIN rail.

When installing two or more drivers in parallel, it is possible to install them closely in the horizontal direction. Provide a minimum clearance of 50 mm (1.97 in.) in the vertical direction.

When installing three or more drivers closely, the heat generation of the inside drivers become high. Install the less frequently used drivers toward the inside. Use the "Overheat warning" parameter to check the inside temperature of the driver.

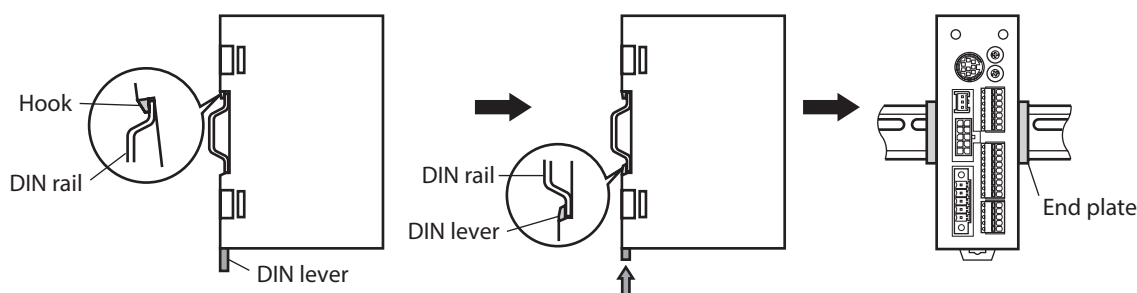


- Install the driver inside an enclosure whose pollution degree is 2 or better environment, or whose degree of protection is IP54 minimum.
- Do not install any equipment that generates a large amount of heat or noise near the driver.
- Do not install the driver underneath the controller or other equipment vulnerable to heat.
- If the ambient temperature of the driver exceeds 50 °C (122 °F), improve the ventilation condition.
- Be sure to install the driver vertically (vertical position).



Unit: mm (in.)

1. Pull down the DIN lever of the driver and lock it. Hang the hook at the rear to the DIN rail.
2. Hold the driver to the DIN rail, and push up the DIN lever to secure.
3. Secure both sides of the driver using end plates.

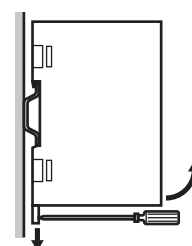


Removing from DIN rail

Pull the DIN lever down until it locks using a slotted screwdriver, and lift the bottom of the driver to remove it from the rail.

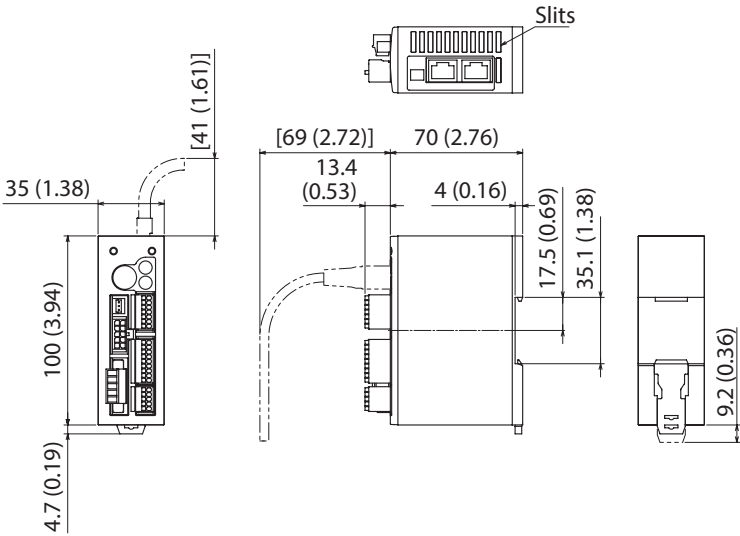
Use force of about 10 to 20 N (2.2 to 4.5 lb.) to pull the DIN lever to lock it.

Excessive force may damage the DIN lever.



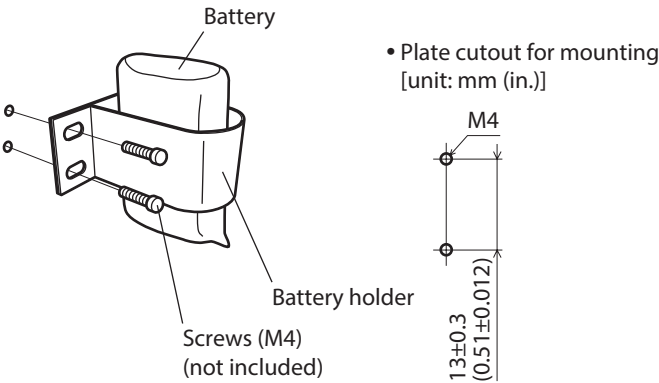
Dimension [unit: mm (in.)]

Mass: 0.17 kg (0.37 lb.)



3-6 Installing the battery

A battery and battery holder are included in our battery set **BAT01B**. Use the battery holder to secure the battery.



4 Connection

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

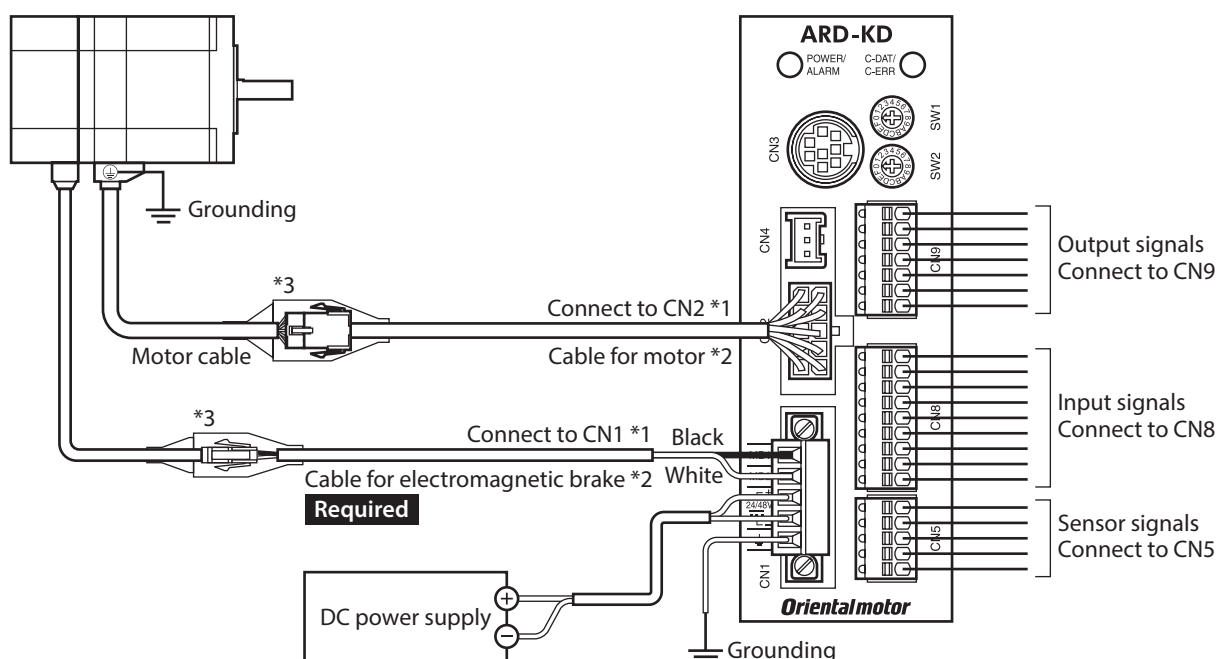


WARNING

For protection against electric shock, do not turn on the power supply until the wiring is completed.

4-1 Connection example

The figure shows the electromagnetic brake type motor.



*1 Keep 30 m (98.4 ft.) or less for the wiring distance between the motor and driver.

*2 These cables are provided as our products. Purchase them separately.

Use the cable for motor when the length of the motor cable is not enough.

*3 If connector covers are attached on cables, cover the connected connectors using them.

Note

- Connect the connectors securely. Insecure connector connection may cause malfunction or damage to the motor or driver.
- When connecting/disconnecting the connector, turn off the power and wait for the POWER LED to turn off before doing so.
- When connecting, check the silk screen of the driver and pay attention to the polarity of the power supply. Reverse-polarity connection may cause damage to the driver. The power-supply circuit and the RS-485 communication circuit are not insulated. Therefore, when controlling multiple drivers via RS-485 communication, the reverse polarity of the power supply will cause a short circuit and may result in damage to the drivers.
- Do not wire the power supply cable of the driver in the same cable duct with other power lines or motor cables. Doing so may cause malfunction due to noise.
- The lead wires of the "cable for electromagnetic brake" have polarities, so connect them in the correct polarities. If the lead wires are connected with their polarities reversed, the electromagnetic brake will not operate properly.

memo

- When disconnecting the connector, pull out while pressing the latches on the connector.
- When installing the motor on a moving part, use a flexible cable having excellent flex resistance. Refer to p.79 for the model name.

● Cable size and tightening torque

| Connector | Terminal symbol | Recommended cable size | Screw size | Tightening torque [N·m (oz·in)] |
|-----------|--------------------|----------------------------------------------------------|------------|---------------------------------|
| CN1 | 24/48V+ 24/48V– | Stranded wire AWG24 to 16 (0.2 to 1.25 mm ²) | M2 | 0.22 to 0.25 (31 to 35) |
| | MB1, MB2 | Stranded wire AWG20 (0.5 mm ²) | | |
| CN5 | – | Stranded wire AWG26 to 20 (0.14 to 0.5 mm ²) | – | – |
| CN8 | – | Stranded wire AWG26 to 20 (0.14 to 0.5 mm ²) | – | – |
| CN9 | – | Stranded wire AWG26 to 20 (0.14 to 0.5 mm ²) | – | – |

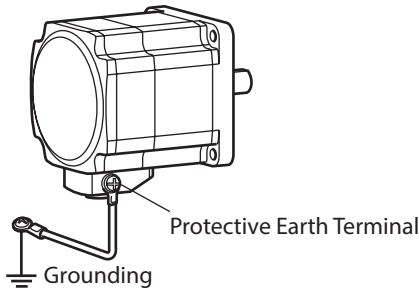
4-2 **Grounding the motor and driver**

■ **Grounding the motor**

Be sure to ground the Protective Earth Terminal of the motor. (It is not needed when the driver power supply voltage is 24 VDC.)

- Grounding wire: AWG18 (0.75 mm²) or more
- Screw size: M4
- Tightening torque: 1.2 N·m (170 oz·in)

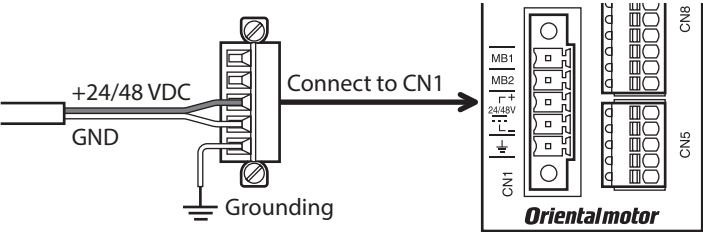
Use a round terminal when grounding, and secure it with a mounting screw with a washer. Ground wires and crimp terminals are not included.



■ **Grounding the driver**

Ground the Frame Ground Terminal (CN1) as necessary.

Use a grounding wire of AWG24 to 16 (0.2 to 1.25 mm²), and do not share the Frame Ground Terminal with a welder or any other power equipment.

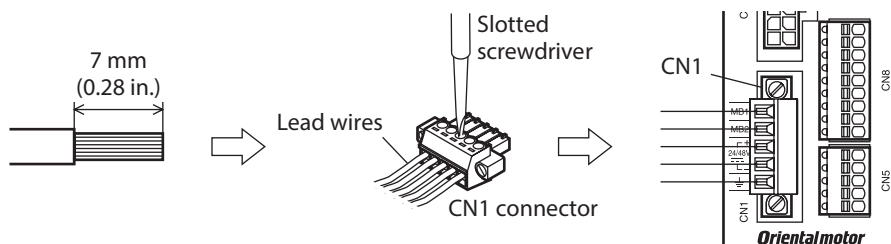


4-3 Connecting the power supply and electromagnetic brake

Use the CN1 connector (5 pins) to connect the power supply and electromagnetic brake

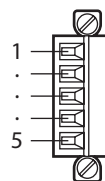
■ Connecting method

1. Strip the insulation cover of the lead wire (AWG24 to 16: 0.2 to 1.25 mm²) by 7 mm (0.28 in.)
2. Insert each lead wire into the CN1 connector and tighten the screw with a slotted screwdriver.
Connector screw size: M2
Tightening torque: 0.22 to 0.25 N·m (31 to 35 oz·in)
3. Insert the CN1 connector into the CN1, and tighten the screw.
Connector screw size: M2.5
Tightening torque: 0.4 N·m (56 oz·in)



Pin assignment

| Pin No. | Signal name | Description |
|---------|-------------|----------------------------------|
| 1 | MB1 | Electromagnetic brake – (Black) |
| 2 | MB2 | Electromagnetic brake + (White) |
| 3 | + | 24 VDC/48 VDC power supply input |
| 4 | – | Power supply ground |
| 5 | FG | Frame ground |



■ Power supply current capacity

The current capacity of the power supply varies depending on the product to be combined. When motorized actuators are used, check while referring to the model name of the equipped motor. In the case of the **DGII** Series, check the current capacity of a main power supply with the **DGII** Series OPERATING MANUAL Actuator Edition.

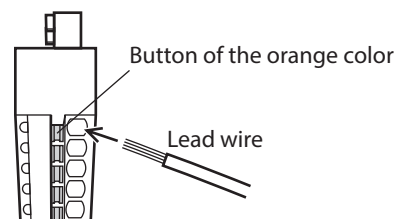
| Motor model | Input power supply voltage | Power supply current capacity | |
|------------------------------|----------------------------|-------------------------------|----------------------------|
| | | Without electromagnetic brake | With electromagnetic brake |
| ARM14 | 24 VDC±5 % * | 0.4 A or more | – |
| ARM15 | | 0.5 A or more | – |
| ARM24 ARM26 | | 1.25 A or more | 1.3 A or more |
| ARM46 | 24 VDC±5 % * 48 VDC±5 % | 1.72 A or more | 1.8 A or more |
| ARM66 | | 3.55 A or more | 3.8 A or more |
| ARM69 | | 3.45 A or more | 3.7 A or more |
| ARM98 | | 2.85 A or more | 3.1 A or more |

* If the distance between the motor and driver is extended to 20 to 30 m (65.6 to 98.4 ft.), use a power supply of 24 VDC±4 %.

4-4 Connecting the I/O signals

■ Wiring method

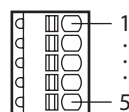
- Applicable lead wire: AWG26 to 20 (0.14 to 0.5 mm²)
 - Stripping length of wire insulation: 8 mm (0.31 in.)
1. Strip the insulation cover of the lead wire.
 2. Insert the lead wire while pushing the button of the orange color on the connector with a slotted screwdriver.
 3. After having inserted, release the button to secure the lead wire.



■ Pin assignment

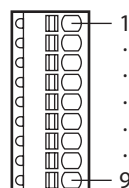
● Sensor signals (CN5)

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



● Input signals (CN8)

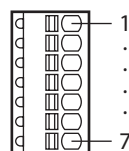
| Pin No. | Signal name | Description * |
|---------|-------------|---------------------------|
| 1 | IN0 | Control input 0 (HOME) |
| 2 | IN1 | Control input 1 (START) |
| 3 | IN2 | Control input 2 (M0) |
| 4 | IN3 | Control input 3 (M1) |
| 5 | IN4 | Control input 4 (M2) |
| 6 | IN5 | Control input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



* (): Initial value

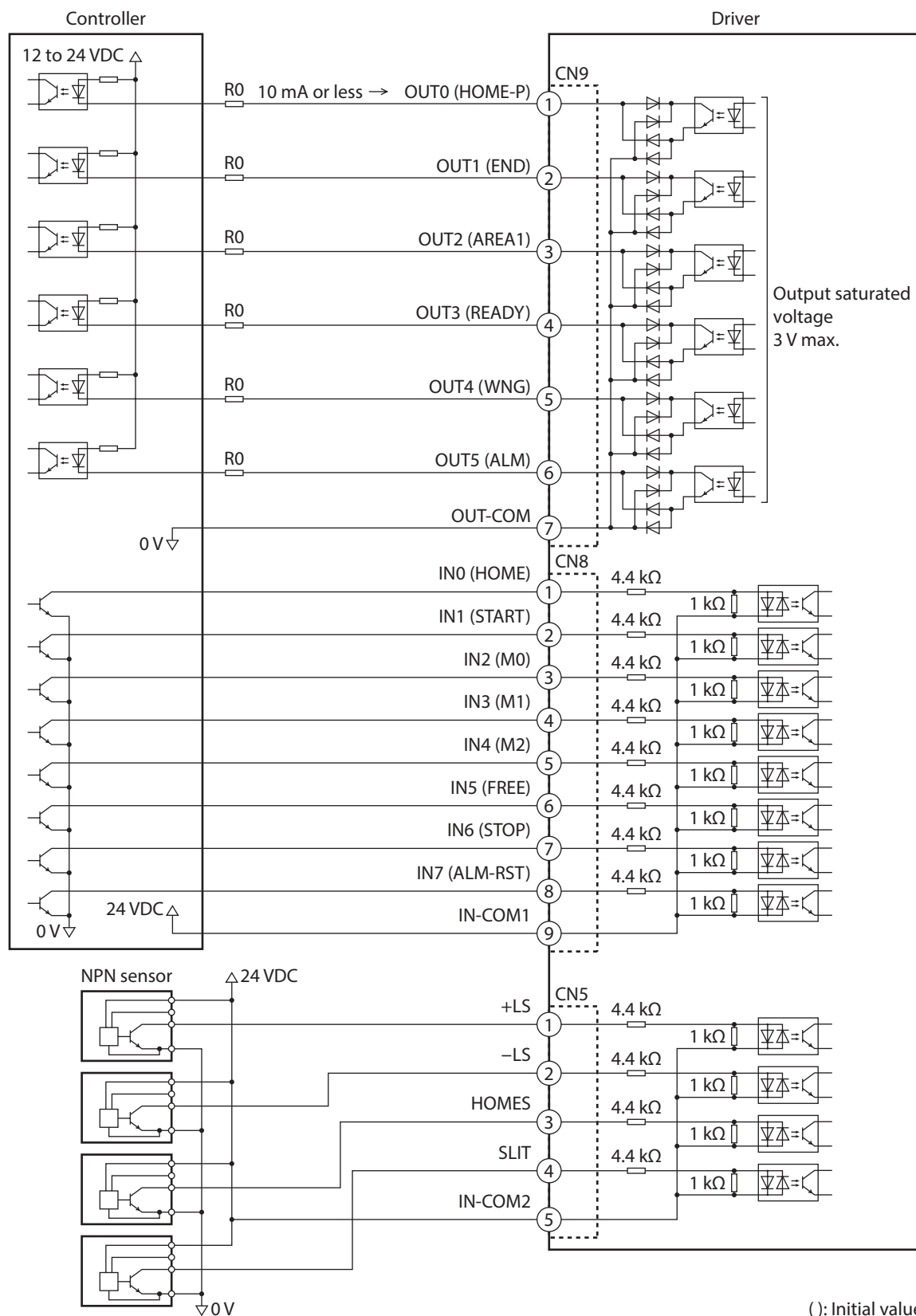
● Output signals (CN9)

| Pin No. | Signal name | Description * |
|---------|-------------|---------------------------|
| 1 | OUT0 | Control output 0 (HOME-P) |
| 2 | OUT1 | Control output 1 (END) |
| 3 | OUT2 | Control output 2 (AREA1) |
| 4 | OUT3 | Control output 3 (READY) |
| 5 | OUT4 | Control output 4 (WNG) |
| 6 | OUT5 | Control output 5 (ALM) |
| 7 | OUT-COM | Output signals common |



* (): Initial value

■ Connection example with a current sink output circuit (NPN specifications)

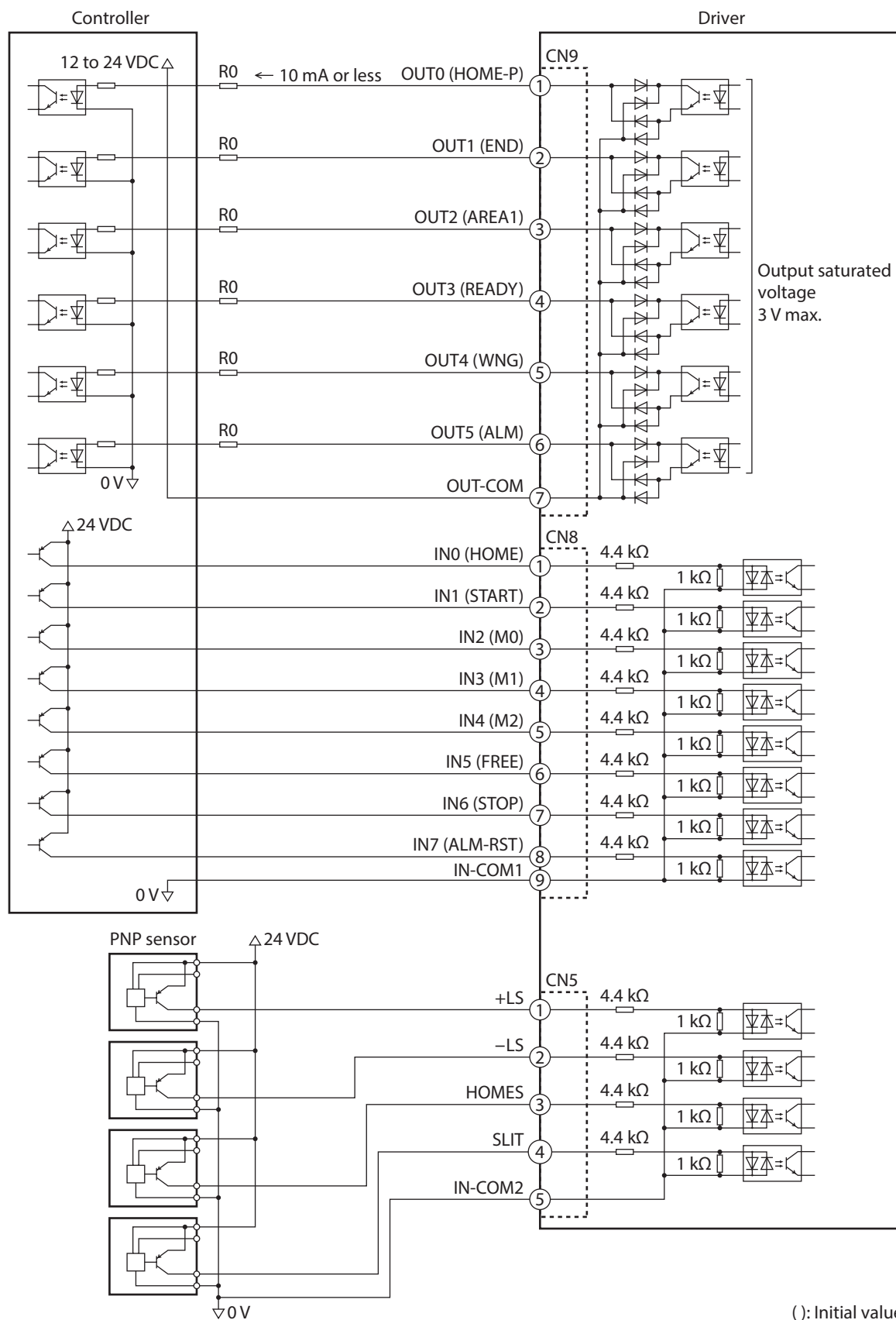


(): Initial value

memo

- Use input signals at 24 VDC.
- Use output signals at 12 to 24 VDC 10 mA or less. If the current exceeds 10 mA, connect an external resistor R0 so that the current becomes 10 mA or less.
- The saturated voltage of the output signal is 3 VDC maximum.

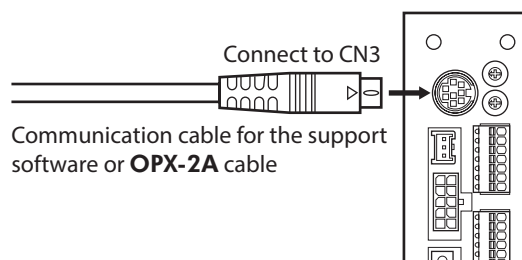
■ Connection example with a current source output circuit (PNP specifications)



- Use input signals at 24 VDC.
- Use output signals at 12 to 24 VDC 10 mA or less. If the current exceeds 10 mA, connect an external resistor R0 so that the current becomes 10 mA or less.
- The saturated voltage of the output signal is 3 VDC maximum.

4-5 Connecting the data setter

Connect the communication cable for the support software or **OPX-2A** cable to the data edit connector (CN3) on the driver.

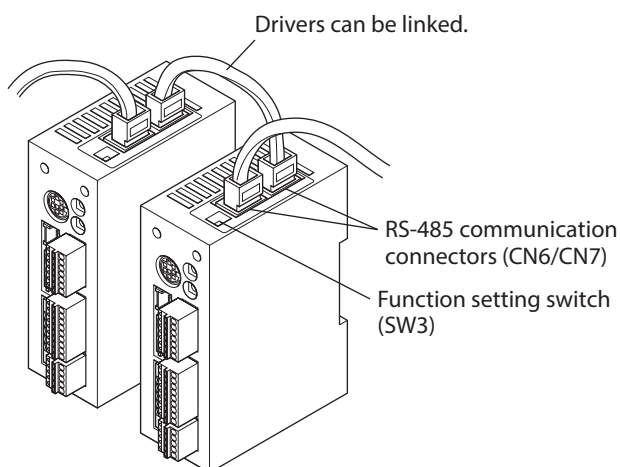


⚠ CAUTION

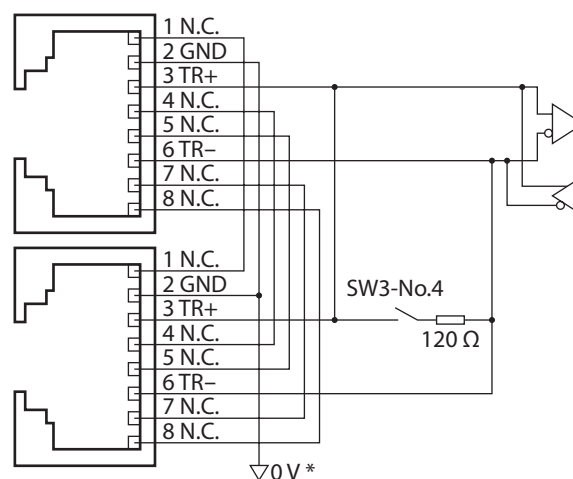
The power supply connector (CN1), data edit connector (CN3), and RS-485 communication connectors (CN6/CN7) of the driver are not insulated. When grounding the positive terminal of the power supply, do not connect any equipment (PC, etc.) whose negative terminal is grounded. Doing so may cause the driver and these equipment to short, damaging both.

4-6 Connecting the RS-485 communication cable

Connect this cable if you want to control your product via RS-485 communication. Connect the RS-485 communication cable to CN6 or CN7 on the driver. You can use the vacant connectors to connect a different driver. A driver link cable is also available in our products. Refer to p.82 for the model name. You can also use a commercial LAN cable (straight cable) to link drivers.



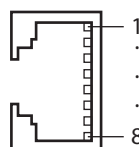
• Internal input circuit



* The GND line is used in common with CN1 (not insulated).

CN6/CN7 pin assignment

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

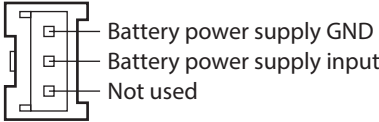


4-7 Connecting and charging the battery

Connect our battery **BAT01B** when using in the absolute-position backup system.

When the battery is connected to the battery connector (CN4) of the driver and the 24 VDC power is turned on, the battery will start charging. It takes approximately 32 hours to fully charge the battery [at an ambient temperature of 20 °C (68 °F)].

Refer to p.166 for setting method of the absolute-position backup system.



Battery specifications

| | |
|-----------------------|-------------------------------------------------------|
| Battery type | Sealed nickel-metal hydride battery |
| Nominal voltage | 2.4 V |
| Rated capacity | 1,900 mAh |
| Mass | 0.10 kg (3.5 oz) |
| Expected life | Approximately 4 years *1 |
| Charging time | 32 hours *1 |
| Data retention period | Approximately 360 hours (Approximately 15 days) *1 *2 |
| Ambient temperature | 0 to +40 °C (+32 to +104 °F) (non-freezing) |
| Ambient humidity | 45 to 85 % (non-condensing) |

*1 At an ambient temperature of 20 °C (68 °F)

*2 After the power is cut off with the battery fully charged.

4-8 Noise measures

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

Measures against electrical noise

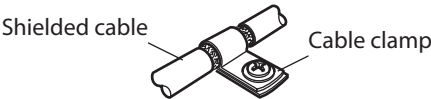
There are the following three methods mainly to take measures against the electrical noise.

Noise suppression

- When relays or electromagnetic switches are used together with the system, use noise filters and CR circuits to suppress surges generated by them.
- Use our connection cable or extension cable when extending a wiring distance between the motor and driver. Refer to p.79 for the model name.
- Cover the driver by a metal plate such as aluminum. This is effective in shielding the electrical noise emitted from the driver.

Prevention of noise propagation

- Connect a noise filter in the power supply cable of driver.
- Place the power lines, such as the motor and power supply cables, keeping a distance of 200 mm (7.87 in.) or more from the signal lines, and also do not bundle them or wire them in parallel. If the power cables and signal cables have to cross, cross them at a right angle.
- Use shielded twisted pair cables for power lines and signal lines.
- Keep cables as short as possible without coiling and bundling extra lengths.
- Grounding multiple points will increase effect to block electrical noise because impedance on the grounding points is decreased. However, ground them so that a potential difference does not occur among the grounding points. I/O signal cables that include a ground wire are provided in our product line. Refer to p.82 for the model name.
- To ground a shielded cable, use a metal cable clamp that will maintain contact with the entire circumference of the cable. Ground the cable clamp near the product.



● Suppression of effect by noise propagation

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

■ Noise suppression parts

● Noise filter

- Connect the following noise filter (or equivalent) to the DC power line. When using a power supply transformer, be sure to connect a noise filter to the AC input side of the power supply transformer. Doing so will prevent the propagated noise through the power line. Install the noise filter as close to the driver as possible.

| Manufacture | Model |
|---------------------------|--------------|
| SOSHIN ELECTRIC CO., LTD. | HF2010A-UPF |
| Schaffner EMC | FN2070-10-06 |

- Use the AWG18 (0.75 mm²) or thicker wire for the input and output cables of the noise filter, and secure firmly using a cable clamp etc. so that the cable does not come off the enclosure.
- Place the input cable as far apart as possible from the output cable, and do not wire the cables in parallel. If the input and output cable are placed at a close distance or if they are wired in parallel, the noise inside the enclosure affects the power cable through stray capacitance, and the noise suppressing effect will reduce.
- Connect the ground terminal of the noise filter to the grounding point, using as thick and short a wire as possible.
- When connecting a noise filter inside an enclosure, wire the input cable of the noise filter as short as possible. Wiring in long distance may reduce the noise suppressing effect.

■ Our noise suppression parts

Refer to p.82 for the model name.

● I/O signal cable

This cable is a shielded twisted pair cable for good noise immunity to connect the driver and controller. The ground wires useful to grounding are provided at both ends of the cable. The EMC measures are conducted using the Oriental Motor I/O signal cable.

● Surge suppressor

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

4-9 Conformity to the EMC Directive

Effective measures must be taken against the EMI that the motor and driver may give to adjacent control-system equipment, as well as the EMS of the motor and driver itself, in order to prevent a serious functional impediment in the machinery. The use of the following installation and wiring methods will enable the motor and driver to be compliant with the EMC Directive. Refer to p.325 for the applicable standards.

Oriental Motor conducts EMC measurements on its motors and drivers in accordance with "Example of installation and wiring" on p.78.

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

● Connecting noise filter

In large electrically noisy environments, connect a noise filter. Refer to "Noise filter" in the above.

● Connecting the power supply

Use a DC power supply that conforms to the EMC Directive.

Use a shielded twisted pair cable for wiring. Refer to "Prevention of noise propagation" on p.76 for wiring method.

● Connecting the motor cable

Use our connection cable or extension cable when extending the wiring distance between the motor and driver. Refer to p.79 for the model name.

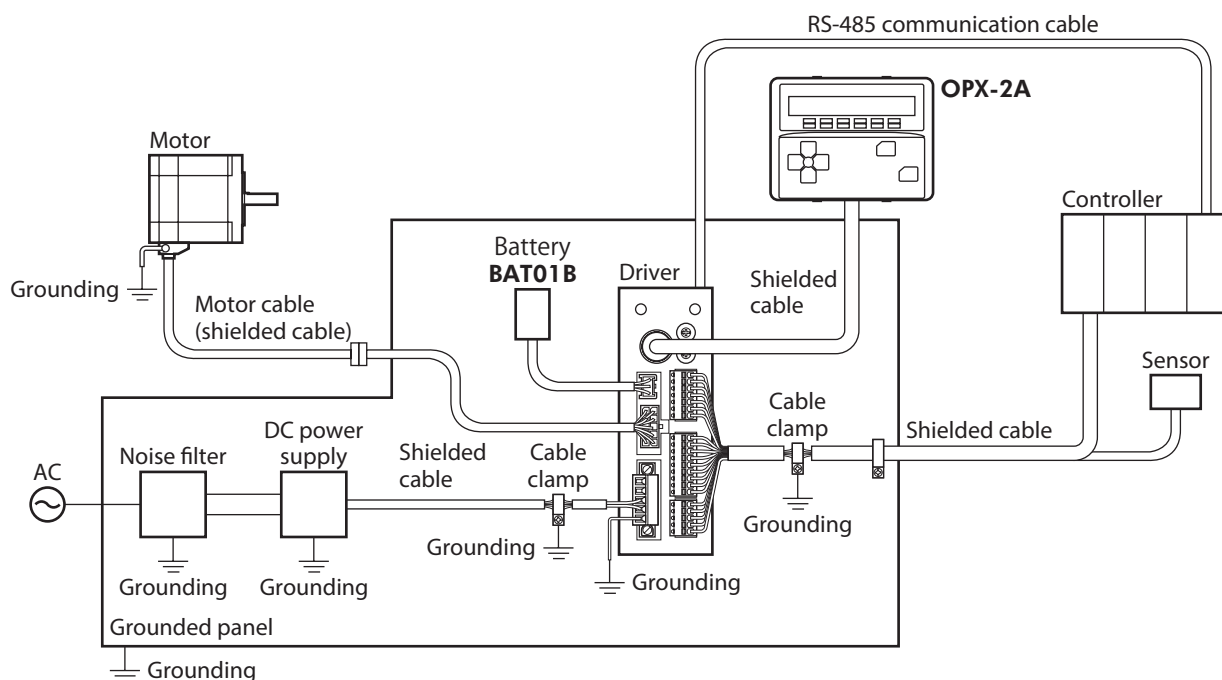
● Connecting the signal cable

Refer to "Prevention of noise propagation" on p.76.

● How to ground

- The cable used to ground the motor, driver and noise filter must be as thick and short as possible so that no potential difference is generated.
- Choose a large, thick and uniformly conductive surface for the grounding point.
- Be sure to ground the Protective Earth Terminal of the motor and driver. Refer to p.70 for grounding method.

● Example of installation and wiring



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

5 Cables

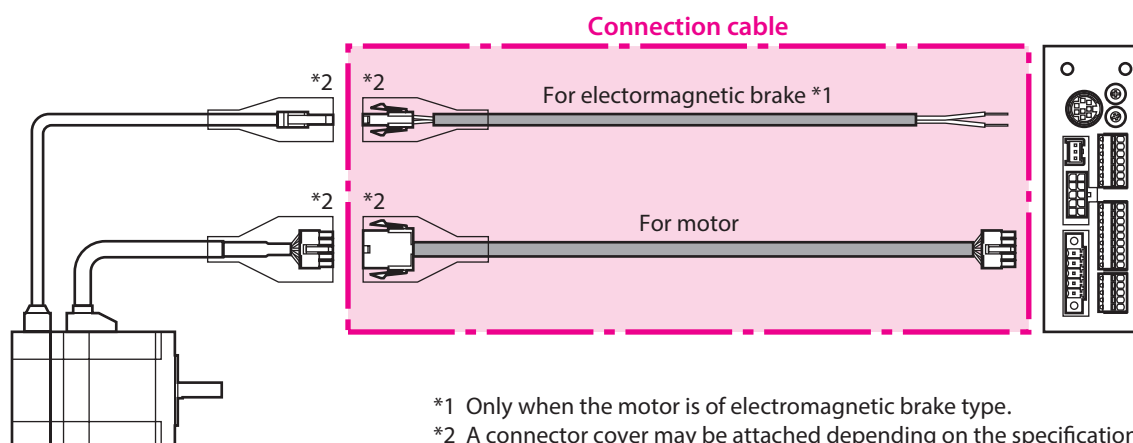


When installing the motor on a moving part, use a flexible cable having excellent flex resistance.

5-1 Connection cable set

Use when connecting a motor and a driver.

The cable set for electromagnetic brake motors consists of two cables, one for motor and the other for electromagnetic brake.



● Connection cable set model

| Length [m (ft.)] | For standard type motor | | For electromagnetic brake type motor | |
|---------------------|-------------------------|----------------------|--------------------------------------|----------------------|
| | Without connector cover | With connector cover | Without connector cover | With connector cover |
| 0.5 (1.6) | CC005VA2F2 | — | CC005VA2FB2 | — |
| 1 (3.3) | CC010VA2F2 | CC010VAF2 | CC010VA2FB2 | CC010VAFB2 |
| 1.5 (4.9) | CC015VA2F2 | — | CC015VA2FB2 | — |
| 2 (6.6) | CC020VA2F2 | CC020VAF2 | CC020VA2FB2 | CC020VAFB2 |
| 2.5 (8.2) | CC025VA2F2 | — | CC025VA2FB2 | — |
| 3 (9.8) | CC030VA2F2 | CC030VAF2 | CC030VA2FB2 | CC030VAFB2 |
| 4 (13.1) | CC040VA2F2 | — | CC040VA2FB2 | — |
| 5 (16.4) | CC050VA2F2 | CC050VAF2 | CC050VA2FB2 | CC050VAFB2 |
| 7 (23) | CC070VA2F2 | CC070VAF2 | CC070VA2FB2 | CC070VAFB2 |
| 10 (32.8) | CC100VA2F2 | CC100VAF2 | CC100VA2FB2 | CC100VAFB2 |
| 15 (49.2) | CC150VA2F2 | CC150VAF2 | CC150VA2FB2 | CC150VAFB2 |
| 20 (65.6) | CC200VA2F2 | CC200VAF2 | CC200VA2FB2 | CC200VAFB2 |
| 30 (98.4) | CC300VA2F2 | CC300VAF2 | CC300VA2FB2 | CC300VAFB2 |

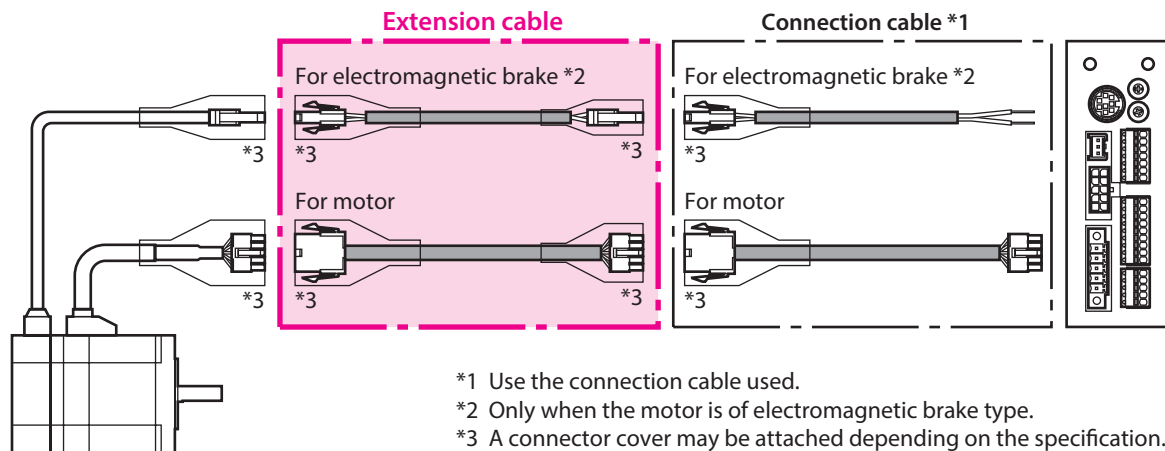
● Flexible connection cable set model

| Length [m (ft.)] | For standard type motor | | For electromagnetic brake type motor | |
|---------------------|-------------------------|----------------------|--------------------------------------|----------------------|
| | Without connector cover | With connector cover | Without connector cover | With connector cover |
| 0.5 (1.6) | CC005VA2R2 | — | CC005VA2RB2 | — |
| 1 (3.3) | CC010VA2R2 | CC010VAR2 | CC010VA2RB2 | CC010VARB2 |
| 1.5 (4.9) | CC015VA2R2 | — | CC015VA2RB2 | — |
| 2 (6.6) | CC020VA2R2 | CC020VAR2 | CC020VA2RB2 | CC020VARB2 |
| 2.5 (8.2) | CC025VA2R2 | — | CC025VA2RB2 | — |
| 3 (9.8) | CC030VA2R2 | CC030VAR2 | CC030VA2RB2 | CC030VARB2 |
| 4 (13.1) | CC040VA2R2 | — | CC040VA2RB2 | — |
| 5 (16.4) | CC050VA2R2 | CC050VAR2 | CC050VA2RB2 | CC050VARB2 |
| 7 (23) | CC070VA2R2 | CC070VAR2 | CC070VA2RB2 | CC070VARB2 |
| 10 (32.8) | CC100VA2R2 | CC100VAR2 | CC100VA2RB2 | CC100VARB2 |
| 15 (49.2) | CC150VA2R2 | CC150VAR2 | CC150VA2RB2 | CC150VARB2 |
| 20 (65.6) | CC200VA2R2 | CC200VAR2 | CC200VA2RB2 | CC200VARB2 |
| 30 (98.4) | CC300VA2R2 | CC300VAR2 | CC300VA2RB2 | CC300VARB2 |

5-2 Extension cable set

Use when extending the distance between a motor and a driver or when the length of the connection cable used is not enough. Extend the distance by connecting the extension cable to the connection cable.

The cable set for electromagnetic brake motors consists of two cables, one for motor and the other for electromagnetic brake.



When extending the wiring length by connecting an extension cable to the connection cable, keep the total cable length to 30 m (98.4 ft.) or less.

● Extension cable set model

| Length [m (ft.)] | For standard type motor | | For electromagnetic brake type motor | |
|---------------------|-------------------------|----------------------|--------------------------------------|----------------------|
| | Without connector cover | With connector cover | Without connector cover | With connector cover |
| 0.5 (1.6) | CC005VA2F2 | – | CC005VA2FBT2 | – |
| 1 (3.3) | CC010VA2F2 | CC010VAFT2 | CC010VA2FBT2 | CC010VAFBT2 |
| 1.5 (4.9) | CC015VA2F2 | – | CC015VA2FBT2 | – |
| 2 (6.6) | CC020VA2F2 | CC020VAFT2 | CC020VA2FBT2 | CC020VAFBT2 |
| 2.5 (8.2) | CC025VA2F2 | – | CC025VA2FBT2 | – |
| 3 (9.8) | CC030VA2F2 | CC030VAFT2 | CC030VA2FBT2 | CC030VAFBT2 |
| 4 (13.1) | CC040VA2F2 | – | CC040VA2FBT2 | – |
| 5 (16.4) | CC050VA2F2 | CC050VAFT2 | CC050VA2FBT2 | CC050VAFBT2 |
| 7 (23) | CC070VA2F2 | CC070VAFT2 | CC070VA2FBT2 | CC070VAFBT2 |
| 10 (32.8) | CC100VA2F2 | CC100VAFT2 | CC100VA2FBT2 | CC100VAFBT2 |
| 15 (49.2) | CC150VA2F2 | CC150VAFT2 | CC150VA2FBT2 | CC150VAFBT2 |
| 20 (65.6) | CC200VA2F2 | CC200VAFT2 | CC200VA2FBT2 | CC200VAFBT2 |

● Flexible extension cable set model

| Length [m (ft.)] | For standard type motor | | For electromagnetic brake type motor | |
|---------------------|-------------------------|----------------------|--------------------------------------|----------------------|
| | Without connector cover | With connector cover | Without connector cover | With connector cover |
| 0.5 (1.6) | CC005VA2R2 | – | CC005VA2RBT2 | – |
| 1 (3.3) | CC010VA2R2 | CC010VART2 | CC010VA2RBT2 | CC010VARBT2 |
| 1.5 (4.9) | CC015VA2R2 | – | CC015VA2RBT2 | – |
| 2 (6.6) | CC020VA2R2 | CC020VART2 | CC020VA2RBT2 | CC020VARBT2 |
| 2.5 (8.2) | CC025VA2R2 | – | CC025VA2RBT2 | – |
| 3 (9.8) | CC030VA2R2 | CC030VART2 | CC030VA2RBT2 | CC030VARBT2 |
| 4 (13.1) | CC040VA2R2 | – | CC040VA2RBT2 | – |
| 5 (16.4) | CC050VA2R2 | CC050VART2 | CC050VA2RBT2 | CC050VARBT2 |
| 7 (23) | CC070VA2R2 | CC070VART2 | CC070VA2RBT2 | CC070VARBT2 |
| 10 (32.8) | CC100VA2R2 | CC100VART2 | CC100VA2RBT2 | CC100VARBT2 |
| 15 (49.2) | CC150VA2R2 | CC150VART2 | CC150VA2RBT2 | CC150VARBT2 |
| 20 (65.6) | CC200VA2R2 | CC200VART2 | CC200VA2RBT2 | CC200VARBT2 |

6 Accessories

6-1 Setting tool

■ Communication cable for the support software

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

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

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

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

■ Data setter

The data setter lets you set operation data and parameters for your **AR** Series with ease and also functions as a monitor.

Model: **OPX-2A**

6-2 Wiring support tool

■ RS-485 communication cable

You can link drivers using this cable connected to the RS-485 communication connectors (CN6, CN7).

Model: **CC001-RS4** [0.1 m (0.3 ft.)]

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

■ I/O signal cable

A shielded cable for driver control I/O signals offering excellent noise resistance. The ground wires useful to grounding are provided at both ends of the cable.

Select the cable suitable for the number of I/O signals connected.

General-purpose type

| Cable length [m (ft.)] | Number of lead wire | | | |
|---------------------------|---------------------|--------------------|--------------------|--------------------|
| | 6 pcs. | 10 pcs. | 12 pcs. | 16 pcs. |
| 0.5 (1.6) | CC06D005B-1 | CC10D005B-1 | CC12D005B-1 | CC16D005B-1 |
| 1 (3.3) | CC06D010B-1 | CC10D010B-1 | CC12D010B-1 | CC16D010B-1 |
| 1.5 (4.9) | CC06D015B-1 | CC10D015B-1 | CC12D015B-1 | CC16D015B-1 |
| 2 (6.6) | CC06D020B-1 | CC10D020B-1 | CC12D020B-1 | CC16D020B-1 |

■ CR circuit for surge suppression

This product is effective to suppress the surge which occurs in a relay contact part. Use it to protect the contacts of the relay or switch.

Model: **EPCR1201-2**

■ CR circuit module

This product is effective to suppress the surge which occurs in a relay contact part. Use this product to protect the contacts of the relay or switch.

Four pieces of CR circuit for surge suppression are mounted on the compact circuit, and this product can be installed to the DIN rail. This product can make the wiring easily and securely since it also supports terminal block connection.

Model: **VCS02**

6-3 Others

■ Battery set

This is a battery set (including a battery and battery holder) required in the absolute-position backup system.

Model: **BAT01B**

4 AC power input type/ DC power input type Common

This part explains common contents to the AR Series AC power input type and DC power input type.

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1 Explanation of I/O signals

In this manual, I/O signals are described as follows.

- Direct I/O: I/O signals accessed via input signal connector (CN8) and output signal connector (CN9)
- Remote I/O: I/O signals accessed via RS-485 communication

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

1-1 Assignment of direct I/O

■ Assignment to the input terminals

The input signals shown below can be assigned to the input terminals IN0 to IN7 of CN8 by setting parameters. For details on input signals, refer to p.94.

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

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

| Assignment No. | Signal name | Function |
|----------------|-------------|---------------------------------------------------------------------------------------------|
| 0 | No function | Set when the input terminal is not used. |
| 1 | FWD | Execute continuous operation in the positive direction. |
| 2 | RVS | Execute continuous operation in the negative direction. |
| 3 | HOME | Execute return-to-home operation. |
| 4 | START | Execute positioning operation. |
| 5 | SSTART | Execute sequential positioning operation. |
| 6 | +JOG | Execute JOG operation in the positive direction. |
| 7 | –JOG | Execute JOG operation in the negative direction. |
| 8 | MS0 | Execute direct positioning operation. |
| 9 | MS1 | |
| 10 | MS2 | |
| 11 | MS3 | |
| 12 | MS4 | |
| 13 | MS5 | |
| 16 | FREE | Stop the motor excitation and release the electromagnetic brake. |
| 17 | C-ON | Switch the motor excitation between excitation and non-excitation. |
| 18 | STOP | Stop of the motor operation. |
| 24 | ALM-RST | Reset the current alarm. |
| 25 | P-PRESET | Execute position preset. |
| 26 | P-CLR | Reset the absolute position error alarm. |
| 27 | HMI | Release of the function limitation of the MEXE02 or OPX-2A . |
| 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 | |

| Assignment No. | Signal name | Function |
|----------------|-------------|---------------------------------------------------------------------------------------------|
| 39 | R7 | General signals. Use these signals when controlling the system via RS-485 communication. |
| 40 | R8 | |
| 41 | R9 | |
| 42 | R10 | |
| 43 | R11 | |
| 44 | R12 | |
| 45 | R13 | |
| 46 | R14 | |
| 47 | R15 | |
| 48 | M0 | Select the operation data No. using these six bits. |
| 49 | M1 | |
| 50 | M2 | |
| 51 | M3 | |
| 52 | M4 | |
| 53 | M5 | |

Related parameter

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

| | | | | | |
|----------------|----------|--------------|---------|---------|--------|
| 0: No function | 8: MS0 | 18: STOP | 35: R3 | 43: R11 | 51: M3 |
| 1: FWD | 9: MS1 | 24: ALM-RST | 36: R4 | 44: R12 | 52: M4 |
| 2: RVS | 10: MS2 | 25: P-PRESET | 37: R5 | 45: R13 | 53: M5 |
| 3: HOME | 11: MS3 | 26: P-CLR | 38: R6 | 46: R14 | |
| 4: START | 12: MS4 | 27: HMI | 39: R7 | 47: R15 | |
| 5: SSTART | 13: MS5 | 32: R0 | 40: R8 | 48: M0 | |
| 6: +JOG | 16: FREE | 33: R1 | 41: R9 | 49: M1 | |
| 7: -JOG | 17: C-ON | 34: R2 | 42: R10 | 50: M2 | |



- Do not assign the same input signal to multiple input terminals. When the same input signal is assigned to multiple input terminals, the function will be executed if any of the terminals becomes active.
- The ALM-RST input and P-CLR input will be executed when turning from ON to OFF. The P-PRESET input will be executed when turning from OFF to ON.
- When the C-ON input and HMI input are not assigned to the input terminals, these inputs will always be set to ON. When assigning to both direct I/O and remote I/O, the function will be executed when both of them are set to ON.

■ Changing the logic level setting of input signals

You can change the logic level setting for input terminals IN0 to IN7 using the parameter.

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|----------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------|
| I/O function [Input] | IN0 input logic level setting | Changes the logic level setting for input terminals IN0 to IN7. [Setting range] 0: Make (N.O.) 1: Brake (N.C.) | 0 |
| | IN1 input logic level setting | | |
| | IN2 input logic level setting | | |
| | IN3 input logic level setting | | |
| | IN4 input logic level setting | | |
| | IN5 input logic level setting | | |
| | IN6 input logic level setting | | |
| | IN7 input logic level setting | | |

■ Assignment to the output terminals

The output signals shown below can be assigned to the output terminals OUT0 to OUT5 of CN9 by setting parameters. For details on output signals, refer to p.100.

| Direct I/O signal name | Initial value | Direct I/O signal name | Initial value |
|------------------------|---------------|------------------------|---------------|
| OUT0 | 70: HOME-P | OUT3 | 67: READY |
| OUT1 | 69: END | OUT4 | 66: WNG |
| OUT2 | 73: AREA1 | OUT5 | 65: ALM |

| Assignment No. | Signal name | Function |
|----------------|-------------|---------------------------------------------------|
| 0 | No function | Set when the output terminal is not used. |
| 1 | FWD_R | Output in response to the FWD input. |
| 2 | RVS_R | Output in response to the RVS input. |
| 3 | HOME_R | Output in response to the HOME input. |
| 4 | START_R | Output in response to the START input. |
| 5 | SSTART_R | Output in response to the SSTART input. |
| 6 | +JOG_R | Output in response to the +JOG input. |
| 7 | –JOG_R | Output in response to the –JOG input. |
| 8 | MS0_R | Output in response to the MS0 to MS5 input. |
| 9 | MS1_R | |
| 10 | MS2_R | |
| 11 | MS3_R | |
| 12 | MS4_R | |
| 13 | MS5_R | |
| 16 | FREE_R | Output in response to the FREE input. |
| 17 | C-ON_R | Output in response to the C-ON input. |
| 18 | STOP_R | Output in response to the STOP input. |
| 32 | R0 | Output the status of the general signal R0 to R9. |
| 33 | R1 | |
| 34 | R2 | |
| 35 | R3 | |
| 36 | R4 | |
| 37 | R5 | |
| 38 | R6 | |
| 39 | R7 | |
| 40 | R8 | |
| 41 | R9 | |

| Assignment No. | Signal name | Function |
|----------------|-------------|------------------------------------------------------------|
| 42 | R10 | Output the status of the general signal R10 to R15. |
| 43 | R11 | |
| 44 | R12 | |
| 45 | R13 | |
| 46 | R14 | |
| 47 | R15 | |
| 48 | M0_R | Output in response to the M0 to M5 input. |
| 49 | M1_R | |
| 50 | M2_R | |
| 51 | M3_R | |
| 52 | M4_R | |
| 53 | M5_R | |
| 60 | +LS_R | Output in response to the +LS input. |
| 61 | –LS_R | Output in response to the –LS input. |
| 62 | HOMES_R | Output in response to the HOMES input. |
| 63 | SLIT_R | Output in response to the SLIT input. |
| 65 | ALM | Output the alarm status of the driver (normally closed). |
| 66 | WNG | Output the warning status of the driver. |
| 67 | READY | Output when the driver is ready. |
| 68 | MOVE | Output when the motor operates. |
| 69 | END | Output when the positioning operation is completed. |
| 70 | HOME-P | Output when the motor is in home position. |
| 71 | TLC | Output when the load is outside of the motor torque range. |
| 72 | TIM | Output once every 7.2° rotation of the motor output shaft. |
| 73 | AREA1 | Output when the motor is within the area 1. |
| 74 | AREA2 | Output when the motor is within the area 2. |
| 75 | AREA3 | Output when the motor is within the area 3. |
| 80 | S-BSY | Output when the driver is in internal processing state. |
| 82 | MPS * | Output the ON-OFF state of the main power supply. |

* AC power input only

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|--------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| I/O function [Output] | OUT0 output function selection | Assigns the following output signals to OUT0 to OUT5 of the output terminals. [Setting range] Refer to the following table. | 70: HOME-P |
| | OUT1 output function selection | | 69: END |
| | OUT2 output function selection | | 73: AREA1 |
| | OUT3 output function selection | | 67: READY |
| | OUT4 output function selection | | 66: WNG |
| | OUT5 output function selection | | 65: ALM |

| | | | | | |
|----------------|------------|---------|-----------|-------------|-----------|
| 0: No function | 10: MS2_R | 35: R3 | 45: R13 | 61: –LS_R | 72: TIM |
| 1: FWD_R | 11: MS3_R | 36: R4 | 46: R14 | 62: HOMES_R | 73: AREA1 |
| 2: RVS_R | 12: MS4_R | 37: R5 | 47: R15 | 63: SLIT_R | 74: AREA2 |
| 3: HOME_R | 13: MS5_R | 38: R6 | 48: M0_R | 65: ALM | 75: AREA3 |
| 4: START_R | 16: FREE_R | 39: R7 | 49: M1_R | 66: WNG | 80: S-BSY |
| 5: SSTART_R | 17: C-ON_R | 40: R8 | 50: M2_R | 67: READY | 82: MPS * |
| 6: +JOG_R | 18: STOP_R | 41: R9 | 51: M3_R | 68: MOVE | |
| 7: –JOG_R | 32: R0 | 42: R10 | 52: M4_R | 69: END | |
| 8: MS0_R | 33: R1 | 43: R11 | 53: M5_R | 70: HOME-P | |
| 9: MS1_R | 34: R2 | 44: R12 | 60: +LS_R | 71: TLC | |

* AC power input only

1-2 Assignment of remote I/O

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

■ Assignment of input signals

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

| Assignment No. | Signal name | Function | Setting range |
|----------------|-------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| 0 | No function | Set when the input terminal is not used. | — |
| 1 | FWD | Execute continuous operation in the positive direction. | 0: Deceleration stop 1: Operation |
| 2 | RVS | Execute continuous operation in the negative direction. | |
| 3 | HOME | Execute return-to-home operation. | 0: No operation 1: Start operation |
| 4 | START | Execute positioning operation. | |
| 5 | SSTART | Execute sequential positioning operation. | |
| 6 | +JOG | Execute JOG operation in the positive direction. | |
| 7 | –JOG | Execute JOG operation in the negative direction. | |
| 8 | MS0 | Execute direct positioning operation of the operation data No. set by the I/O parameter. | |
| 9 | MS1 | | |
| 10 | MS2 | | |
| 11 | MS3 | | |
| 12 | MS4 | | |
| 13 | MS5 | | |
| 16 | FREE | Stop the motor excitation and release the electromagnetic brake. | 0: No operation 1: Electromagnetic brake release+motor non-excitation |
| 17 | C-ON | Switch the motor excitation between excitation and non-excitation. | 0: Motor non-excitation 1: Motor excitation |
| 18 | STOP | Stop of the motor operation. | 0: No operation 1: Stop operation |
| 24 | ALM-RST * | Reset the current alarm. | 0: No operation 1: Reset alarm |
| 25 | P-PRESET * | Execute position preset. | 0: No operation 1: Execute preset |
| 26 | P-CLR * | Reset the absolute position error alarm. | 0: No operation 1: Reset alarm |
| 27 | HMI | Release of the function limitation of the MEXE02 or OPX-2A | 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 | | |

| Assignment No. | Signal name | Function | Setting range |
|----------------|-------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| 43 | R11 | General signals. Use these signals when controlling the system via RS-485 communication. | 0: OFF 1: ON |
| 44 | R12 | | |
| 45 | R13 | | |
| 46 | R14 | | |
| 47 | R15 | | |
| 48 | M0 | Select the operation data No. using these six bits. Refer to p.95 for details on the combination. | 0: OFF 1: ON (Operation data No.0 to 63 can be selected.) |
| 49 | M1 | | |
| 50 | M2 | | |
| 51 | M3 | | |
| 52 | M4 | | |
| 53 | M5 | | |

* It cannot be set in the driver that is before the specification change. Refer to p.7 for details.

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|--------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------|----------------|
| I/O function [RS-485] | NET-IN0 input function selection | Assigns the following input signals to NET-IN0 to NET-IN15. [Setting range] Refer to the following table. | 48: M0 |
| | NET-IN1 input function selection | | 49: M1 |
| | NET-IN2 input function selection | | 50: M2 |
| | NET-IN3 input function selection | | 4: START |
| | NET-IN4 input function selection | | 3: HOME |
| | NET-IN5 input function selection | | 18: STOP |
| | NET-IN6 input function selection | | 16: FREE |
| | NET-IN7 input function selection | | 0: No function |
| | NET-IN8 input function selection | | 8: MS0 |
| | NET-IN9 input function selection | | 9: MS1 |
| | NET-IN10 input function selection | | 10: MS2 |
| | NET-IN11 input function selection | | 5: SSTART |
| | NET-IN12 input function selection | | 6: +JOG |
| | NET-IN13 input function selection | | 7: -JOG |
| | NET-IN14 input function selection | | 1: FWD |
| | NET-IN15 input function selection | | 2: RVS |

| | | | | | |
|----------------|---------|----------------|--------|---------|---------|
| 0: No function | 7: -JOG | 16: FREE | 32: R0 | 39: R7 | 46: R14 |
| 1: FWD | 8: MS0 | 17: C-ON | 33: R1 | 40: R8 | 47: R15 |
| 2: RVS | 9: MS1 | 18: STOP | 34: R2 | 41: R9 | 48: M0 |
| 3: HOME | 10: MS2 | 24: ALM-RST * | 35: R3 | 42: R10 | 49: M1 |
| 4: START | 11: MS3 | 25: P-PRESET * | 36: R4 | 43: R11 | 50: M2 |
| 5: SSTART | 12: MS4 | 26: P-CLR * | 37: R5 | 44: R12 | 51: M3 |
| 6: +JOG | 13: MS5 | 27: HMI | 38: R6 | 45: R13 | 52: M4 |
| | | | | | 53: M5 |

* These three signals cannot be set in the driver which is before the specification change. Refer to p.7 for details.



- Do not assign the same input signal to multiple input terminals. When the same input signal is assigned to multiple input terminals, the function will be executed if any of the terminals becomes active.
- The ALM-RST input and P-CLR input will be executed when turning from ON to OFF.
The P-PRESET input will be executed when turning from OFF to ON.
- When the C-ON input and HMI input are not assigned to the input terminals, these inputs will always be set to ON. When assigning to both direct I/O and remote I/O, the function will be executed when both of them are set to ON.

■ Assignment to the output terminals

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

| Assignment No. | Signal name | Function | Data read |
|----------------|-------------|--------------------------------------------------------|------------------------------------------|
| 0 | No function | Set when the output terminal is not used. | — |
| 1 | FWD_R | Output in response to the FWD input. | 0: OFF 1: ON |
| 2 | RVS_R | Output in response to the RVS input. | |
| 3 | HOME_R | Output in response to the HOME input. | |
| 4 | START_R | Output in response to the START input. | |
| 5 | SSTART_R | Output in response to the SSTART input. | |
| 6 | +JOG_R | Output in response to the +JOG input. | |
| 7 | –JOG_R | Output in response to the –JOG input. | |
| 8 | MS0_R | Output in response to the MS0 input. | |
| 9 | MS1_R | Output in response to the MS1 input. | |
| 10 | MS2_R | Output in response to the MS2 input. | |
| 11 | MS3_R | Output in response to the MS3 input. | |
| 12 | MS4_R | Output in response to the MS4 input. | |
| 13 | MS5_R | Output in response to the MS5 input. | |
| 16 | FREE_R | Output in response to the FREE input. | |
| 17 | C-ON_R | Output in response to the C-ON input. | |
| 18 | STOP_R | Output in response to the STOP input. | |
| 32 | R0 | Output the status of the general signal R0 to R15. | |
| 33 | R1 | | |
| 34 | R2 | | |
| 35 | R3 | | |
| 36 | R4 | | |
| 37 | R5 | | |
| 38 | R6 | | |
| 39 | R7 | | |
| 40 | R8 | | |
| 41 | R9 | | |
| 42 | R10 | | |
| 43 | R11 | | |
| 44 | R12 | | |
| 45 | R13 | | |
| 46 | R14 | | |
| 47 | R15 | | |
| 48 | M0_R | Output in response to the M0 to M5 input. | |
| 49 | M1_R | | |
| 50 | M2_R | | |
| 51 | M3_R | | |
| 52 | M4_R | | |
| 53 | M5_R | | |
| 60 | +LS_R | Output in response to the +LS input. | |
| 61 | –LS_R | Output in response to the –LS input. | |
| 62 | HOMES_R | Output in response to the HOMES input. | |
| 63 | SLIT_R | Output in response to the SLIT input. | |
| 65 | ALM | Output the alarm status of the driver (normally open). | 0: Alarm not present 1: Alarm present |

| Assignment No. | Signal name | Function | Data read |
|----------------|-------------|------------------------------------------------------------|-----------------------------------------------------|
| 66 | WNG | Output the warning status of the driver. | 0: Warning not present 1: Warning present |
| 67 | READY | Output when the driver is ready. | 0: Not ready 1: Ready |
| 68 | MOVE | Output when the motor operates. | 0: Motor stopped 1: Motor operating |
| 69 | END | Output when the positioning operation is completed. | 0: Motor operating 1: Motor operating completion |
| 70 | HOME-P | Output when the motor is in home position. | 0: Not home position 1: Home position |
| 71 | TLC | Output when the load is outside of the motor torque range. | 0: Inside torque range 1: Outside torque range |
| 72 | TIM | Output once every 7.2° rotation of the motor output shaft. | 0: OFF 1: ON |
| 73 | AREA1 | Output when the motor is within the area 1. | 0: Outside area 1: Inside area |
| 74 | AREA2 | Output when the motor is within the area 2. | |
| 75 | AREA3 | Output when the motor is within the area 3. | |
| 80 | S-BSY | Output when the driver is in internal processing state. | 0: OFF 1: ON |
| 82 | MPS * | Output the ON-OFF state of the main power supply. | |

* AC power input only

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|--------------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------|
| I/O function [RS-485] | NET-OUT0 output function selection | Assigns the following output signals to NET-OUT0 to NET-OUT15. [Setting range] Refer to the following table. | 48: M0_R |
| | NET-OUT1 output function selection | | 49: M1_R |
| | NET-OUT2 output function selection | | 50: M2_R |
| | NET-OUT3 output function selection | | 4: START_R |
| | NET-OUT4 output function selection | | 70: HOME-P |
| | NET-OUT5 output function selection | | 67: READY |
| | NET-OUT6 output function selection | | 66: WNG |
| | NET-OUT7 output function selection | | 65: ALM |
| | NET-OUT8 output function selection | | 80: S-BSY |
| | NET-OUT9 output function selection | | 73: AREA1 |
| | NET-OUT10 output function selection | | 74: AREA2 |
| | NET-OUT11 output function selection | | 75: AREA3 |
| | NET-OUT12 output function selection | | 72: TIM |
| | NET-OUT13 output function selection | | 68: MOVE |
| | NET-OUT14 output function selection | | 69: END |
| | NET-OUT15 output function selection | | 71: TLC |

| | | | | | |
|----------------|------------|---------|-----------|-------------|-----------|
| 0: No function | 10: MS2_R | 35: R3 | 45: R13 | 61: -LS_R | 72: TIM |
| 1: FWD_R | 11: MS3_R | 36: R4 | 46: R14 | 62: HOMES_R | 73: AREA1 |
| 2: RVS_R | 12: MS4_R | 37: R5 | 47: R15 | 63: SLIT_R | 74: AREA2 |
| 3: HOME_R | 13: MS5_R | 38: R6 | 48: M0_R | 65: ALM | 75: AREA3 |
| 4: START_R | 16: FREE_R | 39: R7 | 49: M1_R | 66: WNG | 80: S-BSY |
| 5: SSTART_R | 17: C-ON_R | 40: R8 | 50: M2_R | 67: READY | 82: MPS * |
| 6: +JOG_R | 18: STOP_R | 41: R9 | 51: M3_R | 68: MOVE | |
| 7: -JOG_R | 32: R0 | 42: R10 | 52: M4_R | 69: END | |
| 8: MS0_R | 33: R1 | 43: R11 | 53: M5_R | 70: HOME-P | |
| 9: MS1_R | 34: R2 | 44: R12 | 60: +LS_R | 71: TLC | |

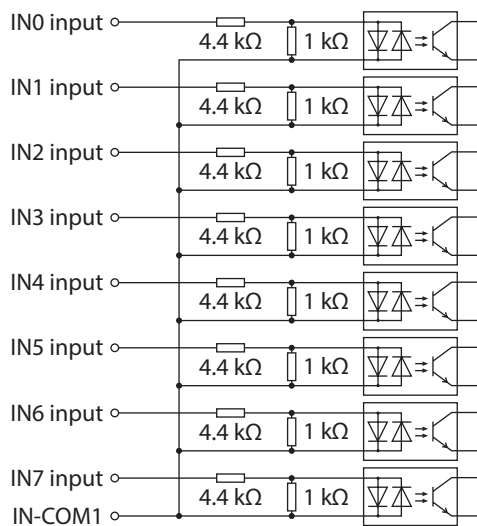
* AC power input only

1-3 Input signals

All input signals of the driver are photocoupler inputs.

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

■ Internal input circuit



■ M0 to M5 inputs

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

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

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

■ START input

This signal starts the positioning operation.

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

Related parameter

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

■ SSTART input

This signal starts the sequential positioning operation. (p.172)

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

Related parameter

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

■ MS0 to MS5 input

This signal starts the direct positioning operation. (p.171)

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

Related parameter

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

■ HOME input

This signal starts the return-to-home operation. (p.182)

Turn the HOME input ON to start return-to-home operation. When the return-to-home operation is completed and the motor stops, the HOME-P output turns ON.

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------|
| Home operation | Home-seeking mode | Sets the mode for return-to-home operation. [Setting range] 0: 2-sensor mode 1: 3-sensor mode 2: Push mode | 1 |
| | Operating speed of home-seeking | Sets the operating speed for return-to-home operation. [Setting range] 1 to 1,000,000 Hz | 1,000 |

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Home operation | Acceleration/ deceleration of home- seeking | Sets the acceleration/deceleration rate (acceleration/deceleration time) for return-to- home operation. [Setting range] 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) | 1,000 |
| | Starting speed of home- seeking | Sets the starting speed for return-to-home operation. [Setting range] 1 to 1,000,000 Hz | 500 |
| | Position offset of home-seeking | Sets the amount of offset from mechanical home. [Setting range] -8,388,608 to 8,388,607 step | 0 |
| | Starting direction of home-seeking | Sets the starting direction for home detection. [Setting range] 0: Negative direction 1: Positive direction | 1 |
| | SLIT detection with home-seeking | Sets whether or not to concurrently use the SLIT input for return-to-home operation. 0: Disable 1: Enable | 0 |
| | TIM signal detection with home-seeking | Sets whether or not to concurrently use the TIM signal for return-to-home operation. [Setting range] 0: Disable 1: Enable | 0 |
| | Operating current of home-seeking with push-motion | Sets the operating current, based on the rated current being 100 %, for push-motion return-to- home operation. [Setting range] 0 to 1,000 (1=0.1 %) | 1,000 |

■ FWD input, RVS input

These signals start the continuous operation. (p.190)

Operation is performed based on the FWD or RVS input and the operating speed corresponding to the selected operation data No.

Turn the FWD signal to ON, to perform continuous operation in the positive direction.

Turn the RVS signal to ON, to perform continuous operation in the negative direction.

If the signal of the same direction is turned ON again during deceleration, the motor will accelerate and continue operating.

If the FWD and RVS inputs are turned ON simultaneously, the motor will decelerate to a stop.

When the operation data No. is changed during continuous operation, the speed will change to the one specified for the new operation data No.

■ +JOG input, –JOG input

These signals start the JOG operation. (p.195)

Turn the +JOG signal to ON, to perform JOG operation in the positive direction.

Turn the –JOG signal to ON, to perform JOG operation in the negative direction.

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Operation | JOG travel amount | Sets the travel amount for JOG operation. [Setting range] 1 to 8,388,607 step | 1 |
| | JOG operating speed | Sets the operating speed for JOG operation. [Setting range] 1 to 1,000,000 Hz | 1,000 |
| | Acceleration/ deceleration rate of JOG | Sets the acceleration/deceleration rate (acceleration/deceleration time) for JOG operation. [Setting range] 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) | 1,000 |
| | JOG starting speed | Sets the starting speed for JOG operation. [Setting range] 0 to 1,000,000 Hz | 500 |

■ STOP input

When the STOP input turns ON, the motor will stop.

When the STOP input turns ON while a positioning operation is being performed, the balance of the travel amount will be cleared. Refer to p.198 for stop action.

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| I/O | STOP input action | Sets how the motor should stop when a STOP input is turned ON. [Setting range] 0: Immediate stop 1: Deceleration stop 2: Immediate stop & Current OFF 3: Deceleration stop & Current OFF | 1 |

■ C-ON input

This signal is used to excite the motor.

The motor will be excited when the C-ON input is ON, while the motor will become non-excitation status when the C-ON input is OFF.

When an electromagnetic brake motor is used, the electromagnetic brake will be released after the motor is excited.



When the C-ON input is not assigned to the direct I/O or remote I/O, this input will always be set to ON. When assigning to both direct I/O and remote I/O, the function will be executed when both of them are set to ON.

■ FREE input

When the FREE input is turned ON, the motor current will be cut off. The motor will lose its holding torque, and the output shaft can be turned manually. When an electromagnetic brake motor is used, the electromagnetic brake will also be released.



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

Relations among the status of the FREE input, the C-ON input and the motor output shaft are shown in the tables.

Motor without an electromagnetic brake

| C-ON input FREE input | OFF | ON |
|--------------------------|-------------------------------------|--------------------------------------------------------|
| OFF | Output shaft is in a released state | Output shaft is in a holding state by motor excitation |
| ON | Output shaft is in a released state | Output shaft is in a released state |

Motor with an electromagnetic brake

| C-ON input FREE input | OFF | ON |
|--------------------------|-------------------------------------------------------------|--------------------------------------------------------|
| OFF | Output shaft is in a holding state by electromagnetic brake | Output shaft is in a holding state by motor excitation |
| ON | Output shaft is in a released state | Output shaft is in a released state |

■ P-PRESET input

This is a signal for the command position preset.

When the P-PRESET input is turned ON, the command position is set as the value of the "Preset position" parameter.

(This signal will become effective when turning from OFF to ON.)

However, the preset will not execute in the following conditions.

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

Related parameter

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

■ ALM-RST input

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

Note that some alarms cannot be reset with the ALM-RST input. Refer to p.145 for alarm descriptions.

■ P-CLR input

If the P-CLR input is turned from ON to OFF while an absolute position error alarm is generated, the alarm will be reset. (The alarm will be reset at the OFF edge of the P-CLR input.)

The P-CLR input can reset the absolute position error alarm only.

■ HMI input

When the HMI input is turned ON, the function limitation of the **MEXE02** or **OPX-2A** 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
- Parameters setting, writing, downloading, initializing
- Data setting, clearing, initializing



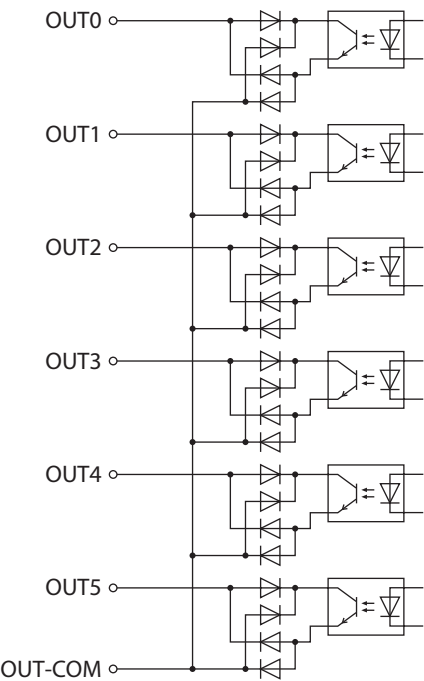
When the HMI input is not assigned to the input terminal, this input will always be set to ON. When assigning to both direct I/O and remote I/O, the function will be executed when both of them are set to ON.

1-4

Output signals

- The output signals of the driver are photocoupler/open-collector output.
- Direct I/O I/O for normally open: "ON: Current-carrying", "OFF: Not current-carrying"
I/O for normally closed: "ON: Not current-carrying", "OFF: Current-carrying"
 - Remote I/O..... "ON: 1", "OFF: 0"

■ Internal output circuit



■ ALM output

Refer to p.145 for alarm descriptions.

