Oriental motor

HM-60523-2

Drivers for 5-Phase Stepping Motors

CVD Series

Fully Closed-Loop Control Type

OPERATING MANUAL Function Edition

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

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

1 Introduction

2 Before starting operation

3 Operation

4 I/O signals

5 Modbus RTU control (RS-485 communication)

6 Register address list

7 Other functions

1 Introduction

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

◆Table of contents

1 Introduction

1-1 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 "4 Safety precautions" on p.12. In addition, be sure to observe the contents described in warning, caution, and note in this manual.
The product described in this document is designed and manufactured to be incorporated into 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.

1-2 About operating manuals

■ Related operating manuals

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

- **CVD** Series Fully Closed-Loop Control Type OPERATING MANUAL
- **CVD** Series Fully Closed-Loop Control Type OPERATING MANUAL Function Edition (this document)

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

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

1-3 How to use operating manuals

This product can be controlled by pulse input or RS-485 communication.
This manual describes operation, control via RS-485 communication, register address list, and so on. Refer to the **CVD** Series Fully Closed-Loop Control Type OPERATING MANUAL for installation, connection, alarms, and so on.

■ Note the following:

- **Setting methods of operation data and parameters**

  Operation data and parameters can be set using the **MEXE02** support software or via RS-485 communication (Modbus control).

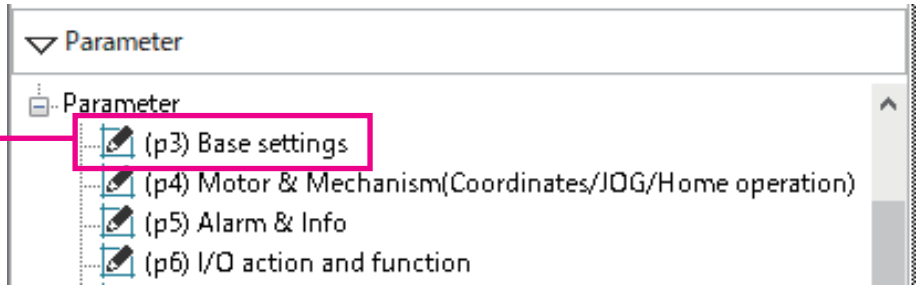
- **Description in both decimal and hexadecimal**

  In this document, register addresses are mainly described in hexadecimal. When a decimal number is described together, it is described in parentheses ( ).

■ When the screen display of the MEXE02 software is described

When the screen display of the **MEXE02** software version 4 is described, it may be indicated using a number such as "(p3)" described in front of the parameter type.

Example of description



MEXE02 code	Name	Description	Setting range	Initial value
p3	Smooth drive function	Enables the smooth drive function.	0: Disable 1: Enable	1

10-1 (p3) Base settings parameters

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
0220h (544)	0221h (545)	Direct data operation zero speed command action	When "0" is written to the operating speed, selects whether to decelerate the motor to a stop or to change only the speed to 0 r/min in an operating status.	0: Deceleration stop command 1: Speed zero command	0	B

2 Overview of the product

The **CVD** Series fully closed-loop control type driver is a DC input driver for 5-phase stepping motors.

■ Equipped with the fully closed-loop correction function

The fully closed-loop correction function is a function that corrects the positional displacement of the motor with high accuracy using the information from the externally installed encoder. This product directly reads the position of an object (load, table, machine, etc.) with an external encoder, compares it with the command position (target position) inside the driver, and corrects the motor position. Therefore, there is no need for the host controller to correct an error due to gear backlash, lead screw pitch, torsion, elongation, etc. that exists between the motor and the object.
When the difference (position deviation) between the command position and the feedback position becomes a certain value or less, the driver completes the positioning and automatically switches to open-loop mode. In open-loop mode, since position information is not fed back, operation can be performed without hunting.

■ Low vibration and low noise

A board type microstepping driver equipped with the smooth drive function achieves low-vibration and low-noise operation.

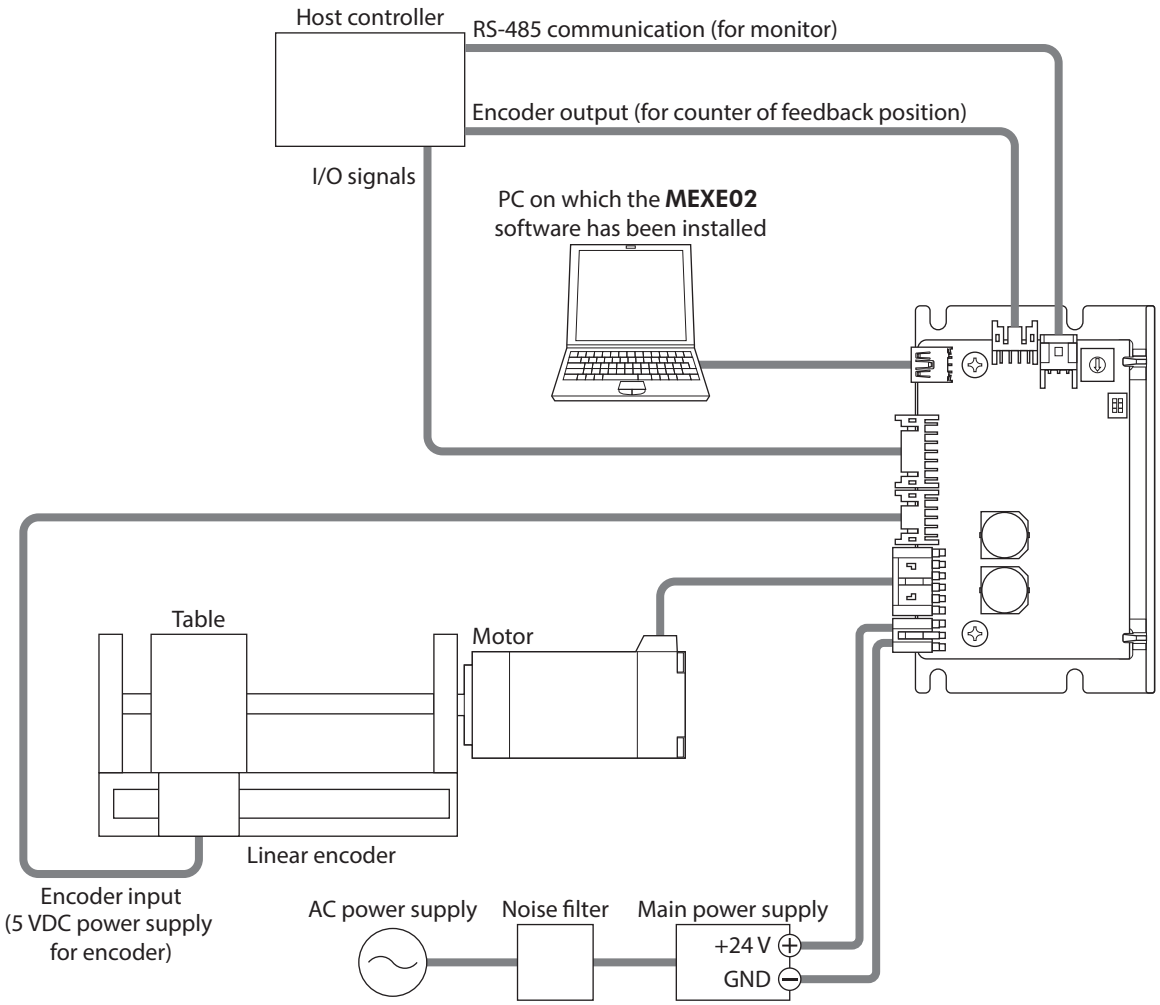
■ Operation by pulse input

Operation is performed by inputting pulses to the driver using a host controller.

■ Compatible with network communication

The driver is compatible with Modbus RTU (RS-485 communication) and can monitor the present position information. Also, operation data and parameters can be set, and operation can be started and stopped via RS-485 communication. Operation data and parameters can also be set using the **MEXE02** software.

3 System configuration



4 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.

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 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.
- Use a DC power supply with reinforced insulation on its primary and secondary sides for a main power supply. 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 insert a finger or an object between the board and the heat sink. Doing so may result in fire or injury.
- 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 result in damage to the product.

Installation

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

Operation

- Use a motor and 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, 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 any abnormality is observed, stop the operation immediately to turn off the main power supply. Failure to do so may result in fire or injury.

5 Precautions for use

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

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

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

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

  The USB connector (CN3) on the driver is not electrically insulated. When grounding the positive terminal of the main 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 main power supply while writing the data to non-volatile memory, and also do not turn off for five seconds after writing is 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 **CVD** Series Fully Closed-Loop Control Type OPERATING MANUAL for the 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.

2 Before starting operation

This part explains the settings that are required before starting operation.

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1 Flow of settings necessary for operation

This chapter describes the setting procedure required when controlling the motor via RS-485 communication.

Setting of motor
⇨ p.17

Set the parameter according to the product to be combined. If the parameter is set, the output current of the driver is automatically set.

↓

Setting of resolution
⇨ p.18

↓

Setting of fully closed-loop system
⇨ p.19

Set for the operation with the fully closed-loop system using an external encoder.

↓

Setting of RS-485 communication
⇨ p.27

Set for RS-485 communication such as the termination resistor and address number.

↓

Setting of operating current and stop current
⇨ p.31

↓

Setting of command filters
⇨ p.33

2 Setting of motor

Set the "Applicable motor setting" parameter according to the product to be combined.
If the parameter is set, the output current of the driver is automatically set.

⚠CAUTION Be sure to set in accordance with the product being combined. If the output current of the driver is accidentally set to a value higher than the rated current of the motor being combined, fire or a skin burn(s) may result.

memo
- The parameter that has been set will be enabled after the main power supply is turned on again.
- If the parameter is set to a value not described in the table, the motor will remain in a non-excitation state and information of Motor setting error will be generated.

■ Parameter setting values for the combined products

Models in the table describe part of the entire name of models.
- The box (□) in the motor model indicates a number representing the motor length.
- The box (■) in the motor model indicates **A** (single shaft) or **B** (double shaft) representing the motor shaft shape.

● When combined with a motor

Model	Setting of parameter	Output current of driver to be set (A/phase)
PK513 **PK52□P** **PKP52□MN03**	18: 5-phase, 0.35 A/phase	0.35
PK52□H **PK54□** **PKP52□MN07**	19: 5-phase, 0.75 A/phase	0.75
PKP52□N12	20: 5-phase, 1.2 A/phase	1.2
PK56□	21: 5-phase, 1.4 A/phase	1.4
PKP54□MN **PKP54□N18■** **PKP54□N18■2**	22: 5-phase, 1.8 A/phase	1.8
PKP56□FMN **PKP56□FN24■2**	23: 5-phase, 2.4 A/phase	2.4

● When combined with a motorized actuator

Model	Setting of parameter	Output current of driver to be set (A/phase)
DRLM20	18: 5-phase, 0.35 A/phase	0.35
DRLM28 **DHM28PAK2** **DRLM42** **DHM42PAK**	19: 5-phase, 0.75 A/phase	0.75
DRLM60	21: 5-phase, 1.4 A/phase	1.4

● Related parameter

MEXE02 code	Name	Description	Setting range	Initial value
p4	Applicable motor setting	Sets the output current of the driver according to the product to be combined. Check "Parameter setting values for the combined products" and set the parameter.	0: No setting 18: 5-phase, 0.35 A/phase 19: 5-phase, 0.75 A/phase 20: 5-phase, 1.2 A/phase 21: 5-phase, 1.4 A/phase 22: 5-phase, 1.8 A/phase 23: 5-phase, 2.4 A/phase	0

3 Setting of resolution

Set the "Electronic gear A" and "Electronic gear B" parameters according to a desired resolution.
If the "Electronic gear A" and "Electronic gear B" parameters are set, the resolution per revolution of the motor output shaft can be set.
Note that the calculated value must fall within the setting range specified below.

Setting range of resolution: 100 to 125,000 P/R
Initial value: 500 P/R

$$\text{Resolution (P/R)} = 500 \times \frac{\text{Electronic gear B}}{\text{Electronic gear A}}$$

Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p4	Electronic gear A	Sets the denominator of the electronic gear.	1 to 65,535	1
	Electronic gear B	Sets the numerator of the electronic gear.		1

Note If a resolution out of the setting range is set, information of Electronic gear setting error will be generated. If the main power supply is turned on again or Configuration is executed in a state where information of Electronic gear setting error is generated, an alarm of Electronic gear setting error will be generated.

memo
- The step angle is a theoretical value.
- The actual step angle for the geared type is calculated using the formula: step angle divided by gear ratio.
- Compared with the standard type, the resolution and the step angle of the high-resolution type are twice and one-half, respectively.

■ Calculation method of electronic gears A and B

This section explains how to calculate the electronic gears A and B with an example of a ball screw.
- When a ball screw with a lead of 12 mm is to be moved 0.01 mm per step.
- Gear ratio: 1 (No speed reduction mechanism between the motor and ball screw.)

$$\text{Resolution on mechanism} = 500 \times \frac{\text{Electronic gear B}}{\text{Electronic gear A}} = \frac{\text{Ball screw lead}}{\text{Minimum travel amount}}$$

$$\text{In this example:} \quad 500 \times \frac{\text{Electronic gear B}}{\text{Electronic gear A}} = \frac{12\ \text{mm}}{0.01\ \text{mm}}$$

$$\text{By calculation:} \quad \frac{\text{Electronic gear B}}{\text{Electronic gear A}} = \frac{12}{5}$$

Therefore, the electronic gear A is 5 and the electronic gear B is 12, and the resolution is 1,200 P/R.

4 Setting related to the fully closed-loop correction

This section describes the settings to perform the correction by the fully closed-loop control using an externally installed encoder.

4-1 Mechanism information

Set the related parameters according to the encoder, motor, and mechanism to be used.

Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p11	Encoder type	Selects the type of the encoder to be connected.	0: Linear 1: Rotary	0
	Encoder count action	Selects the action when ENC-A+ is turned from OFF to ON while ENC-B+ is OFF.	0: Counting down 1: Counting up	1
	Basic step angle	Sets the basic step angle of the motor to be used.	1: 0.72° (Standard type) 2: 0.36° (High resolution type)	1
	Mechanism lead	Sets the lead of the mechanism to be assembled to the motor.	1 to 500 (1=0.1 mm)	10
	Gear ratio	Sets the gear ratio when using a gear reduction mechanism.	10 to 10,000 (1=0.1)	10

memo When the "Encoder type" parameter is set to "1: Rotary," the value set in the "Mechanism lead" parameter is disabled.

■ Setting example: When using a ball screw with a linear encoder

This section shows an example of setting the parameters when used under the following conditions.

- Motor type: **PK**/**PKP** Series standard type
- Gear ratio: 1 (No speed reduction mechanism between the motor and ball screw.)
- Ball screw lead: 6 mm
- The travel direction of the ball screw is the same as the counting direction of the pulses output from the linear encoder.

MEXE02 code	Name	Setting value
p11	Encoder type	0: Linear
	Encoder count action	1: Counting up
	Basic step angle	1: 0.72° (Standard type)
	Mechanism lead	60 (1=0.1 mm)
	Gear ratio	10 (1=0.1)

4-2 Encoder resolution

Set the related parameters according to the encoder to be used.

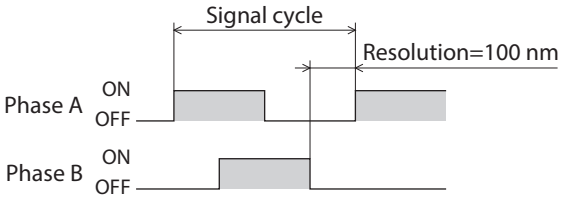
Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p11	Encoder type	Selects the type of the encoder to be connected.	0: Linear 1: Rotary	0
	Linear encoder resolution	Sets the resolution of the linear encoder.	1 to 50,000 nm	100
	Rotary encoder resolution	Sets the resolution of the rotary encoder.	100 to 16,777,215 P/R	10,000
	Multiplication number	Sets the multiplication number used as the basis for the feedback position.	0: ×1 multiplication 1: ×2 multiplication 2: ×4 multiplication	2

■ Setting example: When a linear encoder is used

When using a linear encoder whose specifications are shown in the figure, the parameter settings are as follows.

Parameter name	Setting value
Encoder type	0: Linear
Linear encoder resolution	100
Multiplication number	2: ×4 multiplication



memo When the "Encoder type" parameter is set to "0: Linear," the value set in the "Rotary encoder resolution" parameter is disabled.

4-3 Encoder count action

The value obtained by multiplying the encoder input according to the setting of the "Multiplication number" parameter is the feedback position. The feedback position can be read on the status monitor of the **MEXE02** software or "Feedback position (cnt)" of RS-485 communication.
For the encoder count action, refer to "Relationship between encoder input waveform and feedback position" on p.21.
The feedback position is preset to zero in the following cases.

- When position preset has been executed to set the coordinates.
- When return-to-home operation has been completed properly.

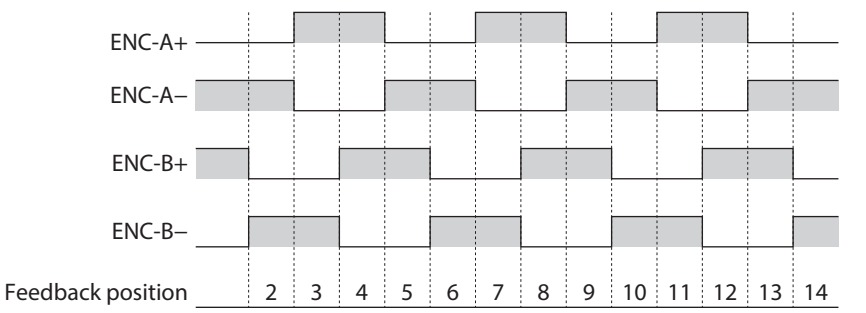
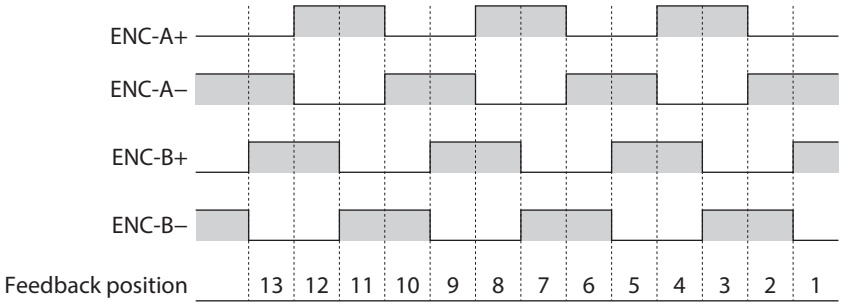
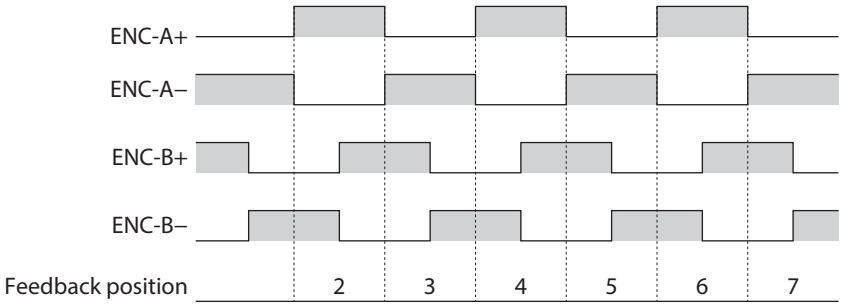
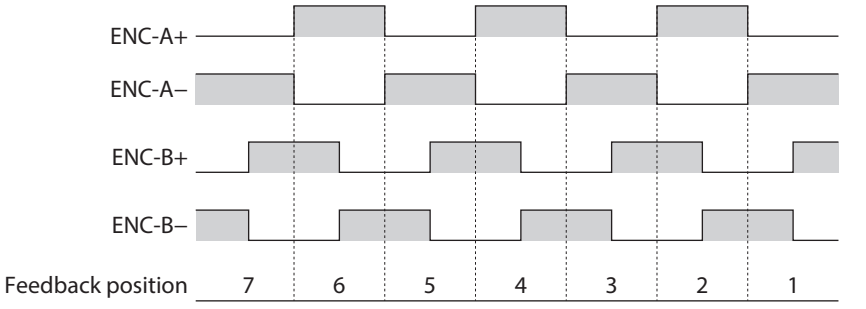
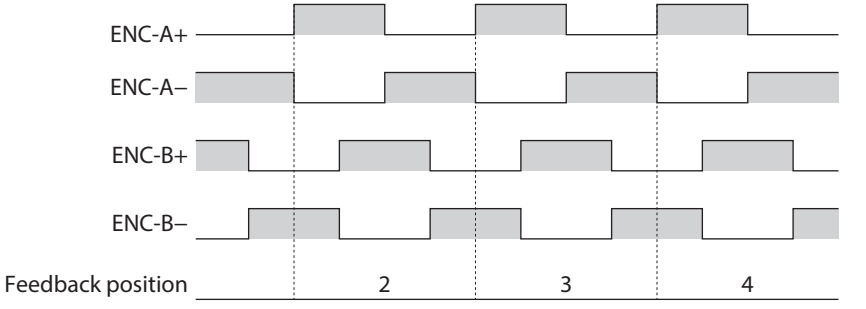
Related parameters

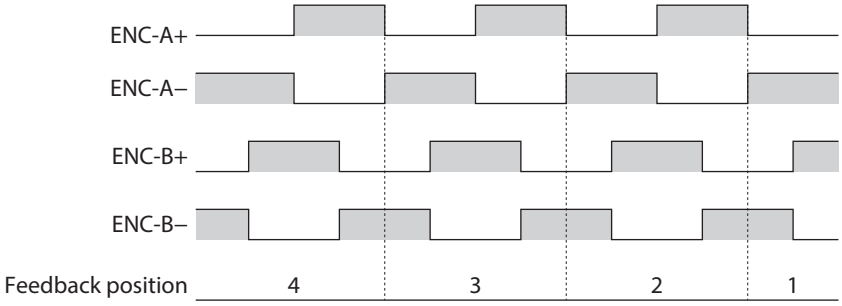
MEXE02 code	Name	Description	Setting range	Initial value
p11	Encoder count action	Selects the action when ENC-A+ is turned from OFF to ON while ENC-B+ is OFF.	0: Counting down 1: Counting up	1
	Multiplication number	Sets the multiplication number used as the basis for the feedback position.	0: ×1 multiplication 1: ×2 multiplication 2: ×4 multiplication	2
p4	Motor rotation direction	Sets the rotation direction of the motor output shaft.	0: Positive direction=CCW 1: Positive direction=CW	1

memo Set the related parameters so that the motor rotation direction and the encoder count action match.

■ Relationship between encoder input waveform and feedback position

The feedback position when the "Multiplication number" parameter and "Encoder count action" parameter are set is as follows.
The figure shows an example when the "Encoder count action" parameter is set to "1: Counting up." When the "Encoder count action" parameter is set to "0: Counting down," counting up and counting down are reversed.
Refer to the OPERATING MANUAL for the specifications of encoder input section.

Multiplication number	Count action	Waveform
×4 multiplication (Initial value)	Counting up	
	Counting down	
×2 multiplication	Counting up	
	Counting down	
×1 multiplication	Counting up	

Multiplication number	Count action	Waveform
×1 multiplication	Counting down	

4-4 Fully closed-loop correction function

■ Adjustment of correction range

The correction range when the fully closed-loop correction is performed can be adjusted.
The deviation between the command position and the feedback position is monitored and the motor position is corrected until the deviation falls within the range set in the "In-position range" parameter after the FCLOOP-RDY output is turned ON.

Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p11	Correction operation waiting time	Sets the time from the stop at the command position to the start of the correction operation by the fully closed-loop control. Set a value that is longer than or equal to the settling time for the residual vibration to end after the stop.	0 to 10,000 ms	10
	In-position range	Sets the allowable range of the position deviation based on the feedback position.	0 to 100,000 cnt	5

memo When a high-resolution type encoder is used, the correction operation may be unstable if the value set in the "In-position range" parameter is too low. Reconsider the setting of the "In-position range" parameter if the correction operation is unstable.

■ Adjustment of the correction speed

The correction speed when the fully closed-loop correction is performed can be adjusted.
The higher the value of the "Correction speed gain" parameter, the shorter the time required to reach the command speed.

Related parameter

MEXE02 code	Name	Description	Setting range	Initial value
p11	Correction speed gain	Sets the speed when the fully closed-loop correction is performed.	1 to 1,000 (1=0.1)	10

memo If the value set in the "Correction speed gain" parameter is too high, the overshoot during correction will be large, causing the correction operation to be unstable. Reconsider the setting of the "Correction speed gain" parameter if the correction operation is unstable.

■ Adjustment of the correction upper limit

Sets the upper limit of the correction amount when the fully closed-loop correction is performed. Adjust according to the position deviation between the motor and the encoder caused by backlash or torsion of the mechanism. When the position deviation is large, increase the value.

memo

- If the position deviation exceeds the correction upper limit, the operation of the fully closed-loop correction cannot be completed and an alarm of Encoder timeout may be generated.
- If the "Encoder correction timeout" parameter is set to "0: Disable," a state in which the position deviation occurs will continue because an alarm of Encoder timeout will not be generated.

Related parameter

MEXE02 code	Name	Description	Setting range	Initial value
p11	Correction upper limit	Sets the upper limit of the correction amount when the fully closed-loop correction is performed.	1 to 100 (1=0.01 rev)	1

■ Signals related to the fully closed-loop correction function

Signals related to the fully closed-loop correction function are as follows. For details on the signals, refer to the reference page.

- **Input signals**

Signal name	Reference
P-PRESET	p.99
FCLOOP-DIS	p.100

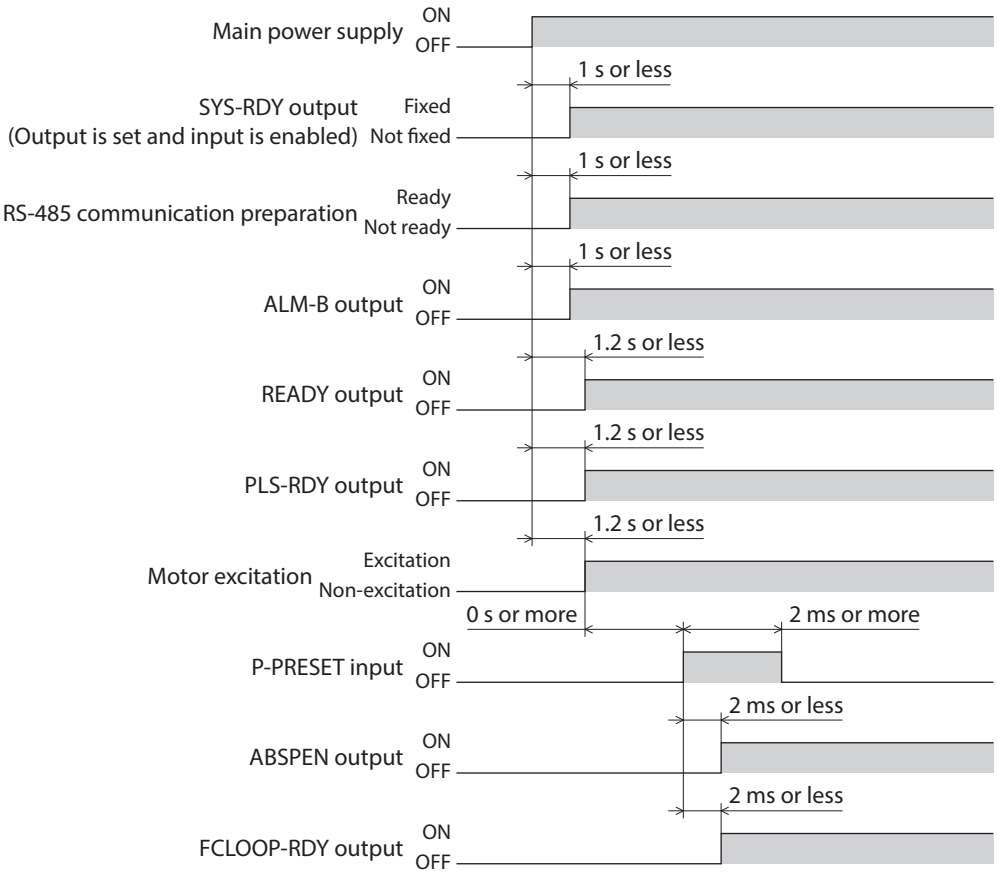
- **Output signals**

Signal name	Reference
FCLOOP-RDY	p.103
ENC-IN-POS	p.106
FCLOOP-MON	p.106

■ Timing chart

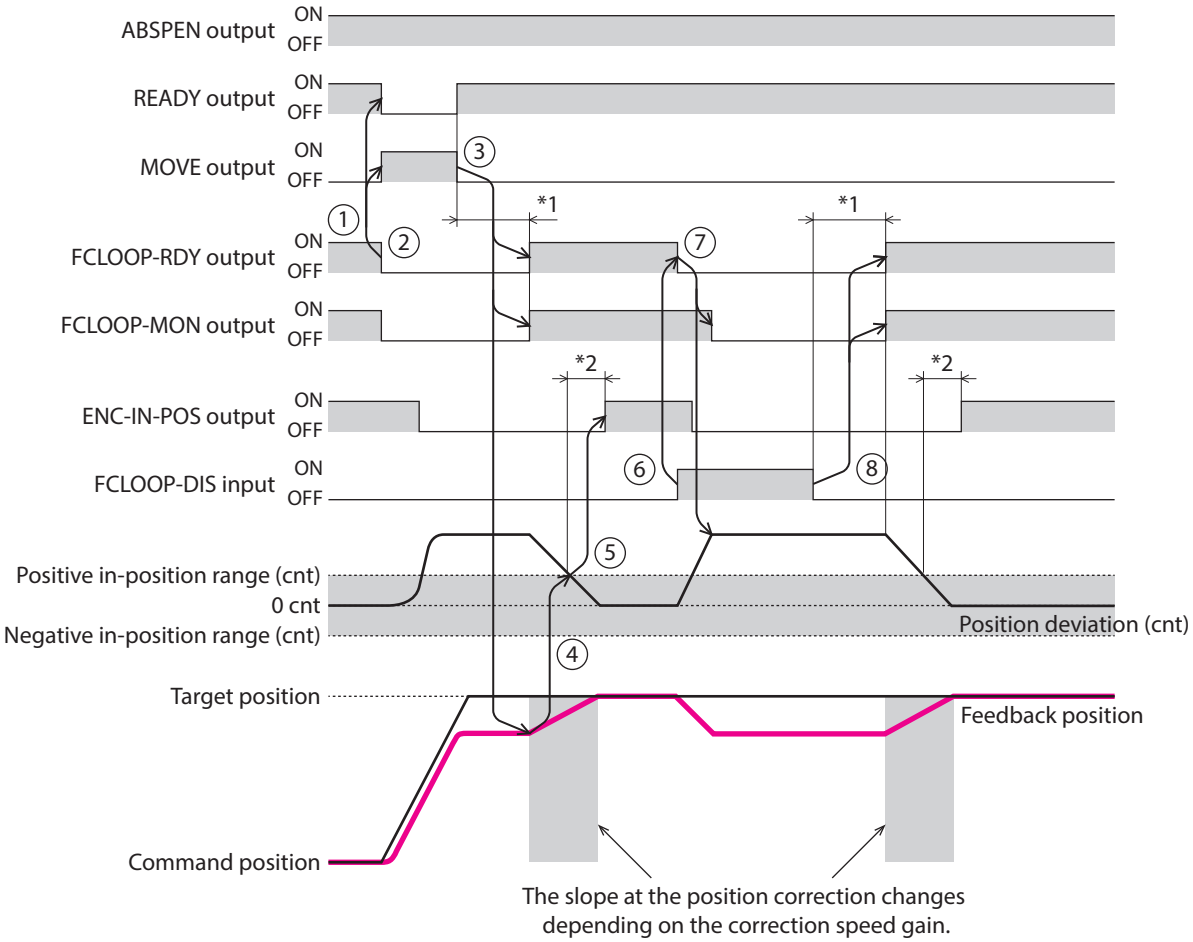
● How to start the correction function

1. Check that the READY output is being ON.
2. Turn the P-PRESET input ON.
   The ABSPEN output is turned ON and the FCLOOP-RDY output is turned ON.



● Relationship between signals during correction operation

1. Check that the FCLOOP-RDY output is in an ON state.
2. Execute operation.
   During operation, the FCLOOP-RDY output and the READY output are turned OFF, and the MOVE output is turned ON. During this time, the position correction is not performed.
3. When the operation is completed, the MOVE output is turned OFF. After the time set in the "Correction operation waiting time" parameter has elapsed, the FCLOOP-RDY and FCLOOP-MON outputs are turned ON and the position correction is started.
4. When the correction of the position is started, it is performed according to the speed of the correction operation adjusted by the "Correction speed gain" parameter until the position deviation is equal to or less than the value set in the "In-position range" parameter.
5. When the time set in the "In-position delay time" parameter has elapsed, the ENC-IN-POS output is turned ON and positioning is completed.
6. When the FCLOOP-DIS input is turned ON to disable the correction by the fully closed-loop control, the FCLOOP-RDY output is turned OFF.
7. When the FCLOOP-RDY output is turned OFF, the position deviation returns to the state before the correction is performed, and the FCLOOP-MON output was turned OFF.
8. When the FCLOOP-DIS input is turned OFF to enable the correction by the fully closed-loop control, the FCLOOP-RDY and FCLOOP-MON outputs are turned ON after the time set in the "Correction operation waiting time" parameter has elapsed, and the position correction is resumed.



*1 Correction operation waiting time (ms)
*2 In-position delay time (ms)

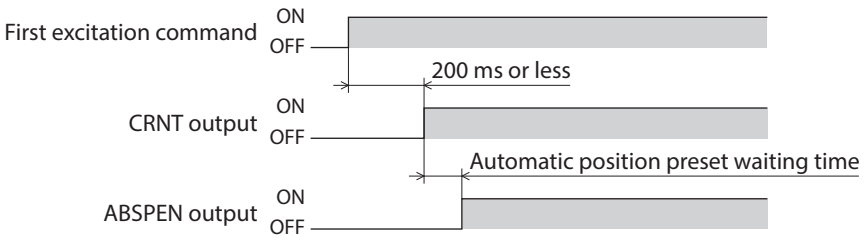
memo After the correction by the fully closed-loop control has been performed, if the position deviation is outside the setting range of the "In-position range" parameter due to an external force, correction will be performed again.

4-5 Automatic position preset function

After the main power supply is turned on and the motor is excited for the first time, position preset is automatically executed to set the coordinates.

Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p11	Automatic position preset enable	Sets whether or not to automatically execute the position preset after the main power supply is turned on and the motor is excited for the first time.	0: Disable 1: Enable	0
	Automatic position preset waiting time	Sets the waiting time from when the main power supply is turned on and the motor is excited for the first time until the position preset is automatically executed.	100 to 1,000 ms	100



5 Settings related to RS-485 communication

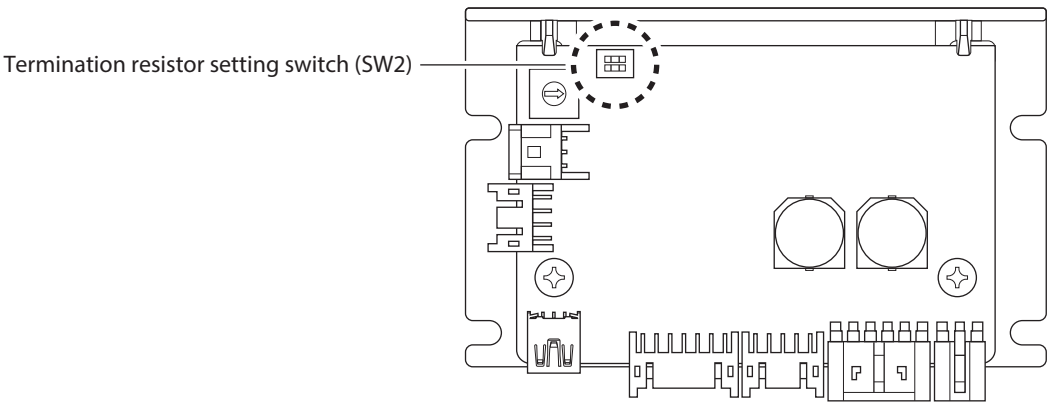
5-1 Setting of termination resistor

Set the termination resistor (120 Ω) of RS-485 communication on the driver that is farthest away (at the end) from the host controller.
Set both No.1 and No.2 of the termination resistor setting switch (SW2) to ON.

memo
- Turn off the main power supply of the driver before setting the switches.
- If only one of the two switches is set to ON, a communication error may occur.

Factory setting: Both Nos. 1 and 2 are OFF (Termination resistor disabled)

SW2 switch No. 1, No. 2	Termination resistor (120 Ω)
Both are OFF	Disable
Both are ON	Enable



5-2 Setting of address number (server address)

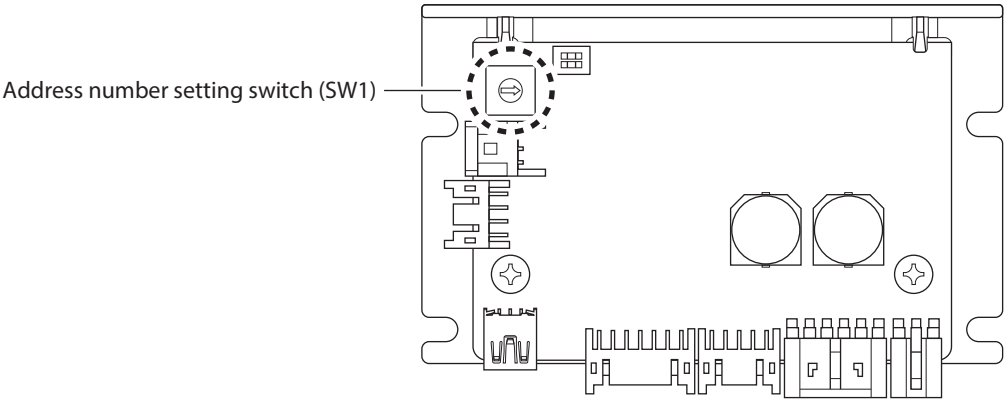
Set the address number (server address) using the address number setting switch. Make sure that each address number (server address) set for each driver is not duplicated.

Note Do not set the address number (server address) 0 because it is reserved for broadcasting.

Factory setting: Address number (server address) 1 [Address number setting switch: 1]

Address number setting switch	Address number (Server address)
0	Not used.
1	1
2	2
3	3
4	4
5	5
6	6
7	7

Address number setting switch	Address number (Server address)
8	8
9	9
A	10
B	11
C	12
D	13
E	14
F	15



5-3 Setting of communication parameters

Set the parameters required for RS-485 communication before starting communication.

■ Parameters updated when turning on the main power supply

These are parameters related to sending and receiving via RS-485 communication.
When the setting is changed or initialized, turn the main power off and on again.
These parameters are excluded from Configuration.

MEXE02 code	Name	Description	Setting range	Initial value
p10	Server address (Modbus)	Sets the address number (server address).	−1: The switch setting of the driver is followed 1 to 31: Address number (server address)* *Do not use 0.	−1
	Baudrate (Modbus)	Sets the transmission rate.	0: 9,600 bps 1: 19,200 bps 2: 38,400 bps 3: 57,600 bps 4: 115,200 bps 5: 230,400 bps	4
	Byte & word order (Modbus)	Sets the byte order of 32-bit data. Set when the arrangement of communication data is different from that of the host controller. (Setting example⇨"Setting example of "Byte & word order (Modbus)" parameter")	0: Even Address-High Word & Big-Endian 1: Even Address-Low Word & Big-Endian 2: Even Address-High Word & Little-Endian 3: Even Address-Low Word & Little-Endian	0
	Communication parity (Modbus)	Sets the communication parity.	0: None 1: Even parity 2: Odd parity	1
	Communication stop bit (Modbus)	Sets the communication stop bit.	0: 1 bit 1: 2 bits	0
	Transmission waiting time (Modbus)	Sets the transmission waiting time.	0 to 10,000 (1=0.1 ms)	30
	Silent interval (Modbus)	Sets the silent interval.	0: Automatic 1 to 100 (1=0.1 ms)	0

memo To initialize parameters in the table, perform one of the following. After initialization, use the **MEXE02** software to set the driver to the same settings as the host controller. If the settings of the driver and the host controller are different, communication cannot be established.
- "All data batch initialization" of the maintenance command
- "Reset" of the **MEXE02** software

Setting example of "Byte & word order (Modbus)" parameter

When 32-bit data "1234 5678h" is stored in the register address 1000h and 1001h, the arrangement changes to the following according to the setting of the parameter.

Setting of parameter	1000h (even number address)		1001h (odd number address)	
	Upper	Lower	Upper	Lower
0: Even Address-High Word & Big-Endian	12h	34h	56h	78h
1: Even Address-Low Word & Big-Endian	56h	78h	12h	34h
2: Even Address-High Word & Little-Endian	34h	12h	78h	56h
3: Even Address-Low Word & Little-Endian	78h	56h	34h	12h

■ Parameters updated immediately after rewriting

Set the following parameters via RS-485 communication or using the **MEXE02** software.

MEXE02 code	Name	Description	Setting range	Initial value
p10	Communication timeout (Modbus)	Sets the condition under which a communication timeout is generated.	0: Not monitored 1 to 10,000 ms	0
	Communication error alarm (Modbus)	If the RS-485 communication error occurs for the set number of times, an alarm of RS-485 communication error is generated.	0: Disable 1 to 10 times	3
	Server error response mode (Modbus)	Sets the response when the server error occurred.	0: Normal response is returned 1: Exception response is returned	1

6 Setting of operating current and stop current

The operating current and the stop current are calculated based on the base current (%).
The base current is a current used to set the operating current and the stop current and is set as a percentage (%) of the maximum output current of the driver. If the load is small and there is sufficient allowance for torque, the motor temperature rise can be suppressed by setting a lower base current.

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

6-1 Operating current

The motor operating current is calculated as follows.

- Motor operating current = Maximum output current × "Base current" parameter setting value × "Operating current" setting value

Related operation data

MEXE02 code	Name	Description	Setting range	Initial value
p1	Operating current	Sets the motor operating current based on the base current being 100 %.	0 to 1,000 (1=0.1 %)	1,000

Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p3	Base current	Sets the base current.	0 to 1,000 (1=0.1 %)	1,000
p4	JOG/HOME operating current	Sets the operating current rate for JOG operation or return-to-home operation, based on the base current being 100 %.	0 to 1,000 (1=0.1 %)	1,000

Related register

Register address		Name	Description	Setting range	Initial value
Upper	Lower				
0064h (100)	0065h (101)	Direct data operation operating current	Sets the operating current based on the base current being 100 %.	0 to 1,000 (1=0.1 %)	1,000

6-2 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 as follows.

- Motor stop current = Maximum output current × "Base current" parameter setting value × "Stop current" parameter value

Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p3	Base current	Sets the base current.	0 to 1,000 (1=0.1 %)	1,000
	Stop current	Sets the motor stop current based on the base current being 100 %.		500

Note When the "Applicable motor setting" parameter is set to "23: 5-phase 2.4 A/phase," set the "Stop current" parameter to 75 % or less.

7 Setting of command filters

Using the command filter to adjust the motor response can suppress motor vibration.
There are two types of command filters, LPF (speed filter) and moving average filter.

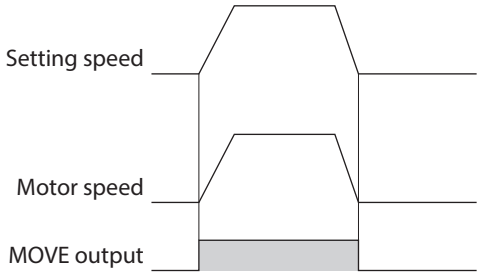
Related parameters

MEXE02 code	Parameter name	Description	Setting range	Initial value
p3	Command filter setting	Sets the filter function to adjust the motor response.	1: LPF (Speed filter) 2: Moving average filter	1
	Command filter time constant	Adjusts the motor response.	0 to 200 ms	1

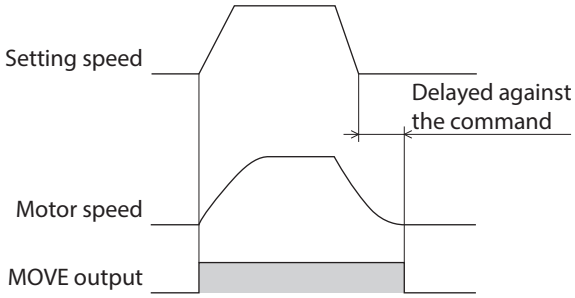
■ LPF (Speed filter)

Select "1: LPF (speed filter)" with the "Command filter setting" parameter and set the "Command filter time constant" parameter.
Increasing the value in the "Command filter time constant" parameter can suppress motor vibration during low-speed operation and make the motor movement smoother when starting/stopping. However, setting it too high will reduce synchronization performance in response to the command. Set an appropriate value according to a load or an application.

- When the "Command filter time constant" parameter is set to 0 ms

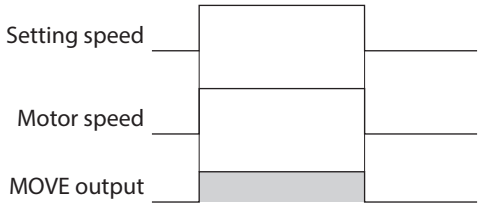
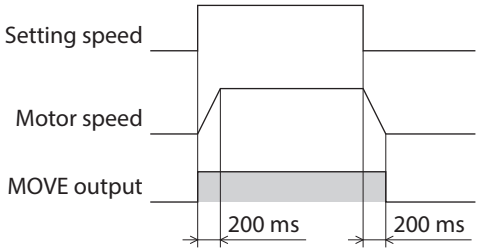
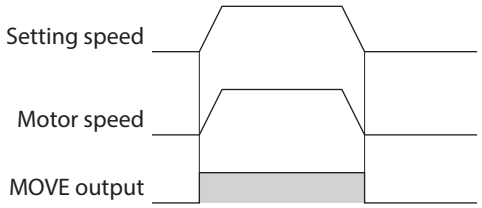
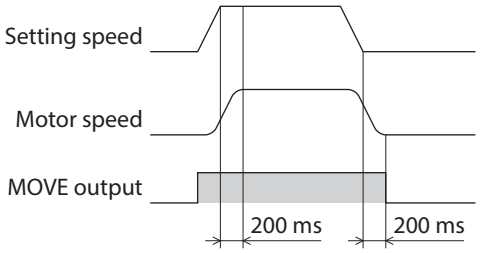


- When the "Command filter time constant" parameter is set to 200 ms



■ Moving average filter

Select "2: Moving average filter" with the "Command filter setting" parameter and set the "Command filter time constant" parameter.
The positioning time can be shortened by suppressing the residual vibration during positioning operation.
The optimal value for the "Command filter time constant" parameter varies depending on a load or operating condition. Set an appropriate value according to a load or operating condition.

	When the "Command filter time constant" parameter is set to 0 ms	When the "Command filter time constant" parameter is set to 200 ms
Self-start (rectangular) drive		
Trapezoidal drive		

3 Operation

This part explains the operation functions and parameters.

◆Table of contents

1 Pulse-input operation

Pulse-input operation is an operation in which pulses are input from the host controller to the driver to control the motor.

1-1 Pulse input mode

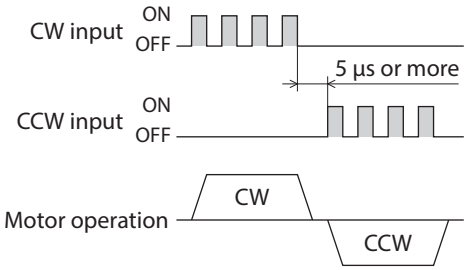
Set the pulse input mode of the driver according to the pulse output mode of the host controller used.

Related parameter

MEXE02 code	Name	Description	Setting range	Initial value
p10	PULSE-I/F mode selection	Sets the pulse input mode.	–1: Disable 1: 2-pulse input mode 2: 1-pulse input mode	1

■ 2-Pulse input mode (Factory setting)

When the CW input is turned from OFF to ON, the motor rotates in the clockwise direction by one step.
When the CCW input is turned from OFF to ON, the motor rotates in the counterclockwise direction by one step.

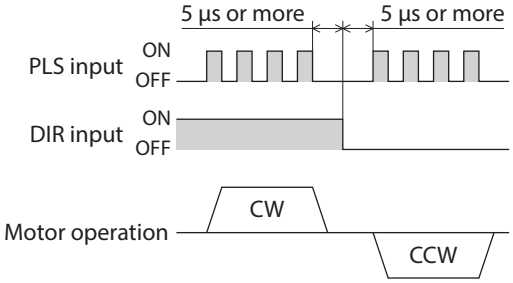


Note Do not input the CW input and the CCW input at the same time. The motor will not operate properly.

memo When the motor is stopped, be sure to stop inputting a pulse signal (pulse input OFF).

■ 1-Pulse input mode

When the PLS input is turned from OFF to ON while the DIR input is ON, the motor rotates in the clockwise direction by one step.
When the PLS input is turned from OFF to ON while the DIR input is OFF, the motor rotates in the counterclockwise direction by one step.



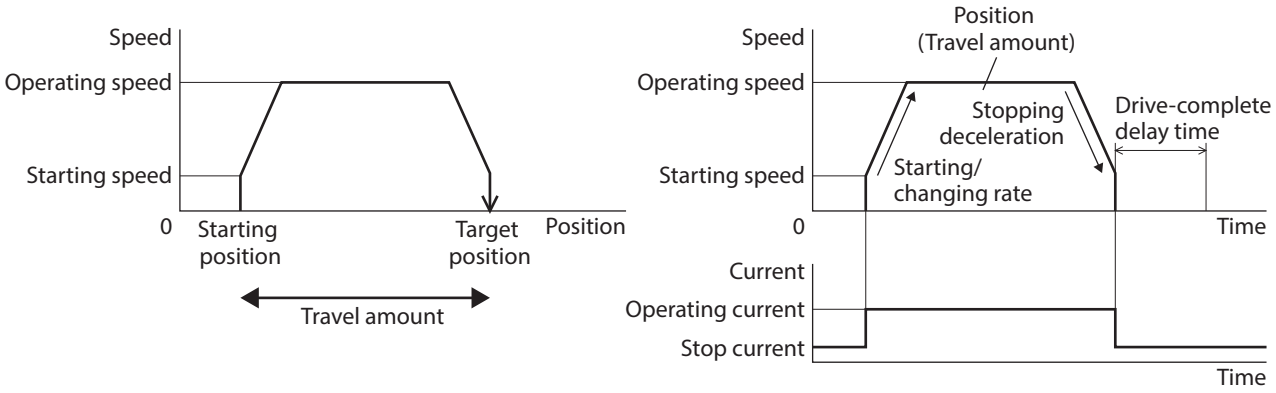
memo When the motor is stopped, be sure to stop inputting a pulse signal (pulse input OFF).

2 Positioning SD (stored data) operation

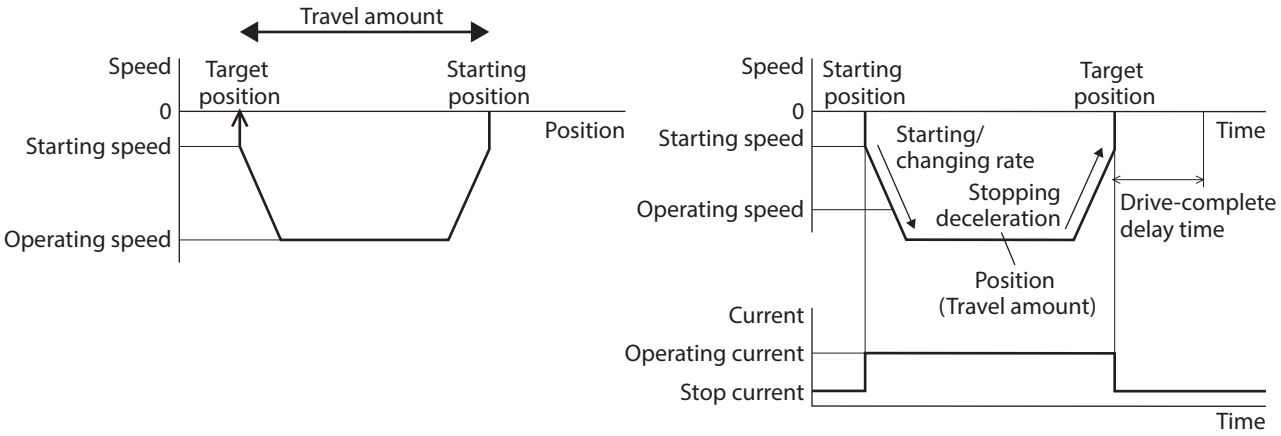
Positioning SD operation is an operation in which the operating speed and position (travel amount) of the motor are set to the operation data to execute the operation. When positioning SD operation is executed, the motor starts rotating at the starting speed and accelerates until it reaches the operating speed. Once the motor reaches the operating speed, it keeps the speed constant. Then, it decelerates when approaching the target position, and finally comes to a stop.

