Electric Actuator
ECR (Controller)

INSTRUCTION MANUAL

SM-A10615-A

- Be sure to read this instruction manual before using the product.
- Pay especially close attention to the safety-related information contained within.
- Keep this instruction manual in a safe place so that it is readily available when needed.

PREFACE

Thank you for purchasing this CKD **"ECR" controller for electric actuators**. In order for this product to be used to its fullest potential, this instruction manual describes basic topics such as how to mount and use it. Read this manual thoroughly prior to use.
Keep this instruction manual in a safe place so that it is not lost.

The specifications and images in this instruction manual are subject to change without prior notice.

SAFETY INFORMATION

When designing and manufacturing equipment using this product, you are obligated to manufacture safe equipment. Therefore, confirm that the safety of the equipment's mechanisms and the system that runs the electrical controls can be ensured.

It is important to select, use, handle and maintain CKD products appropriately to ensure their safe usage.
Be sure to observe the warnings and precautions listed in this instruction manual to ensure equipment safety.

This product is equipped with various safety measures. Even so, mishandling could cause an accident. To prevent such an accident from occurring...

Make sure that you read this instruction manual thoroughly and understand its content before use.

There are three levels of precautions to indicate the level and potential for danger or damage: "DANGER", "WARNING" and "CAUTION".

⚠ DANGER	Mishandling could likely cause death or serious injury.
⚠ WARNING	Mishandling could cause death or serious injury.
⚠ CAUTION	Mishandling could cause injury or physical damage.

Note that some items indicated with "CAUTION" may lead to serious results depending on the conditions.
All items contain important information and must be observed.

The following icon is used to indicate other general precautions and usage hints.

✎ Indicates a general precaution or usage hint.

Product precautions

⚠ DANGER

Do not use this product for the following applications.
- Medical devices involved in maintaining or managing human life or health
- Mechanisms or machines meant to transfer or transport people
- Important security parts in machines

⚠ WARNING

Use this product in accordance with specifications.

Disposal precautions

⚠ CAUTION

When disposing of the product, follow laws and regulations related to processing and cleaning waste. Request a specialized waste processing vendor to dispose of waste.
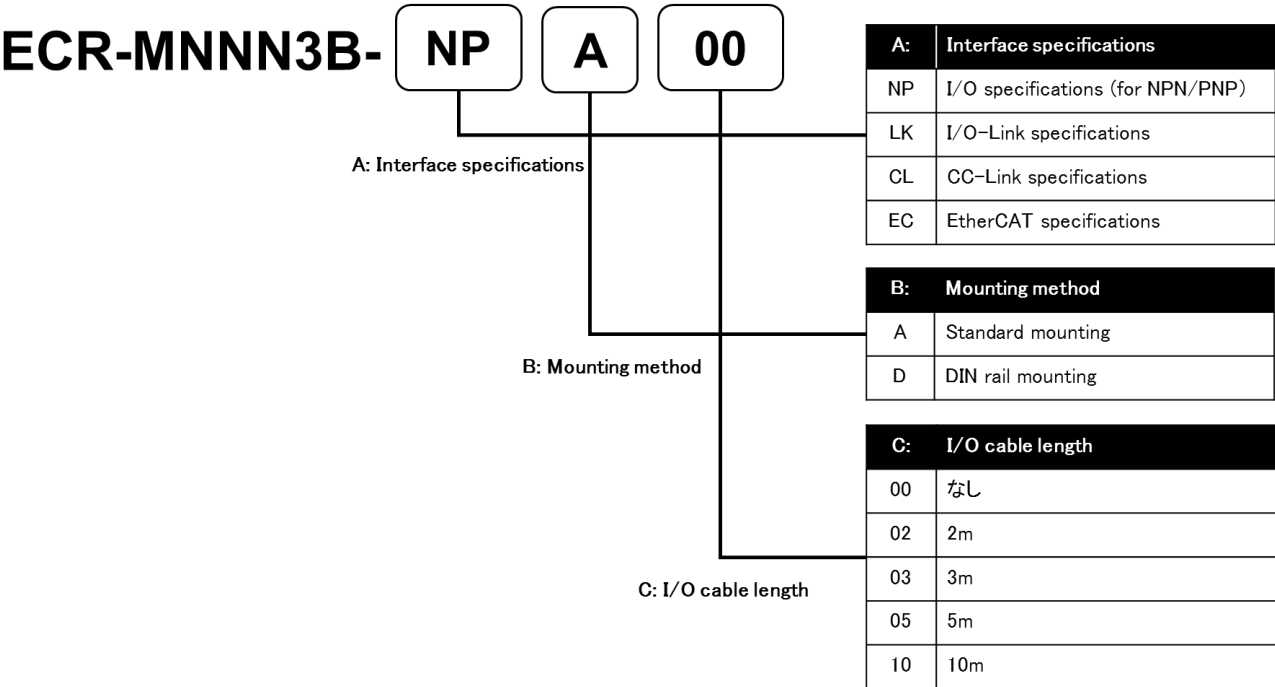
CONTENTS

1. PRODUCT OVERVIEW

1.1   Controller Model number explanation

ECR-MNNN3B- **NP** **A** **00**

A: Interface specifications

B: Mounting method

C: I/O cable length

A:	Interface specifications
NP	I/O specifications (for NPN/PNP)
LK	I/O-Link specifications
CL	CC-Link specifications
EC	EtherCAT specifications

B:	Mounting method
A	Standard mounting
D	DIN rail mounting

C:	I/O cable length
00	なし
02	2m
03	3m
05	5m
10	10m

*C: The I/O cable length can only be selected when the interface specification is I/O specification. In a case other than the I/O specification, 00 only.

1.2   System configuration
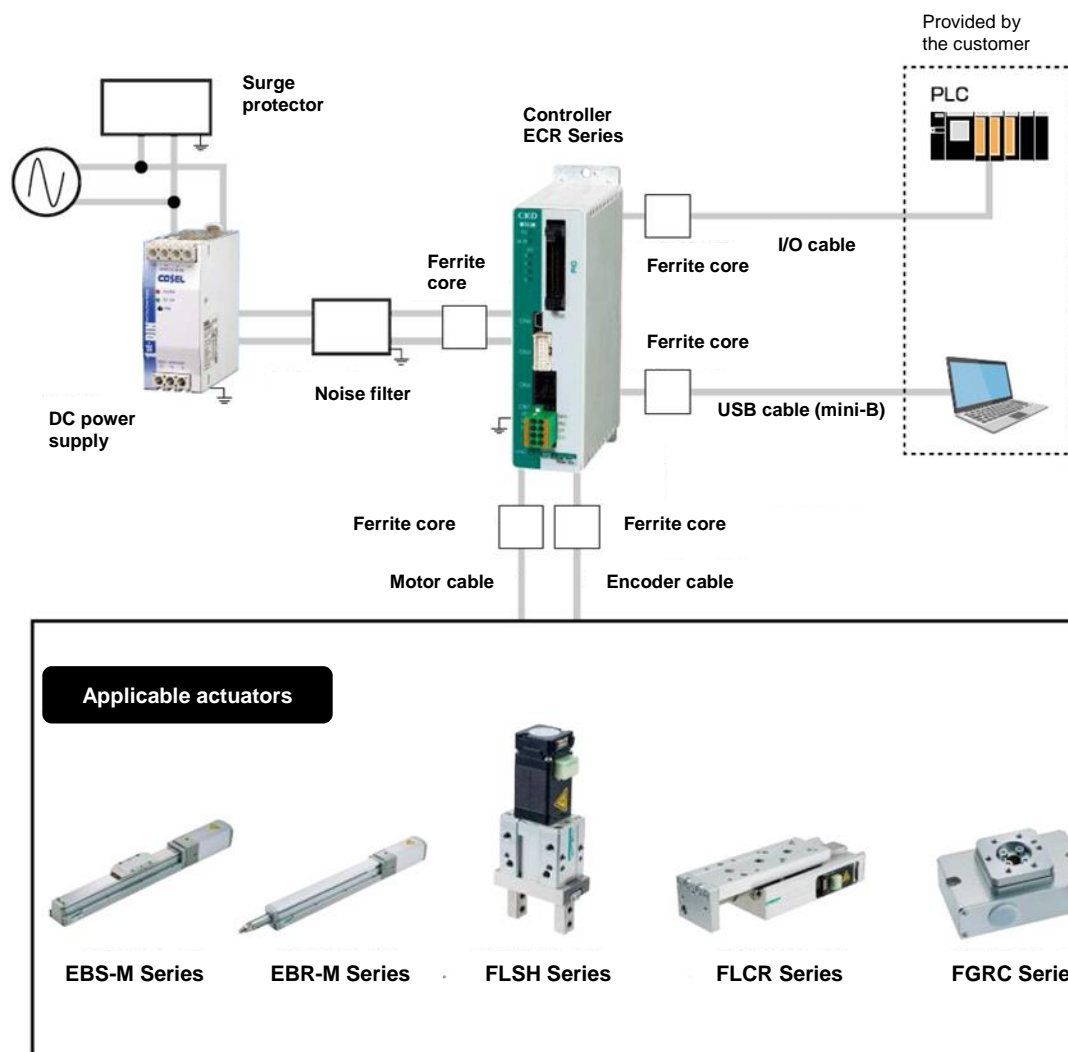
System components that can be purchased from CKD are listed below.

Items	Name	Product name、Model No.
Normal configuration (when selecting the set model number)	Controller	ECR Series
	Actuator	EBS-M/EBR-M/FLSH/FLCR/FGRC Series
	Motor cable	EA-CBLM1-※
	Encoder cable	EA-CBLE1-※
	I/O cable	EA-CBLNP1-※
Sold separately	24 VDC power supply	EA-PWR-KHNA240F-24
	48 VDC power supply	EA-PWR-KHNA480F-48
	Surge protector	AX-NSF-RAV-781BXZ-4
	Noise filter	AX-NSF-NF2015A-OD
	Ferrite core (7 pieces)	EA-NSF-FC01-SET
Freeware	PC setting software	S-Tools

Other devices must be provided by the customer.

2. SPECIFICATIONS

2.1   Basic specifications

Items	Descriptions
Applicable actuators	EBS-M/EBR-M/FLSH/FLCR/FGRC
Setting tool	Setting software (S-Tools)
Operation mode (PIO)	Teaching 64-point mode, 64-point mode, 128-point mode, 256-point mode, 512-point mode, Simple 7-point mode, Solenoid valve mode double 2 position type, Solenoid valve mode double 3 position type, Solenoid valve mode single type
Number of inputs	16 points
Number of outputs	16 points
Power supply voltage	24 VDC ±10% or 48 VDC ±10%
Power capacity	Max. 480 W
Indicator lamps	SV: ON when servo ON, ALM: ON during alarm, ST: Load indication or alarm indication
Brake release input	24 VDC ±10% or 48 VDC ±10%
Emergency stop release input	24 VDC ±10% or 48 VDC ±10%
Insulation resistance	10 M Ω or more with 500 VDC
Withstand voltage	500 VAC for 1 min.
Specified ambient temperature	0 to 40°C (no freezing)
Specified ambient humidity	35 to 80% RH (no condensation)
Storage ambient temperature	-10 to 50°C (no freezing)
Storage ambient humidity	35 to 80% RH (no condensation)
Specified atmosphere	No corrosive gas, explosive gas or dust
Degree of protection	IP20
Weight	Approx. 400g Approx. 430 g (DIN rail mounting)

2.2 Dimensions

● Normal mounting

● DIN rail mounting

Grounding terminal
(M3 × 5 pan head screw)

4
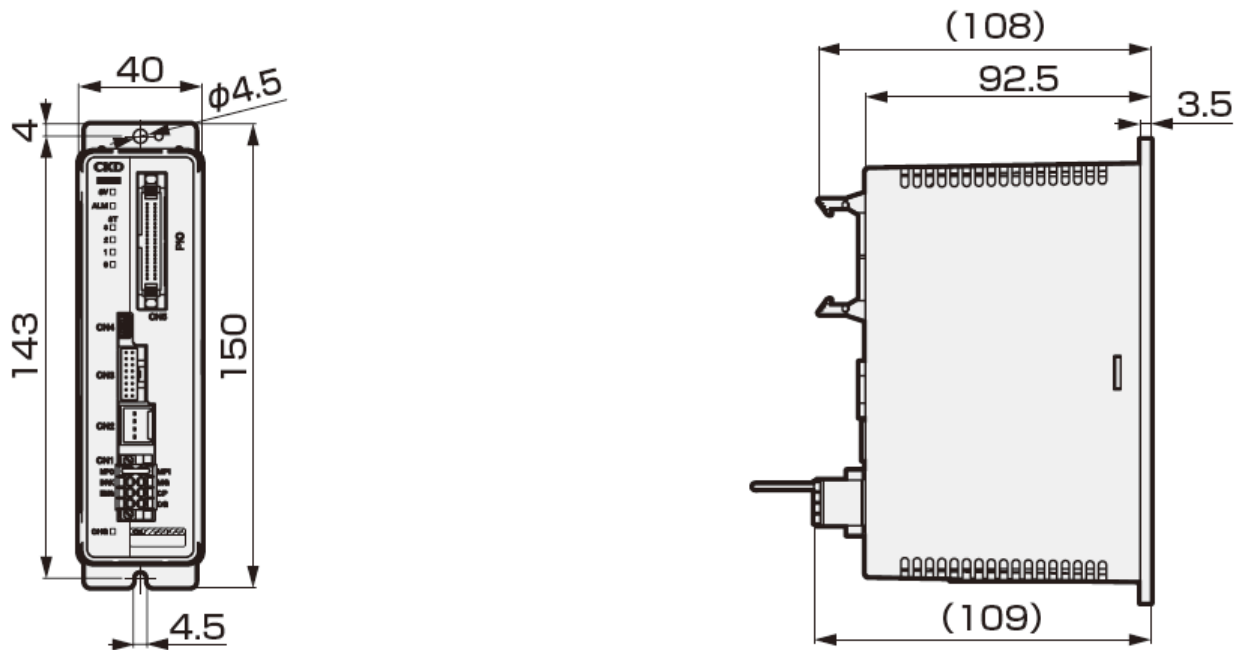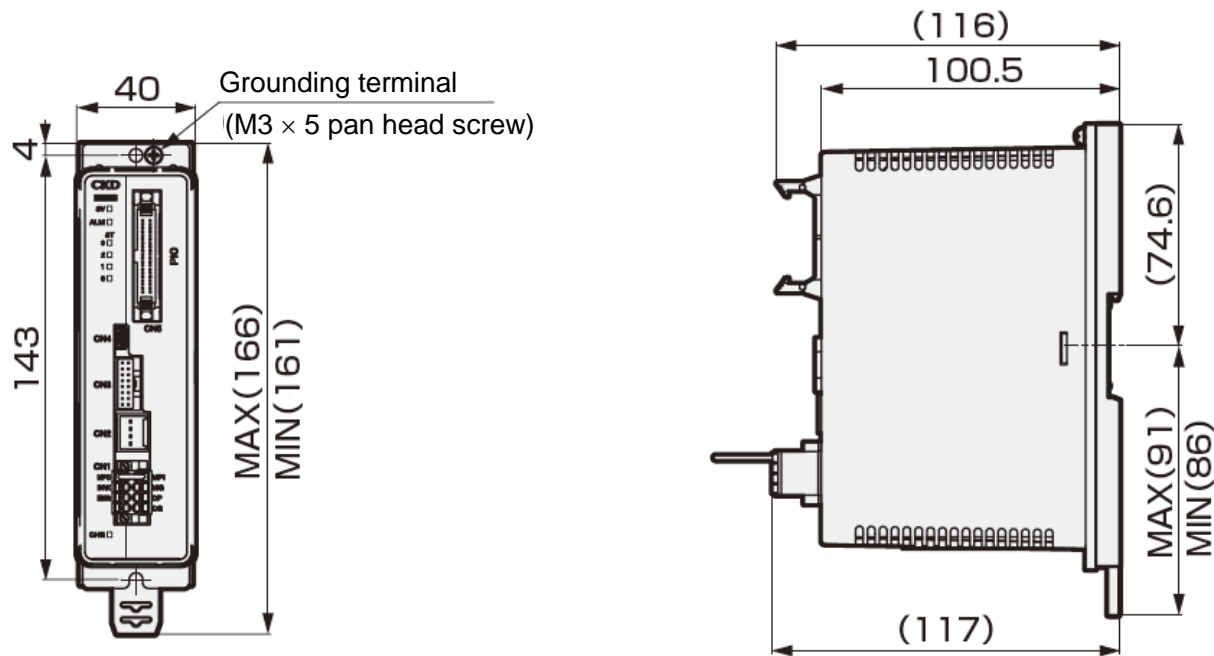
2.3   Panel details
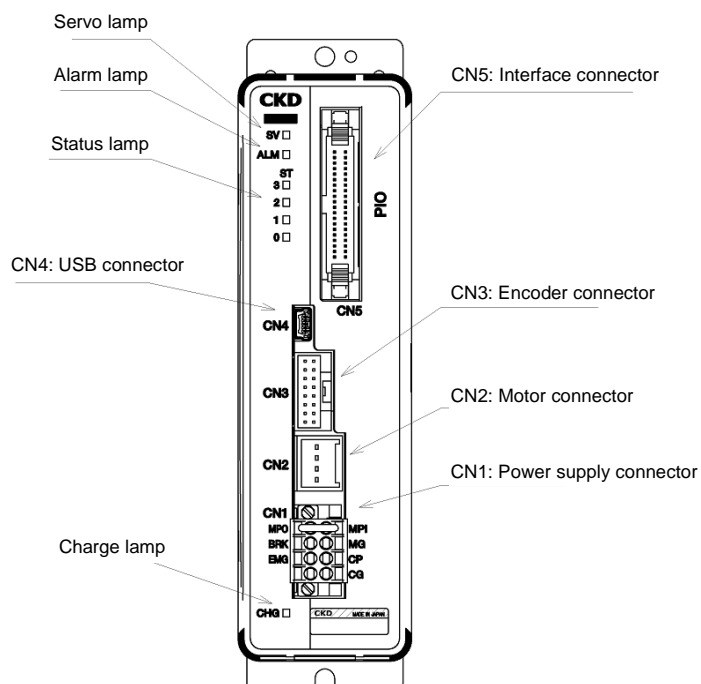
Code	Name	Description
SV	Servo lamp	Indicates whether servo is ON or OFF Servo ON: Steady green Servo OFF: Blinking green
ALM	Alarm lamp	Indicates an alarm/warning has occurred Occurrence of alarm which cannot be released: Steady red Occurrence of alarm which can be released: Blinking red (fast blinking) Occurrence of warning: Blinking red (slow blinking)
ST	Status lamp	Operating: Displays the amount of electrical current to the motor (four levels) During alarm: Displays the type of alarm
CN1	Power supply connector	Connector used to connect the controller to the power Refer to 4.1 for information on wiring method
CN2	Motor connector	Connector used to connect the motor cable Connection cable model No.: EA－CBLM1－***
CN3	Encoder connector	Connector used to connect the encoder cable Connection cable model No.: EA－CBLE1－***
CN4	USB connector	Connector used to connect the setting tool (PC setting software) Connection cable: Commercially available USB cable (mini-B type)
CN5	Interface connector	Connector used to connect the upper device Refer to 4.3 for information on wiring Connection cable model No.: EA－CBLNP1－**
CHG	Charge lamp	Indicates the state of the passing of the current of the controller power supply Current is passed: Steady orange No current is passed: Unlit

■ Status lamp indication

<If there is no alarm>

ST lamp				Operation
3	2	1	0	
□	□	□	□	A current of 5% or less is passing for the rated current.
□	□	□	■	A current of 24% or less is passing for the rated current.
□	□	■	■	A current of 49% or less is passing for the rated current.
□	■	■	■	A current of 74% or less is passing for the rated current.
■	■	■	■	A current of 75% or more is passing for the rated current.

□: Unlit, ■ Lit

<If there is alarm>

ST lamp				Operation
3	2	1	0	
□	□	□	■	Alarm 0x1*** occurs.
□	□	■	□	Alarm 0x2*** occurs.
□	□	■	■	Alarm 0x3*** occurs.
□	■	□	□	Alarm 0x4*** occurs.
□	■	■	□	Alarm 0x6*** occurs.
□	■	■	■	Alarm 0x7*** occurs.

*For the supporting of the alarm code and alarm description, refer to "8.1Alarm Indications and Countermeasures"エラー! 参照元が見つかりません。.

□: Unlit, ■ Lit

3. INSTALLATION

3.1   Installation precautions

- Be careful when transporting or handling this product, so that it is not dropped or otherwise subject to impact.
- Confirm the ambient temperature and atmosphere listed in the product specifications when storing or using 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.
- Use the product in an operating ambient temperature of 0 to 40°C. Ventilate if heat builds up.
- Install the product away from direct sunlight, dust and heat generating sources. Install it in a location free from corrosive gas, explosive gas, combustible gas and combustibles in general. This product was not designed to be chemically resistant.
- Do not use this product in areas subject to high current or strong magnetic fields. Do not pipe/wire (using a multi-conductor cable) it together with large motor power cables. Doing otherwise could introduce noise in the product body or cables. Be careful of inverter power supplies and wiring used with robots and similar machines (cannot be wired/piped together). Be sure to frame ground the same power supply and insert a filter into the output section.
- Secure the cable in place so that it cannot be easily moved. When securing it in place, do not bend the cable to the bending radius of 63 mm or less.
- 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.

4. WIRING

4.1 Power supply wiring

4.1.1 Power supply connector specifications

List of power supply connector terminals (DFMC1,5/4-STF-3,5 (PHOENIX CONTACT))

Terminal name	Function name	Description of function
MPI	Motor power supply (+)	The product is shipped with MPI and MPO connected via jumper wire, and with the control power supply and motor power supply connected. To separate the control power supply and motor power supply, remove the jumper wire between MPI and MPO, and then apply 24 or 48 VDC.
MPO	Motor power supply shutoff	The product is shipped with MPI and MPO connected via jumper wire, and with the control power supply and motor power supply connected. To separate the control power supply and motor power supply, remove the jumper wire between MPI and MPO.
MG	Motor power supply (-)	Same 0 VDC applied for motor power supply and force brake release.
BRK	Force brake release	Forcibly releases the brake. 24 VDC or 48 VDC: Forcibly releases brake. 0 VDC or open: Allows the brake to be applied.
CP	Control power supply (+)	Control power supply. Applies either 24 VDC or 48 VDC.
EMG	Emergency stop input	Connects the emergency stop switch for b contact. 24 VDC or 48 VDC applied: Emergency stop released. 0 VDC or released: Emergency stop applied.
CG	Control power supply (-)	Same 0 VDC applied for control power supply and emergency stop input.
NC	Open pin	Not used

Power supply connector (power supply connector is an accessory)
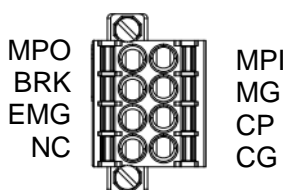
Use electrical wiring with the following specifications to connect to the power supply connector.

