Oriental motor

HM-60436-6

αSTEP AZ Series/ Motorized Actuator equipped with AZ Series AC Power Input

MECHATROLINK-III Compatible Driver

USER MANUAL

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.

Original instructions

1 Introduction

2 Hardware

3 MECHATROLINK-III communications

4 Parameter list

5 Troubleshooting

6 Reference materials

1 Introduction

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

◆Table of contents

1 Before using the product

Only qualified personnel of electrical and mechanical engineering should work with the product.
Use the product correctly after thoroughly reading the section "4 Safety precautions" on p.12. In addition, be sure to observe the contents described in warning, caution, and note in this manual.
The product described in this manual is 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 compensation for damage caused through failure to observe this warning.

2 Operating manuals

2-1 Related operating manuals

Download the operating manuals from Oriental Motor Website Download Page or contact your nearest Oriental Motor sales office.

- **AZ** Series/Motorized Actuator equipped with **AZ** Series AC power input MECHATROLINK-III Compatible Driver USER MANUAL (this document)
- **AZ** Series/Motorized Actuator equipped with **AZ** Series OPERATING MANUAL Function Edition

Read the following operating manuals for motors and motorized actuators.

- OPERATING MANUAL Motor
- OPERATING MANUAL Actuator
- Motorized Actuator OPERATING MANUAL Function Setting Edition

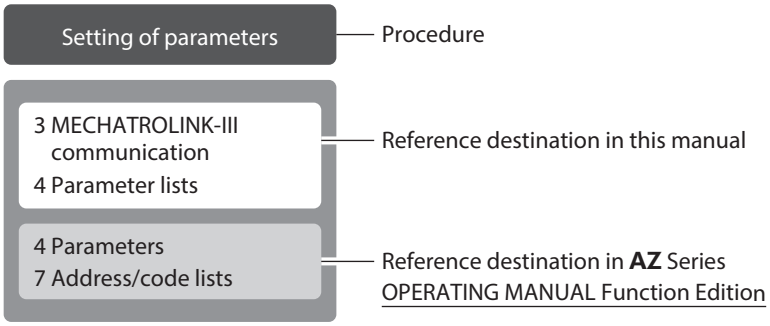
2-2 How to use operating manuals

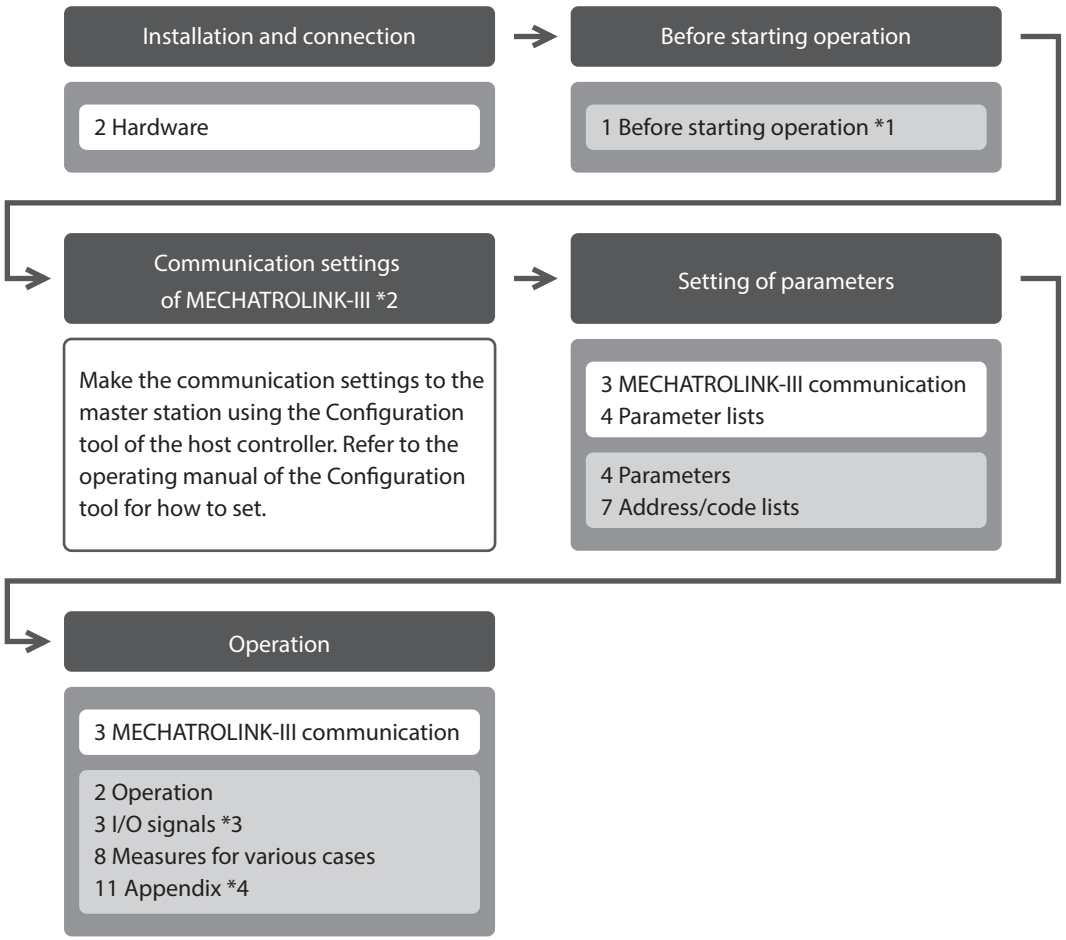
To use the product, read this manual together with the **AZ** Series OPERATING MANUAL Function Edition.
This manual describes contents specific to the MECHATROLINK-III compatible driver, and the **AZ** Series OPERATING MANUAL Function Edition describes contents common to the **AZ** Series products. Refer to the **AZ** Series OPERATING MANUAL Function Edition for the contents not included in this manual.

■ How to read reference destinations

The title name of the operating manual is described in the reference destination.

memo The title number described in the reference destination may be changed. Use the title name when checking the reference destination.





*1 When a motorized actuator is used, the following contents cannot be operated via MECHATROLINK-III. Use the support software **MEXE02**.
- Copying the fixed value (parameter) of the ABZO sensor to driver
- Creation of recovery data file and method of recovery

*2 Refer to this manual for how to set the station address. (⇨ p.37)
*3 Refer to this manual for the power removal function. (⇨ p.39)
*4 Refer to this manual for LEDs of the driver. (⇨ p.22)

3 Overview of the product

The **AZ** Series AC power input MECHATROLINK-III compatible driver is the dedicated driver for the **AZ** Series AC power input products.
Connecting the driver directly to the master station can operate the motor via MECHATROLINK-III.

■ How to set parameters

Parameters can be set via MECHATROLINK-III or using the **MEXE02**.
This manual describes how to set operation data and parameters via MECHATROLINK-III.

■ Equipped with the power removal function

The power removal function is a function that stops supplying the power to the motor by the hardware. The power removal function is assumed to be used to prevent unexpected starting of the moving parts of equipment when an operator works inside the operating range of the moving parts.

4 Safety precautions

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

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

⚠WARNING

General

- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. 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. Handling by unqualified personnel 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. Doing so may result in electric shock.
- Do not touch the driver while the power is supplied. Doing so may result in fire or electric shock.
- Take measures to keep the moving parts in position if the product is used in vertical operations such as elevating equipment. Failure to do so may result in injury or damage to equipment.
- When the driver generates an alarm (any of the driver's protective functions is triggered), first remove the cause and then clear the protective function. Continuing the operation without removing the cause of the problem may cause malfunction of the motor and driver, leading to injury or damage to equipment.
- Do not touch the terminals indicated ⚠ ⚠ signs on the driver's front panel while the power is supplied because high voltage is applied. Doing so may result in fire or electric shock.

Installation

- Install the driver in an enclosure. Failure to do so may result in electric shock or injury.
- Be sure to ground the driver as it is Class I equipment. Failure to do so may result in electric shock.

Connection

- Keep the input power voltage of the driver within the specified range. Failure to do so may result in fire or electric shock.
- Connect the product 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 cable. Doing so may result in fire or electric shock.

Operation

- Turn off the main power supply and control power supply in the event of a power failure. Failure to do so may result in injury or damage to equipment.
- Take safety measures in the event of a momentary voltage drop. Failure to do so may cause the motor to stop or reduce the holding force or rotational torque, resulting in 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 driver. Doing so may result in injury or damage to equipment.

Maintenance and inspection

- Do not touch the connection terminals of the driver immediately after turning off the main power supply and control power supply. Before performing connection or inspection, turn off the main power supply and control power supply, and check the CHARGE LED has been turned off. Residual voltage may cause electric shock.

⚠CAUTION

General

- Do not use the driver beyond the specifications. Doing so may result in electric shock, injury, or damage to equipment.
- Keep your fingers and objects out of the openings in the driver. Failure to do so may result in fire, electrical shock, or injury.
- Do not touch the driver while operating or immediately after stopping. Doing so may result in a skin burn(s).
- Do not forcibly bend or pull the cable that is connected to the driver. Doing so may cause damage to the product.

Installation

- Keep the area around the driver free of combustible materials. Failure to do so may result in fire or a skin burn(s).
- Do not leave anything around the driver that would obstruct ventilation. Doing so may result in damage to equipment.

Operation

- Use a motor and a 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 turning on the main power supply and control power supply, turn all input signals to the driver to OFF. Failure to do so may result in injury or damage to equipment.
- When moving the moving part by hands, put the motor into a non-excitation state. Operating in a state where the motor is excited may cause injury.
- When an abnormal condition has occurred, immediately stop operation to turn off the main power supply and control power supply. Failure to do so may result in fire, electrical shock, or injury.
- Take measures against static electricity when operating the switches of the driver. Failure to do so may result in the driver malfunction or damage to equipment.
- For the control 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.

Inspection and maintenance

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

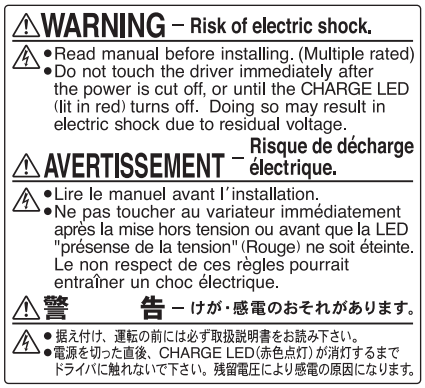
4-1 Graphical symbols on the driver's front panel

	⚠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 (CN3) and the main power supply input terminal (CN4). Do not touch them while the power is supplied. Doing so may result in fire or electric shock.

4-2 Description of warning

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

Electrical hazard warning label



Material: PET

5 Precautions for use

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

- **Always use Oriental Motor cables to connect a motor and a driver.**

  Refer to the cable models on p.48.

- **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.

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

  The USB connector on the driver is not electrically insulated. When grounding the positive terminal of the control power supply, do not connect any equipment (PC, etc.) whose negative terminal is grounded. Doing so may cause the driver and this equipment to short, damaging both. When connecting, do not ground equipment.

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

  Do not turn off the control power supply while writing the data to the non-volatile memory, and also do not turn off for five 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.

- **Noise elimination measures**

  Refer to p.34 for the noise elimination measures.

- **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 installing an earth leakage breaker, use a product offering resistance against high frequency current such as the one specified below.
  Mitsubishi Electric Corporation: NV series

- **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 Oriental Motor's regeneration resistor RGB100.**

  An alarm of overvoltage may be generated depending on the operating condition of the motor. If the alarm of overvoltage was generated, reconsider the operating condition or use the regeneration resistor **RGB100** of Oriental Motor. Refer to p.27 for the connection method.

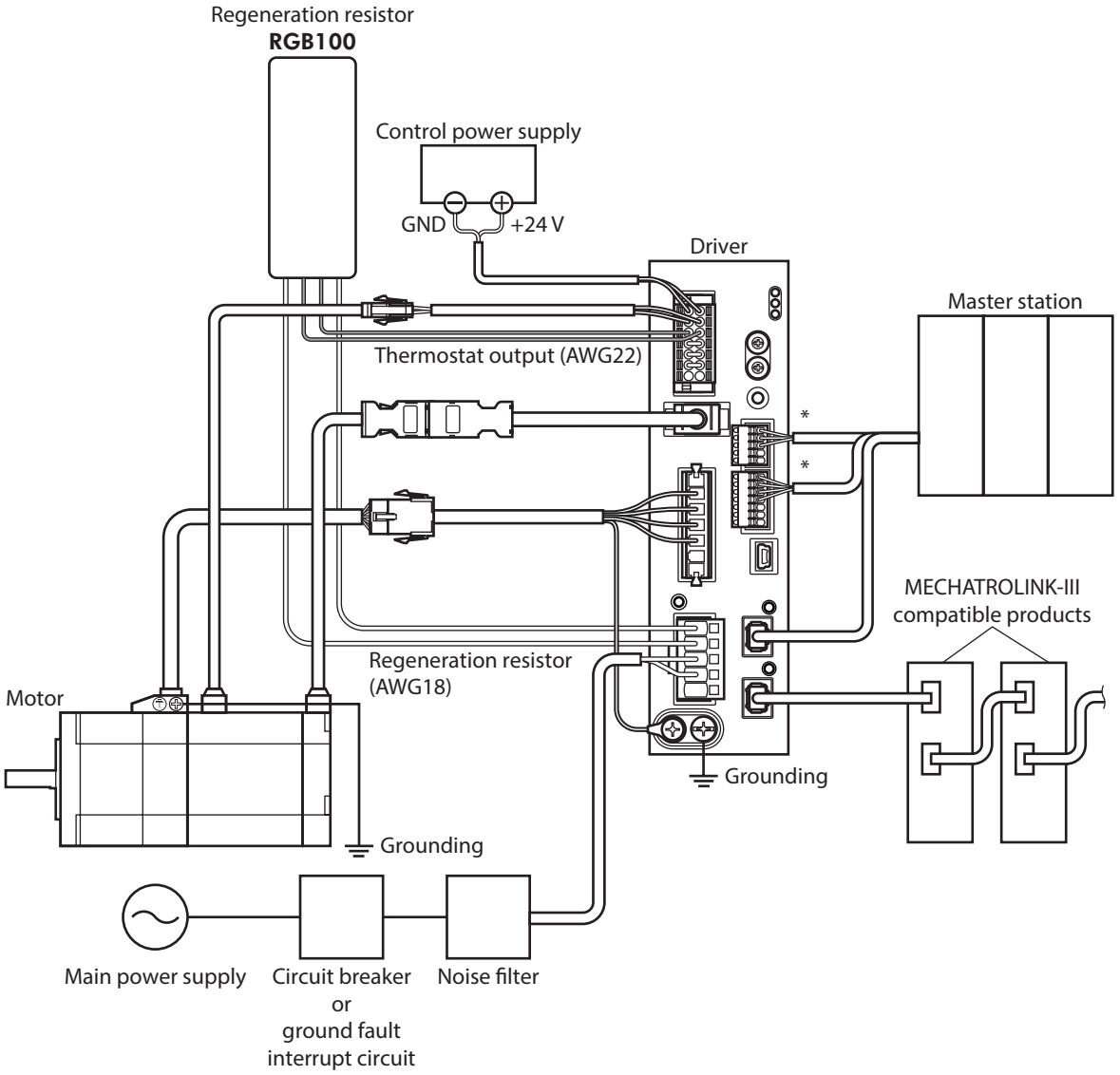
2 Hardware

This part explains names and functions of each part of the driver, installation and connection methods or the like.

◆Table of contents

1 System configuration

The figure shows an example when the cable type electromagnetic brake motor with single-phase 200-240 VAC input is used.



* Connect when using direct I/O or sensors.

2 Preparation

This chapter explains the items you should check, as well as names and functions 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.

- Driver ..... 1 unit
- CN1 connector (14 pins) ..... 1 piece
- CN4 connector (5 pins) ..... 1 piece
- CN5 connector (5 pins) ..... 1 piece
- CN6 connector (7 pins) ..... 1 piece
- Connector lever ..... 1 piece (for CN4 connector)
- Instructions and Precautions for Safe Use ..... 1 copy

Included connector model

Type	Part number	Manufacturer
CN1 connector	DFMC1,5/7-ST-3,5-LR	PHOENIX CONTACT GmbH & Co. KG
CN4 connector	05JFAT-SAXGDK-H5.0	J.S.T. Mfg. Co., Ltd.
CN5 connector	FK-MC 0,5/5-ST-2,5	PHOENIX CONTACT GmbH & Co. KG
CN6 connector	FK-MC 0,5/7-ST-2,5	PHOENIX CONTACT GmbH & Co. KG

2-2 How to identify the product model

Check the driver model against the model shown on the nameplate. Refer to p.20 for how to identify the nameplate.

AZD - C M3
1 2 3

1	Series	**AZD**: **AZ** Series driver
2	Power supply input	**A**: Single-phase 100-120 VAC **C**: Single-phase/Three-phase 200-240 VAC
3	Network type	**M3**: MECHATROLINK-III

2-3 Products possible to combine

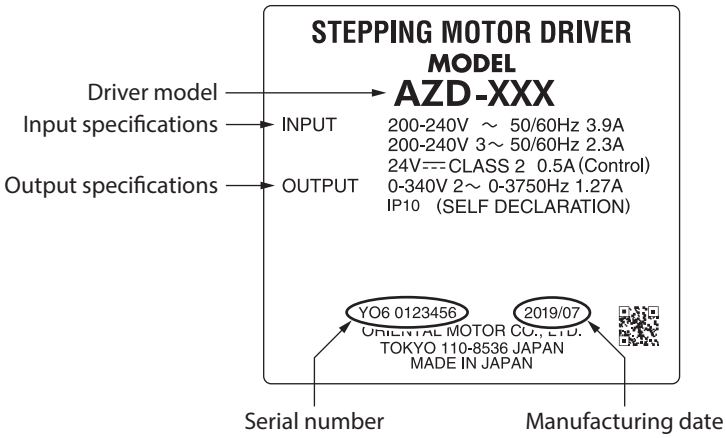
Products with which the driver can be combined are listed below. Check the model name of the product with the nameplate.

Power supply type	Product type	Applicable Series	Model name representing Series name *1	Example of model name
AC power input	Stepping motor	**AZ** Series	**AZM**	**AZM46AC** **AZM66AC-TS10**
	Motorized actuator	**EAS** Series *2	**EASM**	**EASM4NXD005AZAC**
		EAC Series *2	**EACM**	**EACM4RWE15AZMC**
		EZS Series *2	**EZSM**	**EZSM6D005AZAC**
		EZSH Series *2	**EZSHM**	**EZSHM6H020AZAC**
		DGII Series	**DGM** **DGB**	**DGM85R-AZAC** **DGB85R12-AZACR**
		L Series	**LM**	**LM4F500AZMC-1**

*1 The driver described in this manual can be combined with products that begin with these model names.
*2 For these motorized actuators, the equipped motors have been evaluated to affix the CE Marking and the UKCA Marking. Check the model name of the equipped motor with the nameplate.

2-4 Information about nameplate

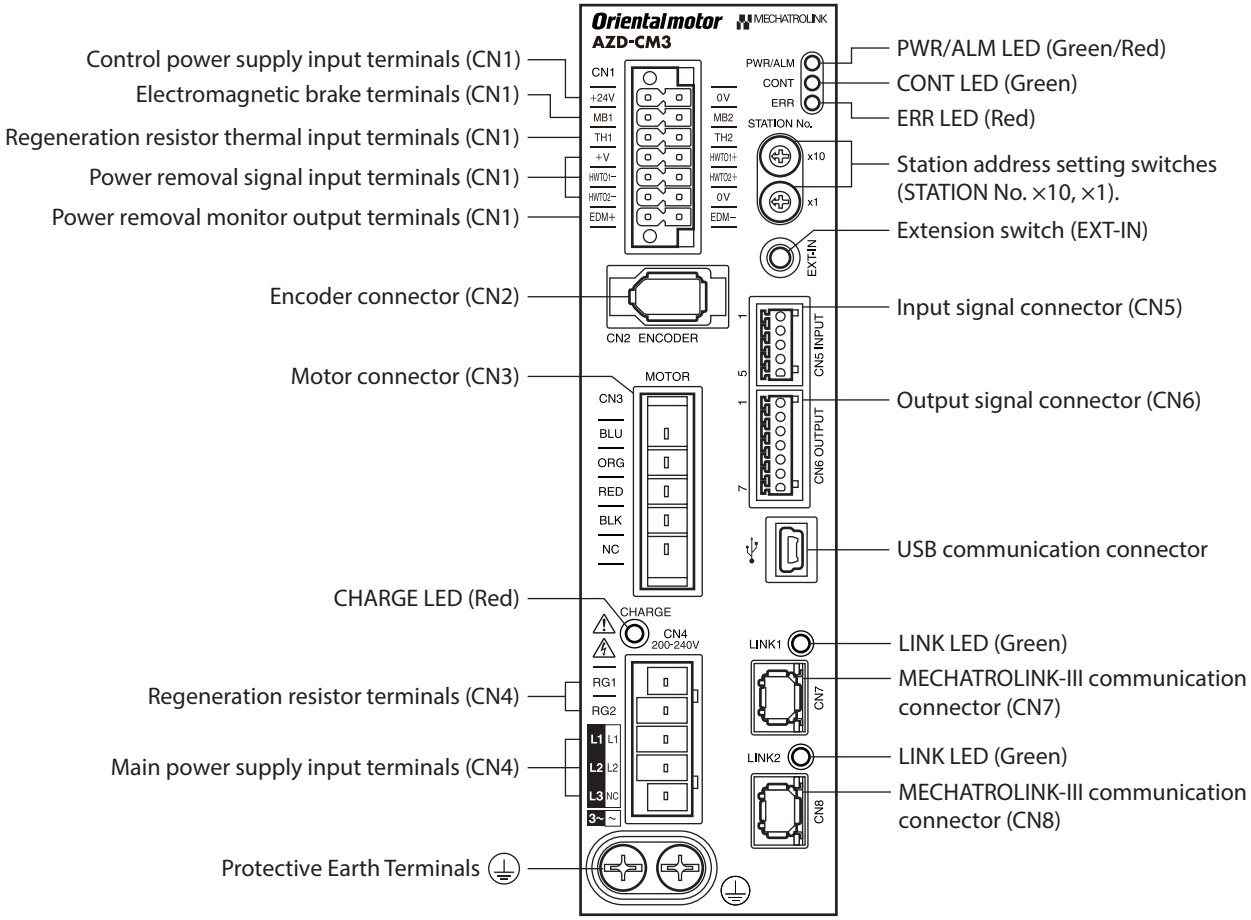
The figure shows an example.



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

2-5 Names and functions of parts

The figure shows the **AZD-CM3**.



Type	Name	Sign	Description
LED	CHARGE LED (Red)	CHARGE	This LED is lit while the main power supply is turned on. After the main power is turned off, the LED is turned off once the residual voltage in the driver drops to a safe level.
	PWR/ALM LED (Green/Red)	PWR/ALM	• This LED is lit in green while the control power supply is turned on. • If an alarm (protective function) is generated, the LED will blink in red. • If the power removal function (p.39) is triggered, the LED will blink in green. • If information is generated, the LED will simultaneously blink in green and red twice. (Green and red colors may overlap and it may be visible to orange.)
	CONT LED (Green)	CONT	This LED is lit while a connection is established.
	ERR LED (Red)	ERR	This LED blinks when an error occurred in MECHATROLINK-III.
	LINK LED (Green)	LINK1, LINK2	This LED is lit while MECHATROLINK-III is properly connected.
Switch	Station address setting switches	STATION No. ×10 STATION No. ×1	Sets the station address of the driver. Factory setting: 3 (×10: 0, ×1: 3)
	Extension switch	EXT-IN	This switch is used after allocating input signals. The allocated input signal can be executed just pressing the extension switch (EXT-IN).
Connector	Encoder connector (CN2)	ENCODER	Connects the encoder.
	Motor connector (CN3)	MOTOR	Connects the motor.
	Input signals connector (CN5)	INPUT	Connects the input signals.
	Output signal connector (CN6)	OUTPUT	Connects the output signals.
	USB communication connector		Connects a PC in which the **MEXE02** has been installed. (USB2.0 mini-B port)
	MECHATROLINK-III communication connectors (CN7, CN8)	–	Connects the MECHATROLINK-III cable.
Terminal	Control power supply input terminals (CN1)	+24V, 0V	Connects a control power supply.
	Electromagnetic brake terminals (CN1)	MB1, MB2	Connects the lead wires from the cable for electromagnetic brake.
	Regeneration resistor thermal terminals (CN1)	TH1, TH2	Connects the Oriental Motor's regeneration resistor **RGB100**. If the regeneration resistor **RGB100** is not connected, short the TH1 and TH2 terminals.
	Power removal signal input terminals (CN1)	HWTO1+, HWTO1– HWTO2+, HWTO2–	Connects external equipment.
	Power removal monitor output terminals (CN1)	EDM+, EDM–	
	Regeneration resistor terminals (CN4)	RG1, RG2	Connects the Oriental Motor's regeneration resistor **RGB100**.
	Main power supply input terminals (CN4)	L, N, NC L1, L2, NC L1, L2, L3	Connects a main power supply.
	Protective Earth Terminals		Ground using a grounding wire of AWG 16 to 14 (1.25 to 2.0 mm^2).

2-6 Indication of LEDs

■ PWR/ALM LED

This LED indicates the status of the driver.

LED status		Description
Green	Red	
No light	No light	The control power supply is not turned on.
Light	No light	The control power supply is turned on.
No light	Blinking	An alarm is being generated. The alarm type generated can be checked by counting the number of times the LED blinks. The LED is lit in green when the alarm is reset.
Blinking	No light	The power removal function has been activated. The LED is lit in green when the Servo ON command (SV_ON: 31h) is sent after the power removal function is released.
Blinking twice at the same time *		• Information is being generated. The LED is lit in green when the information is cleared. • Teaching, remote operation is being executed with the **MEXE02**. The LED is lit in green when teaching, remote operation is completed.
Blinks at the same time *		The interlock was released by holding down the extension switch (EXT-IN). The LED is lit in green when the time set in the Extended input (EXT-IN) interlock releasing duration (device parameter 1973h) is elapsed.
Lit at the same time *		The input signal allocated to the extension switch (EXT-IN) is being executed. The LED is lit in green when it is completed.
Repeating "Green → Red → Simultaneously lit → No light"		This is the driver simulation mode.

* Green and red colors may overlap and it may be visible to orange.

■ CONT LED, ERR LED, LINK LED

These LEDs indicate the communication status of MECHATROLINK-III.

Name	LED status	Description
CONT (Green)	OFF	No link
	Light	Link establishment
ERR (Red)	No light	No communication error
	Blinking	Communication error occurred
LINK1 (Green) LINK2 (Green)	No light	Cable not connected
	Light	Cable connected

3 Installation

This chapter explains the installation location and installation method of the driver.

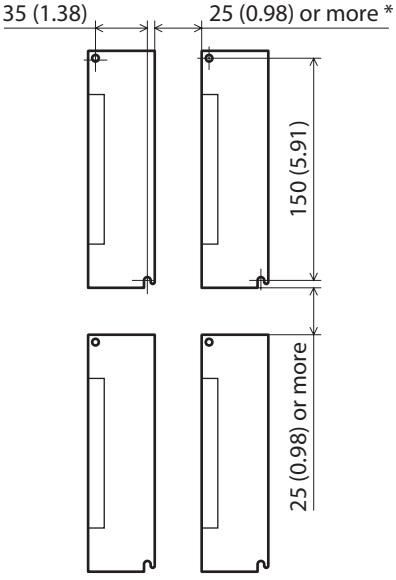
3-1 Installation location

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

- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature: 0 to +55 °C [+32 to 131 °F] (non-freezing)
- Operating ambient humidity: 85 % or less (non-condensing)
- Area free of explosive atmosphere, 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
- Up to 1,000 m (3,300 ft.) above sea level

3-2 Installation method

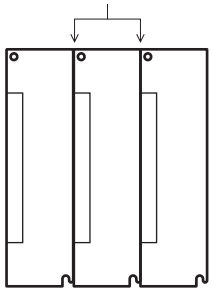
The driver is designed so that heat is dissipated via air convection and conduction through the enclosure. Install the driver to a flat metal plate offering high heat conductivity [material: aluminum, 200×200×2 mm (7.87x7.87x0.08 in.) or equivalent]. When installing the driver, provide clearances of at least 25 mm (0.98 in.) in the horizontal and vertical directions between the driver and enclosure or other equipment within the enclosure.
When installing the driver, use two screws (M4, not included) to secure the driver through the mounting holes.



[Unit: mm (in.)]

* If the following conditions are satisfied, drivers can be installed closely in the horizontal direction.
  - Metal plate [material: aluminum, 350×350×2 mm (13.78×13.78×0.08 in.) or equivalent]
  - Ambient temperature: 0 to 40 °C [+32 to 104 °F]

Possible to install closely

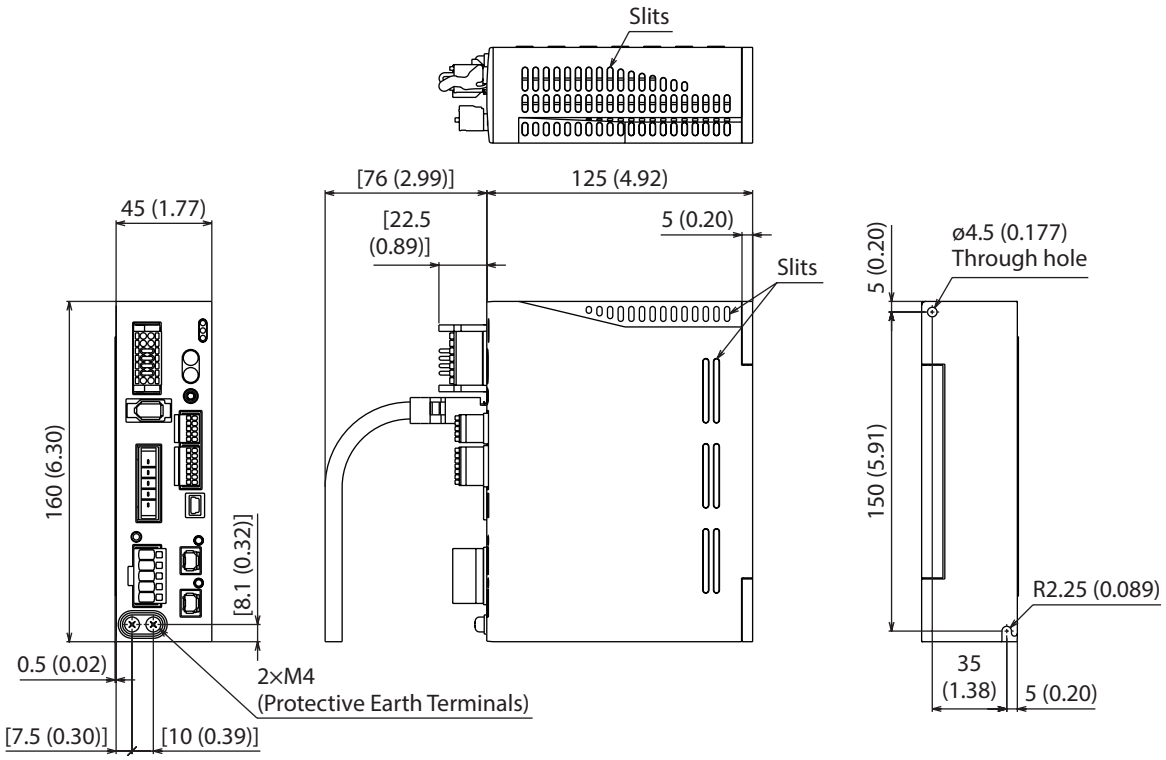


Note

- Install the driver in an enclosure whose degree of protection is IP54 minimum when used in a pollution degree 3 environment.
- Do not install any equipment that generates a large amount of heat or noise near the driver.
- Do not install the driver underneath the master station or other equipment vulnerable to heat.
- If the ambient temperature of the driver exceeds 55 °C (131 °F), reconsider the ventilation condition such as providing forced cooling by using fans or creating spaces between the drivers.
- Be sure to install the driver vertically (in vertical position).

■ Dimensions [Unit: mm (in.)]

Mass: 0.66 kg (1.45 lb.)



4 Connection

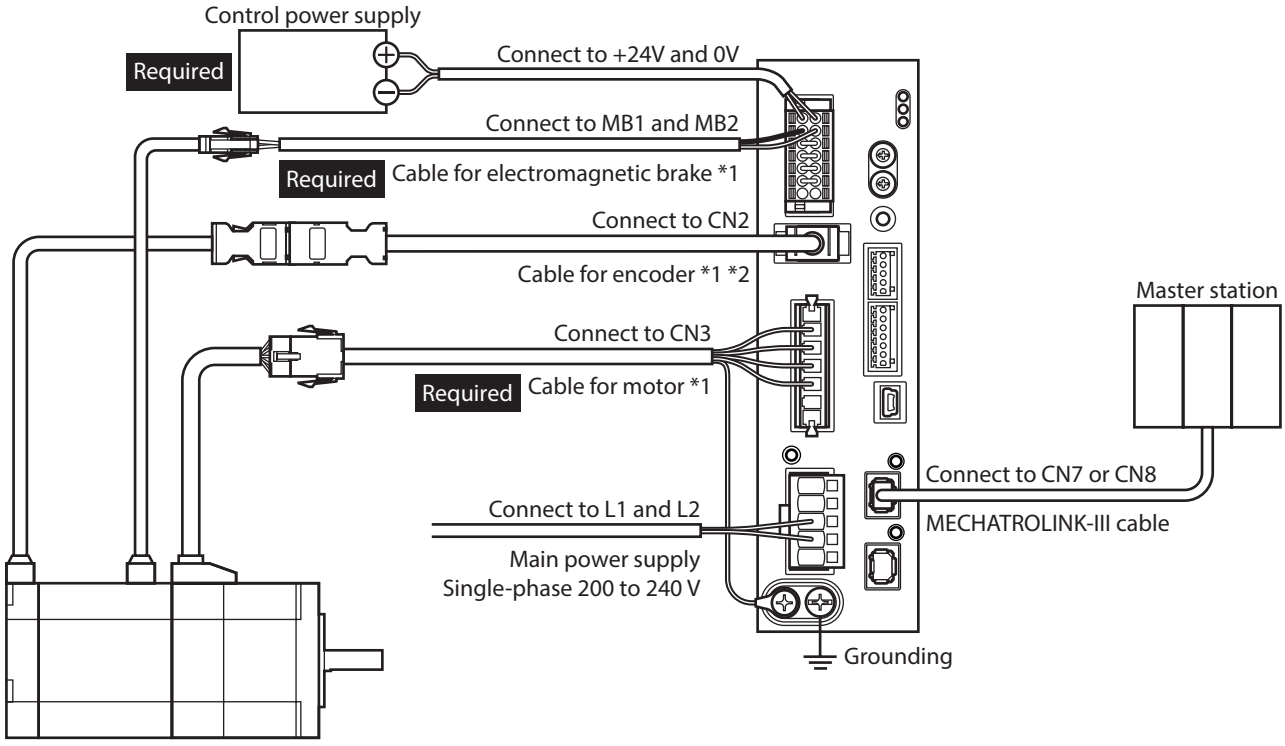
This chapter explains a connection example of a driver and a motor, connection methods of power supplies and the regeneration resistor **RGB100**, the grounding method, and others.
The installation and wiring methods to conform to the EMC Directive/Regulations as well as protection against noise are also explained.

⚠WARNING

- For protection against electric shock, do not turn on the main power supply and the control power supply until the wiring is completed.
- A high voltage is applied to the motor connector (CN3) and the main power supply input terminals (CN4). Do not touch them while the power is supplied. Doing so may result in fire or electric shock.

4-1 Connection example

Use connection cables of Oriental Motor to connect the motor. Check the model names of the cable on p.48.
The figure shows an example when the cable type electromagnetic brake motor with single-phase 200-240 VAC input is used.



*1 Theses cables are provided in Oriental Motor products. Purchase them separately.
*2 Use the cable for encoder when the length of the encoder cable of motor is not enough.

Note

- Connect the connectors securely. Insecure connections may cause malfunction or damage to the motor or driver.
- Before connecting or disconnecting a connector, turn off the main power supply and the control power supply, and check the CHARGE LED has been turned off. The residual voltage may cause electric shock.
- 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.
- Do not wire the power supply cable of the driver in the same cable duct with other power lines or the motor cable. Doing so may cause malfunction due to noise.

Note Keep the wiring distance between the motor and the driver equal to or less than the following values. Exceeding the following wiring distance may cause the driver to generate heat or increase the electrical noise emitted from the product.
Cable type: 20 m (65.6 ft.)
Connector type: 10 m (32.8 ft.)

memo
- A control power supply is required with or without an electromagnetic brake. Be sure to connect it.
- When disconnecting the motor cable, pull out while pressing the latches on the connector with fingers.
- When installing the motor on a moving part, use a flexible cable. Refer to p.48 for the model name.

■ Electrical wire size

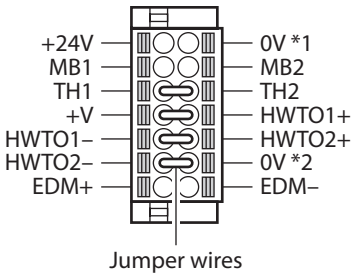
Connector	Terminal symbol	Recommended wire size
CN1	+24V, 0V, MB1, MB2, TH1, TH2, HWTO1+, HWTO1–, HWTO2+, HWTO2–, EDM+, EDM–	Stranded wire or solid wire AWG 24 to 16 (0.2 to 1.25 mm^2)
CN4	RG1, RG2, L, N, L1, L2, L3	Stranded wire or solid wire AWG 18 to 14 (0.75 to 2.0 mm^2)
CN5, CN6	–	Stranded wire or solid wire AWG 26 to 20 (0.14 to 0.5 mm^2)

4-2 Connecting the control power supply, regeneration resistor, and electromagnetic brake (CN1)

Use the CN1 connector (14 pins) to connect the control power supply, the regeneration resistor, and the electromagnetic brake.

■ Pin assignment

There are terminals of 0 V for control power supply and for internal connection. Check each position in the figure and table below.

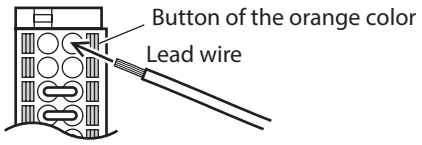


Sign	Description
+24V, 0V *1	Connects a control power supply.
MB1, MB2	Connects the lead wires from the cable for electromagnetic brake. MB1: Electromagnetic brake– (Black) MB2: Electromagnetic brake+ (White)
TH1, TH2	Connects the signal lines of the Oriental Motor's regeneration resistor **RGB100**. If the regeneration resistor is not used, connect a jumper wire to short-circuit.
HWTO1+, HWTO1– HWTO2+, HWTO2–	Connects external equipment. When using the power removal function, remove the jumper wires and connect the external equipment. If the power removal function is not used, connect jumper wires to short-circuit.
EDM+, EDM–	Connects external equipment. If the power removal function is not used, do not connect anything.
+V, 0V *2	These are for internal connection. Do not connect anything. If the power removal function is not used, connect jumper wires to short-circuit.

■ Wiring method of CN1 connector

- Applicable lead wire: AWG 24 to 16 (0.2 to 1.25 mm^2)
- Lead wire strip length: 10 mm (0.39 in.)

1. Strip the insulation of the lead wires.
2. Insert the lead wire while pushing the button of the orange color with a screwdriver.
3. After having inserted, release the button to secure the lead wire.



■ Connecting the control power supply

Use a control power supply with the following capacity.
The control power supply is a power supply for control circuit. Be sure to connect it.

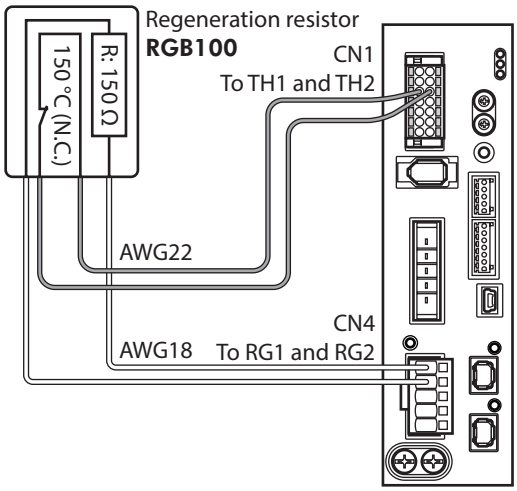
Input power supply voltage	Power supply current capacity	
	Without electromagnetic brake	With electromagnetic brake
24 VDC±5 % *1	0.25 A	0.5 A *2

*1 When an electromagnetic brake motor is used, if the wiring distance between a cable type motor and a driver is extended to 20 m (65.6 ft.) using Oriental Motor cables, the input voltage is 24 VDC±4 %.
*2 The **AZM46** type is 0.33 A.

■ Connecting the regeneration resistor

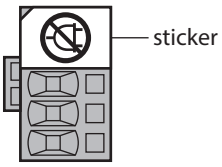
If vertical drive (gravitational operation) such as elevating applications is performed or if sudden start-stop operation of a large inertia is repeated frequently, connect the Oriental Motor's regeneration resistor **RGB100**.

- The two thin lead wires (AWG 22: 0.3 mm^2) of the regeneration resistor are the thermostat outputs. Connect them to TH1 and TH2 using the CN1 connector.
- Regenerative current flows through the two thick lead wires (AWG 18: 0.75 mm^2) of the regeneration resistor. Connect them to RG1 and RG2 using the CN4 connector.



Note

A sticker is placed on RG1 and RG2 of the CN4 connector to prevent incorrect wiring. Remove the sticker only when connecting the regeneration resistor.
Incorrectly connecting the lead wires of the main power supply may result in damage to the product.



memo

- When connecting the regeneration resistor, 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 to generate an alarm of the regeneration resistor overheat. When an alarm of regeneration resistor overheat is generated, turn off the main power supply and check the error content.

Regeneration resistor specifications

Model	**RGB100**
Allowable power consumption	Continuous regenerative power: 50 W * Instantaneous regenerative power: 600 W
Resistance value	150 Ω
Thermostat operating temperature	Operation: Opens at 150±7 °C (302±13 °F) Reset: Closes at 145±12 °C (293±22°F) [normally closed]
Thermostat electrical rating	120 VAC 4 A or 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 aluminum plate [350×350×3 mm (13.78×13.78×0.12 in.)] is ensured.

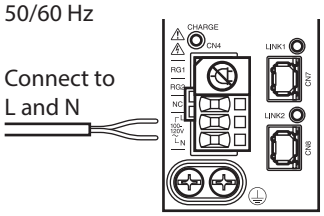
4-3 Connecting the main power supply (CN4)

The connecting method varies depending on the power supply specification.

Note Do not connect the lead wires of the main power supply to the regeneration resistor connection terminals (RG1, RG2). Doing so may result in damage to the product.

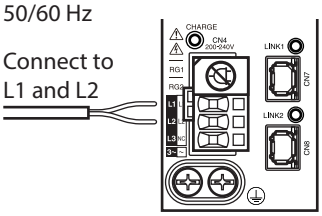
Single-phase
100 - 120 VAC –15% to +6%
50/60 Hz

Connect to
L and N



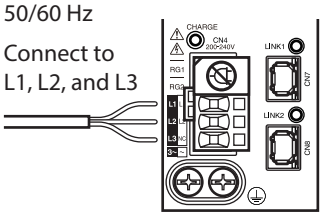
Single-phase
200 - 240 VAC –15% to +6%
50/60 Hz

Connect to
L1 and L2



Three-phase
200 - 240 VAC –15% to +6%
50/60 Hz

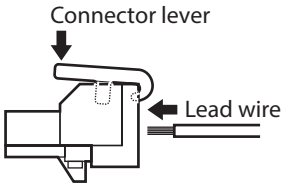
Connect to
L1, L2, and L3



■ Wiring method of CN4 connector

- Applicable lead wire: AWG18 to 14 (0.75 to 2.0 mm^2)
- Lead wire strip length: 9 mm (0.35 in.)

1. Strip the insulation of the lead wires.
2. Insert the connector lever.
3. Insert the lead wire while pushing down the connector lever.



■ Power supply current capacity

The current capacity for the main power supply varies depending on the product combined.
Check the current capacity in reference to the equipped motor model name when using the **EAC** Series, **EAS** Series, **EZS** Series, or **EZSH** Series.
The box (☐) in the model indicates an alphabet (**B**, **M**, or **R**) representing the shape of the actuator.

● **Single-phase 100-120 VAC**

Model	Power supply current capacity
AZM46	2.7 A or more
AZM48	2.7 A or more
AZM66	3.8 A or more
AZM69	5.4 A or more
AZM98	5.5 A or more
AZM911	6.4 A or more
DG☐85	2.7 A or more
DG☐130	3.8 A or more
DG☐200	6.4 A or more
LM2	3.8 A or more
LM4	3.8 A or more

● **Single-phase 200-240 VAC**

Model	Power supply current capacity
AZM46	1.7 A or more
AZM48	1.6 A or more
AZM66	2.3 A or more
AZM69	3.3 A or more
AZM98	3.3 A or more
AZM911	3.9 A or more
DG☐85	1.7 A or more
DG☐130	2.3 A or more
DG☐200	3.9 A or more
LM2	2.3 A or more
LM4	2.3 A or more

● **Three-phase 200-240 VAC**

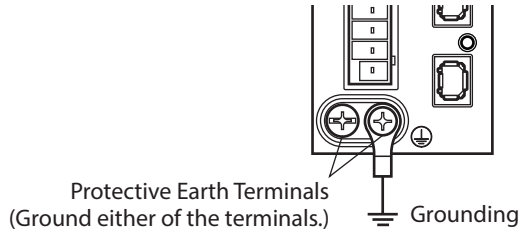
Motor model	Power supply current capacity
AZM46	1.0 A or more
AZM48	1.0 A or more
AZM66	1.4 A or more
AZM69	2.0 A or more
AZM98	2.0 A or more
AZM911	2.3 A or more
DG☐85	1.0 A or more
DG☐130	1.4 A or more
DG☐200	2.3 A or more
LM2	1.4 A or more
LM4	1.4 A or more

4-4 Grounding the driver

Two Protective Earth Terminals (screw size: M4) are provided on the driver. Be sure to ground one of the Protective Earth Terminals. Either of the two Protective Earth Terminals can be used for grounding the driver.

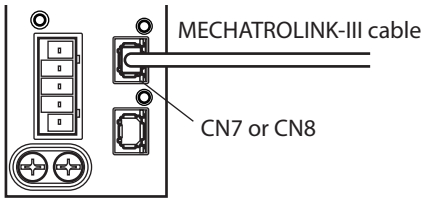
- Grounding wire: AWG 16 to 14 (1.25 to 2.0 mm^2)
- Tightening torque: 1.2 N•m (170 oz-in)

Connect the grounding wire of the "cable for motor" to the other terminal 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.



4-5 Connecting the MECHATROLINK-III cable.

Connect the MECHATROLINK-III cable to the MECHATROLINK-III communication connectors (CN7, CN8).
Use the dedicated cable with connector for the MECHATROLINK-III cable.
Using a vacant connector can connect to another MECHATROLINK-III compatible product.



4-6 Connecting the USB cable

Using a USB cable of the following specification, connect a PC in which the **MEXE02** has been installed to the USB communication connector.

Specifications	USB2.0 (Full speed)
Cable	Length: 3 m (9.8 ft.) or less Shape: A to mini B

memo
- Connect the driver and a PC directly using a USB cable.
- In large electrically noisy environments, use the USB cable with a ferrite core or install a ferrite core to the USB cable.

