CKD

Controller for Electric actuators

ECMG-D series

Drive unit

INSTRUCTION MANUAL

SM-A62474/4-A

- Read this Instruction Manual before using the product.
- Read the safety notes carefully.
- Keep this Instruction Manual in a safe and convenient place for future reference.

CKD株式会社

PREFACE

Thank you for purchasing **this CKD controller for electric actuators "ECMG-D Series Drive Unit."**
This Instruction Manual contains basic matters such as installation and usage instructions in order to ensure optimal performance of the product. Please read this Instruction Manual thoroughly and use the product properly.
Keep this Instruction Manual in a safe place and be careful not to lose it.

Product specifications and appearances presented in this Instruction Manual are subject to change without notice.

SAFETY INFORMATION

When designing and manufacturing any device incorporating the product, the manufacturer has an obligation to ensure that the device is safe. To that end, make sure that the safety of the machine mechanism of the device and the electric system that controls such mechanism is ensured.

Ensure to observe organization’s standards, laws and regulations etc. for safety related to design and management of the equipment.

In order to use our products safely, it is important to select, use, handle, and maintain the products properly.

Observe the warnings and precautions described in this Instruction Manual to ensure device safety. Although various safety measures have been adopted in the product, customer's improper handling may lead to an accident. To avoid this:

Thoroughly read and understand this Instruction Manual before using the product.

To explicitly indicate the severity and likelihood of a potential harm or damage, precautions are classified into three categories: “DANGER”, “WARNING”, and “CAUTION”.

⚠ DANGER	Indicates an imminent hazard. Improper handling will cause death or serious injury to people.
⚠ WARNING	Indicates a potential hazard. Improper handling may cause death or serious injury to people.
CAUTION	Indicates a potential hazard. Improper handling may cause injury to people or damage to property.

Precautions classified as “CAUTION” may still lead to serious results depending on the situation.
All precautions are equally important and must be observed.

Other general precautions and tips on using the product are indicated by the following icon.

	Indicates general precautions and tips on using the product.

Precautions on Product Use

⚠ DANGER

Do not use this product for the following applications.

- Medical equipment pertaining to sustainment and management of human life and body
- Mechanism and mechanical device for transferring and transporting people
- Critical parts for securing safety in a mechanical device

⚠ WARNING

The product must be handled by the person who has sufficient knowledge and experience.

This product is designed and manufactured as equipment and parts for general industrial machinery.

Use the product within the specifications.

It cannot be used outside of product-specific specifications. Never modify or additionally process the product.

Since this product is intended for use in general industrial machinery equipment and parts, it is not applicable to be used outdoors or in the following conditions and environments.

(It will be applicable if you consult with our company at the time of its adoption and understand the specifications of our company's product. However, even in such a case, take safety measures to avoid danger in case of failure.)

- Use in equipment and applications that come into direct contact with nuclear power, railways, aviation, ships, vehicles, medical equipment, beverages and food.
- Use in applications requiring safety, such as recreational equipment, emergency shut off circuits, press machines, brake circuits, and safety measures.
- Use in applications that are expected to have a significant impact on people and property and require special safety.

Never handle the product or remove the equipment until safety is confirmed.

- Check and maintain the machinery and equipment only after confirming that all systems related to the product are safe. Turn off the power supply of the equipment and the corresponding equipment to prevent a short circuit.
- Even when the operation is stopped, there may be a high-temperature part or a charging part. Handle the product and remove the equipment carefully.

Precautions on Product Disposal

CAUTION

When disposing of the product, comply with laws pertaining to disposal and cleaning of wastes and have an industrial waste disposal company dispose of the product.

CONTENTS

PREFACE ..... **i**
SAFETY INFORMATION ..... **ii**
Precautions on Product Use iii
Precautions on Product Disposal iii
CONTENTS ..... **iv**
1. PRODUCT OVERVIEW **1**
1.1 System Overview 1
1.1.1 System structure 1
1.1.2 Workflow 3
1.2 Instruction Manuals Related to This Product 5
1.3 Software version updates 6
1.3.1 List of versions 6
1.3.2 How to check the version 8
1.3.3 Software version and suitable actuator 8
1.4 Unit composition 10
1.5 Name of each part 11
1.5.1 Name of each part of the drive unit 11
1.6 LED indication 13
1.6.1 LED indication of the drive unit 13
1.7 Model Number Indication 15
1.7.1 Display of the model number of the drive unit 15
1.8 Specifications 16
1.8.1 Basic specifications 16
1.9 Dimensions 17
2. INSTALLATION **18**
2.1 Environment 21
2.2 Unpacking 22
2.3 Connection and wiring methods between units 23
2.3.1 Wiring with actuator 23
3. USAGE **27**
3.1 Updating and setting actuator information 27
3.1.1 Overwriting actuator information (when using drive unit: A type) 27
3.1.2 Setting actuator information (drive unit: B type) 28
3.2 Send/Receive data (drive unit) 29
3.3 Operation mode 32
3.4 Setting parameters 33
3.4.1 Parameters List 33
3.4.2 Soft limit settings and outside soft limit signal output 37
3.4.3 Zone output 41
3.4.4 Adjusting the gains 43
3.4.5 Setting threshold values 47
3.5 Point data setting 48
3.5.1 Point data list 48
3.5.2 Selecting the position specification method 49
3.5.3 Selecting the operation method 50
3.5.4 Setting the position 51
3.5.5 Setting the positioning width 52
3.5.6 Setting the speed 53
3.5.7 Setting the acceleration 56

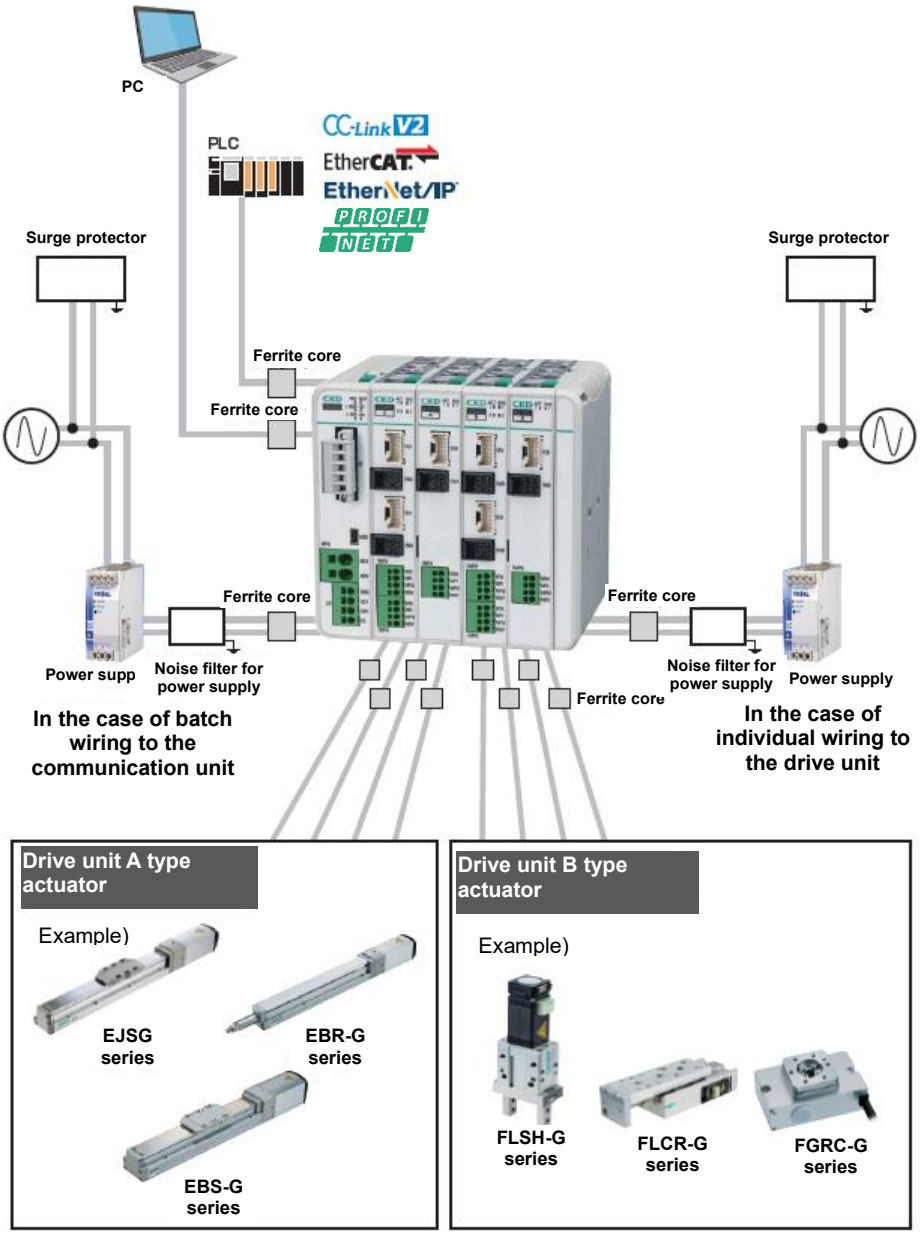
3.5.8 Setting the deceleration 56
3.5.9 Selecting the acceleration/deceleration method 57
3.5.10 Selecting the stop method 57
3.5.11 Selecting the rotation direction 58
3.5.12 Setting the gain magnification 59
3.5.13 Setting the point zone 59
3.5.14 Setting the pressing rate 60
3.5.15 Setting the pressing speed 62
3.5.16 Setting the pressing distance 62
3.6 Operation timing chart 63
3.6.1 Emergency stop and release 63
3.6.2 Forced release of brake 64
3.6.3 Operation of servo ON/OFF 65
3.6.4 Power-on sequence 66
3.6.5 Home position return operation 68
3.6.6 Positioning operation 92
3.6.7 Signal of output selection 100
3.6.8 Pressing operation 102
3.6.9 Operation when a new operation signal is input during operation 105
3.6.10 Operation when stop signal is input during operation 106
3.6.11 Holding operation after travel complete 107
4. MAINTENANCE AND INSPECTION 109
4.1 Precautions on Product Disposal 109
5. TROUBLESHOOTING 110
5.1 Problems, Causes, and Solutions 110
5.1.1 Items to Check When a Problem Occurs 113
5.2 Alarm Indications and Countermeasures 114
6. PRODUCT COMPLIANCE 120
7. WARRANTY PROVISIONS 121
7.1 Warranty Conditions 121
7.2 Warranty Period 121

1. PRODUCT OVERVIEW

1.1 System Overview

- CC-Link is a registered trademark of Mitsubishi Electric Corporation.
- EtherCAT® is the patented technology and registered trademark licensed by German Beckhoff Automation GmbH & Co. KG.
- EtherNet/IP® is a registered trademark of ODVA.
- PROFINET is a standard based on Industrial Ethernet proposed by the Profibus Organization.
- Windows is a registered trademark of Microsoft Corporation in the United States, Japan, and other countries.
- Other company and product names in this document are company's trademarks or registered trademarks.

1.1.1 System structure



Components in the system structure that are available from CKD are listed below.

	Component	Product name/Model no.
This product	Communication unit	ECMG-C series
	Drive unit	ECMG-D series
	End unit	ECMG-P series
Accessories	Communication connector (CC-Link) Note 1	1 port: MSTB 2,5/5-STF-5,08 ABGYAU (PHOENIX CONTACT) 2 ports: TFKC2,5/5-STF-5,08AU (PHOENIX CONTACT)
Sold separately	Actuator	EBS-G/EJSG/EBR-G/FLSH-G/FLCR-G/FGRC-G/ GSSD2/GSTK/GSTG/GSTS/GSTL/GCKW series
	Motor cable	EA-CBLM*-*
	Encoder cable	EA-CBLE*-*
	Motor and encoder relay cable	EA-CBLME*-*
	24 VDC power supply Note 2	EA-PWR-KHNA240F-24
Provided for free	PC setting software	S-Tools

Note 1: Please select a communication connector with either 1 or 2 ports when purchasing a communication units with CC-Link specification.
Note 2: The recommended power supply differs depending on the power supply capacity. Refer to Instruction Manual (SM-A62471) for details.

To use this product as a product conforming to the European standards, refer to Instruction Manual (SM-A62471) and follow the instructions.

1.1.2 Workflow

Follow the steps below to wire and set the controller so that it can be operated from the PLC. This Instruction Manual explains steps 3, 7, 8 and 9. Refer to Instruction Manual (SM-A62471) for other procedures.

1 Unpack

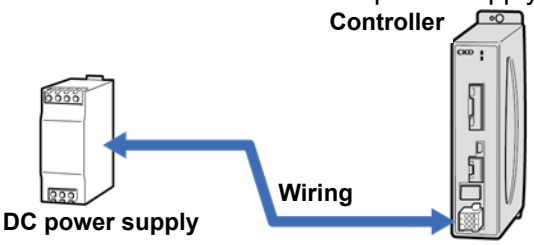
Take the product out of the box. Refer to Instruction Manual (SM-A62471) for details.

2 Assemble the unit

Connect the communication unit, drive unit and end unit. Refer to Instruction Manual (SM-A62471) for details.

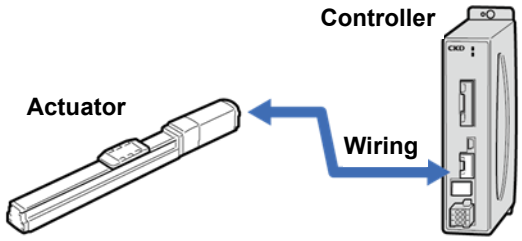
3 Connect the power supply

Connect the controller and the power supply. Refer to Instruction Manual (SM-A62471) for details.



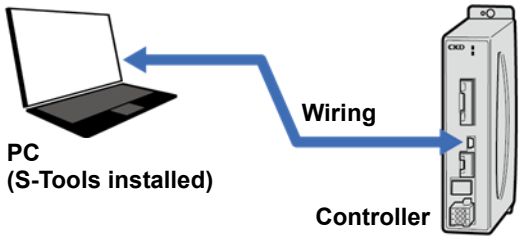
4 Connect the actuator

Connect the controller and the actuator. Refer to “2.3.2 Actuator wiring” for details.



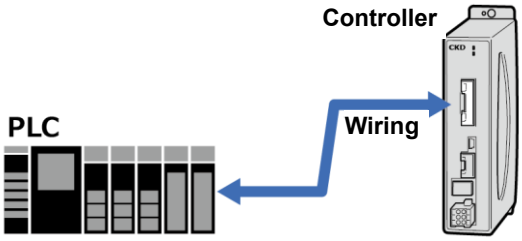
5 Connect S-Tools

Connect the controller and a PC with S-Tools installed. Refer to Instruction Manual (SM-A62471) for details.



6 Connecting a PLC

Connect the controller and the PLC. Refer to Instruction Manual (SM-A62471) for details.



7 Set the communication settings

Use S-Tools to set the parameters for controller communication. Set the master by following the instruction manual by the manufacturer of the master unit. If necessary, import the setting file. Refer to Instruction Manual (SM-A62471) for details.

8 Setting actuator information

Set the information of the actuator connected to the controller.
Refer to “3.1 Updating and setting actuator information” for details.
*No setting is required for A-type drive units. Note that if multiple actuators are used with one controller, the model information must be overwritten when switching actuators. Refer to “3.1 Updating and setting actuator information” for information on overwriting method.

9 Set parameters and point data

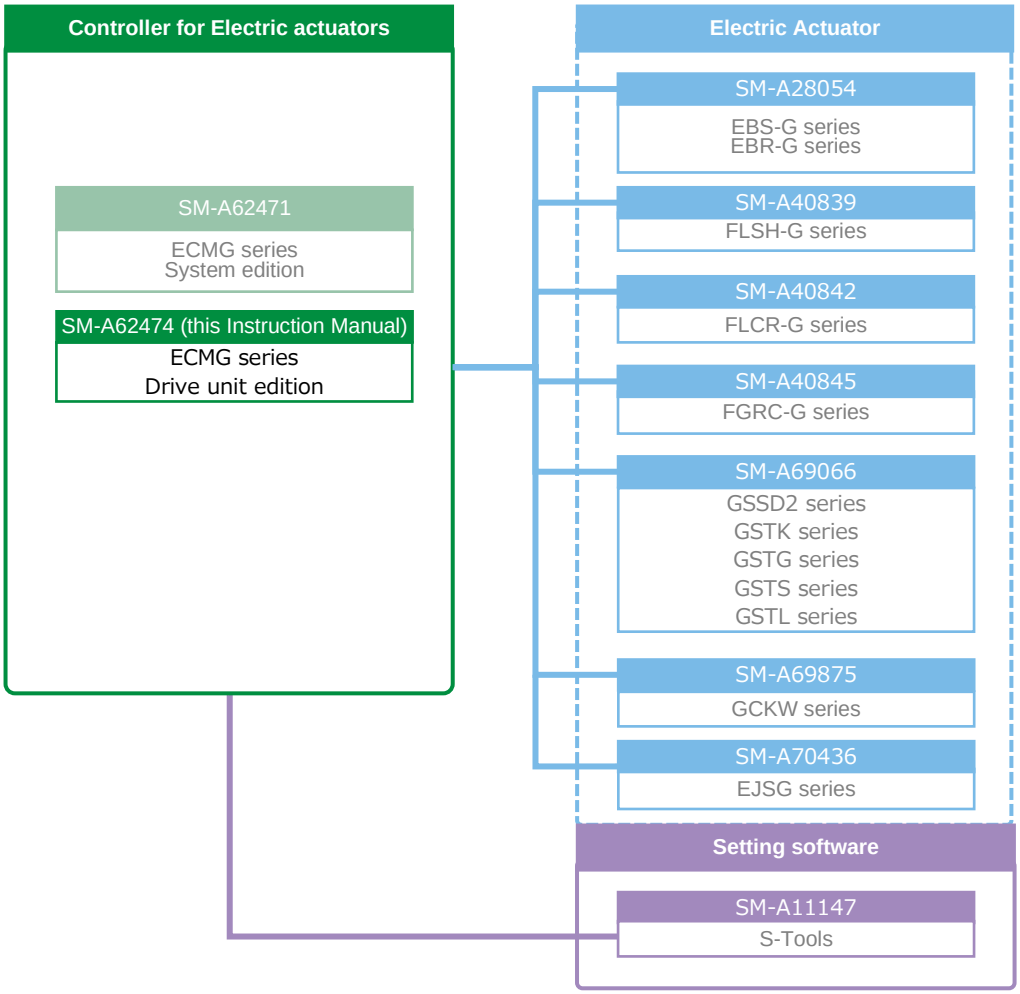
Determine the controller setting. Refer to “3.4 Setting parameters” and “3.5 Point data setting” for more information.

10 Start operation

Operate the actuator using the PLC. Refer to “3.6 Operation timing chart” for details.

1.2 Instruction Manuals Related to This Product

This manual covers drive units only. Refer to Instruction Manual (SM-A62471) for other unit information such as communication specifications. The instruction manuals related to this product are as follows.



1.3 Software version updates

1.3.1 List of versions

■ Actuator and controller software version

The actuator to be used and the suitable controller software version are listed below.

<Drive unit: A type>

Actuator	Controller software version	
	Communication unit	Drive unit
EBS-G/EBR-G series	Ver.1.00.00 or higher	Ver.1.00.00 or higher
EJSG series	Ver.1.00.00 or higher	Ver.1.01.00 or higher
GSSD2/GSTK/GSTG/GSTS/GSTL series	Ver.1.00.00 or higher	Ver.1.03.00 or higher

<Drive unit: B type>

Actuator	Controller software version	
	Communication unit	Drive unit
FLSH-G/FLCR-G/FGRC-G series	Ver.1.00.00 or higher	Ver.1.00.00 or higher
GCKW series	Ver.1.00.00 or higher	Ver.1.02.00 or higher

■ Additional function and controller software version

The relationship between the function added below and the suitable controller software version is described.

<Drive unit: A type>

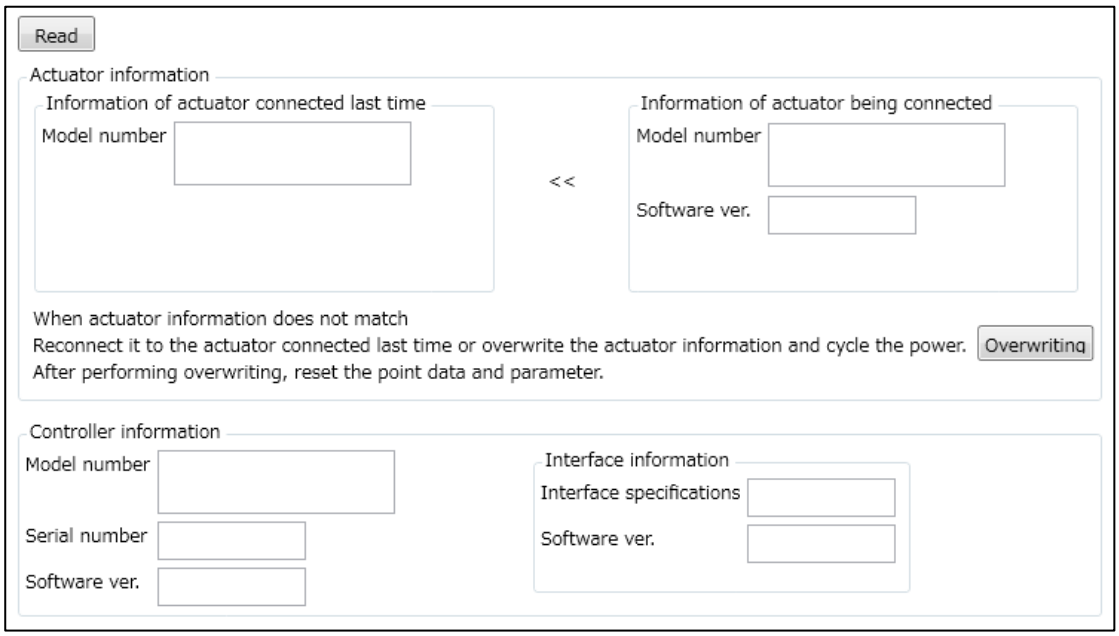
Additional function		Controller software version	
Item	Explanation	Communication unit	Drive unit
Addition of parameter -Point signal output holding -Holding time of traveling signal ON	3.4.1	Ver.1.00.00 or higher	Ver.1.02.00 or higher
Addition of signal -Outside soft limit -Outside soft limit (-) -Outside soft limit (+)	3.4.2		
Addition of parameter -First servo ON method	3.4.1		Ver.1.04.00 or higher
Addition of parameter options -Home position return direction (coordinate axis)	3.4.1 3.6.5		Ver.1.06.00 or higher

<Drive unit: B type>

Additional function		Controller software version	
Item	Explanation	Communication unit	Drive unit
Addition of parameter -Point signal output holding -Holding time of traveling signal ON	3.4.1	Ver.1.00.00 or higher	Ver.1.01.00 or higher
Addition of signal -Outside soft limit -Outside soft limit (-) -Outside soft limit (+)	3.4.2		
Addition of parameter options -Home position return direction (coordinate axis)	3.4.1 3.6.5		Ver.1.04.00 or higher
Addition of parameter -FGRC home position return direction method	3.4.1 3.6.5		

1.3.2 How to check the version

The controller software version can be checked from the controller information in the S-Tools [Model information] view.



1.3.3 Software version and suitable actuator

For drive unit A type, the following specifications differ depending on the combination of the software version of the drive unit and the serial number of the actuator.

■ EJSG/EBS-G/EBR-G series

Drive unit software version	Actuator serial number	Specifications	
		Availability	Applicable parameters when G1 and G2 gains are set to 0
All versions	No.3301 or earlier	No	Unavailable
Up to Ver.1.03.00	No.3301 or higher	Yes	Parameters for ECG
Ver.1.04.00 or higher	No.3301-No.3X10	Yes	Parameters for ECG
	No.3X11 or higher	Yes	Parameters for ECMG

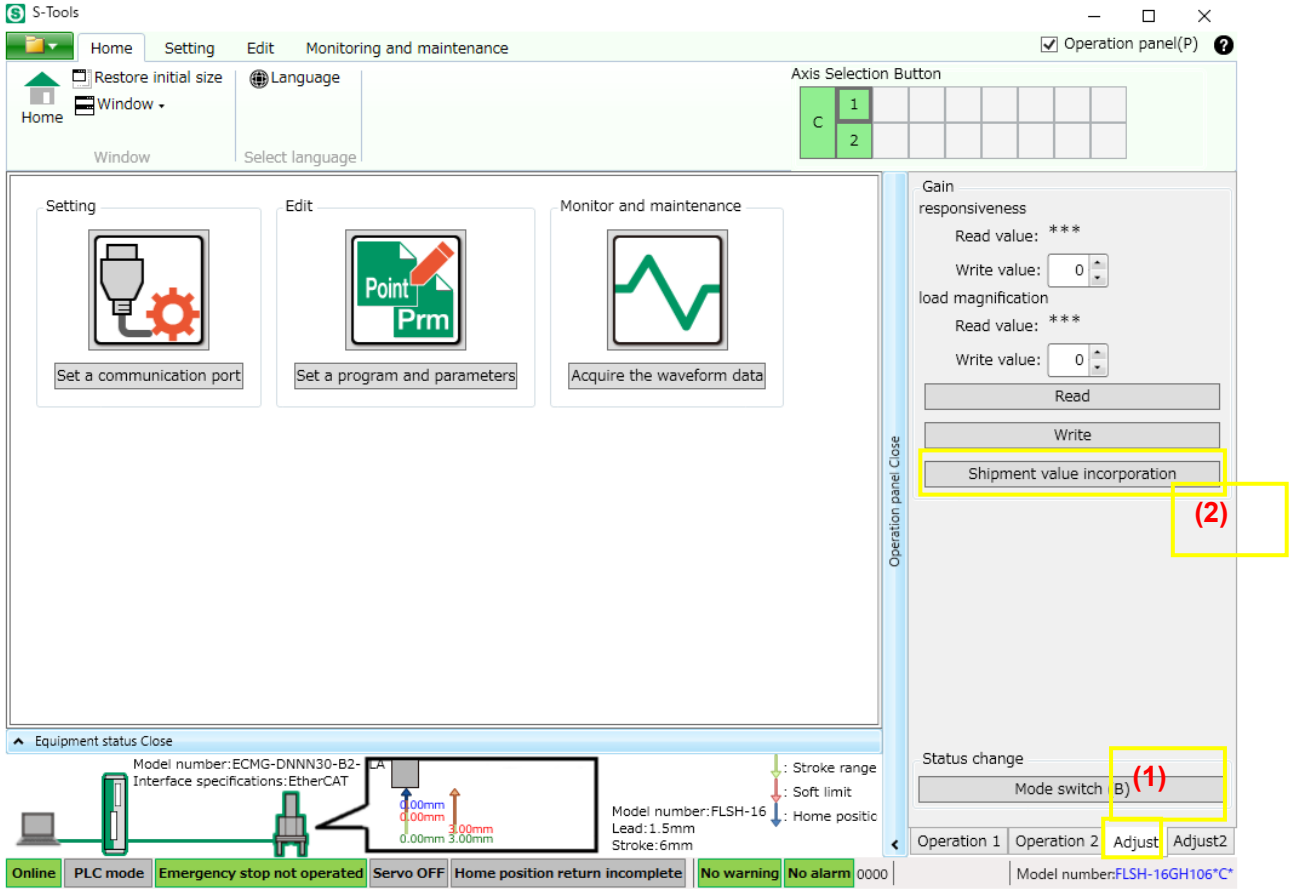
* In the case of combinations where ECG parameters are applied, it is necessary to set the gain before use. Refer to "3.4.4 Adjusting the gains" for details.

■ GSSD2/GSTK/GSTG/GSTS/GSTL series

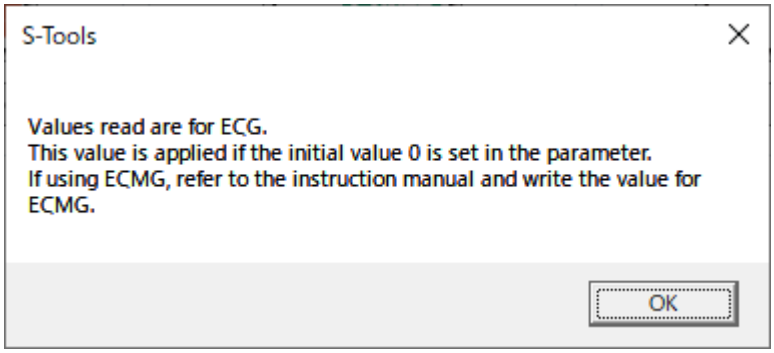
Drive unit software version	Actuator serial number	Specifications	
		Availability	Applicable parameters when G1 and G2 gains are set to 0
All versions	No.3524 or earlier	No	Unavailable
Up to Ver.1.02.00	No.3524 or higher	No	Unavailable
Ver.1.03.00 or higher	No.3524 or higher	Yes	Parameters common to ECG and ECMG

■ How to check applicable parameters

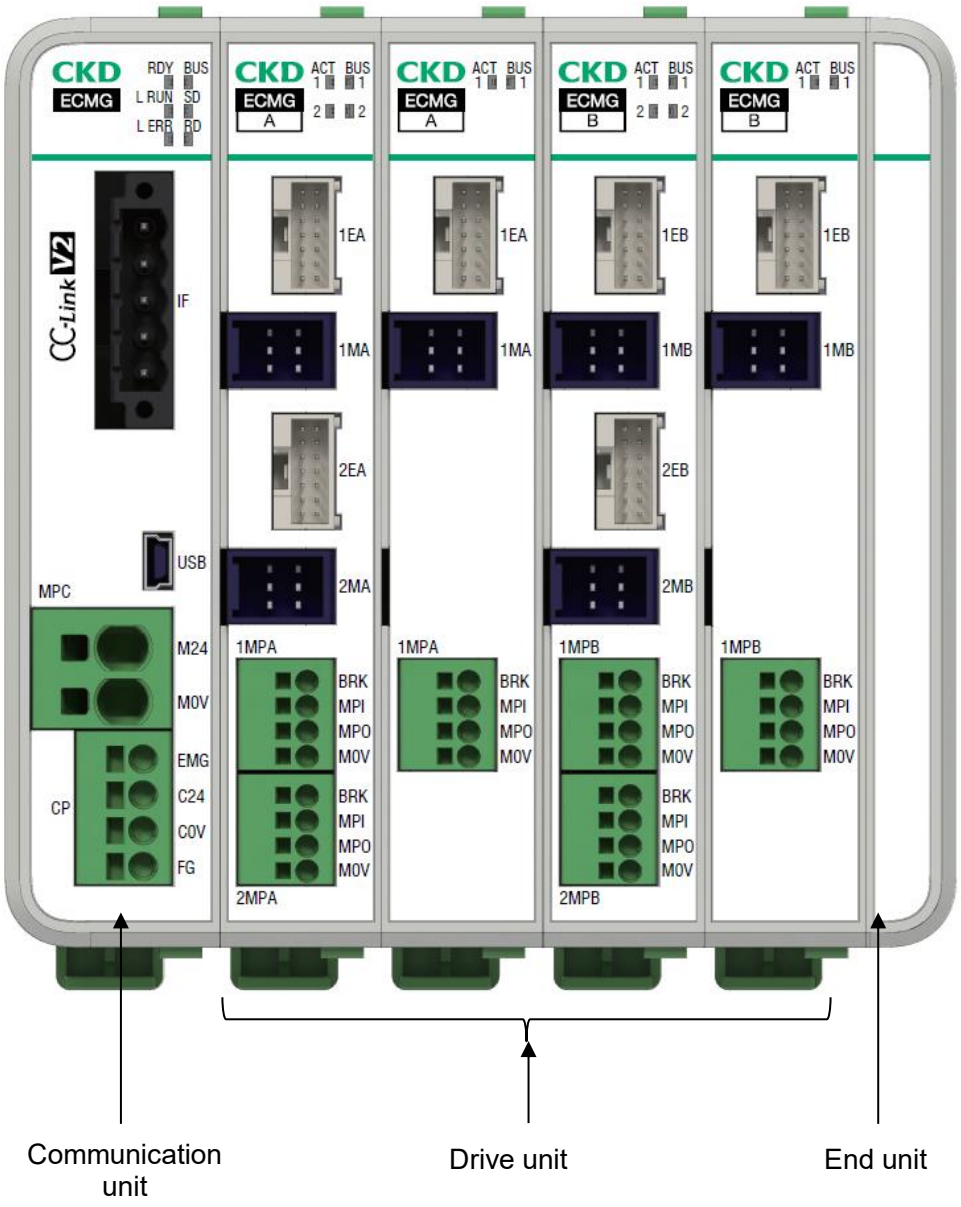
The applicability of the ECG parameters can be checked by using S-Tools (Ver. 1.05.09.00 or higher). Select the [Adjustment] tab on the control panel and press the [Importing factory-default] button.



If the ECG parameters are applicable, read the G1 and G2 gain after the following message is displayed: If the following message is not displayed, the ECMG parameters are being read, and the ECMG parameters are applied even when G1 and G2 gains are set to 0.



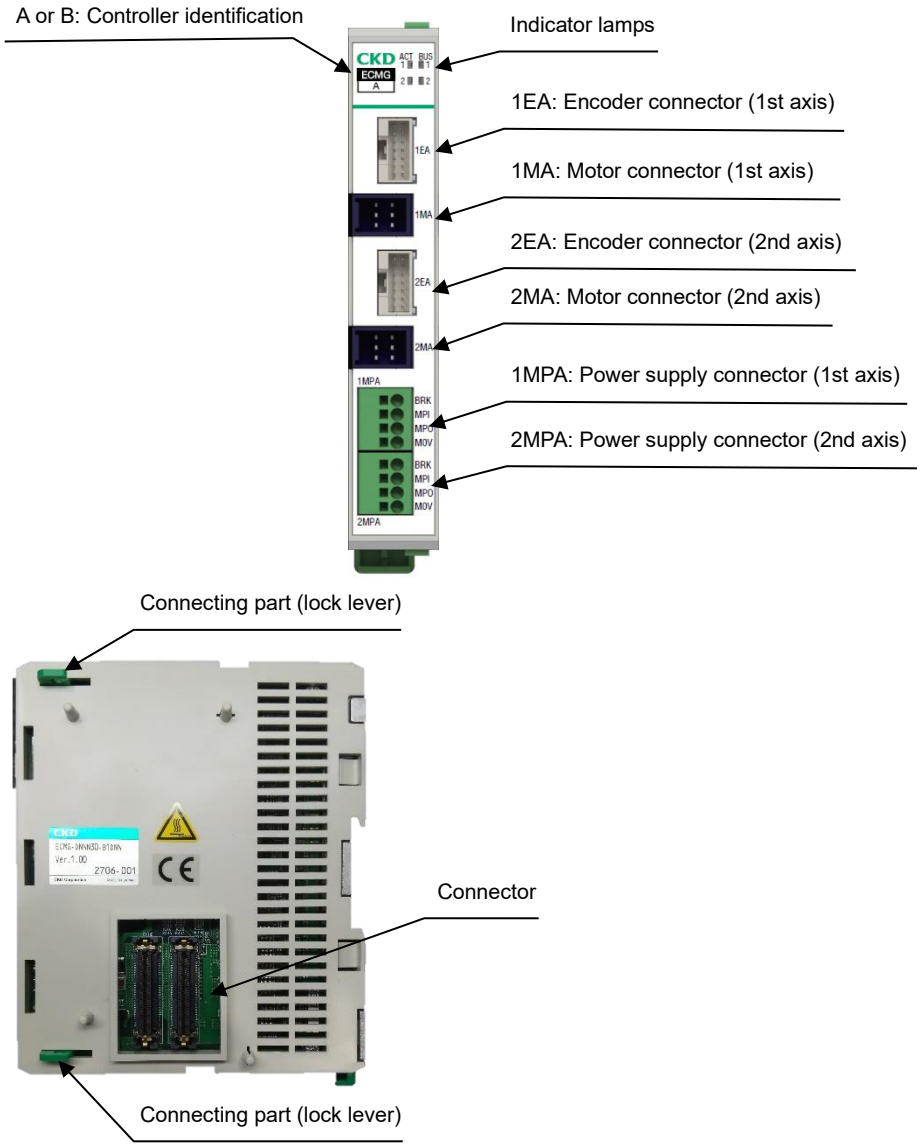
1.4 Unit composition



Part name	Explanation	No. of connected units
Communication unit	This unit directly communicates with external devices such as PLCs and PCs.	1 unit
Drive unit	This unit drives the electric actuator. There are units that can be connected with 1 axis and units that can be connected with 2 axes. There are A type and B type, and the connectable actuators are different.	1 to 8 units
End unit	This unit indicates the end of a unit connection.	1 unit

1.5 Name of each part

1.5.1 Name of each part of the drive unit



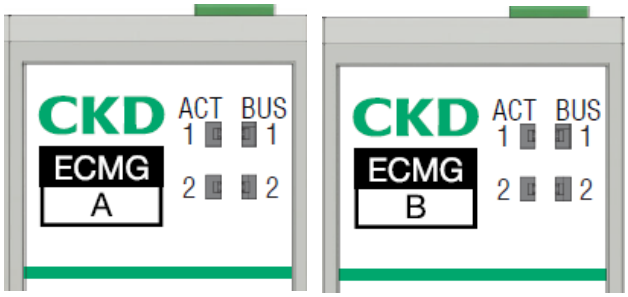
<table>
<tr><th>Code</th><th>Part name</th><th colspan="2">Description</th></tr>
<tr><td rowspan="3">A or B</td><td rowspan="3">Controller identification symbol</td><td>Identification symbol: A</td><td>Identification symbol: B</td></tr>
<tr><td>Unit type: A type</td><td>Unit type: B type</td></tr>
<tr><td>Supported actuators:
EBS-G series
EJSG series,
EBR-G series,
GSSD2 series,
GSTK series,
GSTG series,
GSTS series,
GSTL series</td><td>Supported actuators:
FLSH-G series,
FLCR-G series,
FGRC-G series,
GCKW series</td></tr>
<tr><td>ACT (1, 2),
BUS (1, 2)</td><td>Indicator lamps</td><td colspan="2">Indicates the operating status of the drive unit.
Refer to “1.6.1
LED indication of the drive unit” for information on LED indications.</td></tr>
<tr><td>1EA, 2EA
Note 1</td><td>Encoder connector (n)
(n = 1, 2)</td><td>Connector used to connect the encoder cable
Connection cable model No.:
EA - CBLE□ - □□□
Refer to “2.3.1 Wiring with actuator” for connection cables.</td><td rowspan="2">Connector for connecting the motor/encoder relay cable.
Connection cable model No.:
EA - CBLME□ - □□□
Refer to “2.3.1 Wiring with actuator” for connection cables.</td></tr>
<tr><td>1MA, 2MA
Note 1</td><td>Motor connector (n)
(n = 1, 2)</td><td>Connector used to connect the motor cable.
Connection cable model No.:
EA - CBLM□ - □□□
Refer to “2.3.1 Wiring with actuator” for connection cables.</td></tr>
<tr><td>1MPA, 2MPA
Note 1</td><td>Power supply connector (n)
(n = 1, 2)</td><td colspan="2">Connector used to connect the power supply.
Refer to Instruction Manual (SM-A62471) for the wiring method.</td></tr>
</table>

Note 1: 2MPA, 2MA and 2EA are mounted only on the drive unit for 2-axis, not on the drive unit for 1-axis.

