Oriental motor

HM-60391

Drivers for 2-Phase, 5-Phase Stepping Motors

CVD Series

RS-485 communication type

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.

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

4 Register address lists

5 Measures for various cases

Related operating manuals

For operating manuals not included with the product, contact your nearest Oriental Motor sales office or download from Oriental Motor Website Download Page.
Also read the operating manual of the motor used in combination with a driver.

Operating manual name	Included or not included with product
CVD Series RS-485 communication type OPERATING MANUAL Driver Edition	Included
CVD Series RS-485 communication type USER MANUAL	Not included
CVD Series RS-485 communication type OPERATING MANUAL Function Edition (this document)	Not included

How to read this manual

■ Note the following:

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

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

- **The setting unit may vary depending on the application such as the MEXE02.**

  Note the setting unit when setting operation data and parameters. This manual uses a setting unit "step" for explanation.

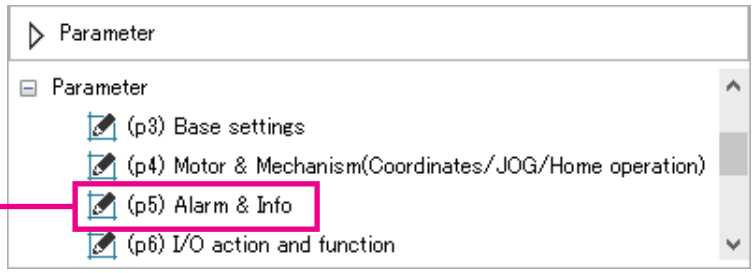
- **Description in both decimal and hexadecimal numbers**

  In this manual, 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 is described

When the screen display of the **MEXE02** with software version 4 is described, it may be indicated using a number such as "(p5)" described in front of the parameter type.

Example of description



MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p5	035Eh (862)	035Fh (863)	Tripmeter information (INFO-TRIP)	Sets the generation condition of the tripmeter information (INFO-TRIP). **[Setting range]** 0 (disable), 1 to 2,147,483,647 (1=0.1 kRev)	0

10-3 (p5) Alarm & Info parameters

Register address		Item	Description	Initial value	Update
Upper	Lower				
0340h (832)	0341h (833)	Driver temperature information (INFO-DRVTMP)	Sets the generation condition of the driver temperature information (INFO-DRVTMP). **[Setting range]** 40 to 85 °C	85	A

1 Operation

This part explains the operation functions and parameters.

◆Table of contents

1 Setting of resolution

A desired resolution per revolution of the motor output shaft can be set using parameters.

Initial value **Drivers for 2-phase stepping motors: 200 P/R (step angle 1.8°)**
Drivers for 5-phase stepping motors: 500 P/R (step angle 0.72°)

- **Related parameters**

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p4	039Ch (924)	039Dh (925)	Base resolution setting	Sets the resolution in combination with the "Resolution [Base resolution: 200 P/R | 500 P/R]" parameter. Refer to table next for resolutions that can be set. **[Setting range]** –1: Depending on the driver product name * 0: 200 P/R 1: 500 P/R	–1
	039Eh (926)	039Fh (927)	Resolution [Base resolution: 200 P/R | 500 P/R]	Set the resolution in combination with the "Base resolution setting" parameter. Refer to table next for resolutions that can be set. **[Setting range]** 0 to 15	0

* 200 P/R: Driver model started with **CVD2**
500 P/R: Driver model started with **CVD5**

- **Resolution list**

"Resolution [Base resolution: 200 P/R | 500 P/R]" parameter	"Base resolution setting" parameter			
	200 P/R (2-phase)		500 P/R (5-phase)	
	Resolution (P/R)	Step angle	Resolution (P/R)	Step angle
0	200	1.8°	500	0.72°
1	400	0.9°	1,000	0.36°
2	800	0.45°	1,250	0.288°
3	1,000	0.36°	2,000	0.18°
4	1,600	0.225°	2,500	0.144°
5	2,000	0.18°	4,000	0.09°
6	3,200	0.1125°	5,000	0.072°
7	5,000	0.072°	10,000	0.036°
8	6,400	0.05625°	12,500	0.0288°
9	10,000	0.036°	20,000	0.018°
10	12,800	0.028125°	25,000	0.0144°
11	20,000	0.018°	40,000	0.009°
12	25,000	0.0144°	50,000	0.0072°
13	25,600	0.0140625°	62,500	0.00576°
14	50,000	0.0072°	100,000	0.0036°
15	51,200	0.00703125°	125,000	0.00288°

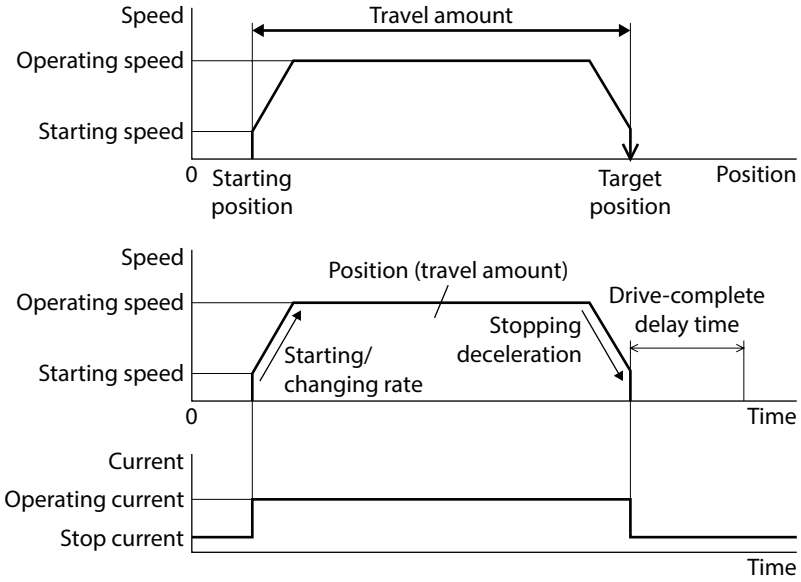
memo
- Step angles are theoretical values.
- The actual step angle for the geared type is calculated by the formula: step angle divided by gear ratio.
- Compared with the standard type, the resolution and the step angle of the high-resolution type are twice and one-half, respectively.

2 Positioning SD (stored data) operation

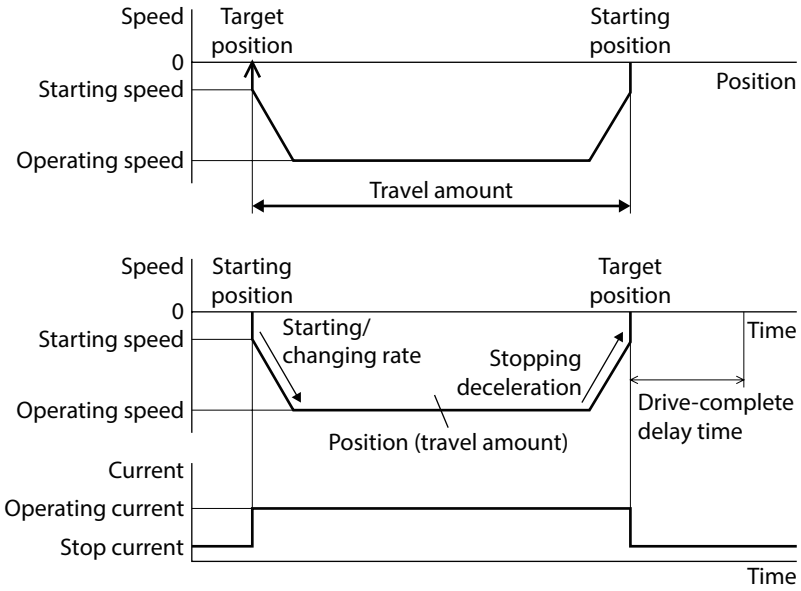
Positioning SD operation is an operation executed by setting the motor operating speed, position (travel amount) and other items as operation data. When positioning SD operation is executed, the motor is started running at the starting speed and accelerates until the operating speed is reached. Once the operating speed is reached, that speed is maintained. Then the motor decelerates when the target position approaches, and finally comes to a stop.

2-1 Operation

- **When start position < target position (operation in forward direction)**



- **When start position > 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 depends on the setting of "Position" of operation data.
  When a positive value is set, the motor rotates in the forward direction. When a negative value is set, it rotates in the reverse direction.
- When a negative value is set to "Speed" of operation data, it is considered to be a speed of absolute value.

2-2 Setting of operation data

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

● **Related operation data**

MEXE02 code	Item	Description	Setting range	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 absolute operating speed. For continuous operation, when a positive value is set, the motor rotates in the forward direction. When a negative value is set, it rotates in the reverse direction.	−4,000,000 to 4,000,000 Hz	1,000
	Starting/changing rate	Sets the acceleration/deceleration rate (acceleration/deceleration time) for start and change of the speed.	1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000
	Stopping deceleration	Sets the deceleration rate (deceleration time) for stop.	1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	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.	−256: Stop −2: +2 −1: +1 0 to 255: Operation data number	−1
	Loop count	Sets the number of loop times.	0: − (no loop) 2 to 255: Loop 2{ to loop 255{ (number of loop times)	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: }L-End (loop end point)	0

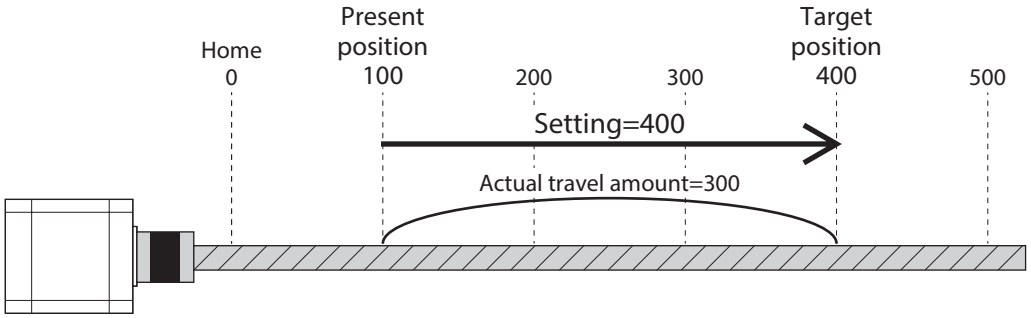
■ Operation type, position

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.

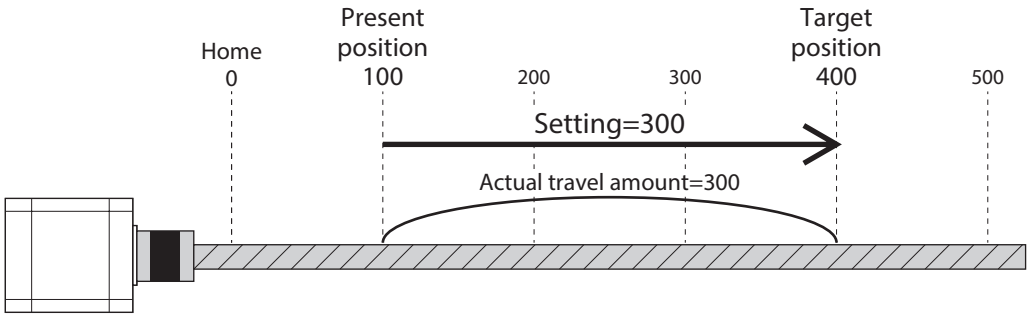
  Example: Setting to move from the present position "100" to the target position "400"



- **Incremental positioning**

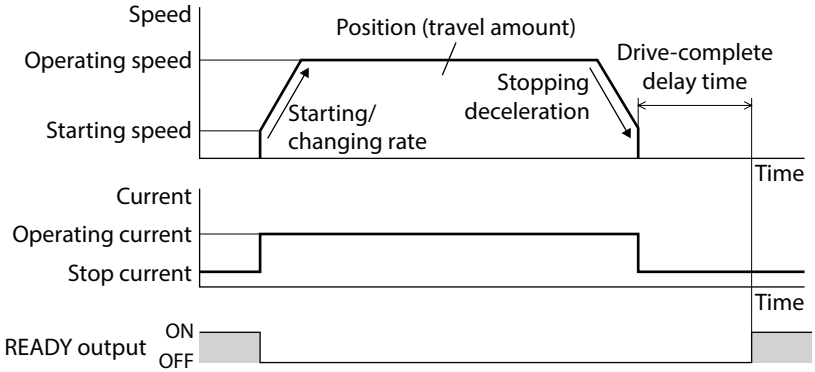
  Positioning operation with the set travel amount is performed from the present command position. Set the target position by using the position to which the motor has moved as a start point of the next movement. It is suitable for operation in which the same travel amount is repeatedly used.

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

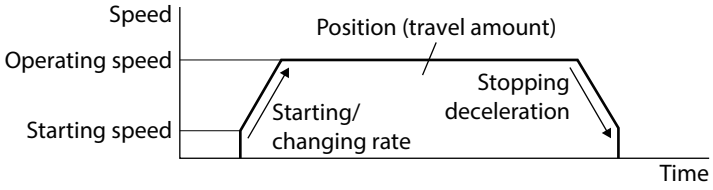


■ Speed, Starting/changing rate, Stopping deceleration, Operating current, Drive-complete delay time

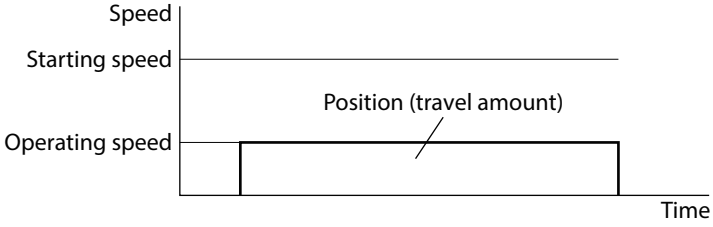
Set the speed, starting/changing rate, stopping deceleration, operating current, and drive-complete delay time required for positioning SD operation.



- **When starting speed < operating speed**



- **When operating speed ≤ starting speed**



■ Link, Next data number

For details about link, refer to p.18. (⇨"2-5 Mode for link operation of operation data" on p.18)

- **No Link**

  Executes operation once with one operation data number. (single-motion operation)

- **Manual sequential**

  Executes operation of the operation data number set in "Next data number" every time the SSTART input is input. The SSTART input is enabled when the READY output is being ON.

- **Automatic sequential**

  Starts operation of the operation data number set in "Next data number" automatically after stop for the time set in "Drive-complete delay time."

- **Continuous sequential operation**

  Executes operation of the operation data number set in "Next data number" continuously without stopping the motor.

■ Loop count, Loop offset, Loop end number

When you set loop count, loop offset, loop end number, the loop function is enabled. (⇨"Loop function" on p.26)

2-3 Selection of operation data number

There are two methods to select the operation data number to be started as shown below.

- Selection by NET selection number
- Selection using the M0 to M7 inputs

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

- **NET selection number**

  The NET selection number is used to set the operation data number via the remote I/O.
  If an operation data number other than 0 to 255 is set, the NET selection number is disabled, and selection using the M0 to M7 inputs is enabled.

● **Selection using the M0 to M7 inputs**

This is a method in which a desired operation data number is selected by a combination of 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 Types of positioning SD operation

■ Absolute positioning

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

● **Related parameter**

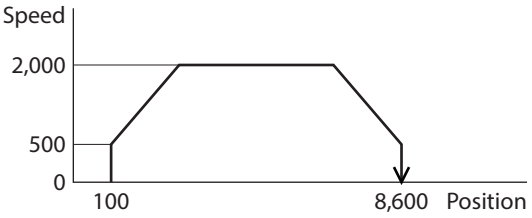
MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p3	0290h (656)	0291h (657)	Permission of absolute positioning without setting absolute coordinates	Permits absolute positioning operation when the position coordinate is not set. **[Setting range]** 0: Disable 1: Enable	1

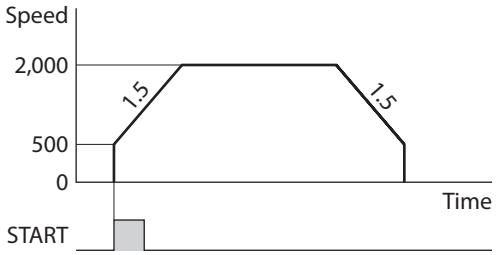
● **Usage example:**
When the motor is operated from the command position 100 to the target position 8,600

Setting of operation data

No.	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)

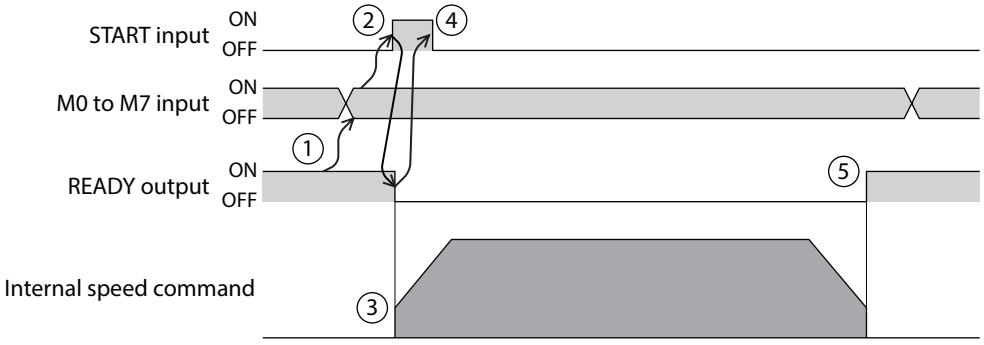
Operation image



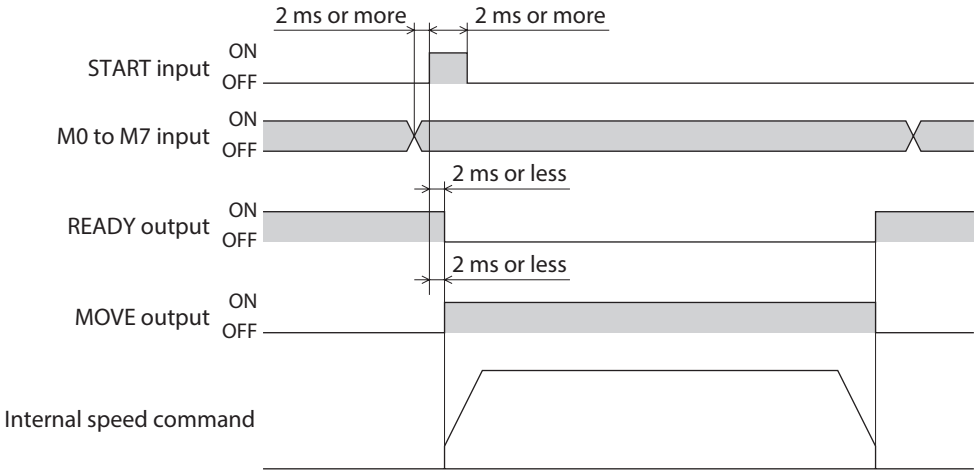


Operation method

1. Check that the READY output is 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 operation.
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)

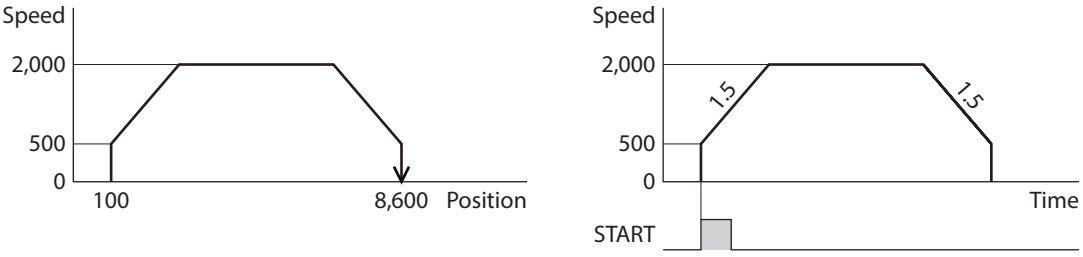
Set the travel amount from the present command position to the target position.

- **Usage example:**
  When the motor is operated from the command position 100 to the target position 8,600

Setting of operation data

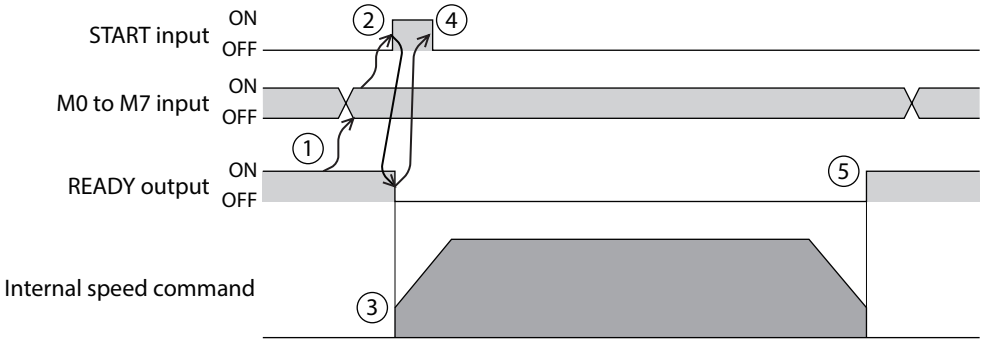
No.	Operation type	Position [step]	Speed [Hz]	Starting/changing rate [kHz/s]	Stopping deceleration [kHz/s]
0	2: Incremental positioning (based on command position)	8,500	2,000	1,500 (1=0.001)	1,500 (1=0.001)

Operation image

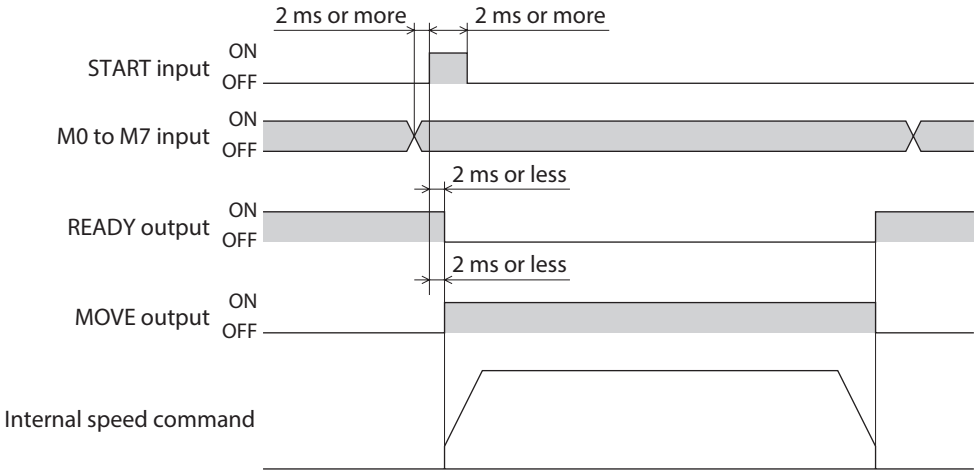


Operation method

1. Check that the READY output is 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 operation.
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 Mode for link operation of operation data

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

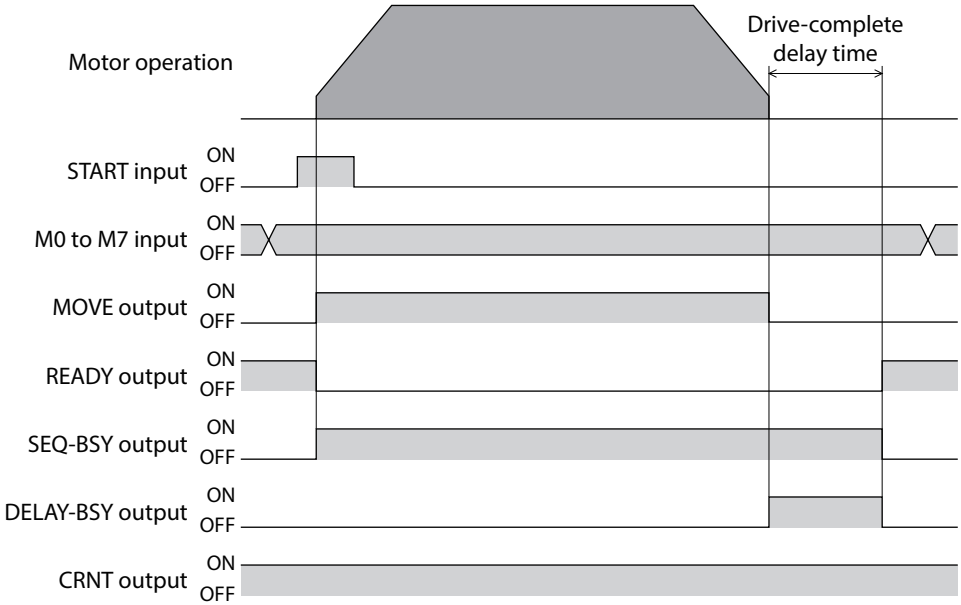
Related operation data

MEXE02 code	Item	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.	−256: Stop −2: +2 −1: +1 0 to 255: Operation data number	−1

■ No link (single-motion operation)

Operation is executed once with one operation data number.

Timing chart



■ Manual sequential operation

Operation of the operation data number set in "Next data number" is executed whenever the SSTART input is turned ON. This method is convenient when multiple positioning operations must be executed sequentially, because there is no need to repeatedly select each operation data number.

memo

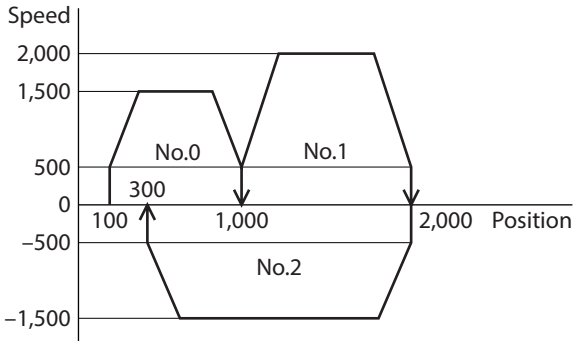
- In the case of the operation data number in which the manual sequential operation is set, the SEQ-BSY output is not turned OFF even if the operation is completed. (manual sequential waiting status) Operation of the operation data number set in "Next data number" is executed when the SSTART input is turned ON in this status.
- Operation of the operation data number currently selected is executed when the SSTART input is turned ON while the SEQ-BSY output is being OFF.

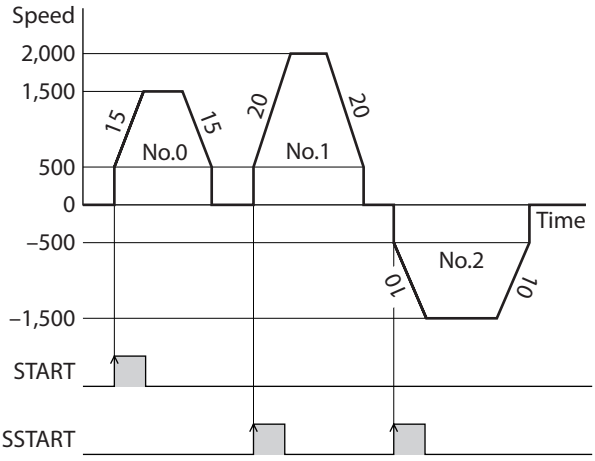
● Usage example: When positioning operation is performed for multiple coordinates at an arbitrary timing

Setting of operation data

No.	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

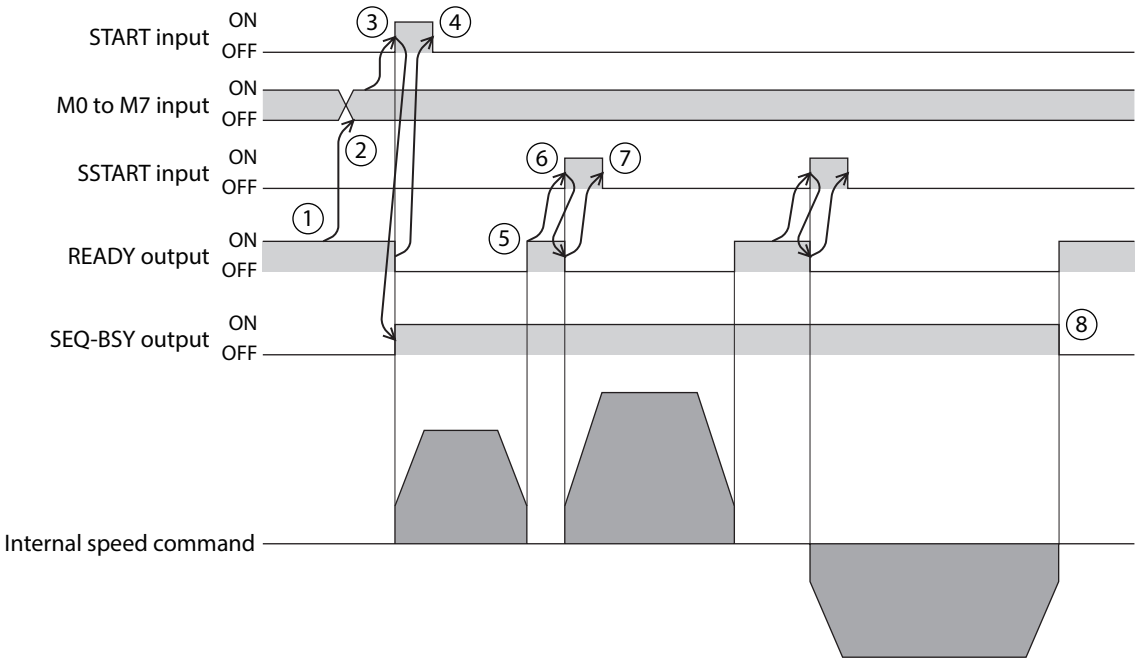
Operation image



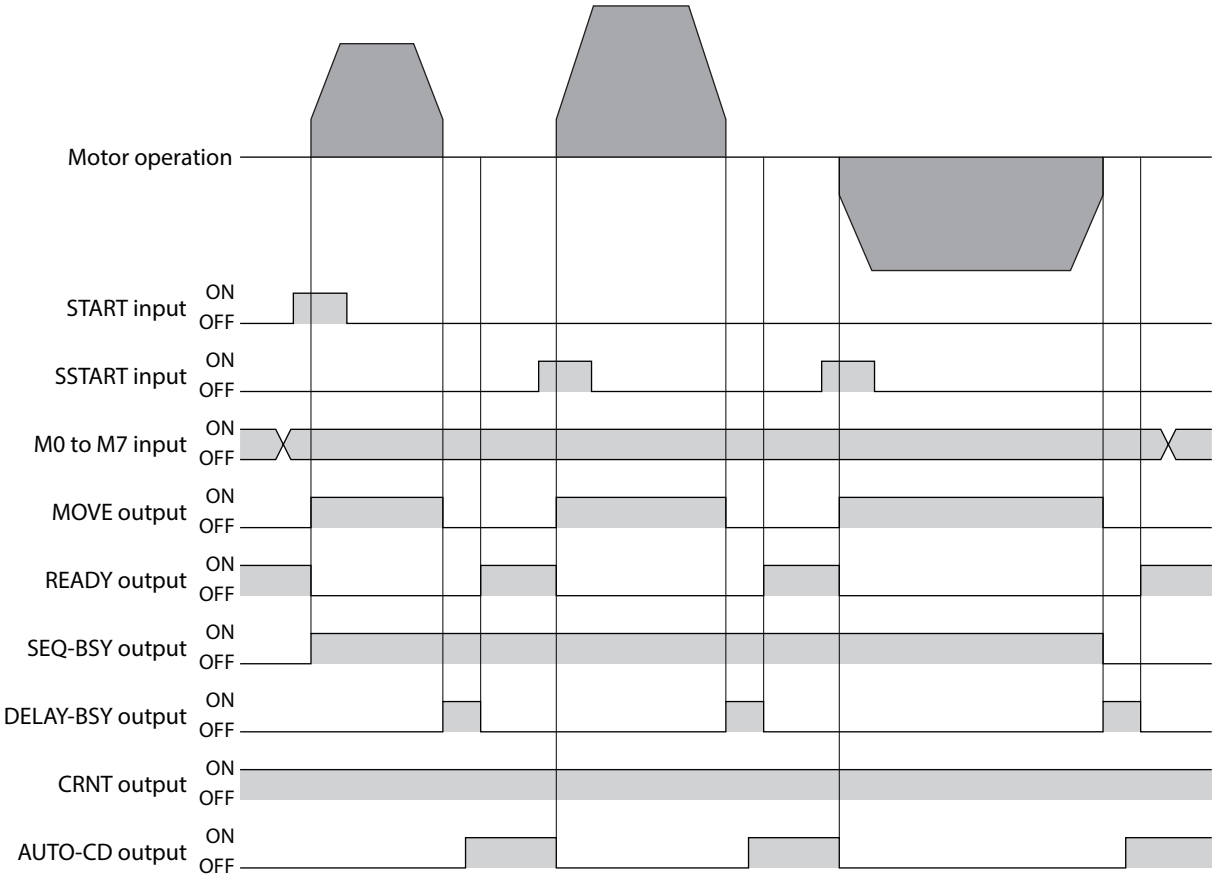


Operation method

1. Check that the READY output is 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, and the SEQ-BSY output is turned ON. Then, the motor starts operation.
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.
   The operation of the operation data number linked in "1: Manual sequential" is started.
7. Check that the READY output has been turned OFF and turn the SSTART input OFF.
8. When all the operations linked are completed, the SEQ-BSY output is turned OFF, and the READY output is turned ON.



Timing chart



■ Automatic sequential operation

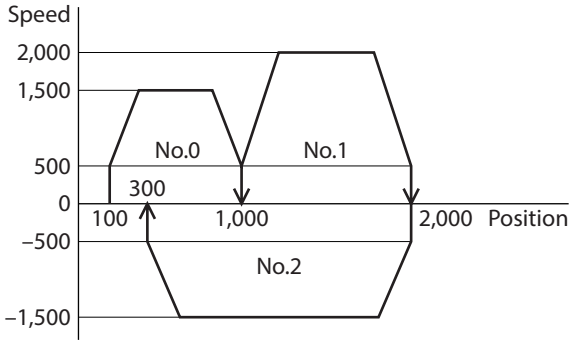
More than one operation are executed automatically and sequentially. After one operation is completed, operation of the operation data number set in "Next data number" is started after stop for the time set in "Drive-complete delay time." If operation data includes data for which "0: No link" is set, the motor is stopped after the positioning SD operation with respect to the "0: No link" operation data is completed.