2-1 Operation

- **When a value of the starting position is lower than that of the target position (operation in forward direction)**



- **When a value of the starting position is higher than that of the target position (operation in reverse direction)**



Note The maximum travel amount of positioning SD operation is 2,147,483,647 steps. If the travel amount of the motor exceeds the maximum travel amount, an alarm of Operation data error is generated.

memo
- The rotation direction (forward/reverse) of positioning SD operation is determined based on the setting of "Position" of the operation data.
  Setting a positive value rotates the motor in the forward direction, and setting a negative value rotates it in the reverse direction.
- When a negative value is set to "Speed" of the operation data, the motor is operated at a speed of absolute value.

2-2 Setting the operation data

The following operation data is required for positioning SD operation. Up to 256 operation data (No. 0 to No. 255) can be set.

- **Related operation data**

MEXE02 code	Name	Description	Setting range*1	Initial value
p1	Operation type	Selects the operation type.	1: Absolute positioning 2: Incremental positioning (based on command position)	2
	Position	Sets the target position (travel amount).	–2,147,483,648 to 2,147,483,647 steps	0
	Speed	Sets the operating speed. Positioning operation is performed at an operating speed of the absolute value. For continuous operation, setting a positive value rotates the motor in the forward direction, and setting a negative value rotates it in the reverse direction.	–4,000,000 to 4,000,000 Hz	1,000
	Starting/ changing rate	Sets the acceleration/deceleration rate or the acceleration/ deceleration time when staring or changing the speed.	1 to 1,000,000,000 (1=0.001)*2	30,000
	Stopping deceleration	Sets the deceleration rate or the deceleration time when stopping.		30,000
	Operating current	Sets the motor operating current based on the base current being 100 %.	0 to 1,000 (1=0.1 %)	1,000
	Drive-complete delay time	Sets the waiting time generated after operation is completed.	0 to 65,535 (1=0.001 s)	0
	Link	Sets the mode for link operation.	0: No link 1: Manual sequential 2: Automatic sequential 3: Continuous sequential operation	0
	Next data number	Sets the next data number.	–256: No link [Stop] –2: Operation data number after next one [↓↓(+2)] –1: Next operation data number [↓(+1)] 0 to 255: Operation data number	–1
	Loop count	Sets the number of loop times.	0: No loop [–] 2 to 255: Number of loop times [loop 2{ to loop 255{]	0
	Loop offset	Offsets the position (travel amount) every time loop is executed.	–4,194,304 to 4,194,303 steps	0
	Loop end number	Sets to the operation data number in which loop is completed.	0: Not the loop end point [–] 1: Loop end point [}L-End]	0

*1 A value in the brackets [ ] is shown on the screen of the **MEXE02** software.
*2 The setting unit is followed the "Acceleration/deceleration unit" parameter.

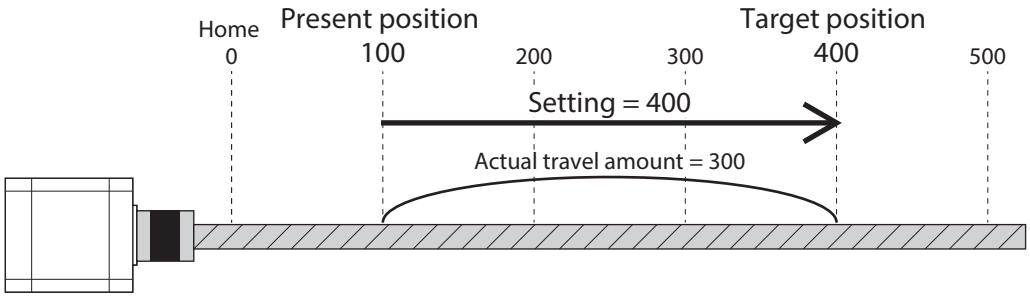
■ Operation type, Position

There are two operation types, and the setting method of the target position differs depending on the operation type.

- **Absolute positioning**

  Positioning operation is performed from the present position to the set target position. Set the target position on coordinates with the home as a reference.

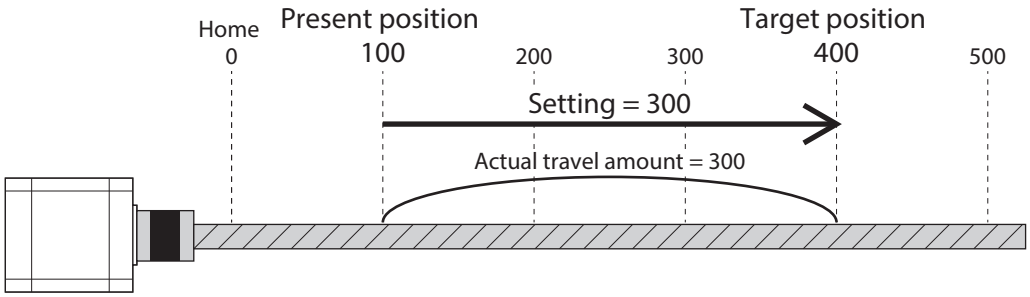
  Example: Setting when moving from the present position "100" to the target position "400"



- **Incremental positioning**

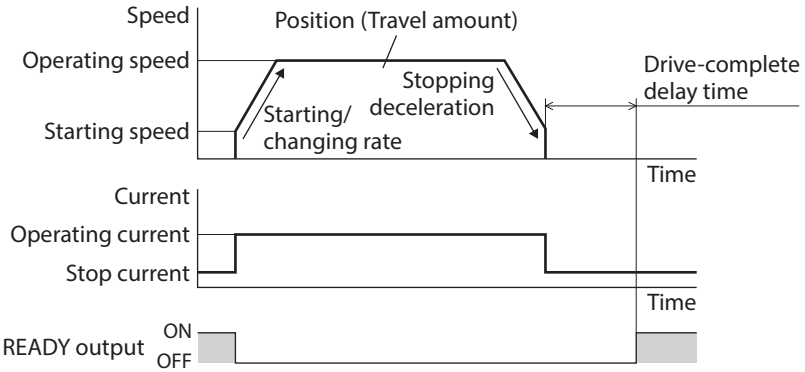
  Positioning operation with the set travel amount is performed from the present command position.
  Set the target position by using the position to which the motor has moved as the starting point for the next movement. This is suitable when the same travel amount is repeatedly operated.

  Example: Setting when moving from the present position "100" to the target position "400"

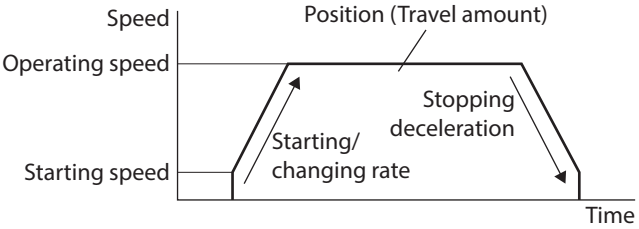


■ Speed, Starting/changing rate, Stopping deceleration, Operating current, Drive-complete delay time

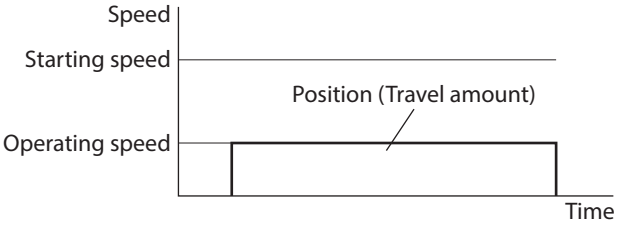
Set the speed, starting/changing rate, stopping deceleration, operating current, and drive-complete delay time required for positioning SD operation.



● When the operating speed is higher than the starting speed



● When the starting speed is equal to or higher than the operating speed



■ Link, Next data number

Refer to "2-5 Link method of operation data" on p.44 for details.

- **No link**

  Operation is executed once with a single operation data number. (Single-motion operation)

- **Manual sequential**

  Operation based on the operation data number set in the "Next data number" is executed whenever the SSTART input is turned ON. The SSTART input is enabled when the READY output is being ON.

- **Automatic sequential**

  Operation based on the operation data number set in the "Next data number" is automatically started after stop for the time set in the "Drive-complete delay time."

- **Continuous sequential operation**

  Operation based on the operation data number set in the "Next data number" is executed without stopping the motor.

■ Loop count, Loop offset, Loop end number

If the loop count, the loop offset, and the loop end number are set, the loop function is enabled.
(⇨"Loop function" on p.53)

2-3 Operation data number selection

There are two methods to select the operation data number to start, as shown below.
- Selection by NET selection number
- Selection by M0 to M7 inputs

The priority is in order of NET selection number, M0 to M7 inputs.

● NET selection number

The NET selection number is a method that sets the operation data number with remote I/O.
If an operation data number other than 0 to 255 is set, the NET selection number is disabled and the selection by the M0 to M7 inputs is enabled.

● Selection by M0 to M7 inputs

This is a method in which a desired operation data number is selected by a combination of the ON-OFF status of the M0 to M7 inputs.

Operation data number	M7	M6	M5	M4	M3	M2	M1	M0
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	**ON**
2	OFF	OFF	OFF	OFF	OFF	OFF	**ON**	OFF
. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
253	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	OFF	**ON**
254	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	OFF
255	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**

2-4 Positioning SD operation types

■ Absolute positioning

Set the target position on coordinates with the home as a reference.

● Related parameter

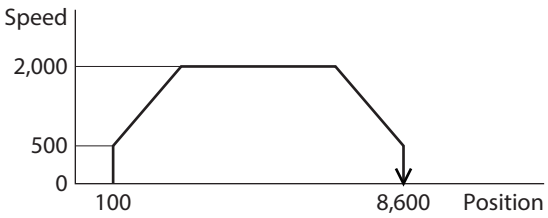
MEXE02 code	Name	Description	Setting range	Initial value
p3	Permission of absolute positioning without setting absolute coordinates	Permits absolute positioning operation in a state where coordinates are not set.	0: Disable 1: Enable	1

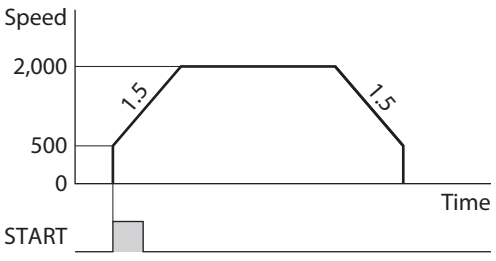
● Example of use:
When the motor is operated from the command position "100" to the target position "8,600"

Setting the operation data

Number	Operation type	Position [step]	Speed [Hz]	Starting/changing rate [kHz/s]	Stopping deceleration [kHz/s]
0	1: Absolute positioning	8,600	2,000	1,500 (1=0.001)	1,500 (1=0.001)

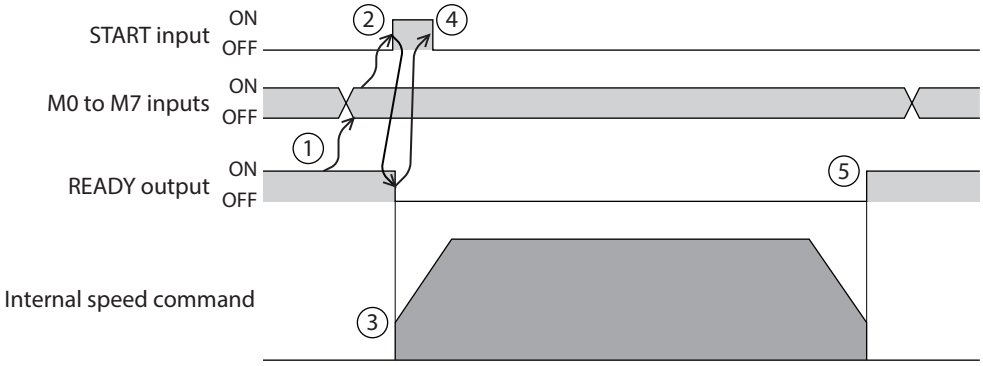
Operation example



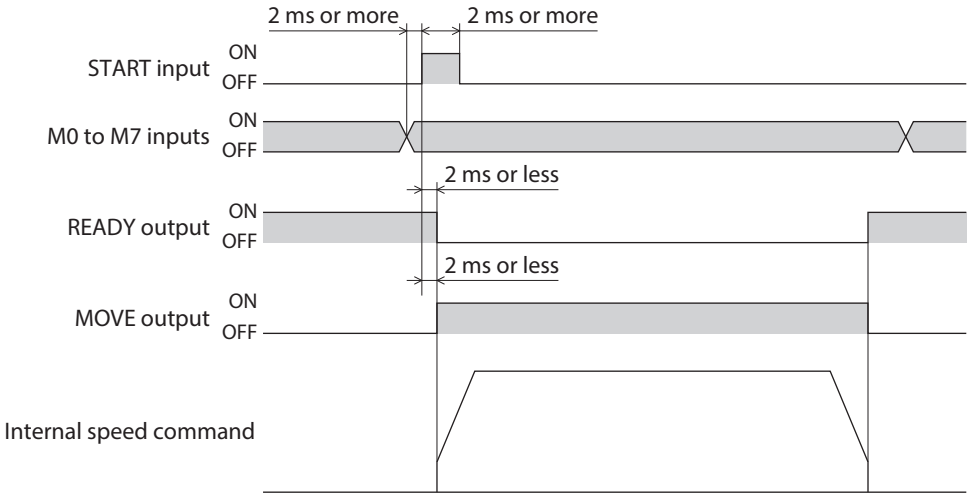


Operating method

1. Check that the READY output is being ON.
2. Select the operation data number using the M0 to M7 inputs and turn the START input ON.
3. The READY output is turned OFF and the motor starts operating.
4. Check that the READY output has been turned OFF and turn the START input OFF.
5. When the operation is completed, the READY output is turned ON.



Timing chart



■ Incremental positioning (based on command position)

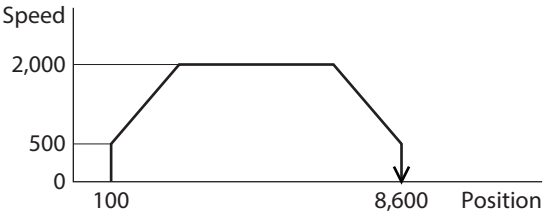
Set the travel amount from the present command position to the target position.

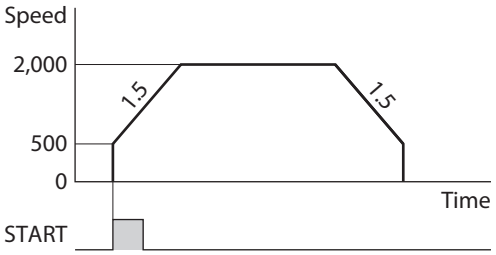
- **Example of use:**
  When the motor is operated from the command position "100" to the target position "8,600"

Setting the operation data

Number	Operation type	Position [step]	Speed [Hz]	Starting/changing rate [kHz/s]	Stopping deceleration [kHz/s]
0	2: Incremental positioning (based on command position)	8,500	2,000	1,500 (1=0.001)	1,500 (1=0.001)

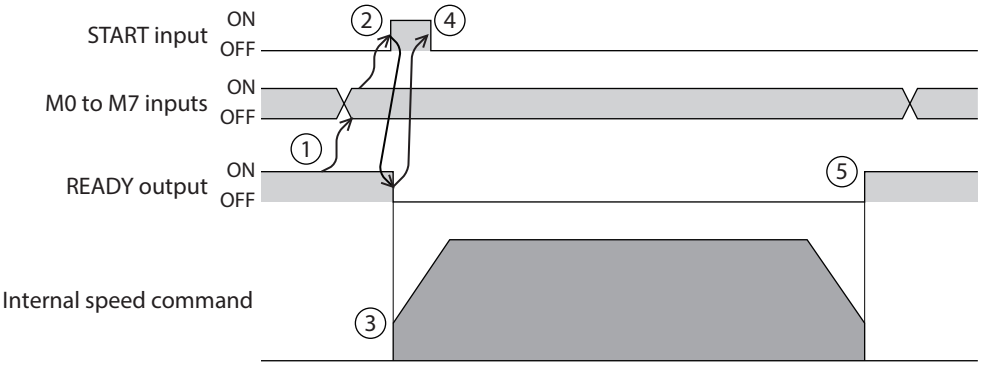
Operation example



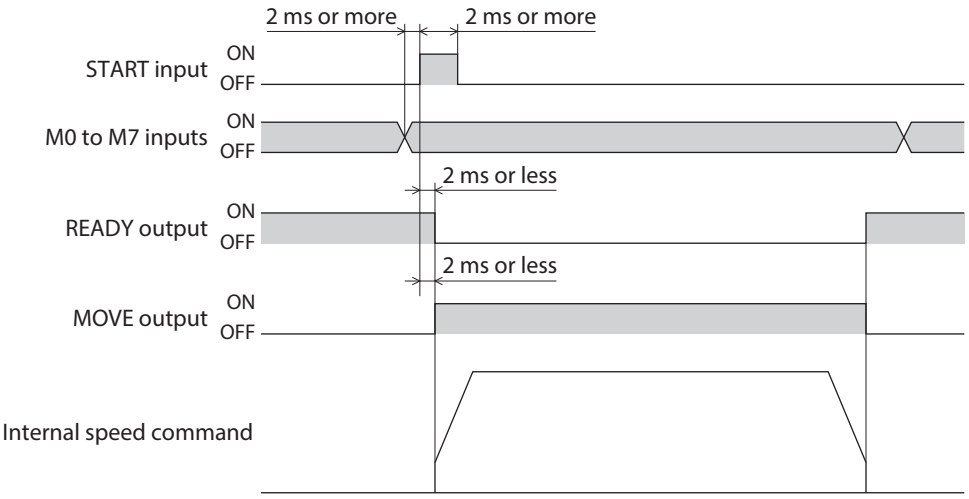


Operating method

1. Check that the READY output is being ON.
2. Select the operation data number using the M0 to M7 inputs and turn the START input ON.
3. The READY output is turned OFF and the motor starts operating.
4. Check that the READY output has been turned OFF and turn the START input OFF.
5. When the operation is completed, the READY output is turned ON.



Timing chart



2-5 Link method of operation data

Operations of two or more operation data numbers are linked. If the base point for linked operation is changed using the M0 to M7 inputs, linked operation with multiple operation patterns can be set. This can be used when a different operation pattern for each load is set.
When the command position reaches the target position, the operation transits to the next operation data number linked.

Related operation data

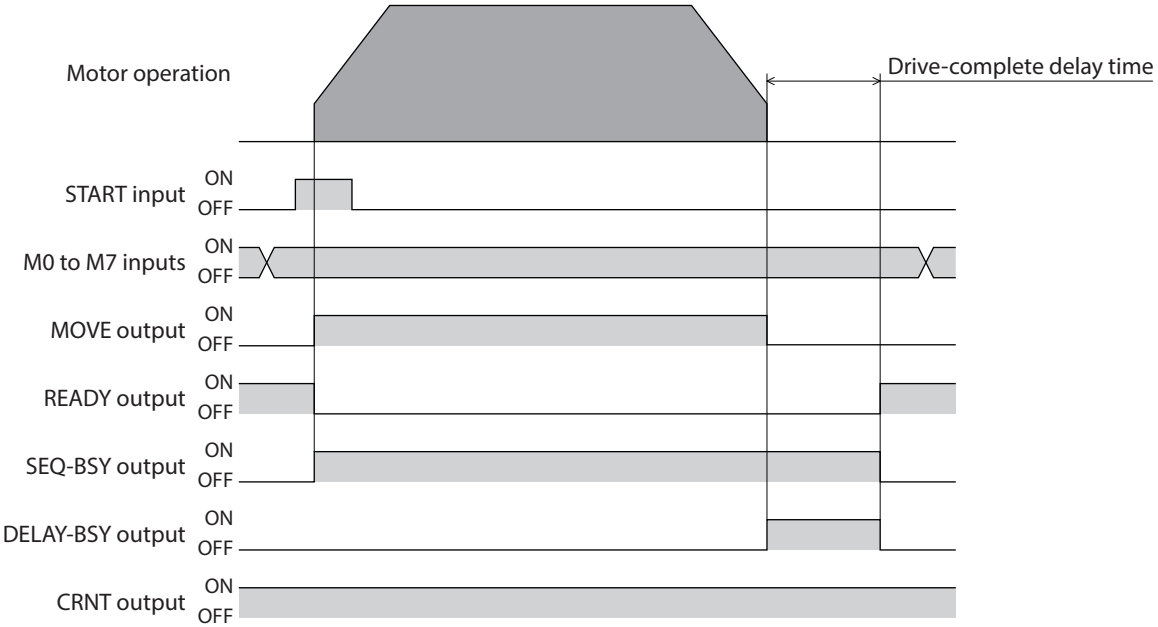
MEXE02 code	Name	Description	Setting range*	Initial value
p1	Link	Sets the mode for link operation.	0: No link 1: Manual sequential 2: Automatic sequential 3: Continuous sequential operation	0
	Next data number	Sets the next data number.	−256: No link [Stop] −2: Operation data number after next one [↓↓(+2)] −1: Next operation data number [↓(+1)] 0 to 255: Operation data number	−1

* A value in the brackets [ ] is shown on the screen of the **MEXE02** software.

■ No link (single-motion operation)

Operation is executed once with a single operation data number.

Timing chart



■ Manual sequential operation

Operation based on the operation data number set in the next data number is executed whenever the SSTART input is turned ON. This is a convenient method when multiple positioning operations are performed sequentially because it is not necessary to select each operation data number repeatedly.

memo

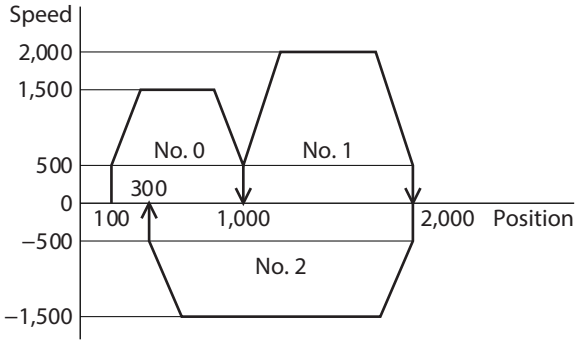
- Even if operation of the operation data number for which the manual sequential operation is set is completed, the SEQ-BSY output is not turned OFF (manual sequential waiting state). If the SSTART input is turned ON in this state, the operation data number set in the next data number is executed.
- If the SSTART input is turned ON in a state where the SEQ-BSY output is OFF, the operation data number presently selected is executed.

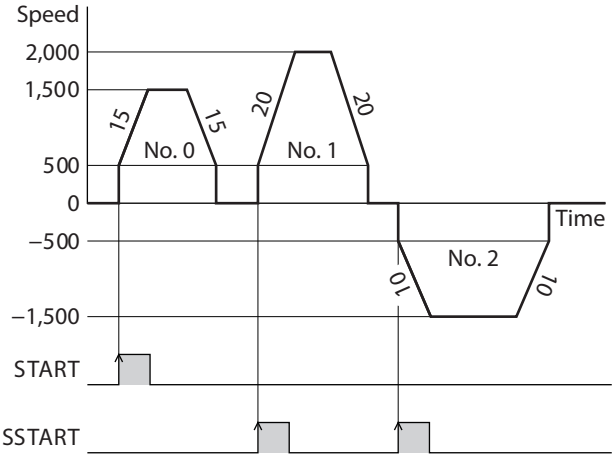
● Example of use: When positioning operation is performed at multiple coordinates at a desired time

Setting the operation data

Number	Operation type	Position [step]	Speed [Hz]	Starting/ changing rate [kHz/s]	Stopping deceleration [kHz/s]	Link	Next data number
0	1: Absolute positioning	1,000	1,500	15,000 (1=0.001)	15,000 (1=0.001)	1: Manual sequential	−1: ↓(+1)
1	1: Absolute positioning	2,000	2,000	20,000 (1=0.001)	20,000 (1=0.001)	1: Manual sequential	−1: ↓(+1)
2	1: Absolute positioning	300	1,500	10,000 (1=0.001)	10,000 (1=0.001)	0: No link	−256: Stop

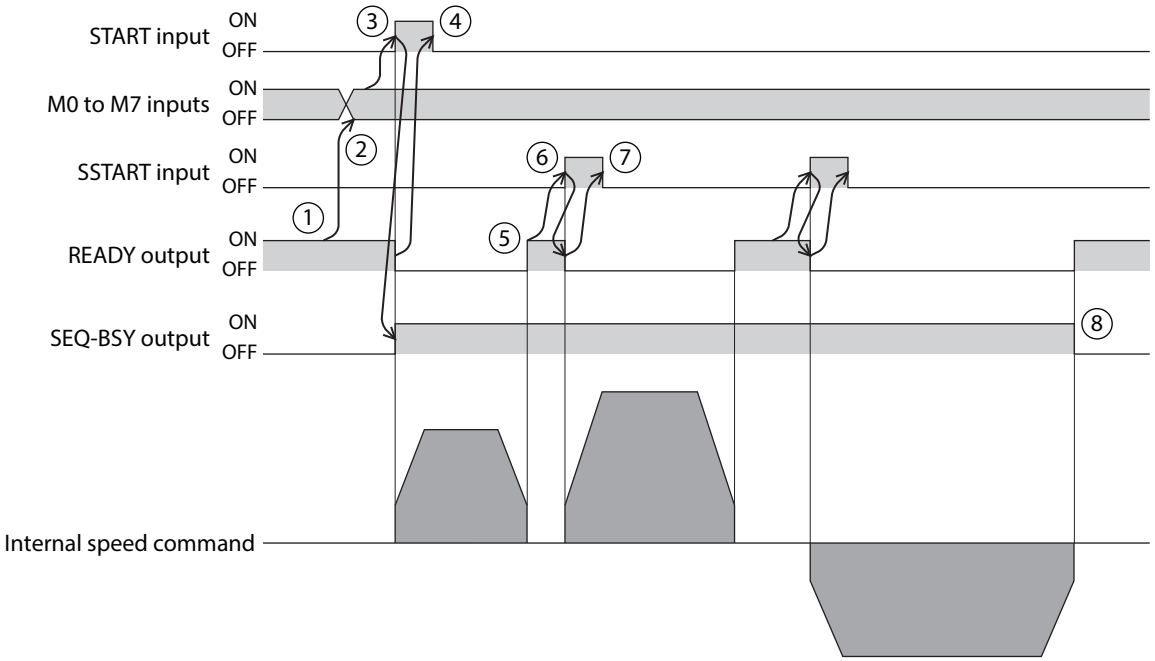
Operation example



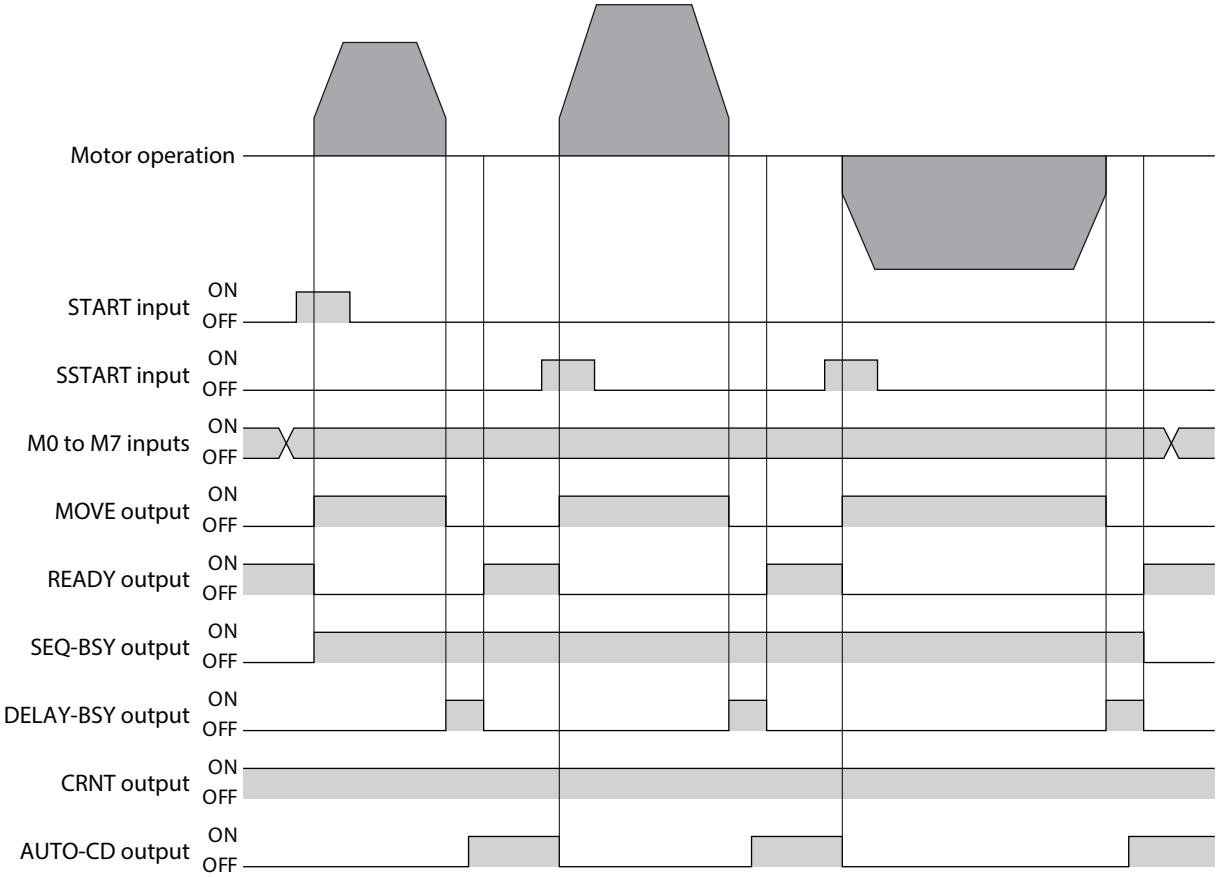


Operating method

1. Check that the READY output is being ON.
2. Select the operation data number using the M0 to M7 inputs.
3. Turn the START input ON.
   The READY output is turned OFF, the SEQ-BSY output is turned ON, and the motor starts operating.
4. Check that the READY output has been turned OFF and turn the START input OFF.
5. When the operation is completed, the READY output is turned ON.
6. Check that the READY output has been turned ON and turn the SSTART input ON.
   Operation of the operation data number linked by manual sequential is started.
7. Check that the READY output has been turned OFF and turn the SSTART input OFF.
8. When all linked operations are completed, the SEQ-BSY output is turned OFF and the READY output is turned ON.



Timing chart



■ Automatic sequential operation

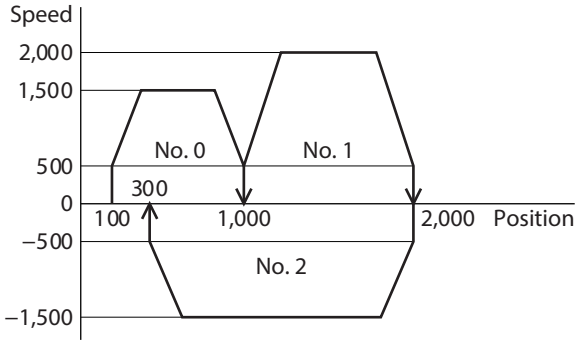
Two or more operations are automatically executed in sequence. After one operation is completed, operation of the operation data number set in the "Next data number" is started after stop for the time set in the "Drive-complete delay time." If there is operation data for which "0: No link" is set in the middle of the operation, the motor will stop after positioning SD operation with respect to the operation data of "0: No link" is completed.

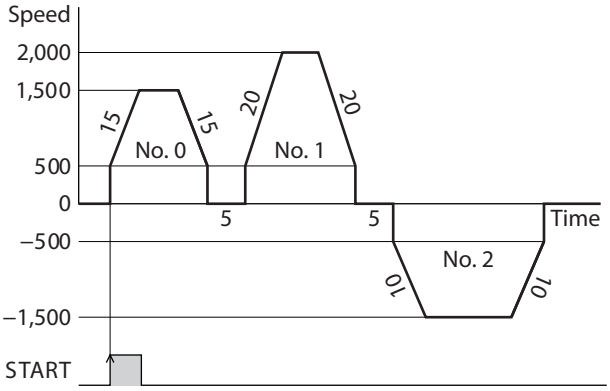
- **Example of use: When positioning operation is automatically performed at multiple coordinates**

Setting the operation data

Number	Operation type	Position [step]	Speed [Hz]	Starting/ changing rate [kHz/s]	Stopping deceleration [kHz/s]	Drive-complete delay time[s]	Link	Next data number
0	1: Absolute positioning	1,000	1,500	15,000 (1=0.001)	15,000 (1=0.001)	5,000 (1=0.001)	2: Automatic sequential	−1: ↓(+1)
1	1: Absolute positioning	2,000	2,000	20,000 (1=0.001)	20,000 (1=0.001)	5,000 (1=0.001)	2: Automatic sequential	−1: ↓(+1)
2	1: Absolute positioning	300	1,500	10,000 (1=0.001)	10,000 (1=0.001)	0	0: No link	−256: Stop

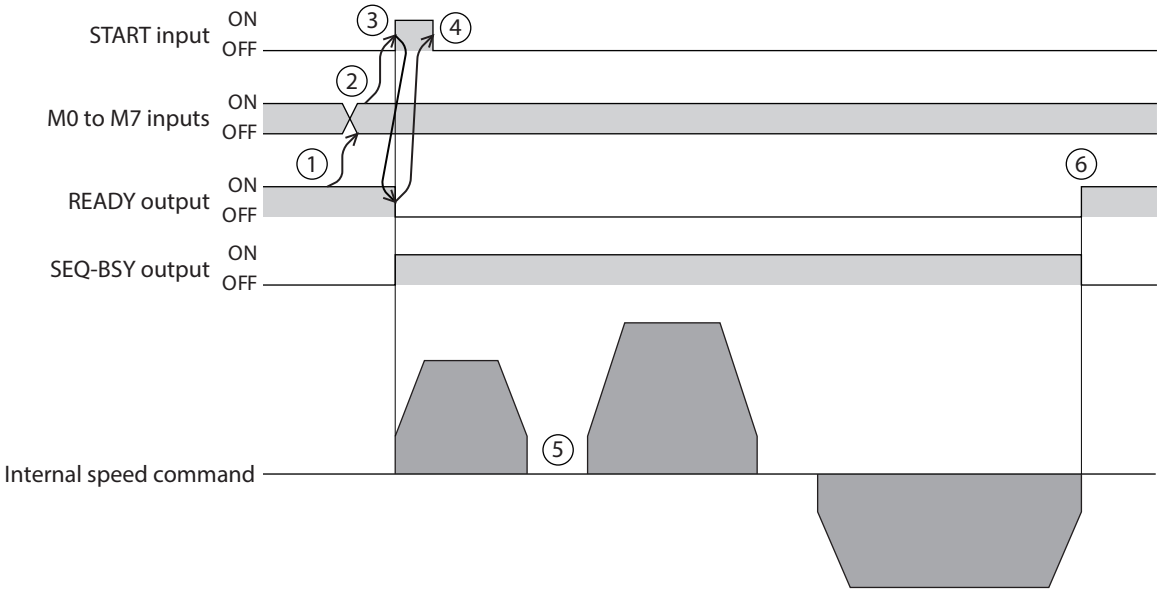
Operation example



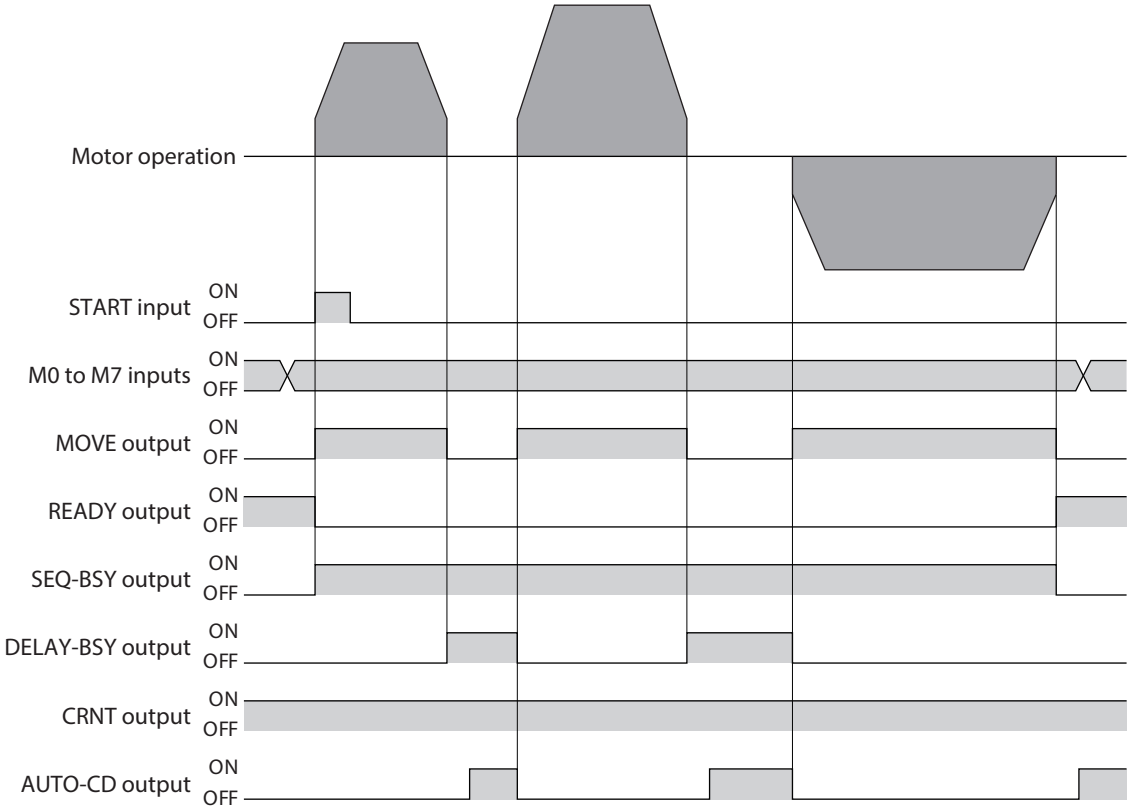


Operating method

1. Check that the READY output is being ON.
2. Select the operation data number using the M0 to M7 inputs.
3. Turn the START input ON.
   The READY output is turned OFF, the SEQ-BSY output is turned ON, and the motor starts operating.
4. Check that the READY output has been turned OFF and turn the START input OFF.
5. When the first operation is completed, the operation linked to "Automatic sequential" is started after stopping for the time set in "Drive-complete delay time."
6. When all linked operations are completed, the SEQ-BSY output is turned OFF and the READY output is turned ON.



Timing chart



■ Continuous sequential operation

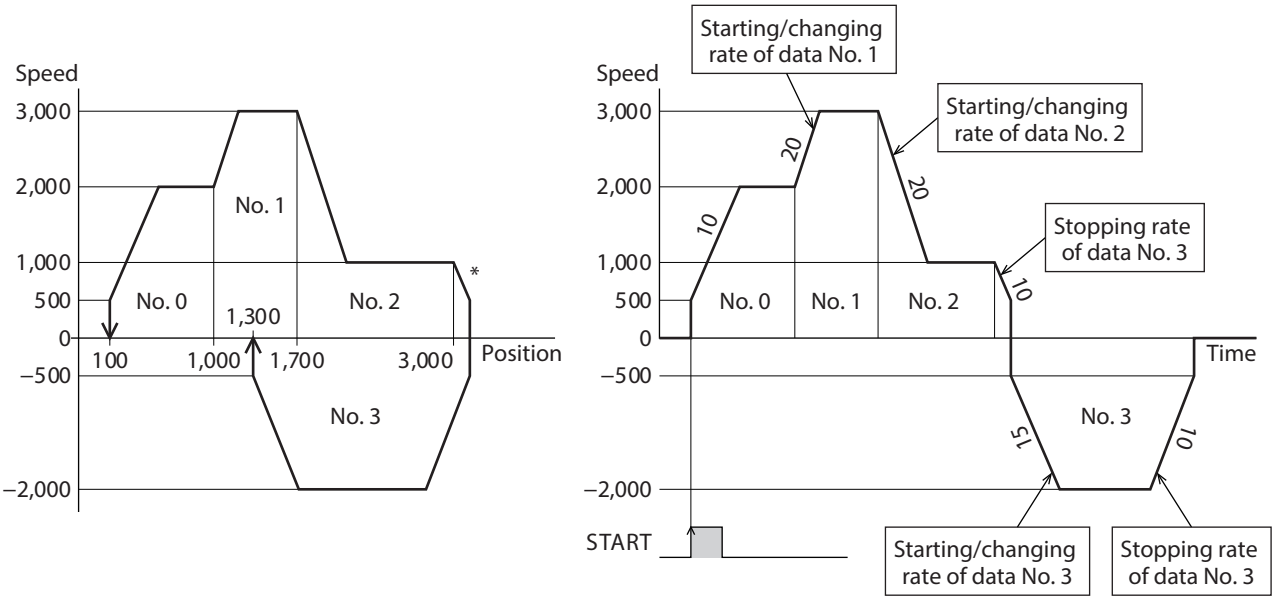
Operation based on the operation data number set in the "Next data number" is executed continuously without stopping the motor. If there is operation data for which "0: No link" is set in the middle of the operation, the motor will stop after positioning SD operation with respect to the operation data of "0: No link" is completed.

- **Example of use: When the speed is changed at positions specified.**

Setting the operation data

Number	Operation type	Position [step]	Speed [Hz]	Starting/ changing rate [kHz/s]	Stopping deceleration [kHz/s]	Link	Next data number
0	1: Absolute positioning	1,000	2,000	10,000 (1=0.001)	15,000 (1=0.001)	3: Continuous sequential operation	−1: ↓(+1)
1	1: Absolute positioning	1,700	3,000	20,000 (1=0.001)	20,000 (1=0.001)	3: Continuous sequential operation	−1: ↓(+1)
2	1: Absolute positioning	3,000	1,000	20,000 (1=0.001)	20,000 (1=0.001)	3: Continuous sequential operation	−1: ↓(+1)
3	1: Absolute positioning	1,300	2,000	15,000 (1=0.001)	10,000 (1=0.001)	0: No link	−256: Stop

Operation example



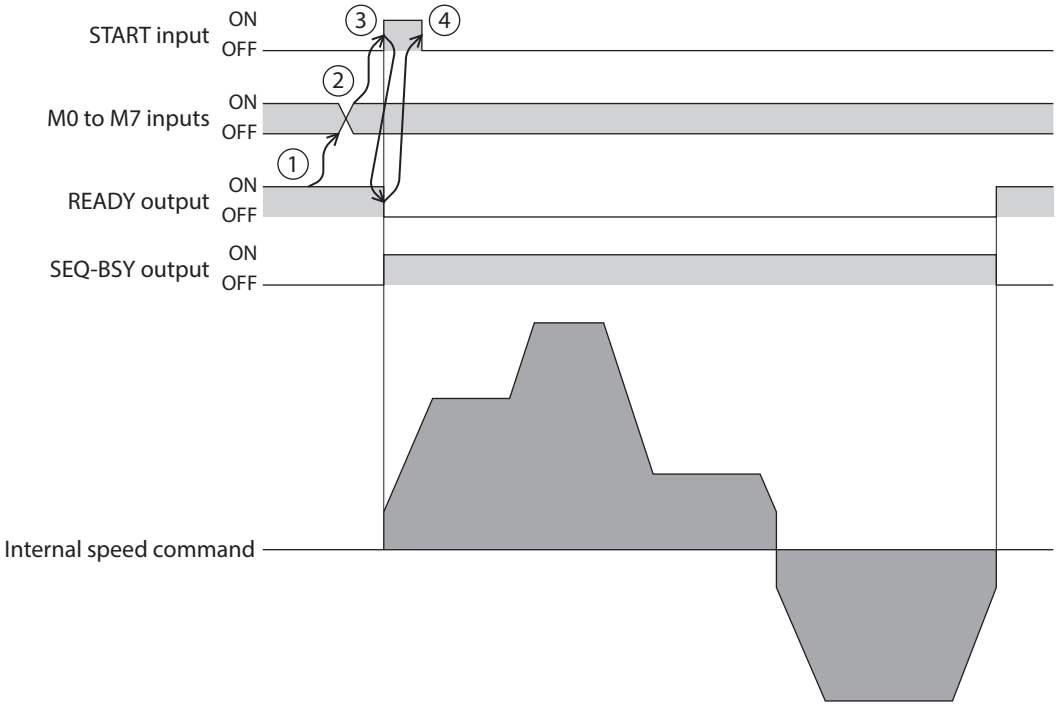
* If the direction of operation is switched to the opposite direction in the middle of operation, the target position will be exceeded.

memo

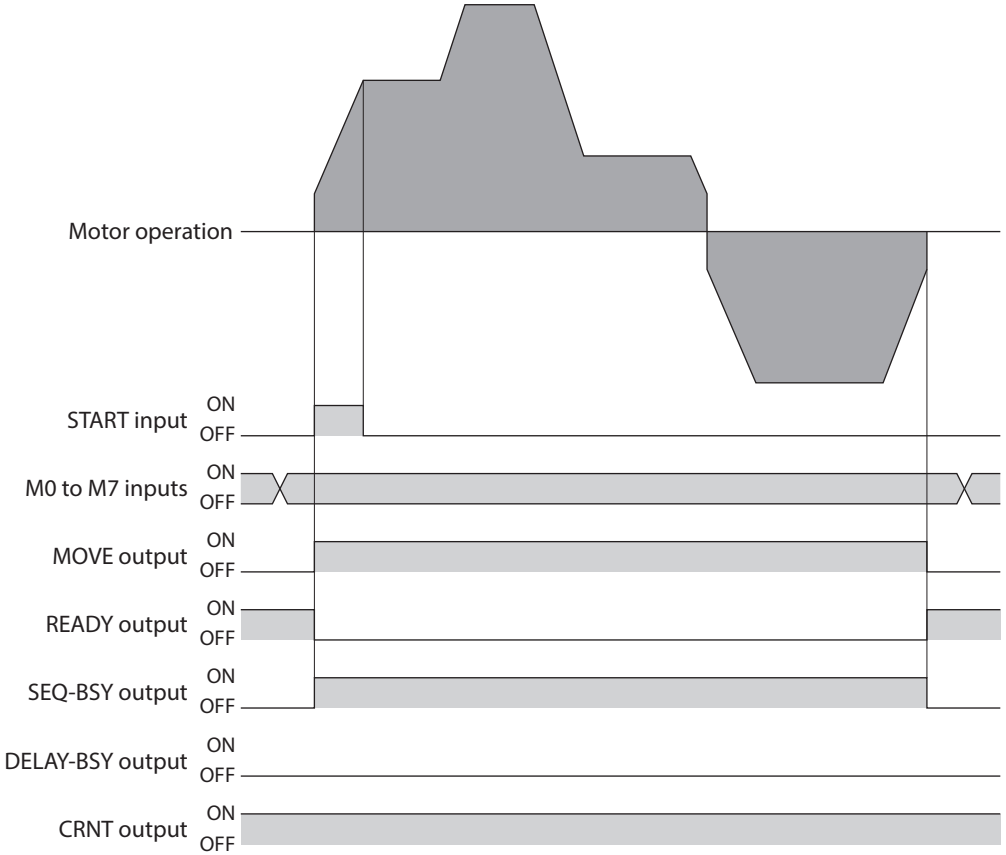
- To link to the next operation data number, the motor accelerates according to the starting/ changing rate of the next data number.
- If operation of the next data number was set to the rotation in the opposite direction, the motor decelerates according to the stopping deceleration of the next data number.
- When stopped, the motor decelerates according to the stopping deceleration of the operation data number linked at last.

Operating method

1. Check that the READY output is being ON.
2. Select the operation data number using the M0 to M7 inputs.
3. Turn the START input ON.
   The READY output is turned OFF, the SEQ-BSY output is turned ON, and the motor starts operating.
4. Check that the READY output has been turned OFF and turn the START input OFF.
5. When the motor reaches the target position during operation, the operation transitions to the next operation linked, and the motor starts acceleration/deceleration from the present speed to the target speed.
6. When all linked operations are completed, the SEQ-BSY output is turned OFF and the READY output is turned ON.



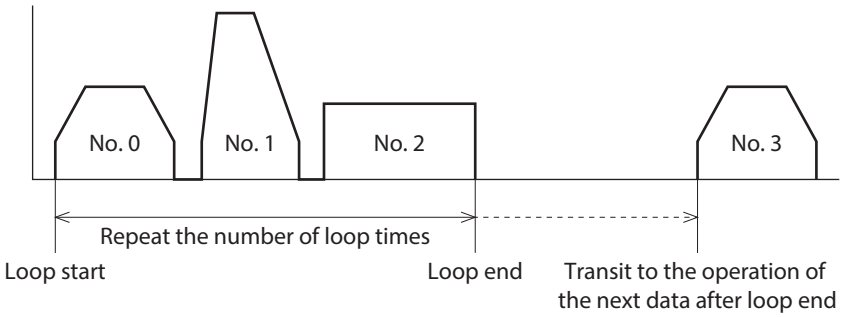
Timing chart



2-6 Sequence function

■ Loop function

The loop function is a function that repeats the operation of the linked operation data numbers the set number of times.
From the operation data number where the "Loop count" is set to that where the "Loop end number" is set, the operation is repeated the number of times set in the "Loop count." When the operation is completed the set number of times, the operation transitions to the operation data number that is set in "Next data number."



Note If "0: No link" is included in "Link" of the operation data number to be looped, the motor stops when operation of the operation data number for which "0: No link" is set is completed. Be sure to link all operation data numbers using "1: Manual sequential," "2: Automatic sequential," or "3: Continuous sequential operation."

Related operation data

MEXE02 code	Name	Description	Setting range*	Initial value
p1	Link	Sets the mode for link operation.	0: No link 1: Manual sequential 2: Automatic sequential 3: Continuous sequential operation	0
	Next data number	Sets the next data number.	−256: No link [Stop] −2: Operation data number after next one [↓↓(+2)] −1: Next operation data number [↓(+1)] 0 to 255: Operation data number	−1
	Loop count	Sets the number of loop times.	0: No loop [−] 2 to 255: Number of loop times [loop 2{ to loop 255{]	0
	Loop offset	Offsets the position (travel amount) every time loop is executed.	−4,194,304 to 4,194,303 steps	0
	Loop end number	Sets to the operation data number in which loop is completed.	0: Not the loop end point [−] 1: Loop end point [}L-End]	0

* A value in the brackets [ ] is shown on the screen of the **MEXE02** software.

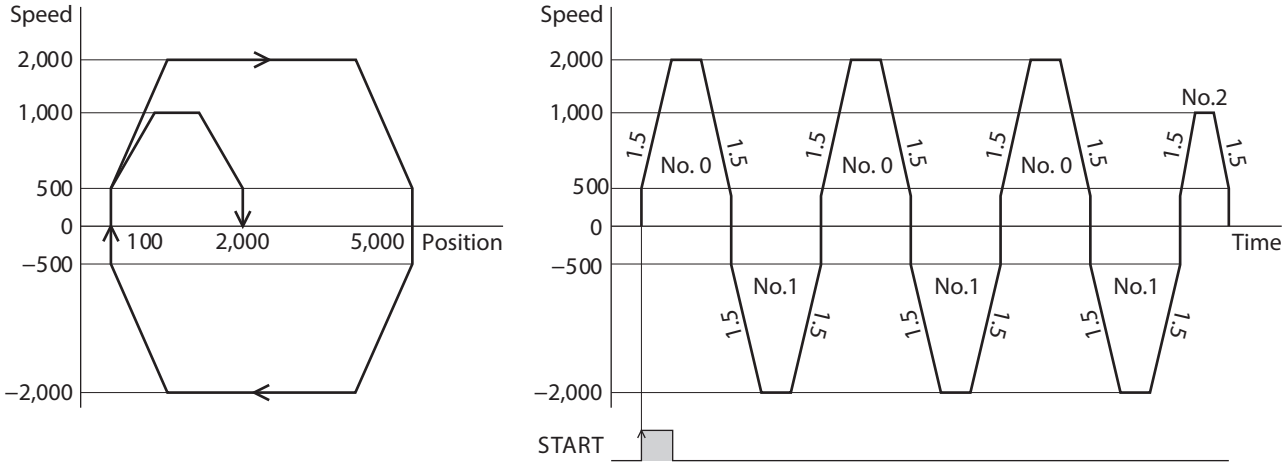
- **Example of use: When operating from operation data No. 0 to No. 1 is repeated three times.**

Setting the operation data

Number	Operation type	Position [step]	Speed [Hz]	Starting/changing rate [kHz/s]	Stopping deceleration [kHz/s]
0	1: Absolute positioning	5,000	2,000	1,500 (1=0.001)	1,500 (1=0.001)
1	1: Absolute positioning	100	2,000	1,500 (1=0.001)	1,500 (1=0.001)
2	1: Absolute positioning	2,000	1,000	1,500 (1=0.001)	1,500 (1=0.001)

Number	Link	Next data number	Loop count	Loop end number
0	2: Automatic sequential	−1: ↓(+1)	3: Loop 3{	0: –
1	2: Automatic sequential	−1: ↓(+1)	0: –	1: }L-End
2	0: No link	−256: Stop	0: –	0: –

Operation example



■ Offset of loop

If an offset is set, the target position for positioning can be shifted by the amount set in the "Loop offset" while repeating the loop. Use for palletizing operation, etc.