Core wire	0.75 mm^2 (AWG18) solid wire, stranded wire, stranded wire with bar terminal (without insulating sleeve)
Lead wire stripping area	10 mm from the end of the lead wire

⚠ 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 or 48 VDC is applied to force brake release (BRK), the brake will be forcibly released, and the movable part of the actuator could fall, causing injury or damaging the workpiece.

4.1.2 Power supply circuit

Item		Specifications
Motor power supply voltage		24 VDC ±10% or 48 VDC ±10%
Motor section instantaneous max. current	□20(FLSH-16,FLCR-16,FGRC-10)	1.5 A or less
	□25(FLSH-20,FLCR-20,FGRC-30)	3.0 A or less
	□25L(FLSH-25,FLCR-25)	4.5 A or less
	□35(EBS-04,EBR-04)	4.0 A or less
	□35(FGRC-50)	4.2 A or less
	□42(EBS-05,EBR-05)	5.2 A or less
	□56(EBS-08,EBR-08)	8.6 A or less
Control power supply voltage		24 VDC ±10% or 48 VDC ±10%
Current consumption		1 A or less

The control power supply and motor power supply can be connected to an external power supply using one of the two following methods. If the control power supply and motor power supply are used with different external power supplies, the control power supply and motor power supply voltage can be used separately with 24 V and 48 V.

<Using the control power supply and motor power supply connected to the same external power supply>

<Using the control power supply and motor power supply connected to different external power supplies>
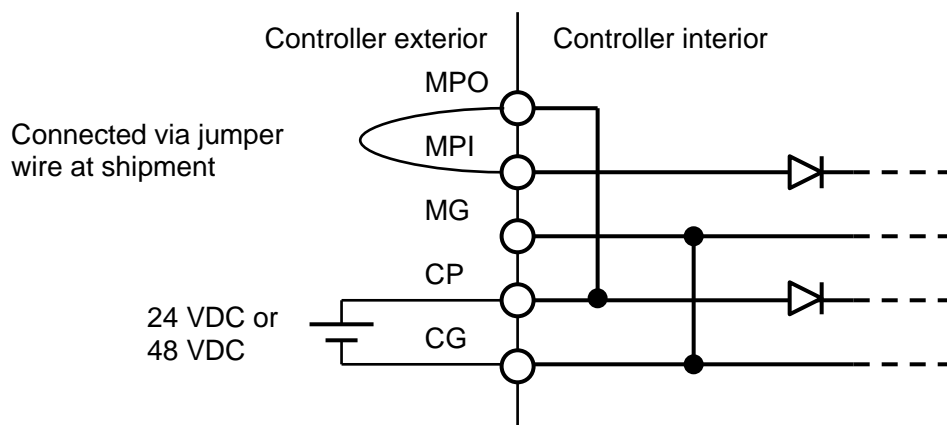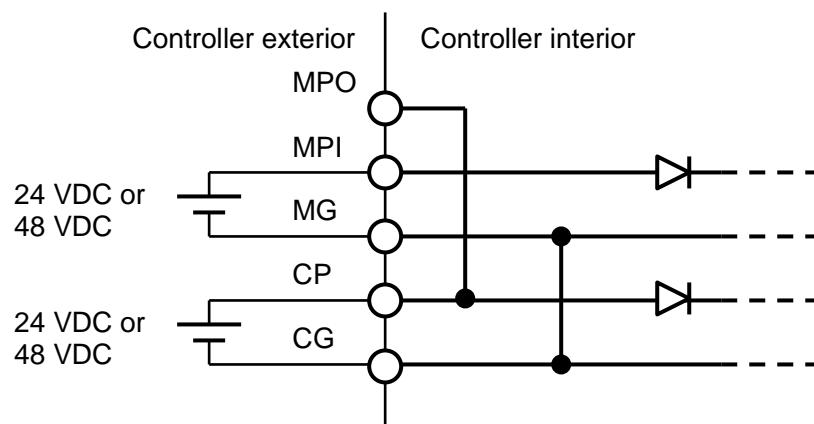
4.1.3 Basic power supply configuration
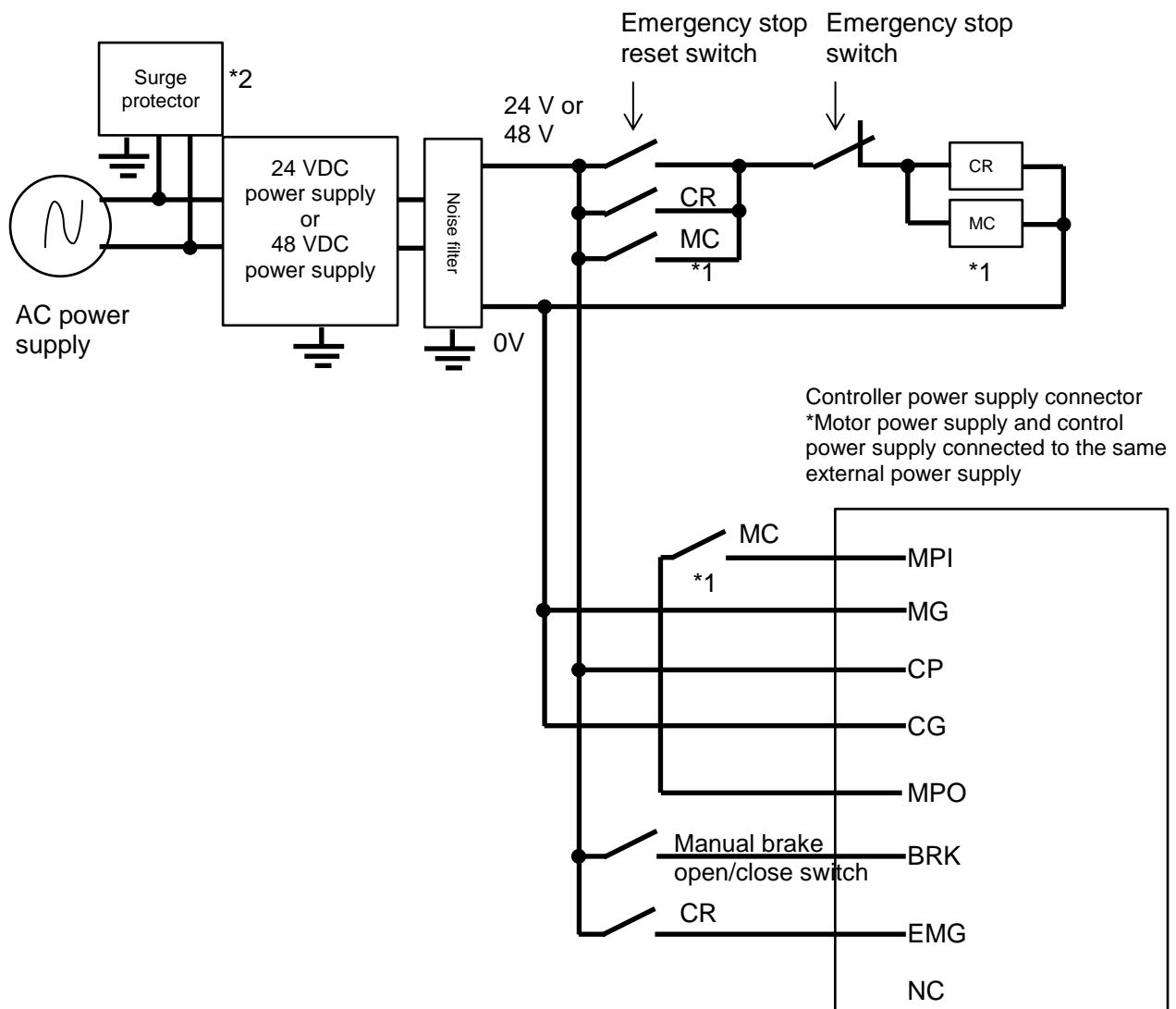
*1: To externally shut the motor power supply off (such as for supporting safety categories), connect a contact from an electromagnetic switch or other device between the MPI and MPO terminals.
*2: A surge protector is required to comply with the CE marking.

⚠ 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 or 48 VDC is applied to force brake release (BRK), the brake will be forcibly released, and the movable part of the actuator could fall, causing injury or damaging the workpiece.

⚠ CAUTION

Reconfirm wiring prior to passing current to prevent mis-wiring.
Make sure that wires are not loose and cannot be disconnected.

4.2   Actuator wiring

Use the dedicated motor cable and encoder cable to wire the controller and actuator.

4.2.1   Motor cable Model number explanation

EA-CBLM1- | S | 01

A: Cable type

B: Cable length (L)

A :	Cable type
S	Secured cable
R	Movable cable

B :	Cable length(L)
01	1m
03	3m
05	5m
10	10m

4.2.2   Motor cable dimensions

Actuator side

Controller side

(17.5) (26)   L   (15) (12)

(12)

Secured : $\phi 6$
Movable : $\phi 6.5$

(11.5)

4.2.3 Encoder cable Model number explanation

EA-CBLE1- [**S**] [**01**]

A: Cable type

B: Cable length (L)

A:	Cable type
S	Secured cable
R	Movable cable

B:	Cable length(L)
01	1m
03	3m
05	5m
10	10m

4.2.4 Encoder cable Model number explanation

| Actuator side | | Controller side |

(17) (26) L (9) (8.5)

(24) (18)

Secured : φ8.5
Movable : φ10.5
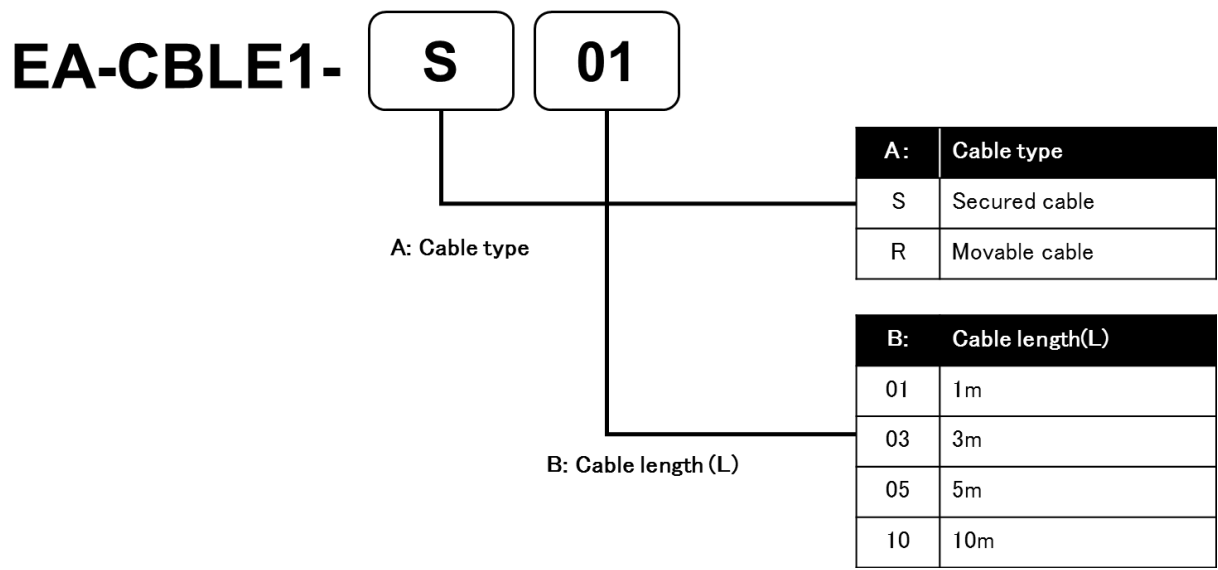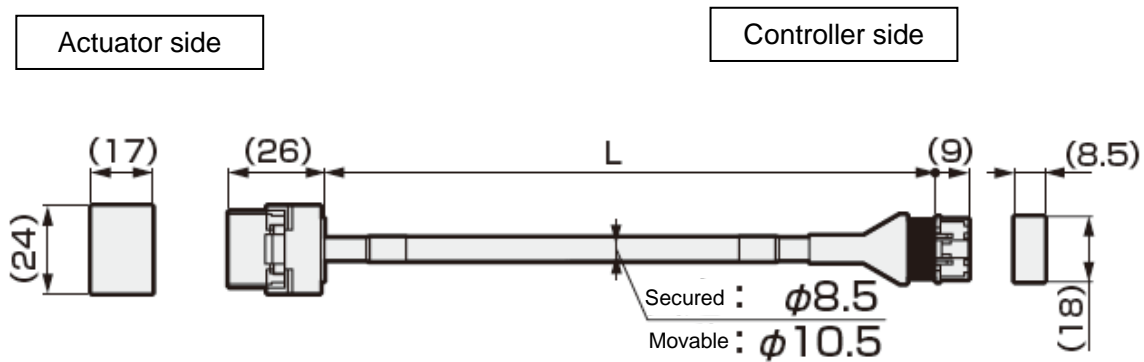
4.3   I/O wiring

Use the dedicated I/O cable to wire the controller and upper system (PLC).

4.3.1   I/O cable Model number explanation

EA-CBLNP1- [02]

A: Cable length (L)

A:	Cable length(L)
02	2m
03	3m
05	5m
10	10m

4.3.2   I/O cable dimensions
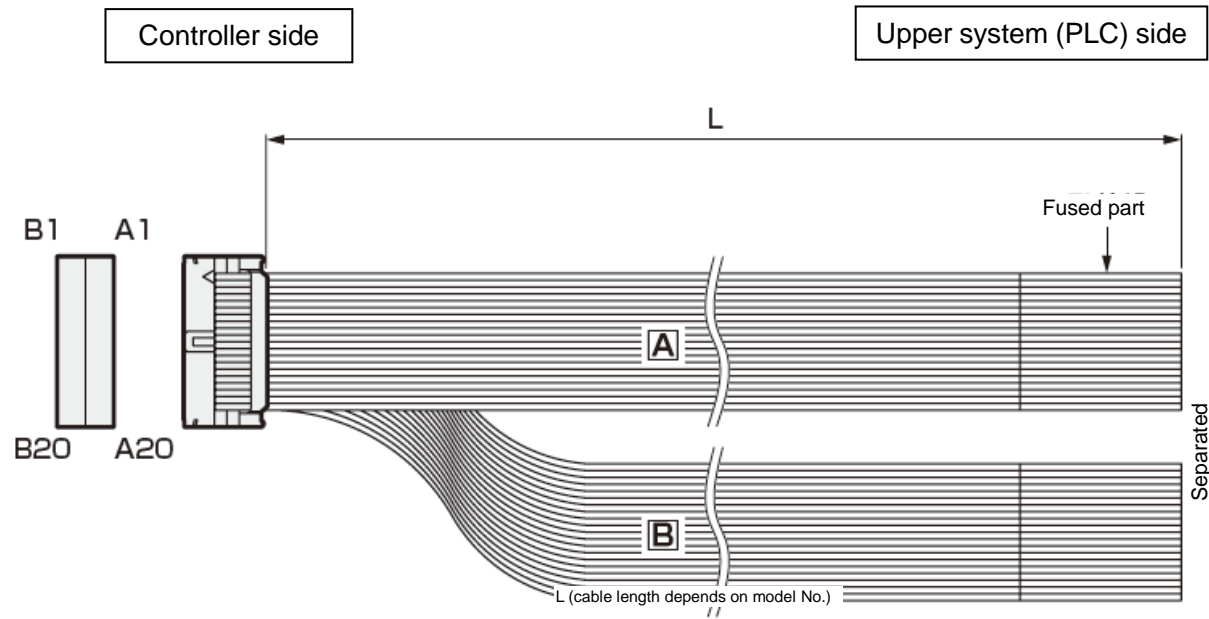
A: Input, B: Output

4.3.3   I/O cable specifications

Connector: 1.27 mm pitch two-piece connector HIF6-40D-1.27R(20) [Hirose Electric]
Cable: Flat cable
　　　UL2651, AWG#28, (strand structure: 7/0.127 mm, covering diameter: 0.8 to 1.0 mm), 20
　　　core×2
　　　Terminal separated at fused part

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4.3.4 Basic I/O cable configuration

Output side COM	External power supply	24 VDC*2 Brown → A1 Input common +/-*3
		Red → A2
PLC output Unit	General purpose input*1 Orange	A3 General purpose input 0
	General purpose input*1 Yellow	A4 General purpose input 1
	General purpose input*1 Green	A5 General purpose input 2
	General purpose input*1 Blue	A6 General purpose input 3
	General purpose input*1 Purple	A7 General purpose input 4
	General purpose input*1 Gray	A8 General purpose input 5
	General purpose input*1 White	A9 General purpose input 6
Output side	General purpose input*1 Black	A10 General purpose input 7
	General purpose input*1 Brown	A11 General purpose input 8
	General purpose input*1 Red	A12 General purpose input 9
	General purpose input*1 Orange	A13 General purpose input 10
	General purpose input*1 Yellow	A14 General purpose input 11
	General purpose input*1 Green	A15 General purpose input 12
	General purpose input*1 Blue	A16 General purpose input 13
	General purpose input*1 Purple	A17 General purpose input 14
	General purpose input*1 Gray	A18 General purpose input 15

Input Signal

Input side COM	External power supply	24 VDC*2 Brown → B1 Output common +/-*3
		Red → B2
PLC input unit	General purpose output*1 Orange	B3 General purpose output 0
	General purpose output*1 Yellow	B4 General purpose output 1
	General purpose output*1 Green	B5 General purpose output 2
	General purpose output*1 Blue	B6 General purpose output 3
	General purpose output*1 Purple	B7 General purpose output 4
	General purpose output*1 Gray	B8 General purpose output 5
	General purpose output*1 White	B9 General purpose output 6
	General purpose output*1 Black	B10 General purpose output 7
	General purpose output*1 Brown	B11 General purpose output 8
	General purpose output*1 Red	B12 General purpose output 9
Input side	General purpose output*1 Orange	B13 General purpose output 10
	General purpose output*1 Yellow	B14 General purpose output 11
	General purpose output*1 Green	B15 General purpose output 12
	General purpose output*1 Blue	B16 General purpose output 13
	General purpose output*1 Purple	B17 General purpose output 14
	General purpose output*1 Gray	B18 General purpose output 15

Output signal

*1 Refer to "4.3.6 General purpose input/output signal assignment " for general purpose input/output.
*2 An external power supply (24 VDC) is required for both input and output. Input and output common
   can use either + or -.
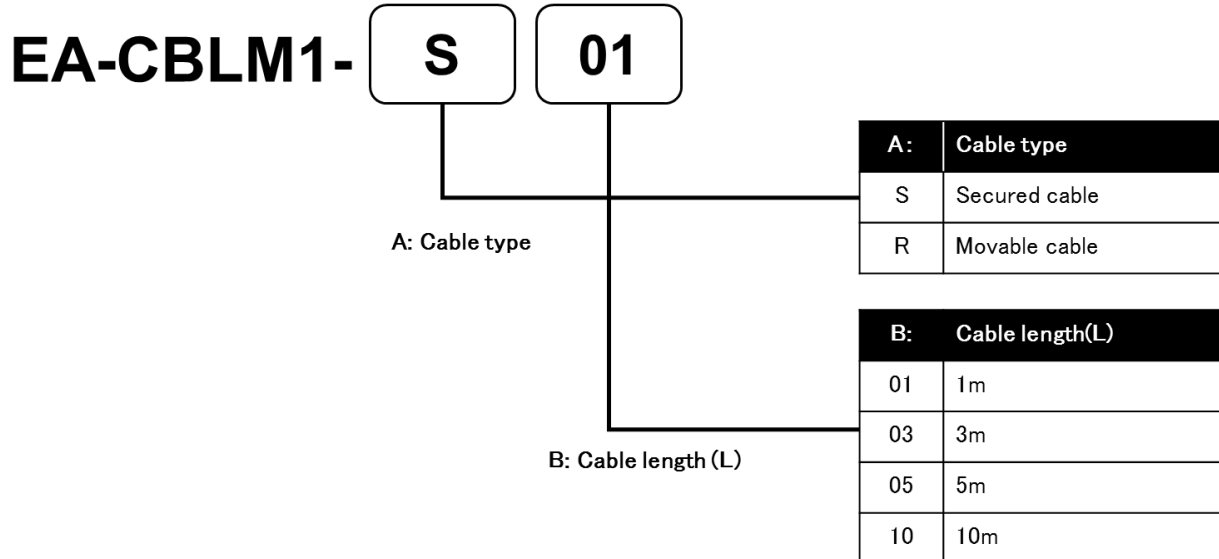*3 Input common and output common are not connected within the controller.