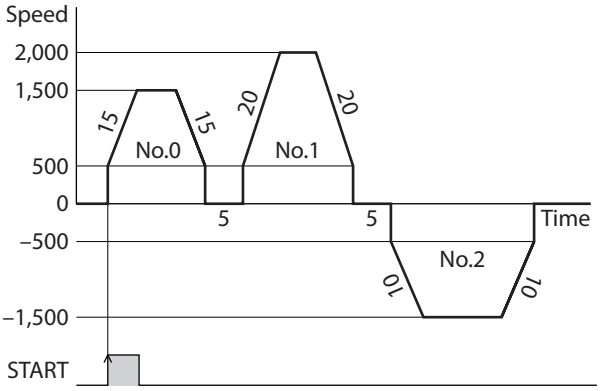
● **Usage example: When positioning operation is performed automatically for multiple coordinates**

Setting of operation data

No.	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

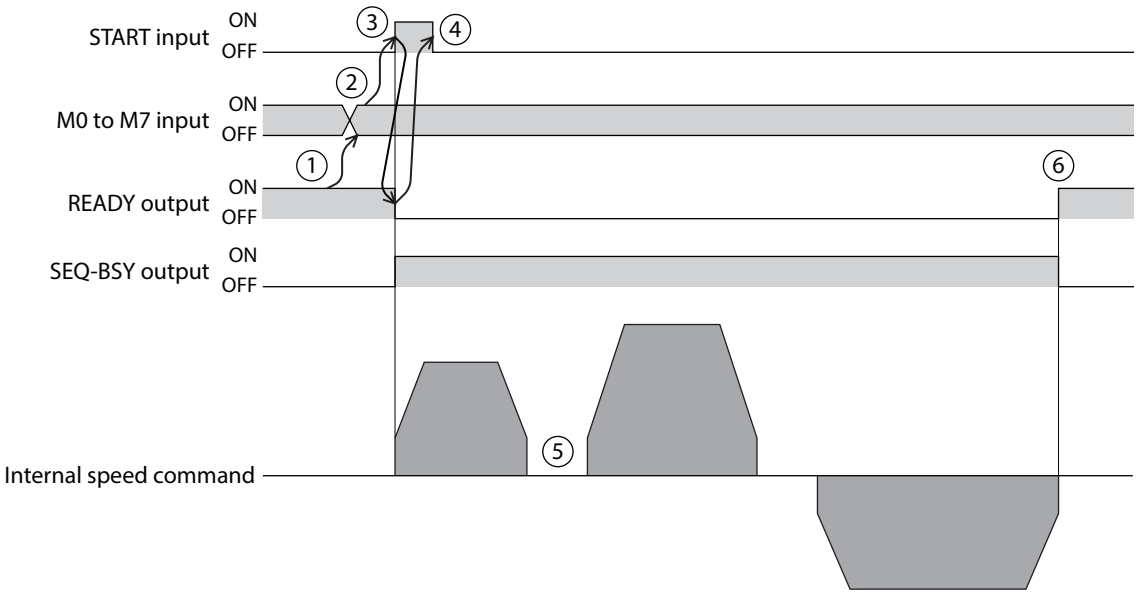
Operation image



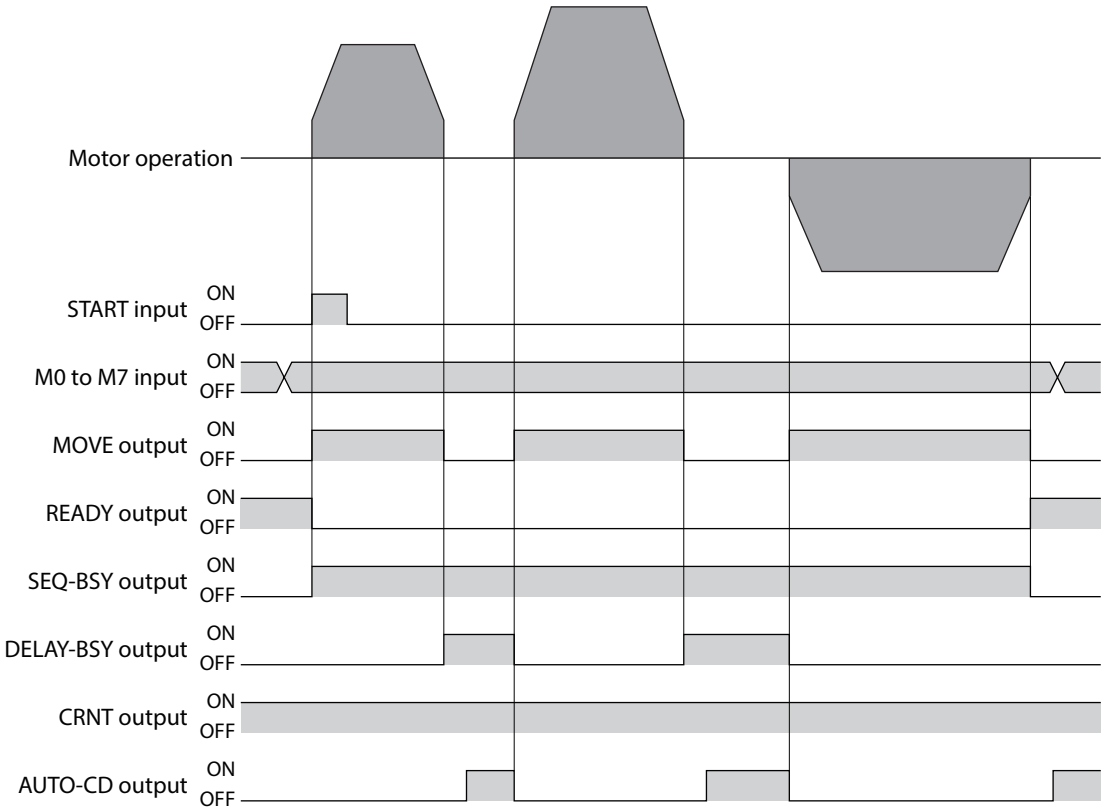


Operation method

1. Check that READY is 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, and the SEQ-BSY output is turned ON. Then, the motor starts operation.
4. Check that the READY output has been turned OFF and turn the START input OFF.
5. When the first operation is completed, operation linked in "2: Automatic sequential" is started after stop for time set in "Drive-complete delay time."
6. When all the operations linked are completed, the SEQ-BSY output is turned OFF, and the READY output is turned ON.



Timing chart



■ Continuous sequential operation

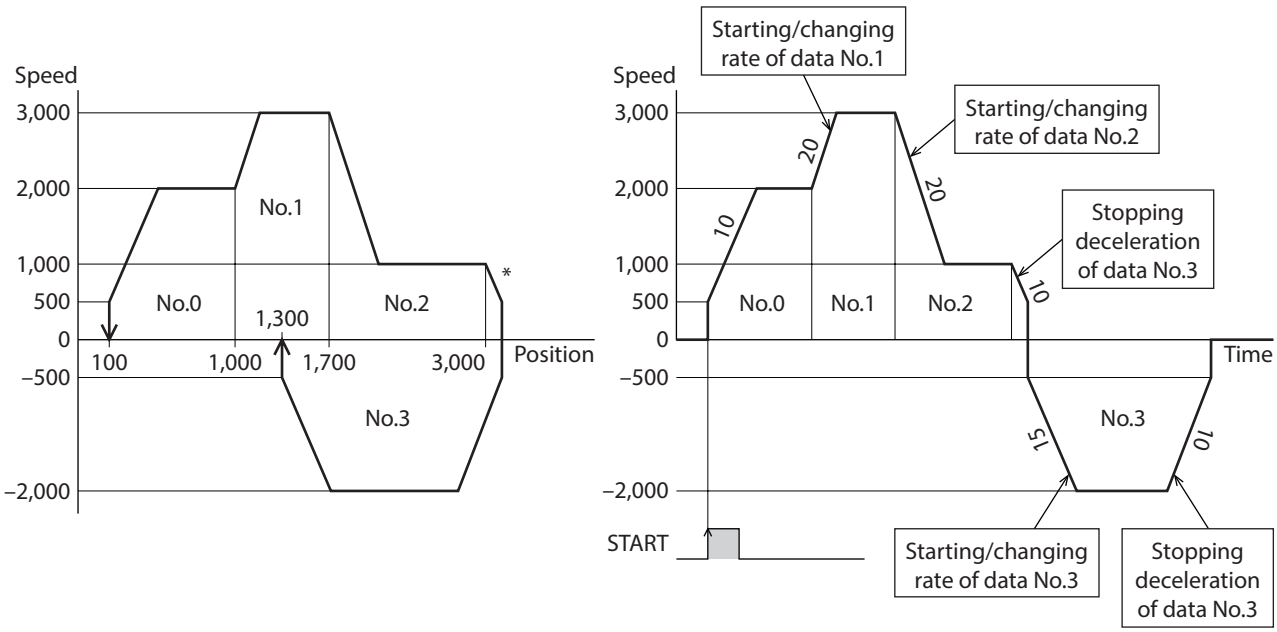
Operation of the operation data number set in "Next data number" is executed continuously without stopping the motor. If operation data includes data for which "0: No link" is set, the motor is stopped after the positioning SD operation with respect to the "0: No link" operation data is completed.

● **Usage example: When the speed is changed at a specified position**

Setting of operation data

No.	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 image



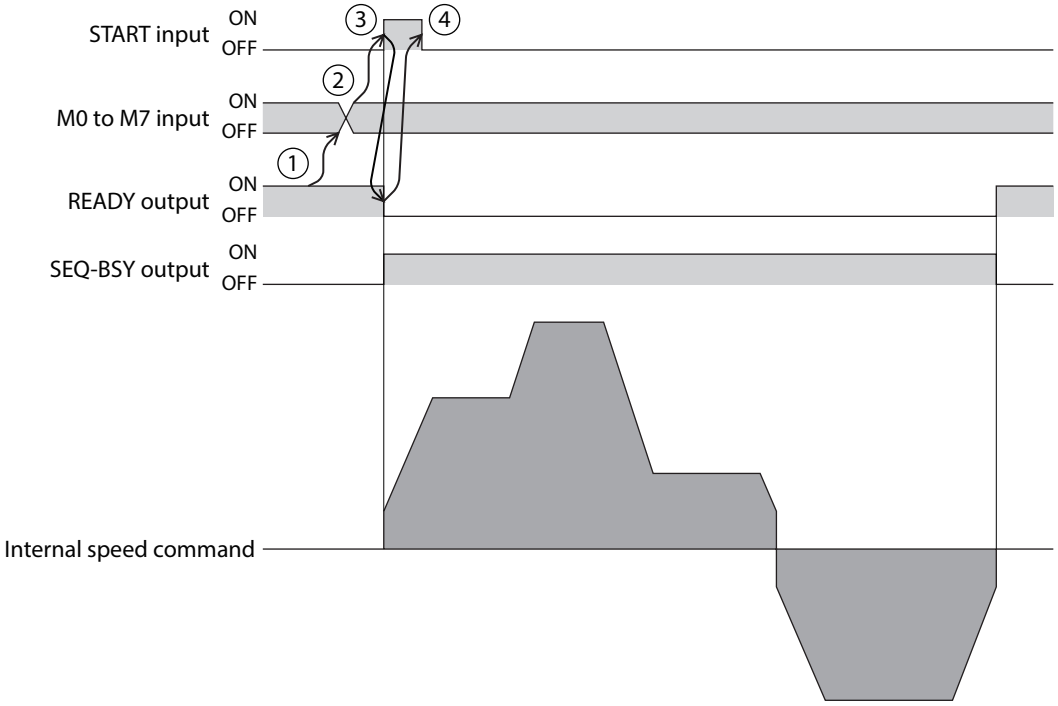
* If the direction of the operation is switched to the opposite direction while the operation is executed, the motor passes by the target position.

memo

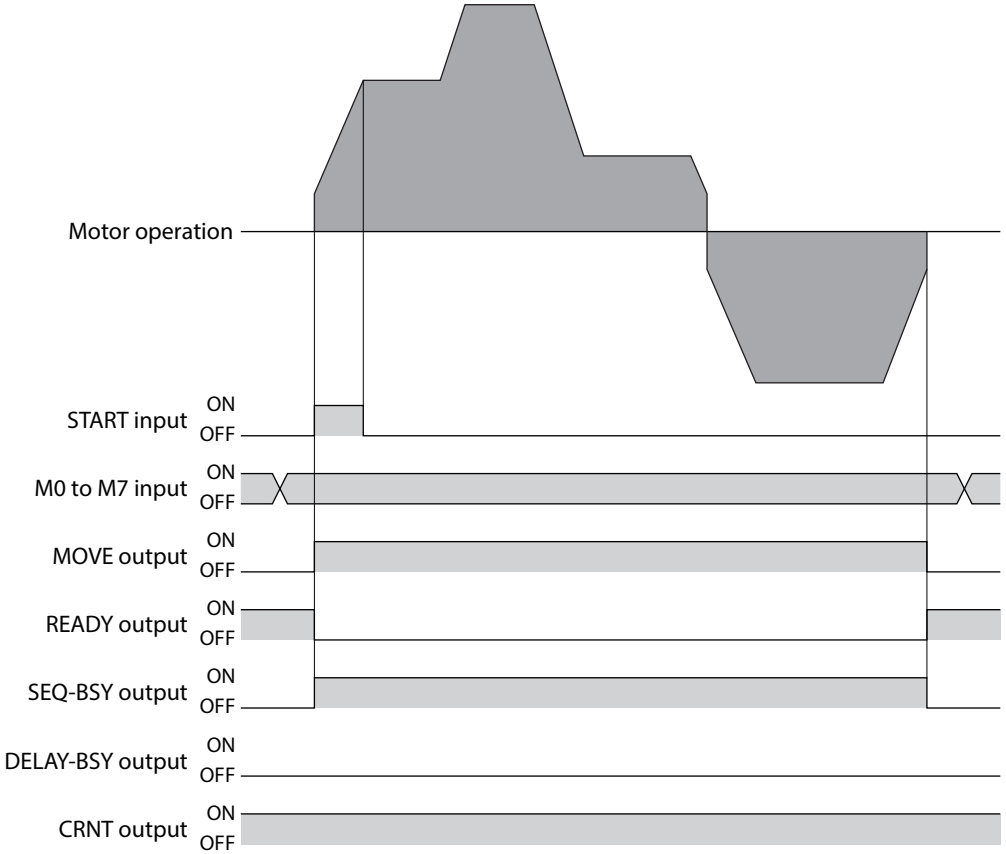
- To link to the next operation data number, the motor accelerates with the starting/changing rate of the next data.
- When the motor rotates in the opposite direction in the operation of the next data, it decelerates at the stopping deceleration of the next data.
- To stop, the motor decelerates at the stopping deceleration of the operation data number linked last.

Operation method

1. Check that the READY output is 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, and the SEQ-BSY output is turned ON. Then, the motor starts operation.
4. Check that the READY output has been turned OFF and turn the START input OFF.
5. When the motor in operation reaches the target position, it transits to the next operation linked, and acceleration/deceleration from the present speed to the target speed is started.
6. When all the operations linked are completed, the SEQ-BSY output is turned OFF, and the READY output is turned ON.



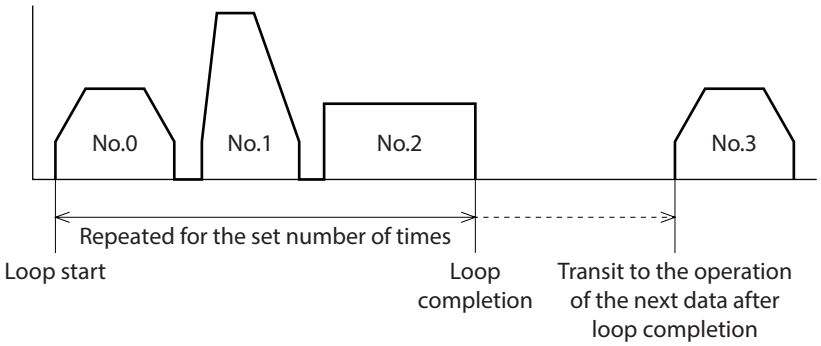
Timing chart



2-6 Sequence function

■ Loop function

The loop function is a function to repeat the operation of the linked operation data number for the number of times set.
Operation is repeated from the operation data number for which "Loop count" is set to the operation data number to which "Loop end number" is set for the number of times set in the "Loop count." When the operation for the number of times set is completed, the operation transits to the operation data number that is set to "Next data number."



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

Related operation data

MEXE02 code	Item	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.	−256: Stop −2: +2 −1: +1 0 to 255: Operation data number	−1
	Loop count	Sets the number of loop times.	0: – (no loop) 2 to 255: Loop 2{ to loop 255{ (number of loop times)	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: }L-End (loop end point)	0

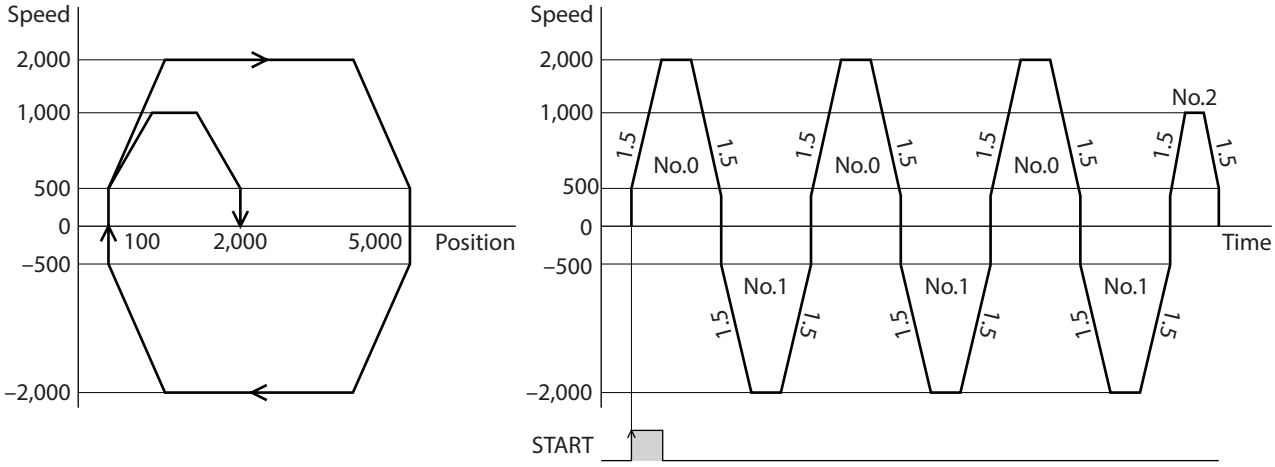
- **Usage example: When operation from the operation data No.0 to No.1 is repeated three times**

Setting of operation data

No.	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)

No.	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 image



■ Offset of loop

When the offset is set, the target position of positioning can be moved for the amount set in "Loop offset" while repeating loop. Use this function for palletizing operation.

- **Usage example: When operation from the operation data No.0 to No.1 is repeated three times (The target position is increased by 100 steps for each loop)**

Setting of operation data

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

No.	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)

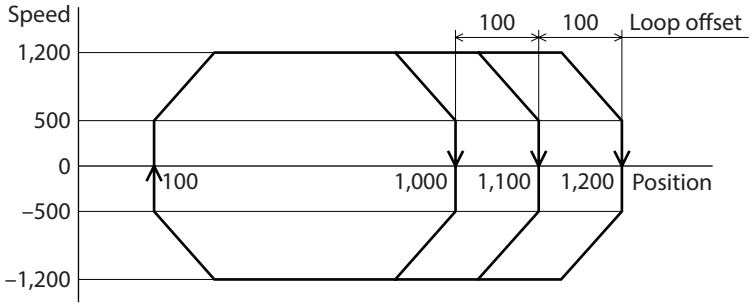
No.	Link	Next data number	Loop count	Loop offset	Loop end number
0	2: Automatic sequential	−1: +1	3: Loop 3{	100	0: –
1	2: Automatic sequential	−256: Stop	0: –	0	1: }L-End

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

No.	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)

No.	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 image



2-7 Extended operation data setting

The specification of the operation data can be extended.

■ Extended loop function

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

MEXE02 code	Item	Fixed value
p1	Next data number	−1: +1
	Loop count	Repeat start operation data number: Number of times of repeat Other: –
	Loop offset	0
	Loop end number	Repeat end operation data number: 1 (}L-End) Other: –

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

Related operation data

MEXE02 code	Item	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.	−256: Stop −2: +2 −1: +1 0 to 255: Operation data number	−1

Related extended operation data setting

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p2	1000h (4096)	1001h (4097)	Repeat start operation data number	Sets the operation data number from which extended loop operation is started. **[Setting range]** −1 (Disable), 0 to 255	−1
	1002h (4098)	1003h (4099)	Repeat end operation data number	Sets the operation data number in which extended loop operation is completed. **[Setting range]** −1 (Disable), 0 to 255	−1
	1004h (4100)	1005h (4101)	Repeat time	Sets the number of repeat times of extended loop operation. **[Setting range]** −1 (Disable), 0 to 100,000,000	−1

- **Usage example:**
  Transition to the operation data No.2 after repeating the operation data No.0 and No.1 500 times.

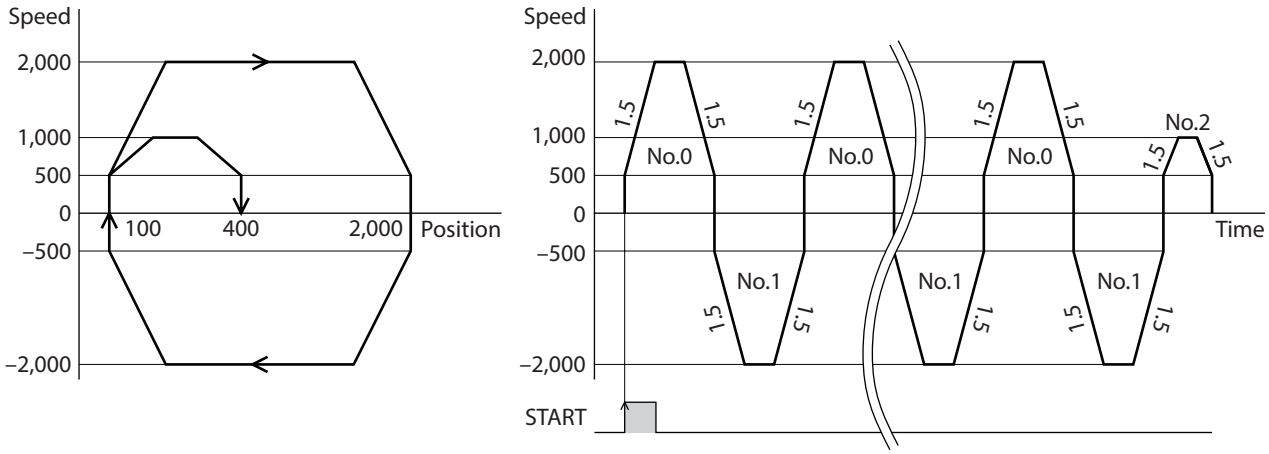
Setting of operation data

No.	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 image



■ Common setting and separate setting of acceleration/deceleration

In "Rate selection" of extended operation data setting, the acceleration/deceleration in positioning SD operation and continuous macro operation can be set as follows.

- Common setting: The values set in the "Common acceleration rate or time" and "Common stopping deceleration" parameters are followed.
- Separate setting: The acceleration/deceleration set under the applicable operation data number is followed.

Related extended operation data setting

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p2	0280h (640)	0281h (641)	Common acceleration rate or time	Sets the starting/changing rate or starting/changing time in common setting. **[Setting range]** 1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000
	0282h (642)	0283h (643)	Common stopping deceleration	Sets the stopping deceleration or stop time in common setting. **[Setting range]** 1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000
	028Ch (652)	028Dh (653)	Rate selection	Sets whether to use the common acceleration/deceleration or the acceleration/deceleration specified for the operation data. **[Setting range]** 0: Common rate (common setting) 1: Rate of each operation data (separate setting)	1

2-8 Stop operation

■ Operation stop input

The motor stops when an operation stop signal is input while the motor is operating.

Related parameters

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p6	0E00h (3584)	0E01h (3585)	STOP input action	Sets how to stop the motor when the STOP input is turned ON. **[Setting range]** 0: Immediate stop 3: Deceleration stop	3
	0E04h (3588)	0E05h (3589)	FW-BLK/RV-BLK input action	Sets how to stop the motor when the FW-BLK input or RV-BLK input is turned ON. **[Setting range]** 0: Immediate stop 1: Deceleration stop	1

■ Hardware overtravel

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

Related parameter

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p6	0E02h (3586)	0E03h (3587)	FW-LS/RV-LS input action	Sets how to stop the motor when the FW-LS input or RV-LS input is turned ON. **[Setting range]** −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

■ Software overtravel

The software overtravel is a function that limits the range of movement by setting the upper and lower limits of the moving range by the parameter.
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. In addition, when the parameter is set to "2: Immediate stop with alarm" or "3: Deceleration stop with alarm," an alarm of software overtravel is generated after the motor stops.

Related parameters

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p3	0386h (902)	0387h (903)	Software overtravel	Sets the operation when the software overtravel is detected. **[Setting range]** −1: Disable 0: Immediate stop 1: Deceleration stop 2: Immediate stop with alarm 3: Deceleration stop with alarm	3
	0388h (904)	0389h (905)	Positive software limit	Sets the value of software limit in the forward direction. **[Setting range]** −2,147,483,648 to 2,147,483,647 steps	2,147,483,647
	038Ah (906)	038Bh (907)	Negative software limit	Sets the value of software limit in the reverse direction. **[Setting range]** −2,147,483,648 to 2,147,483,647 steps	−2,147,483,648

■ Escape from limit

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

2-9 Base current and stop current

■ Base current

Set the base current rate (%) for the operating current and stop current.
The maximum driver output current can be changed using the "Base current" parameter. If the load is small and there is an ample allowance for torque, the motor temperature rise can be suppressed by setting a lower base current.

- Operating current of motor = Maximum output current × "Base current" parameter setting value × "Operating current" value set for each operation data number

Related parameter

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p3	024Ch (588)	024Dh (589)	Base current	Sets the maximum output current of the motor as a percentage of the rated current, based on the rated current being 100 %. **[Setting range]** 0 to 1,000 (1=0.1 %)	1,000

Note Excessively low base current may cause a problem in starting the motor or holding the load in position. Do not reduce the current any more than is necessary.

■ Stop current

When the motor stops, the automatic current cutback function is actuated to lower the motor current to the stop current.

- Stop current of motor = Maximum output current × "Base current" parameter setting value × "Stop current" parameter value

Related parameter

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p3	0250h (592)	0251h (593)	Stop current	Sets the current at motor standstill as a percentage of the base current, based on the base current being 100 %. **[Setting range]** 0 to 500 (1=0.1 %)	500

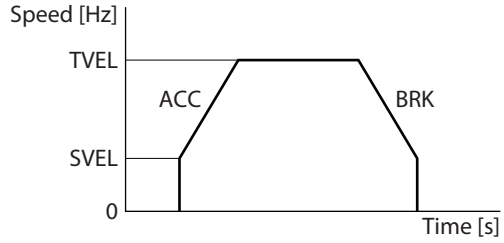
2-10 Acceleration/deceleration unit

Set the acceleration/deceleration unit using the "Acceleration/deceleration unit" parameter.
The settable units are the acceleration/deceleration rate (kHz/s, ms/kHz) and the acceleration/deceleration time (s).

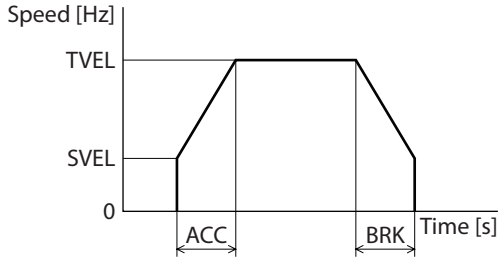
Explanation of labels

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

In case of [kHz/s] or [ms/kHz] setting



In case of setting with [s]



Related parameter

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p3	028Eh (654)	028Fh (655)	Acceleration/ deceleration unit	Sets the acceleration/deceleration unit. **[Setting range]** 0: kHz/s 1: s 2: ms/kHz	0

Note The maximum acceleration/deceleration value is fixed to 1 GHz/s, and the minimum acceleration/deceleration value to 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 should be within the range.

2-11 Starting speed

Set the operating speed of the motor at the time of operation start. Rectangular operation (drive without acceleration/deceleration time) is executed at the operating speed if the operating speed is below the starting speed.

Related parameters

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p3	0284h (644)	0285h (645)	Starting speed	Sets the starting speed for positioning SD operation or continuous macro operation. **[Setting range]** 0 to 4,000,000 Hz	100
p4	02A6h (678)	02A7h (679)	(JOG) Starting speed	Sets the starting speed for JOG macro operation. **[Setting range]** 0 to 4,000,000 Hz	100
	02C6h (710)	02C7h (711)	(HOME) Starting speed	Sets the starting speed for return-to-home operation. **[Setting range]** 1 to 4,000,000 Hz	100

3 Return-to-home operation

Return-to-home operation is an operation to detect the home by using an external sensor.
It is executed to return from the present position to the home at the time of power-on and upon completion of positioning operation.

3-1 Types of return-to-home operation

Return-to-home operation can be performed in the following three patterns.

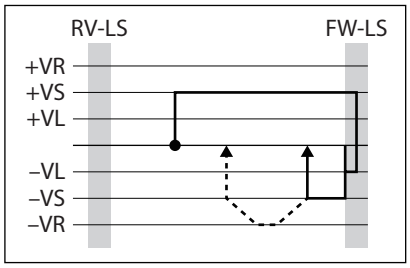
Item	Description	Features
2-sensor mode	When the limit sensor is detected, the motor rotates in the reverse direction and pulls out of the limit sensor. After pulling out of the limit sensor, the motor moves to stop according to the value set in the "(HOME) Backward steps in 2 sensor home-seeking" parameter. The position at which the motor stopped becomes the home.	• Two external sensors are required • The operating speed is low (return-to-home starting speed)
3-sensor mode	When the limit sensor is detected, the motor rotates in the reverse direction and pulls out of the limit sensor. After that, the motor stops when the ON edge of the HOME sensor is detected. The position at which the motor stopped becomes the home.	• Three external sensors are required * • The operating speed is high (return-to-home operation speed)
One-way rotation mode	The motor stops when the ON edge of the HOME sensor is detected. After that, the motor pulls out at the speed set in the "(HOME) Last speed" parameter until the OFF edge of the HOME sensor is detected. After pulling out of the limit sensor, the motor moves to stop according to the value set in the "(HOME) Operating amount in uni-directional home-seeking" parameter. The position at which the motor stopped becomes the home.	• One external sensor is required • The operating speed is high (return-to-home operation speed) • Not rotate in the reverse direction

* With a rotating mechanism, the home can be detected even with one external sensor.

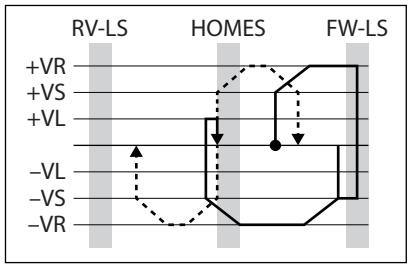
Explanation of labels

- VR: Return-to-home operation speed
- VS: Return-to-home starting speed
- VL: Last speed
- - - : Orbit when a home offset is set

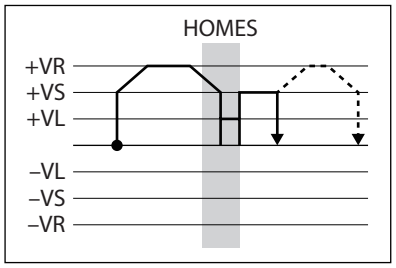
2-sensor mode



3-sensor mode



One-way rotation mode



3-2 Setting of parameters

Related parameters

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p3	038Ch (908)	038Dh (909)	Preset position	Sets the preset position. **[Setting range]** −2,147,483,648 to 2,147,483,647 steps	0
p4	02BCh (700)	02BDh (701)	JOG/HOME command filter time constant	Sets the time constant for command filter. **[Setting range]** 1 to 200 ms	1
	02BEh (702)	02BFh (703)	JOG/HOME operating current	Sets the operating current rate. **[Setting range]** 0 to 1,000 (1=0.1 %)	1,000
	02C0h (704)	02C1h (705)	(HOME) Home-seeking mode	Sets the mode for return-to-home operation. **[Setting range]** 0: 2 sensors 1: 3 sensors 2: One-way rotation	1
	02C2h (706)	02C3h (707)	(HOME) Starting direction	Sets the starting direction for home detection. **[Setting range]** 0: Negative side 1: Positive side	1
	02C4h (708)	02C5h (709)	(HOME) Acceleration/ deceleration	Sets the acceleration/deceleration rate or acceleration/deceleration time for return-to-home operation. **[Setting range]** 1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000
	02C6h (710)	02C7h (711)	(HOME) Starting speed	Sets the starting speed for return-to-home operation. **[Setting range]** 1 to 4,000,000 Hz	100
	02C8h (712)	02C9h (713)	(HOME) Operating speed	Sets the operating speed for return-to-home operation. **[Setting range]** 1 to 4,000,000 Hz	1,000
	02CAh (714)	02CBh (715)	(HOME) Last speed	Sets the operating speed for final positioning with the home. **[Setting range]** 1 to 10,000 Hz	100
	02D2h (722)	02D3h (723)	(HOME) Backward steps in 2 sensor home-seeking	Sets the backward steps after return-to-home operation in 2-sensor mode. **[Setting range]** 0 to 8,388,607 steps	200
	02D4h (724)	02D5h (725)	(HOME) Operating amount in uni-directional home-seeking	Sets the operating amount after return-to-home operation in one-way rotation mode. **[Setting range]** 0 to 8,388,607 steps	200

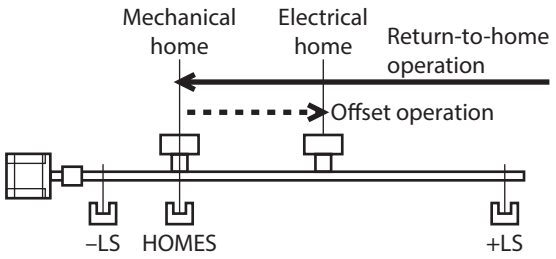
memo

- Since the position coordinate is not set during return-to-home operation, the ABSPEN output is turned OFF.
- Preset (P-PRESET) is executed after return-to-home operation to set the position coordinate. Therefore, the mechanical coordinate of the home depends on the "Preset position" parameter.