- **Example of use: When operation from operation data No. 0 to No. 1 is repeated three times. (When the target position is increased by 100 steps every time loop is executed)**

Setting the operation data

In absolute positioning: The coordinates of the target position is offset.

Number	Operation type	Position [step]	Speed [Hz]	Starting/changing rate [kHz/s]	Stopping deceleration [kHz/s]
0	1: Absolute positioning	1,000	1,200	1,500 (1=0.001)	1,500 (1=0.001)
1	1: Absolute positioning	100	1,200	1,500 (1=0.001)	1,500 (1=0.001)

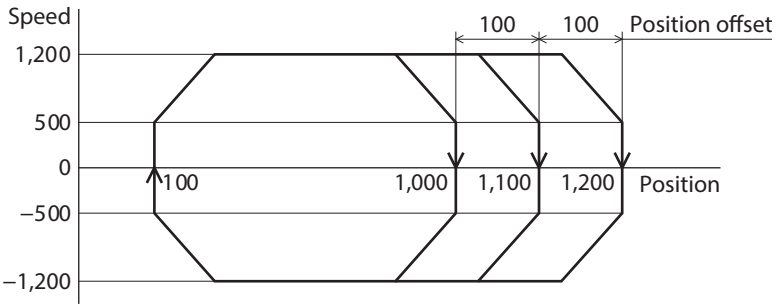
Number	Link	Next data number	Loop count	Loop offset	Loop end number
0	2: Automatic sequential	−1: ↓(+1)	3: Loop 3{	100	0: –
1	2: Automatic sequential	−256: Stop	0: –	0	1: }L-End

In incremental positioning: The travel amount to the target position is offset.

Number	Operation type	Position [step]	Speed [Hz]	Starting/changing rate [kHz/s]	Stopping deceleration [kHz/s]
0	2: Incremental positioning (based on command position)	900	1,200	1,500 (1=0.001)	1,500 (1=0.001)
1	2: Incremental positioning (based on command position)	−900	1,200	1,500 (1=0.001)	1,500 (1=0.001)

Number	Link	Next data number	Loop count	Loop offset	Loop end number
0	2: Automatic sequential	−1: ↓(+1)	3: Loop 3{	100	0: –
1	2: Automatic sequential	−256: Stop	0: –	−100	1: }L-End

Operation example



2-7 Extended operation data setting

Specifications of operation data can be extended.

■ Extended loop function

The extended loop function is a function to execute loop operation for the number of times (256 times or more) that cannot be set in the operation data. This function can be used to repeat a simple operation as in an endurance test. Operation is repeated the number of times set in "Repeat time" from the operation data number set in "Repeat start operation data number" to that set in "Repeat end operation data number." When the operation is completed for the set number of times, the operation transitions to the operation data number that is set in "Next data number."
When the extended loop function is used, the operation data from "Repeat start operation data number" to "Repeat end operation data number" is fixed to the following values.

MEXE02 code	Name	Fixed value
p1	Next data number	↓ (+1)
	Loop count	Repeat start operation data number: Number of repetitions Others: –
	Loop offset	0
	Loop end number	Repeat end operation data number: End Others: –

Note If "0: No link" is included in "Link" of the operation data number to be looped, the motor stops when operation of the operation data number for which "0: No link" is set is completed. Be sure to link all operation data numbers using "1: Manual sequential," "2: Automatic sequential," or "3: Continuous sequential operation."

Related operation data

MEXE02 code	Name	Description	Setting range*	Initial value
p1	Link	Sets the mode for link operation.	0: No link 1: Manual sequential 2: Automatic sequential 3: Continuous sequential operation	0
	Next data number	Sets the next data number.	–256: No link [Stop] –2: Operation data number after next one [↓↓(+2)] –1: Next operation data number [↓(+1)] 0 to 255: Operation data number	–1

* A value in the brackets [ ] is shown on the screen of the **MEXE02** software.

Related extended operation data setting

MEXE02 code	Name	Description	Setting range	Initial value
p2	Repeat start operation data number	Sets the operation data number at which extended loop operation is started.	–1: Disable 0 to 255: Operation data number	–1
	Repeat end operation data number	Sets the operation data number at which extended loop operation is completed.		–1
	Repeat time	Sets the number of repetitions for extended loop operation.	–1: Disable 0 to 100,000,000 times	–1

- **Example of use:**
  When operation is transitioned to operation data No. 2 after operating operation data No. 0 and No. 1 is repeated 500 times.

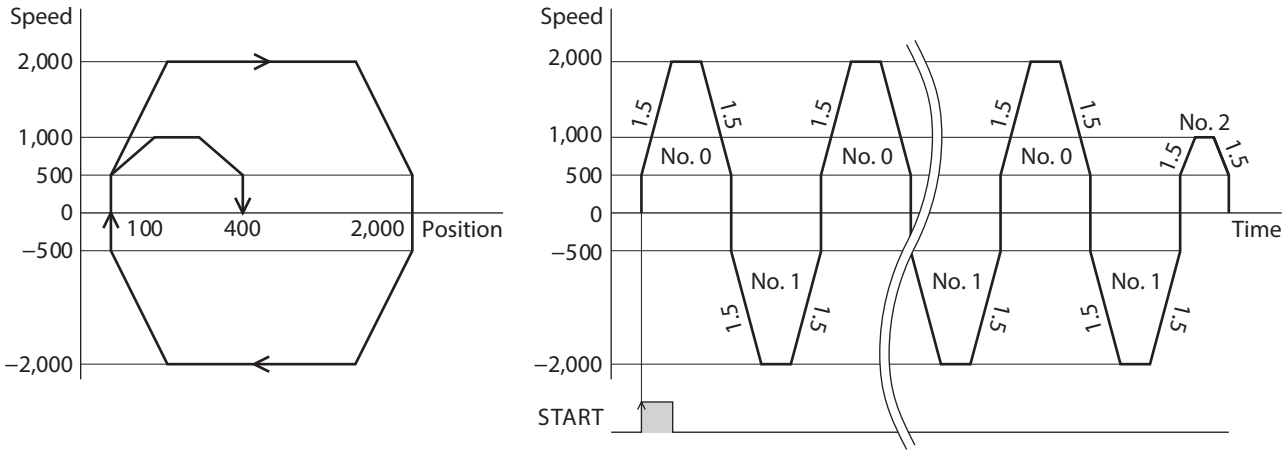
Setting the operation data

Number	Operation type	Position [step]	Speed [Hz]	Starting/ changing rate [kHz/s]	Stopping deceleration [kHz/s]	Link	Next data number
0	1: Absolute positioning	2,000	2,000	1,500 (1=0.001)	1,500 (1=0.001)	2: Automatic sequential	−1: ↓(+1)
1	1: Absolute positioning	100	2,000	1,500 (1=0.001)	1,500 (1=0.001)	2: Automatic sequential	−1: ↓(+1)
2	1: Absolute positioning	400	1,000	1,500 (1=0.001)	1,500 (1=0.001)	0: No link	−256: Stop

Extended operation data setting

Repeat start operation data number	0
Repeat end operation data number	1
Repeat time	500

Operation example



■ Common setting and separate setting for acceleration/deceleration

The acceleration/deceleration in positioning SD operation and continuous macro operation can be set as follows using the "Rate selection" parameter of the Extended operation data setting.

- Common setting: The values set in the "Common starting/changing rate" parameter and the "Common stopping rate" parameter are followed.
- Separate setting: The acceleration/deceleration set in the operation data number is followed.

Related extended operation data setting

MEXE02 code	Name	Description	Setting range	Initial value
p2	Common starting/ changing rate	Sets the acceleration/deceleration rate or the acceleration/deceleration time when starting or changing speed in the common setting.	1 to 1,000,000,000 (1=0.001)*	30,000
	Common stopping rate	Sets the deceleration rate or the deceleration time when stopping in the common setting.		30,000
	Rate selection	Sets whether to use the common acceleration/deceleration or the acceleration/deceleration specified in the operation data.	0: The common rate is used (common setting) 1: The rate of each operation data is used (separate setting)	1

* The setting unit is followed the "Acceleration/deceleration unit" parameter.

memo The parameters set here are disabled in pulse-input operation.

2-8 Stopping movement

■ Operation stop input

When the operation stop signal is input during motor operation, the motor stops.

Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p6	STOP input action	Sets how to stop the motor when the STOP input is turned ON.	0: Immediate stop 3: Deceleration stop	3
	FW-BLK/RV-BLK input action	Sets how to stop the motor when the FW-BLK input or the RV-BLK input is turned ON.	0: Immediate stop 1: Deceleration stop	1

memo The motor always stops immediately in pulse-input operation. The parameters set here are disabled.

■ Hardware overtravel

Hardware overtravel is a function that installs the limit sensors (FW-LS, RV-LS) at the upper and lower limits of the travel range and limits the travel range. If the "FW-LS/RV-LS input action" parameter is set, the motor can be stopped when the limit sensor is detected.

Related parameter

MEXE02 code	Name	Description	Setting range	Initial value
p6	FW-LS/RV-LS input action	Sets how to stop the motor when the FW-LS input or the RV-LS input is turned ON.	−1: Used as a return-to-home sensor 0: Immediate stop 1: Deceleration stop 2: Immediate stop with alarm 3: Deceleration stop with alarm	2

memo The motor always stops immediately in pulse-input operation. The parameters set here are disabled.

■ Software overtravel

Software overtravel is a function that uses the parameters to set the upper and lower limits of the travel range and limits the travel range.
If the "Software overtravel" parameter 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 parameters

MEXE02 code	Name	Description	Setting range	Initial value
p3	Software overtravel	Sets the motor operation when the software overtravel is detected.	−1: Disable 0: Immediate stop 1: Deceleration stop 2: Immediate stop with alarm 3: Deceleration stop with alarm	3
	Positive software limit	Sets the value of software limit in the forward direction.	−2,147,483,648 to 2,147,483,647 steps	2,147,483,647
	Negative software limit	Sets the value of software limit in the reverse direction.		−2,147,483,648

memo
- The motor always stops immediately in pulse-input operation. The parameters set here are disabled.
- Software overtravel is enabled while coordinates are set. Refer to p.82 for setting the coordinates.

■ Escape from the limit sensor

It is possible to escape in the reverse direction when the limit in the forward direction is detected and in the forward direction when that in the reverse direction is detected.

2-9 Operating current and stop current

The operating current and the stop current are calculated based on the base current (%).
The base current is a current used to set the operating current and the stop current and is set as a percentage (%) of the maximum output current of the driver. If the load is small and there is sufficient allowance for torque, the motor temperature rise can be suppressed by setting a lower base current.

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

■ Operating current

The motor operating current is calculated as follows.

- Motor operating current = Maximum output current × "Base current" parameter setting value × "Operating current" setting value

Related operation data

MEXE02 code	Name	Description	Setting range	Initial value
p1	Operating current	Sets the motor operating current based on the base current being 100 %.	0 to 1,000 (1=0.1 %)	1,000

Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p3	Base current	Sets the base current.	0 to 1,000 (1=0.1 %)	1,000
p4	JOG/HOME operating current	Sets the operating current for JOG operation or return-to-home operation, based on the base current being 100 %.	0 to 1,000 (1=0.1 %)	1,000

Related register

Register address		Name	Description	Setting range	Initial value
Upper	Lower				
0064h (100)	0065h (101)	Direct data operation operating current	Sets the operating current based on the base current being 100 %.	0 to 1,000 (1=0.1 %)	1,000

■ 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 as follows.

- Motor stop current = Maximum output current × "Base current" parameter setting value × "Stop current" parameter value

Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p3	Base current	Sets the base current.	0 to 1,000 (1=0.1 %)	1,000
	Stop current	Sets the motor stop current based on the base current being 100 %.		500

memo When the "Applicable motor setting" parameter is set to "23: 5-phase 2.4 A/phase," set the "Stop current" parameter to 75 % or less.

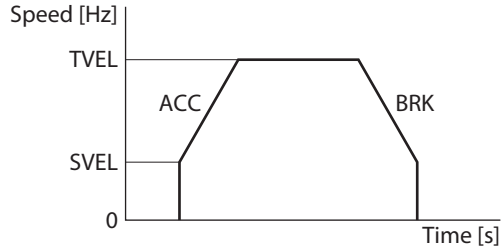
2-10 Acceleration/deceleration unit

The unit of acceleration/deceleration can be set using the "Acceleration/deceleration unit" parameter.
The acceleration/deceleration rate (kHz/s, ms/kHz) and acceleration/deceleration time (s) can be set as a unit.

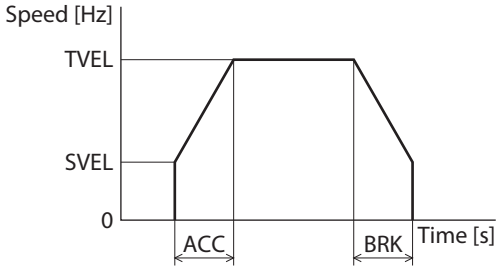
Explanation of code

- TVEL: Operating speed
- SVEL: Starting speed
- ACC: Starting/changing rate
- BRK: Stop

For [kHz/s] or [ms/kHz] setting



For [s] setting



Related parameter

MEXE02 code	Name	Description	Setting range	Initial value
p3	Acceleration/ deceleration unit	Sets the acceleration/deceleration unit.	0: kHz/s 1: s 2: ms/kHz	0

Note The maximum acceleration/deceleration value is fixed at 1 GHz/s, and the minimum acceleration/ deceleration value is fixed at 1 Hz/s. When the "Acceleration/deceleration unit" parameter is set to "1: s," set the acceleration/deceleration time so that the acceleration/deceleration rate falls within this range.

2-11 Starting speed

Set the operating speed of the motor when starting operation. When the operating speed is lower than the starting speed, self-start operation (rectangular operation) is performed at the operating speed.

Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p3	Starting speed	Sets the starting speed for positioning SD operation or continuous macro operation.	0 to 4,000,000 Hz	100
p4	(JOG) Starting speed	Sets the starting speed for JOG macro operation.	0 to 4,000,000 Hz	100
	(HOME) Return-to-home starting speed	Sets the starting speed for return-to-home operation.	1 to 4,000,000 Hz	100

3 Return-to-home operation

Return-to-home operation is operation to detect the home using an external sensor.
It is executed to return from the present position to the home when the main power supply is turned on or positioning operation is completed.

3-1 Return-to-home operation types

There are three types of return-to-home operations, as shown below.

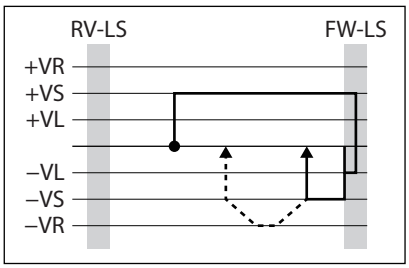
Item	Description	Features
2-sensor mode	When the limit sensor is detected, the motor rotates in the reverse direction and pull out of the limit sensor. After pulling out of the limit sensor, the motor rotates according to the value set in the "(HOME) Backward steps in 2 sensor return-to-home" parameter and stops. The position at which the motor stopped is set as the home.	• Two sensors are required externally. • The operating speed is at a low rate (return-to-home starting speed).
3-sensor mode	When the limit sensor is detected, the motor rotates in the reverse direction and pull out of the limit sensor. After that, it stops when the ON edge of the HOME sensor is detected. The position at which the motor stopped is set as the home.	• Three sensors are required externally.* • The operating speed is at a high rate (return-to-home operating speed).
One-way rotation mode	The motor stops when the ON edge of the HOME sensor is detected. After that, until the OFF edge of the HOME sensor is detected, it pulls out of the sensor according to the speed set in the "(HOME) Return-to-home last speed" parameter. 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" parameter and stops. The position at which the motor stopped is set as the home.	• One external sensor is required. • The operating speed is at a high rate (return-to-home operating speed). • Not reversed.

* For a rotating mechanism, the home can be detected even using one external sensor.

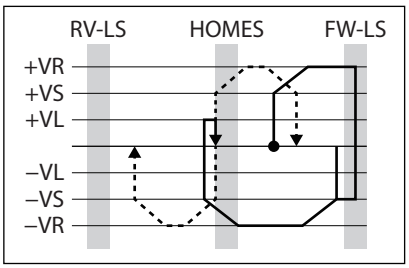
Explanation of code

- VR: (HOME) Return-to-home operating speed
- VS: (HOME) Return-to-home starting speed
- VL: (HOME) Return-to-home last speed
- - - -: Orbit when the home offset is set

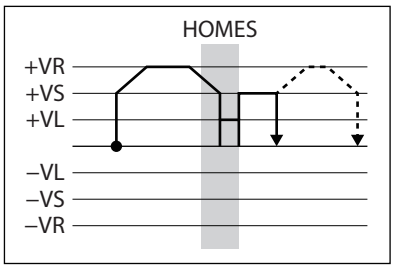
• 2-Sensor mode



• 3-Sensor mode



• One-way rotation mode



3-2 Setting of parameters

Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p4	JOG/HOME command filter time constant	Sets the time constant for the command filter.	1 to 200 ms	1
	JOG/HOME operating current	Sets the operating current for JOG operation or return-to-home operation, based on the base current being 100 %.	0 to 1,000 (1=0.1 %)	1,000
	(HOME) Return-to-home mode	Sets the return-to-home method.	0: 2-sensor 1: 3-sensor 2: One-way rotation	1
	(HOME) Return-to-home starting direction	Sets the starting direction for detecting the home.	0: Negative side 1: Positive side	1
	(HOME) Return-to-home acceleration/deceleration	Sets the acceleration/deceleration rate or the acceleration/deceleration time for return-to-home operation.	1 to 1,000,000,000 (1=0.001)*	30,000
	(HOME) Return-to-home starting speed	Sets the starting speed for return-to-home operation.	1 to 4,000,000 Hz	100
	(HOME) Return-to-home operating speed	Sets the operating speed for return-to-home operation.		1,000
	(HOME) Return-to-home last speed	Sets the operating speed when finally positioning with the home.	1 to 10,000 Hz	100
	(HOME) Backward steps in 2 sensor return-to-home	Sets the amount of backward steps after return-to-home operation in the 2-sensor mode.	0 to 8,388,607 steps	200
	(HOME) Operating amount in uni-directional return-to-home	Sets the operating amount after return-to-home operation in the one-way rotation mode.		200

* The setting unit is followed the "Acceleration/deceleration unit" parameter.

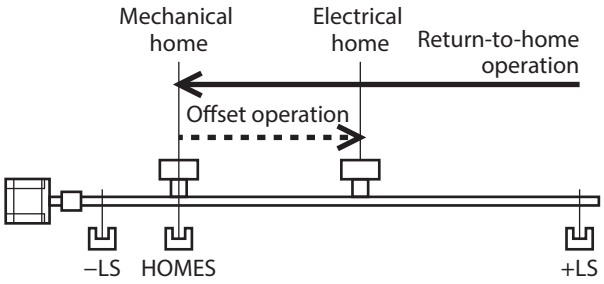
memo

- The ABSPEN output is turned OFF since the coordinates are not fixed during return-to-home operation.
- In return-to-home operation, the position preset (P-PRESET) is executed to set the coordinates after return-to-home operation is completed.

3-3 Additional function

- **Home offset**

This is a function that performs positioning operation of the value set in the "(HOME) Return-to-home position offset" parameter after return-to-home operation and sets the stopped position as the home.
The home set by the "(HOME) Return-to-home position offset" parameter is called the "electrical home" in distinction from the mechanical home. If the value of the position offset is 0, the mechanical home and the electrical home are in the same position.



- **Detection of external sensor (signal)**

When the SLIT input and/or the TIM output or the ZSG output are used simultaneously with return-to-home operation, the home can be detected more accurately.

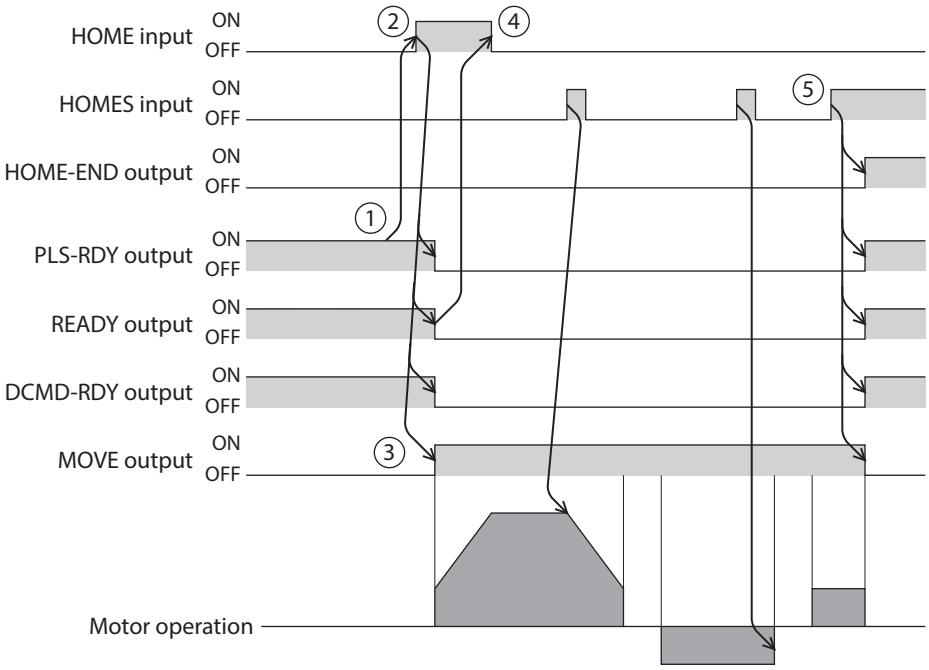
memo When using the TIM output, set the resolution to a value that is an integer multiple of 50.

- **Related parameters**

MEXE02 code	Name	Description	Setting range	Initial value
p4	(HOME) Return-to-home SLIT detection	Sets whether to use the SLIT input together when returning to the home.	0: Disable 1: Enable	0
	(HOME) Return-to-home TIM/ZSG signal detection	Sets whether to use the TIM output or the ZSG output together when returning to the home.	0: Disable 1: TIM 2: ZSG	0
	(HOME) Return-to-home position offset	Sets the amount of offset from the home.	–2,147,483,647 to 2,147,483,647 steps	0

3-4 Timing chart (3-sensor mode)

1. Check that the READY output is being ON.
2. Turn the HOME input ON.
3. The PLS-RDY output, the READY output, and the DCMD-RDY output are turned OFF, the MOVE output is turned ON, and return-to-home operation is started.
4. Check that the READY output has been turned OFF and turn the HOME input OFF.
5. The HOMES input is turned ON and return-to-home operation is completed.
   The HOME-END output, the PLS-RDY output, the READY output, and the DCMD-RDY output are turned ON, and the MOVE output is turned OFF.



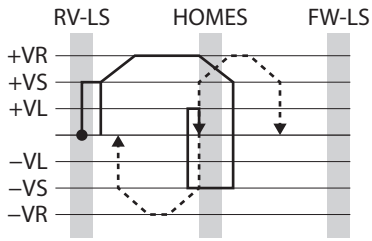
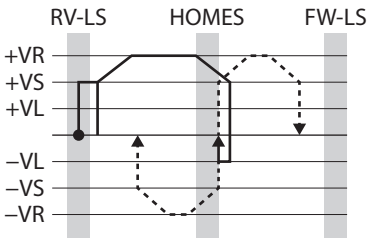
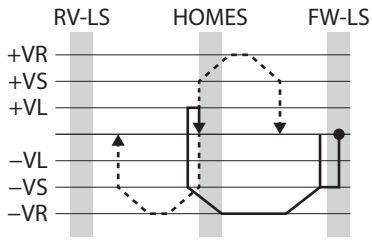
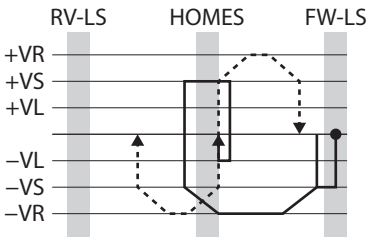
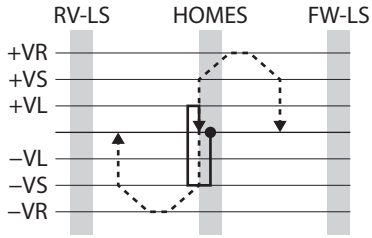
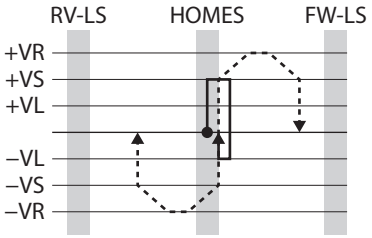
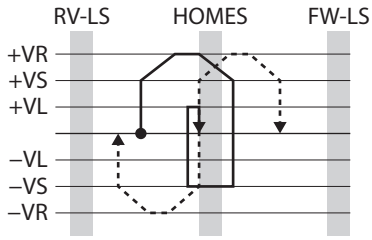
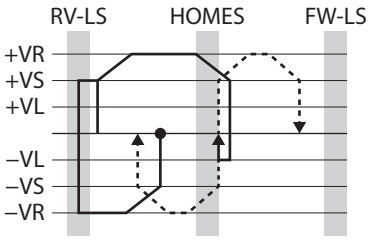
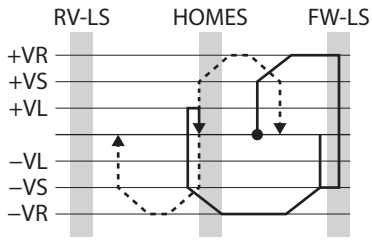
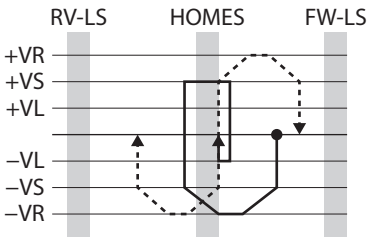
3-5 Operation sequence

■ 3-sensor mode

When the limit sensor is detected during operation, the motor rotates in the reverse direction and pulls out of the limit sensor. The motor operates at the "(HOME) Return-to-home operating speed" and stops when the ON edge of the HOME sensor is detected. The position at which the motor stopped is set as the home.

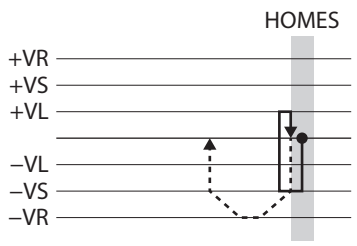
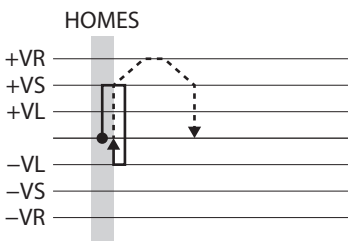
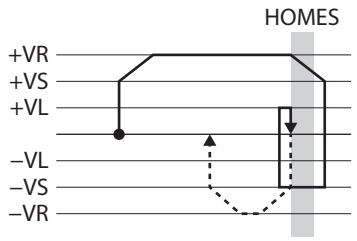
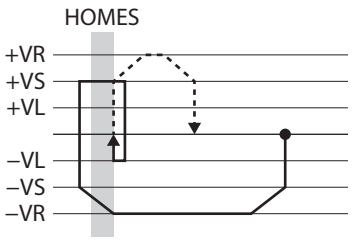
Explanation of code

- VR: (HOME) Return-to-home operating speed
- VS: (HOME) Return-to-home starting speed
- VL: (HOME) Return-to-home last speed
- - - -: 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 using the HOME sensor only (rotating machine etc.)**

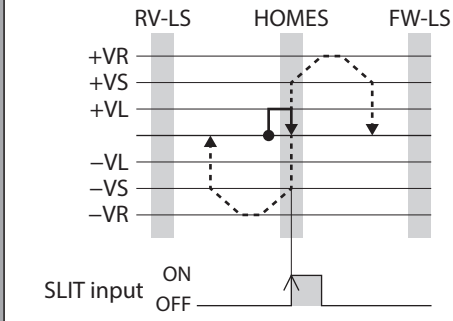
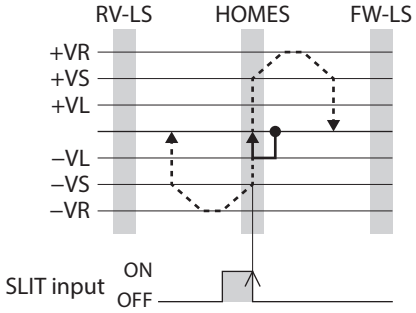
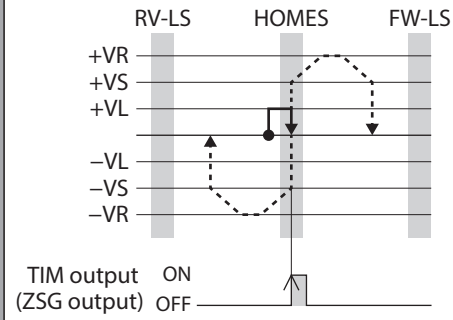
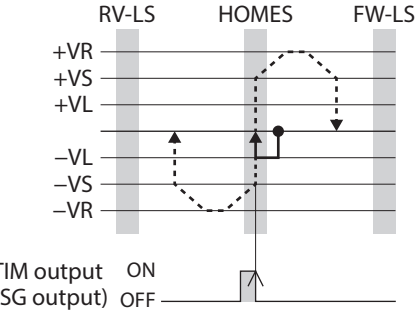
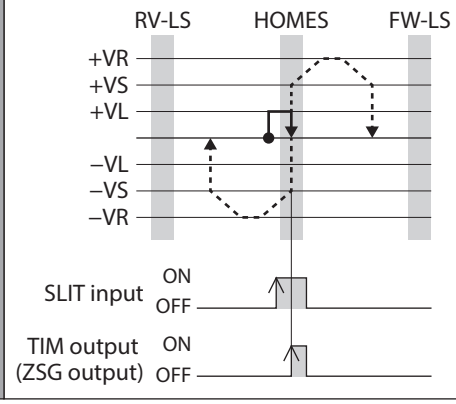
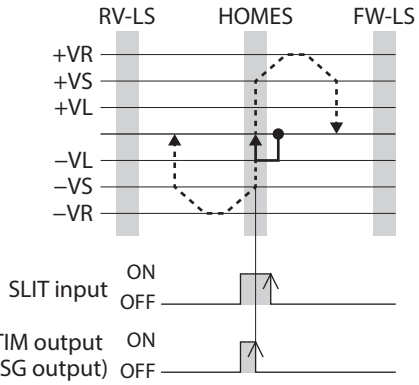
  If the limit sensor is not used, for example on a rotating mechanism, the sequence is as follows.

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

Note Depending on the value set in the "(HOME) Return-to-home acceleration/deceleration" parameter, the motor may decelerate to a stop beyond the HOME sensor after the HOME sensor is detected. There is a risk of contact if the distance between the mechanical end and the HOME sensor is close, so leave enough space between them.

- **When the SLIT input and/or the TIM output or the ZSG output 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.

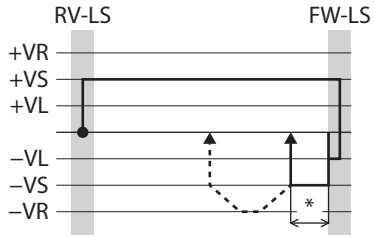
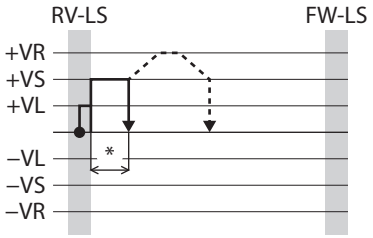
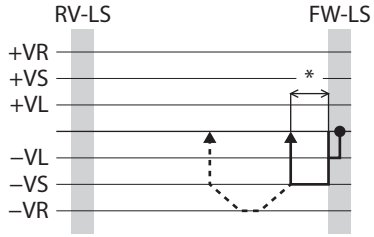
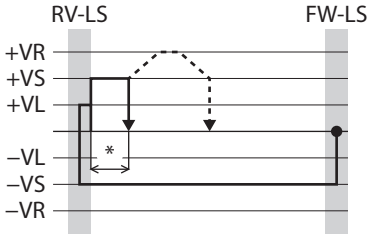
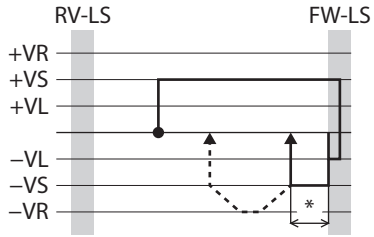
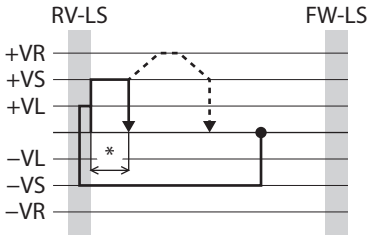
Home detection signal	Starting direction of return-to-home operation: Positive direction	Starting direction of return-to-home operation: Negative direction
SLIT input		
TIM output or ZSG output		
SLIT input and TIM output, or SLIT input and ZSG output		

■ 2-sensor mode

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

Explanation of code

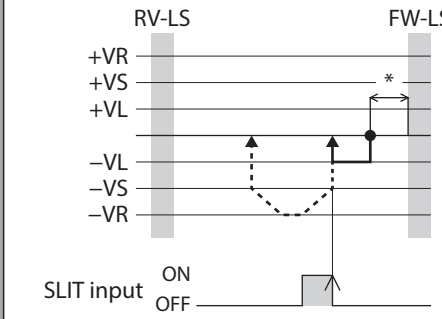
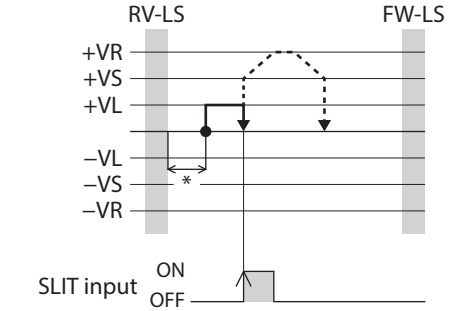
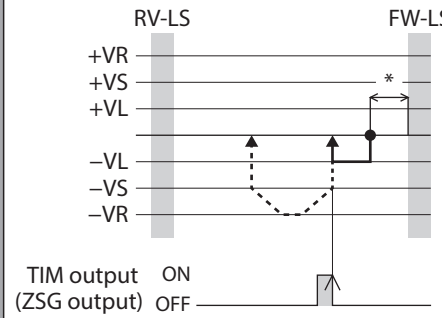
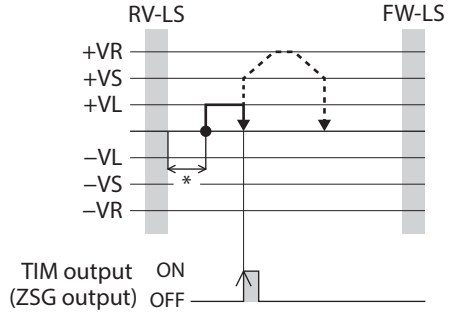
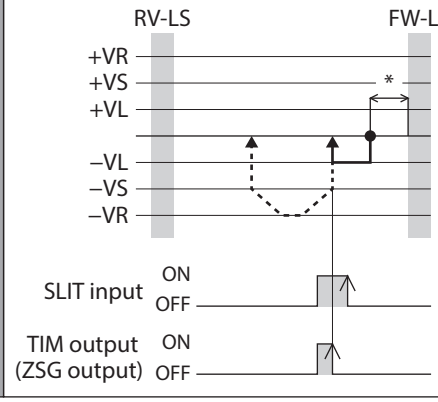
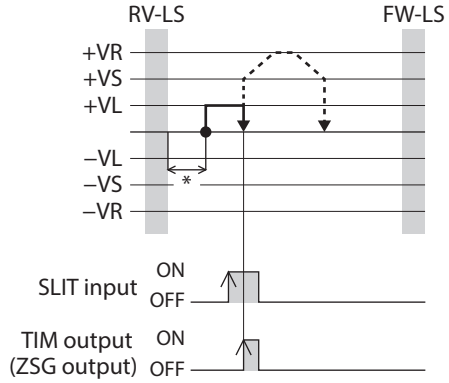
- VR: (HOME) Return-to-home operating speed
- VS: (HOME) Return-to-home starting speed
- VL: (HOME) Return-to-home last speed
- - - -: Orbit when the home offset is set

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		

* The motor pulls out of the limit sensor and rotates according to the value set in the "(HOME) Backward steps in 2 sensor return-to-home."

- **When the SLIT input and/or the TIM output or the ZSG output 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.

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

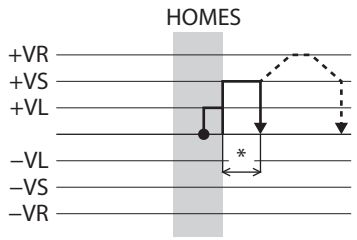
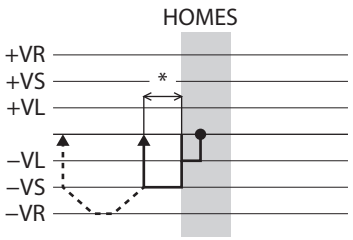
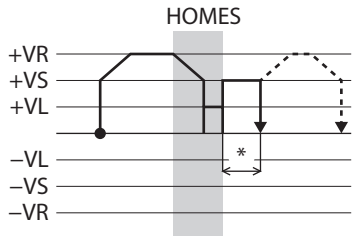
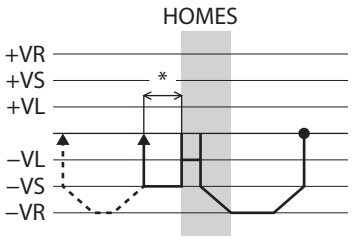
* The motor pulls out of the limit sensor and rotates according to the value set in the "(HOME) Backward steps in 2 sensor return-to-home."

■ One-way rotation mode

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

Explanation of code

- VR: (HOME) Return-to-home operating speed
- VS: (HOME) Return-to-home starting speed
- VL: (HOME) Return-to-home last speed
- - - -: Orbit when the home offset is set

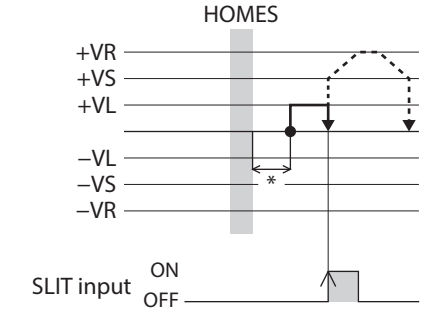
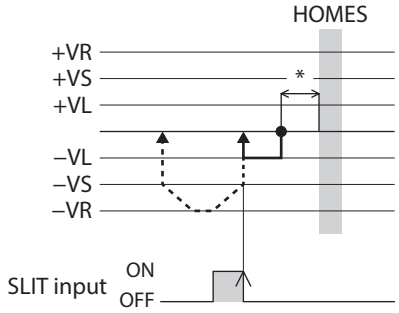
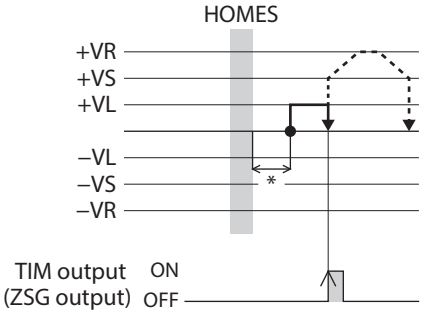
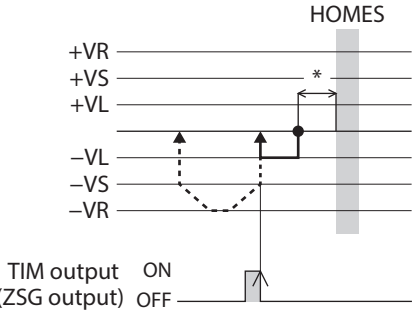
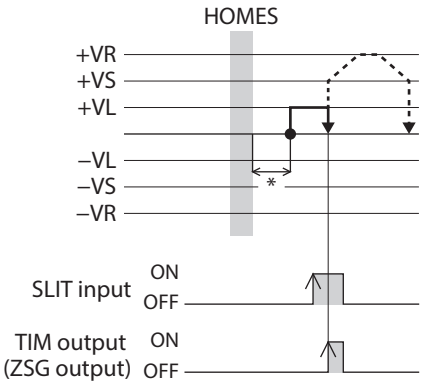
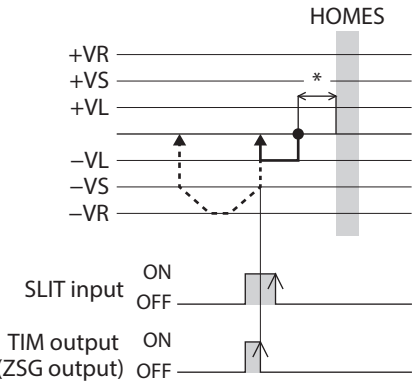
Starting position of return-to-home operation	Starting direction of return-to-home operation: Positive direction	Starting direction of return-to-home operation: Negative direction
HOMES		
Other than HOMES		

* The motor pulls out of the HOME sensor and rotates according to the value set in the "(HOME) Operating amount in uni-directional return-to-home."

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

- **When the SLIT input and/or the TIM output or the ZSG output 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.

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

* The motor pulls out of the HOME sensor and rotates according to the value set in the "(HOME) Operating amount in uni-directional return-to-home."

4 Macro operation

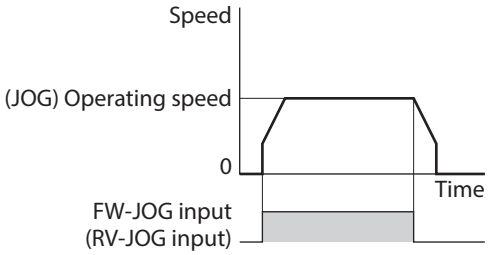
Macro operation is an operation method that turns a specific input signal ON to automatically execute operation corresponding to the signal. Macro operation includes JOG operation, inching operation, and continuous operation. The travel amount, the operating speed, the acceleration/deceleration, the stopping deceleration, etc. for each operation are set with parameters.

4-1 Macro operation types

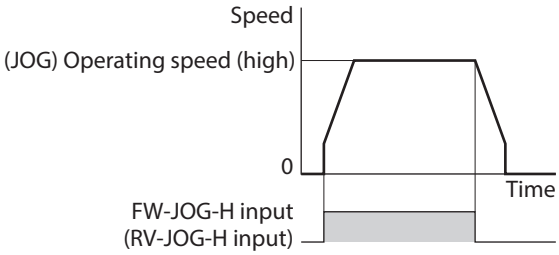
Note Operation data link and loop function cannot be used in macro operation. To link operation data, use positioning SD operation.

■ JOG macro operation

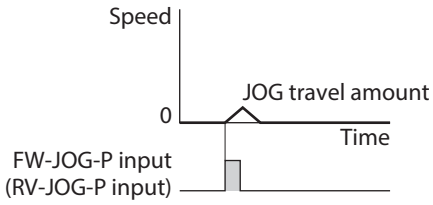
JOG macro operation is a macro operation that uses parameters specific to JOG.



JOG operation



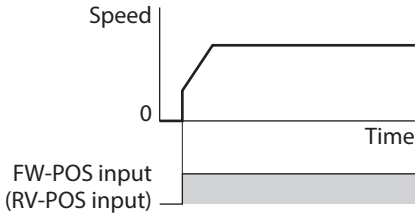
High-speed JOG operation



Inching operation

■ Continuous macro operation

Continuous macro operation is a macro operation that uses "Speed," "Starting/changing rate," "Stopping deceleration," and "Operating current" of operation data.

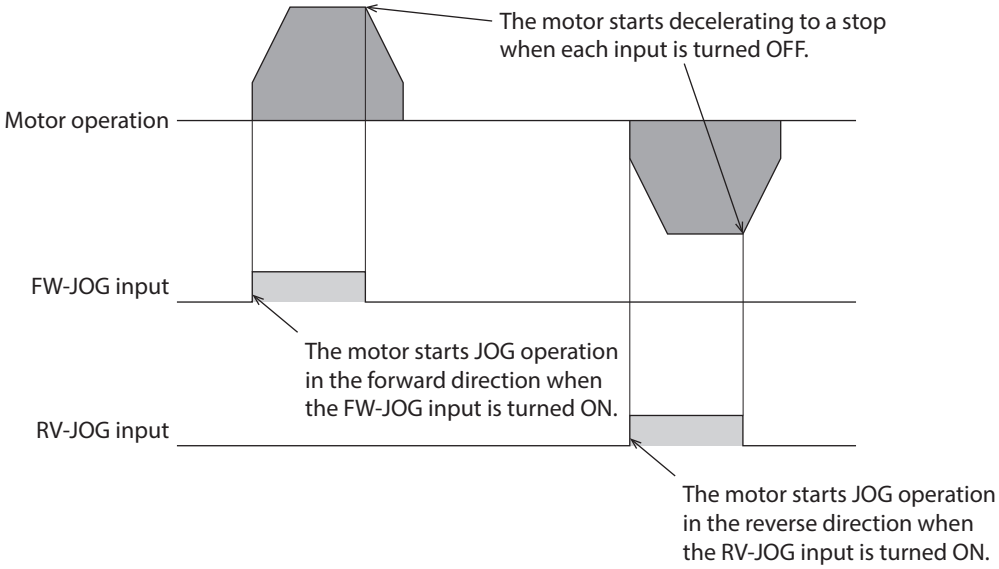


Continuous operation

4-2 JOG operation

In JOG operation, the motor operates continuously in one direction while the FW-JOG input or the RV-JOG input is being ON.
If the signal having input is turned OFF, the motor will decelerate to a stop. Motor operation can also be stopped by inputting the operation stop signal.
If both the FW-JOG input and the RV-JOG input are turned ON simultaneously, the motor will decelerate to a stop.

- **Operation example**



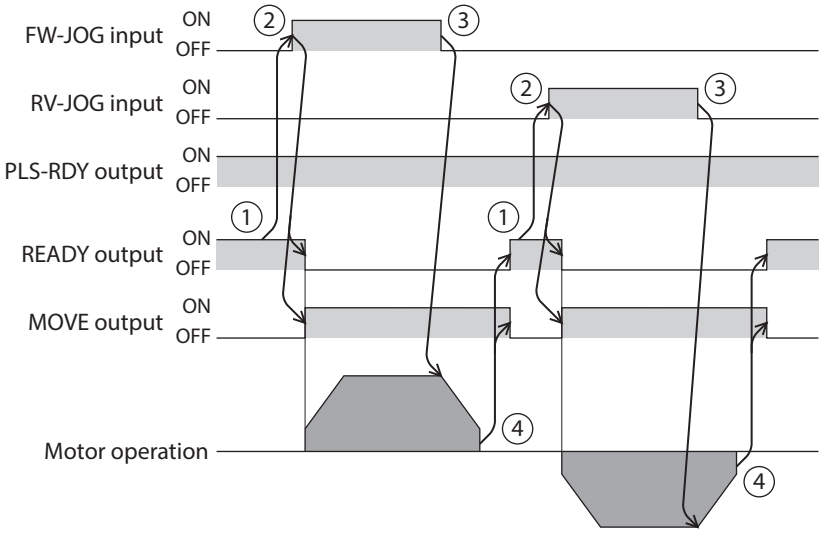
- **Related parameters**

MEXE02 code	Name	Description	Setting range	Initial value
p4	JOG/HOME command filter time constant	Sets the time constant for the command filter.	1 to 200 ms	1
	JOG/HOME operating current	Sets the operating current for JOG operation or return-to-home operation, based on the base current being 100 %.	0 to 1,000 (1=0.1 %)	1,000
	(JOG) Operating speed	Sets the operating speed for JOG operation and inching operation.	1 to 4,000,000 Hz	200
	(JOG) Acceleration/ deceleration	Sets the acceleration/deceleration rate or the acceleration/deceleration time for JOG macro operation.	1 to 1,000,000,000 (1=0.001)*	30,000
	(JOG) Starting speed	Sets the starting speed for JOG macro operation.	0 to 4,000,000 Hz	100

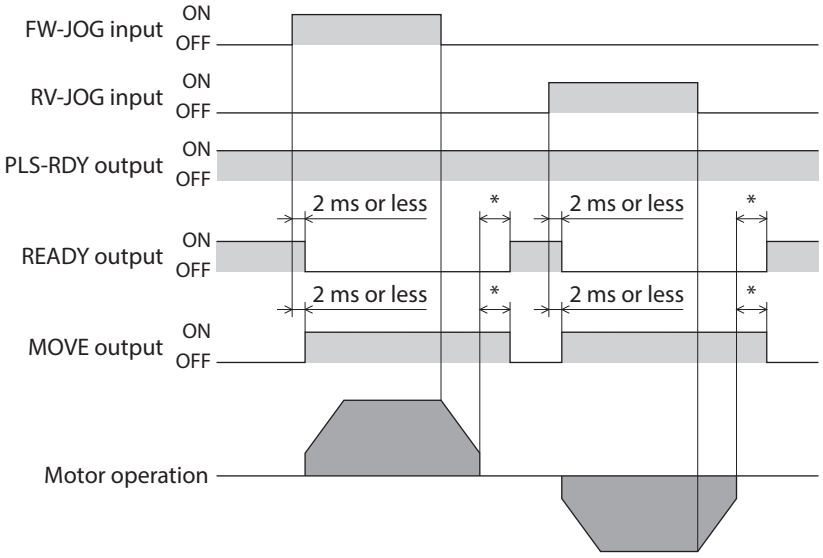
* The setting unit is followed the "Acceleration/deceleration unit" parameter.

- **Operating method**

1. Check that the READY output is being ON.
2. Turn the FW-JOG input (or RV-JOG input) ON.
   The READY output is turned OFF, the MOVE output is turned ON, and the motor starts operating.
3. Turn the FW-JOG input (or RV-JOG input) OFF.
   The motor starts deceleration stop.
4. When the motor stops, the READY output is turned ON and the MOVE output is turned OFF.



- **Timing chart**

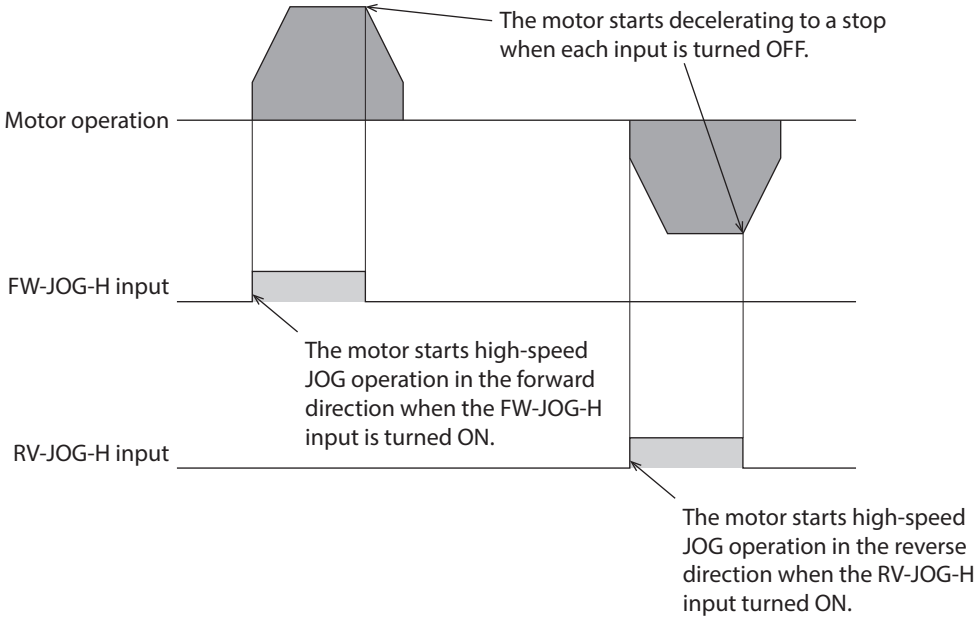


* It varies depending on the load, operating velocity, speed filter, etc.