> ⚠**CAUTION**
>
> **Reconfirm wiring prior to passing current to prevent mis-wiring.**
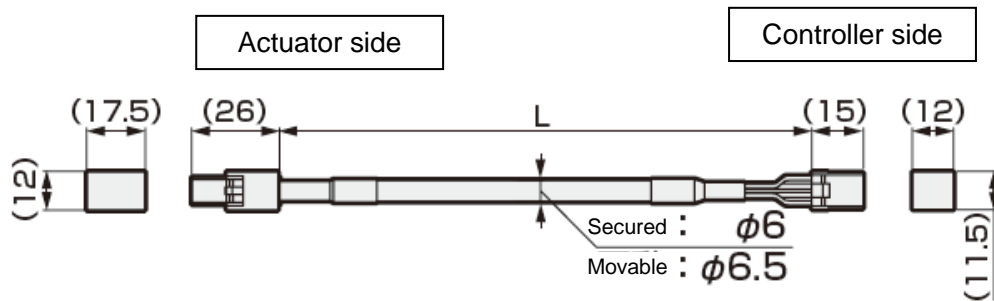> **Make sure that wires are not loose and cannot be disconnected.**
> **Be sure to insulate unused wiring.**
>   There is a risk of malfunction, failure, or electric shock.
> **After turning the power ON, use the setting tool to confirm that the input/output signals are**
> **correct.**

▌4.3.5 I/O cable assignment

No.	Line color	Name	No.	Line color	Name
A1	Brown	Input common (+/-)	B1	Brown	Output common (+/-)
A2	Red	Input common (+/-)	B2	Red	Output common (+/-)
A3	Orange	General purpose input 0	B3	Orange	General purpose output 0
A4	Yellow	General purpose input 1	B4	Yellow	General purpose output 1
A5	Green	General purpose input 2	B5	Green	General purpose output 2
A6	Blue	General purpose input 3	B6	Blue	General purpose output 3
A7	Purple	General purpose input 4	B7	Purple	General purpose output 4
A8	Gray	General purpose input 5	B8	Gray	General purpose output 5
A9	White	General purpose input 6	B9	White	General purpose output 6
A10	Black	General purpose input 7	B10	Black	General purpose output 7
A11	Brown	General purpose input 8	B11	Brown	General purpose output 8
A12	Red	General purpose input 9	B12	Red	General purpose output 9
A13	Orange	General purpose input 10	B13	Orange	General purpose output 10
A14	Yellow	General purpose input 11	B14	Yellow	General purpose output 11
A15	Green	General purpose input 12	B15	Green	General purpose output 12
A16	Blue	General purpose input 13	B16	Blue	General purpose output 13
A17	Purple	General purpose input 14	B17	Purple	General purpose output 14
A18	Gray	General purpose input 15	B18	Gray	General purpose output 15
A19	White	-	B19	White	-
A20	Black	-	B20	Black	-

4.3.6 General purpose input/output signal assignment

4.3.6.1 Signal name list

■ Input signals

PSBn	Point number selection bit n (n=0 to 8)
PST	Point travel start
PnST	Point number n travel start (n=1 to 7)
VnST	Solenoid valve travel command n (n=1 or 2)
VST	Solenoid valve travel command
OST	Home position return start
SVON	Servo ON
ALMRST	Alarm reset
STOP	Stop
PAUSE	Pause
TEACH	Teaching selection
INCH	INCH selection
JIM	JOG/INCH (-) travel start
JIP	JOG/INCH (+) travel start
WRST	Write start

■ Output signals

PCBn	Point number confirmation bit n (n=0 to 8)
PEND	Point travel complete
PnEND	Point number n travel complete (n=1 to 7)
SWn	Switch n (n=1 or 2)
OEND	Home position return start
MOVE	Traveling
ZONEn	Zone n (n=1 or 2)
PZONE	Point zone
SONS	Servo ON state
ALM	Alarm
WARN	Warning
READY	Operation preparation complete
ACBn	Alarm confirmation bit n (n=0 to 3)
TEACHS	Teaching state
WREND	Write complete

4.3.6.2 **Normal mode**

|	64-point mode	128-point mode	256-point mode	512-point mode
General purpose input 0	PSB0	PSB0	PSB0	PSB0
General purpose input 1	PSB1	PSB1	PSB1	PSB1
General purpose input 2	PSB2	PSB2	PSB2	PSB2
General purpose input 3	PSB3	PSB3	PSB3	PSB3
General purpose input 4	PSB4	PSB4	PSB4	PSB4
General purpose input 5	PSB5	PSB5	PSB5	PSB5
General purpose input 6	-	PSB6	PSB6	PSB6
General purpose input 7	-	-	PSB7	PSB7
General purpose input 8	-	-	-	PSB8
General purpose input 9	-	-	-	-
General purpose input 10	PST	PST	PST	PST
General purpose input 11	OST	OST	OST	OST
General purpose input 12	SVON	SVON	SVON	SVON
General purpose input 13	ALMRST	ALMRST	ALMRST	ALMRST
General purpose input 14	STOP	STOP	STOP	STOP
General purpose input 15	PAUSE	PAUSE	PAUSE	PAUSE
General purpose output 0	PCB0/ACB0	PCB0/ACB0	PCB0/ACB0	PCB0/ACB0
General purpose output 1	PCB1/ACB1	PCB1/ACB1	PCB1/ACB1	PCB1/ACB1
General purpose output 2	PCB2/ACB2	PCB2/ACB2	PCB2/ACB2	PCB2/ACB2
General purpose output 3	PCB3/ACB3	PCB3/ACB3	PCB3/ACB3	PCB3/ACB3
General purpose output 4	PCB4	PCB4	PCB4	PCB4
General purpose output 5	PCB5	PCB5	PCB5	PCB5
General purpose output 6	PZONE	PCB6	PCB6	PCB6
General purpose output 7	MOVE	MOVE	PCB7	PCB7
General purpose output 8	ZONE1	PZONE/ ZONE1/ ZONE2/ MOVE	PZONE/ ZONE1/ ZONE2/ MOVE	PCB8
General purpose output 9	ZONE2	PZONE/ ZONE1/ ZONE2/ MOVE	PZONE/ ZONE1/ ZONE2/ MOVE	PZONE/ ZONE1/ ZONE2/ MOVE
General purpose output 10	PEND	PEND	PEND	PEND
General purpose output 11	OEND	OEND	OEND	OEND
General purpose output 12	SONS	SONS	SONS	SONS
General purpose output 13	ALM	ALM	ALM	ALM
General purpose output 14	WARN	WARN	WARN	WARN
General purpose output 15	READY	READY	READY	READY

4.3.6.3 Teaching 64-point mode, simple 7-point mode, solenoid valve mode

	Teaching 64-point mode	Simple 7-point mode	Solenoid valve mode double 2 position type	Solenoid valve mode double 3 position type	Solenoid valve mode single type
General purpose input 0	PSB0	P1ST	V1ST	V1ST	-
General purpose input 1	PSB1	P2ST	V2ST	V2ST	VST
General purpose input 2	PSB2	P3ST	-	-	-
General purpose input 3	PSB3	P4ST	-	-	-
General purpose input 4	PSB4	P5ST	-	-	-
General purpose input 5	PSB5	P6ST	-	-	-
General purpose input 6	TEACH	P7ST	-	-	-
General purpose input 7	JIM	-	-	-	-
General purpose input 8	JIP	-	-	-	-
General purpose input 9	INCH	-	-	-	-
General purpose input 10	PST/WRST	-	-	-	-
General purpose input 11	OST	OST	OST	OST	OST
General purpose input 12	SVON	SVON	SVON	SVON	SVON
General purpose input 13	ALMRST	ALMRST	ALMRST	ALMRST	ALMRST
General purpose input 14	STOP	STOP	-	-	-
General purpose input 15	PAUSE	PAUSE	-	-	-
General purpose output 0	PCB0/ACB0	P1END	P1END	P1END	P1END
General purpose output 1	PCB1/ACB1	P2END	P2END	P2END	P2END
General purpose output 2	PCB2/ACB2	P3END	-	-	-
General purpose output 3	PCB3/ACB3	P4END	-	-	-
General purpose output 4	PCB4	P5END	SW1	SW1	SW1
General purpose output 5	PCB5	P6END	SW2	SW2	SW2
General purpose output 6	TEACHS	P7END	-	-	-
General purpose output 7	MOVE	MOVE	MOVE	MOVE	MOVE
General purpose output 8	PZONE/ ZONE1/ ZONE2/ MOVE	ZONE1	ZONE1	ZONE1	ZONE1
General purpose output 9	PZONE/ ZONE1/ ZONE2/ MOVE	ZONE2	ZONE2	ZONE2	ZONE2
General purpose output 10	PEND/WREND	PZONE	PZONE	PZONE	PZONE
General purpose output 11	OEND	OEND	OEND	OEND	OEND
General purpose output 12	SONS	SONS	SONS	SONS	SONS
General purpose output 13	ALM	ALM	ALM	ALM	ALM
General purpose output 14	WARN	WARN	WARN	WARN	WARN
General purpose output 15	READY	READY	READY	READY	READY

4.3.7 Input/output circuit

● Input circuit

Item	Specifications
Number of inputs	16
Input voltage	24 VDC ±10%
Input current	3.7 mA
Min. ON input voltage	19 V
Max. OFF input current	0.2 mA
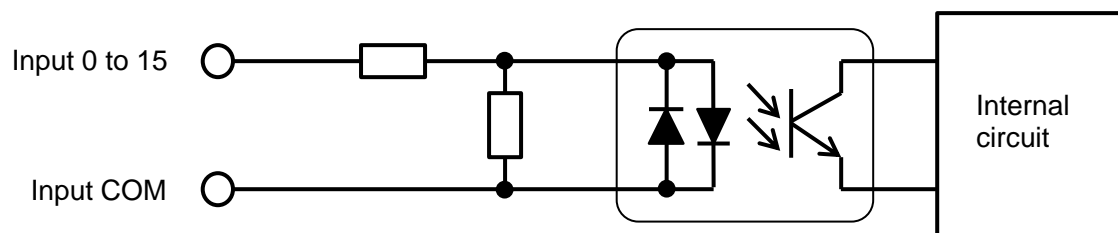
Input has no polarity, so input COM can use either + or -.

● Output circuit

Item	Specifications
Number of outputs	16
Load voltage	24 VDC ±10%
Load current	20 mA or less
Internal voltage drop when ON	3 V or less
Leakage current when OFF	0.1 mA or less
Output short-circuit protection circuit	Yes
Connecting load	PLC
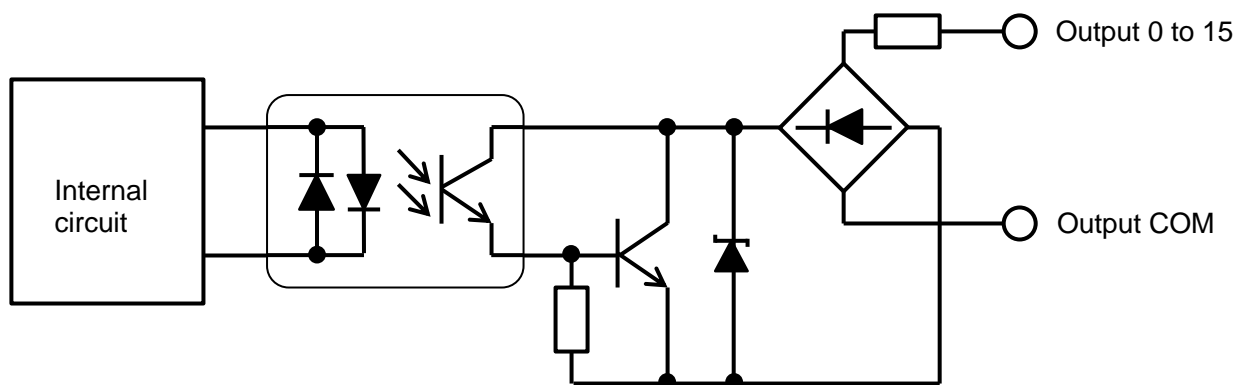
Output has no polarity, so output COM can use either + or -.

4.4 S-Tools setting software wiring

4.4.1 Communication specifications

Item	Specifications
Interface	USB 2.0
Communication speed	Full speed(12Mbps)

4.4.2 Connection method

■ Connection
Use a USB cable (mini-B type) to connect CN4 on the front of the controller with a USB port on a PC.

■ Removal
After closing the S-Tools setting software, remove from the connector.

> ⚠ **CAUTION**
>
> ● **Controller I/O connector I/O signals are disabled (with some exceptions) when operating or configuring using S-Tools. Disconnecting in this state will make it impossible to control it from the PLC or other upper device.**
> ● **Refer to the S-Tools setting software instruction manual for details.**
> ● **Make sure that wires are not loose and cannot be disconnected.**
> ● **It is assumed that the setting tool will be connected only for adjustment. Disconnect the USB cable from the controller prior to use during normal operation.**
> ● **Never connect it to another device.**

5. PARAMETERS DATA CONFIGURATION

Use the S-Tools setting software to set or change parameters.
Refer to the S-Tools setting software instruction manual (SM-A11147) for specific setting instructions and other details.

5.1 Parameters List

Name	Description	Setting range	Initial value	Unit
Soft limit (+)	Set the positive direction (opposite motor side) of the movable range. The setting range is from the Soft limit (-) value to the sum of stroke and margin (3 mm). *In the case of the rotary, the setting range is from the Soft limit (-) value to 360 (deg). If Soft limit (+) and Soft limit (-) are both set to 0, the stroke range becomes the movable range. Refer to "5.2 Soft limit" for details.	Soft limit (-) to Sum of stroke and margin (3 mm) *In the case of the rotary, the Soft limit (-) value to 360 (deg)	0.00	mm (deg)
Soft limit (-)	Set the negative direction (motor side) of the movable range. The setting range is from the sum of stroke and margin (3 mm) to the Soft limit (+) value. *In the case of the rotary, the setting range is from -360 (deg) to the Soft limit (+) value. If Soft limit (+) and Soft limit (-) are both set to 0, the stroke range becomes the movable range. Refer to "5.2 Soft limit" for details.	Sum of stroke and margin (3 mm) to Soft limit (+) *In the case of the rotary, -360 (deg) to the Soft limit (+) value	0.00	mm (deg)
Zone 1 (+)	Set the positive-side position of Zone 1 output. Refer to "5.3 Zone output" for details.	-9999.99 to 9999.99	0.00	mm (deg)
Zone 1 (-)	Set the negative-side position of Zone 1 output. Refer to "5.3 Zone output" for details.	-9999.99 to 9999.99	0.00	mm (deg)
Zone 2 (+)	Set the positive-side position of Zone 2 output. Refer to "5.3 Zone output" for details.	-9999.99 to 9999.99	0.00	mm (deg)
Zone 2 (-)	Set the positive-side position of Zone 2 output. Refer to "5.3 Zone output" for details.	-9999.99 to 9999.99	0.00	mm (deg)
Zone hysteresis	Set the hystereses of Zone 1 and Zone 2 outputs. Refer to "5.3 Zone output" for details.	0.00 to 9.99	0.00	mm (deg)
Home position return direction	Set the home position return direction to the negative direction :motor side (0) or positive direction :opposite motor side (1).	0 to 1	0 (Negative direction: Motor side)	None
Home position return speed	Set the speed for returning to home position.	EBR-04 screw lead: 6 mm EBR-05 screw lead: 2 mm EBR-05 screw lead: 5 mm → 5 to 20 EBS-04 screw lead: 6 mm EBS-05 screw lead: 2 mm EBS-05 screw lead: 5 mm EBS-08 screw lead: 5 mm → 5 to 25 EBS-04 screw lead: 12 mm EBS-05 screw lead: 10 mm EBS-05 screw lead: 20 mm EBS-08 screw lead: 10 mm EBS-08 screw lead: 20 mm EBR-04 screw lead: 12 mm EBR-05 screw lead: 10 mm EBR-05 screw lead: 20 mm EBR-08 screw lead: 5 mm EBR-08 screw lead: 10 mm EBR-08 screw lead: 20 mm → 5 to 30 FLSH → 5 to 25 FLCR → 5 to 20 FGRC → 20 to 30	20	mm/s (deg/s)
Home position offset amount	Set the offset amount for the home position. Refer to "7.5 Home position return operation" for details.	- Stroke to + Stroke	1.00	mm (deg)
Automatic home position return	Set the automatic home position return upon power-on to Enabled (0) or Disabled (1).	0 to 1	0 (Disabled)	None
Emergency stop input disabled	Set the emergency stop input to Enabled (0) or Disabled (1).	0 to 1	0 (Enabled)	None
Calendar function disabled	Set the calendar function to Enabled (0) or Disabled (1).	0 to 1	0 (Enabled)	None
Pressing judgment time	Set the time to spend for completing pressing in the pressing interval. (Pressing is determined as completed if the current value has reached the pressing current value during the pressing judgment time)	0 to 9999	200	ms
Fixed current at stop	Set the current value to maintain the workpiece when stopped.	0 to 100	65	%

Name	Description	Setting range	Initial value	Unit
Automatic servo OFF time 1	This setting is enabled when Auto Servo OFF 1 is selected as the stop method for point data. Servo OFF is initiated after the positioning operation is completed and the set time has elapsed.	0 to 9999	0	sec
Automatic servo OFF time 2	This setting is enabled when Auto Servo OFF 2 is selected as the stop method for point data. Servo OFF is initiated after the positioning operation is completed and the set time has elapsed.	0 to 9999	0	
Automatic servo OFF time 3	This setting is enabled when Auto Servo OFF 3 is selected as the stop method for point data. Servo OFF is initiated after the positioning operation is completed and the set time has elapsed.	0 to 9999	0	
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 (10^3deg)
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
Common positioning width	Set the common allowable value for positioning complete output. When 0 is set in point data, this value is read.	0.01 to 9.99	0.10	mm (deg/s)
Common speed	Set the common speed for the transport interval. When 0 is set in point data, this value is read.	Refer to "6.2.5 Setting the speed."	100	mm/s
Common acceleration	Set the common acceleration for the transport interval. When 0 is set in point data, this value is read.	0.01 to 1.00	0.10	G
Common deceleration	Set the common deceleration for the transport interval. When 0 is set in point data, this value is read.	0.01 to 1.00	0.10	G
Common pressing current	Set the common current value for the pressing interval. When 0 is set in point data, this value is read.	Refer to "6.2.13 Setting the pressing current."	50	%
Common pressing speed	Set the common speed for the pressing interval. When 0 is set in point data, this value is read.	Refer to "6.2.14 Setting the pressing speed."	10	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	+10.00	mm (deg)
Common acceleration/deceleration method	The value is fixed to Trapezoid (0). When 0 is set in point data, this value is read.	0	0 (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 OFF3	Control	None
Common rotation direction	Set the common rotation direction at the time of rotary selection and rotation. When "Common" is set in point data, this setting is read.	Close rotation, CW, CCW	Close rotation	None

Name	Description	Setting range	Initial value	Unit
Operation mode (PIO)	Set the operation mode. 0: 64-point mode — 5: Simple 7-point mode 1: 128-point mode — 6: Solenoid valve mode 1 (double 2-position type) 2: 256-point mode — 7: Solenoid valve mode 2 (double 3-position type) 3: 512-point mode — 8: Solenoid valve mode 3 (single type) 4: Teaching 64-point mode Refer to "7.6 Positioning operation" for details.	0 to 8	0 (64-point mode)	None
Input signal filter	Set the period for not responding to the PIO input signal from PLC, etc.	0 to 19	5	ms
Output selection 1	Select the assignment of signals output 8 at PIO signal output 9 in operation modes 1: 128-point mode, 2: 256-point mode, and 4: Teaching 64-point mode. 0: Point zone 1: Zone 1 2: Zone 2 3: Traveling	0 to 3	1 (Zone 1)	None
Output selection 2	Select the assignment of signals output 9 at PIO signal output 10 in operation modes 1: 128-point mode, 2: 256-point mode, 3: 512-point mode, and 4: Teaching 64-point mode. 0: Point zone 1: Zone 1 2: Zone 2 3: Traveling	0 to 3	2 (Zone 2)	None
Pause input disabled	Enable (0) or disable (1) the pause signal (PIO signal input 14) input in operation modes 0: 64-point mode, 1: 128-point mode, 2: 256-point mode, 3: 512-point mode, 4: Teaching 64-point mode, and 5: Simple 7-point mode.	0 to 1	0 (Enabled)	None
Stop input disabled	Enable (0) or disable (1) the stop signal (PIO signal input 15) input in operation modes 0: 64-point mode, 1: 128-point mode, 2: 256-point mode, 3: 512-point mode, 4: Teaching 64-point mode, and 5: Simple 7-point mode.	0 to 1	0 (Enabled)	None
JOG/INCH speed	Set the speed for JOG/INCH(-) travel start (PIO signal input 7) and JOG/INCH(+) travel start (PIO signal input 8) signals in operation mode 4: Teaching 64-point mode.	1 to 100	100	mm/s (deg/s)
INCH distance	Set the distance for INCH operation for JOG/INCH(-) travel start (PIO signal input 7) and JOG/INCH(+) travel start (PIO signal input 8) signals in operation mode 4: Teaching 64-point mode.	0.01 to 10.00	10.00	mm (deg)
G1 gain (responsiveness)	Adjust the convergence time of the speed waveform. As the setting value increases, the position proportional gain, speed proportional gain and speed integral gain increase. This increases directive following ability, but can more easily cause oscillation.	0 to 15	0	None
G2 gain (load magnification)	Adjust according to the actuator load. As the setting value increases, the speed proportional gain and speed integral gain increase. Increasing G2 gain decreases speed rippling. If the load is large, set the setting value to a large value.	0 to 15	0	None

*1: In relation to "G1 gain (responsiveness)" and "G2 gain (load magnification)", setting this to "0" will cause it to read the actuator eigenvalue. The actuator eigenvalue can be checked using S-Tools. Refer to the S Tools setting software instruction manual for details.
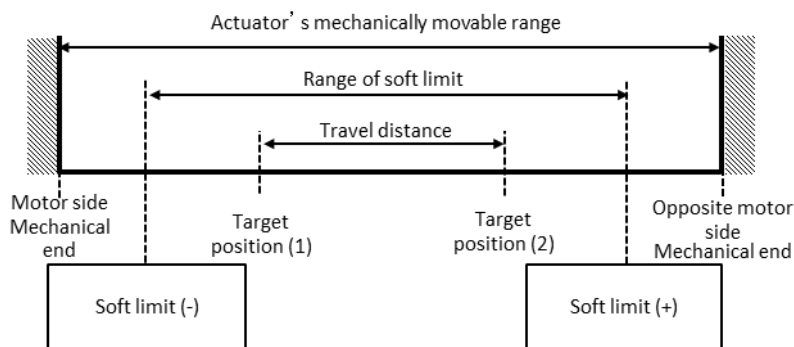
5.2   Soft limit

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.

5.2.1   EBS/EBR/FLSH/FLCR

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.

5.2.2   FGRC

The home position x-coordinate is 0.
Set the soft limit to a value that is or is outside of the "movement distance". Set the soft limit (+) value to be the soft limit (-) value or higher.

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.
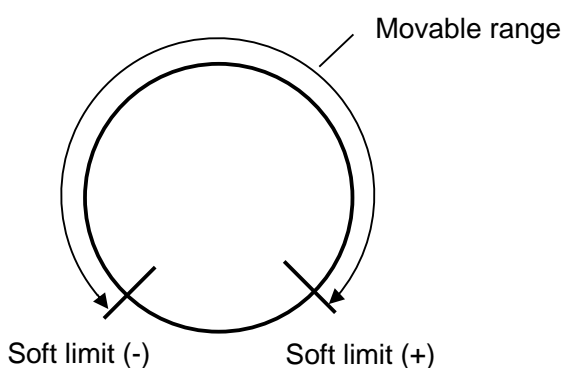
Setting example
Soft limit (+) ... 140 [deg]
Soft limit (-) ... -140 [deg]
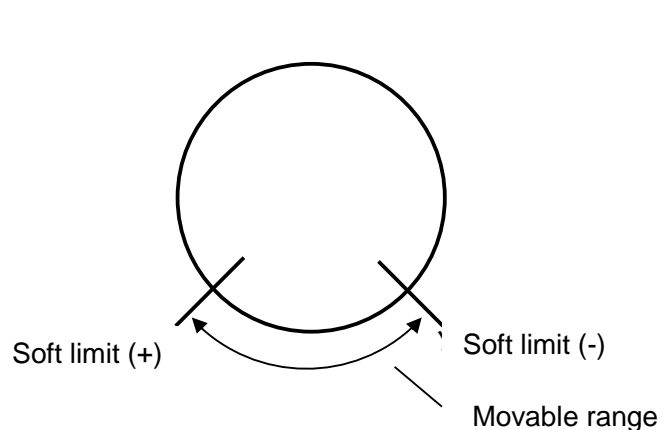
Setting example
Soft limit (+) ... 220 [deg]
Soft limit (-) ... 140 [deg]

5.3   Zone output

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

E.g. Zone 1(-): 20 mm, Zone 1(+): 50 mm,   Zone hysteresis: 5 mm (Sample settings)
　　Zone 2(-): 50 mm, Zone 2(+): 20 mm,   Zone hysteresis: 5 mm (Sample settings)

5.4   Adjusting the gains

If there is abnormality in the operation of the actuator, change the setting of the parameters "G1 gain (responsiveness)" and "G2 gain (load magnification)" and adjust the gains. For the setting of the parameters "G1 gain (responsiveness)" and "G2 gain (load magnification)", the setting software S-Tools is required. Refer to "3.7.2.3. A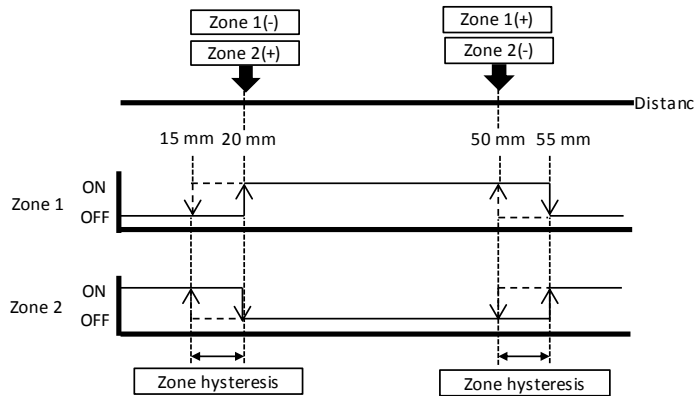djustment" of the S-Tools setting software instruction manual (SM-A11147) for specific setting instructions and other details.