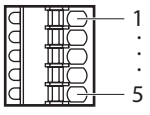
4-7 Connecting the I/O signals (CN5, CN6)

■ Pin assignment

● **Input signals connector (CN5)**

Pin No.	Name	Description *
1	IN0	Control input 0 (FW-BLK)
2	IN1	Control input 1 (RV-BLK)
3	IN2	Control input 2 (EXT1)
4	IN3	Control input 3 (DEC)
5	IN-COM	Input common

* ( ): Initial value

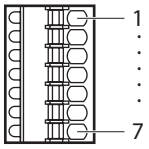


- Input voltage: 24 VDC±10 %
- Internal resistor: 4.4 kΩ

● **Output signal connector (CN6)**

Pin No.	Name	Description *
1	OUT0+	Control output 0 (ALM-B)
2	OUT0–	
3	OUT1+	Control output 1 (READY)
4	OUT1–	
5	OUT2+	Control output 2 (MOVE)
6	OUT2–	
7	N.C.	–

* ( ): Initial value

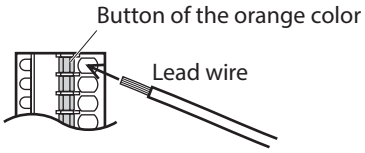


- Output voltage: 4.5 to 26.4 VDC
- Output current: 10 mA or less

■ Wiring method of connectors for CN5 and CN6

- Applicable lead wire: AWG26 to 20 (0.14 to 0.5 mm^2)
- Lead wire strip length: 8 mm (0.31 in.)

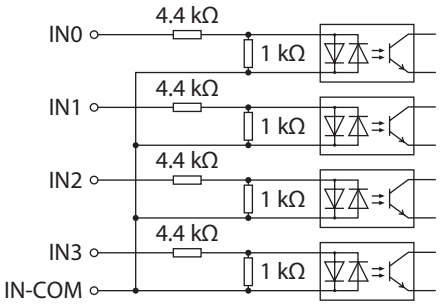
1. Strip the insulation of the lead wires.
2. Insert the lead wire while pushing the button of the orange color with a screwdriver.
3. After having inserted, release the button to secure the lead wire.



■ Input signals

- Photocoupler inputs
- Input resistance: 4.4 kΩ
- Input voltage: 24 VDC±10 %

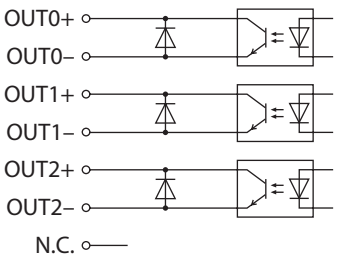
● **Internal circuit**



■ Output signals

- Maximum output current: 10 mA
- Applicable voltage: 4.5 to 26.4 VDC

● **Internal circuit**

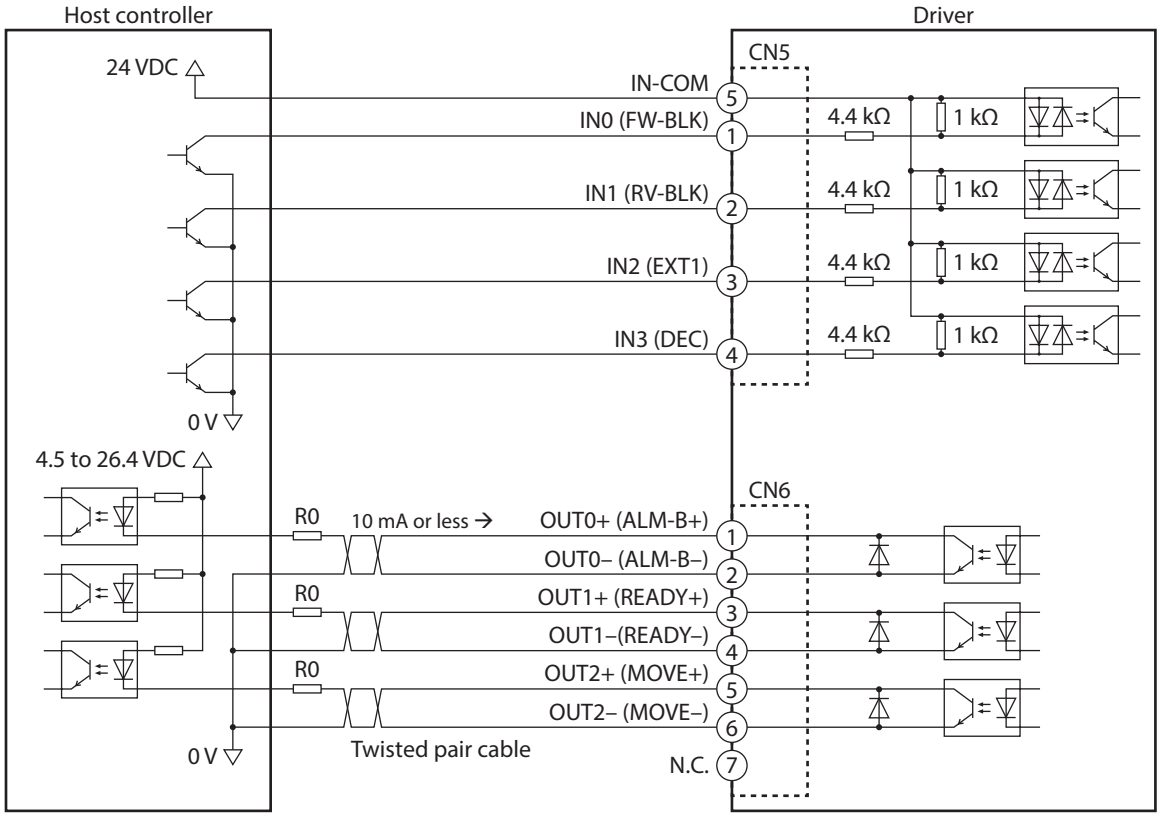


■ Connection diagram

memo

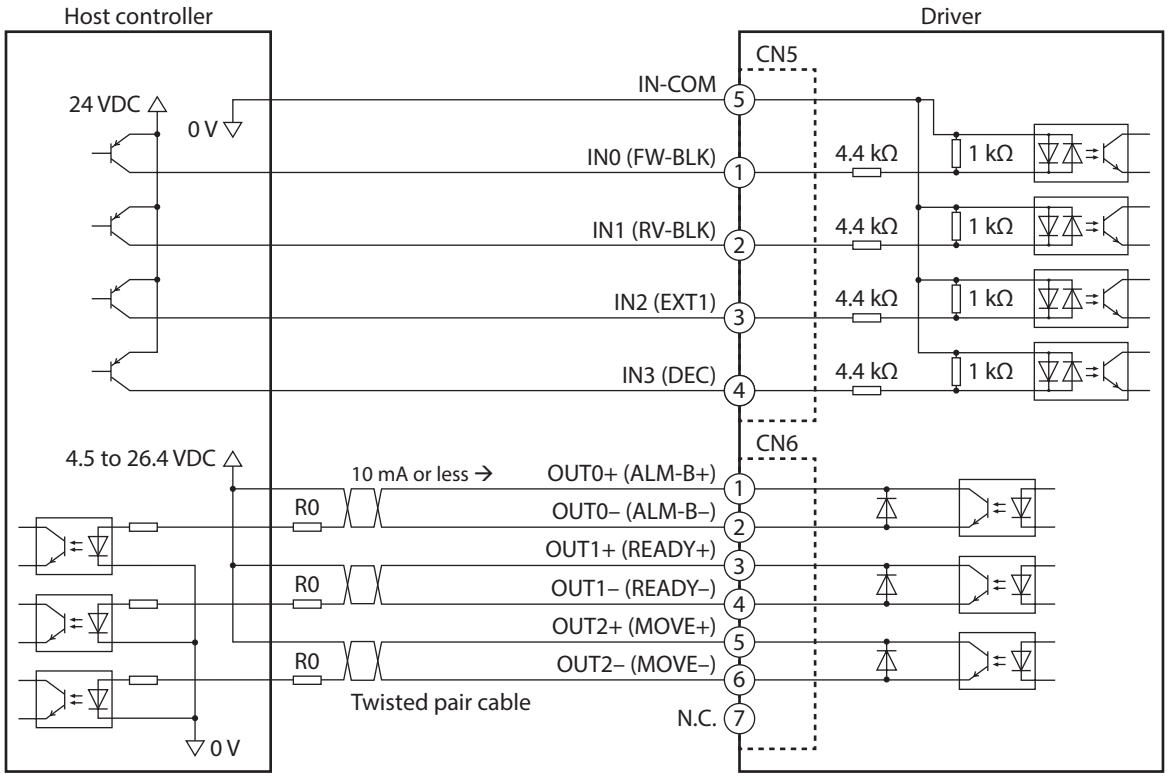
- Use input signals at 24 VDC.
- Use output signals at 4.5 to 26.4 VDC, 10 mA or less. If the current exceeds 10 mA, connect an external resistor R0 to keep 10 mA or less.

● Connection example with a current sink output circuit



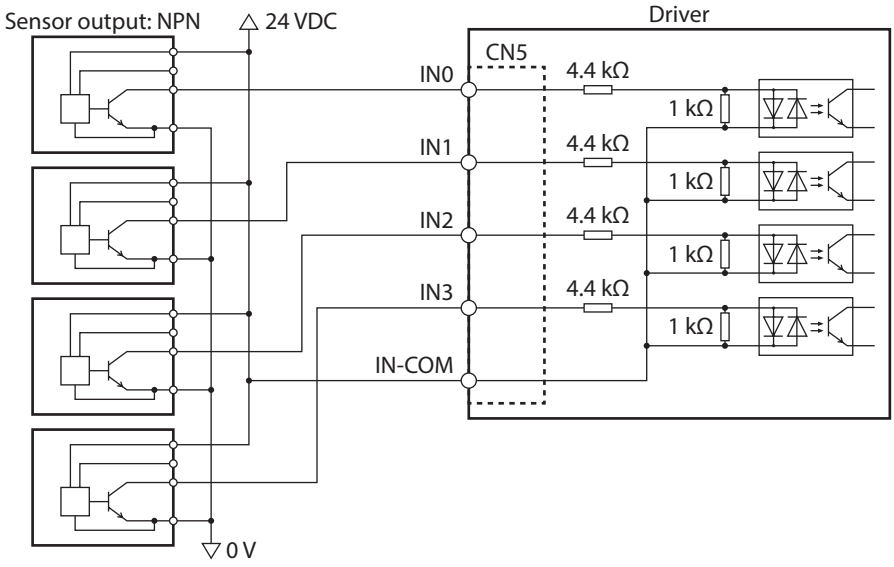
* ( ): Initial value

- **Connection example with a current source output circuit**

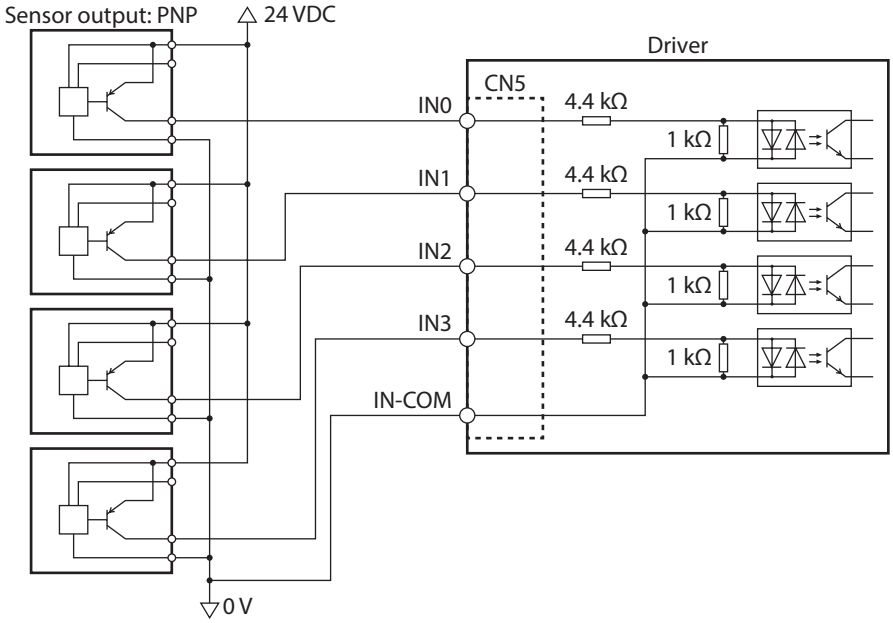


* ( ): Initial value

- **Connection example with sensors of a current sink output circuit type**



● **Connection example with sensors of a current source output circuit type**



4-8 Noise elimination measures

There are two types of electrical noises: 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 equipment 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

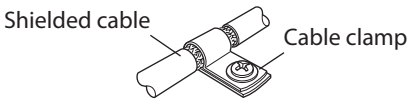
There are the following three methods mainly to take measures against the electrical noise.

● **Noise suppression**

- When relays or electromagnetic switches are used, use noise filters or CR circuits to suppress surge generated by them.
- Use Oriental Motor connection cables when extending the wiring distance between a motor and a driver. Refer to p.48 for the model name. This is effective in suppressing the electrical noise emitted from the motor.
- Cover the driver by a metal plate such as aluminum. This is effective in shielding the electrical noise emitted from the driver.

● **Prevention of noise propagation**

- Connect a noise filter to the power supply cable of the 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 a power cable and a signal cable 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.
- To ground a shielded cable, use a metal cable clamp that can maintain contact with the entire circumference of the shielded cable, and ground as near the product as possible.



● **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. When increasing the effect of noise attenuation by the ferrite core, loop the cable a lot.

■ Noise suppression product

● 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.

Manufacturer	Single-phase 100-120 VAC, Single-phase 200-240 VAC	Three-phase 200-240 VAC
Soshin Electric Co., Ltd.	HF2010A-UPF	HF3010C-SZA
Schaffner EMC	FN2070-10-06	FN3025HP-10-71

- Use the AWG18 (0.75 mm^2) or thicker wire for the input and output cables of the noise filter, and secure firmly using a cable clamp or others 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 cables are placed at a close distance or if they are wired in parallel, the noise in the enclosure affects the power cable through stray capacitance, and the noise suppressing effect will reduce.
- Connect the ground terminal of the noise filter to the grounding point, using as thick and short a wire as possible.
- When connecting a noise filter in an enclosure, wire the input cable of the noise filter as short as possible. Wiring in long distance may reduce the noise suppressing effect.

■ Oriental Motor's noise suppression products

Refer to p.53 for the model name.

● 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. A CR circuit for surge suppression and a CR circuit module are provided.

4-9 Conformity to EMC Directive/Regulations

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 EMC Directive/Regulations.
Oriental Motor conducts EMC testing on its motors and drivers in accordance with "Example of installation and wiring" on p.36. The user is responsible for ensuring the machine's compliance with the EMC, based on the installation and wiring explained below.

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

● Connecting the noise filter

In large electrically noisy environments, connect a noise filter. Refer to "Noise filter" for details.

● Connecting the control power supply

Use a DC power supply compliant with EMC Directive/Regulations for the control power supply.
Wire and ground the power supply over the shortest possible distance using a shielded cable.
Refer to "Prevention of noise propagation" on p.34 for how to ground the shielded cable.

● Connecting the motor cable

Use Oriental Motor connection cables when extending the wiring distance between a motor and a driver. Refer to p.48 for the model name.

● Connecting the signal cable

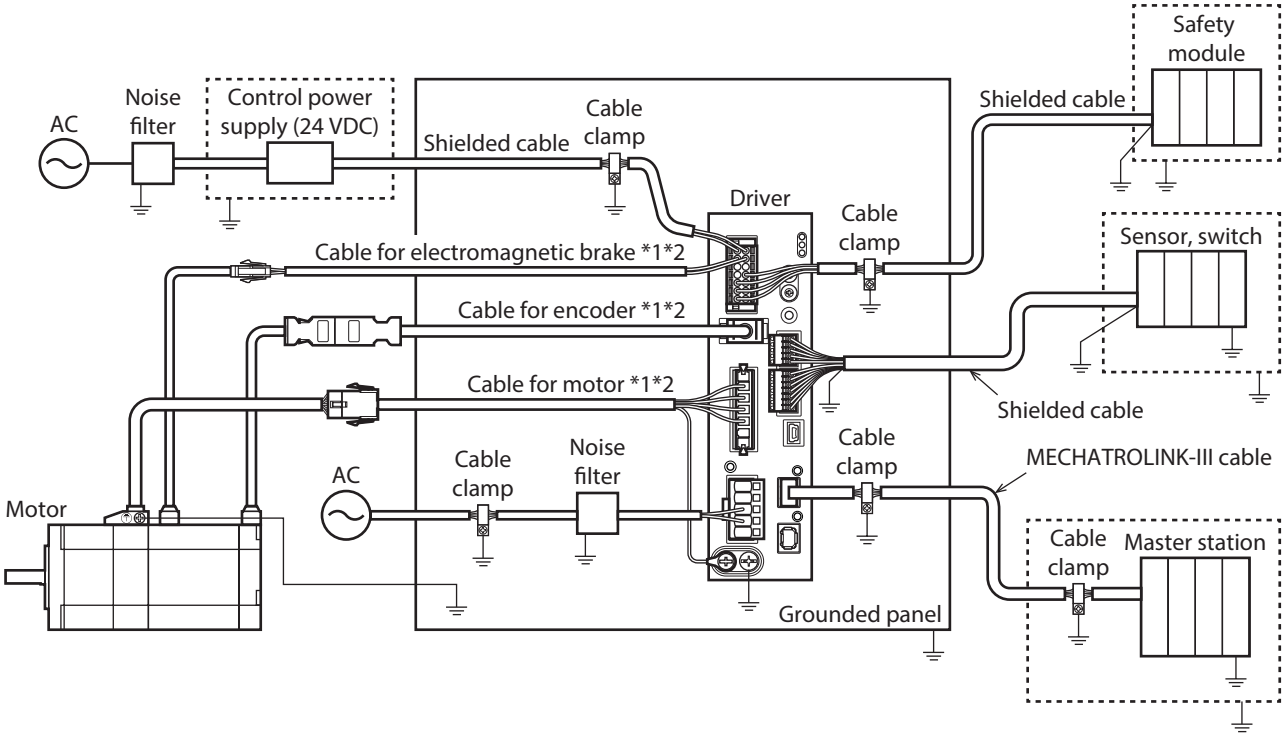
Refer to "Prevention of noise propagation" on p.34.

● Grounding method

- 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.
- When installing a motor and a driver, connect their Protective Earth Terminals. Refer to p.30 for the grounding method.

- **Example of installation and wiring**

  Use connection cables of Oriental Motor to connect the motor. Check the model names of the cable on p.48.
  The figure shows an example when the cable type electromagnetic brake motor is used.



*1 It is our cable.

*2 For the AZ Series connector type motors of frame size 85 mm(3.35 in.), the EMC test is conducted in a state where a ferrite core is installed near the connector on the motor side of the connection cable.

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

5 Settings

This chapter explains how to set the functions of the driver.

5-1 Station address

Set the station address of the driver using two station address setting switches (STATION No. ×10, ×1).
The station address setting switches are hexadecimal. Convert the station address from decimal to hexadecimal to set.
When connecting two or more MECHATROLINK-III compatible products, do not set duplicate station addresses.

Setting range 3 to 239 (03h to EFh)
Factory setting 3 (×10: 0, ×1: 3)

memo
- Be sure to turn off the control power supply of the driver before setting the switches. Setting the switches in a state where the control power supply is on will not enable the new setting.
- The station address 0 to 2 (00h to 02h) and 240 to 255 (F0h to FFh) cannot be used.

5-2 Extension input signals

Input signals can be allocated to the extension switch (EXT-IN).

Factory setting P-PRESET

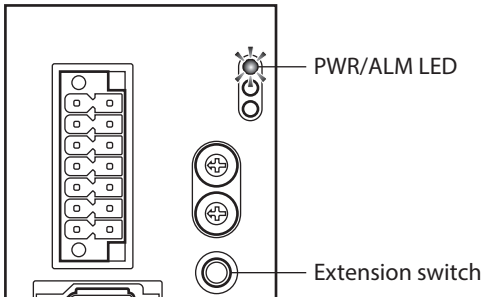
Related parameters

Parameter No.	Name	Description	Initial value
1970h	Extended input (EXT-IN) function	Selects the input signal to allocate to the extension switch (EXT-IN). **[Setting range]** Input signal list⇨p.115	9: P-PRESET
1971h	Extended input (EXT-IN) inverting mode	ON/OFF of the input signal allocated to the extension switch (EXT-IN) is inverted. **[Setting range]** 0: Not invert 1: Invert	0
1972h	Extended input (EXT-IN) interlock releasing time	Normally, the extension switch (EXT-IN) is interlocked. Holding down the switch for a certain time period releases the interlock to enable the allocated function. This parameter is used to set the time period during which the switch is held down in order to release the interlock. **[Setting range]** 0: Interlock disabled 1 to 50 (1=0.1 s)	10
1973h	Extended input (EXT-IN) interlock releasing duration	Sets the time period during which the state releasing the interlock is retained. **[Setting range]** 0 to 50 (1=0.1 s)	30
1974h	Extended input (EXT-IN) ON monitor time	When the signal allocated to the extension switch (EXT-IN) is input, the PWR/ALM LED is lit in green and red at the same. This parameter is used to set the time period during which the LED is lit. **[Setting range]** 0 to 50 (1=0.1 s)	10

■ How to operate the extension switch (EXT-IN)

Normally, the extension switch (EXT-IN) is interlocked. If the following operation is performed, the interlock of the extension switch (EXT-IN) is released, and the allocated input signal is executed.

1. Hold down the extension switch (EXT-IN) until the PWR/ALM LED blinks in green and red at the same.
   Green and red colors may overlap and it may be visible to orange.
   While the PWR/ALM LED is blinking, the state releasing the interlock (*2) is continued.
2. While the PWR/ALM LED is blinking, release the hand from the extension switch (EXT-IN), and press it again.
   When the input signal allocated to the extension switch (EXT-IN) is executed, the PWR/ALM LED is lit in green and red at the same (*3). After that, it is lit in green only.

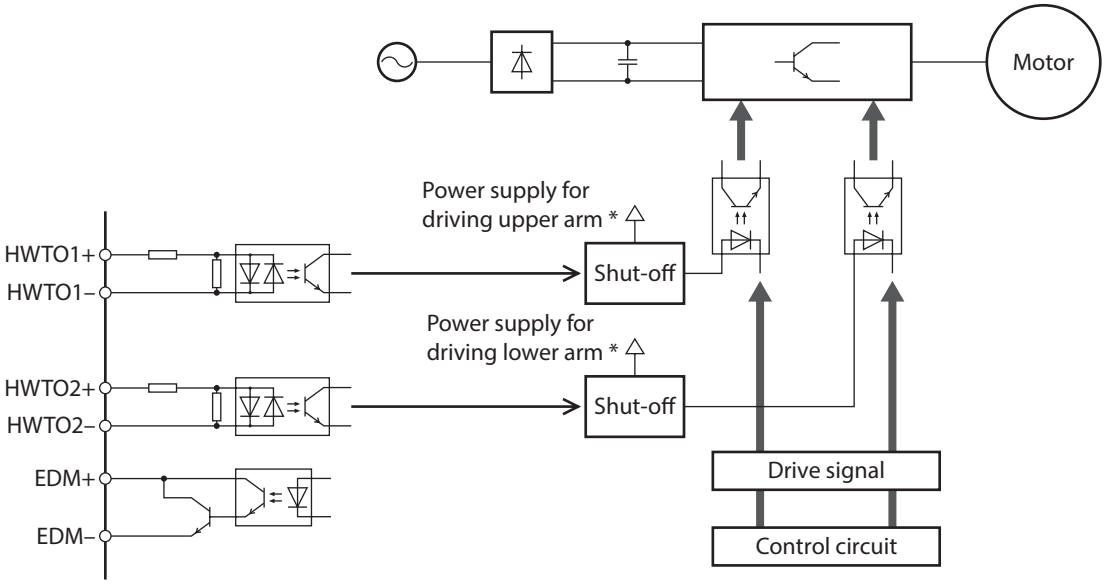


*1 The time period during which the extension switch (EXT-IN) is held down can be set in the Extended input (EXT-IN) interlock releasing time (device parameter 1972h).
*2 The time period during which the interlock is being released can be set in the Extended input (EXT-IN) interlock releasing duration (device parameter 1973h).
*3 The time period during which the PWR/ALM LED is lit can be set in the Extended input (EXT-IN) ON monitor time (device parameter 1974h).

memo Be sure to perform the operation of the step 2 while the PWR/ALM LED blinks. If the PWR/ALM LED has returned to green light, perform from the step 1 again.

6 Power removal function

The power removal function is a function that stops supplying the power to the motor by the hardware.
This function shuts off the drive signal of the inverter circuit that controls the motor current with two input channels (HWTO1 input, HWTO2 input). This brings a shutoff state of the power supplying to the motor (power removal status).
The power removal function is assumed to be used to prevent unexpected starting of the moving parts of equipment when an operator works inside the operating range of the moving parts.



* Turning the HWTO1 input OFF causes the upper arm drive signal of the inverter circuit to shut off.
Turning the HWTO2 input OFF causes the lower arm drive signal of the inverter circuit to shut off.

Note Be sure to check the motor is in a standstill state before executing the power removal function. Executing the power removal function while the motor is operated may cause damage to the motor, the driver, or equipment.

6-1 Safety parameters

Item	Specifications
Safety integrity level	SIL 3 *
Average frequency of a dangerous failure per hour	PFH=2.96×10^{-9} [1/h]
Hardware fault tolerance	HFT=1
Subsystem	Type A
Mission time	10 years
Response time	15 ms or less
Performance level	PL e (Category 3)*
Mean time to dangerous failure	MTTFd: High
Average diagnostic coverage	DC_{avg}: Medium
Stop category	0 (IEC 60204-1)

* It is necessary to monitor the EDM output using an external device.

6-2 Notes when using the power removal function

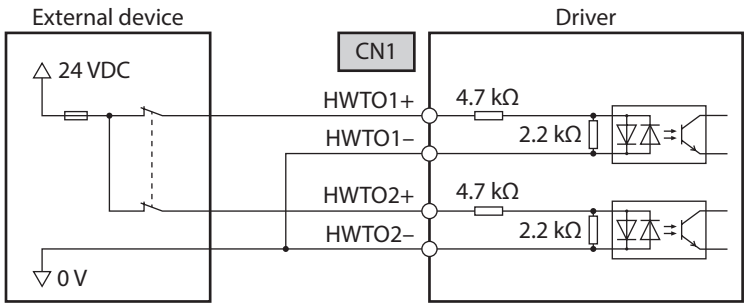
- **When the power removal function is used, be sure to conduct a risk assessment of equipment in advance and check that the safety requirements of the safety-related parts of a control system are satisfied.**
- **The design of the safety-related parts of a control system using the power removal function should be performed by qualified personnel who are trained in the relevant safety standards and understand the contents of this chapter.**
- **If the power removal function is activated, the motor output shaft may be rotated by external forces (gravity on a vertical axis, etc.). To hold the motor output shaft in position, install an external brake mechanism or equivalent. The brake mechanism of the electromagnetic brake motor is used for the purpose to hold the position. Do not use the brake mechanism of the electromagnetic brake motor for braking the motor rotation. This may result in injury or damage to equipment.**
- **If the power removal function is activated, the driver stops supplying the power to the motor. However, the power supplying to the driver is not shut off, and the driver is not electrically insulated either. Before performing maintenance or inspection, always turn off the driver power, and check the CHARGE LED is turned off. Failure to do so may result in electric shock.**
- **If the inverter circuit is failed, the motor output shaft may rotate up to 180 degrees in an electrical angle (3.6 degrees in a mechanical angle) even when the power removal function is activated. Make sure this movement does not cause hazardous situations. Failure to do so may result in injury or damage to equipment.**
- **Connect the I/O signals related to the power removal function to an external device which conforms to the safety standard.**
- **Be sure to perform the verification testing of the power removal function when starting up or maintaining the equipment, or when replacing the driver. Failure to do so may result in injury or damage to equipment. If the power removal function is used in an incorrect state such as incorrect wiring of I/O signals, the power removal function may not be activated properly, causing hazardous situations.**

6-3 I/O signals

■ HWTO1 input, HWTO2 input

These are signals to activate the power removal function.

Note Provide the contacts individually for operating the HWTO1 input and the HWTO2 input.

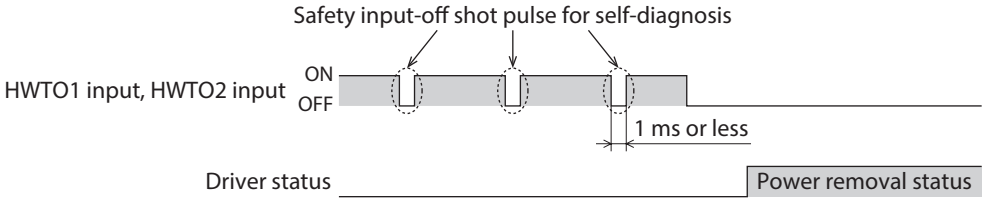


Specifications

- Input voltage: 24 VDC±10 %

Safety input-off shot pulse for self-diagnosis of external device

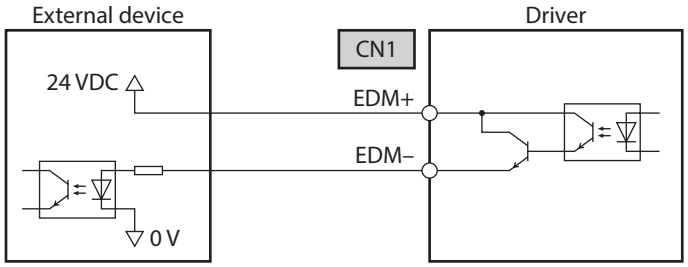
If the safety output signal output from an external device includes the safety input-off shot pulse for self-diagnosis, use an external device which pulse width is 1 ms or less. If the OFF-time of the HWTO1 input or the HWTO2 input by the safety input-off shot pulse is 1 ms or less, the power removal function is not activated.



■ EDM output

The EDM output is a signal to monitor a failure in the power removal function.

Note The EDM output is not an output signal to ensure the safety. Do not use the EDM output for any other purpose except for monitoring a failure.



Specifications

- Voltage: 30 VDC or less
- Current: 50 mA or less
- Output saturated voltage: 1.1 VDC maximum.

6-4 Operation of power removal function

■ Transition to power removal status

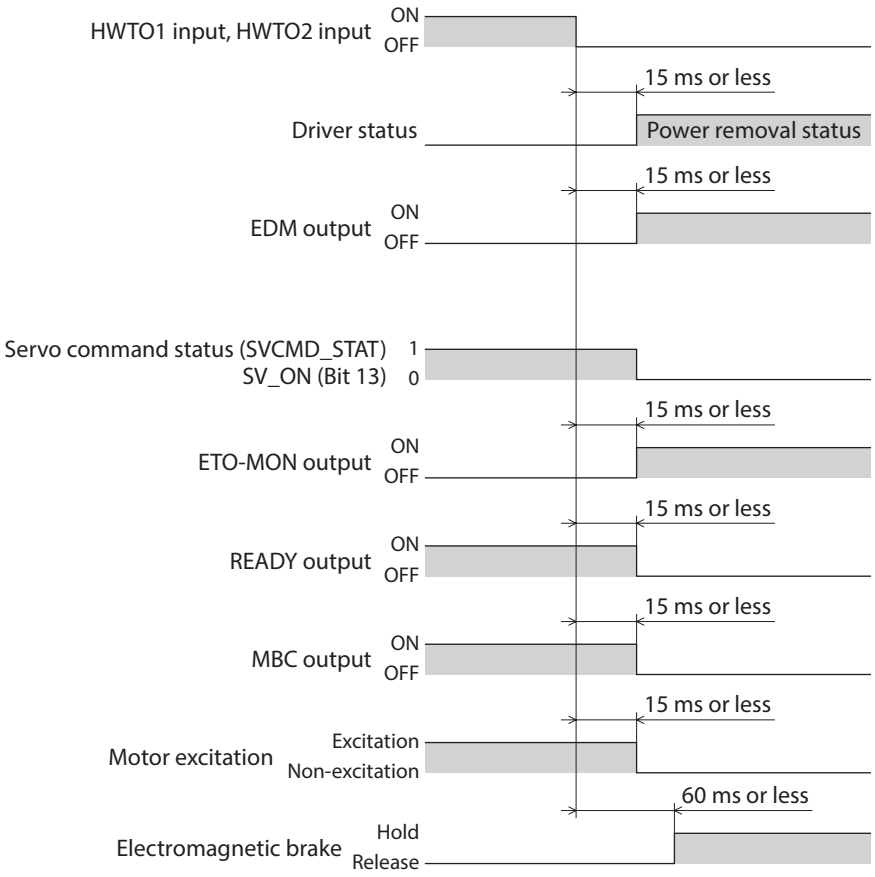
If both the HWTO1 and HWTO2 inputs are turned OFF, the driver transitions to the power removal status, and the power supplying to the motor is shut off by the hardware, causing the motor to put into a non-excitation state.
In the power removal status, the status of the motor and driver will be as follows. [When the HWTO mode selection (device parameter 1190h) is set to "0: Alarm is not present (initial value)"]

- SV_ON (Bit 13) of the Servo command status (SVCMD_STAT) is 0
- The ETO-MON output is ON.
- The READY output and the MBC output are OFF.
- The PWR/ALM LED blinks in green.
- When an electromagnetic brake motor is used, the electromagnetic brake is in a state of holding the motor shaft.

Note

- Be sure to check the motor is in a standstill state before executing the power removal function. Executing the power removal function while the motor is operated may cause damage to the motor, the driver, or equipment.
- It takes 15 ms maximum from when the HWTO1 and HWTO2 inputs are turned OFF until when the driver is in the power removal status.
- To transition to the power removal status, be sure to turn the HWTO1 and HWTO2 inputs OFF for at least 15 ms.
- The Servo command status (SVCMD_STAT), the ETO-MON output, the READY output, the MBC output, the PWR/ALM LED, and the electromagnetic brake are not safety-related parts of a control system.

- **Timing chart**



■ Return from power removal status

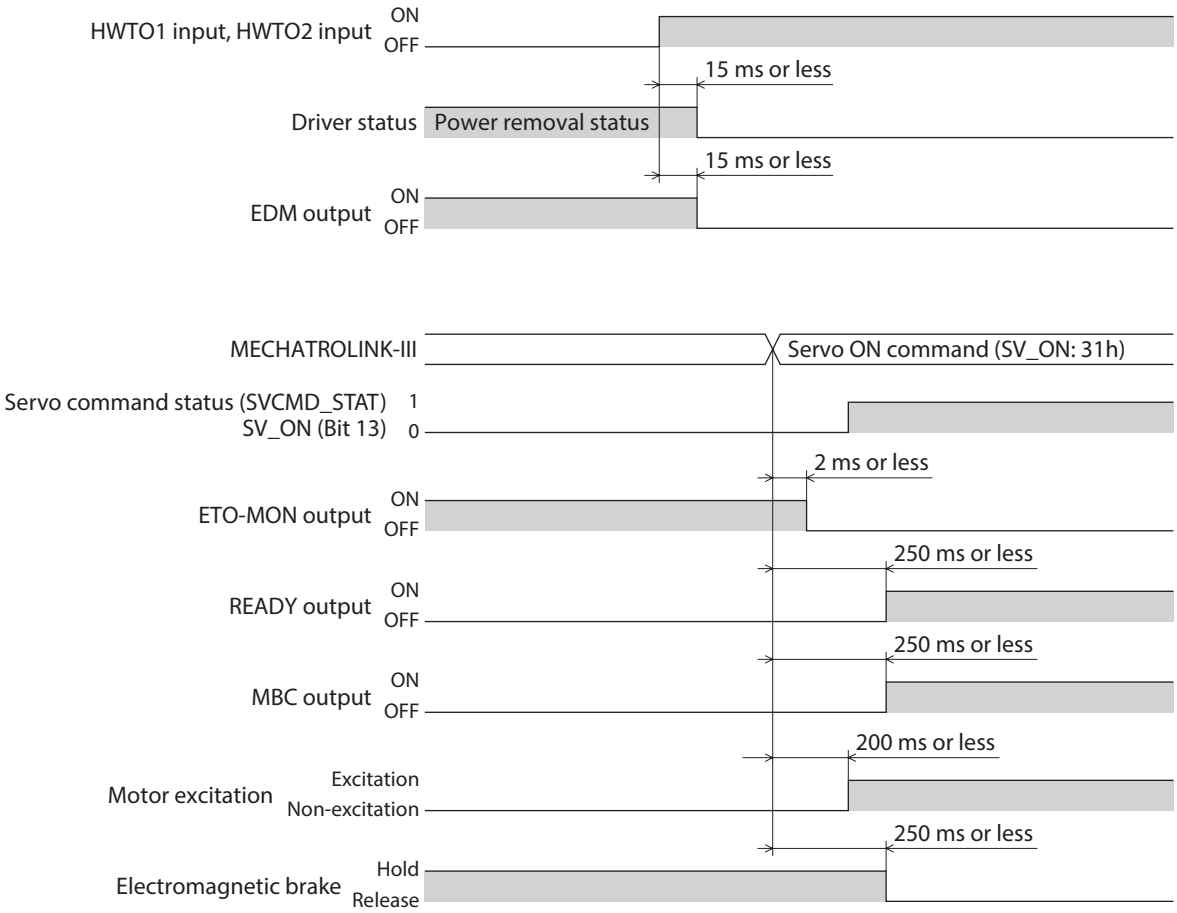
If both the HWTO1 and the HWTO2 inputs are turned ON, the power removal status is released. At this time, the motor remains in a non-excitation state.
To put the motor into an excitation state, send the Servo ON command (SV_ON: 31h) via MECHATROLINK-III. When the Servo ON command (SV_ON: 31h) is sent, the status of the motor and driver will be as follows.

- SV_ON (Bit 13) of the Servo command status (SVCMD_STAT) is 1
- The ETO-MON output is OFF.
- The READY output and the MBC output are ON.
- The PWR/ALM LED is lit in green.
- When an electromagnetic brake motor is used, the electromagnetic brake is in a state of releasing the motor shaft.

Note

- Check the equipment is in a safe state before returning the driver from the power removal status.
- Even if either the HWTO1 input or the HWTO2 input is turned ON, the power removal status cannot be released.
- If the ON-time of the HWTO1 and HWTO2 inputs is less than 15 ms, the power removal status may not be released.
- When the power removal status is released, a shut-off state of supplying the power to the motor by the hardware is also released.
- The Servo ON command (SV_ON: 31h) is not a safety-related part of a control system.

● **Timing chart**



■ Failure detection of power removal function

Monitoring the input status of the HWTO1 and HWTO2 inputs and the output status of the EDM output relative to the inputs can detect the failure of the power removal function.
When the power removal function is properly operated, the combination of each signal is any of the following.
Combinations other than the table indicate the power removal function of the driver is in a failure state.

HWTO1 input	HWTO2 input	EDM output
ON	**ON**	OFF
OFF	OFF	**ON**
ON	OFF	OFF
OFF	**ON**	OFF

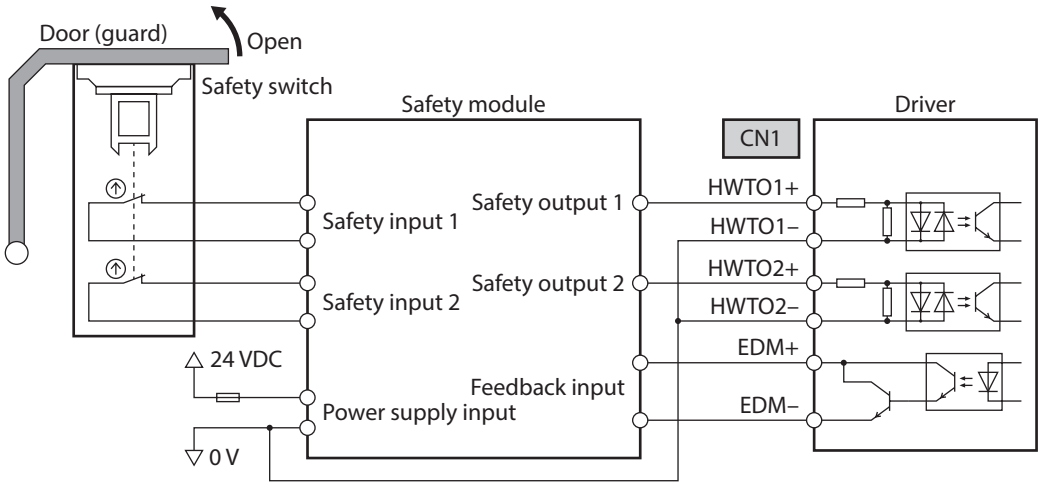
If only one of the HWTO1 input and the HWTO2 input is ON or OFF, the external device or wiring has failed. Check the cause and take a measure immediately. At this time, the EDM output is in an OFF state and the motor puts into a non-excitation state.

Note

- Do not release the power removal function when the EDM output is in an OFF state.
- If the driver or external device is failed or an error in wirings occurs, check the cause and take a measure immediately.
- The power removal function of the driver is classified in Category 3 of ISO 13849-1. Not all dangerous failures can be detected with the EDM output.

6-5 Example of use

This section describes the connection method that the power removal function is activated when the door (guard) is opened using a safety module.



■ Operation in normal state

● When the door (guard) is opened

Open the door (guard).
↓
The safety input 1 and the safety input 2 of the safety module are turned OFF.
↓
The safety output 1 and the safety output 2 of the safety module are turned OFF.
↓
The HWTO1 input and the HWTO2 input of the driver are turned OFF.
↓
The power removal function is activated and the EDM output is turned ON.

● When the door (guard) is closed

Close the door (guard).
↓
The safety input 1 and the safety input 2 of the safety module are turned ON.
↓
The safety output 1 and the safety output 2 of the safety module are turned ON because the feedback input (the EDM output of the driver) is ON.
↓
The HWTO1 input and the HWTO2 input of the driver are turned ON, and the power removal function is released.

■ How to detect a failure

If a failure that the HWTO1 input or the HWTO2 input is not turned OFF occurs, the EDM output is not turned ON. A failure can be detected because the safety module is not reset even if the door (guard) is closed and the motor cannot be started.

6-6 Verification testing of power removal function

- Be sure to perform the verification testing of the power removal function when starting up or maintaining the equipment, or when replacing the driver.
- According to use conditions of the safety related parts of a control system, perform a verification test of the power removal function at least once three months.
- Keep the verification result on record.

■ Description of verification testing

1. Turn on the control power supply and main power supply of the driver while both the HWTO1 and HWTO2 inputs are an ON state.
2. Check that the motor is excited by the Servo ON command (SV_ON: 31h) and the EDM output is an OFF state.
3. Turn both the HWTO1 and HWTO2 inputs OFF.
   Check that the motor is in a non-excitation state and the EDM output is in an ON state.

6-7 Related functions

Note The related functions are not safety-related parts of a control system.

- **HWTOIN-MON output**

  If the HWTO1 input or the HWTO2 input is turned OFF, the HWTOIN-MON output is turned ON.

- **ETO-MON output**

  If the HWTO1 input or the HWTO2 input is turned OFF when the HWTO mode selection (device parameter 1190h) is set to "0: Alarm is not present," the ETO-MON output is turned ON. If the motor is excited by the Servo ON command (SV_ON: 31h) after both the HWTO1 and HWTO2 inputs are turned ON, the ETO-MON output is turned OFF.

  Related parameters

Parameter No.	Name	Description	Initial value
1190h	HWTO mode selection	Generates an alarm when the HWTO1 input or the HWTO2 input is turned OFF. **[Setting range]** 0: Alarm is not present 1: Alarm is present	0

- **EDM-MON output**

  If both the HWTO1 and HWTO2 inputs are turned OFF, the EDM-MON output is turned ON.

Note Be sure to use the EDM output of CN1 to detect the failure of the power removal function.

- **Alarm of HWTO input detection**

  If the HWTO mode selection (device parameter 1190h) is set to "1: Alarm is present," an alarm will be generated when the HWTO1 input or the HWTO2 input is turned OFF. (HWTO input detection, alarm code 68h)
  At this time, the PWR/ALM LED blinks once in red repeatedly.
  When the HWTO mode selection (device parameter 1190h) is set to "1: Alarm is present," the motor can be excited if the ALM-RST input is turned from OFF to ON after the power removal function is released. (It is enabled at the ON edge.)

  Related parameters

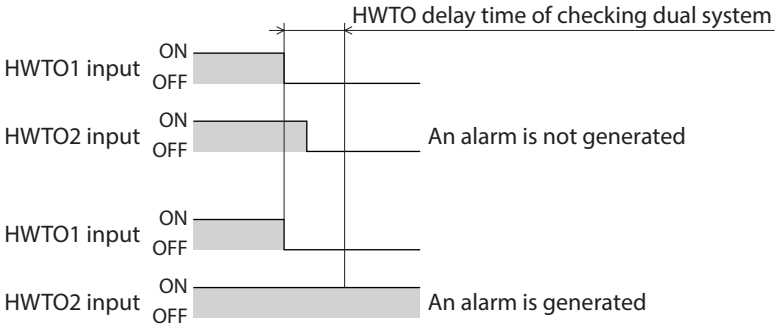
Parameter No.	Name	Description	Initial value
1190h	HWTO mode selection	Generates an alarm when the HWTO1 input or the HWTO2 input is turned OFF. **[Setting range]** 0: Alarm is not present 1: Alarm is present	0

- **Alarm of HWTO input circuit error**

  If a time after either the HWTO1 input or the HWTO2 input is turned OFF until the other input is turned OFF exceeds the value set in the HWTO delay time of checking dual system (device parameter 1191h), an alarm will be generated. (HWTO input circuit error, alarm code 53h)
  At this time, the PWR/ALM LED blinks twice in red repeatedly.

  Related parameters

Parameter No.	Name	Description	Initial value
1191h	HWTO delay time of checking dual system	If a time after either the HWTO1 input or the HWTO2 input is turned OFF until the other input is turned OFF exceeds the value set in this parameter, an alarm will be generated. **[Setting range]** 0 to 10 (Disable), 11 to 100 ms	0



7 Inspection and maintenance

7-1 Inspection

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

■ Inspection item

- Check if the openings in the driver are clogged.
- Check if the installation place of the driver is loose.
- Check if any of the connection parts of the driver is loose.
- Check if dust is deposited on the driver.
- Check if the driver has unusual smells or appearance defects.

Note The driver uses semiconductor components. Static electricity may damage the semiconductor components of the driver, so be extremely careful when handling them.

7-2 Warranty

Check on the Oriental Motor Website for the product warranty.

