Oriental motor

HM-60519-2

Drivers for 2-Phase, 5-Phase Stepping Motors

CVD Series

Multi-Axis Type

EtherCAT Compatible

OPERATING MANUAL Software Edition

Thank you for purchasing an Oriental Motor product.

This Operating Manual describes product handling procedures and safety precautions.

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

1 Introduction

2 I/O signals

3 EtherCAT communication

4 Object list

5 Troubleshooting

1 Introduction

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1 Before using the product

Only qualified personnel of electrical and mechanical engineering should work with the product.
Use the product properly after thoroughly reading the section "3 Safety precautions" on p.8. In addition, be sure to observe the contents described in warning, caution, and note in this manual.
The product described in this manual is designed and manufactured to be incorporated in general industrial equipment. Do not use it for any other purpose. Oriental Motor Co., Ltd. is not responsible for any compensation for damage caused through failure to observe this warning.

2 Related operating manuals

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

- **CVD** Series Multi-Axis Type EtherCAT Compatible OPERATING MANUAL Hardware Edition
- **CVD** Series Multi-Axis Type EtherCAT Compatible OPERATING MANUAL Software Edition (This document)

Read the following operating manuals for a motor or a motorized actuator.

- OPERATING MANUAL Motor Edition
- OPERATING MANUAL Actuator Edition

■ How to use operating manuals

To use the product, read both the Hardware Edition and the Software Edition (this document) of the **CVD** Series Multi-Axis Type operating manuals.
The Hardware Edition describes installation, connection, etc.
The Software Edition describes control methods via EtherCAT, object list, troubleshooting, etc.

■ About notation of objects

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

3 Safety precautions

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

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

⚠WARNING

General

- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, in areas subjected to splashing water, or near combustible materials. Doing so may result in fire or injury.
- Assign qualified personnel to the task of installing, wiring, operating, inspecting, and troubleshooting the product. Handling by unqualified personnel may result in fire, injury, or damage to equipment.
- 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 operation without correcting the cause of the problem may cause the motor and driver to malfunction, resulting in injury or damage to equipment.
- Do not use the brake mechanism of the electromagnetic brake motor for braking or as a safety brake. The electromagnetic brake is intended to hold the moving part and motor positions. This may cause injury or damage to equipment.
- Depending on the type of alarm (protection function), the motor may stop to lose holding force when an alarm is generated. This may cause injury or damage to equipment.

Installation

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

Connection

- Keep the input power voltage of the driver within the specified range. Failure to do so may result in fire.
- Connect the product securely according to the connection diagram. Failure to do so may result in fire.
- Do not forcibly bend, pull, or pinch the cable. Doing so may result in fire.

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.
- 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.

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 injury or damage to equipment.
- Do not touch the driver during operation or immediately after stopping. The surface is hot, and this may cause a skin burn(s).
- Do not forcibly bend or pull the cable that is connected to the driver. Doing so may cause damage.

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 driver only in the specified combination. An incorrect combination may cause a fire.
- Provide an emergency stop device or emergency stop circuit external to the equipment so that the entire system will operate safely in the event of a system failure or malfunction. Failure to do so may result in injury.
- Before turning on the main power supply and the control power supply, turn all input signals to the driver OFF. Failure to do so may result in injury or damage to equipment.
- When moving the moving part manually, put the motor in a non-excitation state. Performing work while the motor is in an excitation state may result in injury.
- If an abnormal condition has occurred, immediately stop operation to turn off the main power supply and the control power supply. Failure to do so may result in fire or injury.

4 Precautions for use

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

- **Note on connecting a main power supply and a control power supply whose positive terminals are grounded**

  The USB connector (CN3) 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 non-volatile memory**

  Do not turn off the control power supply while writing data to non-volatile memory, and do not turn off the control power supply for five seconds after writing has been completed. Doing so may abort writing the data and cause an alarm of EEPROM error to generate. Non-volatile memory can be rewritten approximately 100,000 times.

- **Noise elimination measures**

  Refer to the OPERATING MANUAL Hardware Edition for noise elimination measures.

- **Regeneration**

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

- **When using an electromagnetic brake motor in a vertical drive such as elevating equipment, provide a sufficient safety factor and evaluate it with the user's equipment.**

  When a stepping motor in an open-loop system is excited after the control power supply is turned on, a specific phase is excited. Therefore, a load may fall depending on the load.
  Evaluate the product in the user's environment and ensure a sufficient safety factor and use.

2 I/O signals

This part explains input signals and output signals.

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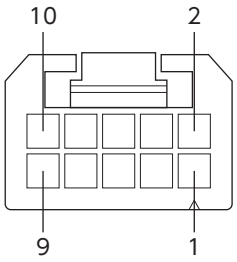
1 Signal type

1-1 Direct I/O

Direct I/O (DIN, DOUT) is a method in which a signal is input directly by connecting the cable to the I/O connector. Signals are assigned using parameters. Refer to "2 Signal lists" on p.17 for signals that can be assigned.

Pin number	Signal name	Description*
1	IN-COM	Input common
2	IN0	Control input 0 (FW-LS)
3	IN1	Control input 1 (RV-LS)
4	IN2	Control input 2 (HOMES)
5	IN3	Control input 3 (FREE)
6	GND	GND
7	OUT+	Control output (ALM-B)
8	OUT–	
9	IN-COM	Input common
10	+24 V	Output power supply for sensor

Applicable connector
Housing insertion direction



* Values in parentheses ( ) are initial values.

■ Status check for direct I/O

The status of direct I/O 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
–	–	–	–	–	–	–	OUT
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
–	–	–	–	IN3	IN2	IN1	IN0

Related object

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

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

■ Direct input (DIN)

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 an input terminal, this input will always be in an ON state. If it is assigned to both direct I/O and remote I/O, the function will be executed only when both of them are turned ON.

● Input function

Selects an input signal to be assigned to DIN.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4840h	*	DIN0 input function	U8	RW	No	○	Input signal list ⇨p.17 (Initial value: 28 [FW-LS])	C
4841h	*	DIN1 input function	U8	RW	No	○	Input signal list ⇨p.17 (Initial value: 29 [RV-LS])	C
4842h	*	DIN2 input function	U8	RW	No	○	Input signal list ⇨p.17 (Initial value: 30 [HOMES])	C
4843h	*	DIN3 input function	U8	RW	No	○	Input signal list ⇨p.17 (Initial value: 1 [FREE])	C

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

● Inverting mode

Changes the ON-OFF setting of DIN.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4850h	*	DIN0 inverting mode	U8	RW	No	○	0: Non invert 1: Invert (Initial value: 0)	C
4851h	*	DIN1 inverting mode	U8	RW	No	○	0: Non invert 1: Invert (Initial value: 0)	C
4852h	*	DIN2 inverting mode	U8	RW	No	○	0: Non invert 1: Invert (Initial value: 0)	C
4853h	*	DIN3 inverting mode	U8	RW	No	○	0: Non invert 1: Invert (Initial value: 0)	C

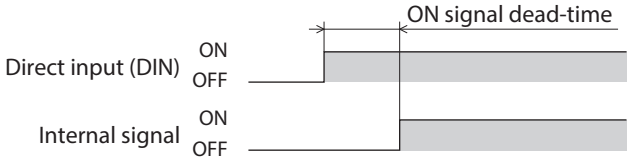
* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

● ON signal dead-time

The input signal is turned ON when the time having set is exceeded. This can be used to take a measure to eliminate the noise or to adjust the timing between the devices.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
48C0h	*	DIN0 ON signal dead-time	U8	RW	No	○	0 to 250 ms (Initial value: 0)	C
48C1h	*	DIN1 ON signal dead-time	U8	RW	No	○	0 to 250 ms (Initial value: 0)	C
48C2h	*	DIN2 ON signal dead-time	U8	RW	No	○	0 to 250 ms (Initial value: 0)	C
48C3h	*	DIN3 ON signal dead-time	U8	RW	No	○	0 to 250 ms (Initial value: 0)	C

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.



■ Direct output (DOUT)

● Output function

Selects an output signal to be assigned to DOUT.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4860h	*	DOUT (Normal) output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 130 [ALM-B])	C

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

● Inverting mode

Changes the ON-OFF setting of DOUT.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4870h	*	DOUT inverting mode	U8	RW	No	○	0: Non invert 1: Invert (Initial value: 0)	C

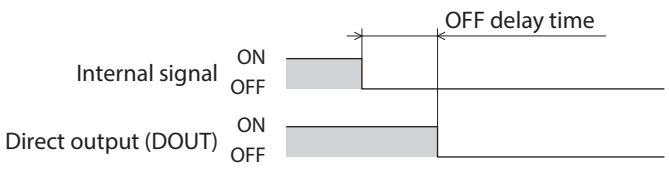
* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

● OFF delay time

The output signal is turned OFF when the time having set is exceeded. This can be used to take a measure to eliminate the noise or to adjust the timing between the devices.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
48E0h	*	DOUT OFF delay time	U8	RW	No	○	0 to 250 ms (Initial value: 0)	C

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.



1-2 Remote I/O

Remote I/O is I/O to be accessed via EtherCAT.

■ Remote input

The Driver input command (403Eh) is an input command from the MainDevice to the driver. The arrangement of bits is as follows.
Bit 0 to Bit 7 are assigned to the R-IN0 to R-IN7. Bit 8 to Bit 15 are not used.
Values in parentheses ( ) are initial values.

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
R-IN7 (No function)	R-IN6 (No function)	R-IN5 (No function)	R-IN4 (No function)	R-IN3 (No function)	R-IN2 (No function)	R-IN1 (No function)	R-IN0 (No function)

Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
403Eh	*	Driver input command	U16	RW	RxPDO	–	0000h to FFFFh (Initial value: 0)	A
4900h	*	R-IN0 input function	U8	RW	No	○	Input signal list ⇨p.17 (Initial value: 0 [No function])	C
4901h	*	R-IN1 input function	U8	RW	No	○	Input signal list ⇨p.17 (Initial value: 0 [No function])	C
4902h	*	R-IN2 input function	U8	RW	No	○	Input signal list ⇨p.17 (Initial value: 0 [No function])	C
4903h	*	R-IN3 input function	U8	RW	No	○	Input signal list ⇨p.17 (Initial value: 0 [No function])	C
4904h	*	R-IN4 input function	U8	RW	No	○	Input signal list ⇨p.17 (Initial value: 0 [No function])	C
4905h	*	R-IN5 input function	U8	RW	No	○	Input signal list ⇨p.17 (Initial value: 0 [No function])	C
4906h	*	R-IN6 input function	U8	RW	No	○	Input signal list ⇨p.17 (Initial value: 0 [No function])	C
4907h	*	R-IN7 input function	U8	RW	No	○	Input signal list ⇨p.17 (Initial value: 0 [No function])	C

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

■ Remote output

The status of the R-OUT0 to R-OUT15 can be checked with the Driver status (403Fh). The arrangement of bits is as follows.
Values in parentheses ( ) are initial values.

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
R-OUT15 (CONST-OFF)	R-OUT14 (CONST-OFF)	R-OUT13 (MOVE)	R-OUT12 (TIM)	R-OUT11 (CONST-OFF)	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 (No function)	R-OUT2 (ZSG)	R-OUT1 (RV-LS_R)	R-OUT0 (FW-LS_R)

Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
403Fh	*	Driver output status	U16	RO	TxPDO	–	–	–
4910h	*	R-OUT0 output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 28 [FW-LS_R])	C
4911h	*	R-OUT1 output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 29 [RV-LS_R])	C
4912h	*	R-OUT2 output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 155 [ZSG])	C
4913h	*	R-OUT3 output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 0 [No function])	C
4914h	*	R-OUT4 output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 144 [HOME-END])	C
4915h	*	R-OUT5 output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 204 [DCMD-RDY])	C
4916h	*	R-OUT6 output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 135 [INFO])	C
4917h	*	R-OUT7 output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 129 [ALM-A])	C
4918h	*	R-OUT8 output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 136 [SYS-BSY])	C
4919h	*	R-OUT9 output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 160 [AREA0])	C
491Ah	*	R-OUT10 output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 161 [AREA1])	C
491Bh	*	R-OUT11 output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 128 [CONST-OFF])	C
491Ch	*	R-OUT12 output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 157 [TIM])	C
491Dh	*	R-OUT13 output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 134 [MOVE])	C
491Eh	*	R-OUT14 output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 128 [CONST-OFF])	C
491Fh	*	R-OUT15 output function	U8	RW	No	○	Output signal list ⇨p.18 (Initial value: 128 [CONST-OFF])	C

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

2 Signal lists

Assign I/O signals via EtherCAT or using the **MEXE02** software.
To assign signals via EtherCAT, use the "Assignment number" in the table instead of the signal name.

2-1 Input signals list

Refer to "3 Input signals" on p.20 for details about each signal.

Assignment number	Signal name	Functions	Status
0	No function	Set when the input terminal is not used.	–
1	FREE	This is used to shut off the motor current to put the motor in 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 and motor non-excitation
5	STOP	This is used to stop the motor.	0: No motion 1: Stop operation
8	ALM-RST	This is used to reset the alarm presently being generated.	0: No motion 1: Reset alarm
9	P-PRESET	This is used to rewrite the mechanical home to the present position.	0: No motion 1: Execute preset
14	INFO-CLR	This is used to clear the information status.	0: No operation 1: Information status clear
16	HMI	This is used to release the function limitation of the **MEXE02** software.	0: Function limitation 1: Release the function limitation
26	FW-BLK	This is used to stop the operation in the forward direction.	0: No operation 1: Forward direction operation stop
27	RV-BLK	This is used to stop the operation in the reverse direction.	0: No operation 1: Reverse direction operation stop
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.	
30	HOMES	This is a signal to be input from the mechanical home sensor (HOME sensor).	
31	SLIT	This is a signal to be input from the slit sensor.	
80	R0	These are general signals.	
81	R1		
82	R2		
83	R3		
84	R4		
85	R5		
86	R6		
87	R7		
88	R8		
89	R9		
90	R10		
91	R11		
92	R12		
93	R13		

Assignment number	Signal name	Functions	Status
94	R14	These are general signals	0: OFF 1: ON
95	R15		
104	EXT1	This is an external latch signal for the touch probe 1.	
105	EXT2	This is an external latch signal for the touch probe 2.	

2-2 Output signals list

Refer to "4 Output signals" on p.27 for details about each signal.

Assignment number	Signal name	Functions	Status
0	No function	Set when the output terminal is not used.	–
1 to 127	Response signal	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 at all times.	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: Normal state 1: System preparation completion
132	READY	Output when the driver is ready to operate.	0: Operation not possible 1: Ready for operation
134	MOVE	Output while 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
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
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 a state of automatic current cutback.	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 have been set.	0: Coordinates setting is not completed 1: Coordinates setting is completed
149	PRST-DIS	After the position preset (P-PRESET) was executed, this signal is output when the position preset (P-PRESET) is required again before the motor is operated.	0: Normal state 1: Preset is not completed
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.	

Assignment number	Signal name	Functions	Status
155	ZSG	Output when the phase Z input is detected.	0: Normal 1: Phase Z input is present
157	TIM	Output every time the motor output shaft rotates by 7.2 degrees with reference to the command position.	0: OFF 1: ON
160	AREA0	Output when the motor is within the area.	0: Outside the range of AREA 1: In the range of AREA
161	AREA1		
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 hold 1: Electromagnetic brake release
196	OPE-BSY	Output while internal oscillation is performed. This signal is not output in the Cyclic synchronous position mode (CSP).	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 while 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
226	INFO-DRVTMP	Output when the corresponding information is generated.	0: No information 1: During information generation
228	INFO-OVOLT		
229	INFO-UVOLT		
233	INFO-START		
235	INFO-PR-REQ		
236	INFO-MSET-E		
237	INFO-EGR-E		
240	INFO-FW-OT		
241	INFO-RV-OT		
252	INFO-DSLMTD		
253	INFO-IOTEST		
254	INFO-CFG		
255	INFO-RBT		

3 Input signals

3-1 Operation control

■ Excitation switching signal

This signal is used to switch the motor excitation state between excitation and non-excitation.

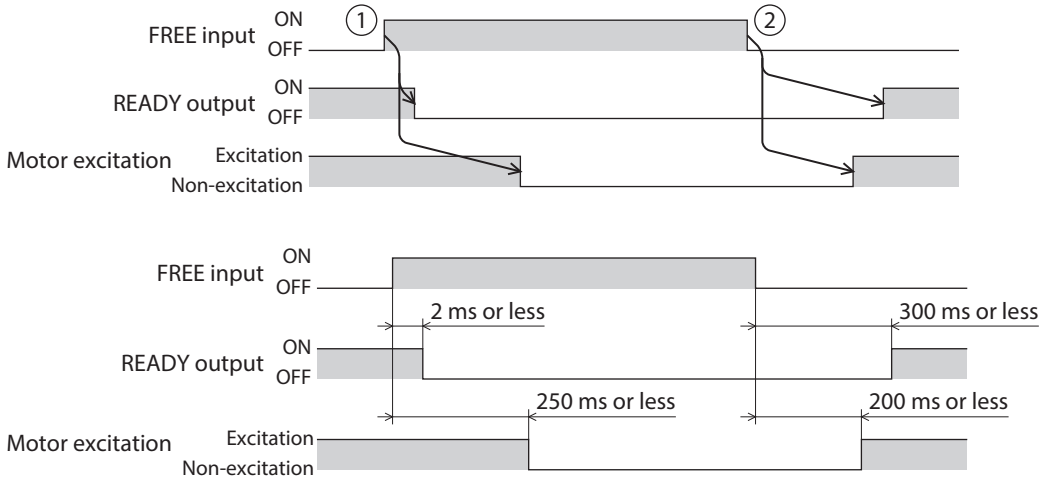
- **FREE input**

When the FREE input is turned ON, the motor current is shut off to put the motor in a non-excitation state. The motor output shaft can be rotated manually since the motor holding force is lost. In the case of an electromagnetic brake motor, the electromagnetic brake is also in a state of releasing the motor shaft.

Note When a load is installed vertically, do not turn the FREE input ON. The motor will lose its holding force and a load may fall.

When the motor is in an excitation state

1. When the FREE input is turned ON, the READY output is turned OFF to put the motor in a non-excitation state.
2. When the FREE input is turned OFF, the motor goes into an excitation state to turn the READY output ON.



■ Operation stop signals

These signals are used to stop the motor operation.

● STOP input

When the STOP input is turned ON, the motor stops the operation according to the setting of the STOP input action (4700h). The remaining travel amount is cleared.

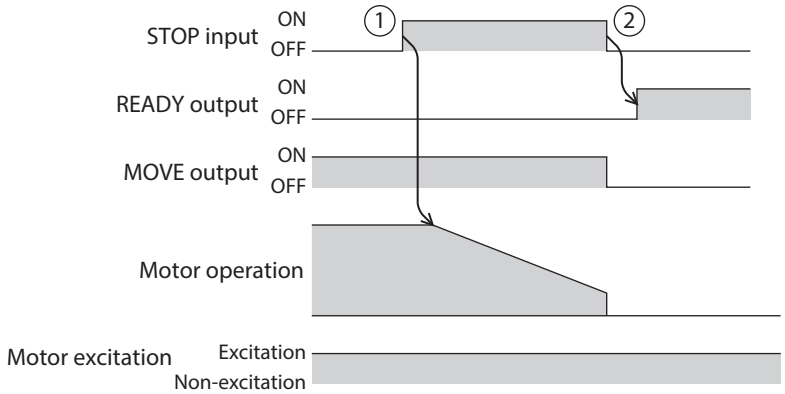
Related object

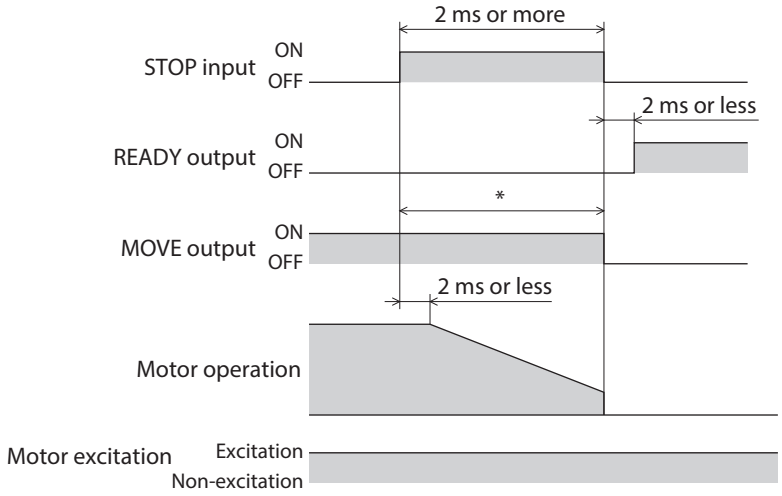
Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4700h	*	STOP input action	INT8	RW	No	○	0: Immediate stop 3: Deceleration stop (Initial value: 3)	A

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

When the STOP input action is set to "3: Deceleration stop" (When the motor stops while the STOP input is ON)

1. When the STOP input is turned ON during operation, the motor starts the stopping movement.
2. When the STOP input is turned OFF, the READY output is turned ON.

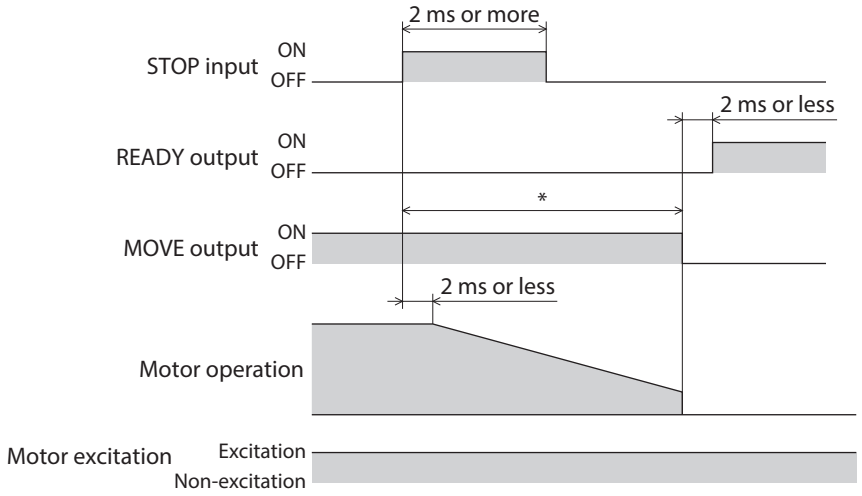




* It varies depending on the driving condition.

When the STOP input action is set to "3: Deceleration stop" (When the motor does not stop while the STOP input is ON)

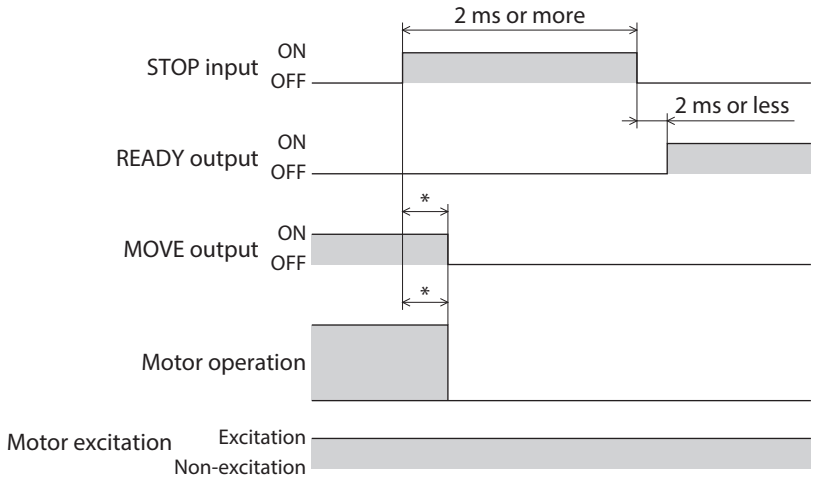
1. When the STOP input is turned ON during operation, the motor starts the stopping movement.
   Even after the STOP input is turned OFF, the motor continues the deceleration operation until it stops.
2. When the motor stops, the READY output is turned ON.



* It varies depending on the driving condition.

When the STOP input action is set to "0: Immediate stop"

1. If the STOP input is turned ON during operation, the motor stops at the command position at the time the ON state of the STOP input is detected.
2. When the STOP input is turned OFF, the READY output is turned ON.



* It varies depending on the driving condition.

- **FW-BLK input, RV-BLK input**

Turning the FW-BLK input ON will stop operation in the forward direction, and turning the RV-BLK input ON will stop operation in the reverse direction. While an input signal that has stopped operation is ON, the motor will not operate even if an operation start signal that operates it in the same direction as the stop signal is input. The motor will operate in the event of an operation start signal that operates it in the opposite direction.
The motor stops the operation according to the value set in the FW-BLK/RV-BLK input action (4702h). The remaining travel amount is cleared.

Related object

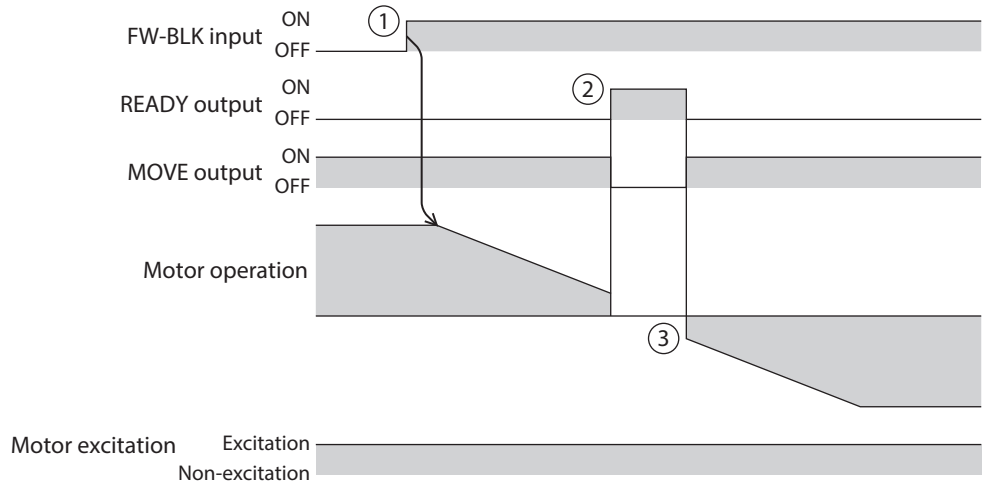
Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4702h	*	FW-BLK/RV-BLK input action	INT8	RW	No	○	0: Immediate stop 1: Deceleration stop (Initial value: 0)	A

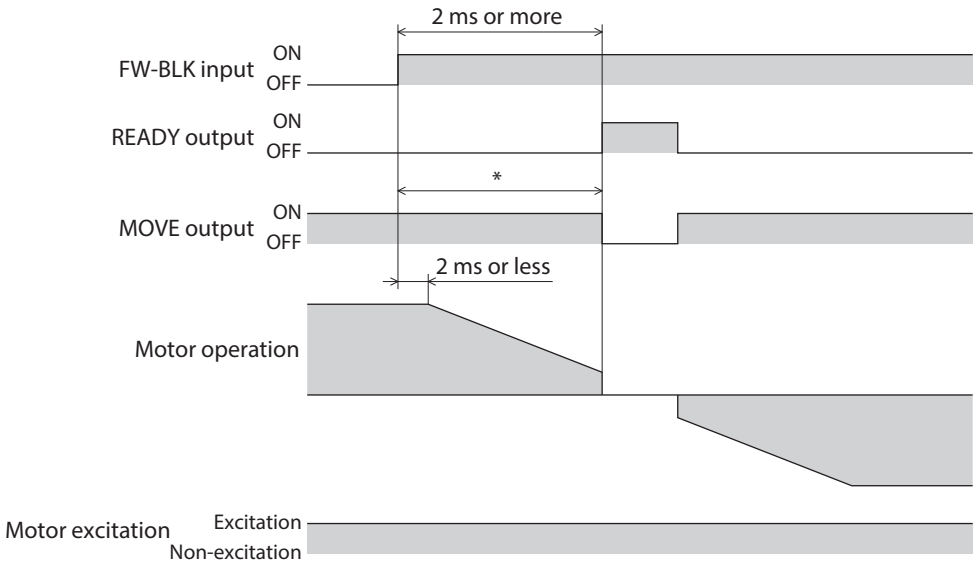
* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

memo The following information is generated when the FW-BLK input or the RV-BLK input is turned ON.
- When the FW-BLK input is turned ON: "Forward operation prohibition"
- When the RV-BLK input is turned ON: "Reverse operation prohibition"

When the FW-BLK/RV-BLK input action is set to "1: Deceleration stop" (when the motor stops while the FW-BLK input is ON)

1. When the FW-BLK input is turned ON during operation in the forward direction, the motor starts to stop.
2. When operation is stopped, the READY output is turned ON.
3. If an operation start signal in the reverse direction is input while the FW-BLK input is ON, the READY output is turned OFF to start operation.