■ 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.

6. POINT DATA CONFIGURATION

Use the S-Tools setting software to set or change the point data.
Refer to the S-Tools setting software instruction manual for specific setting instructions and other details.

6.1   Positioning point

The number of point data that can be set depends on the operation mode. The operation mode can be selected via parameters.

Normal mode				Teaching mode	Simple mode	Solenoid valve mode		
64-point	128-point	256-point	512-point	Teaching 64-point	Simple 7-point	Double 2 position type	Double 3 position type	Single type
Max. 64-point	Max. 128-point	Max. 256-point	Max. 512-point	Max. 64-point	7-point	2-point		

6.2   Point data list

The following items can be set for each point.

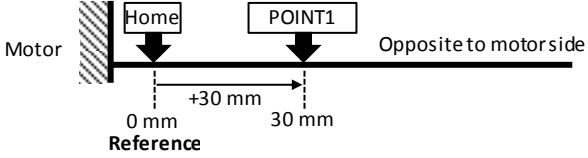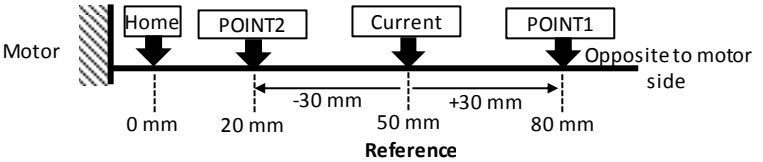| Setting item	Description
Position specification method	Select either Absolute or Incremental. Refer to "6.2.1 Selecting the position specification method" for details.
Operation method	Select Positioning operation, Pressing operation 1, or Pressing operation 2. Refer to "6.2.2 Selecting the operation method" for details.
Position	For Positioning operation, set this to the final target position [mm]. For Pressing operations 1 and 2, set this to the pressing start position [mm]. * 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 "6.2.3 Setting the position" for details.
Positioning width	Set the output range for the Point travel complete output signal and Switch 1,2 output signal using the width (one side) to the final target position [mm]. Refer to "6.2.4 Setting the positioning width" for details.
Speed	Set the speed for the transport interval [mm/s]. Refer to "6.2.5 Setting the speed" for details.
Acceleration	Set the acceleration for the transport interval [G]. Refer to "6.2.6 Setting the acceleration" for details.
Deceleration	Set the deceleration for the transport interval [G]. Refer to "6.2.7 Setting the deceleration" for details.
Acceleration/deceleration method	Only Trapezoid operation can be selected. Refer to "6.2.8 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 "6.2.9 Selecting the stop method" for details.
Rotation direction	Set the rotation direction of the rotary. Refer to "6.2.10 Selecting the rotation direction" for details.
Gain magnification	Set the gain magnification [%]. Refer to "6.2.11 Setting the gain magnification" for details.
Point zone+	Set Point zone+ [mm]. Refer to "6.2.12 Setting the point zone" for details.
Point zone-	Set Point zone- [mm]. Refer to "6.2.12 Setting the point zone" for details.
Pressing current	Set the current value [%] for the pressing interval. Refer to "6.2.13 Setting the pressing current" for details.
Pressing speed	Set the speed for the pressing interval [mm/s]. Refer to "6.2.14 Setting the pressing speed" for details.
Pressing distance	Set the pressing interval width [mm]. Refer to "6.2.15 Setting the pressing distance" for details.

▌ 6.2.1 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	Position specification selection	Initial value of position specification
Model		
EBS/EBR/FLSH/ FLCR/FGRC	Absolute Incremental	Absolute

・Setting example:

Position specification	Description	Setting example
Absolute .	Sets the distance from the home position with the home position (0 mm) as the reference.	Sample setting: POINT 1 Position: +30 mm Motor Home POINT1 Opposite to motor side +30 mm 0 mm 30 mm **Reference** The positioning completion point for POINT1 is the point 30 mm from the home position.
Incremental	Sets the distance from the current position with the current position as the reference. A negative value input represents a position on the motor side and a positive value input represents a position on the opposite motor side.	Sample setting: POINT 1 Position: +30 mm POINT 2 Position: -30 mm Motor Home POINT2 Current POINT1 Opposite to motor side -30 mm +30 mm 0 mm 20 mm 50 mm 80 mm **Reference** The positioning completion point for POINT1 is the point 80 mm from the home position. The positioning completion point for POINT2 is the point 20 mm from the home position.

6.2.2 Selecting the operation method

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

・Setting range and initial values (factory-default)

Actuator model	Operation selection	Initial value of operation
Model		
EBS/EBR/FLSH/ FLCR/FGRC	Positioning operation Pressing operation 1 Pressing operation 2	Positioning operation

・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 "7.6. 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. A completion signal is output when the set pressing current has been reached. When the actuator reaches the positioning completion point, the pressing operation ends and the actuator comes to a stop. Refer to "7.7. 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. The actuator operates at the set pressing current, and a completion signal is output when the actuator comes within the positioning width. When the actuator reaches the positioning completion point, the pressing operation ends and the actuator comes to a stop. Refer to "7.7 Pressing operation" for details.

6.2.3 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	Position setting range [mm], [deg] *1	Initial position value [mm], [deg] *1
Model		
EBS/EBR/FLSH/ FLCR	Negative stroke length to positive stroke length	0
FGRC	0 to 359.99	0

*1 [deg] are used in the case of the model number FGRC and [mm] unit in the case of other models.

6.2.4 Setting the positioning width

Set the output range for the Point travel complete output signal and Switch 1,2 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	Position width setting range [mm], [deg] *3	Initial position width value [mm], [deg] *3
Model		
EBS/EBR/FLSH/ FLCR/FGRC	0.00 to 9.99 *1	0.00 *2

*1 When this is set to 0.00, the common positioning width of the parameters data will be applied.
*2 The common positioning width is applied because 0.00 is set as the initial value (factory-default).
*3: [deg] are used in the case of the model number FGRC and [mm] unit in the case of other models.

・Setting example:

Operation	Setting example
Positioning operation	Sample setting: POINT 1 Position (Absolute position): +50 mm, Positioning width: 5 mm When the actuator travels to a distance in the range between 45 mm and 55 mm, a travel complete signal is output. Even when the actuator travels outside of the positioning width range due to an overshoot or other reasons, the complete signal is still maintained.
Pressing operation 1	The completion signal is determined by the set pressing current, and therefore is not affected by the positioning width settings.
Pressing operation 2	Sample setting: POINT 1 Position (Absolute position): +40 mm, Pressing distance: +10 mm, Positioning width: 5 mm When the actuator travels to a distance in the range between 45 mm and 55 mm, a travel complete signal is output. Even when the actuator travels outside of the positioning width range due to a push-back or other reasons, the complete signal is still maintained.

6.2.5 Setting the speed

The speed for the travel interval can be set.

・Setting range and initial values (factory-default)

<EBS/EBR series>

Actuator model				Speed setting range [mm/s], [deg/s] *1*2*4	Initial speed value [mm/s], [deg/s] *3*4
Model	Body size	Motor mounting direction	Screw lead		
EBS	04	ME	06	7 to 400	0
			12	15 to 800	0
		MR,MD,ML	06	7 to 400	0
			12	15 to 700	0
	05	ME	02	2 to 130	0
			05	6 to 300	0
			10	12 to 700	0
			20	25 to 1100	0
		MR,MD,ML	02	2 to 130	0
			05	6 to 300	0
			10	12 to 600	0
			20	25 to 1100	0
	08	ME	05	6 to 250	0
			10	12 to 550	0
			20	25 to 1100	0
		MR,MD,ML	05	6 to 225	0
			10	12 to 550	0
			20	25 to 1000	0
EBR	04	ME	06	7 to 350	0
			12	15 to 600	0
		MR,MD,ML	06	7 to 350	0
			12	15 to 600	0
	05	ME	02	2 to 130	0
			05	6 to 330	0
			10	12 to 600	0
			20	25 to 800	0
		MR,MD,ML	02	2 to 120	0
			05	6 to 330	0
			10	12 to 500	0
			20	25 to 800	0
	08	ME	05	6 to 225	0
			10	12 to 450	0
			20	25 to 900	0
		MR,MD,ML	05	6 to 225	0
			10	12 to 450	0
			20	25 to 700	0

*1: Operation may not be stable even in the setting range, depending on the acceleration, deceleration or installation method.
*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.
*3: The common speed is applied because the initial value (factory-default) is set to 0.
*4: [deg] are used in the case of the model number FGRC and [mm] unit in the case of other models.

<FLSH/FLCR/FGRC series>

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

*1: Operation may not be stable even in the setting range, depending on the acceleration, deceleration or installation method.
*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.
*3: The common speed is applied because the initial value (factory-default) is set to 0.
*4: [deg] are used in the case of the model number FGRC and [mm] unit in the case of other models.

▎6.2.6 Setting the acceleration

The acceleration for the travel interval can be set.

・Setting range and initial values (factory-default)

Actuator model	Acceleration setting range [G] *1	Initial acceleration value [G] *2
Model		
EBS/EBR	0.01 to 1.00	0.00
FLSH	0.10 to 0.30	0.00
FLCR	0.10 to 0.30	0.00
FGRC	0.10 to 0.30	0.00

*1: 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.
*2: The common acceleration is applied because the initial value (factory-default) is set to 0.

▌ 6.2.7 Setting the deceleration

The deceleration for the travel interval can be set.

・Setting range and initial values (factory-default)

Actuator model	Deceleration setting range [G]*1	Initial deceleration value [G]*2
Model		
EBS/EBR	0.01 to 1.00	0.00
FLSH	0.10 to 0.30	0.00
FLCR	0.10 to 0.30	0.00
FGRC	0.10 to 0.30	0.00

*1: Deceleration can be set to 0 in point data. If this is set to 0, the common deceleration of the parameters data will be applied.
*2: The common deceleration is applied because the initial value (factory-default) is set to 0.

▌ 6.2.8 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	Description
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.

6.2.9 Selecting the stop method

You can select the stop method for when the positioning operation or pressing operation is completed. 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	Description
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	Actuator is controlled to a stop after the positioning or pressing operations is completed. Servo OFF is initiated after the time set in Auto Servo OFF Time 1 in the parameters data elapses.
Automatic Servo OFF 2	Actuator is controlled to a stop after the positioning or pressing operations is completed. Servo OFF is initiated after the time set in Automatic servo OFF time 2 in the parameters data elapses.
Automatic Servo OFF 3	Actuator is controlled to a stop after the positioning or pressing operations is completed. 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.

6.2.10 Selecting the rotation direction

Set the rotation direction of the rotary.

•Selectable rotation directions

Rotation direction	Description
Common	The stop method set by the common stop method of the parameters data will be applied.
Close rotation	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).

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

6.2.11 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	Gain magnification setting range [%]*1	Initial value of gain magnification [%]*2
Model		
EBS/EBR/FLSH/ FLCR/FGRC	0 to 9999	0

*1 When this is set to 0, gain magnification will not be used.
*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.

▎6.2.12 Setting the point zone

You can set the border value for switching the Point zone output signal from OFF to ON as Point zone(+) and the border value for switching from ON to OFF as Point zone(-) using the distance from the home position.
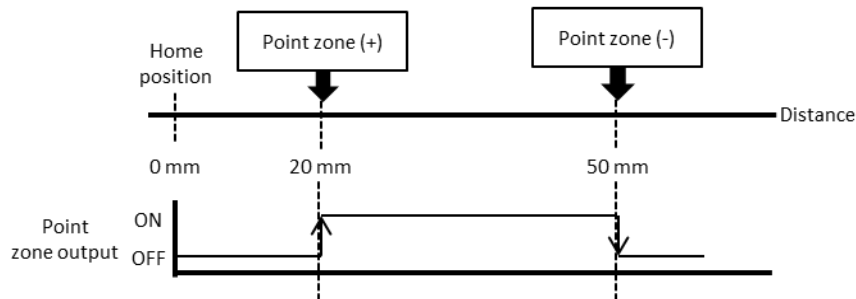
・Setting range and initial values (factory-default)

Actuator model	Point zone (+) Point zone (-)	Initial value of point zone
Model	**[mm], [deg] *1**	**[mm], [deg] *1**
EBS/EBR/FLSH/ FLCR/FGRC	-9999.99 to 9999.99	0.00

*1: [deg] are used in the case of the model number FGRC and [mm] unit in the case of other models.

・Sample Settings:

E.g.: Point zone (+) : 20 mm and Point zone (-): 50 mm (Sample settings)

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▌ 6.2.13 Setting the pressing current

The current value for the pressing interval can be set.

・Setting range and initial values (factory-default)

Actuator model	Pressing current setting range [%]*1	Initial value of pressing current [%]*2
Model		
EBS/EBR/FLSH/ FLCR/FGRC	1 to 100	0.00

*1: The pressing current can be set to 0 in point data. If this is set to 0, the common pressing current of the parameters data will be applied.
*2: The common pressing current is applied because the initial value (factory-default) is set to 0.

6.2.14 Setting the pressing speed
The speed of the pushing interval can be set.

・Setting range and initial values (factory-default)

<EBS/EBR series>

Actuator model				Pressing speed setting range [mm/s], [deg/s] *1*3	Initial pressing speed value [mm/s], [deg/s] *2*3
Model	Body size	Motor mounting direction	Screw lead		
EBS	04	ME	06	5 to 25	0
			12	5 to 30	0
		MR,MD,ML	06	5 to 25	0
			12	5 to 30	0
	05	ME	02	5 to 25	0
			05	5 to 25	0
			10	5 to 30	0
			20	5 to 30	0
		MR,MD,ML	02	5 to 25	0
			05	5 to 25	0
			10	5 to 30	0
			20	5 to 30	0
	08	ME	05	5 to 25	0
			10	5 to 30	0
			20	5 to 30	0
		MR,MD,ML	05	5 to 25	0
			10	5 to 30	0
			20	5 to 30	0
EBR	04	ME	06	5 to 20	0
			12	5 to 30	0
		MR,MD,ML	06	5 to 20	0
			12	5 to 30	0
	05	ME	02	5 to 20	0
			05	5 to 20	0
			10	5 to 30	0
			20	5 to 30	0
		MR,MD,ML	02	5 to 20	0
			05	5 to 20	0
			10	5 to 30	0
			20	5 to 30	0
	08	ME	05	5 to 30	0
			10	5 to 30	0
			20	5 to 30	0
		MR,MD,ML	05	5 to 30	0
			10	5 to 30	0
			20	5 to 30	0

*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.
*2: The common pressing speed is applied because the initial value (factory-default) is set to 0.
*3: [deg] are used in the case of the model number FGRC and [mm] unit in the case of other models.

<FLSH/FLCR/FGRC series>

Actuator model			Pressing speed setting range [mm/s], [deg/s] *1*3	Initial pressing speed value [mm/s], [deg/s] *2*3
Model	Body size	Screw lead		
FLSH	16	H1	5 to 25	0
	20	H1	5 to 25	0
	25	H1	5 to 25	0
FLCR	16	02	2 to 20	0
		08	5 to 20	0
	20	02	2 to 20	0
		08	5 to 20	0
	25	02	2 to 20	0
		06	5 to 20	0
FGRC	10		20 to 30	0
	30		20 to 30	0
	50		20 to 30	0

*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.
*2: The common pressing speed is applied because the initial value (factory-default) is set to 0.
*3: [deg] are used in the case of the model number FGRC and [mm] unit in the case of other models.

6.2.15 Setting the pressing distance

The pressing interval width can be set.

・Setting range and initial values (factory-default)

Actuator model	Pressing distance setting range [mm], [deg] *1*3	Initial pressing distance value [mm], [deg] *2*3
Model		
EBS/EBR/FLSH/ FLCR	Negative stroke length to positive stroke length	0
FGRC	0 to 359.99	0

*1: If the pressing distance is set to 0 in the point data, the common pressing distance of the parameters data will be applied.
*2: The common pressing distance is applied because the initial value (factory-default) is set to 0.
*3: [deg] are used in the case of the model number FGRC and [mm] unit in the case of other models.
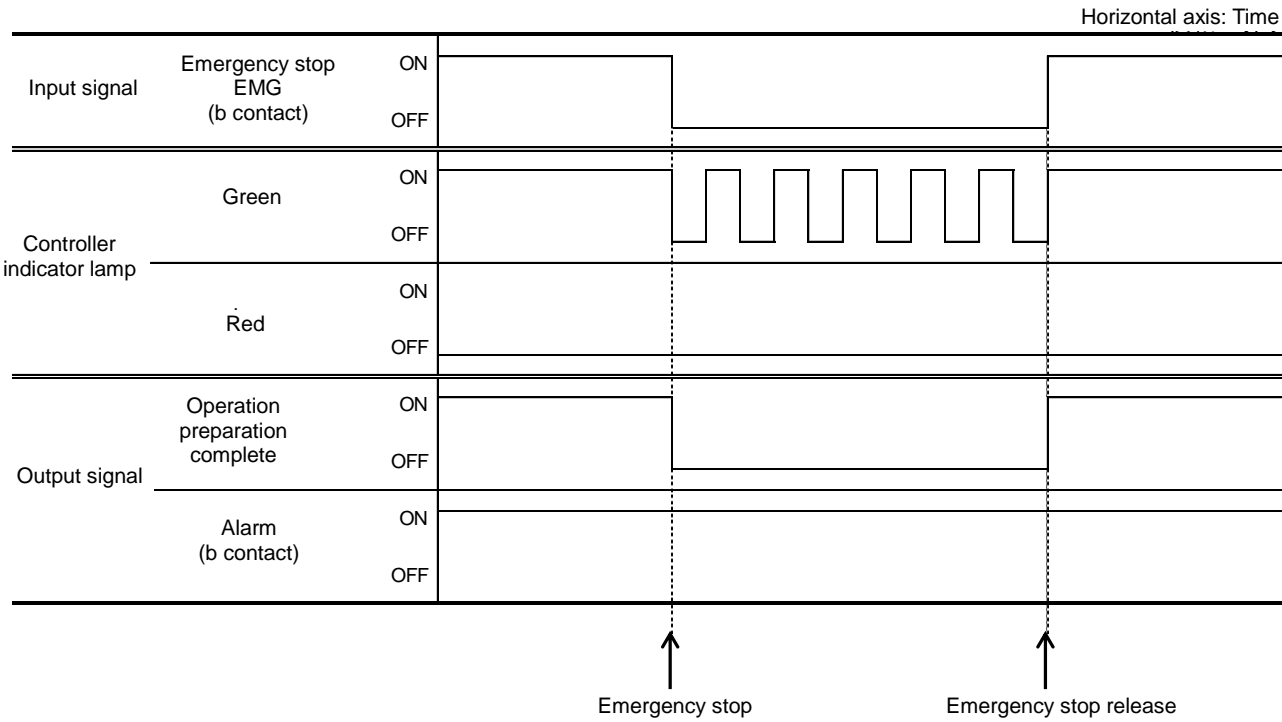
7. OPERATION

7.1   Emergency stop and release

If an emergency stop is performed during operation, no current is passed to the motor after deceleration stops.

Operation preparation complete output turns OFF until the emergency stop is released. The electromagnetic brake is also locked if a brake is attached. A short is generated between the motor terminals and it enters the dynamic brake status.

To release emergency stop, first confirm the surrounding area is safe, and then turn the emergency stop signal (b contact) ON.

⚠ CAUTION

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

Be careful of the input signal status.
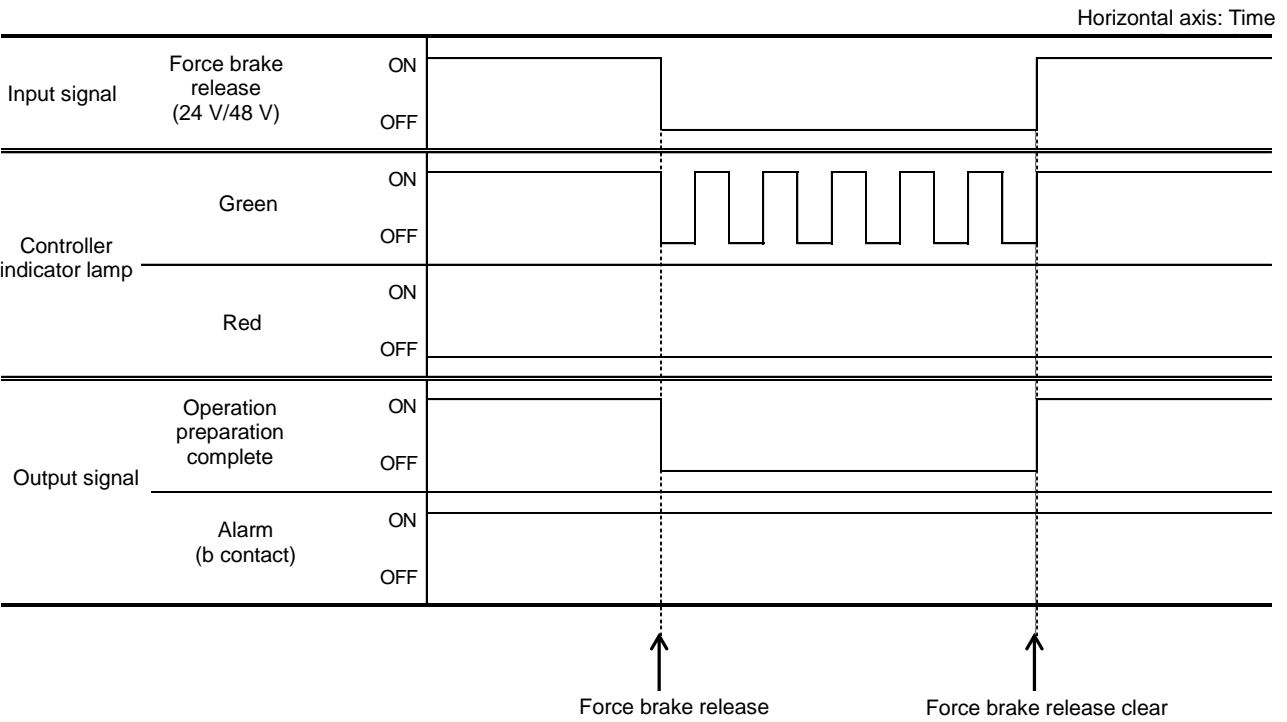For solenoid valve mode single/double 3 position type, the travel command signal is level input, so it may operate when emergency stop is released.