7-3 Disposal

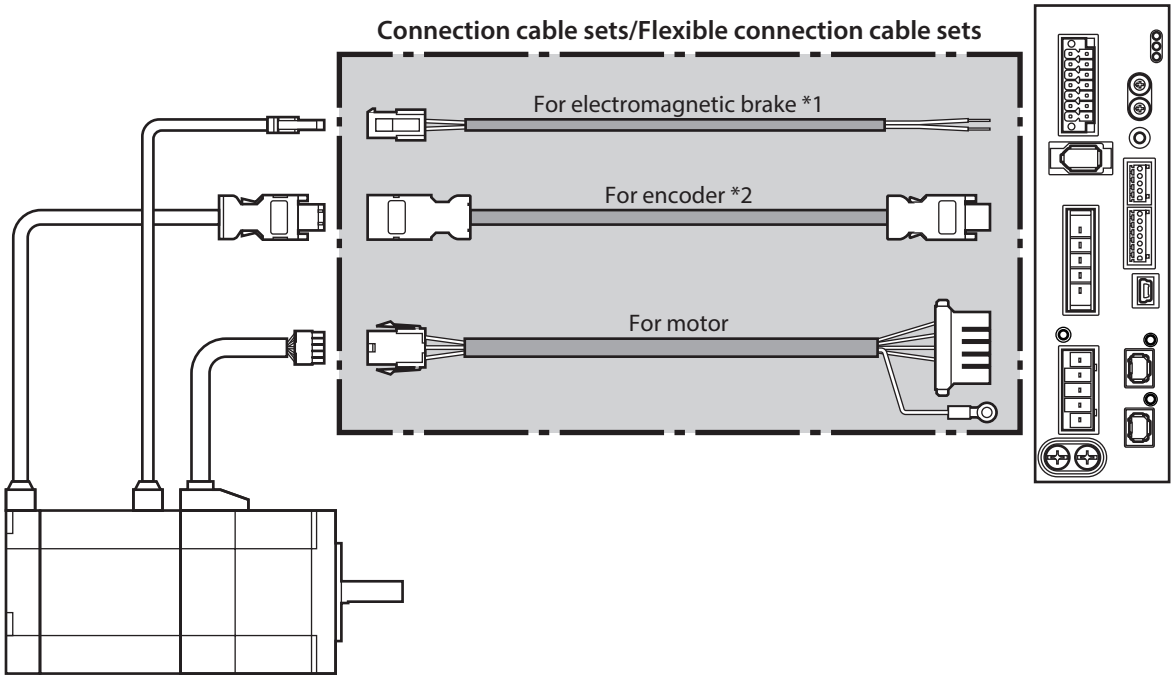
Dispose the product correctly in accordance with laws and regulations, or instructions of local governments.

8 Cables

8-1 Connection cables (For cable type)

■ Connection cable sets/Flexible connection cable sets

These cables are used when connecting a motor and a driver. The cable set includes two cables for the motor and the encoder.
The cable set of electromagnetic brake motors includes three cables for the motor, the encoder, and the electromagnetic brake.



*1 Only when the motor is the electromagnetic brake type.
*2 Use the cable for encoder when the length of the encoder cable of motor is not enough.

memo When installing the motor on a moving part, use a flexible cable.

- **Connection cable sets**

For motor/encoder

Model	Length [m (ft.)]
CC005VZF	0.5 (1.6)
CC010VZF	1 (3.3)
CC015VZF	1.5 (4.9)
CC020VZF	2 (6.6)
CC025VZF	2.5 (8.2)
CC030VZF	3 (9.8)
CC040VZF	4 (13.1)
CC050VZF	5 (16.4)
CC070VZF	7 (23.0)
CC100VZF	10 (32.8)
CC150VZF	15 (49.2)
CC200VZF	20 (65.6)

For motor/encoder/electromagnetic brake

Model	Length [m (ft.)]
CC005VZFB	0.5 (1.6)
CC010VZFB	1 (3.3)
CC015VZFB	1.5 (4.9)
CC020VZFB	2 (6.6)
CC025VZFB	2.5 (8.2)
CC030VZFB	3 (9.8)
CC040VZFB	4 (13.1)
CC050VZFB	5 (16.4)
CC070VZFB	7 (23.0)
CC100VZFB	10 (32.8)
CC150VZFB	15 (49.2)
CC200VZFB	20 (65.6)

- **Flexible connection cable sets**

For motor/encoder

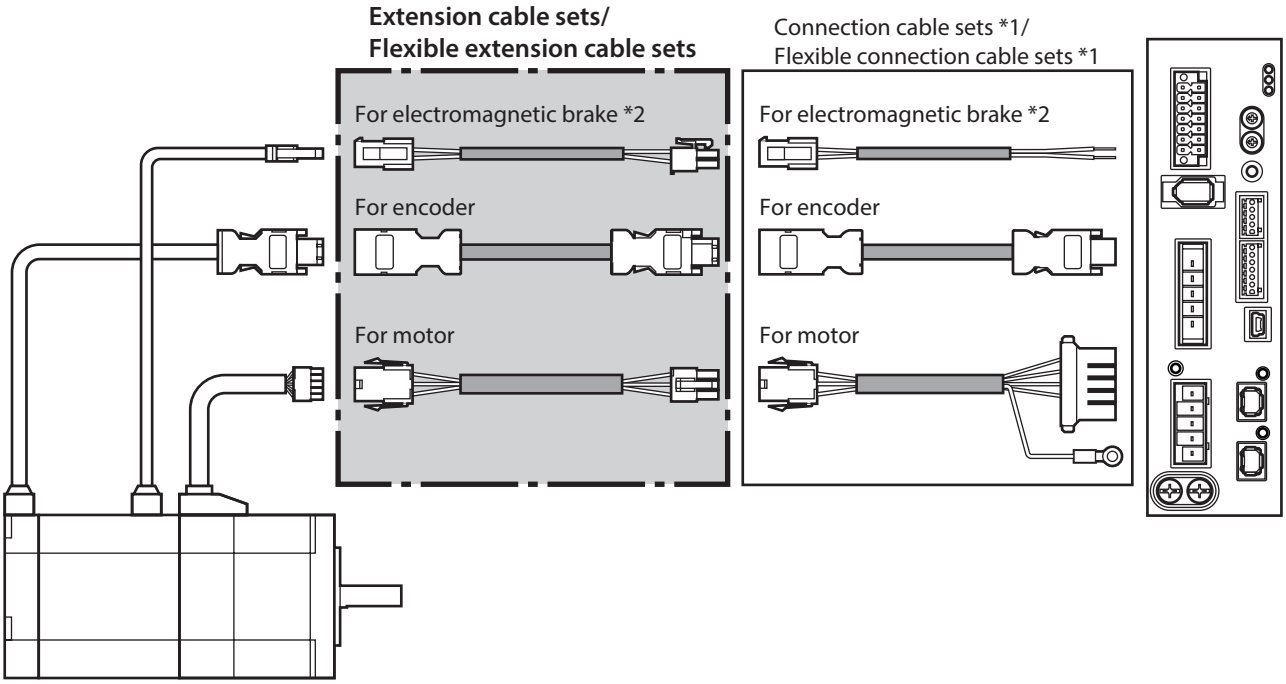
Model	Length [m (ft.)]
CC005VZR	0.5 (1.6)
CC010VZR	1 (3.3)
CC015VZR	1.5 (4.9)
CC020VZR	2 (6.6)
CC025VZR	2.5 (8.2)
CC030VZR	3 (9.8)
CC040VZR	4 (13.1)
CC050VZR	5 (16.4)
CC070VZR	7 (23.0)
CC100VZR	10 (32.8)
CC150VZR	15 (49.2)
CC200VZR	20 (65.6)

For motor/encoder/electromagnetic brake

Model	Length [m (ft.)]
CC005VZRB	0.5 (1.6)
CC010VZRB	1 (3.3)
CC015VZRB	1.5 (4.9)
CC020VZRB	2 (6.6)
CC025VZRB	2.5 (8.2)
CC030VZRB	3 (9.8)
CC040VZRB	4 (13.1)
CC050VZRB	5 (16.4)
CC070VZRB	7 (23.0)
CC100VZRB	10 (32.8)
CC150VZRB	15 (49.2)
CC200VZRB	20 (65.6)

■ Extension cable sets/Flexible extension cable sets

These cables are used when extending the connection cable (add between the motor and connection cable).
Use if the length of the connection cable used is not enough when extending the distance between a motor and a driver.
The cable set includes two cables for the motor and the encoder. The cable set of electromagnetic brake motors includes three cables for the motor, the encoder, and the electromagnetic brake.



*1 Use the connection cable used.
*2 Only when the motor is the electromagnetic brake type.

memo
- When installing the motor on a moving part, use a flexible cable.
- When extending the wiring length by connecting an extension cable to the connection cable, keep the total cable length to 20 m (65.6 ft.) or less.

● Extension cable sets

For motor/encoder

Model	Length [m (ft.)]
CC010VZFT	1 (3.3)
CC020VZFT	2 (6.6)
CC030VZFT	3 (9.8)
CC050VZFT	5 (16.4)
CC070VZFT	7 (23.0)
CC100VZFT	10 (32.8)
CC150VZFT	15 (49.2)

For motor/encoder/electromagnetic brake

Model	Length [m (ft.)]
CC010VZFBT	1 (3.3)
CC020VZFBT	2 (6.6)
CC030VZFBT	3 (9.8)
CC050VZFBT	5 (16.4)
CC070VZFBT	7 (23.0)
CC100VZFBT	10 (32.8)
CC150VZFBT	15 (49.2)

- **Flexible extension cable sets**

For motor/encoder

Model	Length [m (ft.)]
CC010VZRT	1 (3.3)
CC020VZRT	2 (6.6)
CC030VZRT	3 (9.8)
CC050VZRT	5 (16.4)
CC070VZRT	7 (23.0)
CC100VZRT	10 (32.8)
CC150VZRT	15 (49.2)

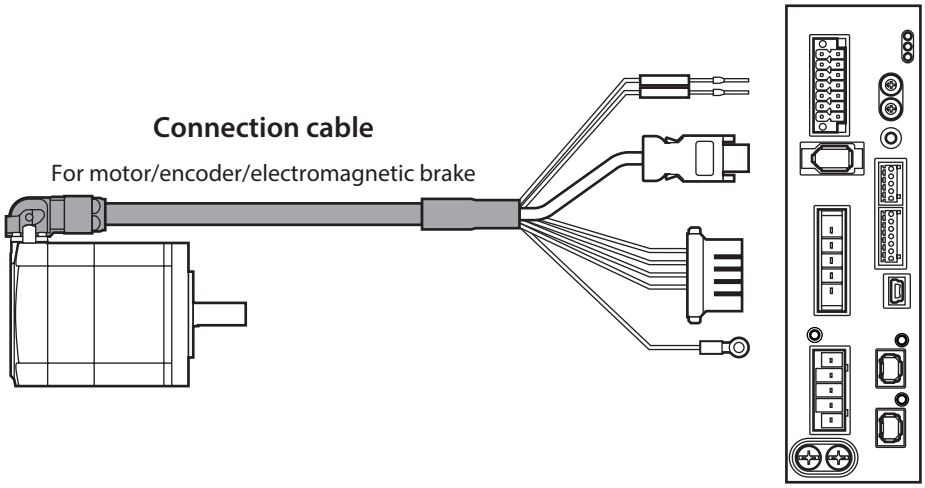
For motor/encoder/electromagnetic brake

Model	Length [m (ft.)]
CC010VZRBT	1 (3.3)
CC020VZRBT	2 (6.6)
CC030VZRBT	3 (9.8)
CC050VZRBT	5 (16.4)
CC070VZRBT	7 (23.0)
CC100VZRBT	10 (32.8)
CC150VZRBT	15 (49.2)

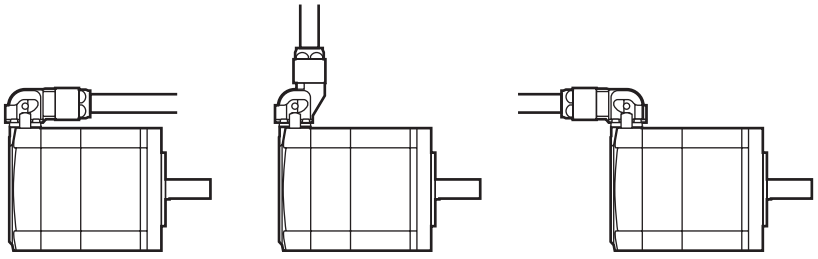
8-2 Connection cables (For connector type)

■ Connection cables/Flexible connection cables

These cables are used when connecting a motor and a driver.



The model name of the connection cable varies depending on the outlet direction from the motor. Refer to the figures.



Cable outlet direction
Output shaft direction

Cable outlet direction
Vertical direction

Cable outlet direction
Opposite to output shaft direction

memo When installing the motor on a moving part, use a flexible cable.

- **Connection cables**

For motor/encoder

Length [m (ft.)]	Cable outlet direction		
	Output shaft direction	Vertical direction	Opposite to output shaft direction
1 (3.3)	**CCM010Z1AFF**	**CCM010Z1AVF**	**CCM010Z1ABF**
2 (6.6)	**CCM020Z1AFF**	**CCM020Z1AVF**	**CCM020Z1ABF**
3 (9.8)	**CCM030Z1AFF**	**CCM030Z1AVF**	**CCM030Z1ABF**
5 (16.4)	**CCM050Z1AFF**	**CCM050Z1AVF**	**CCM050Z1ABF**
7 (23.0)	**CCM070Z1AFF**	**CCM070Z1AVF**	**CCM070Z1ABF**
10 (32.8)	**CCM100Z1AFF**	**CCM100Z1AVF**	**CCM100Z1ABF**

For motor/encoder/electromagnetic brake

Length [m (ft.)]	Cable outlet direction		
	Output shaft direction	Vertical direction	Opposite to output shaft direction
1 (3.3)	**CCM010Z1BFF**	**CCM010Z1BVF**	**CCM010Z1BBF**
2 (6.6)	**CCM020Z1BFF**	**CCM020Z1BVF**	**CCM020Z1BBF**
3 (9.8)	**CCM030Z1BFF**	**CCM030Z1BVF**	**CCM030Z1BBF**
5 (16.4)	**CCM050Z1BFF**	**CCM050Z1BVF**	**CCM050Z1BBF**
7 (23.0)	**CCM070Z1BFF**	**CCM070Z1BVF**	**CCM070Z1BBF**
10 (32.8)	**CCM100Z1BFF**	**CCM100Z1BVF**	**CCM100Z1BBF**

- **Flexible connection cables**

For motor/encoder

Length [m (ft.)]	Cable outlet direction		
	Output shaft direction	Vertical direction	Opposite to output shaft direction
1 (3.3)	**CCM010Z1AFR**	**CCM010Z1AVR**	**CCM010Z1ABR**
2 (6.6)	**CCM020Z1AFR**	**CCM020Z1AVR**	**CCM020Z1ABR**
3 (9.8)	**CCM030Z1AFR**	**CCM030Z1AVR**	**CCM030Z1ABR**
5 (16.4)	**CCM050Z1AFR**	**CCM050Z1AVR**	**CCM050Z1ABR**
7 (23.0)	**CCM070Z1AFR**	**CCM070Z1AVR**	**CCM070Z1ABR**
10 (32.8)	**CCM100Z1AFR**	**CCM100Z1AVR**	**CCM100Z1ABR**

For motor/encoder/electromagnetic brake

Length [m (ft.)]	Cable outlet direction		
	Output shaft direction	Vertical direction	Opposite to output shaft direction
1 (3.3)	**CCM010Z1BFR**	**CCM010Z1BVR**	**CCM010Z1BBR**
2 (6.6)	**CCM020Z1BFR**	**CCM020Z1BVR**	**CCM020Z1BBR**
3 (9.8)	**CCM030Z1BFR**	**CCM030Z1BVR**	**CCM030Z1BBR**
5 (16.4)	**CCM050Z1BFR**	**CCM050Z1BVR**	**CCM050Z1BBR**
7 (23.0)	**CCM070Z1BFR**	**CCM070Z1BVR**	**CCM070Z1BBR**
10 (32.8)	**CCM100Z1BFR**	**CCM100Z1BVR**	**CCM100Z1BBR**

9 Accessories

9-1 Relay contact protection parts/circuits

- **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 it to protect the contacts of the relay or switch.
  4 pieces of CR circuit for surge suppression are mounted on the compact circuit, and this product can be installed to the DIN rail. This product can make the wiring easily and securely since it also supports terminal block connection.

  Model: **VCS02**

9-2 Regeneration resistor

If vertical drive (gravitational operation) such as elevating applications is performed or if sudden start-stop operation of a large inertia is repeated frequently, connect the regeneration resistor.
Always connect the regeneration resistor if information or alarm of overvoltage is generated.

Model: **RGB100**

3 MECHATROLINK-III communications

This part explains the communications specifications for MECHATROLINK-III as well as supported commands.

◆Table of contents

1 Communications specifications

1-1 MECHATROLINK-III interface

Item	Description
Communication protocol	MECHATROLINK-III
Transmission rate	100 Mbps
Transmission cycle	0.5 ms to 4 ms (0.5 ms increment)
Communication cycle	0.5 ms to 32 ms (0.5 ms increment)
MECHATROLINK communications number of words	• Cyclic communications: 48 bytes/station or 32 bytes/station • Event-driven communications: 64 bytes fixed
Station address setting	03h to EFh
Extension address	0 (Station address +0000h)
Communications connector	Industrial mini I/O connector
Communication mode	• Cyclic communications • Event-driven communications
Profile type	• Cyclic communications: Standard stepping motor drivers profile, standard servo profile • Event-driven communications: Profile for acquiring ID information by event-driven communications

1-2 Application layer frame format

In cyclic communications, this product is compatible with 48-byte and 32-byte communication formats of MECHATROLINK-III.

Byte	32 bytes	48 bytes	Description
0 to 31	Possible to use	Possible to use	Main commands
32 to 47	Not possible to use	Possible to use	Subcommands

1-3 Communication phases

In MECHATROLINK-III, the transition is performed among the communication phase 1 to communication phase 3.

Communication phase 1	Initial state, communications not established
Communication phase 2	Asynchronous communications state
Communication phase 3	Synchronous communications state

1-4 Communication timing

This product can start communicating with the master station in approximately 3 seconds after the control power supply is turned on.

2 Main commands

This chapter explains common commands for cyclic communications and event-driven communications.

2-1 Common command format

- **Data format of cyclic communications**

Byte	Command	Response	Description
0	CMD	RCMD	Command code specified for individual commands.
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 31	CMD_DATA	RSP_DATA	Specified for individual commands.
32 to 47	–	–	Subcommand area

- **Data format of event-driven communications**

Byte	Command	Response	Description
0	CMD	RCMD	Command code specified for individual commands.
1	WDT	RWDT	Watchdog data (not used)
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 47	CMD_DATA	RSP_DATA	Specified for individual commands.
48 to 63	Reserved (0)	Reserved (0 fixed)	

2-2 Common command header

■ Common command code

Command code	Command	Operation	Cyclic communications	Event-driven communications
00h	NOP	No operation (disabled)	○	○
01h	PRM_RD	Read parameter	×*	×
02h	PRM_WR	Write parameter	×*	×
03h	ID_RD	Read ID	○	○
04h	CONFIG	Device setup request	○	×
05h	ALM_RD	Read alarm/warning	○	×
06h	ALM_CLR	Clear alarm/warning state	○	×
0Dh	SYNC_SET	Request for establishing synchronization	○	×
0Eh	CONNECT	Request for establishing connection	○	○
0Fh	DISCONNECT	Request for releasing connection	○	○
1Bh	PPRM_RD	Read retentive parameter	×*	×
1Ch	PPRM_WR	Write retentive parameter	×*	×
1Dh	MEM_RD	Read memory	×	×
1Eh	MEM_WR	Write memory	×	×

* It is not used in the standard servo profile and the standard stepping motor drivers profile. Instead, use the SVPRM_RD command and the SVPRM_WR command.

■ Watchdog data (WDT/RWDT)

While synchronous communications are performed by cyclic communications, the master and device stations exchange synchronous data every communication cycle. This synchronous data is called the watchdog data, and used for establishing synchronous communications and detecting watchdog error in synchronous communications.

● **Data format**

	Bits 7 to 4	Bits 3 to 0
WDT	SN	MN
RWDT	RSN	RMN

Master station side (WDT)

MN: Increases in incremental. (Initializes to 0 when cyclic communications start.)
SN: Copies RSN to send.

Device station side (RWDT)

RSN: Increases in incremental. (Initializes to 0 when cyclic communications start.)
RMN: Copies MN to return.

■ Command control (CMD_CTRL)

● **Arrangement of bits**

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
CMD_ID		Reserved (0)	Reserved (0)	ALM_CLR	Reserved (0)	Reserved (0)	Reserved (0)
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved (0)							

● **Details of bits**

Bit	Name	Description
3	ALM_CLR	Setting from 0 to 1 resets the alarm/warning at the leading edge of bit.
6, 7	CMD_ID	The master station uses the command ID to have a device station acknowledge that the command is a new command when the master station sends the same command repeatedly to the device station. Applicable commands: External input feed command (EX_FEED: 37h) External input positioning command (EX_POSING: 39h) Zero point return command (ZRET: 3Ah)

■ Command status (CMD_STAT)

● **Arrangement of bits**

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
RCMD_ID		Reserved (0 fixed)	Reserved (0 fixed)	ALM_CLR_CMP	CMDRDY	D_WAR	D_ALM
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
COMM_ALM				CMD_ALM			

● **Details of bits**

Bit	Name	Description
0	D_ALM	0: Possible to operate. 1: The driver protective function is activated and the device alarm is being generated.
1	D_WAR	0: Possible to operate. 1: A warning is being generated.

<table>
<tr><th>Bit</th><th>Name</th><th>Description</th></tr>
<tr><td>2</td><td>CMDRDY</td><td>0: Command reception disabled
1: Command reception enabled
When a command is sent from the master station and is in a state of executing, the CMDRDY changes to 0. When executing the command is completed, the CMDRDY changes to 1.</td></tr>
<tr><td>3</td><td>ALM_CLR_CMP</td><td>1: Completion of ALM_CLR
If the alarm/warning is received by setting the ALM_CLR (Bit 3) of the command control (CMD_CTRL) to 1, the ALM_CLR_CMP changes to 1. If the ALM_CLR (Bit 3) of the command control (CMD_CTRL) is set to 0, the ALM_CLR_CMP also changes to 0.</td></tr>
<tr><td>6, 7</td><td>RCMD_ID</td><td>This is echo-back of the CMD_ID (Bits 6, 7) of the command control (CMD_CTRL).</td></tr>
<tr><td>8 to 11</td><td>CMD_ALM</td><td>If an error occurs in a command, the code is indicated using four bits. If a normal command is received, the CMD_ALM changes to 0. The phase state and motor state are not changed.
<table>
<tr><th>Error type</th><th>Code</th><th>Description</th><th>Note</th></tr>
<tr><td>–</td><td>0h</td><td>Normal</td><td></td></tr>
<tr><td>Warning</td><td>1h</td><td>Invalid data</td><td>The device station notifies the warning state.</td></tr>
<tr><td rowspan="5">Alarm</td><td>8h</td><td>Unsupported command received</td><td rowspan="5">The device station notifies the alarm state. The command is not executed.</td></tr>
<tr><td>9h</td><td>Invalid data</td></tr>
<tr><td>Ah</td><td>Command execution condition error</td></tr>
<tr><td>Bh</td><td>Subcommand combination error</td></tr>
<tr><td>Ch</td><td>Phase error</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Bit</th><th>Name</th><th>Description</th></tr>
<tr><td>12 to 15</td><td>COMM_ALM</td><td>
If an error occurs in MECHATROLINK-III, the code is indicated using four bits. Refer to p.169 for details. Descriptions vary according to cyclic communications or event-driven communications.
[Cyclic communications]
<table>
<tr><th>Error type</th><th>Code</th><th>Description</th><th>Note</th></tr>
<tr><td>–</td><td>0h</td><td>Normal</td><td></td></tr>
<tr><td rowspan="3">Warning</td><td>1h</td><td>FCS error</td><td>An error is detected in the Frame Check Sequence.</td></tr>
<tr><td>2h</td><td>Command data not received</td><td>The command data to the local station could not be received.</td></tr>
<tr><td>3h</td><td>Synchronous frame not received</td><td>The synchronous frame could not been received.</td></tr>
<tr><td rowspan="5">Alarm</td><td>8h</td><td>FCS error</td><td rowspan="3">A warning was detected consecutively.</td></tr>
<tr><td>9h</td><td>Command data not received</td></tr>
<tr><td>Ah</td><td>Synchronous frame not received</td></tr>
<tr><td>Bh</td><td>Synchronization interval error</td><td>This is not supported.</td></tr>
<tr><td>Ch</td><td>WDT error</td><td>An error was detected by the WDT check of synchronous communications.</td></tr>
</table>
If an alarm is generated, the following will be occurred.
• If the system is in the communication phase 3 (synchronous communications), it will shift to the communication phase 2 (asynchronous communications).
• If the motor is in the servo ON state, the servo OFF state is established.
• An alarm of the Network bus error (alarm code 81h) is generated while the motor is being operated.
[Event-driven communications]
<table>
<tr><th>Error type</th><th>Code</th><th>Description</th><th>Note</th></tr>
<tr><td>–</td><td>0h</td><td>Normal</td><td></td></tr>
<tr><td rowspan="2">Warning</td><td>1h</td><td>FCS error</td><td>An error is detected in the Frame Check Sequence.</td></tr>
<tr><td>2h</td><td>Data reception error</td><td>An error is detected in the received data.</td></tr>
<tr><td rowspan="2">Alarm</td><td>8h</td><td>FCS error</td><td rowspan="2">A warning was detected consecutively.</td></tr>
<tr><td>9h</td><td>Data reception error</td></tr>
</table>
</td></tr>
</table>

2-3 Common commands list

■ Cyclic communications

Command code	Command	Operation	Communication phase *		
			1	2	3
00h	NOP	No operation (disabled)	–	○	○
03h	ID_RD	Read ID	–	○	○
04h	CONFIG	Device setup request	–	○	○
05h	ALM_RD	Read alarm/warning	–	○	○
06h	ALM_CLR	Clear alarm/warning state	–	○	○
0Dh	SYNC_SET	Request for establishing synchronization	–	○	Δ
0Eh	CONNECT	Request for establishing connection	○	Δ	Δ
0Fh	DISCONNECT	Request for releasing connection	○	○	○

* ○: Can be executed, Δ: Ignored, –: Indefinite response data
Refer to p.56 for the communication phase.

■ Event-driven communications

Command code	Command	Operation	Communication phase *		
			1	2	3
00h	NOP	No operation (disabled)	–	○	Not supported
03h	ID_RD	Read ID	–	○	
0Eh	CONNECT	Request for establishing connection	○	Δ	
0Fh	DISCONNECT	Request for releasing connection	○	○	

* ○: Can be executed, Δ: Ignored, –: Indefinite response data
Refer to p.56 for the communication phase.

2-4 Details of common commands

■ No operation command (NOP: 00h)

This is "No operation command."

Byte	Command	Response	Description
0	NOP (00h)	NOP (00h)	No operation
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 31	Reserved (0)	Reserved (0 fixed)	

■ Read ID command (ID_RD: 03h)

This command reads the ID of a device.

Byte	Command	Response	Description
0	ID_RD (03h)	ID_RD (03h)	Read ID
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4	ID_CODE	ID_CODE	ID data selection code (refer to the ID_CODE list)
5	OFFSET	OFFSET	ID read offset When reading a data larger than the ID data response field, set the OFFSET amount. The setting range is 0 to a value of ID data size minus 1 (ID data size −1). If a value is invalid, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 9, and the command will not be executed.
6, 7	SIZE	SIZE	Read data size (bytes) 1 to 24 bytes are read in cyclic communications, and 1 to 32 bytes are read in event-driven communications. If a value is invalid, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 9, and the command will not be executed.
8 to 31	Reserved (0)	ID	ID data corresponding to ID_CODE

ID_CODE list

ID_CODE	Name	Data size (byte)	Description
01h	Vendor ID code	4	5 (ORIENTAL MOTOR CO., LTD.)
02h	Device code	4	5120 (**AZD-AM3**), 5121 (**AZD-CM3**)
03h	Device version	4	Bits 0 to 7: Minor version (BCD) Bits 8 to 15: Major version (BCD) Bits 16 to 31: Reserved (0 fixed)
04h	Device information file version	4	Bits 0 to 7: Release number Bits 8 to 11: Minor version Bits 12 to 15: Major version Bits 16 to 31: Reserved (0 fixed)
05h	Extended address setting	4	1 (Fixed)
06h	Serial number	32	The serial number is indicated in ASCII code. (Delimiter: 00)
10h	Profile type 1	4	1Ah (Standard stepping motor drivers profile)
11h	Profile version 1	4	0100h (Major version 1, Minor version 0)
12h	Profile type 2	4	10h (Standard servo profile)
13h	Profile version 2	4	0100h (Major version 1, Minor version 0)
14h	Profile type 3	4	00FFh (not supported code)
15h	Profile version 3	4	0000h (not supported)
16h	Minimum value of transmission cycle	4	50,000 [×0.01 µs] (0.5 ms)
17h	Maximum value of transmission cycle	4	400,000 [×0.01 µs] (4 ms)
18h	Transmission cycle increment (GRANULARITY)	4	02h (0.5 ms increment)
19h	Minimum value of communication cycle	4	50,000 [×0.01 µs] (0.5 ms)
1Ah	Maximum value of communication cycle	4	3,200,000 [×0.01 µs] (32 ms)
1Bh	Number of transmission bytes	4	0Ch (supporting 32-byte and 48-byte)

ID_CODE	Name	Data size (byte)	Description
1Ch	Number of transmission bytes (Current setting)	4	Number of transmission bytes in cyclic communications 04h: 32 bytes 08h: 48 bytes
1Dh	Profile type (Current selection)	4	Profile type presently selected
20h	Supported communication mode	4	07h (supporting cyclic communications, event-driven communications, and message communications)
21h	MAC address	8	0 (not supporting Ethernet communications)
30h	List of supported main commands	32	Taking Bit 0 as NOP (00h), returns supported/not supported of the main commands by 1/0 in order from Bit 0.
38h	List of supported subcommands	32	Taking Bit 0 as NOP (00h), returns supported/not supported of the subcommands by 1/0 in order from Bit 0.
40h	List of supported common parameters	32	Taking Bit 0 as the parameter number 0, returns supported/not supported of the parameters by 1/0 in order from Bit 0.
60h	List of supported message communication sub-functions	32	Taking Bit 0 as the sub-function 0, returns supported/not supported of the sub-functions of the message communication function (42h) by 1/0 in order from Bit 0.
68h	Message communication message relay support	4	Support status for the message relay commands. Bit 0: Message relay support status (0: not supported, 1: supported) Bits 16 to 32: Maximum supportable relay level
69h	Message communication timeout period	4	Timeout period for command processing of message commands except for the file access commands (sub-function code:31h to 36h). 5 [s]
6Ah	Message communication timeout period (for file access commands)	4	Timeout period for command processing of file access commands (sub-function code: 31h to 36h). 5 [s]
80h	Main device name	32	The model name is indicated in ASCII code. (Delimiter: 00h)
90h	Sub device 1 name	32	Motor model (delimiter: 00h)
98h	Sub device 1 version	4	0 (not supported)
A0h	Sub device 2 name	32	0 (not supported)
A8h	Sub device 2 version	4	0 (not supported)
B0h	Sub device 3 name	32	0 (not supported)
B8h	Sub device 3 version	4	0 (not supported)

■ Setup device command (CONFIG: 04h)

This command sets up devices. If the CONFIG command is sent while the motor is in the servo ON state, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to A, and it will not be executed.

Byte	Command	Response	Description
0	CONFIG (04h)	CONFIG (04h)	Device setup request
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4	CONFIG_MOD	CONFIG_MOD	0: Update of parameter not updated immediately (execution of configuration) 1: Write batch non-volatile memory 2: Parameter initialization If a value is invalid, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 9, and the command will not be executed.
5 to 7	Reserved (0)	Reserved (0)	
8 to 31	Reserved (0)	Reserved (0 fixed)	

memo If the setting of the electronic gear is changed when the device setup is performed by setting the CONFIG_MOD (Byte 4) to 0, the coordinates will be generated again. Check the command position after executing the device setup. When setting the home again, use the ZRET command or the POS_SET command.

■ Read alarm or warning command (ALM_RD: 05h)

This command is used to check an activated state of a protective function.

Byte	Command	Response	Description
0	ALM_RD (05h)	ALM_RD (05h)	Read alarm/warning
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4, 5	ALM_RD_MOD	ALM_RD_MOD	0: Present alarm 1: Read alarm history (up to 10 alarms can be read. 0 is stored in the space when the number of alarms is less than 10 items.) If a value is invalid, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 9, and the command will not be executed.
6, 7	ALM_INDEX	ALM_INDEX	0: Fixed
8 to 31	Reserved (0)	ALM_DATA	When the ALM_RD_MOD (Bytes 4, 5) is 0, the present alarm code is stored in Bytes 8 and 9, and Bytes 10 to 31 changes to 0. When the ALM_RD_MOD is 1, the alarm history is stored by two bytes at a time in order of the latest alarm, starting from Byte 8.

■ Clear alarm or warning command (ALM_CLR: 06h)

This command resets an alarm. Some alarms cannot be reset with the ALM_CLR command.

Byte	Command	Response	Description
0	ALM_CLR (06h)	ALM_CLR (06h)	Clear alarm/warning state
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4, 5	ALM_CLR_MOD	ALM_CLR_MOD	0: Clears the present alarm 1: Clears the alarm history If a value is invalid, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 9, and the command will not be executed.
6, 7	Reserved (0)	Reserved (0)	
8 to 31	Reserved (0)	Reserved (0 fixed)	

■ Start synchronous communication command (SYNC_SET: 0Dh)

This command starts synchronous communications. In interpolation operation, set to the synchronous communication mode (phase 3).
If the system has already been shifted to the phase 3, only a normal response will be returned.

Byte	Command	Response	Description
0	SYNC_SET (0Dh)	SYNC_SET (0Dh)	Request for establishing synchronization
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 31	Reserved (0)	Reserved (0 fixed)	

■ Establish connection command (CONNECT: 0Eh)

This command establishes a MECHATROLINK-III connection. When this command is completed to execute, the control of device stations is started by means of MECHATROLINK-III.

Byte	Command	Response	Description
0	CONNECT (0Eh)	CONNECT (0Eh)	Request for establishing connection
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4	VER	VER	30h: MECHATROLINK application layer version If a value is invalid, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 30h is set.
5	COM_MOD	COM_MOD	02h: Synchronous communications (single transmission) 00h: Asynchronous communications (single transmission) 82h: Synchronous communications (single transmission), subcommand enabled 80h: Asynchronous communications (single transmission), subcommand enabled If a value is invalid, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 9, and the command will not be executed.

Byte	Command	Response	Description
6	COM_TIM	COM_TIM	1 to 64: Multiplying factor of communication cycle Set so that a value obtained by multiplying the transmission cycle (0.5 to 4 ms) by the multiplying factor of communication cycle (1 to 64) should be 0.5 to 32 ms. If a value is invalid, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 9, and the command will not be executed.
7	PROFILE_TYPE	PROFILE_TYPE	• Cyclic communications Set 1Ah (Standard stepping motor drivers profile) or 10h (Standard servo profile). • Event-driven communications Only 01h (Profile for acquiring ID information by event-driven communication) can be set. If a value is invalid, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 9, and the command will not be executed.
8 to 31	Reserved (0)	Reserved (0 fixed)	

■ Disconnection command (DISCONNECT: 0Fh)

This command releases the control by means of MECHATROLINK-III, and the system shifts to the phase 1. If the motor is in the servo ON state, the servo OFF state is established. The motion command being executed is also cleared.

Byte	Command	Response	Description
0	DISCONNECT (0Fh)	DISCONNECT (0Fh)	Request for releasing connection
1	Reserved (0)	Reserved (undefined)	
2 to 3	Reserved (0)	Reserved (undefined)	
4 to 31	Reserved (0)	Reserved (0 fixed)	

2-5 Standard servo profile main command format

Main commands for the standard servo profile and standard stepping motor drivers profile are specified by the 32-byte command and response data as shown in the table.

Byte	Command	Response	Description
0	CMD	RCMD	Command code specified for individual commands.
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 31	CMD_DATA	RSP_DATA	Specified for individual commands.
32 to 47	–	–	Subcommand area

2-6 Servo command control and servo command status fields (SVCMD_CTRL/SVCMD_STAT)

■ Servo command control field (SVCMD_CTRL)

Specifies a motion command for a device station. The designation in the servo command control field is valid even if the CMD_ALM (Bits 8 to 11) of the command status (CMD_STAT) is generated.

● **Arrangement of bits**

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved (0)		ACCFIL		STOP_MODE		CMD_CANCEL	CMD_PAUSE
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved (0)		LT_SEL2		LT_SEL1		LT_REQ2	LT_REQ1
Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
SEL_MON2				SEL_MON1			
Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
Reserved (0)				SEL_MON3			

memo After the move command such as POSING or FEED was specified, if it is switched to another command, pause or cancellation by the CMD_CANCEL (Bit 1) or CMD_PAUSE (Bit 0) cannot be performed. To use the CMD_CANCEL or CMD_PAUSE, be sure to return to the move command once. After the CMD_CANCEL or CMD_PAUSE was specified, even if the move command is switched to another command, the pause state or cancellation state is continued.

● **Details of bits**

bit	Name	Description
0	CMD_PAUSE	Setting from 0 to 1 causes the presently specified move command to pause. The motion stops in accordance with the setting of the STOP_MODE (Bits 2, 3). When the STOP_MODE is set to "Stop after deceleration," the motion decelerates in accordance with the DECR (Bits 24 to 27) in each command. When it stops, the CMD_PAUSE_CMP (Bit 0) of the servo command status (SVCMD_STAT) changes to 1. The DEN (Bit 12) of the servo command input signal monitor (SVCMD_IO) remains 0.
1	CMD_CANCEL	Setting from 0 to 1 causes the presently specified move command to cancel. The move command is canceled. This command is given priority over the CMD_PAUSE (Bit 0). The motion stops in accordance with the setting of the STOP_MODE (Bits 2, 3). When the STOP_MODE is set to "Stop after deceleration," the motion decelerates in accordance with the DECR (Bits 24 to 27) in each command. When it stops, the CMD_PAUSE_CMP (Bit 0) of the servo command status (SVCMD_STAT) and the DEN (Bit 12) of the servo command input signal monitor (SVCMD_IO) changes to 1.
2, 3	STOP_MODE	Sets the stop mode when stopping by the CMD_PAUSE (Bit 0) or CMD_CANCEL (Bit 1). 0: Stop after deceleration 1: Immediate stop
4, 5	ACCFIL	The motor can be operated smoothly by setting the position reference filter. If the setting is changed while the motor is being operated, the new setting is applied after the motor is stopped. 0: No position reference filter 1: Exponential function position reference filter 2: Movement average position reference filter
8, 9	LT_REQ1 LT_REQ2	Setting from "0" to "1" performs latching by an external input signal.

bit	Name	Description
10 to 13	LT_SEL1 LT_SEL2	Sets an external input signal which is a trigger when latching by the LT_REQ (Bits 8, 9). While the corresponded LT_REQ is 1, the signal cannot be changed. 0: C phase 1: External input signal 1 2: External input signal 2 3: External input signal 3
16 to 27	SEL_MON1 SEL_MON2 SEL_MON3	From the following table, sets data to monitor with the monitor 1 to monitor 3 of the response data.

Data possible to monitor with SEL_MON

Selection code	Monitor data	Name	Description
0h	APOS	Feedback position	Present position of the motor
1h	CPOS	Command position	Command position before applying the acceleration/deceleration filter [reference unit]
2h	PERR	Position error	Difference between IPOS and APOS (feedback position) [reference unit]
3h	LPOS1	Latched position 1	Motor position latched by LT_SEL1 [reference unit]
4h	LPOS2	Latched position 2	Motor position latched by LT_SEL2 [reference unit]
5h	FSPD	Feedback speed	Present speed of the motor [reference unit/s]
6h	CSPD	Reference Speed	Command speed of the motor [reference unit/s]
7h	TRQ	Reference Torque	Command current of the motor [0.1 %] (command current value of α control mode)
8h	ALARM	Present alarm code	Present alarm/warning code
9h	MPOS	Command position	Command position before acceleration/deceleration filter (=CPOS) [reference unit]
Ah	–	Reserved	(0 fixed)
Bh	–	Reserved	(0 fixed)
Ch	CMN1	Common monitor 1	Monitors the data specified at the Monitor select for SEL_MON1 (common parameter 89h).*
Dh	CMN2	Common monitor 2	Monitors the data specified at the Monitor select for SEL_MON2 (common parameter 8Ah).*
Eh	OMN1	Optional monitor 1	Monitors the data specified at the Optional monitor 1 selection (device parameter 13C0h).
Fh	OMN2	Optional monitor 2	Monitors the data specified at the Optional monitor 2 selection (device parameter 13C1h).

* Refer to the following table for data that can be monitored with the CMN.

- **Data possible to monitor with CMN**

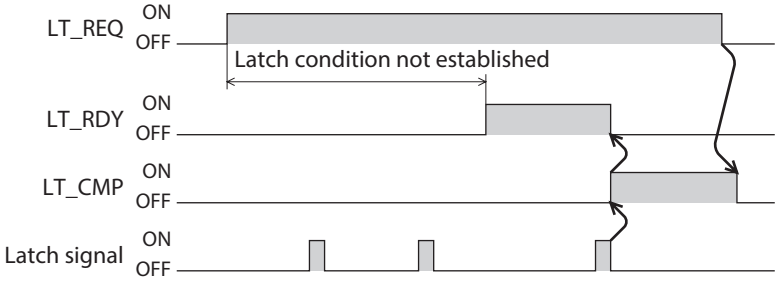
Selection code	Monitor data	Description
0h	TPOS	Target position [reference unit] This is frequently updated while the FEED command is operated. In the case of the POSING command and INTERPOLATE command, it is the set target position. In the case of the ZRET command and POS_SET command, it is updated when completed.
1h	IPOS	Command position before applying the acceleration/deceleration filter [reference unit]
2h	POS_OFST	Offset value set in the POS_SET command [reference unit]
3h	TSPD	Target speed set in the move command [reference unit/s]
4h	SPD_LIM	Not supported: 0 fixed (speed limit value)
5h	TRQ_LIM	Operating current (torque limit value) [0.1 %]
6h	SV_STAT	Byte 1: Present communication phase 00h: Phase 0 01h: Phase 1 02h: Phase 2 (asynchronous communications) 03h: Phase 3 (synchronous communications) Byte 2: Present control mode 0: Position control mode Byte 3: Reserved (0 fixed) Byte 4: Expansion input signal monitor (refer to the table below)
7h	–	Reserved (0 fixed)
8h	INIT_PGPOS (Low)	Command position (lower) when the SENS_ON command is executed. This is valid when the POS_RDY (Bit 10) of the servo command status (SVCMD_STAT) is 1.
9h	INIT_PGPOS (High)	Command position (higher) for when the SENS_ON command is executed This will be either "0000 0000h" or "FFFF FFFFh."

Arrangement of Bits for expansion input signal monitor

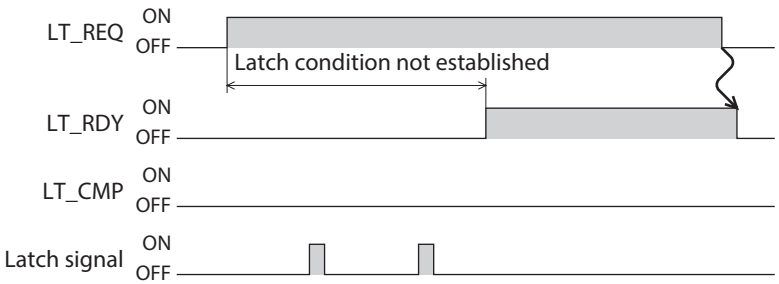
bit	Name	Description	Value	Settings
0	LT_RDY1	Processing status for latch detection specified by the LT_REQ1 (Bit 8) of the Servo command control (SVCMD_CTRL)	0	Latch detection not processed
			1	During latch detection processing
1	LT_RDY2	Processing status for latch detection specified by the LT_REQ2 (Bit 9) of the Servo command control (SVCMD_CTRL)	0	Latch detection not processed
			1	During latch detection processing
2, 3	LT_SEL1R	Latch signal 1	0	C phase
			1	External input signal 1
			2	External input signal 2
			3	External input signal 3
4, 5	LT_SEL2R	Latch signal 2	0	C phase
			1	External input signal 1
			2	External input signal 2
			3	External input signal 3
6	Reserved (0)			
7	Reserved (0)			

- **Operation of LT_RDY**

When latching is completed



When latching is not completed



■ Servo command status field (SVCMD_STAT)

This specifies the status of the device station. The designation in the servo command status field is valid even if the CMD_ALM (Bits 8 to 11) of the command status (CMD_STAT) is generated.

- **Arrangement of bits**

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved (0 fixed)		ACCFIL		Reserved (0 fixed)		CMD_CANCEL_CMP	CMD_PAUSE_CMP
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved (0 fixed)		SV_ON	M_RDY	PON	POS_RDY	L_CMP2	L_CMP1
Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
SEL_MON2				SEL_MON1			
Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
VS4	VS3	VS2	VS1	SEL_MON3			

● **Details of bits**

bit	Name	Description
0	CMD_PAUSE_CMP	Completion of pause of move command This changes to 1 if the move command pauses.
1	CMD_CANCEL_CMP	Completion of cancellation of move command This changes to 1 if the move command is canceled.
4, 5	ACCFIL	Position reference filter This represents the position reference filter presently executed. 0: No position reference filter 1: Exponential function position reference filter 2: Movement average position reference filter
8, 9	L_CMP1 L_CMP2	Latch completion This changes to 1 when latching by the LT_REQ (Bits 8, 9) of the servo command control (SVCMD_CTRL) is completed. 1 is maintained until the LT_REQ changes to 0.
10	POS_RDY	Position data enabled This represents the position data having monitored is enabled. 0: Disabled 1: Enabled When the ABZO sensor is used, it changes to 1 if the processing of the SENS_ON command is completed, and it changes to 0 if the processing of the SENS_OFF command is completed.
11	PON	Power ON This changes to 1 while the main power is supplied.
12	M_RDY	Motor energization ready This changes to 1 if the motor is ready to be the servo ON state. It changes to 0 while an alarm is present or the PON (Bit 11) of the servo command status (SVCMD_STAT) is 0.
13	SV_ON	Servo ON This changes to 1 when the motor is in an excitation state.
16 to 27	SEL_MON1 SEL_MON2 SEL_MON3	These represent the data selected by the SEL_MON1 to SEL_MON3 (Bits 16 to 27) of the servo command control (SVCMD_CTRL).
28	VS1	Vendor specific 1 (RG_OH) When a regeneration resistor of Oriental Motor is used, this changes to 1 if the regeneration resistor is overheated.
29	VS2	–
30	VS3	–
31	VS4	Vendor specific 4 (BRK_OFF_REQ) This changes to 1 if the electromagnetic brake is requested to release by the BRK_OFF command. It will return to 0 if any of the following state is brought. • The BRK_ON command was executed. • The DISCONNECT command was executed. • A communication error occurred, and the CMD_ALM (Bits 8 to 11) of the command status (CMD_STAT) changed to 8 or more. • The initialization of the master station was detected. • The control power supply of the driver was shut off.

Note If the SV_OFF command is executed when the VS4 (BRK_OFF_REQ) is 1, the motor puts into a non-excitation state while the electromagnetic brake remains in a state of releasing. The moving part may fall because the motor loses the holding force. Operate with enough care.

2-7 Servo command I/O signal (SVCMD_IO)

■ Allocation of bits for servo command output signals

The servo command output signals are signals output from the master station to the device station. The servo command output signals are valid even if the CMD_ALM (Bits 8 to 11) of the command status (CMD_STAT) is generated.