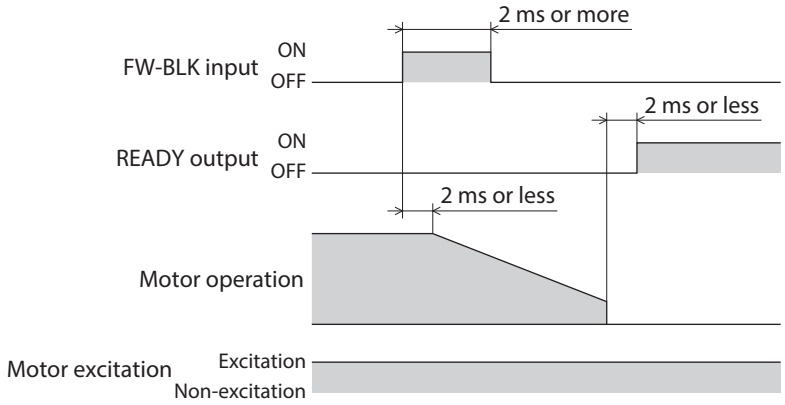




* It varies depending on the driving condition.

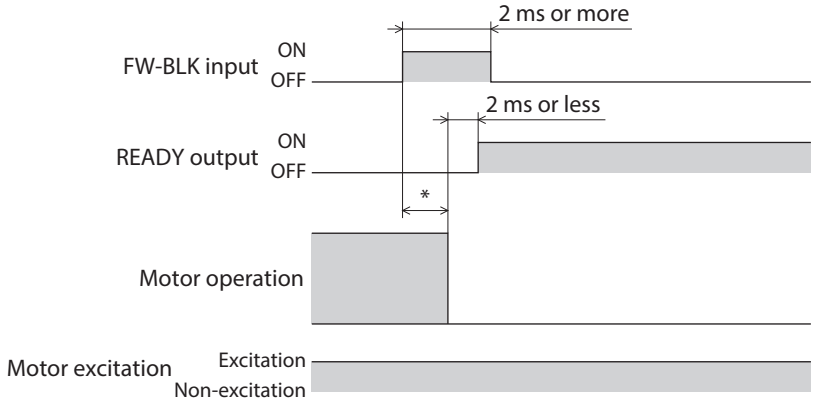
When the FW-BLK/RV-BLK input action is set to "1: Deceleration stop" (when the motor does not stop while the FW-BLK input is ON)

1. When the FW-BLK input is turned ON during operation in the forward direction, the motor starts to stop.
2. Even after the FW-BLK input is turned OFF, the motor continues the deceleration operation until it stops. When operation is stopped, the READY output is turned ON.



When the FW-BLK/RV-BLK input action is set to "0: Immediate stop"

1. If the FW-BLK input is turned ON during operation in the forward direction, the motor will stop.
2. The motor stops at the command position at the time when the ON status of the FW-BLK input was detected.



* It varies depending on the driving condition.

3-2 Position coordinate management

■ External sensor input signals

● FW-LS input, RV-LS input

These are input signals from the limit sensors. The FW-LS input is a signal for a sensor in the forward direction and the RV-LS input is that in the reverse direction.

- Return-to-home:
  When the FW-LS input or the RV-LS input is detected, return-to-home operation is performed according to the setting of the Homing method (6098h).
- Other than return-to-home:
  The hardware overtravel is detected to stop the motor. When the FW-LS/RV-LS input action (4701h) is set to "–1: Use as the sensor for return-to-home," the motor does not stop.

Related object

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4701h	*	FW-LS/RV-LS input action	INT8	RW	No	○	–1: Used as a return-to-home sensor 0: Immediate stop 1: Deceleration stop 2: Immediate stop with alarm 3: Deceleration stop with alarm (Initial value: 2)	A

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

● HOMES input

This is an input signal from the mechanical home sensor when the (HOME) Return-to-home mode (4160h) is set to the 3-sensor mode or the one-way rotation mode.

Related object

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4160h	*	(HOME) Return-to-home mode	U8	RW	No	○	0: 2-sensor 1: 3-sensor 2: One-way rotation (Initial value: 1)	B

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

● SLIT input

Connect when returning to the home using a sensor with slit.
When return-to-home operation is performed, using the SLIT input simultaneously can detect the home more accurately.

■ Coordinate preset signal

This signal is used to preset the home.

● P-PRESET input

When the P-PRESET input is turned ON, the command position is rewritten to the value set in the Preset position (41C6h).
However, preset cannot be executed while the motor is in operation.

3-3 Management of driver

■ Status release signals

These signals are used to release the signal or status that is not automatically released.

- **ALM-RST input**

  If an alarm is generated, the motor will stop. At this time, turning the ALM-RST input from OFF to ON will reset the alarm (the alarm will be reset at the ON edge of the ALM-RST input). Be sure to remove the cause of the alarm and ensure safety before resetting the alarm.
  Note that some alarms cannot be reset with the ALM-RST input.

- **INFO-CLR input**

  This signal is enabled when the Information auto clear (41BFh) is set to "0: Disable."
  Turning the INFO-CLR input ON will clear the information status.

■ Driver function change signals

- **HMI input**

  Turning the HMI input ON will release the function limitation of the **MEXE02** software. Turning it OFF will limit the function.
  The functions to be limited are shown below.
  - I/O test
  - Remote operation
  - Writing operation data and parameters, downloading, initializing

Note When the HMI input is not assigned to direct I/O or remote I/O, this input will always be in an ON state. If it is assigned to both direct I/O and remote I/O, the function will be executed only when both of them are turned ON.

4 Output signals

4-1 Management of driver

■ Driver status indication signals

- **ALM-A output, ALM-B output**

  If an alarm is generated, the ALM-A output is turned ON and the ALM-B output is turned OFF. At the same time, the ALM LED on the driver will blink red, and the motor will stop. When an alarm to put the motor in a non-excitation state is generated, the motor will be in a non-excitation state after it stops.
  The ALM-A output is normally open and the ALM-B output is normally closed.

- **SYS-RDY output**

  After the control power supply is turned on, when output signals are ready to operate ON-OFF and signals are enabled to input, the SYS-RDY output is turned ON.

- **INFO output**

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

  Related object

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
41BFh	*	Information auto clear	U8	RW	No	○	0: Disabled (Not turned OFF automatically) 1: Enabled (Turned OFF automatically) (Initial value: 1)	A

  * Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

- **SYS-BSY output**

  This signal is turned ON while the driver executes the maintenance command.

- **Output of information signals**

  If corresponding information is generated, each output signal is turned ON.

■ Hardware status indication signal

- **CRNT output**

  The CRNT output is turned ON while the motor is in an excitation state.

- **MPS output**

  The MPS output is turned ON when the main power supply is turned on.

- **MBC output**

  Use this signal when controlling the electromagnetic brake by the host controller.
  The MBC output is turned ON when the electromagnetic brake releases the motor shaft, and OFF when it holds.

4-2 Management of operation

■ Operation status indication signals

● READY output

When the driver is ready to operate, the READY output is turned ON. Input the operation start command to the driver after the READY output is turned ON.
The READY output is turned ON when all of the following conditions are met.

- The control power supply and the main power supply of the driver are turned on.
- The excitation command is input from the MainDevice.
- The FREE input is OFF.
- The STOP input is OFF.
- An alarm is not being generated.
- The motor is not operated.
- The following monitors or menus are not executed with the **MEXE02** software.
  – Remote operation
  – I/O test
  – Data writing
  – Restore to factory settings
- The following commands are not executed via EtherCAT.
  – Configuration
  – All data batch initialization
  – Read batch NV memory
  – Write batch NV memory

● MOVE output

The MOVE output is turned ON while the motor operates.

Related object

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
470Ah	*	MOVE minimum ON time	U8	RW	No	○	0 to 255 ms (Initial value: 0)	A

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

● OPE-BSY output

The OPE-BSY output is turned ON while the driver executes internal oscillation.

● IN-POS output

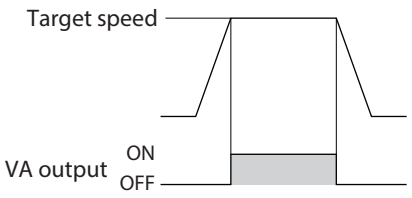
The IN-POS output is turned ON when positioning operation is completed.

● AUTO-CD output

When the current value reaches to the value set in the Stop current (4128h) by the automatic current cutback function, the AUTO-CD output is turned ON.

● VA output

The VA output is turned ON when the motor command speed matches the target speed.



● HOME-END output

The HOME-END output is turned ON at the following conditions.

- When return-to-home operation is completed.
- When position preset (P-PRESET) is executed and coordinates are set.

■ Direct data operation status indication signals

● DCMD-FULL output

This signal is output while 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.

● DCMD-RDY output

This signal is output when the driver is ready to operate.
The DCMD-RDY output is turned ON when all of the following conditions are met.

- The control power supply and the main power supply of the driver are turned on.
- The excitation command is input from the EhterCAT MainDevice.
- The STOP input is OFF.
- An alarm is not being generated.
- The following monitors or menus are not executed with the **MEXE02** software.
  – Remote operation
  – I/O test
  – Data writing
  – Restore to factory settings
- The following commands are not executed via EtherCAT.
  – Configuration
  – All data batch initialization
  – Read batch NV memory
  – Write batch NV memory

■ Motor position indication signals

These signals are output according to the motor position.

● ZSG output

The ZSG output is turned ON when the phase Z signal from the encoder is detected.

● TIM output

Each time the motor output shaft rotates by 7.2 degrees (3.6 degrees for the high-resolution type), the motor excitation state returns to the step "0" position and the TIM output is turned ON.
If an AND circuit is configured with the home sensor and the TIM output when the home is detected, the variation for the motor stop positions in a range of the home sensor can be reduced and the home can be detected more accurately.

Note

- The TIM output is properly turned ON when the command speed is 500 Hz or less.
- When using the TIM output, set the travel amount or the resolution so that the motor output shaft stops at an integral multiple of 7.2 degrees (3.6 degrees for the high-resolution type).

- **AREA0 output, AREA1 output**

  The AREA outputs are turned ON when the motor is within the set area.
  They are turned ON when the motor is within the area even if the motor stops.

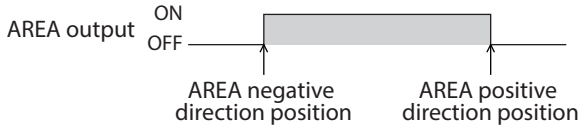
Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4740h	*	AREA0 positive direction position/offset	INT32	RW	No	○	−2,147,483,648 to 2,147,483,647 (Initial value: 0)	A
4741h	*	AREA0 negative direction position/ detection range	INT32	RW	No	○		A
4742h	*	AREA1 positive direction position/offset	INT32	RW	No	○		A
4743h	*	AREA1 negative direction position/ detection range	INT32	RW	No	○		A
4750h	*	AREA0 range setting mode	U8	RW	No	○	0: Range setting with absolute value 1: Offset/width setting from the target position (Initial value: 0)	A
4751h	*	AREA1 range setting mode	U8	RW	No	○		A

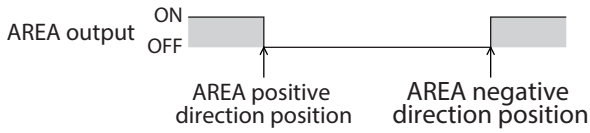
* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

When the "AREA range setting mode" (4750h, 4751h) is "0: Range setting with absolute value"

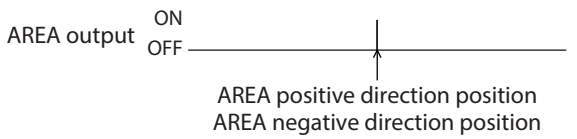
- When a value in the AREA positive direction position/offset (4740h, 4742h) is larger than that in the AREA negative direction position/detection range (4741h, 4743h)
  When the motor position is equal to or larger than a value in the "AREA negative direction position/detection range" or equal to or smaller than that in the "AREA positive direction position/offset," the AREA output is turned ON.



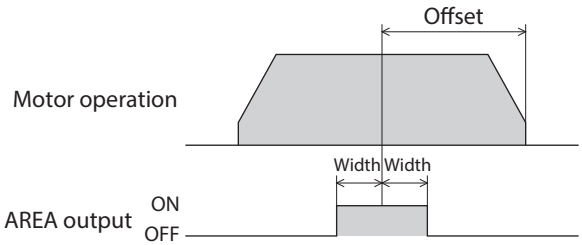
- When a value in the AREA positive direction position/offset (4740h, 4742h) is smaller than that in the AREA negative direction position/detection range (4741h, 4743h)
  When the motor position is equal to or smaller than a value in the "AREA positive direction position/offset" or equal to or larger than that in the "AREA negative direction position/detection range," the AREA output is turned ON.



- When a value in the AREA positive direction position/offset (4740h, 4742h) is equal to that in the AREA negative direction position/detection range (4741h, 4743h)
  When the motor position is equal to values in the "AREA negative direction position/detection range" and the "AREA positive direction position/offset," the AREA output is turned ON.



When the AREA range setting mode (4750h, 4751h) is "1: Offset/width setting from the target position"



- **FW-SLS output, RV-SLS output**

  If the command position exceeds the range specified in the Software position limit (607Dh) when the Software overtravel (41C3h) is set to other than "–1: Disable," the FW-SLS output or the RV-SLS output is turned ON.

■ Coordinate status indication signal

- **ABSPEN output**

  The ABSPEN output is turned ON when the coordinates are set.

- **PRST-DIS output**

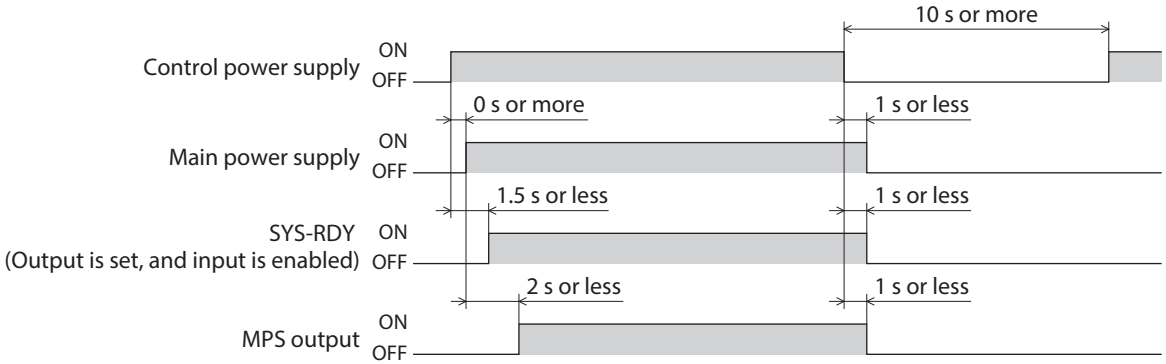
  The PRST-DIS output is turned ON when the home is required to set again. When the PRST-DIS output is turned ON, perform return-to-home operation or position preset (P-PRESET) to set the home.

■ Response outputs

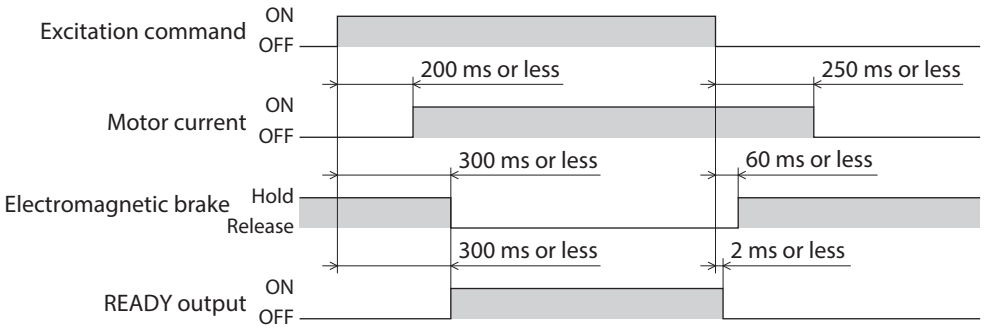
This is a signal to output the ON-OFF status of the corresponding input signal. (Input signal_R)

5 Timing chart

■ Power activation



■ Excitation



3 EtherCAT communication

This part explains the EtherCAT communication specifications and the corresponding objects.

◆Table of contents

■ Setting of data and parameters

Data and parameters described in this manual can be set using the **MEXE02** software in addition to EtherCAT.

■ Notation rules

● About the update time

In this manual, each update time is represented in an alphabet.

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

1 Communication specifications

1-1 EtherCAT communication interface

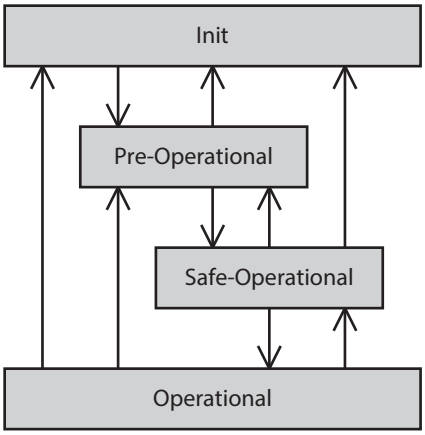
Item	Description
Communications standards	IEC 61158 Type12
Physical layer/Protocol	100 BASE-TX (IEEE 802.3)
Transmission rate	100 Mbps
Communication cycle	• Free Run mode: 1 ms or more • Sync Manager 2 event synchronization mode: 1 ms or more • DC mode: 0.5 ms, 1 ms, 2 ms, 3 ms, 4 ms, 5 ms, 6 ms, 7 ms, 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

1-2 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)

1-3 EtherCAT State Machine (ESM)

The EtherCAT State Machine (ESM) is controlled by the MainDevice.



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 transmit PDO can be performed. The status of the driver can be sent to the MainDevice in transmit PDO.
Operational	Possible	Possible	Possible	The mailbox communication, transmit PDO, and receive PDO can be performed. Commands can be sent from the MainDevice to the driver in PDO communication.

1-4 Process Data Objects (PDO)

Process Data Objects (PDO) are used in real-time data communication of EtherCAT.
There are two types of PDOs, transmit PDO (TxPDO) and receive PDO (RxP0DO). Transmit PDO (TxPDO) is the data transmission from the driver to the MainDevice. Receive PDO (RxPDO) is the data reception from the MainDevice to the driver.

Contents, which are sent and received using PDO, are set by the PDO mapping object and the Sync Manager 2/Sync Manager 3 PDO assignment object.
PDO mapping is to set the PDO mapping object in each driver axis.
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 four bytes that are Index, Sub-index, and Length of assigned object. 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

The PDO mapping object is different for each axis. Check the table below.
Up to 8 objects can be mapped in a single PDO.

Axis	Receive PDO mapping object		Transmit PDO mapping object	
	Receive PDO	Index	Transmit PDO	Index
Driver axis 1	RxPDO1	1600h	TxPDO1	1A00h
	RxPDO2	1601h	TxPDO2	1A01h
Driver axis 2	RxPDO1	1610h	TxPDO1	1A10h
	RxPDO2	1611h	TxPDO2	1A11h
Driver axis 3	RxPDO1	1620h	TxPDO1	1A20h
	RxPDO2	1621h	TxPDO2	1A21h
Driver axis 4	RxPDO1	1630h	TxPDO1	1A30h
	RxPDO2	1631h	TxPDO2	1A31h

Check the table below for the objects to be mapped to the PDO of each driver axis.

Axis	Objects of profile area	Objects of manufacturer-specific area
Driver axis 1	6000h to 67FFh	Sub-index 1 of 4000h to 4FFFh
Driver axis 2	6800h to 6FFFh	Sub-index 2 of 4000h to 4FFFh
Driver axis 3	7000h to 77FFh	Sub-index 3 of 4000h to 4FFFh
Driver axis 4	7800h to 7FFFh	Sub-index 4 of 4000h to 4FFFh

memo In this manual, the index of the driver axis 1 is described for the objects in the profile area (*). The objects of the driver axis 2 to axis 4 are indexes offset by 800h from the object on the previous axis.
*Objects are configured as follows.

Index (Hex)	Object	Overview
1000h to 1FFFh	CoE Communication Area	CoE communication area
3000h to 3FFFh	Manufacturer-Specific Area	No function
4000h to 4FFFh		Sets an axis number (1 to 4) to the Sub-Index of the driver objects.
5000h to 5FFFh		No function
6000h to 67FFh	Profile Area	Profile area of axis 1
6800h to 6FFFh		Profile area of axis 2
7000h to 77FFh		Profile area of axis 3
7800h to 7FFFh		Profile area of axis 4

■ Sync Manager 2/Sync Manager 3 PDO assignment object

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 32 bytes can be assigned in each driver axis.

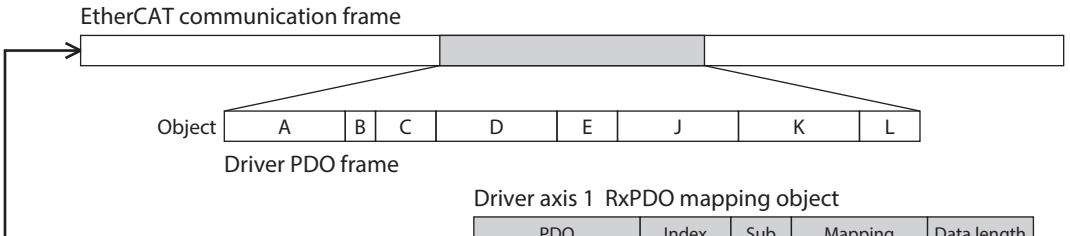
■ Setting of PDO mapping object

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/Sync Manager 3 PDO assignment object 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 Step 3.
5. Change the Sync Manager 2/Sync Manager 3 PDO assignment object.
6. Change the number of entries of the Sync Manager 2/Sync Manager 3 PDO assignment object to the number assigned in the step 5.

■ Example of PDO mapping

This section introduces an example of RxPDO mapping. Data of 2 bytes and 4 bytes are little-endian.
In the EtherCAT communication with the MainDevice, data for all axes is sent and received simultaneously.



Sync Manager 2 PDO assignment object

Index	Sub	Setting value
1C12h	00h	4
	01h	1600h
	02h	1610h
	03h	1621h
	04h	1631h

Driver axis 1 RxPDO mapping object

PDO	Index	Sub	Mapping	Data length
Axis 1 - RxPDO1	1600h	00h	3	–
		01h	Object A	4 byte
		02h	Object B	1 byte
		03h	Object C	2 byte
Axis 1 - RxPDO2	1601h	00h	0	–

Driver axis 2 RxPDO mapping object

PDO	Index	Sub	Mapping	Data length
Axis 2 - RxPDO1	1610h	00h	2	–
		01h	Object D	4 byte
		02h	Object E	2 byte
Axis 2 - RxPDO2	1611h	00h	2	–
		01h	Object F	4 byte
		02h	Object G	4 byte

Driver axis 3 RxPDO mapping object

PDO	Index	Sub	Mapping	Data length
Axis 3 - RxPDO1	1620h	00h	2	–
		01h	Object H	4 byte
		02h	Object I	2 byte
Axis 3 - RxPDO2	1621h	00h	2	–
		01h	Object J	4 byte
		02h	Object K	4 byte

Driver axis 4 RxPDO mapping object

PDO	Index	Sub	Mapping	Data length
Axis 4 - RxPDO1	1630h	00h	0	–
Axis 4 - RxPDO2	1631h	00h	1	–
		01h	Object L	2 byte

1-5 Service Data Objects (SDO)

Service Data Objects (SDO) are used when reading or writing the parameter object or monitoring via EtherCAT. SDO is not synchronized to the EtherCAT communication cycles, but is sent and received in 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 is 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 PDO mappings or the data length exceeded the limit.
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 saved to the application.
0800 0021h	Data cannot be transferred or saved to the application because of local control.
0800 0022h	Data cannot be transferred or saved to the application in the present device status.
0800 0023h	Object dictionary cannot be generated or object dictionary does not exist.

1-6 Synchronous mode of EtherCAT communication

This product is compatible with three modes of EtherCAT.

- **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 SM2 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 0.5 ms or 1 to 8 ms (in 1 ms increments).

1-7 Distributed Clocks

The term Distributed Clocks (DC) is a method to synchronize operation by sharing the same clock between the MainDevice 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 synchronously with SYNC0.

1-8 Emergency message

If an error occurs in the driver, an emergency message is sent to the MainDevice using the mailbox communication.
The emergency message is sent only once per error.
The emergency message consists of the following 8 bytes.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
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 MainDevice using the mailbox communication.
The emergency message when the alarm is generated consists of the following 8 bytes.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Emergency error code (FF00h)		Error register object (1001h)	Manufacturer-specific error definition field				
			Alarm axis number	Alarm code	0		

The emergency error code is FF00h regardless of the alarm contents.
Byte 2 is the same value as the error register object.
Byte 3 is the driver axis number that an alarm was generated.
Byte 4 is an alarm code. Refer to p.139 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.

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
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 cannot be mapped is mapped in the PDO mapping.
- The object for TxPDO is mapped in RxPDO. Or the object for RxPDO is mapped in TxPDO.
- The object with a different driver axis is mapped.