3-3 Extended function

- **Home offset**

Home offset is a function to perform positioning operation according to the amount set in the "(HOME) Position offset" parameter after return-to-home operation and set the position where the motor stopped as the home.
The home set by the "(HOME) Position offset" parameter is called "electrical home" in distinction from the mechanical home. If the value of the position offset is 0, the mechanical home and the electrical home will be the same position.



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

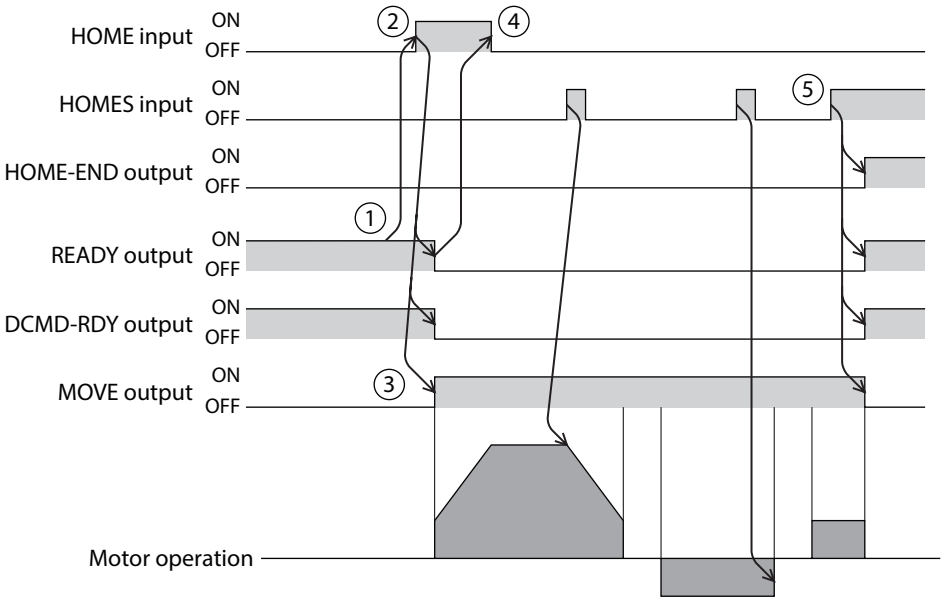
When performing return-to-home operation, use of the SLIT input or TIM signal increases the accuracy of home detection.

- **Related parameters**

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p4	02CCh (716)	02CDh (717)	(HOME) SLIT detection	Sets whether or not to concurrently use the SLIT input for return-to-home operation. **[Setting range]** 0: Disable 1: Enable	0
	02CEh (718)	02CFh (719)	(HOME) TIM signal detection	Sets whether or not to concurrently use the TIM signal for return-to-home operation. **[Setting range]** 0: Disable 1: TIM output	0
	02D0h (720)	02D1h (721)	(HOME) Position offset	Sets the amount of offset from the home. **[Setting range]** –2,147,483,647 to 2,147,483,647 steps	0

3-4 Timing chart (in case of 3-sensor mode)

1. Check that the READY output is ON.
2. Turn the HOME input ON.
3. The READY output and 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, READY output, and DCMD-RDY output are turned ON, and the MOVE output is turned OFF.



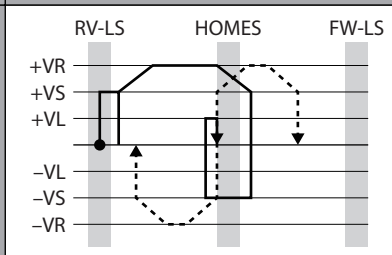
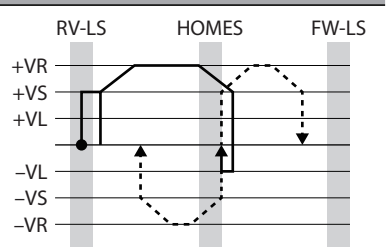
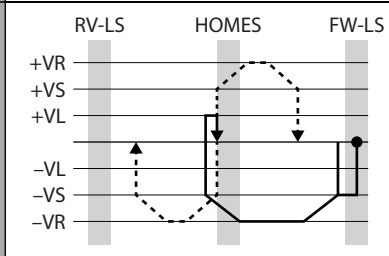
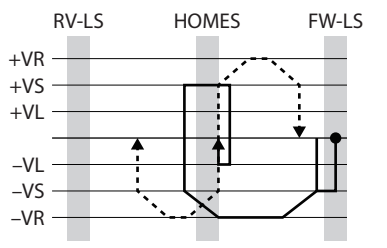
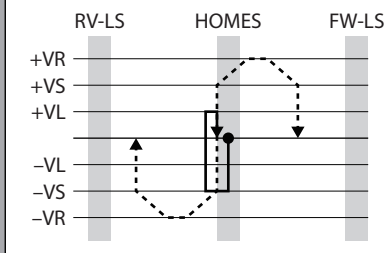
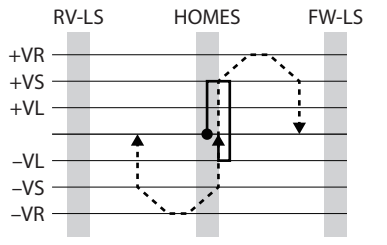
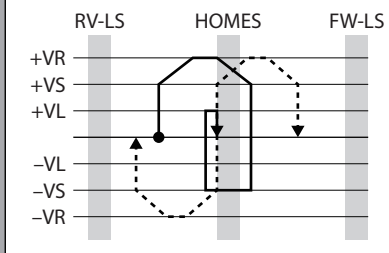
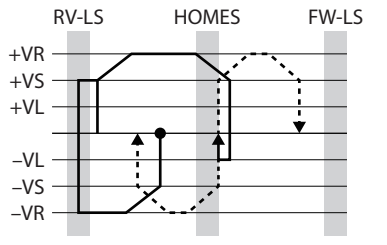
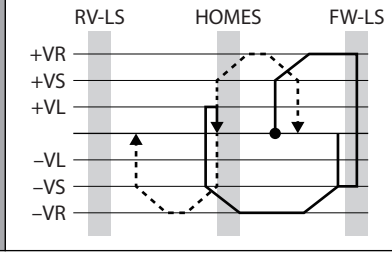
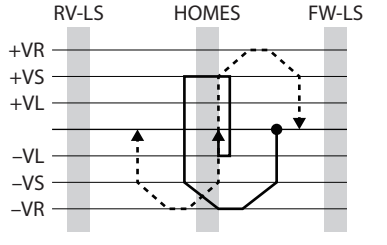
3-5 Operation sequence

■ 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) Operating speed," and it stops if the ON edge of the HOME sensor is detected.
The position at which the motor stopped becomes the home.

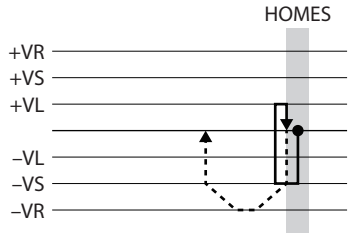
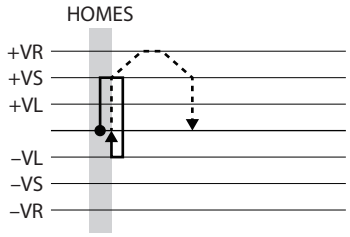
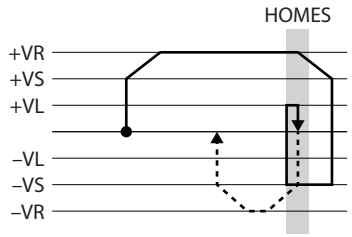
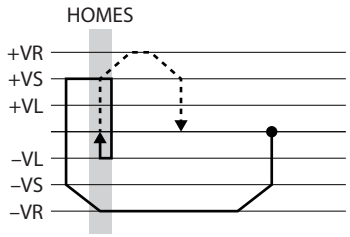
Explanation of labels

- VR: Return-to-home operation speed
- VS: Return-to-home starting speed
- VL: Last speed
- - - : Orbit when a 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 only the HOME sensor is used (rotating mechanism, etc.)**

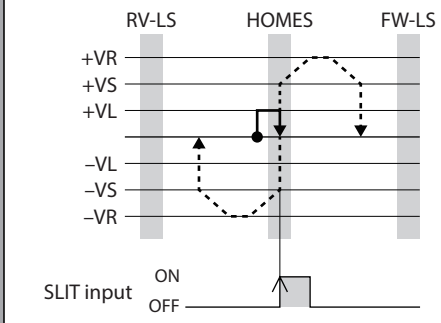
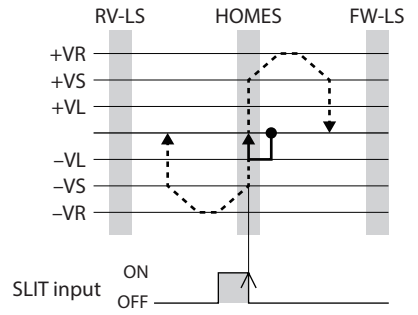
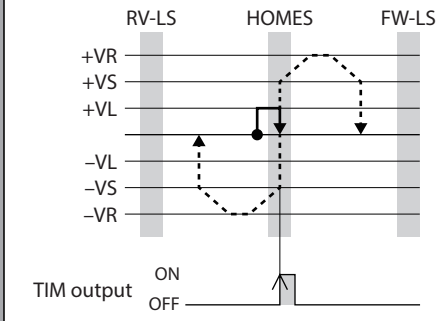
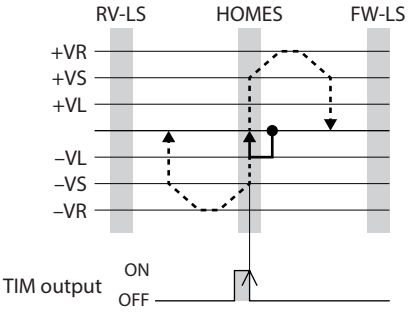
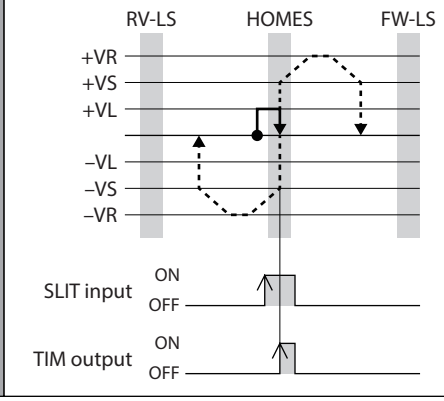
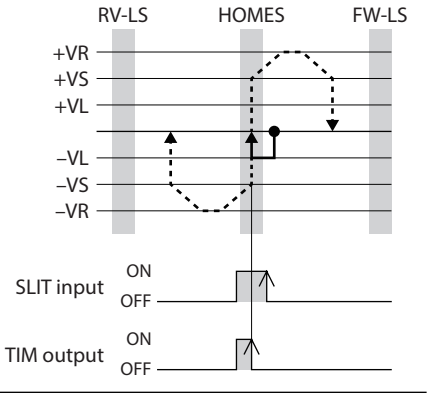
  If the limit sensor is not used, in case of a rotating mechanism for example, the sequence is as follows.

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

Note The motor may pass by the HOME sensor and decelerate to a stop even after the HOME sensor is detected depending on the value set in the "(HOME) Acceleration/deceleration" parameter. Keep an adequate distance between the mechanical end and the HOME sensor because they may touch each other when the distance is too short.

- **When the SLIT input and/or TIM signal are used concurrently**

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

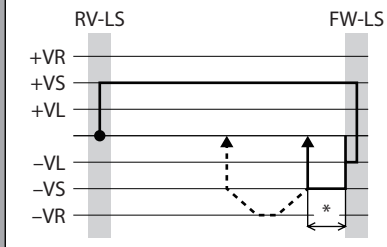
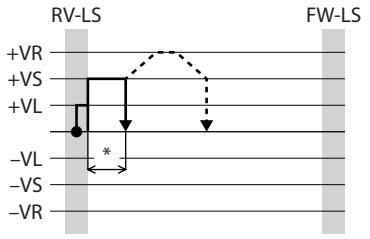
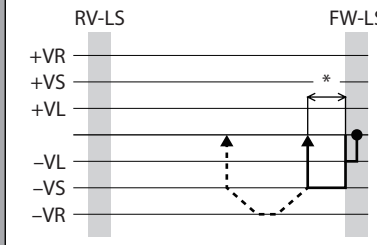
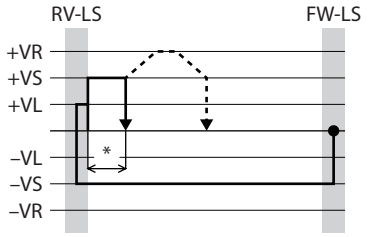
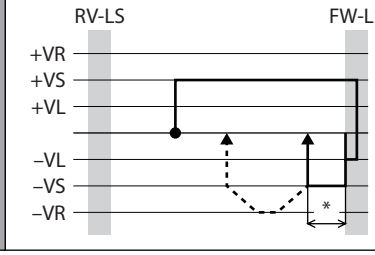
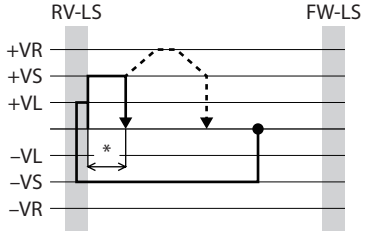
Home detection signal	Starting direction of return-to-home operation: Positive direction	Starting direction of return-to-home operation: Negative direction
SLIT input		
TIM signal		
SLIT input and TIM signal		

■ 2-sensor mode

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

Explanation of labels

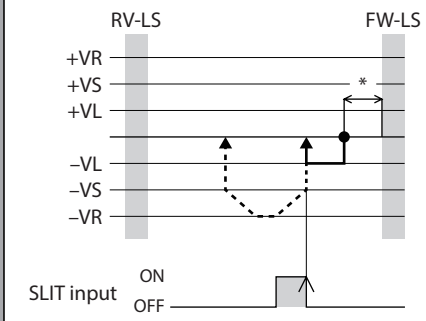
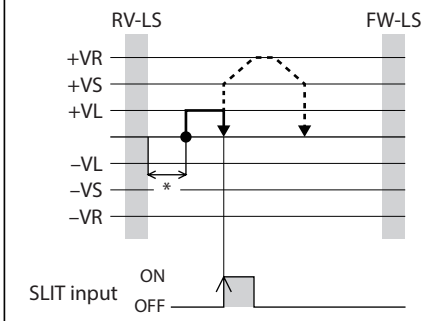
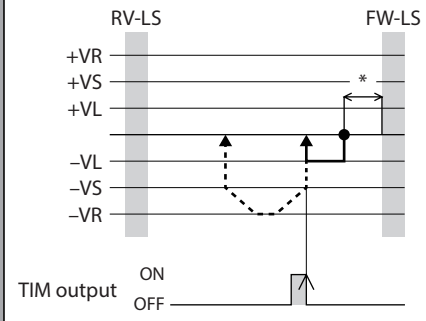
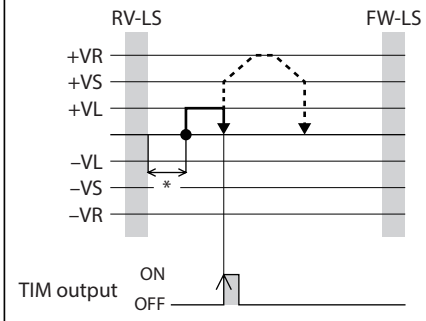
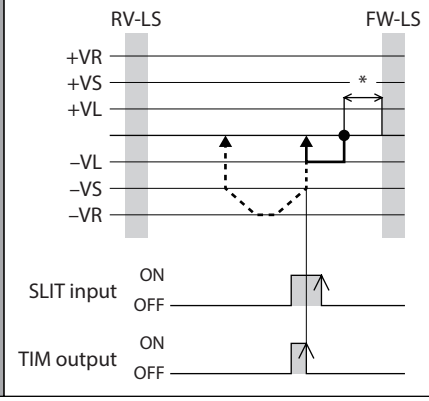
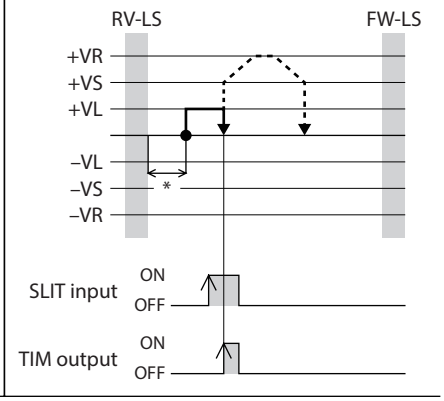
- VR: Return-to-home operation speed
- VS: Return-to-home starting speed
- VL: Last speed
- - - : Orbit when a home offset is set

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 moves according to the value of "(HOME) Backward steps in 2 sensor home-seeking."

- **When the SLIT input and/or TIM signal are used concurrently**

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

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

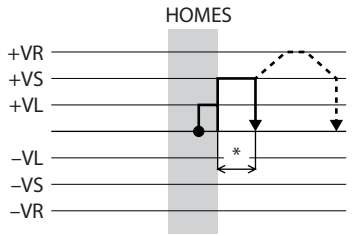
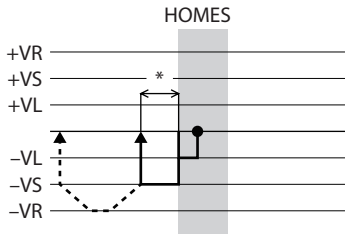
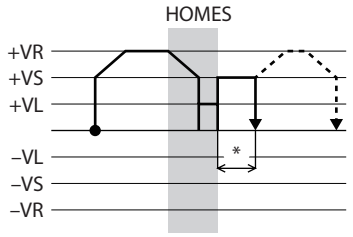
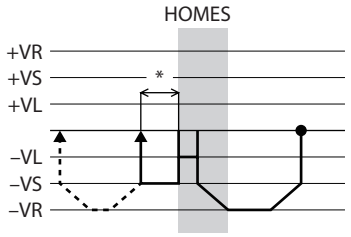
* The motor pulls out of the limit sensor and moves according to the value of "(HOME) Backward steps in 2 sensor home-seeking."

■ One-way rotation mode

The motor is operated in the starting direction of return-to-home at the operating speed and 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 last speed, operates according to the value of the operating amount in unidirectional home-seeking at the starting speed, and stops. The position at which the motor stopped becomes the home.

Explanation of labels

- VR: Return-to-home operation speed
- VS: Return-to-home starting speed
- VL: Last speed
- - - : Orbit when a home offset is set

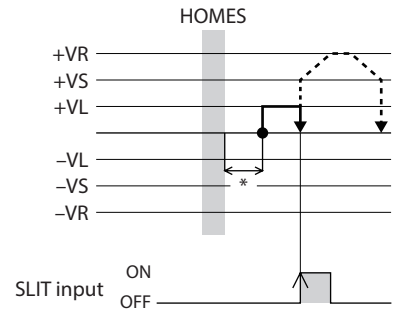
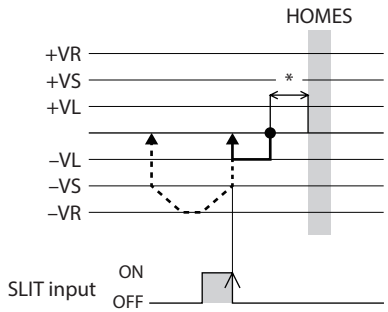
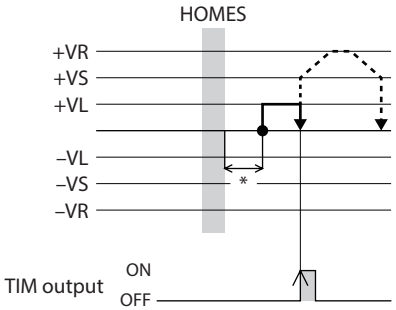
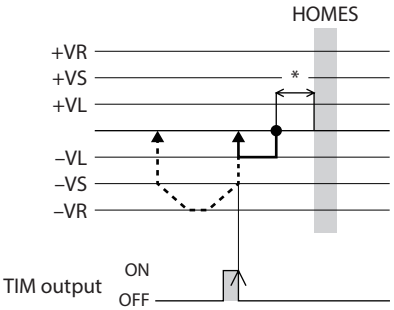
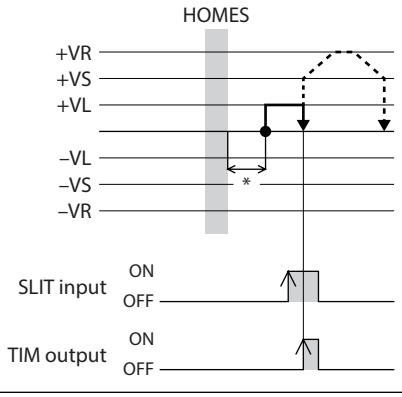
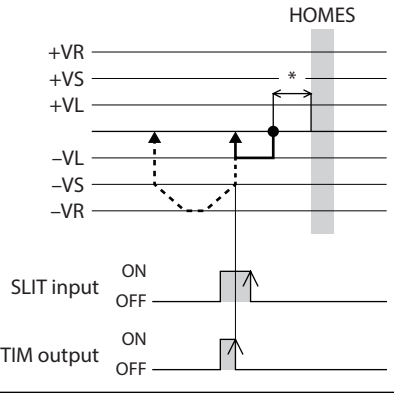
Starting position of return-to-home operation	Starting direction of return-to-home operation: Positive direction	Starting direction of return-to-home operation: Negative direction
HOMES		
Other than HOMES		

* The motor pulls out of the HOME sensor and moves according to the value of "(HOME) Operating amount in unidirectional home-seeking."

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

- **When the SLIT input and/or TIM signal are used concurrently**

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

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

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

4 Macro operation

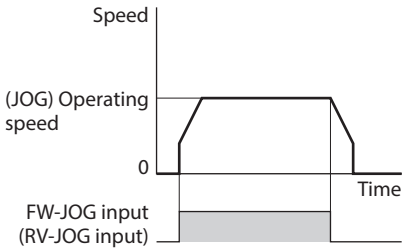
Macro operation is an operation type in which a specific input signal is turned ON to automatically perform operation corresponding to the signal. The macro operation includes JOG operation, inching operation, continuous operation, etc. The travel amount, operating speed, acceleration/deceleration rate, stopping deceleration, etc. for each operation are set with parameters.

4-1 Types of macro operation

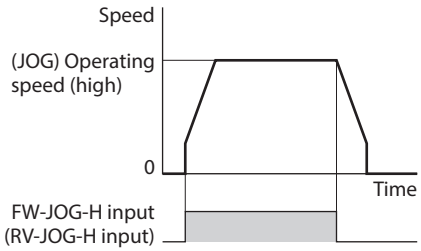
Note With macro operation, link of operation data and loop function cannot be used. If you want to link operation data, use positioning SD operation.

■ JOG macro operation

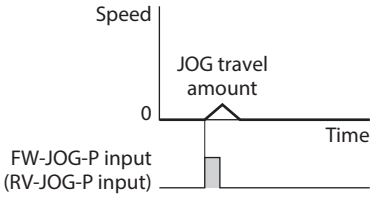
JOG macro operation is a macro operation in which a parameter exclusive for JOG is used.



JOG operation



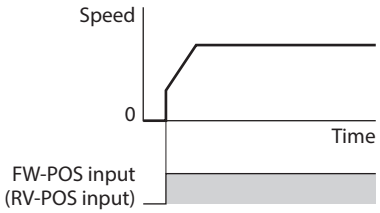
High-speed JOG operation



Inching operation

■ Continuous macro operation

Continuous macro operation is a macro operation in which "Speed," "Starting/changing rate," "Stopping deceleration," and "Operating current" of operation data are used.

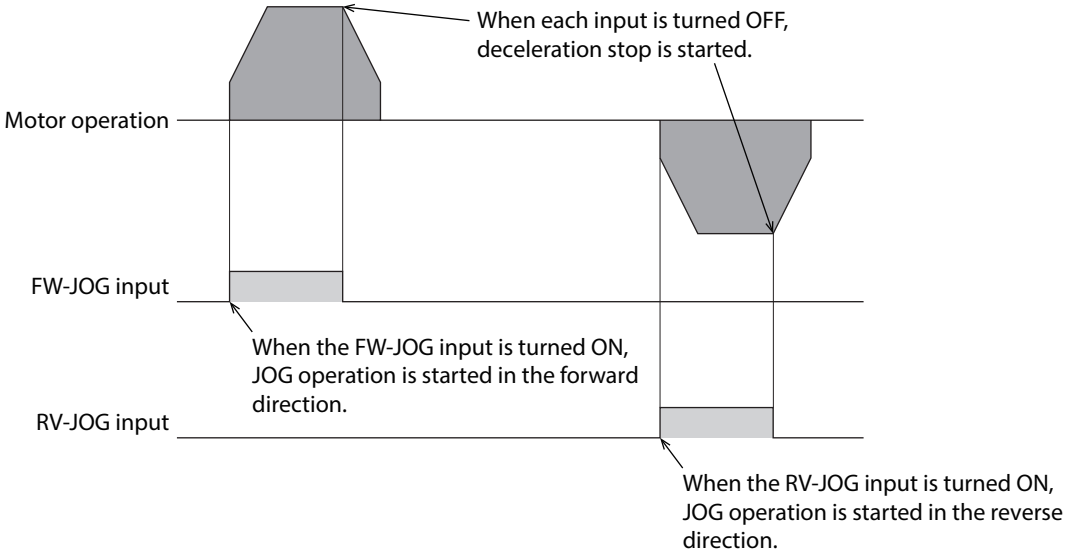


Continuous operation

4-2 JOG operation

With JOG operation, the motor operates continuously in one direction while the FW-JOG input or RV-JOG input is ON. If the input signal is turned OFF, the motor decelerates to a stop. Operation can be stopped also by inputting an operation stop signal.
If the FW-JOG input and the RV-JOG input are turned ON simultaneously, the motor decelerates to a stop.

- **Operation image**

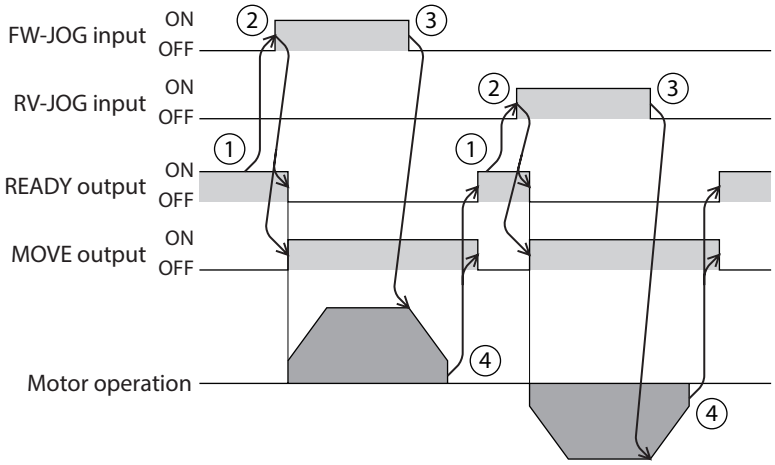


- **Related parameters**

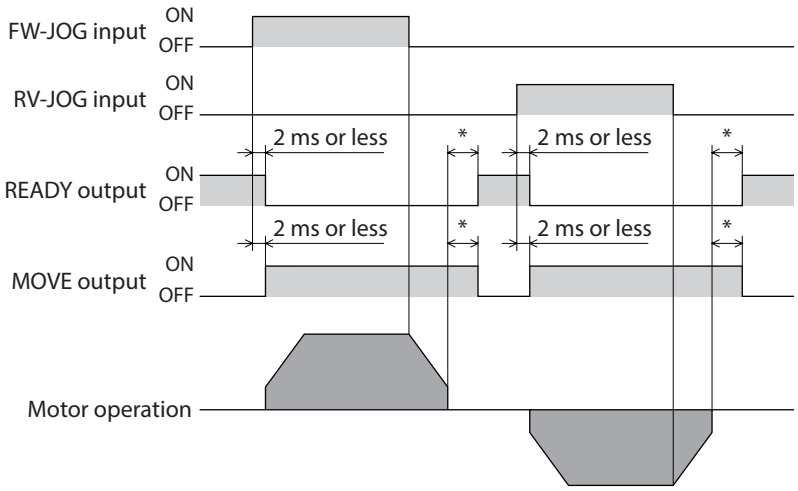
MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p4	02BCh (700)	02BDh (701)	JOG/HOME command filter time constant	Sets the time constant for command filter. **[Setting range]** 1 to 200 ms	1
	02BEh (702)	02BFh (703)	JOG/HOME operating current	Sets the operating current rate. **[Setting range]** 0 to 1,000 (1=0.1 %)	1,000
	02A2h (674)	02A3h (675)	(JOG) Operating speed	Sets the operating speed for JOG operation and inching operation. **[Setting range]** 1 to 4,000,000 Hz	200
	02A4h (676)	02A5h (677)	(JOG) Acceleration/ deceleration	Sets the acceleration/deceleration rate or acceleration/deceleration time for JOG macro operation. **[Setting range]** 1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000
	02A6h (678)	02A7h (679)	(JOG) Starting speed	Sets the starting speed for JOG macro operation. **[Setting range]** 0 to 4,000,000 Hz	100

- **Operation method**

1. Check that the READY output is ON.
2. Turn the FW-JOG input (or RV-JOG input) ON.
   The READY output is turned OFF, and the MOVE output is turned ON. Then, the motor starts operation.
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**

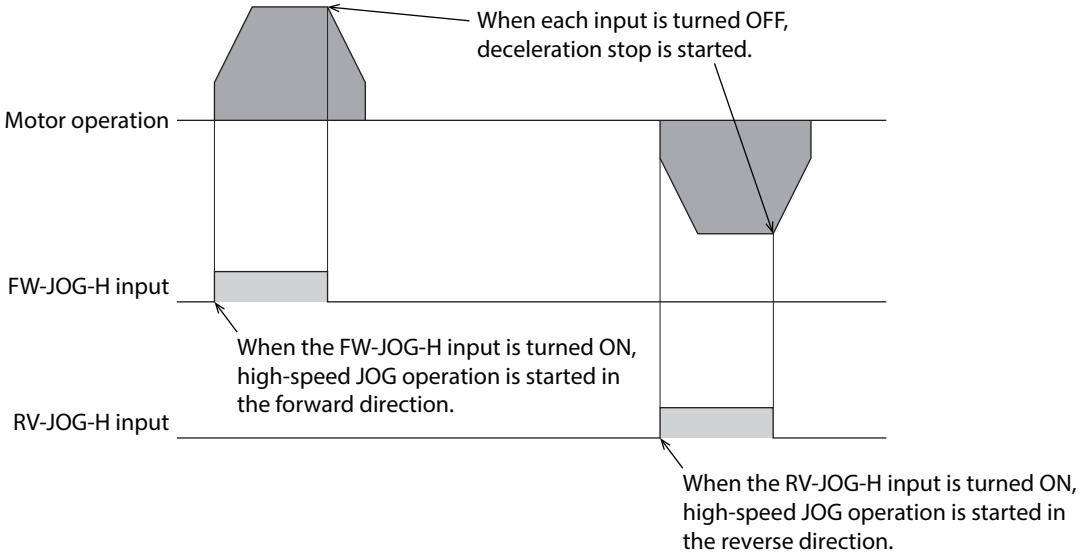


* The specific time varies depending on the operating speed, speed filter and other.

4-3 High-speed JOG operation

With high-speed JOG operation, the motor operates continuously in one direction at a high speed while the FW-JOG-H input or RV-JOG-H input is ON. If the input signal is turned OFF, the motor decelerates to a stop. Operation can be stopped also by inputting an operation stop signal.
If the FW-JOG-H input and the RV-JOG-H input are turned ON simultaneously, the motor decelerates to a stop.

- **Operation image**

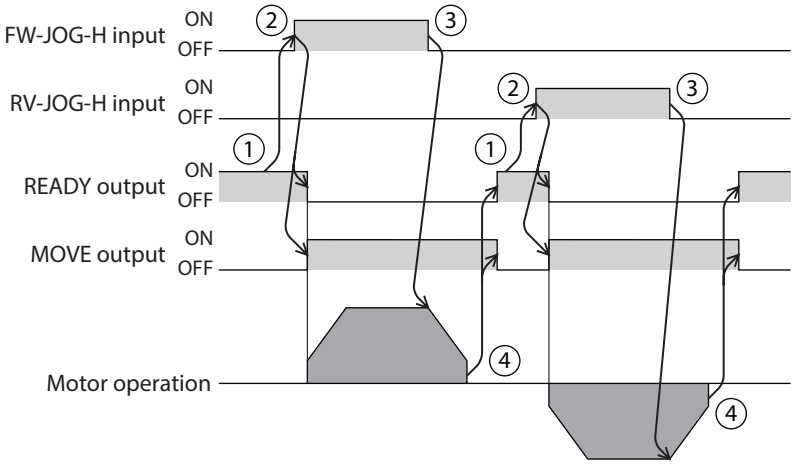


- **Related parameters**

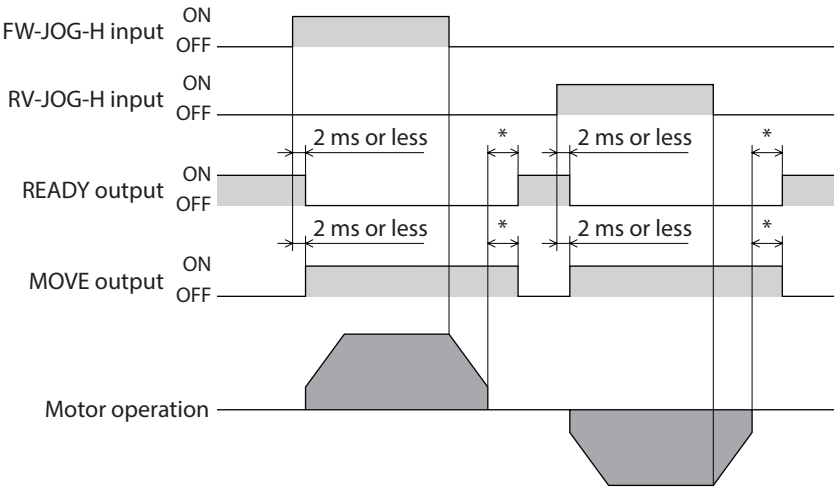
MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p4	02BCh (700)	02BDh (701)	JOG/HOME command filter time constant	Sets the time constant for command filter. **[Setting range]** 1 to 200 ms	1
	02BEh (702)	02BFh (703)	JOG/HOME operating current	Sets the operating current rate. **[Setting range]** 0 to 1,000 (1=0.1 %)	1,000
	02A4h (676)	02A5h (677)	(JOG) Acceleration/ deceleration	Sets the acceleration/deceleration rate or acceleration/deceleration time for JOG macro operation. **[Setting range]** 1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000
	02A6h (678)	02A7h (679)	(JOG) Starting speed	Sets the starting speed for JOG macro operation. **[Setting range]** 0 to 4,000,000 Hz	100
	02A8h (680)	02A9h (681)	(JOG) Operating speed (high)	Sets the operating speed for high-speed JOG operation. **[Setting range]** 1 to 4,000,000 Hz	1,000

- **Operation method**

1. Check that the READY output is ON.
2. Turn the FW-JOG-H input (or RV-JOG-H input) ON.
   The READY output is turned OFF, and the MOVE output is turned ON. Then, the motor starts operation.
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**

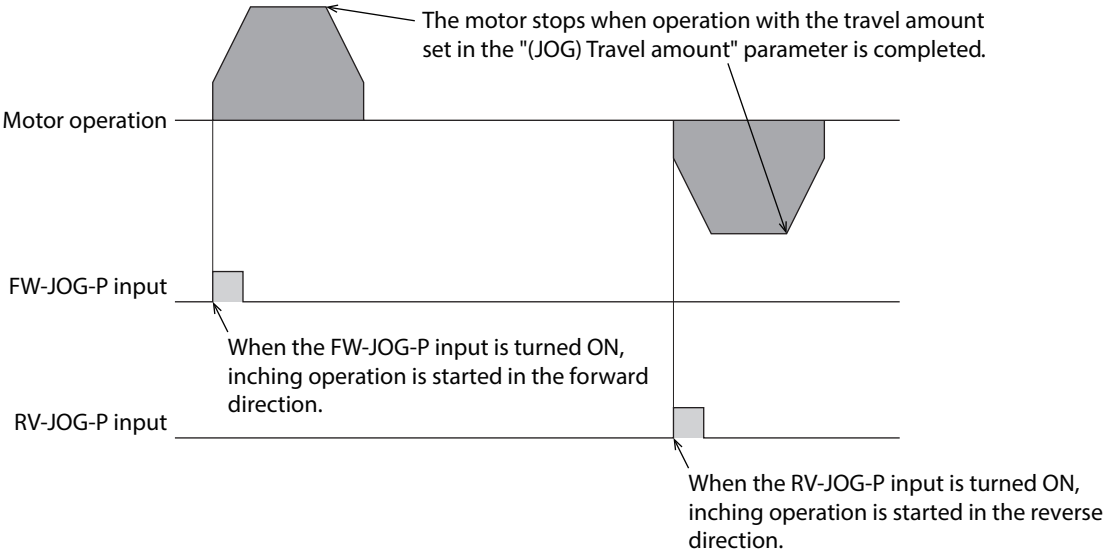


* The specific time varies depending on the operating speed, speed filter and other.