7.2   Force brake release

When the force brake release signal is input (24 V or 48 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

Force brake release   Force brake release clear

⚠ 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 or 48 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.

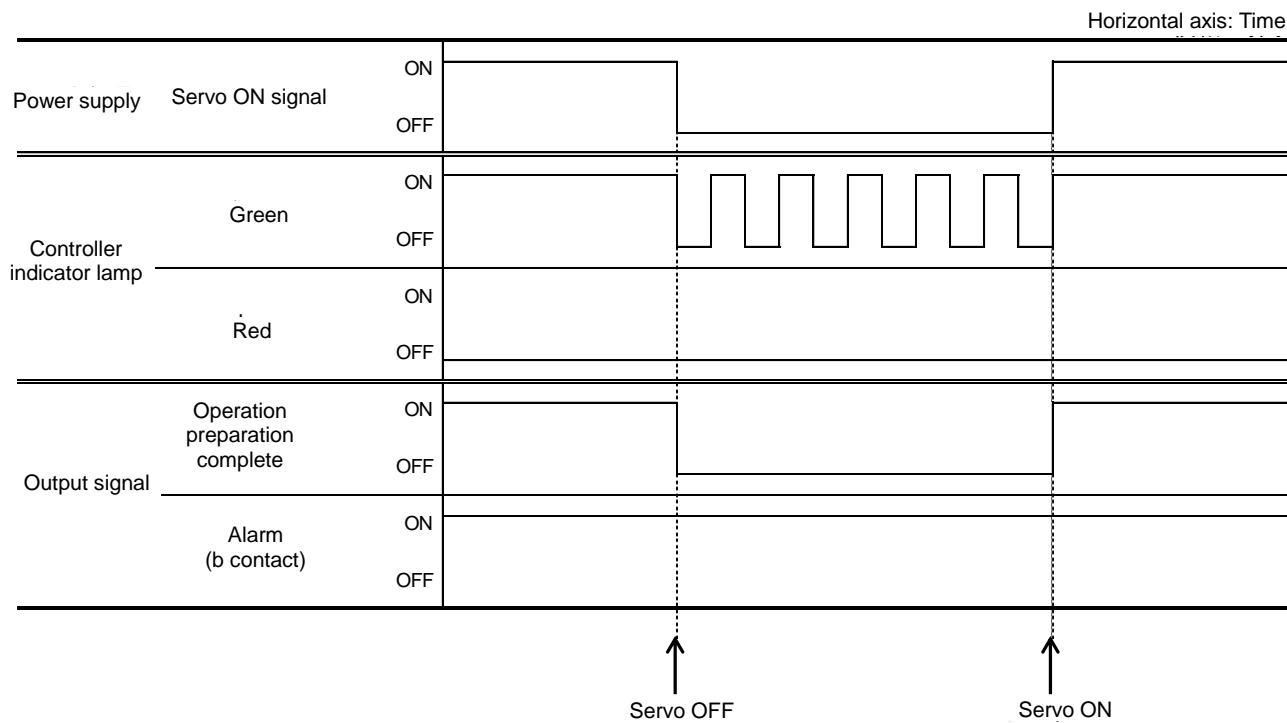**Be careful of the input signal status.**
For solenoid valve mode single/double 3 position type, the travel command signal is level input, so it may operate when force brake release is cleared.

7.3   Servo ON/OFF

   If the servo is turned OFF (servo ON signal turned OFF) during operation, no current is passed to the motor after deceleration stops.
   Operation preparation complete output turns OFF while the servo is OFF. The electromagnetic brake is also locked if a brake is attached.
   The "S-Tools" setting software can be used to turn the servo ON/OFF regardless of the status of the servo ON signal.

Horizontal axis: Time

Power supply	Servo ON signal		
Controller indicator lamp	Green		
	Red		
Output signal	Operation preparation complete		
	Alarm (b contact)		

Servo OFF   Servo ON

⚠ WARNING

Confirm safety within the operation range.
   Turning the servo OFF during operation could result in unexpected operation.


⚠ CAUTION

If operation from the "S-Tools" setting software is enabled, operation will not be received from the servo ON signal.

Be careful of the input signal status.
   For solenoid valve mode single/double 3 position type, the travel command signal is level input, so it may operate when the servo is turned ON.

7.4 Power ON sequence

The figure below shows a time chart from power ON to operation preparation complete.
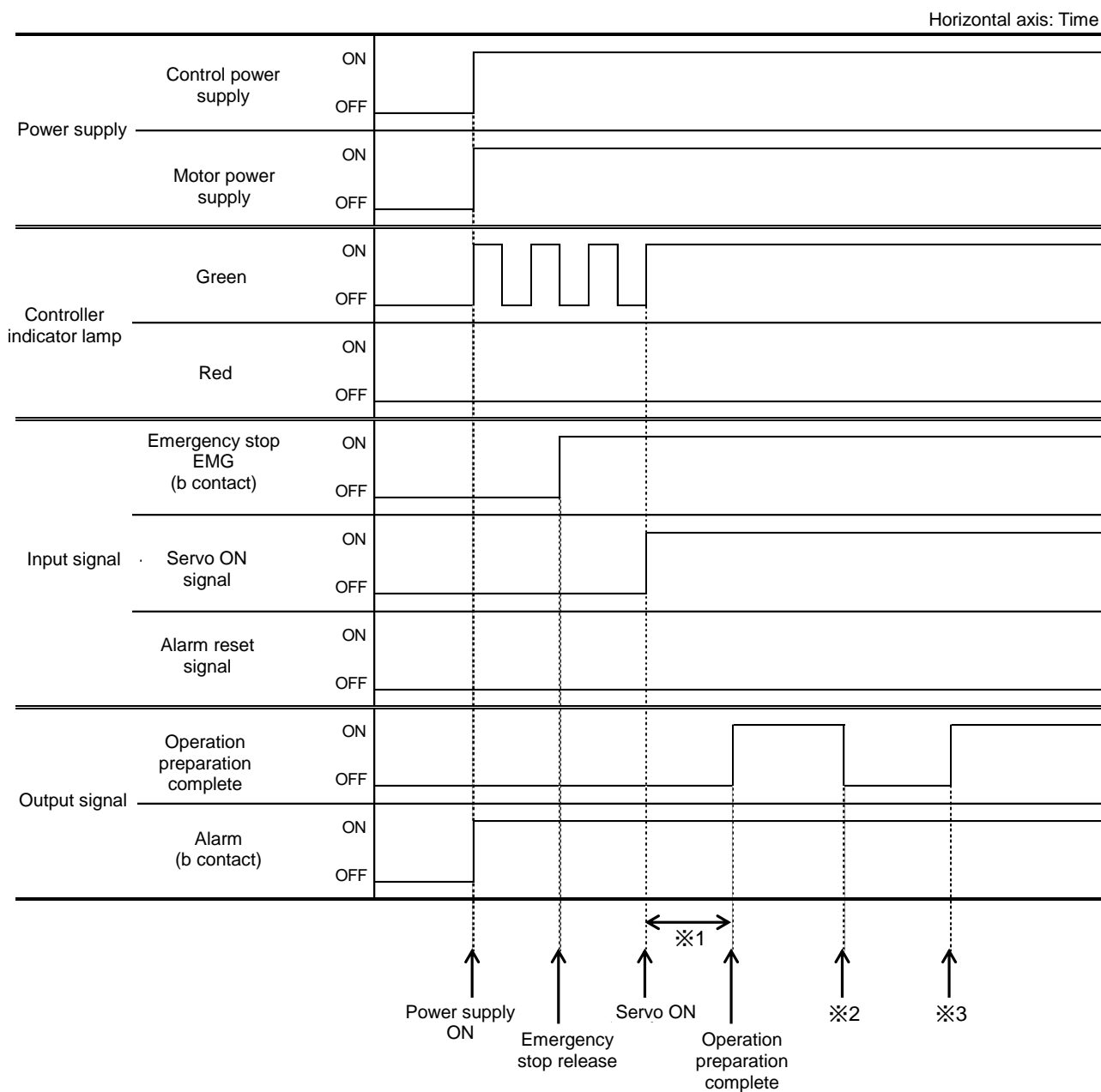
*1 When the power is turned ON and the servo is first turned ON, it will take around 1 s.
*2. If operation from the "S-Tools" setting software has been enabled, operation preparation complete output will turn OFF.
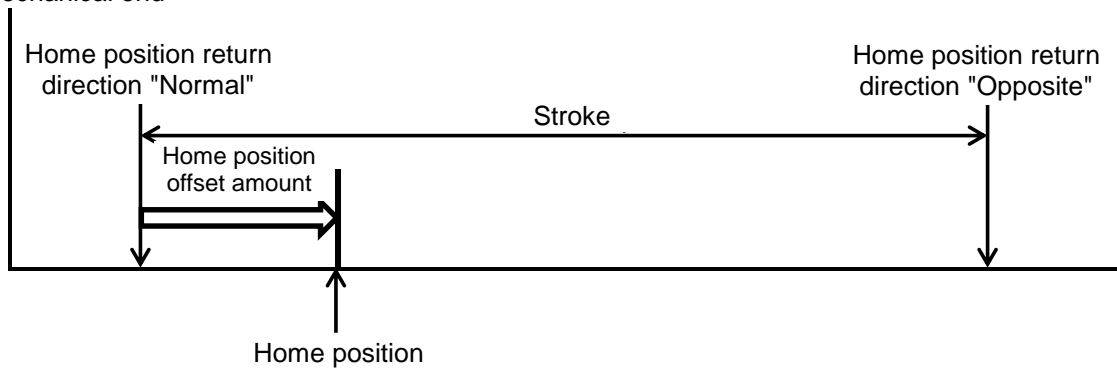*3. If operation from the "S-Tools" setting software has been disabled, operation preparation complete output will turn ON.

7.5   Home position return operation

7.5.1   EBS / EBR

Home position return operation is performed according to related parameters.

Motor mechanical end

Home position

Setting item	Overview
Home position return direction	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 the parameters list in "5. Parameters Data Configuration" for details.

An absolute encoder without a battery is used, so point travel is possible even if home position return operation is not executed.

When home position return is performed, the operation is completed without pressing against the mechanical end.
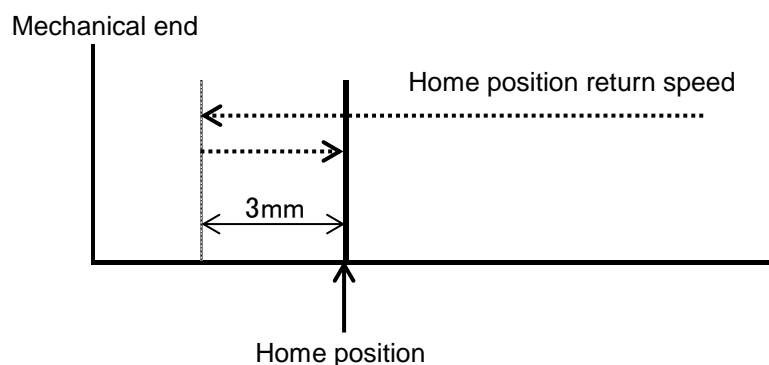
Home position

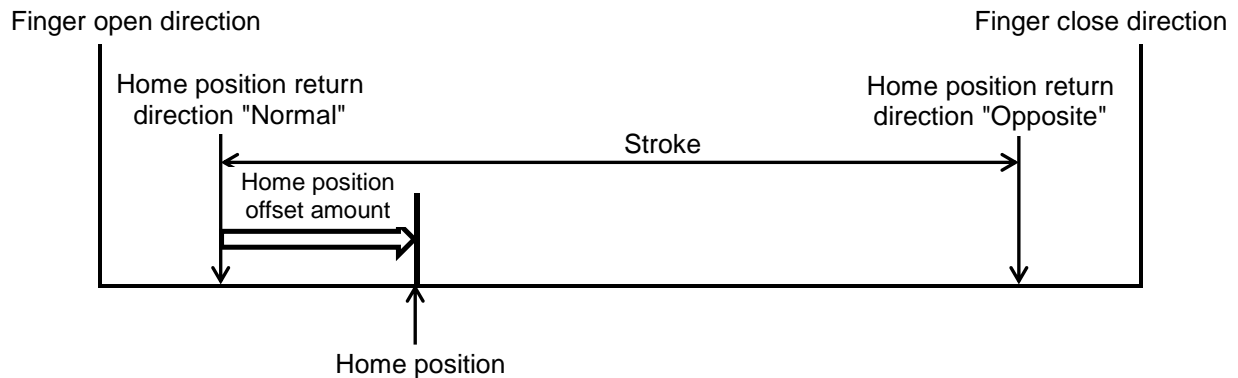|	If the home position return direction is "Normal", the home position return operation is completed by the operation from the motor side. If the home position return direction is "Opposite", the home position return operation is completed by the operation from the opposite motor side. (The reverse operation is not performed using the position at home position return start.)
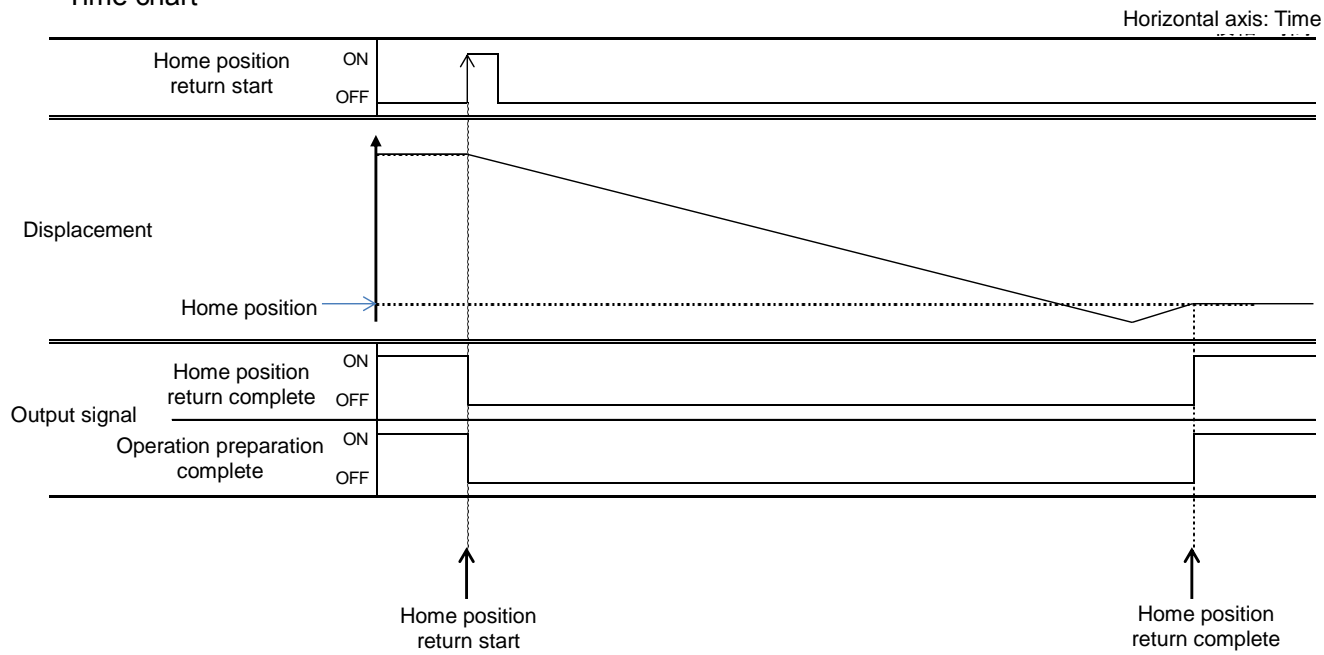
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• Time chart

Horizontal axis: Time

* During home position return, both home position return complete and operation preparation complete output turn OFF.

7.5.2 FLSH

Home position return operation is performed according to related parameters.
The open direction of the finger is the standard home position return direction.

Finger open direction   Finger close direction

Home position return
direction "Normal"   Home position return
                                                                         direction "Opposite"

                                    Stroke

Home position
offset amount

                                    Home position

Setting item	Overview
Home position return direction	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 the parameters list in "5. Parameters Data Configuration" for details.

   If the parameter "home position offset amount" is "0.00", a position of 0.25 mm from the mechanical
end is the home position.
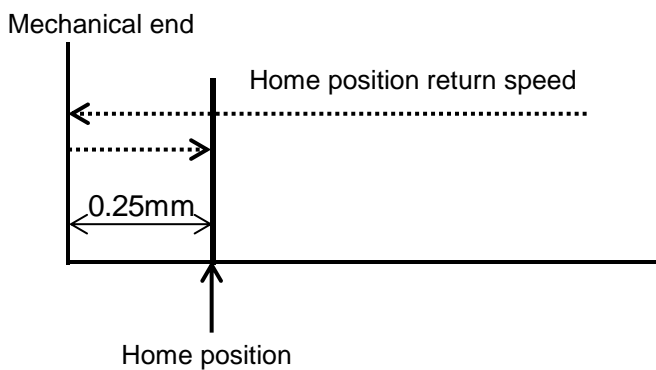
Mechanical end

                    Home position return speed

0.25mm

          Home position

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

•Time chart

Horizontal axis: Time
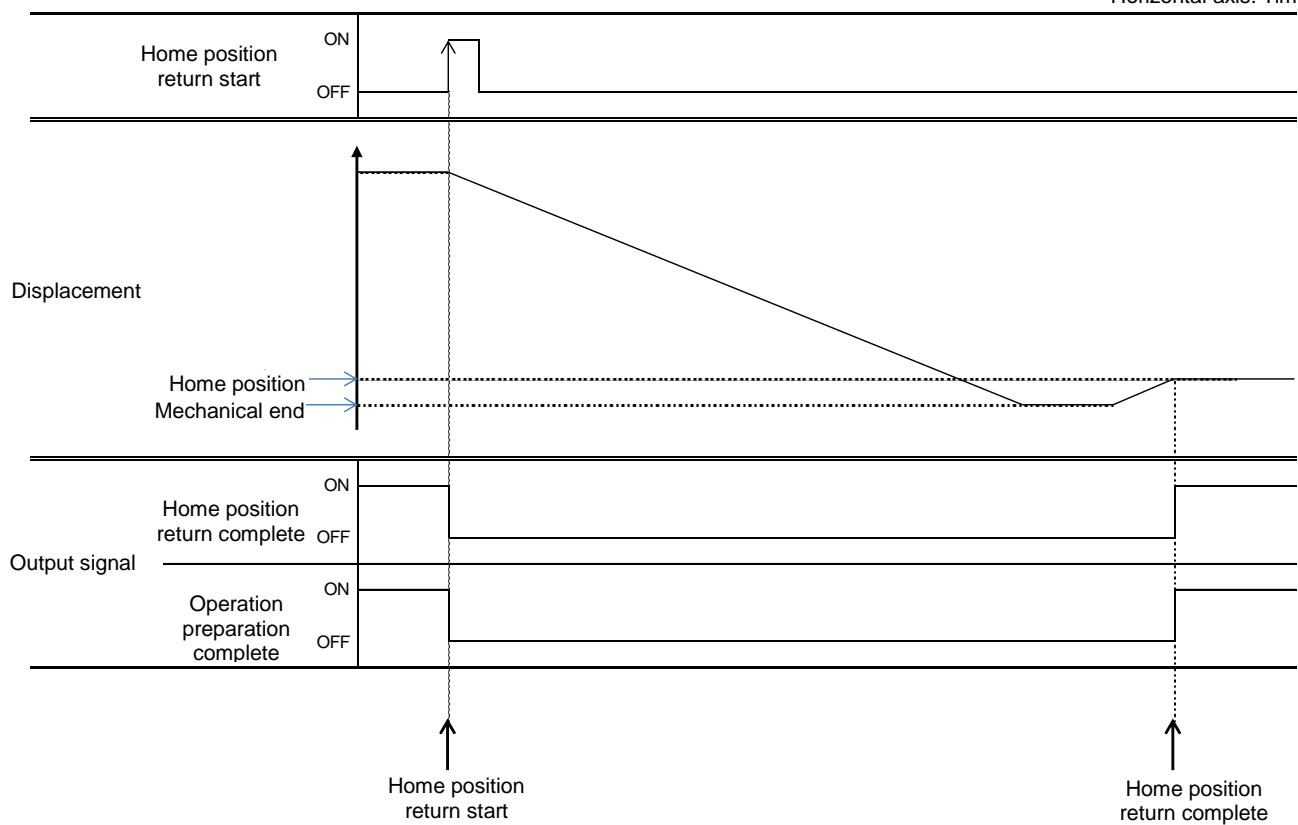
* During home position return, both home position return complete and operation preparation complete output turn OFF.

7.5.3 FLCR

Home position return operation is performed according to related parameters.

Mechanical end on PULL side

Setting item	Overview
Home position return direction	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 the parameters list in "5. Parameters Data Configuration" for details.

If the parameter "home position offset amount" is "0.00", a position of 1 mm from the mechanical end is the home position.