2 Drive profile

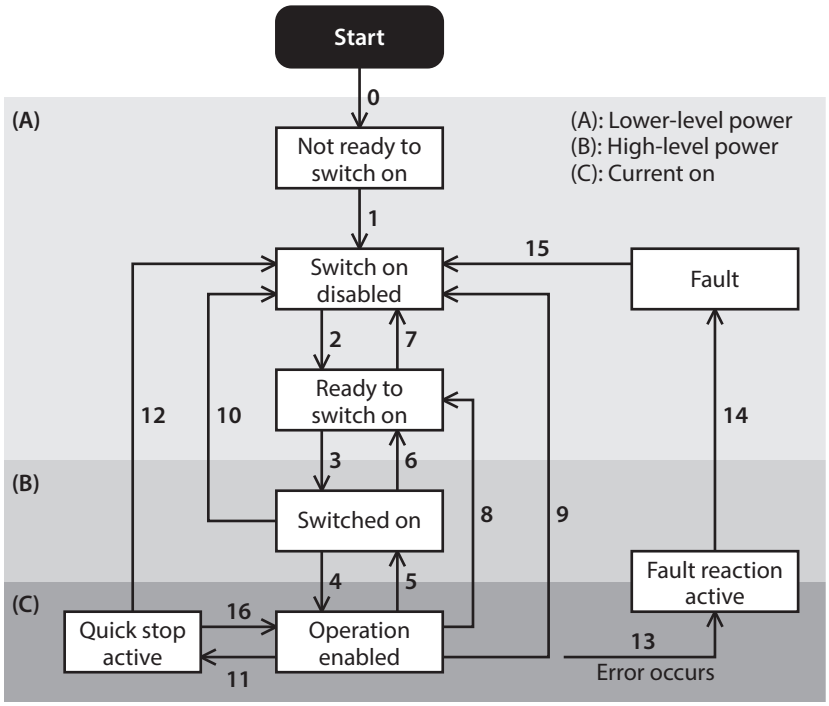
memo In this manual, the index of the driver axis 1 is described for the objects in the profile area. The objects of the driver axis 2 to axis 4 are indexes offset by 800h from the object on the previous axis. Refer to the table below.

Example of the first Index of driver axis 1 to axis 4

AXIS	Index	Sub	Name	Type	R/W	PDO	Save	Range	Update
AXIS1	603Fh	00h	Error code	U16	RO	TxPDO	–	–2,147,483,648 to 2,147,483,647 (Initial value: 0)	–
AXIS2	683Fh	00h							
AXIS3	703Fh	00h							
AXIS4	783Fh	00h							

2-1 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

State	Signal state	Motor status	Setting of parameter
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 is 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

State	Signal state	Motor status	Setting of parameter
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

■ 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→1	–	–	–	–	15

* When the following conditions are not met, the state will not transition from "Ready to switch on" to "Switched on" even if the command is received.
·The state of 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** software.

Note After transitioning to "Operation enabled," 250 ms are required for the motor to be excited and for the preparation for operation to be 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 a period of at least 250 ms has elapsed since the transition to "Operation enabled" or after the DCMD-RDY output is turned ON.

● 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	• ESM transitions to other than Operational. • The main power is shut off. • The FREE input is ON.	Transitions to "Ready to switch on." (Transition number 6)
Operation enabled	During stop	• ESM transitions to other than Operational. • The main power is shut off. • The FREE input is ON.	Transitions to "Ready to switch on." (Transition number 8) The motor goes into a non-excitation state.
	During operation	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 goes into a non-excitation state. (Transition number 13, 14)
		The main power is shut off.	An alarm of Main power supply off is generated (alarm code 23h). After transitioning from "Fault reaction active" to "Fault," the motor goes 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 goes into a non-excitation state.
Quick stop active	During stop	• ESM transitions to other than Operational. • The main power is shut off. • The FREE input is ON.	Transitions to "Switch on disabled." (Transition number 12) The motor goes into a non-excitation state.
	During operation	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 goes into a non-excitation state. (Transition number 13, 14)
		The main power is shut off.	An alarm of Main power supply off is generated (alarm code 23h). After transitioning from "Fault reaction active" to "Fault," the motor goes into a non-excitation state. (Transition number 13, 14)
		The FREE input is ON.	Transitions to "Switch on disabled." (Transition number 12) The motor goes 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.

2-2 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 that is enabled can be checked in the Modes of operation display (6061h).

2-3 Cyclic synchronous position mode (CSP)

In the Cyclic synchronous position mode, path generation (profile generation) is performed by the MainDevice. By cyclic synchronous communication, when the Target position (607Ah) is sent from the MainDevice to the driver, the driver performs position control.
Use the Cyclic synchronous position mode when EtherCAT is operating 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 MainDevice in the Cyclic synchronous position mode, if the operation is stopped by an I/O signal without using the MainDevice, the position deviation may occur. When inputting the stop signal such as the STOP input or the FREE input, 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, the motor may start rotating suddenly.
  · Execute the operation stop from the MainDevice.
  · Clear the position deviation between the MainDevice and the driver.
- Since the position is managed by the MainDevice 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 in 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	○	0, 1, 3, 6, 8, 9 (⇨ p.44) (Initial value: 0)	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

■ 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 is allowed.
		1	This is used to stop 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.42.

■ 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
–	–	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
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) is reset.
12	Target position ignored	0	The target position command is disabled. When the state is any of the following, 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 while any of the internal limit functions listed below are active. • Limit sensor (FW-LS/RV-LS) • Operation prohibition input (FW-BLK/RV-BLK) • Software 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.43.

2-4 Profile position mode (PP)

The Profile position mode operates in the internal profile of the driver. Path generation (profile generation) is performed with the driver. The target position, speed, acceleration and others are set with the MainDevice.

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, 1, 3, 6, 8, 9 (⇨ p.44) (Initial value: 0)	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
6084h	00h	Profile deceleration [step/s^2]	U32	RW	RxPDO	○	1 to 1,000,000,000 (Initial value: 300,000)	B
4142h	*	Starting speed [Hz]	INT32	RW	No	○	0 to 4,000,000 (Initial value: 5,000)	B

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

■ 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	Halt
–	Reserved	Reserved	Reserved	–		Change on set point	
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	Reserved	–	Reserved
13	Reserved	–	Reserved
12	Reserved	–	Reserved
10	Reserved	–	Reserved
9	Change on set point	–	Not supported.
8	Halt	0	Operation is allowed.
		1	Stop operation. The stopping method is based on 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.
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 saved. 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.
4	New set point	0→1	Start of positioning operation Before starting operation, select 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 an interval of more than twice the communication cycle has elapsed. 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.42.

■ 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
–	–	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

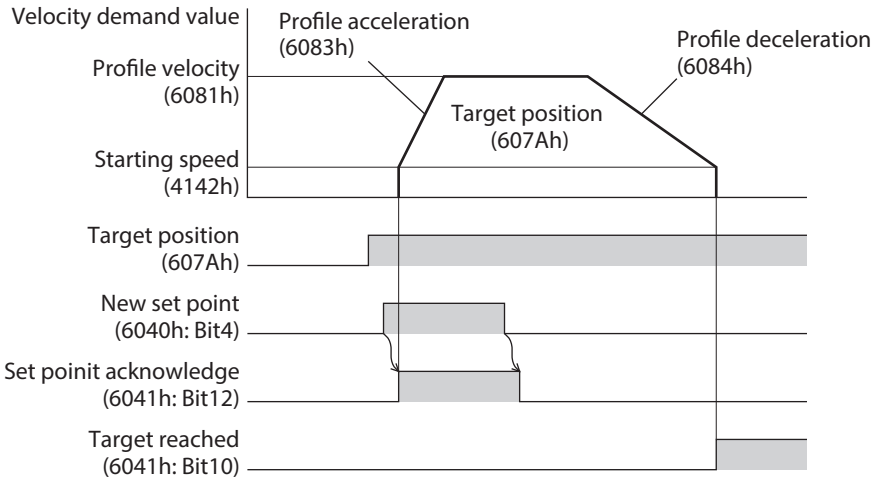
Bit	Name	Value	Description
13	Following error	0	The position deviation error does not occur.
		1	The position deviation error occurs. The position deviation exceeded the value set in the Following error window (6065h). The value changes to 0 if an alarm of Excessive position deviation (alarm code 10h) 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.
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 while any of the internal limit functions listed below are active. • Limit sensor (FW-LS/RV-LS) • Operation prohibition input (FW-BLK/RV-BLK) • Software 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: When positioning operation is properly completed, the value changes to 1. It does not change to 1 if the positioning operation was interrupted along 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 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.43.

■ Operation in Profile position mode

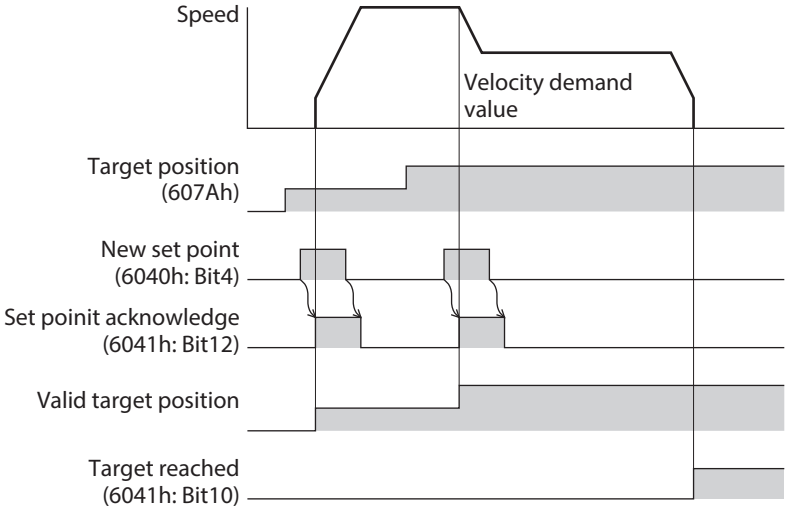
● Positioning operation

Positioning operation is started when the Target position (607Ah) is set and the New set point (6040h: Bit 4) is set to 1.



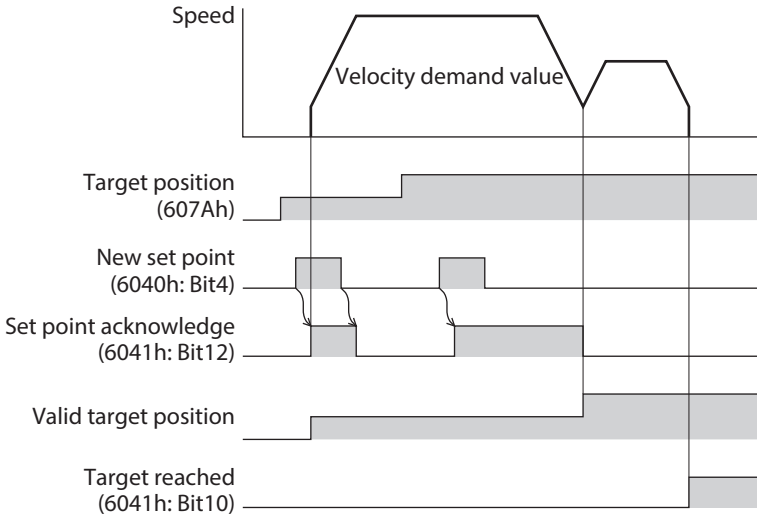
Single set-point [When the Change set immediately (6040h: Bit 5) is 1]

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



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 saved. When the present operation is completed, the stored new operation command is started.



■ Operation type of Profile position mode

The operation type of the Profile position mode is set with the Controlword (6040h). The operation modes are listed in the table.

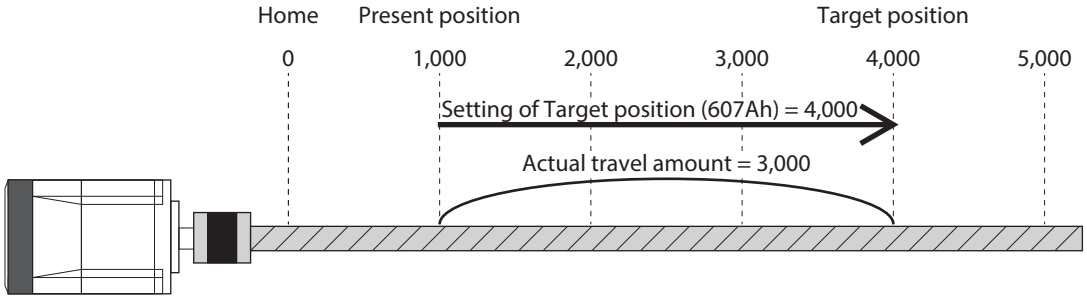
Operation type	Controlword (6040h)
	Abs/Rel (Bit 6)
Absolute positioning	0
Incremental positioning (Based on command position)	1

● 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.

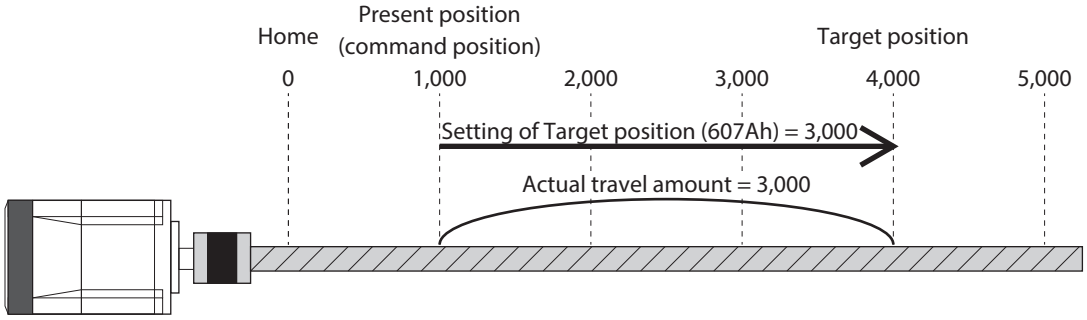


- **Incremental positioning (Based on command position)**

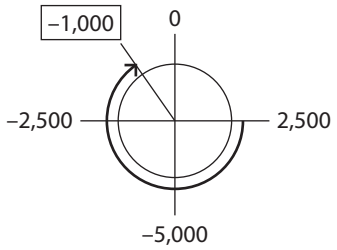
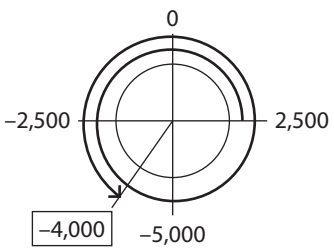
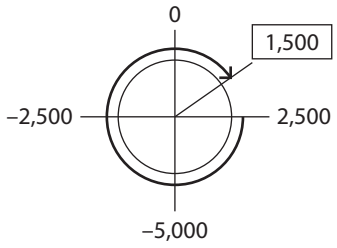
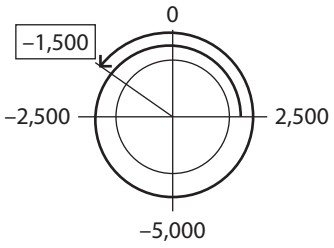
  Positioning operation with the set travel amount is performed from the present command position. In the Target position (607Ah), set the travel amount from the present command position to the target position.

  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.



■ Orbit comparison of positioning operation

Operation type	Initial vale → Value set in Target position (607Ah)	
	2,500 → 9,000	2,500 → –14,000
Absolute positioning		
Incremental positioning (based on command position)		

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

2-5 Cyclic synchronous velocity mode (CSV)

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

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, 1, 3, 6, 8, 9 (⇨p.44) (Initial value: 0)	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

<table>
<tr><th>Bit 15</th><th>Bit 14</th><th>Bit 13</th><th>Bit 12</th><th>Bit 11</th><th>Bit 10</th><th>Bit 9</th><th>Bit 8</th></tr>
<tr><td colspan="5">Manufacturer specific (ms)</td><td rowspan="2">Reserved</td><td>oms</td><td rowspan="2">Halt</td></tr>
<tr><td>–</td><td>–</td><td>–</td><td>Reserved</td><td>–</td><td>–</td></tr>
<tr><th>Bit 7</th><th>Bit 6</th><th>Bit 5</th><th>Bit 4</th><th>Bit 3</th><th>Bit 2</th><th>Bit 1</th><th>Bit 0</th></tr>
<tr><td rowspan="2">Fault reset</td><td colspan="3">Operation mode specific (oms)</td><td rowspan="2">Enable operation</td><td rowspan="2">Quick stop</td><td rowspan="2">Enable voltage</td><td rowspan="2">Switch on</td></tr>
<tr><td>–</td><td>–</td><td>–</td></tr>
</table>

Details of Controlword

Bit	Name	Value	Description
12	Reserved	0	Reserved
8	Halt	0	Operation is allowed.
		1	This is used to stop 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.42.

■ Statusword of Cyclic synchronous velocity mode

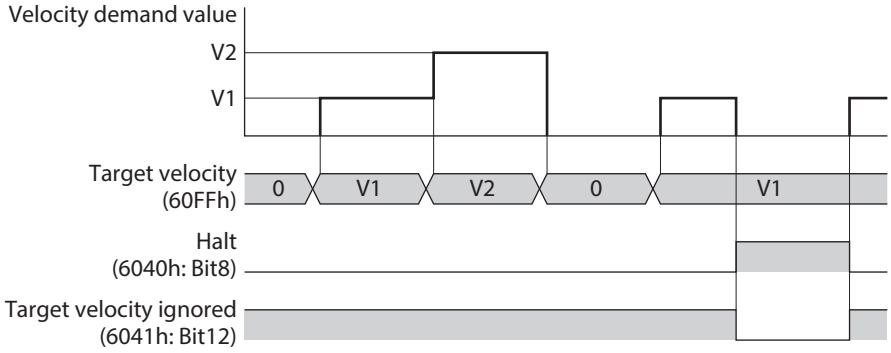
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific		Operation mode specific		Internal limit active	Reserved	Remote	ms
–	–	Reserved	Target velocity ignored				–
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation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

Details of Statusword

Bit	Name	Value	Description
13	Reserved	0	Reserved
12	Target velocity ignored	0	The target velocity command is disabled. When the state is any of the following, 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 while any of the internal limit functions listed below are active. • Limit sensor (FW-LS/RV-LS) • Operation prohibition input (FW-BLK/RV-BLK) • Software limit
10	Reserved	0	Reserved
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.43.

■ Operation in Cyclic synchronous velocity mode



2-6 Profile velocity mode (PV)

The Profile velocity mode operates in the internal profile of the driver. Path generation (profile generation) is performed with the driver. The speed, acceleration, and others are set with the MainDevice.

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, 1, 3, 6, 8, 9 (⇨p.44) (Initial value: 0)	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	*	Starting speed [Hz]	INT32	RW	No	○	0 to 4,000,000 (Initial value: 5,000)	B

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

■ 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
–	–	–	Reserved	–		–	
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
12	Reserved	0	Reserved
8	Halt	0	Operation is allowed.
		1	This is used to stop the operation. The stopping method is based on 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.42.

■ Statusword of Profile velocity mode

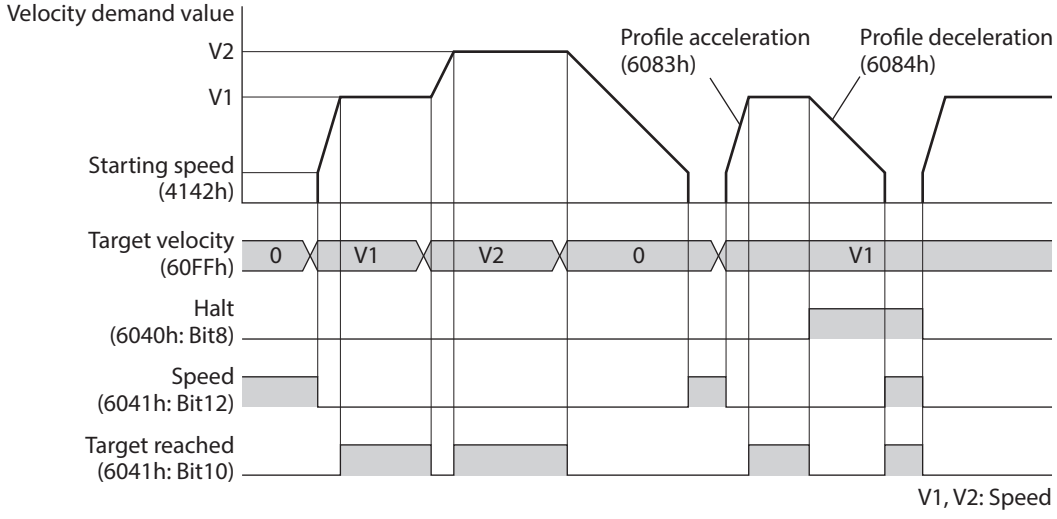
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Manufacturer specific		Operation mode specific		Internal limit active	Target reached	Remote	ms
–	–	–	Speed				–
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched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

Details of Statusword

Bit	Name	Value	Description
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 while any of the internal limit functions listed below are active. • Limit sensor (FW-LS/RV-LS) • Operation prohibition input (FW-BLK/RV-BLK) • Software limit
10	Target reached	0	• When the Halt (6040h: Bit 8) is 0: The internal command 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 command speed reached the Target velocity (60FFh). When the Halt is 0, the status of the VA output signal is output. • 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.

For Bit 6 to Bit 0, refer to "Status output of drive state machine" on p.43.

■ Operation in Profile velocity mode



2-7 Homing mode (HM)

The Homing mode is used to set the home. Path generation (profile generation) is performed with 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 return-to-home (Homing) method" on p.59.

■ 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	Stop operation. The stopping method is based on the setting of the Halt option code (605Dh).
4	Homing operation start	0→1	Start of return-to-home operation If the "Homing operation start" is set to 0 during return-to-home operation, the motor will decelerate to a stop. When the state is any of the following, 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.42.

■ 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
Reserved	–	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	Reserved	0	Reserved
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 while any of the internal limit functions listed below are active. • Limit sensor (FW-LS/RV-LS) • Operation prohibition input (FW-BLK/RV-BLK) • Software 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.43.

● 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)	Status
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 return-to-home (Homing) 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 with the limit sensor (FW-LS/RV-LS), to start running in the negative direction.
18	Return-to-home with the limit sensor (FW-LS/RV-LS), to start running in the positive direction.
24	Return-to-home with the home sensor (HOMES), to start running in the positive direction.
28	Return-to-home with the home sensor (HOMES), to start in the negative direction.
35, 37*	Home preset
–1	Return-to-home operation of our 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, 28, 35, 37, –1 (⇨"Selection of return-to-home (Homing) method") (Initial value: 24)	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: 1,000)	B
609Ah	00h	Homing acceleration [step/s^2]	U32	RW	No	○	1 to 1,000,000,000 (Initial value: 300,000)	B
415Fh	*	JOG/HOME operating current [1=0.1 %]	INT16	RW	No	○	0 to 1,000 (Initial value: 1,000)	B
4163h	*	(HOME) Return-to-home starting speed [Hz]	INT32	RW	No	○	1 to 4,000,000 (Initial value: 5,000)	B
4169h	*	(HOME) Backward steps in 2 sensor return-to-home [step]	INT32	RW	No	○	0 to 8,388,607 (Initial value: 5,000)	B
41C6h	*	Preset position [step]	INT32	RW	No	○	–2,147,483,648 to 2,147,483,647 (Initial value: 0)	A

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

● 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.

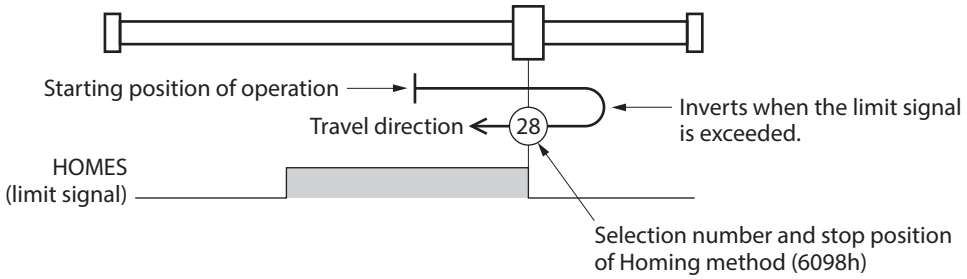
Related objects (Oriental Motor's specifications)

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: 1,000)	B
609Ah	00h	Homing acceleration [step/sec^2]	U32	RW	No	○	1 to 1,000,000,000 (Initial value: 300,000)	B
415Fh	*	JOG/HOME operating current [1=0.1 %]	INT16	RW	No	○	0 to 1,000 (Initial value: 1,000)	B
4160h	*	(HOME) Return-to-home mode	U8	RW	No	○	0: 2-sensor 1: 3-sensor 2: One-way rotation (Initial value: 1)	B
4161h	*	(HOME) Return-to-home starting direction	U8	RW	No	○	0: Negative side 1: Positive side (Initial value: 1)	B
4163h	*	(HOME) Return-to-home starting speed [Hz]	INT32	RW	No	○	1 to 4,000,000 (Initial value: 5,000)	B
4166h	*	(HOME) Return-to-home SLIT detection	U8	RW	No	○	0: Disable 1: Enable (Initial value: 1)	B
4167h	*	(HOME) Return-to-home TIM/ZSG signal detection	U8	RW	No	○	0: Disable 1: TIM 2: ZSG (Initial value: 0)	B
4168h	*	(HOME) Return-to-home position offset [Hz]	INT32	RW	No	○	–2,147,483,647 to 2,147,483,647 (Initial value: 0)	B
4169h	*	(HOME) Backward steps in 2 sensor return-to-home [step]	INT32	RW	No	○	0 to 8,388,607 (Initial value: 5,000)	B
416Ah	*	(HOME) Operating amount in uni-directional return-to-home [step]	INT32	RW	No	○	0 to 8,388,607 (Initial value: 5,000)	B
41C6h	*	Preset position [step]	INT32	RW	No	○	–2,147,483,648 to 2,147,483,647 (Initial value: 0)	A

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

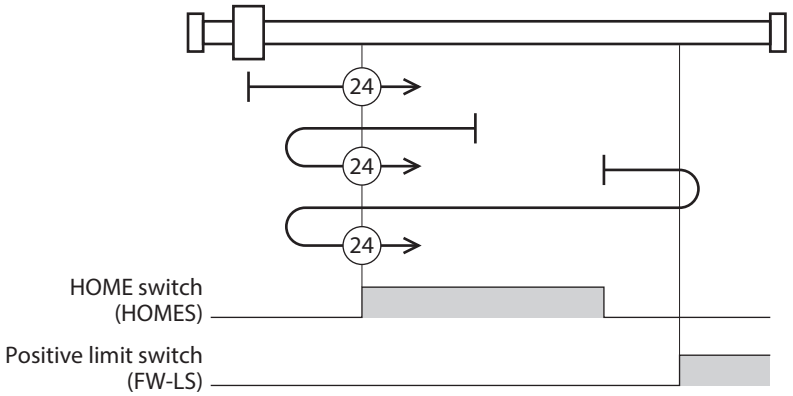
■ Operation in Homing mode of CiA402 drive profile

How to read the figure



- **Homing method: 24 [Return-to-home with the home sensor (HOMES), to start running in the positive direction]**

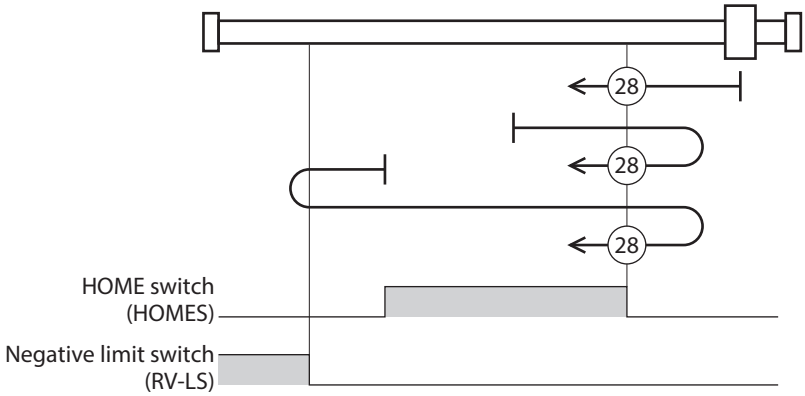
  When the HOME sensor is detected, the motor rotates in the reverse direction and pulls out of the HOME sensor at the (HOME) Return-to-home starting speed (4163h). After pulling out of the HOME sensor, the motor reverses once again, and continue to operate at the Speed during search for zero (6099h-02h). 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.