- **Direct I/O**
When an alarm generates, the ALM output will turn OFF. At the same time, the ALM LED (or ALARM LED) of the driver will blink and the motor current will be cut off and stop. The ALM output is normally closed.
- **Remote I/O**
When an alarm generates, the ALM output will turn ON. At the same time, the ALM LED (or ALARM LED) of the driver will blink and the motor current will be cut off and stop. The ALM output is normally open.
- **Related parameter**

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Alarm | Overload alarm | Sets the condition that an overload alarm generates. [Setting range] 1 to 300 (1=0.1 s) | 50 |
| | Excessive position deviation alarm at current ON | Sets the condition that an excessive position deviation alarm generates when the motor is in a state of current ON. [Setting range] 1 to 30,000 (1=0.01 rev) | 300 |
| | Return-to-home incomplete alarm | When the positioning operation is started while the position origin has not been set, selects whether the alarm generates or not. [Setting range] 0: Disable 1: Enable | 0 |

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Alarm | Excessive position deviation alarm at current OFF | Sets the condition that an excessive position deviation alarm generates when the motor is in a state of current OFF. If the position deviation exceeds the setting value in the "Excessive position deviation alarm at current ON" parameter, the excessive position deviation warning at current OFF generates. In addition, if the C-ON input is turned ON, the excessive position deviation alarm at current OFF generates. [Setting range] 1 to 30,000 (1=0.01 rev) | 10,000 |
| | Communication timeout | Sets the condition in which a communication timeout occurs in RS-485 communication. It is not monitored when the set value is 0. [Setting range] 0: Not monitored 1 to 10,000 ms | 0 |
| Communication | Communication error alarm | Sets the condition in which a RS-485 communication error alarm generates. A communication error alarm generates after a RS-485 communication error has occurred by the number of times set here. [Setting range] 1 to 10 times | 3 |

■ WNG output

When a warning generates, the WNG output turns ON. Refer to p.152 for warning descriptions.

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Warning | Overheat warning | Sets the condition that a main circuit overheat warning generates. [Setting range] 40 to 85 °C | 85 |
| | Overload warning | Sets the condition that an overload warning generates. [Setting range] 1 to 300 (1=0.1 s) | 50 |
| | Overspeed warning | Sets the condition that an overspeed warning generates. [Setting range] 1 to 5,000 r/min | 4,500 |
| | Overvoltage warning | Sets the condition that an overvoltage warning generates. [Setting range] AC power input: 120 to 450 V DC power input: 150 to 630 V (1=0.1 V) | AC power input: 435 DC power input: 630 |
| | Undervoltage warning | Sets the condition that an undervoltage warning generates. [Setting range] AC power input: 120 to 280 V DC power input: 150 to 630 V (1=0.1 V) | AC power input: 120 DC power input: 180 |
| | Excessive position deviation warning at current ON | Sets the condition that an excessive position deviation warning generates when the motor is in a state of current ON. [Setting range] 1 to 30,000 (1=0.01 rev) | 300 |

■ READY output

When the driver becomes ready, the READY output turns ON. Input operating commands to the driver after the READY output has turned ON.

The READY output turns ON when all of the following conditions are satisfied.

- The driver main power supply is turned ON.
- All inputs which start operation are OFF
- The FREE input is OFF
- The C-ON input is ON (When the C-ON input is assigned)
- The STOP input is OFF
- An alarm is not present.
- The motor is not operating.
- Test function, downloading or teaching function was not performed using the **MEXE02**.
- Test operation, downloading, initializing or teaching function was not performed using the **OPX-2A**.
- Configuration commands, all data initialization commands and batch non-volatile memory read commands are not executed via RS-485 communication.

■ HOME-P output

The HOME-P output turns ON corresponding to the setting of the "HOME-P output function selection" parameter. Refer to p.200 for setting the position origin.

● When "HOME-P output function selection" parameter is set to "Home output"

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

● When "HOME-P output function selection" parameter is set to "Return-to-home complete output"

Regardless of the command position by the driver, if the position origin for the driver is set, the HOME-P output will turn ON. Therefore, it turns ON after completing the return-to-home operation or preset.

Once the HOME-P output turns ON, it will not turn OFF until the motor has moved from the position origin.



When a battery is used, it is charged while the DC power supply is being ON. If the battery runs down or the data retention period passes over in a state where the DC power supply is OFF, the position coordinate will be an unset state (the position origin has been lost).

● Related parameter

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

■ MOVE output

The MOVE output turns ON while the motor is operating.

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|---------------------------------|-----------------------------------------------------------------------------|---------------|
| I/O | Minimum ON time for MOVE output | Sets the minimum ON time for MOVE output. [Setting range] 0 to 255 ms | 0 |

■ END output

When the motor has completed its movement, the END output will turn ON. When the motor was converged in a position of the "END signal range" parameter against the command position while the MOVE output is in an OFF status, the END output turns ON.

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| I/O | END signal range | Sets the output range of the END signal (the motor operation converges within this angular range). [Setting range] 0 to 180 (1=0.1°) | 18 |
| | Positioning complete output offset | Sets the offset for the END signal (the offset for converging angular range). [Setting range] -18 to 18 (1=0.1°) | 0 |

■ TLC output

When the load exceeds the motor torque range, the TLC output will turn ON.

When performing push-motion operation, if the load exceeds the torque range calculated from the current ratio of push-motion operation, the TLC output will turn ON.

This output can be used for the completion signal of the push-motion operation.

■ AREA1 to AREA3 outputs

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

It turns ON when the motor is inside the area even when the motor stops.

Related parameter

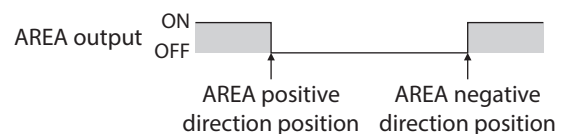
| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------|---------------|
| I/O | AREA1 positive direction position | Sets the AREA1 to AREA3 positive direction position. [Setting range] -8,388,608 to 8,388,607 step | 0 |
| | AREA2 positive direction position | | |
| | AREA3 positive direction position | | |
| | AREA1 negative direction position | Sets the AREA1 to AREA3 negative direction position. [Setting range] -8,388,608 to 8,388,607 step | 0 |
| | AREA2 negative direction position | | |
| | AREA3 negative direction position | | |

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

To turn the AREA output ON:

Motor position \leq AREA positive direction position, or

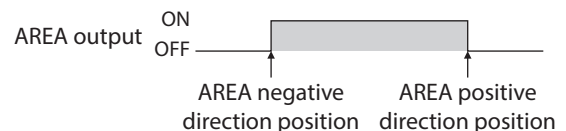
Motor position \geq AREA negative direction position



● When the "AREA positive direction position" parameter > "AREA negative direction position" parameter

To turn the AREA output ON:

AREA negative direction position \leq Motor position \leq AREA positive direction position



● **When the "AREA positive direction position" parameter = "AREA negative direction position" parameter**

To turn the AREA output ON:

Motor position = AREA negative direction position = AREA positive direction position



When using AREA1 to AREA3 output to confirm the motor position, you can use two types - the command position and the actual position.

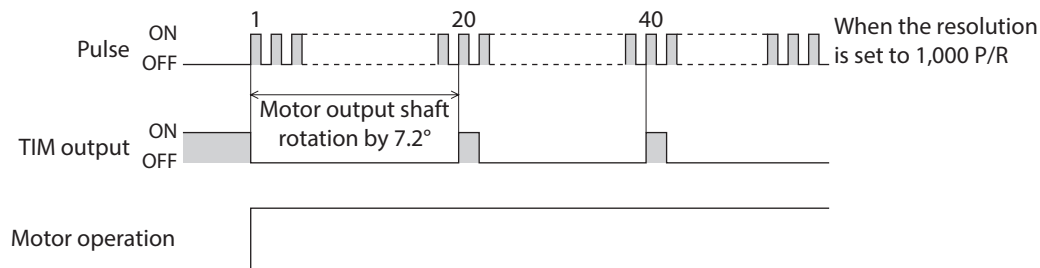
AREA1 and AREA2: Command position

AREA3: Actual position

■ TIM output

The TIM output will turn ON every time the motor output shaft rotates by 7.2°.

If the command speed is faster than 30 r/min, TIM output will not be output correctly.



The TIM output is a signal that is output for 50 times per revolution of the motor output shaft. When the TIM output is used, set the resolution to be an integral multiple of 50 using the "Electronic gear" parameters.

■ 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 (AC power input only)

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

■ Response output

The response output is the output signal that shows the ON/OFF status corresponding to the input signals.

The tables show the correspondence between the input signals and output signals.

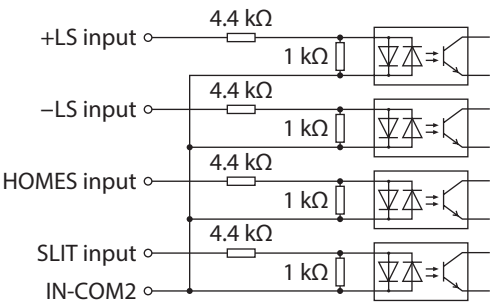
| Input signal | Output signal | Input signal | Output signal | Input signal | Output signal |
|--------------|---------------|--------------|---------------|--------------|---------------|
| FWD | FWD_R | MS2 | MS2_R | M2 | M2_R |
| RVS | RVS_R | MS3 | MS3_R | M3 | M3_R |
| HOME | HOME_R | MS4 | MS4_R | M4 | M4_R |
| START | START_R | MS5 | MS5_R | M5 | M5_R |
| SSTART | SSTART_R | FREE | FREE_R | +LS | +LS_R |
| +JOG | +JOG_R | C-ON | C-ON_R | -LS | -LS_R |
| -JOG | -JOG_R | STOP | STOP_R | HOMES | HOMES_R |
| MS0 | MS0_R | M0 | M0_R | SLIT | SLIT_R |
| MS1 | MS1_R | M1 | M1_R | | |



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

1-5 Sensor inputs

Internal input circuit



+LS input, -LS input

These signals are input from the applicable limit sensors. The +LS input is for the positive direction sensor and the -LS input is for the negative direction sensor.

- Return-to-home operationWhen the +LS or -LS input is detected, perform the return-to-home operation according to the setting of the "Home-seeking mode" parameter.
- Any other operationDetect the hardware overtravel and stop the motor. Refer to p.198 for hardware overtravel.

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| I/O | Hardware overtravel | Sets whether to enable or disable hardware overtravel detection using \pm LS inputs. [Setting range] 0: Disable 1: Enable | 1 |
| | Overtravel action | Sets the motor stop action to take place upon the occurrence of overtravel. [Setting range] 0: Immediate stop 1: Decelerate stop | 0 |
| | LS contact configuration | Sets the \pm LS input logics. [Setting range] 0: Make (N.O.) 1: Brake (N.C.) | 0 |

HOMES input

The HOMES input is the input for the mechanical home sensor when setting the "Home-seeking mode" parameter to the "3-sensor mode." Refer to p.182 for return-to-home operation.

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|-------------------|-------------------------------------------------------------------------------------|---------------|
| I/O | HOMES logic level | Sets the HOMES input logic. [Setting range] 0: Make (N.O.) 1: Brake (N.C.) | 0 |

4 AC power input type/DC power input type Common

■ SLIT input

Connect the SLIT input when using motorized linear slides equipped with a slit.
When detecting the home, use of the SLIT input in addition to the HOMES will increase the accuracy of home detection. Refer to p.182 for return-to-home operation.

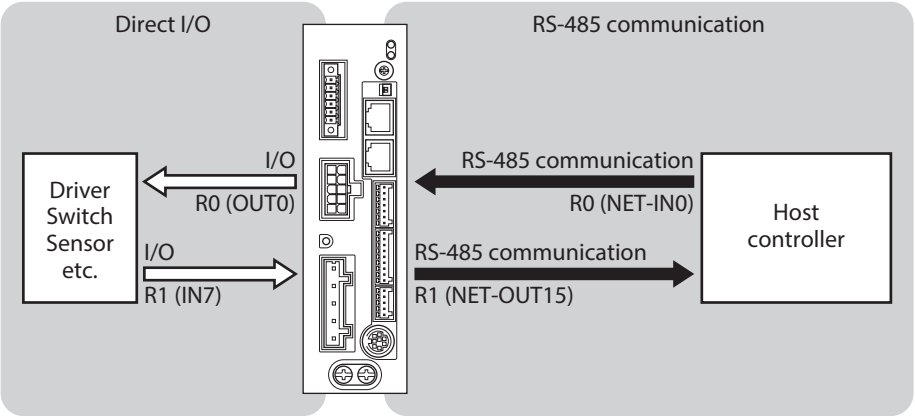
Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|------------------|------------------------------------------------------------------------------------|---------------|
| I/O | SLIT logic level | Sets the SLIT input logic. [Setting range] 0: Make (N.O.) 1: Brake (N.C.) | 0 |

1-6 General signals (R0 to R15)

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

- When outputting the signals from the host controller 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 host controller
Assign the general signal R1 to the IN7 input and NET-OUT15.
When turning the IN7 input ON by the external device, the NET-OUT15 becomes 1. When turning the IN7 input OFF, the NET-OUT15 becomes 0. The logic level of the IN7 input can be set using "IN7 input logic level setting" parameter.



* The figure shows the AC power input.

2 Method of control via I/O

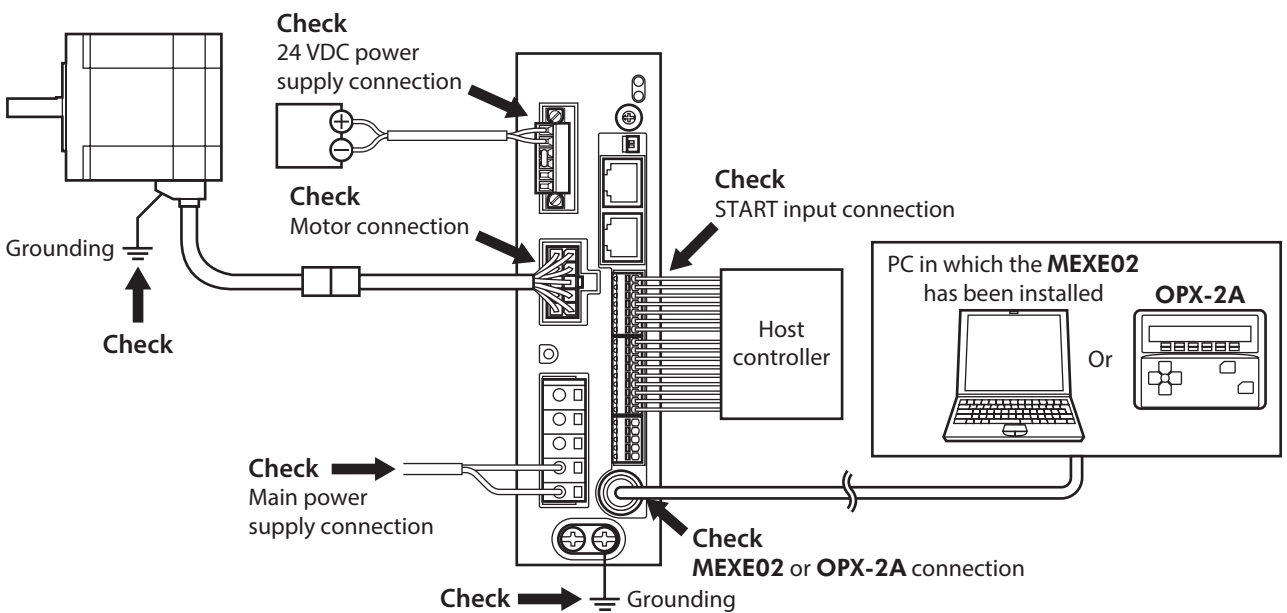
2-1 Guidance

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

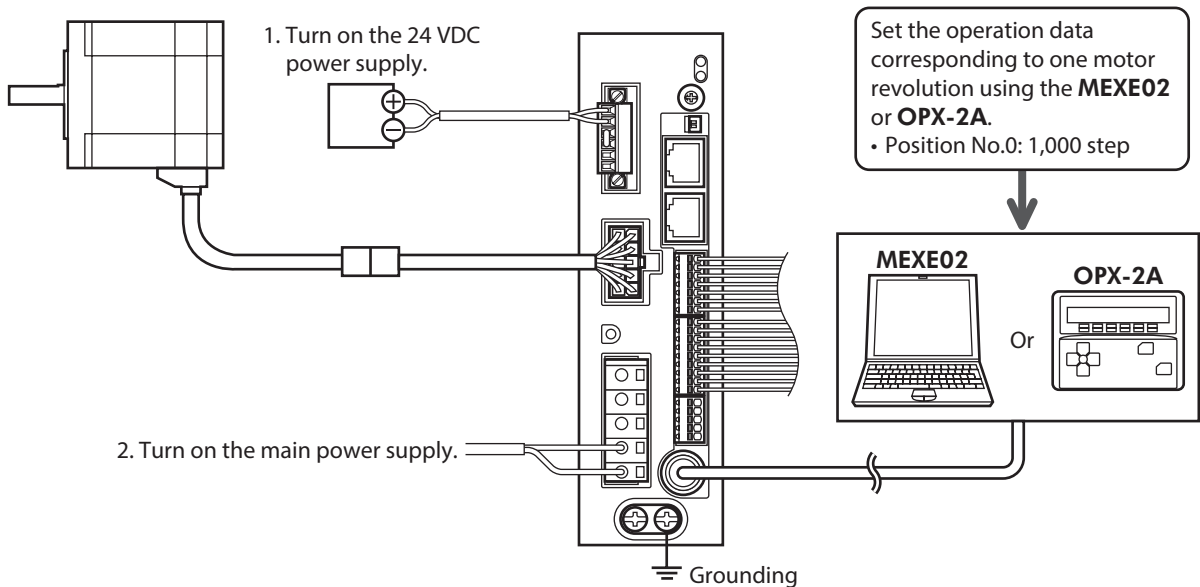
Note Before operating the motor, check the condition of the surrounding area to ensure safety.

■ AC power input

STEP 1 Check the installation and connection



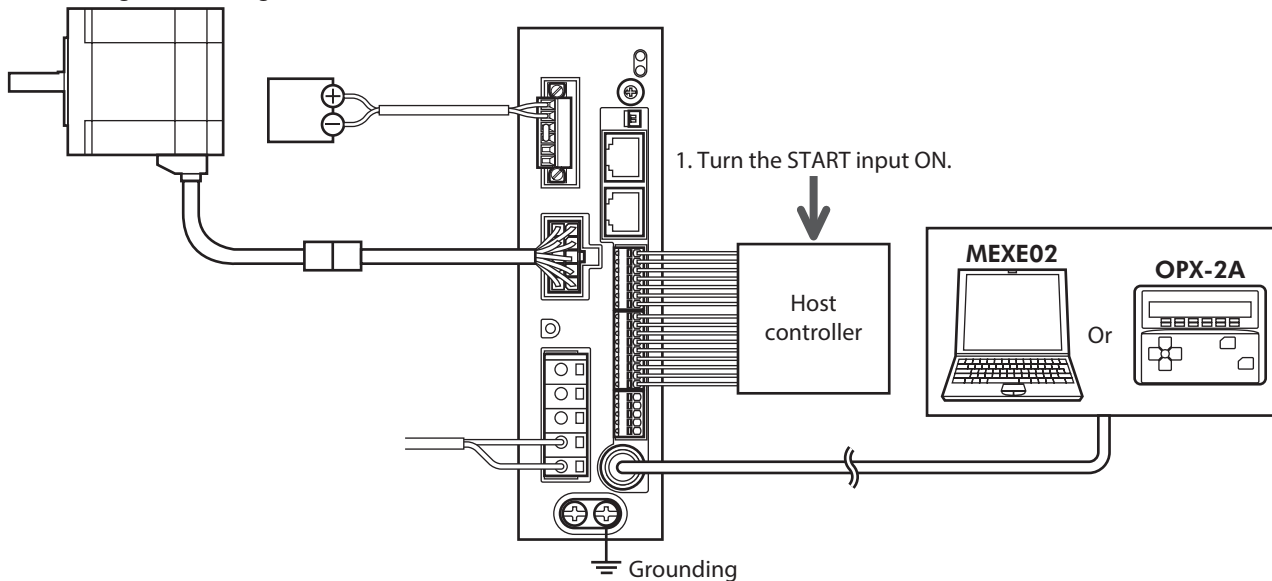
STEP 2 Turn on the power and set the operation data



4 AC power input type/DC power input type Common

STEP 3 Operate the motor

2. Check the motor rotates according to the setting.



STEP 4 Were you able to operate the motor properly?

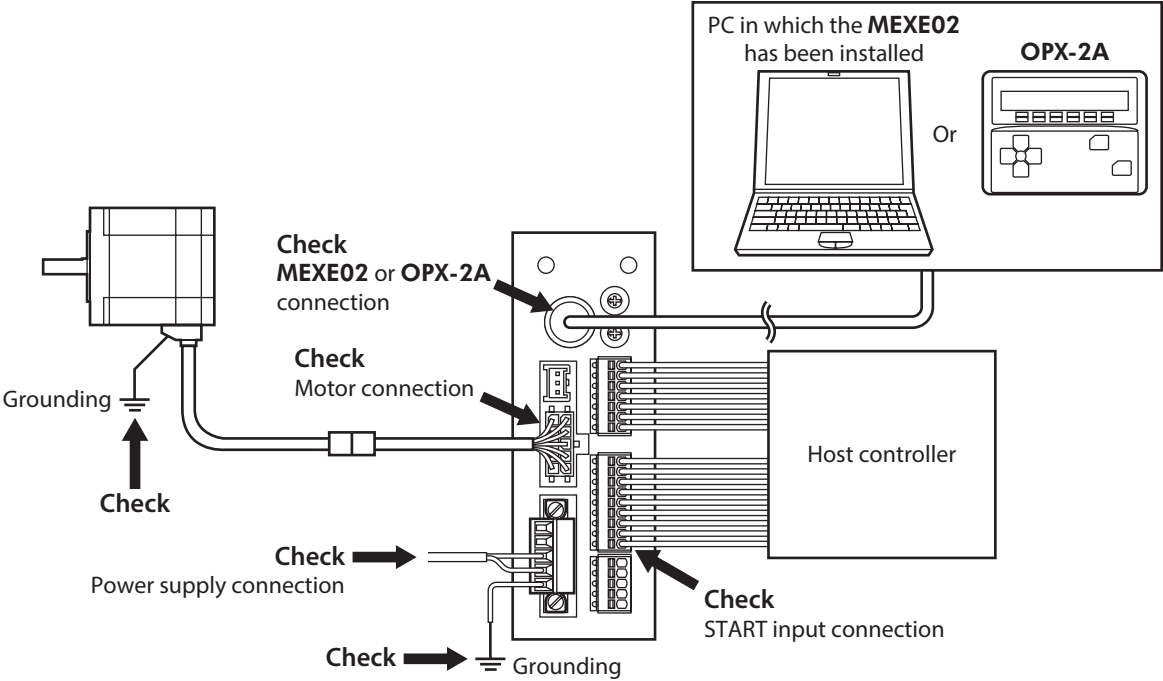
How did it go? Were you able to operate the motor properly? If the motor does not function, check the following points:

- Are the regeneration resistor thermal input terminals (TH1 and TH2) on the CN1 short-circuited?
- Is any alarm present?
- Are the power supply and motor connected securely?

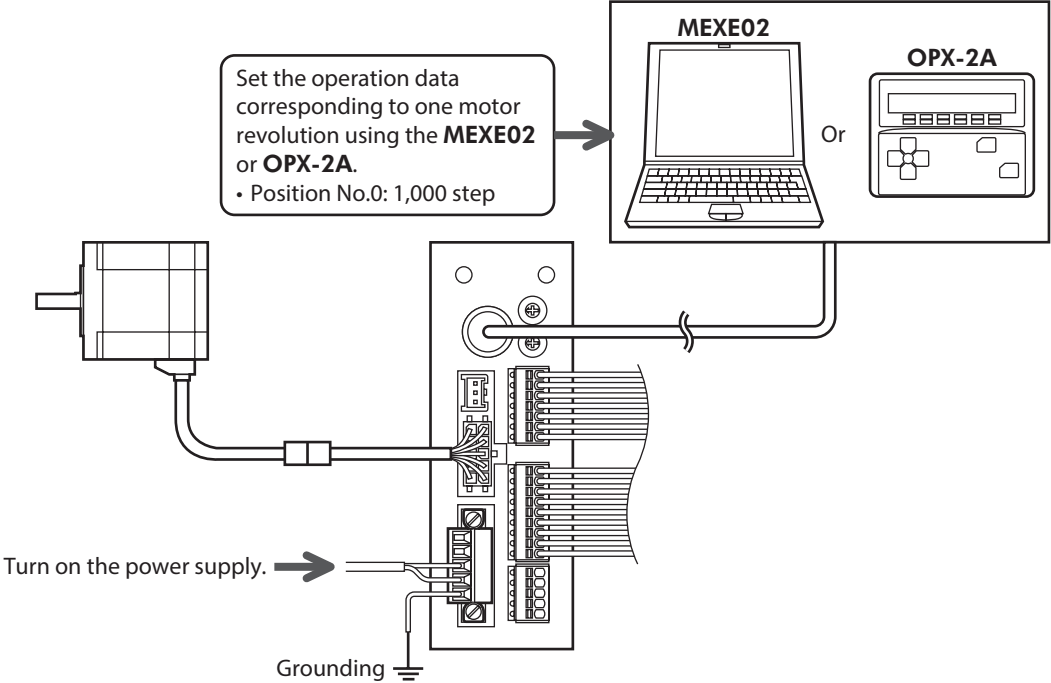
For more detailed settings and functions, refer to "5 Operation type and setting" on p.155.

■ DC power input

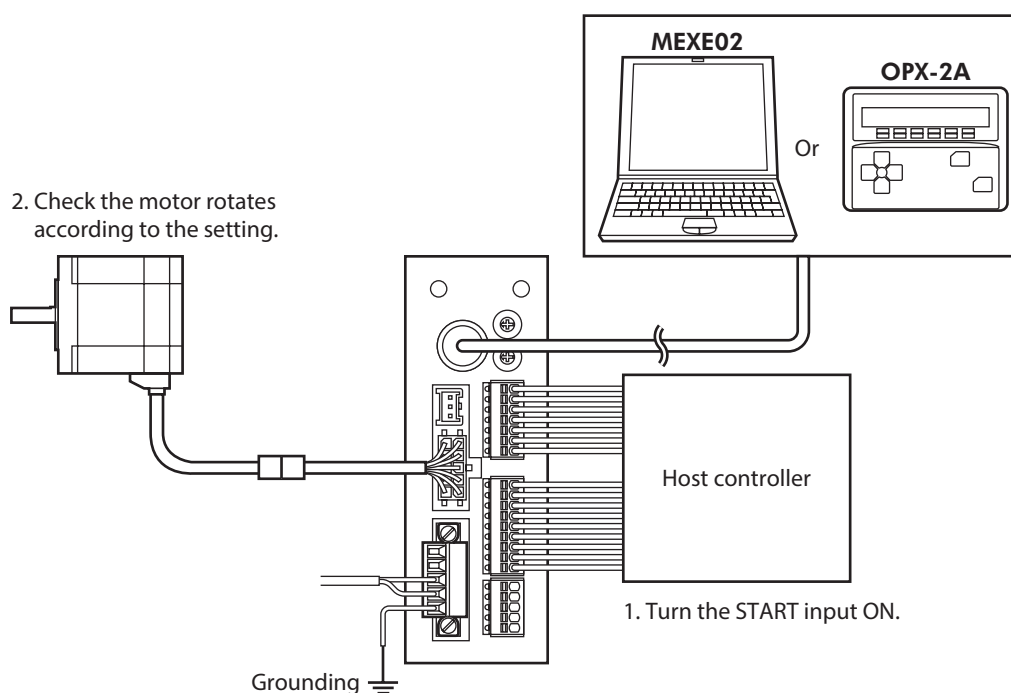
STEP 1 Check the installation and connection



STEP 2 Turn on the power and set the operation data



STEP 3 Operate the motor



STEP 4 Were you able to operate the motor properly?

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

- Is any alarm present?
- Are the power supply and motor connected securely?

For more detailed settings and functions, refer to "5 Operation type and setting" on p.155.

2-2 Operation data

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

If the data is changed, a recalculation and setup will be performed after the operation is stopped.

| Data | Description | Initial value |
|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Position No.0 to Position No.63 | Sets the position (distance) for positioning operation. [Setting range] –8,388,608 to +8,388,607 step | 0 |
| Operating speed No.0 to Operating speed No.63 | Sets the operating speed in positioning operation and continuous operation. [Setting range] 0 to 1,000,000 Hz | 1,000 |
| Operation mode No.0 to Operation mode No.63 | Selects how to specify the position (travel amount) in positioning operation. [Setting range] 0: Incremental (INC) 1: Absolute (ABS) | 0 |
| Operation function No.0 to Operation function No.63 | Sets the operation mode to execute positioning operation. [Setting range] 0: Single-motion 1: Linked-motion 2: Linked-motion 2 3: Push | 0 |
| Acceleration No.0 to Acceleration No.63 | Sets the acceleration rate (acceleration time) in positioning operation and continuous operation. *1 [Setting range] 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *2 | 1,000 |
| Deceleration No.0 to Deceleration No.63 | Sets the deceleration rate (deceleration time) in positioning operation and continuous operation. *1 [Setting range] 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *2 | 1,000 |
| Push current No.0 to Push current No.63 | Sets the current rate of push-motion operation. [Setting range] 0 to 1,000 (1=0.1 %) *3 | 200 |
| Sequential positioning No.0 to Sequential positioning No.63 | Sets whether to enable or disable sequential positioning operation. [Setting range] 0: Disable 1: Enable | 0 |
| Dwell time No.0 to Dwell time No.63 | Sets the dwell time to be used in linked-motion 2 operation. [Setting range] 0 to 50,000 (1=0.001 s) | 0 |

*1 This item is effective when the "Acceleration/deceleration type" parameter is set to "Separate." If this parameter is set to "Common," the values of the "Common acceleration" and "Common deceleration" parameters will be used (initial value: separate).

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

*3 For the driver which is before the specification change, the setting range is 0 to 500 (1=0.1 %). Refer to p.7 for details.

2-3 Parameter

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

When turning the driver DC power supply on, the parameters saved in the non-volatile memory will be sent to the RAM. Then, the recalculation and setup for the parameters are executed in the RAM.

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 non-volatile 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 update the new value varies depending on the parameter. Refer to the following four types.

| Update timing | | Description |
|---------------|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| A | Immediately | Executes the recalculation and setup immediately when writing the parameter. |
| B | After stopping the operation | Executes the recalculation and setup after stopping the operation. |
| C | After executing the configuration or cycling the power | Executes the recalculation and setup after executing the configuration or cycling the DC power supply. |
| D | After cycle the power | Executes the recalculation and setup after cycling the DC power supply. |

In this chapter, each update timing is represented in A to D.



- Parameters set via RS-485 communication or industrial network are saved in the RAM. If parameters, which are required turning on the power again in order to update, are changed, 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.

■ Parameter list

| | | |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I/O parameter (p.114) | <ul style="list-style-type: none"> • STOP input action • Hardware overtravel • Overtravel action • END signal range • Positioning complete output offset • AREA1 positive direction position • AREA1 negative direction position • AREA2 positive direction position • AREA2 negative direction position • AREA3 positive direction position • AREA3 negative direction position | <ul style="list-style-type: none"> • Minimum ON time for MOVE output • LS contact configuration • HOMES logic level • SLIT logic level • MS0 operation No. selection • MS1 operation No. selection • MS2 operation No. selection • MS3 operation No. selection • MS4 operation No. selection • MS5 operation No. selection • HOME-P output function selection |
| | <ul style="list-style-type: none"> • RUN current • STOP current • Position loop gain • Speed loop gain • Speed loop integral time constant • Speed filter | <ul style="list-style-type: none"> • Moving average time • Filter selection • Speed difference gain 1 • Speed difference gain 2 • Control mode • Smooth drive |

| | | |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Operation parameter (p.116) | <ul style="list-style-type: none"> • Common acceleration • Common deceleration • Starting speed • JOG operating speed • Acceleration/deceleration rate of JOG • JOG starting speed • Acceleration/deceleration type | <ul style="list-style-type: none"> • Acceleration/deceleration unit • Automatic return operation • Operation speed of automatic return • Acceleration (deceleration) of automatic return • Starting speed of automatic return • JOG travel amount |
| Home operation parameter (p.117) | <ul style="list-style-type: none"> • Home-seeking mode • Operating speed of home-seeking • Acceleration/deceleration of home-seeking • Starting speed of home-seeking • Position offset of home-seeking | <ul style="list-style-type: none"> • Starting direction of home-seeking • SLIT detection with home-seeking • TIM signal detection with home-seeking • Operating current of home-seeking with push-motion |
| Alarm parameter (p.118) | <ul style="list-style-type: none"> • Overload alarm • Excessive position deviation alarm at current ON | <ul style="list-style-type: none"> • Return-to-home incomplete alarm • Excessive position deviation alarm at current OFF |
| Warning parameter (p.118) | <ul style="list-style-type: none"> • Overheat warning • Overload warning • Overspeed warning | <ul style="list-style-type: none"> • Overvoltage warning • Undervoltage warning • Excessive position deviation warning at current ON |
| Coordinates parameter (p.119) | <ul style="list-style-type: none"> • Electronic gear A • Electronic gear B • Motor rotation direction • Software overtravel | <ul style="list-style-type: none"> • Positive software limit • Negative software limit • Preset position • Wrap setting • Wrap setting range |
| Common parameter (p.119) | <ul style="list-style-type: none"> • Data setter speed display • Data setter edit • Absolute back-up system | |
| I/O function [input] parameter (p.120) | <ul style="list-style-type: none"> • IN0 to IN7 input function selection • IN0 to IN7 input logic level setting | |
| I/O function [output] parameter (p.120) | <ul style="list-style-type: none"> • OUT0 to OUT5 output function selection | |
| I/O function [RS-485] parameter (p.121) | <ul style="list-style-type: none"> • NET-IN0 to NET-IN15 input function selection • NET-OUT0 to NET-OUT15 output function selection | |
| Communication parameter (p.122) | <ul style="list-style-type: none"> • Communication timeout • Communication error alarm • Communication parity | <ul style="list-style-type: none"> • Communication stop bit • Transmission waiting time |

■ I/O parameter

| Parameter name | Description | Initial value | Update (p.112) |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------|
| STOP input action | Sets how the motor should stop when a STOP input is turned ON. [Setting range] 0: Immediate stop 1: Decelerate stop 2: Immediate stop & Current OFF 3: Deceleration stop & Current OFF | 1 | A |
| Hardware overtravel | Sets whether to enable or disable hardware overtravel detection using ±LS inputs. [Setting range] 0: Disable 1: Enable | 1 | |
| Overtravel action | Sets the motor stop action to take place upon the occurrence of overtravel. [Setting range] 0: Immediate stop 1: Decelerate stop | 0 | |
| END signal range | Sets the output range of the END signal (the motor operation converges within this angular range). [Setting range] 0 to 180 (1=0.1°) | 18 | |
| Positioning complete output offset | Sets the offset for the END signal (the offset for converging angular range). [Setting range] −18 to 18 (1=0.1°) | 0 | |
| AREA1 positive direction position | Sets the AREA1 to AREA3 positive direction position. [Setting range] −8,388,608 to 8,388,607 step | 0 | |
| AREA2 positive direction position | | | |
| AREA3 positive direction position | | | |
| AREA1 negative direction position | Sets the AREA1 to AREA3 negative direction position. [Setting range] −8,388,608 to 8,388,607 step | 0 | |
| AREA2 negative direction position | | | |
| AREA3 negative direction position | | | |
| Minimum ON time for MOVE output | Sets the minimum ON time for MOVE output. [Setting range] 0 to 255 ms | 0 | |
| LS contact configuration | Sets the ±LS input logics. [Setting range] 0: Make (N.O.) 1: Brake (N.C.) | 0 | C |
| HOMES logic level | Sets the HOMES input logic. [Setting range] 0: Make (N.O.) 1: Brake (N.C.) | 0 | |
| SLIT logic level | Sets the SLIT input logic. [Setting range] 0: Make (N.O.) 1: Brake (N.C.) | 0 | |

| Parameter name | Description | Initial value | Update (p.112) |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------|---------------|----------------|
| MS0 operation No. selection | Sets operation data No. corresponding to MS0 to MS5 input. [Setting range] Operation data No.0 to 63 | 0 | B |
| MS1 operation No. selection | | 1 | |
| MS2 operation No. selection | | 2 | |
| MS3 operation No. selection | | 3 | |
| MS4 operation No. selection | | 4 | |
| MS5 operation No. selection | | 5 | |
| HOME-P output function selection | Sets the timing to output the HOME-P output. [Setting range] 0: Home output 1: Return-to-home complete output | 0 | A |

■ Motor parameter

| Parameter name | Description | Initial value | Update (p.112) |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|
| RUN current | Sets the motor operating current based on the rated current being 100 %. [Setting range] 0 to 1,000 (1=0.1 %) | 1,000 | A |
| STOP current | Sets the motor standstill current as a percentage of the rated current, based on the rated current being 100 %. [Setting range] 0 to 500 (1=0.1 %) | 500 | |
| Position loop gain | Adjusts the motor response in reaction to the position deviation. [Setting range] 1 to 50 | 10 | |
| Speed loop gain | Adjusts the motor response in reaction to the speed deviation. [Setting range] 10 to 200 | 180 | |
| Speed loop integral time constant | Adjusts the deviation that cannot be adjusted with the speed loop gain. [Setting range] 100 to 2,000 (1=0.1 ms) | 1,000 | |
| Speed filter | Adjusts the motor response. [Setting range] 0 to 200 ms | 1 | B |
| Moving average time | Sets the time constant for the moving average filter. [Setting range] 1 to 200 ms | 1 | |
| Filter selection | Sets the filter function to adjust the motor response. [Setting range] 0: Speed filter 1: Moving average filter | 0 | C |
| Speed difference gain 1 | Adjusts vibration during operation. [Setting range] 0 to 500 | 45 | A |
| Speed difference gain 2 | Adjusts vibration during acceleration/deceleration. [Setting range] 0 to 500 | 45 | |

| Parameter name | Description | Initial value | Update (p.112) |
|----------------|--------------------------------------------------------------------------------------------------------|---------------|----------------|
| Control mode | Sets the control mode of the driver. [Setting range] 0: Normal mode 1: Current control mode | 0 | C |
| Smooth drive | Sets whether to enable or disable smooth drive function. [Setting range] 0: Disable 1: Enable | 1 | |

■ Operation parameter

| Parameter name | Description | Initial value | Update (p.112) |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|
| Common acceleration | Sets the common acceleration rate (common acceleration time) in positioning operation and continuous operation. [Setting range] 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) * | 1,000 | B |
| Common deceleration | Sets the common deceleration rate (common deceleration time) in positioning operation and continuous operation. [Setting range] 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) * | 1,000 | |
| Starting speed | Sets the starting speed in positioning operation and continuous operation. The motor will operate at the starting speed if the operating speed is below the starting speed. [Setting range] 0 to 1,000,000 Hz | 500 | |
| JOG operating speed | Sets the operating speed for JOG operation. [Setting range] 1 to 1,000,000 Hz | 1,000 | |
| Acceleration/ deceleration rate of JOG | Sets the acceleration/deceleration rate (acceleration/deceleration time) for JOG operation. [Setting range] 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) * | 1,000 | |
| JOG starting speed | Sets the starting speed for JOG operation. [Setting range] 0 to 1,000,000 Hz | 500 | |
| Acceleration/ deceleration type | Sets whether to use the common acceleration/deceleration or the acceleration/deceleration specified for the operation data. [Setting range] 0: Common 1: Separate | 1 | |
| Acceleration/ deceleration unit | Sets the acceleration/deceleration unit. [Setting range] 0: ms/kHz 1: s | 0 | C |
| Automatic return operation | Sets whether to enable or disable automatic return operation. [Setting range] 0: Disable 1: Enable | 0 | |
| Operation speed of automatic return | Sets the operating speed for automatic return operation. [Setting range] 1 to 1,000,000 Hz | 1,000 | B |

| Parameter name | Description | Initial value | Update (p.112) |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|
| Acceleration (deceleration) of automatic return | Sets the acceleration/deceleration rate (acceleration/deceleration time) for automatic return operation. [Setting range] 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) * | 1,000 | B |
| Starting speed of automatic return | Sets the starting speed for automatic return operation. [Setting range] 0 to 1,000,000 Hz | 500 | |
| JOG travel amount | Sets the travel amount for JOG operation. [Setting range] 1 to 8,388,607 step | 1 | |

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

■ Home operation parameter

| Parameter name | Description | Initial value | Update (p.112) |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|
| Home-seeking mode | Sets the mode for return-to-home operation. [Setting range] 0: 2-sensor mode 1: 3-sensor mode 2: Push mode | 1 | B |
| Operating speed of home-seeking | Sets the operating speed for return-to-home operation. [Setting range] 1 to 1,000,000 Hz | 1,000 | |
| Acceleration/deceleration of home-seeking | Sets the acceleration/ deceleration rate (acceleration/ deceleration time) for return-to-home operation. [Setting range] 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) * | 1,000 | |
| Starting speed of home-seeking | Sets the starting speed for return-to-home operation. [Setting range] 1 to 1,000,000 Hz | 500 | |
| Position offset of home-seeking | Sets the amount of offset from mechanical home. [Setting range] -8,388,608 to 8,388,607 step | 0 | |
| Starting direction of home-seeking | Sets the starting direction for home detection. [Setting range] 0: Negative direction 1: Positive direction | 1 | |
| SLIT detection with home-seeking | Sets whether or not to concurrently use the SLIT input for return-to-home operation. [Setting range] 0: Disable 1: Enable | 0 | |
| TIM signal detection with home-seeking | Sets whether or not to concurrently use the TIM signal for return-to-home operation. [Setting range] 0: Disable 1: Enable | 0 | |
| Operating current of home-seeking with push-motion | Sets the operating current for push-motion return-to-home operation based on the rated current being 100 %. [Setting range] 0 to 1,000 (1=0.1 %) | 1,000 | |

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

■ Alarm parameter

| Parameter name | Description | Initial value | Update (p.112) |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|
| Overload alarm | Sets the condition that an overload alarm generates. [Setting range] 1 to 300 (1=0.1 s) | 50 | A |
| Excessive position deviation alarm at current ON | Sets the condition that an excessive position deviation alarm generates when the motor is in a state of current ON. [Setting range] 1 to 30,000 (1=0.01 rev) | 300 | |
| Return-to-home incomplete alarm | When the positioning operation is started while the position origin has not been set, selects whether the alarm generates or not. [Setting range] 0: Disable 1: Enable | 0 | C |
| Excessive position deviation alarm at current OFF | Sets the condition that an excessive position deviation alarm generates when the motor is in a state of current OFF. If the position deviation exceeds the setting value in the "Excessive position deviation alarm at current ON" parameter, the excessive position deviation warning at current OFF generates. In addition, if the C-ON input is turned ON, the excessive position deviation alarm at current OFF generates. [Setting range] 1 to 30,000 (1=0.01 rev) | 10,000 | A |

■ Warning parameter

| Parameter name | Description | Initial value | Update (p.112) |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|
| Overheat warning | Sets the condition that a main circuit overheat warning generates. [Setting range] 40 to 85 °C | 85 | A |
| Overload warning | Sets the condition that an overload warning generates. [Setting range] 1 to 300 (1=0.1 s) | 50 | |
| Overspeed warning | Sets the condition that an overspeed warning generates. [Setting range] 1 to 5,000 r/min | 4,500 | |
| Overvoltage warning (AC power input) | Sets the condition that an overvoltage warning generates. [Setting range] 120 to 450 V | 435 | |
| Overvoltage warning (DC power input) | Sets the condition that an overvoltage warning generates. [Setting range] 150 to 630 (1=0.1 V) | 630 | |
| Undervoltage warning (AC power input) | Sets the condition that an undervoltage warning generates. [Setting range] 120 to 280 V | 120 | |
| Undervoltage warning (DC power input) | Sets the condition that an undervoltage warning generates. [Setting range] 150 to 630 (1=0.1 V) | 180 | |
| Excessive position deviation warning at current ON | Sets the condition that an excessive position deviation warning generates when the motor is in a state of current ON. [Setting range] 1 to 30,000 (1=0.01 rev) | 300 | |

■ Coordinates parameter

| Parameter name | Description | Initial value | Update (p.112) |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|
| Electronic gear A | Sets the denominator of electronic gear. [Setting range] 1 to 65,535 | 1 | C |
| Electronic gear B | Sets the numerator of electronic gear. [Setting range] 1 to 65,535 | 1 | |
| Motor rotation direction | Sets the rotation direction of motor output shaft. [Setting range] 0: Positive direction=CCW 1: Positive direction=CW | 1 | |
| Software overtravel | Sets whether to enable or disable software overtravel detection using soft limits. [Setting range] 0: Disable 1: Enable | 1 | A |
| Positive software limit | Sets the value of soft limit in positive direction. [Setting range] -8,388,608 to 8,388,607 step | 8,388,607 | |
| Negative software limit | Sets the value of soft limit in negative direction. [Setting range] -8,388,608 to 8,388,607 step | -8,388,608 | |
| Preset position | Sets the preset position. [Setting range] -8,388,608 to 8,388,607 step | 0 | |
| Wrap setting | Sets whether to enable or disable wrap function. [Setting range] 0: Disable 1: Enable | 0 | C |
| Wrap setting range | Sets the wrap setting range. [Setting range] 1 to 8,388,607 step | 1,000 | |

■ Common parameter

| Parameter name | Description | Initial value | Update (p.112) |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------|----------------|
| Data setter speed display | Sets the display method of the speed monitor for the OPX-2A . [Setting range] 0: Signed 1: Absolute value | 0 | A |
| Data setter edit | Sets whether it is possible to edit using the OPX-2A . [Setting range] 0: Disable 1: Enable | 1 | |
| Absolute back-up system | Sets whether to enable or disable absolute-position backup system. [Setting range] 0: Disable 1: Enable | 0 | C |

■ I/O function [input] parameter

| Parameter name | Description | Initial value | Update (p.112) |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------|---------------|----------------|
| IN0 input function selection | Assigns the input signals to IN0 to IN7 of the input terminals. [Setting range] Refer to the following table. | 3: HOME | C |
| IN1 input function selection | | 4: START | |
| IN2 input function selection | | 48: M0 | |
| IN3 input function selection | | 49: M1 | |
| IN4 input function selection | | 50: M2 | |
| IN5 input function selection | | 16: FREE | |
| IN6 input function selection | | 18: STOP | |
| IN7 input function selection | | 24: ALM-RST | |
| IN0 input logic level setting | Changes the logic level setting for input terminals IN0 to IN7. [Setting range] 0: Make (N.O.) 1: Brake (N.C.) | 0 | |
| IN1 input logic level setting | | | |
| IN2 input logic level setting | | | |
| IN3 input logic level setting | | | |
| IN4 input logic level setting | | | |
| IN5 input logic level setting | | | |
| IN6 input logic level setting | | | |
| IN7 input logic level setting | | | |

Setting range for IN input function selection

| | | | | | |
|----------------|----------|--------------|---------|---------|--------|
| 0: No function | 8: MS0 | 18: STOP | 35: R3 | 43: R11 | 51: M3 |
| 1: FWD | 9: MS1 | 24: ALM-RST | 36: R4 | 44: R12 | 52: M4 |
| 2: RVS | 10: MS2 | 25: P-PRESET | 37: R5 | 45: R13 | 53: M5 |
| 3: HOME | 11: MS3 | 26: P-CLR | 38: R6 | 46: R14 | |
| 4: START | 12: MS4 | 27: HMI | 39: R7 | 47: R15 | |
| 5: SSTART | 13: MS5 | 32: R0 | 40: R8 | 48: M0 | |
| 6: +JOG | 16: FREE | 33: R1 | 41: R9 | 49: M1 | |
| 7: -JOG | 17: C-ON | 34: R2 | 42: R10 | 50: M2 | |

■ I/O function [output] parameter

| Parameter name | Description | Initial value | Update (p.112) |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------|---------------|----------------|
| OUT0 output function selection | Assigns the output signals to OUT0 to OUT5 of the output terminals. [Setting range] Refer to the following table. | 70: HOME-P | C |
| OUT1 output function selection | | 69: END | |
| OUT2 output function selection | | 73: AREA1 | |
| OUT3 output function selection | | 67: READY | |
| OUT4 output function selection | | 66: WNG | |
| OUT5 output function selection | | 65: ALM | |

Setting range for OUT output function selection

| | | | | | |
|----------------|------------|---------|-----------|-------------|-----------|
| 0: No function | 10: MS2_R | 35: R3 | 45: R13 | 61: -LS_R | 72: TIM |
| 1: FWD_R | 11: MS3_R | 36: R4 | 46: R14 | 62: HOMES_R | 73: AREA1 |
| 2: RVS_R | 12: MS4_R | 37: R5 | 47: R15 | 63: SLIT_R | 74: AREA2 |
| 3: HOME_R | 13: MS5_R | 38: R6 | 48: M0_R | 65: ALM | 75: AREA3 |
| 4: START_R | 16: FREE_R | 39: R7 | 49: M1_R | 66: WNG | 80: S-BSY |
| 5: SSTART_R | 17: C-ON_R | 40: R8 | 50: M2_R | 67: READY | 82: MPS * |
| 6: +JOG_R | 18: STOP_R | 41: R9 | 51: M3_R | 68: MOVE | |
| 7: -JOG_R | 32: R0 | 42: R10 | 52: M4_R | 69: END | |
| 8: MS0_R | 33: R1 | 43: R11 | 53: M5_R | 70: HOME-P | |
| 9: MS1_R | 34: R2 | 44: R12 | 60: +LS_R | 71: TLC | |

* AC power input only.

■ I/O function [RS-485] parameter

| Parameter name | Description | Initial value | Update (p.112) |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|
| NET-IN0 input function selection | Assigns the input signals to NET-IN0 to NET-IN15. [Setting range] Refer to "Setting range for NET-IN input function selection". | 48: M0 | C |
| NET-IN1 input function selection | | 49: M1 | |
| NET-IN2 input function selection | | 50: M2 | |
| NET-IN3 input function selection | | 4: START | |
| NET-IN4 input function selection | | 3: HOME | |
| NET-IN5 input function selection | | 18: STOP | |
| NET-IN6 input function selection | | 16: FREE | |
| NET-IN7 input function selection | | 0: No function | |
| NET-IN8 input function selection | | 8: MS0 | |
| NET-IN9 input function selection | | 9: MS1 | |
| NET-IN10 input function selection | | 10: MS2 | |
| NET-IN11 input function selection | | 5: SSTART | |
| NET-IN12 input function selection | | 6: +JOG | |
| NET-IN13 input function selection | | 7: -JOG | |
| NET-IN14 input function selection | | 1: FWD | |
| NET-IN15 input function selection | | 2: RVS | |
| NET-OUT0 output function selection | Assigns the output signals to NET-OUT0 to NET-OUT15. [Setting range] Refer to "Setting range for NET-OUT output function selection" on p.122. | 48: M0_R | |
| NET-OUT1 output function selection | | 49: M1_R | |
| NET-OUT2 output function selection | | 50: M2_R | |
| NET-OUT3 output function selection | | 4: START_R | |
| NET-OUT4 output function selection | | 70: HOME-P | |
| NET-OUT5 output function selection | | 67: READY | |
| NET-OUT6 output function selection | | 66: WNG | |
| NET-OUT7 output function selection | | 65: ALM | |
| NET-OUT8 output function selection | | 80: S-BSY | |
| NET-OUT9 output function selection | | 73: AREA1 | |
| NET-OUT10 output function selection | | 74: AREA2 | |
| NET-OUT11 output function selection | | 75: AREA3 | |
| NET-OUT12 output function selection | | 72: TIM | |
| NET-OUT13 output function selection | | 68: MOVE | |
| NET-OUT14 output function selection | | 69: END | |
| NET-OUT15 output function selection | | 71: TLC | |

● Setting range for NET-IN input function selection

| | | | | | |
|----------------|---------|----------------|--------|---------|---------|
| 0: No function | 7: -JOG | 16: FREE | 32: R0 | 39: R7 | 46: R14 |
| 1: FWD | 8: MS0 | 17: C-ON | 33: R1 | 40: R8 | 47: R15 |
| 2: RVS | 9: MS1 | 18: STOP | 34: R2 | 41: R9 | 48: M0 |
| 3: HOME | 10: MS2 | 24: ALM-RST * | 35: R3 | 42: R10 | 49: M1 |
| 4: START | 11: MS3 | 25: P-PRESET * | 36: R4 | 43: R11 | 50: M2 |
| 5: SSTART | 12: MS4 | 26: P-CLR * | 37: R5 | 44: R12 | 51: M3 |
| 6: +JOG | 13: MS5 | 27: HMI | 38: R6 | 45: R13 | 52: M4 |
| | | | | | 53: M5 |

* It cannot be set in the driver that is before the specification change. Refer to p.7 for details.

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

| | | | | | |
|----------------|------------|---------|-----------|-------------|-----------|
| 0: No function | 10: MS2_R | 35: R3 | 45: R13 | 61: -LS_R | 72: TIM |
| 1: FWD_R | 11: MS3_R | 36: R4 | 46: R14 | 62: HOMES_R | 73: AREA1 |
| 2: RVS_R | 12: MS4_R | 37: R5 | 47: R15 | 63: SLIT_R | 74: AREA2 |
| 3: HOME_R | 13: MS5_R | 38: R6 | 48: M0_R | 65: ALM | 75: AREA3 |
| 4: START_R | 16: FREE_R | 39: R7 | 49: M1_R | 66: WNG | 80: S-BSY |
| 5: SSTART_R | 17: C-ON_R | 40: R8 | 50: M2_R | 67: READY | 82: MPS * |
| 6: +JOG_R | 18: STOP_R | 41: R9 | 51: M3_R | 68: MOVE | |
| 7: -JOG_R | 32: R0 | 42: R10 | 52: M4_R | 69: END | |
| 8: MS0_R | 33: R1 | 43: R11 | 53: M5_R | 70: HOME-P | |
| 9: MS1_R | 34: R2 | 44: R12 | 60: +LS_R | 71: TLC | |

* AC power input only.

■ **Communication parameter**

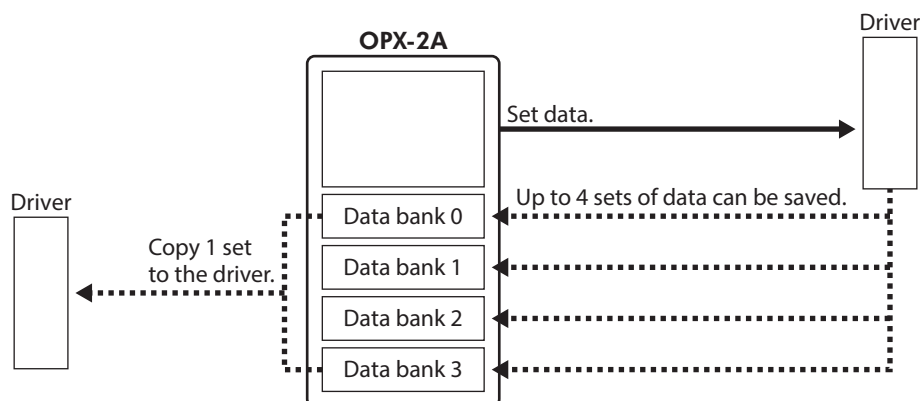
| Parameter name | Description | Initial value | Update (p.112) |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|
| Communication timeout | Sets the condition in which a communication timeout occurs in RS-485 communication. It is not monitored when the set value is 0. [Setting range] 0: Not monitored 1 to 10,000 ms | 0 | A |
| Communication error alarm | Sets the condition in which a RS-485 communication error alarm generates. A communication error alarm generates after a RS-485 communication error has occurred by the number of times set here. [Setting range] 1 to 10 times | 3 | |
| Communication parity | Sets the parity of RS-485 communication. [Setting range] 0: None 1: Even 2: Odd | 1 | D |
| Communication stop bit | Sets the stop bit of RS-485 communication. [Setting range] 0: 1 bit 1: 2 bits | 0 | |
| Transmission waiting time | Sets the transmission waiting time of RS-485 communication. [Setting range] 0 to 10,000 (1=0.1 ms) | 100 | |

3 Operation using the OPX-2A

This chapter explains the overview and operating method for the **OPX-2A**.
When connect or disconnect the **OPX-2A** cable, turn off the driver power supply.

3-1 Overview of the OPX-2A

The **OPX-2A** is a data setter that can set the operation data and parameters, and execute monitor and others.
In addition, the **OPX-2A** can be used to save the data of driver. There are four destinations (data banks) to save data.



The **OPX-2A** can be used for the following purposes:

- Set data for the driver.
- Monitor the communication time or communication status.
- Check and clear the alarm records.
- The data set in the driver can be saved to the **OPX-2A**.
- The data saved in the **OPX-2A** can be copied to another driver connected to the **OPX-2A**.

■ Notation

In this manual, keys are denoted by symbols, such as $\left[\begin{smallmatrix} \text{MODE} \\ \text{ESC} \end{smallmatrix} \right]$ $\left[\text{SET} \right]$ $\left[\uparrow \right]$ $\left[\downarrow \right]$ $\left[\leftarrow \right]$ $\left[\rightarrow \right]$.
In figures, a simplified illustration of the display and LED indicators is used, as shown below.



■ Edit lock function

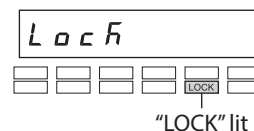
Enable the edit lock function if you want to prevent data from being edited or cleared. Data cannot be changed or deleted while the edit lock function is enabled.

● Setting the edit lock function

In the top screen of each operation mode, press the $\left[\begin{smallmatrix} \text{MODE} \\ \text{ESC} \end{smallmatrix} \right]$ key for at least 5 seconds.

The display will show "Lock" and the edit lock function will be enabled.

The "LOCK" LED in the LED indicator area will also be lit.



● Canceling the edit lock function

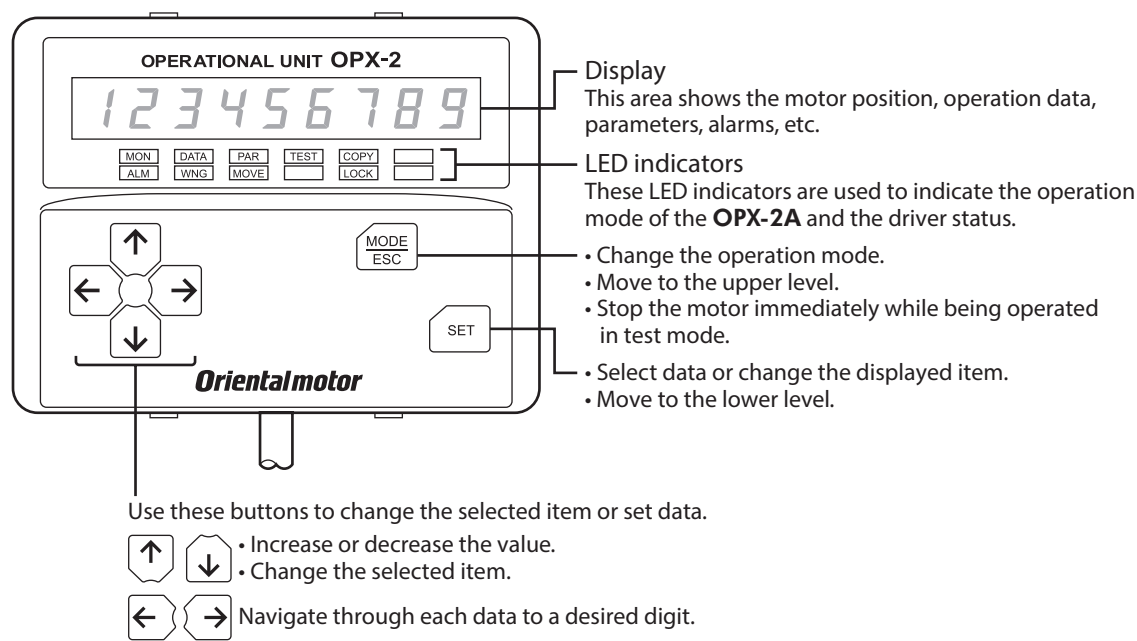
Again in the top screen of each operation mode, press the $\left[\begin{smallmatrix} \text{MODE} \\ \text{ESC} \end{smallmatrix} \right]$ key for at least 5 seconds.

The display will show "UnLock" and the edit lock function will be cancelled.

The "LOCK" LED in the LED indicator area will turn off.



3-2 Names and functions of parts



3-3 How to read the display

The display consists of 7-segment LEDs. (The number "5" and alphabet "S" are the same.)

• Numbers

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 7 | 8 | 8 | 9 | 9 | 0 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

• Alphabets

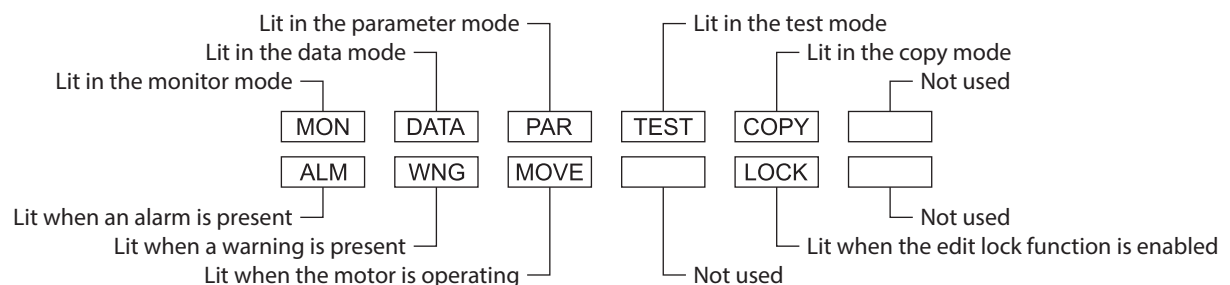
| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | A | B | b | C | c | D | d | E | E | F | F | G | G | H | H | I | I | J | J | K | K | L | L |
| M | m | N | n | O | o | P | P | Q | q | R | r | S | S | T | t | U | u | V | v | W | w | Y | y |

• Signes

| | | | |
|---|---|---|---|
| + | + | - | - |
|---|---|---|---|

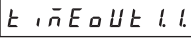
■ How to read the LED indicators

When the operation mode is changed or an alarm or warning generates, a corresponding LED will be lit. While the motor is operating or the edit lock function is enabled, the condition is also indicated by the illumination of a corresponding LED.



3-4 OPX-2A error display

Errors displayed on the **OPX-2A** are explained.

| Error display | Meaning | Action |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | A communication error occurred between the OPX-2A and driver. | <ul style="list-style-type: none"> • Check if the OPX-2A is connected securely. • Check if the OPX-2A cable is disconnected or damaged. • The OPX-2A or the communication part of the driver may have damaged. Contact your nearest Oriental Motor sales office. |

- Broken line indicates that data writing cannot be executed when internal processing is in progress via RS-485 communication. "mEm-BUSy" is displayed even when the **[SET]** key is pressed.
- In the lower screen level except the top screen, press **[^{MODE}ESC]** key to return to the previous level.

- The following limitations are present while the edit lock function is enabled.
 - Data mode, parameter mode: Although they are displayed on the screen, they are unable to operate.
 - Clearing the alarm and warning records, clearing the data, position preset, teaching and copy mode: They are not displayed on the screen.
- When the HMI input is in OFF, functions other than monitor mode, upload, verification or viewing of the parameter mode cannot be executed.

Top screen of the monitor mode
n a n

Speed
r E u

Command position
P

This is a screen at which the power supply was turned on.

Operation number
a P E - n

Selected number
S E L - n

Alarm
A L

- Alarm record 1 (latest)**
A L - 1
- Alarm record 10 (oldest)**
A L - 10
- Clear alarm records**
A L r E c - c L r
- Reset of absolute position error alarm**
A L 3 3 - r S t
- Alarm reset**
A L - r S t

Warning
u n G

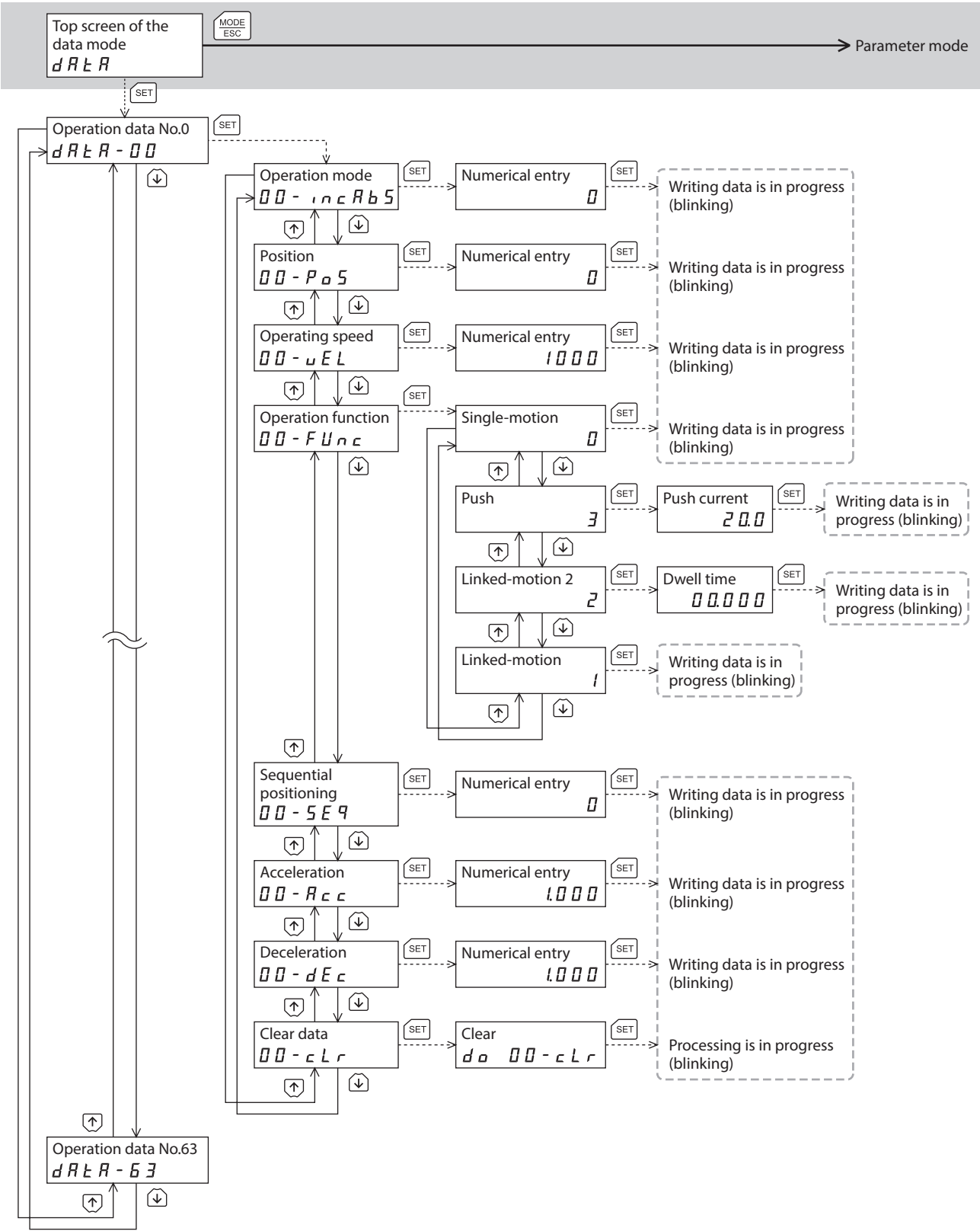
- Warning record 1 (latest)**
u n G - 1
- Warning record 10 (oldest)**
u n G - 10
- Clear warning records**
u n G - c L r

Direct I/O monitor
d i o

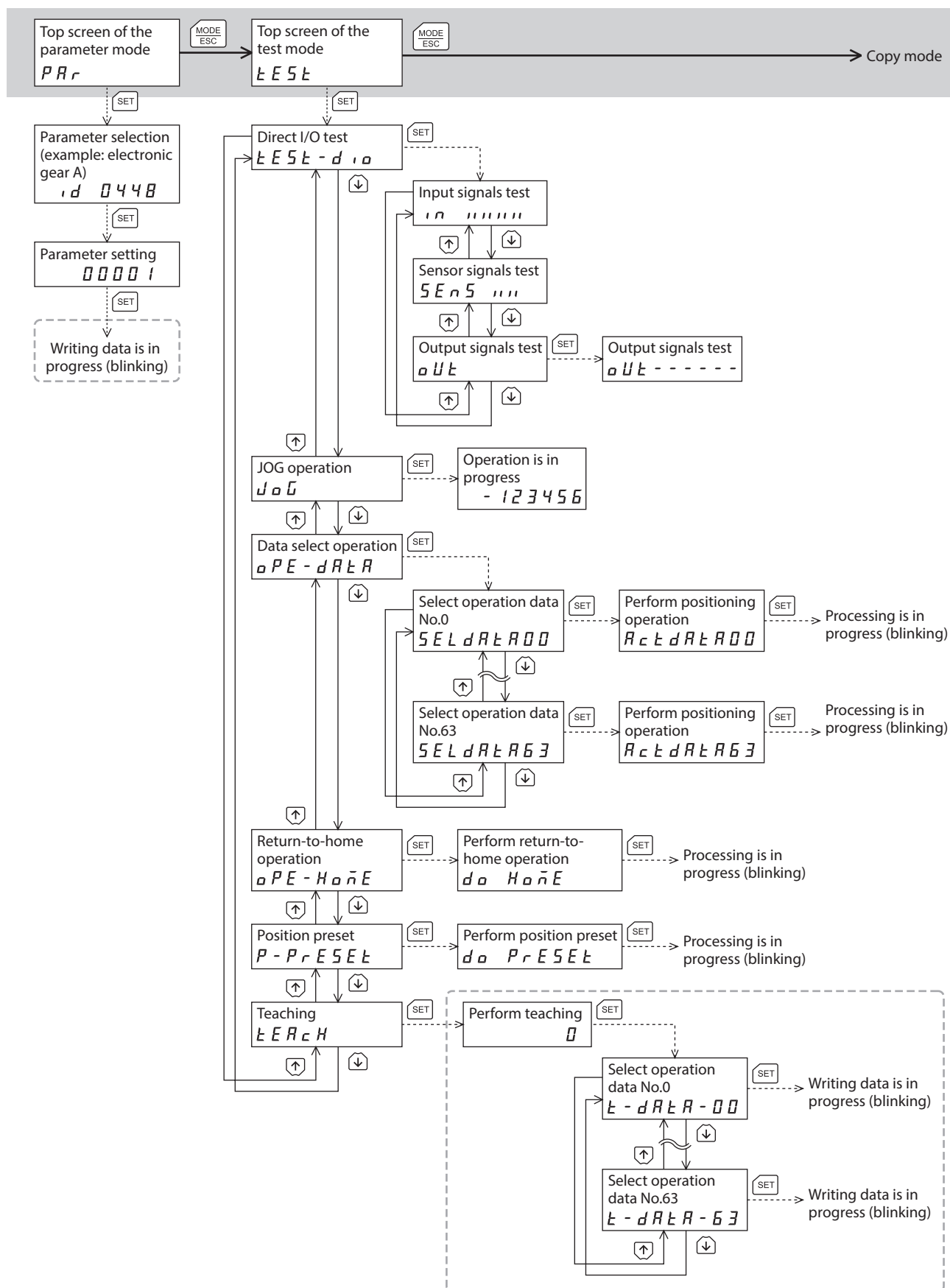
- Input signals monitor**
i n
- Sensor signals monitor**
S E n S
- Output signals monitor**
o U t

Processing is in progress (blinking)

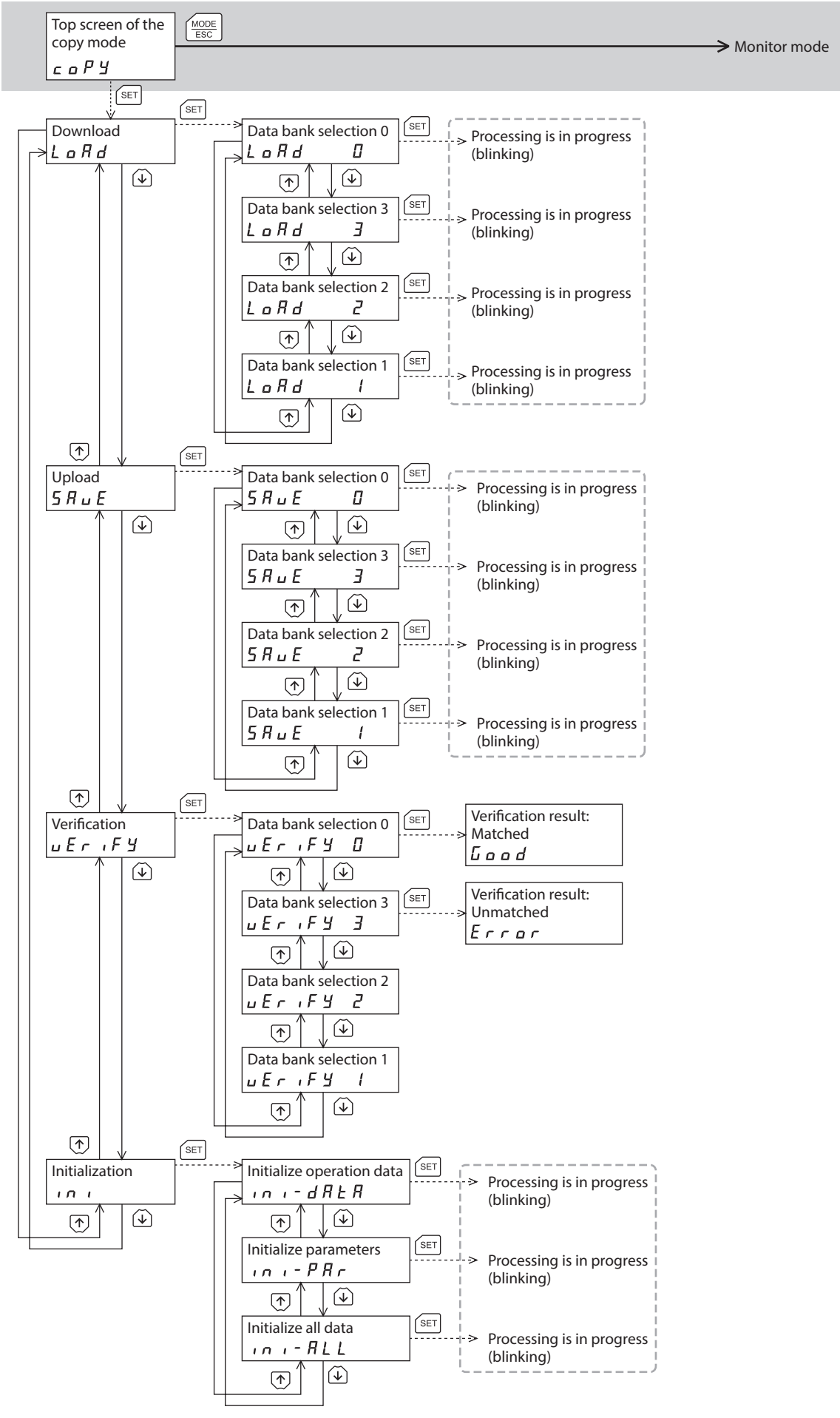
● Data mode



● Parameter mode, test mode



● Copy mode



3-6 Monitor mode

■ Overview of the monitor mode

● Monitoring the operating status

You can monitor the motor speed, command position, operation data number corresponding to the current operation and operation data number currently selected in real time.