4-4 Inching operation

With inching operation, when the FW-JOG-P input or RV-JOG-P input is turned from OFF to ON, positioning operation is executed.
After rotating according to the number of the steps set in "(JOG) Travel amount," the motor stops.

- **Operation image**

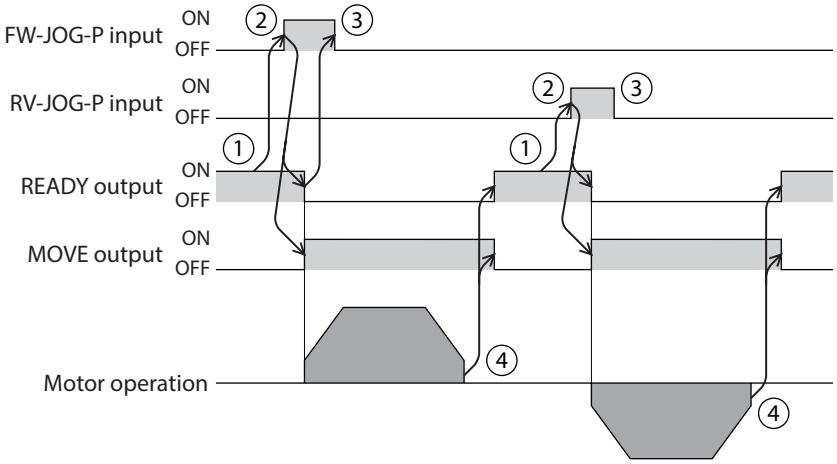


- **Related parameters**

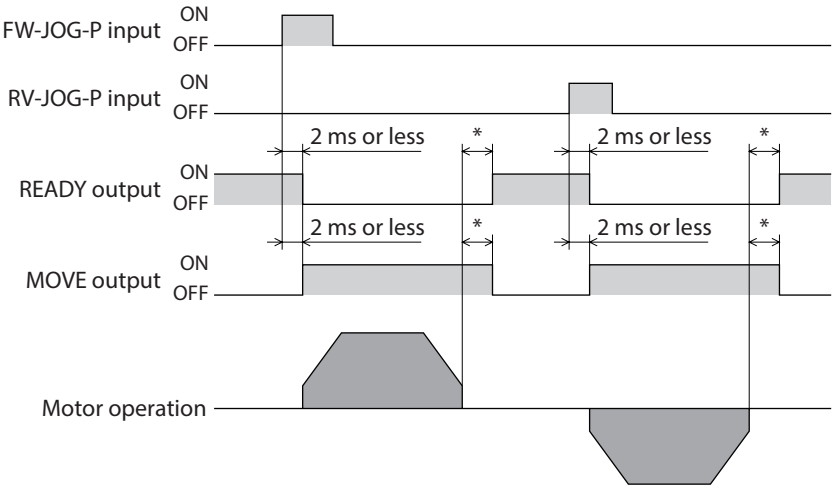
MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p4	02BCh (700)	02BDh (701)	JOG/HOME command filter time constant	Sets the time constant for command filter. **[Setting range]** 1 to 200 ms	1
	02BEh (702)	02BFh (703)	JOG/HOME operating current	Sets the operating current rate. **[Setting range]** 0 to 1,000 (1=0.1 %)	1,000
	02A0h (672)	02A1h (673)	(JOG) Travel amount	Sets the travel amount for inching operation. **[Setting range]** 1 to 8,388,607 steps	1
	02A2h (674)	02A3h (675)	(JOG) Operating speed	Sets the operating speed for JOG operation and inching operation. **[Setting range]** 1 to 4,000,000 Hz	200
	02A4h (676)	02A5h (677)	(JOG) Acceleration/ deceleration	Sets the acceleration/deceleration rate or acceleration/deceleration time for JOG macro operation. **[Setting range]** 1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000
	02A6h (678)	02A7h (679)	(JOG) Starting speed	Sets the starting speed for JOG macro operation. **[Setting range]** 0 to 4,000,000 Hz	100

- **Operation method**

1. Check that the READY output is ON.
2. Turn the FW-JOG-P input (or RV-JOG-P input) ON.
   The READY output is turned OFF, and the MOVE output is turned ON. Then, the motor starts operation.
3. Check that 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**

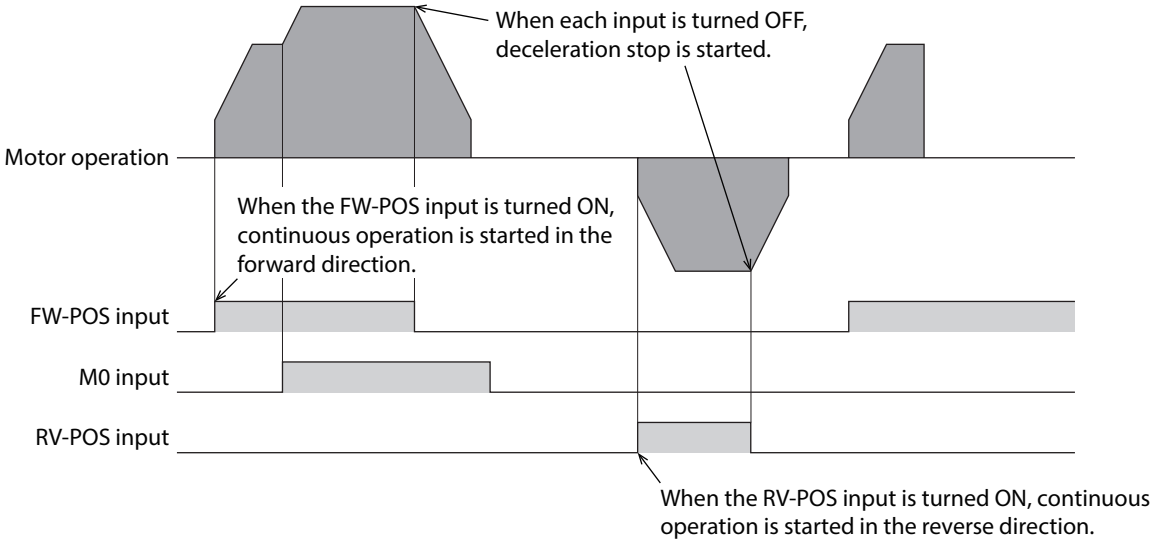


* The specific time varies depending on the operating speed, speed filter and other.

4-5 Continuous operation

The motor operates continuously at the operating speed of the operation data number selected while the FW-POS input or RV-POS input is ON. When the operation data number is changed while executing continuous operation, the speed is changed.
When the FW-POS input or RV-POS input is turned OFF, the motor decelerates to a stop. If the signal of the same rotation direction is turned ON while decelerating, the motor accelerates again and continues operation.
If the FW-POS input and the RV-POS input are turned ON simultaneously, the motor decelerates to a stop.

- **Operation image**



- **Related operation data**

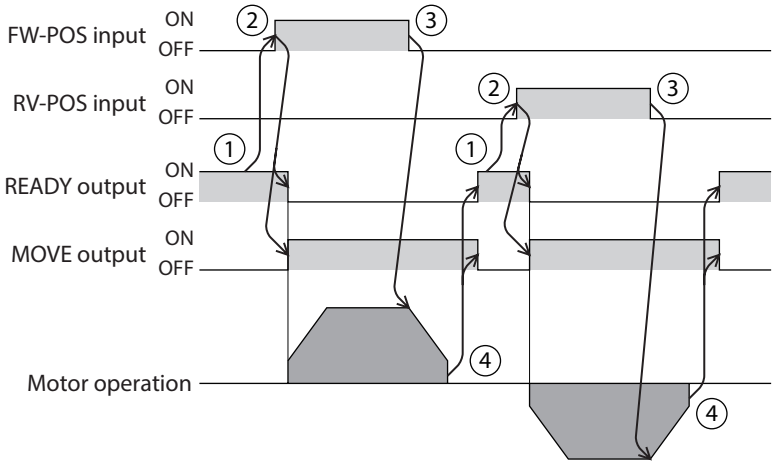
MEXE02 code	Item	Description	Setting range	Initial value
p1	Speed	Sets the operating speed.	−4,000,000 to 4,000,000 Hz	1,000
	Starting/ changing rate	Sets the acceleration/deceleration rate (acceleration/deceleration time) for start and change of the speed.	1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000
	Stopping deceleration	Sets the deceleration rate (deceleration time) for stop.	1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	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

- **Related parameter**

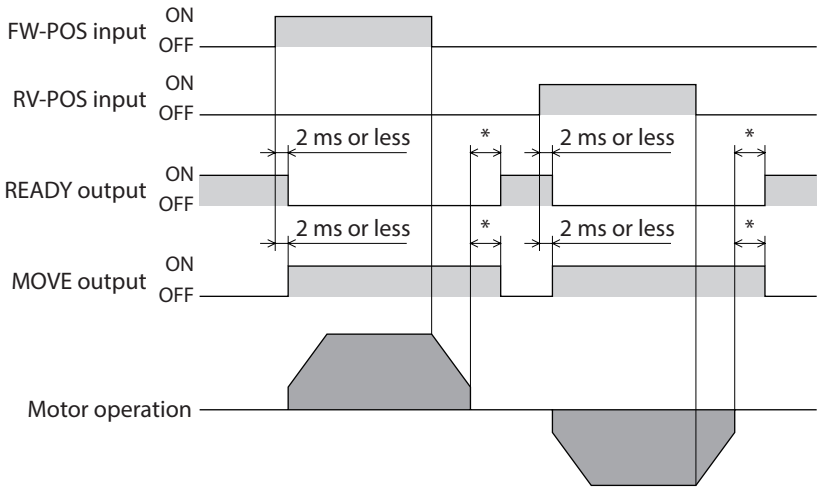
MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p3	0284h (644)	0285h (645)	Starting speed	Sets the starting speed for positioning SD operation or continuous macro operation. **[Setting range]** 0 to 4,000,000 Hz	100

- **Operation method**

1. Check that the READY output is ON.
2. Turn the FW-POS input (or RV-POS input) ON.
   The READY output is turned OFF, and the MOVE output is turned ON. Then, the motor starts operation.
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**



* The specific time varies depending on the operating speed, speed filter and other.

5 Position coordinate management

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

- Return-to-home operation
- Position preset.....The command position will be the value set in the "Preset position" parameter.

Note If the position coordinate has not been set, the absolute positioning operation cannot be performed. (when the "Permission of absolute positioning without setting absolute coordinates" parameter is "0: Disable")

● Related parameter

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p3	0290h (656)	0291h (657)	Permission of absolute positioning without setting absolute coordinates	Permits absolute positioning operation when the position coordinate is not set. **[Setting range]** 0: Disable 1: Enable	1
	038Ch (908)	038Dh (909)	Preset position	Sets the preset position. **[Setting range]** –2,147,483,648 to 2,147,483,647 steps	0

● Cases in which the position coordinate is not set

In the following cases, the position coordinate is not set. The ABSPEN output is turned OFF.

- When the power supply is turned on
- During return-to-home operation
- After Configuration was executed
- After the motor excitation was stopped

2 I/O signals

This chapter 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 a signal is input directly by connecting the I/O cable to the connector.

Item	Description
Input function	The input signal to be assigned to DIN is selected.
Inverting mode	ON/OFF of the input signal can be changed.
ON signal dead-time	When the set time is exceeded, the input signal is turned ON. You can use this value for prevention of noise and adjustment of the timing between devices.

- **Input function**

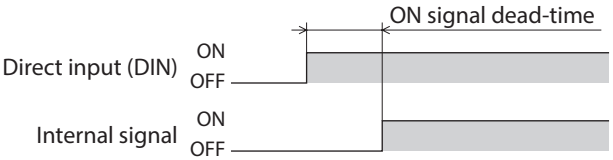
MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p7	1080h (4224)	1081h (4225)	DIN0 input function	Selects the input signal to be assigned to DIN. **[Setting range]** Input signal list ⇨p.61	56: FW-POS
	1082h (4226)	1083h (4227)	DIN1 input function		57: RV-POS
	1084h (4228)	1085h (4229)	DIN2 input function		5: STOP
	1086h (4230)	1087h (4231)	DIN3 input function		8: ALM-RST
	1088h (4232)	1089h (4233)	DIN4 input function		30: HOMES
	108Ah (4234)	108Bh (4235)	DIN5 input function		28: FW-LS
	108Ch (4236)	108Dh (4237)	DIN6 input function		29: RV-LS

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

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p7	10A0h (4256)	10A1h (4257)	DIN0 inverting mode	Changes ON/OFF setting of DIN. **[Setting range]** 0: Non invert 1: Invert	0
	10A2h (4258)	10A3h (4259)	DIN1 inverting mode		0
	10A4h (4260)	10A5h (4261)	DIN2 inverting mode		0
	10A6h (4262)	10A7h (4263)	DIN3 inverting mode		0
	10A8h (4264)	10A9h (4265)	DIN4 inverting mode		0
	10AAh (4266)	10ABh (4267)	DIN5 inverting mode		0
	10ACh (4268)	10ADh (4269)	DIN6 inverting mode		0

● **ON signal dead-time**

MEXE02 code	Register address Upper	Register address Lower	Item	Description	Initial value
p7	1180h (4480)	1181h (4481)	DIN0 ON signal dead-time	Sets the ON signal dead-time of DIN. **[Setting range]** 0 to 250 ms	0
	1182h (4482)	1183h (4483)	DIN1 ON signal dead-time		0
	1184h (4484)	1185h (4485)	DIN2 ON signal dead-time		0
	1186h (4486)	1187h (4487)	DIN3 ON signal dead-time		0
	1188h (4488)	1189h (4489)	DIN4 ON signal dead-time		0
	118Ah (4490)	118Bh (4491)	DIN5 ON signal dead-time		0
	118Ch (4492)	118Dh (4493)	DIN6 ON signal dead-time		0



1-2 Direct output

Direct output (DOUT) is a method in which a signal is output directly by connecting the I/O cable to the connector.

Item	Description
Output function	The output signal to be assigned to DOUT is selected.
Inverting mode	ON/OFF of the output signal can be changed.
OFF delay time	When the set time is exceeded, the output signal is turned OFF. You can use this value for prevention of noise and adjustment of the timing between devices.

● **Output function**

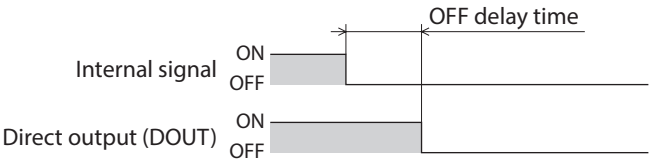
MEXE02 code	Register address Upper	Register address Lower	Item	Description	Initial value
p8	10C0h (4288)	10C1h (4289)	DOUT0 output function	Selects the output signal to be assigned to DOUT. **[Setting range]** Output signal list ⇨ p.62	130: ALM-B
	10C2h (4290)	10C3h (4291)	DOUT1 output function		157: TIM

● **Inverting mode**

MEXE02 code	Register address Upper	Register address Lower	Item	Description	Initial value
p8	10E0h (4320)	10E1h (4321)	DOUT0 inverting mode	Changes ON/OFF setting of DOUT. **[Setting range]** 0: Non invert 1: Invert	0
	10E2h (4322)	10E3h (4323)	DOUT1 inverting mode		0

- **OFF delay time**

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p8	11C0h (4544)	11C1h (4545)	DOUT0 OFF delay time	Sets the OFF delay time of DOUT. **[Setting range]** 0 to 250 ms	0
	11C2h (4546)	11C3h (4547)	DOUT1 OFF delay time		



2 Signal list

Assign input and output signals via RS-485 communication or using the **MEXE02**.

2-1 Input signal list

To assign signals via RS-485 communication, use the "Assignment number" in the table instead of the signal names. For details of each signal, refer to "4 Input signals" on p.66.

Assignment number	Signal name	Function
0	No function	Set when the input terminal is not used.
2	AWO	Cut off the current of the motor and remove the motor excitation.
5	STOP	Stop the motor.
8	ALM-RST	Release the alarm that is present.
9	P-PRESET	Execute the position preset.
13	LAT-CLR	Clear the latch information.
14	INFO-CLR	Release the information status.
16	HMI	Release the function limitation of the **MEXE02**.
26	FW-BLK	Stop operation in the forward direction.
27	RV-BLK	Stop operation in the reverse direction.
28	FW-LS	A signal input from the limit sensor in the forward direction.
29	RV-LS	A signal input from the limit sensor in the reverse direction.
30	HOMES	A signal input from the mechanical home sensor.
31	SLIT	A signal input from the slit sensor.
32	START	Execute positioning SD operation.
33	SSTART	Execute positioning SD operation. Execute operation of the next data number in manual sequential operation.
36	HOME	Execute return-to-home operation.
48	FW-JOG	Execute JOG operation in the forward direction.
49	RV-JOG	Execute JOG operation in the reverse direction.
50	FW-JOG-H	Execute high-speed JOG operation in the forward direction.
51	RV-JOG-H	Execute high-speed JOG operation in the reverse direction.
52	FW-JOG-P	Execute inching operation in the forward direction.
53	RV-JOG-P	Execute inching operation in the reverse direction.
56	FW-POS	Execute continuous operation in the forward direction.
57	RV-POS	Execute continuous operation in the reverse direction.
64	M0	Select the operation data number using eight bits.
65	M1	
66	M2	
67	M3	
68	M4	
69	M5	
70	M6	
71	M7	
80	R0	General signals.
81	R1	
82	R2	
83	R3	

Assignment number	Signal name	Function
84	R4	General signals.
85	R5	
86	R6	
87	R7	

2-2 Output signal list

To assign signals via RS-485 communication, use the "Assignment number" in the table instead of the signal names.
For details of each signal, refer to "5 Output signals" on p.74.

Assignment number	Signal name	Function
0	No function	Set when the output terminal is not used.
2	AWO_R	Output in response to the input signal.
5	STOP_R	
8	ALM-RST_R	
9	P-PRESET_R	
13	LAT-CLR_R	
14	INFO-CLR_R	
16	HMI_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	
69	M5_R	
70	M6_R	
71	M7_R	
80	R0_R	
81	R1_R	
82	R2_R	

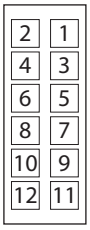
Assignment number	Signal name	Function
83	R3_R	Output in response to the input signal.
84	R4_R	
85	R5_R	
86	R6_R	
87	R7_R	
128	CONST-OFF	The output function is not used.
129	ALM-A	Output the alarm status of the driver (normally open).
130	ALM-B	Output the alarm status of the driver (normally closed).
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.
134	MOVE	Output when the motor operates.
135	INFO	Output the information status of the driver.
136	SYS-BSY	Output when the driver is in internal processing status.
141	VA	Output when the operating speed reaches the target speed.
142	CRNT	Output while the motor is excited.
143	AUTO-CD	Output when the motor is in automatic current cutback status.
144	HOME-END	Output upon completion of return-to-home operation and when position preset is executed.
145	ABSPEN	Output when the position coordinate is set.
147	PLS-OUT	Output 50 pulses 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.
157	TIM	Output every time the motor output shaft rotates by 7.2° from the home.
160	AREA0	Output when the motor is within the area.
161	AREA1	
198	SEQ-BSY	Output when positioning SD operation is executed.
199	DELAY-BSY	Output when the driver is in waiting status. (drive-complete delay time)
204	DCMD-RDY	Output when the driver is ready to start direct data operation.
205	DCMD-FULL	Output when data is written in the buffer area of direct data operation.
226	INFO-DRVTMP	Output when corresponding information is generated.
228	INFO-OVOLT	
229	INFO-UVOLT	
233	INFO-START	
235	INFO-PR-REQ	
236	INFO-MSET-E	
239	INFO-NET-E	
240	INFO-FW-OT	
241	INFO-RV-OT	
244	INFO-TRIP	
245	INFO-ODO	
252	INFO-DSLMTD	
253	INFO-IOTEST	
254	INFO-CFG	
255	INFO-RBT	

3 Signal types

3-1 Direct I/O

Direct I/O is I/O accessed via the I/O signal connector.
Assign the input signals to pin No.2 to No.10 of the I/O signal connector by parameters.
For input signals that can be assigned, refer to "2-1 Input signal list" on p.61.

Pin No.	Terminal name	Initial value
2	DIN0	FW-POS
4	DIN2	STOP
6	DIN4	HOMES
8	DIN6	RV-LS
10	DOUT1	TIM
12	N.C.	Not used



Pin No.	Terminal name	Initial value
1	IN-COM	Input common
3	DIN1	RV-POS
5	DIN3	ALM-RST
7	DIN5	FW-LS
9	DOUT0	ALM-B
11	OUT-COM	Output common

Related parameters

DIN input function	Input function
DIN0	FW-POS
DIN1	RV-POS
DIN2	STOP
DIN3	ALM-RST
DIN4	HOMES
DIN5	FW-LS
DIN6	RV-LS

DOUT output function	Output function
DOUT0	ALM-B
DOUT1	TIM

Note

- When the same input signal is assigned to multiple input terminals, the function is executed if any of the terminals has input.
- When the HMI input is not assigned to the input terminals, this input is always turned ON. Also, when this input is assigned to both direct I/O and remote I/O, the function is executed only when both of them are turned ON.

3-2 Remote I/O

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

■ Assignment to input signals

Assign the input signals shown below to the R-IN0 to R-IN15 of the remote I/O by parameters.
For input signals that can be assigned, refer to "2-1 Input signal list" on p.61.

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	No function
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 is executed if any of the terminals has input.
- When the HMI input is not assigned to the input terminals, this input is always turned ON. Also, when this input is assigned to both direct I/O and remote I/O, the function is executed only when both of them are turned ON.

■ Assignment to output signals

Assign the output signals shown below to the R-OUT0 to R-OUT15 of the remote I/O by parameters.
For output signals that can be assigned, refer to "2-2 Output signal list" on p.62.

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	CONST-OFF
R-OUT12	TIM
R-OUT13	MOVE
R-OUT14	CONST-OFF
R-OUT15	CONST-OFF

4 Input signals

4-1 Operation control

■ Excitation switching signal

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

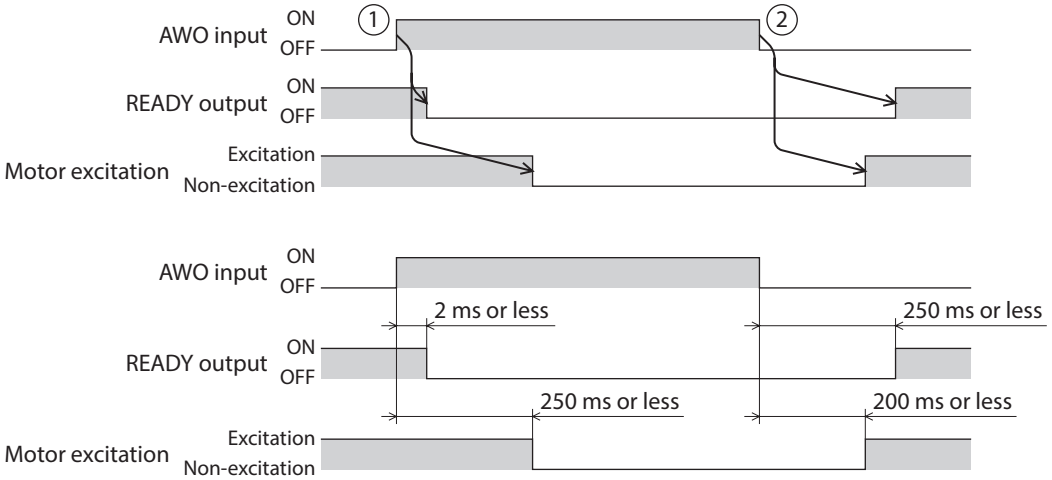
- **AWO input**

When the AWO input is turned ON, the motor current is cut off and the motor excitation is stopped.
The motor output shaft can be rotated manually since the motor holding torque is lost.

Note When driving a vertical load, do not turn the AWO input ON. Since the motor loses its holding torque, the load may drop.

When the motor is excited

1. When the AWO input is turned ON, the READY output is turned OFF, and the motor excitation is stopped.
2. When the AWO input is turned OFF, the motor is excited, and the READY output is turned ON.



■ Operation stop signals

These signals are used to stop operation of the motor.

- **STOP input**

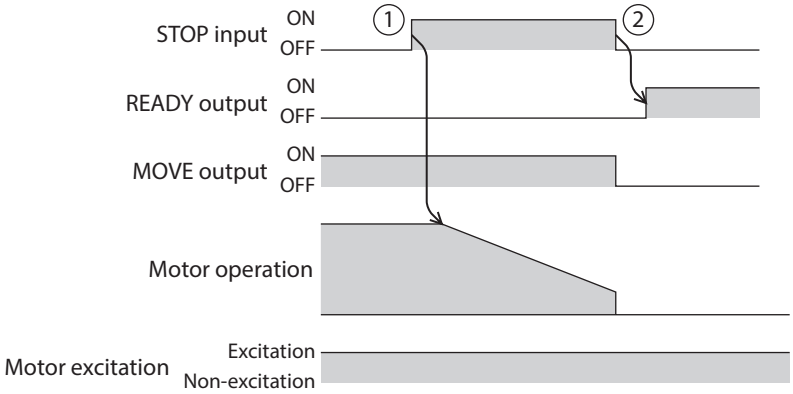
When the STOP input is turned ON, the motor stops operation according to the "STOP input action" parameter. The remaining travel amount is cleared.

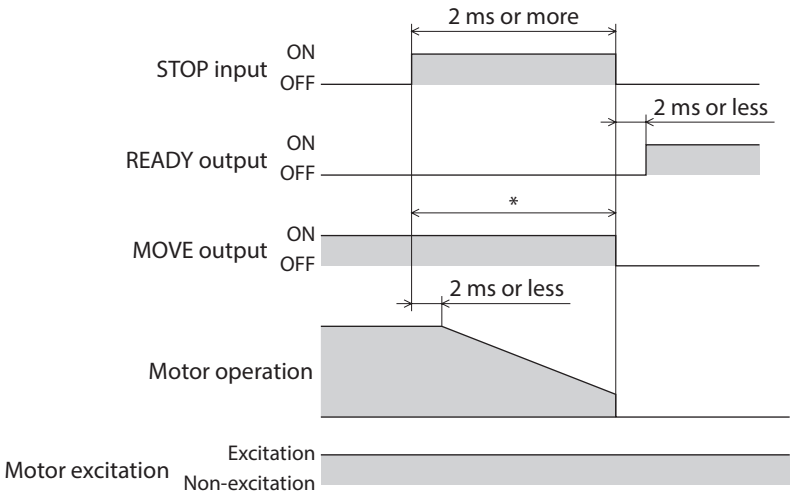
Related parameter

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p6	0E00h (3584)	0E01h (3585)	STOP input action	Sets how to stop the motor when the STOP input is turned ON. **[Setting range]** 0: Immediate stop 3: Deceleration stop	3

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

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

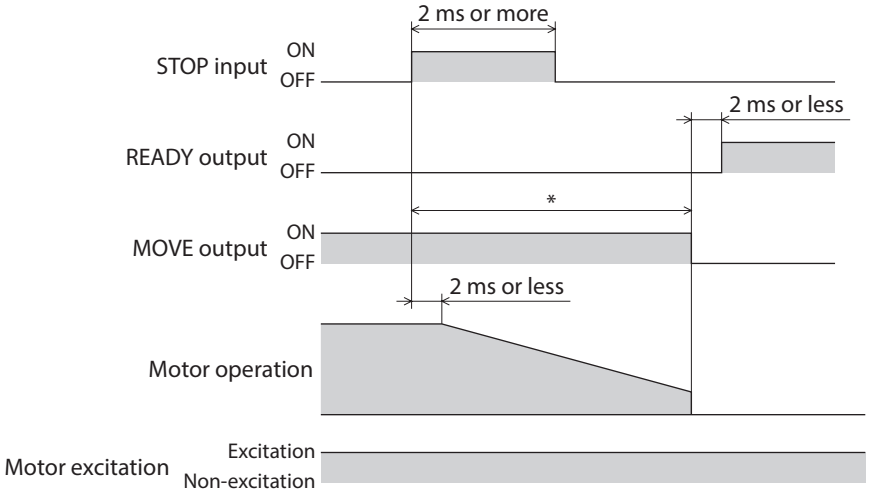




* It varies depending on the driving condition.

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

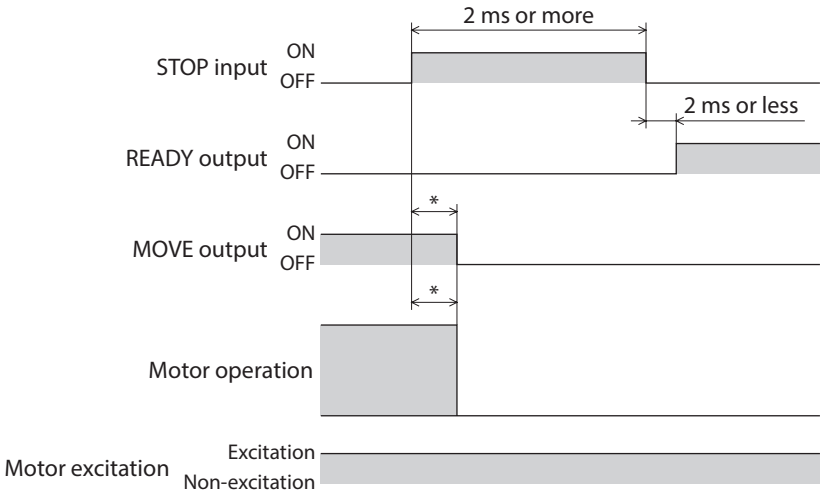
1. When the STOP input is turned ON during operation, the motor starts stop operation.
   Even after the STOP input is turned OFF, the motor continues deceleration operation until it stops.
2. When the motor stops, the READY output is turned ON.



* It varies depending on the driving condition.

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

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



* It varies depending on the driving condition.

● FW-BLK input and RV-BLK input

The motor stops operation in the forward direction when the FW-BLK input is turned ON and stops operation in the reverse direction when the RV-BLK input is turned ON. When each input is ON, the motor does not operate even if the operation start signal in the stopping direction is input. The operation start signal in the opposite direction functions. The motor stops operation according to the "FW-BLK/RV-BLK input action" parameter. The remaining travel amount is cleared.