  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) Return-to-home mode (4160h): 1 [3-sensor]
  - (HOME) Return-to-home starting direction (4161h): 1 [Positive side]
  - (HOME) Return-to-home SLIT detection (4166h): 0 [Disable]
  - (HOME) Return-to-home TIM/ZSG signal detection (4167h): 0 [Disable]

- **Homing method: 28 [Return-to-home with the home sensor (HOMES), to start running 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) Return-to-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.

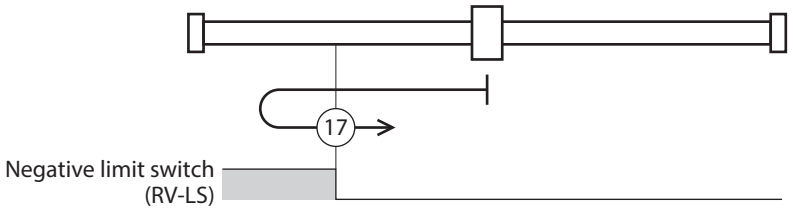


In the case of return-to-home operation of Oriental Motor's specifications, the same operation is performed if the following data is set.

- (HOME) Return-to-home mode (4160h): 1 [3-sensor]
- (HOME) Return-to-home starting direction (4161h): 0 [Negative side]
- (HOME) Return-to-home SLIT detection (4166h): 0 [Disable]
- (HOME) Return-to-home TIM/ZSG signal detection (4167h): 0 [Disable]

- **Homing method: 17 [Return-to-home with the limit sensor (FW-LS/RV-LS), to start running 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 return-to-home (4169h) and stops. The position at which the motor stopped is set as the home.

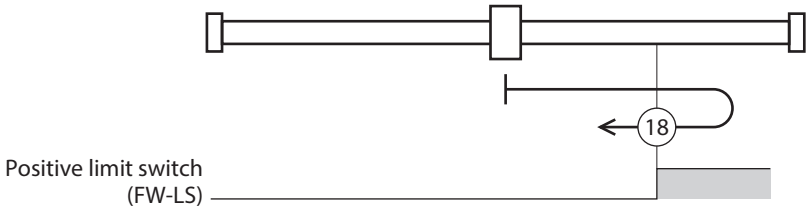


In the case of return-to-home operation of Oriental Motor's specifications, the same operation is performed if the following data is set.

- (HOME) Return-to-home mode (4160h): 0 [2-sensor]
- (HOME) Return-to-home starting direction (4161h): 0 [Negative side]
- (HOME) Return-to-home SLIT detection (4166h): 0 [Disable]
- (HOME) Return-to-home TIM/ZSG signal detection (4167h): 0 [Disable]

- **Homing method: 18 [Return-to-home with the limit sensor (FW-LS/RV-LS), to start running 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 return-to-home (4169h) and stops. The position at which the motor stopped is set as the home.



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) Return-to-home mode (4160h): 0 [2-sensor]
- (HOME) Return-to-home starting direction (4161h): 1 [Positive side]
- (HOME) Return-to-home SLIT detection (4166h): 0 [Disable]
- (HOME) Return-to-home TIM/ZSG signal detection (4167h): 0 [Disable]

- **Homing method: 35, Homing method: 37 [Home preset]**

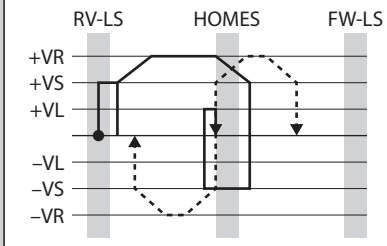
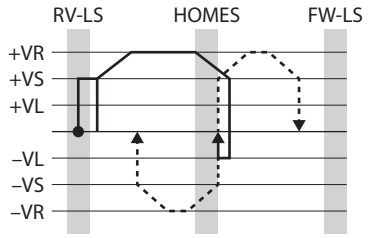
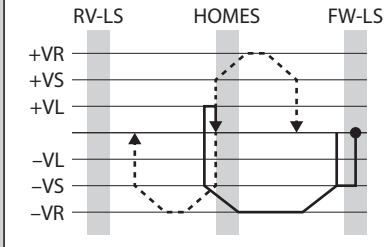
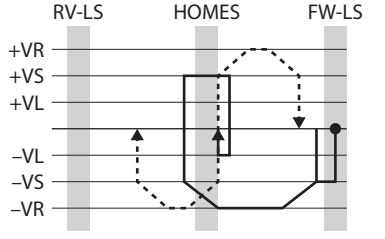
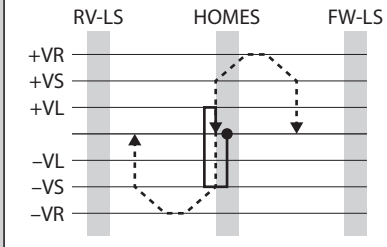
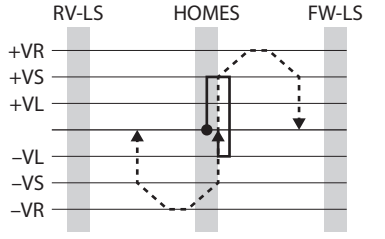
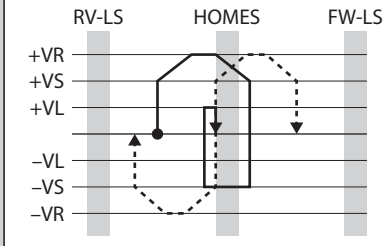
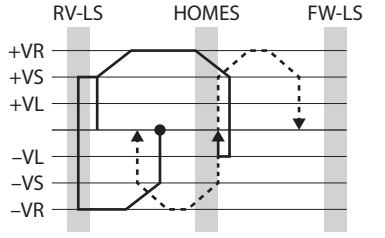
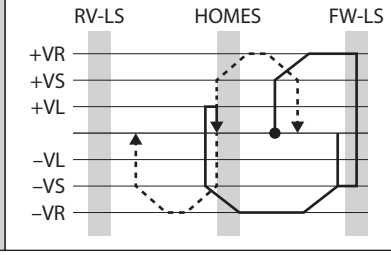
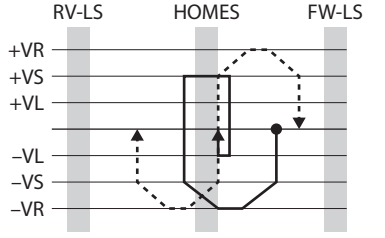
The present position is set as the home. The home preset can be executed except when the drive state machine is in a state of "Operation enabled." It can also be executed even when the motor is in a non-excitation state.

■ Operation in return-to-home 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.

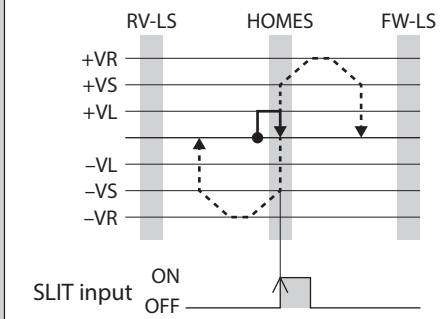
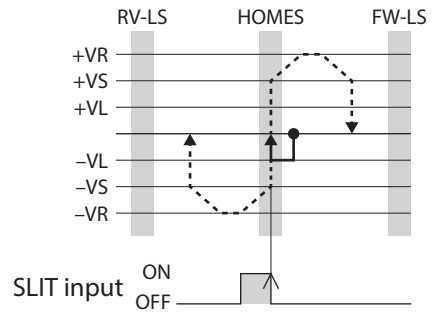
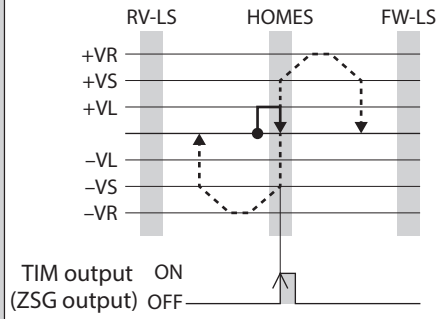
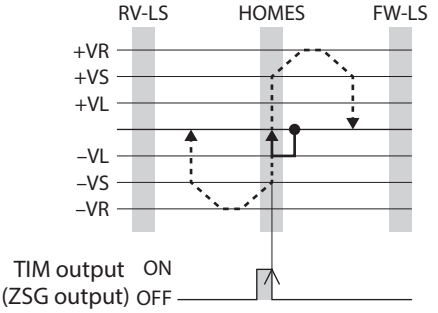
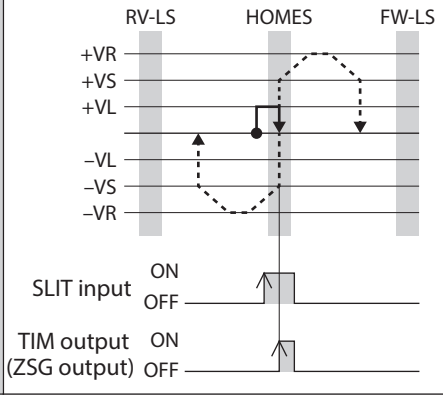
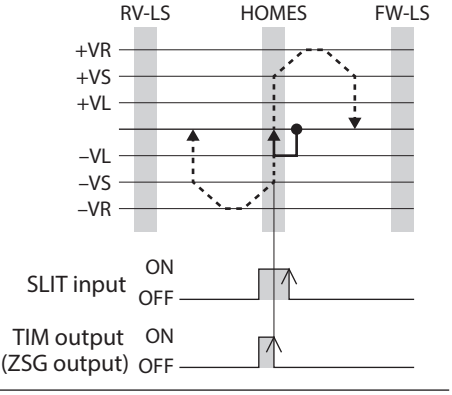
Explanation of code	• VR: Speed during search for switch (6099h-01h) • VS: (HOME) Return-to-home starting speed (4163h) • VL: Speed during search for zero (6099h-02h) • - - -: Orbit when the home offset is set

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

When the SLIT input, TIM signal, and/or ZSG signal are used simultaneously

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.

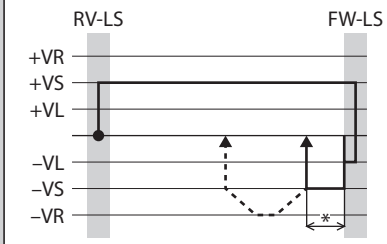
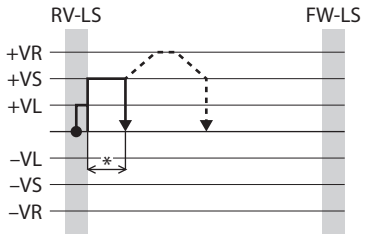
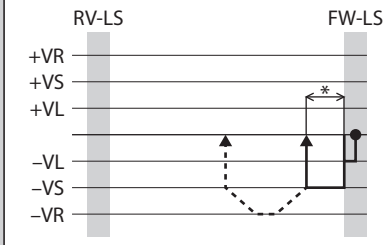
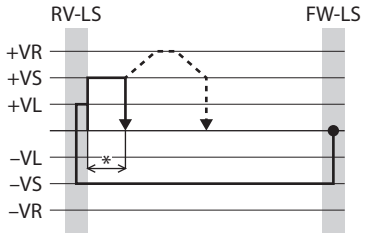
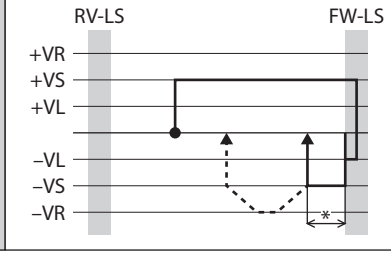
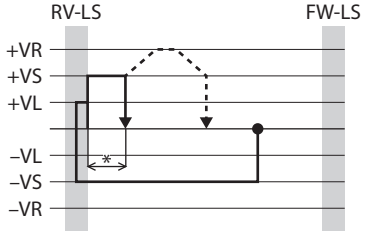
Explanation of code	• VR: Speed during search for switch (6099h-01h) • VS: (HOME) Return-to-home starting speed (4163h) • VL: Speed during search for zero (6099h-02h) • - - -: Orbit when the home offset is set

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

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

The motor operates at the the (HOME) Return-to-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 return-to-home (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) Return-to-home starting speed (4163h) • VL: Speed during search for zero (6099h-02h) • - - -: Orbit when the home offset is set

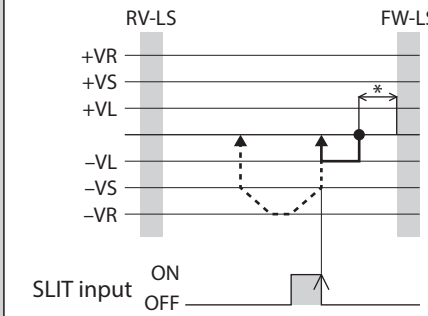
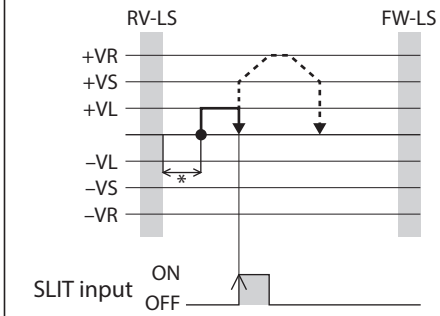
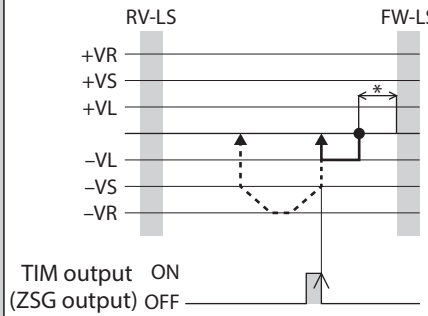
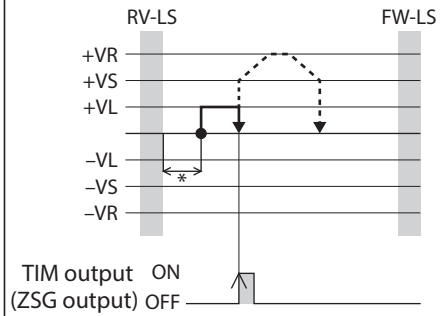
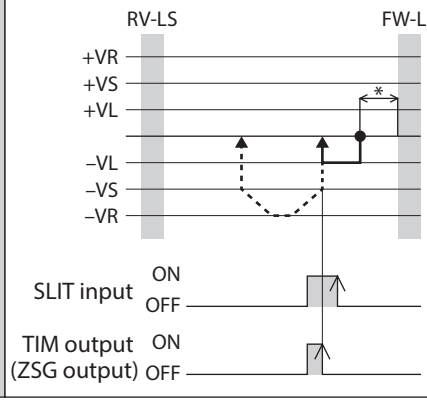
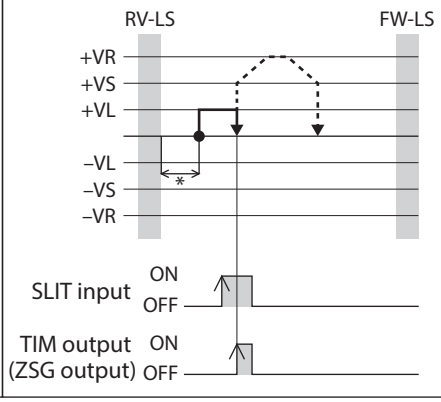
Starting position of return-to-home operation	Starting direction of return-to-home operation: Positive direction	Starting direction of return-to-home operation: Negative direction
RV-LS		
FW-LS		
Between RV-LS and FW-LS		

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

When the SLIT input, TIM signal, and/or ZSG signal are used simultaneously

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) Return-to-home starting speed (4163h) • VL: Speed during search for zero (6099h-02h) • - - -: Orbit when the home offset is set

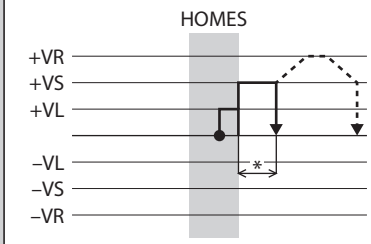
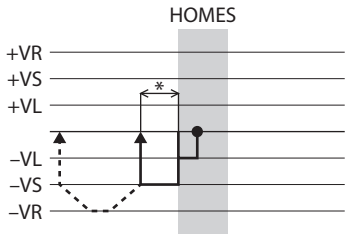
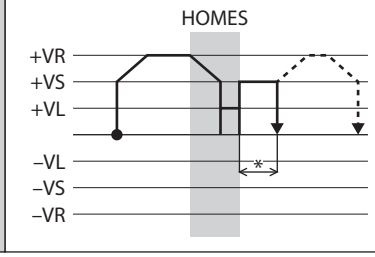
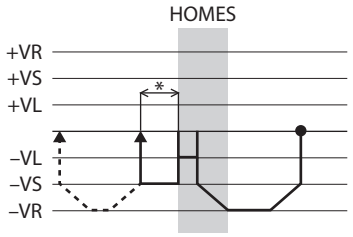
Home detection signal	Starting direction of return-to-home operation: Positive direction	Starting direction of return-to-home operation: Negative direction
SLIT input		
TIM signal or ZSG signal		
SLIT input and TIM signal or SLIT input and ZSG signal		

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

● 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 return-to-home (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) Return-to-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 direction	Starting direction of return-to-home operation: Negative direction
HOMES		
Other than HOMES		

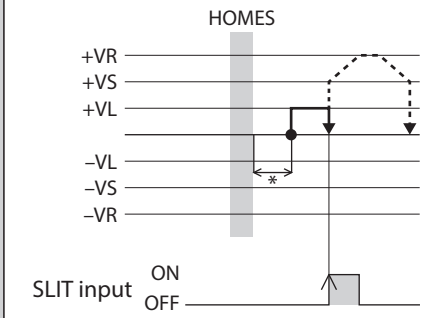
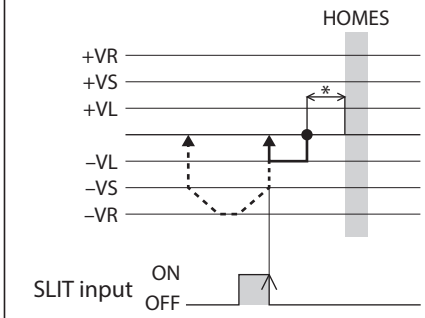
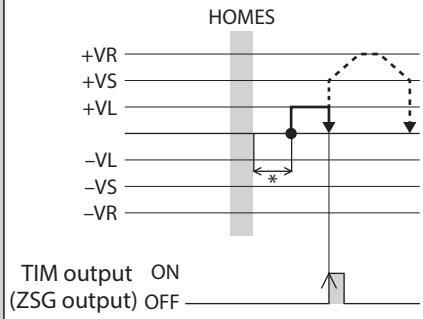
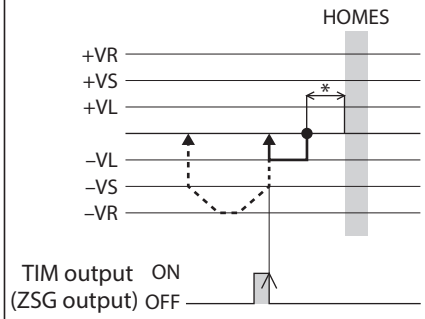
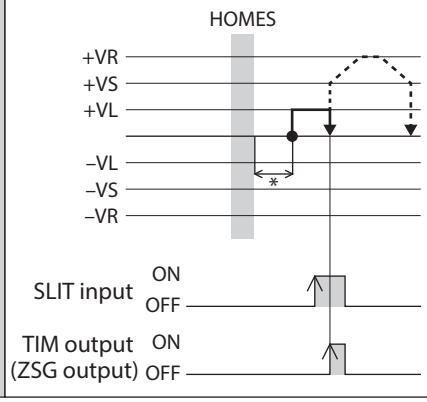
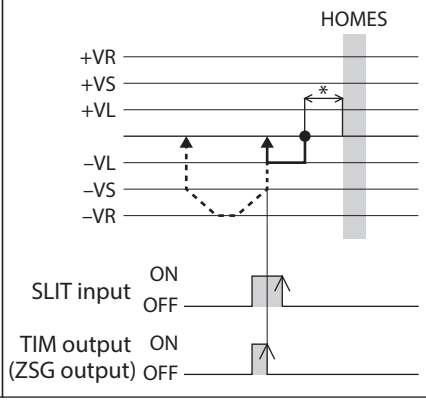
* After pulling out of the HOME sensor, the motor rotates according to the value set in the (HOME) Operating amount in uni-directional return-to-home (416Ah) and stops.

memo If the motor pulls out of the HOME sensor during deceleration stop after the HOME sensor has been detected, 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, TIM signal, and/or ZSG signal are used simultaneously

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) Return-to-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 direction	Starting direction of return-to-home operation: Negative direction
SLIT input		
TIM signal or ZSG signal		
SLIT input and TIM signal or SLIT input and ZSG signal		

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

3 Functions

3-1 Setting the applicable product

Set the applicable motor setting (413Ah) according to the product combined.
If the parameter is set, the output current of the driver is automatically set.

⚠CAUTION Be sure to set the parameter according to the product combined. If the output current of the driver is set to a value higher than the rated current of the product combined by mistake in setting, fire or a skin burn(s) may result.

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- The parameter that has been set will be enabled after the main power supply is turned on again.
- Do not set values not described in the table.

Type	Series	Product to be combined*1	Applicable motor setting (413Ah)	Output current of driver to be set (A/phase)
2-Phase stepping motors Bipolar	PKP	**PKP213D05■**	34	0.5
		PKP203D06A **PKP214D06■**	35	0.6
		PKP24□D08■2	36	0.85
		PKP26□D14■2	37	1.4
		PKP22□D15■ **PKP22□D15■2** **PKP22□MD15■** **PKP23□D15■** **PKP24□D15■** **PKP24□MD15■** **PKP262FD15A**	38	1.5
		PKP24□D15■2 **PKP24□MD15■2**	39	1.5
		PKP23□D23■ **PKP24□D23■**	40	2.3
		PKP24□D23■2	41	2.3
		PKP25□D28■A2 **PKP26□D28■** **PKP26□D28■2** **PKP26□MD28■** **PKP26□MD28■2**	42	2.8
5-Phase stepping motors	PK	**PK513** **PK52□P**	18	0.35
		PK52□H **PK54□**	19	0.75
		PK56□*2	21	1.4
	PKP	**PKP52□MN03** **PKP52□N03**	18	0.35
		PKP52□MN07 **PKP52□N07**	19	0.75
		PKP52□N12	20	1.2
		PKP54□MN **PKP54□N18■** **PKP54□N18■2**	22	1.8
		PKP56□FMN **PKP56□FN24■2**	23	2.4

Type	Series	Product to be combined*1	Applicable motor setting (413Ah)	Output current of driver to be set (A/phase)
Motorized actuators	**DRL**II	**DRLM20**	18	0.35
		DRLM28 **DRLM42**	19	0.75
		DRLM60	21	1.4
	DH	**DHM28PAK2** **DHM42PAK**	19	0.75

*1 Product models in the table describe part of the whole name of the products. The driver can be combined with products that include the product models listed here. Note, however, that the motors with a voltage output type encoder are excluded.
The box (□) in the product model indicates a number representing the motor length.
The box (■) in the product model indicates **A** (single shaft), **B** (double shaft), or **M** (with an electromagnetic brake) representing the motor shape.
*2 Motors with a rated current of 1.4 A/phase are covered.

3-2 Setting of 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 (P/R) = 10,000 × Electronic gear B (6091h-02h) / Electronic gear A (6091h-01h)
- Factory setting: 10,000 P/R
- Setting range: 100 to 125,000 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

memo

- If a value out of the setting range is set, information of Electronic gear setting error is generated (information code 2000h). If 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 the position preset (P-PRESET) was executed in a state where the Home offset (607Ch) is other than 0, execute the position preset (P-PRESET) again. When the Home offset (607Ch) is 0, it is no need to execute the position preset (P-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.

3-3 Touch probe

The touch probe is a function that sets the external latch input signal (EXT1 input, EXT2 input) or the output signal (TIM output) as a trigger and latches the internal command position when the trigger is input. Select the signal that is set as a trigger with the Trigger selection (Bit 2 / Bit 10) of the Touch probe function (60B8h).
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	–	–	–

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

- **Related signals**

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.
TIM output	This signal is output every time the motor output shaft rotates by 7.2 degrees. 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 each time a trigger is input.
2	Touch probe 1 trigger selection	0	Sets the external latch input EXT1 as a trigger.
		1	Sets the TIM output as a trigger.
3	Reserved	0	Reserved
4	Touch probe 1 positive value action	0	Disables the latch function on the positive value of a trigger.
		1	Enables the latch function on the positive value of a trigger.
5	Touch probe 1 negative value action	0	Disables the latch function on the negative value of a trigger.
		1	Enables the latch function on 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 each time a trigger is input.
10	Touch probe 2 trigger selection	0	Sets the external latch input EXT2 as a trigger.
		1	Sets the TIM output as a trigger.
11	Reserved	0	Reserved
12	Touch probe 2 positive value action	0	Disables the latch function on the positive value of a trigger.
		1	Enables the latch function on the positive value of a trigger.
13	Touch probe 2 negative value action	0	Disables the latch function on the negative value of a trigger.
		1	Enables the latch function on the negative value of a trigger.
14	Reserved	0	Reserved
15	Reserved	0	Reserved

■ Details of touch probe status

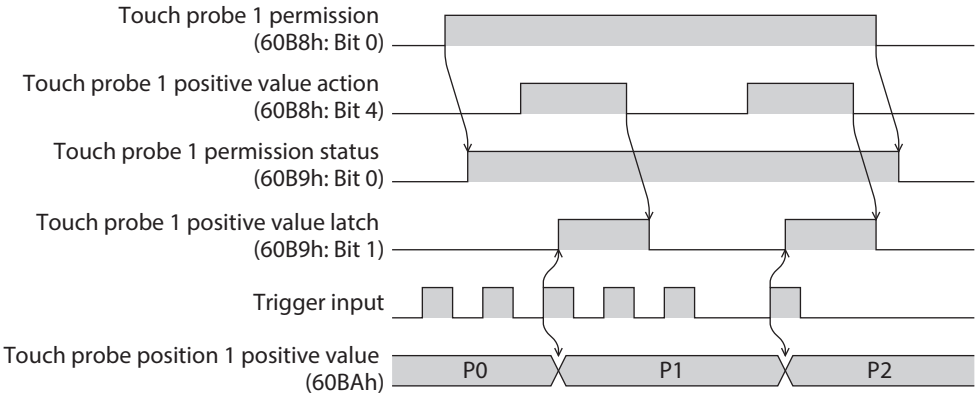
The status of the touch probe is output by the Touch probe status (60B9h).
The status of the touch probe 1 is output in the lower 8 bits and that of the touch probe 2 is output in the upper 8 bits.