A range capable to monitor with the **OPX-2A** is from –19,999,999 to 19,999,999 with up to eight digit numbers. However, only seven digit numbers can be shown on the display of the **OPX-2A**, so only the last seven digit numbers are shown when the monitored value is eight digit numbers, and a dot is marked on the lower right of the display.

• Display example

| | | | | | | |
|-----------------|-------------|-------------|-------------|------------|------------|------------|
| Actual value | –19,999,999 | –10,000,001 | –10,000,000 | 10,000,000 | 10,000,001 | 19,999,999 |
| Displayed value | –9999999. | –0000001. | –0000000. | 0000000. | 0000001. | 9999999. |

● Checking the alarms/warnings, clearing alarm/warning records, and resetting alarms

- If an alarm or warning generates, a corresponding alarm code or warning code will be displayed. You can check the code to identify the details of the alarm/warning.
- Up to 10 most recent alarms/warnings can be displayed, starting from the latest one.
- You can reset the alarms currently present.
- You can clear alarm/warning records.

● Checking the I/O signals

You can check the ON/OFF status of each I/O signal of the driver.

■ Monitor items

● Speed

You can check the motor speed (unit: r/min).

While the motor is rotating in the CCW direction, “–” is shown in front of the displayed value. If the speed is indicated by an absolute value, no sign is shown to indicate the rotating direction. You can select the value display format using the "Data setter speed display" parameter.

● Command position

You can check the command position of the motor with reference to the home position.

If a resolution is set, an appropriate value based on the resolution is shown as steps.

● Operation number

You can check the operation data number corresponding to the data used in the current positioning operation.

● Selected number

You can check the operation data number currently selected.

● Alarm

When an alarm generates, a corresponding alarm code will be displayed. You can also reset alarms or check and clear alarm records. Refer to p.146 for details about alarm codes and the method to reset alarms.



Do not turn off the driver power supply while an alarm is being reset or alarm records are being cleared (=while the display is blinking). Doing so may damage the data.



Some alarms cannot be reset on the **OPX-2A**. Check by the "Alarm list" on p.146. To reset these alarms, you must turn on the power supply again.

● **Warning**

When a warning generates, a corresponding warning code will be displayed. You can also check or clear warning records. For details about warning code, refer to p.152.

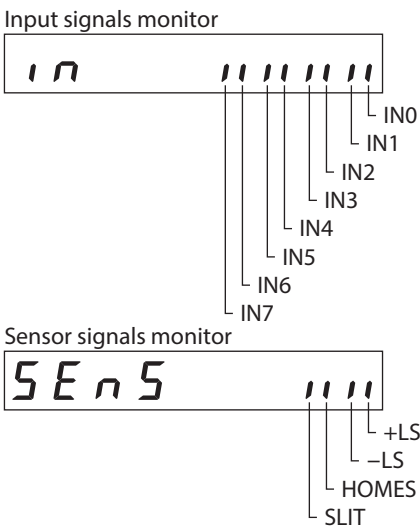
Note Do not turn off the driver power supply while warning records are being cleared (=while the display is blinking). Doing so may damage the data.

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

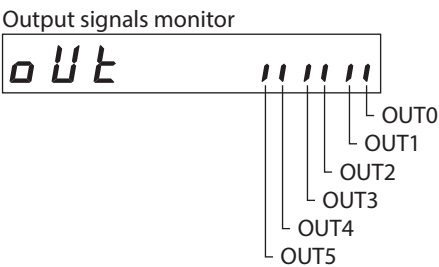
● **Direct I/O monitor**

You can check the ON/OFF status of each I/O signal of the driver.
Each digit on the 7-segment LED display corresponds to a signal. The LED is lit when the signal is ON, and it is unlit when the signal is OFF.

● **Input signals**



● **Output signals**



3-7 Data mode

Up to 64 sets of motor operation data can be set. Once set, the operation data is saved in the non-volatile memory of the driver. The data will not be lost even after the **OPX-2A** is disconnected from the driver.

Note Operation data has significant bearing on motor operation. Before setting any operation data, make sure you fully understand the content of the operation data.

- memo**
- If the operations are limited by the edit lock function or HMI input, operation data cannot be edited.
 - Operation data can also be set by selecting the ID with the parameter mode.
 - If the value you have input is outside the setting range, "Error" will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.
 - If **[SET]** key is pressed while executing the internal processing via RS-485 communication, "mEm-bUSy" may be displayed. Check "3-5 Screen transitions" on p.126 when "mEm-bUSy" is displayed. Be sure to wait until all internal processing is completed, before pressing the **[SET]** key.

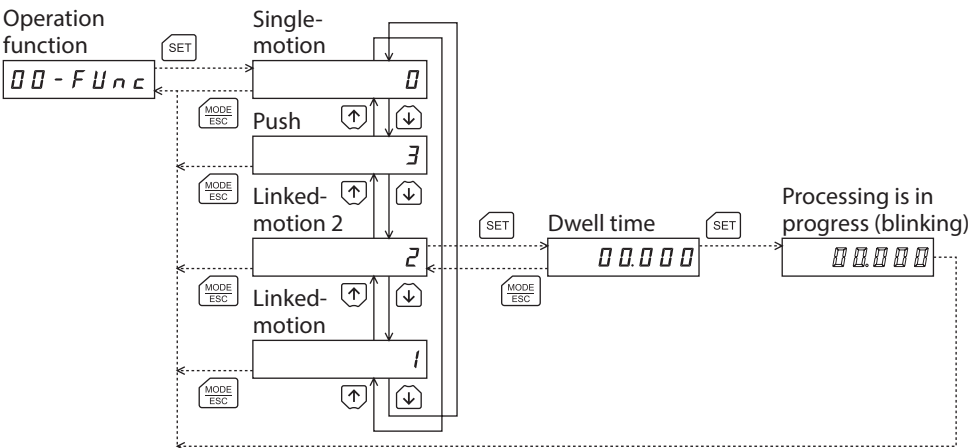
■ Setting item

| Setting item | Description | Initial value |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Operation mode | Selects how to specify the position (travel amount) in positioning operation. [Setting range] 0: Incremental 1: Absolute | 0 |
| Position | Sets the position (distance) for positioning operation. [Setting range] −8,388,608 to +8,388,607 step | 0 |
| Operating speed | Sets the operating speed in positioning operation and continuous operation. [Setting range] 1 to 1,000,000 Hz | 1,000 |
| Operation function | Sets the operation mode to execute positioning operation. [Setting range] 0: Single-motion 1: Linked-motion 2: Linked-motion 2 3: Push | 0 |
| Sequential positioning | Sets whether to enable or disable sequential positioning operation. [Setting range] 0: Disable 1: Enable | 0 |
| Acceleration * | Sets the acceleration rate (acceleration time) in positioning operation and continuous operation. [Setting range] 0.001 to 1,000.000 ms/kHz or 0.001 to 1,000.000 s | 1.000 |
| Deceleration * | Sets the deceleration rate (deceleration time) in positioning operation and continuous operation. [Setting range] 0.001 to 1,000.000 ms/kHz or 0.001 to 1,000.000 s | |
| Push current | Sets the current rate of push-motion operation. [Setting range] 0.0 to 100.0 % | 20.0 |
| Dwell time | Sets the dwell time to be used in linked-motion 2 operation. [Setting range] 0.000 to 50.000 s | 0.000 |

* This item is effective when the "Acceleration/deceleration type" parameter is set to "Separate."
If this parameter is set to "Common," the values of the "Common acceleration" and "Common deceleration" parameters will be used.

● How to set the dwell time

When displaying the "2: Linked-motion 2" on the "Operation function" and pressing the【SET】key, the screen to set the dwell time is displayed. Input the dwell time using the【↑】【↓】【←】【→】keys and press the【SET】key.



■ Setting example

This section explains how to change the the operation mode and position of the operation data No.0.

- Operation mode: Changes from incremental to absolute.
- Position: Changes from 0 step to 10,000 steps.

1. Use the **[MODE/ESC]** key to select the data mode.
The "DATA" LED is lit.
2. Press the **[SET]** key on the top screen of the data mode.
The display changes to the operation data No.0 screen.
3. Press the **[SET]** key.
The display changes to the operation mode screen.
4. Press the **[SET]** key again.
The present set value of the operation mode is displayed with blinking.
5. Press the **[↓]** key once to select "1."
Change to absolute mode (blinking).
6. Press the **[SET]** key.
The blinking speed of the input value becomes quickly and the value is set. The display returns to the operation mode screen.
7. Press the **[↓]** key.
The display changes to the position screen.
8. Press the **[SET]** key.
The present set value of the position is displayed with blinking.
9. Use the **[↑][↓][←][→]** keys to select "10,000."
The selected digit is displayed with blinking.
10. Press the **[SET]** key.
The blinking speed of the input value becomes quickly and the value is set. The display returns to the position screen.
11. Press the **[MODE/ESC]** key.
The display returns to the operation data No.0 screen.

Top screen of the data mode

d R L R

SET

Operation data No.0

d R L R - 00

SET

Operation mode

00 - i n c R b S

SET

Present value (blinking)

00

↓

Change to absolute mode (blinking)

00

SET

Confirm the changed value (quick blinking)

00

Return to the operation mode

00 - i n c R b S

↓

Position

00 - P o S

SET

Present value (blinking)

00000000

Use **[↑]** **[↓]** to increase/decrease the value.

Use **[←]** **[→]** to navigate through the digits.

Input 10,000 (blinking)

00 10000

SET

Confirm the changed value (quick blinking)

00 10000

Return to the position

00 - P o S

MODE/ESC

Return to the operation data No.0

d R L R - 00

■ Initialization of the selected operation data

All of the set value for the selected operation data number can be reverted to the initial values. Perform "clear data" of the data mode. For the operation, check the screen transitions of the data mode on p.127.

■ Initialization of all operation data

All of the operation data saved in the driver can be reverted to the initial values. Perform "Initialize operation data" of the copy mode. For the operation, check the screen transitions of the copy mode on p.129.

3-8

Parameter mode

You can set parameters relating to motor operation and control. These parameters are saved in the non-volatile memory of the driver.

Note

Parameters have significant bearing on motor operation. Before setting any parameter, make sure you fully understand the content of the parameter.

- memo
- If operations are limited by the edit lock function or HMI input, parameters cannot be edited.
 - If the value you have input is outside the setting range, "Error" will be displayed for 1 second. If this error display appears, input a different value that falls within the setting range.
 - If **[SET]** key is pressed while executing the internal processing via RS-485 communication, "mEm-bUSy" may be displayed. Check "3-5 Screen transitions" on p.126 when "mEm-bUSy" is displayed. Be sure to wait until all internal processing is completed, before pressing the **[SET]** key.
 - If a nonexistent parameter ID is entered, "id-Err" will be displayed for 1 second. Check the ID and enter the correct one.

● **Timing to update the setting value**

When a parameter is changed, the timing to update the new value varies depending on the parameter. Refer to the following three types.

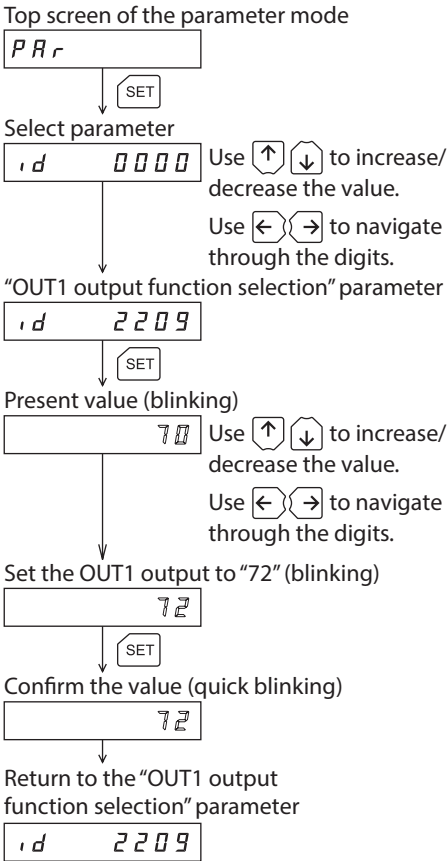
| Update timing | | Description |
|---------------|------------------------------|------------------------------------------------------------------------------|
| A | Immediately | Executes the recalculation and setup immediately when writing the parameter. |
| B | After stopping the operation | Executes the recalculation and setup after stopping the operation. |
| C | After cycle the power | Executes the recalculation and setup after cycling the DC power supply. |

In this chapter, each update timing is represented in A to C.

■ **Setting example**

This section explains how to assign the TIM output to the OUT1 output.

1. Use the **[MODE/ESC]** key to select the parameter mode.
The "PAR" LED is lit.
2. Press the **[SET]** key on the top screen of the parameter mode.
3. Use the **[↑][↓][←][→]** keys to enter [ID: 2209] in the "OUT1 output function selection" parameter.
4. Press the **[SET]** key.
The present set value of the "OUT1 output function selection" parameter is displayed with blinking.
5. Use the **[↑][↓][←][→]** keys to enter "72."
"72" indicates the TIM output.
6. Press the **[SET]** key.
The blinking speed of the input value becomes quickly and the value is set.
The display returns to the "OUT1 output function selection" parameter screen.



■ Parameter list

There is an unique ID in each parameter. With the **OPX-2A**, set the parameter selecting the ID.

● Operation data

Operation data can also be set by selecting the data mode.

| ID | Parameter name | Setting range | Initial value | Update (p.134) |
|--------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------|---------------|----------------|
| 640 to 703 | Operation mode No.0 to Operation mode No.63 | 0: Incremental 1: Absolute | 0 | B |
| 512 to 575 | Position No.0 to Position No.63 | −8,388,608 to +8,388,607 step | 0 | |
| 576 to 639 | Operating speed No.0 to Operating speed No.63 | 0 to 1,000,000 Hz | 1,000 | |
| 704 to 767 | Operation function No.0 to Operation function No.63 | 0: Single-motion 1: Linked-motion 2: Linked-motion 2 3: Push | 0 | |
| 960 to 1023 | Sequential positioning No.0 to Sequential positioning No.63 | 0: Disable 1: Enable | 0 | |
| 768 to 831 | Acceleration No.0 * to Acceleration No.63 * | 0.001 to 1,000.000 ms/kHz or 0.001 to 1,000.000 s | 1.000 | |
| 832 to 895 | Deceleration No.0 * to Deceleration No.63 * | 0.001 to 1,000.000 ms/kHz or 0.001 to 1,000.000 s | 1.000 | |
| 896 to 959 | Push current No.0 to Push current No.63 | 0.0 to 100.0 % | 20.0 | |
| 1024 to 1087 | Dwell time No.0 to Dwell time No.63 | 0.000 to 50.000 s | 0.000 | |

* This item is effective when the "Acceleration/deceleration type" parameter is set to "Separate."
If this parameter is set to "Common," the values of the "Common acceleration" and "Common deceleration" parameters will be used.

● Parameter

| ID | Parameter name | Setting range | Initila value | Update (p.134) |
|-----|-------------------------------------------|------------------------------------------------------------------------------------------------------------------|---------------|-------------------|
| 256 | STOP input action | 0: Immediate stop 1: Decelerate stop 2: Immediate stop & Current OFF 3: Deceleration stop & Current OFF | 1 | A |
| 257 | Hardware overtravel | 0: Disable 1: Enable | 1 | |
| 258 | Overtravel action | 0: Immediate stop 1: Decelerate stop | 0 | |
| 259 | END signal range | 0.0 to 18.0° | 1.8 | |
| 260 | Positioning complete output offset | −1.8 to 1.8° | 0.0 | |
| 261 | AREA1 positive direction position | −8,388,608 to 8,388,607 step | 0 | |
| 262 | AREA1 negative direction position | | | |
| 263 | AREA2 positive direction position | | | |
| 264 | AREA2 negative direction position | | | |
| 265 | AREA3 positive direction position | | | |
| 266 | AREA3 negative direction position | | | |
| 267 | Minimum ON time for MOVE output | 0 to 255 ms | 0 | C |
| 268 | LS contact configuration | 0: Make (N.O.) 1: Brake (N.C.) | 0 | |
| 269 | HOMES logic level | | | |
| 270 | SLIT logic level | | | |
| 288 | RUN current | 0.0 to 100.0 % | 100.0 | A |
| 289 | STOP current | 0.0 to 50.0 % | 50.0 | |
| 290 | Position loop gain | 1 to 50 | 10 | |
| 291 | Speed loop gain | 10 to 200 | 180 | |
| 292 | Speed loop integral time constant | 10.0 to 200.0 ms | 100.0 | |
| 293 | Speed filter | 0 to 200 ms | 1 | B |
| 294 | Moving average time | 1 to 200 ms | 1 | |
| 320 | Common acceleration | 0.001 to 1,000.000 ms/kHz or 0.001 to 1,000.000 s | 1.000 | |
| 321 | Common deceleration | | | |
| 322 | Starting speed | 0 to 1,000,000 Hz | 500 | |
| 323 | JOG operating speed | 1 to 1,000,000 Hz | 1,000 | |
| 324 | Acceleration/deceleration rate of JOG | 0.001 to 1,000.000 ms/kHz or 0.001 to 1,000.000 s | 1.000 | |
| 325 | JOG starting speed | 0 to 1,000,000 Hz | 500 | |
| 326 | Acceleration/deceleration type | 0: Common 1: Separate | 1 | |
| 327 | Acceleration/deceleration unit | 0: ms/kHz 1: s | 0 | |
| 352 | Home-seeking mode | 0: 2-sensor mode 1: 3-sensor mode 2: Push mode | 1 | B |
| 353 | Operating speed of home-seeking | 1 to 1,000,000 Hz | 1,000 | |
| 354 | Acceleration/deceleration of home-seeking | 0.001 to 1,000.000 ms/kHz or 0.001 to 1,000.000 s | 1.000 | |
| 355 | Starting speed of home-seeking | 1 to 1,000,000 Hz | 500 | |
| 356 | Position offset of home-seeking | −8,388,608 to 8,388,607 step | 0 | |
| 357 | Starting direction of home-seeking | 0: Negative direction 1: Positive direction | 1 | |

| ID | Parameter name | Setting range | Initial value | Update (p.134) |
|------|----------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------|----------------|
| 358 | SLIT detection with home-seeking | 0: Disable 1: Enable | 0 | B |
| 359 | TIM signal detection with home-seeking | | | |
| 360 | Operating current of home-seeking with push-motion | 0.0 to 100.0 % | 100.0 | |
| 384 | Overload alarm | 0.1 to 30.0 s | 5.0 | A |
| 385 | Excessive position deviation alarm at current ON | 0.01 to 300.00 rev | 3.00 | |
| 388 | Return-to-home incomplete alarm | 0: Disable 1: Enable | 0 | C |
| 416 | Overheat warning | 40 to 85 °C | 85 | A |
| 417 | Overload warning | 0.1 to 30.0 s | 5.0 | |
| 418 | Overspeed warning | 1 to 5,000 r/min | 4,500 | |
| 419 | Overvoltage warning | AC power input: 120 to 450 V DC power input: 150 to 630 (1=0.1 V) | AC power input: 435 DC power input: 630 | |
| 420 | Undervoltage warning | AC power input: 120 to 280 V DC power input: 150 to 630 (1=0.1 V) | AC power input: 120 DC power input: 180 | |
| 421 | Excessive position deviation warning at current ON | 0.01 to 300.00 rev | 3.00 | |
| 448 | Electronic gear A | 1 to 65,535 | 1 | C |
| 449 | Electronic gear B | | | |
| 450 | Motor rotation direction | 0: Positive direction=CCW 1: Positive direction=CW | 1 | |
| 451 | Software overtravel | 0: Disable 1: Enable | 1 | A |
| 452 | Positive software limit | -8,388,608 to 8,388,607 step | 8,388,607 | |
| 453 | Negative software limit | | -8,388,608 | |
| 454 | Preset position | | 0 | |
| 455 | Wrap setting | 0: Disable 1: Enable | 0 | C |
| 456 | Wrap setting range | 1 to 8,388,607 step | 1,000 | |
| 480 | Data setter speed display | 0: Signed 1: Absolute value | 0 | A |
| 482 | Absolute back-up system | 0: Disable 1: Enable | 0 | C |
| 2048 | MS0 operation No. selection | 0 to 63 | 0 | B |
| 2049 | MS1 operation No. selection | | 1 | |
| 2050 | MS2 operation No. selection | | 2 | |
| 2051 | MS3 operation No. selection | | 3 | |
| 2052 | MS4 operation No. selection | | 4 | |
| 2053 | MS5 operation No. selection | | 5 | |
| 2054 | HOME-P output function selection | 0: Home output 1: Return-to-home complete output | 0 | A |
| 2064 | Filter selection | 0: Speed filter 1: Moving average filter | 0 | C |
| 2065 | Speed difference gain 1 | 0 to 500 | 45 | A |
| 2066 | Speed difference gain 2 | | | |
| 2067 | Control mode | 0: Normal mode 1: Current control mode | 0 | C |
| 2068 | Smooth drive | 0: Disable 1: Enable | 1 | C |
| 2080 | Automatic return operation | | 0 | |

| ID | Parameter name | Setting range | Initila value | Update (p.134) |
|------|---------------------------------------------------|------------------------------------------------------|----------------|-------------------|
| 2081 | Operation speed of automatic return | 1 to 1,000,000 Hz | 1,000 | B |
| 2082 | Acceleration (deceleration) of automatic return | 0.001 to 1,000.000 ms/kHz or 0.001 to 1,000.000 s | 1.000 | |
| 2083 | Starting speed of automatic return | 0 to 1,000,000 Hz | 500 | |
| 2084 | JOG travel amount | 1 to 8,388,607 step | 1 | |
| 2112 | Excessive position deviation alarm at current OFF | 0.01 to 300.00 rev | 100.00 | A |
| 2176 | IN0 input function selection | Refer to "IN input function selection" on p.140. | 3: HOME | C |
| 2177 | IN1 input function selection | | 4: START | |
| 2178 | IN2 input function selection | | 48: M0 | |
| 2179 | IN3 input function selection | | 49: M1 | |
| 2180 | IN4 input function selection | | 50: M2 | |
| 2181 | IN5 input function selection | | 16: FREE | |
| 2182 | IN6 input function selection | | 18: STOP | |
| 2183 | IN7 input function selection | | 24: ALM-RST | |
| 2192 | IN0 input logic level setting | 0: Make (N.O.) 1: Brake (N.C.) | 0 | |
| 2193 | IN1 input logic level setting | | | |
| 2194 | IN2 input logic level setting | | | |
| 2195 | IN3 input logic level setting | | | |
| 2196 | IN4 input logic level setting | | | |
| 2197 | IN5 input logic level setting | | | |
| 2198 | IN6 input logic level setting | | | |
| 2199 | IN7 input logic level setting | | | |
| 2208 | OUT0 output function selection | Refer to "OUT output function selection" on p.140. | 70: HOME-P | |
| 2209 | OUT1 output function selection | | 69: END | |
| 2210 | OUT2 output function selection | | 73: AREA1 | |
| 2211 | OUT3 output function selection | | 67: READY | |
| 2212 | OUT4 output function selection | | 66: WNG | |
| 2213 | OUT5 output function selection | | 65: ALM | |
| 2224 | NET-IN0 input function selection | Refer to "NET-IN input function selection" on p.140. | 48: M0 | C |
| 2225 | NET-IN1 input function selection | | 49: M1 | |
| 2226 | NET-IN2 input function selection | | 50: M2 | |
| 2227 | NET-IN3 input function selection | | 4: START | |
| 2228 | NET-IN4 input function selection | | 3: HOME | |
| 2229 | NET-IN5 input function selection | | 18: STOP | |
| 2230 | NET-IN6 input function selection | | 16: FREE | |
| 2231 | NET-IN7 input function selection | | 0: No function | |
| 2232 | NET-IN8 input function selection | | 8: MS0 | |
| 2233 | NET-IN9 input function selection | | 9: MS1 | |
| 2234 | NET-IN10 input function selection | | 10: MS2 | |
| 2235 | NET-IN11 input function selection | | 5: SSTART | |
| 2236 | NET-IN12 input function selection | | 6: +JOG | |
| 2237 | NET-IN13 input function selection | | 7: –JOG | |
| 2238 | NET-IN14 input function selection | | 1: FWD | |
| 2239 | NET-IN15 input function selection | | 2: RVS | |

| ID | Parameter name | Setting range | Initial value | Update (p.134) |
|------|-------------------------------------|--------------------------------------------------------|---------------|----------------|
| 2240 | NET-OUT0 output function selection | Refer to "NET-OUT output function selection" on p.140. | 48: M0_R | C |
| 2241 | NET-OUT1 output function selection | | 49: M1_R | |
| 2242 | NET-OUT2 output function selection | | 50: M2_R | |
| 2243 | NET-OUT3 output function selection | | 4: START_R | |
| 2244 | NET-OUT4 output function selection | | 70: HOME-P | |
| 2245 | NET-OUT5 output function selection | | 67: READY | |
| 2246 | NET-OUT6 output function selection | | 66: WNG | |
| 2247 | NET-OUT7 output function selection | | 65: ALM | |
| 2248 | NET-OUT8 output function selection | | 80: S-BSY | |
| 2249 | NET-OUT9 output function selection | | 73: AREA1 | |
| 2250 | NET-OUT10 output function selection | | 74: AREA2 | |
| 2251 | NET-OUT11 output function selection | | 75: AREA3 | |
| 2252 | NET-OUT12 output function selection | | 72: TIM | |
| 2253 | NET-OUT13 output function selection | | 68: MOVE | |
| 2254 | NET-OUT14 output function selection | | 69: END | |
| 2255 | NET-OUT15 output function selection | | 71: TLC | |
| 2304 | Communication timeout | 0: Not monitored 1 to 10,000 ms | 0 | A |
| 2305 | Communication error alarm | 1 to 10 times | 3 | |
| 2563 | Communication parity | 0: None 1: Even 2: Odd | 1 | C |
| 2564 | Communication stop bit | 0: 1 bit 1: 2 bits | 0 | |
| 2565 | Transmission waiting time | 0.0 to 1,000.0 ms | 10.0 | |

● **Setting range for function selection parameters**

IN input function selection

| | | | | | |
|----------------|----------|--------------|---------|---------|--------|
| 0: No function | 8: MS0 | 18: STOP | 35: R3 | 43: R11 | 51: M3 |
| 1: FWD | 9: MS1 | 24: ALM-RST | 36: R4 | 44: R12 | 52: M4 |
| 2: RVS | 10: MS2 | 25: P-PRESET | 37: R5 | 45: R13 | 53: M5 |
| 3: HOME | 11: MS3 | 26: P-CLR | 38: R6 | 46: R14 | |
| 4: START | 12: MS4 | 27: HMI | 39: R7 | 47: R15 | |
| 5: SSTART | 13: MS5 | 32: R0 | 40: R8 | 48: M0 | |
| 6: +JOG | 16: FREE | 33: R1 | 41: R9 | 49: M1 | |
| 7: -JOG | 17: C-ON | 34: R2 | 42: R10 | 50: M2 | |

OUT output function selection

| | | | | | |
|----------------|------------|---------|-----------|-------------|-----------|
| 0: No function | 10: MS2_R | 35: R3 | 45: R13 | 61: -LS_R | 72: TIM |
| 1: FWD_R | 11: MS3_R | 36: R4 | 46: R14 | 62: HOMES_R | 73: AREA1 |
| 2: RVS_R | 12: MS4_R | 37: R5 | 47: R15 | 63: SLIT_R | 74: AREA2 |
| 3: HOME_R | 13: MS5_R | 38: R6 | 48: M0_R | 65: ALM | 75: AREA3 |
| 4: START_R | 16: FREE_R | 39: R7 | 49: M1_R | 66: WNG | 80: S-BSY |
| 5: SSTART_R | 17: C-ON_R | 40: R8 | 50: M2_R | 67: READY | 82: MPS * |
| 6: +JOG_R | 18: STOP_R | 41: R9 | 51: M3_R | 68: MOVE | |
| 7: -JOG_R | 32: R0 | 42: R10 | 52: M4_R | 69: END | |
| 8: MS0_R | 33: R1 | 43: R11 | 53: M5_R | 70: HOME-P | |
| 9: MS1_R | 34: R2 | 44: R12 | 60: +LS_R | 71: TLC | |

* AC power input only.

NET-IN input function selection

| | | | | | |
|----------------|----------|----------------|---------|---------|--------|
| 0: No function | 8: MS0 | 18: STOP | 35: R3 | 43: R11 | 51: M3 |
| 1: FWD | 9: MS1 | 24: ALM-RST * | 36: R4 | 44: R12 | 52: M4 |
| 2: RVS | 10: MS2 | 25: P-PRESET * | 37: R5 | 45: R13 | 53: M5 |
| 3: HOME | 11: MS3 | 26: P-CLR * | 38: R6 | 46: R14 | |
| 4: START | 12: MS4 | 27: HMI | 39: R7 | 47: R15 | |
| 5: SSTART | 13: MS5 | 32: R0 | 40: R8 | 48: M0 | |
| 6: +JOG | 16: FREE | 33: R1 | 41: R9 | 49: M1 | |
| 7: -JOG | 17: C-ON | 34: R2 | 42: R10 | 50: M2 | |

* It cannot be set in the driver that is before the specification change. Refer to p.7 for details.

NET-OUT output function selection

| | | | | | |
|----------------|------------|---------|-----------|-------------|-----------|
| 0: No function | 10: MS2_R | 35: R3 | 45: R13 | 61: -LS_R | 72: TIM |
| 1: FWD_R | 11: MS3_R | 36: R4 | 46: R14 | 62: HOMES_R | 73: AREA1 |
| 2: RVS_R | 12: MS4_R | 37: R5 | 47: R15 | 63: SLIT_R | 74: AREA2 |
| 3: HOME_R | 13: MS5_R | 38: R6 | 48: M0_R | 65: ALM | 75: AREA3 |
| 4: START_R | 16: FREE_R | 39: R7 | 49: M1_R | 66: WNG | 80: S-BSY |
| 5: SSTART_R | 17: C-ON_R | 40: R8 | 50: M2_R | 67: READY | 82: MPS * |
| 6: +JOG_R | 18: STOP_R | 41: R9 | 51: M3_R | 68: MOVE | |
| 7: -JOG_R | 32: R0 | 42: R10 | 52: M4_R | 69: END | |
| 8: MS0_R | 33: R1 | 43: R11 | 53: M5_R | 70: HOME-P | |
| 9: MS1_R | 34: R2 | 44: R12 | 60: +LS_R | 71: TLC | |

* AC power input only.

3-9

Test mode

■ Overview of the test mode

- **Direct I/O test**
You can check the ON/OFF status of each input signal of the driver. You can also switch the ON/OFF status of each output signal on the **OPX-2A**. When checking the connection condition of the driver, perform the direct I/O test.
- **JOG operation**
You can operate the motor using the keys on the **OPX-2A**.
- **Data select operation**
You can perform the positioning operation.
- **Return-to-home operation**
You can perform the return-to-home operation.
- **Position preset**
You can set the preset value as the command position.
- **Teaching**
You can operate the motor using the keys on the **OPX-2A** and update the attained position in the operation data.



- Stop the motor operation before changing to the test mode.
- When you move from the top screen of the test mode to a lower level, the following inputs will be disabled.
START, SSTART, HOME, ±JOG, FWD, RVS and MS0 to MS5.
- In the direct I/O test, if the screen moves to the lower level, all of I/O signals and operation will be disabled.
- If the **[SET]** key is pressed while executing the internal processing via RS-485 communication, "mEm-bUSy" may be displayed. Check "3-5 Screen transitions" on p.126 when "mEm-bUSy" is displayed. Be sure to wait until all internal processing is completed, before pressing the **[SET]** key.
- If "Error" is displayed when data select operation, return-to-home operation, position preset or teaching function is performed, check whether an alarm generates.
- When the HMI input is OFF, test mode cannot be executed.

● What happens when the **[SET]** key is pressed while the motor is operating

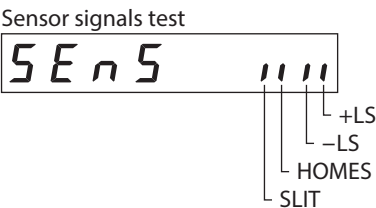
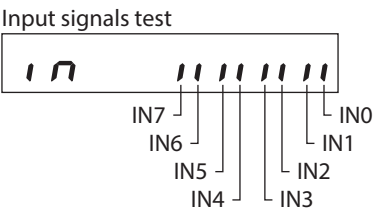
While the motor is operating, you cannot move to any lower level from the top screen of the test mode. Pressing the **[SET]** key will generate an error, and "oPE-Err" will be shown. Be sure to stop the motor operation before pressing the **[SET]** key.

o P E - E r r

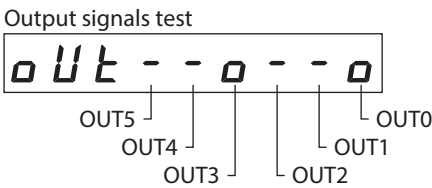
■ Direct I/O test

When checking the connection condition of the driver, perform the direct I/O test.
Each digit on the 7-segment LED display corresponds to a signal. The LED is lit when the input signal is ON, and it is unlit when the input signal is OFF.
Use the **[↑]****[↓]** keys to switch the ON-OFF state of the output signal. "□" is displayed when the signal is ON, while "-" is displayed when the signal is OFF.

● Input signals



● Output signals



Use **[←]****[→]** to navigate through the digits.
Use **[↑]****[↓]** to switch the ON/OFF status.
[□] indicates the ON status.
[-] indicates the OFF status.

■ JOG operation

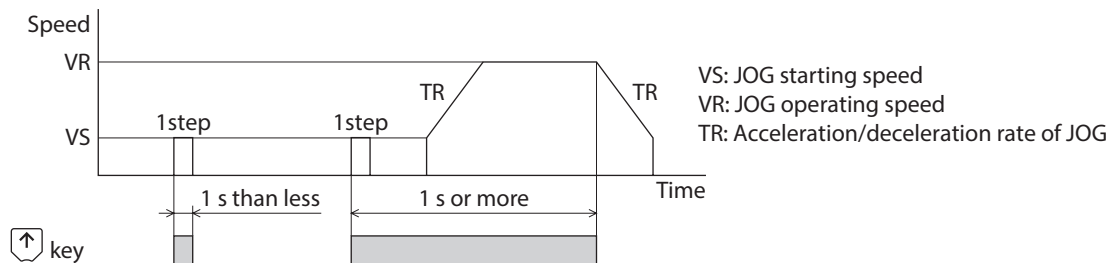
You can operate the motor using the keys on the **OPX-2A**.

Pressing the [↑] key once causes the motor to rotate one step in the positive direction. Pressing and holding the key causes the motor to rotate continuously in the positive direction.

Pressing the [↓] key once causes the motor to rotate one step in the negative direction. Pressing and holding the key causes the motor to rotate continuously in the negative direction.

The operating speed corresponds to the value set in the "JOG operating speed" parameter.

Take note that when the value set in the "JOG starting speed" parameter is greater than the value set in the "JOG operating speed" parameter, the JOG starting speed will become effective.



Note During operation, the motor rotates at the specified operating speed while each applicable key is pressed. Before commencing the operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situations.

■ Data select operation

Select a desired operation data number and then press the [SET] key, and positioning operation will be performed.



Note During operation, the motor rotates at the specified operating speed. Before commencing the operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situations.

■ Return-to-home operation

You can perform a return-to-home operation. The operating speed corresponds to the value set in the "Operating speed of home-seeking" parameter.



Note During operation, the motor rotates at the specified operating speed. Before commencing the operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situations.

■ Presetting the position

In this operation, the command position is preset by rewriting the value in the "Preset position" parameter.



If operations are limited by the edit lock function, the preset cannot be performed.

■ Teaching

You can operate the motor using the keys on the **OPX-2A** and update the attained position in the operation data.

The absolute mode will be automatically selected as the operation mode of any position data set by teaching.

The operating speed, acceleration/deceleration rate and starting speed of teaching are the same as the corresponding settings applicable to JOG operation.



Note During operation, the motor rotates at the specified operating speed. Before commencing the operation, consider the status of the equipment and condition of its surroundings to confirm thoroughly that motor rotation will not cause any dangerous situations.



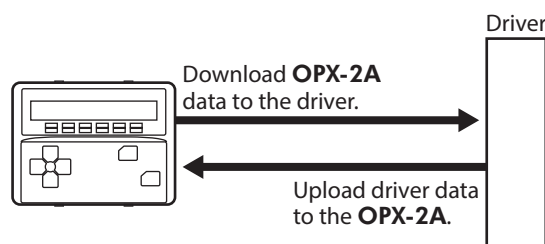
If operations are limited by the edit lock function, the teaching cannot be performed.

3-10 Copy mode

■ Overview of the copy mode

● Download

Data saved in the **OPX-2A** can be copied to the driver. If a download error occurs, a code indicating the description of the error will blink on the display. Download will not be performed and the display will return to the top screen of download. Refer to the following "Error of the copy mode" to display the error.



● Upload

Data saved in the driver can be copied to the **OPX-2A**.

● Verification

Data in the **OPX-2A** can be verified against the corresponding data in the driver.

If the verification finds that the two sets of data match, "Good" will be shown. If the two do not match, "Error" will be shown.

If a verification error occurs, a code indicating the description of the error will blink on the display. Verification will not be performed and the display will return to the top screen of verification. Refer to the following "Error of the copy mode" to display the error.

● Initializing data

Data saved in the driver can be restored to the initial values.

● What happens when the [SET] key is pressed while the edit lock function is enabled

While the edit lock function is enabled, you cannot move to any lower level from the top screen of the copy mode. Pressing the [SET] key will generate an error, and "Lock-Err" will be shown. Be sure to cancel the edit lock function before pressing the [SET] key. Refer to p.123 for the procedure to cancel the edit lock function.

Lock-Err

■ Error of the copy mode

If an error occurs in download or verification, the error code will blink on the display.

At this time, the processing will not be executed and the display will return to the top screen.

| Blinking display | Description | Action |
|-----------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Prod-Err</i> | There is a discrepancy between the selected product series and the data being processed. | <ul style="list-style-type: none"> Check the product series. Check the data bank number on the OPX-2A. |
| <i>Head-Err</i> <i>bcc-Err</i> | An error occurred while processing. | Execute the processing again. If the same error occurs, the data saved in the OPX-2A may have damaged. Upload and set the data of the OPX-2A again. |
| <i>no-data</i> | The specified data bank number does not contain data. | Check the data bank number. |

Note

Do not turn off the driver power supply while processing is in progress (=while the display is blinking). Doing so may damage the data.

memo

When a parameter that the power supply is required to turn on again for updating was changed by downloading, turn on the DC power supply of the driver again.

4 Inspection and maintenance

4-1 Inspection

It is recommended that periodic inspections be conducted for the items listed below after each operation of the motor. If an abnormal condition is noted, discontinue any use and contact your nearest Oriental Motor sales office.

■ Inspection item

- Check if any of the screws having installed the motor comes loose.
- Check if an unusual noise is generated from a bearing part (ball bearings) of the motor.
- Check if a damage or stress is applied on the cable.
- Check if the connection part between the cable and driver comes loose.
- Check if the motor output shaft and the load shaft are out of alignment.
- Check if the openings in the driver clogged.
- Check if the mounting place of the driver is loose.
- Check if any attachment of dust, etc., on the driver.
- Check if any strange smells or appearances within the driver.



The driver uses semiconductor elements. Handle the driver with care since static electricity may damage semiconductor elements.

4-2 Warranty

Check on the Oriental Motor Website or General Catalog for the product warranty.

4-3 Disposal

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

5 Alarms and warnings

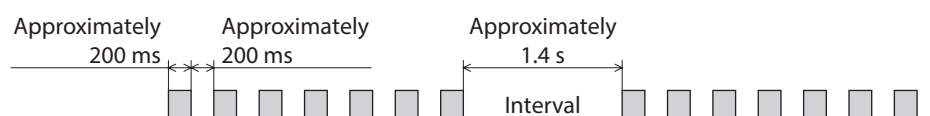
The driver provides alarms that are designed to protect the driver from overheating, poor connection, error in operation, etc. (protective functions), as well as warnings that are output before the corresponding alarms generate (warning functions).

5-1 Alarms

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

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

Example: Hardware overtravel alarm [number of times the ALM LED (or ALARM LED) blinks: 7]



■ Alarm reset

Perform one of the reset operations specified below. Before resetting an alarm, always remove the cause of the alarm and ensure safety. Refer to p.313 for the timing chart.

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



The absolute position error alarm can be reset by turning the P-CLR input from ON to OFF, or executing the reset of the absolute position error alarm using the **MEXE02**, **OPX-2A** or via RS-485 communication. This alarm cannot be reset by any other methods.

■ 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 **MEXE02** or **OPX-2A**.

■ Alarm list

| Code | Number of times the ALARM LED blinks | Alarm type | Cause |
|------|--------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10h | 4 | Excessive position deviation | <ul style="list-style-type: none"> When the motor was in a state of current on, the deviation between the command position and actual position at the motor output shaft exceeded the value set in the "Excessive position deviation alarm at current ON" parameter. The load is large, or the acceleration/deceleration is too short. |
| 12h | | Excessive position deviation during current OFF | The C-ON input was turned ON while an excessive position deviation warning during current OFF was present. |
| 20h | 5 | Overcurrent *2 | The motor, cable and driver output circuit were short-circuited. |
| 21h | 2 | Main circuit overheating | The internal temperature of the driver exceeded 85 °C (185 °F). |
| 22h | 3 | Overvoltage | <ul style="list-style-type: none"> The power supply voltage exceeded the permissible value. A large inertial load was stopped abruptly or vertical operation was performed. |
| 23h | | Main power off *2 | The motor was started when the main power supply had been cut off. |
| 25h | | Undervoltage | The main power was cut off momentarily or the voltage became low. |
| 27h | 7 | Backup battery undervoltage | The battery voltage became below the rated value. |
| 28h | 8 | Sensor error | A sensor error occurred while the motor was operating. |
| 29h | 9 | CPU peripheral circuit error | An error occurred in the CPU. |
| 2Dh | 5 | Main circuit output error *2 | The motor cable was disconnected. |
| 30h | 2 | Overload | A load exceeding the peak torque was applied for the time exceeded the "Overload alarm" parameter. |
| 31h | | Overspeed | The actual speed of the motor output shaft exceeded 4,500 r/min. |

| Remedial action | Alarm reset | Motor excitation *1 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| <ul style="list-style-type: none"> • Reduce the load or increase the acceleration/deceleration. • Increase the setting value for the "RUN current" parameter. | <ul style="list-style-type: none"> • Turn the ALM-RST input from ON (1) to OFF (0). • Perform alarm reset. | Non-excitation |
| <ul style="list-style-type: none"> • Do not turn the C-ON input ON while an excessive position deviation warning at current OFF is present. • Set the "Automatic return operation" parameter to "disable." | | |
| Turn off the power supply, and check that the motor, cable and driver output circuit are not short-circuited before turning on the power again. | Cycle the power. | |
| Review the ventilation condition inside the enclosure. | <ul style="list-style-type: none"> • Turn the ALM-RST input from ON (1) to OFF (0). • Perform alarm reset. | |
| <ul style="list-style-type: none"> • Check the input voltage of the power supply. • If this alarm generates during operation, reduce the load or increase the acceleration/deceleration. | <ul style="list-style-type: none"> • Cycle the power. • Perform alarm reset (DC power input only). | |
| Check if the main power supply has been input normally. | <ul style="list-style-type: none"> • Turn the ALM-RST input from ON (1) to OFF (0). • Perform alarm reset. | Excitation |
| Check the input voltage of the main power supply. | | |
| Charge the battery. | Cycle the power. | Non-excitation |
| Turn off the power, and turn on the power again after checking the connection for the motor cable and driver. | | |
| <ul style="list-style-type: none"> • If a battery is used, turn off the power before disconnecting it. After that, connect the battery again, and turn on the power. Check an alarm does not generate, and be sure to perform return-to-home operation. • If a battery is not used, turn on the power again. After that, check an alarm does not generate, and be sure to perform return-to-home operation. | | |
| Turn off the power, and turn on the power again after checking the connection for the motor cable and driver. | | |
| <ul style="list-style-type: none"> • Reduce the load or increase the acceleration/deceleration. • Increase the setting value for the "RUN current" parameter. • Check the connection of the driver and electromagnetic brake. • Check the "Electronic gear" parameter and set the speed of the motor output shaft to 4,500 r/min or less. • If the motor is overshooting at the time of acceleration, increase the acceleration. | <ul style="list-style-type: none"> • Turn the ALM-RST input from ON (1) to OFF (0). • Perform alarm reset. | |

| Code | Number of times the ALARM LED blinks | Alarm type | Cause |
|------|--------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 33h | 7 | Absolute position error | <p>While the "Absolute back-up system" parameter was "Enable," one of the following conditions is satisfied.</p> <ul style="list-style-type: none"> • The power was turned on while the position origin was not set. • The power was turned on while the battery was not connected. • The power was turned on while operation range of multi-rotation was exceeded the specification. <p>Sudden load fluctuations occurred when the position was managed with the battery.</p> |
| 34h | 2 | Command pulse error | The command pulse frequency exceeded the specified value. |
| 41h | 9 | EEPROM error | The data stored in the driver was damaged. |
| 42h | 8 | Initial sensor error | A sensor error occurred when the power was turned on. |
| 43h | | Initial rotor rotation error | The motor output shaft did not stand still when the power was turned on. |
| 45h | | Motor combination error | A motor not supported by the driver is connected. |
| 4Ah | 7 | Return-to-home incomplete | The positioning operation was started when the position origin has not been set. |
| 51h | 2 | Regeneration resistor overheat *2 | <ul style="list-style-type: none"> • The regeneration resistor is not connected correctly. • The regeneration resistor was overheated abnormally. |
| 60h | 7 | ±LS both sides active | Both the +LS input and –LS input were detected when LS detection was enabled. |
| 61h | | Reverse limit sensor connection | The limit sensor opposite to the operating direction has detected during a return-to-home operation in 2-sensor mode or 3-sensor mode. |
| 62h | | Home seeking error | Return-to-home operation did not complete normally. |
| 63h | | No HOMES | The mechanical home sensor is not detected at a position between positive direction limit sensor and negative direction limit sensor during return-to-home operation in 3-sensor mode. |

| Remedial action | Alarm reset | Motor excitation *1 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| <ul style="list-style-type: none"> After resetting the alarm, execute P-PRESET or return-to-home operation. Check the connection of the battery. Or replace the battery. | <ul style="list-style-type: none"> Turn the P-CLR input from ON (1) to OFF (0). Perform the reset of the absolute position error alarm. | Excitation |
| Do not apply sudden load fluctuations. | | |
| Check the "Electronic gear" parameter and reduce the speed of the motor output shaft to 4,500 r/min or less. | <ul style="list-style-type: none"> Turn the ALM-RST input from ON (1) to OFF (0). Perform alarm reset. | Non-excitation |
| Initialize the all parameters. | | |
| Turn off the power supply, and check the connection of the motor cable and driver before turning on the power again. | | |
| Review the load and make sure the motor output shaft does not turn by an external force when the power is turned on. | | |
| Check the model name of motor and driver, and use the motor and driver in the correct combination. | Cycle the power. | |
| Perform the position preset or return-to-home operation. | <ul style="list-style-type: none"> Turn the ALM-RST input from ON (1) to OFF (0). Perform alarm reset. | Excitation |
| Turn off the power supply, and check the following items before turning on the power again. <ul style="list-style-type: none"> When the regeneration resistor is not used, short-circuit the TH1 and TH2 terminals on the CN1. Connect the regeneration resistor correctly. Regenerative power from the motor exceeds the allowable regenerative power of the regeneration resistor. Make sure the load and operating condition. | Cycle the power. | Non-excitation |
| After resetting the alarm, check the sensor logic installed and "LS contact configuration" parameter. | | |
| After resetting the alarm, check the wiring of the limit sensor. | <ul style="list-style-type: none"> Turn the ALM-RST input from ON (1) to OFF (0). Perform alarm reset. | Excitation |
| <ul style="list-style-type: none"> An unanticipated load may have been applied during the return-to-home operation. Check the load. If the installation positions of limit sensor and mechanical home sensor are close to one another, the return-to-home sequence may not end properly, depending on the starting direction of return-to-home operation. Review the sensor installation positions and the starting direction of return-to-home operation. Return-to-home operation may have been performed in a condition where both +LS input and -LS input were detected. Check the sensor logic and "LS contact configuration" parameter. | | |
| Set a mechanical home sensor between positive direction and negative direction limit sensors. | | |

| Code | Number of times the ALARM LED blinks | Alarm type | Cause |
|------|--------------------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 64h | 7 | TIM, Z, SLIT signal error | None of the SLIT input or TIM output could be detected during return-to-home operation. |
| 66h | | Hardware overtravel | A +LS input or –LS input signal was detected when the "Hardware overtravel" parameter was enabled. |
| 67h | | Software overtravel | A software limit was reached when the "Software overtravel" parameter was enabled. |
| 6Ah | | Home seeking offset error | A limit sensor was detected during offset movement as part of return-to-home operation. |
| 70h | 7 | Abnormal operation data | <ul style="list-style-type: none"> • Data of different directions may be linked in linked-motion operation. • Five or more data may be linked. • Positioning operation of the operating speed 0 r/min was performed. • The larger value than 500 r/min was set in the operating speed of push-motion operation. *3 |
| 71h | | Electronic gear setting error | The resolution set in the "Electronic gear" parameter was outside of the specification. |
| 72h | | Wrap setting error | The resolution and "Wrap setting range" parameter was inconsistent. |
| 81h | | Network bus error | When the motor operates, the master controller for the network converter shows a disconnected status. |
| 83h | | Communication switch setting error | Transmission rate setting switch (SW2) was out-of-specification. |
| 84h | | RS-485 communication error | The number of consecutive RS-485 communication errors reached the "Communication error alarm" parameter. |
| 85h | | RS-485 communication timeout | The time set in the "Communication timeout" parameter has elapsed, and yet the communication could not be established with the host controller. |
| 8Eh | | Network converter error | The network converter generated an alarm. |
| F0h | Lit | CPU error | CPU malfunctioned. |

*1 When an alarm generates, an excitation state of the motor is as follows.

Non-excitation: When an alarm generates, the motor current will be cut off and the motor will lose its holding torque.

The electromagnetic brake will automatically actuate and hold the position when using the electromagnetic brake motor.

Excitation: Even when an alarm generates, the motor current will not be cut off and the motor position will be held.

*2 AC power input only.

*3 For the driver which is before the specification change, the maximum speed of push-motion operation is 30 r/min. Refer to p.8 for details.

If the alarm is not cleared even when these remedial actions have been performed, the driver may have been damaged. Contact your nearest Oriental Motor sales office.

| Remedial action | Alarm reset | Motor excitation *1 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|------------------------|
| <ul style="list-style-type: none"> Adjust the connection condition of the motor output shaft and load as well as the mechanical home sensor position so that at least one of the SLIT input or TIM output will turn ON while HOMES input is ON. Set the "SLIT detection with home-seeking" parameter to "Disable" if the SLIT input are not used with HOMES, while set the "TIM signal detection with home-seeking" parameter to "Disable" if the TIM output are not used with HOMES. | <ul style="list-style-type: none"> Turn the ALM-RST input from ON (1) to OFF (0). Perform alarm reset. | Excitation |
| After resetting the alarm, escape from the limit sensor by continuous operation or by return-to-home operation. | | |
| In single-motion operation, check to see if the position exceeds the softlimit. In linked-motion operation, check to see if the result of linked position exceeds the softlimit. | | |
| After resetting the alarm, check the offset value. | <ul style="list-style-type: none"> Turn the ALM-RST input from ON (1) to OFF (0). Perform alarm reset. | Excitation |
| After resetting the alarm, check the operation data. | | |
| Turn off the power supply, and set the "Electronic gear" parameter correctly so that the resolution is in a range of 100 to 10,000 P/R before turning on the power again. | Cycle the power. | Non-excitation |
| Turn off the power supply, and set the "Wrap setting range" parameter correctly before turning on the power again. | | |
| Check the master controller connector or cable. | <ul style="list-style-type: none"> Turn the ALM-RST input from ON (1) to OFF (0). Perform alarm reset. | Excitation |
| Check the transmission rate setting switch (SW2). | Cycle the power. | Non-excitation |
| <ul style="list-style-type: none"> Check the connection between the host controller and driver. Check the setting of RS-485 communication. | <ul style="list-style-type: none"> Turn the ALM-RST input from ON (1) to OFF (0). Perform alarm reset. | Excitation |
| Check the connection between the host controller and driver. | | |
| Check the alarm code of the network converter. | | |
| Cycle the power. | Cycle the power. | Non-excitation |

5-2 Warning

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

■ Warning records

Up to 10 generated warnings are saved in the RAM in order of the latest to oldest.

Warning records saved in the RAM can be read and cleared when performing any of the following.

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



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

■ Warning list

| Code | Warning type | Cause | Remedial action |
|------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10h | Excessive position deviation | <ul style="list-style-type: none"> • When the motor was in a state of current ON, the deviation between the command position and actual position at the motor output shaft exceeded the value set in the "Excessive position deviation warning at current ON" parameter. • The load is large or acceleration/deceleration is too short. | <ul style="list-style-type: none"> • Reduce the load or increase the acceleration/deceleration. • Increase the setting value for the "RUN current" parameter. |
| 12h | Excessive position deviation during current OFF | When the motor was in a state of current OFF, the deviation between the command position and actual position at the motor output shaft exceeded the value set in the "Excessive position deviation alarm at current OFF" parameter. (This warning is output when the "Auto return operation" parameter is set to "Enable.") | Reduce the amount of rotation at current OFF to the specified setting value or less. Or, change the setting value. |
| 21h | Main circuit overheat | The internal temperature of the driver exceeded the value set in the "Overheat warning" parameter. | Review the ventilation condition inside the enclosure. |
| 22h | Overvoltage | <ul style="list-style-type: none"> • The voltage of the power supply exceeded the value set in the "Overvoltage warning" parameter. • A large inertial load was stopped abruptly or vertical operation was performed. | <ul style="list-style-type: none"> • Check the input voltage of the power supply. • If this alarm generates during operation, reduce the load or increase the acceleration/deceleration. |
| 25h | Undervoltage | <ul style="list-style-type: none"> • The voltage of the power supply fell below the value set in the "Undervoltage warning" parameter. • The main power was cut off momentarily or the voltage became low. | Check the input voltage of the power supply. |
| 30h | Overload | <ul style="list-style-type: none"> • A load exceeding the peak torque was applied for the time set in the "Overload warning" parameter or longer. • The load is large or acceleration/deceleration is too short. | <ul style="list-style-type: none"> • Reduce the load or increase the acceleration/deceleration. • Increase the setting value for the "RUN current" parameter. • Check if the electromagnetic brake is released during operation. |
| 31h | Overspeed | The actual speed of the motor output shaft exceeded the value set in the "Overspeed warning" parameter. | <ul style="list-style-type: none"> • Check the "Electronic gear" parameter and reduce the speed of the motor output shaft to the value set in the parameter or less. • If an overshoot is occurred at the time of accelerating, increase the acceleration/deceleration. |
| 48h | Battery connection error | The battery was unconnected while the "Absolute back-up system" parameter was "Enable." | Check the battery connection. |

| Code | Warning type | Cause | Remedial action |
|------|-------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 71h | Electronic gear setting error | The resolution set in the "Electronic gear" parameter is outside the specified range. | Turn off the power supply, and set the "Electronic gear" parameter correctly so that the resolution is in a range of 100 to 10,000 P/R before turning on the power again. |
| 72h | Wrap setting error | The resolution and "Wrap setting range" parameter was inconsistent. | Turn off the power supply, and set the "Wrap setting range" parameter correctly before turning on the power again. |
| 84h | RS-485 communication error | A RS-485 communication error was detected. | <ul style="list-style-type: none"> • Check the connection between the host controller and driver. • Check the setting of RS-485 communication. |

5-3 Communication errors

Up to 10 communication errors are saved in the RAM in order of the latest to the oldest and you can check using the **MEXE02** or via RS-485 communication.

■ Communication error records

Up to 10 communication errors are saved in the RAM in order of the latest to oldest.

Communication error records saved in the RAM can be read and cleared when performing any of the following.

- Read the communication error records by the monitor command via RS-485 communication.
- Clear the communication error records by the maintenance command via RS-485 communication.
- Read and clear the communication error records by the status monitor of the **MEXE02**.



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

■ 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 host controller and driver. • Check the setting of RS-485 communication. |
| 88h | Command not yet defined | The command requested by the master controller 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 controller could not be executed since the MEXE02 or OPX-2A was communicating with the driver. | Wait until the processing for the MEXE02 or OPX-2A will be completed. |
| 8Ah | Not possible to execute because of non-volatile memory processing | The command could not be executed because the driver was processing the non-volatile memory. · 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 complete. • When the EEPROM error was generated, initialize the parameter using the MEXE02, OPX-2A or via RS-485 communication. |
| 8Ch | Outside setting range | The setting data requested by the master controller could not be executed due to outside the range. | Check the setting data. |
| 8Dh | Command execute disable | When the command could not be executed, it tried to do it. | Check the driver status. |

6 Troubleshooting and remedial actions

During motor operation, the motor or driver may fail to function properly due to an improper setting or wiring. When the motor cannot be operated correctly, refer to the contents provided in this chapter and take appropriate action. If the problem persists, contact your nearest Oriental Motor sales office.

| Phenomenon | Possible cause | Remedial action |
|---------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • The motor is not excited. • The motor output shaft can be moved by hand. | The C-ON input is turned OFF. | Turn the C-ON input ON and confirm that the motor will be excited. |
| | The FREE input is turned ON. | Turn the FREE input OFF. |
| The motor has a holding torque even if it is put into a non-excitation state. * | Effect of dynamic brake. | If the motor is put into a non-excitation state using the C-ON input or the STOP input, the motor windings is in a state of being short-circuited in the driver, and the holding torque larger than when the power is shut off is generated (dynamic brake). To release the dynamic brake, shut off the power or turn the FREE input ON. |
| The motor does not operate. | An electromagnetic brake motor is used and the electromagnetic brake is in the holding state. | Check the connections between electromagnetic brake and driver. |
| | The STOP input is turned ON. | Turn the STOP input OFF. |
| | The position (distance) is not set in the operation data while positioning operation. | Check the operation data. |
| | The FWD input and RVS input are turned ON simultaneously in the continuous operation. | Turn either FWD input or RVS input ON. |
| The motor rotates in the direction opposite to the specified direction. | The "Motor rotation direction" parameter is set wrong. | Check the setting of the "Motor rotation direction" parameter. |
| The gear output shaft rotates in the direction opposite to the motor output shaft. | A gear that rotates in the direction opposite to the motor output shaft is used. | <ul style="list-style-type: none"> • The rotation direction of the TH geared type may differ from that of the motor depending on the frame size or the gear ratio. Refer to p.18 for details. • With Harmonic geared type, the gear output shaft always rotates in the direction opposite to the motor. |
| Motor operation is unstable. | Connection error in the motor or power supply. | Check the connections between the driver, motor and power supply. |
| | The "RUN current" or "STOP current" parameter is too low. | Return the "RUN current" or "STOP current" parameter to its initial setting and check the motor operation. If the motor output torque is too large relative to the load, vibration will increase. |
| Motor vibration is too large. | Load is too small. | Lower the operating current using the "RUN current" parameter. If the motor output torque is too large relative to the load, vibration will increase. |
| The electromagnetic brake does not release. | The power is not supplied to the electromagnetic brake. | Check the connections between electromagnetic brake and driver. |

* DC power input only.



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

5 Operation type and setting

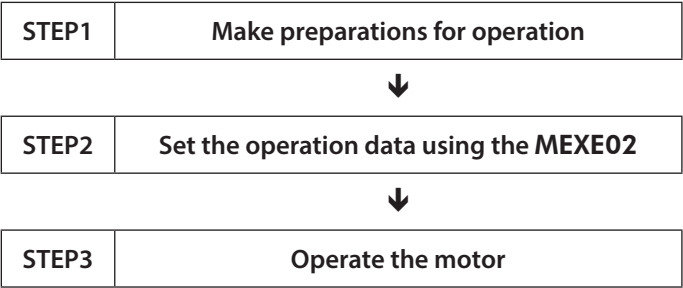
This part explains the details of operation and how to set the driver function.

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1 Guidance

If you are new to the **AR** Series built-in controller type, read this section to understand the operating methods along with the operation flow.
This section explains an example to perform positioning operation using the **MEXE02**.



■ Checking the factory setting

| Setting item | Factory setting |
|-------------------|---------------------------------|
| Resolution | 1,000 P/R (0.36°/step) |
| Operating current | 1,000 (Base current rate 100 %) |
| Speed filter | 1 ms |
| Home position | Motor position at power on |

Note

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

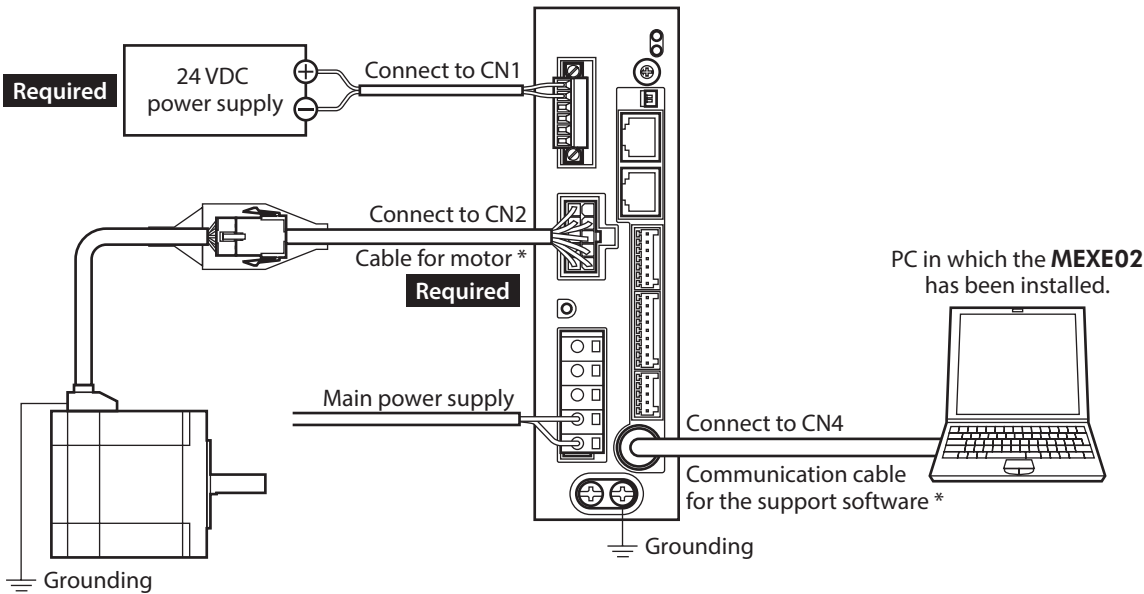
STEP 1

Make preparations for operation

1. Wire the driver by reference to the figure.

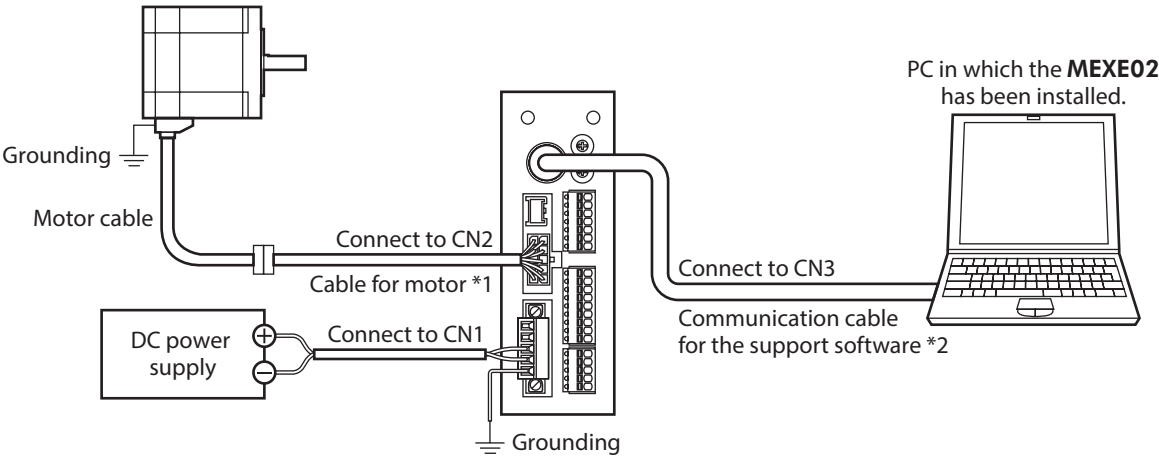
● AC power input

Be sure to connect a 24 VDC power supply.



* These cables are provided as our products. Purchase them separately.

● DC power input

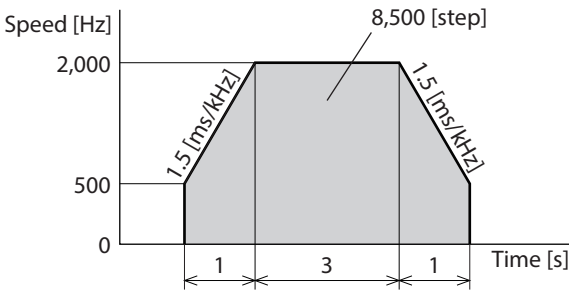


*1 This cable is provided as our product. When the length of the motor cable is not enough, purchase it separately.
*2 This cable is provided as our product. Purchase it separately.

2. Start the **MEXE02**, and turn on the driver main power supply.
Refer to the "Support software **MEXE02 OPERATING MANUAL**" for how to start or use the **MEXE02**.

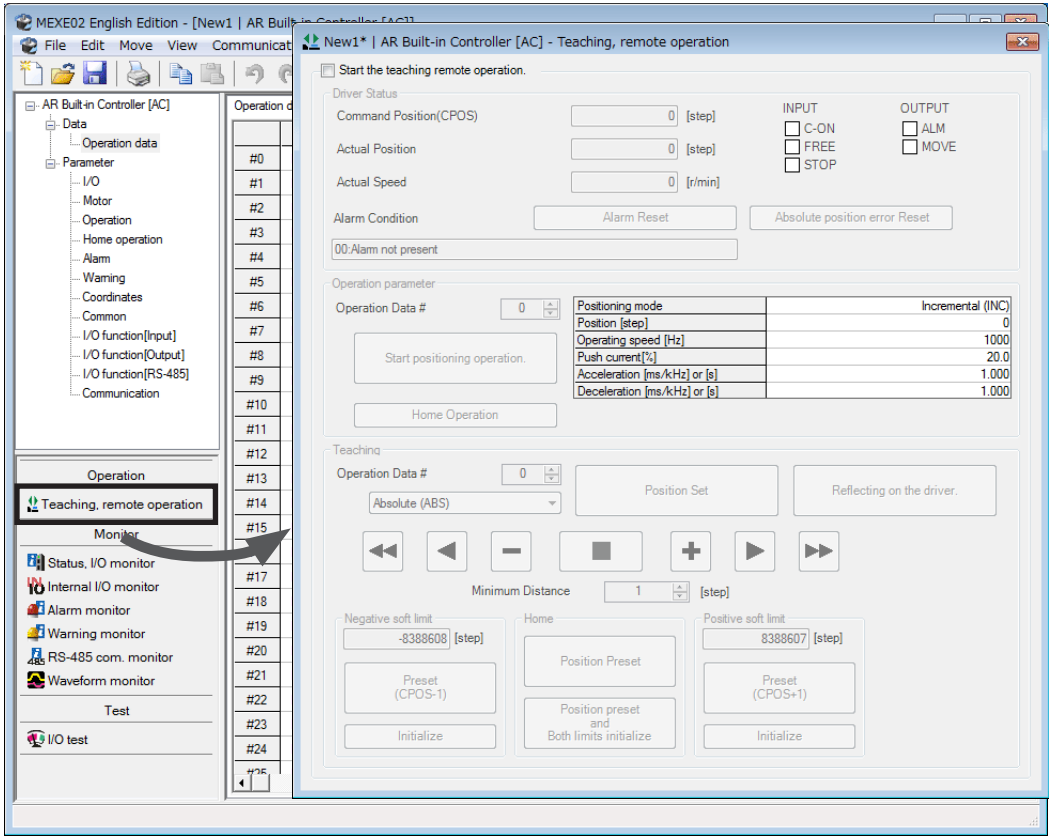
STEP 2 Set the operation data using the MEXE02

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

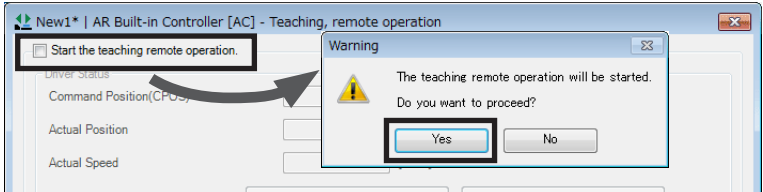


| | Operation mode | Position [step] | Operating speed [Hz] | Operation function | Push current [%] | Dwell time [s] | Sequential positioning | Acceleration [ms/kHz] or [s] | Deceleration [ms/kHz] or [s] |
|----|-------------------|-----------------|----------------------|--------------------|------------------|----------------|------------------------|------------------------------|------------------------------|
| #0 | Incremental (INC) | 0 | 1000 | Single-motion | 20.0 | 0.000 | Disable | 1.000 | 1.000 |
| #1 | Incremental (INC) | 8500 | 2000 | Single-motion | 20.0 | 0.000 | Disable | 1.500 | 1.500 |

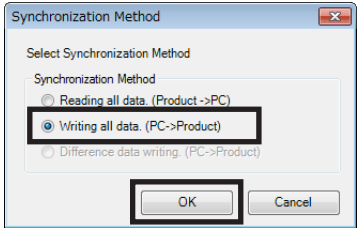
2. Click the [Teaching, remote operation] short-cut button in the left side of the screen.
The teaching, remote operation window appears.



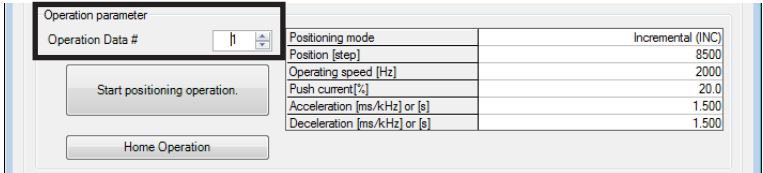
3. Click "Start the teaching remote operation," and click [Yes] on the pop-up window (Warning).



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

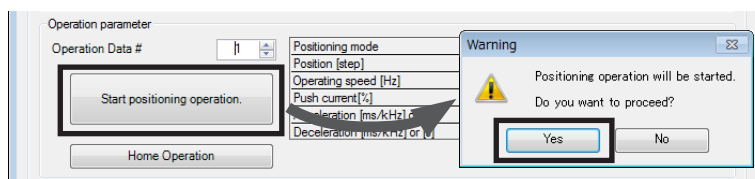


5. Select the operation data No.1.

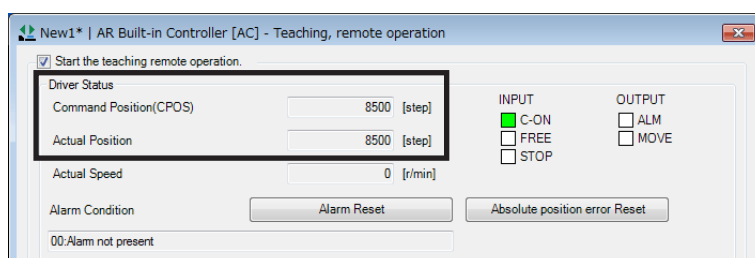


STEP 3 Operate the motor

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



2. Check that the command position and actual position have changed to 8,500.
If they are 8,500, positioning operation is performed properly.



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

Positioning operation has been completed.

2 Adjustment and setting

This chapter explains how to adjust/set the motor and driver functions. When a parameter is changed, the timing to update the new value varies depending on the parameter. Refer p.112 for details.

2-1 Resolution

Set a resolution when using in combination with a mechanism product such as a geared motor or an actuator. When the "Electronic gear A" and "Electronic gear B" parameters are set, the resolution per one rotation of the motor output shaft can be set. Note that the calculated value must fall within the setting range specified next:

Resolution setting range: 100 to 10,000 P/R

$$\text{Resolution} = 1,000 \times \frac{\text{Electronic gear B}}{\text{Electronic gear A}}$$

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|-------------------|--------------------------------------------------------------------------|---------------|
| Coordinates | Electronic gear A | Sets the denominator of electric gear. [Setting range] 1 to 65,535 | 1 |
| | Electronic gear B | Sets the numerator of electric gear. [Setting range] 1 to 65,535 | 1 |



- If the value outside of the setting range is set, the "electronic gear setting error warning" will generate. If the power is cycled or the configuration is executed while the "electronic gear setting error warning" is present, an "electronic gear setting error alarm" will generate.
- If the resolution was changed while the absolute-position backup system was in enable status, perform the return-to-home operation or P-PRESET.
- When the TIM output is used, set the "Electronic gear" parameters to be an integral multiple of 50.

■ Calculation of electronic gear A and B

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

● Example: Ball screw

Ball screw lead : 12 mm

Minimum travel amount : 0.01 mm

Gear ratio : 1 (No speed reduction mechanism between the motor and ball screw)

$$\text{Resolution} = 1,000 \times \frac{\text{Electronic gear B}}{\text{Electronic gear A}} = \frac{\text{Ball screw lead}}{\text{Minimum travel amount}} \times \text{Gear ratio}$$

$$\text{In this example: } 1,000 \times \frac{\text{Electronic gear B}}{\text{Electronic gear A}} = \frac{12 \text{ mm}}{0.01 \text{ mm}} \times 1$$

$$\text{Result: } \frac{\text{Electronic gear B}}{\text{Electronic gear A}} = \frac{12}{10}$$

Therefore, the electronic gear A and B are 10 and 12 respectively, and the resolution will be 1,200 P/R.

● **Example: Rotary table**

Step angle per one rotation : 360°
 Minimum step angle : 0.01°
 Gear ratio : 10 [Using the geared motor (gear ratio 10:1)]

$$\text{Resolution} = 1,000 \times \frac{\text{Electronic gear B}}{\text{Electronic gear A}} = \frac{\text{Minimum step angle}}{\text{Step angle per one rotation}} \times \text{Gear ratio}$$

$$\text{In this example: } 1,000 \times \frac{\text{Electronic gear B}}{\text{Electronic gear A}} = \frac{360^\circ}{0.01^\circ} \times \frac{1}{10}$$

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

Therefore, the electronic gear A and B are 10 and 36 respectively, and the resolution will be 3,600 P/R.

2-2 Operating current

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

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|----------------|---------------------------------------------------------------------------------------------------------------------|---------------|
| Motor | RUN current | Sets the motor operating current based on the rated current being 100 %. [Setting range] 0 to 1,000 (1=0.1 %) | 1,000 |



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

2-3 Standstill current

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

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Motor | STOP current | Sets the motor standstill current as a percentage of the rated current, based on the rated current being 100 %. [Setting range] 0 to 500 (1=0.1 %) | 500 |

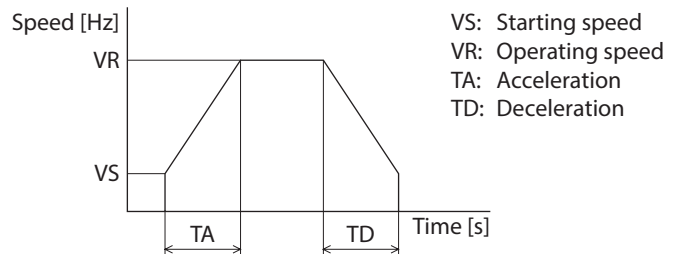
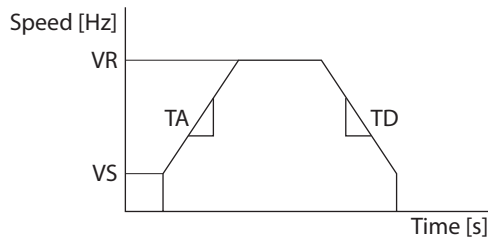
2-4 Acceleration/deceleration rate and acceleration/deceleration time

■ Acceleration/deceleration unit

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

• Acceleration/deceleration unit: ms/kHz

• Acceleration/deceleration unit: s



Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|------------------------------------|----------------------------------------------------------------------------------|---------------|
| Operation | Acceleration/ deceleration unit | Sets the acceleration/deceleration unit. [Setting range] 0: ms/kHz 1: s | 0 |

■ Common setting and separate setting of the acceleration/deceleration

The acceleration/deceleration for positioning operation or continuous operation can be set as follows using the "Acceleration/deceleration type" parameter:

Separate: The acceleration/deceleration set under the applicable operation data No. will be followed.

