Orientalmotor

α STEP

AZ Series/Motorized Actuator equipped with AZ Series

mini Driver

EtherCAT Drive Profile Compatible

USER MANUAL

Introduction

Hardware

EtherCAT communication

Object list

Troubleshooting

Reference materials

Thank you for purchasing an Oriental Motor product.

This Manual describes product handling procedures and safety precautions.

● Please read it thoroughly to ensure safe operation.

● Always keep the manual where it is readily available.

1 Introduction

2 Hardware

3 EtherCAT communication

4   Object 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 "4 Safety precautions" on p.10. In addition, be sure to observe the contents described in warning, caution, and note in this manual.
The product described in this document has been designed and manufactured to be incorporated in general industrial equipment. Do not use for any other purpose. Oriental Motor Co., Ltd. is not responsible for any compensation for damage caused through failure to observe this warning.

1 Introduction

2 Operating manuals

2-1 Related operating manuals

For operating manuals, download from Oriental Motor Website Download Page or contact your nearest Oriental Motor sales office.

- **AZ** Series/Motorized Actuator equipped with **AZ** Series
  mini Driver EtherCAT Drive Profile Compatible 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 Edition

- OPERATING MANUAL Actuator Edition

- 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 mini Driver EtherCAT drive profile compatible, 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.
Reference destinations are indicated according to the flow of use.

■ 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.

| Setting of parameters | —— Procedure |

| 3 EtherCAT communication
4 Object lists | —— Reference destination in this manual |

| 4 Parameters
7 Address/code lists | —— Reference destination in **AZ** Series
OPERATING MANUAL Function Edition |

1 Introduction

Installation and connection →	Before starting operation →	Setting of node address
2 Hardware	1 Before starting operation *1	2 Hardware

Setting of parameters →	Operation
3 EtherCAT communication 4 Object lists	3 EtherCAT communication
4 Parameters 7 Address/code lists	3 I/O signals 8 Measures for various cases 11 Appendix *2

*1 When a motorized actuator is used, the following contents cannot be operated via EtherCAT communication. 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 "LEDs of the driver." (⇨ p.19)

■ **Description of power supplies**

This manual describes contents when a main power supply and a control power supply are used.
The mini Driver can also be used with a main power supply only. When using it with only the main power supply, replace "main power supply and control power supply" or "control power supply" with "main power supply" to read this manual.

■ **About notation of objects**

In this manual, the object name is followed by the index number in parentheses.
Example: Controlword (6040h)

3 Overview of the product

The **AZ** Series mini Driver EtherCAT drive profile compatible is the dedicated driver for the **AZ** Series products.

■ Compact and light weight

Compact and lightweight are achieved, offering the dimensions of 69×56×30 mm (2.72×2.2×1.18 in.) and the mass of 0.11 kg (0.24 lb.).

■ How to set parameters

EtherCAT objects that can be saved in the driver are called parameters.
Parameters can be set via EtherCAT communication or using the **MEXE02**.
This manual describes how to set parameters via EtherCAT communication.

■ Providing the ESI File

The ESI file (EtherCAT Slave Information file) is a file that describes the specific information of the EtherCAT slave products in XML format. By importing the ESI file to the EtherCAT Configuration Tool of a PLC (programmable controller), the settings of EtherCAT communication can be configured before the driver is delivered.
For details, contact your nearest Oriental Motor sales office.

1 Introduction

4 Safety precautions

The precautions described below are intended to ensure the safe and correct use of the product, and to prevent the customer and others 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, in places 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.
- When an alarm of the driver is generated (any of the driver's protective functions is triggered), remove the cause before resetting the alarm (protective function). Continuing the operation without removing the cause of the problem may cause malfunction of the motor and the driver, leading to injury or damage to equipment.

Installation

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

Connection

- Observe the product specifications for the power supply voltage of the driver. Failure to do so may result in fire or electric shock.
- Connect the product securely according to the connection diagram. Failure to do so may result in fire or electric shock.
- Do not forcibly bend, pull, or pinch the connection cable. Doing so may result in fire or electric shock.

Operation

- Turn off the main power supply and the control power supply in the event of a power failure. Failure to do so may result 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.

⚠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 during operation 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.
- 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.
- 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.
- When moving the moving part manually, put the motor into a non-excitation state. Continuing the work while the motor is in an excitation state may result in injury.
- For the main power supply and 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.
- 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.

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.32.

● **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 the dielectric strength test with the motor and driver connected may result in damage to the product.

● **Note when connecting a main power supply and a control power supply in a state of grounding the positive side**

The USB connector on the driver is not electrically insulated. When grounding the positive terminals of a main power supply and a 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.27 for the noise elimination measures.

● **Regeneration**

When operating a large load inertia at a high speed, the regenerative energy generated may increase the voltage of the main power supply, causing an alarm of Overvoltage to generate. To prevent damage to the driver, reconsider the operating conditions so that regenerative voltage does not generate.

■ **Notes when the connection cable is used**

Note the following points when an Oriental Motor cable is used.

● **When inserting the connector**

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

● **When pulling out the connector**

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

● **Bending radius of cable**
  - Use the cable in a condition where the bending radius of the cable is as follows.
    Cable type: More than 6 times the cable diameter
    Connector type: More than 2.8 times the cable diameter
  - Do not bend the lead wires part or secure with a clamp, etc. Doing so may result in damage to the connector.

Do not bend the lead wires part

Cable type: More than 6 times the cable diameter
Connector type: More than 2.8 times the cable diameter

1 Introduction
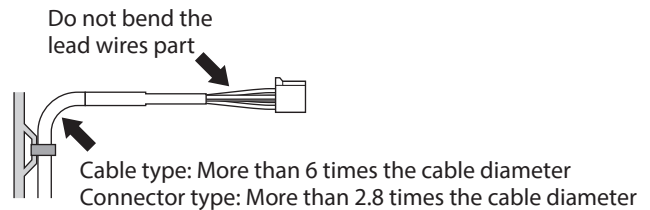
● **How to fix the cable**

Fix the cable at two places near the connectors as shown in the figure or fix it with a wide clamp to take measures to prevent stress from being applied to the connectors.

In the case of a flexible cable, this area is a movable range.

Fixing at two places

Motor

Do not bend the lead wires part or fix with a clamp

Fixing at two places
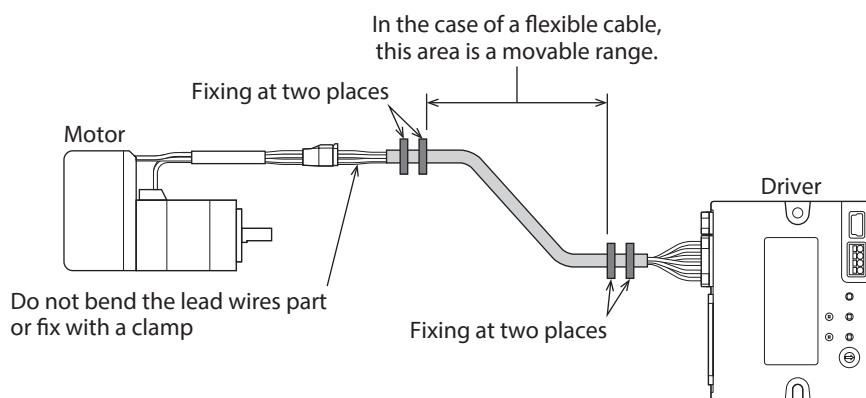
Driver

2   Hardware

This part explains names and functions of each part of the driver, installation and connection methods, and so on.

◆**Table of contents**

1   System configuration

*1 Connecting the control power supply allows you to continue monitoring even if the main power supply is shut off. Connect it as necessary.
*2 It is recommended that a circuit breaker or a circuit protector is connected because incorrect wiring of the power supply may cause the internal input circuit to short-circuit.
*3 Connect when using direct inputs 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 branch or sales office from which you purchased the product.

- Driver .... 1 unit
- Instructions and Precautions for Safe Use .... 1 copy

2-2 How to identify the product model

Check the driver model against the model shown on the nameplate. Refer to "2-4 Information about nameplate" on p.18 for how to identify the nameplate.

AZD - K R ED
  1   2 3 4

1	Series	**AZD**: **AZ** Series driver
2	Power supply input	**K**: DC power input
3	Driver figure	**R**: Compact
4	Type	**ED**: EtherCAT Drive Profile Compatible

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
DC power input	Stepping Motor	**AZ** Series	**AZM**	**AZM46AK**
	Motorized actuator	**EAC** Series *2	**EACM**	**EACM2E05AZAK**
		EAS Series *2	**EASM**	**EASM4NXD005AZAK**
		EZS Series *2	**EZSM**	**EZSM6D005AZAK**
		DR Series	**DR**	**DR28G2.5B03-AZAKU**
		DRS2 Series	**DRSM**	**DRSM60-05A4AZAK**
		DGII Series *2	**DGM** **DGB**	**DGM85R-AZAK** **DGB85R12-AZAKR**
		EH Series *2	**EH**	**EH4-AZAKH**
		L Series *2	**LM**	**LM4F150AZAK-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. The model name of the equipped motor can be checked as follows.
  EAC Series, **EAS** Series, **EZS** Series: Check with the motor nameplate.
  DGII Series, **EH** Series, **L** Series: Check with "P/N (Motor P/N)" described on the actuator nameplate.

2-4 Information about nameplate

The figure shows an example.

Driver model ⟶ MODEL **AZD-XXXX**

Oriental motor MOTOR DRIVER

Serial number ⟶ PO4 0123456 2022/01 ◄

ORIENTAL MOTOR CO., LTD.
TOKYO 110-8536 JAPAN MADE IN JAPAN

Manufacturing date
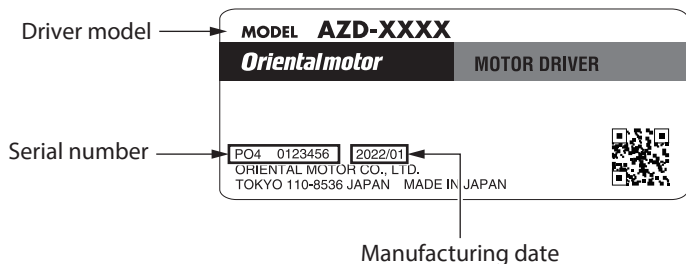
2-5 Names and functions of parts

PWR/ALM LED (Green/Red/Blue)
RUN LED (Green)
ERR LED (Red)
Node address setting switch (ECAT ID ×1)
Input signal connector (CN5)
USB connector
L/A LED (Green)
Mounting hole
Cutout for mounting

CONTROL POWER
MAIN POWER

Power supply connector (CN1)
Motor/encoder/electromagnetic brake connector (CN2)
EtherCAT communication connector (ECAT OUT CN4)
EtherCAT communication connector (ECAT IN CN3)
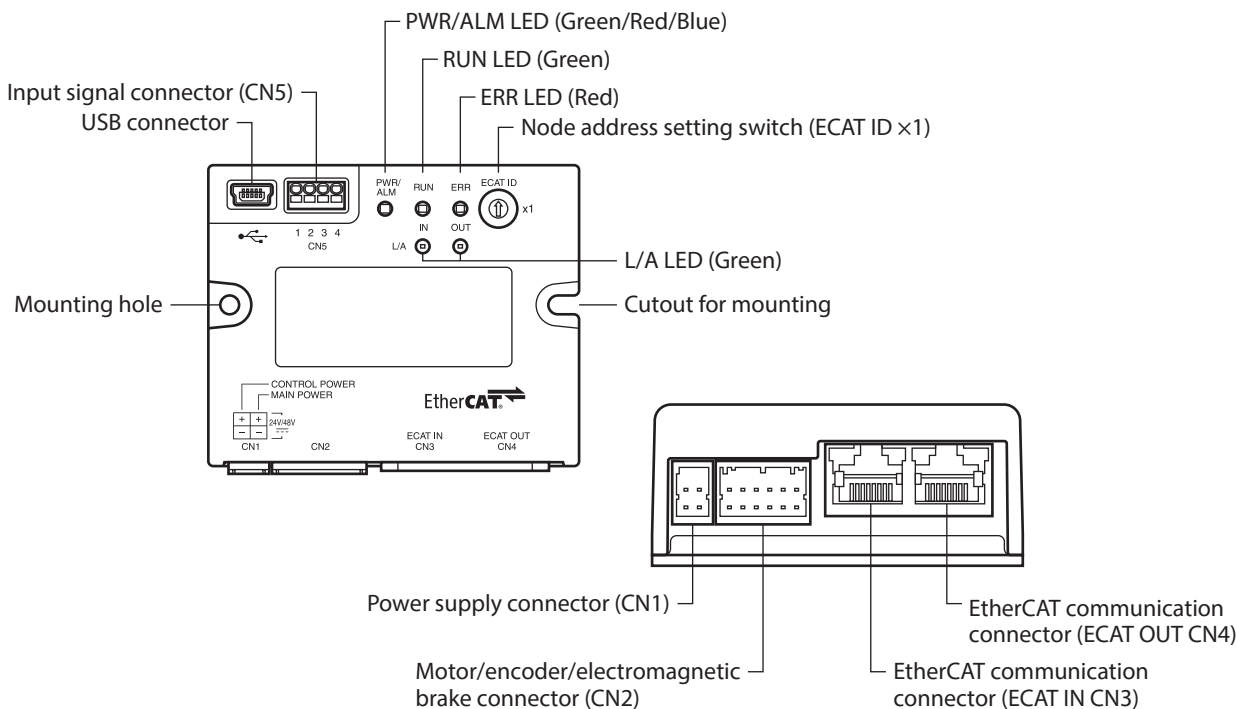
Type	Name	Sign	Description
LED	PWR/ALM LED (Green/Red/Blue)	PWR/ALM	This LED indicates the status of the driver.
	RUN LED (Green)	RUN	This LED indicates the status of EtherCAT communication.
	ERR LED (Red)	ERR	This LED blinks when an error occurred via EtherCAT communication.
	L/A LED (Green)	L/A	This LED indicates the LINK/ACT status of EtherCAT communication.
Switch	Node address setting switch	ECAT ID ×1	Sets the node address. Factory setting: 0 (×1: 0)
Connector	Power supply connector (CN1)	+, −	Connects a main power supply and a control power supply.
	Motor/encoder/electromagnetic brake connector (CN2)	−	Connects the motor, the encoder, and the electromagnetic brake.
	USB communication connector	⌁	Connects a PC in which the **MEXE02** has been installed. (USB2.0 mini-B port)
	EtherCAT communication connector (CN3)	ECAT IN	Connects with the upper-level EtherCAT communication compatible product.

Type	Name	Sign	Description
Connector	EtherCAT communication connector (CN4)	ECAT OUT	Connects with the EtherCAT communication compatible product of the following node address.
	Input signal connector (CN5)	–	Connects when using direct inputs or sensors.

2-6   Indication of LEDs

■ LED indication related to driver status

PWR/ALM LED status	Description
No light	The main power supply and the control power supply are not turned on.
Green light	The main power supply and/or the control power supply are turned on.
Blinking red	An alarm is being generated. The alarm message 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 blue	• Information is being generated. The LED is lit in green when the information is cleared. • Remote operation is being executed with the **MEXE02**. The LED is lit in green when remote operation 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.

■ LED indication related to EtherCAT communication status

LED indicator	LED status	Description
RUN (Green)	No light	Initialization state
	Blinking *	Pre-Operational state
	Single flash *	Safe-Operational state
	Lit	Operational state (normal condition)
ERR (Red)	No light	No communication error
	Blinking *	Communication setting error
	Single flash *	Communication data error
	Double flash *	Communication watchdog timeout
L/A (Green)	No light	No link
	Lit	Link establishment
	Flickering *	In operation after link establishment

* The blinking state of the LED is as follows. (Unit: ms)

2 Hardware
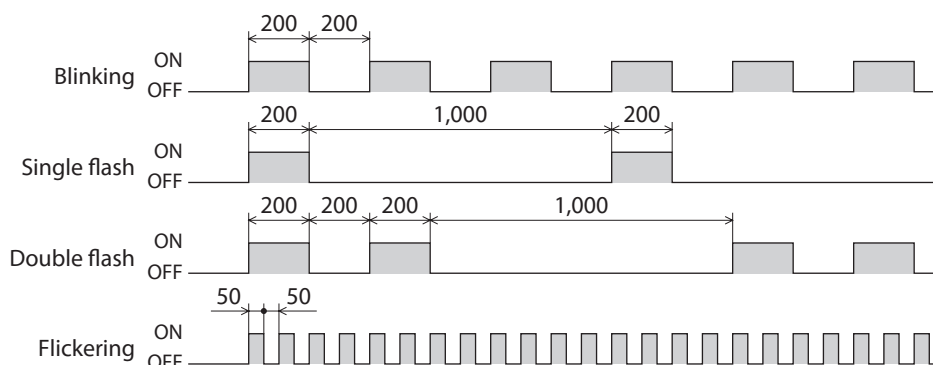
3 Installation

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 +50 °C [+32 to 122 °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 can be installed in any direction.
Install the driver onto a flat metal plate offering high heat conductivity [material: aluminum, 150×150×2 mm (5.91×5.91×0.08 in.) or equivalent].
When installing the driver, use the mounting holes and the cutouts for mounting to secure on the metal plate with two screws (M3: not included).

Screws (M3)

Metal plate
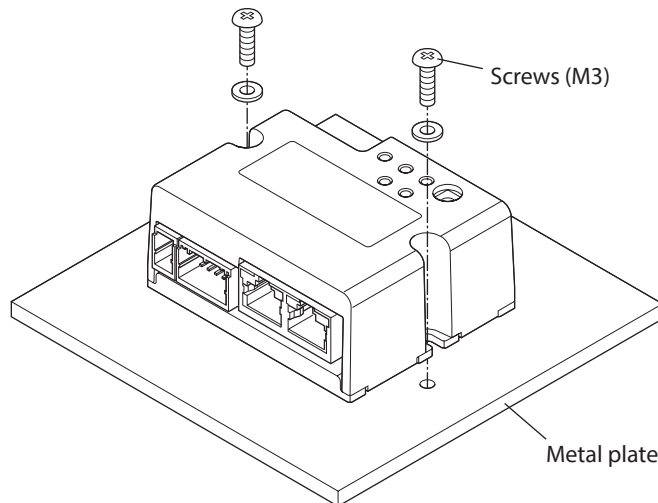
Note
- Install the driver in an enclosure.
- Do not install any equipment that generates a large amount of heat or noise near the driver.
- Do not install the driver underneath an EtherCAT master or other equipment sensitive to heat.
- If the ambient temperature of the driver exceeds 50 °C (122 °F), reconsider the ventilation conditions such as providing forced cooling by using fans.

2 Hardware

■ Dimensions [Unit: mm (in.)]

Mass: 0.11 kg (0.24 lb.)

69 [2.72]

4 [0.16] 61 [2.4]

30 [1.18]

ø3.5 [0.138]

26 [1.02]

56 [2.2]

R1.75 [0.069]

(40 [1.57])

2 [0.08]
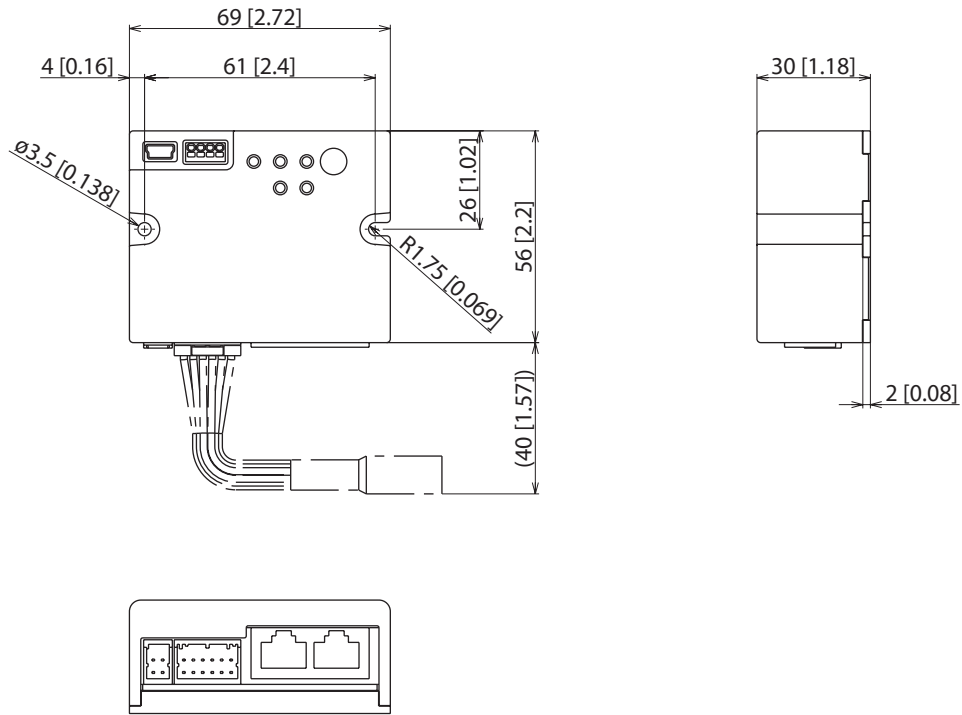
4 Connection

This chapter explains a connection example of a driver and a motor, connection methods of a main power supply and a control power supply, and so on.
The installation and wiring methods in compliance with the EMC Directives/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.

4-1 Connection example

The figure shows an example when the **AZM14** motor is connected.
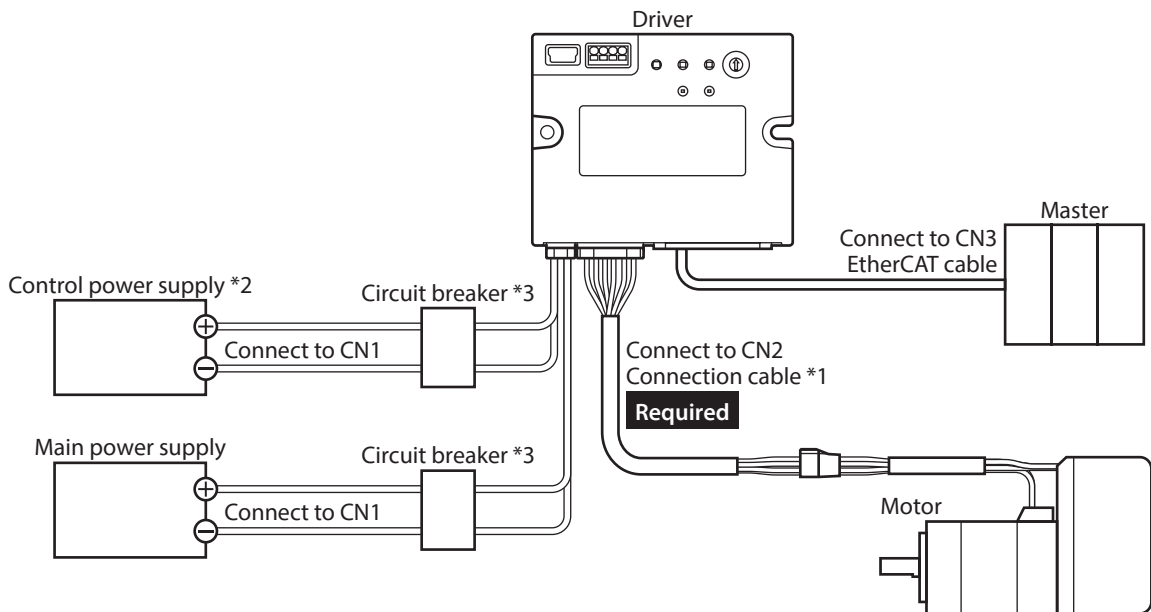
*1 It is an Oriental motor cable. Purchase is required separately.
*2 Connecting the control power supply allows you to continue monitoring even if the main power supply is shut off. Connect it as necessary.
*3 It is recommended that a circuit breaker or a circuit protector is connected because incorrect wiring may cause the internal input circuit to short-circuit.

Note
● Connect the connectors securely. Insecure connections may cause malfunction or damage to the motor or the driver.
● When connecting the cables, secure them so that no load is applied to the connectors. Applying a load to the connector may result in a connection failure, causing the driver to malfunction.
● Keep 10 m (32.8 ft.) or less for the wiring distance between a motor and a driver. Exceeding 10 m (32.8 ft.) in the wiring distance may result in increase of the electrical noise emitted from the driver.
● Keep 2 m (6.6 ft.) or less for the cable length of the main power supply and control power supply.

memo
● Before connecting or disconnecting a connector, turn off the main power supply and the control power supply, and check the PWR/ALM LED has been turned off.
● When disconnecting the connector, pull out while pressing the latches on the connector with fingers.

4-2 Connecting the main power supply and the control power supply (CN1)

Connect a main power supply to the CN1 connector.
Connecting the control power supply allows you to continue monitoring even if the main power supply is shut off.
Connect it as necessary.

Note Make sure the polarity of the power supply before connecting. Reverse-polarity connection may cause damage to the driver.

■ Applicable connector

Type	Part number	Applicable lead wire
Connector housing	1-1827864-2 (TE Connectivity)	AWG22 (0.34 to 0.37 mm^2) AWG20 (0.51 to 0.53 mm^2)
Contact	1827589-2 (TE Connectivity)	AWG18 (0.85 to 0.87 mm^2) Lead wire insulation outer diameter: ø1.4 to 2.2 mm (ø0.055 to 0.087 in.)
Designated crimp tool	2119142-1 (TE Connectivity)	Lead wire insulation strip length: 1.7 to 2.3 mm (0.067 to 0.091 in.)

■ Pin assignment

The figure shows the view from the insertion side of contacts.

Pin No.	Name	Description
A1	GND	Ground for control power supply
A2	GND	Ground for main power supply
B1	Control power supply	+24 VDC/+48 VDC
B2	Main power supply	+24 VDC/+48 VDC
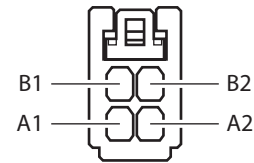
memo A1 and A2 are not electrically insulated.

■ Voltage specifications

The voltage specifications of power supply input include the rated voltage and the allowable operating voltage.
The voltage specifications are common for the main power supply and the control power supply.

Rated voltage	24 VDC±5 % 48 VDC±5 %
Allowable operating voltage	24 VDC input: 20 to 32 VDC (22.8 to 32 VDC) * 48 VDC input: 40 to 55 VDC

* The value in parentheses ( ) is the one when the electromagnetic brake motor is connected.

memo Set the Main power mode (41FAh) to "0: 24 VDC" or "1: 48 VDC" when the main power supply starts up slowly or the voltage of the main power supply is unstable. ()

2 Hardware

■ Internal input circuit

The driver can be used with the main power supply and control power supply, or with the main power supply only. When using only the main power supply, the power is supplied from the main power supply to the control power supply circuit inside the driver.
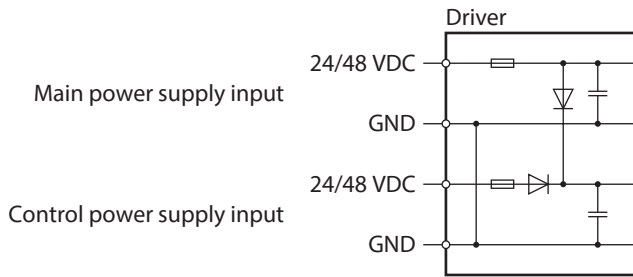
■ Power supply current capacity

● Current capacity for main power supply

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 when using the **EAC** Series, **EAS** Series, or **EZS** Series.

Series	Model	Rated voltage	Power supply current capacity
AZ Series **EAC** Series **EAS** Series **EZS** Series	**AZM14**	24 VDC±5 %	0.4 A or more
	AZM15		0.5 A or more
	AZM24, **AZM26**		1.4 A or more
	AZM46	24 VDC±5 % 48 VDC±5 %	1.6 A or more
	AZM48		2.1 A or more
	AZM66		3.7 A or more
	AZM69		3.5 A or more
DGII Series	**DGM60**	24 VDC±5 %	1.4 A or more
	DGB85	24 VDC±5 % 48 VDC±5 %	1.6 A or more
	DGB130		3.7 A or more
	DGM85		1.6 A or more
	DGM130		3.7 A or more
DR Series	**DR20**	24 VDC±5 %	0.4 A or more
	DR28		1.3 A or more
DRS2 Series	**DRSM42**	24 VDC±5 % 48 VDC±5 %	1.5 A or more
	DRSM60		2.6 A or more
EH Series	**EH3**	24 VDC±5 %	0.4 A or more
	EH4		1.4 A or more
L Series	**LM2**, **LM4**	24 VDC±5 % 48 VDC±5 %	3.7 A or more

● Current capacity for control power supply

Rated voltage	Power supply current capacity	
	Without electromagnetic brake	With electromagnetic brake
24 VDC±5 % 48 VDC±5 %	0.15 A	0.4 A *

* The **AZM46** type is 0.23 A.

4-3   Connecting the EtherCAT cable (CN3/CN4)

Connect an EtherCAT master to the CN3 (ECAT IN) connector on the driver using the EtherCAT cable.
Be sure to connect from the CN4 (ECAT OUT) connector to the CN3 (ECAT IN) connector when connecting between drivers.
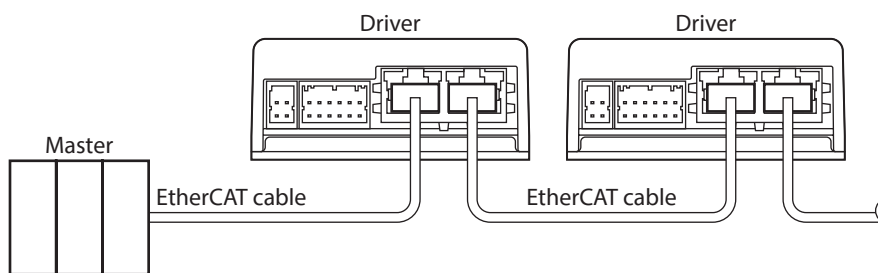
■ Pin assignment

Signal name	Description
TXP	Transmitted data +
TXN	Transmitted data −
RXP	Received data +
N.C.	–
N.C.	–
RXN	Received data −
N.C.	–
N.C.	–
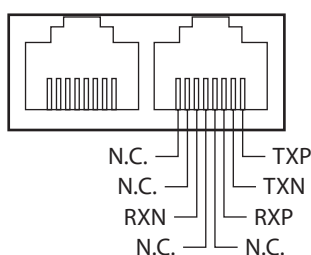
4-4   Connecting the USB cable

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.

2 Hardware

4-5 Connecting input signals (CN5)

Connect when using direct inputs or sensors.

■ Applicable lead wire and terminal

Applicable lead wire	● AWG26 to 20 (0.14 to 0.5 mm^2)
	● Lead wire strip length: 6 mm (0.24 in.)
Applicable ferrule terminal	Without sleeve: 0.25 to 0.5 mm^2
	With sleeve: 0.25 to 0.34 mm^2

■ Pin assignment

Pin No.	Signal name	Description *
1	IN0+	Control input 0 (HOMES)
2	IN0−	
3	IN1+	Control input 1 (FREE)
4	IN1−	
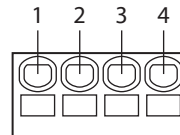
* ( ): Initial value

■ Connection example with a current sink output circuit
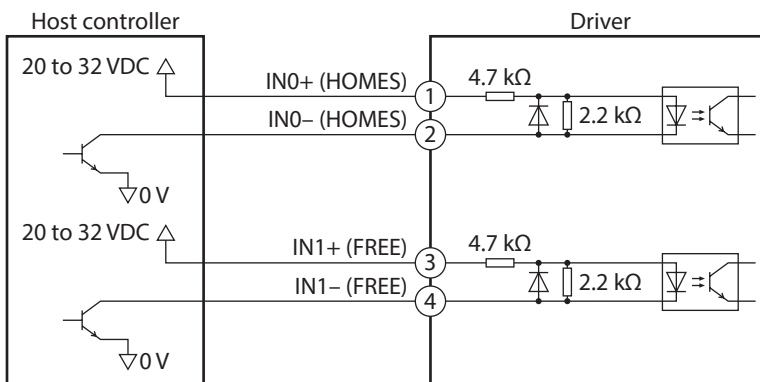
* ( ): Initial value

■ Connection example with a current source output circuit
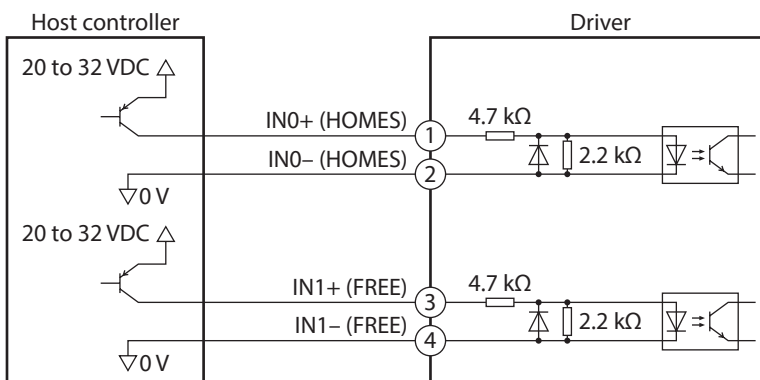
* ( ): Initial value

4-6   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 an Oriental Motor connection cable when extending the wiring distance between a motor and a driver. Refer to p.32 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 on the input side of the DC power supply.
- 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.

Shielded cable

Cable clamp
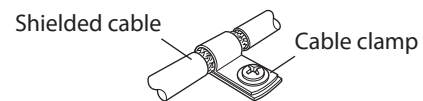
● **Suppression of effect by noise propagation**

- 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.

4-7   Conformity to EMC Directives/Regulations

Effective measures must be taken against EMI that the motor and driver may give to adjacent control-system equipment, as well as 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 Directives/Regulations.
Oriental Motor conducts EMC testing on its motors and drivers in accordance with "Example of installation and wiring" on p.28. The user is responsible for ensuring the machine's compliance with 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 main power supply and the control power supply**

Use DC power supplies compliant with EMC Directives/Regulations for the main power supply and the control power supply. Use shielded cables to wire and ground as short as possible. Refer to "Prevention of noise propagation" for how to ground the shielded cable.

● **Ferrite core**

Install the following ferrite core (or equivalent) to the places shown in "Example of installation and wiring" on p.28.
Part No.: ZCAT3035-1330 (TDK Corporation)

2 Hardware

● **Connecting the motor cable**

Use an Oriental Motor connection cable when extending the wiring distance between a motor and a driver. Refer to p.32 for the model name.

● **Connecting the signal cable**

Refer to "Prevention of noise propagation" on p.27.

● **Grounding method**

- Wires used to ground the motor must be as thick and short as possible so that no potential difference is generated between the grounding points.
- Choose a large, thick and uniformly conductive surface for the grounding point.
- Make sure to ground the Protective Earth Terminal of the motor.

● **Example of installation and wiring**

The figure shows an example when the cable type electromagnetic brake motor is used.
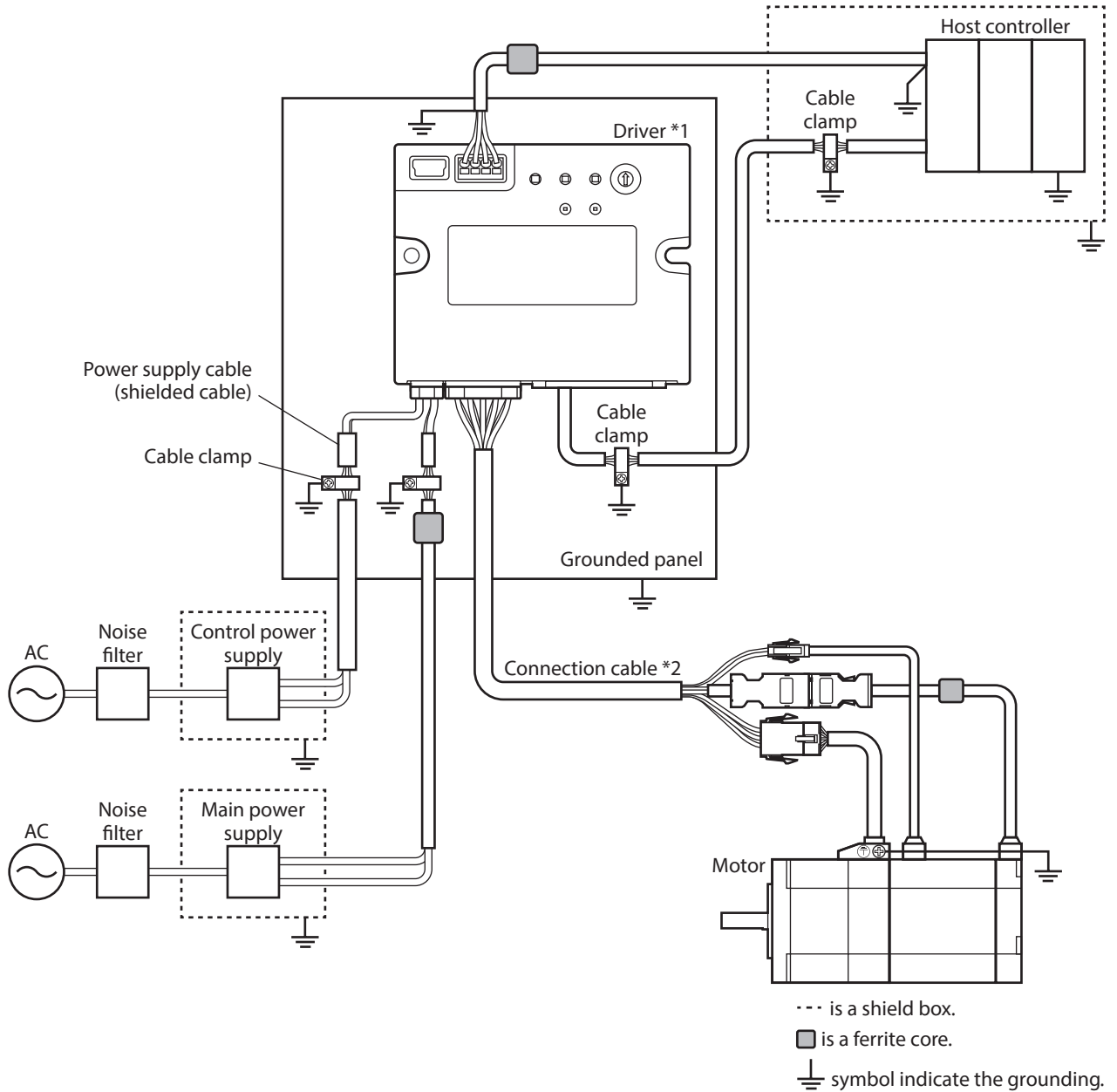
*1 The driver is grounded by making the heat sink contact directly with the grounded panel.
*2 An Oriental Motor cable is used.

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.
- When connecting the following products, cover the motor cable with a shielded braided sleeving. Use the cable clamps to ground both ends of the shielded braided sleeving.
  - **AZ** Series: **AZM14**, **AZM15**, **AZM24**, **AZM26**
  - **EAC** Series: **EACM2**
  - **EAS** Series: **EASM2**
  - **DR** Series: **DR20**, **DR28**
  - **DGII** Series: **DGM60**
  - **EH** Series: **EH3**, **EH4**

2 Hardware

5 Setting of node address

This chapter explains how to set the node address.

5-1 Setting method

Use the node address setting switch (ECAT ID ×1) to set the node address.
The node address setting switch is hexadecimal. Convert the node address from decimal to hexadecimal to set.
When connecting two or more EtherCAT communication compatible products, do not set duplicate node addresses.

Factory setting: 0 (×1: 0)

Setting range	Description
0 (00h)	The setting of the EtherCAT master is enabled.
1 to 15 (01h to 0Fh)	The setting of the driver is enabled.

Note Be sure to turn off the main power supply and control power supply of the driver before setting the switch. Setting the switch in a state where the main power supply and control power supply is on will not enable the new setting.

2 Hardware

6   Inspection and maintenance

6-1   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 any of the mounting screws secured 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.

6-2   Warranty

Check on the Oriental Motor Website for the product warranty.