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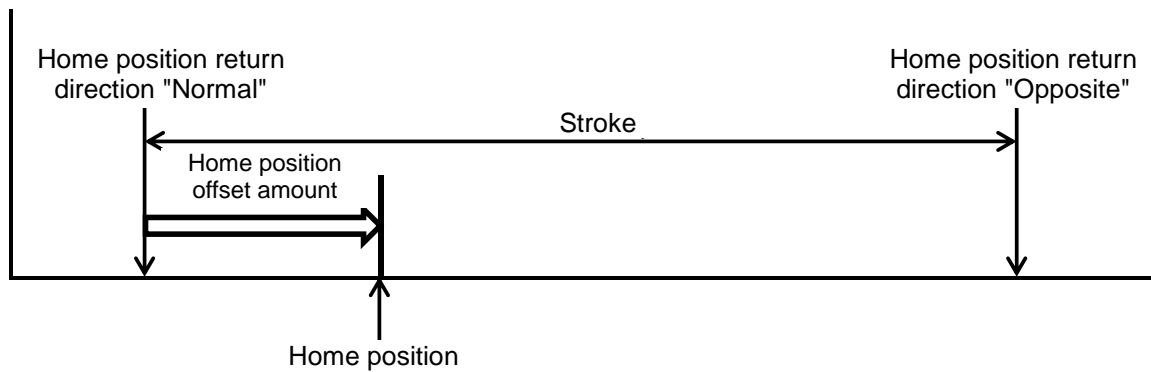
•Time chart

Horizontal axis: Time
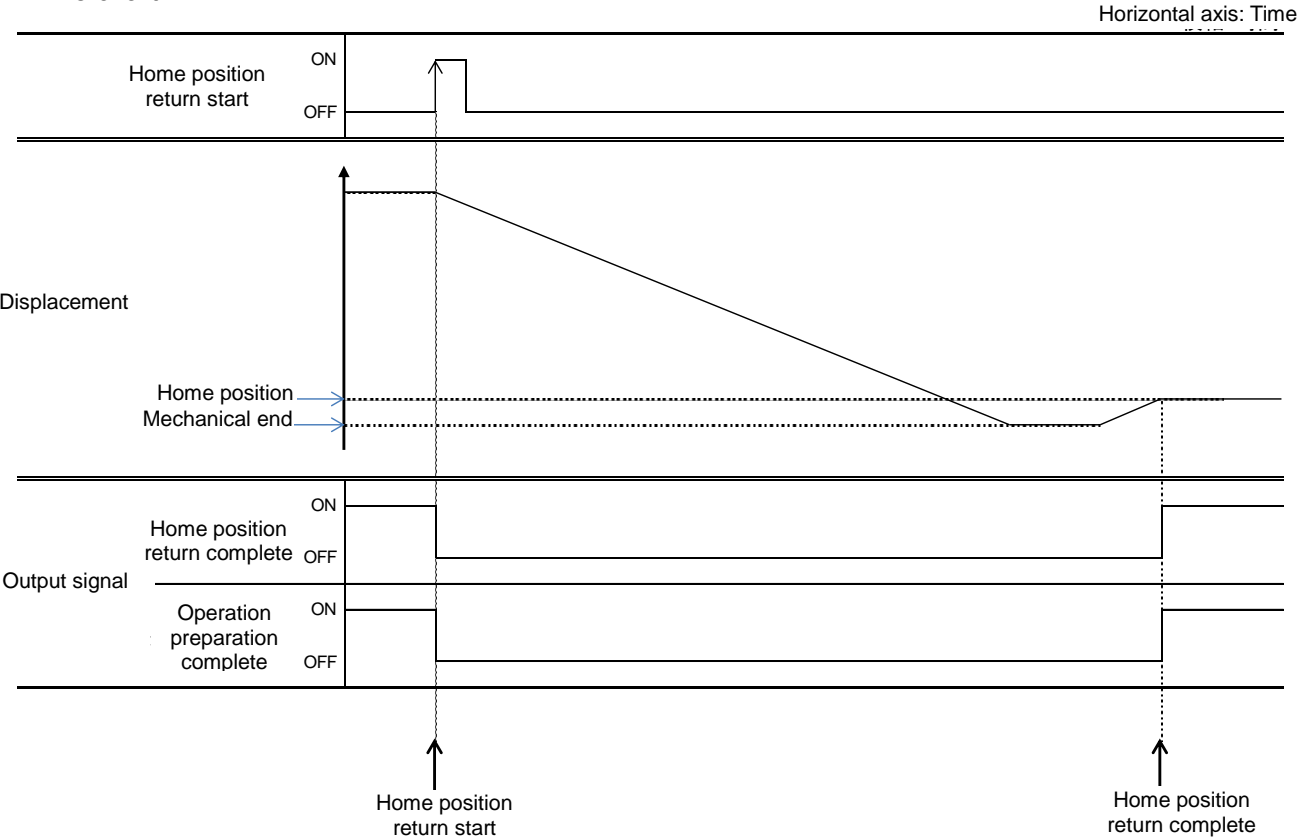
* During home position return, both home position return complete and operation preparation complete output turn OFF.

7.5.4 FGRC

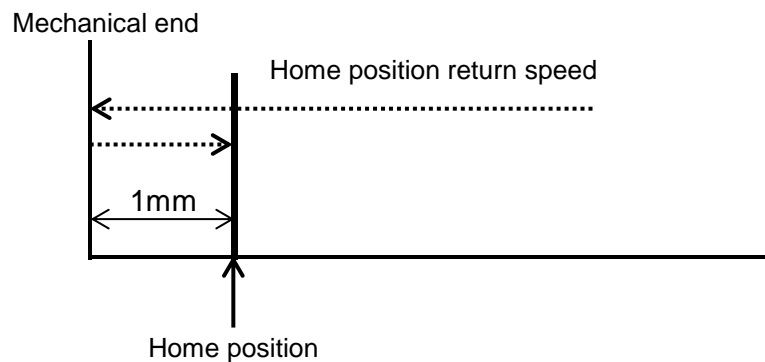Home position return operation is performed according to related parameters.
*This is a figure seen from the upper surface of the table.
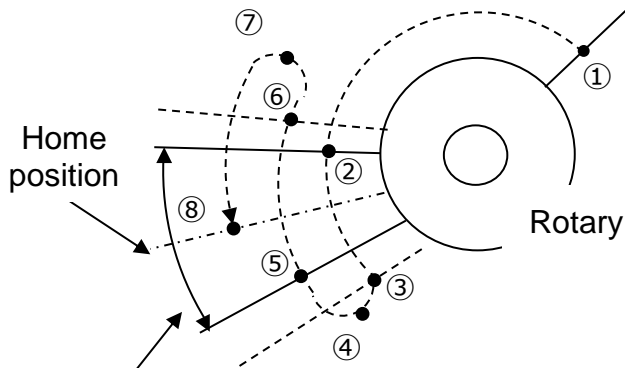
Proximity sensor detection range

(1) When the command of a home position return is given, an operation is started in the specified rotation direction.
The rotation speed is 30 deg/s.
(2) The proximity sensor is turned ON.
(3) The proximity sensor is turned OFF.
(4) Reverse movement is performed.
(5) The proximity sensor is turned ON.
(6) The proximity sensor is turned OFF.
(7) The home position is calculated from the results of (2), (3), (5) and (6).
The home position is the center of the detection range of the sensor.
The point operation to the home position is started.
(8) The home position return is completed.

| Setting item	Overview
Home position return direction	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 the parameters list in "5. Parameters Data Configuration" for details.

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.

•Time chart
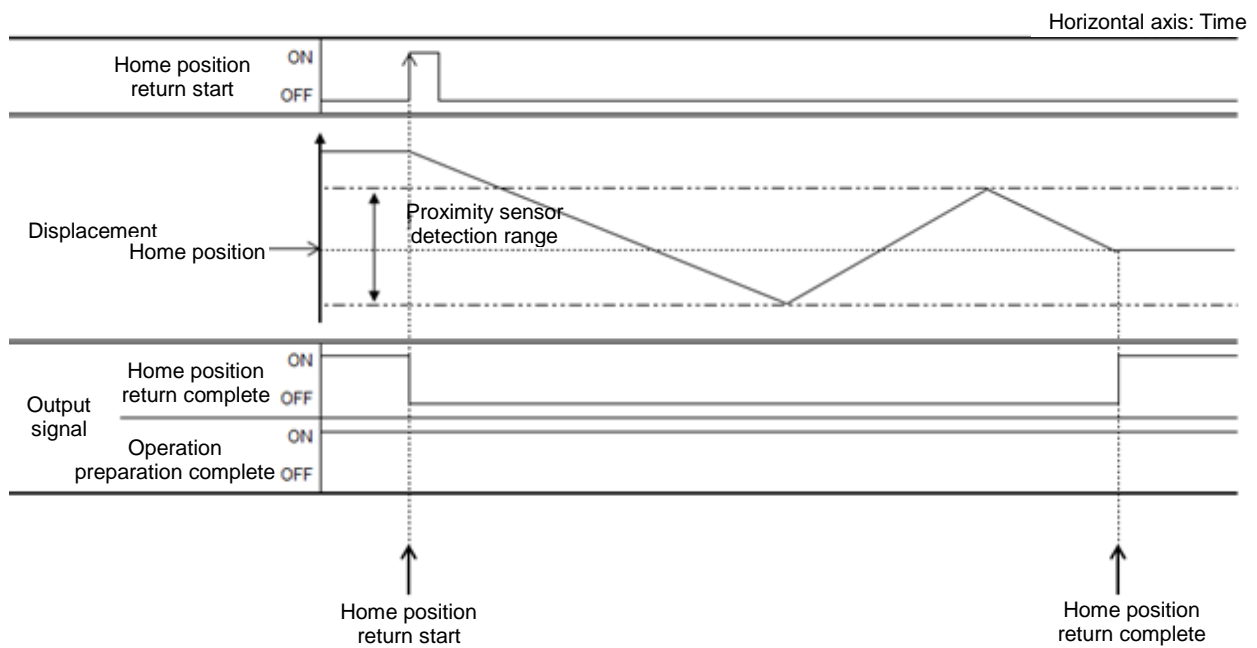
Horizontal axis: Time

* During home position return, both home position return complete and operation preparation complete output turn OFF.

7.6   Positioning operation

7.6.1   Normal mode (64-point, 128-point, 256-point and 512-point mode)

Once the point number is specified with the point number selection bit, traveling begins via ON edge input of the point travel start signal.

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

General purpose input 0 to 8 Point No. Selection bit 0 to 8	Description
-	Sets the point No. in binary. 64-point mode: Point No. selection bit 0 to 5 128-point mode: Point No. selection bit 0 to 6 256-point mode: Point No. selection bit 0 to 7 512-point mode: Point No. selection bit 0 to 8

General purpose input 10 Point travel start	Description
1↑	Operates to point set with the point No. selection bit. After setting the point No. selection bit, wait at least for the time set in the parameter "input signal filter" (initial value = 5 ms) before input.

Setting example: 64-point mode

General purpose input 0	General purpose input 1	General purpose input 2	General purpose input 3	General purpose input 4	General purpose input 5	General purpose input 10	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

General purpose output 0 to 8 Point No. Confirmation bit 0 to 8	Description
-	Outputs the point No. in binary after travel is complete. 64-point mode: Point No. confirmation bit 0 to 5 128-point mode: Point No. confirmation bit 0 to 6 256-point mode: Point No. confirmation bit 0 to 7 512-point mode: Point No. confirmation bit 0 to 8

General purpose output 10 Point travel complete	Description
1	Turns ON when it finishes traveling to the set point.

• Time chart
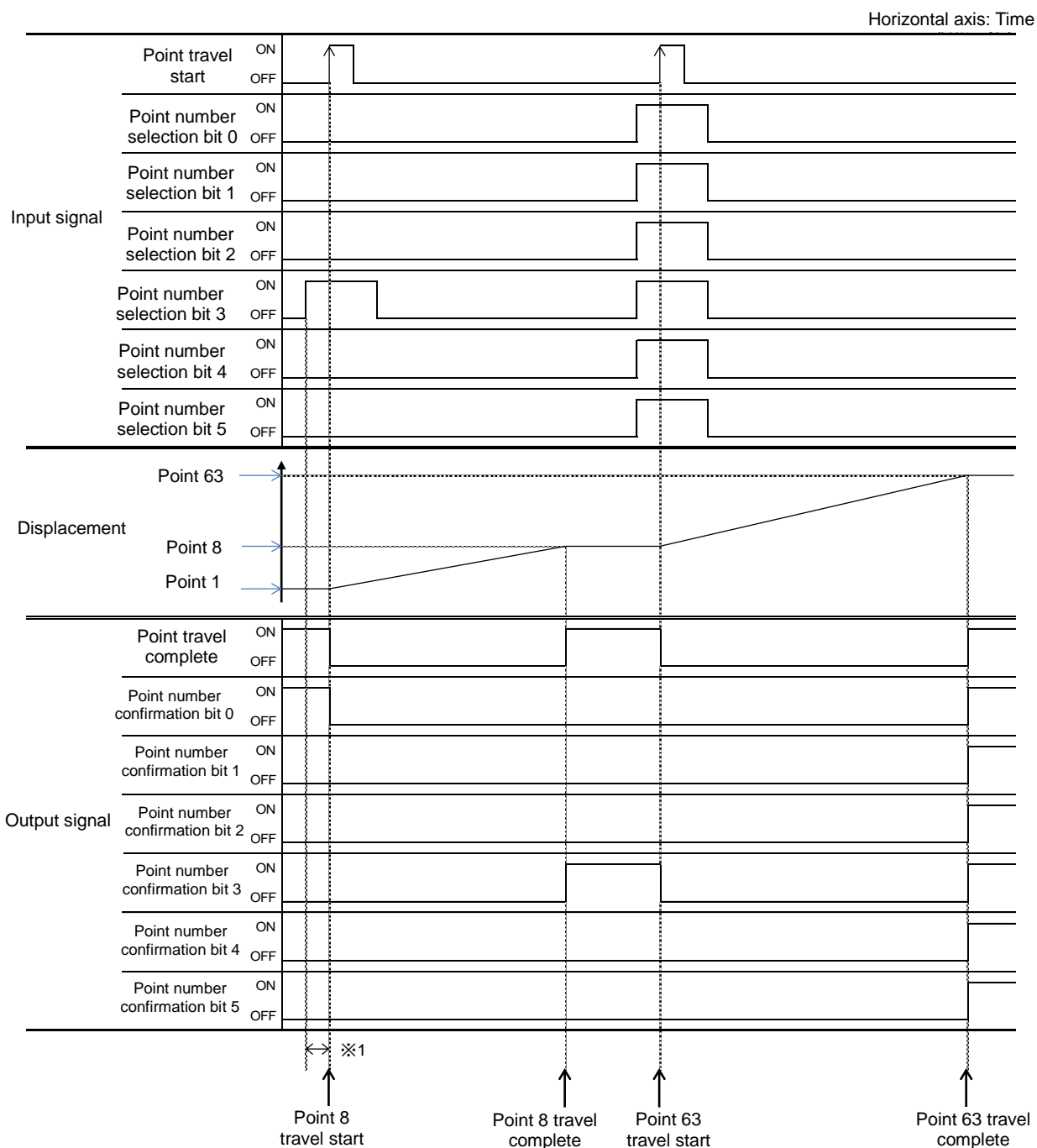
*1 After setting the point No. selection bit, wait at least for the time set in the parameter "input signal filter" (initial value = 5 ms) before input.

7.6.2 Teaching 64-point mode

PIO input can be used to perform actuator jog (JOG) and inching (INCH) operations, and to perform point setting. The operation method in the normal state is the same as "normal mode (64-point mode)".

• Input signal   0: OFF (level input), 1: ON (level input), 1↑: ON edge input, x: Don't care

General purpose input 0 to 5 / Point No. Selection bit 0 to 5	Description
-	Sets the point No. in binary.

| General purpose input 10 / Point travel start/Write start	Description
1↑	Normal status: Operates to point set with the point No. selection bit.
	Teaching status: Writes the current position to the point set with the point No. selection bit.

Setting example:

General purpose input 0	General purpose input 1	General purpose input 2	General purpose input 3	General purpose input 4	General purpose input 5	General purpose input 10	Description
0	0	0	0	0	0	1↑	Writes point 0 as the current position.
1	0	0	0	0	0	1↑	Writes point 1 as the current position.
0	0	0	1	0	0	1↑	Writes point 8 as the current position.
1	1	1	1	1	1	1↑	Writes point 63 as the current position.

General purpose input 6 / Teaching selection	Description
0	Selects normal status. General purpose input 0 to 5 and 10 functions the same as normal mode (64-point mode).
1	Selects teaching state. The point can be set with general purpose input 0 to 5 and 10. JOG-INCH operation can be performed with general purpose input 7 to 9.

General purpose input 7 / JOG/INCH (+) travel start	General purpose input 8 / JOG/INCH (-) travel start	General purpose input 9 / INCH selection	Description
1↑	0	0	Starts JOG operation to the opposite motor side.
0	x	0	Stops JOG operation to the opposite motor side.
0	1↑	0	Starts JOG operation to the motor side.
x	0	0	Stops JOG operation to the motor side.
1↑	0	1	INCH travels to the opposite motor side.
0	1↑	1	INCH travels to the motor side.

* The JOG/INCH speed and travel distance can be set via user parameters. Refer to "5. Parameters Data Configuration" for details.

• Output signal   0: OFF, 1: ON

General purpose output 10	Description
Point travel complete/Write complete	
1	Normal status: Turns ON when it finishes traveling to the set point.
	Teaching status: Turns ON once the set point data is written.

General purpose output 0 to 5	Description
Point No. Confirmation bit 0 to 5	
-	Outputs the point No. in binary after travel is complete.

General purpose output 6	Description
Teaching status	
0	Turns OFF when normal status is selected.
1	Turns ON when teaching status is selected.

• Time chart
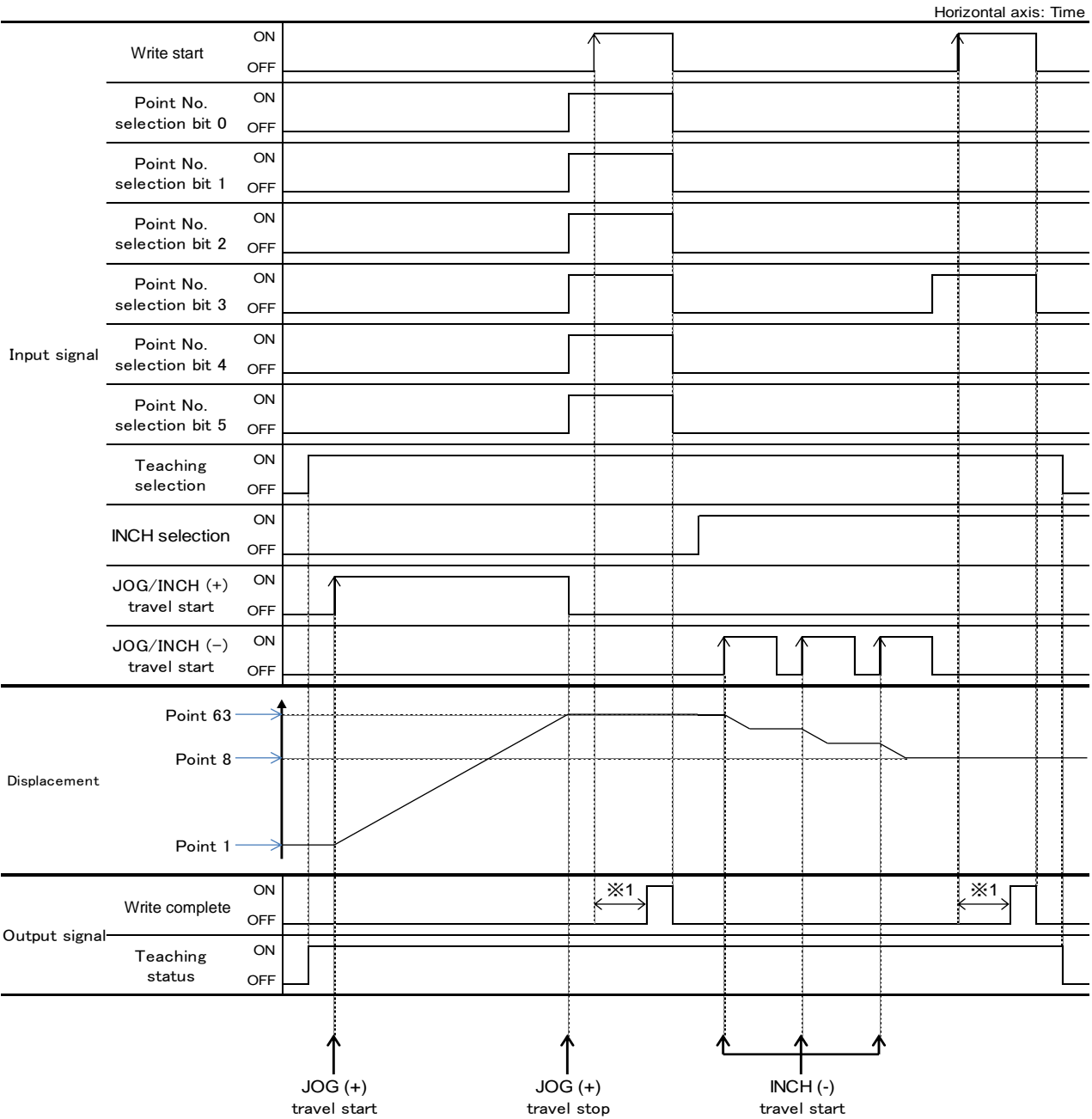
*1. It will take several seconds for writing to complete once point write is input.

The normal status time chart is the same as for "normal mode". Refer to the time chart in "7.6.1 Normal mode".

▌7.6.3 Simple 7-point mode

Traveling begins via ON edge input of the point travel start signal.

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

General purpose input 0 to 6 Point No. 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 No. 0 travel start	Point No. 1 travel start	Point No. 2 travel start	Point No. 3 travel start	Point No. 4 travel start	Point No. 5 travel start	Point No. 6 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

General purpose output 0 to 6 Point No. 1 to 7 travel complete	Description
1	Turns ON when it finishes traveling to the corresponding point.

• Time chart

Horizontal axis: Time

Input signal	Point No. 1 travel start	ON / OFF	
	Point No. 2 travel start	ON / OFF	
	Point No. 3 travel start	ON / OFF	
	Point No. 4 travel start	ON / OFF	
	Point No. 5 travel start	ON / OFF	
	Point No. 6 travel start	ON / OFF	
	Point No. 7 travel start	ON / OFF	

Displacement
Point 7
Point 3
Point 1

Output signal	Point No. 1 travel complete	ON / OFF	
	Point No. 2 travel complete	ON / OFF	
	Point No. 3 travel complete	ON / OFF	
	Point No. 4 travel complete	ON / OFF	
	Point No. 5 travel complete	ON / OFF	
	Point No. 6 travel complete	ON / OFF	
	Point No. 7 travel complete	ON / OFF	

Point 3 travel start | Point 3 travel complete | Point 4 travel start *1 | Point 7 travel start | Point 7 travel complete

*1. Does not start traveling while another point number travel start input is ON.

7.6.4 Solenoid valve mode (double 2 position type)

Travels between two points via ON edge input.