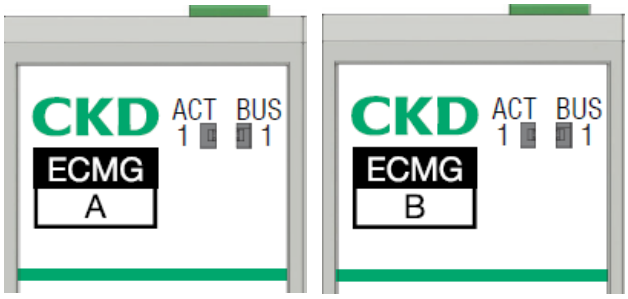
1.6 LED indication

1.6.1 LED indication of the drive unit

<For 2-axis>



<For 1-axis>



Part name	Color	Explanation
ACT	Green	Displays the operating status of the drive unit.
	Red	Displays the alarm occurrence status of the drive unit.
BUS	Green	Displays the communication status between units.
	Red	Displays the alarm occurrence status during communication between units.

■ ACT lamp

Controller status		RDY
Control power OFF		Off
Normal	At servo ON	Lit green
	At servo OFF	Blinking green (lit once per second)
At alarm occurrence	At the time of the occurrence of alarm which cannot be released	Lit red
	At the time of the occurrence of alarm which can be released	Blinking red (lit once per second)
At the time of the occurrence of warning		Blinking red (lit once every two seconds)

■ BUS lamp

Controller status (Inter-unit communication status)		BUS
Control power OFF		Off
Normal	During normal operation	Lit green
	During initialization	Blinking green (lit once per second)
At alarm occurrence	When an internal communication error occurs	Lit red
	At the time of the occurrence of alarm which can be released	Blinking red (lit once per second)

1.7 Model Number Indication

1.7.1 Display of the model number of the drive unit

There are two types of drive unit, A type and B type, and the connectable actuators are different.

Drive unit type	Suitable actuator
A type	EBS-G/EJSG/EBR-G/GSSD2/GSTK/ GSTG/GSTS/GSTL series
B type	FLSH-G/FLCR-G/FGRC-G/ GCKW series

■ A type (suitable actuators: EBS-G/EJSG/EBR-G/GSSD2/GSTK/GSTG/GSTS/GSTL series)

ECMG-DNNR30-A2 DNN

Specifications of drive unit	
A2	For A-type 2-axis connection
A1	For A-type 1-axis connection

■ B type (suitable actuators: FLSH-G/FLCR-G/FGRC-G/GCKW series)

ECMG-DNNN30-B2 DNN

Specifications of drive unit	
B2	For B-type 2-axis connection
B1	For B-type 1-axis connection

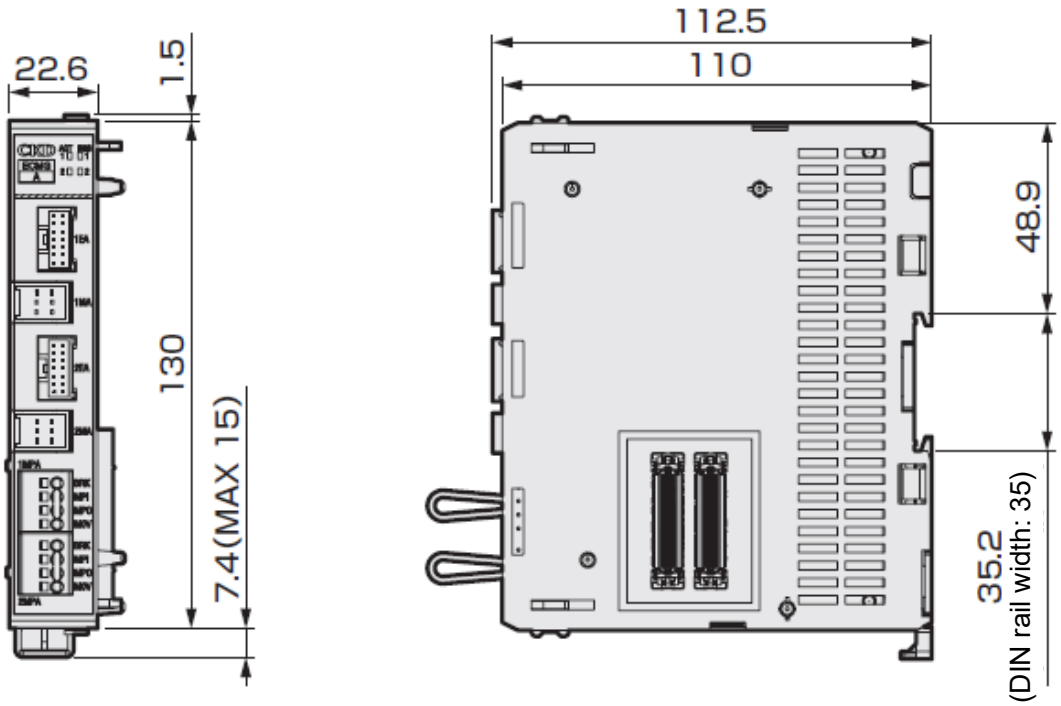
1.8 Specifications

1.8.1 Basic specifications

Item		Description	
Unit type		A type	B type
Applicable actuators		EBS-G/EJSG/EBR-G/GSSD2/GSTK/ GSTG/GSTS/GSTL	FLSH-G/FLCR-G/FGRC-G/GCKW
Indicator lamps	1 axis	ACT 1, BUS 1	
	2 axes	ACT 1, BUS 1, ACT 2, BUS 2	
Brake release input		24 VDC ± 10%	
Power supply voltage		24 VDC ± 10%	
Insulation resistance		10 MΩ or more with 500 VDC	
Withstand voltage		500 VAC, 1 minute	
Operating ambient temperature		0 to 40ºC (Non-freezing)	
Operating ambient humidity		35 to 80%RH (Non-condensing)	
Storage ambient temperature		-10 to 50ºC (Non-freezing)	
Storage ambient humidity		35 to 80%RH (Non-condensing)	
Operating atmosphere		No corrosive gas, explosive gas, or dust	
Degree of protection		IP20	
Weight		About 295 g	

1.9 Dimensions

■ **Drive unit**



2. INSTALLATION

⚠DANGER

Do not use in locations with ignitable, flammable, or explosive substances or other such dangerous substances.
This may cause ignition, ignition, or explosion.

Do not work with wet hands.
Doing so may cause electric shock.

Prevent water and oil from splashing onto the product.
A fire, electric leakage, or failure may occur. Even oil drops and oil mists are prohibited.

When connecting a personal computer, prevent frame ground of the computer from being grounded.
If a plus terminal of the product is grounded, connecting the product to a PC with a USB cable may cause short-circuit in the DC power supply.

Make sure to hold and secure a workpiece to install the product.
An injury may occur if the product falls down, falls off, or operates abnormally.

Use a DC stabilized power supply (24 VDC ± 10%) with sufficient capacity as a power supply for the controller and the input/output circuit.
If the product is directly connected to an AC power supply, a fire, burst or damage may occur.

Install overcurrent protective equipment (such as a breaker for wiring and a circuit protector) on the power supply on the primary side when wiring in accordance with "JIS B 9960-1:2019 (IEC 60204-1:2016) Safety of machinery - Electrical equipment of machines - Part 1: General requirements".

Description from "7.2.1 General" of JIS B 9960-1:2019:
Overcurrent protection shall be provided where the current in a circuit can exceed either the rating of any component or the allowable current of the conductors, whichever is the lesser value. The ratings or settings to be selected are detailed in 7.2.10.

⚠ WARNING

Do not install the product to a combustible material.
If the product is installed near a combustible material, a fire may result.

Do not place heavy objects on cables or pinch them.
Otherwise, the cover of the cable may tear or excessive stress is applied, causing poor continuity and insulation degradation.

Do not connect the communication connector used for this product to other devices.
A malfunction or damage may occur.

Do not use or store the product in an environment where there is strong electromagnetic waves or radiation.
A malfunction or failure may occur.

Because precision instruments are integrated, do not lay the product sideways or subject the product to vibration or impact during transportation.
Component damage may occur.

Do not perform disassembly or modification of products that are not specified in this manual.
An injury, accident, malfunction, or failure may occur; in addition, the specifications described in this manual may not be satisfied.

Install a safety fence to prevent entry into the actuator operation range.

Insulate unused wires.
A malfunction, failure, or electric shock may occur.

If the system is such that the machine stops in the event of a system failure such as an emergency stop or a power failure, design and implement a safety circuit or a safety device to prevent damages to the devices and injuries to people.

Install the product indoors and in a dry place.
In a place where water can splash onto the product or where humidity is high (80% or more and with condensation), an electric leakage or fire accident may occur.

Perform class D grounding (ground resistance: 100 Ω or less) for the product.
An electric leakage may occur and cause an electric shock or malfunction.

Perform the wiring of the product securely so as not to cause miswiring or loosening of connectors, as confirmed in this instruction manual. Also, check the insulation of the wiring.
Make sure that the wires do not contact other circuits and there is no ground fault and insulation failure between terminals. Otherwise, an overcurrent may flow into the product and cause damage. This may result in an abnormal operation or fire.

Insulate unused wires.
A malfunction, failure, or electric shock may occur.

When restarting after emergency stop or abnormal stop, check that it is safe for the actuator to operate.

Design safety circuits or devices as the entire system including hardware in order to prevent damage to the device or an accident resulting in injury or death in the event that a machine stops due to system abnormality such as an emergency stop or a power failure.

When wiring the product, refer to this Instruction Manual or any other relevant instruction manuals to make sure that the wiring is correct and connectors are firmly connected.
Otherwise, abnormal operation or the flow of an overcurrent may result. Overcurrent may cause abnormal operation, damage, or fire.

⚠ WARNING

When installing the actuator in a direction other than horizontal, select the type with brake.
If the motor is not equipped with a brake, the movable parts may fall off at servo OFF (including emergency stops and alarms) or power OFF, which may result in injury or damage to the workpiece.

Do not carry or install the product by holding its cable or the movable section.

An injury or cable disconnection may occur.

2.1 Environment

- Confirm the ambient temperature and atmosphere listed in the product specifications when storing or using the product.
- Install the product where it is not subjected to direct sunlight and away from a heating element. Also, avoid dust, corrosive gas, explosive gas, inflammable gas, and combustible material. Chemical resistance has not been considered for the product.
- This product cannot be mounted or used in wet or oily locations.
- Doing so could cause electricity leakage or fires. Oil and oil mist are strictly prohibited.
- If there is heat generation from the equipment in the surroundings, or if heat gets stuck, please take measures to keep the ambient temperature at 0 to 40°C, such as installing a fan on the control panel.
- Install the controller so that the exhaust port faces up and down and the power supply connector on the front panel faces down. Allow at least 50 mm of space on both the top and bottom surfaces to allow for natural convection.
- Use the setting tool (S-Tools setting software) to set parameters. Leave a space of at least 70 mm in front of the controller, so that the connector can be attached and removed.
- Provide a safety fence to prevent access to the movable range of the electric actuator. In case of an emergency, install the product in a place where the emergency stop button switch can be easily operated. The emergency stop button switch must not be automatically reset, and the structure and wiring must not allow a person to reset the switch inadvertently.

2.2 Unpacking

CAUTION

Do not carry heavy products alone.

Do not stand on the package.

In order to prevent deforming the package, do not place heavy objects and objects of which their load concentrates.

Do not apply unnecessary force to any part of the product.

When carrying or handling the product, use extreme care not to apply impact to the product (for example, do not drop the product).

When taking the product out of the package, hold the product body.

Place the product horizontally when not in use.

Check that the model number ordered and the model number indicated on the product are the same.
Check the exterior of the product for any damage.

ECMG-DNNR30-A*DNN

No.	Product	
1	Drive unit (ECMG-DNNR30-A*DNN)	Note 1
2	INSTRUCTION MANUAL	

Note 1: A jumper wire is included to connect the power plugs MPI and MPO. To use individual power supply, remove the jumper wire. Refer to Instruction Manual (SM-A62471) for details.

ECMG-DNNN30-B*DNN

No.	Product	
1	Drive unit (ECMG-DNNN30-B*DNN)	Note 1
2	INSTRUCTION MANUAL	

Note 1: A jumper wire is included to connect the power plugs MPI and MPO. To use individual power supply, remove the jumper wire. Refer to Instruction Manual (SM-A62471) for details..

2.3 Connection and wiring methods between units

⚠ WARNING

Perform the wiring with the power supply turned OFF.
Touching the electrical wiring connections (bare charging part) may cause electric shock.

Do not touch the charging part with bare hands.
Doing so may cause electric shock.

Read and fully understand this instruction manual before performing the electrical wiring.

CAUTION

Check the working voltage and polarity before wiring and energizing.
A wrong wiring may cause failure.

Take countermeasures against lightning surges in the equipment side.
The product is not resistant to lightning surges.
For an AC voltage, use it in the installation category 2.

To prevent the wiring connection from loosening or coming off, retighten the screws of the terminal block with a specified torque, and insert the connectors correctly.
This may cause fire, electric shock or malfunction of the equipment.

Use a dedicated communication cable conforming to the CC-Link specifications.

Secure a sufficient bending radius of the communication cable to avoid excessive bending.

Secure distance from the communication cable to the power line and the high voltage line so that it is not affected by noise. Keep away.

This Instruction Manual covers only wiring to the actuator. For connecting between units and wiring with power supply and S-Tools, etc., refer to Instruction Manual (SM-A62471).

2.3.1 Wiring with actuator

Use a special relay cable for wiring between the drive unit and an actuator. The combinations of controller and relay cable are shown in the table below.

Unit type	Relay cable	
A type	Motor cable	EA-CBLM*-***
	Encoder cable	EA-CBLE*-***
B type	Motor and encoder relay cable	EA-CBLME*-***

■ Motor cable model number system (drive unit: A type)

EA-CBLM 4 - S 01

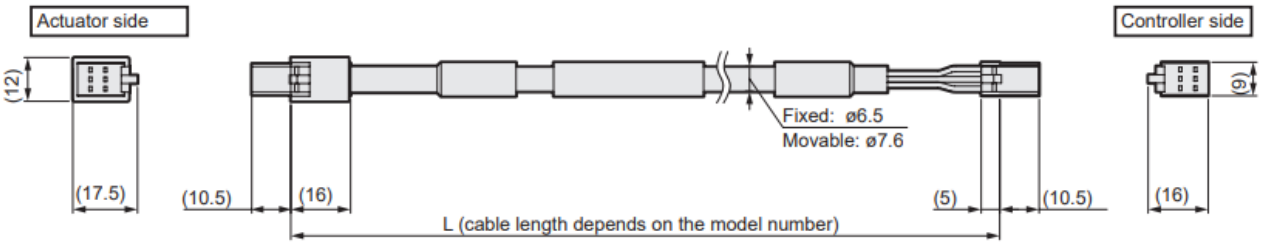
Cable specifications	
4	EBS-G/EBR-G/EJSG/ EJSG-FP1/EJSG-C/ GSSD2/GSTK/ GSTG/GSTS/GSTL
5	EJSG-P4/ EJSG-G

Cabele type	
S	Fixed cable
R	Movable cable

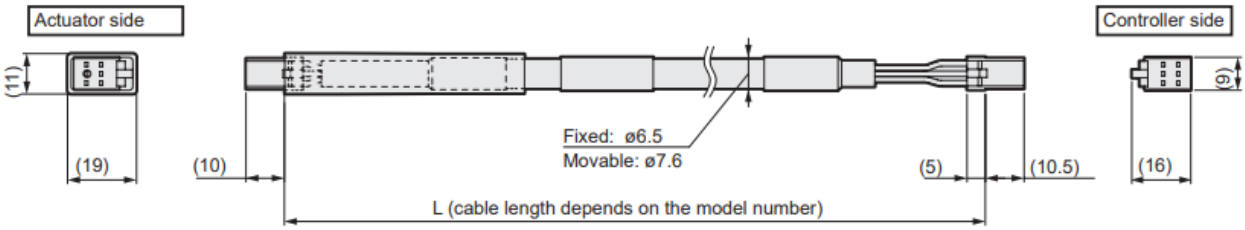
Cable length	
01	1m
03	3m
05	5m
10	10m

■ Motor cable dimensions (drive unit: A type)

• EA-CBLM4: For EBS-G/EBR-G/EJSG/EJSG-FP1/EJSG-C/GSSD2/GSTK/GSTG/GSTS/GSTL



• EA-CBLM5: For EJSG-P4/EJSG-G



■ Encoder cable model number system (drive unit: A type)

EA-CBLE 4 - S 01

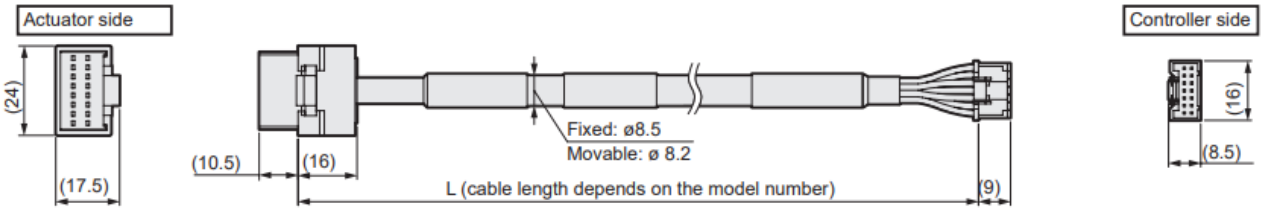
Cable specifications	
4	EBS-G/EBR-G/EJSG/ EJSG-FP1/EJSG-C/ GSSD2/GSTK/ GSTG/GSTS/GSTL
5	EJSG-P4 EJSG-G

Cabele type	
S	Fixed cable
R	Movable cable

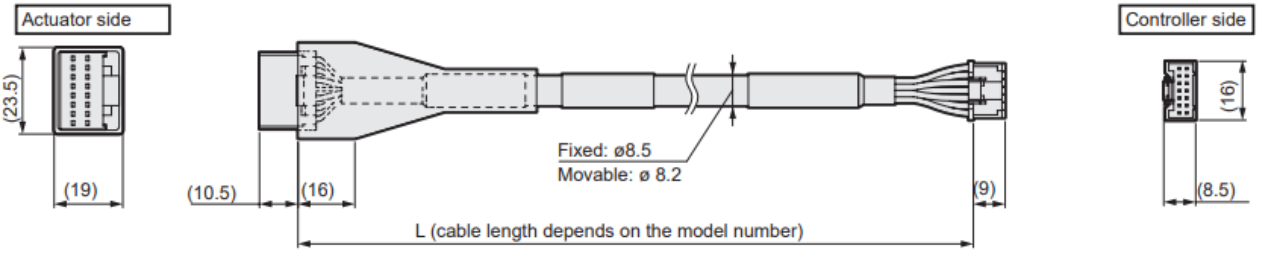
Cable length	
01	1m
03	3m
05	5m
10	10m

■ Encoder cable dimensions (drive unit: A type)

• EA-CBLE4: For EBS-G/EBR-G/EJSG/EJSG-FP1/EJSG-C/GSSD2/GSTK/GSTG/GSTS/GSTL



• EA-CBLE5: For EJSG-P4/EJSG-G



■ Model number system of motor/encoder relay cable (drive unit: B type)

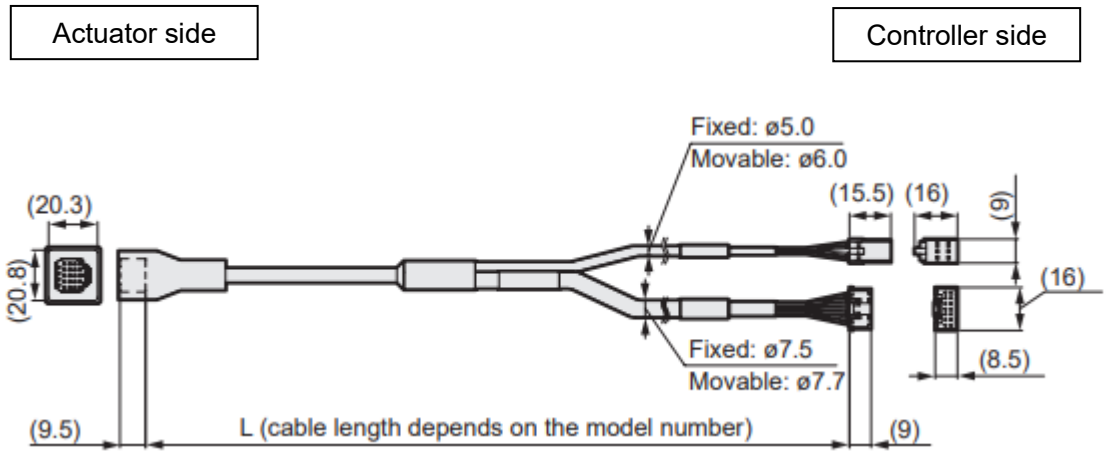
EA-CBLME4- **S** **01**

Cable type	
S	Fixed cable
R	Movable cable

Cable length	
01	1m
03	3m
05	5m
10	10m

■ Dimensions of motor/encoder relay cable (drive unit: B type)

• For FLSH-G/FLCR-G/FGRC-G/GCKW



3. USAGE

3.1 Updating and setting actuator information

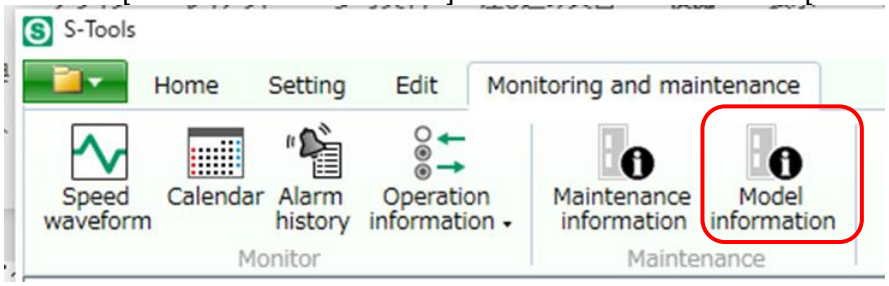
To set the ECMG series, the S-Tools version must be 1.05.00.00 or higher.

3.1.1 Overwriting actuator information (when using drive unit: A type)

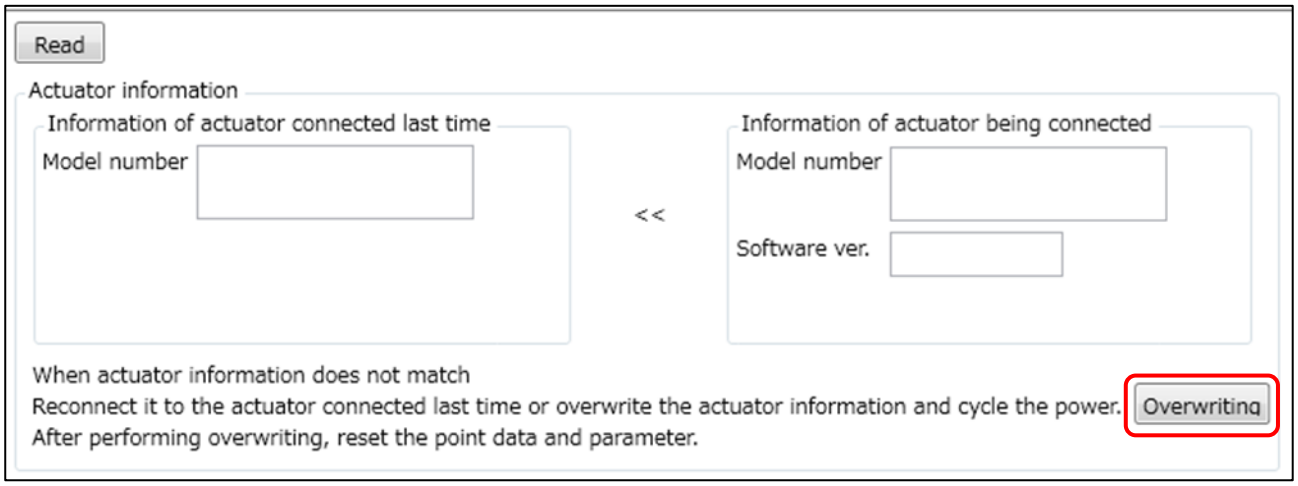
Products in the EBS-G /EJSG/EBR-G series have the function to automatically recognize actuators, but when actuators of different model numbers are connected to one controller, the actuator information must be overwritten. For details, refer to “Actuator setting” in the S-Tools Instruction Manual (SM-A11147).

<Procedure for overwriting actuator information>
Write the connected actuator information to the controller using the S-Tools.

1 Click [Model information] of S-Tools.
Select the [Monitor and maintenance] tab of S-Tools and click the [Model information] button.



2 Click [Overwrite].
Click the [Read] button, confirm that the model number of the actuator information of the previous connection is different from that of the actuator information of the current connection, and then click the [Overwrite] button.

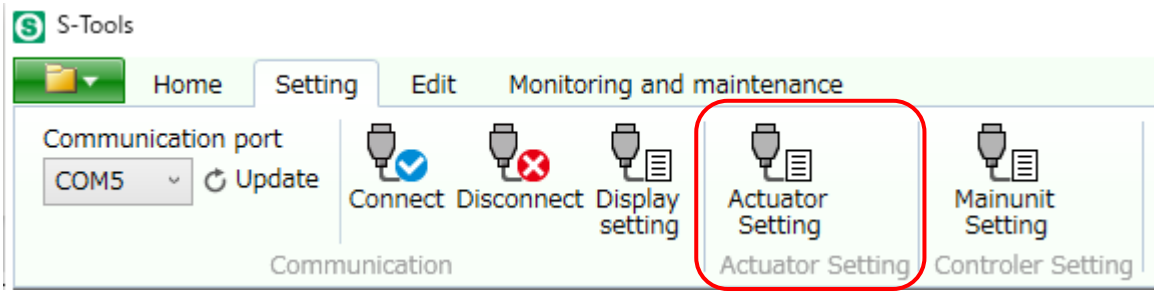


3.1.2 Setting actuator information (drive unit: B type)

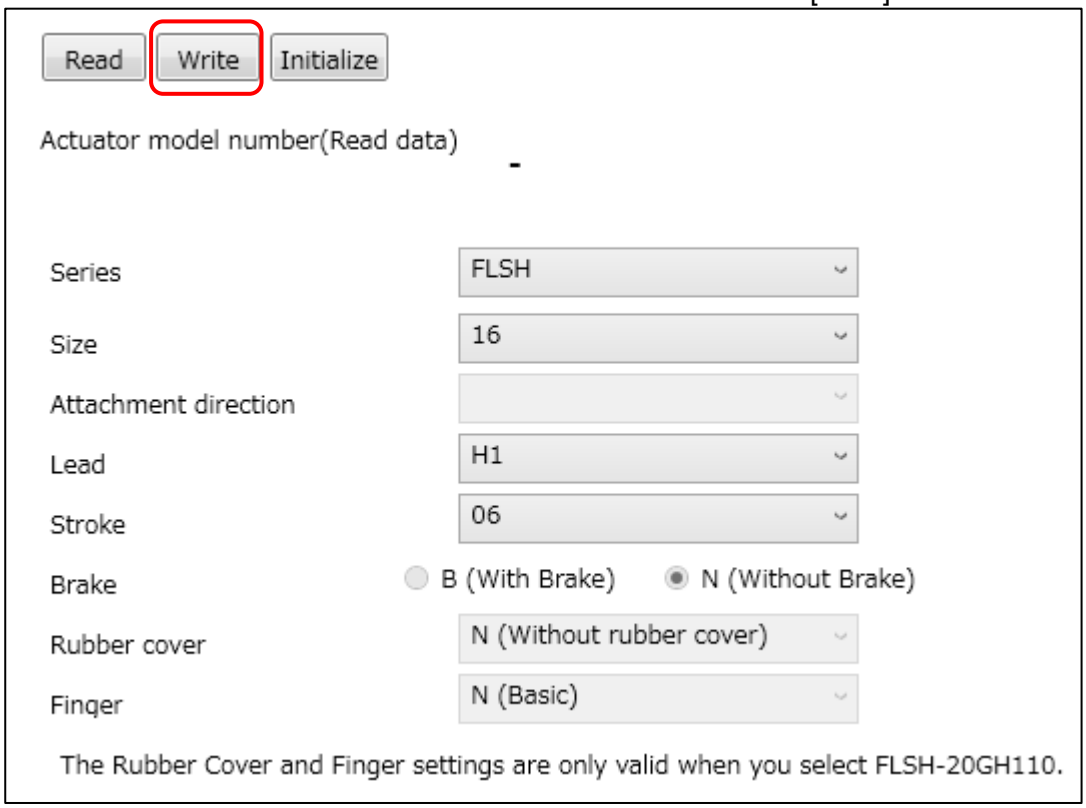
For the B-type drive unit, be sure to set the actuator information when connecting the actuator for the first time and when changing the connected actuator. For details, refer to “Actuator setting” in the S-Tools Instruction Manual (SM-A11147).

<Procedure for writing actuator information>
Use S-Tools to select the model number of the actuator to be used and write it to the controller.

1 Click [Actuator Setting] of S-Tool.
Select the [Setting] tab in S-Tool and click the [Actuator Setting] button.



2 Select the actuator to be used and click [Write].
Select the model number of the actuator to be used and click the [Write] button.



3.2 Send/Receive data (drive unit)

The following data is transmitted and received between the PLC and the controller, and cyclic transmission is used for all data transmission and reception. Refer to Instruction Manual (SM-A62471) for the communication method.

Part Name	Description
Input/output signals	Controls the controller from the PLC.
Monitoring	Position, speed, current, and alarm status are monitored.

■ Input/output signals

The items listed in the table below (signal name) are transmitted and received.

Classification	Item (signal name)
Data to be written to the controller by the PLC	Point number selection bit n, point travel start, point number n travel start, home position return, servo ON, alarm reset, stop, pause, INCH selection, JOG/INCH (+) travel start, JOG/INCH (-) travel start, direct value travel selection, position, positioning width, speed, acceleration, deceleration, pressing rate, pressing speed, pressing distance, mode, gain magnification
Data to be read from the controller by the PLC	Point number confirmation bit n, point travel complete, point number n travel complete, home position return complete, servo ON state, traveling, zone 1, zone 2, point zone, outside soft limit, outside soft limit (-), outside soft limit (+), alarm, warning, operation preparation complete, alarm confirmation bit n, direct travel status

Only point operation can be performed when PIO mode is selected.
When the simple direct value mode, standard direct value mode, or full direct value mode is selected, and the direct value travel is selected in the “direct value travel selection,” it is necessary to set the “position,” “speed,” etc.

<Data to be written to the controller by the PLC>

Signal name	Explanation	
Point number selection bit n	Sets the point number (0 to 63) to be selected when the movement start, in binary (n = 0 to 5).	
Point travel start	Starts the movement with the setting of the selected point number when switched from OFF to ON.	
Point number n movement start	Starts the movement with the setting of the point number n (1 to 7) when switched from OFF to ON.	
Home position return start	Starts the home position return when switched from OFF to ON.	
Servo ON	When OFF	Switches the actuator to the servo OFF status.
	When ON	Switches the actuator to the servo ON status.
Alarm reset	Executes the alarm reset when switched from OFF to ON.	
Stop	When ON	The actuator can be moved.
	When OFF	The actuator cannot be moved. If switched OFF while moving, the actuator decelerates and stops and the travel command is canceled Even if it is turned ON, travel does not restart.
Pause	When ON	The actuator can be moved.
	When OFF	The actuator cannot be moved. If switched OFF while moving, the actuator decelerates and stops and the travel command is canceled Even if it is turned ON, travel does not restart.
INCH selection	When ON	NCH is selected, and Inching travel is performed by inputting "JOG/INCH (+) (-) travel start." Inching travel cannot be performed when the home position return is not completed.
	When OFF	JOG is selected, and JOG travel is performed by inputting “JOG/INCH (+) (-) travel start”.
JOG/INCH (-) travel start	When it is ON, the actuator moving part moves in the - direction. The speed is the value set in the parameter “JOG/INCH Speed”, and the acceleration and deceleration are 0.3 G for the ECG-A series and 0.1 G for the ECG-B series.	
JOG/INCH (+) travel start	When it is ON, the actuator moving part moves in the + direction. The speed is the value set in the parameter “JOG/INCH Speed”, and the acceleration and deceleration are 0.3 G for the ECG-A series and 0.1 G for the ECG-B series.	
Direct value travel selection	When OFF	Switches to point travel.
	When ON	Switches to direct value travel.

For the “point number selection bit n,” the bit with larger n indicates the upper value when the point number is set in binary.
<Input example>
When bit 0 = OFF, bit 1 = OFF, bit 2 = ON, and bit 3 = OFF in the point number selection bit, this indicates that the point 4 is selected.

<Data to be read from the controller by the PLC>

Signal name	Explanation
Point number confirmation bit n	The number (0 to 63) of the point that has completed the movement is output in binary. (n=0 to 5)
Point travel complete	Turns ON when the movement is completed.
Point number n movement complete	Turns ON when the movement to the point number n (1 to 7) is completed.
Home position return complete	Turns ON when the home position return is completed, and turns OFF when it is not completed or during the home position return.
Traveling	Turns ON when the actuator is moving, and turns OFF when it is stopped.
Zone n	Turns ON when the current position is within the range set by the parameter “zone n (+) (-),” and turns OFF when it is not within the above range (n = 1, 2). Refer to “3.4.3 Zone output” for details.
Point zone	Turns ON when the current position is within the range set by the “point zone (+) (-)” of the point number n during or after moving with the setting of the point number n, and turns OFF when it is not within the above range (n = 0 to 63).
Servo ON state	Turns ON when the servo ON state, and turns OFF when the servo OFF state.
Alarm	Turns OFF when an alarm occurs, and turns ON when no alarm occurs.
Warning	Turns OFF when a warning occurs, and turns ON when no warning occurs.
Operation preparation complete	Turns ON when the travel command from the PLC can be received, and turns OFF when it cannot be received. However, when the input signal for pause is OFF, the actuator cannot move even if the operation preparation complete is ON.
Alarm confirmation bit n	When an alarm occurs, the number of the fourth digit from the bottom of the alarm is output in binary. (n = 0 to 3)
Direct value travel status	It is OFF when the power is turned on, and when a direct value travel starts, the direct value travel status is turned ON. When a point travel starts, the direct value travel status is turned OFF.
Outside soft limit Note 1	Turns ON when the actuator's current position is outside the set soft limit range. Refer to "3.4.2 Soft limit settings and outside soft limit signal output" for details.
Outside soft limit (+) Note 1	Turns ON when the actuator's current position is greater than the set soft limit (+). Refer to "3.4.2 Soft limit settings and outside soft limit signal output" for details.
Outside soft limit (-) Note 1	Turns ON when the actuator's current position is less than the set soft limit (-). Refer to "3.4.2 Soft limit settings and outside soft limit signal output" for details.

Note 1: This signal cannot be used if the software version is old. Refer to "1.3.1 List of versions" for compatibility of version and controller specifications.

For the “point number confirmation bit n” and “alarm confirmation bit n,” the bit with larger n indicates the upper value when the point number or the alarm code is output in binary.
<Output example>
When bit 0 = OFF, bit 1 = OFF, bit 2 = ON, and bit 3 = OFF in the alarm confirmation bit, this indicates that alarm 0x4*** has occurred. Refer to “5.2 Alarm Indications and Countermeasures” for the details of alarms.

■ Monitoring

Operate the following items (signal name).

Classification	Item (signal name)
Data to be written to the controller by the PLC (Remote output and Remote register (output))	Monitoring No., monitoring request
Data to be read from the controller by the PLC (Remote input and Remote register (input))	Monitoring response, monitoring complete, monitor value, Position, Speed, Current value, Alarm

When the data to be monitored is selected in “monitor No.,” and “monitor request” is turned ON, the current value of the selected data is output in “monitor value.”

3.3 Operation mode

There are four modes of operation (CC-Link, EtherCAT, EtherNet/IP , PROFINET): The PIO mode can be changed among the 2 types according to the setting of operation mode (PIO).

Part name	Abbreviation	Operation mode (CC-Link), Operation mode (EtherCAT), Operation mode (EtherNet/IP), Operation mode (PROFINET)
PIO mode	PIO	0
Simple direct value mode	SDP	1
Standard direct value mode	HDP	2
Full direct value mode	FDP	3

■ PIO mode

This mode performs control in accordance with conventional signal I/O.

Part name	Abbreviation	Operation mode (PIO)
64-point mode	B064	0
Simple 7-point mode	S007	1

■ Simple direct value mode and standard direct value mode, and full direct value mode

This mode is used to perform control by point travel or direct value travel.