4-3 High-speed JOG operation

In high-speed JOG operation, the motor performs continuous operation in one direction while the FW-JOG-H input or the RV-JOG-H input is being ON. If the signal having input is turned OFF, the motor will decelerate to a stop. Motor operation can also be stopped by inputting the operation stop signal.
If both the FW-JOG-H input and the RV-JOG-H input are turned ON simultaneously, the motor will decelerate to a stop.

- **Operation example**



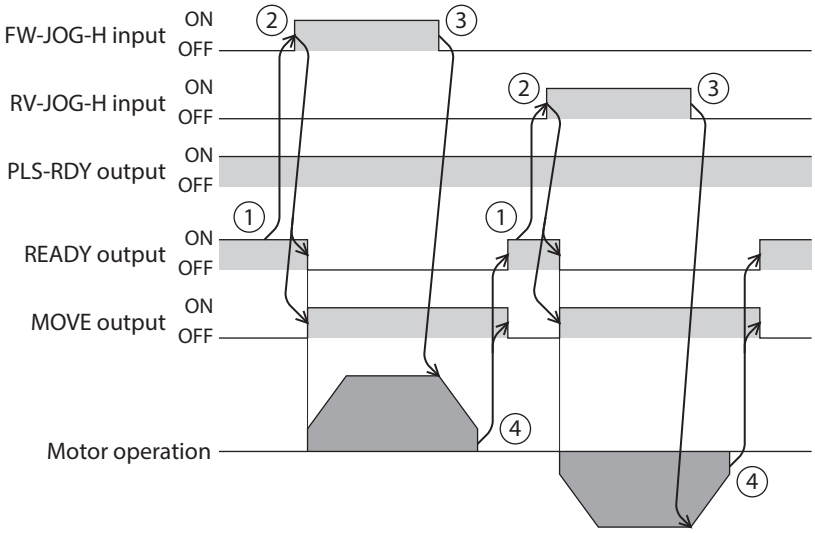
- **Related parameters**

MEXE02 code	Name	Description	Setting range	Initial value
p4	JOG/HOME command filter time constant	Sets the time constant for the command filter.	1 to 200 ms	1
	JOG/HOME operating current	Sets the operating current rate for JOG operation or return-to-home operation, based on the base current being 100 %.	0 to 1,000 (1=0.1 %)	1,000
	(JOG) Acceleration/ deceleration	Sets the acceleration/deceleration rate or the acceleration/deceleration time for JOG macro operation.	1 to 1,000,000,000 (1=0.001)*	30,000
	(JOG) Starting speed	Sets the starting speed for JOG macro operation.	0 to 4,000,000 Hz	100
	(JOG) Operating speed (high)	Sets the operating speed for high-speed JOG operation.	1 to 4,000,000 Hz	1,000

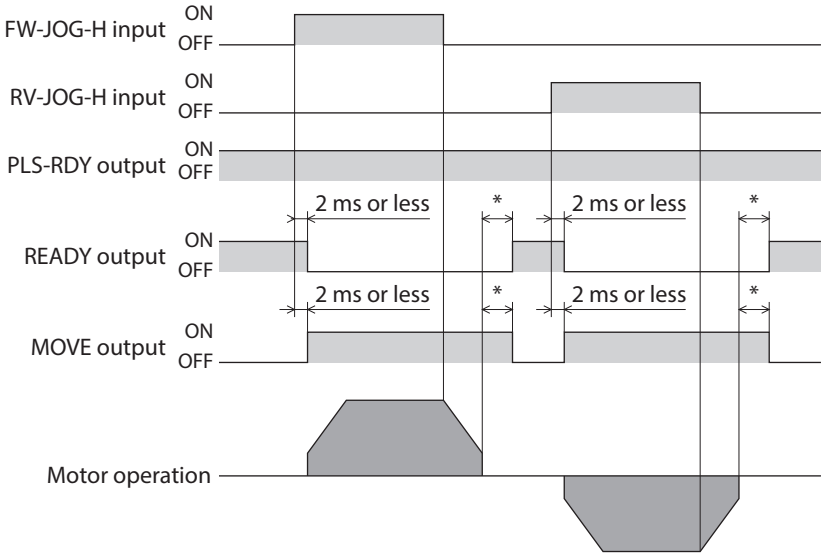
* The setting unit is followed the "Acceleration/deceleration unit" parameter.

- **Operating method**

1. Check that the READY output is being ON.
2. Turn the FW-JOG-H input (or RV-JOG-H input) ON.
   The READY output is turned OFF, the MOVE output is turned ON, and the motor starts operating.
3. Turn the FW-JOG-H input (or RV-JOG-H input) OFF.
   The motor starts deceleration stop.
4. When the motor stops, the READY output is turned ON and the MOVE output is turned OFF.



- **Timing chart**

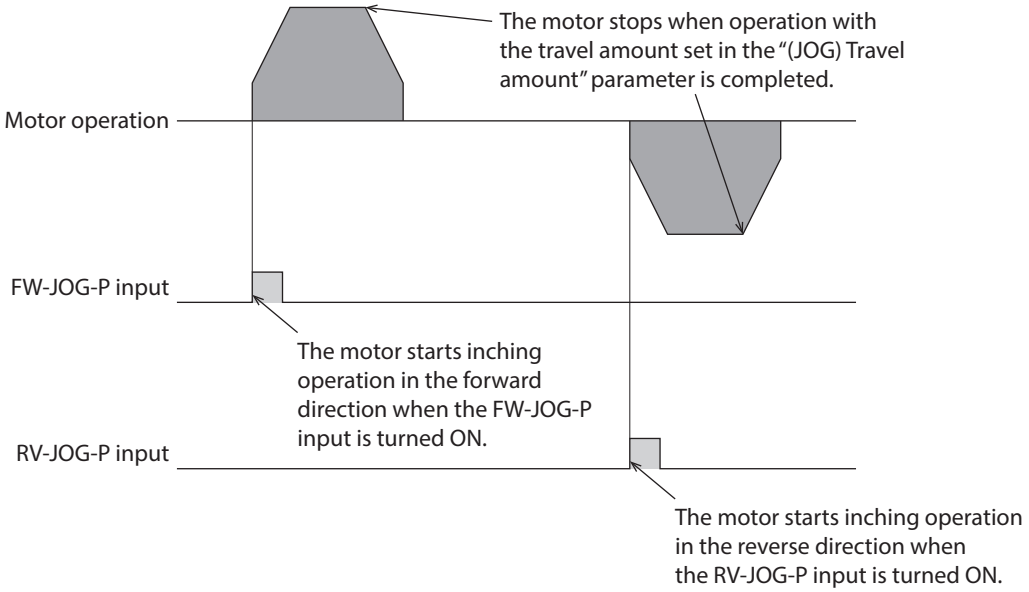


* It varies depending on the operating speed, speed filter, etc.

4-4 Inching operation

In inching operation, the motor performs positioning operation when the FW-JOG-P input or the RV-JOG-P input is turned from OFF to ON.
The motor stops when it rotates by the number of steps set in "(JOG) Travel amount."

- **Operation example**



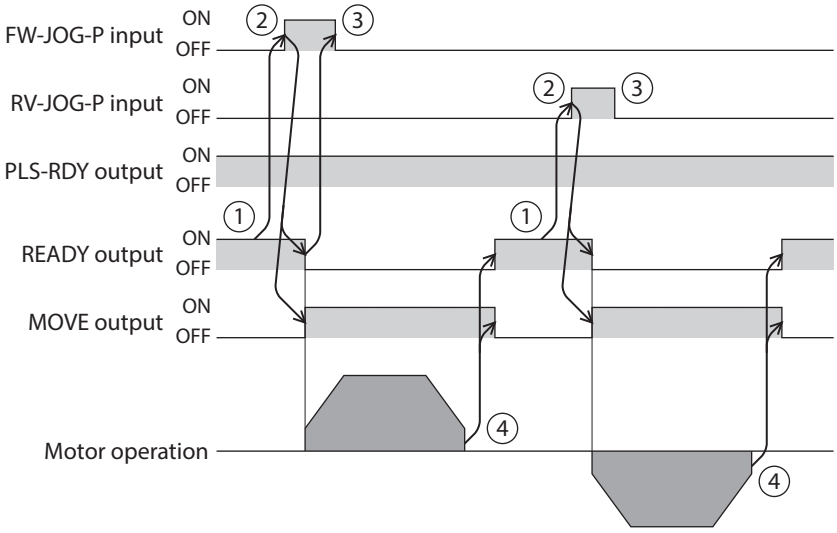
- **Related parameters**

MEXE02 code	Name	Description	Setting range	Initial value
p4	JOG/HOME command filter time constant	Sets the time constant for the command filter.	1 to 200 ms	1
	JOG/HOME operating current	Sets the operating current rate for JOG operation or return-to-home operation, based on the base current being 100 %.	0 to 1,000 (1=0.1 %)	1,000
	(JOG) Travel amount	Sets the travel amount for inching operation.	1 to 8,388,607 steps	1
	(JOG) Operating speed	Sets the operating speed for JOG operation and inching operation.	1 to 4,000,000 Hz	200
	(JOG) Acceleration/ deceleration	Sets the acceleration/deceleration rate or the acceleration/deceleration time for JOG macro operation.	1 to 1,000,000,000 (1=0.001)*	30,000
	(JOG) Starting speed	Sets the starting speed for JOG macro operation.	0 to 4,000,000 Hz	100

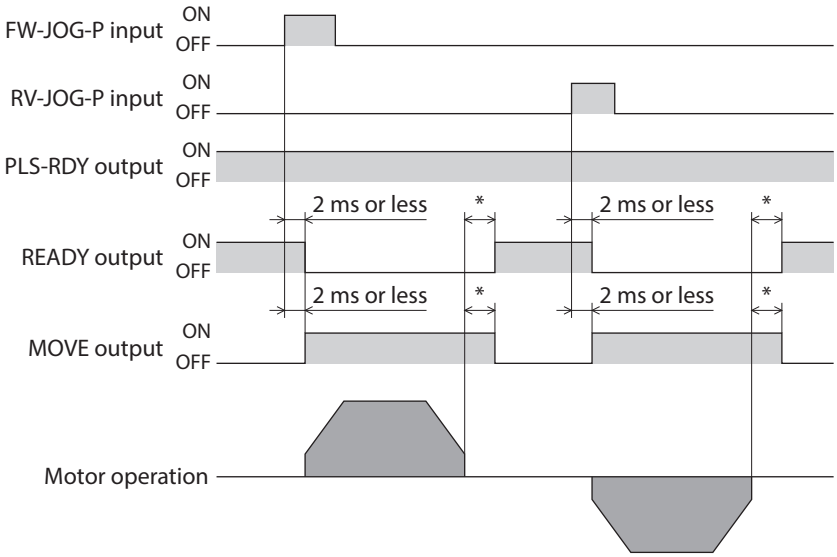
* The setting unit is followed the "Acceleration/deceleration unit" parameter.

- **Operating method**

1. Check that the READY output is being ON.
2. Turn the FW-JOG-P input (or RV-JOG-P input) ON.
   The READY output is turned OFF, the MOVE output is turned ON, and the motor starts operating.
3. Check the READY output has been turned OFF and turn the FW-JOG-P input (or RV-JOG-P input) OFF.
4. When the motor stops, the READY output is turned ON and the MOVE output is turned OFF.



- **Timing chart**

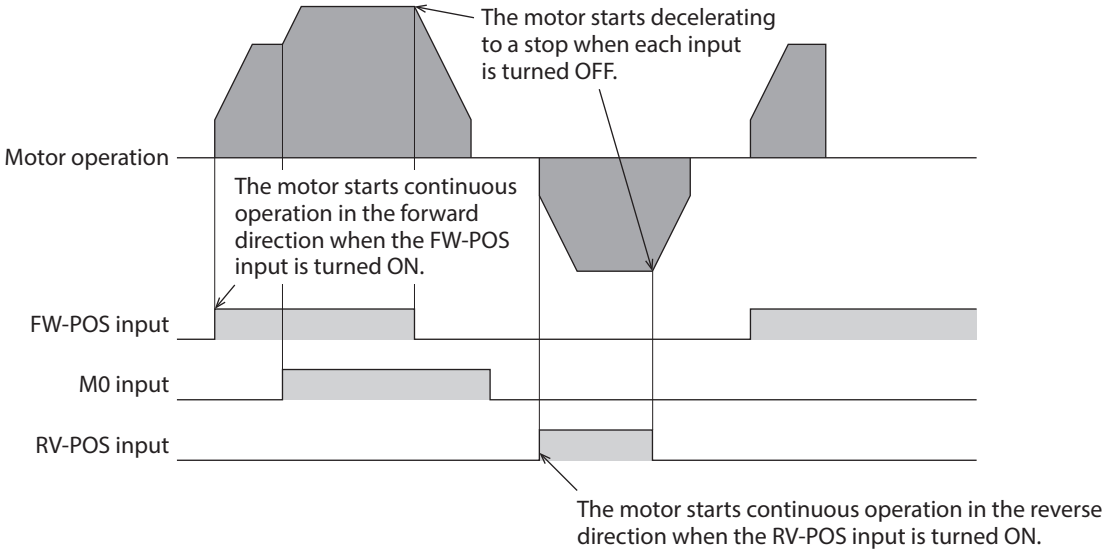


* It varies depending on the load, operating velocity, speed filter, etc.

4-5 Continuous operation

The motor performs continuous operation at the operating speed corresponding to the operation data number being selected while the FW-POS input or the RV-POS input is ON. When the operation data number is changed during continuous operation, the speed will be changed.
If the FW-POS input or the RV-POS input is turned OFF, the motor will decelerate to a stop. If the signal of the same direction is turned ON while decelerating, the motor will accelerate again and continue the operation.
If both the FW-POS input and the RV-POS input are turned ON simultaneously, the motor will decelerate to a stop.

- **Operation example**



- **Related operation data**

MEXE02 code	Name	Description	Setting range	Initial value
p1	Speed	Sets the operating speed.	−4,000,000 to 4,000,000 Hz	1,000
	Starting/changing rate	Sets the acceleration/deceleration rate or the acceleration/deceleration time when staring or changing the speed.	1 to 1,000,000,000 (1 = 0.001)*	30,000
	Stopping deceleration	Sets the deceleration rate or the deceleration time when stopping.		30,000
	Operating current	Sets the motor operating current based on the base current being 100 %.	0 to 1,000 (1=0.1 %)	1,000

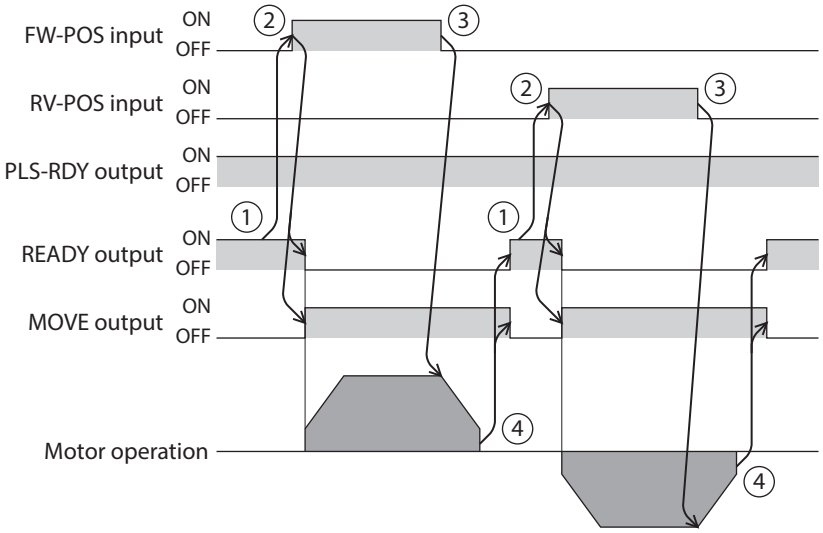
* The setting unit is followed the "Acceleration/deceleration unit" parameter.

- **Related parameter**

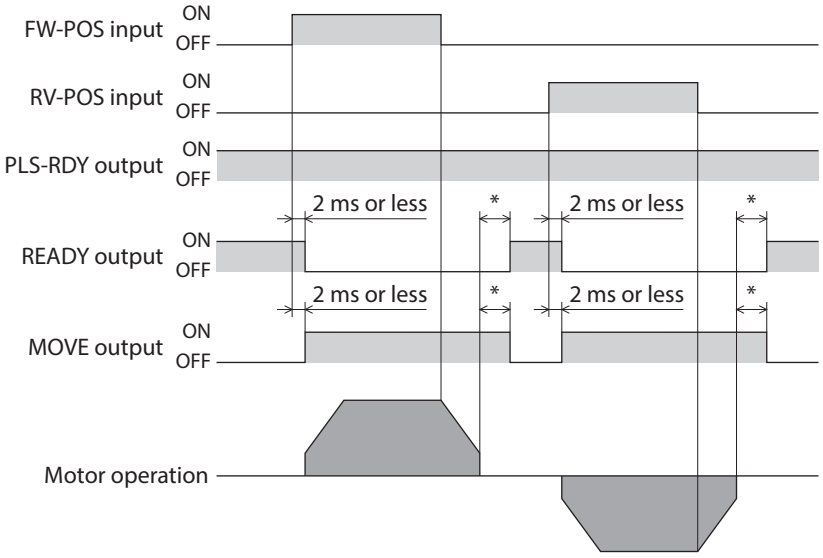
MEXE02 code	Name	Description	Setting range	Initial value
p3	Starting speed	Sets the starting speed for positioning SD operation or continuous macro operation.	0 to 4,000,000 Hz	100

- **Operating method**

1. Check that the READY output is being ON.
2. Turn the FW-POS input (or RV-POS input) ON.
   The READY output is turned OFF, the MOVE output is turned ON, and the motor starts operating.
3. Turn the FW-POS input (or RV-POS input) OFF.
   The motor starts deceleration stop.
4. When the motor stops, the READY output is turned ON and the MOVE output is turned OFF.



- **Timing chart**



* It varies depending on the load, operating speed, speed filter, etc.

5 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 and the feedback position are preset to zero.

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

● Related parameter

MEXE02 code	Name	Description	Setting range	Initial value
p3	Permission of absolute positioning without setting absolute coordinates	Permits absolute positioning operation in a state where coordinates are not set.	0: Disable 1: Enable	1

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

4 I/O signals

This part explains input signals and output signals.

◆Table of contents

1 Overview of I/O signals

1-1 Direct input

Direct input (DIN) is a method in which the I/O cable is connected to the connector to input signals directly.

Name	Description
Input function	Selects an input signal to be assigned to DIN.
Inverting mode	The ON-OFF setting of the signal can be changed.
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.

- **Input function**

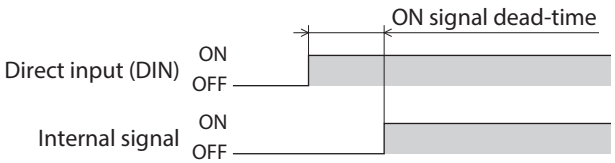
MEXE02 code	Name	Description	Setting range	Initial value
p7	DIN0 input function	Selects an input signal to be assigned to DIN.	Input signals list ⇨p.86	9: P-PRESET
	DIN1 input function			112: FCLOOP-DIS
	DIN2 input function			2: AWO

- **Change of ON-OFF setting of input signals**

MEXE02 code	Name	Description	Setting range	Initial value
p7	DIN0 inverting mode	Changes the ON-OFF setting of DIN.	0: Non invert 1: Invert	0
	DIN1 inverting mode			0
	DIN2 inverting mode			0

- **ON signal dead-time**

MEXE02 code	Name	Description	Setting range	Initial value
p7	DIN0 ON signal dead-time	Sets the ON signal dead-time of DIN.	0 to 250 ms	0
	DIN1 ON signal dead-time			0
	DIN2 ON signal dead-time			0



1-2 Direct output

Direct output (DOUT) is a method in which the I/O cable is connected to the connector to output signals directly.

Name	Description
Output function	Selects an output signal to be assigned to DOUT.
Inverting mode	The ON-OFF setting of the signal can be changed.
OFF delay time	The output signal is turned OFF when the time that has been set is exceeded. This can be used to take a measure to eliminate the noise or to adjust the timing between the devices.

- **Output function**

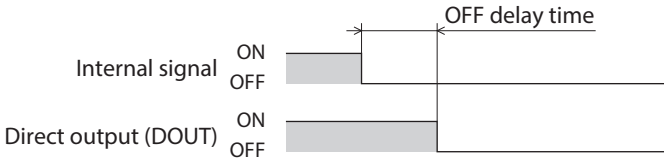
MEXE02 code	Name	Description	Setting range	Initial value
p8	DOUT0 output function	Selects an output signal to be assigned to DOUT.	Output signals list ⇨p.87	130: ALM-B
	DOUT1 output function			188: ENC-IN-POS
	DOUT2 output function			157: TIM

- **Inverting mode**

MEXE02 code	Name	Description	Setting range	Initial value
p8	DOUT0 inverting mode	Changes the ON-OFF setting of DOUT.	0: Non invert 1: Invert	0
	DOUT1 inverting mode			0
	DOUT2 inverting mode			0

- **OFF delay time**

MEXE02 code	Name	Description	Setting range	Initial value
p8	DOUT0 OFF delay time	Sets the OFF delay time of DOUT.	0 to 250 ms	0
	DOUT1 OFF delay time			0
	DOUT2 OFF delay time			0



2 Signals list

Assign I/O signals via RS-485 communication or using the **MEXE02** software.
To assign signals via RS-485 communication, use the "Assignment number" in the table instead of the signal names.

2-1 Input signal list

Refer to "4 Input signals" on p.92 for details on each signal.

Assignment number	Signal name	Function
0	No function	Set when the input terminal is not used.
2	AWO	This is used to shut off the motor current to put the motor in a non-excitation state.
5	STOP	This is used to stop the motor.
8	ALM-RST	This is used to reset the alarm presently being generated.
9	P-PRESET	This is used to execute the position preset.
13	LAT-CLR	This is used to clear the latch status.
14	INFO-CLR	This is used to clear the information status.
16	HMI	This is used to release the function limitation of the **MEXE02** software.
19	PLS-XMODE	This is used to change the number of input pulses and the magnification of the frequency.
20	PLS-DIS	This is used to disable the pulse input.
26	FW-BLK	This is used to stop the operation in the forward direction.
27	RV-BLK	This is used to stop the operation in the reverse direction.
28	FW-LS	This is a signal to be input from the limit sensor in the forward direction.
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.
31	SLIT	This is a signal to be input from the slit sensor.
32	START	This is used to execute positioning SD operation.
33	SSTART	This is used to execute positioning SD operation. In manual sequential operation, operation of the next data number is executed.
36	HOME	This is used to execute return-to-home operation.
48	FW-JOG	This is used to execute JOG operation in the forward direction.
49	RV-JOG	This is used to execute JOG operation in the reverse direction.
50	FW-JOG-H	This is used to execute high-speed JOG operation in the forward direction.
51	RV-JOG-H	This is used to execute high-speed JOG operation in the reverse direction.
52	FW-JOG-P	This is used to execute inching operation in the forward direction.
53	RV-JOG-P	This is used to execute inching operation in the reverse direction.
56	FW-POS	This is used to execute continuous operation in the forward direction.
57	RV-POS	This is used to execute continuous operation in the reverse direction.
64	M0	These eight bits are used to select an operation data number.
65	M1	
66	M2	
67	M3	
68	M4	
69	M5	
70	M6	
71	M7	

Assignment number	Signal name	Function
80	R0	These are general signals.
81	R1	
82	R2	
83	R3	
84	R4	
85	R5	
86	R6	
87	R7	
112	FCLOOP-DIS	This is used to disable the fully closed-loop control.

2-2 Output signal list

Refer to "5 Output signals" on p.101 for details on each signal.

Assignment number	Signal name	Function
0	No function	Set when the output terminal is not used.
2	AWO_R	Output in response to an input signal.
5	STOP_R	
8	ALM-RST_R	
9	P-PRESET_R	
13	LAT-CLR_R	
14	INFO-CLR_R	
16	HMI_R	
19	PLS-XMODE_R	
20	PLS-DIS_R	
26	FW-BLK_R	
27	RV-BLK_R	
28	FW-LS_R	
29	RV-LS_R	
30	HOMES_R	
31	SLIT_R	
32	START_R	
33	SSTART_R	
36	HOME_R	
48	FW-JOG_R	
49	RV-JOG_R	
50	FW-JOG-H_R	
51	RV-JOG-H_R	
52	FW-JOG-P_R	
53	RV-JOG-P_R	
56	FW-POS_R	
57	RV-POS_R	
64	M0_R	
65	M1_R	
66	M2_R	
67	M3_R	
68	M4_R	

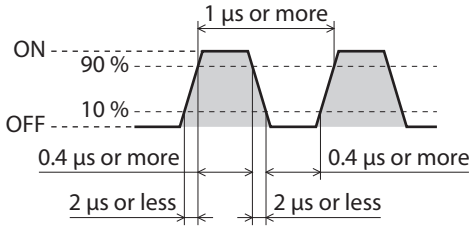
Assignment number	Signal name	Function
69	M5_R	Output in response to an input signal.
70	M6_R	
71	M7_R	
80	R0_R	
81	R1_R	
82	R2_R	
83	R3_R	
84	R4_R	
85	R5_R	
86	R6_R	
87	R7_R	
112	FCLOOP-DIS_R	
128	CONST-OFF	Output an OFF state at all times.
129	ALM-A	Output the alarm status of the driver (normally open).
130	ALM-B	Output the alarm status of the driver (normally closed).
131	SYS-RDY	Output when the main power supply of the driver is turned on.
132	READY	Output when the driver is ready to operate.
133	PLS-RDY	Output when pulse input is enabled.
134	MOVE	Output while the motor operates.
135	INFO	Output the information status of the driver.
136	SYS-BSY	Output when the driver is in an internal processing state.
141	VA	Output when the operating speed reaches the target speed.
142	CRNT	Output when the motor is in an excitation state.
143	AUTO-CD	Output when the motor is in a state of automatic current cutback.
144	HOME-END	Output when return-to-home operation is completed or position preset is executed.
145	ABSPEN	Output when coordinates are set.
147	PLS-OUT	Output 50 pulses (50 times) with each revolution of the motor output shaft.
153	FW-SLS	Output when the 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 ENC-Z signal is input from the encoder.
157	TIM	Output every time the motor output shaft rotates by 7.2 degrees from the home.
160	AREA0	Output when the motor is within the area.
161	AREA1	
162	AREA2	
188	ENC-IN-POS	Output when positioning operation is completed on the basis of the encoder.
189	FCLOOP-MON	Output when the motor is in the process of position correction by the fully closed-loop control.
190	FCLOOP-RDY	Output when the position correction by the fully closed-loop control is ready to be performed.
198	SEQ-BSY	Output when positioning SD operation is being performed.
199	DELAY-BSY	Output when the motor is stopped by the setting of the “Drive-complete delay time.”
203	PLS-LOST	Output when a pulse is input while pulse input is disabled.
204	DCMD-RDY	Output when direct data operation is ready to start.
205	DCMD-FULL	Output when data is being written to the buffer area of direct data operation.

Assignment number	Signal name	Function
226	INFO-DRVTMP	Output when the corresponding information is generated.
228	INFO-OVOLT	
229	INFO-UVOLT	
233	INFO-START	
235	INFO-PR-REQ	
236	INFO-MSET-E	
237	INFO-EGR-E	
239	INFO-NET-E	
240	INFO-FW-OT	
241	INFO-RV-OT	
244	INFO-TRIP	
245	INFO-ODO	
248	INFO-ENC-E	
252	INFO-DSLMTD	
253	INFO-IOTEST	
254	INFO-CFG	
255	INFO-RBT	

3 Signal type

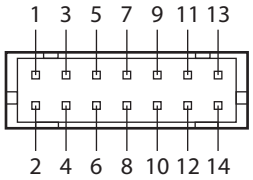
3-1 Pulse signal

Input pulses with a sharp rise and fall as shown in the figure.
The figure shows the voltage level of the pulse signal.



3-2 Direct I/O

Use parameters to assign the signals to pin No. 6 to pin No. 14 of the I/O signal connector. Refer to "2 Signals list" on p.86 for signals that can be assigned.



Pin number	Terminal name*1	Initial value*1*2
1	CW+ [PLS+]	CW pulse input positive side [Pulse input positive side]
2	CW– [PLS–]	CW pulse input negative side [Pulse input negative side]
3	CCW+ [DIR+]	CCW pulse input positive side [Rotation direction input positive side]
4	CCW– [DIR–]	CCW pulse input negative side [Rotation direction input negative side]
5	IN-COM	Input common
6	IN0	Control input 0 (P-PRESET)
7	IN1	Control input 1 (FCLOOP-DIS)
8	IN2	Control input 2 (AWO)
9	OUT0+	Control output 0 (ALM-B)
10	OUT0–	
11	OUT1+	Control output 1 (ENC-IN-POS)
12	OUT1–	
13	OUT2+	Control output 2 (TIM)
14	OUT2–	

*1 Values in brackets [ ] are signals when the 1-pulse input mode is set.
*2 Values in parentheses ( ) are initial values.

Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p7	DIN0 input function	Selects an input signal to be assigned to DIN.	Input signal list ⇨p.86	9: P-PRESET
	DIN1 input function			112: FCLOOP-DIS
	DIN2 input function			2: AWO
p8	DOUT0 output function	Selects an output signal to be assigned to DOUT.	Output signal list ⇨p.87	130: ALM-B
	DOUT1 output function			188: ENC-IN-POS
	DOUT2 output function			157: TIM

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.

3-3 Remote I/O

Remote I/O is I/O to be accessed via RS-485 communication.

■ Assignment to input signals

Use parameters to assign the input signals to R-IN0 to R-IN15 of remote I/O.
Refer to "2-1 Input signal list" on p.86 for input signals that can be assigned.

Remote I/O signal name	Initial value
R-IN0	M0
R-IN1	M1
R-IN2	M2
R-IN3	START
R-IN4	HOME
R-IN5	STOP
R-IN6	AWO
R-IN7	ALM-RST

Remote I/O signal name	Initial value
R-IN8	FCLOOP-DIS
R-IN9	No function
R-IN10	No function
R-IN11	SSTART
R-IN12	FW-JOG-P
R-IN13	RV-JOG-P
R-IN14	FW-POS
R-IN15	RV-POS

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.

■ Assignment to output signals

Use parameters to assign the output signals to R-OUT0 to R-OUT15 of remote I/O.
Refer to "2-2 Output signal list" on p.87 for output signals that can be assigned.

Remote I/O signal name	Initial value
R-OUT0	M0_R
R-OUT1	M1_R
R-OUT2	M2_R
R-OUT3	START_R
R-OUT4	HOME-END
R-OUT5	READY
R-OUT6	INFO
R-OUT7	ALM-A

Remote I/O signal name	Initial value
R-OUT8	SYS-BSY
R-OUT9	AREA0
R-OUT10	AREA1
R-OUT11	AREA2
R-OUT12	TIM
R-OUT13	MOVE
R-OUT14	ENC-IN-POS
R-OUT15	FCLOOP-MON

4 Input signals

4-1 Operation control

■ Excitation switching signal

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

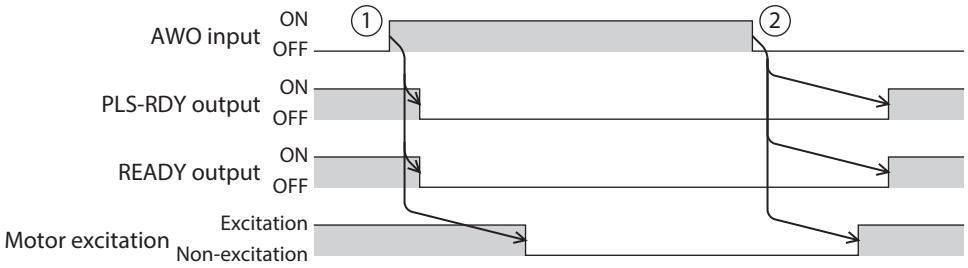
- **AWO input**

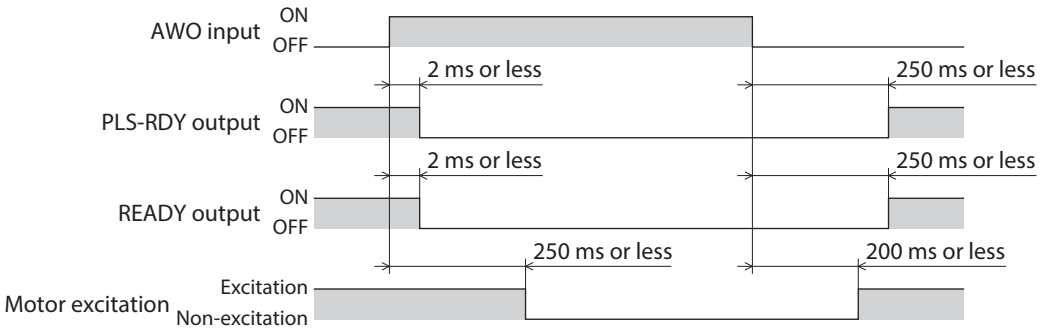
When the AWO input is turned ON, the motor current is shut off to put the motor in a non-excitation state. The output shaft can be rotated manually since the holding force of the motor is lost. When the AWO input is turned OFF, the motor current is supplied to restore the holding force of the motor.

Note When a load is installed vertically, do not turn the AWO 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 AWO input is turned ON, the PLS-RDY output and the READY output are turned OFF to put the motor in a non-excitation state.
2. When the AWO input is turned OFF, the motor goes into an excitation state to turn the PLS-RDY output and 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 operation according to the setting of the "STOP input action" parameter. The remaining travel amount is cleared.

Function for each operation

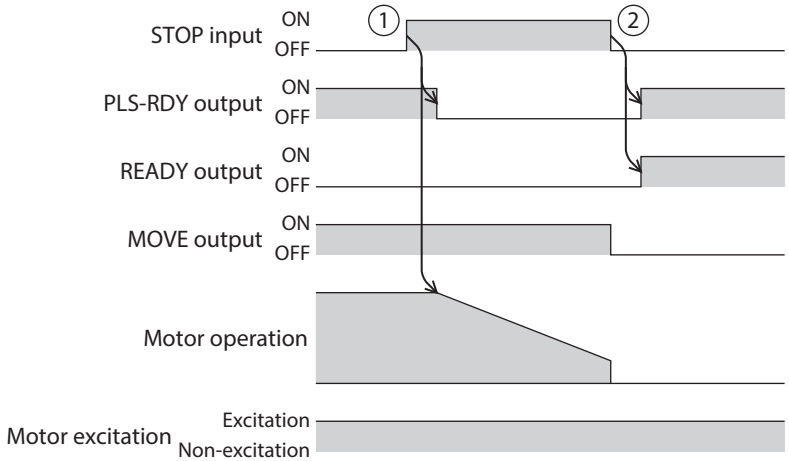
Method of operation	Function
Pulse-input operation	The motor stops immediately. Pulse input is disabled.
SD operation	Operation is stopped according to the setting of the "STOP input action" parameter. The remaining travel amount is cleared.
Macro operation	
Direct data operation	

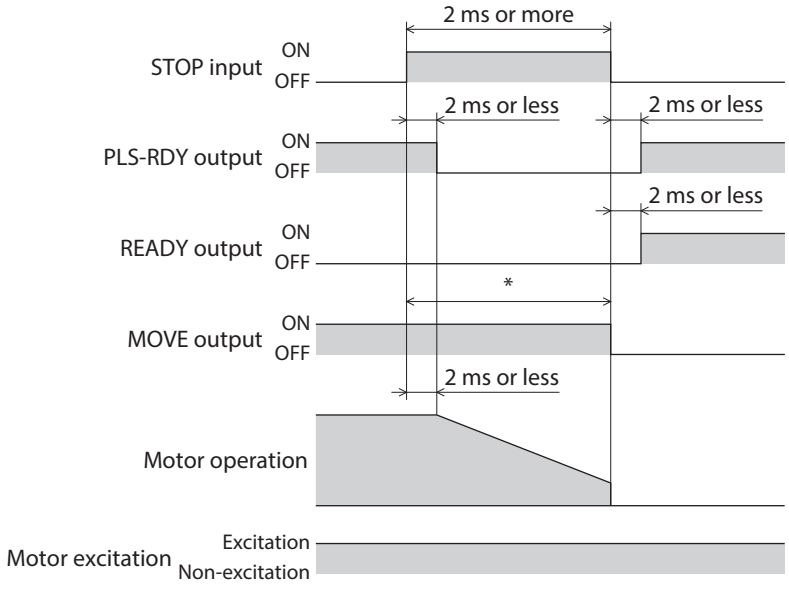
Related parameter

MEXE02 code	Name	Description	Setting range	Initial value
p6	STOP input action	Sets how to stop the motor when the STOP input is turned ON.	0: Immediate stop 3: Deceleration stop	3

When the "STOP input action" parameter 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 PLS-RDY output is turned OFF and the motor starts the stop operation.
2. When the STOP input is turned OFF, the PLS-RDY output and the READY output are turned ON.

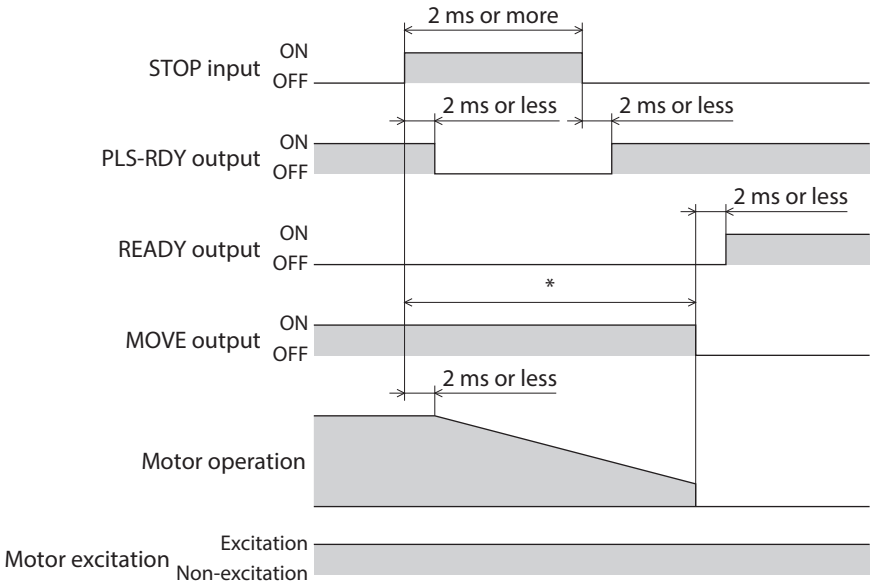




* It varies depending on the driving condition.

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

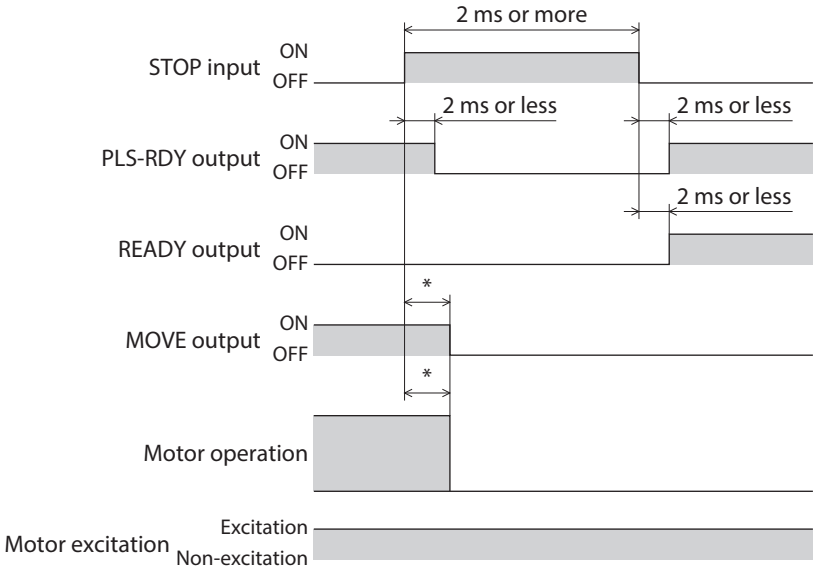
1. When the STOP input is turned ON during operation, the PLS-RDY output is turned OFF and the motor starts the stop operation.
2. When the STOP input is turned OFF, the PLS-RDY output is turned ON.
   Even after the STOP input is turned OFF, the motor continues the deceleration operation until it stops.
3. When the motor stops, the READY output is turned ON.



* It varies depending on the driving condition.

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

1. When the STOP input is turned ON during operation, the PLS-RDY output is turned OFF and 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 PLS-RDY output and the READY output are 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.
Operation is stopped according to the value set in the "FW-BLK/RV-BLK input action" parameter. The remaining travel amount is cleared.

Function for each operation

Method of operation	Function
Pulse-input operation	The motor stops immediately. The pulse input in the direction corresponding to the input signal is disabled.
SD operation	Operation is stopped according to the value set in the "FW-BLK/RV-BLK input action" parameter. The remaining travel amount is cleared.
Macro operation	
Direct data operation	

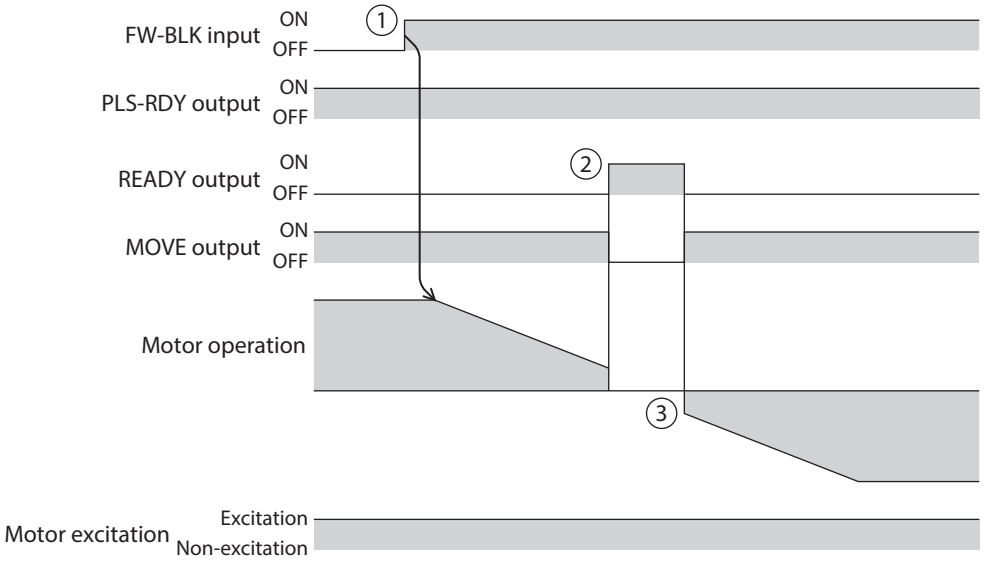
Related parameter

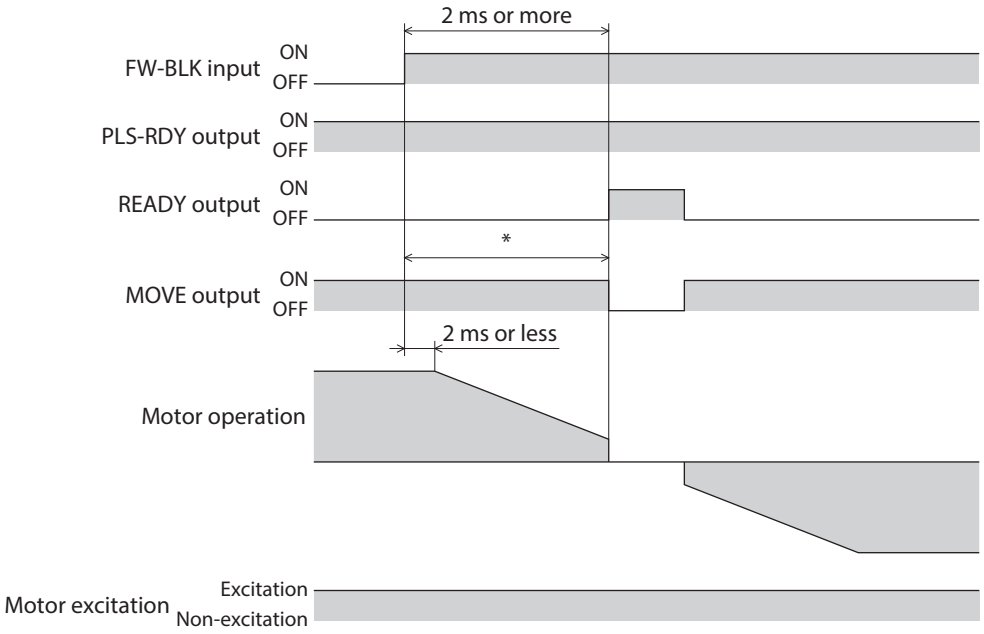
MEXE02 code	Name	Description	Setting range	Initial value
p6	FW-BLK/RV-BLK input action	Sets how to stop the motor when the FW-BLK input or the RV-BLK input is turned ON.	0: Immediate stop 1: Deceleration stop	1

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" parameter 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 the stop operation.
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.

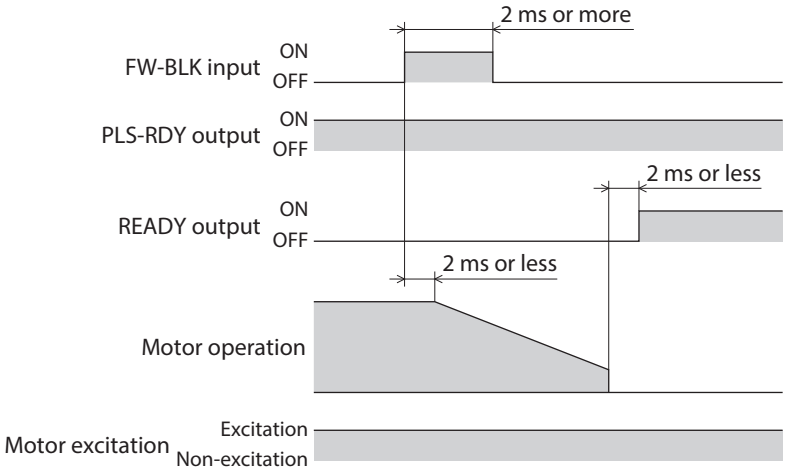




* It varies depending on the driving condition.

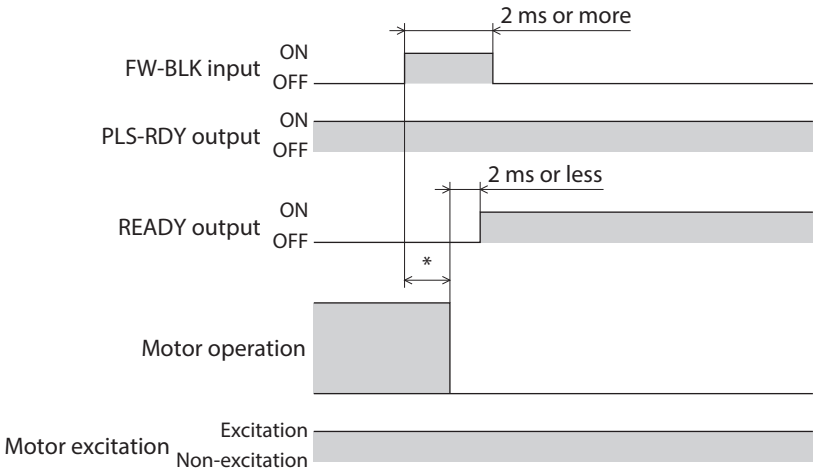
When the "FW-BLK/RV-BLK input action" parameter is set to "1: Deceleration stop" (when the motor does not stop while the FW-BLK input is ON)

1. When the FW-BLK input is turned ON during operation in the forward direction, the motor starts the stop operation.
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" parameter is set to "0: Immediate stop"

1. When the FW-BLK input is turned ON during operation in the forward direction, the motor stops.
2. The motor stops at the command position at the time the ON state of the FW-BLK input is detected.



* It varies depending on the driving condition.

■ Signals used for positioning SD operation

- **START input**

  When the operation data number is selected to turn the START input ON, positioning SD operation is started.
  In manual sequential operation, the operation data number to be the starting point is started.

- **SSTART input**

  When the SSTART input is turned ON, positioning SD operation is started.
  In manual sequential operation, operation based on the next operation data number linked is started every time the SSTART input is turned ON. In other than manual sequential operation, operation based on the operation data number selected is started.

- **M0 to M7 inputs**

  Select a desired operation data number for positioning operation or continuous operation based on a combination of the ON-OFF status of the M0 to M7 inputs.

Operation data number	M7	M6	M5	M4	M3	M2	M1	M0
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	OFF	OFF	OFF	**ON**
2	OFF	OFF	OFF	OFF	OFF	OFF	**ON**	OFF
3	OFF	OFF	OFF	OFF	OFF	OFF	**ON**	**ON**
. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
252	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	OFF	OFF
253	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	OFF	**ON**
254	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	OFF
255	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**

Setting example 1: When the operation data No. 8 (binary number: 0000 1000) is specified

Operation data number	M7	M6	M5	M4	M3	M2	M1	M0
8	OFF	OFF	OFF	OFF	**ON**	OFF	OFF	OFF

Setting example 2: When the operation data No. 116 (binary number: 0111 0100) is specified

Operation data number	M7	M6	M5	M4	M3	M2	M1	M0
116	OFF	**ON**	**ON**	**ON**	OFF	**ON**	OFF	OFF

■ Signal used for high-speed return-to-home operation

- **HOME input**

  When the HOME input is turned ON, return-to-home operation is started. When return-to-home operation is completed and the motor stops, the HOME-END output is turned ON.

■ Signals used for macro operation

- **FW-JOG input, RV-JOG input**

  When the FW-JOG input is turned ON, JOG operation is performed in the forward direction. When the RV-JOG input is turned ON, JOG operation is performed in the reverse direction.

- **FW-JOG-H input, RV-JOG-H input**

  When the FW-JOG-H input is turned ON, high-speed JOG operation is performed in the forward direction. When the RV-JOG-H input is turned ON, high-speed JOG operation is performed in the reverse direction.

- **FW-JOG-P input, RV-JOG-P input**

  When the FW-JOG-P input is turned ON, inching operation is performed in the forward direction. When the RV-JOG-P input is turned ON, inching operation is performed in the reverse direction.

- **FW-POS input, RV-POS input**

  When the operation data number is selected to turn the FW-POS input or RV-POS input ON, continuous operation is started at the operating speed corresponding to the selected operation data number. When the FW-POS input is turned ON, the motor rotates in the forward direction. When the RV-POS input is turned ON, the motor rotates in the reverse direction.
  If the signal of the same rotation direction is turned ON while the motor decelerates to a stop, the motor accelerates again and continues operation.
  If both the FW-POS input and the RV-POS input are turned ON simultaneously, the motor will decelerate to a stop.
  When the operation data number is changed during continuous operation, the operating speed is changed to that of the changed operation data number.

4-2 Coordinates 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 "(HOME) Return-to-home mode" parameter.
  - Other than return-to-home:
    Hardware overtravel is detected to stop the motor. When the "FW-LS/RV-LS input action" parameter is set to "–1: Used as a return-to-home sensor," the motor does not stop.

Related parameter

MEXE02 code	Name	Description	Setting range	Initial value
p6	FW-LS/RV-LS input action	Sets how to stop the motor when the FW-LS input or the RV-LS input is turned ON.	–1: Used as a return-to-home sensor 0: Immediate stop 1: Deceleration stop 2: Immediate stop with alarm 3: Deceleration stop with alarm	2

- **HOMES input**

  This is an input signal from the mechanical home sensor when the "(HOME) Return-to-home mode" parameter is set to "1: 3-sensor" or "2: One-way rotation."

  Related parameter

MEXE02 code	Name	Description	Setting range	Initial value
p4	(HOME) Return-to-home mode	Sets the return-to-home method.	0: 2-sensor 1: 3-sensor 2: One-way rotation	1

- **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 and the feedback position are preset to zero and the coordinates are set. However, preset cannot be executed while the motor is in operation.

4-3 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 correct the cause of the alarm and ensure safety before resetting the alarm.
  Note that some alarms cannot be reset with the ALM-RST input.
  Refer to the OPERATING MANUAL for alarms.