6-3   Disposal

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

2 Hardware

7 Cable

7-1 Connection cables (for cable type)

■ Connection cables/Flexible connection cables (For AZM14, AZM15, AZM24, AZM26)

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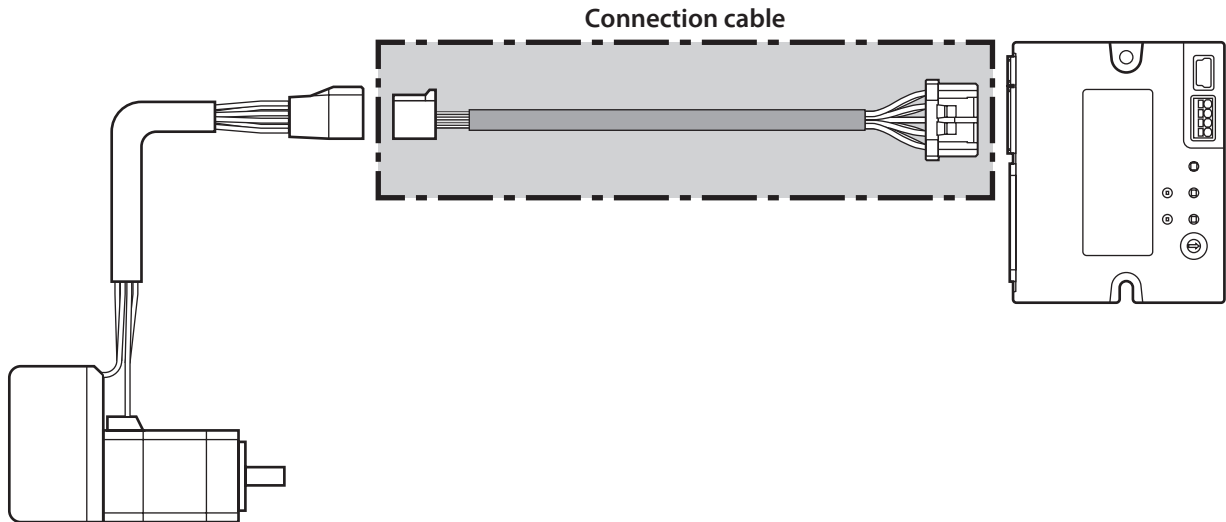
Connection cable

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

● **Connection cables**
  For motor/encoder

Model	Length [m (ft.)]
CCM005Z2AAF	0.5 (1.6)
CCM010Z2AAF	1 (3.3)
CCM030Z2AAF	3 (9.8)
CCM050Z2AAF	5 (16.4)
CCM100Z2AAF	10 (32.8)

● **Flexible connection cables**
  For motor/encoder

Model	Length [m (ft.)]
CCM005Z2AAR	0.5 (1.6)
CCM010Z2AAR	1 (3.3)
CCM030Z2AAR	3 (9.8)
CCM050Z2AAR	5 (16.4)
CCM100Z2AAR	10 (32.8)

2 Hardware

■ Connection cables/Flexible connection cables (For AZM46, AZM48, AZM66, AZM69)

These cables are used when connecting a motor and a driver.
The figure shows an example when the electromagnetic brake motor is used.
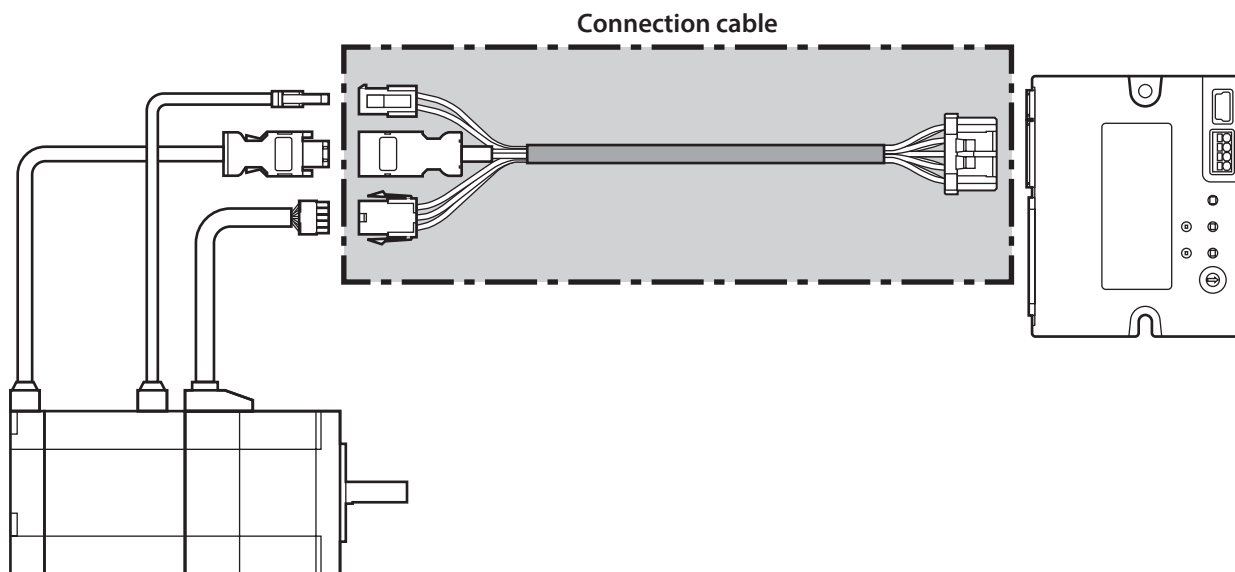
Connection cable

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

● Connection cables

For motor/encoder

Model	Length [m (ft.)]
CCM005Z2ABF	0.5 (1.6)
CCM010Z2ABF	1 (3.3)
CCM030Z2ABF	3 (9.8)
CCM050Z2ABF	5 (16.4)
CCM100Z2ABF	10 (32.8)

For motor/encoder/electromagnetic brake

Model	Length [m (ft.)]
CCM005Z2ACF	0.5 (1.6)
CCM010Z2ACF	1 (3.3)
CCM030Z2ACF	3 (9.8)
CCM050Z2ACF	5 (16.4)
CCM100Z2ACF	10 (32.8)

● Flexible connection cables

For motor/encoder

Model	Length [m (ft.)]
CCM005Z2ABR	0.5 (1.6)
CCM010Z2ABR	1 (3.3)
CCM030Z2ABR	3 (9.8)
CCM050Z2ABR	5 (16.4)
CCM100Z2ABR	10 (32.8)

For motor/encoder/electromagnetic brake

Model	Length [m (ft.)]
CCM005Z2ACR	0.5 (1.6)
CCM010Z2ACR	1 (3.3)
CCM030Z2ACR	3 (9.8)
CCM050Z2ACR	5 (16.4)
CCM100Z2ACR	10 (32.8)

2 Hardware

■ Extension cables/Flexible extension cables

These cables are used when extending a connection cable (add between the driver 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 extension cables and the flexible extension cables are common to all motors.
The figure shows an example when the **AZM14** motor is connected.

Connection cable *   **Extension cable**

* Use the connection cable used.

(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, make the total cable length 10 m (32.8 ft.) or less.

● **Extension cables**

Model	Length [m (ft.)]
CCM010Z2ADFT	1 (3.3)
CCM030Z2ADFT	3 (9.8)
CCM050Z2ADFT	5 (16.4)

● **Flexible extension cables**

Model	Length [m (ft.)]
CCM010Z2ADRT	1 (3.3)
CCM030Z2ADRT	3 (9.8)
CCM050Z2ADRT	5 (16.4)

2 Hardware

7-2 Connection cable (for connector type)

■ Connection cable/Flexible connection cable

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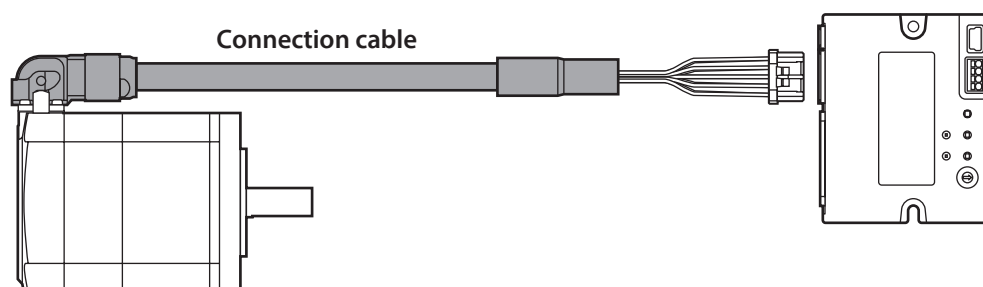
Connection cable

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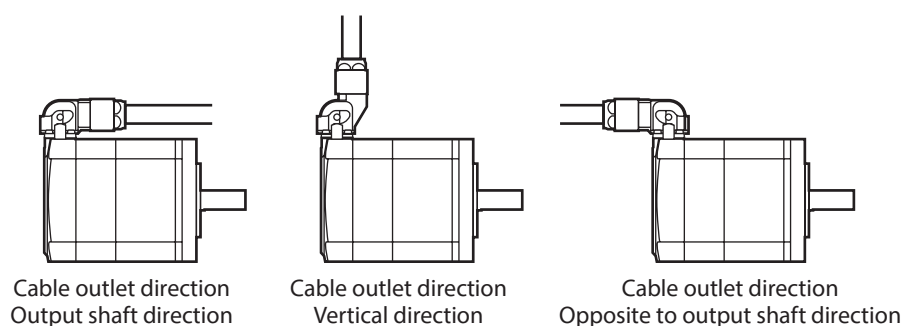
Cable outlet direction
Output shaft direction

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 cable

Length [m (ft.)]	Cable outlet direction		
	Output shaft direction	Vertical direction	Opposite to output shaft direction
0.2 (0.7)	CCM002Z1EFF	CCM002Z1EVF	CCM002Z1EBF
0.5 (1.6)	CCM005Z1EFF	CCM005Z1EVF	CCM005Z1EBF
1 (3.3)	CCM010Z1EFF	CCM010Z1EVF	CCM010Z1EBF
2 (6.6)	CCM020Z1EFF	CCM020Z1EVF	CCM020Z1EBF
3 (9.8)	CCM030Z1EFF	CCM030Z1EVF	CCM030Z1EBF
5 (16.4)	CCM050Z1EFF	CCM050Z1EVF	CCM050Z1EBF
7 (23.0)	CCM070Z1EFF	CCM070Z1EVF	CCM070Z1EBF
10 (32.8)	CCM100Z1EFF	CCM100Z1EVF	CCM100Z1EBF

2 Hardware

● **Flexible connection cable**

Length [m (ft.)]	Cable outlet direction		
	Output shaft direction	Vertical direction	Opposite to output shaft direction
0.5 (1.6)	**CCM005Z1EFR**	**CCM005Z1EVR**	**CCM005Z1EBR**
1 (3.3)	**CCM010Z1EFR**	**CCM010Z1EVR**	**CCM010Z1EBR**
2 (6.6)	**CCM020Z1EFR**	**CCM020Z1EVR**	**CCM020Z1EBR**
3 (9.8)	**CCM030Z1EFR**	**CCM030Z1EVR**	**CCM030Z1EBR**
5 (16.4)	**CCM050Z1EFR**	**CCM050Z1EVR**	**CCM050Z1EBR**
7 (23.0)	**CCM070Z1EFR**	**CCM070Z1EVR**	**CCM070Z1EBR**
10 (32.8)	**CCM100Z1EFR**	**CCM100Z1EVR**	**CCM100Z1EBR**

■ **Extension cables/Flexible extension cables**

These cables are used when extending a connection cable (add between the driver 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.

Extension cable

Connection cable *

* Use the connection cable used.

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, make the total cable length 10 m (32.8 ft.) or less.

● **Extension cables**

Model	Length [m (ft.)]
CCM010Z2ADFT	1 (3.3)
CCM030Z2ADFT	3 (9.8)
CCM050Z2ADFT	5 (16.4)

● **Flexible extension cables**

Model	Length [m (ft.)]
CCM010Z2ADRT	1 (3.3)
CCM030Z2ADRT	3 (9.8)
CCM050Z2ADRT	5 (16.4)

7-3 Power supply cable

This cable is used when connecting a driver to power supplies.
Model: **LCD06Z2AY** [0.6 m (2 ft.)]

2 Hardware

3 EtherCAT communication

This part explains how to control via EtherCAT communication.

◆Table of contents

1 Guidance

If you are new to this product, read this chapter to understand the operating methods along with the operation flow. This is an example how to operate the motor via EtherCAT communication.

STEP 1	Installation and connection

⬇

STEP 2	Before starting operation

⬇

STEP 3	Setting of node address

⬇

STEP 4	Operation of motor
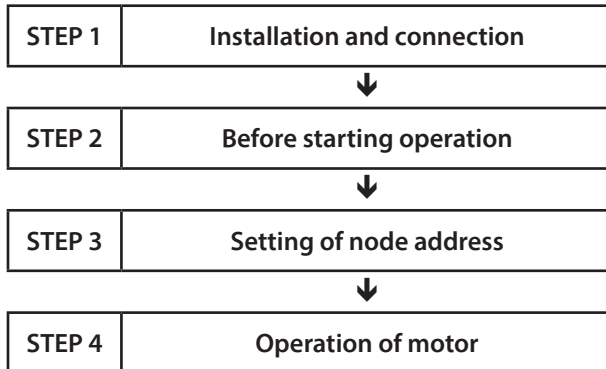
● **Operating conditions**

This operation is performed under the following conditions.

- Number of drivers connected: 1 unit
- Node address: 1

Note
- Before operating the motor, check the condition of the surrounding area to ensure safety.
- Before starting based on the guidance, import the ESI file to the setting tool of the EtherCAT master and register the system configuration in advance. For details, contact your nearest Oriental Motor sales office.

3 EtherCAT communication

STEP 1   Check the installation and connection.
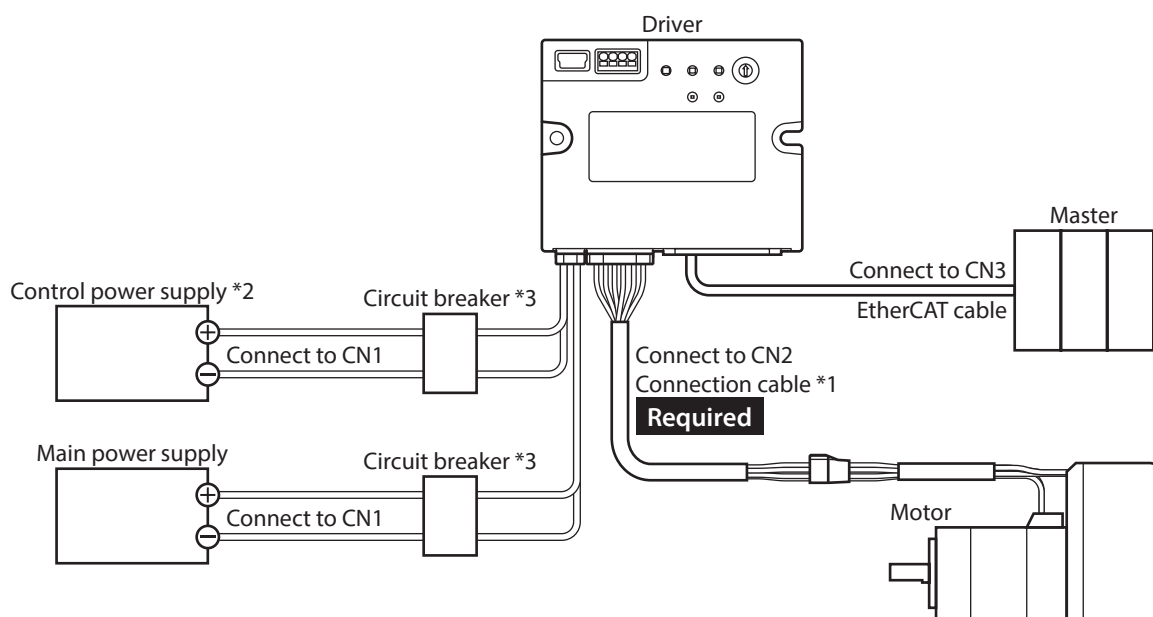
*1 It is an Oriental motor cable. Purchase is required separately.
*2 Connecting the control power supply allows you to continue monitoring even if the main power supply is shut off. Connect it as necessary.
*3 It is recommended that a circuit breaker or a circuit protector is connected because incorrect wiring may cause the internal input circuit to short-circuit.

STEP 2   Make preparations for operation.

Refer to "Before starting operation" in the **AZ** Series OPERATING MANUAL Function Edition.

STEP 3   Set a node address.

Set a node address using the node address setting switch (ECAT ID ×1) on the driver.

1. Set the node address setting switch as shown below.

   Setting: 1 (×1: 1)
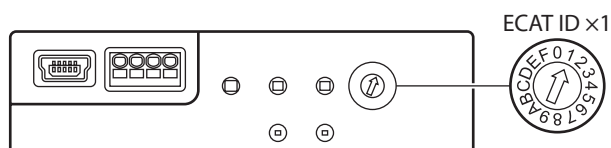
2. Turn on the main power supply and the control power supply again.

Note   Be sure to turn off the main power supply and control power supply of the driver before setting the switch. Setting the switch while the main power supply and the control power supply are in an on-state will not enable the new setting.

STEP 4   Operate the motor

Put the motor into an excitation state via EtherCAT communication to input the operation command.

3 EtherCAT communication

STEP 5	Were you able to operate?

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

- Is the PWR/ALM LED blinking in red?
  An alarm is being generated. Refer to p.150 for details.
- Are the power supply, the motor and the EtherCAT cable connected securely?
- Is the node address set correctly?
- Is the ERR LED blinking in red?
  A communication error is being detected. Refer to p.19 for details.

3 EtherCAT communication

2   Communications specifications

2-1   EtherCAT communication interface

Item	Description
Communications standards	IEC 61158 Type12
Physical layer/Protocol	100 BASE-TX (IEEE 802.3)
Transmission rate	100 Mbps
Communication cycle	• Free Run mode: 1 ms or more • Sync manager 2 event synchronization mode: 1 ms or more • DC mode: 0.25 ms, 0.5 ms, 1 ms, 2 ms, 3 ms, 4 ms, 5 ms, 6 ms, 7 ms, 8 ms
Communication port/Connector	RJ45×2 (shielded) ECAT IN: EtherCAT input ECAT OUT: EtherCAT output
Topology	Daisy chain (up to 65,535 nodes)
Process data	Variable PDO mapping
Sync manager	• SM0: Mailbox output • SM1: Mailbox input • SM2: Process data output • SM3: Process data input
Mailbox (CoE)	• Emergency message • SDO request • SDO response • SDO information
Synchronization mode	• Free Run mode (asynchronous) • Sync manager 2 event synchronization mode • DC mode (SYNC0 event synchronization)
Device profile	IEC 61800-7 CiA402 drive profile

2-2   CiA402 drive profile

Item	Description
Modes of operation	• Profile position mode (PP) • Profile velocity mode (PV) • Homing mode (HM) • Cyclic synchronous position mode (CSP) • Cyclic synchronous velocity mode (CSV)
Function	Touch probe (position latch) function 2 inputs (EXT1, EXT2)

3 EtherCAT communication

2-3   EtherCAT state machine (ESM)

The EtherCAT state machine (ESM) is controlled by the EtherCAT master.
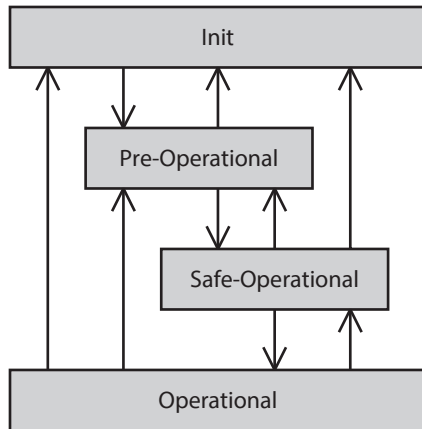
ESM State	SDO communication	Transmit PDO (TxPDO)	Receive PDO (RxPDO)	Status
Init	Not possible	Not possible	Not possible	During initialization. Communication cannot be performed.
Pre-Operational	Possible	Not possible	Not possible	The mailbox communication (SDO) can be performed. The process data communication (PDO) cannot be performed.
Safe-Operational	Possible	Possible	Not possible	The mailbox communication and the transmit PDO can be performed. The status of the driver can be sent to the EtherCAT master by the transmit PDO.
Operational	Possible	Possible	Possible	The mailbox communication, transmit PDO, and receive PDO can be performed. Commands can be sent from the EtherCAT master to the driver by PDO communication.

2-4   Process data object (PDO)

Process data object (PDO) is used in real-time data communication of EtherCAT communication.
There are two types of PDO: transmit PDO (TxPDO) and receive PDO (RxPDO). The transmit PDO (TxPDO) is to send data from the driver to the EtherCAT master. The receive PDO (RxPDO) is to receive data from the EtherCAT master to the driver.

Contents, which are sent and received using PDO, are set by the PDO mapping object and the Sync manager 2 and Sync manager 3 PDO assignment objects.
The PDO mapping is to set the PDO mapping object.
Sync manager 2 PDO assignment and Sync manager 3 PDO assignment are to set the PDO mapping object that performs communication actually.

The PDO mapping object is consisted of 4 bytes that are indexes of assigned object (Index), sub-index (Sub-index), and data length (Length). Only data of 08h (1 byte), 10h (2 bytes), and 20h (4 bytes) can be set in the data length.

Index	Sub-index	Data length
(2 bytes)	(1 byte)	(1 byte)

■ **PDO mapping object**

Up to 16 objects can be mapped in a single PDO.

Receive PDO mapping object		Transmit PDO mapping object	
Receive PDO	Index	Transmit PDO	Index
RxPDO1	1600h	TxPDO1	1A00h
RxPDO2	1601h	TxPDO2	1A01h

Objects to be mapped in PDO are as follows.

Objects of profile area	Objects of manufacturer-specific area
6000h to 67FFh	4000h to 4FFFh

memo The configuration of objects is as follows.

Index (Hex)	Object	Overview
1000h to 1FFFh	CoE Communication Area	CoE communication area
2000h to 3FFFh	Manufacturer-Specific Area	Not used
4000h to 4FFFh		Driver object
5000h to 5FFFh		Not used
6000h to 67FFh	Profile Area	Profile area

■ **Sync manager 2 and Sync manager 3 PDO assignment objects**

The SM (Sync Manager Channel) PDO assignment objects set the relationship between PDO and Sync Manager. The Sync manager 2 PDO assignment (1C12h) is the assignment object dedicated to the receive PDO. The Sync manager 3 PDO assignment (1C13h) is the assignment object dedicated to the transmit PDO.
Objects of up to 64 bytes can be assigned.

■ **Setting of PDO mapping object**

The PDO mapping can be changed when the ESM is Pre-Operational. Change the PDO mapping in the following steps.

1. Set the number of entries of the Sync manager 2 and Sync manager 3 PDO assignment objects to 0.

2. Set the number of entries of the PDO mapping object to 0.

3. Change the PDO mapping object.

4. Change the number of entries of the PDO mapping object to the number of objects mapped in the step 3.

5. Change the Sync manager 2 and Sync manager 3 PDO assignment objects.

6. Change the number of entries of the Sync manager 2 and Sync manager 3 PDO assignment objects to the number assigned in the step 5.

3 EtherCAT communication

■ **Example of PDO mapping**

This section introduces an example of PDO mapping. Data of 2 bytes and 4 bytes are little-endian.
With the Sync manager 2 and Sync manager 3 PDO assignment objects, set the mapping of PDO communication by selecting the PDO mapping object that performs communication actually.

PDO mapping object

PDO	Index	Sub	Mapping	Data length
RxPDO1	1600h	00h	9	–
		01h	Object A	4 byte
		02h	Object B	2 byte
		03h	Object C	4 byte
		04h	Object D	1 byte
		05h	Object E	4 byte
		06h	Object F	1 byte
		07h	Object G	2 byte
		08h	Object H	1 byte
		09h	Object I	1 byte
		0Ah to 10h	0	–
RxPDO2	1601h	00h	0	–
		01h to 10h	0	–

SM2 PDO assignment object

Index	Sub	Setting value
1C12h	00h	1
	01h	1600h

TxPDO mapping object

PDO	Index	Sub	Mapping	Data length
TxPDO1	1A00h	00h	5	–
		01h	Object L	2 byte
		02h	Object M	2 byte
		03h	Object N	4 byte
		04h	Object O	1 byte
		05h	Object P	4 byte
		06h to 10h	0	–
TxPDO2	1A01h	00h	0	–
		01h to 10h	0	–

SM3 PDO assignment object

Index	Sub	Setting value
1C13h	00h	1
	01h	1A00h

3 EtherCAT communication

2-5 Service data object (SDO)

When read and write of the parameter object is performed, or monitor is executed via EtherCAT communication, the Service data object (SDO) is used. SDO is not synchronized to EtherCAT communication cycles, but it is sent and received in an arbitrary timing. The setting of PDO mapping is also performed using SDO.

■ SDO abort code

If an error occurs while SDO is sent and received, an abort code is sent back. The abort codes are listed in the table.

Abort code	Description
0503 0000h	Toggle bit did not inverted.
0504 0000h	SDO protocol timeout
0504 0001h	Client/server command specifier is not enabled or unknown.
0504 0005h	Out of range of memory
0601 0000h	Unsupported access to an object
0601 0001h	Read access was performed to a write only object.
0601 0002h	Write access was performed to a read only object.
0602 0000h	The object does not exist.
0604 0041h	The object can not be mapped in PDO.
0604 0042h	The number of the PDO mappings or the data length exceeded the limitation.
0604 0043h	General parameter incompatibility
0604 0047h	General internal incompatibility in the device
0606 0000h	Access failed due to a hardware error
0607 0010h	Data type does not match, length of service parameter does not match.
0607 0012h	Data type does not match, length of service parameter is too long.
0607 0013h	Data type does not match, length of service parameter is too short.
0609 0011h	Sub-index does not exist.
0609 0030h	The setting range of the parameter was exceeded. (For write access)
0609 0031h	The value of the write parameter is too large.
0609 0032h	The value of the write parameter is too small.
0609 0036h	The maximum value is less than the minimum value.
0800 0000h	General error
0800 0020h	Data cannot be transferred or stored to the application.
0800 0021h	Data cannot be transferred or stored to the application because of local control.
0800 0022h	Data cannot be transferred or stored to the application in the present device status.
0800 0023h	Object dictionary cannot be generated or object dictionary does not exist.

2-6 Synchronous mode of EtherCAT communication

This product is compatible with three modes of EtherCAT communication.

● **Free Run mode**

The driver operates in asynchronous with EtherCAT communication.
The communication cycle of the Free Run mode is 1 ms or more.

● **Sync manager 2 event synchronization mode**

The driver operates in synchronization with EtherCAT communication. An application is synchronized with the Sync manager 2 event.
Whenever the driver receives the process data output (RxPDO), the Sync manager 2 event is generated.
The communication cycle of the Sync manager 2 event synchronization mode is 1 ms or more.

● **DC mode (SYNC0 event synchronization)**

The driver operates in synchronization with EtherCAT communication. An application is synchronized with the SYNC0 event.
The communication cycle of the DC mode is 0.25 ms, 0.5 ms, or 1 to 8 ms (in 1 ms unit).

3 EtherCAT communication

2-7 Distributed Clocks

The Distributed Clocks (DC) is a method to synchronize operation by sharing the same clock between the EtherCAT master and the driver.

The interruption signal (SYNC0) is output at a precise interval based on the DC. In the DC mode, an application is executed in synchronization with SYNC0.

2-8 Emergency message

If an error occurs in the driver, an emergency message is sent to the EtherCAT master using the mailbox communication.

The emergency message is sent only once per error.

The emergency message consists of the following 8 bytes.

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
Emergency error code		Error register object (1001h)	Manufacturer-specific error definition field				

■ Emergency message when an alarm is generated

If an alarm is generated in the driver, an emergency message is sent to the EtherCAT master using the mailbox communication.

The emergency message when the alarm is generated consists of the following 8 bytes.

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
Emergency error code (FF00h)		Error register object (1001h)	Manufacturer-specific error definition field				
			0	Alarm code	0		

The emergency error code is FF00h regardless of the alarm contents.

The byte 2 is the same value as the error register object.

The byte 4 is the alarm code. Refer to p.151 for alarm codes.

■ Emergency code when the ESM transition error is generated

If the transition from Pre-Operational to Safe-Operational was failed in the ESM, the following emergency code is sent.

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
Emergency error code (A000h)		Channel (02h)	Diagnosis data				
			0Ah	0			

If the transition from Pre-Operational to Safe-Operational was requested during the following state, this emergency code is generated. Check the contents, and reconsider the setting and other conditions.

- The unsupported communication cycle in the DC mode is set.
- The object that mapping is not possible is mapped in the PDO mapping.
- The object for TxPDO is mapped in RxPDO. Or the object for RxPDO is mapped in TxPDO.

3 EtherCAT communication

3   Drive profile

3-1   Drive state machine

The drive state machine is controlled by the Controlword object (6040h). The status of each state can be checked with the Statusword object (6041h).

	Control power supply	Main power supply	ESM	Motor
	ON	ON or OFF	–	Non-excitation
	ON	ON	Operational	Non-excitation
	ON	ON	Operational	Excitation

(A): Lower-level power
(B): High-level power
(C): Current on
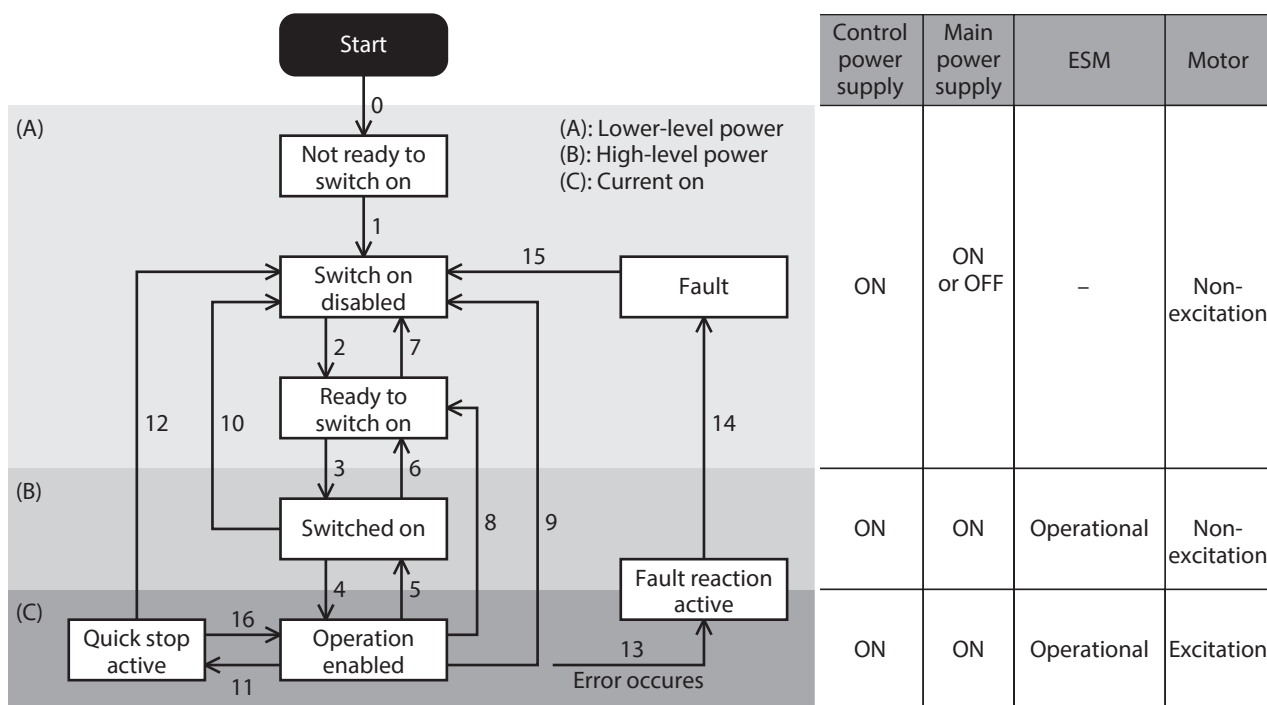
State	Signal state	Motor status	Parameter setting
Not ready to switch on	The control power supply was turned on, and the initialization processing is executing.	Non-excitation	Not possible to set
Switch on disabled	The initialization was completed.	Non-excitation	Possible to set
Ready to switch on	A state where the main power supply can be turned on.	Non-excitation	Possible to set
Switched on	A state where the main power supply was turned on.	Non-excitation	Possible to set
Operation enabled	The motor is in an excitation state, and the operation function is enabled.	Excitation	Possible to set
Quick stop active	The Quick stop command was received, and the operation stop is processing.	Excitation	Possible to set
Fault reaction active	The driver generates an alarm and the operation stop is processing.	Excitation	Possible to set
Fault	An alarm of the driver is being generated.	Non-excitation	Possible to set

Note   After transitioning to "Operation enabled," 250 ms is required until the motor is excited and the preparation for operation is completed. The motor does not start rotating even if the operation command is input before the preparation for operation is completed. Input the operation command after 250 ms have elapsed from having transitioned to "Operation enabled" or after the DCMD-RDY output has been turned ON.

3 EtherCAT communication

■ State transition of drive state machine

The drive state machine is controlled by the Controlword object (6040h).

● Controlword object (6040h)

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific (ms)					Reserved	oms	Halt
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Fault reset	Operation mode specific (oms)			Enable operation	Quick stop	Enable voltage	Switch on

● State transition commands by Controlword

State control command	Bit 7	Bit 3	Bit 2	Bit 1	Bit 0	Transition number in the figure
Shutdown	–	–	1	1	0	2, 6, 8
Switch on	–	0	1	1	1	3 *
Switch on + enable operation	–	1	1	1	1	3+4 *
Disable voltage	–	–	–	0	–	7, 9, 10, 12
Quick stop	–	–	0	1	–	7, 10, 11
Disable operation	–	0	1	1	1	5
Enable operation	–	1	1	1	1	4, 16
Fault reset	0 to 1	–	–	–	–	15

* When the following conditions are not satisfied, the state will not transition from "Ready to switch on" to "Switched on" even if the command is received.
 - The state of the ESM is Operational.
 - The main power is supplied.
 - The FREE input is being OFF.
 - Test operation (remote operation) is not being executed using the **MEXE02**.

● State transition other than above

Transition number in the figure	Transition event
0	Transitions automatically when the control power supply is turned on.
1	Transitions automatically when the initialization of the driver is completed.
12	If the Quick stop option code (605Ah) is 1 to 3, transitions to "Switch on disabled" after the motor stops when the Quick stop command is send.
13, 14	Transitions if an alarm is generated

If the drive state machine is in a state of any of "Switched on," "Operation enabled," or "Quick stop active," the state transitions when an event in the table next is generated.

State	Motor operation	Event	Action
Switched on	During stop	● The ESM transitions to other than Operational. ● The main power was cut off. ● The FREE input is ON.	Transitions to "Ready to switch on." (Transition number 6)
Operation enabled	During stop	● The ESM transitions to other than Operational. ● The main power was cut off. ● The FREE input is ON.	Transitions to "Ready to switch on." (Transition number 8) The motor puts into a non-excitation state.

State	Motor operation	Event	Action
Operation enabled	During operation	The ESM transitions to other than Operational.	An alarm of Network bus error is generated (alarm code 81h). After transitioning from "Fault reaction active" to "Fault," the motor puts into a non-excitation state. (Transition number 13, 14)
		The main power was cut off.	An alarm of Main power supply off is generated (alarm code 23h). After transitioning from "Fault reaction active" to "Fault," the motor puts into a non-excitation state. (Transition number 13, 14)
		The FREE input is ON.	Transitions to "Ready to switch on." (Transition number 8) The motor puts into a non-excitation state.
Quick stop active	During stop	• The ESM transitions to other than Operational. • The main power was cut off. • The FREE input is ON.	Transitions to "Switch on disabled." (Transition number 12) The motor puts into a non-excitation state.
	During operation	The ESM transitions to other than Operational.	An alarm of Network bus error is generated (alarm code 81h). After transitioning from "Fault reaction active" to "Fault," the motor puts into a non-excitation state. (Transition number 13, 14)
		The main power was cut off.	An alarm of Main power supply off is generated (alarm code 23h). After transitioning from "Fault reaction active" to "Fault," the motor puts into a non-excitation state. (Transition number 13, 14)
		The FREE input is ON.	Transitions to "Switch on disabled." (Transition number 12) The motor puts into a non-excitation state.

■ Status output of drive state machine

The status of the drive state machine is output by the Statusword object (6041h).

● Statusword object (6041h)

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific (ms)		Operation mode specific (oms)		Internal limit active	Target reached	Remote	ms

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on

● Status output of Statusword

State	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Start	0	0	0	0	0	0	0
Not ready to switch on	0	0	0	0	0	0	0
Fault	0	1	− *	1	0	0	0
Fault reaction active	0	1	− *	1	1	1	1
Switch on disabled	1	1	− *	0	0	0	0
Ready to switch on	0	1	− *	0	0	0	1
Switched on	0	1	− *	0	0	1	1
Operation enabled	0	1	− *	0	1	1	1
Quick stop active	0	0	− *	0	1	1	1

* "Voltage enabled" changes to 1 while the main power is supplied.

3-2 Operation modes

The driver supports the operation modes listed below.
- Cyclic synchronous position mode (CSP)
- Profile position mode (PP)
- Cyclic synchronous velocity mode (CSV)
- Profile velocity mode (PV)
- Homing mode (HM)

■ Switching of operation mode

The operation mode can be switched by the Modes of operation (6060h).

Setting value of operation mode	Operation mode
0 (Initial value)	Operation function disable
1	Profile position mode (PP)
3	Profile velocity mode (PV)
6	Homing mode (HM)
8	Cyclic synchronous position mode (CSP)
9	Cyclic synchronous velocity mode (CSV)

Switch the operation mode while operation is stopped. When it was switched during operation, the new operation mode will be enabled after the operation is stopped.
The operation mode which is enabled can be checked in the Modes of operation display (6061h).

3-3 Cyclic synchronous position mode (CSP)

In the Cyclic synchronous position mode, a path generation (profile generation) is performed by the EtherCAT master. By cyclic synchronous communication, when the Target position (607Ah) is sent from the EtherCAT master to the driver, the driver performs position controls.
Use the Cyclic synchronous position mode when EtherCAT communication is performed in the DC mode. If the Cyclic synchronous position mode is used in the Free Run mode or Sync manager 2 event synchronization mode, the speed fluctuation or vibration may increase.

Note
- Since the position is managed by the EtherCAT master in the Cyclic synchronous position mode, if the operation is stopped without the EtherCAT master, the position deviation may cause. When inputting the stop signal such as the STOP input or the FREE input or when executing the power removal function, be sure to perform the following operations to clear the position deviation. If the stop signal is turned OFF while the position deviation is remained or if the ETO-CLR input is turned ON after the power removal status is released, the motor may start rotating suddenly.
  · Execute the operation stop from the EtherCAT master.
  · Clear the position deviation between the EtherCAT master and the driver.
- Since the position is managed by the EtherCAT master in the Cyclic synchronous position mode, executing the position preset (P-PRESET) in the driver while the motor is excited may cause the motor to start suddenly or an alarm of Command pulse error to generate. Put the motor into a non-excitation state before executing the position preset (P-PRESET) in the driver.

Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6040h	00h	Controlword	U16	RW	RxPDO	–	0000h to FFFFh (Initial value: 0000h)	A
6041h	00h	Statusword	U16	RO	TxPDO	–	–	–
6060h	00h	Modes of operation	INT8	RW	RxPDO	O	0 (Initial value), 1, 3, 6, 8, 9 (⇨ "Switching of operation mode")	B
6061h	00h	Modes of operation display	INT8	RO	TxPDO	–	–	–
6062h	00h	Position demand value [step]	INT32	RO	TxPDO	–	–	–

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6064h	00h	Position actual value [step]	INT32	RO	TxPDO	–	–	–
607Ah	00h	Target position [step]	INT32	RW	RxPDO	–	−2,147,483,648 to 2,147,483,647 (Initial value: 0)	A
607Dh	01h	Min. position limit [step]	INT32	RW	No	○	−2,147,483,648 to 2,147,483,647 (Initial value: −2,147,483,648)	A
	02h	Max. position limit [step]	INT32	RW	No	○	−2,147,483,648 to 2,147,483,647 (Initial value: 2,147,483,647)	A

■ Controlword of Cyclic synchronous position mode

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific (ms)					Reserved	oms	Halt
–	–	–	–	–		–	
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Fault reset	Operation mode specific (oms)			Enable operation	Quick stop	Enable voltage	Switch on
	–	–	–				

Details of Controlword

Bit	Name	Value	Description
8	Halt	0	Operation allowed
		1	Stop operation. The stopping method is "Immediate stop."

For Bit 7 and Bit 3 to Bit 0, refer to "State transition of drive state machine" on p.48.

■ Statusword of Cyclic synchronous position mode

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific		Operation mode specific		Internal limit active		Remote	ms
TLC	–	Following error	Target position ignored		–		–
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on

Details of Statusword

Bit	Name	Value	Description
15	TLC	0	A load does not reach the upper limit of the motor output torque.
		1	A load reached the upper limit of the motor output torque.
13	Following error	0	The position deviation error does not occur.
		1	The position deviation error occurs. The position deviation exceeded the value set in the Following error window (6065h). The value changes to 0 if an alarm of Excessive position deviation (alarm code 10h) or an alarm of Overload (alarm code 30h) is reset.

Bit	Name	Value	Description
12	Target position ignored	0	The target position command is disabled. When the state is any of the followings, the value changes to 0 and the target position is disabled. • The drive state machine is other than "Operation enabled." • The motor is in a non-excitation state. • The Halt (6040h: Bit 8) has been set to 1. • The STOP input is being ON. • The internal limit is in an active state.
		1	The target position command is enabled.
11	Internal limit active	0	The function limitation by the internal limit is not in an active state.
		1	The function limitation by the internal limit became an active state. The value changes to 1 when any of the following internal limit functions is being activated. • Limit sensor (FW-LS/RV-LS) • Operation prohibition input (FW-BLK/RV-BLK) • Software limit • Mechanism limit
9	Remote	1	The value changes to 1 when the initialization is completed.
7	Warning	0	Information is not generated. When the cause of information is cleared, the Warning is automatically cleared to 0.
		1	Information is being generated.

For Bit 6 to Bit 0, refer to "Status output of drive state machine" on p.49.

3-4 Profile position mode (PP)

The Profile position mode operates in the internal profile of the driver. A path generation (profile generation) is performed in the driver. The target position, velocity, acceleration and others are set in the EtherCAT master.

Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6040h	00h	Controlword	U16	RW	RxPDO	–	0000h to FFFFh (Initial value: 0000h)	A
6041h	00h	Statusword	U16	RO	TxPDO	–	–	–
6060h	00h	Modes of operation	INT8	RW	RxPDO	○	0 (Initial value), 1, 3, 6, 8, 9 (⇨ p.50)	B
6061h	00h	Modes of operation display	INT8	RO	TxPDO	–	–	–
6062h	00h	Position demand value [step]	INT32	RO	TxPDO	–	–	–
6064h	00h	Position actual value [step]	INT32	RO	TxPDO	–	–	–
607Ah	00h	Target position [step]	INT32	RW	RxPDO	–	−2,147,483,648 to 2,147,483,647 (Initial value: 0)	A
607Dh	01h	Min. position limit [step]	INT32	RW	No	○	−2,147,483,648 to 2,147,483,647 (Initial value: −2,147,483,648)	A
	02h	Max. position limit [step]	INT32	RW	No	○	−2,147,483,648 to 2,147,483,647 (Initial value: 2,147,483,647)	A
6081h	00h	Profile velocity [Hz]	U32	RW	RxPDO	○	0 to 4,000,000 (Initial value: 10,000)	B
6083h	00h	Profile acceleration [step/s^2]	U32	RW	RxPDO	○	1 to 1,000,000,000 (Initial value: 300,000)	B

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6084h	00h	Profile deceleration [step/s^2]	U32	RW	RxPDO	○	1 to 1,000,000,000 (Initial value: 300,000)	B
4142h	00h	Starting speed [Hz]	INT32	RW	No	○	0 to 4,000,000 (Initial value: 5,000)	B
414Fh	00h	Wrap positioning mode	U8	RW	RxPDO	○	0: Wrap absolute positioning 1: Wrap proximity 2: Wrap forward direction 3: Wrap reverse direction (Initial value: 0)	B

■ Controlword of Profile position mode

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific (ms)					Reserved	oms	
–	Wrap	Push	Base position of Rel	–		Change on set point	Halt
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Fault reset	Operation mode specific (oms)			Enable operation	Quick stop	Enable voltage	Switch on
	Abs/Rel	Change set immediately	New set point				

Details of Controlword

Bit	Name	Value	Description
14	Wrap	1	Wrap absolute positioning operation After the Wrap is set to 1, when the New set point (6040h: Bit 4) is set to 1 to start operation, wrap absolute positioning operation is performed. The operating method is in accordance with the setting of the Wrap positioning mode (414Fh).
13	Push	1	Push-motion positioning operation After the Push is set to 1, when the New set point (6040h: Bit 4) is set to 1 to start operation, push-motion positioning operation is performed. The Push current (4121h) is applied to the motor current. When the Halt (6040h: Bit 8) is set to 1 or when the STOP input is turned ON, the operation is stopped. The Stop current (4128h) is applied to the motor current at standstill.
12	Base position of Rel	0	Incremental positioning operation (based on command position) Positioning operation of the set travel amount is performed from the present command position. The travel amount is set with the Target position (607Ah).
		1	Incremental positioning operation (based on actual position) Positioning operation of the set travel amount is performed from the present actual position. The travel amount is set with the Target position (607Ah).
10	Reserved	–	Reserved
9	Change on set point	–	Not supported.
8	Halt	0	Operation is allowed.
		1	Stops the operation. The stopping method is in accordance with the setting of the Halt option code (605Dh).
6	Abs/Rel	0	Absolute positioning operation The Target position (607Ah) is applied to the target position of absolute positioning operation.
		1	Incremental positioning operation The Target position (607Ah) is applied to the target position of incremental positioning operation.

Bit	Name	Value	Description
5	Change set immediately	0	When the New set point (6040h: Bit 4) is set from 0 to 1 during operation, the new operation command is stored. When the present operation is completed, the stored new operation command is started.
		1	When the New set point (6040h: Bit 4) is set from 0 to 1 during operation, the new operation command is immediately applied. During push-motion operation, when the New set point (6040h: Bit 4) is set from 0 to 1 to start new operation, set the Change set immediately to 1.
4	New set point	0 to 1	Start of positioning operation Before starting operation, select the Wrap (6040h: Bit 14), Push (6040h: Bit 13), Base position of Rel (6040h: Bit 12), and Abs/Rel (6040h: Bit 6). When positioning operation is started in a state where the operation is stopped by setting the Halt (6040h: Bit 8) to 1, set the Halt (6040h: Bit 8) from 1 to 0 first and leave an interval at more than double of the communication cycle before setting the New set point (6040h: Bit 4) from 0 to 1. The operation may not be started unless the interval at more than double of the communication cycle is left. The command cannot be received in the following state, and the operation is not started. • The Halt (6040h: Bit 8) has been set to 1. • The STOP input is being ON. • The drive state machine is other than "Operation enabled." • The motor is in a non-excitation state.

For Bit 7 and Bit 3 to Bit 0, refer to "State transition of drive state machine" on p.48.

■ Statusword of Profile position mode

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific		Operation mode specific		Internal limit active	Target reached	Remote	ms
TLC	–	Following error	Set point acknowledge				–
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on

Details of Statusword

Bit	Name	Value	Description
15	TLC	0	A load does not reach the upper limit of the motor output torque.
		1	A load reached the upper limit of the motor output torque. When push-motion operation is performed, use this signal as the completion signal of push-motion operation.
13	Following error	0	The position deviation error does not occur.
		1	The position deviation error occurs. The position deviation exceeded the value set in the Following error window (6065h). The value changes to 0 if an alarm of Excessive position deviation (alarm code 10h) or an alarm of Overload (alarm code 30h) is reset.
12	Set point acknowledge	0	The operation start by the New set point (6040h: Bit 4) has not been received.
		1	The operation start by the New set point (6040h: Bit 4) was received. When the New set point (6040h: Bit 4) is set to 1 to receive the operation start, the Set point acknowledge changes to 1. When the New set point (6040h: Bit 4) is set to 0, the Set point acknowledge also changes to 0.

Bit	Name	Value	Description
11	Internal limit active	0	The function limitation by the internal limit is not in an active state.
		1	The function limitation by the internal limit became an active state. The value changes to 1 when any of the following internal limit functions are activated. • Limit sensor (FW-LS/RV-LS) • Operation prohibition input (FW-BLK/RV-BLK) • Software limit • Mechanism limit
10	Target reached	0	• When the Halt (6040h: Bit 8) is 0: Positioning operation is not completed. • When the Halt (6040h: Bit 8) is 1: During deceleration stop.
		1	• When the Halt (6040h: Bit 8) is 0 After positioning operation is properly completed, the value changes to 1 when the actual position has converged in a range of the Position window (6067h) with respect to the command position. It does not change to 1 when the positioning operation was interrupted on the way. It changes to 0 if operation is started from a state where the positioning was completed. • When the Halt (6040h: Bit 8) is 1: The value changes to 1 when the operation velocity demand value (operation command speed) becomes 0.
9	Remote	1	The value changes to 1 when the initialization is completed.
7	Warning	0	Information is not generated. When the cause of information is cleared, the Warning is automatically cleared to 0.
		1	Information is being generated.

For Bit 6 to Bit 0, refer to "Status output of drive state machine" on p.49.

■ Operation in Profile position mode

● Positioning operation

Positioning operation is started when the Target position (607Ah) is set and the New set point (6040h: Bit 4) is set to 1.
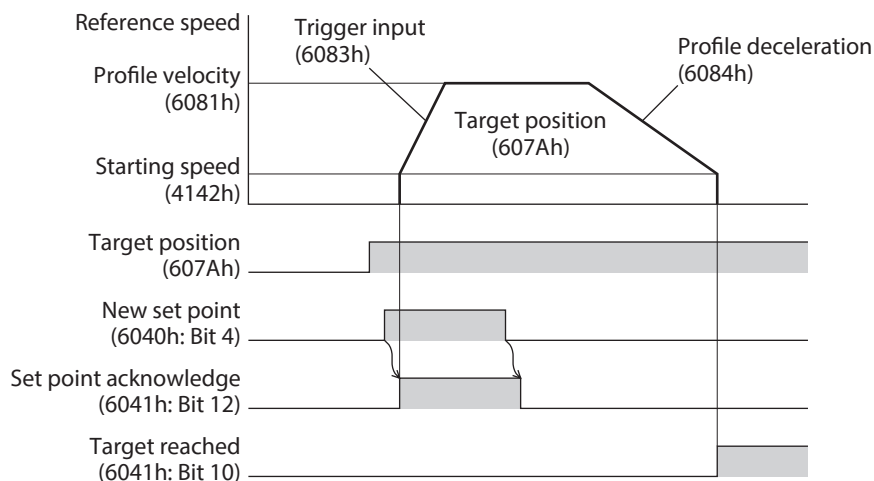
Single set-point [When the Change set immediately (6040h: Bit 5) is 1]

If the New set point (6040h: Bit 4) is newly set during operation, the new operation command is applied immediately.

Velocity

Reference speed

Target position (607Ah)

New set point (6040h: Bit 4)

Set point acknowledge (6041h: Bit 12)

Effective target position

Target reached (6041h: Bit 10)
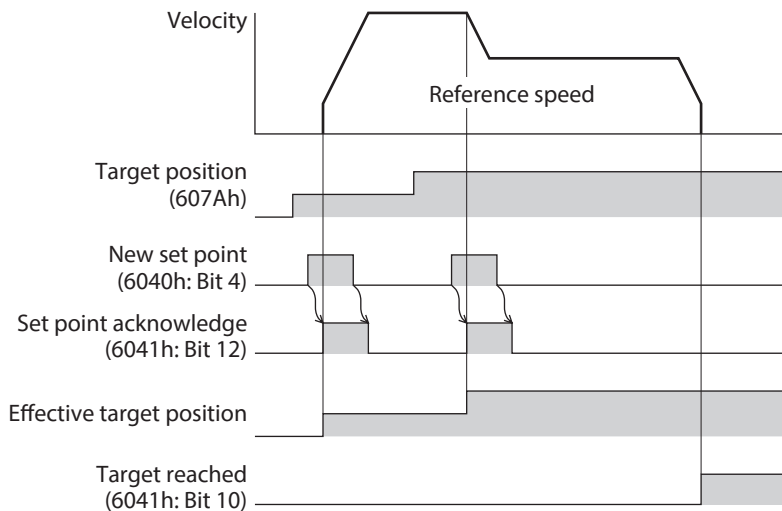
Set of set-points [When the Change set immediately (6040h: Bit 5) is 0]

When the New set point (6040h: Bit 4) is newly set during operation, the new operation command is stored. When the present operation is completed, the stored new operation command is started.

Velocity

Reference speed

Target position (607Ah)

New set point (6040h: Bit 4)

Set point acknowledge (6041h: Bit 12)

Effective target position

Target reached (6041h: Bit 10)
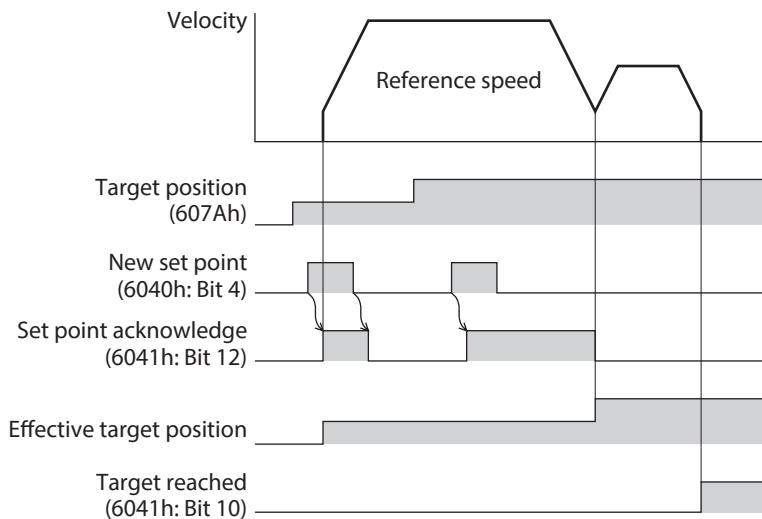
● **Push-motion positioning operation**

After the Push (6040h: Bit 13) is set to 1, when the New set point (6040h: Bit 4) is set to 1, push-motion positioning operation is started. When push-motion positioning operation is started, self-start operation (rectangular operation) is performed at the operating speed set in the Profile velocity (6081h).
During operation, when the New set point (6040h: Bit 4) is set from 0 to 1 to start new operation, set the Change set immediately to 1.

Note
● When a mechanism installed to the motor pressed against a load, push-motion operation is performed while the position deviation of 2.7° generates. Since an alarm of Overload may be generated if the operation is stopped in this state, perform operation to return the actual position by 3.6° before push-motion operation is stopped.
● Do not perform push-motion operation with geared motors and the **DGII** Series. Doing so may cause damage to the motor or gear part.
● When push-motion operation is stopped in a state where a load is pressed, set the Operating current (4120h) of the next operation to be executed, to a value in the Push current (4121h) or less. If a higher current value than the Push current (4121h) is set, the push current may increase when the operation transitions, causing an unexpected push force to apply.

When a mechanism installed to the motor had presses against a load

When a load is pressed, the TLC (6041h: Bit 15) of Statusword changes to 1.
If the "Halt (6040h: Bit 8)" of Controlword is set to 1 or the STOP input is turned ON, the operation is stopped and the push-motion status is canceled.
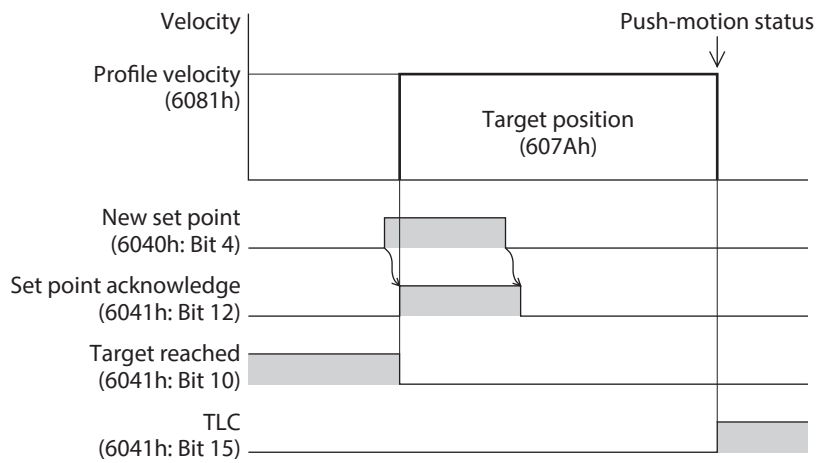
When a mechanism installed to the motor had not presses against a load

If the motor reaches the target position without pressing a load, the operation is completed. The TLC (6041h: Bit 15) does not change to 1.
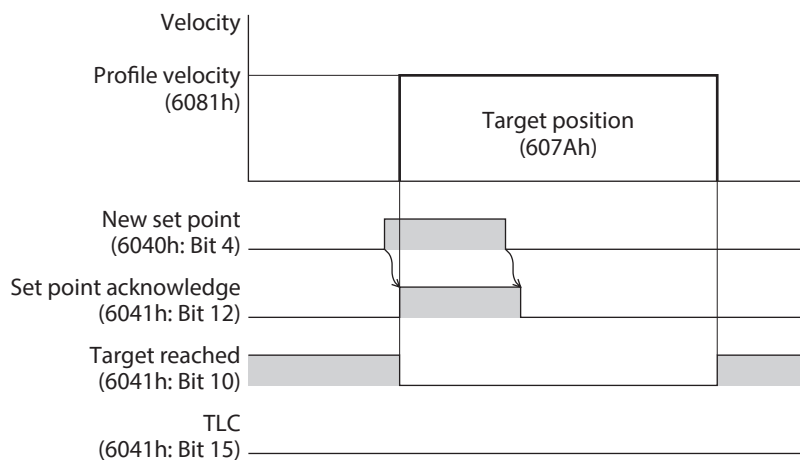
● **Wrap absolute positioning operation**

After the Target position (607Ah) is set and the Wrap (6040h: Bit 14) is set to 1, wrap absolute positioning operation is started when the New set point (6040h: Bit 4) is set to 1. With wrap absolute positioning operation, absolute positioning operation is performed regardless of the value of the Abs/Rel (6040h: Bit 6).

memo When wrap absolute positioning operation is performed, set the Wrap setting (41C7h) to "1: Enable."
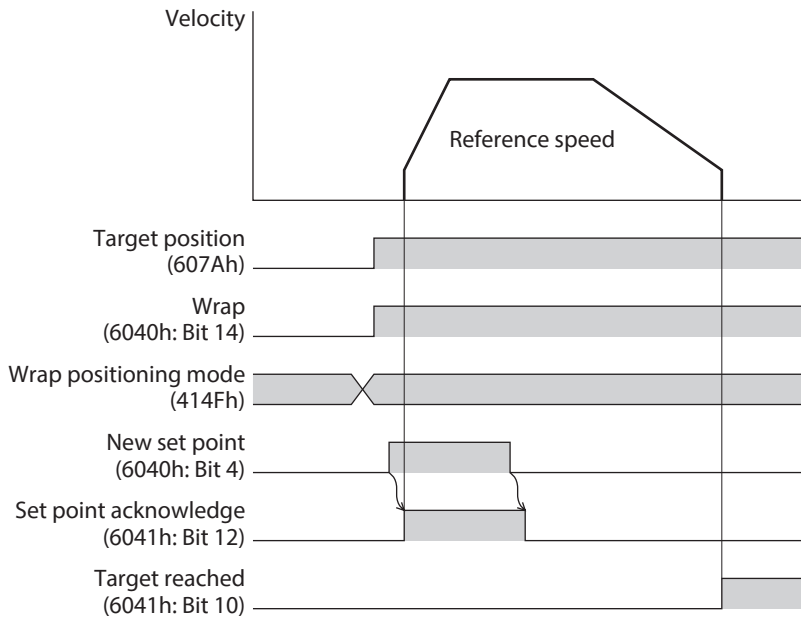
■ Operation mode of Profile position mode

The operation mode of the Profile position mode is set with the Controlword (6040h) and the Wrap positioning mode (414Fh). The operation modes are listed in the table.

Operation mode	Wrap positioning mode (414Fh)	Controlword (6040h)			
		Wrap (Bit 14)	Push (Bit 13)	Base position of Rel (Bit 12)	Abs/Rel (Bit 6)
Absolute positioning	–	0	0	–	0
Incremental positioning (based on command position)	–	0	0	0	1
Incremental positioning (based on actual position)	–	0	0	1	1
Absolute positioning push-motion	–	0	1	–	0
Incremental positioning push-motion (based on command position)	–	0	1	0	1
Incremental positioning push-motion (based on actual position)	–	0	1	1	1
Wrap absolute positioning	0	1	0	–	–
Wrap proximity positioning	1	1	0	–	–
Wrap forward direction absolute positioning	2	1	0	–	–
Wrap reverse direction absolute positioning	3	1	0	–	–
Wrap absolute push-motion	0	1	1	–	–
Wrap proximity push-motion	1	1	1	–	–
Wrap forward direction push-motion	2	1	1	–	–
Wrap reverse direction push-motion	3	1	1	–	–

● **Absolute positioning**

Positioning operation is performed from the present position to the set target position. In the Target position (607Ah), set the target position on the coordinates with the home as a reference.

Example: When moving from the command position "1,000" to the target position "4,000"

Set 4,000 steps in the Target position (607Ah) to start absolute positioning operation.
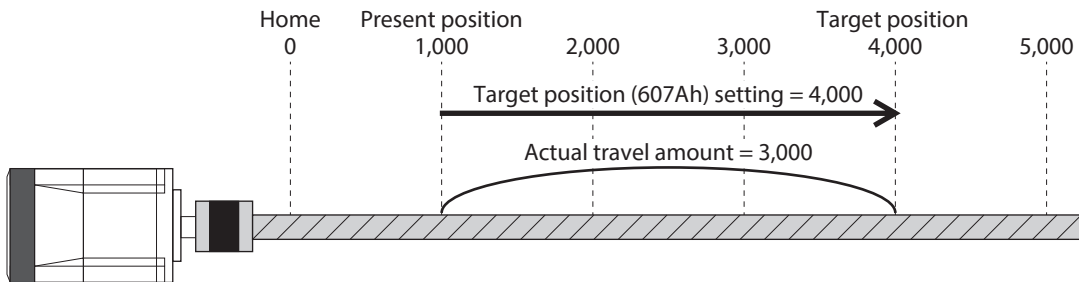
● **Incremental positioning (based on command position)**

Positioning operation with the set travel amount is performed from the present command position. In the Target position (607Ah), set the travel amount from the present command position to the target position.

Example: When moving from the command position "1,000" to the target position "4,000"

Set 3,000 steps in the Target position (607Ah) to start incremental positioning (based on command position) operation.
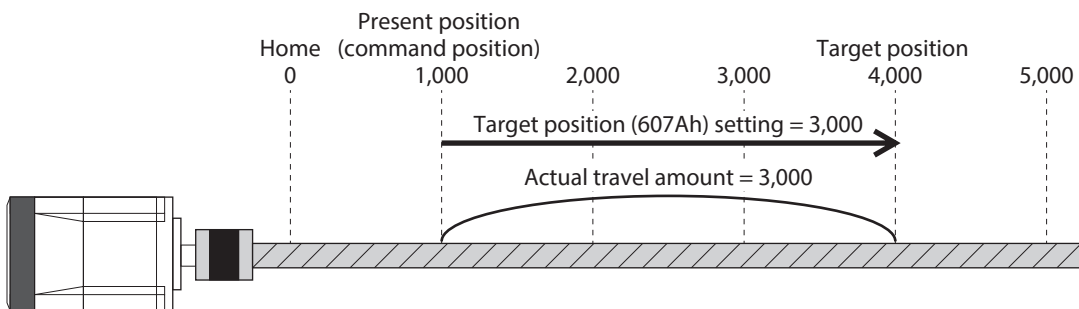
● **Incremental positioning (based on actual position)**

Positioning operation with the set travel amount is performed from the present actual position. In the Target position (607Ah), set the travel amount from the present actual position.

Example: When moving 3,000 steps from the command position "1,000" and the actual position "900"

Set 3,000 steps in the Target position (607Ah) to start incremental positioning (based on actual position) operation. The command position and the actual position after completing the operation will be "3,900."
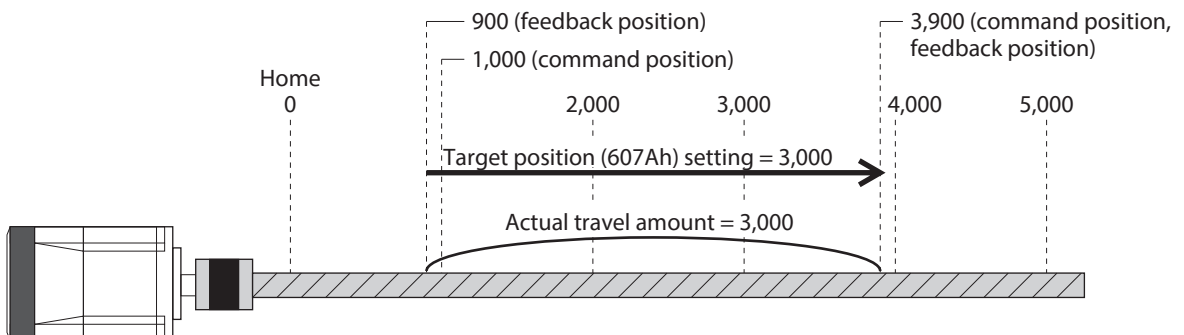
(memo) • The reference position of the operation based on the actual position varies depending on a load.
• If the command position and the actual position are different such as push-motion operation, the next operation can be started based on the actual position of the push position or the like.

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● **Wrap absolute positioning**

Positioning operation is performed to the target position within the wrap range. In the Target position (607Ah), set the target position within the wrap range. Refer to p.86 for the wrap function.

Example: When moving from the command position "1,000" to the target position "4,000"
(wrap setting range 1.0 rev, wrap offset ratio 50.00 %)

Set the items in the table to start wrap absolute positioning operation.

Index	Name	Setting value
41C7h	Wrap setting	1: Enable
41C9h	Initial coordinate generation & wrap setting range [1=0.1 rev]	10
41CBh	Initial coordinate generation & wrap range offset ratio [1=0.01 %]	5,000
414Fh	Wrap positioning mode	0: Wrap absolute positioning
607Ah	Target position [step]	4,000

Home
0
Present position
1,000

• Target position (607Ah) setting = 4,000
• Actual travel amount = 3,000

−2,500   2,500

4,000
Target position

−5,000
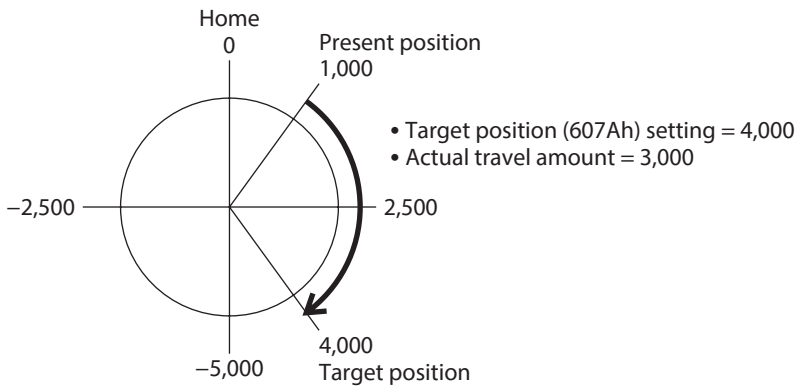
● **Wrap proximity positioning**

Positioning operation in the shortest distance is performed to the target position within the wrap range. In the Target position (607Ah), set the target position within the wrap range. Refer to p.86 for the wrap function.

Example: When moving from the command position "−4,000" to the target position "4,000"
(wrap setting range 1.0 rev, wrap offset ratio 50.00 %)

Set the items in the table to start wrap proximity positioning operation.

Index	Name	Setting value
41C7h	Wrap setting	1: Enable
41C9h	Initial coordinate generation & wrap setting range [1=0.1 rev]	10
41CBh	Initial coordinate generation & wrap range offset ratio [1=0.01 %]	5,000
414Fh	Wrap positioning mode	1: Wrap proximity
607Ah	Target position [step]	4,000

Home
0

• Target position (607Ah) setting = 4,000
• Actual travel amount = -2,000

−2,500   2,500

−4,000   4,000
Present position −5,000 Target position
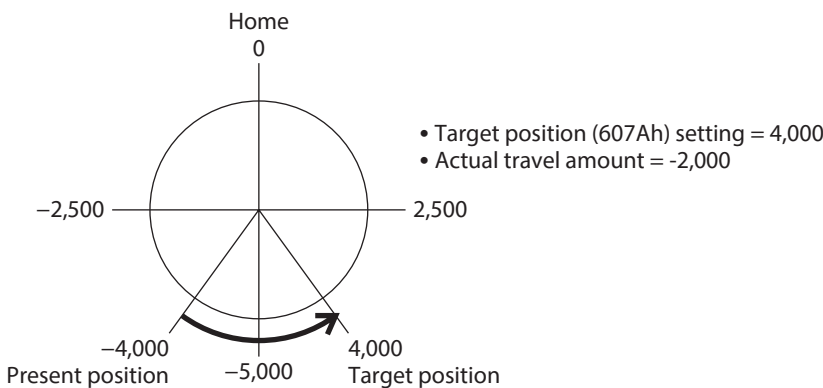
● **Wrap forward direction absolute positioning**

Positioning operation in the forward direction is performed to the target position within the wrap range. In the Target position (607Ah), set the target position within the wrap range. Refer to p.86 for the wrap function.

Example: When moving from the command position "1,000" to the target position "−4,000"
(wrap setting range 1.0 rev, wrap offset ratio 50.00 %)

Set the items in the table to start wrap forward direction absolute positioning operation.

Index	Name	Setting value
41C7h	Wrap setting	1: Enable
41C9h	Initial coordinate generation & wrap setting range [1=0.1 rev]	10
41CBh	Initial coordinate generation & wrap range offset ratio [1=0.01 %]	5,000
414Fh	Wrap positioning mode	2: Wrap forward direction
607Ah	Target position [step]	−4,000

Home
0
Present position
1,000

• Target position (607Ah) setting = −4,000
• Actual travel amount = 5,000

−2,500   2,500

−4,000   −5,000
Target position
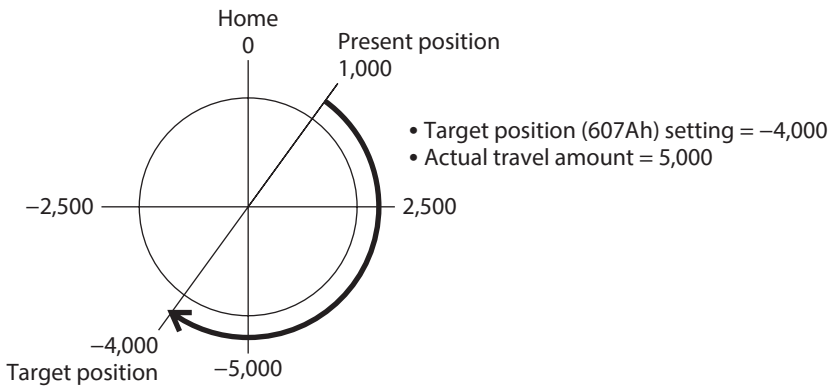
● **Wrap reverse direction absolute positioning**

Positioning operation in the reverse direction is performed to the target position within the wrap range. In the Target position (607Ah), set the target position within the wrap range. Refer to p.86 for the wrap function.

Example: When moving from the command position "1,000" to the target position "4,000"
(wrap setting range 1.0 rev, wrap offset ratio 50.00 %)

Set the items in the table to start wrap reverse direction absolute positioning operation.

Index	Name	Setting value
41C7h	Wrap setting	1: Enable
41C9h	Initial coordinate generation & wrap setting range [1=0.1 rev]	10
41CBh	Initial coordinate generation & wrap range offset ratio [1=0.01 %]	5,000
414Fh	Wrap positioning mode	3: Wrap reverse direction
607Ah	Target position [step]	4,000

Home
0
Present position
1,000

• Target position (607Ah) setting = 4,000
• Actual travel amount = -7,000

−2,500   2,500

−5,000
4,000
Target position

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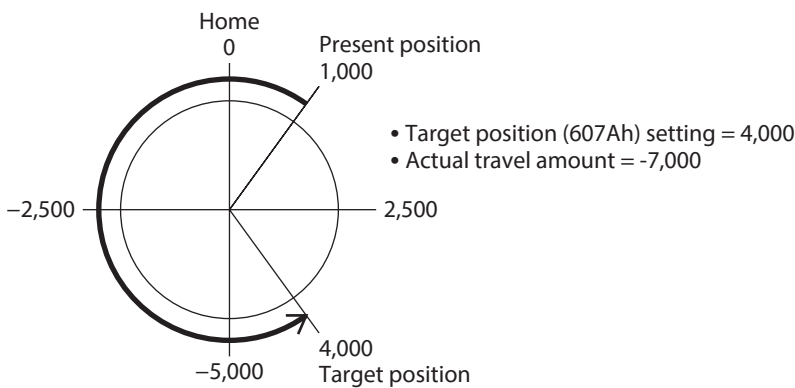
■ Orbit comparison of positioning operation

These are examples when the wrap setting range is set to 1 rev and the wrap range offset ratio is set to 50 %.

Operation mode	Initial value → The value set in the "Target position (607Ah)"	
	2,500 → 9,000	2,500 → −14,000
Absolute positioning Sets the coordinates of the target position from the home.	−1,000 / 0 / −2,500 / 2,500 / −5,000	0 / −2,500 / 2,500 / −4,000 / −5,000
• Incremental positioning (based on command position) **• Incremental positioning (based on actual position)** Sets the travel amount from the command position or the actual position to the target position.	0 / 1,500 / −2,500 / 2,500 / −5,000	0 / −1,500 / −2,500 / 2,500 / −5,000
Wrap absolute positioning Sets the target position on coordinates with the home as a reference. Operation is performed within the wrap range.	−1,000 / 0 / −2,500 / 2,500 / −5,000	0 / −2,500 / 2,500 / −4,000 / −5,000
Wrap proximity positioning Sets the target position on coordinates with the home as a reference. Operation in the shortest distance is performed to the target position within the wrap range.	−1,000 / 0 / −2,500 / 2,500 / −5,000	0 / −2,500 / 2,500 / −4,000 / −5,000
Wrap forward direction absolute positioning Sets the target position on coordinates with the home as a reference. Operation in the forward direction is performed to the target position within the wrap range.	−1,000 / 0 / −2,500 / 2,500 / −5,000	0 / −2,500 / 2,500 / −4,000 / −5,000
Wrap reverse direction absolute positioning Sets the target position on coordinates with the home as a reference. Operation in the reverse direction is performed to the target position within the wrap range.	−1,000 / 0 / −2,500 / 2,500 / −5,000	0 / −2,500 / 2,500 / −4,000 / −5,000

* The value in □ represents the coordinates of the position where the motor stopped.

3-5　Cyclic synchronous velocity mode (CSV)

In the Cyclic synchronous velocity mode, a path generation (profile generation) is performed by the EtherCAT master. By cyclic synchronous communication, when the Target velocity (60FFh) is sent from the EtherCAT master to the driver, the driver performs speed controls.

Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6040h	00h	Controlword	U16	RW	RxPDO	–	0000h to FFFFh (Initial value: 0000h)	A
6041h	00h	Statusword	U16	RO	TxPDO	–	–	–
6060h	00h	Modes of operation	INT8	RW	RxPDO	○	0 (Initial value), 1, 3, 6, 8, 9 (⇨p.50)	B
6061h	00h	Modes of operation display	INT8	RO	TxPDO	–	–	–
606Bh	00h	Velocity demand value [Hz]	INT32	RO	TxPDO	–	–	–
606Ch	00h	Velocity actual value [Hz]	INT32	RO	TxPDO	–	–	–
60FFh	00h	Target velocity [Hz]	INT32	RW	RxPDO	–	−4,000,000 to 4,000,000 (Initial value: 0)	A

■ Controlword of Cyclic synchronous velocity mode

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific (ms)					Reserved	oms	Halt
–	–	Type		–		–	

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Fault reset	Operation mode specific (oms)			Enable operation	Quick stop	Enable voltage	Switch on
	–	–	–				

Details of Controlword

Bit	Name	Value	Description
13	Type	–	Selects the operation mode of the Cyclic synchronous velocity mode. The operation mode changed is updated immediately. For details, refer to "Operation mode of Cyclic synchronous velocity mode"
12		–	
8	Halt	0	Operation is allowed.
		1	Stops the operation. The stopping method is "Immediate stop."

For Bit 7 and Bit 3 to Bit 0, refer to "State transition of drive state machine" on p.48.

■ Operation mode of Cyclic synchronous velocity mode

The operation mode of the Cyclic synchronous velocity mode is set with the Type (6040h: Bit 13, Bit 12). The operation modes are listed in the table.

Bit 13	Bit 12	Operation mode	Description
0	0	Continuous operation (position control)	Performs continuous operation at the Target velocity (60FFh). Since operation is performed while the position deviation is monitored, an alarm of Overload or Excessive position deviation is generated when a load exceeding the motor torque is applied. If the position deviation suddenly occurs, for example, when a large load is removed, the motor accelerates suddenly or puts into a state of overspeed to remove the deviation.
0	1	Continuous operation (speed control)	Performs continuous operation at the Target velocity (60FFh). When a load exceeding the motor torque is applied, an alarm of Overload is generated.

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Bit 13	Bit 12	Operation mode	Description
1	0	Continuous operation (push-motion) *	Performs continuous operation at the Target velocity (60FFh). When a mechanism installed to the motor presses against a load, pressure is continuously applied to the load.
1	1	Continuous operation (torque control) *	In the Cyclic synchronous velocity mode, the movement is the same between continuous operation (push-motion) and continuous operation (torque control).

Note *When continuous operation (push-motion) or continuous operation (torque control) is performed, note the following.

- When a mechanism installed to the motor pressed against a load, push-motion operation is performed while a position deviation of 2.7° generates. Since an alarm of Overload may be generated if the operation is stopped in this state, perform operation to return the actual position by 3.6° before push-motion operation is stopped.
- Do not perform push-motion operation with geared motors and the **DGII** Series. Doing so may cause damage to the motor or gear part.
- When push-motion operation is stopped in a state where a load is pressed, set the Operating current (4120h) of the next operation to be executed, to a value in the Push current (4121h) or less. If a higher current value than the Push current (4121h) is set, the push current may increase when the operation transitions, causing an unexpected push force to apply.

■ Statusword of Cyclic synchronous velocity mode

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific		Operation mode specific		Internal limit active	Reserved	Remote	ms
TLC	–	Reserved	Target velocity ignored				–
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on

Details of Statusword

Bit	Name	Value	Description
15	TLC	0	A load does not reach the upper limit of the motor output torque.
		1	A load reached the upper limit of the motor output torque.
13	Reserved	0	Reserved
12	Target velocity ignored	0	The target velocity command is disabled. When the state is any of the followings, the value changes to 0 and the Target velocity is disabled. • The drive state machine is other than "Operation enabled." • The motor is in a non-excitation state. • The Halt (6040h: Bit 8) has been set to 1. • The STOP input is being ON. • The internal limit is in an active state.
		1	The target velocity command is enabled.
11	Internal limit active	0	The function limitation by the internal limit is not in an active state.
		1	The function limitation by the internal limit became an active state. The value changes to 1 when any of the following internal limit functions is being activated. • Limit sensor (FW-LS/RV-LS) • Operation prohibition input (FW-BLK/RV-BLK) • Software limit • Mechanism limit
10	Reserved	0	Reserved
9	Remote	1	The value changes to 1 when the initialization is completed.

Bit	Name	Value	Description
7	Warning	0	Information is not generated. When the cause of information is cleared, the Warning is automatically cleared to 0.
		1	Information is being generated.

For Bit 6 to Bit 0, refer to "Status output of drive state machine" on p.49.

■ Operation in Cyclic synchronous velocity mode
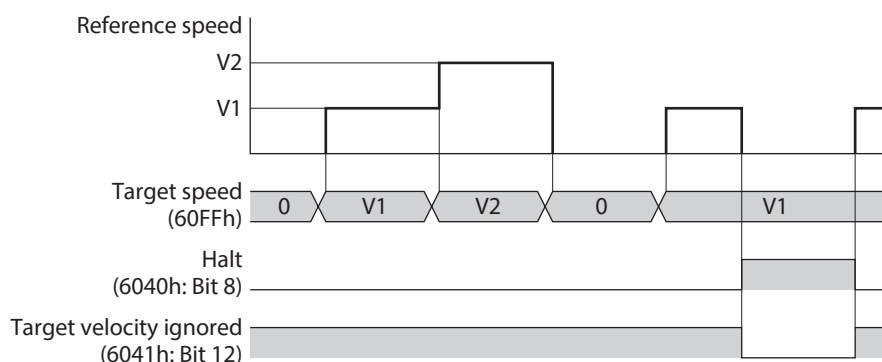
3-6   Profile velocity mode (PV)

The Profile velocity mode operates in the internal profile of the driver. A path generation (profile generation) is performed in the driver. The speed, acceleration, and others are set in the EtherCAT master.

Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6040h	00h	Controlword	U16	RW	RxPDO	–	0000h to FFFFh (Initial value: 0000h)	A
6041h	00h	Statusword	U16	RO	TxPDO	–	–	–
6060h	00h	Modes of operation	INT8	RW	RxPDO	○	0 (Initial value), 1, 3, 6, 8, 9 (⇨ p.50)	B
6061h	00h	Modes of operation display	INT8	RO	TxPDO	–	–	–
606Bh	00h	Velocity demand value [Hz]	INT32	RO	TxPDO	–	–	–
606Ch	00h	Velocity actual value [Hz]	INT32	RO	TxPDO	–	–	–
6083h	00h	Profile acceleration [step/s^2]	U32	RW	RxPDO	○	1 to 1,000,000,000 (Initial value: 300,000)	B
6084h	00h	Profile deceleration [step/s^2]	U32	RW	RxPDO	○	1 to 1,000,000,000 (Initial value: 300,000)	B
60FFh	00h	Target velocity [Hz]	INT32	RW	RxPDO	–	−4,000,000 to 4,000,000 (Initial value: 0)	B
4142h	00h	Starting speed [Hz]	INT32	RW	No	○	0 to 4,000,000 (Initial value: 5,000)	B

■ Controlword of Profile velocity mode

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific (ms)					Reserved	oms	Halt
–	–	Type		–		–	
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Fault reset	Operation mode specific (oms)			Enable operation	Quick stop	Enable voltage	Switch on
	–	–	–				

Details of Controlword

Bit	Name	Value	Description
13	Type	−	Selects the operation mode of the Profile velocity mode. The operation mode changed is updated immediately. For details, refer to "Operation mode of Profile velocity mode".
12		−	
8	Halt	0	Operation is allowed.
		1	Stops the operation. The stopping method is in accordance with the setting of the Halt option code (605Dh).

For Bit 7 and Bit 3 to Bit 0, refer to "State transition of drive state machine" on p.48.

■ Operation mode of Profile velocity mode

The operation mode of the Profile velocity mode is set with the Type (6040h: Bit 13, Bit 12). The operation modes are listed in the table.

Bit 13	Bit 12	Operation mode	Description
0	0	Continuous operation (position control)	The motor starts rotating at the Starting speed (4142h) and accelerates until the Target velocity (60FFh) is reached. Once the Target velocity (60FFh) is reached, operation is continued with the speed maintained. Since operation is performed while the position deviation is monitored, an alarm of Overload or Excessive position deviation is generated when a load exceeding the motor torque is applied. If the position deviation suddenly occurs, for example, when a large load is removed, the motor accelerates suddenly or puts into a state of overspeed to remove the deviation.
0	1	Continuous operation (speed control)	The motor starts rotating at the Starting speed (4142h) and accelerates until the Target velocity (60FFh) is reached. Once the Target velocity (60FFh) is reached, operation is continued with the speed maintained. When a load exceeding the motor torque is applied, an alarm of Overload is generated.
1	0	Continuous operation (push-motion) *	The motor starts rotating at the Starting speed (4142h) and accelerates until the Target velocity (60FFh) is reached. Once the Target velocity (60FFh) is reached, operation is continued with the speed maintained. When a mechanism installed to the motor presses against a load, pressure is continuously applied to the load.
1	1	Continuous operation (torque control) *	The motor performs self-start operation (rectangular operation) at the Target velocity (60FFh) and continues the operation with the speed maintained. When a mechanism installed to the motor presses against a load, pressure is continuously applied to the load.

Note *When continuous operation (push-motion) or continuous operation (torque control) is performed, note the following.

- When a mechanism installed to the motor pressed against a load, push-motion operation is performed while a position deviation of 2.7° generates. Since an alarm of Overload may be generated if the operation is stopped in this state, perform operation to return the actual position by 3.6° before push-motion operation is stopped.
- Do not perform push-motion operation with geared motors and the **DGII** Series. Doing so may cause damage to the motor or gear part.
- When push-motion operation is stopped in a state where a load is pressed, set the Operating current (4120h) of the next operation to be executed, to a value in the Push current (4121h) or less. If a higher current value than the Push current (4121h) is set, the push current may increase when the operation transitions, causing an unexpected push force to apply.