<table>
<tr><th></th><th>Simple direct value mode</th><th>Standard direct value mode and full direct value mode</th></tr>
<tr><td>Point travel</td><td colspan="2">• When direct value travel selection is turned off, it becomes point travel.
• The point data selection method is the same as the 64-point mode of the PIO mode.
• When point travel starts, the direct value travel status is turned OFF.</td></tr>
<tr><td rowspan="2">Direct value travel</td><td colspan="2">• When direct value travel selection is turned on, it becomes direct value travel.
• When the direct value travel is started, the direct value travel status is turned ON.
• The point number confirmation bit is not set when the travel is completed.</td></tr>
<tr><td>• Only the data that are input from the PLC are used as position data; and other data (including speed and acceleration) to be used are from point data.
• The point data selection method is the same as the 64-point mode of the PIO mode.
• It is used to change only the position data based on the set point data.</td><td>• It operates using data (data equivalent to point data such as position and speed) that are input from a PLC.</td></tr>
</table>

3.4 Setting parameters

Parameters can be set and changed from PLC or S-Tools. Refer to the S-Tools setting software Instruction Manual (SM-A11147) for specific setting instructions and other details.

To set the parameters, the direction in which the actuator travels is as follows: However, if "Home position return direction (coordinate axis)" = "Opposite (inverse coordinates)", "- direction" and " + direction" will be reversed.
"- direction" indicates the motor direction, the finger opening direction, the PULL direction, and the counterclockwise.
"+ direction" indicates the opposite motor direction, the finger closing direction, the PUSH direction, and the clockwise.

3.4.1 Parameters List

Part name Note 1	Description		Setting range	Initial value	Unit
☆ Soft limit (+) Note 1	Set the positive direction (opposite motor side) of the movable range. If soft limit (+) and soft limit (-) are both set to 0, the stroke range becomes the movable range. Refer to “3.4.2 Soft limit” for details.		Soft limit (-) to sum of +stroke and margin *In the case of the FGRC, the soft limit (-) value to 360 (deg)	0,00	mm (deg)
☆ Soft limit (-) Note 1	Set the negative direction (motor side) of the movable range. If soft limit (+) and soft limit (-) are both set to 0, the stroke range becomes the movable range. Refer to “3.4.2 Soft limit” for details.		Subtraction of -stroke and margin to soft limit (+) *In the case of the FGRC, -360 (deg) to the soft limit (+) value	0.00	mm (deg)
Zone 1 (+)	Set the positive-side position of Zone 1 output. Refer to “3.4.3 Zone output” for details.		- 9999.99 to 9999.99 Note 2	0.00	mm (deg)
Zone 1 (-)	Set the negative-side position of Zone 1 output. Refer to “3.4.3 Zone output” for details.		- 9999.99 to 9999.99 Note 2	0.00	mm (deg)
Zone 2 (+)	Set the positive-side position of Zone 2 output. Refer to “3.4.3 Zone output” for details.		- 9999.99 to 9999.99 Note 2	0.00	mm (deg)
Zone 2 (-)	Set the negative (-) side position of Zone 2 output. Refer to “3.4.3 Zone output” for details.		- 9999.99 to 9999.99 Note 2	0.00	mm (deg)
Zone hysteresis	Set the hysteresis of Zone 1 and Zone 2 outputs. Refer to “3.4.3 Zone output” for details.		0.00 to 9.99	0.00	mm (deg)
Home position return direction (coordinate axis) Note 1 and 3	Set the direction of the home position return to "Normal (normal coordinates)" or "Opposite (normal coordinates), Opposite (inverse coordinates)." Refer to "3.6.5 Home position return operation" for details.		Normal (normal coordinates), Opposite (normal coordinates), Opposite (inverse coordinates)	Normal (normal coordinates)	None
Home position return speed	Set the speed for returning to home position.	EBS, EJSG, EBR	5 to 20	20	mm/s (deg/s)
		GSSD2, GSTK, GSTG, GSTS, GSTL	20 to 30		
		FLSH, GCKW	5 to 15	15	
		FLCR	5 to 20		
		FGRC	20 to 30 Note 4		

Note 1: The power supply needs to be turned on again or the software needs to be reset to reflect the configurations of the parameter.
Note 2: In the FGRC series, set values of Zone 1 (+), Zone 1 (-), Zone 2 (+), and Zone 2 (-) are regarded as 0 when the set value is 360 or more or - 360 or less.
Note 3: Opposite (inverse coordinates) cannot be selected if the software version is old. Refer to "1.3.1 List of versions" for compatibility of version and controller specifications.
Note 4: The initial value is 15 mm/s, so set again within the range of 20 to 30 mm/s.

Name	Description	Setting range	Initial value	Unit
Home position offset amount Note 1	Set the offset amount for the home position. Refer to “3.6.5 Home position return operation” for details.	When the home position return direction (coordinate axis) = Normal (normal coordinates), Opposite (inverse coordinates) 0.00 to + stroke When the home position return direction (coordinate axis) = Opposite (normal coordinates) - stroke to 0.00	0.00	mm (deg)
Automatic home position return Note 1	When this is set to enabled, home position return is performed at the first travel command input after the controller is powered on, and the travel starts at the second travel command input. It is not enabled, when the actuator with an absolute encoder is used.	Disabled, enabled	Disabled	None
FGRC home position return direction method Note 1, 2 and 3	This parameter is valid only when connecting FGRC series. In the FGRC series, select whether the home position returning is based on the position of the internal sensor or the position pressed against the externally mounted stopper. Refer to "3.6.5 Home position return operation" for details.	Sensor, Pressing against	Sensor	Not included
Emergency stop input Note 1	Set the emergency stop input to Enabled or Disabled.	Enabled, disabled	Enabled	None
First servo ON method Note 1 and 2	Set the excitation method when the servo is turned ON for the first time after the power is turned on. The "Simple" setting simplifies the excitation phase detection operation and shortens the time to ready for operation. Drive unit: Only A type can be set.	Normal, Simple	Normal	None
Pressing judgment time	Set the time to spend for completing pressing in the pressing interval. (During the pressing judgment time, when the current value reaches the one corresponding to the value set in the pressing rate, it is judged that pressing is complete.)	0 to 9999	200	ms
Fixed current at stop	Set the current value to maintain the workpiece when stopped.	0 to 100	65	%
Automatic Servo OFF 1	It becomes valid if Automatic servo OFF 1 in “Stop method” described in Point Data is selected. The servo is turned OFF when the set time has elapsed after the travel is completed.	0 to 9999	0	sec
Automatic Servo OFF 2	It becomes valid if Automatic servo OFF 2 in “Stop method” described in Point Data is selected. The servo is turned OFF when the set time has elapsed after the travel is completed.	0 to 9999	0	sec
Automatic Servo OFF 3	It becomes valid if Automatic servo OFF 3 in “Stop method” described in Point Data is selected. The servo is turned OFF when the set time has elapsed after the travel is completed.	0 to 9999	0	sec

Note 1: The power supply needs to be turned on again or the software needs to be reset to reflect the configurations of the parameter.
Note 2: This parameter cannot be used if the software version is old. Refer to "1.3.1 List of versions" for compatibility of version and controller specifications.
Note 3: When selecting the option "pressing against," the product selection must be made after calculating the torque at the time of pressing against.

Part name	Description	Setting range	Initial value	Unit
Threshold value for integrated running distance (Actuator)	A warning is output when the integrated running distance reaches the set threshold. No warning is output when the setting value is 0.	0 to 999999999	0	m (10^3 deg)
Threshold value for integrated number of travel times (Actuator)	A warning is output when the integrated number of actuator travel times reaches the set threshold. No warning is output when the setting value is 0.	0 to 999999999	0	times
Threshold value for integrated operating time (Motor)	A warning is output when the integrated motor operating time reaches the set threshold. No warning is output when the setting value is 0.	0 to 999999999	0	sec
Temperature threshold value	A warning is output when the substrate temperature of the drive unit exceeds the set threshold. No warning is output when the setting value is 0.	0.0～255.0	80.0	°C
Common positioning width	Set the tolerance value for positioning completion output. When 0 is set in point data, this value is read.	0.01 to 9.99	0.10	mm (deg)
Common speed	Set the common speed for the transport interval. When 0 is set in point data, this value is read.	Refer to “3.5.6 Setting the speed”.	30	mm/s (deg/s)
Common acceleration	Set the acceleration for the travel interval. When 0 is set in point data, this value is read.	Refer to “3.5.7 Setting the acceleration”.	0.10	G
Common deceleration	Set the deceleration for the travel interval. When 0 is set in point data, this value is read.	Refer to “3.5.8 Setting the deceleration”.	0.10	G
Common pressing rate	Set the common pressing rate in a pressing interval. When 0 is set in point data, this value is read.	Refer to “3.5.14 Setting the pressing rate”.	50	%
Common pressing speed	Set the common pressing speed in a pressing interval. When 0 is set in point data, this value is read.	Refer to “3.5.15 Setting the pressing speed”.	15	mm/s (deg/s)
Common pressing distance	Set the common pressing distance for the pressing interval. When 0 is set in point data, this value is read.	Negative stroke length to positive stroke length	3.00	mm (deg)
Common acceleration/ deceleration method	The value is fixed to Trapezoid. When “Common” is set in point data, this value is read.	Trapezoid	Trapezoid	None
Common stop method	Set the common stop method after positioning completion. When “Common” is set in point data, this setting is read.	Control, fixed excitation, automatic servo OFF 1, Automatic servo OFF 2, automatic servo OFF 3	Control	None
Common rotation direction	Set the common rotation direction at the time of the FGRC connection. When “Common” is set in point data, this setting is read.	Shortest rotation, CW, CCW	Shortest rotation	None

Part name	Description	Setting range	Initial value	Unit
Operation mode (PIO) Note 1	Set the operation mode.	64-point mode, simple 7-point mode	64-point mode	None
Output selection 1 Note 1 and 2	Select the allocation of the signal to be output with the output selection 1.	Point zone, Zone 1, Zone 2, Traveling, Warning, Outside soft limit (-), and Outside soft limit (+)	Zone 1	None
Output selection 2 Note 1 and 2	Select the allocation of the signal to be output with the output selection 2.	Point zone, Zone 1, Zone 2, Traveling, Warning, Outside soft limit (-), and Outside soft limit (+)	Zone 2	None
Stop input Note 1	Set “enabled” or “disabled” for the stop signal when the operation mode (communication) is PIO mode.	Enabled, disabled	Enabled	None
JOG/INCH speed	Set the speed for the JOG/INCH (-) travel start and JOG/INCH (+) travel start signals.	1 to 100	30	mm/s (deg/s)
INCH distance	This is for setting the distance the actuator travels when a JOG/INCH (-) travel start signal or JOG/INCH (+) travel start signal is input with INCH selected (INCH selected is ON).	0.01 to 10.00	0.10	mm (deg)
Point signal output holding Note 1 and 3	If enabled, point number confirmation bit n, point travel complete, point number n travel complete, and point zones will not be cleared when the servo is turned OFF, emergency stop is made, or the brake is forced to release. Even if enabled, the above signal is cleared when the stop signal is turned OFF or when an alarm occurs.	Disabled, Enabled	Disabled	None
Holding time of traveling signal ON Note 1 and 3	Sets the time to hold the ON state of the traveling signal during a point travel or a direct value travel from the start of traveling. Even if the travel complete position is reached within the set time, it does not turn OFF, and the ON state of the moving signal is kept for the set time. Even if the time is set, the ON state of the traveling signal is not maintained when the stop operation is performed due to emergency stop, stop signal OFF, or alarm occurrence.	0 to 9999	0	ms
G1 gain (responsiveness)	This is for adjusting the convergence time of the speed waveform. As the set value increases, the position proportional gain, speed proportional gain, and speed integral gain increase. It improves command tracking but oscillation is more likely to occur. If set to 0, the internal factory setting will be applied. Use the initial value unless there is a problem.	0 to 15	0	None
G2 gain (load magnification)	This is adjusted according to the actuator load. As the set value increases, the speed proportional gain and speed integral gain increase. Increasing the G2 gain reduces speed ripple. If the load is large, increase the set value. If set to 0, the internal factory setting will be applied. Use the initial value unless there is a problem.	0 to 15	0	None

Note 1: The power supply needs to be turned on again or the software needs to be reset to reflect the configurations of the parameter.
Note 2: If the software version is old, the outside soft limit, outside soft limit (-), and outside soft limit (+) cannot be selected. Refer to "1.3.1 List of versions" for compatibility of version and controller specifications.
Note 3: This parameter cannot be used if the software version is old. Refer to "1.3.1 List of versions" for compatibility of version and controller specifications.

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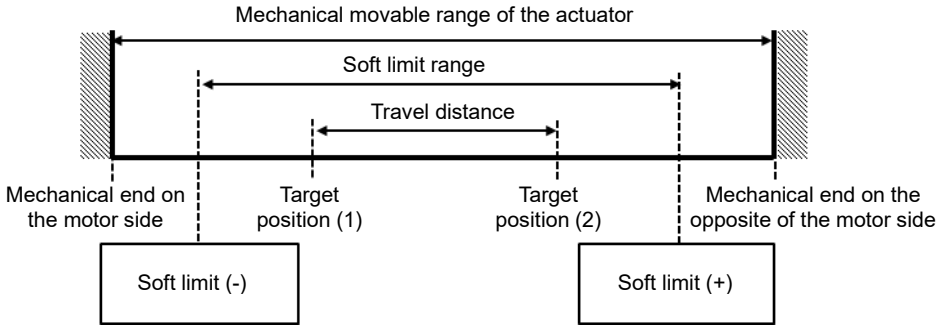
3.4.2 Soft limit settings and outside soft limit signal output

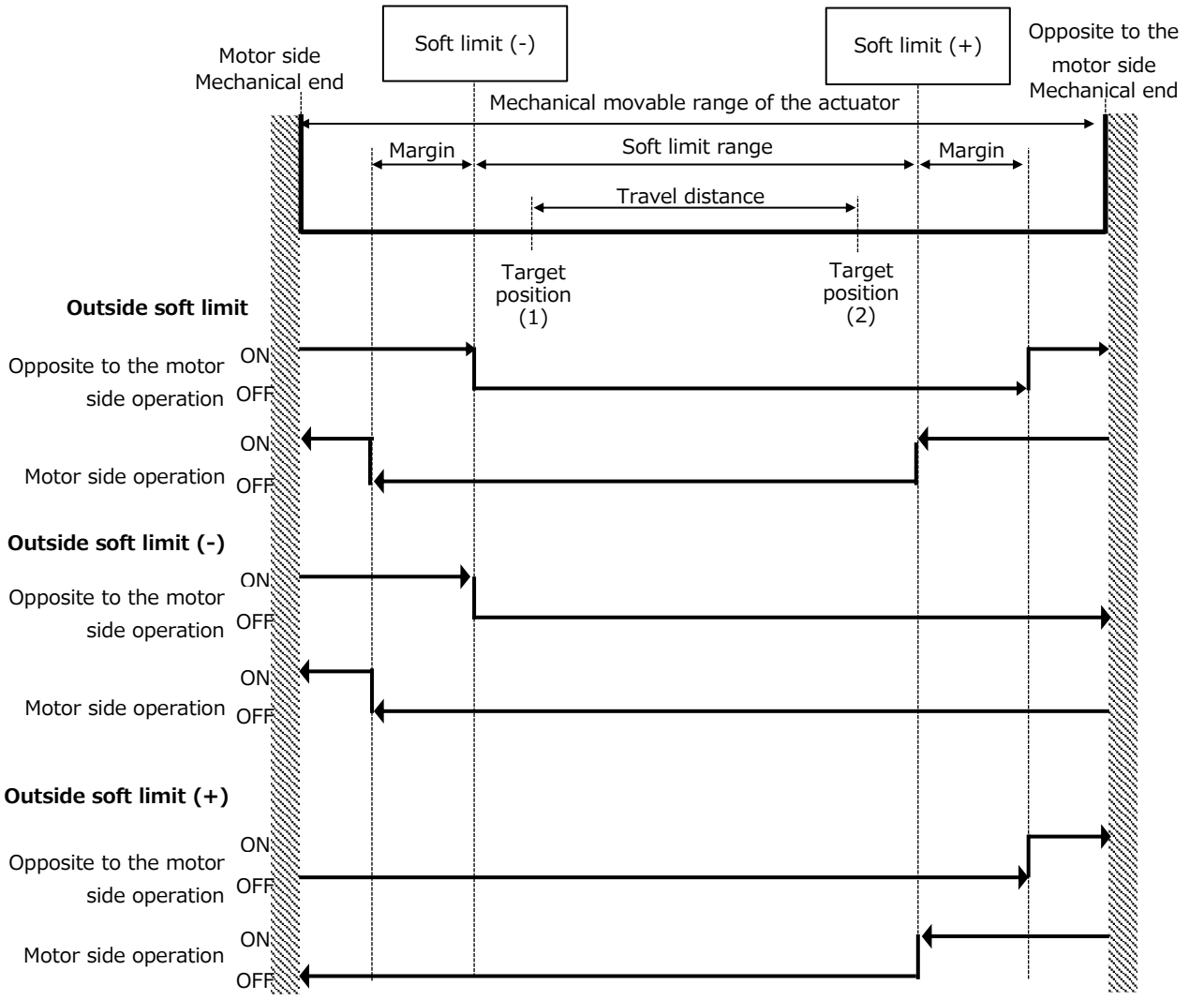
This parameters determines the movable range in transport and pressing operations.
Exceeding the soft limit range during the above operations results in an alarm output. If an operation completed in a position outside of the soft limit range, the alarm is output before starting the next operation.

■ EBS/EJSG/EBR/FLSH/FLCR/GSSD2/GSTK/GSTG/GSTS/GSTL/GCKW

The motor side x-coordinate is negative while the opposite motor side x-coordinate is positive. The home position x-coordinate is 0.
Set the soft limit to a value that is or is outside of “the movement distance (target position (1), (2))” and inside of “the actuator’s mechanical movable range.”



The outside soft limit, outside soft limit (+) and outside soft limit (-) signals can be used to detect when the actuator's current position is outside the soft limit range.
Output examples for each signal are shown below.



• When soft limit (+) = soft limit (-) = 0, each signal of outside soft limit is always turned OFF.

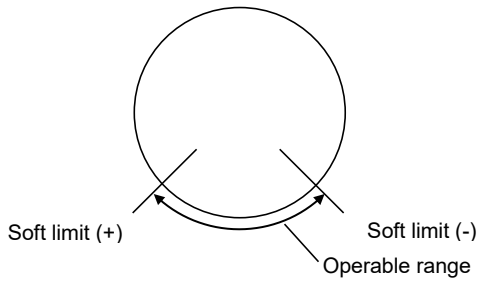
The value of the margin varies for each actuator. Refer to the table below.

Actuator model number / Series	Margin	Unit
EBS	3	mm
EJSG	3	
EBR	3	
FLSH	0.2	
FLCR	0.5	
GSSD2	0.5	
GSTK	0.5	
GSTG	0.5	
GSTS	0.5	
GSTL	0.5	
GCKW	0.2	

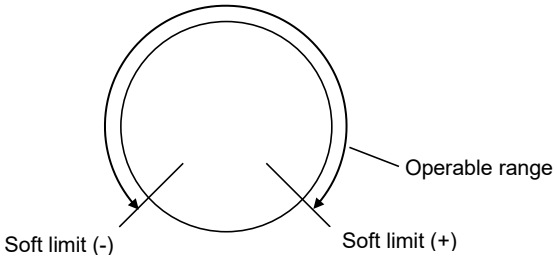
■ FGRC

The home position x-coordinate is 0.
Set the soft limit to a value that is or is outside of the “movement distance.” The soft limit (+) must be set to a value equal to or greater than the soft limit (-), and when limiting the operable range with the soft limit, the range from soft limit (-) to the soft limit (+) must be set within 360 deg. When both the soft limit (+) and the soft limit (-) are 0, there is no limitation on the operating range.

The movable range changes as shown in the following figure depending on the setting of the soft limit.
* This is a figure in which FGRC is seen from the above.

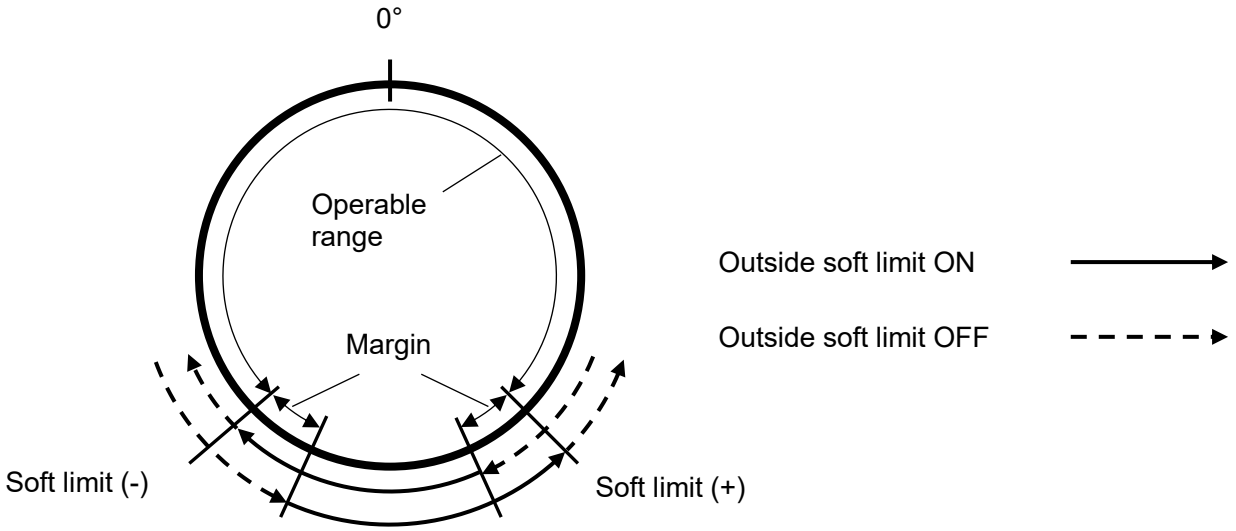


Setting example
Soft limit (+) ... 225 [deg]
Soft limit (-) ... 135 [deg]



Setting example
Soft limit (+) ... 135 [deg]
Soft limit (-) ... -135 [deg]

The outside soft limit signal can be used to detect when the actuator's current position is outside the soft limit range.
In the FGRC series, only outside soft limit is output, and outside soft limit (+) and outside soft limit (-) are not output.
Output examples of outside soft limit is shown below.



When soft limit (+) = soft limit (-) = 0, each signal of outside soft limit is always turned OFF.

The value of the margin varies for each actuator. Refer to the table below.

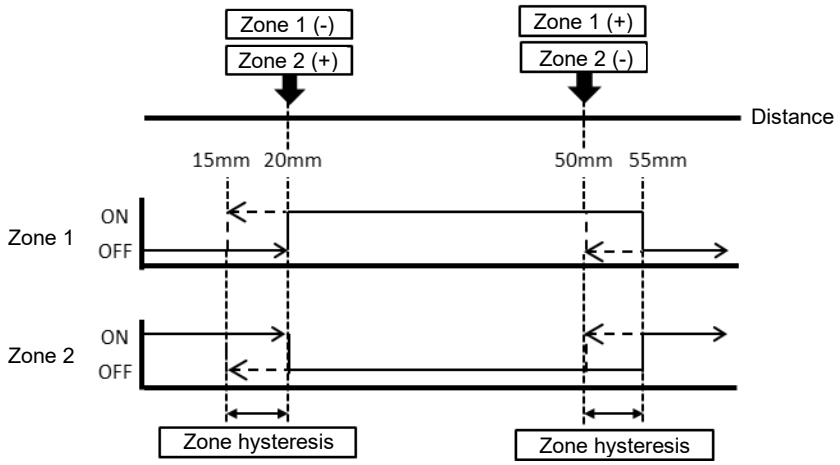
Actuator model number		Margin	Unit
Series			
FGRC	10	0.3	deg
	30	0.2	
	50		

3.4.3 Zone output

When the current position is within the setting range, output signals Zone 1 and Zone 2 can be turned ON or OFF.

■ EBS/EJSG/EBR/FLSH/FLCR/GSSD2/GSTK/GSTG/GSTS/GSTL/GCKW

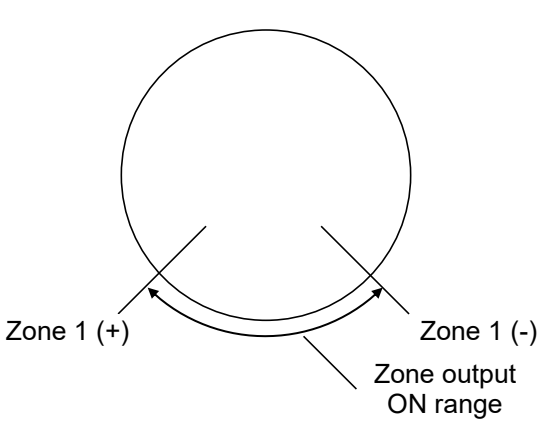
Example Zone 1(-): 20 mm, Zone 1(+): 50 mm, Zone hysteresis: 5 mm set
Zone 2(-): 50 mm, Zone 2(+): 50 mm, Zone hysteresis: 5 mm set



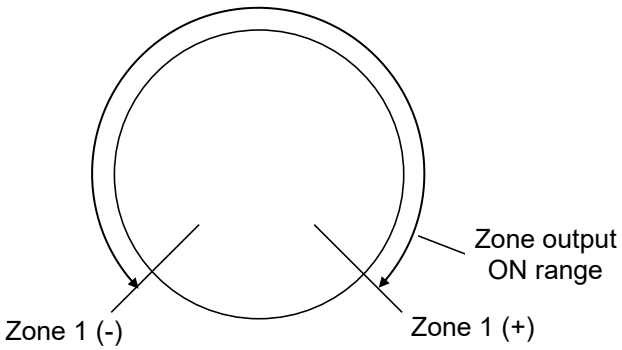
When Zone n (+) = Zone n (-), the output signal of Zone n is always OFF (n = 1, 2).

■ FGRC

The output range changes as shown in the following figure depending on the setting of the zone.
* This is a figure in which FGRC is seen from the above.

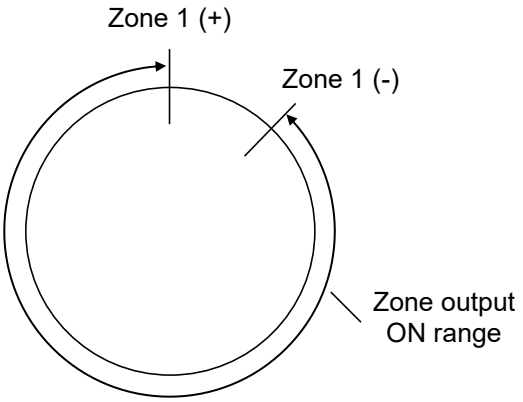


Setting example
Zone 1 (+) ... 225 [deg]
Zone 1 (-) ... 135 [deg]



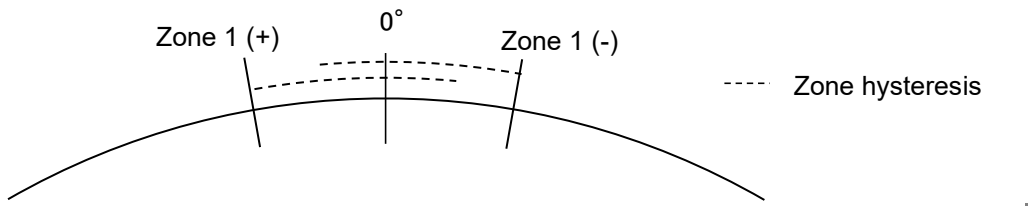
Setting example
Zone 1 (+) ... 135 [deg]
Zone 1 (-) ... -135 [deg]

If the zone setting value is 360 or more or -360 or less, the setting value is treated as 0.



Setting example
Zone 1 (+) … 9999.99 [deg]
Zone 1 (-) … 45 [deg]

When the zone hysteresis is interfering, the zone output does not change once it is switched.



Setting example
Zone 1 (+) … 358 [deg]
Zone 1 (-) … 2 [deg]
Zone hysteresis … 3 [deg]

Output example
The zone output is OFF in the range from 358 [deg] to 2 [deg] after the home position return.
The zone output is ON when the actuator moves to the position of 2 [deg] or more or 358 [deg] or less from the above range, and remains ON no matter where the actuator moves.

3.4.4 Adjusting the gains

In the following cases, change the setting of the parameters “G1 gain (responsiveness)” and “G2 gain (load magnification).” For the change of the gains, the setting software S-Tools is required. For more information, including how to set these settings, refer to “Adjustment” in “3.7.2 Control Panel” of S-Tools Instruction Manual (SM-A11147).

■ Gain setting according to power supply voltage and installation method (EBS/EBR series)

When using the EBS series and EBR series actuators, change the setting of the parameters "G1 gain (responsiveness)" and "G2 gain (load magnification)" according to the table below.

<EBS series>

Actuator model number				Horizontal Note 1		Vertical	
Series	Size	Motor Mounting direction	Screw lead	G1	G2	G1	G2
EBS	04	GE	6	2	7	3	6
			12	2	8	2	4
		GR GD GL	6	2	9	2	8
			12	2	9	2	9
	05	GE	2	2	7	2	3
			5	2	7	2	5
			10	2	4	5	2
			20	2	8	6	3
		GR GD GL	2	2	4	2	4
			5	2	4	2	4
			10	2	5	3	3
			20	2	6	2	5
	08	GE	5	2	8	3	6
			10	2	6	2	6
			20	2	9	2	7
		GR GD GL	5	2	7	2	5
			10	2	7	2	4
			20	2	7	2	4

Note 1: The G1 gain (responsiveness) and G2 gain (load magnification) applied by setting "0" are factory-adjusted parameters for unloaded and horizontal installation. However, if the controller or actuator version is older, the parameters adjusted for the ECG series are applied. Refer to "1.3.3 Software version and suitable actuator" for details.

When installing the product on a wall, use the same gain setting as for horizontal installation.

<EBR series>

Actuator model number				Horizontal Note 1		Vertical	
Series	Size	Motor Mounting direction	Screw lead	G1	G2	G1	G2
EBR	04	GE	6	2	8	2	7
			12	2	6	3	3
		GR GD GL	6	2	10	3	8
			12	2	8	3	8
	05	GE	2	4	4	4	3
			5	2	7	2	7
			10	2	7	2	7
			20	2	6	3	7
		GR GD GL	2	5	5	2	5
			5	3	7	2	5
			10	2	9	2	7
			20	2	7	2	7
	08	GE	5	2	8	2	8
			10	2	8	3	4
			20	2	8	2	6
		GR GD GL	5	3	9	2	6
			10	2	8	2	7
			20	2	9	2	6

Note 1: The G1 gain (responsiveness) and G2 gain (load magnification) applied by setting "0" are factory-adjusted parameters for unloaded and horizontal installation. However, if the controller or actuator version is older, the parameters adjusted for the ECG series are applied. Refer to "1.3.3 Software version and suitable actuator" for details.

When installing the product on a wall, use the same gain setting as for horizontal installation.

■ Gain setting according to power supply voltage and installation method (EJSG series)

When using the EJSG series actuator, change the setting of the parameters "G1 gain (responsiveness)" and "G2 gain (load magnification)" according to the table below.

<EJSG series (standard series)>

Actuator model number				Horizontal Note 1		Vertical	Note 1
Series	Size	Motor Mounting direction	Screw lead	G1	G2	G1	G2
EJSG	04	E	6	3	4	4	5
			12	3	6	3	6
		R D L	6	2	7	2	8
			12	3	8	3	8
	05	E	5	3	5	2	4
			10	4	4	4	3
			20	7	2	6	3
		R D L	5	3	6	2	5
			10	3	5	3	5
			20	3	6	3	5
	08	E	5	2	5	2	5
			10	2	6	2	6
			20	2	6	2	6
		R D L	5	2	6	3	6
			10	2	6	2	7
			20	2	6	2	7

Note 1: The G1 gain (responsiveness) and G2 gain (load magnification) applied by setting "0" are factory-adjusted parameters for unloaded and horizontal installation. However, if the controller or actuator version is older, the parameters adjusted for the ECG series are applied. Refer to "1.3.3 Software version and suitable actuator" for details.

When installing the product on a wall, use the same gain setting as for horizontal installation.

■ Gain setting according to power supply voltage and installation method (GSSD2/GSTK/GSTG/GSTS/GSTL series)

When using the GSSD2, GSTK, GSTG, GSTS, or GSTL series actuators, change the setting of the parameters "G1 gain (responsiveness)" and "G2 gain (load magnification)" according to the table below.

<GSSD2/GSTK/GSTG/GSTS/GSTL series>

Actuator model number				Horizontal Note 1		Vertical	
Series	Size	Motor Mounting direction	Screw lead	G1	G2	G1	G2
GSSD2 GSTK GSTG GSTS GSTL	20	GE	6	5	5	6	5
			9	4	7	2	9
	32	GE	6	2	8	2	8
			12	4	8	4	6
	50	GE	6	5	7	5	7
			12	6	4	6	5

Note 1: The G1 gain (responsiveness) and G2 gain (load magnification) applied by setting "0" are factory-adjusted parameters for unloaded and horizontal installation.

When installing the product on a wall, use the same gain setting as for horizontal installation.

■ Gain adjustment method

If there is abnormality in the operation of the actuator, adjust the gain by the following methods.

If abnormal sound is generated during a stop
If high-pitched abnormal sound is generated from the actuator during a stop, the set value of the gain is high, so decrease the G2 gain. If no effect is found even if the G2 gain has been decreased, decrease also the G1 gain to make an adjustment.

If abnormal sound is generated during an operation
If abnormal sound is generated during an operation at a constant speed other than an acceleration time, the set value of the gain is high, so decrease the G2 gain. If no effect is found even if the G2 gain has been decreased, decrease also the G1 gain to make an adjustment.

If the actuator vibrates during an operation
If the actuator vibrates during an operation, the set value of the gain is low, so increase the G2 gain. If no effect is found even if the G2 gain has been increased, increase also the G1 gain to make an adjustment.

If the actuator does not stop at the set position
If the actuator does not stop at the set position, the overload (H) alarm (alarm code: 6702) is given. Since the setting of the gain is high, decrease the G1 gain or G2 gain.

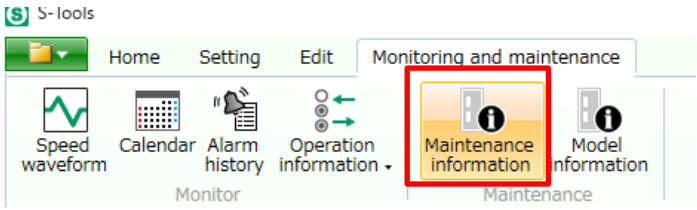
If no workpiece can be carried
If the actuator does not operate at the set speed or stops during movement to the set position during workpiece transfer, the set value of the gain is low, so increase the G2 gain. If abnormal sound is generated during a stop or during an operation by increasing the G2 gain, decrease the G1 gain.

3.4.5 Setting threshold values

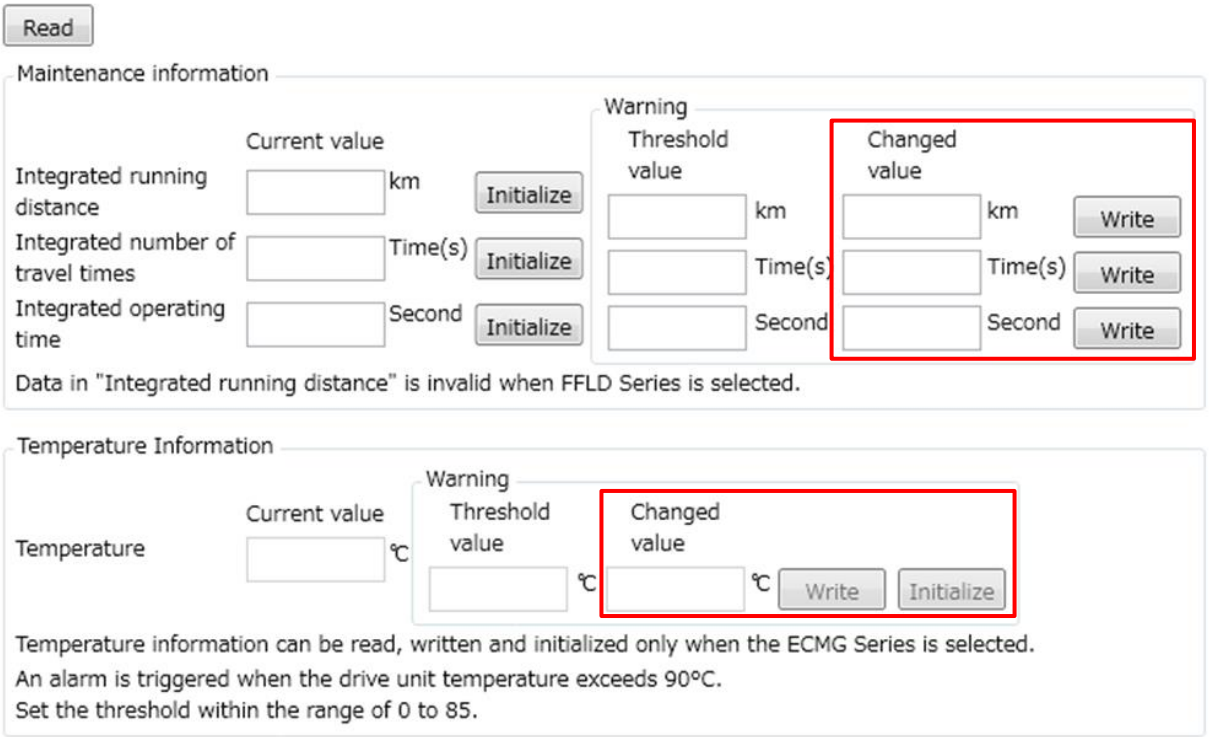
Set the values of the integrated running distance threshold, integrated number of travel times threshold, integrated operating time threshold, and temperature rise threshold from the PLC or S-Tools. Refer to the Instruction Manual (SM-A 62471) for setting from the PLC.

■ How to set threshold values (using S-Tools)

1 Select the [Monitor and maintenance] tab of S-Tools and click the [Maintenance information] button.



2 Enter the value to set in the text box in the [Change value] column for the threshold that you want to change and click the [Write] button.