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



- When performing linked operation, the acceleration/deceleration for the starting linked operation data No. is applied even when the "Acceleration/deceleration type" parameter is set to "Separate."
- Refer to p.193 for the acceleration/deceleration when performing variable speed operation.

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Operation | Acceleration/ deceleration type | Sets whether to use the common acceleration/ deceleration or the acceleration/deceleration specified for the operation data. [Setting range] 0: Common 1: Separate | 1 |

2-5 Smooth drive

You can achieve lower vibration and smoother movement using the smooth drive function.

You may feel vibration in the low speed range when this function is set to "disable." Set the function to "enable" under normal conditions of use.

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|----------------|-----------------------------------------------------------------------------------------------------------|---------------|
| Motor | Smooth drive | Sets whether to enable or disable smooth drive function. [Setting range] 0: Disable 1: Enable | 1 |

2-6

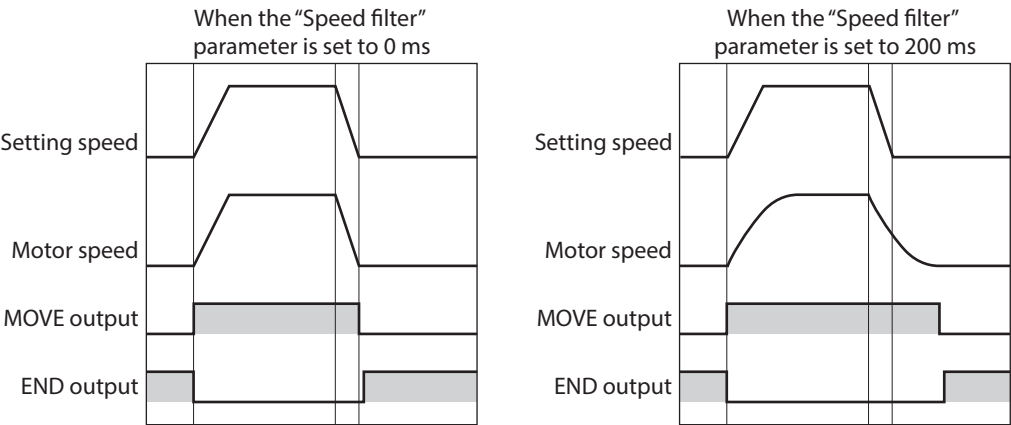
Speed filter

If the “Filter selection” parameter is set to “Speed filter,” the motor response can be adjusted with the “Speed filter” parameter.

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

Related parameter

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



memo

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

2-7 Moving average filter

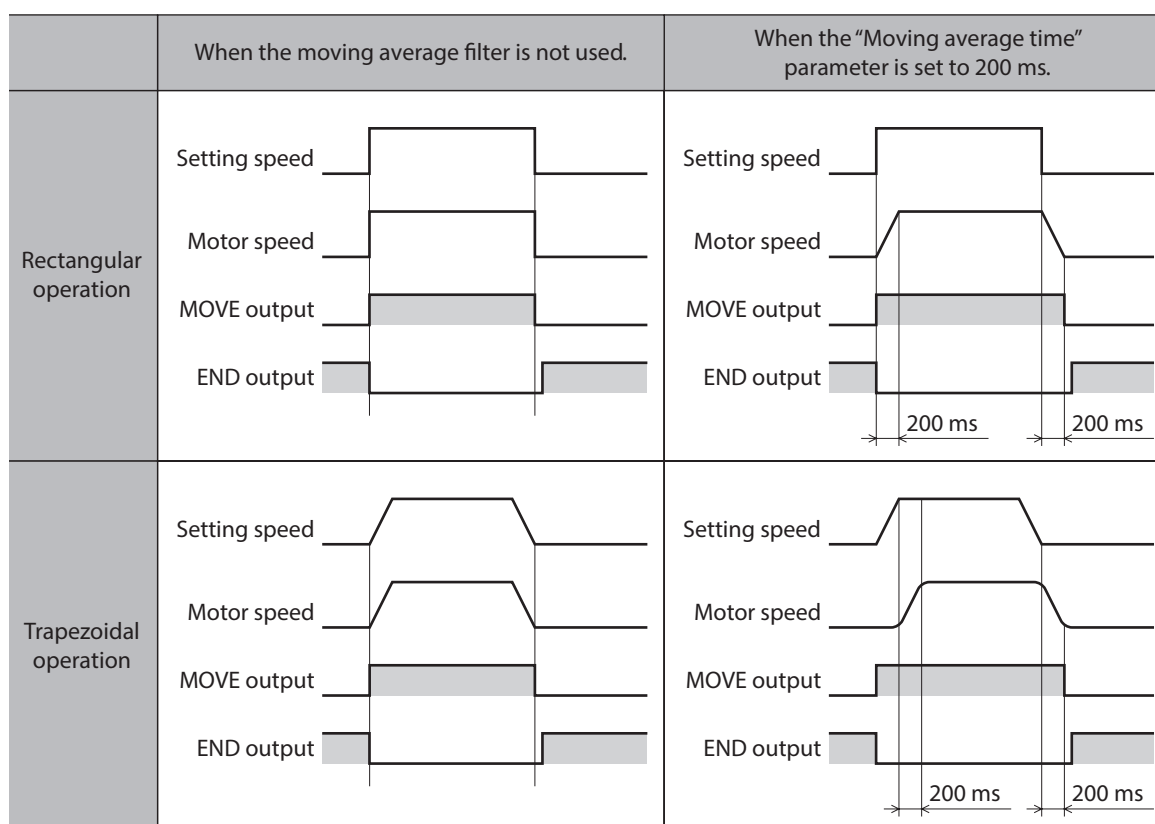
The motor response can be adjusted when setting the "Filter selection" parameter to "Moving average filter" and setting the value for the "Moving average time" parameter.

The positioning time can be shortened by suppressing the residual vibration for the positioning operation.

Optimum value for the "Moving average time" parameter varies depending on the load or operation condition. Set a suitable value based on the load or application.

Related parameter

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



2-8 Speed error gain

The speed error gain is used to suppress vibration while the motor is operating or accelerating/decelerating.

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|-------------------------|------------------------------------------------------------------------------------|---------------|
| Motor | Speed difference gain 1 | Adjusts vibration during operation. [Setting range] 0 to 500 | 45 |
| | Speed difference gain 2 | Adjusts vibration during acceleration/deceleration. [Setting range] 0 to 500 | 45 |

2-9 Control mode

The driver operates in one of two control modes: the normal mode, and the current control mode. If noise is heard during high-speed operation or there is notable vibration, it may be effective to switch to the current control mode. Note, however, that a slight delay may occur in the current control mode, compared to the normal mode, depending on the condition of the load. Keep the driver in the normal mode during normal conditions of use.

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|----------------|------------------------------------------------------------------------------------------------------|---------------|
| Motor | Control mode | Sets the control mode of the driver. [Setting range] 0: Normal mode 1: Current control mode | 0 |

2-10 Position loop gain, speed loop gain, speed loop integral time constant

These items are effective in the current control mode.

Vibration that occurs while the motor is accelerating/decelerating or at standstill can be adjusted to an optimal value. (The optimal value varies depending on the equipment and operating conditions.)

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Motor | Position loop gain | Adjusts the motor response in reaction to the position deviation. When this value is increased, the deviation between the command position and actual position will be small. An excessively high value may increase the motor overshooting or cause motor hunting. [Setting range] 1 to 50 | 10 |
| | Speed loop gain | Adjusts the motor response in reaction to the speed deviation. When this value is increased, the deviation between the command speed and actual speed will be small. An excessively high value may increase the motor overshooting or cause motor hunting. [Setting range] 10 to 200 | 180 |
| | Speed loop integral time constant | Adjusts the deviation that cannot be adjusted with the speed loop gain. An excessively high value may slow the motor response. On the other hand, an excessively low value may cause motor hunting. [Setting range] 100 to 2,000 (1=0.1 ms) | 1,000 |

2-11 Absolute-position backup system

This product can be used in the absolute-position backup mode when connecting our battery **BAT0B**. Since the absolute position can be kept during an electrical outage or after turning off the power, the return-to-home operation is not required when the power is turned on.

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|-------------------------|------------------------------------------------------------------------------------------------------------------|---------------|
| Common | Absolute back-up system | Sets whether to enable or disable absolute-position backup system. [Setting range] 0: Disable 1: Enable | 0 |

■ Setting of the absolute-position backup system

1. Turn off the driver main power and DC power supply, and then connect the battery to the battery connector (AC power input: CN10, DC power input: CN4).
2. Turn on the driver main power and DC power supply.
3. Set the "Absolute back-up system" parameter to "Enable."
4. Turn off the driver main power and DC power supply, and then turn on again.
5. Since the "absolute position error alarm" generates at this time, reset the alarm using either of the following methods.
 - Turn the P-CLR input from ON to OFF. (The alarm will be reset at the OFF edge of the P-CLR input.)
 - Perform the reset of the absolute position error alarm using the **MEXE02**, **OPX-2A** or via RS-485 communication.
6. Perform the return-to-home operation or P-PRESET.



- Do not turn off the driver power supply before the return-to-home operation or P-PRESET is completed. The "absolute position error alarm" may generate when turning on the power supply next time.
- Even when the absolute-position backup system is used, the absolute position may be lost if the motor cable is disconnected. If this occurs, turn off the main power and DC power supply, disconnect the battery, and then set up again following above steps.

■ Specification of the absolute-position backup system

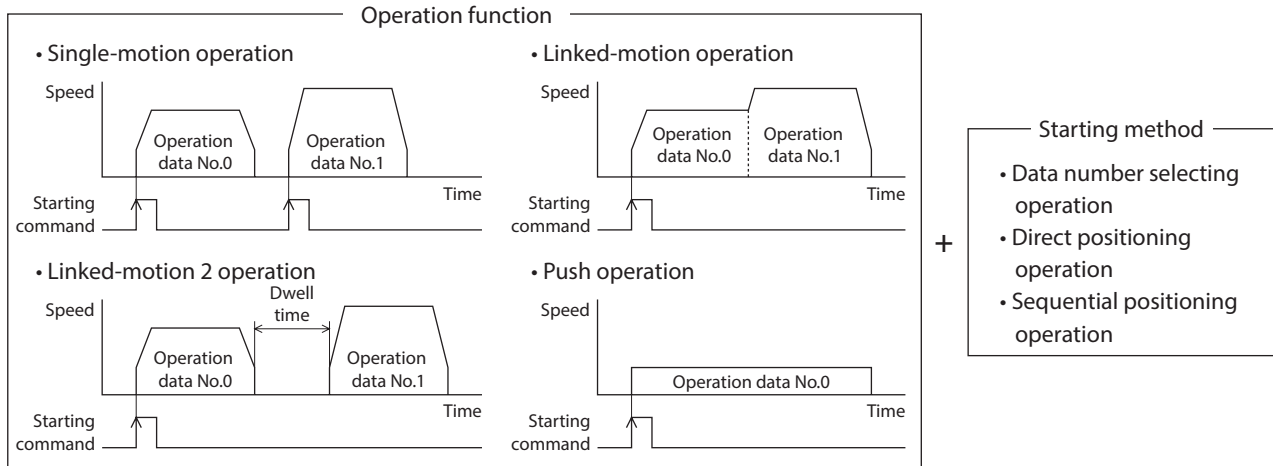
| | |
|-----------------------------------|---------------------------------------------------------------------------------------|
| Data retention period | 15 days [At an ambient temperature of 20 °C (68 °F), fully charged, motor standstill] |
| Charging time | 32 hours [At an ambient temperature of 20 °C (68 °F)] |
| Operation range of multi-rotation | –167,772 to +167,772 revolutions |

3 Operation type and function list

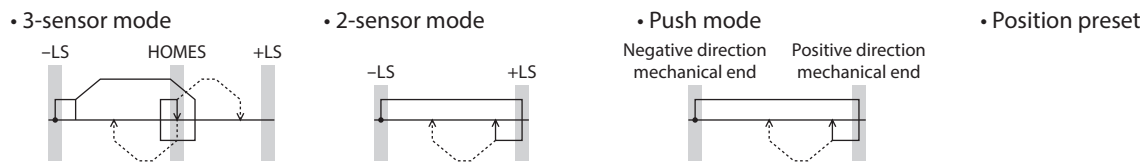
Operation

[Setting by operation data and parameters]

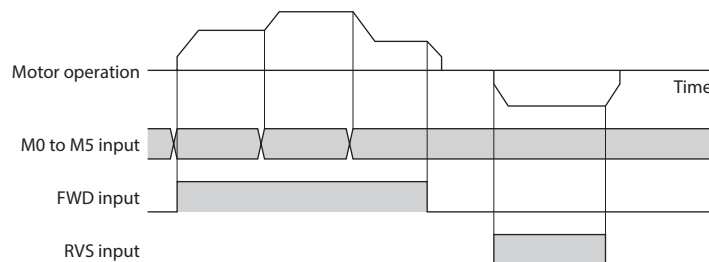
Positioning operation



Return-to-home operation



Continuous operation



Other operations

- JOG operation
- Automatic return operation

Function

[Setting by parameters]

| | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • I/O <ul style="list-style-type: none"> Input logic level STOP input action Overtravel • I/O function <ul style="list-style-type: none"> Input function Input logic Output function | <ul style="list-style-type: none"> • Motor function <ul style="list-style-type: none"> Operating current Standstill current Speed filter Moving average filter • I/O function (RS-485) <ul style="list-style-type: none"> Input function Output function | <ul style="list-style-type: none"> • Operation function <ul style="list-style-type: none"> Acceleration/deceleration type Acceleration/deceleration unit JOG operation Automatic return operation • Alarm/warning <ul style="list-style-type: none"> Alarm detection Warning detection | <ul style="list-style-type: none"> • Return-to-home function <ul style="list-style-type: none"> Home position offset External sensor signal detection Return-to-home speed Return-to-home starting direction • Coordination setting <ul style="list-style-type: none"> Resolution (electronic gear) Wrap function Motor rotation direction |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

4 Positioning operation

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

The operation function can also be set in operation data. The operation function is how to operate consecutive operation data (example: operation data No.0, No.1, No.2).

4-1 Operation data

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

| MEXE02 tree view | Setting item | Description | Initial value |
|------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Operation data | Position | Sets the position (distance) for positioning operation. [Setting range] –8,388,608 to +8,388,607 step | 0 |
| | Operating speed | Sets the operating speed in positioning operation. [Setting range] 0 to 1,000,000 Hz | 1,000 |
| | Acceleration | Sets the acceleration rate (acceleration time) in positioning operation. [Setting range] 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) | 1,000 |
| | Deceleration | Sets the deceleration rate (deceleration time) in positioning operation. [Setting range] 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) | 1,000 |
| | Operation mode | Selects how to specify the position (travel amount) in positioning operation. [Setting range] 0: Incremental (INC) 1: Absolute (ABS) | 0 |
| | Operation function | Sets the operation mode to execute positioning operation. [Setting range] 0: Single-motion 1: Linked-motion 2: Linked-motion 2 3: Push | 0 |
| | Dwell time | Sets the dwell time to be used in linked-motion 2 operation. [Setting range] 0 to 50,000 (1=0.001 s) | 0 |
| | Push current | Sets the current rate of push-motion operation. [Setting range] 0 to 1,000 (1=0.1 %) * | 200 |
| | Sequential positioning | Sets whether to enable or disable sequential positioning operation. [Setting range] 0: Disable 1: Enable | 0 |

* For the driver which is before the specification change, the setting range is 0 to 500 (1=0.1 %). Refer to p.7 for details.

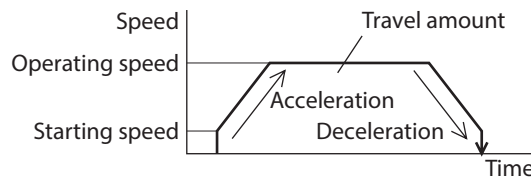
● Position, operating speed, acceleration, deceleration

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

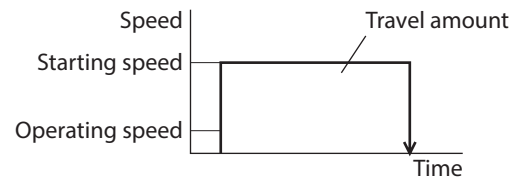
Separate : The acceleration/deceleration set under the applicable operation data No. will be followed (Each 64 data for acceleration and deceleration).

Common : The setting of the "Common acceleration" and "Common deceleration" parameter will be followed (Each one data for acceleration and deceleration).

When the starting speed < operating speed



When the starting speed ≥ operating speed



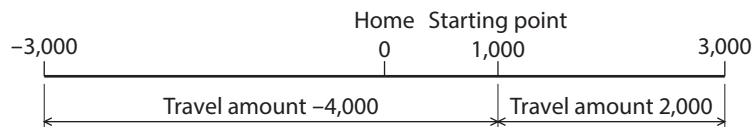
● Operation mode

The following two operation modes are available:

Absolute (ABS) mode

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

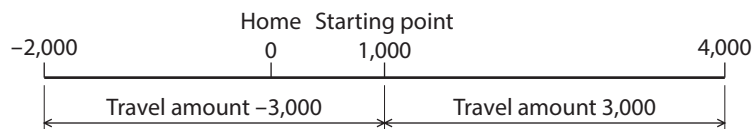
Example: When positioning operation is performed with setting the starting point to 1,000 and setting the destination to +3,000 and -3,000



Incremental (INC) mode

Each motor destination becomes the starting point for the next movement. This mode is suitable when the same position (distance) is repeatedly used [Incremental positioning].

Example: When positioning operation is performed with setting the starting point to 1,000 and setting the destination to +3,000 and -3,000



● Operation function, dwell time

The following four operation function are available:

| Operation function | Description | Ref. |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Single-motion | A single operation data set is executed. | p.175 |
| Linked-motion | Multiple sets of operation data are linked to perform multi-variable speed operation | p.176 |
| Linked-motion 2 | Dwell time (stop waiting time) can be set between operation data. Operation data whose rotation direction is different can also be linked. | p.177 |
| Push-motion | This is an operation of continuously applying pressure on the load when pressing against the load during positioning operation. | p.179 |

4-2 Starting method of positioning operation

The following three types are available in the starting method.

| Starting method | Description |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data number selecting operation | When the START input is turned ON with selecting the operation data No. by a combination of the M0 to M5 inputs, the positioning operation will perform. |
| Direct positioning operation | When any of the MS0 to MS5 inputs is turned ON, the positioning operation corresponding to the input data No. will perform. |
| Sequential positioning operation | Positioning operation is performed to the next operation data No. every time a SSTART input signal is input. |

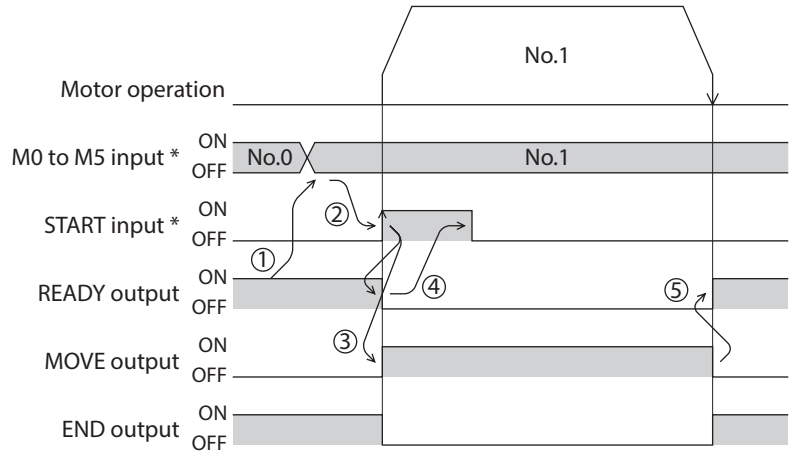
■ Data number selecting operation

Select an operation data based on a combination of ON/OFF status of the M0 to M5 inputs. Refer p.95 for details.

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

Operating method

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



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

■ Direct positioning operation

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

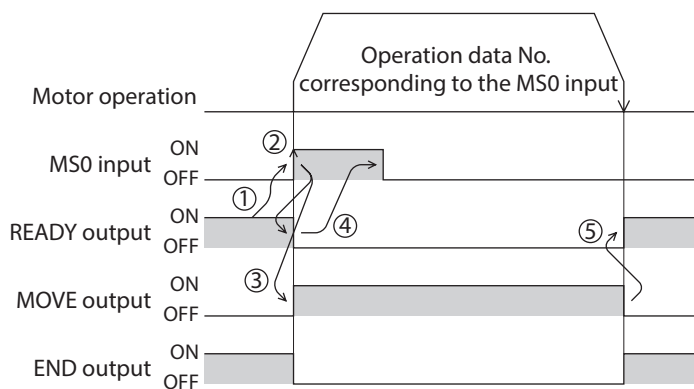
The operation data assigning to the MS0 to MS5 inputs will be set by parameters.

Related parameter

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

Operating method

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



■ Sequential positioning operation

In sequential positioning operation, whenever turning the SSTART input ON, the positioning operation for the following operation data No. will be performed. This function is useful when multiple positioning operations must be performed sequentially, because there is no need to select each data number.

When the "sequential positioning" of operation data is executed up to the data No. set to "disable", the operation returns to the original data No. that was selected before starting the sequential positioning operation. And the sequential positioning operation will start again.

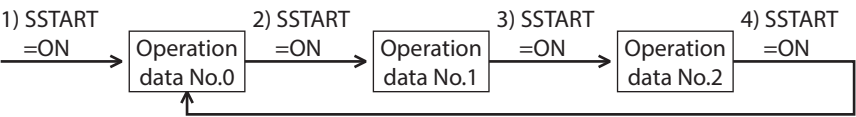
If the starting point for the sequential positioning operation is changed using the M0 to M5 inputs or the MS0 to MS5 inputs, multiple sequential positioning operations can be set. It is convenient for setting a different operating pattern for each component or each process of works.

● When the operating pattern is one type

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

Setting example

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

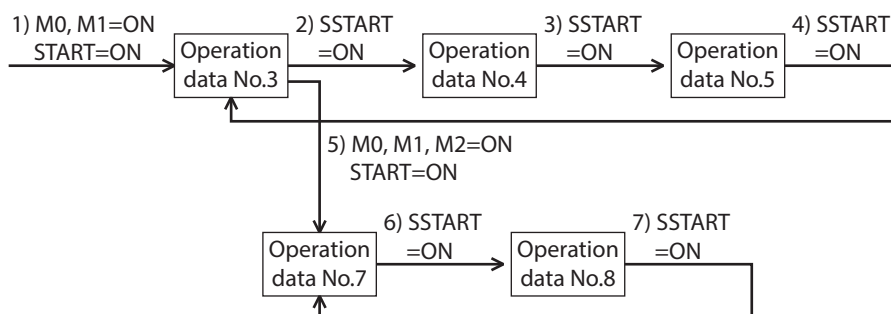


● When the operating patterns are multiple

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

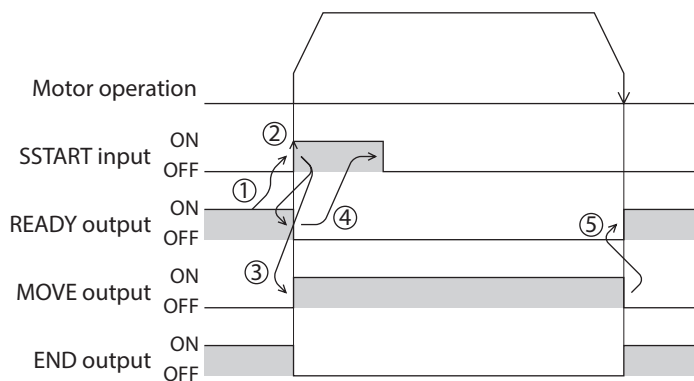
Setting example

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



● Operating method

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



● Key points about sequential positioning operation

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

- When the DC power supply is turned ON.
- When operations other than the positioning operation are performed (return-to home operation, continuous operation, etc.).
- When an alarm is generated and reset.
- When the STOP input is turned ON.
- When a signal to put the motor into a non-excitation state, such as the FREE input or C-ON input, was input.
- When the P-PRESET is executed.
- When a configuration is executed.



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

4-3 Operation function

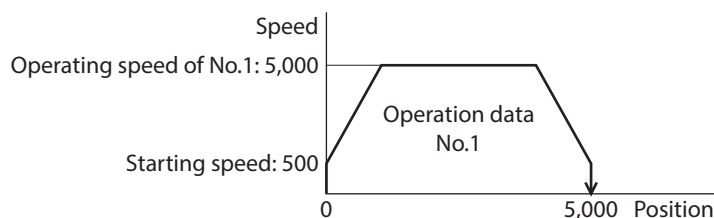
■ Single-motion operation

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

● Example of single-motion operation

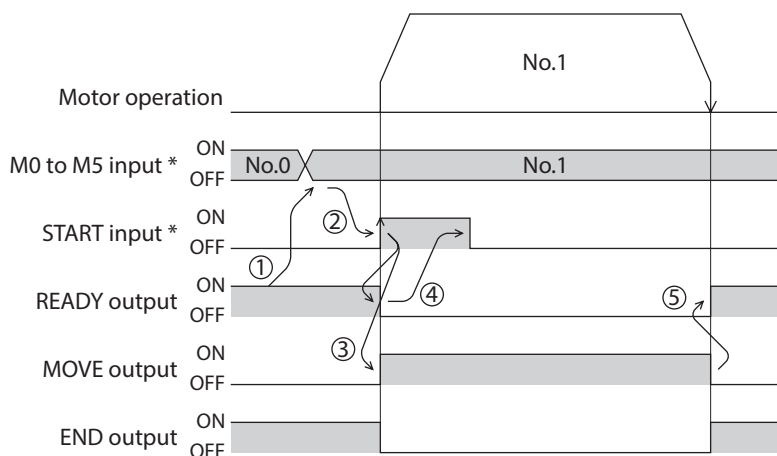
| | Operation mode | Position [step] | Operating speed [Hz] | Operation function | Push current [%] | Dwell time [s] | Sequential positioning | Acceleration [ms/kHz] or [s] | Deceleration [ms/kHz] or [s] |
|----|-------------------|-----------------|----------------------|--------------------|------------------|----------------|------------------------|------------------------------|------------------------------|
| #0 | Incremental (INC) | 0 | 1000 | Single-motion | 20.0 | 0.000 | Disable | 1.000 | 1.000 |
| #1 | Incremental (INC) | 5000 | 5000 | Single-motion | 20.0 | 0.000 | Disable | 1000.000 | 1000.000 |

Operation example



Operating method

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



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

■ **Linked-motion operation**

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

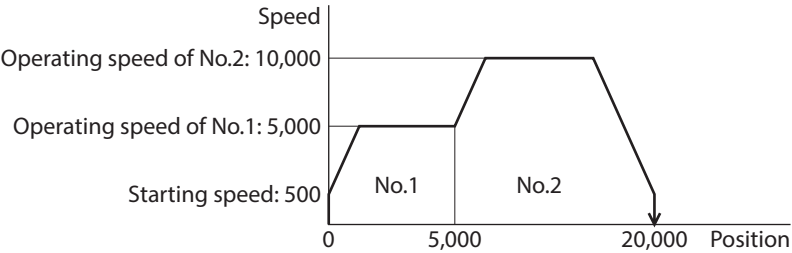


- Multiple operation data of different directions cannot be linked. An operation data error alarm will generate during operation.
- Up to four sets of operation data can be linked. When combining the linked-motion operation and the linked-motion 2 operation, make sure the total number of linked operation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

● **Example of linked-motion operation**

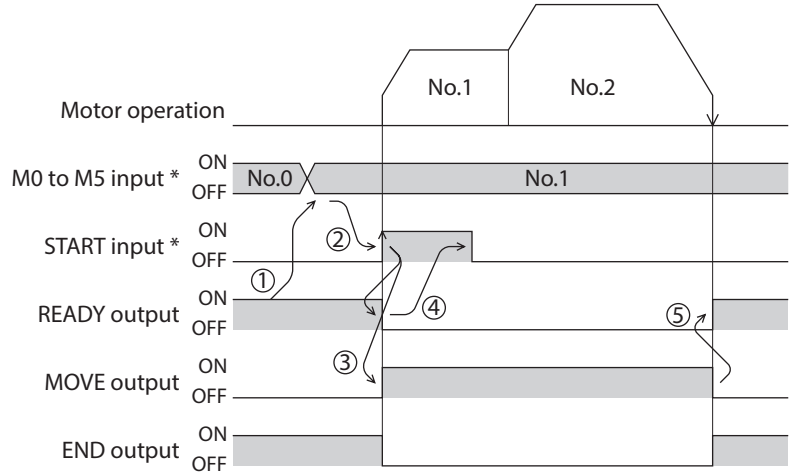
| | Operation mode | Position [step] | Operating speed [Hz] | Operation function | Push current [%] | Dwell time [s] | Sequential positioning | Acceleration [ms/kHz] or [s] | Deceleration [ms/kHz] or [s] |
|----|-------------------|-----------------|----------------------|--------------------|------------------|----------------|------------------------|------------------------------|------------------------------|
| #0 | Incremental (INC) | 0 | 1000 | Single-motion | 20.0 | 0.000 | Disable | 1.000 | 1.000 |
| #1 | Incremental (INC) | 5000 | 5000 | Linked-motion | 20.0 | 0.000 | Disable | 1000.000 | 1000.000 |
| #2 | Incremental (INC) | 20000 | 10000 | Single-motion | 20.0 | 0.000 | Disable | 1.000 | 1.000 |

Operation example



Operating method

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



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

■ Linked-motion 2 operation

By setting the “operation function” of operation data to “Linked-motion2,” an operation data whose rotation direction is different can be linked. In this case, the system stops for the dwell time after each positioning operation, and then performs operation according to the next operation data. If operation data includes data for which “single-motion” or “push” is set, the motor will stop after the positioning with respect to the “single” or “push” operation data is completed.

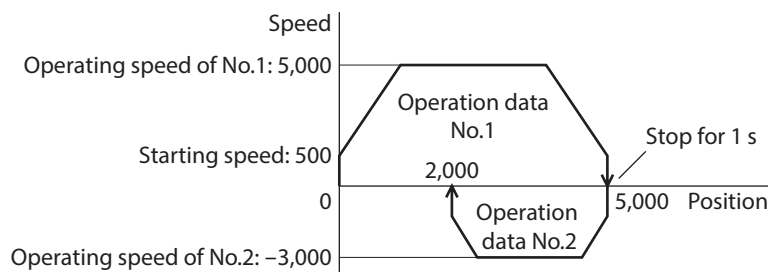


- Up to four sets of operation data can be linked. When combining the linked-motion operation and the linked-motion 2 operation, make sure the total number of linked operation data sets does not exceed four. When linked-motion operation is performed with five or more sets of operation data linked together, an operation data error alarm will generate upon start of operation.
- No.0 will not be linked even when “linked-motion2” is set for data No.63, because the operation pertaining to No.63 will be processed independently.

● Example of linked-motion 2 operation

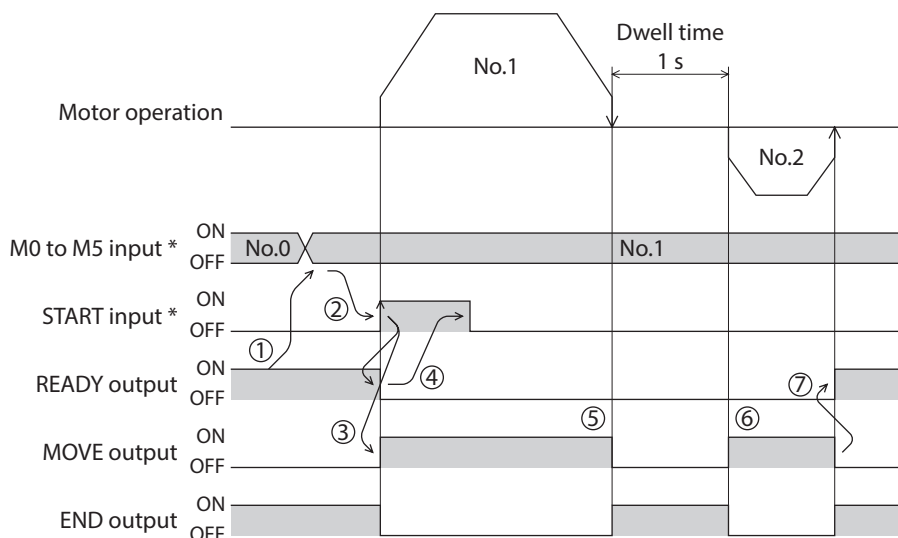
| | Operation mode | Position [step] | Operating speed [Hz] | Operation function | Push current [%] | Dwell time [s] | Sequential positioning | Acceleration [ms/kHz] or [s] | Deceleration [ms/kHz] or [s] |
|----|-------------------|-----------------|----------------------|--------------------|------------------|----------------|------------------------|------------------------------|------------------------------|
| #0 | Incremental (INC) | 0 | 1000 | Single-motion | 20.0 | 0.000 | Disable | 1.000 | 1.000 |
| #1 | Incremental (INC) | 5000 | 5000 | Linked-motion 2 | 20.0 | 1.000 | Disable | 1000.000 | 1000.000 |
| #2 | Incremental (INC) | -3000 | 3000 | Single-motion | 20.0 | 0.000 | Disable | 1000.000 | 1000.000 |

Operation example



Operating method

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

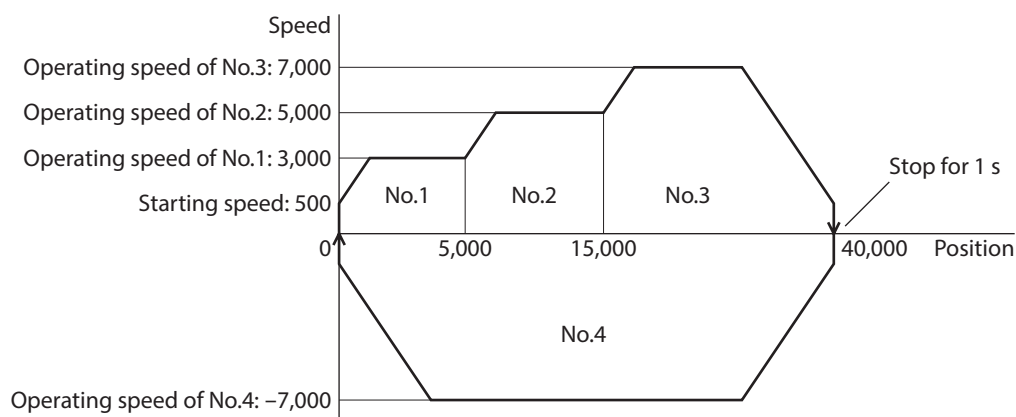


* In direct I/O, turn the START input ON after setting the M0 to M5 inputs. In remote I/O, the operation will be performed even when turning the M0 to M5 inputs and the START input ON simultaneously.

● **Example of linked-motion 2 operation;
When combining the linked-motion operation and the linked-motion 2 operation**

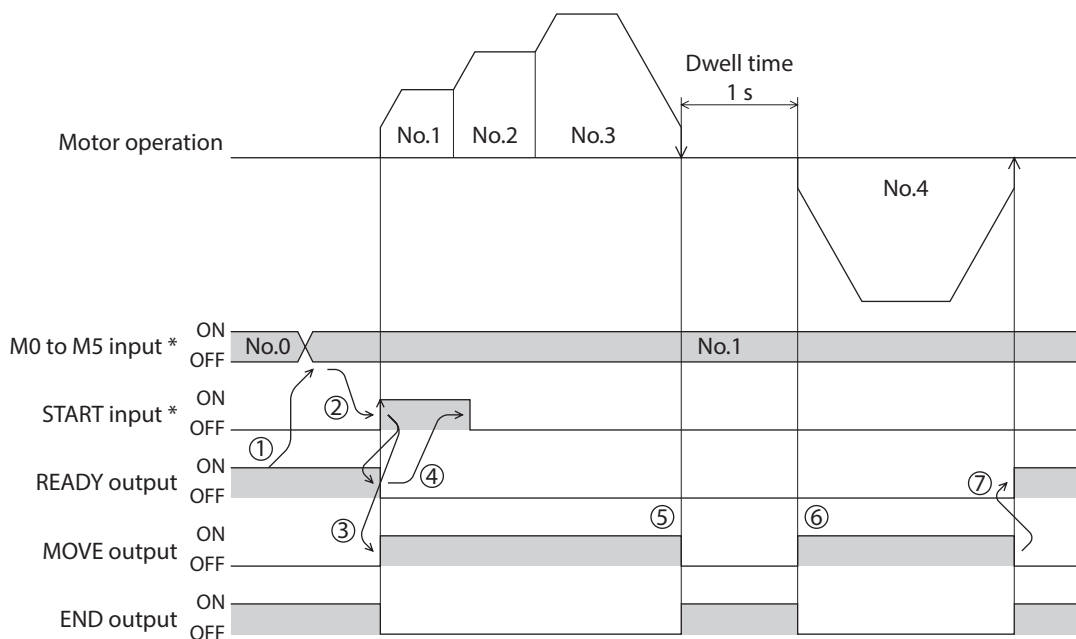
| | Operation mode | Position [step] | Operating speed [Hz] | Operation function | Push current [%] | Dwell time [s] | Sequential positioning | Acceleration [ms/kHz] or [s] | Deceleration [ms/kHz] or [s] |
|----|-------------------|-----------------|----------------------|--------------------|------------------|----------------|------------------------|------------------------------|------------------------------|
| #0 | Incremental (INC) | 0 | 1000 | Single-motion | 20.0 | 0.000 | Disable | 1.000 | 1.000 |
| #1 | Incremental (INC) | 5000 | 3000 | Linked-motion | 20.0 | 0.000 | Disable | 1000.000 | 1000.000 |
| #2 | Incremental (INC) | 10000 | 5000 | Linked-motion | 20.0 | 0.000 | Disable | 1.000 | 1.000 |
| #3 | Incremental (INC) | 25000 | 7000 | Linked-motion 2 | 20.0 | 1.000 | Disable | 1.000 | 1.000 |
| #4 | Absolute (ABS) | 0 | 7000 | Single-motion | 20.0 | 0.000 | Disable | 1000.000 | 1000.000 |

Operation example



Operating method

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



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

4-4 Push-motion operation

When the "operation function" is set to "push," the motor performs an operation of continuously applying pressure on the load when pressing against the load. In push-motion operation, the motor performs constant speed operation at the operating speed of the selected operation data No. but the acceleration/deceleration will not be applied.

The motor becomes push-motion status when pressing against the load, and the TLC output and READY output are turned ON. The set current value of push-motion operation is applied to the motor current.

When the operation was completed with non-push-motion status, the motor stops, and the END output and READY output are turned ON. The set current of push-motion operation is applied to the motor current at standstill.

When the STOP input is turned ON, the motor stops, and the END output and READY output are turned ON. The STOP current is applied to the motor current at standstill.

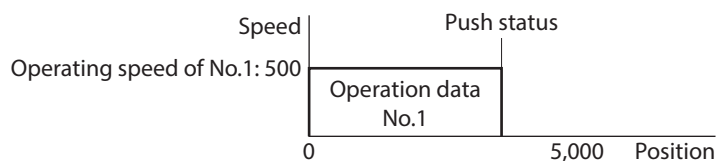
Note Do not perform push-motion operation with geared motors. Doing so may cause damage to the motor or gear part.

- memo**
- Regardless of resolution, the maximum speed of push-motion operation is 500 r/min. If the push-motion operation is started by setting higher speed than 500 r/min, an operation data error alarm will generate. For the driver which is before the specification change, the maximum speed of push-motion operation is 30 r/min. Refer to p.8 for details.
 - If push-motion operation is performed for a long time while a large push-motion current is set, the driver may increase heat generation and generate the main circuit overheat alarm.

● Example of push-motion operation; When it had pressed against the load

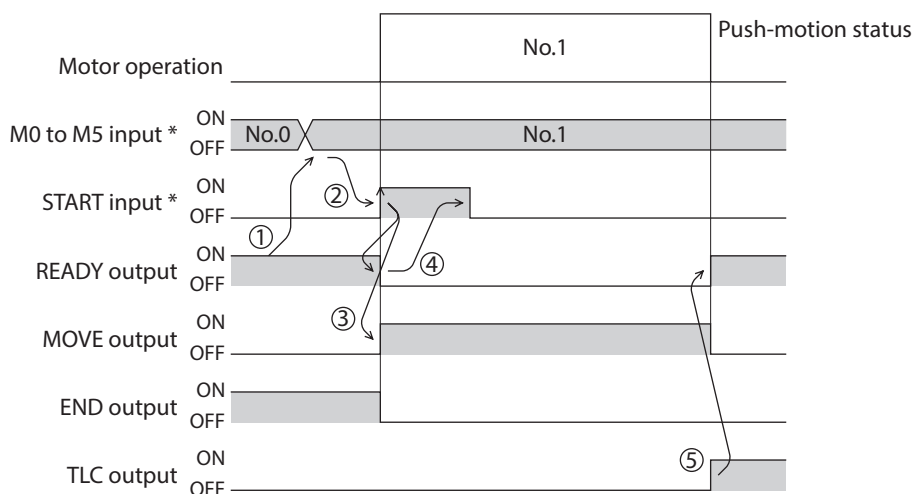
| | Operation mode | Position [step] | Operating speed [Hz] | Operation function | Push current [%] | Dwell time [s] | Sequential positioning | Acceleration [ms/kHz] or [s] | Deceleration [ms/kHz] or [s] |
|----|-------------------|-----------------|----------------------|--------------------|------------------|----------------|------------------------|------------------------------|------------------------------|
| #0 | Incremental (INC) | 0 | 1000 | Single-motion | 20.0 | 0.000 | Disable | 1.000 | 1.000 |
| #1 | Incremental (INC) | 5000 | 500 | Push | 50.0 | 0.000 | Disable | 1.000 | 1.000 |

Operation example



Operating method

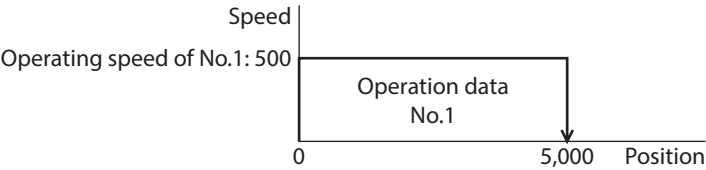
- 1) Check the READY output is ON.
- 2) Select the operation data No.1 by turning the M0 input ON and turn the START input ON.
- 3) The motor starts the positioning operation for the operation data No.1.
- 4) Check that the READY output has been turned OFF and turn the START input OFF.
- 5) When the motor becomes push-motion status, the TLC output will be turned ON and then the READY output will be turned ON.



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

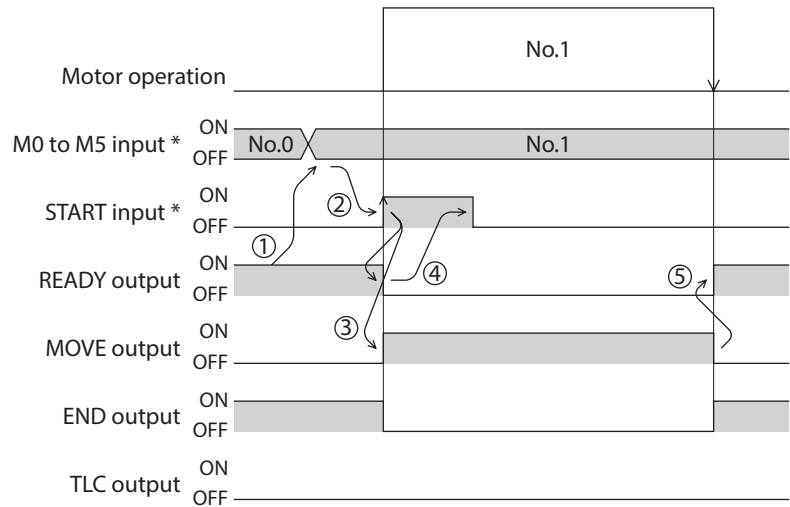
● Example of push-motion operation; When it had not pressed against the load

Operation example



Operating method

- 1) Check the READY output is ON.
- 2) Select the operation data No.1 by turning the M0 input ON and turn the START input ON.
- 3) The motor starts the positioning operation for the operation data No.1.
- 4) Check that the READY output has been turned OFF and turn the START input OFF.
- 5) When the motor reaches to the target position, the operation will be stopped and the READY output will be turned ON. Since the motor did not become push-motion status, the TLC output remains OFF.

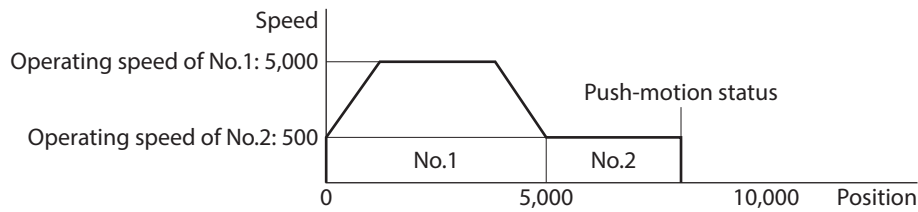


* In direct I/O, turn the START input ON after setting the M0 to M5 inputs. In remote I/O, the operation will be performed even when turning the M0 to M5 inputs and the START input ON simultaneously.

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

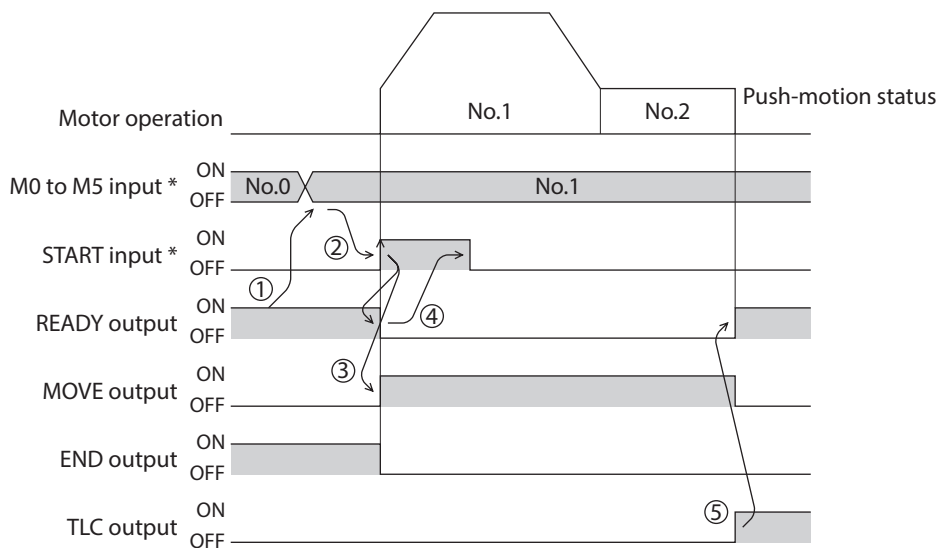
| | Operation mode | Position [step] | Operating speed [Hz] | Operation function | Push current [%] | Dwell time [s] | Sequential positioning | Acceleration [ms/kHz] or [s] | Deceleration [ms/kHz] or [s] |
|----|-------------------|-----------------|----------------------|--------------------|------------------|----------------|------------------------|------------------------------|------------------------------|
| #0 | Incremental (INC) | 0 | 1000 | Single-motion | 20.0 | 0.000 | Disable | 1.000 | 1.000 |
| #1 | Incremental (INC) | 5000 | 5000 | Linked-motion | 20.0 | 0.000 | Disable | 1000.000 | 1000.000 |
| #2 | Incremental (INC) | 5000 | 500 | Push | 50.0 | 0.000 | Disable | 1.000 | 1.000 |

Operation example



Operating method

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



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

5 Return-to-home operation

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

Return-to-home operation can be performed in the following four modes:

| Operation type | Description | Feature |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3-sensor mode | The motor operates at the "operating speed of home-seeking." When the HOME sensor is detected, the motor will stop and the stop position will be the home position. | <ul style="list-style-type: none"> • 3 external sensors are needed. *3 • Operating speed is high (Operating speed of home-seeking). |
| 2-sensor mode | The motor operates at the "starting speed of home-seeking." When the limit sensor is detected, the motor will rotate in the reverse direction and escape from the limit sensor. After escaping from the limit sensor, the motor will move 200 steps and stop, and then the stop position will be the home position. *2 | <ul style="list-style-type: none"> • 2 external sensors are needed. • Operating speed is low (Starting speed of home-seeking). |
| Push mode *1 | The motor operates at the "starting speed of home-seeking." When the moving part for the motor is pressed against a mechanical stopper etc., the motor will rotate in the reverse direction. After reversing, the motor will move 200 steps and stop, and then the stop position will be the home position. *2 | <ul style="list-style-type: none"> • No external sensor is needed. • Operating speed is low (Starting speed of home-seeking). |
| Position preset | When executing the P-PRESET at the position that the motor stops, the command position will be the value of the "Preset position" parameter. The home position can be set to any position. | <ul style="list-style-type: none"> • No external sensor is needed. • The home position can be set to any position. |

*1 Do not perform push-mode return-to-home operation for geared motors.

*2 It moves 200 steps regardless of resolution. Therefore, the actual travel distance may vary according to resolution.

*3 The home position can be detected even one piece of the external sensor. In that case, connect only the HOME sensor.

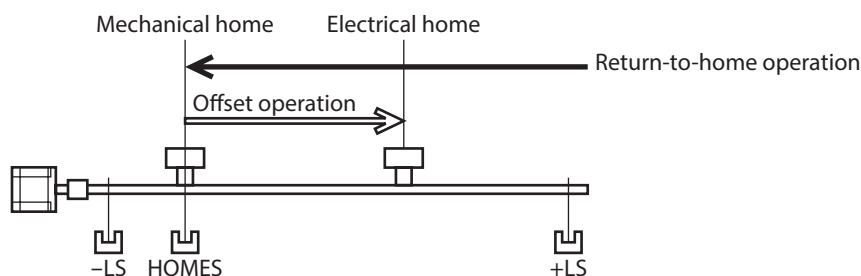
■ Additional function

| Additional function | 2-sensor mode 3-sensor mode Push mode | Position preset | Related parameter |
|------------------------------------------|---------------------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Home offset | Possible | Not possible | • Position offset of home-seeking |
| External sensor (signal) detection | Possible | Not possible | <ul style="list-style-type: none"> • SLIT detection with home-seeking • TIM signal detection with home-seeking |
| Command position after returning to home | The position becomes "0" | Any position | • Preset position |

● Home offset

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

If the amount of offset from mechanical home is "0," the mechanical home and electrical home will become the same.



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

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



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

- **Command position after returning to home**

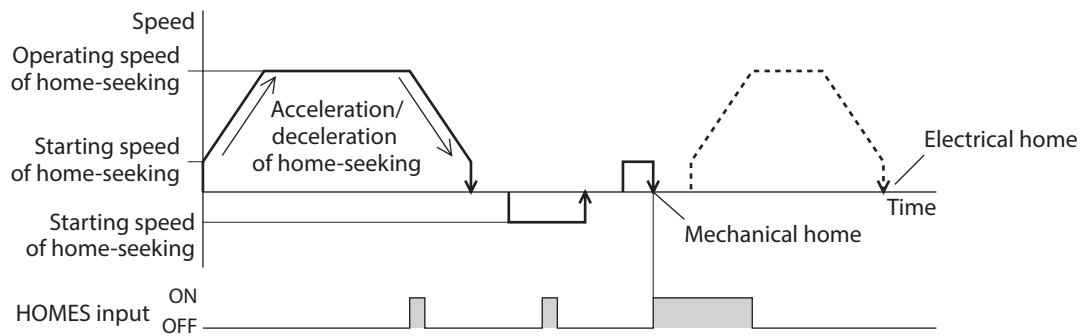
When executing the P-PRESET at the position that the motor stops, the command position will be the value of the "Preset position" parameter.

- **Parameters related to return-to-home operation**

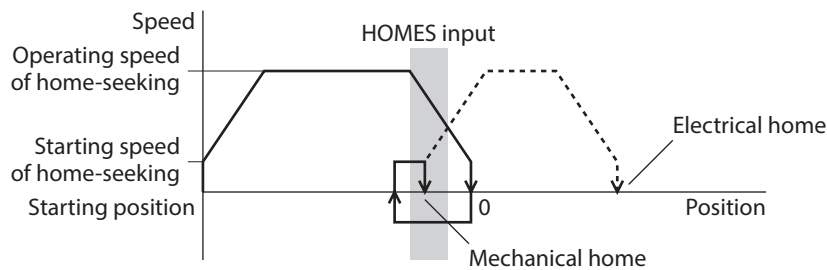
| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Home operation | Home-seeking mode | Sets the mode for return-to-home operation. [Setting range] 0: 2-sensor mode 1: 3-sensor mode 2: Push mode | 1 |
| | Operating speed of home-seeking | Sets the operating speed for return-to-home operation. [Setting range] 1 to 1,000,000 Hz | 1,000 |
| | Acceleration/ deceleration of home-seeking | Sets the acceleration/deceleration rate (acceleration/deceleration time) for return-to-home operation. [Setting range] 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) | 1,000 |
| | Starting speed of home-seeking | Sets the starting speed for return-to-home operation. [Setting range] 1 to 1,000,000 Hz | 500 |
| | Position offset of home-seeking | Sets the amount of offset from mechanical home. [Setting range] -8,388,608 to 8,388,607 step | 0 |
| | Starting direction of home-seeking | Sets the starting direction for home detection. [Setting range] 0: Negative side 1: Positive side | 1 |
| | SLIT detection with home-seeking | Sets whether or not to concurrently use the SLIT input for return-to-home operation. [Setting range] 0: Disable 1: Enable | 0 |
| | TIM signal detection with home-seeking | Sets whether or not to concurrently use the TIM signal for return-to-home operation. [Setting range] 0: Disable 1: Enable | 0 |
| | Operating current of home-seeking with push-motion | Sets the operating current for push-motion return-to-home operation based on the rated current being 100 %. [Setting range] 0 to 1,000 (1=0.1 %) | 1,000 |

● Operation example (when using 3-sensor mode)

Operating sequence in seeing a time axis

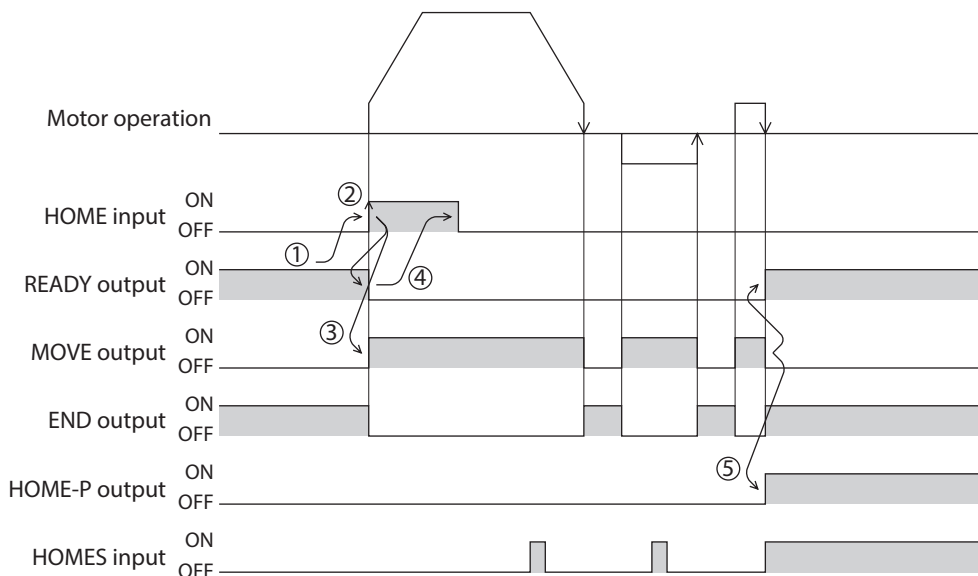


Operating sequence in seeing a travel amount



● Operating method

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



5-1 Operation sequence

■ 3-sensor mode

VS: Starting speed of home-seeking

VR: Operating speed of home-seeking

VL: Last speed of return-to-home (When VS < 500 Hz: VS, When VS ≥ 500 Hz: 500 Hz)

--- Broken line indicates a home offset move.

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

● When using the HOME sensor only

If the limit sensor is not used such as a rotating mechanism, operation sequences are as follows.

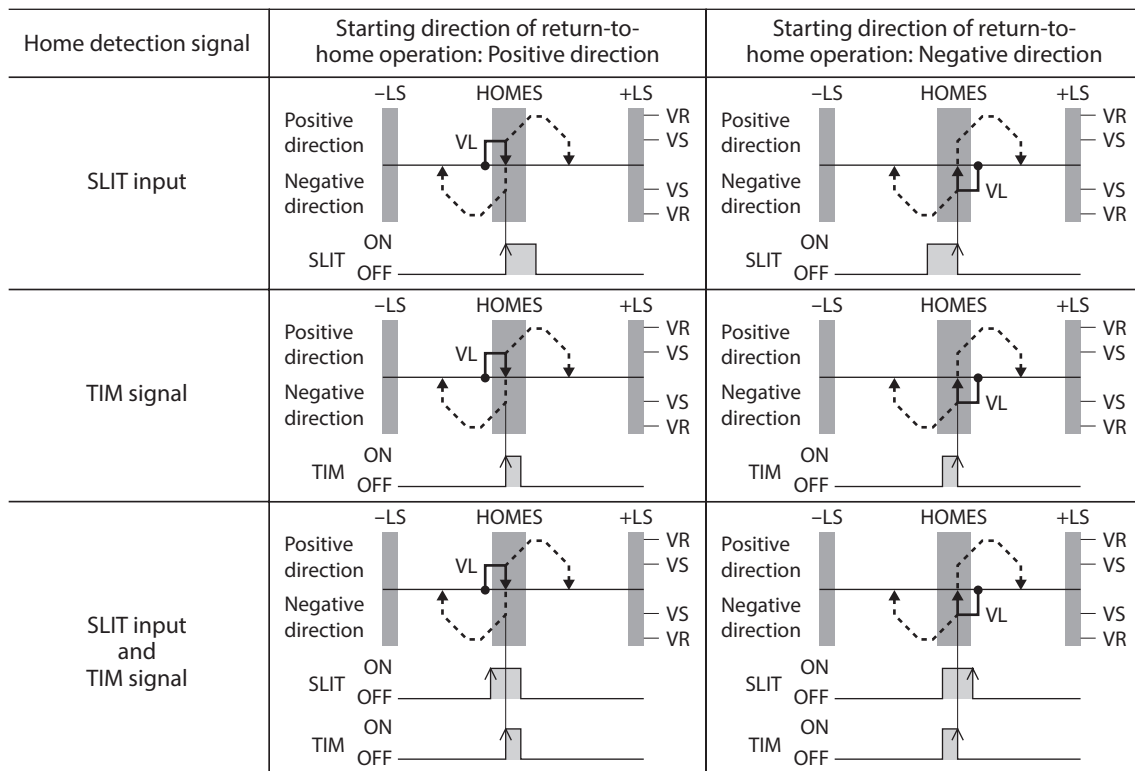
| Starting position of return-to-home operation | Starting direction of return-to-home operation: Positive direction | Starting direction of return-to-home operation: Negative direction |
|-----------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|
| HOMES | | |
| Not HOMES | | |

Note

Depending on the setting value of the "Acceleration/deceleration of home-seeking" parameter, the motor may decelerate to a stop in excess of the HOME sensor after the HOME sensor was detected. Since there is a risk of contact if the distance between the mechanical end and the HOME sensor is close, provide enough distance between them.

● When concurrently using the SLIT input and/or TIM signal

After the HOME sensor is detected, the operation will continue until the external sensor (signal) will be detected. If the external sensor (signal) is detected while the HOME sensor is ON, the return-to-home operation will complete.



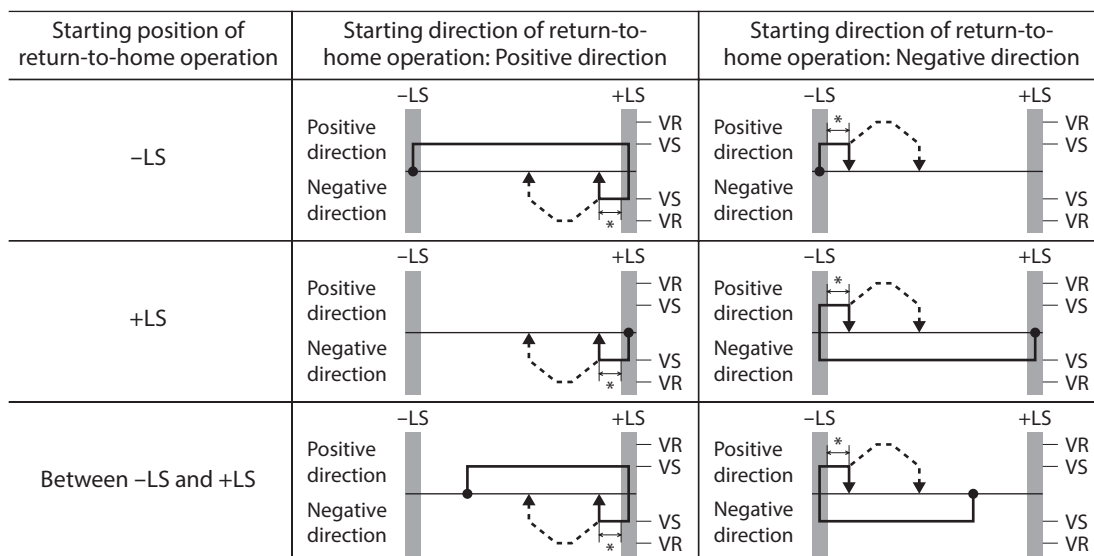
■ 2-sensor mode

VS: Starting speed of home-seeking

VR: Operating speed of home-seeking

VL: Last speed of return-to-home (When VS < 500 Hz: VS, When VS ≥ 500 Hz: 500 Hz)

--- Broken line indicates a home offset move.



* After pulling out of the limit sensor, the motor will move 200 steps.

● When concurrently using the SLIT input and/or TIM signal

When the limit sensor is detected, the motor will rotate in the reverse direction and escape from the limit sensor. After escaping from the limit sensor, the motor will move 200 steps and stop once. Then, the motor operation will continue until the external sensor (signal) will be detected. When the external sensor (signal) is detected, return-to-home operation will complete.

| Home detection signal | Starting direction of return-to-home operation: Positive direction | Starting direction of return-to-home operation: Negative direction |
|---------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|
| SLIT input | | |
| TIM signal | | |
| SLIT input and TIM signal | | |

* After pulling out of the limit sensor, the motor will move 200 steps.

■ Push mode

VS: Starting speed of home-seeking

VR: Operating speed of home-seeking

VL: Last speed of return-to-home (When VS < 500 Hz: VS, When VS ≥ 500 Hz: 500 Hz)

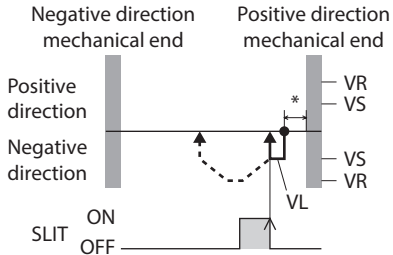
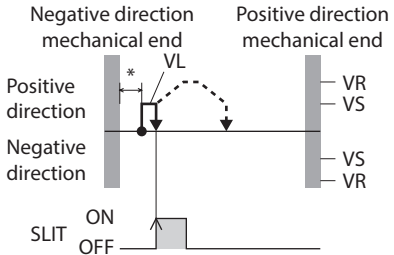
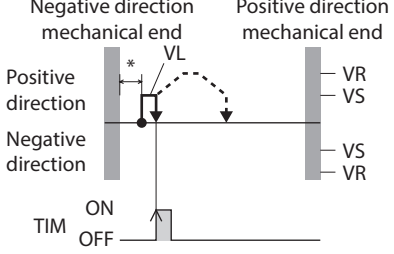
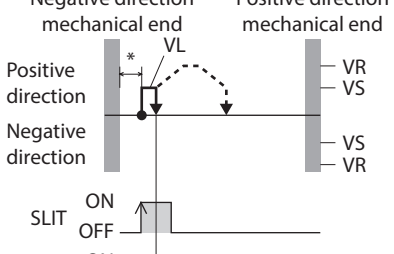
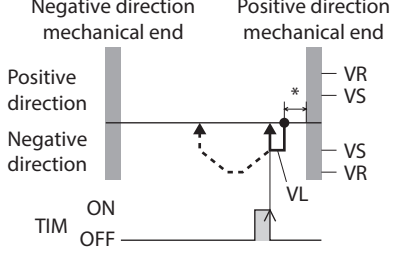
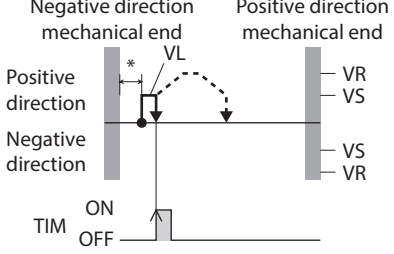
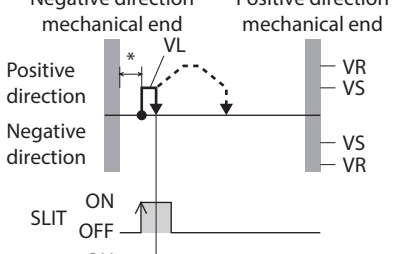
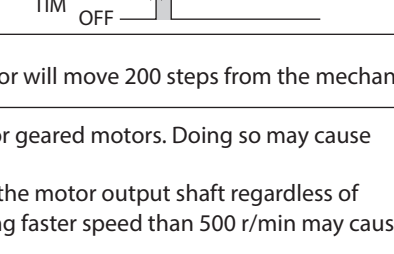
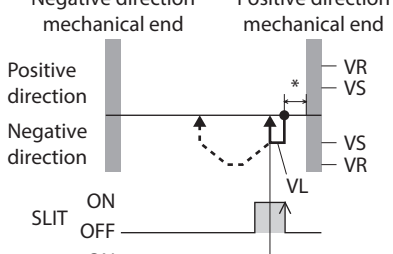
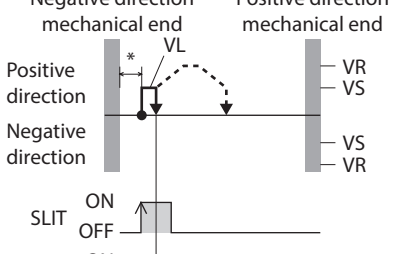
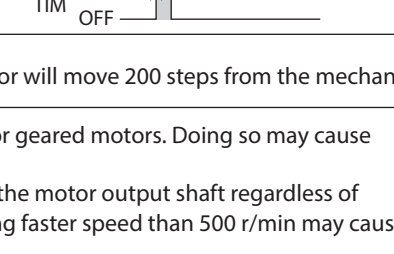

--- Broken line indicates a home offset move.

| Starting position of return-to-home operation | Starting direction of return-to-home operation: Positive direction | Starting direction of return-to-home operation: Negative direction |
|-----------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|
| Negative direction mechanical end | | |
| Positive direction mechanical end | | |
| Between mechanical ends | | |

* The motor will move 200 steps from the mechanical end.

● When concurrently using the SLIT input and/or TIM signal

When the moving part for the motor is pressed against a mechanical stopper etc., the motor will rotate in the reverse direction. After reversing, the motor will move 200 steps and stop once. Then, the motor operation will continue until the external sensor (signal) is detected. When the external sensor (signal) is detected, return-to-home operation will complete.

| Home detection signal | Starting direction of return-to-home operation: Positive direction | | Starting direction of return-to-home operation: Negative direction | |
|---------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| SLIT input | Negative direction mechanical end | Positive direction mechanical end | Negative direction mechanical end | Positive direction mechanical end |
| |  |  |  |  |
| TIM signal | Negative direction mechanical end | Positive direction mechanical end | Negative direction mechanical end | Positive direction mechanical end |
| |  |  |  |  |
| SLIT input and TIM signal | Negative direction mechanical end | Positive direction mechanical end | Negative direction mechanical end | Positive direction mechanical end |
| |  |  |  |  |

* The motor will move 200 steps from the mechanical end.

Note

- Do not perform push-mode return-to-home operation for geared motors. Doing so may cause damage to the motor.
- The maximum speed for the push-mode is 500 r/min on the motor output shaft regardless of resolution. Starting return-to-home operation with setting faster speed than 500 r/min may cause damage to the motor.

5-2

Position preset

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

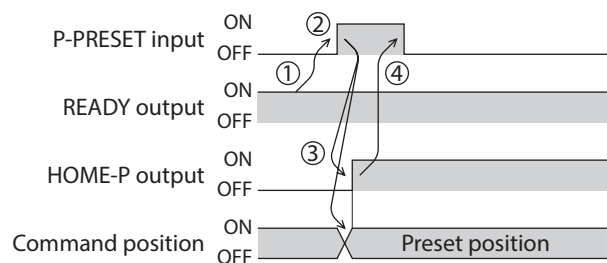
- When the motor is operating
- When an alarm is present

● Related parameter

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

● Operating method

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



6 Continuous operation

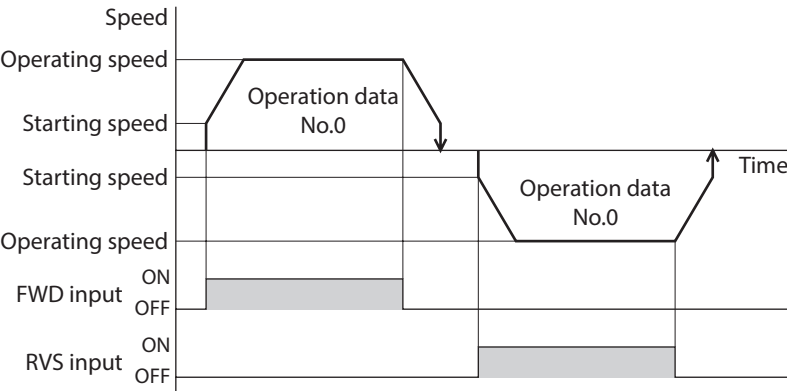
The motor operates continuously while the FWD or RVS input is ON.
Operation is performed based on the FWD or RVS input and the operating speed corresponding to the selected operation data No. When the operation data No. is changed during continuous operation, the speed will change to the speed specified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

■ Operation data

Operation data for continuous operation are as follows.

| MEXE02 tree view | Setting item | Description | Initial value |
|------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Operation data | Operating speed | Sets the operating speed in continuous operation. [Setting range] 1 to 1,000,000 Hz | 1,000 |
| | Acceleration | Sets the acceleration rate (acceleration time) in continuous operation. * [Setting range] 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) | 1,000 |
| | Deceleration | Sets the deceleration rate (deceleration time) in continuous operation. * [Setting range] 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) | 1,000 |

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



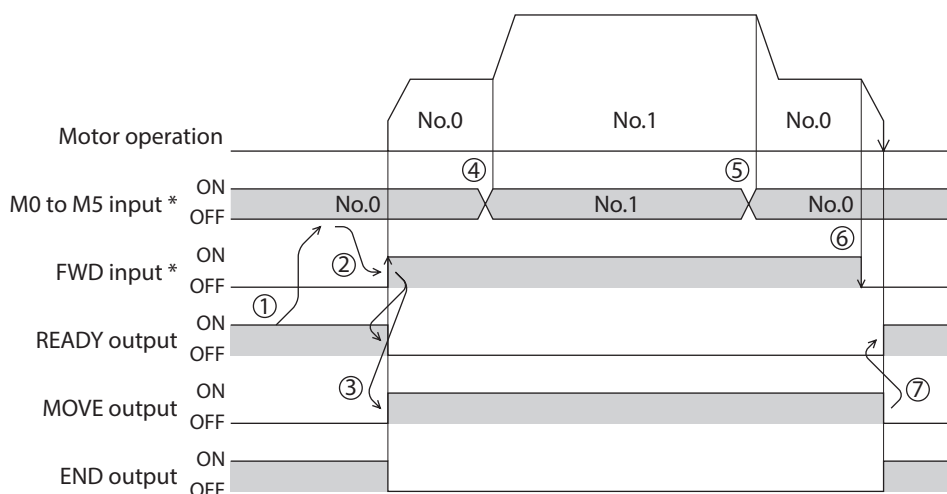
6-1 Starting method of continuous operation

When selecting the operation data No. and turning the FWD input or RVS input ON, continuous operation will be started. Select an operation data based on a combination of ON/OFF status of the M0 to M5 inputs. Refer to p.95 for details.

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

● Operating method

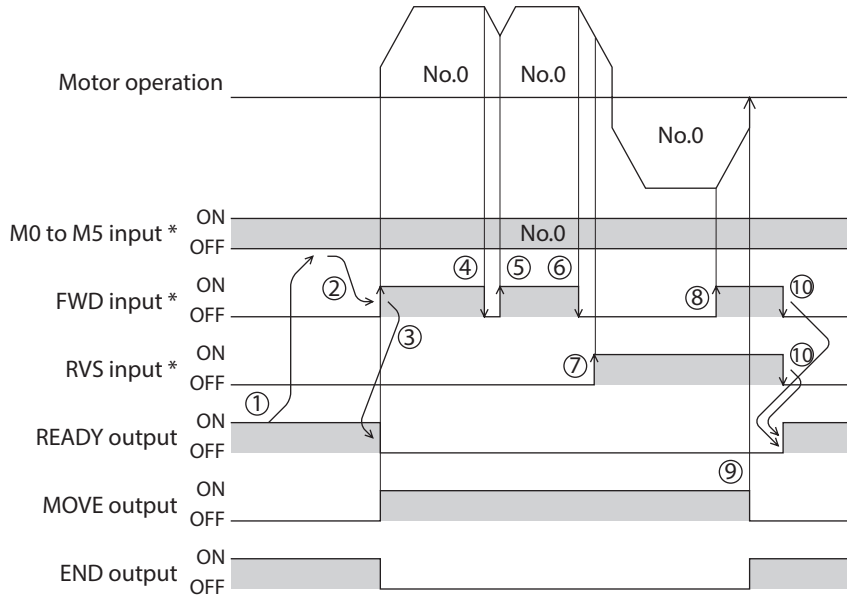
- 1) Check the READY output is ON.
- 2) Select the operation data No. by a combination of the M0 to M5 inputs and turn the FWD input ON.
- 3) The motor starts continuous operation. The READY output will be turned OFF.
- 4) Select the operation data No.1 by turning the M0 input ON. The motor accelerates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



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

● Operating method; When combining the FWD input and RVS input

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

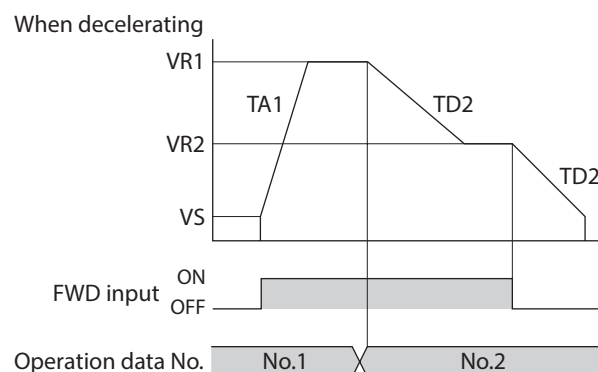
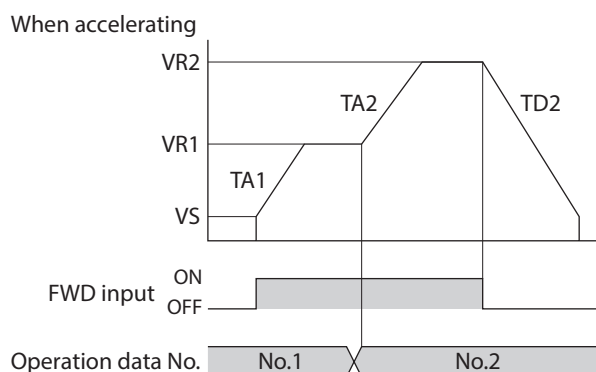


* In direct I/O, turn the FWD input or RVS input ON after setting the M0 to M5 inputs.
In remote I/O, the operation will be performed even when turning the M0 to M5 inputs and the FWD (RVS) input ON simultaneously.