- **LAT-CLR input**

  When the LAT-CLR input is turned ON, the latch status is cleared. (Latch function ⇨p.203)
  When the latched status is cleared, the value of the following command is cleared to zero.
  - Latch monitor status (STOP)
  - Event monitor command position (STOP)

  When the value of the "Latch monitor status (STOP)" command is cleared to zero, the following operation information stored in the latch monitor can be overwritten.
  - Command position
  - Target position
  - Operation data number
  - Number of loop times

- **INFO-CLR input**

  This signal is enabled when the "Information auto clear" parameter is set to "0: Disable (not turned OFF automatically)."
  When the INFO-CLR input is turned ON, the information status is cleared.

■ Driver function change signals

● HMI input

When the HMI input is turned ON, the function limitation of the **MEXE02** software is released. Turning it OFF will limit the function.
The functions to be limited are shown below.

- I/O test
- Teaching, remote operation
- Data writing
- Restores to the factory setting

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.

● PLS-XMODE input

When the PLS-XMODE input is turned ON, the number of input pulses and the magnification of the frequency are changed.

Related parameter

MEXE02 code	Name	Description	Setting range	Initial value
p6	PLS-XMODE pulse multiplying factor	Sets the pulse magnification when the PLS-XMODE input is turned ON.	2 to 30 times	10

memo Set the pulse input frequency not to exceed 1 MHz.

● PLS-DIS input

When the PLS-DIS input is turned ON, pulse input is disabled.

● FCLOOP-DIS input

If the FCLOOP-DIS input is turned ON when the "Fully closed-loop correction enable" parameter is set to "1: Enable," the correction by the fully closed-loop control is disabled. Also, the FCLOOP-RDY input is turned OFF.
To disable the FCLOOP-DIS input, set the "Fully closed-loop mode" parameter to "1: FCLOOP-DIS input disable." The correction by the fully closed-loop control is enabled regardless of whether the FCLOOP-DIS input is ON or OFF.

Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p11	Fully closed-loop correction enable	Enables the correction by the fully closed-loop control.	0: Disable 1: Enable	1
	Fully closed-loop mode	Selects whether to enable or disable the fully closed-loop correction according to the FCLOOP-DIS input when the "Fully closed-loop correction enable" parameter is set to "1: Enable."	0: Follow FCLOOP-DIS input 1: FCLOOP-DIS input disable	0

5 Output signals

5-1 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 PWR/ALM LED on the driver will blink in 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 main 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 parameter

MEXE02 code	Name	Description	Setting range	Initial value
p5	Information LED condition	Sets the LED status when information is generated.*	0: Disable (LED does not blink) 1: Enable (LED blinks)	1
	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

* Since the red and green LED blinks at the same time, the two colors overlap and appear orange.

- **SYS-BSY output**

  This signal is turned ON while the driver executes the maintenance command via RS-485 communication.

- **Output of information signals**

  If corresponding information is generated, each output signal is turned ON.
  Refer to the OPERATING MANUAL for details on information.

■ Hardware status indication signal

- **CRNT output**

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

5-2 Management of operation

■ Operation status indication signals

● READY output

When the driver is ready to start positioning SD operation, macro operation, or return-to-home operation, 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 main power supply of the driver is turned on.
- All inputs that start operation are OFF.
- The AWO 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.
  – Teaching, remote operation
  – Data writing
  – I/O test
- The following commands are not executed via RS-485 communication.
  – Configuration
  – Data batch initialization
  – All data batch initialization
  – Read batch NV memory

● PLS-RDY output

When the driver is ready to start operation by pulse input, the PLS-RDY output is turned ON. Input pulses after the PLS-RDY output is turned ON.

● MOVE output

The MOVE output is turned ON while the motor operates.

Related parameter

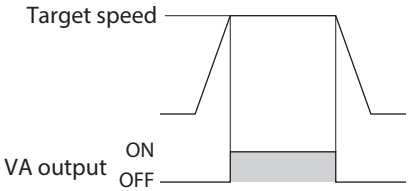
MEXE02 code	Name	Description	Setting range	Initial value
p6	MOVE minimum ON time	Sets the minimum time during which the MOVE output remains ON.	0 to 255 ms	0

● AUTO-CD output

When the current value reaches to the value set in the "Stop current" parameter by the automatic current cutback function, the AUTO-CD output is turned ON.

● VA output

When the motor command speed matches the target speed, the VA output is turned ON.



● HOME-END output

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

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

● FCLOOP-RDY output

When all of the following conditions are met, the FCLOOP-RDY output is turned ON and the correction by the fully closed-loop control is performed.

- The main power supply of the driver is turned on.
- The AWO input is OFF.
- The STOP input is OFF.
- An alarm is not being generated.
- The motor is not operated.
- The following commands are not executed via RS-485 communication.
  – Configuration
  – Data batch initialization
  – All data batch initialization
  – Read batch NV memory
  – Write batch NV memory
- The correction by the fully closed-loop control is enabled.
- The motor coordinates are set.
- The encoder coordinates are set.
- The time set in the "Correction operation waiting time" parameter has elapsed.

Note

The conditions under which the encoder coordinates are to be set are as follows.

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

If an alarm of Encoder excessive position deviation or Encoder timeout is generated after the encoder coordinates are set, the encoder coordinates will be in an unset state. To continue operation after the alarm is reset, set the encoder coordinates again.

memo

- The conditions under which the correction by the fully closed-loop control is disabled are as follows.
  – The "Fully closed-loop correction enable" parameter is set to "0: Disable."
  – The FCLOOP-DIS input is in an ON state when the "Fully closed-loop mode" parameter is set to "1: Follow FCLOOP-DIS input."
- Even if the FCLOOP-RDY output is ON, the correction by the fully closed-loop control will not be performed when the position deviation is less than a value set in the "In-position range" parameter.

Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p11	Fully closed-loop correction enable	Enables the correction by the fully closed-loop control.	0: Disable 1: Enable	1
	Fully closed-loop mode	Selects whether to enable or disable the fully closed-loop correction according to the FCLOOP-DIS input when the "Fully closed-loop correction enable" parameter is set to "1: Enable."	0: Follow FCLOOP-DIS input 1: FCLOOP-DIS input disable	0
	Correction operation waiting time	Sets the time from the stop at the command position to the start of the correction operation by the fully closed-loop control. Set a value that is longer than or equal to the settling time for the residual vibration to end after the stop.	0 to 10,000 ms	10

■ Positioning SD operation status indication signals

● SEQ-BSY output

The SEQ-BSY output is turned ON while positioning SD operation is performed.

● DELAY-BSY output

The DELAY-BSY output is turned ON when the motor is stopped by the setting of the "Drive-complete delay time."

■ Direct data operation status indication signals

● DCMD-FULL output

The DCMD-FULL output is turned ON when data is being written to the buffer area of direct data operation.

● DCMD-RDY output

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

- The main power supply of the driver is turned on.
- The AWO input is OFF.
- The STOP input is OFF.
- An alarm is not being generated.
- The following monitors or menus are not executed with the **MEXE02** software.
  – Teaching, remote operation
  – I/O test
  – Data writing
- The following commands are not executed via RS-485 communication.
  – Configuration
  – Data batch initialization
  – All data batch initialization
  – Read batch NV memory

■ Motor position indication signals

These signals are output according to the motor position.

● 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 within 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).

● PLS-OUT output

The PLS-OUT output is turned ON 50 times (100 times for the high resolution type) with each revolution of the motor output shaft. The ON-OFF ratio (duty cycle) when operating at a constant speed is 50 %. The maximum output frequency is 500 Hz.

● PLS-LOST output

If a pulse is input while the PLS-RDY output is OFF (pulse input is disabled), the PLS-LOST output is turned ON.
When the LAT-CLR input is turned from OFF to ON, the PLS-LOST output is turned OFF.
The conditions under which pulse input is disabled are as follows.

- When the motor is in a non-excitation state.
- When the operation stop signal is ON.
- When the PLS-DIS input is ON.

● AREA0, AREA1, AREA2 outputs

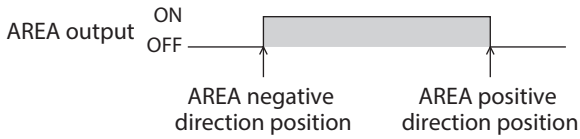
The AREA outputs are turned ON when the motor is within the set area.
They are turned ON when the motor is within the area even if the motor stops.

Related parameters

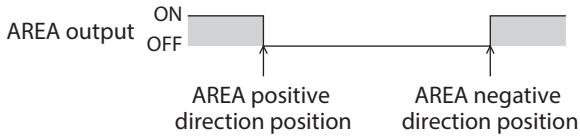
MEXE02 code	Name	Description	Setting range	Initial value
p6	AREA0 positive direction position/offset	Sets the positive direction position or offset from the target position for the AREA output.	–2,147,483,648 to 2,147,483,647 steps	0
	AREA1 positive direction position/offset			0
	AREA2 positive direction position/offset			0
	AREA0 negative direction position/detection range	Sets the negative direction position or distance from the offset position for the AREA output.	–2,147,483,648 to 2,147,483,647 steps	0
	AREA1 negative direction position/detection range			0
	AREA2 negative direction position/detection range			0
	AREA0 range setting mode	Sets the range setting method for the AREA output.	0: Range setting with absolute value 1: Offset/width setting from the target position	0
	AREA1 range setting mode			0
	AREA2 range setting mode			0

When the "AREA range setting mode" parameter is "0: Range setting with absolute value"

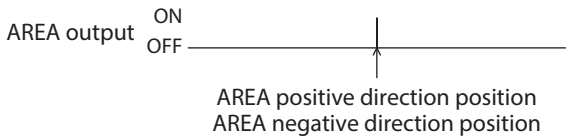
- When a value in the "AREA positive direction position/ offset" parameter is larger than that in the "AREA negative direction position/ detection range" parameter
  When the motor position is equal to or larger than a value in the "AREA negative direction position/ detection range" parameter or equal to or smaller than that in the "AREA positive direction position/ offset" parameter, the AREA output is turned ON.



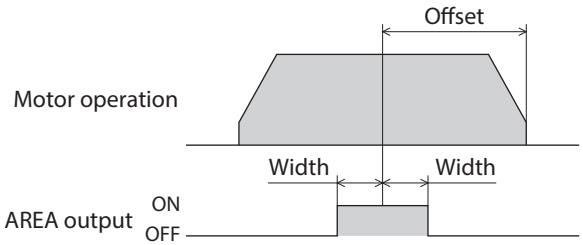
- When a value in the "AREA positive direction position/ offset" parameter is smaller than that in the "AREA negative direction position/ detection range" parameter
  When the motor position is equal to or smaller than a value in the "AREA positive direction position/ offset" parameter or equal to or larger than that in the "AREA negative direction position/ detection range" parameter, the AREA output is turned ON.



- When a value in the "AREA positive direction position/ offset" parameter is equal to that in the "AREA negative direction position/ detection range" parameter
  When the motor position is equal to values in the "AREA negative direction position/ detection range" parameter and the "AREA positive direction position/ offset" parameter, the AREA output is turned ON.



When the "AREA range setting mode" parameter 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 limit" parameter when the "Software overtravel" parameter is set to a value other than "–1: Disable," the FW-SLS output or the RV-SLS output is turned ON.

- **ZSG output**

  This signal is used when an encoder is connected. The ZSG output signal is output when the ENC-Z input signal is input to the encoder input connector (CN5) from the encoder.

memo
- The ZSG output signal is properly output when the ENC-Z input is ON for 1 ms or longer.
- There is a maximum delay of 3 ms on the ZSG output. Use it to check the stop position.

- **ENC-IN-POS output**

  The ENC-IN-POS output is turned ON when the following conditions are met.
  - The position deviation (cnt) was equal to or less than the value set in the "In-position range" parameter.
  - The time set in the "In-position delay time" parameter has elapsed.

  If the ENC-IN-POS output is turned OFF while the FCLOOP-RDY output is ON, the correction by the fully closed-loop control will be performed until the ENC-IN-POS output is turned ON. When the ENC-IN-POS output is turned ON, the fully closed-loop correction is completed and the hunting-free open-loop state is entered.

Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p11	In-position delay time	Sets the time from when the position deviation enters the in-position range to when the ENC-IN-POS output is turned ON, based on the encoder position information.	0 to 1,000 ms	10
	In-position range	Sets the allowable range of the position deviation based on the feedback position.	0 to 100,000 cnt	5

memo
- If a value set in the "In-position range" parameter is too low, the ENC-IN-POS output will be unstable depending on the environmental conditions of the equipment and will be turned ON and OFF repeatedly.
- If the "In-position range" parameter is set to "0," the ENC-IN-POS output is turned ON when the position deviation (cnt) is 1 cnt or less. However, the correction by the fully closed-loop control is performed until the position deviation (cnt) is 0 cnt.

- **FCLOOP-MON output**

  When the correction by the fully closed-loop control is performed, the FCLOOP-MON output is turned ON.

memo
Even if the FCLOOP-RDY output is ON, the correction by the fully closed-loop control will not be performed when the position deviation is less than a value set in the "In-position range" parameter. Also, the FCLOOP-MON output will not be turned ON.

■ Coordinate status indication signal

- **ABSPEN output**

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

5-3 Response outputs

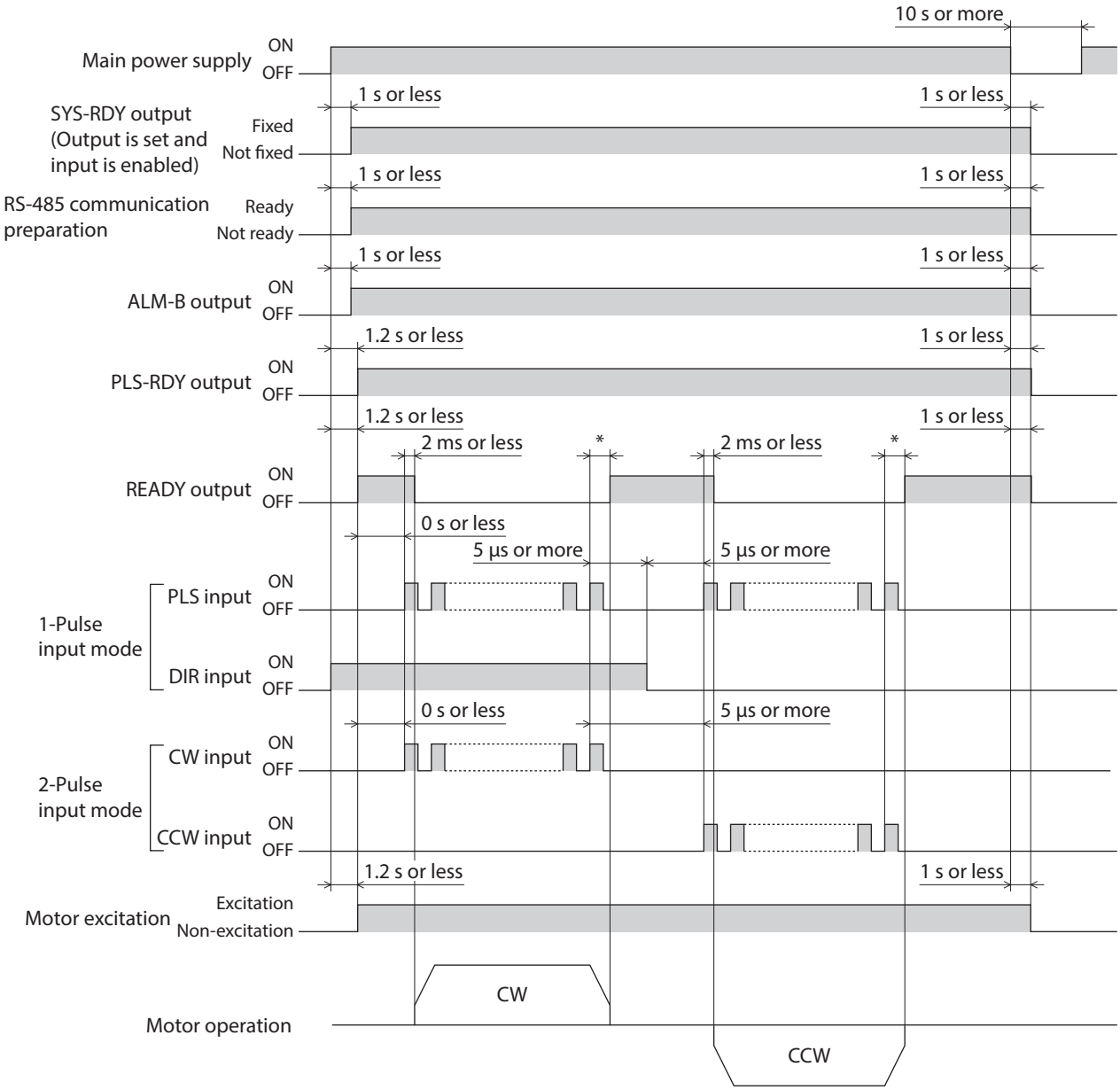
A response output is a signal that outputs the ON-OFF status of the corresponding input signal.
The table below shows the correspondence between input signals and output signals.

Input signal	Output signal
AWO	AWO_R
STOP	STOP_R
ALM-RST	ALM-RST_R
P-PRESET	P-PRESET_R
LAT-CLR	LAT-CLR_R
INFO-CLR	INFO-CLR_R
HMI	HMI_R
PLS-XMODE	PLS-XMODE_R
PLS-DIS	PLS-DIS_R
FW-BLK	FW-BLK_R
RV-BLK	RV-BLK_R
FW-LS	FW-LS_R
RV-LS	RV-LS_R
HOMES	HOMES_R
SLIT	SLIT_R
START	START_R
SSTART	SSTART_R
HOME	HOME_R
FW-JOG	FW-JOG_R
RV-JOG	RV-JOG_R
FW-JOG-H	FW-JOG-H_R
RV-JOG-H	RV-JOG-H_R

Input signal	Output signal
FW-JOG-P	FW-JOG-P_R
RV-JOG-P	RV-JOG-P_R
FW-POS	FW-POS_R
RV-POS	RV-POS_R
M0	M0_R
M1	M1_R
M2	M2_R
M3	M3_R
M4	M4_R
M5	M5_R
M6	M6_R
M7	M7_R
R0	R0_R
R1	R1_R
R2	R2_R
R3	R3_R
R4	R4_R
R5	R5_R
R6	R6_R
R7	R7_R
FCLOOP-DIS	FCLOOP-DIS_R

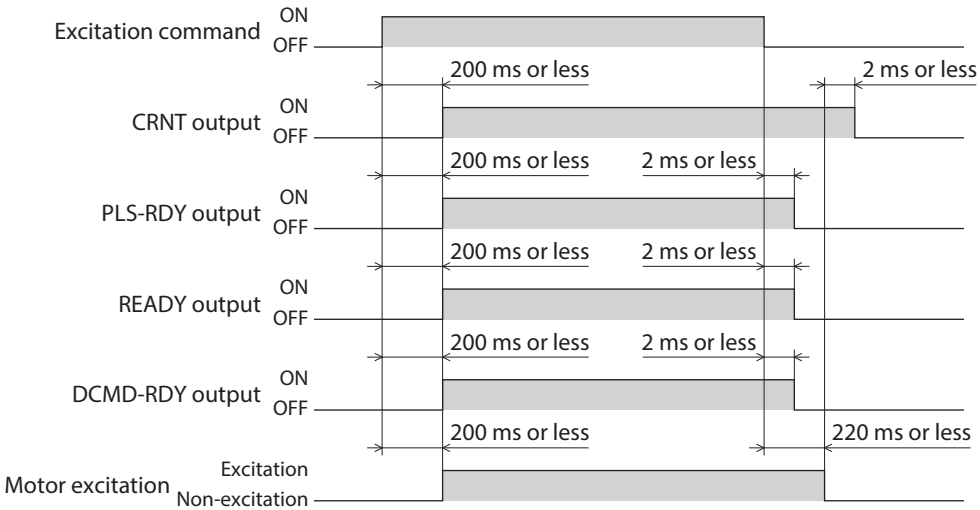
6 Timing chart

■ Main power supply ON



* It varies depending on the operating speed, command filter, etc.

■ Excitation


Excitation command
ON
OFF
200 ms or less
2 ms or less
CRNT output
ON
OFF
200 ms or less
2 ms or less
PLS-RDY output
ON
OFF
200 ms or less
2 ms or less
READY output
ON
OFF
200 ms or less
2 ms or less
DCMD-RDY output
ON
OFF
200 ms or less
220 ms or less
Motor excitation
Excitation
Non-excitation

5 Modbus RTU control (RS-485 communication)

This part explains how to control via RS-485 communication using a host controller. The protocol used for RS-485 communication is the Modbus protocol.

◆Table of contents

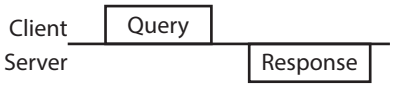
1 Modbus RTU specifications

1-1 Communication mode

The Modbus protocol is easy to use and its specification is open to the public, so it is widely used in industrial applications.
Modbus communication is based on the single-client/multi-server method. Only the client can issue a query (command).
Each server executes the processing requested by the query and returns a response message.
The driver supports the RTU mode only as the transmission mode. The ASCII mode is not supported.
Under this protocol, messages are sent in one of two methods.

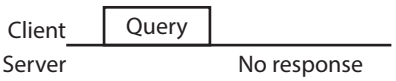
- **Unicast mode**

  The client sends a query to a single server. The server executes the processing and returns a response.



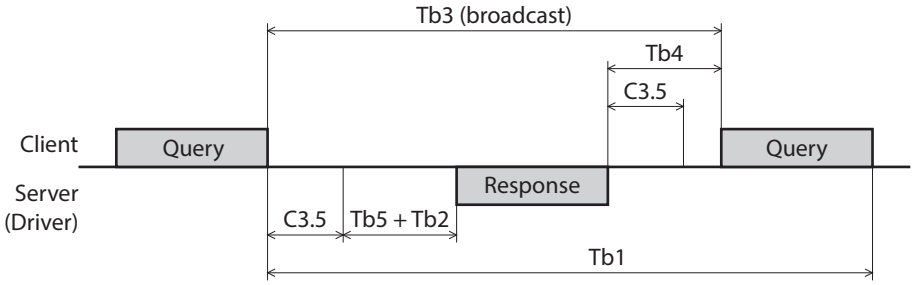
- **Broadcast mode**

  If the server address 0 is specified on the client, the client can send a command to all servers. Each server executes the processing, but does not return a response.



1-2 Communication timing

The communication time monitored by the driver and the communication timing of the client are as follows.



Code	Name	Description
Tb1	Communication timeout (Driver)	The driver monitors an interval between received queries. If the driver cannot receive a query after the time set in the "Communication timeout (Modbus)" parameter has elapsed, an alarm of Communication timeout is generated. When normal messages including messages to other servers were received, an alarm of Communication timeout is not generated.
Tb2	Transmission waiting time (Driver)	This is the amount of time from when the driver receives a query from the client to when it starts sending a response. Set using the "Transmission waiting time (Modbus)" parameter.
Tb3	Broadcast interval (Client)	In broadcast, this is the amount of time until the client sends the next query. A time equivalent to or longer than the silent interval (C3.5) plus 5 ms is required.
Tb4	Transmission waiting time (Client)	This is the amount of time from when the client receives the response to when it sends the next query (setting on the client side). Set so that it is equal to or longer than the time of the silent interval (C3.5). If the "Silent interval (Modbus)" parameter is set to "0: Automatic," set the client side according to the "Estimate of transmission waiting time (client) (Tb 4)" in the table below.
Tb5	Query processing time (Driver)	This is the amount of time that the driver processes a received query. The query processing time varies depending on the message structure of the received query.

Code	Name	Description
C3.5	Silent interval	This is the amount of time to determine the end of a query or response message. An interval equal to or longer than the time of the silent interval (C3.5) is required when the message ends. When the "Silent interval (Modbus)" parameter of the driver is set to "0: Automatic," the silent interval (C3.5) varies depending on the transmission rate. For details, refer to the "Silent interval (C3.5)" shown on the table below.

When the "Silent interval (Modbus)" parameter is set to "0 (Automatic)"

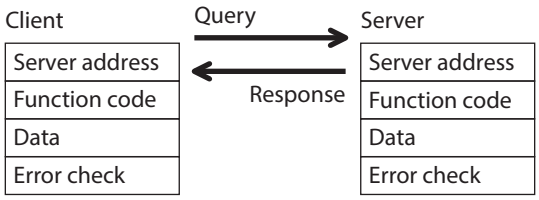
Transmission rate (bps)	Silent interval (C3.5)	Estimate of transmission waiting time (client) (Tb4)
9,600	4.0 ms or more	5.0 ms or more
19,200 or more	2.5 ms or more	3.0 ms or more

Note

- If the transmission waiting time (Tb4) of the client is shorter than the silent interval, the driver discards the message and a communication error occurs. When a communication error occurs, check the silent interval of the driver and set the transmission waiting time (Tb4) of the client again.
- The silent interval (C3.5) may vary depending on the product series connected. When connecting multiple product series, set the driver parameters as follows.
  – "Silent interval (Modbus)" parameter: "0: Automatic"
  – "Transmission waiting time (Modbus)" parameter: 1.0 ms or more
- In a system where only products having the "Silent interval (Modbus)" parameter are connected, the communication cycle can be improved if the setting of the "Silent interval (Modbus)" parameter is common to the products connected. Use in a state of setting to "0: Automatic" normally.

2 Message structure

The message format is shown below.



2-1 Query

The query message structure is shown below.

Server address	Function code	Data	Error check
8 bits	8 bits	N × 8 bits	16 bits

■ Server address

Specify the server address. (Unicast mode)
If the server address is set to 0 (zero), the client can send a query to all servers. (Broadcast mode)

■ Function code

The function codes and message lengths supported by the driver are as follows.

Function code	Function	Number of registers	Broadcast
03h	Reading from a holding register(s)	1 to 125	Not possible
06h	Writing to a holding register	1	Possible
08h	Diagnosis	–	Not possible
10h	Writing to multiple holding registers	1 to 123	Possible
17h	Reading/writing from/to multiple holding registers	Read: 1 to 125 Write: 1 to 121	Not possible

■ Data

Set the data related to the function code. The data length varies depending on the function code.

■ Error check

In the Modbus RTU mode, error checks are based on the CRC-16 method. The server calculates a CRC-16 of each received message and compares the result against the error check value included in the message. If the calculated CRC-16 value matches the error check value, the server determines that the message is normal.

- **CRC-16 calculation method**

1. Calculate an exclusive-OR (XOR) value of the default value of FFFFh and server address (8 bits).
2. Shift the result of step 1 to the right by 1 bit. Repeat this shift until the overflow bit becomes "1."
3. Upon obtaining "1" as the overflow bit, calculate an XOR of the result of step 2 and A001h.
4. Repeat steps 2 and 3 until a shift is performed eight times.
5. Calculate an XOR of the result of step 4 and function code (8 bits).
   Repeat steps 2 to 4 for all bytes.
   The final result gives the result of CRC-16 calculation.

- **Calculation example of CRC-16**

The table shows a calculation example when setting the server address of the first byte to 02h and the function code of the second byte to 07h.
The result of actual CRC-16 calculation is calculated including the data on and after the third byte.

Description	Result	Bit shifted out
CRC register initial value FFFFh	1111 1111 1111 1111	–
Lead byte 02h	0000 0000 0000 0010	–
Initial value FFFFh and XOR	1111 1111 1111 1101	–
First time of right shift	0111 1111 1111 1110	1
A001h and XOR	1010 0000 0000 0001 1101 1111 1111 1111	–
Second time of right shift	0110 1111 1111 1111	1
A001h and XOR	1010 0000 0000 0001 1100 1111 1111 1110	–
Third time of right shift	0110 0111 1111 1111	0
Fourth time of right shift	0011 0011 1111 1111	1
A001h and XOR	1010 0000 0000 0001 1001 0011 1111 1110	–
Fifth time of right shift	0100 1001 1111 1111	0
Sixth time of right shift	0010 0100 1111 1111	1
A001h and XOR	1010 0000 0000 0001 1000 0100 1111 1110	–
Seventh time of right shift	0100 0010 0111 1111	0
Eighth time of right shift	0010 0001 0011 1111	1
A001h and XOR	1010 0000 0000 0001 1000 0001 0011 1110	–
Next byte 07h and XOR	0000 0000 0000 0111 1000 0001 0011 1001	–
First time of right shift	0100 0000 1001 1100	1
A001h and XOR	1010 0000 0000 0001 1110 0000 1001 1101	–
Second time of right shift	0111 0000 0100 1110	1
A001h and XOR	1010 0000 0000 0001 1101 0000 0100 1111	–
Third time of right shift	0110 1000 0010 0111	1
A001h and XOR	1010 0000 0000 0001 1100 1000 0010 0110	–
Fourth time of right shift	0110 0100 0001 0011	0
Fifth time of right shift	0011 0010 0000 1001	1
A001h and XOR	1010 0000 0000 0001 1001 0010 0000 1000	–
Sixth time of right shift	0100 1001 0000 0100	0
Seventh time of right shift	0010 0100 1000 0010	0
Eighth time of right shift	0001 0010 0100 0001	0
Result of CRC-16	0001 0010 0100 0001	–

2-2 Response

Responses returned by the server are classified into three types: normal response, no response, and exception response.
The response message structure is the same as the query message structure.

Server address	Function code	Data	Error check
8 bits	8 bits	N x 8 bits	16 bits

■ Normal response

Upon receiving a query from the client, the server executes the requested processing and returns a response corresponding to the function code.

■ No response

The server may not return a response even if the the client sends a query. This state is called no response.
The causes of no response are listed below.

- **Transmission error**

The server discards the query if it detects any of the transmission errors in the table. A response will not be sent back.

Cause of transmission error	Description
Framing error	Stop bit 0 was detected.
Parity error	A mismatch with the specified parity was detected.
Mismatched CRC	The calculated value of CRC-16 was found not matching the error check value.
Invalid message length	The message length exceeded 256 bytes.

- **Other than transmission error**

A response may not be returned without any transmission error being detected.

Cause	Description
Broadcast	If the query was broadcast, the server executes the requested processing but does not return a response.
Mismatched server address	When the server address in the query is not matched the server address of the driver.

■ Exception response

An exception response is returned if the server cannot execute the processing requested by the query. This response is appended with an exception code that indicates the reason why the processing cannot be executed. The message structure of an exception response is as follows.

Server address	Function code	Exception code	Error check
8 bits	8 bits	8 bits	16 bits

- **Function code**

The function code in an exception response is the sum of the function code in the query and 80h.

Function code of query	Exception response
03h	83h
06h	86h
08h	88h
10h	90h
17h	97h

- **Example of exception response**

Server address		01h
Function code		10h
Data	Register address (Upper)	02h
	Register address (Lower)	4Ch
	Number of registers (Upper)	00h
	Number of registers (Lower)	02h
	Number of data bytes	04h
	Write value of register address (Upper)	00h
	Write value of register address (Lower)	00h
	Write value of register address +1 (Upper)	03h
	Write value of register address +1 (Lower)	E9h
Error check (Lower)		2Fh
Error check (Upper)		D4h

Query →

← Response

Server address		01h
Function code		90h
Data	Exception code	04h
Error check (Lower)		4Dh
Error check (Upper)		C3h

- **Exception code**

This code indicates the reason why the processing cannot be executed.

Exception code	Communication error code	Cause	Description
01h	88h	Invalid function	The processing could not be executed because the function code was invalid. • The function code is not supported. • The sub-function code for diagnosis (08h) is other than 00h.
02h	88h	Invalid data address	The processing could not be executed because the data address was invalid. • The register address is not supported (other than 0000h to 57FFh). • The sum of the register address and the number of registers is 5800h or more.
03h	8Ch	Invalid data	The processing could not be executed because the data was invalid. • The number of registers is 0. • The number of bytes is a value other than "the number of register ×2." • Invalid data length
04h	89h 8Ah 8Ch 8Dh	Server error	• The processing could not be executed because an error occurred on the server. • The following operation is being executed in the **MEXE02** software (89h). – Data writing – Initialization or Configuration – I/O test or teaching, remote operation • Non-volatile memory is being processed (8Ah). – Internal processing is in progress (SYS-BSY is ON). – An alarm of "EEPROM error" is present • The parameter is outside the setting range (8Ch). – The write value is outside the setting range. • Command execute disable (8Dh)

- **About server errors**

When the "Server error response mode (Modbus)" parameter is set to "0: Normal response," a normal response is returned even if a server error occurs. Set it when no exception response is required, such as in the case of a touch screen.

3 Function code

This chapter explains the function codes supported by the driver.
Note that if a function code other than the ones introduced here is sent, the function code cannot be executed.

3-1 Reading of a holding register(s) (03h)

This function code is used to read a register (16 bits). Up to 125 consecutive registers (125 × 16 bits) can be read.
Read the upper and lower data at the same time. If not, an invalid value may be read.
When multiple holding registers are read, they are read in order of register address.

■ Example of read

Read the "Operation type, Position, Speed" in the operation data No. 1 of the server address 1.

Description	Register address	Value read	Corresponding decimal
Operation type of operation data No. 1 (Upper)	1840h (6208)	0000h	2
Operation type of operation data No. 1 (Lower)	1841h (6209)	0002h	
Position of operation data No. 1 (Upper)	1842h (6210)	FFFFh	−10,000
Position of operation data No. 1 (Lower)	1843h (6211)	D8F0h	
Speed of operation data No. 1 (Upper)	1844h (6212)	0000h	10,000
Speed of operation data No. 1 (Lower)	1845h (6213)	2710h	

● **Query**

Field name		Data	Description
Server address		01h	Server address 1
Function code		03h	Reading from a holding register(s)
Data	Register address (Upper)	18h	Register address to start reading from
	Register address (Lower)	40h	
	Number of registers (Upper)	00h	Number of registers to be read from the starting register address (6 registers=0006h)
	Number of registers (Lower)	06h	
Error check (Lower)		C2h	Calculation result of CRC-16
Error check (Upper)		BCh	

● **Response**

Field name		Data	Description
Server address		01h	Same as query
Function code		03h	Same as query
Data	Number of data bytes	0Ch	Twice the number of registers in the query
	Read value of register address (Upper)	00h	Value read from register address 1840h
	Read value of register address (Lower)	00h	
	Read value of register address +1 (Upper)	00h	Value read from register address 1841h
	Read value of register address +1 (Lower)	02h	
	Read value of register address +2 (Upper)	FFh	Value read from register address 1842h
	Read value of register address +2 (Lower)	FFh	
	Read value of register address +3 (Upper)	D8h	Value read from register address 1843h
	Read value of register address +3 (Lower)	F0h	
	Read value of register address +4 (Upper)	00h	Value read from register address 1844h
	Read value of register address +4 (Lower)	00h	
	Read value of register address +5 (Upper)	27h	Value read from register address 1845h
	Read value of register address +5 (Lower)	10h	
Error check (Lower)		82h	Calculation result of CRC-16
Error check (Upper)		EAh	

3-2 Writing to a holding register (06h)

This function code is used to write data to a specified register address. However, since the result of combining the upper and lower data may be outside the data range, write the upper and lower data at the same time using the "Writing to multiple holding registers (10h)."

■ Example of write

Write 50h (80) to the command filter time constant of the server address 2.

Description	Register address	Value write	Corresponding decimal
Command filter time constant (Lower)	255h (597)	50h	80

● **Query**

Field name		Data	Description
Server address		02h	Server address 2
Function code		06h	Writing to a holding register
Data	Register address (Upper)	02h	Register address to be written
	Register address (Lower)	55h	
	Write value (Upper)	00h	Value written to the register address
	Write value (Lower)	50h	
Error check (Lower)		98h	Calculation result of CRC-16
Error check (Upper)		6Dh	

- **Response**

Field name		Data	Description
Server address		02h	Same as query
Function code		06h	Same as query
Data	Register address (Upper)	02h	Same as query
	Register address (Lower)	55h	
	Write value (Upper)	00h	Same as query
	Write value (Lower)	50h	
Error check (Lower)		98h	Calculation result of CRC-16
Error check (Upper)		6Dh	

3-3 Diagnosis (08h)

This function code is used to diagnose communication between the client and the server. Arbitrary data is sent and the result of the returned data is used to determine if the communication is normal. 00h (reply to query) is the only sub-function.

■ Example of diagnosis

Arbitrary data (1234h) is sent to the server to diagnose.

- **Query**

Field name		Data	Description
Server address		03h	Server address 3
Function code		08h	Diagnosis
Data	Sub-function code (Upper)	00h	Return the query data
	Sub-function code (Lower)	00h	
	Data value (Upper)	12h	Arbitrary data (1234h)
	Data value (Lower)	34h	
Error check (Lower)		ECh	Calculation result of CRC-16
Error check (Upper)		9Eh	

- **Response**

Field name		Data	Description
Server address		03h	Same as query
Function code		08h	Same as query
Data	Sub-function code (Upper)	00h	Same as query
	Sub-function code (Lower)	00h	
	Data value (Upper)	12h	Same as query
	Data value (Lower)	34h	
Error check (Lower)		ECh	Same as query
Error check (Upper)		9Eh	

3-4 Writing to multiple holding registers (10h)

This function code is used to write data to multiple consecutive registers. Up to 123 registers can be written.
Write the upper and lower data at the same time. If not, an invalid value may be written.
Registers are written in order of register address. Note that even when an exception response is returned because some data is invalid, such as data outside the specified range, etc., other data may have been written properly.

■ Example of write

Set the following data to the "Starting/changing rate," "Stopping deceleration," and "Operating current" of the operation data No. 3 at the server address 4.

Description	Register address	Value write	Corresponding decimal
Starting/changing rate of operation data No. 3 (Upper)	18C6h (6342)	0000h	10,000
Starting/changing rate of operation data No. 3 (Lower)	18C7h (6343)	2710h	
Stopping deceleration of operation data No. 3 (Upper)	18C8h (6344)	0000h	20,000
Stopping deceleration of operation data No. 3 (Lower)	18C9h (6345)	4E20h	
Operating current of operation data No. 3 (Upper)	18CAh (6346)	0000h	500
Operating current of operation data No. 3 (Lower)	18CBh (6347)	01F4h	

● **Query**

Field name		Data	Description
Server address		04h	Server address 4
Function code		10h	Writing to multiple holding registers
Data	Register address (Upper)	18h	Register address to start writing from
	Register address (Lower)	C6h	
	Number of registers (Upper)	00h	Number of registers to be written from the starting register address (6 registers=0006h)
	Number of registers (Lower)	06h	
	Number of data bytes	0Ch	Twice the number of registers in the query
	Write value of register address (Upper)	00h	Value written to register address 18C6h
	Write value of register address (Lower)	00h	
	Write value of register address +1 (Upper)	27h	Value written to register address 18C7h
	Write value of register address +1 (Lower)	10h	
	Write value of register address +2 (Upper)	00h	Value written to register address 18C8h
	Write value of register address +2 (Lower)	00h	
	Write value of register address +3 (Upper)	4Eh	Value written to register address 18C9h
	Write value of register address +3 (Lower)	20h	
	Write value of register address +4 (Upper)	00h	Value written to register address 18CAh
	Write value of register address +4 (Lower)	00h	
	Write value of register address +5 (Upper)	01h	Value written to register address 18CBh
	Write value of register address +5 (Lower)	F4h	
Error check (Lower)		6Ch	Calculation result of CRC-16
Error check (Upper)		A0h	

- **Response**

Field name		Data	Description
Server address		04h	Same as query
Function code		10h	Same as query
Data	Register address (Upper)	18h	Same as query
	Register address (Lower)	C6h	
	Number of registers (Upper)	00h	Same as query
	Number of registers (Lower)	06h	
Error check (Lower)		A6h	Calculation result of CRC-16
Error check (Upper)		C3h	

3-5 Read/write of multiple holding registers (17h)

With a single function code, reading data and writing data for multiple consecutive registers can be performed.
Data is written first, and then data is read from the specified registers.

■ Read

Data can be read from up to 125 consecutive registers.
Read the upper and lower data at the same time. If not, an invalid value may be read.
If multiple registers are read, they are read in order of register address.

■ Write

Data can be written to up to 121 consecutive registers.
Write the upper and lower data at the same time. If not, an invalid value may be written.
Registers are written in order of register address. Note that even when an exception response is returned because some data is invalid, such as data outside the specified range, etc., other data may have been written properly.

■ Example of read/write

Prepare the read address and write address in a single query.
In this example, the data is written to the "Position" and "Speed" of the operation data No. 1, and then the presently selected data number and the operation data number are read.

Description	Register address	Value write	Corresponding decimal
Position of operation data No. 1 (Upper)	1842h (6210)	0000h	10,000
Position of operation data No. 1 (Lower)	1843h (6211)	2710h	
Speed of operation data No. 1 (Upper)	1844h (6212)	0000h	5,000
Speed of operation data No. 1 (Lower)	1845h (6213)	1388h	

Description	Register address	Value read	Corresponding decimal
Present selected data number (Upper)	00C2h (194)	0000h	1
Present selected data number (Lower)	00C3h (195)	0001h	
Present operation data number (Upper)	00C4h (196)	FFFFh	–1
Present operation data number (Lower)	00C5h (197)	FFFFh	

- **Query**

Field name		Data	Description
Server address		01h	Server address 1
Function code		17h	Reading/writing from/to multiple holding registers
Data	(Read) Register address (Upper)	00h	Register address to start reading from
	(Read) Register address (Lower)	C2h	
	(Read) Number of registers (Upper)	00h	Number of registers to be read from the starting register address (4 registers=0004h)
	(Read) Number of registers (Lower)	04h	
	(Write) Register address (Upper)	18h	Register address to start writing from
	(Write) Register address (Lower)	42h	
	(Write) Number of registers (Upper)	00h	Number of registers to be written from the starting register address (4 registers=0004h)
	(Write) Number of registers (Lower)	04h	
	(Write) Number of data bytes	08h	Value of twice the number of (Write) registers in the query
	(Write) Write value of register address (Upper)	00h	Value written to register address 1842h
	(Write) Write value of register address (Lower)	00h	
	(Write) Write value of register address +1 (Upper)	27h	Value written to register address 1843h
	(Write) Write value of register address +1 (Lower)	10h	
	(Write) Write value of register address +2 (Upper)	00h	Value written to register address 1844h
	(Write) Write value of register address +2 (Lower)	00h	
	(Write) Write value of register address +3 (Upper)	13h	Value written to register address 1845h
	(Write) Write value of register address +3 (Lower)	88h	
Error check (Lower)		4Dh	Calculation result of CRC-16
Error check (Upper)		EAh	

- **Response**

Field name		Data	Description
Server address		01h	Same as query
Function code		17h	Same as query
Data	(Read) Number of data bytes	08h	Twice the number of (Read) registers in the query
	(Read) Read value of register address (Upper)	00h	Value read from register address 00C2h
	(Read) Read value of register address (Lower)	00h	
	(Read) Read value of register address +1 (Upper)	00h	Value read from register address 00C3h
	(Read) Read value of register address +1 (Lower)	01h	
	(Read) Read value of register address +2 (Upper)	FFh	Value read from register address 00C4h
	(Read) Read value of register address +2 (Lower)	FFh	
	(Read) Read value of register address +3 (Upper)	FFh	Value read from register address 00C5h
	(Read) Read value of register address +3 (Lower)	FFh	
Error check (Lower)		E9h	Calculation result of CRC-16
Error check (Upper)		C3h	

4 Setting example of data in Modbus RTU mode

4-1 Remote I/O commands

These are commands related to remote I/O. The set value is stored in RAM.

Register address		Name	Description	Setting range	Initial value	R/W
Upper	Lower					
0072h (114)	0073h (115)	NET selection number	Selects the operation data number. Operation data can be sent at the same time as "Driver input command (2nd)."	–1: Disable 0 to 255: Operation data number*	–1	R/W
0074h (116)	0075h (117)	Driver input command (2nd)	The same input command as "Driver input command (reference)" is automatically set.	–	0	R/W
0076h (118)	0077h (119)	NET selection number	Selects the operation data number. Operation data can be sent at the same time as "Driver input command (automatic OFF)."	–1: Disable 0 to 255: Operation data number*	–1	R/W
0078h (120)	0079h (121)	Driver input command (automatic OFF)	The same input command as "Driver input command (reference)" is automatically set. If the input signal is turned ON with this command, it is automatically turned OFF after 250 µs.	–	0	R/W
007Ah (122)	007Bh (123)	NET selection number	Selects the operation data number. Operation data can be sent at the same time as "Driver input command (reference)."	–1: Disable 0 to 255: Operation data number*	–1	R/W
007Ch (124)	007Dh (125)	Driver input command (reference)	Sets the input command to the driver. (Details of bits arrangement ⇨ p.125)	–	0	R/W
007Eh (126)	007Fh (127)	Driver output status	Reads the output status of the driver. (Details of bits arrangement ⇨ p.125)	–	–	R

* When a value other than 0 to 255 is set, the NET selection number is disabled and the selection by the M0 to M7 inputs is enabled.

■ Driver input command

These are the driver input signals that can be accessed via Modbus communication. They can also be accessed in units of one register (16 bits).

● **Upper**

Register address	Description							
007Ch (124)	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
	–	–	–	–	–	–	–	–

● **Lower**

Values in brackets [ ] are initial values. They can be changed using the parameter.

Register address	Description							
007Dh (125)	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	R-IN15 [RV-POS]	R-IN14 [FW-POS]	R-IN13 [RV-JOG-P]	R-IN12 [FW-JOG-P]	R-IN11 [SSTART]	R-IN10 [No function]	R-IN9 [No function]	R-IN8 [FCLOOP-DIS]
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	R-IN7 [ALM-RST]	R-IN6 [AWO]	R-IN5 [STOP]	R-IN4 [HOME]	R-IN3 [START]	R-IN2 [M2]	R-IN1 [M1]	R-IN0 [M0]

■ Driver output status

These are the driver output signals that can be accessed via Modbus communication. They can also be accessed in units of one register (16 bits).

● **Upper**

Register address	Description							
007Eh (126)	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
	–	–	–	–	–	–	–	–

● **Lower**

Values in brackets [ ] are initial values. They can be changed using the parameter.

Register address	Description							
007Fh (127)	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	R-OUT15 [FCLOOP-MON]	R-OUT14 [ENC-IN-POS]	R-OUT13 [MOVE]	R-OUT12 [TIM]	R-OUT11 [AREA2]	R-OUT10 [AREA1]	R-OUT9 [AREA0]	R-OUT8 [SYS-BSY]
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	R-OUT7 [ALM-A]	R-OUT6 [INFO]	R-OUT5 [READY]	R-OUT4 [HOME-END]	R-OUT3 [START_R]	R-OUT2 [M2_R]	R-OUT1 [M1_R]	R-OUT0 [M0_R]

4-2 Positioning operation

As an example, this section explains how to execute the following positioning operation.

- **Setting example**
  - Address number (Server address): 1
  - Operation data number: 0
  - Position (Travel amount): 1,000 steps
  - Operating speed: 5,000 Hz
- **Operation procedure**

1. Send the following query to set the position (travel amount) of the operation data No. 0 to 1,000 steps and the speed to 5,000 Hz.

Query

Field name		Data	Description
Server address		01h	Server address 1
Function code		10h	Writing to multiple holding registers
Data	Register address (Upper)	18h	Register address to start writing from =Position No. 0 (1802h)
	Register address (Lower)	02h	
	Number of registers (Upper)	00h	Number of registers to be written from the starting register address=4 registers (0004h)
	Number of registers (Lower)	04h	
	Number of data bytes	08h	Twice the number of registers in the query=8 (08h)
	Write value of register address (Upper)	00h	Value written to register address 1802h =Position (travel amount) 1,000 steps (0000 03E8h)
	Write value of register address (Lower)	00h	
	Write value of register address +1 (Upper)	03h	
	Write value of register address +1 (Lower)	E8h	
	Write value of register address +2 (Upper)	00h	Value written to register address 1804h =Operating speed 5,000 Hz (0000 1388h)
	Write value of register address +2 (Lower)	00h	
	Write value of register address +3 (Upper)	13h	
	Write value of register address +3 (Lower)	88h	
Error check (Lower)		03h	Calculation result of CRC-16
Error check (Upper)		17h	

Response

Field name		Data	Description
Server address		01h	Same as query
Function code		10h	Same as query
Data	Register address (Upper)	18h	Same as query
	Register address (Lower)	02h	
	Number of registers (Upper)	00h	Same as query
	Number of registers (Lower)	04h	
Error check (Lower)		66h	Calculation result of CRC-16
Error check (Upper)		AAh	

2. Send the following query to turn the START ON. Positioning operation is started.

Query

Field name		Data	Description
Server address		01h	Server address 1
Function code		06h	Writing to a holding register
Data	Register address (Upper)	00h	Register address to be written =Driver input command (007Dh)
	Register address (Lower)	7Dh	
	Write value (Upper)	00h	Value written to register address =START ON (0008h)*
	Write value (Lower)	08h	
Error check (Lower)		18h	Calculation result of CRC-16
Error check (Upper)		14h	

* In the initial setting, START is assigned to Bit 3 of the driver input command (007Dh). (1000 in binary=0008h in hexadecimal)

Response

Field name		Data	Description
Server address		01h	Same as query
Function code		06h	Same as query
Data	Register address (Upper)	00h	Same as query
	Register address (Lower)	7Dh	
	Write value (Upper)	00h	Same as query
	Write value (Lower)	08h	
Error check (Lower)		18h	Calculation result of CRC-16
Error check (Upper)		14h	

3. When positioning operation is completed, send the following query to turn START OFF.

Query

Field name		Data	Description
Server address		01h	Server address 1
Function code		06h	Writing to a holding register
Data	Register address (Upper)	00h	Register address to be written =Driver input command (007Dh)
	Register address (Lower)	7Dh	
	Write value (Upper)	00h	Value written to register address =START OFF (0000h)
	Write value (Lower)	00h	
Error check (Lower)		19h	Calculation result of CRC-16
Error check (Upper)		D2h	

Response

Field name		Data	Description
Server address		01h	Same as query
Function code		06h	Same as query
Data	Register address (Upper)	00h	Same as query
	Register address (Lower)	7Dh	
	Write value (Upper)	00h	Same as query
	Write value (Lower)	00h	
Error check (Lower)		19h	Calculation result of CRC-16
Error check (Upper)		D2h	

4-3 Continuous operation

As an example, this section explains how to execute the following continuous operation.

- **Setting example**
  - Address number (Server address): 1
  - Operation data number: 0
  - Rotation direction: Forward direction (Clockwise rotation)
  - Operating speed: 5,000 Hz
- **Operation procedure**

1. Send the following query to set the operating speed of the operation data No. 0 to 5,000 Hz.

Query

Field name		Data	Description
Server address		01h	Server address 1
Function code		10h	Writing to multiple holding registers
Data	Register address (Upper)	18h	Register address to start writing from =Operating speed No. 0 (1804h)
	Register address (Lower)	04h	
	Number of registers (Upper)	00h	Number of registers to be written from the starting register address=2 registers (0002h)
	Number of registers (Lower)	02h	
	Number of data bytes	04h	Twice the number of registers in the query=4 (04h)
	Write value of register address (Upper)	00h	Value written to register address 1804h =Operating speed 5,000 Hz (0000 1388h)
	Write value of register address (Lower)	00h	
	Write value of register address +1 (Upper)	13h	
	Write value of register address +1 (Lower)	88h	
Error check (Lower)		55h	Calculation result of CRC-16
Error check (Upper)		0Ah	

Response

Field name		Data	Description
Server address		01h	Same as query
Function code		10h	Same as query
Data	Register address (Upper)	18h	Same as query
	Register address (Lower)	04h	
	Number of registers (Upper)	00h	Same as query
	Number of registers (Lower)	02h	
Error check (Lower)		06h	Calculation result of CRC-16
Error check (Upper)		A9h	

2. Send the following query to turn FW-POS ON. Continuous operation is started.

Query

Field name		Data	Description
Server address		01h	Server address 1
Function code		06h	Writing to a holding register
Data	Register address (Upper)	00h	Register address to be written =Driver input command (007Dh)
	Register address (Lower)	7Dh	
	Write value (Upper)	40h	Value written to register address =FW-POS ON (4000h)*
	Write value (Lower)	00h	
Error check (Lower)		28h	Calculation result of CRC-16
Error check (Upper)		12h	

* In the initial setting, FW-POS is assigned to Bit 14 of the driver input command (007Dh). (0100 0000 0000 0000 in binary=4000h in hexadecimal)

Response

Field name		Data	Description
Server address		01h	Same as query
Function code		06h	Same as query
Data	Register address (Upper)	00h	Same as query
	Register address (Lower)	7Dh	
	Write value (Upper)	40h	Same as query
	Write value (Lower)	00h	
Error check (Lower)		28h	Calculation result of CRC-16
Error check (Upper)		12h	

3. To stop continuous operation, send the following query to turn FW-POS OFF. The motor decelerates to a stop.

Query

Field name		Data	Description
Server address		01h	Server address 1
Function code		06h	Writing to a holding register
Data	Register address (Upper)	00h	Register address to be written =Driver input command (007Dh)
	Register address (Lower)	7Dh	
	Write value (Upper)	00h	Value written to register address =FW-POS OFF (0000h)
	Write value (Lower)	00h	
Error check (Lower)		19h	Calculation result of CRC-16
Error check (Upper)		D2h	

Response

Field name		Data	Description
Server address		01h	Same as query
Function code		06h	Same as query
Data	Register address (Upper)	00h	Same as query
	Register address (Lower)	7Dh	
	Write value (Upper)	00h	Same as query
	Write value (Lower)	00h	
Error check (Lower)		19h	Calculation result of CRC-16
Error check (Upper)		D2h	

4-4 Return-to-home operation

As an example, this section explains how to execute the following return-to-home operation.