Part Name	Description
Threshold value for integrated running distance	A warning is output when the integrated running distance reaches the set threshold. No warning is output when the setting value is 0.
Threshold value for integrated number of travel times	A warning is output when the integrated number of actuator travel times reaches the set threshold. No warning is output when the setting value is 0.
Threshold value for integrated operating time	A warning is output when the integrated motor operating time reaches the set threshold. No warning is output when the setting value is 0. The integrated operating time indicates the time while the servo is ON.
Temperature threshold value	A warning is output when the substrate temperature of the drive unit exceeds the set threshold. No warning is output when the setting value is 0.

3.5 Point data setting

You can set and change point data using PLC or S-Tools setting software. Refer to the S-Tools setting software Instruction Manual (SM-A11147) for specific setting instructions and other details.

3.5.1 Point data list

The following items can be set for each point.

Setting item	Description
Position specification method	Select either Absolute or Incremental. Refer to “3.5.2 Selecting the position specification method” for details.
Operation method	Select Positioning operation, Pressing operation 1, or Pressing operation 2. Refer to “3.5.3 Selecting the operation method” for details.
Position	For Positioning operation, set this to the final target position (mm) (deg). When the operation method is set to pressing operation 1 or pressing operation 2, the final target position is determined together with the pressing distance. * Set Positioning operation and Pressing operations 1 and 2 with “Operation method.” * The final target positions for Pressing operations 1 and 2 are determined by “Position” and “Pressing distance.” Refer to “3.5.4 Setting the position” for details.
Positioning width	Set the output range of the point travel completion output signal as the width (one side) with respect to the final target position in [mm] ([deg]). Refer to “3.5.5 Setting the positioning width” for details.
Speed	Set the speed in a travel interval in [mm/s] ([deg/s]). Refer to “3.5.6 Setting the speed” for details.
Acceleration	Set the acceleration for the transport interval [G]. Refer to “3.5.7 Setting the acceleration” for details.
Deceleration	Set the deceleration for the transport interval [G]. Refer to “3.5.8 Setting the deceleration” for details.
Acceleration/deceleration method	Only Trapezoid operation can be selected. Refer to “3.5.9 Selecting the acceleration/deceleration method” for details.
Stop method	Select Control stop, Fixed excitation, Automatic Servo OFF 1, Automatic Servo OFF 2, or Automatic Servo OFF 3. Refer to “3.5.10 Selecting the stop method” for details.
Rotation direction	Set the rotation direction of the FGRC. Refer to “3.5.11 Selecting the rotation direction” for details.
Gain magnification	Set the gain magnification [%]. Refer to “3.5.12 Setting the gain magnification” for details.
Point zone (+)	Set the point zone in + [mm] ([deg]). Refer to “3.5.13 Setting the point zone” for details.
Point zone (-)	Set the point zone in - [mm] ([deg]). Refer to “3.5.13 Setting the point zone” for details.
Pressing rate	Set the rate of the upper limit of the pressing force in a pressing interval to the maximum pressing force in percentage [%]. Refer to “3.5.14 Setting the pressing rate” for details.
Pressing speed	Set the speed in a pressing interval in [mm/s] ([deg/s]). Refer to “3.5.15 Setting the pressing speed” for details.
Pressing distance	Set the pressing interval width in [mm/s] ([deg/s]). Refer to “3.5.16 Setting the pressing distance” for details.

3.5.2 Selecting the position specification method

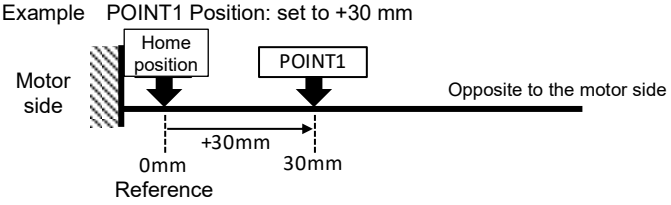
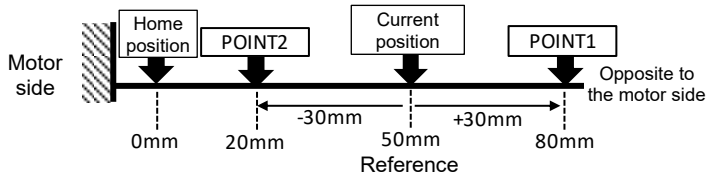
You can select either Absolute or Incremental as the position specification method.

・Setting range and initial values (factory-default)

Actuator model number / Series	Position specification selection	Initial value of position specification
EBS/EJSG/EBR/FLSH/FLCR/FGRC/ GSSD2/GSTK/GSTG/GSTS/GSTL/GCKW	Absolute Incremental Note 1	Absolute

Note 1 When “incremental” is selected in FGRC series, and the rotation direction is set to “shortest rotation,” the actuator rotates in the CW direction by the incremental operation.

・Setting example:

Position specification	Explanation	Setting example
Absolute	Set the distance from the home position, with the home position (0 mm) regarded as the reference.	Example POINT1 Position: set to +30 mm  The positioning completion point of POINT 1 is 30 mm from the home position.
Incremental	Set the distance from the current position, with the current position regarded as the reference. If a negative (-) value is input, the position will be on the motor side; if a positive (+) value is input, the position will be on the opposite to the motor side.	Example POINT1 Position: set to +30 mm POINT2 Position: set to -30 mm  The positioning completion point of POINT 1 is 80 mm from the home position. The positioning completion point of POINT 2 is 20 mm from the home position.

3.5.3 Selecting the operation method

As for operation method, you can select from Positioning operation, Pressing operation 1, and Pressing operation 2.

・Setting range and initial values (factory default)

Actuator model number Series	Operation selection	Initial value of operation
EBS/EJSG/EBR/FLSH/FLCR/FGRC/ GSSD2/GSTK/GSTG/GSTS/GSTL/GCKW	Positioning operation Pressing operation 1 Note 1 Note 2 Pressing operation 2 Note 1 Note 2	Positioning operation

Note 1 When pressing operation 1 or 2 is selected in FGRC series, do not set the rotation direction to “shortest rotation.”
Note 2 When pressing operation 1 or 2 is selected in FGRC series, and an operation command is issued at a setting where the value of the position and pressing distance is 360 deg or more, an alarm “point data (position)” occurs, and the command is not accepted.

・Description of operation

Operation	Explanation
Positioning operation	This operation is intended for general transport. A completion signal is output when the actuator has come within the positioning width. When the actuator reaches the positioning completion point, it comes to a stop. Refer to “3.6.6 Positioning operation” for details.
Pressing operation 1	This operation keeps pushing the workpiece toward the pressing completion point during the pressing operation. While this operation is ongoing, pausing caused by external force will not be detected as an alarm. This setting can be used when clamping. When the set pressing rate is reached, a completion signal is output. When the actuator reaches the pressing completion point, the pressing operation ends and the actuator comes to a stop. Refer to “3.6.8 Pressing operation” for details.
Pressing operation 2	This operation keeps pushing the workpiece toward the pressing completion point during the pressing operation. While this operation is ongoing, pausing caused by external force will not be detected as an alarm. This setting can be used when press-fitting. While the actuator operates at the set pressing rate and reaches within the positioning width, it outputs a completion signal. When the actuator reaches the pressing completion point, the pressing operation ends and the actuator comes to a stop. Refer to “3.6.8 Pressing operation” for details.

3.5.4 Setting the position

Set the movement position.
The movement position differs depending on the position specification method and operation method.

・Setting range and initial values (factory default)

Actuator model number Series	Position setting range [mm], [deg] Note 1	Initial position value [mm], [deg] Note 1
EBS/EJSG/EBR/FLSH/FLCR/ GSSD2/GSTK/GSTG/GSTS/GSTL/GCKW	Negative stroke length to positive stroke length	0
FGRC	0.00 to 359.99 Note 2 Note 3 Note 4	0

Note 1 [deg] for FGRC series, and [mm] for other models.
Note 2 For FGRC series, set the operation starting point and the operation ending point 0.05 deg or more apart. If the setting is less than 0.05 deg, the actuator may not operate and output a point travel complete signal.
Note 3 When connecting FGRC series, and the position is set to the value of 360 or more, the position setting value will be the remainder of dividing the setting value by 360.
Note 4 For oscillating operation on FGRC series, set the travel distance to 359.90 or less.

3.5.5 Setting the positioning width

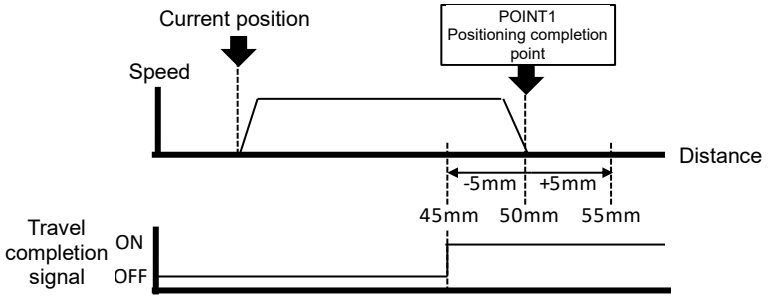
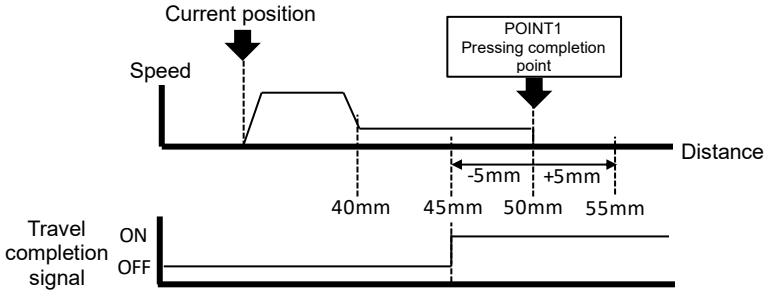
Set the output range of the point travel completion output signal.
Set this using the width to the travel complete position (one side).
The meaning of positioning width differs depending on the operation method.

・Setting range and initial values (factory default)

Actuator model number / Series	Position width setting range [mm], [deg] Note 3	Initial position width value [mm], [deg] Note 3
EBS/EJSG/EBR/FLSH/FLCR/FGRC/ GSSD2/GSTK/GSTG/GSTS/GSTL/GCKW	0.00 to 9.99 Note 1	0.00 Note 2

Note 1: When this is set to 0.00, the common positioning width of the parameters data will be applied.
Note 2: The common positioning width is applied because 0.00 is set as the initial value (factory-default).
Note 3: [deg] for FGRC series, and [mm] for other models.

・Setting example:

Operation	Setting example
Positioning operation	Example Setting: position (absolute position): + 50 mm, positioning width: 5 mm  When traveling to the range of 45 mm to 55 mm, the travel completion signal is output. The completion signal is retained even if the position goes out of the positioning width range by overshoot etc.
Pressing operation 1	The setting of the positioning width is not reflected because the completion signal is judged by the set pressing rate.
Pressing operation 2	Example POINT1 Setting: position (absolute position): + 40 mm, pressing distance: 10 mm, positioning width: 5 mm  When traveling to the range of 45 mm to 55 mm, the travel completion signal is output. After the travel completion signal is output, the completion signal is retained even if the position goes out of the positioning width range by pushing back, etc.

When "Point signal output holding" is "Disabled," the travel completion signal is turned OFF when servo is OFF, emergency stop and brake force release is performed, but when "Point signal output holding" is "Enabled", servo is turned OFF, the travel completion signal does not turn OFF after emergency stop and brake release.

3.5.6 Setting the speed

The speed for the travel interval can be set.

・Setting range and initial values (factory default)

<EBS/EBR series>

Actuator model number				Speed setting range [mm/s] Note 1, Note 2	Initial speed value [mm/s] Note 3
Series	Body size	Motor mounting direction	Screw lead		
EBS	04	GE	06	7 to 450	0
			12	15 to 900	0
		GR, GD, GL	06	7 to 375	0
			12	15 to 600	0
	05	GE	02	2 to 130	0
			05	6 to 375	0
			10	12 to 750	0
			20	25 to 1120	0
		GR, GD, GL	02	2 to 130	0
			05	6 to 325	0
			10	12 to 635	0
			20	25 to 1120	0
	08	GE	05	6 to 240	0
			10	12 to 430	0
			20	25 to 800	0
		GR, GD, GL	05	6 to 200	0
			10	12 to 430	0
			20	25 to 800	0
EBR	04	GE	06	7 to 400	0
			12	15 to 700	0
		GR, GD, GL	06	7 to 350	0
			12	15 to 600	0
	05	GE	02	2 to 130	0
			05	6 to 375	0
			10	12 to 750	0
			20	25 to 1000	0
		GR, GD, GL	02	2 to 130	0
			05	6 to 375	0
			10	12 to 650	0
			20	25 to 1000	0
	08	GE	05	6 to 250	0
			10	12 to 470	0
			20	25 to 750	0
		GR, GD, GL	05	6 to 230	0
			10	12 to 450	0
			20	25 to 700	0

Note 1: Operation may not be stable even in the setting range, depending on the acceleration, deceleration, or installation method.
Note 2: This can be set to 0 in point data. If this is set to 0, the common speed of the parameters data will be applied.
Note 3: The common speed is applied because the initial value (factory-default) is set to 0.

<EJSG series (standard series, G series)>

Actuator model number				Speed setting range [mm/s] Note 1 and 2	Initial speed value [mm/s] Note 3
Series	Body size	Motor mounting direction	Screw lead		
EJSG	04	E	06	7 to 320	0
			12	15 to 500	0
		R, D, L	06	7 to 250	0
			12	15 to 400	0
	05	E	05	6 to 290	0
			10	12 to 500	0
			20	25 to 850	0
		R, D, L	05	6 to 250	0
			10	12 to 400	0
			20	25 to 700	0
	08	E	05	6 to 150	0
			10	12 to 250	0
			20	25 to 500	0
		R, D, L	05	6 to 125	0
			10	12 to 250	0
			20	25 to 400	0

Note 1: Operation may not be stable even in the setting range, depending on the acceleration, deceleration, or installation method.
Note 2: This can be set to 0 in point data. If this is set to 0, the common speed of the parameters data will be applied.
Note 3: The common speed is applied because the initial value (factory-default) is set to 0.

<EJSG series (C series, P4 series, FP1 series)>

Actuator model number				Speed setting range [mm/s] Note 1 and 2	Initial speed value [mm/s] Note 3
Series	Body size	Motor mounting direction	Screw lead		
EJSG	04	E	06	7 to 260	0
			12	15 to 400	0
		R, D, L	06	7 to 200	0
			12	15 to 320	0
	05	E	05	6 to 230	0
			10	12 to 400	0
			20	25 to 680	0
		R, D, L	05	6 to 200	0
			10	12 to 320	0
			20	25 to 560	0
	08	E	05	6 to 120	0
			10	12 to 200	0
			20	25 to 400	0
		R, D, L	05	6 to 100	0
			10	12 to 200	0
			20	25 to 320	0

Note 1: Operation may not be stable even in the setting range, depending on the acceleration, deceleration, or installation method.
Note 2: This can be set to 0 in point data. If this is set to 0, the common speed of the parameters data will be applied.
Note 3: The common speed is applied because the initial value (factory-default) is set to 0.

<GSSD2/GSTK/GSTG/GSTS/GSTL series>

Actuator model number				Speed setting range [mm/s] Note 1 and 2	Initial speed value [mm/s] Note 3
Series	Body size	Motor mounting direction	Screw lead		
GSSD2 GSTK GSTG GSTS GSTL	20	GE	06	10 to 300	0
			09	12 to 400	0
	32	GE	06	10 to 250	0
			12	15 to 500	0
	50	GE	06	10 to 250	0
			12	15 to 500	0

Note 1: Operation may not be stable even in the setting range, depending on the acceleration, deceleration, or installation method.
Note 2: This can be set to 0 in point data. If this is set to 0, the common speed of the parameters data will be applied.
Note 3: The common speed is applied because the initial value (factory-default) is set to 0.

<FLSH/FLCR/FGRC series>

Actuator model number			Speed setting range [mm/s], [deg/s] Note 1, Note 2, Note 4	Initial speed value [mm/s], [deg/s] Note 3, Note 4
Series	Body size	Screw lead		
FLSH	16	H1	5 to 50	0
	20	H1	5 to 50	0
	25	H1	5 to 50	0
FLCR	16	02	2 to 100	0
		08	10 to 250	0
	20	02	2 to 100	0
		08	10 to 300	0
	25	02	2 to 75	0
		06	7 to 200	0
FGRC	10		20 to 200	0
	30		20 to 200	0
	50		20 to 200	0
GCKW	16	H1	5 to 50	0
	20	H1	5 to 50	0
	25	H1	5 to 50	0

Note 1 Operation may not be stable even in the setting range, depending on the acceleration, deceleration, or installation method.
Note 2 This can be set to 0 in the point data. If this is set to 0, the common speed of the parameters data will be applied.
Note 3 The common speed is applied because the initial value (factory-default) is set to 0.
Note 4 [deg] for FGRC series, and [mm] for other models.

3.5.7 Setting the acceleration

The acceleration for the travel interval can be set.

・Setting range and initial values (factory default)

Actuator model number	Acceleration setting range [G] Note 1, Note 2		Initial acceleration value [G] Note 3
Series	When installed horizontally (wall hanging installation)	When installed vertically	
EBS/EBR	0.10 to 1.00 Note 4 Note 5	0.10 to 0.50 Note 4	0.00
GSSD2/GSTK/GSTG/GSTS/GSTL	0.10 to 0.70	0.10 to 0.30	0.00
FLSH/GCKW	0.10 to 0.30	0.10 to 0.30	0.00
FLCR	0.10 to 0.30	0.10 to 0.30	0.00
FGRC	0.10 to 0.30	0.10 to 0.30	0.00

Note 1: When converting units, assume 1G = 9800 mm/s^2 (deg/s^2) for calculation.
Note 2: This can be set to 0 in point data. If this is set to 0, the common acceleration of the parameters data will be applied.
Note 3: The common acceleration is applied because the initial value (factory-default) is set to 0.
Note 4: It can be set from 0.01 G to 0.09 G, but the operation may become unstable.
Note 5: For screw lead 2, use in the range of 0.10 G to 0.50 G. It can be set up to the upper limit of 1.00 G, but the operation may become unstable.

3.5.8 Setting the deceleration

The deceleration for the travel interval can be set.

・Setting range and initial values (factory default)

Actuator model number	Deceleration setting range [G] Note 1, Note 2		Initial acceleration value [G] Note 3
Series	When installed horizontally (wall hanging installation)	When installed vertically	
EBS/EBR	0.10 to 1.00 Note 4 Note 5	0.10 to 0.50 Note 4	0.00
GSSD2/GSTK/GSTG/GSTS/GSTL	0.10 to 0.70	0.10 to 0.30	0.00
FLSH/GCKW	0.10 to 0.30	0.10 to 0.30	0.00
FLCR	0.10 to 0.30	0.10 to 0.30	0.00
FGRC	0.10 to 0.30	0.10 to 0.30	0.00

Note 1: When converting units, assume 1G = 9800 mm/s^2 (deg/s^2) for calculation.
Note 2: This can be set to 0 in point data. If this is set to 0, the common deceleration of the parameters data will be applied.
Note 3: The common deceleration is applied because the initial value (factory-default) is set to 0.
Note 4: It can be set from 0.01 G to 0.09 G, but the operation may become unstable.
Note 5: For screw lead 2, use in the range of 0.10 G to 0.50 G. It can be set up to the upper limit of 1.00 G, but the operation may become unstable.

3.5.9 Selecting the acceleration/deceleration method

You can select the acceleration/deceleration method for the positioning operation and pressing operation. You can select either Common or Trapezoid as the acceleration/deceleration method.

・Selectable acceleration/deceleration methods and initial values (factory-default)

Acceleration/deceleration method	Explanation
Common	The acceleration/deceleration method set by the common acceleration/deceleration method of the parameters data will be applied.
Trapezoid	This is the acceleration/deceleration method where the speed command changes at a certain rate.

* Because the initial value (factory-default) is set to Common, the common acceleration/deceleration method is applied.

3.5.10 Selecting the stop method

You can select the stop method after reaching the target position in positioning operation or pressing operation. You can select Common, Control, Fixed excitation, Automatic Servo OFF 1, Automatic Servo OFF 2, or Automatic Servo OFF 3 as the stop method.

・Selectable stop methods and initial values (factory-default)

Stop method	Explanation
Common	The stop method set by the common stop method of the parameters data will be applied.
Control	After the positioning or pressing operations is completed, the actuator is controlled at a current that can maintain the completion position to hold the stop position.
Fixed excitation	After the positioning or pressing operations is completed, the actuator is held at the stop position by a fixed current set in the parameters data.
Automatic Servo OFF 1	The control stops after reaching the target position in positioning or pressing operation. Servo OFF is initiated after the time set in Automatic servo OFF time 1 in the parameter data elapses.
Automatic Servo OFF 2	The control stops after reaching the target position in positioning or pressing operation. Servo OFF is initiated after the time set in Automatic servo OFF time 2 in the parameters data elapses.
Automatic Servo OFF 3	The control stops after reaching the target position in positioning or pressing operation. Servo OFF is initiated after the time set in Automatic servo OFF time 3 in the parameters data elapses.

* Because the initial value (factory-default) is set to Common, the common stop method is applied.

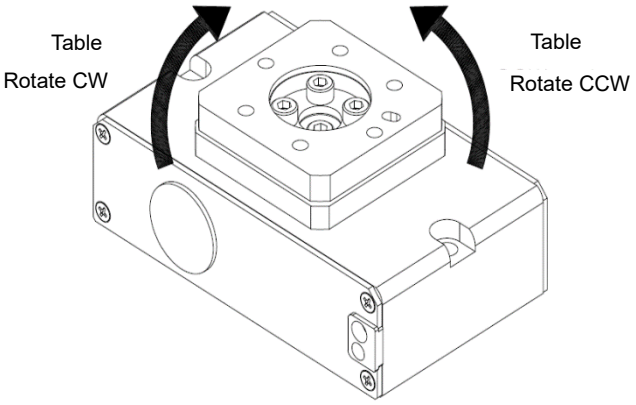
3.5.11 Selecting the rotation direction

Set the rotation direction of the FGRC.

・Selectable rotation directions

Rotation direction	Explanation
Common	The rotation direction set in the common rotation direction of the parameter data is applied.
Shortest rotation Note 1 Note 2	From the current position to the target position, it rotates to a direction in which the operation distance is short.
CW	It rotates in the CW direction (clockwise).
CCW	It rotates in the CCW direction (counterclockwise).

Note 1 When shortest rotation is selected in FGRC series, do not set the operation method to “pressing operation 1, 2.”
Note 2 When shortest rotation is selected in FGRC series, the actuator rotates in the CW direction by setting the position specification method to “incremental.”
* Because the initial value (factory-default) is set to Common, the common rotation direction is applied.



3.5.12 Setting the gain magnification

Use this only when gain adjustment is required for each point. This should normally be used with a setting value of 0.

・Setting range and initial values (factory default)

Actuator model number / Series	Gain magnification setting range [%] Note 1	Initial value of gain magnification [%] Note 2
EBS/EBR/FLSH/FLCR/FGRC/ GSSD2/GSTK/GSTG/GSTS/GSTL/GCKW	0 to 9999	0

Note 1: When this is set to 0, gain magnification will not be used.
Note 2: Gain magnification is not used because the initial value (factory-default) is set to 0.

Using the wrong setting could result in unstable control. If control is unstable, contact CKD.

3.5.13 Setting the point zone

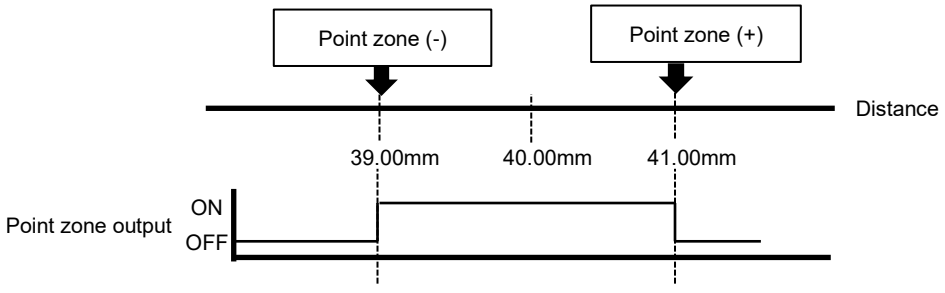
The point zone output signal can be set as the distance from the home position, where the boundary value for switching the signal from OFF to ON and ON to OFF is a point zone (−) and (+), respectively, with the + direction operation being the standard.

・Setting range and initial values (factory default)

Actuator model number / Series	Point zone +, Point zone - [mm], [deg] Note 1	Initial value of point zone [mm], [deg] Note 1
EBS/EBR/FLSH/FLCR/FGRC/ GSSD2/GSTK/GSTG/GSTS/GSTL/GCKW	-9999.99 to 9999.99	0.00

Example 1) Point zone setting and output signal

Point zone (-): 39.00 mm
Point zone (+): 41.00 mm



・Even when the point zone (−) < point zone (+) < 0, the output signal of the point zone turns ON in the interval between the point zone (−) and the point zone (+), and turns OFF in other intervals.
・When the point zone (−) > the point zone (+), the output signal of the point zone is turned OFF in the interval between the point zone (+) and the point zone (−), and turned ON in other intervals.
・When Point zone (+) = Point zone (-), the output signal of the point zone is always OFF.
・If the "Point signal output holding" setting is enabled, the output signal of the point zone will not be turned OFF during servo OFF, emergency stop and brake release.

3.5.14 Setting the pressing rate

The rate to the maximum pressing force in a pressing interval can be set.

・Setting range and initial values (factory default)

Actuator model number			Setting range of the pressing rate [%] Note 1	Default value of pressing rate [%] Note 2
Series	Body size	Screw lead		
EBS	04	06	20 to 100	0
		12	20 to 100	0
	05	02	20 to 80	0
		05	20 to 80	0
		10	20 to 80	0
		20	20 to 80	0
	08	05	20 to 100	0
		10	20 to 100	0
		20	20 to 100	0
EJSG	04	06	20 to 100	0
		12	20 to 100	0
	05	05	20 to 80	0
		10	20 to 80	0
		20	20 to 80	0
	08	05	20 to 100	0
		10	20 to 100	0
		20	20 to 100	0
EBR	04	06	20 to 100	0
		12	20 to 100	0
	05	02	20 to 80	0
		05	20 to 80	0
		10	20 to 80	0
		20	20 to 80	0
	08	05	20 to 100	0
		10	20 to 100	0
		20	20 to 100	0
GSSD2 GSTK GSTG GSTS GSTL	20	06	40 to 100	0
		09	40 to 100	0
	32	06	30 to 100	0
		12	30 to 100	0
	50	06	30 to 100	0
		12	30 to 100	0

Note 1: The pressing rate can be set to 0 in the point data. When the rate is set to 0, the common pressing rate of parameter data is applied.
Note 2: Since the default value (value upon shipping) is set to 0, the common pressing rate is applied.

Actuator model number			Setting range of the pressing rate [%] Note 1	Default value of pressing rate [%] Note 2
Series	Body size	Screw lead		
FLSH	16	H1	30 to 100	0
	20	H1	30 to 100	0
	25	H1	30 to 100	0
FLCR	16	02	30 to 100	0
		08	30 to 100	0
	20	02	30 to 100	0
		08	30 to 100	0
	25	02	30 to 100	0
		06	30 to 100	0
FGRC	10		20 to 100	0
	30		20 to 100	0
	50		20 to 100	0

Note 1: The pressing rate can be set to 0 in the point data. When the rate is set to 0, the common pressing rate of parameter data is applied.

Note 2: Since the default value (value upon shipping) is set to 0, the common pressing rate is applied

3.5.15 Setting the pressing speed

The speed of the pressing interval can be set.

・Setting range and initial values (factory default)

Actuator model number		Pressing speed setting range [mm/s], [deg/s] Note 1, Note 3	Initial pressing speed value [mm/s], [deg/s] Note 2, Note 3
Series	Screw lead		
EBS/EJSG/EBR		5 to 20	0
GSSD2/GSTK/GSTG/GSTS/GSTL	6	10 to 20	0
	9	12 to 20	0
	12	15 to 20	0
FLCR	2	2 to 20	0
	6, 8	5 to 20	0
FLSH/GCKW		5 to 15	0
FGRC		20 to 30 Note 4	0

Note 1: The pressing speed can be set to 0 in point data. If this is set to 0, the common pressing speed of the parameters data will be applied.
Note 2: The common pressing speed is applied because the initial value (factory default) is set to 0.
Note 3: [deg] for FGRC series, and [mm] for other models.
Note 4: The initial value of the common pressing speed is 15 mm/s. Change the pressing speed or the common pressing speed within the setting range when performing pressing operation using the FGRC series.
* Set the pressing speed to be less than or equal to the speed for the transport interval. If the pressing speed is higher, the speed for the transport interval is automatically applied to the pressing speed.

3.5.16 Setting the pressing distance

The pressing interval width can be set.

・Setting range and initial values (factory default)

Actuator model number	Pressing distance setting range [mm], [deg] Note 1, Note 2, Note 3	Initial pressing distance value [mm], [deg] Note 3, Note 4
Series		
EBS/EBR/FLSH/FLCR/ GSSD2/GSTK/GSTG/GSTS/GSTL/GCKW	Negative stroke length to positive stroke length	0
FGRC	0 to 359.99	0

Note 1: If the pressing distance is set to 0 in the point data, the common pressing distance of the parameters data will be applied.
Note 2: Do not set the common pressing distance to 0.
Note 3: [deg] for FGRC series, and [mm] for other models.
Note 4: The common pressing distance is applied because the initial value (factory-default) is set to 0.

3.6 Operation timing chart

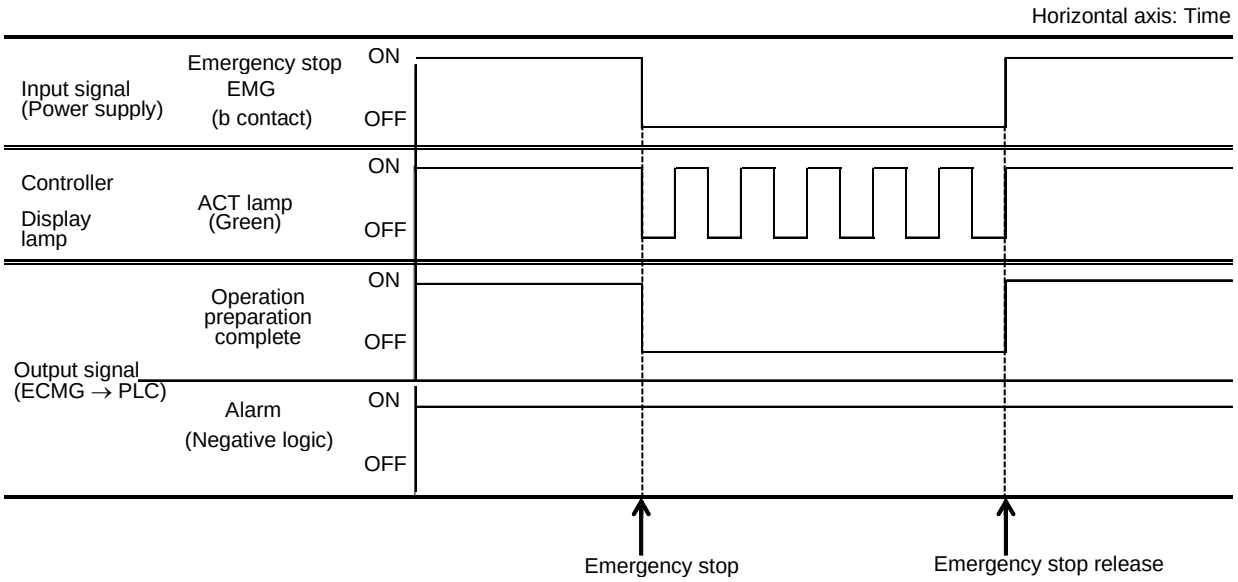
There are two alarm status signals: “Alarm status (communication unit)” that indicates the alarm status of the communication unit, and “Alarm status” that indicates the alarm status of the drive unit. Check both alarm statuses before operating the actuator.

3.6.1 Emergency stop and release

CAUTION

Be careful of emergency stop wiring disconnection.
Emergency stop status is not treated as an alarm, so no alarm signal will be output.

If an emergency stop is performed during operation, a short is generated between the motor terminals after deceleration and stop, and it enters the dynamic brake status.
Operation preparation complete output turns OFF until the emergency stop is released. The electromagnetic brake is also locked if a brake is attached.
To release emergency stop, first confirm the surrounding area is safe, and then turn the emergency stop signal (b contact) ON.



- Dynamic brakes play a role of helping to stop operation, but they do not have a holding torque when stopped. Use an actuator with a brake when installing the actuator vertically.
- When performing an emergency stop, it may take several seconds to stop depending on the travel speed and load.

3.6.2 Forced release of brake

⚠WARNING

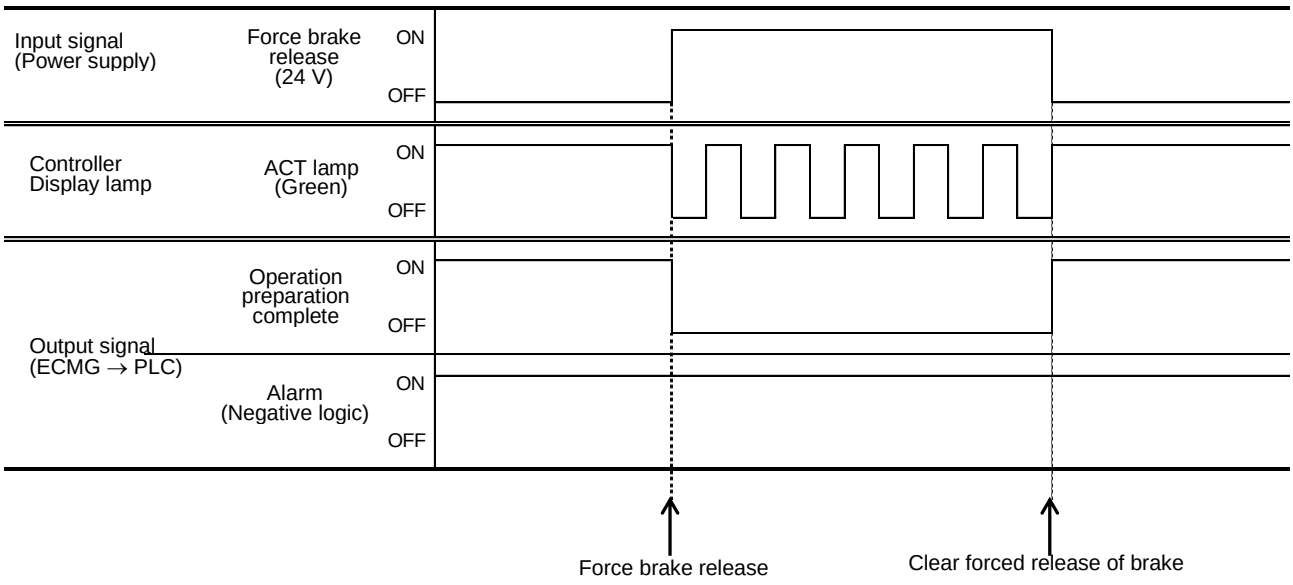
Always set the input for force brake release (BRK) to either 0 VDC or open during normal operation, so that the brake can be applied.
If 24 VDC is applied to force brake release (BRK), the brake will be forcibly released. The movable part of the actuator could fall, causing injury or damaging the workpiece.

CAUTION

Be careful of force brake release wiring disconnection.
Force brake release status is not treated as an alarm, so no alarm signal will be output.

When the force brake release signal is input (24 V applied), the electromagnetic brake is forcibly released (if one is attached). If force brake release is performed during operation, no current is passed to the motor after deceleration stops. This operates the same as emergency stop, but the electromagnetic brake is left released.

Horizontal axis: Time



3.6.3 Operation of servo ON/OFF

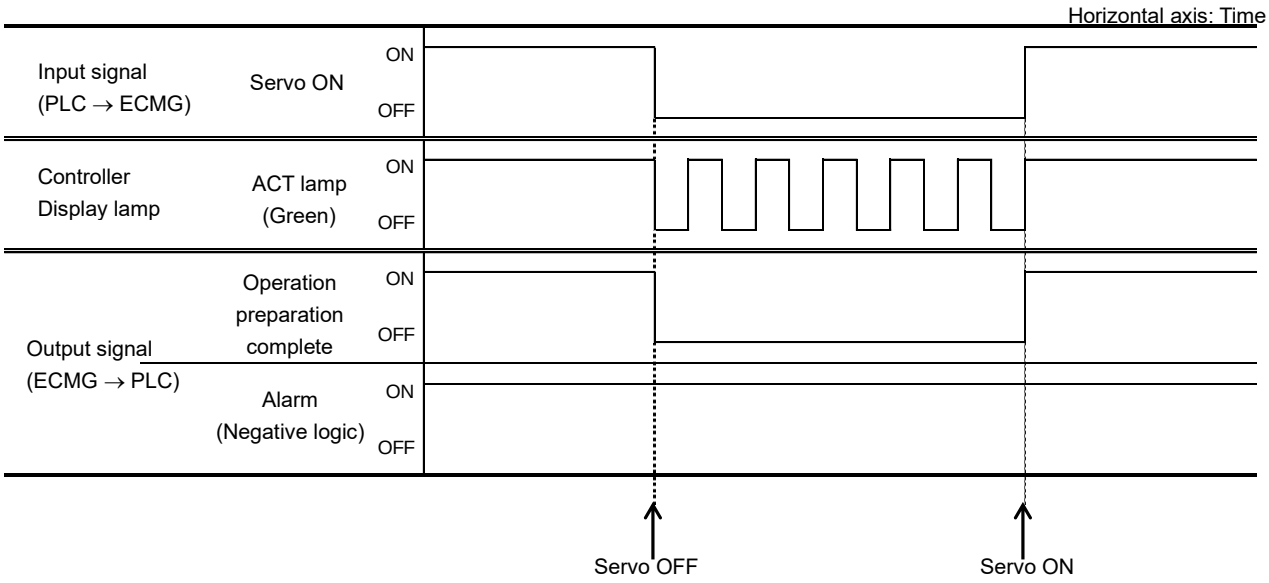
⚠WARNING

Keep safety in mind.
When turning servo OFF during operation, operation may continue with the inertia of the workpiece.