6-2 Variable speed operation

■ When acceleration/deceleration is "separate"

● Acceleration/deceleration unit: ms/kHz



● Explanation of labels

VS: Starting speed (Hz)

VR1: Operating speed of operation data No.1 (Hz)

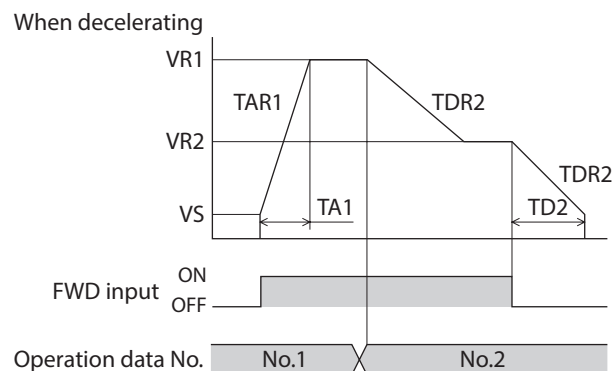
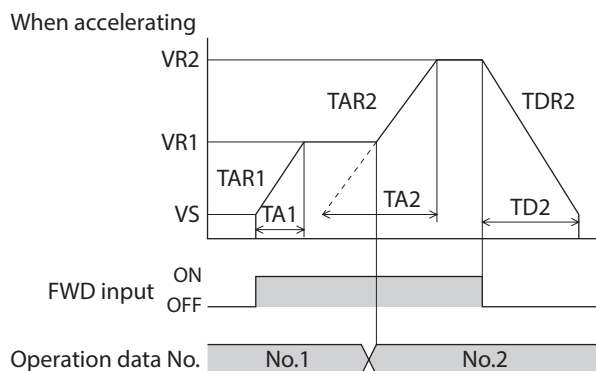
VR2: Operating speed of operation data No.2 (Hz)

TA1: Acceleration rate of operation data No.1 (ms/kHz)

TA2: Acceleration rate of operation data No.2 (ms/kHz)

TD2: Deceleration rate of operation data No.2 (ms/kHz)

● Acceleration/deceleration unit: s



● Explanation of labels

VS: Starting speed (Hz)

VR1: Operating speed of operation data No.1 (Hz)

VR2: Operating speed of operation data No.2 (Hz)

TA1: Acceleration time of operation data No.1 (s)

TA2: Acceleration time of operation data No.2 (s)

TD2: Deceleration time of operation data No.2 (s)

TAR1: Acceleration rate of operation data No.1 (Hz/s)

TAR2: Acceleration rate of operation data No.2 (Hz/s)

TDR2: Deceleration rate of operation data No.2 (Hz/s)

● Calculation method for acceleration/deceleration rate

$$TAR1 = (VR1 - VS) / TA1$$

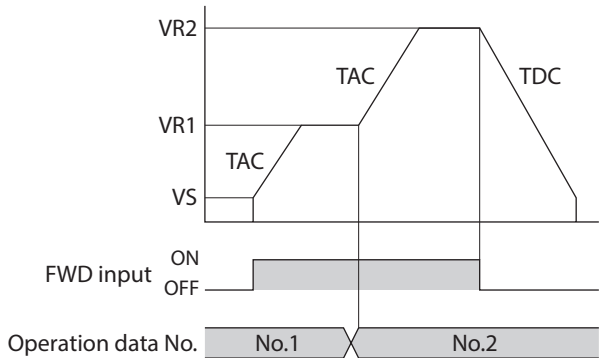
$$TAR2 = (VR2 - VS) / TA2$$

$$TDR2 = (VR2 - VS) / TD2$$

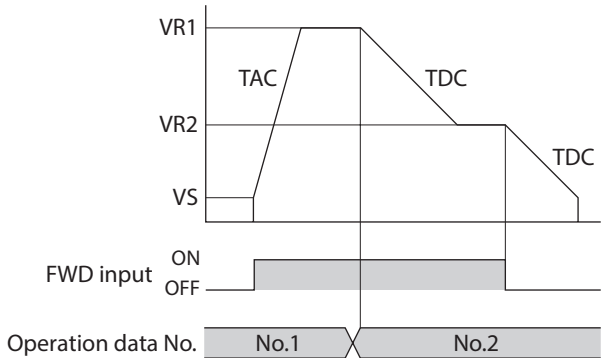
■ When acceleration/deceleration is "common"

● Acceleration/deceleration unit: ms/kHz

When accelerating



When decelerating

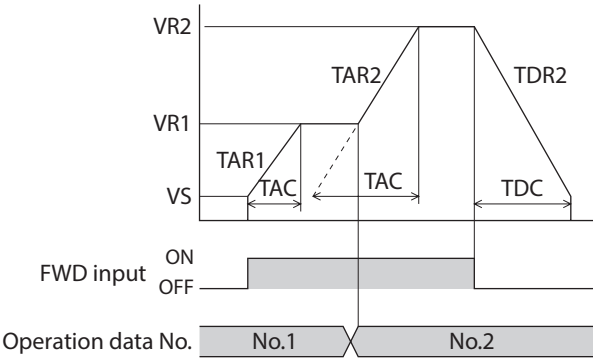


- Explanation of labels
VS: Starting speed (Hz)
VR1: Operating speed of operation data No.1 (Hz)
VR2: Operating speed of operation data No.2 (Hz)

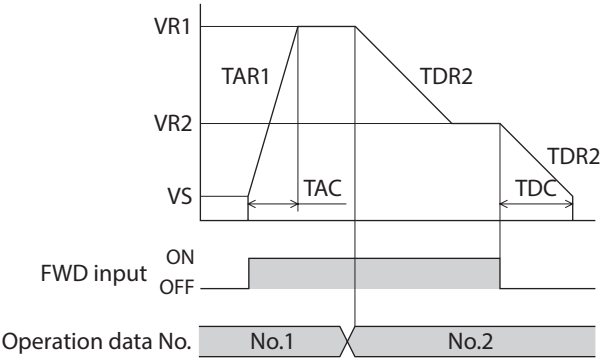
TAC: Common acceleration rate (ms/kHz)
TDC: Common deceleration rate (ms/kHz)

● Acceleration/deceleration unit: s

When accelerating



When decelerating



- Explanation of labels
VS: Starting speed (Hz)
VR1: Operating speed of operation data No.1 (Hz)
VR2: Operating speed of operation data No.2 (Hz)
TAC: Common acceleration time (s)
TDC: Common deceleration time (s)

TAR1: Acceleration rate of operation data No.1 (Hz/s)
TAR2: Acceleration rate of operation data No.2 (Hz/s)
TDR2: Deceleration rate of operation data No.2 (Hz/s)

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

7 Other operation

7-1 JOG operation

JOG operation is a function to perform positioning operation of the travel amount set in the "JOG travel amount" parameter.

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

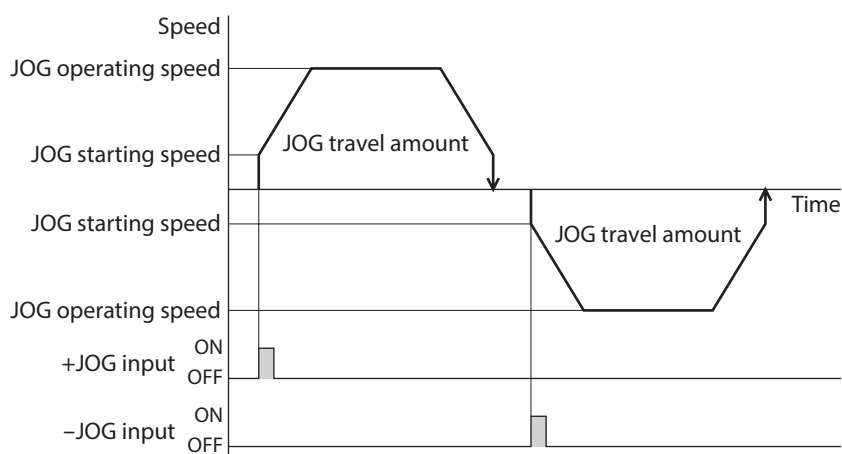
When the –JOG signal to ON, JOG operation is in the negative direction.

This function is convenient for fine adjustment of the position.

● Related parameter

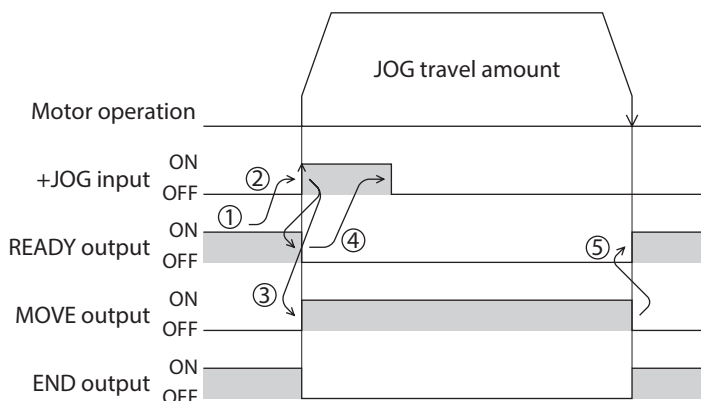
| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Operation | JOG operating speed | Sets the operating speed for JOG operation. [Setting range] 1 to 1,000,000 Hz | 1,000 |
| | Acceleration/ deceleration rate of JOG | Sets the acceleration/deceleration rate (acceleration/ deceleration time) for JOG operation. [Setting range] 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) | 1,000 |
| | JOG starting speed | Sets the starting speed for JOG operation. [Setting range] 0 to 1,000,000 Hz | 500 |
| | JOG travel amount | Sets the travel amount for JOG operation. [Setting range] 1 to 8,388,607 step | 1 |

● Operation example



● Operating method

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



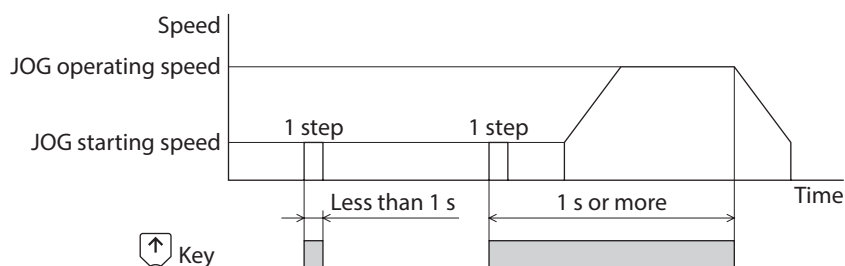
7-2 Test operation

Test operation is performed using the **MEXE02** or **OPX-2A**. JOG operation and teaching function can be performed. Refer to the "Support software **MEXE02** OPERATING MANUAL" when setting with the **MEXE02**, and p.123 when setting with the **OPX-2A**.

■ JOG operation

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

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



■ Teaching

This is a function to move the motor using the **MEXE02** or **OPX-2A** and set the current position as the position (travel amount) of the operation data. When the position (travel amount) is set using teaching function, the "operation mode" will always be the absolute mode.

The operating speed, acceleration/deceleration and starting speed of teaching function are same as those of JOG operation.



Perform teaching function when the position origin is set. Refer to p.200 for setting the position origin.

7-3 Automatic return operation

When a position deviation occurs by an external force while the motor is in a non-excitation state, the motor can automatically return to the position where the motor last stopped.

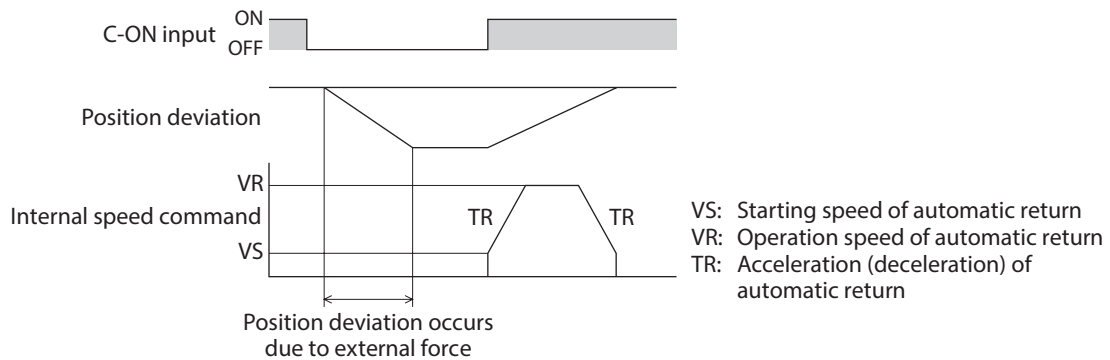
When the power is turned on and motor is reexcited by turning the C-ON input ON or turning the FREE input OFF, automatic return operation will be executed under the following conditions;

- When the main power is turned on
- When the C-ON input is turned from OFF to ON
- When the FREE input is turned from ON to OFF

● Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Operation | Automatic return operation | Sets whether to enable or disable automatic return operation. [Setting range] 0: Disable 1: Enable | 0 |
| | Operation speed of automatic return | Sets the operating speed for automatic return operation. [Setting range] 1 to 1,000,000 Hz | 1,000 |
| | Acceleration (deceleration) of automatic return | Sets the acceleration/deceleration rate (acceleration/deceleration time) for automatic return operation. [Setting range] 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) | 1,000 |
| | Starting speed of automatic return | Sets the starting speed for automatic return operation. [Setting range] 0 to 1,000,000 Hz | 500 |

● Example of automatic return operation

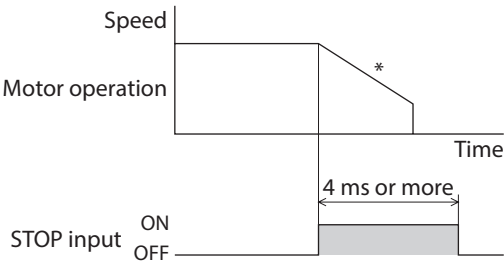


- Automatic return operation will not be executed immediately after turning on the DC power supply or executing the configuration command.
- If an alarm generates while the motor is in a non-excitation state, the automatic return operation will not be executed normally.

7-4 Stop operation

■ STOP action

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

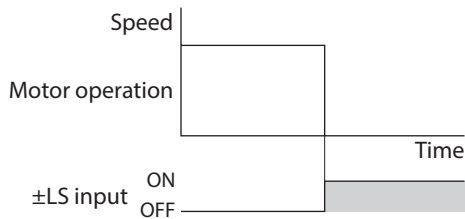


* The deceleration time is determined by the setting of "Deceleration" in the operation data.

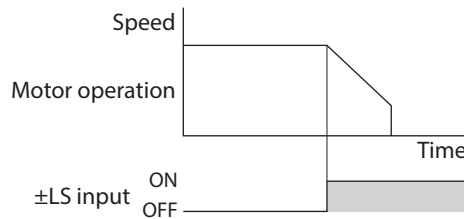
■ Hardware overtravel

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

• Immediate stop



• Decelerate stop



Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| I/O | Hardware overtravel | Sets whether to enable or disable hardware overtravel detection using \pm LS inputs. [Setting range] 0: Disable 1: Enable | 1 |
| | Overtravel action | Sets the motor stop action to take place upon the occurrence of overtravel. [Setting range] 0: Immediate stop 1: Decelerate stop | 0 |

Note When the "Overtravel action" parameter is set to "Decelerate stop," consider the distance from the start of deceleration to the stop, and do not allow a load to contact with the edge of the mechanism.

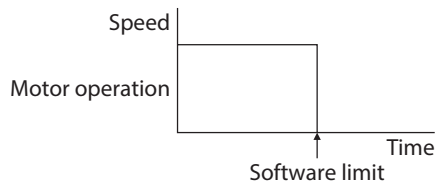
■ Software overtravel

The software overtravel is a function that limits the range of movement using the parameter.

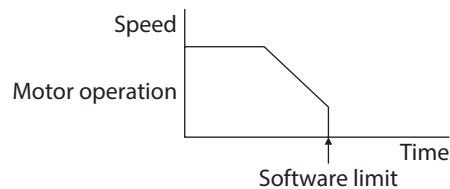
If the "Software overtravel" parameter is set to "Enable," the motor can be stopped when exceeding the software limit. The stopping mode is determined by the setting of "Overtravel action" parameter. For example, setting the "Overtravel action" parameter to "Decelerate stop" can decelerate the motor according to the deceleration rate and stop it at the software limit.

The figures below show the motor movement when an operation exceeding the software limit is started during operation.

• Immediate stop



• Decelerate stop



Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| I/O | Overtravel action | Sets the motor stop action to take place upon the occurrence of overtravel. [Setting range] 0: Immediate stop 1: Decelerate stop | 0 |
| | Software overtravel | Sets whether to enable or disable software overtravel detection using soft limits. [Setting range] 0: Disable 1: Enable | 1 |
| Coordinates | Positive software limit | Sets the value of soft limit in positive direction. [Setting range] -8,388,608 to 8,388,607 step | 8,388,607 |
| | Negative software limit | Sets the value of soft limit in negative direction. [Setting range] -8,388,608 to 8,388,607 step | -8,388,608 |



- Software overtravel will become effective after the position origin is set. Refer to p.200 for setting the position origin.
- When the value of the software limit is changed while the motor is operating, the motor will stop according to the setting of the "Overtravel action" parameter.

■ Escape from the limit sensor

It is possible to escape in the negative direction when detecting the positive direction limit, and possible to escape in the positive direction when detecting the negative direction limit.

The table shows the types of operation that can be used when escaping from the limit.

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

8 Coordination management

8-1 Position coordinate management

The driver manages the motor position information. If the absolute-position backup system is used connecting our battery **BAT01B**, the position information is kept even when the power is turned off.

■ Position origin for the driver

● When the absolute-position backup system is disabled

The position origin will be set whenever one of the following operations is executed:

- Return-to-home operation
- P-PRESET input is turned ON

● When the absolute-position backup system is enabled

When the absolute-position backup system is enabled, once the position origin is set, there is no need to set the position origin again even if the power is turned off. However, if the absolute position error alarm generates, the position origin will be lost. In this case, after clearing the absolute position error alarm by the P-CLR input, set the position origin by executing one of the followings.

- Return-to-home operation
- P-PRESET input is turned ON

■ When the position origin has not been set

If the "Return-to-home incomplete alarm" parameter is set to "Enable," positioning operations can be prohibited while the position origin has not been set.

The return-to-home incomplete alarm will generate if the START input, SSTART input or the MS0 to MS5 inputs are turned ON while the position origin has not been set. Refer to p.146 for alarm.

Related parameter

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

8-2 Wrap function

The wrap function is a function that resets the command position or multi-rotation data to 0 whenever the command position exceeds the set value by the "Wrap setting range" parameter. Since the multi-rotation data is also reset to 0, the unidirectional continuous rotation with the absolute-position backup system will be possible. The command position varies in a range of "0 to (wrap setting value-1)."

Related parameter

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|--------------------|------------------------------------------------------------------------------------------------|---------------|
| Coordinates | Wrap setting | Sets whether to enable or disable wrap function. [Setting range] 0: Disable 1: Enable | 0 |
| | Wrap setting range | Sets the wrap setting range. [Setting range] 1 to 8,388,607 step | 1,000 |



- When setting the "Wrap setting" parameter to "Enable," the software overtravel will be disabled. (It is disabled even when setting the "Software overtravel" parameter to "Enable.")
- If the "Wrap setting" parameter or "Wrap setting range" parameter is changed while the "Absolute back-up system" parameter is "Enable," the absolute position may be lost. Perform return-to-home operation or the P-PRESET when the wrap settings are changed.

■ Setting condition of wrap function

Condition 1: $\frac{\text{Electronic gear B} \times 1,000}{\text{Electronic gear A} \times 50} = \text{An integer}$

Condition 2: $\text{Wrap setting value} \times \frac{\text{Electronic gear A} \times 50}{\text{Electronic gear B} \times 1,000} = \text{An integer}$

The wrap setting error warning will generate when not meeting these formulas.



When not meeting these formulas while the "Wrap setting" parameter is "Enable," the wrap setting error warning will generate. If the power is turned on again or the configuration is executed while the wrap setting error warning is present, the wrap setting error alarm will generate.

■ Example for wrap function

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

- Wrap setting range : 3,600
- Resolution : 1,000 P/R (electronic gear A=1, electronic gear B=1)
- Command position : 900

Condition 1: $\frac{\text{Electronic gear B} \times 1,000}{\text{Electronic gear A} \times 50} = \frac{1 \times 1,000}{1 \times 50} = 20$

Condition 2: $\text{Wrap setting value} \times \frac{\text{Electronic gear A} \times 50}{\text{Electronic gear B} \times 1,000} = 3,600 \times \frac{1 \times 50}{1 \times 1,000} = 180$

The calculation result of these two formulas is an integer and this meets the setting condition.
Following tables are examples when the positioning operation is performed from 900 steps of the command position.

| Position | Operation mode: Incremental | Operation mode: Absolute |
|----------|-----------------------------|--------------------------|
| +1,000 | | |
| -1,000 | | |
| +5,000 | | |
| -5,000 | | |

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

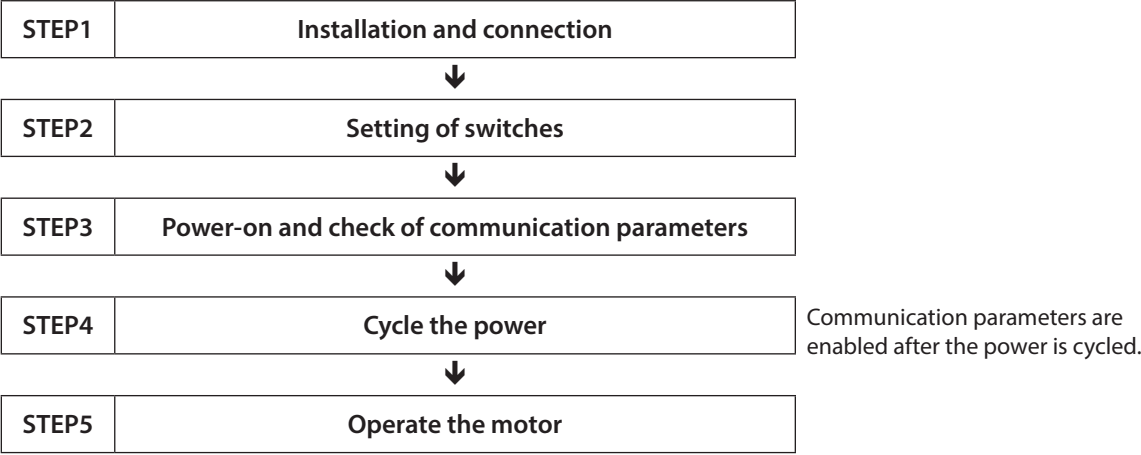
This part explains how to control from the host controller via RS-485 communication. The protocol for the RS-485 communication is the Modbus protocol.

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1 Guidance

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



● **Operation condition**

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

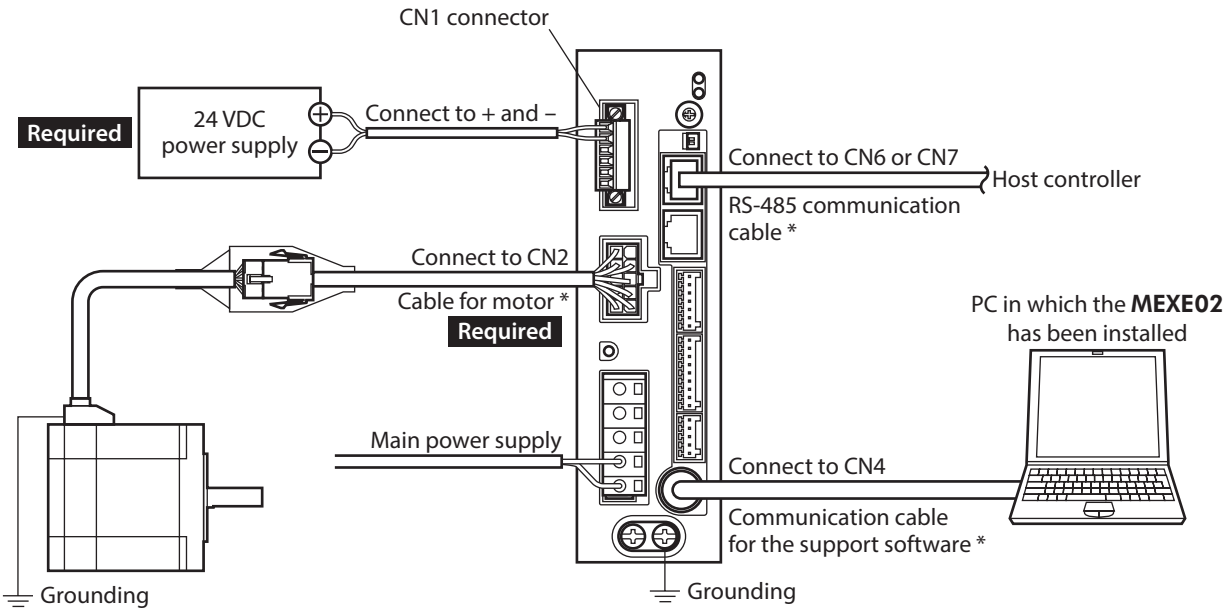
- Number of drivers connected: 1 unit
- Address number: 1
- Transmission rate: 115,200 bps
- Termination resistor: Enable

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

STEP 1

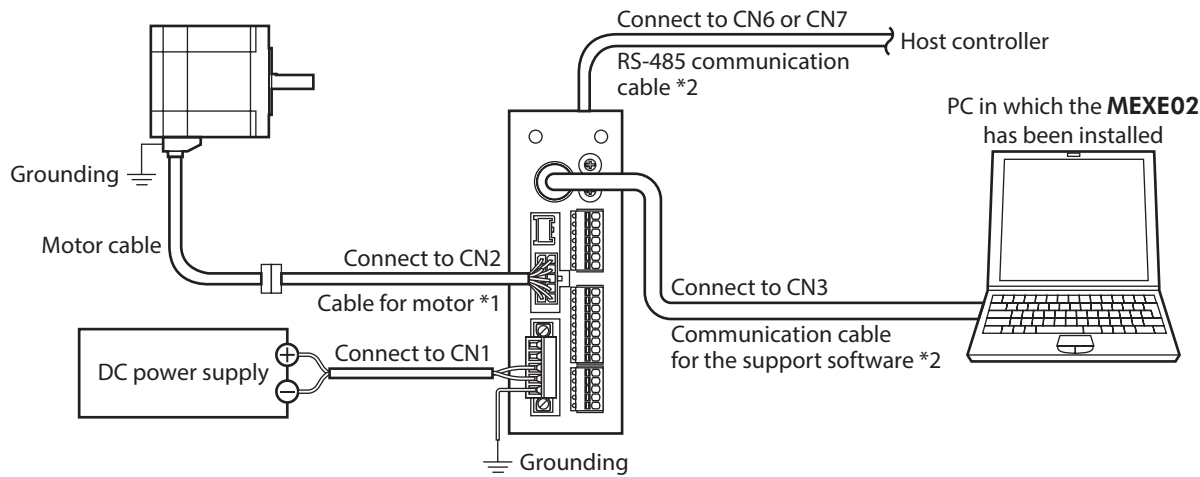
Check the installation and connection

■ **AC power input**



* These cables are provided as our products. Purchase them separately.

■ DC power input



*1 This cable is provided as our product. When the length of the motor cable is not enough, purchase it separately.
*2 These cables are provided as our products. Purchase them separately.

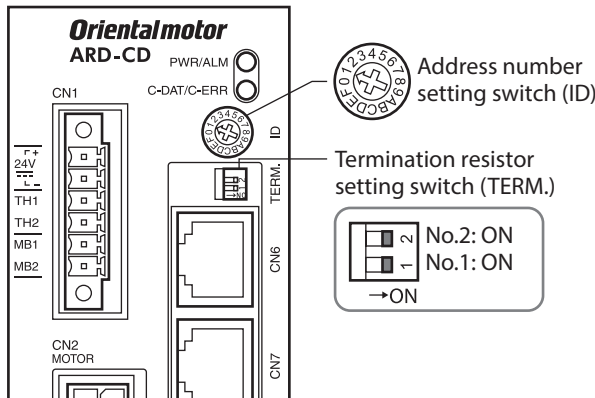
STEP 2 Setting the switches

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

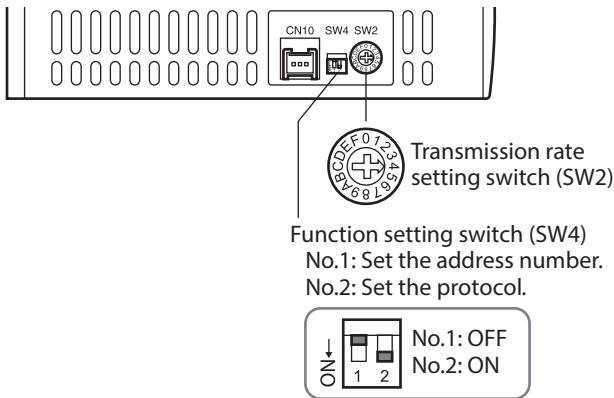
■ AC power input

| Setting item | Switch | Factory setting |
|--------------------------------|-----------------------------------|-------------------------|
| Protocol: Modbus protocol | Turn No.2 of SW4 ON | OFF |
| Address number: 1 | Turn No.1 of SW4 OFF, set ID to 1 | No.1 of SW4: OFF, ID: 0 |
| Transmission rate: 115,200 bps | Set SW2 to 4 | 7 |
| Termination resistor: ON | Set Nos.1 and 2 of TERM. ON | OFF |

● Driver front side



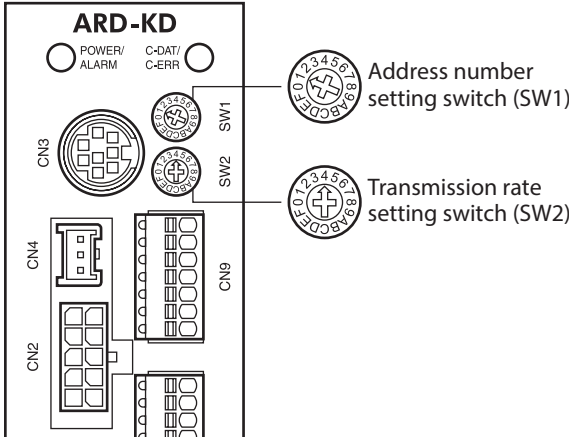
● Driver bottom side



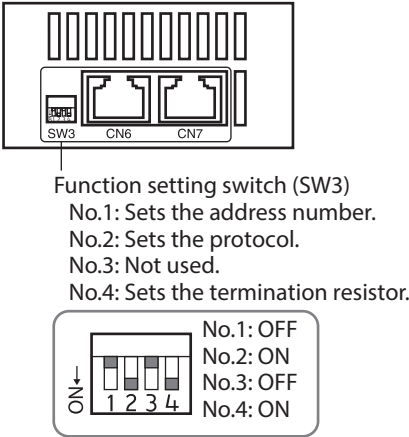
■ DC power input

| Setting item | Switch | Factory setting |
|--------------------------------|------------------------------------|--------------------------|
| Protocol: Modbus protocol | Turn No.2 of SW3 ON | OFF |
| Address number: 1 | Turn No.1 of SW3 OFF, set SW1 to 1 | No.1 of SW3: OFF, SW1: 0 |
| Transmission rate: 115,200 bps | Set SW2 to 4 | 7 |
| Termination resistor: ON | Set No.4 of SW3 ON | OFF |

● Driver front side



● Driver bottom side



STEP 3 Turn on the power and check the communication parameters

Check the following communication parameters with the **MEXE02**.
If communication cannot be established, review the communication parameters of the driver.

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

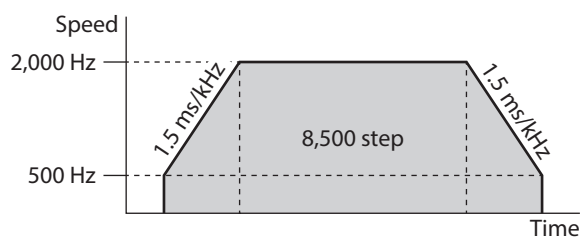
memo Set the transmission interval of frames sent from the master to be longer than the silent interval of the driver. When the transmission rate is 115,200 bps, the silent interval of the driver is 2.5 ms.

STEP 4 Cycle the power

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

STEP 5 Send a message and operate the motor

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



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

• Operation mode of operation data No.0

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

• Position of operation data No.0

| Field name | | Data | Description |
|---------------------|--------------------------|------|-------------------------------|
| Slave address | | 01h | Slave address 1 |
| Function code | | 06h | Writing to a holding register |
| Data | Register address (upper) | 04h | Position No.0 (0401h) |
| | Register address (lower) | 01h | |
| | Value written (upper) | 21h | 8,500 step (2134h) |
| | Value written (lower) | 34h | |
| Error check (lower) | | C0h | Calculation result of CRC-16 |
| Error check (upper) | | BDh | |

• Operating speed of operation data No.0

| Field name | | Data | Description |
|---------------------|--------------------------|------|-------------------------------|
| Slave address | | 01h | Slave address 1 |
| Function code | | 06h | Writing to a holding register |
| Data | Register address (upper) | 04h | Operating speed No.0 (0481h) |
| | Register address (lower) | 81h | |
| | Value written (upper) | 07h | 2,000 Hz (07D0h) |
| | Value written (lower) | D0h | |
| Error check (lower) | | DBh | Calculation result of CRC-16 |
| Error check (upper) | | 7Eh | |

• Acceleration of operation data No.0

| Field name | | Data | Description |
|---------------------|--------------------------|------|-------------------------------|
| Slave address | | 01h | Slave address 1 |
| Function code | | 06h | Writing to a holding register |
| Data | Register address (upper) | 06h | Acceleration No.0 (0601h) |
| | Register address (lower) | 01h | |
| | Value written (upper) | 05h | 1.5 ms/kHz (05DCh) |
| | Value written (lower) | DCh | |
| Error check (lower) | | DAh | Calculation result of CRC-16 |
| Error check (upper) | | 4Bh | |

• Deceleration of operation data No.0

| Field name | | Data | Description |
|---------------------|--------------------------|------|-------------------------------|
| Slave address | | 01h | Slave address 1 |
| Function code | | 06h | Writing to a holding register |
| Data | Register address (upper) | 06h | Deceleration No.0 (0681h) |
| | Register address (lower) | 81h | |
| | Value written (upper) | 05h | 1.5 ms/kHz (05DCh) |
| | Value written (lower) | DCh | |
| Error check (lower) | | DBh | Calculation result of CRC-16 |
| Error check (upper) | | A3h | |

2. Send the following two queries and perform operation.

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

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

• START input OFF

| Field name | | Data | Description |
|---------------------|--------------------------|------|-------------------------------|
| Slave address | | 01h | Slave address1 |
| Function code | | 06h | Writing to a holding register |
| Data | Register address (upper) | 00h | Driver input command (007Dh) |
| | Register address (lower) | 7Dh | |
| | Value written (upper) | 00h | START OFF (0000h) |
| | Value written (lower) | 00h | |
| Error check (lower) | | 19h | Calculation result of CRC-16 |
| Error check (upper) | | D2h | |

3. Check the motor rotates according to the setting.

STEP 6 Were you able to operate the motor properly?

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

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

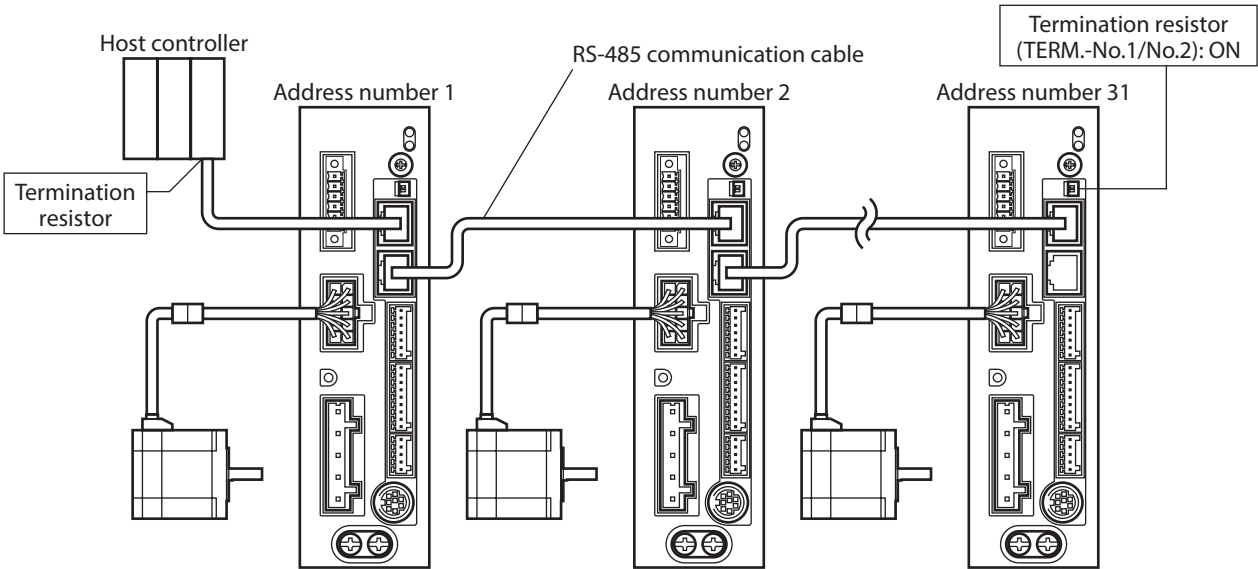
2 Communication specifications

| | |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electrical characteristics | In conformance with EIA-485, straight cable Use a twisted pair cable (TIA/EIA-568B CAT5e or higher is recommended) and keep the total wiring distance including extension to 50 m (164 ft.) or less. * |
| Communication mode | Half duplex Asynchronous mode (data: 8 bits, stop bit: 1 bit/2 bits, parity: none/even number/odd number) |
| Transmission rate | Selectable from 9,600 bps, 19,200 bps, 38,400 bps, 57,600 bps and 115,200 bps. |
| Protocol | Modbus RTU mode |
| Connection figure | Up to 31 drivers can be connected to one host 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.

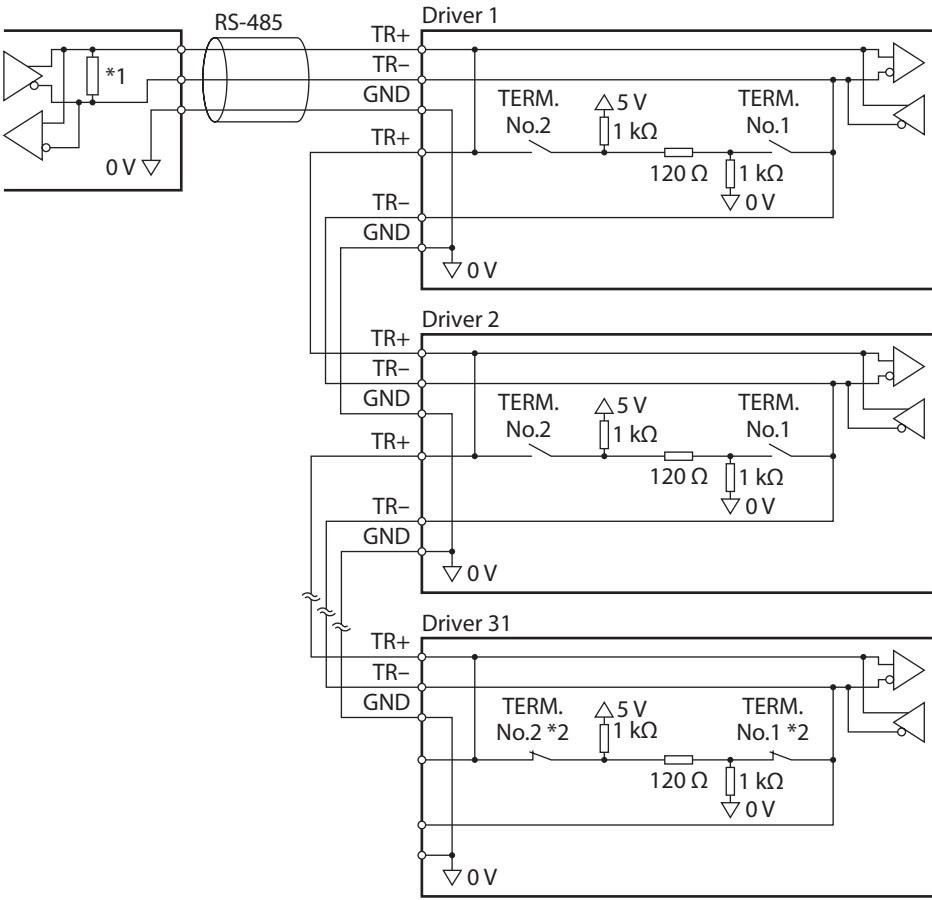
■ Connection example

The figure shows the model for AC power input.



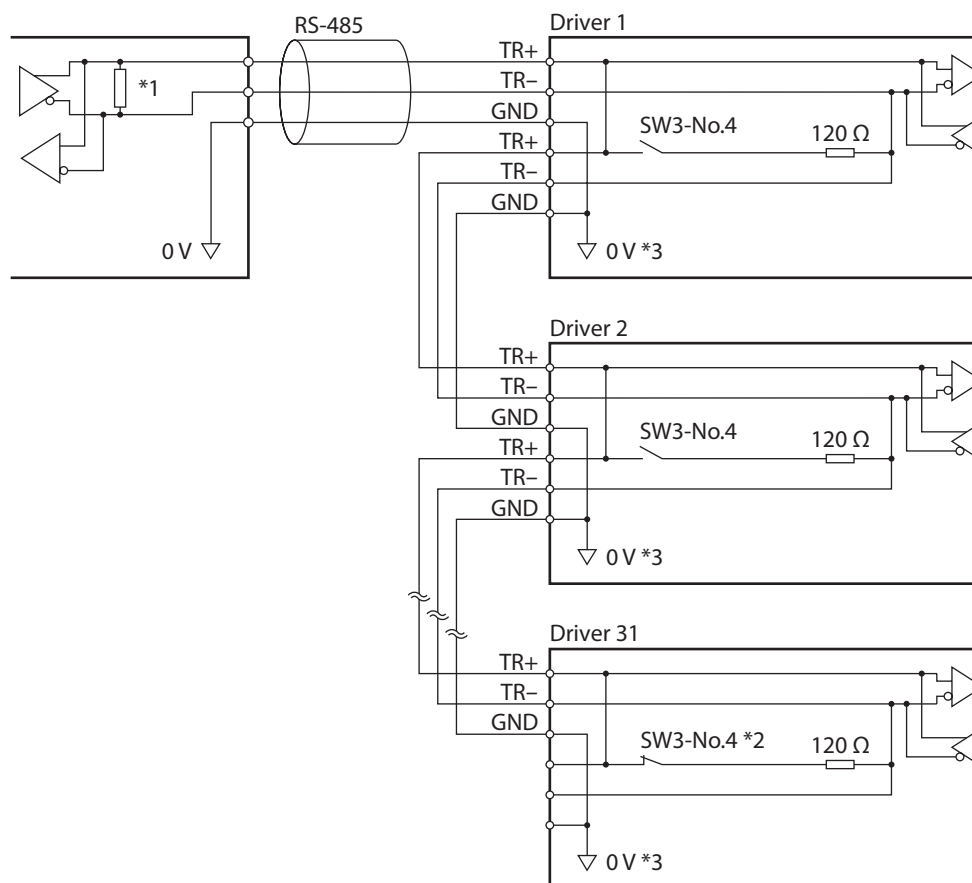
Internal circuit diagram

AC power input



*1 Termination resistor 120 Ω
*2 Turn the termination resistor ON (TERM.-Nos.1 and 2).

● DC power input



*1 Termination resistor 120 Ω

*2 Turn the termination resistor ON (SW3-No.4).

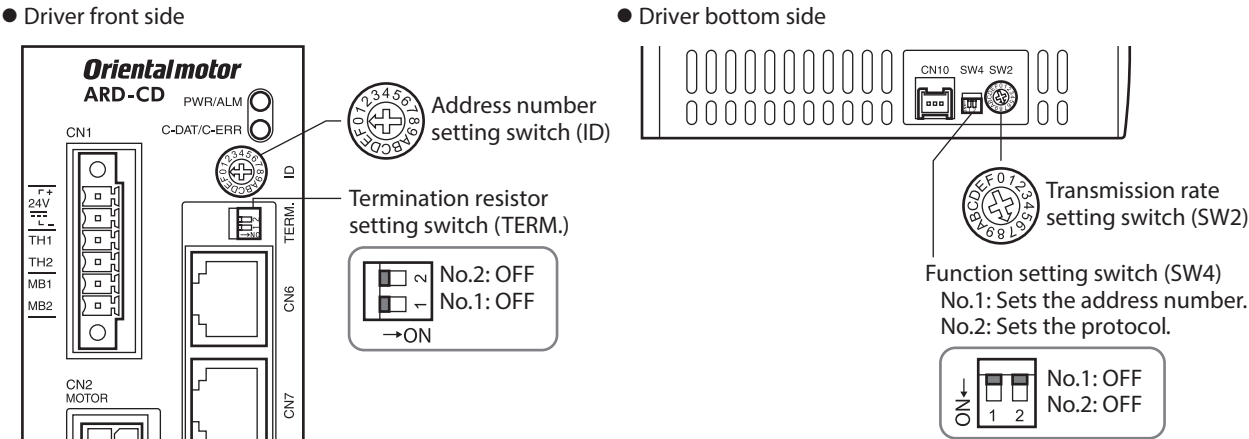
*3 Common with GND of CN1 (Non-isolated)

3 Setting the switches

Switches differ in the AC power input driver and the DC power input driver. Set properly.

3-1 Setting the AC power input

The figures show the status of factory setting.



Note When setting any switch, turn off the main power supply and the 24 VDC power supply of the driver and wait for the CHARGE LED to turn off before doing so. The residual voltage may cause electric shock.

memo The set switches are enabled after the 24 VDC power supply is turned on again.

■ Protocol

Using the SW4-No.2 of the function setting switch to ON. The Modbus protocol is selected.

Factory setting OFF

| SW4-No.2 | Protocol |
|----------|-----------------------------------|
| ON | Modbus RTU mode |
| OFF | Connecting with network converter |

■ Transmission rate

Using the transmission rate setting switch (SW2), set the transmission rate.
The transmission rate to be set should be the same as the transmission rate of the host controller.

Factory setting 7

| SW2 | Transmission rate (bps) | SW2 | Transmission rate (bps) |
|-----|-------------------------|--------|-------------------------|
| 0 | 9,600 | 4 | 115,200 |
| 1 | 19,200 | 5, 6 | Not used |
| 2 | 38,400 | 7 | Network converter |
| 3 | 57,600 | 8 to F | Not used |

memo Do not set SW2 to positions 5, 6, and 8 to F.

■ Address number (slave address)

Using the address number setting switch (ID) and SW4-No.1 of the function setting switch, set the address number (slave address). Make sure each address number (slave address) you set for each driver is unique. Address number (slave address) 0 is reserved for broadcasting, so do not use this address.

Factory setting ID: 0, SW4-No.1: OFF

| ID | SW4-No.1 | Address number (slave address) | ID | SW4-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 |

■ Termination resistor

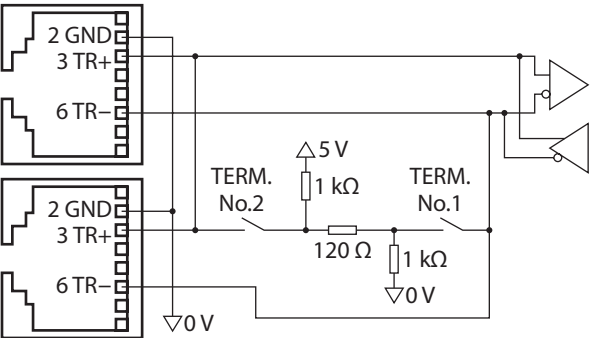
Set a termination resistor (120 Ω) of RS-485 communication for the driver located farthest away (positioned at the end) from the host controller.

Turn the termination resistor setting switch (TERM.-Nos.1 and 2) ON to set the termination resistor for RS-485 communication (120 Ω).

Factory setting Nos.1 and 2: Both OFF (termination resistor disabled)

| TERM.-Nos.1 and 2 | Termination resistor (120 Ω) |
|-------------------|------------------------------|
| Both are OFF | Disabled |
| Both are ON | Enabled |

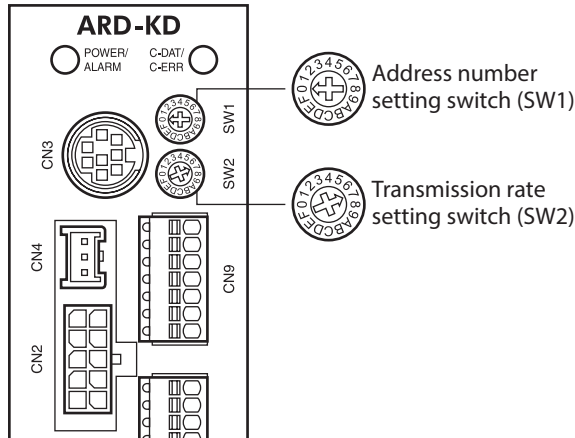
memo If only one of No.1 or No.2 is turned ON, a communication error may occur.



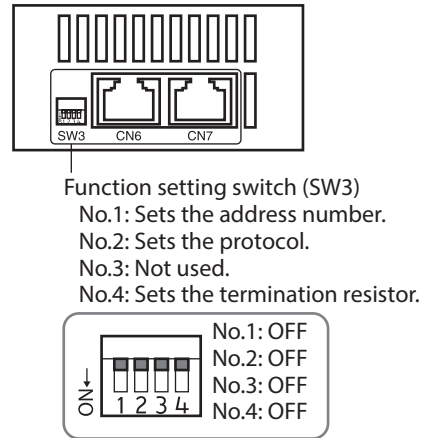
3-2 Setting the DC power input

The figures show the status of factory setting.

● Driver front side



● Driver bottom side



memo Be sure to turn off the driver power supply 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 supply is cycled.

■ Protocol

Using the SW3-No.2 of the function setting switch to ON. The Modbus protocol is selected.

Factory setting OFF

| SW3-No.2 | Protocol |
|----------|-----------------------------------|
| ON | Modbus RTU mode |
| OFF | Connecting with network converter |

■ Transmission rate

Using the transmission rate setting switch (SW2), set the transmission rate.

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

Factory setting 7

| SW2 | Transmission rate (bps) |
|--------|-------------------------|
| 0 | 9,600 |
| 1 | 19,200 |
| 2 | 38,400 |
| 3 | 57,600 |
| 4 | 115,200 |
| 5, 6 | Not used |
| 7 | Network converter |
| 8 to F | Not used |

memo Do not set SW2 to positions 5, 6, and 8 to F.

■ Address number (slave address)

Using the address number setting switch (SW1) and SW3-No.1 of the function setting switch, set the address number (slave address). 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, SW3-No.1: OFF

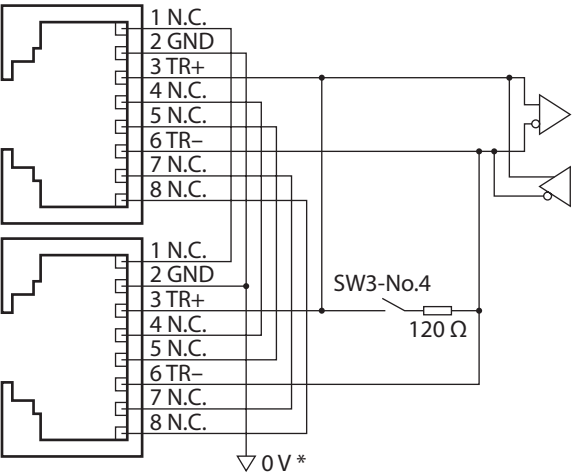
| SW1 | SW3-No.1 | Address number (slave address) | SW1 | SW3-No.1 | Address number (slave address) |
|-----|----------|--------------------------------|-----|----------|--------------------------------|
| 0 | OFF | Not used | 0 | ON | 16 |
| 1 | | 1 | 1 | | 17 |
| 2 | | 2 | 2 | | 18 |
| 3 | | 3 | 3 | | 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 |

■ Termination resistor

Set a termination resistor (120 Ω) of RS-485 communication for the driver located farthest away (positioned at the end) from the host controller. Turn the termination resistor setting switch (SW3-No.4) 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 |



* Common with GND of CN1 (Non-isolated)

4 Setting of RS-485 communication

Set parameters required RS-485 communication first.

When a parameter is changed, the timing to update the new value varies depending on the parameter. Refer to "Communication parameter" on p.122 for the timing to update each parameter.

■ Parameters set with the MEXE02 or OPX-2A

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

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|---------------------------|----------------------------------------------------------------------------------------------------------|---------------|
| Communication | Communication parity | Sets the parity of RS-485 communication. [Setting range] 0: None 1: Even 2: Odd | 1 |
| | Communication stop bit | Sets the stop bit of RS-485 communication. [Setting range] 0: 1 bit 1: 2 bits | 0 |
| | Transmission waiting time | Sets the transmission waiting time of RS-485 communication. [Setting range] 0 to 10,000 (1=0.1 ms) | 100 |

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

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

| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Communication | Communication timeout | Sets the condition in which a communication timeout occurs in RS-485 communication. It is not monitored when the set value is 0. [Setting range] 0: Not monitored 1 to 10,000 ms | 0 |
| | Communication error alarm | Sets the condition in which a RS-485 communication error alarm generates. A communication error alarm generates after a RS-485 communication error has occurred by the number of times set here. [Setting range] 1 to 10 times | 3 |

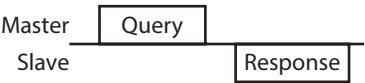
5 Communication mode and communication timing

5-1 Communication mode

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

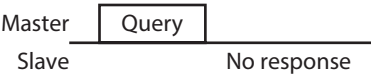
● **Unicast mode**

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



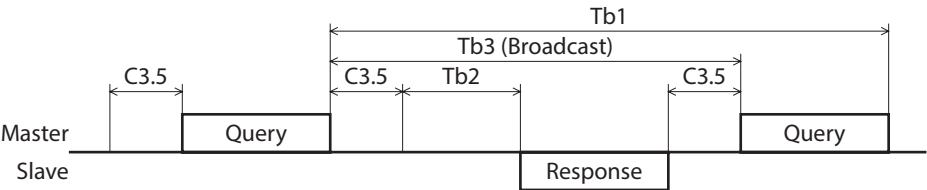
● **Broadcast mode**

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



5-2 Communication timing

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



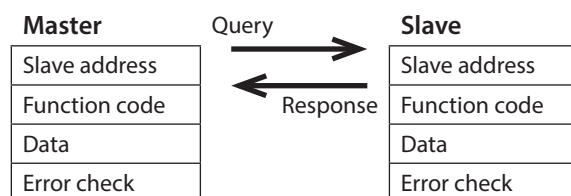
| Character | Name | Description |
|-----------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tb1 | Communication timeout | Intervals between received queries are monitored. If no query could be received after the time set in the "Communication timeout" parameter, a RS-485 communication timeout alarm generates. |
| Tb2 | Transmission waiting time | The time after the slave switches its communication line to the transmission mode upon receiving a query from the master, until it starts sending a response. Sets using the "Transmission waiting time" parameter. The actual transmission waiting time corresponds to the silent interval (C3.5) + transmission waiting time (Tb2). |
| Tb3 | Broadcasting interval | The time until the next query is sent in broadcasting. A time equivalent to or longer than the silent interval (C3.5) plus 5 ms is required. |
| C3.5 | Silent interval | Be sure to provide a waiting time of 3.5 characters or more. If this waiting time is less than 3.5 characters long, the driver cannot respond. Refer to the following table for transmission waiting time. |

Transmission waiting time of the "silent interval (C3.5)"

| Transmission rate (bps) | Silent interval | Frame interval of master (reference) |
|---------------------------------------|-----------------|--------------------------------------|
| 9,600 | 4 ms or more | 5.0 ms or more |
| 19,200 38,400 57,600 115,200 | 2.5 ms or more | 3.0 ms or more |

6 Message

The message format is shown below.



6-1 Query

The query message structure is shown below.

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

■ Slave address

Specify the slave address (unicast mode).

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

■ Function code

The function codes and message lengths supported by the driver are as follows.

| Function code | Function | Message length | | Broadcast |
|---------------|---------------------------------------|----------------|----------|------------|
| | | Query | Response | |
| 03h | Reading from a holding register(s) | 8 | 7 to 37 | Impossible |
| 06h | Writing to a holding register | 8 | 8 | Possible |
| 08h | Diagnosis | 8 | 8 | Impossible |
| 10h | Writing to multiple holding registers | 11 to 41 | 8 | Possible |

■ Data

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

■ Error check

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

● CRC-16 calculation method

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

● Example of CRC-16 calculation

The 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 query message structure.

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

■ Normal response

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

■ No response

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

● Transmission error

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

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

● Other than transmission error

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

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

■ Exception response

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

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

● Function code

The function code in the exception response is a sum of the function code in the query and 80h.

| Function code of query | Exception response |
|------------------------|--------------------|
| 03h | 83h |
| 06h | 86h |
| 08h | 88h |
| 10h | 90h |

● Example of exception response

| Master | | | | Slave | | |
|---------------------|---------------------------------------------|-----|-----------------------------|---------------------|----------------|-----|
| Slave address | | 01h | Query → ← Response | Slave address | | 01h |
| Function code | | 10h | | Function code | | 90h |
| Data | Register address (upper) | 02h | | Data | Exception code | 04h |
| | Register address (lower) | 42h | | Error check (lower) | | 4Dh |
| | Number of registers (upper) | 00h | | Error check (upper) | | C3h |
| | Number of registers (lower) | 02h | | | | |
| | Number of data bytes | 04h | | | | |
| | Value written to register address (upper) | 00h | | | | |
| | Value written to register address (lower) | 00h | | | | |
| | Value written to register address+1 (upper) | 03h | | | | |
| | Value written to register address+1 (lower) | 20h | | | | |
| | Error check (lower) | | 6Eh | | | |
| Error check (upper) | | 0Eh | | | | |

● 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 or initialization is in progress using the MEXE02 · Downloading, initializing or teaching function is in progress using the OPX-2A • 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) The value write is outside the setting range. • Command execute disable (8Dh) |

7 Function code

This chapter explains the function codes supported by the **AR** Series drivers.

Note that the function code cannot be executed if function codes other than those introduced here are sent.

7-1 Reading from a holding register(s) (03h)

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

■ Example of read

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

| Description | Register address | Value read | Corresponding decimal |
|--------------------------------------|------------------|------------|-----------------------|
| Operation data position No.1 (upper) | 0402h | 0000h | 10,000 |
| Operation data position No.1 (lower) | 0403h | 2710h | |
| Operation data position No.2 (upper) | 0404h | FFFFh | -10,000 |
| Operation data position No.2 (lower) | 0405h | D8F0h | |

● Query

| Field name | | Data | Description |
|---------------------|-----------------------------|------|---------------------------------------------------------------------------------------|
| Slave address | | 01h | Slave address1 |
| Function code | | 03h | Reading from holding registers |
| Data | Register address (upper) | 04h | Register address to start reading from |
| | Register address (lower) | 02h | |
| | Number of registers (upper) | 00h | Number of registers to be read from the starting register address (4 registers=0004h) |
| | Number of registers (lower) | 04h | |
| Error check (lower) | | E4h | Calculation result of CRC-16 |
| Error check (upper) | | F9h | |

● Response

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

7-2 Writing to a holding register (06h)

This function code is used to write data to a specified register address.

However, since the result combining the upper and lower may be outside the data range, write the upper and lower at the same time using the "Writing to multiple holding registers (10h)."

■ Example of write

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

| Description | Register address | Value written | Corresponding decimal |
|--------------|------------------|---------------|-----------------------|
| Speed filter | 024Bh | 50h | 80 |

● Query

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

● Response

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

7-3

Diagnosis (08h)

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

■ Example of diagnosis

Send arbitrary data (1234h) to the slave.

● Query

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

● Response

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

7-4 Writing to multiple holding registers (10h)

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

■ Example of write

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

| Description | Register address | Value written | Corresponding decimal |
|------------------------------------------|------------------|---------------|-----------------------|
| Operation data acceleration No.2 (upper) | 0604h | 0000h | 10000 |
| Operation data acceleration No.2 (lower) | 0605h | 2710h | |
| Operation data acceleration No.3 (upper) | 0606h | 0000h | 20000 |
| Operation data acceleration No.3 (lower) | 0607h | 4E20h | |
| Operation data acceleration No.4 (upper) | 0608h | 0007h | 500000 |
| Operation data acceleration No.4 (lower) | 0609h | A120h | |

● Query

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

● Response

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

8 Register address list

All data used by the driver is 32-bit wide. Since the register for the Modbus protocol is 16-bit wide, one data is described by two registers.

Since the address assignment is big endian, the even number addresses become the upper and the odd number addresses become the lower.

8-1 Operation commands

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

| Register address | | Name | Description | READ/ WRITE | Setting range |
|------------------|-------|-------------------------------|---------------------------------------------|----------------|-----------------------------------------------------------------------------------------------|
| Dec | Hex | | | | |
| 48 | 0030h | Group (upper) | Sets the address number for the group send. | R/W | -1 : Individual (No group setting) 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 | Refer to "Driver input command (007Ch/007Dh)" on p.229. |
| 125 | 007Dh | Driver input command (lower) | | | |
| 126 | 007Eh | Driver output command (upper) | Reads the output status of the driver. | R | Refer to "Driver output command (007Eh/007Fh)" on p.229. |
| 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. Refer to p.246 for group details. The initial value is -1. When setting a group, read/write to the upper and lower at the same time.

| 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 a group address. [FFFFh] | | | | | | | |
| | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| | 1 to 31: Sets a group address. [FFFFh] | | | | | | | |

* []: Initial value

■ Driver input command (007Ch/007Dh)

These are the driver input signals that can be accessed via RS-485 communication. Refer to p.94 for each input signal.

| Address (Hex) | Description of address | | | | | | | |
|---------------|------------------------|-------|-------|-------|-------|-------|------|------|
| 007Ch | Bit15 | Bit14 | Bit13 | Bit12 | Bit11 | Bit10 | Bit9 | Bit8 |
| | — | — | — | — | — | — | — | — |
| | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| | — | — | — | — | — | — | — | — |

| Address (Hex) | Description of address * | | | | | | | |
|---------------|--------------------------|-------------------|--------------------|--------------------|----------------------|-------------------|------------------|------------------|
| 007Dh | Bit15 | Bit14 | Bit13 | Bit12 | Bit11 | Bit10 | Bit9 | Bit8 |
| | NET-IN15 [RVS] | NET-IN14 [FWD] | NET-IN13 [–JOG] | NET-IN12 [+JOG] | NET-IN11 [SSTART] | NET-IN10 [MS2] | NET-IN9 [MS1] | NET-IN8 [MS0] |
| | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| | NET-IN7 [not used] | NET-IN6 [FREE] | NET-IN5 [STOP] | NET-IN4 [HOME] | NET-IN3 [START] | NET-IN2 [M2] | NET-IN1 [M1] | NET-IN0 [M0] |

* []: Initial value

■ Driver output command (007Eh/007Fh)

These are the driver output signals that can be received via RS-485 communication. Refer to p.100 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 [END] | NET-OUT13 [MOVE] | NET-OUT12 [TIM] | NET-OUT11 [AREA3] | NET-OUT10 [AREA2] | NET-OUT9 [AREA1] | NET-OUT8 [S-BSY] |
| | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| | NET-OUT7 [ALM] | NET-OUT6 [WNG] | NET-OUT5 [READY] | NET-OUT4 [HOME-P] | NET-OUT3 [START_R] | NET-OUT2 [M2_R] | NET-OUT1 [M1_R] | NET-OUT0 [M0_R] |

* []: Initial value

8-2 Maintenance commands

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

| Register address | | Name | Description | Setting range |
|------------------|-------|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Dec | Hex | | | |
| 384 | 0180h | Reset alarm (upper) | Resets the alarms that are present. Some alarms cannot be reset with the “reset alarm.” | 0, 1 |
| 385 | 0181h | Reset alarm (lower) | | |
| 386 | 0182h | Absolute position error alarm reset (upper) | Resets the absolute position error alarm. | |
| 387 | 0183h | Absolute position error alarm reset (lower) | | |
| 388 | 0184h | Clear alarm records (upper) | Clears alarm records. | |
| 389 | 0185h | Clear alarm records (lower) | | |
| 390 | 0186h | Clear warning records (upper) | Clears warning records. | |
| 391 | 0187h | Clear warning records (lower) | | |
| 392 | 0188h | Clear communication error records (upper) | Clears the communication error records. | |
| 393 | 0189h | Clear communication error records (lower) | | |
| 394 | 018Ah | P-PRESET execute (upper) | Presets the command position. | |
| 395 | 018Bh | P-PRESET execute (lower) | | |
| 396 | 018Ch | Configuration (upper) | Executes the parameter recalculation and the setup. | |
| 397 | 018Dh | Configuration (lower) | | |
| 398 | 018Eh | All data initialization (upper) * | Resets the operation data and parameters saved in the non-volatile memory, to their defaults. | |
| 399 | 018Fh | All data initialization (lower) * | | |
| 400 | 0190h | Batch non-volatile 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 non-volatile memory read (lower) | | |
| 402 | 0192h | Batch non-volatile 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 non-volatile memory write (lower) | | |

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

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

Shows the driver status before and after executing the configuration.

| Item | Configuration is ready to execute | Configuration is executing | Configuration is completed |
|------------------------------------------------------|-----------------------------------|----------------------------|--------------------------------|
| AC power input: PWR LED DC power input: POWER LED | Lit | Lit | Based on the driver condition. |
| AC power input: ALM LED DC power input: ALARM LED | OFF | OFF | |
| Electromagnetic brake | Hold/Release | Hold | |
| Motor excitation | Excitation/Non-excitation | Non-excitation | |
| Output signals | Allowed | Indeterminate | Allowed |
| Input signals | | Not allowed | |
| Sensor inputs | | | |



- The correct monitor value may not return even when the monitor is executed while executing the configuration.
- If the "Automatic return action" parameter is "Enable" while meeting the conditions performing the automatic return operation, the automatic return operation will not perform immediately after 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 | Setting 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) | | |

| Register address | | Name | Description | Setting range |
|------------------|-------|-------------------------------------------|--------------------------------------------------------------------------|---------------|
| Dec | Hex | | | |
| 148 | 0094h | Alarm record 10 (upper) | Monitors the alarm records. | 00h to FFh |
| 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) | | |
| 160 | 00A0h | Warning record 5 (upper) | | |
| 161 | 00A1h | Warning record 5 (lower) | | |
| 162 | 00A2h | Warning record 6 (upper) | | |
| 163 | 00A3h | Warning record 6 (lower) | | |
| 164 | 00A4h | Warning record 7 (upper) | | |
| 165 | 00A5h | Warning record 7 (lower) | | |
| 166 | 00A6h | Warning record 8 (upper) | | |
| 167 | 00A7h | Warning record 8 (lower) | | |
| 168 | 00A8h | Warning record 9 (upper) | | |
| 169 | 00A9h | Warning record 9 (lower) | | |
| 170 | 00AAh | Warning record 10 (upper) | | |
| 171 | 00ABh | Warning record 10 (lower) | | |
| 172 | 00ACh | Communication error code (upper) | Monitors the last received communication error code. | |
| 173 | 00ADh | Communication error code (lower) | | |
| 174 | 00AEh | Communication error code record 1 (upper) | Monitors the communication error records 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) | | |

| Register address | | Name | Description | Setting range |
|------------------|-------|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Dec | Hex | | | |
| 184 | 00B8h | Communication error code record 6 (upper) | Monitors the communication error records that have occurred in the past. | 00h to FFh |
| 185 | 00B9h | Communication error code record 6 (lower) | | |
| 186 | 00BAh | Communication error code record 7 (upper) | | |
| 187 | 00BBh | Communication error code record 7 (lower) | | |
| 188 | 00BCh | Communication error code record 8 (upper) | | |
| 189 | 00BDh | Communication error code record 8 (lower) | | |
| 190 | 00BEh | Communication error code record 9 (upper) | | |
| 191 | 00BFh | Communication error code record 9 (lower) | | |
| 192 | 00C0h | Communication error code record 10 (upper) | | |
| 193 | 00C1h | Communication error code record 10 (lower) | | |
| 194 | 00C2h | Present selected data No. (upper) | Monitors the operation data No. currently selected. | 0 to 63 |
| 195 | 00C3h | Present selected data No. (lower) | | |
| 196 | 00C4h | Present operation data No. (upper) | Monitors the operation data No. corresponding to the data used in the current positioning operation. This address is used in linked-motion operation and sequential positioning operation. While the motor is stopped, the last used operation data number is indicated. "-1" is indicated until the positioning operation is performed after turning the power on. | -1 to 63 |
| 197 | 00C5h | Present operation data No. (lower) | | |
| 198 | 00C6h | Command position (upper) | Monitors the command position. | -2,147,483,648 to 2,147,483,647 step |
| 199 | 00C7h | Command position (lower) | | |
| 200 | 00C8h | Command speed (upper) | Monitors the current command speed. | -4,500 to +4,500 r/min +: Forward -: Reverse 0: Stop |
| 201 | 00C9h | Command speed (lower) | | |
| 204 | 00CCh | Actual position (upper) | Monitors the actual position. Shows the value that updated the data having set with the electronic gear. | -2,147,483,648 to 2,147,483,647 step |
| 205 | 00CDh | Actual position (lower) | | |
| 206 | 00CEh | Actual speed (upper) | Monitors the actual speed. | -4,500 to +4,500 r/min |
| 207 | 00CFh | Actual speed (lower) | | |
| 210 | 00D2h | Remaining dwell time (upper) | Monitors how much of the dwell time used in the linked-motion 2 operation remains. | 0 to 50,000 ms |
| 211 | 00D3h | Remaining dwell time (lower) | | |
| 212 | 00D4h | Direct I/O and electromagnetic brake status (upper) | Monitors the each direct I/O signal and electromagnetic brake status. | Refer to the following table. |
| 213 | 00D5h | Direct I/O and electromagnetic brake status (lower) | | |

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

| Address (Hex) | | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
|---------------|-------|------|------|------|------|------|-------|------|------|
| 00D4h | Upper | — | — | — | — | — | — | — | MB |
| | Lower | — | — | OUT5 | OUT4 | OUT3 | OUT2 | OUT1 | OUT0 |
| 00D5h | Upper | — | — | IN7 | IN6 | IN5 | IN4 | IN3 | IN2 |
| | Lower | IN1 | IN0 | — | — | SLIT | HOMES | —LS | +LS |

8-4 Parameter R/W commands

Write or read parameters. All commands can be read and written (READ/WRITE). For details on parameters, refer to p.112.

■ Operation data

If the data is changed, a recalculation and setup will be performed after the operation is stopped.

| Register address | | Name | Setting range | Initial value |
|------------------|-------|--------------------------------------|-----------------------------------------------------------------------|---------------|
| Dec | Hex | | | |
| 1024 | 0400h | Position No.0 (upper) | –8,388,608 to 8,388,607 step | 0 |
| 1025 | 0401h | Position No.0 (lower) | | |
| to | to | to | | |
| 1150 | 047Eh | Position No.63 (upper) | | |
| 1151 | 047Fh | Position No.63 (lower) | | |
| 1152 | 0480h | Operating speed No.0 (upper) | 0 to 1,000,000 Hz | 1,000 |
| 1153 | 0481h | Operating speed No.0 (lower) | | |
| to | to | to | | |
| 1278 | 04FEh | Operating speed No.63 (upper) | | |
| 1279 | 04FFh | Operating speed No.63 (lower) | | |
| 1280 | 0500h | Operation mode No.0 (upper) | 0: Incremental 1: Absolute | 0 |
| 1281 | 0501h | Operation mode No.0 (lower) | | |
| to | to | to | | |
| 1406 | 057Eh | Operation mode No.63 (upper) | | |
| 1407 | 057Fh | Operation mode No.63 (lower) | | |
| 1408 | 0580h | Operation function No.0 (upper) | 0: Single-motion 1: Linked-motion 2: Linked-motion 2 3: Push | 0 |
| 1409 | 0581h | Operation function No.0 (lower) | | |
| to | to | to | | |
| 1534 | 05FEh | Operation function No.63 (upper) | | |
| 1535 | 05FFh | Operation function No.63 (lower) | | |
| 1536 | 0600h | Acceleration No.0 (upper) | 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *1 *2 | 1,000 |
| 1537 | 0601h | Acceleration No.0 (lower) | | |
| to | to | to | | |
| 1662 | 067Eh | Acceleration No.63 (upper) | | |
| 1663 | 067Fh | Acceleration No.63 (lower) | | |
| 1664 | 0680h | Deceleration No.0 (upper) | 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *1 *2 | 1,000 |
| 1665 | 0681h | Deceleration No.0 (lower) | | |
| to | to | to | | |
| 1790 | 06FEh | Deceleration No.63 (upper) | | |
| 1791 | 06FFh | Deceleration No.63 (lower) | | |
| 1792 | 0700h | Push current No.0 (upper) | 0 to 1,000 (1=0.1 %) *3 | 200 |
| 1793 | 0701h | Push current No.0 (lower) | | |
| to | to | to | | |
| 1918 | 077Eh | Push current No.63 (upper) | | |
| 1919 | 077Fh | Push current No.63 (lower) | | |
| 1920 | 0780h | Sequential positioning No.0 (upper) | 0: Disable 1: Enable | 0 |
| 1921 | 0781h | Sequential positioning No.0 (lower) | | |
| to | to | to | | |
| 2046 | 07FEh | Sequential positioning No.63 (upper) | | |
| 2047 | 07FFh | Sequential positioning No.63 (lower) | | |

| Register address | | Name | Setting range | Initial value |
|------------------|-------|--------------------------|-------------------------|---------------|
| Dec | Hex | | | |
| 2048 | 0800h | Dwell time No.0 (upper) | 0 to 50,000 (1=0.001 s) | 0 |
| 2049 | 0801h | Dwell time No.0 (lower) | | |
| to | to | to | | |
| 2174 | 087Eh | Dwell time No.63 (upper) | | |
| 2175 | 087Fh | Dwell time No.63 (lower) | | |

*1 This item is effective when the "Acceleration/deceleration type" parameter is set to "Separate." If this parameter is set to "Common," the values of the "Common acceleration" and "Common deceleration" parameters will be used (initial value: separate).

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

*3 For the driver which is before the specification change, the setting range is 0 to 500 (1=0.1 %). Refer to p.7 for details.