• Input signal   0: OFF (level input), 1: ON (level input), 1↑: ON edge input
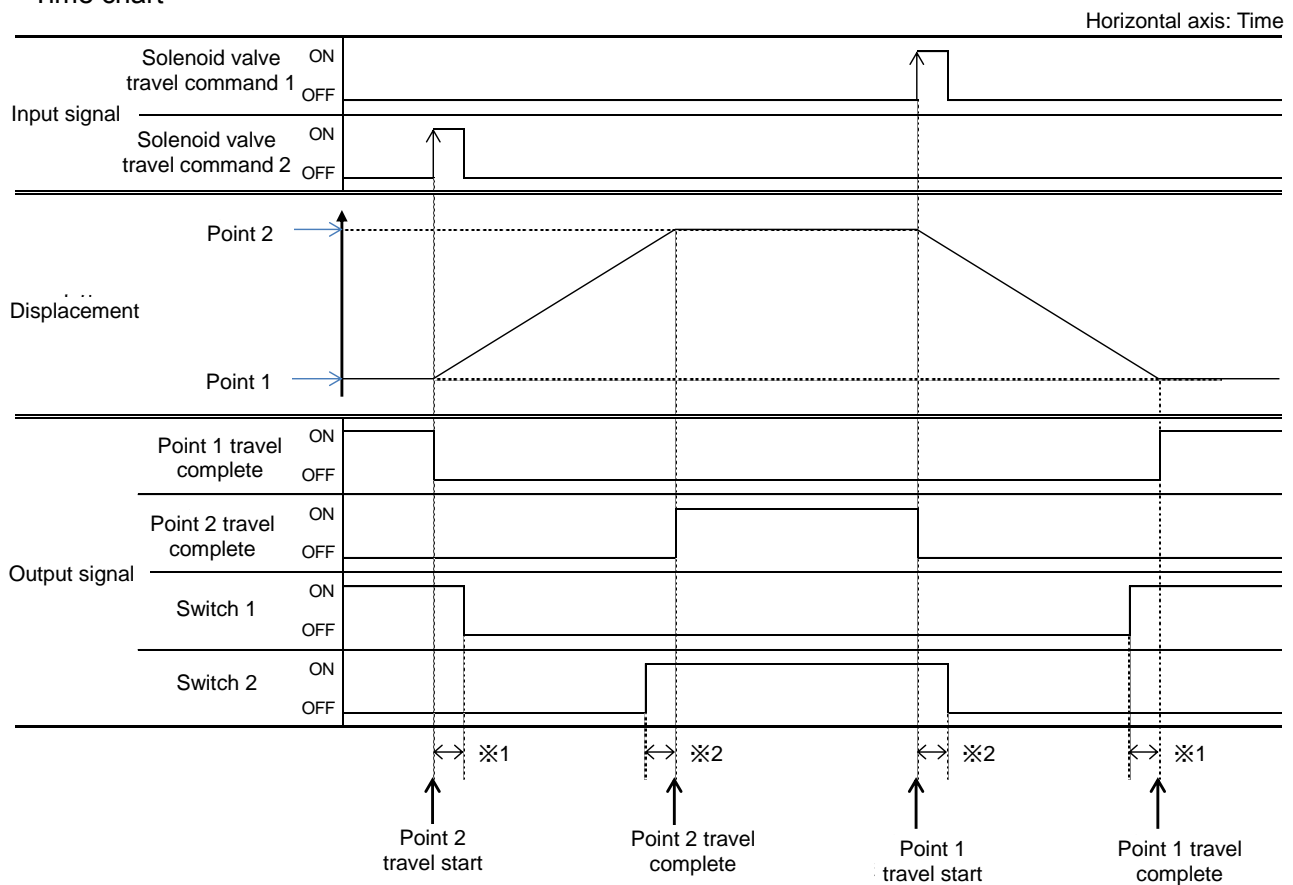
General purpose input 0	General purpose input 1	Description
Solenoid valve travel command 1	Solenoid valve travel command 2	
1↑	0	Begins traveling to point 1.
0	1↑	Begins traveling to point 2.

• Output signal   0: OFF, 1: ON

General purpose output 0	General purpose output 1	Description
Point 1 travel complete	Point 2 travel complete	
1	0	Turns ON when it finishes traveling to point 1.
0	1	Turns ON when it finishes traveling to point 2.

General purpose output 4	General purpose output 5	Description
Switch 1	Switch 2	
1	0	Turns ON when in the positioning complete range of point 1.
0	1	Turns ON when in the positioning complete range of point 2.

• Time chart

*1. Output continues while in the positioning width of point 1.
*2. Output continues while in the positioning width of point 2.

7.6.5 Solenoid valve mode (double 3 position type)
Travels between two points when turned ON (level input).

• Input signal   0: OFF (level input), 1: ON (level input)

General purpose input 0	General purpose input 1	Description
Solenoid valve travel command 1	Solenoid valve travel command 2	
1	0	Begins traveling to point 1.
0	1	Begins traveling to point 2.
0	0	Suspends travel operation and stops at that point.

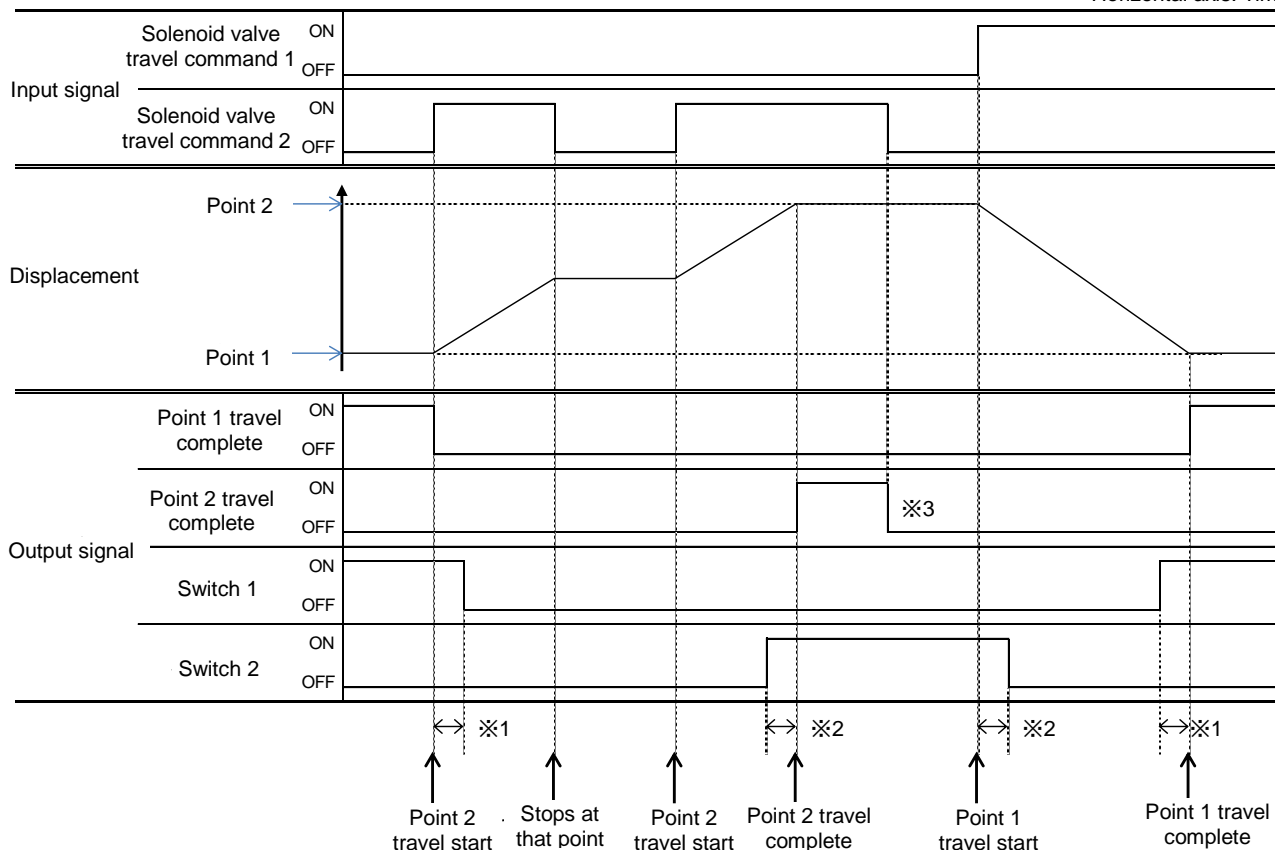• Output signal   0: OFF, 1: ON

General purpose output 0	General purpose output 1	Description
Point 1 travel complete	Point 2 travel complete	
1	0	Turns ON when it finishes traveling to point 1.
0	1	Turns ON when it finishes traveling to point 2.

General purpose output 4	General purpose output 5	Description
Switch 1	Switch 2	
1	0	Turns ON when in the positioning complete range of point 1.
0	1	Turns ON when in the positioning complete range of point 2.

• Time chart

Horizontal axis: Time

*1. Output continues while in the positioning width of point 1.
*2. Output continues while in the positioning width of point 2.
*3. When the solenoid valve travel command is turned OFF, travel complete output also turns OFF.

7.6.6 Solenoid valve mode (single type)

Travels between two points when one input single turns OFF (level input) or ON (level input).

• Input signal   0: OFF (level input), 1: ON (level input)

| General purpose input 1 Solenoid valve travel command	Description
0	Begins traveling to point 1.
1	Begins traveling to point 2.

• Output signal   0: OFF, 1: ON

General purpose output 0 Point 1 travel complete	General purpose output 1 Point 2 travel complete	Description
1	0	Turns ON when it finishes traveling to point 1.
0	1	Turns ON when it finishes traveling to point 2.

General purpose output 4 Switch 1	General purpose output 5 Switch 2	Description
1	0	Turns ON when in the positioning complete range of point 1.
0	1	Turns ON when in the positioning complete range of point 2.

• Time chart

Horizontal axis: Time
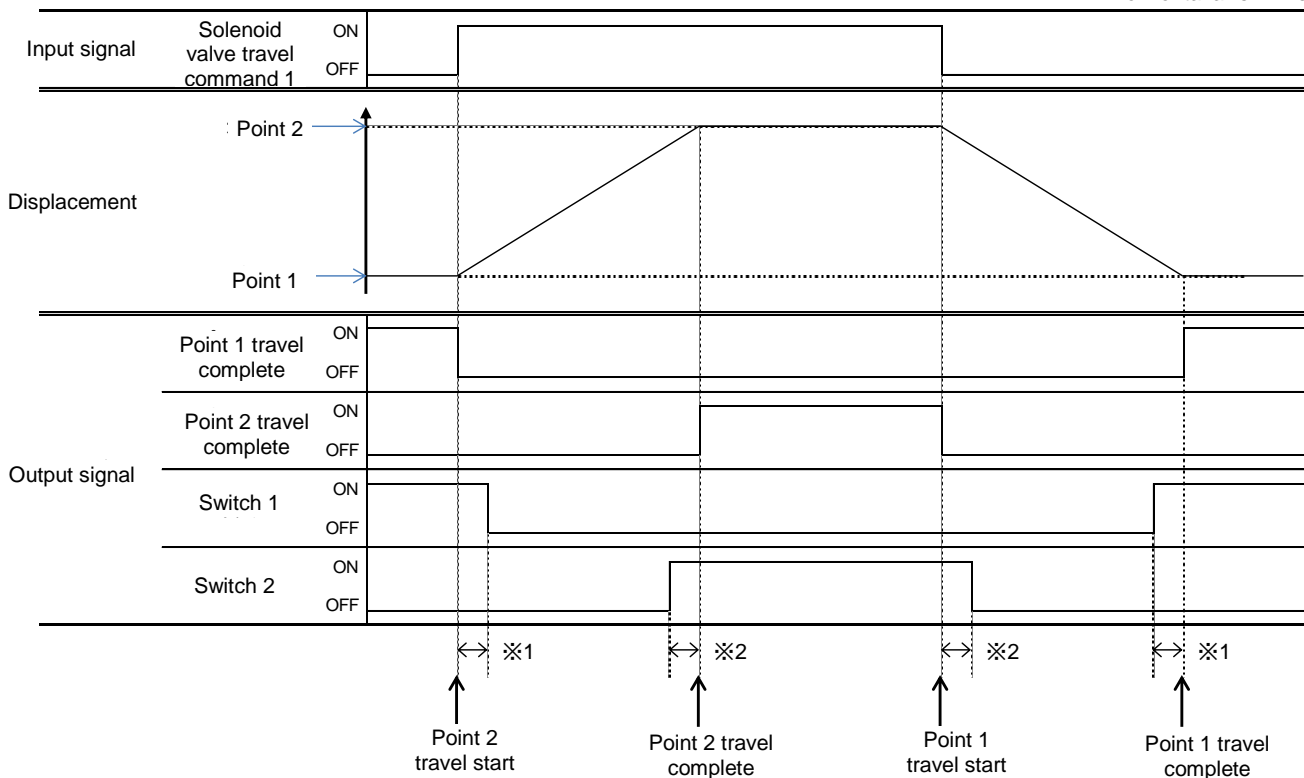
*1. Output continues while in the positioning width of point 1.
*2. Output continues while in the positioning width of point 2.

7.6.7 Other output signals

In addition to the output signals described previously, the following signals are also output.

• Output signal

Output signal name	Description
Point zone	Turns ON when within the range set with point zone (+) and point zone (-). Refer to "6.2.12 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 "5.3 Zone output" for details on zone 1.
Zone 2	Turns ON when within the range set with zone 2 (+) and zone 2 (-). Refer to "5.3 Zone output" for details on zone 2.

* The output No. differs for each output depending on the operation mode. Refer to "4.3.6 General purpose input/output signal assignment" for details.

• Time chart

Horizontal axis: Time
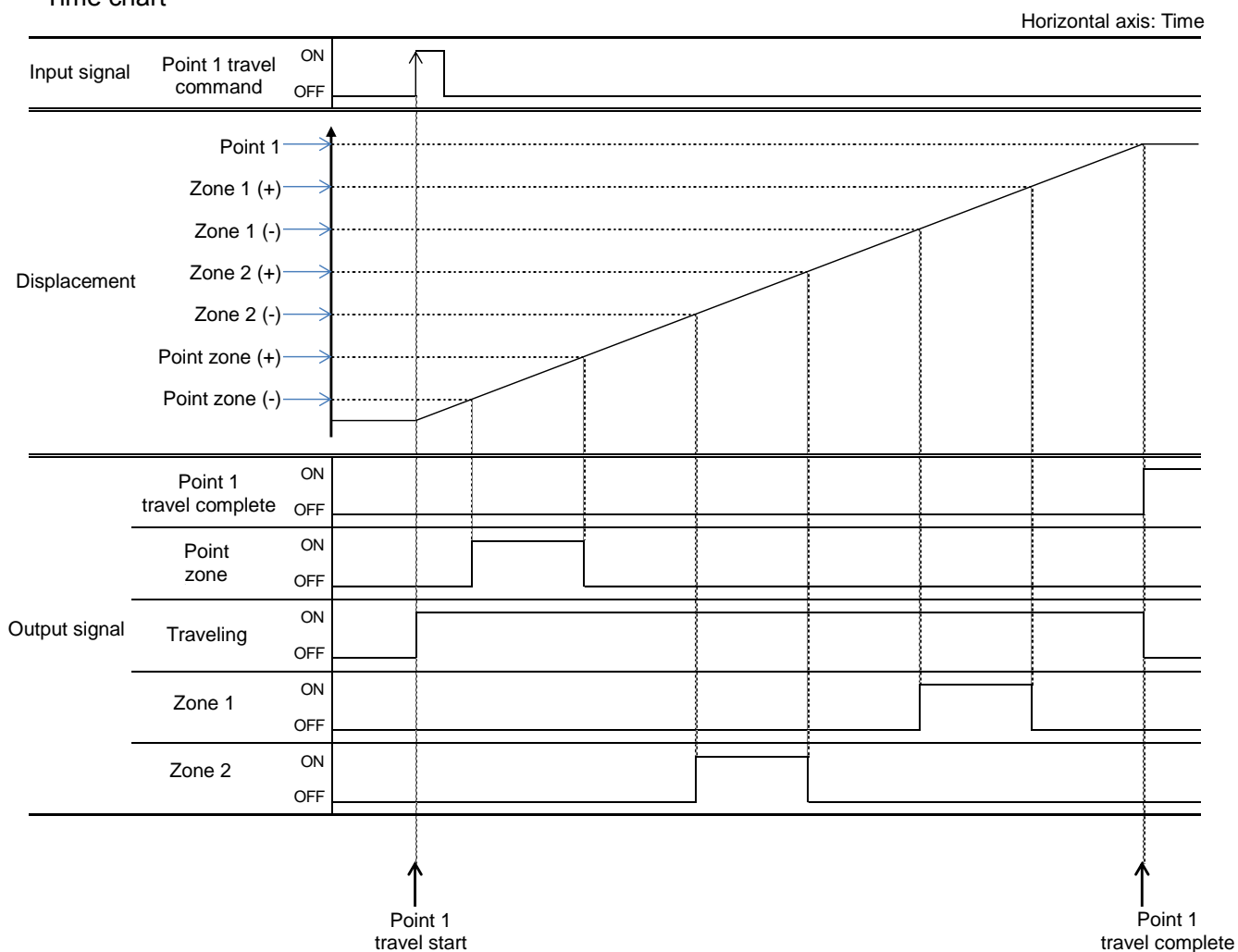
7.7   Pressing operation

Pressing operations can be performed by configuring either "pressing operation 1" or "pressing operation 2" in point data. Following a transport operation, it will operate at the "pressing current" or lower set in the pressing interval. An alarm will not be output even if it stops upon contact with the workpiece.

• Pressing operation settings

Setting item	Description
Pressing current	The max. current value can be set in the pressing interval. Refer to "6.2.13 Setting the pressing current" for details.
Pressing speed	The speed of the pressing interval can be set. Refer to "6.2.14 Setting the pressing speed" for details.
Pressing distance	The pressing interval width can be set. Refer to "6.2.15 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 parameters list in "5. Parameters Data Configuration" for details.

• Time chart

Horizontal axis: Time

65
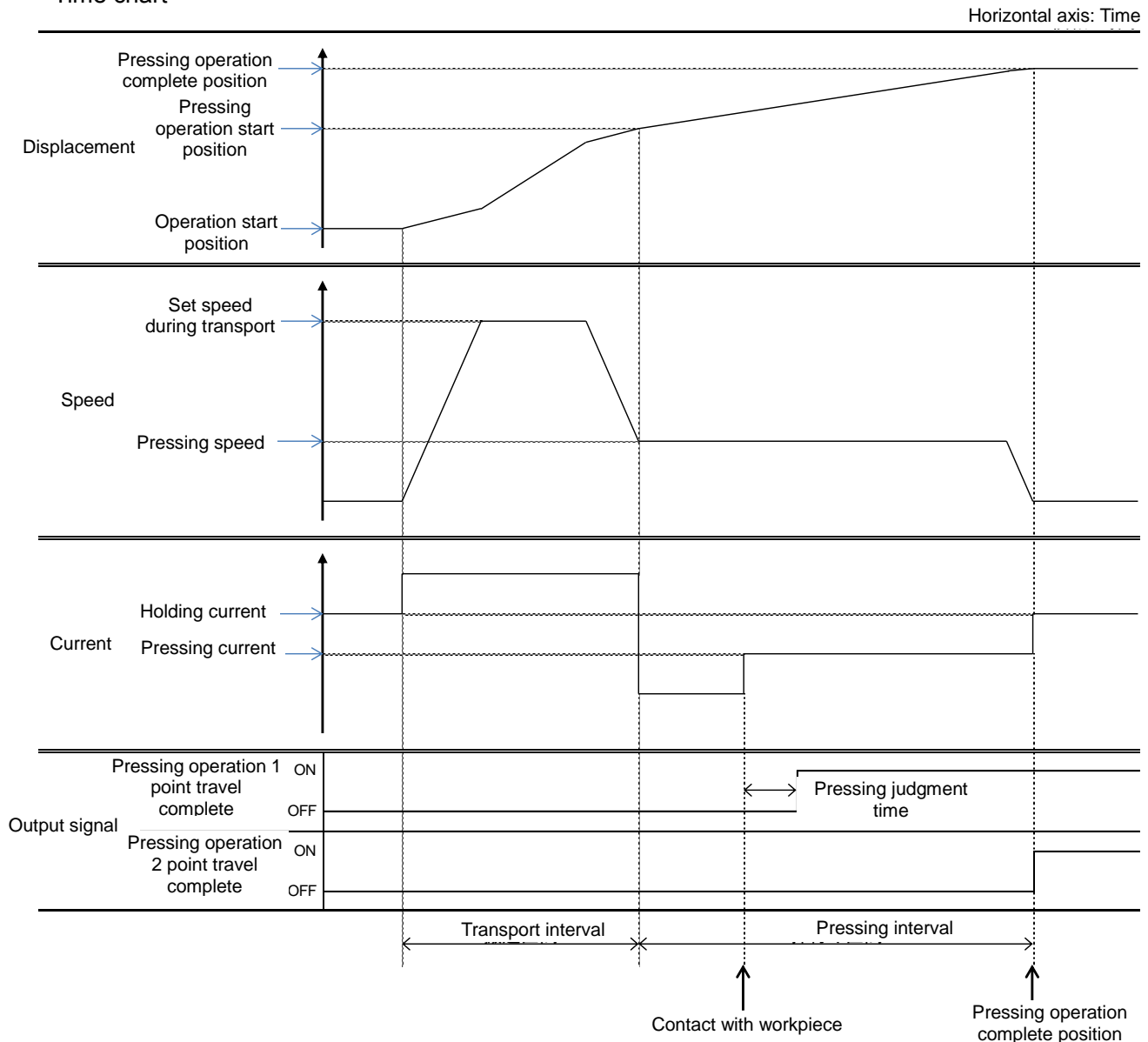
7.8 Operation when a new operation signal is input during operation

When a new operation signal is input during operation, operation is performed as follows.

New point target position	Operation 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.

⚠ **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.

7.9   Stop/pause signal input

Operation can be stopped by inputting a stop signal during operation. This also applies for pause signals. However, the same operation will resume if pause is released. The remaining operation can be canceled by inputting a stop signal while paused. Travel complete is not output when stopped by the stop signal. However, if it is stopped by the pause signal and reaches the point before the pause, the point travel complete is output.