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

■ Operation sequence of touch probe

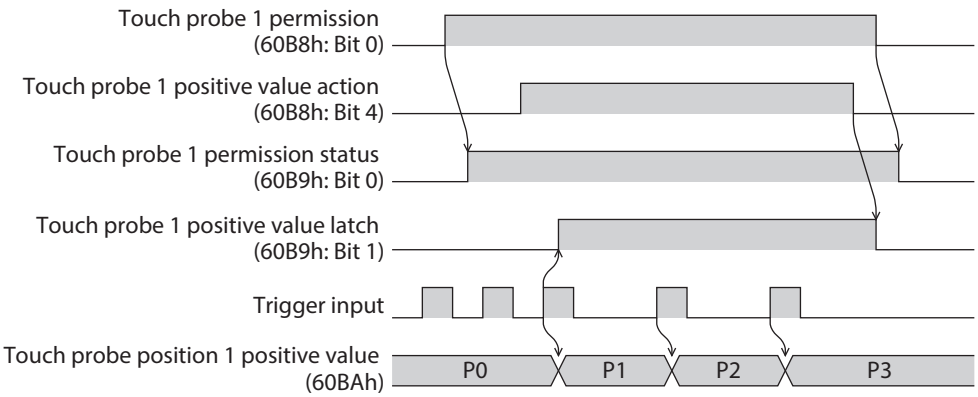
The operation examples of the touch probe 1 are shown below.

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



P0 to P2: Latched position

- **When the trigger action is "Continuous action" (60B8h: Bit 1 is 1)**



P0 to P3: Latched position

3-4 Maintenance commands

Maintenance commands are used to execute resetting alarms, batch processing of non-volatile memory or the like. All commands are for WRITE.

Note The maintenance commands include a process in which the memory is operated. Be careful not to execute them unnecessarily in succession.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
40C0h	*	Alarm reset	U8	RW	No	–	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. (Initial value: 0)	–
40C2h	*	Clear alarm history	U8	RW	No	–		
40C5h	*	P-PRESET execution	U8	RW	No	–		
40C6h	*	Configuration	U8	RW	No	–		
40C8h	*	Read batch NV memory	U8	RW	No	–		
40C9h	*	Write batch NV memory	U8	RW	No	–		
40CAh	*	All data batch initialization	U8	RW	No	–		
40D3h	*	Clear information	U8	RW	No	–		
40D4h	*	Clear information history	U8	RW	No	–		
40D7h	*	Encoder counter clear	U8	RW	No	–		

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

Description of commands

Name	Description
Alarm reset	Resets the alarm being generated presently. Some alarms cannot be reset.
Clear alarm history	Clears the alarm history.
P-PRESET execution	Presets the command position.
Configuration	Executes recalculation and setup of the parameter.
Read batch NV memory	Reads the parameters stored in non-volatile memory to RAM. All operation data and parameters stored in RAM are overwritten.
Write batch NV memory	Writes the parameters stored in RAM to non-volatile memory. Non-volatile memory can be rewritten approximately 100,000 times.
All data batch initialization	Resets all parameters stored in non-volatile memory to their initial values.
Clear information	Clears the information.
Clear information history	Clears the information history.
Encoder counter clear	Clears the Position actual internal value (6063h).

■ Configuration

Configuration can be executed when all of the following conditions are met.

- 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** software.

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
Electromagnetic brake	Hold/Release	Hold	Based on the driver condition.
Motor excitation	Excitation/non-excitation	Non-excitation	
Output signals	Enable	Disable	Enable
Input signal	Enable	Disable	Enable

memo Even if monitor is executed while Configuration is being executed, the correct monitor value may not return.

■ How to execute the maintenance commands

There are two types of execution methods. 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 MainDevice.

- **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 non-volatile memory, such as Write batch NV memory (40C9h), are executed consecutively, increase the length of the intervals between commands.

3-5 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 allocated to the input terminals IN0 to IN3 of the driver axis. For signals possible to allocate, refer to "Input signals list" on p.78.

Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4840h	*	DIN0 input function	U8	RW	No	○	0 to 127 (Initial value: 28 [FW-LS])	C
4841h	*	DIN1 input function	U8	RW	No	○	0 to 127 (Initial value: 29 [RV-LS])	C
4842h	*	DIN2 input function	U8	RW	No	○	0 to 127 (Initial value: 30 [HOMES])	C
4843h	*	DIN3 input function	U8	RW	No	○	0 to 127 (Initial value: 1 [FREE])	C

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

■ Assignment to output terminals

Output signals can be assigned to the output terminals OUT of the driver axis. Refer to p.79 for signals that can be assigned.

Related object

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4860h	*	DOUT0 (Normal) output function	U8	RW	No	○	0 to 255 [Initial value: 130 (ALM-B)]	C

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

■ Direct I/O

The status of direct I/O 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
–	–	–	–	–	–	–	OUT
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
–	–	–	–	IN3	IN2	IN1	IN0

Related object

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

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

■ Driver input command

The Driver input command (403Eh) is an input command from the EtherCAT MainDevice to the driver. The arrangement of bits is as follows.
Bit 0 to Bit 7 are assigned to the R-IN0 to R-IN7. Bit 8 to Bit 15 are not used.
Values in parentheses ( ) are initial values.

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
R-IN7 (No function)	R-IN6 (No function)	R-IN5 (No function)	R-IN4 (No function)	R-IN3 (No function)	R-IN2 (No function)	R-IN1 (No function)	R-IN0 (No function)

Related objects

Refer to p.78 for signals that can be assigned.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4900h	*	R-IN0 input function	U8	RW	No	○	0 to 127 (Initial value: 0 [No function])	C
4901h	*	R-IN1 input function	U8	RW	No	○	0 to 127 (Initial value: 0 [No function])	C
4902h	*	R-IN2 input function	U8	RW	No	○	0 to 127 (Initial value: 0 [No function])	C
4903h	*	R-IN3 input function	U8	RW	No	○	0 to 127 (Initial value: 0 [No function])	C
4904h	*	R-IN4 input function	U8	RW	No	○	0 to 127 (Initial value: 0 [No function])	C
4905h	*	R-IN5 input function	U8	RW	No	○	0 to 127 (Initial value: 0 [No function])	C
4906h	*	R-IN6 input function	U8	RW	No	○	0 to 127 (Initial value: 0 [No function])	C

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4907h	*	R-IN7 input function	U8	RW	No	○	0 to 127 (Initial value: 0 [No function])	C

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

■ 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 (CONST-OFF)	R-OUT14 (CONST-OFF)	R-OUT13 (MOVE)	R-OUT12 (TIM)	R-OUT11 (CONST-OFF)	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 (No function)	R-OUT2 (ZSG)	R-OUT1 (RV-LS_R)	R-OUT0 (FW-LS_R)

Related objects

Refer to p.79 for signals that can be assigned.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4910h	*	R-OUT0 output function	U8	RW	No	○	0 to 255 [Initial value: 28 (FW-LS_R)]	C
4911h	*	R-OUT1 output function	U8	RW	No	○	0 to 255 [Initial value: 29 (RV-LS_R)]	C
4912h	*	R-OUT2 output function	U8	RW	No	○	0 to 255 (Initial value: 155 [ZSG])	C
4913h	*	R-OUT3 output function	U8	RW	No	○	0 to 255 (Initial value: 0 [No function])	C
4914h	*	R-OUT4 output function	U8	RW	No	○	0 to 255 (Initial value: 144 [HOME-END])	C
4915h	*	R-OUT5 output function	U8	RW	No	○	0 to 255 (Initial value: 204 [DCMD-RDY])	C
4916h	*	R-OUT6 output function	U8	RW	No	○	0 to 255 (Initial value: 135 [INFO])	C
4917h	*	R-OUT7 output function	U8	RW	No	○	0 to 255 (Initial value: 129 [ALM-A])	C
4918h	*	R-OUT8 output function	U8	RW	No	○	0 to 255 (Initial value: 136 [SYS-BSY])	C
4919h	*	R-OUT9 output function	U8	RW	No	○	0 to 255 (Initial value: 160 [AREA0])	C
491Ah	*	R-OUT10 output function	U8	RW	No	○	0 to 255 (Initial value: 161 [AREA1])	C
491Bh	*	R-OUT11 output function	U8	RW	No	○	0 to 255 (Initial value: 128 [CONST-OFF])	C
491Ch	*	R-OUT12 output function	U8	RW	No	○	0 to 255 (Initial value: 157 [TIM])	C
491Dh	*	R-OUT13 output function	U8	RW	No	○	0 to 255 (Initial value: 134 [MOVE])	C

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
491Eh	*	R-OUT14 output function	U8	RW	No	○	0 to 255 (Initial value: 128 [CONST-OFF])	C
491Fh	*	R-OUT15 output function	U8	RW	No	○	0 to 255 (Initial value: 128 [CONST-OFF])	C

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

■ Input signals list

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

Assignment number	Signal name	Functions	Status
0	No function	Set when the input terminal is not used.	–
1	FREE	This is used to shut off the motor current to put the motor in 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 and motor non-excitation
5	STOP	This is used to stop the motor.	0: No motion 1: Stop operation
8	ALM-RST	This is used to reset the alarm presently being generated.	0: No motion 1: Reset alarm
9	P-PRESET	This is used to rewrite the mechanical home to the present position.	0: No motion 1: Execute preset
14	INFO-CLR	This is used to clear the information status.	0: No operation 1: Information status clear
16	HMI	This is used to release the function limitation of the **MEXE02** software.	0: Function limitation 1: Release the function limitation
26	FW-BLK	This is used to stop the operation in the forward direction.	0: No operation 1: Forward direction operation stop
27	RV-BLK	This is used to stop the operation in the reverse direction.	0: No operation 1: Reverse direction operation stop
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.	
30	HOMES	This is a signal to be input from the mechanical home sensor (HOME sensor).	
31	SLIT	This is a signal to be input from the slit sensor.	
80	R0	These are general signals.	
81	R1		
82	R2		
83	R3		
84	R4		
85	R5		
86	R6		
87	R7		
88	R8		
89	R9		
90	R10		
91	R11		
92	R12		

Assignment number	Signal name	Functions	Status
93	R13	These are general signals.	0: OFF 1: ON
94	R14		
95	R15		
104	EXT1	This is an external latch signal for the touch probe 1.	
105	EXT2	This is an external latch signal for the touch probe 2.	

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. When it is assigned to both direct I/O (DIN0 to DIN3) and remote I/O (R-IN0 to R-IN7), the function will be executed when both of them changes to 1.

■ Output signals list

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

Assignment number	Signal name	Functions	Status
0	No function	Set when the output terminal is not used.	–
1 to 127	Response signal	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 at all times.	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: Normal state 1: System preparation completion
132	READY	Output when the driver is ready to operate.	0: Operation not possible 1: Ready for operation
134	MOVE	Output while 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
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
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 a state of automatic current cutback.	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

Assignment number	Signal name	Functions	Status
145	ABSPEN	Output when coordinates have been set.	0: Coordinates setting is not completed 1: Coordinates setting is completed
149	PRST-DIS	After the position preset (P-PRESET) was executed, this signal is output when the position preset (P-PRESET) is required again before the motor is operated.	0: Normal state 1: Preset is not completed
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.	
155	ZSG	Output when the phase Z input is detected.	0: Normal 1: Phase Z input is present
157	TIM	Output every time the motor output shaft rotates by 7.2 degrees with reference to the command position.	0: OFF 1: ON
160	AREA0	Output when the motor is within the area.	0: Outside the range of AREA 1: In the range of AREA
161	AREA1		
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 hold 1: Electromagnetic brake release
196	OPE-BSY	Output while internal oscillation is performed. This signal is not output in the Cyclic synchronous position mode (CSP).	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 while 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
226	INFO-DRVTMP	Output when the corresponding information is generated.	0: No information 1: During information generation
228	INFO-OVOLT		
229	INFO-UVOLT		
233	INFO-START		
235	INFO-PR-REQ		
236	INFO-MSET-E		
237	INFO-EGR-E		
240	INFO-FW-OT		
241	INFO-RV-OT		
252	INFO-DSLMTD		
253	INFO-IOTEST		
254	INFO-CFG		
255	INFO-RBT		

3-6 Saving parameters

Parameters are stored in RAM or non-volatile memory in the driver. The parameters stored in RAM are erased when the control power supply is shut off, but the parameters stored in non-volatile memory remain stored even when the control power supply is shut off.
When the control power supply of the driver is turned on, the parameters stored in non-volatile memory is transferred to RAM, and recalculation and setup for the parameters is executed in RAM.
When parameters are set via EtherCAT, they are stored in the RAM. To save the parameters stored in RAM to non-volatile memory, execute the Write batch NV memory (40C9h) of the maintenance command for each driver axis.

memo
- Non-volatile memory can be rewritten approximately 100,000 times.
- Do not shut off the control power supply while writing the data to non-volatile memory, and also do not shut off for five seconds after writing is completed. Doing so may abort the data write and cause an alarm of EEPROM error (alarm code 41h) to generate.

3-7 Operating current and stop current

If the load is small and there is sufficient allowance for torque, the motor temperature rise can be suppressed by setting the operating current or stop current to lower values.

Note
If the operating current or stop current is set too low, there may be a problem starting the motor or holding the load. Do not reduce the current setting more than necessary.

● Operating current

The motor operating current is calculated using the following formula.
- Operating current = Maximum output current × Operating current (4120h)

● Stop current

When the motor stops, the automatic current cutback function is activated and the motor current is reduced to the stop current.
The motor stop current is calculated using the following formula.
- Stop current = Maximum output current × Stop current (4128h)

Note
Use the stop current at a setting of 50 % or less. If the stop current is 50 % or more, the motor output current may not be the same even if the stop current and the operating current are set to the same value. If a value greater than 50 % is set, monitor the motor temperature and ensure that the motor case temperature does not exceed 100 °C (212 °F). Also, make a sufficient evaluation with the customer's equipment and use the motor under conditions that will not generate a driver overheat alarm.

● Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4120h	*1	Operating current [1=0.1 %]	INT16	RW	RxPDO	○	0 to 1,000 (Initial value: 1,000)	A*2
4128h	*1	Stop current [1=0.1 %]	INT16	RW	RxPDO	○	0 to 1,000 (Initial value: 500)	A
415Fh	*1	JOG/HOME operating current [1=0.1 %]	INT16	RW	No	○	0 to 1,000 (Initial value: 1,000)	B

*1 Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.
*2 In the Profile position mode, it will be updated when operation is started.

3-8 Stopping movement

■ Operation stop input

Inputting the operation stop signal during motor operation causes the motor to stop.

Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4700h	*	STOP input action	INT8	RW	No	○	0: Immediate stop 3: Deceleration stop (Initial value: 3)	A
4702h	*	FW-BLK/RV-BLK input action	INT8	RW	No	○	0: Immediate stop 1: Deceleration stop (Initial value: 0)	A

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

■ Hardware overtravel

Hardware overtravel is a function that limits the range of movement by installing the limit sensors (FW-LS, RV-LS) at the upper and lower limits of the moving range. If the FW-LS/RV-LS input action (4701h) is set, the motor can be stopped when the limit sensor is detected.

Related object

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4701h	*	FW-LS/RV-LS input action	INT8	RW	No	○	−1: Used as a return-to-home sensor 0: Immediate stop 1: Deceleration stop 2: Immediate stop with-alarm 3: Deceleration stop with-alarm (Initial value: 2)	A

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

■ Software overtravel

Software overtravel is a function that limits the travel range by setting the upper and lower limits of the travel range with the parameters.
If the Software overtravel (41C3h) is set to "0: Immediate stop" or "1: Deceleration stop," the motor can be stopped according to the setting of the parameter when the software limit is reached. And if it is set to "2: Immediate stop with alarm" or "3: Deceleration stop with alarm," an alarm will be generated to stop the motor when the software limit is reached.

Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
41C3h	*	Software overtravel	INT8	RW	No	○	−1: Disable 0: Immediate stop 1: Deceleration stop 2: Immediate stop with alarm 3: Deceleration stop with alarm (Initial value: 3)	A
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

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

memo Software overtravel is enabled while coordinates are set. Refer to "3-9 Coordinates management" for setting the coordinates.

■ Escape from the limit sensor

It is possible to escape in the reverse direction if the limit in the forward direction is detected, and in the forward direction if the limit in the reverse direction is detected.

3-9 Coordinates management

The driver manages the position information. The home is set if one of the following is executed, and the ABSPEN output is turned ON.

- Return-to-home operation
- Position preset: The command position will be the value set in the Preset position (41C6h).

Note The absolute positioning operation cannot be executed without setting coordinates. (When the Permission of absolute positioning without setting absolute coordinates (4148h) is "0: Disable")

● Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4148h	*	Permission of absolute positioning without setting absolute coordinates	U8	RW	No	○	0: Disable 1: Enable (Initial value: 1)	B
41C6h	*	Preset position	INT32	RW	No	○	−2,147,483,648 to 2,147,483,647 steps (Initial value: 0)	A

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

● A state where coordinates setting is not completed

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

- When the power supply is turned on
- During return-to-home operation
- After Configuration was executed
- After the motor was in a non-excitation state

4 Object list

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

◆**Table of contents**

1 Composition of object dictionary

Objects are configured as follows.

Index (Hex)	Object	Overview
2000h to 3FFFh	Manufacturer-Specific Area	No function
4000h to 4FFFh		Sets an axis number (1 to 4) to the Sub-Index of the driver objects.
5000h to 5FFFh		No function
6000h to 67FFh	Profile Area	Profile area of axis 1
6800h to 6FFFh		Profile area of axis 2
7000h to 77FFh		Profile area of axis 3
7800h to 7FFFh		Profile area of axis 4

memo

- In this manual, the index of the driver axis 1 is described for the objects in the profile area. The objects of the driver axis 2 to axis 4 are indexes offset by 800h from the object on the previous axis.
- When setting the driver objects of the manufacturer-specific area, set an axis number (1 to 4) to Sub-Index.

■ Object dictionary item

Item	Description
Index, Sub, name	Index, Sub-Index, and name of objects.
Type	Definition objects of data type. Abbreviations used in this manual are listed in the table below.
Access	Access method of objects. • RW: Values can be read and written. • RO: Values can be read only.
PDO	Indicates whether PDO mapping of objects can be performed. • RxPDO: Mapping to RxPDO can be performed. • TxPDO: Mapping to TxPDO can be performed. • No: Mapping to PDO cannot be performed.
Save	Indicates whether or not data will be saved to non-volatile memory when the Write batch NV memory is executed. • ○: Saved in non-volatile memory. • –: Not saved in non-volatile memory.

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	–

Item	Description
Update	Indicates the timing for updating the change when a value in the object is changed. • A: Update immediately • B: Update after operation stop • C: Update after executing Configuration • D: Update after turning on the control power supply again

2 Objects of CoE communication area

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

2-1 Descriptions of each object

- **Device Type (1000h)**

This indicates the device profile.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1000h	00h	Device Type	U32	RO	No	–	FFFF 0192h	–	–

Details of initial values

Bit	Name	Description
0 to 15	Device profile	0192h: DS402
16 to 31	Additional information	FFFFh: Multi-axis driver

- **Error register (1001h)**

This indicates the error status of the driver. If an error occurs in any axis of the driver, the General error (Bit 0) will change to 1.
It will change to 0 when all errors are cleared.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1001h	00h	Error Register	U8	RO	No	–	0	–	–

- **Manufacturer Device Name (1008h)**

This indicates the product name.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1008h	00h	Manufacturer Device Name	STRING	RO	No	–	**CVD4A-KED**	–	–

- **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	Initial value	Range	Update
1009h	00h	Manufacturer Hardware version	STRING	RO	No	–	Indicates Manufacturer 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	Initial value	Range	Update
100Ah	00h	Manufacturer Software version	STRING	RO	No	–	Indicates Manufacturer 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	Initial value	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 1432h	–	–
	03h	Revision Number	U32	RO	No	–	1111 xxxxh	–	–
	04h	Serial Number	U32	RO	No	–	0	–	–

- **Driver axis 1 Receive PDO Mapping 1 (1600h)**

  This is used to set the receive PDO mapping 1 of the driver axis 1.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1600h	00h	Number of entries	U8	RW	No	–	4	0 to 8	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		A
	03h	Mapping entry 3	U32	RW	No	–	6060 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	6081 0020h		A
	05h	Mapping entry 5	U32	RW	No	–	0000 0000h		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

- **Driver axis 1 Receive PDO mapping 2 (1601h)**

  This is used to set the receive PDO mapping 2 of the driver axis 1.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1601h	00h	Number of entries	U8	RW	No	–	5	0 to 8	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		A
	03h	Mapping entry 3	U32	RW	No	–	60FF 0020h		A
	04h	Mapping entry 4	U32	RW	No	–	6060 0008h		A
	05h	Mapping entry 5	U32	RW	No	–	60B8 0010h		A
	06h	Mapping entry 6	U32	RW	No	–	0000 0000h		A
	07h	Mapping entry 7	U32	RW	No	–			A
	08h	Mapping entry 8	U32	RW	No	–			A

- **Driver axis 2 Receive PDO mapping 1 (1610h)**

  This is used to set the receive PDO mapping 1 of the driver axis 2.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1610h	00h	Number of entries	U8	RW	No	–	4	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	6840 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	687A 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	6860 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	6881 0020h		A
	05h	Mapping entry 5	U32	RW	No	–	0000 0000h		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

- **Driver axis 2 Receive PDO mapping 2 (1611h)**

  This is used to set the receive PDO mapping 2 of the driver axis 2.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1611h	00h	Number of entries	U8	RW	No	–	5	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	6840 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	687A 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	68FF 0020h		A
	04h	Mapping entry 4	U32	RW	No	–	6860 0008h		A
	05h	Mapping entry 5	U32	RW	No	–	68B8 0010h		A
	06h	Mapping entry 6	U32	RW	No	–	0000 0000h		A
	07h	Mapping entry 7	U32	RW	No	–			A
	08h	Mapping entry 8	U32	RW	No	–			A

- **Driver axis 3 Receive PDO mapping 1 (1620h)**

  This is used to set the receive PDO mapping 1 of the driver axis 3.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1620h	00h	Number of entries	U8	RW	No	–	4	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	7040 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	707A 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	7060 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	7081 0020h		A
	05h	Mapping entry 5	U32	RW	No	–	0000 0000h		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

- **Driver axis 3 Receive PDO mapping 2 (1621h)**

  This is used to set the receive PDO mapping 2 of the driver axis 3

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1621h	00h	Number of entries	U8	RW	No	–	5	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	7040 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	707A 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	70FF 0020h		A
	04h	Mapping entry 4	U32	RW	No	–	7060 0008h		A
	05h	Mapping entry 5	U32	RW	No	–	70B8 0010h		A
	06h	Mapping entry 6	U32	RW	No	–	0000 0000h		A
	07h	Mapping entry 7	U32	RW	No	–			A
	08h	Mapping entry 8	U32	RW	No	–			A

- **Driver axis 4 Receive PDO mapping 1 (1630h)**

  This is used to set the receive PDO mapping 1 of the driver axis 4.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1630h	00h	Number of entries	U8	RW	No	–	4	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	7840 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	787A 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	7860 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	7881 0020h		A
	05h	Mapping entry 5	U32	RW	No	–	0000 0000h		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

- **Driver axis 4 Receive PDO mapping 2 (1631h)**

  This is used to set the receive PDO mapping 2 of the driver axis 4

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1631h	00h	Number of entries	U8	RW	No	–	5	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	7840 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	787A 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	78FF 0020h		A
	04h	Mapping entry 4	U32	RW	No	–	7860 0008h		A
	05h	Mapping entry 5	U32	RW	No	–	78B8 0010h		A
	06h	Mapping entry 6	U32	RW	No	–	0000 0000h		A
	07h	Mapping entry 7	U32	RW	No	–			A
	08h	Mapping entry 8	U32	RW	No	–			A

- **Driver axis 1 Transmit PDO mapping 1 (1A00h)**

  This is used to set the transmit PDO mapping 1 of the driver axis 1.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1A00h	00h	Number of entries	U8	RW	No	–	3	0 to 8	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		A
	03h	Mapping entry 3	U32	RW	No	–	6061 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	0000 0000h		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

- **Driver axis 1 Transmit PDO mapping 2 (1A01h)**

  This is used to set the transmit PDO mapping 2 of the driver axis 1.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1A01h	00h	Number of entries	U8	RW	No	–	8	0 to 8	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		A
	03h	Mapping entry 3	U32	RW	No	–	6061 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	60B9 0010h		A
	05h	Mapping entry 5	U32	RW	No	–	60BA 0020h		A
	06h	Mapping entry 6	U32	RW	No	–	60BC 0020h		A
	07h	Mapping entry 7	U32	RW	No	–	603F 0010h		A
	08h	Mapping entry 8	U32	RW	No	–	60FD 0020h		A

- **Driver axis 2 Transmit PDO mapping 1 (1A10h)**

  This is used to set the transmit PDO mapping 1 of the driver axis 2.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1A10h	00h	Number of entries	U8	RW	No	–	3	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	6841 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	6864 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	6861 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	0000 0000h		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

- **Driver axis 2 Transmit PDO mapping 2 (1A11h)**

  This is used to set the transmit PDO mapping 2 of the driver axis 2.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1A11h	00h	Number of entries	U8	RW	No	–	8	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	6841 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	6864 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	6861 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	68B9 0010h		A
	05h	Mapping entry 5	U32	RW	No	–	68BA 0020h		A
	06h	Mapping entry 6	U32	RW	No	–	68BC 0020h		A
	07h	Mapping entry 7	U32	RW	No	–	683F 0010h		A
	08h	Mapping entry 8	U32	RW	No	–	68FD 0020h		A

- **Driver axis 3 Transmit PDO mapping 1 (1A20h)**

  This is used to set the transmit PDO mapping 1 of the driver axis 3.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1A20h	00h	Number of entries	U8	RW	No	–	3	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	7041 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	7064 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	7061 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	0000 0000h		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

- **Driver axis 3 Transmit PDO mapping 2 (1A21h)**

  This is used to set the transmit PDO mapping 2 of the driver axis 3.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1A21h	00h	Number of entries	U8	RW	No	–	8	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	7041 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	7064 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	7061 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	70B9 0010h		A
	05h	Mapping entry 5	U32	RW	No	–	70BA 0020h		A
	06h	Mapping entry 6	U32	RW	No	–	70BC 0020h		A
	07h	Mapping entry 7	U32	RW	No	–	703F 0010h		A
	08h	Mapping entry 8	U32	RW	No	–	70FD 0020h		A

- **Driver axis 4 Transmit PDO mapping 1 (1A30h)**

  This is used to set the transmit PDO mapping 1 of the driver axis 4.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1A30h	00h	Number of entries	U8	RW	No	–	3	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	7841 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	7864 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	7861 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	0000 0000h		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

- **Driver axis 4 Transmit PDO mapping 2 (1A31h)**

  This is used to set the transmit PDO mapping 2 of the driver axis 4.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1A31h	00h	Number of entries	U8	RW	No	–	8	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	7841 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	7864 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	7861 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	78B9 0010h		A
	05h	Mapping entry 5	U32	RW	No	–	78BA 0020h		A
	06h	Mapping entry 6	U32	RW	No	–	78BC 0020h		A
	07h	Mapping entry 7	U32	RW	No	–	783F 0010h		A
	08h	Mapping entry 8	U32	RW	No	–	78FD 0020h		A

- **Sync Manager communication (1C00h)**

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

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

- **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 "1-4 Process Data Objects (PDO)" on p.36 for how to set the PDO mapping.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1C12h	00h	Number of entries	U8	RW	No	–	4	0 to 4	A
	01h	Index of assigned PDO 1	U16	RW	No	–	1600h	0000h to FFFFh	A
	02h	Index of assigned PDO 2	U16	RW	No	–	1610h		A
	03h	Index of assigned PDO 3	U16	RW	No	–	1620h		A
	04h	Index of assigned PDO 4	U16	RW	No	–	1630h		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 "1-4 Process Data Objects (PDO)" on p.36 for how to set the PDO mapping.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1C13h	00h	Number of entries	U8	RW	No	–	4	0 to 4	A
	01h	Index of assigned PDO 1	U16	RW	No	–	1A00h	0000h to FFFFh	A
	02h	Index of assigned PDO 2	U16	RW	No	–	1A10h		A
	03h	Index of assigned PDO 3	U16	RW	No	–	1A20h		A
	04h	Index of assigned PDO 4	U16	RW	No	–	1A30h		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	Initial value	Range	Update
1C32h	00h	Number of entries	U8	RO	No	–	20h	–	–
	01h	Synchronization Type	U16	RW	No	–	01h	00h, 01h, 02h	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	–	0007 A120h (500,000 ns)		–
	06h	Calc and Copy Time [ns]	U32	RO	No	–	0001 E848h (125,000 ns)		–
	07h	Reserved	U32	–	No	–	–	–	–
	08h	Reserved	U16	–	No	–	–	–	–
	09h	Delay Time [ns]	U32	RO	No	–	0	–	–
	0Ah to 1Fh	Reserved	U16	–	No	–	–	–	–
	20h	Sync Error	BOOL	RO	No	–	0	–	–

Details of Sync Manager 2 Synchronization objects

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	Initial value	Range	Update
1C33h	00h	Number of entries	U8	RO	No	–	20h	–	–
	01h	Synchronization Type	U16	RW	No	–	22h	00h, 02h, 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	–	0007 A120h (500,000 ns)		–
	06h	Calc and Copy Time [ns]	U32	RO	No	–	0003 0D40h (200,000 ns)		–
	07h	Reserved	U32	–	No	–	–	–	–
	08h	Reserved	U16	–	No	–	–	–	–
	09h	Delay Time [ns]	U32	RO	No	–	0	–	–
	0Ah to 1Fh	Reserved	U16	–	No	–	–	–	–
	20h	Sync Error	BOOL	RO	No	–	0	–	–

Details of Sync Manager 3 Synchronization objects

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. Bit0: Free Run mode (asynchronous) Bit1: Sync Manager 2 event synchronization mode Bit2: 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.
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.