- **Setting example**
  - Address number (Server address): 1
  - Operating conditions: Initial values
- **Operation procedure**

1. Send the following query to turn HOME ON. Return-to-home operation is started.

Query

Field name		Data	Description
Server address		01h	Server address 1
Function code		06h	Writing to a holding register
Data	Register address (Upper)	00h	Register address to be written =Driver input command (007Dh)
	Register address (Lower)	7Dh	
	Write value (Upper)	00h	Value written to register address =HOME ON (0010h)*
	Write value (Lower)	10h	
Error check (Lower)		18h	Calculation result of CRC-16
Error check (Upper)		1Eh	

* In the initial setting, HOME is assigned to Bit 4 of the driver input command (007Dh). (10000 in binary = 0010h in hexadecimal)

Response

Field name		Data	Description
Server address		01h	Same as query
Function code		06h	Same as query
Data	Register address (Upper)	00h	Same as query
	Register address (Lower)	7Dh	
	Write value (Upper)	00h	Same as query
	Write value (Lower)	10h	
Error check (Lower)		18h	Calculation result of CRC-16
Error check (Upper)		1Eh	

2. When return-to-home operation is completed, send the following query to turn HOME OFF again.

Query

Field name		Data	Description
Server address		01h	Server address 1
Function code		06h	Writing to a holding register
Data	Register address (Upper)	00h	Register address to be written =Driver input command (007Dh)
	Register address (Lower)	7Dh	
	Write value (Upper)	00h	Value written to register address =HOME OFF (0000h)
	Write value (Lower)	00h	
Error check (Lower)		19h	Calculation result of CRC-16
Error check (Upper)		D2h	

Response

Field name		Data	Description
Server address		01h	Same as query
Function code		06h	Same as query
Data	Register address (Upper)	00h	Same as query
	Register address (Lower)	7Dh	
	Write value (Upper)	00h	Same as query
	Write value (Lower)	00h	
Error check (Lower)		19h	Calculation result of CRC-16
Error check (Upper)		D2h	

5 Data setting method

5-1 Overview of setting methods

There are three methods to set data via Modbus communication.
When handling multiple pieces of data, the communication specifications of Modbus allow reading/writing from/to consecutive addresses.

■ When setting the operation data

Input method	Features
Direct data operation	Rewriting of data and start of operation can be executed at the same time. (Reference ⇨ p.139)
Direct reference	• Specifies the address to set the data. • If the data consists of consecutive addresses, multiple pieces of data can be handled with a single query. • Inputs the remote I/O to operate according to the set data.
Indirect reference	• Indirect reference is a method in which data is stored in addresses exclusive for sending (indirect reference addresses) and set. • Even if addresses of the data to be set are not consecutive, multiple pieces of data can be handled with a single query because the indirect reference addresses are consecutive. • Inputs the remote I/O to operate according to the set data.

■ When setting the parameters or monitoring, etc.

- When addresses are consecutive:
  Set by direct reference.
- When addresses of data are not consecutive:
  When indirect reference is used, multiple commands can be executed with a single query.

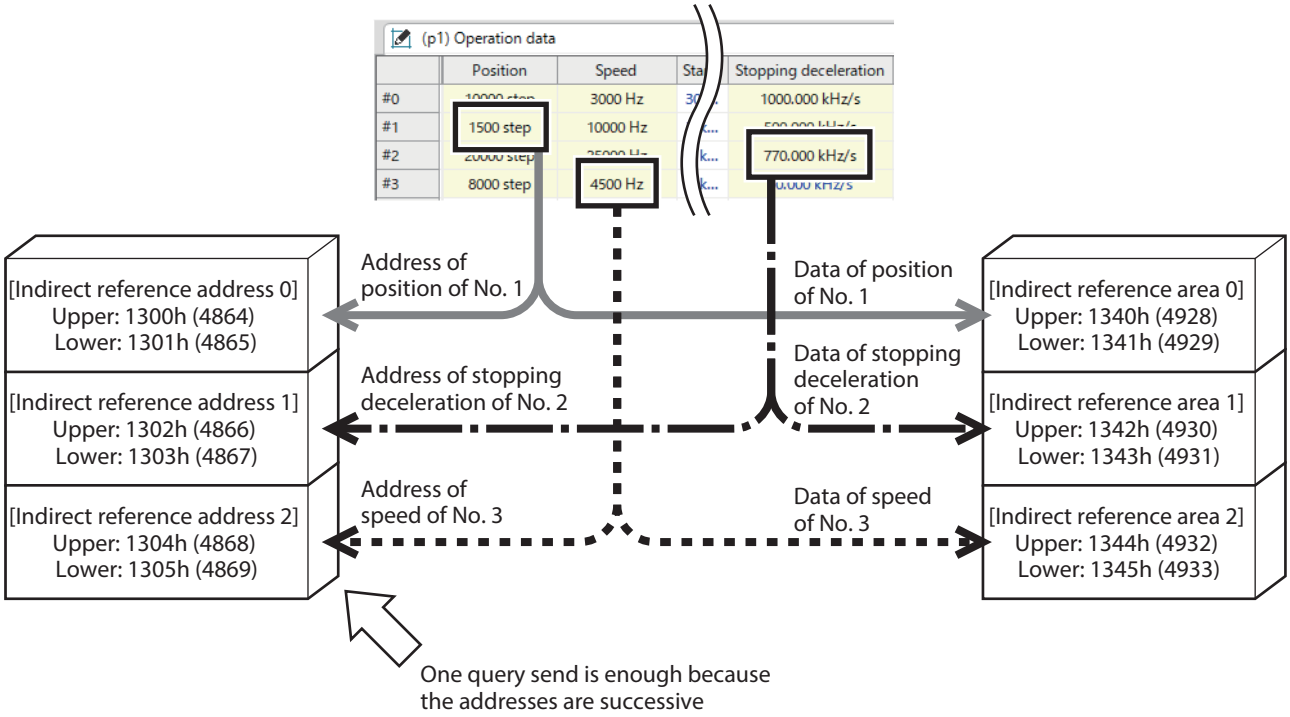
Direct and indirect references are described below.

5-2 Direct reference

Direct reference is a method in which data is set by specifying addresses. Consecutive multiple addresses can be sent with a single query. However, if the addresses to be set are not consecutive, as many queries as the number of addresses should be sent.

5-3 Indirect reference

Indirect reference is a method in which data is stored in addresses exclusive for sending (indirect reference addresses) and set. Even if addresses of the data to be set are not consecutive, multiple pieces of data can be sent with a single query because the indirect reference addresses are consecutive.
The addresses of the data to be set is stored in the "Address" of indirect reference. The setting values of data are stored in "Area" of indirect reference.



■ Addresses and areas of indirect reference

Indirect reference has 32 addresses and 32 areas (0 to 31).

Name	Description
Indirect reference address (0)	Stores the ID of the data to be sent in indirect reference. ID is a unique number that is stored internally by the driver and assigned to each setting item. In Modbus communication, be sure to input the "value half of the register address" because the value twice the ID is the register address.
Indirect reference address (1)	
• • •	
Indirect reference address (30)	
Indirect reference address (31)	
Indirect reference area 0	Stores the setting value of data to be sent in indirect reference.
Indirect reference area 1	
• • •	
Indirect reference area 30	
Indirect reference area 31	

Related parameters

MEXE02 code	Register address		Name	Description	Setting range	Initial value
	Upper	Lower				
p10	1300h (4864)	1301h (4865)	Indirect reference address setting (0)	Sets the ID of the data to be stored in the indirect reference address.	0 to FFFFh (0 to 65,535)	0
	1302h (4866)	1303h (4867)	Indirect reference address setting (1)			
	1304h (4868)	1305h (4869)	Indirect reference address setting (2)			
	1306h (4870)	1307h (4871)	Indirect reference address setting (3)			
	1308h (4872)	1309h (4873)	Indirect reference address setting (4)			
	130Ah (4874)	130Bh (4875)	Indirect reference address setting (5)			
	130Ch (4876)	130Dh (4877)	Indirect reference address setting (6)			
	130Eh (4878)	130Fh (4879)	Indirect reference address setting (7)			
	1310h (4880)	1311h (4881)	Indirect reference address setting (8)			
	1312h (4882)	1313h (4883)	Indirect reference address setting (9)			
	1314h (4884)	1315h (4885)	Indirect reference address setting (10)			
	1316h (4886)	1317h (4887)	Indirect reference address setting (11)			
	1318h (4888)	1319h (4889)	Indirect reference address setting (12)			
	131Ah (4890)	131Bh (4891)	Indirect reference address setting (13)			
	131Ch (4892)	131Dh (4893)	Indirect reference address setting (14)			
	131Eh (4894)	131Fh (4895)	Indirect reference address setting (15)			
	1320h (4896)	1321h (4897)	Indirect reference address setting (16)			
	1322h (4898)	1323h (4899)	Indirect reference address setting (17)			
	1324h (4900)	1325h (4901)	Indirect reference address setting (18)			
	1326h (4902)	1327h (4903)	Indirect reference address setting (19)			
	1328h (4904)	1329h (4905)	Indirect reference address setting (20)			
	132Ah (4906)	132Bh (4907)	Indirect reference address setting (21)			
	132Ch (4908)	132Dh (4909)	Indirect reference address setting (22)			
	132Eh (4910)	132Fh (4911)	Indirect reference address setting (23)			
	1330h (4912)	1331h (4913)	Indirect reference address setting (24)			
	1332h (4914)	1333h (4915)	Indirect reference address setting (25)			

MEXE02 code	Register address		Name	Description	Setting range	Initial value
	Upper	Lower				
p10	1334h (4916)	1335h (4917)	Indirect reference address setting (26)	Sets the ID of the data to be stored in the indirect reference address.	0 to FFFFh (0 to 65,535)	0
	1336h (4918)	1337h (4919)	Indirect reference address setting (27)			
	1338h (4920)	1339h (4921)	Indirect reference address setting (28)			
	133Ah (4922)	133Bh (4923)	Indirect reference address setting (29)			
	133Ch (4924)	133Dh (4925)	Indirect reference address setting (30)			
	133Eh (4926)	133Fh (4927)	Indirect reference address setting (31)			

- **Register addresses of indirect reference areas**

Register address		Name
Upper	Lower	
1340h (4928)	1341h (4929)	Indirect reference area 0
1342h (4930)	1343h (4931)	Indirect reference area 1
1344h (4932)	1345h (4933)	Indirect reference area 2
1346h (4934)	1347h (4935)	Indirect reference area 3
1348h (4936)	1349h (4937)	Indirect reference area 4
134Ah (4938)	134Bh (4939)	Indirect reference area 5
134Ch (4940)	134Dh (4941)	Indirect reference area 6
134Eh (4942)	134Fh (4943)	Indirect reference area 7
1350h (4944)	1351h (4945)	Indirect reference area 8
1352h (4946)	1353h (4947)	Indirect reference area 9
1354h (4948)	1355h (4949)	Indirect reference area 10
1356h (4950)	1357h (4951)	Indirect reference area 11
1358h (4952)	1359h (4953)	Indirect reference area 12
135Ah (4954)	135Bh (4955)	Indirect reference area 13
135Ch (4956)	135Dh (4957)	Indirect reference area 14
135Eh (4958)	135Fh (4959)	Indirect reference area 15

Register address		Name
Upper	Lower	
1360h (4960)	1361h (4961)	Indirect reference area 16
1362h (4962)	1363h (4963)	Indirect reference area 17
1364h (4964)	1365h (4965)	Indirect reference area 18
1366h (4966)	1367h (4967)	Indirect reference area 19
1368h (4968)	1369h (4969)	Indirect reference area 20
136Ah (4970)	136Bh (4971)	Indirect reference area 21
136Ch (4972)	136Dh (4973)	Indirect reference area 22
136Eh (4974)	136Fh (4975)	Indirect reference area 23
1370h (4976)	1371h (4977)	Indirect reference area 24
1372h (4978)	1373h (4979)	Indirect reference area 25
1374h (4980)	1375h (4981)	Indirect reference area 26
1376h (4982)	1377h (4983)	Indirect reference area 27
1378h (4984)	1379h (4985)	Indirect reference area 28
137Ah (4986)	137Bh (4987)	Indirect reference area 29
137Ch (4988)	137Dh (4989)	Indirect reference area 30
137Eh (4990)	137Fh (4991)	Indirect reference area 31

■ Setting example

The following is an example of sending data to and receiving data from the address number 1 using indirect reference.

- **STEP 1: Registration in indirect reference addresses**

Setting data

Indirect reference address	Register address			Data to be sent	ID
	Upper	Lower			
Indirect reference address setting (0)	1300h	1301h	←	Position of operation data No. 1	C21h (Half the value of register address 1842h)
Indirect reference address setting (1)	1302h	1303h	←	Stopping deceleration of operation data No. 2	C44h (Half the value of register address 1888h)
Indirect reference address setting (2)	1304h	1305h	←	Speed of operation data No. 3	C62h (Half the value of register address 18C4h)

Send the following query and register the ID of the data to be sent in the indirect reference addresses.

Query

Field name		Data	Description
Server address		01h	Server address 1
Function code		10h	Writing to multiple holding registers
Data	Register address (Upper)	13h	Register address to start writing from =Indirect reference address setting (0) (1300h)
	Register address (Lower)	00h	
	Number of registers (Upper)	00h	Number of registers to be written from the starting register address=6 registers (0006h)
	Number of registers (Lower)	06h	
	Number of data bytes	0Ch	Twice the number of registers in the query=12 (0Ch)
	Write value of register address (Upper)	00h	Value written to register address 1300h =ID of operation data No. 1 position (C21h)
	Write value of register address (Lower)	00h	
	Write value of register address +1 (Upper)	0Ch	
	Write value of register address +1 (Lower)	21h	
	Write value of register address +2 (Upper)	00h	Value written to register addresses 1302h =ID of operation data No. 2 stopping deceleration (C44h).
	Write value of register address +2 (Lower)	00h	
	Write value of register address +3 (Upper)	0Ch	
	Write value of register address +3 (Lower)	44h	
	Write value of register address +4 (Upper)	00h	Value written to register address 1304h =ID of operation data No.3 speed (C62h)
	Write value of register address +4 (Lower)	00h	
	Write value of register address +5 (Upper)	0Ch	
	Write value of register address +5 (Lower)	62h	
Error check (Lower)		D7h	Calculation result of CRC-16
Error check (Upper)		A6h	

- **STEP 2: Writing to indirect reference areas**

Setting data

Indirect reference area	Register address			Data to be sent	Setting value
	Upper	Lower			
Indirect reference area 0	1340h	1341h	←	Position of operation data No. 1	1,500 (5DCh)
Indirect reference area 1	1342h	1343h	←	Stopping deceleration of operation data No. 2	770,000 (BBFD0h)
Indirect reference area 2	1344h	1345h	←	Speed of operation data No. 3	4,500 (1194h)

Send the following query to write the setting values of the data to be sent in indirect reference areas.

Query

Field name		Data	Description
Server address		01h	Server address 1
Function code		10h	Writing to multiple holding registers
Data	Register address (Upper)	13h	Register address to start writing from =Indirect reference area 0 (1340h)
	Register address (Lower)	40h	
	Number of registers (Upper)	00h	Number of registers to be written from the starting register address=6 registers (0006h)
	Number of registers (Lower)	06h	
	Number of data bytes	0Ch	Twice the number of registers in the query=12 (0Ch)
	Write value of register address (Upper)	00h	Value written to register address 1340h =Operation data No. 1 position 1,500 (5DCh)
	Write value of register address (Lower)	00h	
	Write value of register address +1 (Upper)	05h	
	Write value of register address +1 (Lower)	DCh	
	Write value of register address +2 (Upper)	00h	Value written to register address 1342h =Operation data No. 2 stopping deceleration 770,000 (BBFD0h)
	Write value of register address +2 (Lower)	0Bh	
	Write value of register address +3 (Upper)	BFh	
	Write value of register address +3 (Lower)	D0h	
	Write value of register address +4 (Upper)	00h	Value written to register address 1344h =Operation data No. 3 speed 4,500 (1194h)
	Write value of register address +4 (Lower)	00h	
	Write value of register address +5 (Upper)	11h	
	Write value of register address +5 (Lower)	94h	
Error check (Lower)		72h	Calculation result of CRC-16
Error check (Upper)		E5h	

- **STEP 3: Reading from indirect reference areas**

  Send the following query to read the data written to indirect reference areas.

Query

Field name		Data	Description
Server address		01h	Server address 1
Function code		03h	Reading from a holding register(s)
Data	Register address (Upper)	13h	Register address to start reading from =Indirect reference area 0 (1340h)
	Register address (Lower)	40h	
	Number of registers (Upper)	00h	Number of registers to be read from the starting register address (6 registers=0006h)
	Number of registers (Lower)	06h	
Error check (Lower)		C0h	Calculation result of CRC-16
Error check (Upper)		98h	

Response

Field name		Data	Description
Server address		01h	Same as query
Function code		03h	Same as query
Data	Number of data bytes	0Ch	Twice the number of registers in the query =12 (0Ch)
	Read value of register address (Upper)	00h	Value read from register address 1340h =1,500 (5DCh)
	Read value of register address (Lower)	00h	
	Read value of register address +1 (Upper)	05h	
	Read value of register address +1 (Lower)	DCh	
	Read value of register address +2 (Upper)	00h	Value read from register address 1342h =770,000 (BBFD0h)
	Read value of register address +2 (Lower)	0Bh	
	Read value of register address +3 (Upper)	BFh	
	Read value of register address +3 (Lower)	D0h	
	Read value of register address +4 (Upper)	00h	Value read from register address 1344h =4,500 (1194h)
	Read value of register address +4 (Lower)	00h	
	Read value of register address +5 (Upper)	11h	
	Read value of register address +5 (Lower)	94h	
Error check (Lower)		27h	Calculation result of CRC-16
Error check (Upper)		87h	

It was found that the data had been written normally using indirect reference.

6 Direct data operation

6-1 Overview of direct data operation

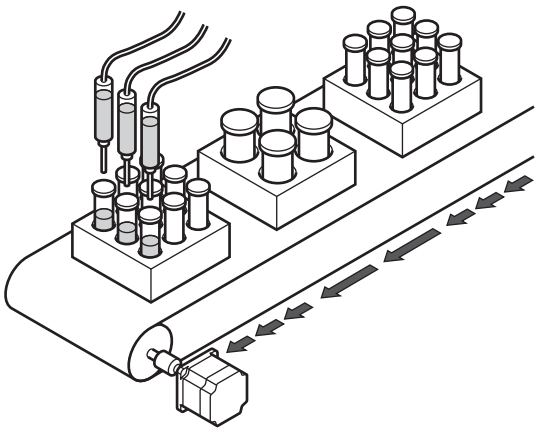
Direct data operation is a mode that allows the data to be rewritten and the operation to be started at the same time. It is suitable for frequently changing operation data such as position (travel amount) or speed, or for applications that require fine position adjustment.
There are the following eight types of triggers to rewrite the data and start the operation at the same time.

- One of the following items: Operation data number, Operation type, Position, Speed, Starting/changing rate, Stopping deceleration, and Operating current
- Rewrite of the above seven items at once

■ Application example of direct data operation

● Example 1

The position (travel amount) and/or the speed should be adjusted each time the load is changed because the feed rate is different for each load.



Setting example

- Position (travel amount): Change as desired
- Speed: Change as desired
- Trigger: All the items (setting value of trigger: 1)

Procedure

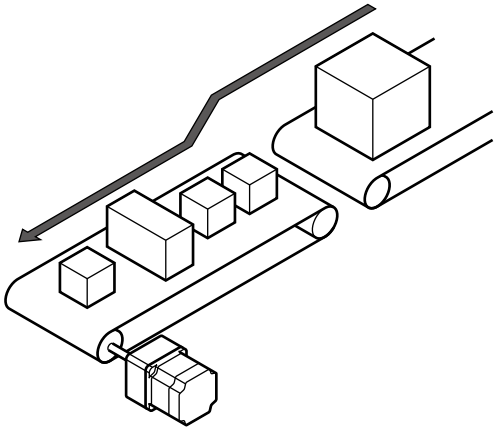
1. Write the data for the position and speed.
2. Write "1" to the trigger.

Result

When the trigger is written, the changed value is immediately updated and operation is performed with the new position and speed.

● Example 2

The speed should be changed immediately using the touch screen because a large load is inspected at a lower speed.



Setting example

- Speed: Change as desired
- Trigger: Speed (Setting value of trigger: –4)

Procedure

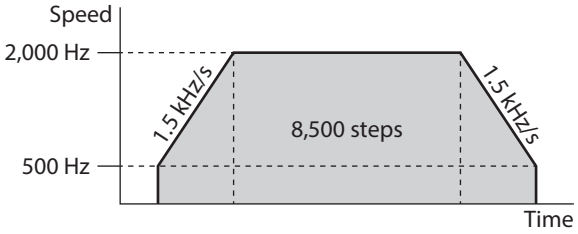
1. Write "–4" to the trigger.
2. Write the data of the speed.

Result

When the speed is written, the changed value is immediately updated and operation is performed at the new speed.

■ Comparison of operating methods

As an example, this section explains how to execute the following positioning operation with commonly used Modbus control and direct data operation.
The trigger for direct data operation is assumed to be rewritten collectively.



● Commonly used Modbus control

1. Send the following five queries to set the operation data.

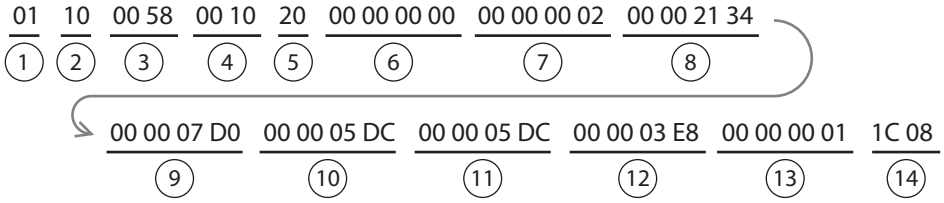
Communication data (Hex)	Description
01 10 18 00 00 02 04 00 00 00 02 D8 6E	Operation type of operation data No. 0=2: Incremental positioning (based on command position)
01 10 18 02 00 02 04 00 00 21 34 C1 F1	Position of operation data No. 0=8,500 steps
01 10 18 04 00 02 04 00 00 07 D0 5B F0	Speed of operation data No. 0=2,000 Hz
01 10 18 06 00 02 04 00 00 05 DC DB 4C	Starting/changing rate of operation data No. 0=1.5 kHz/s
01 10 18 08 00 02 04 00 00 05 DC 5A C0	Stopping deceleration of operation data No. 0=1.5 kHz/s

2. Send the following two queries to execute operation.

Communication data (Hex)	Description
01 10 00 7C 00 02 04 00 00 00 08 F5 18	The START input is turned ON (operation data No. 0 is started).
01 10 00 7C 00 02 04 00 00 00 00 F4 DE	The START input is turned OFF.

● Direct data operation

Send the operation data and the trigger with the following query. The operation is started at the same time as sending.



Number	Communication data (Hex)	Description
1	01	Address number=1
2	10	Function code=0010h
3	00 58	Write register lead address=0058h
4	00 10	Number of write registers=16 registers
5	20	Number of write data bytes=32 bytes
6	00 00 00 00	Operation data number=0
7	00 00 00 02	Operation type=2: Incremental positioning (based on command position)
8	00 00 21 34	Position=8,500 steps
9	00 00 07 D0	Speed=2,000 Hz
10	00 00 05 DC	Starting/changing rate=1.5 kHz/s
11	00 00 05 DC	Stopping deceleration=1.5 kHz/s
12	00 00 03 E8	Operating current = 100.0 %
13	00 00 00 01	Trigger=1: All data updated
14	1C 08	Error check

memo In direct data operation, the motor can be operated by sending a single query, unlike the commonly used Modbus control.

6-2 Command necessary for direct data operation

Related commands

Register address		Name	Description	Setting range	Initial value
Upper	Lower				
0058h (88)	0059h (89)	Direct data operation operation data number	Selects the operation data number.	0 to 255: Operation data number	0
005Ah (90)	005Bh (91)	Direct data operation operation type	Sets the operation type.	0: No setting 1: Absolute positioning 2: Incremental positioning (based on command position)	2
005Ch (92)	005Dh (93)	Direct data operation position	Sets the target position.	−2,147,483,648 to 2,147,483,647 steps	0
005Eh (94)	005Fh (95)	Direct data operation speed	Sets the operating speed.	−4,000,000 to 4,000,000 Hz	1,000
0060h (96)	0061h (97)	Direct data operation starting/changing rate	Sets the acceleration/deceleration rate or the acceleration/deceleration time when staring or changing the speed.	1 to 1,000,000,000 (1=0.001)*	30,000
0062h (98)	0063h (99)	Direct data operation stopping rate	Sets the deceleration rate or the deceleration time when stopping.		30,000
0064h (100)	0065h (101)	Direct data operation operating current	Sets the operating current based on the base current being 100 %.	0 to 1,000 (1=0.1 %)	1,000
0066h (102)	0067h (103)	Direct data operation trigger	Sets the trigger. (About TRIG ⇨ p.142)	−7: Operation data number −6: Operation type −5: Position −4: Speed −3: Starting/changing rate −2: Stopping deceleration −1: Operating current 0: Disable 1: All data updated	0
0068h (104)	0069h (105)	Direct data operation forwarding destination	Selects the stored area when the next direct data is transferred during direct data operation. (Forwarding destination ⇨ p.143)	0: Execution memory 1: Buffer memory	0

* The setting unit is followed the "Acceleration/deceleration unit" parameter.

■ Trigger

This is a trigger to rewrite the data and start the operation at the same time for direct data operation.

- **When the trigger setting is "0" or "1"**

  When "1" is written to the trigger, all data is written and direct data operation is started at the same time.
  When operation is started, the trigger automatically returns to "0."

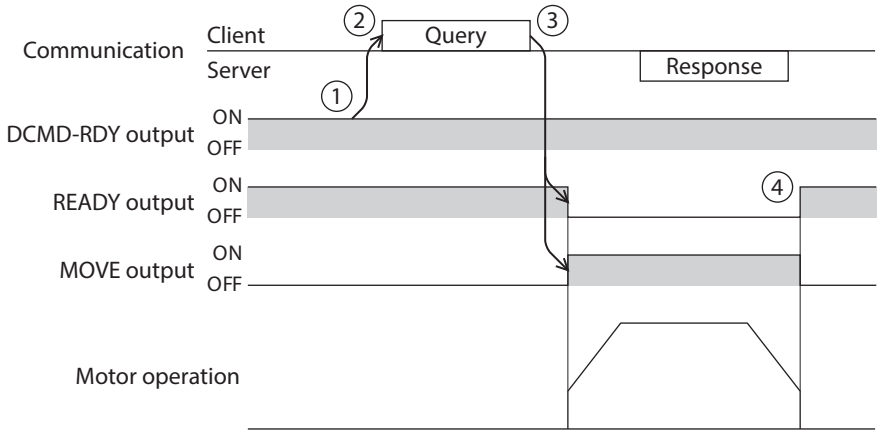
- **When the trigger setting is "–1 to –7"**

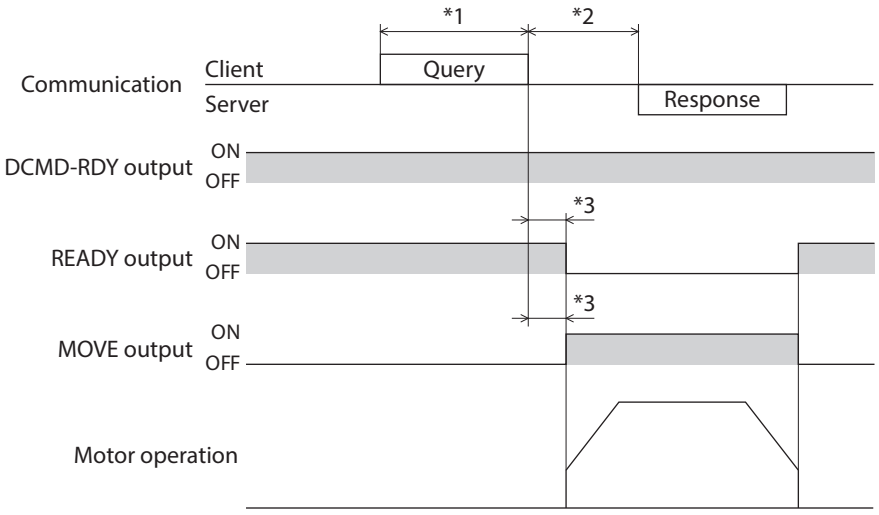
  Direct data operation is started when the data corresponding to the trigger is written. Even if operation is started, the setting value of the trigger is retained.

Setting value		Trigger
Dec	Hex	
–7	FFFF FFF9h	Operation data number
–6	FFFF FFFAh	Operation type
–5	FFFF FFFBh	Position
–4	FFFF FFFCh	Speed
–3	FFFF FFFDh	Starting/changing rate
–2	FFFF FFFEh	Stopping deceleration
–1	FFFF FFFFh	Operating current

- **Timing chart**

  1. Check that the DCMD-RDY output is being ON.
  2. Send a query (including the trigger and data) to perform direct data operation.
  3. When the client receives a query, the READY output is turned OFF, the MOVE output is turned ON, and operation is started.
  4. When the motor stops, the READY output is turned ON.





*1 Query via RS-485 communication
*2 C3.5 (silent interval) + Tb5 (query processing time (driver)) + Tb2 (transmission waiting time (driver side))
*3 C3.5 (silent interval) + 4 ms or less

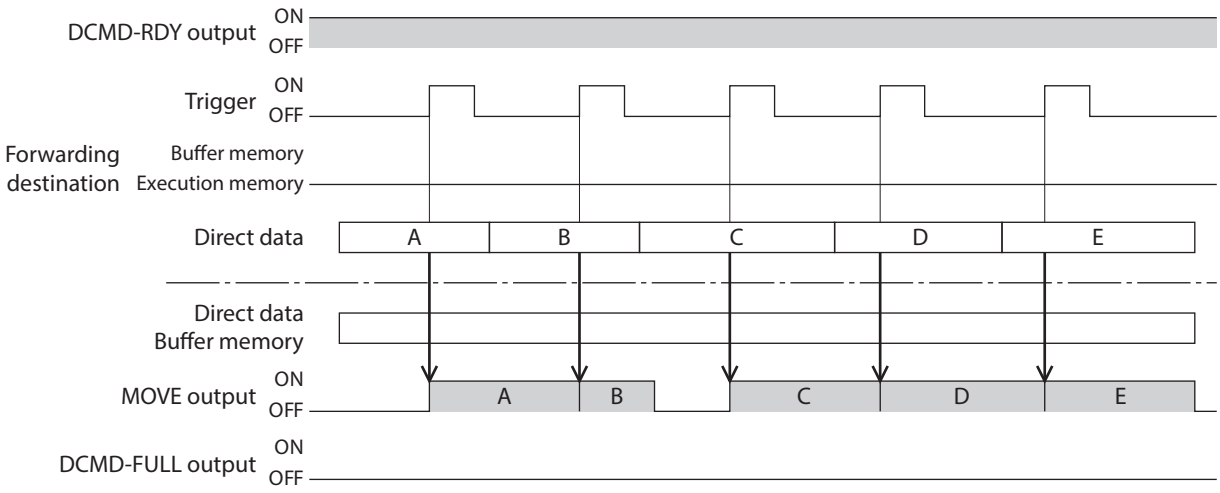
■ Forwarding destination

This is used to select the stored area when the next direct data is transferred during direct data operation.

Setting value		Linked method
Dec	Hex	
0	0000 0000h	Execution memory
1	0000 0001h	Buffer memory

● When the forwarding destination is set to "0: Execution memory"

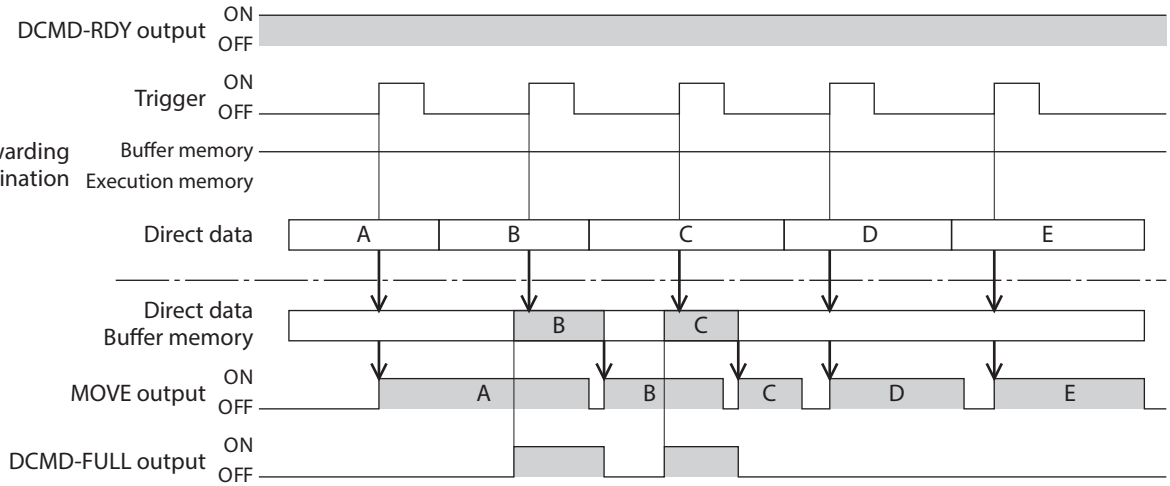
When the trigger is written, the data in operation can be rewritten to the next direct data.



Note If the trigger is written while the DCMD-FULL output is in an ON state, the direct data will not be applied to the operation.

- **When the forwarding destination is set to "1: Buffer memory"**

  When the trigger is written, the next direct data is stored in the buffer memory. When the data during operation is completed, operation of the buffer memory is automatically started. One set of direct data can be stored in the buffer memory.
  If the next direct data is written to the buffer memory, the DCMD-FULL output is turned ON.
  During stop or continuous operation, even if "1: Buffer memory" is specified, the data is not saved in the buffer memory and is immediately rewritten to the next direct data.



- **Related parameters**

MEXE02 code	Name	Description	Setting range	Initial value
p3	Direct data operation zero speed command action	Selects whether the motor will decelerate to a stop or change only the speed to 0 r/min in an operating status when "0" is written to the speed in direct data operation.	0: Deceleration stop command 1: Speed zero command*	0
	Direct data operation trigger initial value	Sets the initial value of the trigger.	–7: Operation data number update –6: Operation type update –5: Position update –4: Speed update –3: Starting/changing rate update –2: Stopping deceleration update –1: Operating current update 0: The trigger is used	0
	Direct data operation forwarding destination initial value	Sets the initial value of the forwarding destination.	0: Execution memory 1: Buffer memory	0
	Direct data operation operation parameter initial value reference data number	Sets the operation data number to be used as the initial value.	0 to 255	0

* Although the motor does not rotate because the speed is 0 r/min, the I/O signals are in an operating status.

7 Group send

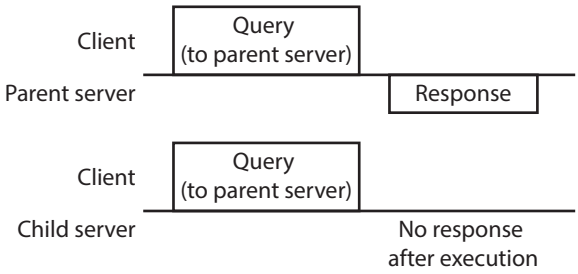
Multiple servers are made into a group and a query is sent to all servers in the group at once.

■ Group composition

A group consists of a parent server and child servers, and only the parent server returns a response.

■ Group address

To perform the group send, set a group address to the child servers to be included in the group. The child servers to which the group address has been set can receive a query sent to the parent server.
The parent server is not always required. A group can be composed by only child servers. In this case, set an unused address as an address of the group.
When a query is sent from the client to the address of the group, the child servers execute the processing.



However, no response is returned. In broadcast, all the servers execute the processing, however, the servers that execute the processing can be limited in this method.

■ Parent server

No special setting is required on the parent server to perform the group send. The address of the parent server becomes the group address. When a query is sent from the client to the parent server, the parent server executes the requested processing and returns a response. (Same as the unicast mode)

■ Child server

Servers to which the address of the parent server is set become the child servers.
When the child servers receive a query sent to the address of the group, they execute the processing. However, no response is returned.
The function code that can be executed in the group send is "Writing to multiple holding registers (10h)" only.

■ Setting of Group

Set the address of the parent server to the "Group ID" of the child servers. Change the group in the unicast mode. For reading and writing when setting the "Group ID," execute the upper and lower register addresses at the same time.

- **Related command**

Register address		Name	Description	Setting range	Initial value
Upper	Lower				
0030h (48)	0031h (49)	Group ID	Sets the address of a group (address number of parent server).	−1: Individual (group send is not performed) 1 to 31: The address (address of the parent server) of the group	−1

Note

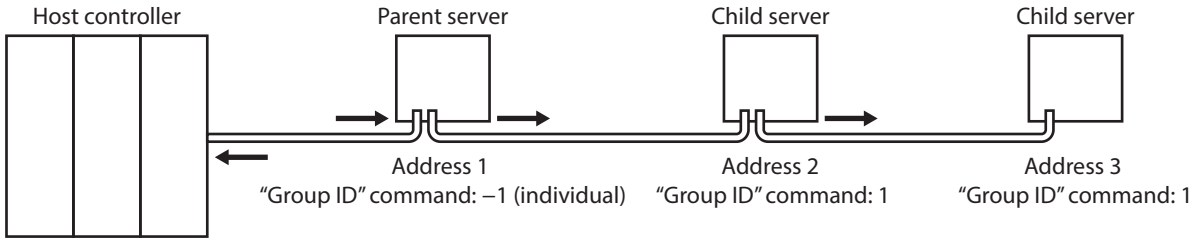
- Do not set "0" to the group ID.
- Change the group address in the unicast mode.
- The group setting is stored in RAM, so the initial value is returned when the main power supply of the driver is turned off.

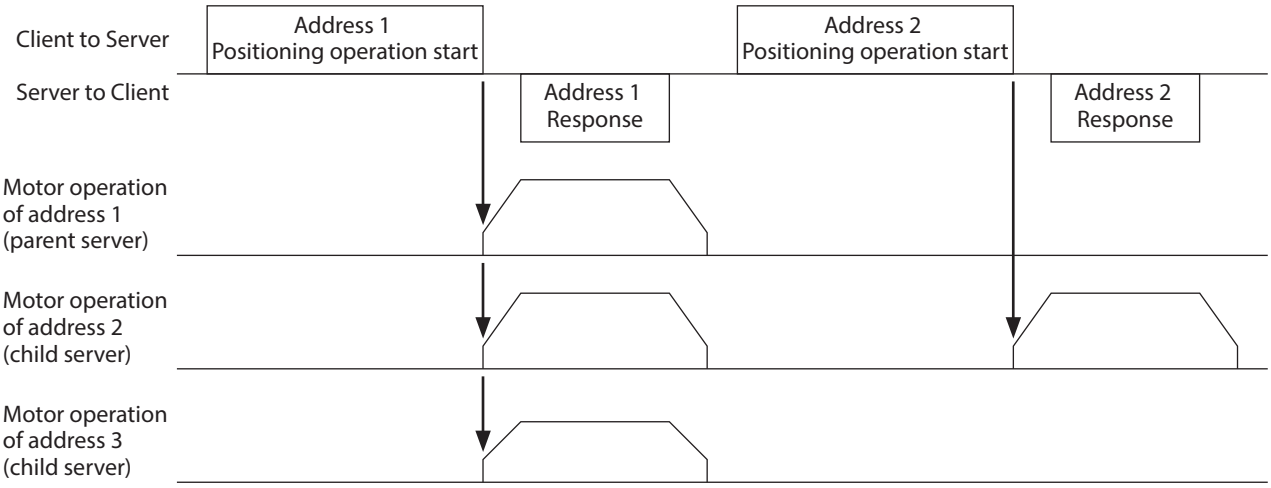
- **Related parameter**

The setting value of the "Group ID" command is stored in RAM. In this case, if the main power supply is turned off, the setting will be returned to the initial value and the group will be released. Therefore, it is necessary to set the group again each time the main power supply is turned on.
On the other hand, the "Initial group ID (Modbus)" parameter can be stored in non-volatile memory. If the address of a group is set in this parameter and stored in non-volatile memory, the group will not be released even if the main power supply is turned off. The group function can be used immediately when the main power supply is turned on.

MEXE02 code	Name	Description	Setting range	Initial value
p10	Initial group ID (Modbus)	Sets the address of a group (address number of parent server). It is stored even if the main power supply is turned off.	–1: Disable 1 to 31*	–1

* Do not use 0.





8 RS-485 communication monitor

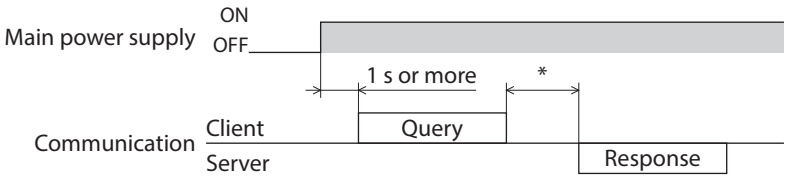
This chapter indicates items that can be monitored via RS-485 communication. They can also be checked using the "RS-485 communication monitor" of the**MEXE02** software.

Register address		Name	Description
Upper	Lower		
00ACh (172)	00ADh (173)	Present communication error	Indicates the communication error code received last time.
0150h (336)	0151h (337)	RS-485 reception frame counter	Indicates the number of frames received.*1
0154h (340)	0155h (341)	RS-485 reception byte counter	Indicates the number of bytes received.
0156h (342)	0157h (343)	RS-485 transmission byte counter	Indicates the number of bytes transmitted.
0158h (344)	0159h (345)	RS-485 communication normal reception frame counter (All)	Indicates the number of normal frames received.
015Ah (346)	015Bh (347)	RS-485 communication normal reception frame counter (Only own address)	Indicates the number of normal frames received to own address.
015Ch (348)	015Dh (349)	RS-485 abnormal reception frame counter (All)	Indicates the number of abnormal frames received.*2
015Eh (350)	015Fh (351)	RS-485 transmission frame counter	Indicates the number of frames transmitted.
0160h (352)	0161h (353)	RS-485 register write abnormal counter	Indicates the number of times the server error (exception code 04h) occurred.

*1 The target to count the number of frames received can be selected using the "(RS-485) Receive packet monitor" parameter.
*2 An abnormal frame is determined when the RS-485 communication error (error code 84h) occurred.

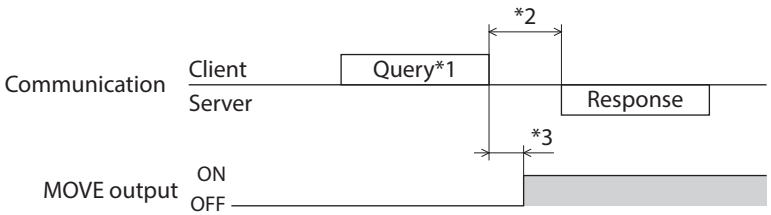
9 Timing chart

9-1 Communication start



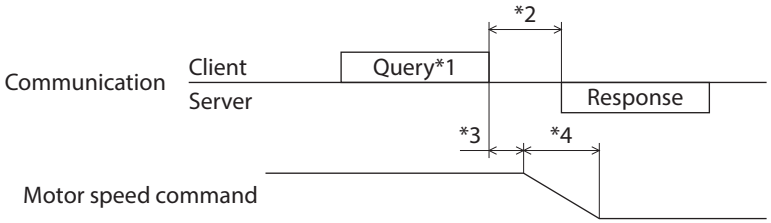
* C3.5 (silent interval) + Tb5 (query processing time (driver)) + Tb2 (transmission waiting time (driver side))

9-2 Operation start



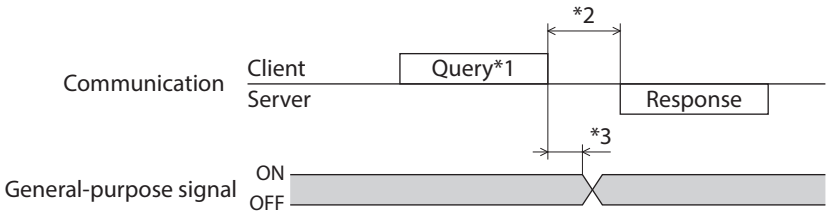
*1 A message including a query to start operation via RS-485 communication
*2 C3.5 (silent interval) + Tb5 (query processing time (driver)) + Tb2 (transmission waiting time (driver side))
*3 C3.5 (silent interval) + 2 ms or less

9-3 Operation stop, speed change



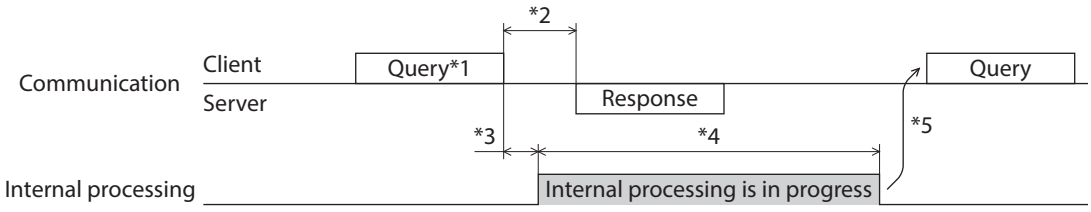
*1 A message including a query to stop operation and another to change the speed via RS-485 communication
*2 C3.5 (silent interval) + Tb5 (query processing time (driver)) + Tb2 (transmission waiting time (driver side))
*3 It varies depending on the operating condition.
*4 It varies depending on the setting of the "STOP input action" parameter.

9-4 General-purpose signal



*1 A message including a query for remote output via RS-485 communication
*2 C3.5 (silent interval) + Tb5 (query processing time (driver)) + Tb2 (transmission waiting time (driver side))
*3 C3.5 (silent interval) + 2 ms or less

9-5 Configuration



*1 A message including a query for configuration via RS-485 communication
*2 C3.5 (silent interval) + Tb5 (query processing time (driver)) + Tb2 (transmission waiting time (driver side))
*3 C3.5 (silent interval) + 2 ms or less
*4 1 s or less
*5 Do not execute writing while configuration is executed.

10 Detection of communication errors

There are three types of functions to detect an error that occurs in RS-485 communication: communication error, alarm, and information.

10-1 Communication errors

If the error code 84h of the communication error is generated, the C-DAT/C-ERR LED will be lit in red.
For communication errors other than 84h, the LED will not be lit or blink.
The communication error can be checked using the "Communication error history" command via RS-485 communication or using the **MEXE02** software.

Note The communication error history is cleared when the main power supply of the driver is turned off because it is stored in RAM.

■ Communication error list

Type of communication error	Error code	Cause
RS-485 communication error	84h	A transmission error was detected. (Reference ⇨ p.116)
Command not yet defined	88h	An exception response (exception code 01h, 02h) was detected. (Reference ⇨ p.117)
Execution disable due to user I/F communication in progress	89h	An exception response (exception code 04h) was detected. (Reference ⇨ p.117)
Execution disable due to non-volatile memory processing in progress	8Ah	
Out of setting range	8Ch	An exception response (exception code 03h, 04h) was detected. (Reference ⇨ p.117)
Command execute disable	8Dh	An exception response (exception code 04h) was detected. (Reference ⇨ p.117)

10-2 Alarms related to RS-485 communication

If an alarm related to RS-485 communication is generated, the ALM-A output is turned ON and the ALM-B output is turned OFF to stop the motor.
The PWR/ALM LED on the driver will blink in red.

■ Alarm list related to RS-485 communication

Alarm code	Alarm type	Cause
84h	RS-485 communication error	The RS-485 communication error occurred successively by the number of times set in the "Communication error alarm (Modbus)" parameter.
85h	RS-485 communication timeout	The time set in the "Communication timeout (Modbus)" parameter has elapsed and communication with the host controller has still not been established.

Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p10	Communication timeout (Modbus)	Sets the condition under which a communication timeout is generated.	0: Not monitored 1 to 10,000 ms	0
	Communication error alarm (Modbus)	If the RS-485 communication error occurs for the set number of times, an alarm of RS-485 communication error is generated.	0: Disable 1 to 10 times	3

10-3 Information related to RS-485 communication

If the RS-485 communication error (error code 84h) is detected, information of RS-485 communication error is generated.
The motor continues to operate during information unlike in the case of an alarm. And the PWR/ALM LED blinks twice in red and green at the same time. (Red and green colors may overlap and may be visible as orange.)
The information will be cleared automatically if RS-485 communication is performed in a normal condition.

■ Information list related to RS-485 communication

Information item	Information bit output signal	Cause	Condition to clear
RS-485 communication error	INFO-NET-E	An RS-485 communication error was detected.	RS-485 communication was performed properly.

6 Register address list

This part describes lists of register addresses used in Modbus communication.

◆Table of contents

1 Timing of the update of parameters

All data used by the driver is 32 bits wide. With the Modbus protocol, since the register is 16 bits wide, two registers represent one data.

Parameters are stored in RAM or non-volatile memory. The parameters stored in RAM are erased when the main power supply is shut off, but the parameters stored in non-volatile memory are retained even if the main power supply is shut off.
When the main power supply of the driver is turned on, the parameters stored in non-volatile memory are sent to RAM, and recalculation and setup for the parameters are performed in RAM.

When parameters are set via RS-485 communication, they are stored in RAM. To save the parameters stored in RAM to non-volatile memory, execute "Write batch NV memory" of the maintenance command.
Parameters set with the **MEXE02** software are stored in non-volatile memory when "Data writing" is performed.

When a parameter is changed, the timing for updating the new value varies depending on the parameter. Refer to "Notation rules" for details about the update timing.

memo

- Parameters set via RS-485 communication are stored in RAM. When changing a parameter that requires the main power supply to be turned on again to update the data, be sure to save it to non-volatile memory before turning off the main power supply.
- Non-volatile memory can be rewritten approximately 100,000 times.

■ Notation rules

● Timing of the update

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

Notation	Update timing
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 main power supply is turned on again.
D	Recalculation and setup are executed after the main power supply is turned on again.

● READ and WRITE

In this manual, READ and WRITE may be represented as follows.

Notation	Description
R	READ
W	WRITE
R/W	READ/WRITE

2 I/O commands

These are commands related to I/O (input and output). The set value is stored in RAM.

Register address		Name	Description	Setting range	Initial value	R/W
Upper	Lower					
0072h (114)	0073h (115)	NET selection number	Selects the operation data number. Operation data can be sent at the same time as "Driver input command (2nd)."	−1: Disable 0 to 255: Operation data number*	−1	R/W
0074h (116)	0075h (117)	Driver input command (2nd)	The same input command as "Driver input command (reference)" is automatically set.	–	0	R/W
0076h (118)	0077h (119)	NET selection number	Selects the operation data number. Operation data can be sent at the same time as "Driver input command (automatic OFF)."	−1: Disable 0 to 255: Operation data number*	−1	R/W
0078h (120)	0079h (121)	Driver input command (automatic OFF)	The same input command as "Driver input command (reference)" is automatically set. If the input signal is turned ON with this command, it is automatically turned OFF after 250 µs.	–	0	R/W
007Ah (122)	007Bh (123)	NET selection number	Selects the operation data number. Operation data can be sent at the same time as "Driver input command (reference)."	−1: Disable 0 to 255: Operation data number*	−1	R/W
007Ch (124)	007Dh (125)	Driver input command (reference)	Sets the input command to the driver. (Details of bits arrangement ⇨ Next section)	–	0	R/W
007Eh (126)	007Fh (127)	Driver output status	Reads the output status of the driver. (Details of bits arrangement ⇨p.156)	–	–	R

* When a value other than 0 to 255 is set, the NET selection number is disabled and the selection by the M0 to M7 inputs is enabled.

■ Driver input command

These are the driver input signals that can be accessed via Modbus communication. They can also be accessed in units of one register (16 bits).