• Time chart
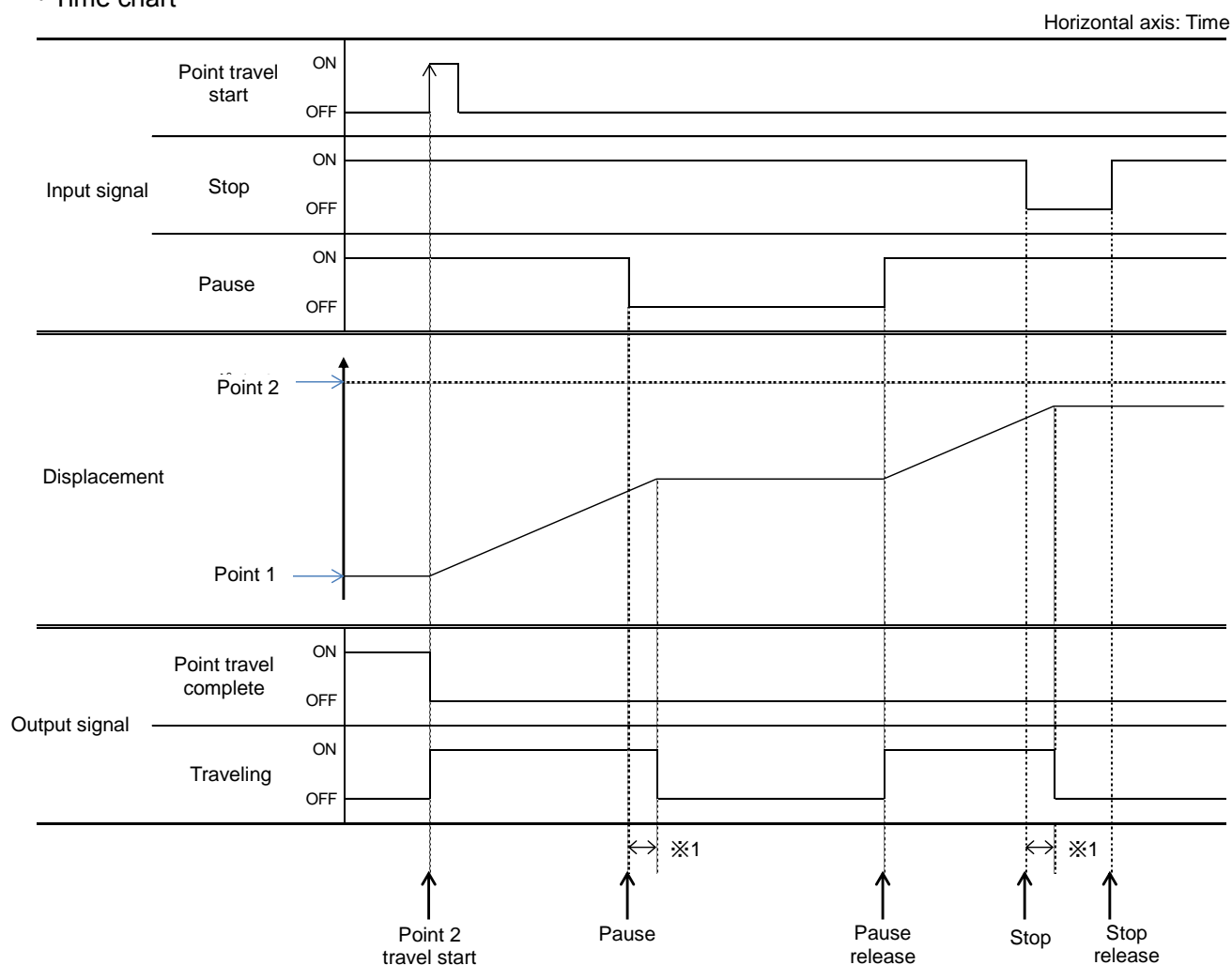
*1. Once the stop/pause signal is input, it decelerates then stops. Confirm stopping using the traveling signal.

7.10 Holding operation after travel complete

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 will be generated and it will switch to the dynamic brake status.

Actuator model			Holding force [kg]	
Model	Body size	Screw lead	When using 24 V power supply	When using 48 V power supply
EBS	04	06	6.6	8.3
		12	2.5	3.3
	05	02	24.0	24.0
		05	16.6	16.6
		10	8.3	8.3
		20	4.5	4.5
	08	05	38.3	40.0
		10	18.3	18.3
		20	10.0	10.0
EBR	04	06	9.1	10.0
		12	4.5	5.0
	05	02	24.0	24.0
		05	15.0	16.6
		10	6.6	10.0
		20	4.1	4.1
	08	05	35.0	38.3
		10	15.0	20.0
		20	8.0	11.6
FLSH	16	H1		
	20	H1		
	25	H1		
FLCR	16	02	4.0	4.0
		08	0.5	0.5
	20	02	6.0	6.0
		08	0.8	0.8
	25	02	8.5	8.5
		06	3.0	3.0
FGRC	10			
	30			
	50			

⚠ 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.

8. TROUBLESHOOTING

8.1　Alarm Indications and Countermeasures

■ Alarms

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	*Issue*	Cause/countermeasure	Reset
0X1000 to 0x1FFF	Memory (read)	*Indicates that an abnormality has been detected while reading data from the memory at power-on.*	If the alarm code is 0x1300 to 0x13FF, there is a problem with the parameters data. Initialize the parameters data and reset the system. If the alarm code is 0x1500 to 0x15FF, there is a problem with the point data. Initialize the point data and reset the system. If the alarm code is 0x1700 to 0x170F, there is a problem with the alarm data. Initialize the alarm data and reset the system. If the alarm code is 0x1800 to 0x180F, there is a problem with the conservation data. Initialize the conservation data and reset the system. If the alarm code is 0x1B00 to 0x1B0F, there is a problem with the actuator information. Save the information of the actuator connected last time with the information of the actuator being connected and reset the system. If the alarm code is none of the above, there is a problem with the internal data. If this reoccurs even after turning the power ON again, contact CKD.	Available
0X2000 to 0x2FFF	Memory (write)	*Indicates that an abnormality has been detected while writing data to the memory when editing data.*	If this reoccurs even after turning the power ON again, contact CKD.	Not available
0x3000 to 0x30FF	Temperature	*Indicates a high temperature inside the controller.*	Check the ambient temperature. If this reoccurs even after turning the power ON again, contact CKD.	Not available
0x3100 to 0x31FF	Current	*Indicates overcurrent in the motor.*	If this reoccurs even after turning the power ON again, contact CKD.	Not available
0x3200 to 0x320FF	Encoder not connected	*Indicates an abnormality in the connection state between the controller and actuator.*	Check the connection state of the cable and connector. If this reoccurs even after turning the power ON again, contact CKD.	Not available
0x3210 to 0x322F	Encoder abnormality	Indicates an abnormality in the position information.	If this reoccurs even after resetting the alarm, contact CKD.	Possible
0x3800 to 0x38FF	TOOL not connected	*Indicates an abnormality in the connector's connection state when used in TOOL mode.*	Check the connection state of the cable and connector. If the connector is disconnected, connect the connector, switch to PLC mode, and then reset the alarm.	Possible
0x3900 to 0x39FF	Interface	*Indicates an error in the interface.*	If this reoccurs even after turning the power ON again, contact CKD.	Not available
0x3A00 to 0x3A0F	Actuator model number abnormality	Indicates that the model numbers of the actuator connected last time and actuator being connected are different when the power is turned ON.	Save the information of the actuator connected last time with the information of the actuator being connected and turn the power ON again.	Not available
0x4000 to 0x40FF	Parameters data	*Indicates an error in the parameters data after the power is turned ON.*	Reconfigure the "soft limit (+)," "soft limit (-)," "home position return speed," "home position offset amount," and "fixed current at stop" parameters, and then reset.	Possible
0x4100 to 0x41FF	Point data (position)	*Indicates an error with the point data for the point No. during point travel command input.*	The final target position exceeds the range of the soft limit. Reconfigure the "position" and "pressing distance" point data, and then reset the alarm.	Possible
0x4200 to 0x42FF	Point data (speed)	*Indicates an error with the point data for the point No. during point travel command input.*	The pressing speed is higher than the speed, or exceeds the setting range. Reconfigure the "speed," "acceleration," "deceleration," and "pressing speed" point data, and then reset the alarm.	Possible
0x4300 to 0x43FF	Point data (pressing)	*Indicates an error with the point data for the point No. during point travel command input.*	It exceeds the point data range. Reconfigure the "pressing current" point data, and then reset the alarm.	Possible
0x4400 to 0x440F	IO-Link data abnormality	Indicates an abnormality in the data setting or IO-Link backup data.	After reconfiguring the data or reconfiguring the data storage function, turn the power ON again.	Not available
0x6000 to 0x60FF	Servo ON	*Indicates an error with the motor excitation encoder data signal, when the servo is first turned ON after turning the power supply ON.*	Check the connection state of the cable and connector connecting the controller and actuator. Confirm that the actuator is not locked, and then reset the alarm.	Possible
0x6100 to 0x61FF	Encoder	*Indicates that the encoder Z phase signal could not be detected during the first operation after turning the power supply ON.*	Check the connection state of the cable and connector connecting the controller and actuator. Confirm that there is no problem, and then reset the alarm.	Possible

Alarm code	Alarm	Issue	Cause/countermeasure	Reset
0x6200 to 0x62FF	Home position return	*Indicates that the home position could not be detected even after traveling a distance greater than the stroke of the actuator during Home position return.*	Check the connection state of the cable and connector connecting the controller and actuator. Confirm that there is no problem, and then reset the alarm.	Possible
0x6400 to 0x64FF	Soft limit over	*Indicates that the current position exceeds the soft limit range during point travel.*	If this occurs due to overshooting when positioning near the soft limit, revise the load conditions and other settings. This also occurs when a point travel command is input outside the soft limit range. In this case, move the actuator by hand within the soft limit range. Confirm that there is no problem, and then reset the alarm.	Possible
0x6500 to 0x65FF	Overload (M)	Indicates that it cannot travel.	Revise the load conditions and operation conditions. Confirm that there is no problem, and then reset the alarm.	Possible
0x6600 to 0x66FF	Overload (P)	Indicates that it has been pushed back to the pressing start position due to an outside force during pressing.	Revise the load conditions and operation conditions. Confirm that there is no problem, and then reset the alarm.	Possible
0x6700 to 0x67FF	Overload (S)	Indicates that it cannot stop.	Revise the load conditions and operation conditions. Confirm that there is no problem, and then reset the alarm.	Possible
0x6800 to 0x68FF	Overload (H)	Indicates that the position has become misaligned when stopping.	Revise the load conditions and operation conditions. Revise the "current when stopped" setting for the parameters data. Confirm that there is no problem, and then reset the alarm.	Possible
0x6900 to 0x69FF	Overload (C)	Indicates overcurrent in the motor.	Revise the load conditions and operation conditions. Confirm that there is no problem, and then reset the alarm.	Possible
0x6A00 to 0x6AFF	Overload (D)	Indicates an error in the position control.	Revise the load conditions and operation conditions. Confirm that there is no problem, and then reset the alarm.	Possible
0x6B00 to 0x6BFF	Overload (T)	Indicates a continuously output excess torque.	Revise the load conditions and operation conditions. Revise the "Torque alarm time" setting for the parameter data. Confirm that there is no problem, and then reset the alarm.	Possible
0x6C00 to 0x6CFF	Home position return (rotary)	Indicates that an excessive load has been detected during a home position return.	Confirm that there is no workpiece colliding in the home position return operation range. Confirm that there is no problem, and then reset the alarm.	Possible
0x7000 to 0x7FFF	Memory (initialization)	Indicates that an abnormality has been detected while initializing the data of the memory when editing data.	If this reoccurs even after turning the power ON again, contact CKD.	Not available

■ Warnings
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	Issue	Cause/countermeasure
0x0100	Calendar initialized	There was an error with the calendar function, so the date setting was initialized.	The internal power supply is disconnected and the date setting could not be retained. Reconfigure the date for the calendar function. The warning will be canceled once reconfiguration is complete.
0x0200	Maintenance data (running distance)	The integrated running distance exceeded the threshold value.	The integrated running distance exceeded the threshold value for the user parameters setting. Reconfigure the threshold value once maintenance has been performed. The warning will be canceled once the threshold value exceeds the integrated running distance.
0x0210	Maintenance data (number of travel times)	The integrated number of travel times exceeded the threshold value.	The integrated number of travel times exceeded the threshold value for the user parameters setting. Reconfigure the threshold value once maintenance has been performed. The warning will be canceled once the threshold value exceeds the integrated number of travel times.
0x0220	Maintenance data (operating time)	The integrated operating time exceeded the threshold value.	The integrated operating time exceeded the threshold value for the user parameters setting. Reconfigure the threshold value once maintenance has been performed. The warning will be canceled once the threshold value exceeds the integrated operating time.

8.2   What to Check when Trouble Occurs

1	Check the light status on the controller.
	  Lit green: Current passed to motor (servo ON)
	  Blinking green: Current not passed to motor (servo OFF)
	  Lit red: Occurrence of alarm which cannot be released
	  Blinking red: Occurrence of alarm which can be released
	  Off: Control power supply shutoff

2	Check whether there is an error on the host controller.
3	Check the voltage of the control power supply (24 VDC or 48 VDC).
4	Check the alarm details. Alarm details can be checked using the S-Tools setting software.
5	Check the I/O status. The I/O status can be checked using the S-Tools setting software.
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.

8.3   Troubleshooting

No.	Issue	Cause	Countermeasure
1	The light on the body does not light up even when the power supply is turned ON.	The wiring is incorrect.	Check the power supply wiring.
		It is disconnected.	Confirm that the wiring is neither pinched nor disconnected. Check the connector and terminal.
		The product has failed or is broken.	It will need to be repaired. Check 8.2 What to Check when Trouble Occurs, and then contact us.
2	The light on the body stays lit red.	An alarm has occurred.	Check the alarm and its cause in 8.1 Alarm Indications and Countermeasures, and then resolve the cause.
		System error.	It will need to be repaired. Check 8.2 What to Check when Trouble Occurs, and then contact us.
3	The operation preparation complete signal is not output.	The emergency stop signal is connected with the a contact.	Connect emergency stop (EMG) wiring to the b contact.
		The wiring is incorrect.	Refer again to "4. Wiring".
4	The PLC signal causes unexpected operation.	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.
		The position/speed/acceleration/pressing force setting is incorrect.	Check the point data details.
		The operation mode setting is incorrect.	Check the "operation mode" details for the parameters.
		The wiring is incorrect.	Refer again to "4. Wiring".
		There is a large amount of load friction.	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.
		The internal resistance of the product increases.	Revise the environmental conditions and working conditions, and check the duration of use (operating distance).
		The actuator body is broken.	It will need to be repaired. Check 8.2 What to Check when Trouble Occurs, and then contact us.
5	The product vibrates.	The actuator fitting is loose.	Tighten the bolts.

No.	Issue	Cause	Countermeasure	
6	The PLC does not move.	It is in TOOL mode.	Use the setting tool to change it to PLC mode.	
		The wiring is incorrect.	Check "4. Wiring."	
		It is disconnected.	Confirm that the wiring is neither pinched nor disconnected. Check the connector and terminal.	
		An overload error has occurred.	Recheck the transport load and speed.	
		The power supply capacity is insufficient.	Confirm that the power supply capacity satisfies the required voltage and current.	
7	The work moves under its own weight during emergency stop.	The servo turns OFF during emergency stop.	Brakeless specification	Use a type with brake.
			Brake is forcibly released	Turn force release OFF for the brake.
		A load exceeding the holding force operates.	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.	
8	Positioning complete output does not turn OFF.	The positioning complete output width is too large for the travel distance.	Check the "positioning width" for the point data.	
9	Unable to perform pushing operation.	It is not set to pushing operation.	Check the "operation method" for the point data.	
10	It loses synchronization.	The load or speed is excessive.	Confirm that the workpiece weight and operation speed satisfy specification values. Perform gain adjustment.	
12	It does not speed up (it runs very slow).	It is set to pushing/operation instead of standard transport operation.	Check the "operation method" for the point data. Perform gain adjustment.	
13	It overshoots.	The transport weight is heavy or the deceleration is high.	Confirm that the workpiece weight and operation speed satisfy specification values. Use a smaller deceleration value. Perform gain adjustment.	
14	It does not reach the target takt.	The acceleration or speed setting is incorrect.	Check the "acceleration" and "speed" for the point data.	

9. EUROPEAN STANDARDS

When using this product in compliance with European standards, carefully read this chapter and use the product accordingly.
Products with CE marks are compliant with European standards. Products without CE marks are not compliant with European standards.
This product is provided as a part for use integrated in the customer's equipment. The CE mark attached to the product itself indicates that the product is compliant with EMC directives under limited conditions by CKD. If you plan to integrate this product into your completed equipment and ship or use the final product within Europe, you must confirm the compliance of the final product with EU directives.

9.1   EU command/European standards

EMC Directive: 2014/30/EU
             EN61000-6-2:2005
             EN 55011: 2009+A1: 2010(Group 1 Class A)

RoHS Directive: 2011/65/EU and (EU)2015/863
             EN 50581:2012

9.2   Precautions when used in Europe (EU)

9.2.1 Suitable actuators

Combinations of controller model Nos. and suitable actuators are listed below.

Controller model No.	Suitable actuator
ECR Series	EBS Series
	EBR Series
	FLSH Series
	FLCR Series
	FGRC Series

9.2.2 Working environment

Condition	Temperature	Humidity
During use	0 to 40°C (no freezing)	35 to 80% RH (no condensation)
During storage	-10 to 50°C (no freezing)	35 to 80% RH (no condensation)
During transport	-10 to 50°C (no freezing)	35 to 80% RH (no condensation)

9.2.3 Installation method

The following figure shows how to install this product (EBS series/EBR series) in compliance with European standards.
A surge protector and ferrite core are required to comply with European standards.
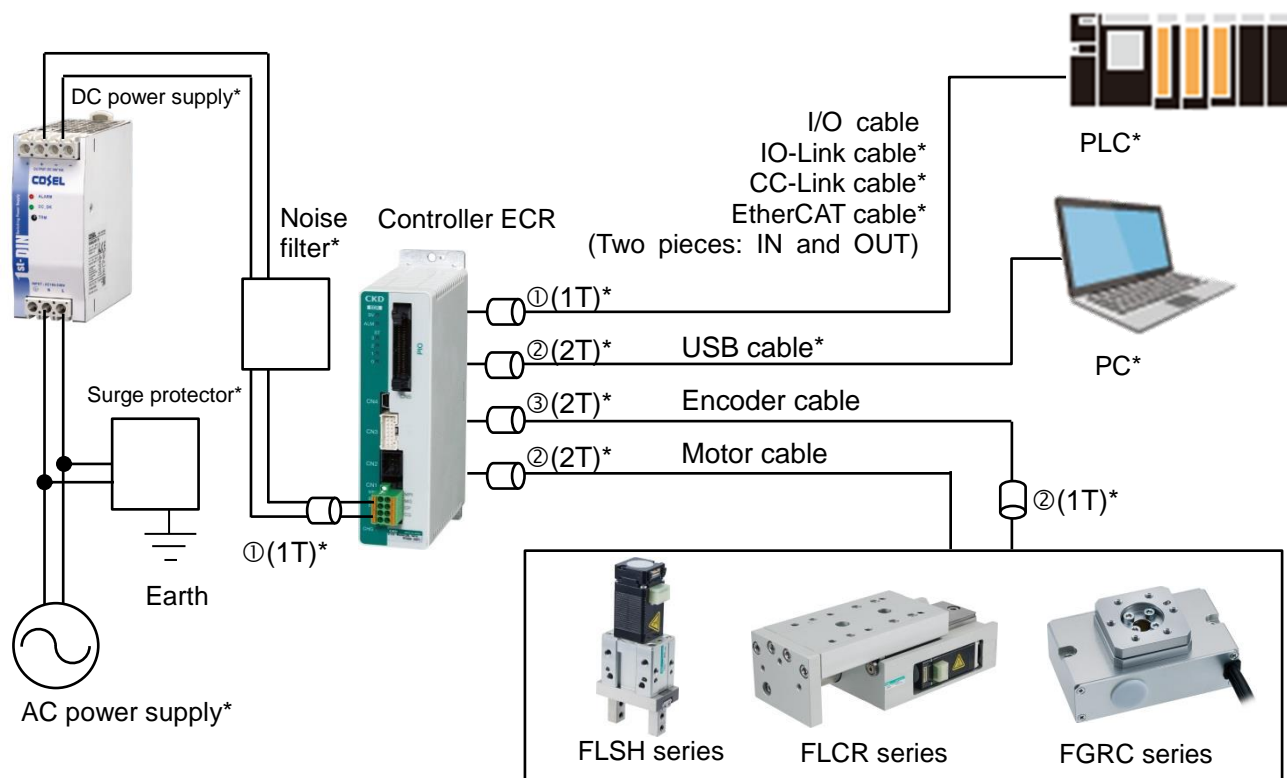
<EMC countermeasure example (EBS series/EBR series)>

Devices and cables indicated with an asterisk (*) are not supplied with the product.
As for motor cables, encoder cables and I/O cables, dedicated cables are attached.

Part used	Model	Maker
Surge protector	R-A-V-781BXZ-4	Manufactured by OKAYA ELECTRIC INDUSTRIES CO., LTD.
	R-A-V-781BWZ-4	
	RSPD-250-Q4	
	RSPD-250-U4	
Ferrite core ①	E04SR301334	Manufactured by SEIWA ELECTRIC MFG CO., LTD.
Ferrite core ②	RFC-H13	Manufactured by KITAGAWA INDUSTRIES CO., LTD.
Ferrite core ③	RFC-20	Manufactured by KITAGAWA INDUSTRIES CO., LTD.

The following figure shows how to install this product (FLSH series/FLCR series/FGRC series) in compliance with European standards.
A surge protector, noise protector and ferrite core are required to comply with European standards.

<EMC countermeasure example (FLSH series/FLCR series/FGRC series)>

Devices and cables indicated with an asterisk (*) are not supplied with the product.
As for motor cables, encoder cables and I/O cables, dedicated cables are attached.

Part used	Model	Maker
Surge protector	R-A-V-781BXZ-4	Manufactured by OKAYA ELECTRIC INDUSTRIES CO., LTD.
	R-A-V-781BWZ-4	
	RSPD-250-Q4	
	RSPD-250-U4	
Noise filter (single phase 15 A)	NF2015A-OD	SOSHIN ELECTRIC CO., LTD.
Ferrite core ①	E04SR301334	Manufactured by SEIWA ELECTRIC MFG CO., LTD.
Ferrite core ②	RFC-H13	Manufactured by KITAGAWA INDUSTRIES CO., LTD.
Ferrite core ③	RFC-20	Manufactured by KITAGAWA INDUSTRIES CO., LTD.

10. WARRANTY PROVISIONS

10.1 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.

10.2 Warranty Period

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

10.3 Remarks

• Warranty period specified in 10.2 is based on the assumption that the product is operated for not more than eight (8) hours a day. If the product reaches the end of its service life within one (1) year, the warranty shall expire at that time.
• If the product is exported outside Japan by the customer, it shall be repaired if returned to CKD's facility or a company or plant specified by CKD. Work and cost associated with the return shall not be covered by the warranty. The repaired product shall be delivered to a place in Japan specified by the customer in a package appropriate for delivery in Japan.