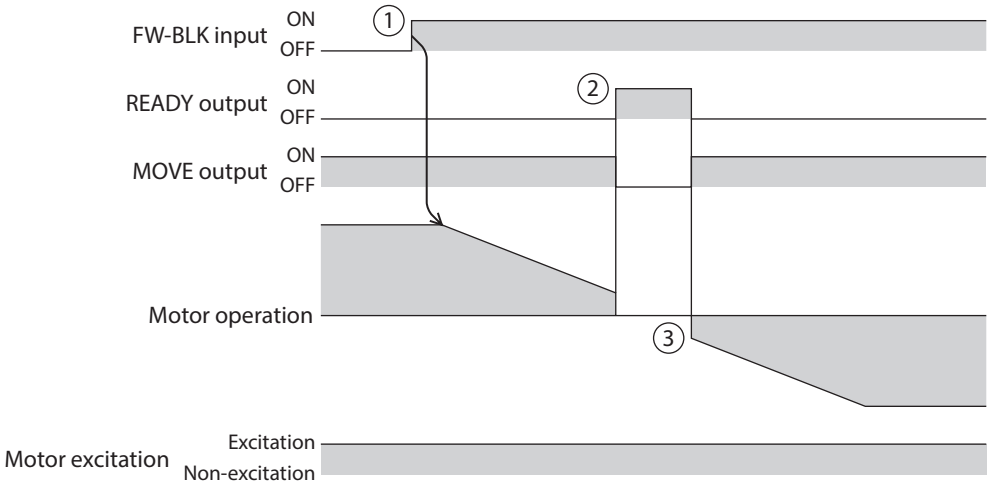
Related parameter

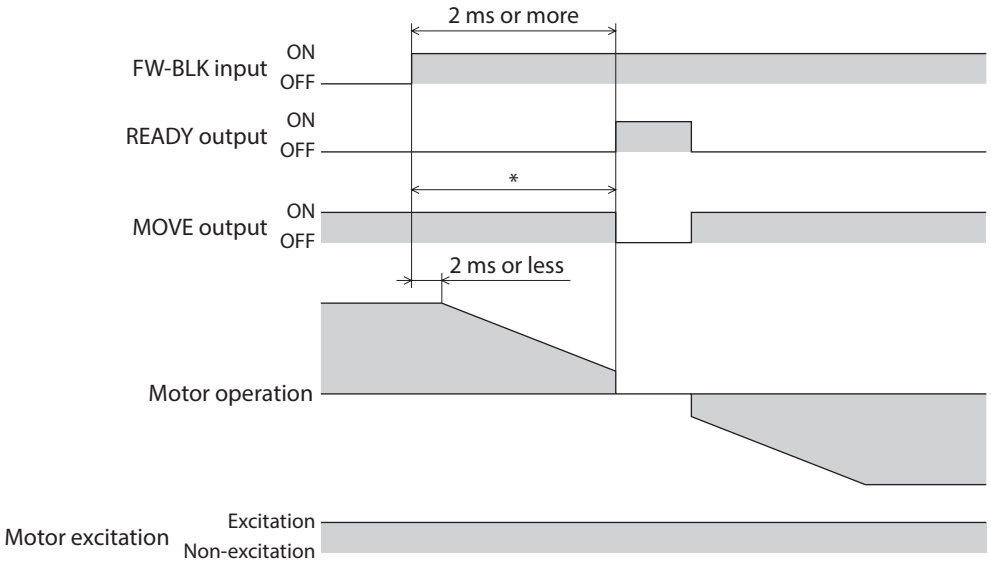
MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p6	0E04h (3588)	0E05h (3589)	FW-BLK/RV-BLK input action	Sets how to stop the motor when the FW-BLK input or the RV-BLK input is turned ON. **[Setting range]** 0: Immediate stop 1: Deceleration stop	1

memo When the FW-BLK input and the RV-BLK input are turned ON, the following information is generated.
- When the FW-BLK input is ON: "Forward operation prohibition"
- When the RV-BLK input is ON: "Reverse operation prohibition"

When the FW-BLK/RV-BLK input action is "1: Deceleration stop" (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 stop operation.
2. When operation stops, the READY output is turned ON.
3. When the operation start signal in the reverse direction is input while the FW-BLK input is ON, the READY output is turned OFF, and the operation is started.

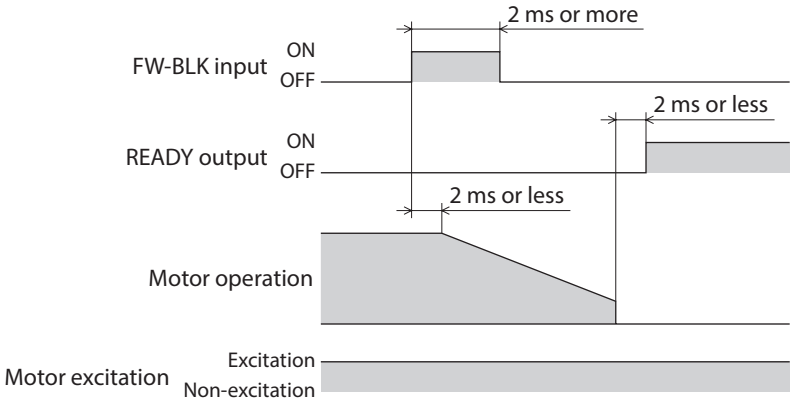




* It varies depending on the driving condition.

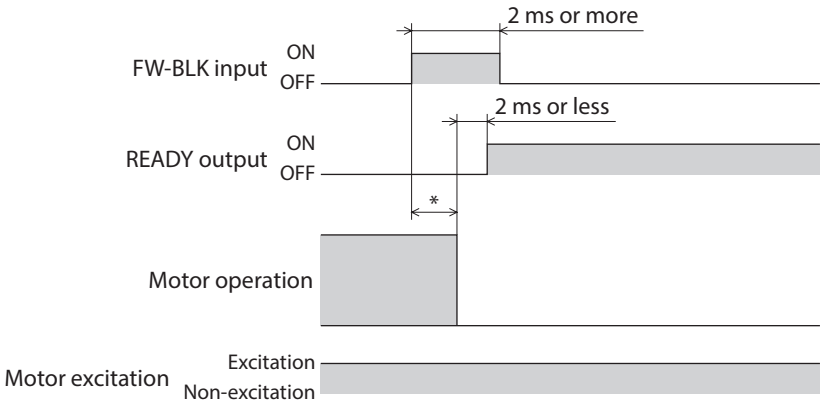
When the FW-BLK/RV-BLK input action is "1: Deceleration stop"
(The motor does not stop while the FW-BLK input is ON)

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



When the FW-BLK/RV-BLK input action is "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 when the ON status of the FW-BLK input was detected.



* It varies depending on the driving condition.

■ Signals used for positioning SD operation

- **START input**

  When the START input is turned ON after selecting the operation data number, positioning SD operation is started. In manual sequential operation, the operation data number that is the starting point is started.

- **SSTART input**

  When the SSTART input is turned ON, positioning SD operation is started.
  In manual sequential operation, operation of the operation data number of the next data is started whenever the SSTART input is turned ON. In operation other than manual sequential operation, operation of the selected operation data number is started.

- **M0 to M7 inputs**

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

Operation data No.	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: To specify the operation data No. 8 (binary representation: 0000 1000)

Operation data No.	M7	M6	M5	M4	M3	M2	M1	M0
8	OFF	OFF	OFF	OFF	**ON**	OFF	OFF	OFF

Setting example 2: To specify the operation data No. 116 (binary representation: 0111 0100)

Operation data No.	M7	M6	M5	M4	M3	M2	M1	M0
116	OFF	**ON**	**ON**	**ON**	OFF	**ON**	OFF	OFF

■ Signal used for 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 and RV-JOG input**

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

- **FW-JOG-H input and RV-JOG-H input**

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

- **FW-JOG-P input and RV-JOG-P input**

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

● **FW-POS input and RV-POS input**

When the operation data number is selected and the FW-POS input or RV-POS input is turned 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, and 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 the FW-POS input and the RV-POS input are turned ON simultaneously, the motor decelerates to a stop.
When the operation data number is changed during continuous operation, the speed is changed to the one specified for the new operation data number.

4-2 Position coordinate management

■ External sensor input signals

● **FW-LS input and RV-LS input**

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

- Return-to-home operation
  When the FW-LS input or RV-LS input is detected, return-to-home operation is performed according to the setting of the "Home-seeking mode" parameter.
- Other than return-to-home operation
  The 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	Register address		Item	Description	Initial value
	Upper	Lower			
p6	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. **[Setting range]** –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 setting the "(HOME) Home-seeking mode" parameter to the "1: 3 sensors" or "2: One-way rotation."

Related parameter

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p4	02C0h (704)	02C1h (705)	(HOME) Home-seeking mode	Sets the mode for return-to-home operation. **[Setting range]** 0: 2 sensors 1: 3 sensors 2: One-way rotation	1

● **SLIT input**

Connect when executing return-to-home operation using a sensor with a slit.
When executing return-to-home operation, use of the SLIT input in addition to the HOMES increases the accuracy of home detection.

■ Position coordinate preset signal

This is a signal to preset the home.

- **P-PRESET input**

  When the P-PRESET input is turned ON, the command position is rewritten to the value set in the "Preset position" parameter.
  However, preset cannot be executed while the motor is operating.

4-3 Management of driver

■ Status releasing signals

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

- **ALM-RST input**

  When an alarm is generated, the motor stops. If the ALM-RST input is turned from OFF to ON at this time, the alarm is reset (the alarm is reset at the ON edge of the ALM-RST input). Always reset an alarm after removing the cause of the alarm and ensuring safety.
  Note that some alarms cannot be reset by the ALM-RST input.
  For the alarms, refer to USER MANUAL.

- **LAT-CLR input**

  This signal is used to clear the latched status. The information cleared by LAT-CLR is as follows.
  (latch function ⇨p.172)
  - Command position, target position, operation data number, and number of loop times when operation is interrupted by operation stop signal.

- **INFO-CLR input**

  This signal is enabled when the "Information auto clear" parameter is set to "0: Disable."
  When the INFO-CLR input is turned ON, the information status is released.

■ Driver function change signal

- **HMI input**

  When the HMI input is turned ON, the function limitation of the **MEXE02** is released. When the HMI input is turned OFF, the function limitation is imposed.
  The following functions are limited.
  - I/O test
  - Teaching, remote operation
  - Writing operation data and parameters, downloading, initializing

Note When the HMI input is not assigned to the direct I/O or remote I/O, this input is always set to ON. Also, when this input is assigned to both direct I/O and remote I/O, the function is executed only when both of them are set to ON.

5 Output signals

5-1 Management of driver

■ Driver status indication signals

- **ALM-A output and ALM-B output**

  When 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 blinks in red, and the motor stops. When an alarm to put the motor in a non-excitation state is generated, the motor current is cut off after motor stop.
  The ALM-A output is normally open, and the ALM-B output is normally closed.

- **SYS-RDY output**

  The SYS-RDY output is turned ON when the driver is ready to operate and enables to receive input signals after power-on.

- **INFO output**

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

  Related parameters

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p5	037Ch (892)	037Dh (893)	Information LED condition	Sets the status of the LED when information is generated. * **[Setting range]** 0: Disable (LED does not blink) 1: Enable (LED blinks)	1
	037Eh (894)	037Fh (895)	Information auto clear	When the cause of information is eliminated, the INFO output and the bit output of the corresponding information are turned OFF automatically. **[Setting range]** 0: Disable (not turned OFF automatically) 1: Enable (turned OFF automatically)	1

  * Since the red color and green color of the LED blink at the same time, the two colors overlap and seem to be orange.

- **SYS-BSY output**

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

- **Output of information signals**

  When corresponding information is generated, each output signal is turned ON.
  For details of information, refer to USER MANUAL.

■ Hardware status indication signal

- **CRNT output**

  The CRNT output is turned ON while the motor is excited.

5-2 Management of operation

■ Operating 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 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 satisfied.

- 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 present
- The motor is not operated
- Teaching, remote operation, download, and I/O test are not executed in the **MEXE02**
- "Configuration" command, "Batch data initialization" command, "All data batch initialization"command, and "Read batch NV memory" command are not executed via RS-485 communication

● MOVE output

The MOVE output is turned ON while the motor is operating.

Related parameter

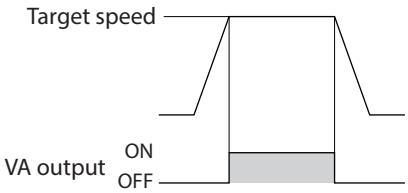
MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p6	0E14h (3604)	0E15h (3605)	MOVE minimum ON time	Sets the minimum ON time for the MOVE output. **[Setting range]** 0 to 255 ms	0

● AUTO-CD output

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

● VA output

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



● HOME-END output

The HOME-END output is turned ON in the following cases.

- When return-to-home operation is completed
- When the position coordinate is set after position preset is executed

■ Positioning SD operation status indication signals

● SEQ-BSY output

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

● DELAY-BSY output

The DELAY-BSY output is turned ON when the driver is in the drive-complete delay time.

■ Direct data operation status indication signals

● DCMD-FULL output

The DCMD-FULL output is turned ON when data is written in 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 satisfied.

- The main power supply of the driver is turned on
- The AWO input is OFF
- The STOP input is OFF
- An alarm is not present
- Teaching, remote operation, download, and I/O test are not executed in the **MEXE02**
- "Configuration" command, "Batch data initialization" command, "All data batch initialization" command, and "Read batch NV memory" command are not executed via RS-485 communication

■ Motor position indication signals

These signals are outputs according to the position of the motor.

● TIM output

Every time the motor output shaft rotates by 7.2° (3.6° for 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 tolerance for the motor stop positions in a range of the home sensor can be reduced and the further accurate home can be detected.

Note

- If the command speed is 500 Hz or more, the TIM output is not turned ON correctly.
- 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° (3.6° for high-resolution type).

● PLS-OUT output

The PLS-OUT output is output 50 times 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.

● AREA0 output, AREA1 output

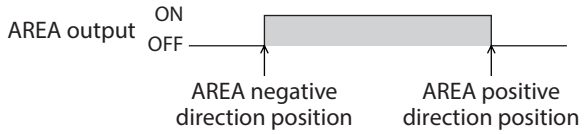
The AREA outputs are turned ON when the motor is inside the set area.
They are turned ON when the motor is inside the area even if the motor is stopped.

Related parameters

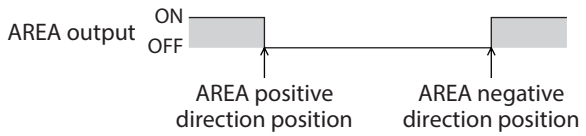
MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p6	0E80h (3712)	0E81h (3713)	AREA0 positive direction position/offset	Sets the positive direction position or offset from the target position for the AREA output. **[Setting range]** −2,147,483,648 to 2,147,483,647 steps	0
	0E84h (3716)	0E85h (3717)	AREA1 positive direction position/offset		0
	0E82h (3714)	0E83h (3715)	AREA0 negative direction position/detection range	Sets the negative direction position or distance from the offset position for the AREA output. **[Setting range]** −2,147,483,648 to 2,147,483,647 steps	0
	0E86h (3718)	0E87h (3719)	AREA1 negative direction position/detection range		0
	0EA0h (3744)	0EA1h (3745)	AREA0 range setting mode	Sets the range setting mode of AREA output. **[Setting range]** 0: Absolute pos (Range setting with absolute value) 1: Offset/width setting from the target position	0
	0EA2h (3746)	0EA3h (3747)	AREA1 range setting mode		0

When the "AREA range setting mode" parameter is "0: Absolute pos"

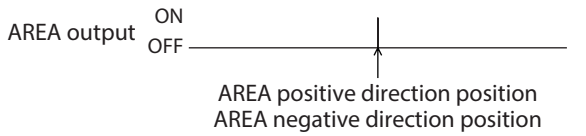
- "AREA positive direction position/offset" parameter > "AREA negative direction position/detection range" parameter
  When the position of the motor is "AREA negative direction position/detection range" or more or "AREA positive direction position/offset" or less, the AREA output is turned ON.



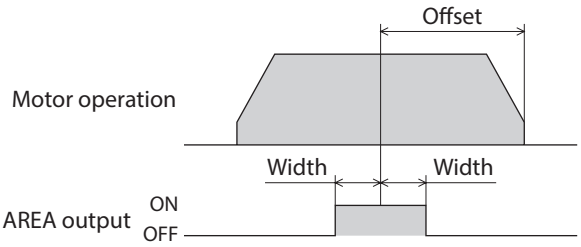
- "AREA positive direction position/offset" parameter < "AREA negative direction position/detection range" parameter
  When the position of the motor is "AREA positive direction position/offset" or less or "AREA negative direction position/detection range" or more, the AREA output is turned ON.



- "AREA positive direction position/offset" parameter = "AREA negative direction position/detection range" parameter
  When the position of the motor is equal to "AREA negative direction position/detection range" and "AREA positive direction position/offset," 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 and RV-SLS output**

  If the command position exceeds the range specified in the "Software limit" parameter when the "Software overtravel" parameter is set to other than "–1: Disable," the FW-SLS output and the RV-SLS output are turned ON.

■ Position coordinate status indication signal

- **ABSPEN output**

  When the position coordinate has been set, the ABSPEN output is turned ON.

5-3 Response output

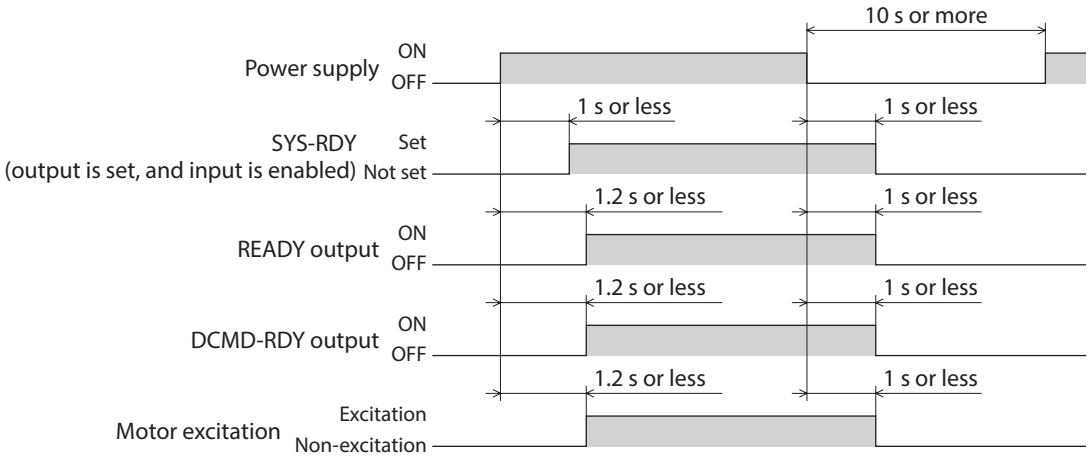
The response output is a signal to output the ON/OFF status corresponding to an input signal.
The tables show the correspondence between the input signals and output signals.

Input signals	Output signals
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
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

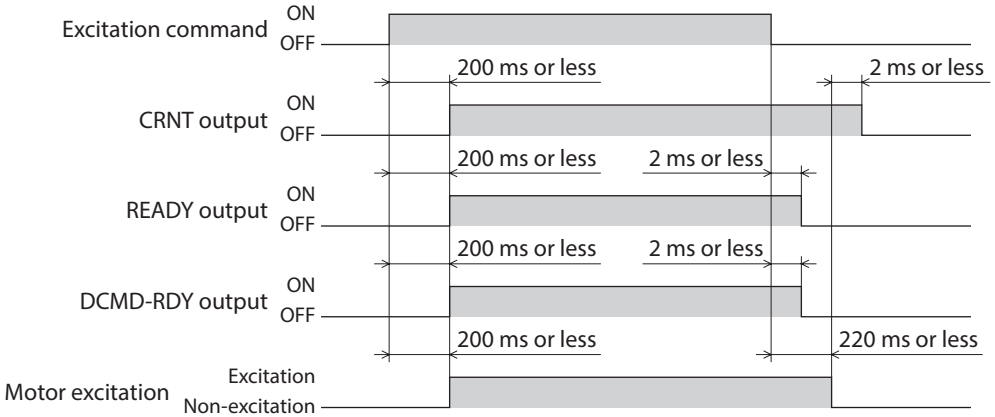
Input signals	Output signals
FW-JOG-P	FW-JOG-P_R
RV-JOG-P	RV-JOG-P_R
FW-POS	FW-POS_R
RV-POS	RV-POS_R
M0	M0_R
M1	M1_R
M2	M2_R
M3	M3_R
M4	M4_R
M5	M5_R
M6	M6_R
M7	M7_R
R0	R0_R
R1	R1_R
R2	R2_R
R3	R3_R
R4	R4_R
R5	R5_R
R6	R6_R
R7	R7_R

6 Timing chart

■ Power supply



■ Excitation



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

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

◆Table of contents

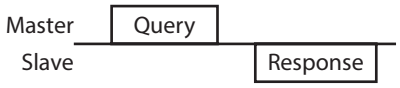
1 Specification of Modbus RTU

1-1 Communication mode

The Modbus protocol is simple and its specification is open to the public, so this protocol is used widely in industrial applications.
Modbus communication is based on the single-master/multiple-slave method. Only the master can issue a query (command).
Each slave executes the process requested by query and returns a response message.
The driver supports only the RTU mode as a transmission mode. It does not support the ASCII mode.
Messages are sent in one of two methods.

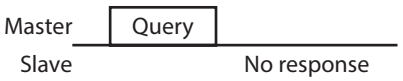
- **Unicast mode**

  The master sends a query to only one slave. The slave executes the process and returns a response.



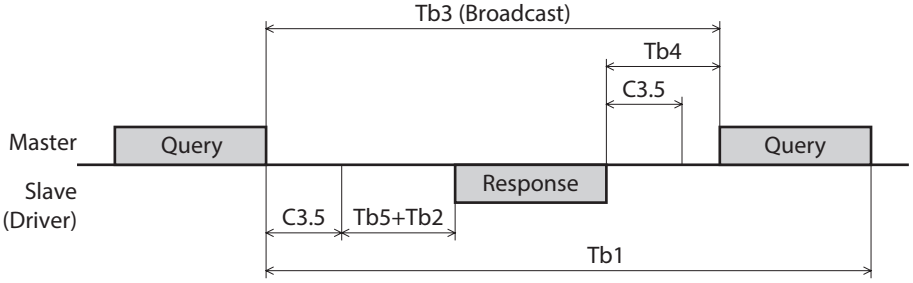
- **Broadcast mode**

  If slave address 0 is specified on the master, the master can send a query to all slaves. Each slave executes the process, but does not return a response.



1-2 Communication timing

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



Character	Name	Description
Tb1	Communication timeout (Driver)	The driver monitors an interval between received queries. If the driver is unable to 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 slaves were received, communication timeout does not occur.
Tb2	Transmission waiting time (Driver)	This is the amount of time from when the driver receives a query from the master until when it starts sending a response. This is set using the "Transmission waiting time (Modbus)" parameter.
Tb3	Broadcasting interval (Master)	This is the amount of time until the master sends the next query in broadcasting. A time equivalent to or longer than the silent interval (C3.5) plus 5 ms is required.
Tb4	Communication timeout (Master)	This is the amount of time from when the master receives the response until when it sends the next query (setting in the master 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 master side according to the "Estimate of transmission waiting time (master) (Tb4)" 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.

Character	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 in the table below.

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

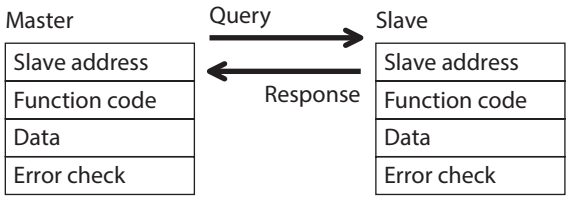
Transmission rate (bps)	Silent interval (C3.5)	Estimate of transmission waiting time (Master) (Tb4)
9,600	4.0 ms or more	5.0 ms or more
19,200 or more	2.5 ms or more	3.0 ms or more

Note

- If the transmission waiting time (Tb4) of the master is shorter than the silent interval, the slave discards the message and a communication error occurs. When a communication error occurs, check the silent interval of the slave and set the transmission waiting time (Tb4) of the master again.
- The silent interval (C3.5) may vary depending on the product series connected. When connecting multiple product series, set parameters as follows.
  – "Silent interval (Modbus)" parameter: "0: automatically set"
  – "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. Normally, use it as "0: automatically set."

2 Message structure

The message format is shown.



2-1 Query

The query message structure is shown.

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

■ Slave address

Specify the slave address (unicast mode).
If the slave address is set to 0, the master can send a query to all slaves (broadcast mode).

■ Function code

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

Function code	Function	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	Read/write of multiple holding registers	Read: 1 to 125 Write: 1 to 121	Not possible

■ Data

Set data associated with 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 slave calculates a CRC-16 of each received message and compares the result against the error check value included in the message. If the calculated CRC-16 value matches the error check value, the slave determines that the message is normal.

- **CRC-16 calculation method**

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

- **Calculation example of CRC-16**

The table shows a calculation example when setting the slave 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

Slave-returned responses are classified into three types: normal response, no response, and exception response. The response message structure is the same as the query message structure.

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

■ Normal response

Upon receiving a query from the master, the slave executes the requested process and returns a response corresponding to the function code.

■ No response

The slave may not return a response to a query sent by the master. This condition is referred to as "no response." The causes of no response are explained.

- **Transmission error**

The slave discards the query if any of the transmission errors in the table is detected. No response is returned.

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

- **Other than transmission error**

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

Cause	Description
Broadcast	If the query was broadcast, the slave executes the requested process but does not return a response.
Mismatched slave address	The slave address in the query was found not matching the slave address of the driver.

■ Exception response

An exception response is returned if the slave cannot execute the process requested by the query. Appended to this response is an exception code indicating why the process cannot be executed. The message structure of exception response is as follows.

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

- **Function code**

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

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

● **Example of exception response**

Slave address		01h	Query	Slave address		01h
Function code		10h	→	Function code		90h
Data	Register address (upper)	02h		Data	Exception code	04h
	Register address (lower)	4Ch	←	Error check (lower)		4Dh
	Number of registers (upper)	00h	Response	Error check (upper)		C3h
	Number of registers (lower)	02h				
	Number of bytes	04h				
	Value write to register address (upper)	00h				
	Value write to register address (lower)	00h				
	Value write to register address + 1 (upper)	03h				
	Value write to register address + 1 (lower)	E9h				
Error check (lower)		2Fh				
Error check (upper)		D4h				

● **Exception code**

Indicates why the process cannot be executed.

Exception code	Communication error code	Cause	Description
01h	88h	Invalid function	The process could not be executed because the function code was invalid. • The function code is not supported • The sub-function code for diagnosis (08h) is other than 00h
02h	88h	Invalid data address	The process could not be executed because the data address was invalid. • The register address is not supported (other than 0000h to 57FFh) • The register address and the number of registers are 5800h or more in total
03h	8Ch	Invalid data	The process could not be executed because the data was invalid. • The number of registers is 0 • The number of bytes is other than "the number of register ×2" • The data length is outside the specified range
04h	89h 8Ah 8Ch 8Dh	Slave error	The process could not be executed because an error occurred at the slave. • Any of the following is being executed with **MEXE02** (89h) - Downloading (writing to the driver) - Initialization or Configuration - I/O test or teaching • Non-volatile memory processing is in progress (8Ah) - Internal processing is in progress (SYS-BSY is ON) - An alarm of EEPROM error is present • Outside the parameter setting range (8Ch) - Value write is out of the setting range • Command execute disable (8Dh)

● **About slave error**

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

3 Function codes

This chapter explains the function codes supported by the driver.
Note that the function code cannot be executed if function codes other than those introduced here are sent.

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

Read a register (16 bits). Up to 125 successive registers (125×16 bits) can be read.
Read the upper and lower data at the same time. If they are not read at the same time, the value may be invalid.
If multiple holding registers are read, they are read in order of register addresses.

■ Example of read

Read the "Operation type," "Position," and "Speed" of the operation data No.1 of the slave 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
Slave address		01h	Slave address 1
Function code		03h	Reading from holding registers
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
Slave 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
	Value read from register address (upper)	00h	Value read from register address 1840h
	Value read from register address (lower)	00h	
	Value read from register address + 1 (upper)	00h	Value read from register address 1841h
	Value read from register address + 1 (lower)	02h	
	Value read from register address + 2 (upper)	FFh	Value read from register address 1842h
	Value read from register address + 2 (lower)	FFh	
	Value read from register address + 3 (upper)	D8h	Value read from register address 1843h
	Value read from register address + 3 (lower)	F0h	
	Value read from register address + 4 (upper)	00h	Value read from register address 1844h
	Value read from register address + 4 (lower)	00h	
	Value read from register address + 5 (upper)	27h	Value read from register address 1845h
	Value read from 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 combining the upper and lower may be outside the data range, write the upper and lower at the same time using the "Multiple holding registers (10h)."

■ Example of write

Write 50h (80) as a command filter time constant to slave address 2.

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

● **Query**

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

- **Response**

Field name		Data	Description
Slave address		02h	Same as query
Function code		06h	Same as query
Data	Register address (upper)	02h	Same as query
	Register address (lower)	55h	
	Value write (upper)	00h	Same as query
	Value write (lower)	50h	
Error check (lower)		98h	Calculation result of CRC-16
Error check (upper)		6Dh	

3-3 Diagnosis (08h)

Diagnose the communication between the master and slave. Arbitrary data is sent and the result of returned data is used to determine whether the communication is normal. 00h (reply to query) is the only sub-function.

■ Example of diagnosis

Send arbitrary data (1234h) to the slave for diagnosis.

- **Query**

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

- **Response**

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

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

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

■ Example of write

Set the following data to the "Starting/changing rate," "Stopping deceleration," and "Operating current" of the operation data No.3 at the slave 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
Slave address		04h	Slave 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 bytes	0Ch	Twice the number of registers in the query
	Value write to register address (upper)	00h	Value written to register address 18C6h
	Value write to register address (lower)	00h	
	Value write to register address + 1 (upper)	27h	Value written to register address 18C7h
	Value write to register address + 1 (lower)	10h	
	Value write to register address + 2 (upper)	00h	Value written to register address 18C8h
	Value write to register address + 2 (lower)	00h	
	Value write to register address + 3 (upper)	4Eh	Value written to register address 18C9h
	Value write to register address + 3 (lower)	20h	
	Value write to register address + 4 (upper)	00h	Value written to register address 18CAh
	Value write to register address + 4 (lower)	00h	
	Value write to register address + 5 (upper)	01h	Value written to register address 18CBh
	Value write to register address + 5 (lower)	F4h	
Error check (lower)		6Ch	Calculation result of CRC-16
Error check (upper)		A0h	

● **Response**

Field name		Data	Description
Slave 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 successive registers can be performed.
Data is written first, and then data is read from the specified registers.

■ Read

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

■ Write

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

■ Example of read/write

Prepare the read address and write address in a single query.
In this example, after writing the data to "Position" and "Speed" of the operation data No.1, read the present selected data number and operation data number.

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
Slave address		01h	Slave address 1
Function code		17h	Read/write of 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 bytes	08h	Value of twice the number of (Write) registers in the query
	(Write) Value write to register address (upper)	00h	Value written to register address 1842h
	(Write) Value write to register address (lower)	00h	
	(Write) Value write to register address + 1 (upper)	27h	Value written to register address 1843h
	(Write) Value write to register address + 1 (lower)	10h	
	(Write) Value write to register address + 2 (upper)	00h	Value written to register address 1844h
	(Write) Value write to register address + 2 (lower)	00h	
	(Write) Value write to register address + 3 (upper)	13h	Value written to register address 1845h
	(Write) Value write to register address + 3 (lower)	88h	
Error check (lower)		4Dh	Calculation result of CRC-16
Error check (upper)		EAh	

- **Response**

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

4 Example of data setting in Modbus RTU mode

This section explains in hexadecimal numbers.

4-1 Remote I/O command

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

Register address		Item	Description	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)." **[Setting range]** –1 (disable), 0 to 255 *	–1	R/W
0074h (116)	0075h (117)	Driver input command (2nd)	The input command same as "Driver input command (reference)" is set automatically.	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)." **[Setting range]** –1 (disable), 0 to 255 *	–1	R/W
0078h (120)	0079h (121)	Driver input command (automatic OFF)	The input command same as "Driver input command (reference)" is set automatically. When the input signal is turned ON with this command, it is turned OFF automatically 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)." **[Setting range]** –1 (disable), 0 to 255 *	–1	R/W
007Ch (124)	007Dh (125)	Driver input command (reference)	Sets the input command to the driver. (details of bit arrangement ⇨p.95)	0	R/W
007Eh (126)	007Fh (127)	Driver output status	Acquires the output status of the driver. (details of bit arrangement ⇨p.95)	–	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 be accessed by one register (16 bits). The value in brackets [ ] is the initial value.

● **Upper**

Register address	Description							
007Ch (124)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	–	–	–	–	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	–	–	–	–	–	–

● **Lower**

Register address	Description							
007Dh (125)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	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 [No function]
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	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 be accessed by one register (16 bits). The value in brackets [ ] is the initial value.

● **Upper**

Register address	Description							
007Eh (126)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	–	–	–	–	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	–	–	–	–	–	–

● **Lower**

Register address	Description							
007Fh (127)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	R-OUT15 [CONST-OFF]	R-OUT14 [CONST-OFF]	R-OUT13 [MOVE]	R-OUT12 [TIM]	R-OUT11 [CONST-OFF]	R-OUT10 [AREA1]	R-OUT9 [AREA0]	R-OUT8 [SYS-BSY]
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	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, here is a description how to execute the following positioning operation.

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

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

Query

Field name		Data	Description
Slave address		01h	Slave 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 bytes	08h	Twice the number of registers in the query=8 (08h)
	Value write to register address (upper)	00h	Value written to register address 1802h =Position (travel amount) 1,000 steps (0000 03E8h)
	Value write to register address (lower)	00h	
	Value write to register address + 1 (upper)	03h	
	Value write to register address + 1 (lower)	E8h	
	Value write to register address + 2 (upper)	00h	Value written to register address 1804h =Operating speed 5,000 Hz (0000 1388h)
	Value write to register address + 2 (lower)	00h	
	Value write to register address + 3 (upper)	13h	
	Value write to register address + 3 (lower)	88h	
Error check (lower)		03h	Calculation result of CRC-16
Error check (upper)		17h	

Response

Field name		Data	Description
Slave 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 and turn START ON. Positioning operation is started.

Query

Field name		Data	Description
Slave address		01h	Slave address 1
Function code		06h	Writing to a holding register
Data	Register address (upper)	00h	Register address to which writing is executed =Driver input command (007Dh)
	Register address (lower)	7Dh	
	Value write (upper)	00h	Value written to the register address =START ON (0008h) *
	Value write (lower)	08h	
Error check (lower)		18h	Calculation result of CRC-16
Error check (upper)		14h	

* START is assigned to bit3 of the driver input command (007Dh) in initial setting.
(1000 in a binary number=0008h in a hexadecimal number)

Response

Field name		Data	Description
Slave address		01h	Same as query
Function code		06h	Same as query
Data	Register address (upper)	00h	Same as query
	Register address (lower)	7Dh	
	Value write (upper)	00h	Same as query
	Value write (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 and turn START OFF again.

Query

Field name		Data	Description
Slave address		01h	Slave address 1
Function code		06h	Writing to a holding register
Data	Register address (upper)	00h	Register address to which writing is executed =Driver input command (007Dh)
	Register address (lower)	7Dh	
	Value write (upper)	00h	Value written to the register address =START OFF (0000h)
	Value write (lower)	00h	
Error check (lower)		19h	Calculation result of CRC-16
Error check (upper)		D2h	

Response

Field name		Data	Description
Slave address		01h	Same as query
Function code		06h	Same as query
Data	Register address (upper)	00h	Same as query
	Register address (lower)	7Dh	
	Value write (upper)	00h	Same as query
	Value write (lower)	00h	
Error check (lower)		19h	Calculation result of CRC-16
Error check (upper)		D2h	

4-3 Continuous operation

As an example, here is a description how to execute the following continuous operation.