- **Arrangement of bits**

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
N_CL	P_CL	P_PPI	V_PPI	Reserved (0)			
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved (0)				G_SEL			
Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
VSO8	VSO7	VSO6	VSO5	VSO4	VSO3	VSO2	VSO1
Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
VSO16	VSO15	VSO14	VSO13	VSO12	VSO11	VSO10	VSO9

- **Details of bits**

bit	Name	Description
4	V_PPI	Speed loop P/PI control Not supported.
5	P_PPI	Position loop P/PI control Not supported.
6	P_CL	Forward torque limit Not supported.
7	N_CL	Reverse torque limit Not supported.
8 to 11	G_SEL	Gain select Not supported.
16 to 23	VSO1 to VSO8	Vendor specific 1 to Vendor specific 8 These are allocated to R-IN0 to R-IN7 of the driver, respectively. Nothing is allocated in the initial setting, so allocate input signals using the device parameter.
24 to 30	VSO9 to VSO15	Vendor specific 9 to Vendor specific 15 Not supported [reserved (0)]
31	VSO16	Vendor specific 16 (ZRET_SEL) This is used to set the return-to-home method when return-to-home (zero point return) is performed with the ZRET command. 0: MECHATROLINK-III standard method 1: Oriental Motor specific method

■ Allocation of Bits for servo command input signal monitor

The servo command input signal monitor indicates the state of the signals of the device station that the master station receives. The servo command input signal monitor is valid even if the CMD_ALM (Bits 8 to 11) of the command status (CMD_STAT) is generated.

● Arrangement of bits

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
ESTP	EXT3	EXT2	EXT1	N-OT	P-OT	DEC	Reserved (0 fixed)
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
ZPOINT	PSET	NEAR	DEN	N-SOT	P-SOT	BRK_ON	Reserved (0 fixed)
Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
Reserved (0 fixed)				ZSPD	V_CMP	V_LIM	T_LIM
Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
VSI8	VSI7	VSI6	VSI5	VSI4	VSI3	VSI2	VSI1

● Details of bits

bit	Name	Description
1	DEC	Zero return deceleration limit switch input This changes to 1 when the deceleration limit switch used for return-to-home operation is being ON.
2	P-OT	Forward drive prohibition input This is used to prohibit further operation in the forward direction when the FW_BLK input is detected (overtravel). If the overtravel in the forward direction is activated, the P-OT changes to 1. The ZSPD (Bit 19) changes to 1 during standstill.
3	N-OT	Reverse drive prohibition input This is used to prohibit further operation in the reverse direction when the RV_BLK input is detected (overtravel). If the overtravel in the reverse direction is activated, the N-OT changes to 1. The ZSPD (Bit 19) changes to 1 during standstill.
4 to 6	EXT1, EXT2, EXT3	External latch input This changes to 1 when the external latch signal is being input.
7	ESTP	Emergency stop This changes to 1 when the STOP input is being input.
9	BRK_ON	This changes to 1 while the electromagnetic brake is activated and 0 when it is in a state of releasing.
10	P-SOT	Forward software limit This changes to 1 when the Forward software limit (common parameter 26h) is exceeded. If the software limit is detected, the motor is forcibly stopped.
11	N-SOT	Reverse software limit This changes to 1 when the Reverse software limit (common parameter 28h) is exceeded. If the software limit is detected, the motor is forcibly stopped.
12	DEN	Distribution completed This changes to 1 when the position reference is completed. If it is paused with the CMD_PAUSE (Bit 0) of the servo command control (SVCMD_CTRL), the DEN will not return to 0.
13	NEAR	Near position This changes to 1 when the difference between the target position (TPOS) and feedback position (APOS) is in the range of the Near-position range (common parameter 67h).
14	PSET	Positioning completed This changes to 1 when the DEN (Bit 12) is 1 and the difference between the target position (TPOS) and feedback position (APOS) is in the range of the In-position range (common parameter 66h).

bit	Name	Description
15	ZPOINT	Zero point This changes to 1 when the command position (CPOS) is in the range of the Zero point detection range (common parameter 8Bh).
16	T_LIM	Torque limit (TLC) This changes to 1 when the output torque reaches the upper limit value.
17	V_LIM	Speed limit (VA) This changes to 1 when the target speed (TSPD) reaches the reference speed (CSPD).
18	V_CMP	Speed match This changes to 1 when the difference between the target speed (TSPD) and feedback speed (FSPD) is equal to or less than the Speed match signal detection range (common parameter 8Fh).
19	ZSPD	Zero speed This changes to 1 when the feedback speed (FSPD) is equal to or less than the Zero speed detection range (common parameter 8Eh).
24 to 31	VSI1 to VSI8	Vendor specific 1 to Vendor specific 8 These are allocated to R-OUT0 to R-OUT7 of the driver, respectively. The initial setting is as shown in the table. To change the signal, allocate with the device parameter.

Name	Remote I/O	Initial allocation	Note
VSI1	R-OUT0	FW-BLK_R	Same as the initial setting of DIN0
VSI2	R-OUT1	RV-BLK_R	Same as the initial setting of DIN1
VSI3	R-OUT2	EXT1_R	Same as the initial setting of DIN2
VSI4	R-OUT3	DEC_R	Same as the initial setting of DIN3
VSI5	R-OUT4	ALM-B	Same as the initial setting of DOUT0
VSI6	R-OUT5	READY	Same as the initial setting of DOUT1
VSI7	R-OUT6	MOVE	Same as the initial setting of DOUT2
VSI8	R-OUT7	HWTOIN-MON	–

2-8 Commands list

The driver supports commands for the standard servo profile and the standard stepping motor drivers profile.

Command code	Command	Operation	Support	Communication phase *1		
				1	2	3
20h	POS_SET	Set coordinates	○	–	○	○
21h	BRK_ON	Request for applying brake	○	–	○	○
22h	BRK_OFF	Release brake	○	–	○	○
23h	SENS_ON	Request for turning sensor ON	○	–	○	○
24h	SENS_OFF	Request for turning sensor OFF	○	–	○	○
30h	SMON	Monitor servo status	○	–	○	○
31h	SV_ON	Servo ON	○	–	○	○
32h	SV_OFF	Servo OFF	○	–	○	○
34h	INTERPOLATE	Interpolation	○	–	×	○
35h	POSING	Positioning	○	–	○	○
36h	FEED	Constant speed feed	○	–	○	○
37h	EX_FEED	Positioning at constant speed by external input	○	–	○	○
39h	EX_POSING	Positioning by external input	○	–	○	○
3Ah	ZRET	Return to home (zero point return)	○	–	○	○
3Ch	VELCTRL	Speed control (velocity control)	*2	–	◆	◆
3Dh	TRQCTRL	Torque (thrust) control	*2	–	◆	◆
40h	SVPRM_RD	Read servo parameter	○	–	○	○
41h	SVPRM_WR	Write servo parameter	○	–	○	○

*1 [How to read symbols] ○: Can be executed, ×: Command error, –: Indefinite response data, ◆: Can be executed with the standard servo profile
Refer to p.56 for the communication phase.
*2 The VELCTRL (3Ch) and TRQCTRL (3Dh) do not support the standard stepping motor drivers profile.

2-9 Details of commands

The driver supports commands for the standard servo profile and the standard stepping motor drivers profile.

■ Set coordinates command (POS_SET: 20h)

This command sets the command position. The set coordinates are saved in the non-volatile memory.

Byte	Command	Response	Description
0	POS_SET (20h)	POS_SET (20h)	Set coordinates
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 15	POS_SET_MOD	POS_SET_MOD	80h: Enable of reference point (enable of software overtravel) If a value is invalid, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 9, and the command will not be executed.
16 to 19	POS_DATA	POS_DATA	Data set in the position reference
20 to 23	Reserved (0)	MONITOR1	Monitor 1
24 to 27	Reserved (0)	MONITOR2	Monitor 2
28 to 31	Reserved (0)	MONITOR3	Monitor 3

memo

- The Set coordinates command cannot be executed while the motor is being operated.
- Even when the motor is stopped, if the position deviation between the command position and feedback position is large (when the TLC output is being ON), the Set coordinates command (POS_SET: 20h) cannot be executed.

■ Apply brake command (BRK_ON: 21h)

This command switches the electromagnetic brake in the servo OFF state to a state of holding. The electromagnetic brake is brought into a state of releasing in the servo ON state.
If the BRK_ON command is executed, the VS4 (Bit 31: BRK_OFF_REQ) of the SVCMD_STAT (Bytes 4 to 7) changes to 0.

Byte	Command	Response	Description
0	BRK_ON (21h)	BRK_ON (21h)	Request for applying brake
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 15	Reserved (0)	CPRM_SEL_MON1	Fixed monitor 1
16 to 19	Reserved (0)	CPRM_SEL_MON2	Fixed monitor 2
20 to 23	Reserved (0)	MONITOR1	Monitor 1
24 to 27	Reserved (0)	MONITOR2	Monitor 2
28 to 31	Reserved (0)	MONITOR3	Monitor 3

■ Release brake command (BRK_OFF: 22h)

This command switches the electromagnetic brake in the servo OFF state to a state of releasing. The electromagnetic brake is brought into a state of releasing in the servo ON state.
If the BRK_OFF command is executed, the VS4 (Bit 31: BRK_OFF_REQ) of the SVCMD_STAT (Bytes 4 to 7) changes to 1.

Byte	Command	Response	Description
0	BRK_OFF (22h)	BRK_OFF (22h)	Request for releasing brake
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 15	Reserved (0)	CPRM_SEL_MON1	Fixed monitor 1
16 to 19	Reserved (0)	CPRM_SEL_MON2	Fixed monitor 2
20 to 23	Reserved (0)	MONITOR1	Monitor 1
24 to 27	Reserved (0)	MONITOR2	Monitor 2
28 to 31	Reserved (0)	MONITOR3	Monitor 3

Note If the SV_OFF command is executed after the BRK_OFF command is executed, the motor puts into a non-excitation state while the electromagnetic brake remains in a state of releasing. The moving part may fall because the motor loses the holding force. Operate with enough care.

memo Whether the electromagnetic brake is brought into a state of releasing when the SV_OFF command is executed can be checked with the VS4 (Bit 31: BRK_OFF_REQ) of the SVCMD_STAT (Bytes 4 to 7).
When VS4 is 0: Executing the SV_OFF command will put the motor into a non-excitation state after holding with the electromagnetic brake.
When VS4 is 1: Executing the SV_OFF command will put the motor into a non-excitation state while remaining the electromagnetic brake in a state of releasing.

■ Turn sensor ON command (SENS_ON: 23h)

This command initializes the sensor.
If the SENS_ON command is executed, the command position is set to the INIT_PGPOS (initial position), and the POS_RDY (Bit 10) of the SVCMD_STAT (Bytes 4 to 7) changes to 1.

Byte	Command	Response	Description
0	SENS_ON (23h)	SENS_ON (23h)	Sensor ON
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 15	Reserved (0)	CPRM_SEL_MON1	Fixed monitor 1
16 to 19	Reserved (0)	CPRM_SEL_MON2	Fixed monitor 2
20 to 23	Reserved (0)	MONITOR1	Monitor 1
24 to 27	Reserved (0)	MONITOR2	Monitor 2
28 to 31	Reserved (0)	MONITOR3	Monitor 3

■ Turn sensor OFF command (SENS_OFF: 24h)

This command is used to turn off the power supply of the sensor. The sensor itself and the coordinates are not changed.

Byte	Command	Response	Description
0	SENS_OFF (24h)	SENS_OFF (24h)	Sensor OFF
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 15	Reserved (0)	CPRM_SEL_MON1	Fixed monitor 1
16 to 19	Reserved (0)	CPRM_SEL_MON2	Fixed monitor 2
20 to 23	Reserved (0)	MONITOR1	Monitor 1
24 to 27	Reserved (0)	MONITOR2	Monitor 2
28 to 31	Reserved (0)	MONITOR3	Monitor 3

■ Servo status monitor command (SMON: 30h)

This command is used to read the alarms, the status, the state of the I/O signals, and the data (position, speed, etc.) specified with the monitor selection.

Byte	Command	Response	Description
0	SMON (30h)	SMON (30h)	Monitor servo status
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 15	Reserved (0)	CPRM_SEL_MON1	Fixed monitor 1
16 to 19	Reserved (0)	CPRM_SEL_MON2	Fixed monitor 2
20 to 23	Reserved (0)	MONITOR1	Monitor 1
24 to 27	Reserved (0)	MONITOR2	Monitor 2
28 to 31	Reserved (0)	MONITOR3	Monitor 3

■ Servo ON command (SV_ON: 31h)

This command is used to start excitation of the stepping motor. Sending the SV_ON command brings the electromagnetic brake into a state of releasing at the same time of the servo ON control.
When the product is in a non-excitation state by an alarm, in the power removal status, or in an OFF state of the main power supply [when M_RDY (Bit 12) of SVCMD_STAT (Bytes 4 to 7) is 0], even if the command is sent, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to A, and the command will not be executed.

Byte	Command	Response	Description
0	SV_ON (31h)	SV_ON (31h)	Servo ON
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 15	Reserved (0)	CPRM_SEL_MON1	Fixed monitor 1
16 to 19	Reserved (0)	CPRM_SEL_MON2	Fixed monitor 2
20 to 23	Reserved (0)	MONITOR1	Monitor 1
24 to 27	Reserved (0)	MONITOR2	Monitor 2
28 to 31	Reserved (0)	MONITOR3	Monitor 3

■ Servo OFF command (SV_OFF: 32h)

This command is used to put the stepping motor into a non-excitation state. If the move command is executed, it is cleared.
When the motor puts into a non-excitation state, the electromagnetic brake will be a state having set with the BRK_ON command or the BRK_OFF command.

Byte	Command	Response	Description
0	SV_OFF (32h)	SV_OFF (32h)	Servo OFF
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 15	Reserved (0)	CPRM_SEL_MON1	Fixed monitor 1
16 to 19	Reserved (0)	CPRM_SEL_MON2	Fixed monitor 2
20 to 23	Reserved (0)	MONITOR1	Monitor 1
24 to 27	Reserved (0)	MONITOR2	Monitor 2
28 to 31	Reserved (0)	MONITOR3	Monitor 3

Note If the SV_OFF command is executed after the BRK_OFF command is executed, the motor puts into a non-excitation state while the electromagnetic brake remains in a state of releasing. The moving part may fall because the motor loses the holding force. Operate with enough care. When holding by the electromagnetic brake even after the motor is put into a non-excitation state, execute the BRK_ON command before executing the SV_OFF command.

memo Whether the electromagnetic brake is brought into a state of releasing when the SV_OFF command is executed can be checked with the VS4 (Bit 31: BRK_OFF_REQ) of the SVCMD_STAT (Bytes 4 to 7).
When VS4 is 0: Executing the SV_OFF command will put the motor into a non-excitation state after holding with the electromagnetic brake.
When VS4 is 1: Executing the SV_OFF command will put the motor into a non-excitation state while remaining the electromagnetic brake in a state of releasing.

■ Interpolation command (INTERPOLATE: 34h)

This command can be used in the synchronous communication mode (phase 3).
Commanding the absolute position every communication cycle will perform interpolation feeding over time.
If this command is used in the asynchronous communication mode (phase 2), the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to C, and it will not be executed. Also, if this command is used in the servo OFF state, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to A, and it will not be executed.

Byte	Command	Response	Description
0	INTERPOLATE (34h)	INTERPOLATE (34h)	Interpolation
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 15	TPOS	CPRM_SEL_MON1	• Command: Target position Sets the absolute coordinate position to be moved every communication cycle. Do not exceed 4,000 for the difference from the last position reference (communication cycle: per 1 ms). If an invalid value is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 9, and the command will not be executed. Unit: Reference unit [step] The resolution can be set with the Electronic gear A (device parameter 11C0h) and Electronic gear B (device parameter 11C1h). The initial value is 10,000 [P/R]. • Response: Fixed monitor 1
16 to 19	VFF (not used)	CPRM_SEL_MON2	• Command: Speed feed forward The speed feed forward is not supported. The data is disregarded. • Response: Fixed monitor 2
20 to 23	TFF (not used)	MONITOR1	• Command: Torque feed forward The torque feed forward is not supported. The data is disregarded. • Response: Monitor 1
24 to 27	Reserved (0)	MONITOR2	Response: Monitor 2
28 to 31	TLIM	MONITOR3	• Command: Operating current Specifies the operating current in a percent (%). Sets with unsigned 4-byte data. If a value exceeding 1,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1,000 is set. If "FFFF FFFFh" is set, a warning state is not occurred, and the command operates by deeming that 1,000 is set. Setting unit: 0.1 [%] • Response: Monitor 3

■ Positioning command (POSING: 35h)

This command is used to execute positioning operation traveling to the absolute position having set.
If this command is used in the servo OFF state, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to A, and it will not be executed.

Byte	Command	Response	Description
0	POSING (35h)	POSING (35h)	Positioning
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 15	TPOS	CPRM_SEL_MON1	• Command: Target position Sets the positioning point at the absolute position. Unit: Reference unit [step] The resolution can be set with the Electronic gear A (device parameter 11C0h) and Electronic gear B (device parameter 11C1h). The initial value is 10,000 [P/R]. • Response: Fixed monitor 1
16 to 19	TSPD	CPRM_SEL_MON2	• Command: Target speed Sets the speed of positioning operation with unsigned 4-byte data. If a value exceeding 4,000,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 4,000,000 is set. If 0 is set, the motor stops while remaining in a state of operating. Unit: Reference unit/s [Hz] • Response: Fixed monitor 2
20 to 23	ACCR	MONITOR1	• Command: Acceleration, deceleration Sets the acceleration and deceleration of positioning operation with unsigned 4-byte data. If a value exceeding 1,000,000,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1,000,000,000 is set. If "FFFF FFFFh" is set, a warning state is not occurred, and the command operates by deeming that 1,000,000,000 is set. If 0 is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1 is set. Unit: Reference unit/s^2 [Hz/s] • Response: Monitor 1, monitor 2
24 to 27	DECR	MONITOR2	
28 to 31	TLIM	MONITOR3	• Command: Operating current Sets the operating current with unsigned 4-byte data. If a value exceeding 1,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1,000 is set. If "FFFF FFFFh" is set, a warning state is not occurred, and the command operates by deeming that 1,000 is set. Unit: 0.1 [%] • Response: Monitor 3

■ Feed command (FEED: 36h)

This command is used to perform constant speed feed control at the set speed. If this command is used in the servo OFF state, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to A, and it will not be executed.

Byte	Command	Response	Description
0	FEED (36h)	FEED (36h)	Constant speed feed
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 15	Reserved (0)	CPRM_SEL_MON1	Fixed monitor 1
16 to 19	TSPD	CPRM_SEL_MON2	• Command: Target speed Sets the speed of constant speed feed operation with signed 4-byte data. If a value exceeding 4,000,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 4,000,000 is set. If a value lower than −4,000,000 (minimum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that −4,000,000 is set. If 0 is set, the motor stops while remaining in a state of operating. Unit: Reference unit/s [Hz] • Response: Fixed monitor 2
20 to 23	ACCR	MONITOR1	• Command: Acceleration, deceleration Sets the acceleration and deceleration of constant speed feed operation with unsigned 4-byte data. If a value exceeding 1,000,000,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1,000,000,000 is set. If "FFFF FFFFh" is set, a warning state is not occurred, and the command operates by deeming that 1,000,000,000 is set. If 0 is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1 is set. Unit: Reference unit/s^2 [Hz/s] • Response: Monitor 1, monitor 2
24 to 27	DECR	MONITOR2	
28 to 31	TLIM	MONITOR3	• Command: Operating current Sets the operating current with unsigned 4-byte data. If a value exceeding 1,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1,000 is set. If "FFFF FFFFh" is set, a warning state is not occurred, and the command operates by deeming that 1,000 is set. Unit: 0.1 [%] • Response: Monitor 3

■ External input feed command (EX_FEED: 37h)

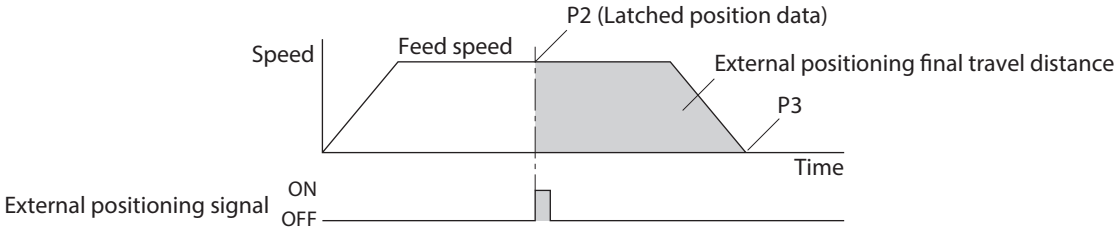
This command performs positioning operation if the external input signal is input while constant speed feed is executed. If the feed speed is changed, the speed and direction of positioning operation is changed. If this command is used in the servo OFF state, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to A, and it will not be executed.

Byte	Command	Response	Description
0	EX_FEED (37h)	EX_FEED (37h)	Positioning at constant speed by external input
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 15	Reserved (0)	CPRM_SEL_MON1	Fixed monitor 1
16 to 19	TSPD	CPRM_SEL_MON2	• Command: Target speed Sets the speed of constant speed feed operation with signed 4-byte data. If a value exceeding 4,000,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 4,000,000 is set. If a value lower than −4,000,000 (minimum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that −4,000,000 is set. If 0 is set, the motor stops while remaining in a state of operating. Unit: Reference unit/s [Hz] • Response: Fixed monitor 2
20 to 23	ACCR	MONITOR1	• Command: Acceleration, deceleration Sets the acceleration and deceleration of constant speed feed operation with unsigned 4-byte data. If a value exceeding 1,000,000,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1,000,000,000 is set. If "FFFF FFFFh" is set, a warning state is not occurred, and the command operates by deeming that 1,000,000,000 is set. If 0 is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1 is set. Unit: Reference unit/s^2 [Hz/s] • Response: Monitor 1, monitor 2
24 to 27	DECR	MONITOR2	
28 to 31	TLIM	MONITOR3	• Command: Operating current Sets the operating current with unsigned 4-byte data. If a value exceeding 1,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1,000 is set. If "FFFF FFFFh" is set, a warning state is not occurred, and the command operates by deeming that 1,000 is set. Unit: 0.1 [%] • Response: Monitor 3

- **Operation sequence**

The following describes the operation sequence for external input positioning operation at constant speed feed using the EX_FEED command.

1. The master station sends the EX_FEED command.
   It selects the latch signal with the LT_SEL1 (Bits 10, 11) of the SVCMD_CTRL (Bytes 4 to 7), and changes the LT_REQ1 (Bit 8) to 1 to output the latch request by the external input signal.
2. The device station which received the EX_FEED command starts traveling at the specified feed speed (TSPD).
3. When the external input signal is input, the device station changes the L_CMP1 (Bit 8) of the SVCMD_STAT (Bytes 4 to 7) to 1 to notify the master station that the present position latching by the external input signal is completed. At the same time, the device station calculates the remaining travel distance based on the travel distance until now and the position (P2) latched by the external input signal, and performs positioning operation to P3 (positioning target position by the external input signal).
   After the command data to travel to the final target position is output, the device station changes the DEN (Bit 12) of the SVCMD_IO (input) (Bytes 8 to 11) to 1 to notify the master station that the distribution is completed.



memo The travel direction after latching is determined by the sign of the setting value for the External positioning final travel distance (common parameter 83h).

- If the external positioning final travel distance is a positive value:
  When latching is performed during traveling in the positive direction, positioning is performed in the positive direction (the same direction).
  When latching is performed during traveling in the negative direction, positioning is performed in the positive direction (the reverse direction).
- If the external positioning final travel distance is a negative value:
  When latching is performed during traveling in the positive direction, positioning is performed in the negative direction (the reverse direction).
  When latching is performed during traveling in the negative direction, positioning is performed in the negative direction (the same direction).

■ External input positioning command (EX_POSING: 39h)

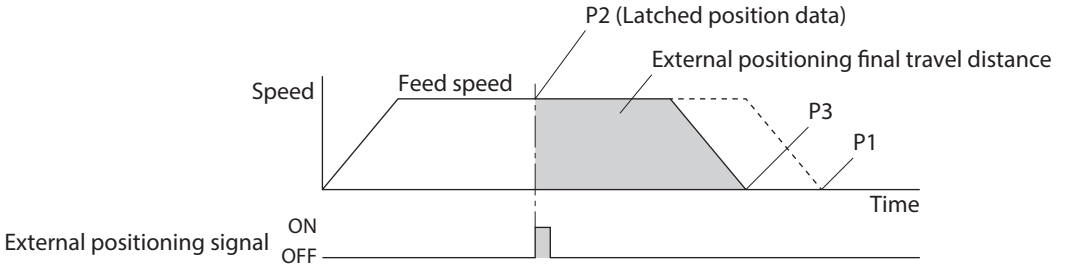
If the external input signal is input while constant speed feed is executed at the specified feed speed, positioning operation is performed. If the feed speed is changed, the speed and direction of positioning operation is changed. If this command is used in the servo OFF state, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to A, and it will not be executed.

Byte	Command	Response	Description
0	EX_POSING (39h)	EX_POSING (39h)	Positioning by external input
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 15	TPOS	CPRM_SEL_MON1	• Command: Target position Sets the positioning point at the absolute position. Unit: Reference unit [step] The resolution can be set with the Electronic gear A (device parameter 11C0h) and Electronic gear B (device parameter 11C1h). The initial value is 10,000 [P/R]. • Response: Fixed monitor 1
16 to 19	TSPD	CPRM_SEL_MON2	• Command: Target speed Sets the speed of constant speed feed operation with unsigned 4-byte data. If a value exceeding 4,000,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 4,000,000 is set. If 0 is set, the motor stops while remaining in a state of operating. Unit: Reference unit/s [Hz] • Response: Fixed monitor 2
20 to 23	ACCR	MONITOR1	• Command: Acceleration, deceleration Sets the acceleration and deceleration of constant speed feed operation with unsigned 4-byte data. If a value exceeding 1,000,000,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1,000,000,000 is set. If "FFFF FFFFh" is set, a warning state is not occurred, and the command operates by deeming that 1,000,000,000 is set. If 0 is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1 is set. Unit: Reference unit/s^2 [Hz/s] • Response: Monitor 1, monitor 2
24 to 27	DECR	MONITOR2	
28 to 31	TLIM	MONITOR3	• Command: Operating current Sets the operating current with unsigned 4-byte data. If a value exceeding 1,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1,000 is set. If "FFFF FFFFh" is set, a warning state is not occurred, and the command operates by deeming that 1,000 is set. Unit: 0.1 [%] • Response: Monitor 3

Operation sequence

The following describes the operation sequence for external input positioning operation using the EX_POSING command.

1. The master station sends the EX_POSING command.
   Position (P1) is set in the TPOS if the external input signal is not input.
   It selects the latch signal with the LT_SEL1 (Bits 10, 11) of the SVCMD_CTRL (Bytes 4 to 7), and changes the LT_REQ1 (Bit 8) to 1 to output the latch request by the external input signal.
2. The device station which received the EX_POSING command starts feeding at the specified feed speed (TSPD).
3. When the external input signal is input, the device station changes the L_CMP1 (Bit 8) of the SVCMD_STAT (Bytes 4 to 7) to 1 to notify the master station that the present position latching by the external input signal is completed.
   At the same time, the device station calculates the remaining travel distance based on the travel distance until now (P1) and the position (P2) latched by the external input signal, and performs positioning operation to P3 (positioning target position by the external input signal).
   After the command data to travel to the final target position is output, the device station changes the DEN (Bit 12) of the SVCMD_IO (input) (Bytes 8 to 11) to 1 to notify the master station that the distribution is completed.



memo The travel direction after latching is determined by the sign of the setting value for the External positioning final travel distance (common parameter 83h).

- If the external positioning final travel distance is a positive value:
  When latching is performed during traveling in the positive direction, positioning is performed in the positive direction (the same direction).
  When latching is performed during traveling in the negative direction, positioning is performed in the positive direction (the reverse direction).
- If the external positioning final travel distance is a negative value:
  When latching is performed during traveling in the positive direction, positioning is performed in the negative direction (the reverse direction).
  When latching is performed during traveling in the negative direction, positioning is performed in the negative direction (the same direction).

■ Zero point return command (ZRET: 3Ah)

This command is used to set a coordinate origin by detecting the home (zero point).
If this command is used in the servo OFF state, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to A, and it will not be executed.

Byte	Command	Response	Description
0	ZRET (3Ah)	ZRET (3Ah)	Return to home (zero point return)
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 15	MODE	CPRM_SEL_MON1	• Command: Mode Refer to the table below. • Response: Fixed monitor 1
16 to 19	TSPD	CPRM_SEL_MON2	• Command: Target speed Sets the speed of positioning operation with unsigned 4-byte data. If a value exceeding 4,000,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 4,000,000 is set. If 0 is set, the motor stops while remaining in a state of operating. Unit: Reference unit/s [Hz] • Response: Fixed monitor 2
20 to 23	ACCR	MONITOR1	• Command: Acceleration, deceleration Sets the acceleration and deceleration of constant speed feed operation with unsigned 4-byte data. If a value exceeding 1,000,000,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1,000,000,000 is set. If "FFFF FFFFh" is set, a warning state is not occurred, and the command operates by deeming that 1,000,000,000 is set. If 0 is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1 is set. Unit: Reference unit/s^2 [Hz/s] • Response: Monitor 1, monitor 2
24 to 27	DECR	MONITOR2	
28 to 31	TLIM	MONITOR3	• Command: Operating current Sets the operating current with unsigned 4-byte data. If a value exceeding 1,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1,000 is set. If "FFFF FFFFh" is set, a warning state is not occurred, and the command operates by deeming that 1,000 is set. Unit: 0.1 [%] • Response: Monitor 3

- **About MODE**

  Return-to-home (zero point return) operation is set with the lower 1 byte.

  Arrangement of bits

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
HOME_DIR	Reserved (0)			TYPE			

  Details of bits

bit	Name	Description
0 to 3	TYPE	Sets the zero point return type. 0: Zero point return by latch signal 1: Zero point return by DEC (Bit 1) of SVCMD_IO (input) (Bytes 8 to 11) + latch signal
7	HOME_DIR	Sets the direction of return-to-home (zero point return). 0: Positive direction 1: Negative direction

- **When setting the VSO16 (Bit 31) of the SVCMD_IO (output) (Bytes 8 to 11) to 0 to start**

  Return-to-home (zero point return) is performed by the MECHATROLINK-III standard method.
  Sending the ZRET command causes to travel in the direction of return-to-home (zero point return) having set in the HOME_DIR (Bit 7) of the MODE (Bits 12 to 15). Detecting the latch signal causes to perform positioning operation for the distance of the Final travel for zero point return (common parameter 86h). The position when the operation is completed is set as the home.

- **When setting the VSO16 (Bit 31) of the SVCMD_IO (output) (Bytes 8 to 11) to 1 to start**

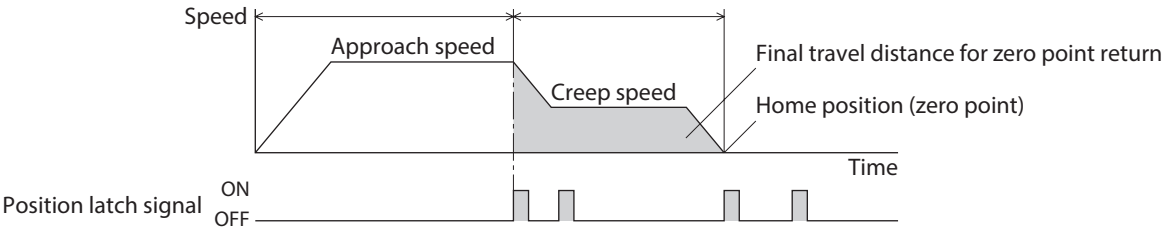
  Return-to-home (zero point return) is performed by the Oriental Motor specific method. The operation mode and operating speed are set with the device parameter.

- **Operation sequence [if the VSO16 (Bit 31) of the SVCMD_IO (output) is 0]**

  This is the operation sequence of return-to-home (zero point return) by the MECHATROLINK-III standard method.

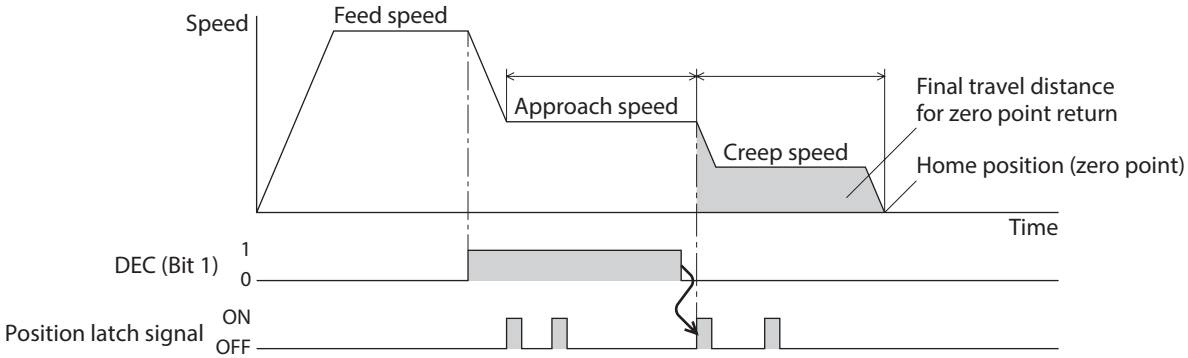
  When the TYPE (Bits 0 to 3) of the MODE (Bytes 12 to 15) is 0

  1. The master station sends the ZRET command.
     It selects the latch signal with the LT_SEL1 (Bits 10, 11) of the SVCMD_CTRL (Bytes 4 to 7), and changes the LT_REQ1 (Bit 8) to 1 to output the latch request.
  2. The device station, which received the ZRET command, starts feeding in the specified direction (HOME_DIR: Bit 7 of MODE) at the speed set for the Zero point return approach speed (common parameter 84h).
  3. When the latch signal is input, the device station executes positioning for the distance of the Final travel for zero point return (common parameter 86h). After the completion of positioning, the device station sets the present position as the home (zero point).



When the TYPE (Bits 0 to 3) of the MODE (Bytes 12 to 15) is 1

1. The master station sends the ZRET command.
   It selects the latch signal with the LT_SEL1 (Bits 10, 11) of the SVCMD_CTRL (Bytes 4 to 7), and changes the LT_REQ1 (Bit 8) to 1 to output the latch request.
2. The device station, which received the ZRET command, starts feeding in the specified direction (HOME_DIR: Bit 7 of MODE) at the specified feed speed (TSPD: Bytes 16 to 19).
3. If the DEC (Bit 1) of the SVCMD_IO (input) (Bytes 8 to 11) changes to 1, the feed speed changes to the Zero point return approach speed (common parameter 84h).
4. If the latch signal selected with the LT_SEL1 (Bits 10, 11) of the SVCMD_CTRL (Bytes 4 to 7) is input after the DEC (Bit 1) of the SVCMD_IO (input) (Bytes 8 to 11) was set to 0, the device station executes positioning for the distance of the Final travel for zero point return (common parameter 86h). After the completion of positioning, the device station sets the present position as the home (zero point).



memo The travel direction after latching is determined by the sign of the setting value for the External positioning final travel distance (common parameter 83h).

- If the external positioning final travel distance is a positive value:
  When latching is performed during traveling in the positive direction, positioning is performed in the positive direction (the same direction).
  When latching is performed during traveling in the negative direction, positioning is performed in the positive direction (the reverse direction).
- If the external positioning final travel distance is a negative value:
  When latching is performed during traveling in the positive direction, positioning is performed in the negative direction (the reverse direction).
  When latching is performed during traveling in the negative direction, positioning is performed in the negative direction (the same direction).

- **Operation sequence [if the VSO16 (Bit 31) of the SVCMD_IO (output) is 1]**

  This is the operation sequence of return-to-home (zero point return) for the Oriental Motor specific method. There are four types of return-to-home operations shown below.

Item	Description	Features
2-sensor mode	When the limit sensor is detected, the motor rotates in the reverse direction and pull out of the limit sensor. After pulling out of the sensor, it rotates according to the number of steps set in the "(HOME) Backward steps in 2 sensor home-seeking" (device parameter 1169h) and stops. The stop position is set as the home (zero point).	• Two sensors are required externally. • The operating speed is at a low rate (starting speed of home-seeking)
3-sensor mode	When the limit sensor is detected, the motor rotates in the reverse direction and pull out of the limit sensor. After that, it stops when the ON edge of the HOME sensor is detected. The stop position is set as the home (zero point).	• Three sensors are required externally.* • The operating speed is at a high rate (operating speed of home-seeking).
One-way rotation mode	The motor stops when the ON edge of the HOME sensor is detected. After that, until the OFF edge of the HOME sensor is detected, it pulls out of the sensor according to the speed set in the "(HOME) Last speed" (device parameter 1165h). After pulling out of the sensor, the motor rotates according to the number of steps set in the "(HOME) Operating amount in unidirectional home-seeking" (device parameter 116Ah) and stops. The stop position is set as the home (zero point).	• One external sensor is required • The operating speed is at a high rate (operating speed of home-seeking). • Not reversed.
Push-motion mode	The motor rotates in the reverse direction when a mechanism installed to the motor presses against a mechanical stopper, etc. After that, it rotates according to the value set in the "(HOME) Backward steps after first entry in push-home-seeking" (device parameter 116Ch) and reverses, and then operates at the "(HOME) Last speed." When a mechanism installed to the motor presses against a mechanical stopper or others, it rotates in the reverse direction and stops after moving according to the value set in the "(HOME) Backward steps in push-home-seeking" (116Eh). The stop position is set as the home (zero point).	• An external sensor is not required. • The operating speed is at a high rate (operating speed of home-seeking).

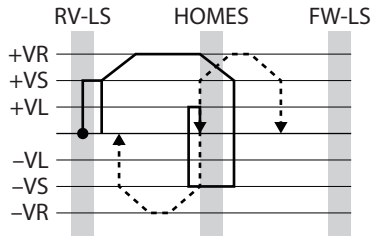
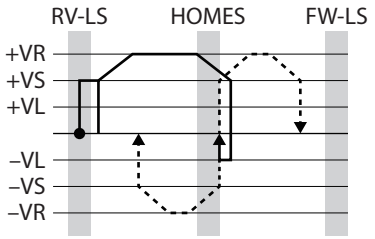
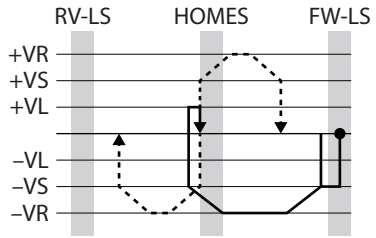
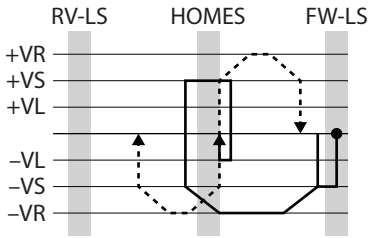
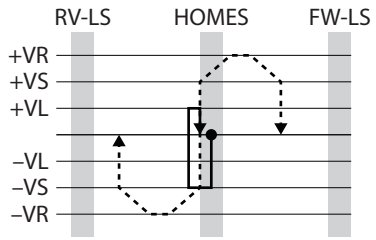
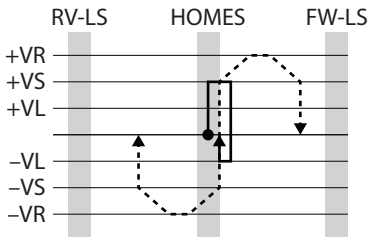
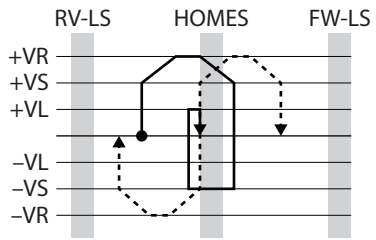
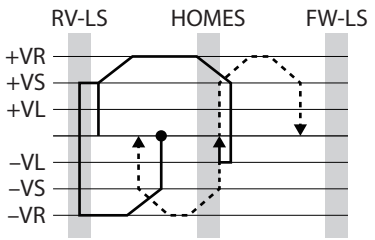
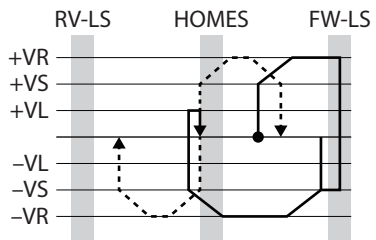
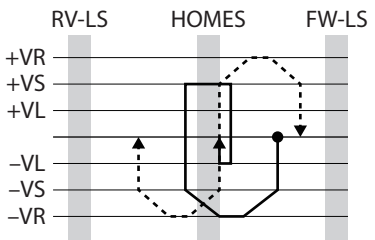
* The home can be detected even using one external sensor. In that case, connect only the HOME sensor.

Note Do not perform push-motion return-to-home operation with geared motors and the **DGII** Series. Doing so may damage the motor and the gears.

Return-to-home operation sequence of 3-sensor mode

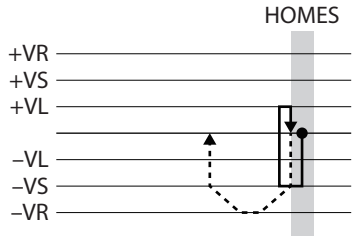
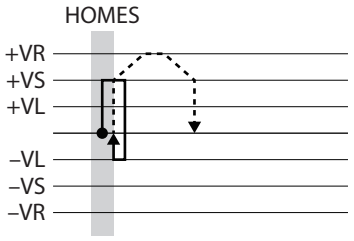
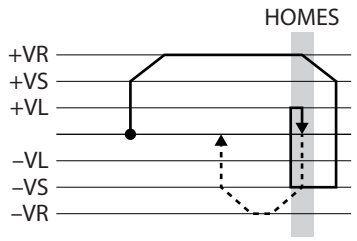
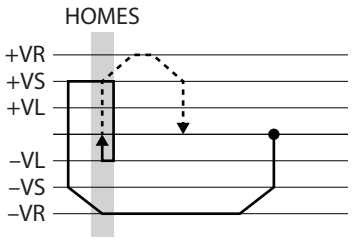
When the limit sensor is detected during operation, the motor rotates in the reverse direction and pulls out of the limit sensor. The motor operates at the (HOME) Operating speed and stops when the ON edge of the HOME sensor is detected. The stop position is set as the home (zero point).

Explanation of code	• VR: (HOME) Operating speed (device parameter 1164h) • VS: (HOME) Starting speed (device parameter 1163h) • VL: (HOME) Last speed (device parameter 1165h) • - - -: Orbit when the home offset is set.

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

When using the HOME sensor only (rotating machine, etc.)

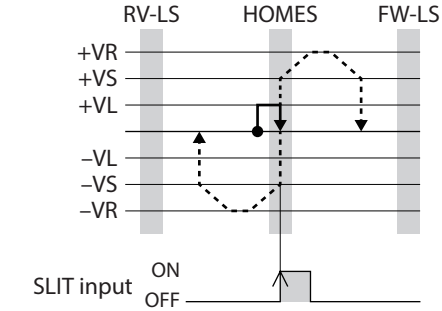
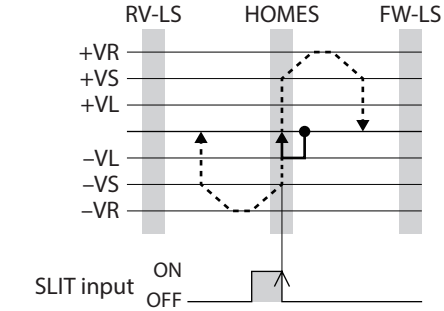
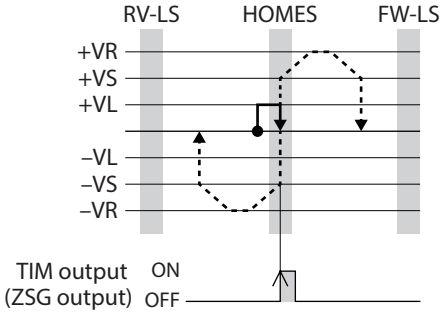
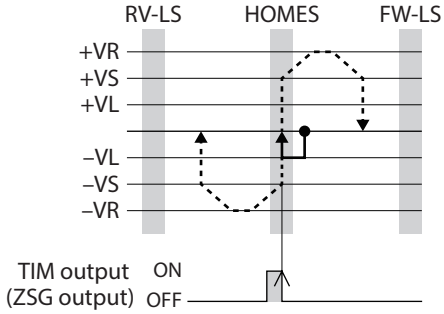
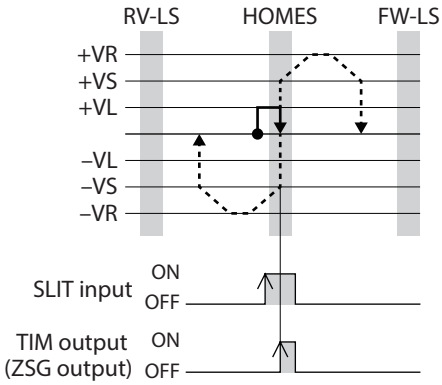
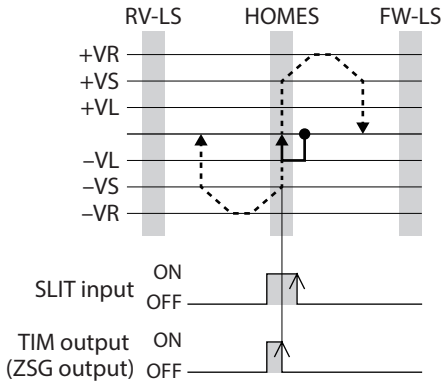
If the limit sensor is not used, in case of a rotating mechanism for example, the sequence is as follows.

Starting position of return-to-home operation	Starting direction of return-to-home operation: Positive side	Starting direction of return-to-home operation: Negative side
HOMES		
Other than HOMES		

Note Depending on the value set in the "(HOME) Acceleration/deceleration" (device parameter 1162h), the motor may decelerate to a stop in excess of the HOME sensor after the HOME sensor was detected. There is a risk of contact if the distance between the mechanical end and the HOME sensor is close, so provide enough distance between them.

When the SLIT input, TIM output, and ZSG output are used concurrently

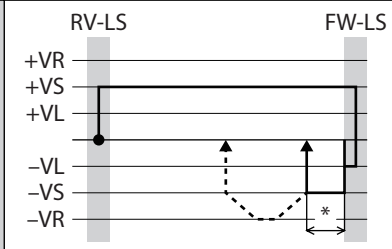
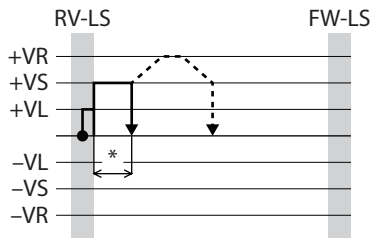
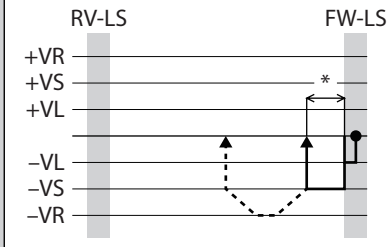
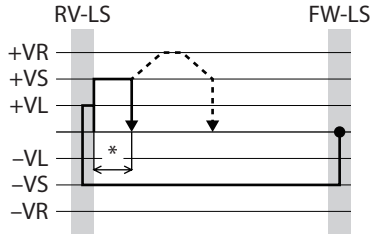
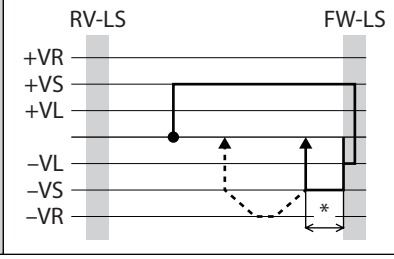
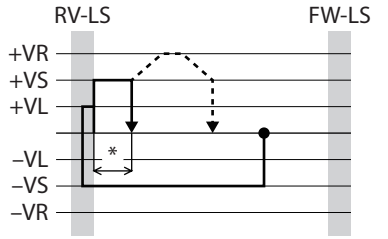
Even after return-to-home operation is completed, operation is continued until an external signal is detected. If an external signal is detected while the HOME sensor is ON, return-to-home operation is completed.