2-2 Object list

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1000h	00h	Device Type	U32	RO	No	–	FFFF0192h	–	–
1001h	00h	Error Register	U8	RO	No	–	0	–	–
1008h	00h	Manufacturer Device Name	STRING	RO	No	–	**CVD4A-KED**	–	–
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 1432h	–	–
	03h	Revision Number	U32	RO	No	–	1111 xxxxh	–	–
	04h	Serial Number	U32	RO	No	–	0	–	–
1600h	Axis 1 Receive PDO Mapping 1 (Axis 1 - RxPDO1)								
	00h	Number of entries	U8	RW	No	–	4	0 to 8	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		A
	03h	Mapping entry 3	U32	RW	No	–	6060 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	6081 0020h		A
	05h to 08h	Mapping entry 5 to 8	U32	RW	No	–	0000 0000h		A
1601h	Axis 1 Receive PDO Mapping 2 (Axis 1 - RxPDO2)								
	00h	Number of entries	U8	RW	No	–	5	0 to 8	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		A
	03h	Mapping entry 3	U32	RW	No	–	60FF 0020h		A
	04h	Mapping entry 4	U32	RW	No	–	6060 0008h		A
	05h	Mapping entry 5	U32	RW	No	–	60B8 0010h		A
	06h to 08h	Mapping entry 6 to 8	U32	RW	No	–	0000 0000h		A
1610h	Axis 2 Receive PDO Mapping 1 (Axis 2 - RxPDO1)								
	00h	Number of entries	U8	RW	No	–	4	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	6840 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	687A 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	6860 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	6881 0020h		A
	05h to 08h	Mapping entry 5 to 8	U32	RW	No	–	0000 0000h		A
1611h	Axis 2 Receive PDO Mapping 2 (Axis 2 - RxPDO2)								
	00h	Number of entries	U8	RW	No	–	5	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	6840 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	687A 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	68FF 0020h		A
	04h	Mapping entry 4	U32	RW	No	–	6860 0008h		A
	05h	Mapping entry 5	U32	RW	No	–	68B8 0010h		A
	06h to 08h	Mapping entry 6 to 8	U32	RW	No	–	0000 0000h		A
1620h	Axis 3 Receive PDO Mapping 1 (Axis 3 - RxPDO1)								
	00h	Number of entries	U8	RW	No	–	4	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	7040 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	707A 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	7060 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	7081 0020h		A
	05h to 08h	Mapping entry 5 to 8	U32	RW	No	–	0000 0000h		A

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1621h	Axis 3 Receive PDO Mapping 2 (Axis 3 - RxPDO2)								
	00h	Number of entries	U8	RW	No	–	5	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	7040 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	707A 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	70FF 0020h		A
	04h	Mapping entry 4	U32	RW	No	–	7060 0008h		A
	05h	Mapping entry 5	U32	RW	No	–	70B8 0010h		A
	06h to 08h	Mapping entry 6 to 8	U32	RW	No	–	0000 0000h		A
1630h	Axis 4 Receive PDO Mapping 1 (Axis 4 - RxPDO1)								
	00h	Number of entries	U8	RW	No	–	4	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	7840 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	787A 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	7860 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	7881 0020h		A
	05h to 08h	Mapping entry 5 to 8	U32	RW	No	–	0000 0000h		A
1631h	Axis 4 Receive PDO Mapping 2 (Axis 4 - RxPDO2)								
	00h	Number of entries	U8	RW	No	–	5	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	7840 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	787A 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	78FF 0020h		A
	04h	Mapping entry 4	U32	RW	No	–	7860 0008h		A
	05h	Mapping entry 5	U32	RW	No	–	78B8 0010h		A
	06h to 08h	Mapping entry 6 to 8	U32	RW	No	–	0000 0000h		A
1A00h	Axis 1 Transmit PDO Mapping 1 (Axis 1 - TxPDO1)								
	00h	Number of entries	U8	RW	No	–	3	0 to 8	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		A
	03h	Mapping entry 3	U32	RW	No	–	6061 0008h		A
	04h to 08h	Mapping entry 4 to 8	U32	RW	No	–	0000 0000h		A
1A01h	Axis 1 Transmit PDO Mapping 2 (Axis 1 - TxPDO2)								
	00h	Number of entries	U8	RW	No	–	8	0 to 8	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		A
	03h	Mapping entry 3	U32	RW	No	–	6061 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	60B9 0010h		A
	05h	Mapping entry 5	U32	RW	No	–	60BA 0020h		A
	06h	Mapping entry 6	U32	RW	No	–	60BC 0020h		A
	07h	Mapping entry 7	U32	RW	No	–	603F 0010h		A
	08h	Mapping entry 8	U32	RW	No	–	60FD 0020h		A
1A10h	Axis 2 Transmit PDO Mapping 1 (Axis 2 - TxPDO1)								
	00h	Number of entries	U8	RW	No	–	3	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	6841 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	6864 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	6861 0008h		A
	04h to 08h	Mapping entry 4 to 8	U32	RW	No	–	0000 0000h		A
1A11h	Axis 2 Transmit PDO Mapping 2 (Axis 2 - TxPDO2)								
	00h	Number of entries	U8	RW	No	–	8	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	6841 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	6864 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	6861 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	68B9 0010h		A
	05h	Mapping entry 5	U32	RW	No	–	68BA 0020h		A
	06h	Mapping entry 6	U32	RW	No	–	68BC 0020h		A
	07h	Mapping entry 7	U32	RW	No	–	683F 0010h		A
	08h	Mapping entry 8	U32	RW	No	–	68FD 0020h		A

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1A20h	Axis 3 Transmit PDO Mapping 1 (Axis 3 - TxPDO1)								
	00h	Number of entries	U8	RW	No	–	3	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	7041 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	7064 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	7061 0008h		A
	04h to 08h	Mapping entry 4 to 8	U32	RW	No	–	0000 0000h		A
1A21h	Axis 3 Transmit PDO Mapping 2 (Axis 3 - TxPDO2)								
	00h	Number of entries	U8	RW	No	–	8	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	7041 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	7064 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	7061 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	70B9 0010h		A
	05h	Mapping entry 5	U32	RW	No	–	70BA 0020h		A
	06h	Mapping entry 6	U32	RW	No	–	70BC 0020h		A
	07h	Mapping entry 7	U32	RW	No	–	703F 0010h		A
	08h	Mapping entry 8	U32	RW	No	–	70FD 0020h		A
1A30h	Axis 4 Transmit PDO Mapping 1 (Axis 4 - TxPDO1)								
	00h	Number of entries	U8	RW	No	–	3	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	7841 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	7864 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	7861 0008h		A
	04h to 08h	Mapping entry 4 to 8	U32	RW	No	–	0000 0000h		A
1A31h	Axis 4 Transmit PDO Mapping 2 (Axis 4 - TxPDO2)								
	00h	Number of entries	U8	RW	No	–	8	0 to 8	A
	01h	Mapping entry 1	U32	RW	No	–	7841 0010h	0000 0000h to FFFF FFFFh	A
	02h	Mapping entry 2	U32	RW	No	–	7864 0020h		A
	03h	Mapping entry 3	U32	RW	No	–	7861 0008h		A
	04h	Mapping entry 4	U32	RW	No	–	78B9 0010h		A
	05h	Mapping entry 5	U32	RW	No	–	78BA 0020h		A
	06h	Mapping entry 6	U32	RW	No	–	78BC 0020h		A
	07h	Mapping entry 7	U32	RW	No	–	783F 0010h		A
	08h	Mapping entry 8	U32	RW	No	–	78FD 0020h		A
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 (MainDevice to driver)		–
	02h	Communication type sync manager 1	U8	RO	No	–	2: Mailbox input (Driver to MainDevice)		–
	03h	Communication type sync manager 2	U8	RO	No	–	3: Process data output (MainDevice to driver)		–
	04h	Communication type sync manager 3	U8	RO	No	–	4: Process data input (Driver to MainDevice)		–
1C12h	Sync Manager 2 PDO assignment								
	00h	Number of entries	U8	RW	No	–	4	0 to 4	A
	01h	Index of assigned PDO 1	U16	RW	No	–	1600h	0000h to FFFFh	A
	02h	Index of assigned PDO 2	U16	RW	No	–	1610h		A
	03h	Index of assigned PDO 3	U16	RW	No	–	1620h		A
	04h	Index of assigned PDO 4	U16	RW	No	–	1630h		A

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
1C13h	Sync Manager 3 PDO assignment								
	00h	Number of entries	U8	RW	No	–	4	0 to 4	A
	01h	Index of assigned PDO 1	U16	RW	No	–	1A00h	0000h to FFFFh	A
	02h	Index of assigned PDO 2	U16	RW	No	–	1A10h		A
	03h	Index of assigned PDO 3	U16	RW	No	–	1A20h		A
	04h	Index of assigned PDO 4	U16	RW	No	–	1A30h		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	–	0007 A120h (500,000 ns)		–
	06h	Calc and Copy Time [ns]	U32	RO	No	–	0001 E848h (125,000 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	–	0007 A120h (500,000 ns)		–
	06h	Calc and Copy Time [ns]	U32	RO	No	–	0003 0D40h (200,000 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	–	–

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.

3-1 Descriptions of each object

- **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.139 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 bits

Bit	Name	Description
0	Switch on	Controls the status of the drive state machine. Refer to "State transition of drive state machine" on p.42 for details.
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 "2 Drive profile" on p.41 for details.
5		
6		
7	Fault reset	Resets the alarm when changing from 0 to 1.
8	Halt	Refer to each operation mode of "2 Drive profile" on p.41 for details.
9	Operation mode specific	
10	Reserved	Reserved
11	Manufacturer specific	Manufacturer-specific bit. Refer to each operation mode of "2 Drive profile" on p.41 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 bits

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.43 for details.
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. It will automatically change to 0 when the information status is resolved.
8	Manufacturer specific	Manufacturer-specific bit. Refer to each operation mode of "2 Drive profile" on p.41 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 "2 Drive profile" on p.41 for details.
11	Internal limit active	Indicates the status of the function limitation by the internal limit. Refer to each operation mode of "2 Drive profile" on p.41 for details.
12	Operation mode specific	It varies depending on the operation mode. Refer to each operation mode of "2 Drive profile" on p.41 for details.
13		
14	Manufacturer specific	Manufacturer-specific bit. Refer to each operation mode of "2 Drive profile" on p.41 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	All windings off
1	Decelerates to a stop according to the Profile deceleration (6084h). Transitions to "Switch on disabled" after stop.
2	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	Decelerates to a stop according to the Profile deceleration (6084h). Keeps "Quick stop active" after stop.
6	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 action 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	All windings off
1	Decelerates to a stop according to the Profile deceleration (6084h). The motor goes into a non-excitation state after it stops.

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

This is used to set the action 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	All windings off
1	Decelerates to a stop according to the Profile deceleration (6084h). The motor goes into a non-excitation state after it stops.

- **Halt option code (605Dh)**

This is used to set the action 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	Decelerates to a stop according to the Profile deceleration (6084h). Keeps "Operation enabled" after stop.
2	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
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)

● 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.

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

● Position actual internal value (6063h)

This indicates the count value of the encoder input. (x4 multiplication)
The value is cleared to zero when the encoder counter clear of the maintenance command is executed or return-to-home is completed.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6063h	00h	Position actual internal value	INT32	RO	TxPDO	–	–	–

● Position actual value (6064h)

This indicates the command position or the present position detected by the encoder.
For details, refer to the Profile area detection monitor reference selection (command, detection) (41DAh).

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 under which the excessive position deviation alarm is generated.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
6065h	00h	Following error window [1=0.1°]	U32	RW	No	○	0 to 3,600 (Initial value: 72)	C

- **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 command speed or the speed detected by the encoder.
For details, refer to the Profile area detection monitor reference selection (command, detection) (41DAh).

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

- **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 feedback 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

- **Max profile velocity [Hz] (607Fh)**

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

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
607Fh	00h	Max profile velocity [Hz]	U32	RW	RxPDO	○	0 to 4,000,000 (Initial value: 4,000,000)	B

- **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 electronic gear is set, the resolution per revolution of the motor output shaft can be changed. Refer to p.70 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	○		C

● Homing method (6098h)

This is used to set the return-to-home method for return-to-home operation. Refer to p.59 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 with the limit sensor (FW-LS/RV-LS), to start running in the negative direction.
18	Return-to-home with the limit sensor (FW-LS/RV-LS), to start running in the positive direction.
24	Return-to-home with the home sensor (HOMES), to start running in the positive direction.
28	Return-to-home with the home sensor (HOMES), to start 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: 1,000)	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

● Touch probe function (60B8h)

This is used to set the action of the touch probe. Refer to p.71 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 bits

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 each time a trigger is input.
2	Touch probe 1 trigger selection	0	Sets the external latch input EXT1 as a trigger.
		1	Sets the TIM output as a trigger.
3	Reserved	0	Reserved
4	Touch probe 1 positive value action	0	Disables the latch function on the positive value of a trigger.
		1	Enables the latch function on the positive value of a trigger.

Bit	Name	Value	Description
5	Touch probe 1 negative value action	0	Disables the latch function on the negative value of a trigger.
		1	Enables the latch function on 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 each time a trigger is input.
10	Touch probe 2 trigger selection	0	Sets the external latch input EXT2 as a trigger.
		1	Sets the TIM output as a trigger.
11	Reserved	0	Reserved
12	Touch probe 2 positive value action	0	Disables the latch function on the positive value of a trigger.
		1	Enables the latch function on the positive value of a trigger.
13	Touch probe 2 negative value action	0	Disables the latch function on the negative value of a trigger.
		1	Enables the latch function on the negative value of a trigger.
14	Reserved	0	Reserved
15	Reserved	0	Reserved

- **Touch probe status (60B9h)**

This indicates the status of the touch probe. Refer to p.71 for details.

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

Details of 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

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

This indicates the position latched on 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 on 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 on 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 on 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	–	–	–

- **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
60E3h	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	–

Details of range

Setting value	Description
17	Return-to-home with the limit sensor (FW-LS/RV-LS), to start running in the negative direction.
18	Return-to-home with the limit sensor (FW-LS/RV-LS), to start running in the positive direction.
24	Return-to-home with the home sensor (HOMES), to start running in the positive direction.
28	Return-to-home with the home sensor (HOMES), to start 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 position actual value (feedback 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 I/O.

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

Details of bits

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 to 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	DIN2	Status of DIN2 input (0: Not carrying current, 1: Carrying current)*3
27	DIN3	Status of DIN3 input (0: Not carrying current, 1: Carrying current)*3
28 to 31	–	Reserved

*1 To acquire the status, input signals are required to be assigned to the input terminals IN0 and IN3 of the input signal connector (CN9). Assign using the DIN0 input function (4840h) to the DIN3 input function (4843h).
*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	–		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 bits

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

- **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 bits

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

3-2 Object list

memo In this manual, the index of the driver axis 1 is described for the objects in the profile area. The objects of the driver axis 2 to axis 4 are indexes offset by 800h from the object on the previous axis.

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	0000h to FFFFh	A
6041h	00h	Statusword	U16	RO	TxPDO	–	–	–	–
605Ah	00h	Quick stop option code	INT16	RW	No	○	2	0, 1, 2, 3, 5, 6, 7	A
605Bh	00h	Shutdown option code	INT16	RW	No	○	1	0, 1	A
605Ch	00h	Disable operation option code	INT16	RW	No	○	1	0, 1	A
605Dh	00h	Halt option code	INT16	RW	No	○	1	1 to 3	A
6060h	00h	Modes of operation	INT8	RW	RxPDO	○	0	0, 1, 3, 6, 8, 9	B
6061h	00h	Modes of operation display	INT8	RO	TxPDO	–	–	–	–
6062h	00h	Position demand value [step]	INT32	RO	TxPDO	–	–	–	–
6063h	00h	Position actual internal value	INT32	RO	TxPDO	–	–	–	–
6064h	00h	Position actual value [step]	INT32	RO	TxPDO	–	–	–	–
6065h	00h	Following error window [1=0.1°]	U32	RW	No	○	72	0 to 3,600	C
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	○	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	○	–2,147,483,648	–2,147,483,648 to 2,147,483,647	A
	02h	Max position limit [step]	INT32	RW	No	○	2,147,483,647		A
607Fh	00h	Max profile velocity [Hz]	U32	RW	RxPDO	○	4,000,000	0 to 4,000,000	B
6081h	00h	Profile velocity [Hz]	U32	RW	RxPDO	○	10,000	0 to 4,000,000	A
6083h	00h	Profile acceleration [step/s^2]	U32	RW	RxPDO	○	300,000	1 to 1,000,000,000	B
6084h	00h	Profile deceleration [step/s^2]	U32	RW	RxPDO	○	300,000	1 to 1,000,000,000	B
6085h	00h	Quick stop deceleration [step/s^2]	U32	RW	RxPDO	○	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	○	1	1 to 65,535	C
	02h	Electronic gear B	U32	RW	No	○	1	1 to 65,535	C
6098h	00h	Homing method	INT8	RW	No	○	24	17, 18, 24, 28, 35, 37, –1	B
6099h	Homing speed								
	00h	Number of entries	U8	RO	No	–	2	–	–
	01h	Speed during search for switch [Hz]	U32	RW	No	○	10,000	1 to 4,000,000	B
	02h	Speed during search for zero [Hz]	U32	RW	No	○	1,000	1 to 10,000	B
609Ah	00h	Homing acceleration [step/s^2]	U32	RW	No	○	300,000	1 to 1,000,000,000	B
60B8h	00h	Touch probe function	U16	RW	RxPDO	–	0000h	0000h to FFFFh	A

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
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	–	–	–	–
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. The driver objects are the objects for driver axes 1 to axis 4. In this manual, the Sub-index is described as "*". Set the axis number (1 to 4) in the Sub-Index of each object to access.

4-1 Descriptions of each object

- **Driver input command (403Eh)**

This is an input command from the MainDevice to the driver.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
403Eh	*	Driver input command	U16	RW	RxPDO	–	0000h to FFFFh (Initial value: 0)	A

- **Driver output status (403Fh)**

The status of R-OUT0 to R-OUT15 can be checked.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
403Fh	*	Driver output status	U16	RO	TxPDO	–	–	–

- **Present alarm (4040h)**

This is the alarm code presently being generated.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4040h	*	Present alarm	U16	RO	TxPDO	–	–	–

- **Alarm history1 (4041h)**

This is the most recent item in the alarm history. When an alarm is being generated, its code is also indicated on the alarm history 1 simultaneously.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4041h	*	Alarm history 1	U16	RO	No	–	–	–

- **Alarm history 2 to 9 (4042h to 4049h)**

These are the items in the alarm history.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4042h	*	Alarm history 2	U16	RO	No	–	–	–
4043h	*	Alarm history 3	U16	RO	No	–	–	–
4044h	*	Alarm history 4	U16	RO	No	–	–	–
4045h	*	Alarm history 5	U16	RO	No	–	–	–
4046h	*	Alarm history 6	U16	RO	No	–	–	–
4047h	*	Alarm history 7	U16	RO	No	–	–	–
4048h	*	Alarm history 8	U16	RO	No	–	–	–
4049h	*	Alarm history 9	U16	RO	No	–	–	–

- **Alarm history 10 (404Ah)**

This is the oldest item in the alarm history.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
404Ah	*	Alarm history 10	U16	RO	No	–	–	–

- **Command speed (4064h)**

This is the present command speed. (r/min)

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4064h	*	Command Speed	INT32	RO	TxPDO	–	–	–

- **Feedback position (4066h)**

This indicates the command position or the present position detected by the encoder. (step)
For details, refer to the Profile area detection monitor reference selection (command, detection) (41DAh).

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4066h	*	Feedback position	INT32	RO	TxPDO	–	–	–

- **Feedback speed (4067h)**

This indicates the present command speed or the speed detected by the encoder. (r/min)
For details, refer to the Profile area detection monitor reference selection (command, detection) (41DAh).

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4067h	*	Feedback speed	INT32	RO	TxPDO	–	–	–

- **Direct I/O (406Ah)**

This is the status of direct I/O.

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

- **Present information (407Bh)**

This is the information code presently being generated.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
407Bh	*	Present information	INT32	RO	TxPDO	–	–	–

- **Driver temperature (407Ch)**

This is the present driver temperature. (1=0.1 °C)

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
407Ch	*	Driver temperature	INT16	RO	TxPDO	–	–	–

- **Feedback position 32-bit counter (4090h)**

This is a 32-bit counter of the feedback position.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4090h	*	Feedback position 32-bit counter	INT32	RO	TxPDO	–	–	–

- **Command position 32-bit counter (4091h)**

This is a 32-bit counter of the command position.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4091h	*	Command position 32-bit counter	INT32	RO	TxPDO	–	–	–

- **Operating current (4092h)**

This is the present operating current. (1=0.1 %)

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4092h	*	Operating current	INT16	RO	TxPDO	–	–	–

- **Main power supply time (40A1h)**

This is the time elapsed since the main power supply was turned on in minutes. (min)

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
40A1h	*	Main power supply time	INT32	RO	TxPDO	–	–	–

- **Inverter voltage (40A3h)**

This is the inverter voltage of the driver. (1=0.1 V)

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
40A3h	*	Inverter voltage	INT16	RO	TxPDO	–	–	–

- **Elapsed time from BOOT (40A9h)**

This is the time elapsed since the control power supply was turned on. (ms)

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
40A9h	*	Elapsed time from BOOT	INT32	RO	TxPDO	–	–	–

- **Alarm reset (40C0h)**

This is used to reset the alarm presently being generated. Some alarms cannot be reset.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
40C0h	*	Alarm reset	U8	RW	No	–	0, 1, 2 (Initial value: 0)	–

Details of range

Setting value	Description
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.

- **Clear alarm history (40C2h)**

This is used to clear the alarm history.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
40C2h	*	Clear alarm history	U8	RW	No	–	0, 1, 2 (Initial value: 0)	–

Details of range

Setting value	Description
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.

- **P-PRESET execution (40C5h)**

This is used to preset the command position.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
40C5h	*	P-PRESET execution	U8	RW	No	–	0, 1, 2 (Initial value: 0)	–

Details of range

Setting value	Description
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.

- **Configuration (40C6h)**

This is used to execute recalculation and setup of the parameter.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
40C6h	*	Configuration	U8	RW	No	–	0, 1, 2 (Initial value: 0)	–

Details of range

Setting value	Description
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.

- **Read batch NV memory (40C8h)**

This is used to read the parameters stored in non-volatile memory to RAM. All operation data and parameters stored in RAM are overwritten.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
40C8h	*	Read batch NV memory	U8	RW	No	–	0, 1, 2 (Initial value: 0)	–

Details of range

Setting value	Description
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.

- **Write batch NV memory (40C9h)**

This is used to write the parameters stored in RAM to non-volatile memory. Non-volatile memory can be rewritten approximately 100,000 times.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
40C9h	*	Write batch NV memory	U8	RW	No	–	0, 1, 2 (Initial value: 0)	–

Details of range

Setting value	Description
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.

- **All data batch initialization (40CAh)**

This is used to reset all parameters stored in non-volatile memory to their initial values.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
40CAh	*	All data batch initialization	U8	RW	No	–	0, 1, 2 (Initial value: 0)	–

Details of range

Setting value	Description
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.

- **Clear information (40D3h)**

Clears the information.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
40D3h	*	Clear information	U8	RW	No	–	0, 1, 2 (Initial value: 0)	–

Details of range

Setting value	Description
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.

- **Clear information history (40D4h)**

Clears the information history.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
40D4h	*	Clear information history	U8	RW	No	–	0, 1, 2 (Initial value: 0)	–

Details of range

Setting value	Description
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.

- **Encoder counter clear (40D7h)**

This is used to clear the Position actual internal value (6063h).

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
40D7h	*	Encoder counter clear	U8	RW	No	–	0, 1, 2 (Initial value: 0)	–

Details of range

Setting value	Description
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.

- **Operating current (4120h)**

This is used to set the motor operating current based on the rated current being 100 %. (1=0.1 %)
In the Profile position mode, it will be updated when operation is started.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4120h	*	Operating current	INT16	RW	RxPDO	○	0 to 1,000 (Initial value: 1,000)	A

- **Stop current (4128h)**

This is used to set the motor stop current based on the rated current being 100 %. (1=0.1 %)

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4128h	*	Stop current	INT16	RW	RxPDO	○	0 to 1,000 (Initial value: 500)	A

- **Command filter setting (4129h)**

This is used to set the filter function to adjust the motor response.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4129h	*	Command filter setting	INT8	RW	No	○	1: LPF (Speed filter) 2: Moving average filter (Initial value: 1)	B

- **Command filter time constant (412Ah)**

This is used to adjust the motor response.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
412Ah	*	Command filter time constant	INT16	RW	RxPDO	○	0 to 200 ms (Initial value: 1)	B

- **Smooth drive function (412Ch)**

This is used to set the smooth drive function.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
412Ch	*	Smooth drive function	U8	RW	No	○	0: Disable 1: Enable (Initial value: 1)	C

- **Automatic current cutback function (4132h)**

This is used to set the automatic current cutback function.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4132h	*	Automatic current cutback function	U8	RW	No	○	0: Disable 1: Enable (Initial value: 1)	A

- **Automatic current cutback switching time (4133h)**

This is used to set a period of time from when the motor stops to when the automatic current cutback function is activated.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4133h	*	Automatic current cutback switching time	INT16	RW	No	○	0 to 1,000 ms (Initial value: 100)	A

- **Applicable motor setting (413Ah)**

This is used to set a motor to be used. Refer to p.69 for a motor that can be set.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
413Ah	*	Applicable motor setting	INT8	RW	No	○	0 to 63 (Initial value: 0)	D

- **Starting speed (4142h)**

This is used to set the starting speed for the Profile position mode (PP) and the Profile velocity mode (PV).