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■ **Statusword of Profile velocity mode**

| Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific		Operation mode specific		Internal limit active	Target reached	Remote	ms
TLC	–	–	Speed				–
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on

Details of Statusword

Bit	Name	Value	Description
15	TLC	0	A load does not reach the upper limit of the motor output torque.
		1	A load reached the upper limit of the motor output torque.
12	Speed	0	Internal command speed is other than 0.
		1	Internal command speed is 0.
11	Internal limit active	0	The function limitation by the internal limit is not in an active state.
		1	The function limitation by the internal limit became an active state. The value changes to 1 when any of the following internal limit functions is being activated. ● Limit sensor (FW-LS/RV-LS) ● Operation prohibition input (FW-BLK/RV-BLK) ● Software limit ● Mechanism limit
10	Target reached	0	● When the Halt (6040h: Bit 8) is 0: The internal feedback speed does not reach the Target velocity (60FFh). ● When the Halt (6040h: Bit 8) is 1: During deceleration stop. (Internal command speed is other than 0.)
		1	● When the Halt (6040h: Bit 8) is 0: The internal feedback speed reached the Target velocity (60FFh). When the Halt is 0, the status of the VA output signal is output. The judgment level of the target velocity reached can be set with the VA mode selection (4718h) and the VA detection speed range (4719h). ● When the Halt (6040h: Bit 8) is 1: The internal command speed is 0.
9	Remote	1	The value changes to 1 when the initialization is completed.
7	Warning	0	Information is not generated. When the cause of information is cleared, the Warning is automatically cleared to 0.
		1	Information is being generated.

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■ Operation in Profile velocity mode

V1, V2: velocity
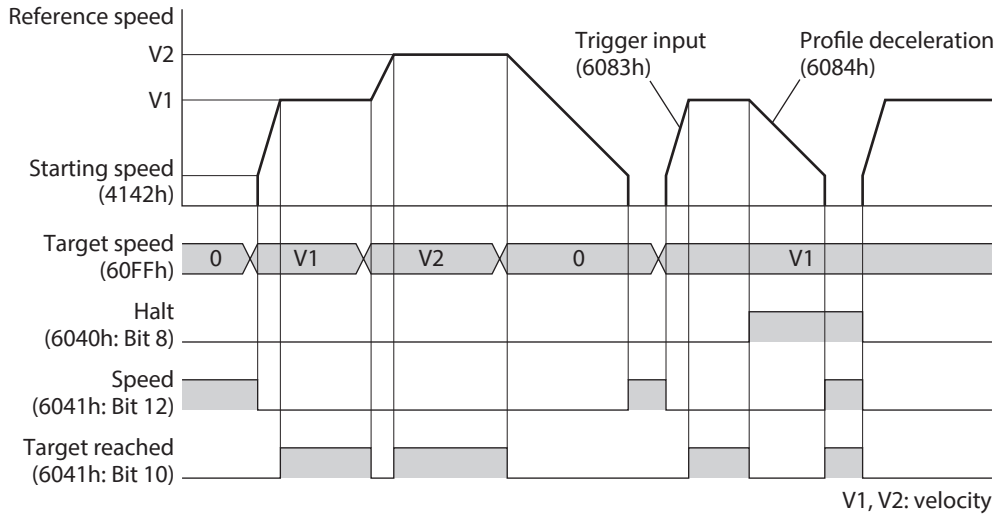
(memo) When the Type (6040h: Bit 13, Bit 12) is set to continuous operation (torque control), self-start operation (rectangular operation) at the Target velocity (60FFh) is performed.

3-7 Homing mode (HM)

The Homing mode is used to set the home. A path generation (profile generation) is performed in the driver. If return-to-home operation is performed, the position preset (P-PRESET) is executed when the operation is completed, and the home will be the value set in the Home offset (607Ch).

● **Related objects**

Refer to "Selection of Homing (return-to-home) method" on p.70.

■ Before starting operation; When a motorized actuator is used

For parameters of the **AZ** Series, the different values have been stored in the ABZO sensor and the driver, respectively. The values based on the product specifications are stored in the ABZO sensor. The values stored in the ABZO sensor cannot be changed because of the fixed value. Meantime, the values for the standard type (motor only) are stored in the driver parameters.

In a state of the factory shipment, the parameter information (fixed value) stored in the ABZO sensor is used preferentially. Since parameters stored in the driver are prioritized in the Homing mode, change the setting according to the following steps.

1. Copy the ABZO information (fixed value) of the ABZO sensor to the driver. Refer to the **AZ** Series OPERATING MANUAL Function Edition for details.

2. Change the JOG/HOME/ZHOME operation setting (47F5h) to "1: Manual setting."

3. Change the Homing method (6098h) to "−1: Return-to-home of our specifications."

4. Execute the Write batch NV memory (40C9h).

5. Turn on the main power supply and control power supply of the driver again.
   With these steps, the driver parameters will be prioritized.

■ Controlword of Homing mode

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific (ms)					Reserved	oms	Halt
–	–	–	–	–		–	
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Fault reset	Operation mode specific (oms)			Enable operation	Quick stop	Enable voltage	Switch on
	–	–	Homing operation start				

Details of Controlword

Bit	Name	Value	Description
8	Halt	0	Operation is allowed.
		1	Stops the operation. The stopping method is in accordance with the setting of the Halt option code (605Dh).
4	Homing operation start	0 to 1	Start of return-to-home operation If the "Homing operation start" is set to 0 during return-to-home operation, the motor decelerates to a stop. When the state is any of the followings, the command is not received, and the operation is not started. ● During operation ● The Halt (6040h: Bit 8) has been set to 1. ● The STOP input is being ON. ● The drive state machine is other than "Operation enabled." ● The motor is in a non-excitation state.

For Bit 7 and Bit 3 to Bit 0, refer to "State transition of drive state machine" on p.48.

■ Statusword of Homing mode

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific		Operation mode specific		Internal limit active	Target reached	Remote	ms
TLC	–	Homing error	Homing attained				–
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on

● **Details of Statusword**

Bit	Name	Value	Description
15	TLC	0	A load does not reach the upper limit of the motor output torque.
		1	A load reached the upper limit of the motor output torque.
13	Homing error	0/1	Outputs the status of the motor based on a combination of values in the Homing error, Homing attained (6041h: Bit 12), and Target reached (6041h: Bit 10). Refer to the next table for details.
12	Homing attained	0/1	Outputs the status of the motor based on a combination of values in the Homing error (6041h: Bit 13), Homing attained, and Target reached (6041h: Bit 10). Refer to the next table for details.
11	Internal limit active	0	The function limitation by the internal limit is not in an active state.
		1	The function limitation by the internal limit became an active state. The value changes to 1 when any of the following internal limit functions is being activated. ● Limit sensor (FW-LS/RV-LS) ● Operation prohibition input (FW-BLK/RV-BLK) ● Software limit ● Mechanism limit
10	Target reached	0/1	Outputs the status of the motor based on a combination of values in the Homing error (6041h: Bit 13), Homing attained (6041h: Bit 12), and Target reached. Refer to the next table for details.
9	Remote	1	The value changes to 1 when the initialization is completed.
7	Warning	0	Information is not generated. When the cause of information is cleared, the Warning is automatically cleared to 0.
		1	Information is being generated.

For Bit 6 to Bit 0, refer to "Status output of drive state machine" on p.49.

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● **Status output of motor**

The status of the motor is output based on a combination of values in the Homing error (Bit 13), Homing attained (Bit 12), and Target reached (Bit 10).

Homing error (Bit 13)	Homing attained (Bit 12)	Target reached (Bit 10)	Signal state
0	0	0	During operation of return-to-home operation
0	0	1	Return-to-home operation is interrupted, or it is not started.
0	1	0	– (Not generated)
0	1	1	Return-to-home operation was properly completed.
1	0	0	– (Not generated)
1	0	1	Interrupted since an alarm was generated during return-to-home operation.
1	1	0	Reserved
1	1	1	Reserved

■ **Selection of Homing (return-to-home) method**

The return-to-home method is selected with the Homing method (6098h). The driver supports the following methods to return to the home.

Homing method	Description
17	Return-to-home by the limit sensor (FW-LS/RV-LS). Starts in the negative direction.
18	Return-to-home by the limit sensor (FW-LS/RV-LS). Starts in the positive direction.
24	Return-to-home by the home sensor (HOMES). Starts in the positive direction.
28	Return-to-home by the home sensor (HOMES). Starts in the negative direction.
35, 37 *	Home preset
−1	Return-to-home of Oriental Motor's specifications

* 35 and 37 perform the same action.

● **Related objects**

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
607Ch	00h	Home offset [step]	INT32	RW	No	○	−2,147,483,648 to 2,147,483,647 (Initial value: 0)	A
6098h	00h	Homing method	INT8	RW	No	○	17, 18, 24 (Initial value), 28, 35, 37, −1 (⇨ "Selection of Homing (return-to-home) method")	B
6099h	01h	Speed during search for switch [Hz]	U32	RW	No	○	1 to 4,000,000 (Initial value: 10,000)	B
	02h	Speed during search for zero [Hz]	U32	RW	No	○	1 to 10,000 (Initial value: 5,000)	B
609Ah	00h	Homing acceleration [step/s^2]	U32	RW	No	○	1 to 1,000,000,000 (Initial value: 300,000)	B
415Fh	00h	JOG/HOME/ZHOME operating current [1=0.1 %]	INT16	RW	No	○	0 to 1,000 (Initial value: 1,000)	B
4163h	00h	(HOME) Starting speed [Hz]	INT32	RW	No	○	1 to 4,000,000 (Initial value: 5,000)	B
4169h	00h	(HOME) Backward steps in 2 sensor home-seeking [step]	INT32	RW	No	○	0 to 8,388,607 (Initial value: 5,000)	B
41C6h	00h	Preset position [step]	INT32	RW	No	○	−2,147,483,648 to 2,147,483,647 (Initial value: 0)	A

● **Return-to-home operation of Oriental Motor's specifications**

When the Homing method (6098h) is set to −1, the return-to-home mode of Oriental Motor's specifications is applied.

Related objects (Oriental Motor's specifications)

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
607Ch	00h	Home offset [step]	INT32	RW	No	○	−2,147,483,648 to 2,147,483,647 (Initial value: 0)	A
6099h	01h	Speed during search for switch [Hz]	U32	RW	No	○	1 to 4,000,000 (Initial value: 10,000)	B
	02h	Speed during search for zero [Hz]	U32	RW	No	○	1 to 10,000 (Initial value: 5,000)	B
609Ah	00h	Homing acceleration [step/s^2]	U32	RW	No	○	1 to 1,000,000,000 (Initial value: 300,000)	B
415Fh	00h	JOG/HOME/ZHOME operating current [1=0.1 %]	INT16	RW	No	○	0 to 1,000 (Initial value: 1,000)	B
4160h	00h	(HOME) Home-seeking mode	U8	RW	No	○	0: 2-sensor 1: 3-sensor * 2: One-way rotation (Initial value) 3: Push-motion	B
4161h	00h	(HOME) Starting direction	U8	RW	No	○	0: Negative side 1: Positive side (Initial value)	B
4163h	00h	(HOME) Starting speed [Hz]	INT32	RW	No	○	1 to 4,000,000 (Initial value: 5,000)	B
4166h	00h	(HOME) SLIT detection	U8	RW	No	○	0: Disable (Initial value) 1: Enable	B
4167h	00h	(HOME) TIM/ZSG signal detection	U8	RW	No	○	0: Disable (Initial value) 1: TIM 2: ZSG	B
4168h	00h	(HOME) Position offset [Hz]	INT32	RW	No	○	−2,147,483,647 to 2,147,483,647 (Initial value: 0)	B
4169h	00h	(HOME) Backward steps in 2 sensor home-seeking [step]	INT32	RW	No	○	0 to 8,388,607 (Initial value: 5,000)	B
416Ah	00h	(HOME) Operating amount in uni-directional home-seeking [step]	INT32	RW	No	○	0 to 8,388,607 (Initial value: 5,000)	B
416Bh	00h	(HOME) Operating current for push-home-seeking [1=0.1 %]	INT16	RW	No	○	0 to 1,000 (Initial value: 1,000)	B
416Ch	00h	(HOME) Backward steps after first entry in push-home-seeking [step]	INT32	RW	No	○	0 to 8,388,607 (Initial value: 0)	B
416Dh	00h	(HOME) Pushing time in push-home-seeking [ms]	U16	RW	No	○	0 to 65,535 (Initial value: 200)	B
416Eh	00h	(HOME) Backward steps in push-home-seeking [step]	INT32	RW	No	○	0 to 8,388,607 (Initial value: 5,000)	B
41C6h	00h	Preset position [step]	INT32	RW	No	○	−2,147,483,648 to 2,147,483,647 (Initial value: 0)	A

* Two input signals are provided for the mini Driver. Return-to-home operation of the 3-sensor mode requires three inputs: HOMES input, FW-LS input, and RV-LS input. Therefore, return-to-home operation of the 3-sensor mode is not recommended for the mini Driver.

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■ Operation in Homing mode of CiA402 drive profile

How to read the figure

Starting position of operation

Traveling direction ← 28

HOMES
(limit signal)

Reverses when the motor passed
through the limit signal

Selection number of the "Homing
method (6098h)" and stop position
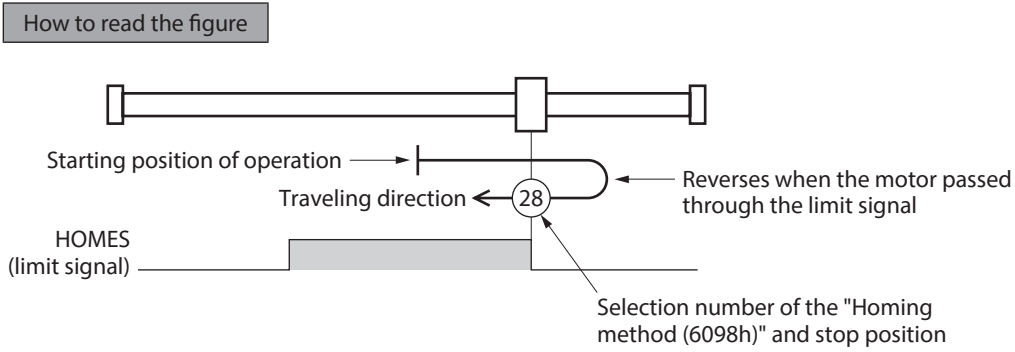
● **Homing method: 24 [Return-to-home by the home sensor (HOMES), starts in the positive direction]**

When the HOME sensor is detected, the motor rotates in the reverse direction and pulls out of the HOME sensor at the (HOME) Starting speed (4163h). After pulling out of the HOME sensor, the motor reverses once again, and continue to operate at the Speed during search for zero (6099h-02h). The motor stops when the ON edge of the HOME sensor is detected, and the position at which the motor stopped is set as the home.

HOME switch
(HOMES)

Positive limit switch
(FW-LS)

In the case of return-to-home operation of Oriental Motor's specifications, the same operation is performed if the following data is set.
- (HOME) Home-seeking mode (4160h): 1 [3-sensor]
- (HOME) Starting direction (4161h): 1 [positive side]
- (HOME) SLIT detection (4166h): 0 [disable]
- (HOME) TIM/ZSG signal detection (4167h): 0 [disable]

● **Homing method: 28 [Return-to-home by the home sensor (HOMES), starts in the negative direction]**

When the HOME sensor is detected, the motor rotates in the reverse direction and pulls out of the HOME sensor at the (HOME) Starting speed (4163h). After pulling out of the HOME sensor, the motor reverses once again, and continue to operate at the Speed during search for zero (6099h-02h). The motor stops when the ON edge of the HOME sensor is detected, and the position at which the motor stopped is set as the home.

HOME switch
(HOMES)

Negative limit switch
(RV-LS)

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In the case of return-to-home operation of Oriental Motor's specifications, the same operation is performed if the following data is set.
- (HOME) Home-seeking mode (4160h): 1 [3-sensor]
- (HOME) Starting direction (4161h): 0 [negative side]
- (HOME) SLIT detection (4166h): 0 [disable]
- (HOME) TIM/ZSG signal detection (4167h): 0 [disable]

● **Homing method: 17 [Return-to-home by the limit sensor (FW-LS/RV-LS), starts in the negative direction]**

After pulling out of the limit sensor, the motor rotates according to the value set in the (HOME) Backward steps in 2 sensor home-seeking (4169h) and stops. The position at which the motor stopped is set as the home.

Negative limit switch
(RV-LS)
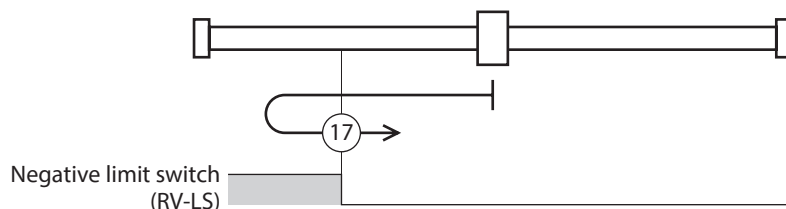
In the case of return-to-home operation of Oriental Motor's specifications, the same operation is performed if the following data is set.
- (HOME) Home-seeking mode (4160h): 0 [2-sensor]
- (HOME) Starting direction (4161h): 0 [negative side]
- (HOME) SLIT detection (4166h): 0 [disable]
- (HOME) TIM/ZSG signal detection (4167h): 0 [disable]

● **Homing method: 18 [Return-to-home by the limit sensor (FW-LS/RV-LS), starts in the positive direction]**

After pulling out of the limit sensor, the motor rotates according to the value set in the (HOME) Backward steps in 2 sensor home-seeking (4169h) and stops. The position at which the motor stopped is set as the home.

Positive limit switch
(FW-LS)
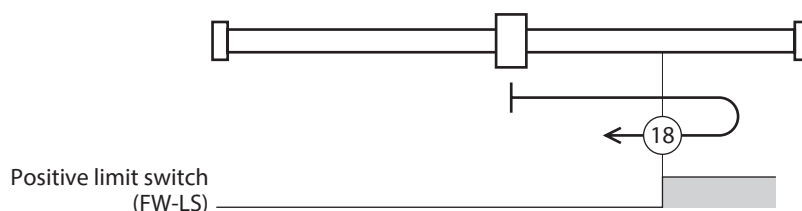
In the case of return-to-home operation of Oriental Motor's specifications, the same operation is performed if the following data is set.
- (HOME) Home-seeking mode (4160h): 0 [2-sensor]
- (HOME) Starting direction (4161h): 1 [positive side]
- (HOME) SLIT detection (4166h): 0 [disable]
- (HOME) TIM/ZSG signal detection (4167h): 0 [disable]

● **Homing method: 35, Homing method: 37 (home preset)**

The present position is set as the home. The home preset can be executed except when the drive state machine is in a state of "Operation enabled." It can also be executed even when the motor is in a non-excitation state.

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■ Operation in Homing mode of Oriental Motor's specifications

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

The motor operates at the Speed during search for switch (6099h-01h). When the limit sensor is detected during operation, the motor rotates in the reverse direction and pulls out of the limit sensor. The motor stops when the ON edge of the HOME sensor is detected, and the position at which the motor stopped is set as the home.

memo Three input signals of the HOMES input, FW-LS input, and RV-LS input are used for return-to-home operation in the 3-sensor mode, but the mini Driver has only two input signals. Therefore, connect either the HOMES input and the FW-LS input or the HOMES input and the RV-LS input.

Explanation of code	• VR: Speed during search for switch (6099h-01h)
	• VS: (HOME) Starting speed (4163h)
	• VL: Speed during search for zero (6099h-02h)
	• - - -: 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 the TIM output and/or the 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.

Explanation of code	• VR: Speed during search for switch (6099h-01h)
	• VS: (HOME) Starting speed (4163h)
	• VL: Speed during search for zero (6099h-02h)
	• - - -: Orbit when the home offset is set

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

● **Return-to-home operation sequence of 2-sensor mode**

The motor operates at the the (HOME) Starting speed (4163h). When the limit sensor is detected, the motor rotates in the reverse direction and pulls out of the limit sensor.
After pulling out of the limit sensor, the motor rotates according to the value set in the (HOME) Backward steps in 2 sensor home-seeking (4169h) and stops. The position at which the motor stopped is set as the home.

Explanation of code	• VR: Speed during search for switch (6099h-01h) • VS: (HOME) Starting speed (4163h) • VL: Speed during search for zero (6099h-02h) • - - -: 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		

* After pulling out of the limit sensor, the motor rotates according to the value set in the (HOME) Backward steps in 2 sensor home-seeking (4169h) and stops.

When the TIM output and/or the 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.

Explanation of code	• VR: Speed during search for switch (6099h-01h) • VS: (HOME) Starting speed (4163h) • VL: Speed during search for zero (6099h-02h) • - - -: Orbit when the home offset is set.

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

* After pulling out of the limit sensor, the motor rotates according to the value set in the (HOME) Backward steps in 2 sensor home-seeking (4169h) and stops.

(memo) Two input signals are provided for the mini Driver. Since two input signals of the FW-LS input and RV-LS input are used for return-to-home operation in the 2-sensor mode, the SLIT input cannot be connected.

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● **One-way rotation mode**

The motor operates at the Speed during search for switch (6099h-01h). When the HOME sensor is detected, the motor decelerates to a stop and pulls out of the HOME sensor at the Speed during search for zero (6099h-02h).
After pulling out of the limit sensor, the motor rotates according to the value set in the (HOME) Operating amount in uni-directional home-seeking (416Ah) and stops. The position at which the motor stopped is set as the home.

Explanation of code	• VR: Speed during search for switch (6099h-01h)
	• VS: (HOME) Starting speed (4163h)
	• VL: Speed during search for zero (6099h-02h)
	• - - -: 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		

* After pulling out of the HOME sensor, the motor rotates according to the value set in the (HOME) Operating amount in uni-directional home-seeking (416Ah) and stops.

(memo) If the motor pulls out of the HOME sensor during deceleration stop after detection of the HOME sensor, an alarm of Return-to-home error (alarm code 62h) is generated. Set the Homing acceleration (609Ah) so that the motor can stop in the range of the HOME sensor.

When the SLIT input, the TIM output, and the 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.

Explanation of code	• VR: Speed during search for switch (6099h-01h) • VS: (HOME) Starting speed (4163h) • VL: Speed during search for zero (6099h-02h) • - - -: Orbit when the home offset is set.

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		

* After pulling out of the HOME sensor, the motor rotates according to the value set in the (HOME) Operating amount in uni-directional home-seeking (416Ah) and stops.

● **Push-motion mode**

The motor operates at the Speed during search for switch (6099h-01h). When a mechanism installed to the motor presses against the stopper or others installed in the mechanical end, the motor rotates in the reverse direction and stops after rotating according to the value set in the (HOME) Backward steps after first entry in push-home-seeking (416Ch). Once again, the motor starts operation toward the stopper. It rotates in the reverse direction when pressing against the stopper, and stops after rotating the value set in the (HOME) Backward steps in push-home-seeking (416Eh).

Note	Do not perform push-motion operation with geared motors and the **DGII** Series. Doing so may cause damage to the motor or gear part.

Explanation of code	• VR: Speed during search for switch (6099h-01h)
	• VS: (HOME) Starting speed (4163h)
	• VL: Speed during search for zero (6099h-02h)
	• - - -: 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 (416Ch) and stops.

*2 The motor rotates from the mechanical end according to the value set in the (HOME) Backward steps in push-home-seeking (416Eh) and stops.

When the SLIT input, the TIM output, and the 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.

Explanation of code	• VR: Speed during search for switch (6099h-01h)
	• VS: (HOME) Starting speed (4163h)
	• VL: Speed during search for zero (6099h-02h)
	• - - -: Orbit when the home offset is set.

Home detection signal	Starting direction of return-to-home operation: Positive side	Starting direction of return-to-home operation: Negative side
SLIT input	Reverse side mechanical end — Forward side mechanical end +VR +VS +VL −VL −VS −VR SLIT input ON / OFF	Reverse side mechanical end — Forward side mechanical end +VR +VS +VL −VL −VS −VR SLIT input ON / OFF
TIM output or ZSG output	Reverse side mechanical end — Forward side mechanical end +VR +VS +VL −VL −VS −VR TIM output (ZSG output) ON / OFF	Reverse side mechanical end — Forward side mechanical end +VR +VS +VL −VL −VS −VR TIM output (ZSG output) ON / OFF
SLIT input and TIM output or SLIT input and ZSG output	Reverse side mechanical end — Forward side mechanical end +VR +VS +VL −VL −VS −VR SLIT input ON / OFF TIM output (ZSG output) ON / OFF	Reverse side mechanical end — Forward side mechanical end +VR +VS +VL −VL −VS −VR SLIT input ON / OFF TIM output (ZSG output) ON / OFF

* The motor rotates from the mechanical end according to the value set in the (HOME) Backward steps in push-home-seeking (416Eh) and stops.

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4 Functions

4-1 Touch probe

The touch probe is a function to set the external latch input signal (EXT1 input, EXT2 input) or the output signal (ZSG output, TIM output) as a trigger, and to latch the position when the trigger is input. For the position to latch, either the internal command position or the feedback position can be selected.
The touch probe has the touch probe 1 and touch probe 2.

● **Related objects**

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
60B8h	00h	Touch probe function	U16	RW	RxPDO	–	0000h to FFFFh (Initial value: 0000h)	A
60B9h	00h	Touch probe status	U16	RO	TxPDO	–	–	–
60BAh	00h	Touch probe position 1 positive value [step]	INT32	RO	TxPDO	–	–	–
60BBh	00h	Touch probe position 1 negative value [step]	INT32	RO	TxPDO	–	–	–
60BCh	00h	Touch probe position 2 positive value [step]	INT32	RO	TxPDO	–	–	–
60BDh	00h	Touch probe position 2 negative value [step]	INT32	RO	TxPDO	–	–	–
44B0h	00h	Touch probe 1 latch position	U8	RW	No	–	0: Latches the feedback position (Initial value) 1: Latches the command position	A
44B1h	00h	Touch probe 2 latch position	U8	RW	No	–	0: Latches the feedback position (Initial value) 1: Latches the command position	A
44B2h	00h	Touch probe 1 TIM/ZSG signal select	U8	RW	No	–	0: Latch on the ZSG output (Initial value) 1: Latch on the TIM output	A
44B3h	00h	Touch probe 2 TIM/ZSG signal select	U8	RW	No	–	0: Latch on the ZSG output (Initial value) 1: Latch on the TIM output	A

● **Related signals**

Signal name	Description
EXT1 input	This is an external latch input signal for the touch probe 1.
EXT2 input	This is an external latch input signal for the touch probe 2.
ZSG output	This signal can be used in the touch probe 1 and touch probe 2.
TIM output	This signal is output every time the motor output shaft rotates by 7.2 °. It can be used in the touch probe 1 and touch probe 2.

■ Details of touch probe function

The action of the touch probe is set with the Touch probe function (60B8h).
Set the action of the touch probe 1 in the lower 8 bits and that of the touch probe 2 in the upper 8 bits.

Set the trigger condition using the Touch probe 1 trigger action/Touch probe 2 trigger action (Bit 1/Bit 9) and the Touch probe 1 trigger selection/Touch probe 2 trigger selection (Bit 2/Bit 10). After that, changing the Touch probe 1 permission/Touch probe 2 permission (Bit 0/Bit 8) from 0 to 1 latches according to the set trigger condition.
Be sure to change the Touch probe 1 permission/Touch probe 2 permission (Bit 0/Bit 8) back to 0 before changing the trigger condition. Changing the trigger condition while the Touch probe 1 permission/Touch probe 2 permission (Bit 0/Bit 8) remains 1 will not be enabled.

Bit	Name	Value	Description
0	Touch probe 1 permission	0	Disables the touch probe 1.
		1	Enables the touch probe 1.
1	Touch probe 1 trigger action	0	First trigger action Latches only once on the first trigger.
		1	Continuous action Latches every time a trigger is input.
2	Touch probe 1 trigger selection	0	Sets the external latch input EXT1 as a trigger.
		1	Sets the ZSG output or the TIM output as a trigger.
3	Reserved	0	Reserved
4	Touch probe 1 positive value action	0	Disables the latch function at the positive value of a trigger.
		1	Enables the latch function at the positive value of a trigger.
5	Touch probe 1 negative value action	0	Disables the latch function at the negative value of a trigger.
		1	Enables the latch function at the negative value of a trigger.
6	Reserved	0	Reserved
7	Reserved	0	Reserved
8	Touch probe 2 permission	0	Disables the touch probe 2.
		1	Enables the touch probe 2.
9	Touch probe 2 trigger action	0	First trigger action Latches only once on the first trigger.
		1	Continuous action Latches every time a trigger is input.
10	Touch probe 2 trigger selection	0	Sets the external latch input EXT2 as a trigger.
		1	Sets the ZSG output or the TIM output as a trigger.
11	Reserved	0	Reserved
12	Touch probe 2 positive value action	0	Disables the latch function at the positive value of a trigger.
		1	Enables the latch function at the positive value of a trigger.
13	Touch probe 2 negative value action	0	Disables the latch function at the negative value of a trigger.
		1	Enables the latch function at the negative value of a trigger.
14	Reserved	0	Reserved
15	Reserved	0	Reserved

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■ Details of touch probe status

The status of the touch probe is output by the Touch probe status (60B9h).
The status of the touch probe 1 is output in the lower 8 bits, and that of the touch probe 2 is output in the upper 8 bits.

Bit	Name	Value	Description
0	Touch probe 1 permission status	0	The touch probe 1 is disabled.
		1	The touch probe 1 is enabled.
1	Touch probe 1 positive value latch	0	Has not latch on the positive value of the touch probe 1.
		1	Latched on the positive value of the touch probe 1.
2	Touch probe 1 negative value latch	0	Has not latch on the negative value of the touch probe 1.
		1	Latched on the negative value of the touch probe 1.
3 to 7	Reserved	0	Reserved
8	Touch probe 2 permission status	0	The touch probe 2 is disabled.
		1	The touch probe 2 is enabled.
9	Touch probe 2 positive value latch	0	Has not latch on the positive value of the touch probe 2.
		1	Latched on the positive value of the touch probe 2.
10	Touch probe 2 negative value latch	0	Has not latch on the negative value of the touch probe 2.
		1	Latched on the negative value of the touch probe 2.
11 to 15	Reserved	0	Reserved

■ Trigger and latch position

A signal that is set as a trigger is selected by the Trigger selection (Bit 2/Bit 10) of the Touch probe function (60B8h). The ZSG output and the TIM output can be selected with the Touch probe TIM/ZSG signal select (44B2h/44B3h). The latch position varies depending on the signal that was set as a trigger. When the external latch input (EXT1 input, EXT2 input) is set as a trigger, the latch position can be set to ether the feedback position (actual position) or the internal command position.

Signal name	Latch position
External latch input	Feedback position (actual position) or internal command position. Select by the Touch probe latch position (44B0h/44B1h).
ZSG output	Feedback position
TIM output	Internal command position

Related objects

Index	Sub	Object name	Initial value	Description
44B0h	00h	Touch probe 1 latch position	0	0: Latches the feedback position
44B1h	00h	Touch probe 2 latch position	0	1: Latches the command position
44B2h	00h	Touch probe 1 TIM/ZSG signal select	0	0: Latch on the ZSG output
44B3h	00h	Touch probe 2 TIM/ZSG signal select	0	1: Latch on the TIM output

■ Operation sequence of touch probe

The operation examples of the touch probe 1 are shown below.

● When the trigger action is "First trigger action (60B8h: Bit 1 is 0)

Touch probe 1 permission
(60B8h: Bit 0)

Touch probe 1 up-edge action
(60B8h: Bit 4)

Touch probe 1 permission status
(60B9h: Bit 0)

Touch probe 1 up-edge latch
(60B9h: Bit 1)

Trigger input

Touch probe 1 latch position (up-edge)
(60BAh)

| P0 | P1 | P2 |

P0 to P2: Latched position
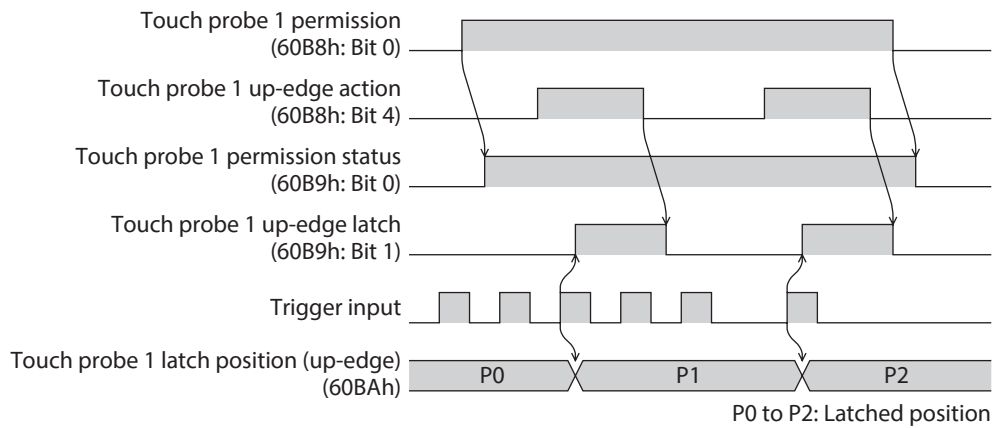
● When the trigger action is "Continuous action (60B8h: Bit 1 is 1)

Touch probe 1 permission
(60B8h: Bit 0)

Touch probe 1 up-edge action
(60B8h: Bit 4)

Touch probe 1 permission status
(60B9h: Bit 0)

Touch probe 1 up-edge latch
(60B9h: Bit 1)

Trigger input

Touch probe 1 latch position (up-edge)
(60BAh)

| P0 | P1 | P2 | P3 |

P0 to P3: Latched position
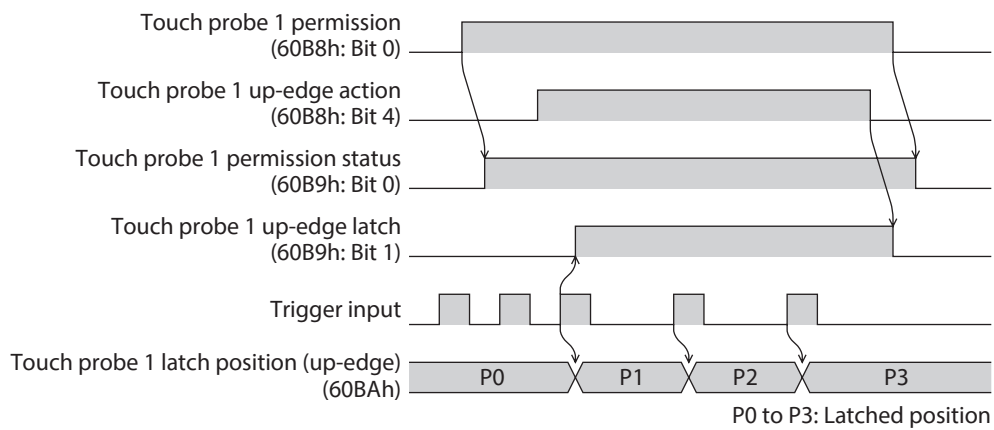
4-2   Resolution

When the Gear ratio (6091h) is set, the resolution per revolution of the motor output shaft can be set.
- Resolution of the motor output shaft = 10,000 × Electronic gear B (6091h-02h)/Electronic gear A (6091h-01h)
- Factory setting: 10,000 P/R
- Setting range: 100 to 10,000 P/R

Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6091h	00h	Number of entries	U8	RO	No	–	2	–
	01h	Electronic gear A	U32	RW	No	○	1 to 65,535 (Initial value: 1)	C
	02h	Electronic gear B	U32	RW	No	○	1 to 65,535 (Initial value: 1)	C

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> memo
> - If a value out of the setting range is set, information of Electronic gear setting error is generated (information code 2000h). If the main power supply and the control power supply is turned on again or Configuration is executed in a state where information of Electronic gear setting error is being generated, an alarm of Electronic gear setting error will be generated (alarm code 71h).
> - If the resolution was changed after preset was executed in a state where the Home offset (607Ch) is other than 0, execute preset again. When the Home offset (607Ch) is 0, it is no need to execute preset again even if the resolution is changed. (The present position is calculated automatically.)
> - When the TIM output is used in return-to-home operation or the like, set the resolution to be an integral multiple of 50.

4-3 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.

Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
41C7h	00h	Wrap setting	U8	RW	No	○	0: Disable 1: Enable (Initial value)	C
41C9h	00h	Initial coordinate generation & wrap setting range [1=0.1 rev]	INT32	RW	No	○	5 to 655,360 (Initial value: 10)	C
41CBh	00h	Initial coordinate generation & wrap range offset ratio [1=0.01 %]	U16	RW	No	○	0 to 10,000 (Initial value: 5,000)	C
41CCh	00h	Initial coordinate generation & wrap range offset value [step]	INT32	RW	No	○	−536,870,912 to 536,870,911 (Initial value: 0)	C

4-4 Operating current and stop current

Set the base current rate (%) for the operating current and stop current in the Base current (4126h).
- Operating current = Maximum output current × Base current (4126h) × Operating current (4120h)
- Stop current = Maximum output current × Base current (4126h) × Stop current (4128h)
- Push current = Maximum output current × Base current (4126h) × Push current (4121h)

> memo
> If the base current is set, the maximum output current of the driver can be changed. If a load is small and there is an ample allowance for torque, the motor temperature rise can be suppressed by setting a lower base current. However, excessively low base current may cause a problem in starting the motor or holding the load in position. Do not reduce the base current any more than is necessary.

Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4120h	00h	Operating current [1=0.1 %]	INT16	RW	RxPDO	○	0 to 1,000 (Initial value: 1,000)	A *
4121h	00h	Push current [1=0.1 %]	INT16	RW	RxPDO	○	0 to 1,000 (Initial value: 200)	A *
4126h	00h	Base current [1=0.1 %]	INT16	RW	RxPDO	○	0 to 1,000 (Initial value: 1,000)	A
4128h	00h	Stop current [1=0.1 %]	INT16	RW	RxPDO	○	0 to 1,000 (Initial value: 500)	A

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
415Fh	00h	JOG/HOME/ZHOME operating current [1=0.1 %]	INT16	RW	No	○	0 to 1,000 (Initial value: 1,000)	B
416Bh	00h	(HOME) Operating current for push-home-seeking [1=0.1 %]	INT16	RW	No	○	0 to 1,000 (Initial value: 1,000)	B

* In the Profile position mode, it will be updated when operation is started.

4-5　　Maintenance commands

Maintenance commands are used to perform resetting alarms, position preset (P-PRESET), batch processing for the non-volatile memory, and others.

(memo) The maintenance commands include processing in which the memory is operated, such as batch processing for the non-volatile memory and position preset (P-PRESET). Be careful not to execute them unnecessarily in succession.

Related objects

Index	Sub	Name	Description
40C0h	00h	Alarm reset	Resets the alarm being generated presently. Some alarms cannot be reset.
40C2h	00h	Clear alarm history	Clears the alarm history.
40C5h	00h	P-PRESET execution	Presets the command position.
40C6h	00h	Configuration	Executes recalculation and setup of the parameter.
40C8h	00h	Read batch NV memory	Reads the parameters stored in the non-volatile memory to the RAM. All operation data and parameters stored in the RAM are overwritten.
40C9h	00h	Write batch NV memory	Writes the parameters stored in the RAM to the non-volatile memory. The non-volatile memory can be rewritten approximately 100,000 times.
40CAh	00h	All data batch initialization	Restores the parameters stored in the non-volatile memory to their initial values.
40CBh	00h	Read from backup	Reads all the data from the backup area.
40CCh	00h	Write to backup	Writes all the data to the backup area.
40CDh	00h	Clear latch information	Clears the cumulative load. This is used when the Cumulative load value auto clear (41B3h) is set to "0: Disable."
40CFh	00h	Clear tripmeter	Clears the tripmeter.
40D1h	00h	ZSG-PRESET	Sets the position of phase Z again.
40D2h	00h	Clear ZSG-PRESET	Clears the position data of phase Z that was set again with the ZSG-PRESET (40D1h).
40D3h	00h	Clear information	Clears the information.
40D4h	00h	Clear information history	Clears the information history.

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■ How to execute the maintenance commands

The following two methods are available to execute maintenance commands. Use them selectively in accordance with the intended use.

● Write 1 to data (recommended)

When data is changed from 0 to 1 after 1 is written to it, the command is executed.
To execute the same command again, restore the data to 0 and then write 1. It is safe because the command is not executed in succession even if 1 is consecutively written from the EtherCAT master.

● Write 2 to data

When 2 is written to data, the command is executed. After execution, the data is restored to 1 automatically. Data does not need to restore to 1, and it can be written consecutively.
If commands which take time to write to the non-volatile memory such as Write batch NV memory (40C9h) are executed consecutively, increase the length of the intervals between commands.

■ Configuration

Configuration can be executed when all of the following conditions are satisfied:
- An alarm is not being generated.
- 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	Blinking blue	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** Even if monitor is executed while Configuration is being executed, the correct monitor value may not return.

4-6 Assignment of I/O functions

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

■ Assignment to input terminals

Input signals can be assigned to the input terminals IN0 and IN1. Refer to p.93 for signals that can be assigned.

Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4840h	00h	DIN0 input function	U8	RW	No	○	0 to 127 [Initial value: 30 (HOMES)]	C
4841h	00h	DIN1 input function	U8	RW	No	○	0 to 127 [Initial value: 1 (FREE)]	C

■ Direct I/O

The status of direct inputs can be checked with the Direct I/O (406Ah). 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
–	–	–	–	–	–	–	–
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
VR-IN3	VR-IN2	VR-IN1	VR-IN0	–	–	–	–
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
–	–	–	–	–	–	IN1	IN0

Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
406Ah	00h	Direct I/O	U32	RO	TxPDO	–	–	–

■ 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.