CAUTION

When turning the servo ON, check that the actuator operates safely.
The actuator could start operating once the servo is turned ON, which could cause injury or damage the workpiece.

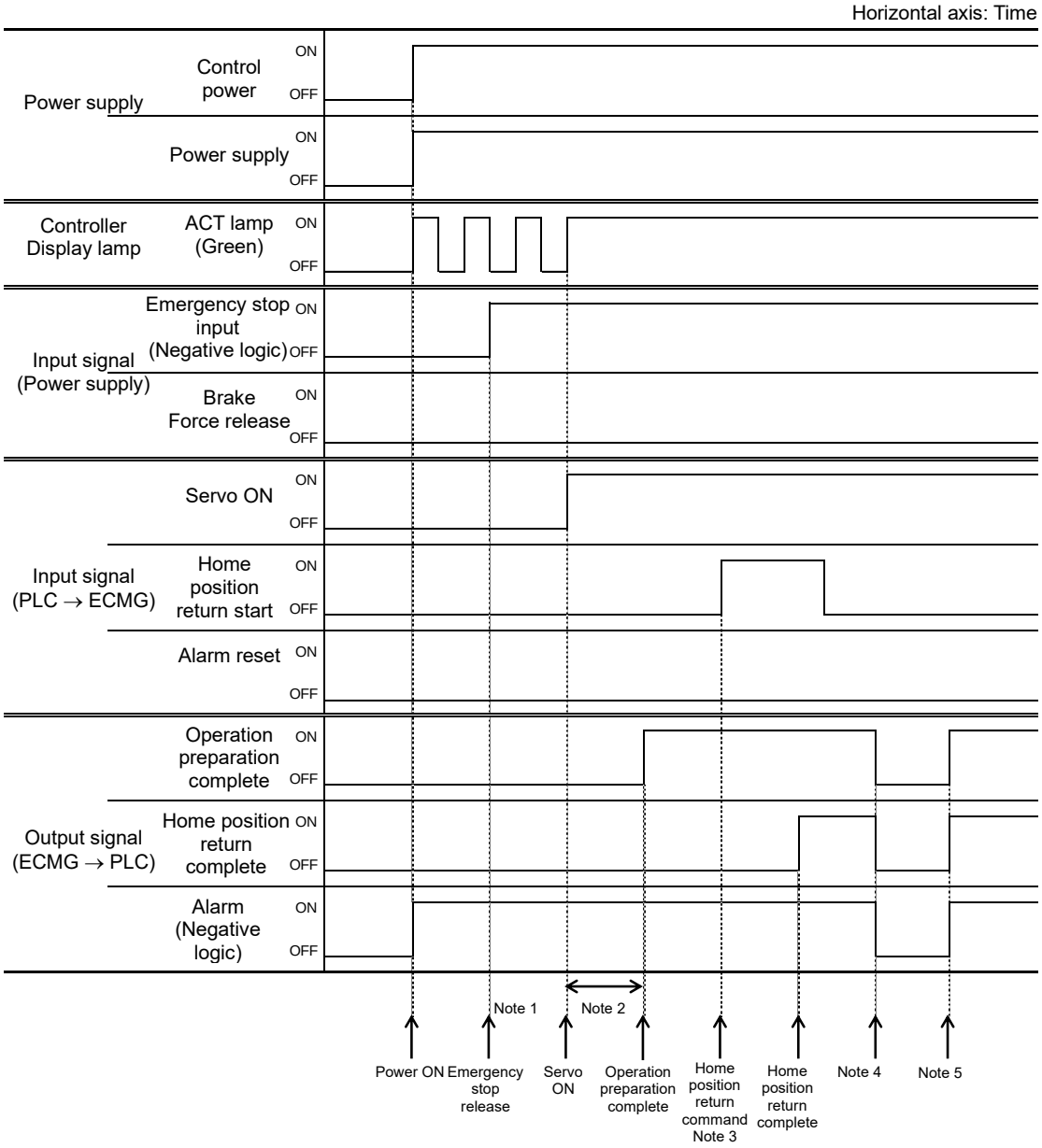
If the servo is turned OFF (servo ON signal turned OFF) during operation, no current is passed to the motor after deceleration stops. While the servo is OFF, the ready for operation output is turned OFF. If a brake is attached, the electromagnetic brake is locked. The setting software “S-Tools” enables turning the servo ON/OFF regardless of the status of servo ON signal.



If operation by setting tool is enabled, servo ON/OFF operation cannot be received via the servo ON signal.

3.6.4 Power-on sequence

The diagram below shows the timing chart of home position return completion from the beginning of the return after the power is turned on.



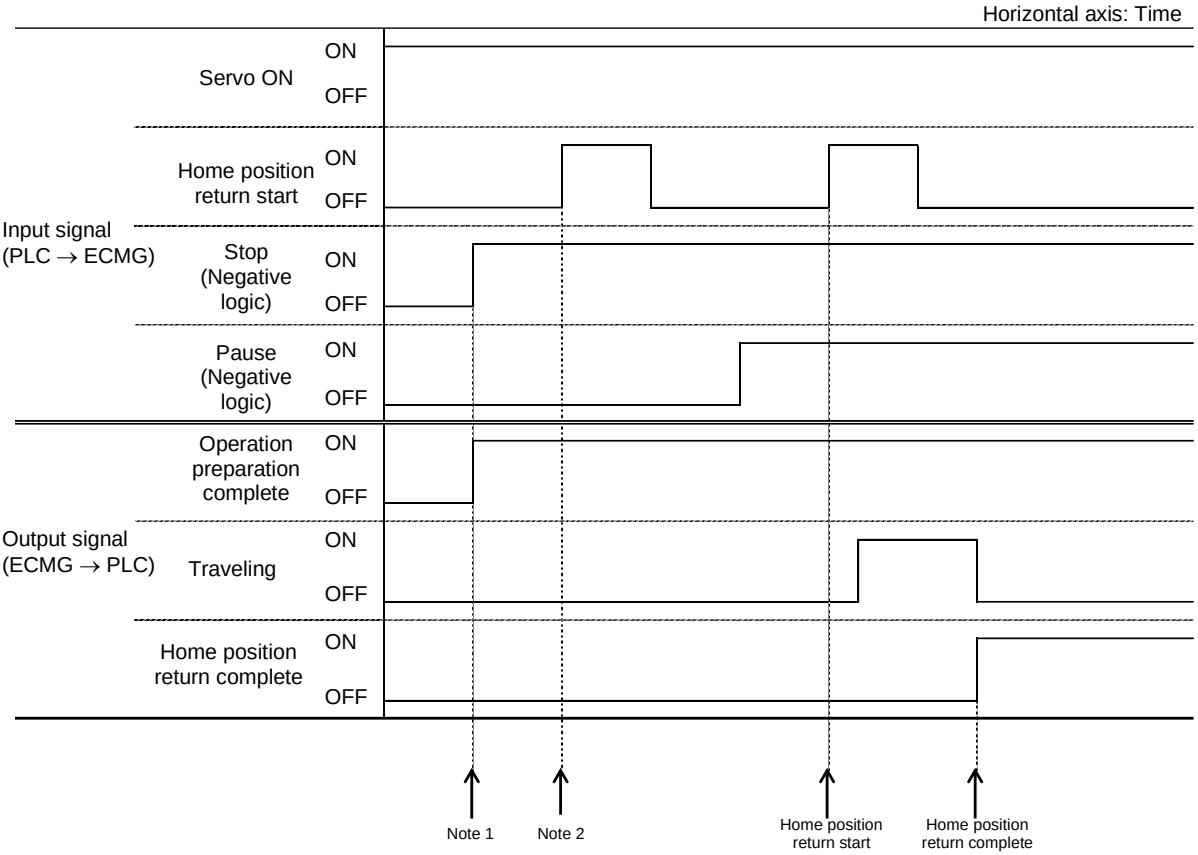
Note 1: The emergency stop is not released automatically. The figure above shows the timing when it is recognized that the emergency stop is ON after the power is turned on.
Note 2: Depending on the stroke position, operation preparation complete takes 2 s to 10 s following the first servo ON after turning the power ON.
Note 3: When operating with the parameter automatic home position return is disabled.
Note 4: When operation with the setting tool is enabled (TOOL mode).
Note 5: When operation with the setting tool is disabled (PLC mode).

Due to the use of a stepping motor, excitation phase detection is performed following the first servo ON after turning the power ON.

■ Effect of stop and pause signals on operation

After turning on the power, turn on the stop and pause before turning on a travel command such as the home position return start. Actuator cannot be operated while the stop or pause is OFF.

・Time chart



Note 1: While the stop is OFF, the operation preparation complete does not turn ON even when the servo is ON, and actuators do not operate even when a travel command such as the home position return start is turned ON.

Note 2: While the pause is OFF, actuators do not operate even if a travel command such as home position return start is turned ON.

3.6.5 Home position return operation

If contacting with the workpiece during a home position return, the home position may be displaced.

■ EBS/EJSG/EBR (incremental encoder)

Home position return operation is performed according to parameters listed in the table below.

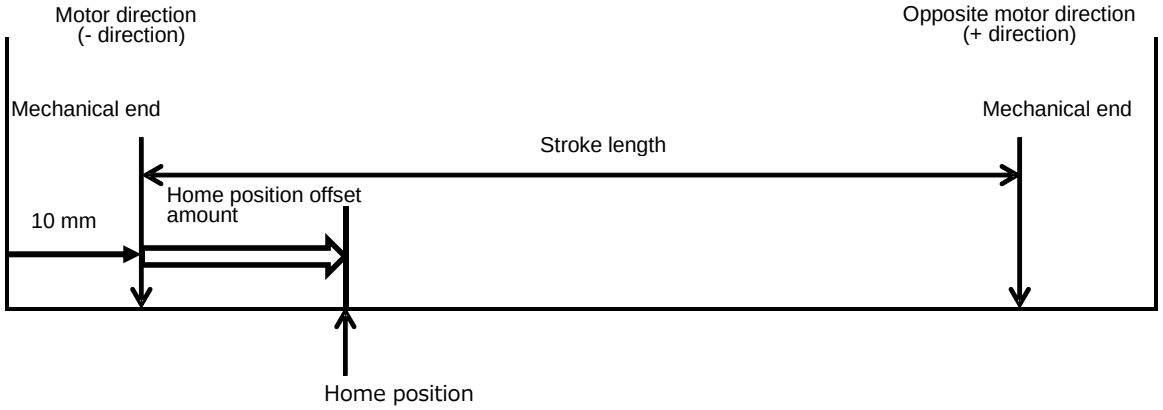
Setting item	Overview
Home position return direction (coordinate axis)	Sets the home position return direction.
Home position return speed	Sets the home position return speed.
Home position offset amount	Sets the offset amount for the home position.
Automatic home position return	Sets whether to automatically home position return during operation when the power supply is turned ON.

* Refer to “3.4.1 Parameters List” for the setting range and initial value.

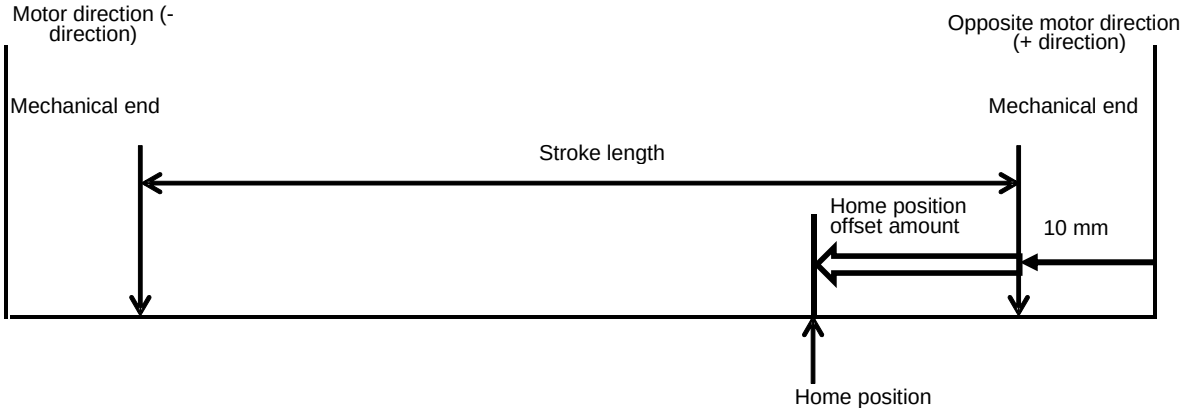
The table below shows the relationship between the "Home position return direction (coordinate axis)" setting and the home position and the coordinate axis when the "Home position offset amount" = 0 mm.

Home position return direction (coordinate axis)	Home position	+ direction	- direction
Normal (normal coordinates)	10 mm from the mechanical end on the motor side toward the opposite motor direction	Opposite motor direction	Motor direction
Opposite (normal coordinates)	10 mm from the mechanical end on the opposite motor side toward the motor direction	Opposite motor direction	Motor direction
Opposite (inverse coordinates)	10 mm from the mechanical end on the opposite motor side toward the motor direction	Motor direction	Opposite motor direction

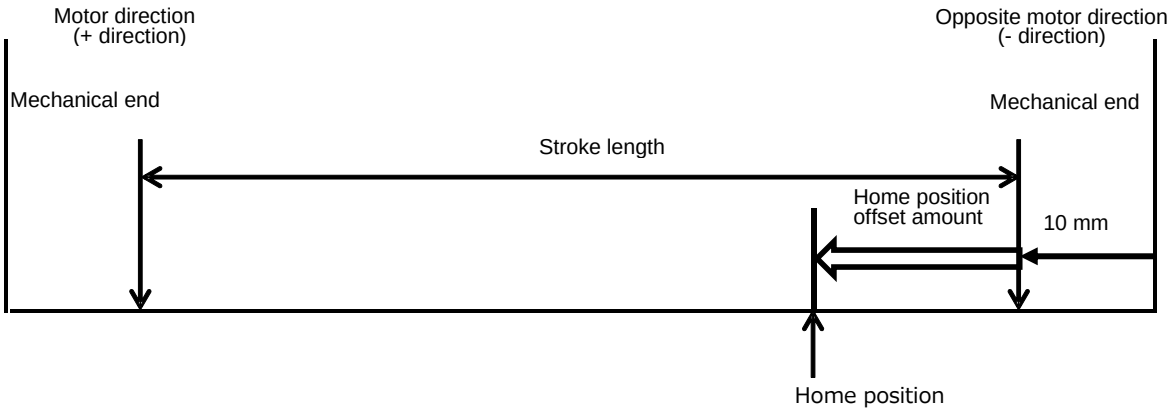
<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Normal (normal coordinates)">



<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Normal (normal coordinates)">

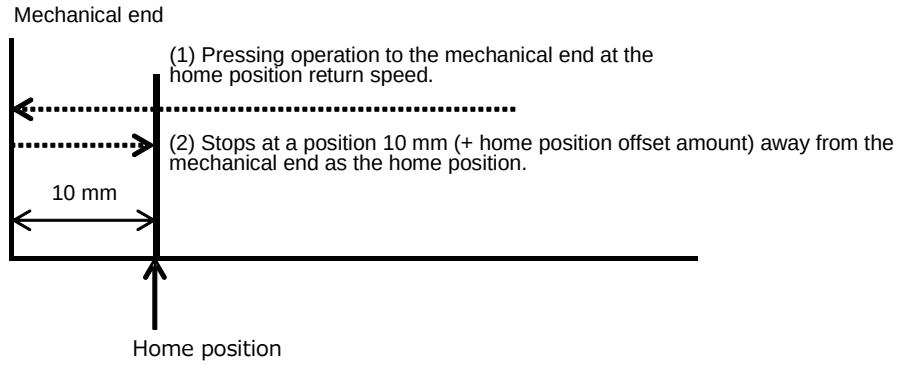


<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Opposite (inverse coordinates)">

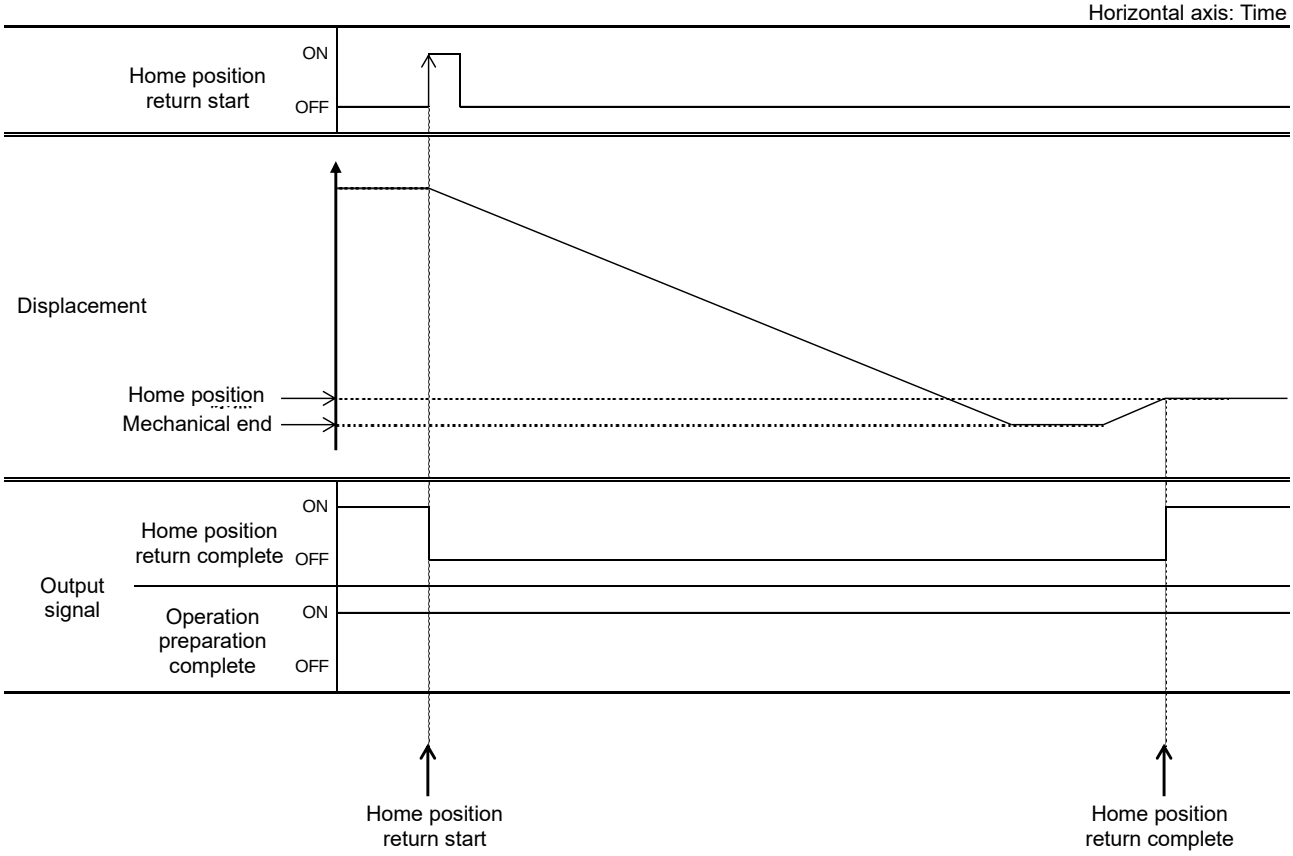


<Home position return operation>

When home position return is performed, it travels to the mechanical end with a pressing operation and then travels to the mechanical end and then to a position 10 mm away from the mechanical end as the home position.



<Time chart>



* The home position return complete output turns OFF during the home position return.

■ EBS/EJSG/EBR (absolute encoder)

Home position return operation is performed according to parameters listed in the table below

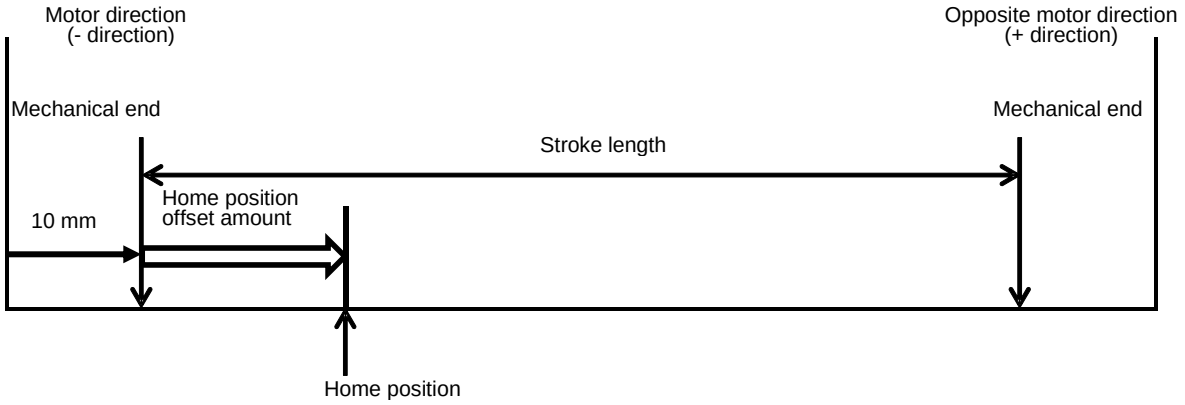
Setting item	Overview
Home position return direction (coordinate axis)	Sets the home position return direction.
Home position return speed	Sets the home position return speed.
Home position offset amount	Sets the offset amount for the home position.

* Refer to “3.4.1 Parameters List” for the setting range and initial value.
* The automatic home position return is disabled for EBS/EJSG/EBR..

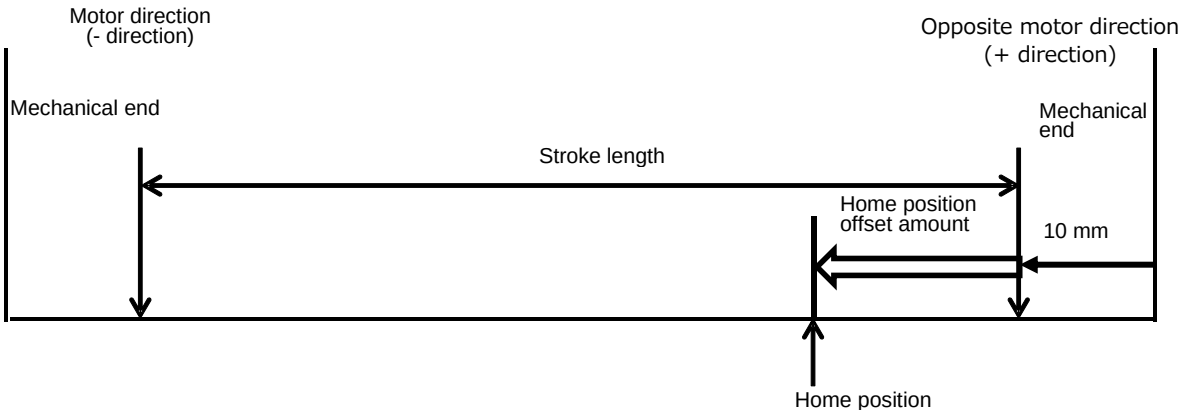
The table below shows the relationship between the "Home position return direction (coordinate axis)" setting and the home position and the coordinate axis when the "Home position offset amount" = 0 mm.

Home position return direction (coordinate axis)	Home position	+ direction	- direction
Normal (normal coordinates)	10 mm from the mechanical end on the motor side toward the opposite motor direction	Opposite motor direction	Motor direction
Opposite (normal coordinates)	10 mm from the mechanical end on the opposite motor side toward the motor direction	Opposite motor direction	Motor direction
Opposite (inverse coordinates)	10 mm from the mechanical end on the opposite motor side toward the motor direction	Motor direction	Opposite motor direction

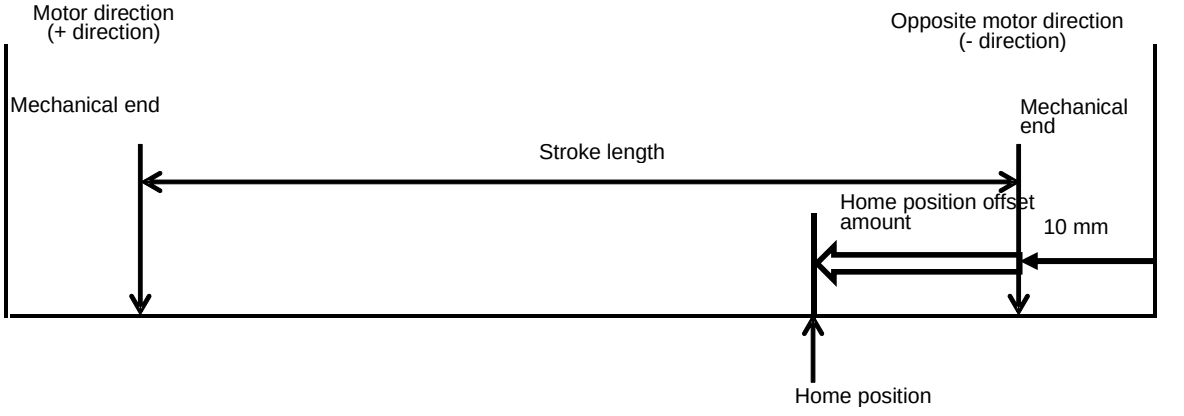
<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Normal (normal coordinates)">



<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Opposite (normal coordinates)">

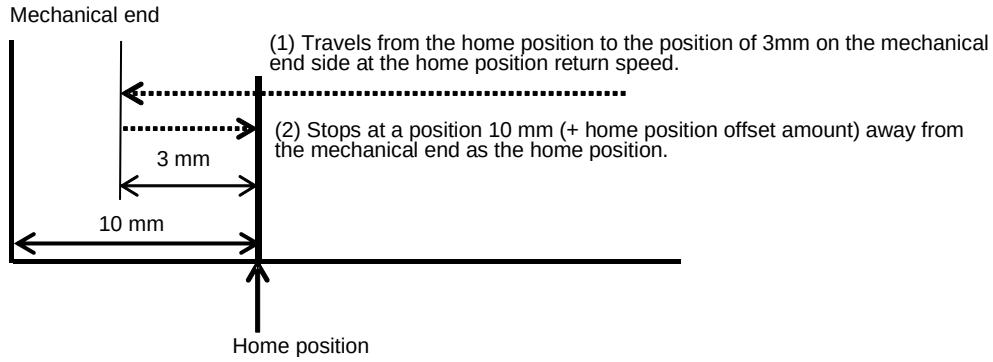


<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Opposite (inverse coordinates)">

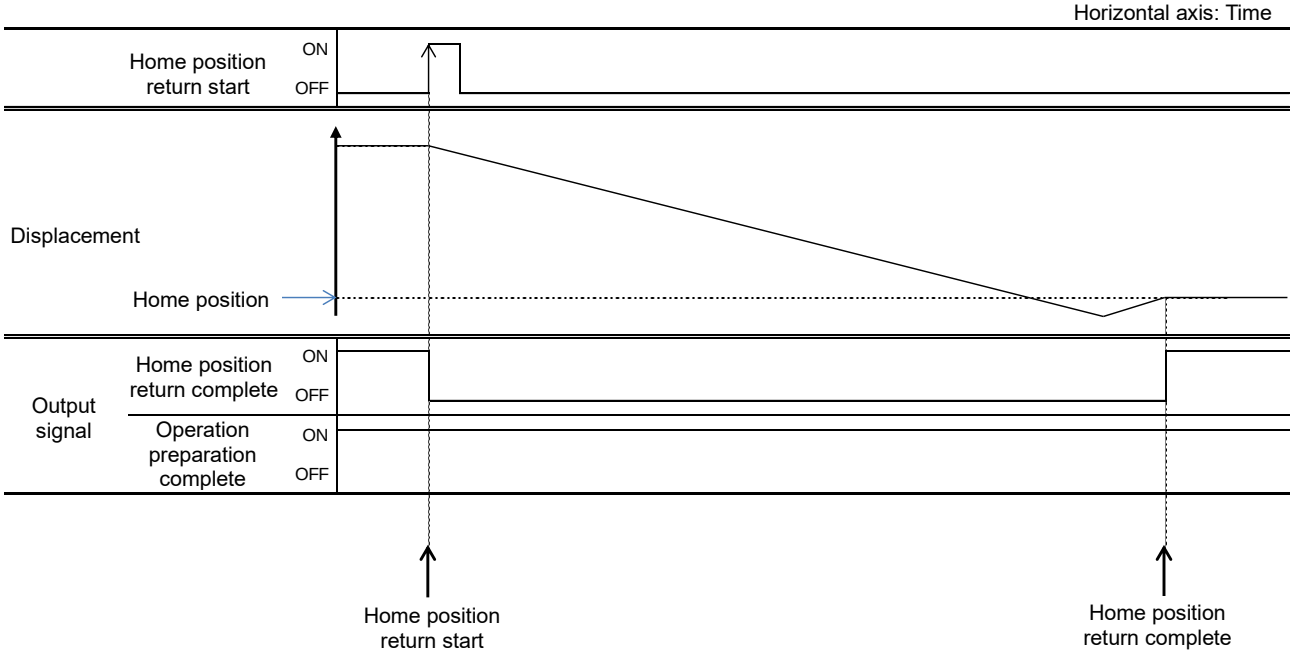


<Home position return operation>

When home position return is performed, it travels 3 mm from the home position of the side of the mechanical end, and then travels to the home position without pressing against the mechanical end.
An absolute encoder without a battery is used, so point travel is possible even if home position return operation is not executed.
The home position is 10 mm from the mechanical end.



<Time chart>



* The home position return complete output turns OFF during the home position return.

■ GSSD2/GSTK/GSTG/GSTS/GSTL (incremental encoder)

Home position return operation is performed according to parameters listed in the table below.

Setting item	Overview
Home position return direction (coordinate axis)	Sets the home position return direction.
Home position return speed	Sets the home position return speed.
Home position offset amount	Sets the offset amount for the home position.
Automatic home position return	Sets whether to automatically home position return during operation when the power supply is turned ON.

* Refer to "3.4.1 Parameters List" for the setting range and initial value.

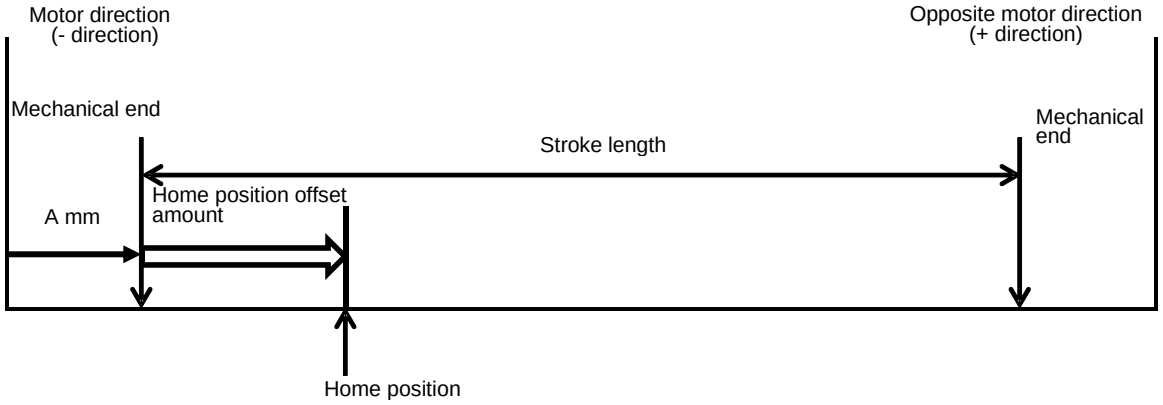
The table below shows the relationship between the "Home position return direction (coordinate axis)" setting and the home position and the coordinate axis when the "Home position offset amount" = 0 mm. The value entered in A is different for each model.

Home position return direction (coordinate axis)	Home position	+ direction	- direction
Normal (normal coordinates)	A mm from the mechanical end on the motor side toward the opposite motor direction	Opposite motor direction	Motor direction
Opposite (normal coordinates)	A mm from the mechanical end on the opposite motor side toward the motor direction	Opposite motor direction	Motor direction
Opposite (inverse coordinates)	A mm from the mechanical end on the opposite motor side toward the motor direction	Motor direction	Opposite motor direction

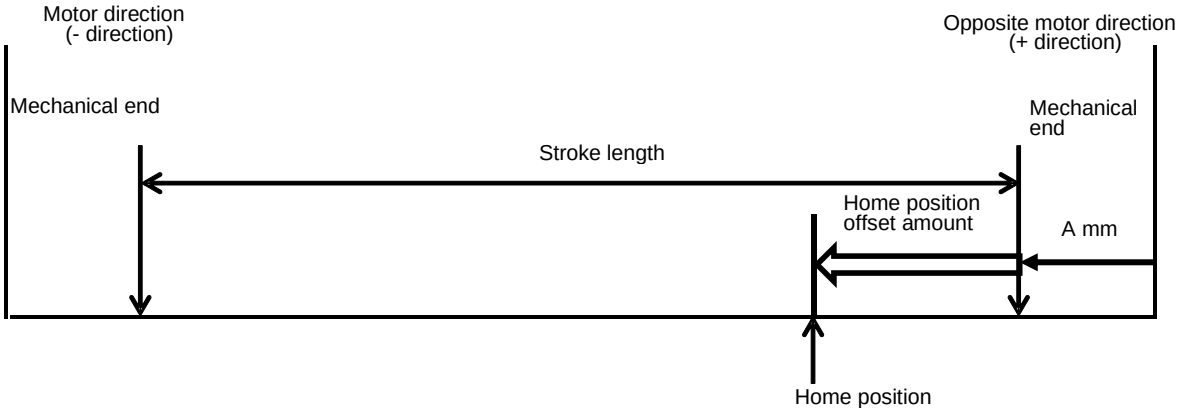
<The value of A (position from mechanical end) for each model>
When the parameter "home position return direction" is "Normal" and the "Home position offset amount" is "0.00," the position from the mechanical end in the table below will be the home position.

Actuator model number			Position from mechanical end [mm]
Series	Body size	Screw lead	
GSSD2 GSTK GSTG GSTS GSTL	20	06	3.0
		09	
	32	06	
		12	
	50	06	
		12	
GSTG	20	06	4.1
		09	
	32	06	2.6
		12	
	50	06	3.3
		12	
GSTS GSTL	20	06	5.0
		09	
	32	06	5.6
		12	
	50	06	2.8
		12	

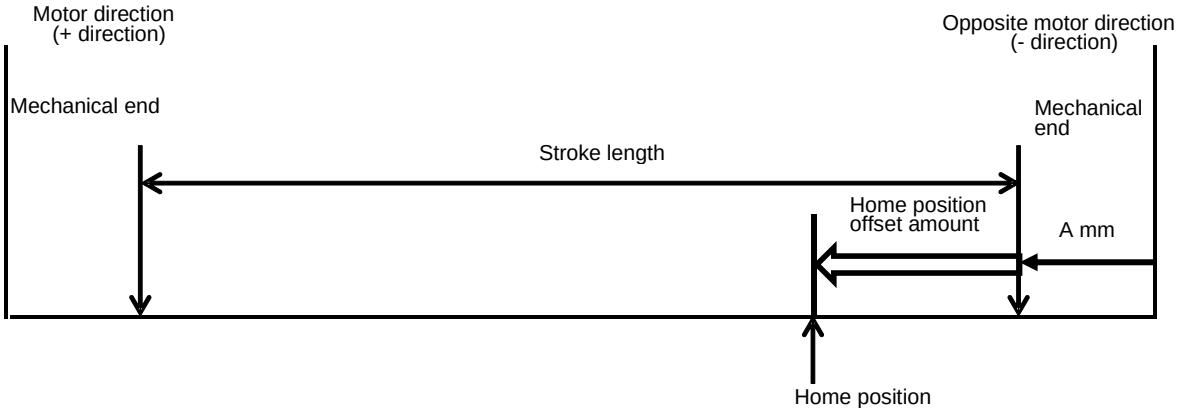
<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Normal (normal coordinates)">



<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Opposite (normal coordinates)">

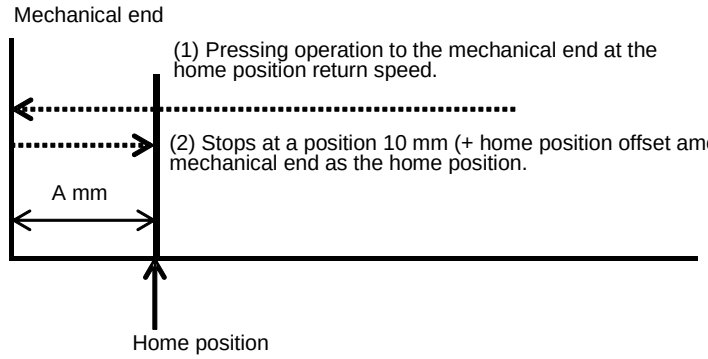


<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Opposite (inverse coordinates)">

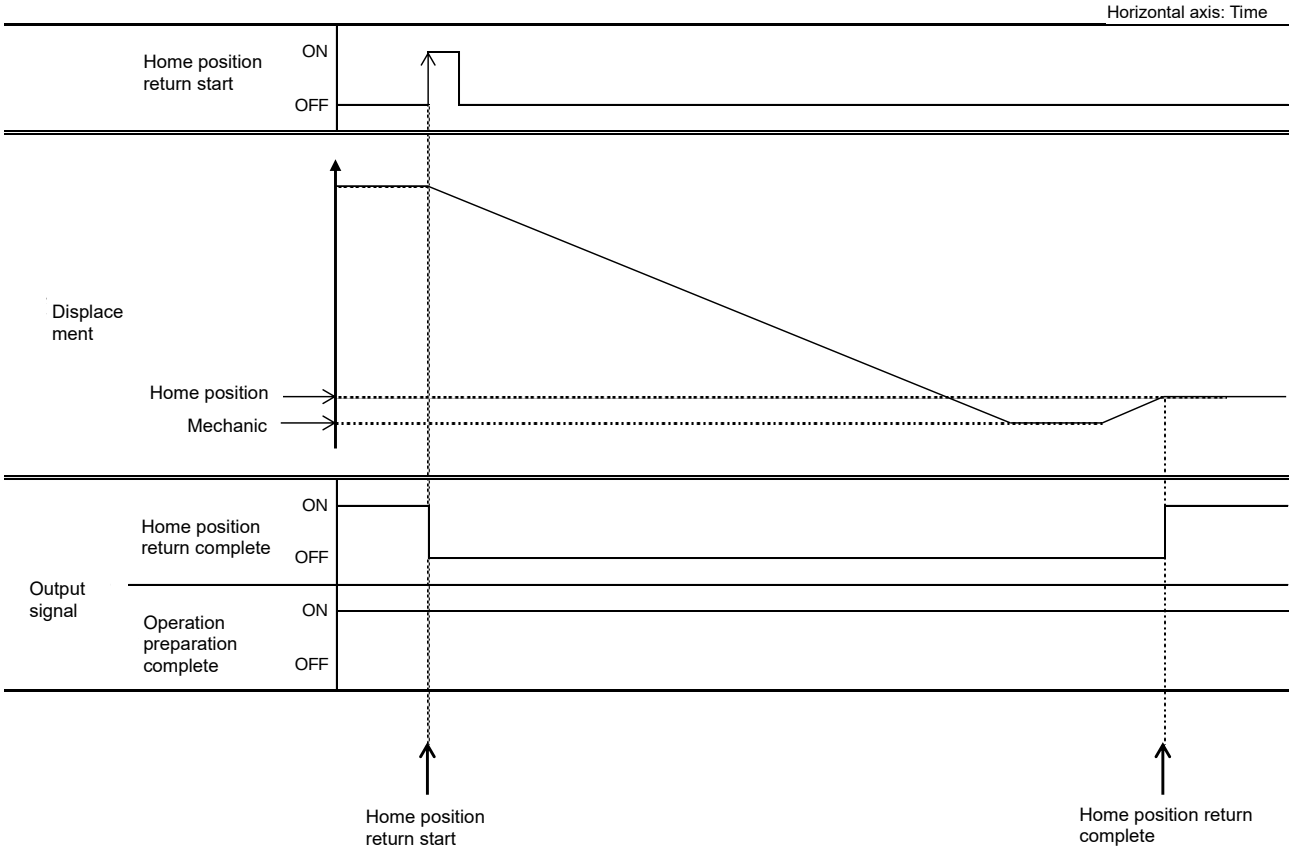


<Home position return operation>

When home position return is performed, it travels to the mechanical end with a pressing operation and then travels to the mechanical end and then to a position A mm away from the mechanical end as the home position.