Home detection signal	Starting direction of return-to-home operation: Positive side	Starting direction of return-to-home operation: Negative side
SLIT input		
TIM output or ZSG output		
SLIT input and TIM output or SLIT input and ZSG output		

● 2-sensor mode

The motor operates in the starting direction of return-to-home at the (HOME) Starting speed. When the limit sensor is detected, the motor rotates in the reverse direction and pulls out of the limit sensor at the (HOME) Last speed. After pulling out of the limit sensor, the motor operates according to the value set in the (HOME) Backward steps in 2 sensor home-seeking at the (HOME) Starting speed, and stops. The stop position is set as the home.

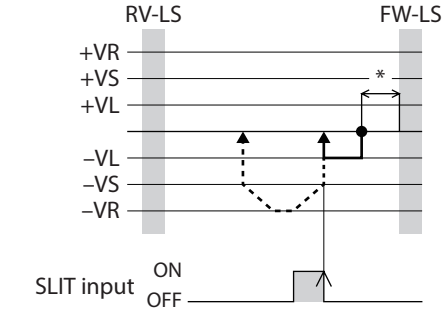
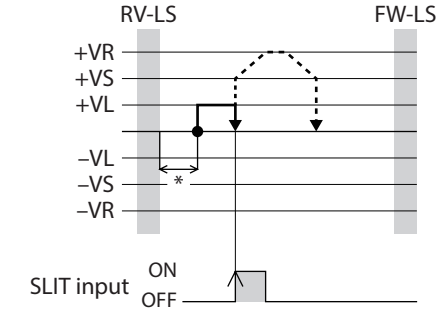
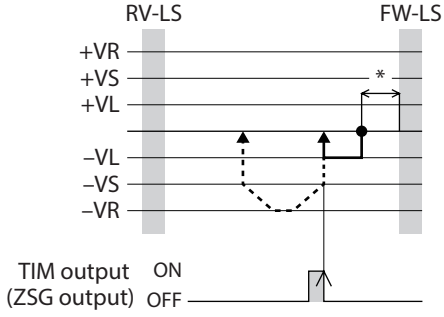
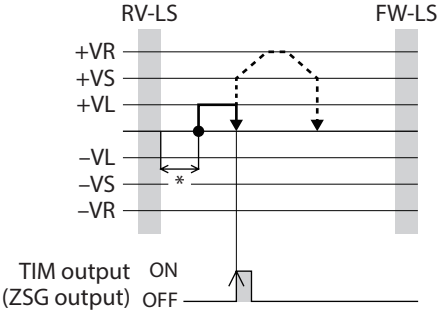
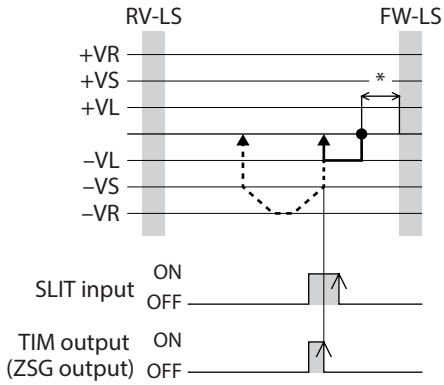
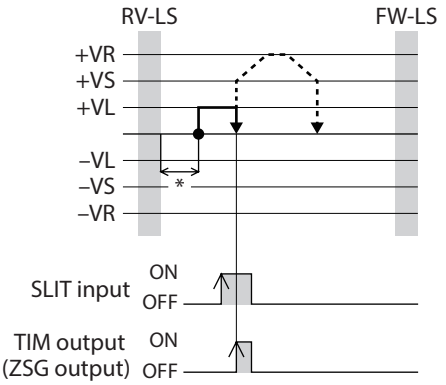
Explanation of code	• VR: (HOME) Operating speed (device parameter 1164h) • VS: (HOME) Starting speed (device parameter 1163h) • VL: (HOME) Last speed (device parameter 1165h) • - - -: Orbit when the home offset is set.

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

* The motor pulls out of the limit sensor, and rotates according to the value set in the "(HOME) Backward steps in 2-sensor mode home-seeking" (device parameter 1169h).

When the SLIT input, TIM output, and ZSG output are used concurrently

Even after return-to-home operation is completed, operation is continued until an external signal is detected. If an external signal is detected, return-to-home operation is completed.

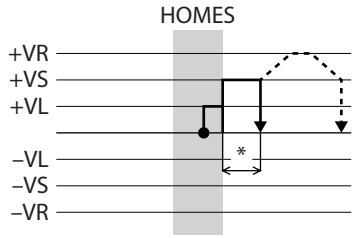
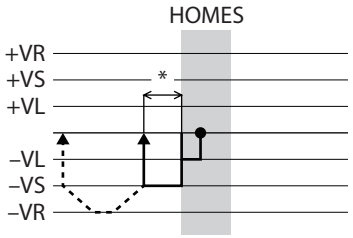
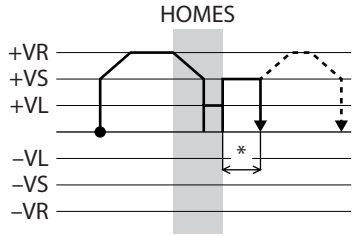
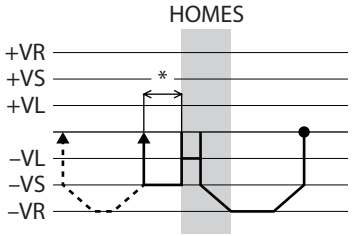
Home detection signal	Starting direction of return-to-home operation: Positive side	Starting direction of return-to-home operation: Negative side
SLIT input		
TIM output or ZSG output		
SLIT input and TIM output or SLIT input and ZSG output		

* The motor pulls out of the limit sensor, and rotates according to the value set in the "(HOME) Backward steps in 2-sensor mode home-seeking" (device parameter 1169h).

- **One-way rotation mode**

The motor operates in the starting direction of return-to-home at the (HOME) Operating speed, and it decelerates to a stop when the HOME sensor is detected. After that, the motor pulls out of the range of the HOME sensor at the (HOME) Last speed, operates according to the value set in the (HOME) Operating amount in uni-directional home-seeking at the (HOME) Starting speed, and stops. The stop position is set as the home.

Explanation of code	• VR: (HOME) Operating speed (device parameter 1164h) • VS: (HOME) Starting speed (device parameter 1163h) • VL: (HOME) Last speed (device parameter 1165h) • - - -: Orbit when the home offset is set.

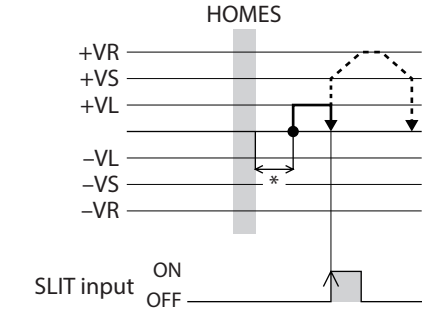
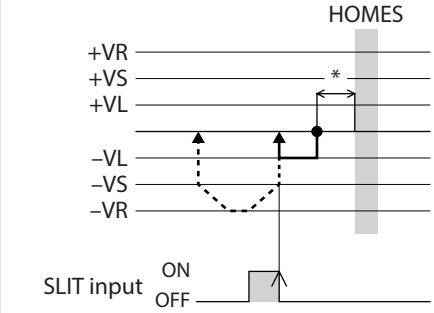
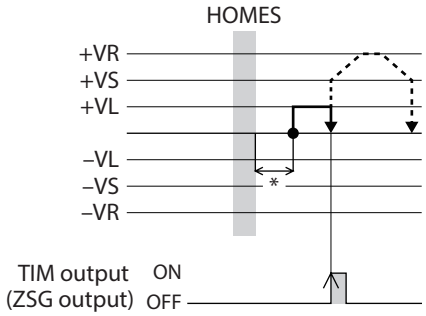
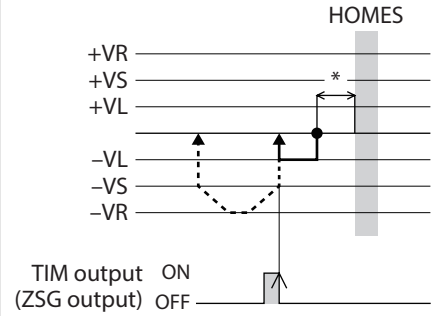
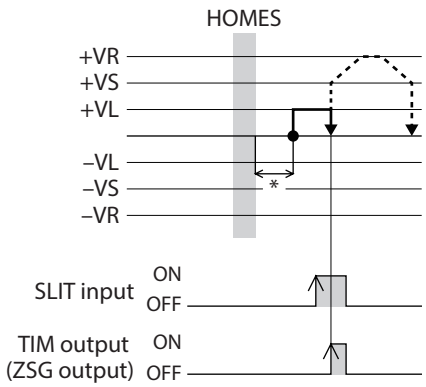
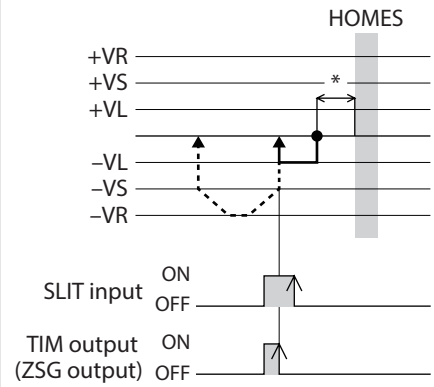
Starting position of return-to-home operation	Starting direction of return-to-home operation: Positive side	Starting direction of return-to-home operation: Negative side
HOMES		
Other than HOMES		

* The motor pulls out of the HOME sensor, and rotates according to the value set in the "(HOME) Operating amount in uni-directional home-seeking" (device parameter 116Ah).

Note When the operation is started from a position other than the HOME sensor, if the motor pulls out of the HOME sensor during deceleration stop after detection of the HOME sensor, an alarm of the Return-to-home error is generated. Set the "(HOME) Acceleration/deceleration rate" (device parameter 1162h) so that the motor can stop in the range of the HOME sensor.

When the SLIT input, TIM output, and ZSG output are used concurrently

Even after return-to-home operation is completed, operation is continued until an external signal is detected. If an external signal is detected, return-to-home operation is completed.

Home detection signal	Starting direction of return-to-home operation: Positive side	Starting direction of return-to-home operation: Negative side
SLIT input		
TIM output or ZSG output		
SLIT input and TIM output or SLIT input and ZSG output		

* The motor pulls out of the HOME sensor, and rotates according to the value set in the "(HOME) Operating amount in uni-directional home-seeking" (device parameter 116Ah).

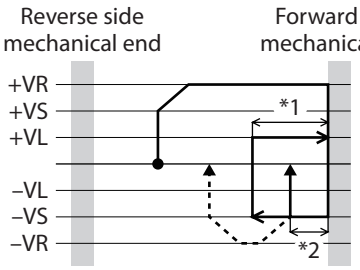
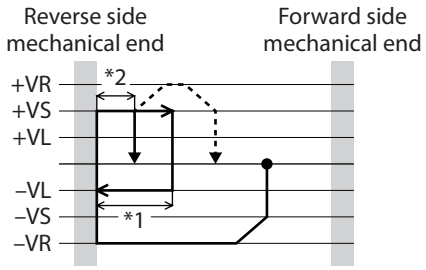
● Push-motion mode

The motor operates in the starting direction of return-to-home at the (HOME) Operating speed, and rotates in the reverse direction when a mechanism installed to the motor presses against a stopper or others mounted at the mechanical end. After that, the motor operates according to the value set in the (HOME) Backward steps after first entry in push-home-seeking and stops, and then operates again toward the stopper at the (HOME) Last speed. When the motor presses against a stopper or others again, it rotates in the reverse direction, operates according to the value set in the (HOME) Backward steps in push-home-seeking, and stops.
The push force can be set using the "(HOME) Operating current for push-home-seeking" (device parameter 116Bh).

Note

- Do not perform push-motion return-to-home operation with geared motors and the **DGII** Series. Doing so may damage the motor and the gears.
- Set a value suitable for the used motorized actuator to the "(HOME) Operating current for push-home-seeking" (device parameter 116Bh). Too large operating current may cause damage to the product. Refer to the Motorized Actuator OPERATING MANUAL Function Setting Edition for details.

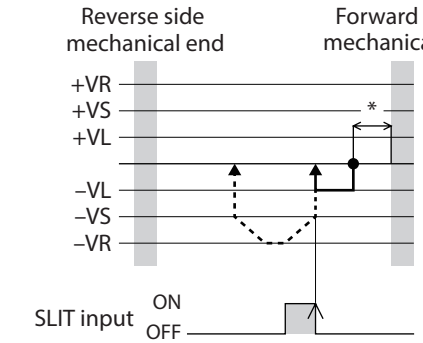
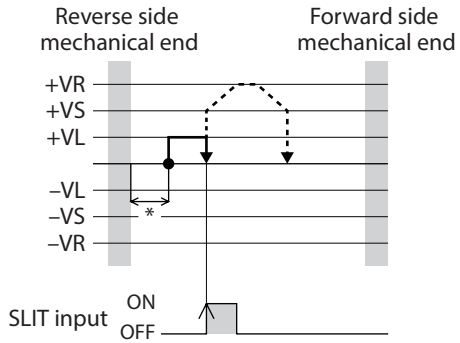
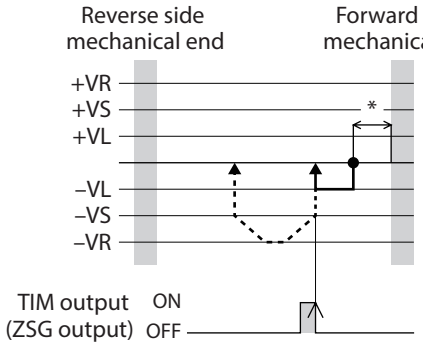
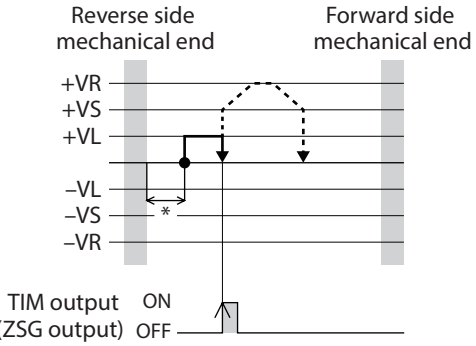
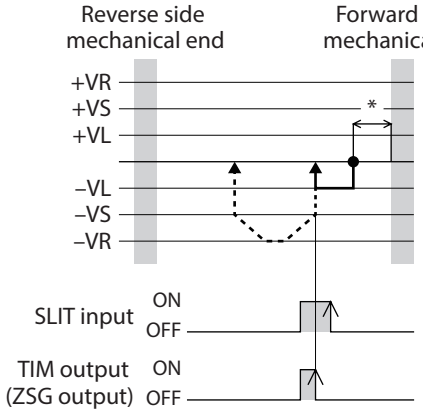
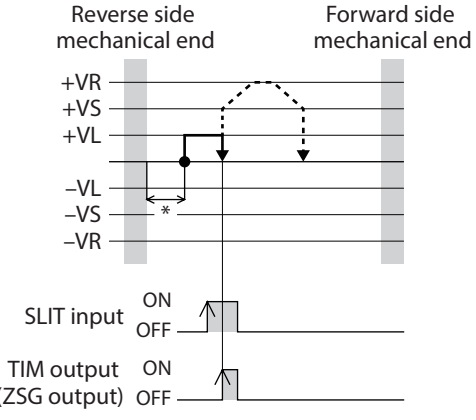
Explanation of code	• VR: (HOME) Operating speed (device parameter 1164h) • VS: (HOME) Starting speed (device parameter 1163h) • VL: (HOME) Last speed (device parameter 1165h) • - - -: Orbit when the home offset is set.

Starting position of return-to-home operation	Starting direction of return-to-home operation: Positive side	Starting direction of return-to-home operation: Negative side
Between mechanical ends		

*1 The motor rotates from the mechanical end according to the value set in the "(HOME) Backward steps after first entry in push-home-seeking" (device parameter 116Ch).
*2 The motor rotates from the mechanical end according to the value set in the "(HOME) Backward steps in push-home-seeking" (device parameter 116Eh).

When the SLIT input, TIM output, and ZSG output are used concurrently

Even after return-to-home operation is completed, operation is continued until an external signal is detected. If an external signal is detected, return-to-home operation is completed.

Home detection signal	Starting direction of return-to-home operation: Positive side	Starting direction of return-to-home operation: Negative side
SLIT input		
TIM output or ZSG output		
SLIT input and TIM output or SLIT input and ZSG output		

* The motor rotates from the mechanical end according to the value set in the "(HOME) Backward steps in push-home-seeking" (device parameter 116Eh).

■ Velocity control command (VELCTRL: 3Ch)

This command sends the speed reference to a device station to perform speed control. To cancel the speed control, set the VREF (Bytes 16 to 19) to 0, or set the CMD_CANCEL (Bit 1) of the SVCMD_CTRL (Bytes 4 to 7) to 1.
In the standard stepping motor drivers profile, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 8, and the command will not be executed. If this command is used in the servo OFF state, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to A, and it will not be executed.

Byte	Command	Response	Description
0	VELCTRL (3Ch)	VELCTRL (3Ch)	Speed control
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 15	TFF	CPRM_SEL_MON1	• Command: Torque feed forward The torque feed forward is not operative. (It is disregarded.) • Response: Fixed monitor 1
16 to 19	VREF	CPRM_SEL_MON2	• Command: Reference speed Sets the reference speed of speed control with signed 4-byte data. Specifies the rotation direction with a sign. If a value exceeding 4,000,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 4,000,000 is set. If a value lower than −4,000,000 (minimum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that −4,000,000 is set. If 0 is set, the motor stops. Unit: Reference unit/s [Hz] • Response: Fixed monitor 2
20 to 23	ACCR	MONITOR1	• Command: Acceleration, deceleration Sets the acceleration and deceleration of speed control with unsigned 4-byte data. If a value exceeding 1,000,000,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1,000,000,000 is set. If "FFFF FFFFh" is set, a warning state is not occurred, and the command operates by deeming that 1,000,000,000 is set. If 0 is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1 is set. Unit: Reference unit/s^2 [Hz/s] • Response: Monitor 1, monitor 2
24 to 27	DECR	MONITOR2	
28 to 31	TLIM	MONITOR3	• Command: Operating current Sets the operating current with unsigned 4-byte data. If a value exceeding 1,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1,000 is set. If "FFFF FFFFh" is set, a warning state is not occurred, and the command operates by deeming that 1,000 is set. Unit: 0.1 [%] • Response: Monitor 3

■ Torque (thrust) control command (TRQCTRL: 3Dh)

This command sends the torque reference to a device station to perform torque control.
In the standard stepping motor drivers profile, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 8, and the command will not be executed. If this command is used in the servo OFF state, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to A, and it will not be executed.

Byte	Command	Response	Description
0	TRQCTRL (3Dh)	TRQCTRL (3Dh)	Torque (thrust) control
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12 to 15	VLIM	CPRM_SEL_MON1	• Command: Speed limit Sets the speed limit value of the torque (thrust) limit with unsigned 4-byte data. If a value exceeding 4,000,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 4,000,000 is set. If "FFFF FFFFh" is set, a warning state is not occurred, and the command operates by deeming that the smaller value is set as the result of comparing 4,000,000 with the maximum speed of the driver. Unit: Reference speed/s [Hz] • Response: Fixed monitor 1
16 to 19	TQREF	CPRM_SEL_MON2	• Command: Reference torque Sets the reference torque with signed 4-byte data. Set as a percent (%) of the operating current. Specifies the direction of the output torque with a sign. If a value exceeding 1,000 (maximum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that 1,000 is set. If a value lower than −1,000 (minimum value) is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command operates by deeming that −1,000 is set. Unit: 0.1 [%] • Response: Fixed monitor 2
20 to 23	Reserved (0)	MONITOR1	Monitor 1
24 to 27	Reserved (0)	MONITOR2	Monitor 2
28 to 31	Reserved (0)	MONITOR3	Monitor 3

■ Read servo parameter command (SVPRM_RD: 40h)

This command reads the parameters.
Refer to "4 Parameter list" on p.133 for parameter numbers, setting ranges, initial values, etc.

Byte	Command	Response	Description
0	SVPRM_RD (40h)	SVPRM_RD (40h)	Read servo parameter
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12, 13	NUM	NUM	Parameter number If a number not described in the parameter list is accessed, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 9, and the command will not be executed.
14	SIZE	SIZE	4 (fixed) If a value other than 4 is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 9, and the command will not be executed.
15	MODE	MODE	00h, 01h: Common parameter (read from RAM area) 10h, 11h: Device parameter (read from RAM area) If a value is invalid, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 9, and the command will not be executed.
16 to 31	Reserved (0)	PARAMETER	Parameter data is returned by 4-byte data in order from Byte 16.

■ Write servo parameter command (SVPRM_WR: 41h)

This command writes the parameters.
Refer to "4 Parameter list" on p.133 for parameter numbers, setting ranges, initial values, etc.

Byte	Command	Response	Description
0	SVPRM_WR (41h)	SVPRM_WR (41h)	Write servo parameter
1	WDT	RWDT	Watchdog data
2, 3	CMD_CTRL	CMD_STAT	Command control, command status
4 to 7	SVCMD_CTRL	SVCMD_STAT	Servo command control, servo command status
8 to 11	SVCMD_IO (output)	SVCMD_IO (input)	Servo command I/O signal
12, 13	NUM	NUM	Parameter number If a number not described in the parameter list is accessed, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 9, and the command will not be executed.
14	SIZE	SIZE	4 (fixed) If a value other than 4 is set, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 9, and the command will not be executed.
15	MODE	MODE	00h: Common parameter (write to RAM area) 01h: Common parameter (write to RAM area and non-volatile memory area) 10h: Device parameter (write to RAM area) 11h: Device parameter (write to RAM area and non-volatile memory area) If a value is invalid, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 9, and the command will not be executed.
16 to 31	PARAMETER	PARAMETER	Parameter data is set by 4-byte data in order from Byte 16. If a value is invalid, the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) changes to 1, and the command will not be executed.

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To save parameters written to the RAM area to the non-volatile memory, execute either of the following operations.

- Write 1 to the CONFIG_MOD (Byte 4) of the CONFIG command, and execute the write batch non-volatile memory.
- Execute the Write batch NV memory (device parameter 10C9h).

3 Subcommands

In cyclic communications, byte 32 to byte 47 in the MECHATROLINK-III data field can be used as subcommands. At the time of establishment of MECHATROLINK-III, set the subcommands to enable with the CONNECT (0Eh) of the main commands.

memo
- The driver supports subcommands for the standard servo profile and the standard stepping motor drivers profile.
- Subcommands can be used when the number of transmission bytes of cyclic communications is 48 bytes. The subcommands cannot be used when the number of transmission bytes of cyclic communications is 32 bytes.

3-1 Subcommand format

Subcommands use byte 32 to byte 47 of the MECHATROLINK-III data field, and are used as auxiliary function commands for the main command.

Byte	Command	Response	Description
32	SUB_CMD	SUB_RCMD	Command code specified for individual commands.
33 to 35	SUB_CTRL	SUB_STAT	Subcommand control, subcommand status
36 to 47	SUB_CMD_DATA	SUB_RSP_DATA	Specified for individual commands.

3-2 Subcommand control/subcommand status field (SUB_CTRL/SUB_STAT)

■ Subcommand control field (SUB_CTRL)

● **Arrangement of bits**

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved (0)							
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
SEL_MON4				Reserved (0)			
Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
SEL_MON6				SEL_MON5			

● **Details of bits**

bit	Name	Description
12 to 23	SEL_MON4 SEL_MON5 SEL_MON6	Sets the data to be monitored with the monitor 4 to monitor 6. For the monitor items, refer to the servo command control (SVCMD_CTRL) of the main commands. (⇨ p.67)

■ Subcommand status (SUB_STAT)

● Arrangement of bits

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved (0)					SUBCMDRDY	Reserved (0)	
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
SEL_MON4				SUBCMD_ALM			
Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
SEL_MON6				SEL_MON5			

● Details of bits

bit	Name	Description
2	SUBCMDRDY	0: Command reception disabled 1: Command reception enabled When a command is sent from the master station and is in a state of executing, the SUBCMDRDY changes to 0. When executing the command is completed, the SUBCMDRDY changes to 1. If a subcommand is set to disable with the CONNECT (0Eh) of the main commands when MECHATROLINK-III is established, the SUBCMDRDY changes to 1.
8 to 11	SUBCMD_ALM	If an error occurs in a subcommand, the code is indicated using four bits. If a normal subcommand is received, the SUBCMD_ALM changes to 0. The phase state and the motor state are not changed. For details, refer to the CMD_STAT of the main commands. (⇨p.58)
12 to 23	SEL_MON4 SEL_MON5 SEL_MON6	These represent the data monitored by the SEL_MON4 to SEL_MON6 of the subcommand control (SUB_CTRL).

3-3 Subcommands list

Command code	Command	Operation	Communication phase *		
			1	2	3
00h	NOP	No operation (disabled)	–	○	○
05h	ALM_RD	Read alarm/warning	–	○	○
06h	ALM_CLR	Clear alarm/warning state	–	○	○
1Dh	MEM_RD	Read memory	–	×	×
1Eh	MEM_WR	Write memory	–	×	×
30h	SMON	Monitor servo status	–	○	○
40h	SVPRM_RD	Read servo parameter	–	○	○
41h	SVPRM_WR	Write servo parameter	–	○	○

* ○: Can be executed, ×: Command error, –: Indefinite response data
Refer to p.56 for the communication phase.

■ Combinations of main commands and subcommands

The combinations of main commands and subcommands are listed below.

Explanation of code

○: Can be combined
–: Cannot be combined. The SUBCMD_ALM (Bits 8 to 11) of the SUB_STAT (Bytes 33 to 35) changes to C.
×: Cannot be combined. The CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) or the SUBCMD_ALM (Bits 8 to 11) of the SUB_STAT (Bytes 33 to 35) changes to B.
Oblique line: Cannot execute a command. The CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) or the SUBCMD_ALM (Bits 8 to 11) of the SUB_STAT (Bytes 33 to 35) changes to 8.

			Subcommand							
			NOP (00h)	ALM_RD (05h)	ALM_CLR (06h)	MEM_RD (1Dh)	MEM_WR (1Eh)	SMON (30h)	SVPRM_RD (40h)	SVPRM_WR (41h)
Main command	Common command	NOP (00h)	○	○	○			○	○	○
		ID_RD (03h)	○	○	○			○	○	○
		CONFIG (04h)	○	○	○			○	○	○
		ALM_RD (05h)	○	○	○			○	○	○
		ALM_CLR (06h)	○	○	○			○	○	○
		SYNC_SET (0Dh)	○	○	○			○	○	○
		CONNECT (0Eh)	○	○	○			○	○	○
		DISCONNECT (0Fh)	○	–	–			–	–	–
		MEM_RD (1Dh)								
		MEM_WR (1Eh)								

Main command	Standard servo profile command / Standard stepping motor drivers profile		Subcommand							
			NOP (00h)	ALM_RD (05h)	ALM_CLR (06h)	MEM_RD (1Dh)	MEM_WR (1Eh)	SMON (30h)	SVPRM_RD (40h)	SVPRM_WR (41h)
		POS_SET (20h)	○	○	○			○	○	○
		BRK_ON (21h)	○	○	○			○	○	○
		BRK_OFF (22h)	○	○	○			○	○	○
		SENS_ON (23h)	○	○	○			○	○	○
		SENS_OFF (24h)	○	○	○			○	○	○
		SMON (30h)	○	○	○			○	○	○
		SV_ON (31h)	○	○	○			○	○	○
		SV_OFF (32h)	○	○	○			○	○	○
		INTERPOLATE (34h)	○	○	○			○	○	○
		POSING (35h)	○	○	○			○	○	○
		FEED (36h)	○	○	○			○	○	○
		EX_FEED (37h)	○	○	○			○	○	○
		EX_POSING (39h)	○	○	○			○	○	○
		ZRET (3Ah)	○	○	○			○	○	○
		VELCTRL * (3Ch)	○	○	○			○	○	○
		TRQCTRL * (3Dh)	○	○	○			○	○	○
		SVPRM_RD (40h)	○	○	○			○	○	○
		SVPRM_WR (41h)	○	○	○			○	○	×

* The standard stepping motor drivers profile is not supported.

memo As for other than the NOP (00h), CONNECT (0Eh), and DISCONNECT (0Fh) of the common commands, if the communication phase is 1 even when the combination is shown as "Can be combined (○)," the CMD_ALM (Bits 8 to 11) of the CMD_STAT (Bytes 2, 3) or the SUBCMD_ALM (Bits 8 to 11) of the SUB_STAT (Bytes 33 to 35) changes to C.

3-4 Details of subcommands

■ No operation subcommand (NOP: 00h)

This is "No operation command."

Byte	Command	Response	Description
32	NOP (00h)	NOP (00h)	No operation
33 to 35	SUB_CTRL	SUB_STAT	Subcommand control, subcommand status
36 to 47	Reserved (0)	Reserved (0)	

■ Read alarm or warning subcommand (ALM_RD: 05h)

This command is used to check an activated state of a protective function.

Byte	Command	Response	Description
32	ALM_RD (05h)	ALM_RD (05h)	Read alarm/warning
33 to 35	SUB_CTRL	SUB_STAT	Subcommand control, subcommand status
36, 37	ALM_RD_MOD	ALM_RD_MOD	0: Present alarm 1: Read alarm history (up to 10 alarms can be read. 0 is stored in the space when the number of alarms is less than 10 items.) If a value is invalid, the SUBCMD_ALM (Bits 8 to 11) of the SUB_STAT (Bytes 33 to 35) changes to 9, and the command will not be executed.
38, 39	ALM_INDEX	ALM_INDEX	When the ALM_RD_MOD (Bytes 36, 37) is 0, 0 is fixed. When the ALM_RD_MOD is 1, specify the first alarm history number with 0 to 9. If a value is invalid, the SUBCMD_ALM (Bits 8 to 11) of the SUB_STAT (Bytes 33 to 35) changes to 9, and the command will not be executed.
40 to 47	Reserved (0)	ALM_DATA	When the ALM_RD_MOD (Bytes 36, 37) is 0, the present alarm code is stored in Bytes 40 and 41, and Bytes 42 to 47 changes to 0. When the ALM_RD_MOD is 1, the alarm history is stored by two bytes at a time in order of the history number specified with the ALM_INDEX (Bytes 38, 39) starting from Byte 40.

■ Clear alarm or warning subcommand (ALM_CLR: 06h)

This command resets an alarm. Some alarms cannot be reset with this subcommand.

Byte	Command	Response	Description
32	ALM_CLR (06h)	ALM_CLR (06h)	Clear alarm/warning state
33 to 35	SUB_CTRL	SUB_STAT	Subcommand control, subcommand status
36, 37	ALM_CLR_MOD	ALM_CLR_MOD	0: Clears the present alarm. If a value is invalid, the SUBCMD_ALM (Bits 8 to 11) of the SUB_STAT (Bytes 33 to 35) changes to 9, and the command will not be executed.
38 to 47	Reserved (0)	Reserved (0)	

memo To clear the alarm history, use the ALM_CLR (06h) of the main commands. It cannot be cleared with the subcommands.

■ Servo status monitor subcommand (SMON: 30h)

This command is used to read the alarms, the status, and the data (position, speed, etc.) specified with the monitor selection.

Byte	Command	Response	Description
32	SMON (30h)	SMON (30h)	Monitor servo status
33 to 35	SUB_CTRL	SUB_STAT	Subcommand control, subcommand status
36 to 39	Reserved (0)	MONITOR4	Monitor 4
40 to 43	Reserved (0)	MONITOR5	Monitor 5
44 to 47	Reserved (0)	MONITOR6	Monitor 6

■ Read servo parameter subcommand (SVPRM_RD: 40h)

This command reads the parameters.
Refer to "4 Parameter list" on p.133 for parameter numbers, setting ranges, initial values, etc.

Byte	Command	Response	Description
32	SVPRM_RD (40h)	SVPRM_RD (40h)	Read servo parameter
33 to 35	SUB_CTRL	SUB_STAT	Subcommand control, subcommand status
36, 37	NUM	NUM	Parameter number If a number not described in the parameter list is accessed, the SUBCMD_ALM (Bits 8 to 11) of the SUB_STAT (Bytes 33 to 35) changes to 9, and the command will not be executed.
38	SIZE	SIZE	4 (fixed) If a value other than 4 is set, the SUBCMD_ALM (Bits 8 to 11) of the SUB_STAT (Bytes 33 to 35) changes to 9, and the command will not be executed.
39	MODE	MODE	00h, 01h: Common parameter (read from RAM area) 10h, 11h: Device parameter (read from RAM area) If a value is invalid, the SUBCMD_ALM (Bits 8 to 11) of the SUB_STAT (Bytes 33 to 35) changes to 9, and the command will not be executed.
40 to 47	Reserved (0)	PARAMETER	Parameter data is returned by 4-byte data in order from Byte 40.

■ Write servo parameter subcommand (SVPRM_WR: 41h)

This command writes the parameters.
Refer to "4 Parameter list" on p.133 for parameter numbers, setting ranges, initial values, etc.
While the write servo parameter command (SVPRM_WR: 41h) is being executed, the SUBCMD_ALM (Bits 8 to 11) of the SUB_STAT (Bytes 33 to 35) changes to B, and the command will not be executed.

Byte	Command	Response	Description
32	SVPRM_WR (41h)	SVPRM_WR (41h)	Write servo parameter
33 to 35	SUB_CTRL	SUB_STAT	Subcommand control, subcommand status
36, 37	NUM	NUM	Parameter number If a number not described in the parameter list is accessed, the SUBCMD_ALM (Bits 8 to 11) of the SUB_STAT (Bytes 33 to 35) changes to 9, and the command will not be executed.
38	SIZE	SIZE	4 (fixed) If a value other than 4 is set, the SUBCMD_ALM (Bits 8 to 11) of the SUB_STAT (Bytes 33 to 35) changes to 9, and the command will not be executed.
39	MODE	MODE	00h: Common parameter (write to RAM area only) 10h: Device parameter (write to RAM area only) If a value is invalid, the SUBCMD_ALM (Bits 8 to 11) of the SUB_STAT (Bytes 33 to 35) changes to 9, and the command will not be executed.
40 to 47	PARAMETER	PARAMETER	Parameter data is set by 4-byte data in order from Byte 40. If a value is invalid, the SUBCMD_ALM (Bits 8 to 11) of the SUB_STAT (Bytes 33 to 35) changes to 9, and the command will not be executed.

memo To save parameters written to the RAM area to the non-volatile memory, execute either of the following operations.

- Write 1 to the CONFIG_MOD (Byte 4) of the CONFIG command, and execute the write batch non-volatile memory.
- Execute the Write batch NV memory (device parameter 10C9h).

4 Allocation of I/O functions

This section explains the allocation of I/O functions and internal I/O status.

4-1 Direct I/O

■ Allocation to input terminals

Input signals can be allocated to the input terminals IN0 to IN3 of the driver.
Refer to "Input signals list" on p.115 for signals that can be allocated.

Related parameters

Refer to p.135 for how to read the table.

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1840h	DIN0 input function	R/W	NV	C	Input signals list⇨p.115	26: FW-BLK	–	4
1841h	DIN1 input function	R/W	NV	C		27: RV-BLK	–	4
1842h	DIN2 input function	R/W	NV	C		104: EXT1	–	4
1843h	DIN3 input function	R/W	NV	C		107: DEC	–	4

Note The composite functions are initially set in DIN0 to DIN3 as shown in the table below.
The composite function is a function to turn the two signals ON or OFF simultaneously by a single input.
Input signals used in return-to-home (zero point return) operation of the MECHATROLINK-III standard method are allocated to the input function of DIN0 to DIN3, and input signals used in return-to-home operation of Oriental Motor specific method are allocated to the composite functions of DIN0 to DIN3. Therefore, return-to-home (zero point return) operation by both the MECHATROLINK-III standard method and the Oriental Motor specific method can be performed in the state of initial setting.

Input terminal	DIN input function parameter	DIN composite input function parameter
DIN0	26: FW-BLK	28: FW-LS
DIN1	27: RV-BLK	29: RV-LS
DIN2	104: EXT1	30: HOMES
DIN3	107: DEC	Not used

■ Allocation to output terminals

Output signals can be allocated to the output terminals OUT0 to OUT2 f the driver.
Refer to "Output signals list" on p.117 for signals that can be allocated.

Related parameters

Refer to p.135 for how to read the table.

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1860h	DOUT0 (Normal) Output function	R/W	NV	C	Output signals list⇨p.117	130: ALM-B	–	4
1861h	DOUT1 (Normal) Output function	R/W	NV	C		132: READY	–	4
1862h	DOUT2 (Normal) Output function	R/W	NV	C		134: MOVE	–	4

■ Direct I/O monitor

The status of direct I/O can be checked with the Direct-I/O (device parameter 106Ah). The arrangement of bits is as follows.

Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
–	–	–	–	–	–	–	–
Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
–	–	–	–	–	DOUT2	DOUT1	DOUT0
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
VIR-IN3	VIR-IN2	VIR-IN1	VIR-IN0	–	EXT-IN	–	–
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
–	–	–	–	DIN3	DIN2	DIN1	DIN0

Related parameter

Refer to p.135 for how to read the table.

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
106Ah	Direct I/O	R	V	–	–	–	–	4

■ I/O status

The status of the I/O inside the driver can be monitored with the I/O status. The arrangement of bits for the internal I/O is as follows.

Parameter No.	Description							
10B8h	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	SLIT	HOMES	RV-LS	FW-LS	RV-BLK	FW-BLK	–	–
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	SPD-LMT	CRNT-LMT	T-MODE	–	–	CCM	–	HMI
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	INFO-CLR	LAT-CLR	–	–	–	P-PRESET	ALM-RST
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	STOP	–	–	–	FREE	Not used
10B9h	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	–	–	–	–	–	–	–	–
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	–	–	–	–	–	–	–	–
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	–	–	–	–	–	–	–
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	–	–	–	–	–	–
10BAh	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	R15	R14	R13	R12	R11	R10	R9	R8
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	R7	R6	R5	R4	R3	R2	R1	R0
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	–	–	–	–	–	–	–
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	–	–	–	–	–	–

Parameter No.	Description							
10BBh	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	–	–	–	–	–	–	–	–
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	–	–	–	–	–	–	–	–
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	–	–	–	DEC	EXT3	EXT2	EXT1
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	–	–	–	–	–	–
10BCh	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	–	–	TIM	–	ZSG	RV-SLS	FW-SLS	–
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	ORGN-STLD	PRST-STLD	PRST-DIS	–	–	–	ABSPEN	HOME-END
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	AUTO-CD	CRNT	VA	TLC	–	–	ETO-MON	SYS-BSY
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	INFO	MOVE	–	READY	SYS-RDY	ALM-B	ALM-A	CONST-OFF
10BDh	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	–	–	–	–	–	–	–	–
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	–	–	USR-OUT1	USR-OUT0	–	–	–	–
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	–	HWTOIN-MON	EDM-MON	–	RG	MBC	MPS
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	AREA7	AREA6	AREA5	AREA4	AREA3	AREA2	AREA1	AREA0
10BEh	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	–	–	–	–	–	–	–	–
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	–	–	–	–	–	–	–	–
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	–	–	DCMD-RDY	–	–	–	–
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	–	OPE-BSY	–	–	SPD-LMTD	CRNT-LMTD
10BFh	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	INFO-RBT	INFO-CFG	INFO-IOTEST	INFO-DSLMTD	–	–	–	–
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	–	–	INFO-ODO	INFO-TRIP	INFO-CULD1	INFO-CULD0	INFO-RV-OT	INFO-FW-OT
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	INFO-RND-E	INFO-EGR-E	–	INFO-PR-REQ	INFO-ZHOME	INFO-START	INFO-SPD
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	INFO-OLTIME	INFO-UVOLT	INFO-OVOLT	INFO-MTRTMP	INFO-DRVTMP	INFO-POSERR	INFO-USRIO

Related parameters

Refer to p.135 for how to read the table.

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
10B8h	IO status1	R	V	–	–	–	–	4
10B9h	IO status2	R	V	–	–	–	–	4
10BAh	IO status3	R	V	–	–	–	–	4
10BBh	IO status4	R	V	–	–	–	–	4
10BCh	IO status5	R	V	–	–	–	–	4
10BDh	IO status6	R	V	–	–	–	–	4
10BEh	IO status7	R	V	–	–	–	–	4
10BFh	IO status8	R	V	–	–	–	–	4

4-2 Remote I/O

■ Servo command output signals

VSO1 to VSO8 (Bits 16 to 23) of the servo command output signals are allocated to R-IN0 to R-IN7, respectively. Input signals can be allocated to R-IN using parameters. Refer to "Input signals list" on p.115 for signals that can be allocated.

Related parameters

Refer to p.135 for how to read the table.

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1900h	R-IN0 input function	R/W	NV	C	Input signals list⇨p.115	0: Not used	–	4
1901h	R-IN1 input function	R/W	NV	C		0: Not used	–	4
1902h	R-IN2 input function	R/W	NV	C		0: Not used	–	4
1903h	R-IN3 input function	R/W	NV	C		0: Not used	–	4
1904h	R-IN4 input function	R/W	NV	C		0: Not used	–	4
1905h	R-IN5 input function	R/W	NV	C		0: Not used	–	4
1906h	R-IN6 input function	R/W	NV	C		0: Not used	–	4
1907h	R-IN7 input function	R/W	NV	C		0: Not used	–	4

■ Servo command input signal monitor

VSI1 to VSI8 (Bits 24 to 31) of the servo command signal monitor are allocated to R-OUT0 to R-OUT7, respectively. Output signals of R-OUT can be changed using parameters. Refer to "Output signals list" on p.117 for signals that can be allocated.

Related parameters

Refer to p.135 for how to read the table.

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1910h	R-OUT0 output function	R/W	NV	C	Output signals list⇨p.117	26: FW-BLK	–	4
1911h	R-OUT1 output function	R/W	NV	C		27: RV-BLK	–	4
1912h	R-OUT2 output function	R/W	NV	C		104: EXT1	–	4
1913h	R-OUT3 output function	R/W	NV	C		107: DEC	–	4

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1914h	R-OUT4 output function	R/W	NV	C	Output signals list⇨p.117	130: ALM-B	–	4
1915h	R-OUT5 output function	R/W	NV	C		132: READY	–	4
1916h	R-OUT6 output function	R/W	NV	C		134: MOVE	–	4
1917h	R-OUT7 output function	R/W	NV	C		173: HWTOIN-MON	–	4

4-3 I/O signals list

To allocate signals via MECHATROLINK-III, use the "Allocation No." in the table instead of the signal names.

■ Input signals list

Allocation number		Signal name	Description	Operation
Dec	Hex			
0	0h	Not used	Set when the input terminal is not used.	–
1	1h	FREE	Shut off the motor current to put the motor into a non-excitation state. When an electromagnetic brake motor is used, the electromagnetic brake is in a state of releasing the motor shaft.	0: No operation 1: Electromagnetic brake release and motor non-excitation
5	5h	STOP	Stop the motor.	0: No operation 1: Operation stop
8	8h	ALM-RST	Reset the alarm being generated presently. However, alarms related to MECHATROLINK-III cannot be reset.	0: No operation 1: Alarm reset
9	9h	P-PRESET	Preset the present position to the mechanical home.	0: No operation 1: Preset execution
13	Dh	LAT-CLR	Clear the cumulative load. This is used when the Cumulative load value auto clear (device parameter 11B3h) is set to "0: Not clear."	0: No operation 1: Cumulative load clear
14	Eh	INFO-CLR	Clear the information status.	0: No operation 1: Information status clear
16	10h	HMI	Release the function limitation of the **MEXE02**.	0: Function limitation 1: Function limitation release
18	12h	CCM	Change the control mode from the normal mode to the current control mode.	0: Normal mode 1: Current control mode.
21	15h	T-MODE	Disable the overload alarm.	0: No operation 1: Overload alarms disabled
22	16h	CRNT-LMT	Execute the current limit.	0: Current limit release 1: Current limit
23	17h	SPD-LMT	Execute the speed limit. It cannot be used for the INTERPOLATE command.	0: Speed limit release 1: Speed limit
26	1Ah	FW-BLK	Stop the operation in the forward direction. It corresponds to the P-OT (Bit 2) of the servo command input signal (SVCMD_IO).	0: No operation 1: Forward direction operation stop
27	1Bh	RV-BLK	Stop the operation in the reverse direction. It corresponds to the N-OT (Bit 3) of the servo command input signal (SVCMD_IO).	0: No operation 1: Reverse direction operation stop

Allocation number		Signal name	Description	Operation
Dec	Hex			
28	1Ch	FW-LS	This is a signal to be input from the limit sensor in the forward direction. It is used in return-to-home operation of the Oriental Motor specific method.	0: OFF 1: ON
29	1Dh	RV-LS	This is a signal to be input from the limit sensor in the reverse direction. It is used in return-to-home operation of the Oriental Motor specific method.	0: OFF 1: ON
30	1Eh	HOMES	This is a signal to be input from the HOME sensor. It is used in return-to-home operation of the Oriental Motor specific method.	0: OFF 1: ON
31	1Fh	SLIT	This is a signal to be input from the SLIT sensor. It is used in return-to-home operation of the Oriental Motor specific method.	0: OFF 1: ON
80	50h	R0	These are general signals.	0: OFF 1: ON
81	51h	R1		
82	52h	R2		
83	53h	R3		
84	54h	R4		
85	55h	R5		
86	56h	R6		
87	57h	R7		
88	58h	R8		
89	59h	R9		
90	5Ah	R10		
91	5Bh	R11		
92	5Ch	R12		
93	5Dh	R13		
94	5Eh	R14		
95	5Fh	R15		
104	68h	EXT1	These are external latch signals.	0: OFF 1: ON
105	69h	EXT2		
106	6Ah	EXT3		
107	6Bh	DEC	This is the Zero return deceleration limit switch input. It is the deceleration signal for return-to-home (zero point return) operation.	0: OFF 1: ON

Note

- When the same input signal is allocated to multiple input terminals, the function will be executed if any of the terminals becomes active.
- When the HMI input is not allocated to the input terminal, this input will always be 1. When it is allocated to both direct I/O (DIN0 to DIN3) and remote I/O (R-IN0 to R-IN7), the function will be executed when both of them changes to 1.