● Upper

Register address	Description							
007Ch (124)	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
	–	–	–	–	–	–	–	–

● Lower

Values in brackets [ ] are initial values. They can be changed using the parameter.
(Parameters ⇨p.186, assignment of input signals ⇨p.91)

Register address	Description							
007Dh (125)	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	R-IN15 [RV-POS]	R-IN14 [FW-POS]	R-IN13 [RV-JOG-P]	R-IN12 [FW-JOG-P]	R-IN11 [SSTART]	R-IN10 [Not used]	R-IN9 [Not used]	R-IN8 [FCLOOP-DIS]
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	R-IN7 [ALM-RST]	R-IN6 [AWO]	R-IN5 [STOP]	R-IN4 [HOME]	R-IN3 [START]	R-IN2 [M2]	R-IN1 [M1]	R-IN0 [M0]

■ Driver output status

These are the driver output signals that can be accessed via Modbus communication. They can also be accessed in units of one register (16 bits).

- **Upper**

Register address	Description							
007Eh (126)	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
	–	–	–	–	–	–	–	–

- **Lower**

Values in brackets [ ] are initial values. They can be changed using the parameter.
(Parameters ⇨p.186, assignment of output signals ⇨p.91)

Register address	Description							
007Fh (127)	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	R-OUT15 [FCLOOP-MON]	R-OUT14 [ENC-IN-POS]	R-OUT13 [MOVE]	R-OUT12 [TIM]	R-OUT11 [AREA2]	R-OUT10 [AREA1]	R-OUT9 [AREA0]	R-OUT8 [SYS-BSY]
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	R-OUT7 [ALM-A]	R-OUT6 [INFO]	R-OUT5 [READY]	R-OUT4 [HOME-END]	R-OUT3 [START_R]	R-OUT2 [M2_R]	R-OUT1 [M1_R]	R-OUT0 [M0_R]

3 Group command

This is a command related to group send. The set value is stored in RAM.

Register address		Name	Description	Setting range	Initial value	R/W
Upper	Lower					
0030h (48)	0031h (49)	Group ID	Sets the address of a group (address number of parent server).*1	−1: Individual (group send is not performed) 1 to 31: The address of the group (address number of the parent server)	−1*2	R/W

*1 Do not set "0" to the group ID.
*2 The initial value can be changed using the "Initial group ID (Modbus)" parameter.

4 Protect release command

The key code to release the function limitation by the HMI input is set.

Register address		Name	Description	Initial value	R/W
Upper	Lower				
0044h (68)	0045h (69)	HMI release key	Inputs the key code to release the limitation by the HMI input. **[Key code]** 33890312h (864617234)	0	R/W

5 Direct data operation commands

These are commands used when direct data operation is performed. The set value is stored in RAM.
All commands are READ/WRITE.

Register address		Name	Description	Setting range	Initial value
Upper	Lower				
0058h (88)	0059h (89)	Direct data operation operation data number	Selects the operation data number.	0 to 255: Operation data number	0
005Ah (90)	005Bh (91)	Direct data operation operation type	Sets the operation type.	0: No setting 1: Absolute positioning 2: Incremental positioning (based on command position)	2
005Ch (92)	005Dh (93)	Direct data operation position	Sets the target position.	–2,147,483,648 to 2,147,483,647 steps	0
005Eh (94)	005Fh (95)	Direct data operation speed	Sets the operating speed.	–4,000,000 to 4,000,000 Hz	1,000
0060h (96)	0061h (97)	Direct data operation starting/changing rate	Sets the acceleration/deceleration rate or the acceleration/deceleration time when staring or changing the speed.	1 to 1,000,000,000 (1=0.001)*	30,000
0062h (98)	0063h (99)	Direct data operation stopping rate	Sets the deceleration rate or the deceleration time when stopping.		30,000
0064h (100)	0065h (101)	Direct data operation operating current	Sets the operating current based on the base current being 100 %.	0 to 1,000 (1=0.1 %)	1,000
0066h (102)	0067h (103)	Direct data operation trigger	Sets the trigger.	–7: Operation data number –6: Operation type –5: Position –4: Speed –3: Starting/changing rate –2: Stopping deceleration –1: Operating current 0: Disable 1: All data updated	0
0068h (104)	0069h (105)	Direct data operation forwarding destination	Selects the stored area when the next direct data is transferred during direct data operation.	0: Execution memory 1: Buffer memory	0

* The setting unit is followed the "Acceleration/deceleration unit" parameter.

6 Maintenance commands

Maintenance commands are used to execute the alarm reset, clear latch information, batch processing of non-volatile memory, and the like. All commands are WRITE.

Note The maintenance commands include processing in which the memory is operated, such as batch processing of non-volatile memory. Make sure not to successively execute them unnecessarily.

Register address		Name	Description
Upper	Lower		
0180h (384)	0181h (385)	Alarm reset	Resets the alarm being generated presently. Some alarms cannot be reset.
0184h (388)	0185h (389)	Clear alarm history	Clears the alarm history.
0188h (392)	0189h (393)	Clear communication error history	Clears the communication error history.
018Ah (394)	018Bh (395)	P-PRESET execution	Presets the command position and the feedback position to zero.
018Ch (396)	018Dh (397)	Configuration	Executes recalculation and setup of the parameter. (About configuration ⇨p.161)
018Eh (398)	018Fh (399)	Batch data initialization (excluding communication parameters)	Restores the parameters stored in non-volatile memory to their initial values. (Excluding parameters related to communication setting)
0190h (400)	0191h (401)	Read batch NV memory	Reads the parameters stored in non-volatile memory to RAM. All operation data and parameters stored in RAM are overwritten.
0192h (402)	0193h (403)	Write batch NV memory	Writes the parameters stored in RAM to non-volatile memory. Non-volatile memory can be rewritten approximately 100,000 times.
0194h (404)	0195h (405)	All data batch initialization (including communication parameters)	Restores all parameters stored in non-volatile memory to their initial values.
019Ah (410)	019Bh (411)	Clear latch information	Clears the latch state to overwrite the operation information.
019Ch (412)	019Dh (413)	Clear sequence history	Clears the sequence history.
019Eh (414)	019Fh (415)	Clear tripmeter	Clears the tripmeter.
01A6h (422)	01A7h (423)	Clear information	Clears the information.
01A8h (424)	01A9h (425)	Clear information history	Clears the information history.
01AAh (426)	01ABh (427)	Alarm history details	When writing the number of history (1 to 10) to this command and executing the "Alarm history details" of the monitor command, the detailed items of the specified alarm history can be checked.

■ Configuration

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

- No alarm is present.
- The motor is not operated.
- The following monitors or menus are not executed with the **MEXE02** software.
  - Teaching, remote operation
  - I/O test
  - Data writing

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

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

memo Even if monitor is performed while Configuration is in progress, the correct monitor value may not be returned.

6-1 How to execute the maintenance commands

There are two types of execution methods. Use them selectively according to their 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 will not be executed successively even if 1 is continuously written from the client.

- **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 be restored to 1 and can be written successively.
  If commands that take time to write to non-volatile memory, such as the "Write batch NV memory" command, are executed successively, increase the length of the intervals between commands.

- **"Alarm history details" command**

  Write the number of the "alarm history" (1 to 10) of the monitor command to this command.

7 Monitor commands

Monitor commands are used to monitor the command position, the command speed, the alarm and information history, etc. All commands are READ.

Register address		Name	Description
Upper	Lower		
0080h (128)	0081h (129)	Present alarm	Indicates the alarm code presently being generated.
0082h (130)	0083h (131)	Alarm history 1	Indicates the most recent alarm history. When an alarm is being generated, its code is also displayed on the alarm history 1 simultaneously.
0084h (132)	0085h (133)	Alarm history 2	Indicates the alarm history.
0086h (134)	0087h (135)	Alarm history 3	
0088h (136)	0089h (137)	Alarm history 4	
008Ah (138)	008Bh (139)	Alarm history 5	
008Ch (140)	008Dh (141)	Alarm history 6	
008Eh (142)	008Fh (143)	Alarm history 7	
0090h (144)	0091h (145)	Alarm history 8	
0092h (146)	0093h (147)	Alarm history 9	
0094h (148)	0095h (149)	Alarm history 10	Indicates the oldest alarm history.
00ACh (172)	00ADh (173)	Present communication error	Indicates the communication error code received last time.
00AEh (174)	00AFh (175)	Communication error history 1	Indicates the most recent communication error code history. When a communication error is present, the code is also displayed in the communication error history 1 at the same time.
00B0h (176)	00B1h (177)	Communication error history 2	Indicates the communication error code history.
00B2h (178)	00B3h (179)	Communication error history 3	
00B4h (180)	00B5h (181)	Communication error history 4	
00B6h (182)	00B7h (183)	Communication error history 5	
00B8h (184)	00B9h (185)	Communication error history 6	
00BAh (186)	00BBh (187)	Communication error history 7	
00BCh (188)	00BDh (189)	Communication error history 8	
00BEh (190)	00BFh (191)	Communication error history 9	
00C0h (192)	00C1h (193)	Communication error history 10	Indicates the oldest communication error code history.

Register address		Name	Description
Upper	Lower		
00C2h (194)	00C3h (195)	Present selected data number	Indicates the operation data number presently selected. Priority is applied in the following order: NET selection number, M0 to M7 inputs.
00C4h (196)	00C5h (197)	Present operation data number	Indicates the operation data number presently being operated in positioning SD operation or continuous macro operation In operation without using operation data, –1 is displayed. –1 is displayed also during stop.
00C6h (198)	00C7h (199)	Command position (step)	Indicates the present command position. (step)
00C8h (200)	00C9h (201)	Command speed (r/min)	Indicates the present command speed. (r/min)
00CAh (202)	00CBh (203)	Command speed (Hz)	Indicates the present command speed. (Hz)
0CC0h (3264)	0CC1h (3265)	Command position (cnt)	Indicates the present command position. (cnt) (p11) It is displayed based on the value set in the Encoder settings parameter.
0CC2h (3266)	0CC3h (3267)	Feedback position (cnt)	Indicates the present feedback position. (cnt) (p11) It is displayed based on the value set in the Encoder settings parameter.
0CC4h (3268)	0CC5h (3269)	Position deviation (cnt)	Indicates the present position deviation. (cnt) The difference between the command position (cnt) and the feedback position (cnt) is displayed.
0CC8h (3272)	0CC9h (3273)	Feedback position (step)	Indicates the present feedback position. (step) Based on the motor resolution, a value obtained by converting the feedback position (cnt) by the encoders input to "step(s)" is displayed.
0CCAh (3274)	0CCBh (3275)	Position deviation (step)	Indicates the present position deviation. (step) The difference between the command position (step) and the feedback position (step) is displayed.
0CD0h (3280)	0CD1h (3281)	Position deviation (nm)	Indicates the present position deviation. (nm) Based on the setting value in the (p11) Encoder settings parameter, a value obtained by converting the difference between the command position (cnt) and the feedback position (cnt) to "nm" is displayed. If the "Encoder type" parameter is set to "1: Rotary," 0 is displayed.
0CD6h (3286)	0CD7h (3287)	Position deviation (mdeg)	Indicates the present position deviation. (mdeg) Based on the setting value in the (p11) Encoder settings parameter, a value obtained by converting the difference between the command position (cnt) and the feedback position (cnt) to "mdeg" is displayed. If the "Encoder type" parameter is set to "0: Linear," 0 is displayed.
00D2h (210)	00D3h (211)	Remaining dwell time	Indicates the remaining time in the drive-complete delay time. (ms)
00D4h (212)	00D5h (213)	Direct I/O	Indicates the status of direct I/O. (Arrangement of bits ⇨p.168)
00DEh (222)	00DFh (223)	Target position	Indicates the target command position in absolute coordinates for the operations shown below. – Positioning SD operation, inching operation, return-to-home operation (during offset movement) Indicates the operation starting position for the operations shown below. – Continuous macro operation, JOG macro operation other than inching operation, return-to-home operation (when sensors are used)

Register address		Name	Description
Upper	Lower		
00E0h (224)	00E1h (225)	Next number	Indicates the operation data number specified in "Next data number" of the operation data in operation. The value is latched even after the operation is completed. When "Link" is set to "0: No Link" or "Next data number" is set to "–256: Stop," –1 is displayed.
00E2h (226)	00E3h (227)	Loop origin number	Indicates the operation data number that is the starting point of the loop in loop operation (extended loop operation). When the loop is not being executed or is stopped, –1 is displayed.
00E4h (228)	00E5h (229)	Loop count	Indicates the present number of loop times in loop operation (extended loop operation). When operation other than the loop is being executed or the loop is stopped, 0 is displayed.
00F2h (242)	00F3h (243)	Event monitor command position (STOP)	Latches the command position when operation is stopped by the operation stop input. The value is overwritten if the same event is generated while latching. When the latch is cleared, 0 is displayed.
00F6h (246)	00F7h (247)	Present information	Indicates the information code presently being generated. Refer to the OPERATING MANUAL for details on information codes.
00F8h (248)	00F9h (249)	Driver temperature	Indicates the present driver temperature. (1=0.1 °C)
00FCh (252)	00FDh (253)	Odometer	Indicates the cumulative amount of rotation of the motor output shaft stored in the driver. This cannot be cleared on the customer side. (1=0.1 kRev)
00FEh (254)	00FFh (255)	Tripmeter	Indicates the total amount of rotation of the motor output shaft stored in the driver. This can be cleared on the customer side. (1=0.1 kRev)
0100h (256)	0101h (257)	Sequence history 1	Indicates the history of the operation data numbers that have been executed so far. –1 is always displayed when stopped. During operation, the value same as the "Present operation data number" is also displayed in the sequence history 1.
0102h (258)	0103h (259)	Sequence history 2	Indicates the history of the operation data numbers that have been executed so far. –1 is always displayed when stopped.
0104h (260)	0105h (261)	Sequence history 3	
0106h (262)	0107h (263)	Sequence history 4	
0108h (264)	0109h (265)	Sequence history 5	
010Ah (266)	010Bh (267)	Sequence history 6	
010Ch (268)	010Dh (269)	Sequence history 7	
010Eh (270)	010Fh (271)	Sequence history 8	
0110h (272)	0111h (273)	Sequence history 9	
0112h (274)	0113h (275)	Sequence history 10	
0114h (276)	0115h (277)	Sequence history 11	
0116h (278)	0117h (279)	Sequence history 12	

Register address		Name	Description
Upper	Lower		
0118h (280)	0119h (281)	Sequence history 13	Indicates the history of the operation data numbers that have been executed so far. –1 is always displayed when stopped.
011Ah (282)	011Bh (283)	Sequence history 14	
011Ch (284)	011Dh (285)	Sequence history 15	
011Eh (286)	011Fh (287)	Sequence history 16	
0126h (294)	0127h (295)	Loop count buffer	Indicates the present number of loop times in loop operation (extended loop operation). The value is kept until the operation start signal is turned ON.
0140h (320)	0141h (321)	Main power supply count	Indicates the number of times when the main power supply has been turned on.
0142h (322)	0143h (323)	Main power supply time	Indicates the total time in minutes that the main power supply has been on.
0146h (326)	0147h (327)	Inverter voltage	Indicates the inverter voltage of the driver. (1=0.1 V)
0148h (328)	0149h (329)	Main power supply voltage	Indicates the main power supply voltage of the driver. (1=0.1 V)
014Ch (332)	014Dh (333)	ROT SW	Indicates the input status of the address number setting switch (SW1).
0150h (336)	0151h (337)	RS-485 reception frame counter	Indicates the number of frames received. The target to count the number of frames received can be selected using the "(RS-485) Receive packet monitor" parameter.
0152h (338)	0153h (339)	Elapsed time from BOOT	Indicates the time that has elapsed since the main power supply was turned on.
0154h (340)	0155h (341)	RS-485 reception byte counter	Indicates the number of bytes received.
0156h (342)	0157h (343)	RS-485 transmission byte counter	Indicates the number of bytes transmitted.
0158h (344)	0159h (345)	RS-485 communication normal reception frame counter (All)	Indicates the number of normal frames received.
015Ah (346)	015Bh (347)	RS-485 communication normal reception frame counter (Only own address)	Indicates the number of normal frames received to own address.
015Ch (348)	015Dh (349)	RS-485 abnormal reception frame counter (All)	Indicates the number of abnormal frames received.
015Eh (350)	015Fh (351)	RS-485 transmission frame counter	Indicates the number of frames transmitted.
0160h (352)	0161h (353)	RS-485 register write abnormal counter	Indicates the number of times the server error (exception code 04h) occurred.
0170h (368)	0171h (369)	I/O status 1	Indicates the ON-OFF status of the internal I/O. (Arrangement of bits ⇨ p.168)
0172h (370)	0173h (371)	I/O status 2	
0174h (372)	0175h (373)	I/O status 3	
0176h (374)	0177h (375)	I/O status 4	
0178h (376)	0179h (377)	I/O status 5	
017Ah (378)	017Bh (379)	I/O status 6	

Register address		Name	Description
Upper	Lower		
017Ch (380)	017Dh (381)	I/O status 7	Indicates the ON-OFF status of the internal I/O. (Arrangement of bits ⇨ p.168)
017Eh (382)	017Fh (383)	I/O status 8	
0A00h (2560)	0A01h (2561)	Alarm history details (Alarm code)	Indicates the description of the alarm history specified by the "Alarm history details" of the maintenance command.
0A02h (2562)	0A03h (2563)	Alarm history details (Sub code)	
0A04h (2564)	0A05h (2565)	Alarm history details (Driver temperature)	
0A08h (2568)	0A09h (2569)	Alarm history details (Inverter voltage)	
0A0Ah (2570)	0A0Bh (2571)	Alarm history details (Physical I/O input)	
0A0Ch (2572)	0A0Dh (2573)	Alarm history details (R-I/O output)	
0A0Eh (2574)	0A0Fh (2575)	Alarm history details (Operation information 0)	
0A10h (2576)	0A11h (2577)	Alarm history details (Operation information 1)	
0A12h (2578)	0A13h (2579)	Alarm history details (Command position)	
0A14h (2580)	0A15h (2581)	Alarm history details (Elapsed time from Boot)	
0A16h (2582)	0A17h (2583)	Alarm history details (Elapsed time from starting operation)	
0A18h (2584)	0A19h (2585)	Alarm history details (Main power supply time)	
0A20h (2592)	0A21h (2593)	Information history 1	Indicates the most recent information history. When information is being generated, its code is also displayed on the information history 1 simultaneously.
0A22h (2594)	0A23h (2595)	Information history 2	Indicates the information history.
0A24h (2596)	0A25h (2597)	Information history 3	
0A26h (2598)	0A27h (2599)	Information history 4	
0A28h (2600)	0A29h (2601)	Information history 5	
0A2Ah (2602)	0A2Bh (2603)	Information history 6	
0A2Ch (2604)	0A2Dh (2605)	Information history 7	
0A2Eh (2606)	0A2Fh (2607)	Information history 8	
0A30h (2608)	0A31h (2609)	Information history 9	
0A32h (2610)	0A33h (2611)	Information history 10	
0A34h (2612)	0A35h (2613)	Information history 11	
0A36h (2614)	0A37h (2615)	Information history 12	

Register address		Name	Description
Upper	Lower		
0A38h (2616)	0A39h (2617)	Information history 13	Indicates the information history.
0A3Ah (2618)	0A3Bh (2619)	Information history 14	
0A3Ch (2620)	0A3Dh (2621)	Information history 15	
0A3Eh (2622)	0A3Fh (2623)	Information history 16	Indicates the oldest information history.
0A40h (2624)	0A41h (2625)	Information time history 1	Indicates the history of the time when the most recent information was generated. When information is being generated, the time when the present information was generated is displayed.
0A42h (2626)	0A43h (2627)	Information time history 2	Indicates the history of the time when information was generated.
0A44h (2628)	0A45h (2629)	Information time history 3	
0A46h (2630)	0A47h (2631)	Information time history 4	
0A48h (2632)	0A49h (2633)	Information time history 5	
0A4Ah (2634)	0A4Bh (2635)	Information time history 6	
0A4Ch (2636)	0A4Dh (2637)	Information time history 7	
0A4Eh (2638)	0A4Fh (2639)	Information time history 8	
0A50h (2640)	0A51h (2641)	Information time history 9	
0A52h (2642)	0A53h (2643)	Information time history 10	
0A54h (2644)	0A55h (2645)	Information time history 11	
0A56h (2646)	0A57h (2647)	Information time history 12	
0A58h (2648)	0A59h (2649)	Information time history 13	
0A5Ah (2650)	0A5Bh (2651)	Information time history 14	
0A5Ch (2652)	0A5Dh (2653)	Information time history 15	
0A5Eh (2654)	0A5Fh (2655)	Information time history 16	Indicates the history of the time when the oldest information was generated.
0BB0h (2992)	0BB1h (2993)	Latch monitor status (STOP)	Latches the first information in which an event in parentheses ( ) is generated. The information is maintained until the latch is cleared.
0BB2h (2994)	0BB3h (2995)	Latch monitor command position (STOP)	
0BB6h (2998)	0BB7h (2999)	Latch monitor target position (STOP)	
0BB8h (3000)	0BB9h (3001)	Latch monitor operation number (STOP)	
0BBAh (3002)	0BBBh (3003)	Latch monitor number of loops (STOP)	

■ Direct I/O

The arrangement of bits for direct I/O is indicated.

Register address	Description							
00D4h (212)	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
	–	–	–	–	–	DOUT2	DOUT1	DOUT0
00D5h (213)	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
	–	–	–	–	–	DIN2	DIN1	DIN0

■ I/O status

The arrangement of bits for internal I/O is indicated.

● **Input signals**

Register address	Description							
0170h (368)	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	SLIT	HOMES	RV-LS	FW-LS	RV-BLK	FW-BLK	–	–
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	–	PLS-DIS	PLS-XMODE	–	–	HMI
0171h (369)	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	INFO-CLR	LAT-CLR	–	–	–	P-PRESET	ALM-RST
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	STOP	–	–	AWO	–	No function
0172h (370)	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	–	–	–	–	–	RV-POS	FW-POS
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	RV-JOG-P	FW-JOG-P	RV-JOG-H	FW-JOG-H	RV-JOG	FW-JOG
0173h (371)	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
	–	–	–	HOME	–	–	SSTART	START
0174h (372)	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
	R7	R6	R5	R4	R3	R2	R1	R0
0175h (373)	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
	M7	M6	M5	M4	M3	M2	M1	M0
0176h (374)	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
	–	–	–	–	–	–	–	FCLOOP-DIS

Register address	Description							
0177h (375)	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
	–	–	–	–	–	–	–	–

- **Output signals**

Register address	Description							
0178h (376)	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	–	TIM	–	ZSG	RV-SLS	FW-SLS	–
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	–	–	PLS-OUT	–	ABSPEN	HOME-END
0179h (377)	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	AUTO-CD	CRNT	VA	–	–	–	–	SYS-BSY
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	INFO	MOVE	PLS-RDY	READY	SYS-RDY	ALM-B	ALM-A	CONST-OFF
017Ah (378)	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	FCLOOP-RDY	FCLOOP-MON	ENC-IN-POS	–	–	–	–
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	–	–	–	–	–	–
017Bh (379)	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
	–	–	–	–	–	AREA2	AREA1	AREA0
017Ch (380)	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
	–	–	–	–	–	–	–	–
017Dh (381)	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	–	DCMD-FULL	DCMD-RDY	PLS-LOST	–	–	–
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	DELAY-BSY	SEQ-BSY	–	–	–	–	–	–
017Eh (382)	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	INFO-RBT	INFO-CFG	INFO-IOTEST	INFO-DSLMTD	–	–	–	INFO-ENC-E
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	INFO-ODO	INFO-TRIP	–	–	INFO-RV-OT	INFO-FW-OT
017Fh (383)	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	INFO-NET-E	–	INFO-EGR-E	INFO-MSET-E	INFO-PR-REQ	–	INFO-START	–
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	INFO-UVOLT	INFO-OVOLT	–	INFO-DRVTMP	–	–

8 Operation data R/W commands

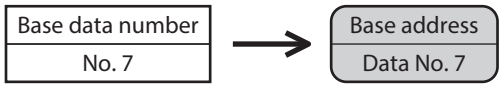
The operation data is set with the operation data R/W commands. Use these addresses when consecutively inputing all the setting items included in the operation data. All commands are READ/WRITE.

8-1 Overview of address arrangement

There are two methods for setting the operation data, "direct reference" and "offset reference." Although addresses are different, the stored area is the same. Use them selectively according to their intended use.

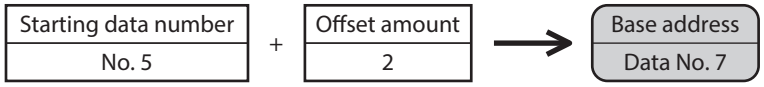
■ Direct reference

Direct reference is a method that specifies the register address (base address) of the operation data number to be a reference point and inputs.



■ Offset reference

Offset reference is a method that sets an operation data number to be the starting point (starting data number), specifies an offset from the starting data number, and inputs. Set the the starting data number with the "DATA offset reference origin" parameter.



memo
- The number of operation data items that can be specified with offset reference is 32. (Offset values are up to 31.)
- The setting value of the "DATA offset reference origin" parameter is stored in RAM.

8-2 Direct reference

■ Base address of each operation data number

Base address		Operation data number	Base address		Operation data number	Base address		Operation data number	Base address		Operation data number
Dec	Hex		Dec	Hex		Dec	Hex		Dec	Hex	
6144	1800	No. 0	7040	1B80	No. 14	7936	1F00	No. 28	8832	2280	No. 42
6208	1840	No. 1	7104	1BC0	No. 15	8000	1F40	No. 29	8896	22C0	No. 43
6272	1880	No. 2	7168	1C00	No. 16	8064	1F80	No. 30	8960	2300	No. 44
6336	18C0	No. 3	7232	1C40	No. 17	8128	1FC0	No. 31	9024	2340	No. 45
6400	1900	No. 4	7296	1C80	No. 18	8192	2000	No. 32	9088	2380	No. 46
6464	1940	No. 5	7360	1CC0	No. 19	8256	2040	No. 33	9152	23C0	No. 47
6528	1980	No. 6	7424	1D00	No. 20	8320	2080	No. 34	9216	2400	No. 48
6592	19C0	No. 7	7488	1D40	No. 21	8384	20C0	No. 35	9280	2440	No. 49
6656	1A00	No. 8	7552	1D80	No. 22	8448	2100	No. 36	9344	2480	No. 50
6720	1A40	No. 9	7616	1DC0	No. 23	8512	2140	No. 37	9408	24C0	No. 51
6784	1A80	No. 10	7680	1E00	No. 24	8576	2180	No. 38	9472	2500	No. 52
6848	1AC0	No. 11	7744	1E40	No. 25	8640	21C0	No. 39	9536	2540	No. 53
6912	1B00	No. 12	7808	1E80	No. 26	8704	2200	No. 40	9600	2580	No. 54
6976	1B40	No. 13	7872	1EC0	No. 27	8768	2240	No. 41	9664	25C0	No. 55

Base address		Operation data number
Dec	Hex	
9728	2600	No. 56
9792	2640	No. 57
9856	2680	No. 58
9920	26C0	No. 59
9984	2700	No. 60
10048	2740	No. 61
10112	2780	No. 62
10176	27C0	No. 63
10240	2800	No. 64
10304	2840	No. 65
10368	2880	No. 66
10432	28C0	No. 67
10496	2900	No. 68
10560	2940	No. 69
10624	2980	No. 70
10688	29C0	No. 71
10752	2A00	No. 72
10816	2A40	No. 73
10880	2A80	No. 74
10944	2AC0	No. 75
11008	2B00	No. 76
11072	2B40	No. 77
11136	2B80	No. 78
11200	2BC0	No. 79
11264	2C00	No. 80
11328	2C40	No. 81
11392	2C80	No. 82
11456	2CC0	No. 83
11520	2D00	No. 84
11584	2D40	No. 85
11648	2D80	No. 86
11712	2DC0	No. 87
11776	2E00	No. 88
11840	2E40	No. 89
11904	2E80	No. 90
11968	2EC0	No. 91
12032	2F00	No. 92
12096	2F40	No. 93
12160	2F80	No. 94
12224	2FC0	No. 95
12288	3000	No. 96
12352	3040	No. 97
12416	3080	No. 98
12480	30C0	No. 99
12544	3100	No. 100
12608	3140	No. 101
12672	3180	No. 102

Base address		Operation data number
Dec	Hex	
12736	31C0	No. 103
12800	3200	No. 104
12864	3240	No. 105
12928	3280	No.106
12992	32C0	No. 107
13056	3300	No. 108
13120	3340	No. 109
13184	3380	No. 110
13248	33C0	No. 111
13312	3400	No. 112
13376	3440	No. 113
13440	3480	No. 114
13504	34C0	No. 115
13568	3500	No. 116
13632	3540	No. 117
13696	3580	No. 118
13760	35C0	No. 119
13824	3600	No. 120
13888	3640	No. 121
13952	3680	No. 122
14016	36C0	No. 123
14080	3700	No. 124
14144	3740	No. 125
14208	3780	No. 126
14272	37C0	No. 127
14336	3800	No. 128
14400	3840	No. 129
14464	3880	No. 130
14528	38C0	No. 131
14592	3900	No. 132
14656	3940	No. 133
14720	3980	No. 134
14784	39C0	No. 135
14848	3A00	No. 136
14912	3A40	No. 137
14976	3A80	No. 138
15040	3AC0	No. 139
15104	3B00	No. 140
15168	3B40	No. 141
15232	3B80	No. 142
15296	3BC0	No. 143
15360	3C00	No. 144
15424	3C40	No. 145
15488	3C80	No. 146
15552	3CC0	No. 147
15616	3D00	No. 148
15680	3D40	No. 149

Base address		Operation data number
Dec	Hex	
15744	3D80	No. 150
15808	3DC0	No. 151
15872	3E00	No. 152
15936	3E40	No. 153
16000	3E80	No. 154
16064	3EC0	No. 155
16128	3F00	No. 156
16192	3F40	No. 157
16256	3F80	No. 158
16320	3FC0	No. 159
16384	4000	No. 160
16448	4040	No. 161
16512	4080	No. 162
16576	40C0	No. 163
16640	4100	No. 164
16704	4140	No. 165
16768	4180	No. 166
16832	41C0	No. 167
16896	4200	No. 168
16960	4240	No. 169
17024	4280	No. 170
17088	42C0	No. 171
17152	4300	No. 172
17216	4340	No. 173
17280	4380	No. 174
17344	43C0	No. 175
17408	4400	No. 176
17472	4440	No. 177
17536	4480	No. 178
17600	44C0	No. 179
17664	4500	No. 180
17728	4540	No. 181
17792	4580	No. 182
17856	45C0	No. 183
17920	4600	No. 184
17984	4640	No. 185
18048	4680	No. 186
18112	46C0	No. 187
18176	4700	No. 188
18240	4740	No. 189
18304	4780	No. 190
18368	47C0	No. 191
18432	4800	No. 192
18496	4840	No. 193
18560	4880	No. 194
18624	48C0	No. 195
18688	4900	No. 196

Base address		Operation data number
Dec	Hex	
18752	4940	No. 197
18816	4980	No. 198
18880	49C0	No. 199
18944	4A00	No. 200
19008	4A40	No. 201
19072	4A80	No. 202
19136	4AC0	No. 203
19200	4B00	No. 204
19264	4B40	No. 205
19328	4B80	No. 206
19392	4BC0	No. 207
19456	4C00	No. 208
19520	4C40	No. 209
19584	4C80	No. 210
19648	4CC0	No. 211
19712	4D00	No. 212
19776	4D40	No. 213
19840	4D80	No. 214
19904	4DC0	No. 215
19968	4E00	No. 216
20032	4E40	No. 217
20096	4E80	No. 218
20160	4EC0	No. 219
20224	4F00	No. 220
20288	4F40	No. 221
20352	4F80	No. 222
20416	4FC0	No. 223
20480	5000	No. 224
20544	5040	No. 225
20608	5080	No. 226
20672	50C0	No. 227
20736	5100	No. 228
20800	5140	No. 229
20864	5180	No. 230
20928	51C0	No. 231
20992	5200	No. 232
21056	5240	No. 233
21120	5280	No. 234
21184	52C0	No. 235
21248	5300	No. 236
21312	5340	No. 237
21376	5380	No. 238
21440	53C0	No. 239
21504	5400	No. 240
21568	5440	No. 241
21632	5480	No. 242
21696	54C0	No. 243

Base address		Operation data number
Dec	Hex	
21760	5500	No. 244
21824	5540	No. 245
21888	5580	No. 246

Base address		Operation data number
Dec	Hex	
21952	55C0	No. 247
22016	5600	No. 248
22080	5640	No. 249

Base address		Operation data number
Dec	Hex	
22144	5680	No. 250
22208	56C0	No. 251
22272	5700	No. 252

Base address		Operation data number
Dec	Hex	
22336	5740	No. 253
22400	5780	No. 254
22464	57C0	No. 255

■ Register address

The setting items of operation data are set with the operation data R/W commands.
The register addresses for the setting items are arranged based on the base address of the operation data number. (Base address ⇨p.170)
For example, in the case of the setting item "Position," adding 2 and 3 to the base address will be the upper address and the lower address, respectively.

MEXE02 code	Register address	Name	Setting range*1	Initial value	Update
p1	Base address +0 (Upper)	Operation type	1: Absolute positioning 2: Incremental positioning (based on command position)	2	B
	Base address +1 (Lower)				
	Base address +2 (Upper)	Position	–2,147,483,648 to 2,147,483,647 steps	0	B
	Base address +3 (Lower)				
	Base address +4 (Upper)	Speed	–4,000,000 to 4,000,000 Hz	1,000	B
	Base address +5 (Lower)				
	Base address +6 (Upper)	Starting/changing rate	1 to 1,000,000,000 (1=0.001)*2	30,000	B
	Base address +7 (Lower)				
	Base address +8 (Upper)	Stopping deceleration	1 to 1,000,000,000 (1=0.001)*2	30,000	B
	Base address +9 (Lower)				
	Base address +10 (Upper)	Operating current	0 to 1,000 (1=0.1 %)	1,000	B
	Base address +11 (Lower)				
	Base address +12 (Upper)	Drive-complete delay time	0 to 65,535 (1=0.001 s)	0	B
	Base address +13 (Lower)				
	Base address +14 (Upper)	Link	0: No link 1: Manual sequential 2: Automatic sequential 3: Continuous sequential operation	0	B
	Base address +15 (Lower)				
	Base address +16 (Upper)	Next data number	–256: No link [Stop] –2: Operation data number after next one [↓↓(+2)] –1: Next operation data number [↓(+1)] 0 to 255: Operation data number	–1	B
	Base address +17 (Lower)				
	Base address +18 (Upper)	Area offset	This is a reserved function. It cannot be used.	0	B
	Base address +19 (Lower)				
	Base address +20 (Upper)	Area width	This is a reserved function. It cannot be used.	–1	B
	Base address +21 (Lower)				
	Base address +22 (Upper)	Loop count	0: No loop [–] 2 to 255: Number of loop times [loop 2{ to loop 255{]	0	B
	Base address +23 (Lower)				
	Base address +24 (Upper)	Loop offset	–4,194,304 to 4,194,303 steps	0	B
	Base address +25 (Lower)				
	Base address +26 (Upper)	Loop end number	0: Not the loop end point [–] 1: Loop end point [}L-End]	0	B
	Base address +27 (Lower)				

*1 A value in the brackets [ ] is shown on the screen of the **MEXE02** software.
*2 The setting unit is followed the "Acceleration/deceleration unit" parameter.

■ Setting example

As an example, this section explains how to set the following operation data to operation data No. 0 and No. 1.

Setting item	Operation data No. 0	Operation data No. 1
Operation type	Absolute positioning	Incremental positioning (based on command position)
Position [step]	1,000	1,000
Speed [Hz]	1,000	1,000
Operating current [%]	50.0	70.0

● Setting of operation data No. 0

Seeing the table on p.170, we can find that the base address of operation data No. 0 is "1800h (6144)."
Based on this base address, the register addresses for the setting items are calculated from the table on p.172.

Base address
1800h (6144)

Setting item	Register address			Setting value
	Calculation method	Dec	Hex	
Operation type	Upper: Base address +0	6144 + 0 = 6144	1800h	1
	Lower: Base address +1	6144 + 1 = 6145	1801h	
Position	Upper: Base address +2	6144 + 2 = 6146	1802h	1,000
	Lower: Base address +3	6144 + 3 = 6147	1803h	
Speed	Upper: Base address +4	6144 + 4 = 6148	1804h	1,000
	Lower: Base address +5	6144 + 5 = 6149	1805h	
Operating current	Upper: Base address +10	6144 + 10 = 6154	180Ah	500
	Lower: Base address +11	6144 + 11 = 6155	180Bh	

● Setting of operation data No. 1

Seeing the table on p.170, we can find that the base address of operation data No. 1 is "1840h (6208)."
Based on this base address, the register addresses for the setting items are calculated from the table on p.172.

Base address
1840h (6208)

Setting item	Register address			Setting value
	Calculation method	Dec	Hex	
Operation type	Upper: Base address +0	6208 + 0 = 6208	1840h	2
	Lower: Base address +1	6208 + 1 = 6209	1841h	
Position	Upper: Base address +2	6208 + 2 = 6210	1842h	1,000
	Lower: Base address +3	6208 + 3 = 6211	1843h	
Speed	Upper: Base address +4	6208 + 4 = 6212	1844h	1,000
	Lower: Base address +5	6208 + 5 = 6213	1845h	
Operating current	Upper: Base address +10	6208 + 10 = 6218	184Ah	700
	Lower: Base address +11	6208 + 11 = 6219	184Bh	

8-3 Offset reference

Offset reference is not always necessary for Modbus communication, as data up to data No. 255 can be input directly. However, the offset reference can be conveniently used for Modbus communication because it is not necessary to change the address of the setting items if only the data number of the starting point is changed. Use it to edit a large amount of operation data, for example, on the touch screen.

Related parameter

Register address		Name	Description	Setting range	Initial value
Upper	Lower				
17FEh (6142)	17FFh (6143)	DATA offset reference origin	Sets the operation data number that is the starting point of offset reference.	0 to 255	0

memo The setting value of the "DATA offset reference origin" parameter is stored in RAM.

■ Base address

This indicates the register address (base address) of the operation data number to be a reference point when setting with offset reference.
The base address is fixed. The base address of the starting data number is always "1800h (6144)."
Since the offset reference can only specify up to 32 items of operation data, change the starting data number when inputting to operation data No. 32 or more.

memo The number of operation data items that can be specified with offset reference is 32. (Offset values are up to 31.)

Base address		Operation data number
Upper	Lower	
1800h (6144)	1801h (6145)	Starting data number +0
1840h (6208)	1841h (6209)	Starting data number +1
1880h (6272)	1881h (6273)	Starting data number +2
18C0h (6336)	18C1h (6337)	Starting data number +3
1900h (6400)	1901h (6401)	Starting data number +4
1940h (6464)	1941h (6465)	Starting data number +5
1980h (6528)	1981h (6529)	Starting data number +6
19C0h (6592)	19C1h (6593)	Starting data number +7
1A00h (6656)	1A01h (6657)	Starting data number +8
1A40h (6720)	1A41h (6721)	Starting data number +9
1A80h (6784)	1A81h (6785)	Starting data number +10
1AC0h (6848)	1AC1h (6849)	Starting data number +11
1B00h (6912)	1B01h (6913)	Starting data number +12
1B40h (6976)	1B41h (6977)	Starting data number +13
1B80h (7040)	1B81h (7041)	Starting data number +14
1BC0h (7104)	1BC1h (7105)	Starting data number +15

Base address		Operation data number
Upper	Lower	
1C00h (7168)	1C01h (7169)	Starting data number +16
1C40h (7232)	1C41h (7233)	Starting data number +17
1C80h (7296)	1C81h (7297)	Starting data number +18
1CC0h (7360)	1CC1h (7361)	Starting data number +19
1D00h (7424)	1D01h (7425)	Starting data number +20
1D40h (7488)	1D41h (7489)	Starting data number +21
1D80h (7552)	1D81h (7553)	Starting data number +22
1DC0h (7616)	1DC1h (7617)	Starting data number +23
1E00h (7680)	1E01h (7681)	Starting data number +24
1E40h (7744)	1E41h (7745)	Starting data number +25
1E80h (7808)	1E81h (7809)	Starting data number +26
1EC0h (7872)	1EC1h (7873)	Starting data number +27
1F00h (7936)	1F01h (7937)	Starting data number +28
1F40h (8000)	1F41h (8001)	Starting data number +29
1F80h (8064)	1F81h (8065)	Starting data number +30
1FC0h (8128)	1FC1h (8129)	Starting data number +31

■ Register address

The setting items of operation data are set with the operation data R/W commands.
The register address for the setting item is arranged based on the base address. (Base address ⇨p.174)
For example, in the case of the setting item "Position," adding 2 and 3 to the base address will be the upper address and the lower address, respectively.

Register address	Name	Setting range*1	Initial value	Update
Base address +0 (Upper)	Operation type	1: Absolute positioning 2: Incremental positioning (based on command position)	2	B
Base address +1 (Lower)				
Base address +2 (Upper)	Position	−2,147,483,648 to 2,147,483,647 steps	0	B
Base address +3 (Lower)				
Base address +4 (Upper)	Speed	−4,000,000 to 4,000,000 Hz	1,000	B
Base address +5 (Lower)				
Base address +6 (Upper)	Starting/changing rate	1 to 1,000,000,000 (1=0.001)*2	30,000	B
Base address +7 (Lower)				
Base address +8 (Upper)	Stopping deceleration	1 to 1,000,000,000 (1=0.001)*2	30,000	B
Base address +9 (Lower)				
Base address +10 (Upper)	Operating current	0 to 1,000 (1=0.1 %)	1,000	B
Base address +11 (Lower)				
Base address +12 (Upper)	Drive-complete delay time	0 to 65,535 (1=0.001 s)	0	B
Base address +13 (Lower)				
Base address +14 (Upper)	Link	0: No link 1: Manual sequential 2: Automatic sequential 3: Continuous sequential operation	0	B
Base address +15 (Lower)				
Base address +16 (Upper)	Next data number	−256: No link [Stop] −2: Operation data number after next one [↓↓(+2)] −1: Next operation data number [↓(+1)] 0 to 255: Operation data number	−1	B
Base address +17 (Lower)				
Base address +18 (Upper)	Area offset	This is a reserved function. It cannot be used.	0	B
Base address +19 (Lower)				
Base address +20 (Upper)	Area width	This is a reserved function. It cannot be used.	−1	B
Base address +21 (Lower)				
Base address +22 (Upper)	Loop count	0: No loop [–] 2 to 255: Number of loop times [loop 2{ to loop 255{]	0	B
Base address +23 (Lower)				
Base address +24 (Upper)	Loop offset	−4,194,304 to 4,194,303 steps	0	B
Base address +25 (Lower)				
Base address +26 (Upper)	Loop end number	0: Not the loop end point [–] 1: Loop end point [}L-End]	0	B
Base address +27 (Lower)				

*1 A value in the brackets [ ] is shown on the screen of the **MEXE02** software.
*2 The setting unit is followed the "Acceleration/deceleration unit" parameter.

■ Setting example

The register address for the setting item is arranged based on the base address of the operation data number. (Base address ⇨ p.174, register address ⇨ p.175)
The following example explains the register addresses of the setting items when data No. 0, No. 32, and No. 255 are set as the starting data.

● When the "DATA offset reference origin" parameter is 0 (starting data No. 0)

- Seeing the table on p.174, we can find that the base address of operation data No. 0 is "1800h (6144)." Based on this base address, the register address for each item is calculated from the table on p.175.
- Operation data No. 1 is obtained by adding offset 1 to No. 0. Seeing the table on p.174, we can find that the base address of the operation data No. 1 is "1840h (6208)." Calculate the register address of each item from the table on p.175 in the same way as for data No. 0.
- When the starting data is No. 0, the data that can be specified by offset reference is up to No. 31. Calculate the register address of No. 31 in the same way as for No. 1.

Setting item	Calculation method	Base address (Data No. 0)		Offset=1 (Data No. 1)		•••	Offset=31 (Data No. 31)	
		Register address		Register address			Register address	
		Upper	Lower	Upper	Lower		Upper	Lower
Operation type	Base address +0 (Upper)	1800h (6144)	1801h (6145)	1840h (6208)	1841h (6209)		1FC0h (8128)	1FC1h (8129)
	Base address +1 (Lower)							
Position	Base address +2 (Upper)	1802h (6146)	1803h (6147)	1842h (6210)	1843h (6211)		1FC2h (8130)	1FC3h (8131)
	Base address +3 (Lower)							
Speed	Base address +4 (Upper)	1804h (6148)	1805h (6149)	1844h (6212)	1845h (6213)		1FC4h (8132)	1FC5h (8133)
	Base address +5 (Lower)							
Starting/changing rate	Base address +6 (Upper)	1806h (6150)	1807h (6151)	1846h (6214)	1847h (6215)		1FC6h (8134)	1FC7h (8135)
	Base address +7 (Lower)							
Stopping deceleration	Base address +8 (Upper)	1808h (6152)	1809h (6153)	1848h (6216)	1849h (6217)		1FC8h (8136)	1FC9h (8137)
	Base address +9 (Lower)							
Operating current	Base address +10 (Upper)	180Ah (6154)	180Bh (6155)	184Ah (6218)	184Bh (6219)		1FCAh (8138)	1FCBh (8139)
	Base address +11 (Lower)							
Drive-complete delay time	Base address +12 (Upper)	180Ch (6156)	180Dh (6157)	184Ch (6220)	184Dh (6221)		1FCCh (8140)	1FCDh (8141)
	Base address +13 (Lower)							
Link	Base address +14 (Upper)	180Eh (6158)	180Fh (6159)	184Eh (6222)	184Fh (6223)		1FCEh (8142)	1FCFh (8143)
	Base address +15 (Lower)							
Next data number	Base address +16 (Upper)	1810h (6160)	1811h (6161)	1850h (6224)	1851h (6225)		1FD0h (8144)	1FD1h (8145)
	Base address +17 (Lower)							
Area offset	Base address +18 (Upper)	1812h (6162)	1813h (6163)	1852h (6226)	1853h (6227)		1FD2h (8146)	1FD3h (8147)
	Base address +19 (Lower)							
Area width	Base address +20 (Upper)	1814h (6164)	1815h (6165)	1854h (6228)	1855h (6229)		1FD4h (8148)	1FD5h (8149)
	Base address +21 (Lower)							
Loop count	Base address +22 (Upper)	1816h (6166)	1817h (6167)	1856h (6230)	1857h (6231)		1FD6h (8150)	1FD7h (8151)
	Base address +23 (Lower)							
Loop offset	Base address +24 (Upper)	1818h (6168)	1819h (6169)	1858h (6232)	1859h (6233)		1FD8h (8152)	1FD9h (8153)
	Base address +25 (Lower)							
Loop end number	Base address +26 (Upper)	181Ah (6170)	181Bh (6171)	185Ah (6234)	185Bh (6235)		1FDAh (8154)	1FDBh (8155)
	Base address +27 (Lower)							

- **When the "DATA offset reference origin" parameter is "32" (starting data No. 32)**

  Set data No. 32 as the starting point with the "DATA offset reference origin" parameter. This allows you to specify the data from No. 32 to No. 63.
  Seeing the table on p.174, we can find that the base address of operation data No. 32 is "1800h (6144)." Based on this base address, the register address for each item is calculated from the table on p.175.
  Calculate the register address of data No. 33 to No. 63 in the same way.

Setting item	Calculation method	Base address (Data No. 32) Register address Upper	Base address (Data No. 32) Register address Lower	Offset = 1 (Data No. 33) Register address Upper	Offset = 1 (Data No. 33) Register address Lower	•••	Offset = 31 (Data No. 63) Register address Upper	Offset = 31 (Data No. 63) Register address Lower
Operation type	Base address +0 (Upper)	1800h (6144)	1801h (6145)	1840h (6208)	1841h (6209)		1FC0h (8128)	1FC1h (8129)
	Base address +1 (Lower)							
Position	Base address +2 (Upper)	1802h (6146)	1803h (6147)	1842h (6210)	1843h (6211)		1FC2h (8130)	1FC3h (8131)
	Base address +3 (Lower)							
Speed	Base address +4 (Upper)	1804h (6148)	1805h (6149)	1844h (6212)	1845h (6213)		1FC4h (8132)	1FC5h (8133)
	Base address +5 (Lower)							
Starting/changing rate	Base address +6 (Upper)	1806h (6150)	1807h (6151)	1846h (6214)	1847h (6215)		1FC6h (8134)	1FC7h (8135)
	Base address +7 (Lower)							
Stopping deceleration	Base address +8 (Upper)	1808h (6152)	1809h (6153)	1848h (6216)	1849h (6217)		1FC8h (8136)	1FC9h (8137)
	Base address +9 (Lower)							
Operating current	Base address +10 (Upper)	180Ah (6154)	180Bh (6155)	184Ah (6218)	184Bh (6219)		1FCAh (8138)	1FCBh (8139)
	Base address +11 (Lower)							
Drive-complete delay time	Base address +12 (Upper)	180Ch (6156)	180Dh (6157)	184Ch (6220)	184Dh (6221)		1FCCh (8140)	1FCDh (8141)
	Base address +13 (Lower)							
Link	Base address +14 (Upper)	180Eh (6158)	180Fh (6159)	184Eh (6222)	184Fh (6223)		1FCEh (8142)	1FCFh (8143)
	Base address +15 (Lower)							
Next data number	Base address +16 (Upper)	1810h (6160)	1811h (6161)	1850h (6224)	1851h (6225)		1FD0h (8144)	1FD1h (8145)
	Base address +17 (Lower)							
Area offset	Base address +18 (Upper)	1812h (6162)	1813h (6163)	1852h (6226)	1853h (6227)		1FD2h (8146)	1FD3h (8147)
	Base address +19 (Lower)							
Area width	Base address +20 (Upper)	1814h (6164)	1815h (6165)	1854h (6228)	1855h (6229)		1FD4h (8148)	1FD5h (8149)
	Base address +21 (Lower)							
Loop count	Base address +22 (Upper)	1816h (6166)	1817h (6167)	1856h (6230)	1857h (6231)		1FD6h (8150)	1FD7h (8151)
	Base address +23 (Lower)							
Loop offset	Base address +24 (Upper)	1818h (6168)	1819h (6169)	1858h (6232)	1859h (6233)		1FD8h (8152)	1FD9h (8153)
	Base address +25 (Lower)							
Loop end number	Base address +26 (Upper)	181Ah (6170)	181Bh (6171)	185Ah (6234)	185Bh (6235)		1FDAh (8154)	1FDBh (8155)
	Base address +27 (Lower)							

- **When the "DATA offset reference origin" parameter is "255" (starting data No. 255)**

  Set data No. 255 as the starting point with the "DATA offset reference origin" parameter. Adding offset 1 to data No. 255 accesses data No. 0.

Setting item	Calculation method	Base address (Data No. 255)		Offset=1 (Data No. 0)		•••	Offset=31 (Data No. 30)	
		Register address		Register address			Register address	
		Upper	Lower	Upper	Lower		Upper	Lower
Operation type	Base address +0 (Upper)	1800h (6144)	1801h (6145)	1840h (6208)	1841h (6209)		1FC0h (8128)	1FC1h (8129)
	Base address +1 (Lower)							
Position	Base address +2 (Upper)	1802h (6146)	1803h (6147)	1842h (6210)	1843h (6211)		1FC2h (8130)	1FC3h (8131)
	Base address +3 (Lower)							
Speed	Base address +4 (Upper)	1804h (6148)	1805h (6149)	1844h (6212)	1845h (6213)		1FC4h (8132)	1FC5h (8133)
	Base address +5 (Lower)							
Starting/changing rate	Base address +6 (Upper)	1806h (6150)	1807h (6151)	1846h (6214)	1847h (6215)		1FC6h (8134)	1FC7h (8135)
	Base address +7 (Lower)							
Stopping deceleration	Base address +8 (Upper)	1808h (6152)	1809h (6153)	1848h (6216)	1849h (6217)		1FC8h (8136)	1FC9h (8137)
	Base address +9 (Lower)							
Operating current	Base address +10 (Upper)	180Ah (6154)	180Bh (6155)	184Ah (6218)	184Bh (6219)		1FCAh (8138)	1FCBh (8139)
	Base address +11 (Lower)							
Drive-complete delay time	Base address +12 (Upper)	180Ch (6156)	180Dh (6157)	184Ch (6220)	184Dh (6221)		1FCCh (8140)	1FCDh (8141)
	Base address +13 (Lower)							
Link	Base address +14 (Upper)	180Eh (6158)	180Fh (6159)	184Eh (6222)	184Fh (6223)		1FCEh (8142)	1FCFh (8143)
	Base address +15 (Lower)							
Next data number	Base address +16 (Upper)	1810h (6160)	1811h (6161)	1850h (6224)	1851h (6225)		1FD0h (8144)	1FD1h (8145)
	Base address +17 (Lower)							
Area offset	Base address +18 (Upper)	1812h (6162)	1813h (6163)	1852h (6226)	1853h (6227)		1FD2h (8146)	1FD3h (8147)
	Base address +19 (Lower)							
Area width	Base address +20 (Upper)	1814h (6164)	1815h (6165)	1854h (6228)	1855h (6229)		1FD4h (8148)	1FD5h (8149)
	Base address +21 (Lower)							
Loop count	Base address +22 (Upper)	1816h (6166)	1817h (6167)	1856h (6230)	1857h (6231)		1FD6h (8150)	1FD7h (8151)
	Base address +23 (Lower)							
Loop offset	Base address +24 (Upper)	1818h (6168)	1819h (6169)	1858h (6232)	1859h (6233)		1FD8h (8152)	1FD9h (8153)
	Base address +25 (Lower)							
Loop end number	Base address +26 (Upper)	181Ah (6170)	181Bh (6171)	185Ah (6234)	185Bh (6235)		1FDAh (8154)	1FDBh (8155)
	Base address +27 (Lower)							

9 Extended operation data setting R/W commands

Parameters for extended operation data setting can be set. All commands are READ/WRITE.