<Time chart>



* The home position return complete output turns OFF during the home position return.

■ GSSD2/GSTK/GSTG/GSTS/GSTL (absolute encoder)

Home position return operation is performed according to parameters listed in the table below.

Setting item	Overview
Home position return direction (coordinate axis)	Sets the home position return direction.
Home position return speed	Sets the home position return speed.
Home position offset amount	Sets the offset amount for the home position.

* Refer to "3.4.1 Parameters List" for the setting range and initial value.
* An absolute encoder without a battery is used, so the automatic home position return will be disabled.

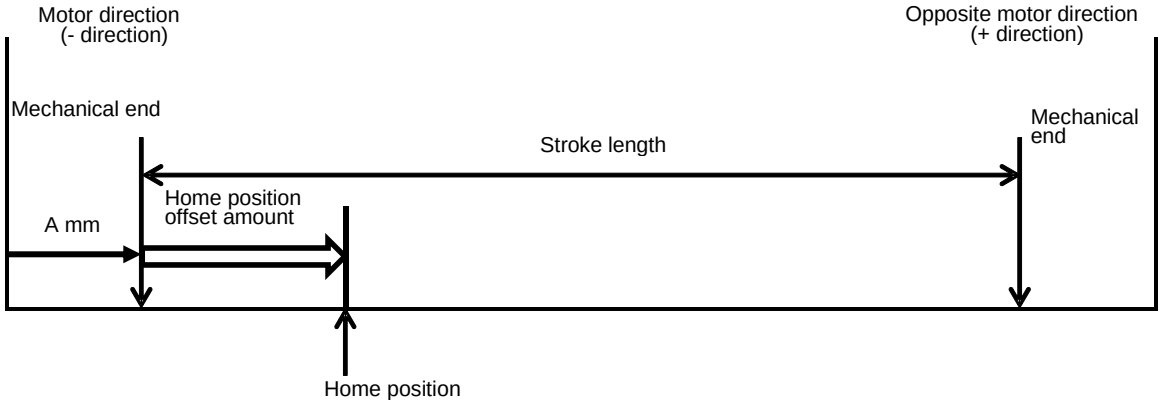
The table below shows the relationship between the "Home position return direction (coordinate axis)" setting and the home position and the coordinate axis when the "Home position offset amount" = 0 mm. The value entered in A is different for each model.

Home position return direction (coordinate axis)	Home position	+ direction	− direction
Normal (normal coordinates)	A mm from the mechanical end on the motor side toward the opposite motor direction	Opposite motor direction	Motor direction
Opposite (normal coordinates)	A mm from the mechanical end on the opposite motor side toward the motor direction	Opposite motor direction	Motor direction
Opposite (inverse coordinates)	A mm from the mechanical end on the opposite motor side toward the motor direction	Motor direction	Opposite motor direction

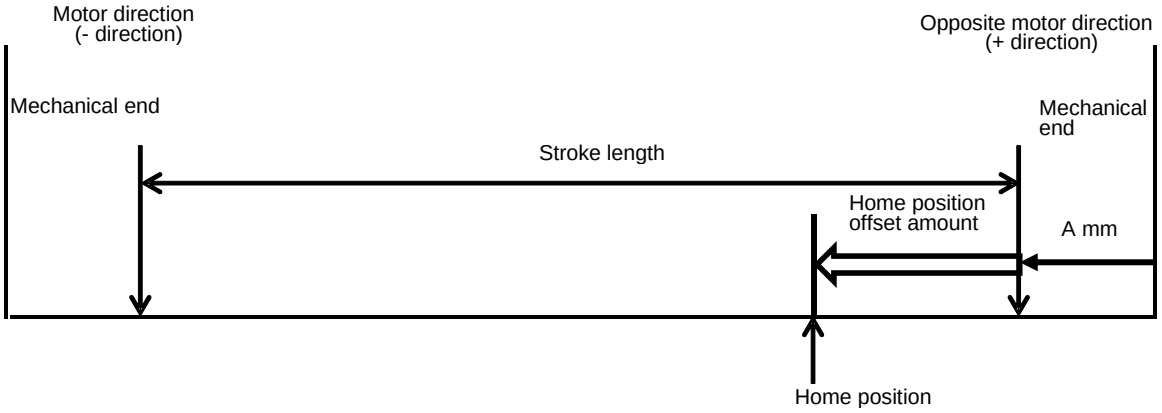
<The value of A (position from mechanical end) for each model>
When the parameter "home position return direction" is "Normal" and the "Home position offset amount" is "0.00," the position from the mechanical end in the table below will be the home position.

Actuator model number			Position from mechanical end [mm]
Series	Body size	Screw lead	
GSSD2 GSTK GSTG GSTS GSTL	20	06	3.0
		09	
	32	06	
		12	
	50	06	
		12	
GSTG	20	06	4.1
		09	
	32	06	2.6
		12	
	50	06	3.3
		12	
GSTS GSTL	20	06	5.0
		09	
	32	06	5.6
		12	
	50	06	2.8
		12	

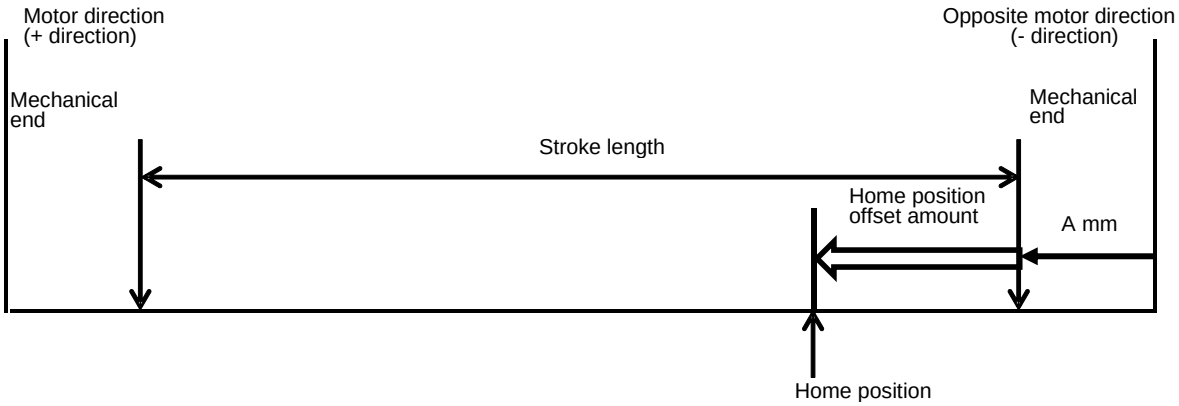
<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Normal (normal coordinates)">



<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Opposite (normal coordinates)">

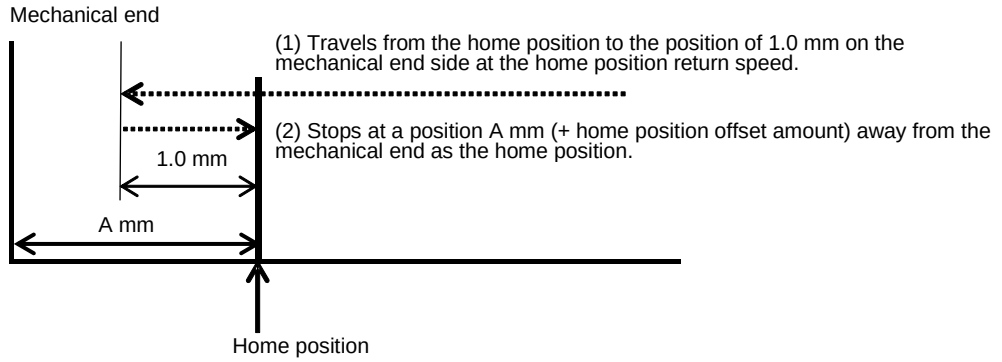


<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Opposite (inverse coordinates)">

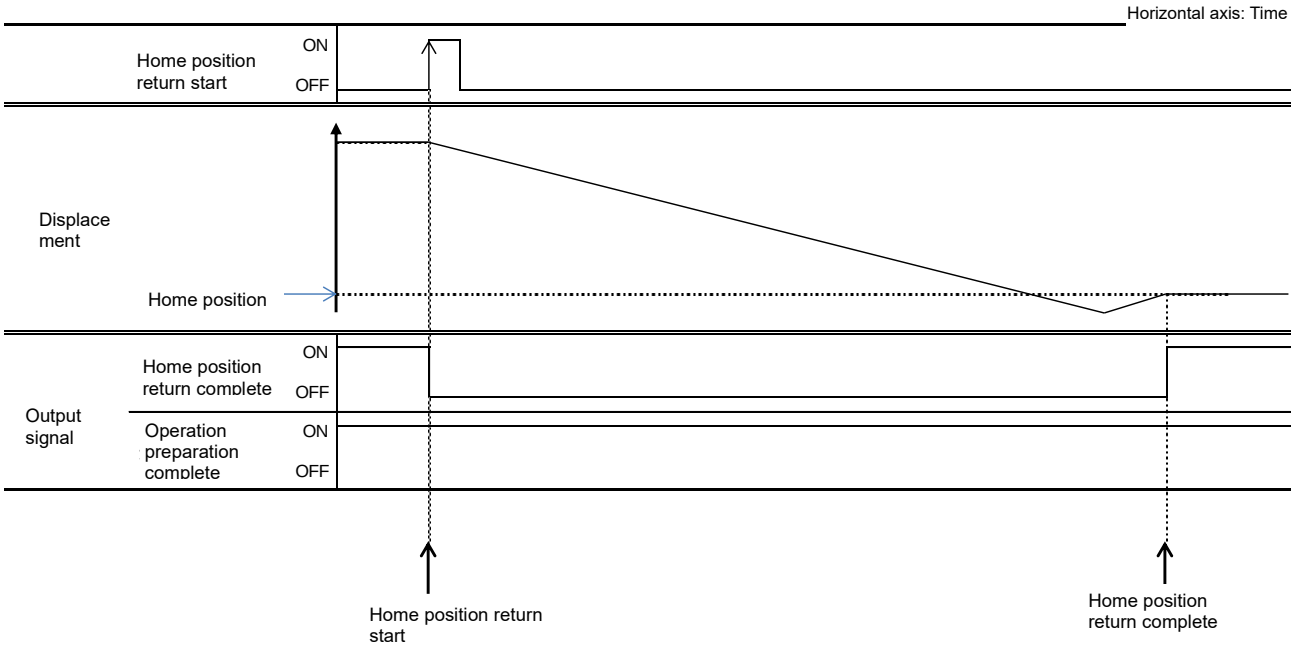


<Home position return operation>

When home position return is performed, it travels 3 mm from the home position of the side of the mechanical end, and then travels to the home position without pressing against the mechanical end. An absolute encoder without a battery is used, so point travel is possible even if home position return operation is not executed. The home position is 10 mm from the mechanical end.



<Time chart>



* The home position return complete output turns OFF during the home position return.

■ FLSH/GCKW

Home position return operation is performed according to parameters listed in the table below.

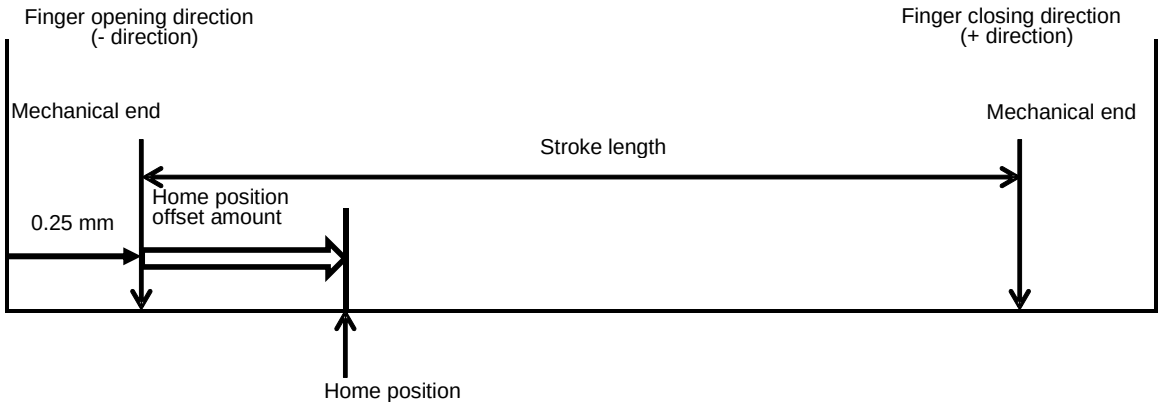
Setting item	Overview
Home position return direction (coordinate axis)	Sets the home position return direction.
Home position return speed	Sets the home position return speed.
Home position offset amount	Sets the offset amount for the home position.
Automatic home position return	Sets whether to automatically home position return during operation when the power supply is turned ON.

* Refer to “3.4.1 Parameters List” for the setting range and initial value.

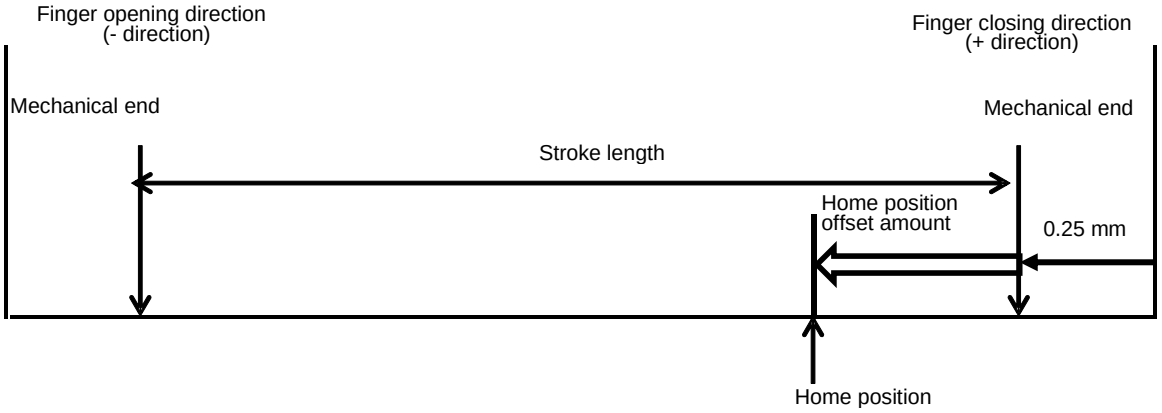
The table below shows the relationship between the "Home position return direction (coordinate axis)" setting and the home position and the coordinate axis when the "Home position offset amount" = 0 mm.

Home position return direction (coordinate axis)	Home position	+ direction	- direction
Normal (normal coordinates)	0.25 mm from the mechanical end on the motor side toward the opposite motor direction	Closing direction	Opening direction
Opposite (normal coordinates)	0.25 mm from the mechanical end on the opposite motor side toward the motor direction	Closing direction	Opening direction
Opposite (inverse coordinates)	0.25 mm from the mechanical end on the opposite motor side toward the motor direction	Opening direction	Closing direction

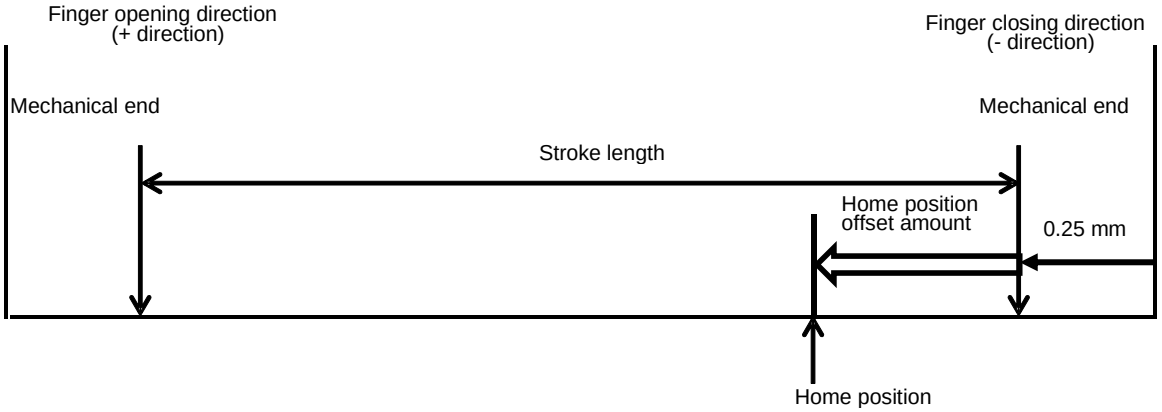
<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Normal (normal coordinates)">



<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Opposite (normal coordinates)">

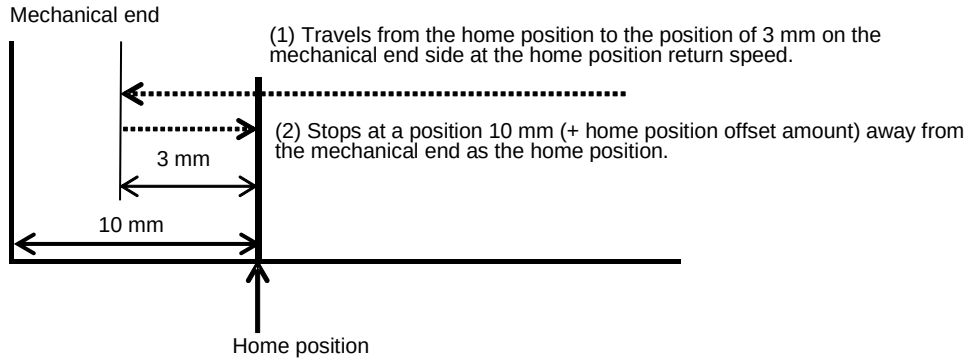


<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Opposite (inverse coordinates)">

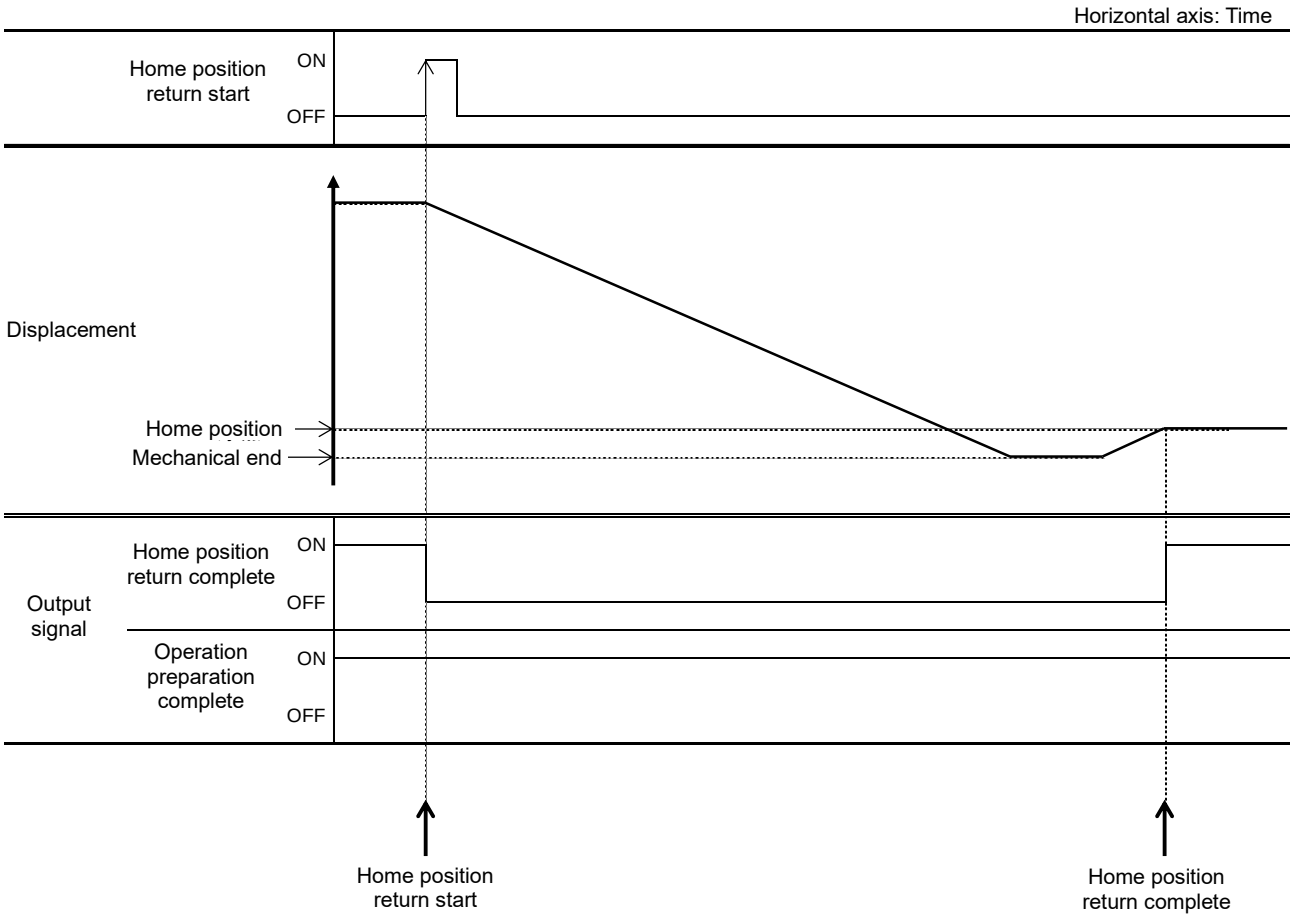


<Home position return operation>

When home position return is performed, it travels 3 mm from the home position of the side of the mechanical end, and then travels to the home position without pressing against the mechanical end. An absolute encoder without a battery is used, so point travel is possible even if home position return operation is not executed. The home position is 10 mm from the mechanical end.



<タイムチャート>



* The home position return complete output turns OFF during the home position return.

■ FLCR

Home position return operation is performed according to parameters listed in the table below

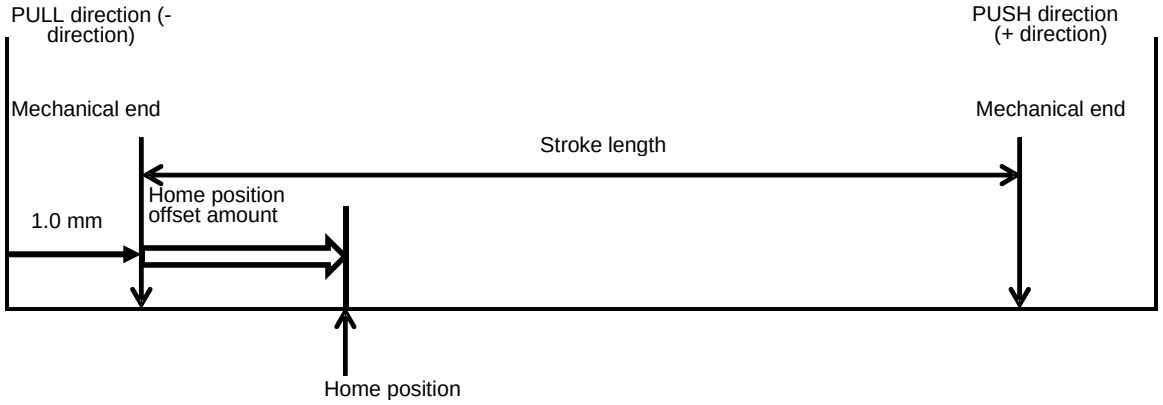
Setting item	Overview
Home position return direction (coordinate axis)	Sets the home position return direction.
Home position return speed	Sets the home position return speed.
Home position offset amount	Sets the offset amount for the home position.
Automatic home position return	Sets whether to automatically home position return during operation when the power supply is turned ON.

* Refer to “3.4.1 Parameters List” for the setting range and initial value.

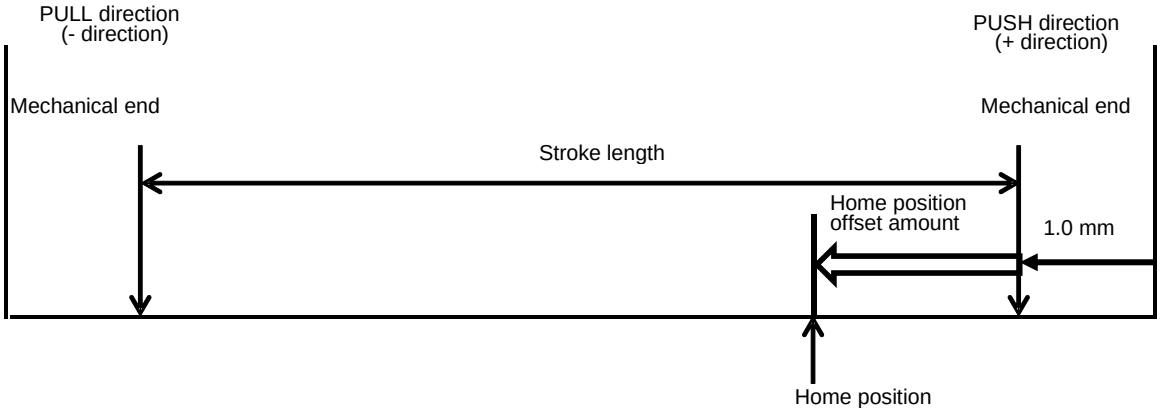
The table below shows the relationship between the "Home position return direction (coordinate axis)" setting and the home position and the coordinate axis when the "Home position offset amount" = 0 mm.

Home position return direction (coordinate axis)	Home position	+ direction	- direction
Normal (normal coordinates)	1.0 mm from the mechanical end on the motor side toward the opposite motor direction	PUSH direction	PULL direction
Opposite (normal coordinates)	1.0 mm from the mechanical end on the opposite motor side toward the motor direction	PUSH direction	PULL direction
Opposite (inverse coordinates)	1.0 mm from the mechanical end on the opposite motor side toward the motor direction	PULL direction	PUSH direction

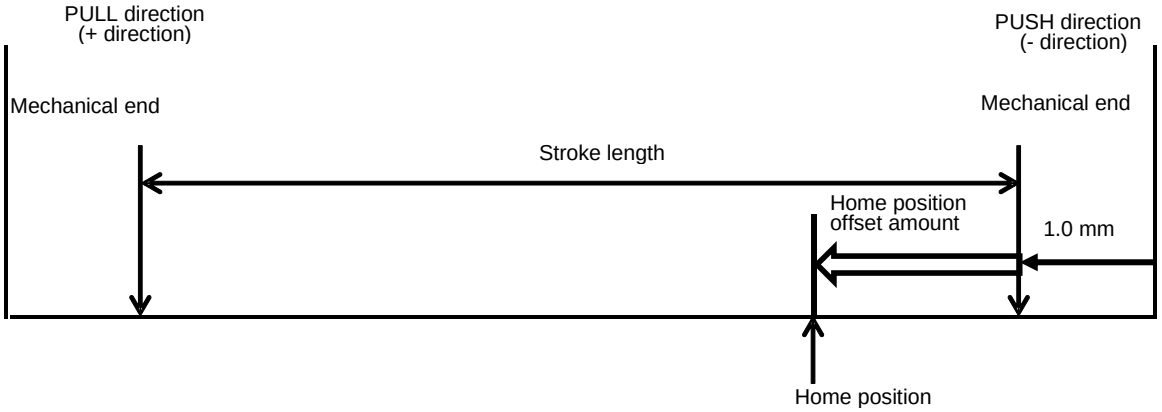
<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Normal (normal coordinates)">



<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Opposite (normal coordinates)">

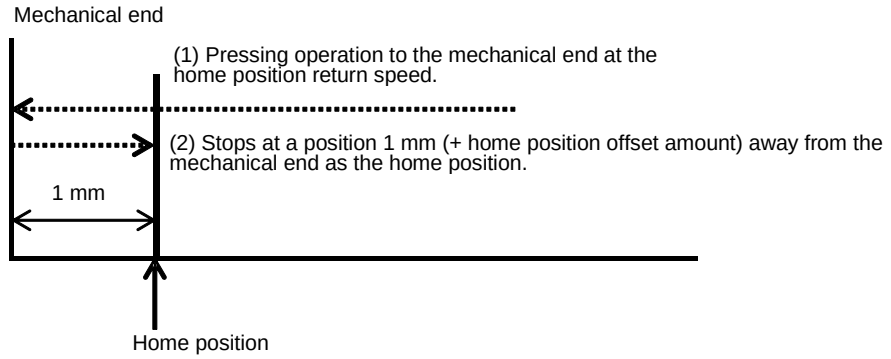


<Home position and coordinate axes when "Home position return direction (coordinate axis)" = "Opposite (inverse coordinates)">

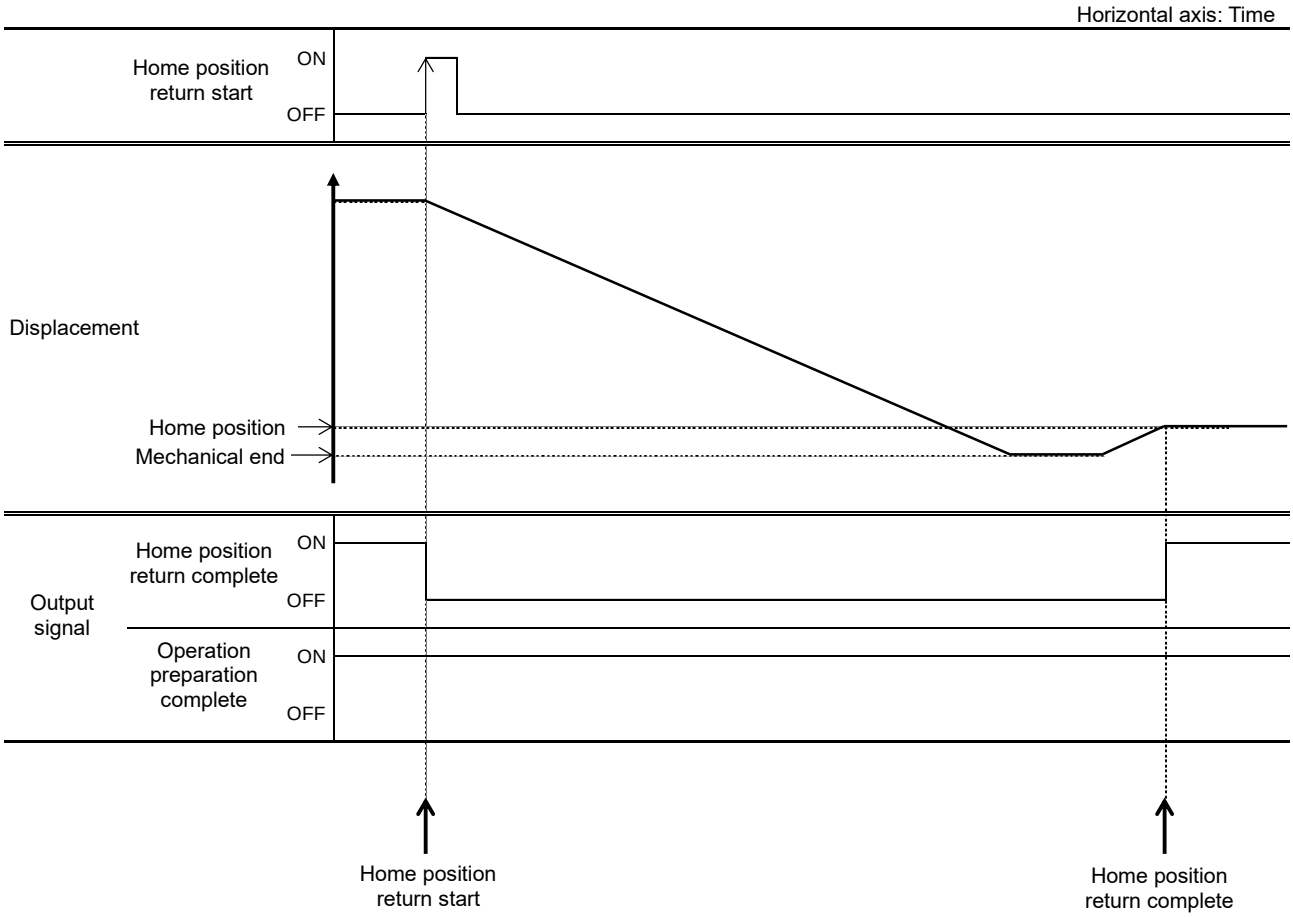


<Home position return operation>

When home position return is performed, it travels to the mechanical end with a pressing operation and then travels to the mechanical end and then to a position 1 mm away from the mechanical end as the home position.



<Time chart>



* The home position return complete output turns OFF during the home position return.

■ FGRC

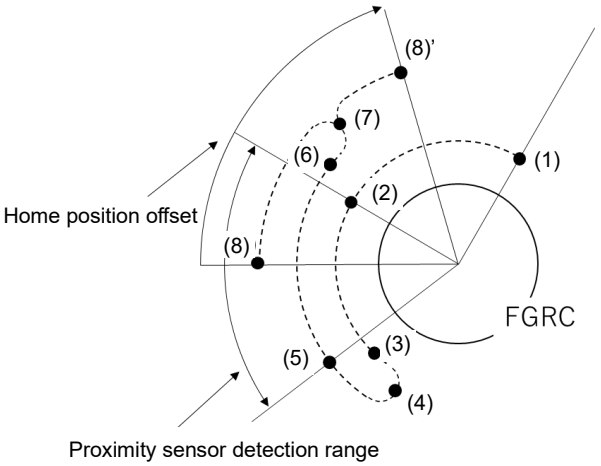
Home position return operation is performed according to parameters listed in the table below.

Setting item	Overview
Home position return direction (coordinate axis)	Sets the home position return direction.
Home position return speed	Sets the home position return speed.
Home position offset amount	Sets the offset amount for the home position.
Automatic home position return	Sets whether to automatically home position return during operation when the power supply is turned ON.

* Refer to “3.4.1 Parameters List” for the setting range and initial value.

<Example of setting and operation (when "FGRC home position return direction method" = "Sensor")>

Home position return operation is performed according to corresponding parameters.
*This is a figure seen from the upper surface of the table.



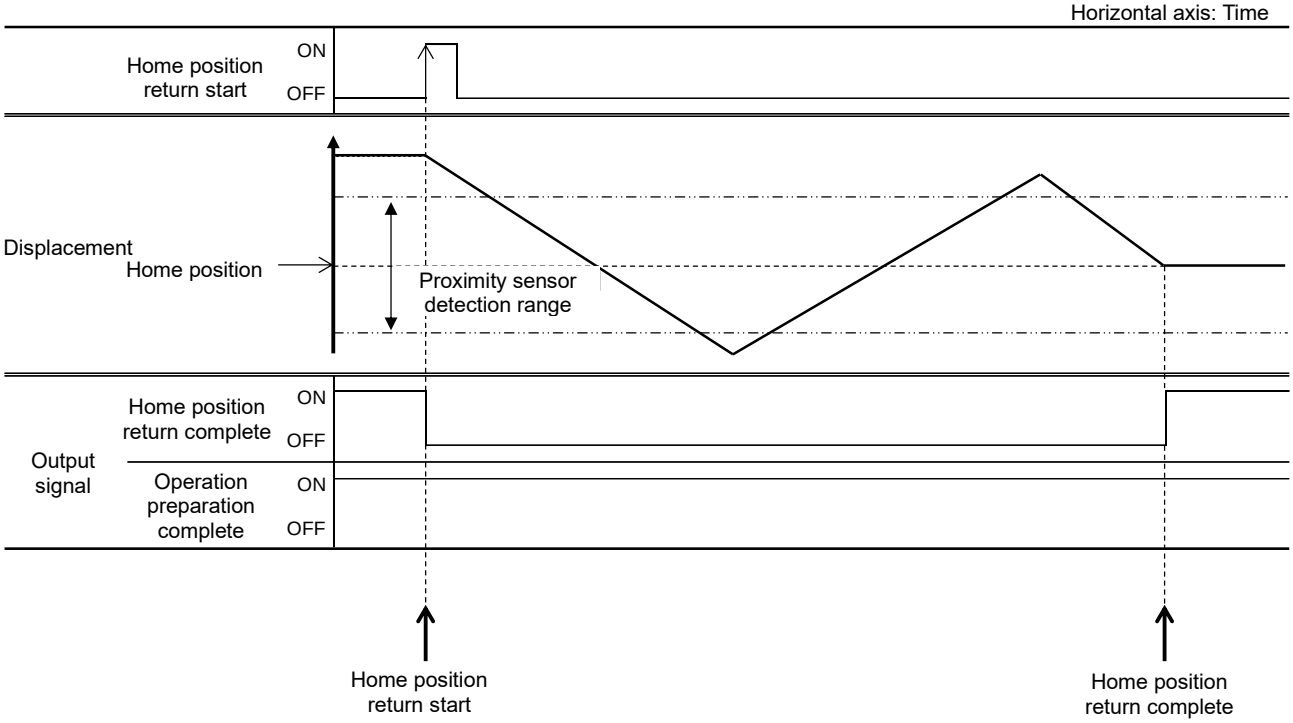
(1) When the command of the home position return is given, an operation is started in the specified rotation direction.
The rotation speed is the speed (20 deg/s to 30 deg/s) set by the home position return speed.
(2) The proximity sensor turns on.
(3) The proximity sensor turns off.
(4) Travel in reverse.
(5) The proximity sensor turns on.
(6) The proximity sensor turns off.
The home position offset reference position is calculated from the results of (2), (3), (5), and (6).
(7) The actuator stops once, and starts the operation to the home position.
(8) The home position return is completed when the home position offset amount is 0.
(8)’ When the home position offset amount is other than 0, the actuator travels by the setting value, and the home position return is completed.