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

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

Query

Field name		Data	Description
Slave address		01h	Slave 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 bytes	04h	Twice the number of registers in the query=4 (04h)
	Value write to register address (upper)	00h	Value written to register address 0480h =Operating speed 5,000 Hz (0000 1388h)
	Value write to register address (lower)	00h	
	Value write to register address + 1 (upper)	13h	
	Value write to register address + 1 (lower)	88h	
Error check (lower)		55h	Calculation result of CRC-16
Error check (upper)		0Ah	

Response

Field name		Data	Description
Slave 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 and turn FW-POS ON. Continuous operation is started.

Query

Field name		Data	Description
Slave address		01h	Slave address 1
Function code		06h	Writing to a holding register
Data	Register address (upper)	00h	Register address to which writing is executed =Driver input command (007Dh)
	Register address (lower)	7Dh	
	Value write (upper)	40h	Value written to the register address =FW-POS ON (4000h) *
	Value write (lower)	00h	
Error check (lower)		28h	Calculation result of CRC-16
Error check (upper)		12h	

* FW-POS is assigned to bit14 of the driver input command (007Dh) in initial setting.
(0100 0000 0000 0000 in a binary number=4000h in a hexadecimal number)

Response

Field name		Data	Description
Slave address		01h	Same as query
Function code		06h	Same as query
Data	Register address (upper)	00h	Same as query
	Register address (lower)	7Dh	
	Value write (upper)	40h	Same as query
	Value write (lower)	00h	
Error check (lower)		28h	Calculation result of CRC-16
Error check (upper)		12h	

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

Query

Field name		Data	Description
Slave address		01h	Slave address 1
Function code		06h	Writing to a holding register
Data	Register address (upper)	00h	Register address to which writing is executed =Driver input command (007Dh)
	Register address (lower)	7Dh	
	Value write (upper)	00h	Value written to the register address =FW-POS OFF (0000h)
	Value write (lower)	00h	
Error check (lower)		19h	Calculation result of CRC-16
Error check (upper)		D2h	

Response

Field name		Data	Description
Slave address		01h	Same as query
Function code		06h	Same as query
Data	Register address (upper)	00h	Same as query
	Register address (lower)	7Dh	
	Value write (upper)	00h	Same as query
	Value write (lower)	00h	
Error check (lower)		19h	Calculation result of CRC-16
Error check (upper)		D2h	

4-4 Return-to-home operation

As an example, here is a description how to execute the following return-to-home operation.

- **Setting example**
  - Address number (slave address): 1
  - Operation condition: Initial value
- **Operation procedure**

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

Query

Field name		Data	Description
Slave address		01h	Slave address 1
Function code		06h	Writing to a holding register
Data	Register address (upper)	00h	Register address to which writing is executed =Driver input command (007Dh)
	Register address (lower)	7Dh	
	Value write (upper)	00h	Value written to the register address =HOME ON (0010h) *
	Value write (lower)	10h	
Error check (lower)		18h	Calculation result of CRC-16
Error check (upper)		1Eh	

* HOME is assigned to bit4 of the driver input command (007Dh) in initial setting.
(10000 in a binary number=0010h in a hexadecimal number)

Response

Field name		Data	Description
Slave address		01h	Same as query
Function code		06h	Same as query
Data	Register address (upper)	00h	Same as query
	Register address (lower)	7Dh	
	Value write (upper)	00h	Same as query
	Value write (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 and turn HOME OFF again.

Query

Field name		Data	Description
Slave address		01h	Slave address 1
Function code		06h	Writing to a holding register
Data	Register address (upper)	00h	Register address to which writing is executed =Driver input command (007Dh)
	Register address (lower)	7Dh	
	Value write (upper)	00h	Value written to the register address =HOME OFF (0000h)
	Value write (lower)	00h	
Error check (lower)		19h	Calculation result of CRC-16
Error check (upper)		D2h	

Response

Field name		Data	Description
Slave address		01h	Same as query
Function code		06h	Same as query
Data	Register address (upper)	00h	Same as query
	Register address (lower)	7Dh	
	Value write (upper)	00h	Same as query
	Value write (lower)	00h	
Error check (lower)		19h	Calculation result of CRC-16
Error check (upper)		D2h	

5 Data setting method

5-1 Overview of setting method

There are three methods to set data via Modbus communication.
The communication specification of Modbus allows reading/writing from/to successive addresses when multiple data pieces are handled.

■ When operation data is set

Input method	Features
Direct data operation	Rewriting of data and start of operation can be executed at the same time. (⇨p.109)
Direct reference	• Data is set by specifying the address. • If the data consists of successive addresses, multiple data pieces can be handled with one query. • The set data is operated by inputting the remote I/O.
Indirect reference	• This 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 successive, multiple data pieces can be handled with one query because the indirect reference addresses are successive. • The set data is operated by inputting the remote I/O.

■ When setting of parameters or monitoring, etc. is executed

- When addresses are successive: Set data by using direct reference.
- When addresses are not successive: If indirect reference is used, multiple commands can be executed with one query.

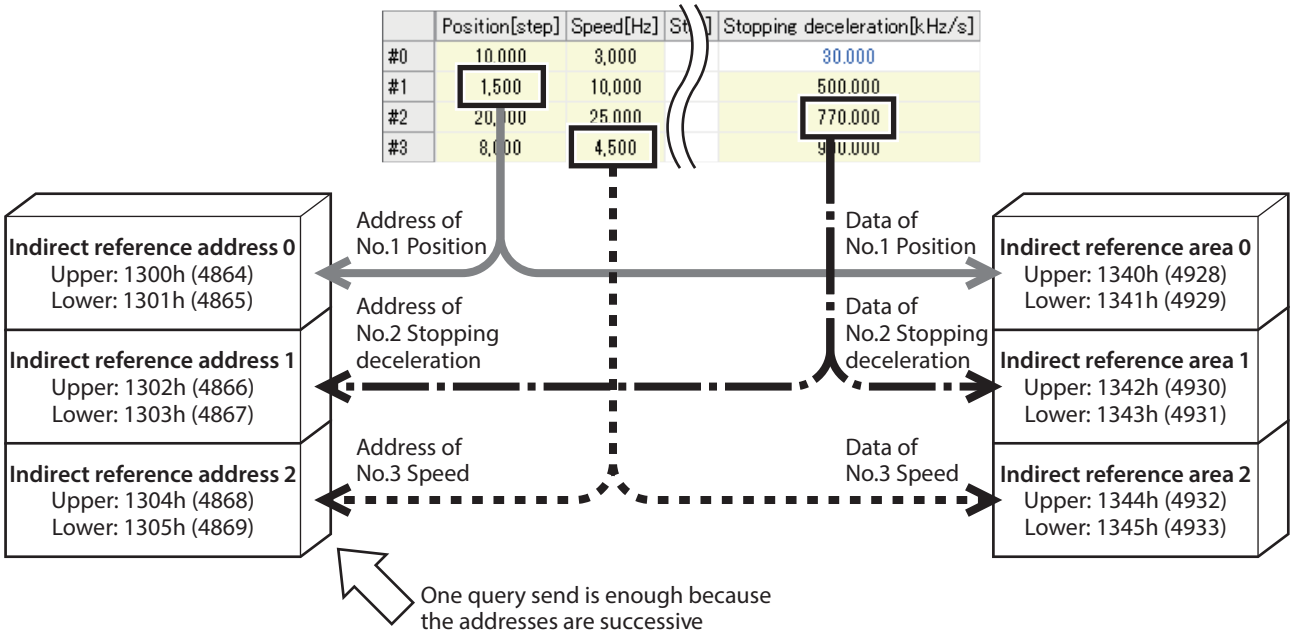
Here, direct reference and indirect reference are explained.

5-2 Direct reference

Direct reference is a method in which data is set by specifying addresses. Multiple successive addresses can be sent with one query. However, if addresses to be set are not successive, queries as many 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 successive, multiple data pieces can be sent with one query because the indirect reference addresses are successive.
The addresses of the data to be set are stored in "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).

Item	Description
Indirect reference address setting (0)	Stores the ID of data to be sent in indirect reference. The ID is a unique number retained inside the driver and assigned to each setting item. In Modbus communication, a value twice as much as the ID is the register address. Be sure to input the "half value of the register address."
Indirect reference address setting (1)	
. . .	
Indirect reference address setting (30)	
Indirect reference address setting (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		Item	Description	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. **[Setting range]** 0 to FFFFh (0 to 65,535)	0
	1302h (4866)	1303h (4867)	Indirect reference address setting (1)		0
	1304h (4868)	1305h (4869)	Indirect reference address setting (2)		0
	1306h (4870)	1307h (4871)	Indirect reference address setting (3)		0
	1308h (4872)	1309h (4873)	Indirect reference address setting (4)		0
	130Ah (4874)	130Bh (4875)	Indirect reference address setting (5)		0
	130Ch (4876)	130Dh (4877)	Indirect reference address setting (6)		0
	130Eh (4878)	130Fh (4879)	Indirect reference address setting (7)		0
	1310h (4880)	1311h (4881)	Indirect reference address setting (8)		0
	1312h (4882)	1313h (4883)	Indirect reference address setting (9)		0
	1314h (4884)	1315h (4885)	Indirect reference address setting (10)		0
	1316h (4886)	1317h (4887)	Indirect reference address setting (11)		0
	1318h (4888)	1319h (4889)	Indirect reference address setting (12)		0
	131Ah (4890)	131Bh (4891)	Indirect reference address setting (13)		0
	131Ch (4892)	131Dh (4893)	Indirect reference address setting (14)		0
	131Eh (4894)	131Fh (4895)	Indirect reference address setting (15)		0
	1320h (4896)	1321h (4897)	Indirect reference address setting (16)		0
	1322h (4898)	1323h (4899)	Indirect reference address setting (17)		0
	1324h (4900)	1325h (4901)	Indirect reference address setting (18)		0
	1326h (4902)	1327h (4903)	Indirect reference address setting (19)		0
	1328h (4904)	1329h (4905)	Indirect reference address setting (20)		0
	132Ah (4906)	132Bh (4907)	Indirect reference address setting (21)		0
	132Ch (4908)	132Dh (4909)	Indirect reference address setting (22)		0
	132Eh (4910)	132Fh (4911)	Indirect reference address setting (23)		0
	1330h (4912)	1331h (4913)	Indirect reference address setting (24)		0
	1332h (4914)	1333h (4915)	Indirect reference address setting (25)		0

MEXE02 code	Register address		Item	Description	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. **[Setting range]** 0 to FFFFh (0 to 65,535)	0
	1336h (4918)	1337h (4919)	Indirect reference address setting (27)		0
	1338h (4920)	1339h (4921)	Indirect reference address setting (28)		0
	133Ah (4922)	133Bh (4923)	Indirect reference address setting (29)		0
	133Ch (4924)	133Dh (4925)	Indirect reference address setting (30)		0
	133Eh (4926)	133Fh (4927)	Indirect reference address setting (31)		0

- **Register addresses of indirect reference areas**

Register address		Item
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		Item
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/receiving of data to/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 value of register address 1842h)
Indirect reference address setting (1)	1302h	1303h	←	Stopping deceleration of operation data No.2	C44h (half value of register address 1888h)
Indirect reference address setting (2)	1304h	1305h	←	Speed of operation data No.3	C62h (half 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
Slave address		01h	Slave 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 bytes	0Ch	Twice the number of registers in the query=12 (0Ch)
	Value write to register address (upper)	00h	Value written to register address 1300h =ID of operation data No.1 position (C21h)
	Value write to register address (lower)	00h	
	Value write to register address + 1 (upper)	0Ch	
	Value write to register address + 1 (lower)	21h	
	Value write to register address + 2 (upper)	00h	Value written to register address 1302h =ID of operation data No.2 stopping deceleration (C44h)
	Value write to register address + 2 (lower)	00h	
	Value write to register address + 3 (upper)	0Ch	
	Value write to register address + 3 (lower)	44h	
	Value write to register address + 4 (upper)	00h	Value written to register address 1304h =ID of operation data No.3 speed (C62h)
	Value write to register address + 4 (lower)	00h	
	Value write to register address + 5 (upper)	0Ch	
	Value write to 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 and write the setting values of the data to be sent in the indirect reference areas.

Query

Field name		Data	Description
Slave address		01h	Slave 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 bytes	0Ch	Twice the number of registers in the query=12 (0Ch)
	Value write to register address (upper)	00h	Value written to register address 1340h =Operation data No.1 position 1,500 (5DCh)
	Value write to register address (lower)	00h	
	Value write to register address + 1 (upper)	05h	
	Value write to register address + 1 (lower)	DCh	
	Value write to register address + 2 (upper)	00h	Value written to register address 1342h =Operation data No.2 stopping deceleration 770,000 (BBFD0h)
	Value write to register address + 2 (lower)	0Bh	
	Value write to register address + 3 (upper)	BFh	
	Value write to register address + 3 (lower)	D0h	
	Value write to register address + 4 (upper)	00h	Value written to register address 1344h =Operation data No.3 speed 4,500 (1194h)
	Value write to register address + 4 (lower)	00h	
	Value write to register address + 5 (upper)	11h	
	Value write to 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 and read the data written in the indirect reference areas.

Query

Field name		Data	Description
Slave address		01h	Slave address 1
Function code		03h	Reading from holding registers
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
Slave 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)
	Value read from register address (upper)	00h	Value read from register address 1340h =1,500 (5DCh)
	Value read from register address (lower)	00h	
	Value read from register address + 1 (upper)	05h	
	Value read from register address + 1 (lower)	DCh	
	Value read from register address + 2 (upper)	00h	Value read from register address 1342h =770,000 (BBFD0h)
	Value read from register address + 2 (lower)	0Bh	
	Value read from register address + 3 (upper)	BFh	
	Value read from register address + 3 (lower)	D0h	
	Value read from register address + 4 (upper)	00h	Value read from register address 1344h =4,500 (1194h)
	Value read from register address + 4 (lower)	00h	
	Value read from register address + 5 (upper)	11h	
	Value read from 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 by using indirect reference.

6 Direct data operation

6-1 Overview of direct data operation

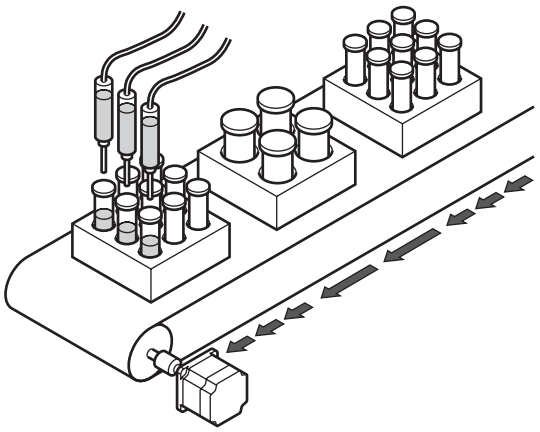
Direct data operation is a mode that allows rewriting of data and start of operation to be executed at the same time. It is suitable to frequently change operation data such as the position (travel amount) and speed or to fine-tune the position.
There are eight types of triggers to start operation at the same time as rewriting of data.

- One of the following items: operation data number, operation type, position, speed, starting/changing rate, stopping deceleration, and operating current
- The above seven items are collectively rewritten

■ Usage examples of direct data operation

● Example 1

The position (travel amount) and the speed should be adjusted since the feed rate varies depending on lots.



Setting example

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

Steps

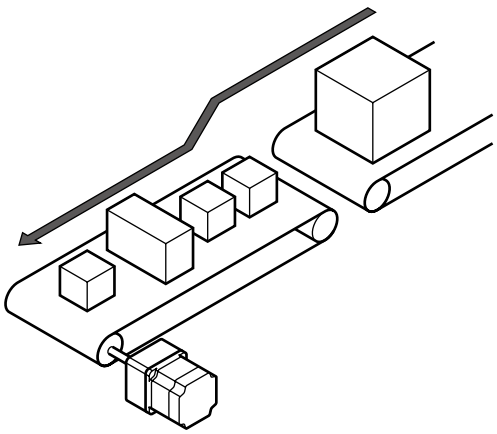
1. Write the data of the position and speed.
2. Write "1" to the trigger.

Result

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

● Example 2

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



Setting example

- Speed: Change arbitrarily
- Trigger: Speed (setting value of trigger: –4)

Steps

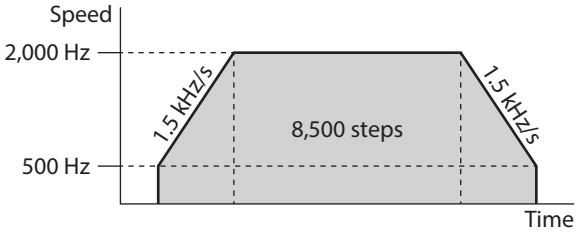
1. Write "–4" to the trigger.
2. Write the data of the speed.

Result

When the speed is written, the changed value is updated immediately, 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 and set the operation data.

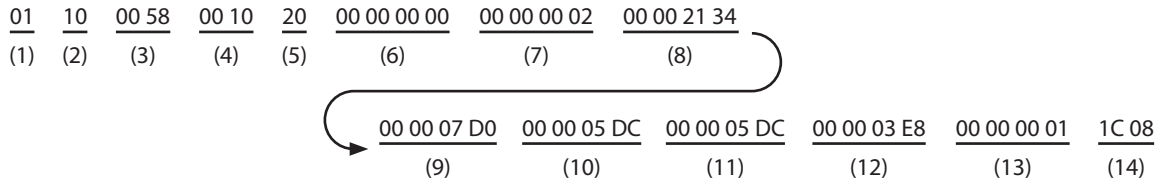
Communication data (Hex)	Description
01 10 18 00 00 02 04 00 00 00 02 D8 6E	Operation data No.0 operation type=2: Incremental positioning (based on command position)
01 10 18 02 00 02 04 00 00 21 34 C1 F1	Operation data No.0 position=8,500 steps
01 10 18 04 00 02 04 00 00 07 D0 5B F0	Operation data No.0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

2. Send the following two queries and execute operation.

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

● Direct data operation

With the following query, send the operation data and the trigger. Operation is started at the same time as transmission.



No.	Communication data (Hex)	Description
(1)	01	Address number=1
(2)	10	Function code=0010h
(3)	00 58	Writing register first address=0058h
(4)	00 10	Number of writing registers=16
(5)	20	Number of writing 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, compared with commonly used Modbus control, the motor can be operated by sending a query only once.

6-2 Commands required for direct data operation

Related commands

Register address		Item	Description	Initial value
Upper	Lower			
0058h (88)	0059h (89)	Direct data operation operation data number	Sets the operation data number to be used in direct data operation. **[Setting range]** 0 to 255	0
005Ah (90)	005Bh (91)	Direct data operation operation type	Sets the operation type for direct data operation. **[Setting range]** 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 for direct data operation. **[Setting range]** −2,147,483,648 to 2,147,483,647 steps	0
005Eh (94)	005Fh (95)	Direct data operation speed	Sets the operating speed for direct data operation. **[Setting range]** −4,000,000 to 4,000,000 Hz	1,000
0060h (96)	0061h (97)	Direct data operation starting/changing rate	Sets the starting/changing rate or starting/changing time for direct data operation. **[Setting range]** 1 to 1,000,000,000(1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000
0062h (98)	0063h (99)	Direct data operation stopping deceleration	Sets the stopping deceleration or stop time for direct data operation. **[Setting range]** 1 to 1,000,000,000(1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000
0064h (100)	0065h (101)	Direct data operation operating current	Sets the operating current for direct data operation. **[Setting range]** 0 to 1,000 (1=0.1 %)	1,000
0066h (102)	0067h (103)	Direct data operation trigger	Sets the trigger for direct data operation. (about the trigger ⇨p.112) **[Setting range]** −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 transmitted during direct data operation. (about data destination ⇨p.113) **[Setting range]** 0: Execution memory 1: Buffer memory	0

■ Trigger

This is a trigger to start operation at the same time as rewriting of data in direct data operation.

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

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

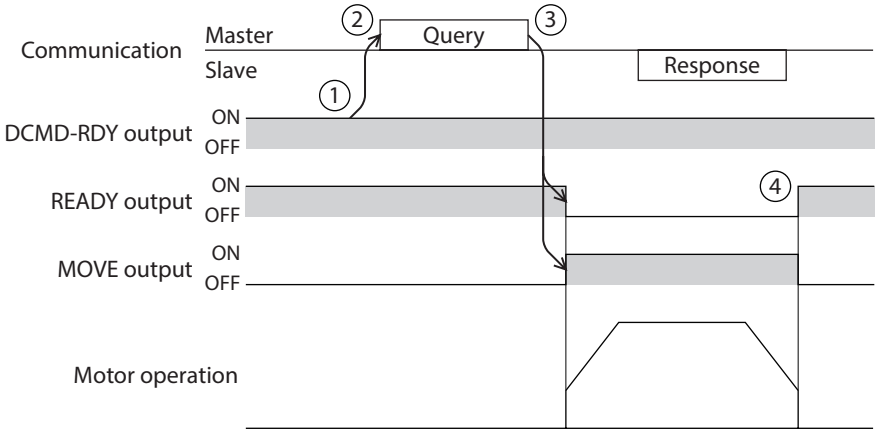
- **When the trigger is "−1 to −7"**

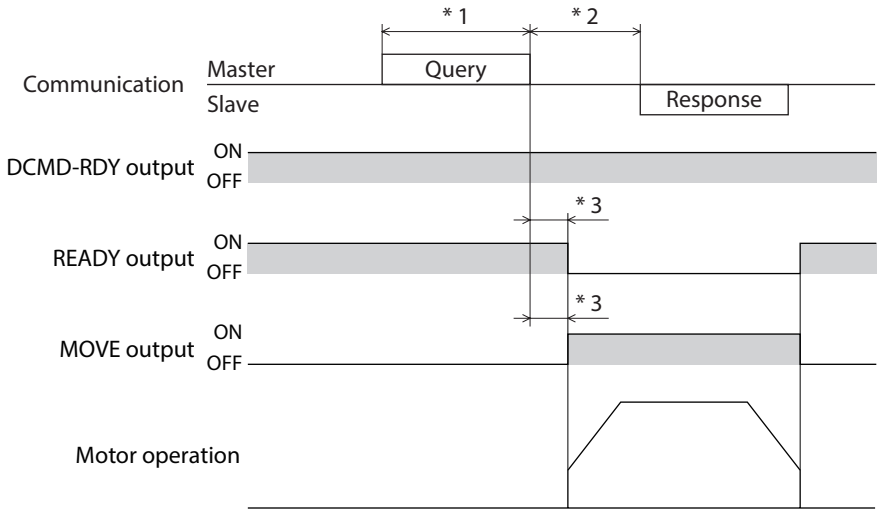
  When the data corresponding to the trigger is written, direct data operation is started. Even if operation is started, the setting value of the trigger is retained.

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 ON.
2. Send a query (including the trigger and data) to execute direct data operation.
3. When the master receives the 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))
*3 C3.5 (silent interval) + 4 ms or less

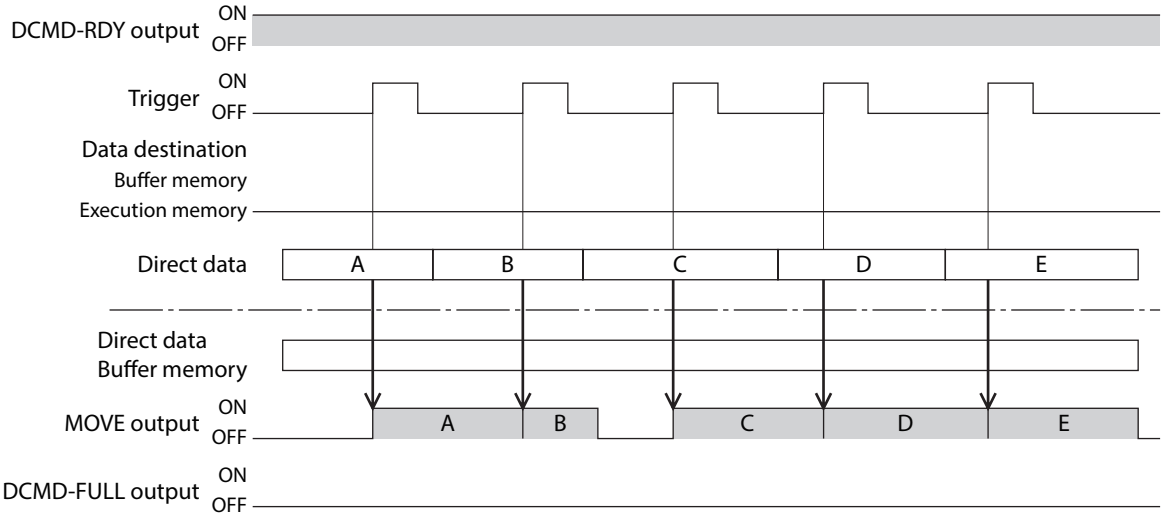
■ Data destination

Select the stored area when the next direct data is transmitted during direct data operation.

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

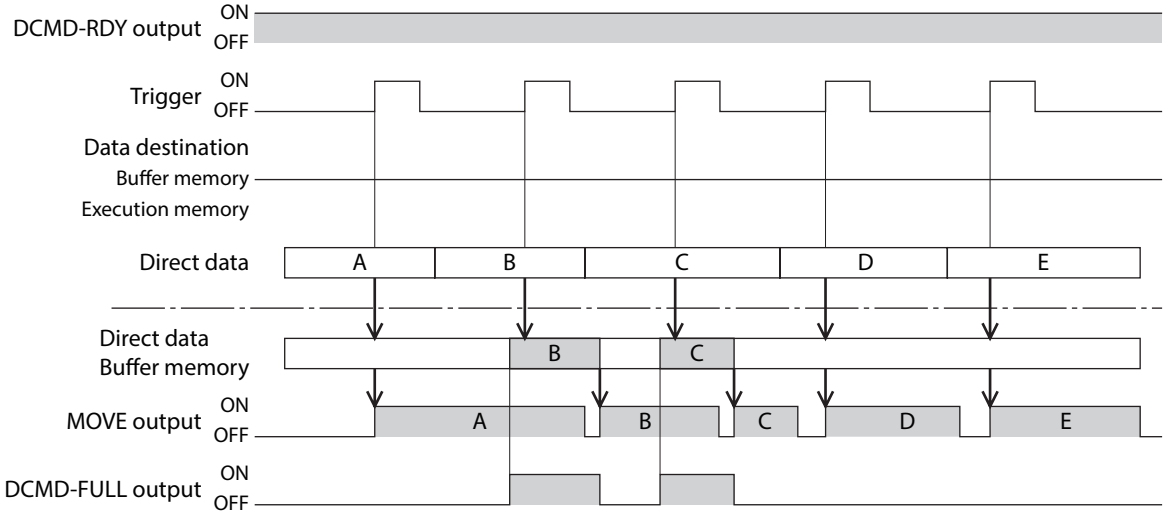
● When the data destination is set to "0: Execution memory"

When the trigger is written, the data in operation is rewritten to the next direct data. When the next direct data is stored in the buffer memory, the data in the buffer memory is deleted.



● **When the data 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 in operation is completed, operation of the buffer memory is started automatically. Only one piece of direct data can be stored in the buffer memory.
When the next direct data is written in the buffer memory, the DCMD-FULL output is turned ON.
During stop and continuous operation, the data is not stored in the buffer memory even if "1: Buffer memory" is specified and is rewritten to the next direct data immediately.



● **Related parameters**

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p3	0220h (544)	0221h (545)	Direct data operation zero speed command action	When "0" is written to the speed in direct data operation, selects whether to cause the motor to decelerate to a stop or to change the speed to 0 r/min in an operating status. **[Setting range]** 0: Deceleration stop command 1: Speed zero command *	0
	0222h (546)	0223h (547)	Direct data operation trigger initial value	Sets the initial value of the trigger used in direct data operation. **[Setting range]** –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
	0224h (548)	0225h (549)	Direct data operation data destination initial value	Sets the initial value of the destination used in direct data operation. **[Setting range]** 0: Execution memory 1: Buffer memory	0
	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 of direct data. **[Setting range]** 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

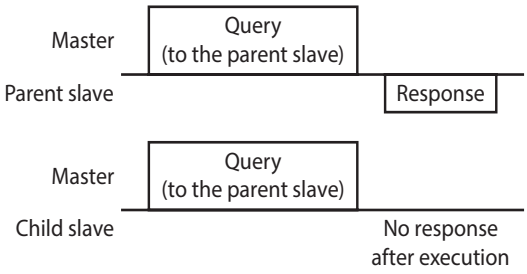
Multiple slaves are made into a group and a query is sent to these group at once.

■ Group composition

A group consists of one parent slave and child slaves, and only the parent slave returns a response.

■ Group address

To perform a group send, set a group address to the child slaves to be included in the group. The child slaves to which the group address has been set can receive a query sent to the parent slave.
The parent slave is not always required. A group can be composed by only child slaves. In this case, set an unused address as an address of the group.
When a query is sent from the master to the address of the group, the child slaves execute the process.
However, no response is returned. In broadcasting, all the slaves execute the process, however, the slaves that execute the process can be limited in this method.



■ Parent slave

No special setting is required on the parent slave to perform a group send. The address of the parent slave becomes the group address. Upon sending a query from the master to the parent slave, the parent slave executes the requested process and returns a response. (same as the unicast mode)

■ Child slave

Slaves to which the address of the parent slave is set become the child slaves.
When a query sent to the address of the group is received, the child slaves execute the process. However, no response is returned.
The function code executable in group send is only "Writing to multiple holding registers (10h)."

■ Setting of Group

Set the address of the parent slave to the "Group ID" of the child slaves. Change the group in the unicast mode.
Execute upper and lower reading and writing at the same time when setting the "Group ID."

Related command

Register address		Item	Description	Initial value	READ/ WRITE
Upper	Lower				
0030h (48)	0031h (49)	Group ID	Sets a group address. **[Setting range]** −1: individual (group send is not executed) 1 to 31: Address of group (address number of parent slave)	−1	R/W

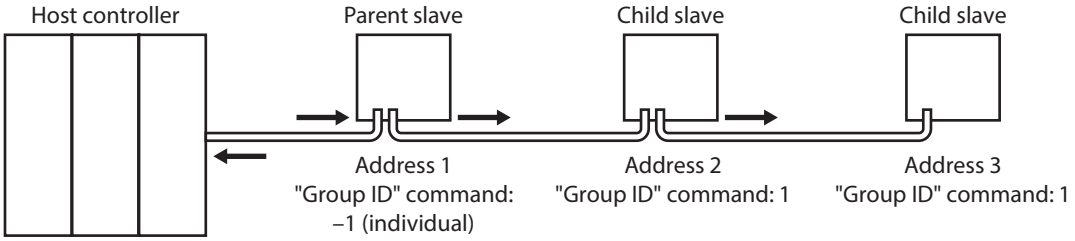
Note

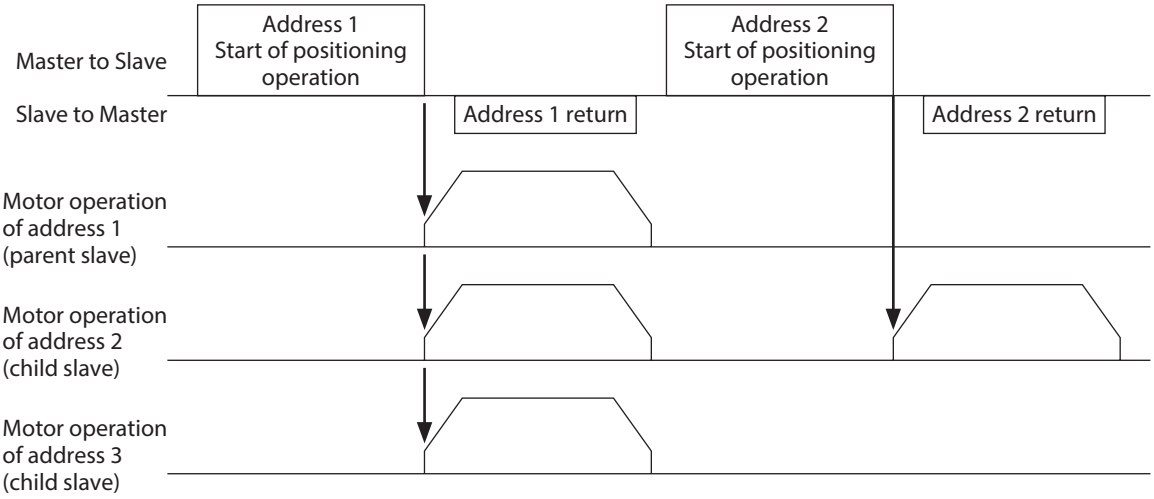
- Do not set "0" to the group ID.
- Change the group address in the unicast mode.
- Since the group setting is stored in RAM, the initial value is returned when the driver is turned off.

- **Related parameter**

The setting value of the "Group ID" command is stored in RAM. In this case, if the power supply is turned off, the setting will be returned to the initial value and the group will be released. Therefore, the group should be always reset after power-on.
On the other hand, the "Initial group ID" parameter is stored in the non-volatile memory. If a group is set in this parameter, the group will not be released even when the power supply is turned off. The group function can be used immediately after power-on.

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p10	1394h (5012)	1395h (5013)	Initial group ID (Modbus)	Sets the address (address number of the parent slave) of the group. It is stored even if the power is turned off. **[Setting range]** –1: Disable (no group transmission) 1 to 31: Group ID	–1





8 RS-485 communication monitor

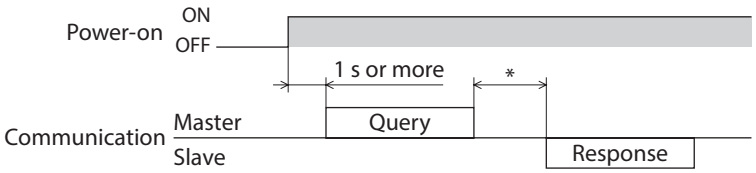
This section indicates items that can be monitored via RS-485 communication. They can also be checked using the "RS-485 communication monitor" of the **MEXE02**.

Register address		Item	Description
Upper	Lower		
00ACh (172)	00ADh (173)	Present communication error	Shows the last received communication error code.
0150h (336)	0151h (337)	RS-485 Reception frame counter	Shows the number of frames received. *1
0154h (340)	0155h (341)	RS-485 Reception byte counter	Shows the number of bytes received.
0156h (342)	0157h (343)	RS-485 Transmission byte counter	Shows the number of bytes transmitted.
0158h (344)	0159h (345)	RS-485 Normal reception frame counter (all)	Shows the number of normal frames received.
015Ah (346)	015Bh (347)	RS-485 Normal reception frame counter (only own address)	Shows the number of normal frames received to own address.
015Ch (348)	015Dh (349)	RS-485 Abnormal reception frame counter (all)	Shows the number of abnormal frames received. *2
015Eh (350)	015Fh (351)	RS-485 Transmission frame counter	Shows the number of frames transmitted.
0160h (352)	0161h (353)	RS-485 Register write abnormal counter	Shows the number of times the slave 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.