Driver object	Description							
I/O status 1 (40B8h)	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	–	CLR	–	FREE	Not used
I/O status 2 (40B9h)	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
	–	–	–	–	–	–	–	–
I/O status 3 (40BAh)	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
	–	–	–	–	–	–	–	–

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Driver object	Description							
I/O status 4 (40BBh)	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
	–	–	–	–	–	–	EXT2	EXT1
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	–	–	–	–	–	–
I/O status 5 (40BCh)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	–	–	TIM	RND-ZERO	ZSG	RV-SLS	FW-SLS	RND-OVF
	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	–	IN-POS	–	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
I/O status 6 (40BDh)	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
	–	–	–	–	–	–	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
I/O status 7 (40BEh)	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-FULL	DCMD-RDY	–	–	–	–
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	–	OPE-BSY	–	–	SPD-LMTD	CRNT-LMTD
I/O status 8 (40BFh)	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 objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
40B8h	00h	I/O status 1	U32	RO	TxPDO	–	–	–
40B9h	00h	I/O status 2	U32	RO	TxPDO	–	–	–
40BAh	00h	I/O status 3	U32	RO	TxPDO	–	–	–
40BBh	00h	I/O status 4	U32	RO	TxPDO	–	–	–
40BCh	00h	I/O status 5	U32	RO	TxPDO	–	–	–
40BDh	00h	I/O status 6	U32	RO	TxPDO	–	–	–
40BEh	00h	I/O status 7	U32	RO	TxPDO	–	–	–
40BFh	00h	I/O status 8	U32	RO	TxPDO	–	–	–

■ Driver input command

The Driver input command (403Eh) is an input command from the EtherCAT master to the driver. The arrangement of bits is as follows.
Bit 0 to Bit 15 are assigned to the R-IN0 to R-IN15.
( ): Initial value

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
R-IN15 (not used)	R-IN14 (not used)	R-IN13 (not used)	R-IN12 (not used)	R-IN11 (not used)	R-IN10 (not used)	R-IN9 (not used)	R-IN8 (not used)
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
R-IN7 (not used)	R-IN6 (not used)	R-IN5 (not used)	R-IN4 (not used)	R-IN3 (not used)	R-IN2 (not used)	R-IN1 (not used)	R-IN0 (not used)

Related objects

Refer to p.93 for signals that can be assigned.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4900h	00h	R-IN0 input function	U8	RW	No	O	0 to 127 [Initial value: 0 (not used)]	C
4901h	00h	R-IN1 input function	U8	RW	No	O	0 to 127 [Initial value: 0 (not used)]	C
4902h	00h	R-IN2 input function	U8	RW	No	O	0 to 127 [Initial value: 0 (not used)]	C
4903h	00h	R-IN3 input function	U8	RW	No	O	0 to 127 [Initial value: 0 (not used)]	C
4904h	00h	R-IN4 input function	U8	RW	No	O	0 to 127 [Initial value: 0 (not used)]	C
4905h	00h	R-IN5 input function	U8	RW	No	O	0 to 127 [Initial value: 0 (not used)]	C
4906h	00h	R-IN6 input function	U8	RW	No	O	0 to 127 [Initial value: 0 (not used)]	C
4907h	00h	R-IN7 input function	U8	RW	No	O	0 to 127 [Initial value: 0 (not used)]	C
4908h	00h	R-IN8 input function	U8	RW	No	O	0 to 127 [Initial value: 0 (not used)]	C
4909h	00h	R-IN9 input function	U8	RW	No	O	0 to 127 [Initial value: 0 (not used)]	C
490Ah	00h	R-IN10 input function	U8	RW	No	O	0 to 127 [Initial value: 0 (not used)]	C
490Bh	00h	R-IN11 input function	U8	RW	No	O	0 to 127 [Initial value: 0 (not used)]	C
490Ch	00h	R-IN12 input function	U8	RW	No	O	0 to 127 [Initial value: 0 (not used)]	C

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
490Dh	00h	R-IN13 input function	U8	RW	No	○	0 to 127 [Initial value: 0 (not used)]	C
490Eh	00h	R-IN14 input function	U8	RW	No	○	0 to 127 [Initial value: 0 (not used)]	C
490Fh	00h	R-IN15 input function	U8	RW	No	○	0 to 127 [Initial value: 0 (not used)]	C

■ Driver status

The status of the R-OUT0 to R-OUT15 can be checked with the Driver status (403Fh). The arrangement of bits is as follows.
( ): Initial value

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
R-OUT15 (TLC)	R-OUT14 (IN-POS)	R-OUT13 (MOVE)	R-OUT12 (TIM)	R-OUT11 (AREA2)	R-OUT10 (AREA1)	R-OUT9 (AREA0)	R-OUT8 (SYS-BSY)

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
R-OUT7 (ALM-A)	R-OUT6 (INFO)	R-OUT5 (DCMD-RDY)	R-OUT4 (HOME-END)	R-OUT3 (not used)	R-OUT2 (ZSG)	R-OUT1 (RV-LS_R)	R-OUT0 (FW-LS_R)

Related objects

Refer to p.94 for signals that can be assigned.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4910h	00h	R-OUT0 output function	U8	RW	No	○	0 to 255 [Initial value: 28 (FW-LS_R)]	C
4911h	00h	R-OUT1 output function	U8	RW	No	○	0 to 255 [Initial value: 29 (RV-LS_R)]	C
4912h	00h	R-OUT2 output function	U8	RW	No	○	0 to 255 [Initial value: 155 (ZSG)]	C
4913h	00h	R-OUT3 output function	U8	RW	No	○	0 to 255 [Initial value: 0 (not used)]	C
4914h	00h	R-OUT4 output function	U8	RW	No	○	0 to 255 [Initial value: 144 (HOME-END)]	C
4915h	00h	R-OUT5 output function	U8	RW	No	○	0 to 255 [Initial value: 204 (DCMD-RDY)]	C
4916h	00h	R-OUT6 output function	U8	RW	No	○	0 to 255 [Initial value: 135 (INFO)]	C
4917h	00h	R-OUT7 output function	U8	RW	No	○	0 to 255 [Initial value: 129 (ALM-A)]	C
4918h	00h	R-OUT8 output function	U8	RW	No	○	0 to 255 [Initial value: 136 (SYS-BSY)]	C
4919h	00h	R-OUT9 output function	U8	RW	No	○	0 to 255 [Initial value: 160 (AREA0)]	C
491Ah	00h	R-OUT10 output function	U8	RW	No	○	0 to 255 [Initial value: 161 (AREA1)]	C
491Bh	00h	R-OUT11 output function	U8	RW	No	○	0 to 255 [Initial value: 162 (AREA2)]	C
491Ch	00h	R-OUT12 output function	U8	RW	No	○	0 to 255 [Initial value: 157 (TIM)]	C
491Dh	00h	R-OUT13 output function	U8	RW	No	○	0 to 255 [Initial value: 134 (MOVE)]	C
491Eh	00h	R-OUT14 output function	U8	RW	No	○	0 to 255 [Initial value: 138 (IN-POS)]	C
491Fh	00h	R-OUT15 output function	U8	RW	No	○	0 to 255 [Initial value: 140 (TLC)]	C

■ Input signals list

To assign signals via EtherCAT communication, use the "Assignment number" in the table instead of the signal names.

Assignment number	Signal name	Function	Signal state
0	Not used	Set when the input terminal is not used.	–
1	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 motion 1: Electromagnetic brake is in a state of releasing + motor non-excitation
3	CLR	Clear the deviation (position deviation) between the command position and the actual position to zero.	0: No motion 1: Clear deviation
5	STOP	Stop the motor.	0: No motion 1: Stop operation
8	ALM-RST	Reset the alarm generated presently.	0: No motion 1: Reset alarm
9	P-PRESET	Rewrite the mechanical home to the present position.	0: No motion 1: Execute preset
13	LAT-CLR	Clear the cumulative load. This is used when the Cumulative load value auto clear (41B3h) is set to "0: Disable."	0: No motion 1: Clear cumulative load
14	INFO-CLR	Clear the information status.	0: No motion 1: Clear information status
16	HMI	Release the function limitation of the **MEXE02**.	0: Function limitation 1: Release the function limitation
18	CCM	Change the control mode from the normal mode to the current control mode.	0: Normal mode 1: Current control mode
21	T-MODE	Disable the overload alarm.	0: No motion 1: Disable the overload alarm
22	CRNT-LMT	Execute the current limit.	0: Release the current limitation 1: Current limit
23	SPD-LMT	Execute the speed limit. This signal cannot be used in the Cyclic synchronous position mode (CSP).	0: Release the speed limit 1: Speed limit
26	FW-BLK	Stop the operation in the forward direction.	0: No motion 1: Stop the forward direction operation
27	RV-BLK	Stop the operation in the reverse direction.	0: No motion 1: Stop the reverse direction operation
28	FW-LS	This is a signal to be input from the limit sensor in the forward direction.	0: OFF 1: ON
29	RV-LS	This is a signal to be input from the limit sensor in the reverse direction.	0: OFF 1: ON
30	HOMES	This is a signal input from the mechanical home sensor.	0: OFF 1: ON
31	SLIT	This is a signal to be input from the slit sensor.	0: OFF 1: ON
80	R0	These are general signals.	0: OFF 1: ON
81	R1		
82	R2		
83	R3		
84	R4		
85	R5		
86	R6		

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Assignment number	Signal name	Function	Signal state
87	R7	These are general signals.	0: OFF 1: ON
88	R8		
89	R9		
90	R10		
91	R11		
92	R12		
93	R13		
94	R14		
95	R15		
104	EXT1	This is an external latch signal for the touch probe 1.	0: OFF 1: ON
105	EXT2	This is an external latch signal for the touch probe 2.	0: OFF 1: ON

Note
- When the same input signal is assigned to multiple input terminals, the function will be executed if any of the terminals becomes active.
- When the HMI input is not assigned to the input terminal, this input will always be 1. If it is assigned to both direct I/O (DIN0, DIN1) and remote I/O (R-IN0 to R-IN15), the function will be executed when both of them changes to 1.

■ **Output signals list**

To assign signals via EtherCAT communication, use the "Assignment number" in the table instead of the signal names.

Assignment number	Signal name	Function	Signal state
0	Not used	Set when the output terminal is not used.	–
1 to 127	Response signal (Input signal_R)	Output in response to the corresponding input signal.	0: Input signal is OFF 1: Input signal is ON
128	CONST-OFF	Output an OFF state all the time.	0: OFF
129	ALM-A	Output the alarm status of the driver. (Normally open)	0: No alarm 1: During alarm generation
130	ALM-B	Output the alarm status of the driver. (Normally closed)	0: During alarm generation 1: No alarm
131	SYS-RDY	Output when the control power supply of the driver is turned on.	0: During system preparation 1: System preparation is completed
132	READY	Output when the driver is ready to operate.	0: Operation not possible 1: Ready for operation
134	MOVE	Output when the motor operates.	0: Motor standstill 1: During motor operation
135	INFO	Output the information status of the driver.	0: No information 1: During information generation
136	SYS-BSY	Output when the driver is in an internal processing state.	0: No internal processing 1: During internal processing
138	IN-POS	Output when positioning operation is completed. This signal is not output in the Cyclic synchronous position mode (CSP).	0: During positioning operation 1: Positioning operation is completed
140	TLC	Output when the output torque reaches the upper limit value.	0: Within torque range 1: Outside torque range
141	VA	Output when the operating speed reaches the target speed. This signal is not output in the Cyclic synchronous position mode (CSP).	0: Target speed is not reached 1: Target speed is reached

Assignment number	Signal name	Function	Signal state
142	CRNT	Output when the motor is in an excitation state.	0: Motor non-excitation 1: Motor excitation
143	AUTO-CD	Output when the motor is in automatic current cutback status.	0: Normal state 1: Automatic current cutback status
144	HOME-END	Output when return-to-home operation is completed or position preset (P-PRESET) is executed.	0: Other than home 1: Home
145	ABSPEN	Output when coordinates are set.	0: Coordinates setting is not completed 1: Coordinates setting is completed
149	PRST-DIS	After preset, output when preset is required again before the motor is operated.	0: Normal state 1: Preset is not completed
150	PRST-STLD	Output when the mechanical home is set.	0: Mechanical home setting is not completed 1: Mechanical home setting is completed
151	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
152	RND-OVF	The output is inverted when the wrap range is exceeded. (Toggle action)	0 and 1 are switched every time the wrap range is exceeded.
153	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	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	ZSG	Output every time the actual position of the motor rotates by one revolution from the position having preset.	0: Normal state 1: Motor one revolution
156	RND-ZERO	Output when the motor is at the home of the wrap range in a state where the Wrap setting (41C7h) is enabled.	0: Other than wrap home 1: Wrap home
157	TIM	Output every time the motor output shaft rotates by 7.2 ° with reference to the command position.	0: OFF 1: ON
160	AREA0	Output when the motor is in the range of the AREA0.	0: Outside the range of AREA 1: Inside the range of AREA
161	AREA1	Output when the motor is in the range of the AREA1.	
162	AREA2	Output when the motor is in the range of the AREA2.	
163	AREA3	Output when the motor is in the range of the AREA3.	
164	AREA4	Output when the motor is in the range of the AREA4.	
165	AREA5	Output when the motor is in the range of the AREA5.	
166	AREA6	Output when the motor is in the range of the AREA6.	
167	AREA7	Output when the motor is in the range of the AREA7.	

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Assignment number	Signal name	Function	Signal state
168	MPS	Output when the main power supply is in an ON state.	0: Main power supply OFF 1: Main power supply ON
169	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
180	USR-OUT0	Output a logical product (AND) or a logical sum (OR) for two types of output signals.	0: OFF 1: ON
181	USR-OUT1		
192	CRNT-LMTD	Output when the current limit is performed.	0: No current limit 1: Current limit
193	SPD-LMTD	Output when the speed limit is performed.	0: No speed limit 1: Speed limit
196	OPE-BSY	Output while internal oscillation is being performed.	0: No internal oscillation 1: During internal oscillation
204	DCMD-RDY	Output when the driver is ready to operate.	0: Operation not possible 1: Ready for operation
205	DCMD-FULL	Output when data is written in the buffer area. If operation of Set of Set-points is performed in the Profile position mode, the operation command is written in the buffer area.	0: No data in buffer 1: Data in buffer
224	INFO-USRIO	Output when corresponding information is generated.	0: No information 1: During information generation
225	INFO-POSERR		
226	INFO-DRVTMP		
227	INFO-MTRTMP		
228	INFO-OVOLT		
229	INFO-UVOLT		
230	INFO-OLTIME		
232	INFO-SPD		
233	INFO-START		
234	INFO-ZHOME		
235	INFO-PR-REQ		
237	INFO-EGR-E		
238	INFO-RND-E		
240	INFO-FW-OT		
241	INFO-RV-OT		
242	INFO-CULD0		
243	INFO-CULD1		
244	INFO-TRIP		
245	INFO-ODO		
252	INFO-DSLMTD		
253	INFO-IOTEST		
254	INFO-CFG		
255	INFO-RBT		

5 Coordinates management

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.
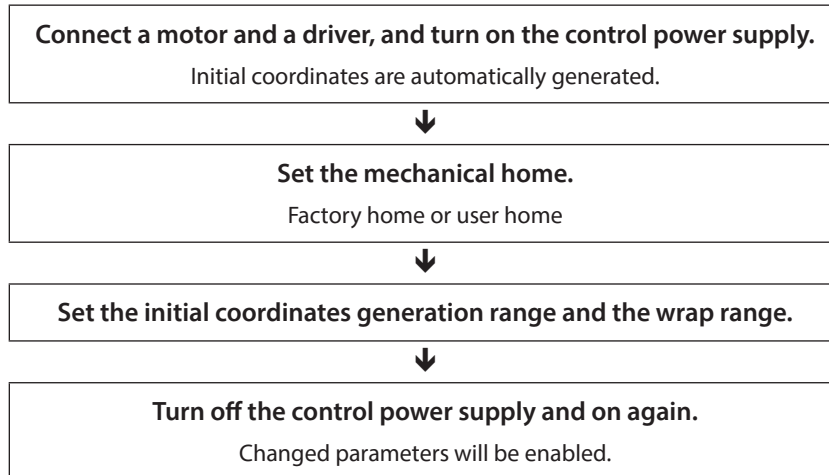
■ About ABZO sensor

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 counts exceeds 1,800 revolutions (*), it is reset to 0 and is newly started from 1.
* The amount of multiple rotations varies depending on the motor frame size. Check on the following table.

Multiple rotation amount of ABZO sensor

Motor frame size [mm (in.)]	Specifications of ABZO sensor
20 (0.79), 28 (1.10)	900 revolutions
40 (1.57), 42 (1.65), 60 (2.36), 85 (3.35), 90 (3.54)	1,800 revolutions

■ Initial coordinate generation

"Initial coordinate generation" refers to determining how to use the rotation range of up to 1,800 revolutions (or 900 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 (47F2h)
- Initial coordinate generation & wrap setting range (41C9h)
- Initial coordinate generation & wrap range offset ratio (41CBh)
- Initial coordinate generation & wrap range offset value (41CCh)

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

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● **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. .

Motor output shaft
−900 to 900 revolutions

−900 rev   0   900 rev
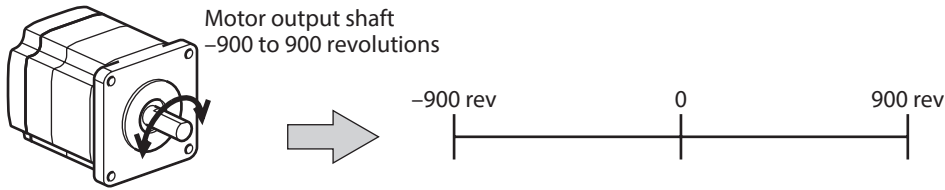
● **Setting example of motorized linear slides**

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

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

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

From the above, the actual coordinate is in the range of −5 to 95 revolutions.
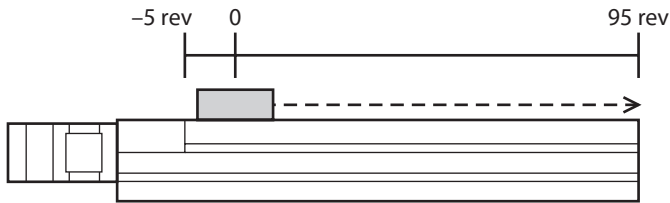
−5 rev   0   95 rev

Setting examples of parameters

Index	Name	Setting value
47F2h	Initial coordinate generation & wrap coordinate setting	1: Manual setting
41C9h	Initial coordinate generation & wrap setting range [1=0.1 rev]	1,000
41CBh	Initial coordinate generation & wrap range offset ratio [1=0.01 %]	500
41CCh	Initial coordinate generation & wrap range offset value	0 step

■ 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.104 for the specific setting methods.

Note To set the wrap function, change the Initial coordinate generation & wrap coordinate setting (47F2h) to "1: Manual setting." [Initial value: 0 (Prioritize ABZO setting)]
When this parameter is changed, turn off the main power supply and 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: If the wrap function is performed when the motor rotates 180 times in the same direction
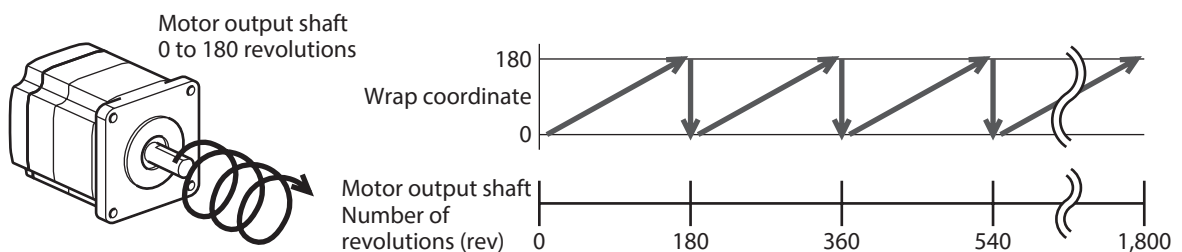
The present position of the motor is preset every 180 revolutions, however, the 32-bit counter in the driver is not preset.

Example: When the range of use of the motor is offset to −90 to 90 revolutions
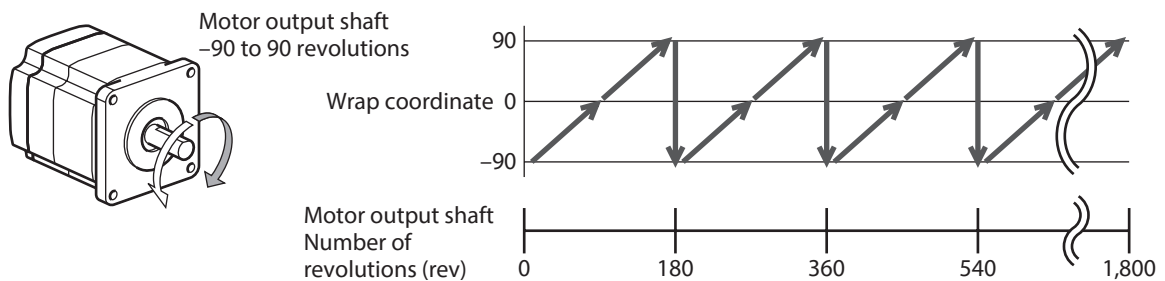
When the wrap setting range is exceeded, the sign is reversed.

● **Setting example of index table**

This 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
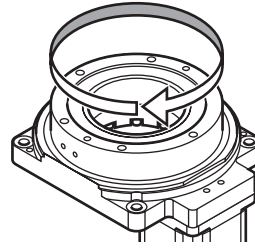
Concept of initial coordinate
To rotate the index table in both directions, 18 revolutions are divided into positive and negative revolutions, 50 % for
each direction.
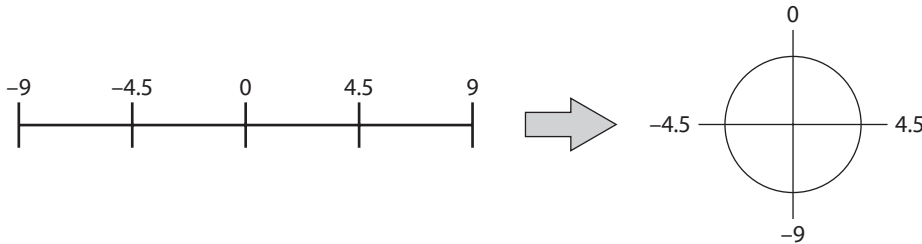
Setting examples of parameters

Index	Name	Setting value
47F2h	Initial coordinate generation & wrap coordinate setting	1: Manual setting
41C7h	Wrap setting	1: Enable
41C9h	Initial coordinate generation & wrap setting range [1=0.1 rev]	180
41CBh	Initial coordinate generation & wrap range offset ratio [1=0.01 %]	5,000
41CCh	Initial coordinate generation & wrap range offset value	0 step

● **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 the 32-bit counter is shown below.

Example: If the wrap function is performed when the motor rotates 180 times in the same direction
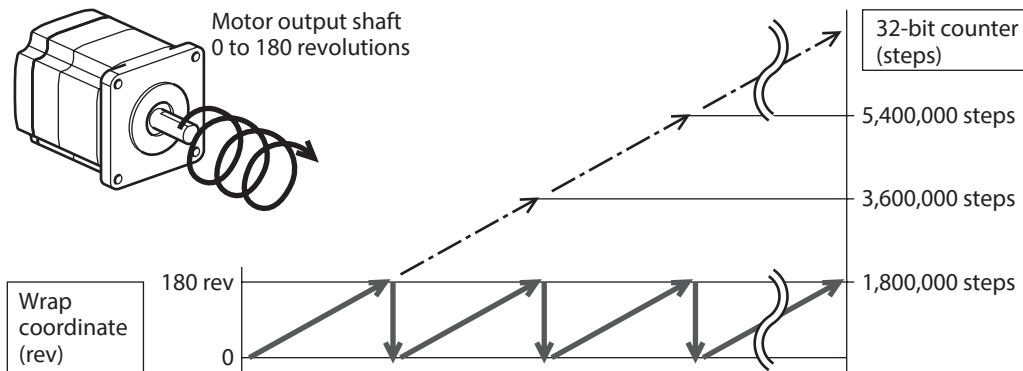
The present position of the motor is preset by 180 revolutions, however, the 32-bit counter is not preset.
The value of the 32-bit counter can be checked by the Command position 32-bit counter (4091h).
The 32-bit counter goes around between −2,147,483,648 and 2,147,483,647.

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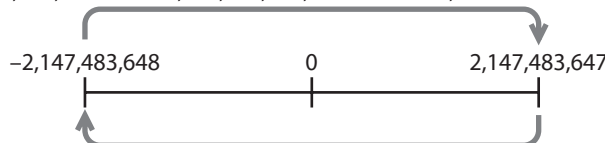
It shows −2,147,483,648 after 2,147,483,647, and after that, it shows in ascending order.

5-2 Coordinate origin

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

> **Note** The following operations 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 (4148h) is "0: Disable")

Related object

Index	Name	Description	Initial value
4148h	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	0

■ Mechanical home

The mechanical home is a position of the home 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 actuators. 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 the "Position preset clear" 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 actual position changes to the value set in the Home offset (607Ch) and the home is set.

Related objects

Index	Name	Description	Initial value
607Ch	Position offset	Sets the preset position. **[Setting range]** −2,147,483,648 to 2,147,483,647 steps	0
4148h	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	0

● 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 Home offset (607Ch) 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 specifications of the ABZO sensor and parameters based on the pre-assembled mechanism to the motor are written in the ABZO sensor in advance.

Related objects

Index	Name	Description	Initial value
47F0h	Mechanism settings	To change the mechanism settings parameter, select "Manual setting." **[Setting range]** 0: Prioritize ABZO setting 1: Manual setting (use driver parameter)	1
47F1h	Gear ratio setting	Sets the gear ratio for geared motor. When "0: Gear ratio setting disable" is set, the gear ratio is considered as "1." **[Setting range]** 0: Gear ratio setting disable 1 to 32,767: Gear ratio (1=0.01)	0
47F2h	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	0
47F3h	Mechanism limit parameter setting	Disables the ABZO setting of the mechanism limit parameter. **[Setting range]** 0: Follow ABZO setting 1: Disable	0
47F4h	Mechanism protection parameter setting	Disables the ABZO setting of the mechanism protection parameter. **[Setting range]** 0: Follow ABZO setting 1: Disable	0
47F5h	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	0

■ When parameters of the wrap function are set

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

1. Change the Initial coordinate generation & wrap coordinate setting (47F2h) to "1: Manual setting."
   When it is changed to "1: Manual setting," the following driver parameters can be set manually.
   - Wrap setting
   - The number of the RND-ZERO output in wrap range
   - 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.

| Index	Name	Setting value
41C7h	Wrap setting	1: Enable
41CDh	The number of the RND-ZERO output in wrap range	1
41C9h	Initial coordinate generation & wrap setting range [1=0.1 rev]	1,000
41CBh	Initial coordinate generation & wrap range offset ratio [1=0.01 %]	5,000
41CCh	Initial coordinate generation & wrap range offset value	0 step

5-4　Mechanism settings parameter

The mechanism settings parameter is a parameter required when used in combination with a mechanism, such as geared motors or motorized actuators.

Note　To change the mechanism settings parameter, change the Mechanism settings (47F0h) to "1: Manual setting." [Initial value: 1 (Manual setting)]
When this parameter is changed, turn off the main power supply and 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 object

Index	Name	Description	Initial value
41C2h	Motor rotation direction	Sets the rotation direction of the motor output shaft. **[Setting range]** 0: Positive side=Counterclockwise 1: Positive side=Clockwise 2: Positive side=Counterclockwise (the driver parameter is applied) 3: Positive side=Clockwise (the driver parameter is applied)	1

5-5　Initial coordinate generation & wrap coordinate parameters

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

■ Wrap function

Refer to p.99 for the wrap function.

● Related operation modes

When the following operations are performed in the Profile position mode (PP), set the wrap function.
- Wrap absolute positioning operation
- Wrap proximity positioning operation
- Wrap forward direction absolute positioning operation
- Wrap reverse direction absolute positioning operation
- Wrap absolute push-motion operation
- Wrap proximity push-motion operation
- Wrap forward direction push-motion operation
- Wrap reverse direction push-motion operation

Related objects

Index	Name	Description	Initial value
414Fh	Wrap positioning mode	Sets the operation mode for wrap positioning operation. **[Setting range]** 0: Wrap absolute positioning 1: Wrap proximity 2: Wrap forward direction 3: Wrap reverse direction	0
47F2h	Initial coordinate generation & wrap coordinate setting	To use the wrap function, select "Manual setting." **[Setting range]** 0: Prioritize ABZO setting 1: Manual setting	0
41C7h	Wrap setting	Sets the wrap function. **[Setting range]** 0: Disable 1: Enable	1
41C9h	Initial coordinate generation & wrap setting range	Sets the wrap range. The command position returns to 0 when the motor rotates by the number of times set here. **[Setting range]** Refer to the next table. (1=0.1 rev)	10
41CBh	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
41CCh	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 (41C9h)

Since the internal coordinate of the ABZO sensor is 1,800 revolutions (or 900 revolutions), select a value from the table, and set in the Initial coordinate generation & wrap setting range (41C9h).
In the table, the values which are surrounded with thick box border cannot be set for the ABZO sensor of 900 revolutions.

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

Wrap setting range [rev]						
0.5	1.8	4.8	12.0	25.0	72.0	200.0
0.6	2.0	5.0	12.5	30.0	75.0	225.0
0.8	2.4	6.0	14.4	36.0	90.0	300.0
0.9	2.5	7.2	15.0	37.5	100.0	360.0
1.0	3.0	7.5	18.0	40.0	112.5	450.0
1.2	3.6	8.0	20.0	45.0	120.0	600.0
1.5	4.0	9.0	22.5	50.0	150.0	900.0
1.6	4.5	10.0	24.0	60.0	180.0	1,800.0

● **Setting example**
  When setting the Initial coordinate generation & wrap range offset ratio (41CBh) to "50 %" and the Initial coordinate generation & wrap range offset value (41CCh) to "0 step"

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

Index	Sub	Name	Setting value
6091h	01h	Electronic gear A	1
	02h	Electronic gear B	1
47F2h	00h	Initial coordinate generation & wrap coordinate setting	1 (Manual setting)
41C7h	00h	Wrap setting	1 (Enable)
41C9h	00h	Initial coordinate generation & wrap setting range	10 (1.0 rev)
41CBh	00h	Initial coordinate generation & wrap range offset ratio	5,000 (50.00 %)
41CCh	00h	Initial coordinate generation & wrap range offset value	0 (0 step)

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

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

Index	Sub	Name	Setting value
6091h	01h	Electronic gear A	1
	02h	Electronic gear B	1
47F2h	00h	Initial coordinate generation & wrap coordinate setting	1 (Manual setting)
41C7h	00h	Wrap setting	1 (Enable)
41C9h	00h	Initial coordinate generation & wrap setting range	18,000 (1,800 rev)
41CBh	00h	Initial coordinate generation & wrap range offset ratio	5,000 (50.00 %)
41CCh	00h	Initial coordinate generation & wrap range offset value	0 (0 step)

Coordinates example

When the parameters are set as shown in the above table, the motor can be operated on coordinates in the figure.
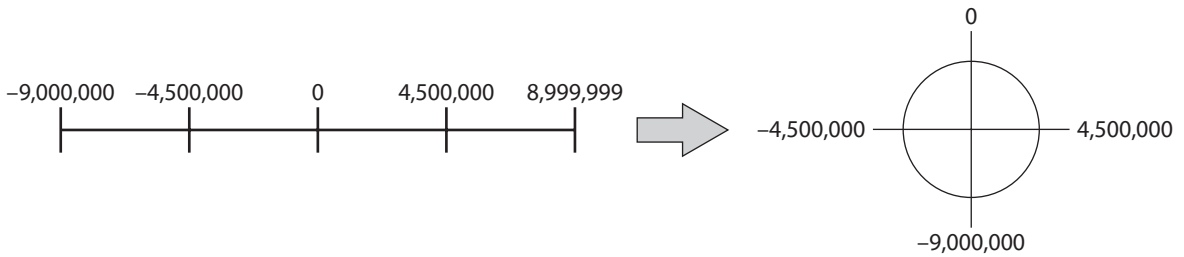
Note If the Wrap setting (41C7h) or the Initial coordinate generation & wrap setting range (41C9h) is changed, the absolute position may be shifted. When the parameter is changed, perform the position preset (P-PRESET) or return-to-home operation.

● **Setting conditions of Initial coordinate generation & wrap setting range (41C9h)**

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

Condition 1 $\dfrac{1,800\ *}{\text{Wrap setting range}} = \text{To be an integer}$ * The motors of frame size 20 mm (0.79 in.) and 28 mm (1.10 in.) are 900.

Condition 2 $\text{Wrap setting range} \times \text{Resolution} = \text{Wrap setting range} \times \dfrac{\text{Electronic gear B}}{\text{Electronic gear A}} \times 10,000$
$= \text{To be an integer}$

Note If the setting conditions of the Initial coordinate generation & wrap setting range (41C9h) is not satisfied even when the Wrap setting (41C7h) is set to "1: Enable," information of the Wrap setting error will be generated. If the main power supply and the control power supply are 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 $\text{Wrap setting range} \times \dfrac{\text{Electronic gear B}}{\text{Electronic gear A}} \times 10,000 = 100 \times \dfrac{1}{1} \times 10,000 = 1,000,000$

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: 14.4 rev
- Resolution: 3,333.333... P/R (electronic gear A=3, electronic gear B=1)
- Motor: **TS** geared motor (gear ratio 3.6)

Condition 1 $\quad \dfrac{1,800}{\text{Wrap setting range}} = \dfrac{1,800}{14.4} = 125$

Condition 2 $\quad \text{Wrap setting range} \times \dfrac{\text{Electronic gear B}}{\text{Electronic gear A}} \times 10,000 = 14.4 \times \dfrac{1}{3} \times 10,000 = 48,000$

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

Setting example 3

- Wrap setting range: 4.5 rev
- Resolution: 10,000 P/R (electronic gear A=1, electronic gear B=1)
- Actuator: **DGII** Series (gear ratio 18)

Condition 1 $\quad \dfrac{1,800}{\text{Wrap setting range}} = \dfrac{1,800}{4.5} = 400$

Condition 2 $\quad \text{Wrap setting range} \times \dfrac{\text{Electronic gear B}}{\text{Electronic gear A}} \times 10,000 = 4.5 \times \dfrac{1}{1} \times 10,000 = 45,000$

The setting conditions are satisfied since both the conditions (1) and (2) are integers. In the case of this setting, the wrap function is executed every time the motor rotates by 90 degrees on the output shaft of **DGII** Series.

Setting example 4

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

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

Condition 2 $\quad \text{Wrap setting range} \times \text{Resolution} = 1,000 \times 10,000 = 10,000,000$

The setting conditions are not satisfied since the condition (1) is not an integer. Information of 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 t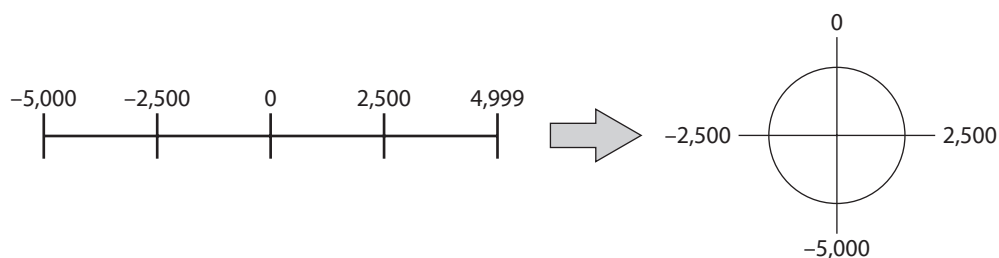he Initial coordinate generation & wrap range offset ratio (41CBh) and the Initial coordinate generation & wrap range offset value (41CCh).

● Wrap offset ratio setting

When the Initial coordinate generation & wrap range offset ratio (41CBh) 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
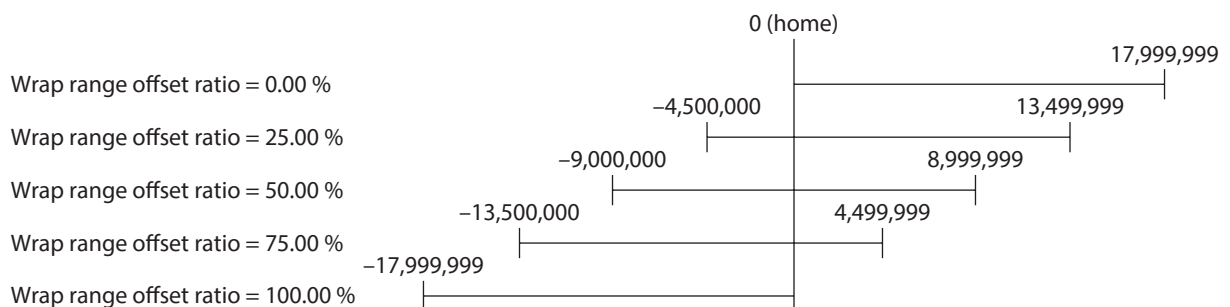
● **Wrap range offset value setting**

The coordinates can be shifted in a step unit for the coordinate system having offset with the Initial coordinate generation & wrap range offset ratio (41CBh).

Note When the coordinates are set with the Initial coordinate generation & wrap range offset value (41CCh), information of Wrap setting error is generated if the home is not included in the coordinates. If the main power supply and the control power supply are 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 %.

```
                          −9,000,000      0       8,999,999
Wrap range offset value = 0 step      |─────────|──────────|
                            −8,999,000            9,000,999
Wrap range offset value = 1,000 step    |────────|──────────|
                         −9,001,000               8,998,999
Wrap range offset value = −1,000 step  |─────────|─────────|
```
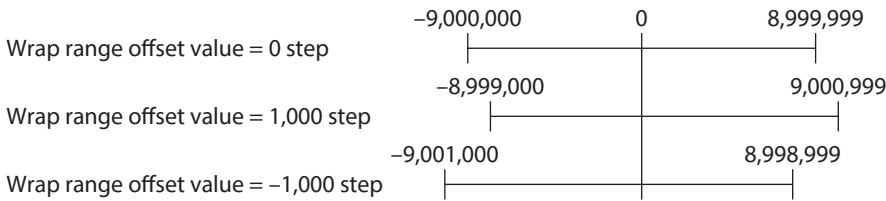
Setting example 2: When the wrap range is 1,800 rev, the resolution is 10,000 P/R, and the wrap offset ratio setting is 0 %.

```
                          0                    17,999,999
Wrap range offset value = 0 step    |───────────────────|
                            1,000                18,000,999
Wrap range offset value = 1,000 step *  |─────────────────|
                         −1,000               17,998,999
Wrap range offset value = −1,000 step |──────────────────|
```
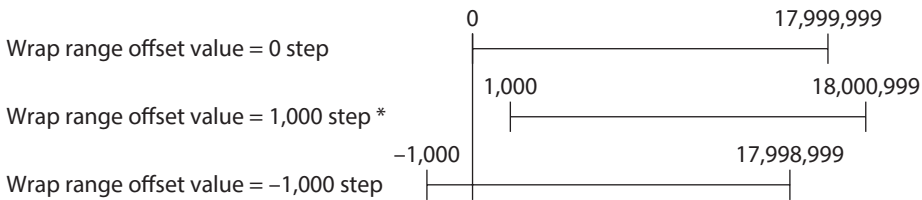
* Information of wrap setting error is generated.

■ **RND-ZERO output**

The RND-ZERO output is a signal that is output for each division boundary point when the wrap range is divided evenly with the home as a reference.
The number of divisions can be set with the The number of the RND-ZERO output in wrap range (41CDh). The RND-ZERO output is output when the Wrap setting (41C7h) is set to "1: Enable."

● **Example of use 1**
When the RND-ZERO signal is output for every rotation of the output shaft
(In case of wrap range of 1,800 rev and a geared motor of gear ratio 7.2)

$$\text{The number of the RND-ZERO output in wrap range} = \frac{\text{Wrap range}}{\text{Gear ratio}} = \frac{1,800}{7.2} = 250$$

This example of use can check that the position of the motor is in the home. With a geared motor, it can be used as a phase Z signal that outputs one pulse for every rotation.

● **Example of use 2**
When the moving range is evenly divided by 90 degrees and the RND-ZERO signal is output for a certain travel amount

$$\text{Number of division of movable range} = \frac{360°}{90°} = 4$$

$$\text{The number of the RND-ZERO output in wrap range} = \frac{\text{Wrap range}}{\text{Gear ratio}} \times \text{Number of division of movable range}$$

$$= \frac{1,800}{18} \times 4 = 400$$

This example of use can output a signal regularly during operation of the motorized actuator or hollow rotary actuator. It can be used to synchronize multiple motors and to operate by inputting the RND-ZERO signal to other system.

Related object

Index	Name	Description	Initial value
41CDh	The number of the RND-ZERO output in wrap range	Sets the number of times to turn the RND-ZERO output ON in the wrap range. **[Setting range]** 1 to 536,870,911 divisions	1

3 EtherCAT communication

6   Object dictionary

This chapter explains the details of objects.

6-1   Composition of object dictionary

Objects are composed as follows.