9-1 (p2) Extended operation data setting

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
0280h (640)	0281h (641)	Common starting/ changing rate	Sets the acceleration/deceleration rate or the acceleration/ deceleration time when starting or changing the speed in the common setting.	1 to 1,000,000,000 (1=0.001)*	30,000	B
0282h (642)	0283h (643)	Common stopping rate	Sets the deceleration rate or the deceleration time when stopping in the common setting.		30,000	B
028Ch (652)	028Dh (653)	Rate selection	Sets whether to use the common acceleration/deceleration or the acceleration/deceleration specified in the operation data.	0: The common rate is used (common setting) 1: The rate of each operation data is used (separate setting)	1	B
1000h (4096)	1001h (4097)	Repeat start operation data number	Sets the operation data number at which extended loop operation is started.	–1: Disable 0 to 255: Operation data number	–1	B
1002h (4098)	1003h (4099)	Repeat end operation data number	Sets the operation data number at which extended loop operation is completed.		–1	B
1004h (4100)	1005h (4101)	Repeat time	Sets the number of repetitions for extended loop operation.	–1: Disable 0 to 100,000,000 times	–1	B

* The setting unit is followed the "Acceleration/deceleration unit" parameter.

Note Rewrite the parameters of extended operation data setting while operation is stopped.

10 Parameter R/W commands

These commands are used to write or read parameters. All commands are READ/WRITE.

10-1 (p3) Base settings parameters

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
0220h (544)	0221h (545)	Direct data operation zero speed command action	When "0" is written to the speed, selects whether to decelerate the motor to a stop or to change only the speed to 0 r/min in an operating status.	0: Deceleration stop command 1: Speed zero command	0	B
0222h (546)	0223h (547)	Direct data operation trigger initial value	Sets the initial value of the trigger.	–7: Operation data number update –6: Operation type update –5: Position update –4: Speed update –3: Starting/changing rate update –2: Stopping deceleration update –1: Operating current update 0: The trigger is used	0	C
0224h (548)	0225h (549)	Direct data operation forwarding destination initial value	Sets the initial value of the forwarding destination.	0: Execution memory 1: Buffer memory	0	C
0226h (550)	0227h (551)	Direct data operation operation parameter initial value reference data number	Sets the operation data number to be used as the initial value.	0 to 255	0	C
024Ch (588)	024Dh (589)	Base current	Sets the base current.	0 to 1,000 (1=0.1 %)	1,000	A
0250h (592)	0251h (593)	Stop current	Sets the motor stop current based on the base current being 100 %.		500	A
0252h (594)	0253h (595)	Command filter setting	Sets the filter function to adjust the motor response.	1: LPF (Speed filter) 2: Moving average filter	1	B
0254h (596)	0255h (597)	Command filter time constant	Adjusts the motor response.	0 to 200 ms	1	B
0258h (600)	0259h (601)	Smooth drive function	Enables the smooth drive function.	0: Disable 1: Enable	1	C
0266h (614)	0267h (615)	Automatic current cutback switching time	Sets a period of time from when the motor stops to when the automatic current cutback function is activated.	0 to 1,000 ms	100	A
0284h (644)	0285h (645)	Starting speed	Sets the starting speed for positioning SD operation or continuous macro operation.	0 to 4,000,000 Hz	100	B
028Eh (654)	028Fh (655)	Acceleration/ deceleration unit	Sets the acceleration/ deceleration unit.	0: kHz/s 1: s 2: ms/kHz	0	C

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
0290h (656)	0291h (657)	Permission of absolute positioning without setting absolute coordinates	Permits absolute positioning operation in a state where coordinates are not set.	0: Disable 1: Enable	1	B
0386h (902)	0387h (903)	Software overtravel	Sets the action when the software overtravel is detected.	−1: Disable 0: Immediate stop 1: Deceleration stop 2: Immediate stop with alarm 3: Deceleration stop with alarm	3	A
0388h (904)	0389h (905)	Positive software limit	Sets the value of software limit in the forward direction.	−2,147,483,648 to 2,147,483,647 steps	2,147,483,647	A
038Ah (906)	038Bh (907)	Negative software limit	Sets the value of software limit in the reverse direction.		−2,147,483,648	A

10-2 (p4) Motor & Mechanism (Coordinates/JOG/Home operation) setting parameters

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
0274h (628)	0275h (629)	Applicable motor setting	Sets the output current of the driver according to the product to be combined. Check "Parameter setting values for the combined products" on p.17 and set the parameter.	0: No setting 18: 5-phase, 0.35 A/phase 19: 5-phase, 0.75 A/phase 20: 5-phase, 1.2 A/phase 21: 5-phase, 1.4 A/phase 22: 5-phase, 1.8 A/phase 23: 5-phase, 2.4 A/phase	0	D
02A0h (672)	02A1h (673)	(JOG) Travel amount	Sets the travel amount for inching operation.	1 to 8,388,607 steps	1	B
02A2h (674)	02A3h (675)	(JOG) Operating speed	Sets the operating speed for JOG operation and inching operation.	1 to 4,000,000 Hz	200	B
02A4h (676)	02A5h (677)	(JOG) Acceleration/ deceleration	Sets the acceleration/deceleration rate or the acceleration/ deceleration time for JOG macro operation.	1 to 1,000,000,000 (1=0.001)*	30,000	B
02A6h (678)	02A7h (679)	(JOG) Starting speed	Sets the starting speed for JOG macro operation.	0 to 4,000,000 Hz	100	B
02A8h (680)	02A9h (681)	(JOG) Operating speed (high)	Sets the operating speed for high-speed JOG operation.	1 to 4,000,000 Hz	1,000	B
02BCh (700)	02BDh (701)	JOG/HOME command filter time constant	Sets the time constant for the command filter.	1 to 200 ms	1	B
02BEh (702)	02BFh (703)	JOG/HOME operating current	Sets the operating current for JOG operation or return-to-home operation, based on the base current being 100 %.	0 to 1,000 (1=0.1 %)	1,000	B
02C0h (704)	02C1h (705)	(HOME) Return-to-home mode	Sets the return-to-home method.	0: 2-sensor 1: 3-sensor 2: One-way rotation	1	B
02C2h (706)	02C3h (707)	(HOME) Return-to-home starting direction	Sets the starting direction for detecting the home.	0: Negative side 1: Positive side	1	B

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
02C4h (708)	02C5h (709)	(HOME) Return-to-home acceleration/ deceleration	Sets the acceleration/deceleration rate or the acceleration/ deceleration time for return-to-home operation.	1 to 1,000,000,000 (1=0.001)*	30,000	B
02C6h (710)	02C7h (711)	(HOME) Return-to-home starting speed	Sets the starting speed for return-to-home operation.	1 to 4,000,000 Hz	100	B
02C8h (712)	02C9h (713)	(HOME) Return-to-home operating speed	Sets the operating speed for return-to-home operation.		1,000	B
02CAh (714)	02CBh (715)	(HOME) Return-to-home last speed	Sets the operating speed when finally positioning with the home.	1 to 10,000 Hz	100	B
02CCh (716)	02CDh (717)	(HOME) Return-to-home SLIT detection	Sets whether to use the SLIT input together when returning to the home.	0: Disable 1: Enable	0	B
02CEh (718)	02CFh (719)	(HOME) Return-to-home TIM/ZSG signal detection	Sets whether to use the TIM output or the ZSG output together when returning to the home.	0: Disable 1: TIM 2: ZSG	0	B
02D0h (720)	02D1h (721)	(HOME) Return-to-home position offset	Sets the amount of offset from the home.	–2,147,483,647 to 2,147,483,647 steps	0	B
02D2h (722)	02D3h (723)	(HOME) Backward steps in 2 sensor return-to-home	Sets the amount of backward steps after return-to-home operation in the 2-sensor mode.	0 to 8,388,607 steps	200	B
02D4h (724)	02D5h (725)	(HOME) Operating amount in uni-directional return-to-home	Sets the operating amount after return-to-home operation in the one-way rotation mode.		200	B
0380h (896)	0381h (897)	Electronic gear A	Sets the denominator of the electronic gear.	1 to 65,535	1	C
0382h (898)	0383h (899)	Electronic gear B	Sets the numerator of the electronic gear.		1	C
0384h (900)	0385h (901)	Motor rotation direction	Sets the rotation direction of the motor output shaft.	0: Positive direction=CCW 1: Positive direction=CW	1	C

* The setting unit is followed the "Acceleration/deceleration unit" parameter.

10-3 (p5) Alarm & Information setting parameters

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
0340h (832)	0341h (833)	Driver temperature information (INFO-DRVTMP)	Sets the condition under which the information is generated.	40 to 85 °C	85	A
0356h (854)	0357h (855)	Overvoltage information (INFO-OVOLT)		180 to 430 (1=0.1 V)	430	A
0358h (856)	0359h (857)	Undervoltage information (INFO-UVOLT)			180	A
035Eh (862)	035Fh (863)	Tripmeter information (INFO-TRIP)		0: Disable 1 to 2,147,483,647 (1=0.1 kRev)	0	A
0360h (864)	0361h (865)	Odometer information (INFO-ODO)			0	A
037Ch (892)	037Dh (893)	Information LED condition	Sets the LED status when information is generated.	0: Disable (LED does not blink) 1: Enable (LED blinks)	1	A

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
037Eh (894)	037Fh (895)	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	A
0F44h (3908)	0F45h (3909)	INFO action (Driver temperature information (INFO-DRVTMP))	Sets the bit output, the INFO output, and the LED status when information is generated.	0: No info reflect (Only the bit output is ON.)* 1: Info reflect (The bit output and the INFO output are ON and the LED blinks.)	1	A
0F48h (3912)	0F49h (3913)	INFO action (Overvoltage information (INFO-OVOLT))			1	A
0F4Ah (3914)	0F4Bh (3915)	INFO action (Undervoltage information (INFO-UVOLT))			1	A
0F52h (3922)	0F53h (3923)	INFO action (Start operation error information (INFO-START))			1	A
0F56h (3926)	0F57h (3927)	INFO action (PRESET request information (INFO-PR-REQ))			1	A
0F58h (3928)	0F59h (3929)	INFO action (Motor setting error information (INFO-MSET-E))			1	A
0F5Ah (3930)	0F5Bh (3931)	INFO action (Electronic gear setting error information (INFO-EGR-E))			1	A
0F5Eh (3934)	0F5Fh (3935)	INFO action (RS-485 communication error information (INFO-NET-E))			1	A
0F60h (3936)	0F61h (3937)	INFO action (Forward operation prohibition information (INFO-FW-OT))			1	A
0F62h (3938)	0F63h (3939)	INFO action (Reverse operation prohibition information (INFO-RV-OT))			1	A
0F68h (3944)	0F69h (3945)	INFO action (Tripmeter information (INFO-TRIP))			1	A
0F6Ah (3946)	0F6Bh (3947)	INFO action (Odometer information (INFO-ODO))			1	A
0F70h (3952)	0F71h (3953)	INFO action (Encoder setting error information (INFO-ENC-E))			1	A
0F78h (3960)	0F79h (3961)	INFO action (Start operation restricted mode information (INFO-DSLMTD))			1	A
0F7Ah (3962)	0F7Bh (3963)	INFO action (I/O test mode information (INFO-IOTEST))			1	A
0F7Ch (3964)	0F7Dh (3965)	INFO action (Configuration request information (INFO-CFG))			1	A
0F7Eh (3966)	0F7Fh (3967)	INFO action (Reboot request information (INFO-RBT))			1	A

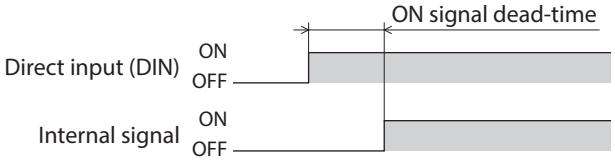
* It remains in the information history of the **MEXE02** software or RS-485 communication even if the "INFO action" parameter is set to "0: No info reflect (Only the bit output is ON.)."

10-4 (p6) I/O action and function parameters

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
0E00h (3584)	0E01h (3585)	STOP input action	Sets how to stop the motor when the STOP input is turned ON.	0: Immediate stop 3: Deceleration stop	3	A
0E02h (3586)	0E03h (3587)	FW-LS/RV-LS input action	Sets how to stop the motor when the FW-LS input or the RV-LS input is turned ON.	−1: Used as a return-to-home sensor 0: Immediate stop 1: Deceleration stop 2: Immediate stop with alarm 3: Deceleration stop with alarm	2	A
0E04h (3588)	0E05h (3589)	FW-BLK/RV-BLK input action	Sets how to stop the motor when the FW-BLK input or the RV-BLK input is turned ON.	0: Immediate stop 1: Deceleration stop	1	A
0E14h (3604)	0E15h (3605)	MOVE minimum ON time	Sets the minimum time during which the MOVE output remains ON.	0 to 255 ms	0	A
0E18h (3608)	0E19h (3609)	PLS-XMODE pulse multiplying factor	Sets the pulse magnification when the PLS-XMODE input is turned ON.	2 to 30 times	10	A
0E26h (3622)	0E27h (3623)	PLS-LOST check algorithm	This is enabled in pulse input operation. It is used to select whether to increment or decrement the count depending on the rotation direction when counting the number of invalid pulses. When "Signed" is selected, pulses in the forward direction are counted as positive values, and pulses in the reverse direction are counted as negative values.	0: Unsigned 1: Signed	0	A
0E80h (3712)	0E81h (3713)	AREA0 positive direction position/offset	• AREA positive direction position/offset Sets the positive direction position or offset from the target position for the AREA output. • AREA negative direction position/offset Sets the negative direction position or distance from the offset position for the AREA output.	−2,147,483,648 to 2,147,483,647 steps	0	A
0E82h (3714)	0E83h (3715)	AREA0 negative direction position/detection range			0	A
0E84h (3716)	0E85h (3717)	AREA1 positive direction position/offset			0	A
0E86h (3718)	0E87h (3719)	AREA1 negative direction position/detection range			0	A
0E88h (3720)	0E89h (3721)	AREA2 positive direction position/offset			0	A
0E8Ah (3722)	0E8Bh (3723)	AREA2 negative direction position/detection range			0	A
0EA0h (3744)	0EA1h (3745)	AREA0 range setting mode	Sets the range setting method for the AREA output.	0: Range setting with absolute value 1: Offset/width setting from the target position	0	A
0EA2h (3746)	0EA3h (3747)	AREA1 range setting mode			0	A
0EA4h (3748)	0EA5h (3749)	AREA2 range setting mode			0	A

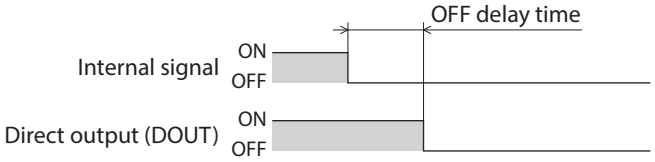
10-5 (p7) Direct-IN function selection (DIN) parameters

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
1080h (4224)	1081h (4225)	DIN0 input function	Selects an input signal to be assigned to DIN.	Input signal list ⇨p.86	9: P-PRESET	C
1082h (4226)	1083h (4227)	DIN1 input function			112: FCLOOP-DIS	C
1084h (4228)	1085h (4229)	DIN2 input function			2: AWO	C
10A0h (4256)	10A1h (4257)	DIN0 inverting mode	Changes the ON-OFF setting of DIN.	0: Non invert 1: Invert	0	C
10A2h (4258)	10A3h (4259)	DIN1 inverting mode			0	C
10A4h (4260)	10A5h (4261)	DIN2 inverting mode			0	C
1180h (4480)	1181h (4481)	DIN0 ON signal dead-time	Sets the ON signal dead-time of DIN.	0 to 250 ms	0	C
1182h (4482)	1183h (4483)	DIN1 ON signal dead-time			0	C
1184h (4484)	1185h (4485)	DIN2 ON signal dead-time			0	C



10-6 (p8) Direct-OUT function selection (DOUT) parameters

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
10C0h (4288)	10C1h (4289)	DOUT0 output function	Selects an output signal to be assigned to DOUT.	Output signal list ⇨p.87	130: ALM-B	C
10C2h (4290)	10C3h (4291)	DOUT1 output function			188: ENC-IN-POS	C
10C4h (4292)	10C5h (4293)	DOUT2 output function			157: TIM	C
10E0h (4320)	10E1h (4321)	DOUT0 inverting mode	Changes the ON-OFF setting of DOUT.	0: Non invert 1: Invert	0	C
10E2h (4322)	10E3h (4323)	DOUT1 inverting mode			0	C
10E4h (4324)	10E5h (4325)	DOUT2 inverting mode			0	C
11C0h (4544)	11C1h (4545)	DOUT0 OFF delay time	Sets the OFF delay time of DOUT.	0 to 250 ms	0	C
11C2h (4546)	11C3h (4547)	DOUT1 OFF delay time			0	C
11C4h (4548)	11C5h (4549)	DOUT2 OFF delay time			0	C

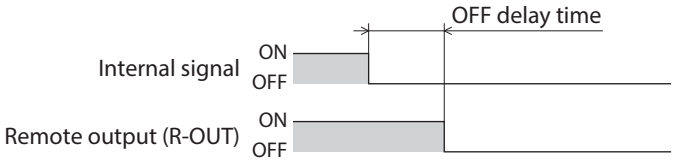


10-7 (p9) Remote-I/O function selection (R-I/O) parameters

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
1200h (4608)	1201h (4609)	R-IN0 input function	Selects the input signal to be assigned to remote I/O.	Input signal list ⇨p.86	64: M0	C
1202h (4610)	1203h (4611)	R-IN1 input function			65: M1	C
1204h (4612)	1205h (4613)	R-IN2 input function			66: M2	C
1206h (4614)	1207h (4615)	R-IN3 input function			32: START	C
1208h (4616)	1209h (4617)	R-IN4 input function			36: HOME	C
120Ah (4618)	120Bh (4619)	R-IN5 input function			5: STOP	C
120Ch (4620)	120Dh (4621)	R-IN6 input function			2: AWO	C
120Eh (4622)	120Fh (4623)	R-IN7 input function			8: ALM-RST	C
1210h (4624)	1211h (4625)	R-IN8 input function			112: FCLOOP-DIS	C
1212h (4626)	1213h (4627)	R-IN9 input function			0: No function	C

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
1214h (4628)	1215h (4629)	R-IN10 input function	Selects the input signal to be assigned to remote I/O.	Input signal list ⇨p.86	0: No function	C
1216h (4630)	1217h (4631)	R-IN11 input function			33: SSTART	C
1218h (4632)	1219h (4633)	R-IN12 input function			52: FW-JOG-P	C
121Ah (4634)	121Bh (4635)	R-IN13 input function			53: RV-JOG-P	C
121Ch (4636)	121Dh (4637)	R-IN14 input function			56: FW-POS	C
121Eh (4638)	121Fh (4639)	R-IN15 input function			57: RV-POS	C
1220h (4640)	1221h (4641)	R-OUT0 output function	Selects the output signal to be assigned to remote I/O.	Output signal list ⇨p.87	64: M0_R	C
1222h (4642)	1223h (4643)	R-OUT1 output function			65: M1_R	C
1224h (4644)	1225h (4645)	R-OUT2 output function			66: M2_R	C
1226h (4646)	1227h (4647)	R-OUT3 output function			32: START_R	C
1228h (4648)	1229h (4649)	R-OUT4 output function			144: HOME-END	C
122Ah (4650)	122Bh (4651)	R-OUT5 output function			132: READY	C
122Ch (4652)	122Dh (4653)	R-OUT6 output function			135: INFO	C
122Eh (4654)	122Fh (4655)	R-OUT7 output function			129: ALM-A	C
1230h (4656)	1231h (4657)	R-OUT8 output function			136: SYS-BSY	C
1232h (4658)	1233h (4659)	R-OUT9 output function			160: AREA0	C
1234h (4660)	1235h (4661)	R-OUT10 output function			161: AREA1	C
1236h (4662)	1237h (4663)	R-OUT11 output function			162: AREA2	C
1238h (4664)	1239h (4665)	R-OUT12 output function			157: TIM	C
123Ah (4666)	123Bh (4667)	R-OUT13 output function			134: MOVE	C
123Ch (4668)	123Dh (4669)	R-OUT14 output function			188: ENC-IN-POS	C
123Eh (4670)	123Fh (4671)	R-OUT15 output function			189: FCLOOP-MON	C
1260h (4704)	1261h (4705)	R-OUT0 OFF delay time	Sets the OFF delay time of remote I/O.	0 to 250 ms	0	C
1262h (4706)	1263h (4707)	R-OUT1 OFF delay time			0	C
1264h (4708)	1265h (4709)	R-OUT2 OFF delay time			0	C
1266h (4710)	1267h (4711)	R-OUT3 OFF delay time			0	C
1268h (4712)	1269h (4713)	R-OUT4 OFF delay time			0	C

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
126Ah (4714)	126Bh (4715)	R-OUT5 OFF delay time	Sets the OFF delay time of remote I/O.	0 to 250 ms	0	C
126Ch (4716)	126Dh (4717)	R-OUT6 OFF delay time			0	C
126Eh (4718)	126Fh (4719)	R-OUT7 OFF delay time			0	C
1270h (4720)	1271h (4721)	R-OUT8 OFF delay time			0	C
1272h (4722)	1273h (4723)	R-OUT9 OFF delay time			0	C
1274h (4724)	1275h (4725)	R-OUT10 OFF delay time			0	C
1276h (4726)	1277h (4727)	R-OUT11 OFF delay time			0	C
1278h (4728)	1279h (4729)	R-OUT12 OFF delay time			0	C
127Ah (4730)	127Bh (4731)	R-OUT13 OFF delay time			0	C
127Ch (4732)	127Dh (4733)	R-OUT14 OFF delay time			0	C
127Eh (4734)	127Fh (4735)	R-OUT15 OFF delay time			0	C



10-8 (p10) Communication & I/F function parameters

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
03E0h (992)	03E1 (993)	PULSE-I/F mode selection	Sets the pulse input mode.	–1: Disable 1: 2-pulse input mode 2: 1-pulse input mode	1	D
03E4h (996)	03E5h (997)	USB-ID enable	The COM port can be fixed. (⇨p.191)	0: Disable 1: Enable	1	D
03E6h (998)	03E7h (999)	USB-ID	This can be set when the "USB-ID enable" parameter is set to "1: Enable." Sets the ID to the COM port. (⇨p.191)	0 to 999,999,999	0	D
03EAh (1002)	03EBh (1003)	LED-OUT mode	Selects the function of the C-DAT/C-ERR LED.	–1: The LED is not lit 1: Functions as C-DAT/C-ERR LED	1	A
1300h (4864)	1301h (4865)	Indirect reference address setting (0)	Sets the ID of the data to be stored in the indirect reference address.	0 to FFFFh (0 to 65,535)	0	A
1302h (4866)	1303h (4867)	Indirect reference address setting (1)			0	A
1304h (4868)	1305h (4869)	Indirect reference address setting (2)			0	A
1306h (4870)	1307h (4871)	Indirect reference address setting (3)			0	A

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
1308h (4872)	1309h (4873)	Indirect reference address setting (4)	Sets the ID of the data to be stored in the indirect reference address.	0 to FFFFh (0 to 65,535)	0	A
130Ah (4874)	130Bh (4875)	Indirect reference address setting (5)			0	A
130Ch (4876)	130Dh (4877)	Indirect reference address setting (6)			0	A
130Eh (4878)	130Fh (4879)	Indirect reference address setting (7)			0	A
1310h (4880)	1311h (4881)	Indirect reference address setting (8)			0	A
1312h (4882)	1313h (4883)	Indirect reference address setting (9)			0	A
1314h (4884)	1315h (4885)	Indirect reference address setting (10)			0	A
1316h (4886)	1317h (4887)	Indirect reference address setting (11)			0	A
1318h (4888)	1319h (4889)	Indirect reference address setting (12)			0	A
131Ah (4890)	131Bh (4891)	Indirect reference address setting (13)			0	A
131Ch (4892)	131Dh (4893)	Indirect reference address setting (14)			0	A
131Eh (4894)	131Fh (4895)	Indirect reference address setting (15)			0	A
1320h (4896)	1321h (4897)	Indirect reference address setting (16)			0	A
1322h (4898)	1323h (4899)	Indirect reference address setting (17)			0	A
1324h (4900)	1325h (4901)	Indirect reference address setting (18)			0	A
1326h (4902)	1327h (4903)	Indirect reference address setting (19)			0	A
1328h (4904)	1329h (4905)	Indirect reference address setting (20)			0	A
132Ah (4906)	132Bh (4907)	Indirect reference address setting (21)			0	A
132Ch (4908)	132Dh (4909)	Indirect reference address setting (22)			0	A
132Eh (4910)	132Fh (4911)	Indirect reference address setting (23)			0	A
1330h (4912)	1331h (4913)	Indirect reference address setting (24)			0	A
1332h (4914)	1333h (4915)	Indirect reference address setting (25)			0	A
1334h (4916)	1335h (4917)	Indirect reference address setting (26)			0	A
1336h (4918)	1337h (4919)	Indirect reference address setting (27)			0	A
1338h (4920)	1339h (4921)	Indirect reference address setting (28)			0	A
133Ah (4922)	133Bh (4923)	Indirect reference address setting (29)			0	A
133Ch (4924)	133Dh (4925)	Indirect reference address setting (30)			0	A

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
133Eh (4926)	133Fh (4927)	Indirect reference address setting (31)	Sets the ID of the data to be stored in the indirect reference address.	0 to FFFFh (0 to 65,535)	0	A
1380h (4992)	1381h (4993)	Server address (Modbus)	Sets the address number (server address).	−1: The switch setting of the driver is followed 1 to 31: Address number (server address)* *Do not use 0.	−1	D
1382h (4994)	1383h (4995)	Baudrate (Modbus)	Sets the transmission rate.	0: 9,600 bps 1: 19,200 bps 2: 38,400 bps 3: 57,600 bps 4: 115,200 bps 5: 230,400 bps	4	D
1384h (4996)	1385h (4997)	Byte & word order (Modbus)	Sets the byte order of 32-bit data. Set when the arrangement of communication data is different from that of the host controller. (⇨ "Setting example of "Byte & word order (Modbus)" parameter" on p.191)	0: Even Address-High Word & Big-Endian 1: Even Address-Low Word & Big-Endian 2: Even Address-High Word & Little-Endian 3: Even Address-Low Word & Little-Endian	0	D
1386h (4998)	1387h (4999)	Communication parity (Modbus)	Sets the communication parity.	0: None 1: Even parity 2: Odd parity	1	D
1388h (5000)	1389h (5001)	Communication stop bit (Modbus)	Sets the communication stop bit.	0: 1 bit 1: 2 bits	0	D
138Ah (5002)	138Bh (5003)	Communication timeout (Modbus)	Sets the condition under which a communication timeout is generated.	0: Not monitored 1 to 10,000 ms	0	A
138Ch (5004)	138Dh (5005)	Communication error alarm (Modbus)	If the RS-485 communication error occurs for the set number of times, an alarm of RS-485 communication error is generated.	0: Disable 1 to 10 times	3	A
138Eh (5006)	138Fh (5007)	Transmission waiting time (Modbus)	Sets the transmission waiting time.	0 to 10,000 (1=0.1 ms)	30	D
1390h (5008)	1391h (5009)	Silent interval (Modbus)	Sets the silent interval.	0: Automatic 1 to 100 (1=0.1 ms)	0	D
1392h (5010)	1393h (5011)	Server error response mode (Modbus)	Sets the response when the server error occurred.	0: Normal response is returned 1: Exception response is returned	1	A
1394h (5012)	1395h (5013)	Initial group ID (Modbus)	Sets the address of a group (address number of parent server).* It is stored even if the main power supply is turned off.	−1: Disable (no group transmission) 1 to 31* *Do not use 0.	−1	C
13C0h (5056)	13C1h (5057)	(RS-485) Receive packet monitor	Selects the target for the RS-485 communication monitor of the **MEXE02** software.	0: All 1: Only own address	0	A
13F6h (5110)	13F7h (5111)	USB-PID	Sets the product ID to be displayed in the COM port. (⇨ p.192)	0 to 31	0	D

■ Setting example of "Byte & word order (Modbus)" parameter

When 32-bit data "1234 5678h" is stored in the register address 1000h and 1001h, the arrangement changes to the following according to the setting of the parameter.

Setting of parameter	1000h (even number address)		1001h (odd number address)	
	Upper	Lower	Upper	Lower
0: Even Address-High Word & Big-Endian	12h	34h	56h	78h
1: Even Address-Low Word & Big-Endian	56h	78h	12h	34h
2: Even Address-High Word & Little-Endian	34h	12h	78h	56h
3: Even Address-Low Word & Little-Endian	78h	56h	34h	12h

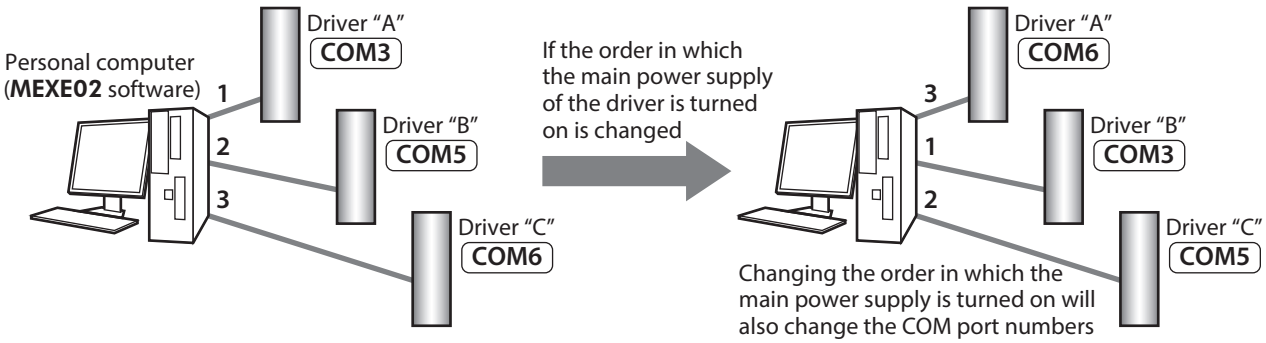
memo This manual describes based on "0: Even Address-High Word & Big-Endian."

■ USB-ID

The USB-ID is a parameter to associate the USB port (COM port number) of a PC with the driver. The COM port number is used when setting the communication port with the **MEXE02** software.
If multiple drivers are connected to a PC, the PC assigns empty COM ports to the drivers in the order they are connected. If the main power supply of the driver is turned on again, or if the UBS cable is disconnected and reconnected, the assigned COM port numbers may change because the order in which the connection is recognized by the PC is changed.

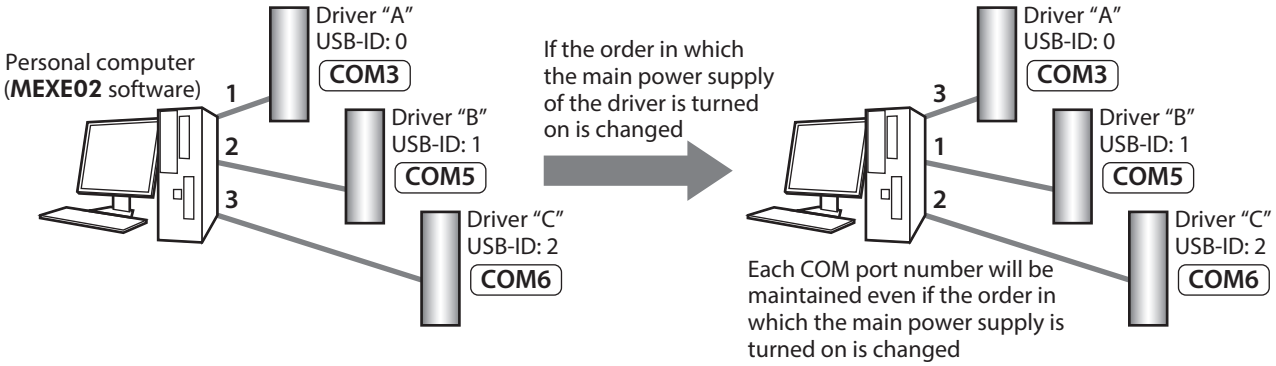
- **When the USB-ID is not set**

COM port number	Connection status	
1	Connected	
2	Connected	
3	Empty	← COM port on the driver that the main power supply was turned on first
4	Connected	
5	Empty	← COM port on the driver that the main power supply was turned on second
6	Empty	← COM port on the driver that the main power supply was turned on third



● **When the USB-ID is set**

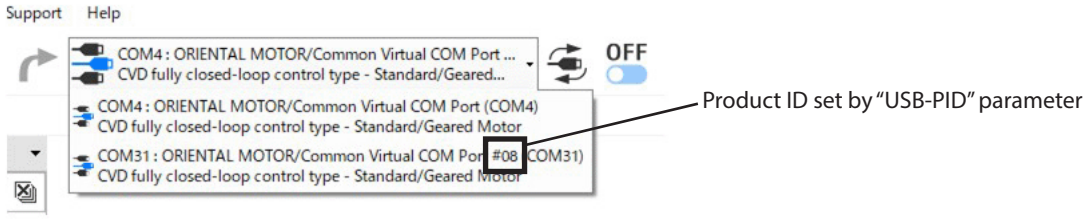
If the "USB-ID" parameter is set, the same COM port numbers are always displayed regardless of the order of connection because the COM port number is fixed to each driver. (The USB-ID and the COM port number may not match because a PC assigns empty COM port numbers in descending order.)



Note The COM port number set with the "USB-ID" parameter is disabled if the PC is changed.

■ USB-PID

Although the USB-ID can fix the COM port number to each driver, changing the PC will also change and disable the COM port numbers.
Meanwhile, the USB-PID is a parameter to set an ID number to the driver itself. Even if the PC or the COM port number is changed, the product can be easily identified using the **MEXE02** software because the ID number of the driver does not change.



memo If the USB-PID with the same number is set to multiple drivers, the COM port numbers are assigned in the order they are connected.

10-9 (p11) Encoder settings parameters

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
0E36h (3638)	0E37h (3639)	Fully closed-loop correction enable	Enables the correction by the fully closed-loop control.	0: Disable 1: Enable	1	A
0E38h (3640)	0E39h (3641)	Encoder type	Selects the type of the encoder to be connected.	0: Linear 1: Rotary	0	C
0E3Ah (3642)	0E3Bh (3643)	Encoder count action	Selects the action when ENC-A+ is turned from OFF to ON while ENC-B+ is OFF.	0: Counting down 1: Counting up	1	C
0E3Ch (3644)	0E3Dh (3645)	Basic step angle	Sets the basic step angle of the motor to be used.	1: 0.72° (Standard type) 2: 0.36° (High resolution type)	1	C
0E40h (3648)	0E41h (3649)	Linear encoder resolution	Sets the resolution of the linear encoder.	1 to 50,000 nm	100	C
0E42h (3650)	0E43h (3651)	Mechanism lead	Sets the mechanism lead to be assembled to the motor.	1 to 500 (1=0.1 mm)	10	C

Register address		Name	Description	Setting range	Initial value	Update
Upper	Lower					
0E46h (3654)	0E47h (3655)	Rotary encoder resolution	Sets the resolution of the rotary encoder.	100 to 16,777,215 P/R	10,000	C
0E48h (3656)	0E49h (3657)	Gear ratio	Sets the gear ratio when using a gear reduction mechanism.	10 to 10,000 (1=0.1)	10	C
0E4Ch (3660)	0E4Dh (3661)	In-position delay time	Sets the time from when the position deviation enters the in-position range to when the ENC-IN-POS output is turned ON, based on the encoder position information.	0 to 1,000 ms	10	A
0E4Eh (3662)	0E4Fh (3663)	In-position range	Sets the allowable range of the position deviation based on the feedback position.	0 to 100,000 cnt	5	A
0E50h (3664)	0E51h (3665)	Correction operation waiting time	Sets the time from the stop at the command position to the start of the correction operation by the fully closed-loop control. Set a value that is longer than or equal to the settling time for the residual vibration to end after the stop.	0 to 10,000 ms	10	A
0E52h (3666)	0E53h (3667)	Fully closed-loop mode	Selects whether to enable or disable the fully closed-loop correction according to the FCLOOP-DIS input when the "Fully closed-loop correction enable" parameter is set to "1: Enable."	0: Follow FCLOOP-DIS input 1: FCLOOP-DIS input disable	0	A
0E54h (3668)	0E55h (3669)	Correction speed gain	Sets the speed when the fully closed-loop correction is performed.	1 to 1,000 (1=0.1)	10	A
0E5Eh (3678)	0E5Fh (3679)	Encoder excessive position deviation alarm	Sets the condition under which the excessive position deviation alarm based on the encoder is generated.	0: Disable 1 to 1,000 (1=0.01 rev)	300	C
0E60h (3680)	0E61h (3681)	Encoder correction timeout	Sets the correction timeout period by the encoder.	0: Disable 1 to 10,000 ms	3,000	A
0E64h (3684)	0E65h (3685)	Multiplication number	Sets the multiplication number used as the basis for the feedback position.	0: ×1 multiplication 1: ×2 multiplication 2: ×4 multiplication	2	D
0E66h (3686)	0E67h (3687)	Correction upper limit	Sets the upper limit of the correction amount when the fully closed-loop correction is performed.	1 to 100 (1=0.01 rev)	1	A
0E68h (3688)	0E69h (3689)	Automatic position preset enable	Sets whether or not to automatically execute the position preset after the main power supply is turned on and the motor is excited for the first time.	0: Disable 1: Enable	0	D
0E6Ah (3690)	0E6Bh (3691)	Automatic position preset waiting time	Sets the waiting time from when the main power supply is turned on and the motor is excited for the first time until the position preset is automatically executed.	100 to 1,000 ms	100	A

7 Other functions

◆Table of contents

1 Vibration suppression

1-1 LPF (speed filter) and moving average filter

Using the command filter to adjust the motor response can suppress motor vibration.
There are two types of command filters, LPF (speed filter) and moving average filter.

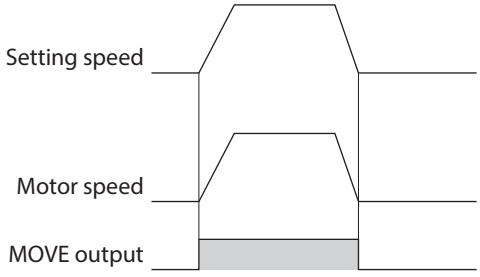
Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p3	Command filter setting	Sets the filter function to adjust the motor response.	1: LPF (Speed filter) 2: Moving average filter	1
	Command filter time constant	Adjusts the motor response.	0 to 200 ms	1

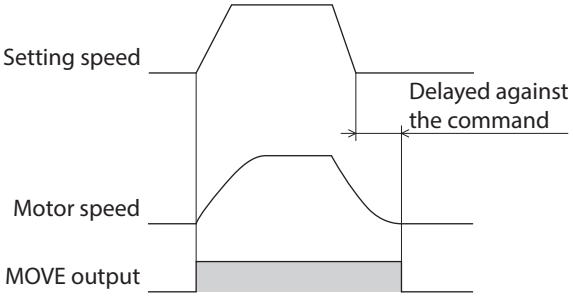
■ LPF (Speed filter)

Select "1: LPF (speed filter)" with the "Command filter setting" parameter and set the "Command filter time constant" parameter.
Increasing the value in the "Command filter time constant" parameter can suppress motor vibration during low-speed operation and make the motor movement smoother when starting/stopping. However, setting it too high will reduce synchronization performance in response to the command. Set an appropriate value according to a load or an application.

- When the "Command filter time constant" parameter is set to 0 ms

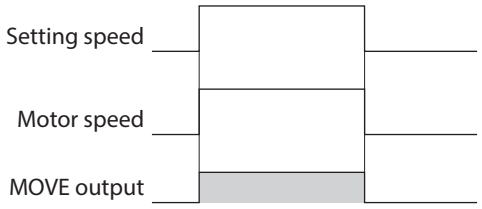
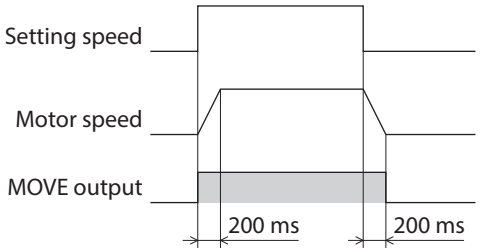
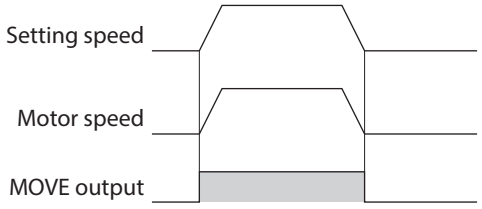
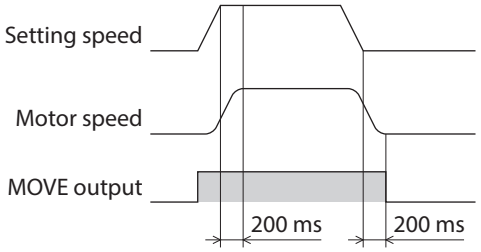


- When the "Command filter time constant" parameter is set to 200 ms



■ Moving average filter

Select "2: Moving average filter" with the "Command filter setting" parameter and set the "Command filter time constant" parameter.
The positioning time can be shortened by suppressing the residual vibration during positioning operation.
The optimal value for the "Command filter time constant" parameter varies depending on a load or operating condition. Set an appropriate value according to a load or operating condition.

	When the "Command filter time constant" parameter is set to 0 ms	When the "Command filter time constant" parameter is set to 200 ms
Self-start (rectangular) drive		
Trapezoidal drive		

1-2 Smooth drive function

Using the smooth drive function can suppress the motor vibration.
If the smooth drive function is not used (when set to "0: Disable"), vibration may be increased at low speeds. Normally set this to "1: Enable."

Related parameter

MEXE02 code	Name	Description	Setting range	Initial value
p3	Smooth drive function	Enables the smooth drive function.	0: Disable 1: Enable	1

2 Heat generation suppression

2-1 Automatic current cutback function

The automatic current cutback function is a method of suppressing motor heat generation by automatically reducing the motor current to the stop current when the motor stops. When operation is resumed, the current automatically increases to the operating current.

Related parameter

MEXE02 code	Name	Description	Setting range	Initial value
p3	Automatic current cutback switching time	Sets a period of time from when the motor stops to when the automatic current cutback function is activated.	0 to 1,000 ms	100

3 LED indicators of driver

Various driver status can be checked by the lighting state or the number of blinks of LEDs on the driver.

3-1 LED lighting status

■ PWR/ALM LED (LED1)

The status of the driver can be checked.

Green	Red	Description
No light	No light	The main power is not supplied.
Light	No light	The main power is supplied.
–	Blinking	An alarm is being generated. The alarm item generated can be checked by counting the number of times the LED blinks. The LED is lit in green when the alarm is reset.
At the same time, two times blinking		• Information is being generated. Green and red colors may overlap and it may be visible to orange. The LED is lit in green when the information is cleared. • Teaching, remote operation is being executed with the **MEXE02** software. Green and red colors may overlap and it may be visible to orange. The LED is lit in green when teaching, remote operation is completed.

■ C-DAT/C-ERR LED (LED2)

The status of RS-485 communication can be checked.

Green	Red	Description
Light/blinking	–	The driver communicates with the client properly via RS-485 communication.
–	Light	An error occurs in communication with the client via RS-485 communication. The LED is lit or blink in green when the communication status returns to normal.

3-2 Changing the lighting conditions of LED

Related parameter

MEXE02 code	Name	Description	Setting range	Initial value
p10	LED-OUT mode	Selects the function of the C-DAT/C-ERR LED.	–1: The LED is not lit 1: Functions as C-DAT/C-ERR LED	1

4 Using general signals

The R0 to R7 inputs are general-purpose signals. Using the R0 to R7 inputs, I/O signals of the external device can be controlled by the host controller via the driver. Direct I/O of the driver can be used as an I/O module.

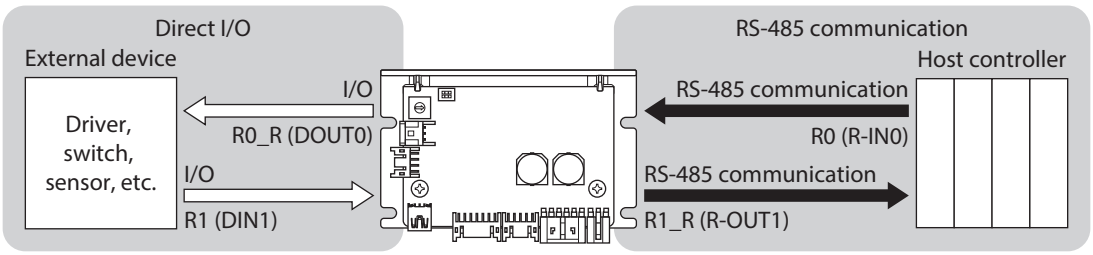
■ Example of use for general signals

- **When signals are output from the host controller to the external device**

  Assign the R0 input to the DOUT0 output and R-IN0.
  The DOUT0 output is turned ON when R-IN0 is set to 1, and the DOUT0 output is turned OFF when R-IN0 is set to 0.

- **When signals output from the external device are input to the host controller**

  Assigns the R1 input to the DIN1 input and R-OUT1.
  R-OUT1 changes to 1 when the DIN1 input is turned ON by the external device, and R-OUT1 changes to 0 when the DIN1 input is turned OFF. The ON-OFF status of the DIN1 input can be set using the "DIN1 inverting mode" parameter.



Related parameters

MEXE02 code	Name	Description	Setting range	Initial value
p7	DIN0 input function	Selects an input signal to be assigned to DIN.	Input signal list ⇨p.86	9: P-PRESET
	DIN1 input function			112: FCLOOP-DIS
	DIN2 input function			2: AWO
	DIN0 inverting mode	Changes the ON-OFF setting of DIN.	0: Non invert 1: Invert	0
	DIN1 inverting mode			0
	DIN2 inverting mode			0
p8	DOUT0 output function	Selects an output signal to be assigned to DOUT.	Output signal list ⇨p.87	130: ALM-B
	DOUT1 output function			188: ENC-IN-POS
	DOUT2 output function			157: TIM
	DOUT0 inverting mode	Changes the ON-OFF setting of DOUT.	0: Non invert 1: Invert	0
	DOUT1 inverting mode			0
	DOUT2 inverting mode			0
p9	R-IN0 input function	Selects the input signal to be assigned to remote I/O.	Input signal list ⇨p.86	64: M0
	R-IN1 input function			65: M1
	R-IN2 input function			66: M2
	R-IN3 input function			32: START
	R-IN4 input function			36: HOME
	R-IN5 input function			5: STOP
	R-IN6 input function			2: AWO
	R-IN7 input function			8: ALM-RST
	R-IN8 input function			112: FCLOOP-DIS
	R-IN9 input function			0: No function
	R-IN10 input function			0: No function
	R-IN11 input function			33: SSTART
	R-IN12 input function			52: FW-JOG-P

MEXE02 code	Name	Description	Setting range	Initial value
p9	R-IN13 input function	Selects the input signal to be assigned to remote I/O.	Input signal list ⇨p.86	53: RV-JOG-P
	R-IN14 input function			56: FW-POS
	R-IN15 input function			57: RV-POS
	R-OUT0 output function	Selects the output signal to be assigned to remote I/O.	Output signal list ⇨p.87	64: M0_R
	R-OUT1 output function			65: M1_R
	R-OUT2 output function			66: M2_R
	R-OUT3 output function			32: START_R
	R-OUT4 output function			144: HOME-END
	R-OUT5 output function			132: READY
	R-OUT6 output function			135: INFO
	R-OUT7 output function			129: ALM-A
	R-OUT8 output function			136: SYS-BSY
	R-OUT9 output function			160: AREA0
	R-OUT10 output function			161: AREA1
	R-OUT11 output function			162: AREA2
	R-OUT12 output function			157: TIM
	R-OUT13 output function			134: MOVE
	R-OUT14 output function			188: ENC-IN-POS
	R-OUT15 output function			189: FCLOOP-MON

5 Useful for equipment maintenance

The various functions of the driver are also useful for equipment maintenance.

5-1 Tripmeter and Odometer

The total amount of rotation and the cumulative amount of rotation of the motor stored in the driver can be used for equipment maintenance.
Check the values of the tripmeter (total amount of rotation) and odometer (cumulative amount of rotation) using the **MEXE02** software or via RS-485communication. If the information is set based on these values, appropriate maintenance can be performed according to the rotation amount of the motor.

- **Related monitors**

MEXE02 code	Name	Description
m3	Odometer	Indicates the cumulative amount of rotation of the motor output shaft stored in the driver. This cannot be cleared on the customer side. (1=0.1 kRev)
	Tripmeter	Indicates the total amount of rotation of the motor output shaft stored in the driver. This can be cleared on the customer side. (1=0.1 kRev)

Note Data in the tripmeter and odometer is stored in non-volatile memory of the driver at one-minute intervals. If the main power supply is turned off before the data is saved in the driver, the rotation amount for one minute will not be reflected.

memo The tripmeter can be reset after maintenance of the equipment. Execute the "Clear tripmeter" of the maintenance command.

- **Related parameters**

MEXE02 code	Name	Description	Setting range	Initial value
p5	Tripmeter information (INFO-TRIP)	Sets the condition under which the information is generated.	0: Disable 1 to 2,147,483,647 (1=0.1 kRev)	0
	Odometer information (INFO-ODO)			0

5-2 Latch function

The latch function is a function that saves the instantaneous operation information in the driver when the operation is stopped. A trigger to generate a latch is called a "latch trigger." The operation information saved by the latch function is maintained until it is cleared. The latched operation information can be used for the maintenance of the equipment and for the checking the operating situation.

■ Information to be latched

Command position	Command position when the latch trigger is generated.
Target position	Target position in the stopped operation
Operation data number	Operation data number when latched.
Number of loop times	When latched while performing loop operation or the extended loop function, the number of loop times when latched is saved.

memo All operation information having latched is cleared if the main power supply is turned on again.

■ Timing of latch

- When operation is stopped by the AWO input or the STOP input.
- When operation is stopped by software overtravel or hardware overtravel.
- When operation was stopped by alarm generation.
- When operation is stopped by the FW-BLK input while operation in the forward direction is executed.
- When operation is stopped by the RV-BLK input while operation in the reverse direction is executed.

memo Positioning SD operation, return-to-home operation, macro operation, and direct data operation are latched by operation stop.

■ Related I/O signals

● **LAT-CLR input (⇨p.99)**

If the LAT-CLR input is turned ON, the latch status is cleared, and operation information can be overwritten.

■ Monitor of operation information

The operation information latched can be checked by the event monitor or the latch monitor.
Check the monitor value via RS-485 communication. It cannot be checked with the **MEXE02** software.

● **Event monitor**

The command position is saved in the event monitor. The value is overwritten each time the event trigger is generated.
When the LAT-CLR input is turned ON, the value of the "Event monitor command position (STOP)" command is cleared to zero.

● **Latch monitor**

The following operation information is saved in the latch monitor. A value that was latched the first time will continue to be stored.
When the LAT-CLR input is turned ON, the value in the "Latch monitor status (STOP)" command is cleared to zero and the following operation information can be overwritten.

- Command position
- Target position
- Operation data number
- Number of loop times

memo When the value in the "Latch monitor status (STOP)" command is 1 (in the latch status), the operation information will not be overwritten even if a latch trigger is generated.

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