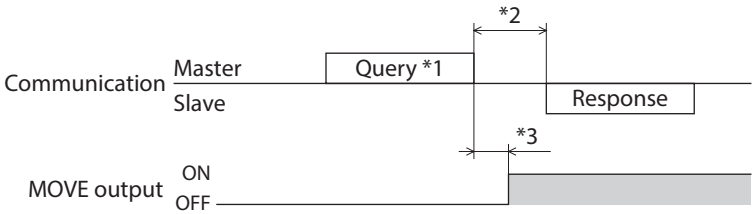
9 Timing chart

9-1 Communication start



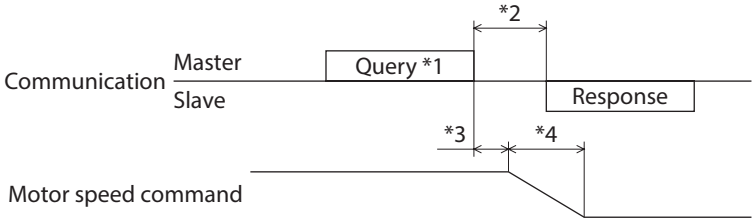
* C3.5 (silent interval) + Tb5 (query processing time (Driver)) + Tb2 (transmission waiting time (Driver))

9-2 Start of operation



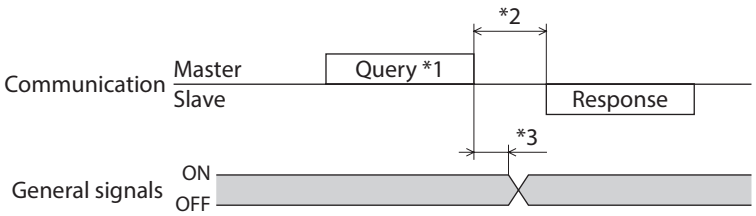
*1 A message including a query to start operation via RS-485 communication.
*2 C3.5 (silent interval) + Tb5 (query processing time (Driver)) + Tb2 (transmission waiting time (Driver))
*3 C3.5 (silent interval) + 2 ms or less

9-3 Operation stop, speed change



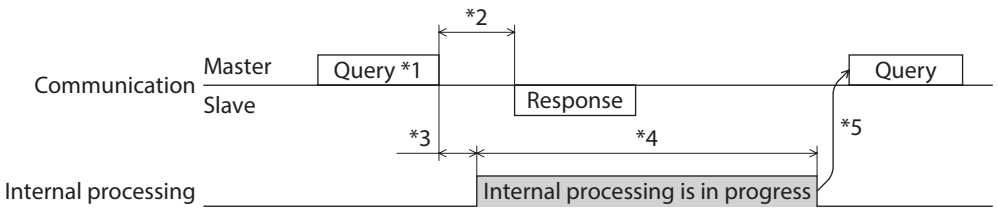
*1 A message including a query to stop operation and another to change the speed via RS-485 communication.
*2 C3.5 (silent interval) + Tb5 (query processing time (Driver)) + Tb2 (transmission waiting time (Driver))
*3 It varies depending on the operating condition.
*4 It varies depending on the setting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

9-4 General signals



*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))
*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))
*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

This is a function to detect abnormalities that may occur in RS-485 communication, including three types: communication errors, alarms, and information.

10-1 Communication errors

When the communication error with error code 84h occurs, the C-DAT/C-ERR LED of the driver is lit in red.
For communication errors other than 84h, the LED is not lit and does not blink.
You can check the communication errors using the "Communication error history" command or using the **MEXE02**.

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

■ Communication error list

Communication error type	Error code	Cause
RS-485 communication error	84h	A transmission error was detected. (⇨p.86)
Command not yet defined	88h	An exception response (exception code 01h, 02h) was detected. (⇨p.87)
Execution is disabled due to user I/F communication in progress	89h	An exception response (exception code 04h) was detected. (⇨p.87)
Execution disabled due to Non-volatile memory processing in progress	8Ah	
Outside setting range	8Ch	An exception response (exception code 03h, 04h) was detected. (⇨p.87)
Command execute disable	8Dh	An exception response (exception code 04h) was detected. (⇨p.87)

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 of the driver blinks in red.

■ List of alarms related to RS-485 communication

Alarm code	Alarm type	Cause
84h	RS-485 communication error	The RS-485 communication error occurred in succession for the number of times set in the "Communication error detection (Modbus)" parameter.
85h	RS-485 communication timeout	The time set in the "Communication timeout (Modbus)" parameter has elapsed, and yet the communication could not be established with the host controller.

Related parameters

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p10	138Ah (5002)	138Bh (5003)	Communication timeout (Modbus)	Sets the generation condition of the communication timeout. **[Setting range]** 0 (not monitored), 1 to 10,000 ms	0
	138Ch (5004)	138Dh (5005)	Communication error detection (Modbus)	When the RS-485 communication error has occurred for the set number of times, an alarm of RS-485 communication error is generated. **[Setting range]** 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, the RS-485 communication error information is generated.
Unlike an alarm, even if information is generated, the motor is operated continuously. Also, the red light and green light of PWR/ALM LED blink twice at the same time. (Red and green colors may overlap and it may be visible to orange.)
The information will be cleared automatically if RS-485 communication is performed in a normal condition.

■ List of information related to RS-485 communication

Content of information	Information bit output signal	Cause	Releasing condition
RS-485 communication error	INFO-NET-E	A RS-485 communication error was detected.	RS-485 communication was performed normally.

4 Register address lists

This part provides lists of register addresses used for Modbus communication.

◆**Table of contents**

1 Update timing of parameters

All data used by the driver is 32-bit wide. Since the register for the Modbus protocol is 16-bit wide, one data is described by two registers.

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

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

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

- Update immediately..... Executes the recalculation and setup as soon as the parameter is written.
- Update after stopping the operation..... Executes the recalculation and setup after stopping the operation.
- Update after executing the configuration ..... Executes the recalculation and setup after executing the configuration or turning on the power supply again.
- Update after turning the power ON again..... Executes the recalculation and setup after turning on the power supply again.

memo

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

■ Notation rules

In this document, each update timing is represented in an alphabetical character.

A: Update immediately
B: Update after stopping the operation
C: Update after executing the configuration
D: Update after turning the power ON again

In this document, READ/WRITE may be abbreviated as "R/W."

2 I/O commands

These are commands related to I/O. The set values are stored in RAM.

Register address		Item	Description	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)." **[Setting range]** –1 (disable), 0 to 255 *	–1	R/W
0074h (116)	0075h (117)	Driver input command (2nd)	The input command same as "Driver input command (reference)" is set automatically.	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)." **[Setting range]** –1 (disable), 0 to 255 *	–1	R/W
0078h (120)	0079h (121)	Driver input command (automatic OFF)	The input command same as "Driver input command (reference)" is set automatically. When the input signal is turned ON with this command, it is turned OFF automatically 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)." **[Setting range]** –1 (disable), 0 to 255 *	–1	R/W
007Ch (124)	007Dh (125)	Driver input command (reference)	Sets the input command to the driver. (details of bit arrangement ⇨ p.126)	0	R/W
007Eh (126)	007Fh (127)	Driver output status	Acquires the output status of the driver. (details of bit arrangement ⇨ p.126)	–	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 be accessed by one register (16 bits).

- **Upper**

Register address	Description							
007Ch (124)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	–	–	–	–	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	–	–	–	–	–	–

- **Lower**

The value in brackets [ ] is the initial value. They can be changed by parameters. (parameters ⇨p.155, assignment of input signals ⇨p.61)

Register address	Description							
007Dh (125)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	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 [no function]
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	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 be accessed by one register (16 bits).

- **Upper**

Register address	Description							
007Eh (126)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	–	–	–	–	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	–	–	–	–	–	–

- **Lower**

The value in brackets [ ] is the initial value. They can be changed by parameters. (parameters ⇨p.155, assignment of output signals ⇨p.62)

Register address	Description							
007Fh (127)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	R-OUT15 [CONST-OFF]	R-OUT14 [CONST-OFF]	R-OUT13 [MOVE]	R-OUT12 [TIM]	R-OUT11 [CONST-OFF]	R-OUT10 [AREA1]	R-OUT9 [AREA0]	R-OUT8 [SYS-BSY]
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	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		Item	Description	Initial value	R/W
Upper	Lower				
0030h (48)	0031h (49)	Group ID	Sets a group address. *1 **[Setting range]** −1: individual (group send is not executed) 1 to 31: Address of group (address number of parent slave)	−1 *2	R/W

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

4 Protect release command

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

Register address		Item	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 to use when performing direct data operation. The set values are stored in RAM.
All commands are used for read/write (READ/WRITE).

Register address		Item	Description	Initial value
Upper	Lower			
0058h (88)	0059h (89)	Direct data operation operation data number	Sets the operation data number to be used in direct data operation. **[Setting range]** 0 to 255	0
005Ah (90)	005Bh (91)	Direct data operation operation type	Sets the operation type for direct data operation. **[Setting range]** 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 for direct data operation. **[Setting range]** −2,147,483,648 to 2,147,483,647 steps	0
005Eh (94)	005Fh (95)	Direct data operation Speed	Sets the operating speed for direct data operation. **[Setting range]** −4,000,000 to 4,000,000 Hz	1,000
0060h (96)	0061h (97)	Direct data operation starting/changing rate	Sets the starting/changing rate or starting/changing time for direct data operation. **[Setting range]** 1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000
0062h (98)	0063h (99)	Direct data operation stopping deceleration	Sets the stopping deceleration or stop time for direct data operation. **[Setting range]** 1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000
0064h (100)	0065h (101)	Direct data operation operating current	Sets the operating current for direct data operation. **[Setting range]** 0 to 1,000 (1=0.1 %)	1,000
0066h (102)	0067h (103)	Direct data operation trigger	Sets the trigger for direct data operation. **[Setting range]** −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 transmitted during direct data operation. **[Setting range]** 0: Execution memory 1: Buffer memory	0

6 Maintenance commands

Release of alarms, clearing of latches and batch processing of the non-volatile memory are executed.
All commands are used for write (WRITE).

Note The maintenance commands include processing in which the memory is operated, such as non-volatile memory batch processing. Be careful not to execute them unnecessarily in succession.

Register address		Item	Description
Upper	Lower		
0180h (384)	0181h (385)	Alarm reset	Resets the alarm that is present. Some alarms cannot be reset.
0184h (388)	0185h (389)	Clear alarm history	Clears alarm history.
0188h (392)	0189h (393)	Clear communication error history	Clears communication error history.
018Ah (394)	018Bh (395)	P-PRESET execution	Presets the command position.
018Ch (396)	018Dh (397)	Configuration	Executes the parameter recalculation and the setup. (about configuration ⇨p.131)
018Eh (398)	018Fh (399)	Batch data initialization (excluding communication parameters)	Resets the parameters stored in the 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 the 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 the non-volatile memory. The non-volatile memory can be rewritten approximately 100,000 times.
0194h (404)	0195h (405)	All data batch initialization (including communication parameters)	Resets all the parameters stored in the non-volatile memory to their initial values.
019Ah (410)	019Bh (411)	Clear latch information	Clears latch information.
019Ch (412)	019Dh (413)	Clear sequence history	Clears sequence history.
019Eh (414)	019Fh (415)	Clear tripmeter	Clears the tripmeter.
01A6h (422)	01A7h (423)	Clear information	Clears information.
01A8h (424)	01A9h (425)	Clear information history	Clears information history.
01AAh (426)	01ABh (427)	Alarm history details	When a history number (1 to 10) is written to this command and the monitor command "Alarm history details" is executed, the detailed items of the specified alarm history can be checked.

■ Configuration

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

- An alarm is not present
- The motor is not operating
- I/O test, teaching, remote operation, teaching, and downloading are not executed with the **MEXE02**

The table shows the driver status before and after executing the configuration.

Item	Configuration is ready to execute	Configuration is being executed	After execution of configuration
PWR/ALM LED	Green lit	The red and green colors blink at the same time (They overlap and may seem to be orange.)	Depends on the driver condition.
Motor excitation	Excitation/non-excitation	Non-excitation	
Output signal	Enable	Disable	Enable
Input signal	Enable	Disable	Enable

memo The correct monitor value may not be returned even if monitoring is executed during configuration.

6-1 How to execute maintenance commands

Use the following two methods in accordance with your purpose.

- **Writing 1 to data (recommended)**

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

- **Writing 2 to data**

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

- **With "Alarm history details" command**

  To this command, write the number (1 to 10) of the monitor command "Alarm history."

7 Monitor commands

These commands are used to monitor the command position, command speed, alarm and information history, etc. All commands are used for read (READ).

Register address		Item	Description
Upper	Lower		
0080h (128)	0081h (129)	Present alarm	Shows the present alarm code.
0082h (130)	0083h (131)	Alarm history 1	Shows the latest alarm history. When an alarm is generated, the code is displayed also in alarm history 1 at the same time.
0084h (132)	0085h (133)	Alarm history 2	Shows 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	Shows the oldest alarm history.
00ACh (172)	00ADh (173)	Present communication error	Shows the last received communication error code.
00AEh (174)	00AFh (175)	Communication error history 1	Shows the latest communication error code history. When a communication error is generated, the code is displayed also in communication error history 1 at the same time.
00B0h (176)	00B1h (177)	Communication error history 2	Shows 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	Shows the oldest communication error code history.
00C2h (194)	00C3h (195)	Present selected data number	Shows the operation data number currently selected. The order of the priority is: NET selection number, M0 to M7 inputs.

Register address		Item	Description
Upper	Lower		
00C4h (196)	00C5h (197)	Present operation data number	Shows the operation data number executed in positioning SD operation or continuous macro operation. In operation not using operation data, –1 is displayed. –1 is displayed also during stop.
00C6h (198)	00C7h (199)	Command position	Shows the present command position.
00C8h (200)	00C9h (201)	Command speed (r/min)	Shows the present command speed. (r/min)
00CAh (202)	00CBh (203)	Command speed (Hz)	Shows the present command speed. (Hz)
00D2h (210)	00D3h (211)	Remaining dwell time	Shows the remaining time in the drive-complete delay time. (ms)
00D4h (212)	00D5h (213)	Direct I/O	Shows the status of direct input and output. (bit arrangement ⇨ p.138)
00DEh (222)	00DFh (223)	Target position	• Shows the target command position in the following operations in an absolute coordinate. – Positioning SD operation, inching operation, return-to-home operation (at the time of offset travel) • Shows the operation starting position in the following operations. – Continuous macro operation, JOG macro operations other than inching operation, return-to-home operation (when a sensor is used)
00E0h (224)	00E1h (225)	Next number	Shows 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 "0: No Link" or "Next data number" is "-256: Stop," –1 is displayed.
00E2h (226)	00E3h (227)	Loop origin number	Shows the operation data number that is the starting point of the loop in loop operation (extended loop operation). When loop is not executed or stopped, –1 is displayed.
00E4h (228)	00E5h (229)	Loop count	Shows the present number of loop times in loop operation (extended loop operation). When operation other than loop is executed or 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 STOP input. If the same event is generated again during latch, the value is overwritten. When latch is cleared, 0 is displayed.
00F6h (246)	00F7h (247)	Information	Shows the present information code. (details of the Information code ⇨ p.137)
00F8h (248)	00F9h (249)	Driver temperature	Shows the present driver temperature. [1=0.1 °C]
00FCh (252)	00FDh (253)	Odometer	Shows the cumulative amount of rotations of the motor output shaft stored in the driver. (1=0.1 kRev) It cannot cleared by the user.
00FEh (254)	00FFh (255)	Tripmeter	Shows the total amount of rotations of the motor output shaft stored in the driver. (1=0.1 kRev) It can be cleared by the user.
0100h (256)	0101h (257)	Sequence history 1	Shows the history of operation data numbers executed previously. –1 is displayed when the motor is stopped. During operation, the value same as the "Present operation data number" is displayed also in the sequence history 1.
0102h (258)	0103h (259)	Sequence history 2	Shows the history of operation data numbers executed previously. –1 is displayed when the motor is stopped.
0104h (260)	0105h (261)	Sequence history 3	

Register address		Item	Description
Upper	Lower		
0106h (262)	0107h (263)	Sequence history 4	Shows the history of operation data numbers executed previously. –1 is displayed when the motor is stopped.
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	
0118h (280)	0119h (281)	Sequence history 13	
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	Shows the present number of loop times in loop operation (extended loop operation). The value is retained until the operation start signal is turned ON.
0140h (320)	0141h (321)	Main power supply count	Shows the number of times when the main power supply was turned on.
0142h (322)	0143h (323)	Main power supply time	Shows the time that has passed since the main power supply was turned on by minute.
0146h (326)	0147h (327)	Inverter voltage	Shows the inverter voltage of the driver. (1=0.1 V)
0148h (328)	0149h (329)	Power supply voltage	Shows the power supply voltage of the driver. (1=0.1 V)
014Ch (332)	014Dh (333)	ROT SW	Shows the input status of the motor setting switch (SW1).
0150h (336)	0151h (337)	RS-485 reception frame counter	Shows 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	Shows the time that has elapsed since the power supply was turned on.
0154h (340)	0155h (341)	RS-485 Reception byte counter	Shows the number of bytes received.
0156h (342)	0157h (343)	RS-485 Transmission byte counter	Shows the number of bytes transmitted.
0158h (344)	0159h (345)	RS-485 Normal reception frame counter (all)	Shows the number of normal frames received.
015Ah (346)	015Bh (347)	RS-485 Normal reception frame counter (only own address)	Shows the number of normal frames received to own address.

Register address		Item	Description
Upper	Lower		
015Ch (348)	015Dh (349)	RS-485 Abnormal reception frame counter (all)	Shows the number of abnormal frames received.
015Eh (350)	015Fh (351)	RS-485 Transmission frame counter	Shows the number of frames transmitted.
0160h (352)	0161h (353)	RS-485 Register write abnormal counter	Shows the number of times the slave error (exception code 04h) occurred.
0170h (368)	0171h (369)	I/O status 1	Shows the ON/OFF status of internal I/O. (bit arrangement ⇨p.138)
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	
017Ch (380)	017Dh (381)	I/O status 7	
017Eh (382)	017Fh (383)	I/O status 8	
0A00h (2560)	0A01h (2561)	Alarm history details (alarm code)	Shows the contents of the alarm history specified in the maintenance command "Alarm history details ."
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	Shows the latest information history. When information is generated, the code is displayed also in information history 1 at the same time.
0A22h (2594)	0A23h (2595)	Information history 2	Shows the information history.
0A24h (2596)	0A25h (2597)	Information history 3	

Register address		Item	Description
Upper	Lower		
0A26h (2598)	0A27h (2599)	Information history 4	Shows the information history.
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	
0A38h (2616)	0A39h (2617)	Information history 13	
0A3Ah (2618)	0A3Bh (2619)	Information history 14	
0A3Ch (2620)	0A3Dh (2621)	Information history 15	
0A3Eh (2622)	0A3Fh (2623)	Information history 16	Shows the oldest information history.
0A40h (2624)	0A41h (2625)	Information time history 1	Shows the history of the time when the latest information was generated. If information is being generated, the generation time of the information is displayed.
0A42h (2626)	0A43h (2627)	Information time history 2	Shows 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	

Register address		Item	Description
Upper	Lower		
0A5Ah (2650)	0A5Bh (2651)	Information time history 14	Shows the history of the time when information was generated.
0A5Ch (2652)	0A5Dh (2653)	Information time history 15	
0A5Eh (2654)	0A5Fh (2655)	Information time history 16	Shows 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 the event in ( ) was generated. The information is retained 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 loop (STOP)	

■ Information codes

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

Example: When information items of the driver temperature and the overvoltage are generated

Information code of driver temperature: 0000 0004h
Information code of overvoltage: 0000 0010h
Logical sum (OR) of two information codes: 0000 0014h

Information code	Display in 32 bits	Information item
00000004h	0000 0000 0000 0000 0000 0000 0000 0100	Driver temperature
00000010h	0000 0000 0000 0000 0000 0000 0001 0000	Overvoltage
00000020h	0000 0000 0000 0000 0000 0000 0010 0000	Undervoltage
00000200h	0000 0000 0000 0000 0000 0010 0000 0000	Operation start error
00000800h	0000 0000 0000 0000 0000 1000 0000 0000	PRESET request
00001000h	0000 0000 0000 0000 0001 0000 0000 0000	Motor setting error
00008000h	0000 0000 0000 0000 1000 0000 0000 0000	RS-485 communication error
00010000h	0000 0000 0000 0001 0000 0000 0000 0000	Forward operation prohibition
00020000h	0000 0000 0000 0010 0000 0000 0000 0000	Reverse operation prohibition
00100000h	0000 0000 0001 0000 0000 0000 0000 0000	Tripmeter
00200000h	0000 0000 0010 0000 0000 0000 0000 0000	Odometer
10000000h	0001 0000 0000 0000 0000 0000 0000 0000	Operation start restricted mode
20000000h	0010 0000 0000 0000 0000 0000 0000 0000	I/O test mode
40000000h	0100 0000 0000 0000 0000 0000 0000 0000	Configuration request
80000000h	1000 0000 0000 0000 0000 0000 0000 0000	Reboot request

■ Direct I/O

The following are the bit arrangements of direct I/O.

Register address	Description							
00D4h (212)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	–	–	–	–	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	–	–	–	–	DOUT1	DOUT0
00D5h (213)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	–	–	–	–	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	DIN6	DIN5	DIN4	DIN3	DIN2	DIN1	DIN0

■ I/O status

The following are the bit arrangements of internal I/O.

● Input signals

Register address	Description							
0170h (368)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	SLIT	HOMES	RV-LS	FW-LS	RV-BLK	FW-BLK	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	–	–	–	–	–	HMI
0171h (369)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	INFO-CLR	LAT-CLR	–	–	–	P-PRESET	ALM-RST
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	STOP	–	–	AWO	–	No function
0172h (370)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	–	–	–	–	RV-POS	FW-POS
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	RV-JOG-P	FW-JOG-P	RV-JOG-H	FW-JOG-H	RV-JOG	FW-JOG
0173h (371)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	–	–	–	–	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	–	HOME	–	–	SSTART	START
0174h (372)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	–	–	–	–	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	R7	R6	R5	R4	R3	R2	R1	R0
0175h (373)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	–	–	–	–	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	M7	M6	M5	M4	M3	M2	M1	M0
0176h (374)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	–	–	–	–	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	–	–	–	–	–	–
0177h (375)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	–	–	–	–	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	–	–	–	–	–	–

● **Output signals**

Register address	Description							
0178h (376)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	TIM	–	–	RV-SLS	FW-SLS	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	–	–	PLS-OUT	–	ABSPEN	HOME-END
0179h (377)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	AUTO-CD	CRNT	VA	–	–	–	–	SYS-BSY
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	INFO	MOVE	–	READY	SYS-RDY	ALM-B	ALM-A	CONST-OFF
017Ah (378)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	–	–	–	–	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	–	–	–	–	–	–
017Bh (379)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	–	–	–	–	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	–	–	–	–	AREA1	AREA0
017Ch (380)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	–	–	–	–	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	–	–	–	–	–	–
017Dh (381)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	–	–	DCMD-FULL	DCMD-RDY	–	–	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	DELAY-BSY	SEQ-BSY	–	–	–	–	–	–
017Eh (382)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	INFO-RBT	INFO-CFG	INFO-IOTEST	INFO-DSLMTD	–	–	–	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	INFO-ODO	INFO-TRIP	–	–	INFO-RV-OT	INFO-FW-OT
017Fh (383)	Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
	INFO-NET-E	–	–	INFO-MSET-E	INFO-PR-REQ	–	INFO-START	–
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
	–	–	INFO-UVOLT	INFO-OVOLT	–	INFO-DRVTMP	–	–

8 Operation data R/W commands

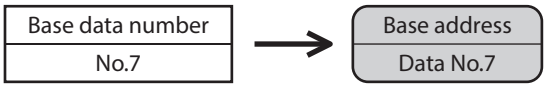
With the operation data R/W commands, operation data is set. To input all the setting items included in operation data in succession, use the following addresses. All commands are used for read/write.

8-1 Overview of address arrangement

There are two methods to set the operation data: "direct reference" and "offset reference." The stored areas are the same even if the addresses are different. Use them respectively in accordance with your purpose.

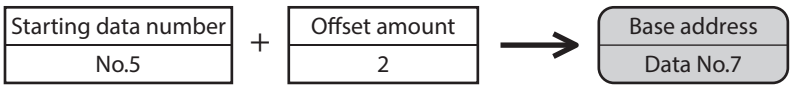
■ Direct reference

Direct reference is a method in which the register address (base address) of the base operation data number is specified to input data.



■ Offset reference

Offset reference is a method in which the operation data number of the starting point (starting data number) is set and the offset from the starting data number is specified to input data. The starting data number is set with the "DATA offset reference origin" parameter.



memo

- Up to 32 pieces of operation data can be specified in offset reference. (The offset value is 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 No.
Dec	Hex	
6144	1800	No.0
6208	1840	No.1
6272	1880	No.2
6336	18C0	No.3
6400	1900	No.4
6464	1940	No.5
6528	1980	No.6
6592	19C0	No.7
6656	1A00	No.8
6720	1A40	No.9
6784	1A80	No.10
6848	1AC0	No.11
6912	1B00	No.12
6976	1B40	No.13
7040	1B80	No.14
7104	1BC0	No.15
7168	1C00	No.16
7232	1C40	No.17
7296	1C80	No.18
7360	1CC0	No.19
7424	1D00	No.20
7488	1D40	No.21
7552	1D80	No.22
7616	1DC0	No.23
7680	1E00	No.24
7744	1E40	No.25
7808	1E80	No.26
7872	1EC0	No.27
7936	1F00	No.28
8000	1F40	No.29
8064	1F80	No.30
8128	1FC0	No.31
8192	2000	No.32
8256	2040	No.33
8320	2080	No.34
8384	20C0	No.35
8448	2100	No.36
8512	2140	No.37
8576	2180	No.38
8640	21C0	No.39
8704	2200	No.40

Base address		Operation data No.
Dec	Hex	
8768	2240	No.41
8832	2280	No.42
8896	22C0	No.43
8960	2300	No.44
9024	2340	No.45
9088	2380	No.46
9152	23C0	No.47
9216	2400	No.48
9280	2440	No.49
9344	2480	No.50
9408	24C0	No.51
9472	2500	No.52
9536	2540	No.53
9600	2580	No.54
9664	25C0	No.55
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

Base address		Operation data No.
Dec	Hex	
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
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

Base address		Operation data No.
Dec	Hex	
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
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

Base address		Operation data No.
Dec	Hex	
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
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

Base address		Operation data No.
Dec	Hex	
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
21760	5500	No.244
21824	5540	No.245
21888	5580	No.246
21952	55C0	No.247
22016	5600	No.248
22080	5640	No.249
22144	5680	No.250
22208	56C0	No.251
22272	5700	No.252
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 command.
The register addresses of the setting items are arranged based on the base addresses of the operation data numbers. (base address ⇨p.141)
For example, in the case of the setting item "Position," if 2 and 3 are added to the base address, they become the upper and lower addresses respectively.

MEXE02 code	Register address	Item	Setting range	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 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000	B
	Base address + 7 (lower)				
	Base address + 8 (upper)	Stopping deceleration	1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	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: Stop –2: +2 –1: +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: None (–) 2 to 255: loop2 { to loop255 { (number of loop times)	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: None (–) 1: } L-End (loop end point)	0	B
	Base address + 27 (lower)				

■ Setting example

As an example, here is a description how to set the following operation data to the 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

From the table on p.141, we can find that the base address of the operation data No.0 is "1800h (6144)."
Based on this base address, the register addresses of the setting items are calculated from the table on p.143.

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

From the table on p.141, we can find that the base address of the operation data No.1 is "1840h (6208)."
Based on this base address, the register addresses of the setting items are calculated from the table on p.143.

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

With Modbus communication, offset reference is not necessary because up to the operation data No.255 can be directly input.
However, offset reference can be used conveniently also in Modbus communication because the addresses of the setting items do not need to be changed if just the starting data number is changed. Use it to edit a large volume of operation data, on the touch screen, for example.

Related parameter

Register address		Item	Description	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. **[Setting range]** 0 to 255	0

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

9 Extended operation data setting R/W commands

Parameters for extended operation data setting can be set. All commands are used for read/write.

MEXE02 code	Register address		Item	Description	Initial value	Update
	Upper	Lower				
p2	0280h (640)	0281h (641)	Common acceleration rate or time	Sets the starting/changing rate or starting/changing time in common setting. **[Setting range]** 1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000	B
	0282h (642)	0283h (643)	Common stopping deceleration	Sets the stopping deceleration or stop time in common setting. **[Setting range]** 1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000	B
	028Ch (652)	028Dh (653)	Rate selection	Sets whether to use the common acceleration/deceleration or the acceleration/deceleration specified for the operation data. **[Setting range]** 0: Common rate (common setting) 1: Rate of each operation data (separate setting)	1	B
	1000h (4096)	1001h (4097)	Repeat start operation data number	Sets the operation data number from which extended loop operation is started. **[Setting range]** −1 (disable), 0 to 255	−1	B
	1002h (4098)	1003h (4099)	Repeat end operation data number	Sets the operation data number in which extended loop operation is completed. **[Setting range]** −1 (disable), 0 to 255	−1	B
	1004h (4100)	1005h (4101)	Repeat time	Sets the number of repeat times of extended loop operation. **[Setting range]** −1 (disable), 0 to 100,000,000	−1	B

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

10 Parameter R/W commands

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

10-1 (p3) Base settings parameters

Register address		Item	Description	Initial value	Update
Upper	Lower				
0220h (544)	0221h (545)	Direct data operation zero speed command action	When "0" is written to the speed in direct data operation, selects whether to cause the motor to decelerate to a stop or to change the speed to 0 r/min in an operating status. **[Setting range]** 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 used in direct data operation. **[Setting range]** −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 data destination initial value	Sets the initial value of the destination used in direct data operation. **[Setting range]** 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 of direct data. **[Setting range]** 0 to 255	0	C
024Ch (588)	024Dh (589)	Base current	Sets the maximum output current of the motor as a percentage of the rated current, based on the rated current being 100 %. **[Setting range]** 0 to 1,000 (1=0.1 %)	1,000	A
0250h (592)	0251h (593)	Stop current	Sets the current at motor standstill as a percentage of the base current, based on the base current being 100 %. **[Setting range]** 0 to 500 (1=0.1 %)	500	A
0252h (594)	0253h (595)	Command filter setting	Sets the filter to adjust the motor response. **[Setting range]** 1: LPF (speed filter) 2: Moving average filter	1	B
0254h (596)	0255h (597)	Command filter time constant	Adjusts the motor response. **[Setting range]** 0 to 200 ms	1	B

Register address		Item	Description	Initial value	Update
Upper	Lower				
0258h (600)	0259h (601)	Smooth drive function	Enables the smooth drive function. **[Setting range]** 0: Disable 1: Enable	1	C
0266h (614)	0267h (615)	Automatic current cutback switching time	Sets the time from the stop of motor to operation of the automatic current cutback function. **[Setting range]** 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. **[Setting range]** 0 to 4,000,000 Hz	100	B
028Eh (654)	028Fh (655)	Acceleration/ deceleration unit	Sets the acceleration/deceleration unit. **[Setting range]** 0: kHz/s 1: s 2: ms/kHz	0	C
0290h (656)	0291h (657)	Permission of absolute positioning without setting absolute coordinates	Permits absolute positioning operation when the position coordinate is not set. **[Setting range]** 0: Disable 1: Enable	1	B
0386h (902)	0387h (903)	Software overtravel	Sets the operation when the software overtravel is detected. **[Setting range]** −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. **[Setting range]** −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. **[Setting range]** −2,147,483,648 to 2,147,483,647 steps	−2,147,483,648	A
038Ch (908)	038Dh (909)	Preset position	Sets the preset position. **[Setting range]** −2,147,483,648 to 2,147,483,647 steps	0	A

10-2 (p4) Motor & mechanism (coordinates/JOG/HOME operation) parameters

Register address		Item	Description	Initial value	Update
Upper	Lower				
02A0h (672)	02A1h (673)	(JOG) Travel amount	Sets the travel amount for inching operation. **[Setting range]** 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. **[Setting range]** 1 to 4,000,000 Hz	200	B
02A4h (676)	02A5h (677)	(JOG) Acceleration/ deceleration	Sets the acceleration/deceleration rate or acceleration/ deceleration time for JOG macro operation. **[Setting range]** 1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000	B
02A6h (678)	02A7h (679)	(JOG) Starting speed	Sets the starting speed for JOG macro operation. **[Setting range]** 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. **[Setting range]** 1 to 4,000,000 Hz	1,000	B
02BCh (700)	02BDh (701)	JOG/HOME command filter time constant	Sets the time constant for command filter. **[Setting range]** 1 to 200 ms	1	B
02BEh (702)	02BFh (703)	JOG/HOME operating current	Sets the operating current rate. **[Setting range]** 0 to 1,000 (1=0.1 %)	1,000	B
02C0h (704)	02C1h (705)	(HOME) Home-seeking mode	Sets the mode for return-to-home operation. **[Setting range]** 0: 2 sensors 1: 3 sensors 2: One-way rotation	1	B
02C2h (706)	02C3h (707)	(HOME) Starting direction	Sets the starting direction for home detection. **[Setting range]** 0: Negative side 1: Positive side	1	B
02C4h (708)	02C5h (709)	(HOME) Acceleration/ deceleration	Sets the acceleration/deceleration rate or acceleration/ deceleration time for return-to-home operation. **[Setting range]** 1 to 1,000,000,000 (1=0.001 kHz/s, 1=0.001 s or 1=0.001 ms/kHz)	30,000	B
02C6h (710)	02C7h (711)	(HOME) Starting speed	Sets the starting speed for return-to-home operation. **[Setting range]** 1 to 4,000,000 Hz	100	B
02C8h (712)	02C9h (713)	(HOME) Operating speed	Sets the operating speed for return-to-home operation. **[Setting range]** 1 to 4,000,000 Hz	1,000	B
02CAh (714)	02CBh (715)	(HOME) Last speed	Sets the operating speed for final positioning with the home. **[Setting range]** 1 to 10,000 Hz	100	B

Register address		Item	Description	Initial value	Update
Upper	Lower				
02CCh (716)	02CDh (717)	(HOME) SLIT detection	Sets whether or not to concurrently use the SLIT input for return-to-home operation. **[Setting range]** 0: Disable 1: Enable	0	B
02CEh (718)	02CFh (719)	(HOME) TIM signal detection	Sets whether or not to concurrently use the TIM signal for return-to-home operation. **[Setting range]** 0: Disable 1: TIM output	0	B
02D0h (720)	02D1h (721)	(HOME) Position offset	Sets the amount of offset from the home. **[Setting range]** −2,147,483,647 to 2,147,483,647 steps	0	B
02D2h (722)	02D3h (723)	(HOME) Backward steps in 2 sensor home-seeking	Sets the backward steps after return-to-home operation in 2-sensor mode. **[Setting range]** 0 to 8,388,607 steps	200	B
02D4h (724)	02D5h (725)	(HOME) Operating amount in uni-directional home-seeking	Sets the operating amount after return-to-home operation in one-way rotation mode. **[Setting range]** 0 to 8,388,607 steps	200	B
0384h (900)	0385h (901)	Motor rotation direction	Sets the rotation direction of the motor output shaft. **[Setting range]** 0: Positive side=Counterclockwise 1: Positive side=Clockwise	1	C
039Ch (924)	039Dh (925)	Base resolution setting	Sets the resolution in combination with the "Resolution [Base resolution: 200 P/R | 500 P/R]" parameter. Refer to p.151 for resolutions that can be set. **[Setting range]** −1: Depending on the driver product name * 0: 200 P/R 1: 500 P/R	−1	D
039Eh (926)	039Fh (927)	Resolution [Base resolution: 200 P/R | 500 P/R]	Set the resolution in combination with the "Base resolution setting" parameter. Refer to p.151 for resolutions that can be set. **[Setting range]** 0 to 15	0	C

* 200 P/R: Driver model started with **CVD2**
500 P/R: Driver model started with **CVD5**

- **Resolution list**

"Resolution [Base resolution: 200 P/R | 500 P/R]" parameter	"Base resolution setting" parameter			
	200 P/R (2-phase)		500 P/R (5-phase)	
	Resolution (P/R)	Step angle	Resolution (P/R)	Step angle
0	200	1.8°	500	0.72°
1	400	0.9°	1,000	0.36°
2	800	0.45°	1,250	0.288°
3	1,000	0.36°	2,000	0.18°
4	1,600	0.225°	2,500	0.144°
5	2,000	0.18°	4,000	0.09°
6	3,200	0.1125°	5,000	0.072°
7	5,000	0.072°	10,000	0.036°
8	6,400	0.05625°	12,500	0.0288°
9	10,000	0.036°	20,000	0.018°
10	12,800	0.028125°	25,000	0.0144°
11	20,000	0.018°	40,000	0.009°
12	25,000	0.0144°	50,000	0.0072°
13	25,600	0.0140625°	62,500	0.00576°
14	50,000	0.0072°	100,000	0.0036°
15	51,200	0.00703125°	125,000	0.00288°

memo
- Step angles are theoretical values.
- The actual step angle for the geared type is calculated by 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.