The incremental encoder is used, so a home position return operation is required after the power supply is turned ON.

- If the home position return direction is “Normal,” an operation is started counterclockwise (in the CCW direction).
- If the home position return direction is “Opposite,” an operation is started clockwise (in the CW direction).
- If an obstacle is placed in the proximity sensor detection range, the home position return is not completed.

- When traveling the home position offset amount, the rotation direction cannot be specified. When the home position return direction is “Normal”, it moves clockwise (CW direction). When the home position return direction is “Opposite”, it moves counterclockwise.

<Time chart (when "FGRC home position return direction method" = "Sensor")>

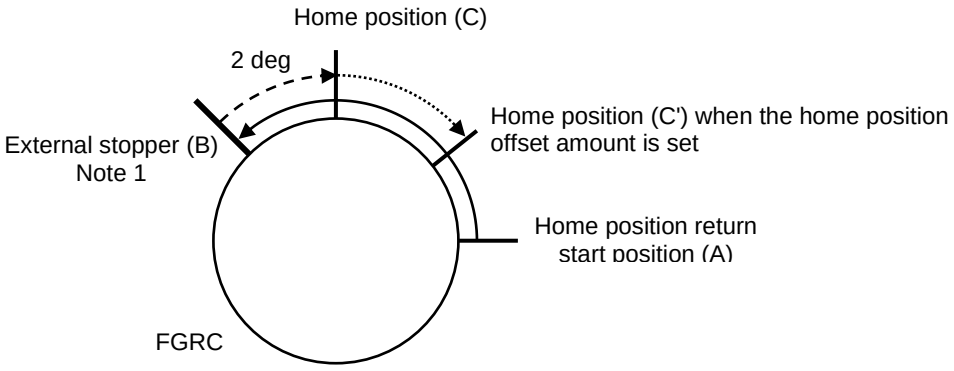


* The home position return complete output turns OFF during the home position return.

<Example of setting and operation (when "FGRC home position return direction method" = "Pressing against")>

The following example shows the operation when the parameter "Home position return direction (coordinate axis)" is "Normal (normal coordinates)."

1. When the start command of the home position return is input, it rotates counter-clockwise from the "Home position return start position (A)."
2. Presses against the "External stopper (B)."
3. When the home position offset amount is 0.00, the home position will be the position 2 deg inverted from the position of the "External stopper (B)."
4. If the home position offset amount is between 0.01 and 360.00, the home position will be the position (C') rotated clockwise by the home position offset amount set from "Home position (C)." * This is a figure seen from the upper surface of the table.

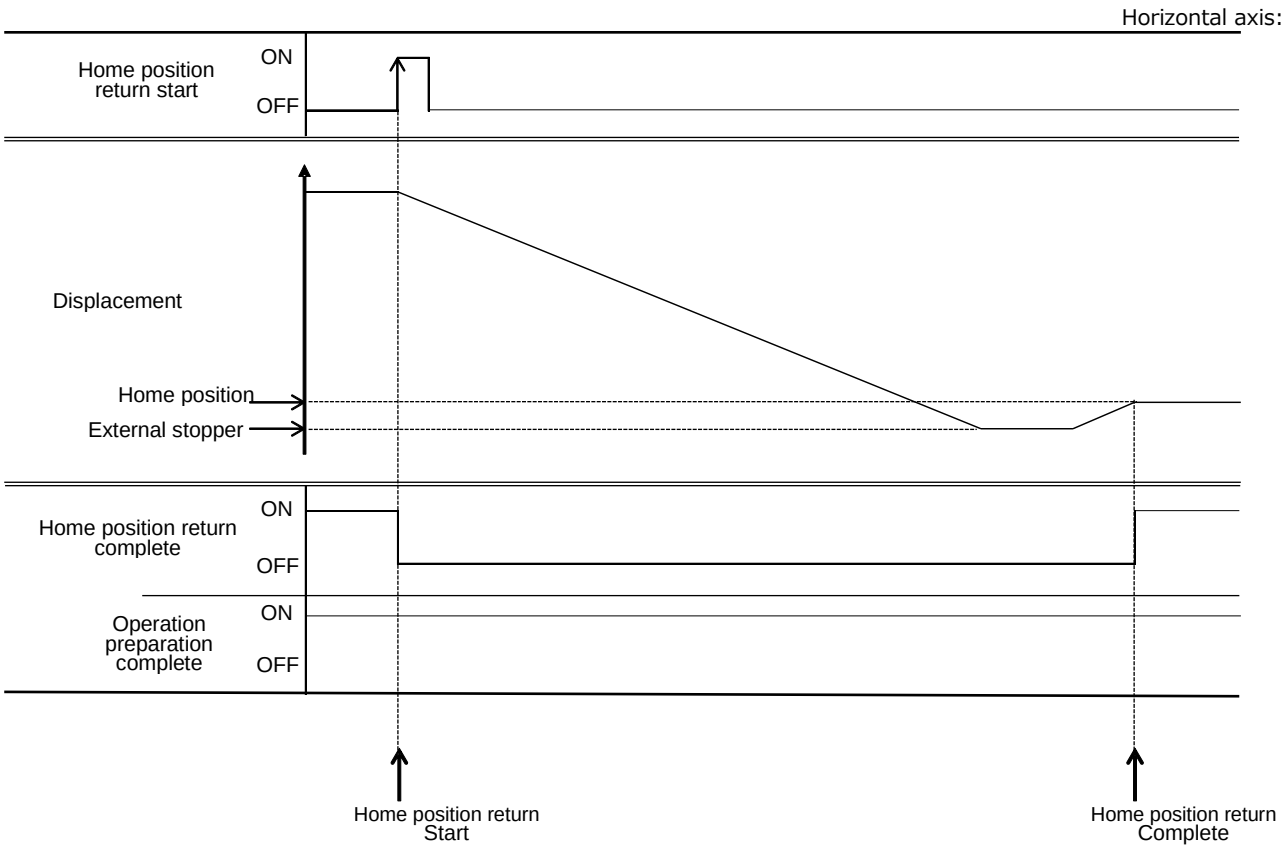


Note 1: The external stopper and the fitting jig are to be prepared by the customer.

The incremental encoder is used, so a home position return operation is required after the power supply is turned ON.

- If the home position return direction is "Normal," an operation is started counterclockwise (in the CCW direction).
- If the home position return direction is "Opposite," an operation is started clockwise (in the CW direction).
- If there is an obstacle in the range (A) to (B), the system recognizes the home position as 2 deg inverted position from the location where the obstacle collided.
- An obstacle in the range (B) to (C) will not complete the home position return.
- When traveling the home position offset amount, the rotation direction can not be specified. When the home position return direction is "Normal," it moves clockwise (CW direction). When the home position return direction is "Opposite," it moves counterclockwise.

<Time chart (when "FGRC home position return direction method" = "Pressing against")>



* The home position return complete output turns OFF during the home position return.

3.6.6 Positioning operation

Depending on the operating environment and conditions, it may take time for the actuator to stop. If the stop time is 1.0 s or less, contact us.

■ Normal mode (64-point mode)

<Point operation>
Once the point number is specified with the point number selection bit, traveling begins via ON edge input of the point travel start signal. Use the following input and output signals for operation.

・ Input signal 0: OFF (level input), 1: ON (level input), 1↑: ON edge input

Point number selection bit 0 to 5	Description
-	Sets the point No. in binary.

Point travel start	Description
1 ↑	Point travel start Operates to point set with the point No. selection bit.

Setting example:

Point number selection bit 0	Point number selection bit 1	Point number selection bit 2	Point number selection bit 3	Point number selection bit 4	Point number selection bit 5	Point travel start	Description
0	0	0	0	0	0	1 ↑	Begins traveling to point 0.
1	0	0	0	0	0	1 ↑	Begins traveling to point 1.
0	0	0	1	0	0	1 ↑	Begins traveling to point 8.
1	1	1	1	1	1	1 ↑	Begins traveling to point 63.

・Output signal 0: OFF, 1: ON

Point number confirmation bit 0 to 5	Description
-	Outputs the point No. in binary after travel is complete.

* When an alarm occurs, the upper 1 digit of the alarm code is output in binary.

Point travel complete	Description
1	Turns ON when it finishes traveling to the set point.

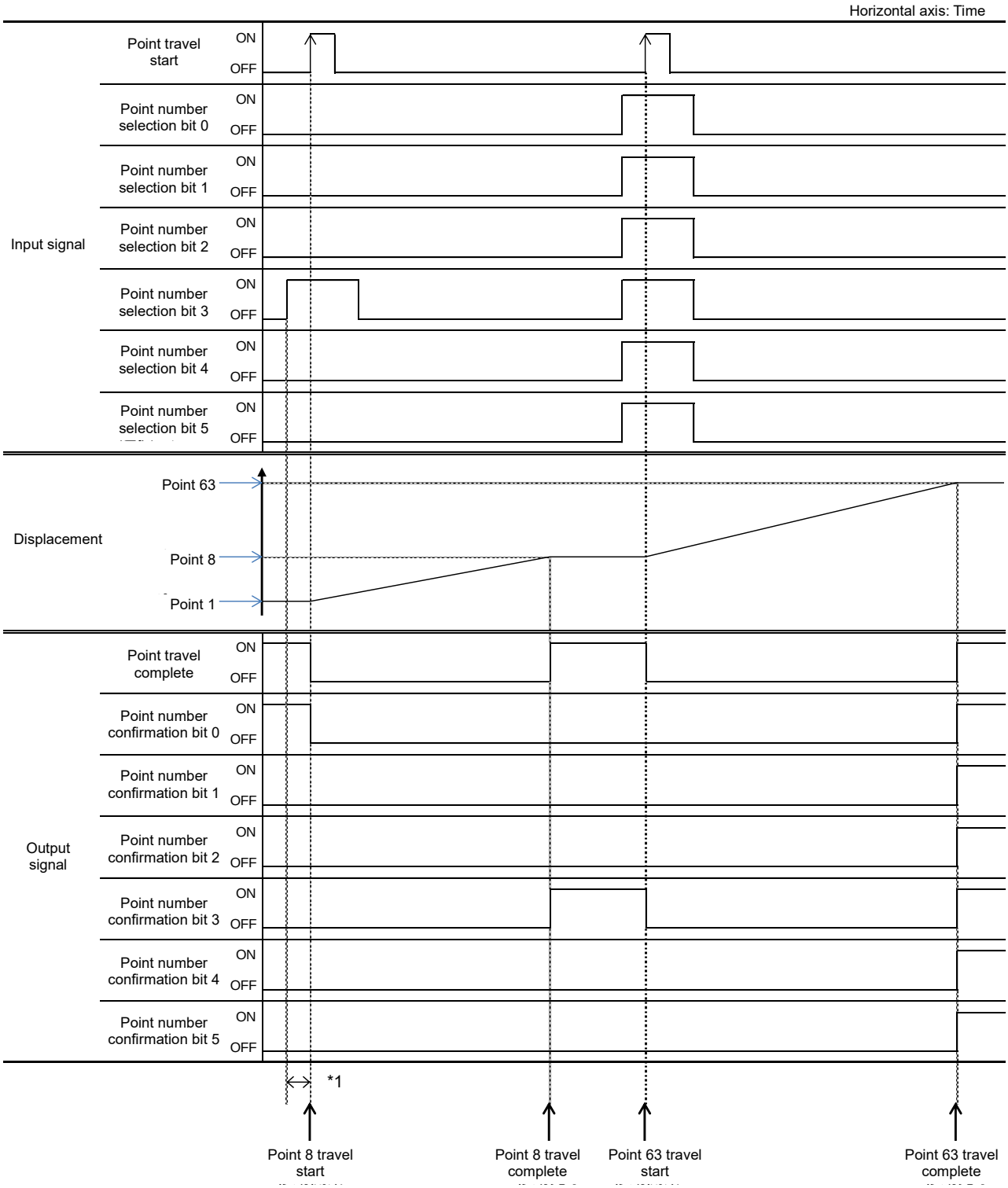
・Operation procedure

1 Set the point number in the point number selection bit.

2 Turn ON the point travel start

3 Output the point number set by the point number confirmation bit and confirm that point travel completion is ON.

・Time chart



*1 The interval between setting the point number selection bit and turning ON the point travel start shall be at least twice the communication cycle.

<JOG operation>

Use the following input and output signals for operation.

JOG (−) travel start	JOG (+) travel start	Description
0	1 ↑	Starts JOG operation to the opposite motor side.
X	0	Stops JOG operation to the opposite motor side.
1 ↑	0	Starts JOG operation to the motor side.
0	x	Stops JOG operation to the motor side.

* The JOG speed can be set via user parameters. Refer to “3.4 Setting parameters” for details.

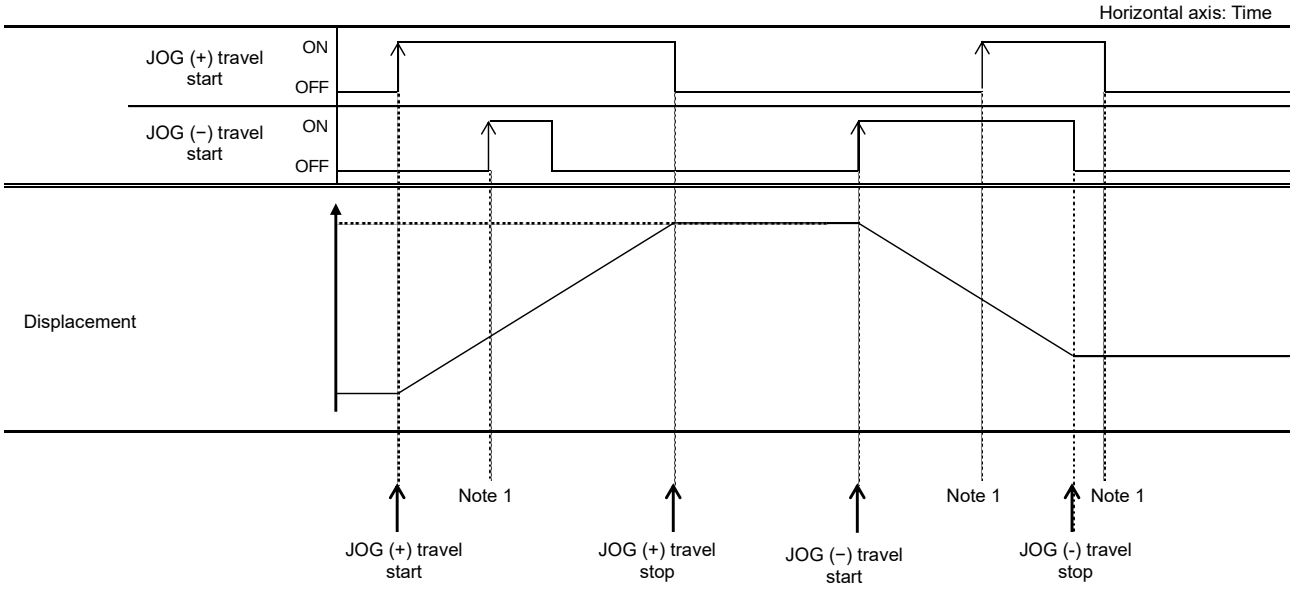
・How to operate

1 Set arbitrary JOG speed for the parameter.

2 For a travel in the + direction, turn ON the JOG (+) travel start. For a travel in the - direction, turn ON the JOG (-) travel start.

3 When the actuator travels to the target position, turn OFF the JOG (+) travel start or the JOG (−) travel start that was ON.

・Time chart



Note 1: When the jog operation is performed in one direction, the command for jog travel start in the opposite direction is not accepted even if it is turned ON. Even if the jog travel start command in operation is turned OFF in that state, the travel command that is turned ON is not accepted.

・Jog operation is executed even when the home position return is not completed. When the automatic home position return is “enabled” and the home position return is not completed, the home position return is not executed before jog operation.
・The jog operation is a function for teaching, etc. When using the FGRC series, the operation may become unstable if continues to rotate more than 360 deg in a certain direction.

■ Simple 7-point mode

<Point operation>

Traveling begins via ON edge input of the point travel start signal. Use the following input and output signals.

・Input signal 0: OFF (level input), 1: ON (level input), 1↑: ON edge input

Point number 1 to 7 Travel start	Description
1 ↑	Starts traveling to corresponding point. During ON edge input, if another point No. travel start signal switches ON, traveling does not start.

Setting example:

Point number 1 travel start	Point number 2 travel start	Point number 3 travel start	Point number 4 travel start	Point number 5 travel start	Point number 6 travel start	Point number 7 travel start	Description
1 ↑	0	0	0	0	0	0	Begins traveling to point 1.
0	0	1 ↑	0	0	0	0	Begins traveling to point 3.
0	0	0	0	0	0	1 ↑	Begins traveling to point 7.
0	0	1	1 ↑	0	0	0	Does not start traveling while another point No. travel start input is ON.

・Output signal 0: OFF, 1: ON

Point No. 1 to 7 travel complete	Description
1	Turns ON when it finishes traveling to the corresponding point.

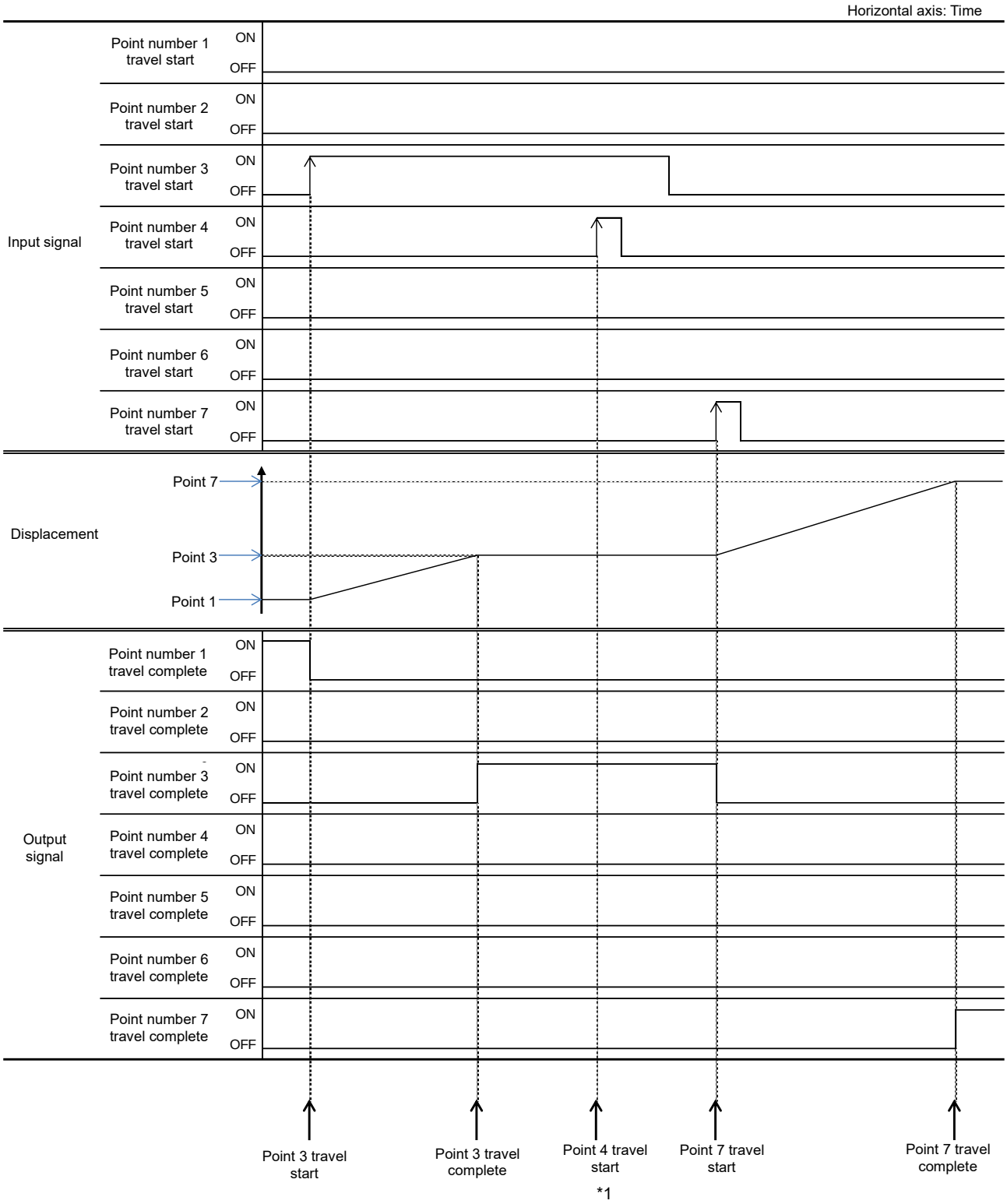
・Operation procedure

1 Turn ON the point travel start corresponding to the point where you want the actuator to operate.

2 Turn OFF the point travel start that was ON.

3 Confirm that the completion of point travel for the corresponding point is turned ON.

・Time chart



*1 Does not start traveling while another point No. travel start input is ON.

<JOG operation>

The jog operation is similar to the 64-point mode. Refer to “Normal mode (64-point mode)” of “3.6.6 Positioning operation” for details.

■ Direct value operation

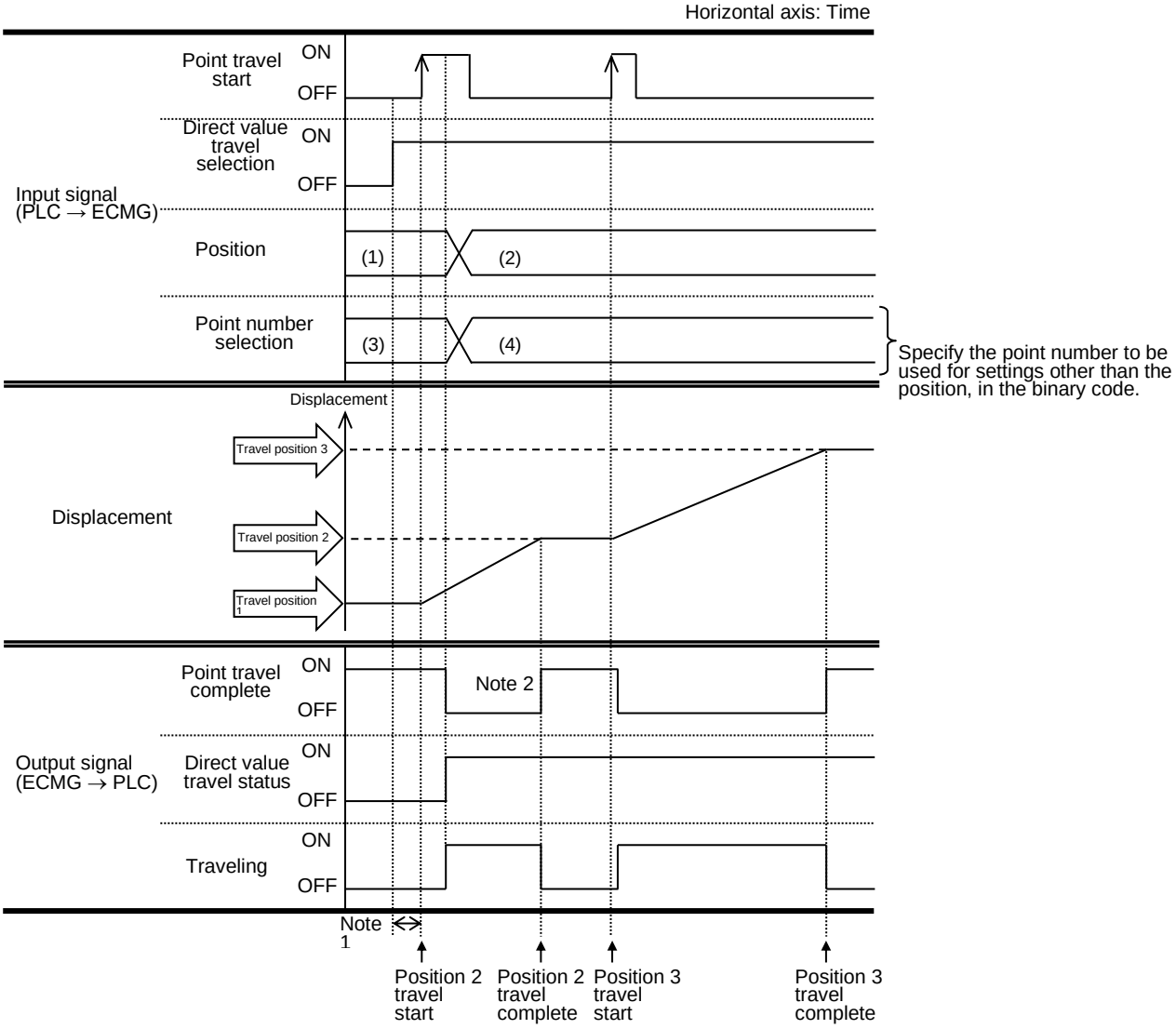
<Simple direct value mode>

1 Check that the point data for the point number to be specified is set.

2 Set the position and point number.

3 Set Direct value travel selection to ON. (Order of steps 2 and 3 can be reversed.)

4 Turn ON the point travel start bit
The position setting is reflected only in the operation when the point travel start bit is turned ON, and the position of the set point number is not updated.

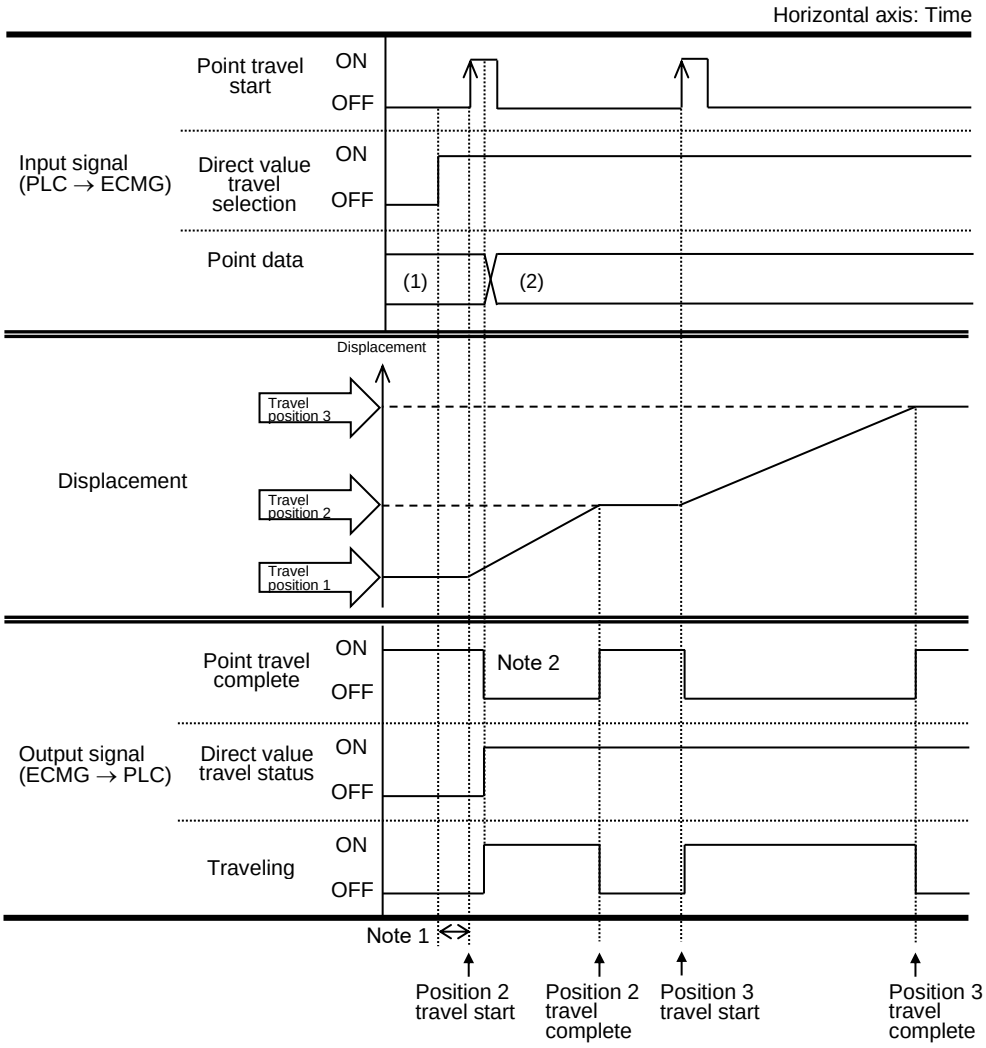


Note 1: Leave an interval of at least 10 ms for point travel start ON after setting the position and point number.
Note 2: Note that the previous point travel complete will still be ON until an instruction is received, even after point travel start ON. Also, both travel complete and moving may be ON at the same time depending on the timing.

* (1) indicates that the position data of travel position 2 is set, and (2) indicates that the position data of travel position 3 is set.
* (3) ((4)) indicates the state in which the point number that sets the point data used in the travel to travel position 2 (3) is set in the diagram of simple direct value mode. (If the point data other than the position is the same, (3) may remain as is.)
* When the point travel is completed, point number is not set and all the point number confirmation bits are turned OFF.
* The stop and pause operations are the same as the point operation.

<Full direct value mode and standard direct value mode>

After setting the position, speed, and other point data, turn the point travel start bit ON.



Note 1: Leave an interval of at least 10 ms for point travel start ON after setting the point data.

Note 2: Note that the previous point travel complete will still be ON until an instruction is received, even after point travel start ON. Also, both travel complete and moving may be ON at the same time depending on the timing.

* (1) indicates that the point data of travel position 2 is set, and (2) indicates that the point data of travel position 3 is set.

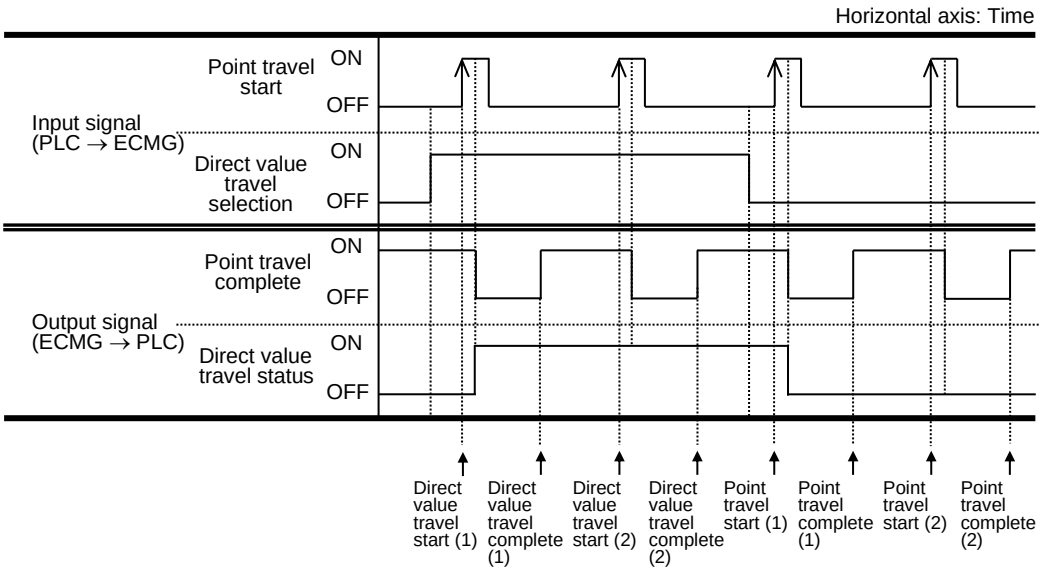
* While the direct value travel selection is ON, the point number selection setting does not affect the travel.

* When the travel is completed, point number is not set and all the point number confirmation bits are turned OFF.

* The stop and pause operations are the same as the point operation.

<Direct value travel selection and direct travel status>

Turn ON the direct value travel selection. When the direct value travel starts, the direct value travel status is turned ON, and it stays ON until the next point travel starts. (It remains ON even when the servo OFF.)



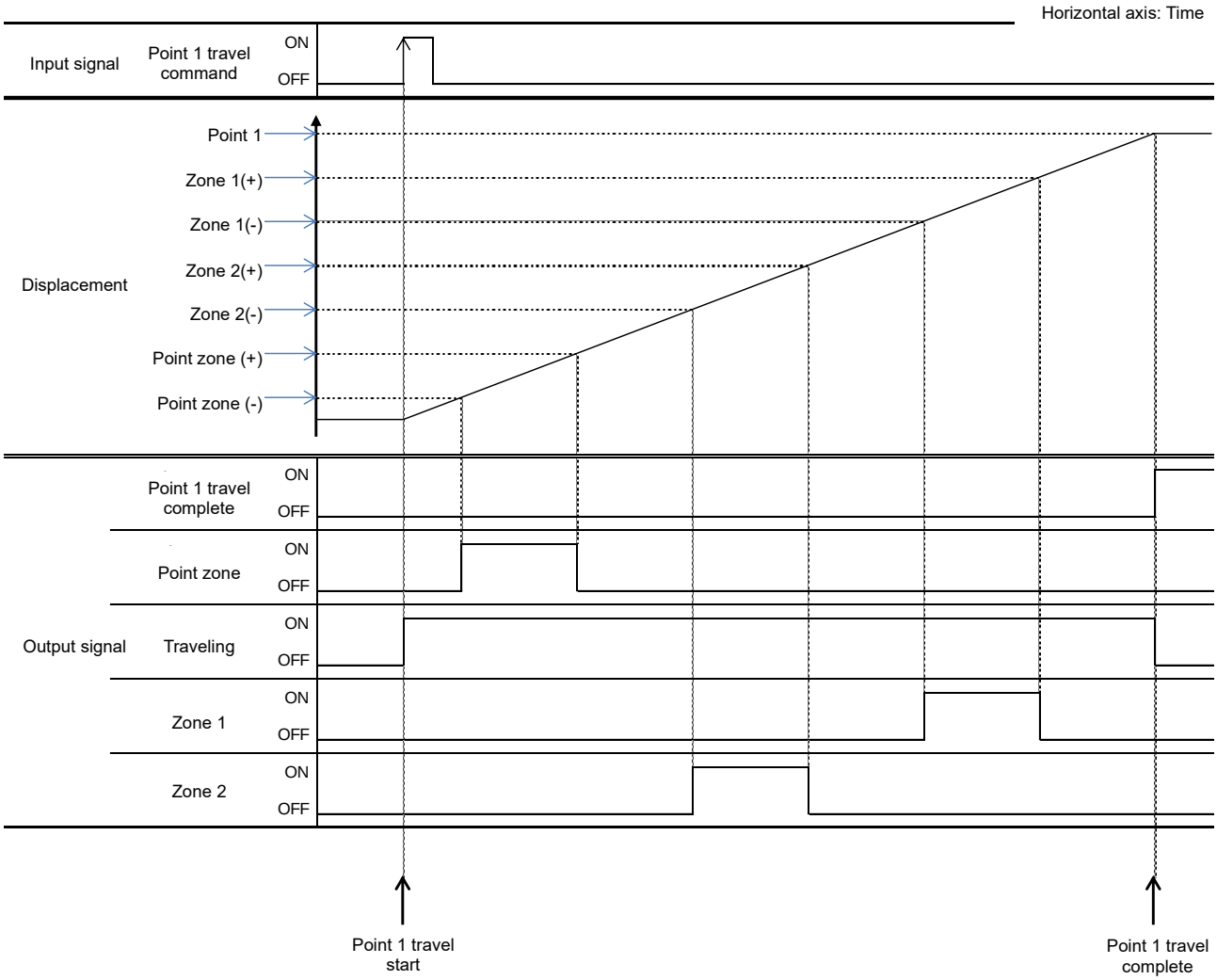
3.6.7 Signal of output selection

In addition to the output signals described previously, the following signals are output according to the settings of output selection 1 and output selection 2 of the parameter.

・Output signal

Output signal name	Description
Point zone	Turns ON when within the range set with point zone (+) and point zone (-). Refer to “3.5.13 Setting the point zone” for details on point zones.
Traveling	Turns ON during point traveling.
Zone 1	Turns ON when within the range set with zone 1 (+) and zone 1 (-). Refer to “3.4.3 Zone output” for details on zone 1.
Zone 2	Turns ON when within the range set with zone 2 (+) and zone 2 (-). Refer to “3.4.3 Zone output” for details on zone 2.
Warning	It is turned OFF when a minor error is detected that will not affect the operation of the actuator. Refer to "5.2 Alarm Indications and Countermeasures" for details.
Outside soft limit	It is turned ON when the current position is outside the soft limit (+) and (-) set by the parameter Refer to "3.4.2 Soft limit settings and outside soft limit signal output” for details.
Outside soft limit (-)	It is turned ON when the current position is less than the soft limit (-) set by the parameter Refer to "3.4.2 Soft limit settings and outside soft limit signal output” for details.
Outside soft limit (+)	It is turned ON when the current position is greater than the soft limit (+) set by the parameter Refer to "3.4.2 Soft limit settings and outside soft limit signal output” for details.