■ Output signals list

Allocation number		Signal name	Description	Operation
Dec	Hex			
0	0h	Not used	Set when the output terminal is not used.	–
Same as input signal		Response signal (Input signal_R)	Output in response to the corresponding input signal.	0: Input signal is OFF 1: Input signal is ON
128	80h	CONST-OFF	Output an OFF state all the time.	0: OFF
129	81h	ALM-A	Output the alarm status of the driver. (Normally open)	0: No alarm 1: During alarm generation
130	82h	ALM-B	Output the alarm status of the driver. (Normally closed)	0: During alarm generation 1: No alarm
131	83h	SYS-RDY	Output when the control power supply of the driver is turned on.	0: Normal state 1: System preparation completion
132	84h	READY	Output when the driver is ready to operate.	0: Operation not possible 1: Operation preparation completion
134	86h	MOVE	Output when the motor operates.	0: Motor standstill 1: During motor operation
135	87h	INFO	Output the information status of the driver.	0: No information 1: During information generation
136	88h	SYS-BSY	Output when the driver is in an internal processing state.	0: No internal processing 1: During internal processing
137	89h	ETO-MON	Output until the motor is excited after the HWTO1 input or the HWTO2 input is turned OFF.	0: OFF 1: ON
140	8Ch	TLC	Output when the output torque reaches the upper limit value.	0: Within torque range 1: Outside torque range
141	8Dh	VA	Output when the operating speed reaches the target speed.	0: Target speed is not reached 1: Target speed is reached
142	8Eh	CRNT	Output when the motor is in an excitation state.	0: Motor non-excitation 1: Motor excitation
143	8Fh	AUTO-CD	Output when the motor is in current cutback status.	0: Normal state 1: Automatic current cutback status
144	90h	HOME-END	Output when high-speed return-to-home operation or return-to-home operation is completed, or the position preset (P-PRESET) is executed.	0: Other than home 1: Home
145	91h	ABSPEN	Output when coordinates are set.	0: Coordinates setting is not completed 1: Coordinates setting is completed
149	95h	PRST-DIS	After the position preset (P-PRESET) was executed, this signal is output when the position preset (P-PRESET) is required again before the motor is operated.	0: Normal state 1: Preset is not completed
150	96h	PRST-STLD	Output when the mechanical home is set.	0: Mechanical home setting is not completed 1: Mechanical home setting is completed

Allocation number		Signal name	Description	Operation
Dec	Hex			
151	97h	ORGN-STLD	Output when the mechanical home suitable to the product is set at the time of factory shipment.	0: Mechanical home setting is not completed 1: Mechanical home setting is completed
153	99h	FW-SLS	Output when the software limit in the forward direction is reached.	0: Software limit in the forward direction is not reached 1: Software limit in the forward direction is reached
154	9Ah	RV-SLS	Output when the software limit in the reverse direction is reached.	0: Software limit in the reverse direction is not reached. 1: Software limit in the reverse direction is reached.
155	9Bh	ZSG	Output every time the feedback position of the motor increases by one revolution from the position having preset.	0: OFF 1: ON
157	9Dh	TIM	Output every time the motor output shaft rotates by 7.2 ° with reference to the command position.	0: OFF 1: ON
160	A0h	AREA0	Output when the motor is in the range of the AREA0.	0: Outside the range of AREA 1: In the range of AREA
161	A1h	AREA1	Output when the motor is in the range of the AREA1.	
162	A2h	AREA2	Output when the motor is in the range of the AREA2.	
163	A3h	AREA3	Output when the motor is in the range of the AREA3.	
164	A4h	AREA4	Output when the motor is in the range of the AREA4.	
165	A5h	AREA5	Output when the motor is in the range of the AREA5.	
166	A6h	AREA6	Output when the motor is in the range of the AREA6.	
167	A7h	AREA7	Output when the motor is in the range of the AREA7.	
168	A8h	MPS	Output when the main power supply is in an ON state.	0: Main power supply OFF 1: Main power supply ON
169	A9h	MBC	Output when the electromagnetic brake is in a state of releasing the motor shaft..	0: Electromagnetic brake is in a state of holding 1: Electromagnetic brake is in a state of releasing
170	AAh	RG	Output when the driver is in a regeneration state.	0: Normal state 1: Regeneration state
172	ACh	EDM-MON	Output when both the HWTO1 and HWTO2 inputs are turned OFF.	0: OFF 1: ON
173	ADh	HWTOIN-MON	Output when either the HWTO1 input or the HWTO2 input is turned OFF.	0: OFF 1: ON
180	B4h	USR-OUT0	Output a logical product (AND) or a logical sum (OR) for two types of output signals.	0: OFF 1: ON
181	B5h	USR-OUT1		
192	C0h	CRNT-LMTD	Output when the current limit is performed.	0: No current limit 1: Current limit
193	C1h	SPD-LMTD	Output when the speed limit is performed.	0: No speed limit 1: Speed limit

Allocation number		Signal name	Description	Operation
Dec	Hex			
196	C4h	OPE-BSY	Output while internal oscillation is being performed.	0: No internal oscillation 1: During internal oscillation
204	CCh	DCMD-RDY	Output when the driver is ready to operate.	0: Operation not possible 1: Operation preparation completion
224	E0h	INFO-USRIO	Output when the corresponding information is generated.	0: No information 1: During information generation
225	E1h	INFO-POSERR		
226	E2h	INFO-DRVTMP		
227	E3h	INFO-MTRTMP		
228	E4h	INFO-OVOLT		
229	E5h	INFO-UVOLT		
230	E6h	INFO-OLTIME		
232	E8h	INFO-SPD		
233	E9h	INFO-START		
234	EAh	INFO-ZHOME		
235	EBh	INFO-PR-REQ		
237	EDh	INFO-EGR-E		
238	EEh	INFO-RND-E		
240	F0h	INFO-FW-OT		
241	F1h	INFO-RV-OT		
242	F2h	INFO-CULD0		
243	F3h	INFO-CULD1		
244	F4h	INFO-TRIP		
245	F5h	INFO-ODO		
252	FCh	INFO-DSLMTD		
253	FDh	INFO-IOTEST		
254	FEh	INFO-CFG		
255	FFh	INFO-RBT		

5 Coordinates management

This chapter explains generation of the initial coordinates, setting of the mechanical home, wrap function, etc..

To use the wrap function (*), a master station that supports the wrap function is required.
The wrap function cannot be used with master stations not support the wrap function.

* The wrap function is a function to automatically preset the position information of the present position when the number of revolutions of the motor output shaft exceeds the set range.

5-1 Overview of coordinates management

The **AZ** Series manages the position coordinates of the motor with the ABZO sensor (mechanical multi-rotation absolute sensor). The present coordinates are mechanically recorded inside the ABZO sensor. Therefore, even if the motor output shaft is rotated by an external force when the control power supply is in an OFF state, the absolute coordinates with respect to the home can be maintained.
Set the coordinates according to the following flow.

Connect a motor and a driver, and turn on the control power supply.
Initial coordinates are automatically generated.

↓

Set the mechanical home.
Factory home or user home

↓

Set the initial coordinates generation range and the wrap range.

↓

Turn off the control power supply and on again.
Changed parameters will be enabled.

■ About ABZO sensor

The ABZO sensor is a mechanical multi-rotation absolute sensor that does not require a battery.
It stores the present position as an absolute position until the number of revolutions of the motor output shaft exceeds 1,800. The present position is stored even if the control power supply is turned off.
When the number of revolutions exceeds 1,800, the count number is reset to 0 and is newly started from 1.

■ Initial coordinate generation

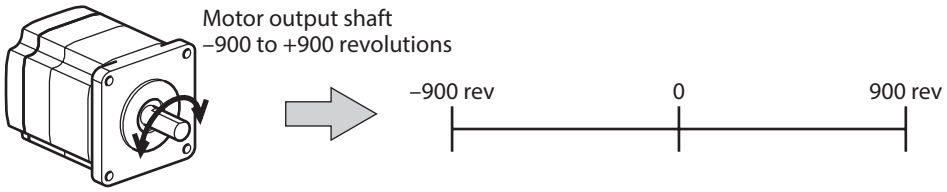
"Initial coordinate generation" indicates to decide how to use the rotation range of up to 1,800 revolutions that the ABZO sensor can manage. There are four parameters required for initial coordinate generation as shown below. These parameters are read when the control power supply is turned on.

- Initial coordinate generation & wrap coordinate setting
- Initial coordinate generation & wrap setting range
- Initial coordinate generation & wrap range offset ratio
- Initial coordinate generation & wrap range offset value

memo Regardless of whether the wrap function is enabled or disabled, the initial coordinate is generated when the control power supply is turned on.

● Example of factory setting of the motor

This example shows when the motor of the frame size 60 mm (2.36 in.) is used.
To use coordinates both in forward and reverse directions, 1,800 revolutions are divided into positive and negative revolutions, 50 % for each direction.



● Setting example of motorized linear slides

The following is an example to set the home of a motorized linear slide at the position of 30 mm from the motor side.

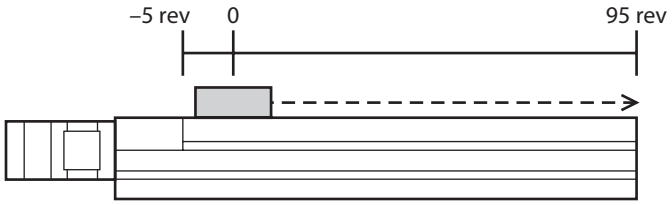
- Motorized linear slide size: 4
- Motorized linear slide stroke: 600 mm
- Motorized linear slide pitch: 6 mm/rev

Concept of initial coordinate

$$\text{Initial coordinate generation range} = \frac{\text{Stroke}}{\text{Pitch}} = \frac{600}{6} = 100 \text{ rev}$$

$$\text{Wrap range offset ratio} = \frac{\text{Home position (zero point)}}{\text{Stroke}} \times 100 = \frac{30}{600} \times 100 = 5\ (\%)$$

From the above, the actual coordinate is in the range of –5 to 95 revolutions.



Setting examples of parameters

Parameter No.	Name	Setting value
17F2h	Initial coordinate generation & wrap coordinate setting	1 (Manual setting)
11C9h	Initial coordinate generation & wrap setting range	1,000 (100.0 rev)
11CBh	Initial coordinate generation & wrap range offset ratio	500 (5.00 %)
11CCh	Initial coordinate generation & wrap range offset value	0 (0 step)

■ Wrap function

To use the wrap function, a master station that supports the wrap function is required. The wrap function cannot be used with master stations not support the wrap function.

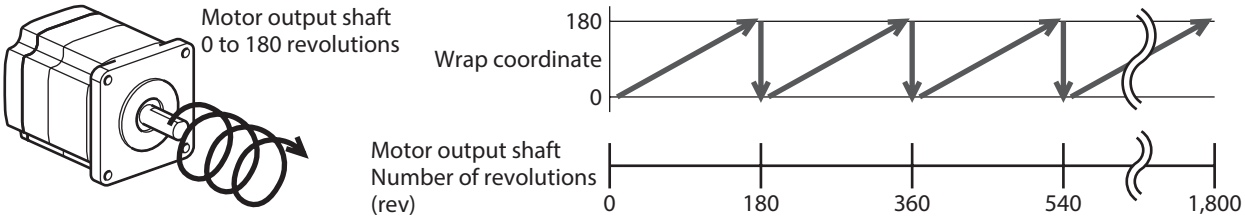
The wrap function is a function to automatically preset the position information of the present position when the number of revolutions of the motor output shaft exceeds the set range. Setting the wrap offset can restrict the operation area of equipment or control an index table with coordinates on the positive and negative sides. Refer to p.127 for the specific setting methods.

Note When the wrap function is set with the **MEXE02**, change the Initial coordinate generation & wrap coordinate setting (device parameter 17F2h) to "1: Manual setting." (Initial value: Prioritize ABZO setting) When this parameter is changed, turn off the control power supply of the driver and on again.

● Concept of wrap setting

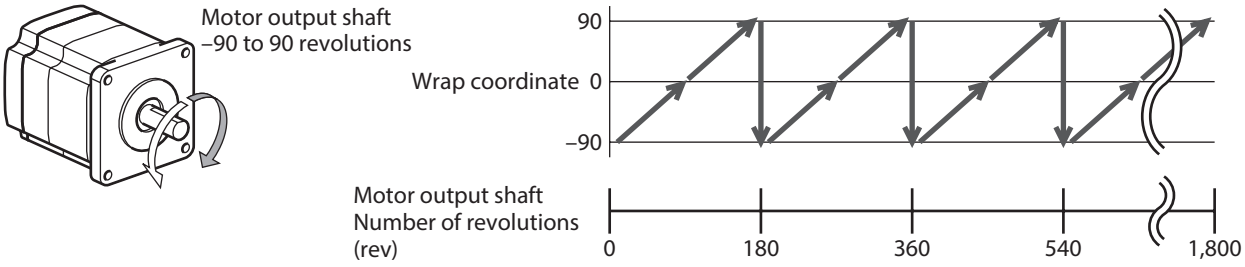
This example explains using the motor of the frame size 60 mm (2.36 in.).
With the wrap setting, 1,800 revolutions managed by the ABZO sensor are divided evenly to generate coordinates within the number of revolutions divided evenly.
Therefore, only a divisor (divisible value) of 1,800 can be set.

Example: When the wrap function executes if the motor rotates 180 times in the same direction



The present position of the motor is preset every 180 revolutions, however, the 32-bit counter in the driver is not preset.

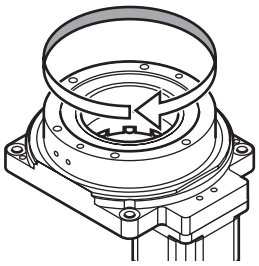
Example: When the range of use of the motor is offset to –90 to 90 revolutions



When the wrap setting range is exceeded, the sign is reversed.

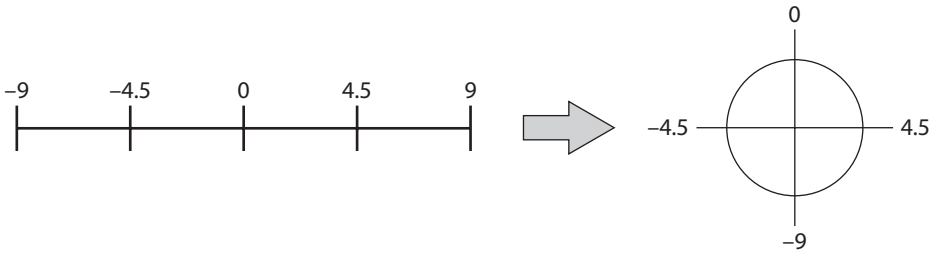
- **Setting example of index table**

The following is an example in which the index table is made rotate once when the motor output shaft rotates 18 times.
Gear ratio of motor:18



Concept of initial coordinate

To rotate the index table in both directions, 18 revolutions are divided into positive and negative rotations, 50 % for each direction.



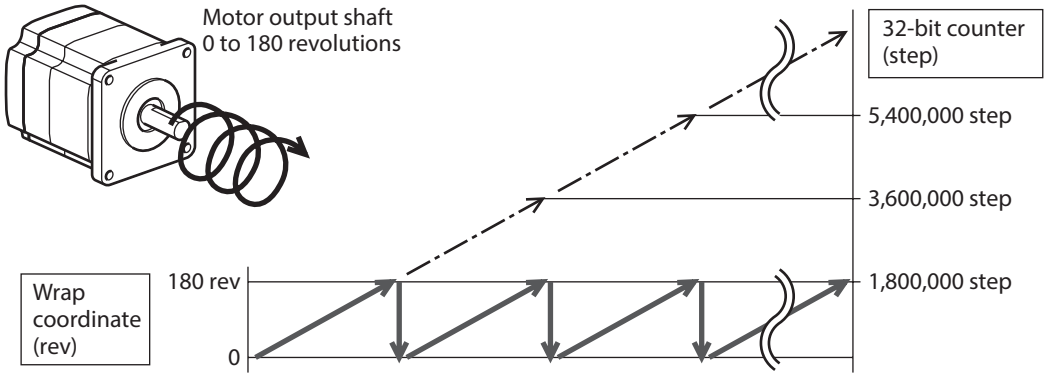
Setting examples of parameters

Parameter No.	Name	Setting value
17F2h	Initial coordinate generation & wrap coordinate setting	1 (Manual setting)
11C9h	Initial coordinate generation & wrap setting range	180 (18.0 rev)
11CBh	Initial coordinate generation & wrap range offset ratio	5,000 (50.0 %)
11CCh	Initial coordinate generation & wrap range offset value	0 (0 step)
11C7h	Wrap setting	1 (Enable)

- **Relation between the wrap function and the 32-bit counter inside the driver**

The 32-bit counter inside the driver outputs the position information of the motor as the number of steps regardless of whether the wrap function is enabled or disabled.
When the wrap function is enabled, the relation between the wrap coordinate and 32-bit counter is shown below.

Example: When the wrap function executes if the motor rotates 180 times in the same direction

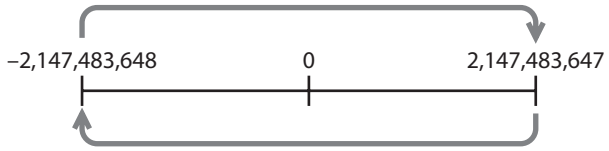


The present position of the motor is preset by 180 revolutions, however, the 32-bit counter is not preset.

memo The value of the 32-bit counter can be checked on the status monitor screen of the **MEXE02**.

The 32-bit counter goes around between –2,147,483,648 and 2,147,483,647.

It shows 2,147,483,647 after –2,147,483,648, and after that, it shows in descending order.



It shows –2,147,483,648 after 2,147,483,647, and after that, it shows in ascending order.

5-2 Coordinate origin

When coordinates are set, the ABSPEN output is turned ON.

Note The following operation cannot be executed if coordinates are not set.
- High-speed return-to-home operation
- Absolute positioning operation (when the "Permission of absolute positioning without setting absolute coordinates" (device parameter 1148h) is "0: Disable")

Related parameters

Parameter No.	Name	Description	Initial value
1148h	Permission of absolute positioning without setting absolute coordinates	Permits absolute positioning operation in a state where coordinates are not set. **[Setting range]** 0: Disable 1: Enable	1

■ Mechanical home

The mechanical home is the home position stored by the ABZO sensor. The mechanical home includes the "factory home" written in the ABZO sensor at the time of factory shipment and the "user home" set by performing return-to-home operation or the position preset (P-PRESET).

- **Factory home**

  The factory home is set in products with which the mechanism is pre-assembled to the motor, such as motorized linear slides. It cannot be changed.
  If the factory home is set, the ORGN-STLD output is turned ON.

- **User home**

  When the user home is set by performing return-to-home operation or the position preset (P-PRESET), the PRST-STLD output is turned ON. The user home can be cleared by "Position preset clear" under the [Communication] menu of the **MEXE02**.
  If the user home is set, the home information is written to the non-volatile memory. The non-volatile memory can be rewritten approximately 100,000 times.

■ Mechanical home setting

To set the mechanical home coordinates, perform the position preset (P-PRESET) or return-to-home operation. If the mechanical home coordinates are set, operation is performed on the coordinates centered on the mechanical home.

- **Position preset (P-PRESET)**

If the position preset (P-PRESET) is executed, the command position and the feedback position have the value set in the Preset position (device parameter 11C6h) and the home is set.

Related parameters

Parameter No.	Name	Description	Initial value
11C6h	Preset position	Sets the preset position. **[Setting range]** –2,147,483,648 to 2,147,483,647 steps	0
1148h	Permission of absolute positioning without setting absolute coordinates	Permits absolute positioning operation in a state where coordinates are not set. **[Setting range]** 0: Disable 1: Enable	1

- **Return-to-home operation**

When return-to-home operation is performed, the mechanical home can be set.

■ A state where coordinates are not set

Coordinates will be an unset state in the following cases. The ABSPEN output is turned OFF.

- Factory shipment state
- When the position preset (P-PRESET) is performed in a state where the Preset position (device parameter 11C6h) is set to a value other than "0" and then the resolution is changed
- When "Position preset clear" under the [Communication] menu of the **MEXE02** is executed
- During return-to-home operation

5-3 Parameters related to ABZO sensor

With the **AZ** Series, the specification of the ABZO sensor and parameters based on the pre-assembled mechanism to the motor are written in the ABZO sensor in advance. Normally, setting of the ABZO sensor is prioritized than a parameter set in the **MEXE02**.

Related parameters

Parameter No.	Name	Description	Initial value
17F0h	Mechanism settings	To change the mechanism settings parameter, select "Manual setting." **[Setting range]** 0: Prioritize ABZO setting 1: Manual setting (use driver parameter)	1
17F1h	Gear ratio setting	Sets the gear ratio for geared motor. Setting to "0: Prioritize ABZO setting" causes the product-specific gear ratio to set automatically. **[Setting range]** 0: Prioritize ABZO setting 1 to 32,767: Gear ratio (1=0.01)	0
17F2h	Initial coordinate generation & wrap coordinate setting	To change the initial coordinate generation & wrap coordinate parameter, select "Manual setting." **[Setting range]** 0: Prioritize ABZO setting 1: Manual setting (use driver parameter)	0

Parameter No.	Name	Description	Initial value
17F3h	Mechanism limit parameter setting	Disables the ABZO setting of the mechanism limit parameter. **[Setting range]** 0: Prioritize ABZO setting 1: Disable the encoder parameters	0
17F4h	Mechanism protection parameter setting	Disables the ABZO setting of the mechanism protection parameter. **[Setting range]** 0: Prioritize ABZO setting 1: Disable the encoder parameters	0
17F5h	JOG/HOME/ZHOME operation setting	To change the parameter for JOG operation and return-to-home operation, select "Manual setting." **[Setting range]** 0: Prioritize ABZO setting 1: Manual setting (use driver parameter)	0

5-4 Mechanism settings parameter

The mechanism settings parameter is a parameter required for combined use with the mechanism such as the geared motor and motorized actuator.

Note To change the mechanism settings parameter, change the Mechanism settings (device parameter 17F0h) to "1: Manual setting" (Initial value: Manual setting). When this parameter is changed, turn off the control power supply of the driver and on again.

■ Motor rotation direction

Set the relation between the coordinate system of the motor and the actual rotation direction.

Related parameter

Parameter No.	Name	Description	Initial value
11C2h	Motor rotation direction	Sets the rotation direction of the motor output shaft. **[Setting range]** 0: Positive side=Counterclockwise direction 1: Positive side=Clockwise direction	1

5-5 Parameters related to initial coordinate generation & wrap coordinate

These are parameters to be used when the coordinate system is generated.

■ Coordinate generation

If the wrap setting range is set, a coordinate is generated within the number of revolutions that equally divided 1,800 revolutions the ABZO sensor manages.

- **Related parameters**

Parameter No.	Name	Description	Initial value
17F2h	Initial coordinate generation & wrap coordinate setting	To use the wrap function, select "Manual setting." **[Setting range]** 0: Prioritize ABZO setting 1: Manual setting (use driver parameter)	0
11C9h	Initial coordinate generation & wrap setting range	Sets the wrap range. The command position returns to 0 when the motor rotates for the number of times set here. **[Setting range]** Refer to the next subsection. (1=0.1 rev)	10
11CBh	Initial coordinate generation & wrap range offset ratio	Sets the offset ratio of the wrap range. **[Setting range]** 0 to 10,000 (1=0.01 %)	5,000
11CCh	Initial coordinate generation & wrap range offset value	Sets the offset amount of the wrap range. **[Setting range]** −536,870,912 to 536,870,911 steps	0

- **Value that can be set in the "Initial coordinate generation & wrap setting range" parameter**

Since the internal coordinate of the ABZO sensor is 1,800 rev, select a value from the table, and set in the Initial coordinate generation & wrap setting range (device parameter 11C9h).

memo The table shows the values when setting with the **MEXE02**. When setting via MECHATROLINK-III, multiply the values in the table by 10.

Wrap setting range (rev)					
1.0	8.0	20.0	45.0	100.0	300.0
2.0	9.0	24.0	50.0	120.0	360.0
3.0	10.0	25.0	60.0	150.0	450.0
4.0	12.0	30.0	72.0	180.0	600.0
5.0	15.0	36.0	75.0	200.0	900.0
6.0	18.0	40.0	90.0	225.0	1,800.0

- **Setting example: When the wrap range is set to −50 to 50 revolutions**

1. Change the Initial coordinate generation & wrap coordinate setting (device parameter 17F2h) to "1: Manual setting."
   When it is changed to "1: Manual setting," the following driver parameters can be set manually.
   - Initial coordinate generation & wrap setting range
   - Initial coordinate generation & wrap range offset ratio
   - Initial coordinate generation & wrap range offset value
2. Set each parameter as follows.

Parameter No.	Name	Setting value
11C9h	Initial coordinate generation & wrap setting range	1,000 (100.0 rev)
11CBh	Initial coordinate generation & wrap range offset ratio	5,000 (50.00 %)
11CCh	Initial coordinate generation & wrap range offset value	0 (0 step)

■ Setting of wrap function

To use the wrap function, a master station that supports the wrap function is required. The wrap function cannot be used with master stations not support the wrap function.

The wrap function is a function to automatically preset the position information of the present position when the number of revolutions of the motor output shaft exceeds the set range. Refer to p.122 for the overview of the wrap function.

Related parameters

Parameter No.	Name	Description	Initial value
11C7h	Wrap setting	Sets the wrap function. **[Setting range]** 0: Disable 1: Enable	0

Note If a master station not compatible with the wrap function is used, remain the setting of the Wrap setting (device parameter 11C7h) as "0: Disable" (initial value: Disable). If the Wrap setting (device parameter 11C7h) is set to "1: Enable" with the master station not compatible with the wrap function, the feedback position and the command position of the **MEXE02** are preset but the present position of the master station is not preset. Therefore, the present position of the **MEXE02** and that of the master station are deviated, causing the motor to operate unexpectedly or an alarm of the Command pulse error to generate.

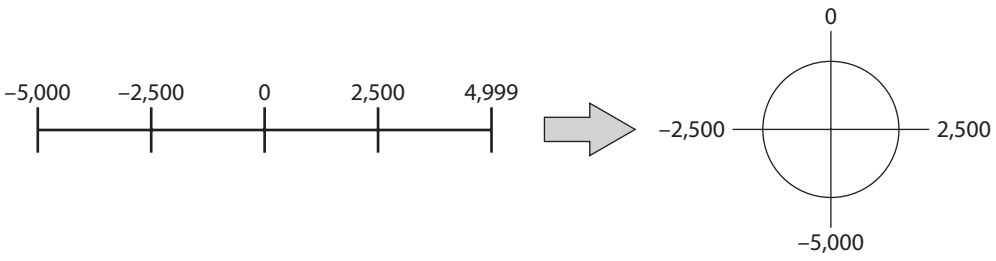
■ Setting example of wrap function

- **Setting example:**
  When "Initial coordinate generation & wrap range offset ratio" is set to "50 %" and "Initial coordinate generation & wrap range offset value" to "0"

Example 1: Coordinates when the wrap setting range is 1 rev and the resolution is 10,000 P/R

Parameter No.	Name	Setting value
11C0h	Electronic gear A	1
11C1h	Electronic gear B	1
17F2h	Initial coordinate generation & wrap coordinate setting	1 (Manual setting)
11C9h	Initial coordinate generation & wrap setting range	10 (1.0 rev)
11CBh	Initial coordinate generation & wrap range offset ratio	5,000 (50.00 %)
11CCh	Initial coordinate generation & wrap range offset value	0 (0 step)
11C7h	Wrap setting	1 (Enable)

Coordinates example
When the parameters are set as shown in the table, the motor can be operated on coordinates in the figure.



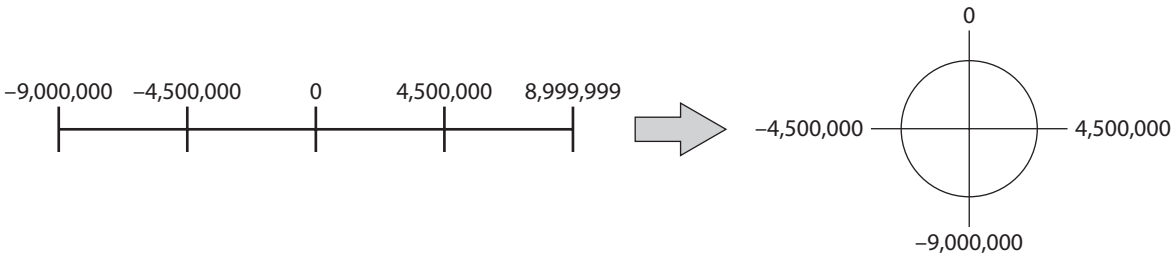
Note If the Wrap setting (device parameter 11C7h) or the Initial coordinate generation & wrap setting range (device parameter 11C9h) is changed, the absolute position may be shifted. When the parameter is changed, perform the position preset (P-PRESET) or return-to-home operation.

Example 2: Coordinates when the wrap setting range is 1,800 rev and the resolution is 10,000 P/R

Parameter No.	Name	Setting value
11C0h	Electronic gear A	1
11C1h	Electronic gear B	1
17F2h	Initial coordinate generation & wrap coordinate setting	1 (Manual setting)
11C9h	Initial coordinate generation & wrap setting range	18,000 (1,800.0 rev)
11CBh	Initial coordinate generation & wrap range offset ratio	5,000 (50.00 %)
11CCh	Initial coordinate generation & wrap range offset value	0 (0 step)
11C7h	Wrap setting	1 (Enable)

Coordinates example

When the parameters are set as shown in the table, the motor can be operated on coordinates in the figure.



Note If the Wrap setting (device parameter 11C7h) or the Initial coordinate generation & wrap setting range (device parameter 11C9h) is changed, the absolute position may be shifted. When the parameter is changed, perform the position preset (P-PRESET) or return-to-home operation.

- **Setting condition of the Initial coordinate generation & wrap setting range (device parameter 11C9h)**

When the wrap range satisfies the following conditions, continuous rotation in the same direction while the home position is maintained can be performed.

Condition (1) $\dfrac{1{,}800}{\text{Wrap setting range}}$ = To be an integer

Condition (2) Wrap setting range × Resolution = Wrap setting range × $\dfrac{\text{Electronic gearB}}{\text{Electronic gear A}}$ × 10,000 = To be an integer

Note If the setting conditions of the Initial coordinate generation & wrap setting range (device parameter 11C9h) is not satisfied even when the Wrap setting (device parameter 11C7h) is set to "1: Enable," information of the Wrap setting error will be generated. If the power supply is turned on again or Configuration is executed in a state where information of the Wrap setting error is generated, an alarm of the Wrap setting error will be generated.

Setting example 1

- Wrap setting range: 100 rev
- Resolution: 10,000 P/R (electronic gear A=1, electronic gear B=1)
- Motor: Standard motor (gear ratio 1)

Condition (1) $\dfrac{1{,}800}{\text{Wrap setting range}} = \dfrac{1{,}800}{100} = 18$

Condition (2) Wrap setting range × $\dfrac{\text{Electronic gear B}}{\text{Electronic gear A}}$ × 10,000 = 100 × $\dfrac{1}{1}$ × 10,000 = 1,000,000

The setting conditions are satisfied since both the conditions (1) and (2) are integers. The wrap function can be used.

Setting example 2

- Wrap setting range: 1,000 rev
- Resolution: 10,000 P/R (electronic gear A=1, electronic gear B=1)
- Motor: **TS** geared motor (gear ratio 20)

Condition (1) $\dfrac{1{,}800}{\text{Wrap setting range}} = \dfrac{1{,}800}{1{,}000} = 1.8$

Condition (2) Wrap setting range × Resolution = 1,000 × 10,000 = 10,000,000

The setting conditions are not satisfied since the condition (1) is not an integer. Information of the Wrap setting error is generated and the wrap function cannot be executed.

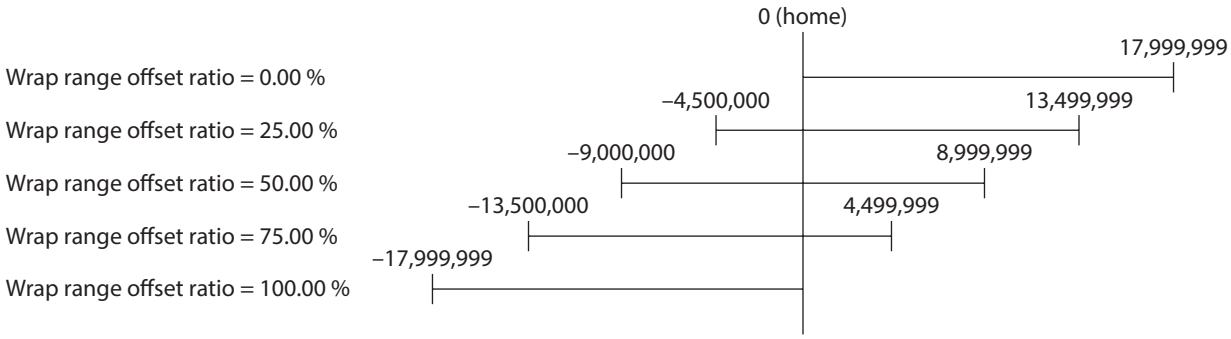
■ Wrap offset function

The position of the boundary point of the wrap range can be offset by using the mechanical home as a reference. The wrap offset is set with the Initial coordinate generation & wrap range offset ratio (device parameter 11CBh) and the Initial coordinate generation & wrap range offset value (device parameter 11CCh).

● Wrap offset ratio setting

When the Initial coordinate generation & wrap range offset ratio (device parameter 11CBh) is set, the wrap range can be offset in the negative direction.

Setting example: When the wrap range is 1,800 rev and the resolution is 10,000 P/R

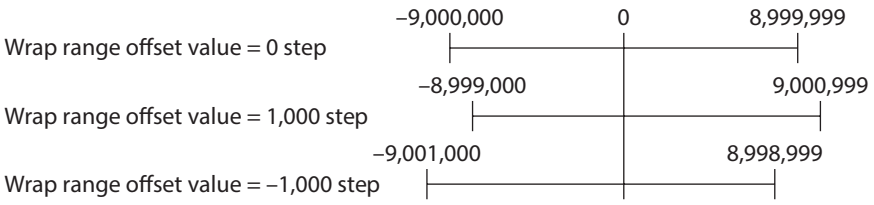


● Wrap range offset value setting

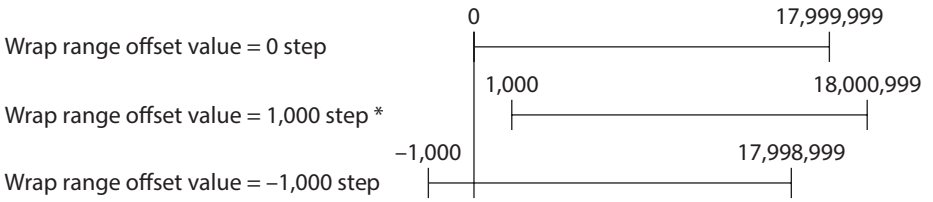
For the coordinate system having offset with the Initial coordinate generation & wrap range offset ratio (device parameter 11CBh), the coordinate can be shifted by step.

Note When the coordinate is set with the Initial coordinate generation & wrap range offset value (device parameter 11CCh), information of the Wrap setting error is generated if the home is not included in the coordinate. If the power supply is turned on again or Configuration is executed in a state where information of the Wrap setting error is generated, an alarm of the Wrap setting error will be generated.

Setting example 1: When the wrap range is 1,800 rev, the resolution is 10,000 P/R, and the wrap offset ratio setting is 50 %.



Setting example 2: When the wrap range is 1,800 rev, the resolution is 10,000 P/R, and the wrap offset ratio setting is 0 %.



* Information of wrap setting error is generated

4 Parameter list

This part describes the list of parameters supported by the driver.

◆Table of contents

1 Saving parameters

Data and parameters can also be set using the **MEXE02** in addition to MECHATROLINK-III.

Parameters are saved in the RAM or non-volatile memory of the driver. The parameters in the RAM are erased once the control power supply is shut off, but the parameters in the non-volatile memory are remained to store even if the control power supply is shut off. When the control power supply of the driver is turned on, the parameters stored in the non-volatile memory will be sent to the RAM, and the recalculation and setup for the parameters will be executed in the RAM.

If parameters are set via MECHATROLINK-III, they are saved in the RAM. To save the parameters stored in the RAM to the non-volatile memory, execute the write batch non-volatile memory (CONFIG_MOD: Byte 4) of the CONFIG command or Write batch NV memory (device parameter 10C9h) of the maintenance parameter.

Note

- If parameters are set via MECHATROLINK-III, they are saved in the RAM. When updating the setting by turning on the control power supply again, be sure to save the parameter in the non-volatile memory before turning off the control power supply. If the control power supply is turned off before the data is stored in the non-volatile memory, the parameter is not updated.
- Do not shut off the control power supply while writing the data to the non-volatile memory, and also do not shut off for 5 seconds after the completion of writing the data. Doing so may abort the data write and cause an alarm of the EEPROM error (alarm code 41h) to generate.

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

2 How to read the list

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
26	Forward software limit	R/W	NV	A	–2,147,483,648 to 2,147,483,647	2,147,483,647	Reference unit	4

Indicates the timing in an alphabet that the changed new value is updated when a parameter is changed. (Refer to the next table.)

NV: The monitor parameters are automatically saved in the non-volatile memory. Parameters other than the monitor parameters are saved in the non-volatile memory if "Write batch non-volatile memory" is performed.
V: This is not saved in the non-volatile memory even if the "Write batch non-volatile memory" is performed.

R: Possible to read (READ)
W: Possible to write (WRITE)
R/W: Possible to read and write (READ/WRITE)

- **Timing for parameter to update**

Notation	Update timing	Description
A	Update immediately	Recalculation and setup are immediately executed when the parameter is written.
B	Update after operation stop	Recalculation and setup are executed when the operation is stopped.
C	Update after executing Configuration	Recalculation and setup are executed after Configuration is executed or the control power supply is turned on again.
D	Update after turning on the control power supply again	Recalculation and setup are executed after the control power supply is turned on again.

3 Setting of electronic gears

When positioning operation is repetitively performed in one direction infinitely, be sure to set the electronic gears first using the "Electronic gear list" as reference. Setting the electronic gears will allow consistency between the feedback position of the motor and the position information of the master station. If positioning operation is not repetitively performed in one direction infinitely, the setting of the electronic gears is not required.

- **Related parameters**

When setting via MECHATROLINK-III

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
11C0h	Electronic gear A	R/W	NV	C	1 to 65,535	1	–	4
11C1h	Electronic gear B	R/W	NV	C	1 to 65,535	1	–	4

When setting with MEXE02

Tree view	Name	Setting range	Initial value
Motor & Mechanism	Electronic gear A	1 to 65,535	1
	Electronic gear B		

- **Electronic gear list**

Gear ratio	Electronic gear A	Electronic gear B	Motor resolution [step]	Resolution per revolution of mechanism [step]
1	625	512	8,192	8,192
3.6	1,125	1,024	9,102.22	32,768
5	3,125	2,048	6,553.60	32,768
7.2	1,125	1,024	9,102.22	65,536
9	5,625	4,096	7,281.78	65,536
10	3,125	2,048	6,553.60	65,536
12	1,875	1,024	5,461.33	65,536
15	9,375	8,192	8,738.13	131,072
18	5,625	4,096	7,281.78	131,072
20	3,125	2,048	6,553.60	131,072
25	15,625	8,192	5,242.88	131,072
30	9,375	8,192	8,738.13	262,144
36	5,625	4,096	7,281.78	262,144
50	15,625	8,192	5,242.88	262,144
100	15,625	8,192	5,242.88	524,288
120	9,375	8,192	8,738.13	1,048,576

4 Parameter setting when products made by Yaskawa Electric Corporation are used

When using products (master station, servo motor, etc.) made by Yaskawa Electric Corporation, take note of the following points.

■ Setting of resolution

Calculate the resolution according to the following formula.

$$\text{Resolution (rotary) [0Ah]} = 10{,}000 \times \frac{\text{Electronic gear B [11C1h]}}{\text{Electronic gear A [11C0h]}} \text{ (pulse/rev)}$$

* The resolution of the output shaft for geared motors is a value obtained by multiplying the calculated resolution by the gear ratio.

Note

- Note that the relation between the numerator and denominator in this calculation formula is opposite in the calculation of the servo motors made by Yaskawa Electric Corporation.
- When motorized actuators are used, the resolution set with the device parameter (11C0h, 11C1h) is given priority over the resolution (fixed value) based on the product specifications.

■ Setting when positioning operation is repetitively performed in one direction infinitely

When positioning operation is repetitively performed in one direction infinitely using the master station made by Yaskawa Electric Corporation, set parameters as shown below.

- **Motor**

Parameter No.	Name	Setting value of parameter
24h	Multiturn limit	1,799
11CBh	Initial coordinate generation & wrap range offset ratio	0
17F2h	Initial coordinate generation & wrap coordinate setting	1: Manual setting

- **DGII Series**

Parameter No.	Name	Setting value of parameter		
		Gear ratio 12	Gear ratio 18	Gear ratio 36
24h	Multiturn limit	11	17	35
11CBh	Initial coordinate generation & wrap range offset ratio	0		
17F2h	Initial coordinate generation & wrap coordinate setting	1: Manual setting		

■ Wrap setting range

When the Initial coordinate generation & wrap coordinate setting (device parameter 17F2h) is set to "1: Manual setting," set the parameter as shown below.

- **Motor**

Parameter No.	Name	Setting value of parameter
11C9h	Initial coordinate generation & wrap setting range	18,000

- **DGII Series**

Parameter No.	Name	Setting value of parameter		
		Gear ratio 12	Gear ratio 18	Gear ratio 36
11C9h	Initial coordinate generation & wrap setting range	120	180	360

■ Stopping method of interpolation operation by STOP input

While the interpolation operation (INTERPOLATE command) is being executed, if the operation is stopped by the STOP input, it is instantaneously stopped regardless of the setting of the STOP input action (device parameter 1700h).

5 Common parameters

There are some parameters linked with the driver specific device parameter in the common parameters. Setting either of the parameters will also apply to the linked parameter.
Refer to the table below for the parameters applied.

Correspondence table of device parameters linked with common parameters

Common parameter			Device parameter		
Type	No.	Name	No.	Name	Type
Machine specification related parameter	21h	Electronic gear ratio (Numerator)	11C1h	Electronic gear B	Coordination parameter
	22h	Electronic gear ratio (Denominator)	11C0h	Electronic gear A	
	26h	Forward software limit	11C4h	Positive software limit	
	28h	Reverse software limit	11C5h	Negative software limit	
Adjustment related parameters	61h	Speed loop gain *	1130h	SVE speed loop gain *	Basic setting parameter
	62h	Speed loop integral time constant *	1131h	SVE speed loop integral time constant *	
	63h	Position loop gain *	112Fh	SVE position loop gain *	
	6Ah	Starting speed	1142h	Starting speed	
	6Bh	Operating current	1126h	Base current	
	6Ch	Stopping current	1128h	Stop current	

* A unit for the setting value is different between the common parameter and the device parameter.

■ Parameters which unit is different between the common parameter and the device parameter

If a unit for the setting values is different between the common parameter and the device parameter, setting either of parameters will set a value converted the unit to the parameter having linked. If the common parameter is set, a value obtained by omitting numbers below the setting unit is set in the device parameter.
The actual operation is performed with the value set in the device parameter.

- **Setting example**

When the common parameter was set

Common parameter					Device parameter			
No.	Name	Unit	Setting value		No.	Name	Unit	Setting value
61h	Speed loop gain	0.001 Hz	185,500	→	1130h	SVE speed loop gain	–	185
62h	Speed loop integral time constant	μs	123,450	→	1131h	SVE speed loop integral time constant	0.1 ms	1,234
63h	Position loop gain	0.001/s	12,500	→	112Fh	SVE position loop gain	–	12

When the device parameter was set

Device parameter					Common parameter			
No.	Name	Unit	Setting value		No.	Name	Unit	Setting value
1130h	SVE speed loop gain	–	185	→	61h	Speed loop gain	0.001 Hz	185,000
1131h	SVE speed loop integral time constant	0.1 ms	1,234	→	62h	Speed loop integral time constant	μs	123,400
112Fh	SVE position loop gain	–	12	→	63h	Position loop gain	0.001/s	12,000

5-1 Device information related parameters

Parameter No.	Name	Description
01h	Encoder type	Reads the type of the encoder.
02h	Motor type	Reads the type of the motor.
03h	Semi-closed/fully-closed type	Reads the control method of the motor.
04h	Rated speed	Reads the rated speed of the motor.
05h	Maximum output speed	Reads the maximum output speed of the motor.
06h	Speed multiplier	Reads the multiplier in 10^n, for the Rated speed (04h) and the Maximum output speed (05h).
07h	Rated torque	Reads the rated torque of the motor. This is fixed to 0.
08h	Maximum output torque	Read the maximum output torque of the motor. This is fixed to 0.
09h	Torque multiplier	Reads the multiplier in 10^n, for the Rated torque (07h) and the Maximum output torque (08h).
0Ah	Resolution (Rotary)	Reads the resolution per revolution of the motor output shaft.
0Bh	Linear scale pitch	This is the parameter to secure the connectivity with the master station. It is not applied even if set.
0Ch	Pulses per scale pitch (Linear)	This is the parameter to secure the connectivity with the master station. It is not applied even if set.

5-2 Machine specification related parameters

Parameter No.	Name	Description
21h	Electronic gear ratio (Numerator)	Sets the Electronic gear B (11C1h).
22h	Electronic gear ratio (Denominator)	Sets the Electronic gear A (11C0h).
23h	Absolute encoder origin offset	This is the parameter to secure the connectivity with the master station. It is not applied even if set.
24h	Multiturn limit	Sets when a rotary table or similar device is used as the absolute position detection system. Set a value obtained by subtracting 1 from the upper limit value of the rotation speed of the motor output shaft.
25h	Limit setting	Sets whether to enable or disable the FW-BLK input (*1) to prohibit the operation in the forward direction, the RV-BLK input (*2) to prohibit the operation in the reverse direction, forward software limit, and reverse software limit. Refer to "Details about Limit setting (25h)" on p.142 for details.
26h	Forward software limit	Sets the Positive software limit (11C4h).
28h	Reverse software limit	Sets the Negative software limit (11C5h).

*1 It corresponds to the P-OT (forward drive prohibition input) of the servo command input signal (SVCMD_IO).
*2 It corresponds to the N-OT (reverse drive prohibition input) of the servo command input signal (SVCMD_IO).

R/W	Save	Update	Range	Initial value	Unit	Size (byte)
R	–	–	0: Absolute encoder 1: Incremental encoder	0	–	4
R	–	–	0: Rotary motor 1: Linear motor	0	–	4
R	–	–	0: Semi-closed 1: Fully-closed	0	–	4
R	–	–	–	3,000	min^{-1}	4
R	–	–	–	4,500	min^{-1}	4
R	–	–	–	0	–	4
R	–	–	–	0	N·m	4
R	–	–	–	0	N·m	4
R	–	–	–	–2	–	4
R	–	–	100 to 100,000	10,000	pulse/rev	4
R/W	NV	–	0 to 1,000,000	1	nm	4
R/W	NV	–		1	pulse/pitch	4

R/W	Save	Update	Range	Initial value	Unit	Size (byte)
R/W	NV	C	1 to 65,535 Notes when setting ⇨ p.137	1	–	4
R/W	NV	C		1	–	4
R/W	NV	–	–2,147,483,648 to 2,147,483,647	0	Reference unit	4
R/W	NV	C	0 to 2,147,483,647 Notes when setting ⇨ p.137	0	rev	4
R/W	NV	C	0 to 255	0	–	4
R/W	NV	A	–2,147,483,648 to 2,147,483,647	2,147,483,647	Reference unit	4
R/W	NV	A		–2,147,483,648	Reference unit	4

- **Details about Limit setting (25h)**

Bit arrangements

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved (0)	Reserved (0)	N-SOT	P-SOT	Reserved (0)	Reserved (0)	N-OT	P-OT

Details of bits

bit	Name	Description
0	P-OT	Sets whether to enable or disable the FW-BLK input to prohibit the operation in the forward direction. 0: Enable * 1: Disable
1	N-OT	Sets whether to enable or disable the RV-BLK input to prohibit the operation in the reverse direction. 0: Enable * 1: Disable
4	P-SOT	Sets whether to enable or disable the forward software limit. 0: Disable 1: Enable
5	N-SOT	Sets whether to enable or disable the reverse software limit. 0: Disable 1: Enable

* "0" is enabled in Bit 0 and Bit 1.