10-3 (p5) Alarm & Info parameters

Register address		Item	Description	Initial value	Update
Upper	Lower				
0340h (832)	0341h (833)	Driver temperature information (INFO-DRVTMP)	Sets the generation condition of the driver temperature information (INFO-DRVTMP). **[Setting range]** 40 to 85 °C	85	A
0356h (854)	0357h (855)	Overvoltage information (INFO-OVOLT)	Sets the generation condition of the overvoltage information (INFO-OVOLT). **[Setting range]** 180 to 430 (1=0.1 V)	430	A
0358h (856)	0359h (857)	Undervoltage information (INFO-UVOLT)	Sets the generation condition of the undervoltage information (INFO-UVOLT). **[Setting range]** 180 to 430 (1=0.1 V)	180	A
035Eh (862)	035Fh (863)	Tripmeter information (INFO-TRIP)	Sets the generation condition of the tripmeter information (INFO-TRIP). **[Setting range]** 0 (disable), 1 to 2,147,483,647 (1=0.1 kRev)	0	A
0360h (864)	0361h (865)	Odometer information (INFO-ODO)	Sets the generation condition of the odometer information (INFO-ODO). **[Setting range]** 0 (disable), 1 to 2,147,483,647 (1=0.1 kRev)	0	A

Register address		Item	Description	Initial value	Update
Upper	Lower				
037Ch (892)	037Dh (893)	Information LED condition	Sets the status of the LED when information is generated. **[Setting range]** 0: Disable (LED does not blink) 1: Enable (LED blinks)	1	A
037Eh (894)	037Fh (895)	Information auto clear	When the cause of information is eliminated, the INFO output and the bit output of the corresponding information are turned OFF automatically. **[Setting range]** 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, INFO output, and the status of the LED when information is generated. **[Setting range]** 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 (operation start 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
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
0F78h (3960)	0F79h (3961)	INFO action (operation start 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

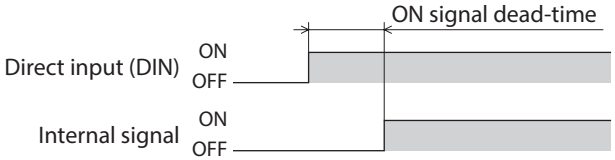
* Even if the "INFO action" parameter is set to "0," this remains in the information history of the RS-485 communication or **MEXE02**.

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

Register address		Item	Description	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. **[Setting range]** 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. **[Setting range]** −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. **[Setting range]** 0: Immediate stop 1: Deceleration stop	1	A
0E14h (3604)	0E15h (3605)	MOVE minimum ON time	Sets the minimum ON time for the MOVE output. **[Setting range]** 0 to 255 ms	0	A
0E80h (3712)	0E81h (3713)	AREA0 positive direction position/offset	Sets the positive direction position or offset from the target position for the AREA0 output. **[Setting range]** −2,147,483,648 to 2,147,483,647 steps	0	A
0E82h (3714)	0E83h (3715)	AREA0 negative direction position/detection range	Sets the negative direction position or distance from the offset position for the AREA0 output. **[Setting range]** −2,147,483,648 to 2,147,483,647 steps	0	A
0E84h (3716)	0E85h (3717)	AREA1 positive direction position/offset	Sets the positive direction position or offset from the target position for the AREA1 output. **[Setting range]** −2,147,483,648 to 2,147,483,647 steps	0	A
0E86h (3718)	0E87h (3719)	AREA1 negative direction position/detection range	Sets the negative direction position or distance from the offset position for the AREA1 output. **[Setting range]** −2,147,483,648 to 2,147,483,647 steps	0	A
0EA0h (3744)	0EA1h (3745)	AREA0 range setting mode	Sets the range setting mode of AREA0 output. **[Setting range]** 0: Range setting with absolute value 1: Offset/width setting from the target position	0	A
0EA2h (3746)	0EA3h (3747)	AREA1 range setting mode	Sets the range setting mode of AREA1 output. **[Setting range]** 0: Range setting with absolute value 1: Offset/width setting from the target position	0	A

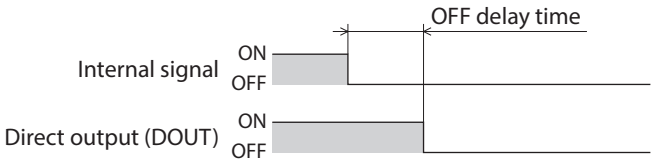
10-5 (p7) Direct-IN function (DIN) parameters

Register address		Item	Description	Initial value	Update
Upper	Lower				
1080h (4224)	1081h (4225)	DIN0 input function	Selects the input signal to be assigned to DIN. **[Setting range]** Input signal list ⇨p.61	56: FW-POS	C
1082h (4226)	1083h (4227)	DIN1 input function		57: RV-POS	C
1084h (4228)	1085h (4229)	DIN2 input function		5: STOP	C
1086h (4230)	1087h (4231)	DIN3 input function		8: ALM-RST	C
1088h (4232)	1089h (4233)	DIN4 input function		30: HOMES	C
108Ah (4234)	108Bh (4235)	DIN5 input function		28: FW-LS	C
108Ch (4236)	108Dh (4237)	DIN6 input function		29: RV-LS	C
10A0h (4256)	10A1h (4257)	DIN0 inverting mode	Changes ON/OFF setting of DIN. **[Setting range]** 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
10A6h (4262)	10A7h (4263)	DIN3 inverting mode		0	C
10A8h (4264)	10A9h (4265)	DIN4 inverting mode		0	C
10AAh (4266)	10ABh (4267)	DIN5 inverting mode		0	C
10ACh (4268)	10ADh (4269)	DIN6 inverting mode		0	C
1180h (4480)	1181h (4481)	DIN0 ON signal dead-time	Sets the ON signal dead-time of DIN. **[Setting range]** 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
1186h (4486)	1187h (4487)	DIN3 ON signal dead-time		0	C
1188h (4488)	1189h (4489)	DIN4 ON signal dead-time		0	C
118Ah (4490)	118Bh (4491)	DIN5 ON signal dead-time		0	C
118Ch (4492)	118Dh (4493)	DIN6 ON signal dead-time		0	C



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

Register address		Item	Description	Initial value	Update
Upper	Lower				
10C0h (4288)	10C1h (4289)	DOUT0 output function	Selects the output signal to be assigned to DOUT. **[Setting range]** Output signal list ⇨ p.62	130: ALM-B	C
10C2h (4290)	10C3h (4291)	DOUT1 output function		157: TIM	C
10E0h (4320)	10E1h (4321)	DOUT0 inverting mode	Changes ON/OFF setting of DOUT. **[Setting range]** 0: Non invert 1: Invert	0	C
10E2h (4322)	10E3h (4323)	DOUT1 inverting mode		0	C
11C0h (4544)	11C1h (4545)	DOUT0 OFF delay time	Sets the OFF delay time of DOUT. **[Setting range]** 0 to 250 ms	0	C
11C2h (4546)	11C3h (4547)	DOUT1 OFF delay time		0	C

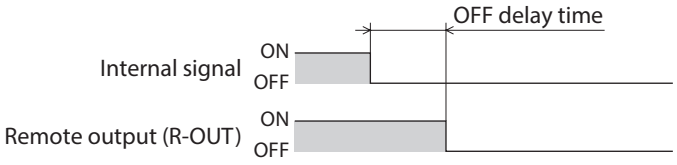


10-7 (p9) Remote-I/O function (R-I/O) parameters

Register address		Item	Description	Initial value	Update
Upper	Lower				
1200h (4608)	1201h (4609)	R-IN0 input function	Selects the input signal to be assigned to remote I/O. **[Setting range]** Input signal list ⇨ p.61	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		0: No function	C
1212h (4626)	1213h (4627)	R-IN9 input function		0: No function	C
1214h (4628)	1215h (4629)	R-IN10 input function		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

Register address		Item	Description	Initial value	Update
Upper	Lower				
121Ah (4634)	121Bh (4635)	R-IN13 input function	Selects the input signal to be assigned to remote I/O. **[Setting range]** Input signal list ⇨p.61	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. **[Setting range]** Output signal list ⇨p.62	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		128: CONST-OFF	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		128: CONST-OFF	C
123Eh (4670)	123Fh (4671)	R-OUT15 output function		128: CONST-OFF	C
1260h (4704)	1261h (4705)	R-OUT0 OFF delay time	Sets the OFF delay time of remote I/O. **[Setting range]** 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
126Ah (4714)	126Bh (4715)	R-OUT5 OFF delay time		0	C
126Ch (4716)	126Dh (4717)	R-OUT6 OFF delay time		0	C
126Eh (4718)	126Fh (4719)	R-OUT7 OFF delay time		0	C

Register address		Item	Description	Initial value	Update
Upper	Lower				
1270h (4720)	1271h (4721)	R-OUT8 OFF delay time	Sets the OFF delay time of remote I/O. **[Setting range]** 0 to 250 ms	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 parameters

Register address		Item	Description	Initial value	Update
Upper	Lower				
03E4h (996)	03E5h (997)	USB-ID enable	The COM port can be fixed. (⇨p.160) **[Setting range]** 0: Disable 1: Enable	1	D
03E6h (998)	03E7h (999)	USB-ID	This is settable when the "USB-ID enable" parameter is set to "1: Enable." Sets the ID to the COM port. (⇨p.160) **[Setting range]** 0 to 999,999,999	0	D
03EAh (1002)	03EBh (1003)	LED-OUT mode	Selects the function of the C-DAT/C-ERR LED. **[Setting range]** −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. **[Setting range]** 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
1308h (4872)	1309h (4873)	Indirect reference address setting (4)		0	A
130Ah (4874)	130Bh (4875)	Indirect reference address setting (5)		0	A

Register address		Item	Description	Initial value	Update
Upper	Lower				
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)	Sets the ID of the data to be stored in the indirect reference address. **[Setting range]** 0 to FFFFh (0 to 65,535)	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
133Eh (4926)	133Fh (4927)	Indirect reference address setting (31)		0	A

Register address		Item	Description	Initial value	Update
Upper	Lower				
1380h (4992)	1381h (4993)	Slave address (Modbus)	Sets the address number (slave address). **[Setting range]** 1 to 31 * * Do not use 0.	1	D
1382h (4994)	1383h (4995)	Baudrate (Modbus)	Sets the transmission rate. **[Setting range]** 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 it when the arrangement of the communication data is different from that of the host controller. (⇨p.160) **[Setting range]** 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. **[Setting range]** 0: None 1: Even parity 2: Odd parity	1	D
1388h (5000)	1389h (5001)	Communication stop bit (Modbus)	Sets the communication stop bit. **[Setting range]** 0: 1 bit 1: 2 bits	0	D
138Ah (5002)	138Bh (5003)	Communication timeout (Modbus)	Sets the generation condition of the communication timeout. **[Setting range]** 0 (not monitored), 1 to 10,000 ms	0	A
138Ch (5004)	138Dh (5005)	Communication error detection (Modbus)	When the RS-485 communication error has occurred for the set number of times, an alarm of RS-485 communication error is generated. **[Setting range]** 0 (disable), 1 to 10	3	A
138Eh (5006)	138Fh (5007)	Transmission waiting time (Modbus)	Sets the transmission waiting time. **[Setting range]** 0 to 10,000 (1=0.1 ms)	30	D
1390h (5008)	1391h (5009)	Silent interval (Modbus)	Sets the silent interval. **[Setting range]** 0 (automatically set), 1 to 100 (1=0.1 ms)	0	D
1392h (5010)	1393h (5011)	Slave error response mode (Modbus)	Sets the response when a slave error occurs. **[Setting range]** 0: As normal response 1: As exception response	1	A
1394h (5012)	1395h (5013)	Initial group ID (Modbus)	Sets the address (address number of the parent slave) of the group. It is stored even if the power is turned off. **[Setting range]** −1: Disable (no group transmission) 1 to 31: Group ID * * Do not use 0.	−1	C

Register address		Item	Description	Initial value	Update
Upper	Lower				
13C0h (5056)	13C1h (5057)	(RS-485) Receive packet monitor	Selects the target for the RS-485 communication monitor of the **MEXE02**. **[Setting range]** 0: All 1: Only own address	0	A
13F6h (5110)	13F7h (5111)	USB-PID	Sets an ID number of a driver that will be shown along with a COM port number. (⇨p.161) **[Setting range]** 0 to 31	0	D

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

When 32-bit data "12345678h" is stored at the register addresses 1000h and 1001h, arrangement is changed as follows depending on the setting of parameters.

Setting of parameters	1000h (even address)		1001h (odd 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

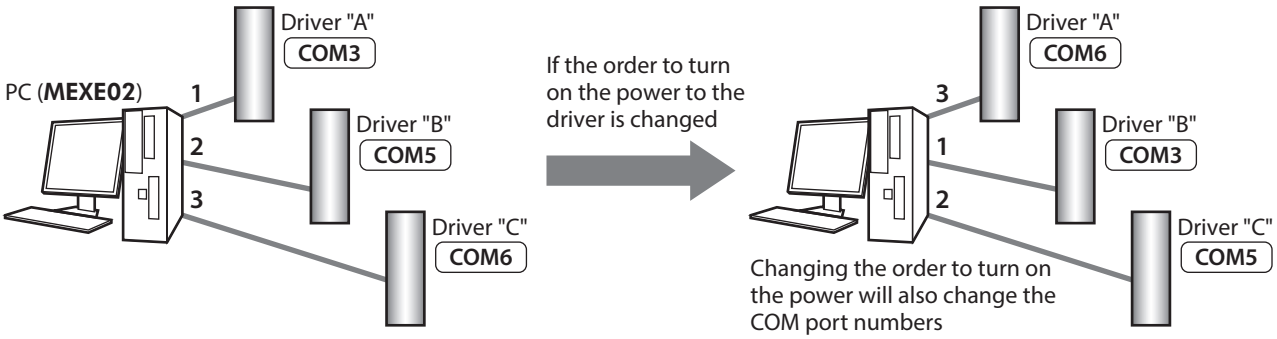
memo The description in this document is based on "0: Even Address-High Word & Big-Endian."

■ 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**.
If multiple drivers are connected to a PC, the PC allocates empty COM ports to the drivers in the connected order. If the driver power is turned on again or if the UBS cable is removed and inserted, the allocated COM port numbers may change because the order of connection recognized by the PC is changed.

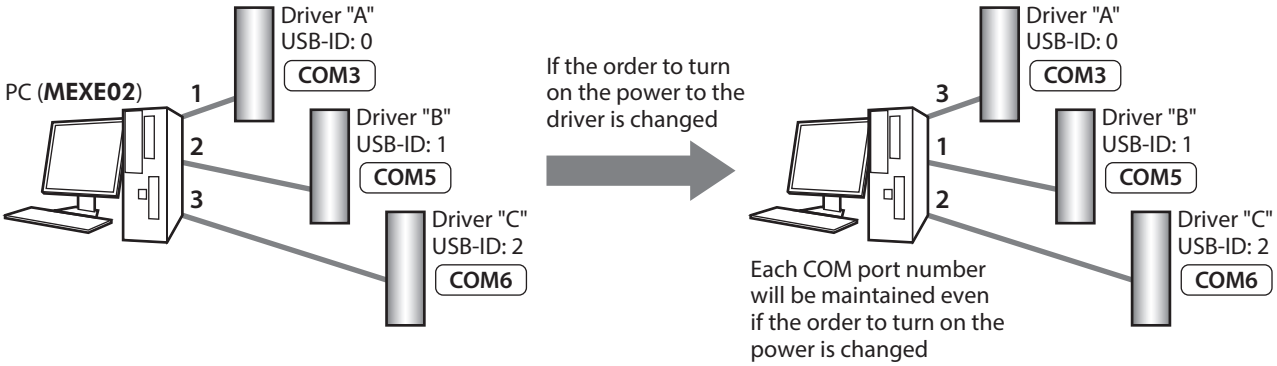
- **When the USB-ID is not set**

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



● When the USB-ID is set

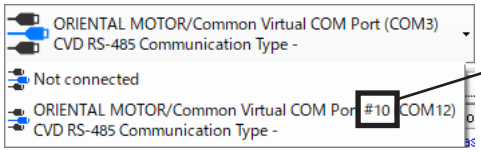
If the "USB-ID" parameter is set, the same COM port numbers are always displayed regardless of the order of connection because the COM port number is fixed to each driver. (The USB-ID and the COM port number may not match because a PC associates with empty COM port numbers in descending order.)



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 easily be distinguished using the **MEXE02** because the ID number of the driver is not changed.



ID number set with the "USB-PID" parameter

memo If the USB-PID of the same number is set to multiple drivers, the COM port numbers are allocated in the order of connection.

5 Measures for various cases

◆Table of contents

1 Vibration suppression

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

If the command filter to adjust the motor response is used, the vibration of the motor can be suppressed.
There are two types of command filters: LPF (speed filter) and moving average filter.

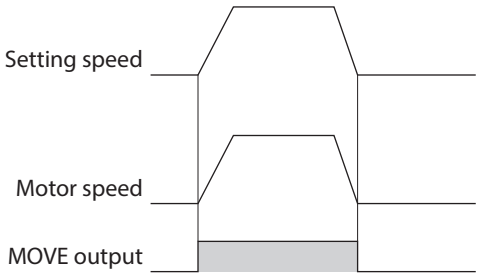
Related parameters

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p3	0252h (594)	0253h (595)	Command filter setting	Sets the filter to adjust the motor response. **[Setting range]** 1: LPF (speed filter) 2: Moving average filter	1
	0254h (596)	0255h (597)	Command filter time constant	Adjusts the motor response. **[Setting range]** 0 to 200 ms	1

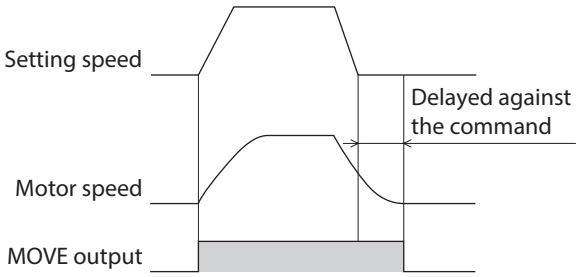
■ LPF (speed filter)

Select "1: LPF" in the "Command filter setting" parameter and set the "Command filter time constant" parameter. When the value of the "Command filter time constant" parameter is increased, vibration can be suppressed during low-speed operation, and starting/stopping of the motor becomes smooth. Note, however, if this setting is too high, it results in lower synchronicity with commands. Set a suitable value according to the load or application.

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

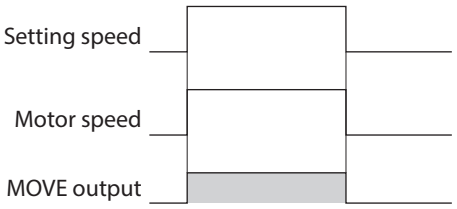
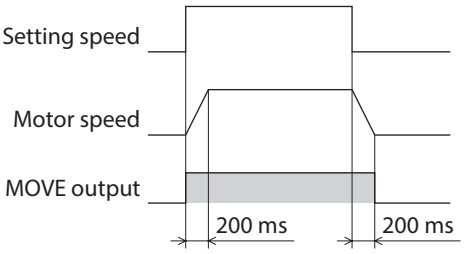
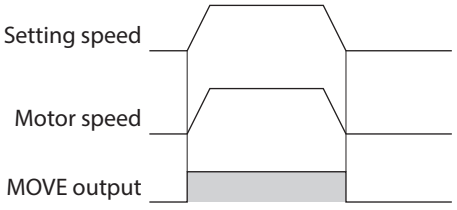
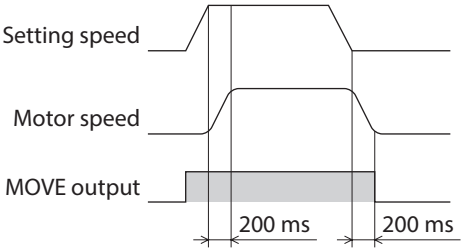


- When the "Command filter time constant" parameter is 200 ms



■ Moving average filter

Select "2: Moving average filter" in the "Command filter setting" parameter and set the "Command filter time constant" parameter.
The motor response can be adjusted. The positioning time can be shortened by suppressing the residual vibration for positioning operation.
Optimum value for the "Command filter time constant" parameter varies depending on the load or operating condition. Set a suitable value according to the load or operating condition.

	When the "Command filter time constant" parameter is 0 ms	When the "Command filter time constant" parameter is 200 ms
Rectangular operation		
Trapezoidal operation		

1-2 Smooth drive function

Using the smooth drive function can suppress the motor vibration to allow for smoother motion.
If the smooth drive function is not used (set to "0: Disable"), vibration in low speeds may be increased. Set the function to "1: Enable" under normal conditions of use.

Related parameter

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p3	0258h (600)	0259h (601)	Smooth drive function	Enables the smooth drive function. **[Setting range]** 0: Disable 1: Enable	1

2 Suppression of heat generation

2-1 Automatic current cutback function

The automatic current cutback function is a method in which heat generation of the motor is suppressed by automatically decreasing the motor current to the stop current at motor standstill.
When operation is restarted, the current automatically increases to the operating current.

Related parameter

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p3	0266h (614)	0267h (615)	Automatic current cutback switching time	Sets the time from the stop of motor to operation of the automatic current cutback function. **[Setting range]** 0 to 1,000 ms	100

3 LEDs on the driver

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

3-1 Lighting state of LEDs

■ PWR/ALM LED

The driver status can be checked.

Green	Red	Description
OFF	OFF	The power supply is not turned on.
Lit	OFF	The power supply is turned on.
–	Blinking	An alarm is being generated. The cause of the alarm can be checked by counting the number of times the LED blinks. The LED is lit in green when the alarm is reset.
Blinking twice at the same time		• Information is being generated. Red and green colors may overlap and it may be visible to orange. The LED is lit in green when the information is reset. • Teaching, remote operation is being executed with the **MEXE02**. Red and green 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

The status of RS-485 communication can be checked.

Green	Red	Description
Lit/blinking	–	The driver is communicating with the master station properly via RS-485 communication.
–	Lit	A RS-485 communication error occurs with the master station. The LED is lit or blinks in green when the communication status returns to normal.

3-2 Change of lighting condition of LED

Related parameter

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p10	03EAh (1002)	03EBh (1003)	LED-OUT mode	Selects the function of the C-DAT/C-ERR LED. **[Setting range]** –1: The LED is not lit 1: Functions as C-DAT/C-ERR LED	1

4 Use of general signals

The R0 to R7 inputs are general signals. Using the R0 to R7 inputs, I/O signals for 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.

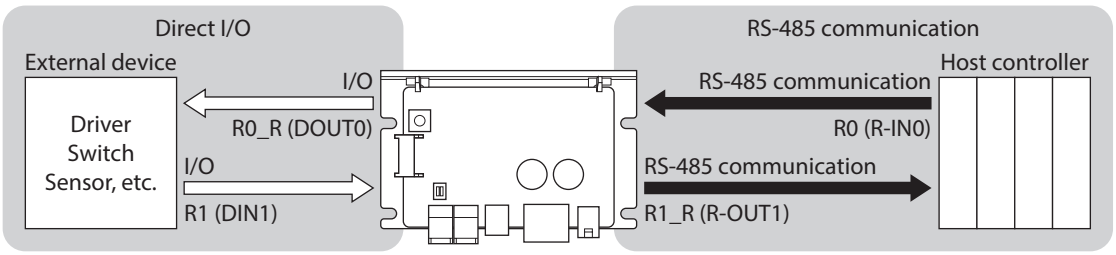
■ Usage example of general signals

- **When outputting the signals from the host controller to the external device**

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

- **When inputting the output of the external device to the host controller**

  Assign the R1 input to the DIN1 input and R-OUT1.
  When the DIN1 input is turned ON by the external device, R-OUT1 becomes 1, and when the DIN1 input is turned OFF, R-OUT1 becomes 0. ON/OFF of the DIN1 input can be set using "DIN1 inverting mode" parameter.



Related parameters

MEXE02 code	Register address Upper	Register address Lower	Item	Description	Initial value
p7	1080h (4224)	1081h (4225)	DIN0 input function	Selects the input signal to be assigned to DIN. **[Setting range]** Input signal list ⇨ p.61	56: FW-POS
	1082h (4226)	1083h (4227)	DIN1 input function		57: RV-POS
	1084h (4228)	1085h (4229)	DIN2 input function		5: STOP
	1086h (4230)	1087h (4231)	DIN3 input function		8: ALM-RST
	1088h (4232)	1089h (4233)	DIN4 input function		30: HOMES
	108Ah (4234)	108Bh (4235)	DIN5 input function		28: FW-LS
	108Ch (4236)	108Dh (4237)	DIN6 input function		29: RV-LS
	10A0h (4256)	10A1h (4257)	DIN0 inverting mode	Changes ON/OFF setting of DIN. **[Setting range]** 0: Non invert 1: Invert	0
	10A2h (4258)	10A3h (4259)	DIN1 inverting mode		0
	10A4h (4260)	10A5h (4261)	DIN2 inverting mode		0
	10A6h (4262)	10A7h (4263)	DIN3 inverting mode		0
	10A8h (4264)	10A9h (4265)	DIN4 inverting mode		0
	10AAh (4266)	10ABh (4267)	DIN5 inverting mode		0
	10ACh (4268)	10ADh (4269)	DIN6 inverting mode		0

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p8	10C0h (4288)	10C1h (4289)	DOUT0 output function	Selects the output signal to be assigned to DOUT. **[Setting range]** Output signal list ⇨p.62	130: ALM-B
	10C2h (4290)	10C3h (4291)	DOUT1 output function		157: TIM
	10E0h (4320)	10E1h (4321)	DOUT0 inverting mode	Changes ON/OFF setting of DOUT. **[Setting range]** 0: Non invert 1: Invert	0
	10E2h (4322)	10E3h (4323)	DOUT1 inverting mode		0
p9	1200h (4608)	1201h (4609)	R-IN0 input function	Selects the input signal to be assigned to remote I/O. **[Setting range]** Input signal list ⇨p.61	64: M0
	1202h (4610)	1203h (4611)	R-IN1 input function		65: M1
	1204h (4612)	1205h (4613)	R-IN2 input function		66: M2
	1206h (4614)	1207h (4615)	R-IN3 input function		32: START
	1208h (4616)	1209h (4617)	R-IN4 input function		36: HOME
	120Ah (4618)	120Bh (4619)	R-IN5 input function		5: STOP
	120Ch (4620)	120Dh (4621)	R-IN6 input function		2: AWO
	120Eh (4622)	120Fh (4623)	R-IN7 input function		8: ALM-RST
	1210h (4624)	1211h (4625)	R-IN8 input function		0: No function
	1212h (4626)	1213h (4627)	R-IN9 input function		0: No function
	1214h (4628)	1215h (4629)	R-IN10 input function		0: No function
	1216h (4630)	1217h (4631)	R-IN11 input function		33: SSTART
	1218h (4632)	1219h (4633)	R-IN12 input function		52: FW-JOG-P
	121Ah (4634)	121Bh (4635)	R-IN13 input function		53: RV-JOG-P
	121Ch (4636)	121Dh (4637)	R-IN14 input function		56: FW-POS
	121Eh (4638)	121Fh (4639)	R-IN15 input function		57: RV-POS
	1220h (4640)	1221h (4641)	R-OUT0 output function	Selects the output signal to be assigned to remote I/O. **[Setting range]** Output signal list ⇨p.62	64: M0_R
	1222h (4642)	1223h (4643)	R-OUT1 output function		65: M1_R
	1224h (4644)	1225h (4645)	R-OUT2 output function		66: M2_R
	1226h (4646)	1227h (4647)	R-OUT3 output function		32: START_R
	1228h (4648)	1229h (4649)	R-OUT4 output function		144: HOME-END
	122Ah (4650)	122Bh (4651)	R-OUT5 output function		132: READY
	122Ch (4652)	122Dh (4653)	R-OUT6 output function		135: INFO

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p9	122Eh (4654)	122Fh (4655)	R-OUT7 output function	Selects the output signal to be assigned to remote I/O. **[Setting range]** Output signal list ⇨p.62	129: ALM-A
	1230h (4656)	1231h (4657)	R-OUT8 output function		136: SYS-BSY
	1232h (4658)	1233h (4659)	R-OUT9 output function		160: AREA0
	1234h (4660)	1235h (4661)	R-OUT10 output function		161: AREA1
	1236h (4662)	1237h (4663)	R-OUT11 output function		128: CONST-OFF
	1238h (4664)	1239h (4665)	R-OUT12 output function		157: TIM
	123Ah (4666)	123Bh (4667)	R-OUT13 output function		134: MOVE
	123Ch (4668)	123Dh (4669)	R-OUT14 output function		128: CONST-OFF
	123Eh (4670)	123Fh (4671)	R-OUT15 output function		128: CONST-OFF

5 Utilization for maintenance of equipment

Various functions of the driver are also helpful for maintenance of the equipment.

5-1 Tripmeter (total amount of rotations) and odometer (cumulative amount of rotations)

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

- **Monitor commands**

Register address		Item	Description
Upper	Lower		
00FCh (252)	00FDh (253)	Odometer	Shows the cumulative amount of rotations of the motor output shaft stored in the driver. (1=0.1 kRev) It cannot cleared by the user.
00FEh (254)	00FFh (255)	Tripmeter	Shows the total amount of rotations of the motor output shaft stored in the driver. (1=0.1 kRev) It can be cleared by the user.

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

memo
- The tripmeter can also be reset after maintenance of the equipment. Execute the "Clear tripmeter" of the maintenance command.
- The tripmeter and odometer can also be checked on the status monitor window of the **MEXE02**.

- **Related parameters**

MEXE02 code	Register address		Item	Description	Initial value
	Upper	Lower			
p5	035Eh (862)	035Fh (863)	Tripmeter information (INFO-TRIP)	Sets the generation condition of the tripmeter information (INFO-TRIP). **[Setting range]** 0 (disable), 1 to 2,147,483,647 (1=0.1 kRev)	0
	0360h (864)	0361h (865)	Odometer information (INFO-ODO)	Sets the generation condition of the odometer information (INFO-ODO). **[Setting range]** 0 (disable), 1 to 2,147,483,647 (1=0.1 kRev)	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 represents "latch trigger." The operation information saved by the latch function is maintained until it is cleared. The operation information latched can be useful for doing maintenance on equipment or checking the operating status.

■ Operation information latched

- Command position..... Command position when a latch trigger is generated
- Target position ..... Target position in the stopped operation
- Operation data number..... Operation data number when latched
- Loop count..... When latched while performing loop operation or the extended loop function, the number of loop times when latched is saved.

memo All the operation information latched is cleared if the power is turn on again.

■ Timing of latch

- When an operation was stopped by the AWO input or STOP input.
- When an operation was stopped by the software overtravel or the hardware overtravel.
- When operation was stopped by alarm generation.
- When an operation was stopped by the FW-BLK input while performing the operation in the forward direction.
- When an operation was stopped by the RV-BLK input while performing the operation in the reverse direction.

memo Positioning SD operation, macro operation, and direct data operation are latched by operation stop.

■ Related input/output signal

● **LAT-CLR input (⇨p.73)**

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 saved by the latch function can be checked by the latch monitor of RS-485 communication. It cannot be checked with the **MEXE02**.
The following operation information is saved in the latch monitor. The value latched first time is continued to retain. Turning the LAT-CLR input from OFF to ON will enable the operation information to overwrite.

- Status (1 is stored when being in latch status.)
- Command position
- Target position
- Operation data number
- Loop count

memo When the "status" in the latch monitor is 1 (in latch status), the operation information will not be overwritten even if a latch trigger is generated.

■ Revision record

Revision number	Revision contents
First edition	

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