・Time chart


Horizontal axis: Time
Input signal
Point 1 travel command
ON
OFF
Displacement
Point 1
Zone 1(+)
Zone 1(-)
Zone 2(+)
Zone 2(-)
Point zone (+)
Point zone (-)
Output signal
Point 1 travel complete
Point zone
Traveling
Zone 1
Zone 2
Point 1 travel start
Point 1 travel complete

3.6.8 Pressing operation

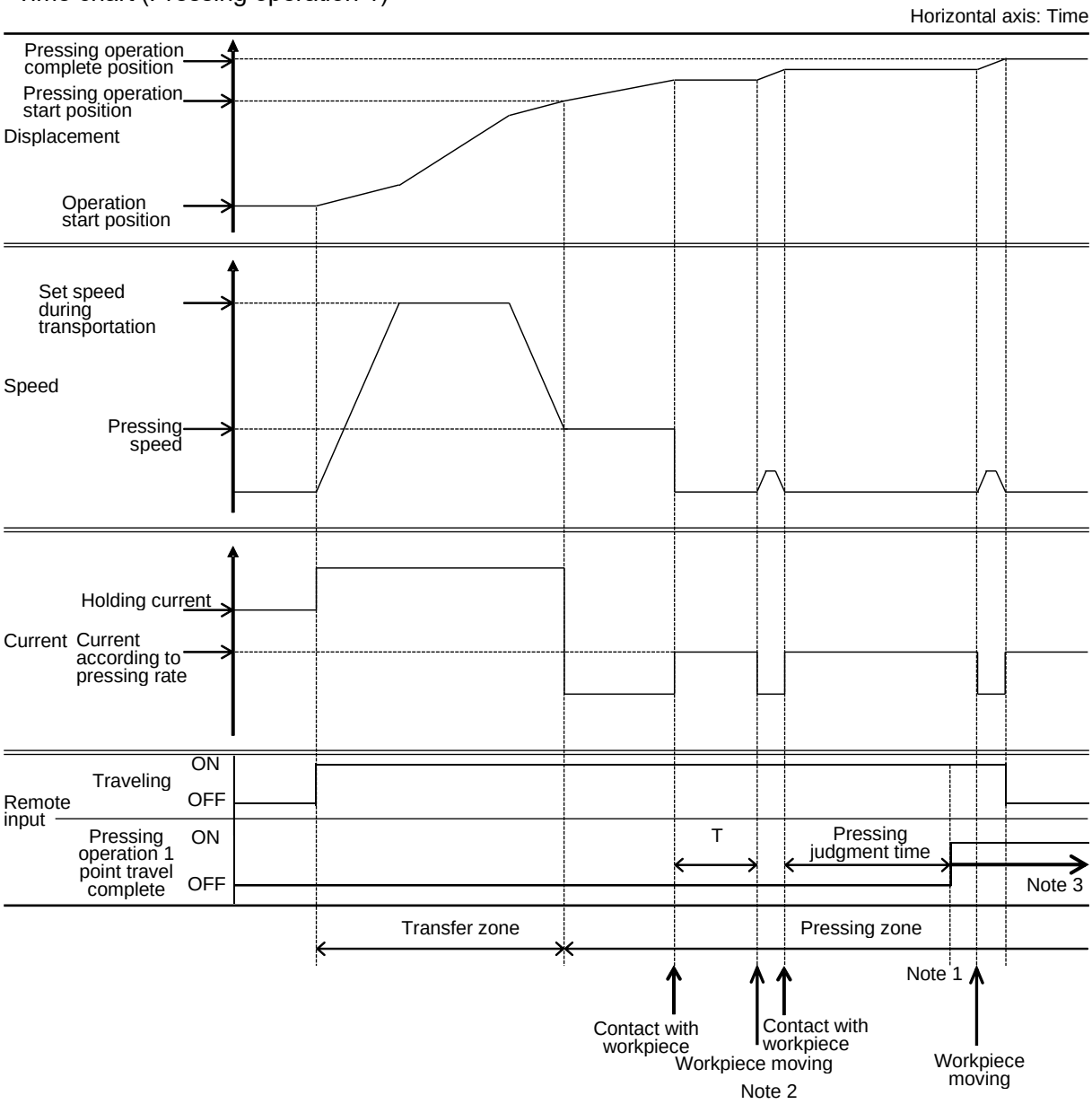
Depending on the operating environment and conditions, it may take time for the actuator to stop. If the stop time is 1.0 s or less, contact us.

Pressing operations can be performed by configuring either "pressing operation 1" or "pressing operation 2" in point data. After the travel operation, the actuator operates in the pressing interval at the set "pressing rate" or less. An alarm will not be output in the pressing interval even if it stops upon contact with the workpiece.

・Pressing operation settings

Setting item	Description
Pressing rate	The rate of the upper limit of the pressing force in a pressing interval to the maximum pressing force can be set in percentage [%]. Refer to “3.5.14 Setting the pressing rate” for details.
Pressing speed	The speed of the pressing interval can be set. Refer to “3.5.15 Setting the pressing speed” for details.
Pressing distance	The pressing interval width can be set. Refer to “3.5.16 Setting the pressing distance” for details.
Pressing judgment time	When setting pressing operation 1, the time until determining that pressing is complete can be set. Refer to the Parameter list of “Chapter 5: PARAMETERS DATA CONFIGURATION” for details.

・Time chart (Pressing operation 1)



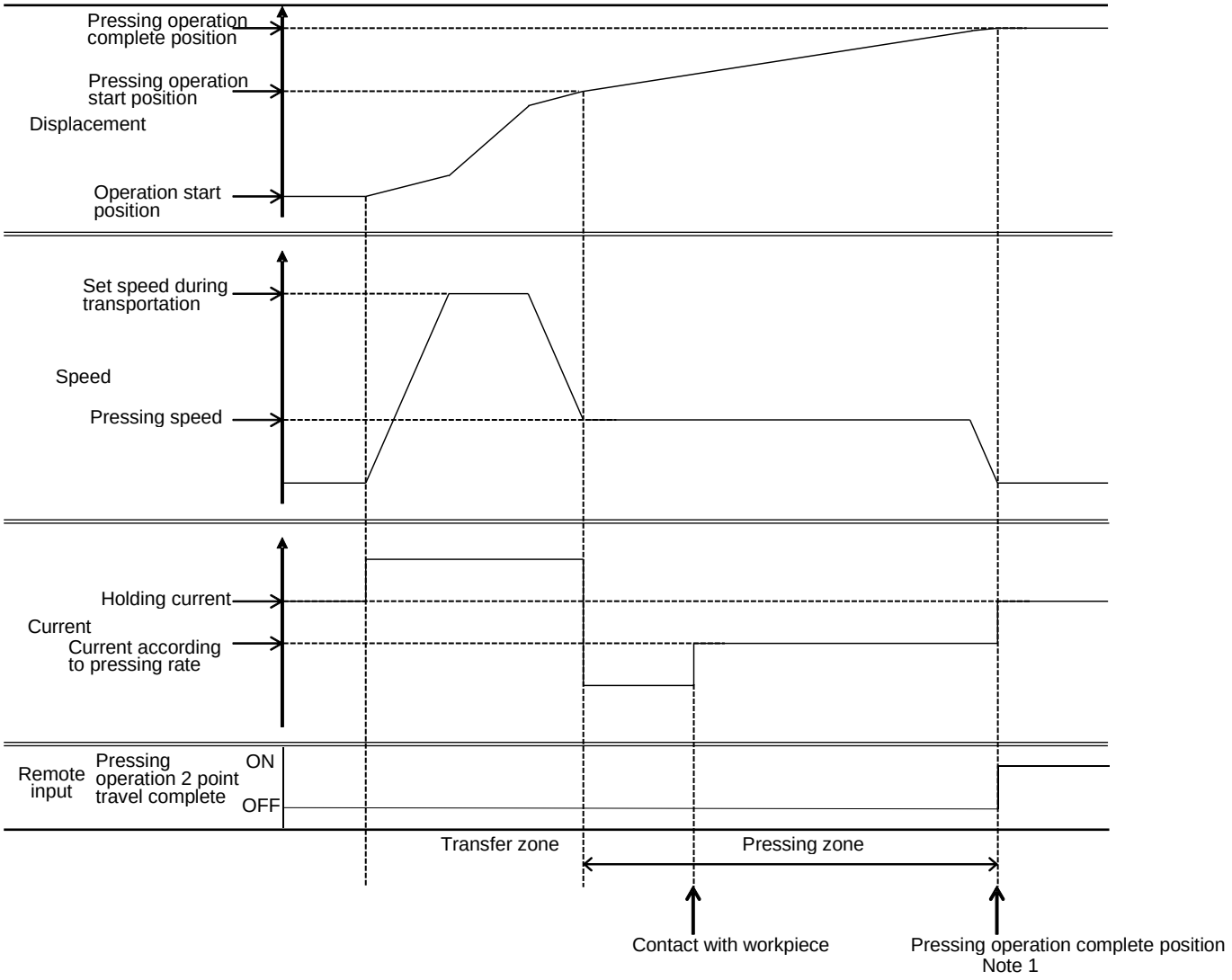
Note 1: If current corresponding to “Pressing judgment time” continues to flow for the “Pressing judgement time” or longer, the point travel completion is output. However, the output during traveling does not turn off until the pressing operation completion position is reached.

Note 2: If a displacement such as the workpiece moving occurs earlier than the pressing judgment time is reached during pressing, the above judgment time will be reset. (T < Pressing judgment time)

Note 3: Even if the workpiece moves after the travel completion output, the point travel completion output continues to be ON.

・Time chart (Pressing operation 2)

Horizontal axis: Time



Note 1: When the pressing operation completion position is reached, the point travel completion is output. If the actuator stops halfway and does not reach the operation completion position, the point travel completion is not output.

3.6.9 Operation when a new operation signal is input during operation

CAUTION

Be careful of the operation signal input timing.

- It may be impossible to operate as configured according to settings such as the position, speed and acceleration.
- If a new operation signal is input near the soft limit, an over soft limit alarm may be output.
- When a new operating signal is input during acceleration/deceleration, an overload alarm may be output.

Be careful of the movement at the input of the new operation signal.

When a new operation signal is entered, the actuator will temporarily decelerate.

If a new point operation signal is input during point operation, the following operations are performed.

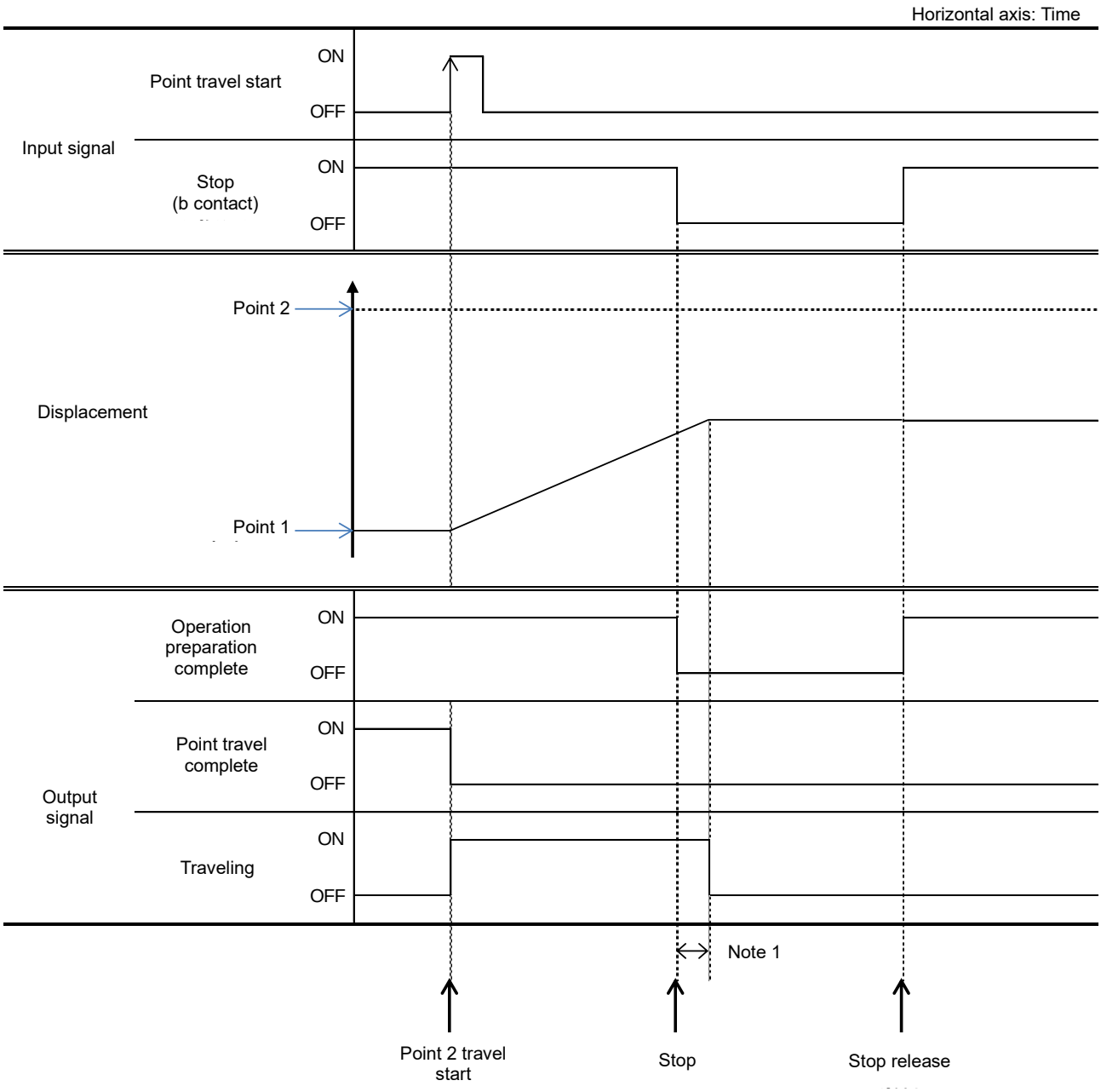
New point target position	Description
Same as current actuation direction	Continues to operate to the target position at the speed set in the new point.
Opposite of current actuation direction	After decelerating, begins operating in the opposite direction.

Depending on the operating environment and conditions, it may take time for the actuator to stop. If the stop time is 1.0 s or less, contact us.

3.6.10 Operation when stop signal is input during operation

Operation can be stopped by inputting a stop signal during operation. Travel complete is not output when stopped by the stop signal.

・Time chart



Note 1 Once the stop signal is input, it decelerates then stops. Confirm stopping using the traveling signal.

3.6.11 Holding operation after travel complete

⚠WARNING

Prevent falling during vertical operation.
When a workpiece is placed in the vertical direction, vibration or a sudden impact to the equipment could cause a load exceeding the holding force above to be applied. When placing a workpiece in the vertical direction, be sure to implement safety measures to prevent falling.

If the “stop method” is set to “fixed” for the point data, it is held at the current value set in the “fixed current at stop” user parameters once travel is complete. If a load exceeding the holding force shown in the following table is applied while holding, an alarm may occur.

Actuator model number			Holding force [kg]
Series	Body size	Screw lead	When using 24 V power supply
EBS	04	06	9.2
		12	3.3
	05	02	18.3
		05	10.0
		10	3.3
		20	0.8
	08	05	33.3
		10	18.3
		20	3.3
EJSG	04	06	9.2
		12	3.3
	05	05	10.0
		10	3.3
		20	0.8
	08	05	33.3
		10	18.3
		20	3.3
EBR	04	06	8.3
		12	2.9
	05	02	23.3
		05	14.0
		10	6.7
		20	1.7
	08	05	55.0
		10	20.0
		20	8.3
GSSD2 GSTK GSTG GSTS GSTL	20	06	6.4
		09	4.0
	32	06	11.6
		12	4.8
	50	06	19.6
		12	13.2

Actuator model number			Holding force [kg]
Series	Body size	Screw lead	When using 24 V power supply
FLSH	16	H1	
	20	H1	
	25	H1	
FLCR	16	02	4.0
		08	0.5
	20	02	6.0
		08	0.8
	25	02	8.5
		06	3.0
FGRC	10		
	30		
	50		
GCKW	16	H1	
	20	H1	
	25	H1	

4. MAINTENANCE AND INSPECTION

⚠WARNING

Do not perform disassembly or modification of products that are not specified in this manual.
An injury, accident, malfunction, or failure may occur; in addition, the specifications described in this manual may not be satisfied.

Do not attach or remove wires and connectors with the power turned on.
A malfunction, failure, or electric shock may occur.

Do not work with wet hands.
Doing so may cause electric shock.

Do not touch the heat sink and cement resistance inside the controller or the motor of an actuator.
Electric shock or burns may result.

Install the product before wiring.
An electric shock may occur.

Before performing inspection, wait five minutes or longer after turning off the power and check the voltage with a tester.
An electric shock may occur.

CAUTION

Take measures to prevent a third person from turning on the power unexpectedly when performing maintenance, inspection, or repair.

Wiring and inspections must be performed by specialists.

Use a power cable with a sufficient capacity that allows the maximum instantaneous current.
A heat generation or damage may occur during operation.

Perform periodic inspections (two to three times a year) to confirm that the product operates properly.

Turn off the power immediately if abnormal heat, smoke, odor, sound, or vibration occurs in the product.
Damage to the product or fire may occur.

4.1 Precautions on Product Disposal

CAUTION

When disposing of the product, comply with “Waste Management and Public Cleansing Act” and have an industrial waste disposal company dispose of the product.

5. TROUBLESHOOTING

5.1 Problems, Causes, and Solutions

If the product does not operate as intended, confirm the table below for a possible solution.

Problem	Cause	Solution
The RUN lamp does not light or flash even when the power supply is turned ON.	Wiring is not correct.	Check the power supply wiring.
	The cable is broken.	Confirm that the wiring is neither pinched nor disconnected. Check the connector and terminal.
	Product is malfunctioning or is damaged.	It will need to be repaired. Check “5.1.1 Items to Check When a Problem Occurs” and then contact us.
	The power supply is malfunctioning.	Repair or replace the power supply.
	Power capacity is insufficient.	Use a power supply with a larger capacity.
The RUN lamp remains lit in red.	Alarm has been issued.	Check the alarm and its cause in “5.2 Alarm Indications and Countermeasures” and then remove it.
	There is an abnormality in system.	It will need to be repaired. Check “5.1.1 Items to Check When a Problem Occurs” and then contact us.
No operation standby completion signal is output.	The emergency stop signal is connected with the a-contact.	Connect emergency stop (EMG) wiring to the b-contact.
	The voltage is applied to the force brake release signal.	Ensure that the voltage is not applied to the force brake release signal during the operation.
	The servo is OFF.	Input the servo ON signal from the PLC.
	The stop signal is OFF.	Turn ON the stop signal.
	Wiring is not correct.	Refer to the wiring method in Instruction Manual (SM-A62471) and check the wiring.

Problem	Cause	Solution
Product does not operate as intended with PLC signal.	The input signal is unstable.	The input from the host system may be chattering. Ensure the input signal is at least 20 msec.
	It stops during operation.	The transport load may be too large. Recheck the specifications.
	Setting of position, speed, acceleration, or pressing rate is not correct.	Check the point data details.
	Setting of operation mode is not correct.	Check the “operation mode” details for the parameters.
	Wiring is not correct.	Refer to the wiring method in Instruction Manual (SM-A62471) and check the wiring.
	Friction load is too large.	Check the load friction during transport. Confirm that it is not seizing with the workpiece.
	It is colliding with the workpiece.	Check the assembly and setting status.
	Internal resistance of product has increased.	Check the environment conditions and the conditions of use. Check how long the product has been in use (operation distance).
	Actuator body is damaged.	It will need to be repaired. Check “5.1.1 Items to Check When a Problem Occurs” and then contact us.
Product itself vibrates. The actuator makes abnormal sounds.	The actuator fitting is loose.	Retighten the bolts.
	Resonation occurs.	Perform gain adjustment.
Product cannot be operated with PLC.	It is in TOOL mode.	Use the setting tool (S-Tools) to change it to PLC mode.
	Wiring is not correct.	Refer to the wiring method in Instruction Manual (SM-A62471) and check the wiring.
	The cable is broken.	Confirm that the wiring is neither pinched nor disconnected. Check the connector and terminal.
	Overload error occurs.	Recheck the transport load and speed.
	Power capacity is insufficient.	Confirm that the power supply capacity satisfies the required voltage and current.

Problem	Cause	Solution	
Workpiece moves due to its own weight during an emergency stop.	The servo turns OFF during emergency stop.	Designed to be brake-less	Use a type with brake.
		Brake is forcibly released	Turn force release OFF for the brake.
	Load exceeding holding force is applied.	Confirm that an external force equal to or higher than the holding force is not being operated. Revise the “current when stopped” setting for the parameters data.	
Positioning completion output does not turn off.	The positioning complete width is too large for the travel distance.	Check the “positioning width” for the point data.	
Pressing operation cannot be performed.	Operation method is not set to pressing operation.	Check the "Operation method" in the point data.	
The maximum speed is not achieved.	The load or speed is excessive.	Confirm that the workpiece weight and operation speed satisfy specification values. Perform gain adjustment.	
Speed is not high enough. (very slow)	Operation method is set to pressing operation instead of positioning operation.	Check the “Operation method” in the point data. Make a gain adjustment	
Overshoot occurs.	Both transfer weight and amount of deceleration are large.	Confirm that the workpiece weight and operation speed satisfy specification values. Use a smaller deceleration value. Perform gain adjustment.	
Product cannot reach target takt time.	The acceleration or speed setting is incorrect.	Check the “acceleration” and “speed” for the point data.	

If you have any other questions or concerns, contact your nearest CKD sales office or distributor.

5.1.1 Items to Check When a Problem Occurs

1	Check the state of the controller LEDs. Refer to “1.6 LED indication” for information on LED indications. * Refer to Instruction Manual (SM-A62471) for the LED indication of the communication unit.
2	Check whether there is an error on the PLC.
3	Check the voltage of the control power supply (24 VDC).
4	Check the alarm details. Alarm details can be checked using the S-Tools setting software.
5	Check the communication status with the PLC using the PLC development tool or S-Tools.
6	Confirm that the cable is neither “disconnected” nor “pinched,” and that it is connected properly. When checking conductivity, turn the power supply OFF and disconnect the wiring to prevent electric shock.
7	Confirm that anti-noise measures (such as connecting a grounding wire or installing a surge suppressor) have been implemented.
8	Check the history leading up to the trouble occurring and the operation condition when the trouble occurred.
9	Check the product's serial No.

*Check the cause of the problem according to the above items. Also, refer to “5.1.1 Items to Check When a Problem Occurs” or “5.2 Alarm Indications and Countermeasures” as a solution.

5.2 Alarm Indications and Countermeasures

CAUTION

When an alarm occurs, eliminate the cause of the alarm.
Repeated operation under the condition that an alarm is generated may impose a load on the actuator and controller, and may accelerate degradation of the product or cause damage.

Consider the possibility of actuator or controller malfunctions.
If an alarm related to the operation of the actuator such as "overload (C)" occurs, the actuator or controller may be malfunctioning. If the alarm recurs after performing the countermeasures listed in the table below and turning the controller power back on, contact CKD.

Alarms generated by the communication unit are not output by the drive unit. If an error occurs on the drive unit side, check whether an alarm has occurred on the communication unit.

■ Alarm

These are output when an error that affects the operation of the actuator is detected in the controller. There are two types of alarms depending on the degree of error: alarms that can be reset, and alarms that require the power to be turned ON again.

Alarm code	Alarm item	Description	Solution	Alarm reset
0x1000 to 0x1FFF	Memory (Read)	An error has been detected in reading data from memory at power-on.	“0x1300 to 0x13FF” indicates that there is an error in the parameter data. Initialize the parameter data and power cycle. “0x1500 to 0x15FF” indicates that there is an error in the point data. Initialize the point data and power cycle. “0x1700 to 0x170F” indicates that there is an error in the alarm data. Initialize the alarm data and power cycle. “0x1800 to 0x180F” indicates that there is an error in the maintenance data. Initialize the maintenance data and power cycle. “0x1B00 to 0x1B0F” indicates that there is an error in the actuator information in the drive unit (A type). Overwrite the information of the actuator connected last time with the information of the actuator being connected and power cycle. “0x1B10 to 0x1B1F” indicates that there is an error in the actuator information in the drive unit (B type). Initialize or overwrite the actuator information, and turn the power on again. Other codes indicate that there is an error in the data inside. If the error reoccurs even after power cycling, contact your nearest CKD sales office or distributor.	No
0x2000 to 0x2FFF	Memory (Write)	An error has been detected in writing data into memory when changing data.	If the error reoccurs even after power cycling, contact your nearest CKD sales office or distributor.	No
0x3000 to 0x30FF	Temperature	The temperature in the controller is high.	Check the ambient temperature. If the error reoccurs even after power cycling, contact your nearest CKD sales office or distributor.	No
0x3100 to 0x31FF	Current	An overcurrent flowed from the power supply.	If the error reoccurs even after power cycling, contact your nearest CKD sales office or distributor.	No
0x3210 to 0x321F	Encoder for other models connected	Indicates that an encoder that is not compatible with the controller is connected.	If the error reoccurs even after power cycling, contact your nearest CKD sales office or distributor.	No
0x3220 to 0x322F	Encoder identification abnormality	Indicates that there is an abnormality in the identification of the encoder type (incremental/absolute).	If the error reoccurs even after power cycling, contact your nearest CKD sales office or distributor.	No

Alarm code	Alarm item	Description	Solution	Alarm reset
0x3230 to 0x32FF	Encoder not connected	Indicates an abnormality in the connection state between the controller and actuator.	Check the connection between the cable and the connector. If the error reoccurs even after power cycling, contact your nearest CKD sales office or distributor.	No
0x3400 to 0x341F	Software reset error	Indicates that internal cyclic communication with the communication unit could not be resumed after performing a software reset of the drive unit.	Turn on the power again.	No
0x3400 to 0x342F	Encoder not connected	Indicates an abnormality in the connection state between the controller and actuator.	Check the connection between the cable and the connector. If the error reoccurs even after power cycling, contact your nearest CKD sales office or distributor.	No
0x3800 to 0x38FF	TOOL Not connected	There is a problem with the connector connection while using the product in TOOL mode.	Check the connection between the cable and the connector. If the connector is disconnected, connect the connector. After changing the mode to PLC mode, reset the alarm.	Yes
0x3900 to 0x39FF	Interface	Indicates an error in the interface.	If the error reoccurs even after power cycling, contact your nearest CKD sales office or distributor.	No
0x3A00 to 0x3A0F	Actuator Model number error	Indicates that the model number of the actuator connected last time and actuator being connected are different when the power is turned ON.	Reconnect to the previously connected actuator. Or, overwrite the information of the actuator connected last time with the information of the actuator being connected and turn the power ON again.	No
0x3A10 to 0x3A1F	Actuator information not set	Indicates that actuator information is not set in the controller when the drive unit (B type) is powered on.	Set the actuator information and turn on the power again.	No
0x3A20 to 0x3A2F	Changing actuator information	Indicates that the drive unit (B type) has not been turned on again after the actuator information was changed.	Turn on the power again.	No
0x3A30 to 0x3A3F	Actuator information error (ECG only)	Indicates that an actuator not compatible with the ECMG series is connected.	Contact your nearest CKD sales office or distributor.	No
0x3B00 to 0x3B0F	Number of axes error (Not connected)	Indicates that an operable axis cannot be detected.	Check that the drive unit is connected to the communication unit, and then turn the power on again. Check the LED indication of the drive unit to see if there is any abnormality with the drive unit.	No
0x3B10 to 0x3B1F	Number of axes error (Excess)	Indicates that the communication unit has detected more than 17 axes.	Check if nine or more drive units are connected to one communication unit.	No
0x3B20 to 0x3B2F	Axis number error (Duplicate)	Indicates a duplicate axis number.	Set the axis number again. Refer to Instruction Manual (SM-A62471) for how to set the axis number.	No

Alarm code	Alarm item	Description	Solution	Alarm reset
0x3B30 to 0x3B3F	Axis number error (Out of range)	Indicates that the axis number is out of range.	Set the axis number again. Refer to Instruction Manual (SM-A62471) for how to set the axis number.	No
0x3B40 to 0x3B4F	Number of units error (Excess)	Indicates that the communication unit has detected nine or more drive units.	Check if nine or more drive units are connected to one communication unit.	No
0x3B50 to 0x3B5F	Axis number writing error (At startup)	Indicates failure to set the axis number at power ON.	Turn on the power again.	No
0x3C00 to 0x3C8F	Internal cyclic communication error (At startup)	Indicates an error in internal cyclic communication at power ON.	Check that there is no abnormality with the connection between units and turn the power on again.	No
0x3D00 to 0x3D8F	Internal cyclic communication error	Indicates an error in internal cyclic communication.	If this alarm is generated in both the communication unit and the drive unit, release the alarm in the drive unit before releasing the alarm in the communication unit.	Yes
0x3F00 to 0x3F0F	Drive unit mismatch	Indicates that the drive unit connected to the communication unit has changed since the last startup.	Confirm that the axis number, point data, and user parameters are set correctly, update the drive unit information from S-Tools, and turn the power on again. For information on how to update the drive unit information, refer to Instruction Manual (SM-A62471)..	No
0x4000 to 0x40FF	Parameter data	There is an error in the parameter data.	“0x4010 to 0x401F” indicates that there is an error in the setting of the home position offset amount. “0x4020 to 0x402F” indicates that there is an error in the setting of the home position return speed. Reconfigure the user parameters and perform an alarm reset.	Yes
0x4100 to 0x41FF	Point data (Position)	When a point travel command is input, there is an error in the point data of the point number.	The final target position exceeds the range of the soft limit, or the final target position is 360 deg or more in FGRC series. Reconfigure the following point data and reset the alarm. Point data: position, pressing distance	Yes
0x4200 to 0x42FF	Point Data (Speed)	When a point travel command is input, there is an error in the point data of the point number.	The point data setting is outside the setting range. Reconfigure the following point data and reset the alarm. For “0x4202”, review the setting of “Pressing speed” in the point data. For “0x4212”, review the “Speed” setting of the point data. For “0x4222”, review the “Acceleration” setting of the point data. For “0x4232”, review the “Deceleration” setting of the point data.	Yes
0x4300 to 0x43FF	Point data (Pressing)	When a point travel command is input, there is an error in the point data of the point number.	The point data setting is outside the setting range. Reconfigure the following point data and reset the alarm. Point data: pressing rate	Yes
0x4500 to 0x450F	CC-Link data error (Version)	The protocol version of CC-Link differs between the upper device and the communication unit.	Check whether the version information of the upper device matches that of the communication unit, and then turn the power on again.	No
0x4510 to 0x451F	CC-Link data error (The number of stations occupied)	The number of stations occupied is insufficient for the data capacity required from the setting of the operation mode of each drive unit.	Check that there are no problems with the operation mode (CC-Link) and the number of stations occupied, and then turn the power on again.	No

Alarm code	Alarm item	Description	Solution	Alarm reset
0x4600 to 0x460F	Operation mode setting error	The data size of internal cyclic communication exceeds the controller specification.	Review the operation mode setting.	No
0x4700 to 0x470F	Axis number setting error	An axis number other than 1 to 16 is set.	Review the axis number.	No
0x5000 to 0x5FFF	Internal non-cyclic communication error	Indicates an error in the internal non-cyclic communication.	Perform an alarm reset.	Yes
0x6000 to 0x60FF	Servo ON	There is an error in the encoder data signal for motor excitation when the servo is turned on for the first time after power-on.	Check the connection of the cable and the connector connecting the controller and the actuator. Check that the actuator is not restrained and reset the alarm. For a B-type drive unit, check that the actuator information setting matches the connected actuator. Refer to “” for how to set actuator information.	Yes
0x6200 to 0x62FF	Home position return	The home position cannot be detected even after traveling a distance longer than the stroke of the actuator when returning to the home position.	Check the connection of the cable and the connector connecting the controller and the actuator. Confirm that there is no problem, and then reset the alarm.	Yes
0x6400 to 0x64FF	Outside soft limit	The present position is outside the range of the soft limit during point travel.	If the alarm occurs due to an overshoot when positioning close to the soft limit, check the load conditions. The alarm will also occur when a point travel command is input from outside the range of the soft limit. In this case, move the actuator manually so that the present position is within the range of the soft limit. Confirm that there is no problem, and then reset the alarm.	Yes
0x6500 to 0x65FF	Overload (M)	The fingers cannot travel.	It occurs when the actuator cannot operate for a certain period of time or is pushed back in the direction opposite to the direction of operation while the actuator is in operation except during pressing operation. Check the load and operating conditions. Check if there is any object within the movable range that interferes with the operation. Confirm that there is no problem, and then reset the alarm.	Yes
0x6600 to 0x66FF	Overload (P)	The fingers have been pushed back to the pressing start point by external force when pressing.	Check the load and operating conditions. Confirm that there is no problem, and then reset the alarm.	Yes
0x6700 to 0x67FF	Overload (S)	The fingers cannot stop.	Check the load and operating conditions. Confirm that there is no problem, and then reset the alarm.	Yes
0x6800 to 0x68FF	Overload (H)	The fingers have become misaligned when stopping.	Check the load and operating conditions. Check the setting of the “Holding current at stop” in the parameter data. Confirm that there is no problem, and then reset the alarm.	Yes
0x6900 to 0x69FF	Overload (C)	An overcurrent has flown into the motor.	Check the load and operating conditions. Confirm that there is no problem, and then reset the alarm.	Yes
0x6A00 to 0x6AFF	Overload (D)	There is a problem in controlling the position.	Check the load and operating conditions. Confirm that there is no problem, and then reset the alarm.	Yes
0x6B00 to 0x6BFF	Overload (T)	Excessive torque output has continued.	Check the load and operating conditions. Confirm that there is no problem, and then reset the alarm.	Yes
0x6C00 to 0x6CFF	Home position return (C)	Excessive load is detected during home position return in the FGRC.	Check that there are no workpieces to collide with within the homing operation range. Confirm that there is no problem, and then reset the alarm.	Yes

Alarm code	Alarm item	Description	Solution	Alarm reset
0x7000 to 0x7FFF	Memory (Initialize)	An error has been detected in initializing memory data when changing data.	If the error reoccurs even after power cycling, contact your nearest CKD sales office or distributor.	No

When an alarm occurs, the actuator is in the servo OFF state. In case of an actuator with a brake, the brake is applied and the holding torque is applied. In case of an actuator without brake, the dynamic brake is applied but the holding torque is not applied.

■ Warning

These are output when a minor error that will not affect the operation of the actuator is detected in the controller. They can be canceled by changing controller settings.

Alarm code	Alarm item	Phenomenon	Cause/Solution
0x0101	Calendar Initialization	The date setting has been initialized due to an error in the calendar function .	The internal power supply was cut off and the date setting could not be retained. Reset the date of calendar function. The warning is canceled when the resetting is completed.
0x0111	Calendar writing error	Indicates that the date write was not complete.	Reset the date of calendar function. If the error occurs again even after resetting, please contact us.
0x0201	Maintenance data (Running distance)	The integrated running distance has exceeded the threshold.	The integrated running distance has exceeded the threshold set in the user parameter. After performing maintenance, reconfigure the threshold. The warning is cleared when the threshold exceeds the integrated running distance.
0x0211	Maintenance data (Number of travels)	The integrated number of travels has exceeded the threshold.	The integrated number of travels has exceeded the threshold set in the user parameter. After performing maintenance, reconfigure the threshold. The warning is cleared when the threshold exceeds the integrated number of travels.
0x0221	Maintenance data (Operating time)	The integrated operating time has exceeded the threshold.	The integrated operating time has exceeded the threshold set in the user parameter. After performing maintenance, reconfigure the threshold. The warning is cleared when the threshold exceeds the integrated operating time.
0x0401	Power supply voltage drop	The power supply voltage has dropped below a certain value.	The power supply voltage detected by the controller is less than 21.6 V while the power supply is ON. Adjust the power supply voltage. The warning is canceled when the power supply voltage detected by the controller is 21.6 V or more.
0x0501	Temperature error (drive unit)	Drive unit temperature exceeds the threshold	The drive unit temperature exceeds the threshold set in the user parameter. After checking the operating conditions, reconfigure the threshold. The warning is cleared when the drive unit temperature falls below the threshold.

6. PRODUCT COMPLIANCE

Refer to Instruction Manual (SM-A62471).

7. WARRANTY PROVISIONS

7.1 Warranty Conditions

■ Warranty coverage

If the product specified herein fails for reasons attributable to CKD within the warranty period specified below, CKD will promptly provide a replacement for the faulty product or a part thereof or repair the faulty product at one of CKD's facilities free of charge.
However, following failures are excluded from this warranty:

- Failure caused by handling or use of the product under conditions and in environments not conforming to those stated in the catalog, the Specifications, or this Instruction Manual.
- Failure caused by incorrect use such as careless handling or improper management.
- Failure not caused by the product.
- Failure caused by use not intended for the product.
- Failure caused by modifications/alterations or repairs not carried out by CKD.
- Failure that could have been avoided if the customer's machinery or device, into which the product is incorporated, had functions and structures generally provided in the industry.
- Failure caused by reasons unforeseen at the level of technology available at the time of delivery.
- Failure caused by acts of nature and disasters beyond control of CKD.

The warranty stated herein covers only the delivered product itself. Any loss or damage induced by failure of the delivered product is excluded from this warranty.

■ Confirmation of product compatibility

It is the responsibility of the customer to confirm compatibility of the product with any system, machinery, or device used by the customer.

■ Others

The terms and conditions of this warranty stipulate basic matters.
When the terms and conditions of the warranty described in individual specification drawings or the Specifications are different from those of this warranty, the specification drawings or the Specifications shall have a higher priority.

7.2 Warranty Period

The product is warranted for one (1) year from the date of delivery to the location specified by the customer.