Index (Hex)	Object	Overview
1000h to 1FFFh	CoE Communication Area	CoE communication area
2000h to 3FFFh		Not used
4000h to 4FFFh	Manufacturer-Specific Area	Driver object
5000h to 5FFFh		Not used
6000h to 67FFh	Profile Area	Profile area

■ Object dictionary item

Item	Description
Index, sub, name	Index, sub-Index, and name of objects
Type	Definition objects of data type. Abbreviations described in the table below are used in this manual. **Abbreviation / Data type / Description / Range of value** BOOL / Boolean / 1-bit unsigned data / 0, 1 INT8 / Integer8 / 8-bit signed data / −128 to 127 INT16 / Integer16 / 16-bit signed data / −32,768 to 32,767 INT32 / Integer32 / 32-bit signed data / −2,147,483,648 to 2,147,483,647 U8 / Unsigned8 / 8-bit unsigned data / 0 to 255 U16 / Unsigned16 / 16-bit unsigned data / 0 to 65,535 U32 / Unsigned32 / 32-bit unsigned data / 0 to 4,294,967,295 STRING / Visible String / Character string / −
Access	Access method of objects. ● RW: Read and write of values are possible. ● RO: Only read of values is possible.
PDO	Indicates whether the PDO mapping of objects is possible. ● RxPDO: Mapping to RxPDO is possible. ● TxPDO: Mapping to TxPDO is possible. ● No: Mapping to PDO is not possible.
Save	Indicates whether data is saved in the non-volatile memory when the batch non-volatile memory write was executed. ● O: Saved in the non-volatile memory. ● −: Not saved in the non-volatile memory.
Update	Indicates the timing to update the change when a value in the object was changed. ● A: Update immediately ● B: Update after operation stop ● C: Update after executing configuration ● D: Update after turning on the main power supply and control power supply again

6-2 Objects of CoE communication area

These objects are used to make settings related to EtherCAT communication or to indicate the status.

● **Device type (1000h)**

This indicates the device profile.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
1000h	00h	Device type	U32	RO	No	–	0004 0192h	–

Details of range

Bit	Name	Description
0 to 15	Device profile	0192h: DS402
16 to 31	Additional information	0004h: ST Single axis driver

● **Error register (1001h)**

This indicates the error status of the driver. If an error occurs in the driver, the General error (Bit 0) is changed to 1. It is changed to 0 when the error is cleared.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
1001h	00h	Error register	U8	RO	No	–	Bit 0: General error Bit 1 to 7: Reserved	–

● **Manufacturer device name (1008h)**

This indicates the product name.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
1008h	00h	Manufacturer device name	STRING	RO	No	–	**AZD-KRED**	–

● **Manufacturer hardware version (1009h)**

This indicates the hardware version of the driver. "V.1.00" is indicated when the version is 1.00.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
1009h	00h	Manufacturer hardware version	STRING	RO	No	–	Hardware version	–

● **Manufacturer software version (100Ah)**

This indicates the software version of the driver. "V.1.00" is indicated when the version is 1.00.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
100Ah	00h	Manufacturer software version	STRING	RO	No	–	Software version	–

● **Identity object (1018h)**

This indicates the product information of the driver. The serial number is always 0.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
1018h	00h	Number of entries	U8	RO	No	–	4	–
	01h	Vendor ID	U32	RO	No	–	0000 02BEh	–
	02h	Product code	U32	RO	No	–	0000 1402h	–
	03h	Revision number	U32	RO	No	–	0000 xxxxh	–
	04h	Serial number	U32	RO	No	–	0	–

● **Receive PDO mapping 1 (1600h)**

This is used to set the receive PDO mapping 1.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
1600h	00h	Number of entries	U8	RW	No	–	0 to 16 (Initial value: 3)	A
	01h	Mapping entry 1	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 6040 0010h)	A
	02h	Mapping entry 2	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 607A 0020h)	A
	03h	Mapping entry 3	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 6060 0008h)	A
	04h	Mapping entry 4	U32	RW	No	–		A
	05h	Mapping entry 5	U32	RW	No	–		A
	06h	Mapping entry 6	U32	RW	No	–		A
	07h	Mapping entry 7	U32	RW	No	–		A
	08h	Mapping entry 8	U32	RW	No	–		A
	09h	Mapping entry 9	U32	RW	No	–		A
	0Ah	Mapping entry 10	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 0000 0000h)	A
	0Bh	Mapping entry 11	U32	RW	No	–		A
	0Ch	Mapping entry 12	U32	RW	No	–		A
	0Dh	Mapping entry 13	U32	RW	No	–		A
	0Eh	Mapping entry 14	U32	RW	No	–		A
	0Fh	Mapping entry 15	U32	RW	No	–		A
	10h	Mapping entry 16	U32	RW	No	–		A

● **Receive PDO mapping 2 (1601h)**

This is used to set the receive PDO mapping 2.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
1601h	00h	Number of entries	U8	RW	No	–	0 to 16 (Initial value: 5)	A
	01h	Mapping entry 1	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 6040 0010h)	A
	02h	Mapping entry 2	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 607A 0020h)	A
	03h	Mapping entry 3	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 60FF 0020h)	A
	04h	Mapping entry 4	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 6060 0008h)	A
	05h	Mapping entry 5	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 60B8 0010h)	A
	06h	Mapping entry 6	U32	RW	No	–		A
	07h	Mapping entry 7	U32	RW	No	–		A
	08h	Mapping entry 8	U32	RW	No	–		A
	09h	Mapping entry 9	U32	RW	No	–		A
	0Ah	Mapping entry 10	U32	RW	No	–		A
	0Bh	Mapping entry 11	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 0000 0000h)	A
	0Ch	Mapping entry 12	U32	RW	No	–		A
	0Dh	Mapping entry 13	U32	RW	No	–		A
	0Eh	Mapping entry 14	U32	RW	No	–		A
	0Fh	Mapping entry 15	U32	RW	No	–		A
	10h	Mapping entry 16	U32	RW	No	–		A

● **Transmit PDO mapping 1 (1A00h)**

This is used to set the transmit PDO mapping 1.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
1A00h	00h	Number of entries	U8	RW	No	–	0 to 16 (Initial value: 3)	A
	01h	Mapping entry 1	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 6041 0010h)	A
	02h	Mapping entry 2	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 6064 0020h)	A
	03h	Mapping entry 3	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 6061 0008h)	A
	04h	Mapping entry 4	U32	RW	No	–		A
	05h	Mapping entry 5	U32	RW	No	–		A
	06h	Mapping entry 6	U32	RW	No	–		A
	07h	Mapping entry 7	U32	RW	No	–		A
	08h	Mapping entry 8	U32	RW	No	–		A
	09h	Mapping entry 9	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 0000 0000h)	A
	0Ah	Mapping entry 10	U32	RW	No	–		A
	0Bh	Mapping entry 11	U32	RW	No	–		A
	0Ch	Mapping entry 12	U32	RW	No	–		A
	0Dh	Mapping entry 13	U32	RW	No	–		A
	0Eh	Mapping entry 14	U32	RW	No	–		A
	0Fh	Mapping entry 15	U32	RW	No	–		A
	10h	Mapping entry 16	U32	RW	No	–		A

● **Transmit PDO mapping 2 (1A01h)**

This is used to set the transmit PDO mapping 2.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
1A01h	00h	Number of entries	U8	RW	No	–	0 to 16 (Initial value: 8)	A
	01h	Mapping entry 1	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 6041 0010h)	A
	02h	Mapping entry 2	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 6064 0020h)	A
	03h	Mapping entry 3	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 6061 0008h)	A
	04h	Mapping entry 4	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 60B9 0010h)	A
	05h	Mapping entry 5	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 60BA 0020h)	A
	06h	Mapping entry 6	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 60BC 0020h)	A
	07h	Mapping entry 7	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 603F 0010h)	A
	08h	Mapping entry 8	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 60FD 0020h)	A
	09h	Mapping entry 9	U32	RW	No	–		A
	0Ah	Mapping entry 10	U32	RW	No	–		A
	0Bh	Mapping entry 11	U32	RW	No	–		A
	0Ch	Mapping entry 12	U32	RW	No	–	0000 0000h to FFFF FFFFh (Initial value: 0000 0000h)	A
	0Dh	Mapping entry 13	U32	RW	No	–		A
	0Eh	Mapping entry 14	U32	RW	No	–		A
	0Fh	Mapping entry 15	U32	RW	No	–		A
	10h	Mapping entry 16	U32	RW	No	–		A

3 EtherCAT communication

● **Sync manager communication type (1C00h)**

This is used to set the communication type of Sync manager (SM).

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
1C00h	00h	Number of entries	U8	RO	No	–	4	–
	01h	Communication type sync manager 0	U8	RO	No	–	1: Mailbox output (EtherCAT master to driver)	–
	02h	Communication type sync manager 1	U8	RO	No	–	2: Mailbox input (Driver to EtherCAT master)	–
	03h	Communication type sync manager 2	U8	RO	No	–	3: Process data output (EtherCAT master to driver)	–
	04h	Communication type sync manager 3	U8	RO	No	–	4: Process data input (Driver to EtherCAT master)	–

● **Sync manager 2 PDO assignment (1C12h)**

This is used to set the object assigned in the Process data output (receive PDO: RxPDO) of the Sync manager 2 (SM2).
It can be changed when the EtherCAT communication state machine is Pre-operational.
Refer to "Setting of PDO mapping object" on p.43 for how to set the PDO mapping.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
1C12h	00h	Number of entries	U8	RW	No	–	0, 1 (Initial value: 1)	A
	01h	Index of assigned PDO 1	U16	RW	No	–	0000h to FFFFh (Initial value: 1600h)	A

● **Sync manager 3 PDO assignment (1C13h)**

This is used to set the object assigned in the Process data input (transmit PDO: TxPDO) of the Sync manager 3 (SM3).
It can be changed when the EtherCAT communication state machine is Pre-operational.
Refer to "Setting of PDO mapping object" on p.43 for how to set the PDO mapping.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
1C13h	00h	Number of entries	U8	RW	No	–	0, 1 (Initial value: 1)	A
	01h	Index of assigned PDO 1	U16	RW	No	–	0000h to FFFFh (Initial value: 1A00h)	A

● **Sync manager 2 synchronization (1C32h)**

This is used to set the synchronization type of the Sync manager 2 (SM2) and indicates the status.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
1C32h	00h	Number of entries	U8	RO	No	–	20h	–
	01h	Synchronization type	U16	RW	No	–	00h, 01h, 02h (Initial value: 01h)	A
	02h	Cycle time [ns]	U32	RO	No	–	–	–
	03h	Shift time [ns]	U32	RO	No	–	0	–
	04h	Synchronization types supported	U16	RO	No	–	0007h	–
	05h	Minimum cycle time [ns]	U32	RO	No	–	0003 D090h (250,000 ns)	–
	06h	Calc and copy time [ns]	U32	RO	No	–	0001 86A0h (100,000 ns)	–
	07h	Reserved	U32	–	–	–	–	–
	08h	Reserved	U16	–	–	–	–	–
	09h	Delay time [ns]	U32	RO	No	–	0	–
	0Ah to 1Fh	Reserved	U16	–	–	–	–	–
	20h	Sync error	BOOL	RO	No	–	0	–

Details of Sync manager 2 synchronization object

Sub	Name	Description
01h	Synchronization type	00h: Free run mode (asynchronous) 01h: Sync manager 2 event synchronization mode 02h: DC mode (SYNC0 event synchronization)
02h	Cycle time [ns]	Indicates the cycle time of the SYNC0 event.
03h	Shift time [ns]	The shift time is not supported. The read value is always 0.
04h	Synchronization types supported	Indicates the synchronization type supported. Bit 0: Free run mode (asynchronous) Bit 1: Sync manager 2 event synchronization mode Bit 2: DC mode (SYNC0 event synchronization)
05h	Minimum cycle time [ns]	Indicates the minimum cycle time supported.
06h	Calc and copy time [ns]	Indicates the minimum value of the internal calculation and copy time that is needed from the Sync manager 2 event to the SYNC0 event.
09h	Delay time [ns]	The delay time is not supported. The read value is always 0.
20h	Sync error	Changes to 1 if the sync error is detected.

● **Sync manager 3 synchronization (1C33h)**

This is used to set the synchronization type of the Sync manager 3 (SM3) and indicates the status.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
1C33h	00h	Number of entries	U8	RO	No	–	20h	–
	01h	Synchronization type	U16	RW	No	–	00h, 02h, 22h (Initial value: 22h)	A
	02h	Cycle time [ns]	U32	RO	No	–	–	–
	03h	Shift time [ns]	U32	RO	No	–	0	–
	04h	Synchronization types supported	U16	RO	No	–	0007h	–
	05h	Minimum cycle time [ns]	U32	RO	No	–	0003 D090h (250,000 ns)	–
	06h	Calc and copy time [ns]	U32	RO	No	–	0002 49F0h (150,000 ns)	–
	07h	Reserved	U32	–	–	–	–	–
	08h	Reserved	U16	–	–	–	–	–
	09h	Delay time [ns]	U32	RO	No	–	–	–
	0Ah to 1Fh	Reserved	U16	–	–	–	–	–
	20h	Sync error	BOOL	RO	No	–	0	–

Details of Sync manager 3 synchronization object

Sub	Name	Description
01h	Synchronization type	00h: Free run mode (asynchronous) 02h: DC mode (SYNC0 event synchronization) 22h: Sync manager 2 event synchronization mode
02h	Cycle time [ns]	Indicates the cycle time of the SYNC0 event.
03h	Shift time [ns]	The shift time is not supported. The read value is always 0.
04h	Synchronization types supported	Indicates the synchronization type supported. Bit 0: Free run mode (asynchronous) Bit 1: Sync manager 2 event synchronization mode Bit 2: DC mode (SYNC0 event synchronization)
05h	Minimum cycle time [ns]	Indicates the minimum cycle time supported.
06h	Calc and copy time [ns]	Indicates the minimum value of the internal calculation and copy time that is needed from the SYNC0 event to the Sync manager 3 event.

Sub	Name	Description
09h	Delay time [ns]	The delay time is not supported. The read value is always 0.
20h	Sync error	Changes to 1 if the sync error is detected.

6-3 Objects of profile area

Objects in the profile area are defined by the CiA402 drive profile. These are used to set the driver operation and to indicate the status.

● Error code (603Fh)

This indicates the error code being generated in the driver.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
603Fh	00h	Error code	U16	RO	TxPDO	–	–	–

(memo) If an alarm is generated in the driver, an error code is indicated. The lower 8 bits of the error code represents the alarm code, and the upper 8 bits represents FFh. "0000h" is indicated when an alarm is not generated. Refer to p.151 for alarm codes.

● Controlword (6040h)

This is used to control the transition of the drive state machine, start/stop of operation, etc.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6040h	00h	Controlword	U16	RW	RxPDO	–	0000h to FFFFh (Initial value: 0000h)	A

Details of range

Bit	Name	Description
0	Switch on	Controls the status of the drive state machine. Refer to "State transition of drive state machine" on p.48.
1	Enable voltage	
2	Quick stop	
3	Enable operation	
4	Operation mode specific	It varies depending on the operation mode. Refer to each operation mode of "3 Drive profile" for details.
5		
6		
7	Fault reset	Resets the alarm when changing from 0 to 1.
8	Halt	Refer to each operation mode of "3 Drive profile" for details.
9	Operation mode specific	
10	Reserved	Reserved
11	Manufacturer specific	Manufacturer-specific bit. Refer to each operation mode of "3 Drive profile" for details.
12		
13		
14		
15		

● **Statusword (6041h)**

This is used to indicate the status of the drive state machine and the operation status of the driver.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6041h	00h	Statusword	U16	RO	TxPDO	–	–	–

Details of range

Bit	Name	Description
0	Ready to switch on	Indicates the status of the drive state machine. Refer to "Status output of drive state machine" on p.49.
1	Switched on	
2	Operation enabled	
3	Fault	
4	Voltage enabled	
5	Quick stop	
6	Switch on disabled	
7	Warning	Changes to 1 if information of the driver is generated. When the information status is resolved, it is automatically cleared to 0.
8	Manufacturer specific	Manufacturer-specific bit. Refer to each operation mode of "3 Drive profile" for details.
9	Remote	Changes to 1 when the driver initialization is completed.
10	Target reached	It varies depending on the operation mode. Refer to each operation mode of "3 Drive profile" for details.
11	Internal limit active	Indicates the status of the function limitation by the internal limit. Refer to each operation mode of "3 Drive profile" for details.
12	Operation mode specific	It varies depending on the operation mode. Refer to each operation mode of "3 Drive profile" for details.
13		
14	Manufacturer specific	Manufacturer-specific bit. Refer to each operation mode of "3 Drive profile" for details.
15		

● **Quick stop option code (605Ah)**

This used to set the action by the Quick stop command. When the setting is changed while the Quick stop is being operated, the new setting is updated after stop.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
605Ah	00h	Quick stop option code	INT16	RW	No	○	0, 1, 2, 3, 5, 6, 7 (Initial value: 2)	A

Details of range

Setting value	Description
0	Current off
1	The motor decelerates to a stop according to the Profile deceleration (6084h). Transitions to "Switch on disabled" after stop.
2	The motor decelerates to a stop according to the Quick stop deceleration (6085h). Transitions to "Switch on disabled" after stop.
3	The motor stops immediately. Transitions to "Switch on disabled" after stop.
5	The motor decelerates to a stop according to the Profile deceleration (6084h). Keeps "Quick stop active" after stop.
6	The motor decelerates to a stop according to the Quick stop deceleration (6085h). Keeps "Quick stop active" after stop.
7	The motor stops immediately. Keeps "Quick stop active" after stop.

(memo) If the Quick stop command is executed while the motor decelerates to a stop, the deceleration switches to the Quick stop deceleration. However, when the deceleration stop is performed by the STOP input signal, the deceleration will not switch even if the Quick stop command is executed.

● **Shutdown option code (605Bh)**

This is used to set the operation when transitioning from "Operation enabled" to "Ready to switch on."

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
605Bh	00h	Shutdown option code	INT16	RW	No	○	0, 1 (Initial value: 1)	A

Details of range

Setting value	Description
0	Current off
1	The motor decelerates to a stop according to the Profile deceleration (6084h). The motor puts into a non-excitation state after it stops.

● **Disable operation option code (605Ch)**

This is used to set the operation when transitioning from "Operation enabled" to "Switched on."

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
605Ch	00h	Disable operation option code	INT16	RW	No	○	0, 1 (Initial value: 1)	A

Details of range

Setting value	Description
0	Current off
1	The motor decelerates to a stop according to the Profile deceleration (6084h). The motor puts into a non-excitation state after it stops.

● **Halt option code (605Dh)**

This is used to set the operation when "Halt (Bit 8)" of the Controlword (6040h) was set.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
605Dh	00h	Halt option code	INT16	RW	No	○	1, 2, 3 (Initial value: 1)	A

Details of range

Setting value	Description
1	The motor decelerates to a stop according to the Profile deceleration (6084h). Keeps "Operation enabled" after stop.
2	The motor decelerates to a stop according to the Quick stop deceleration (6085h). Keeps "Operation enabled" after stop.
3	The motor stops immediately. Keeps "Operation enabled" after stop.

● **Modes of operation (6060h)**

This is used to set the operation mode of the driver. Change the operation mode while the motor is stopped. When the setting is changed during operation, the new setting is updated after stop.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6060h	00h	Modes of operation	INT8	RW	RxPDO	○	0, 1, 3, 6, 8, 9 (Initial value: 0)	B

Details of range

Setting value	Description	Setting value	Description
0	Operation function disable	6	Homing mode (HM)
1	Profile position mode (PP)	8	Cyclic synchronous position mode (CSP)
3	Profile velocity mode (PV)	9	Cyclic synchronous velocity mode (CSV)

● **Modes of operation display (6061h)**

This indicates the operation mode that is enabled actually. The range is the same as the Modes of operation (6060h).

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6061h	00h	Modes of operation display	INT8	RO	TxPDO	–	–	–

● **Position demand value (6062h)**

This indicates the command position. When the Wrap setting (41C7h) is set to 1, the value in the wrap range is indicated.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6062h	00h	Position demand value [step]	INT32	RO	TxPDO	–	–	–

● **Position actual value (6064h)**

This indicates the present position detected by the ABZO sensor. When the Wrap setting (41C7h) is set to 1, the value in the wrap range is indicated.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6064h	00h	Position actual value [step]	INT32	RO	TxPDO	–	–	–

● **Following error window (6065h)**

This is used to set the condition in which the position deviation alarm is generated.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6065h	00h	Following error window [1=0.01 rev]	U32	RW	No	○	1 to 30,000 (Initial value: 300)	A

● **Position window (6067h)**

This is used to set the output range of the positioning completion output (IN-POS). It is the same as the "IN-POS positioning completion signal range" parameter of the **AZ** Series.
In the Profile position mode, after positioning operation is properly completed, the Target Reached (6041h: Bit 10) of the Statusword changes to 1 when the actual position has converged in a range of the Position window (6067h) with respect to the Position demand value (command position).
The IN-POS output range can be offset by the IN-POS positioning completion signal offset (4704h).

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6067h	00h	Position window [1=0.1°]	U32	RW	No	○	0 to 180 (Initial value: 18)	A

● **Velocity demand value (606Bh)**

This indicates the present command speed (Hz).

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
606Bh	00h	Velocity demand value [Hz]	INT32	RO	TxPDO	–	–	–

● **Velocity actual value (606Ch)**

This indicates the present feedback speed (Hz).

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
606Ch	00h	Velocity actual value [Hz]	INT32	RO	TxPDO	–	–	–

● **Target position (607Ah)**

This is used to set the target position in the Cyclic synchronous position mode and the Profile position mode.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
607Ah	00h	Target position [step]	INT32	RW	RxPDO	–	−2,147,483,648 to 2,147,483,647 (Initial value: 0)	A

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● **Home offset (607Ch)**

This is used to offset the home after return-to-home operation is completed in the Homing mode. The command position and the actual position after completion of return-to-home will be the value set in the Home offset. Since the offset value is written to the same register as the Preset position (41C6h), if the Home offset (607Ch) is changed, the Preset position (41C6h) will be the same value.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
607Ch	00h	Home offset [step]	INT32	RW	No	○	−2,147,483,648 to 2,147,483,647 (Initial value: 0)	A

● **Software position limit (607Dh)**

This is used to set the software limit. The Min. position limit represents the limit of the reverse direction, and the Max. position limit represents the limit of the forward direction.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
607Dh	00h	Number of entries	U8	RO	No	−	2	−
	01h	Min. position limit [step]	INT32	RW	No	○	−2,147,483,648 to 2,147,483,647 (Initial value: −2,147,483,648)	A
	02h	Max. position limit [step]	INT32	RW	No	○	−2,147,483,648 to 2,147,483,647 (Initial value: 2,147,483,647)	A

● **Profile velocity (6081h)**

This is used to set the operating speed for the Profile position mode.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6081h	00h	Profile velocity [Hz]	U32	RW	RxPDO	○	0 to 4,000,000 (Initial value: 10,000)	A

● **Profile acceleration (6083h)**

This is used to set the acceleration for the Profile position mode and the Profile velocity mode.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6083h	00h	Profile acceleration [step/s^2]	U32	RW	RxPDO	○	1 to 1,000,000,000 (Initial value: 300,000)	B

● **Profile deceleration (6084h)**

This is used to set the deceleration for the Profile position mode and the Profile velocity mode.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6084h	00h	Profile deceleration [step/s^2]	U32	RW	RxPDO	○	1 to 1,000,000,000 (Initial value: 300,000)	B

● **Quick stop deceleration (6085h)**

This is used to set the deceleration for the Quick stop. This is the deceleration when the Quick stop command of the drive state machine was enabled while the Quick stop option code (605Ah) was set to 2 or 6.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6085h	00h	Quick stop deceleration [step/s^2]	U32	RW	RxPDO	○	1 to 1,000,000,000 (Initial value: 1,000,000)	B

● **Gear ratio (6091h)**

This is used to set the electronic gear. The electronic gear A is the denominator of the electronic gear, and the electronic gear B is the numerator of the electronic gear.
If the Gear ratio (6091h) is set, the resolution per revolution of the motor output shaft can be changed. Refer to "4-2 Resolution" on p.85 for details.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6091h	00h	Number of entries	U8	RO	No	–	2	–
	01h	Electronic gear A	U32	RW	No	○	1 to 65,535 (Initial value: 1)	C
	02h	Electronic gear B	U32	RW	No	○	1 to 65,535 (Initial value: 1)	C

● **Homing method (6098h)**

This is used to set the return-to-home method for return-to-home operation. Refer to p.70 for details.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6098h	00h	Homing method	INT8	RW	No	○	17, 18, 24, 28, 35, 37, −1 (Initial value: 24)	B

Details of range

Setting value	Description
17	Return-to-home by the limit sensor (FW-LS/RV-LS). Starts in the negative direction.
18	Return-to-home by the limit sensor (FW-LS/RV-LS). Starts in the positive direction.
24	Return-to-home by the home sensor (HOMES). Starts in the positive direction.
28	Return-to-home by the home sensor (HOMES). Starts in the negative direction.
35, 37 *	Home preset
−1	Return-to-home operation of Oriental Motor's specifications

* 35 and 37 perform the same action.

● **Homing speed (6099h)**

This is used to set the operating speed and feedback speed for return-to-home operation. The feedback speed is the operating speed when position adjustment is performed with the home finally.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6099h	00h	Number of entries	U8	RO	No	–	2	–
	01h	Speed during search for switch [Hz]	U32	RW	No	○	1 to 4,000,000 (Initial value: 10,000)	B
	02h	Speed during search for zero [Hz]	U32	RW	No	○	1 to 10,000 (Initial value: 5,000)	B

● **Homing acceleration (609Ah)**

This is used to set the acceleration/deceleration for return-to-home operation.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
609Ah	00h	Homing acceleration [step/s^2]	U32	RW	No	○	1 to 1,000,000,000 (Initial value: 300,000)	B

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● **Touch probe function (60B8h)**

This is used to set the action of the touch probe. Refer to p.83 for details.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
60B8h	00h	Touch probe function	U16	RW	RxPDO	–	0000h to FFFFh (Initial value: 0000h)	A

Details of range

Bit	Name	Value	Description
0	Touch probe 1 permission	0	Disables the touch probe 1.
		1	Enables the touch probe 1.
1	Touch probe 1 trigger action	0	First trigger action Latches only once on the first trigger.
		1	Continuous action Latches every time a trigger is input.
2	Touch probe 1 trigger selection	0	Sets the external latch input EXT1 as a trigger.
		1	Sets the ZSG output or the TIM output as a trigger.
3	Reserved	0	Reserved
4	Touch probe 1 positive value action	0	Disables the latch function at the positive value of a trigger.
		1	Enables the latch function at the positive value of a trigger.
5	Touch probe 1 negative value action	0	Disables the latch function at the negative value of a trigger.
		1	Enables the latch function at the negative value of a trigger.
6	Reserved	0	Reserved
7	Reserved	0	Reserved
8	Touch probe 2 permission	0	Disables the touch probe 2.
		1	Enables the touch probe 2.
9	Touch probe 2 trigger action	0	First trigger action Latches only once on the first trigger.
		1	Continuous action Latches every time a trigger is input.
10	Touch probe 2 trigger selection	0	Sets the external latch input EXT2 as a trigger.
		1	Sets the ZSG output or the TIM output as a trigger.
11	Reserved	0	Reserved
12	Touch probe 2 positive value action	0	Disables the latch function at the positive value of a trigger.
		1	Enables the latch function at the positive value of a trigger.
13	Touch probe 2 negative value action	0	Disables the latch function at the negative value of a trigger.
		1	Enables the latch function at the negative value of a trigger.
14	Reserved	0	Reserved
15	Reserved	0	Reserved

3 EtherCAT communication

● **Touch probe status (60B9h)**

This indicates the status of the touch probe. Refer to p.84 for details.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
60B9h	00h	Touch probe status	U16	RO	TxPDO	–	–	–

Details of range

Bit	Name	Value	Description
0	Touch probe 1 permission status	0	The touch probe 1 is disabled.
		1	The touch probe 1 is enabled.
1	Touch probe 1 positive value latch	0	Has not latch on the positive value of the touch probe 1.
		1	Latched on the positive value of the touch probe 1.
2	Touch probe 1 negative value latch	0	Has not latch on the negative value of the touch probe 1.
		1	Latched on the negative value of the touch probe 1.
3 to 7	Reserved	0	Reserved
8	Touch probe 2 permission status	0	The touch probe 2 is disabled.
		1	The touch probe 2 is enabled.
9	Touch probe 2 positive value latch	0	Has not latch on the positive value of the touch probe 2.
		1	Latched on the positive value of the touch probe 2.
10	Touch probe 2 negative value latch	0	Has not latch on the negative value of the touch probe 2.
		1	Latched on the negative value of the touch probe 2.
11 to 15	Reserved	0	Reserved

● **Touch probe position 1 positive value (60BAh)**

This indicates the position latched at the positive value of the touch probe 1.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
60BAh	00h	Touch probe position 1 positive value [step]	INT32	RO	TxPDO	–	–	–

● **Touch probe position 1 negative value (60BBh)**

This indicates the position latched at the negative value of the touch probe 1.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
60BBh	00h	Touch probe position 1 negative value [step]	INT32	RO	TxPDO	–	–	–

● **Touch probe position 2 positive value (60BCh)**

This indicates the position latched at the positive value of the touch probe 2.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
60BCh	00h	Touch probe position 2 positive value [step]	INT32	RO	TxPDO	–	–	–

● **Touch probe position 2 negative value (60BDh)**

This indicates the position latched at the negative value of the touch probe 2.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
60BDh	00h	Touch probe position 2 negative value [step]	INT32	RO	TxPDO	–	–	–

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● **Supported homing methods (60E3h)**

This indicates the Homing (return-to-home) method supported by the driver.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
	00h	Number of entries	U8	RO	No	–	6	–
	01h	1st supported homing method	U16	RO	No	–	17	–
	02h	2nd supported homing method	U16	RO	No	–	18	–
60E3h	03h	3rd supported homing method	U16	RO	No	–	24	–
	04h	4th supported homing method	U16	RO	No	–	28	–
	05h	5th supported homing method	U16	RO	No	–	35	–
	06h	6th supported homing method	U16	RO	No	–	37	–

Details of range

Setting value	Description
17	Return-to-home by the limit sensor (FW-LS/RV-LS). Starts in the negative direction.
18	Return-to-home by the limit sensor (FW-LS/RV-LS). Starts in the positive direction.
24	Return-to-home by the home sensor (HOMES). Starts in the positive direction.
28	Return-to-home by the home sensor (HOMES). Starts in the negative direction.
35, 37 *	Home preset

* 35 and 37 perform the same action.

● **Following error actual value (60F4h)**

This indicates the deviation between the command position and the feedback position (actual position).

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
60F4h	00h	Following error actual value [step]	INT32	RO	TxPDO	–	–	–

● **Digital inputs (60FDh)**

This indicates the status of direct inputs.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
60FDh	00h	Digital inputs	U32	RO	TxPDO	–	–	–

Details of range

Bit	Name	Description
0	RV-BLK *1	Status of RV-BLK input (0: OFF, 1: ON) *2
1	FW-BLK *1	Status of FW-BLK input (0: OFF, 1: ON) *2
2	HOMES *1	Status of HOMES input (0: OFF, 1: ON) *2
3 to 15	–	Reserved
16	EXT1 *1	Status of EXT1 input (0: OFF, 1: ON) *2
17	EXT2 *1	Status of EXT2 input (0: OFF, 1: ON) *2
18, 19	–	Reserved
20	ZSG	Status of ZSG output (0: OFF, 1: ON) *2
21 to 23	–	Reserved
24	DIN0	Status of DIN0 input (0: Not carrying current, 1: Carrying current) *3
25	DIN1	Status of DIN1 input (0: Not carrying current, 1: Carrying current) *3
26 to 31	–	Reserved

*1 To acquire the status, input signals are required to assign to the input terminals IN0 and IN1 of the input signal connector (CN5). Assign using the DIN0 input function (4840h) and the DIN1 input function (4841h).
*2 [Normally open] ON: Carrying current, OFF: Not carrying current
   [Normally closed] ON: Not carrying current, OFF: Carrying current
*3 It represents a state of "Carrying current" or "Not carrying current" of the internal photocoupler.

● **Digital outputs (60FEh)**

This is used to control the electromagnetic brake.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
60FEh	00h	Number of entries	U8	RO	No	−	2	−
	01h	Physical output	U32	RW	RxPDO	−	0000 0000h to FFFF FFFFh (Initial value: 0000 0000h)	A
	02h	Bit mask	U32	RW	No	−	0000 0000h to FFFF FFFFh (Initial value: 0000 0000h)	A

Details of physical outputs

Bit	Name	Description
0	Electromagnetic brake control	0: Electromagnetic brake releasing 1: Electromagnetic brake holding
1 to 31	−	Reserved

Details of bit mask

Bit	Name	Description
0	Mask of Bit 0	0: Brake control of physical outputs disable 1: Brake control of physical outputs enable
1 to 31	−	Reserved

● **Target velocity (60FFh)**

This is used to set the operating speed for the Cyclic synchronous velocity mode and the Profile velocity mode.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
60FFh	00h	Target velocity [Hz]	INT32	RW	RxPDO	−	−4,000,000 to 4,000,000 (Initial value: 0)	A

● **Supported drive modes (6502h)**

This indicates the operation mode supported by the product.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6502h	00h	Supported drive modes	U32	RO	No	−	0000 01A5h	−

Details of range

Bit	Name	Value	Description
0	PP (Profile position mode)	1	1: Supported
1	VL (Velocity mode)	0	0: Not supported
2	PV (Profile velocity mode)	1	1: Supported
3	TQ (Torque profile mode)	0	0: Not supported
4	Reserved	0	Reserved
5	HM (Homing mode)	1	1: Supported
6	IP (Interpolated position mode)	0	0: Not supported
7	CSP (Cyclic synchronous position mode)	1	1: Supported
8	CSV (Cyclic synchronous velocity mode)	1	1: Supported
9	CST (Cyclic synchronous torque mode)	0	0: Not supported
10 to 31	Reserved	0	Reserved

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● **Device profile number (67FFh)**

This indicates the device type and the profile number.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
67FFh	00h	Device profile number	U32	RO	No	–	0004 0192h	–

Details of range

Bit	Name	Description
0 to 15	Device profile	0192h: DS402
16 to 31	Device type	0004h: Stepping motor

6-4　Objects of manufacturer-specific area

These are our specific objects.
Refer to the **AZ** Series OPERATING MANUAL Function Edition for driver objects that are not described in this document.

● **Operation voltage mode (40B7h)**

This indicates the voltage mode of the actual main power supply. Sets the voltage mode of the main power supply with the Main power mode (41FAh).

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
40B7h	00h	Operation voltage mode	U8	RO	No	–	–	–

Details of range

Setting value	Description
0	The main power supply is not turned on. [When the Main power mode (41FAh) is set to −1 (automatic discrimination)]
24	Operates in the 24 VDC mode.
48	Operates in the 48 VDC mode.

● **Current setting during push-motion (413Ch)**

This is used to select the setting method of the current for push-motion operation.
When "0: Push current" is selected, set with the Push current (4121h). Set the current value other than push-motion operation with the Operating current (4120h).
When "1: Operating current" is selected, set the current value for all operation with the Operating current (4120h).

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
413Ch	00h	Current setting during push-motion	U8	RW	No	○	0, 1 (Initial value: 0)	A

Details of range

Setting value	Description
0	Push current
1	Operating current

● **Non-excitation mode selection (413Dh)**

This is used to select whether to enable the dynamic brake status or the free-run status when the motor is in a non-excitation state. In the dynamic brake status, the motor windings will be in a state of being short-circuited inside the driver, and the braking torque will generate. In the free-run status, the dynamic brake will be disabled, and the braking torque will not generate.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
413Dh	00h	Non-excitation mode selection	U8	RW	No	○	0, 1 (Initial value: 0)	A

Details of range

Setting value	Description
0	Dynamic brake status
1	Free-run status

● **Wrap positioning mode (414Fh)**

This is used to set the operation mode for wrap positioning operation.
For details about operation mode, refer to "Operation mode of Profile position mode" on p.58.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
414Fh	00h	Wrap positioning mode	U8	RW	RxPDO	○	0, 1, 2, 3 (Initial value: 0)	B

Details of range

Setting value	Description
0	Wrap absolute positioning
1	Wrap proximity
2	Wrap forward direction
3	Wrap reverse direction

● **Main power mode (41FAh)**

This is used to set the voltage mode of the main power supply. The voltage mode of the main power supply voltage is discriminated in 50 ms after the main power supply is turned on. Set the Main power mode (41FAh) to "0: 24 VDC" or "1: 48 VDC" when the main power supply starts up slowly or the voltage of the main power supply is unstable.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
41FAh	00h	Main power mode	INT8	RW	No	○	−1, 0, 1 (Initial value: −1)	D

Details of range

Setting value	Description
−1	Automatic discrimination (discriminates the input power supply voltage automatically.)
0	24 VDC mode
1	48 VDC mode

Note
- The optimal values in the motor control parameters are set in the driver according to the voltage mode. If the voltage mode is not set correctly, torque may decrease or vibration may increase.
- If −1 is set, after the control power supply is turned on, the voltage value is automatically discriminated when the main power supply is turned on first. Be sure to shut off the control power supply when changing the voltage of the main power supply.
- The voltage mode actually operated can be checked with the Operation voltage mode (40B7h).

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● **Touch probe 1 latch position (44B0h)**

This is used to set the position to latch by the external latch input (EXT1). The changed value is updated when the Touch probe 1 permission (60B8h: Bit 0) is changed from 0 to 1.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
44B0h	00h	Touch probe 1 latch position	U8	RW	No	○	0, 1 (Initial value: 0)	A

Details of range

Setting value	Description
0	Latches the feedback position (actual position).
1	Latches the command position.

● **Touch probe 2 latch position (44B1h)**

This is used to set the position to latch by the external latch input (EXT2). The changed value is updated when the Touch probe 2 permission (60B8h: Bit 8) is changed from 0 to 1.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
44B1h	00h	Touch probe 2 latch position	U8	RW	No	○	0, 1 (Initial value: 0)	A

Details of range

Setting value	Description
0	Latches the feedback position (actual position).
1	Latches the command position.

● **Touch probe 1 TIM/ZSG signal select (44B2h)**

This is used to set the TIM output or the ZSG output as a trigger. The changed value is updated when the Touch probe 1 permission (60B8h: Bit 0) is changed from 0 to 1.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
44B2h	00h	Touch probe 1 TIM/ZSG signal select	U8	RW	No	○	0, 1 (Initial value: 0)	A

Details of range

Setting value	Description
0	Latches by the ZSG output.
1	Latches by the TIM output.

● **Touch probe 2 TIM/ZSG signal select (44B3h)**

This is used to set the TIM output or the ZSG output as a trigger. The changed value is updated when the Touch probe 2 permission (60B8h: Bit 8) is changed from 0 to 1.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
44B3h	00h	Touch probe 2 TIM/ZSG signal select	U8	RW	No	○	0, 1 (Initial value: 0)	A

Details of range

Setting value	Description
0	Latches by the ZSG output.
1	Latches by the TIM output.

● **Driver CPU number (4642h)**

This indicates the CPU number of the software of the driver.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4642h	00h	Driver CPU number	U16	RO	No	–	–	–

● **Driver software version (4643h)**

This indicates the software version of the driver. "0100h" is indicated when the version is 1.00.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4643h	00h	Driver software version	U16	RO	No	–	–	–

3 EtherCAT communication

4   Object list

This part describes the lists of objects supported by the driver.

◆Table of contents

1   Timing for parameter to update

EtherCAT objects that can be saved in the driver are called parameters.
Parameters are saved in RAM or non-volatile memory of the driver. Parameters stored in RAM are erased once the main power supply and control power supply are shut off, however, parameters stored in non-volatile memory are retained even if these power supplies are shut off.
When the control power supply of the driver is turned on, the parameters stored in the non-volatile memory is transfered to the RAM, and recalculation and setup for the parameters is executed in the RAM.

Parameters set via EtherCAT communication are stored in the RAM. To save the parameters stored in the RAM to the non-volatile memory, execute the Write batch NV memory (40C9h) of the maintenance command.
When a parameter is changed, the timing to update the new value varies depending on the parameter. Refer to "Notation rules" for details about the update timing.

Note Do not shut off the control power supply while writing the data to the non-volatile memory, and also do not shut off for five seconds after the completion of writing the data. Doing so may abort the data write and cause an alarm of EEPROM error (alarm code 41h) to generate.

memo ● Parameters set via EtherCAT communication are stored in the RAM. For parameters required for turning on the main power supply or control power supply again, be sure to save them in the non-volatile memory before turning off the power.
● The non-volatile memory can be rewritten approximately 100,000 times.

■ Notation rules

● Timing to update

In this part, each update timing is represented in an alphabet.

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 main power supply and control power supply are turned on again.
D	Update after turning on the main power supply and control power supply again	Recalculation and setup are executed after the main power supply and control power supply are turned on again.

● READ and WRITE

READ/WRITE may be represented as follows in this manual.