■ User parameters

When a parameter is changed, the timing to update the new value varies depending on the parameter. Refer to the following three types.

| Update timing | | Description |
|---------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| A | Immediately | Executes the recalculation and setup immediately when writing the parameter. |
| B | After stopping the operation | Executes the recalculation and setup after stopping the operation. |
| C | After executing the configuration or after cycling the power | Executes the recalculation and setup after executing the configuration or turning the DC power ON again. |

In this chapter, each update timing is represented in A to C.

| Register address | | Name | Setting range | Initial value | Update (p.235) |
|------------------|-------|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|---------------|-------------------|
| Dec | Hex | | | | |
| 512 | 0200h | STOP input action (upper) | 0: Immediate stop 1: Deceleration stop 2: Immediate stop & Current OFF 3: Deceleration stop & Current OFF | 1 | A |
| 513 | 0201h | STOP input action (lower) | | | |
| 514 | 0202h | Hardware overtravel (upper) | 0: Disable 1: Enable | 1 | |
| 515 | 0203h | Hardware overtravel (lower) | | | |
| 516 | 0204h | Overtravel action (upper) | 0: Immediate stop 1: Deceleration stop | 0 | |
| 517 | 0205h | Overtravel action (lower) | | | |
| 518 | 0206h | END signal range (upper) | 0 to 180 (1=0.1°) | 18 | |
| 519 | 0207h | END signal range (lower) | | | |
| 520 | 0208h | Positioning complete output offset (upper) | −18 to 18 (1=0.1°) | 0 | |
| 521 | 0209h | Positioning complete output offset (lower) | | | |
| 522 | 020Ah | AREA1 positive direction position (upper) | −8,388,608 to 8,388,607 step | 0 | |
| 523 | 020Bh | AREA1 positive direction position (lower) | | | |
| 524 | 020Ch | AREA1 negative direction position (upper) | | | |
| 525 | 020Dh | AREA1 negative direction position (lower) | | | |

| Register address | | Name | Setting range | Initial value | Update (p.235) | |
|------------------|-------|-------------------------------------------|------------------------------------------------|---------------|-------------------|---|
| Dec | Hex | | | | | |
| 526 | 020Eh | AREA2 positive direction position (upper) | −8,388,608 to 8,388,607 step | 0 | A | |
| 527 | 020Fh | AREA2 positive direction position (lower) | | | | |
| 528 | 0210h | AREA2 negative direction position (upper) | | | | |
| 529 | 0211h | AREA2 negative direction position (lower) | | | | |
| 530 | 0212h | AREA3 positive direction position (upper) | | | | |
| 531 | 0213h | AREA3 positive direction position (lower) | | | | |
| 532 | 0214h | AREA3 negative direction position (upper) | | | | |
| 533 | 0215h | AREA3 negative direction position (lower) | | | | |
| 534 | 0216h | Minimum ON time for MOVE output (upper) | 0 to 255 ms | 0 | | |
| 535 | 0217h | Minimum ON time for MOVE output (lower) | | | | |
| 536 | 0218h | LS contact configration (upper) | 0: Make (N.O.) 1: Brake (N.C.) | 0 | C | |
| 537 | 0219h | LS contact configration (lower) | | | | |
| 538 | 021Ah | HOMES logic level (upper) | | | | |
| 539 | 021Bh | HOMES logic level (lower) | | | | |
| 540 | 021Ch | SLIT logic level (upper) | | | | |
| 541 | 021Dh | SLIT logic level (lower) | | | | |
| 576 | 0240h | RUN current (upper) | 0 to 1,000 (1=0.1 %) | 1,000 | A | |
| 577 | 0241h | RUN current (lower) | | | | |
| 578 | 0242h | STOP current (upper) | 0 to 500 (1=0.1 %) | 500 | | |
| 579 | 0243h | STOP current (lower) | | | | |
| 580 | 0244h | Position loop gain (upper) | 1 to 50 | 10 | A | |
| 581 | 0245h | Position loop gain (lower) | | | | |
| 582 | 0246h | Speed loop gain (upper) | 10 to 200 | 180 | | |
| 583 | 0247h | Speed loop gain (lower) | | | | |
| 584 | 0248h | Speed loop integral time constant (upper) | 100 to 2,000 (1=0.1 ms) | 1,000 | | |
| 585 | 0249h | Speed loop integral time constant (lower) | | | | |
| 586 | 024Ah | Speed filter (upper) | 0 to 200 ms | 1 | | B |
| 587 | 024Bh | Speed filter (lower) | | | | |
| 588 | 024Ch | Moving average time (upper) | 1 to 200 ms | 1 | | |
| 589 | 024Dh | Moving average time (lower) | | | | |
| 640 | 0280h | Common acceleration (upper) | 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) * | 1,000 | | |
| 641 | 0281h | Common acceleration (lower) | | | | |
| 642 | 0282h | Common deceleration (upper) | 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) * | 1,000 | | |
| 643 | 0283h | Common deceleration (lower) | | | | |
| 644 | 0284h | Starting speed (upper) | 0 to 1,000,000 Hz | 500 | | |
| 645 | 0285h | Starting speed (lower) | | | | |
| 646 | 0286h | JOG operating speed (upper) | 1 to 1,000,000 Hz | 1,000 | | |
| 647 | 0287h | JOG operating speed (lower) | | | | |

| Register address | | Name | Setting range | Initial value | Update (p.235) |
|------------------|-------|------------------------------------------------------------|------------------------------------------------------|---------------|-------------------|
| Dec | Hex | | | | |
| 648 | 0288h | Acceleration/deceleration rate of JOG (upper) | 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) * | 1,000 | B |
| 649 | 0289h | Acceleration/deceleration rate of JOG (lower) | | | |
| 650 | 028Ah | JOG starting speed (upper) | 0 to 1,000,000 Hz | 500 | |
| 651 | 028Bh | JOG starting speed (lower) | | | |
| 652 | 028Ch | Acceleration/deceleration type (upper) | 0: Common 1: Separate | 1 | |
| 653 | 028Dh | Acceleration/deceleration type (lower) | | | |
| 654 | 028Eh | Acceleration/deceleration unit (upper) | 0: ms/kHz 1: s | 0 | C |
| 655 | 028Fh | Acceleration/deceleration unit (lower) | | | |
| 704 | 02C0h | Home-seeking mode (upper) | 0: 2-sensor mode 1: 3-sensor mode 2: Push mode | 1 | B |
| 705 | 02C1h | Home-seeking mode (lower) | | | |
| 706 | 02C2h | Operating speed of home-seeking (upper) | 1 to 1,000,000 Hz | 1,000 | |
| 707 | 02C3h | Operating speed of home-seeking (lower) | | | |
| 708 | 02C4h | Acceleration/deceleration of home-seeking (upper) | 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s)* | 1,000 | |
| 709 | 02C5h | Acceleration/deceleration of home-seeking (lower) | | | |
| 710 | 02C6h | Starting speed of home-seeking (upper) | 1 to 1,000,000 Hz | 500 | |
| 711 | 02C7h | Starting speed of home-seeking (lower) | | | |
| 712 | 02C8h | Position offset of home-seeking (upper) | −8,388,608 to 8,388,607 step | 0 | |
| 713 | 02C9h | Position offset of home-seeking (lower) | | | |
| 714 | 02CAh | Starting direction of home-seeking (upper) | 0: Negative direction 1: Positive direction | 1 | |
| 715 | 02CBh | Starting direction of home-seeking (lower) | | | |
| 716 | 02CCh | SLIT detection with home-seeking (upper) | 0: Disable 1: Enable | 0 | |
| 717 | 02CDh | SLIT detection with home-seeking (lower) | | | |
| 718 | 02CEh | TIM signal detection with home-seeking (upper) | 0: Disable 1: Enable | 0 | |
| 719 | 02CFh | TIM signal detection with home-seeking (lower) | | | |
| 720 | 02D0h | Operating current of home-seeking with push-motion (upper) | 0 to 1,000 (1=0.1 %) | 1,000 | |
| 721 | 02D1h | Operating current of home-seeking with push-motion (lower) | | | |
| 768 | 0300h | Overload alarm (upper) | 1 to 300 (1=0.1 s) | 50 | A |
| 769 | 0301h | Overload alarm (lower) | | | |

| Register address | | Name | Setting range | Initial value | Update (p.235) |
|------------------|-------|------------------------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------|-------------------|
| Dec | Hex | | | | |
| 770 | 0302h | Excessive position deviation alarm at current ON (upper) | 1 to 30,000 (1=0.01 rev) | 300 | A |
| 771 | 0303h | Excessive position deviation alarm at current ON (lower) | | | |
| 776 | 0308h | Return-to-home incomplete alarm (upper) | 0: Disable 1: Enable | 0 | C |
| 777 | 0309h | Return-to-home incomplete alarm (lower) | | | |
| 832 | 0340h | Overheat warning (upper) | 40 to 85 °C | 85 | A |
| 833 | 0341h | Overheat warning (lower) | | | |
| 834 | 0342h | Overload warning (upper) | 1 to 300 (1=0.1 s) | 50 | |
| 835 | 0343h | Overload warning (lower) | | | |
| 836 | 0344h | Overspeed warning (upper) | 1 to 5,000 r/min | 4,500 | |
| 837 | 0345h | Overspeed warning (lower) | | | |
| 838 | 0346h | Overvoltage warning (upper) | ● AC power input: 120 to 450 V ● DC power input: 150 to 630 (1=0.1 V) | AC power input: 435 DC power input: 630 | |
| 839 | 0347h | Overvoltage warning (lower) | | | |
| 840 | 0348h | Undervoltage warning (upper) | ● AC power input: 120 to 280 V ● DC power input: 150 to 630 (1=0.1 V) | AC power input: 120 DC power input: 180 | |
| 841 | 0349h | Undervoltage warning (lower) | | | |
| 842 | 034Ah | Excessive position deviation warning at current ON (upper) | 1 to 30,000 (1=0.01 rev) | 300 | |
| 843 | 034Bh | Excessive position deviation warning at current ON (lower) | | | |
| 896 | 0380h | Electronic gear A (upper) | 1 to 65,535 | 1 | C |
| 897 | 0381h | Electronic gear A (lower) | | | |
| 898 | 0382h | Electronic gear B (upper) | 1 to 65,535 | 1 | |
| 899 | 0383h | Electronic gear B (lower) | | | |
| 900 | 0384h | Motor rotation direction (upper) | 0: Positive direction=CCW 1: Positive direction=CW | 1 | |
| 901 | 0385h | Motor rotation direction (lower) | | | |
| 902 | 0386h | Software overtravel (upper) | 0: Disable 1: Enable | 1 | A |
| 903 | 0387h | Software overtravel (lower) | | | |
| 904 | 0388h | Positive software limit (upper) | −8,388,608 to 8,388,607 step | 8,388,607 | |
| 905 | 0389h | Positive software limit (lower) | | | |
| 906 | 038Ah | Negative software limit (upper) | −8,388,608 to 8,388,607 step | −8,388,608 | |
| 907 | 038Bh | Negative software limit (lower) | | | |
| 908 | 038Ch | Preset position (upper) | −8,388,608 to 8,388,607 step | 0 | |
| 909 | 038Dh | Preset position (lower) | | | |
| 910 | 038Eh | Wrap setting (upper) | 0: Disable 1: Enable | 0 | C |
| 911 | 038Fh | Wrap setting (lower) | | | |
| 912 | 0390h | Wrap setting range (upper) | 1 to 8,388,607 step | 1,000 | |
| 913 | 0391h | Wrap setting range (lower) | | | |
| 960 | 03C0h | Data setter speed display (upper) | 0: Signed 1: Absolute value | 0 | A |
| 961 | 03C1h | Data setter speed display (lower) | | | |
| 962 | 03C2h | Data setter edit (upper) | 0: Disable 1: Enable | 1 | |
| 963 | 03C3h | Data setter edit (lower) | | | |
| 964 | 03C4h | Absolute back-up system (upper) | 0: Disable 1: Enable | 0 | C |
| 965 | 03C5h | Absolute back-up system (lower) | | | |

| Register address | | Name | Setting range | Initial value | Update (p.235) |
|------------------|-------|------------------------------------------------------------|--------------------------------------------------------|---------------|-------------------|
| Dec | Hex | | | | |
| 4096 | 1000h | MS0 operation No. selection (upper) | 0 to 63 | 0 | B |
| 4097 | 1001h | MS0 operation No. selection (lower) | | | |
| 4098 | 1002h | MS1 operation No. selection (upper) | | 1 | |
| 4099 | 1003h | MS1 operation No. selection (lower) | | | |
| 4100 | 1004h | MS2 operation No. selection (upper) | | 2 | |
| 4101 | 1005h | MS2 operation No. selection (lower) | | | |
| 4102 | 1006h | MS3 operation No. selection (upper) | | 3 | |
| 4103 | 1007h | MS3 operation No. selection (lower) | | | |
| 4104 | 1008h | MS4 operation No. selection (upper) | | 4 | |
| 4105 | 1009h | MS4 operation No. selection (lower) | | | |
| 4106 | 100Ah | MS5 operation No. selection (upper) | | 5 | |
| 4107 | 100Bh | MS5 operation No. selection (lower) | | | |
| 4108 | 100Ch | HOME-P output function selection (upper) | 0: Home output 1: Return-to-home complete output | 0 | A |
| 4109 | 100Dh | HOME-P output function selection (lower) | | | |
| 4128 | 1020h | Filter selection (upper) | 0: Speed filter 1: Moving average filter | 0 | C |
| 4129 | 1021h | Filter selection (lower) | | | |
| 4130 | 1022h | Speed difference gain 1 (upper) | 0 to 500 | 45 | A |
| 4131 | 1023h | Speed difference gain 1 (lower) | | | |
| 4132 | 1024h | Speed difference gain 2 (upper) | 0 to 500 | 45 | |
| 4133 | 1025h | Speed difference gain 2 (lower) | | | |
| 4134 | 1026h | Control mode (upper) | 0: Normal mode 1: Current control mode | 0 | C |
| 4135 | 1027h | Control mode (lower) | | | |
| 4136 | 1028h | Smooth drive (upper) | 0: Disable 1: Enable | 1 | |
| 4137 | 1029h | Smooth drive (lower) | | | |
| 4160 | 1040h | Automatic return operation (upper) | 0: Disable 1: Enable | 0 | |
| 4161 | 1041h | Automatic return operation (lower) | | | |
| 4162 | 1042h | Operation speed of automatic return (upper) | 1 to 1,000,000 Hz | 1,000 | B |
| 4163 | 1043h | Operation speed of automatic return (lower) | | | |
| 4164 | 1044h | Acceleration (deceleration) of automatic return (upper) | 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) * | 1,000 | |
| 4165 | 1045h | Acceleration (deceleration) of automatic return (lower) | | | |

| Register address | | Name | Setting range | Initial value | Update (p.235) |
|------------------|-------|-----------------------------------------------------------|--------------------------------------------------------------------|---------------|-------------------|
| Dec | Hex | | | | |
| 4166 | 1046h | Starting speed of automatic return (upper) | 0 to 1,000,000 Hz | 500 | B |
| 4167 | 1047h | Starting speed of automatic return (lower) | | | |
| 4168 | 1048h | JOG travel amount (upper) | 1 to 8,388,607 step | 1 | |
| 4169 | 1049h | JOG travel amount (lower) | | | |
| 4224 | 1080h | Excessive position deviation alarm at current OFF (upper) | 1 to 30,000 (1=0.01 rev) | 10,000 | A |
| 4225 | 1081h | Excessive position deviation alarm at current OFF (lower) | | | |
| 4352 | 1100h | IN0 input function selection (upper) | Refer to “Setting range for IN input function selection” on p.244. | 3: HOME | C |
| 4353 | 1101h | IN0 input function selection (lower) | | | |
| 4354 | 1102h | IN1 input function selection (upper) | | 4: START | |
| 4355 | 1103h | IN1 input function selection (lower) | | | |
| 4356 | 1104h | IN2 input function selection (upper) | | 48: M0 | |
| 4357 | 1105h | IN2 input function selection (lower) | | | |
| 4358 | 1106h | IN3 input function selection (upper) | | 49: M1 | |
| 4359 | 1107h | IN3 input function selection (lower) | | | |
| 4360 | 1108h | IN4 input function selection (upper) | | 50: M2 | |
| 4361 | 1109h | IN4 input function selection (lower) | | | |
| 4362 | 110Ah | IN5 input function selection (upper) | | 16: FREE | |
| 4363 | 110Bh | IN5 input function selection (lower) | | | |
| 4364 | 110Ch | IN6 input function selection (upper) | | 18: STOP | |
| 4365 | 110Dh | IN6 input function selection (lower) | | | |
| 4366 | 110Eh | IN7 input function selection (upper) | | 24: ALM-RST | |
| 4367 | 110Fh | IN7 input function selection (lower) | | | |
| 4384 | 1120h | IN0 input logic level setting (upper) | 0: Make (N.O.) 1: Brake (N.C.) | 0 | |
| 4385 | 1121h | IN0 input logic level setting (lower) | | | |
| 4386 | 1122h | IN1 input logic level setting (upper) | | | |
| 4387 | 1123h | IN1 input logic level setting (lower) | | | |
| 4388 | 1124h | IN2 input logic level setting (upper) | | | |
| 4389 | 1125h | IN2 input logic level setting (lower) | | | |

| Register address | | Name | Setting range | Initial value | Update (p.235) |
|------------------|-------|---------------------------------------------|------------------------------------------------------------------------------|---------------|-------------------|
| Dec | Hex | | | | |
| 4390 | 1126h | IN3 input logic level setting (upper) | 0: Make (N.O.) 1: Brake (N.C.) | 0 | C |
| 4391 | 1127h | IN3 input logic level setting (lower) | | | |
| 4392 | 1128h | IN4 input logic level setting (upper) | | | |
| 4393 | 1129h | IN4 input logic level setting (lower) | | | |
| 4394 | 112Ah | IN5 input logic level setting (upper) | | | |
| 4395 | 112Bh | IN5 input logic level setting (lower) | | | |
| 4396 | 112Ch | IN6 input logic level setting (upper) | | | |
| 4397 | 112Dh | IN6 input logic level setting (lower) | | | |
| 4398 | 112Eh | IN7 input logic level setting (upper) | | | |
| 4399 | 112Fh | IN7 input logic level setting (lower) | | | |
| 4416 | 1140h | OUT0 output function selection (upper) | Refer to "Setting range for OUT output function selection" on p.244. | 70: HOME-P | |
| 4417 | 1141h | OUT0 output function selection (lower) | | 69: END | |
| 4418 | 1142h | OUT1 output function selection (upper) | | 73: AREA1 | |
| 4419 | 1143h | OUT1 output function selection (lower) | | 67: READY | |
| 4420 | 1144h | OUT2 output function selection (upper) | | 66: WNG | |
| 4421 | 1145h | OUT2 output function selection (lower) | | 65: ALM | |
| 4422 | 1146h | OUT3 output function selection (upper) | | | |
| 4423 | 1147h | OUT3 output function selection (lower) | | | |
| 4424 | 1148h | OUT4 output function selection (upper) | | | |
| 4425 | 1149h | OUT4 output function selection (lower) | | | |
| 4426 | 114Ah | OUT5 output function selection (upper) | Refer to "Setting range for NET-IN input function selection" on p.245. | 48: M0 | |
| 4427 | 114Bh | OUT5 output function selection (lower) | | 49: M1 | |
| 4448 | 1160h | NET-IN0 input function selection (upper) | | | |
| 4449 | 1161h | NET-IN0 input function selection (lower) | | | |
| 4450 | 1162h | NET-IN1 input function selection (upper) | | | |
| 4451 | 1163h | NET-IN1 input function selection (lower) | | | |

| Register address | | Name | Setting range | Initial value | Update (p.235) |
|------------------|-------|-------------------------------------------|------------------------------------------------------------------------|----------------|-------------------|
| Dec | Hex | | | | |
| 4452 | 1164h | NET-IN2 input function selection (upper) | Refer to "Setting range for NET-IN input function selection" on p.245. | 50: M2 | C |
| 4453 | 1165h | NET-IN2 input function selection (lower) | | | |
| 4454 | 1166h | NET-IN3 input function selection (upper) | | 4: START | |
| 4455 | 1167h | NET-IN3 input function selection (lower) | | | |
| 4456 | 1168h | NET-IN4 input function selection (upper) | | 3: HOME | |
| 4457 | 1169h | NET-IN4 input function selection (lower) | | | |
| 4458 | 116Ah | NET-IN5 input function selection (upper) | | 18: STOP | |
| 4459 | 116Bh | NET-IN5 input function selection (lower) | | | |
| 4460 | 116Ch | NET-IN6 input function selection (upper) | | 16: FREE | |
| 4461 | 116Dh | NET-IN6 input function selection (lower) | | | |
| 4462 | 116Eh | NET-IN7 input function selection (upper) | | 0: No function | |
| 4463 | 116Fh | NET-IN7 input function selection (lower) | | | |
| 4464 | 1170h | NET-IN8 input function selection (upper) | | 8: MS0 | |
| 4465 | 1171h | NET-IN8 input function selection (lower) | | | |
| 4466 | 1172h | NET-IN9 input function selection (upper) | | 9: MS1 | |
| 4467 | 1173h | NET-IN9 input function selection (lower) | | | |
| 4468 | 1174h | NET-IN10 input function selection (upper) | | 10: MS2 | |
| 4469 | 1175h | NET-IN10 input function selection (lower) | | | |
| 4470 | 1176h | NET-IN11 input function selection (upper) | | 5: SSTART | |
| 4471 | 1177h | NET-IN11 input function selection (lower) | | | |
| 4472 | 1178h | NET-IN12 input function selection (upper) | | 6: +JOG | |
| 4473 | 1179h | NET-IN12 input function selection (lower) | | | |
| 4474 | 117Ah | NET-IN13 input function selection (upper) | | 7: -JOG | |
| 4475 | 117Bh | NET-IN13 input function selection (lower) | | | |
| 4476 | 117Ch | NET-IN14 input function selection (upper) | | 1: FWD | |
| 4477 | 117Dh | NET-IN14 input function selection (lower) | | | |

| Register address | | Name | Setting range | Initial value | Update (p.235) |
|------------------|-------|---------------------------------------------|--------------------------------------------------------------------------|---------------|-------------------|
| Dec | Hex | | | | |
| 4478 | 117Eh | NET-IN15 input function selection (upper) | Refer to "Setting range for NET-IN input function selection" on p.245. | 2: RVS | |
| 4479 | 117Fh | NET-IN15 input function selection (lower) | | | |
| 4480 | 1180h | NET-OUT0 output function selection (upper) | Refer to "Setting range for NET-OUT output function selection" on p.245. | 48: M0_R | C |
| 4481 | 1181h | NET-OUT0 output function selection (lower) | | | |
| 4482 | 1182h | NET-OUT1 output function selection (upper) | | 49: M1_R | |
| 4483 | 1183h | NET-OUT1 output function selection (lower) | | | |
| 4484 | 1184h | NET-OUT2 output function selection (upper) | | 50: M2_R | |
| 4485 | 1185h | NET-OUT2 output function selection (lower) | | | |
| 4486 | 1186h | NET-OUT3 output function selection (upper) | | 4: START_R | |
| 4487 | 1187h | NET-OUT3 output function selection (lower) | | | |
| 4488 | 1188h | NET-OUT4 output function selection (upper) | | 70: HOME-P | |
| 4489 | 1189h | NET-OUT4 output function selection (lower) | | | |
| 4490 | 118Ah | NET-OUT5 output function selection (upper) | | 67: READY | |
| 4491 | 118Bh | NET-OUT5 output function selection (lower) | | | |
| 4492 | 118Ch | NET-OUT6 output function selection (upper) | | 66: WNG | |
| 4493 | 118Dh | NET-OUT6 output function selection (lower) | | | |
| 4494 | 118Eh | NET-OUT7 output function selection (upper) | | 65: ALM | |
| 4495 | 118Fh | NET-OUT7 output function selection (lower) | | | |
| 4496 | 1190h | NET-OUT8 output function selection (upper) | | 80: S-BSY | |
| 4497 | 1191h | NET-OUT8 output function selection (lower) | | | |
| 4498 | 1192h | NET-OUT9 output function selection (upper) | | 73: AREA1 | |
| 4499 | 1193h | NET-OUT9 output function selection (lower) | | | |
| 4500 | 1194h | NET-OUT10 output function selection (upper) | | 74: AREA2 | |
| 4501 | 1195h | NET-OUT10 output function selection (lower) | | | |
| 4502 | 1196h | NET-OUT11 output function selection (upper) | | 75: AREA3 | |
| 4503 | 1197h | NET-OUT11 output function selection (lower) | | | |

| Register address | | Name | Setting range | Initial value | Update (p.235) |
|------------------|-------|---------------------------------------------|--------------------------------------------------------------------------|---------------|-------------------|
| Dec | Hex | | | | |
| 4504 | 1198h | NET-OUT12 output function selection (upper) | Refer to “Setting range for NET-OUT output function selection” on p.245. | 72: TIM | C |
| 4505 | 1199h | NET-OUT12 output function selection (lower) | | | |
| 4506 | 119Ah | NET-OUT13 output function selection (upper) | | 68: MOVE | |
| 4507 | 119Bh | NET-OUT13 output function selection (lower) | | | |
| 4508 | 119Ch | NET-OUT14 output function selection (upper) | | 69: END | |
| 4509 | 119Dh | NET-OUT14 output function selection (lower) | | | |
| 4510 | 119Eh | NET-OUT15 output function selection (upper) | | 71: TLC | |
| 4511 | 119Fh | NET-OUT15 output function selection (lower) | | | |
| 4608 | 1200h | Communication timeout (upper) | 0: Not monitored 1 to 10,000 ms | 0 | A |
| 4609 | 1201h | Communication timeout (lower) | | | |
| 4610 | 1202h | Communication error alarm (upper) | 1 to 10 times | 3 | |
| 4611 | 1203h | Communication error alarm (lower) | | | |

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

● Setting range for IN input function selection

| | | | | | |
|----------------|----------|--------------|---------|---------|--------|
| 0: No function | 8: MS0 | 18: STOP | 35: R3 | 43: R11 | 51: M3 |
| 1: FWD | 9: MS1 | 24: ALM-RST | 36: R4 | 44: R12 | 52: M4 |
| 2: RVS | 10: MS2 | 25: P-PRESET | 37: R5 | 45: R13 | 53: M5 |
| 3: HOME | 11: MS3 | 26: P-CLR | 38: R6 | 46: R14 | |
| 4: START | 12: MS4 | 27: HMI | 39: R7 | 47: R15 | |
| 5: SSTART | 13: MS5 | 32: R0 | 40: R8 | 48: M0 | |
| 6: +JOG | 16: FREE | 33: R1 | 41: R9 | 49: M1 | |
| 7: -JOG | 17: C-ON | 34: R2 | 42: R10 | 50: M2 | |

● Setting range for OUT output function selection

| | | | | | |
|----------------|------------|---------|-----------|-------------|-----------|
| 0: No function | 10: MS2_R | 35: R3 | 45: R13 | 61: -LS_R | 72: TIM |
| 1: FWD_R | 11: MS3_R | 36: R4 | 46: R14 | 62: HOMES_R | 73: AREA1 |
| 2: RVS_R | 12: MS4_R | 37: R5 | 47: R15 | 63: SLIT_R | 74: AREA2 |
| 3: HOME_R | 13: MS5_R | 38: R6 | 48: M0_R | 65: ALM | 75: AREA3 |
| 4: START_R | 16: FREE_R | 39: R7 | 49: M1_R | 66: WNG | 80: S-BSY |
| 5: SSTART_R | 17: C-ON_R | 40: R8 | 50: M2_R | 67: READY | 82: MPS * |
| 6: +JOG_R | 18: STOP_R | 41: R9 | 51: M3_R | 68: MOVE | |
| 7: -JOG_R | 32: R0 | 42: R10 | 52: M4_R | 69: END | |
| 8: MS0_R | 33: R1 | 43: R11 | 53: M5_R | 70: HOME-P | |
| 9: MS1_R | 34: R2 | 44: R12 | 60: +LS_R | 71: TLC | |

* AC power input only.

● **Setting range for NET-IN input function selection**

| | | | | | |
|----------------|----------|----------------|---------|---------|--------|
| 0: No function | 8: MS0 | 18: STOP | 35: R3 | 43: R11 | 51: M3 |
| 1: FWD | 9: MS1 | 24: ALM-RST * | 36: R4 | 44: R12 | 52: M4 |
| 2: RVS | 10: MS2 | 25: P-PRESET * | 37: R5 | 45: R13 | 53: M5 |
| 3: HOME | 11: MS3 | 26: P-CLR * | 38: R6 | 46: R14 | |
| 4: START | 12: MS4 | 27: HMI | 39: R7 | 47: R15 | |
| 5: SSTART | 13: MS5 | 32: R0 | 40: R8 | 48: M0 | |
| 6: +JOG | 16: FREE | 33: R1 | 41: R9 | 49: M1 | |
| 7: -JOG | 17: C-ON | 34: R2 | 42: R10 | 50: M2 | |

* These three signals cannot be set in the driver which is before the specification change. Refer to p.7 for details.

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

| | | | | | |
|----------------|------------|---------|-----------|-------------|-----------|
| 0: No function | 10: MS2_R | 35: R3 | 45: R13 | 61: -LS_R | 72: TIM |
| 1: FWD_R | 11: MS3_R | 36: R4 | 46: R14 | 62: HOMES_R | 73: AREA1 |
| 2: RVS_R | 12: MS4_R | 37: R5 | 47: R15 | 63: SLIT_R | 74: AREA2 |
| 3: HOME_R | 13: MS5_R | 38: R6 | 48: M0_R | 65: ALM | 75: AREA3 |
| 4: START_R | 16: FREE_R | 39: R7 | 49: M1_R | 66: WNG | 80: S-BSY |
| 5: SSTART_R | 17: C-ON_R | 40: R8 | 50: M2_R | 67: READY | 82: MPS * |
| 6: +JOG_R | 18: STOP_R | 41: R9 | 51: M3_R | 68: MOVE | |
| 7: -JOG_R | 32: R0 | 42: R10 | 52: M4_R | 69: END | |
| 8: MS0_R | 33: R1 | 43: R11 | 53: M5_R | 70: HOME-P | |
| 9: MS1_R | 34: R2 | 44: R12 | 60: +LS_R | 71: TLC | |

* AC power input only.

9 Group send

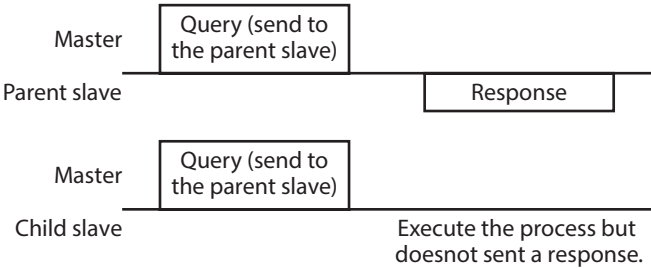
Multiple slaves are made into a group and a query is sent to all slaves in the group at once.

■ **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**

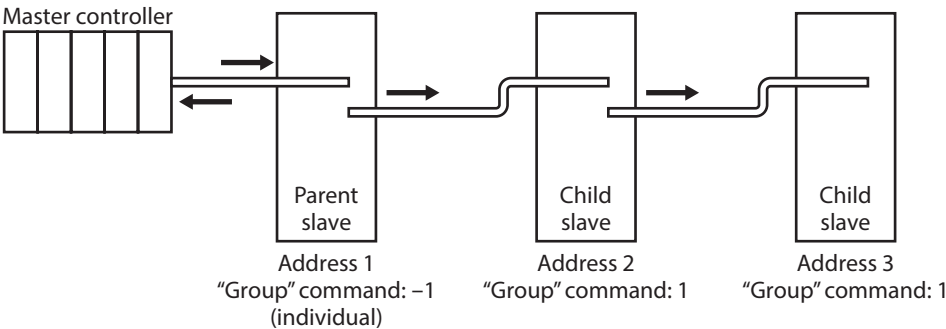
Use a "Group" command to set a group address to each child slave. Change the group in the unicast mode.
When setting a group, read/write to the upper and lower at the same time.

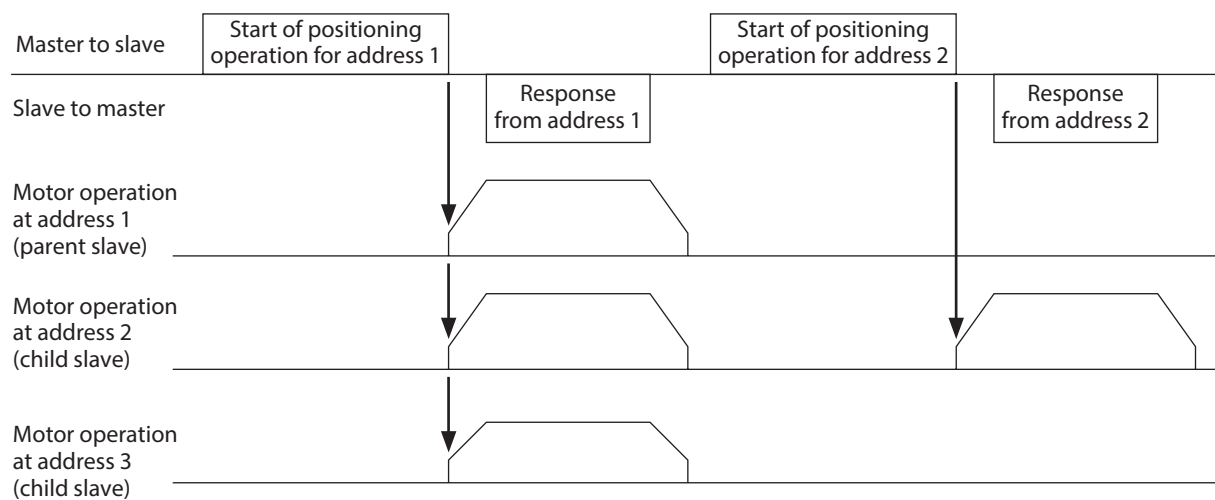
| Register address | | Name | Description | READ/ WRITE | Setting range |
|------------------|-------|---------------|-------------------------|----------------|--------------------------------------------------------------------------------------------------|
| Dec | Hex | | | | |
| 48 | 0030h | Group (upper) | Sets the group address. | R/W | -1 : Individual (No group setting) 1 to 31: Group address (Address number of parent slave) |
| 49 | 0031h | Group (lower) | | | |

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

■ **Function code to execute in a group send**

| Function code | Function |
|---------------|---------------------------------------|
| 10h | Writing to multiple holding registers |





10 Setting example of the operation

10-1 Positioning operation

As an example, here is a description how to execute the following positioning operation. For details of positioning operation, refer to p.168.

This section explains by using the function code "10h" for data writing and using the function code "06h" for remote I/O writing.

● Setting example

- Address number (slave address) : 1
- Position (travel amount) : 1,000 step
- Operating speed : 5,000 Hz

● Operation procedure

1. Send the following query and set the position (travel amount) of the operation data No.0 to 1,000 steps.

Query

| Field name | | Data | Description |
|---------------------|----------------------------------------------|------|-------------------------------------------------------------------------|
| Slave address | | 01h | Slave address1 |
| Function code | | 10h | Writing to multiple holding registers |
| Data | Register address (upper) | 04h | Register address to start writing from = Position No.0 (0400h) |
| | Register address (lower) | 00h | |
| | Number of registers (upper) | 00h | Number of registers to be written from the starting register address |
| | Number of registers (lower) | 02h | |
| | Number of bytes | 04h | Twice the number of registers in the query |
| | Value written to register address (upper) | 00h | Value written to register address = 1,000 steps (0000 03E8h) |
| | Value written to register address (lower) | 00h | |
| | Value written to register address +1 (upper) | 03h | |
| | Value written to register address +1 (lower) | E8h | |
| Error check (lower) | | C1h | Calculation result of CRC-16 |
| Error check (upper) | | D1h | |

Response

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

2. Send the following query and set the operating speed of the operation data No.0 to 5,000 Hz.

Query

| Field name | | Data | Description |
|---------------------|----------------------------------------------|------|--------------------------------------------------------------------------|
| Slave address | | 01h | Slave address1 |
| Function code | | 10h | Writing to multiple holding registers |
| Data | Register address (upper) | 04h | Register address to start writing from = Operating speed No.0 (0480h) |
| | Register address (lower) | 80h | |
| | Number of registers (upper) | 00h | Number of registers to be written from the starting register address |
| | Number of registers (lower) | 02h | |
| | Number of bytes | 04h | Twice the number of registers in the query |
| | Value written to register address (upper) | 00h | Value written to register address = 5,000 Hz (0000 1388h) |
| | Value written to register address (lower) | 00h | |
| | Value written to register address +1 (upper) | 13h | |
| | Value written to register address +1 (lower) | 88h | |
| Error check (lower) | | C4h | Calculation result of CRC-16 |
| Error check (upper) | | 59h | |

Response

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

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

Query

| Field name | | Data | Description |
|---------------------|--------------------------|------|---------------------------------------------------------------------------------|
| Slave address | | 01h | Slave address1 |
| Function code | | 06h | Writing to a holding register |
| Data | Register address (upper) | 00h | Register address to which writing is executed = Driver input command (007Dh) |
| | Register address (lower) | 7Dh | |
| | Value written (upper) | 00h | Value written to register address = START ON (0008h) |
| | Value written (lower) | 08h | |
| Error check (lower) | | 18h | Calculation result of CRC-16 |
| Error check (upper) | | 14h | |

Response

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

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

Query

| Field name | | Data | Description |
|---------------------|--------------------------|------|---------------------------------------------------------------------------------|
| Slave address | | 01h | Slave address1 |
| Function code | | 06h | Writing to a holding register |
| Data | Register address (upper) | 00h | Register address to which writing is executed = Driver input command (007Dh) |
| | Register address (lower) | 7Dh | |
| | Value written (upper) | 00h | Value written to register address = START OFF (0000h) |
| | Value written (lower) | 00h | |
| Error check (lower) | | 19h | Calculation result of CRC-16 |
| Error check (upper) | | D2h | |

Response

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

10-2 Continuous operation

As an example, here is a description how to execute the following continuous operation. For details of continuous operation, refer to p.190.

This section explains by using the function code "10h" for data writing and using the function code "06h" for remote I/O writing.

● Setting example

- Address number (slave address) : 1
- Rotation direction : Forward direction (FWD)
- Operating speed : 5,000 Hz

● Operation procedure

1. Send the following query and set the operating speed of the operation data No.0 to 5,000 Hz.

Query

| Field name | | Data | Description |
|---------------------|----------------------------------------------|------|--------------------------------------------------------------------------|
| Slave address | | 01h | Slave address1 |
| Function code | | 10h | Writing to multiple holding registers |
| Data | Register address (upper) | 04h | Register address to start writing from = Operating speed No.0 (0480h) |
| | Register address (lower) | 80h | |
| | Number of registers (upper) | 00h | Number of registers to be written from the starting register address |
| | Number of registers (lower) | 02h | |
| | Number of bytes | 04h | Twice the number of registers in the query |
| | Value written to register address (upper) | 00h | Value written to register address = 5,000 Hz (0000 1388h) |
| | Value written to register address (lower) | 00h | |
| | Value written to register address +1 (upper) | 13h | |
| | Value written to register address +1 (lower) | 88h | |
| Error check (lower) | | C4h | Calculation result of CRC-16 |
| Error check (upper) | | 59h | |

Response

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

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

Query

| Field name | | Data | Description |
|---------------------|--------------------------|------|---------------------------------------------------------------------------------|
| Slave address | | 01h | Slave address1 |
| Function code | | 06h | Writing to a holding register |
| Data | Register address (upper) | 00h | Register address to which writing is executed = Driver input command (007Dh) |
| | Register address (lower) | 7Dh | |
| | Value written (upper) | 40h | Value written to register address = FWD ON (4000h) |
| | Value written (lower) | 00h | |
| Error check (lower) | | 28h | Calculation result of CRC-16 |
| Error check (upper) | | 12h | |

Response

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

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

Query

| Field name | | Data | Description |
|---------------------|--------------------------|------|---------------------------------------------------------------------------------|
| Slave address | | 01h | Slave address1 |
| Function code | | 06h | Writing to a holding register |
| Data | Register address (upper) | 00h | Register address to which writing is executed = Driver input command (007Dh) |
| | Register address (lower) | 7Dh | |
| | Value written (upper) | 00h | Value written to register address = FWD OFF (0000h) |
| | Value written (lower) | 00h | |
| Error check (lower) | | 19h | Calculation result of CRC-16 |
| Error check (upper) | | D2h | |

Response

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

10-3 Return-to-home operation

As an example, here is a description how to execute the following return-to-home operation. For details of return-to-home operation, refer to p.182.

● Setting example

- Address number (slave address) : 1
- Operation condition : Initial value

● Operation procedure

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

Query

| Field name | | Data | Description |
|---------------------|--------------------------|------|---------------------------------------------------------------------------------|
| Slave address | | 01h | Slave address1 |
| Function code | | 06h | Writing to a holding register |
| Data | Register address (upper) | 00h | Register address to which writing is executed = Driver input command (007Dh) |
| | Register address (lower) | 7Dh | |
| | Value written (upper) | 00h | Value written to register address = HOME ON (0010h) |
| | Value written (lower) | 10h | |
| Error check (lower) | | 18h | Calculation result of CRC-16 |
| Error check (upper) | | 1Eh | |

Response

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

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

Query

| Field name | | Data | Description |
|---------------------|--------------------------|------|---------------------------------------------------------------------------------|
| Slave address | | 01h | Slave address1 |
| Function code | | 06h | Writing to a holding register |
| Data | Register address (upper) | 00h | Register address to which writing is executed = Driver input command (007Dh) |
| | Register address (lower) | 7Dh | |
| | Value written (upper) | 00h | Value written to register address = HOME OFF (0000h) |
| | Value written (lower) | 00h | |
| Error check (lower) | | 19h | Calculation result of CRC-16 |
| Error check (upper) | | D2h | |

Response

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

11 Detection of communication errors

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

11-1 Communication errors

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

memo You can also clear the communication error records by turning off the driver power supply.

| Type of communication error | Error code | Cause |
|-------------------------------------------------------------------|------------|-------------------------------------------------------------------------------|
| RS-485 communication error | 84h | A transmission error was detected. Refer to "No response" on p.221. |
| Command not yet defined | 88h | An exception response (exception code 01h, 02h) was detected. Refer to p.222. |
| Execution disable due to user I/F communication in progress | 89h | An exception response (exception code 04h) was detected. Refer to p.222. |
| Not possible to execute because of non-volatile memory processing | 8Ah | |
| Outside setting range | 8Ch | An exception response (exception code 03h, 04h) was detected. Refer to p.222. |
| Command execute disable | 8Dh | An exception response (exception code 04h) was detected. Refer to p.222. |

11-2 Alarms and warnings

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

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

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

■ Communication switch setting error

When setting the transmission rate setting switch (SW2) to positions 8 to F, the transmission rate setting switch error will occur.

■ RS-485 communication error (84h)

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

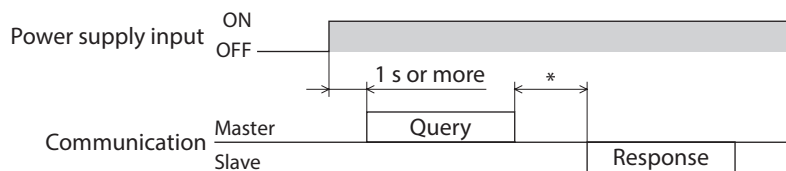
| Description of error | Description |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Warning | A warning generates when one RS-485 communication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

■ RS-485 communication timeout (85h)

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

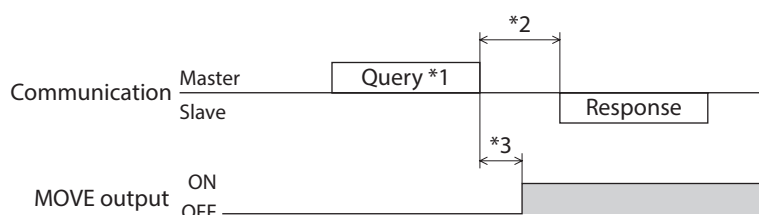
12 Timing charts

■ Communication start



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

■ Operation start

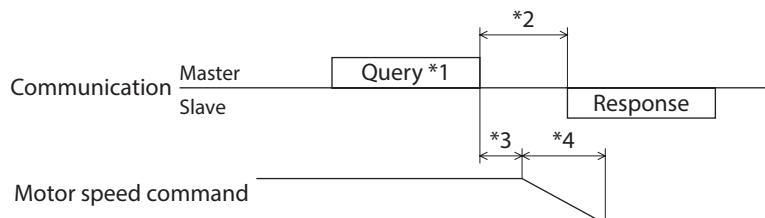


*1 A message including a query to start operation via RS-485 communication.

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

*3 C3.5 (silent interval) + 4 ms or less

■ Operation stop, speed change



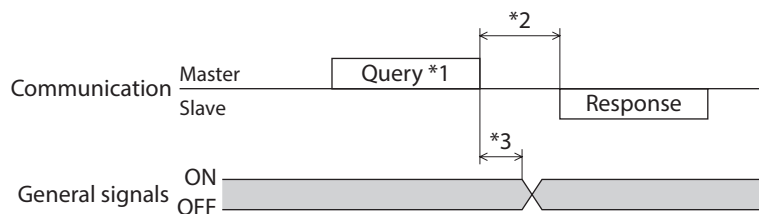
*1 A message including a query to stop operation and another to change the speed via RS-485 communication.

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

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

*4 The deceleration method to be applied at the time of stopping varies according to the "STOP input action" parameter.

■ General signals

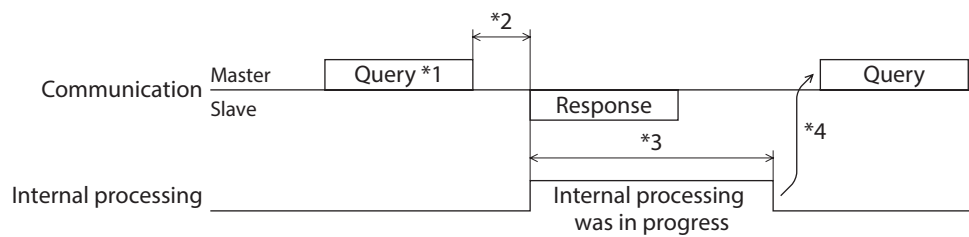


*1 A message including a query for remote output via RS-485 communication.

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

*3 C3.5 (silent interval) + 4 ms or less

■ Configuration



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

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

*3 Command processing time + 1 s or less

*4 Execute a query after the driver internal processing is completed.

7 Method of control via industrial network

This part explains how to control via industrial network using our network converter.

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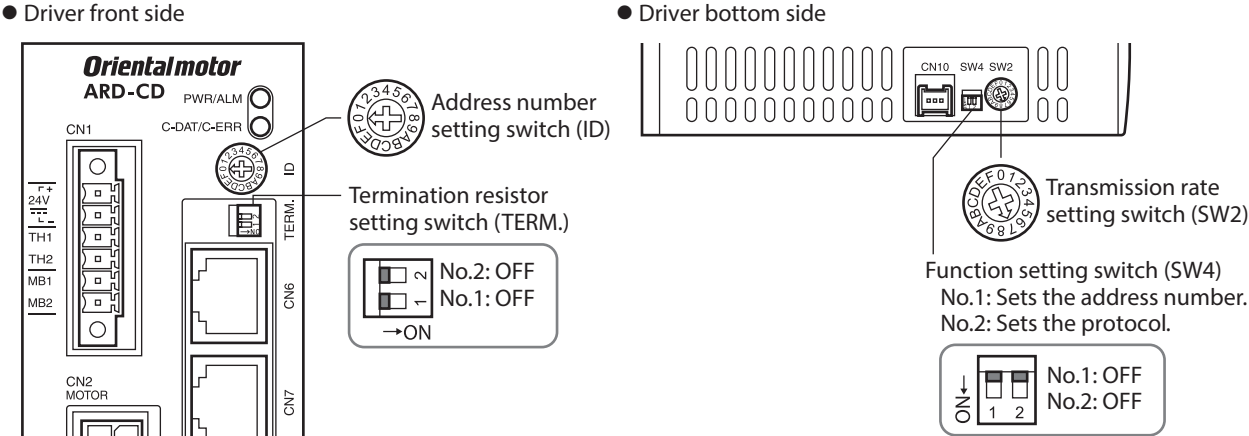
| | | | |
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1 Setting the switches

Switches differ in the AC input driver and the DC input driver. Set properly.

1-1 Setting the AC power input

The figures show the status of factory setting.



Note When setting any switch, turn off the main power supply and the 24 VDC power supply of the driver and wait for the CHARGE LED to turn off before doing so. The residual voltage may cause electric shock.

memo The set switches are enabled after the 24 VDC power supply is turned on again.

■ Protocol

Using the SW4-No.2 of the function setting switch to OFF. The network converter is selected.

Factory setting OFF

| SW4-No.2 | Protocol |
|----------|-----------------------------------|
| ON | Modbus RTU mode |
| OFF | Connecting with network converter |

■ Address number (slave address)

Using the address number setting switch (ID) and SW4-No.1 of the function setting switch, set the address number (slave address). Make sure each address number (slave address) you set for each driver is unique. Up to 16 units can be connected.

Factory setting ID: 0, SW4-No.1: OFF (slave address 0)

| Address number | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|----------------|-----|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| ID | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
| SW4-No.1 | OFF | | | | | | | | | | | | | | | |

■ Transmission rate

Using the transmission rate setting switch (SW2), set the transmission rate to 625,000 bps.

Factory setting 7 (625,000 bps)

■ Termination resistor

Use a termination resistor for the driver located farthest away (positioned at the end) from the network converter. Turn the termination resistor setting switch (TERM.-Nos.1 and 2) ON to set the termination resistor for RS-485 communication (120 Ω).

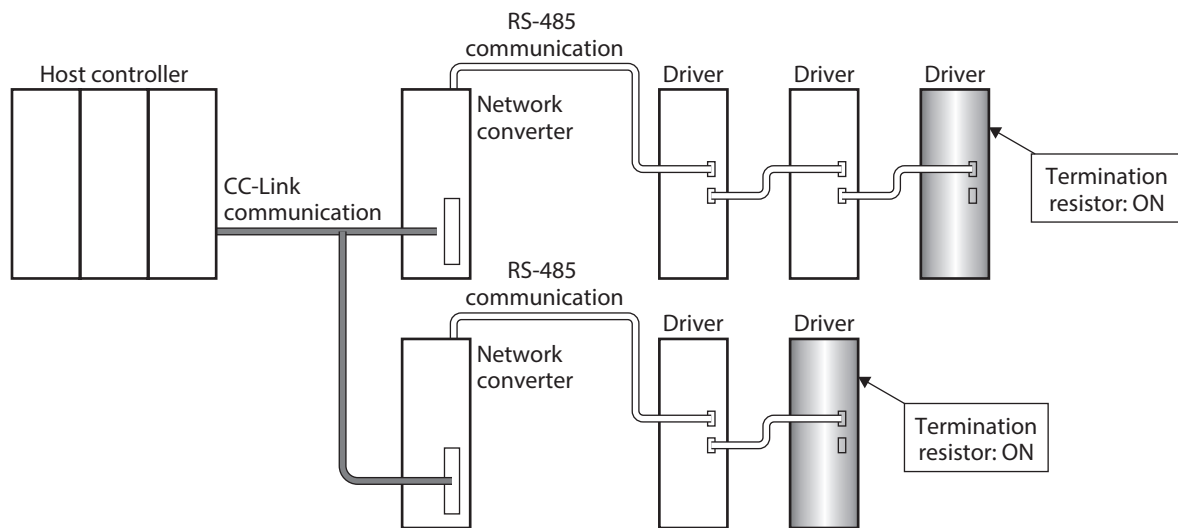
Factory setting Nos.1 and 2: Both OFF (termination resistor disabled)

| TERM.-Nos.1 and 2 | Termination resistor (120 Ω) |
|-------------------|--------------------------------------|
| Both are OFF | Disabled |
| Both are ON | Enabled |



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

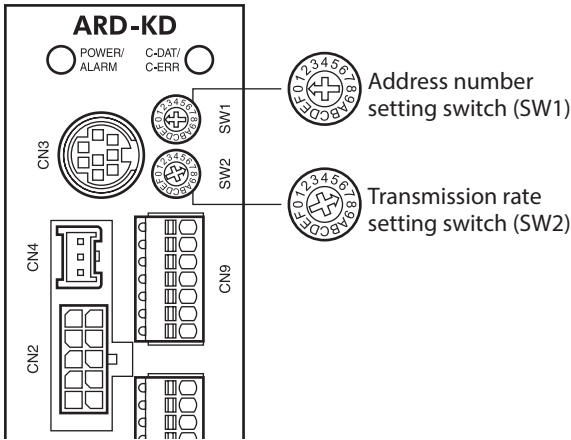
For example, in the case of the following system, the termination resistor should be set to two drivers.



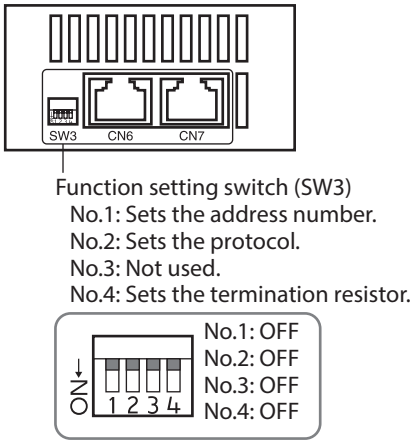
1-2 **Setting the DC power input**

The figures show the status of factory setting.

● Driver front side



● Driver top side



memo Be sure to turn off the driver power supply 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 supply is cycled.

■ **Protocol**

Using the SW3-No.2 of the function setting switch to OFF. The network converter is selected.

Factory setting OFF

| SW3-No.2 | Protocol |
|----------|-----------------------------------|
| ON | Modbus RTU mode |
| OFF | Connecting with network converter |

■ **Address number (slave address)**

Using the address number setting switch (SW1) and SW3-No.1 of the function setting switch, set the address number (slave address). Make sure each address number (slave address) you set for each driver is unique. Up to 16 units can be connected.

Factory setting SW1: 0, SW3-No.1: OFF (slave address 0)

| Address number | 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 |
| SW3-No.1 | OFF | | | | | | | | | | | | | | | |

■ **Transmission rate**

Using the transmission rate setting switch (SW2), set the transmission rate to 625,000 bps.

Factory setting 7 (625,000 bps)

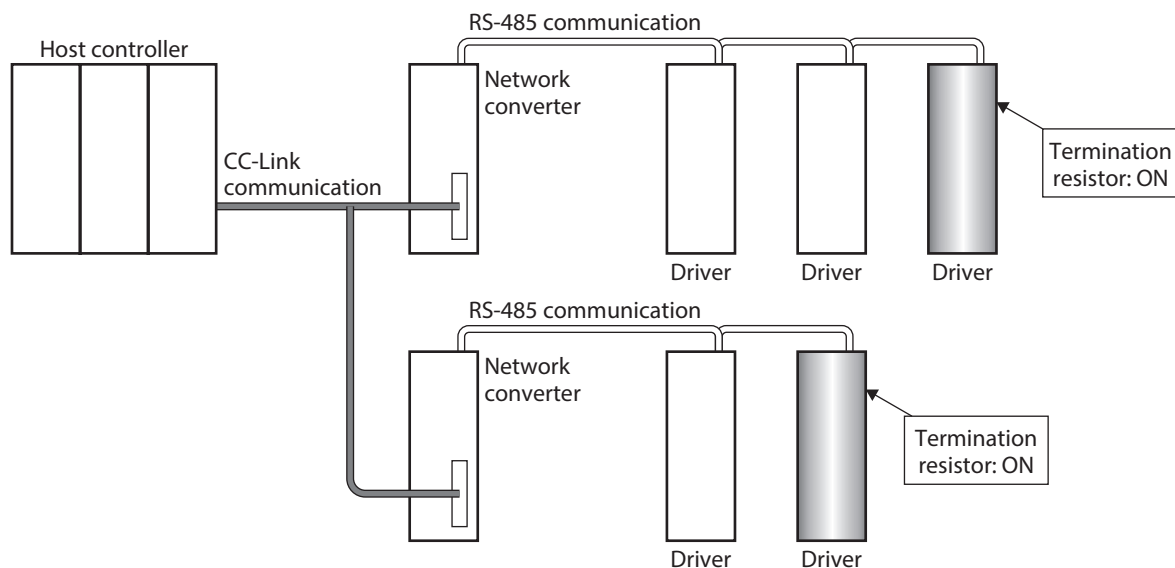
■ Termination resistor

Use a termination resistor for the driver located farthest away (positioned at the end) from the network converter. Turn the termination resistor setting switches (SW3-No.4) 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 |

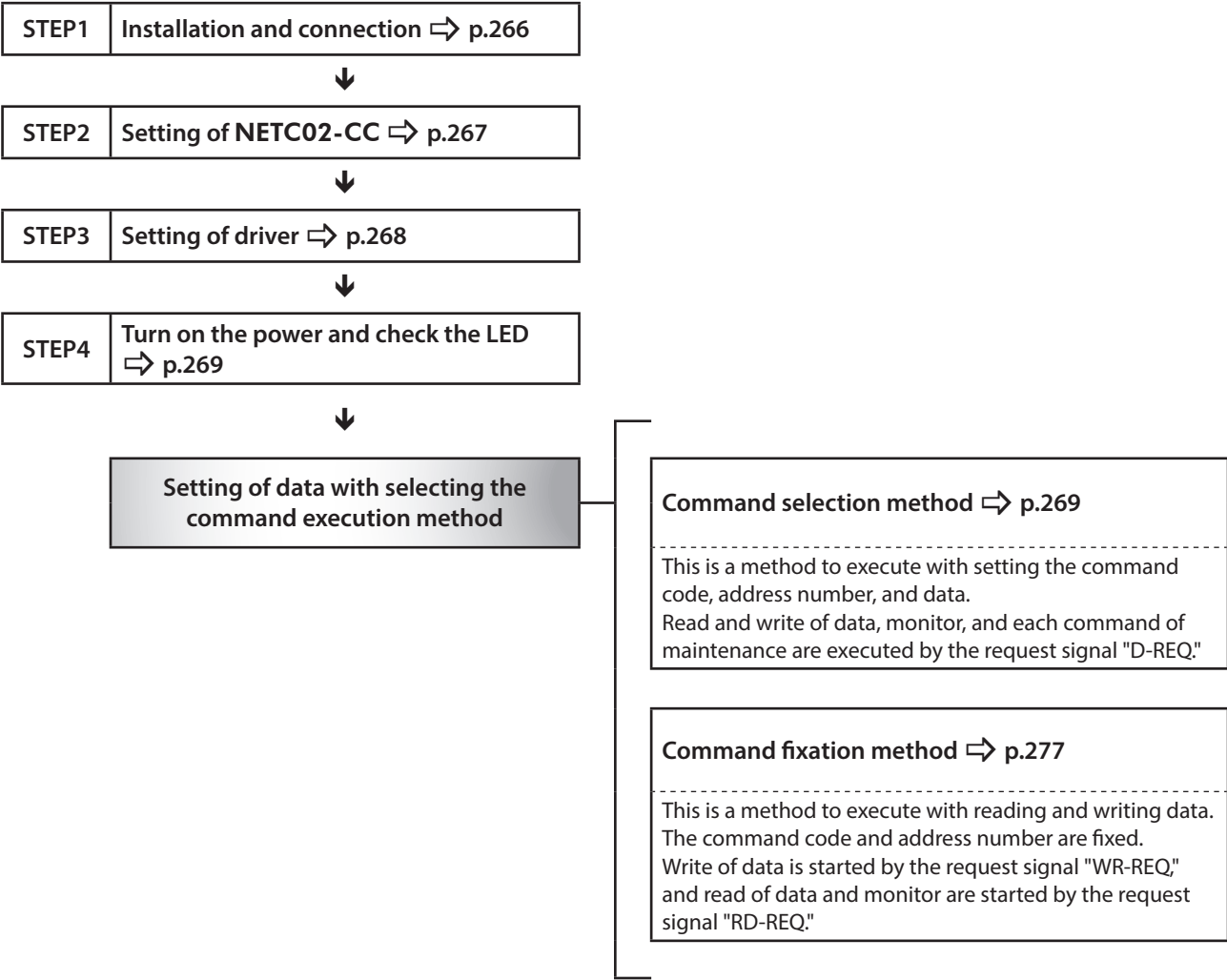
For example, in the case of the following system, the termination resistor should be set to two drivers.



2 Method of control via CC-Link communication

2-1 Guidance

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



■ Setting condition

● Setting of driver

| | |
|----------------------------------------|-------------------|
| Address number 0 | AC power input |
| Address number 1 | DC power input |
| Protocol | Network converter |
| RS-485 communication transmission rate | 625,000 bps |

● Setting of NETC02-CC

| | |
|----------------------------|--------------------|
| Number of connected driver | 2 units |
| CC-Link baud rate | 10 Mbps |
| STATION No. | No.1 |
| Register arrangement mode | 4 word arrangement |

● Setting of the master device

Setting of network parameter

| | |
|------------------------------------|--------------------|
| Remote input (RX) | RX1000 |
| Remote output (RY) | RY1000 |
| Remote register (RW _r) | W0 |
| Remote register (RW _w) | W100 |
| Extended cyclic setting | ×2 |
| Remote device station | 4 station occupied |

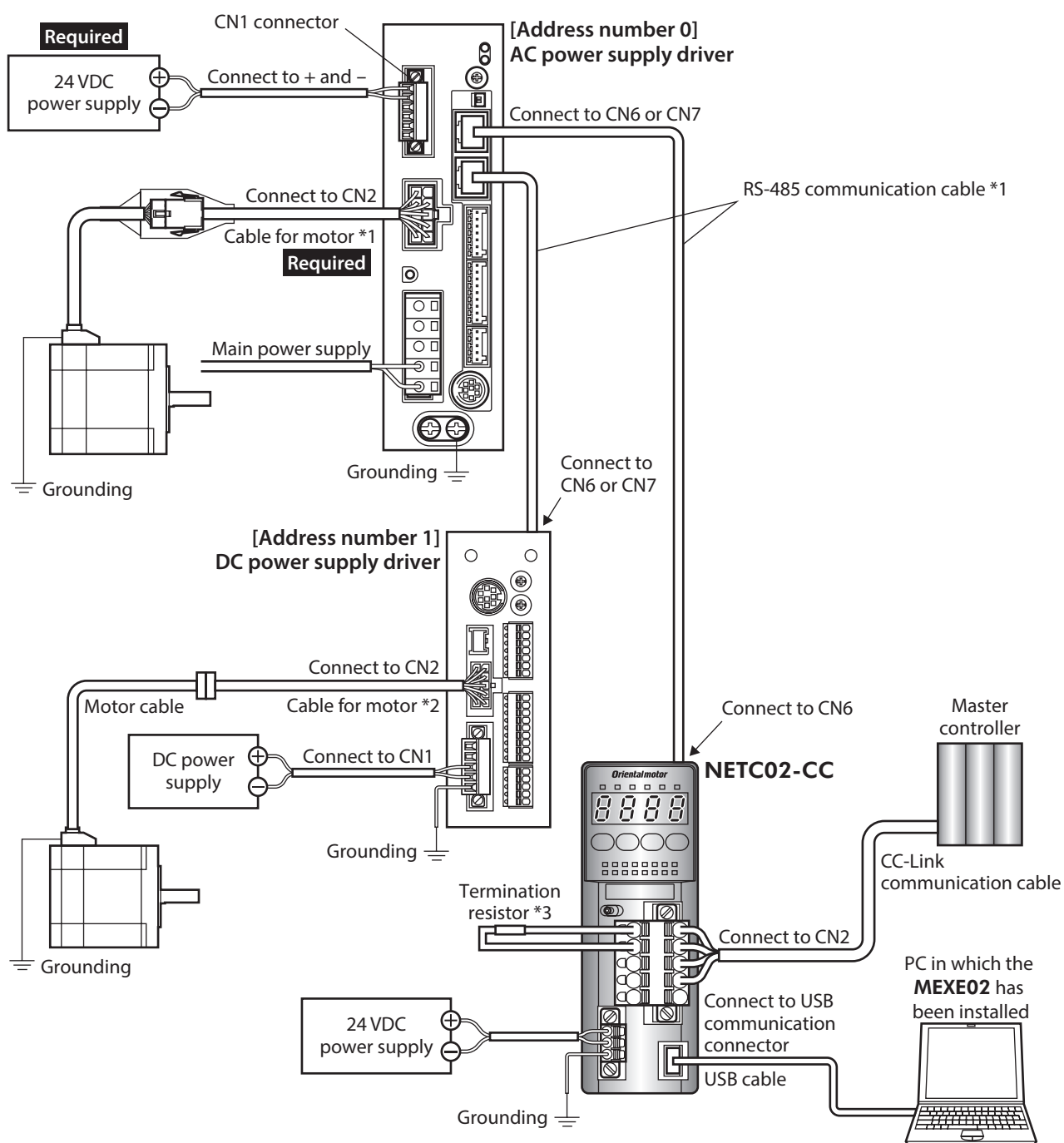
Setting of CC-Link master

| | |
|-------------------|---------|
| CC-Link baud rate | 10 Mbps |
| STATION No. | No.0 |

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

memo The **NETC02-CC** incorporates a termination resistor for RS-485 communication. This product can be used without setting the termination resistor.

STEP 1 Check the installation and connection



*1 These cables are provided as our products. Purchase them separately.

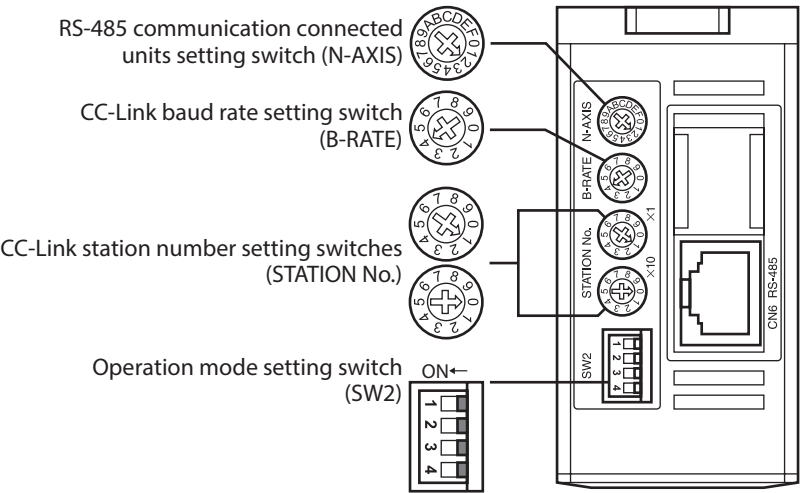
*2 This cable is provided as our product. When the length of the motor cable is not enough, purchase it separately.

*3 The termination resistor does not come with the product (110 Ω , 1/2 W).

STEP 2 Set the switches of the NETC02-CC

Set the switches provided on the upper side of the **NETC02-CC** as follows. The status becomes as shown in the following figures after setting.

| Setting item | Switch | Factory setting |
|-----------------------------------------|---------------------------------------------------------|-------------------|
| RS-485 communication connection unit: 2 | Set N-AXIS to "2" | 1 |
| CC-Link baud rate: 10 Mbps | Set B-RATE to "4" | 0 |
| CC-Link station No.: 1 | Set the ×1 to "1" and the ×10 to "0" of the STATION No. | 1 (×1: 1, ×10: 0) |
| Operation mode: OFF | Set No.1 to No.4 to "OFF" | All OFF |



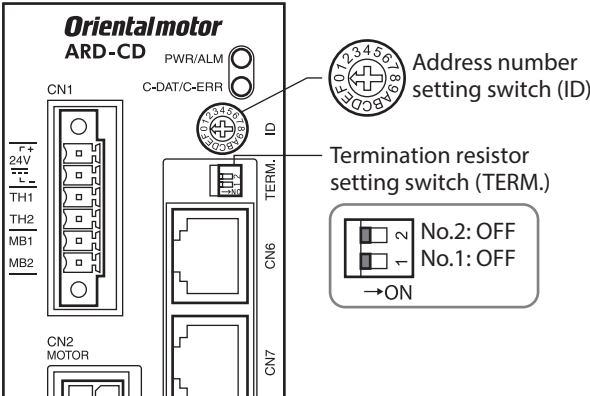
STEP 3Set the switches of the driver

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

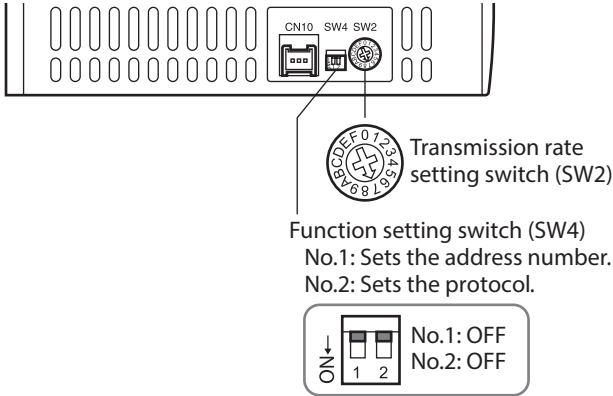
| Setting item | AC power input | DC power input |
|------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------|
| Protocol: Network converter | Set No.2 of SW4 to "OFF" | Set No.2 of SW3 to "OFF" |
| Address number: AC power input driver is "0" DC power input driver is "1" | Set No.1 of SW4 to "OFF" Set ID to "0" | Set No.1 of SW3 to "OFF" Set SW1 to "1" |
| Termination resistor: AC power input driver is "OFF" DC power input driver is "ON" | Set No.1 and No.2 of TERM. to "OFF" | Set No.4 of SW3 to "ON" |
| Transmission rate: 625,000 bps | Set SW2 to "7" | Set SW2 to "7" |

■ AC power input

● Driver front side

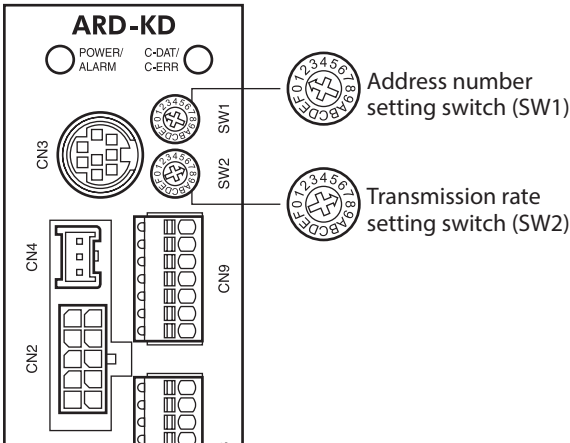


● Driver bottom side

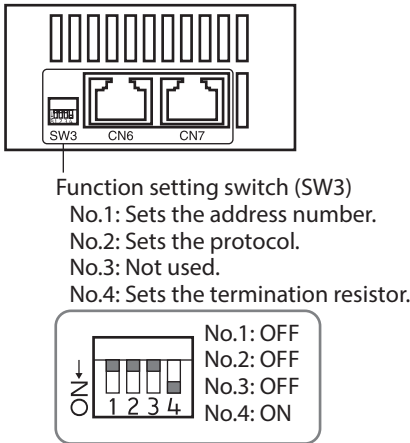


■ DC power input

● Driver front side



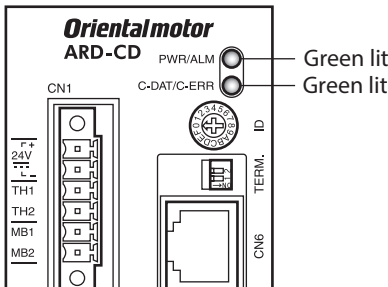
● Driver top side



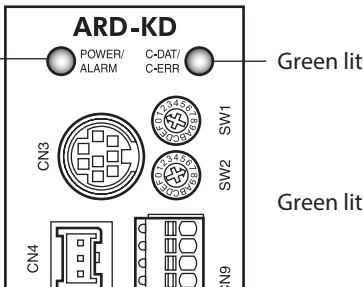
STEP 4 Turn on the power and check the LED

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

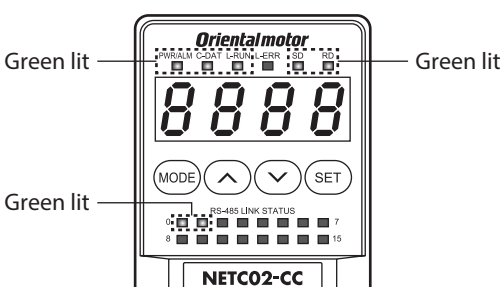
■ AC power input driver



■ DC power input driver

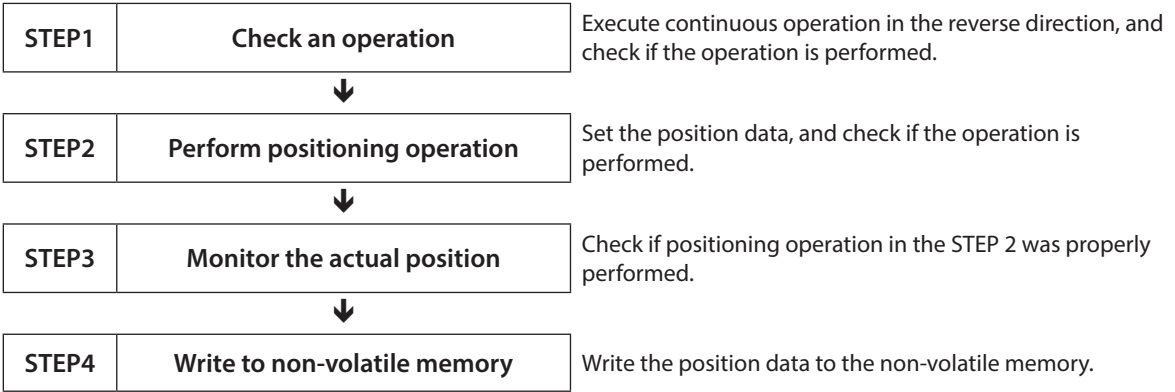


■ Network converter



2-2 Operation example of command selection method

This section explains how to perform the following operations using the command selection method.



■ How to use the request signal

In the operation example, the request signals are used quite differently based on the setting of remote register.

● Operation data, maintenance command

| Request signal | Remote register | |
|----------------|-----------------|------|
| | Write | Read |
| D-REQ0 | RWw100 | RWr0 |
| | RWw101 | RWr1 |
| | RWw102 | RWr2 |
| | RWw103 | RWr3 |
| D-REQ1 | RWw104 | RWr4 |
| | RWw105 | RWr5 |
| | RWw106 | RWr6 |
| | RWw107 | RWr7 |

● Monitor command

| Request signal | Remote register | |
|----------------|-----------------|------|
| | Write | Read |
| D-REQ2 | RWw108 | RWr8 |
| | RWw109 | RWr9 |
| | RWw10A | RWrA |
| | RWw10B | RWrB |
| D-REQ3 | RWw10C | RWrC |
| | RWw10D | RWrD |
| | RWw10E | RWrE |
| | RWw10F | RWrF |

STEP 1 Execute continuous operation in the reverse direction by remote I/O, and check if the operation is performed.

1. Start continuous operation in the reverse direction.
Turn the RVS ON.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|-----------------------------------|
| 0 | RVS | RY100F | 1 | Execution of continuous operation |
| 1 | | RY101F | 1 | |

2. Stop continuous operation.
Turn the RVS OFF.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|------------------------------|
| 0 | RVS | RY100F | 0 | Stop of continuous operation |
| 1 | | RY101F | 0 | |



If not operated, check the setting of the switches, and assignments of remote I/O and remote register.

STEP 2 Perform positioning operation

1. In order to make easier to check that the operation was properly performed when positioning operation was performed, set the position information to "0."
- 1) Set the maintenance command "P-PRESET execution (30C5h)" to remote register.

Master to NETC02-CC

| Address number | Address | Input value | Description |
|----------------|---------|-------------|-----------------------------------|
| 0 | RWw100 | 30C5h | Command code (P-PRESET execution) |
| | RWw101 | 0h | Address number |
| | RWw102 | 1 | Data (lower) |
| | RWw103 | 0 | Data (upper) |
| 1 | RWw104 | 30C5h | Command code (P-PRESET execution) |
| | RWw105 | 1h | Address number |
| | RWw106 | 1 | Data (lower) |
| | RWw107 | 0 | Data (upper) |



Unless "1" is set to the data area, the command is not executed.

- 2) Turn the D-REQ ON to write data to the driver.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|-----------------|
| 0 | D-REQ0 | RY1080 | 1 | Write execution |
| 1 | D-REQ1 | RY1082 | 1 | |

- 3) The response of the D-END is automatically changed to "1" when it is properly processed.