5-3 Unit system related parameters

Parameter No.	Name	Description
41h	Speed unit	This is the speed unit. This is fixed to Hz.
42h	Speed base unit	This is the multiplier in 10^n for the Speed unit (41h). This is fixed to 0.
43h	Position unit	This is the position unit. This is fixed to Step.
44h	Position base unit	This is the multiplier in 10^n for the Position unit (43h). This is fixed to 0.
45h	Acceleration unit	This is the acceleration unit. This is fixed to Hz/s.
46h	Acceleration base unit	This is the multiplier in 10^n for the Acceleration unit (45h).
47h	Torque unit	This is the torque (current) unit. This is fixed to %.
48h	Torque base unit	This is the multiplier in 10^n for the Torque unit (47h). This is fixed to 0.1 %.
49h	Supported unit	Reads units for the speed, position, acceleration, and torque supported by the driver all together. Refer to the next subsection for details.

R/W	Save	Update	Range	Initial value	Unit	Size (byte)
R/W	NV	C	0: Hz	0	–	4
R/W	NV	C	–	0	–	4
R/W	NV	C	0: step	0	–	4
R/W	NV	C	–	0	–	4
R/W	NV	C	0: Hz/s	0	–	4
R/W	NV	C	0 to 3	0	–	4
R/W	NV	C	1: %	1	–	4
R/W	NV	C	–1: 0.1 %	–1	–	4
R	–	–	–	02010101h	–	4

- **Details about Supported unit (49h)**

Bit arrangements

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved			Maximum motor speed/40000000 [Hex]	min^{-1} (r/min)	Percentage of the rated speed	Reference unit/min	Reference unit/s
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved							Reference unit
Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
Reserved						ms (acceleration time)	Reference unit/s^2
Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
Reserved					Maximum torque/40000000 [Hex]	Percentage of the rated torque	N (N·m)

Details of bits

Bit	Description
0 to 31	0: Unit not supported 1: Unit supported

5-4 Adjustment related parameters

Parameter No.	Name	Description
61h	Speed loop gain	Sets the SVE speed loop gain (device parameter 1130h). This is enabled when the Current control mode (device parameter 112Dh) is 2.
62h	Speed loop integral time constant	Sets the SVE speed loop gain integral time constant (device parameter 1131h). This is enabled when the Current control mode (device parameter 112Dh) is 2.
63h	Position loop gain	Sets the SVE position loop gain (device parameter 112Fh). This is enabled when the Current control mode (device parameter 112Dh) is 2.
64h	Feed forward compensation	This is the parameter to secure the connectivity with the master station. It is not applied even if set.
65h	Position loop integral time constant	This is the parameter to secure the connectivity with the master station. It is not applied even if set.
66h	In-position range	Sets the value to output the Positioning completed (PSET: Bit14) of the servo command input signal monitor. If the Distribution completed (DEN: Bit 12) of the servo command input signal monitor is 1 and the difference between the target position (TPOS) and feedback position (APOS) is in the range of the in-position range, the Positioning completed (PSET: Bit 14) changes to 1.
67h	Near-position range	Sets the value to output the Near position (NEAR: Bit 13) of the servo command input signal monitor. When the difference between the target position (TPOS) and feedback position (APOS) is in the range of the near-position range, the Near-position range (NEAR: Bit13) changes to 1.
6Ah	Starting speed	Sets the Startup speed (device parameter 1142h).
6Bh	Operating current	Sets the Base current (device parameter 1126h). Sets the current in operation with the operating current (TLIM).
6Ch	Stopping current	Sets the Stop current (device parameter 1128h). The current obtained by multiplying the maximum output current by the Base current (device parameter 1126h) by the Stop current (device parameter 1128h) flows through the motor at standstill.

R/W	Save	Update	Range	Initial value	Unit	Size (byte)
R/W	NV	A	10,000 to 200,000	180,000	0.001 Hz	4
R/W	NV	A		100,000	µs	4
R/W	NV	A	1,000 to 50,000	10,000	0.001/s	4
R/W	NV	–	0 to 2,147,483,647	0	%	4
R/W	NV	–		0	µs	4
R/W	NV	A	0 to 100,000	50	Reference unit	4
R/W	NV	A	0 to 1,073,741,823	50	Reference unit	4
R/W	NV	B	0 to 4,000,000	5,000	Reference unit/s	4
R/W	NV	A	0 to 1,000	1,000	0.1 %	4
R/W	NV	A		500	0.1 %	4

memo The Startup speed (common parameter 6Ah), the Operating current (common parameter 6Bh), and the Stopping current (common parameter 6Ch) can be used to read or write at the time of the standard stepping motor drivers profile. At the time of the standard servo profile, read or write using the following device parameters.
Starting speed (device parameter 1142h), Base current (device parameter 1126h), Stop current (device parameter 1128h)

5-5 Command related parameters

Parameter No.	Name	Description
81h	Exponential function acceleration/deceleration time constant	Sets the time constant when the Position reference filter (ACCFIL: Bits 4, 5) of the servo command control field (SVCMD_CTRL) is 1.
82h	Moving average time	Sets the Movement average time when the Position reference filter (ACCFIL: Bits 4, 5) of the servo command control field (SVCMD_CTRL) is 2.
83h	Final travel for external input positioning (EX_POSING, EX_FEED)	Uses in the External input feed (EX_FEED: 37h) or External input positioning (EX_POSING: 39h). Sets the distance from the position where an external signal was input to stop.
84h	Zero point return approach speed	Sets the speed after the Zero return deceleration limit switch input (DEC: Bit 1) of the servo command input signal monitor changed to 1 at the Zero point return (ZRET: 3Ah).
85h	Zero point return creep speed	Sets the speed traveling to the home (zero point) after the Zero return deceleration limit switch input (DEC: Bit 1) of the servo command input signal monitor changed from 1 to 0 at the Zero point return (ZRET: 3Ah).
86h	Final travel distance for zero point return	Sets the distance to the home (zero point) from the position where the latch signal was input at the Zero point return (ZRET: 3Ah).
87h	Monitor select 1	Selects the data to monitor by the response Bytes 12 to 15 of commands for the standard stepping motor drivers profile.
88h	Monitor select 2	Selects the data to monitor by the response Bytes 16 to 19 of commands for the standard stepping motor drivers profile.
89h	Monitor select for SEL_MON 1	Selects the data to monitor by the common monitor 1 (CMN1) of the SEL_MON (Bits 16 to 27) of the servo command control field (SVCMD_CTRL).
8Ah	Monitor select for SEL_MON 2	Selects the data to monitor by the common monitor 2 (CMN2) of the SEL_MON (Bits 16 to 27) of the servo command control field (SVCMD_CTRL).
8Bh	Zero point detection range	Sets the value to output the Zero point (ZPOINT: Bit 15) of the servo command input signal monitor.

R/W	Save	Update	Range	Initial value	Unit	Size (byte)
R/W	NV	B	0 to 200,000	1,000	µs	4
R/W	NV	B		1,000	µs	4
R/W	NV	A	–2,147,483,648 to 2,147,483,647	0	Reference unit	4
R/W	NV	A	1 to 4,500,000	30,000	0.001 r/min	4
R/W	NV	A	1 to 4,500,000	6,000	0.001 r/min	4
R/W	NV	A	–2,147,483,648 to 2,147,483,647	0	Reference unit	4
R/W	NV	A	0: APOS (Feedback position) 1: CPOS (Command position) 2: PERR (Position error) 3: LPOS1 (Latched position 1) 4: LPOS2 (Latched position 2) 5: FSPD (Feedback speed) 6: CSPD (Reference speed) 7: TRQ (Torque (force) reference) 8: ALARM (Detailed information on the current alarm) 9: MPOS (Command position) 12: CMN1 (Common monitor 1) 13: CMN2 (Common monitor 2) 14: OMN1 (Optional monitor 1) 15: OMN2 (Optional monitor 2)	1	–	4
R/W	NV	A		0	–	4
R/W	NV	A	0: TPOS (Target position) 1: IPOS (Command position before applying the acceleration/deceleration filter) 2: POS_OFST (Offset value set in the POS_SET command) 3: TSPD (Target speed set in the move command) 4: SPD_LIM (Speed limit value) 5: TRQ_LIM (Torque limit value) 6: SV_STAT * 8: INIT_PGPOS [Low] (Command position when the SENS_ON command was executed [lower]) 9: INIT_PGPOS [High] (Command position when the SENS_ON command was executed [upper])	0	–	4
R/W	NV	A		0	–	4
R/W	NV	A	0 to 100,000	0	Reference unit	4

Parameter No.	Name	Description
8Ch	Forward torque limit	This is the parameter to secure the connectivity with the master station. It is not applied even if set.
8Dh	Reverse torque limit	This is the parameter to secure the connectivity with the master station. It is not applied even if set.
8Eh	Zero speed detection range	Sets the value to output the Zero speed (ZSPD: Bit 19) of the servo command input signal monitor.
8Fh	Speed match signal detection range	Sets the value to output the Speed match (V_CMP: Bit 18) of the servo command input signal monitor.
90h	SVCMD_CTRL bit enabled/ disabled	Reads the status of each bit in the servo command control field (SVCMD_CTRL) of commands for the standard servo profile. Refer to "Details about SVCMD_CTRL bit Enabled/Disabled (90h)" for details.
91h	SVCMD_STAT bit enabled/ disabled	Reads the status of each bit in the servo command status field (SVCMD_STAT) of commands for the standard servo profile. Refer to "Details about SVCMD_STAT bit enabled/disabled (91h)" on p.150 for details.
92h	I/O bit enabled/disabled (Output)	Reads the status of each bit in the servo command output signals of commands for the standard servo profile. Refer to "Details about I/O bit enabled/disabled (Output) (92h)" on p.150 for details.
93h	I/O bit enabled/disabled (Input)	Reads the status of each bit in the servo command input signals of commands for the standard servo profile. Refer to "Details about I/O bit enabled/disabled (Input) (93h)" on p.150 for details.

* Explanation of SV_STAT
  Byte1: Present communication phase
  Byte2: Present control mode
  Byte3: Reserved
  Byte4: Extended input signal monitor

- **Details about SVCMD_CTRL bit Enabled/Disabled (90h)**

Bit arrangements

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved		ACCFIL		STOP_MODE		CMD_CANCEL	CMD_PAUSE
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved		LT_SEL2		LT_SEL1		LT_REQ2	LT_REQ1
Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
SEL_MON2				SEL_MON1			
Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
Reserved				SEL_MON3			

Details of bits

bit	Description
0 to 31	0: Bit definition disabled 1: Bit definition enabled

R/W	Save	Update	Range	Initial value	Unit	Size (byte)
R/W	NV	–	0 to 1,000	1,000	0.1 %	4
R/W	NV	–		1,000	0.1 %	4
R/W	NV	A	1 to 6,000,000	1,000	0.001 r/min	4
R/W	NV	A		1,000	0.001 r/min	4
R	–	–	–	0FFF 3F3Fh	–	4
R	–	–	–	FFFF 3F33h	–	4
R	–	–	–	FFFF 0000h	–	4
R	–	–	–	FF0F FEFEh	–	4

- **Details about SVCMD_STAT bit enabled/disabled (91h)**

Bit arrangements

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved		ACCFIL		Reserved		CMD_CANCEL_CMP	CMD_PAUSE_CMP
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved		SV_ON	M_RDY	PON	POS_RDY	L_CMP2	L_CMP1
Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
SEL_MON2				SEL_MON1			
Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
VS4	VS3	VS2	VS1	SEL_MON3			

Details of bits

bit	Description
0 to 31	0: Bit definition disabled 1: Bit definition enabled

- **Details about I/O bit enabled/disabled (Output) (92h)**

Bit arrangements

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
N_CL	P_CL	P_PPI	V_PPI	Reserved			
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Reserved				G-SEL			
Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
VSO8	VSO7	VSO6	VSO5	VSO4	VSO3	VSO2	VSO1
Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
VSO16	VSO15	VSO14	VSO13	VSO12	VSO11	VSO10	VSO9

Details of bits

bit	Description
0 to 31	0: Bit definition disabled 1: Bit definition enabled

- **Details about I/O bit enabled/disabled (Input) (93h)**

Bit arrangements

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
ESTP	EXT3	EXT2	EXT1	N_OT	P_OT	DEC	Reserved
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
ZPOINT	PSET	NEAR	DEN	N-SOT	P-SOT	BRK-ON	Reserved
Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
Reserved				ZSPD	V_CMP	V_LIM	T_LIM
Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
VSI8	VSI7	VSI6	VSI5	VSI4	VSI3	VSI2	VSI1

Details of bits

bit	Description
0 to 31	0: Bit definition disabled 1: Bit definition enabled

6 Device parameters

Refer to “Parameters” and "Address/code lists" in the "**AZ** Series OPERATING MANUAL Function Edition" for details about each parameters.

6-1 Protect release parameters

Parameter No.	Name	R/W	Save	Update	Setting value	Initial value	Unit	Size (byte)
1020h	Backup DATA access key	R/W	V	A	20519253 (01391955h)	0	–	4
1021h	Backup DATA write key	R/W	V	A	1977326743 (75DB9C97h)	0	–	4
1022h	HMI release key	R/W	V	A	864617234 (33890312h)	0	–	4

6-2 Maintenance parameters

Explanation of [Range]

If 0 is written, a command is not executed.
If 1 is written, a command is executed when the data changed from 0 to 1.
If 2 is written, a command is executed. It will automatically return to 1 after executing.

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
10C0h	Alarm reset	R/W	V	A	0, 1, 2	0	–	4
10C2h	Clear alarm history	R/W	V	A		0	–	4
10C5h	P-PRESET execution	R/W	V	A		0	–	4
10C6h	Configuration	R/W	V	A		0	–	4
10C8h	Read batch NV memory	R/W	V	A		0	–	4
10C9h	Write batch NV memory	R/W	V	A		0	–	4
10CAh	All data batch initialization	R/W	V	A		0	–	4
10CBh	Read from backup	R/W	V	A		0	–	4
10CCh	Write to backup	R/W	V	A		0	–	4
10CDh	Clear latch information	R/W	V	A		0	–	4
10CFh	Clear tripmeter	R/W	V	A		0	–	4
10D1h	ZSG-PRESET	R/W	V	A		0	–	4
10D2h	Clear ZSG-PRESET	R/W	V	A		0	–	4
10D3h	Clear information	R/W	V	A		0	–	4
10D4h	Clear information history	R/W	V	A		0	–	4

■ Configuration

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

- An alarm is not present.
- The motor is not operated.
- I/O test, remote operation, and download are not being executed with the **MEXE02**.

The table below shows the driver status before and after configuration is executed.

Item	Configuration is ready to execute	Configuration is being executed	After configuration is executed
PWR/ALM LED	Green light	Red and green colors blink simultaneously (Red and green colors may overlap and it may be visible to orange.)	Based on the driver condition.
Electromagnetic brake	Hold/Release	Hold	
Motor excitation	Excitation/non-excitation	Non-excitation	
Output signal	Enable	Disable	Enable
Input signals	Enable	Disable	Enable

memo The correct monitor value may not return even if the monitor is executed while configuration is being executed.

6-3 Monitor parameters

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1040h	Present alarm	R	V	–	–	–	–	4
1041h	Alarm history 1	R	NV	–	–	–	–	4
1042h	Alarm history 2	R	NV	–	–	–	–	4
1043h	Alarm history 3	R	NV	–	–	–	–	4
1044h	Alarm history 4	R	NV	–	–	–	–	4
1045h	Alarm history 5	R	NV	–	–	–	–	4
1046h	Alarm history 6	R	NV	–	–	–	–	4
1047h	Alarm history 7	R	NV	–	–	–	–	4
1048h	Alarm history 8	R	NV	–	–	–	–	4
1049h	Alarm history 9	R	NV	–	–	–	–	4
104Ah	Alarm history 10	R	NV	–	–	–	–	4
1063h	Command position	R	V	–	–	–	step	4
1064h	Command speed (r/min)	R	V	–	–	–	min^{-1}	4
1065h	Command speed (Hz)	R	V	–	–	–	Hz	4
1066h	Feedback position	R	V	–	–	–	step	4
1067h	Feedback speed (r/min)	R	V	–	–	–	min^{-1}	4
1068h	Feedback speed (Hz)	R	V	–	–	–	Hz	4
106Ah	Direct I/O	R	V	–	–	–	–	4
106Bh	Torque monitor	R	V	–	–	–	0.1 %	4
106Dh	Cumulative load monitor	R	V	–	–	–	–	4
107Bh	Information	R	V	–	–	–	–	4
107Ch	Driver temperature	R	V	–	–	–	0.1 °C	4
107Dh	Motor temperature	R	V	–	–	–	0.1 °C	4
107Eh	Odometer	R	NV	–	–	–	×100 rev	4
107Fh	Tripmeter	R	NV	–	–	–	×100 rev	4
1090h	Feedback position 32-bit counter	R	V	–	–	–	step	4

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1091h	Command position 32-bit counter	R	V	–	–	–	step	4
1092h	CST operating current	R	V	–	–	–	0.1 %	4
10A0h	Main power supply count	R	NV	–	–	–	count	4
10A1h	Main power supply time	R	NV	–	–	–	min	4
10A2h	Control power supply count	R	NV	–	–	–	count	4
10A3h	Inverter voltage	R	V	–	–	–	0.1 V	4
10A9h	Elapsed time from BOOT	R	V	–	–	–	ms	4
10B8h	IO status 1	R	V	–	–	–	–	4
10B9h	IO status 2	R	V	–	–	–	–	4
10BAh	IO status 3	R	V	–	–	–	–	4
10BBh	IO status 4	R	V	–	–	–	–	4
10BCh	IO status 5	R	V	–	–	–	–	4
10BDh	IO status 6	R	V	–	–	–	–	4
10BEh	IO status 7	R	V	–	–	–	–	4
10BFh	IO status 8	R	V	–	–	–	–	4
1510h	Information history 1	R	V	–	–	–	–	4
1511h	Information history 2	R	V	–	–	–	–	4
1512h	Information history 3	R	V	–	–	–	–	4
1513h	Information history 4	R	V	–	–	–	–	4
1514h	Information history 5	R	V	–	–	–	–	4
1515h	Information history 6	R	V	–	–	–	–	4
1516h	Information history 7	R	V	–	–	–	–	4
1517h	Information history 8	R	V	–	–	–	–	4
1518h	Information history 9	R	V	–	–	–	–	4
1519h	Information history 10	R	V	–	–	–	–	4
151Ah	Information history 11	R	V	–	–	–	–	4
151Bh	Information history 12	R	V	–	–	–	–	4
151Ch	Information history 13	R	V	–	–	–	–	4
151Dh	Information history 14	R	V	–	–	–	–	4
151Eh	Information history 15	R	V	–	–	–	–	4
151Fh	Information history 16	R	V	–	–	–	–	4
1520h	Information time history 1	R	V	–	–	–	–	4
1521h	Information time history 2	R	V	–	–	–	–	4
1522h	Information time history 3	R	V	–	–	–	–	4
1523h	Information time history 4	R	V	–	–	–	–	4
1524h	Information time history 5	R	V	–	–	–	–	4
1525h	Information time history 6	R	V	–	–	–	–	4
1526h	Information time history 7	R	V	–	–	–	–	4
1527h	Information time history 8	R	V	–	–	–	–	4
1528h	Information time history 9	R	V	–	–	–	–	4
1529h	Information time history 10	R	V	–	–	–	–	4
152Ah	Information time history 11	R	V	–	–	–	–	4
152Bh	Information time history 12	R	V	–	–	–	–	4
152Ch	Information time history 13	R	V	–	–	–	–	4
152Dh	Information time history 14	R	V	–	–	–	–	4
152Eh	Information time history 15	R	V	–	–	–	–	4
152Fh	Information time history 16	R	V	–	–	–	–	4

6-4 Driver action simulation setting parameter

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
11FFh	Driver simulation mode	R/W	NV	D	0: The motor is actually connected 1: A virtual motor is used (When ABZO not connected: no ABZO sensor information) 2: A virtual motor is used (When ABZO not connected: a wrap function with up to 1800 revolutions is enabled)	0	–	4

6-5 Base setting parameters

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1126h	Base current	R/W	NV	A	0 to 1,000	1,000	0.1 %	4
1128h	Stop current	R/W	NV	A	0 to 1,000	500	0.1 %	4
112Ch	Smooth drive function	R/W	NV	C	0: Disable 1: Enable	1	–	4
112Dh	Current control mode	R/W	NV	A	0: The setting of the CCM input is followed 1: α control mode (CST) 2: Servo emulation mode (SVE)	0	–	4
112Eh	Servo emulation (SVE) ratio	R/W	NV	A	0 to 1,000	1,000	0.1 %	4
112Fh	SVE position loop gain	R/W	NV	A	1 to 50	10	–	4
1130h	SVE speed loop gain	R/W	NV	A	10 to 200	180	–	4
1131h	SVE speed loop integral time constant	R/W	NV	A	100 to 2,000	1,000	0.1 ms	4
1132h	Automatic current cutback function	R/W	NV	A	0: Disable 1: Enable	1	–	4
1133h	Automatic current cutback switching time	R/W	NV	A	0 to 1,000	100	ms	4
1134h	Operating current ramp up rate	R/W	NV	A	0 to 100	0	ms/100 %	4
1135h	Operating current ramp down rate	R/W	NV	A		0	ms/100 %	4
1136h	Electronic damper function	R/W	NV	A	0: Disable 1: Enable	1	–	4
1137h	Resonance suppression control frequency	R/W	NV	A	100 to 2,000	1,000	Hz	4
1138h	Resonance suppression control gain	R/W	NV	A	–500 to 500	0	–	4
1139h	Deviation acceleration suppressing gain	R/W	NV	A	0 to 500	45	–	4
113Dh	Non-excitation mode selection	R/W	NV	A	0: Dynamic brake status 1: Free-run status	0	–	4
1142h	Starting speed	R/W	NV	B	0 to 4,000,000	5,000	Hz	4

6-6 Coordinate parameter

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
11C0h	Electronic gear A	R/W	NV	C	1 to 65,535	1	–	4
11C1h	Electronic gear B	R/W	NV	C	1 to 65,535	1	–	4
11C3h	Software overtravel	R/W	NV	A	–1: Disable 0: Immediate stop 1: Deceleration stop 2: Immediate stop with alarm 3: Deceleration stop with alarm	1	–	4
11C4h	Positive software limit	R/W	NV	A	–2,147,483,648 to 2,147,483,647	2,147,483,647	step	4
11C5h	Negative software limit	R/W	NV	A	–2,147,483,648 to 2,147,483,647	–2,147,483,648	step	4
11C6h	Preset position	R/W	NV	A	–2,147,483,648 to 2,147,483,647	0	step	4

6-7 Operation parameter

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1148h	Permission of absolute positioning without setting absolute coordinates	R/W	NV	B	0: Disable 1: Enable	1	–	4

6-8 ABZO sensor setting parameters

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
17F0h	Mechanism settings	R/W	NV	D	0: ABZO setting is prioritized 1: Manual setting	1	–	4
17F1h	Gear ratio setting	R/W	NV	D	0: ABZO setting is prioritized 1 to 32,767: Gear ratio	0	×0.01	4
17F2h	Initial coordinate generation & wrap coordinate setting	R/W	NV	D	0: ABZO setting is prioritized 1: Manual setting Note when setting⇨p.137	0	–	4
17F3h	Mechanism limit parameter setting	R/W	NV	D	0: ABZO setting is followed 1: Disable	0	–	4
17F4h	Mechanism protection parameter setting	R/W	NV	D	0: ABZO setting is followed 1: Disable	0	–	4
17F5h	JOG/HOME/ZHOME operation setting	R/W	NV	D	0: ABZO setting is prioritized 1: Manual setting	0	–	4

6-9 Mechanism settings parameter

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
11C2h	Motor rotation direction	R/W	NV	C	0: Positive side = Counterclockwise 1: Positive side = Clockwise	1 *	–	4

* Set to 0 when matching the rotation direction with a servo motor.

6-10 Initial coordinate generation & wrap coordinate parameters

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
11C7h	Wrap setting	R/W	NV	C	0: Disable 1: Enable	0	–	4
11C9h	Initial coordinate generation & wrap setting range	R/W	NV	C	Setting range ⇨ p.127 Note when setting ⇨ p.137	10	×0.1 rev	4
11CBh	Initial coordinate generation & wrap range offset ratio	R/W	NV	C	0 to 10,000 Note when setting ⇨ p.137	5,000	0.01 %	4
11CCh	Initial coordinate generation & wrap range offset value	R/W	NV	C	–536,870,912 to 536,870,911	0	step	4

6-11 JOG/HOME/ZHOME operation information setting parameters

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1151h	(JOG) Operating speed	R/W	NV	B	1 to 4,000,000	10,000	Hz	4
1152h	(JOG) Acceleration/deceleration	R/W	NV	B	1 to 1,000,000,000	300,000	Hz/s	4
1153h	(JOG) Starting speed	R/W	NV	B	0 to 4,000,000	5,000	Hz	4
1154h	(JOG) Operating speed (high)	R/W	NV	B	1 to 4,000,000	50,000	Hz	4
1158h	(ZHOME) Operating speed	R/W	NV	B	1 to 4,000,000	50,000	Hz	4
1159h	(ZHOME) Acceleration/ deceleration	R/W	NV	B	1 to 1,000,000,000	300,000	Hz/s	4
115Ah	(ZHOME) Starting speed	R/W	NV	B	0 to 4,000,000	5,000	Hz	4
115Eh	JOG/HOME/ZHOME command filter time constant	R/W	NV	B	1 to 200	1	ms	4
115Fh	JOG/HOME/ZHOME operating current	R/W	NV	B	0 to 1,000	1,000	0.1 %	4
1160h	(HOME) Home-seeking mode	R/W	NV	B	0: 2-sensor 1: 3-sensor 2: One-way rotation 3: Push-motion	1	–	4
1161h	(HOME) Starting direction	R/W	NV	B	0: Negative side 1: Positive side	1	–	4
1162h	(HOME) Acceleration/ deceleration	R/W	NV	B	1 to 1,000,000,000	300,000	Hz/s	4
1163h	(HOME) Starting speed	R/W	NV	B	1 to 4,000,000	5,000	Hz	4
1164h	(HOME) Operating speed	R/W	NV	B		10,000	Hz	4
1165h	(HOME) Last speed	R/W	NV	B	1 to 10,000	5,000	Hz	4
1166h	(HOME) SLIT detection	R/W	NV	B	0: Disable 1: Enable	0	–	4
1167h	(HOME) TIM/ZSG signal detection	R/W	NV	B	0: Disable 1: TIM output 2: ZSG output	0	–	4
1168h	(HOME) Position offset	R/W	NV	B	–2,147,483,647 to 2,147,483,647	0	step	4
1169h	(HOME) Backward steps in 2 sensor home-seeking	R/W	NV	B	0 to 8,388,607	5,000	step	4
116Ah	(HOME) Operating amount in uni-directional home-seeking	R/W	NV	B		5,000	step	4

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
116Bh	(HOME) Operating current for push-home-seeking	R/W	NV	B	0 to 1,000	1,000	0.1 %	4
116Ch	(HOME) Backward steps after first entry in push-home-seeking	R/W	NV	B	0 to 8,388,607	0	step	4
116Dh	(HOME) Pushing time in push-home-seeking	R/W	NV	B	1 to 65,535	200	ms	4
116Eh	(HOME) Backward steps in push-home-seeking	R/W	NV	B	0 to 8,388,607	5,000	step	4

6-12 Alarm parameters

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1180h	Overload alarm	R/W	NV	A	1 to 300	50	0.1 s	4
1181h	Excessive position deviation alarm	R/W	NV	A	1 to 30,000	300	×0.01 rev	4

6-13 Information setting parameters

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
11A0h	Driver temperature information (INFO-DRVTMP)	R/W	NV	A	40 to 85	85	°C	4
11A1h	Overload time information (INFO-OLTIME)	R/W	NV	A	1 to 300	50	0.1 s	4
11A2h	Speed information (INFO-SPD)	R/W	NV	A	0 to 12,000	0	min^{-1}	4
11A5h	Position deviation information (INFO-POSERR)	R/W	NV	A	1 to 30,000	300	×0.01 rev	4
11A8h	Motor temperature information (INFO-MTRTMP)	R/W	NV	A	40 to 120	85	°C	4
11A9h	Overvoltage information (INFO-OVOLT)	R/W	NV	A	120 to 450	435	V	4
11AAh	Undervoltage information (INFO-UVOLT)	R/W	NV	A	120 to 280	120	V	4
11AFh	Tripmeter information (INFO-TRIP)	R/W	NV	A	0 to 2,147,483,647	0	×100 rev	4
11B0h	Odometer information (INFO-ODO)	R/W	NV	A		0	×100 rev	4
11B1h	Cumulative load 0 information (INFO-CULD0)	R/W	NV	A		0	–	4

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
11B2h	Cumulative load 1 information (INFO-CULD1)	R/W	NV	A	0 to 2,147,483,647	0	–	4
11B3h	Cumulative load value auto clear	R/W	NV	A	0: Does not clear 1: Clear	1	–	4
11B4h	Cumulative load value count divisor	R/W	NV	A	1 to 32,767	1	–	4
11BCh	INFO-USRIO output selection	R/W	NV	A	0 to 255	128	–	4
11BDh	INFO-USRIO output inversion	R/W	NV	A	0: Not invert 1: Invert	0	–	4
11BEh	Information LED condition	R/W	NV	A	0: The LED does not blink 1: The LED blinks	1	–	4
11BFh	Information auto clear	R/W	NV	A	0: Disabled (not turned OFF automatically) 1: Enabled (turned OFF automatically)	1	–	4
17A0h	INFO action (Assigned I/O status information (INFO-USRIO))	R/W	NV	A	0: Only the bit output is ON 1: The bit output and the INFO output are ON and the LED blinks	1	–	4
17A1h	INFO action (Position deviation information (INFO-POSERR))	R/W	NV	A		1	–	4
17A2h	INFO action (Driver temperature information (INFO-DRVTMP))	R/W	NV	A		1	–	4
17A3h	INFO action (Motor temperature information (INFO-MTRTMP))	R/W	NV	A		1	–	4
17A4h	INFO action (Overvoltage information (INFO-OVOLT))	R/W	NV	A		1	–	4
17A5h	INFO action (Undervoltage information (INFO-UVOLT))	R/W	NV	A		1	–	4
17A6h	INFO action (Overload time information (INFO-OLTIME))	R/W	NV	A		1	–	4
17A8h	INFO action (Speed information (INFO-SPD))	R/W	NV	A		1	–	4
17A9h	INFO action (Start operation error information (INFO-START))	R/W	NV	A		1	–	4
17AAh	INFO action (Start ZHOME error information (INFO-ZHOME))	R/W	NV	A		1	–	4

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
17ABh	INFO action (PRESET request information (INFO-PR-REQ))	R/W	NV	A	0: Only the bit output is ON 1: The bit output and the INFO output are ON and the LED blinks	1	–	4
17ADh	INFO action (Electronic gear setting error information (INFO-EGR-E))	R/W	NV	A		1	–	4
17AEh	INFO action (Wrap setting error information (INFO-RND-E))	R/W	NV	A		1	–	4
17B0h	INFO action (Forward operation prohibition information (INFO-FW-OT))	R/W	NV	A		1	–	4
17B1h	INFO action (Reverse operation prohibition information (INFO-RV-OT))	R/W	NV	A		1	–	4
17B2h	INFO action (Cumulative load 0 information (INFO-CULD0))	R/W	NV	A		1	–	4
17B3h	INFO action (Cumulative load 1 information (INFO-CULD1))	R/W	NV	A		1	–	4
17B4h	INFO action (Tripmeter information (INFO-TRIP))	R/W	NV	A		1	–	4
17B5h	INFO action (Odometer information (INFO-ODO))	R/W	NV	A		1	–	4
17BCh	INFO action (Start operation restricted mode information (INFO-DSLMTD))	R/W	NV	A		1	–	4
17BDh	INFO action (I/O test mode information (INFO-IOTEST))	R/W	NV	A		1	–	4
17BEh	INFO action (Configuration request information (INFO-CFG))	R/W	NV	A		1	–	4
17BFh	INFO action (Reboot request information (INFO-RBT))	R/W	NV	A		1	–	4

6-14 I/O parameters

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1700h	STOP input action	R/W	NV	A	0: Immediate stop 1: Deceleration stop Note when setting⇨ p.137	1	–	4
1701h	FW-LS, RV-LS input action	R/W	NV	A	–1: Used as a return-to-home sensor 0: Immediate stop 1: Deceleration stop 2: Immediate stop with alarm 3: Deceleration stop with alarm	–1	–	4
1702h	FW-BLK, RV-BLK input action	R/W	NV	A	0: Immediate stop 1: Deceleration stop	0	–	4
1707h	ZSG signal width	R/W	NV	A	1 to 1,800	18	0.1 °	4
170Ah	MOVE minimum ON time	R/W	NV	A	0 to 255	0	ms	4
19FAh	Current setting during motor standstill at T-MODE	R/W	NV	A	0: Stop current 1: Operating current	0	–	4
170Dh	CRNT-LMT operating current limit value	R/W	NV	A	0 to 1,000	500	0.1 %	4
170Eh	SPD-LMT speed limit type selection	R/W	NV	A	0: Ratio 1: Value	0	–	4
170Fh	SPD-LMT speed limit ratio	R/W	NV	A	1 to 100	50	%	4
1710h	SPD-LMT speed limit value	R/W	NV	A	1 to 4,000,000	10,000	Hz	4
1718h	VA mode selection	R/W	NV	B	0: Feedback speed attainment (speed at feedback position) 1: Speed at command position (only internal profile) 2: Speed at feedback position & command position (only internal profile)	0	–	4
1719h	VA detection speed range	R/W	NV	B	1 to 200	30	min^{-1}	4
1740h	AREA0 positive direction position/offset	R/W	NV	A	–2,147,483,648 to 2,147,483,647	0	step	4
1741h	AREA0 negative direction position/detection range	R/W	NV	A		0	step	4
1742h	AREA1 positive direction position/offset	R/W	NV	A		0	step	4
1743h	AREA1 negative direction position/detection range	R/W	NV	A		0	step	4
1744h	AREA2 positive direction position/offset	R/W	NV	A		0	step	4
1745h	AREA2 negative direction position/detection range	R/W	NV	A		0	step	4
1746h	AREA3 positive direction position/offset	R/W	NV	A		0	step	4
1747h	AREA3 negative direction position/detection range	R/W	NV	A		0	step	4
1748h	AREA4 positive direction position/offset	R/W	NV	A		0	step	4

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1749h	AREA4 negative direction position/detection range	R/W	NV	A	−2,147,483,648 to 2,147,483,647	0	step	4
174Ah	AREA5 positive direction position/offset	R/W	NV	A		0	step	4
174Bh	AREA5 negative direction position/detection range	R/W	NV	A		0	step	4
174Ch	AREA6 positive direction position/offset	R/W	NV	A		0	step	4
174Dh	AREA6 negative direction position/detection range	R/W	NV	A		0	step	4
174Eh	AREA7 positive direction position/offset	R/W	NV	A		0	step	4
174Fh	AREA7 negative direction position/detection range	R/W	NV	A		0	step	4
1750h	AREA0 range setting mode	R/W	NV	A	0: Range setting with absolute value 1: Offset/width setting from the target position	0	–	4
1751h	AREA1 range setting mode	R/W	NV	A		0	–	4
1752h	AREA2 range setting mode	R/W	NV	A		0	–	4
1753h	AREA3 range setting mode	R/W	NV	A		0	–	4
1754h	AREA4 range setting mode	R/W	NV	A		0	–	4
1755h	AREA5 range setting mode	R/W	NV	A		0	–	4
1756h	AREA6 range setting mode	R/W	NV	A		0	–	4
1757h	AREA7 range setting mode	R/W	NV	A		0	–	4
1758h	AREA0 positioning standard	R/W	NV	A	0: Based on feedback position 1: Based on command position	0	–	4
1759h	AREA1 positioning standard	R/W	NV	A		0	–	4
175Ah	AREA2 positioning standard	R/W	NV	A		0	–	4
175Bh	AREA3 positioning standard	R/W	NV	A		0	–	4
175Ch	AREA4 positioning standard	R/W	NV	A		0	–	4
175Dh	AREA5 positioning standard	R/W	NV	A		0	–	4
175Eh	AREA6 positioning standard	R/W	NV	A		0	–	4
175Fh	AREA7 positioning standard	R/W	NV	A		0	–	4

6-15 Direct I/O setting parameters

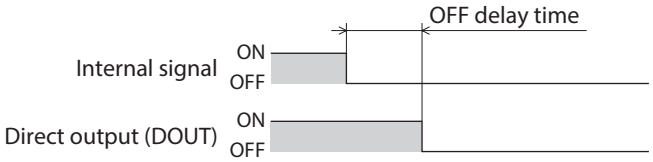
Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1840h	DIN0 input function	R/W	NV	C	Input signals list⇨ p.115	26	–	4
1841h	DIN1 input function	R/W	NV	C		27	–	4
1842h	DIN2 input function	R/W	NV	C		104	–	4
1843h	DIN3 input function	R/W	NV	C		107	–	4
1850h	DIN0 inverting mode	R/W	NV	C	0: Not invert 1: Invert	0	–	4
1851h	DIN1 inverting mode	R/W	NV	C		0	–	4
1852h	DIN2 inverting mode	R/W	NV	C		0	–	4
1853h	DIN3 inverting mode	R/W	NV	C		0	–	4
1860h	DOUT0 (Normal) Output function	R/W	NV	C	Output signals list⇨ p.117	130	–	4
1861h	DOUT1 (Normal) Output function	R/W	NV	C		132	–	4
1862h	DOUT2 (Normal) Output function	R/W	NV	C		134	–	4

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1870h	DOUT0 inverting mode	R/W	NV	C	0: Not invert 1: Invert	0	–	4
1871h	DOUT1 inverting mode	R/W	NV	C		0	–	4
1872h	DOUT2 inverting mode	R/W	NV	C		0	–	4
1880h	DIN0 composite input function	R/W	NV	C	Input signals list⇨ p.115	28	–	4
1881h	DIN1 composite input function	R/W	NV	C		29	–	4
1882h	DIN2 composite input function	R/W	NV	C		30	–	4
1883h	DIN3 composite input function	R/W	NV	C		0	–	4
1890h	DOUT0 composite output function	R/W	NV	C	Output signals list⇨ p.117	128	–	4
1891h	DOUT1 composite output function	R/W	NV	C		128	–	4
1892h	DOUT2 composite output function	R/W	NV	C		128	–	4
18A0h	DOUT0 composite inverting mode	R/W	NV	C	0: Not invert 1: Invert	0	–	4
18A1h	DOUT1 composite inverting mode	R/W	NV	C		0	–	4
18A2h	DOUT2 composite inverting mode	R/W	NV	C		0	–	4
18B0h	DOUT0 composite logical combination	R/W	NV	C	0: AND 1: OR	1	–	4
18B1h	DOUT1 composite logical combination	R/W	NV	C		1	–	4
18B2h	DOUT2 composite logical combination	R/W	NV	C		1	–	4
18C0h	DIN0 ON signal dead-time	R/W	NV	C	0 to 250	0	ms	4
18C1h	DIN1 ON signal dead-time	R/W	NV	C		0	ms	4
18C2h	DIN2 ON signal dead-time	R/W	NV	C		0	ms	4
18C3h	DIN3 ON signal dead-time	R/W	NV	C		0	ms	4
18D0h	DIN0 1 shot signal	R/W	NV	C	0: Disable 1: Enable	0	–	4
18D1h	DIN1 1 shot signal	R/W	NV	C		0	–	4
18D2h	DIN2 1 shot signal	R/W	NV	C		0	–	4
18D3h	DIN3 1 shot signal	R/W	NV	C		0	–	4
18E0h	DOUT0 OFF delay time	R/W	NV	C	0 to 250	0	ms	4
18E1h	DOUT1 OFF delay time	R/W	NV	C		0	ms	4
18E2h	DOUT2 OFF delay time	R/W	NV	C		0	ms	4

6-16 Remote I/O setting parameters

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1900h	R-IN0 input function	R/W	NV	C	Input signals list⇨ p.115	0	–	4
1901h	R-IN1 input function	R/W	NV	C		0	–	4
1902h	R-IN2 input function	R/W	NV	C		0	–	4
1903h	R-IN3 input function	R/W	NV	C		0	–	4
1904h	R-IN4 input function	R/W	NV	C		0	–	4
1905h	R-IN5 input function	R/W	NV	C		0	–	4
1906h	R-IN6 input function	R/W	NV	C		0	–	4
1907h	R-IN7 input function	R/W	NV	C		0	–	4
1910h	R-OUT0 output function	R/W	NV	C	Output signals list⇨ p.117	26	–	4
1911h	R-OUT1 output function	R/W	NV	C		27	–	4
1912h	R-OUT2 output function	R/W	NV	C		104	–	4
1913h	R-OUT3 output function	R/W	NV	C		107	–	4
1914h	R-OUT4 output function	R/W	NV	C		130	–	4
1915h	R-OUT5 output function	R/W	NV	C		132	–	4
1916h	R-OUT6 output function	R/W	NV	C		134	–	4
1917h	R-OUT7 output function	R/W	NV	C		173	–	4
1930h	R-OUT0 OFF delay time	R/W	NV	C	0 to 250	0	ms	4
1931h	R-OUT1 OFF delay time	R/W	NV	C		0	ms	4
1932h	R-OUT2 OFF delay time	R/W	NV	C		0	ms	4
1933h	R-OUT3 OFF delay time	R/W	NV	C		0	ms	4
1934h	R-OUT4 OFF delay time	R/W	NV	C		0	ms	4
1935h	R-OUT5 OFF delay time	R/W	NV	C		0	ms	4
1936h	R-OUT6 OFF delay time	R/W	NV	C		0	ms	4
1937h	R-OUT7 OFF delay time	R/W	NV	C		0	ms	4

■ Reference picture of OFF output-delay time [ms]



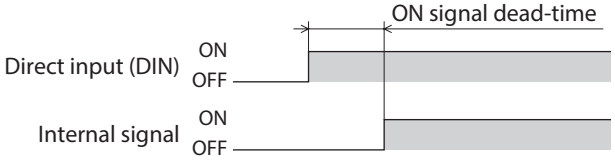
6-17 Extended input setting parameters

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1970h	Extended input (EXT-IN) function	R/W	NV	C	Input signals list⇨ p.115	9	–	4
1971h	Extended input (EXT-IN) inverting mode	R/W	NV	C	0: Not invert 1: Invert	0	–	4
1972h	Extended input (EXT-IN) interlock releasing time	R/W	NV	A	0: Interlock disabled 1 to 50	10	0.1 s	4
1973h	Extended input (EXT-IN) interlock releasing duration	R/W	NV	A	0 to 50	30	0.1 s	4
1974h	Extended input (EXT-IN) ON monitor time	R/W	NV	A		10	0.1 s	4

6-18 Virtual input parameters

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1940h	Virtual input (VIR-IN0) function	R/W	NV	C	Input signals list⇨ p.115	0	–	4
1941h	Virtual input (VIR-IN1) function	R/W	NV	C		0	–	4
1942h	Virtual input (VIR-IN2) function	R/W	NV	C		0	–	4
1943h	Virtual input (VIR-IN3) function	R/W	NV	C		0	–	4
1944h	Virtual input (VIR-IN0) source selection	R/W	NV	C	Output signals list⇨ p.117	128	–	4
1945h	Virtual input (VIR-IN1) source selection	R/W	NV	C		128	–	4
1946h	Virtual input (VIR-IN2) source selection	R/W	NV	C		128	–	4
1947h	Virtual input (VIR-IN3) source selection	R/W	NV	C		128	–	4
1948h	Virtual input (VIR-IN0) inverting mode	R/W	NV	C	0: Not invert 1: Invert	0	–	4
1949h	Virtual input (VIR-IN1) inverting mode	R/W	NV	C		0	–	4
194Ah	Virtual input (VIR-IN2) inverting mode	R/W	NV	C		0	–	4
194Bh	Virtual input (VIR-IN3) inverting mode	R/W	NV	C		0	–	4
194Ch	Virtual input (VIR-IN0) ON signal dead time	R/W	NV	C	0 to 250	0	ms	4
194Dh	Virtual input (VIR-IN1) ON signal dead time	R/W	NV	C		0	ms	4
194Eh	Virtual input (VIR-IN2) ON signal dead time	R/W	NV	C		0	ms	4
194Fh	Virtual input (VIR-IN3) ON signal dead time	R/W	NV	C		0	ms	4
1950h	Virtual input (VIR-IN0) 1 shot signal mode	R/W	NV	C	0: Disable 1: Enable	0	–	4
1951h	Virtual input (VIR-IN1) 1 shot signal mode	R/W	NV	C		0	–	4
1952h	Virtual input (VIR-IN2) 1 shot signal mode	R/W	NV	C		0	–	4
1953h	Virtual input (VIR-IN3) 1 shot signal mode	R/W	NV	C		0	–	4

■ Reference picture of ON signal dead-time [ms]



6-19 User output setting parameters

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1960h	User output (USR-OUT0) source A function	R/W	NV	C	Output signals list⇨p.117	128	–	4
1961h	User output (USR-OUT1) source A function	R/W	NV	C		128	–	4
1962h	User output (USR-OUT0) source A inverting mode	R/W	NV	C	0: Not invert 1: Invert	0	–	4
1963h	User output (USR-OUT1) source A inverting mode	R/W	NV	C		0	–	4
1964h	User output (USR-OUT0) source B function	R/W	NV	C	Output signals list⇨p.117	128	–	4
1965h	User output (USR-OUT1) source B function	R/W	NV	C		128	–	4
1966h	User output (USR-OUT0) source B inverting mode	R/W	NV	C	0: Not invert 1: Invert	0	–	4
1967h	User output (USR-OUT1) source B inverting mode	R/W	NV	C		0	–	4
1968h	User output (USR-OUT0) logical operation	R/W	NV	C	0: AND 1: OR	1	–	4
1969h	User output (USR-OUT1) logical operation	R/W	NV	C		1	–	4

6-20 MECHATROLINK-III parameters

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
13C0h	Option Monitor Select 1	R/W	NV	A	4,096 to 32,767	4,195	–	4
13C1h	Option Monitor Select 2	R/W	NV	A		4,198	–	4
13C5h	Select running current during no command	R/W	NV	A	0: 100 % 1: Operating current	1	–	4
13C6h	Select Phase-C Signal	R/W	NV	A	0: Z-phase 1: TIM	0	–	4

6-21 Communication part parameters

memo The “communication part" refers to the part of the driver control circuit that controls MECHATROLINK-III, etc.

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
–	Number of transmission bytes	R/W	NV	D	0: 32 byte 1: 48 byte	1	–	4
–	USB-ID	R/W	NV	D	0 to 999,999,999	100	–	4
–	USB-PID	R/W	NV	D	0 to 31	0	–	4
–	Driver user name	R/W	NV	A	–	–	–	4

6-22 Power removal function setting parameters

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
1190h	HWTO mode selection	R/W	NV	A	0: Alarm is not present 1: Alarm is present	0	–	4
1191h	HWTO delay time of checking dual system	R/W	NV	A	0 to 10 (disable), 11 to 100 ms	0	ms	4

5 Troubleshooting

This part explains alarm and information functions.

◆Table of contents

1 Detection of communication errors

The ERR LED blinks in red if a communication error occurred in MECHATROLINK-III. Details about the communication error can be checked by counting the number of times the ERR LED blinks.
The communication error will be reset automatically if MECHATROLINK-III returns to the normal state.