Notation	Description
RO	READ
R/W	READ/WRITE

2 Objects of CoE communication area

These objects are used to make settings related to EtherCAT communication or to indicate the status.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1000h	00h	Device type	U32	RO	No	–	0004 0192h	–	–
1001h	00h	Error register	U8	RO	No	–	0	–	–
1008h	00h	Manufacturer device name	STRING	RO	No	–	**AZD-KRED**	–	–
1009h	00h	Manufacturer hardware version	STRING	RO	No	–	Indicates the version number	–	–
100Ah	00h	Manufacturer software version	STRING	RO	No	–	Indicates the version number	–	–
1018h	Identity object								
	00h	Number of entries	U8	RO	No	–	4	–	–
	01h	Vendor ID	U32	RO	No	–	0000 02BEh	–	–
	02h	Product code	U32	RO	No	–	0000 1402h	–	–
	03h	Revision number	U32	RO	No	–	0000 xxxxh	–	–
	04h	Serial number	U32	RO	No	–	0	–	–
1600h	Receive PDO mapping 1 (RxPDO1)								
	00h	Number of entries	U8	RW	No	–	3	0 to 16	A
	01h	Mapping entry 1	U32	RW	No	–	6040 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	607A 0020h	0000 0000h to FFFF FFFFh	A
	03h	Mapping entry 3	U32	RW	No	–	6060 0008h	0000 0000h to FFFF FFFFh	A
	04h to 10h	Mapping entry 4 to 16	U32	RW	No	–	0000 0000h	0000 0000h to FFFF FFFFh	A
1601h	Receive PDO mapping 2 (RxPDO2)								
	00h	Number of entries	U8	RW	No	–	5	0 to 16	A
	01h	Mapping entry 1	U32	RW	No	–	6040 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	607A 0020h	0000 0000h to FFFF FFFFh	A
	03h	Mapping entry 3	U32	RW	No	–	60FF 0020h	0000 0000h to FFFF FFFFh	A
	04h	Mapping entry 4	U32	RW	No	–	6060 0008h	0000 0000h to FFFF FFFFh	A
	05h	Mapping entry 5	U32	RW	No	–	60B8 0010h	0000 0000h to FFFF FFFFh	A
	06h to 10h	Mapping entry 6 to 16	U32	RW	No	–	0000 0000h	0000 0000h to FFFF FFFFh	A
1A00h	Transmit PDO mapping 1 (TxPDO1)								
	00h	Number of entries	U8	RW	No	–	3	0 to 16	A
	01h	Mapping entry 1	U32	RW	No	–	6041 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	6064 0020h	0000 0000h to FFFF FFFFh	A
	03h	Mapping entry 3	U32	RW	No	–	6061 0008h	0000 0000h to FFFF FFFFh	A
	04h to 10h	Mapping entry 4 to 16	U32	RW	No	–	0000 0000h	0000 0000h to FFFF FFFFh	A
1A01h	Transmit PDO mapping 2 (TxPDO2)								
	00h	Number of entries	U8	RW	No	–	8	0 to 16	A
	01h	Mapping entry 1	U32	RW	No	–	6041 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	6064 0020h	0000 0000h to FFFF FFFFh	A
	03h	Mapping entry 3	U32	RW	No	–	6061 0008h	0000 0000h to FFFF FFFFh	A
	04h	Mapping entry 4	U32	RW	No	–	60B9 0010h	0000 0000h to FFFF FFFFh	A
	05h	Mapping entry 5	U32	RW	No	–	60BA 0020h	0000 0000h to FFFF FFFFh	A
	06h	Mapping entry 6	U32	RW	No	–	60BC 0020h	0000 0000h to FFFF FFFFh	A
	07h	Mapping entry 7	U32	RW	No	–	603F 0010h	0000 0000h to FFFF FFFFh	A
	08h	Mapping entry 8	U32	RW	No	–	60FD 0020h	0000 0000h to FFFF FFFFh	A
	09h to 10h	Mapping entry 9 to 16	U32	RW	No	–	0000 0000h	0000 0000h to FFFF FFFFh	A

4 Object list

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1C00h		Sync manager communication type							
	00h	Number of entries	U8	RO	No	–	4	–	–
	01h	Communication type sync manager 0	U8	RO	No	–	1: Mailbox output (EtherCAT master to driver)		–
	02h	Communication type sync manager 1	U8	RO	No	–	2: Mailbox input (Driver to EtherCAT master)		–
	03h	Communication type sync manager 2	U8	RO	No	–	3: Process data output (EtherCAT master to driver)		–
	04h	Communication type sync manager 3	U8	RO	No	–	4: Process data input (Driver to EtherCAT master)		–
1C12h		Sync manager 2 PDO assignment							
	00h	Number of entries	U8	RW	No	–	1	0, 1	A
	01h	Index of assigned PDO 1	U16	RW	No	–	1600h	0 to FFFFh	A
1C13h		Sync manager 3 PDO assignment							
	00h	Number of entries	U8	RW	No	–	1	0, 1	A
	01h	Index of assigned PDO 1	U16	RW	No	–	1A00h	0 to FFFFh	A
1C32h		Sync manager 2 synchronization							
	00h	Number of entries	U8	RO	No	–	20h	–	–
	01h	Synchronization type	U16	RW	No	–	01h	00h: Free run mode (asynchronous) 01h: Sync manager 2 event synchronization mode 02h: DC mode (SYNC0 event synchronization)	A
	02h	Cycle time [ns]	U32	RO	No	–	–	–	–
	03h	Shift time [ns]	U32	RO	No	–	0	–	–
	04h	Synchronization types supported	U16	RO	No	–	0007h	–	–
	05h	Minimum cycle time [ns]	U32	RO	No	–	0003 D090h (250,000 ns)	–	–
	06h	Calc and copy time [ns]	U32	RO	No	–	0001 86A0h (100,000 ns)	–	–
	07h	Reserved	U32	–	–	–	–	–	–
	08h	Reserved	U16	–	–	–	–	–	–
	09h	Delay time [ns]	U32	RO	No	–	0	–	–
	0Ah to 1Fh	Reserved	U16	–	–	–	–	–	–
	20h	Sync error	BOOL	RO	No	–	0	–	–
1C33h		Sync manager 3 synchronization							
	00h	Number of entries	U8	RO	No	–	20h	–	–
	01h	Synchronization type	U16	RW	No	–	22h	00h: Free run mode (asynchronous) 02h: DC mode (SYNC0 event synchronization) 22h: Sync manager 2 event synchronization mode	A
	02h	Cycle time [ns]	U32	RO	No	–	–	–	–
	03h	Shift time [ns]	U32	RO	No	–	0	–	–
	04h	Synchronization types supported	U16	RO	No	–	0007h	–	–
	05h	Minimum cycle time [ns]	U32	RO	No	–	0003 D090h (250,000 ns)	–	–
	06h	Calc and copy time [ns]	U32	RO	No	–	0002 49F0h (150,000 ns)	–	–
	07h	Reserved	U32	–	–	–	–	–	–
	08h	Reserved	U16	–	–	–	–	–	–
	09h	Delay time [ns]	U32	RO	No	–	0	–	–
	0Ah to 1Fh	Reserved	U16	–	–	–	–	–	–
	20h	Sync error	BOOL	RO	No	–	0	–	–

4 Object list

3　Objects of profile area

Objects in the profile area are defined by the CiA402 drive profile. These are used to set the driver operation and to indicate the status.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
603Fh	00h	Error code	U16	RO	TxPDO	–	–	–	–
6040h	00h	Controlword	U16	RW	RxPDO	–	0	0 to FFFFh	A
6041h	00h	Statusword	U16	RO	TxPDO	–	–	–	–
605Ah	00h	Quick stop option code	INT16	RW	No	O	2	0, 1, 2, 3, 5, 6, 7	A
605Bh	00h	Shutdown option code	INT16	RW	No	O	1	0, 1	A
605Ch	00h	Disable operation option code	INT16	RW	No	O	1	0, 1	A
605Dh	00h	Halt option code	INT16	RW	No	O	1	1 to 3	A
6060h	00h	Operation mode	INT8	RW	RxPDO	O	0	0: Operation function disable 1: Profile position mode (PP) 3: Profile velocity mode (PV) 6: Homing mode (HM) 8: Cyclic synchronous position mode (CSP) 9: Cyclic synchronous velocity mode (CSV)	B
6061h	00h	Modes of operation display	INT8	RO	TxPDO	–	–	–	–
6062h	00h	Position demand value [step]	INT32	RO	TxPDO	–	–	–	–
6064h	00h	Position actual value [step]	INT32	RO	TxPDO	–	–	–	–
6065h	00h	Following error window [1=0.01 rev]	U32	RW	No	O	300	1 to 30,000	A
6067h	00h	Position window [1=0.1°]	U32	RW	No	O	18	0 to 180	A
606Bh	00h	Velocity demand value [Hz]	INT32	RO	TxPDO	–	–	–	–
606Ch	00h	Velocity actual value [Hz]	INT32	RO	TxPDO	–	–	–	–
607Ah	00h	Target position [step]	INT32	RW	RxPDO	–	0	−2,147,483,648 to 2,147,483,647	A
607Ch	00h	Home offset [step]	INT32	RW	No	O	0	−2,147,483,648 to 2,147,483,647	A
607Dh		Software position limit							
	00h	Number of entries	U8	RO	No	–	2	–	–
	01h	Min. position limit [step]	INT32	RW	No	O	−2,147,483,648	−2,147,483,648 to 2,147,483,647	A
	02h	Max. position limit [step]	INT32	RW	No	O	2,147,483,647	−2,147,483,648 to 2,147,483,647	A
6081h	00h	Profile velocity [Hz]	U32	RW	RxPDO	O	10,000	0 to 4,000,000	A
6083h	00h	Profile acceleration [step/s²]	U32	RW	RxPDO	O	300,000	1 to 1,000,000,000	B
6084h	00h	Profile deceleration [step/s²]	U32	RW	RxPDO	O	300,000	1 to 1,000,000,000	B
6085h	00h	Quick stop deceleration [step/s²]	U32	RW	RxPDO	O	1,000,000	1 to 1,000,000,000	B
6091h		Gear ratio							
	00h	Number of entries	U8	RO	No	–	2	–	–
	01h	Electronic gear A	U32	RW	No	O	1	1 to 65,535	C
	02h	Electronic gear B	U32	RW	No	O	1	1 to 65,535	C
6098h	00h	Homing method	INT8	RW	No	O	24	−1, 17, 18, 24, 28, 35, 37	B
6099h		Homing speed							
	00h	Number of entries	U8	RO	No	–	2	–	–
	01h	Speed during search for switch [Hz]	U32	RW	No	O	10,000	1 to 4,000,000	B
	02h	Speed during search for zero [Hz]	U32	RW	No	O	5,000	1 to 10,000	B
609Ah	00h	Homing acceleration [step/s²]	U32	RW	No	O	300,000	1 to 1,000,000,000	B
60B8h	00h	Touch probe function	U16	RW	RxPDO	–	0000h	0000h to FFFFh	A
60B9h	00h	Touch probe status	U16	RO	TxPDO	–	–	–	–
60BAh	00h	Touch probe position 1 positive value [step]	INT32	RO	TxPDO	–	–	–	–

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
60BBh	00h	Touch probe position 1 negative value [step]	INT32	RO	TxPDO	–	–	–	–
60BCh	00h	Touch probe position 2 positive value [step]	INT32	RO	TxPDO	–	–	–	–
60BDh	00h	Touch probe position 2 negative value [step]	INT32	RO	TxPDO	–	–	–	–
60E3h		Supported homing methods							
	00h	Number of entries	U8	RO	No	–	6	–	–
	01h	1st supported homing method	U16	RO	No	–	17	–	–
	02h	2nd supported homing method	U16	RO	No	–	18	–	–
	03h	3rd supported homing method	U16	RO	No	–	24	–	–
	04h	4th supported homing method	U16	RO	No	–	28	–	–
	05h	5th supported homing method	U16	RO	No	–	35	–	–
	06h	6th supported homing method	U16	RO	No	–	37	–	–
60F4h	00h	Following error actual value [step]	INT32	RO	TxPDO	–	0	–	–
60FDh	00h	Digital inputs	U32	RO	TxPDO	–	–	–	–
60FEh		Digital outputs							
	00h	Number of entries	U8	RO	No	–	2	–	–
	01h	Physical output	U32	RW	RxPDO	–	0000 0000h	0000 0000h to FFFF FFFFh	A
	02h	Bit mask	U32	RW	No	–	0000 0000h	0000 0000h to FFFF FFFFh	A
60FFh	00h	Target velocity [Hz]	INT32	RW	RxPDO	–	0	−4,000,000 to 4,000,000	A
6502h	00h	Supported drive modes	U32	RO	No	–	0000 01A5h	–	–
67FFh	00h	Device profile number	U32	RO	No	–	0004 0192h	–	–

4 Objects of manufacturer-specific area

These are Oriental Motor's specific objects.
Refer to the **AZ** Series <u>OPERATING MANUAL Function Edition</u> for details of each object. When checking the **AZ** Series <u>OPERATING MANUAL Function Edition</u>, use the object name instead of the Index.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
4020h	00h	Backup DATA access key	INT32	RW	No	–	0	Key code: 20519253 (01391955h)	A
4021h	00h	Backup DATA write key	INT32	RW	No	–	0	Key code: 1977326743 (75DB9C97h)	A
403Eh	00h	Driver input command	U16	RW	RxPDO	–	0	0000h to FFFFh	A
403Fh	00h	Driver output status	U16	RO	TxPDO	–	–		
4040h	00h	Present alarm	U16	RO	TxPDO	–	–		
4041h	00h	Alarm history 1	U16	RO	No	–	–		
4042h	00h	Alarm history 2	U16	RO	No	–	–		
4043h	00h	Alarm history 3	U16	RO	No	–	–		
4044h	00h	Alarm history 4	U16	RO	No	–	–		
4045h	00h	Alarm history 5	U16	RO	No	–	–		
4046h	00h	Alarm history 6	U16	RO	No	–	–		
4047h	00h	Alarm history 7	U16	RO	No	–	–		
4048h	00h	Alarm history 8	U16	RO	No	–	–		
4049h	00h	Alarm history 9	U16	RO	No	–	–		
404Ah	00h	Alarm history 10	U16	RO	No	–	–		
4064h	00h	Command speed [r/min]	INT32	RO	TxPDO	–	–		
4067h	00h	Feedback speed [r/min]	INT32	RO	TxPDO	–	–		
406Ah	00h	Direct I/O	U32	RO	TxPDO	–	–		
406Bh	00h	Torque monitor [1=0.1 %]	INT16	RO	TxPDO	–	–		
406Dh	00h	Cumulative load monitor	INT32	RO	TxPDO	–	–		
407Bh	00h	Information	INT32	RO	TxPDO	–	–		
407Ch	00h	Driver temperature [1=0.1 ℃]	INT16	RO	TxPDO	–	–		
407Dh	00h	Motor temperature [1=0.1 ℃]	INT16	RO	TxPDO	–	–		
407Eh	00h	Odometer [1=0.1 kRev]	INT32	RO	TxPDO	–	–	–	–
407Fh	00h	Tripmeter [1=0.1 kRev]	INT32	RO	TxPDO	–	–		
4090h	00h	Feedback position 32-bit counter	INT32	RO	TxPDO	–	–		
4091h	00h	Command position 32-bit counter	INT32	RO	TxPDO	–	–		
4092h	00h	CST operating current [1=0.1 %]	INT16	RO	TxPDO	–	–		
40A0h	00h	Main power supply count	INT32	RO	TxPDO	–	–		
40A1h	00h	Main power supply time [min]	INT32	RO	TxPDO	–	–		
40A2h	00h	Control power supply count *	INT32	RO	TxPDO	–	–		
40A3h	00h	Inverter voltage [1=0.1 V]	INT16	RO	TxPDO	–	–		
40A4h	00h	Main power supply voltage [1=0.1 V]	INT16	RO	TxPDO	–	–		
40A9h	00h	Elapsed time from BOOT [ms]	INT32	RO	TxPDO	–	–		
40B7h	00h	Operation voltage mode	U8	RO	TxPDO	–	–		
40B8h	00h	I/O status 1	U32	RO	TxPDO	–	–		
40B9h	00h	I/O status 2	U32	RO	TxPDO	–	–		
40BAh	00h	I/O status 3	U32	RO	TxPDO	–	–		
40BBh	00h	I/O status 4	U32	RO	TxPDO	–	–		
40BCh	00h	I/O status 5	U32	RO	TxPDO	–	–		
40BDh	00h	I/O status 6	U32	RO	TxPDO	–	–		
40BEh	00h	I/O status 7	U32	RO	TxPDO	–	–		
40BFh	00h	I/O status 8	U32	RO	TxPDO	–	–		

* It will be the number of times the main power supply is turned on if the control power supply is not connected.

4 Object list

Objects of manufacturer-specific area

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
40C0h	00h	Alarm reset	U8	RW	No	–	0	0: Not executed. 1: A command is executed when the data changes from 0 to 1. 2: A command is executed. It will automatically return to 1 after executing.	–
40C2h	00h	Clear alarm history	U8	RW	No	–	0		
40C5h	00h	P-PRESET execution	U8	RW	No	–	0		
40C6h	00h	Configuration	U8	RW	No	–	0		
40C8h	00h	Read batch NV memory	U8	RW	No	–	0		
40C9h	00h	Write batch NV memory	U8	RW	No	–	0		
40CAh	00h	All data batch initialization	U8	RW	No	–	0		
40CBh	00h	Read from backup	U8	RW	No	–	0		
40CCh	00h	Write to backup	U8	RW	No	–	0		
40CDh	00h	Clear latch information	U8	RW	No	–	0		
40CFh	00h	Clear tripmeter	U8	RW	No	–	0		
40D0h	00h	Reserved: It cannot be used.	U8	–	–	–	–	–	–
40D1h	00h	ZSG-PRESET	U8	RW	No	–	0	0: Not executed. 1: A command is executed when the data changes from 0 to 1. 2: A command is executed. It will automatically return to 1 after executing.	–
40D2h	00h	Clear ZSG-PRESET	U8	RW	No	–	0		
40D3h	00h	Clear information	U8	RW	No	–	0		
40D4h	00h	Clear information history	U8	RW	No	–	0		
4120h	00h	Operating current	INT16	RW	RxPDO	○	1,000	0 to 1,000 (1=0.1 %)	A *
4121h	00h	Push current	INT16	RW	RxPDO	○	200	0 to 1,000 (1=0.1 %)	A *
4126h	00h	Base current	INT16	RW	RxPDO	○	1,000	0 to 1,000 (1=0.1 %)	A
4128h	00h	Stop current	INT16	RW	RxPDO	○	500	0 to 1,000 (1=0.1 %)	A
4129h	00h	Command filter setting	INT8	RW	No	○	1	1: LPF (speed filter) 2: Moving average filter	B
412Ah	00h	Command filter time constant	INT16	RW	RxPDO	○	1	0 to 200 ms	B
412Ch	00h	Smooth drive function	U8	RW	No	○	1	0: Disable 1: Enable	C
412Dh	00h	Current control mode	U8	RW	No	○	0	0: The setting of the CCM input is followed 1: α control mode (CST) 2: Servo emulation mode (SVE)	A
412Eh	00h	Servo emulation (SVE) ratio	INT16	RW	No	○	1,000	0 to 1,000 (1=0.1 %)	A
412Fh	00h	SVE position loop gain	INT16	RW	No	○	10	1 to 50	A
4130h	00h	SVE speed loop gain	INT16	RW	No	○	180	10 to 200	A
4131h	00h	SVE speed loop integral time constant	INT16	RW	No	○	1,000	100 to 2,000 (1=0.1 ms)	A
4132h	00h	Automatic current cutback function	U8	RW	No	○	1	0: Disable 1: Enable	A
4133h	00h	Automatic current cutback switching time	INT16	RW	No	○	100	0 to 1,000 ms	A
4134h	00h	Operating current ramp up rate	U8	RW	No	○	0	0 to 100 (ms/100 %)	A
4135h	00h	Operating current ramp down rate	U8	RW	No	○	0		A
4136h	00h	Electronic damper function	INT8	RW	No	○	1	0: Disable 1: Enable	A
4137h	00h	Resonance suppression control frequency	INT16	RW	No	○	1,000	100 to 2,000 Hz	A
4138h	00h	Resonance suppression control gain	INT16	RW	No	○	0	−500 to 500	A
4139h	00h	Deviation acceleration suppressing gain	INT16	RW	No	○	45	0 to 500	A
413Ch	00h	Current setting during push-motion	U8	RW	No	○	0	0: Push current 1: Operating current	A
413Dh	00h	Non-excitation mode selection	U8	RW	No	○	0	0: Dynamic brake status 1: Free-run status	A
4142h	00h	Starting speed	INT32	RW	No	○	5,000	0 to 4,000,000 Hz	B
4148h	00h	Permission of absolute positioning without setting absolute coordinates	U8	RW	No	○	0	0: Disable 1: Enable	B

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
414Fh	00h	Wrap positioning mode	U8	RW	RxPDO	○	0	0: Wrap absolute positioning 1: Wrap proximity 2: Wrap forward direction 3: Wrap reverse direction	B
4151h	00h	(JOG) Operating speed	INT32	RW	No	○	10,000	1 to 4,000,000 Hz	B
4152h	00h	(JOG) Acceleration/deceleration	INT32	RW	No	○	300,000	1 to 1,000,000,000 kHz/s	B
4153h	00h	(JOG) Starting speed	INT32	RW	No	○	5,000	0 to 4,000,000 Hz	B
4154h	00h	(JOG) Operating speed (high)	INT32	RW	No	○	50,000	1 to 4,000,000 Hz	B
4158h	00h	(ZHOME) Operating speed	INT32	RW	No	○	50,000	1 to 4,000,000 Hz	B
4159h	00h	(ZHOME) Acceleration/ deceleration	INT32	RW	No	○	300,000	1 to 1,000,000,000 kHz/s	B
415Ah	00h	(ZHOME) Starting speed	INT32	RW	No	○	5,000	0 to 4,000,000 Hz	B
415Eh	00h	JOG/HOME/ZHOME command filter time constant	INT16	RW	No	○	1	1 to 200 ms	B
415Fh	00h	JOG/HOME/ZHOME operating current	INT16	RW	No	○	1,000	0 to 1,000 (1=0.1 %)	B
4160h	00h	(HOME) Home-seeking mode	U8	RW	No	○	2	0: 2-sensor 1: 3-sensor 2: One-way rotation 3: Push-motion	B
4161h	00h	(HOME) Starting direction	U8	RW	No	○	1	0: Negative side 1: Positive side	B
4163h	00h	(HOME) Starting speed	INT32	RW	No	○	5,000	1 to 4,000,000 Hz	B
4166h	00h	(HOME) SLIT detection	U8	RW	No	○	0	0: Disable 1: Enable	B
4167h	00h	(HOME) TIM/ZSG signal detection	U8	RW	No	○	0	0: Disable 1: TIM 2: ZSG	B
4168h	00h	(HOME) Position offset	INT32	RW	No	○	0	−2,147,483,647 to 2,147,483,647 steps	B
4169h	00h	(HOME) Backward steps in 2 sensor home-seeking	INT32	RW	No	○	5,000	0 to 8,388,607 steps	B
416Ah	00h	(HOME) Operating amount in uni-directional home-seeking	INT32	RW	No	○	5,000	0 to 8,388,607 steps	B
416Bh	00h	(HOME) Operating current for push-home-seeking	INT16	RW	No	○	1,000	0 to 1,000 (1=0.1 %)	B
416Ch	00h	(HOME) Backward steps after first entry in push-home-seeking	INT32	RW	No	○	0	0 to 8,388,607 steps	B
416Dh	00h	(HOME) Pushing time in push-home-seeking	U16	RW	No	○	200	1 to 65,535 ms	B
416Eh	00h	(HOME) Backward steps in push-home-seeking	INT32	RW	No	○	5,000	0 to 8,388,607 steps	B
4180h	00h	Overload alarm	INT16	RW	No	○	50	1 to 300 (1=0.1 s)	A
4190h	00h	Reserved: It cannot be used.	U8	–	–	–	–	–	–
4191h	00h	Reserved: It cannot be used.	U8	–	–	–	–	–	–
4198h	00h	Reserved: It cannot be used.	U8	–	–	–	–	–	–
4199h	00h	Reserved: It cannot be used.	U8	–	–	–	–	–	–
419Ah	00h	Reserved: It cannot be used.	U8	–	–	–	–	–	–
419Ch	00h	Reserved: It cannot be used.	U8	–	–	–	–	–	–
41A0h	00h	Driver temperature information (INFO-DRVTMP)	INT16	RW	RxPDO	○	85	40 to 85 ℃	A
41A1h	00h	Overload time information (INFO-OLTIME)	INT16	RW	RxPDO	○	50	1 to 300 (1=0.1 s)	A
41A2h	00h	Speed information (INFO-SPD)	INT16	RW	RxPDO	○	0	0: Disable 1 to 12,000 r/min	A
41A5h	00h	Position deviation information (INFO-POSERR)	INT16	RW	RxPDO	○	300	1 to 30,000 (1=0.01 rev)	A
41A8h	00h	Motor temperature information (INFO-MTRTMP)	INT16	RW	RxPDO	○	85	40 to 120 ℃	A
41A9h	00h	Reserved: It cannot be used.	INT16	–	–	–	–	–	–
41AAh	00h	Reserved: It cannot be used.	INT16	–	–	–	–	–	–

4 Object list

Objects of manufacturer-specific area

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
41ABh	00h	Overvoltage information (INFO-OVOLT)	INT16	RW	RxPDO	○	630	140 to 630 (1=0.1 V)	A
41ACh	00h	Undervoltage information (INFO-UVOLT)	INT16	RW	RxPDO	○	140	140 to 630 (1=0.1 V)	A
41AFh	00h	Tripmeter information (INFO-TRIP)	INT32	RW	RxPDO	○	0	0: Disable 1 to 2,147,483,647 (1=0.1 kRev)	A
41B0h	00h	Odometer information (INFO-ODO)	INT32	RW	RxPDO	○	0	0: Disable 1 to 2,147,483,647 (1=0.1 kRev)	A
41B1h	00h	Cumulative load 0 information (INFO-CULD0)	INT32	RW	RxPDO	○	0	0 to 2,147,483,647	A
41B2h	00h	Cumulative load 1 information (INFO-CULD1)	INT32	RW	RxPDO	○	0	0 to 2,147,483,647	A
41B3h	00h	Cumulative load value auto clear	U8	RW	No	○	1	0: Disable 1: Enable	A
41B4h	00h	Cumulative load value count divisor	U16	RW	No	○	1	1 to 32,767	A
41BCh	00h	INFO-USRIO output selection	U8	RW	No	○	128	Output signals list⇨ p.94	A
41BDh	00h	INFO-USRIO output inversion	U8	RW	No	○	0	0: Not invert 1: Invert	A
41BEh	00h	Information LED condition	U8	RW	No	○	1	0: Disable (LED does not blink) 1: Enable (LED blinks)	A
41BFh	00h	Information auto clear	U8	RW	No	○	1	0: Disable (not turned OFF automatically) 1: Enable (turned OFF automatically)	A
41C2h	00h	Motor rotation direction	U8	RW	No	○	1	0: Positive side=Counterclockwise 1: Positive side=Clockwise 2: Positive side=Counterclockwise (the driver parameter is applied) 3: Positive side=Clockwise (the driver parameter is applied)	C
41C3h	00h	Software overtravel	INT8	RW	No	○	3	−1: Disable 0: Immediate stop 1: Deceleration stop 2: Immediate stop with alarm 3: Deceleration stop with alarm	A
41C6h	00h	Preset position	INT32	RW	No	○	0	−2,147,483,648 to 2,147,483,647 steps	A
41C7h	00h	Wrap setting	U8	RW	No	○	1	0: Disable 1: Enable	C
41C9h	00h	Initial coordinate generation & wrap setting range	INT32	RW	No	○	10	5 to 655,360 (1=0.1 rev)	C
41CBh	00h	Initial coordinate generation & wrap range offset ratio	U16	RW	No	○	5,000	0 to 10,000 (1=0.01 %)	C
41CCh	00h	Initial coordinate generation & wrap range offset value	INT32	RW	No	○	0	−536,870,912 to 536,870,911 steps	C
41CDh	00h	The number of the RND-ZERO output in wrap range	INT32	RW	No	○	1	1 to 536,870,911	C
41F0h	00h	Reserved: It cannot be used.	INT8	–	–	–	–	–	–
41FAh	00h	Main power mode	INT8	RW	No	○	−1	−1: Automatic discrimination 0: 24 VDC 1: 48 VDC	D
41FFh	00h	Driver simulation mode	U8	RW	No	○	0	0: Use real motor 1: Virtual motor (when ABZO not connected = no ABZO information) 2: Virtual motor (when ABZO not connected = 1,800 rev wrap enable) 3: Virtual motor (when ABZO not connected = 900 rev wrap enable)	D
44B0h	00h	Touch probe 1 latch position	U8	RW	No	○	0	0: Latches the feedback position 1: Latches the command position	A
44B1h	00h	Touch probe 2 latch position	U8	RW	No	○	0		
44B2h	00h	Touch probe 1 TIM/ZSG signal select	U8	RW	No	○	0	0: Latch on the ZSG output 1: Latch on the TIM output	A
44B3h	00h	Touch probe 2 TIM/ZSG signal select	U8	RW	No	○	0		

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
4510h	00h	Information history 1	INT32	RO	No	–	–		
4511h	00h	Information history 2	INT32	RO	No	–	–		
4512h	00h	Information history 3	INT32	RO	No	–	–		
4513h	00h	Information history 4	INT32	RO	No	–	–		
4514h	00h	Information history 5	INT32	RO	No	–	–		
4515h	00h	Information history 6	INT32	RO	No	–	–		
4516h	00h	Information history 7	INT32	RO	No	–	–		
4517h	00h	Information history 8	INT32	RO	No	–	–		
4518h	00h	Information history 9	INT32	RO	No	–	–		
4519h	00h	Information history 10	INT32	RO	No	–	–		
451Ah	00h	Information history 11	INT32	RO	No	–	–		
451Bh	00h	Information history 12	INT32	RO	No	–	–		
451Ch	00h	Information history 13	INT32	RO	No	–	–		
451Dh	00h	Information history 14	INT32	RO	No	–	–		
451Eh	00h	Information history 15	INT32	RO	No	–	–		
451Fh	00h	Information history 16	INT32	RO	No	–	–		
4520h	00h	Information time history 1	INT32	RO	No	–	–		
4521h	00h	Information time history 2	INT32	RO	No	–	–		
4522h	00h	Information time history 3	INT32	RO	No	–	–		
4523h	00h	Information time history 4	INT32	RO	No	–	–		
4524h	00h	Information time history 5	INT32	RO	No	–	–		
4525h	00h	Information time history 6	INT32	RO	No	–	–		
4526h	00h	Information time history 7	INT32	RO	No	–	–		
4527h	00h	Information time history 8	INT32	RO	No	–	–		
4528h	00h	Information time history 9	INT32	RO	No	–	–		
4529h	00h	Information time history 10	INT32	RO	No	–	–	–	–
452Ah	00h	Information time history 11	INT32	RO	No	–	–		
452Bh	00h	Information time history 12	INT32	RO	No	–	–		
452Ch	00h	Information time history 13	INT32	RO	No	–	–		
452Dh	00h	Information time history 14	INT32	RO	No	–	–		
452Eh	00h	Information time history 15	INT32	RO	No	–	–		
452Fh	00h	Information time history 16	INT32	RO	No	–	–		
4642h	00h	Driver CPU number	U16	RO	No	–	–	–	–
4643h	00h	Driver software version	U16	RO	No	–	–	–	–
4700h	00h	STOP input action	INT8	RW	No	O	3	0: Immediate stop 3: Deceleration stop	A
4701h	00h	FW-LS, RV-LS input action	INT8	RW	No	O	2	−1: Used as a return-to-home sensor 0: Immediate stop 1: Deceleration stop 2: Immediate stop with alarm 3: Deceleration stop with alarm	A
4702h	00h	FW-BLK, RV-BLK input action	INT8	RW	No	O	0	0: Immediate stop 1: Deceleration stop	A
4704h	00h	IN-POS positioning completion signal offset	INT16	RW	No	O	0	−18 to 18 (1=0.1°)	A
4707h	00h	ZSG signal width	U16	RW	No	O	18	1 to 1,800 (1=0.1°)	A
4708h	00h	RND-ZERO signal width	U16	RW	No	O	10	1 to 10,000 steps	A
4709h	00h	RND-ZERO signal source	U8	RW	No	O	0	0: Based on feedback position 1: Based on command position	A
470Ah	00h	MOVE minimum ON time	U8	RW	No	O	0	0 to 255 ms	A
470Ch	00h	Reserved: It cannot be used.	INT8	–	–	–	–	–	–
470Dh	00h	CRNT-LMT operating current limit value	INT16	RW	No	O	500	0 to 1,000 (1=0.1 %)	A
470Eh	00h	SPD-LMT speed limit type selection	INT8	RW	No	O	0	0: Ratio 1: Value	A
470Fh	00h	SPD-LMT speed limit ratio	INT8	RW	No	O	50	1 to 100 %	A
4710h	00h	SPD-LMT speed limit value	INT32	RW	No	O	10,000	1 to 4,000,000 Hz	A
4713h	00h	Reserved: It cannot be used.	U8	–	–	–	–	–	–

4 Object list

Objects of manufacturer-specific area

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
4718h	00h	VA mode selection	U8	RW	No	○	2	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)	A
4719h	00h	VA detection speed range	U8	RW	No	○	30	1 to 200 r/min	B
4740h	00h	AREA0 positive direction position/offset	INT32	RW	No	○	0		
4741h	00h	AREA0 negative direction position/detection range	INT32	RW	No	○	0		
4742h	00h	AREA1 positive direction position/offset	INT32	RW	No	○	0		
4743h	00h	AREA1 negative direction position/detection range	INT32	RW	No	○	0		
4744h	00h	AREA2 positive direction position/offset	INT32	RW	No	○	0		
4745h	00h	AREA2 negative direction position/detection range	INT32	RW	No	○	0		
4746h	00h	AREA3 positive direction position/offset	INT32	RW	No	○	0		
4747h	00h	AREA3 negative direction position/detection range	INT32	RW	No	○	0	−2,147,483,648 to 2,147,483,647 steps	A
4748h	00h	AREA4 positive direction position/offset	INT32	RW	No	○	0		
4749h	00h	AREA4 negative direction position/detection range	INT32	RW	No	○	0		
474Ah	00h	AREA5 positive direction position/offset	INT32	RW	No	○	0		
474Bh	00h	AREA5 negative direction position/detection range	INT32	RW	No	○	0		
474Ch	00h	AREA6 positive direction position/offset	INT32	RW	No	○	0		
474Dh	00h	AREA6 negative direction position/detection range	INT32	RW	No	○	0		
474Eh	00h	AREA7 positive direction position/offset	INT32	RW	No	○	0		
474Fh	00h	AREA7 negative direction position/detection range	INT32	RW	No	○	0		
4750h	00h	AREA0 range setting mode	U8	RW	No	○	0		
4751h	00h	AREA1 range setting mode	U8	RW	No	○	0		
4752h	00h	AREA2 range setting mode	U8	RW	No	○	0	0: Range setting with absolute value 1: Offset/width setting from the target position	A
4753h	00h	AREA3 range setting mode	U8	RW	No	○	0		
4754h	00h	AREA4 range setting mode	U8	RW	No	○	0		
4755h	00h	AREA5 range setting mode	U8	RW	No	○	0		
4756h	00h	AREA6 range setting mode	U8	RW	No	○	0		
4757h	00h	AREA7 range setting mode	U8	RW	No	○	0		
4758h	00h	AREA0 positioning standard	U8	RW	No	○	0		
4759h	00h	AREA1 positioning standard	U8	RW	No	○	0		
475Ah	00h	AREA2 positioning standard	U8	RW	No	○	0		
475Bh	00h	AREA3 positioning standard	U8	RW	No	○	0	0: Based on feedback position 1: Based on command position	A
475Ch	00h	AREA4 positioning standard	U8	RW	No	○	0		
475Dh	00h	AREA5 positioning standard	U8	RW	No	○	0		
475Eh	00h	AREA6 positioning standard	U8	RW	No	○	0		
475Fh	00h	AREA7 positioning standard	U8	RW	No	○	0		
47A0h	00h	INFO action (Assigned I/O status information (INFO-USRIO))	U8	RW	No	○	1	0: No Info reflect: Only the bit output is ON. 1: Info reflect: The bit output and the INFO output are ON and the LED blinks.	A
47A1h	00h	INFO action (Position deviation information (INFO-POSERR))	U8	RW	No	○	1		
47A2h	00h	INFO action (Driver temperature information (INFO-DRVTMP))	U8	RW	No	○	1		

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
47A3h	00h	INFO action (Motor temperature information (INFO-MTRTMP))	U8	RW	No	○	1		
47A4h	00h	INFO action (Overvoltage information (INFO-OVOLT))	U8	RW	No	○	1		
47A5h	00h	INFO action (Undervoltage information (INFO-UVOLT))	U8	RW	No	○	1		
47A6h	00h	INFO action (Overload time information (INFO-OLTIME))	U8	RW	No	○	1		
47A8h	00h	INFO action (Speed information (INFO-SPD))	U8	RW	No	○	1		
47A9h	00h	INFO action (Start operation error information (INFO-START))	U8	RW	No	○	1		
47AAh	00h	INFO action (Start ZHOME error information (INFO-ZHOME))	U8	RW	No	○	1		
47ABh	00h	INFO action (PRESET request information (INFO-PR-REQ))	U8	RW	No	○	1		
47ADh	00h	INFO action (Electronic gear setting error information (INFO-EGR-E))	U8	RW	No	○	1		
47AEh	00h	INFO action (Wrap setting error information (INFO-RND-E))	U8	RW	No	○	1	0: No Info reflect: Only the bit output is ON. 1: Info reflect: The bit output and the INFO output are ON and the LED blinks.	A
47B0h	00h	INFO action (Forward operation prohibition information (INFO-FW-OT))	U8	RW	No	○	1		
47B1h	00h	INFO action (Reverse operation prohibition information (INFO-RV-OT))	U8	RW	No	○	1		
47B2h	00h	INFO action (Cumulative load 0 information (INFO-CULD0))	U8	RW	No	○	1		
47B3h	00h	INFO action (Cumulative load 1 information (INFO-CULD1))	U8	RW	No	○	1		
47B4h	00h	INFO action (Tripmeter information (INFO-TRIP))	U8	RW	No	○	1		
47B5h	00h	INFO action (Odometer information (INFO-ODO))	U8	RW	No	○	1		
47BCh	00h	INFO action (Start operation restricted mode information (INFO-DSLMTD))	U8	RW	No	○	1		
47BDh	00h	INFO action (I/O test mode information (INFO-IOTEST))	U8	RW	No	○	1		
47BEh	00h	INFO action (Configuration request information (INFO-CFG))	U8	RW	No	○	1		
47BFh	00h	INFO action (Reboot request information (INFO-RBT))	U8	RW	No	○	1		
47F0h	00h	Mechanism settings	U8	RW	No	○	1	0: Prioritize ABZO setting 1: Manual setting	D
47F1h	00h	Gear ratio setting	INT16	RW	No	○	0	0: Gear ratio setting disable 1 to 32,767: Gear ratio (1=0.01)	C
47F2h	00h	Initial coordinate generation & wrap coordinate setting	U8	RW	No	○	0	0: Prioritize ABZO setting 1: Manual setting	D
47F3h	00h	Mechanism limit parameter setting	U8	RW	No	○	0	0: Follow ABZO setting 1: Disable	D
47F4h	00h	Mechanism protection parameter setting	U8	RW	No	○	0	0: Follow ABZO setting 1: Disable	D
47F5h	00h	JOG/HOME/ZHOME operation setting	U8	RW	No	○	0	0: Prioritize ABZO setting 1: Manual setting	D
4840h	00h	DIN0 input function	U8	RW	No	○	30	Input signals list ⇨ p.93	C
4841h	00h	DIN1 input function	U8	RW	No	○	1		
4842h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4843h	00h	Reserved: It cannot be used.	U8	–	–	–	–	–	–
4844h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4845h	00h	Reserved: It cannot be used.	U8	–	–	–	–		

4 Object list

Objects of manufacturer-specific area

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
4850h	00h	DIN0 inverting mode	U8	RW	No	O	0	0: Not invert	C
4851h	00h	DIN1 inverting mode	U8	RW	No	O	0	1: Invert	
4852h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4853h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4854h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4855h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4860h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4861h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4862h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4863h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4864h	00h	Reserved: It cannot be used.	U8	–	–	–	–	–	–
4865h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4870h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4871h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4872h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4873h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4874h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4875h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4880h	00h	DIN0 composite input function	U8	RW	No	O	0	Input signals list⇨p.93	C
4881h	00h	DIN1 composite input function	U8	RW	No	O	0		
4882h	00h	Reserved: It cannot be used.	–	–	–	–	–		
4883h	00h	Reserved: It cannot be used.	–	–	–	–	–		
4884h	00h	Reserved: It cannot be used.	–	–	–	–	–		
4885h	00h	Reserved: It cannot be used.	–	–	–	–	–		
4890h	00h	Reserved: It cannot be used.	–	–	–	–	–		
4891h	00h	Reserved: It cannot be used.	–	–	–	–	–		
4892h	00h	Reserved: It cannot be used.	–	–	–	–	–		
4893h	00h	Reserved: It cannot be used.	–	–	–	–	–		
4894h	00h	Reserved: It cannot be used.	–	–	–	–	–		
4895h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48A0h	00h	Reserved: It cannot be used.	–	–	–	–	–	–	–
48A1h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48A2h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48A3h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48A4h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48A5h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48B0h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48B1h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48B2h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48B3h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48B4h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48B5h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48C0h	00h	DIN0 ON signal dead-time	U8	RW	No	O	0	0 to 250 ms	C
48C1h	00h	DIN1 ON signal dead-time	U8	RW	No	O	0		
48C2h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48C3h	00h	Reserved: It cannot be used.	–	–	–	–	–	–	–
48C4h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48C5h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48D0h	00h	DIN0 1 shot signal	U8	RW	No	O	0	0: Disable	C
48D1h	00h	DIN1 1 shot signal	U8	RW	No	O	0	1: Enable	
48D2h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48D3h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48D4h	00h	Reserved: It cannot be used.	–	–	–	–	–	–	–
48D5h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48E0h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48E1h	00h	Reserved: It cannot be used.	–	–	–	–	–		