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4142h	*	Starting speed	INT32	RW	No	○	0 to 4,000,000 Hz (Initial value: 5,000)	B

- **Permission of absolute positioning without setting absolute coordinates (4148h)**

This is used to permit absolute positioning operation in a state where coordinates are not set.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4148h	*	Permission of absolute positioning without setting absolute coordinates	U8	RW	No	○	0: Disable 1: Enable (Initial value: 1)	B

- **(JOG) Operating speed (4151h)**

This is used to set the operating speed for JOG operation and inching operation.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4151h	*	(JOG) Operating speed	INT32	RW	No	○	1 to 4,000,000 Hz (Initial value: 10,000)	B

- **(JOG) Acceleration/deceleration (4152h)**

This is used to set the acceleration/deceleration rate or the acceleration/deceleration time for JOG operation.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4152h	*	(JOG) Acceleration/ deceleration	INT32	RW	No	○	1 to 1,000,000,000 kHz/s (Initial value: 300,000)	B

- **(JOG) Starting speed (4153h)**

This is used to set the starting speed for JOG operation.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4153h	*	(JOG) Starting speed	INT32	RW	No	○	0 to 4,000,000 Hz (Initial value: 5,000)	B

- **(JOG) Operating speed (high) (4154h)**

This is used to set the operating speed for high-speed JOG operation.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4154h	*	(JOG) Operating speed (high)	INT32	RW	No	○	1 to 4,000,000 Hz (Initial value: 50,000)	B

- **JOG/HOME command filter time constant (415Eh)**

This is used to set the time constant for the command filter.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
415Eh	*	JOG/HOME command filter time constant	INT16	RW	No	○	1 to 200 ms (Initial value: 1)	B

- **JOG/HOME operating current (415Fh)**

This is used to set the operating current for JOG operation. (1=0.1 %)

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
415Fh	*	JOG/HOME operating current	INT16	RW	No	○	0 to 1,000 (Initial value: 1,000)	B

- **(HOME) Return-to-home mode (4160h)**

This is used to set the return-to-home method.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4160h	*	(HOME) Return-to-home mode	U8	RW	No	○	0: 2-sensor 1: 3-sensor 2: One-way rotation (Initial value: 1)	B

- **(HOME) Return-to-home starting direction (4161h)**

This is used to set the starting direction for detecting the home.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4161h	*	(HOME) Return-to-home starting direction	U8	RW	No	○	0: Negative side 1: Positive side (Initial value: 1)	B

- **(HOME) Return-to-home starting speed (4163h)**

This is used to set the starting speed for return-to-home operation.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4163h	*	(HOME) Return-to-home starting speed	INT32	RW	No	○	1 to 4,000,000 Hz (Initial value: 5,000)	B

- **(HOME) Return-to-home SLIT detection (4166h)**

This is used to set whether to use the SLIT input together when returning to the home.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4166h	*	(HOME) Return-to-home SLIT detection	U8	RW	No	○	0: Disable 1: Enable (Initial value: 0)	B

- **(HOME) Return-to-home TIM/ZSG signal detection (4167h)**

This is used to set whether to use the TIM output or the ZSG output together when returning to the home.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4167h	*	(HOME) Return-to-home TIM/ZSG signal detection	U8	RW	No	○	0: Disable 1: TIM output 2: ZSG output (Initial value: 0)	B

- **(HOME) Return-to-home position offset (4168h)**

This is used to set the amount of offset from the home.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4168h	*	(HOME) Return-to-home position offset	INT32	RW	No	○	−2,147,483,647 to 2,147,483,647 steps (Initial value: 0)	B

- **(HOME) Backward steps in 2 sensor return-to-home (4169h)**

This is used to set the amount of backward steps after return-to-home operation in 2-sensor mode.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4169h	*	(HOME) Backward steps in 2 sensor return-to-home	INT32	RW	No	○	0 to 8,388,607 steps (Initial value: 5,000)	B

- **(HOME) Operating amount in uni-directional return-to-home (416Ah)**

This is used to set the operating amount after return-to-home operation in the one-way rotation mode.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
416Ah	*	(HOME) Operating amount in uni-directional return-to-home	INT32	RW	No	○	0 to 8,388,607 steps (Initial value: 5,000)	B

- **Other axis alarm (4187h)**

When an alarm is generated in one of the driver axes, it will cause all other driver axes to generate the alarm. If one of the driver axes is set to enable, all of the driver axes will be enabled.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4187h	*	Other axis alarm	U8	RW	No	○	0: Disable 1: Enable (Initial value: 0)	A

- **Driver temperature information (INFO-DRVTMP) (41A0h)**

This is used to set the condition under which the information is generated.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
41A0h	*	Driver temperature information (INFO-DRVTMP)	INT16	RW	RxPDO	○	40 to 85 °C (Initial value: 85)	A

- **Overvoltage information (INFO-OVOLT) (41ABh)**

This is used to set the condition under which the information is generated.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
41ABh	*	Overvoltage information (INFO-OVOLT)	INT16	RW	RxPDO	○	180 to 430 V (Initial value: 430)	A

- **Undervoltage information (INFO-UVOLT) (41ACh)**

This is used to set the condition under which the information is generated.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
41ACh	*	Undervoltage information (INFO-UVOLT)	INT16	RW	RxPDO	○	180 to 430 V (Initial value: 180)	A

- **Information auto clear (41BFh)**

When the cause of the information is removed, the INFO output and the bit output of the corresponding information are automatically turned OFF.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
41BFh	*	Information auto clear	U8	RW	No	○	0: Disabled (Not turned OFF automatically) 1: Enabled (Turned OFF automatically) (Initial value: 1)	A

- **Motor rotation direction (41C2h)**

This is used to set the rotation direction of the motor output shaft.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
41C2h	*	Motor rotation direction	U8	RW	No	○	0: Positive side=Counterclockwise 1: Positive side=Clockwise (Initial value: 1)	C

● Software overtravel (41C3h)

This is used to set the action when the software overtravel is detected.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
41C3h	*	Software overtravel	INT8	RW	No	○	−1: Disable 0: Immediate stop 1: Deceleration stop 2: Immediate stop with alarm 3: Deceleration stop with alarm (Initial value: 3)	A

● Preset position (41C6h)

Sets the preset position.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
41C6h	*	Preset position	INT32	RW	No	○	−2,147,483,648 to 2,147,483,647 steps (Initial value: 0)	A

● Encoder resolution (41D4h)

This is used to set the resolution of the phase A / phase B encoder to be connected. Set the value to half the encoder resolution when using a high-resolution motor.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
41D4h	*	Encoder resolution	INT32	RW	No	○	1 to 32,767 (Initial value: 500)	C

● Excessive position deviation alarm enable/disable (41D8h)

An alarm of Excessive position deviation can be detected when an encoder is connected.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
41D8h	*	Excessive position deviation alarm enable/disable	U8	RW	No	○	0: Disable 1: Enable (Initial value: 0)	A

● Encoder type (41D9h)

This is used to set the type of the encoder to be connected. If "0: Not used" is selected, the command value is displayed on the monitor value of the feedback position and speed.
For details, refer to the Profile area detection monitor reference selection (command, detection) (41DAh).

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
41D9h	*	Encoder type	U8	RW	No	○	0: Not used 1: Phase A / phase B encoder (Initial value: 0)	D

● Profile area detection monitor reference selection (command, detection) (41DAh)

This is used to select whether to display the Position actual value (6064h) or the Velocity actual value (606Ch).

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
41DAh	*	Profile area detection monitor reference selection (command, detection)	U8	RW	No	○	0: Command 1: Detection (Initial value: 0)	A

The display content of each object varies as shown in the table, depending on the settings of the Encoder type (41D9h) and Profile area detection monitor reference selection (command, detection) (41DAh).

Encoder type (41D9h)	Profile area detection monitor reference selection (command, detection) (41DAh)	Feedback position (4066h)	Feedback speed (4067h)	Position actual value (6064h)	Velocity actual value (606Ch)
0: Not used	0: Command	Command value	Command value	Command value	Command value
	1: Detection	Command value	Command value	Command value	Command value
1: Phase A / Phase B encoder	0: Command	Detection value	Detection value	Command value	Command value
	1: Detection	Detection value	Detection value	Detection value	Detection value

- **Information history 1 (4510h)**

  This is the most recent item in the information history. When information is being generated, its code is also indicated on the information history 1 simultaneously.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4510h	*	Information history 1	INT32	RO	No	–	–	–

- **Information history 2 to 15 (4511h to 451Eh)**

  These are the item in the information history.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4511h	*	Information history 2	INT32	RO	No	–	–	–
4512h	*	Information history 3	INT32	RO	No	–	–	–
4513h	*	Information history 4	INT32	RO	No	–	–	–
4514h	*	Information history 5	INT32	RO	No	–	–	–
4515h	*	Information history 6	INT32	RO	No	–	–	–
4516h	*	Information history 7	INT32	RO	No	–	–	–
4517h	*	Information history 8	INT32	RO	No	–	–	–
4518h	*	Information history 9	INT32	RO	No	–	–	–
4519h	*	Information history 10	INT32	RO	No	–	–	–
451Ah	*	Information history 11	INT32	RO	No	–	–	–
451Bh	*	Information history 12	INT32	RO	No	–	–	–
451Ch	*	Information history 13	INT32	RO	No	–	–	–
451Dh	*	Information history 14	INT32	RO	No	–	–	–
451Eh	*	Information history 15	INT32	RO	No	–	–	–

- **Information history 16 (451Fh)**

  This is the oldest item in the information history.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
451Fh	*	Information history 16	INT32	RO	No	–	–	–

- **Information time history 1 (4520h)**

  This is the history item of the time when the most recent information was generated. When information is being generated, the generated time is also indicated on the information history 1 simultaneously.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4520h	*	Information time history 1	INT32	RO	No	–	–	–

- **Information time history 2 to 15 (4521h to 452Eh)**

These are the history items of the time when the information was generated.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4521h	*	Information time history 2	INT32	RO	No	–	–	–
4522h	*	Information time history 3	INT32	RO	No	–	–	–
4523h	*	Information time history 4	INT32	RO	No	–	–	–
4524h	*	Information time history 5	INT32	RO	No	–	–	–
4525h	*	Information time history 6	INT32	RO	No	–	–	–
4526h	*	Information time history 7	INT32	RO	No	–	–	–
4527h	*	Information time history 8	INT32	RO	No	–	–	–
4528h	*	Information time history 9	INT32	RO	No	–	–	–
4529h	*	Information time history 10	INT32	RO	No	–	–	–
452Ah	*	Information time history 11	INT32	RO	No	–	–	–
452Bh	*	Information time history 12	INT32	RO	No	–	–	–
452Ch	*	Information time history 13	INT32	RO	No	–	–	–
452Dh	*	Information time history 14	INT32	RO	No	–	–	–
452Eh	*	Information time history 15	INT32	RO	No	–	–	–

- **Information time history 16 (452Fh)**

This is the history item of the time when the oldest information was generated.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
452Fh	*	Information time history 16	INT32	RO	No	–	–	–

- **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	*	Driver CPU number	U16	RO	No	–	–	–

- **Driver axis 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	*	Driver axis software version	U16	RO	No	–	–	–

- **STOP input action (4700h)**

This is used to set how to stop the motor when the STOP input is turned ON.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4700h	*	STOP input action	INT8	RW	No	○	0: Immediate stop 3: Deceleration stop (Initial value: 3)	A

- **FW-LS/RV-LS input action (4701h)**

This is used to set how to stop the motor when the FW-LS input or the RV-LS input is turned ON.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4701h	*	FW-LS/RV-LS input action	INT8	RW	No	○	–1: Used as a return-to-home sensor 0: Immediate stop 1: Deceleration stop 2: Immediate stop with alarm 3: Deceleration stop with alarm (Initial value: 2)	A

- **FW-BLK/RV-BLK input action (4702h)**

This is used to set how to stop the motor when the FW-BLK input or the RV-BLK input is turned ON.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4702h	*	FW-BLK/RV-BLK input action	INT8	RW	No	○	0: Immediate stop 1: Deceleration stop (Initial value: 0)	A

- **MOVE minimum ON time (470Ah)**

This is used to set the minimum time during which the MOVE output remains ON.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
470Ah	*	MOVE minimum ON time	U8	RW	No	○	0 to 255 ms (Initial value: 0)	A

- **AREA positive direction position/offset, AREA negative direction position/detection range (4740h to 4743h)**

  - AREA positive direction position/offset
    This is used to set the positive direction position or offset from the target position for the AREA output.
  - AREA negative direction position/detection range
    This is used to set the negative direction position or distance from the offset position for the AREA output.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4740h	*	AREA0 positive direction position/offset	INT32	RW	No	○	−2,147,483,648 to 2,147,483,647 steps (Initial value: 0)	A
4741h	*	AREA0 negative direction position/detection range	INT32	RW	No	○		A
4742h	*	AREA1 positive direction position/offset	INT32	RW	No	○		A
4743h	*	AREA1 negative direction position/detection range	INT32	RW	No	○		A

- **AREA range setting mode (4750h, 4751h)**

This is used to set the range setting method for the AREA output.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4750h	*	AREA0 range setting mode	U8	RW	No	○	0: Range setting with absolute value 1: Offset/width setting from the target position (Initial value: 0)	A
4751h	*	AREA1 range setting mode	U8	RW	No	○		A

- **INFO action (47A2h to 47BFh)**

  This is used to set the status of the bit output and the INFO output when information is generated.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
47A2h	*	INFO action (Driver temperature information (INFO-DRVTMP))	U8	RW	No	○	0: Only the bit output is ON 1: Bit output and INFO output are ON (Initial value: 1)	A
47A4h	*	INFO action (Overvoltage information (INFO-OVOLT))	U8	RW	No	○		A
47A5h	*	INFO action (Undervoltage information (INFO-UVOLT))	U8	RW	No	○		A
47A9h	*	INFO action (Start operation error information (INFO-START))	U8	RW	No	○		A
47ABh	*	INFO action (PRESET request information (INFO-PR-REQ))	U8	RW	No	○		A
47ACh	*	INFO action (Motor setting error information (INFO-MSET-E))	U8	RW	No	○		A
47ADh	*	INFO action (Electronic gear setting error information (INFO-EGR-E))	U8	RW	No	○		A
47B0h	*	INFO action (Forward operation prohibition information (INFO-FW-OT))	U8	RW	No	○		A
47B1h	*	INFO action (Reverse operation prohibition information (INFO-RV-OT))	U8	RW	No	○		A
47BCh	*	INFO action (Start operation restricted mode information (INFO-DSLMTD))	U8	RW	No	○		A
47BDh	*	INFO action (I/O test mode information (INFO-IOTEST))	U8	RW	No	○		A
47BEh	*	INFO action (Configuration request information (INFO-CFG))	U8	RW	No	○		A
47BFh	*	INFO action (Reboot request information (INFO-RBT))	U8	RW	No	○		A

- **DIN input function (4840h to 4843h)**

  These are used to select an input signal to be assigned to DIN. (Input signal list ⇨p.17)

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Update
4840h	*	DIN0 input function	U8	RW	No	○	28	C
4841h	*	DIN1 input function	U8	RW	No	○	29	C
4842h	*	DIN2 input function	U8	RW	No	○	30	C
4843h	*	DIN3 input function	U8	RW	No	○	1	C

- **DIN inverting mode (4850h to 4853h)**

  These are used to change the ON-OFF setting of DIN.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4850h	*	DIN0 inverting mode	U8	RW	No	○	0: Non invert 1: Invert (Initial value: 0)	C
4851h	*	DIN1 inverting mode	U8	RW	No	○		C
4852h	*	DIN2 inverting mode	U8	RW	No	○		C
4853h	*	DIN3 inverting mode	U8	RW	No	○		C

- **DOUT (Normal) output function (4860h)**

This is used to select an output signal to be assigned to DOUT. (Output signal list ⇨p.18)

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Update
4860h	*	DOUT (Normal) output function	U8	RW	No	○	130	C

- **DOUT inverting mode (4870h)**

This is used to change the ON-OFF setting of DOUT.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4870h	*	DOUT inverting mode	U8	RW	No	○	0: Non invert 1: Invert (Initial value: 0)	C

- **DIN ON signal dead-time (48C0h to 48C3h)**

These are used to set the ON signal dead-time of DIN.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
48C0h	*	DIN0 ON signal dead-time	U8	RW	No	○	0 to 250 ms (Initial value: 0)	C
48C1h	*	DIN1 ON signal dead-time	U8	RW	No	○		C
48C2h	*	DIN2 ON signal dead-time	U8	RW	No	○		C
48C3h	*	DIN3 ON signal dead-time	U8	RW	No	○		C

- **DOUT OFF delay time (48E0h)**

This is used to set the OFF delay time of DOUT.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
48E0h	*	DOUT OFF delay time	U8	RW	No	○	0 to 250 ms (Initial value: 0)	C

- **R-IN input function (4900h to 4907h)**

These are used to select an input signal to be assigned to R-IN. (Input signal list ⇨p.17)

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Update
4900h	*	R-IN0 input function	U8	RW	No	○	0	C
4901h	*	R-IN1 input function	U8	RW	No	○		C
4902h	*	R-IN2 input function	U8	RW	No	○		C
4903h	*	R-IN3 input function	U8	RW	No	○		C
4904h	*	R-IN4 input function	U8	RW	No	○		C
4905h	*	R-IN5 input function	U8	RW	No	○		C
4906h	*	R-IN6 input function	U8	RW	No	○		C
4907h	*	R-IN7 input function	U8	RW	No	○		C

- **R-OUT output function (4910h to 491Fh)**

These are used to select an output signal to be assigned to R-OUT. (Output signal list ⇨p.18)

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Update
4910h	*	R-OUT0 output function	U8	RW	No	○	28	C
4911h	*	R-OUT1 output function	U8	RW	No	○	29	C
4912h	*	R-OUT2 output function	U8	RW	No	○	155	C
4913h	*	R-OUT3 output function	U8	RW	No	○	0	C
4914h	*	R-OUT4 output function	U8	RW	No	○	144	C
4915h	*	R-OUT5 output function	U8	RW	No	○	204	C
4916h	*	R-OUT6 output function	U8	RW	No	○	135	C
4917h	*	R-OUT7 output function	U8	RW	No	○	129	C
4918h	*	R-OUT8 output function	U8	RW	No	○	136	C
4919h	*	R-OUT9 output function	U8	RW	No	○	160	C
491Ah	*	R-OUT10 output function	U8	RW	No	○	161	C
491Bh	*	R-OUT11 output function	U8	RW	No	○	128	C
491Ch	*	R-OUT12 output function	U8	RW	No	○	157	C
491Dh	*	R-OUT13 output function	U8	RW	No	○	134	C
491Eh	*	R-OUT14 output function	U8	RW	No	○	128	C
491Fh	*	R-OUT15 output function	U8	RW	No	○	128	C

- **R-OUT OFF delay time (4930h to 493Fh)**

These are used to set the OFF delay time of R-OUT.

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
4930h	*	R-OUT0 OFF delay time	U8	RW	No	○	0 to 250 ms (Initial value: 0)	C
4931h	*	R-OUT1 OFF delay time	U8	RW	No	○		C
4932h	*	R-OUT2 OFF delay time	U8	RW	No	○		C
4933h	*	R-OUT3 OFF delay time	U8	RW	No	○		C
4934h	*	R-OUT4 OFF delay time	U8	RW	No	○		C
4935h	*	R-OUT5 OFF delay time	U8	RW	No	○		C
4936h	*	R-OUT6 OFF delay time	U8	RW	No	○		C
4937h	*	R-OUT7 OFF delay time	U8	RW	No	○		C
4938h	*	R-OUT8 OFF delay time	U8	RW	No	○		C
4939h	*	R-OUT9 OFF delay time	U8	RW	No	○		C
493Ah	*	R-OUT10 OFF delay time	U8	RW	No	○		C
493Bh	*	R-OUT11 OFF delay time	U8	RW	No	○		C
493Ch	*	R-OUT12 OFF delay time	U8	RW	No	○		C
493Dh	*	R-OUT13 OFF delay time	U8	RW	No	○		C
493Eh	*	R-OUT14 OFF delay time	U8	RW	No	○		C
493Fh	*	R-OUT15 OFF delay time	U8	RW	No	○		C

4-2 Object list

These are Oriental Motor's specific objects. The driver objects are the objects for driver axes 1 to axis 4. In this manual, the Sub-index is described as "*". Set the axis number (1 to 4) in the Sub-Index of each object to access.

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
403Eh	*	Driver input command	U16	RW	RxPDO	–	0	0000h to FFFFh	A
403Fh	*	Driver output status	U16	RO	TxPDO	–	–	–	–
4040h	*	Present alarm	U16	RO	TxPDO	–	–	–	–
4041h	*	Alarm history 1	U16	RO	No	–	–	–	–
4042h	*	Alarm history 2							
4043h	*	Alarm history 3							
4044h	*	Alarm history 4							
4045h	*	Alarm history 5							
4046h	*	Alarm history 6							
4047h	*	Alarm history 7							
4048h	*	Alarm history 8							
4049h	*	Alarm history 9							
404Ah	*	Alarm history 10							
4064h	*	Command speed [r/min]	INT32	RO	TxPDO	–	–	–	–
4066h	*	Feedback position [step]	INT32	RO	TxPDO	–	–	–	–
4067h	*	Feedback speed [r/min]	INT32	RO	TxPDO	–	–	–	–
4068h	*	Feedback speed [Hz]	INT32	RO	TxPDO	–	–	–	–
406Ah	*	Direct I/O	U32	RO	TxPDO	–	–	–	–
407Bh	*	Present information	INT32	RO	TxPDO	–	–	–	–
407Ch	*	Driver temperature [1=0.1 °C]	INT16	RO	TxPDO	–	–	–	–
4090h	*	Feedback position 32-bit counter	INT32	RO	TxPDO	–	–	–	–
4091h	*	Command position 32-bit counter	INT32	RO	TxPDO	–	–	–	–
4092h	*	Operating current [1=0.1 %]	INT16	RO	TxPDO	–	–	–	–
40A1h	*	Main power supply time [min]	INT32	RO	TxPDO	–	–	–	–
40A3h	*	Inverter voltage [1=0.1 V]	INT16	RO	TxPDO	–	–	–	–
40A9h	*	Elapsed time from BOOT [ms]	INT32	RO	TxPDO	–	–	–	–
40C0h	*	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	*	Clear alarm history	U8	RW	No	–	0		
40C5h	*	P-PRESET execution	U8	RW	No	–	0		
40C6h	*	Configuration	U8	RW	No	–	0		
40C8h	*	Read batch NV memory	U8	RW	No	–	0		
40C9h	*	Write batch NV memory	U8	RW	No	–	0		
40CAh	*	All data batch initialization	U8	RW	No	–	0		
40D3h	*	Clear information	U8	RW	No	–	0		
40D4h	*	Clear information history	U8	RW	No	–	0		
40D7h	*	Encoder counter clear	U8	RW	No	–	0		
4120h	*	Operating current [1=0.1 %]	INT16	RW	RxPDO	○	1,000	0 to 1,000	A*1
4128h	*	Stop current [1=0.1 %]	INT16	RW	RxPDO	○	500	0 to 1,000	A
4129h	*	Command filter setting	INT8	RW	No	○	1	1: LPF (Speed filter) 2: Moving average filter	B
412Ah	*	Command filter time constant [ms]	INT16	RW	RxPDO	○	1	0 to 200	B
412Ch	*	Smooth drive function	U8	RW	No	○	1	0: Disable 1: Enable	C
4132h	*	Automatic current cutback function	U8	RW	No	○	1	0: Disable 1: Enable	A
4133h	*	Automatic current cutback switching time [ms]	INT16	RW	No	○	100	0 to 1,000	A
413Ah	*	Applicable motor setting	INT8	RW	No	○	0	0 to 63*2	D
4142h	*	Starting speed [Hz]	INT32	RW	No	○	5,000	0 to 4,000,000	B

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
4148h	*	Permission of absolute positioning without setting absolute coordinates	U8	RW	No	○	1	0: Disable 1: Enable	B
4151h	*	(JOG) Operating speed [Hz]	INT32	RW	No	○	10,000	1 to 4,000,000	B
4152h	*	(JOG) Acceleration/ deceleration [kHz/s]	INT32	RW	No	○	300,000	1 to 1,000,000,000	B
4153h	*	(JOG) Starting speed [Hz]	INT32	RW	No	○	5,000	0 to 4,000,000	B
4154h	*	(JOG) Operating speed (high) [Hz]	INT32	RW	No	○	50,000	1 to 4,000,000	B
415Eh	*	JOG/HOME command filter time constant [ms]	INT16	RW	No	○	1	1 to 200	B
415Fh	*	JOG/HOME operating current [1=0.1 %]	INT16	RW	No	○	1,000	0 to 1,000	B
4160h	*	(HOME) Return-to-home mode	U8	RW	No	○	1	0: 2-sensor 1: 3-sensor 2: One-way rotation	B
4161h	*	(HOME) Return-to-home starting direction	U8	RW	No	○	1	0: Negative side 1: Positive side	B
4163h	*	(HOME) Return-to-home starting speed [Hz]	INT32	RW	No	○	5,000	1 to 4,000,000	B
4166h	*	(HOME) Return-to-home SLIT detection	U8	RW	No	○	0	0: Disable 1: Enable	B
4167h	*	(HOME) Return-to-home TIM/ ZSG signal detection	U8	RW	No	○	0	0: Disable 1: TIM output 2: ZSG output	B
4168h	*	(HOME) Return-to-home position offset [step]	INT32	RW	No	○	0	–2,147,483,647 to 2,147,483,647	B
4169h	*	(HOME) Backward steps in 2 sensor return-to-home [step]	INT32	RW	No	○	5,000	0 to 8,388,607	B
416Ah	*	(HOME) Operating amount in uni-directional return-to-home [step]	INT32	RW	No	○	5,000	0 to 8,388,607	B
4187h	*	Other axis alarm	U8	RW	No	○	0	0: Disable 1: Enable	A
41A0h	*	Driver temperature information (INFO-DRVTMP) [°C]	INT16	RW	RxPDO	○	85	40 to 85	A
41ABh	*	Overvoltage information (INFO-OVOLT) [V]	INT16	RW	RxPDO	○	430	180 to 430	A
41ACh	*	Undervoltage information (INFO-UVOLT) [V]	INT16	RW	RxPDO	○	180	180 to 430	A
41BFh	*	Information auto clear	U8	RW	No	○	1	0: Disable (not turned OFF automatically) 1: Enable (turned OFF automatically)	A
41C2h	*	Motor rotation direction	U8	RW	No	○	1	0: Positive side=Counterclockwise 1: Positive side=Clockwise	C
41C3h	*	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	*	Preset position [step]	INT32	RW	No	○	0	–2,147,483,648 to 2,147,483,647	A
41D4h	*	Encoder resolution	INT32	RW	No	○	500	1 to 32,767	C
41D8h	*	Excessive position deviation alarm enable/disable	U8	RW	No	○	0	0: Disable 1: Enable	A
41D9h	*	Encoder type	U8	RW	No	○	0	0: Not used 1: Phase A / phase B encoder	D
41DAh	*	Profile area detection monitor reference selection (command, detection)	U8	RW	No	○	0	0: Command 1: Detection	A