NETC02-CC to master

| Address number | Remote I/O | Address | Response | Description |
|----------------|------------|---------|----------|-----------------|
| 0 | D-END0 | RX1080 | 1 | Write completed |
| 1 | D-END1 | RX1082 | 1 | |

- 4) The value written to the driver is displayed when the response of the D-END is changed to "1."
Check the value is matched with the one having set in the above 1).

NETC02-CC to master

| Address number | Address | Response | Description |
|----------------|---------|----------|--------------------------------------------|
| 0 | RWr0 | 30C5h | Command code response (P-PRESET execution) |
| | RWr1 | 0h | Address number response |
| | RWr2 | 1 | Data (lower) |
| | RWr3 | 0 | Data (upper) |
| 1 | RWr4 | 30C5h | Command code response (P-PRESET execution) |
| | RWr5 | 1h | Address number response |
| | RWr6 | 1 | Data (lower) |
| | RWr7 | 0 | Data (upper) |

- 5) Check it has been written properly, and turn the D-REQ OFF.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|-----------------|
| 0 | D-REQ0 | RY1080 | 0 | Write execution |
| 1 | D-REQ1 | RY1082 | 0 | |

2. Check the position information is changed to "0" by the "P-PRESET execution" of the maintenance command.
1) Set the "Actual position (2066h)" of the monitor command to remote register.

Master to NETC02-CC

| Address number | Address | Input value | Description |
|----------------|---------|-------------|--------------------------------|
| 0 | RWw108 | 2066h | Command code (actual position) |
| | RWw109 | 0h | Address number |
| | RWw10A | 0 | Data (lower) |
| | RWw10B | 0 | Data (upper) |
| 1 | RWw10C | 2066h | Command code (actual position) |
| | RWw10D | 1h | Address number |
| | RWw10E | 0 | Data (lower) |
| | RWw10F | 0 | Data (upper) |

- 2) Turn the D-REQ ON to write data to the driver.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|------------------|
| 0 | D-REQ2 | RY1084 | 1 | Start of monitor |
| 1 | D-REQ3 | RY1086 | 1 | |

- 3) The response of the D-END is automatically changed to "1" when it is properly processed.

NETC02-CC to master

| Address number | Remote I/O | Address | Response | Description |
|----------------|------------|---------|----------|----------------|
| 0 | D-END2 | RX1084 | 1 | During monitor |
| 1 | D-END3 | RX1086 | 1 | |

- 4) The value written to the driver is displayed when the response of the D-END is changed to "1."
Check the data area is changed to "0."

NETC02-CC to master

| Address number | Address | Response | Description |
|----------------|---------|----------|-----------------------------------------|
| 0 | RWr8 | 2066h | Command code response (actual position) |
| | RWr9 | 0h | Address number response |
| | RWrA | 0 | Data (lower) |
| | RWrB | 0 | Data (upper) |
| 1 | RWrC | 2066h | Command code response (actual position) |
| | RWrD | 1h | Address number response |
| | RWrE | 0 | Data (lower) |
| | RWrF | 0 | Data (upper) |

- 5) Check it has been written properly, and turn the D-REQ OFF.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|----------------|
| 0 | D-REQ2 | RY1084 | 0 | End of monitor |
| 1 | D-REQ3 | RY1086 | 0 | |

3. Set the operation data of positioning operation.
Set the position No.0 and position data "5,000 (1388h)" to remote register.

Master to NETC02-CC

| Address number | Address | Input value | Description |
|----------------|---------|------------------|------------------------------|
| 0 | RWw100 | 1200h | Command code (position No.0) |
| | RWw101 | 0h | Address number |
| | RWw102 | 5,000 (1388h) | Data (lower) |
| | RWw103 | | Data (upper) |
| 1 | RWw104 | 1200h | Command code (position No.0) |
| | RWw105 | 1h | Address number |
| | RWw106 | 5,000 (1388h) | Data (lower) |
| | RWw107 | | Data (upper) |

4. Write the set data in the above 3 to the driver to check the response.

- 1) Turn the D-REQ ON.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|-----------------|
| 0 | D-REQ0 | RY1080 | 1 | Write execution |
| 1 | D-REQ1 | RY1082 | 1 | |

- 2) The response of the D-END is automatically changed to "1" when it is properly processed.

NETC02-CC to master

| Address number | Remote I/O | Address | Response | Description |
|----------------|------------|---------|----------|-----------------|
| 0 | D-END0 | RX1080 | 1 | Write completed |
| 1 | D-END1 | RX1082 | 1 | |

- 3) The value written to the driver is displayed when the response of the D-END is changed to "1."
Check the value is matched with the one having set in the above 3.

NETC02-CC to master

| Address number | Address | Response | Description |
|----------------|---------|----------|---------------------------------------|
| 0 | RWr0 | 1200h | Command code response (position No.0) |
| | RWr1 | 0h | Address number response |
| | RWr2 | 5,000 | Data (lower) |
| | RWr3 | (1388h) | Data (upper) |
| 1 | RWr4 | 1200h | Command code response (position No.0) |
| | RWr5 | 1h | Address number response |
| | RWr6 | 5,000 | Data (lower) |
| | RWr7 | (1388h) | Data (upper) |

5. Check it has been written properly, and turn the D-REQ OFF.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|-----------------|
| 0 | D-REQ0 | RY1080 | 0 | Write completed |
| 1 | D-REQ1 | RY1082 | 0 | |

6. Start positioning operation.
Turn the START ON.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|--------------------------------|
| 0 | START | RY1003 | 1 | Start of positioning operation |
| 1 | | RY1013 | 1 | |

7. When positioning operation is started, turn the START OFF.
Even if the START is turned OFF, the operation continues until the command position.

NETC02-CC to master

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|--------------------|
| 0 | START | RY1003 | 0 | Turn the START OFF |
| 1 | | RY1013 | 0 | |

STEP 3 Monitor the actual position

- Set the "Actual position (2066h)" of the monitor command to remote register.

Master to NETC02-CC

| Address number | Address | Input value | Description |
|----------------|---------|-------------|--------------------------------|
| 0 | RWw108 | 2066h | Command code (actual position) |
| | RWw109 | 0h | Address number |
| | RWw10A | 0 | Data (lower) |
| | RWw10B | 0 | Data (upper) |
| 1 | RWw10C | 2066h | Command code (actual position) |
| | RWw10D | 1h | Address number |
| | RWw10E | 0 | Data (lower) |
| | RWw10F | 0 | Data (upper) |

- Write the set data in the above 1 to the driver to check the response.
 - Turn the D-REQ ON.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|------------------|
| 0 | D-REQ2 | RY1084 | 1 | Start of monitor |
| 1 | D-REQ3 | RY1086 | 1 | |

- The response of the D-END is automatically changed to "1" when it is properly processed.

NETC02-CC to master

| Address number | Remote I/O | Address | Response | Description |
|----------------|------------|---------|----------|----------------|
| 0 | D-END2 | RX1084 | 1 | During monitor |
| 1 | D-END3 | RX1086 | 1 | |

- The response of the D-END is changed to "1," the monitor of the actual position is started. The monitor is continued while the D-REQ is ON.

NETC02-CC to master

| Address number | Address | Response | Description |
|----------------|---------|---------------|-----------------------------------------|
| 0 | RWr8 | 2066h | Command code response (actual position) |
| | RWr9 | 0h | Address number response |
| | RWrA | 5,000 (1388h) | Data (lower) |
| | RWrB | | Data (upper) |
| 1 | RWrC | 2066h | Command code response (actual position) |
| | RWrD | 1h | Address number response |
| | RWrE | 5,000 (1388h) | Data (lower) |
| | RWrF | | Data (upper) |

- End the monitor.
Turn the D-REQ OFF.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|----------------|
| 0 | D-REQ2 | RY1084 | 0 | End of monitor |
| 1 | D-REQ3 | RY1086 | 0 | |

STEP 4 Write the position information to the non-volatile memory.



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

- Set the maintenance command "Batch non-volatile memory write (30C9h)" to remote register.

Master to NETC02-CC

| Address number | Address | Input value | Description |
|----------------|---------|-------------|---------------------------------------------------|
| 0 | RWw100 | 30C9h | Command code (batch non-volatile memory write) |
| | RWw101 | 0h | Address number |
| | RWw102 | 1 | Data (lower) |
| | RWw103 | 0 | Data (upper) |
| 1 | RWw104 | 30C9h | Command code (batch non-volatile memory write) |
| | RWw105 | 1h | Address number |
| | RWw106 | 1 | Data (lower) |
| | RWw107 | 0 | Data (upper) |

- Write the set data in the above 1 to the driver to check the response.

- Turn the D-REQ ON.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|-----------------|
| 0 | D-REQ0 | RY1080 | 1 | Write execution |
| 1 | D-REQ1 | RY1082 | 1 | |

- The response of the D-END is automatically changed to "1" when it is properly processed.

NETC02-CC to master

| Address number | Remote I/O | Address | Response | Description |
|----------------|------------|---------|----------|-----------------|
| 0 | D-END0 | RX1080 | 1 | Write completed |
| 1 | D-END1 | RX1082 | 1 | |

- The value written to the driver is displayed when the response of the D-END is changed to "1." Check the value is matched with the one having set in the above 1).

NETC02-CC to master

| Address number | Address | Response | Description |
|----------------|---------|----------|------------------------------------------------------------|
| 0 | RWr0 | 30C9h | Command code response (batch non-volatile memory write) |
| | RWr1 | 0h | Address number response |
| | RWr2 | 1 | Data (lower) |
| | RWr3 | 0 | Data (upper) |
| 1 | RWr4 | 30C9h | Command code response (batch non-volatile memory write) |
| | RWr5 | 1h | Address number response |
| | RWr6 | 1 | Data (lower) |
| | RWr7 | 0 | Data (upper) |

3. Check it has been written properly, and turn the D-REQ OFF.

Master to NETC02-CC

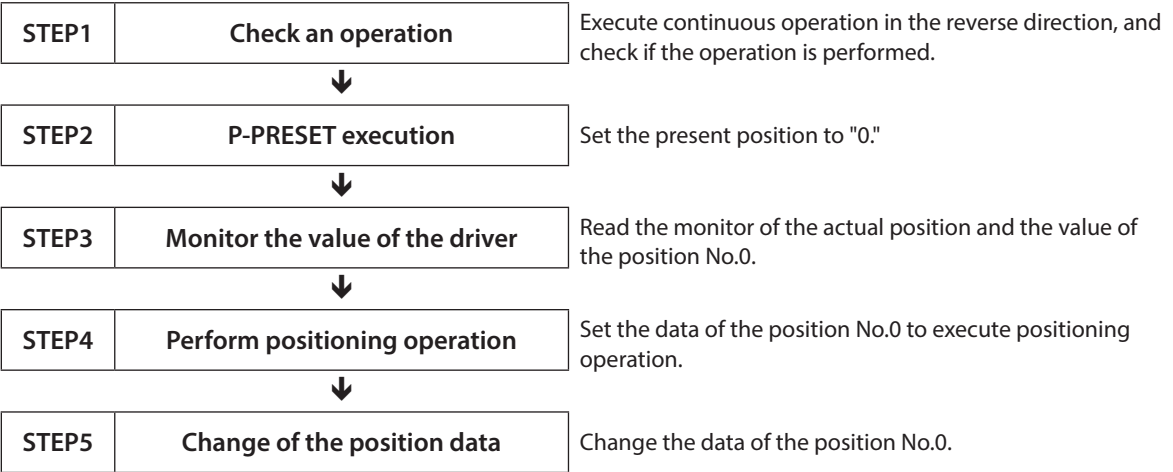
| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|-----------------|
| 0 | D-REQ0 | RY1080 | 0 | Write completed |
| 1 | D-REQ1 | RY1082 | 0 | |



Since the data set via CC-Link communication is saved in the RAM, it is erased when the power is turned off. If the "batch non-volatile memory write" is performed, since the data is saved in the non-volatile memory, it is stored even when the power is turned off.

2-3 **Operation example of command fixation method**

This section explains how to perform the following operations using the command fixation method.



■ **Items of register arrangement (four words arrangement)**

● **Arrangement of write**

| Address number | Remote register | Description | Request signal |
|----------------|-----------------|-----------------------|----------------|
| 0 | RWw100 | Not used | WR-REQ0 |
| | RWw101 | Not used | |
| | RWw102 | Position No.0 (lower) | |
| | RWw103 | Position No.0 (upper) | |
| 1 | RWw104 | Not used | |
| | RWw105 | Not used | |
| | RWw106 | Position No.0 (lower) | |
| | RWw107 | Position No.0 (upper) | |

● **Arrangement of read and monitor**

| Address number | Remote register | Description | Request signal |
|----------------|-----------------|-------------------------|----------------|
| 0 | RWr0 | Actual position (lower) | RD-REQ0 |
| | RWr1 | Actual position (upper) | |
| | RWr2 | Position No.0 (lower) | |
| | RWr3 | Position No.0 (upper) | |
| 1 | RWr4 | Actual position (lower) | |
| | RWr5 | Actual position (upper) | |
| | RWr6 | Position No.0 (lower) | |
| | RWr7 | Position No.0 (upper) | |

STEP 1 Execute continuous operation in the reverse direction by remote I/O, and check if the operation is performed

1. Start continuous operation in the reverse direction.
Turn the RVS ON.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|-----------------------------------|
| 0 | RVS | RY100F | 1 | Execution of continuous operation |
| 1 | | RY101F | 1 | |

2. Stop continuous operation.
Turn the RVS OFF.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|------------------------------|
| 0 | RVS | RY100F | 0 | Stop of continuous operation |
| 1 | | RY101F | 0 | |



If not operated, check the setting of the switches, and assignments of remote I/O and remote register.

STEP 2 Execute the P-PRESET (maintenance command)

1. Set the present position to "0" using the maintenance command "P-PRESET execution."



The maintenance command is performed with the command selection method.

- 1) Set the maintenance command "P-PRESET execution (30C5h)" to remote register.

Master to NETC02-CC

| Address number | Address | Input value | Description |
|----------------|---------|-------------|-----------------------------------|
| 0 | RWw100 | 30C5h | Command code (P-PRESET execution) |
| | RWw101 | 0h | Address number |
| | RWw102 | 1 | Data (lower) |
| | RWw103 | 0 | Data (upper) |
| 1 | RWw104 | 30C5h | Command code (P-PRESET execution) |
| | RWw105 | 1h | Address number |
| | RWw106 | 1 | Data (lower) |
| | RWw107 | 0 | Data (upper) |



Unless "1" is set to the data area, the command is not executed.

- 2) Turn the D-REQ ON to write data to the driver.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|-----------------|
| 0 | D-REQ0 | RY1080 | 1 | Write execution |
| 1 | D-REQ1 | RY1082 | 1 | |

- 3) The response of the D-END is automatically changed to "1" when it is properly processed.

NETC02-CC to master

| Address number | Remote I/O | Address | Response | Description |
|----------------|------------|---------|----------|-----------------|
| 0 | D-END0 | RX1080 | 1 | Write completed |
| 1 | D-END1 | RX1082 | 1 | |

- 4) The value written to the driver is displayed when the response of the D-END is changed to "1."
Check the value is matched with the one having set in the above 1).

NETC02-CC to master

| Address number | Address | Response | Description |
|----------------|---------|----------|--------------------------------------------|
| 0 | RWr0 | 30C5h | Command code response (P-PRESET execution) |
| | RWr1 | 0h | Address number response |
| | RWr2 | 1 | Data (lower) |
| | RWr3 | 0 | Data (upper) |
| 1 | RWr4 | 30C5h | Command code response (P-PRESET execution) |
| | RWr5 | 1h | Address number response |
| | RWr6 | 1 | Data (lower) |
| | RWr7 | 0 | Data (upper) |

- 5) Check it has been written properly, and turn the D-REQ OFF.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|-----------------|
| 0 | D-REQ0 | RY1080 | 0 | Write completed |
| 1 | D-REQ1 | RY1082 | 0 | |

STEP 3 Monitor the value of the driver

Since the register arrangement mode is the four words arrangement, monitor the actual position and read the value of the position No.0.

1. Turn the RD-REQ ON.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|---------------------------|
| 0 | RD-REQ0 | RY1092 | 1 | Start of read and monitor |
| 1 | | | | |

2. When monitor is started, the response of the RD-DAT is automatically changed to "1."

NETC02-CC to master

| Address number | Remote I/O | Address | Response | Description |
|----------------|------------|---------|----------|-------------------------|
| 0 | RD-DAT0 | RX1092 | 1 | During read and monitor |
| 1 | | | | |

- When the response of the RD-DAT is changed to "1," the monitor of the actual position and read of the position No.0 are started.
The monitor is continued while the RD-REQ is ON.

NETC02-CC to master

| Address number | Address | Response | Description |
|----------------|---------|----------|-------------------------|
| 0 | RWr0 | 0 | Actual position (lower) |
| | RWr1 | 0 | Actual position (upper) |
| | RWr2 | 0 * | Position No.0 (lower) |
| | RWr3 | 0 * | Position No.0 (upper) |
| 1 | RWr4 | 0 | Actual position (lower) |
| | RWr5 | 0 | Actual position (upper) |
| | RWr6 | 0 * | Position No.0 (lower) |
| | RWr7 | 0 * | Position No.0 (upper) |

* The initial values is "0."

Since the monitor of the actual position and read of the position No.0 are continuously performed, keep the RD-REQ to the ON-state.

STEP 4 Perform positioning operation

- Set the operation data of positioning operation.
Set the position data "5,000 (1388h)" of the position No.0 to remote register.

Master to NETC02-CC

| Address number | Address | Input value | Description |
|----------------|---------|------------------|-----------------------|
| 0 | RWw100 | 0 | Not used |
| | RWw101 | 0 | Not used |
| | RWw102 | 5,000 (1388h) | Position No.0 (lower) |
| | RWw103 | | Position No.0 (upper) |
| 1 | RWw104 | 0 | Not used |
| | RWw105 | 0 | Not used |
| | RWw106 | 5,000 (1388h) | Position No.0 (lower) |
| | RWw107 | | Position No.0 (upper) |

- Write the set data in the above 1 to the driver to check the response.
 - Turn the WR-REQ ON.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|----------------|
| 0 | WR-REQ0 | RY1090 | 1 | Start of write |
| 1 | | | | |

- The response of the WR-DAT is automatically changed to "1" when it is properly processed.

NETC02-CC to master

| Address number | Remote I/O | Address | Response | Description |
|----------------|------------|---------|----------|--------------|
| 0 | WR-DAT0 | RX1090 | 1 | During write |
| 1 | | | | |

- 3) Since the RD-REQ is kept to the ON-state in the STEP 3, the write value is displayed at the same time the data of the position No.0 is set.
Check the data of the position No.0 is matched with the set value.

NETC02-CC to master

| Address number | Address | Response | Description |
|----------------|---------|------------------|-------------------------|
| 0 | RWr0 | 0 | Actual position (lower) |
| | RWr1 | 0 | Actual position (upper) |
| | RWr2 | 5,000 (1388h) | Position No.0 (lower) |
| | RWr3 | | Position No.0 (upper) |
| 1 | RWr4 | 0 | Actual position (lower) |
| | RWr5 | 0 | Actual position (upper) |
| | RWr6 | 5,000 (1388h) | Position No.0 (lower) |
| | RWr7 | | Position No.0 (upper) |

3. Start positioning operation.
Turn the START ON.

Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|--------------------------------|
| 0 | START | RY1003 | 1 | Start of positioning operation |
| 1 | | RY1013 | 1 | |



Since the RD-REQ is kept to the ON-state in the STEP 3, the monitor of the actual position is started at the same time that positioning operation is started.

4. When positioning operation is started, turn the START OFF.
Even if the START is turned OFF, the operation continues until the command position.

NETC02-CC to master

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|--------------------|
| 0 | START | RY1003 | 0 | Turn the START OFF |
| 1 | | RY1013 | 0 | |

5. When positioning operation was completed, check the actual position changes to "5,000 (1388h)."

NETC02-CC to master

| Address number | Address | Response | Description |
|----------------|---------|------------------|-------------------------|
| 0 | RWr0 | 5,000 (1388h) | Actual position (lower) |
| | RWr1 | | Actual position (upper) |
| | RWr2 | 5,000 (1388h) | Position No.0 (lower) |
| | RWr3 | | Position No.0 (upper) |
| 1 | RWr4 | 5,000 (1388h) | Actual position (lower) |
| | RWr5 | | Actual position (upper) |
| | RWr6 | 5,000 (1388h) | Position No.0 (lower) |
| | RWr7 | | Position No.0 (upper) |

Since the data of the position No.0 is continuously written, keep the WR-REQ to the ON-state.

STEP 5 Change the position data of the operation data No.0

1. Set the position data "3,000 (BB8h)" of the position No.0 to remote register.
Since the WR-REQ is kept to the ON-state in the STEP 4, the write value is displayed at the same time the data of the position No.0 is set.

Master to NETC02-CC

| Address number | Address | Input value | Description |
|----------------|---------|-----------------|-----------------------|
| 0 | RWw100 | 0 | Not used |
| | RWw101 | 0 | Not used |
| | RWw102 | 3,000 (BB8h) | Position No.0 (lower) |
| | RWw103 | | Position No.0 (upper) |
| 1 | RWw104 | 0 | Not used |
| | RWw105 | 0 | Not used |
| | RWw106 | 3,000 (BB8h) | Position No.0 (lower) |
| | RWw107 | | Position No.0 (upper) |

Also, since the RD-REQ is kept to the ON-state in the STEP 3, the write value is read at the same time the data of the position No.0 is set.

Check the value is matched with the one having set in the above 1.

NETC02-CC to master

| Address number | Address | Response | Description |
|----------------|---------|------------------|-------------------------|
| 0 | RWr0 | 5,000 (1388h) | Actual position (lower) |
| | RWr1 | | Actual position (upper) |
| | RWr2 | 3,000 (BB8h) | Position No.0 (lower) |
| | RWr3 | | Position No.0 (upper) |
| 1 | RWr4 | 5,000 (1388h) | Actual position (lower) |
| | RWr5 | | Actual position (upper) |
| | RWr6 | 3,000 (BB8h) | Position No.0 (lower) |
| | RWr7 | | Position No.0 (upper) |

2. Turn the WR-REQ and RD-REQ OFF.

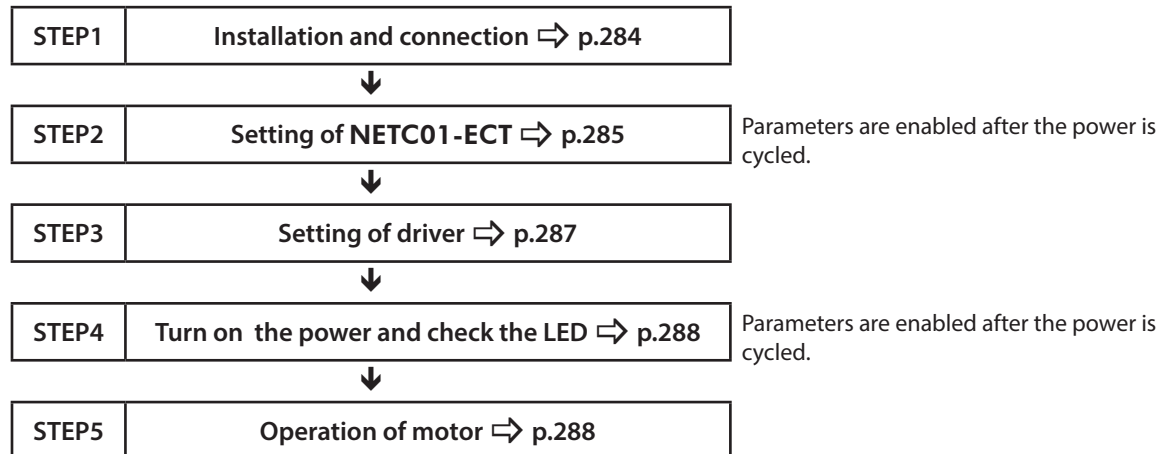
Master to NETC02-CC

| Address number | Remote I/O | Address | Input value | Description |
|----------------|------------|---------|-------------|----------------------------|
| 0 | WR-REQ0 | RY1090 | 0 | Write completed |
| 1 | | | | |
| 0 | RD-REQ0 | RY1092 | 0 | Read and monitor completed |
| 1 | | | | |

3 Method of control via EtherCAT communication

3-1 Guidance

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



● Operation condition

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

- **NETC01-ECT** node address: 1
- Number of drivers connected: 1
- Driver address number: 0
- Driver termination resistor: Enabled

Note

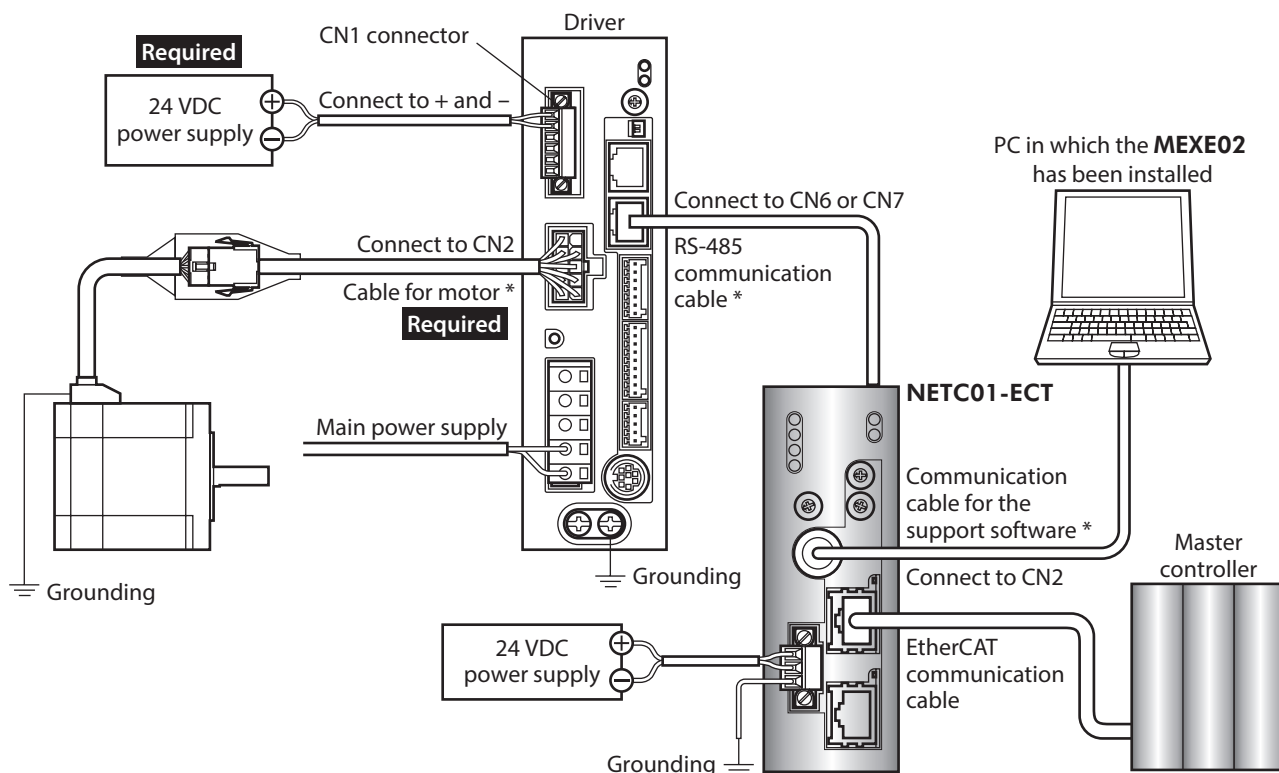
- Before operating the motor, check the condition of the surrounding area to ensure safety.
- Before starting guidance, import the ESI file to the EtherCAT Configuration Tool of the PLC and register the PLC configuration in advance. For details about ESI file, contact your nearest Oriental Motor sales office.

memo

The termination resistor for the **NETC01-ECT** is built into the product. This product can be used without setting the termination resistor.

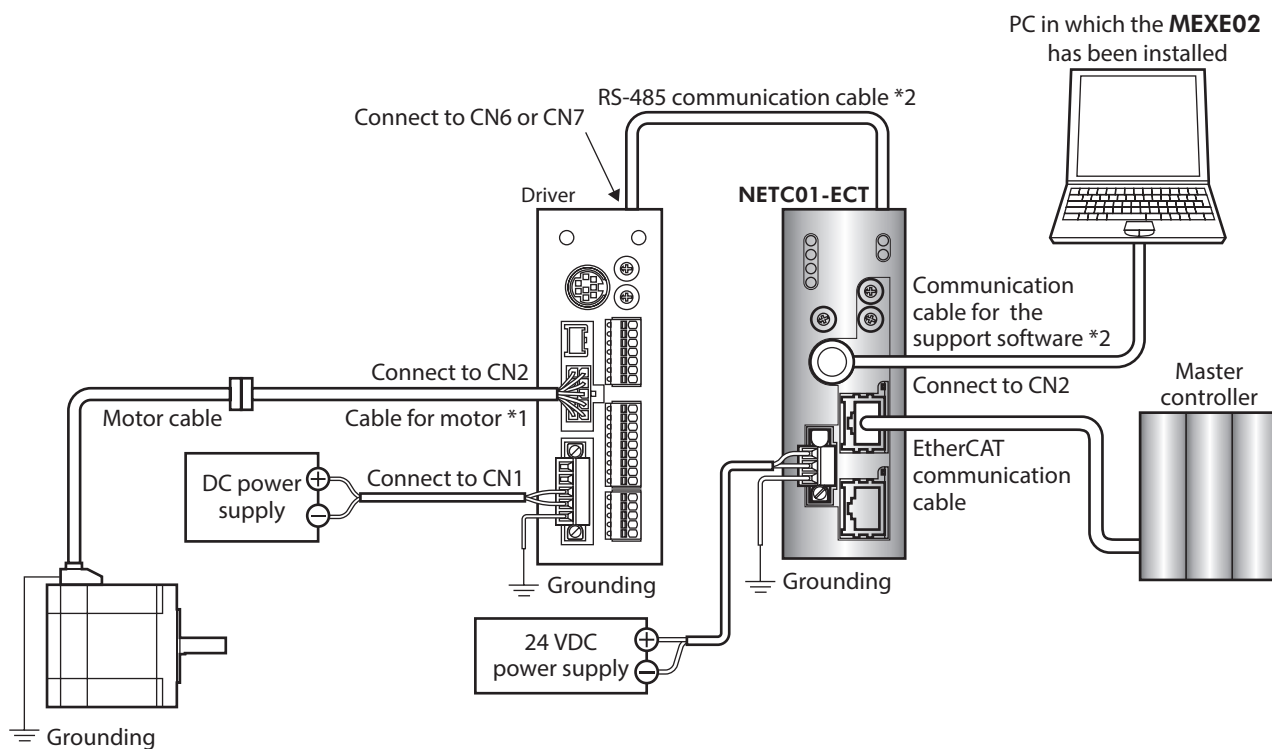
STEP 1 Check the installation and connection

■ AC power input driver



* These cables are provided as our products. Purchase them separately.

■ DC power input driver



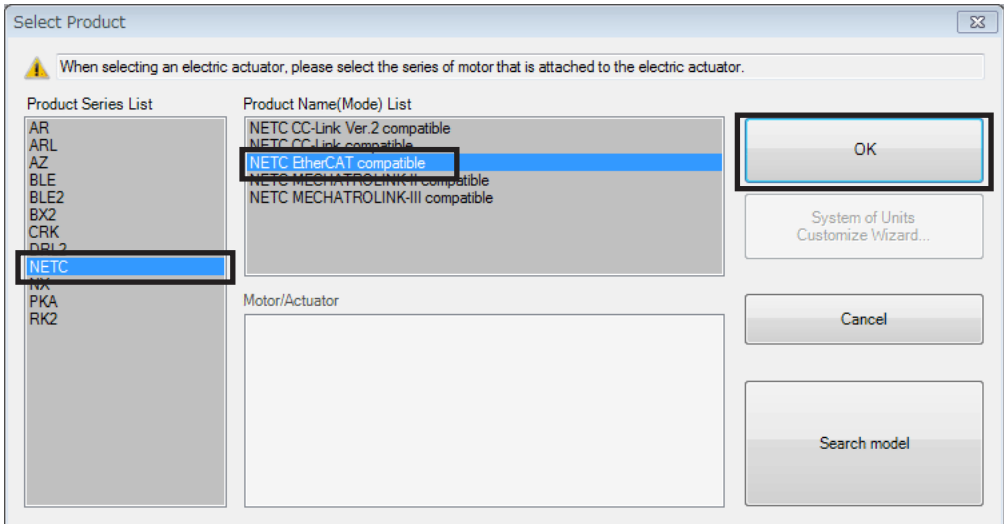
*1 This cable is provided as our product. When the length of the motor cable is not enough, purchase it separately.

*2 These cables are provided as our products. Purchase them separately.

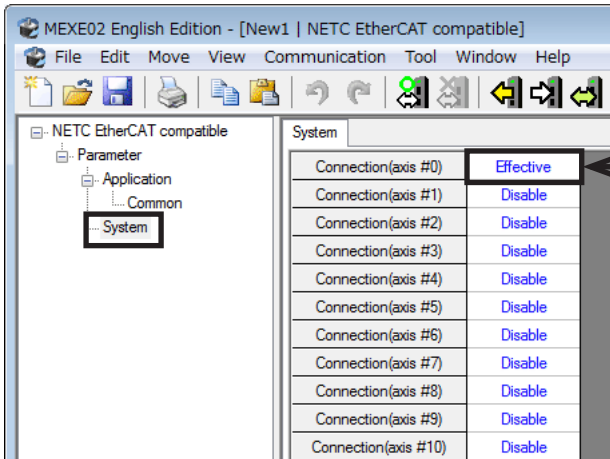
STEP 2 Set the parameters and switches of the NETC01-ECT

Set the parameters and switches of the **NETC01-ECT**.

- 1. Turn on the power to the **NETC01-ECT**.
At this time, since parameters and switches are not set, the ALARM LED will be lit.
Move on the next procedure, and set parameters and switches.
- 2. Start the **MEXE02** and set the parameters.
Select the NETC EtherCAT compatible.



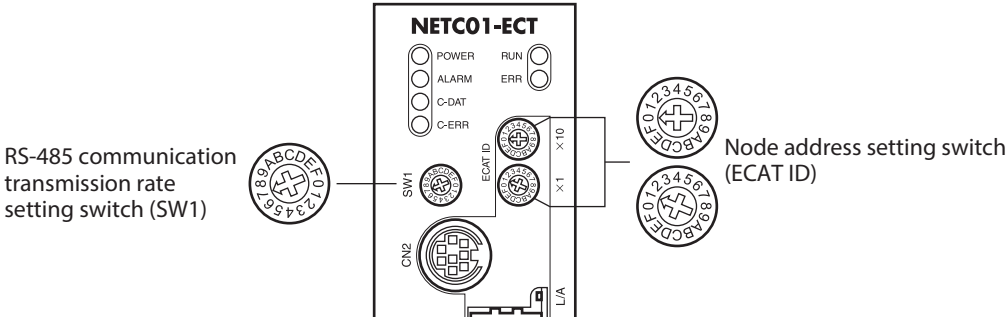
- 3. Set the "Connection (axis #)" parameter of the driver connected to the **NETC01-ECT** to "Enable" using the **MEXE02**.
The initial value in the "Connection (axis #0)" parameter is set to "Enable." When the connected driver is one unit and the address number of the driver is "0," it is not required to set the "Connection (axis #)" parameter.



| MEXE02 tree view | Parameter name | Description | Initial value |
|------------------|-----------------------------------------------|-------------------------------------------------------------------------------|---------------|
| System | Connection (axis #0) | Enables the address number of the driver connected to the NETC01-ECT . | Enable |
| | Connection (axis #1) to Connection (axis #15) | [Setting range] Disable Enable | Disable |

4. Set the switches of the **NETC01-ECT**.
Set as the illustration below.

| Setting contents | Switch | Factory setting |
|--------------------------------------------------|----------------------------------|-------------------|
| RS-485 communication transmission rate: 625 kbps | Set SW1 to 7 | 7 |
| EtherCAT node address: 1 | Set ×10 of ECAT ID to 0, ×1 to 1 | 1 (×10: 0, ×1: 1) |



5. Turn off the **NETC01-ECT** power.



- When multiple drivers are connected, set the "Connection (axis #)" parameters as many as the drivers.
- To update the changed "Connection (axis #)" parameter, cycling the power supply is required.
- For the SW1, always set to "7." If the switch is set to the dial of "8" or higher, the communication switch setting error alarm will be generated when turning on the power. And do not set the switch to the dial of "0" to "6" because they cannot be used. (An alarm will not be generated.)

STEP 3 Set the switches of the driver

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

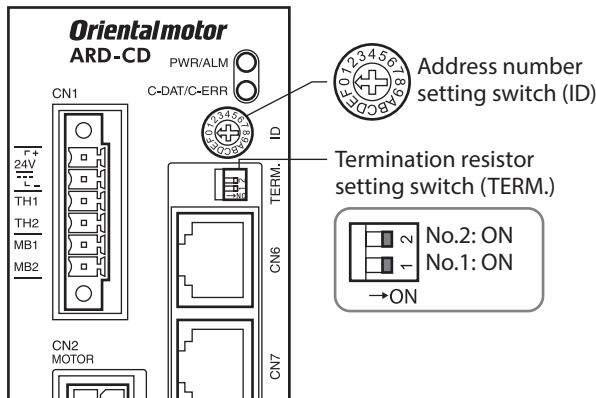
| Setting contents | AC power input | DC power input |
|--------------------------------|-------------------------------------|--------------------------------------|
| Protocol: Network converter | Set No.2 of SW4 OFF | Set No.2 of SW3 OFF |
| Address number: 0 | Set No.1 of SW4 to OFF, set ID to 0 | Set No.1 of SW3 to OFF, set SW1 to 0 |
| Termination resistor: ON | Set No.1 and No.2 of TERM. ON | Set No.4 of SW3 ON |
| Transmission rate: 625,000 bps | Set SW2 to 7 | Set SW2 to 7 |



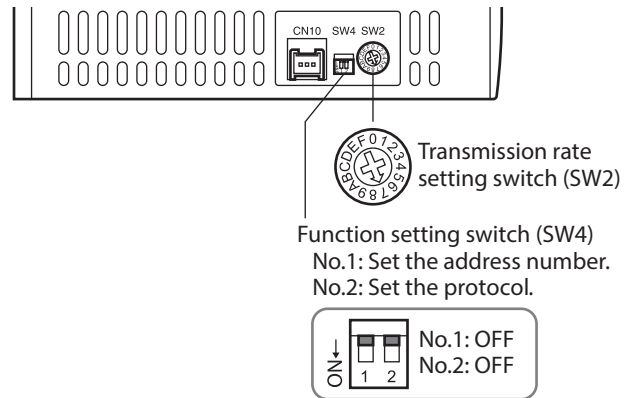
For the address number, set the one with the "Connection (axis #)" parameter of the **NETC01-ECT** set to "Enable."

■ AC power input

● Driver front side

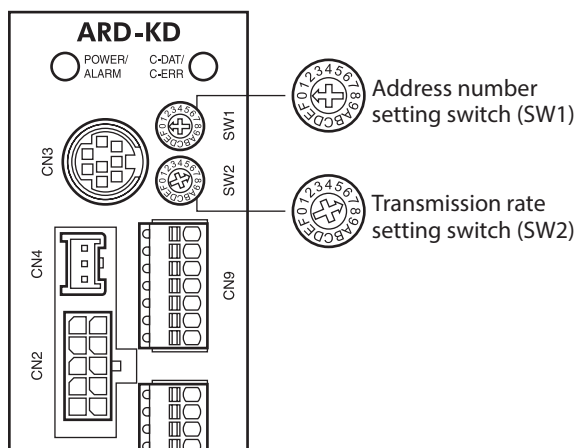


● Driver bottom side

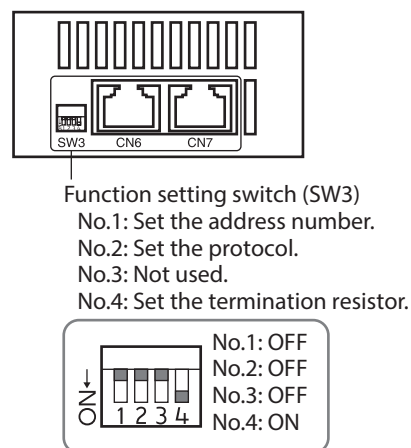


■ DC power input

● Driver front side



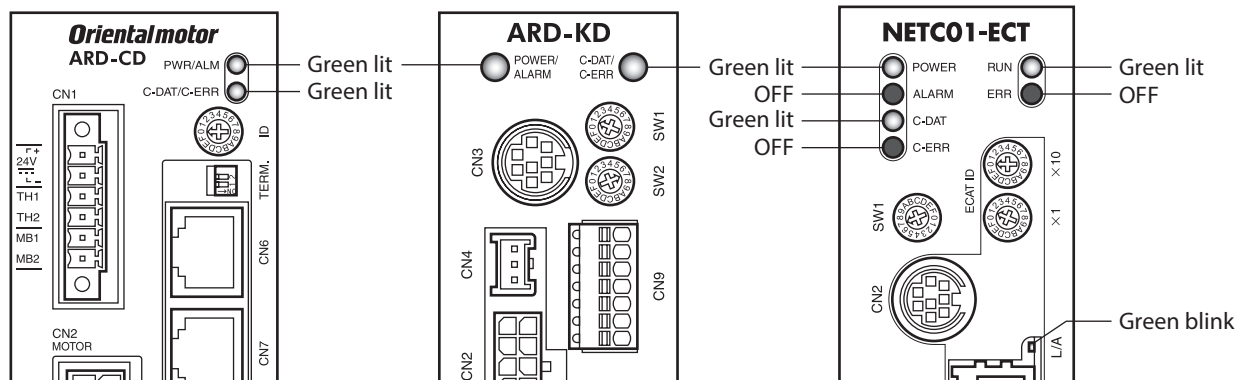
● Driver top side



STEP 4 Turn on the power and check the LED

Check that the LED of the driver and **NETC01-ECT** are as shown in the figure.

- Network converter



- When the C-DAT/C-ERR LED (red) of the driver or the C-ERR LED (red) of the **NETC01-ECT** is lit: Check the transmission rate of RS-485 communication or the address number.
- When the ERR LED (red) of the **NETC01-ECT** is blink:
An EtherCAT communication error has been occurred. Check the error content.

| | |
|---------------|------------------------------------------------------------------------------|
| STEP 5 | Perform continuous operation via remote I/O of EtherCAT communication |
|---------------|------------------------------------------------------------------------------|

Turn FWD of the address number 0 ON with the remote I/O of EtherCAT communication. Continuous operation for the operation data No.0 is started at the 1,000 Hz of starting speed.
Initial values of the remote I/O are as follows.

- Master to NETC01-ECT

| CoE Index | Sub-index | Name | Type | Access | Description | | | | | | | |
|-----------|-----------|---------------------|------|--------|------------------------|----------|----------|----------|----------|----------|---------|---------|
| 2600h | 0 | – | U8 | R | Number of Sub-index: 2 | | | | | | | |
| | 1 | I/O command (lower) | U8 | RW | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| | | | | | NET-IN7 | NET-IN6 | NET-IN5 | NET-IN4 | NET-IN3 | NET-IN2 | NET-IN1 | NET-IN0 |
| | 2 | I/O command (upper) | U8 | RW | No function | FREE | STOP | HOME | START | M2 | M1 | M0 |
| | | | | | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| | | | | | NET-IN15 | NET-IN14 | NET-IN13 | NET-IN12 | NET-IN11 | NET-IN10 | NET-IN9 | NET-IN8 |
| | | | | | RVS | FWD | –JOG | +JOG | SSTART | MS2 | MS1 | MS0 |

| | |
|---------------|-----------------------------------------------------|
| 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 an alarm generated in the driver or **NETC01-ECT**?
- Are the power supply, motor and RS-485 communication cable connected securely?
- Are the protocol, address number, transmission rate and termination resistor set correctly?
- Is the "Connection (axis #)" parameter of the **NETC01-ECT** set correctly?
- Is the C-DAT LED of **NETC01-ECT** turned off? Or is the C-ERR LED lit in red? (A RS-485 communication error has been occurred.)
- Is the ERR LED of **NETC01-ECT** blinks in red? (An EtherCAT communication error has been occurred.)
- Is the L/A LED of **NETC01-ECT** turned off? Or is it blinks in green? (An EtherCAT communication error has been occurred.)
- Is the motor excited, or is the setting of the excitation method correct?
- Are the parameters of the driver set correctly?
- Is the operation stop signal input to the driver?

3-2 Basic operating procedures

This section explains how to perform positioning operation and monitor function as basic operating procedures. This is an example of the operating procedure for controlling via EtherCAT communication using the **NETC01-ECT**.

■ Positioning operation

● Setting example

- Driver address number (slave address): 0
- Operation data No.1
- Position (travel amount): 5,000 steps

● Operating procedure

1. Send the following remote register to set the position (travel amount) of the operation data No.1 to 5,000 steps. When the TRIG is turned ON, the data set in the remote register is written.

[Remote register command of **NETC01-ECT**]

| CoE Index | Sub-Index | Item | Type | Access | Description | | | | | | | |
|-----------------------------|-----------|---------|-------|--------|-------------------------------------------------------|------|------|------|------|------|------|------|
| 2800h (address number 0) | 0 | — | U8 | R | Sub-index number: 4 | | | | | | | |
| | 1 | Axis | U8 | RW | Reserved (not used) | | | | | | | |
| | 2 | Command | U16 | RW | Command code: 1201h (position of operation data No.1) | | | | | | | |
| | 3 | Data | INT32 | RW | Data: 5,000 (travel amount: 5,000 steps) | | | | | | | |
| | 4 | TRIG | U8 | RW | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| | | | | | — | — | — | — | — | — | — | TRIG |

2. When the data writing is completed properly, the TRIG_R is turned ON. At this time, the STATUS remains OFF. Turn the TRIG OFF again after writing.

[Remote register response of **NETC01-ECT**]

| CoE Index | Sub-index | Item | Type | Access | Description | | | | | | | |
|-----------------------------|-----------|---------|-------|--------|------------------------------|------|------|------|---------------|------------|--------|--------|
| 2900h (address number 0) | 0 | — | U8 | R | Sub-index number: 4 | | | | | | | |
| | 1 | Axis | U8 | R | Reserved (not used) | | | | | | | |
| | 2 | Command | U16 | R | Command code response: 1201h | | | | | | | |
| | 3 | Data | INT32 | R | Data response: 5,000 | | | | | | | |
| | 4 | Status | U8 | R | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| | | | | | — | — | — | — | Command Error | Axis Error | STATUS | TRIG_R |



- If the TRIG was turned ON, be sure to turn it OFF again.
- When the data is written with the TRIG, the data is saved in the RAM. If the data is saved in the non-volatile memory, execute the "Batch non-volatile memory (3E85h)" of the maintenance command.

3. Send the following remote I/O to turn the M0 and START ON (9h).
Positioning operation is started. If the motor rotates for 5,000 steps, the positioning operation was successful.

[Remote I/O of **NETC01-ECT**]

| CoE Index | Sub-Index | Item | Type | Access | Description | | | | | | | |
|-----------------------------|-----------|---------------------|------|--------|---------------------|----------|----------|----------|----------|----------|---------|---------|
| 2600h (address number 0) | 0 | — | U8 | R | Sub-index number: 2 | | | | | | | |
| | 1 | I/O command (lower) | U8 | RW | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| | | | | | NET-IN7 | NET-IN6 | NET-IN5 | NET-IN4 | NET-IN3 | NET-IN2 | NET-IN1 | NET-IN0 |
| | 2 | I/O command (upper) | U8 | RW | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| | | | | | NET-IN15 | NET-IN14 | NET-IN13 | NET-IN12 | NET-IN11 | NET-IN10 | NET-IN9 | NET-IN8 |

[NET-IN of **AR** Series (initial value)]

| CoE Index | Sub-Index | Item | Type | Access | Description | | | | | | | |
|-----------------------------|-----------|---------------------|------|--------|---------------------|----------|----------|----------|----------|----------|---------|---------|
| 2600h (address number 0) | 0 | — | U8 | R | Sub-index number: 2 | | | | | | | |
| | 1 | I/O command (lower) | U8 | RW | NET-IN7 | NET-IN6 | NET-IN5 | NET-IN4 | NET-IN3 | NET-IN2 | NET-IN1 | NET-IN0 |
| | | | | | No function | FREE | STOP | HOME | START | M2 | M1 | M0 |
| | 2 | I/O command (upper) | U8 | RW | NET-IN15 | NET-IN14 | NET-IN13 | NET-IN12 | NET-IN11 | NET-IN10 | NET-IN9 | NET-IN8 |
| | | | | | RVS | FWD | —JOG | +JOG | SSTART | MS2 | MS1 | MS0 |

■ Monitor function

● Setting example

- Driver address number (slave address): 0
- Operation data No.0 (the speed was set to 1,000 [Hz])
- Monitor item: Actual speed [r/min]
- Connected driver: **AR** Series

● Operating procedure

1. Send the following remote monitor command to turn the TRIG ON.
The monitor of the actual speed [r/min] of the address number 0 is started.

[Remote monitor command of **NETC01-ECT**]

| CoE Index | Sub-Index | Item | Type | Access | Description | | | | | | | |
|-----------------------------|-----------|---------|-------|--------|-------------------------------------------------------|------|------|------|------|------|------|------|
| 2A00h (address number 0) | 0 | — | U8 | R | Sub-index number: 4 | | | | | | | |
| | 1 | Axis | U8 | RW | Address number: 0 | | | | | | | |
| | 2 | Command | U16 | RW | Command code: 2067h (monitor of actual speed [r/min]) | | | | | | | |
| | 3 | Data | INT32 | RW | Reserved (not used) | | | | | | | |
| | 4 | TRIG | U8 | RW | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| | | | | | — | — | — | — | — | — | — | TRIG |

2. Send the following remote I/O to turn the FWD (40h) of the address number 0 ON.
Continuous operation in the forward direction is started.

[Remote I/O of **NETC01-ECT**]

| CoE Index | Sub-Index | Item | Type | Access | Description | | | | | | | |
|-----------------------------|-----------|---------------------|------|--------|---------------------|----------|----------|----------|----------|----------|---------|---------|
| 2600h (address number 0) | 0 | — | U8 | R | Sub-index number: 2 | | | | | | | |
| | 1 | I/O command (lower) | U8 | RW | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| | | | | | NET-IN7 | NET-IN6 | NET-IN5 | NET-IN4 | NET-IN3 | NET-IN2 | NET-IN1 | NET-IN0 |
| | 2 | I/O command (upper) | U8 | RW | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| | | | | | NET-IN15 | NET-IN14 | NET-IN13 | NET-IN12 | NET-IN11 | NET-IN10 | NET-IN9 | NET-IN8 |

[NET-IN of **AR Series** (initial value)]

| CoE Index | Sub-Index | Item | Type | Access | Description | | | | | | | |
|-----------------------------|-----------|---------------------|------|--------|---------------------|----------|----------|----------|----------|----------|---------|---------|
| 2600h (address number 0) | 0 | — | U8 | R | Sub-index number: 2 | | | | | | | |
| | 1 | I/O command (lower) | U8 | RW | NET-IN7 | NET-IN6 | NET-IN5 | NET-IN4 | NET-IN3 | NET-IN2 | NET-IN1 | NET-IN0 |
| | | | | | No function | FREE | STOP | HOME | START | M2 | M1 | M0 |
| | 2 | I/O command (upper) | U8 | RW | NET-IN15 | NET-IN14 | NET-IN13 | NET-IN12 | NET-IN11 | NET-IN10 | NET-IN9 | NET-IN8 |
| | | | | | RVS | FWD | —JOG | +JOG | SSTART | MS2 | MS1 | MS0 |

3. If the data of the address number 0 is monitored by the remote monitor response, the communication was successful.
The TRIG_R is turned ON while the monitor is performed properly. At this time, the STATUS remains OFF.



The monitor is continued to update while the TRIG of the remote monitor command is being ON.

[Remote monitor response of **NETC01-ECT**]

| CoE Index | Sub-Index | Item | Type | Access | Description | | | | | | | |
|-----------------------------|-----------|---------|-------|--------|------------------------------|------|------|------|---------------|------------|--------|--------|
| 2B00h (address number 0) | 0 | — | U8 | R | Sub-index number: 4 | | | | | | | |
| | 1 | Axis | U8 | R | Address number response: 0 | | | | | | | |
| | 2 | Command | U16 | R | Command code response: 2067h | | | | | | | |
| | 3 | Data | INT32 | R | Monitor data: 1,000 | | | | | | | |
| | 4 | Status | U8 | R | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| | | | | | — | — | — | — | Command Error | Axis Error | STATUS | TRIG_R |

4. Turn the TRIG OFF again to finish the monitor.

4 Details of remote I/O

Remote I/Os are common to all network converters.

4-1 Input signals to the driver

The input signals shown below can be assigned to the NET-IN0 to NET-IN15 of the remote I/O using the parameters. Refer to the following table for the assignments of the NET-IN0 to NET-IN15. The value in [] is the initial value. For details on parameter, refer to "5-5 User parameters" on p.300.

| Bit15 | Bit14 | Bit13 | Bit12 | Bit11 | Bit10 | Bit9 | Bit8 |
|--------------------------|-------------------|--------------------|--------------------|----------------------|-------------------|------------------|------------------|
| NET-IN15 [RVS] | NET-IN14 [FWD] | NET-IN13 [–JOG] | NET-IN12 [+JOG] | NET-IN11 [SSTART] | NET-IN10 [MS2] | NET-IN9 [MS1] | NET-IN8 [MS0] |
| Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| NET-IN7 [No function] | NET-IN6 [FREE] | NET-IN5 [STOP] | NET-IN4 [HOME] | NET-IN3 [START] | NET-IN2 [M2] | NET-IN1 [M1] | NET-IN0 [M0] |

| Signal name | Function | Setting range |
|-------------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| No function | Set when the input terminal is not used. | – |
| FWD | Execute continuous operation in the positive direction. | 0: Deceleration stop 1: Operation |
| RVS | Execute continuous operation in the negative direction. | |
| HOME | Execute return-to-home operation. | 0: No operation 1: Start operation |
| START | Execute positioning operation. | |
| SSTART | Execute sequential positioning operation. | |
| +JOG | Execute JOG operation in the positive direction. | |
| –JOG | Execute JOG operation in the negative direction. | |
| MS0 to MS5 | Execute direct positioning operation of the operation data No. set by the I/O parameter. | 0: No operation 1: Motor non-excitation, electromagnetic brake release |
| FREE | Stop the motor excitation and release the electromagnetic brake. | |
| C-ON | Switch the motor excitation between excitation and non-excitation. | 0: Motor non-excitation 1: Motor excitation |
| STOP | Stop of the motor operation. | 0: No operation 1: Stop operation |
| ALM-RST * | Reset the current alarm. | 0: No operation 1: Reset alarm |
| P-PRESET * | Execute position preset. | 0: No operation 1: Execute preset |
| P-CLR * | Reset the absolute position error alarm. | 0: No operation 1: Reset alarm |
| HMI | Release of the function limitation of the MEXE02 or OPX-2A . | 0: Function limitation 1: Function limitation release |
| R0 to R15 | General signals. Use these signals when controlling the system via RS-485 communication. | 0: OFF 1: ON |
| M0 to M5 | Selects the operation data No. using these six bits. Refer to p.95 for details on the combination. | 0: OFF 1: ON (Operation data Nos.0 to 63 can be selected.) |

* It cannot be set in the driver that is before the specification change. Refer to p.7 for details.



- Do not assign the same input signal to multiple input terminals. When the same input signal is assigned to multiple input terminals, the function will be executed if any of the terminals becomes active.
- The ALM-RST input and P-CLR input will be executed when turning from ON (1) to OFF (0). The P-PRESET input will be executed when turning from OFF (0) to ON (1).
- When the C-ON input and HMI input are not assigned to the input terminals, these inputs will always be set to ON (1). When assigning to both direct I/O and remote I/O, the function will be executed when both of them are set to ON (1).

4-2 Output signals from the driver

The output signals shown below can be assigned to the NET-OUT0 to NET-OUT15 of the remote I/O using the parameters.

Refer to the following table for the assignments of the NET-OUT0 to NET-OUT15. The value in [] is the initial value. For details on parameter, refer to "5-5 User parameters" on p.300.

| Bit15 | Bit14 | Bit13 | Bit12 | Bit11 | Bit10 | Bit9 | Bit8 |
|--------------------|--------------------|---------------------|----------------------|-----------------------|----------------------|---------------------|---------------------|
| NET-OUT15 [TLC] | NET-OUT14 [END] | NET-OUT13 [MOVE] | NET-OUT12 [TIM] | NET-OUT11 [AREA3] | NET-OUT10 [AREA2] | NET-OUT9 [AREA1] | NET-OUT8 [S-BSY] |
| Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
| NET-OUT7 [ALM] | NET-OUT6 [WNG] | NET-OUT5 [READY] | NET-OUT4 [HOME-P] | NET-OUT3 [START_R] | NET-OUT2 [M2_R] | NET-OUT1 [M1_R] | NET-OUT0 [M0_R] |

| Signal name | Function | Data read |
|----------------|--------------------------------------------------------|-----------------------------------------------------|
| No function | Set when the output terminal is not used. | — |
| FWD_R | Output in response to the FWD input. | 0: OFF 1: ON |
| RVS_R | Output in response to the RVS input. | |
| HOME_R | Output in response to the HOME input. | |
| START_R | Output in response to the START input. | |
| SSTART_R | Output in response to the SSTART input. | |
| +JOG_R | Output in response to the +JOG input. | |
| –JOG_R | Output in response to the –JOG input. | |
| MS0_R to MS5_R | Output in response to the MS0 to MS5 input. | |
| FREE_R | Output in response to the FREE input. | |
| C-ON_R | Output in response to the C-ON input. | |
| STOP_R | Output in response to the STOP input. | |
| R0 to R15 | Output the status of the general signal R0 to R15. | |
| M0_R to M5_R | Output in response to the M0 to M5 input. | |
| +LS_R | Output in response to the +LS input. | |
| –LS_R | Output in response to the –LS input. | |
| HOMES_R | Output in response to the HOMES input. | |
| SLIT_R | Output in response to the SLIT input. | |
| ALM | Output the alarm status of the driver (normally open). | 0: Alarm not present 1: Alarm present |
| WNG | Output the warning status of the driver. | 0: Warning not present 1: Warning present |
| READY | Output when the driver is ready. | 0: Not ready 1: Ready |
| MOVE | Output while the motor operates. | 0: Motor stopped 1: Motor operating |
| END | Output when the positioning operation is completed. | 0: Motor operating 1: Motor operating completion |

| Signal name | Function | Data read |
|----------------|-------------------------------------------------------------|---------------------------------------------------|
| HOME-P | Output when the motor is in home position. | 0: Not home position 1: Home position |
| TLC | Output when the load is outside of the motor torque range. | 0: Inside torque range 1: Outside torque range |
| TIM | Output once every 7.2° rotation of the motor Outputs shaft. | 0: OFF 1: ON |
| AREA1 to AREA3 | Output when the motor is within the area. | 0: Outside area 1: Inside area |
| S-BSY | Output when the driver is in internal processing state. | 0: OFF 1: ON |
| MPS * | Output while the driver main power is on. | 0: OFF 1: ON |

* AC power input only

5 Command code list

Command codes are common to all network converters.

5-1 Group function

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

■ Group composition

A group consists of one parent slave and child slaves.

■ Group address

To perform a group send, set a group address to the child slaves to be included in the group.

The child slaves to which the group address has been set can receive a command sent to the parent slave.

The operation command will be sent to the child slaves in the same group by sending it to the parent slave.

● Parent slave

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

● Child slave

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



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

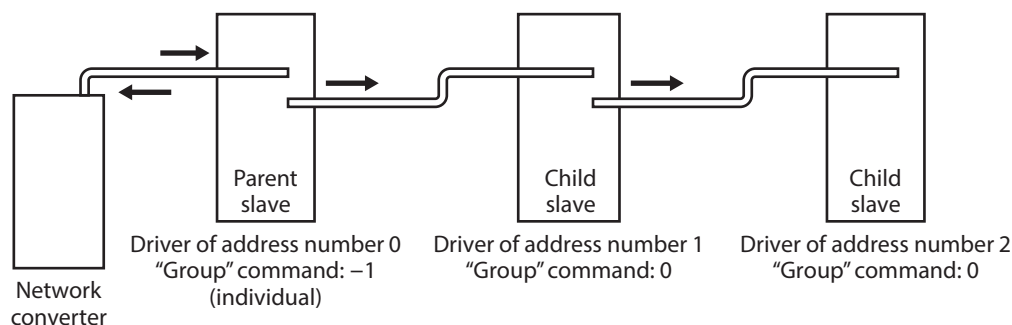
The group setting is not saved in the non-volatile memory even when the maintenance command "Batch non-volatile memory write" executes.

| Command code | | Name | Description | Initial value |
|---------------|-----------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Read | Write | | | |
| 24 (0018h) | 4120 (1018h) | Group | Sets the group address. [Setting range] -1: Individual (No group setting) 0 to 15: Group address (Address number of parent slave) * | -1 |

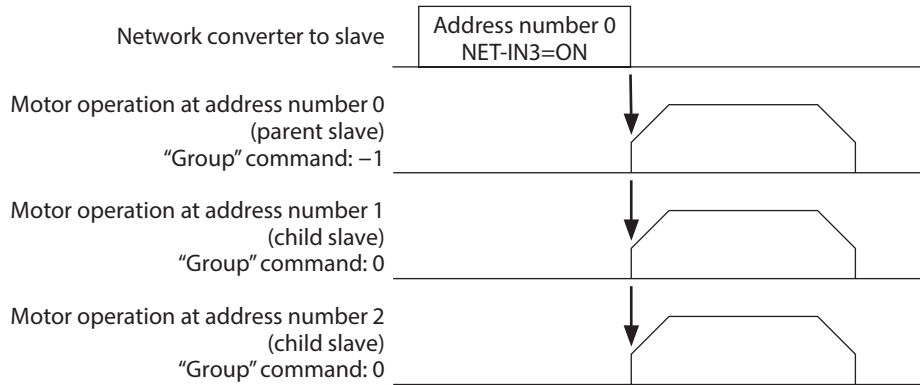
* Set in the 0 to 11 range when using the **NETC01-CC**, and set in the 0 to 15 range when using other network converter.

■ Example for setting of the group function

Set as follows when making a group by setting the driver of address number 0 to the parent slave and by setting the driver of address number 1 and 2 to the child slaves.



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



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

5-2 Maintenance command

These commands are used to clear the alarm records and warning records. They are also used to execute the batch processing for the non-volatile memory.

| Command code | Name | Description | Setting range |
|------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 12480 (30C0h) | Reset alarm | Resets the alarms that are present. Some alarms cannot be reset with the "reset alarm." | 1: Execute |
| 12481 (30C1h) | Absolute position error alarm reset | Resets the absolute position error alarm. Since this alarm is the dedicated alarm for the absolute position error, other alarms cannot be reset. | |
| 12482 (30C2h) | Clear alarm records | Clears alarm records. | |
| 12483 (30C3h) | Clear warning records | Clears warning records. | |
| 12484 (30C4h) | Clear communication error records | Clears communication error records. | |
| 12485 (30C5h) | P-PRESET execute | Updates the command position to the value of the "Preset position" parameter. | |
| 12486 (30C6h) | Configuration | Executes the parameter recalculation and the setup. | |
| 12487 (30C7h) | All data initialization | Resets the operation data and parameters saved in the non-volatile memory to the initial value. Note that "Communication parity", "Communication stop bit", and "Transmission waiting time" parameters are not initialized. | |
| 12488 (30C8h) | Batch non-volatile memory read | Reads the operation data and parameters saved in the non-volatile memory, to the RAM. All operation data and parameters previously saved in the RAM are overwritten. | |
| 12489 (30C9h) | Batch non-volatile memory write | Writes the operation data and parameters saved in the RAM to the non-volatile memory. | |



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

5-3 Monitor command

These commands are used to monitor the driver condition.

| Command code | Name | Description |
|-----------------|-----------------------------------|---------------------------------------------------------------------------------|
| 8256 (2040h) | Present alarm | Monitors the present alarm code. |
| 8257 (2041h) | Alarm record 1 | Monitors the alarm records 1 to 10. |
| 8258 (2042h) | Alarm record 2 | |
| 8259 (2043h) | Alarm record 3 | |
| 8260 (2044h) | Alarm record 4 | |
| 8261 (2045h) | Alarm record 5 | |
| 8262 (2046h) | Alarm record 6 | |
| 8263 (2047h) | Alarm record 7 | |
| 8264 (2048h) | Alarm record 8 | |
| 8265 (2049h) | Alarm record 9 | |
| 8266 (204Ah) | Alarm record 10 | |
| 8267 (2048h) | Present warning | Monitors the present warning code. |
| 8268 (204Ch) | Warning record 1 | Monitors the warning records 1 to 10. |
| 8269 (204Dh) | Warning record 2 | |
| 8270 (204Eh) | Warning record 3 | |
| 8271 (204Fh) | Warning record 4 | |
| 8272 (2050h) | Warning record 5 | |
| 8273 (2051h) | Warning record 6 | |
| 8274 (2052h) | Warning record 7 | |
| 8275 (2053h) | Warning record 8 | |
| 8276 (2054h) | Warning record 9 | |
| 8277 (2055h) | Warning record 10 | |
| 8279 (2057h) | Communication error code record 1 | Monitors the communication error records 1 to 3 that have occurred in the past. |
| 8280 (2058h) | Communication error code record 2 | |
| 8281 (2059h) | Communication error code record 3 | |

| Command code | Name | Description |
|-----------------|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8282 (205Ah) | Communication error code record 4 | Monitors the communication error records 4 to 10 that have occurred in the past. |
| 8283 (205Bh) | Communication error code record 5 | |
| 8284 (205Ch) | Communication error code record 6 | |
| 8285 (205Dh) | Communication error code record 7 | |
| 8286 (205Eh) | Communication error code record 8 | |
| 8287 (205Fh) | Communication error code record 9 | |
| 8288 (2060h) | Communication error code record 10 | |
| 8289 (2061h) | Present selected data No. | Monitors the operation data No. currently selected. |
| 8290 (2062h) | Present operation data No. | Monitors the operation data No. corresponding to the data used in the current positioning operation. This address is used in linked-motion operation and sequential positioning operation. While the motor is stopped, the last used operation data number is indicated. |
| 8291 (2063h) | Command position | Monitors the command position. |
| 8292 (2064h) | Command speed | Monitors the current command speed. (r/min) |
| 8294 (2066h) | Actual position | Monitors the actual position. |
| 8295 (2067h) | Actual speed | Monitors the actual speed. (r/min) |
| 8297 (2069h) | Remaining dwell time | Monitors how much of the dwell time used in the linked-motion 2 operation remains. |
| 8298 (206Ah) | Direct I/O and electromagnetic brake status | Monitors the each direct I/O signal and electromagnetic brake status. Refer to the following table for the assignments. |

■ Direct I/O and electromagnetic brake status [8298 (206Ah)]

| Byte | Bit7 | Bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
|------|------|------|------|------|------|-------|------|------|
| 0 | IN1 | IN0 | — | — | SLIT | HOMES | —LS | +LS |
| 1 | — | — | IN7 | IN6 | IN5 | IN4 | IN3 | IN2 |
| 2 | — | — | OUT5 | OUT4 | OUT3 | OUT2 | OUT1 | OUT0 |
| 3 | — | — | — | — | — | — | — | MB |

5-4 Operation data

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

When the operation data is changed, a recalculation and setup will be performed after the operation is stopped and the changed value will be update.

| Command code | | Name | Setting range | Initial value |
|------------------------------------------|------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------|---------------|
| Read | Write | | | |
| 512 (0200h) to 575 (023Fh) | 4608 (1200h) to 4671 (123Fh) | Position No.0 to Position No.63 | −8,388,608 to 8,388,607 step | 0 |
| 576 (0240h) to 639 (027Fh) | 4672 (1240h) to 4735 (127Fh) | Operating speed No.0 to Operating speed No.63 | 0 to 1,000,000 Hz | 1,000 |
| 640 (0280h) to 703 (02BFh) | 4736 (1280h) to 4799 (12BFh) | Operation mode No.0 to Operation mode No.63 | 0: Incremental 1: Absolute | 0 |
| 704 (02C0h) to 767 (02FFh) | 4800 (12C0h) to 4863 (12FFh) | Operation function No.0 to Operation function No.63 | 0: Single-motion 1: Linked-motion 2: Linked-motion 2 3: Push | 0 |
| 768 (0300h) to 831 (033Fh) | 4864 (1300h) to 4927 (133Fh) | Acceleration No.0 to Acceleration No.63 | 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *1 *2 | 1,000 |
| 832 (0340h) to 895 (037Fh) | 4928 (1340h) to 4991 (137Fh) | Deceleration No.0 to Deceleration No.63 | 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) *1 *2 | 1,000 |
| 896 (0380h) to 959 (03BFh) | 4992 (1380h) to 5055 (13BFh) | Push current No.0 to Push current No.63 | 0 to 1,000 (1=0.1 %) *3 | 200 |
| 960 (03C0h) to 1023 (03FFh) | 5056 (13C0h) to 5119 (13FFh) | Sequential positioning No.0 to Sequential positioning No.63 | 0: Disable 1: Enable | 0 |
| 1024 (0400h) to 1087 (043Fh) | 5120 (1400h) to 5183 (143Fh) | Dwell time No.0 to Dwell time No.63 | 0 to 50,000 (1=0.001 s) | 0 |

*1 This item is effective when the "Acceleration/deceleration type" parameter is set to "Separate." If this parameter is set to "Common", the values of the "Common acceleration" and "Common deceleration" parameters will be used (initial value: separate).

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

*3 For the driver which is before the specification change, the setting range is 0 to 500 (1=0.1 %). Refer to p.7 for details.

5-5 User parameters

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

When turning the driver DC power ON, the parameters saved in the non-volatile memory will be sent to the RAM. Then, the recalculation and setup for the parameters are executed in the RAM.

The parameters are written in the RAM area when setting via industrial network. To save the parameters written in the RAM to non-volatile memory, execute the "Batch non-volatile 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 update the new value varies depending on the parameter. Refer to the following three types.

| Update timing | | Description |
|---------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| A | Immediately | Executes the recalculation and setup immediately when writing the parameter. |
| B | After stopping the operation | Executes the recalculation and setup after stopping the operation. |
| C | After executing the configuration or after cycling the power | Executes the recalculation and setup after executing the configuration or turning the DC power ON again. |

In this chapter, each update timing is represented in A to C.



- The parameters are written in the RAM area when setting via industrial network. If parameters, which are required turning on the power again in order to update, are changed, 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.