Number of ERR LED blinks	Description of error	Cause	Remedial action
2	Cyclic communications end	• The master station stopped cyclic communications during cyclic communications. • The MECHATROLINK-III cable was disconnected during cyclic communications.	• Check the operating status of the master station. • Check the MECHATROLINK-III cable and connector.
3	FCS error	The MECHATROLINK-III cable is affected by electrical noise.	• Check the MECHATROLINK-III cable and connector. • Take measures to eliminate noise.
3	Frame length discrepancy	Number of transmission bytes are not matched in cyclic communications.	Check the setting of the number of transmission bytes.
3	Communication ASIC error	An error was detected in ASIC for MECHATROLINK-III.	• Check the communication settings of the master station. • Check the MECHATROLINK-III cable and connector. • Take measures to eliminate noise.
4	Communication error detection	• The COMM_ALM (Bits 12 to 15) of the command status (CMD_STAT) became 8h or over. (⇨ p.169) • The MECHATROLINK-III cable is affected by electrical noise. • The transmission cycle of cyclic communications was disturbed largely. • The WDT data of synchronous communications is not updated properly.	• Check the communication settings of the master station. • Check the MECHATROLINK-III cable and connector. • Take measures to eliminate noise.

■ COMM_ALM (Bits 12 to 15) of command status (CMD_STAT)

If an error occurs in MECHATROLINK-III, the code is indicated using the COMM_ALM (Bits 12 to 15) of the command status (CMD_STAT). Check with the master station or the **MEXE02** for the COMM_ALM (Bits 12 to 15).

memo

- A warning is generated when the code is 1 to 3h.
- A communication error occurs when the code is 8h and over.
- An alarm of the Network bus error (alarm code 81h) is generated when the code became 8h or over during operation. Check via MECHATROLINK-III or using the **MEXE02** for an alarm of the driver part.

Error type	Code	Description	Cause	Remedial action
Warning	1h	FCS error	The FCS error occurred.	• Check the MECHATROLINK-III cable and connector. • Check if a strong noise source exists around the driver.
	2h	Command data not received	The command data could not be received.	• Check if the master station stops MECHATROLINK-III. • Check the MECHATROLINK-III cable and connector. • Check if a strong noise source exists around the driver. • Check the communication settings of the master station.
	3h	Synchronous frame not received	The synchronous frame could not be received.	• Check if the master station stops MECHATROLINK-III. • Check the MECHATROLINK-III cable and connector. • Check if a strong noise source exists around the driver. • Check the communication settings of the master station.
Alarm	8h	FCS error	The FCS error occurred consecutively.	• Check the MECHATROLINK-III cable and connector. • Check if a strong noise source exists around the driver.
	9h	Command data not received	The command data could not be received consecutively.	• Check if the master station stops MECHATROLINK-III. • Check the MECHATROLINK-III cable and connector. • Check if a strong noise source exists around the driver. • Check the communication settings of the master station.
	Ah	Synchronous frame not received	The synchronous frame could not be received consecutively.	• Check if the master station stops MECHATROLINK-III. • Check the MECHATROLINK-III cable and connector. • Check if a strong noise source exists around the driver. • Check the communication settings of the master station.
	Ch	WDT error	The watchdog data (WDT) error was detected in synchronous communications.	• Check the MECHATROLINK-III cable and connector. • Check if a strong noise source exists around the driver. • Check the WDT processing of the master station.

2 Alarm

This driver has the alarm function to protect from temperature rise, poor connection, error in operation, and the like. If an alarm is generated, the ALM-A output is turned ON and the ALM-B output is turned OFF to stop the motor. At the same time, the PWR/ALM LED or the ERR LED blinks in red depending on the alarm content.
Details of the alarm being generated can be checked by counting the number of timed the PWR/ALM LED blinks, via MECHATROLINK-III, or by using the **MEXE02**.

Note If an alarm is generated, the motor puts into a non-excitation state.

2-1 Alarm reset

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

- Set the ALM_CLR (Bit 3) of the command control (CMD_CTRL) to 1. (It is enabled when changing from 0 to 1.)
- Turn the ALM-RST input ON. (It is enabled at the ON edge of the input.)
- Execute the alarm reset using the **MEXE02**.
- Turn on the control power supply again.

memo Some alarms cannot be reset by other methods than turning on the control power supply again.
Refer to "2-4 Alarm list" on p.171.

2-2 Alarm history

Up to 10 generated alarm items are stored in the non-volatile memory in order of the latest to the oldest. The alarm history stored in the non-volatile memory can be read or cleared if one of the following reset operations is performed.

- Read the alarm history with the Read alarm/warning command (ALM_RD: 05h) of MECHATROLINK-III.
- Clear the alarm history with the Clear alarm or warning command (ALM_CLR: 06h) of MECHATROLINK-III.
- Read and clear the alarm history using the **MEXE02**.

2-3 Generation condition of alarms

Alarms shown in the table will be generated if the generation condition is exceeded.

Alarm code	Alarm name	Motor model	Generation condition
21h	Main circuit overheat	–	85 °C (185 °F)
22h	Overvoltage	–	430 V
26h	Motor overheat	–	85 °C (185 °F)
31h	Overspeed	**AZM46**, **AZM48** **AZM66**, **AZM69**	8,000 r/min
		AZM98, **AZM911**	5,000 r/min
34h	Command pulse error	–	38,400 r/min

2-4 Alarm list

memo
- The “driver part" refers to the part of the driver control circuit that controls the motor, I/O, and the like.
- The “communication part" refers to the part of the driver control circuit that controls MECHATROLINK-III, etc.

■ Alarm list of driver part

Alarm code	Number of PWR/ ALM LED blinks	Alarm type	Cause	Remedial action	How to reset
10h	4	Excessive position deviation	• When the motor was in a state of current ON, the deviation between the command position and feedback position exceeded the value set in the Excessive position deviation alarm (device parameter 1181h) in the motor output shaft. • A load is large or the acceleration/deceleration is too short for the load.	• Decrease the load. • Increase the acceleration/ deceleration time or slow the acceleration/deceleration rate. • Increase the operating current.	Any of reset operations
20h	5	Overcurrent	The motor, the cable, and the driver output circuit were short-circuited.	Turn off the main power supply and the control power supply first, and check that the motor, the cable, and the driver are not damaged before turning on the power supplies again.	Turn on the control power supply again
21h	2	Main circuit overheat	The internal temperature of the driver reached the upper limit of the specification value.	Reconsider the ventilation condition.	Any of reset operations
22h	3	Overvoltage	• The main power supply voltage exceeded the permissible value. • A large load inertia was suddenly stopped. • Vertical operation (elevating operation) was performed.	• Check the input voltage of the main power supply. • Decrease the load. • Increase the acceleration/ deceleration time or slow the acceleration/deceleration rate. • Connect the Oriental Motor’s regeneration resistor. Refer to p.53 for the model name.	Turn on the control power supply again
23h	3	Main power supply OFF	The main power supply was shut off during operation.	Check if the main power supply is properly supplied.	Any of reset operations
25h	3	Undervoltage	The main power supply was shut off momentarily or a voltage shortage was generated.	Check the input voltage of the main power supply.	Any of reset operations
26h	8	Motor overheat	The detection temperature of the ABZO sensor reached the upper limit of the specification value.	• Check the heat radiation condition of the motor. • Reconsider the ventilation condition.	Any of reset operations
28h	8	Sensor error	An error of the ABZO sensor was detected during operation.	Turn off the main power supply and the control power supply, and check the connection of the motor before turning on the power supplies again.	Turn on the control power supply again

Alarm code	Number of PWR/ ALM LED blinks	Alarm type	Cause	Remedial action	How to reset
29h	9	CPU peripheral circuit error	The voltage around the CPU was decreased by shutting off the control power supply instantaneously.	• Turn on the control power supply again. • Check the input voltage of the control power supply. • Check the power supply capacity of the control power supply.	Turn on the control power supply again
2Ah	8	ABZO sensor communication error	An error occurred between the driver and the ABZO sensor.	Turn off the main power supply and the control power supply, and check the connection of the ABZO sensor before turning on the power supplies again.	Turn on the control power supply again
30h	2	Overload	A load exceeding the maximum torque was applied for a time period exceeding the value set in the Overload alarm (device parameter 1180h).	• Decrease the load. • Increase the acceleration/ deceleration time or slow the acceleration/deceleration rate. • Increase the operating current.	Any of reset operations
31h	2	Overspeed	The feedback speed of the motor output shaft exceeded the specification value.	• Reconsider the Electronic gear A (device parameter 11C0h) and the Electronic gear B (device parameter 11C1h), and set so that the speed of the motor output shaft should be less than the specification value. • If an overshoot is occurred at the time of accelerating, increase the acceleration time or slow the acceleration rate.	Any of reset operations
33h	7	Absolute position error	The home information of the ABZO sensor was damaged.	Execute the position preset (P-PRESET) or return-to-home operation, and turn off the control power supply and on again. If it cannot be reset by these methods, the ABZO sensor may be damaged. After resetting the alarm, set the home again.	Turn on the control power supply again
34h	2	Command pulse error	• The command pulse frequency exceeded the specification value. • P-PRESET was executed while the Interpolation command (INTERPOLATE: 34h) was executed.	* Decrease the frequency of the command pulse. * Execute P-PRESET of the driver when the Interpolation command (INTERPOLATE: 34h) is not executed.	Any of reset operations
41h	9	EEPROM error	The data stored in the driver was damaged.	Initialize all parameters.	Turn on the control power supply again
42h	8	Sensor error at power-on	An error of the ABZO sensor was detected when the control power supply was turned on.	Turn off the main power supply and the control power supply, and check the connection of the ABZO sensor before turning on the power supplies again.	Turn on the control power supply again

Alarm code	Number of PWR/ ALM LED blinks	Alarm type	Cause	Remedial action	How to reset
43h	8	Rotation error at power on	The motor was being rotated when the control power supply was turned on.	Reconsider the load conditions so that the motor output shaft does not rotate by an external force when the control power supply is turned on.	Turn on the control power supply again
44h	8	Encoder EEPROM error	The data stored in the ABZO sensor was damaged.	Execute either of the following operations. If the same alarm is still generated, the ABZO sensor has been damaged. Contact your nearest Oriental Motor sales office. • Set phase Z again with the ZSG-PRESET (device parameter 10D1h). • Execute "Clear tripmeter" with the **MEXE02** or the Clear tripmeter (device parameter 10CFh).	Turn on the control power supply again
45h	8	Motor combination error	A motor (motorized actuator) for the DC power supply was connected.	Check the driver model name and the motor model name, and connect them in the correct combination.	Turn on the control power supply again
4Ah	7	Return-to-home incomplete	Absolute positioning operation was started in a state where the coordinates had not been set.	• Reconsider the setting of the Permission of absolute positioning without setting absolute coordinates (device parameter 1148h). • Execute the position preset (P-PRESET) or return-to-home operation.	Any of reset operations
51h	2	Regeneration resistor overheat	• The regeneration resistor is not connected properly. • The regeneration resistor was overheated extraordinarily.	• Connect the regeneration resistor properly. • The allowable regenerative power of the regeneration resistor is exceeded. Reconsider the load and operating conditions.	Turn on the control power supply again
53h	2	HWTO input circuit error	• The time after either the HWTO1 input or the HWTO2 input is turned OFF until the other input is turned OFF exceeded the value set in the HWTO delay time of checking dual system (device parameter 1191h). • An error of the circuit corresponding to the phenomenon above was detected.	• Increase the value set in the HWTO delay time of checking dual system (device parameter 1191h). • Check the wiring of the HWTO1 input and the HWTO2 input.	Turn on the control power supply again

Alarm code	Number of PWR/ ALM LED blinks	Alarm type	Cause	Remedial action	How to reset
60h	7	±LS both sides active	• When the FW-LS/RV-LS input action (device parameter 1701h) is set to alarm generation, both the FW-LS and RV-LS inputs were detected. • Return-to-home operation was executed in a state where both the FW-LS and RV-LS inputs were detected.	Check the sensor logic installed and the parameter for Inverting mode.	Any of reset operations
61h	7	Reverse ±LS connection	The LS input opposite to the operating direction was detected while return-to-home operation in the 2-sensor mode or 3-sensor mode was performed.	Check the wiring of the sensor.	Any of reset operations
62h	7	Return-to-home operation error	• An unanticipated load was applied while return-to-home operation was performed. • The installation positions of the FW-LS and RV-LS sensors and the HOME sensor are near to each other. • Position preset (P-PRESET) processing upon completion of return-to-home operation was failed. • In return-to-home operation in the one-way rotation mode, the HOME sensor was exceeded while the motor decelerated to a stop.	• Check the load. • Reconsider the sensor installation positions and the starting direction of motor operation. • See that a load exceeding the maximum torque is not applied upon completion of return-to-home operation. • Reconsider the specifications of the HOME sensor and the "(HOME) Acceleration/ deceleration" (device parameter 1162h).	Any of reset operations
63h	7	No HOMES	The HOMES input was not detected at a position between the FW-LS input and the RV-LS input while return-to-home operation in the 3-sensor mode was performed.	Install the HOME sensor at a position between the FW-LS and RV-LS sensors.	Any of reset operations
64h	7	TIM, ZSG, SLIT signal error	None of the TIM output, the ZSG output, and the SLIT input could be detected during return-to-home operation.	• Reconsider the connection status of the load and the position of the HOMES sensor so that these signals should be ON while the HOMES input is ON. • If the signals are not used, disable the "(HOME) TIM/ZSG signal detection" (device parameter 1167h) and "(HOME) SLIT detection" (device parameter 1166h).	Any of reset operations
66h	7	Hardware overtravel	When the FW-LS/RV-LS input action (device parameter 1701h) is set to alarm generation, the FW-LS input or the RV-LS input was detected.	• Reconsider the operation data. • Operate the motor in the opposite direction to escape from the sensor. It can be escaped even in return-to-home operation.	Any of reset operations

Alarm code	Number of PWR/ ALM LED blinks	Alarm type	Cause	Remedial action	How to reset
67h	7	Software overtravel	When the Software overtravel (device parameter 11C3h) is set to alarm generation, the motor position reached the set value of the software limit.	• Reconsider the operation data. • Operate the motor in the opposite direction to escape from the sensor. It can be escaped even in return-to-home operation.	Any of reset operations
68h	1	HWTO input detection	When the HWTO mode selection (device parameter 1190h) is set to "1: Alarm is present," the HWTO1 input or the HWTO2 input was turned OFF.	Turn the HWTO1 input and the HWTO2 input ON.	Any of reset operations
6Ah	7	Return-to-home operation offset error	When offset movement as part of return-to-home operation was performed, the FW-LS input or the RV-LS input was detected.	Check the offset value.	Any of reset operations
6Dh	7	Mechanical overtravel	The product having set the home reached the mechanical end.	Check the travel amount (position).	Any of reset operations
70h	7	Operation data error	• The operation was performed at the operating speed or operating current that was exceeded the value set in the Mechanism limit parameter. • Push-motion return-to-home operation was executed with the **DGII** Series.	• Check the operation data. • Push-motion return-to-home operation cannot be executed with the **DGII** Series.	Any of reset operations
71h	7	Electronic gear setting error	The resolution set with the Electronic gear A (device parameter 11C0h) and Electronic gear B (device parameter 11C1h) was out of the specifications.	Reconsider the Electronic gear A (device parameter 11C0h) and the Electronic gear B (device parameter 11C1h), and set so that the resolution should be in the range of the specifications.	Turn on the control power supply again
72h	7	Wrap setting error	The control power supply was turned on in state where the resolution set with the Electronic gear A (device parameter 11C0h) and Electronic gear B (device parameter 11C1h) is inconsistent with the wrap setting value.	Set the wrap setting properly and turn on the control power supply again.	Turn on the control power supply again
81h	7	Network bus error	• A communication error of MECHATROLINK-III was detected during operation. [The COMM_ALM (Bits 12 to 15) of the command status (CMD_STAT) became 8h or over.] ⇨ p.169 • An error of transmission cycle was detected.	An appropriate remedial action varies depending on the sub code. Check the sub code. ⇨ p.176 (The sub code can be checked with the **MEXE02**.)	Any of reset operations

Alarm code	Number of PWR/ ALM LED blinks	Alarm type	Cause	Remedial action	How to reset
82h	7	Driver internal communication error 1	An error was detected in communication between the communication part and the driver part.	An appropriate remedial action varies depending on the sub code. Check the sub code. ⇨p.177 (The sub code can be checked with the **MEXE02**.)	Varies depending on the sub code
83h	7	Communication switch setting error	• The station address setting switch is set to out of the range. • The station address is duplicated with another MECHATROLINK-III compatible product.	Reconsider the setting of the station address.	Turn on the control power supply again
84h	7	Driver internal communication error 2	An error was detected three times consecutively in internal communication.	Execute the alarm clear. If the alarm still cannot be cleared, contact your nearest Oriental Motor sales office.	Any of reset operations
85h	7	Driver internal communication timeout	Internal communication was not performed for 200 ms or more.	Execute the alarm clear. If the alarm still cannot be cleared, contact your nearest Oriental Motor sales office.	Any of reset operations
F0h	Light	CPU error	CPU malfunctioned.	Turn on the control power supply again.	Turn on the control power supply again

● **Sub code of Network bus error (alarm code 81h)**

Sub code	Number of ERR LED blinks	Cause	Remedial action	How to reset
1h to Ch	4	The COMM_ALM (Bits 12 to 15) of the command status (CMD_STAT) became 8h or over during operation.	• Check the operating status of the master station. • Check the MECHATROLINK-III cable and connector.	Any of reset operations
10h	7	The communication was performed at the transmission cycle setting outside the specifications.	Check the transmission cycle of the master station.	Any of reset operations

memo The sub code can be checked with the **MEXE02**.

● **Sub code of Driver internal communication error 1 (alarm code 82h)**

Sub code	Number of ERR LED blinks	Cause	Remedial action	How to reset
10h	7	An error was detected in the communication part. (The alarm content is the communication ASIC access error or the internal high speed communication error)	Reset with the ALM_CLR (Bit 3) of the command control (CMD_CTRL). Details of the alarm can be checked with the**MEXE02**.	Any of reset operations
11h	*	An error was detected in the communication part. (The alarm content is the EEPROM error, the communication ASIC error, the internal low speed communication error, or the CPU error)	Turn on the control power supply again. Details of the alarm can be checked with the**MEXE02**.	Turn on the control power supply again
Other than 10h and 11h	–	An error was detected in communication between the communication part and the driver part.	Execute the alarm clear. If the alarm still cannot be cleared, contact your nearest Oriental Motor sales office.	Any of reset operations

* When an alarm is the EEPROM error or the CPU error: No light
When an alarm is the communication ASIC error: 7
When an alarm is the internal low speed communication error: 8

memo The sub code can be checked with the **MEXE02**.

■ Alarm list of communication part

Details of the alarm can be checked with the **MEXE02**.

Number of ERR LED blinks	Alarm code	Alarm type	Alarm reset*	Description of error	Cause	Remedial action
No light	41h	EEPROM error	×	EEPROM error	The stored data of the communication part was damaged.	Initialize all parameters.
7	81h	Network bus error	×	Communication ASIC error	• Initialization of of ASIC for MECHATROLINK-III was failed. • The WDT timeout of ASIC for MECHATROLINK-III was occurred.	• Reconsider the communication settings of the master station. • Reconsider the wiring of communication. • Take measures to eliminate noise.
7	81h	Network bus error	●	Transmission cycle error	The transmission cycle outside the specifications was set.	Reconsider the setting of the transmission cycle of the master station.
7	82h	Driver internal communication error 1	○	Communication ASIC access error	An error was detected in the ASIC access driver for MECHATROLINK-III.	• Reconsider the communication settings of the master station. • Reconsider the wiring of communication. • Take measures to eliminate noise.

Number of ERR LED blinks	Alarm code	Alarm type	Alarm reset*	Description of error	Cause	Remedial action
7	82h	Driver internal communication error 1	○	Internal high speed communication error	• An error was detected in communication between the communication part and the driver part. • The transmission cycle of cyclic communications was disturbed largely.	• Take measures to eliminate noise. • Reconsider the communication settings of the master station.
8	83h	Communication switch setting error	×	Station address setting error	• The station address setting switch is set to out of the range. • The station address is duplicated with another device station.	Reconsider the setting of the station address.
8	84h	Driver internal communication error 2	×	Internal low speed communication error	An error was detected in communication between the communication part and the driver part.	Take measures to eliminate noise.
No light	F0h	CPU error	×	CPU error	The CPU of the communication part malfunctioned.	Turn on the control power supply again.

* ○: It can be reset by the ALM_CLR (Bit 3) of the command control (CMD_CTRL).
●: It will be reset automatically if MECHATROLINK-III returns to the normal state.
×: It cannot be cleared with the ALM_CLR (Bit 3). Turn off the control power supply and on again to reset.

3 Information

The driver is equipped with a function to generate information output before an alarm is generated.
This function can be utilized for periodic maintenance of equipment by setting a suitable value in the parameter of each information.
For example, utilizing the Motor temperature information (device parameter 11A8h) can prevent equipment malfunction or production stoppage due to motor overheat. In addition, the Tripmeter information (device parameter 11AFh) can be utilized as a reference to do maintenances every time a certain travel distance is reached.

3-1 Status when information is generated

- **Information bit output**

  If information is generated, a bit output (INFO-** output) of the corresponding information is turned ON. (Details of bit output⇨ p.182)
  A desired output signal can be allocated to the INFO-USRIO output among bit outputs and used. If the allocated output signal is turned ON, the INFO-USRIO output is also turned ON.

- **INFO output**

  If information is generated, the INFO output is turned ON.

- **LED indicator**

  If information is generated, the PWR/ALM LED will simultaneously blink in green and red twice. (Green and red colors may overlap and it may be visible to orange.)

- **Motor operation**

  The motor continues to operate during information unlike in the case of an alarm.

- **Parameter**

  Each information has a corresponding "INFO action" parameter. If the parameter is set to "0: Only bit output is turned ON," only the bit output of information is turned ON, and the INFO output and LED are not changed.

Related parameters

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
11A0h	Driver temperature information (INFO-DRVTMP)	R/W	NV	A	40 to 85	85	°C	4
11A1h	Overload time information (INFO-OLTIME)	R/W	NV	A	1 to 300	50	0.1 s	4
11A2h	Speed information (INFO-SPD)	R/W	NV	A	0 to 12,000	0	min^{-1}	4
11A5h	Position deviation information (INFO-POSERR)	R/W	NV	A	1 to 30,000	300	×0.01 rev	4
11A8h	Motor temperature information (INFO-MTRTMP)	R/W	NV	A	40 to 120	85	°C	4
11A9h	Overvoltage information (INFO-OVOLT)	R/W	NV	A	120 to 450	435	V	4
11AAh	Undervoltage information (INFO-UVOLT)	R/W	NV	A	120 to 280	120	V	4
11AFh	Tripmeter information (INFO-TRIP)	R/W	NV	A	0 to 2,147,483,647	0	×100 rev	4
11B0h	Odometer information (INFO-ODO)	R/W	NV	A	0 to 2,147,483,647	0	×100 rev	4

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
11B1h	Cumulative load 0 information (INFO-CULD0)	R/W	NV	A	0 to 2,147,483,647	0	–	4
11B2h	Cumulative load 1 information (INFO-CULD1)	R/W	NV	A	0 to 2,147,483,647	0	–	4
11B3h	Cumulative load value auto clear	R/W	NV	A	0: Not clear 1: Clear	1	–	4
11B4h	Cumulative load value count divisor	R/W	NV	A	1 to 32,767	1	–	4
11BCh	INFO-USRIO output selection	R/W	NV	A	0 to 255	128	–	4
11BDh	INFO-USRIO output inversion	R/W	NV	A	0: Non invert 1: Invert	0	–	4
11BEh	Information LED condition	R/W	NV	A	0: LED not blink 1: LED blinks	1	–	4
11BFh	Information auto clear	R/W	NV	A	0: Disabled (not turned OFF automatically) 1: Enabled (turned OFF automatically)	1	–	4
17A0h	INFO action (Assigned I/O status information (INFO-USRIO))	R/W	NV	A	0: Only bit output is turned ON 1: bit output and INFO output are turned ON, and LED blinks	1	–	4
17A1h	INFO action (Position deviation information (INFO-POSERR))	R/W	NV	A		1	–	4
17A2h	INFO action (Driver temperature information (INFO-DRVTMP))	R/W	NV	A		1	–	4
17A3h	INFO action (Motor temperature information (INFO-MTRTMP))	R/W	NV	A		1	–	4
17A4h	INFO action (Overvoltage information (INFO-OVOLT))	R/W	NV	A		1	–	4
17A5h	INFO action (Undervoltage information (INFO-UVOLT))	R/W	NV	A		1	–	4
17A6h	INFO action (Overload time information (INFO-OLTIME))	R/W	NV	A		1	–	4
17A8h	INFO action (Speed information (INFO-SPD))	R/W	NV	A		1	–	4
17A9h	INFO action (Start operation error information (INFO-START))	R/W	NV	A		1	–	4
17AAh	INFO action (Start ZHOME error information (INFO-ZHOME))	R/W	NV	A		1	–	4

Parameter No.	Name	R/W	Save	Update	Range	Initial value	Unit	Size (byte)
17ABh	INFO action (PRESET request information (INFO-PR-REQ))	R/W	NV	A	0: Only bit output is turned ON 1: bit output and INFO output are turned ON, and LED blinks	1	–	4
17ADh	INFO action (Electronic gear setting error information (INFO-EGR-E))	R/W	NV	A		1	–	4
17AEh	INFO action (Wrap setting error information (INFO-RND-E))	R/W	NV	A		1	–	4
17B0h	INFO action (Forward operation prohibition information (INFO-FW-OT))	R/W	NV	A		1	–	4
17B1h	INFO action (Reverse operation prohibition information (INFO-RV-OT))	R/W	NV	A		1	–	4
17B2h	INFO action (Cumulative load 0 information (INFO-CULD0))	R/W	NV	A		1	–	4
17B3h	INFO action (Cumulative load 1 information (INFO-CULD1))	R/W	NV	A		1	–	4
17B4h	INFO action (Tripmeter information (INFO-TRIP))	R/W	NV	A		1	–	4
17B5h	INFO action (Odometer information (INFO-ODO))	R/W	NV	A		1	–	4
17BCh	INFO action (Start operation restricted mode information (INFO-DSLMTD))	R/W	NV	A		1	–	4
17BDh	INFO action (I/O test mode information (INFO-IOTEST))	R/W	NV	A		1	–	4
17BEh	INFO action (Configuration request information (INFO-CFG))	R/W	NV	A		1	–	4
17BFh	INFO action (Reboot request information (INFO-RBT))	R/W	NV	A		1	–	4

3-2 Information history

Up to 16 generated information items are saved in the RAM in order of the latest to oldest. Information items stored as the information history are the information code, generation time, and contents of information.
The information history stored in the RAM can be read or cleared if one of the following is performed.

- Read the information history with the Information history (device parameters 1510h to 151Fh) of MECHATROLINK-III.
- Clear the information history by setting the Clear information history (device parameter 10D4h) of MECHATROLINK-III to 1. (It is enabled when changing from 0 to 1.)
- Read or clear the information history using the **MEXE02**.

memo Information history is stored in the RAM, so they are cleared when the control power supply of the driver is turned off.

3-3 Information list

Information item	Information bit output signal	Cause	Reset condition
Assigned I/O status	INFO-USRIO	The I/O signal set with the INFO-USRIO output selection (device parameter 11BCh) was turned ON.	The I/O signal set with the INFO-USRIO output selection (device parameter 11BCh) was turned OFF.
Position deviation	INFO-POSERR	The deviation between the command position and feedback position exceeded the value set in the Position deviation information (device parameter 11A5h) in the motor output shaft.	The deviation between the command position and feedback position fell below the value set in the Position deviation information (device parameter 11A5h) in the motor output shaft.
Driver temperature	INFO-DRVTMP	The internal temperature of the driver exceeded the value set in the Driver temperature information (device parameter 11A0h).	The internal temperature of the driver fell about 5 °C (9 °F) below the value set in the Driver temperature information (device parameter 11A0h).
Motor temperature	INFO-MTRTMP	The detection temperature of the encoder exceeded the value set in the Motor temperature information (device parameter 11A8h).	The detection temperature of the encoder fell about 5 °C (9 °F) below the value set in the Motor temperature information (device parameter 11A8h).
Overvoltage	INFO-OVOLT	• The voltage of the main power supply exceeded the value set in the Overvoltage information (device parameter 11A9h). • A large load inertia was suddenly stopped. • Vertical operation (elevating operation) was performed.	The voltage of the main power supply fell below the value set in the Overvoltage information (device parameter 11A9h).
Undervoltage	INFO-UVOLT	• The voltage of the main power supply fell below the value set in the Undervoltage information (device parameter 11AAh). • The main power supply was shut off momentarily or a voltage shortage was generated.	The voltage of the main power supply exceeded the value set in the Undervoltage information (device parameter 11AAh).
Overload time	INFO-OLTIME	A load exceeding the maximum torque was applied for a time period exceeding the value set in the Overload time information (device parameter 11A1h).	The overload counter fell below the value set in the Overload time information (device parameter 11A1h).
Speed	INFO-SPD	The feedback speed of the motor exceeded the value set in the Speed information (device parameter 11A2h).	The feedback speed of the motor fell below the value set in the Speed information (device parameter 11A2h).

Information item	Information bit output signal	Cause	Reset condition
Start operation error	INFO-START	• The operation in the direction having stopped by the FW-BLK input or RV-BLK input was started. • The operation in the direction having stopped by the FW-LS input or RV-LS input was started. • The operation in the direction having stopped by the software limit was started.	Operation was started normally.
Start ZHOME error	INFO-ZHOME	When the coordinates were not set (the ABSPEN output was OFF), high-speed return-to-home operation was started.	Operation was started normally.
Preset request	INFO-PR-REQ	Preset was executed by the position preset (P-PRESET) or return-to-home operation.	Preset was completed.
Electronic gear setting error	INFO-EGR-E	The resolution set with the Electronic gear A (device parameter 11C0h) and Electronic gear B (device parameter 11C1h) was out of the specifications.	The resolution was set in the range of the specifications.
Wrap setting error	INFO-RND-E	The resolution and the Initial coordinate generation & wrap setting range (device parameter 11C9h) were inconsistent.	The Initial coordinate generation & wrap setting range (device parameter 11C9h) was set in the range of the specifications.
Forward operation prohibition	INFO-FW-OT	• The positive software limit was exceeded. • Either the FW-LS input or the FW-BLK input was turned ON.	The position coordinate of the motor was in the range of the positive software limit, and in addition, both the FW-LS input and the FW-BLK input were turned OFF.
Reverse operation prohibition	INFO-RV-OT	• The negative software limit was exceeded. • Either the RV-LS input or the RV-BLK input was turned ON.	The position coordinate of the motor was in the range of the negative software limit, and in addition, both the RV-LS input and the RV-BLK input were turned OFF.
Cumulative load 0	INFO-CULD0	The cumulative load exceeded the value set in the Cumulative load 0 information (device parameter 11B1h).	The cumulative load fell below the value set in the Cumulative load 0 information (device parameter 11B1h).
Cumulative load 1	INFO-CULD1	The cumulative load exceeded the value set in the Cumulative load 1 information (device parameter 11B2h).	The cumulative load fell below the value set in the Cumulative load 1 information (device parameter 11B2h).
Tripmeter	INFO-TRIP	The travel distance of the motor exceeded the value set in the Tripmeter information (device parameter 11AFh).	After one of the following operations was performed, the travel distance (Tripmeter) of the motor fell below the value set in the Tripmeter information (device parameter 11AFh). – The Tripmeter information (device parameter 11AFh) was set again. – The "Clear tripmeter" was executed with the **MEXE02**.
Odometer	INFO-ODO	The cumulative travel distance of the motor exceeded the value set in the Odometer information (device parameter 11B0h).	After the following operation was performed, the cumulative travel distance (Odometer) of the motor fell below the value set in the Odometer information (device parameter 11B0h). – The Odometer information (device parameter 11B0h) was set again.
Start operation restricted mode	INFO-DSLMTD	• "Remote operation" was executed with the **MEXE02**. • Configuration was executed.	• Remote operation was canceled. • Configuration was completed.

Information item	Information bit output signal	Cause	Reset condition
I/O test mode	INFO-IOTEST	• "I/O test" was executed with the **MEXE02**. • Configuration was executed.	• The I/O test mode was canceled. • Configuration was completed.
Configuration request	INFO-CFG	Execution of configuration was requested.	Configuration was executed.
Reboot request	INFO-RBT	Reboot was requested.	Reboot was executed.

memo If the "Preset request" information was generated for 100 ms or more while the Information auto clear (device parameter 11BFh) was set to disable, the preset may have failed.

3-4 Information code

Information codes are indicated in 8-digit hexadecimal number. They can also be read in 32 bits.
If multiple information items are generated, the logical sum (OR) of the information codes is indicated.

Information code	32 bits indication	Information item	Output signal
00000001h	0000 0000 0000 0000 0000 0000 0000 0001	I/O (user setting)	INFO-USRIO
00000002h	0000 0000 0000 0000 0000 0000 0000 0010	Position deviation	INFO-POSERR
00000004h	0000 0000 0000 0000 0000 0000 0000 0100	Driver temperature	INFO-DRVTMP
00000008h	0000 0000 0000 0000 0000 0000 0000 1000	Motor temperature	INFO-MTRTMP
00000010h	0000 0000 0000 0000 0000 0000 0001 0000	Overvoltage	INFO-OVOLT
00000020h	0000 0000 0000 0000 0000 0000 0010 0000	Undervoltage	INFO-UVOLT
00000040h	0000 0000 0000 0000 0000 0000 0100 0000	Overload time	INFO-OLTIME
00000100h	0000 0000 0000 0000 0000 0001 0000 0000	Speed	INFO-SPD
00000200h	0000 0000 0000 0000 0000 0010 0000 0000	Start operation error	INFO-START
00000400h	0000 0000 0000 0000 0000 0100 0000 0000	Start ZHOME error	INFO-ZHOME
00000800h	0000 0000 0000 0000 0000 1000 0000 0000	Preset request	INFO-PR-REQ
00002000h	0000 0000 0000 0000 0010 0000 0000 0000	Electronic gear setting error	INFO-EGR-E
00004000h	0000 0000 0000 0000 0100 0000 0000 0000	Wrap setting error	INFO-RND-E
00010000h	0000 0000 0000 0001 0000 0000 0000 0000	Forward operation prohibition	INFO-FW-OT
00020000h	0000 0000 0000 0010 0000 0000 0000 0000	Reverse operation prohibition	INFO-RV-OT
00040000h	0000 0000 0000 0100 0000 0000 0000 0000	Cumulative load 0	INFO-CULD0
00080000h	0000 0000 0000 1000 0000 0000 0000 0000	Cumulative load 1	INFO-CULD1
00100000h	0000 0000 0001 0000 0000 0000 0000 0000	Tripmeter	INFO-TRIP

Information code	32 bits indication	Information item	Output signal
00200000h	0000 0000 0010 0000 0000 0000 0000 0000	Odometer	INFO-ODO
10000000h	0001 0000 0000 0000 0000 0000 0000 0000	Start operation restricted mode	INFO-DSLMTD
20000000h	0010 0000 0000 0000 0000 0000 0000 0000	I/O test mode	INFO-IOTEST
40000000h	0100 0000 0000 0000 0000 0000 0000 0000	Configuration request	INFO-CFG
80000000h	1000 0000 0000 0000 0000 0000 0000 0000	Reboot request	INFO-RBT

4 Troubleshooting and remedial actions

In motor operation, the motor or the driver may not operate properly due to an improper setting or wrong connection. When the motor cannot be operated properly, refer to the contents provided in this chapter and take an appropriate remedial action. If the problem persists, contact your nearest Oriental Motor sales office.

Phenomenon	Possible cause	Remedial action
• The motor is not excited. • The motor output shaft can be rotated by hand.	Connection error of the motor cable	Check the motor connection.
	The FREE input is being ON.	Turn the FREE input OFF.
	The master station cannot put the motor into the servo ON state.	Check the following before sending the Servo ON command (SV_ON: 31h). • An alarm is not present. • The M_RDY (Bit 12) of the servo command status (SVCMD_STAT) is 1.
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 by the Servo OFF command (SV_OFF: 32h), the motor windings is brought into a state of being short-circuited inside the driver, generating a larger holding torque than when no current is supplied (dynamic brake). To release the dynamic brake, shut off the control power supply or turn the FREE input ON. Using the Non-excitation mode selection (device parameter 113Dh) can select whether to enable the dynamic brake status or the free-run status when the motor is in a non-excitation state.
The motor does not rotate.	When an electromagnetic brake motor is used, the electromagnetic brake is in a state of holding the motor shaft.	Check the connection of the electromagnetic brake.
	The STOP input is being ON.	Turn the STOP input OFF.
The motor rotates in the direction opposite to the specified direction.	The Motor rotation direction (device parameter 11C2h) is set wrongly.	Check the setting of the Motor rotation direction (device parameter 11C2h).
The gearhead output shaft rotates in the direction opposite to the motor.	A geared motor that rotates in the direction opposite to the motor output shaft is used.	• With the **TS** geared type, the gearhead output shaft rotates in the direction opposite to the motor when the gear ratio is 20 or 30. • With the Harmonic geared type, the gearhead output shaft always rotates in the direction opposite to the motor.
Motor operation is unstable.	Connection error of the motor cable or power supply cable.	Check the connections for the driver, the motor, and the main power supply.
	The value set in the Base current (device parameter 1126h) is too low.	Check the setting of the Base current (device parameter 1126h). If the motor current value is low with respect to a load, the torque will also be low and the operation will be unstable.
Motor vibration is too large.	The load is small.	Lower the current with the Base current (device parameter 1126h). If the motor output torque is too large with respect to a load, vibration will increase.
The electromagnetic brake is not put into a state of releasing the motor shaft.	The power is not supplied to the electromagnetic brake.	Check the connection of the electromagnetic brake.

memo When an alarm is being generated, check the alarm message via MECHATROLINK-III or with the **MEXE02**.

6 Reference materials

◆Table of contents

1 Specifications

1-1 Product specifications

Driver model		AZD-AM3	AZD-CM3
Main power supply	Input voltage	Single-phase 100 - 120 VAC −15 to +6 % 50/60 Hz	Single-phase 200 - 240 VAC −15 to +6 % 50/60 Hz Three-phase 200 - 240 VAC −15 to +6 % 50/60 Hz
	Input current	2.7 to 6.4 A *1	Single-phase: 1.6 to 3.9 A *1 Three-phase: 1.0 to 2.3 A *1
Control power supply	Input voltage	24 VDC±5 % *2	
	Input current	0.25 A (0.5 A) *3	
Interface	Control input	Number of input points: 4, photocoupler	
	Control output	Number of output points: 3, photocoupler/open collector	
	Power removal signal input	Number of input points: 2, photocoupler	
	Power removal monitor output	Number of output points: 1, photocoupler/open collector	
	Field network	MECHATROLINK-III	

*1 The input current varies depending on the motor combined. Refer to p.29.
*2 When an electromagnetic brake motor is used, if the wiring distance between a cable type motor and a driver is extended to 20 m (65.6 ft.) using Oriental Motor cables, the input voltage is 24 VDC±4 %.
*3 The value in parentheses ( ) is the one when the electromagnetic brake motor is connected. The **AZM46** type is 0.33 A.

1-2 General specifications

Degree of protection		IP20
Operating environment	Ambient temperature	0 to +55 °C [+32 to +131 °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 Shipping environment	Ambient temperature	−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: • Protective Earth Terminal - Main power supply input terminal • Encoder connector - Main power supply input terminal • I/O signal connector - Main power supply input terminal
Dielectric strength		Sufficient to withstand the specified voltage applied between the following places for 1 minute: • Protective Earth Terminal - Main power supply input terminal 1.5 kVAC 50/60 Hz • Encoder connector - Main power supply input terminal 1.8 kVAC 50/60 Hz • I/O signal connector - Main power supply input terminal 1.8 kVAC 50/60 Hz

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

2 Regulations and standards

2-1 UL Standards, CSA Standards

This product is recognized by UL under UL and CSA Standards.
The driver is not provided with the electronic motor overload protection and the motor overtemperature protection specified in UL and CSA Standards.

2-2 CE Marking / UKCA Marking

This product is affixed with the marks under the following directives/regulations.
EU Declaration of Conformity can be downloaded from Download Page of the product in Oriental Motor Website (https://www.orientalmotor.eu/).

■ EU Low Voltage Directive / UK Electrical Equipment (Safety) Regulation

Installation conditions

Overvoltage category	II
Pollution degree	2
Degree of protection	IP20
Protection against electric shock	Class I Equipment

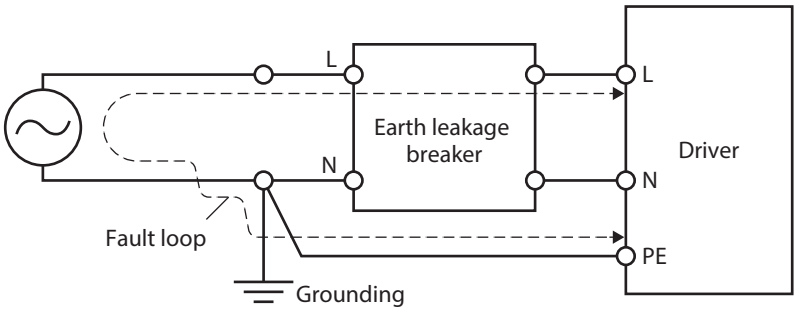
- This product cannot be used in IT power distribution systems.
- Isolate the motor cable, the power supply cable and other drive cables from the signal cables by means of double insulation.
- The temperature of the driver's heat sink may exceed 90 °C (194 °F) depending on the driving condition. Observe the followings.
  - Be sure to perform test operation and check the driver temperature.
  - Do not use the driver near combustibles.
  - Do not touch the driver while operating.
- Use a circuit breaker conforming to EN or IEC Standards.
- The driver is not provided with the electronic motor overload protection and the motor overtemperature protection specified in EN Standards.
- The driver is not provided with the ground fault protection circuit. Wire the product in accordance with "Example of wiring to power supply considering ground fault protection" on p.190. Also observe the followings.
  - Earth leakage breaker: Rated current 15 A, rated sensitivity current 30 mA
  - When connecting to a power supply of Overvoltage category III, use an insulation transformer to ground its secondary side (N for single-phase, neutral point for three-phase).
  - Fault loop impedance: Equal to or less than the value in table

Power supply specifications of driver	Fault loop impedance
Single-phase 100-120 VAC	500 Ω
Single-phase 200-240 VAC Three-phase 200-240 VAC (Delta connection)	1,000 Ω
Three-phase 200-240 VAC (Star connection)	577 Ω

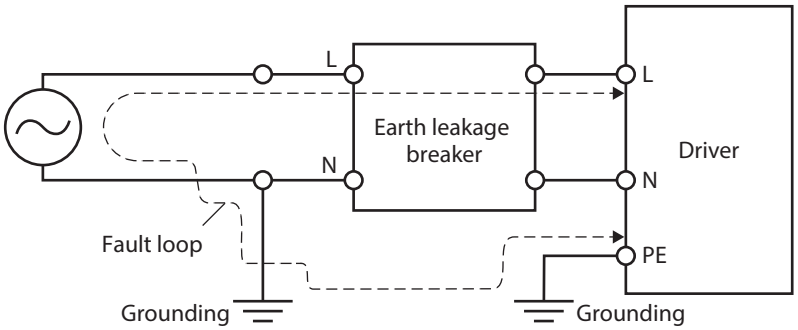
- **Example of wiring to power supply considering ground fault protection**

Single-phase 100-120 VAC, Single-phase 200-240 VAC

- TN power distribution systems

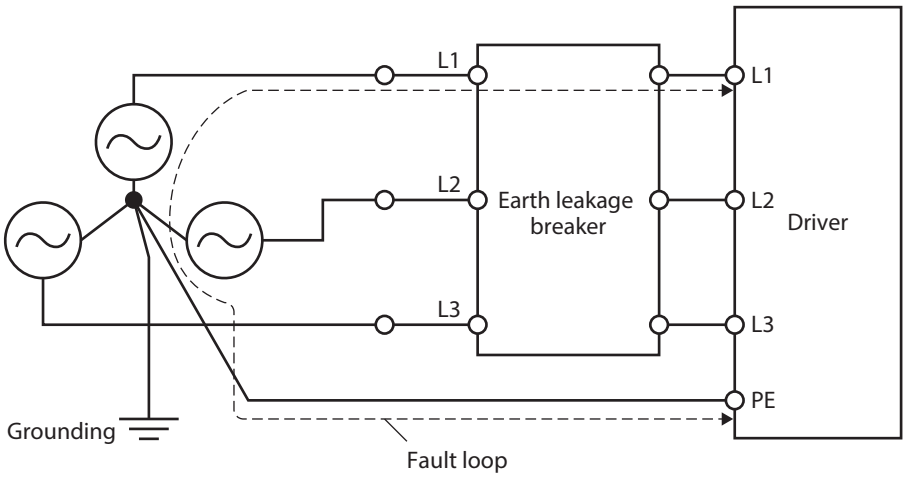


- TT power distribution systems

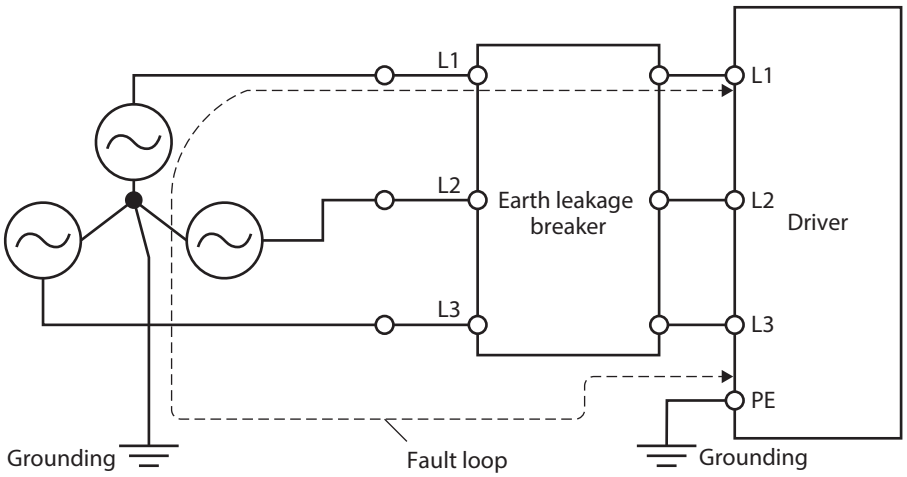


Three-phase 200-240 VAC

- TN power distribution systems



- TT power distribution systems



■ EU EMC Directive/UK EMC Regulation

Refer to "4-9 Conformity to EMC Directive/Regulations" on p.35 for details about conformity.

■ EU Machinery Directive/UK Machinery Regulation

Applicable standards: EN ISO 12100, EN 61800-5-2, EN ISO 13849-1: 2015

■ EU RoHS Directive/UK RoHS Regulation

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

2-3 Functional safety

This product is certified by TÜV SÜD Product Service GmbH under the following standards and affixed with the TÜV SÜD Mark. It is not a certified product if the TÜV SÜD Mark is not affixed.

Applicable standards	Functional safety	IEC 61800-5-2, EN 61800-5-2 IEC 61508-1, EN 61508-1 IEC 61508-2, EN 61508-2 ISO 13849-1:2015, EN ISO 13849-1:2015
	Electrical safety	IEC 61800-5-1, EN 61800-5-1
	EMC	IEC 61000-6-7, EN 61000-6-7
Safety function		STO (Safe Torque Off)

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