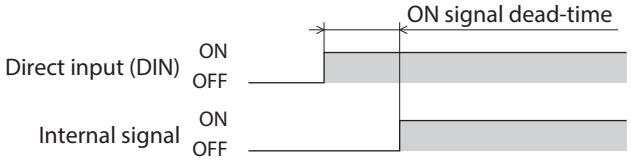
Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
4510h	*	Information history 1	INT32	RO	No	–	–	–	–
4511h	*	Information history 2							
4512h	*	Information history 3							
4513h	*	Information history 4							
4514h	*	Information history 5							
4515h	*	Information history 6							
4516h	*	Information history 7							
4517h	*	Information history 8							
4518h	*	Information history 9							
4519h	*	Information history 10	INT32	RO	No	–	–	–	–
451Ah	*	Information history 11							
451Bh	*	Information history 12							
451Ch	*	Information history 13							
451Dh	*	Information history 14							
451Eh	*	Information history 15							
451Fh	*	Information history 16							
4520h	*	Information time history 1	INT32	RO	No	–	–	–	–
4521h	*	Information time history 2							
4522h	*	Information time history 3							
4523h	*	Information time history 4							
4524h	*	Information time history 5							
4525h	*	Information time history 6							
4526h	*	Information time history 7							
4527h	*	Information time history 8							
4528h	*	Information time history 9							
4529h	*	Information time history 10							
452Ah	*	Information time history 11							
452Bh	*	Information time history 12							
452Ch	*	Information time history 13							
452Dh	*	Information time history 14							
452Eh	*	Information time history 15							
452Fh	*	Information time history 16							
4642h	*	Driver axis CPU number	U16	RO	No	–	–	–	–
4643h	*	Driver axis software version	U16	RO	No	–	–	–	–
4700h	*	STOP input action	INT8	RW	No	○	3	0: Immediate stop 3: Deceleration stop	A
4701h	*	FW-LS/RV-LS input action	INT8	RW	No	○	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	*	FW-BLK, RV-BLK input action	INT8	RW	No	○	0	0: Immediate stop 1: Deceleration stop	A
470Ah	*	MOVE minimum ON time [ms]	U8	RW	No	○	0	0 to 255	A
4740h	*	AREA0 positive direction position/offset [step]	INT32	RW	No	○	0	–2,147,483,648 to 2,147,483,647	A
4741h	*	AREA0 negative direction position/detection range [step]							
4742h	*	AREA1 positive direction position/offset [step]							
4743h	*	AREA1 negative direction position/detection range [step]							
4750h	*	AREA0 range setting mode	U8	RW	No	○	0	0: Range setting with absolute value 1: Offset/width setting from the target position	A
4751h	*	AREA1 range setting mode							

Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
47A2h	*	INFO action (Driver temperature information (INFO-DRVTMP))	U8	RW	No	○	1	0: Only the bit output is ON 1: Bit output and INFO output are ON	A
47A4h	*	INFO action (Overvoltage information (INFO-OVOLT))							
47A5h	*	INFO action (Undervoltage information (INFO-UVOLT))							
47A9h	*	INFO action (Start operation error information (INFO-START))							
47ABh	*	INFO action (PRESET request information (INFO-PR-REQ))							
47ACh	*	INFO action (Motor setting error information (INFO-MSET-E))							
47ADh	*	INFO action (Electronic gear setting error information (INFO-EGR-E))							
47B0h	*	INFO action (Forward operation prohibition information (INFO-FW-OT))							
47B1h	*	INFO action (Reverse operation prohibition information (INFO-RV-OT))							
47BCh	*	INFO action (Start operation restricted mode information (INFO-DSLMTD))							
47BDh	*	INFO action (I/O test mode information (INFO-IOTEST))							
47BEh	*	INFO action (Configuration request information (INFO-CFG))							
47BFh	*	INFO action (Reboot request information (INFO-RBT))							
4840h	*	DIN0 input function	U8	RW	No	○	28	Input signal list⇨p.17	C
4841h	*	DIN1 input function					29		
4842h	*	DIN2 input function					30		
4843h	*	DIN3 input function					1		
4850h	*	DIN0 inverting mode	U8	RW	No	○	○	0: Non invert 1: Invert	C
4851h	*	DIN1 inverting mode							
4852h	*	DIN2 inverting mode							
4853h	*	DIN3 inverting mode							
4860h	*	DOUT (Normal) output function	U8	RW	No	○	130	Output signal list⇨p.18	C
4870h	*	DOUT inverting mode	U8	RW	No	○	0	0: Non invert 1: Invert	C
48C0h	*	DIN0 ON signal dead-time [ms]	U8	RW	No	○	0	0 to 250	C
48C1h	*	DIN1 ON signal dead-time [ms]							
48C2h	*	DIN2 ON signal dead-time [ms]							
48C3h	*	DIN3 ON signal dead-time [ms]							
48E0h	*	DOUT OFF delay time [ms]	U8	RW	No	○	0	0 to 250	C
4900h	*	R-IN0 input function	U8	RW	No	○	0	Input signal list⇨p.17	C
4901h	*	R-IN1 input function							
4902h	*	R-IN2 input function							
4903h	*	R-IN3 input function							
4904h	*	R-IN4 input function							
4905h	*	R-IN5 input function							
4906h	*	R-IN6 input function							
4907h	*	R-IN7 input function							

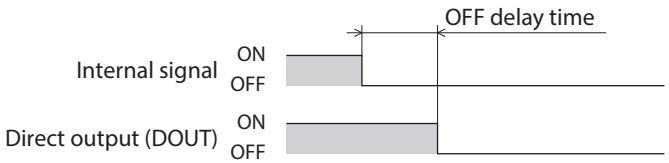
Index	Sub	Name	Type	Access	PDO	Save	Initial value	Range	Update
4910h	*	R-OUT0 output function	U8	RW	No	○	28	Output signal list⇨p.18	C
4911h	*	R-OUT1 output function					29		
4912h	*	R-OUT2 output function					155		
4913h	*	R-OUT3 output function					0		
4914h	*	R-OUT4 output function					144		
4915h	*	R-OUT5 output function					204		
4916h	*	R-OUT6 output function					135		
4917h	*	R-OUT7 output function					129		
4918h	*	R-OUT8 output function					136		
4919h	*	R-OUT9 output function					160		
491Ah	*	R-OUT10 output function					161		
491Bh	*	R-OUT11 output function					128		
491Ch	*	R-OUT12 output function					157		
491Dh	*	R-OUT13 output function					134		
491Eh	*	R-OUT14 output function					128		
491Fh	*	R-OUT15 output function					128		
4930h	*	R-OUT0 OFF delay time [ms]	U8	RW	No	○	0	0 to 250	C
4931h	*	R-OUT1 OFF delay time [ms]							
4932h	*	R-OUT2 OFF delay time [ms]							
4933h	*	R-OUT3 OFF delay time [ms]							
4934h	*	R-OUT4 OFF delay time [ms]							
4935h	*	R-OUT5 OFF delay time [ms]							
4936h	*	R-OUT6 OFF delay time [ms]							
4937h	*	R-OUT7 OFF delay time [ms]							
4938h	*	R-OUT8 OFF delay time [ms]							
4939h	*	R-OUT9 OFF delay time [ms]							
493Ah	*	R-OUT10 OFF delay time [ms]							
493Bh	*	R-OUT11 OFF delay time [ms]							
493Ch	*	R-OUT12 OFF delay time [ms]							
493Dh	*	R-OUT13 OFF delay time [ms]							
493Eh	*	R-OUT14 OFF delay time [ms]							
493Fh	*	R-OUT15 OFF delay time [ms]							

*1 In the Profile position mode, it will be updated when operation is started.
*2 Refer to p.69 for a motor that can be set.

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



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



5 Troubleshooting

This part explains the alarm and information functions.

◆Table of contents

1 Alarms

This driver is equipped with the alarm function to protect against temperature rise, poor connection, operation error, and the like.
If an alarm is generated, the ALM-A output is turned ON and the ALM-B output is turned OFF to stop the motor. At the same time, the ALM LED blinks red.
The type of alarm being generated can be checked by counting the number of blinks of the ALM LED, via EtherCAT, or using the **MEXE02** software.

1-1 Alarm reset

Before resetting an alarm, always correct 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.)
- Turn the ALM-RST input ON. (It is enabled at the ON edge.)
- Execute the alarm reset using the **MEXE02** software.
- Turn on the control power supply again.

Note When turning on the control power supply again, turn off the control power supply and wait for at least five seconds before doing so. The driver may be damaged if the control power supply is turned on immediately after it is turned off.

memo Some alarms cannot be reset by other methods than turning on the control power supply again.
Refer to "1-4 Alarm lists" on p.139.

1-2 Alarm history

Up to 10 generated alarm items are stored in non-volatile memory in order from most recent to oldest. The alarm history can be read and cleared when one of the following items is performed.

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

1-3 Generation condition of alarms

For alarms shown in the table below, an alarm will be generated if the generation condition is exceeded.

Alarm code	Alarm type	Generation condition	Unit
21h	Main circuit overheat	85 (185)	°C (°F)
22h	Overvoltage	43	V
34h	Command position error	9,600	r/min

■ Related object

Index	Sub	Name	Description	Setting range	Initial value
4187h	*	Other axis alarm	When an alarm is generated in one of the driver axes, it will cause all other driver axes to generate the alarm. If one of the driver axes is set to enable, all of the driver axes will be enabled.	0: Disable 1: Enable	0

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

1-4 Alarm lists

■ Alarms of controller section

If an alarm of EEPROM error is detected in the controller section, the alarm will be generated in the controller section and in all axes of the driver section.
Alarms other than EEPROM error are generated only in the controller section.

Alarm code	Number of LED blinks	Alarm type	Cause	Remedial action	How to reset
41h	9	EEPROM error	The data stored in the controller section was damaged.	Initialize all parameters.	Turn on the control power supply again
4Ch	7	Network initialization error	An error was detected during initialization of the EtherCAT module.	Turn on the control power supply again. If the alarm still cannot be cleared, contact your nearest Oriental Motor sales office.	Turn on the control power supply again
82h	7	Driver internal communication error 1	An error was detected in communication with the network CPU.	Refer to "1-1 Alarm reset" on p.138 to reset the alarm. If the alarm still cannot be cleared, contact your nearest Oriental Motor sales office.	Any of reset operations
84h	7	Driver internal communication error 2	An error was detected in internal RS-485 communication.	Turn on the control power supply again. If the alarm still cannot be cleared, contact your nearest Oriental Motor sales office.	Turn on the control power supply again
F0h	Light	CPU error	CPU malfunctioned.	Turn on the control power supply again.	Turn on the control power supply again

■ Alarms of driver section

Note If an alarm is generated in the driver section, the motor goes into a non-excitation state.

Alarm code	Number of 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 feedback position exceeded the value set in the Excessive position deviation alarm (6065h) in the motor output shaft.	• Reduce the load. • Increase the acceleration/deceleration time or slow the acceleration/deceleration rate. • Increase the operating current. • Reconsider the setting of the operation data.	Any of reset operations

Alarm code	Number of LED blinks	Alarm type	Cause	Remedial action	How to reset
20h	5	Overcurrent	• The motor, the cable, and the driver output circuit were short-circuited. • If an encoder is used, the motor connector was wired incorrectly. • An alarm of Overcurrent is latched.	• Turn off the main power supply and the control power supply first, and check that the motor, the cable, and the driver are not damaged before turning on the power supplies again. • If the alarm is generated immediately after the control power supply is turned on, the alarm is latched. Check the wiring of the motor connector and also check if ground fault has occurred, and execute "Latch clear of overcurrent alarm" using the **MEXE02** software.	Turn on the control power supply again **MEXE02** software
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. • Reduce 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 to see if the main power supply is properly supplied. If this alarm is still generated after correcting the wiring of the main power supply, contact your nearest Oriental Motor sales office.	Any of reset operations
25h	3	Undervoltage	The main power supply was momentarily shut off or the voltage was insufficient.	Check the input voltage of the main power supply.	Any of reset operations
34h	2	Command position error	• The operating speed exceeded the permissible value of the driver. • Position preset (P-PRESET) of the driver was executed in the Cyclic synchronous position mode when the motor was in an excitation state.	• Reduce the operating speed. • Put the motor in a non-excitation state before executing position preset (P-PRESET) of the driver in the Cyclic synchronous position mode.	Any of reset operations
35h	2	Alarm detection of other axes	An alarm was generated in one of the driver axes in a state where the Other axis alarm (4187h) was enabled.	Check the alarm content and take appropriate action. Then, reset the alarm for each driver axis.	Any of reset operations
41h	9	EEPROM error	The data stored in the driver was damaged.	Initialize all parameters.	Turn on the control power supply again

Alarm code	Number of LED blinks	Alarm type	Cause	Remedial action	How to reset
4Ah	7	Return-to-home incomplete	Absolute positioning operation was started in a state where the coordinates were not set.	• Reconsider the setting of the Permission of absolute positioning without setting absolute coordinates (4148h). • Execute position preset (P-PRESET) or return-to-home operation.	Any of reset operations
60h	7	±LS both sides active	• When the FW-LS/RV-LS input action (4701h) is set to "Immediate stop with alarm" or "Deceleration stop with alarm", both the FW-LS input or the RV-LS input were detected. • Return-to-home operation was executed in a condition where both the FW-LS input and the RV-LS input were detected.	Check the sensor logic installed and the parameter for the inverting mode.	Any of reset operations
61h	7	Reverse ±LS connection	The LS input opposite to the operating direction was detected while return-to-home operation in the 2-sensor mode or the 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 close 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. • Upon completion of return-to-home operation, ensure that no load exceeding the maximum torque is applied. • Reconsider the specifications of the HOME sensor and the setting 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 HOMES sensor so that these signals should be ON while the HOMES input is ON. • If the signals are not used, disable the Return-to-home TIM/ZSG signal detection (4167h) and Return-to-home SLIT detection (4166h).	Any of reset operations

Alarm code	Number of LED blinks	Alarm type	Cause	Remedial action	How to reset
66h	7	Hardware overtravel	When the FW-LS/RV-LS input action (4701h) is set to "Immediate stop with alarm" or "Deceleration stop with alarm," the FW-LS input or the RV-LS input was detected.	• Reconsider the setting of the operation data. • Operate the motor in the opposite direction to escape from the sensor. The operation can be performed in any of operation modes. It can be escaped even in return-to-home operation.	Any of reset operations
67h	7	Software overtravel	When the Software overtravel (41C3h) is set to "Immediate stop with alarm" or "Deceleration stop with alarm," the motor position reached the value set in the software limit.	• Reconsider the setting of the operation data. • Operate the motor in the opposite direction to escape from the sensor. The operation can be performed in any of operation modes. It can be escaped even in return-to-home operation.	Any of reset operations
6Ah	7	Return-to-home operation offset error	When offset movement as part of return-to-home operation was performed, the FW-LS input or the RV-LS input was detected.	Check the offset value.	Any of reset operations
70h	7	Abnormal operation data	Operation in the profile position mode was started when the operating speed was zero.	Check the operation data.	Any of reset operations
71h	7	Electronic gear setting error	The resolution set in the Electronic gear (6091h) was out of the specification range.	Reconsider the Electronic gear (6091h) and set it so that the resolution is within the specification range.	Turn on the control power supply again
81h	7	Network bus error	• A communication error of EtherCAT was detected during operation. • The EtherCAT communication state machine (ESM) was transitioned to other than Operational during operation.	Check the conditions of the EtherCAT connector, cable, and MainDevice.	Any of reset operations
82h	7	Driver internal communication error 1	An error was detected in communication with the network CPU.	Refer to "1-1 Alarm reset" on p.138 to reset the alarm. If the alarm still cannot be cleared, contact your nearest Oriental Motor sales office.	Any of reset operations
84h	7	Driver internal communication error 2	An error was detected three times consecutively in internal RS-485 communication.	Refer to "1-1 Alarm reset" on p.138 to reset the alarm. If the alarm still cannot be cleared, contact your nearest Oriental Motor sales office.	Any of reset operations
85h	7	Driver internal communication timeout	Internal RS-485 communication was not performed for 200 ms or more.	Refer to "1-1 Alarm reset" on p.138 to reset the alarm. If the alarm still cannot be cleared, contact your nearest Oriental Motor sales office.	Any of reset operations
F0h	Light	CPU error	CPU malfunctioned.	Turn on the control power supply again.	Turn on the control power supply again

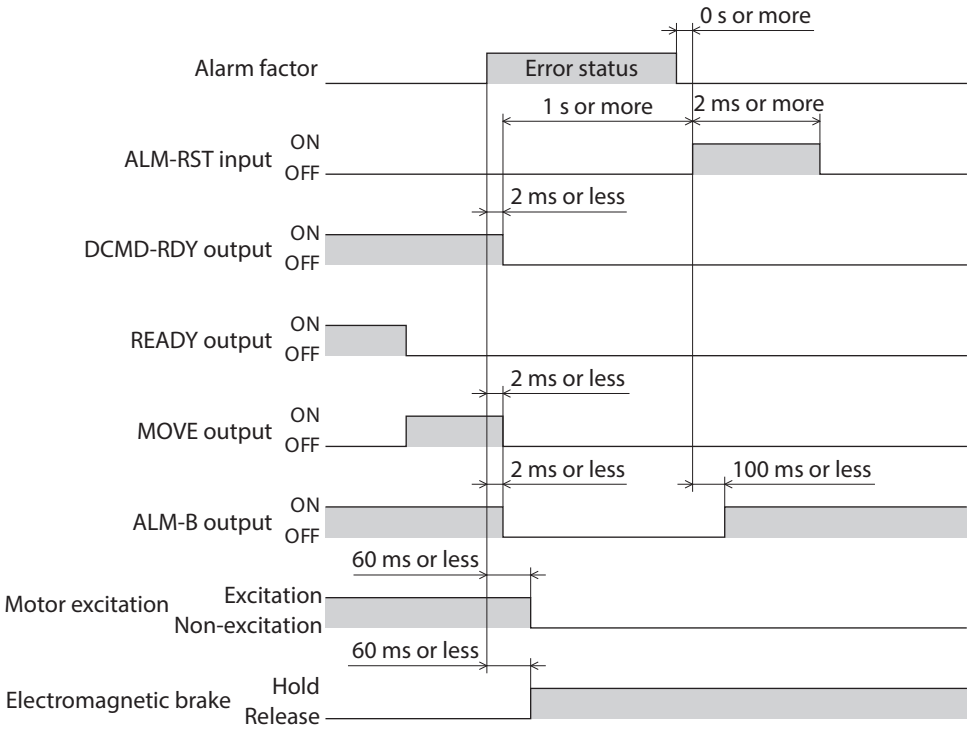
1-5 Timing chart

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 to go into a non-excitation state.
2. Remove the cause of the alarm before turning the ALM-RST input ON.
   The alarm is reset, and the ALM-B output is turned ON.

memo

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

3. Check that the ALM-B output has been turned ON, and then turn the ALM-RST input OFF.



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.

2-1 Status when information is generated

■ Information bit output

If information is generated, a bit output (INFO-∗∗ output) of the corresponding information is turned ON. For details about bit output, refer to p.145.

■ INFO output

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

■ Motor operation

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

■ Parameters

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

Related parameter

Name	Description	Setting range	Initial value
Information auto clear	When the cause of the information is removed, the INFO output and the bit output of the corresponding information are automatically turned OFF.	0: Disable (not turned OFF automatically) 1: Enable (turned OFF automatically)	1
Driver temperature information (INFO-DRVTMP)	Sets the condition under which the driver temperature information (INFO-DRVTMP) is generated.	40 to 85 °C	85
Overvoltage information (INFO-OVOLT)	Sets the condition under which the overvoltage information (INFO-OVOLT) is generated.	180 to 430 (1=0.1 V)	430
Undervoltage information (INFO-UVOLT)	Sets the condition under which the undervoltage information (INFO-UVOLT) is generated.	180 to 430 (1=0.1 V)	180
INFO action (Driver temperature information (INFO-DRVTMP))	Sets the status of the bit output and the INFO output when information is generated.	0: Only the bit output is ON 1: Bit output and INFO output are ON	1
INFO action (Overvoltage information (INFO-OVOLT))			
INFO action (Undervoltage information (INFO-UVOLT))			
INFO action (Start operation error information (INFO-START))			
INFO action (PRESET request information (INFO-PR-REQ))			
INFO action (Motor setting error information (INFO-MSET-E))			

Name	Description	Setting range	Initial value
INFO action (Electronic gear setting error information (INFO-EGR-E))	Sets the status of the bit output and the INFO output when information is generated.	0: Only the bit output is ON 1: Bit output and INFO output are ON	1
INFO action (Forward operation prohibition information (INFO-FW-OT))			
INFO action (Reverse operation prohibition information (INFO-RV-OT))			
INFO action (Start operation restricted mode information (INFO-DSLMTD))			
INFO action (I/O test mode information (INFO-IOTEST))			
INFO action (Configuration request information (INFO-CFG))			
INFO action (Reboot request information (INFO-RBT))			

Check the index number of the parameter in "4 Objects of manufacturer-specific area" on p.115.

2-2 Information history

Up to 16 generated information items are stored in RAM in order from most recent to oldest. The information stored as the information history is the information code, the time of generation, and the information content.
The stored information history can be read or cleared if one of the following operations 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** software.

memo Since information history is stored in RAM, it is cleared when the control power supply of the driver is turned off.

2-3 Information list

Information item	Information bit output signal	Cause	Condition to clear
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).
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 momentarily shut off or the voltage was insufficient.	The voltage of the main power supply exceeded the value set in the Undervoltage information (41ACh).

Information item	Information bit output signal	Cause	Condition to clear
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.	Operation was started normally.
Preset request	INFO-PR-REQ	Preset was executed by position preset (P-PRESET) or return-to-home operation.	Preset was completed.
Motor setting error	INFO-MSET-E	A value not described in "3-1 Setting the applicable product" on p.69 was set.	Set the correct value of the applicable motor setting and write it to non-volatile memory. Then, turn on the control power supply again.
Electronic gear setting error	INFO-EGR-E	The resolution set in the Electronic gear (6091h) was out of the specification range.	The resolution was set within the specification range.
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 of the motor fell into the range of the positive software limit, and additionally, 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 of the motor fell into the range of the negative software limit, and additionally, both the RV-LS input and the RV-BLK input were turned OFF.
Start operation restricted mode	INFO-DSLMTD	• Remote operation was executed with the **MEXE02** software. • Configuration was executed.	• Remote operation was canceled. • Configuration was completed.
I/O test mode	INFO-IOTEST	• I/O test was executed with the **MEXE02** software. • Configuration was executed.	• The I/O test mode was canceled. • Configuration was completed.
Configuration request	INFO-CFG	Configuration was requested to execute.	Configuration was executed.
Reboot request	INFO-RBT	Reboot was requested.	Reboot was executed.

memo If information of Preset request 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.

2-4 Monitor of information

Details of information can be checked with the Information (407Bh) of the driver object.
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
00000004h	0000 0000 0000 0000 0000 0000 0000 0100	Driver temperature	INFO-DRVTMP
00000010h	0000 0000 0000 0000 0000 0000 0001 0000	Overvoltage	INFO-OVOLT
00000020h	0000 0000 0000 0000 0000 0000 0010 0000	Undervoltage	INFO-UVOLT
00000200h	0000 0000 0000 0000 0000 0010 0000 0000	Start operation error	INFO-START
00000800h	0000 0000 0000 0000 0000 1000 0000 0000	Preset request	INFO-PR-REQ
00001000h	0000 0000 0000 0000 0001 0000 0000 0000	Motor setting error	INFO-MSET-E
00002000h	0000 0000 0000 0000 0010 0000 0000 0000	Electronic gear setting error	INFO-EGR-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
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

■ Related objects

Index	Sub	Name	Type	Access	PDO	Save	Range	Update
41A0h	*	Driver temperature information (INFO-DRVTMP) [°C]	INT16	RW	RxPDO	○	40 to 85 (Initial value: 85)	A
41ABh	*	Overvoltage information (INFO-OVOLT) [V]	INT16	RW	RxPDO	○	180 to 430 (Initial value: 430)	A
41ACh	*	Undervoltage information (INFO-UVOLT) [V]	INT16	RW	RxPDO	○	180 to 430 (Initial value: 180)	A
41BFh	*	Information auto clear	U8	RW	No	○	0: Disabled (not turned OFF automatically) 1: Enabled (turned OFF automatically) (Initial value: 1)	A
47A2h	*	INFO action (Driver temperature information (INFO-DRVTMP))	U8	RW	No	○	0: Only the bit output is ON 1: Bit output and INFO output are ON (Initial value: 1)	A
47A4h	*	INFO action (Overvoltage information (INFO-OVOLT))	U8	RW	No	○		A
47A5h	*	INFO action (Undervoltage information (INFO-UVOLT))	U8	RW	No	○		A
47A9h	*	INFO action (Start operation error information (INFO-START))	U8	RW	No	○		A
47ABh	*	INFO action (PRESET request information (INFO-PR-REQ))	U8	RW	No	○		A
47ACh	*	INFO action (Motor setting error information (INFO-MSET-E))	U8	RW	No	○		A
47ADh	*	INFO action (Electronic gear setting error information (INFO-EGR-E))	U8	RW	No	○		A
47B0h	*	INFO action (Forward operation prohibition information (INFO-FW-OT))	U8	RW	No	○		A
47B1h	*	INFO action (Reverse operation prohibition information (INFO-RV-OT))	U8	RW	No	○		A
47BCh	*	INFO action (Start operation restricted mode information (INFO-DSLMTD))	U8	RW	No	○		A
47BDh	*	INFO action (I/O test mode information (INFO-IOTEST))	U8	RW	No	○		A
47BEh	*	INFO action (Configuration request information (INFO-CFG))	U8	RW	No	○		A
47BFh	*	INFO action (Reboot request information (INFO-RBT))	U8	RW	No	○		A

* Set an axis number (1 to 4) in Sub-index due to the driver objects of the manufacturer-specific area.

3 Troubleshooting and remedial actions

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

Phenomenon	Possible cause	Remedial action
• The motor is not excited. • The 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 does not rotate.	When an electromagnetic brake motor is used, the electromagnetic brake is in a state of holding the motor shaft.	Check the connection of the electromagnetic brake.
	The STOP input is being ON.	Turn the STOP input OFF.
The motor rotates in the direction opposite to the specified direction.	The Motor rotation direction (41C2h) is set wrongly.	Check the setting of the Motor rotation direction (41C2h).
	The motor lead wires are incorrectly connected.	Check the connection of the motor lead wires. Connection may vary depending on the motor type, such as 2-phase, 5-phase or the like.
Motor operation is unstable.	Connection error of the motor cable or power supply cable.	Check the connections for the motor and the main power supply.
	The value set in the Operating current (4092h) is too low.	Check the setting of the Operating current (4092h). If the motor current is low relative to the load, the torque will also be low and operation will be unstable.
Motor vibration is too large.	The load is small.	Reduce the current with the Operating current (4092h). If the motor output torque is too large relative to the load, vibration will increase.
The electromagnetic brake is not in a state of releasing the motor shaft.	The power is not supplied to the electromagnetic brake.	Check the connection of the electromagnetic brake.

memo When the alarm is being generated, check the alarm content via EtherCAT or using the **MEXE02** software.

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

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