■ I/O parameter

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|----------------|-----------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------|----------------|
| READ | WRITE | | | | |
| 256 (0100h) | 4352 (1100h) | STOP input action | 0: Immediate stop 1: Deceleration stop 2: Immediate stop & Current OFF 3: Deceleration stop & Current OFF | 1 | A |
| 257 (0101h) | 4353 (1101h) | Hardware overtravel | 0: Disable 1: Enable | 1 | |
| 258 (0102h) | 4354 (1102h) | Overtravel action | 0: Immediate stop 1: Deceleration stop | 0 | |
| 259 (0103h) | 4355 (1103h) | END signal range | 0 to 180 (1=0.1°) | 18 | |
| 260 (0104h) | 4356 (1104h) | Position complete output offset | −18 to 18 (1=0.1°) | 0 | |
| 261 (0105h) | 4357 (1105h) | AREA1 positive direction position | −8,388,608 to 8,388,607 step | 0 | |
| 262 (0106h) | 4358 (1106h) | AREA1 negative direction position | | | |
| 263 (0107h) | 4359 (1107h) | AREA2 positive direction position | | | |
| 264 (0108h) | 4360 (1108h) | AREA2 negative direction position | | | |

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|-----------------|-----------------|-----------------------------------|-----------------------------------------------------|---------------|----------------|
| READ | WRITE | | | | |
| 265 (0109h) | 4361 (1109h) | AREA3 positive direction position | -8,388,608 to 8,388,607 step | 0 | A |
| 266 (010Ah) | 4362 (110Ah) | AREA3 negative direction position | | | |
| 267 (010Bh) | 4363 (110Bh) | Minimum ON time for MOVE output | 0 to 255 ms | 0 | |
| 268 (010Ch) | 4364 (110Ch) | LS contact configuration | 0: Make (N.O.) 1: Brake (N.C.) | 0 | C |
| 269 (010Dh) | 4365 (110Dh) | HOMES logic level | | | |
| 270 (010Eh) | 4366 (110Eh) | SLIT logic level | | | |
| 2048 (0800h) | 6144 (1800h) | MS0 operation No. selection | 0 to 63 | 0 | B |
| 2049 (0801h) | 6145 (1801h) | MS1 operation No. selection | | 1 | |
| 2050 (0802h) | 6146 (1802h) | MS2 operation No. selection | | 2 | |
| 2051 (0803h) | 6147 (1803h) | MS3 operation No. selection | | 3 | |
| 2052 (0804h) | 6148 (1804h) | MS4 operation No. selection | | 4 | |
| 2053 (0805h) | 6149 (1805h) | MS5 operation No. selection | | 5 | |
| 2054 (0806h) | 6150 (1806h) | HOME-P output function selection | 0: Home output 1: Return-to-home complete output | 0 | A |

Motor parameter

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|-----------------|-----------------|-----------------------------------|---------------------------------------------|---------------|----------------|
| READ | WRITE | | | | |
| 288 (0120h) | 4384 (1120h) | RUN current | 0 to 1,000 (1=0.1 %) | 1,000 | A |
| 289 (0121h) | 4385 (1121h) | STOP current | 0 to 500 (1=0.1 %) | 500 | |
| 290 (0122h) | 4386 (1122h) | Position loop gain | 1 to 50 | 10 | |
| 291 (0123h) | 4387 (1123h) | Speed loop gain | 10 to 200 | 180 | |
| 292 (0124h) | 4388 (1124h) | Speed loop integral time constant | 100 to 2,000 (1=0.1 ms) | 1,000 | |
| 293 (0125h) | 4389 (1125h) | Speed filter | 0 to 200 ms | 1 | B |
| 294 (0126h) | 4390 (1126h) | Moving average time | 1 to 200 ms | 1 | |
| 2064 (0810h) | 6160 (1810h) | Filter selection | 0: Speed filter 1: Moving average filter | 0 | C |
| 2065 (0811h) | 6161 (1811h) | Speed difference gain 1 | 0 to 500 | 45 | A |
| 2066 (0812h) | 6162 (1812h) | Speed difference gain 2 | 0 to 500 | 45 | |

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|-----------------|-----------------|--------------|-------------------------------------------|---------------|----------------|
| READ | WRITE | | | | |
| 2067 (0813h) | 6163 (1813h) | Control mode | 0: Normal mode 1: Current control mode | 0 | C |
| 2068 (0814h) | 6164 (1814h) | Smooth drive | 0: Disable 1: Enable | 1 | |

■ Operation parameter

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|-----------------|-----------------|-------------------------------------------------|------------------------------------------------|---------------|----------------|
| READ | WRITE | | | | |
| 320 (0140h) | 4416 (1140h) | Common acceleration | 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) * | 1,000 | B |
| 321 (0141h) | 4417 (1141h) | Common deceleration | 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) * | 1,000 | |
| 322 (0142h) | 4418 (1142h) | Starting speed | 0 to 1,000,000 Hz | 500 | |
| 323 (0143h) | 4419 (1143h) | JOG operating speed | 1 to 1,000,000 Hz | 1,000 | |
| 324 (0144h) | 4420 (1144h) | Acceleration/deceleration rate of JOG | 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) * | 1,000 | |
| 325 (0145h) | 4421 (1145h) | JOG starting speed | 0 to 1,000,000 Hz | 500 | |
| 326 (0146h) | 4422 (1146h) | Acceleration/deceleration type | 0: Common 1: Separate | 1 | C |
| 327 (0147h) | 4423 (1147h) | Acceleration/deceleration unit | 0: ms/kHz 1: s | 0 | |
| 2080 (0820h) | 6176 (1820h) | Automatic return operation | 0: Disable 1: Enable | 0 | |
| 2081 (0821h) | 6177 (1821h) | Operation speed of automatic return | 1 to 1,000,000 Hz | 1,000 | B |
| 2082 (0822h) | 6178 (1822h) | Acceleration (deceleration) of automatic return | 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) * | 1,000 | |
| 2083 (0823h) | 6179 (1823h) | Starting speed of automatic return | 0 to 1,000,000 Hz | 500 | |
| 2084 (0824h) | 6180 (1824h) | JOG travel amount | 1 to 8,388,607 step | 1 | |

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

■ Home operation parameter

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|----------------|-----------------|-------------------------------------------|------------------------------------------------------|---------------|----------------|
| READ | WRITE | | | | |
| 352 (0160h) | 4448 (1160h) | Home-seeking mode | 0: 2-sensor mode 1: 3-sensor mode 2: Push mode | 1 | B |
| 353 (0161h) | 4449 (1161h) | Operating speed of home-seeking | 1 to 1,000,000 Hz | 1,000 | |
| 354 (0162h) | 4450 (1162h) | Acceleration/deceleration of home-seeking | 1 to 1,000,000 (1=0.001 ms/kHz or 1=0.001 s) * | 1,000 | |
| 355 (0163h) | 4451 (1163h) | Starting speed of home-seeking | 1 to 1,000,000 Hz | 500 | |
| 356 (0164h) | 4452 (1164h) | Position offset of home-seeking | −8,388,608 to 8,388,607 step | 0 | |

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|----------------|-----------------|----------------------------------------------------|------------------------------------------------|---------------|----------------|
| READ | WRITE | | | | |
| 357 (0165h) | 4453 (1165h) | Starting direction of home-seeking | 0: Negative direction 1: Positive direction | 1 | B |
| 358 (0166h) | 4454 (1166h) | SLIT detection with home-seeking | 0: Disable 1: Enable | 0 | |
| 359 (0167h) | 4455 (1167h) | TIM signal detection with home-seeking | 0: Disable 1: Enable | 0 | |
| 360 (0168h) | 4456 (1168h) | Operating current of home-seeking with push-motion | 0 to 1,000 (1=0.1 %) | 1,000 | |

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

■ Alarm parameter

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|-----------------|-----------------|---------------------------------------------------|--------------------------|---------------|----------------|
| READ | WRITE | | | | |
| 384 (0180h) | 4480 (1180h) | Overload alarm | 1 to 300 (1=0.1 s) | 50 | A |
| 385 (0181h) | 4481 (1181h) | Excessive position deviation alarm at current ON | 1 to 30,000 (1=0.01 rev) | 300 | |
| 388 (0184h) | 4484 (1184h) | Return-to-home incomplete alarm | 0: Disable 1: Enable | 0 | C |
| 2112 (0840h) | 6208 (1840h) | Excessive position deviation alarm at current OFF | 1 to 30,000 (1=0.01 rev) | 10,000 | A |

■ Warning parameter

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|----------------|-----------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------|
| READ | WRITE | | | | |
| 416 (01A0h) | 4512 (11A0h) | Overheat warning | 40 to 85 °C | 85 | A |
| 417 (01A1h) | 4513 (11A1h) | Overload warning | 1 to 300 (1=0.1 s) | 50 | |
| 418 (01A2h) | 4514 (11A2h) | Overspeed warning | 1 to 5,000 r/min | 4,500 | |
| 419 (01A3h) | 4515 (11A3h) | Overvoltage warning | <ul style="list-style-type: none"> AC power input: 120 to 450 V DC power input: 150 to 630 (1=0.1 V) | AC power input: 435 DC power input: 630 | |
| 420 (01A4h) | 4516 (11A4h) | Undervoltage warning | <ul style="list-style-type: none"> AC power input: 120 to 280 V DC power input: 150 to 630 (1=0.1 V) | AC power input: 120 DC power input: 180 | |
| 421 (01A5h) | 4517 (11A5h) | Excessive position deviation warning at current ON | 1 to 30,000 (1=0.01 rev) | 300 | |

■ Coordinates parameter

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|----------------|-----------------|--------------------------|-------------------------------------------------------|---------------|----------------|
| READ | WRITE | | | | |
| 448 (01C0h) | 4544 (11C0h) | Electronic gear A | 1 to 65,535 | 1 | C |
| 449 (01C1h) | 4545 (11C1h) | Electronic gear B | 1 to 65,535 | 1 | |
| 450 (01C2h) | 4546 (11C2h) | Motor rotation direction | 0: Positive direction=CCW 1: Positive direction=CW | 1 | |
| 451 (01C3h) | 4547 (11C3h) | Software overtravel | 0: Disable 1: Enable | 1 | A |
| 452 (01C4h) | 4548 (11C4h) | Positive software limit | −8,388,608 to 8,388,607 step | 8,388,607 | |
| 453 (01C5h) | 4549 (11C5h) | Negative software limit | −8,388,608 to 8,388,607 step | −8,388,608 | |
| 454 (01C6h) | 4550 (11C6h) | Preset position | −8,388,608 to 8,388,607 step | 0 | |
| 455 (01C7h) | 4551 (11C7h) | Wrap setting | 0: Disable 1: Enable | 0 | C |
| 456 (01C8h) | 4552 (11C8h) | Wrap setting range | 1 to 8,388,607 step | 1,000 | |

■ Common parameter

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|----------------|-----------------|---------------------------|--------------------------------|---------------|----------------|
| READ | WRITE | | | | |
| 480 (01E0h) | 4576 (11E0h) | Data setter speed display | 0: Signed 1: Absolute value | 0 | A |
| 481 (01E1h) | 4577 (11E1h) | Data setter edit | 0: Disable 1: Enable | 1 | |
| 482 (01E2h) | 4578 (11E2h) | Absolute back-up system | 0: Disable 1: Enable | 0 | C |

■ I/O function [Input] parameter

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|-----------------|-----------------|------------------------------|-------------------------------|---------------|----------------|
| READ | WRITE | | | | |
| 2176 (0880h) | 6272 (1880h) | IN0 input function selection | Refer to the following table. | 3: HOME | C |
| 2177 (0881h) | 6273 (1881h) | IN1 input function selection | | 4: START | |
| 2178 (0882h) | 6274 (1882h) | IN2 input function selection | | 48: M0 | |
| 2179 (0883h) | 6275 (1883h) | IN3 input function selection | | 49: M1 | |
| 2180 (0884h) | 6276 (1884h) | IN4 input function selection | | 50: M2 | |
| 2181 (0885h) | 6277 (1885h) | IN5 input function selection | | 16: FREE | |
| 2182 (0886h) | 6278 (1886h) | IN6 input function selection | | 18: STOP | |
| 2183 (0887h) | 6279 (1887h) | IN7 input function selection | | 24: ALM-RST | |

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|-----------------|-----------------|-------------------------------|----------------------------------|---------------|-------------------|
| READ | WRITE | | | | |
| 2192 (0890h) | 6288 (1890h) | IN0 input logic level setting | 0: Make (N.O) 1: Brake (N.C.) | 0 | C |
| 2193 (0891h) | 6289 (1891h) | IN1 input logic level setting | | | |
| 2194 (0892h) | 6290 (1892h) | IN2 input logic level setting | | | |
| 2195 (0893h) | 6291 (1893h) | IN3 input logic level setting | | | |
| 2196 (0894h) | 6292 (1894h) | IN4 input logic level setting | | | |
| 2197 (0895h) | 6293 (1895h) | IN5 input logic level setting | | | |
| 2198 (0896h) | 6294 (1896h) | IN6 input logic level setting | | | |
| 2199 (0897h) | 6295 (1897h) | IN7 input logic level setting | | | |

Setting range for IN input function selection

| | | | | | |
|----------------|----------|--------------|---------|---------|--------|
| 0: No function | 8: MS0 | 18: STOP | 35: R3 | 43: R11 | 51: M3 |
| 1: FWD | 9: MS1 | 24: ALM-RST | 36: R4 | 44: R12 | 52: M4 |
| 2: RVS | 10: MS2 | 25: P-PRESET | 37: R5 | 45: R13 | 53: M5 |
| 3: HOME | 11: MS3 | 26: P-CLR | 38: R6 | 46: R14 | |
| 4: START | 12: MS4 | 27: HMI | 39: R7 | 47: R15 | |
| 5: SSTART | 13: MS5 | 32: R0 | 40: R8 | 48: M0 | |
| 6: +JOG | 16: FREE | 33: R1 | 41: R9 | 49: M1 | |
| 7: -JOG | 17: C-ON | 34: R2 | 42: R10 | 50: M2 | |

■ I/O function [Output] parameter

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|-----------------|-----------------|--------------------------------|----------------------------------|---------------|-------------------|
| READ | WRITE | | | | |
| 2208 (08A0h) | 6304 (18A0h) | OUT0 output function selection | Refer to the following table. | 70: HOME-P | C |
| 2209 (08A1h) | 6305 (18A1h) | OUT1 output function selection | | 69: END | |
| 2210 (08A2h) | 6306 (18A2h) | OUT2 output function selection | | 73: AREA1 | |
| 2211 (08A3h) | 6307 (18A3h) | OUT3 output function selection | | 67: READY | |
| 2212 (08A4h) | 6308 (18A4h) | OUT4 output function selection | | 66: WNG | |
| 2213 (08A5h) | 6309 (18A5h) | OUT5 output function selection | | 65: ALM | |

Setting range for OUT output function selection

| | | | | | |
|----------------|------------|---------|-----------|-------------|-----------|
| 0: No function | 10: MS2_R | 35: R3 | 45: R13 | 61: -LS_R | 72: TIM |
| 1: FWD_R | 11: MS3_R | 36: R4 | 46: R14 | 62: HOMES_R | 73: AREA1 |
| 2: RVS_R | 12: MS4_R | 37: R5 | 47: R15 | 63: SLIT_R | 74: AREA2 |
| 3: HOME_R | 13: MS5_R | 38: R6 | 48: M0_R | 65: ALM | 75: AREA3 |
| 4: START_R | 16: FREE_R | 39: R7 | 49: M1_R | 66: WNG | 80: S-BSY |
| 5: SSTART_R | 17: C-ON_R | 40: R8 | 50: M2_R | 67: READY | 82: MPS * |
| 6: +JOG_R | 18: STOP_R | 41: R9 | 51: M3_R | 68: MOVE | |
| 7: -JOG_R | 32: R0 | 42: R10 | 52: M4_R | 69: END | |
| 8: MS0_R | 33: R1 | 43: R11 | 53: M5_R | 70: HOME-P | |
| 9: MS1_R | 34: R2 | 44: R12 | 60: +LS_R | 71: TLC | |

* AC power input only.

I/O function [RS-485] parameter

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|-----------------|-----------------|------------------------------------|--------------------------------------------------------------------------|----------------|-------------------|
| READ | WRITE | | | | |
| 2224 (08B0h) | 6320 (18B0h) | NET-IN0 input function selection | Refer to "Setting range for NET-IN input function selection" on p.307. | 48: M0 | C |
| 2225 (08B1h) | 6321 (18B1h) | NET-IN1 input function selection | | 49: M1 | |
| 2226 (08B2h) | 6322 (18B2h) | NET-IN2 input function selection | | 50: M2 | |
| 2227 (08B3h) | 6323 (18B3h) | NET-IN3 input function selection | | 4: START | |
| 2228 (08B4h) | 6324 (18B4h) | NET-IN4 input function selection | | 3: HOME | |
| 2229 (08B5h) | 6325 (18B5h) | NET-IN5 input function selection | | 18: STOP | |
| 2230 (08B6h) | 6326 (18B6h) | NET-IN6 input function selection | | 16: FREE | |
| 2231 (08B7h) | 6327 (18B7h) | NET-IN7 input function selection | | 0: No function | |
| 2232 (08B8h) | 6328 (18B8h) | NET-IN8 input function selection | | 8: MS0 | |
| 2233 (08B9h) | 6329 (18B9h) | NET-IN9 input function selection | | 9: MS1 | |
| 2234 (08BAh) | 6330 (18BAh) | NET-IN10 input function selection | | 10: MS2 | |
| 2235 (08BBh) | 6331 (18BBh) | NET-IN11 input function selection | | 5: SSTART | |
| 2236 (08BCh) | 6332 (18BCh) | NET-IN12 input function selection | | 6: +JOG | |
| 2237 (08BDh) | 6333 (18BDh) | NET-IN13 input function selection | | 7: –JOG | |
| 2238 (08BEh) | 6334 (18BEh) | NET-IN14 input function selection | | 1: FWD | |
| 2239 (08BFh) | 6335 (18BFh) | NET-IN15 input function selection | | 2: RVS | |
| 2240 (08C0h) | 6336 (18C0h) | NET-OUT0 output function selection | Refer to "Setting range for NET-OUT output function selection" on p.307. | 48: M0_R | C |
| 2241 (08C1h) | 6337 (18C1h) | NET-OUT1 output function selection | | 49: M1_R | |
| 2242 (08C2h) | 6338 (18C2h) | NET-OUT2 output function selection | | 50: M2_R | |
| 2243 (08C3h) | 6339 (18C3h) | NET-OUT3 output function selection | | 4: START_R | |
| 2244 (08C4h) | 6340 (18C4h) | NET-OUT4 output function selection | | 70: HOME-P | |
| 2245 (08C5h) | 6341 (18C5h) | NET-OUT5 output function selection | | 67: READY | |
| 2246 (08C6h) | 6342 (18C6h) | NET-OUT6 output function selection | | 66: WNG | |
| 2247 (08C7h) | 6343 (18C7h) | NET-OUT7 output function selection | | 65: ALM | |
| 2248 (08C8h) | 6344 (18C8h) | NET-OUT8 output function selection | | 80: S-BSY | |
| 2249 (08C9h) | 6345 (18C9h) | NET-OUT9 output function selection | | 73: AREA1 | |

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|-----------------|-----------------|-------------------------------------|----------------------------------------------------------------|---------------|----------------|
| READ | WRITE | | | | |
| 2250 (08CAh) | 6346 (18CAh) | NET-OUT10 output function selection | Refer to "Setting range for NET-OUT output function selection" | 74: AREA2 | C |
| 2251 (08CBh) | 6347 (18CBh) | NET-OUT11 output function selection | | 75: AREA3 | |
| 2252 (08CCh) | 6348 (18CCh) | NET-OUT12 output function selection | | 72: TIM | |
| 2253 (08CDh) | 6349 (18CDh) | NET-OUT13 output function selection | | 68: MOVE | |
| 2254 (08CEh) | 6350 (18CEh) | NET-OUT14 output function selection | | 69: END | |
| 2255 (08CFh) | 6351 (18CFh) | NET-OUT15 output function selection | | 71: TLC | |

● Setting range for NET-IN input function selection

| | | | | | |
|----------------|----------|----------------|---------|---------|--------|
| 0: No function | 8: MS0 | 18: STOP | 35: R3 | 43: R11 | 51: M3 |
| 1: FWD | 9: MS1 | 24: ALM-RST * | 36: R4 | 44: R12 | 52: M4 |
| 2: RVS | 10: MS2 | 25: P-PRESET * | 37: R5 | 45: R13 | 53: M5 |
| 3: HOME | 11: MS3 | 26: P-CLR * | 38: R6 | 46: R14 | |
| 4: START | 12: MS4 | 27: HMI | 39: R7 | 47: R15 | |
| 5: SSTART | 13: MS5 | 32: R0 | 40: R8 | 48: M0 | |
| 6: +JOG | 16: FREE | 33: R1 | 41: R9 | 49: M1 | |
| 7: -JOG | 17: C-ON | 34: R2 | 42: R10 | 50: M2 | |

* These three signals cannot be set in the driver which is before the specification change. Refer to p.7 for details.

● Setting range for NET-OUT output function selection

| | | | | | |
|----------------|------------|---------|-----------|-------------|-----------|
| 0: No function | 10: MS2_R | 35: R3 | 45: R13 | 61: -LS_R | 72: TIM |
| 1: FWD_R | 11: MS3_R | 36: R4 | 46: R14 | 62: HOMES_R | 73: AREA1 |
| 2: RVS_R | 12: MS4_R | 37: R5 | 47: R15 | 63: SLIT_R | 74: AREA2 |
| 3: HOME_R | 13: MS5_R | 38: R6 | 48: M0_R | 65: ALM | 75: AREA3 |
| 4: START_R | 16: FREE_R | 39: R7 | 49: M1_R | 66: WNG | 80: S-BSY |
| 5: SSTART_R | 17: C-ON_R | 40: R8 | 50: M2_R | 67: READY | 82: MPS * |
| 6: +JOG_R | 18: STOP_R | 41: R9 | 51: M3_R | 68: MOVE | |
| 7: -JOG_R | 32: R0 | 42: R10 | 52: M4_R | 69: END | |
| 8: MS0_R | 33: R1 | 43: R11 | 53: M5_R | 70: HOME-P | |
| 9: MS1_R | 34: R2 | 44: R12 | 60: +LS_R | 71: TLC | |

* AC power input only.

■ Communication parameter

| Command code | | Description | Setting range | Initial value | Update (p.300) |
|-----------------|-----------------|---------------------------|------------------------------------|---------------|----------------|
| READ | WRITE | | | | |
| 2304 (0900h) | 6400 (1900h) | Communication timeout | 0: Not monitored 1 to 10,000 ms | 0 | A |
| 2305 (0901h) | 6401 (1901h) | Communication error alarm | 1 to 10 times | 3 | |

8 **Appendix**

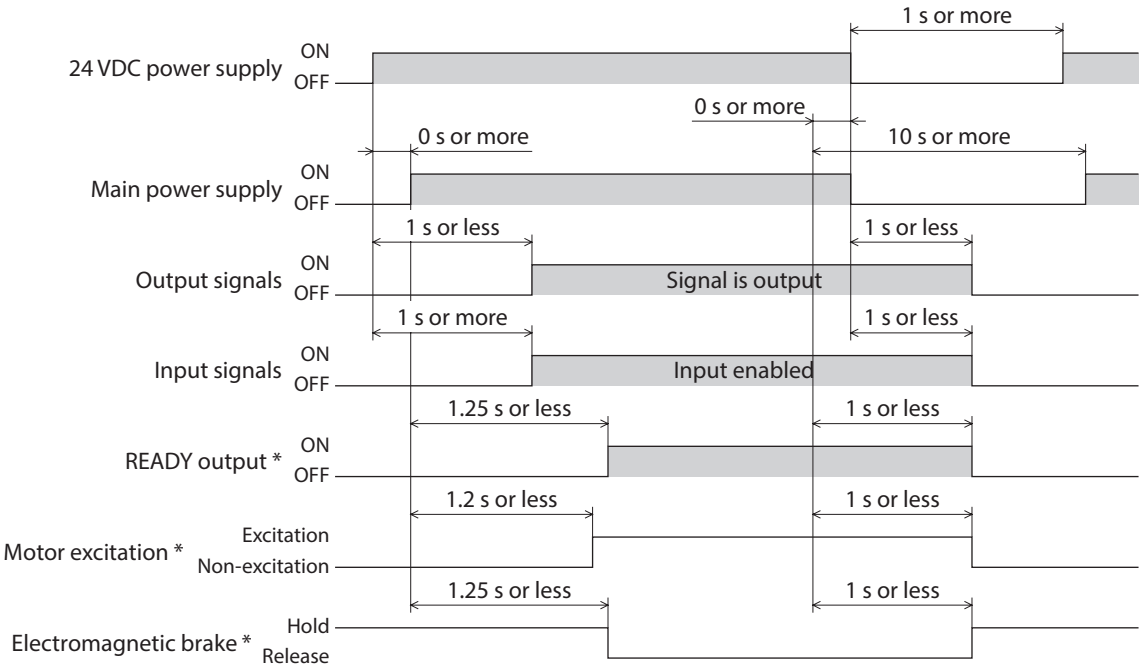
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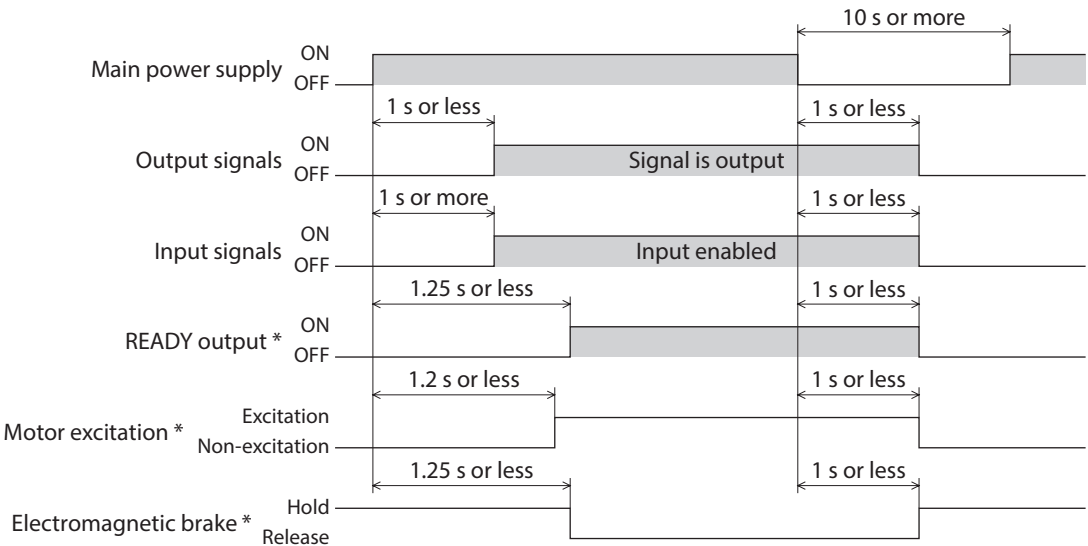
1 Timing charts

■ Power supply input (AC power input)



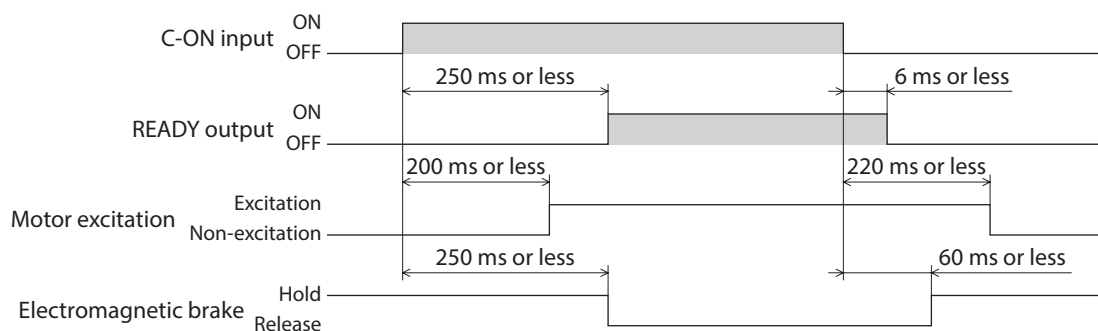
* When the C-ON input is not assigned or when the C-ON input is assigned as normally closed.

■ Power supply input (DC power input)



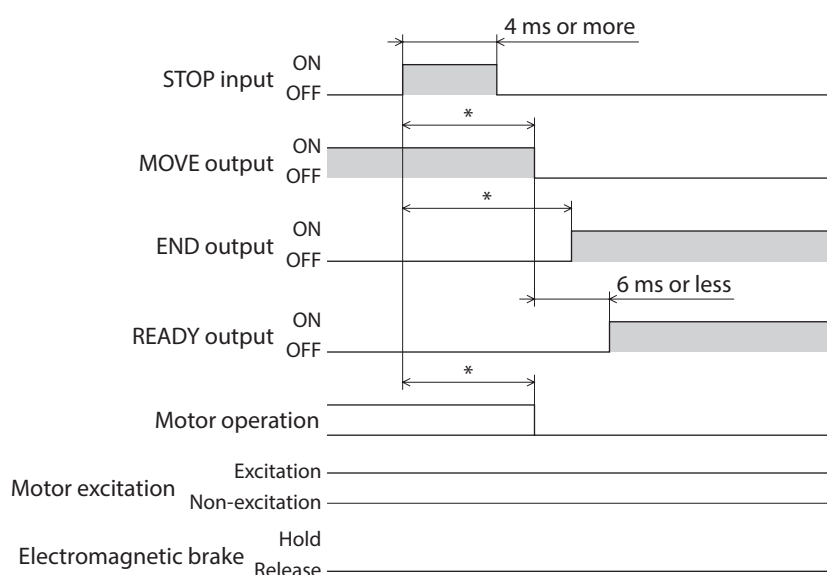
* When the C-ON input is not assigned or when the C-ON input is assigned as normally closed.

■ C-ON input



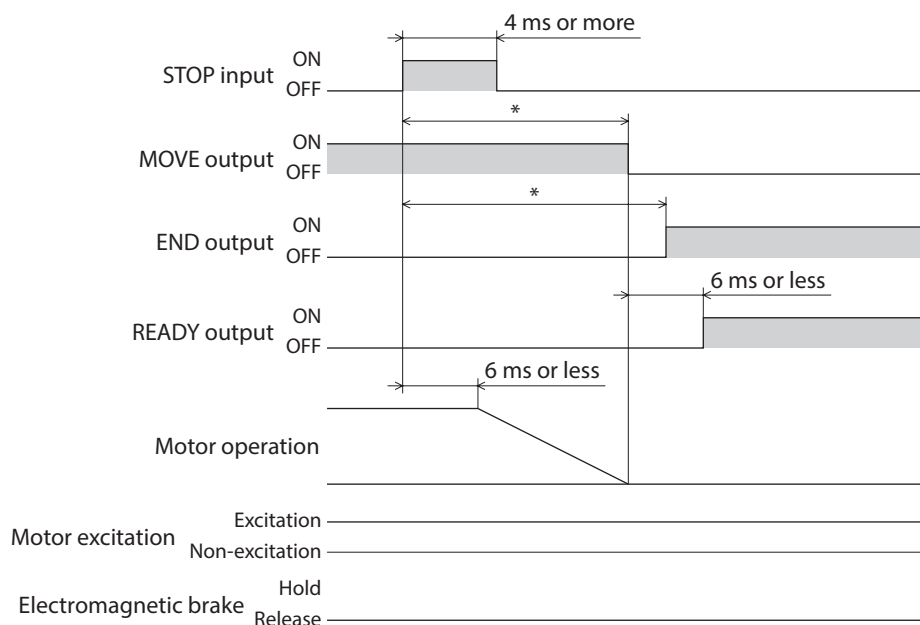
■ STOP input

- When the "STOP input action" parameter is "Immediate stop."



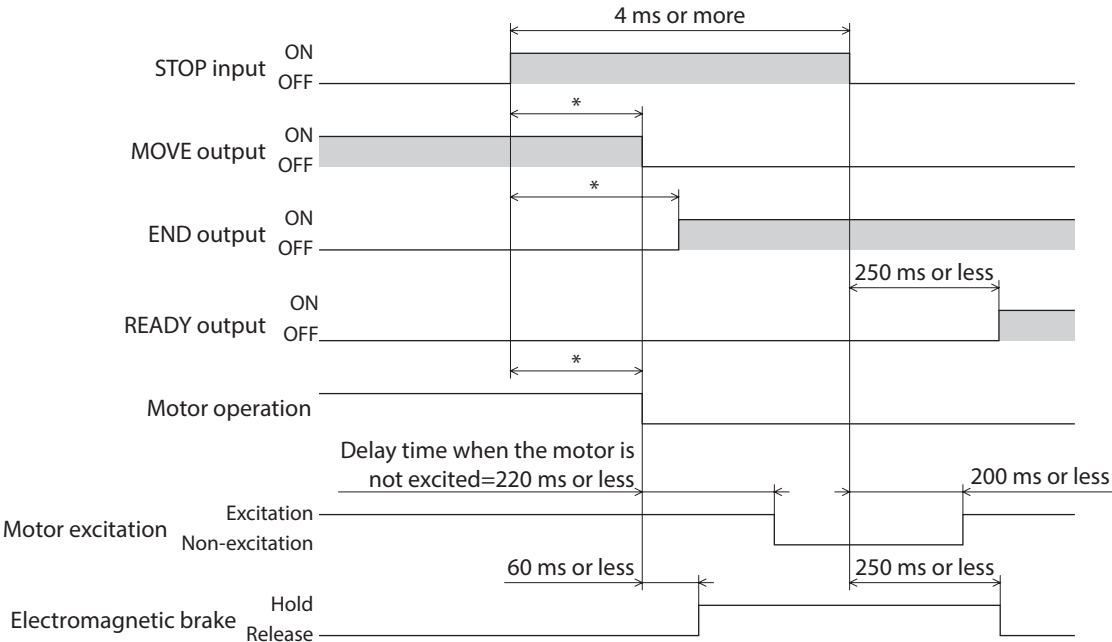
* The specific time varies depending on the load, operating speed, speed filter and other.

- When the "STOP input action" parameter is "Deceleration stop."



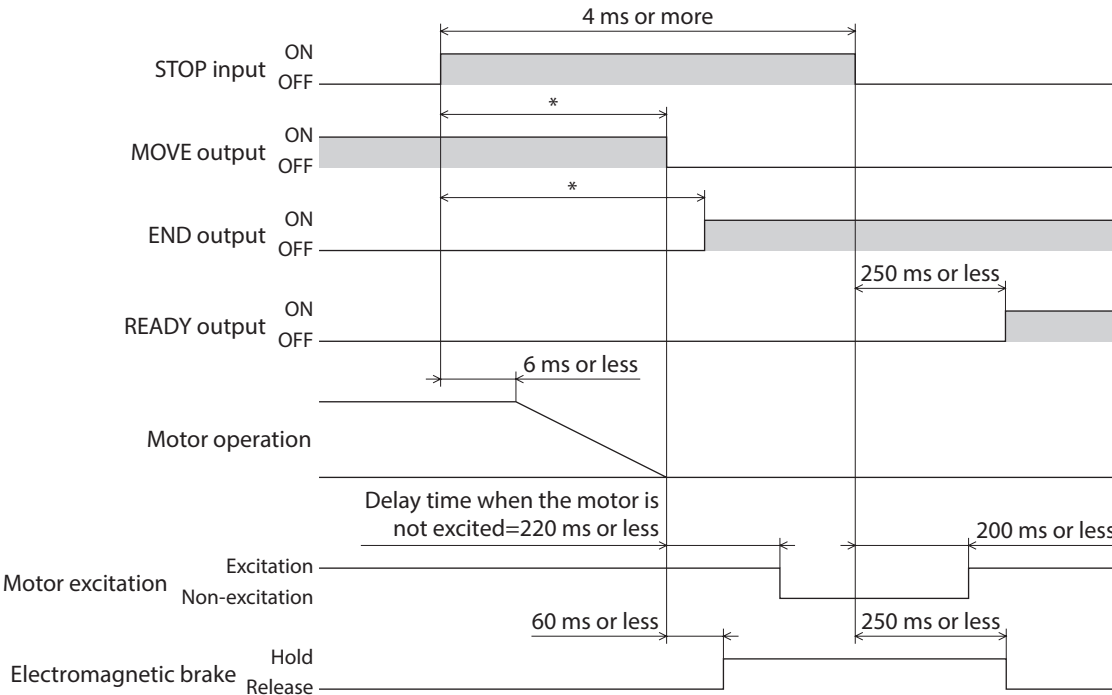
* The specific time varies depending on the load, operating speed, speed filter and other.

● When the “STOP input action” parameter is "Immediate stop & Current OFF."



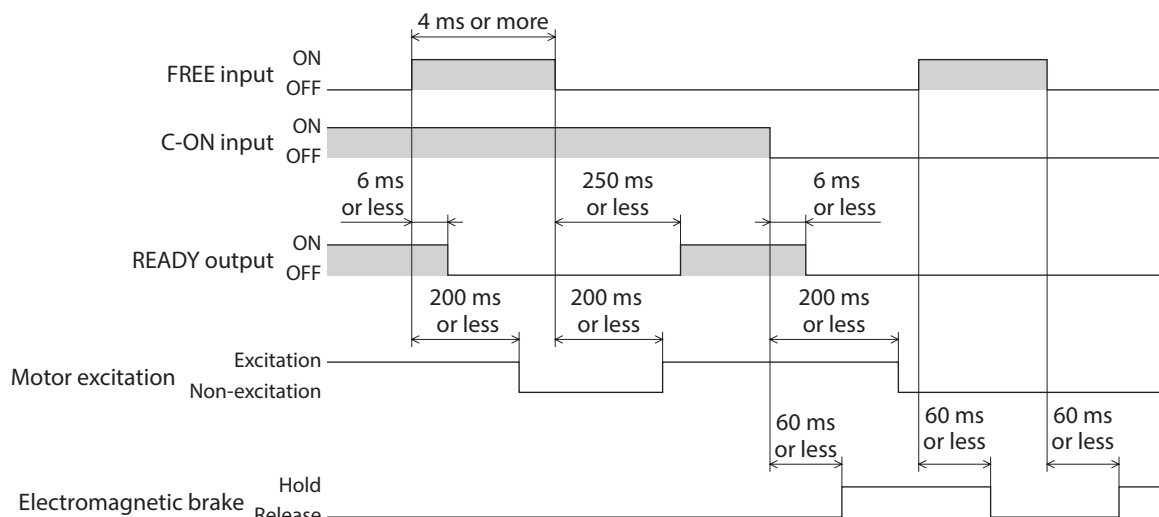
* The specific time varies depending on the load, operating speed, speed filter and other.

● When the “STOP input action” parameter is "Deceleration stop & Current OFF."



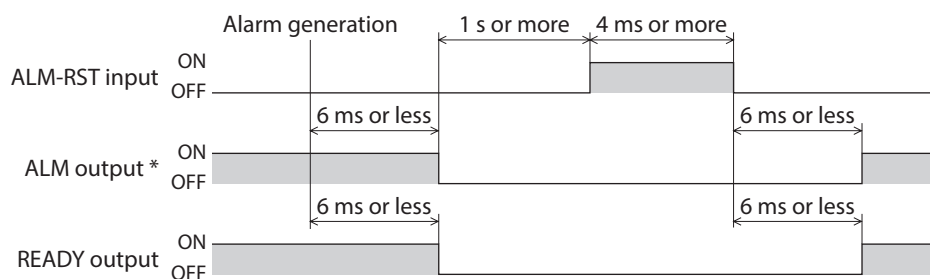
* The specific time varies depending on the load, operating speed, speed filter and other.

■ FREE input



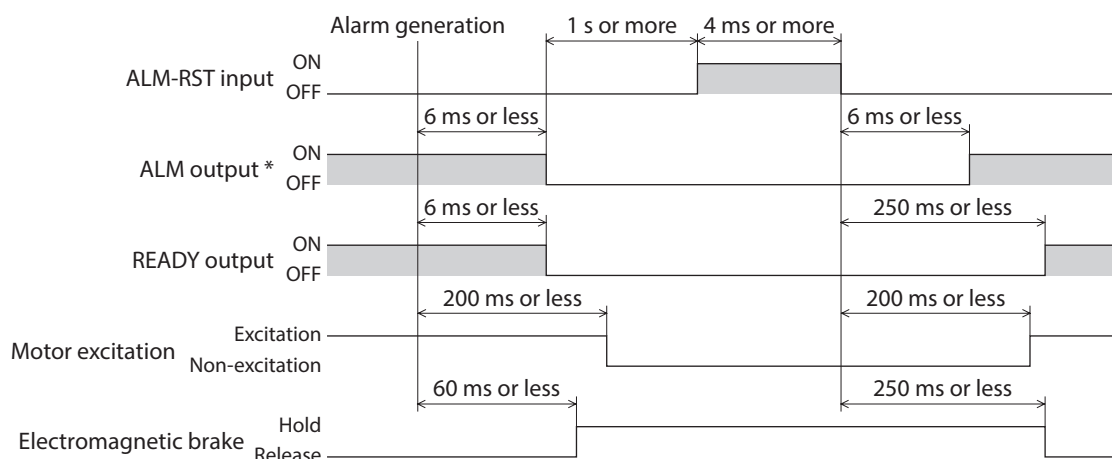
■ ALM-RST input

- When an alarm generates and the motor maintains excitation



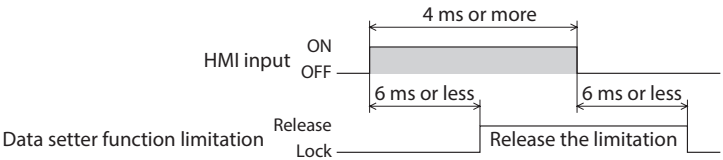
* ALM output is normally closed. It is ON during normal operation and it turns OFF when an alarm generates.

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

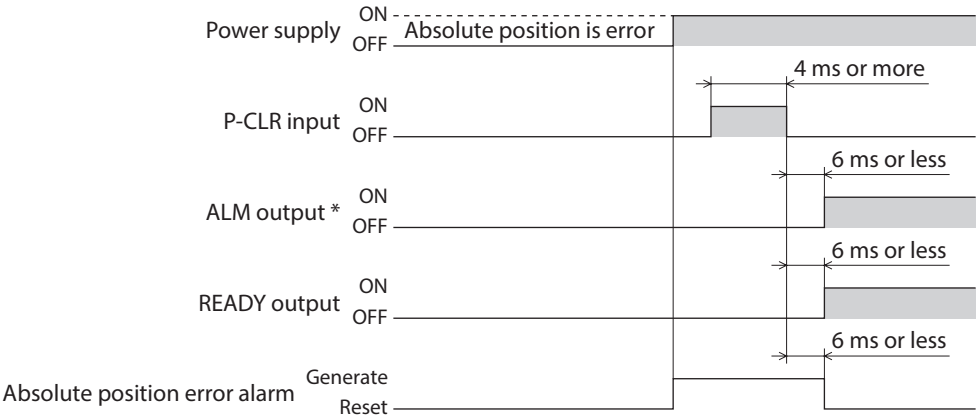


* ALM output is normally closed. It is ON during normal operation and it turns OFF when an alarm generates.

■ HMI input

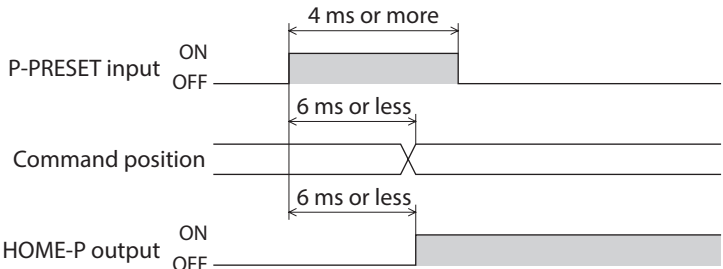


■ P-CLR input

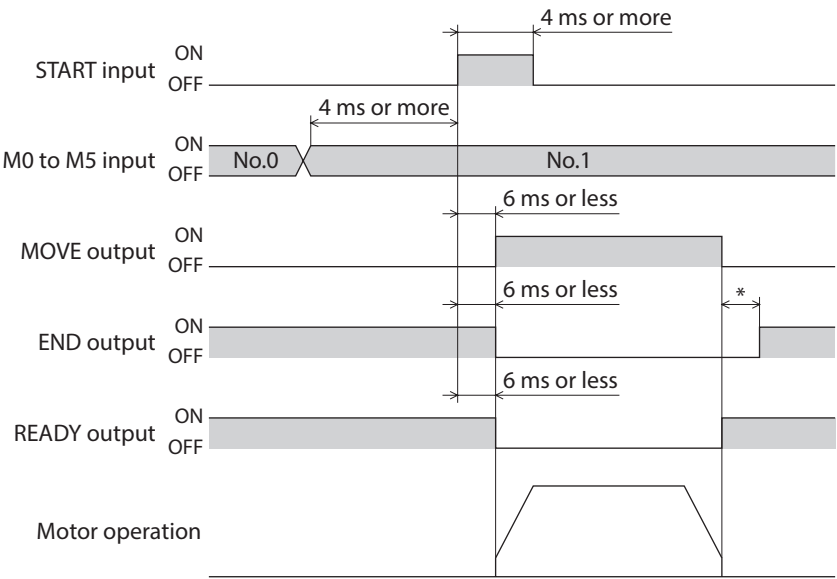


* ALM output is normally closed. It is ON during normal operation and it turns OFF when an alarm generates.

■ P-PRESET input

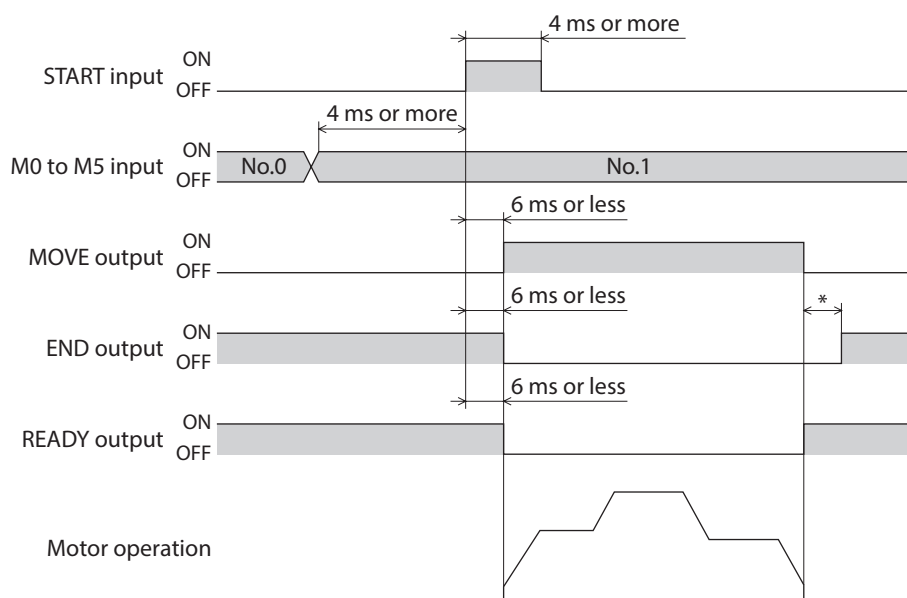


■ Single-motion operation (Positioning operation)



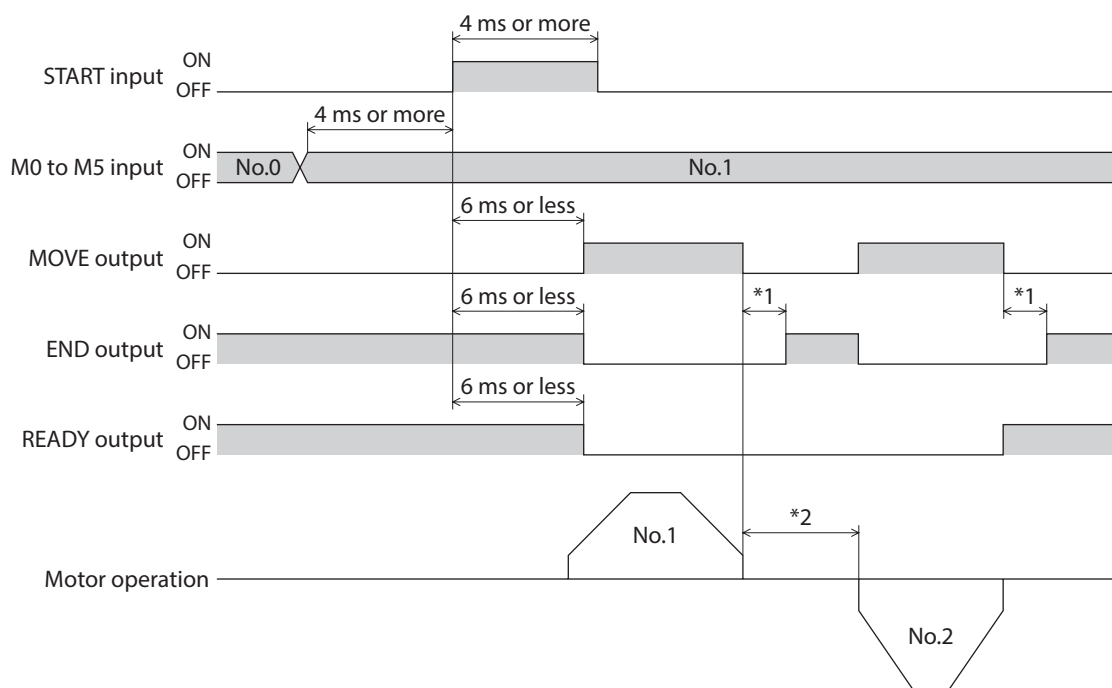
* The specific time varies depending on the load, operating speed, speed filter and other.

■ Linked-motion operation (Positioning operation)



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

■ Linked-motion 2 operation (Positioning operation)

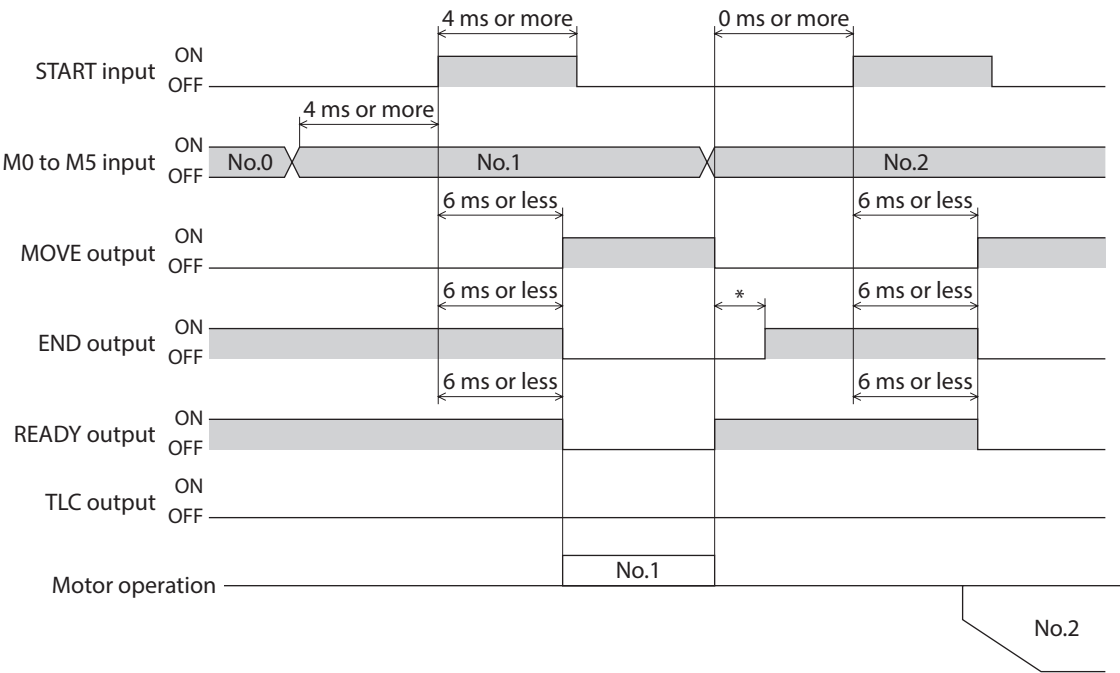


*1 The specific time varies depending on the load, operating speed, speed filter and other.

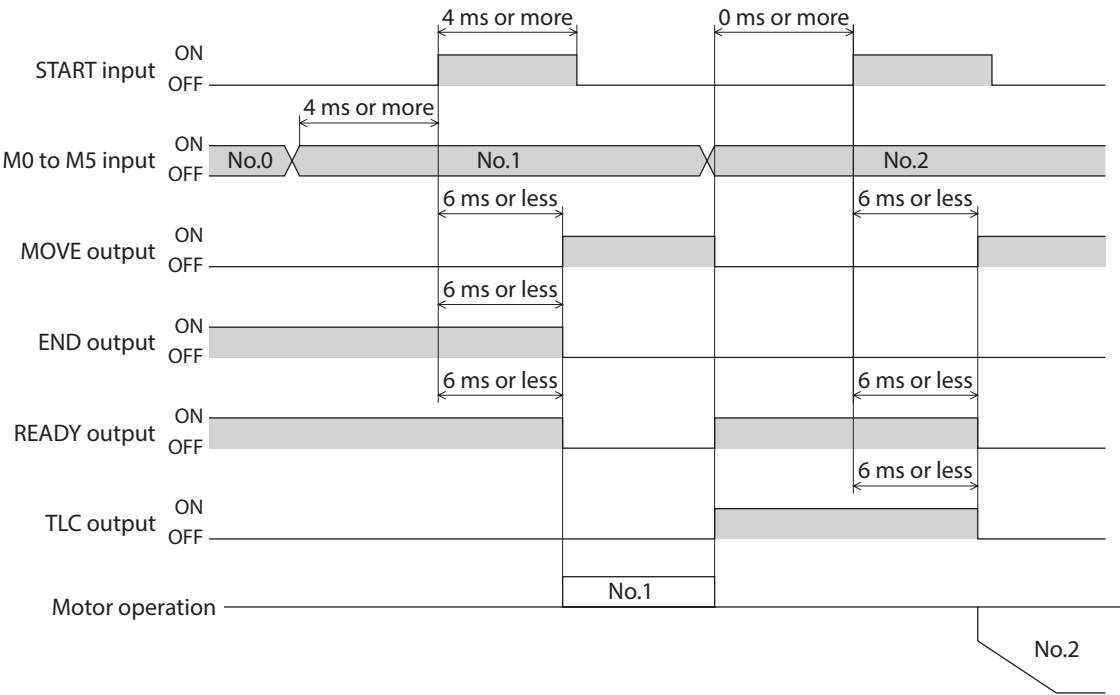
*2 This is the value of the dwell time to be set in operation data No.1.

■ Push operation

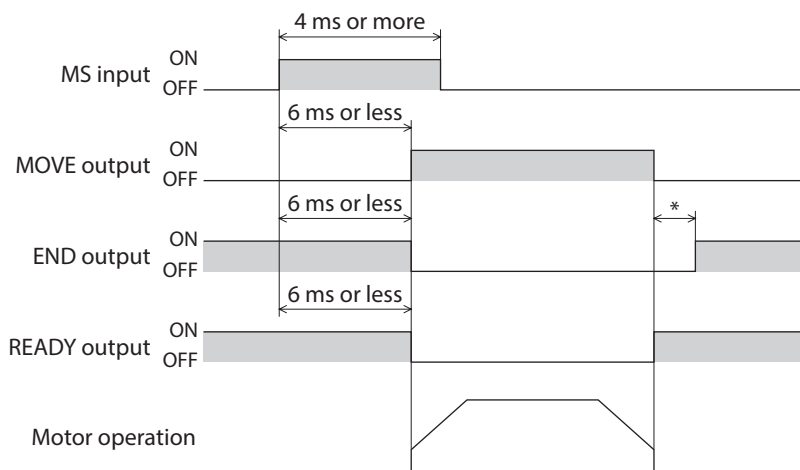
- When the positioning operation is completed before turning to the "push-motion" status



- When the positioning operation is started from the "push-motion" status

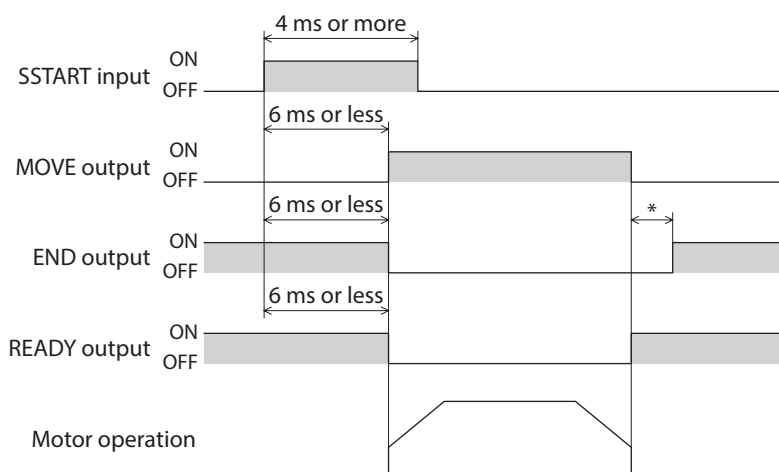


■ Direct positioning operation



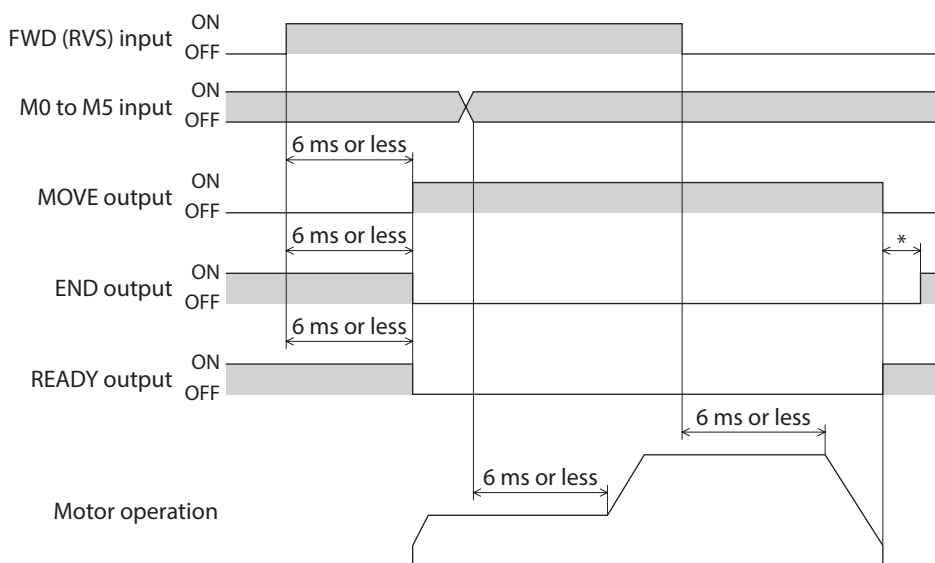
* The specific time varies depending on the load, operating speed, speed filter and other.

■ Sequential positioning operation



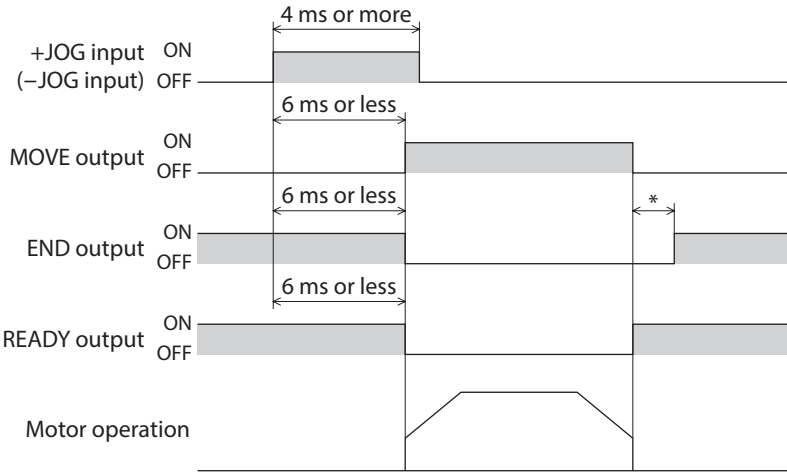
* The specific time varies depending on the load, operating speed, speed filter and other.

■ Continuous operation



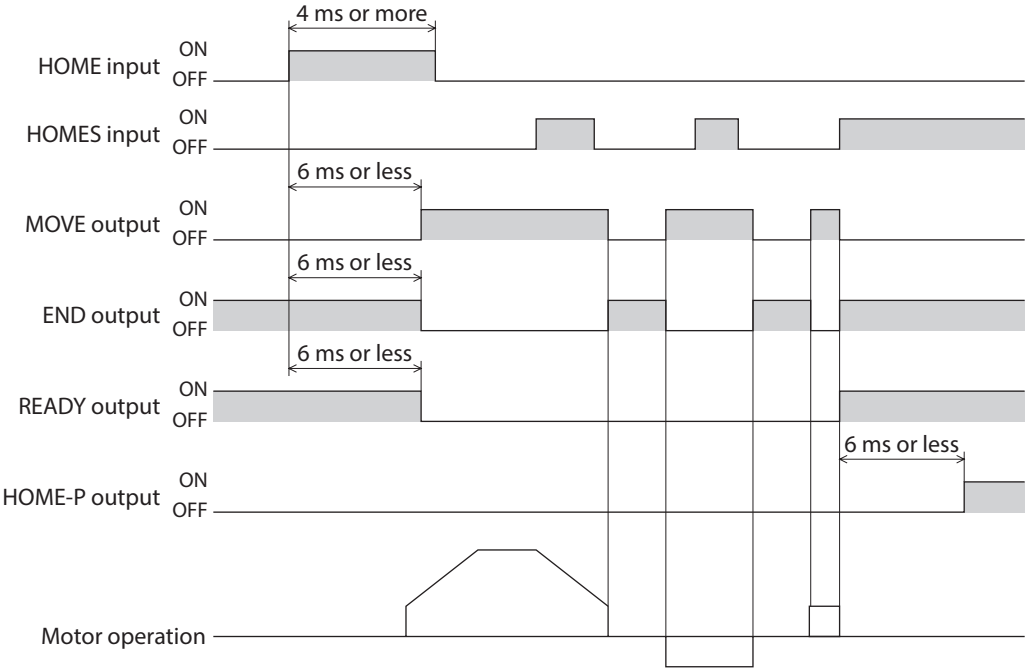
* The specific time varies depending on the load, operating speed, speed filter and other.

■ JOG operation



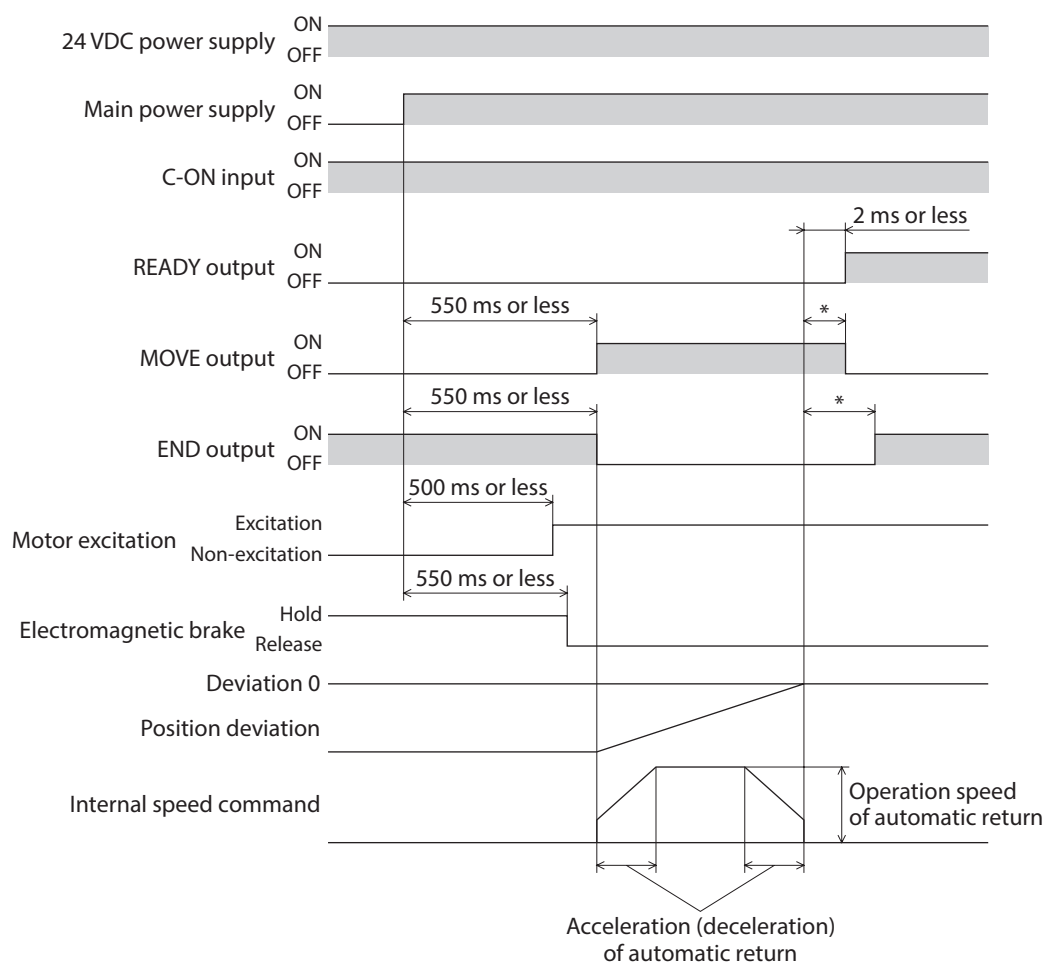
* The specific time varies depending on the load, operating speed, speed filter and other.

■ Return-to-home operation



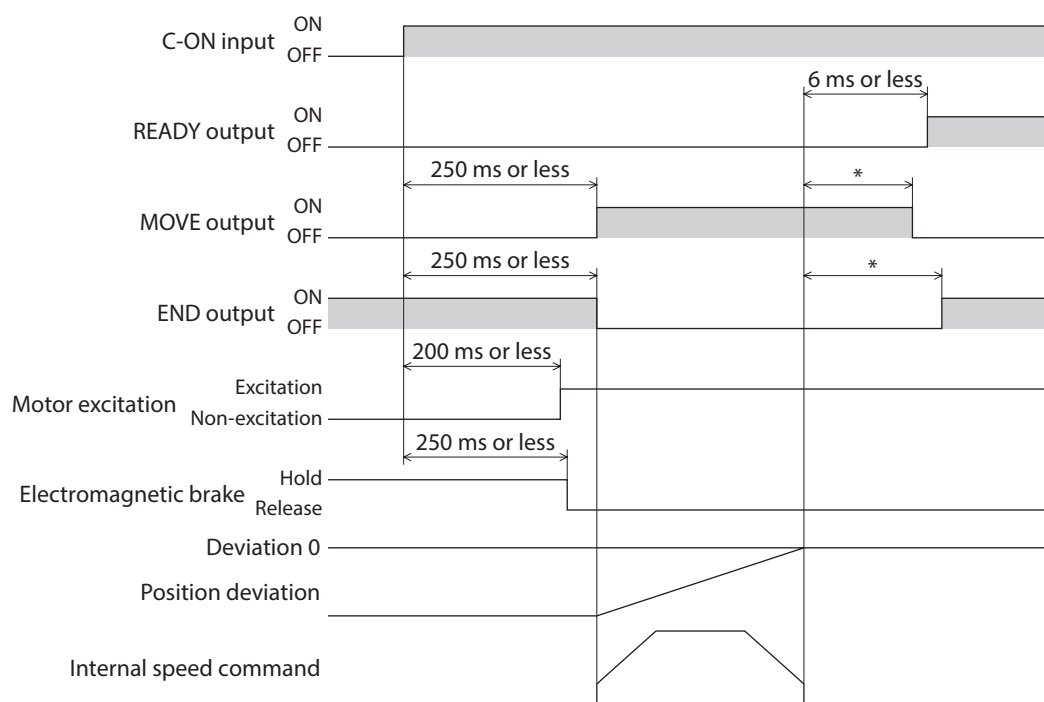
■ Automatic return operation

- When the automatic return operation is performed using the main power supply (AC power input)



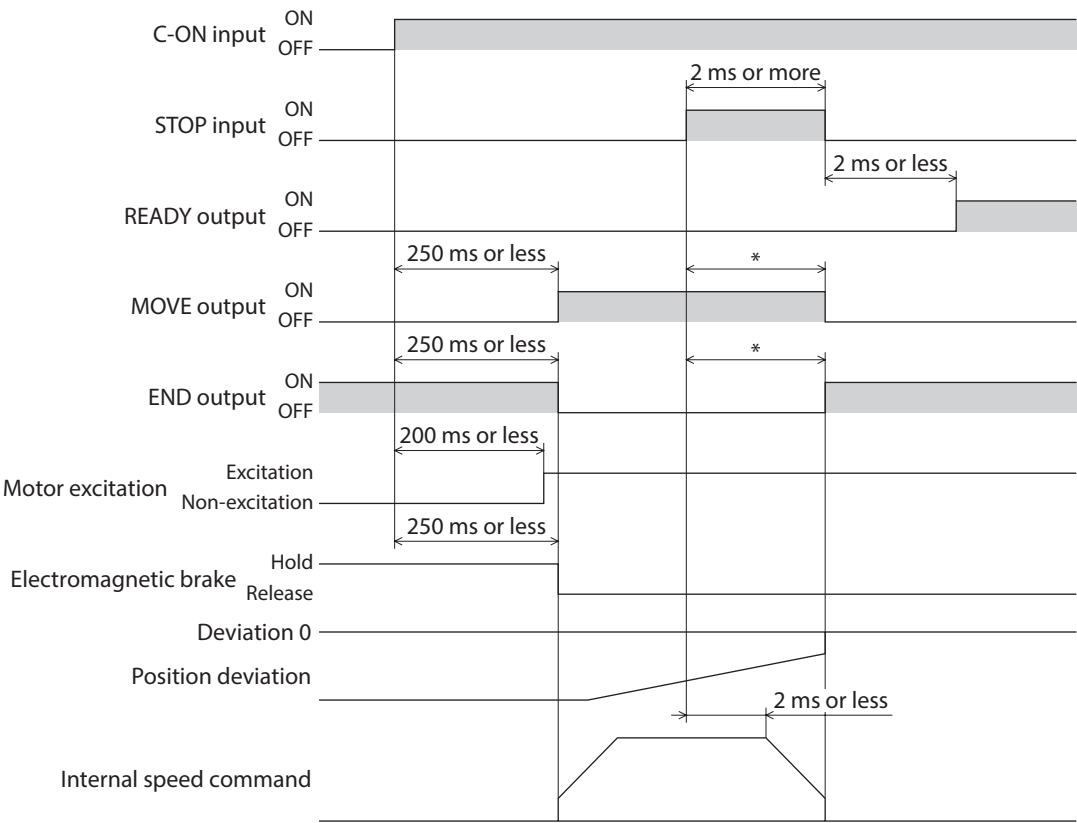
* The specific time varies depending on the load, operating speed, speed filter and other.

- When the automatic return operation is performed using the C-ON input



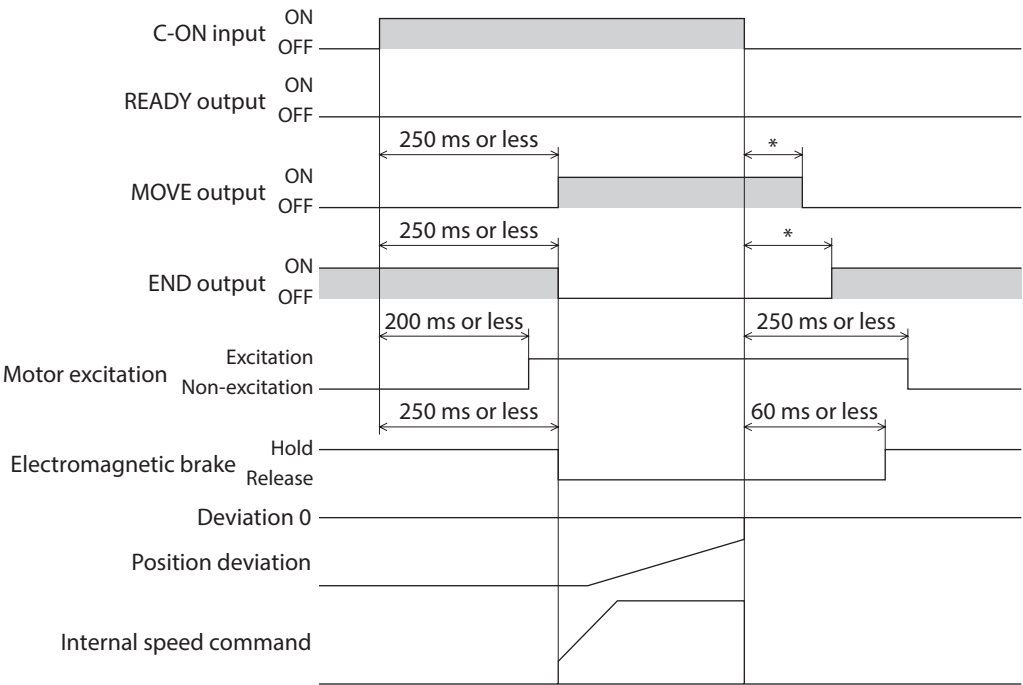
* The specific time varies depending on the load, operating speed, speed filter and other.

● Operation is terminated with the STOP input



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

● When the C-ON input is turned OFF while performing the automatic return operation



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

2 Specifications

Check on the Oriental Motor Website for the product specifications.

3 General specifications

3-1 AC power input

| | | Motor | Driver |
|-----------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Degree of protection | | IP65 (Excluding the mounting surface and connectors.) IP20 (Double shaft type) | IP10 |
| Operation environment | Ambient temperature | –10 to +50 °C (+14 to +122 °F) *1 (non-freezing) Harmonic geared type: 0 to +40 °C (+32 to +104 °F) *1 (non-freezing) | 0 to +55 °C (+32 to +131 °F) *2 (non-freezing) |
| | Humidity | 85 % or less (non-condensing) | |
| | Altitude | Up to 1,000 m (3,300 ft.) above sea level | |
| | Surrounding atmosphere | No corrosive gas, dust, water, or oil | |
| Storage environment | Ambient temperature | –20 to +60 °C (–4 to +140 °F) (non-freezing) | –25 to +70 °C (–13 to +158 °F) (non-freezing) |
| | Humidity | 85 % or less (non-condensing) | |
| | Altitude | Up to 3,000 m (10,000 ft.) above sea level | |
| | Surrounding atmosphere | No corrosive gas, dust, water, or oil | |
| Shipping environment | Ambient temperature | –20 to +60 °C (–4 to +140 °F) (non-freezing) | –25 to +70 °C (–13 to +158 °F) (non-freezing) |
| | Humidity | 85 % or less (non-condensing) | |
| | Altitude | Up to 3,000 m (10,000 ft.) above sea level | |
| | Surrounding atmosphere | No corrosive gas, dust, water, or oil | |
| Insulation resistance | | 100 MΩ or more when 500 VDC megger is applied between the following places: • Case - Motor and sensor windings • Case - Electromagnetic brake windings | 100 MΩ or more when 500 VDC megger is applied between the following places: • Protective Earth Terminals - Power supply terminals • Signal I/O terminals - Power supply terminals |
| Dielectric strength | | Sufficient to withstand the following places for 1 minute. • Case - Motor and sensor windings 1.5 kVAC 50/60 Hz • Case - Electromagnetic brake windings 1.5 kVAC 50/60 Hz | Sufficient to withstand the following for 1 minute. Leak current 13 mA or less. • Protective Earth Terminals - Power supply terminals 1.8 kVAC 50/60 Hz • Signal I/O terminals - Power supply terminals 1.9 kVAC 50/60 Hz |

*1 When installing a motor to a heat sink of a capacity at least equivalent to an aluminum plate [250×250 mm (9.84×9.84 in.), thickness 6 mm (0.24 in.)].

*2 When installing a driver to a heat sink of a capacity at least equivalent to an aluminum plate [200×200 mm (7.87×7.87 in.), thickness 2 mm (0.08 in.)].

3-2 DC power input

| | | Motor | Driver |
|-----------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Degree of protection | | IP65 (Excluding the mounting surface and connectors.) IP20 (Double shaft type, models that the "motor identification" in the product model name is "S") | IP10 |
| Operation environment | Ambient temperature | –10 to +50 °C (+14 to +122 °F) *1 (non-freezing) Harmonic geared type: 0 to +40 °C (+32 to +104 °F) *1 (non-freezing) | 0 to +50 °C (+32 to +122 °F) (non-freezing) |
| | Humidity | 85 % or less (non-condensing) | |
| | Altitude | Up to 1,000 m (3,300 ft.) above sea level | |
| | Surrounding atmosphere | No corrosive gas, dust, water, or oil | |
| Storage environment | Ambient temperature | –20 to +60 °C (–4 to +140 °F) (non-freezing) | –25 to +70 °C (–13 to +158 °F) (non-freezing) |
| | Humidity | 85 % or less (non-condensing) | |
| | Altitude | Up to 3,000 m (10,000 ft.) above sea level | |
| | Surrounding atmosphere | No corrosive gas, dust, water, or oil | |
| Shipping environment | Ambient temperature | –20 to +60 °C (–4 to +140 °F) (non-freezing) | –25 to +70 °C (–13 to +158 °F) (non-freezing) |
| | Humidity | 85 % or less (non-condensing) | |
| | Altitude | Up to 3,000 m (10,000 ft.) above sea level | |
| | Surrounding atmosphere | No corrosive gas, dust, water, or oil | |
| Insulation resistance | | 100 MΩ or more when 500 VDC megger is applied between the following places: • Case - Motor and sensor windings • Case - Electromagnetic brake windings | 100 MΩ or more when 500 VDC megger is applied between the following places: • Frame Ground Terminal - Power supply terminals |
| Dielectric strength | | Sufficient to withstand the following places for 1 minute: • Case - Motor and sensor windings 1.0 kVAC 50/60 Hz *2 • Case - Electromagnetic brake windings 1.0 kVAC 50/60 Hz *2 | Sufficient to withstand the following places for 1 minute: • Frame Ground Terminal - Power supply terminals 500 VAC 50/60 Hz |

*1 When installing a motor to a heat sink of a capacity at least equivalent to an aluminum plate [100×100 mm (3.94×3.94 in.), thickness 6 mm (0.24 in.)].

*2 0.5 kVAC for the **ARM14**, **ARM15**, **ARM24**, and **ARM26**

4 Regulations and standards

4-1 UL Standards

Check the [APPENDIX UL Standards for AR Series](#) for recognition information about UL Standards.

4-2 EU Directives

■ **CE Marking (AC power input)**

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

● **Low Voltage Directive**

Applicable Standards

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

Installation conditions

| | |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Motor | To be incorporated in an equipment Overvoltage category: II Pollution degree: 3 (2 for the double-shaft type) Protection against electric shock: Class I |
| Driver | To be incorporated in an equipment Overvoltage category: II Pollution degree: 2 Protection against electric shock: Class I |

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

● **EMC Directive**

This product is conducted EMC testing under the conditions specified in “Example of installation and wiring” on p.48. The conformance of your mechanical equipment with the EMC Directive will vary depending on such factors as the configuration, wiring, and layout for other control system devices and electrical parts used with this product. It therefore must be verified through conducting EMC measures in a state where all parts including this product have been installed in the equipment.

Applicable Standards

| | |
|-----|----------------------------------------------------|
| EMI | EN 55011 group 1 class A, EN 61000-6-4, EN 61800-3 |
| EMS | EN 61000-6-2, EN 61800-3 |

⚠ CAUTION

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

■ CE Marking (DC power input)

● Low Voltage Directive

The input power supply voltage of this product is 24 VDC/48 VDC. Therefore this product is not subject to the Low Voltage Directive, but install and connect it as follows.

- This product is designed and manufactured to be incorporated in an equipment. Be sure to install the product inside an enclosure.
- For the driver power supply, use a DC power supply with reinforced insulation on its primary and secondary sides.

● EMC Directive

This product is conducted EMC testing under the conditions specified in "Example of installation and wiring" on p.78. The conformance of your mechanical equipment with the EMC Directive will vary depending on such factors as the configuration, wiring, and layout for other control system devices and electrical parts used with this product. It therefore must be verified through conducting EMC measures in a state where all parts including this product have been installed in the equipment.

Applicable Standards

| | |
|-----|----------------------------------------|
| EMI | EN 55011 group 1 class A, EN 61000-6-4 |
| EMS | EN 61000-6-2 |

⚠ CAUTION

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

4-3 Republic of Korea, Radio Waves Act

This product is affixed the KC Mark under the Republic of Korea, Radio Waves Act.

4-4 RoHS Directive

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

■ Revision record

| Revision number | Revised contents |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| First edition | |
| Second edition | <ul style="list-style-type: none">• Revision of words and terms• Correction of minor erroneous descriptions |
| Third edition | <ul style="list-style-type: none">• Addition of descriptions about adding models• Addition of cable set models in accessories• Correction of minor erroneous descriptions |
| Fourth edition | <ul style="list-style-type: none">• Addition of connector models• Revision of words and terms• Correction of minor erroneous descriptions |

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Published in June 2020

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