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
48E2h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48E3h	00h	Reserved: It cannot be used.	–	–	–	–	–		
48E4h	00h	Reserved: It cannot be used.	–	–	–	–	–	–	–
48E5h	00h	Reserved: It cannot be used.	–	–	–	–	–		
4900h	00h	R-IN0 input function	U8	RW	No	○	0		
4901h	00h	R-IN1 input function	U8	RW	No	○	0		
4902h	00h	R-IN2 input function	U8	RW	No	○	0		
4903h	00h	R-IN3 input function	U8	RW	No	○	0		
4904h	00h	R-IN4 input function	U8	RW	No	○	0		
4905h	00h	R-IN5 input function	U8	RW	No	○	0		
4906h	00h	R-IN6 input function	U8	RW	No	○	0		
4907h	00h	R-IN7 input function	U8	RW	No	○	0	Input signals list⇨p.93	C
4908h	00h	R-IN8 input function	U8	RW	No	○	0		
4909h	00h	R-IN9 input function	U8	RW	No	○	0		
490Ah	00h	R-IN10 input function	U8	RW	No	○	0		
490Bh	00h	R-IN11 input function	U8	RW	No	○	0		
490Ch	00h	R-IN12 input function	U8	RW	No	○	0		
490Dh	00h	R-IN13 input function	U8	RW	No	○	0		
490Eh	00h	R-IN14 input function	U8	RW	No	○	0		
490Fh	00h	R-IN15 input function	U8	RW	No	○	0		
4910h	00h	R-OUT0 output function	U8	RW	No	○	28		
4911h	00h	R-OUT1 output function	U8	RW	No	○	29		
4912h	00h	R-OUT2 output function	U8	RW	No	○	155		
4913h	00h	R-OUT3 output function	U8	RW	No	○	0		
4914h	00h	R-OUT4 output function	U8	RW	No	○	144		
4915h	00h	R-OUT5 output function	U8	RW	No	○	204		
4916h	00h	R-OUT6 output function	U8	RW	No	○	135		
4917h	00h	R-OUT7 output function	U8	RW	No	○	129	Output signals list⇨p.94	C
4918h	00h	R-OUT8 output function	U8	RW	No	○	136		
4919h	00h	R-OUT9 output function	U8	RW	No	○	160		
491Ah	00h	R-OUT10 output function	U8	RW	No	○	161		
491Bh	00h	R-OUT11 output function	U8	RW	No	○	162		
491Ch	00h	R-OUT12 output function	U8	RW	No	○	157		
491Dh	00h	R-OUT13 output function	U8	RW	No	○	134		
491Eh	00h	R-OUT14 output function	U8	RW	No	○	138		
491Fh	00h	R-OUT15 output function	U8	RW	No	○	140		
4930h	00h	R-OUT0 OFF delay time	U8	RW	No	○	0		
4931h	00h	R-OUT1 OFF delay time	U8	RW	No	○	0		
4932h	00h	R-OUT2 OFF delay time	U8	RW	No	○	0		
4933h	00h	R-OUT3 OFF delay time	U8	RW	No	○	0		
4934h	00h	R-OUT4 OFF delay time	U8	RW	No	○	0		
4935h	00h	R-OUT5 OFF delay time	U8	RW	No	○	0		
4936h	00h	R-OUT6 OFF delay time	U8	RW	No	○	0		
4937h	00h	R-OUT7 OFF delay time	U8	RW	No	○	0	0 to 250 ms	C
4938h	00h	R-OUT8 OFF delay time	U8	RW	No	○	0		
4939h	00h	R-OUT9 OFF delay time	U8	RW	No	○	0		
493Ah	00h	R-OUT10 OFF delay time	U8	RW	No	○	0		
493Bh	00h	R-OUT11 OFF delay time	U8	RW	No	○	0		
493Ch	00h	R-OUT12 OFF delay time	U8	RW	No	○	0		
493Dh	00h	R-OUT13 OFF delay time	U8	RW	No	○	0		
493Eh	00h	R-OUT14 OFF delay time	U8	RW	No	○	0		
493Fh	00h	R-OUT15 OFF delay time	U8	RW	No	○	0		
4940h	00h	Virtual input (VIR-IN0) function	U8	RW	No	○	0		
4941h	00h	Virtual input (VIR-IN1) function	U8	RW	No	○	0		
4942h	00h	Virtual input (VIR-IN2) function	U8	RW	No	○	0	Input signals list⇨p.93	C
4943h	00h	Virtual input (VIR-IN3) function	U8	RW	No	○	0		

4 Object list

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
4944h	00h	Virtual input (VIR-IN0) source selection	U8	RW	No	○	128	Output signals list ⇨ p.94	C
4945h	00h	Virtual input (VIR-IN1) source selection	U8	RW	No	○	128		
4946h	00h	Virtual input (VIR-IN2) source selection	U8	RW	No	○	128		
4947h	00h	Virtual input (VIR-IN3) source selection	U8	RW	No	○	128		
4948h	00h	Virtual input (VIR-IN0) inverting mode	U8	RW	No	○	0	0: Not invert 1: Invert	C
4949h	00h	Virtual input (VIR-IN1) inverting mode	U8	RW	No	○	0		
494Ah	00h	Virtual input (VIR-IN2) inverting mode	U8	RW	No	○	0		
494Bh	00h	Virtual input (VIR-IN3) inverting mode	U8	RW	No	○	0		
494Ch	00h	Virtual input (VIR-IN0) ON signal dead time	U8	RW	No	○	0	0 to 250 ms	C
494Dh	00h	Virtual input (VIR-IN1) ON signal dead time	U8	RW	No	○	0		
494Eh	00h	Virtual input (VIR-IN2) ON signal dead time	U8	RW	No	○	0		
494Fh	00h	Virtual input (VIR-IN3) ON signal dead time	U8	RW	No	○	0		
4950h	00h	Virtual input (VIR-IN0) 1 shot signal mode	U8	RW	No	○	0	0: Disable 1: Enable	C
4951h	00h	Virtual input (VIR-IN1) 1 shot signal mode	U8	RW	No	○	0		
4952h	00h	Virtual input (VIR-IN2) 1 shot signal mode	U8	RW	No	○	0		
4953h	00h	Virtual input (VIR-IN3) 1 shot signal mode	U8	RW	No	○	0		
4960h	00h	User output (USR-OUT0) source A function	U8	RW	No	○	128	Output signals list ⇨ p.94	C
4961h	00h	User output (USR-OUT1) source A function	U8	RW	No	○	128		
4962h	00h	User output (USR-OUT0) source A inverting mode	U8	RW	No	○	0	0: Not invert 1: Invert	C
4963h	00h	User output (USR-OUT1) source A inverting mode	U8	RW	No	○	0		
4964h	00h	User output (USR-OUT0) source B function	U8	RW	No	○	128	Output signals list ⇨ p.94	C
4965h	00h	User output (USR-OUT1) source B function	U8	RW	No	○	128		
4966h	00h	User output (USR-OUT0) source B inverting mode	U8	RW	No	○	0	0: Not invert 1: Invert	C
4967h	00h	User output (USR-OUT1) source B inverting mode	U8	RW	No	○	0		
4968h	00h	User output (USR-OUT0) logical operation	U8	RW	No	○	1	0: AND 1: OR	C
4969h	00h	User output (USR-OUT1) logical operation	U8	RW	No	○	1		
4970h	00h	Reserved: It cannot be used.	U8	–	–	–	–	–	–
4971h	00h	Reserved: It cannot be used.	U8	–	–	–	–		
4972h	00h	Reserved: It cannot be used.	INT8	–	–	–	–		
4973h	00h	Reserved: It cannot be used.	INT8	–	–	–	–		
4974h	00h	Reserved: It cannot be used.	INT8	–	–	–	–		
49FAh	00h	Current setting during motor standstill at T-MODE	INT32	RW	No	○	0	0: Stop current 1: Operating current	A

* In the Profile position mode, it will be updated when operation is started.

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

ON signal dead-time

Direct input (DIN) ON / OFF

Internal signal ON / OFF

4 Object list
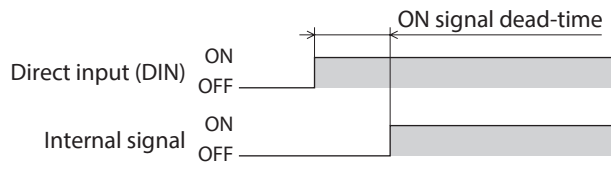
5　Troubleshooting

This part explains alarm and information functions.

◆**Table of contents**

1 Alarms

This driver is equipped with the alarm function to protect from temperature rise, poor connection, error in operation, and others.
If an alarm is generated, the ALM-A output is turned ON and the ALM-B output is turned OFF to stop the motor. The PWR/ALM LED blinks in red simultaneously.
Details of the alarm being generated can be checked by counting the number of times the PWR/ALM LED blinks, via EtherCAT communication, or using the **MEXE02**.

1-1 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 Fault reset (6040h: Bit 7) of Controlword to 1. (It is enabled when changing from 0 to 1.)
- Set the Alarm reset (40C0h) of EtherCAT communication 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 off the main power supply and the control power supply, and on again.

Note
- Some alarms can be reset by only turning on the main power supply and control power supply again. Refer to "1-4 Alarms list" on p.151.
- An alarm of Absolute position error can be reset if the position preset (P-PRESET) or return-to-home operation is performed. If it cannot be reset by these methods, the ABZO sensor may be damaged.

1-2 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 is performed.
- Read the alarm history by the Alarm history (4041h to 404Ah) via EtherCAT communication.
- Clear the alarm history by setting the Clear alarm history (40C2h) of EtherCAT communication to 1. (It is enabled when changing from 0 to 1.)
- Read or clear the alarm history using the **MEXE02**.

1-3 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	–	36 V *1 63 V *2
26h	Motor overheat	–	85 °C (185 °F)
31h	Overspeed	**AZM14**, **AZM15**, **AZM24**, **AZM26**	8,000 r/min
		AZM46, **AZM48**, **AZM66**	4,500 r/min
		AZM69	2,500 r/min
34h	Command pulse error	–	38,400 r/min

*1 When the Main power mode is 24 VDC.
*2 When the Main power mode is 48 VDC.

1-4   Alarms list

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

Alarm code	Number of times 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 the actual position exceeded the value set in the Following error window (6065h) in the motor output shaft. • A load is large, or the acceleration/deceleration time or the acceleration/deceleration rate is too short against the load. • The operating range of positioning push-motion operation was exceeded.	• Decrease a load. • Increase the acceleration/deceleration time or slow the acceleration/deceleration rate. • increase the operating current. • Reconsider the operation data.	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. After that, turn on the main power supply and the control power supply again. If the alarm is still not reset, the motor, the cable, or the driver may be damaged. Contact your nearest Oriental Motor sales office.	Turn on the main and control power supplies 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.	Any of reset operations
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 the voltage became low.	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

5 Troubleshooting

Alarm code	Number of times LED blinks	Alarm type	Cause	Remedial action	How to reset
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. After that, turn on the main power supply and the control power supply again.	Turn on the main and control power supplies again
29h	9	CPU peripheral circuit error	• A temperature significantly higher or lower than the specifications was detected. • The driver internal circuit was damaged.	• Reconsider the ambient temperature and ventilation condition. • Turn off the main power supply and the control power supply, and check if the driver is damaged. After that, turn on the main power supply and the control power supply again. If the alarm has still not reset, the driver may be damaged. Contact your nearest Oriental Motor sales office.	Turn on the main and control power supplies 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. After that, turn on the main power supply and the control power supply again.	Turn on the main and control power supplies again
30h	2	Overload	A load exceeding the maximum torque was applied for the time exceeded the value set in the Overload alarm (4180h).	• 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 (6091h-01h, 02h) and set the speed of the motor output shaft to a value lower 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.	Perform the position preset (P-PRESET) or return-to-home operation to set the home again.	Turn on the main and control power supplies again
34h	2	Command pulse error	• The command pulse frequency exceeded the specification value. • The position preset (P-PRESET) of the driver was executed in the Cyclic synchronous position mode when the motor was in an excitation state.	• Decrease the frequency of the command pulse. • Put the motor into a non-excitation state before executing the position preset (P-PRESET) of the driver in the Cyclic synchronous position mode.	Any of reset operations

5 Troubleshooting

Alarm code	Number of times LED blinks	Alarm type	Cause	Remedial action	How to reset
41h	9	EEPROM error	The data stored in the driver was damaged.	Initialize all parameters.	Turn on the main and control power supplies 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. After that, turn on the main power supply and the control power supply again.	Turn on the main and control power supplies again
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 main and control power supplies 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 (40D1h) of the maintenance command. • Execute the Clear tripmeter (40CFh) of the maintenance command.	Turn on the main and control power supplies again
45h	8	Motor combination error	A motor not allowed to combine with the driver was connected. Refer to p.156 for details.	Check the motor model and the driver model, and connect them in a correct combination.	Turn on the main and control power supplies 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 (4148h). • Execute the position preset (P-PRESET) or return-to-home operation.	Any of reset operations
4Ch	7	Network initialization error	An error was detected during initialization of the EtherCAT module.	Turn on the main power supply and the control power supply again. If the alarm still cannot be cleared, contact your nearest Oriental Motor sales office.	Turn on the main and control power supplies again
60h	7	±LS both sides active	• When the FW-LS/RV-LS input action (4701h) is set to "2: Immediate stop with alarm" or "3: Deceleration stop with alarm," both the FW-LS input and the RV-LS input were detected. • Return-to-home operation was executed in a state where both the FW-LS input and the RV-LS input were detected.	Check the sensor logic installed and the "Inverting mode" parameter.	Any of reset operations

5 Troubleshooting

Alarm code	Number of times LED blinks	Alarm type	Cause	Remedial action	How to reset
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 Homing acceleration (609Ah).	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 HOME sensor so that these signals should be ON while the HOMES input is ON. • If the signals are not used, set the (HOME) TIM/ZSG signal detection (4167h) or the (HOME) SLIT detection (4166h) to "0: Disable."	Any of reset operations
66h	7	Hardware overtravel	When the FW-LS/RV-LS input action (4701h) is set to "2: Immediate stop with alarm" or "3: Deceleration stop with alarm," the FW-LS input or the RV-LS input was detected.	• Reconsider the operation data. • After resetting the alarm, operate the motor in the opposite direction to escape from the sensor. The operation can be performed in any of operation modes. • Reset the alarm and then escape from the sensor manually.	Any of reset operations

Alarm code	Number of times LED blinks	Alarm type	Cause	Remedial action	How to reset
67h	7	Software overtravel	When the Software overtravel (41C3h) is set to "2: Immediate stop with alarm" or "3: Deceleration stop with alarm," the motor position reached the set value of the software limit.	• Reconsider the operation data. • After resetting the alarm, operate the motor in the opposite direction to escape from the sensor. The operation can be performed in any of operation modes. • Reset the alarm and then escape from the sensor manually.	Any of reset operations
6Ah	7	Return-to-home operation offset error	When offset movement as part of return-to-home operation is 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 mechanism limit stored in the ABZO sensor.	• Check the travel amount (position). • Reset the alarm and then escape from the sensor by operating the motor or manually.	Any of reset operations
70h	7	Operation data error	• Operation was performed at the operating speed or operating current exceeding the value set in the "Mechanism protection parameter." • Wrap operation was executed when the Wrap setting (41C7h) was disabled. • Push-motion operation or push-motion return-to-home operation was performed with the **DGII** Series.	• Check the operation data. • Check the value set in the "Mechanism protection parameter" using the unit information monitor of the **MEXE02**. • Check the wrap setting. • Push-motion operation as well as push-motion return-to-home operation cannot be performed with the **DGII** Series.	Any of reset operations
71h	7	Electronic gear setting error	The resolution set in the Electronic gear (6091h-01h, 02h) was out of the specification.	Reconsider the Electronic gear (6091h-01h, 02h), and set so that the resolution should be in the range of the specification.	Turn on the main and control power supplies again
72h	7	Wrap setting error	The control power supply was turned on with the value set in the Wrap setting (41C7h) that is inconsistent with the resolution set in the Electronic gear (6091h-01h, 02h).	Set the wrap setting properly, and turn on the main power supply and the control power supply again.	Turn on the main and control power supplies again
81h	7	Network bus error	• A communication error of EtherCAT communication was detected during operation. • The EtherCAT communication state machine (ESM) was transitioned to other than "Operational" during operation.	Check the conditions of the connector, the cable, and the EtherCAT master of EtherCAT communication.	Any of reset operations
82h	7	Network module error	An error was detected in the network module.	Turn on the main power supply and the control power supply again.	Turn on the main and control power supplies again

5 Troubleshooting

Alarm code	Number of times LED blinks	Alarm type	Cause	Remedial action	How to reset
F0h	Light	CPU error	CPU malfunctioned.	Turn on the main power supply and the control power supply again.	Turn on the main and control power supplies again

Related objects

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
4180h	00h	Overload alarm	INT16	RW	No	○	50	1 to 300 (1=0.1 s)	A
6065h	00h	Following error window	U32	RW	No	○	300	1 to 30,000 (1=0.01 rev)	A

■ About causes of the motor combination error (alarm code 45h)

An alarm of the motor combination error is generated in the following conditions.
- When a motor for the AC power supply was connected to the driver.
- When a motor of frame size 20 mm (0.79 in.) or 28 mm (1.10 in.) was connected to the driver and 48 VDC was applied.

1-5 Timing chart

1. If an error occurs, the ALM-B output, the MOVE output, and the DCMD-RDY output are turned OFF.
   At the same time, the motor stops instantaneously to put into a non-excitation state.

2. Execute operation stop before resetting the alarm. Otherwise, the motor may suddenly start, causing injury or damage to equipment.
   In the Cyclic synchronous position mode (CSP), clear the position deviation between the EtherCAT master and the driver after the operation is stopped.

3. Remove the cause of the alarm and then turn the ALM-RST input ON.
   The alarm is reset, and the ALM-B output is turned ON. If the excitation command is input from the EtherCAT master, the motor puts into an excitation state at the same time as the alarm is reset, and the READY output and the DCMD-RDY output are turned ON.

4. Check the ALM-B output has been turned ON and then turn the ALM-RST input OFF.
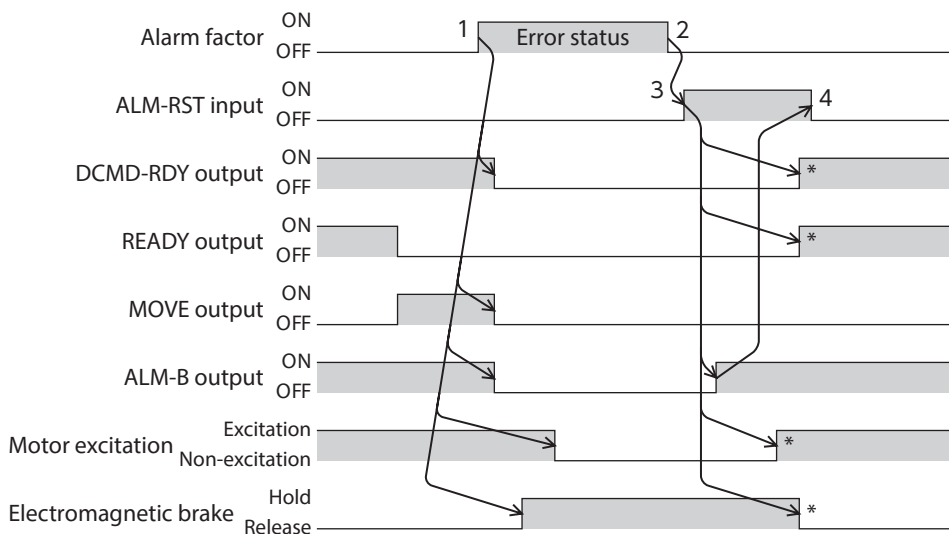
* It is the movement when the excitation command is input from the EhterCAT master at the time the ALM-RST input is turned ON.

* It is the movement when the excitation command is input from the EhterCAT master at the time the ALM-RST input is turned ON.

5 Troubleshooting
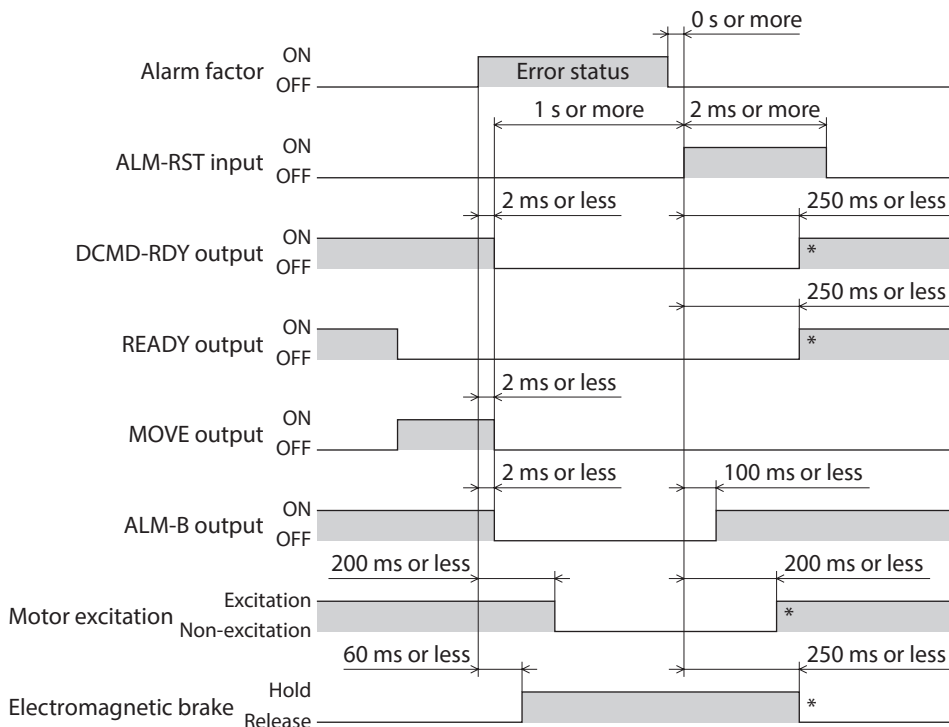
2 Information

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 (41A8h) can prevent equipment malfunction or production stoppage due to motor overheat. In addition, the Tripmeter information (41AFh) can be utilized as a reference to do maintenances every time a certain travel distance is reached.

■ Status when information is generated

● Information bit output

If information is generated, a bit output (INFO-∗∗ output) of the corresponding information is turned ON.
A desired output signal can be assigned to the INFO-USRIO output among bit outputs and used. If the assigned output signal is turned ON, the INFO-USRIO output is also turned ON. For details about bit output, refer to p.161.

● INFO output

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

● LED indicator

If information is generated, the PWR/ALM LED blinks in blue.

● Operation of motor

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: No Info reflect," only the bit output of information is turned ON, and the INFO output and LED are not changed.

Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Initial value	Update
41A0h	00h	Driver temperature information (INFO-DRVTMP)	INT16	RW	RxPDO	○	40 to 85 °C	85	A
41A1h	00h	Overload time information (INFO-OLTIME)	INT16	RW	RxPDO	○	1 to 300 (1=0.1 s)	50	A
41A2h	00h	Speed information (INFO-SPD)	INT16	RW	RxPDO	○	0: Disable 1 to 12,000 r/min	0	A
41A5h	00h	Position deviation information (INFO-POSERR)	INT16	RW	RxPDO	○	1 to 30,000 (1=0.01 rev)	300	A
41A8h	00h	Motor temperature information (INFO-MTRTMP)	INT16	RW	RxPDO	○	40 to 120 °C	85	A
41ABh	00h	Overvoltage information (INFO-OVOLT)	INT16	RW	RxPDO	○	140 to 630 (1=0.1 V)	630	A
41ACh	00h	Undervoltage information (INFO-UVOLT)	INT16	RW	RxPDO	○	140 to 630 (1=0.1 V)	140	A
41AFh	00h	Tripmeter information (INFO-TRIP)	INT32	RW	RxPDO	○	0: Disable 1 to 2,147,483,647 (1=0.1 kRev)	0	A
41B0h	00h	Odometer information (INFO-ODO)	INT32	RW	RxPDO	○	0: Disable 1 to 2,147,483,647 (1=0.1 kRev)	0	A

Index	Sub	Name	Type	Access	PDO	Save	Range	Initial value	Update
41B1h	00h	Cumulative load 0 information (INFO-CULD0)	INT32	RW	RxPDO	○	0 to 2,147,483,647	0	A
41B2h	00h	Cumulative load 1 information (INFO-CULD1)	INT32	RW	RxPDO	○	0 to 2,147,483,647	0	A
41B3h	00h	Cumulative load value auto clear	U8	RW	No	○	0: Disable 1: Enable	1	A
41B4h	00h	Cumulative load value count divisor	U16	RW	No	○	1 to 32,767	1	A
41BCh	00h	INFO-USRIO output selection	U8	RW	No	○	Output signal ⇨p.94	128	A
41BDh	00h	INFO-USRIO output inversion	U8	RW	No	○	0: Not invert 1: Invert	0	A
41BEh	00h	Information LED condition	U8	RW	No	○	0: Disable (LED does not blink) 1: Enable (LED blinks)	1	A
41BFh	00h	Information auto clear	U8	RW	No	○	0: Disable (not turned OFF automatically) 1: Enable (turned OFF automatically)	1	A
47A0h	00h	INFO action (Assigned I/O status information (INFO-USRIO))	U8	RW	No	○	0: No info reflect (Only the bit output is ON.) 1: Info reflect (The bit output and the INFO output are ON and the LED blinks.)	1	A
47A1h	00h	INFO action (Position deviation information (INFO-POSERR))	U8	RW	No	○		1	A
47A2h	00h	INFO action (Driver temperature information (INFO-DRVTMP))	U8	RW	No	○		1	A
47A3h	00h	INFO action (Motor temperature information (INFO-MTRTMP))	U8	RW	No	○		1	A
47A4h	00h	INFO action (Overvoltage information (INFO-OVOLT))	U8	RW	No	○		1	A
47A5h	00h	INFO action (Undervoltage information (INFO-UVOLT))	U8	RW	No	○		1	A
47A6h	00h	INFO action (Overload time information (INFO-OLTIME))	U8	RW	No	○		1	A
47A8h	00h	INFO action (Speed information (INFO-SPD))	U8	RW	No	○		1	A
47A9h	00h	INFO action (Start operation error information (INFO-START))	U8	RW	No	○		1	A
47AAh	00h	INFO action (Start ZHOME error information (INFO-ZHOME))	U8	RW	No	○		1	A

5 Troubleshooting

Index	Sub	Name	Type	Access	PDO	Save	Range	Initial value	Update
47ABh	00h	INFO action (PRESET request information (INFO-PR-REQ))	U8	RW	No	○		1	A
47ADh	00h	INFO action (Electronic gear setting error information (INFO-EGR-E))	U8	RW	No	○		1	A
47AEh	00h	INFO action (Wrap setting error information (INFO-RND-E))	U8	RW	No	○		1	A
47B0h	00h	INFO action (Forward operation prohibition information (INFO-FW-OT))	U8	RW	No	○		1	A
47B1h	00h	INFO action (Reverse operation prohibition information (INFO-RV-OT))	U8	RW	No	○	0: No info reflect (Only the bit output is ON.) 1: Info reflect (The bit output and the INFO output are ON and the LED blinks.)	1	A
47B2h	00h	INFO action (Cumulative load 0 information (INFO-CULD0))	U8	RW	No	○		1	A
47B3h	00h	INFO action (Cumulative load 1 information (INFO-CULD1))	U8	RW	No	○		1	A
47B4h	00h	INFO action (Tripmeter information (INFO-TRIP))	U8	RW	No	○		1	A
47B5h	00h	INFO action (Odometer information (INFO-ODO))	U8	RW	No	○		1	A
47BCh	00h	INFO action (Start operation restricted mode information (INFO-DSLMTD))	U8	RW	No	○		1	A
47BDh	00h	INFO action (I/O test mode information (INFO-IOTEST))	U8	RW	No	○		1	A
47BEh	00h	INFO action (Configuration request information (INFO-CFG))	U8	RW	No	○		1	A
47BFh	00h	INFO action (Reboot request information (INFO-RBT))	U8	RW	No	○		1	A

2-1 Information history

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

- Read the information history by the Information history (4510h to 451Fh) via EtherCAT communication.
- Clear the information history by setting the Clear information history (40D4h) of EtherCAT communication to 1. (It is enabled when changing from 0 to 1.)
- Read or clear the information history using the **MEXE02**.

memo Information history is cleared when the main power supply and control power supply of the driver is turned off because it is stored in RAM.

5 Troubleshooting

2-2　Information list

Information item	Information bit output signal	Cause	Clear condition
Assigned I/O status	INFO-USRIO	The I/O signal set in the INFO-USRIO output selection (41BCh) was turned ON.	The I/O signal set in the INFO-USRIO output selection (41BCh) was turned OFF.
Position deviation	INFO-POSERR	The deviation between the command position and the actual position exceeded the value set in the Position deviation information (41A5h) in the motor output shaft.	The deviation between the command position and the actual position fell below the value set in the Position deviation information (41A5h) in the motor output shaft.
Driver temperature	INFO-DRVTMP	The internal temperature of the driver exceeded the value set in the Driver temperature information (41A0h).	The internal temperature of the driver fell below the value set in the Driver temperature information (41A0h).
Motor temperature	INFO-MTRTMP	The detection temperature of the encoder exceeded the value set in the Motor temperature information (41A8h).	The detection temperature of the encoder fell about 5 °C (9 °F) below the value set in the Motor temperature information (41A8h).
Overvoltage	INFO-OVOLT	• The voltage of the main power supply exceeded the value set in the Overvoltage information (41ABh). • 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 (41ABh).
Undervoltage	INFO-UVOLT	• The voltage of the main power supply fell below the value set in the Undervoltage information (41ACh). • 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 (41ACh).
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 (41A1h).	The overload counter fell below the value set in the Overload time information (41A1h).
Speed	INFO-SPD	The feedback speed of the motor exceeded the value set in the Speed information (41A2h).	The feedback speed of the motor fell below the value set in the Speed information (41A2h).
Start operation error	INFO-START	• Operation in the direction having stopped by the FW-BLK input or the RV-BLK input was started. • Operation in the direction having stopped by the FW-LS input or the RV-LS input was started. • Operation in the direction having stopped by the software limit was started. • When operation could not be executed (e.g., the READY output was OFF), the operation start signal was turned ON.	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 in the Electronic gear (6091h-01h, 02h) was out of the specification.	The resolution was set in the range of the specification.

5 Troubleshooting

Information item	Information bit output signal	Cause	Clear condition
Wrap setting error	INFO-RND-E	The resolution and the Initial coordinate generation & wrap setting range (41C9h) were inconsistent.	The Initial coordinate generation & wrap setting range (41C9h) was set in the range of the specification.
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 (41B1h).	The cumulative load fell below the value set in the Cumulative load 0 information (41B1h).
Cumulative load 1	INFO-CULD1	The cumulative load exceeded the value set in the Cumulative load 1 information (41B2h).	The cumulative load fell below the value set in the Cumulative load 1 information (41B2h).
Tripmeter	INFO-TRIP	The travel distance of the motor exceeded the value set in the Tripmeter information (41AFh).	After one of the following operation was performed, the travel distance (Tripmeter) of the motor fell below the value set in the Tripmeter information (41AFh). – The Tripmeter information (41AFh) was set again. – The Clear tripmeter (40CFh) of the maintenance command was executed.
Odometer	INFO-ODO	The cumulative travel distance of the motor exceeded the value set in the Odometer information (41B0h).	After the following operation was performed, the cumulative travel distance (Odometer) of the motor fell below the value set in the Odometer information (41B0h). – The Odometer information (41B0h) was set again.
Start operation restricted mode	INFO-DSLMTD	• Configuration was executed. • "Remote operation" was executed with the **MEXE02**. • Data was written from the **MEXE02** to the driver. • "Reset" was executed with the **MEXE02**.	• Configuration was completed. • Remote operation was canceled. • Writing data was completed. • Data was restored to the factory setting.
I/O test mode	INFO-IOTEST	• Configuration was executed. • "I/O test" was executed with the **MEXE02**.	• Configuration was completed. • The I/O test mode was canceled.
Configuration request	INFO-CFG	Configuration was requested to execute.	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 in a state where the Information auto clear (41BFh) was set to disable, the preset may have been failed. There are the following two possible reasons that the preset was failed.
- The ABZO sensor is not connected to the driver.
- The preset was executed in a state where the position deviation between the command position and the actual position was 1.8 ° or more.

■ Monitor of information

Details of information can be checked with the Information (407Bh).
The information code having read is indicated in 8-digit hexadecimal number. It 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
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

5 Troubleshooting

3 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 operation cannot be performed 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 motor has a holding torque even if it puts into a non-excitation state.	Effect of dynamic brake.	If the motor puts into a non-excitation state, the motor windings are 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 (413Dh) 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. • Check the input voltage of the control power supply.
	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 (41C2h) is set wrongly.	Check the setting of the Motor rotation direction (41C2h).
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 (4126h) is too low.	Check the setting of the Base current (4126h). If the motor current value is low with respect to a load, the torque will also be low and the operation will be unstable.
	The Main power mode (41FAh) is set wrongly.	Check the setting of the Main power mode (41FAh).
	The main power supply starts up slowly or the voltage of the main power supply is unstable.	Set the Main power mode (41FAh) to "0: 24 VDC" or "1: 48 VDC" according to the rated voltage of the main power supply.
Motor vibration is too large.	The load is small.	Lower the current with the Base current (4126h). If the motor output torque is too large with respect to a load, vibration will increase.
	The Main power mode (41FAh) is set wrongly.	Check the setting of the Main power mode (41FAh).
	The main power supply starts up slowly or the voltage of the main power supply is unstable.	Set the Main power mode (41FAh) to "0: 24 VDC" or "1: 48 VDC" according to the rated voltage of the main power supply.

Phenomenon	Possible cause	Remedial action
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.
	A voltage for the electromagnetic brake is insufficient.	Check the input voltage of the control power supply.

memo | When the alarm is being generated, check the alarm message via EtherCAT communication or using the **MEXE02**.

6   Reference materials

◆**Table of contents**

1   Timing chart

■ Power activation

● When a control power supply is used
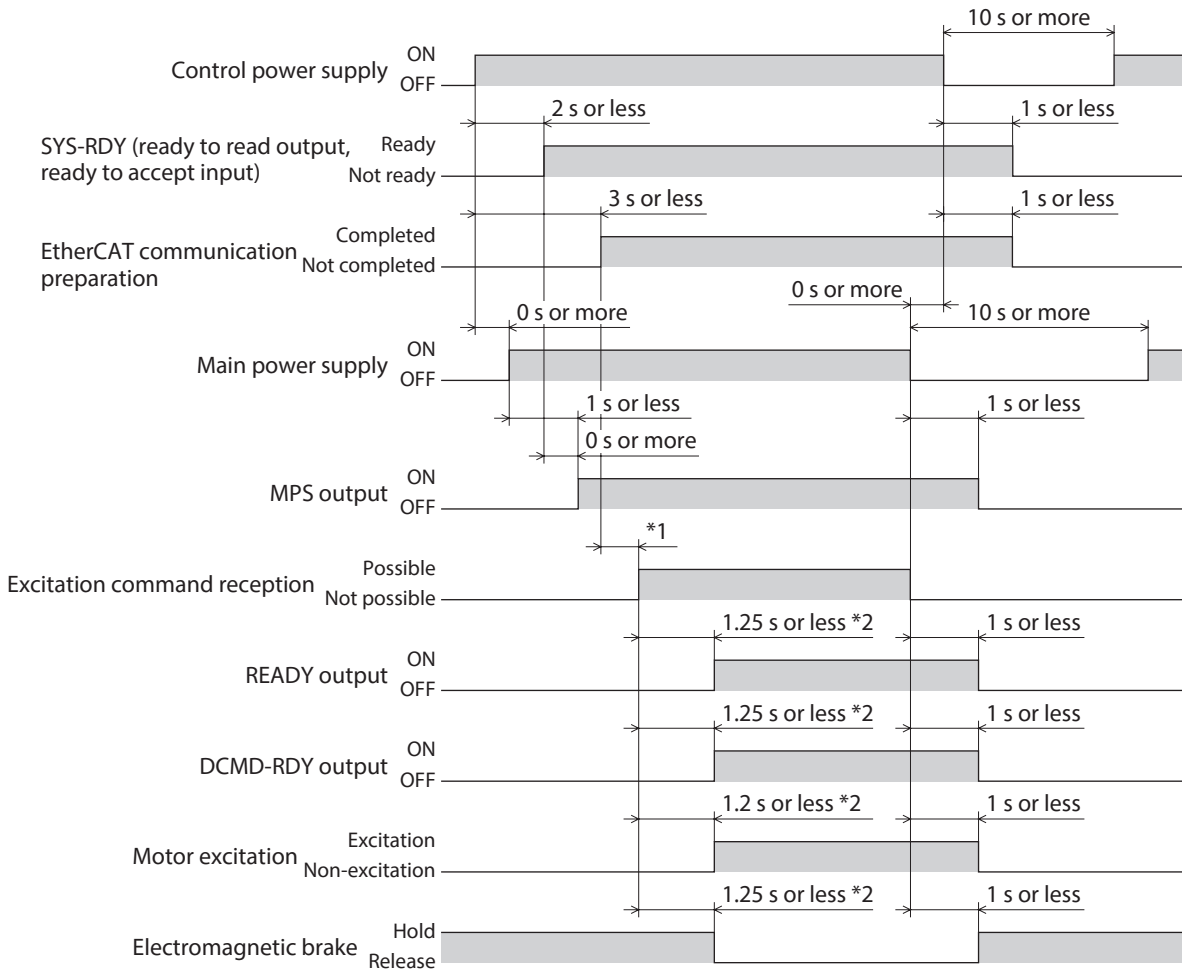
*1 It varies depending on the timing when the command is transitioned from the EtherCAT master.
*2 It represents when the excitation command is received at the same time as the excitation command reception has changed "Possible."

6 Reference materials

● **When a control power supply is not used**
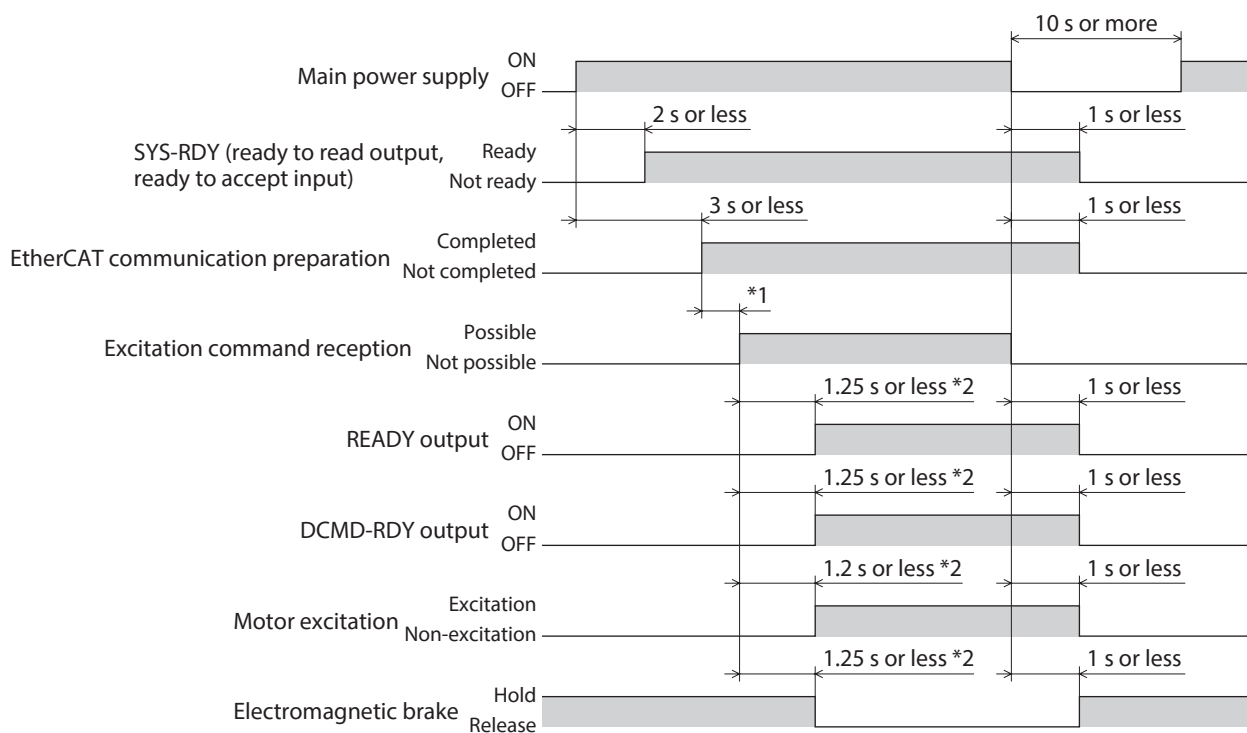
*1 It varies depending on the timing when the command is transitioned from the EtherCAT master.
*2 It represents when the excitation command is received at the same time as the excitation command reception has changed "Possible."

2   Specifications

2-1   Product specifications

Main power supply	Rated voltage	24 VDC±5 % 48 VDC±5 %
	Input current	0.4 to 3.7 A *1
	Allowable operating voltage	24 VDC input: 20 to 32 VDC (22.8 to 32 VDC) *2 48 VDC input: 40 to 55 VDC
Control power supply	Rated voltage	24 VDC±5 % 48 VDC±5 %
	Input current	0.15 A (0.4 A) *3
	Allowable operating voltage	24 VDC input: 20 to 32 VDC (22.8 to 32 VDC) *2 48 VDC input: 40 to 55 VDC
Interface	Control input	20 to 32 VDC Number of input points: 2, photocoupler
	Field network	EtherCAT

*1 The input current varies depending on the motor combined. Refer to p.24.
*2 The value in parentheses ( ) is the one when the electromagnetic brake motor is connected.
*3 The value in parentheses ( ) is the one when the electromagnetic brake motor is connected. The **AZM46** type is 0.23 A.

2-2   General specifications

Degree of protection		IP20
Operating environment	Ambient temperature	0 to +50 °C [+32 to +122 °F] (non-freezing)
	Humidity	85 % or less (non-condensing)
	Altitude	Up to 1,000 m (3,300 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil
Storage environment 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

6 Reference materials

3 Regulations and standards

■ UL Standards, CSA Standards

This product is recognized by UL under the UL and CSA Standards.
Check the APPENDIX UL Standards for **AZ** Series for recognition information about UL Standards.

■ CE Marking/UKCA Marking

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

● EU EMC Directive/UK EMC Regulation

Refer to "4-7 Conformity to EMC Directives/Regulations" on p.27 for details about conformity.

■ EU RoHS Directive/UK RoHS Regulation

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

■ Republic of Korea, Radio Waves Act

This product is affixed with the KC Mark under the Radio Waves Act, the Republic of Korea.

6 Reference materials

• Please contact your nearest Oriental Motor office for further information.